DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B1030-11	B1030-11 - EVAPORATOR TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND
B1030-12	B1030-12 - EVAPORATOR TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY
B1058-11	B1058-11 - RECIRCULATION DOOR CONTROL-CIRCUIT SHORT TO GROUND
B1058-12	B1058-12 - RECIRCULATION DOOR CONTROL-CIRCUIT SHORT TO BATTERY
B1058-13	B1058-13 - RECIRCULATION DOOR CONTROL-CIRCUIT OPEN
B1058-92	B1058-92 - RECIRCULATION DOOR CONTROL-PERFORMANCE OR INCORRECT OPERATION
B105C-00	B105C-00 - RECIRCULATION DOOR TRAVEL RANGE TOO SMALL-
B105D-00	B105D-00 - RECIRCULATION DOOR TRAVEL RANGE TOO LARGE-
B106A-01	B106A-01 - REAR DEFROST EBL CONTROL CIRCUIT-GENERAL ELECTRICAL FAILURE
B10B2-00	B10B2-00 - AC COOL DOWN TEST PERFORMANCE-
B10E8-12	B10E8-12 - BLOWER MOTOR CONTROL-CIRCUIT SHORT TO BATTERY
B10E8-14	B10E8-14 - BLOWER MOTOR CONTROL-CIRCUIT SHORT TO GROUND OR OPEN
B10EB-00	B10EB-00 - BLOWER POWER MODULE
B1107-11	B1107-11 - CABIN TEMPERATURE SENSOR 1-CIRCUIT SHORT TO GROUND
B1107-12	B1107-12 - CABIN TEMPERATURE SENSOR 1-CIRCUIT SHORT TO BATTERY
B11C2-11	B11C2-11 - FRONT MODE DOOR 1 CONTROL-CIRCUIT SHORT TO GROUND
B11C2-12	B11C2-12 - FRONT MODE DOOR 1 CONTROL-CIRCUIT SHORT TO BATTERY
B11C2-13	B11C2-13 - FRONT MODE DOOR 1 CONTROL-CIRCUIT OPEN
B11C2-92	B11C2-92 - FRONT MODE DOOR 1 CONTROL-PERFORMANCE OR INCORRECT OPERATION
B11C3-00	B11C3-00 - FRONT MODE DOOR 1 TRAVEL RANGE TOO SMALL-
B11C4-00	B11C4-00 - FRONT MODE DOOR 1 TRAVEL RANGE TOO LARGE-
B11C7-00	B11C7-00 FRONT MODE DOOR 2 TRAVEL RANGE TOO LARGE
B11C8-11	B11C8-11 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT SHORT TO GROUND
B11C8-12	B11C8-12 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT SHORT TO BATTERY
B11C8-13	B11C8-13 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT OPEN
B11C8-92	B11C8-92 - RIGHT TEMPERATURE DOOR CONTROL-PERFORMANCE OR INCORRECT OPERATION
B11C9-00	B11C9-00 - RIGHT TEMPERATURE DOOR TRAVEL TOO SMALL-
B11CA-00	B11CA-00 - RIGHT TEMPERATURE DOOR TRAVEL TOO LARGE-

DTC	Description
B11CB-11	B11CB-11 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT SHORT TO GROUND
B11CB-12	B11CB-12 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT SHORT TO BATTERY
B11CB-13	B11CB-13 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT OPEN
B11CB-92	B11CB-92 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-PERFORMANCE OR INCORRECT OPERATION
B11CC-00	B11CC-00 - MAIN-LEFT TEMPERATURE DOOR 1 TRAVEL TOO SMALL-
B11CD-00	B11CD-00 - MAIN-LEFT TEMPERATURE DOOR 1 TRAVEL TOO LARGE-
B11D3-00	B11D3-00 - AC COOL DOWN TEST PERFORMANCE - COMPRESSOR CLUTCH NOT ENGAGED-
B11D5-00	B11D5-00 - AC COOL DOWN TEST PERFORMANCE - EVAP TEMP SENOR ERROR-
B11F0-11	B11F0-11 - LEFT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND
B11F0-15	B11F0-15 - LEFT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
B11F1-11	B11F1-11 - RIGHT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND
B11F1-15	B11F1-15 - RIGHT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
B11F2-11	B11F2-11 - LEFT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND
B11F2-15	B11F2-15 - LEFT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
B11F3-11	B11F3-11 - RIGHT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND
B11F3-15	B11F3-15 - RIGHT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN
B11FE-11	B11FE-11 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT SHORT TO GROUND
B11FE-12	B11FE-12 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT SHORT TO BATTERY
B11FE-13	B11FE-13 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT OPEN
B1600-11	B1600-11 - LEFT SOLAR SENSOR-CIRCUIT SHORT TO GROUND
B1600-12	B1600-12 - LEFT SOLAR SENSOR-CIRCUIT SHORT TO BATTERY
B1603-11	B1603-11 - RIGHT SOLAR SENSOR-CIRCUIT SHORT TO GROUND
B1603-12	B1603-12 - RIGHT SOLAR SENSOR-CIRCUIT SHORT TO BATTERY
B160F-11	B160F-11 - TWILIGHT-AMBIENT LIGHT SENSOR INPUT-CIRCUIT SHORT TO GROUND
B160F-12	B160F-12 - TWILIGHT-AMBIENT LIGHT SENSOR INPUT-CIRCUIT SHORT TO BATTERY
B2111-16	B2111-16 - 5 VOLT SUPPLY-CIRCUIT VOLTAGE BELOW THRESHOLD
B2111-17	B2111-17 - 5 VOLT SUPPLY-CIRCUIT VOLTAGE ABOVE THRESHOLD
B2199-16	B2199-16 - BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
B2199-17	B2199-17 - BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
B21DD-84	B21DD-84 - SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
B21DD-85	B21DD-85 - SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
B222A-00	B222A-00 - VEHICLE LINE MISMATCH
B22A9-00	ECU INTERNAL PERFORMANCE

DTC	Description
U0010-00	CAN INTERIOR BUS
U0011-00	CAN INTERIOR BUS OFF PERFORMANCE
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0157-00	U0157-00 - LOST COMMUNICATION WITH REAR CABIN COMFORT CONTROL MODULE
U0165-00	LOST COMMUNICATION WITH REAR HVAC CONTROL MODULE
U0184-00	LOST COMMUNICATION WITH RADIO
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
U0458-00	IMPLAUSIBLE DATA RECIEVED FROM ELECTRONIC OVERHEAD MODULE - REAR
U0466-00	IMPLAUSIBLE DATA RECIEVED FROM HVAC CONTROL MODULE - REAR
U0485-00	IMPLAUSIBLE DATA RECEIVED FROM RADIO
U11B8-00	U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)
U11BB-00	LOST COMMUNICATION WITH VIDEO ROUTING MODULE
U1480-00	IMPLAUSIBLE DATA RECEIVED FROM INTEGRATED CENTER STACK
U1519-00	IMPLAUSIBLE DATA RECEIVED FROM VIDEO ROUTING MODULE

DTC TROUBLESHOOTING

B11F1-11 - RIGHT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C130) Right Floor Temperature Sensor Signal circuit is less than 0.097 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
RIGHT FLOOR DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

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

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE RIGHT FLOOR DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **CHECK THE RIGHT FLOOR DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Right Floor Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

Yes

- Go To 6

No

- Replace the Right Floor Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

        Repair any conditions that are found.

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F1-15 - RIGHT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C130) Right Floor Temperature Sensor Signal circuit is above 4.9 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C919) TEMP SENSOR COMMON RETURN CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT FLOOR DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.

3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE RIGHT FLOOR DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
   1. Turn the ignition off.
   2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C130) RIGHT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C919) TEMP SENSOR COMMON RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **CHECK THE RIGHT FLOOR DUCT TEMPERATURE SENSOR**

   TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

   1. Disconnect the Right Floor Duct Temperature Sensor harness connector.
   2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
   3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
   4. Compare the resistance reading to the Temperature vs. Resistance table.

      Is the resistance within specification for the temperature?

      Yes

      - Go To 7

      No

      - Replace the Right Floor Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
      - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F2-11 - LEFT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C162) Left Panel Temperature Sensor Signal circuit is less than 0.097 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
LEFT PANEL DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE LEFT PANEL DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3

3. **ISOLATE AND CHECK THE (C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 4
4. **ISOLATE AND CHECK THE (C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 5
5. **CHECK THE LEFT PANEL DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Left Panel Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 6

   No

   - Replace the Left Panel Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

      Repair any conditions that are found.
   5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F2-15 - LEFT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C162) Left Panel Temperature Sensor Signal circuit is above 4.9 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C919) TEMP SENSOR COMMON RETURN CIRCUIT OPEN OR HIGH RESISTANCE
LEFT PANEL DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to TESTING FOR AN INTERMITTENT CONDITION .
2. **CHECK THE CONDITION OF THE LEFT PANEL DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to HVAC VERIFICATION TEST .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C162) LEFT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C919) TEMP SENSOR COMMON RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **CHECK THE LEFT PANEL DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Left Panel Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 7

   No

   - Replace the Left Panel Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .

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

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

      Repair any conditions that are found.

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

      Did the DTC return?

      Yes

      - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
      - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

      No

      - The wiring or poor connection problem has been repaired.
      - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F3-11 - RIGHT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C134) Right Panel Temperature Sensor Signal circuit is less than 0.097 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
RIGHT PANEL DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE RIGHT PANEL DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **CHECK THE RIGHT PANEL DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Right Panel Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 6

   No

   - Replace the Right Panel Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

6. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F3-15 - RIGHT PANEL DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C134) Right Panel Temperature Sensor Signal circuit is above 4.9 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C919) TEMP SENSOR COMMON RETURN CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT PANEL DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE RIGHT PANEL DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3

3. **ISOLATE AND CHECK THE (C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 4

    No

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

4. **ISOLATE AND CHECK THE (C134) RIGHT PANEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C919) TEMP SENSOR COMMON RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **CHECK THE RIGHT PANEL DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω

Temperature	Resistance
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Right Panel Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 7

   No

   - Replace the Right Panel Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

      Repair any conditions that are found.
   5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
   6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
   7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
   8. With the scan tool, erase DTCs.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11FE-11 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The compressor of this air conditioning system is the variable displacement type, with electric clutch engagement and external control of the displacement, via the External Control Variable Displacement (ECVD) valve. The compressors are specific for engine version and market.

The Heating, Ventilation, and Air Conditioning (HVAC) module manages the ECVD valve to increase or decrease the compressor displacement and thus the system pressure, via Pulse Width Modulation (PWM) control. External regulation of the displacement improves comfort, operation of the air conditioning system and saves the energy requested by the climate control system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- A/C compressor is commanded on.

SET CONDITION

- The HVAC Module detects a short to ground on the (C27) A/C Compressor Control circuit for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid current draw, the DTC will change from Active to Stored and will stay in the controller memory for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO GROUND
A/C COMPRESSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **ISOLATE AND CHECK THE (C27) A/C COMPRESSOR CONTROL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 3
3. **DISCONNECT A/C COMPRESSOR (VARIABLE DISPLACEMENT SOLENOID) CONNECTOR AND CHECK FOR THE DTC TO RETURN**
    1. Connect the HVAC Module harness connector.
    2. With the scan tool, erase DTCs.
    3. A/C Compressor (Variable Displacement) Solenoid harness connector should remain disconnected.

4. Start the engine.
5. Operate the HVAC system so the A/C compressor would be commanded on.
6. With the scan tool, read DTCs

Did the DTC return?

Yes

- Go To 4

No

- Replace the A/C Compressor in accordance with the Service Information. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

        Repair any conditions that are found.

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to HVAC VERIFICATION TEST .

B11FE-12 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The compressor of this air conditioning system is the variable displacement type, with electric clutch engagement and external control of the displacement, via the External Control Variable Displacement (ECVD) valve. The compressors are specific for engine version and market.

The Heating, Ventilation, and Air Conditioning (HVAC) module manages the ECVD valve to increase or decrease the compressor displacement and thus the system pressure, via Pulse Width Modulation (PWM) control. External regulation of the displacement improves comfort, operation of the air conditioning system and saves the energy requested by the climate control system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- A/C Compressor is commanded on.

SET CONDITION

- The HVAC Module detects a short voltage on the (C27) A/C Compressor Control circuit for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from Active to Stored and will stay in the controller memory for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(C27) A/C COMPRESSOR CONTROL CIRCUIT SHORTED TO ANOTHER CIRCUIT
A/C COMPRESSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.

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

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **ISOLATE AND CHECK THE (C27) A/C COMPRESSOR CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 3

No

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

3. **ISOLATE AND CHECK THE (C27) A/C COMPRESSOR CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 4

4. **CONNECT A JUMPER WIRE BETWEEN THE (C27) A/C COMPRESSOR CONTROL CIRCUIT AND GROUND AND CHECK FOR THE SAME DTC TO RETURN**
    1. Connect a jumper wire between the (C27) A/C Compressor Control circuit and a known good ground.
    2. Connect the HVAC Module harness connector.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off.
    5. Start the engine.
    6. Operate the HVAC system so the A/C Compressor would be commanded on.
    7. With the scan tool, read DTCs

    Did the DTC return?

    Yes

    - Go To 5

    No

    - Replace the A/C Compressor in accordance with the Service Information. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
5. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11FE-13 - VARIABLE AC COMPRESSOR CONTROL-CIRCUIT OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The compressor of this air conditioning system is the variable displacement type, with electric clutch engagement and external control of the displacement, via the External Control Variable Displacement (ECVD) valve. The compressors are specific for engine version and market.

The Heating, Ventilation, and Air Conditioning (HVAC) module manages the ECVD valve to increase or decrease the compressor displacement and thus the system pressure, via Pulse Width Modulation (PWM) control. External regulation of the displacement improves comfort, operation of the air conditioning system and saves the energy requested by the climate control system.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- The A/C Compressor is commanded on.

SET CONDITION

- Current on the (C27) A/C Compressor Control circuit is monitored by the HVAC Module. If the current drops below a calibrated amount for more than 2 seconds, this DTC sets.

DEFAULT ACTION

- If the HVAC Module detects a valid current draw, the DTC will change from Active to Stored and will stay in the controller memory for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C27) A/C COMPRESSOR CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
A/C COMPRESSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **ISOLATE AND CHECK THE (C27) A/C COMPRESSOR CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 3

No

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

3. **CONNECT A JUMPER WIRE BETWEEN GROUND AND THE (C27) A/C COMPRESSOR CONTROL CIRCUIT AND CHECK FOR THE DTC TO RETURN**
    1. The HVAC Module harness connector should be connected.
    2. With the scan tool, erase DTCs.
    3. Turn the ignition off.
    4. A/C Compressor (Variable Displacement) Solenoid harness connector should be disconnected.
    5. Connect a jumper wire between ground and the (C27) A/C Compressor Control circuit at the A/C Compressor Solenoid harness connector.
    6. Start the engine.
    7. Operate the HVAC system so the A/C compressor would be commanded on.
    8. With the scan tool, read DTCs

    Did the DTC for a short to ground on the Variable A/C Compressor Control Circuit set?

    Yes

    - Replace the A/C Compressor in accordance with the Service Information. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 4

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

        Repair any conditions that are found.
    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1600-11 - LEFT SOLAR SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (G39) Sun Sensor Signal 1 circuit is less than 0.195 volt for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(G39) SUN SENSOR SIGNAL 1 CIRCUIT SHORTED TO GROUND
(G39) SUN SENSOR SIGNAL 1 CIRCUIT SHORTED TO ANOTHER CIRCUIT
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (G39) SUN SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector**

terminals.

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (G39) SUN SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
   2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 6

No

- Replacing the Sun Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1600-12 - LEFT SOLAR SENSOR-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (G39) Sun Sensor Signal 1 circuit is above 4.79 volts for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(G39) SUN SENSOR SIGNAL 1 CIRCUIT OPEN OR HIGH RESISTANCE
(G39) SUN SENSOR SIGNAL 1 CIRCUIT SHORTED TO ANOTHER CIRCUIT
SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (G39) SUN SENSOR SIGNAL 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 4

    No

    - Repair the circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
4. **ISOLATE AND CHECK THE (G39) SUN SENSOR SIGNAL 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (G939) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
    2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Sun Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1603-11 - RIGHT SOLAR SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (G139) Sun Sensor Signal 2 circuit is less than 0.195 volt for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(G139) SUN SENSOR SIGNAL 2 CIRCUIT SHORTED TO GROUND
(G139) SUN SENSOR SIGNAL 2 CIRCUIT SHORTED TO ANOTHER CIRCUIT
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (G139) SUN SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (G139) SUN SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.

4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
   2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 6

No

- Replacing the Sun Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1603-12 - RIGHT SOLAR SENSOR-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (G139) Sun Sensor Signal 2 circuit is above 4.79 volts for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(G139) SUN SENSOR SIGNAL 2 CIRCUIT OPEN OR HIGH RESISTANCE
(G139) SUN SENSOR SIGNAL 2 CIRCUIT
SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (G139) SUN SENSOR SIGNAL 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (G139) SUN SENSOR SIGNAL 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (G939) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
    2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Sun Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B160F-11 - TWILIGHT-AMBIENT LIGHT SENSOR INPUT-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (L24) Auto Headlamps Signal circuit is less than 0.195 volt for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO GROUND
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

- Go To 3

3. **ISOLATE AND CHECK THE (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**

1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 6

No

- Replacing the Sun Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

       Repair any conditions that are found.

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

        Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B160F-12 - TWILIGHT-AMBIENT LIGHT SENSOR INPUT-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module monitors the Sun (Solar) Sensors to calculate the sun load being subjected to the vehicle interior. The BCM monitors the Twilight Sensor to detect the ambient light conditions.

Sun Sensors: Most Sun Sensors are the photodiode type, which provide increased resistance as the light intensity increases, so the signal from the sensor drops as the sun shines brighter. The operating range is between 0 and 5 volts. As the sun load increases, the voltage decreases. The signal is sent to the HVAC Module to adjust blend doors and fan speed. Bright sunlight conditions can result in the fan speed increasing, and blend doors opening to improve cooling. Sun Sensors do not respond to fluorescent light, which is read as darkness.

Twilight Sensor: This sensor uses a photoelectric cell to determine the ambient lighting conditions so the BCM can determine when the headlights should be turned on or off. A photocell generates electricity when it is subjected to light. The Twilight Sensor can detect solar lighting as well as florescent lighting. This allows the BCM to turn the headlights on when traveling through a tunnel or parking garage with low lighting conditions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (L24) Auto Headlamps Signal circuit is above 4.79 volts for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
SENSOR GROUND CIRCUIT OPEN OR HIGH RESISTANCE
SUN SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

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

1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE SUN SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (G939) SENSOR GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE SUN SENSOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Sun Sensor in accordance with the Service Information. Refer to **SENSOR, SUN, REMOVAL AND INSTALLATION** .
    2. Connect the Sun Sensor, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 7

    No

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

        Repair any conditions that are found.
    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B2111-16 - 5 VOLT SUPPLY-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The (F710) 5V Reference Signal circuit voltage is less than 4.5 volts for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
LEFT BLEND DOOR ACTUATOR
RIGHT BLEND DOOR ACTUATOR
FRONT MODE DOOR ACTUATOR
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.

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

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE LEFT BLEND DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
   1. Disconnect the component harness connector.
   2. Ensure the ignition is on.
   3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage above 4.8 volts?

Yes

- Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE RIGHT BLEND DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
   1. Disconnect the component harness connector.
   2. Ensure the ignition is on.
   3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage above 4.8 volts?

Yes

- Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 4

4. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE FRONT MODE DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
   1. Disconnect the component harness connector.
   2. Ensure the ignition is on.
   3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage above 4.8 volts?

Yes

- Replace the Mode Door Actuator in accordance with the Service Information.

  Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 5

5. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE RECIRCULATION DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
   1. Disconnect the component harness connector.
   2. Ensure the ignition is on.
   3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage above 4.8 volts?

Yes

- Replace the Recirculation Door Actuator in accordance with the Service Information.

  Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 6

6. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B2111-17 - 5 VOLT SUPPLY-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.

- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The (F710) 5V Reference Signal circuit voltage is more than 5.5 volts for more than 2 seconds.

POSSIBLE CAUSES

Possible Causes
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO VOLTAGE
LEFT BLEND DOOR ACTUATOR
RIGHT BLEND DOOR ACTUATOR
FRONT MODE DOOR ACTUATOR
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to TESTING FOR AN INTERMITTENT CONDITION .
2. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE LEFT BLEND DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
    1. Disconnect the component harness connector.
    2. Ensure the ignition is on.
    3. Measure voltage on the circuit at the component harness connector.

    NOTE: **Leave the component disconnected for the remainder of this procedure.**

    Is the voltage below 5.2 volts?

    Yes

- Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE RIGHT BLEND DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
    1. Disconnect the component harness connector.
    2. Ensure the ignition is on.
    3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage below 5.2 volts?

Yes

- Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 4

4. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE FRONT MODE DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
    1. Disconnect the component harness connector.
    2. Ensure the ignition is on.
    3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage below 5.2 volts?

Yes

- Replace the Mode Door Actuator in accordance with the Service Information.

  Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 5

5. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT VOLTAGE WITH THE RECIRCULATION DOOR ACTUATOR HARNESS CONNECTOR DISCONNECTED**
    1. Disconnect the component harness connector.
    2. Ensure the ignition is on.
    3. Measure voltage on the circuit at the component harness connector.

NOTE: **Leave the component disconnected for the remainder of this procedure.**

Is the voltage below 5.2 volts?

Yes

- Replace the Recirculation Door Actuator in accordance with the Service Information.

  Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .

No

- Go To 6

6. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

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

   Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B2199-16 - BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (A231) Fused B(+) circuit is less than 9.5 volts for more than 15 seconds.

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND OR POWERTRAIN CONTROL MODULE (PCM)
(A231) FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
(Z912) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)**
    1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCs.

    Are any Battery or Charging System DTCs set?

    Yes

    - Perform PCM DTC diagnostic procedure(s). or BCM DTC diagnostic procedures. Refer to . Refer to **DIAGNOSIS AND TESTING** .

    No

    - Go To 3
3. **CHECK THE (A231) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the applicable Electronic Control Unit (ECU) harness connector.
    2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the ECU harness connector. **Note:** refer to (A) in the diagram below.
    3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.

4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit ry.

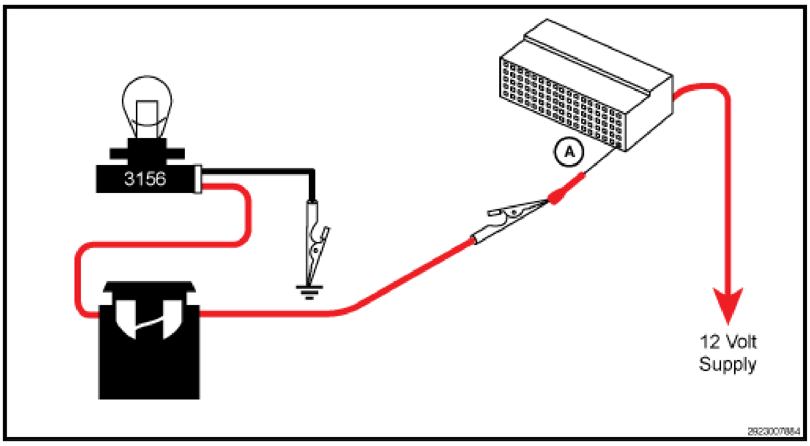
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to STANDARD PROCEDURE .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a Digital Volt-Ohm Meter (DVOM) to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the LOAD TESTING A BATTERY OR IGNITION FEED CIRCUIT for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to STANDARD PROCEDURE .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To 4

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the HVAC VERIFICATION TEST. Refer to HVAC VERIFICATION TEST .

4. **CHECK THE (Z912) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the component harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuit ry.

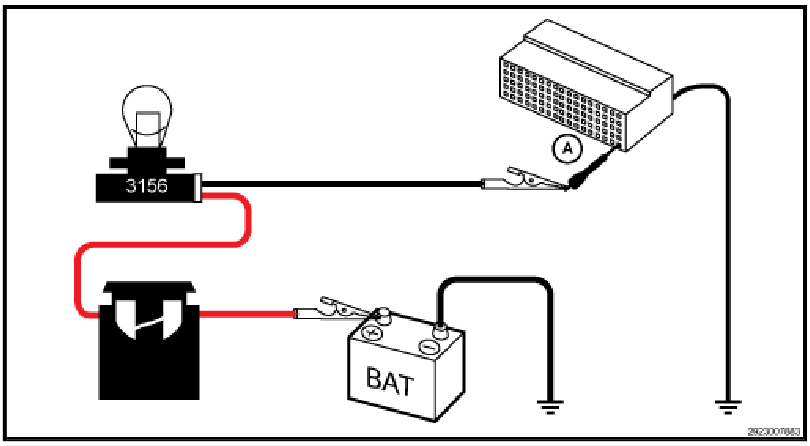
NOTE: Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the LOAD TESTING A GROUND CIRCUIT procedure in CIRCUIT VOLTAGE DROP AND LOAD TESTING PROCEDURES for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to STANDARD PROCEDURE .

NOTE: A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.

NOTE: Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:

- 1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.
- 2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.
- 3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the LOAD TESTING A GROUND CIRCUIT procedure for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to STANDARD PROCEDURE .



NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

NOTE: Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.

Is the load test bulb illuminated and bright?

Yes

- Go To 5

No

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

5. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B2199-17 - BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on for 5 seconds.

SET CONDITION

- The HVAC Module Fused B(+) circuit voltage is above 16.0 volts for more than 15 seconds.

POSSIBLE CAUSES

Possible Causes
BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND OR POWERTRAIN CONTROL MODULE (PCM)
HVAC MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**
    1. With the scan tool, read DTCs and record on the repair order.
    2. Record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    5. With the scan tool, read HVAC Module DTCs.

       Did the DTC return?

       Yes

       - Go To 2

       No

       - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK FOR BATTERY OR CHARGING SYSTEM RELATED DTCS IN THE BODY CONTROL MODULE (BCM) AND POWERTRAIN CONTROL MODULE (PCM)**
    1. With the scan tool, check the BCM and PCM for Battery and Charging System DTCs.

       Are any Battery or Charging System DTCs set?

       Yes

       - Perform PCM DTC diagnostic procedure(s). or BCM DTC diagnostic procedures. Refer to . Refer to **DIAGNOSIS AND TESTING** .

       No

       - Go To 3

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B21DD-84 - SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- A message was received over the Controller Area Network (CAN) bus indicating the vehicle system voltage is less than 10.0 volts for more than 15 seconds.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)
BATTERY OR CHARGING SYSTEM FAULT

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

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**
    1. With the scan tool, read DTCs and record on the repair order.
    2. Record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    5. With the scan tool, read HVAC Module DTCs.

        Did the DTC return?

        Yes

        - Go To 2

        No

        - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **LOW VOLTAGE MESSAGE RECEIVED FROM CONTROLLER AREA NETWORK (CAN) BUS**

NOTE: **This DTC indicates that a message was received over the CAN bus indicating the vehicle system voltage is too low.**

1. Refer to the recorded DTCs.

   Are any battery or charging system related DTCs set in the Powertrain Control Module (PCM)?

   Yes

   - Perform PCM DTC diagnostic procedure(s). Refer to the appropriate service information .

   No

   - Perform the BATTERY SYSTEM DIAGNOSIS AND TESTING and CHARGING SYSTEM DIAGNOSIS AND TESTING procedures. and. Refer to the appropriate service information . .

B21DD-85 - SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The battery voltage supply circuit to the Electronic Control Unit (ECU) is monitored to ensure the proper voltage range is supplied to operate the ECU within its design limits. Vehicle system voltage is also monitored by the ECU through the Controller Area Network (CAN).

If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is normal, the problem is most likely with the ECU battery supply circuit or ground circuit. If the battery supply circuit voltage is out of range and the vehicle system voltage message received over CAN is also out of range, the problem is most likely with the vehicle battery/charging system.

The Ignition voltage supply circuit is used to "wake" the ECU when the vehicle ignition is turned on. This circuit is typically not monitored for voltage supply issues. If the Ignition supply circuit is below a certain voltage, the ECU will not "wake" and therefore cannot set voltage DTCs. Other ECUs in the vehicle will however set lost communication DTCs since the ECU will not be communicating on the CAN.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on.

SET CONDITION

- A message was received over the Controller Area Network (CAN) bus indicating the vehicle system voltage is above 16.0 volts for more than 15 seconds.

POSSIBLE CAUSES

Possible Causes
RELATED CHARGING SYSTEM DTCS PRESENT IN THE POWERTRAIN CONTROL MODULE (PCM)
BATTERY OR CHARGING SYSTEM FAULT

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

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**
   1. With the scan tool, read DTCs and record on the repair order.

2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read HVAC Module DTCs.

   Did the DTC return?

   Yes

   - Go To 2

   No

   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **HIGH VOLTAGE MESSAGE RECEIVED FROM CONTROLLER AREA NETWORK (CAN) BUS**

   NOTE: **This DTC indicates that a message was received over the CAN bus indicating the vehicle system voltage is too high.**

   1. Refer to the recorded DTCs.

      Are any battery or charging system related DTCs set in the Powertrain Control Module (PCM)?

      Yes

      - Perform PCM DTC diagnostic procedure(s). Refer to the appropriate service information .

      No

      - Perform the BATTERY SYSTEM DIAGNOSIS AND TESTING and CHARGING SYSTEM DIAGNOSIS AND TESTING procedures. and. Refer to the appropriate service information . .

B222A-00 - VEHICLE LINE MISMATCH

THEORY OF OPERATION

This Electronic Control Unit (ECU) compares the vehicle configuration stored in memory with the configuration information transmitted on the Controller Area Network (CAN) by other ECUs. If the vehicle configuration stored in memory does not match the information transmitted on the CAN, this DTC will set.

If the vehicle was recently repaired before this DTC was set, check that the ECU was programmed correctly and that the correct parts were installed on the vehicle.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Vehicle configuration stored in the HVAC Module does not match the configuration in another Electronic Control Unit (ECU).

POSSIBLE CAUSES

Possible Causes
CONTROLLER AREA NETWORK (CAN) COMMUNICATION DTCS PRESENT
VEHICLE CONFIGURATION NOT STORED IN THE BODY CONTROL MODULE (BCM)
VEHICLE CONFIGURATION NOT STORED IN THE HVAC MODULE
CONTROL MODULE INSTALLED IN WRONG VEHICLE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **CHECK THE VEHICLE CONFIGURATION**

   NOTE: **The DTC must be active and no BUS communication DTCs present before performing this test. If CAN communication DTCs are present, perform there respective test first. If the DTC is stored, erase the DTC and cycle the ignition. If the DTC resets and changes to active, then proceed.**

   1. With the scan tool, check the vehicle configuration stored in the Body Control Module (BCM).
   2. With the scan tool, check the vehicle configuration stored in the HVAC Module.

   Pick the answer that best describes your findings:

   BCM has wrong or no vehicle configuration.

   - With the scan tool, program the proper vehicle configuration in the BCM.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

   HVAC has wrong vehicle configuration but BCM has correct configuration.

   - Go To 2

   HVAC and BCM have proper calibration and the DTC is active in the HVAC.

   - Check if other modules such as the Powertrain Control Module (PCM) have the wrong configuration stored in the controller and reprogram or replace as necessary. If all other modules show the proper configuration, replace and program the HVAC Module in accordance with the Service Information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
2. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B22A9-00-ECU INTERNAL PERFORMANCE

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The HVAC Module detects an internal problem.

POSSIBLE CAUSES

Possible Causes
HVAC MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**
    1. With the scan tool, read DTCs and record on the repair order.

2. Record the Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read HVAC Module DTCs.

   Did the DTC return?

   Yes

   - Go To 2

   No

   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

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

      Repair any conditions that are found.

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

       Did the DTC return?

       Yes

       - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .

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

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

U0010-00-CAN INTERIOR BUS

NOTE: **The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).**

Perform the comparable CAN IHS Bus diagnostic tests in the BCM. Refer to **DIAGNOSIS AND TESTING** .

U0011-00-CAN INTERIOR BUS OFF PERFORMANCE

NOTE: **The DTC number or title listed above may not appear in the Body Control Module (BCM) diagnostic procedures. If this occurs, perform the CAN Interior Bus diagnostic procedure in the BCM that is comparable to the above DTC title (examples: CAN INTERIOR BUS, CAN INTERIOR BUS OFF, CAN INTERIOR BUS PERFORMANCE or CAN INTERIOR BUS OFF PERFORMANCE).**

Perform the comparable U-Code diagnostic procedure(s) for the CAN IHS Bus in the BCM. Refer to **DIAGNOSIS AND TESTING** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0157-00 - LOST COMMUNICATION WITH REAR CABIN COMFORT CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0165-00-LOST COMMUNICATION WITH REAR HVAC CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0184-00-LOST COMMUNICATION WITH RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0422-00-IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE

NOTE: **This DTC indicates a communication issue has occurred between the Sending control module (Body Control Module - BCM) and the Reporting control module(s) that set this DTC.**

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U0458-00-IMPLAUSIBLE DATA RECIEVED FROM ELECTRONIC OVERHEAD MODULE - REAR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U0466-00-IMPLAUSIBLE DATA RECIEVED FROM HVAC CONTROL MODULE - REAR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U0485-00-IMPLAUSIBLE DATA RECEIVED FROM RADIO

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U11B8-00 LOST COMMUNICATION WITH INTEGRATED CENTER STACK (ICS)

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U11BB-00-LOST COMMUNICATION WITH VIDEO ROUTING MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U1480-00-IMPLAUSIBLE DATA RECEIVED FROM INTEGRATED CENTER STACK

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

U1519-00-IMPLAUSIBLE DATA RECEIVED FROM VIDEO ROUTING MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to COMMUNICATION DIAGNOSTIC PROCEDURE .

DTC TROUBLESHOOTING

B1030-11 - EVAPORATOR TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Evaporator Temperature Sensor is a negative temperature coefficient thermistor type sensor. As the sensor gets colder, the resistance is higher. As the temperature increases, the resistance is lower. The HVAC Module applies a low current, 5-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop.

There are two circuits between the temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

The Evaporator Temperature Sensor is used to monitor the output air temperature at the A/C Evaporator. If the Evaporator is at risk of freezing up, the HVAC Module will request that the A/C compressor decrease the refrigerant pressure. On vehicles equipped with automatic start/stop, the evaporator temperature is monitored to ensure cabin temperature is maintained. If the Evaporator temperature increases above the operator set temperature, the engine is requested to start so the A/C Compressor can pump refrigerant through the system. On Hybrid vehicles, an Electronic A/C Compressor (EAC) may be used so the engine does not have to start and run.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for more than 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C21) Evaporator Temperature Sensor Signal circuit is less than 0.136 volt for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored until the ignition is cycled. There will be a loss of cooling performance while this DTC is active.

POSSIBLE CAUSES

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
EVAPORATOR TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 2

   No

   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE EVAPORATOR TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
   1. Turn the ignition off.
   2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

   Were any problems found?

   Yes

   - Repair the connector and terminals as necessary.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

   No

   - Go To 3
3. **ISOLATE AND CHECK THE (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

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

Yes

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

No

- Go To 5

5. **CHECK THE EVAPORATOR TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 626Ω - 103, 274Ω
-30B°C (-22B°F)	52, 064Ω - 54, 136Ω
-20B°C (-4B°F)	28, 647Ω - 29, 595Ω
-10B°C (14B°F)	16, 379Ω - 16, 819Ω
0B°C (32B°F)	9, 697Ω - 9, 893Ω
10B°C (50B°F)	5, 892Ω - 6, 048Ω
20B°C (68B°F)	3, 689Ω - 3, 805Ω
30B°C (86B°F)	2, 374Ω - 2, 460Ω
40B°C (104B°F)	1, 566Ω - 1, 630Ω

1. Disconnect the Evaporator Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 6

   No

   - Replace the Evaporator Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, EVAPORATOR TEMPERATURE, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

      Repair any conditions that are found.

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

      Did the DTC return?

      Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1030-12 - EVAPORATOR TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Evaporator Temperature Sensor is a negative temperature coefficient thermistor type sensor. As the sensor gets colder, the resistance is higher. As the temperature increases, the resistance is lower. The HVAC Module applies a low current, 5-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop.

There are two circuits between the temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

The Evaporator Temperature Sensor is used to monitor the output air temperature at the A/C Evaporator. If the Evaporator is at risk of freezing up, the HVAC Module will request that the A/C compressor decrease the refrigerant pressure. On vehicles equipped with automatic start/stop, the evaporator temperature is monitored to ensure cabin temperature is maintained. If the Evaporator temperature increases above the operator set temperature, the engine is requested to start so the A/C Compressor can pump refrigerant through the system. On Hybrid vehicles, an Electronic A/C Compressor (EAC) may be used so the engine does not have to start and run.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for more than 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C21) Evaporator Temperature Sensor Signal circuit is above 4.60 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage the DTC will change from active to stored and will stay stored until the ignition is cycled.

POSSIBLE CAUSES

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C919) TEMP SENSOR COMMON RTN CIRCUIT OPEN OR HIGH RESISTANCE
EVAPORATOR TEMPERATURE SENSOR
HVAC MODULE

Always perform the HVAC PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to the appropriate service information .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE EVAPORATOR TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow

the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C919) EVAPORATOR TEMP SENSOR CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **CHECK THE EVAPORATOR TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 626Ω - 103, 274Ω
-30B°C (-22B°F)	52, 064Ω - 54, 136Ω
-20B°C (-4B°F)	28, 647Ω - 29, 595Ω
-10B°C (14B°F)	16, 379Ω - 16, 819Ω
0B°C (32B°F)	9, 697Ω - 9, 893Ω
10B°C (50B°F)	5, 892Ω - 6, 048Ω
20B°C (68B°F)	3, 689Ω - 3, 805Ω
30B°C (86B°F)	2, 374Ω - 2, 460Ω
40B°C (104B°F)	1, 566Ω - 1, 630Ω

1. Disconnect the Evaporator Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 7

   No

   - Replace the Evaporator Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, EVAPORATOR TEMPERATURE, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.

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

   Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1058-11 - RECIRCULATION DOOR CONTROL-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground

- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following condition is true:
  - The HVAC Module detects a short to ground on one of the Recirculation Door Driver circuits for more than 30 ms.
  - Voltage on the (C144) Recirculation Door Signal circuit is less than 0.03 volt for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C141) RECIRCULATION AIR INLET DRIVE CIRCUIT SHORTED TO GROUND
(C140) OUTSIDE AIR INLET DRIVE CIRCUIT SHORTED TO GROUND
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO GROUND
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C140) OUTSIDE AIR INLET DRIVE CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the DVOM to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 6

6. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Recirculation Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1058-12 - RECIRCULATION DOOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following conditions are true:
  - The HVAC Module detects a short to voltage on one of the Recirculation Door Driver circuits for more than 30 ms.
  - Voltage on the (C144) Recirculation Door Signal circuit is more than 3.37 volts for more than 1 second.
  - The HVAC Module detects an open on the (C144) Recirculation Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C140) OUTSIDE AIR INLET DRIVE CIRCUIT (RHD) OR (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (LHD) SHORTED TO ANOTHER CIRCUIT
(C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (RHD) OR (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (LHD) SHORTED TO ANOTHER CIRCUIT
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.

3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (RHD) OR (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (LHD) FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

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

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (RHD) OR (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (LHD) FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 5

5. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 6

6. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 7

No

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

7. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 8

No

- Replacing the Recirculation Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

8. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1058-13 - RECIRCULATION DOOR CONTROL-CIRCUIT OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- One or more of the following conditions is true:
  - The HVAC Module detects an open on one of the Recirculation Door Driver circuits for more than 30 ms.
  - The HVAC Module detects an open on the (C144) Recirculation Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C140) OUTSIDE AIR INLET DRIVE CIRCUIT (RHD) OR (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (LHD) OPEN OR HIGH RESISTANCE
(C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (RHD) OR (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (LHD) OPEN OR HIGH RESISTANCE
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

   - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (RHD) OR (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (LHD) FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C140) OUTSIDE AIR INLET DRIVE CIRCUIT (RHD) OR (C141) RECIRCULATION AIR INLET DRIVE CIRCUIT (LHD) FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 5

No

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

5. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Recirculation Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1058-92 - RECIRCULATION DOOR CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No actuator drive circuit DTCs.

SET CONDITION

- The actual position of the door is more than 0.039 volt from the desired position. When this condition is detected for the first time, up to five attempts (at 30 seconds each attempt) will be made to move the door to the desired position. If the fifth attempt fails, this DTC will set.

POSSIBLE CAUSES

Possible Causes
HIGH RESISTANCE ON ANY OF THE 5 ACTUATOR CIRCUITS
DOOR, DUCTS, OR LINKAGE CONDITIONS THAT COULD CAUSE BINDING
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK ALL FIVE OF THE RECIRCULATION DOOR ACTUATOR CIRCUITS FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.
    6. Repeat the steps above for each of the remaining circuits.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms for all circuits?

    Yes

    - Go To 4

    No

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

4. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

Yes

- Repair the binding condition as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 5

5. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 6

    No

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

        Repair any conditions that are found.
    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B105C-00 - RECIRCULATION DOOR TRAVEL RANGE TOO SMALL-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is more than 1.8 volts, or learned open position (100%) is less than 3.2 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
RECIRCULATION DOOR ACTUATOR DRIVER CIRCUIT DTCS PRESENT

Possible Causes
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT
RECIRCULATION DOOR BINDING
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

Always perform the HVAC PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to the appropriate service information .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **CHECK FOR RELATED DTCS**
    1. With the scan tool, read DTCs.

Are any Actuator Driver Circuit DTCs set?

Yes

- Perform the appropriate diagnostic procedure(s).

No

- Go To 4

4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE RECIRCULATION DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

    Is the voltage between 4.8 and 5.2 volts?

    Yes

    - Go To 5

    No

    - Go To 11

5. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 6

    No

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

6. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 7

7. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 9

    No

    - Repair the circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

        Were any problems found?

        Yes

        - Repair the binding condition as necessary.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - Go To 10
10. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.

5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Recirculation Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 14

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

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B105D-00 - RECIRCULATION DOOR TRAVEL RANGE TOO LARGE-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is less than 1.1 volts, or learned open position (100%) is more than 3.9 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
RECIRCULATION DOOR ACTUATOR DRIVER CIRCUIT DTCS SET
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C144) RECIRCULATION DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN/HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT
RECIRCULATION DOOR STOPS
RECIRCULATION DOOR
RECIRCULATION DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **CHECK FOR RELATED DTCS**
    1. Using the recorded information, review the DTCs.

    Were any Actuator Control Circuit DTCs set?

    Yes

    - Perform the appropriate diagnostic procedure(s).

    No

    - Go To 4
4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE RECIRCULATION DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

    Is the voltage between 4.8 and 5.2 volts?

    Yes

    - Go To 5

    No

    - Go To 11
5. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

- Go To 6

No

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

6. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C144) RECIRCULATION DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

   Is the resistance below 3.0 Ohms?

   Yes

   - Go To 9

   No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE DOOR TO OVER-TRAVEL**
   1. Inspect the door and linkage for conditions that could cause the door to travel beyond the normal stopping positions.
   2. Inspect the door and door stops for damage.
   3. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

   Were any problems found?

   Yes

   - Repair the over-travel condition as necessary.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

   No

   - Go To 10

10. **REPLACE THE RECIRCULATION DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Recirculation Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Recirculation Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.

5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Recirculation Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 14

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

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B106A-01 - REAR DEFROST EBL CONTROL CIRCUIT-GENERAL ELECTRICAL FAILURE

For a complete DEFOGGER SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The HVAC Module detects a high or low electrical condition on the (C115) Defogger Relay Control circuit for 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid current draw, the DTC will change from Active to Stored and will stay in the controller memory for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C115) DEFOGGER RELAY CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
(C115) DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO GROUND
(C115) DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
(C115) DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO ANOTHER CIRCUIT
REAR DEFROST RELAY
POWER DISTRIBUTION CENTER (PDC)
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **ISOLATE AND CHECK THE (C115) DEFOGGER RELAY CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 3

    No

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

3. **ISOLATE AND CHECK THE (C115) DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 4
4. **ISOLATE AND CHECK THE POWER DISTRIBUTION CENTER (PDC) (Z906) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 5

    No

    - Repair the circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
5. **DETERMINE RELAY/PDC CONFIGURATION**

1. Check the PDC layout in the wiring information to determine if the Defogger Relay is removable or if it is embedded on the Printed Circuit Board (PCB) of the PDC.

Is the Relay removable or is it embedded on the PCB?

Removable.

- Go To 6

Embedded on PCB.

- Go To 8

6. **ISOLATE AND CHECK THE PDC FOR AN OPEN/HIGH RESISTANCE**
    1. Disconnect PDC harness connectors C1 and C3,
    2. Remove the Defogger Relay.
    3. Connect a jumper wire across the relay coil terminals 86 and 85 in the PDC relay socket.
    4. Measure the resistance between the PDC connector interface C1, terminal C3 and the PDC connector interface C3, terminal H3.

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 7

    No

    - Replace the PDC in accordance with the Service Information.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK THE HVAC MODULE DEFOGGER RELAY CONTROL HIGH SIDE DRIVER (HSD) OPERATION**
    1. Remove the jumper wire.
    2. Reconnect the PDC and HVAC Module harness connectors.
    3. Connect a test light between the Defogger Relay coil terminals 86 and 85 in the PDC relay socket.
    4. Turn the ignition on.
    5. Turn the Rear Window Defogger on.

    Is the test light illuminated and bright?

    Yes

    - Replace the Defogger Relay in accordance with the Service Information.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 9

8. **CHECK THE RESISTANCE OF THE DEFOGGER RELAY COIL AND INTERNAL PDC CIRCUIT S**
    1. Disconnect PDC harness connectors C1 and C3,
    2. Measure the resistance between the PDC connector interface C1, terminal C3 and the PDC connector interface C3, terminal H3.

    Is the resistance between 72 and 114 Ohms?

Yes

- Go To 9

No

- Replace the PDC in accordance with the Service Information.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

9. **ISOLATE AND CHECK THE (C115) DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT INSIDE THE PDC**
   1. Remove all test equipment and jumper wires from PDC.
   2. Disconnect all PDC harness connectors.
   3. Check for continuity between the PDC connector interface C3, terminal H3 and all other circuits in all PDC connector interfaces.

   NOTE: **Continuity between PDC connector interface C1, terminal C4 and PDC connector interface C3, terminal H3 is normal. There is no need to test for a short between these circuits.**

   Is there continuity between the PDC connector interface C3, terminal H3 and any other internal PDC circuit?

   Yes

   - Replace the PDC in accordance with the Service Information.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

   No

   - Go To 10

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

       Repair any conditions that are found.
    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B10B2-00 - AC COOL DOWN TEST PERFORMANCE-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The HVAC Module has software to enable it to perform an A/C Cool Down Test by a command using a scan tool. This test checks for Evaporator temperature drop over a predetermined time. If the test fails, this DTC will set. However, certain test conditions are required to perform this test. Failure to run this test within those parameters can result in failure of the test.

WHEN MONITORED

This diagnostic runs when the following condition is met:

- An A/C Cool-down Test is performed.

SET CONDITION

- This DTC is set whenever the A/C Cool-down Test is performed and the desired temperature drop is not achieved by the system.

DEFAULT ACTION

- The DTC will be stored after a successful A/C Cool-down Test.

POSSIBLE CAUSES

Possible Causes
A/C SYSTEM WORKING IMPROPERLY

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

DIAGNOSTIC TEST

PERFORM THE A/C COOL-DOWN TEST

1. The following conditions must be met before running the A/C Cool-Down test.

- No Powertrain Control Module (PCM) DTCs present.
- No Communication DTCs present.
- Condenser cooling fan working properly.
- No active HVAC evaporator temperature sensor, sun sensor, recirculation, mode, or blend door actuator DTCs present.
- The refrigerant system must be fully charged.
- The blower motor must operate correctly in all speeds.
- The evaporator temperature must be above 12.7B°C (55B°F).
- The A/C compressor must be turned off.
- Blower must be on high.

2. With the scan tool, perform the A/C Cool-Down Test.

   Did the test pass?

   Yes

   - The problem is not present at this time.
   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

   No

   - Perform the A/C PERFORMANCE procedure. Refer to **DIAGNOSIS AND TESTING** . Run the Cool-Down Test after any repairs are performed.

B10E8-12 - BLOWER MOTOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

A Blower Motor Power Module allows the microprocessor-based HVAC Module to calculate and provide infinitely variable blower motor speeds based upon either manual blower switch input or the Automatic Temperature Control (ATC) programming. The ATC blower motor control system uses a Pulse Width Modulation (PWM) circuit strategy. PWM voltage is applied to a comparator circuit which compares the PWM signal voltage to the blower motor feedback voltage. The resulting output drives the power module circuitry, which provides a linear output voltage to change or maintain the desired blower speed.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Blower is commanded on.

SET CONDITION

- Voltage on the (C56) Front Blower PWM Control circuit is more than 1.37 volts for more than 5 seconds.

POSSIBLE CAUSES

Possible Causes
(C56) FRONT BLOWER PWM CONTROL CIRCUIT SHORTED TO VOLTAGE
BLOWER MOTOR POWER MODULE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **ISOLATE AND CHECK THE (C56) FRONT BLOWER PWM CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**
    1. Turn the ignition off.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Turn the ignition on, engine not running.
    4. Measure voltage on the circuit being tested.

    Is there and voltage present?

    Yes

    - Repair the circuit for a short to voltage.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **REPLACE THE BLOWER MOTOR POWER MODULE AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Blower Motor Power Module in accordance with the Service Information. Refer to **MODULE, POWER, BLOWER MOTOR, REMOVAL AND INSTALLATION** .
    2. Connect the component and ECU harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.

5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 4

No

- Replacing the Blower Motor Power Module corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to HVAC VERIFICATION TEST .

B10E8-14 - BLOWER MOTOR CONTROL-CIRCUIT SHORT TO GROUND OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

A Blower Motor Power Module allows the microprocessor-based HVAC Module to calculate and provide infinitely variable blower motor speeds based upon either manual blower switch input or the Automatic Temperature Control (ATC) programming. The ATC blower motor control system uses a Pulse Width Modulation (PWM) circuit strategy. PWM voltage is applied to a comparator circuit which compares the PWM signal voltage to the blower motor feedback voltage. The resulting output drives the power module circuitry, which provides a linear output voltage to change or maintain the desired blower speed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Blower is commanded on.

SET CONDITION

- Voltage on the (C56) Front Blower PWM Control circuit is less than 0.195 volts for more than 5 seconds.

POSSIBLE CAUSES

Possible Causes
(C7) BLOWER MOTOR SUPPLY CIRCUIT SHORTED TO GROUND
(C7) BLOWER MOTOR SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(C56) FRONT BLOWER PWM CONTROL CIRCUIT SHORTED TO GROUND
(C56) FRONT BLOWER PWM CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
BLOWER MOTOR RELAY
BLOWER MOTOR POWER MODULE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**
    1. With the scan tool, read DTCs and record on the repair order.
    2. Record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    5. With the scan tool, read HVAC Module DTCs.

    Did the DTC return?

    Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **ISOLATE AND CHECK THE (C7) BLOWER MOTOR SUPPLY CIRCUIT FOR VOLTAGE**
   1. Turn the Ignition off.
   2. Disconnect the Blower Motor Power Module C1 harness connector.
   3. Turn the Ignition on.
   4. With a 12-volt test light connected to ground, check the (C7) Blower Motor Supply circuit at the Blower Motor Power Module C1 harness connector.

   NOTE: **The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

   Does the test light illuminate brightly?

   Yes

   - Go To 3

   No

   - Repair the circuit for an open or short to ground. Also check the Blower Motor Relay for proper operation.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

3. **ISOLATE AND CHECK THE (C56) FRONT BLOWER PWM CONTROL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

   NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

   Is there continuity between ground and the circuit being tested?

   Yes

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

   No

   - Go To 4

4. **ISOLATE AND CHECK THE (C56) FRONT BLOWER PWM CONTROL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 5

No

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

5. **ISOLATE AND CHECK THE (Z910) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE BLOWER MOTOR POWER MODULE AND CHECK FOR THE DTC TO RETURN**
   1. Turn the ignition off.

2. Replace the Blower Motor Power Module in accordance with the Service Information. Refer to **MODULE, POWER, BLOWER MOTOR, REMOVAL AND INSTALLATION** .
3. With the scan tool, erase DTCs.
4. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read HVAC Module DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Blower Motor Power Module corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

        Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B10EB-00 - BLOWER POWER MODULE

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

A Blower Motor Power Module allows the microprocessor-based HVAC Module to calculate and provide infinitely variable blower motor speeds based upon either manual blower switch input or the Automatic Temperature Control (ATC) programming. The ATC blower motor control system uses a Pulse Width Modulation (PWM) circuit strategy. PWM voltage is applied to a comparator circuit which compares the PWM signal voltage to the blower motor feedback voltage. The resulting output drives the power module circuitry, which provides a linear output voltage to change or maintain the desired blower speed.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- No Blower Motor circuit DTCs.

SET CONDITION

- This DTC sets when there is a loss of Blower Motor function or the actual Blower Motor speed does not match the desired Blower Motor speed for more than 12 seconds.

POSSIBLE CAUSES

Possible Causes
BLOWER MOTOR POWER MODULE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.

7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **REPLACE THE BLOWER MOTOR POWER MODULE AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Blower Motor Power Module in accordance with the Service Information. Refer to **MODULE, POWER, BLOWER MOTOR, REMOVAL AND INSTALLATION** .
    2. Connect the component and Electronic Control Unit (ECU) harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Replacing the Blower Motor Power Module corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1107-11 - CABIN TEMPERATURE SENSOR 1-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The In-Car (Cabin) Temperature Sensor is a negative temperature coefficient thermistor type sensor. As the sensor gets colder, the resistance is higher. As the temperature increases, the resistance is lower. The HVAC Module applies a low current, 5-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop.

There are four circuits between the In-Car Temperature Sensor and the HVAC Module:

- 12 Volt Ignition
- Temperature Sensor Signal
- Sensor Ground
- Ground

The 12-volt and ground circuits operate a fan that pushes air across the sensor from the cabin compartment. These circuits are not connected to the HVAC Module. Power is supplied directly from the power distribution center. The fan will run when the ignition is turned on. Changes in cabin temperature are monitored by the HVAC Module which will make adjustments as necessary to keep the cabin at the operator set temperature. If the customer is concerned that the cabin temperature is not maintained properly, and no DTCs are set, make sure the fan is operating correctly.

The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.

- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The (C36) Sensor In Car Temp Signal circuit voltage is less than 0.122 volt for 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid signal, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT SHORTED TO GROUND
(C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
IN-CAR TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE IN-CAR TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **REPLACE THE IN-CAR TEMPERATURE SENSOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the In-Car Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, IN-CAR, REMOVAL AND INSTALLATION** .
    2. Connect the In-Car Temperature Sensor, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 6

    No

    - Replacing the In-Car Temperature Sensor corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
6. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B1107-12 - CABIN TEMPERATURE SENSOR 1-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The In-Car (Cabin) Temperature Sensor is a negative temperature coefficient thermistor type sensor. As the sensor gets colder, the resistance is higher. As the temperature increases, the resistance is lower. The HVAC Module applies a low current, 5-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop.

There are four circuits between the In-Car Temperature Sensor and the HVAC Module:

- 12 Volt Ignition
- Temperature Sensor Signal
- Sensor Ground
- Ground

The 12-volt and ground circuits operate a fan that pushes air across the sensor from the cabin compartment. These circuits are not connected to the HVAC Module. Power is supplied directly from the power distribution center. The fan will run when the ignition is turned on. Changes in cabin temperature are monitored by the HVAC Module which will make adjustments as necessary to keep the cabin at the operator set temperature. If the customer is concerned that the cabin temperature is not maintained properly, and no DTCs are set, make sure the fan is operating correctly.

The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The (C36) Sensor In Car Temp Signal circuit voltage is above 4.89 volts for 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid signal, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C37) SENSOR IN CAR TEMP RETURN CIRCUIT OPEN OR HIGH RESISTANCE
IN-CAR TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE IN-CAR TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

    Were any problems found?

    Yes

    - Repair the connector and terminals as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 3
3. **ISOLATE AND CHECK THE (C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C36) SENSOR IN CAR TEMP SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C37) SENSOR IN CAR TEMP RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE IN-CAR TEMPERATURE SENSOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the In-Car Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, EVAPORATOR TEMPERATURE, REMOVAL AND INSTALLATION** .
   2. Connect the In-Car Temperature Sensor, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the In-Car Temperature Sensor corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C2-11 - FRONT MODE DOOR 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following conditions is true:
    - The HVAC Module detects a short to ground on one of the Front Mode Door Driver circuits for more than 30 ms.
    - Voltage on the (C235) Mode Door Signal circuit is less than 0.03 volt for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C142) DEFROST MODE DRIVE CIRCUIT SHORTED TO GROUND
(C143) PANEL MODE DRIVE CIRCUIT SHORTED TO GROUND
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO GROUND
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C142) DEFROST MODE DRIVE CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C143) PANEL MODE DRIVE CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the DVOM to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

   NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

   Is there continuity between ground and the circuit being tested?

   Yes

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

   No

   - Go To 6

6. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 7

   No

   - Replacing the Front Mode Door Actuator corrected the condition.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C2-12 - FRONT MODE DOOR 1 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following condition are true:
  - The HVAC Module detects a short to voltage on one of the Front Mode Door Driver circuits for more than 30 ms.
  - Voltage on the (C235) Mode Door Signal circuit is more than 4.48 volts for more than 1 second.
  - The HVAC Module detects an open on the (C235) Mode Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C142) DEFROST MODE DRIVE CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C143) PANEL MODE DRIVE CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C235) MODE DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C142) DEFROST MODE DRIVE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 4

4. **ISOLATE AND CHECK THE (C143) PANEL MODE DRIVE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 6

6. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 7

No

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

7. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 8

   No

   - Replacing the Front Mode Door Actuator corrected the condition.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
8. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
      - Terminals that have been pushed back into the connector cavity.
      - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

      Repair any conditions that are found.
   5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
   6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C2-13 - FRONT MODE DOOR 1 CONTROL-CIRCUIT OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- One or more of the following conditions is true:
    - The HVAC Module detects an open on one of the Front Mode Door Driver circuits for more than 30 ms.
    - The HVAC Module detects an open on the (C235) Mode Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C142) DEFROST MODE DRIVE CIRCUIT OPEN OR HIGH RESISTANCE
(C143) PANEL MODE DRIVE CIRCUIT OPEN OR HIGH RESISTANCE
(C235) MODE DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **ISOLATE AND CHECK THE (C142) DEFROST MODE DRIVE CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C143) PANEL MODE DRIVE CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 5

No

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

5. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Front Mode Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C2-92 - FRONT MODE DOOR 1 CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.

- No actuator drive circuit DTCs.

SET CONDITION

- The actual position of the door is more than 0.039 volt from the desired position. When this condition is detected for the first time, up to five attempts (at 30 seconds each attempt) will be made to move the door to the desired position. If the fifth attempt fails, this DTC will set.

POSSIBLE CAUSES

Possible Causes
HIGH RESISTANCE ON ANY OF THE 5 ACTUATOR CIRCUITS
BROKEN OR BLOCKED MODE DOOR, DUCTS, OR LINKAGE
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

   - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK ALL FIVE OF THE FRONT MODE DOOR ACTUATOR CIRCUITS FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.
    6. Repeat the steps above for each of the remaining circuits.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

    Is the resistance below 3.0 Ohms for all circuits?

    Yes

    - Go To 4

    No

    - Repair the applicable circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
4. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

    Yes

    - Repair the binding condition as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST STANDARD PROCEDURE** .

    No

    - Go To 5
5. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.

4. With the scan tool, erase DTCs.
5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 6

No

- Replacing the Front Mode Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

      Repair any conditions that are found.

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

       Did the DTC return?

       Yes

       - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
       - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C3-00 - FRONT MODE DOOR 1 TRAVEL RANGE TOO SMALL-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is more than 0.7 volts, or learned open position (100%) is less than 4.0 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
ACTUATOR DRIVER CIRCUIT RELATED DTCS PRESENT
(C235) MODE DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
FRONT MODE DOOR BINDING
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **CHECK FOR RELATED DTCS**
    1. Refer to the recorded DTCs.

    Were any Actuator Control Circuit DTCs set?

    Yes

    - Perform the appropriate diagnostic procedure(s).

    No

    - Go To 4
4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE FRONT MODE DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.

3. Turn the ignition on.
4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
5. Connect the negative lead of the DVOM to a known good ground.
6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is the voltage between 4.8 and 5.2 volts?

Yes

- Go To 5

No

- Go To 11

5. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the DVOM to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector**

terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 9

No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

        Were any problems found?

        Yes

        - Repair the binding condition as necessary.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - Go To 10

10. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 14

    No

    - Replacing the Front Mode Door Actuator corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 13
13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 14

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

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C4-00 - FRONT MODE DOOR 1 TRAVEL RANGE TOO LARGE-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is less than 0.15 volts, or learned open position (100%) is more than 4.85 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
FRONT MODE DOOR ACTUATOR DRIVER CIRCUIT RELATED DTCS PRESENT
(C235) MODE DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C235) MODE DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT
FRONT MODE DOOR STOPS
FRONT MODE DOOR

Possible Causes
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **CHECK FOR RELATED DTCS**
    1. With the scan tool, read DTCs.

    Are any Actuator Control Circuit DTCs set?

    Yes

    - Perform the appropriate diagnostic procedure(s).

    No

    - Go To 4

4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE FRONT MODE DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

    Is the voltage between 4.8 and 5.2 volts?

    Yes

    - Go To 5

    No

    - Go To 11
5. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 6

    No

    - Repair the circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
6. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect the negative lead of the DVOM to a known good ground.
4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C235) MODE DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.

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

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 9

No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE DOOR TO OVER-TRAVEL**
   1. Inspect the door and linkage for conditions that could cause the door to travel beyond the normal stopping positions.
   2. Inspect the door and door stops for damage.
   3. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

Were any problems found?

Yes

- Repair the over-travel condition as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 10

10. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, MODE DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Front Mode Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Front Mode Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 12

    No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

- Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 14

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

        Repair any conditions that are found.
    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C7-00 FRONT MODE DOOR 2 TRAVEL RANGE TOO LARGE

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- The HVAC performs an actuator calibration test.
- Front Mode Door Travel Too Small DTC is not set.

SET CONDITION

- Any one of the following conditions is true:
  - The maximum door position signal voltage reached is more than 4.91 volts during an Actuator Calibration Test.
  - The minimum door position signal voltage is less than 0.08 volts during an Actuator Calibration Test.
  - The actuator is commanded for more than 60 seconds without reaching a hard stop.

NOTE: **Normal operating range is between 0.50v (0% = Air is directed to Defrost, Panel ducts, and Floor ducts) - 4.50v (100% = Air is directed to Defrost). During an actuator calibration test, the position signal may go beyond these limits temporarily.**

MODE DOOR - POSITION VS SIGNAL VOLTAGE VS MODE

Position (% of Overall Door Travel)	Position Signal Voltage	Mode
0% - 1.47%	0.50-0.559	Defrost, Panel Ducts, and Floor Ducts
8.82%	0.853	Defrost and Panel Ducts
16.8% - 19.85%	1.147 - 1.294	Panel Ducts
33.27% - 36.95%	1.831 - 1.978	Panel Ducts and Floor Ducts
49.82% - 53.49%	2.493 - 2.640	Purge
67.65% - 71.32%	3.206 - 3.353	Floor Ducts
83.09% - 86.76%	3.824 - 3.971	Defrost and Floor Ducts
98.16 - 100%	4.42 - 4.50	Defrost

DEFAULT ACTION

- If normal operating conditions are detected, the DTC state will change to Stored. The DTC will remain Stored for 100 ignition cycles if another failure is not detected.

POSSIBLE CAUSES

Possible Causes
RELATED DTCS PRESENT
FRONT MODE DOOR-STOP NOT STOPPING DOOR
FRONT MODE DOOR
FRONT MODE DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Heating Ventilation Air Conditioning Module (HVAC) and record on the repair order.
    2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
    3. With the scan tool, erase all DTCs.
    4. Turn the ignition off for a minimum of 10.0 seconds.
    5. Turn the ignition on.
    6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**

   NOTE: **NO HVAC mode or temp functions will perform as desired unless auto-addressing was successful.**

   NOTE: **NO Heated/Vented Seats functions will operate unless auto-addressing was successful.**

   NOTE: **Auto-addressing needs to be done every time a CSM/CSWSM/CRSM or an Actuator is replaced.**

   NOTE: **Diagnose and repair all LIN Bus related DTC's before performing this test procedure.**

   With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

   - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
   1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
   2. Check for debris or objects in the ducts that could hinder the door movement.
   3. Inspect the door stops for damage.
   4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

      Were any problems found?

      Yes

      - Repair the binding condition as necessary.
      - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

      No

      - Go To 4

4. **REPLACE THE FRONT MODE DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Front Mode Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, RECIRCULATION DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Front Mode Door Actuator, HVAC, and any other disconnected harness connectors.
   3. Turn the ignition on.

4. With the scan tool, erase DTCs.
5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 5

   No

   - Replacing the Front Mode Door Actuator corrected the condition.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

      Repair any conditions that are found.

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

       Did the DTC return?

       Yes

       - Replace the Heating Ventilation Air Conditioning Module (HVAC) in accordance with the service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
       - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Test complete. The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C8-11 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following conditions is true:
  - The HVAC Module detects a short to ground on one of the Right Blend Door Driver circuits for more than 30 ms.
  - Voltage on the (C224) Right Blend Door Signal circuit is less than 0.03 volt for more than 1 second.

NOTE: **Normal operating range is between 0.75v - 0.80v (Max cold) and 4.15 - 4.25v (Max hot).**

-

POSSIBLE CAUSES

Possible Causes
(C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT SHORTED TO GROUND
(C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT SHORTED TO GROUND
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **ISOLATE AND CHECK THE (C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and identify any in-line connectors that may help isolate the location of the short.

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

No

- Go To 6

6. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 7

    No

    - Replacing the Right Blend Door Actuator corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
7. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C8-12 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- One or more of the following condition are true:
  - The HVAC Module detects a short to voltage on one of the Right Blend Door Driver circuits for more than 30 ms.
  - Voltage on the (C224) Right Blend Door Signal circuit is more than 3.9 volts for more than 1 second.
  - The HVAC Module detects an open on the (C224) Right Blend Door Signal circuit for more than 1 second.

NOTE: **Normal operating range is between 0.75v - 0.80v (Max cold) and 4.15 - 4.25v (Max hot).**

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POSSIBLE CAUSES

Possible Causes
(C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to TESTING FOR AN INTERMITTENT CONDITION .
3. **ISOLATE AND CHECK THE (C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.

2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 6

6. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 7

No

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

7. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.

6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 8

No

- Replacing the Right Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

        Repair any conditions that are found.

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

        Did the DTC return?

        Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

        No

        - The wiring or poor connection problem has been repaired.

- Perform the HVAC VERIFICATION TEST. Refer to HVAC VERIFICATION TEST .

B11C8-13 - RIGHT TEMPERATURE DOOR CONTROL-CIRCUIT OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- The HVAC Module detects an open on one of the Right Blend Mode Door Driver circuits for more than 30 ms, OR an open on the (C224) Right Blend Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT OPEN OR HIGH RESISTANCE
(C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT OPEN OR HIGH RESISTANCE
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.

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

Did the DTC return?

Yes

- Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C136) RIGHT BLEND DOOR DRIVER 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C138) RIGHT BLEND DOOR DRIVER 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 5

No

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

5. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

   NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

   Is the resistance below 3.0 Ohms?

   Yes

   - Go To 6

   No

   - Repair the circuit for an open or high resistance.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
6. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**

1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
3. Turn the ignition on.
4. With the scan tool, erase DTCs.
5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Right Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

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

        Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C8-92 - RIGHT TEMPERATURE DOOR CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No actuator drive circuit DTCs.

SET CONDITION

- The actual position of the door is more than 0.039 volt from the desired position. When this condition is detected for the first time, up to five attempts (at 30 seconds each attempt) will be made to move the door to the desired position. If the fifth attempt fails, this DTC will set.

POSSIBLE CAUSES

Possible Causes
HIGH RESISTANCE ON ANY OF THE 5 ACTUATOR CIRCUITS
BROKEN OR BLOCKED RIGHT BLEND DOOR
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **ISOLATE AND CHECK ALL FIVE OF THE RIGHT BLEND DOOR ACTUATOR CIRCUITS FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.
    6. Repeat the steps above for each of the remaining circuits.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

    Is the resistance below 3.0 Ohms for all circuits?

Yes

- Go To 4

No

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

4. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

    Yes

    - Repair the binding condition as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 5
5. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 6

    No

    - Replacing the Right Blend Door Actuator corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
6. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

- Proper connector installation.
- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

   Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11C9-00 - RIGHT TEMPERATURE DOOR TRAVEL TOO SMALL-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is more than 1.35 volts, or learned open position (100%) is less than 3.65 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
RIGHT BLEND DOOR ACTUATOR DRIVER CIRCUIT RELATED DTCS PRESENT
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
RIGHT BLEND DOOR BINDING
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **CHECK FOR RELATED DTCS**
    1. Refer to the recorded DTCs.

    Were any Actuator Control Circuit DTCs set?

    Yes

    - Perform the appropriate diagnostic procedure(s).

    No

    - Go To 4

4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE RIGHT BLEND DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

    Is the voltage between 4.8 and 5.2 volts?

    Yes

    - Go To 5

    No

    - Go To 11

5. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the DVOM to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 9

No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

Yes

- Repair the binding condition as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 10

10. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 14

    No

    - Replacing the Right Blend Door Actuator corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 12

    No

    - Repair the circuit for an open or high resistance.

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 14

14. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.

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

   Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CA-00 - RIGHT TEMPERATURE DOOR TRAVEL TOO LARGE-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground

- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is less than 0.5 volts, or learned open position (100%) is more than 4.5 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
RIGHT BLEND DOOR ACTUATOR DRIVER CIRCUIT RELATED DTCS PRESENT
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C224) RIGHT BLEND DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
RIGHT BLEND DOOR STOPS
RIGHT BLEND DOOR
RIGHT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

- Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **CHECK FOR RELATED DTCS**
    1. With the scan tool, read DTCs.

Are any Actuator Control Circuit DTCs set?

Yes

- Perform the appropriate diagnostic procedure(s).

No

- Go To 4

4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE RIGHT BLEND DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is the voltage between 4.8 and 5.2 volts?

Yes

- Go To 5

No

- Go To 11

5. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the DVOM to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C224) RIGHT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 9

No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE DOOR TO OVER-TRAVEL**
   1. Inspect the door and linkage for conditions that could cause the door to travel beyond the normal stopping positions.
   2. Inspect the door and door stops for damage.
   3. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

Were any problems found?

Yes

- Repair the over-travel condition as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 10

10. **REPLACE THE RIGHT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Right Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Right Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Right Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

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

    Yes

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

    No

    - Go To 14

14. **CHECK RELATED HARNESS CONNECTIONS**

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

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CB-11 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal

- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- Either of the following conditions are true:
  - The HVAC Module detects a short to ground on one of the Left Blend Door Driver circuits for more than 30 ms.
  - Voltage on the (C233) Left Blend Door Signal circuit is less than 0.03 volt for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT SHORTED TO GROUND
(C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT SHORTED TO GROUND
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 6

6. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Left Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

       Repair any conditions that are found.

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

       Did the DTC return?

       Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

       No

        - The wiring or poor connection problem has been repaired.
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CB-12 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT SHORT TO BATTERY

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- Actuator is commanded to move.

SET CONDITION

- Any of the following conditions is true:
  - The HVAC Module detects a short to voltage on one of the Left Blend Door Driver circuits for more than 30 ms.
  - Voltage on the (C233) Left Blend Door Signal circuit is more than 3.9 volts for more than 1 second.
  - The HVAC Module detects an Open on the (C233) Left Blend Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.

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

Did the DTC return?

Yes

- Go To 3

No

- Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

Did the DTC return?

Yes

- Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the Digital Volt-Ohm Meter (DVOM) to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 4

4. **ISOLATE AND CHECK THE (C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**

1. The ignition must be off when performing a resistance check to find a short between circuits.
2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 6

6. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.

Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.

3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 7

No

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

7. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
   1. Replace the Left Blend Door Actuator in accordance with the Service Information. **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
   2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
   3. Turn the ignition on.
   4. With the scan tool, erase DTCs.
   5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
   6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 8

No

- Replacing the Left Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

8. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.

- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CB-13 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-CIRCUIT OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- One or both of the following conditions is true:
  - The HVAC Module detects an open on one of the Left Blend Mode Door Driver circuits for more than 30 ms.
  - The HVAC Module detects an open on the (C233) Left Blend Door Signal circuit for more than 1 second.

POSSIBLE CAUSES

Possible Causes
(C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT OPEN OR HIGH RESISTANCE
(C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT OPEN OR HIGH RESISTANCE
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
   2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
   3. With the scan tool, erase DTCs.
   4. Turn the ignition off for at least 10.0 seconds.
   5. Turn the ignition on.
   6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
   7. With the scan tool, read DTCs.

   Did the DTC return?

   Yes

   - Go To 3

   No

   - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
   1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

   Did the DTC return?

   Yes

   - Go To 3

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

3. **ISOLATE AND CHECK THE (C137) LEFT BLEND DOOR DRIVER 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C139) LEFT BLEND DOOR DRIVER 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 5

No

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

5. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 7

No

- Replacing the Left Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

7. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CB-92 - MAIN-LEFT TEMPERATURE DOOR 1 CONTROL-PERFORMANCE OR INCORRECT OPERATION

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on.
- No actuator drive circuit DTCs.

SET CONDITION

- The actual position of the door is more than 0.039 volt from the desired position. When this condition is detected for the first time, up to five attempts (at 30 seconds each attempt) will be made to move the door to the desired position. If the fifth attempt fails, this DTC will set.

Set Conditions:

- The HVAC Module detects an overheat condition of the Ignition Cycle that controls the Left Blend Door Driver circuits.

POSSIBLE CAUSES

Possible Causes
HIGH RESISTANCE ON ANY OF THE 5 ACTUATOR CIRCUITS
BROKEN OR BLOCKED LEFT BLEND DOOR
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **ISOLATE AND CHECK ALL FIVE OF THE LEFT BLEND DOOR ACTUATOR CIRCUITS FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.
    6. Repeat the steps above for each of the remaining circuits.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms for all circuits?

    Yes

    - Go To 4

    No

    - Repair the applicable circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
4. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

    Yes

- Repair the binding condition as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 5

5. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 6

    No

    - Replacing the Left Blend Door Actuator corrected the condition.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
6. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

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

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CC-00 - MAIN-LEFT TEMPERATURE DOOR 1 TRAVEL TOO SMALL-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.
- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is more than 1.35 volts, or learned open position (100%) is less than 3.65 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
LEFT BLEND DOOR ACTUATOR DRIVER CIRCUIT RELATED DTCS PRESENT
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND

Possible Causes
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT
LEFT BLEND DOOR BINDING
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **CHECK FOR RELATED DTCS**
    1. With the scan tool, read DTCs.

    Are any Actuator Control Circuit DTCs set?

Yes

- Perform the appropriate diagnostic procedure(s).

No

- Go To 4

4. **CHECK THE POSITION SENSOR (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE LEFT BLEND DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

    Is the voltage between 4.8 and 5.2 volts?

    Yes

    - Go To 5

    No

    - Go To 11
5. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 6

    No

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

6. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is there continuity between ground and the circuit being tested?

    Yes

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

    No

    - Go To 7
7. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 8
8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.

2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 9

No

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

9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE BINDING**
    1. Inspect the door and linkage for conditions that could cause the door to not move freely across the total travel of the door.
    2. Check for debris or objects in the ducts that could hinder the door movement.
    3. Inspect the door stops for damage.
    4. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

    Yes

    - Repair the binding condition as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 10

10. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Left Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE POSITION SENSOR (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE POSITION SENSOR (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 13

13. **ISOLATE AND CHECK THE POSITION SENSOR (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

    Yes

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

    No

    - Go To 14

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11CD-00 - MAIN-LEFT TEMPERATURE DOOR 1 TRAVEL TOO LARGE-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Mode and Temperature (Blend) Doors are opened and closed with electric actuators that provide a position signal. There are five circuits that run between each actuator and the HVAC Module:

- 5-Volt Supply
- Position Signal
- Sensor Ground
- 12-Volt Driver Circuit 1
- 12-Volt Driver Circuit 2

The position signal is used by the HVAC module to monitor the door position. If the desired positions cannot be reached during normal operation, a DTC will set. All of the circuits are also monitored, either directly or indirectly, for open/short circuit faults.

WHEN MONITORED

This diagnostic runs continuously when the following condition is met:

- An Actuator Calibration Test is performed.

SET CONDITION

- The HVAC Module learns the normal open position voltage and the normal closed position voltage of the door during an actuator calibration test. If the learned closed position (0%) is less than 0.5 volts, or learned open position (100%) is more than 4.5 volts, this DTC will set.

POSSIBLE CAUSES

Possible Causes
LEFT BLEND DOOR ACTUATOR DRIVE CIRCUIT RELATED DTCS PRESENT
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT SHORTED TO GROUND
(C233) LEFT BLEND DOOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C34) SIGNAL RETURN CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO GROUND
(F710) 5V REFERENCE SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
LEFT BLEND DOOR STOPS
LEFT BLEND DOOR
LEFT BLEND DOOR ACTUATOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Go To 2
2. **PERFORM HVAC ACTUATOR CALIBRATION TEST AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, perform the HVAC Actuator Calibration Test and recheck DTCs.

    Did the DTC return?

    Yes

    - Go To 3

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
3. **CHECK FOR RELATED DTCS**

1. Refer to the recorded DTCs.

Were any Actuator Control Circuit DTCs set?

Yes

- Perform the appropriate diagnostic procedure(s).

No

- Go To 4

4. **CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR PROPER VOLTAGE AT THE LEFT BLEND DOOR ACTUATOR HARNESS CONNECTOR**
    1. Turn the ignition off.
    2. Disconnect the harness connector at the component of the circuit being tested. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals. **Note:** The Electronic Control Unit (ECU) harness connector should still be connected during this test step.
    3. Turn the ignition on.
    4. Set the Digital Volt-Ohm Meter (DVOM) to measure Direct Current (DC) voltage.
    5. Connect the negative lead of the DVOM to a known good ground.
    6. With the positive lead of the DVOM, measure the voltage of the circuit being tested at the component harness connector.

Is the voltage between 4.8 and 5.2 volts?

Yes

- Go To 5

No

- Go To 11

5. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 7

7. **ISOLATE AND CHECK THE (C233) LEFT BLEND DOOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	**When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 8

8. **ISOLATE AND CHECK THE (C34) SIGNAL RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

    NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

    Is the resistance below 3.0 Ohms?

    Yes

    - Go To 9

    No

    - Repair the circuit for an open or high resistance.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .
9. **INSPECT THE DOOR, DUCTS, AND LINKAGE FOR CONDITIONS THAT COULD CAUSE DOOR TO OVER-TRAVEL**
    1. Inspect the door and linkage for conditions that could cause the door to travel beyond the normal stopping positions.
    2. Inspect the door and door stops for damage.
    3. If necessary to gain access to the applicable door and ducts. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION** .

    Were any problems found?

    Yes

    - Repair the over-travel condition as necessary.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 10
10. **REPLACE THE LEFT BLEND DOOR ACTUATOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Left Blend Door Actuator in accordance with the Service Information. Refer to **ACTUATOR, BLEND DOOR, REMOVAL AND INSTALLATION** .
    2. Connect the Left Blend Door Actuator, ECU, and any other disconnected harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data and When Monitored conditions, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 14

No

- Replacing the Left Blend Door Actuator corrected the condition.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

11. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 12

No

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

12. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO GROUND**
    1. The ignition must be off when checking a circuit for continuity to ground.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect the negative lead of the DVOM to a known good ground.
    4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is there continuity between ground and the circuit being tested?

Yes

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

No

- Go To 13

13. **ISOLATE AND CHECK THE (F710) 5V REFERENCE SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE:	When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.

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

    Yes

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

    No

    - Go To 14

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

        Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11D3-00 - AC COOL DOWN TEST PERFORMANCE - COMPRESSOR CLUTCH NOT ENGAGED-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

WHEN MONITORED

This diagnostic runs when the following condition is met:

- An A/C Cool-Down Test is performed.

SET CONDITION

- The HVAC Module receives a Controller Area Network (CAN) message from the Powertrain Control Module (PCM) that the compressor is not engaged when it is requested.

POSSIBLE CAUSES

Possible Causes
LOSS OF COMMUNICATION WITH THE PCM OR MULTIPLE BUS PROBLEMS
A/C COMPRESSOR DTCS SET IN THE PCM
DTCS SET IN THE BODY CONTROL MODULE (BCM)
A/C COMPRESSOR CLUTCH ISSUE
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.

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

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK FOR ACTIVE BUS COMMUNICATION DTCS**
    1. Refer to recorded DTCs.

    Are any Active BUS Communication DTCs set?

    Yes

    - Refer to **DIAGNOSIS AND TESTING** and perform the Stored Lost Communication DTCs diagnostic procedure.

    No

    - Go To 3
3. **CHECK FOR STORED BUS COMMUNICATION DTCS**
    1. Refer to recorded DTCs.

    Are any inactive or stored BUS Communication DTCs set?

    Yes

    - Refer to **DIAGNOSIS AND TESTING** and perform the Stored Lost Communication DTCs diagnostic procedure.

    No

    - Go To 4
4. **CHECK FOR POWERTRAIN CONTROL MODULE (PCM) A/C COMPRESSOR DTCS**
    1. Refer to recorded DTCs.

    Are any PCM A/C Compressor DTCs set?

    Yes

    - Perform the appropriate diagnostic procedure. Refer to the appropriate service information .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - Go To 5

5. **CHECK FOR BODY CONTROL MODULE DTCS**
    1. Refer to recorded DTCs.

       Are any Body Control Module (BCM) DTCs set?

       Yes

       - Refer to **DIAGNOSIS AND TESTING** and perform the Stored Lost Communication DTCs diagnostic procedure.

       No

       - Go To 6
6. **CHECK THE A/C COMPRESSOR**
    1. Start the engine.
    2. Using the HVAC Module, request A/C maximum cool.

       Does the A/C Compressor Clutch engage?

       Yes

       - Go To 7

       No

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

       Repair any conditions that are found.

    5. Reconnect all HVAC Module harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
    6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11D5-00 - AC COOL DOWN TEST PERFORMANCE - EVAP TEMP SENOR ERROR-

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Evaporator Temperature Sensor is a variable resistor that changes in conjunction with temperature, or otherwise known as a thermistor. The Evaporator Temperature Sensor is located in the HVAC housing downstream of the A/C evaporator. The HVAC Module monitors the evaporator temperature by monitoring the voltage change of the Evaporator Temperature Sensor Signal circuit. If the monitored voltage drops below or rises above a predetermined voltage, a Diagnostic Trouble Code (DTC) will set. For further information

WHEN MONITORED

This diagnostic runs when the following conditions are met:

- Ignition is on for 5 seconds.
- An A/C Cool-down Test is performed.

SET CONDITION

- Voltage on the Evaporator Sensor Signal circuit is either less than 0.136 volts or above 4.61 volts for more than 2 seconds during the A/C Cool-down Test.

POSSIBLE CAUSES

Possible Causes
EVAPORATOR TEMPERATURE SENSOR DTC PRESENT
EVAPORATOR TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report, or record the Environmental Data.

3. With the scan tool, erase DTCs.
4. Turn the ignition off for at least 10.0 seconds.
5. Turn the ignition on.
6. Using the recorded Environmental Data and the When Monitored Conditions above, operate the vehicle in the conditions that set the DTC.
7. With the scan tool, read DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **PERFORM HVAC ACTUATOR CALIBRATION TEST**
    1. With the scan tool, perform the HVAC Actuator Calibration Test.

    Did any other HVAC DTCs set while performing the Actuator Calibration Test?

    Yes

    - Refer to **DIAGNOSIS AND TESTING** and perform the appropriate diagnostic procedure.

    No

    - Go To 3
3. **REPLACE THE EVAPORATOR TEMPERATURE SENSOR AND CHECK FOR THE DTC TO RETURN**
    1. Replace the Evaporator Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, EVAPORATOR TEMPERATURE, REMOVAL AND INSTALLATION** .
    2. Connect the component and Electronic Control Unit (ECU) harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data or When Monitored information above, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 4

    No

    - Replacing the Evaporator Temperature Sensor corrected the condition.
4. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect all HVAC Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.

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

    Repair any conditions that are found.

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

    Did the DTC return?

    Yes

    - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

    No

    - The wiring or poor connection problem has been repaired.
    - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F0-11 - LEFT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO GROUND

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C164) Left Floor Temperature Sensor Signal circuit is less than 0.09 volts for 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
LEFT FLOOR DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .

2. **CHECK THE CONDITION OF THE LEFT FLOOR DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
   1. Turn the ignition off.
   2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

   Were any problems found?

   Yes

   - Repair the connector and terminals as necessary.
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

   No

   - Go To 3
3. **ISOLATE AND CHECK THE (C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**
   1. The ignition must be off when checking a circuit for continuity to ground.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect the negative lead of the Digital Volt-Ohm Meter (DVOM) to a known good ground.
   4. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

   NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

   Is there continuity between ground and the circuit being tested?

   Yes

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

   No

   - Go To 4
4. **ISOLATE AND CHECK THE (C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
   1. The ignition must be off when performing a resistance check to find a short between circuits.
   2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
   3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
   4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

   NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector**

terminals.

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

Yes

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

No

- Go To 5

5. **CHECK THE LEFT FLOOR DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Left Floor Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

   Is the resistance within specification for the temperature?

   Yes

   - Go To 6

   No

   - Replace the Left Floor Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
   - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

6. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect all HVAC Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.

- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

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

Did the DTC return?

Yes

- Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- The wiring or poor connection problem has been repaired.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

B11F0-15 - LEFT FLOOR DUCT TEMPERATURE SENSOR-CIRCUIT SHORT TO BATTERY OR OPEN

For a complete HVAC SYSTEM wiring diagram, **Refer to the appropriate wiring information** .

THEORY OF OPERATION

The Panel and Floor Duct Temperature Sensors are negative temperature coefficient thermistor type sensors. The duct temperatures are monitored by the HVAC Module to make sure each temperature door is allowing the correct air temperature to enter the desired zone within the cabin. As the temperature gets colder, the resistance is higher. As the temperature gets warmer, the resistance is lower. The HVAC Module applies a low current, 12-volt signal to the signal circuit and measures the voltage drop across the thermistor. The lower the temperature, the higher the voltage drop. The HVAC Module monitors the temperature sensor signal circuit for voltages that are out of normal operating range. If a problem is detected, a DTC will be set.

There are two circuits between each duct temperature sensor and the HVAC Module:

- Temperature Sensor Signal
- Sensor Ground

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition is on for 5 seconds.
- Battery voltage is between 9.5 and 16.0 volts.

SET CONDITION

- Voltage on the (C164) Left Floor Temperature Sensor Signal circuit is above 4.9 volts for more than 2 seconds.

DEFAULT ACTION

- If the HVAC Module detects a valid voltage, the DTC will change from active to stored and will stay stored for 100 ignition cycles.

POSSIBLE CAUSES

Possible Causes
(C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN OR HIGH RESISTANCE
(C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO ANOTHER CIRCUIT
(C919) TEMP SENSOR COMMON RETURN CIRCUIT OPEN OR HIGH RESISTANCE
LEFT FLOOR DUCT TEMPERATURE SENSOR
HVAC MODULE

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

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. With the scan tool, run a Vehicle Scan Report or record the Environmental Data.
    3. With the scan tool, erase DTCs.
    4. Turn the ignition off for at least 10.0 seconds.
    5. Turn the ignition on.
    6. Using the recorded Environmental Data and the When Monitored Conditions, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

    Yes

    - Go To 2

    No

    - Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. Refer to **TESTING FOR AN INTERMITTENT CONDITION** .
2. **CHECK THE CONDITION OF THE LEFT FLOOR DUCT TEMPERATURE SENSOR CONNECTOR AND TERMINALS**
    1. Turn the ignition off.
    2. Check the temperature sensor and harness connector and terminals for improper installation, damage, and corrosion.

Were any problems found?

Yes

- Repair the connector and terminals as necessary.
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

No

- Go To 3

3. **ISOLATE AND CHECK THE (C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the Digital Volt-Ohm Meter (DVOM). **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 4

No

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

4. **ISOLATE AND CHECK THE (C164) LEFT FLOOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT AT THE HVAC MODULE HARNESS CONNECTOR**
    1. The ignition must be off when performing a resistance check to find a short between circuits.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Connect one lead of the DVOM to the circuit being tested at the ECU harness connector.
    4. With the other lead of the DVOM probe all other circuits at the ECU harness connector.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

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

Yes

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

No

- Go To 5

5. **ISOLATE AND CHECK THE (C919) TEMP SENSOR COMMON RETURN CIRCUIT FOR AN OPEN/HIGH RESISTANCE**
    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the ECU and the component harness connectors containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit. Check the disconnected connectors and related harnesses for damage, corrosion, and loose fitting terminals.
    3. Before testing a circuit, measure the resistance between the two leads of the DVOM. **Note:** Resistance in the meter leads can cause an error in the test results.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the ECU harness connector and measure the resistance of the circuit.

NOTE: **When back-probing a circuit at a harness connector, always use an appropriate back probing tool to prevent damage to the connector terminals.**

Is the resistance below 3.0 Ohms?

Yes

- Go To 6

No

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

6. **CHECK THE LEFT FLOOR DUCT TEMPERATURE SENSOR**

TEMPERATURE VS RESISTANCE

Temperature	Resistance
-40B°C (-40B°F)	98, 008Ω - 103, 892Ω
-30B°C (-22B°F)	51, 739Ω - 54, 461Ω
-20B°C (-4B°F)	28, 469Ω - 29, 773Ω
-10B°C (14B°F)	16, 277Ω - 16, 921Ω
0B°C (32B°F)	9, 632Ω - 9, 958Ω
10B°C (50B°F)	5, 886Ω - 6, 054Ω
20B°C (68B°F)	3, 703Ω - 3, 791Ω
30B°C (86B°F)	2, 389Ω - 2, 445Ω
40B°C (104B°F)	1, 576Ω - 1, 620Ω

1. Disconnect the Left Floor Duct Temperature Sensor harness connector.
2. Note the ambient temperature. If necessary, allow the sensor to acclimate for the most accurate reading.
3. Measure the resistance across the Signal and Sensor Ground terminals at the sensor.
4. Compare the resistance reading to the Temperature vs. Resistance table.

Is the resistance within specification for the temperature?

Yes

- Go To 7

No

- Replace the Left Floor Duct Temperature Sensor in accordance with the Service Information. Refer to **SENSOR, TEMPERATURE, AIR OUTLET, REMOVAL AND INSTALLATION** .
- Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

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

       Repair any conditions that are found.

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

       Did the DTC return?

       Yes

        - Replace the HVAC Module in accordance with the Service information. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
        - Perform the HVAC VERIFICATION TEST. Refer to **HVAC VERIFICATION TEST** .

       No

        - The wiring or poor connection problem has been repaired.

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

STANDARD PROCEDURE

HVAC VERIFICATION TEST

Perform the following procedures to verify that the repair(s) are valid.

1. Make sure that all accessories are turned OFF.
2. Make sure that the battery is fully charged.
3. Turn the ignition OFF.
4. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
5. With the scan tool, record and erase all DTCs from ALL modules.
6. Turn the ignition OFF, disconnect the scan tool from the Data Link Connector (DLC). Open the door and close the door. Wait a minimum of 30 seconds, then turn the ignition ON. Reconnect the scan tool.

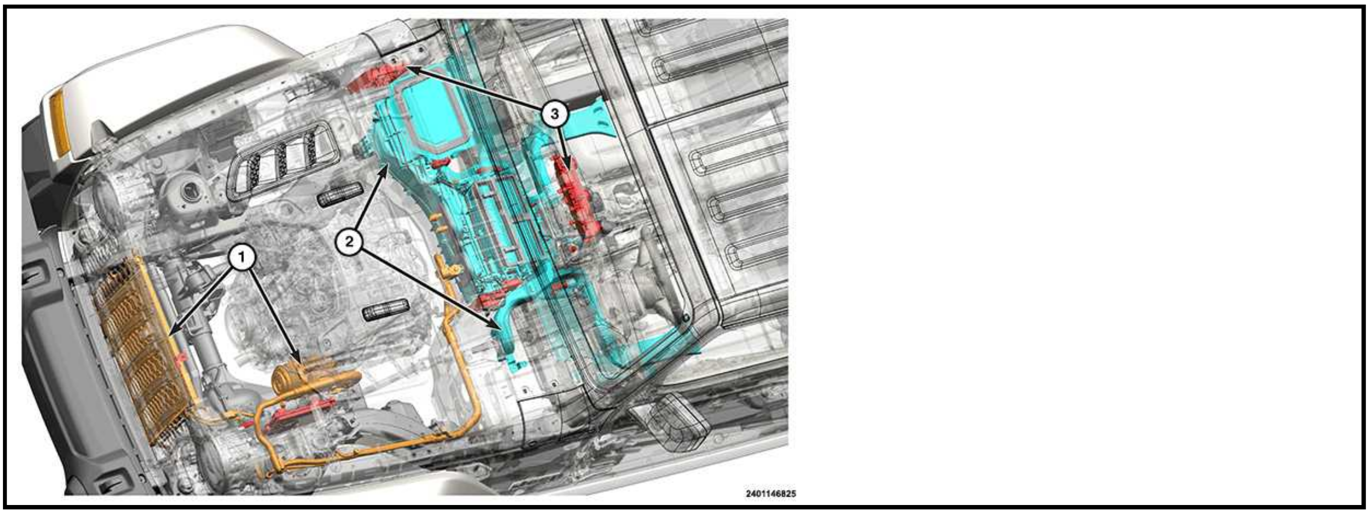
   NOTE: **Disconnecting the scan tool and opening and closing the door will allow the controller to enter into sleep mode.**

7. With the scan tool, perform the HVAC ACTUATOR CALIBRATION TEST.
8. Start and run the engine for two minutes while operating all functions of the system that caused the original concern.
9. With the scan tool, check for DTCs in all modules. Perform the appropriate diagnostic procedure(s). Refer to **DIAGNOSIS AND TESTING** .

DESCRIPTION AND OPERATION

AUTOMATIC TEMPERATURE CONTROL (ATC)

DESCRIPTION



The ATC Heating, Ventilation and Air Conditioning (HVAC) system is comprised of the following three subsystems, refer to the following for more information:

1. **Refer to** PLUMBING, DESCRIPTION AND OPERATION (Orange)
2. **Refer to** DISTRIBUTION, DESCRIPTION AND OPERATION (Light Blue)
3. **Refer to** CONTROLS, DESCRIPTION AND OPERATION (Red)

OPERATION

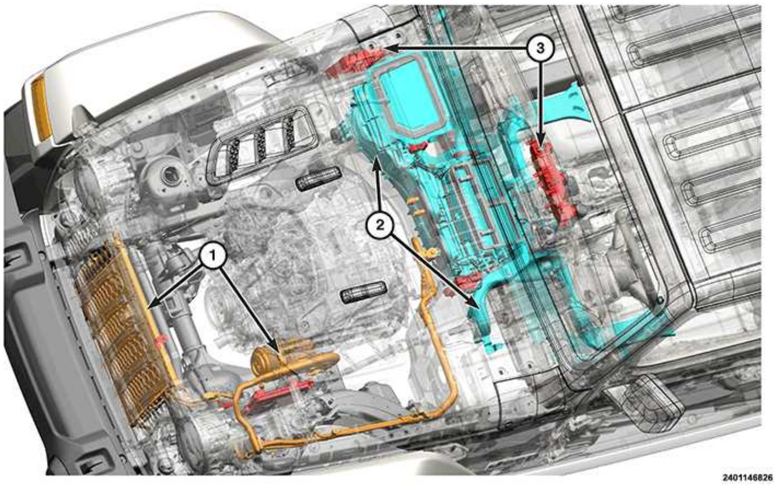
With the automatic system, the operator can choose either automatic or manual operation. During automatic operation, the operator simply sets a target temperature. The Air Conditioning (A/C) and heater module, called the HVAC module, determines the best combination of A/C compressor operation, blend door position, outlet air direction and speed to control passenger compartment humidity and reach the target temperature. During manual operation, the operator can select A/C operation, air flow speed, air flow outlet location, and choose either fresh or recirculated air.

The HVAC module is connected to the Controller Area Network - Interior High Speed (CAN-IHS) data bus and receives the information of the humidity sensor from the Instrument Panel Cluster (IPC) and ambient temperature via CAN. The system manages air recirculation, distribution and temperature using the actuators with potentiometer, for opening, closing and regulating the intermediate positions via electrical commands. The HVAC module controls the mixing temperatures through the temperature sensors located in the HVAC housing. The system manages the air temperature request by also monitoring solar radiation through a dedicated sensor located on the steering column opening cover. The A/C activation request from the user and the heated rear window activation request is sent to and activated by the Body Control Module (BCM) via CAN. The A/C request status and the actuator position are stored in the HVAC module. The HVAC also manages activation of the rear window defroster.

To maintain the performance level of the HVAC system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems. The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. (Refer to the appropriate service information) for more information before opening or attempting any service to the engine cooling system.

MANUAL TEMPERATURE CONTROL (MTC)

DESCRIPTION



The MTC Heating, Ventilation and Air Conditioning (HVAC) system is comprised of the following three subsystems, refer to the following for more information:

1. **Refer to** PLUMBING, DESCRIPTION AND OPERATION (Orange)
2. **Refer to** DISTRIBUTION, DESCRIPTION AND OPERATION (Light Blue)
3. **Refer to** CONTROLS, DESCRIPTION AND OPERATION (Red)

OPERATION

The interior climate of the vehicle is controlled by acting on the three control knobs placed on the Air Conditioning (A/C) heater control which is located on the lower center instrument panel. Based upon the system mode selected, conditioned air can exit the standard A/C housing through one or a combination of the three main housing outlets: defrost, panel or floor. The defrost and panel outlets are located on the top of the HVAC air distribution housing and the floor outlets are located on each side and in the center of the distribution housing. Once the conditioned air exits the HVAC housing, it is then directed through molded plastic ducts to the various outlets within the vehicle interior.

The HVAC module is connected to the Controller Area Network - Interior High Speed (CAN-IHS) data bus and receives the information of the humidity sensor from the Instrument Panel Cluster (IPC) via CAN. The A/C activation request from the user and the heated rear window activation request must be sent to the Body Control Module (BCM) via CAN. The A/C request status and the actuator position are stored in the HVAC module. The system manages air recirculation, distribution and temperature using the actuators with potentiometer, for opening, closing and regulating the intermediate positions via electrical commands. The HVAC module controls the mixing temperatures through the temperature sensors located in the HVAC housing. The system manages the air temperature request by also monitoring solar radiation through a dedicated sensor located on the steering column opening cover. The HVAC manages activation of the rear window defroster.

To maintain the performance level of the HVAC system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems. The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. (Refer to the appropriate service information) for more information before opening or attempting any service to the engine cooling system.

DIAGNOSIS AND TESTING

A/C PERFORMANCE

The Air Conditioning (A/C) system is designed to provide the passenger compartment with low temperature and low humidity air. The A/C evaporator, located in the Heating, Ventilation and Air Conditioning (HVAC) housing is cooled to temperatures near the freezing point. As warm damp air passes over the fins of the A/C evaporator, the air transfers its heat to the refrigerant in the evaporator coils and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an A/C system will be more effective in the Recirculation mode (MAX-A/C). With the system in the Recirculation mode, only air from the passenger compartment passes through the A/C evaporator. As the passenger compartment air dehumidifies, the A/C system performance levels rise.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the A/C system. When humidity is high, the A/C evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and coils. This reduces the amount of heat the A/C evaporator can absorb from the air. High humidity greatly reduces the ability of the A/C evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Removing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers, although an owner may expect too much from their A/C system on humid days. A performance test is the best way to determine whether the system is performing up to design standards. This test also provides valuable clues as to the possible cause of trouble with the A/C system. The ambient air temperature of the vehicle and the location where the vehicle will be tested must be a minimum of 21B°C (70B°F) for this test.

A/C PERFORMANCE TEST

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.**

NOTE: **The ambient air temperature of the location where the vehicle will be tested must be a minimum of 21B°C (70B°F). Also the A/C evaporator temperature must be a minimum of 18B°C (65B°F) prior to conducting the A/C Performance Test.**

1. Use a scan tool to observe the engine rpm and connect a manifold gauge set or an A/C recycling/charging station.
2. Operate the HVAC system under the following conditions:
    - Engine at 1, 000 rpm at operating temperature.
    - Door or windows open.
    - Transmission in PARK or NEUTRAL with parking brake set (depending on application).
    - A/C heater controls set to Recirculation mode (MAX-A/C), full cool, panel mode, blower set to high and with A/C compressor engaged. If the A/C compressor does not engage, see the A/C System Diagnosis table.
3. Insert a thermometer in the driver side center panel air outlet and operate the A/C system until the thermometer temperature stabilizes or a minimum of 5 minutes.

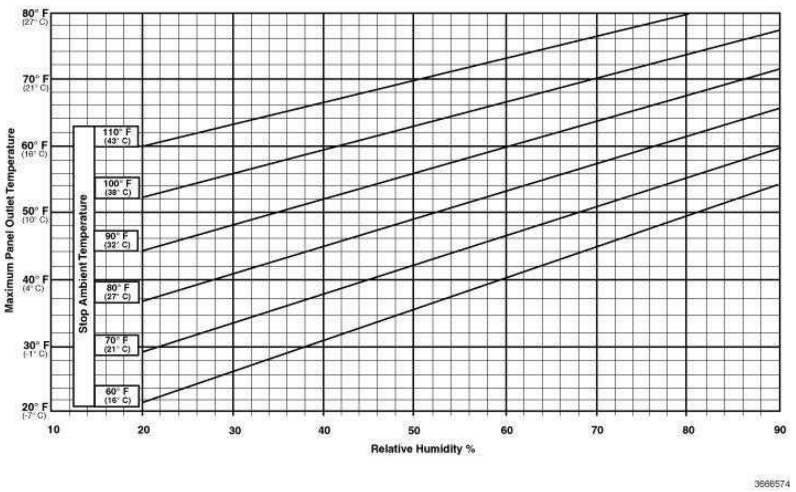
    NOTE: **This procedure requires the technician to know what the temperature and relative humidity is at the time of the test. The temperature must be combined with the relative humidity to calculate the apparent ambient temperature ("feels like" temperature), when the temperatures are above 21B°C (70B°F). Use the current ambient temperature and the relative humidity in your location. This information can be obtained from multiple sources, such as the internet or local news media.**

4. With the A/C clutch engaged, compare the air temperature at the center panel outlet and the compressor discharge pressure (high side) to the A/C Performance Temperature and Pressure chart. The A/C clutch may cycle, depending upon the ambient temperature and humidity. If the A/C clutch cycles, use the readings obtained before the clutch disengaged (coldest temperature).

A/C PERFORMANCE TEMPERATURE AND PRESSURE

Ambient Air Temperature (Apparent)	**21B°C (70B°F)**	**27B°C (80B°F)**	**32B°C (90B°F)**	**38B°C (100B°F)**	**43B°C (110B°F)**
Maximum Allowable Air Temperature at Center Panel Outlet	9B°C (48B°F)	9B°C (48B°F)	12B°C (54B°F)	15B°C (59B°F)	18B°C (65B°F)
Suction Pressure at Service Port (Low Side)	138 to 310 kPa (20 to 45 psi)	138 to 345 kPa (20 to 50 psi)	207 to 365 kPa (30 to 55 psi)	207 to 414 kPa (30 to 60 psi)	241 to 448 kPa (35 to 65 psi)
Discharge Pressure at Service Port (High Side)	1034 to 1724 kPa (150 to 250 psi)	1379 to 2068 kPa (200 to 300 psi)	1551 to 2241 kPa (225 to 325 psi)	1724 to 2413 kPa (250 to 350 psi)	2068 to 2758 kPa (300 to 400 psi)

5. If the air outlet temperature fails to meet the specifications in the A/C Performance Temperature and Pressure chart, or if the compressor discharge pressure is high, see the A/C System Diagnosis table.



A/C SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FOR APPLICATIONS WITH A FIXED DISPLACEMENT COMPRESSOR, RAPID A/C CLUTCH CYCLING WITH POOR PANEL OUTLET TEMPERATURES	1. Low refrigerant system charge	1. See Refrigerant System Leaks in this group. Refer to **PLUMBING, DIAGNOSIS AND TESTING**. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
EQUAL PRESSURES, BUT THE A/C CLUTCH DOES NOT ENGAGE	1. No refrigerant in the refrigerant system	1. See Refrigerant System Leaks in this group. Refer to **PLUMBING, DIAGNOSIS AND TESTING**. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Open fuse	2. See Wiring Information. Check the fuses in the Body Control Module. Repair the shorted circuit or component and replace the fuses.

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Inoperative A/C clutch coil	3. See A/C Compressor in this group. Test the A/C clutch coil and replace, if required.
	4. Inoperative A/C clutch relay	4. See A/C Clutch Relay in this group. Test the A/C clutch relay and relay circuits. Repair the circuits or replace the relay, if required.
	5. Improperly installed or inoperative evaporator temperature sensor	5. See Evaporator Temperature Sensor in this group. Test the sensor and replace, if required.
	6. Inoperative A/C pressure transducer	6. See A/C Pressure Transducer in this group. Test the sensor and replace, if required.
	7. Inoperative Powertrain Control Module (PCM)	7. See Group DTC Based Diagnostics. Test the PCM and replace, if required.
	8. Inoperative HVAC module	8. See - DTC Based Diagnostics. Test the HVAC module and replace, if required.
	9. Inoperative A/C heater control	9. Test the A/C heater control and circuits for compressor clutch engagement signal. Repair as necessary.
NORMAL PRESSURES, BUT A/C PERFORMANCE TEST AIR TEMPERATURES AT CENTER PANEL OUTLET ARE TOO HIGH	1. Excessive refrigerant oil in system	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Blend door actuator or cable inoperative or improperly installed	2. See Blend Door Actuator or Cable in this group. Inspect for proper operation and replace, if required.
	3. Blend door(s) inoperative or sealing improperly	3. See HVAC Housing in this group. Inspect each blend door for proper operation and sealing. Repair if required.
THE LOW SIDE PRESSURE IS NORMAL OR SLIGHTLY LOW, AND THE HIGH SIDE PRESSURE IS TOO LOW	1. Low refrigerant system charge	1. See Refrigerant System Leaks in this group. Refer to **PLUMBING, DIAGNOSIS AND TESTING**. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the A/C evaporator is restricted	2. See A/C Evaporator in this group. Replace the restricted A/C evaporator, if required.
	3. Restricted suction line	3. See A/C Suction line in this group. Check the suction line for restriction. Replace the suction line, if required.
	4. Inoperative A/C compressor	4. See A/C Compressor in this group. Replace the compressor, if required.
THE LOW SIDE PRESSURE IS NORMAL OR SLIGHTLY HIGH, AND THE HIGH SIDE PRESSURE IS TOO HIGH	1. A/C condenser air flow restricted	1. See A/C Condenser in this group. Check the A/C condenser for damaged fins, foreign objects obstructing air flow through the condenser fins and missing or improperly installed air seals. Clean, repair or replace components as required.
	2. Refrigerant flow through the A/C receiver/drier is restricted	2. See A/C Receiver/Drier in this group. Replace the restricted A/C receiver/drier, if required.

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Inoperative radiator cooling fan	3. See Cooling. Test the radiator cooling fan and replace, if required.
	4. Refrigerant system overcharged	4. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	5. Air in the refrigerant system	5. See Refrigerant System Leaks in this group. Refer to **PLUMBING, DIAGNOSIS AND TESTING**. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	6. Engine overheating	6. See Cooling. Test the engine cooling system and repair, if required.
THE LOW SIDE PRESSURE IS TOO HIGH, AND THE HIGH SIDE PRESSURE IS TOO LOW	1. Accessory drive belt slipping	1. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required.
	2. Restricted suction line	2. See A/C Suction line in this group. Check the suction line for restriction. Replace the suction line, if required.
	3. Inoperative A/C expansion valve	3. See A/C Expansion Valve in this group. Replace the A/C expansion valve, if required.
	4. Inoperative A/C compressor	4. See A/C Compressor in this group. Replace the A/C compressor, if required.
THE LOW SIDE PRESSURE IS TOO LOW, AND THE HIGH SIDE PRESSURE IS TOO HIGH	1. Restricted refrigerant flow through the refrigerant lines	1. See Liquid Line, Suction Line and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant lines, as required.
	2. Restricted refrigerant flow through the A/C expansion valve	2. See A/C Expansion Valve in this group. Replace the A/C expansion valve, if required.
	3. Restricted refrigerant flow through the A/C condenser	3. See A/C Condenser in this group. Replace the restricted A/C condenser, if required.

HEATER PERFORMANCE

See Cooling when performing the following checks:

- Check the engine coolant level and flow
- Check engine coolant reserve/recovery system operation
- Check accessory drive belt condition and tension
- Check radiator air flow and the fan drive operation

Perform the A/C System Performance Test, which is found within Heating, Ventilation and Air Conditioning (HVAC) System Diagnosis and Testing. Refer to **DIAGNOSIS AND TESTING**. If any Diagnostic Trouble Codes (DTCs) are found, repair as necessary (the appropriate service information).

WARNING: **Do not remove radiator cap when engine is hot, personal injury can result.**

If engine has been operated recently, wait 15 minutes before removing the radiator cap. Place a rag over the cap and turn it to the first safety stop. Allow pressure to escape through the overflow tube. When the system pressure stabilizes, remove the cap completely.

HEATER PERFORMANCE TEST

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control to the full hot position, the mode control to the floor position, and the blower motor control to the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the HVAC housing floor outlets. Compare the test thermometer reading to the Heater Temperature Reference chart.

HEATER TEMPERATURE REFERENCE

Ambient Air Temperature	**16B°C (60B°F)**	**21B°C (70B°F)**	**26B°C (80B°F)**	**32B°C (90B°F)**
Minimum Heater System Air Outlet Temperature	52B°C (125B°F)	56B°C (133B°F)	59B°C (139B°F)	62B°C (144B°F)

See Cooling if the heater outlet air temperature is below the minimum specification. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system.

OBSTRUCTED COOLANT FLOW

Possible causes of insufficient engine coolant flow are as follows:

- Improper heater hose routing.
- Low engine coolant.
- Pinched, kinked or plugged heater hoses.
- Plugged heater core.
- Plugged heater hose supply and return ports at the engine.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS

Possible causes of insufficient heat due to mechanical problems are as follows:

- Restricted cabin air filter
- Obstructed cowl air intake
- Obstructed heater system outlets
- Inoperative engine thermostat
- Inoperative blower motor system
- Inoperative A/C heater control
- Inoperative or improperly calibrated blend door actuator
- Inoperative, obstructed or improperly installed blend-air door

STANDARD PROCEDURE

A/C EVAPORATOR CLEANING

When equipped with A/C, some vehicle operators may experience a musty odor from the Heating, Ventilation, and Air Conditioning (HVAC) system, primarily at start up in hot and humid climates. This odor may be the result of microbial growth on the HVAC unit air filter. During normal A/C system operation, the filter accumulates dirt, organic debris, and fungal spores. When rain or mist mixes with the dirt on the filter, bacteria and fungal growth progresses and odor may result.

If the vehicle operator experiences a musty odor when operating the A/C system, perform the following:

1. Change the cabin air filter. Refer to **FILTER, CABIN AIR, REMOVAL AND INSTALLATION**.
2. Remove the cowl panel cover. Refer to **COVER, COWL PANEL, REMOVAL AND INSTALLATION** .
3. Clean any dirt and debris that may be present at the HVAC fresh air inlet and the cowl plenum.

If the odor persists, perform the following procedure:

WARNING: **Always use eye protection, rubber gloves and protective clothing when performing the following procedure. Avoid continuous breathing of vapors from evaporator coil cleaning and sealing fluids. Avoid contact with skin and eyes. Failure to follow these instruction may result in possible serious or fatal injury.**

1. Remove the cowl panel cover. Refer to **COVER, COWL PANEL, REMOVAL AND INSTALLATION** .
2. Clean any dirt and debris that may be present at the HVAC fresh air inlet screen and at the top of the cowl panel.
3. Install the cowl panel cover. Refer to **COVER, COWL PANEL, REMOVAL AND INSTALLATION** .
4. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
5. Inspect the evaporator drain tube for foreign material that may be blocking the drain and repair as necessary.
6. Once drain operation has been verified, temporarily plug the drain tube using an appropriate plug.
7. Remove the support and lower the vehicle.
8. Place a protective cover over the driver and front passenger side floor and seating areas.
9. Remove the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
10. Remove and discard the cabin air filter. Refer to **FILTER, CABIN AIR, REMOVAL AND INSTALLATION**.
11. Clean any dirt and debris that may be present inside the HVAC housing through all readily accessible areas inside of the HVAC housing. If necessary, use a vacuum with a small flexible hose, and take caution not to damage the fins of the A/C evaporator.
12. Using a suitable tool, completely coat the entire surface of A/C evaporator with three bottles of MoparB® Cooling Coil Cleaner through the blower motor and filter openings. Be sure to use all of the coil cleaner in each container.
13. Allow the vehicle to sit for 30 minutes.
14. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

    WARNING: **Excess cooling coil coating will drain from the evaporator housing when the clamp, cap or plug is removed from the evaporator drain hose or tube. Always use eye protection, rubber gloves and protective clothing. Avoid continuous breathing of vapors from evaporator coil sealing fluid. Avoid contact with skin and eyes. Failure to follow these instruction may result in possible serious or fatal injury.**

15. Remove the previously installed heater hose plugs and allow excess coil cleaner to drain from the HVAC housing.
16. Remove the support and lower the vehicle.
17. Refill the three empty coil cleaner bottles with clean tap water.
18. Using a suitable tool, completely rinse the entire surface of A/C evaporator with the three bottles of clean tap water through the blower motor and filter openings. Be sure to use all of the water in each container.
19. Install the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
20. Install the cabin air filter cover, without a filter. Refer to **FILTER, CABIN AIR, REMOVAL AND INSTALLATION**.

21. Disconnect the wire harness connector from the A/C compressor to disable compressor operation.
22. Start the engine.
23. Adjust all the windows so they are open approximately 8 mm (0.5 in.).
24. Set the A/C heater controls to the following:
    - Air distribution to Panel and Recirculation mode
    - Temperature to full heat
    - Set the blower to HI
25. Allow the vehicle to run for 20 minutes.
26. Turn the engine OFF.
27. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
28. Inspect the evaporator drain tube for foreign material that may have blocked the drain during evaporator coil cleaning and repair as necessary.
29. Once drain operation has been verified, temporarily plug the drain tube again using an appropriate plug.
30. Remove the support and lower the vehicle.
31. Remove the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
32. Remove the cabin air filter cover. Refer to **FILTER, CABIN AIR, REMOVAL AND INSTALLATION**.
33. Using a suitable tool, completely coat the entire surface of A/C evaporator with one bottle of MoparB® Cooling Coil Coating through the blower motor and filter openings. Be sure to use all of the coil coating in the container.

NOTE: **Be sure to thoroughly clean out the spray delivery tool with warm water once coil coating is complete to prevent damage to the tool.**

34. Refill the empty bottles with clean warm tap water and completely rinse out the PSE Flex Spray Delivery Tool 534-62637, or equivalent.
35. Allow the vehicle to sit for 30 minutes.
36. Install the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
37. Install a new cabin air filter and the cover. Refer to **FILTER, CABIN AIR, REMOVAL AND INSTALLATION**.
38. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

WARNING: **Excess cooling coil coating will drain from the evaporator housing when the clamp, cap or plug is removed from the evaporator drain hose or tube. Always use eye protection, rubber gloves and protective clothing. Avoid continuous breathing of vapors from evaporator coil sealing fluid. Avoid contact with skin and eyes. Failure to follow these instruction may result in possible serious or fatal injury.**

39. Remove the previously installed plugs from the evaporator drain tube and allow excess coil coating to drain from the HVAC housing.
40. Remove the support and lower the vehicle.
41. Start the engine.
42. Adjust all the windows so they are open approximately 8 mm (0.5 in.).
43. Set the A/C heater controls to the following:
    - Air distribution to Panel and Recirculation mode
    - Temperature to full heat
    - Set the blower to HI
44. Allow the vehicle to run for 20 minutes.
45. Turn engine OFF.

46. Remove the protective covers from the driver and front passenger side floor and seating areas.
47. Connect the wire harness connector to the A/C compressor.
48. Verify proper heating and A/C system operation.

TECHNICAL SPECIFICATIONS

A/C SYSTEM

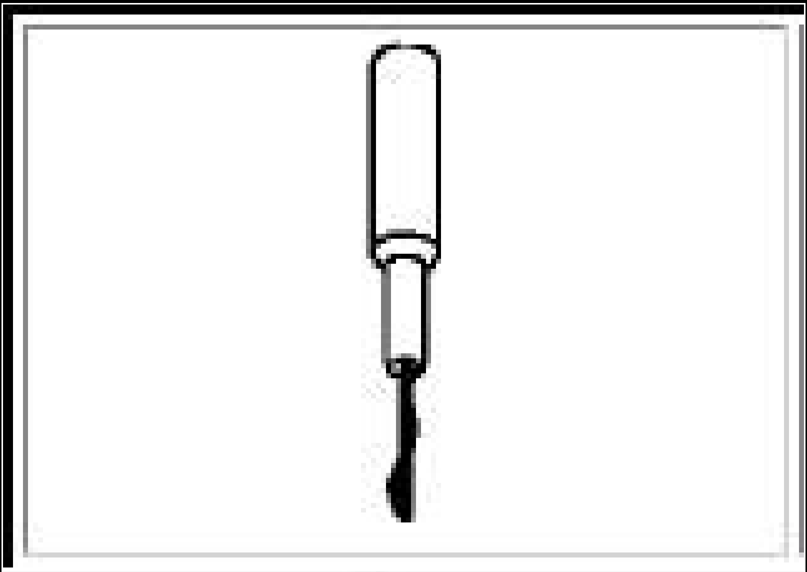
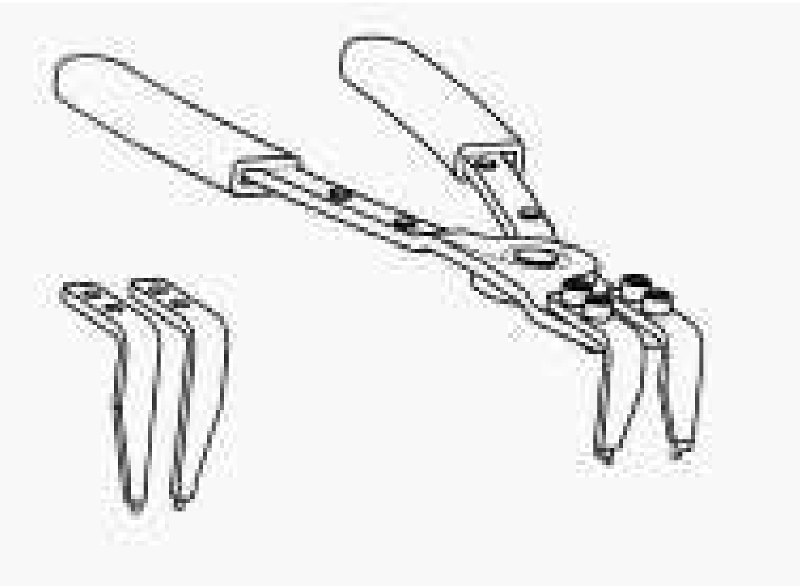
Item	Description	Notes
A/C Clutch Air Gap	0.35 - 0.60 mm (0.014 - 0.024 in.)	Measurement taken at an average of 3 locations 120B° apart.
A/C Clutch Coil Draw	3.53 amps @ at 20B°C (68B°F)	@ 12V B± 0.5V @ 21B° C (70B° F)
A/C Clutch Coil Resistance	3.6 B± 0.08 Ohms at 20B°C (68B°F)	When measured across coil lead connector
External Control Variable Displacement (ECVD) Valve Resistance	10.6 B± 0.5 Ohms	Hanon compressor
Freeze-up Control	Evaporator Temperature Sensor	HVAC housing mounted
High Pressure Control	A/C pressure transducer	A/C liquid line mounted
Refrigerant Oil Capacity	Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** for complete system fill.	
Refrigerant Charge Capacity	Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .	

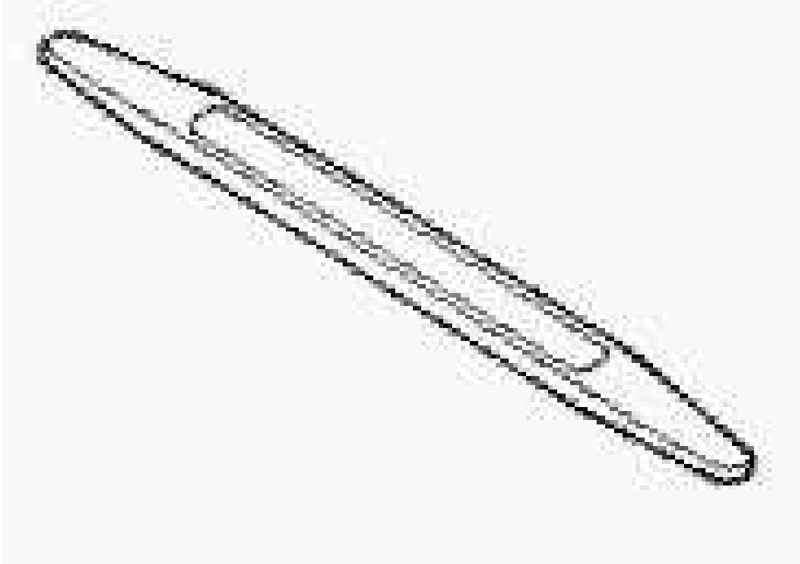
TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	COMMENTS
A/C Compressor Bolts	Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION**.	-	-	Refer to the procedure for special tightening instructions.
A/C Compressor Oil Drain Bolt	10	-	88	B
A/C Compressor Shaft Bolt	14	10	-	B
A/C Compressor Stud	11	8	-	B
A/C Condenser to Radiator Bolts	5	-	45	B
Expansion Valve Bolts	11	8	-	B
HVAC Case to Instrument Panel Reinforcement Bolts	10	-	88	B
Receiver/Drier to Condenser Bolt	22	16	-	B
Discharge Line to A/C Compressor	20	15	-	B
Discharge Line to A/C Condenser Nut	20	15	-	B
Liquid Line to A/C Condenser Nut	20	15	-	B
Suction Jumper Line to A/C Compressor	20	15	-	B
Suction Jumper Line to Suction Liquid Line	20	15	-	B

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.	COMMENTS
Assembly Nut				
Suction Liquid Line Assembly to A/C Expansion Valve Nut	20	15	-	B
Suction Liquid Line Assembly to Body Bolts	9	-	80	B

SPECIAL TOOLS

	6801 - Terminal Probe (Originally Shipped In Kit Number(s) 10190.)
	9764 - Pliers, A/C Snap Ring (Originally Shipped In Kit Number(s) 9909.)

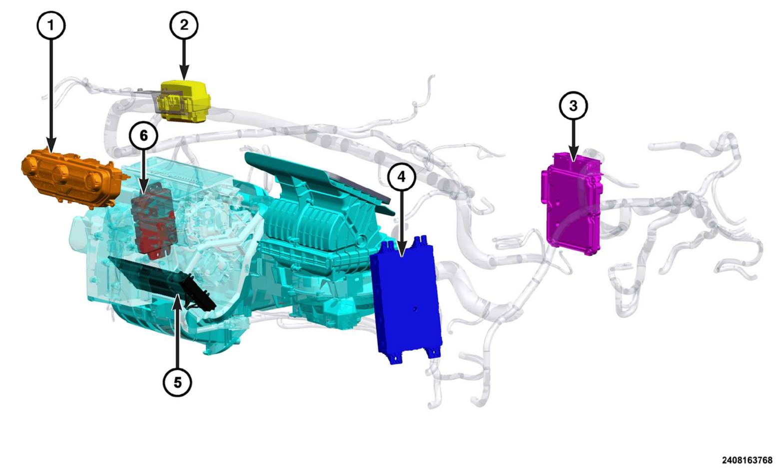
	C-4755 - Trim Stick (Originally Shipped In Kit Number(s) 9299, 9299CC, 9299CC, 9300A-CAN.)

CABIN HEATER

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Cabin Heater system consists of the following components:

COMPONENT INDEX

1.	Refer to A/C HEATER CONTROL part of the Integrated Center Stack (ICS) Module.
2.	Refer to RELAYS IN THE AUXILIARY POWER DISTRIBUTION CENTER (PDC).
3.	Refer to POWERTRAIN CONTROL MODULE (PCM).
4.	Refer to BODY CONTROL MODULE (BCM).
5.	Refer to POSITIVE TEMPERATURE COEFFICIENT (PTC) HEATER.
6.	Refer to HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE.

On diesel engine equipped models, whether they have Automatic Temperature Control (ATC) or Manual Temperature Control (MTC), the climate of the vehicle through the heater assembly can be insufficient due to a cold engine. As an option, an additional system of heating is offered that is activated in the first instants of operation of the engine, according to the temperature of the engine coolant by the HVAC module (2) when requested by the A/C heater control (1).

The cabin heater consists of a device for additional heating, located inside the heater assembly: in this device are located three resistors (PTC1 - 250W, PTC2 - 400W, and PTC3 - 400W).

OPERATION

The operation of the resistors is controlled by the A/C heater control which activates one, two or three PTC resistors (4), thus providing progressive heating with a maximum power of 1050W, determined by a control logic that depends on:

- Ignition switch status
- Engine Stop Start (ESS) System status
- The outside temperature below 20B°C (68B°F)
- The temperature reached by the coolant of the engine about 70B°C (158B°F)
- The number of revolutions of the engine (which must be greater than 700 rpm)
- The battery voltage (which must not fall below 12.6 V)

A/C HEATER CONTROL

A/C HEATER CONTROL

Refer to COMPONENT INDEX.

The A/C Heater Control sends an activation signal to the HVAC module requesting heat.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to COMPONENT INDEX.

CAN-IHS Inputs

- HVAC request for PTC enable

CAN-IHS Outputs

- Relay 1 status
- Relay 2 status
- Relay 3 status

CAN-C Inputs

- Relay 1 enable request
- Relay 2 enable request
- Relay 3 enable request

CAN-C Outputs

- Relay 1 status request
- Relay 2 status request
- Relay 3 status request
- HVAC request for PTC enable
- HVAC request for ESS disable
- PTC relay(s) enabled

Hardwired Outputs

- PTC relay 1 activate
- PTC relay 2 activate
- PTC relay 3 activate

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE

Refer to COMPONENT INDEX.

CAN-IHS Inputs

- Country code
- Remote start present
- Vehicle line - vehicle programming
- PTC heater feature presence
- Ambient temperature - Avg
- Ambient temperature - current
- Ignition status
- Commanded ignition status
- Engine coolant temperature
- ESS engine state
- Type of start requested
- RPM
- Relay 1 status
- Relay 2 status
- Relay 3 status

CAN-IHS Outputs

- PTC enable request
- ESS disable request

POSITIVE TEMPERATURE COEFFICIENT (PTC) HEATER

POSITIVE TEMPERATURE COEFFICIENT (PTC) HEATER

Refer to COMPONENT INDEX.

The power to one, two or three resistors is controlled through three relays located in the auxiliary Power Distribution Center (PDC):

- Level 1: Activation of the first relay only (250W)
- Level 2: Activation of the second relay only (400W)
- Level 3: Activation of the third relay (400W)

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to COMPONENT INDEX.

CAN Inputs

- PTC heater feature presence

- Commanded ignition status
- Relay 1 status request
- Relay 2 status request
- Relay 3 status request
- PTC enable request
- ESS disable request

CAN Outputs

- Relay 1 enable request
- Relay 2 enable request
- Relay 3 enable request

RELAYS IN THE AUXILIARY POWER DISTRIBUTION CENTER (PDC)

RELAYS IN THE AUXILIARY POWER DISTRIBUTION CENTER (PDC)

Refer to **COMPONENT INDEX**.

The PTC relays are located in the auxiliary PDC, mounted to the left side of the top cowl panel in front of the driver.

The PTC relays receive a ground signal to the control side of the relay from the BCM as they are enabled using the inputs from the HVAC module and PCM.

The PTC heater unit is accessed for service after removing the instrument panel and instrument panel carrier. The PTC heater unit is not serviceable and must be replaced as a unit if ineffective or damaged. Refer to **UNIT, HEATER, REMOVAL AND INSTALLATION**.

UNIT, HEATER

REMOVAL AND INSTALLATION

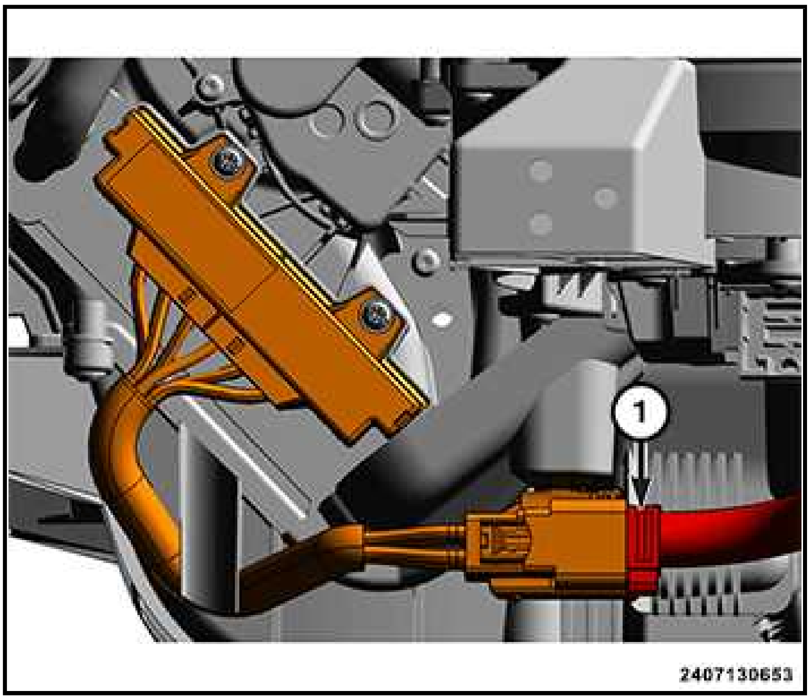
REMOVAL AND INSTALLATION

REMOVAL

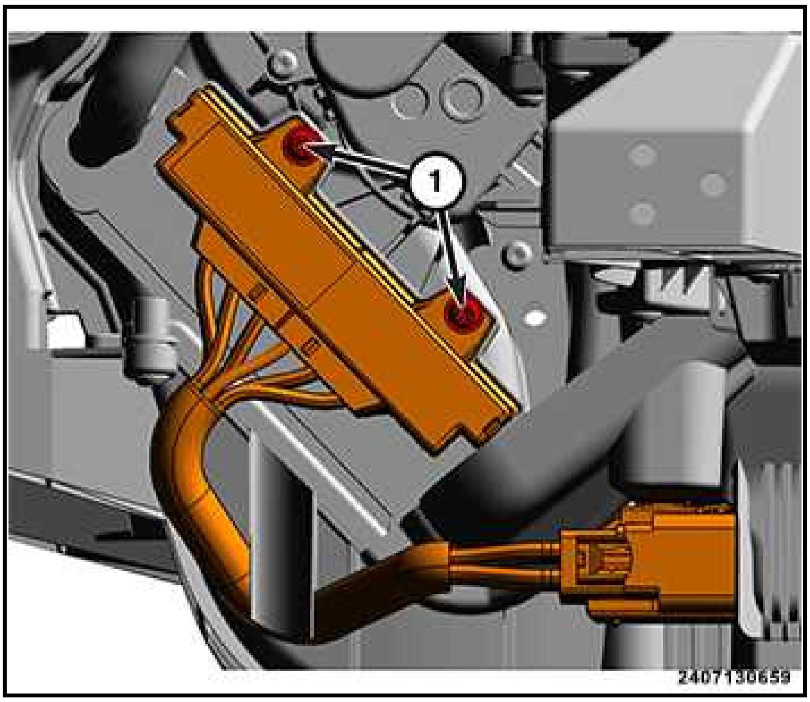
WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

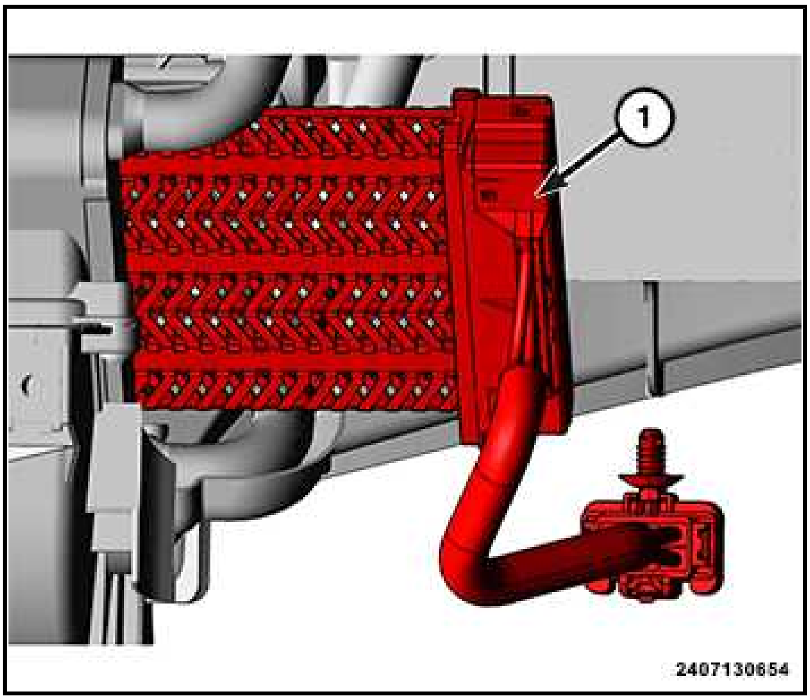
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the HVAC housing Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.



3. Disengage the wire connector lock that secures the wire harness connector to the positive temperature coefficient (PTC) heater unit located on the left side of the HVAC air distribution housing and disconnect the connector (1) from the heater.



4. Remove the two screws (1) that secure the PTC heater unit to the left side of the HVAC air distribution housing.



5. Carefully remove the PTC heater unit (1) from the air distribution housing by pulling it straight out of the housing.

INSTALLATION

1. Carefully install the positive temperature coefficient (PTC) heater unit into the left side of the HVAC air distribution housing. Make sure to position the two locator tabs on the end of the heater unit into the molded locator indentations on the right side of the air distribution housing.
2. Install the two screws that secure the PTC heater unit to the air distribution housing. Tighten the screws securely.
3. Connect the wire harness connector to the PTC heater unit while pushing upward on the connector lock. Make sure the wire harness connector and lock are fully engaged.
4. Install the HVAC housing Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.
5. Connect the negative battery cable(s). Refer to the appropriate service information .

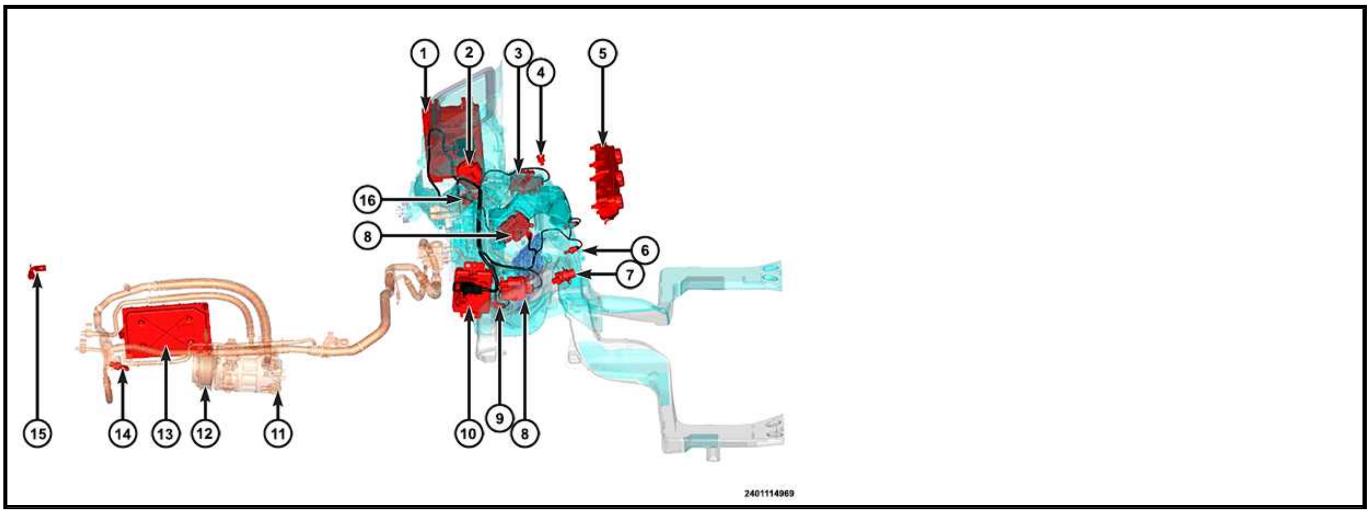
CONTROLS

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION

Heating, Ventilation and Air Conditioning (HVAC) System Controls Operational Video



The HVAC system controls consist of the following components:

COMPONENT INDEX

1.	Refer to **BODY CONTROL MODULE (BCM)**.
2.	**Recirculation Door** Refer to **ACTUATOR**.
3.	**Mode Door** Refer to **ACTUATOR**.
4.	Refer to **SUN SENSOR**.
5.	Refer to **A/C HEATER CONTROL - AUTOMATIC TEMPERATURE CONTROL (ATC)** - part of the Integrated Center Stack (ICS) Module. Refer to **A/C HEATER CONTROL - MANUAL TEMPERATURE CONTROL (MTC)** - part of the ICS Module.
6.	Refer to **AIR OUTLET TEMPERATURE SENSOR**.
7.	Refer to **IN-CAR TEMPERATURE SENSOR**.
8.	**Blend Door** Refer to **ACTUATOR** - ATC shown; MTC located on the right side of the HVAC housing.
9.	Refer to **EVAPORATOR TEMPERATURE SENSOR**.
10.	Refer to **HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE**.
11.	Refer to **EXTERNAL CONTROL VARIABLE DISPLACEMENT (ECVD) VALVE**.
12.	Refer to **ELECTRIC CLUTCH**.
13.	Refer to **POWERTRAIN CONTROL MODULE (PCM)**.
14.	Refer to **A/C PRESSURE TRANSDUCER**.
15.	Refer to **AMBIENT TEMPERATURE SENSOR**.
16.	Refer to **BLOWER MOTOR POWER MODULE**.

OPERATION

The air conditioning system is primarily controlled by the HVAC module using inputs from various sensors around the vehicle, both inside and outside the vehicle. The HVAC module directs the system based on occupant input to the A/C heater control or the UconnectB® touchscreen module in the radio, if equipped. The HVAC module is located on the left side of the HVAC housing, just above the accelerator pedal assembly.

The exterior sensors used to control the operation of the A/C system include the following sensors:

- **Ambient temperature sensor** - mounted in front of the radiator on the left side of the Front End Module (FEM)
- **A/C pressure transducer** - mounted on the high pressure liquid line near the left headlamp assembly

The A/C pressure transducer is used directly by the PCM to control the engagement and disengagement of the compressor clutch. If the pressure in the liquid line is too high, the pressure transducer transmits that signal to the PCM which will disengage the compressor clutch until the pressure is reduced to a safe level for the system to operate. If the pressure in the liquid line is too low, the pressure transducer transmits that signal to the PCM which will prevent the compressor clutch from engaging.

Interior sensors include the following sensors:

- **In-car temperature sensor** - located behind the steering column opening cover to the right of the steering column
- **Sun sensor** - located in the middle left of the defroster grille
- **Evaporator sensor** - located on the lower left side of the HVAC housing directly behind the evaporator so that it is in the air flow of the evaporator
- **Four duct temperature sensors** - one located on the right side, one on the left side and two on the rear of the HVAC housing

All sensors, except the ambient temperature sensor and A/C pressure transducer, send their signal directly to the HVAC module. The ambient temperature sensor sends its signal to the BCM, which then broadcasts it on the Controller Area Network (CAN) and the HVAC module acquires the data via the CAN data bus.

Blower speed is controlled by the HVAC module based on input from the in-car temperature sensor by sending a Pulse Width Modulated (PWM) signal to the blower motor power module, which varies the speed of the blower motor. The blower motor power module is located on the bottom of the blower motor and is integral with the blower motor.

The HVAC module controls the position where the air flow is directed by use of three actuators on the ATC system or two actuators on the MTC system. On the ATC system, one blend door actuator is located on the left side of the HVAC housing and the second blend door actuator and the mode door actuator are located on the right side. On the MTC system, both the blend door and mode door actuators are located on the right side. The flow of outside air to the inside of the vehicle is controlled by the recirculation actuator, which receives a signal from the HVAC module to allow outside air to be brought into the vehicle or to close off the outside air and simply recirculate the air inside the vehicle. This can be directly controlled by occupant input if so desired.

The BCM is the CAN - Interior High Speed (CAN-IHS) gateway in the HVAC system, allowing communication between the HVAC module, Instrument Panel Cluster (IPC) and PCM.

ACTUATOR

ACTUATOR

Refer to COMPONENT INDEX.

The door actuators are direct current motors controlled at 12 volts, but usually operate between 10 and 16 volts. The system contains two blend door actuators in the ATC system or one in the MTC system, one mode door actuator and one recirculation door actuator. All actuators operate in the same fashion.

The specific feature of the potentiometer is that it is linear. The potentiometer receives a 5 volt power supply at terminal 3 and receives the ground at terminal 1. The signal of the potentiometer exits terminal 2 and is compared with the supply of the HVAC module. This is not an absolute value, it is a percentage of the power supply. Therefore this measurement is not linked to the level of the battery. The value of the potentiometer resistance varies depending on its position.

A/C HEATER CONTROL - AUTOMATIC TEMPERATURE CONTROL (ATC)

A/C HEATER CONTROL - AUTOMATIC TEMPERATURE CONTROL (ATC)

Refer to COMPONENT INDEX.

Each of the A/C heater controls in the ICS module are resistor type controls. When a button is pushed or a knob is turned, the ICS module converts a resistive signal to a data message that is then sent to the UconnectB® touchscreen module via the CAN. The controls in the UconnectB® touchscreen module mimic the action selected on the ICS module if the UconnectB® touchscreen module input method is used by the customer. The

UconnectB® touchscreen module will then communicate the A/C heater control request signals to the HVAC module.

The HVAC module is a dedicated microprocessor that automatically drives the electrically operated air-door actuators for the Dual Zone ATC HVAC system. The ATC HVAC module obtains sun load, in-car temperature and evaporator temperature information through hardwired circuits. Occupant HVAC settings and other required vehicle information are obtained over the CAN-IHS data bus.

Inputs

- Temperature unit setup from IPC
- A/C button switch
- Auto button switch
- Rear defrost button switch
- Front defrost button switch
- Power OFF button switch
- Recirculation button switch
- Blower speed knob switch
- Driver temperature UP button switch
- Driver temperature DOWN button switch
- Passenger temperature UP button switch
- Passenger temperature DOWN button switch
- Blower speed selection button switch
- Operational mode status
- Ignition status
- Climate system status from HVAC module

Outputs

- Customer button and knob selections to HVAC module
- Customer button and knob selections to radio
- A/C button light ON/OFF command
- Auto button light ON/OFF command
- Recirculation button light ON/OFF command
- Rear defrost button light ON/OFF command
- Front defrost button light ON/OFF command

The Dual Zone ATC HVAC system is diagnosed using a scan tool Refer to **DIAGNOSIS AND TESTING** .

Prior to replacing an A/C heater control or HVAC module, check for any Diagnostic Trouble Codes (DTCs) related to the HVAC system, and run the calibration procedure to verify that the concern is not an air-door calibration issue, Refer to **STANDARD PROCEDURE** .

The individual A/C heater controls located in the ICS module cannot be adjusted or repaired. If an individual A/C heater control or control indicator lamp is inoperative or damaged, the entire ICS module must be replaced, Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .

The individual A/C heater controls located in the UconnectB® touchscreen module cannot be adjusted or repaired. If an individual A/C heater control or control indicator lamp is inoperative or damaged, the entire UconnectB® touchscreen module must be replaced. Refer to **RADIO, REMOVAL AND INSTALLATION** .

A/C HEATER CONTROL - MANUAL TEMPERATURE CONTROL (MTC)

A/C HEATER CONTROL - MANUAL TEMPERATURE CONTROL (MTC)

Refer to **COMPONENT INDEX**.

Each of the A/C heater controls in the ICS module are resistor type controls. When a button is pushed, or a knob is turned, the ICS module converts a resistive signal to a data message that is then sent to the UconnectB® touchscreen module via the CAN, if equipped. The controls in the UconnectB® touchscreen module mimic the action selected on the ICS module if the UconnectB® touchscreen module input method is used by the customer. The UconnectB® touchscreen module will then communicate the A/C heater control request signals to the HVAC module.

The HVAC module is a dedicated microprocessor for the MTC HVAC system. The MTC HVAC module obtains evaporator temperature information through hard wired circuits, and occupant heating and A/C settings and other required vehicle information over the CAN-IHS data bus.

The MTC heating and A/C system is diagnosed using a scan tool, Refer to **DIAGNOSIS AND TESTING** .

Prior to replacing an A/C heater control or HVAC module, check for any Diagnostic Trouble Codes (DTCs) related to the heating and A/C system, and run the calibration procedure to verify that the concern is not an air-door calibration issue, Refer to **STANDARD PROCEDURE** .

The individual A/C heater controls located in the ICS module cannot be adjusted or repaired. If an individual A/C heater control or control indicator lamp is inoperative or damaged, the entire ICS module must be replaced, Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .

A/C PRESSURE TRANSDUCER

A/C PRESSURE TRANSDUCER

Refer to **COMPONENT INDEX**.

Typical A/C pressure transducer shown

The A/C pressure transducer is a sensor that measures the pressure of the refrigerant in the high-pressure side of the refrigeration system.

It is installed on a Schrader-type fitting located on the refrigerant discharge or liquid line, depending on engine application.

An O-ring seals the connection between the A/C pressure transducer and the refrigerant line fitting. The transducer is connected to the vehicle electrical system by a three-terminal connector.

The Schrader-type valve in the refrigerant line fitting permits the A/C pressure transducer to be removed or installed without disturbing the refrigerant in the A/C system.

NOTE: **Replacement of the O-ring seal is required when the pressure transducer is replaced. Failure to replace the O-ring seal may result in a refrigerant system leak.**

The A/C pressure transducer is connected to a 5 volt supply voltage. Utilizing sensing elements and internal electronics, it creates a voltage signal that is proportional to the pressure. This voltage is received by the Powertrain Control Module (PCM) or Engine Control Module (ECM), where it is converted to a pressure value, and broadcasts the information from the PCM/ECM over the CAN-C bus for use by the other modules.

The PCM/ECM is programmed to respond to this and other sensor inputs to control the operation of the A/C compressor and the radiator cooling fan to optimize A/C system performance and to protect the system components from damage. The PCM will not operate the A/C compressor if there are any A/C pressure transducer circuit faults detected.

The A/C pressure transducer is factory calibrated and cannot be adjusted or repaired and must be replaced if inoperative or damaged.

AIR OUTLET TEMPERATURE SENSOR

AIR OUTLET TEMPERATURE SENSOR

Refer to **COMPONENT INDEX**.

There are four temperature sensors on the HVAC unit output. One is on the left side, one is on the right side and two are on the rear part of the HVAC housing.

These sensors are Negative Temperature Coefficient (NTC) type. This means that their resistance decreases when temperature increases.

The sensor resistance is about 3 kilohms at 25B°C (77B°F) and 9.795 kilohms at 0B°C (32B°F).

The air duct temperature sensors are diagnosed using a scan tool, Refer to **DIAGNOSIS AND TESTING** .

The air duct temperature sensors cannot be adjusted or repaired and must be replaced if inoperative or damaged.

AMBIENT TEMPERATURE SENSOR

AMBIENT TEMPERATURE SENSOR

Refer to **COMPONENT INDEX**.

The HVAC module receives the information about outside temperature to carry out the correct air mixing strategies from the BCM via CAN. The ambient temperature sensor is positioned in front of the radiator and it is managed by the BCM, which also receives the sensor's temperature information. The BCM sends the ambient temperature value via CAN for the modules that require this information.

BLOWER MOTOR POWER MODULE

BLOWER MOTOR POWER MODULE

Refer to **COMPONENT INDEX**.

The blower motor power module is a linear regulator. The HVAC module sends a PWM signal to control the blower motor speed. The regulator sends its operating status to the HVAC module.

The blower motor power module is integral to and serviced with the blower motor.

BODY CONTROL MODULE (BCM)

BODY CONTROL MODULE (BCM)

Refer to COMPONENT INDEX.

The BCM is used in the HVAC system to relay sensor and vehicle operational status to the HVAC module. The information is used by the HVAC module to make changes and adjustments to the system when correction is needed or requested by the operator.

Inputs

- Vehicle speed signal
- Vehicle speed fault status
- A/C Pressure
- A/C Pressure fault status
- A/C compressor status
- Engine RPM
- Engine RPM fault status
- Climate system start/stop info
- Climate system start/stop enable
- Ignition status
- Operational mode status
- Alternator fault status

Outputs

- Climate start/stop info
- Stop/start enable
- Vehicle speed signal
- Vehicle speed fault status
- A/C Pressure
- A/C Pressure fault status
- A/C compressor status
- Engine RPM
- Engine RPM fault status
- Door and swing gate switch status

ELECTRIC CLUTCH

ELECTRIC CLUTCH

Refer to COMPONENT INDEX.

The A/C compressor clutch components provide the means to engage and disengage the A/C compressor from the engine accessory drive belt. When the electromagnetic A/C clutch coil is energized, it magnetically draws the clutch plate into contact with the clutch pulley and drives the compressor shaft. When the A/C clutch coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley assembly.

A/C clutch engagement is controlled by the PCM which receives power from the Power Distribution Center (PDC).

The PCM receives an A/C request message from the HVAC module or A/C heater control over the CAN-Chassis (CAN-C) bus using several inputs to determine A/C compressor clutch control, including:

- Engine revolutions per minute
- Engine coolant temperature
- Throttle position
- Vehicle speed
- Ambient temperature
- A/C evaporator temperature
- A/C system high-side pressure
- A/C switch requests

The A/C clutch control system is diagnosed using a scan tool. Refer to the appropriate service information .

The A/C clutch components cannot be repaired and must be replaced if inoperative or damaged.

A/C Compressor Clutch Inhibit

Using these inputs, the PCM will not allow A/C compressor operation under the following conditions:

- Wide Open Throttle
- Engine is first started or idling too slow
- Engine temperature reaches 126B°C (260B°F) or higher
- Evaporator temperature is below 0B°C (32B°F)
- Ambient temperature sensor signal missing
- Transducer indicates system pressure more than 1999 kPa (290 psi) or less than 234 kPa (34 psi)

EVAPORATOR TEMPERATURE SENSOR

EVAPORATOR TEMPERATURE SENSOR

Refer to **COMPONENT INDEX**.

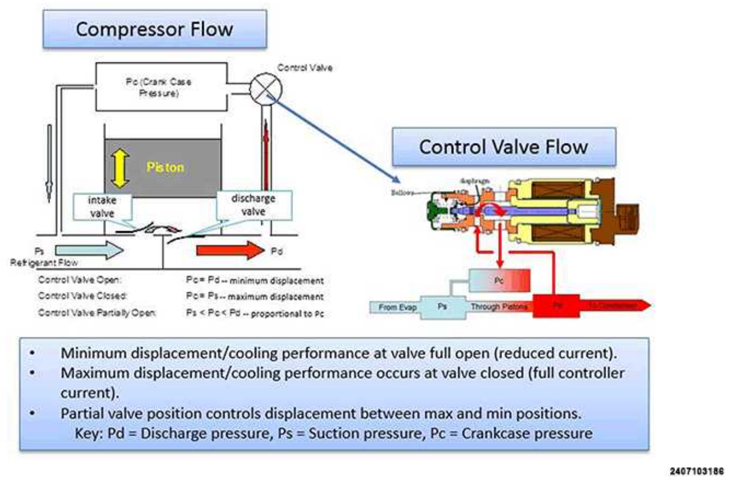
The evaporator temperature sensor is used to measure the temperature of the evaporator for the HVAC module. When the evaporator reaches a temperature that is critical for its safety, the HVAC module disables the A/C request.

The sensor resistance is about 3.0 kilohms at 25B°C (77B°F) and 9.795 kilohms at 0B°C (32B°F).

EXTERNAL CONTROL VARIABLE DISPLACEMENT (ECVD) VALVE

EXTERNAL CONTROL VARIABLE DISPLACEMENT (ECVD) VALVE

Refer to **COMPONENT INDEX**.



The ECVD valve is an electronically controlled solenoid valve that adjusts the displacement of the compressor. A diagnostic scan tool is used to read the data values of the ECVD valve.

The HVAC module regulates the ECVD valve using the following guidelines:

- Controllable 12 VDC (nominal) 400 Hz PWM signal to modulate valve
- Solenoid control valve is driven only if the clutch is engaged by the PCM, according to CAN data bus message
- Current feedback loop is required in the HVAC module
- Compressor clutch is controlled by the PCM according to HVAC module inputs

CONFIGURATION DATA/BOUNDARY CONDITION		HANON
Maximum Displacement		170 cc
Coil Resistance (R @ 20B°C (68B°F)		10.6 Ω
Inductance		51.4 mH @ 20B°C
Max Current vs Compressor RPM	Compressor RPM	ECV Current (mA)
	0	800
	4, 500	800
	6, 000	500
	9, 000	500
Min Current vs Compressor RPM	Compressor RPM	ECV Current (mA)
	0	260
	4, 500	260
	6, 500	260
	9, 000	260
Max Discharge Pressure vs Compressor RPM	Compressor RPM	Max Pressure Limit (Bar A)/(PSI)
	700	30
	2000	30
	4000	24
	6500	15
	8000	15

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) MODULE

Refer to COMPONENT INDEX.

Inputs

- Vehicle speed signal
- Vehicle speed fault status
- A/C Pressure
- A/C Pressure fault status
- A/C compressor status
- Engine RPM
- Engine RPM fault status
- Engine coolant temperature
- Engine coolant temperature fault status
- Alternator fault status
- Climate mode selection from radio
- Climate mode status to radio and A/C heater control
- Temperature unit from IPC
- In-car temperature sensor signal
- A/C switch request
- Sun sensor signal
- Evaporator temperature sensor signal
- Defrost and heated glass status
- MAX A/C status
- Ambient temperature sensor info
- Ambient temperature sensor fault status
- Climate system power mode status
- Fuel cutoff and accident response info
- Engine start/stop status
- Remote start request status
- Door and swing gate switch status
- Blower motor sensor
- Blower speed select request
- Auto mode request
- Sync mode request
- Recirculation mode request
- Battery voltage level
- Internal light status
- A/C heater control buttons and knobs selection input
- ECVD valve current sensor
- Right blend door actuator position
- Left blend door actuator position
- Right mode door actuator position
- Left mode door actuator position
- Recirculation door actuator position
- Right floor duct temperature sensor signal
- Left floor duct temperature sensor signal
- Right vent duct temperature sensor signal
- Left vent duct temperature sensor signal
- Front wiper status

- Rear defrost button repetition request
- Front defrost button repetition request

Outputs

- Compressor request status
- Rear defrost button repetition request
- Front defrost button repetition request
- ECVD valve command to ECVD relay
- Climate system mode status
- Engine start/stop enable info
- Climate system start/stop status
- SAM enable status
- HVAC blower speed command
- HVAC blower speed status
- HVAC blower voltage status
- System and mode light commands
- PTC Max heat request
- Right blend door actuator position command
- Left blend door actuator position command
- Right mode door actuator position command
- Left mode door actuator position command
- Recirculation door actuator position command
- A/C output current status
- Heated glass status

IN-CAR TEMPERATURE SENSOR

IN-CAR TEMPERATURE SENSOR

Refer to COMPONENT INDEX.

The HVAC module uses an in-car temperature sensor to activate the correct operating strategy for the conditioning system.

Sensor specifications:

Function	Unit	Min.	Rated	Max.
Operating temperature	B°C (B°F)	-40 (-40)	23 (73.4)	+85 (+185)
Operating power supply	V_{DC}	8	12	16
Operating current	mA	B	B	100

POWERTRAIN CONTROL MODULE (PCM)

POWERTRAIN CONTROL MODULE (PCM)

Refer to COMPONENT INDEX.

The A/C compressor clutch is controlled by the PCM. The PCM can enable or disable the compressor clutch based upon inputs from the HVAC module, internal data to the PCM or the A/C pressure transducer.

The gasoline engine PCM is mounted to a bracket on the in-board side of the washer reservoir. The diesel engine PCM is located on a bracket between the battery tray and the PDC in the engine compartment.

Inputs

- A/C pressure transducer signal
- Compressor request

Outputs

- A/C pressure transducer 5-volt supply
- A/C pressure transducer ground
- A/C clutch control

SUN SENSOR

SUN SENSOR

Refer to **COMPONENT INDEX**.

The HVAC module uses the sun sensor to measure solar radiation inside the passenger compartment and define the best strategy to cool down the vehicle.

Temperature sensor technical specifications:

Characteristics	**Value**
Supply	5 V B± 0.1
Max. current uptake	10 mA
Operating range Temp.	-40 to 105B°C (-40 to 221B°F)
Output current	I_{min} = 0.25 mA & I_{max} = 2.18 mA
Sun sensor response time	< 10 ms

ACTUATOR, BLEND DOOR

REMOVAL AND INSTALLATION

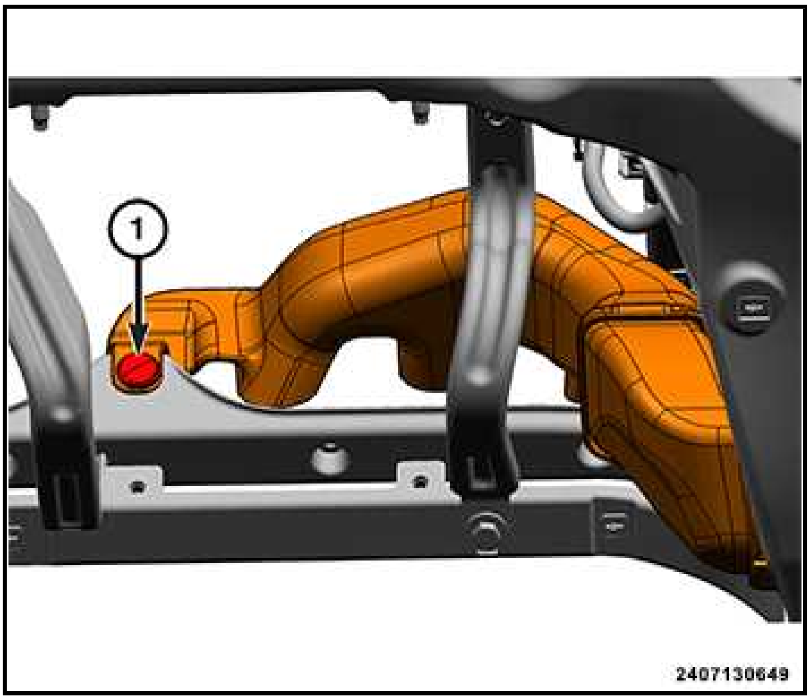
DRIVER SIDE

REMOVAL

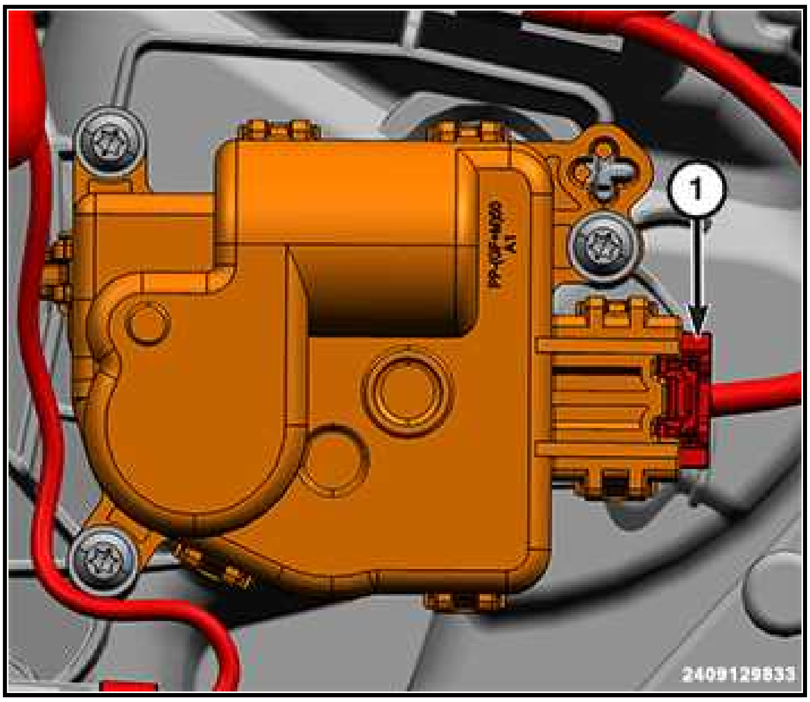
WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

NOTE: **LHD model as shown in illustration. RHD model similar.**

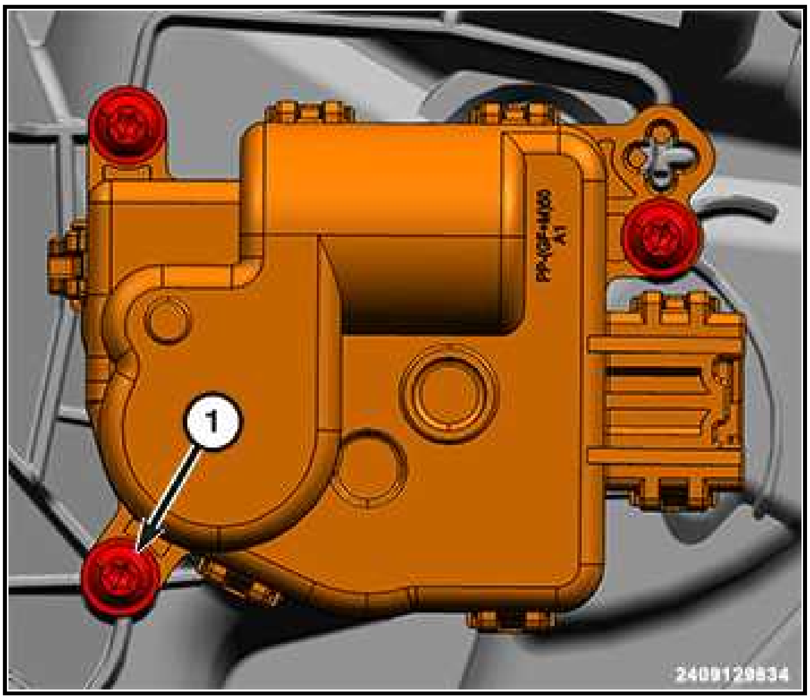
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the steering column opening cover with knee blocker. Refer to **COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION** .



3. Remove the push pin (1) for the floor distribution duct and remove the air duct from the vehicle.



4. Disconnect the wire harness connector (1) from the blend door actuator located on the left side of the HVAC air distribution housing.



5. Remove the three screws (1) that secure the blend door actuator to the air distribution housing and remove the actuator from the vehicle.

INSTALLATION

1. Position the blend door actuator onto the driver side of the HVAC air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those in the blend air door linkage.
2. Install the three screws that secure the blend door actuator to the air distribution housing. Tighten the screws securely.
3. Connect the wire harness connector to the blend door actuator.
4. Connect the floor distribution duct and install the push pin.
5. Install the steering column opening cover with knee blocker. Refer to **COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION** .
6. Connect the negative battery cable(s). Refer to the appropriate service information .
7. Initiate the Actuator Calibration function using a scan tool. Refer to **STANDARD PROCEDURE** .

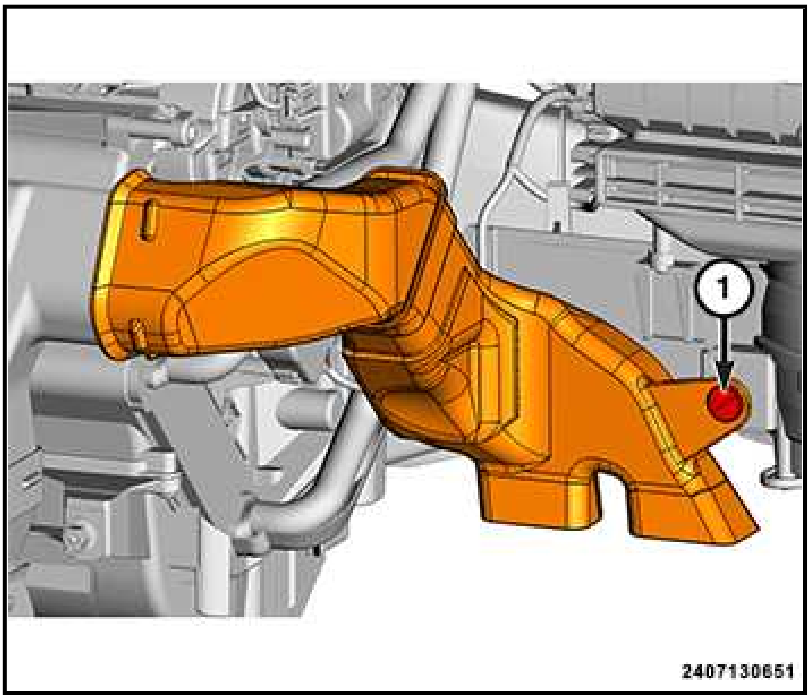
PASSENGER SIDE

REMOVAL

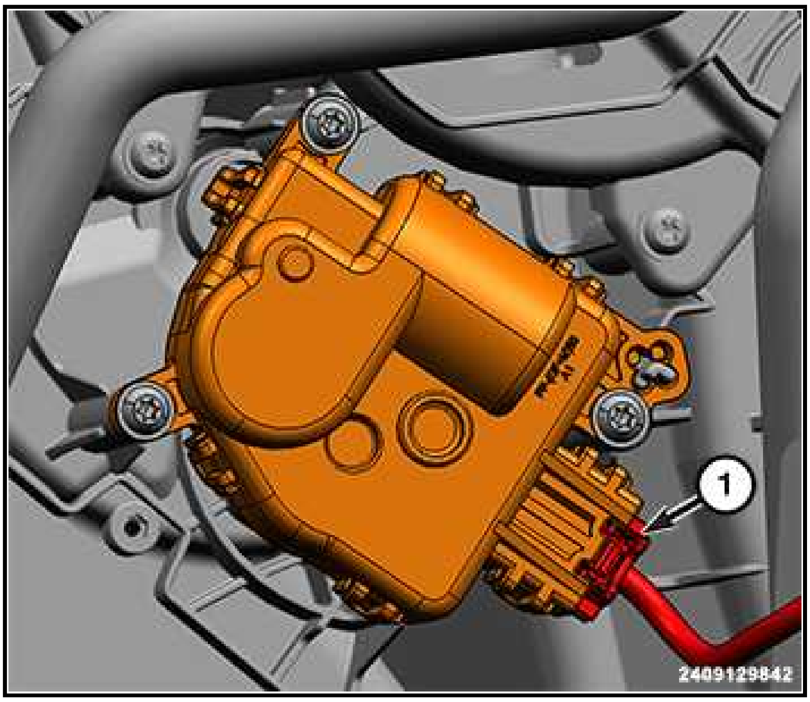
WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

NOTE: **LHD model as shown in illustration. RHD model similar.**

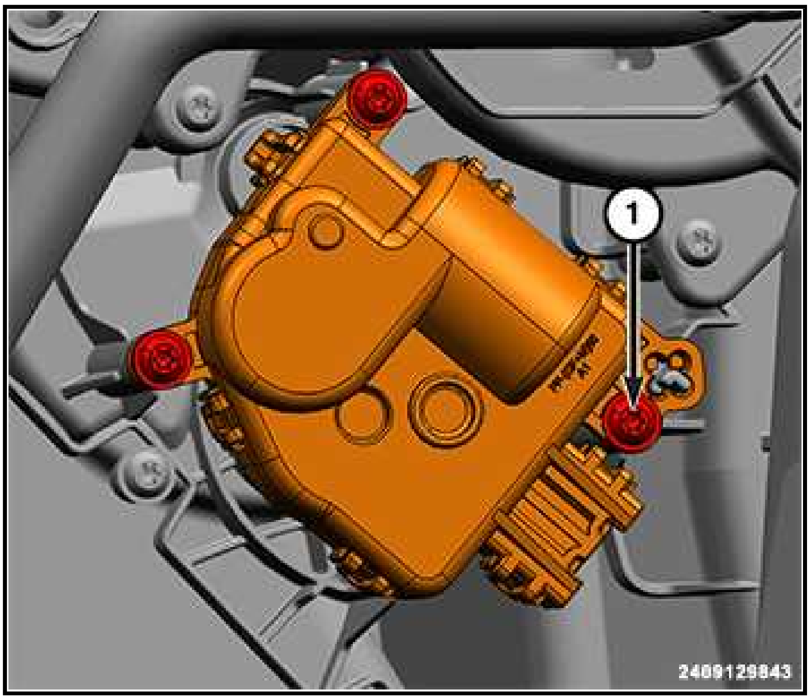
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the glove box from the vehicle. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .



3. Remove the push pin (1) for the floor distribution duct and remove the air duct from the vehicle.



4. Disconnect the wire harness connector (1) from the blend door actuator located on the passenger side of the HVAC air distribution housing.



5. Remove the three screws (1) that secure the blend door actuator to the air distribution housing and remove the actuator from the vehicle.

INSTALLATION

1. Position the blend door actuator onto the HVAC air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those in the blend air door linkage.
2. Install the three screws that secure the blend door actuator to the air distribution housing. Tighten the screws securely.
3. Connect the wire harness connector to the blend door actuator.
4. Connect the floor distribution duct and install the push pin.
5. Install the glove box. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
6. Connect the negative battery cable(s). Refer to the appropriate service information .
7. Initiate the Actuator Calibration function using a scan tool. Refer to **STANDARD PROCEDURE** .

ACTUATOR, MODE DOOR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

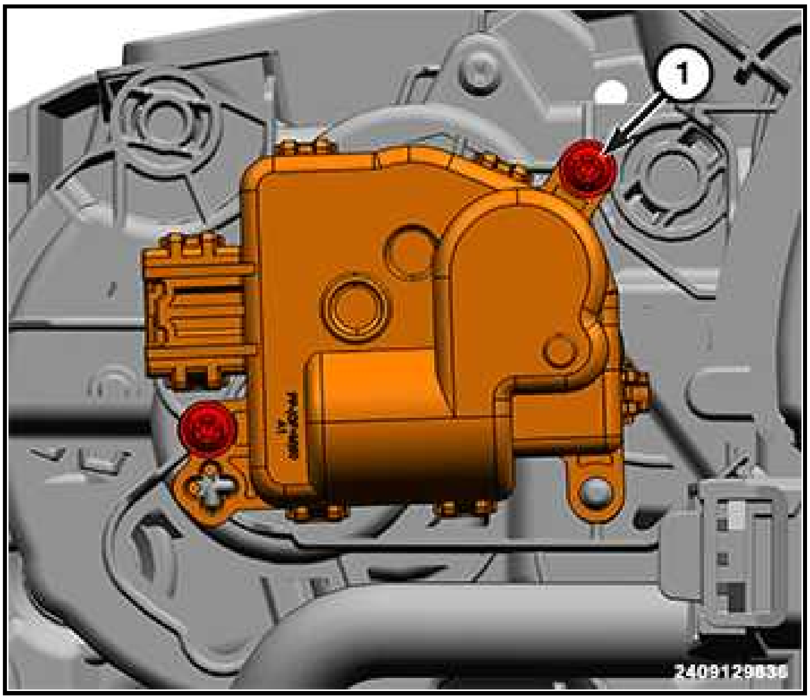
REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

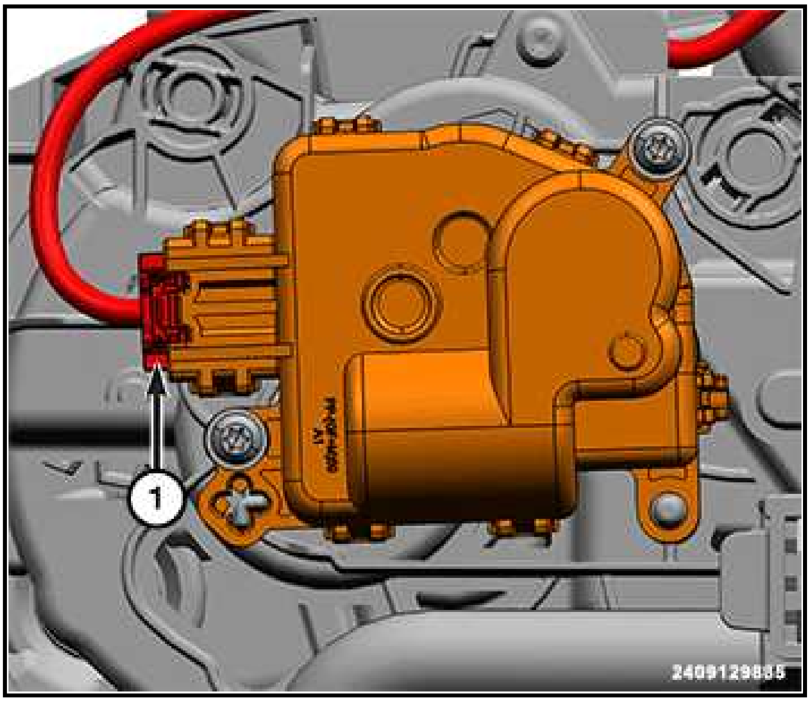
NOTE: **LHD model as shown in illustration. RHD model similar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. On LHD models, remove the glove box from the passenger side of the instrument panel. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .

3. On RHD models, remove the steering column opening cover with knee blocker. Refer to **COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION** .



4. Remove the two screws (1) that secure the mode door actuator to the bracket located on the right side of the air distribution housing.



5. Disconnect the wire harness connector (1) from the mode door actuator and remove the actuator from the vehicle.

INSTALLATION

1. Position the mode door actuator onto the bracket located on the right side of the HVAC air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those in the mode air door linkage.
2. Install the two screws that secure the mode door actuator to the air distribution housing. Tighten the screws securely.
3. Connect the wire harness connector to the mode door actuator.

4. On LHD models, install the glove box and silencer panel. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
5. On RHD models, install the steering column opening cover with knee blocker. Refer to **COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION** .
6. Connect the negative battery cable(s). Refer to the appropriate service information .
7. Initiate the Actuator Calibration function using a scan tool. Refer to **STANDARD PROCEDURE** .

ACTUATOR, RECIRCULATION DOOR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

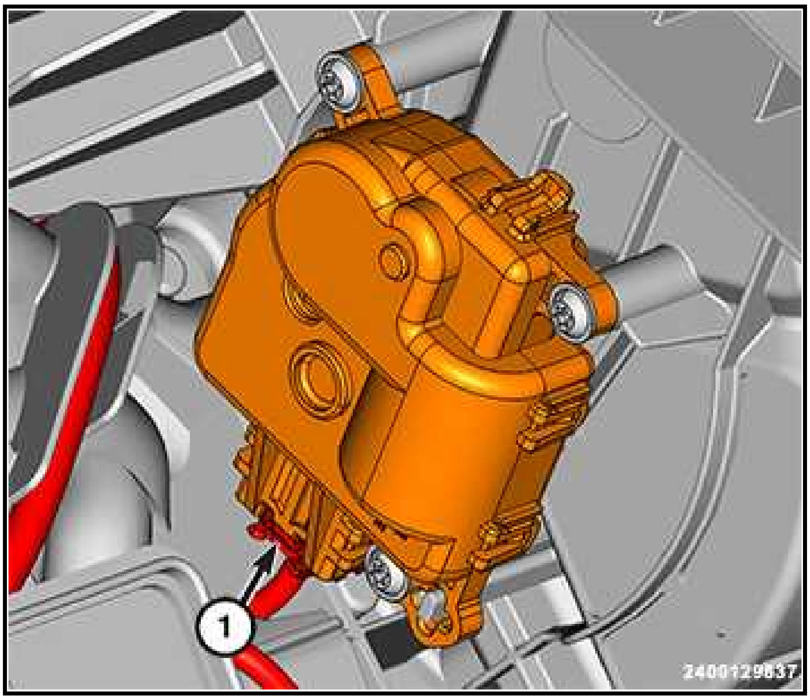
REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

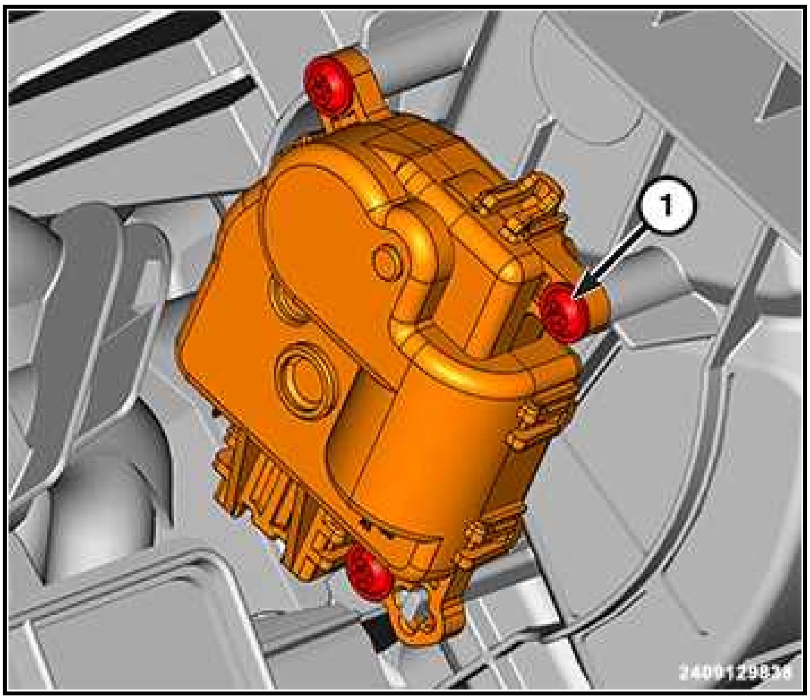
NOTE: **LHD model as shown in illustration, RHD model similar.**

NOTE: **Illustration shown with instrument panel removed for clarity.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the glove box. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .



3. Reach through glove box opening in the instrument panel and disconnect the wire harness connector (1) from the actuator.



4. Remove the screws (1) that secure the recirculation door actuator to the left side of the HVAC air inlet housing and remove the recirculation door actuator from the air inlet housing.
5. Remove the recirculation door actuator from the vehicle.

INSTALLATION

1. Position the recirculation door actuator onto the right side of the HVAC air inlet housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the recirculation door pivot shaft adapter.
2. Install the three screws that secure the recirculation door actuator to the air inlet housing. Tighten the screws securely.
3. Connect the wire harness connector to the mode door actuator.
4. Verify the wire harness connector is securely attached to the recirculation door actuator.
5. Install the glove box. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
6. Connect the negative battery cable(s). Refer to the appropriate service information .
7. Initiate the Actuator Calibration function using a scan tool. Refer to **STANDARD PROCEDURE** .

CONTROL, A/C AND HEATER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The A/C heater controls are integral to the Integrated Center Stack (ICS). For removal and installation of the ICS, Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .

MODULE, POWER, BLOWER MOTOR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

The blower motor power module is serviced only as an assembly with the blower motor. For the replacement procedure of the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.

SENSOR, AMBIENT TEMPERATURE

DIAGNOSIS AND TESTING

AMBIENT AIR TEMPERATURE SENSOR

The temperature function is supported by the ambient air temperature sensor, a wiring circuit, and the Body Control Module (BCM). If any portion of the ambient air temperature sensor circuit fails or if the Controller Area Network (CAN) data bus information is missing, a (- -) will appear in the Electronic Vehicle Information Center (EVIC) display in place of the temperature. When the sensor is exposed to temperatures above 55B°C (130B°F), or if the sensor circuit is shorted, 55B°C (130B°F) will appear in the EVIC display in place of the temperature. When the sensor is exposed to temperatures below -40B°C (-40B°F) or if the sensor circuit is open, -40B°C (-40B°F) will appear in the EVIC display.

NOTE: **The system displays the last known temperature when starting the vehicle and may take some time/mileage to update to an accurate current reading, up to 5 minutes at a maintained speed above 64 km/h (40 mph). Customers with very short commutes may not get an updated reading before the vehicle is turned OFF, or if the ignition does not remain in the OFF position for more than 255 minutes (4 hrs. 15 min.). This strategy was intended to eliminate wildly fluctuating readings and may cause some customer confusion leading to unnecessary diagnostics/parts replacements.**

The ambient air temperature sensor circuit can be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, test the EVIC operation.

SENSOR TEST

1. Turn the ignition switch to the OFF position. Disconnect and isolate the negative battery cable. Disconnect the ambient air temperature sensor wire harness connector.
2. Measure the resistance of the ambient air temperature sensor. At -40B°C (-40B°F), the sensor resistance is 336 kilohms. At 55B°C (130B°F), the sensor resistance is 2.488 kilohms. The sensor resistance should read between these two values. If OK, refer to SENSOR CIRCUIT TEST below. If not OK, replace the inoperative ambient air temperature sensor.

   NOTE: **If the sensor is believed to be the issue, it needs to be unplugged from the connector and tested separately with an ohmmeter. The sensor resistance should read between 8.0 and 12.0 kilohms if testing at room temperature 21B°C (70B°F).**

SENSOR CIRCUIT TEST

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

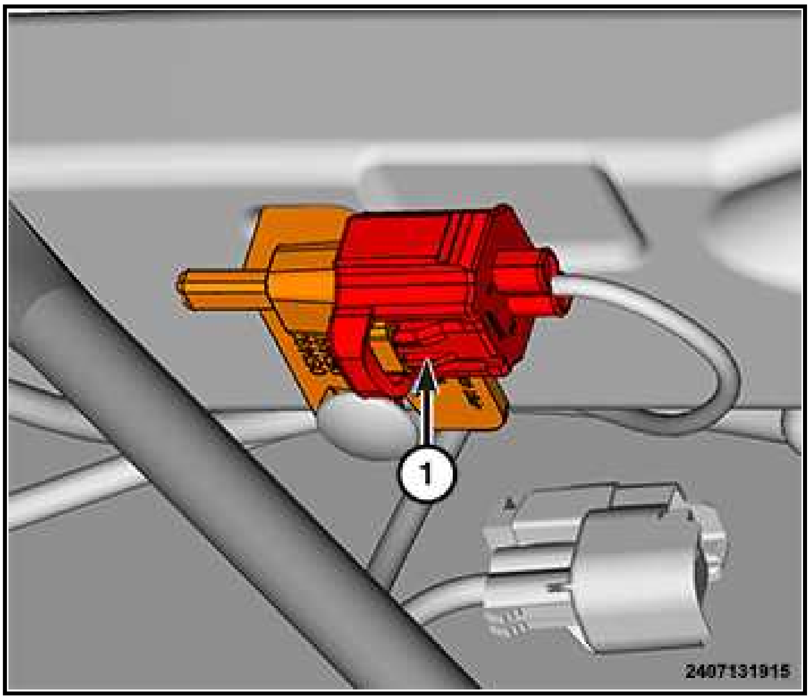
1. Turn the ignition switch to the OFF position. Disconnect and isolate the negative battery cable. Disconnect the wire harness connectors from the ambient air temperature sensor and the BCM.
2. Connect a jumper wire between the two terminals in the body half of the ambient air temperature sensor harness connector.
3. Check for continuity between the sensor return circuit and the ambient air temperature sensor signal circuit cavities of the BCM harness connector. There should be continuity. If OK, go to **Step 4** . If not OK, repair the open sensor return circuit or ambient air temperature sensor signal circuit to the ambient air temperature sensor as required.
4. Check for continuity between the ambient air temperature sensor signal circuit cavity of the BCM harness connector and a good ground. There should be no continuity. If OK, test the EVIC operation. If not OK, repair the shorted ambient air temperature sensor signal circuit as required.

REMOVAL AND INSTALLATION

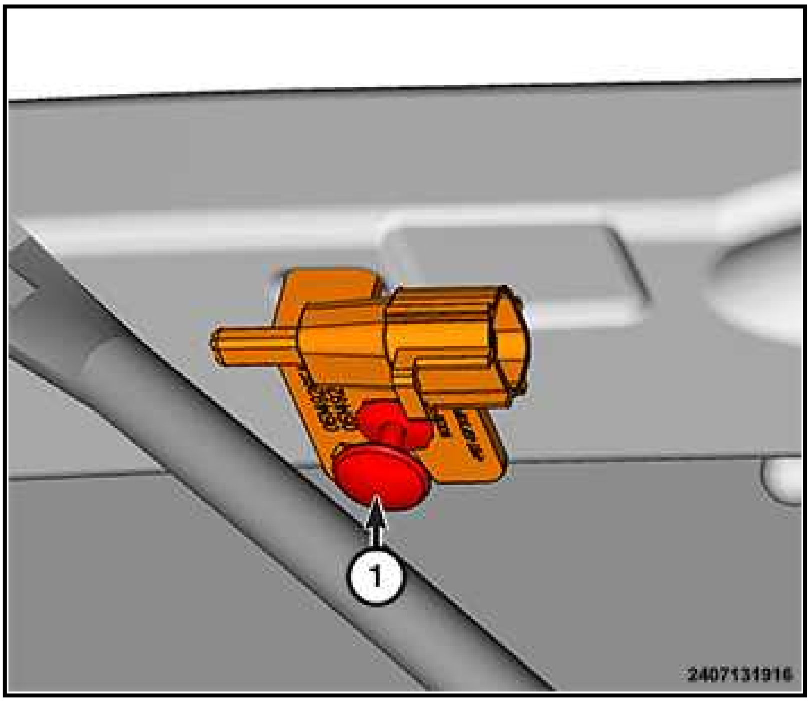
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the grille. Refer to **GRILLE, REMOVAL AND INSTALLATION** .



3. Disconnect the wire harness connector (1) from the ambient air temperature sensor.



4. Remove the push-pin fastener (1) that secures the ambient air temperature sensor to the upper radiator crossmember and remove the sensor.

INSTALLATION

1. Position the ambient air temperature sensor to the upper radiator crossmember and install the push-pin fastener.
2. Connect the wire harness connector to the ambient air temperature sensor.
3. Install the grille. Refer to **GRILLE, REMOVAL AND INSTALLATION** .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

SENSOR, EVAPORATOR TEMPERATURE

REMOVAL AND INSTALLATION

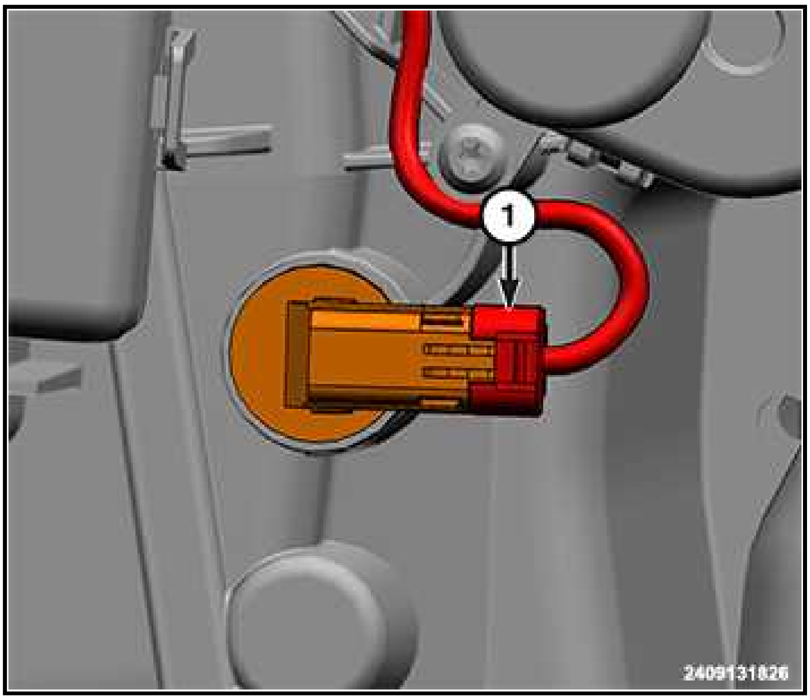
REMOVAL AND INSTALLATION

REMOVAL

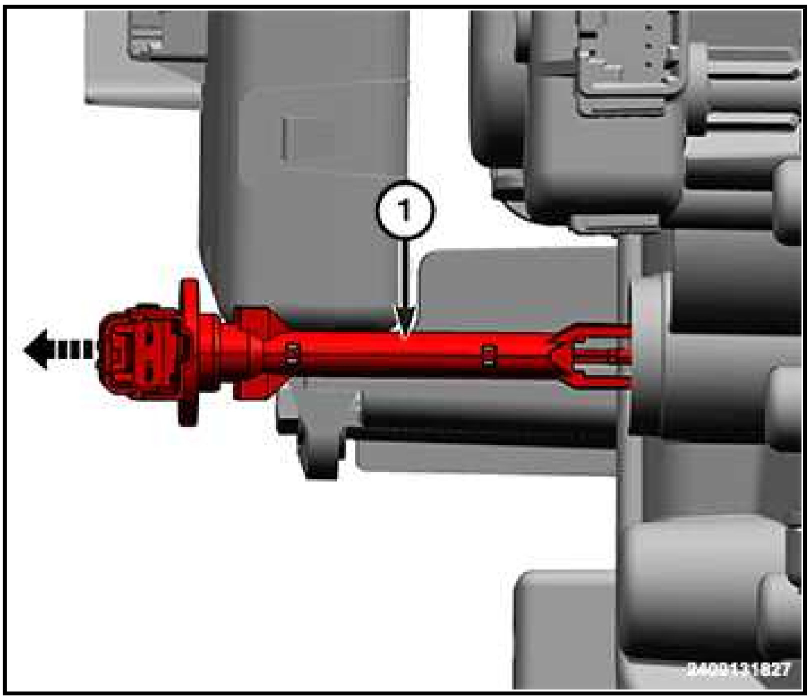
WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

NOTE: **It is not necessary to remove and disassemble the HVAC housing to service the evaporator temperature sensor. The evaporator temperature sensor can be removed for service from underneath the instrument panel.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



2. Reach up under the driver side of the instrument panel and disconnect the instrument panel wire harness connector (1) from the evaporator temperature sensor.



3. Using needle nose pliers, move the evaporator temperature sensor (1) a quarter turn to the left then carefully pull the straight out of the side of the HVAC housing.

INSTALLATION

1. Install the evaporator temperature sensor into the driver side of the HVAC housing then move a quarter turn to the right. Make sure the retaining tabs are fully engaged to the housing.
2. Connect the instrument panel wire harness to the evaporator temperature sensor.
3. Connect the negative battery cable(s). Refer to the appropriate service information .

SENSOR, SUN

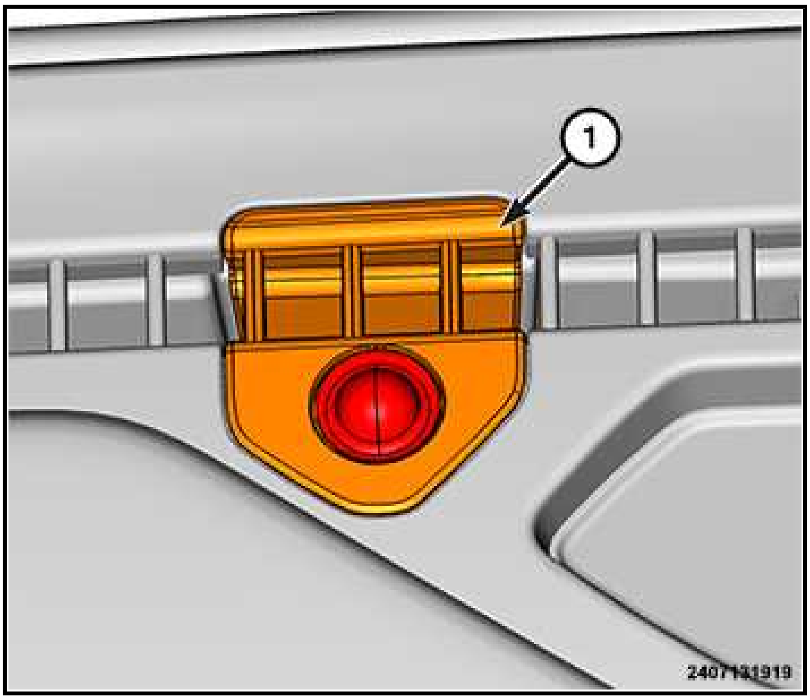
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

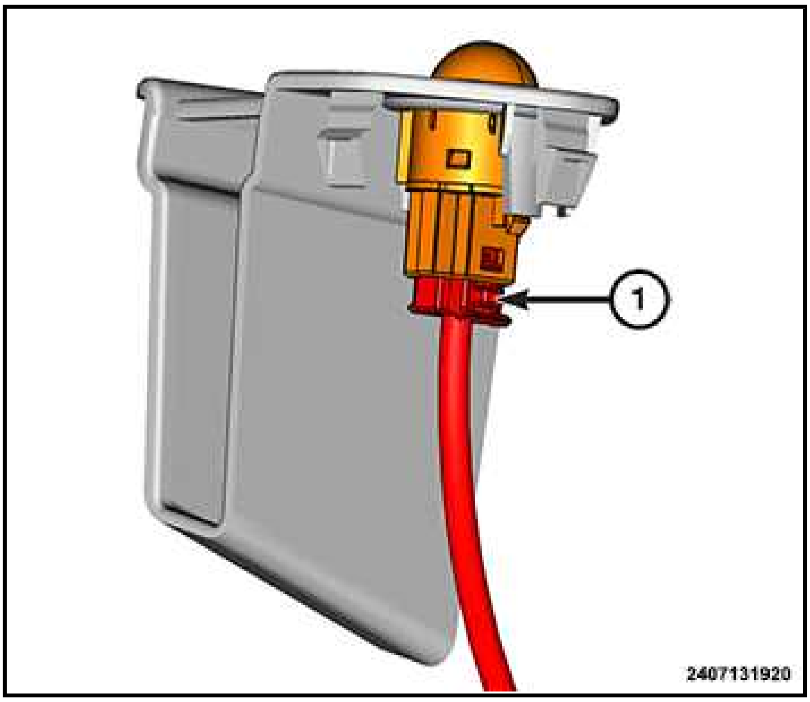
REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable. Wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in possible serious or fatal injury.**

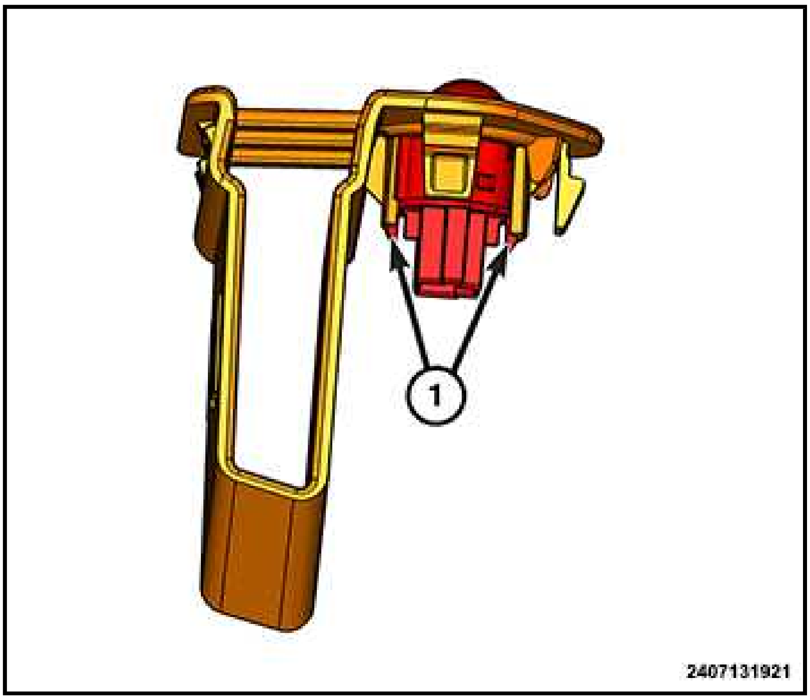
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



2. Using Trim Stick (special tool #C-4755, Trim Stick) or equivalent, remove the defroster grille insert (1).



3. Disconnect the wire harness connector (1) from the sun sensor.



4. Disengage the two retaining tabs (1) then remove the sun sensor from defroster grille insert.

INSTALLATION

1. Install the sun sensor in the defroster grille insert and make sure that the sensor is fully engaged to the defroster grille insert.
2. Connect the wire harness connector to the sun sensor.
3. Install the defroster grille insert into the instrument panel.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

SENSOR, TEMPERATURE, AIR OUTLET

REMOVAL AND INSTALLATION

LEFT FLOOR DUCT

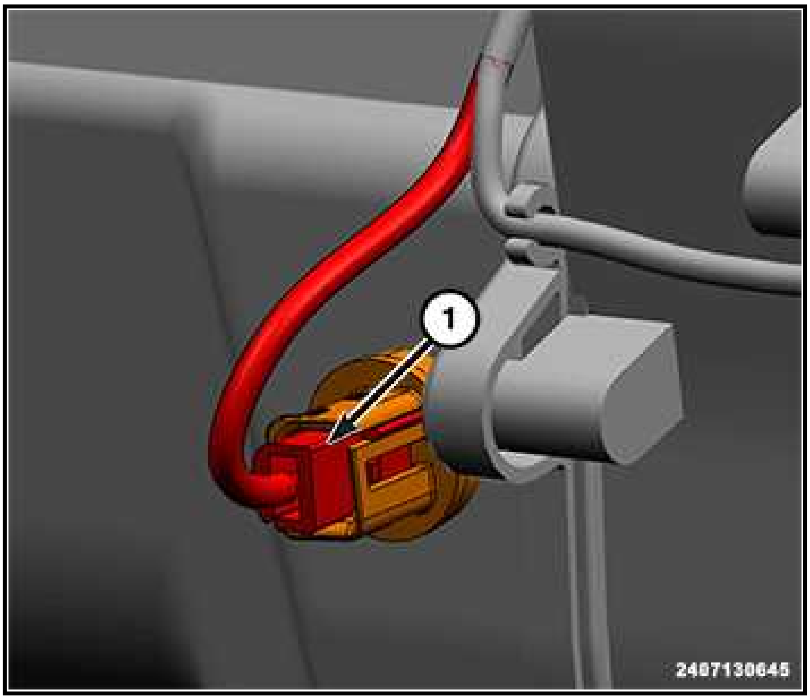
REMOVAL

WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.**

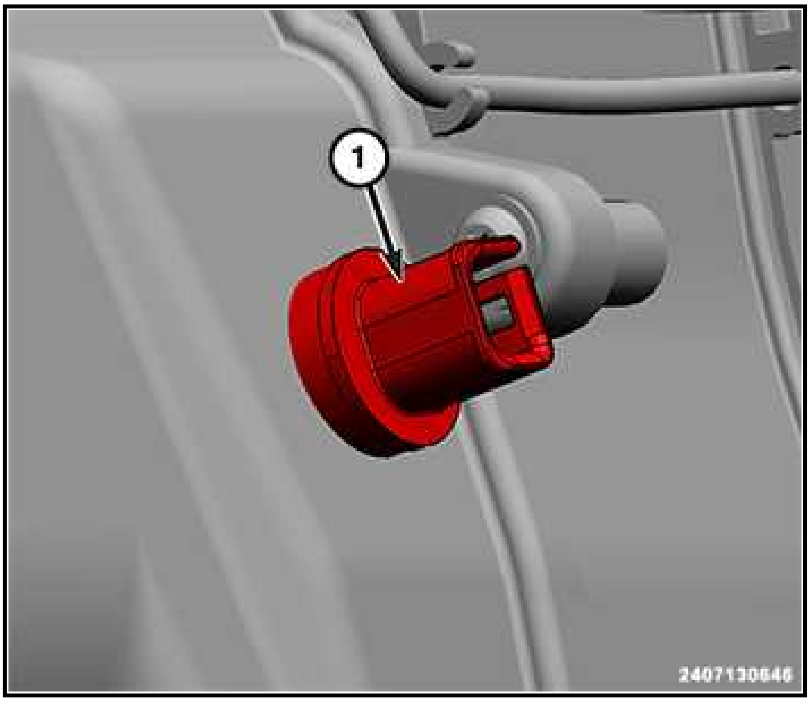
WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable and wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .

2. Remove the instrument panel center trim panel. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .



3. Disconnect the HVAC wire harness connector (1) from the air duct temperature sensor.



4. Using Trim Stick (special tool #C-4755, Trim Stick) or equivalent, disengage the air duct temperature sensor (1) from the left side of the HVAC housing and remove the sensor.

INSTALLATION

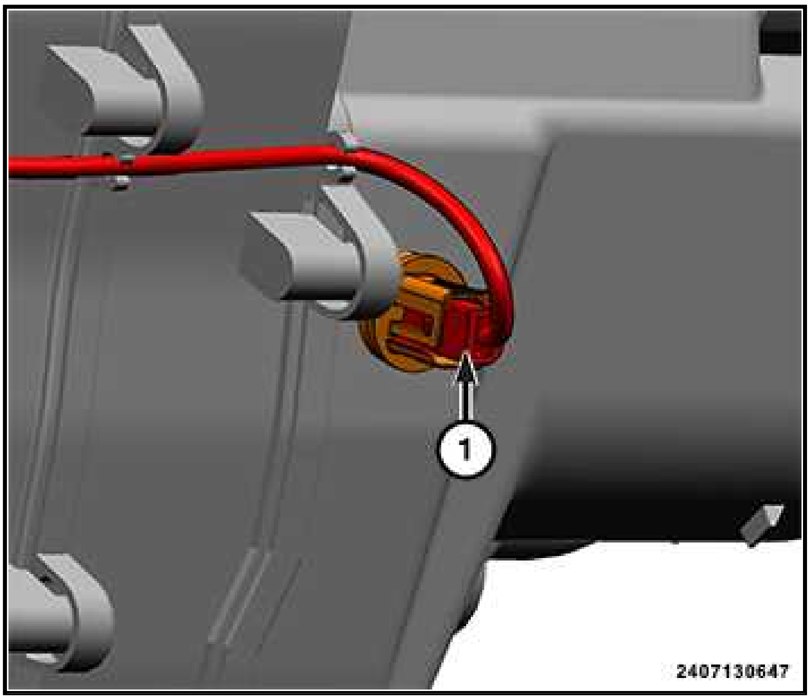
1. Install the air duct temperature sensor into the left side of the HVAC housing. Be certain the sensor retaining tabs are fully engaged to the housing.
2. Connect the HVAC wire harness connector to the air duct temperature sensor.
3. Install the instrument panel center trim panel. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

RIGHT FLOOR DUCT

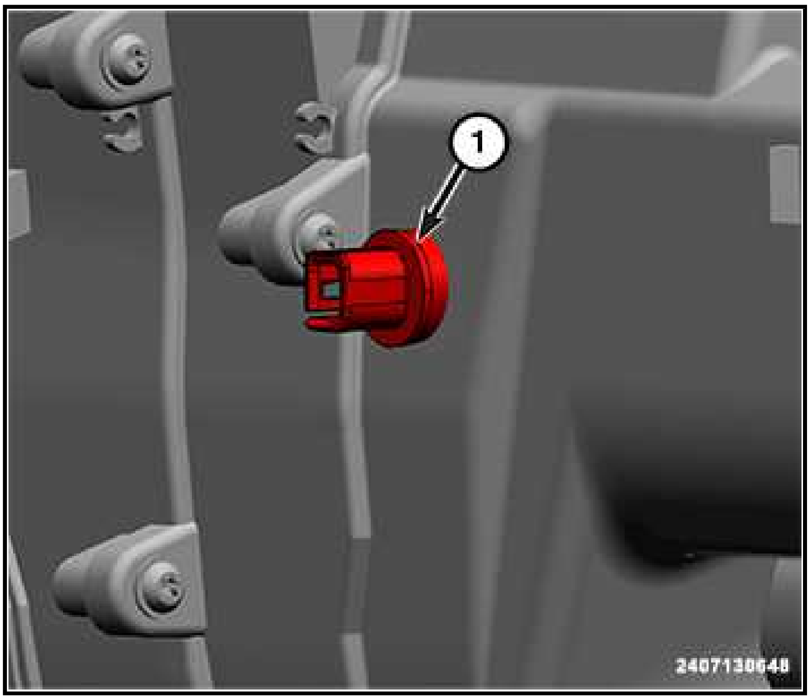
REMOVAL

WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument panel center trim panel. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .



3. Disconnect the HVAC wire harness connector (1) from the air duct temperature sensor.



4. Using Trim Stick (special tool #C-4755, Trim Stick) (1) or equivalent, disengage the air duct temperature sensor (1) from the right side of the HVAC housing and remove the sensor.

INSTALLATION

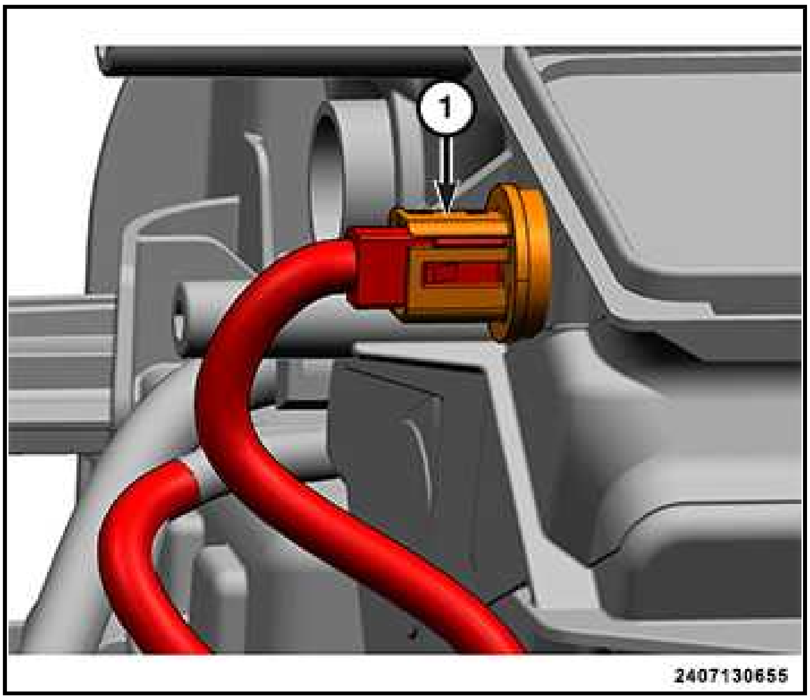
1. Install the air duct temperature sensor into the right side of the HVAC housing. Be certain the sensor retaining tabs are fully engaged to the housing.
2. Connect the HVAC wire harness connector to the air duct temperature sensor.
3. Install the instrument panel center trim panel. Refer to PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

LEFT INSTRUMENT PANEL DUCT

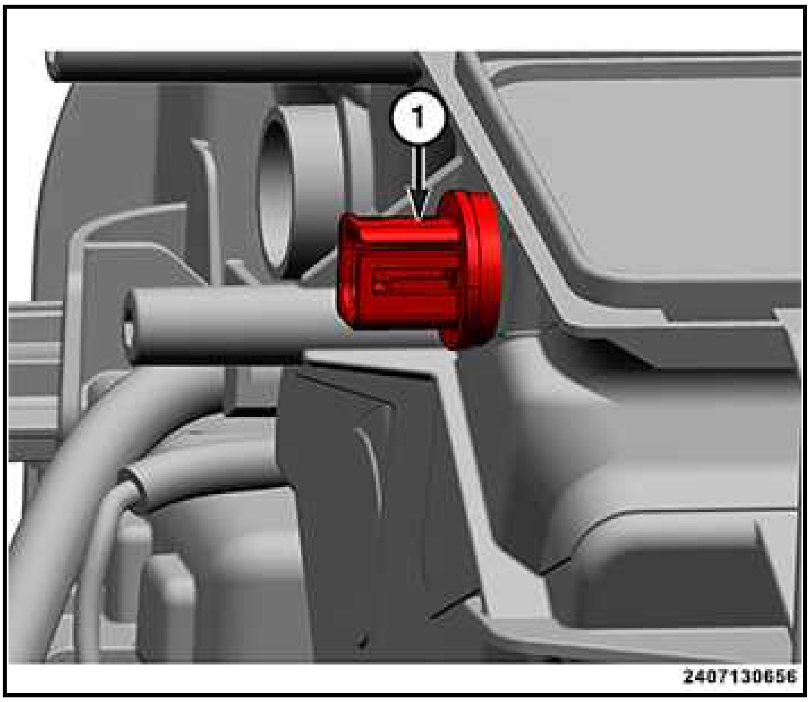
REMOVAL

WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the steering column opening cover. Refer to COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION .



3. Disconnect the wire harness connector from the air duct temperature sensor (1).



4. Using Trim Stick (special tool #C-4755, Trim Stick) or equivalent, disengage the air duct temperature sensor (1) from the left side of the HVAC housing and remove the sensor.

INSTALLATION

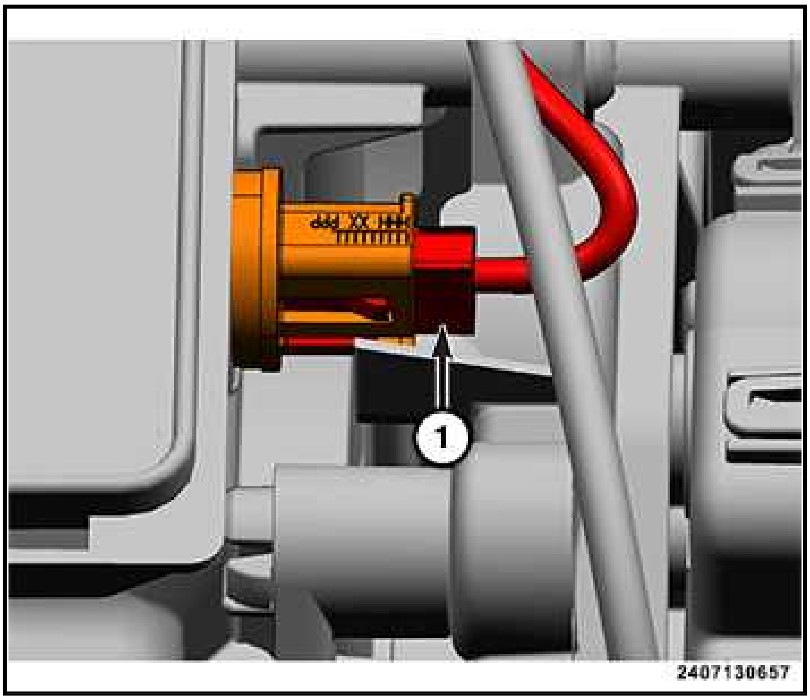
1. Install the air duct temperature sensor into the left side of the HVAC housing. Be certain the sensor retaining tabs are fully engaged to the housing.
2. Connect the HVAC wire harness connector to the air duct temperature sensor.
3. Install the steering column opening cover. Refer to COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

RIGHT INSTRUMENT PANEL DUCT

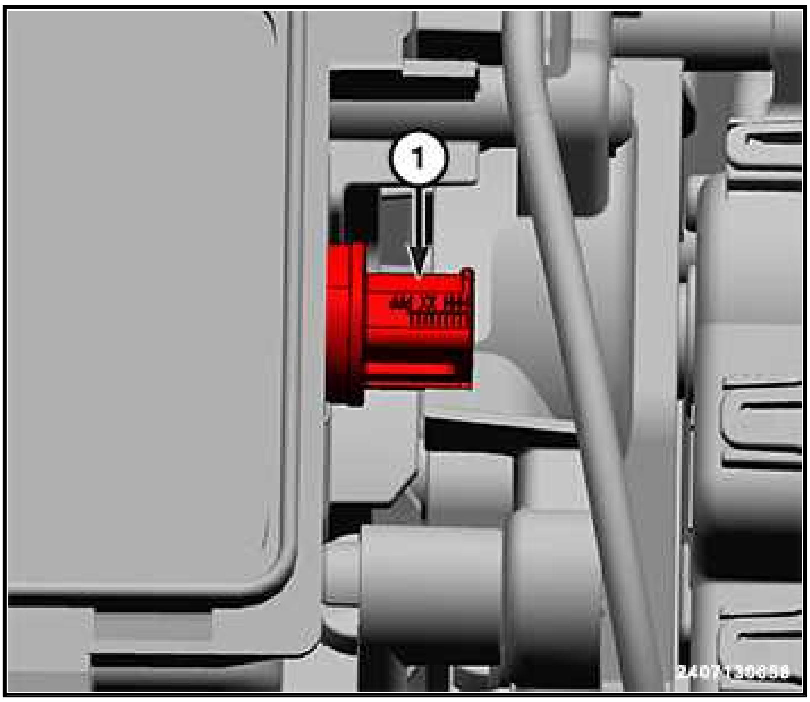
REMOVAL

WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbags, airbag curtains, knee blocker, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect the Intelligent Battery Sensor (IBS)/negative battery cable assembly from the negative battery post, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the glove box. Refer to GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION .



3. Disconnect the HVAC wire harness connector (1) from the air duct temperature sensor.



4. Using Trim Stick (special tool #C-4755, Trim Stick) or equivalent, disengage the air duct temperature sensor (1) from the right side of the HVAC housing and remove the sensor.

INSTALLATION

1. Install the air duct temperature sensor into the right side of the HVAC housing. Be certain the sensor retaining tabs are fully engaged to the housing.
2. Connect the HVAC wire harness connector to the air duct temperature sensor.
3. Install the glove box. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
4. Connect the negative battery cable(s). Refer to the appropriate service information .

SENSOR, TEMPERATURE, IN-CAR

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - IN-CAR TEMPERATURE SENSOR

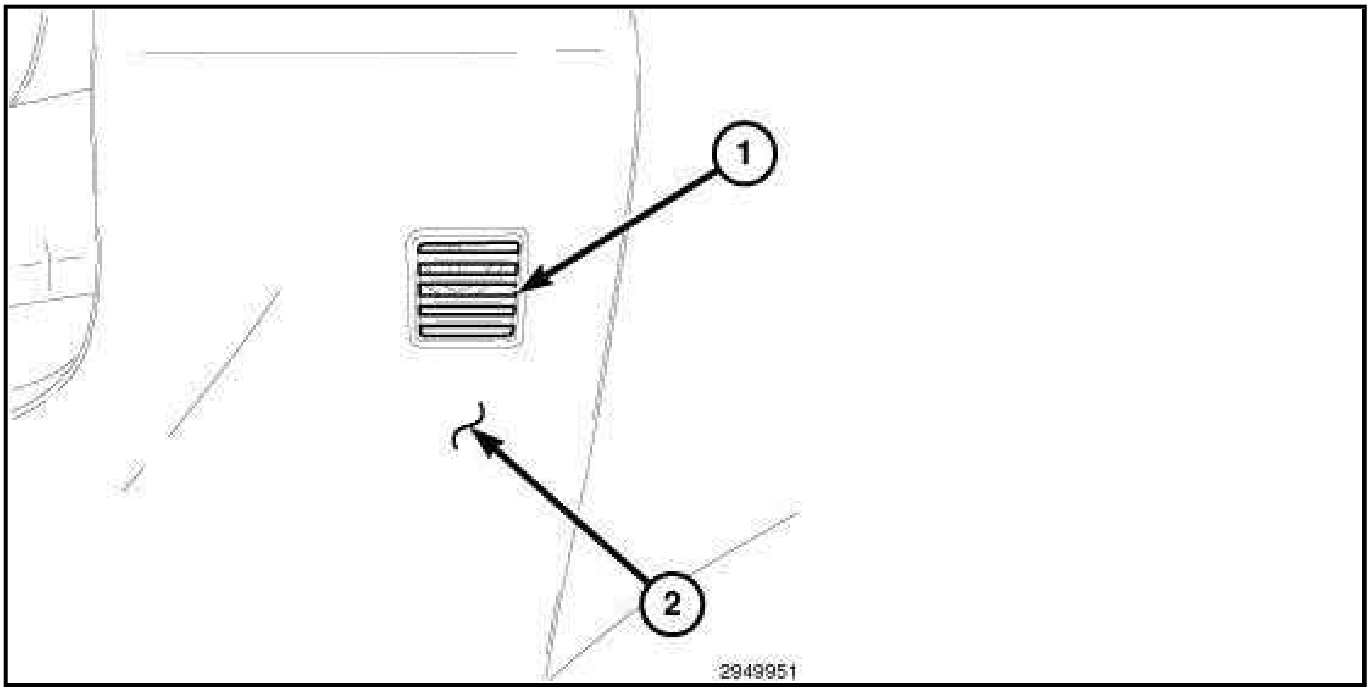
WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.**

NOTE: **For complete circuit diagrams, see Wiring Information. The wiring information includes wiring diagrams, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. For proper wire repair, and connector repair procedures. Refer to STANDARD PROCEDURE . and. Refer to REMOVAL . Refer to INSTALLATION .**

Using a scan tool, check for Diagnostic Trouble Codes (DTCs) related to the in-car temperature sensor and the Heating, Ventilation, and Air Conditioning (HVAC) module. If any DTCs are found, repair as necessary. Refer to **DIAGNOSIS AND TESTING** . If no DTCs are found, perform the two following tests. Replace the in-car temperature sensor if the sensor fails either test.

ASPIRATOR MOTOR TEST

The in-car temperature sensor uses an aspirator motor to draw air from the passenger compartment and flow the air over the temperature thermistor. Test the motor as follows.



1. Place the ignition in the RUN position.
2. Place a small piece of newspaper in front of the aspirator motor opening grille (1), located on the steering column opening cover (2). If the paper sticks to the grille, the aspirator motor is operating properly. The piece of paper should be only large enough to cover the opening.
3. If the paper does not stick to the grille, check the in-car temperature sensor electrical connections and wiring. If connections and wiring are OK, replace the in-car temperature sensor.

TEMPERATURE THERMISTOR TEST

The in-car temperature sensor uses a temperature thermistor to provide resistance values that correlate with temperature change. Test the thermistor as follows.

1. Remove the in-car temperature sensor and place it on a workbench. Refer to **SENSOR, TEMPERATURE, IN-CAR, REMOVAL AND INSTALLATION**.
2. Note the current ambient air temperature of the work area.
3. Use an ohm meter and check the resistance between pins 1 and 2 of the in-car temperature sensor. Compare the temperature of the work area to the found resistance value. The resistance should be within specifications as listed in the Resistance and Temperature chart. If not OK, replace the in-car temperature sensor.

RESISTANCE AND TEMPERATURE

Air Temperature Range	Low Resistance Range (kohm)	High Resistance Range (kohm)
-21B° to -15B°C (-5B° to 5B°F)	292 B± 1.0	223 B± 0.9
-14B° to -9B°C (6B° to 15B°F)	198 B± 0.9	161 B± 0.8
-8B° to -4B°C (16B° to 25B°F)	144 B± 0.8	123 B± 0.8
-3B° to 1B°C (26B° to 35B°F)	111 B± 0.7	95 B± 0.7
2 to 7B°C (36B° to 45B°F)	86 B± 0.7	70 B± 0.6
8 to 12B°C (46B° to 55B°F)	64 B± 0.6	55 B± 0.5
13B° to 18B°C (56B° to 65B°F)	51 B± 0.5	42 B± 0.4
19B° to 23B°C (66B° to 75B°F)	39 B± 0.4	33 B± 0.3
24B° to 29B°C (76B° to 85B°F)	31 B± 0.3	26 B± 0.3
30B° to 35B°C (86B° to 95B°F)	24 B± 0.3	20 B± 0.3
36B° to 40B°C (96B° to 105B°F)	18 B± 0.3	16 B± 0.3
41B° to 46B°C (106B° to 115B°F)	15 B± 0.3	13 B± 0.3

REMOVAL AND INSTALLATION

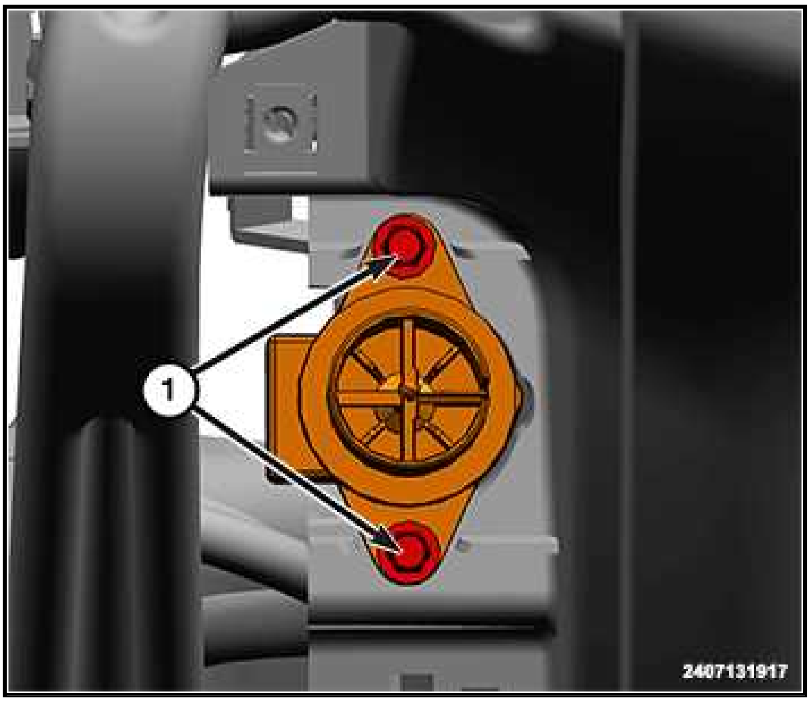
REMOVAL AND INSTALLATION

REMOVAL

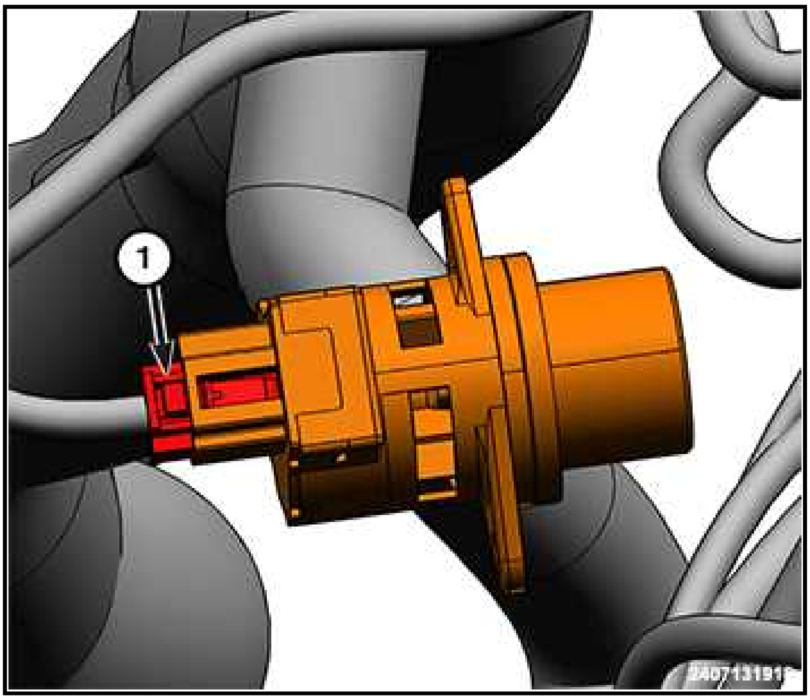
WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

NOTE: **LHD model as shown in illustration, RHD model similar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the steering column opening cover. Refer to COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION .



3. Remove the two screws (1) that secure the in-car temperature sensor to the instrument panel.



4. Disconnect the wire harness connector (1) from the in-car temperature sensor.

INSTALLATION

1. Connect the wire harness connector to the in-car temperature sensor.
2. Position the in-car temperature sensor to the instrument panel.
3. Install the two screws that secure the in-car temperature sensor to the instrument panel. Tighten the screws securely.
4. Install the steering column opening cover. Refer to COVER, STEERING COLUMN OPENING, REMOVAL AND INSTALLATION .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

TRANSDUCER, A/C PRESSURE

DIAGNOSIS AND TESTING

A/C PRESSURE TRANSDUCER

WARNING: **When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts or fan. Do not wear loose clothing. Failure to follow these instructions may result in possible serious or fatal injury.**

1. Check for Diagnostic Trouble Codes (DTCs).
   1. Turn ignition to ON (do not start engine).
   2. With the scan tool, read DTCs. If either of the following DTCs are found, test the transducer and associated wiring, and repair or replace as required

      Refer to the appropriate service information .

      NOTE: **If P0532-A/C PRESSURE SENSOR CIRCUIT LOW or P0533-A/C PRESSURE SENSOR CIRCUIT HIGH are NOT found, go to Step 2 .**

2. Before testing the transducer function, confirm that there is a minimum refrigerant pressure in the A/C system. To confirm, connect a charging station or manifold gauge set to the refrigerant system service ports. Read the pressure on the gauges. There must be a minimum of 300 kPa (43 psi) of pressure to allow the system to operate.

- If the refrigerant pressure is less than 300 kPa (43 psi), then the system is low on charge. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, as required. Refer to **PLUMBING, DIAGNOSIS AND TESTING**.
- If the A/C pressure is greater than 300 kPa (43 psi), verify the transducer function by performing the following steps:
    1. Turn ignition to ON (do not start engine). Read the A/C pressure on the scan tool, and compare to the reading on the charging station or manifold gauge set. The pressure readings should be within B± 50 kPa (7 psi) of each other.

       If pressures are within the above parameters, go to **Step 3** .

       If the pressures differ by more than B± 50 kPa (7 psi), check the A/C pressure transducer wiring for high resistance which can skew the pressure signal reading. If the wiring does not have high resistance, replace the A/C pressure transducer **P0532-A/C Pressure Sensor Circuit High** . Refer to the appropriate service information .

3. Check A/C Pressure Transducer function with A/C operating.
    1. Connect a charging station or manifold gauge set to the refrigerant system service ports.
    2. Start engine with A/C OFF and allow it to idle.
    3. Set the A/C controls to the following positions:
        - Temperature control to full cold
        - Mode control to Panel / Fresh
        - Blower motor control to High speed
        - A/C ON
    4. Allow A/C to operate for five minutes so pressure stabilizes. Using a scan tool, read the A/C pressure, and compare to the measurement on the external gauge.
        - If the pressures are within B± 50 kPa (7 psi) of each other, the transducer is functioning correctly, and does not need to be replaced. If the A/C compressor is cycling too fast, or not cycling on at all, check the A/C system for other issues such as low system charge and issues with the evaporative temperature sensor or A/C clutch relay and wiring **Intermittent Condition** . Refer to the appropriate service information .
        - If the pressures differ by more than B± 50 kPa (7 psi), check the A/C pressure transducer wiring for high resistance which can skew the pressure signal reading. If the wiring does not have high resistance, replace the A/C pressure transducer, **P0532-A/C Pressure Sensor Circuit High** . Refer to the appropriate service information .

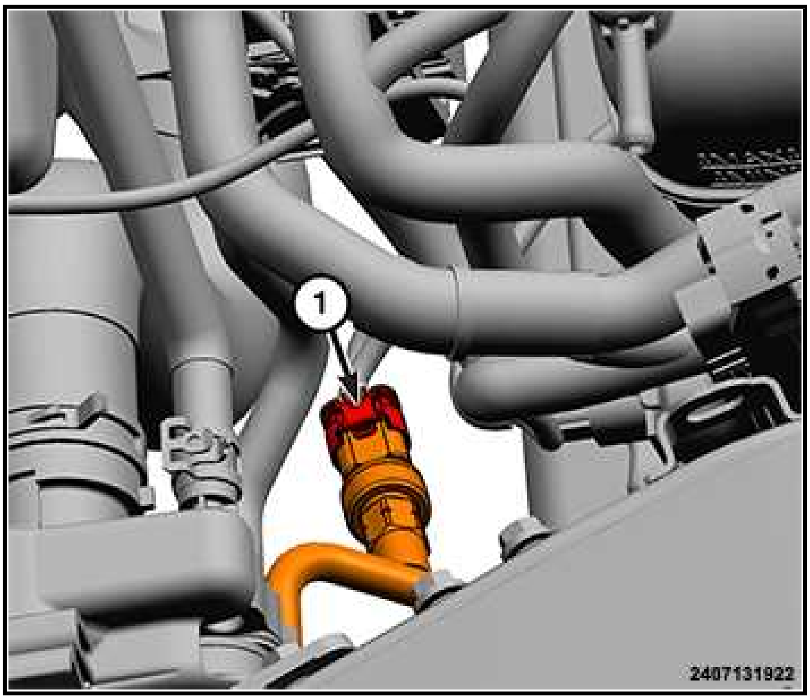
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

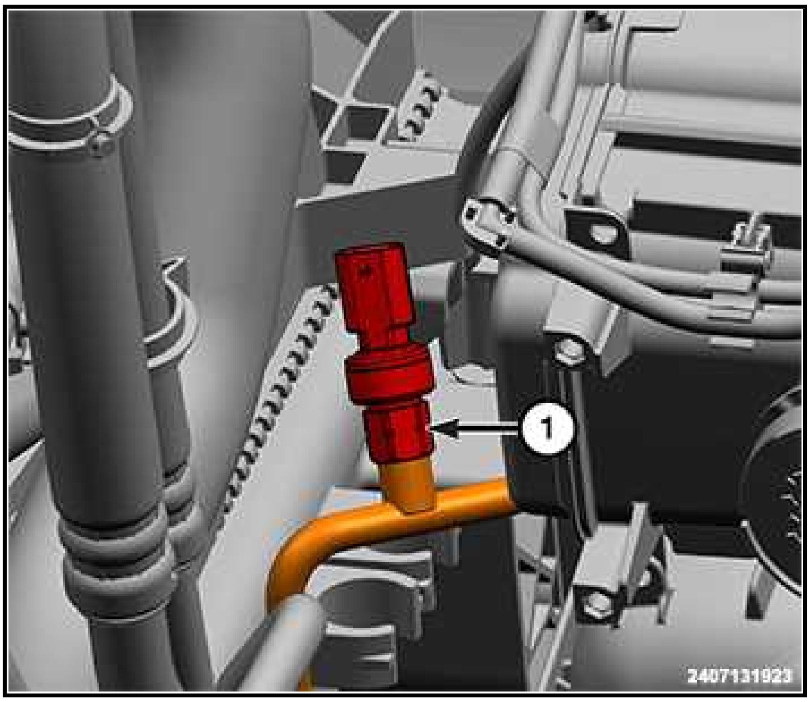
REMOVAL

NOTE: It is not necessary to discharge the refrigerant system to replace the A/C pressure transducer.

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the air cleaner resonator. Refer to **RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION** .



3. Disconnect the wire harness connector (1) from the A/C pressure transducer.



4. Remove the A/C pressure transducer (1) from the A/C discharge line. **Remove and discard the O-ring seal** .

INSTALLATION

NOTE: **Replacement of the O-ring seal is required anytime an A/C pressure transducer is removed. Failure to replace the rubber O-ring seal may result in a refrigerant system leak.**

1. Lubricate a **NEW** rubber O-ring seal with clean refrigerant oil and install it to the fitting. Use only the specified O-ring seal as it is made of special material for the refrigerant used in the system. Use only refrigerant oil of the type required for the A/C compressor.
2. Install the A/C pressure transducer to the A/C discharge line and tighten securely.
3. Connect the wire harness connector to the A/C pressure transducer.

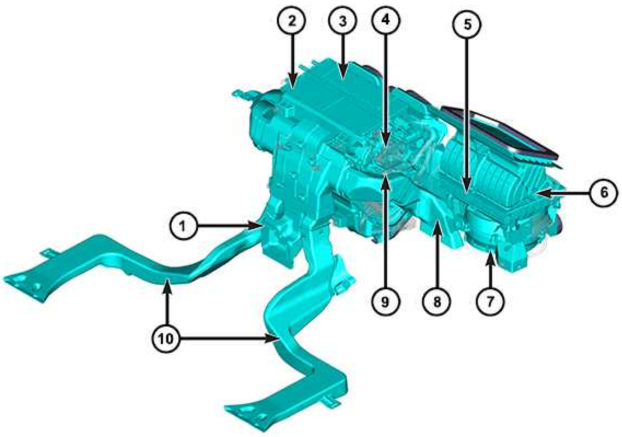
4. Install the air cleaner resonator. Refer to **RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION** .
5. Connect the negative battery cable(s). Refer to the appropriate service information .

DISTRIBUTION

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heating, Ventilation, and Air Conditioning (HVAC) air distribution system consists of the following components:

COMPONENT INDEX

1.	Refer to **CONSOLE DUCT**.
2.	Refer to **VENT DUCT AND DOORS** - Internal to the HVAC housing.
3.	Refer to **DEFROSTER DUCT**.
4.	Refer to **MODE DOOR** - Internal to the HVAC housing.
5.	Refer to **CABIN FILTER**.
6.	Refer to **RECIRCULATION HOUSING AND DOOR**.
7.	Refer to **BLOWER MOTOR**.
8.	Refer to **FRONT FLOOR DUCT** - right side as shown in illustration, left side similar.
9.	Refer to **BLEND DOOR** - Internal to the HVAC housing. Right side as shown in illustration, left side similar
10.	Refer to **REAR FLOOR DUCTS**.

BLEND DOOR

OPERATION

BLEND DOOR

Refer to **COMPONENT INDEX**.

The blend doors adjust the temperature of the outlet air. It is operated by the blend door actuator which receives input from the HVAC module for positioning to achieve the desired temperature. In a dual zone system, there are two blend doors that adjust the driver and passenger sides to the preference and setting of the respective temperature controls.

BLOWER MOTOR

BLOWER MOTOR

Refer to **COMPONENT INDEX**.

The blower motor produces the air flow throughout the HVAC system. The volume of air can be varied by changing the speed of the blower motor using the integral blower motor power module. In the Automatic Temperature Control (ATC) HVAC system, the blower speed can be controlled by the HVAC module when in AUTO mode, or it can be controlled by the operator's input via the blower control switch in the A/C heater control or using the blower control in the radio (if equipped).

The blower motor is used to control the velocity of air moving through the distribution housing by spinning the blower wheel within the air inlet housing at the selected speed. The blower motor is a 12-volt, Direct Current (DC) motor mounted within a plastic housing with an integral wire harness connector and three mounting tabs. The squirrel cage-type blower wheel is secured to the blower motor shaft and is positioned within the air inlet housing on the passenger side of the HVAC housing.

CABIN FILTER

CABIN FILTER

Refer to **COMPONENT INDEX**.

All models are equipped with a cabin air filter that helps purify the outside air entering the vehicle. The cabin air filter is mounted in the HVAC housing, behind the glove box bin. The filter should be replaced at least once a year or every 24, 000 km (15, 000 miles), and checked if the HVAC system performance seems lower than expected. The cabin air filter is labeled with an arrow to indicate the direction of air flow through the filter. There are particulate and carbon filter options available.

CONSOLE DUCT

CONSOLE DUCT

Refer to **COMPONENT INDEX**.

Conditioned air is transferred to the rear passenger knee area through the console duct. The air flow can be directed using the vent controls on the console.

DEFROSTER DUCT

DEFROSTER DUCT

Refer to **COMPONENT INDEX**.

The defroster duct allows air to be directed to the windshield to stop the formation of frost or mist on the windshield. It can be activated by the operator pressing the front defroster control switch on the A/C heater control.

FRONT FLOOR DUCT

FRONT FLOOR DUCT

Refer to **COMPONENT INDEX**.

The front floor ducts direct conditioned air flow to the driver and front passenger floor area when the mode is selected by the operator or when the prerequisites are met in AUTO mode.

MODE DOOR

MODE DOOR

Refer to **COMPONENT INDEX**.

The mode door adjusts the direction of the air flow in the vehicle. It is operated by the mode door actuator which receives input from the HVAC module for positioning to achieve the desired air outlet.

REAR FLOOR DUCTS

REAR FLOOR DUCTS

Refer to **COMPONENT INDEX**.

Conditioned air is transferred to the rear passenger foot area through the rear duct outlets under the driver and passenger seats.

RECIRCULATION HOUSING AND DOOR

RECIRCULATION HOUSING AND DOOR

Refer to **COMPONENT INDEX**.

The recirculation door in the recirculation housing is controlled by the recirculation actuator when the operator presses the recirculation switch control or when the conditions required for AUTO mode determine that the recirculation door be opened or closed.

VENT DUCT AND DOORS

VENT DUCT AND DOORS

Refer to **COMPONENT INDEX**.

The vent duct allows air to be directed to the vent outlets to send conditioned air to the upper vehicle area. It can be activated by the operator pressing the vent control switch on the A/C heater control or by the HVAC module when the prerequisites are met in AUTO mode.

DUCT, INSTRUMENT PANEL, ASSEMBLY

REMOVAL AND INSTALLATION

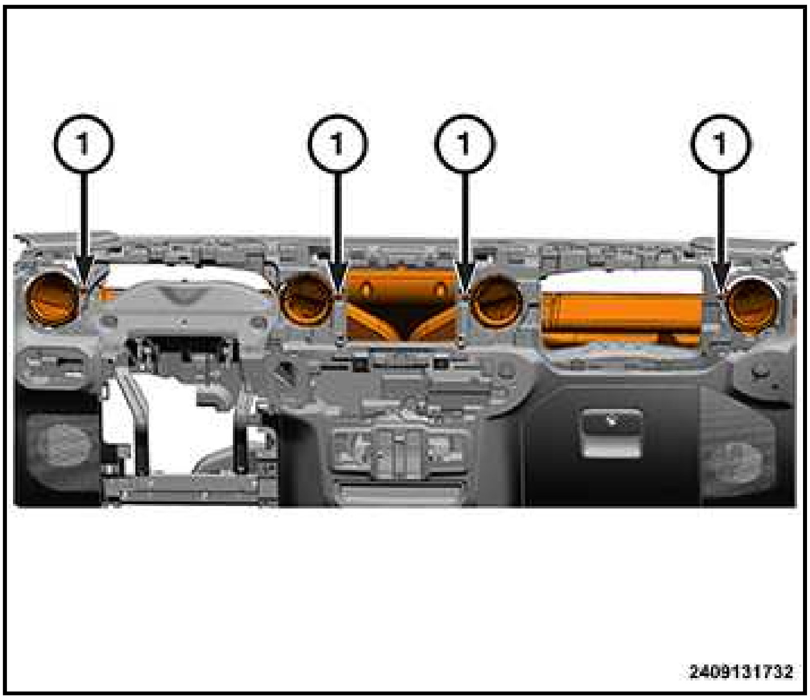
REMOVAL AND INSTALLATION

REMOVAL

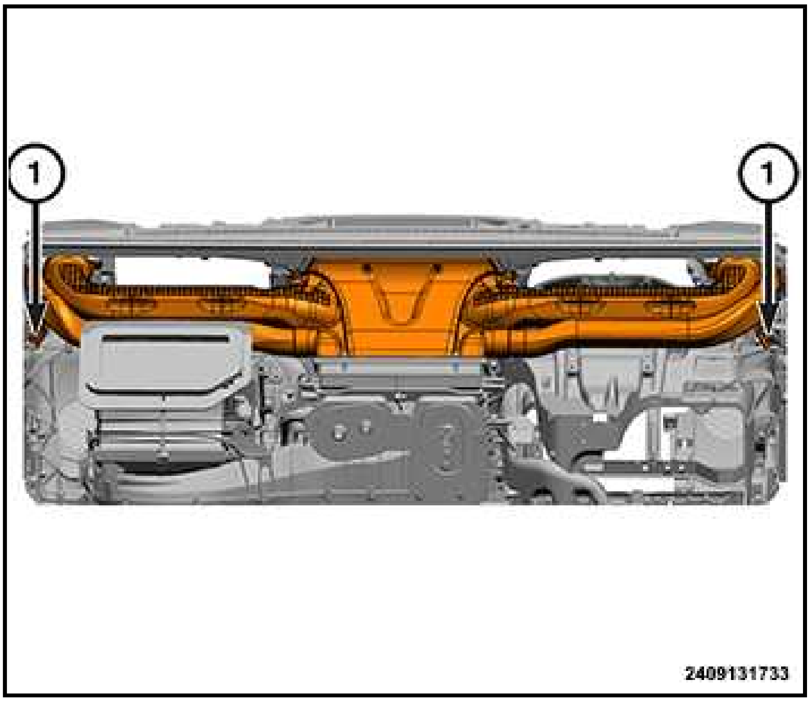
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument cluster bezel. Refer to **BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION** .

NOTE: **Passenger side air bag does not need to be separated from the right side instrument panel trim.**

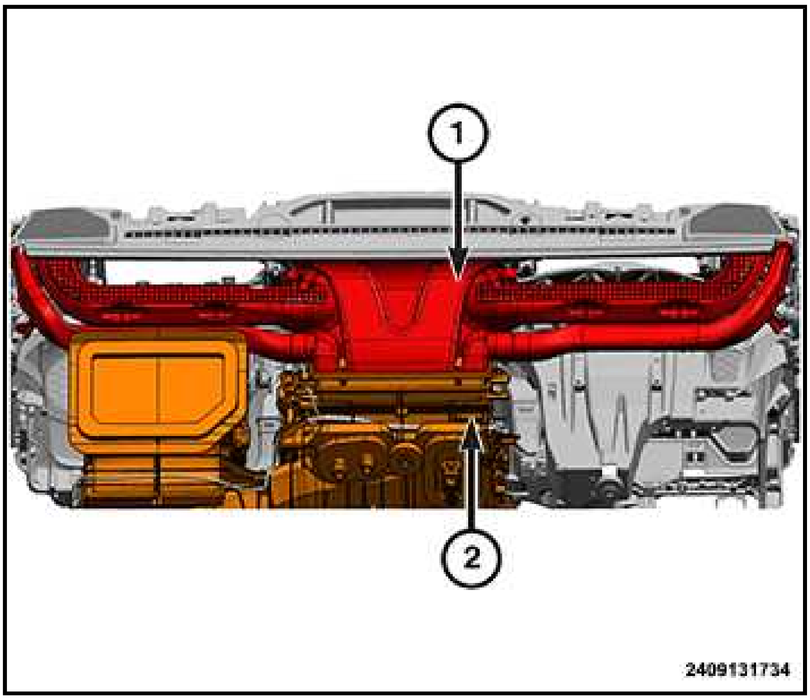
3. Remove the right side instrument panel trim panel with air bag. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .



4. Remove the four screws (1) securing the instrument panel duct assembly to the front of the instrument panel cover.
5. Remove the instrument panel. Refer to **PANEL, INSTRUMENT, REMOVAL AND INSTALLATION**
.



6. Remove the two screws (1) securing the instrument panel duct assembly to the back of the instrument panel cover.



7. Remove the instrument panel duct assembly (1) the HVAC housing (2).

INSTALLATION

1. Install the instrument panel duct assembly to the HVAC housing.
2. Install the two screws securing the instrument panel duct assembly to the back of the instrument panel cover.
3. Install the instrument panel. Refer to **PANEL, INSTRUMENT, REMOVAL AND INSTALLATION** .
4. Install the four screws securing the instrument panel duct assembly to the front of the instrument panel cover.
5. Install the right side instrument panel trim panel with air bag. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .
6. Install the instrument cluster bezel. Refer to **BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION** .
7. Connect the negative battery cable(s). Refer to the appropriate service information .

FILTER, CABIN AIR

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

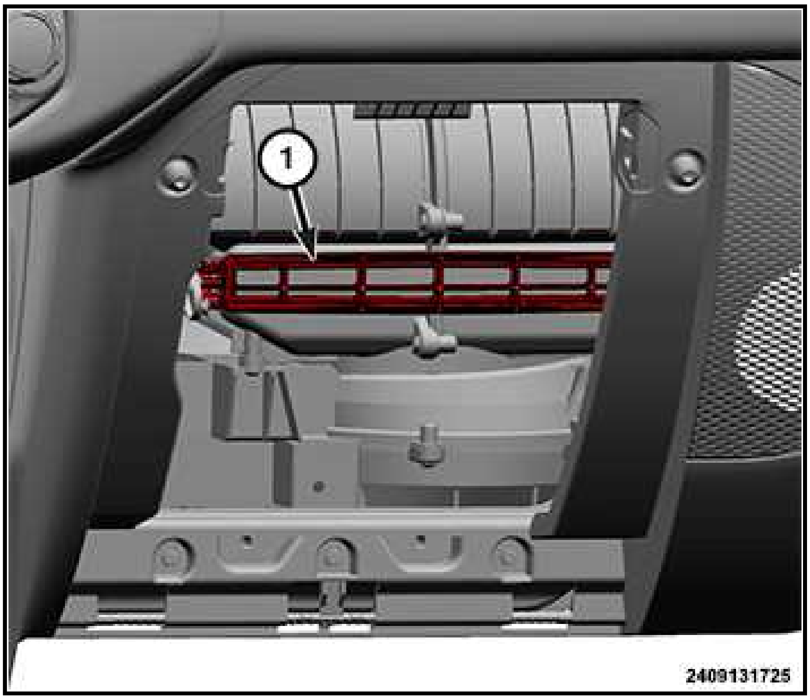
REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

WARNING: **Always make sure the A/C-heater system is turned off and that the ignition switch is in the OFF position prior to servicing the cabin air filter. Never place fingers or other objects into the filter opening of the HVAC housing. Failure to follow this warning may result in serious injury.**

NOTE: **LHD model as shown in illustration, RHD model similar.**

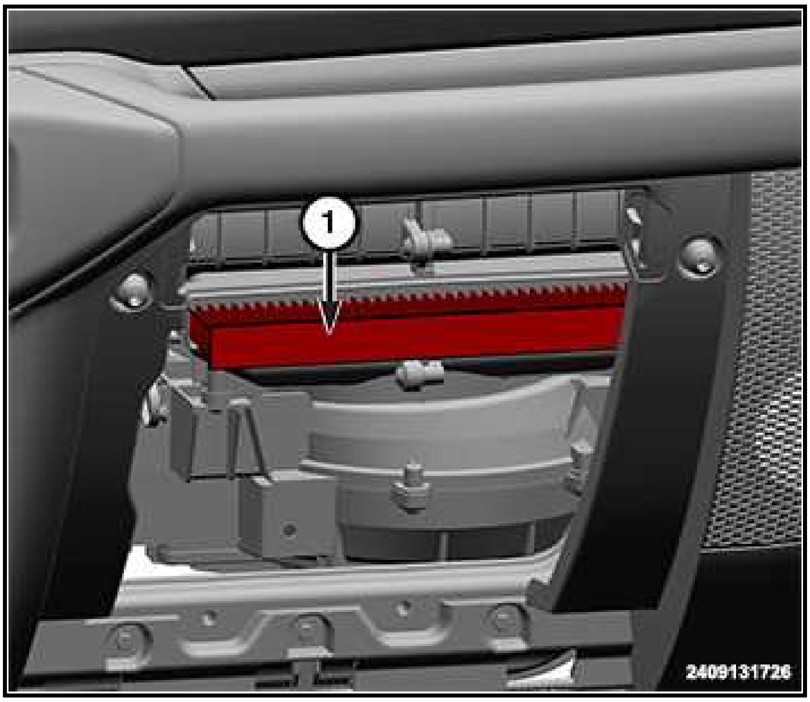
1. Remove the glove box bin. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .



2. Disengage the two retaining tabs that secure the air filter access door (1) to the HVAC housing.

NOTE: **The right side access door may be obstructed on some models by the speaker housing, if so, slide the right cabin air filter to the left after the left cabin air filter is removed, then remove the filter from the housing.**

3. Open the air filter access door (1).



4. Remove the cabin air filter(s) (1) from the HVAC air inlet housing. Pull the filter elements straight out of the housing, one at a time.
5. The cabin air filter (1) may be a one piece design, if so, using the pleats within the air filter, compress the filter enough to pull through the opening within the housing.

INSTALLATION

NOTE: **The two air filter design has been replaced with a single air filter. The single air filter compresses along the pleats to fit inside the HVAC housing opening.**

NOTE: **The cabin air filters are labeled to indicate the orientation. Make sure to properly install the cabin air filters. Failure to properly install the filters will result in the need to replace the filters sooner than required by design.**

1. If equipped with two cabin filters, install the cabin air filters into the HVAC housing. Insert the air filters into the housing one at a time, with the arrow on each filter pointing down.

   NOTE: **The right side cabin filter access door may be obstructed on some models. If so, insert the right side cabin filter into the left side access door opening, then slide the filter to the right.**

2. Compress the air filter pleats enough to insert the air filter into the HVAC housing.
3. Close the air filter access door and engage the retaining tabs that secure the door to the HVAC housing. Make sure the retaining tabs are fully engaged.
4. Install the glove box bin. Refer to **GLOVE BOX, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .

HOUSING, HVAC

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable. Wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in possible serious or fatal injury.**

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

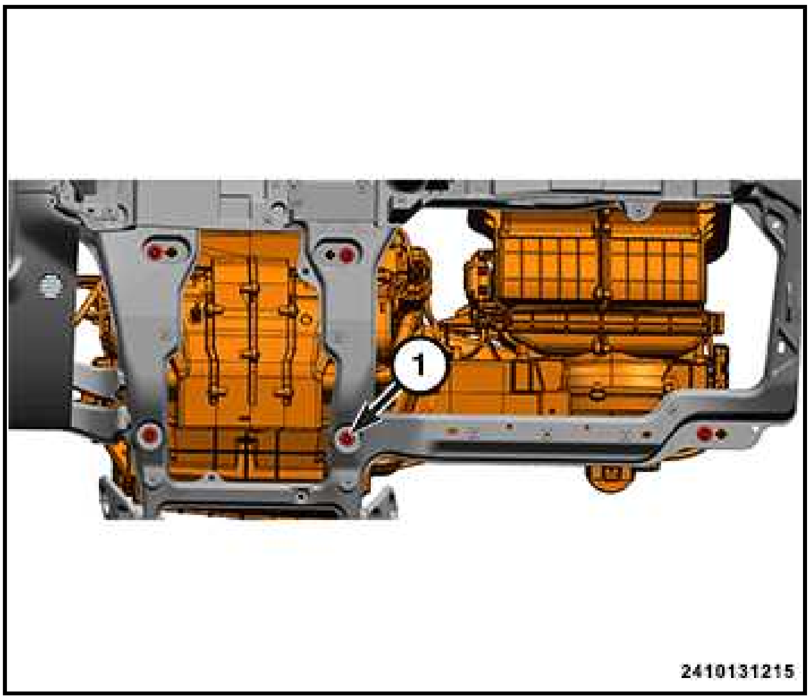
NOTE: **The HVAC housing and instrument panel must be removed from the vehicle as an assembly.**

NOTE: **The HVAC housing must be removed from the instrument panel and disassembled for service of the A/C evaporator, air intake housing, mode-air and blend-air doors and the heater core.**

NOTE: **3.6L LHD model shown in illustrations, Other models similar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument panel and place it on a workbench. Refer to **PANEL, INSTRUMENT, REMOVAL AND INSTALLATION** .
3. Remove the passenger side instrument panel cover. Refer to **COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
4. Disconnect the instrument panel wire harness connectors from the evaporator temperature sensor, blower motor resistor, blower motor and the recirculation door actuator.

5. Remove the instrument panel ducts. Refer to **DUCT, INSTRUMENT PANEL, ASSEMBLY, REMOVAL AND INSTALLATION**.



6. Remove the five bolts (1) that secure the HVAC housing assembly to the center of the instrument panel reinforcement and remove the housing from the support. Use caution not to damage the housing alignment pin during removal of the housing from the support.

INSTALLATION

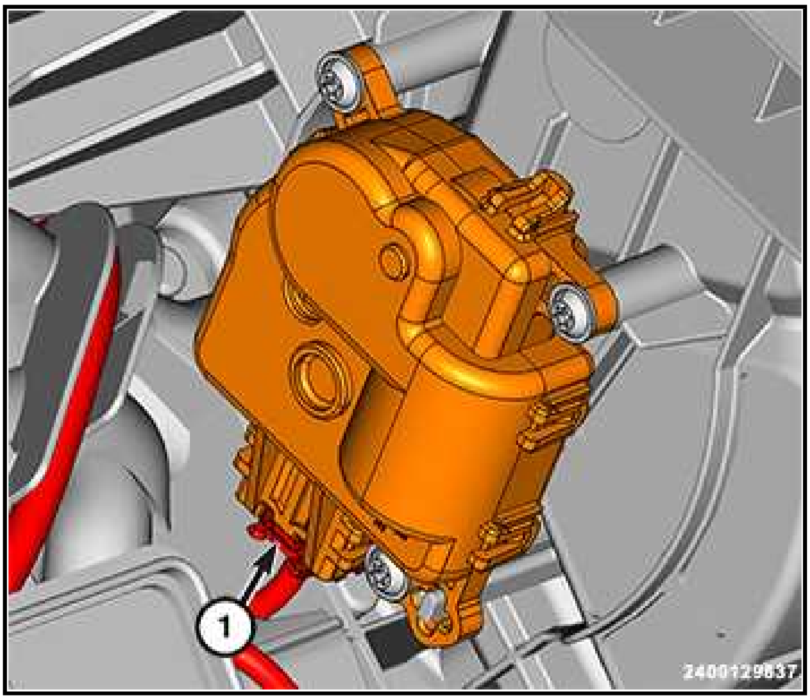
1. Install the five bolts that secure the HVAC housing assembly to the center of the instrument panel reinforcement and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
2. Install the instrument panel ducts. Refer to **DUCT, INSTRUMENT PANEL, ASSEMBLY, REMOVAL AND INSTALLATION**.
3. Connect the instrument panel wire harness connectors to the evaporator temperature sensor, blower motor and the recirculation door actuator.
4. Install the passenger side instrument panel cover. Refer to **COVER, INSTRUMENT PANEL, REMOVAL AND INSTALLATION** .
5. Install the instrument panel. Refer to **PANEL, INSTRUMENT, REMOVAL AND INSTALLATION** .
6. Connect the negative battery cable(s). Refer to the appropriate service information .

DISASSEMBLY AND ASSEMBLY

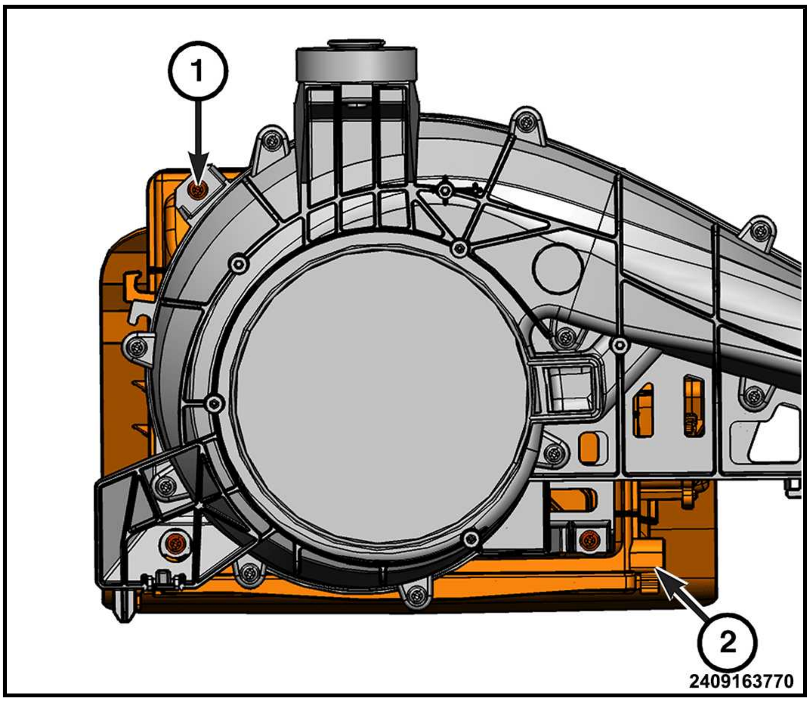
HOUSING - AIR INLET

DISASSEMBLY

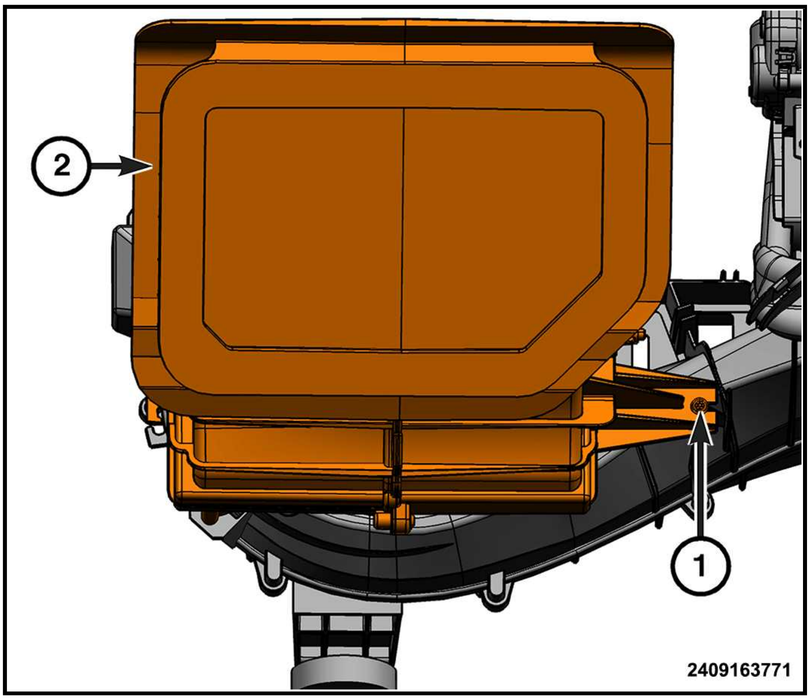
1. Remove the HVAC housing assembly and place it on a workbench. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.



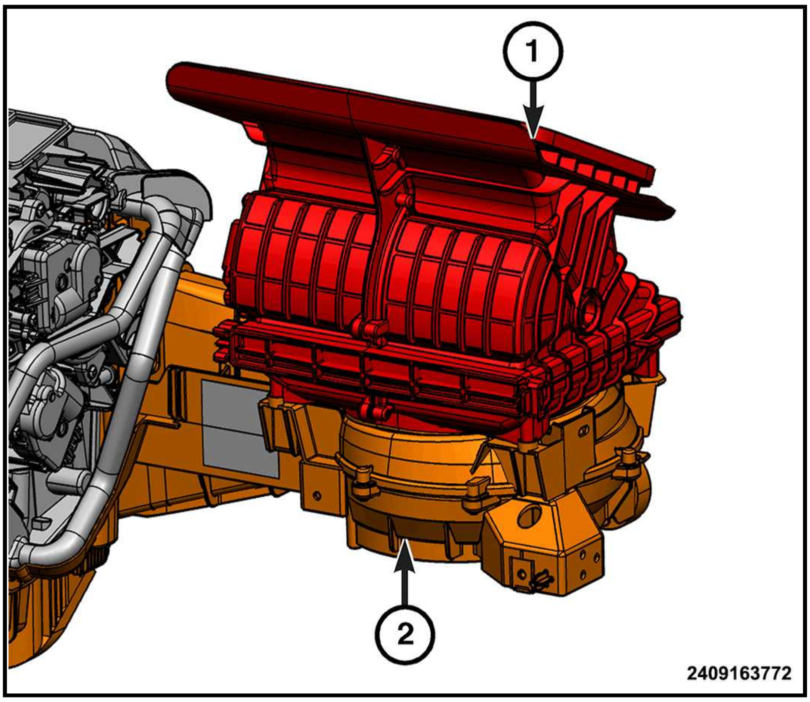
2. Disconnect the wire harness connector (1) from the actuator.



3. Remove the bottom fasteners (1) that secures the air inlet housing (2) to the HVAC housing assembly.



4. Remove the top fastener (1) that secures the air inlet housing (2) to the HVAC housing assembly.



5. Remove the air inlet housing (1) from the HVAC housing assembly (2).

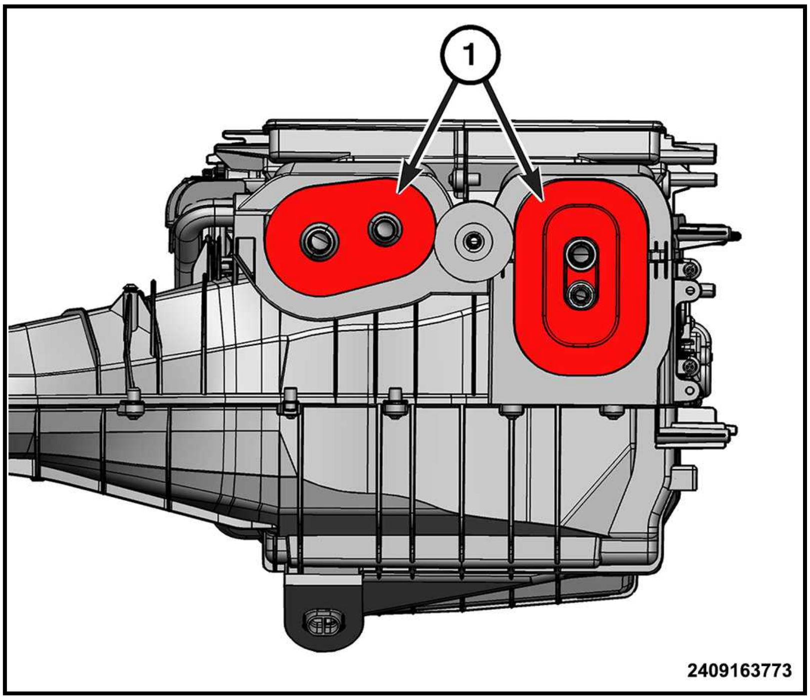
ASSEMBLY

1. Install the air inlet housing to the HVAC housing assembly.
2. Install the top fastener that secures the air inlet housing to the HVAC housing assembly and tighten securely.
3. Install the bottom fasteners that secures the air inlet housing to the HVAC housing assembly and tighten securely.
4. Connect the wire harness connector to the actuator.
5. Install the HVAC housing assembly. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.

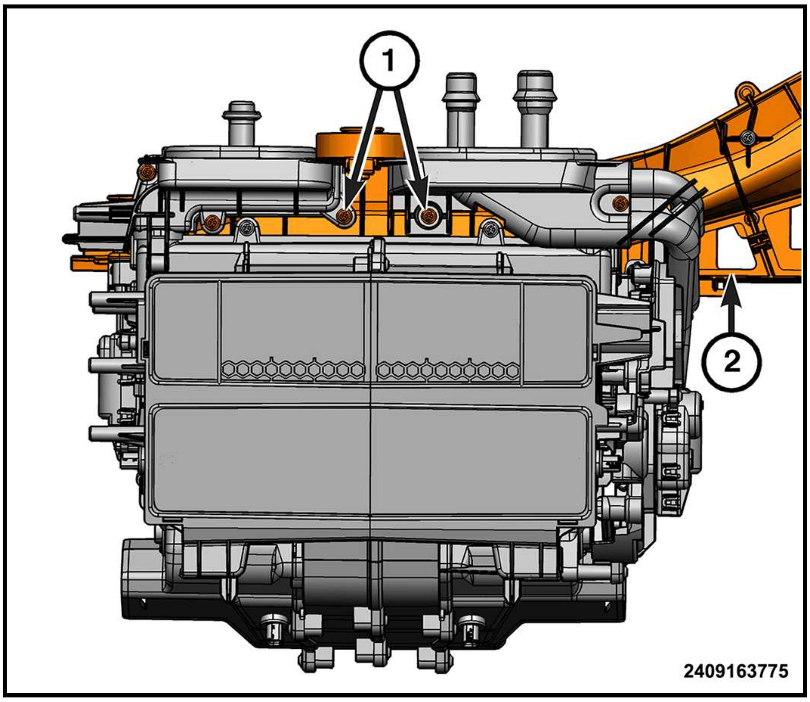
HOUSING - HVAC ASSEMBLY

DISASSEMBLY

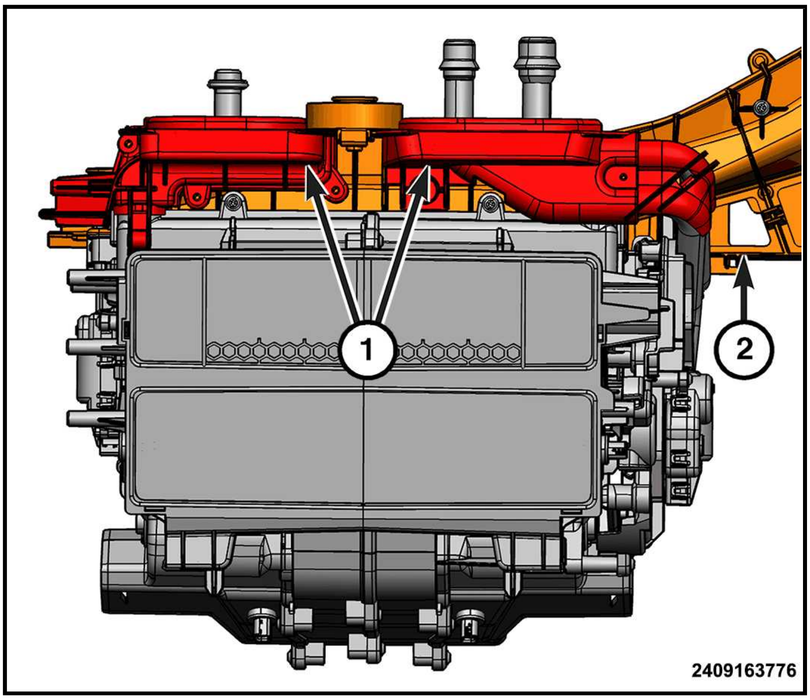
1. Remove the air inlet housing. Refer to **HOUSING, HVAC, DISASSEMBLY AND ASSEMBLY**.
2. Disconnect all necessary wire harness connectors from the HVAC housing.



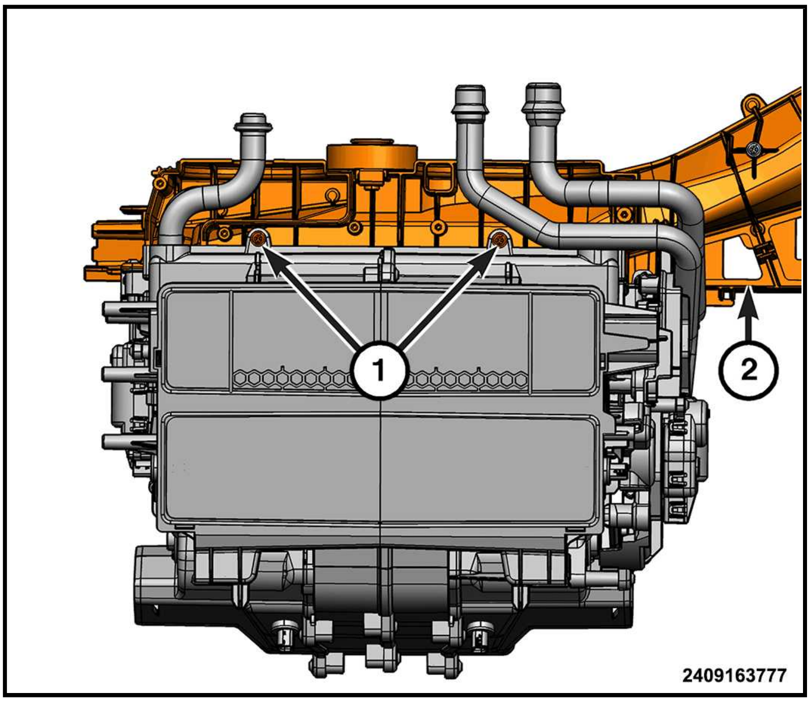
3. Remove the seals (1) from the HVAC housing.



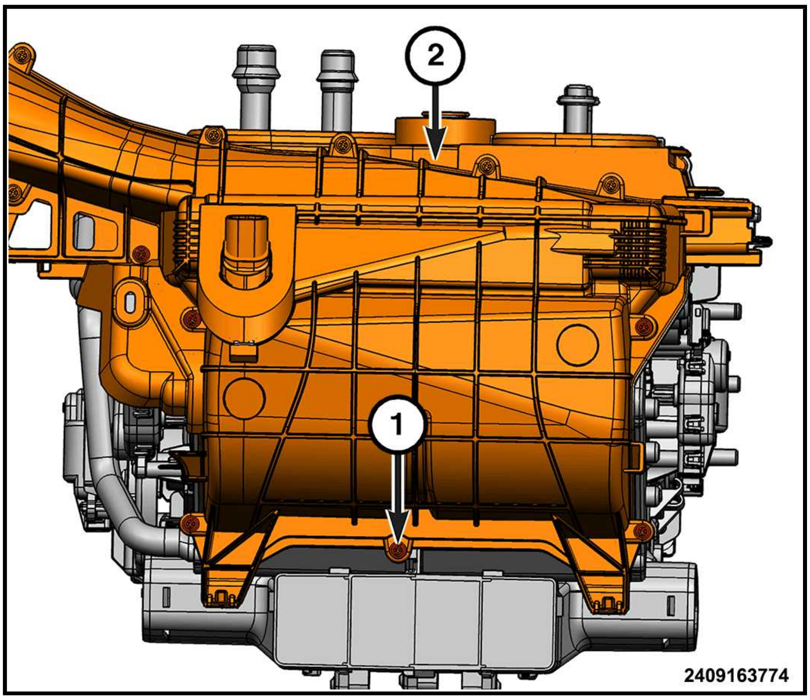
4. Remove the fasteners (1) securing the heater core and evaporator lines to the HVAC housing (2).



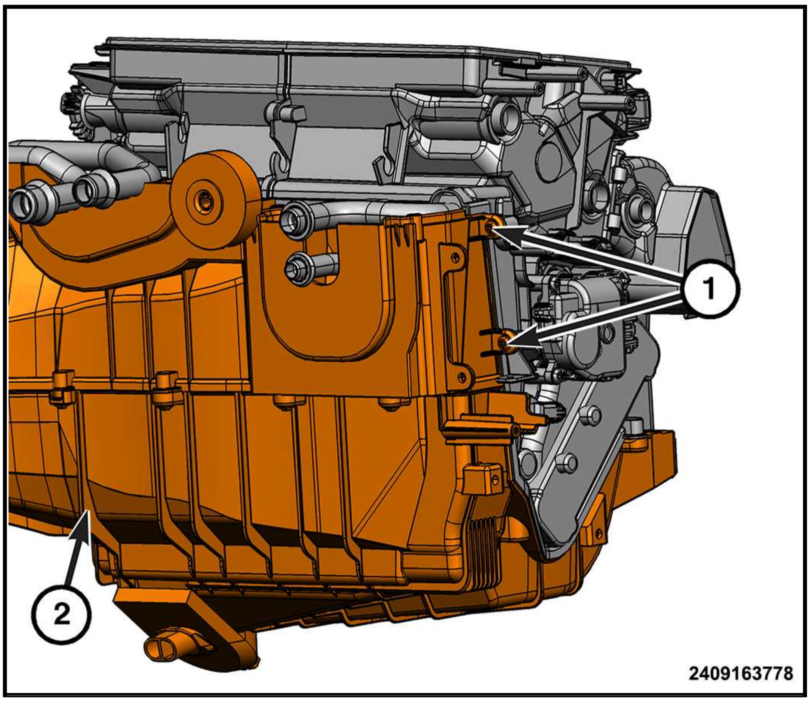
5. Remove the covers (1) from the HVAC housing (2).



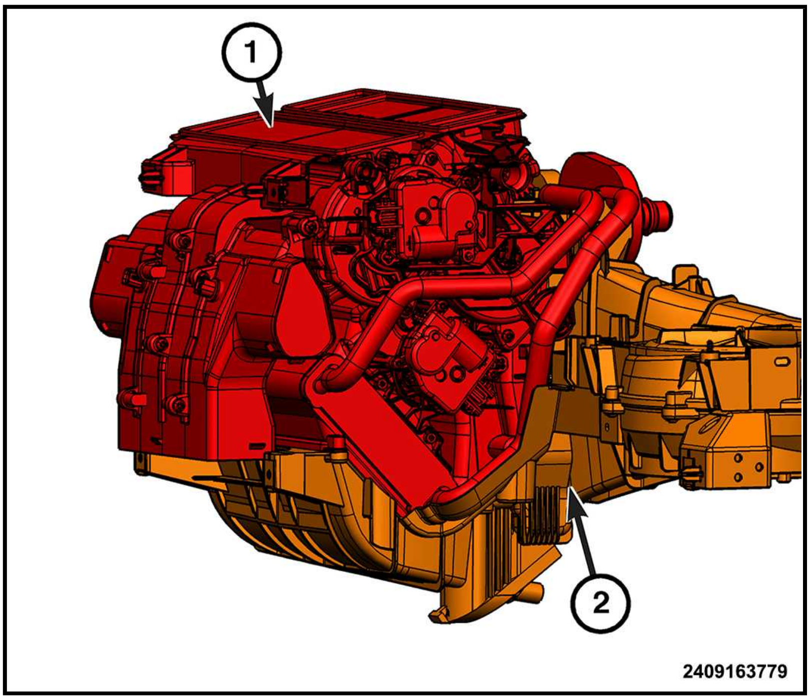
6. Remove the top fasteners (1) securing the HVAC housing (2) to the distribution housing.



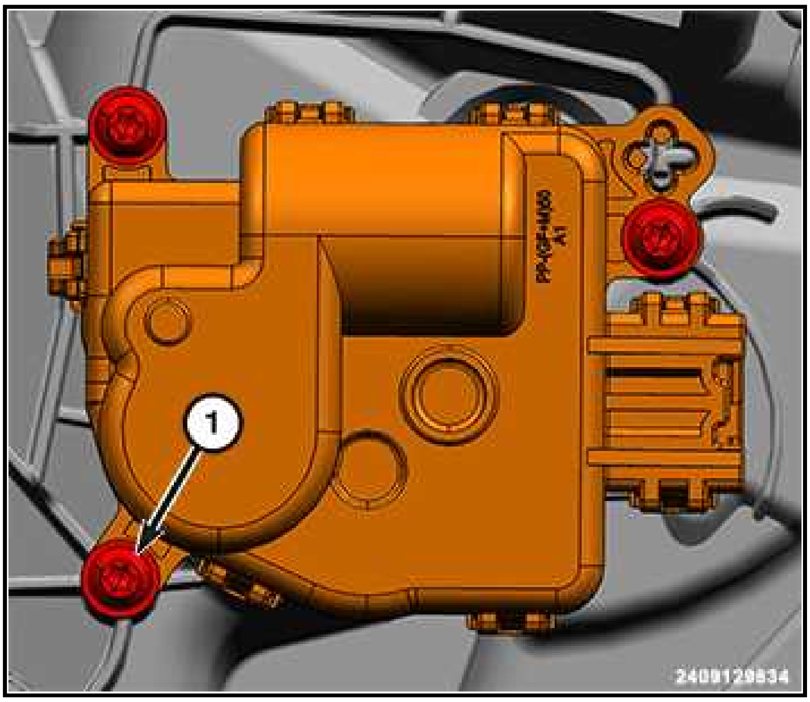
7. Remove the bottom fasteners (1) securing the HVAC housing (2) to the distribution housing.



8. Remove the left side fasteners (1) securing the HVAC housing (2) to the distribution housing.



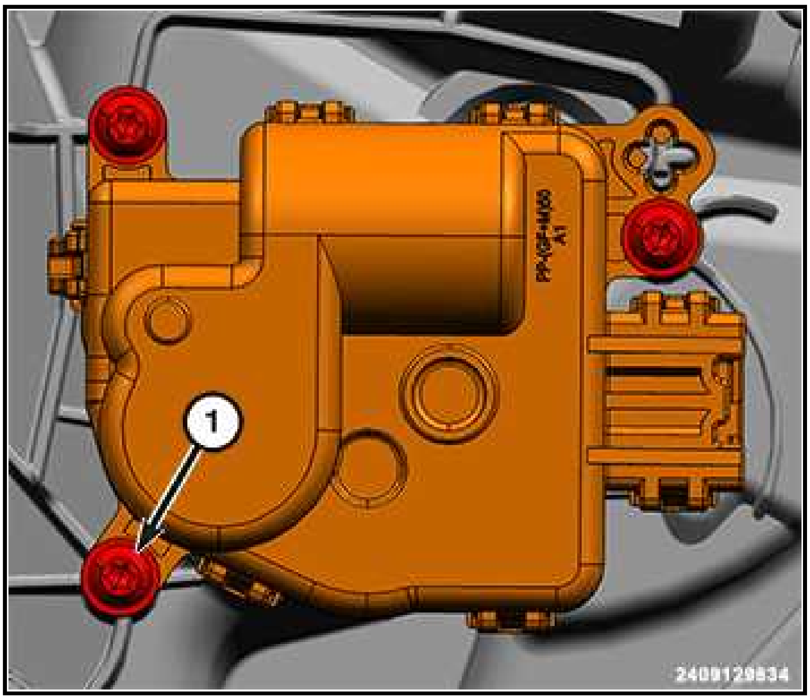
9. Remove the distribution housing (1) from the HVAC housing (2).



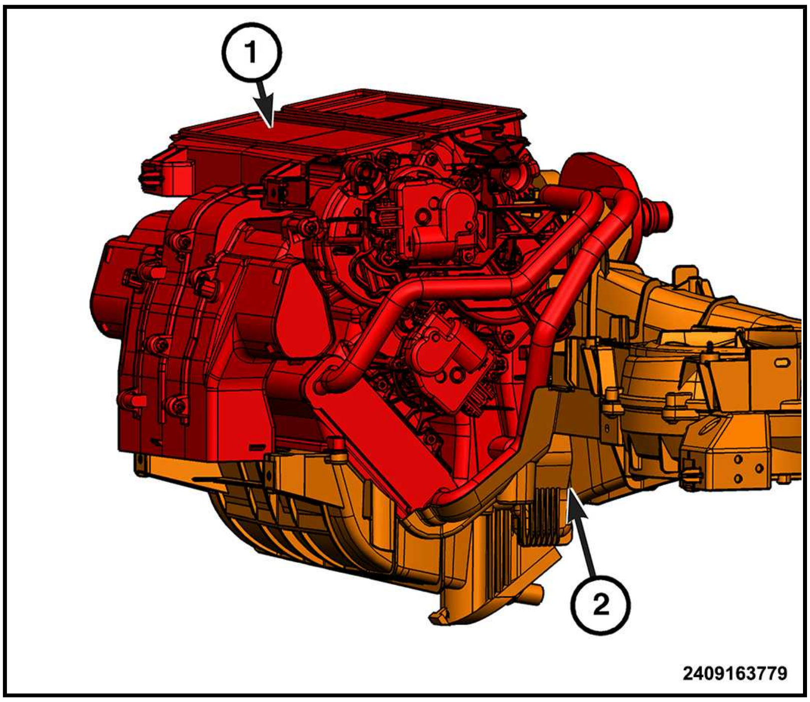
10. If the air distribution housing is being replaced, remove the fasteners (1) that secure the blend door actuator to the air distribution housing and remove the actuator.
11. If the HVAC housing is being replaced, remove the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
12. If the HVAC housing is being replaced, remove the HVAC module. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .

ASSEMBLY

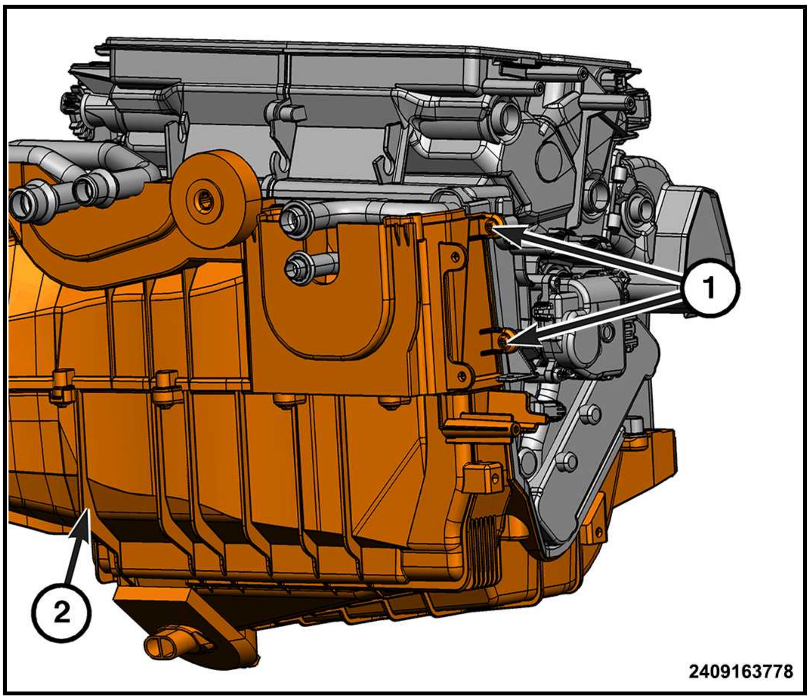
1. If remove, install the HVAC module. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .
2. If remove, install the blower motor. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.



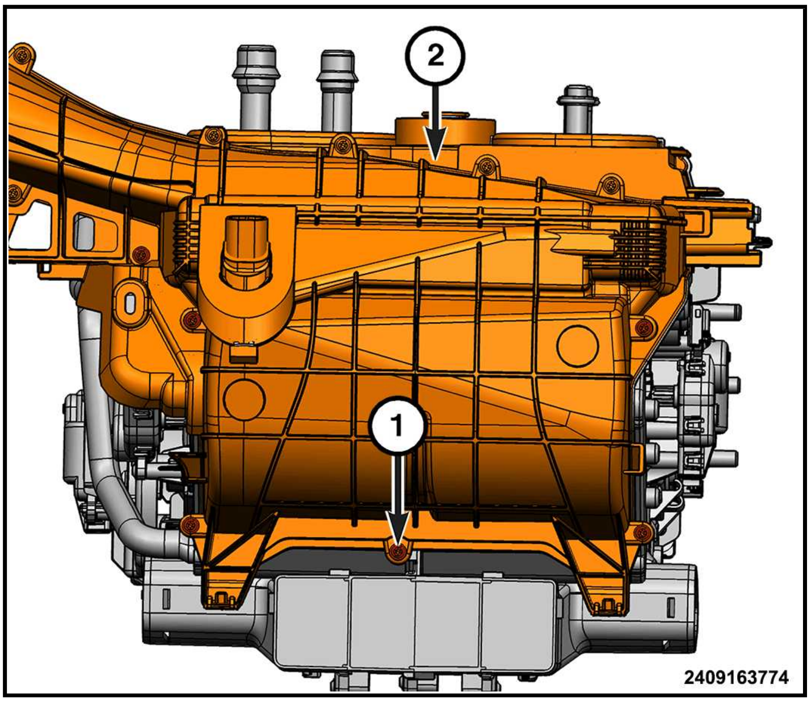
3. If remove, install the fasteners (1) that secure the blend door actuator to the air distribution housing and tighten securely.



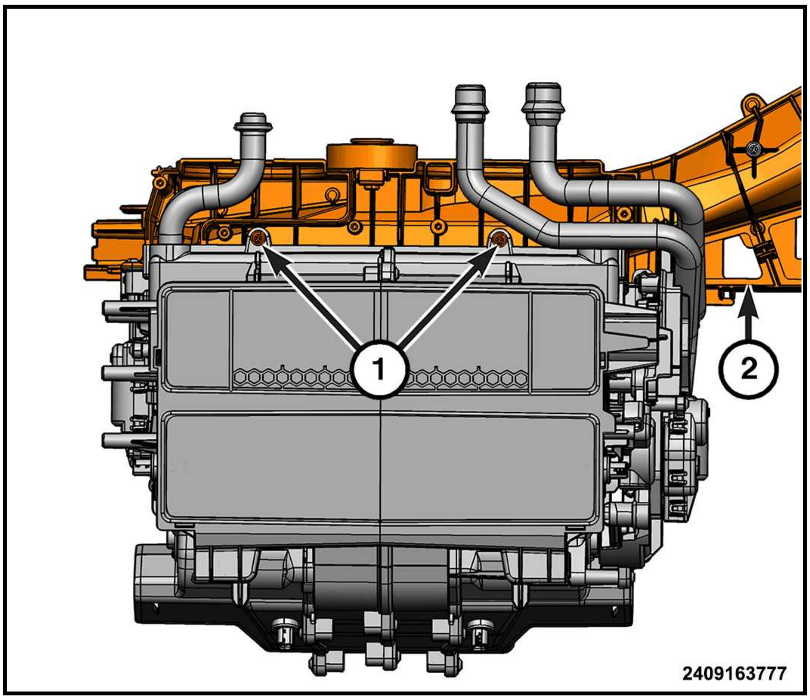
4. Install the distribution housing (1) to the HVAC housing (2).



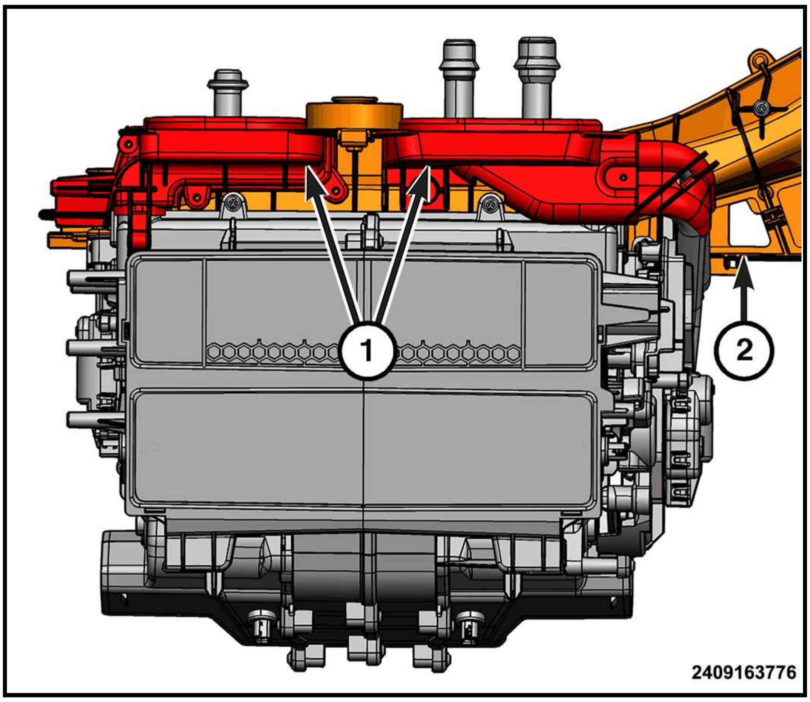
5. Install the left side fasteners (1) securing the HVAC housing (2) to the distribution housing and tighten securely.



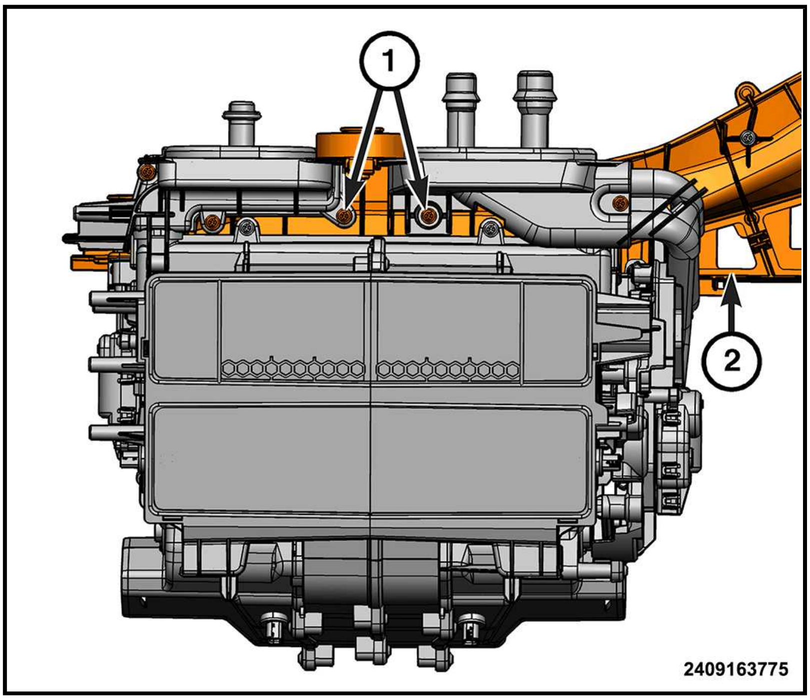
6. Install the bottom fasteners (1) securing the HVAC housing (2) to the distribution housing and tighten securely.



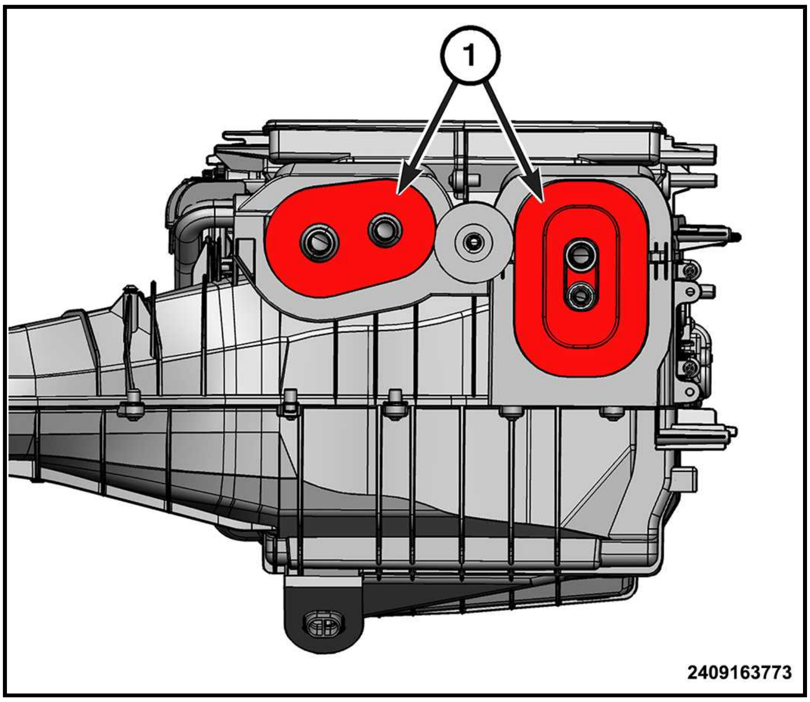
7. Install the top fasteners (1) securing the HVAC housing (2) to the distribution housing and tighten securely.



8. Install the covers (1) to the HVAC housing (2).



9. Install the fasteners (1) securing the heater core and evaporator lines to the HVAC housing (2) and tighten securely.



10. Install the seals (1) to the HVAC housing.
11. Connect all necessary wire harness connectors to the HVAC housing.
12. Install the air inlet housing. Refer to **HOUSING, HVAC, DISASSEMBLY AND ASSEMBLY**.

MOTOR, BLOWER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - BLOWER MOTOR

Any diagnosis of the blower motor should begin with the use of a diagnostic scan tool. Check for any Diagnostic Trouble Code (DTC) data. If a DTC is found, refer to HVAC and perform the appropriate diagnostic procedure before proceeding in this section. Refer to the appropriate wiring information.

WARNING: **Disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and**

isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions may result in accidental airbag deployment and possible serious or fatal injury.

NOTE: **For circuit descriptions and diagrams, refer to Air Conditioning/Heater in Wiring Information.**

BLOWER MOTOR DIAGNOSTIC TABLE		
CONDITION	**POSSIBLE CAUSES**	**CORRECTION**
BLOWER MOTOR INOPERATIVE	1. Fuse inoperative.	Check blower motor fuse. Replace as necessary.
	2. Blower motor relay inoperative.	Check blower motor relay. Replace as necessary.
	3. Wiring or connector issue.	Check Wiring Information. Refer to Air Conditioning/Heater in Wiring Information. Repair wiring or connector as necessary. For wiring repair. Refer to **STANDARD PROCEDURE** . For connector repair, and. Refer to **REMOVAL** . Refer to **INSTALLATION** .
	4. Inoperative blower motor and power module assembly	Check the blower motor and power module assembly for proper operation. Replace as necessary. Refer to **MOTOR, BLOWER, REMOVAL AND INSTALLATION**.
	5. Inoperative A/C heater control	Check the A/C heater control for proper operation. Replace as necessary. Refer to **MODULE, INTEGRATED CENTER STACK (ICSM), REMOVAL AND INSTALLATION** .
	6. Inoperative Heating, Ventilation and Air Conditioning (HVAC) module	Check the HVAC module for proper operation. Replace as necessary. Refer to **MODULE, HVAC, REMOVAL AND INSTALLATION** .

REMOVAL AND INSTALLATION

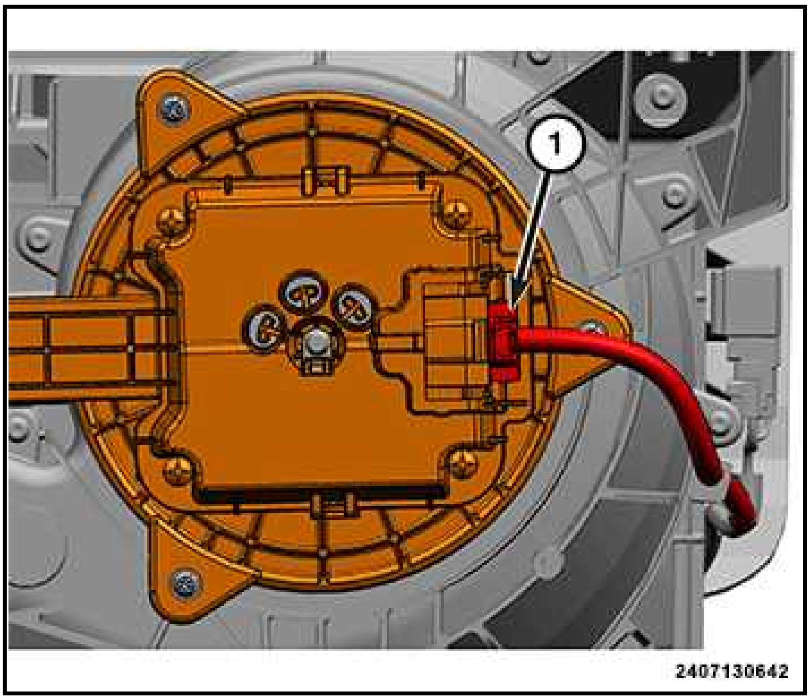
REMOVAL AND INSTALLATION

REMOVAL

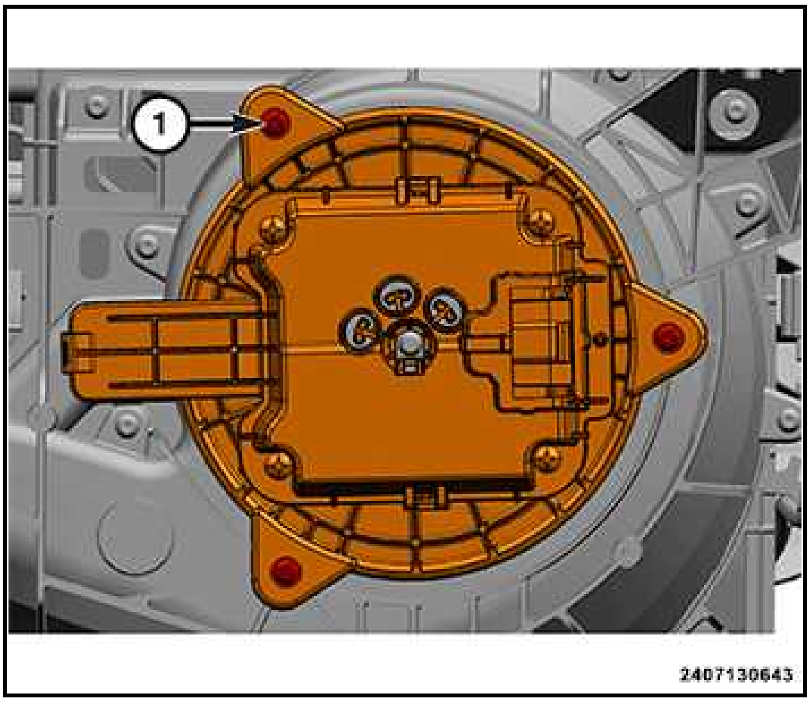
NOTE: **The blower motor is located on the bottom of the passenger side of the HVAC housing. The blower motor can be removed from the vehicle without having to remove the HVAC housing.**

NOTE: **LHD model as shown in illustration. RHD model similar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .



2. From underneath the instrument panel, disconnect the instrument panel wire harness connector (1) from the blower motor.



3. Remove the three screws (1) that secure the blower motor to the bottom of the HVAC housing and remove the blower motor.

INSTALLATION

1. Position the blower motor into the bottom of the HVAC housing.
2. Install the three screws that secure the blower motor to the HVAC housing. Tighten the screws securely.
3. Connect the instrument panel wire harness connector to the blower motor.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

OUTLET, AIR

REMOVAL AND INSTALLATION

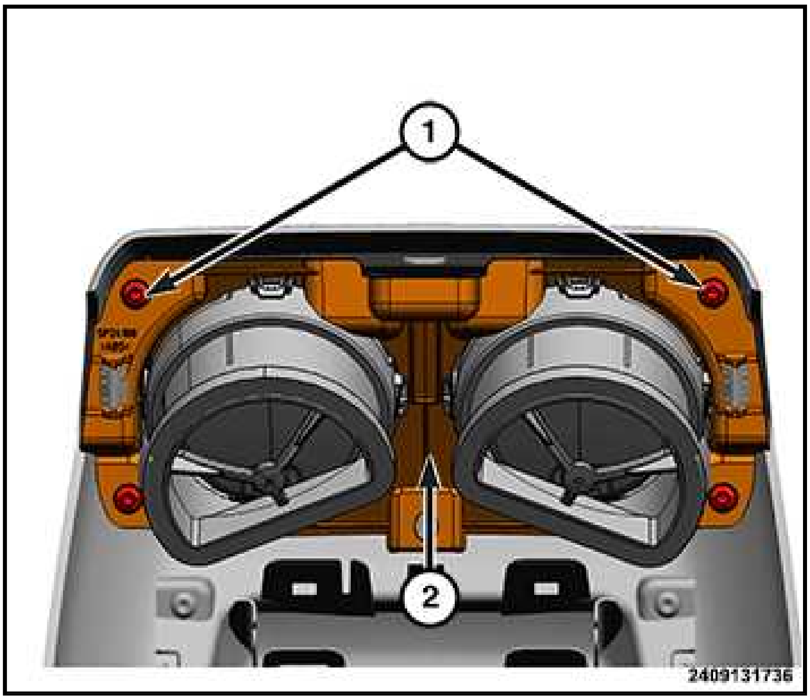
AIR OUTLETS - CONSOLE REAR

REMOVAL

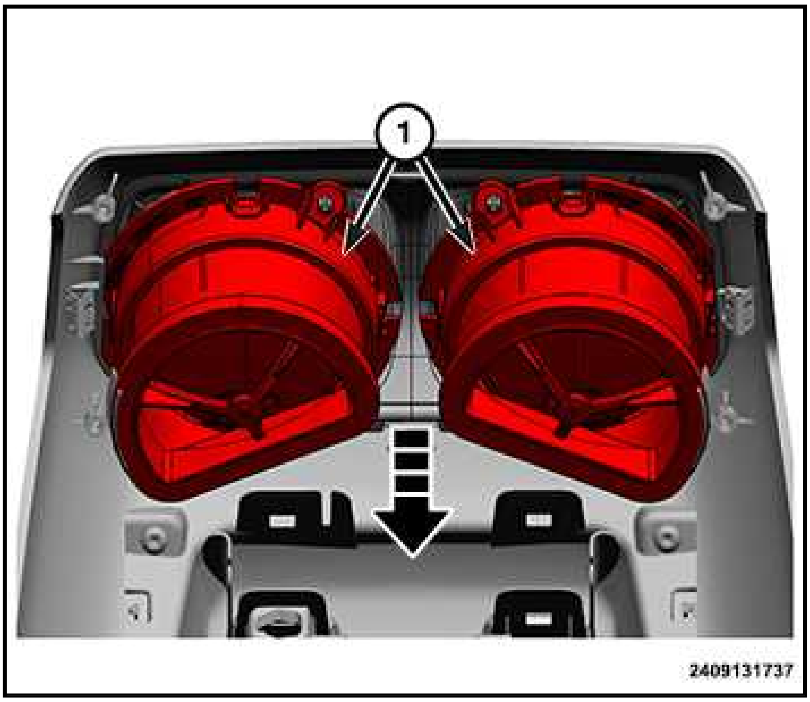
NOTE: **Take the proper precautions to protect the floor console rear trim panel from cosmetic damage while performing this procedure.**

NOTE: **If the foam seal on the console rear ducts is deformed or damaged, the seal must be replaced.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the floor console rear trim panel from the back of the floor console using (special tool #C-4755, Trim Stick) or equivalent. Disconnect any necessary wire harness connectors and place the trim panel on a workbench.



3. Remove the screws (1) that secure floor console rear ducts to the floor console rear trim panel (2).



4. Remove the floor console rear ducts (1) from the floor console rear trim panel.

INSTALLATION

NOTE: **Take the proper precautions to protect the floor console rear trim panel from cosmetic damage while performing this procedure.**

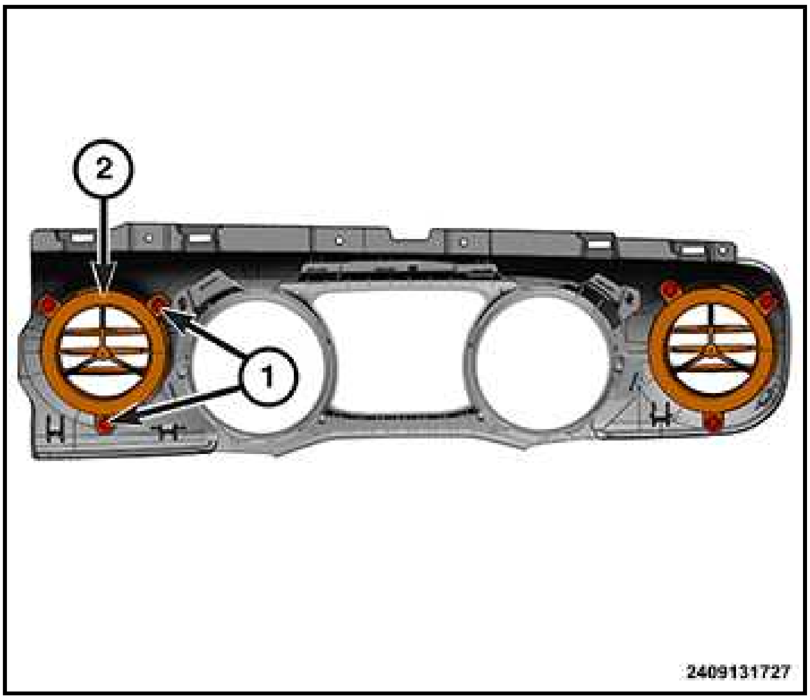
NOTE: **If the foam seal on the console rear ducts is deformed or damaged, the seal must be replaced.**

1. Install the floor console rear ducts to the floor console rear trim panel.
2. Install the screws that secure floor console rear ducts to the floor console rear trim panel. Tighten the screws securely.
3. Install the floor console rear trim panel to the back of the floor console. Be sure to connect any necessary wire harness connectors and properly align the console ducts.
4. Connect the negative battery cable(s). Refer to the appropriate service information .

DRIVER FRONT AIR OUTLETS

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the instrument cluster bezel. Refer to **BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION** .



3. Remove the three screws (1) and remove the appropriate air outlet (2) from the instrument cluster bezel.

INSTALLATION

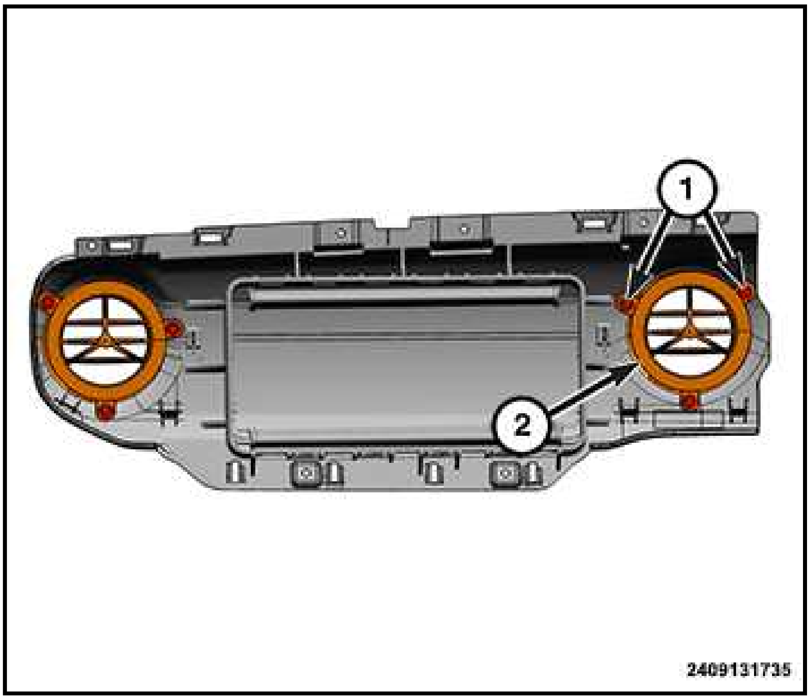
1. Position the air outlet to the instrument cluster bezel and install the three screws securely.
2. Install the instrument cluster bezel. Refer to **BEZEL, INSTRUMENT CLUSTER, REMOVAL AND INSTALLATION** .
3. Connect the negative battery cable(s). Refer to the appropriate service information .

PASSENGER FRONT AIR OUTLETS

REMOVAL

NOTE: **Passenger side air bag does not need to be separated from air bag bezel.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the right side instrument panel trim. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .



3. Remove the three screws (1) and remove the appropriate air outlet (2) from the air bag bezel.

INSTALLATION

1. Install the air outlet to the air bag bezel and tighten the three screws securely.
2. Install the right side instrument panel trim. Refer to **PANEL, INSTRUMENT PANEL TRIM, REMOVAL AND INSTALLATION** .
3. Connect the negative battery cable(s). Refer to the appropriate service information .

PLUMBING

WARNING

WARNING: **The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Serious or fatal injury may result from improper service procedures.**

WARNING: **Avoid breathing the refrigerant and refrigerant oil vapor or mist. Exposure may irritate the eyes, nose, or throat. Wear eye protection when servicing the A/C refrigerant system. Serious eye injury can result from direct contact with the refrigerant. If eye contact occurs, seek medical attention immediately.**

WARNING: **Do not expose the refrigerant to open flame. Poisonous gas is created when refrigerant is burned. An electronic leak detector is recommended. Serious or fatal injury may result from improper service procedures.**

WARNING: **If accidental A/C system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and serious or fatal injury.**

WARNING: **The engine cooling system is designed to develop internal pressures up to 145 kPa (21 psi). Do not remove or loosen the coolant pressure cap, cylinder block**

drain plugs, radiator drain, radiator hoses, heater hoses, or hose clamps while the engine cooling system is hot and under pressure. Allow the vehicle to cool for a minimum of 15 minutes before opening the cooling system for service. Failure to observe this warning can result in serious burns from the heated engine coolant.

CAUTION

CAUTION: **Never add R-12 to a refrigerant system designed to use R-134a or R-1234yf. Never add R-134a to a refrigerant system designed to use R-1234yf. Do not use R-12 equipment or parts on an R-134a or R-1234yf A/C system. Do not use R-134a equipment or parts on an R-1234yf A/C system. These refrigerants are not compatible and damage to the A/C system will result.**

CAUTION: **Never use R-12 refrigerant oil in an A/C system designed to use R-134a or R-1234yf refrigerant oil. Never use R-134a refrigerant oil in an A/C system designed to use R-1234yf refrigerant oil. These refrigerant oils are not compatible and damage to the A/C system will result.**

CAUTION: **The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/recharging equipment or A/C system. Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. FCA US LLC recommends the detection of A/C system leaks through the use of approved leak detectors and fluorescent leak detection dyes. Vehicles found with A/C system sealers should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners voids the warranty for the A/C system.**

CAUTION: **Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.**

CAUTION: **If equipped, do not remove the secondary retention clip from any spring-lock coupler connection while the refrigerant system is under pressure. Recover the refrigerant before removing the secondary retention clip. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.**

CAUTION: **The internal parts of the A/C system will remain stable as long as moisture-free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability. This may cause operational troubles or even serious damage if present in more than very small quantities. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system. Keep service tools and the work area clean. Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug. This will prevent contamination from entering the A/C system.**

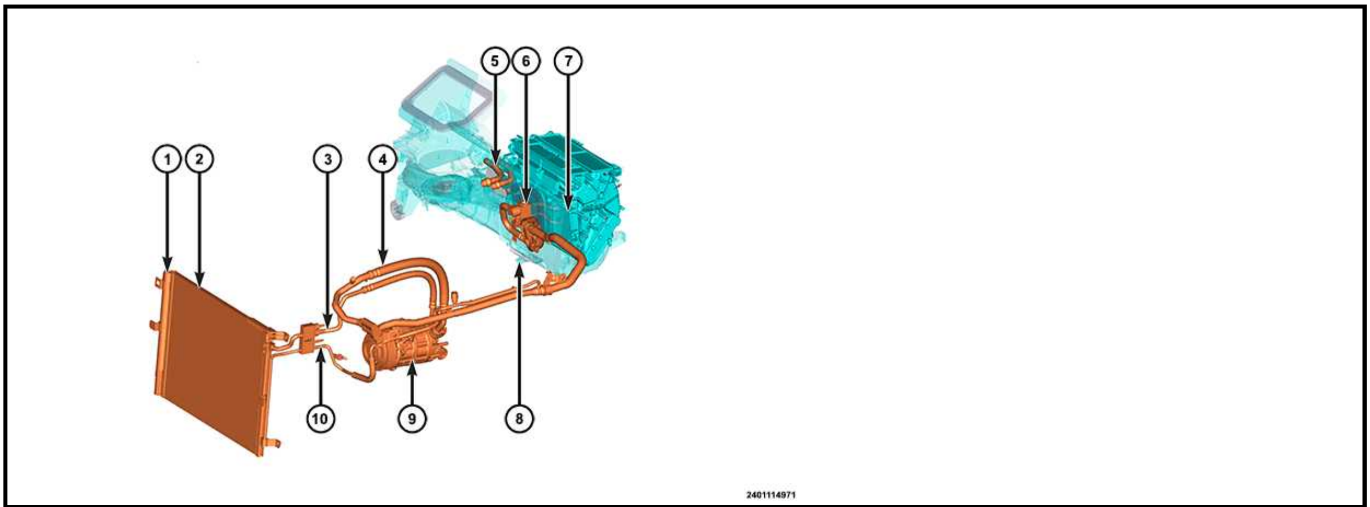
CAUTION: **Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.**

CAUTION: **Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause compressor noise and A/C system failure.**

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Heating, Ventilation and Air Conditioning (HVAC) plumbing system consists of the following components:

COMPONENT INDEX

1.	Refer to **RECEIVER/DRYER**.
2.	Refer to **CONDENSER**.
3.	Refer to **DISCHARGE LINE**.
4.	Refer to **SUCTION/LIQUID LINE AND SUCTION JUMPER** - Suction Line Jumper.
5.	Refer to **HEATER CORE**.
6.	Refer to **EXPANSION VALVE**.
7.	Refer to **EVAPORATOR**.
8.	Refer to **CONDENSATION DRAIN TUBE**.
9.	Refer to **COMPRESSOR**.
10.	Refer to **SUCTION/LIQUID LINE AND SUCTION JUMPER** - Suction/Liquid Line with Internal Heat Exchanger (IHX).

OPERATION

The HVAC refrigerant plumbing system contains the refrigerant and refrigerant oil in an air tight environment so that moisture cannot affect the performance or deterioration of the refrigerant and plumbing components. The refrigerant is used as the medium which absorbs and removes heat from the space to be cooled and subsequently rejects that heat elsewhere.

Circulating refrigerant vapor from the evaporator enters the compressor and is compressed to a higher pressure, resulting in a higher temperature as well. The hot, compressed refrigerant vapor is now at a temperature and pressure at which it can be condensed and is routed through a condenser. Here it is cooled by air flowing across the condenser coils and condensed into a liquid. Thus, the circulating refrigerant removes heat from the system and the heat is carried away by the air moving through the condenser.

The condensed and pressurized liquid refrigerant is next routed through an expansion valve where it undergoes an abrupt reduction in pressure. That pressure reduction results in flash evaporation of a part of the liquid refrigerant, lowering its temperature. The cold refrigerant is then routed through the evaporator. A fan blows the warm air (which is to be cooled) across the evaporator, causing the liquid part of the cold refrigerant mixture to evaporate as well, lowering the temperature even more. The warm air is therefore cooled.

To complete the refrigeration cycle, the refrigerant vapor is routed back into the compressor.

COMPRESSOR

COMPRESSOR

Refer to **COMPONENT INDEX**.

The compressor of the air conditioning system is the variable displacement type, with electric clutch engagement and external control of the displacement, via the External Control Variable Displacement (ECVD) valve. The compressors are specific for engine version and market.

The HVAC module manages the ECVD valve to increase or decrease the compressor displacement and thus the system pressure, via Pulse Width Modulation (PWM) control. External regulation of the displacement improves comfort, operation of the air conditioning system and saves the energy requested by the climate control system.

The A/C compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The A/C compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The A/C compressor draws in low pressure refrigerant vapor from the A/C evaporator through its suction port. It then compresses the refrigerant into a high pressure, high temperature refrigerant vapor, which is then pumped to the A/C condenser through the compressor discharge port.

The external compressor controls are:

- ECVD valve
- Electric clutch

CAUTION: **Be certain to adjust the refrigerant system oil level when replacing an A/C compressor. Failure to properly adjust the refrigerant oil level can prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

CONDENSATION DRAIN TUBE

CONDENSATION DRAIN TUBE

Refer to **COMPONENT INDEX**.

Air moving through the evaporator is cooled by heat exchange as it passes through. Any moisture in the air is condensed by the cooling action and turns into water. As the water accumulates inside the HVAC housing, it is released to the underside of the vehicle through the condensation drain tube. The condensation drain tube is sealed at the HVAC housing and floor pan so that water does not leak into the passenger compartment of the vehicle.

CONDENSER

CONDENSER

Refer to **COMPONENT INDEX**.

When air passes through the fins of the A/C condenser, the high-pressure refrigerant gas within the A/C condenser gives up its heat. The refrigerant then condenses as it leaves the A/C condenser and becomes a high-pressure liquid. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the A/C system. Therefore, it is important that there are no objects placed in front of the radiator grille openings at the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow.

Also, any factory-installed air seals or shrouds must be properly installed following radiator or A/C condenser service.

NOTE: **Replacement of the refrigerant line slim line gaskets is required anytime a refrigerant line is disconnected. Failure to replace the slim line gaskets could result in a refrigerant system leak.**

The A/C condenser has no serviceable parts except for the slim line gaskets. The slim line gaskets used on the connections are made from a special type of rubber not affected by R-1234yf refrigerant. The slim line gaskets must be replaced whenever a refrigerant line is disconnected from the A/C condenser.

The A/C condenser cannot be repaired and must be replaced if leaking or damaged.

DISCHARGE LINE

DISCHARGE LINE

Refer to COMPONENT INDEX.

The discharge line and jumper are made of formed aluminum piping and an outer rubber layer followed by reinforcing threads and an inner rubber layer, the inside of which is coated with a polyamide resin, so that normal engine vibrations do not cause a refrigerant leak in the system. It is sealed at both ends with slim line gaskets that are not affected by R-1234yf refrigerant or the refrigerant oil in the system.

EVAPORATOR

EVAPORATOR

Refer to COMPONENT INDEX.

Refrigerant enters the A/C evaporator from the A/C expansion valve as a low-temperature, low-pressure mixture of liquid and gas. As air flows over the fins of the A/C evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the A/C evaporator.

NOTE: **Replacement of the slim line gaskets is required anytime the A/C expansion valve is removed from the A/C evaporator. Failure to replace the slim line gaskets may result in a refrigerant system leak.**

The A/C evaporator has no serviceable parts except for the slim line gaskets. The slim line gaskets used on the connections are made from a special type material not affected by R-1234yf refrigerant. The slim line gaskets must be replaced whenever the A/C expansion valve is removed from the A/C evaporator.

The A/C evaporator cannot be repaired and must be replaced if leaking or damaged.

EXPANSION VALVE

EXPANSION VALVE

Refer to COMPONENT INDEX.

The A/C expansion valve controls the high pressure, high temperature liquid refrigerant from the A/C liquid line and converts it into a low pressure, low temperature mixture of liquid and gas before it enters the A/C evaporator. A mechanical sensor in the A/C expansion valve monitors the temperature and pressure of the refrigerant leaving the A/C evaporator through the A/C suction line, and adjusts the orifice size at the liquid line port to let the proper amount of refrigerant into the evaporator to meet the vehicle A/C cooling requirements. Controlling the refrigerant flow through the A/C evaporator ensures that none of the refrigerant leaving the A/C evaporator is still in a liquid state, which could damage the A/C compressor.

NOTE: **Replacement of the refrigerant line slim line gasket seals is required anytime a refrigerant line is disconnected from the expansion valve. Failure to replace the**

slim line gasket seals could result in a refrigerant system leak.

The A/C expansion valve is factory calibrated and cannot be adjusted or repaired and must be replaced if inoperative or damaged.

HEATER CORE

HEATER CORE

Refer to **COMPONENT INDEX**.

Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core tubes and fins. Air directed through the heater core picks up the heat from the heater core fins. The blend air door(s) allows control of the heater output air temperature by regulating the amount of air flowing through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and must be replaced if restricted, leaking or damaged.

RECEIVER/DRYER

RECEIVER/DRYER

Refer to **COMPONENT INDEX**.

An A/C receiver/drier, integral to the condenser, cleans debris from the refrigerant and performs the duties of an accumulator in the system.

NOTE: **Replacement of the refrigerant line slim line gaskets is required anytime a refrigerant line is disconnected. Failure to replace the slim line gaskets could result in a refrigerant system leak.**

SUCTION/LIQUID LINE AND SUCTION JUMPER

SUCTION/LIQUID LINE AND SUCTION JUMPER

Refer to **COMPONENT INDEX**.

The suction/liquid line and suction line jumper are made of formed aluminum piping and an outer rubber layer followed by reinforcing threads and an inner rubber layer, the inside of which is coated with a polyamide resin, so that normal engine vibrations do not cause a refrigerant leak in the system. They are sealed at both ends with slim line gaskets that are not affected by R-1234yf refrigerant or the refrigerant oil in the system. The suction line jumper is used to connect the compressor to the suction/liquid line junction block secured to the left fender frame. The suction/liquid line contains the suction line junction block and an IHX on the expansion valve side of the suction line. This results in the liquid line being incorporated into the suction line and cannot be serviced separately.

The liquid line has provisions for attaching the A/C Pressure Transducer to the line and an integral high side service port. The suction line has provisions for an integral low side service port.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

WARNING: **Do not expose the refrigerant to open flame. Poisonous gas is created when refrigerant is burned. An electronic leak detector is recommended. Serious or fatal injury may result from improper service procedures.**

WARNING: **Use extreme care when working around a running engine. Keep hands and fingers clear of the radiator fan, accessory drive belt and all other moving components. Keep away when wearing loose clothing, jewelry or long hair that is not properly secured. Underhood components may become hot to the touch. Be careful not to come into contact with hot engine, A/C and engine cooling system components. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **Always conduct the A/C Performance Test as outlined in this group prior to searching for an A/C refrigerant leak. Refer to DIAGNOSIS AND TESTING.**

When searching for a refrigerant leak in the A/C system, use an Ultra Violet (UV) light and an electronic leak detector that is designed for refrigerant used on this vehicle. It is important to use only high-quality refrigerant leak detection equipment to properly locate refrigerant system leaks, such as the equipment listed in the PSE Service Equipment Catalog. When the use of leak detection dye is required, use only approved refrigerant leak detection dye, available through MoparB®.

LEAK TEST

1. Begin searching for refrigerant leaks using a high quality UV light to detect the fluorescent refrigerant leak detection dye.
    - Inspect all connections, plumbing fittings, brazed joints, hoses, hose crimps, service ports, compressor housing, pressure relief valve and A/C condenser for dye.
    - Inspect the evaporator drain tube and condensate for presence of dye, which indicates a leak from the A/C evaporator.
    - If equipped with rear A/C, inspect the underbody refrigerant lines, fittings, rear evaporator drain tube and condensate for presence of dye, which indicates a leak from the rear evaporator.
    - If no leaks are found using a UV light, proceed to **Step 2** .
2. If a leak is not found with the leak detection dye, operate the Heating, Ventilation and Air Conditioning (HVAC) system with the engine at idle under the following conditions for at least 15 minutes, then proceed to **Step 3** .
    - Doors or windows open.
    - Transmission in Park or Neutral with the parking brake set (depending on transmission application).
    - A/C heater controls set to outside air, full cool, panel mode, high blower and A/C compressor engaged. (If the A/C compressor does not engage, go to **LOW OR EMPTY REFRIGERANT SYSTEM**.
    - If equipped with rear A/C, set rear controls to full cool and high blower.
3. Turn the engine OFF and wait at least 5 minutes.
4. Insert a leak detector, with the proper tip attached for the refrigerant in the A/C system being checked, in the evaporator drain tube and the instrument panel air outlets, to check for evaporator leaks. Check the evaporator tubes at the A/C expansion valve, for leaks not visible behind the expansion valve. Check around the front of the A/C compressor, for compressor shaft seal leaks. Check between the A/C condenser and radiator for condenser leaks not previously visible.
5. If equipped with rear A/C, insert the leak detector in the rear evaporator drain tube and rear air outlets. Check the underbody A/C lines and fittings, evaporator tubes and rear A/C expansion valve.
6. If no leak is found in steps 1-5, remove the caps from the service fill ports, then add several drops of approved refrigerant oil in the ports and inspect for bubbles forming around the valves. If bubbles are present, tighten or replace valve cores as needed and recheck.

LOW OR EMPTY REFRIGERANT SYSTEM

NOTE: **This procedure should only be done after an A/C Performance Test has been conducted and a refrigerant system leak has NOT been found using the factory**

installed leak detection dye.

Do the following if the A/C compressor will not engage and a refrigerant leak in the A/C system is suspected but cannot be found using the factory installed leak detection dye.

1. Recover, evacuate and recharge the refrigerant system. Refer to **STANDARD PROCEDURE**.
2. Operate the HVAC system with the engine at idle under the following conditions for at least 15 minutes:
    - Doors or windows open.
    - Transmission in Park or Neutral with the parking brake set (depending on transmission application).
    - A/C heater controls set to outside air, full cool, panel mode, high blower and A/C compressor engaged.
    - If equipped with rear A/C, set rear controls to full cool and high blower.
3. Turn the engine OFF and return to. Refer to **LEAK TEST**.

STANDARD PROCEDURE

R-1234YF REFRIGERANT SYSTEM RECOVERY

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

CAUTION: **Various aftermarket manufacturers produce A/C system sealants that are designed to stop A/C refrigerant system leaks. The use of A/C system sealants may result in damage to A/C refrigerant recovery/evacuation/recharging equipment or the vehicle A/C system and are not recommended for use by FCA US LLC.**

When servicing the A/C system, an R-1234yf refrigerant recovery/recycling/charging station that meets SAE standard J2843 must be used. In accordance with SAE standard J2843, refrigerant recovery stations must recover 95% of the refrigerant system within 30 minutes at 21.1B°C (70B°F) and be able to measure the amount of refrigerant removed from the system to an accuracy of 28 grams (1.0 oz.). See the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

NOTE: **A/C system should be tested prior to refrigerant recovery if the use of A/C system sealants are suspected. These sealants have the potential to clog refrigerant recovery equipment and cause vehicle A/C component damage. Various tool manufacturers make tool kits that detect A/C system sealants. See the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.**

If sealants are detected in an A/C system, the system should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners void the warranty for the A/C system.

R-1234YF RECOVERY PROCEDURE

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

CAUTION: **A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. See the equipment manufacturer instructions for more information.**

1. If use of aftermarket A/C system sealant is suspected, the A/C system should be tested for sealant prior to refrigerant system recovery. See the operating instructions supplied by the equipment manufacturer for proper use and care of this equipment.
2. Connect an R-1234yf refrigerant recovery/recycling/charging station that meets SAE standard J2843 to the refrigerant system.
3. Recover the A/C refrigerant system following the operating instructions supplied by the recovery/recycling/charging station manufacturer.
4. Disconnect the refrigerant recovery/recycling/charging station from the refrigerant system service ports.
5. Install the caps to the refrigerant system service ports.

R-1234YF REFRIGERANT SYSTEM EVACUATE

If the A/C refrigerant system has been open to the atmosphere, it must be evacuated before the A/C system can be recharged with R-1234yf refrigerant.

NOTE: **Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the A/C compressor.**

Moisture and air in the A/C refrigerant system will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum. Always use an R-1234yf refrigerant recovery/recycling/charging station with a vacuum pump that meets SAE standard J2843, or an R-1234yf compatible manifold gauge set and a stand alone vacuum pump.

If an A/C compressor is left open to the atmosphere for an extended period of time, it is recommended that the refrigerant oil in the compressor be drained and replaced with new refrigerant oil to reduce the possibility of contaminating the refrigerant system. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.

R-1234YF EVACUATION PROCEDURE

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

CAUTION: **A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. See the equipment manufacturer instructions for more information.**

1. Recover the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

   NOTE: **When connecting service equipment couplers to refrigerant line service ports, verify that the valve of each coupler is fully closed prior to connecting. This will reduce the amount of effort required to make the connections.**

2. Connect an R-1234yf refrigerant recovery/recycling/charging station with a vacuum pump that meets SAE standard J2843 to the refrigerant system, or an R-1234yf compatible manifold gauge set and a stand alone vacuum pump (depending on available equipment).
3. Open the refrigerant recovery/recycling/charging station or manifold gauge set valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to recharge to eliminate all moisture in system. When the low-side gauge reads to the lowest degree of vacuum possible (approximately -88 kPa (-26 in. Hg or greater) for 30 minutes, close all valves and turn off vacuum pump. If the refrigerant system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the valves and allow the refrigerant system to evacuate an additional 10 minutes.
4. Close the refrigerant recovery/recycling/charging station or manifold gauge set valves. Turn off and disconnect the vacuum pump.
5. Disconnect the refrigerant recovery/recycling/charging station or manifold gauge set from the refrigerant system service ports.
6. Install the caps to the refrigerant system service ports.

R-1234YF REFRIGERANT SYSTEM CHARGE

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **The Underhood HVAC Specification Label contains the refrigerant fill specification of the vehicle being serviced.**

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected in the system. Refer to **PLUMBING, STANDARD PROCEDURE**.

When charging the A/C system, use an R-1234yf refrigerant recovery/recycling/charging station that meets SAE standard J2843. In accordance with SAE standard J2843, refrigerant recovery stations must charge the system to an accuracy of 14 grams (0.5 oz.). See the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

R-1234YF CHARGING PROCEDURE

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

CAUTION: **A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. See the equipment manufacturer instructions for more information.**

1. Recover and evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
2. Connect an R-1234yf refrigerant recovery/recycling/charging station that meets SAE standard J2843 to the refrigerant system.
3. When required, adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.

   NOTE: **A/C system refrigerant capacity can be found on the HVAC Specification Label, located in the engine compartment.**

4. Open both the low and high side valves, then open the charge valve to allow the refrigerant to flow to the refrigerant system.
5. When the transfer of refrigerant has stopped, close the valves.

   WARNING: **Take care not to open the high side (high pressure) valve while performing Step 7. Failure to follow these instructions may result in possible serious or fatal injury.**

6. Perform the following if all of the refrigerant charge did not transfer from the dispensing device.
   - Open all of the windows in the vehicle.
   - Set the heating and A/C system so that the A/C compressor is operating and the blower motor is operating at its lowest speed setting.
   - Run the engine at a steady high idle (about 1400 rpm).
   - If the A/C compressor does not operate, test the compressor control circuits and repair as required.
   - Open the low side valve and the charge valve to allow the remaining refrigerant to flow to the refrigerant system.
   - When the transfer of refrigerant has stopped, close the valves.
7. Disconnect the refrigerant recovery/recycling/charging station from the refrigerant system service ports.
8. Install the caps to the refrigerant system service ports.

ASSEMBLY, A/C SUCTION AND LIQUID LINE

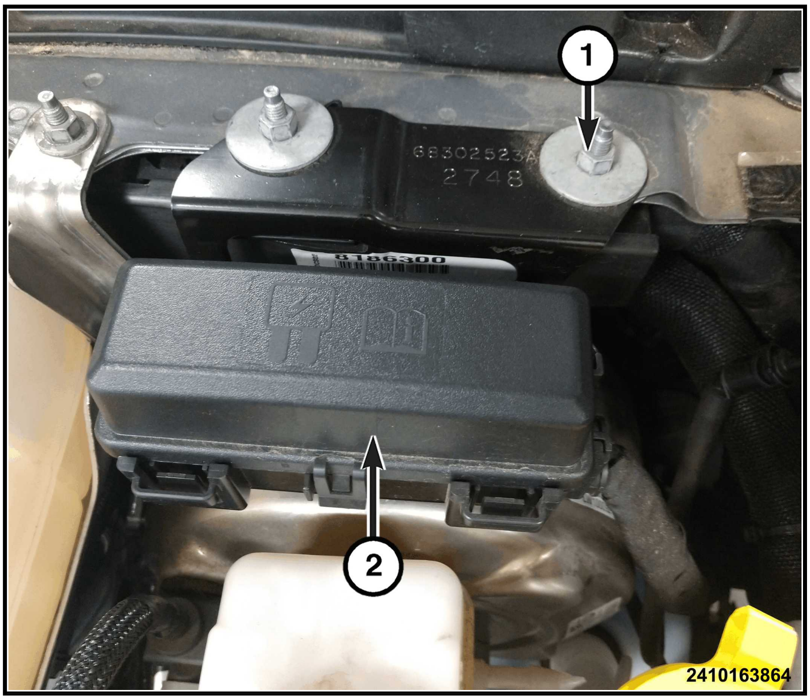
REMOVAL AND INSTALLATION

3.0L

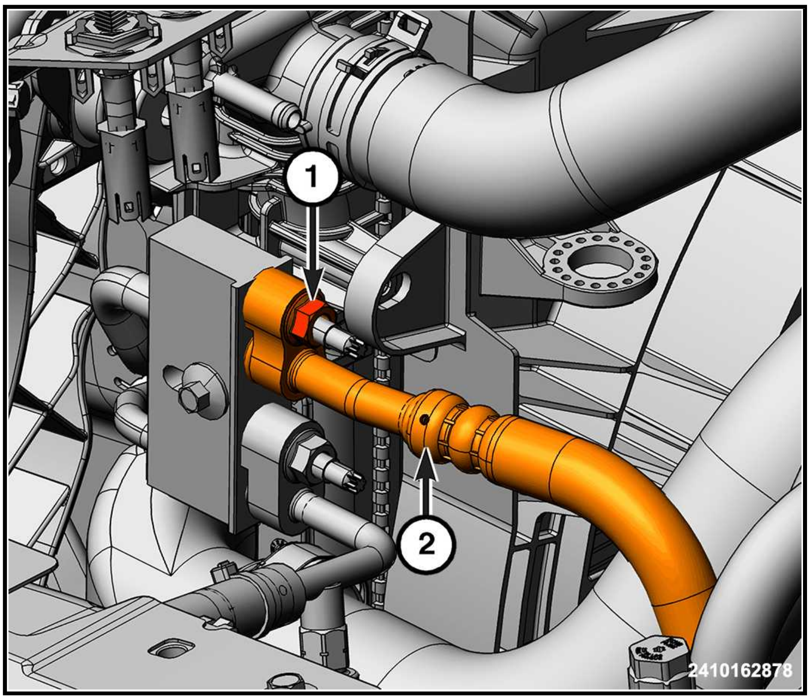
REMOVAL

1. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
2. Remove engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .
3. Remove the air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL AND INSTALLATION** .
4. Remove windshield washer reservoir. Refer to **RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION** .
5. Reposition the pressurized coolant bottle. Refer to **BOTTLE, PRESSURIZED COOLANT, REMOVAL AND INSTALLATION** .

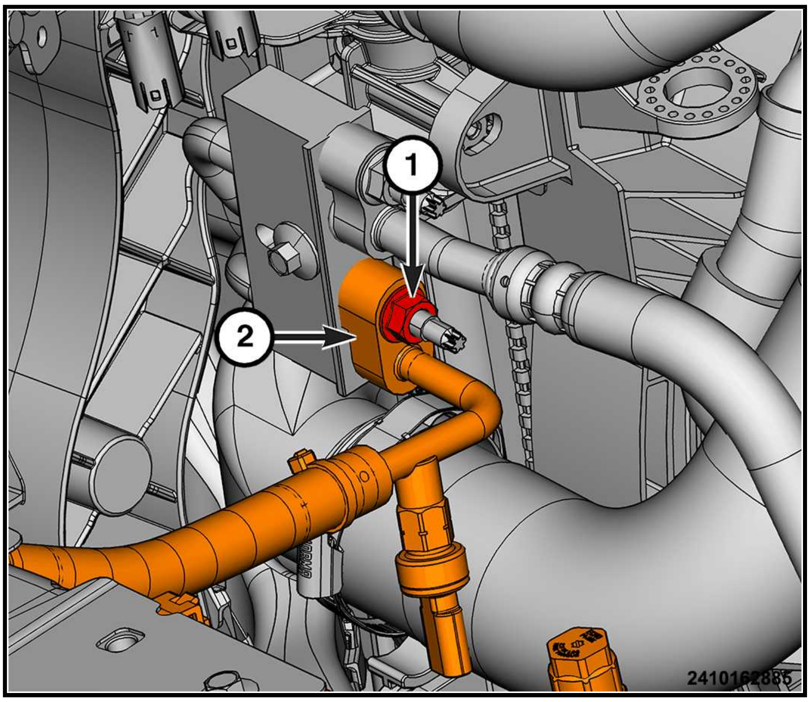
NOTE: **Do not remove pressurized coolant bottle from vehicle.**



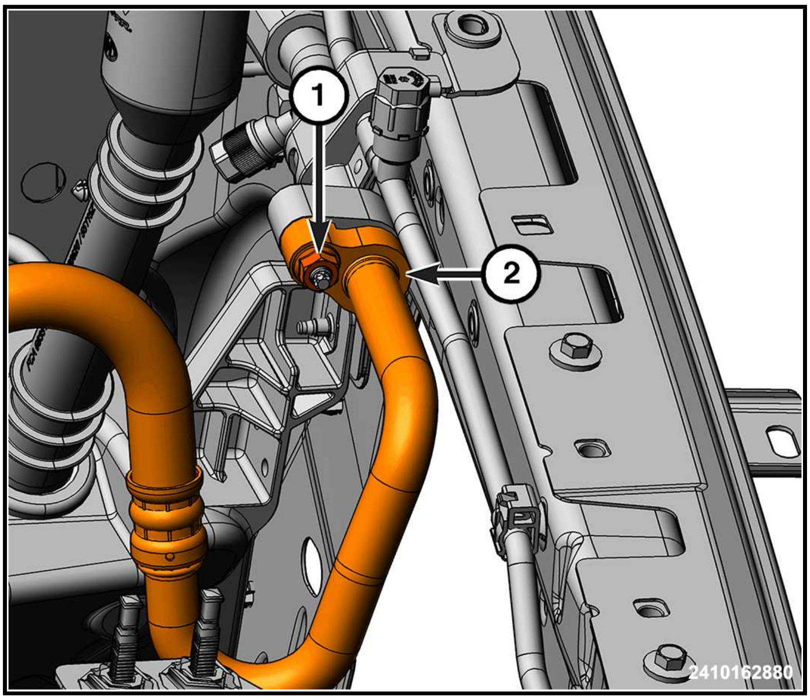
6. Remove the fasteners (1) and position the auxiliary Power Distribution Center (PDC) (2) aside.



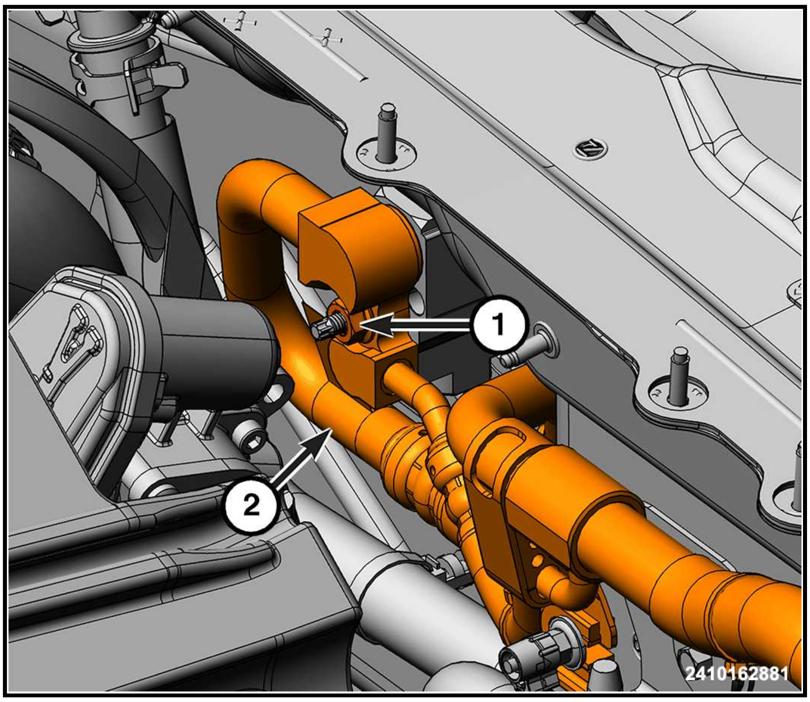
7. Remove the nut (1) and disconnect the A/C discharge line (2) from the condenser and position aside.



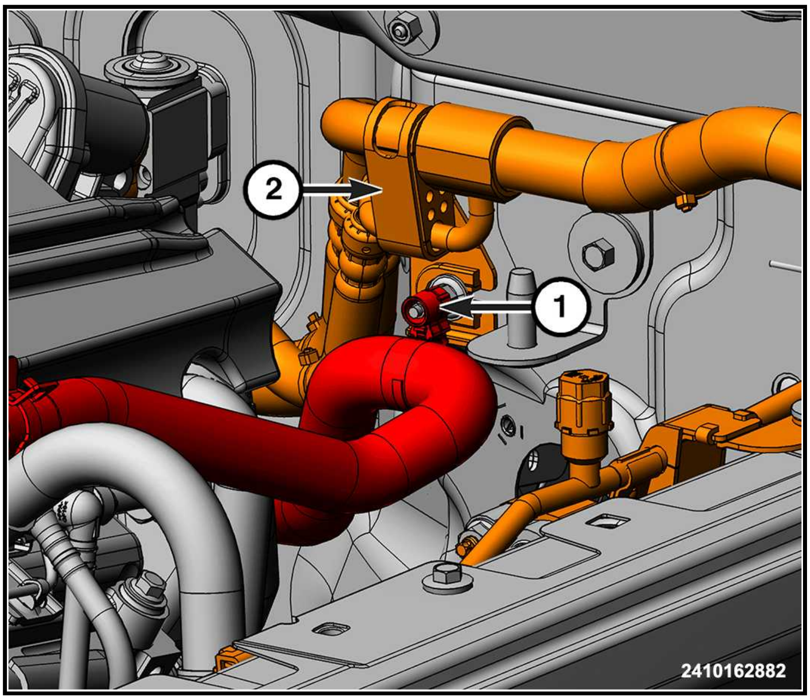
8. Remove the nut (1) and disconnect the A/C suction and liquid line assembly (2) from the condenser.



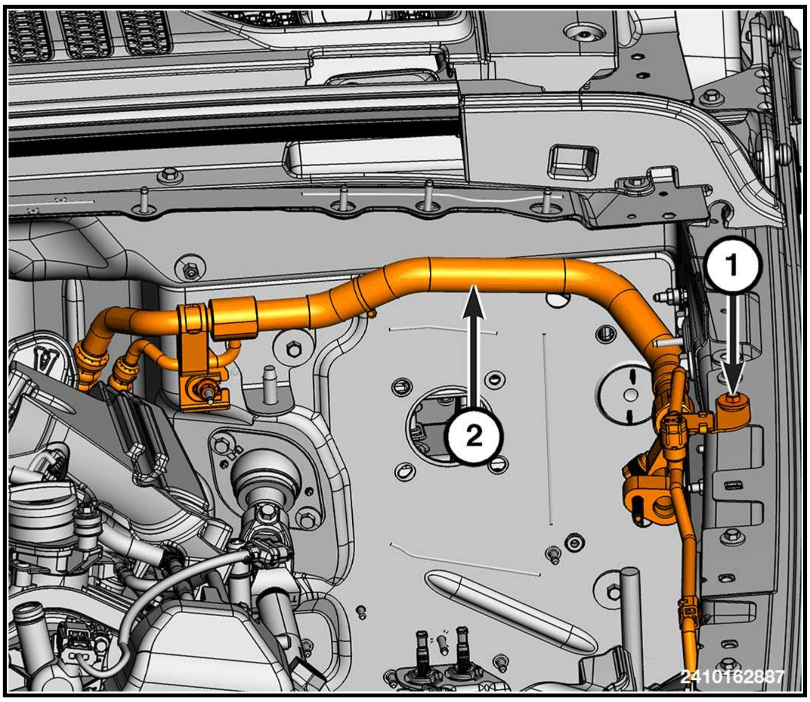
9. Remove the nut (1) and disconnect the suction line jumper (2) from the A/C suction and liquid line assembly and position aside.



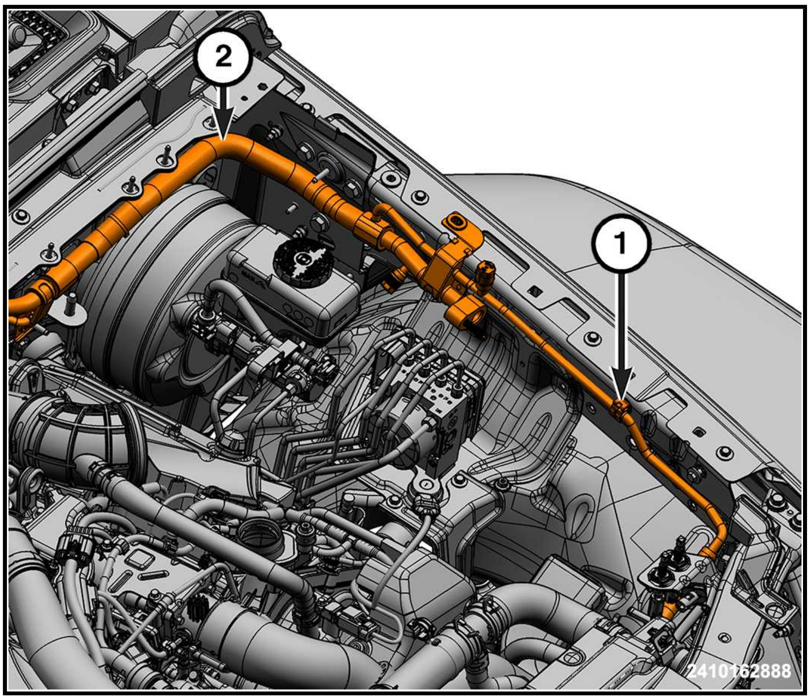
10. Remove the nuts (1) and disconnect the A/C suction and liquid line assembly (2) from the expansion valve.



11. Remove the wire harness retainer (1) from the stud securing the A/C suction and liquid line assembly (2) to the vehicle.

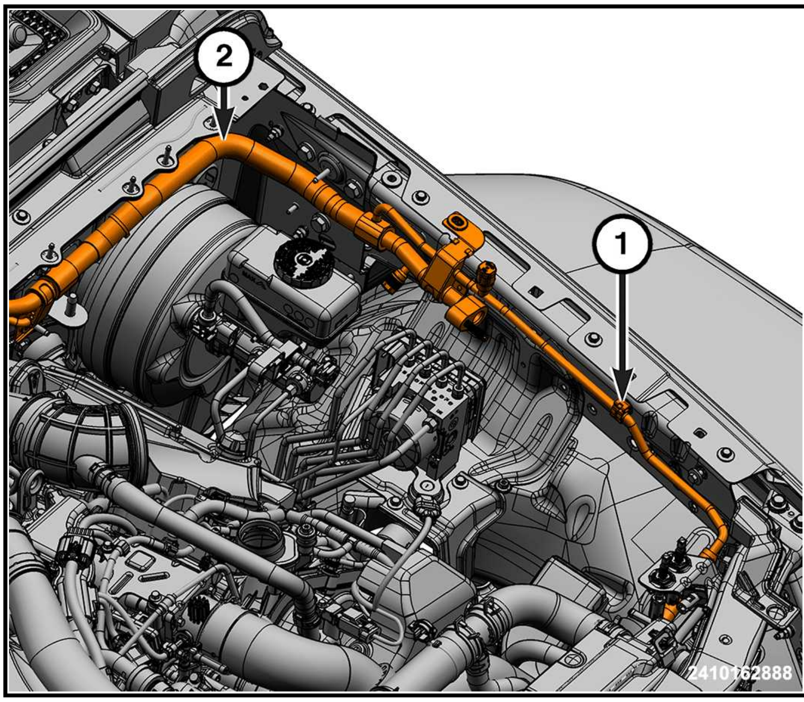


12. Remove the fasteners (1) securing the A/C suction and liquid line assembly (2) to the vehicle.

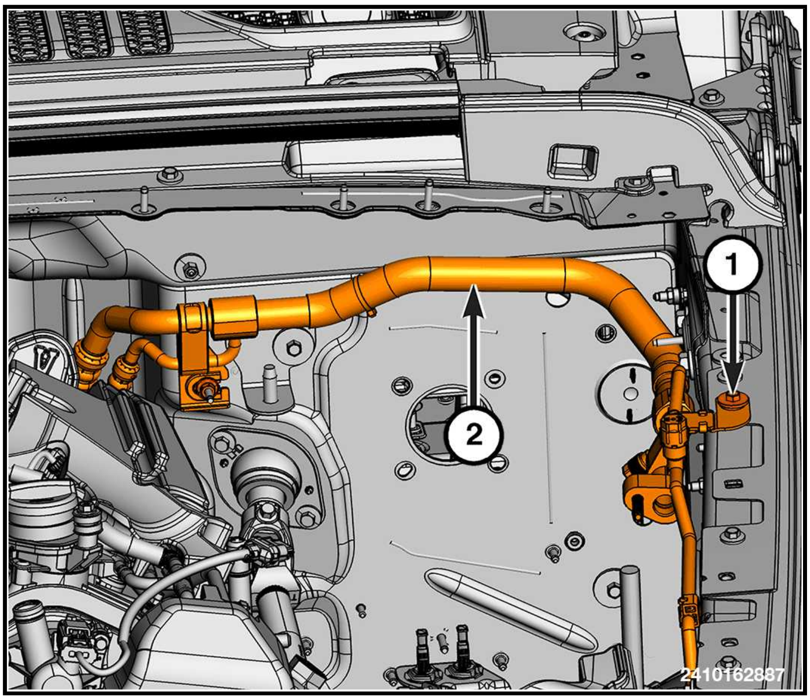


13. Remove the retainer (1) and the A/C suction and liquid line assembly (2) from the vehicle.
14. Remove the A/C pressure transducer. Refer to **TRANSDUCER, A/C PRESSURE, REMOVAL AND INSTALLATION**.

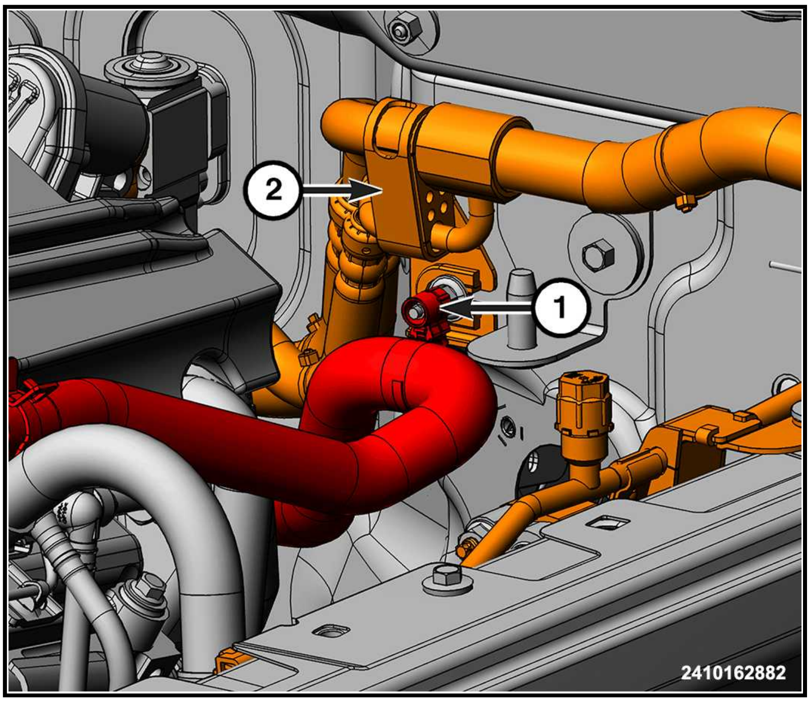
INSTALLATION



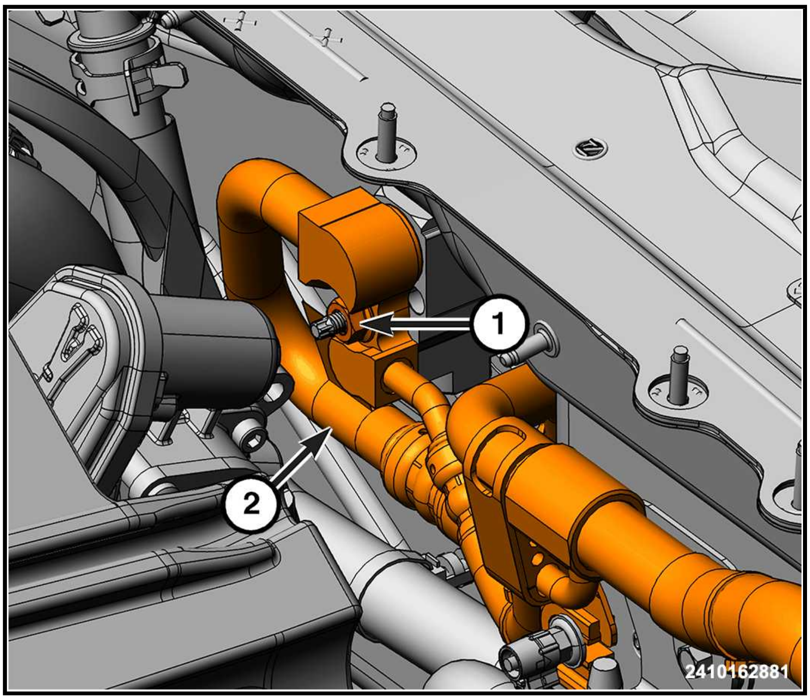
1. Install the A/C pressure transducer. Refer to **TRANSDUCER, A/C PRESSURE, REMOVAL AND INSTALLATION**.
2. Install the A/C suction and liquid line assembly (2) and the retainer (1) to the vehicle.



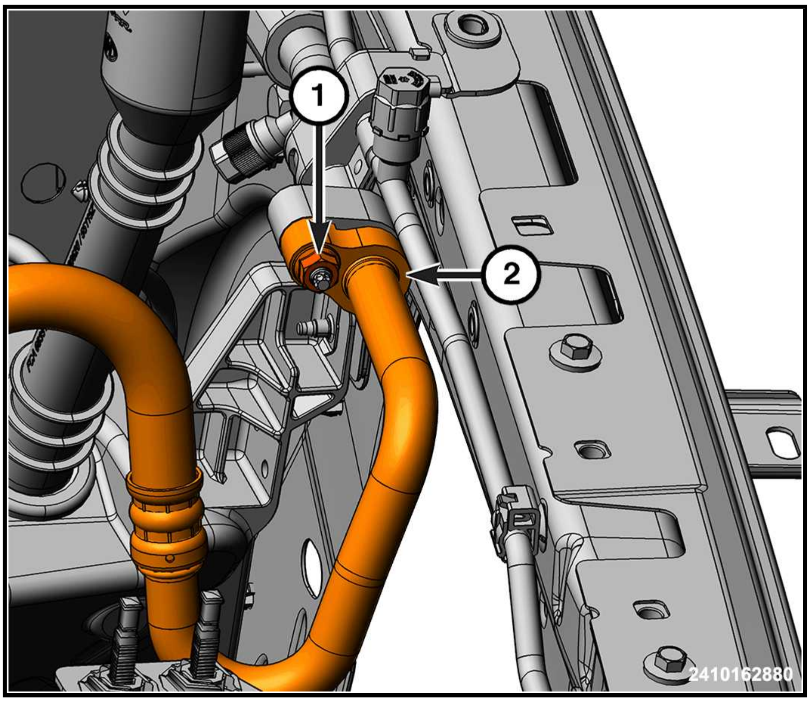
3. Install the fasteners (1) securing the A/C suction and liquid line assembly (2) to the vehicle and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .



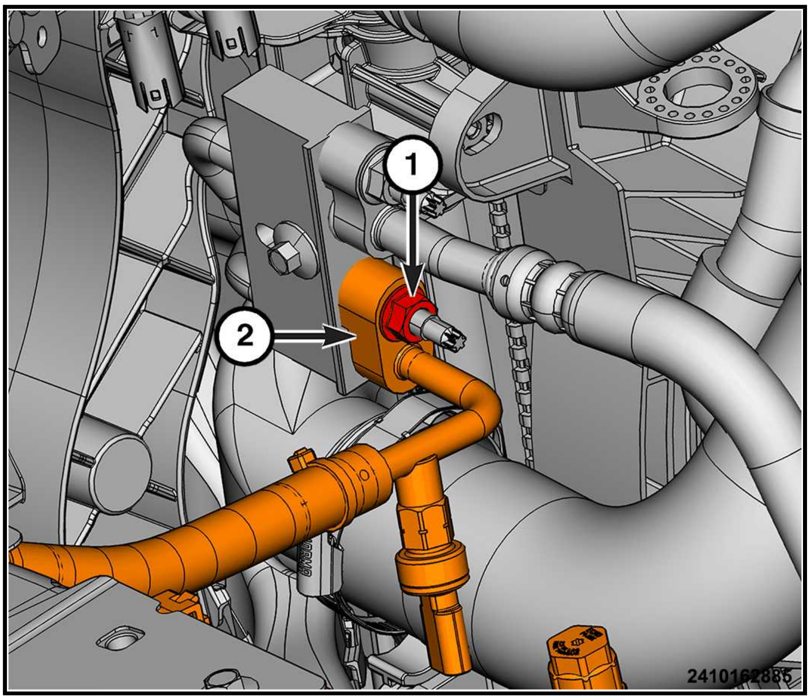
4. Install the wire harness retainer (1) to the stud securing the A/C suction and liquid line assembly (2) to the vehicle.



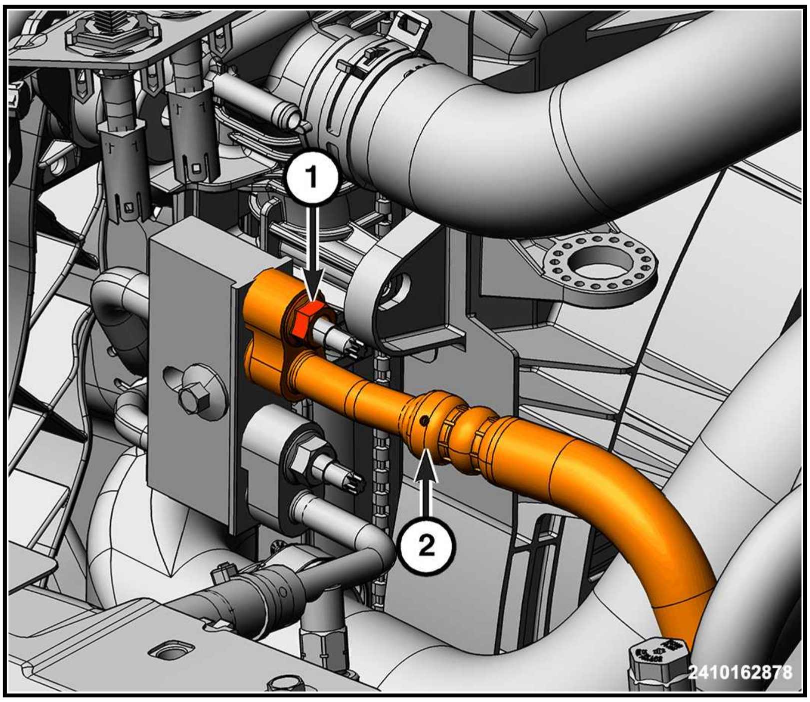
5. Install the A/C suction and liquid line assembly (2) to the expansion valve and tighten the nut (1) to the proper. Refer to **TORQUE SPECIFICATIONS** .



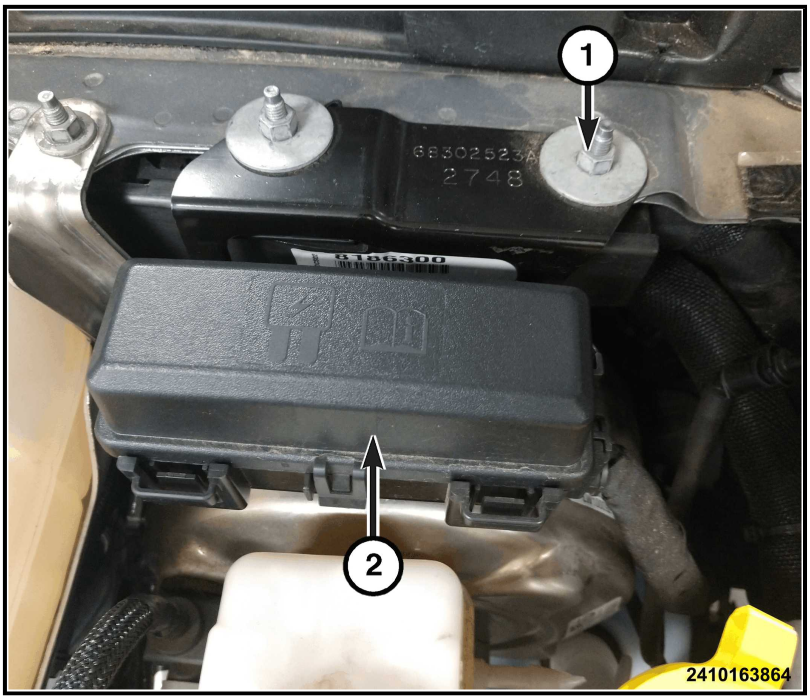
6. Install the suction line jumper (2) to the A/C suction and liquid line assembly and tighten the nut (1) to the proper. Refer to **TORQUE SPECIFICATIONS** .



7. Install A/C suction and liquid line assembly (2) to the condenser and tighten the nut (1) to the proper. Refer to **TORQUE SPECIFICATIONS** .



8. Install A/C discharge line (2) to the condenser and tighten the nut (1) to the proper. Refer to **TORQUE SPECIFICATIONS** .



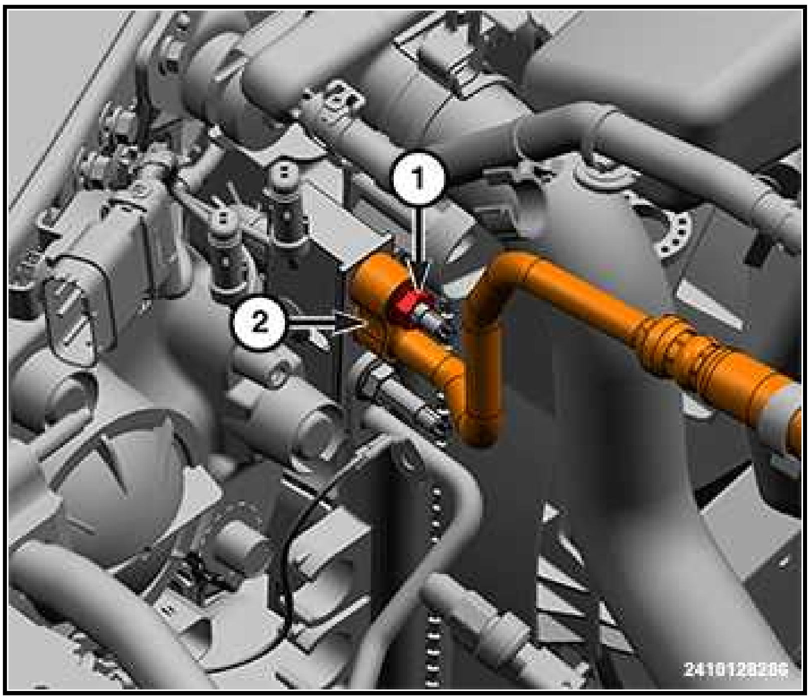
9. Install the fasteners (1) that secure the auxiliary Power Distribution Center (PDC) (2) to the vehicle and tighten securely.
10. Reposition and install the pressurized coolant bottle. Refer to **BOTTLE, PRESSURIZED COOLANT, REMOVAL AND INSTALLATION** .
11. Install the windshield washer hose into the two clips securing it to the A/C suction and liquid line assembly.
12. Install windshield washer reservoir Refer to **RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION** .
13. Install the air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL AND INSTALLATION** .
14. Install engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .
15. Connect the negative battery cable. If equipped with an Intelligent Battery Sensor (IBS), connect the IBS connector.
16. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

3.6L

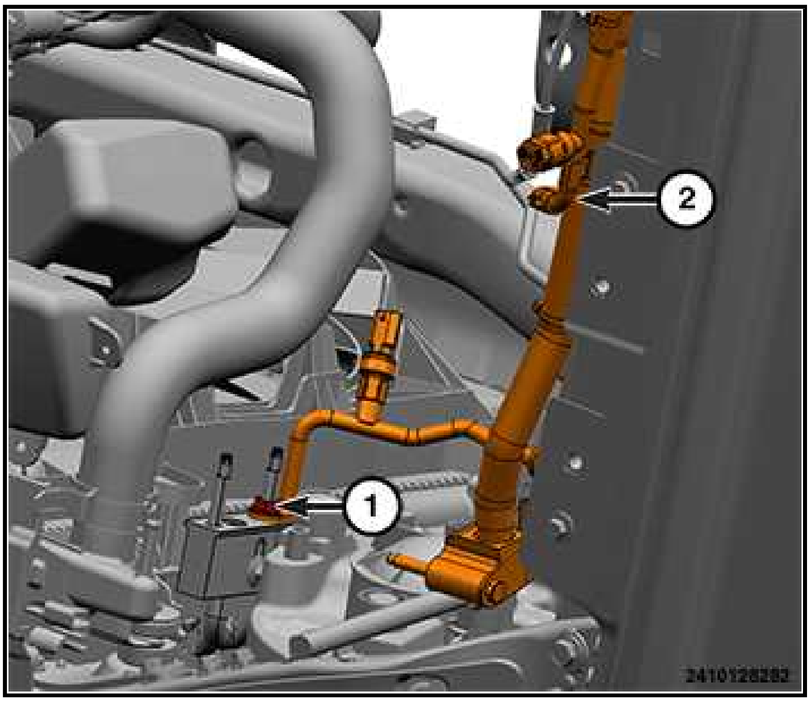
REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .
4. Remove windshield washer reservoir. Refer to **RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION** .
5. Remove the windshield washer hose from the two clips securing it to the A/C suction and liquid line assembly.
6. Reposition the pressurized coolant bottle (Refer to the appropriate service information).

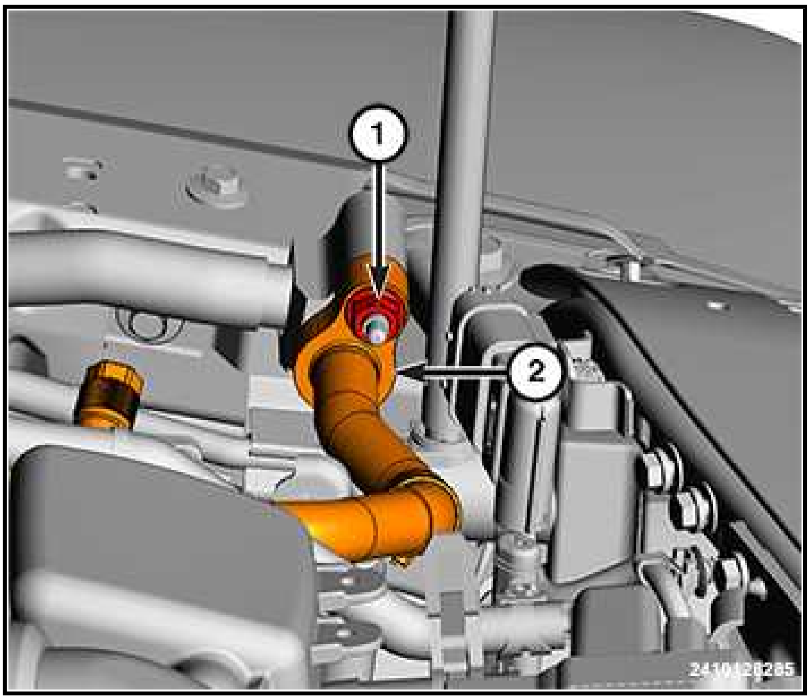
NOTE: **Do not remove pressurized coolant bottle from vehicle.**



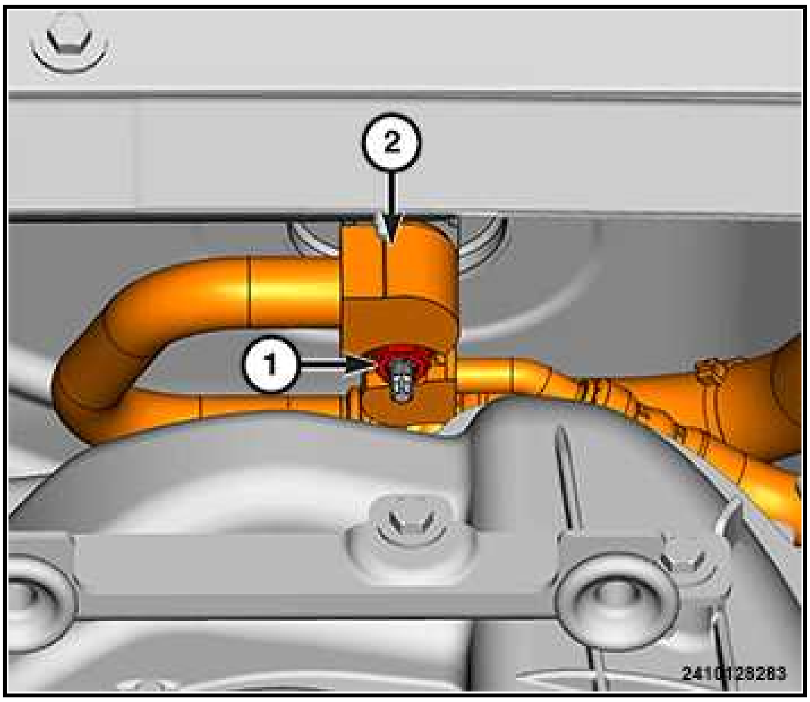
7. Remove the nut (1) and disconnect the A/C discharge line (2) from the condenser and position aside.



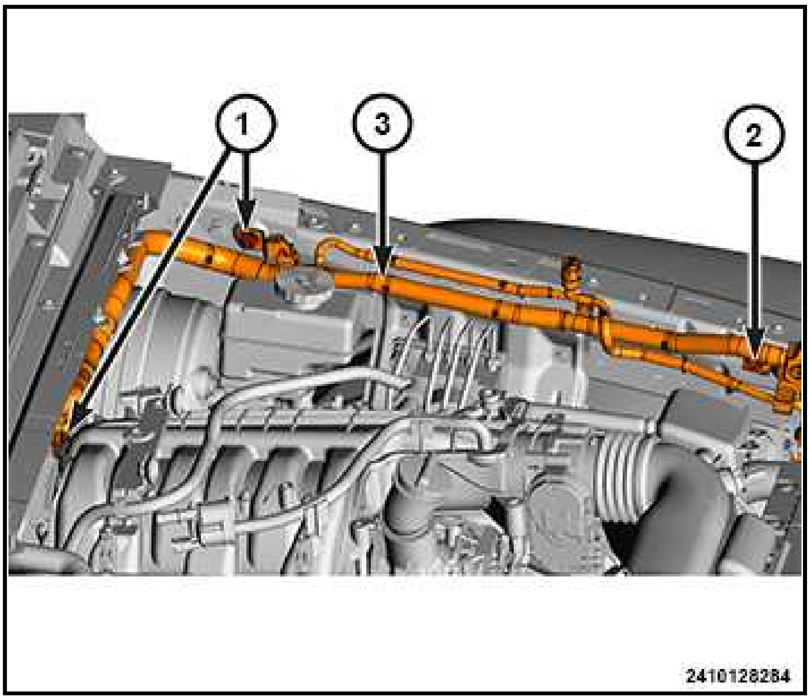
8. Remove the nut (1) and disconnect the A/C suction liquid line assembly (2) from the condenser.



9. Remove the nut (1) and disconnect the suction line jumper (2) from the A/C suction liquid line assembly and position aside.



10. Remove the nuts (1) and disconnect the A/C suction liquid line assembly (2) from the expansion valve.



11. Remove the two nuts (1) and bolt (2) then remove the A/C suction liquid line assembly (3) from the engine compartment. **Remove and discard the O-ring seals.**
12. Remove the A/C pressure transducer. Refer to **TRANSDUCER, A/C PRESSURE, REMOVAL AND INSTALLATION**.

INSTALLATION

NOTE: **Lubricate NEW rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the discharge line fittings. Use only the specified O-rings as they are made of a special material for the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.**

1. Install the A/C pressure transducer. Refer to **TRANSDUCER, A/C PRESSURE, REMOVAL AND INSTALLATION**.
2. Position the A/C line assembly into the engine compartment.
3. Install the two nuts and bolt securing A/C suction liquid line assembly to the vehicle and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
4. Install the A/C suction liquid line assembly to the expansion valve and tighten the nut to the proper. Refer to **TORQUE SPECIFICATIONS** .
5. Install the suction line jumper to the A/C suction liquid line assembly and tighten the nut to the proper. Refer to **TORQUE SPECIFICATIONS** .
6. Install A/C suction liquid line assembly to the condenser and tighten the nut to the proper. Refer to **TORQUE SPECIFICATIONS** .
7. Install A/C discharge line to the condenser and tighten the nut to the proper. Refer to **TORQUE SPECIFICATIONS** .
8. Reposition and install the pressurized coolant bottle (Refer to the appropriate service information).
9. Install the windshield washer hose into the two clips securing it to the A/C suction and liquid line assembly.
10. Install windshield washer reservoir. Refer to **RESERVOIR, WINDSHIELD WASHER, REMOVAL AND INSTALLATION** .
11. Install engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .
12. Connect the negative battery cable(s). Refer to the appropriate service information .
13. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
14. Adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.

15. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

COMPRESSOR, A/C

DIAGNOSIS AND TESTING

A/C CLUTCH COIL

The A/C clutch coil electrical circuit is controlled by the Powertrain Control Module (PCM), through a relay in the Power Distribution Center (PDC). See Wiring Information for complete Heating, Ventilation and Air Conditioning (HVAC) wiring diagrams. Begin testing of a suspected A/C clutch coil problem by performing the preliminary checks.

PRELIMINARY CHECKS

1. Using a scan tool, check for Diagnostic Trouble Codes (DTCs) in the Heating, Ventilation and Air Conditioning (HVAC) and PCM. If no DTCs are found, go to **Step 2** . If any DTCs are found, repair as required.
2. If the A/C clutch still will not engage, verify the refrigerant charge level by conducting the A/C Performance test. Refer to **DIAGNOSIS AND TESTING**. If the refrigerant charge level is OK, go to COIL RESISTANCE TEST and COIL CURRENT DRAW TEST. If the refrigerant charge level is not OK, adjust the refrigerant charge as required.

COIL CURRENT DRAW TEST

1. Verify the battery state of charge. (Refer to the appropriate service information) for any state of charge issues.
2. Connect an ammeter (0 to 10 ampere scale selected) in series with the A/C clutch coil feed terminal using Back Probe Tool (special tool #6801, Terminal Probe). Connect a voltmeter (0 to 20 volt scale selected) to measure voltage across the battery and the A/C clutch coil.
3. With the A/C heater control in the A/C mode and the blower motor at low speed, start the engine and allow it to run at a normal idle speed.
4. The A/C clutch should engage immediately and the clutch coil supply voltage should be within 2 volts of the battery voltage. If the clutch coil supply voltage is OK, go to **Step 5** . If the coil supply voltage is not within 2 volts of battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as necessary.
5. See A/C Clutch Coil Specifications table for acceptable A/C clutch coil current draw. Specifications apply for a work area temperature of 20B°C (68B°F). Refer to **TORQUE SPECIFICATIONS** . If voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until voltage reads below 12.5 volts.
   a. If the A/C clutch coil current reading is zero, the coil is open and must be replaced.
   b. If the A/C clutch coil current reading is above specifications, the coil is shorted and must be replaced.

COIL RESISTANCE TEST

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Disconnect the wire harness connector from the A/C clutch coil connector.
3. Use an ohm meter and Back Probe Tool (special tool #6801, Terminal Probe) and measure the resistance of the A/C clutch coil at the coil connector terminals.
4. See A/C Clutch Coil Specifications table for acceptable A/C clutch coil resistance. Specifications apply for a work area temperature of 20B°C (68B°F). Refer to **TORQUE SPECIFICATIONS** .
   a. If the A/C clutch coil reading is below specifications, the coil is shorted and must be replaced.
   b. If the A/C clutch coil reading is above specifications, the coil is open and must be replaced.

A/C SYSTEM NOISE

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: What sounds like a failed front engine bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets or a loose A/C clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the A/C clutch is engaged, which may not occur when the A/C clutch is disengaged. Check the accessory drive belt condition and tension as described in Group 7 - Cooling, before beginning this procedure.

1. Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Turn the A/C compressor ON and OFF several times to clearly identify the compressor noise. Listen to the A/C compressor while the clutch is engaged and disengaged. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.
2. Loosen all of the compressor mounting hardware and retighten. Check the A/C clutch retainers. Be certain that the A/C clutch coil is mounted securely to the A/C compressor and that the clutch plate and pulley are properly aligned and have the correct air gap. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION**.
3. To duplicate high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).
4. Check the refrigerant system plumbing for incorrect routing, rubbing or interference which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises.
5. If the noise is from opening and closing of the high pressure relief valve, recover, evacuate and recharge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
6. If the high pressure relief valve still does not seat properly, replace the A/C compressor. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION**.

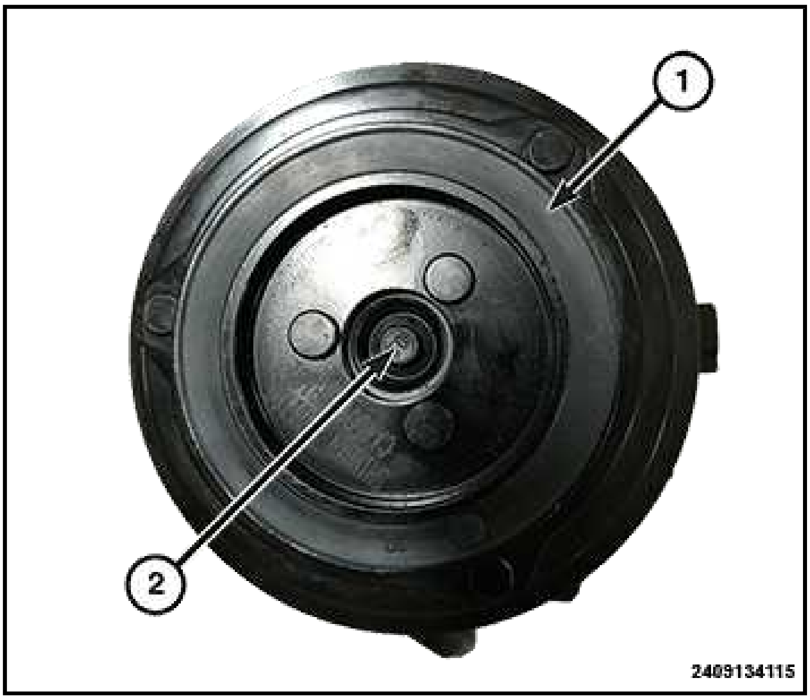
REMOVAL AND INSTALLATION

A/C CLUTCH

REMOVAL

NOTE: **The A/C clutch can be serviced with the refrigerant system fully charged.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the air cleaner resonator. Refer to **RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION** .
3. Remove the accessory drive belt (Refer to 07 - Cooling/Accessory Drive/BELT, Serpentine/Removal and Installation).
4. Disconnect the engine wire harness from the A/C clutch coil connector.
5. Remove the A/C clutch coil connector and lead from the connector bracket.

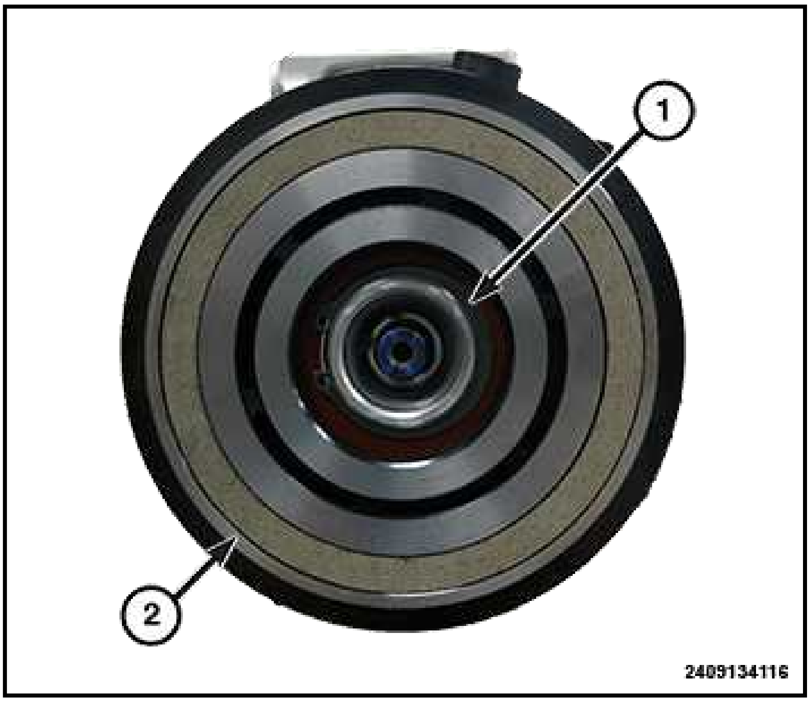


6. Remove the compressor shaft bolt (2). A band-type oil filter wrench or a strap wrench may be used to hold the clutch plate (1) from rotating during bolt removal.

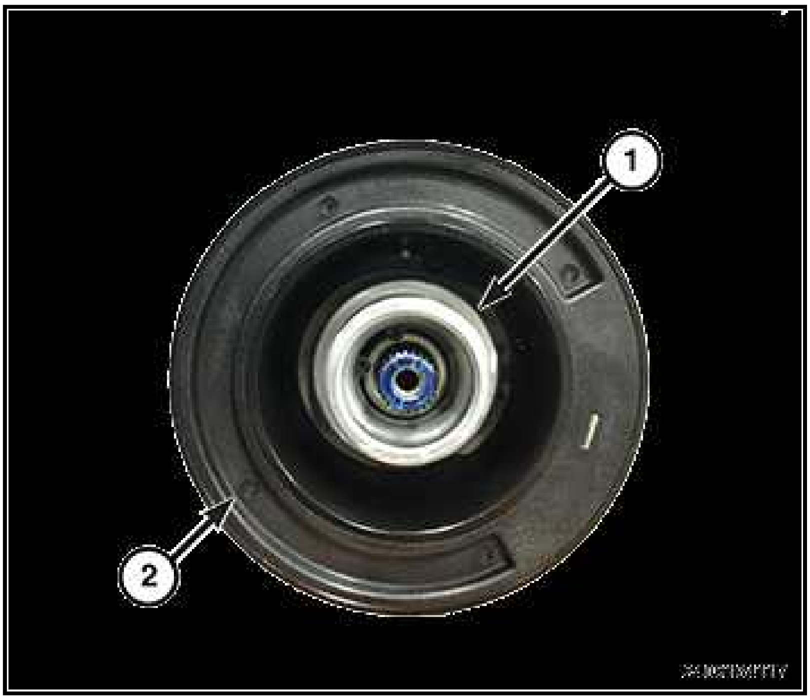
CAUTION: **Do not pry between the clutch plate and the pulley and bearing assembly to remove the clutch plate from the compressor shaft as this may damage the clutch plate.**

NOTE: **Use care not to lose any clutch shim(s) during removal of the clutch plate, as they may be reused during the clutch plate installation process.**

7. Tap the clutch plate (1) lightly with a plastic mallet to release it from the splines on the compressor shaft and remove the clutch plate and shim(s).



8. Using (special tool #9764, Pliers, A/C Snap Ring) or equivalent, remove the snap ring (1) that secures the pulley and bearing assembly (2) to the A/C compressor and remove the pulley and bearing assembly.



9. Using (special tool #9764, Pliers, A/C Snap Ring) or equivalent, remove the snap ring (1) that secures the A/C clutch coil (2) to the A/C compressor and remove the coil.

INSTALLATION

1. Using (special tool #9764, Pliers, A/C Snap Ring) or equivalent, install the snap ring that secures the A/C clutch coil to the A/C compressor.
2. Using (special tool #9764, Pliers, A/C Snap Ring) or equivalent, install the snap ring that secures the pulley and bearing assembly to the A/C compressor with the bevel side of the snap ring facing outward.
3. Position the clutch plate with shims to the compressor shaft.
4. Install the compressor shaft bolt and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** . A band-type oil filter wrench or a strap wrench may be used to hold the clutch plate from rotating during bolt installation.
5. With the clutch plate assembled tight against the shim(s), measure the air gap between the clutch plate and the pulley and bearing assembly. The air gap should be between 0.35 - 0.65 mm (0.014 - 0.026 in.). If the air gap is not between specifications, add or subtract shims as needed until the correct air gap is obtained.
6. Install the A/C clutch coil connector and lead to the connector bracket.
7. Connect the engine wire harness connector to the A/C clutch coil connector.
8. Install the accessory drive belt (Refer to the appropriate service information).
9. Install the air cleaner resonator. Refer to **RESONATOR, AIR CLEANER, REMOVAL AND INSTALLATION** .
10. Connect the negative battery cable(s). Refer to the appropriate service information .

A/C COMPRESSOR - 3.0L

REMOVAL

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

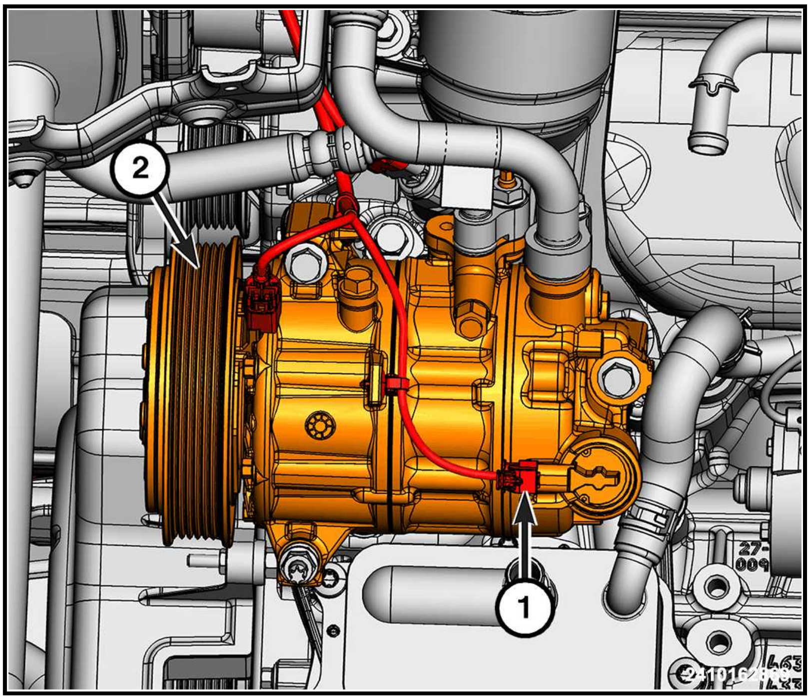
NOTE: **If the compressor is being replaced the A/C receiver/drier filter must be replaced. Refer to DRIER, A/C RECEIVER, REMOVAL AND INSTALLATION.**

NOTE: **The A/C compressor may be removed and repositioned without discharging the refrigerant system or disconnecting the refrigerant lines.**

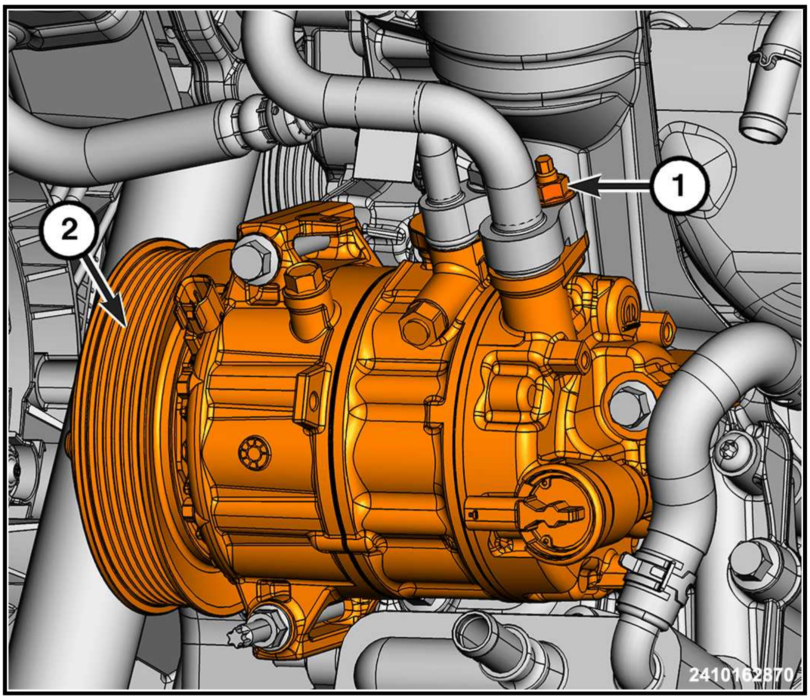
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove the left front wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION** **SHIELD, SPLASH, REAR WHEELHOUSE, REMOVAL AND INSTALLATION** .
4. Remove the intermediate shaft. Refer to **SHAFT, INTERMEDIATE, REMOVAL AND INSTALLATION** .
5. Position accessory drive belt to the side. Refer to **BELT, SERPENTINE, REMOVAL AND INSTALLATION** .
6. Remove fastener for cooler line bracket.
7. Position the transmission fluid cooler tubes aside. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, REMOVAL AND INSTALLATION** .

NOTE: **The transmission fluid cooler tubes do not need to be removed from the vehicle.**

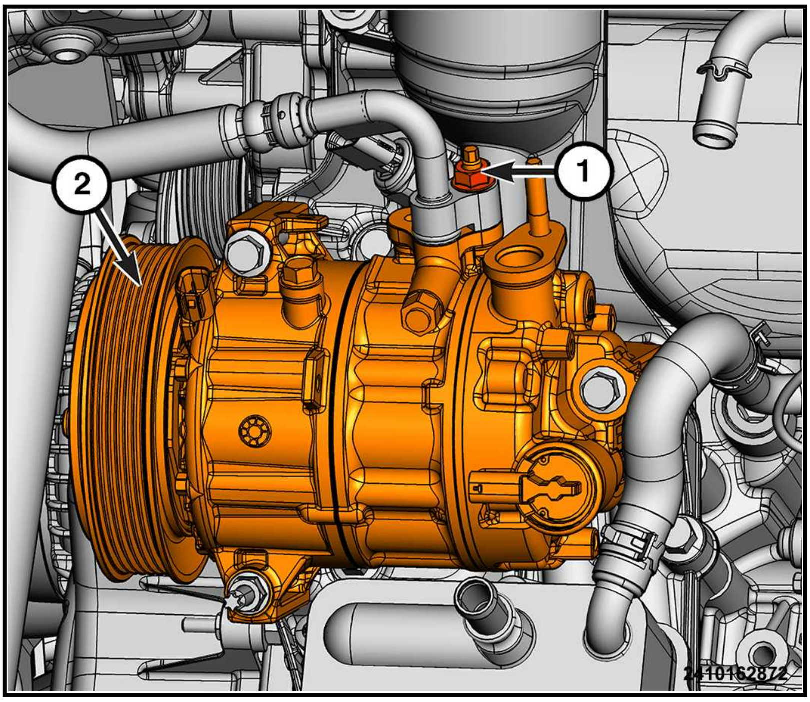
8. Position the vacuum tube aside.



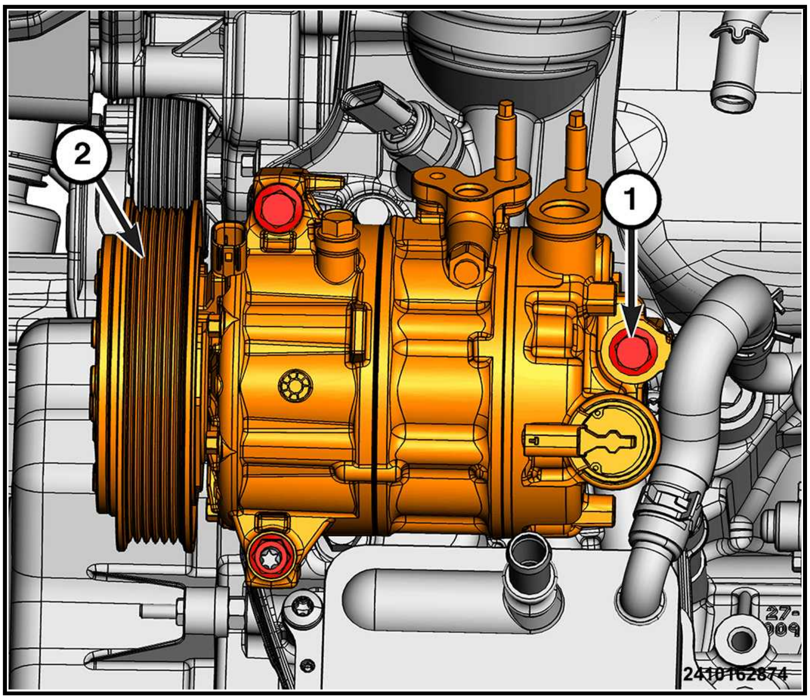
9. Disconnect the wire harness connectors (1) from the A/C compressor (2).



10. Remove the fastener (1) and disconnect the A/C suction jumper line from the A/C compressor (2) and position aside.



11. Remove the fastener (1) and disconnect the A/C discharge line from the A/C compressor (2) and position aside.



12. Remove the fasteners (1) securing the A/C compressor (2) to the engine.
13. Remove the stud, then remove the A/C compressor from the engine compartment.
14. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.

INSTALLATION

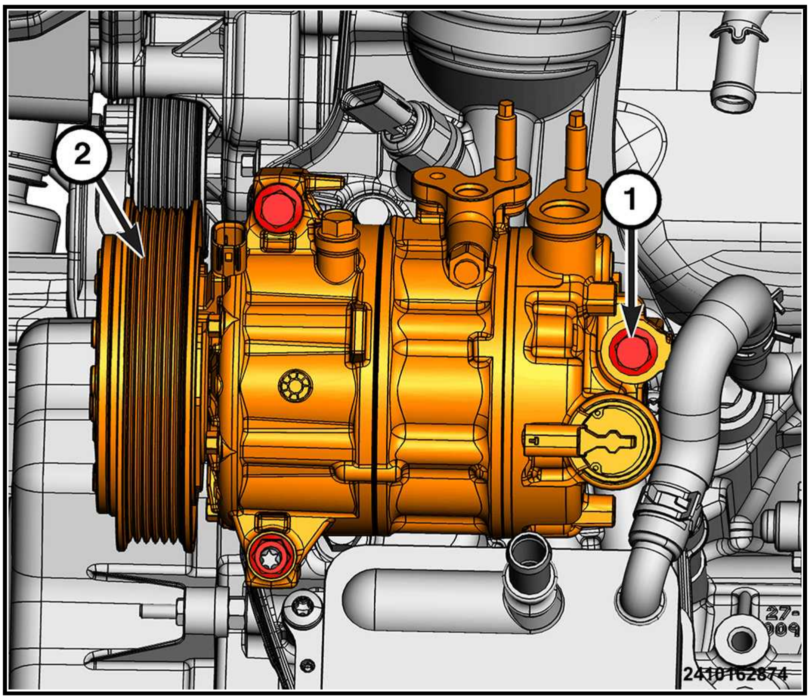
CAUTION: **If the A/C compressor is being replaced, be certain to adjust the refrigerant system oil level. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

CAUTION: **The A/C receiver/drier must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C receiver/drier can cause serious damage to the replacement A/C compressor.**

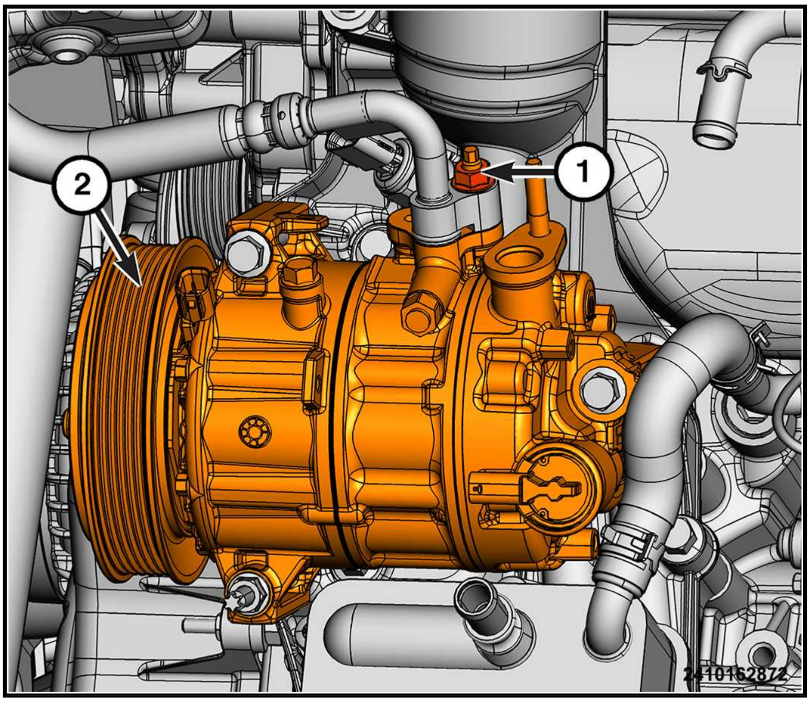
NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be removed from the new A/C compressor. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

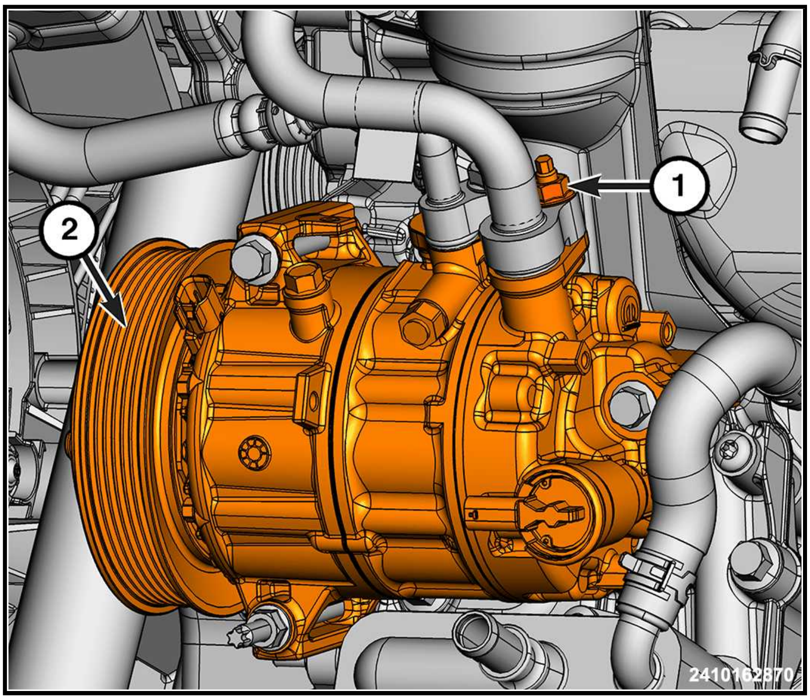
1. If the A/C compressor is being replaced, the refrigerant oil in the old compressor must be first drained and measured. Then the oil in the new A/C compressor must be drained. Finally, the new compressor must be refilled with the same amount of new refrigerant oil that was drained out of the old compressor. When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.



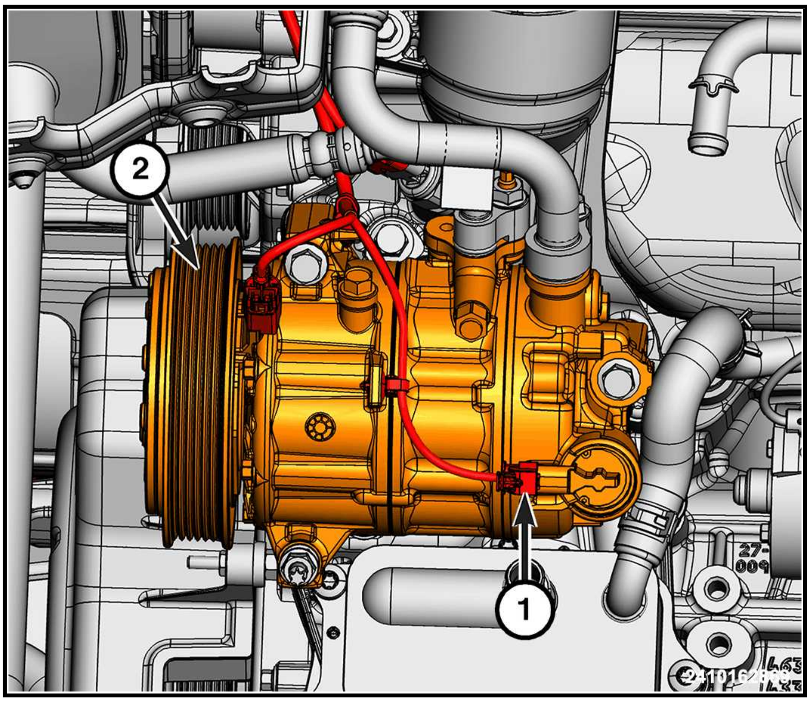
2. Position the A/C compressor (2) to the engine.
3. Install the stud and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
4. Install and tighten the fasteners (1) in the following sequence:
    - Install nut and hand tighten.
    - Install the bolts and hand tighten.
    - Tighten upper bolt to 29 N.m (21 ft. lbs.).
    - Tighten the nut to 29 N.m (21 ft. lbs.).
    - Tighten lower bolt to 29 N.m (21 ft. lbs.).
5. Remove the tape or plugs from the opened refrigerant line fittings and the compressor ports.
6. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the refrigerant line fittings. Use only the specified O-rings as they are made of a special material for the R-1234yf system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.



7. Install the fastener (1) securing the A/C discharge line to the A/C compressor (2) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .



8. Install the fastener (1) securing the A/C suction jumper line to the A/C compressor (2) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .



9. Connect the wire harness connectors (1) to the A/C compressor (2).
10. Install the vacuum tube.
11. Install the transmission fluid cooler tubes. Refer to **TUBES AND HOSES, TRANSMISSION OIL COOLER, REMOVAL AND INSTALLATION** .
12. Install the accessory drive belt. Refer to **BELT, SERPENTINE, REMOVAL AND INSTALLATION** .
13. Install the intermediate shaft. Refer to **SHAFT, INTERMEDIATE, REMOVAL AND INSTALLATION** .
14. Remove the left front wheelhouse splash shield. Refer to **SHIELD, SPLASH, FRONT WHEELHOUSE, REMOVAL AND INSTALLATION** .
15. Connect the negative battery cable(s). Refer to the appropriate service information .
16. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
17. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

A/C COMPRESSOR - 3.6L

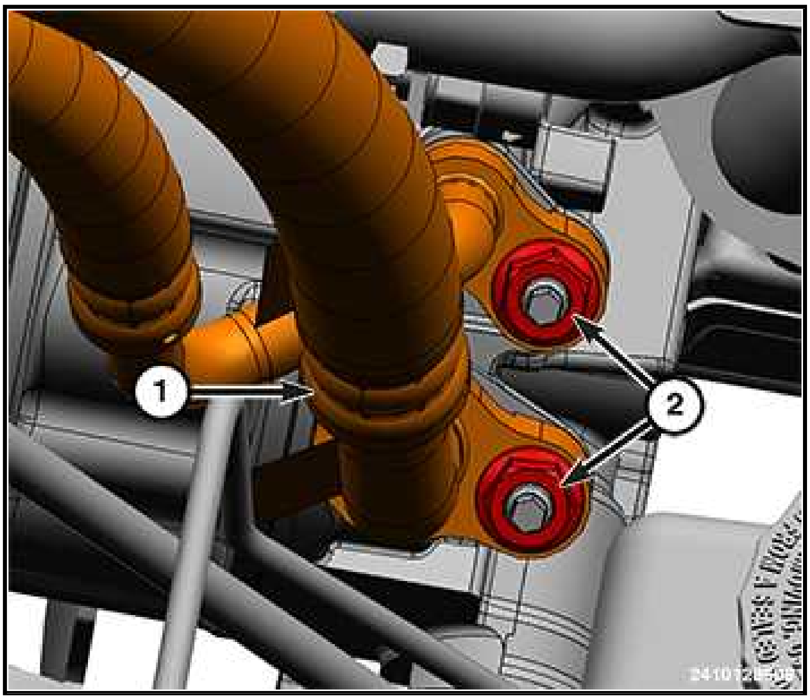
REMOVAL

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

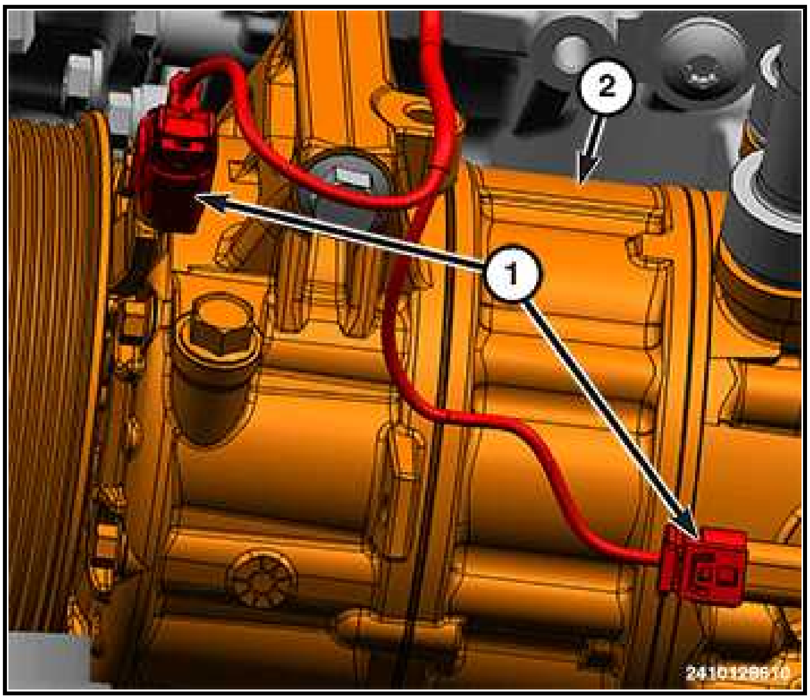
NOTE: **If the compressor is being replaced the A/C receiver/drier must be replaced. Refer to DRIER, A/C RECEIVER, REMOVAL AND INSTALLATION.**

NOTE: **The A/C compressor may be removed and repositioned without discharging the refrigerant system or disconnecting the refrigerant lines.**

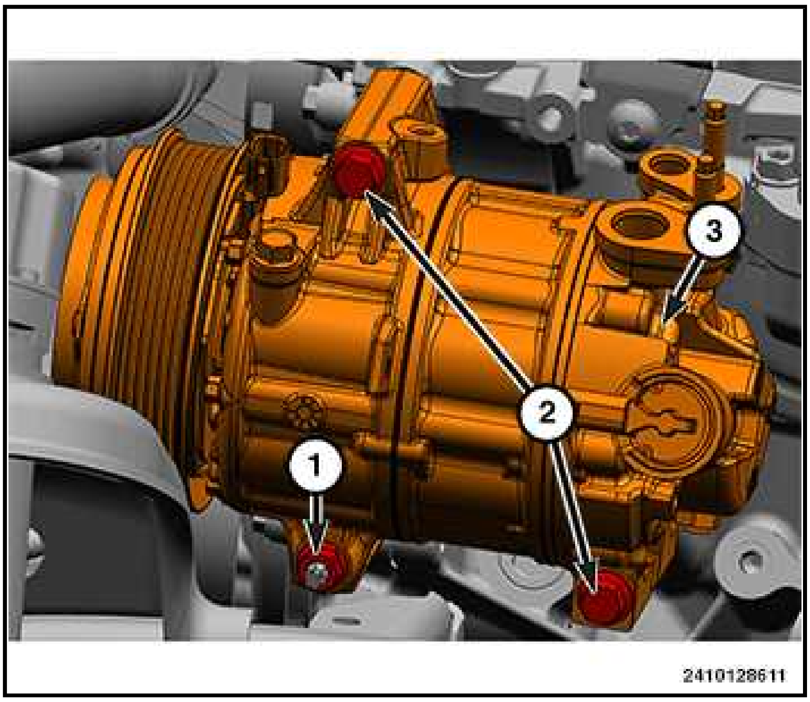
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove the accessory drive belt (Refer to the appropriate service information).



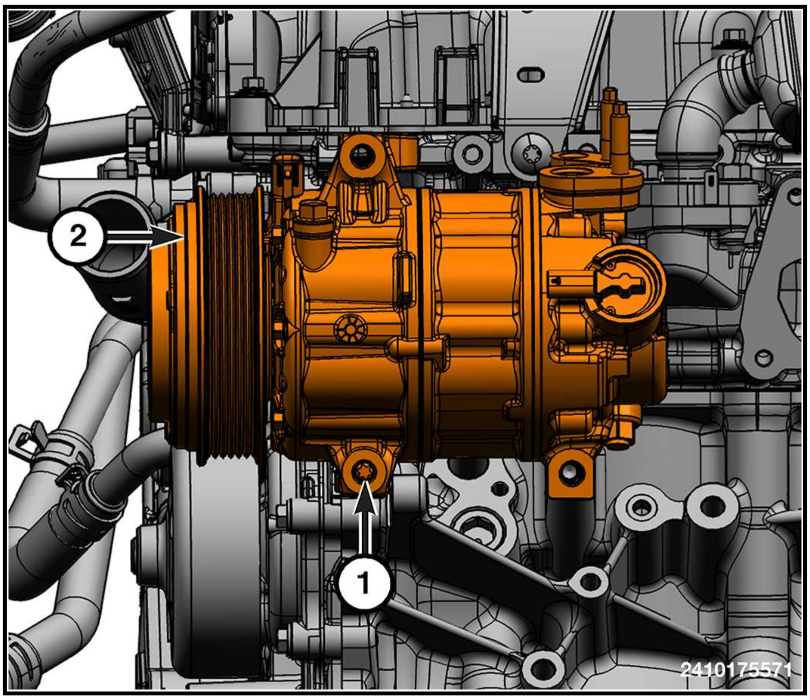
4. Remove the A/C suction jumper and discharge lines (1) to compressor nuts (2).
5. Disconnect the A/C suction jumper and discharge lines (1) from the A/C compressor then position aside. **Discard the O-ring seals and gaskets.**



6. Disconnect both of the wire harness connectors (1) from the A/C compressor (2).



7. Remove the compressor (3) to engine nut (1) and bolts (2).



8. Remove the A/C compressor stud (1).
9. Remove the A/C compressor (2) from the engine compartment.
10. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.

INSTALLATION

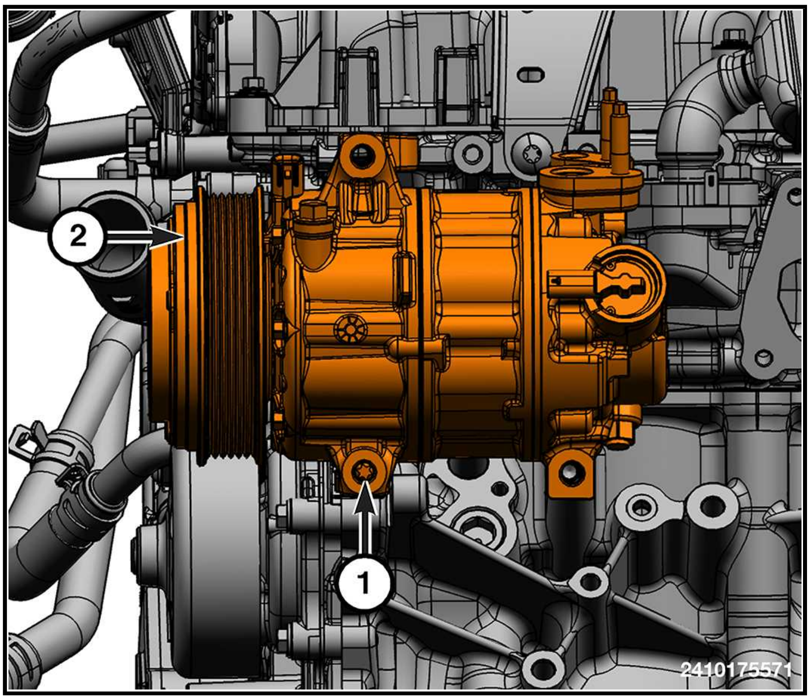
CAUTION: **If the A/C compressor is being replaced, be certain to adjust the refrigerant system oil level. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

CAUTION: **The A/C receiver/drier must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C receiver/drier can cause serious damage to the replacement A/C compressor.**

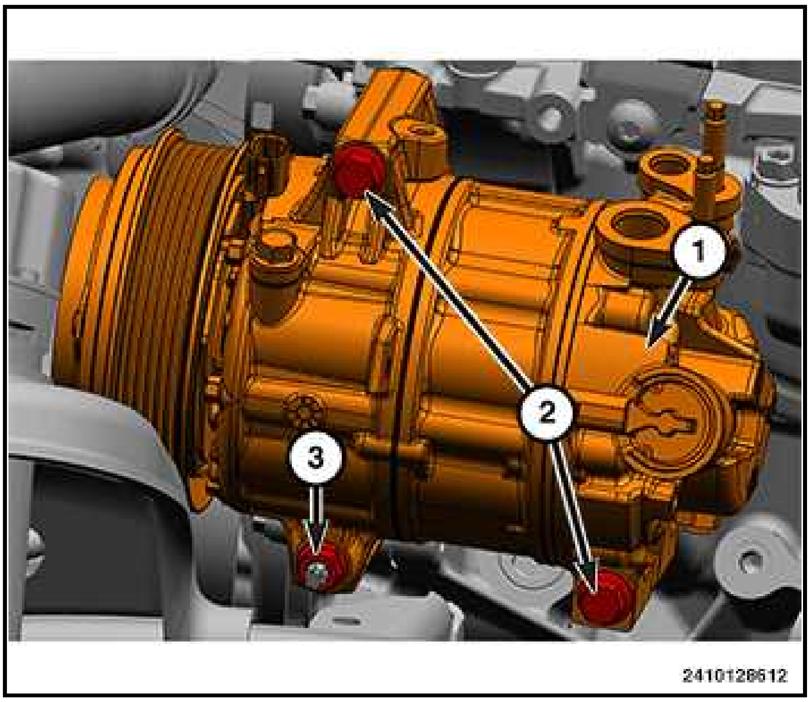
NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be removed from the new A/C compressor. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

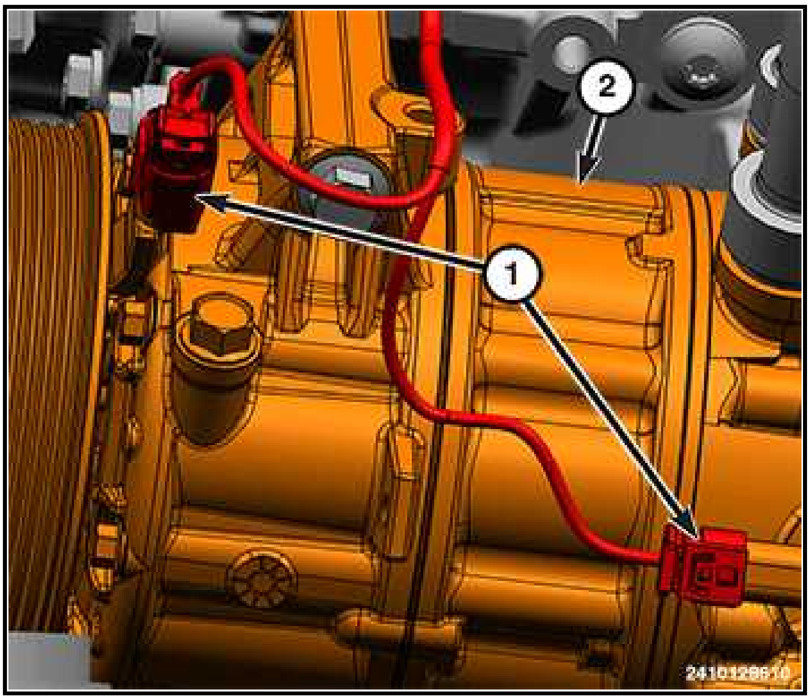
1. If the A/C compressor is being replaced, the refrigerant oil in the old compressor must be first drained and measured. Then the oil in the new A/C compressor must be drained. Finally, the new compressor must be refilled with the same amount of new refrigerant oil that was drained out of the old compressor. When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.



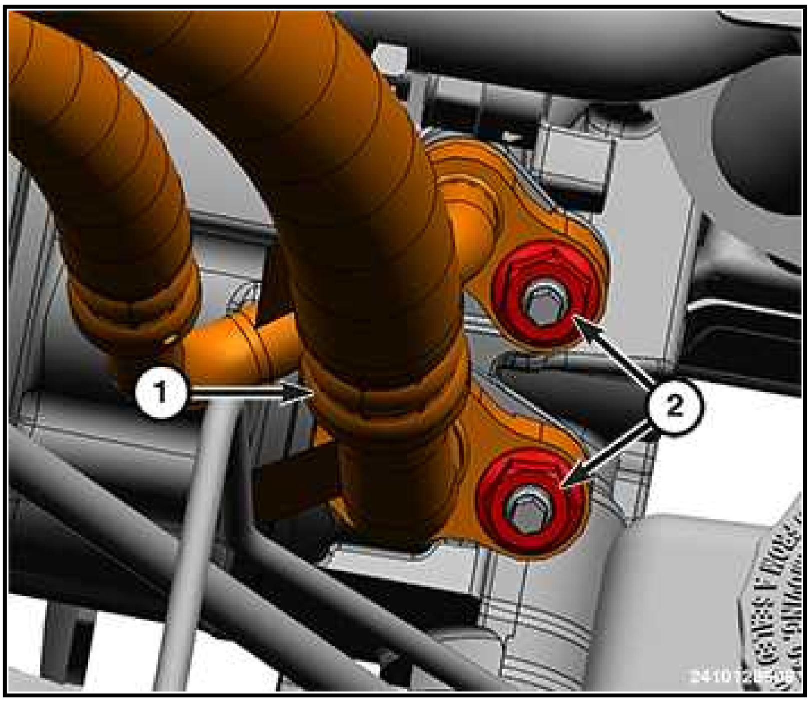
2. Position the A/C compressor (2) to the engine.
3. Install the A/C compressor stud (1) and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .



4. Install and tighten the two bolts (2) and nut (3) in the following sequence:
    - Install nut and hand tighten.
    - Install the bolts and hand tighten.
    - Tighten upper bolt to 29 N.m (21 ft. lbs.).
    - Tighten the nut to 29 N.m (21 ft. lbs.).
    - Tighten lower bolt to 29 N.m (21 ft. lbs.).



5. Connect both of the wire harness connectors (1) to the A/C compressor (2).



6. Remove the tape or plugs from the opened refrigerant line fittings and the compressor ports.
7. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the refrigerant line fittings. Use only the specified O-rings as they are made of a special material for the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Install the A/C suction jumper and discharge lines to the A/C compressor.
9. Install the two nuts securing the A/C suction jumper and discharge lines to compressor. Tighten the two nuts to the proper. Refer to **TORQUE SPECIFICATIONS** .
10. Install the accessory drive belt (Refer to the appropriate service information).
11. Connect the negative battery cable(s). Refer to the appropriate service information .
12. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
13. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

CONDENSER, A/C

REMOVAL AND INSTALLATION

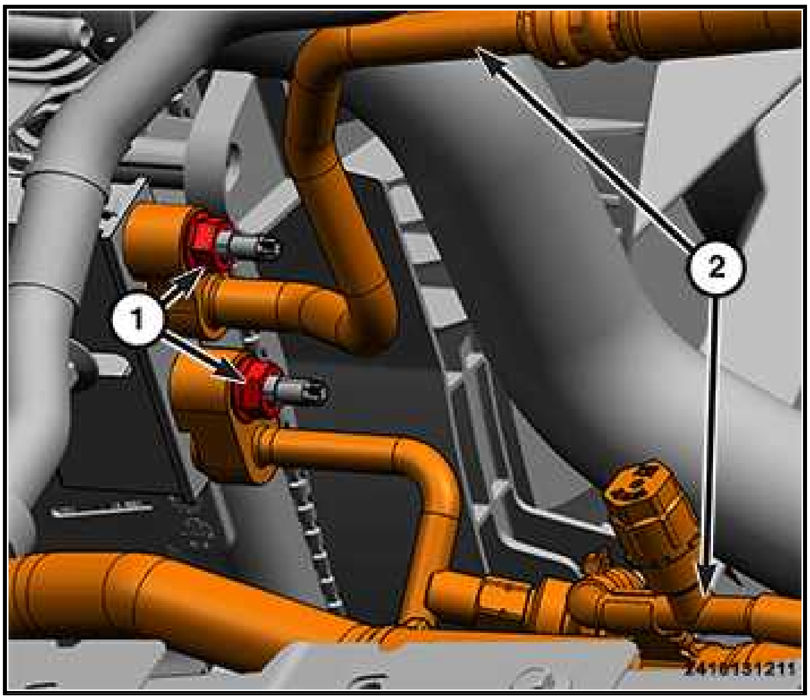
REMOVAL AND INSTALLATION

REMOVAL

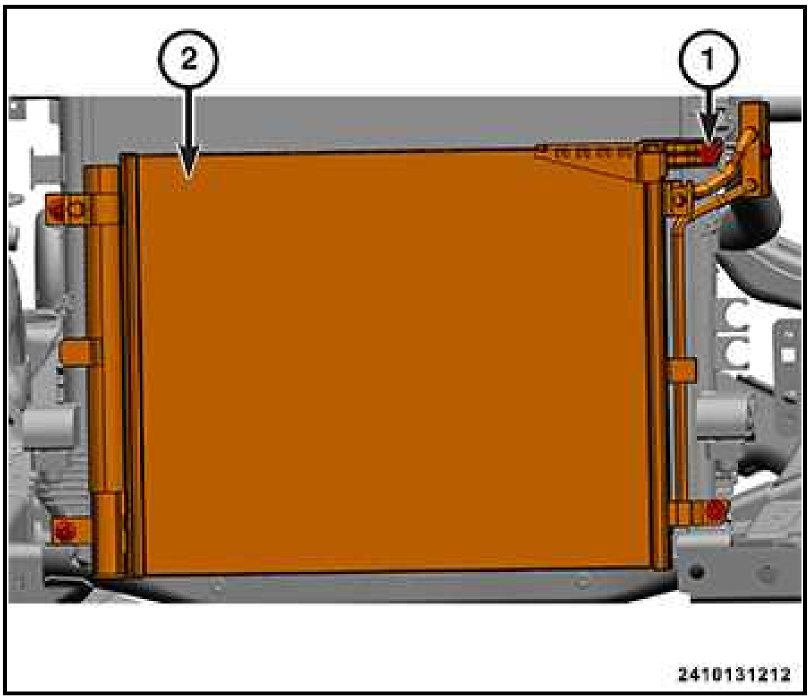
WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

CAUTION: **The A/C receiver/drier must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C receiver drier can cause serious damage to the replacement A/C compressor.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove the cooling fan (Refer to the appropriate service information).
4. Remove both of the headlamp units. Refer to **UNIT, HEADLAMP, REMOVAL AND INSTALLATION** .



5. Remove the nuts (1) that secure the A/C discharge line and A/C liquid line (2) to the A/C condenser.
6. Disconnect the A/C discharge and liquid line from the A/C condenser and remove and discard the O-ring seals and gaskets.
7. Install plugs in, or tape over the opened refrigerant line fittings and condenser ports.
8. Remove the radiator fasteners and reposition (Refer to the appropriate service information).



9. Remove the five retaining bolts (1) securing the A/C condenser (2) to the radiator.
10. Remove A/C condenser (2) from vehicle.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

CAUTION: **The A/C receiver/drier must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C receiver drier can cause serious damage to the replacement A/C compressor.**

NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to** **OIL, REFRIGERANT, STANDARD PROCEDURE****.**

NOTE: **If the A/C condenser is being replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

NOTE: **Be certain that the radiator air seals are installed in their proper locations. These air seals are required for the A/C and engine cooling systems to perform as designed.**

1. Position the A/C condenser to the front of the radiator and install the five retaining bolts. Tighten the bolts to the proper. Refer to TORQUE SPECIFICATIONS .
2. Position the radiator, A/C condenser and transmission oil cooler assembly (Refer to the appropriate service information).
3. Remove the tape or plugs from the open refrigerant line fittings and condenser ports.

4. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets to the refrigerant line fittings. Use only the specified O-ring seals as they are made of a special material for the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
5. Connect the A/C discharge line and the A/C liquid line to the A/C condenser. Install the retaining nuts. Tighten the nuts to the proper. Refer to **TORQUE SPECIFICATIONS** .
6. Install both of the headlamp units. Refer to **UNIT, HEADLAMP, REMOVAL AND INSTALLATION** .
7. Install the cooling fan (Refer to the appropriate service information).
8. Connect the negative battery cable(s). Refer to the appropriate service information .
9. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
10. If the A/C condenser is being replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
11. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

CORE, HEATER

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

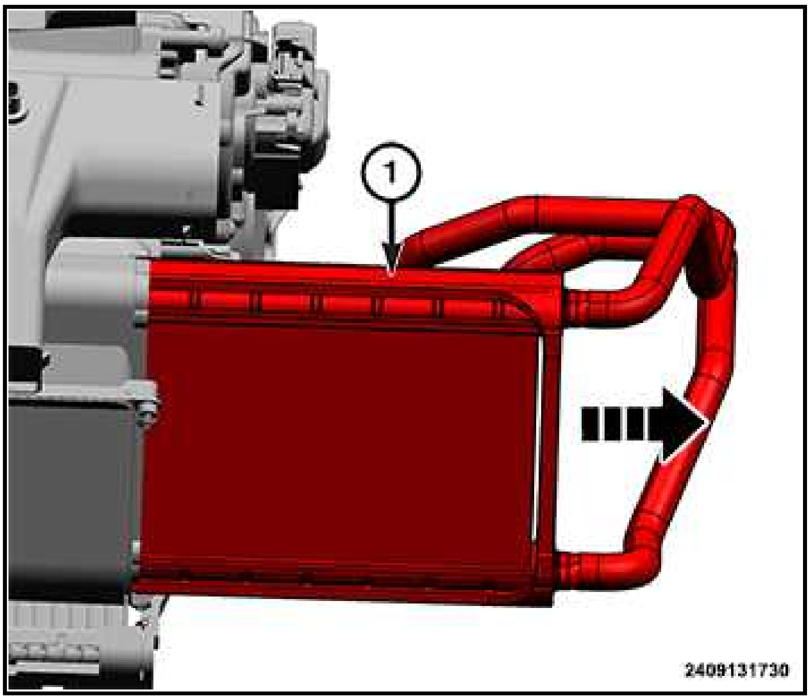
REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.**

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **LHD model with A/C shown in illustrations. RHD and heater-only models similar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Disassemble the HVAC housing assembly on a workbench. Refer to **HOUSING, HVAC, DISASSEMBLY AND ASSEMBLY**.



3. Carefully pull the heater core (1) out of the right side of the air distribution housing.

INSTALLATION

NOTE: LHD model with A/C shown in illustrations. RHD and heater-only models similar.

NOTE: If the foam seals for the heater core are deformed or damaged, they must be replaced.

1. Carefully install the heater core into the right side of the air distribution housing.
2. Assemble the HVAC housing assembly. Refer to **HOUSING, HVAC, DISASSEMBLY AND ASSEMBLY**.
3. Connect the negative battery cable(s). Refer to the appropriate service information .

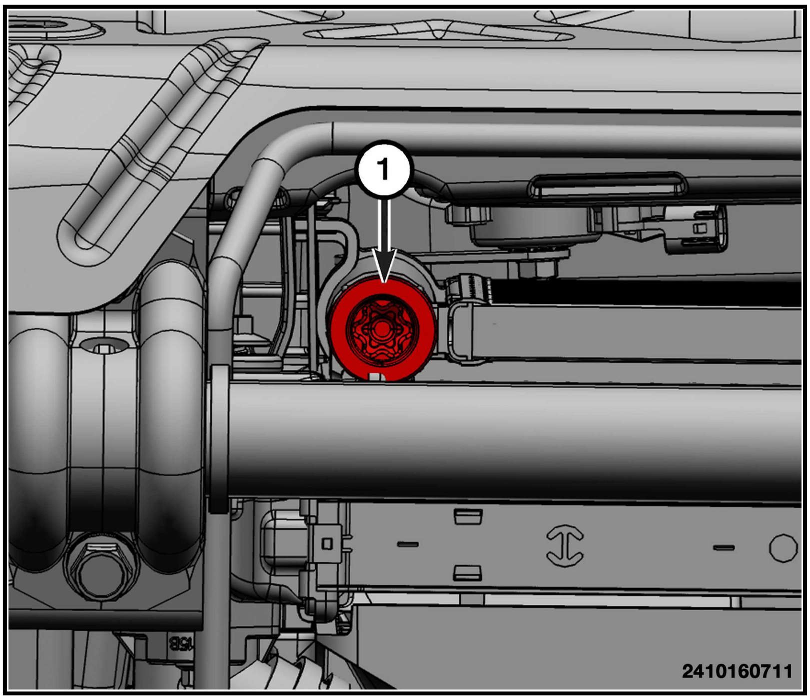
DRIER, A/C RECEIVER

REMOVAL AND INSTALLATION

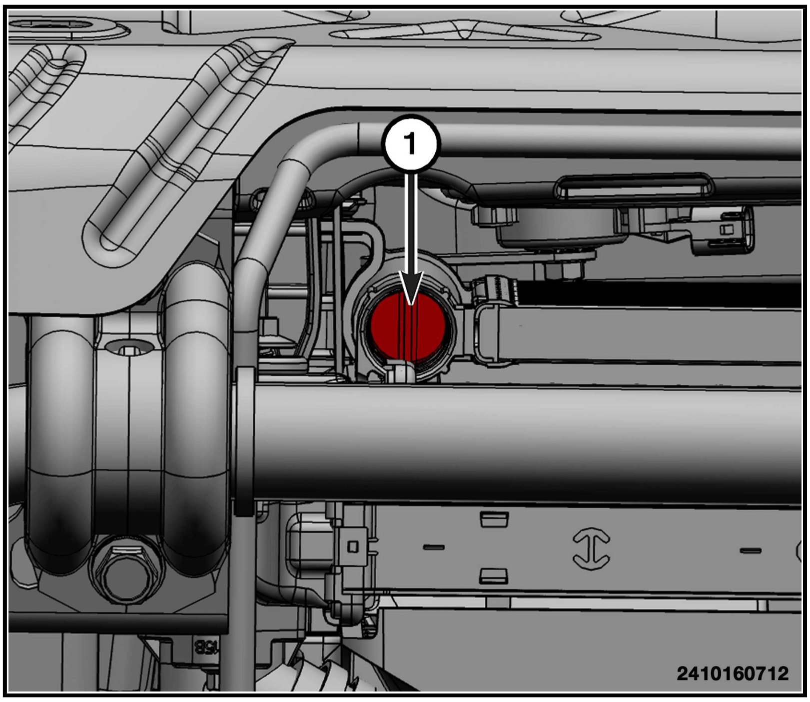
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove the front air dam. Refer to **AIR DAM, FRONT, REMOVAL AND INSTALLATION** .



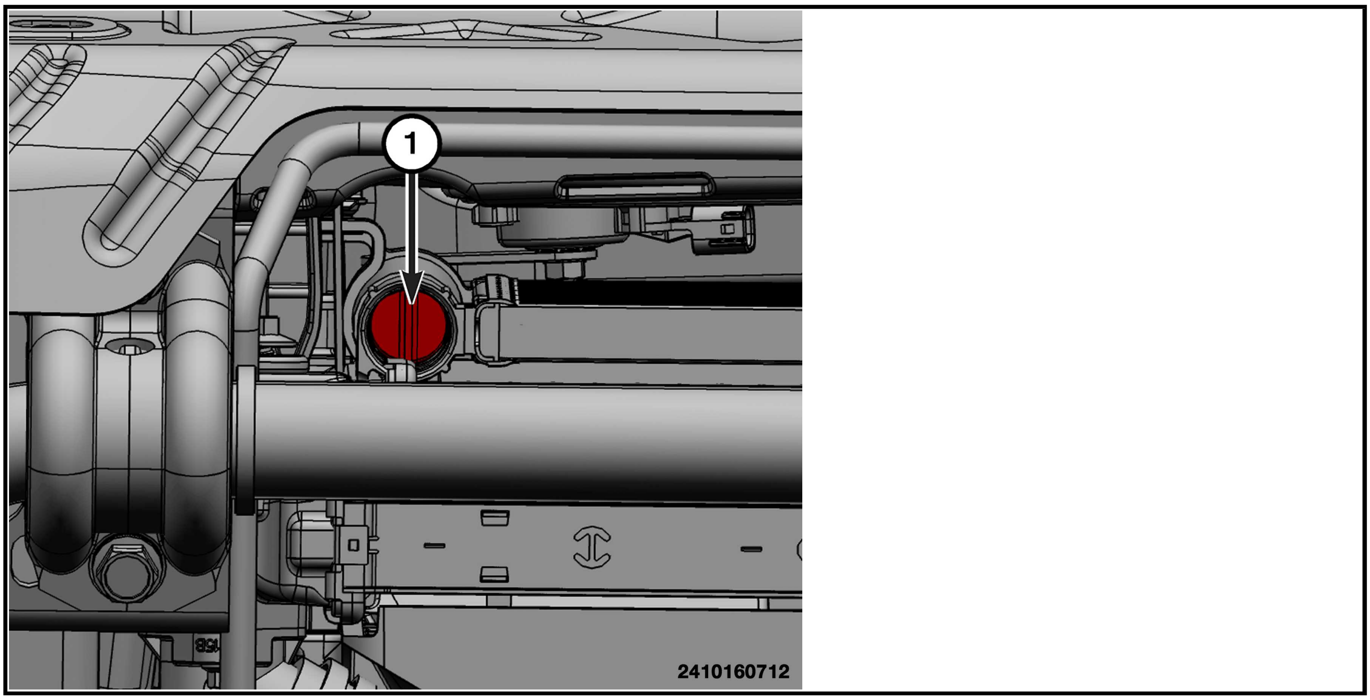
4. Remove the A/C receiver/drier filter plug (1) from the A/C condenser.



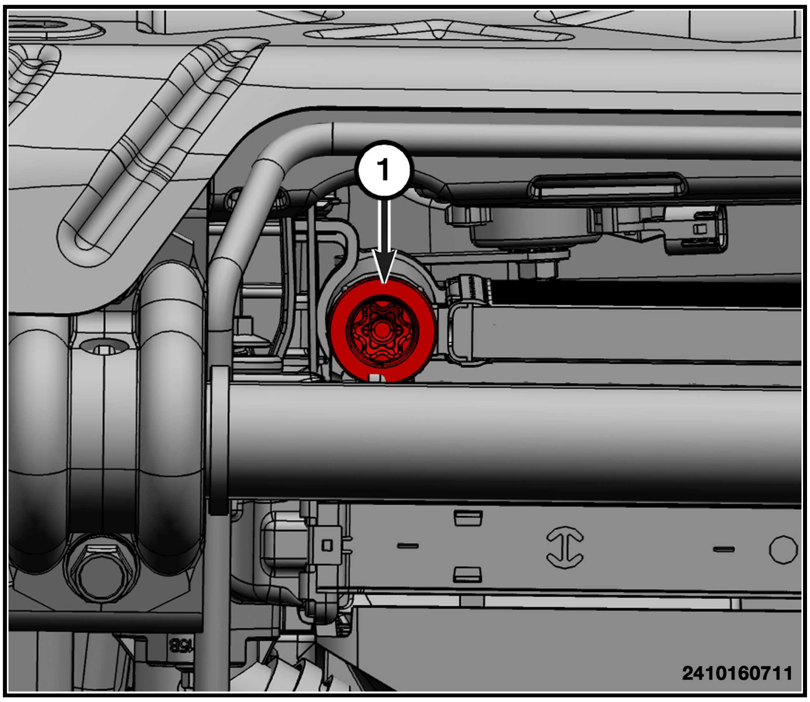
5. Remove the A/C receiver/drier filter (1) from the A/C condenser.

INSTALLATION

CAUTION: **If an internal failure of the A/C compressor has occurred the A/C system must be flushed and the A/C receiver/drier filter must be replaced. Failure to flush the system and replace the A/C receiver/drier filter can cause serious damage to the replacement A/C compressor.**



1. Install the A/C receiver/drier filter (1) to the A/C condenser.



2. Install the A/C receiver/drier filter plug (1) to the A/C condenser and tighten securely.
3. Install the front air dam. Refer to **AIR DAM, FRONT, REMOVAL AND INSTALLATION** .
4. Connect the negative battery cable(s). Refer to the appropriate service information .
5. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
6. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

EVAPORATOR, A/C

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

REMOVAL

WARNING: **Disable the airbag system before attempting any steering wheel, steering column or instrument panel component diagnosis or service. Disconnect and**

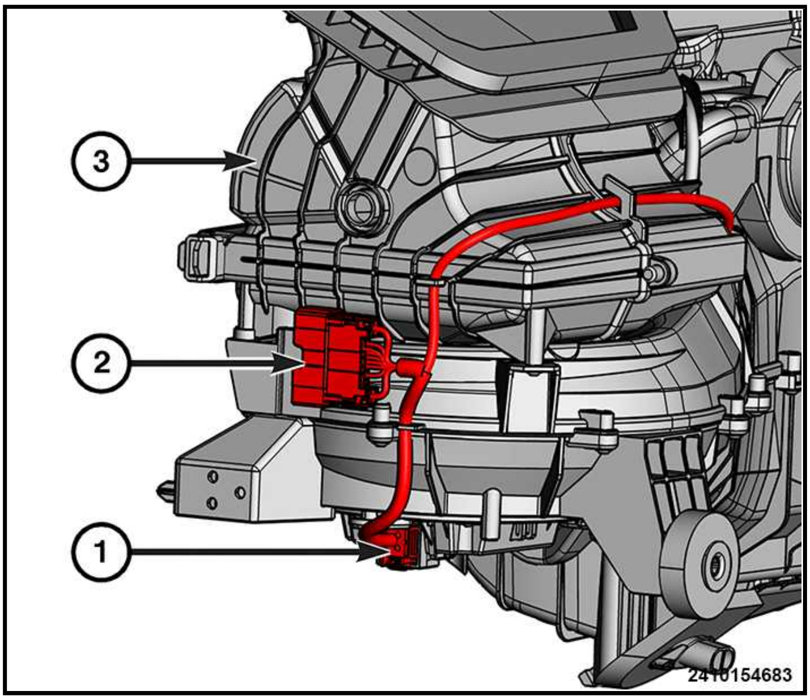
isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

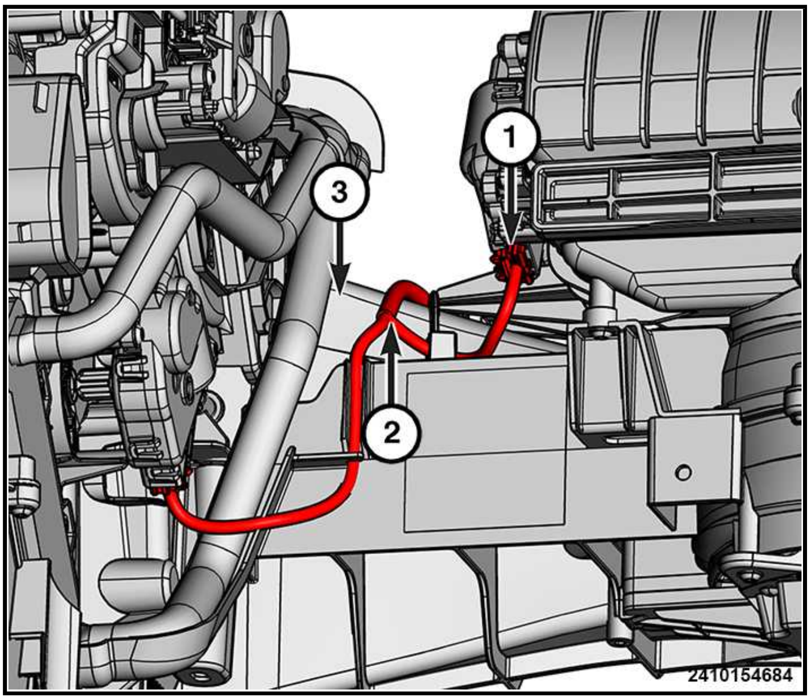
NOTE: **LHD model as shown in illustration, RHD model similar.**

NOTE: **The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.**

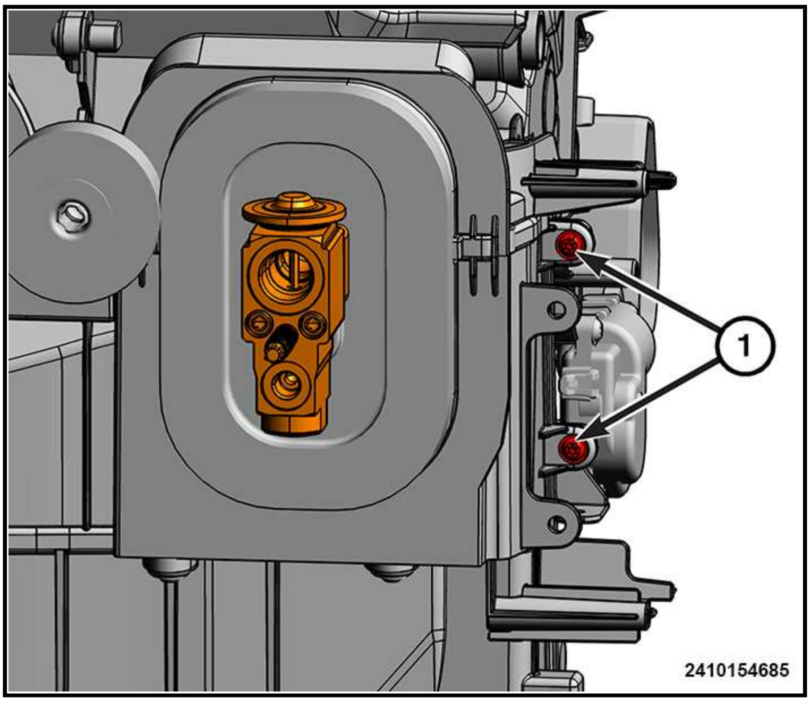
1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Remove the HVAC housing and place it on a workbench. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.



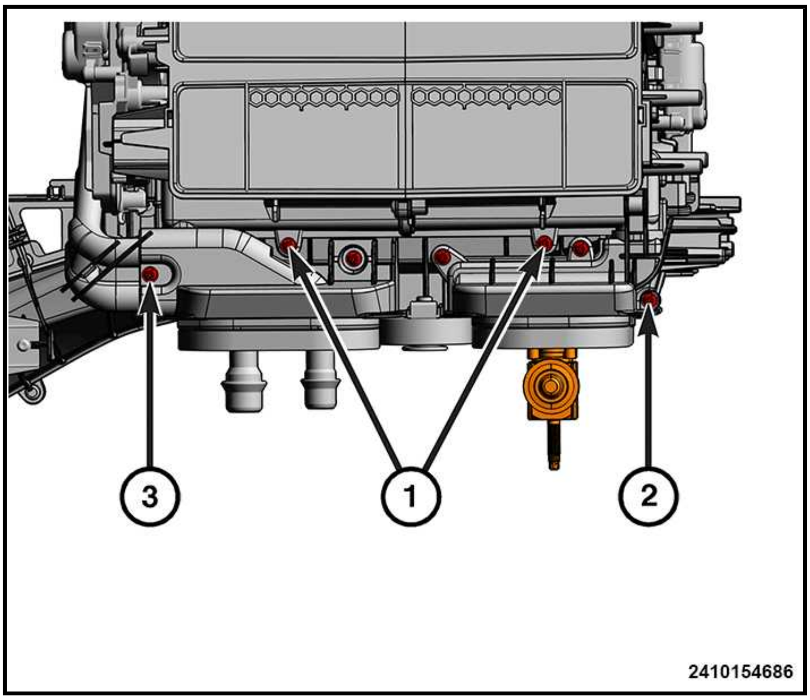
3. Disconnect the wire harness connector (1) from the blower motor.
4. Remove the HVAC wire harness connector (2) from the HVAC housing, then remove the HVAC wire harness from the air inlet housing (3).



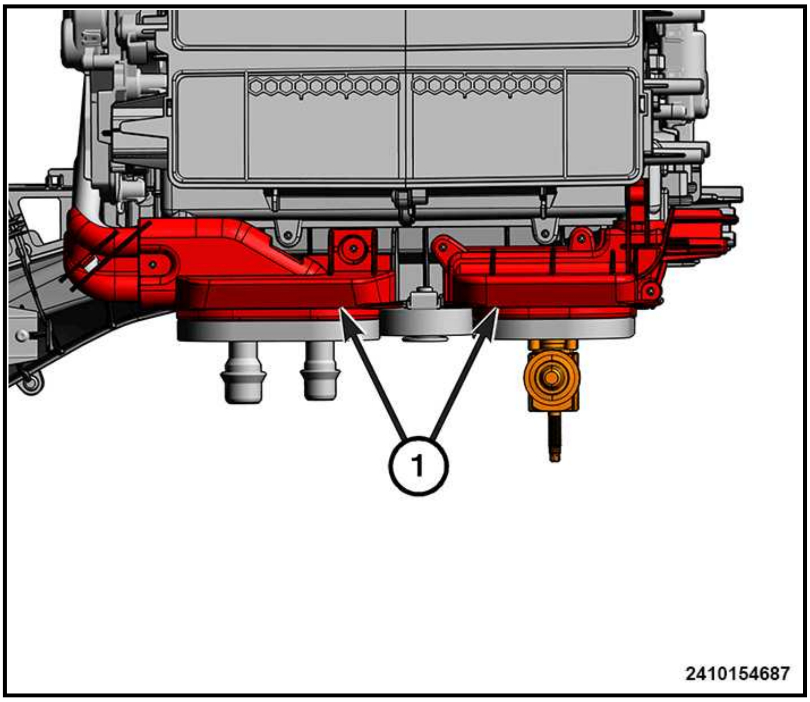
5. Remove the two wire harness connectors (1) from the actuators, then remove the HVAC wire harness (2) from the HVAC housing (3).



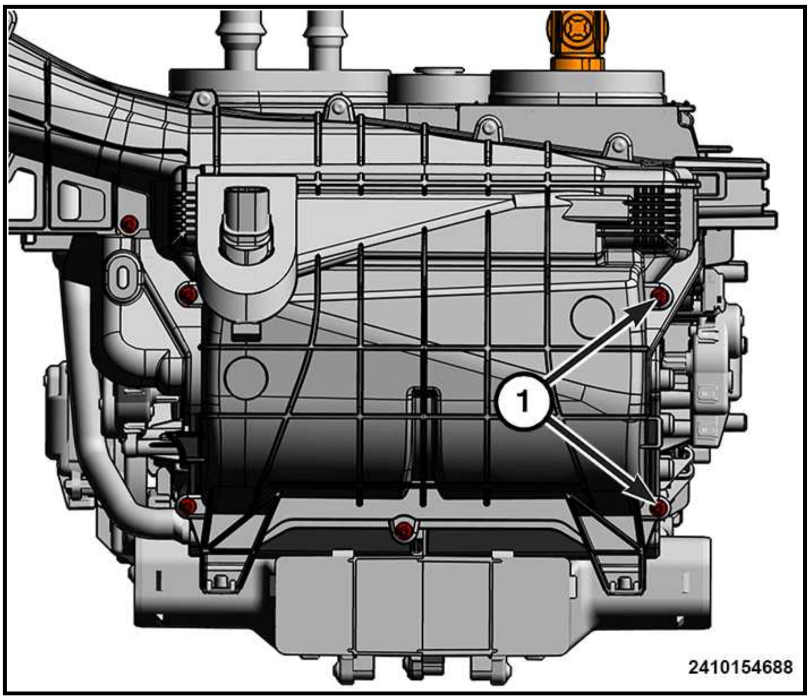
6. Remove the two screws (1) securing the HVAC housing to the distribution housing.



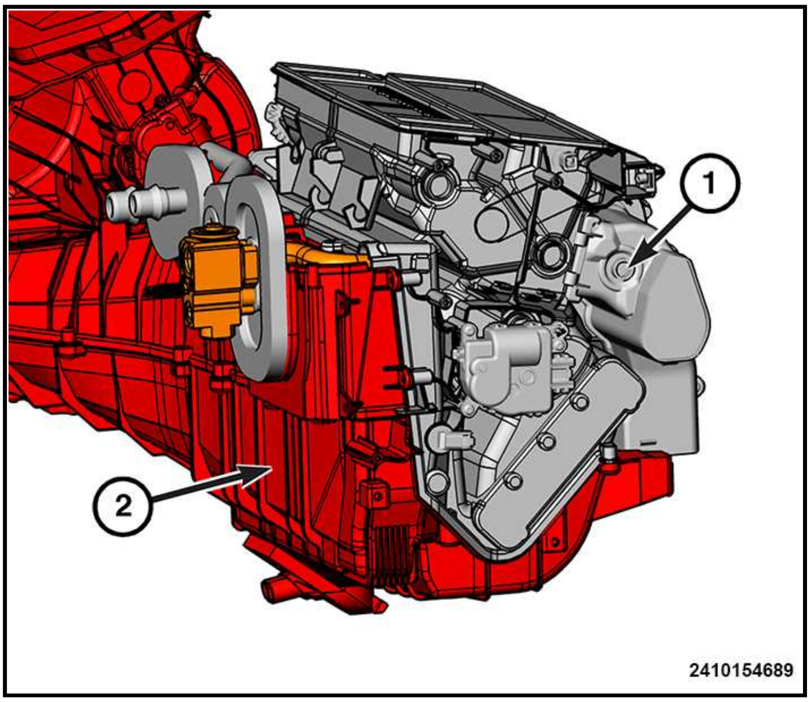
7. Remove the two screws (1) securing the HVAC housing to the distribution housing.
8. Remove the three screws (2) securing the A/C evaporator cover to the HVAC housing.
9. Remove the two screws (3) securing the heater core cover to the HVAC housing.



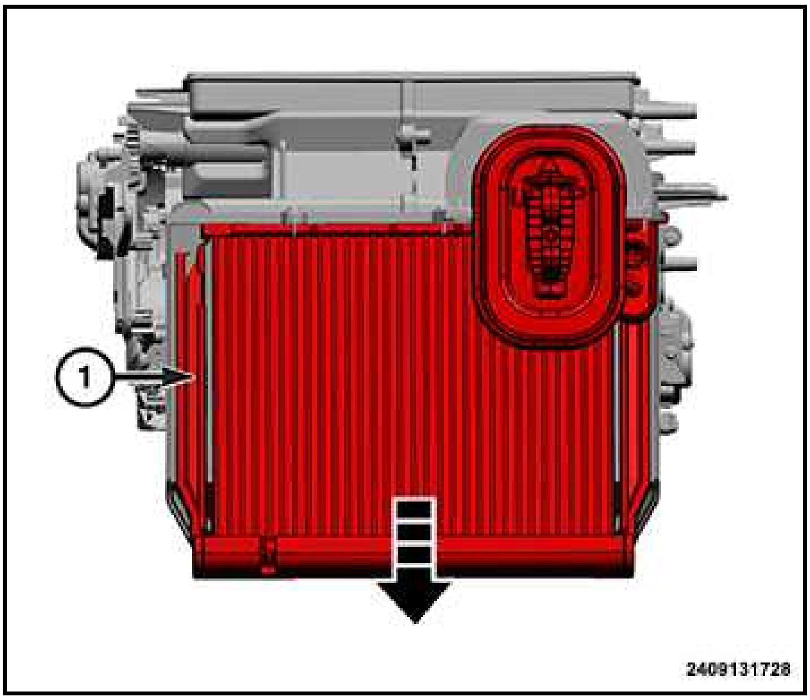
10. Remove the A/C evaporator and heater core covers (1) from the HVAC housing.



11. Remove the six screws (1) securing the HVAC housing to the distribution housing.



12. Separate the distribution housing (1) from the HVAC housing (2).



13. Carefully lower the A/C evaporator (1) out of the distribution housing.

NOTE: **If the foam seal at the front of the HVAC housing is deformed or damaged, the seal must be replaced.**

14. Remove the A/C expansion valve, tapping block and foam seal from the A/C evaporator. Refer to VALVE, A/C EXPANSION, REMOVAL AND INSTALLATION.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

NOTE: **When replacing multiple A/C system components, refer to the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the seals is required anytime a refrigerant line or expansion valve is disconnected. Failure to replace the rubber and metal dual-plane seals may result in a refrigerant system leak.**

1. Install the foam seal, tapping block and A/C expansion valve onto the A/C evaporator. Refer to VALVE, A/C EXPANSION, REMOVAL AND INSTALLATION.
2. Install the A/C evaporator into the distribution housing. Make sure that the evaporator drain is clean and unrestricted and that the evaporator insulator is properly installed.
3. Install the distribution housing to the HVAC housing.
4. Install the six screws securing the HVAC housing to the distribution housing and tighten securely.
5. Install the A/C evaporator and heater core covers to the HVAC housing.
6. Install the two screws securing the heater core cover to the HVAC housing.
7. Install the three screws securing the A/C evaporator cover to the HVAC housing.
8. Install the two screws securing the HVAC housing to the distribution housing.
9. Install the two screws securing the HVAC housing to the distribution housing.

10. Install the HVAC wire harness to the HVAC housing, then install the two wire harness connectors to the actuators.
11. Install the HVAC wire harness to the air inlet housing, then install the HVAC wire harness connector to the HVAC housing.
12. Connect the wire harness connector to the blower motor.
13. Install the HVAC housing. Refer to **HOUSING, HVAC, REMOVAL AND INSTALLATION**.
14. Connect the negative battery cable(s). Refer to the appropriate service information .
15. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
16. Only if the A/C evaporator is being replaced, adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.
17. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

LINE, A/C DISCHARGE

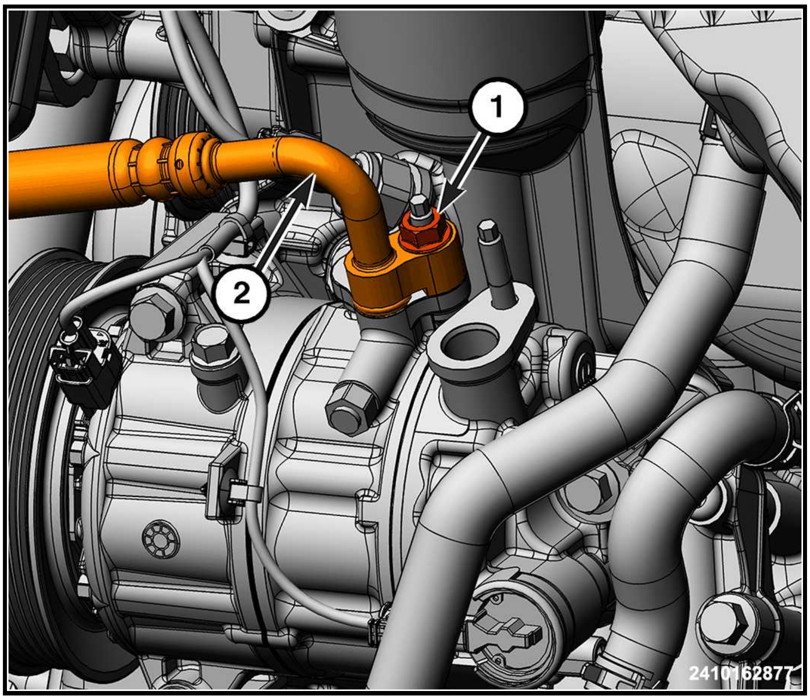
REMOVAL AND INSTALLATION

3.0L

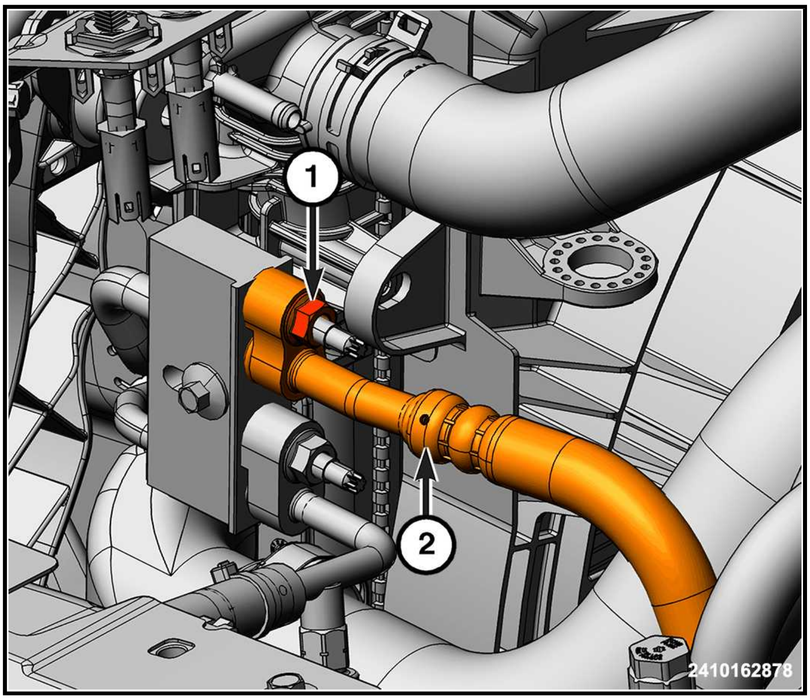
REMOVAL

WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

1. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
2. Remove the A/C suction jumper line. Refer to **LINE, A/C SUCTION JUMPER, REMOVAL AND INSTALLATION**.



3. Remove the fastener (1) that secures the A/C discharge line (2) to the A/C compressor.



4. Remove the fastener (1) that secures the A/C discharge line (2) to the condenser.
5. Remove the A/C discharge line from the engine compartment. **Remove and discard the O-ring seals.**
6. Install plugs in, or tape over the open refrigerant line fittings, the condenser and compressor ports.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

1. Position the A/C discharge line into the engine compartment.
2. Remove the tape or plugs from the opened refrigerant line fittings and the compressor and condenser ports.
3. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the discharge line fittings. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the A/C discharge line to the A/C compressor and the A/C condenser.
5. Install the nut that secures the A/C discharge line to the A/C compressor and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
6. Install the nut that secures the A/C discharge line to the A/C condenser and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
7. Install the A/C suction jumper line. Refer to **LINE, A/C SUCTION JUMPER, REMOVAL AND INSTALLATION**.
8. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
9. Adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.

10. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

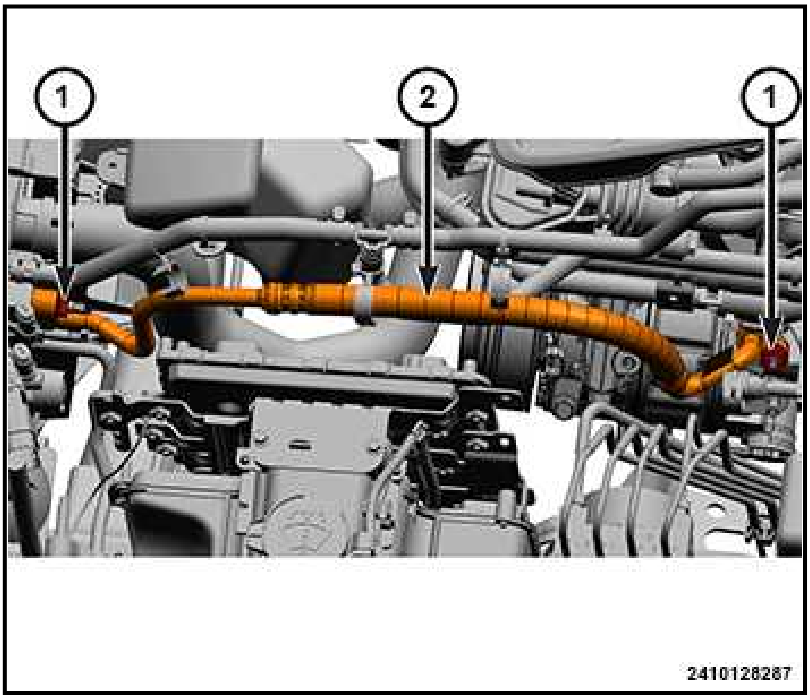
3.6L

REMOVAL

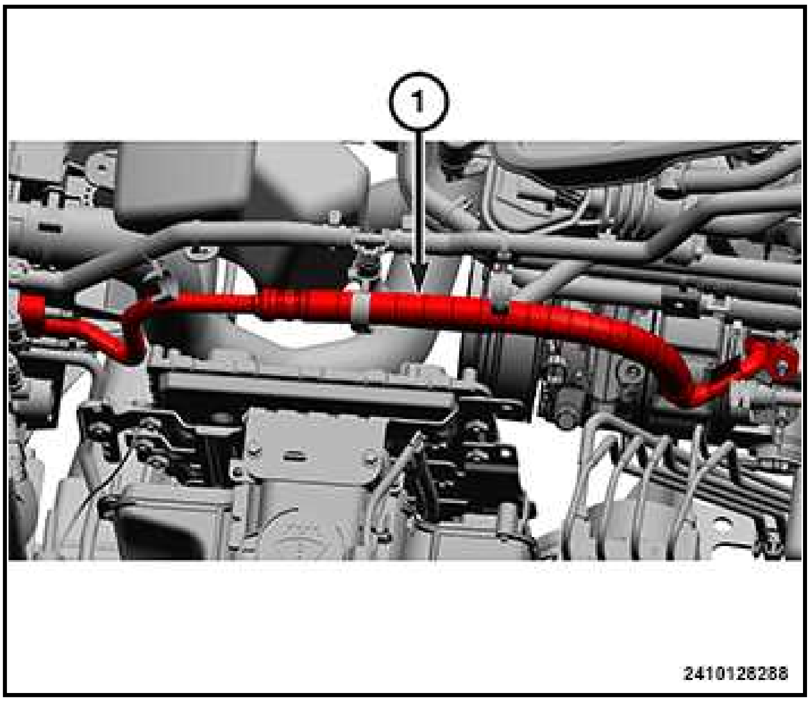
WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **LHD model as shown in illustration, RHD model similar.**

1. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
2. Remove the A/C suction jumper line. Refer to **LINE, A/C SUCTION JUMPER, REMOVAL AND INSTALLATION**.



3. Remove the two nuts (1) that secures the A/C discharge line (2) to the condenser and the A/C compressor.



4. Remove the A/C discharge line (1) from the clip then disconnect from the A/C compressor and the A/C condenser.
5. Remove the A/C discharge line (1) from the engine compartment. **Remove and discard the O-ring seals.**
6. Install plugs in, or tape over the open refrigerant line fittings, the condenser and compressor ports.

INSTALLATION

CAUTION: Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.

NOTE: When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.

NOTE: Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.

1. Position the A/C discharge line into the engine compartment.
2. Remove the tape or plugs from the opened refrigerant line fittings and the compressor and condenser ports.
3. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the discharge line fittings. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the A/C discharge line to the A/C compressor and the A/C condenser.
5. Install the nut that secures the A/C discharge line to the A/C compressor and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
6. Install the nut that secures the A/C discharge line to the A/C condenser and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
7. Install the A/C suction jumper line. Refer to **LINE, A/C SUCTION JUMPER, REMOVAL AND INSTALLATION**.
8. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
9. Adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.
10. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

LINE, A/C SUCTION JUMPER

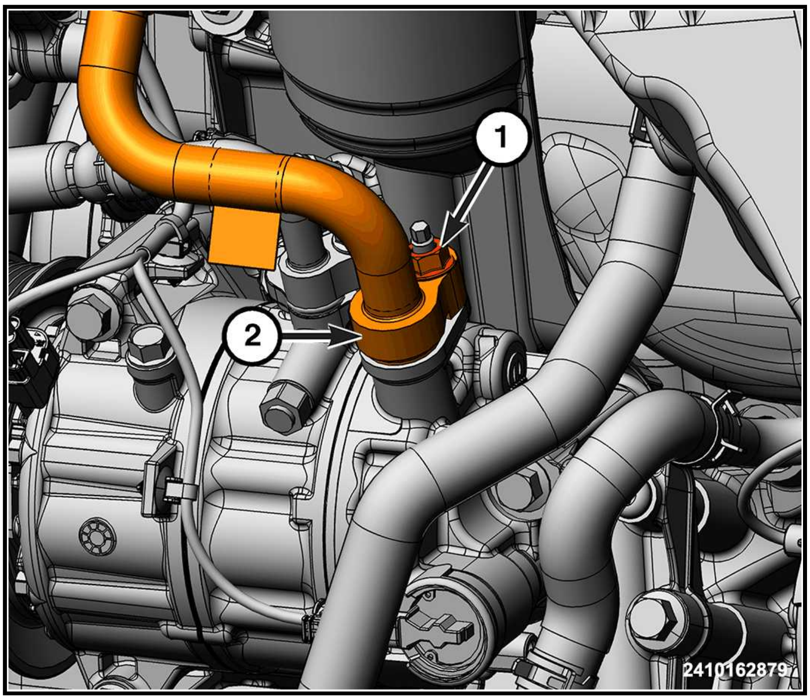
REMOVAL AND INSTALLATION

3.0L

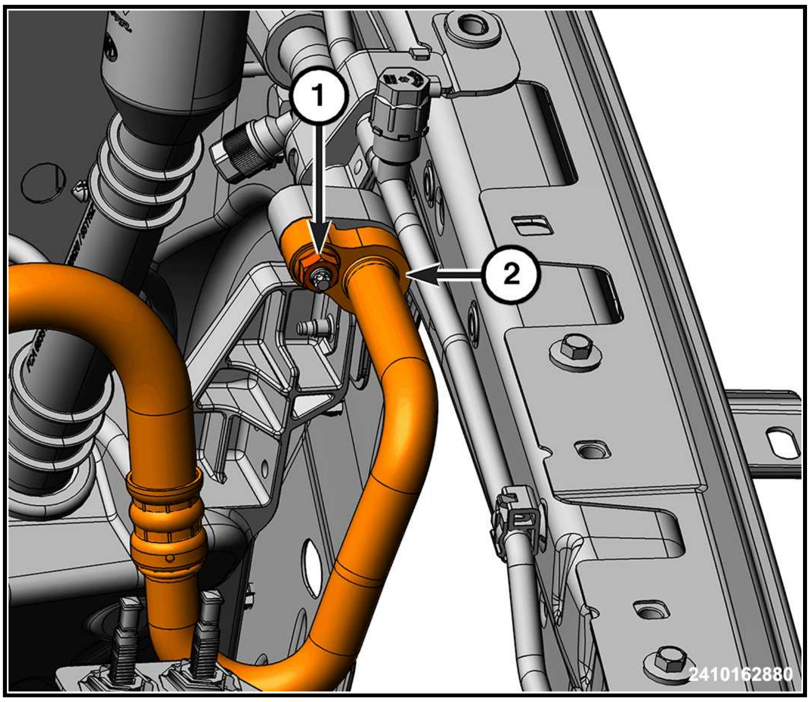
REMOVAL

WARNING: Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.

1. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
2. Remove the air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL AND INSTALLATION** .



3. Remove the fastener (1) that secure the A/C suction jumper line (2) to the A/C compressor.



4. Remove the fastener (1) that secure the A/C suction jumper line (2) to the A/C suction and liquid line assembly.
5. Separate the A/C suction jumper line from the A/C compressor and install plugs in, or tape over the open refrigerant line fittings. **Remove and discard the O-ring seals.**
6. Remove the A/C suction jumper line from the two retainers then remove from the engine compartment.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

1. Position the A/C suction jumper line in the engine compartment then install the A/C suction jumper line to the two retainers.
2. Remove the tape or plugs from the opened refrigerant line fittings.
3. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the suction jumper line fittings. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Install the A/C suction jumper line to the A/C suction and liquid line assembly and the A/C compressor.
5. Install the nut that secures the A/C suction jumper line to the A/C suction line and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
6. Install the nut that secures the A/C suction jumper line to the A/C compressor and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
7. Install the air cleaner housing. Refer to **BODY, AIR CLEANER, REMOVAL AND INSTALLATION** .
8. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
9. Adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.
10. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

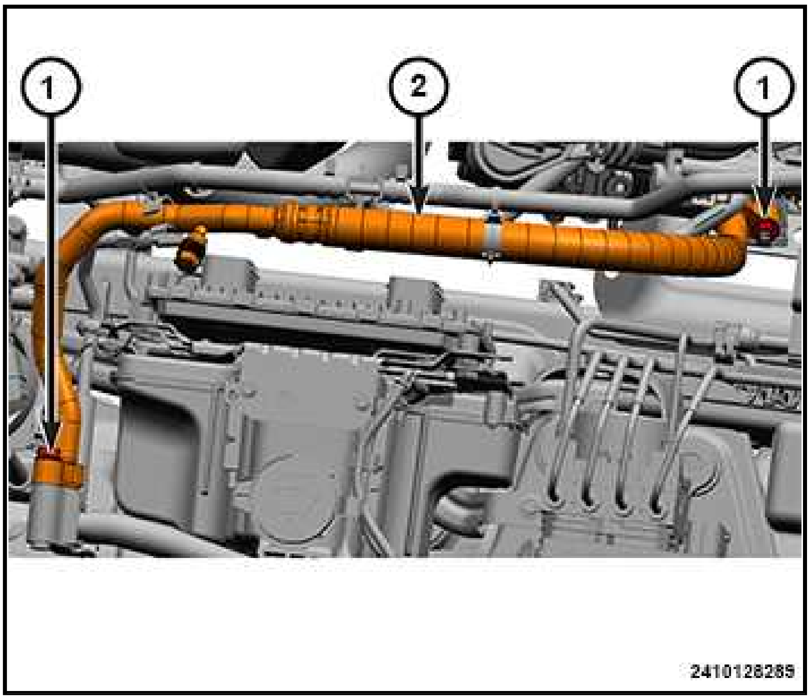
3.6L

REMOVAL

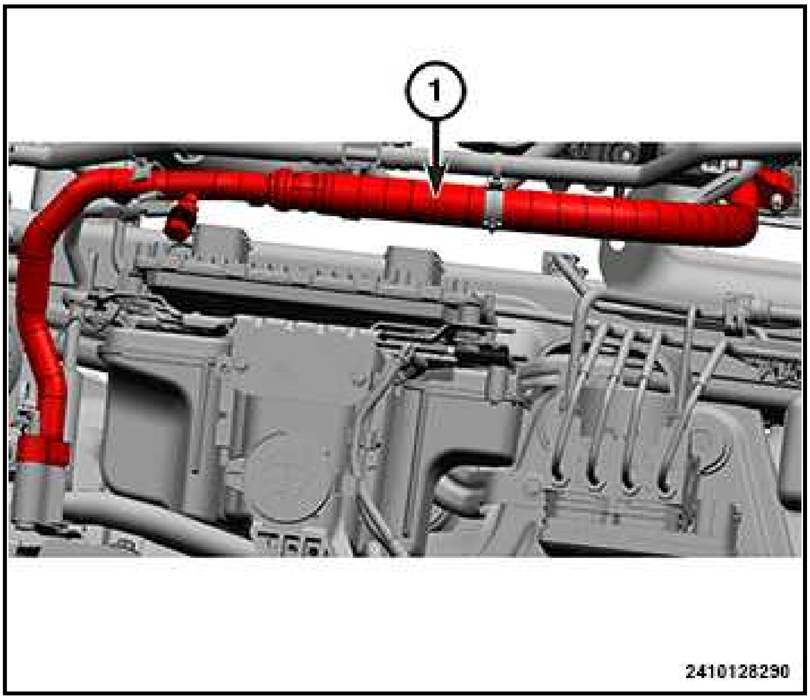
WARNING: **Review the safety precautions and warnings in this group before performing this procedure. Failure to follow these instructions may result in serious or fatal injury.**

NOTE: **LHD as shown in illustration, RHD similar.**

1. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.



2. Remove the two nuts (1) that secure the A/C suction jumper line (2) to the A/C compressor and the A/C suction and liquid line assembly.



3. Separate the A/C suction jumper line (1) from the A/C compressor and install plugs in, or tape over the open refrigerant line fittings. **Remove and discard the O-ring seals.**
4. Remove the A/C suction jumper line (1) from the two retainers then remove from the engine compartment.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets may result in a refrigerant system leak.**

1. Position the A/C suction jumper line in the engine compartment then install the A/C suction jumper line to the two retainers.
2. Remove the tape or plugs from the opened refrigerant line fittings.
3. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil and install them and **NEW** gaskets onto the suction jumper line fittings. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Install the A/C suction jumper line to the A/C suction and liquid line assembly and the A/C compressor.
5. Install the nut that secures the A/C suction jumper line to the A/C suction line and tighten to the proper. Refer to TORQUE SPECIFICATIONS .
6. Install the nut that secures the A/C suction jumper line to the A/C compressor and tighten to the proper. Refer to TORQUE SPECIFICATIONS .

7. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
8. Adjust the refrigerant oil level. Refer to **OIL, REFRIGERANT, STANDARD PROCEDURE**.
9. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.

OIL, REFRIGERANT

STANDARD PROCEDURE

COMPRESSOR OIL DRAIN PROCEDURE - PHEV

CAUTION: **Be certain to adjust the refrigerant system oil level when replacing an A/C compressor. Failure to properly drain and measure the refrigerant oil from the A/C compressor can prevent the A/C system from operating as designed and cause serious compressor damage.**

NOTE: **If no oil remains in the old A/C compressor the total system oil amount should be added. Refer to CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS .**

1. Remove the old A/C compressor from the vehicle and empty all of the refrigerant oil from the A/C compressor ports into a clean measured container.
2. Fill the new A/C compressor with the same amount of refrigerant oil that was emptied out of the old A/C compressor into the ports on the new A/C compressor. Use only clean refrigerant oil of the type recommended for the A/C compressor in the vehicle.
3. Install the new A/C compressor onto the engine. Refer to **COMPRESSOR, A/C, REMOVAL AND INSTALLATION**.

STANDARD PROCEDURE - REFRIGERANT OIL LEVEL

When an A/C system is assembled at the factory, all components except the A/C compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the A/C compressor is dispersed throughout the refrigerant system. The receiver/drier, A/C evaporator, A/C condenser and the A/C compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of refrigerant oil in the A/C system. This ensures proper lubrication of the A/C compressor. Too little oil will result in damage to the A/C compressor, while too much oil will reduce the cooling capacity of the A/C system and consequently result in higher discharge air temperatures.

NOTE: **Most reclaim/recycling equipment will measure the lubricant being removed during recovery. This amount of lubricant should be added back into the system. Refer to the reclaim/recycling equipment manufacturers instructions.**

It will not be necessary to check the oil level in the A/C compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when an A/C condenser, A/C receiver/drier, A/C evaporator or A/C line is replaced. Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .

The refrigerant oil level in a new A/C compressor must first be adjusted prior to compressor installation. See Compressor Drain Procedure.

R1234yf oil levels can be adjusted through the use of an approved oil injection syringe (available through Mopar Service Equipment). Fill the syringe with the correct amount of the correct oil per the adjustment chart. With the system charged, connect the syringe tool to the vehicles' low pressure port. With the engine running at idle, with AC on and blower set to low. Slowly open the valve on the injector while observing the oil being drawn into the system. Once the oil is injected, close the valve, disconnect from the vehicle.

REFRIGERANT

SPECIFICATIONS

Application	Capacity
3.6L engine	Refer to **CAPACITIES AND RECOMMENDED FLUIDS, SPECIFICATIONS** .

VALVE, A/C EXPANSION

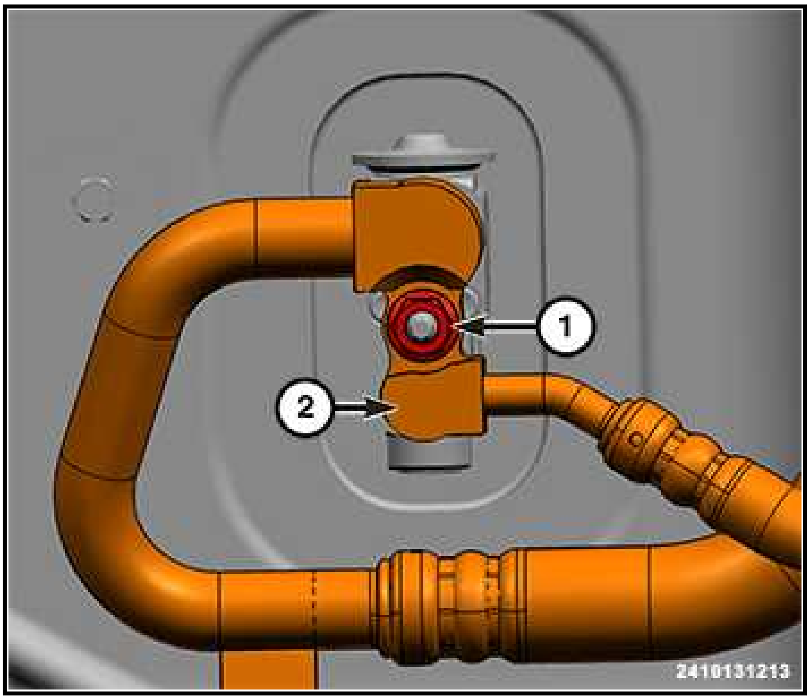
REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

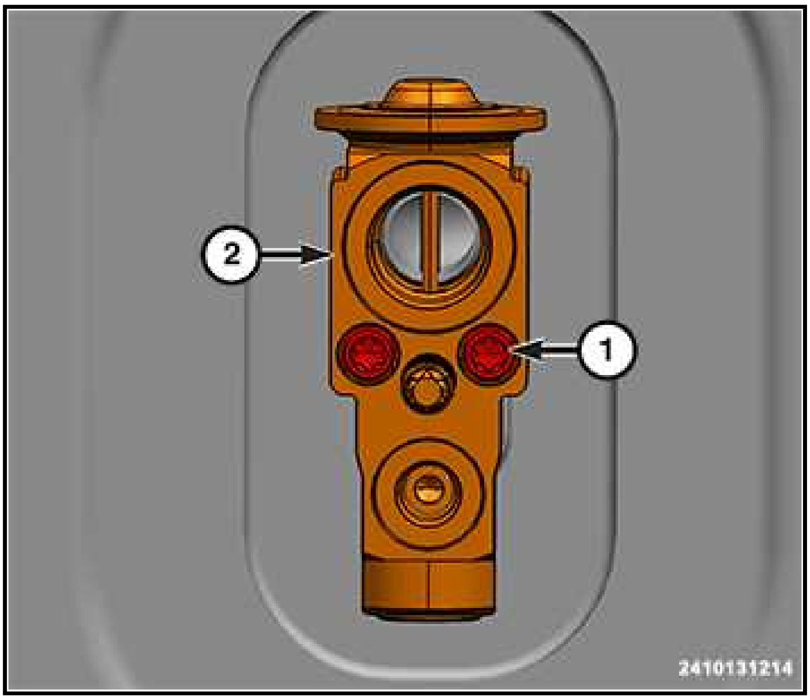
REMOVAL

WARNING: **Review the warnings and cautions for this system before performing the procedure. Failure to follow these instructions may result in serious or fatal injury.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Recover the refrigerant from the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
3. Remove the engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .



4. Remove the nut (1) that secures the A/C suction and liquid line assembly (2) to the A/C expansion valve.
5. Disconnect the A/C liquid and suction lines (2) from the A/C expansion valve, **remove and discard the O-ring seals** and position the refrigerant line assembly out of the way.



6. Remove the two bolts (1) that secure the A/C expansion valve (2) to the evaporator tube tapping block.
7. Remove the A/C expansion valve (2) from the evaporator tube tapping block and **remove and discard the O-ring seals** .
8. Install plugs in, or tape over the opened refrigerant line and evaporator tube fittings and all expansion valve ports.

INSTALLATION

CAUTION: **Be certain to adjust the refrigerant oil level when servicing the A/C refrigerant system. Failure to properly adjust the refrigerant oil level will prevent the A/C system from operating as designed and can cause serious A/C compressor damage.**

NOTE: **When replacing multiple A/C system components, see the Refrigerant Oil Capacities chart to determine how much oil should be added to the refrigerant system. Refer to OIL, REFRIGERANT, STANDARD PROCEDURE.**

NOTE: **Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is disconnected. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.**

1. Remove plugs, or tape from the opened refrigerant line and evaporator tube fittings and all expansion valve ports.
2. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
3. Install the **NEW** O-ring seals and install the A/C expansion valve to the evaporator tube tapping block.
4. Install the two bolts that secure the A/C expansion valve to the evaporator tube tapping block and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
5. Lubricate **NEW** rubber O-ring seals with clean refrigerant oil. Use only the specified O-rings as they are made of a special material for the refrigerant used in the system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
6. Install the **NEW** O-ring seals and install the A/C liquid and suction line assembly to the A/C expansion valve.
7. Install the nut that secures the A/C suction and liquid line assembly to the A/C expansion valve and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .

8. Install the engine cover. Refer to **COVER, ENGINE, REMOVAL AND INSTALLATION** .
9. Connect the negative battery cable(s). Refer to the appropriate service information .
10. Evacuate the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
11. Charge the refrigerant system. Refer to **PLUMBING, STANDARD PROCEDURE**.
