DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
B2199-16	BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD
B2199-17	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
B21DD-84	SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE
B21DD-85	SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE
C0077-00	LOW TIRE PRESSURE
C1501-96	TIRE PRESSURE SENSOR 1 - INTERNAL COMPONENT FAILURE
C1502-96	TIRE PRESSURE SENSOR 2 - INTERNAL COMPONENT FAILURE
C1503-96	TIRE PRESSURE SENSOR 3 - INTERNAL COMPONENT FAILURE
C1504-96	TIRE PRESSURE SENSOR 4 - INTERNAL COMPONENT FAILURE
C151C-00	TIRE PRESSURE SENSORS MISSING-
C151D-00	TIRE PRESSURE SENSOR LOCATION UNDETERMINED-
C1570-00	DUPLICATE TIRE PRESSURE SENSOR IDS-
C1580-00	LEFT/RIGHT SIDE TIRE PRESSURE SENSOR LOCATION UNDETERMINED-
C1581-00	FRONT/REAR TIRE PRESSURE SENSOR LOCATION UNDETERMINED-
C1597-00	TPM SYSTEM DEACTIVATED - WINTER MODE-
C15CB-00	FRONT AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE
C15CC-00	REAR AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE
C15D6-00	RUN FLAT TIRE PRESSURE BELOW THRESHOLD
C2209-00	TIRE PRESSURE MONITOR INTERNAL-
U0001-00	CAN C BUS
U0100-00	LOST COMMUNICATION WITH ECM/PCM
U0121-00	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0155-00	LOST COMMUNICATION WITH CLUSTER/CCN
U0184-00	LOST COMMUNICATION WITH RADIO
U0401-00	IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM
U0415	00-INVALID DATA RECEIVED FROM ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"
U0422-00	IMPLAUSIBLE DATA RECEIVED FROM BODY CONTROL MODULE
U0423-00	IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN
U0485-00	IMPLAUSIBLE DATA RECEIVED FROM RADIO

DIAGNOSIS AND TESTING

B2199-16-BATTERY VOLTAGE-CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

NO TITLE

Reference RELATED LINKS in the top right corner of Service Library for more information

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- System voltage between 8.0 and 16.0 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module senses voltage input below 8.0 volts for 15 seconds.

DEFAULT ACTION

- TPM System is operating normally.

POSSIBLE CAUSES

POSSIBLE CAUSES
NON-FCC COMPLIANT COMPONENTS
LOW VOLTAGE ENGINE DTC
FUSED B(+) CIRCUIT HIGH RESISTANCE
GROUND CIRCUIT HIGH RESISTANCE
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.

2. **CHECK FOR OTHER DTCS**
   1. Refer to the recorded DTCs.

   Are there any battery or charging systems DTCs active or pending?

   Yes

   - Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

   No

   - Go To 3

3. **CHECK THE (A943) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
   2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to 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. Ensure 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 circuitry.

   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 CIRCUIT LOAD TESTING 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 CIRCUIT LOAD TESTING PROCEDURES .**

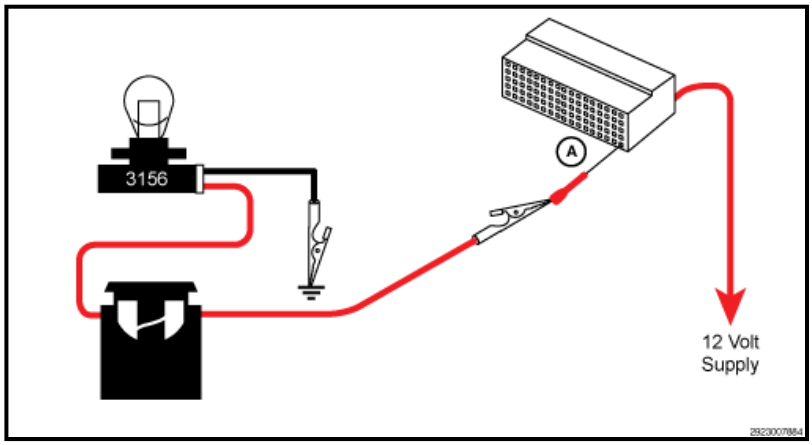
   NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper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



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU 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 TPM VERIFICATION TEST. Refer to STANDARD PROCEDURE - TPM VERIFICATION.

4. **CHECK THE (Z906) 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 circuitry.

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**

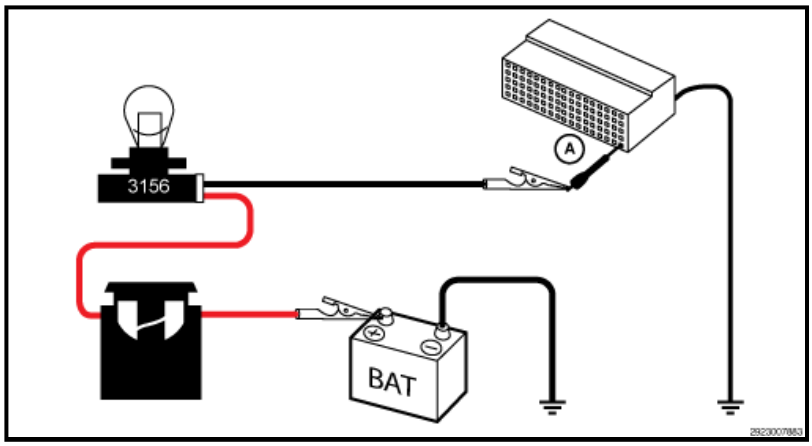
of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .

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 CIRCUIT LOAD TESTING 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 CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU 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 TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

5. **CHECK TPM AND RELATED MODULE HARNESS CONNECTIONS**
    1. Disconnect the TPM harness connector.
    2. Disconnect all related in-line harness connections (if equipped).
    3. 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.

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

        Did the DTC return?

        Yes

        - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
        - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

        No

        - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
        - Test complete.

B2199-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

- Continuously
- Battery voltage between 8.0 and 16.0 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module senses voltage input above 16.0 volts for 15 seconds.

DEFAULT ACTION

- TPM System operates normally

POSSIBLE CAUSES

Possible Causes
HIGH VOLTAGE POWERTRAIN CONTROL MODULE (PCM) DTCS
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.

2. **CHECK FOR OTHER DTCS**
    1. Refer to the recorded DTCs.

    Are there any battery or charging systems DTCs active or pending?

    Yes

    - Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

    No

    - Go To 3
3. **CHECK TPM AND RELATED MODULE HARNESS CONNECTIONS**
    1. Disconnect the TPM harness connector.
    2. Disconnect all related in-line harness connections (if equipped).
    3. 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.

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

    Did the DTC return?

    Yes

    - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
    - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

    No

- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
- Test complete.

B21DD-84-SYSTEM VOLTAGE-SIGNAL BELOW ALLOWABLE RANGE

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- System voltage between 8.0 and 16.0 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module is Receiving CAN messages that system voltage is below 8.0 volts for 15 seconds.

DEFAULT ACTION

- TPM System is operating normally.

POSSIBLE CAUSES

POSSIBLE CAUSES
NON-FCC COMPLIANT COMPONENTS
LOW VOLTAGE ENGINE DTC
FUSED B(+) CIRCUIT HIGH RESISTANCE
GROUND CIRCUIT HIGH RESISTANCE
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.

2. **CHECK FOR OTHER DTCS**

NOTE: **Make sure the battery is fully charged before proceeding.**

1. Refer to the recorded DTCs.

Are there any battery or charging systems DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To 3

3. **CHECK THE (A943) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
   2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to 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. Ensure 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 circuitry.

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 CIRCUIT LOAD TESTING 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 CIRCUIT LOAD TESTING PROCEDURES .**

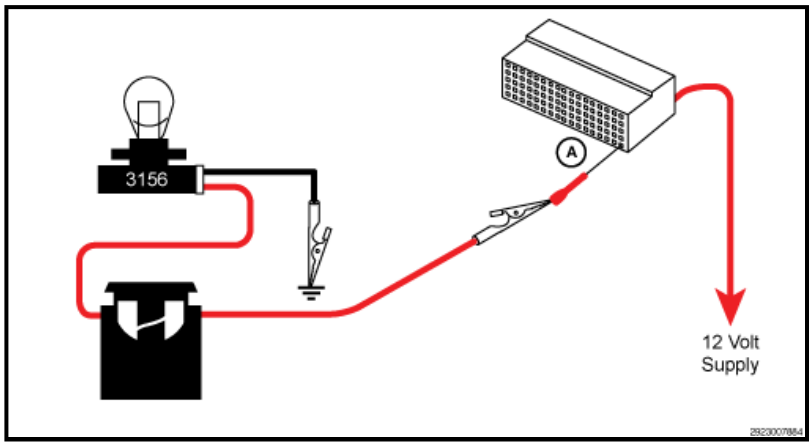
NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper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



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU 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 TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

4. **CHECK THE (Z906) 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 circuitry.

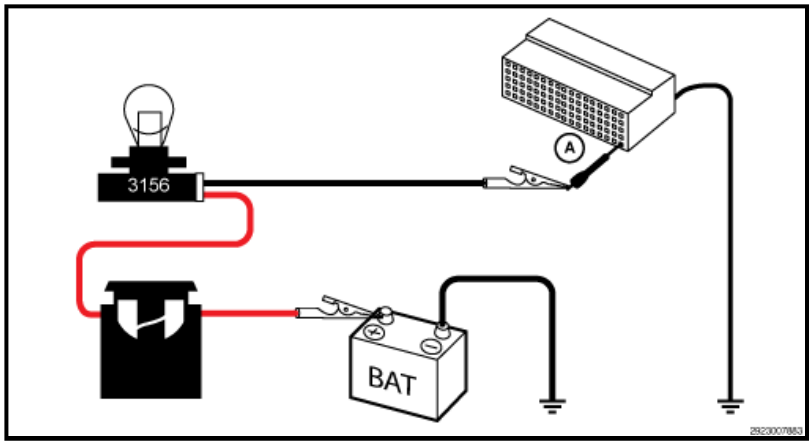
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING 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 CIRCUIT LOAD TESTING PROCEDURES .**

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 CIRCUIT LOAD TESTING 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 CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU 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 TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

5. **CHECK TPM AND RELATED MODULE HARNESS CONNECTIONS**
   1. Disconnect the TPM harness connector.
   2. Disconnect all related in-line harness connections (if equipped).
   3. 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.

   4. Connect the TPM harness connector. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
   5. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.

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

   Did the DTC return?

   Yes

   - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
   - Test complete.

B21DD-85-SYSTEM VOLTAGE-SIGNAL ABOVE ALLOWABLE RANGE

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

- Continuously
- Battery voltage between 8.0 and 16.0 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module is receiving CAN messages that system voltage is above 16.0 volts for 15 seconds.

DEFAULT ACTION

- TPMS system operates as normal

POSSIBLE CAUSES

Possible Causes
FUSED B(+) CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE (PCM) DTCS
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 INTERMITTENT DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **CHECK FOR OTHER DTCS**

    NOTE: Make sure the battery is fully charged before proceeding.

    1. Refer to the recorded DTCs.

    Are there any battery or charging systems DTCs active or pending?

    Yes

    - Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

    No

    - Go To 3
3. **CHECK TPM AND RELATED MODULE HARNESS CONNECTIONS**
    1. Disconnect the TPM harness connector.
    2. Disconnect all related in-line harness connections (if equipped).
    3. 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.

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

   Did the DTC return?

   Yes

   - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
   - Test complete.

C0077-00-LOW TIRE PRESSURE

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

Low Tire Pressure DTCs are set when Tire Pressure is below the preset threshold programmed per vehicle settings. These DTCs can usually be resolved by filling tire to the recommended pressures.

WHEN MONITORED

- With Ignition On. Battery voltage between 9 and 16 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module senses low pressure condition when the tire pressure falls below or is equal to the low pressure threshold value as specified for the vehicle.

DEFAULT ACTION

- TPM Indicator lamp illuminated.

POSSIBLE CAUSES

Possible Causes
INCORRECT TIRE PRESSURE
INCORRECT PLACARD VALUES

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

DIAGNOSTIC TEST

NOTE: DO NOT REPLACE TPM SENSOR. THIS FAULT IS EXPECTED IF TIRE PRESSURE IS 20% BELOW THE PLACARD PRESSURE

Inflate tire to cold placard pressure to remove the fault condition

NOTE: It is recommended to inflate tire 2 psi past placard pressure to ensure fault condition clears.

1. Test drive the vehicle at a speed greater than 24 km/h (15 mph) for 5 minutes in order to receive TPM Sensor data and allow for the system to update.
    1. Test complete
    2. Perform the TPM VERIFICATION TEST. Refer to STANDARD PROCEDURE - TPM VERIFICATION.

C1501-96-TIRE PRESSURE SENSOR 1 - INTERNAL COMPONENT FAILURE

NOTE: Check for and remove any non-FCC compliant components, and verify that the tire pressures are correct, before beginning this diagnostic procedure.

NOTE: DO NOT REPLACE TPM SENSOR(S) IF DTC IS STORED

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 8.0 and 16.0 volts.
- Vehicle speed above 24 km/h (15 mph).

SET CONDITION

- Tire Pressure Monitoring (TPM) Module receives RF signal error if data is not received or cannot be accurately decoded for a maximum of 20 minutes when the vehicle speed is above 24 km/h (15 mph).
- Tire Pressure Monitoring (TPM) Module receives internal sensor hardware error.

- Tire Pressure Monitoring (TPM) Module senses error in the shock sensor, pressure sensor, or temperature sensor.

DEFAULT ACTION

- Tire Pressure Monitoring (TPM) Module Lamp will flash on and off for 75 seconds then remain on solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
TIRE PRESSURE MONITORING (TPM) MODULE

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

NOTE: In the Scan Tool under Data "FF" is the default value. If this value is displayed, the Tire Pressure Monitoring (TPM) Module has not been programmed.

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 "Intermittent DTC Procedure" Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **USE THE TPM-RKE ANALYZER TO VERIFY THE CORRECT TPM SENSOR IS INSTALLED ON THE VEHICLE**

    NOTE: This fault can be set if the incorrect or no TPM Sensor is installed on the vehicle. If the spare tire is currently installed on the vehicle, and it is not equipped with a TPM Sensor, this DTC can be set. Replace the spare with

a TPM Sensor equipped wheel and tire assembly. Test drive the vehicle. If the DTC resets, continue with the diagnostic procedure.

1. Perform a visual inspection to verify that all road wheels are equipped with a TPM Sensor.
2. With the TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) verify the correct TPM Sensor is on the vehicle.

Is the correct TPM Sensor installed on the vehicle?

Yes

- Go To 3

No

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

3. **USE THE TPM-RKE ANALYZER TO LOCATE THE TIRE PRESSURE MONITORING (TPM) SENSOR WITH AN INTERNAL FAULT**

NOTE: **The following procedure is used to locate the TPM Sensor that is setting the internal fault. If the tires have been rotated, the TPM Sensor is no longer in sequence from the factory. Faults are linked to the TPM Sensor IDs. You MUST locate the TPM Sensor that set the fault before continuing. Use the following method below at every tire location.**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

NOTE: **Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the TPM Sensor. If the incorrect vehicle line and/or model year is selected, the TPM Sensor will not respond to the tool.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for a response, and store in the proper location in the TPM-RKE Analyzer. If you receive no response from any of the TPM Sensors, check to make sure that the TPM-RKE Analyzer is set correctly and repeat the process on each non-responsive wheel.
2. Replace the TPM Sensor if the results show a "Damaged Accel", "Damaged Temp", "Damaged Press", "H/W fail", "S/W fail" or the TPM Sensor does not respond after repeated attempts. Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** . Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE**.
3. With the scan tool, select Data Display for the TPM Module.
4. Check to see if the Sensor IDs match what is programmed into the TPM Module.

Has the TPM Sensor been located?

Yes

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND**

INSTALLATION .

- Perform the TPM VERIFICATION TEST. Refer to STANDARD PROCEDURE - TPM VERIFICATION.

No

- Go To 4

4. **USE TPM-RKE ANALYZER TO FIND TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULT FOR MISMATCHED ID**

NOTE: If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to verify the TPM Sensor IDs match what is programmed into the TPM Module. The TPM Sensor Identifications are located under "Data Display" for the TPM Module.

Do the TPM Sensor IDs match what is stored in the TPM Module?

Yes

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION .
- Perform the TPM VERIFICATION TEST. Refer to STANDARD PROCEDURE - TPM VERIFICATION.

No

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to STANDARD PROCEDURE - TPM VERIFICATION.

C1502-96-TIRE PRESSURE SENSOR 2 - INTERNAL COMPONENT FAILURE

NOTE: Check for and remove any non-FCC compliant components, and verify that the tire pressures are correct, before beginning this diagnostic procedure.

NOTE: DO NOT REPLACE TPM SENSOR(S) IF DTC IS STORED

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 8.0 and 16.0 volts.
- Vehicle speed above 24 km/h (15 mph).

SET CONDITION

- Tire Pressure Monitoring (TPM) Module receives RF signal error if data is not received or cannot be accurately decoded for a maximum of 20 minutes when the vehicle speed is above 24 km/h (15 mph).
- Tire Pressure Monitoring (TPM) Module receives internal sensor hardware error.
- Tire Pressure Monitoring (TPM) Module senses error in the shock sensor, pressure sensor, or temperature sensor.

DEFAULT ACTION

- Tire Pressure Monitoring (TPM) Module Lamp will flash on and off for 75 seconds then remain on solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 "Intermittent DTC Procedure" Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **USE THE TPM-RKE ANALYZER TO VERIFY THE CORRECT TPM SENSOR IS INSTALLED ON THE VEHICLE**

    NOTE: **This fault can be set if the incorrect or no TPM Sensor is installed on the vehicle. If the spare tire is currently installed on the vehicle, and it is not**

equipped with a TPM Sensor, this DTC can be set. Replace the spare with a TPM Sensor equipped wheel and tire assembly. Test drive the vehicle. If the DTC resets, continue with the diagnostic procedure.

1. Perform a visual inspection to verify that all road wheels are equipped with a TPM Sensor.
2. With the TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) verify the correct TPM Sensor is on the vehicle.

Is the correct TPM Sensor installed on the vehicle?

Yes

- Go To 3

No

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

3. **USE THE TPM-RKE ANALYZER TO LOCATE THE TIRE PRESSURE MONITORING (TPM) SENSOR WITH AN INTERNAL FAULT**

NOTE: **The following procedure is used to locate the TPM Sensor that is setting the internal fault. If the tires have been rotated, the TPM Sensor is no longer in sequence from the factory. Faults are linked to the TPM Sensor IDs. You MUST locate the TPM Sensor that set the fault before continuing. Use the following method below at every tire location.**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

NOTE: **Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the TPM Sensor. If the incorrect vehicle line and/or model year is selected, the TPM Sensor will not respond to the tool.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for a response, and store in the proper location in the TPM-RKE Analyzer. If you receive no response from any of the TPM Sensors, check to make sure that the TPM-RKE Analyzer is set correctly and repeat the process on each non-responsive wheel.
2. Replace the TPM Sensor if the results show a "Damaged Accel", "Damaged Temp", "Damaged Press", "H/W fail", "S/W fail" or the TPM Sensor does not respond after repeated attempts. Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** . Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
3. With the scan tool, select Data Display for the TPM Module.
4. Check to see if the Sensor IDs match what is programmed into the TPM Module.

Has the TPM Sensor been located?

Yes

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Go To 4

4. **USE TPM-RKE ANALYZER TO FIND TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULT FOR MISMATCHED ID**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to verify the TPM Sensor IDs match what is programmed into the TPM Module. The TPM Sensor Identifications are located under "Data Display" for the TPM Module.

Do the TPM Sensor IDs match what is stored in the TPM Module?

Yes

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1503-96-TIRE PRESSURE SENSOR 3 - INTERNAL COMPONENT FAILURE

NOTE: **Check for and remove any non-FCC compliant components, and verify that the tire pressures are correct, before beginning this diagnostic procedure.**

NOTE: **DO NOT REPLACE TPM SENSOR(S) IF DTC IS STORED**

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously

- Battery voltage between 8.0 and 16.0 volts.
- Vehicle speed above 24 km/h (15 mph).

SET CONDITION

- Tire Pressure Monitoring (TPM) Module receives RF signal error if data is not received or cannot be accurately decoded for a maximum of 20 minutes when the vehicle speed is above 24 km/h (15 mph).
- Tire Pressure Monitoring (TPM) Module receives internal sensor hardware error.
- Tire Pressure Monitoring (TPM) Module senses error in the shock sensor, pressure sensor, or temperature sensor.

DEFAULT ACTION

- Tire Pressure Monitoring (TPM) Module Lamp will flash on and off for 75 seconds then remain on solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 "Intermittent DTC Procedure" Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **USE THE TPM-RKE ANALYZER TO VERIFY THE CORRECT TPM SENSOR IS INSTALLED ON THE VEHICLE**

NOTE: **This fault can be set if the incorrect or no TPM Sensor is installed on the vehicle. If the spare tire is currently installed on the vehicle, and it is not equipped with a TPM Sensor, this DTC can be set. Replace the spare with a TPM Sensor equipped wheel and tire assembly. Test drive the vehicle. If the DTC resets, continue with the diagnostic procedure.**

1. Perform a visual inspection to verify that all road wheels are equipped with a TPM Sensor.
2. With the TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) verify the correct TPM Sensor is on the vehicle.

Is the correct TPM Sensor installed on the vehicle?

Yes

- Go To 3

No

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

3. **USE THE TPM-RKE ANALYZER TO LOCATE THE TIRE PRESSURE MONITORING (TPM) SENSOR WITH AN INTERNAL FAULT**

NOTE: **The following procedure is used to locate the TPM Sensor that is setting the internal fault. If the tires have been rotated, the TPM Sensor is no longer in sequence from the factory. Faults are linked to the TPM Sensor IDs. You MUST locate the TPM Sensor that set the fault before continuing. Use the following method below at every tire location.**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

NOTE: **Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the TPM Sensor. If the incorrect vehicle line and/or model year is selected, the TPM Sensor will not respond to the tool.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for a response, and store in the proper location in the TPM-RKE Analyzer. If you receive no response from any of the TPM Sensors, check to make sure that the TPM-RKE Analyzer is set correctly and repeat the process on each non-responsive wheel.
2. Replace the TPM Sensor if the results show a "Damaged Accel", "Damaged Temp", "Damaged Press", "H/W fail", "S/W fail" or the TPM Sensor does not respond after repeated attempts. Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** . Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
3. With the scan tool, select Data Display for the TPM Module.
4. Check to see if the Sensor IDs match what is programmed into the TPM Module.

Has the TPM Sensor been located?

Yes

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Go To 4

4. **USE TPM-RKE ANALYZER TO FIND TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULT FOR MISMATCHED ID**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to verify the TPM Sensor IDs match what is programmed into the TPM Module. The TPM Sensor Identifications are located under "Data Display" for the TPM Module.

Do the TPM Sensor IDs match what is stored in the TPM Module?

Yes

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1504-96-TIRE PRESSURE SENSOR 4 - INTERNAL COMPONENT FAILURE

NOTE: **Check for and remove any non-FCC compliant components, and verify that the tire pressures are correct, before beginning this diagnostic procedure.**

NOTE: **DO NOT REPLACE TPM SENSOR(S) IF DTC IS STORED**

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously

- Battery voltage between 9 and 16 volts.
- Vehicle speed above 24 km/h (15 mph).

SET CONDITION

- Tire Pressure Monitoring (TPM) Module receives RF signal error if data is not received or cannot be accurately decoded for a maximum of 20 minutes when the vehicle speed is above 24 km/h (15 mph).
- Tire Pressure Monitoring (TPM) Module receives internal sensor hardware error.
- Tire Pressure Monitoring (TPM) Module senses error in the shock sensor, pressure sensor, or temperature sensor.

DEFAULT ACTION

- Tire Pressure Monitoring (TPM) Module Lamp will flash on and off for 75 seconds then remain on solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
AFTERMARKET TIRES/WHEELS
INTERMITTENT TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL DTC
TIRE PRESSURE MONITORING (TPM) SENSOR
TIRE PRESSURE MONITORING (TPM) 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 DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 "Intermittent DTC Procedure" Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **USE THE TPM-RKE ANALYZER TO VERIFY THE CORRECT TPM SENSOR IS INSTALLED ON THE VEHICLE**

NOTE: **This fault can be set if the incorrect or no TPM Sensor is installed on the vehicle. If the spare tire is currently installed on the vehicle, and it is not equipped with a TPM Sensor, this DTC can be set. Replace the spare with a TPM Sensor equipped wheel and tire assembly. Test drive the vehicle. If the DTC resets, continue with the diagnostic procedure.**

1. Perform a visual inspection to verify that all road wheels are equipped with a TPM Sensor.
2. With the TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) verify the correct TPM Sensor is on the vehicle.

Is the correct TPM Sensor installed on the vehicle?

Yes

- Go To 3

No

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

3. **USE THE TPM-RKE ANALYZER TO LOCATE THE TIRE PRESSURE MONITORING (TPM) SENSOR WITH AN INTERNAL FAULT**

NOTE: **The following procedure is used to locate the TPM Sensor that is setting the internal fault. If the tires have been rotated, the TPM Sensor is no longer in sequence from the factory. Faults are linked to the TPM Sensor IDs. You MUST locate the TPM Sensor that set the fault before continuing. Use the following method below at every tire location.**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

NOTE: **Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the TPM Sensor. If the incorrect vehicle line and/or model year is selected, the TPM Sensor will not respond to the tool.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for a response, and store in the proper location in the TPM-RKE Analyzer. If you receive no response from any of the TPM Sensors, check to make sure that the TPM-RKE Analyzer is set correctly and repeat the process on each non-responsive wheel.
2. Replace the TPM Sensor if the results show a "Damaged Accel", "Damaged Temp", "Damaged Press", "H/W fail", "S/W fail" or the TPM Sensor does not respond after repeated attempts. Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** . Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
3. With the scan tool, select Data Display for the TPM Module.
4. Check to see if the Sensor IDs match what is programmed into the TPM Module.

Has the TPM Sensor been located?

Yes

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Go To 4

4. **USE TPM-RKE ANALYZER TO FIND TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULT FOR MISMATCHED ID**

NOTE: **If the TPM Sensor IDs do not match, it may be necessary to move the vehicle to a location away from other TPM Sensors and repeat this step.**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to verify the TPM Sensor IDs match what is programmed into the TPM Module. The TPM Sensor Identifications are located under "Data Display" for the TPM Module.

Do the TPM Sensor IDs match what is stored in the TPM Module?

Yes

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C151C-00-TIRE PRESSURE SENSORS MISSING-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

When installing a new Tire Pressure Monitoring (TPM) Module, the module is programed with universal IDs for the Tire Pressure Monitoring (TPM) Sensors. The TPM Module must be programmed with the correct TPM Sensor ID's.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 9 and 16 volts.
- Vehicle TPM Sensor ID locate process

SET CONDITION

- New Tire Pressure Monitoring (TPM) Module installed.

DEFAULT ACTION

- TPM ECU will not be able to monitor all wheel positions until autolearn detects a correct TPM Sensor ID set.
- TPM Indicator lamp illuminated.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
INCORRECT TIRE PRESSURE MONITORING (TPM) SENSOR ID(S)
TIRE PRESSURE MONITORING (TPM) SENSOR

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

NOTE: In the Scan Tool under Data "FF" is the default value. If this value is displayed, the Tire Pressure Monitoring (TPM) Module has not been programmed.

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) 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 INTERMITTENT DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **USE THE TPM-RKE ANALYZER TO CHECK TIRE PRESSURE MONITORING (TPM) SENSOR ID(S)**

    NOTE: Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to attempt to read the Sensor. If the incorrect vehicle line and/or model year is selected, the Sensor will not respond to the tool.

    NOTE: If you receive no response from any of the tire pressure sensors, check to make sure that the TPM-RKE Analyzer is set correctly, and repeat the

process on each of the non-responsive wheel(s)

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for an ID, store in the proper location in the TPM-RKE Analyzer.
2. Use a TPM-RKE Analyzer to upload the correct IDs and proper locations in the scan tool.
3. With the scan tool, select the TPM Module under "Miscellaneous Functions", follow the procedure for uploading TPM Sensor IDs.
4. With the scan tool, erase TPM Module DTCs.
5. Test drive the vehicle at a speed greater than 24 km/h (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
6. With the scan tool, check to see if the TPM sensor IDs match what is programmed into the TPM Module.

Is the correct TPM Sensor installed on the vehicle?

Yes

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C151D-00-TIRE PRESSURE SENSOR LOCATION UNDETERMINED-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The vehicle Tire Pressure Monitoring (TPM) Sensor locate process occurs after the vehicle is stationary for more than 20 min. The TPM system will determine the sensor positions while driving at speeds above 24 km/h (15 mph). This process can take up to 20 min to determine TPM Sensor positions.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 8.0 and 16.0 volts.
- Vehicle TPM Sensor locate process.

SET CONDITION

- New Tire Pressure Monitoring (TPM) Module has never attempted localization.
- Tire Pressure Monitoring (TPM) Module fails multiple vehicle TPM Sensor locate processes.
- Tire Pressure Monitoring (TPM) Module fails Left/Right or Front/Rear Sensor locate processes.
- Tire Pressure Monitoring (TPM) Sensors are present on first drive, the TPM Sensor location cannot be determined/guaranteed (cannot revert to last known good locations).

DEFAULT ACTION

- For Premium systems "Service TPM System" message displayed.

POSSIBLE CAUSES

Possible Causes
TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

VERIFY IF DTC C151D IS ACTIVE ON ITS OWN

NOTE: **The DTC C151D should not exist on its own. If any other DTCs are present, refer to the appropriate diagnostic procedure for that DTC first before continuing.**

NOTE: **If a new TPM Module was installed, the vehicle must remain stationary for 20 minutes before proceeding with this diagnostic procedure.**

1. Turn the ignition on.
2. With the scan tool, read DTCs and record on the repair order.
3. Test drive the vehicle at a speed greater than 24 km/h (15 mph) for 20 minutes in order to receive TPM Sensor data and allow for the system to update.
4. With the scan tool, erase TPM Module DTCs.
5. With the scan tool, read DTCs.

Is DTC C151D active on its own at this time?

Yes

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1570-00-DUPLICATE TIRE PRESSURE SENSOR IDS-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

When installing a new Tire Pressure Monitoring (TPM) Module, the module is programed with universal IDs for the Tire Pressure Monitoring (TPM) Sensors. The Tire Pressure Monitoring (TPM) Module must be

programmed with the correct TPM Sensor IDs or drive the vehicle for a minimum of 20 minutes with vehicle speed greater than 32 km/h (20 mph).

WHEN MONITORED

- Continuously
- Battery voltage between 8.0 and 16.0 volts.

SET CONDITION

- One or more TPM Sensors unit IDs are duplicated.

DEFAULT ACTION

- TPM ECU will not be able to monitor all wheel positions until autolearn detects a correct TPM Sensor ID set.
- TPM Indicator lamp illuminated.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
SENSOR IDS NOT DOWNLOADED INTO TIRE PRESSURE MONITORING (TPM) MODULE
INCORRECT TIRE PRESSURE MONITORING (TPM) SENSOR IDS
TIRE PRESSURE MONITORING (TPM) SENSOR

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

DIAGNOSTIC TEST

1. **CHECK FOR ACTIVE DTCS BEFORE AND AFTER DRIVING VEHICLE.**
    1. Check for and remove any non-FCC compliant components.
    2. Verify that all tire pressures are to the recommended cold inflation tire pressure specifications.
    3. Turn the ignition on.
    4. With the scan tool, read DTCs and record on the repair order.
    5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
    6. With the scan tool, read DTCs in the TPM Module.

    Is the DTC active?

    Yes

    - Go To 2

    No

    - Perform the Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **CHECK TIRE PRESSURE MONITORING (TPM) SENSOR IDS AFTER UPLOADING THEM WITH TPM-RKE TOOL**

    NOTE: Always be certain to select the proper vehicle line and model year when using this tool, as the tool will automatically use the correct protocol to

attempt to read the Sensor. If the incorrect vehicle line and/or model year is selected, the Sensor will not respond to the tool.

NOTE: **If you receive no response from any of the tire pressure sensors, check to make sure that the TPM-RKE Analyzer is set correctly, and repeat the process on each of the non-responsive wheel(s)**

1. Use a TPM-RKE Analyzer (special tool #2046300080, Kit, TPM/RKE ANALYZER) to scan each TPM Sensor for an ID, store in the proper location in the TPM-RKE Analyzer.
2. Use a TPM-RKE Analyzer to upload the correct IDs and proper locations in the scan tool.
3. With the scan tool, select the TPM Module under "Miscellaneous Functions", follow the procedure for uploading TPM Sensor IDs.
4. With the scan tool, erase TPM Module DTCs.
5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
6. With the scan tool, check to see if the TPM sensor IDs match what is programmed into the TPM Module.

Do the TPM IDs match?

Yes

- Test complete.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

No

- With the scan tool, read TPM DTCs. If any displayed, perform the appropriate diagnostic procedure. If there are none, repeat this test. A bad TPM will have other DTCs set.
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1580-00-LEFT/RIGHT SIDE TIRE PRESSURE SENSOR LOCATION UNDETERMINED-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The vehicle Tire Pressure Monitoring (TPM) Sensor locate process occurs after the vehicle remains stationary for 20 minutes. The Tire Pressure Monitoring (TPM) Module will determine the TPM Sensor positions. The TPM Sensors themselves determine which side of the vehicle they are located on.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 8.0 and 16.0 volts.
- Vehicle TPM Sensor locate process.

SET CONDITION

- New Tire Pressure Monitoring (TPM) Module has never attempted localization.

- Tire Pressure Monitoring (TPM) Module fails multiple vehicle TPM sensor locate processes if localization fails due to Left/Right sensor failure.

DEFAULT ACTION

- TPM system operates as normal

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TIRE PRESSURE MONITORING (TPM) SENSOR
TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR ACTIVE DTCS BEFORE AND AFTER DRIVING VEHICLE.**
    1. Check for and remove any non-FCC compliant components.
    2. Verify that all tire pressures are to the recommended cold inflation tire pressure specifications.
    3. Turn the ignition on.
    4. With the scan tool, read DTCs and record on the repair order.
    5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
    6. With the scan tool, read DTCs in the TPM Module.

    Is the DTC active?

    Yes

    - Go To 2

    No

    - Perform the Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **CHECK FOR ACTIVE TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULTS USING SCAN TOOL**
    1. Turn the ignition on.
    2. With the scan tool, select Data Display for the TPM Module and read for active DTCs for each TPM Sensor.

    Are there any Active sensor faults?

    Yes

    - For each TPM Sensor with a Fault, Install a new Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
    - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

    No

- Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
- Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1581-00-FRONT/REAR TIRE PRESSURE SENSOR LOCATION UNDETERMINED-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The vehicle Tire Pressure Monitoring (TPM) Sensor locate process occurs after the vehicle remains stationary for 20 minutes. The Tire Pressure Monitoring (TPM) Module will determine the Tire Pressure Monitoring (TPM) Sensor positions. The TPM Module measures the signal strength of each TPM sensor and determines if the are in the front or rear.

WHEN MONITORED

- Continuously
- Battery voltage between 8.0 and 16.0 volts.

SET CONDITION

- New Tire Pressure Monitoring (TPM) Module has never attempted localization.
- Tire Pressure Monitoring (TPM) Module fails multiple vehicle TPM sensor locate processes if localization fails due to Front/Rear sensor failure.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TIRE PRESSURE MONITORING (TPM) MODULE HARNESS
INCORRECT TIRE PRESSURE MONITORING (TPM) MODULE INSTALLATION
TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR ACTIVE DTCS BEFORE AND AFTER DRIVING VEHICLE.**
    1. Check for and remove any non-FCC compliant components.
    2. Verify that all tire pressures are to the recommended cold inflation tire pressure specifications.
    3. Turn the ignition on.
    4. With the scan tool, read DTCs and record on the repair order.
    5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
    6. With the scan tool, read DTCs in the TPM Module.

       Is the DTC active?

       Yes

       - Go To 2

No

- Perform the Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.

2. **CHECK FOR ACTIVE TIRE PRESSURE MONITORING (TPM) SENSOR INTERNAL FAULTS USING SCAN TOOL**
   1. Turn the ignition on.
   2. With the scan tool, select Data Display for the TPM Module and read for active DTCs for each TPM Sensor.

   Are there any Active sensor faults?

   Yes

   - For each TPM Sensor with a Fault. Install a new Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Go to 3
3. **CHECK FOR TIRE PRESSURE MONITORING (TPM) MODULE INTERFERENCE**

   NOTE: **Interference may occur if the TPM Module is installed incorrectly or the TPM harness is not fastened properly to the body.**

   1. Turn the ignition off.
   2. Verify the following:
      - Aftermarket devices are installed or in the vehicle.
      - The TPM Module harness is damaged or is routed incorrectly.
      - The TPM Module is installed incorrectly.

      Are there any of the conditions present that cause interference?

      Yes

      - Repair as necessary.
      - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

      No

      - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
      - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C1597-00-TPM SYSTEM DEACTIVATED - WINTER MODE-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

NOTE: **When this DTC is active the TPM Module will enter a deactivation mode (Winter Mode) and the TPM system becomes deactivated. If winter tires and wheel assemblies are installed no repair is required.**

The Tire Pressure Monitor (TPM) Module determines the TPM Sensor positions by performing the vehicle Tire Pressure Monitoring (TPM) Sensor locate procedure. This procedure is run after the vehicle has been stationary for 20 minutes. After driving the vehicle at speeds greater than 24 km/h (15 mph) for a minimum of 10 minutes without the TPM Sensor installed, the TPM Module sends a bus message commanding the TPM telltale lamp to flash for 75 seconds. After the 75 seconds of flashing, the lamp will remain on solid and a chime will be heard. The message center will display SERVICE TPM SYSTEM for five seconds and shut off, all while the tire pressure values will be displayed as dashes. After the ignition has been cycled off and on the TPM telltail lamp will remain off, the message center will no longer display SERVICE TPM SYSTEM, and the tire pressures continue to be displayed as dashes.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Continuously
- Battery voltage between 9 and 16 volts.
- Vehicle TPM Sensor locate process.

SET CONDITION

- BUX/Canada vehicles only.
- Tire Pressure Monitoring (TPM) Module where all four TPM Sensors fail the locate processes at the same time.
- TPM Sensors not installed on winter tire and wheel assemblies.

DEFAULT ACTION

- TPM System is operating normally.
- TPM Indicator lamp illuminated.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TIRE PRESSURE MONITORING (TPM) SENSORS NOT PRESENT
TIRE PRESSURE MONITORING (TPM) SENSORS
TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

1. **CHECK FOR ACTIVE DTCS BEFORE AND AFTER DRIVING VEHICLE.**
    1. Check for and remove any non-FCC compliant components.
    2. Verify that all tire pressures are to the recommended cold inflation tire pressure specifications.
    3. Turn the ignition on.
    4. With the scan tool, read DTCs and record on the repair order.

5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
6. With the scan tool, read DTCs in the TPM Module.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Perform the Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.

2. **CHECK IF TIRE PRESSURE MONITORING (TPM) IS IN WINTER MODE**
   1. Turn the ignition off.
   2. Cycle the ignition from off to on.
   3. Check for the following conditions:
      - The telltale lamp is off.
      - The tire pressure values in the Instrument Cluster are displayed as dashes.
      - The message center **is not** displaying "SERVICE TPM SYSTEM".

   Is Winter Mode activated based on the above conditions?

   Yes

   - The Tire Pressure Monitoring (TPM) Module is now in deactivation mode (Winter Mode). This DTC will remain active until the correct tire and wheel assemblies are installed back on the vehicle. Once one of the correct tire and wheel assemblies are reinstalled, the other three must also be reinstalled prior to turning the ignition on.

   No

   - Go To 3

3. **VERIFY CORRECT TIRE PRESSURE MONITORING (TPM) SENSORS ARE INSTALLED**
   1. Turn the ignition off.
   2. Verify the correct TPM Sensors are installed in all of the tire and wheel assemblies.

   Are the correct TPM Sensors installed?

   Yes

   - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Install the correct Tire Pressure Monitoring (TPM) Sensor in accordance with the Service Information. Refer to **SENSOR, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C15CB-00-FRONT AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

- Continuously
- Battery voltage between 9 and 16 volts.

SET CONDITION

- The Tire Pressure Monitoring (TPM) Module detects placard pressure values are not programmed.

DEFAULT ACTION

.

- TPM malfunction indicator will flash for 75 seconds and then be illuminated ON solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
MISSING PLACARD VALUES IN THE TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

COMPARE TIRE PRESSURE VALUES TO PLACARD VALUES USING SCAN TOOL

NOTE: A false low pressure warning can take place if the Tire Pressure Monitoring system fails localization. This will result in the system defaulting to the value of 80 psi for all TPM sensor locations. Perform the TPM Diagnostic Verification Test standard procedure to correct for this condition.

1. With the scan tool, select "TPM", "Data Display", "Tire Placard Pressure - Front" under each of the TPM Sensor Identification locations.
2. Compare the pressure values with the "Tire Inflation Pressure (Placard) Label located on the driver's side B-Pillar.
3. With the scan tool, select "TPM", "Miscellaneous Functions", "Update Pressure Threshold" and follow the instructions on the scan tool.
4. Enter the front and rear placard pressure values as seen on the Tire Inflation Pressure (Placard) Label.

   Do the tire pressure values match the Placard Values?

   Yes

   - Test complete.
   - Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Repeat this test.

- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C15CC-00-REAR AXLE TIRE PRESSURE PLACARD VALUE IMPLAUSIBLE

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

- Continuously
- Battery voltage between 9 and 16 volts.

SET CONDITION

- The Tire Pressure Monitoring (TPM) Module detects placard pressure values are not programmed.

DEFAULT ACTION

- TPM malfunction indicator will flash for 75 seconds and then be illuminated ON solid.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
MISSING PLACARD VALUES IN THE TIRE PRESSURE MONITORING (TPM) MODULE

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

DIAGNOSTIC TEST

COMPARE TIRE PRESSURE VALUES TO PLACARD VALUES USING SCAN TOOL

NOTE: A false low pressure warning can take place if the Tire Pressure Monitoring system fails localization. This will result in the system defaulting to the value of 80 psi for all TPM sensor locations. Perform the TPM Diagnostic Verification Test standard procedure to correct for this condition.

1. With the scan tool, select "TPM", "Data Display", "Tire Placard Pressure - Rear" under each of the TPM Sensor Identification locations.
2. Compare the pressure values with the "Tire Inflation Pressure (Placard) Label located on the driver's side B-Pillar.
3. With the scan tool, select "TPM", "Miscellaneous Functions", "Update Pressure Threshold" and follow the instructions on the scan tool.
4. Enter the front and rear placard pressure values as seen on the Tire Inflation Pressure (Placard) Label.

   Do the tire pressure values match the Placard Values?

   Yes

   - Test complete.
   - Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Repeat this test.

- Perform the TPM SENSOR VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C15D6-00-RUN FLAT TIRE PRESSURE BELOW THRESHOLD

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Tire Pressure Monitoring (TPM) Sensor actively monitors the air pressure, air temperature inside the tire, the direction of the tire rotation and the internal battery status. Each sensor has a unique ID code. The TPM Sensor transmits the data at regular intervals via an encoded signal to a receiver circuit located in the Tire Pressure Monitoring (TPM) Module.

Low Tire Pressure DTCs are set when Tire Pressure is below the preset threshold programmed per vehicle settings. These DTCs can usually be resolved by filling tire to the recommended pressures.

WHEN MONITORED

- Continuously
- Battery voltage between 9 and 16 volts.

SET CONDITION

- The Tire Pressure Monitoring (TPM) Module has detected pressure in any of the 4 sensors is at least 14.5 psi below minimum placard pressure values.

POSSIBLE CAUSES

Possible Causes
INCORRECT TIRE PRESSURE INCORRECT PLACARD VALUES

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

DIAGNOSTIC TEST

NOTE: DO NOT REPLACE TPM SENSOR. THIS FAULT IS EXPECTED IF TIRE PRESSURE IS 20% BELOW THE PLACARD PRESSURE

Inflate tire to cold placard pressure to remove the fault condition

NOTE: It is recommended to inflate tire 2 psi past placard pressure to ensure fault condition clears.

1. Test drive the vehicle at a speed greater than 24 km/h (15 mph) for 5 minutes in order to receive TPM Sensor data and allow for the system to update.
    1. Test complete
    2. Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

C2209-00-TIRE PRESSURE MONITOR INTERNAL-

For a complete TIRE PRESSURE MONITORING TPM SYSTEM wiring diagram, **refer to the appropriate wiring information** .

WHEN MONITORED

- Continuously
- Battery voltage between 9 and 16 volts.

SET CONDITION

- Tire Pressure Monitoring (TPM) Module detects an internal fault

DEFAULT ACTION

- TPM ECU will attempt to enter shutdown mode.
- TPM Indicator lamp illuminated.
- For Premium systems "Service TPM System" message displayed and pressure values replaced by dashes.

POSSIBLE CAUSES

Possible Causes
NON-FCC COMPLIANT COMPONENTS
TIRE PRESSURE MONITORING (TPM) MODULE - INTERNAL FAULT

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

DIAGNOSTIC TEST

1. **CHECK FOR ACTIVE DTCS BEFORE AND AFTER DRIVING VEHICLE.**
    1. Check for and remove any non-FCC compliant components.
    2. Verify that all tire pressures are to the recommended cold inflation tire pressure specifications.
    3. Turn the ignition on.
    4. With the scan tool, read DTCs and record on the repair order.
    5. Test drive the vehicle at a speed greater than 24 km/r (15 mph) for 20 minutes in order to receive TPM data and allow for the system to update.
    6. With the scan tool, read DTCs in the TPM Module.

       Is the DTC active?

       Yes

       - Go To 2

       No

       - Perform the Intermittent DTC Procedure. Refer to **STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE**.
2. **CHECK TPM AND RELATED MODULE HARNESS CONNECTIONS**
    1. Disconnect the TPM harness connector.
    2. Disconnect all related in-line harness connections (if equipped).
    3. 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.

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

   Did the DTC return?

   Yes

   - Install a new Tire Pressure Monitoring (TPM) Module in accordance with the Service Information. Refer to **MODULE, TIRE PRESSURE MONITORING (TPM), REMOVAL AND INSTALLATION** .
   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

   No

   - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
   - Test complete.

U0001-00-CAN C BUS

NOTE: **This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.**

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: **If present, diagnose and repair DTC U0002-00-CAN C BUS OFF PERFORMANCE- BUS OFF before diagnosing this DTC.**

NO TITLE

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** .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"

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** .

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** .

U0155-00-LOST COMMUNICATION WITH CLUSTER/CCN

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** .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

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** .

U0415-00-INVALID DATA RECEIVED FROM ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE "A"

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

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** .

U0423-00-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN

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** .

STANDARD PROCEDURE

STANDARD PROCEDURE - INTERMITTENT DTC PROCEDURE

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

INTERMITTENT DTC PROCEDURE

1. **INTERMITTENT WIRING DTC**
    1. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
    2. Wiggle test the wiring harness and connectors while monitoring the scan tool data relative to this circuit.
    3. Look for the data to change or for the DTC to reset during the wiggle test.
    4. While monitoring the scan tool data relative to this circuit.
    5. Look for the data to change other than as expected or for the DTC to reset.

    Is there an Active DTC?

    Yes

    - Perform the diagnostic procedure as necessary. Refer to **DIAGNOSIS AND TESTING**.

    No

    - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
    - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.
2. **INTERMITTENT SENSOR DTC PROCEDURE**
    1. The conditions necessary to set this DTC are not present at this time.
    2. Perform any Service Bulletins that may apply to this condition.
    3. Inflate or deflate the tire of the tire pressure sensor that is setting the fault by 5 psi.
    4. With the scan tool, erase TPM DTCs.
    5. Test drive the vehicle for a minimum of 20 minutes with vehicle speed greater than 24 km/h (15 mph).
    6. With the scan tool, read TPM DTCs.

    Is the DTC active?

    Yes

    - Perform the diagnostic procedure as necessary. Refer to **DIAGNOSIS AND TESTING**.

    No

    - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
    - Perform the TPM VERIFICATION TEST. Refer to **STANDARD PROCEDURE - TPM VERIFICATION**.

STANDARD PROCEDURE - TPM VERIFICATION

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

DIAGNOSTIC TEST

1. **TIRE PRESSURE MONITORING (TPM) MODULE**

Was the TPM Module replaced during the test procedure?

Yes

- Go To 2

No

- Go To 3

2. **TPM MODULE REPLACEMENT**
    1. Perform Tire Pressure Monitoring (TPM) system module programming as needed.

       Using (special tool #2046300080, Kit, TPM/RKE ANALYZER) and the scan tool, navigate to the TPM system module and then its "Miscellaneous Functions" menu to select and perform the following procedures:

        1. Program Left Front Tire Sensor ID
        2. Program Left Rear Tire Sensor ID
        3. Program Right Front Tire Sensor ID
        4. Program Right Rear Tire Sensor ID
    2. Drive the vehicle for a minimum of 20 minutes while maintaining a continuous speed above 24 km/h (15 mph).
    3. With the scan tool, read TPM DTCs.

    Are there any DTCs present?

    Yes

    - Repair not complete, perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

    No

    - Go To 3

3. **TPM SENSOR REPLACEMENT**

    NOTE: **If a TPM-RKE Tool is not available, let the vehicle sit stationary for more then 20 minutes, and then proceed to step #4 below.**

    1. Using an updated TPM-RKE Analyzer Tool, select TPM Functions, then enter the Model Year and the Body Style of the vehicle, and for the Trigger Selection select PARK SENSOR
    2. Scan each TPM Sensor at each road wheel, and store each TPM Sensor ID in the correct location. (LEFT FRONT, LEFT REAR, RIGHT FRONT, RIGHT REAR, and SPARE TIRE (if equipped).)
    3. Using the Scan Tool, Go to "TPM", then "Misc Function" and choose the corresponding wheel to Program the Sensor ID. (ID can be obtained on Sensor itself or can be read via the TPM-RKE Analyzer tool)
    4. Drive the vehicle for a minimum of 20 minutes while maintaining a continuous speed above 24 km/h (15 mph).
    5. With the scan tool, read TPM DTCs.

    Are there any TPM DTCs present?

    Yes

    - Perform the appropriate diagnostic procedure. Refer to **DIAGNOSIS AND TESTING**.

No

- Repair complete.

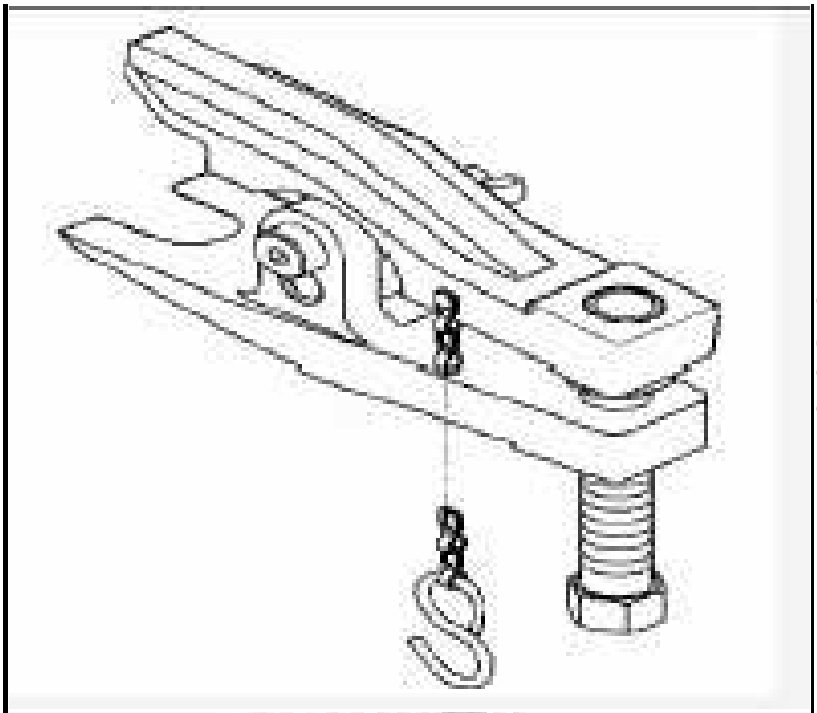
SPECIAL TOOLS

	2050900030 - Remover, Ball Joint
	2051000030 - Receiver, Ball Joint Remover

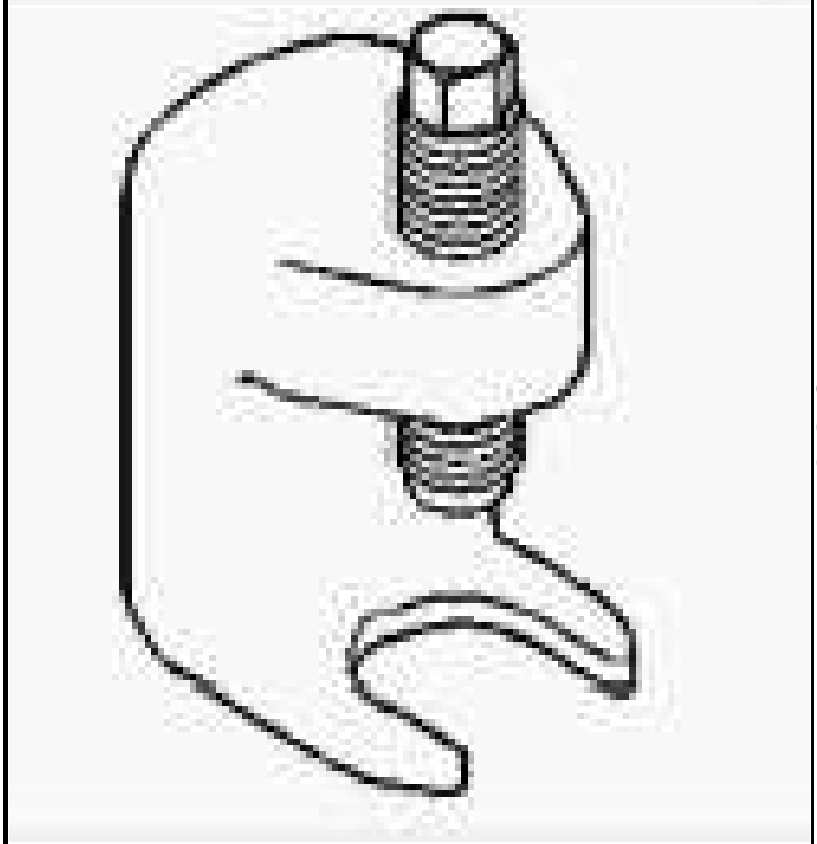
2051100030 - Installer, Ball Joint

2051200030 - Receiver, Ball Joint Lower Installation

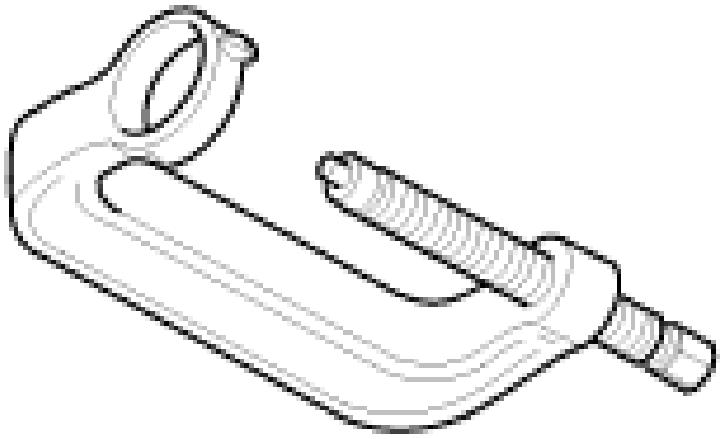
2051300030 - Receiver, Ball Joint Upper Installation



9360 - Remover, Ball Joint
(Originally Shipped In Kit Number(s) 9329, 9515, 9516, 9516-CAN, 9517, 9517-CAN, 9518, 9519, 9540, 9541.)



C-4150A - Press, Ball Joint
(Originally Shipped In Kit Number(s) 6672, 6745.)

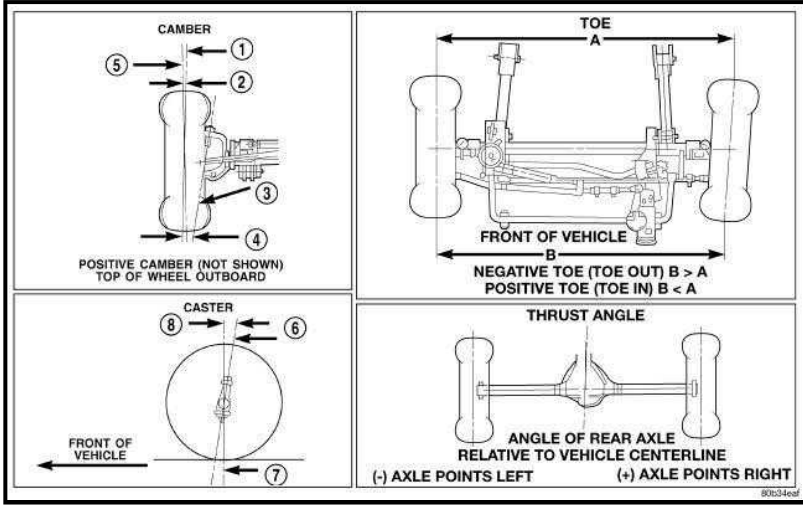
	C-4212F - Press, Ball Joint (Originally Shipped In Kit Number(s) 6745, 6880, 6881, MLR-C03.)

WHEEL ALIGNMENT

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



1 - WHEEL CENTERLINE
2 - NEGATIVE CAMBER ANGLE
3 - PIVOT CENTERLINE
4 - SCRUB RADIUS
5 - TRUE VERTICAL
6 - KING PIN
7 - VERTICAL
8 - POSITIVE CASTER

Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber and toe position.

CAUTION: **Never attempt to modify suspension or steering components by heating or bending.**

OPERATION

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns.
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire. The angle is not adjustable, damaged component(s) must be replaced to correct the camber angle.
- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires. Incorrect wheel toe position is the most common cause of unstable steering and uneven tire wear. The wheel toe position is the **final** front wheel alignment adjustment.
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted. The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, damaged component(s) must be replaced to correct the steering axis inclination angle.
- **THRUST ANGLE** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING

PRE-WHEEL ALIGNMENT INSPECTION

Before starting wheel alignment, the following inspection and necessary corrections must be completed. Refer to the suspension and steering system diagnosis chart below for additional information.

1. Inspect tires for size, air pressure, and tread wear. If tire wear is found, proceed to following steps. If not, proceed to step 2.
    1. Inspect the front wheel bearings for wear using the procedure outlined in the hub and bearing section.
    2. Inspect the front wheels for excessive radial or lateral runout and balance using procedure outlined in tire and wheel section.
2. Inspect the ball joints, linkage pivot points, and the steering gear for looseness, roughness, binding, wear or noise using the appropriate component diagnosis procedure.
3. Road test the vehicle. The purpose of road testing the vehicle is to fully understand the voice of the customer. During the road test, the customer complaint should be duplicated under the same conditions that the customer cites (i.e. road, lane, and speeds) as an issue.
    1. Vehicle pulling and steering wheel off center complaints can often be misdiagnosed. The road test should be used to determine if the vehicle is actually pulling, or if the steering wheel is off center.
    2. While driving in a stable manner, a test driver can differentiate a pull and wheel off center condition by momentarily releasing the steering wheel and observing whether the vehicle tracks straight, follows the road crown or if the steering wheel is simply off center to one side.
    3. Depending on the results, the appropriate corrective action should be applied.

SUSPENSION AND STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn hub and bearing.	1. Replace the hub and bearing.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
EXCESSIVE PLAY IN STEERING	1. Loose or worn hub and bearing.	1. Replace the hub and bearing.

CONDITION	POSSIBLE CAUSES	CORRECTION
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Loose or worn steering gear.	3. Replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearing.	1. Replace the wheel bearing.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Tires worn or out of balance.	3. Replace or balance the tires.
	4. Wheel Alignment.	4. Align the vehicle to specifications.
VEHICLE INSTABILITY	1. Loose or worn wheel bearing.	1. Replace the wheel bearing.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Tire pressure.	3. Adjust the tire pressure.
	4. Wheel Alignment.	4. Align the vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear.	1. Replace the steering gear.
	2. Column coupler binding.	2. Replace the coupler.
	3. Tire pressure.	3. Adjust the tire pressure.
	4. Wheel Alignment.	4. Align the vehicle to specifications.
VEHICLE PULLS TO ONE SIDE	1. Tire pressure.	1. Adjust the tire pressure.
	2. Tire.	2. Cross rotate the front tires.
	3. Wheel Alignment.	3. Align the vehicle to specifications.
	4. Loose or worn steering or suspension components.	4. Tighten or replace components as necessary.
	5. Radial tire lead.	5. Rotate or replace tires as necessary.
	6. Brake pull.	6. Repair the brake system as necessary.
	7. Weak or broken spring.	7. Replace the spring.

NOTE: **If the Steering wheel is off-center prior to the wheel alignment, perform the following:**

- **Adjust the Steering wheel to the "Full Up" position using the adjustment lever on the column.**
- **Turn the Steering wheel to its straight/centered position.**
- **With the Steering wheel centered, use the scan tool and go to the EPS module. Read and record the position of the Steering Angle Sensor.**
- **With the Steering Wheel centered and in the "Full Up" position, reset the value of the steering wheel angle sensor in the EPS module via the Scan Tool.**
- **With the Steering Wheel centered and in the "Full Up" position, measure and adjust the toe-in.**

STANDARD PROCEDURE

WHEEL ALIGNMENT

CAMBER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

Camber can not be adjusted.

CASTER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

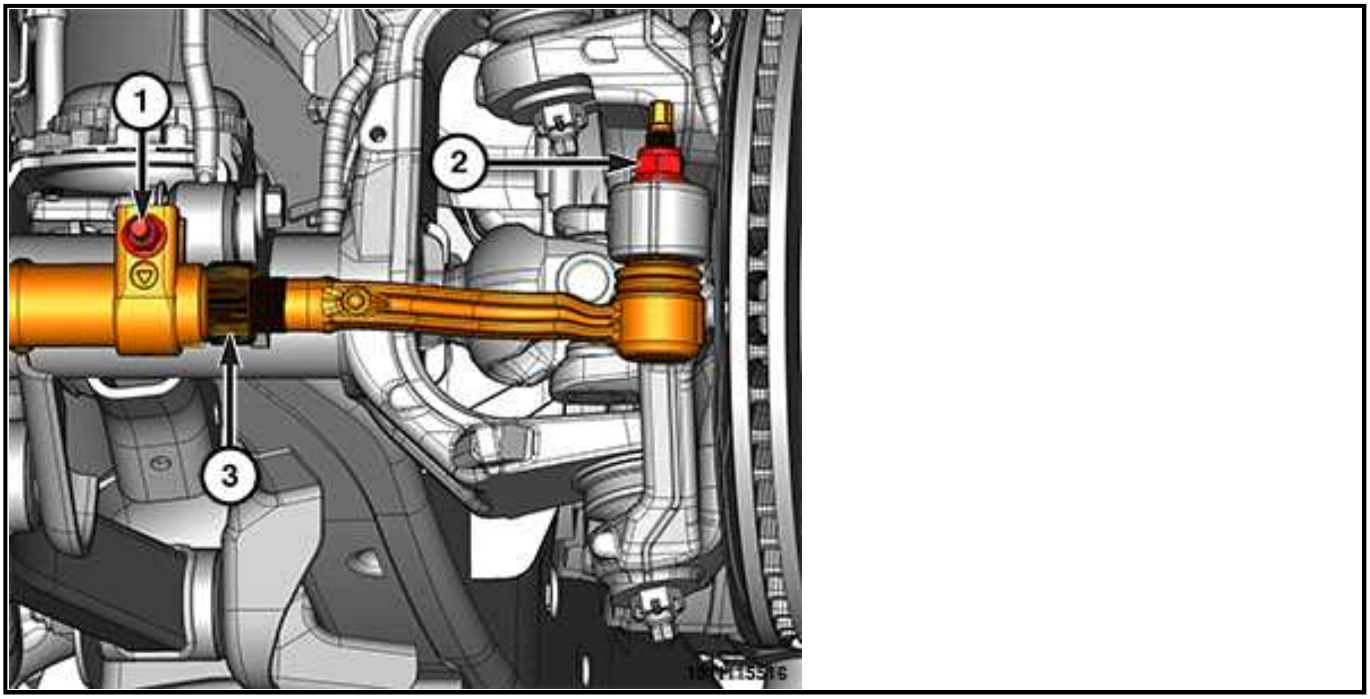
Check the caster of the front axle for correct angle. Be sure the axle is not bent or twisted. Road test the vehicle and observe the steering wheel return-to-center position. Low caster will cause poor steering wheel return ability.

During the road test, turn the vehicle to both the left and right. If the steering wheel returns to the center position unassisted, the caster angle is correct. However, if steering wheel does not return toward the center position unassisted, a low caster angle is probable.

Caster can not be adjusted.

TOE POSITION

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

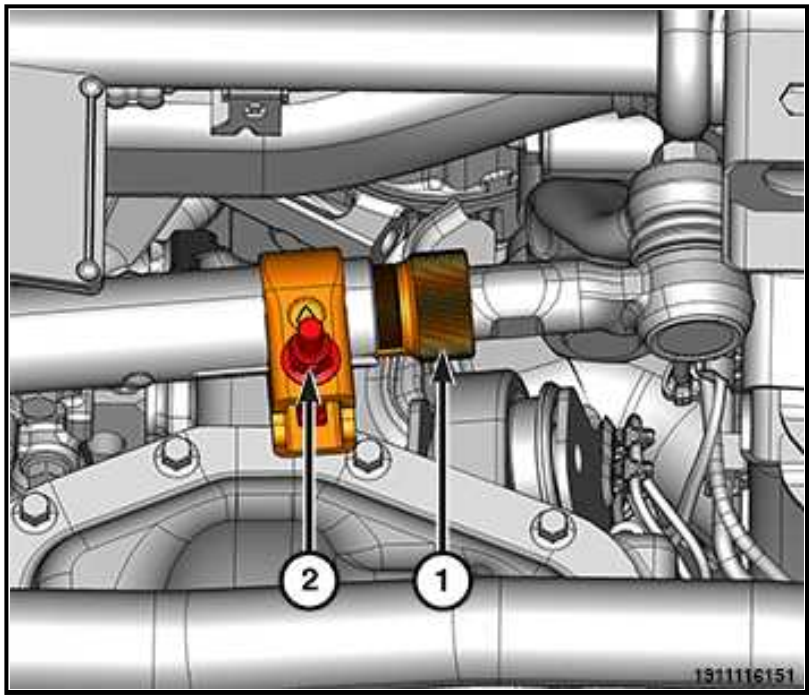


NOTE: **The wheel toe position adjustment is the final adjustment. This adjustment must be performed with the engine running, if the vehicle is equipped with power steering.**

1. Start the engine and turn the steering wheel both ways before straightening the steering wheel. Center and secure the steering wheel.

   NOTE: **Design specifications for the steering wheel angle is 0.5B° right of center.**

2. Loosen the adjustment sleeve clamp bolts (1).
3. Adjust the total toe with the tie rod. Turn the knurled adjuster (3) until the correct total toe is reached. **Center** both sockets at the knuckles and the clamp bolts and tighten to the proper. Refer to **TORQUE SPECIFICATION** . **Make sure the toe setting does not change during clamp tightening.**



4. Adjust the drag link adjuster sleeve (1) so that the left and right toe values are equal. Verify the steering wheel is still straight. Position the drag link adjuster clamp (2) as shown in illustration and tighten to the proper. Refer to **TORQUE SPECIFICATION** .
5. Verify the toe specifications and turn off the engine.

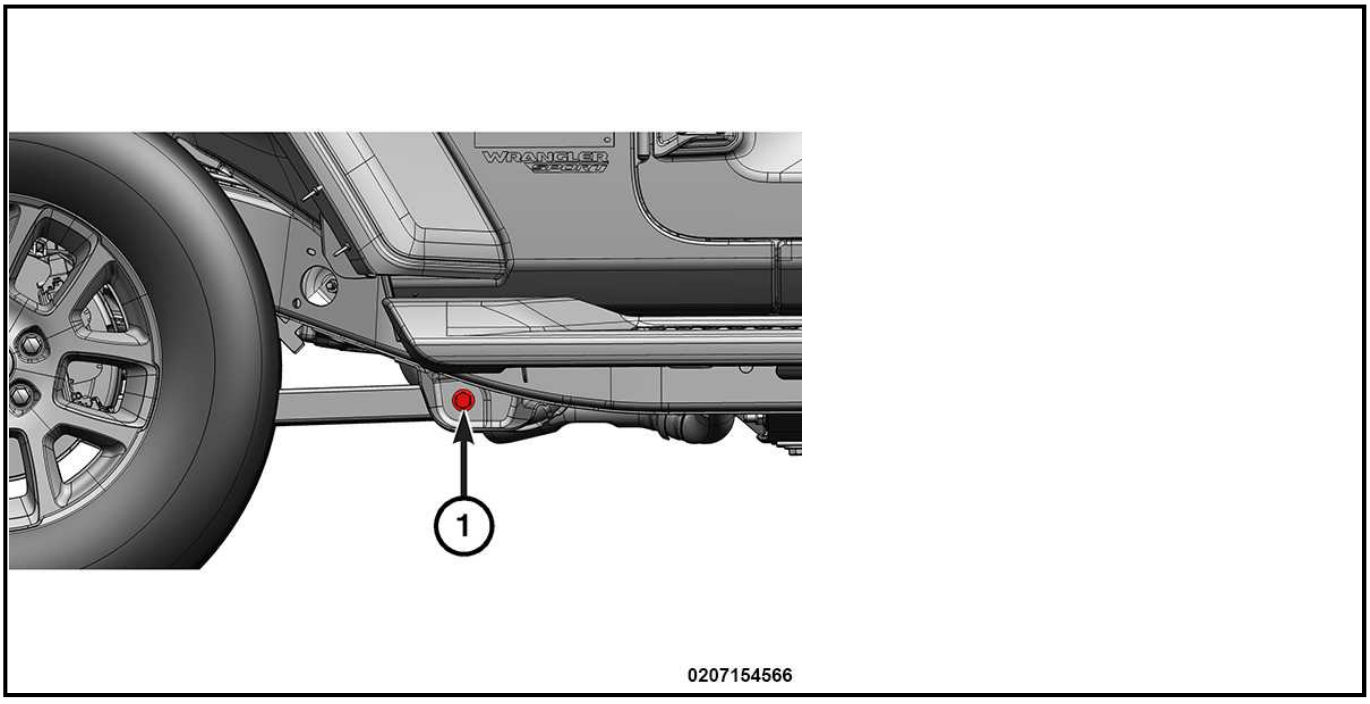
CURB HEIGHT MEASUREMENT

The vehicle suspension height should be measured before performing wheel alignment procedure. Also when front suspension components have been replaced. This measure must be performed with the vehicle supporting it's own weight and taken on both sides of the vehicle.

Front and rear curb heights are not adjustable. The spring selections at assembly determine curb height for acceptable appearance of the vehicle. Curb height dimensions assume full fluids (including fuel) and zero passengers. Refer to the table below for front curb height dimensions.

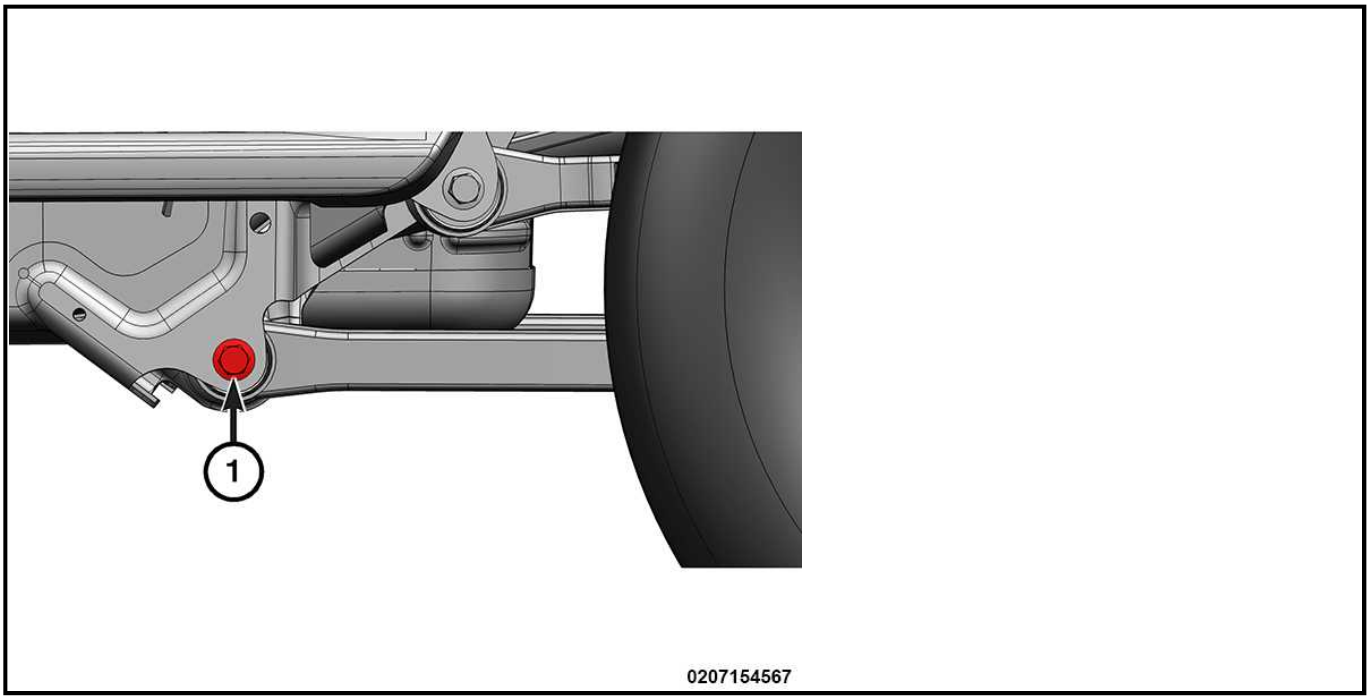
Vehicle curb height audits should be performed utilizing the following procedure:

NOTE: **Make sure the vehicle is in 2WD when checking curb height.**



FRONT CURB HEIGHT

1. Bounce the front of the vehicle five times.
2. Measure and record the dimensions
3. Measure the height from the center of the lower control arm rear bolt (1).
4. Measure the height from the center of the front wheel to the ground.
5. Subtract the lower control arm bolt height from the wheel center height to get the front curb height.



REAR CURB HEIGHT

1. On each side of the vehicle, measure the height from the center of the lower control arm front bolt (1) to the ground.
2. Measure the height from the center of the rear wheel to the ground.
3. Subtract the lower control arm bolt height from the wheel center height to get the rear curb height.

CURB HEIGHT SPECIFICATIONS

MODEL	FRONT	REAR
SPORT	40 mm / B±12 mm 1.57 in. / B± 0.47 in	71 mm / B±12 mm 2.80 in. / B± 0.47 in
RUBICON	32 mm / B±12 mm 1.26 in. / B± 0.47 in	69 mm / B±12 mm 2.72 in. / B± 0.47 in
MOJAVE	20 mm / B±12 mm 0.79 in. / B± 0.47 in	66 mm / B±12 mm 2.60 in. / B± 0.47 in

TOLERANCES

TOLERANCE	CROSS HEIGHT TOLERANCE
B± 12 mm B±0.47 in	B± 12 mm B±0.47 in

TECHNICAL SPECIFICATIONS

MEASUREMENT SPECIFICATIONS

NOTE: **All specifications are given in degrees.**

NOTE: **All wheel alignments are to be set at curb height. Refer to WHEEL ALIGNMENT, STANDARD PROCEDURE.**

Front Wheel Alignment Service Measurement Check Specifications						
B	**Total Toe****	**Caster**	**Cross Caster***	**Camber - Left**	**Camber - Right**	**Cross Camber***
Sport	0.20B° +/- 0.20B°	4.65B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.50B°	-0.25B° +/- 0.50B°	0.00B° +/- 0.50B°
Rubicon	0.20B° +/- 0.20B°	4.45B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.50B°	-0.25B° +/- 0.50B°	0.00B° +/- 0.50B°
Mojave	0.20B° +/- 0.20B°	4.48B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.50B°	-0.25B° +/- 0.50B°	0.00B° +/- 0.50B°
NOTE: **Caster values required to be greater than or equal to 4.0B° for all variants**						
* Cross Alignment values are determined by taking the left side value minus the right side value.						
** TOTAL TOE is the sum of both left and right wheel toe setting. TOTAL TOE must be equally split between each wheel on the same axle to ensure the steering wheel is centered after setting toe. Positive toe is toe-in and negative toe is toe-out.						

Rear Wheel Alignment Service Measurement Check Specifications					
B	**Individual Toe***	**Sum Toe***	**Thrust Angle**	**Individual Camber***	**Cross Camber***
All	0.15B° +/- 0.33B°	0.30B° +/- 0.33B°	0.00B° +/- 0.30B°	-0.10B° +/- 0.65B°	0.00B° +/- 0.65B°
* For reference only. These are non adjustable angles.					

SET-TO SPECIFICATIONS

NOTE: **All specifications are given in degrees.**

NOTE: **All wheel alignments are to be set at curb height. Refer to WHEEL ALIGNMENT, STANDARD PROCEDURE.**

Front Wheel Alignment Set-To Specifications						
B	**Total Toe****	**Caster**	**Cross Caster***	**Camber - Left**	**Camber - Right**	**Cross Camber***
Sport	0.20B° +/- 0.15B°	4.65B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.37B°	-0.25B° +/- 0.37B°	0.00B° +/- 0.50B°
Rubicon	0.20B° +/- 0.15B°	4.45B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.37B°	-0.25B° +/- 0.37B°	0.00B° +/- 0.50B°
Mojave	0.20B° +/- 0.15B°	4.48B° +/- 1.00B°	0.00B° +/- 0.50B°	-0.25B° +/- 0.37B°	-0.25B° +/- 0.37B°	0.00B° +/- 0.50B°
NOTE: **Caster values required to**						

Front Wheel Alignment Set-To Specifications						
B	Total Toe**	Caster	Cross Caster*	Camber - Left	Camber - Right	Cross Camber*
be greater than or equal to 4.0B° for all variants						
* Cross Alignment values are determined by taking the left side value minus the right side value.						
** TOTAL TOE is the sum of both left and right wheel toe setting. TOTAL TOE must be equally split between each wheel on the same axle to ensure the steering wheel is centered after setting toe. Positive toe is toe-in and negative toe is toe-out.						

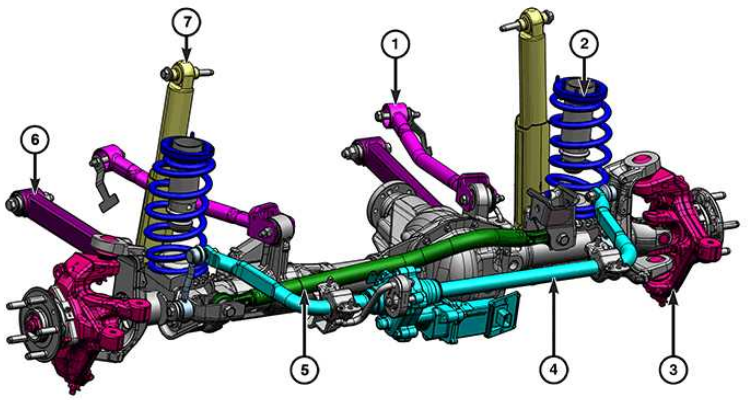
Rear Wheel Alignment Set-to Specifications					
B	Individual Toe*	Sum Toe*	Thrust Angle	Individual Camber*	Cross Camber*
All	0.15B° +/- 0.30B°	0.30B° +/- 0.30B°	0.00B° +/- 0.30B°	-0.10B° +/- 0.50B°	0.00B° +/- 0.50B°
* For reference only. These are non adjustable angles.					

FRONT

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The front suspension system consists of the following major components:

COMPONENT INDEX

1.	Refer to **UPPER CONTROL ARMS**.
2.	Refer to **COIL SPRINGS**.
3.	Refer to **STEERING KNUCKLES**.
4.	Refer to **STABILIZER BAR OR ACTIVE STABILIZER BAR SYSTEM (ASBS)**.
5.	Refer to **TRACK BAR**.
6.	Refer to **LOWER CONTROL ARMS**.
7.	Refer to **SHOCK ABSORBER**.

CAUTION: **Suspension components with rubber/urethane bushings (except stabilizer bar to frame and stabilizer bar to link attachments) should be tightened with the full weight of the vehicle at curb height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their curb height, vehicle ride comfort could be affected and premature bushing wear may occur.**

OPERATION

COIL SPRINGS

COIL SPRINGS

Refer to **COMPONENT INDEX**.

A rubber isolator is located between the top of the spring and the frame. The bottom of the spring seats on the axle perch and uses a rubber isolator.

LOWER CONTROL ARMS

LOWER CONTROL ARMS

Refer to **COMPONENT INDEX**.

The lower control arms are steel and use bushings at both ends of the arm. The arms mount to the frame rail bracket and the axle brackets.

SHOCK ABSORBER

SHOCK ABSORBER

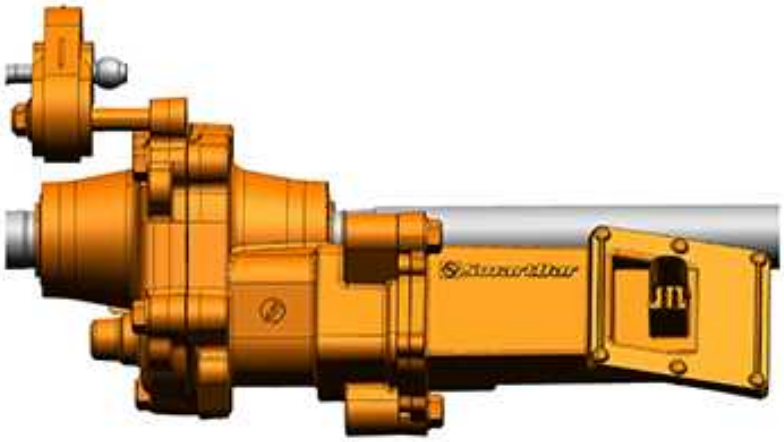
Refer to **COMPONENT INDEX**.

The top of the shock absorbers are bolted to a frame bracket. The bottom of the shocks are bolted to the axle brackets.

STABILIZER BAR OR ACTIVE STABILIZER BAR SYSTEM (ASBS)

STABILIZER BAR OR ACTIVE STABILIZER BAR SYSTEM (ASBS)

Refer to **COMPONENT INDEX**.



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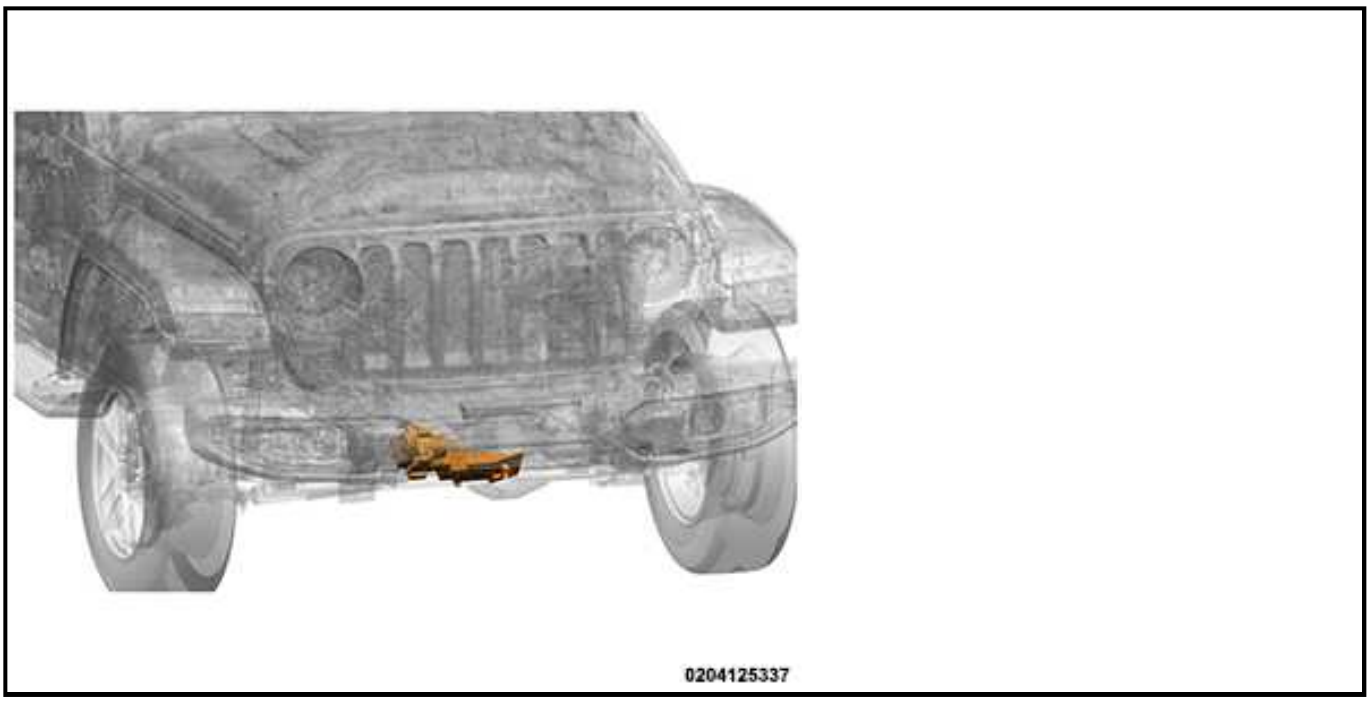


The actuator is a motor driven unit that engages and disengages the disconnecting stabilizer bar.

The ASBS switch is integral to the Auxiliary Switch Bank Module (ASBM) which communicates over LIN to the Body Control Module (BCM). The Body Controller simply gates the switch request to the ASBS module and the LED request from the ASBS to the ASBM. There is no functionality in the BCM.

When the stabilizer bar is disengaged/unlocked the LED in the switch will be SOLID. The LED will be OFF when the stabilizer bar is engaged/locked and will not automatically re-disengage without a customer request (switch actuation).

The LED on the switch will flash for the following reasons:

- When the stabilizer bar disconnect or connect is "In Progress"
- The vehicle speed threshold has been exceeded with stabilizer bar disconnected (when transfer case is 4LO or 4HI)
- The stabilizer bar was previously disconnected (in 4LO/4HI transfer case) and re-connected because transfer case was changed to N

The ASBS module provides status messages which are displayed in the Instrument Panel Cluster (IPC).

The ASBS module receives B+ from a switched ignition feed and has a connection to ground at all times.

The ASBS module communicates over CAN-C.

STEERING KNUCKLES

STEERING KNUCKLES

Refer to **COMPONENT INDEX**.

The steering knuckles are a single aluminum casting with legs machined for the upper and lower ball joints. The steering knuckles also have machined mounting locations for the front brake calipers and hub bearing.

TRACK BAR

TRACK BAR

Refer to **COMPONENT INDEX**.

The front track bar is a forged component with non-replaceable bushings on the frame and axle sides.

UPPER CONTROL ARMS

UPPER CONTROL ARMS

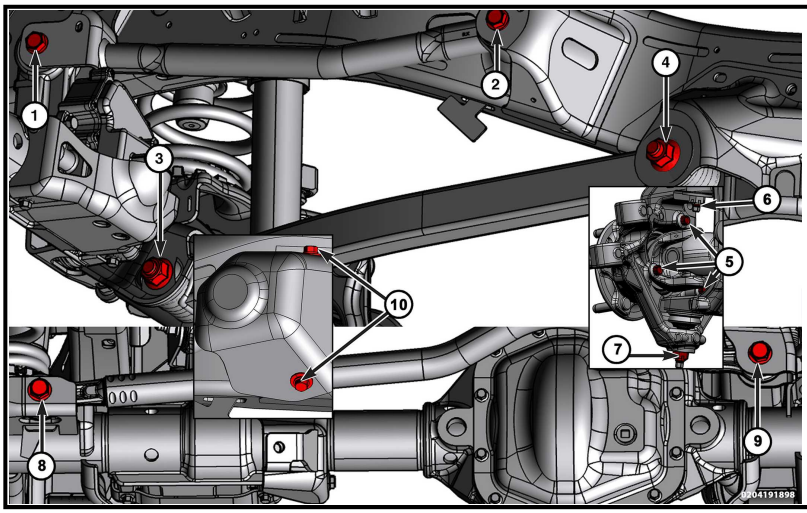
Refer to **COMPONENT INDEX**.

The upper control arms are steel and use rubber bushings at each end of the arm. The arms mount to the frame rail bracket and the axle brackets.

TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

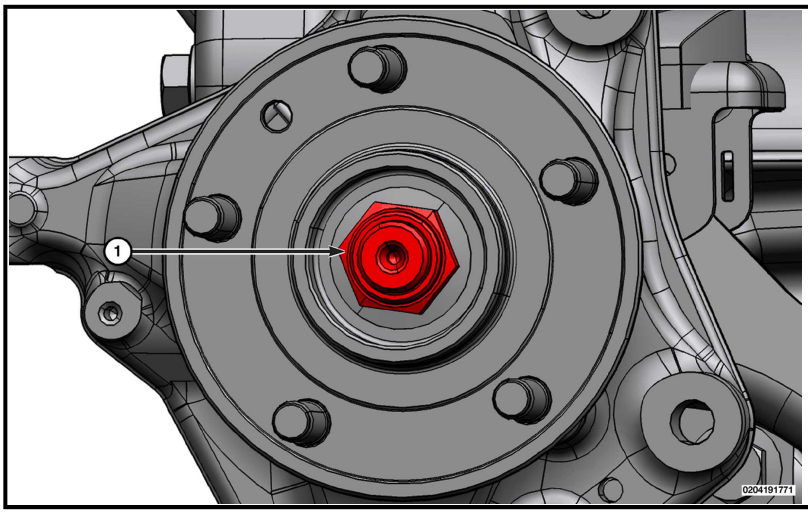
FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction	**20 N. m (15 Ft. Lbs.)**	-

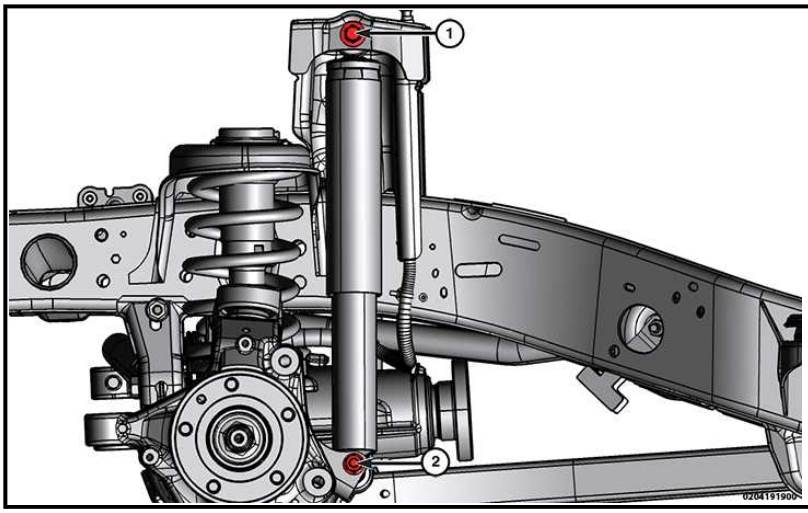
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
	hardened ball joint W/O "IH" marking on the ball joint.		
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
			aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



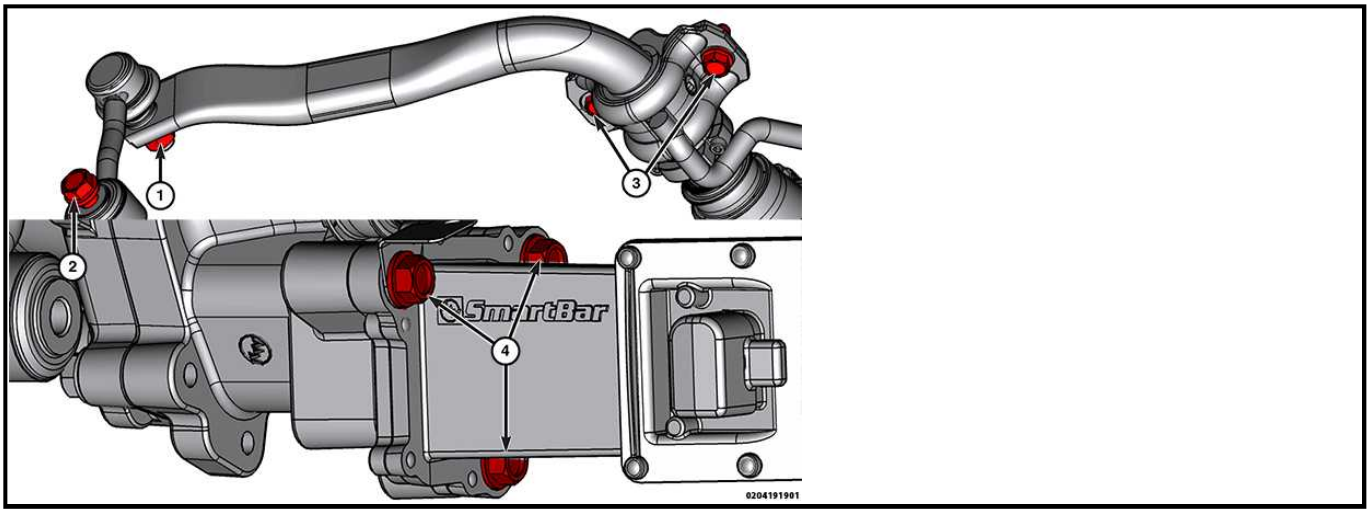
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

SHOCK ABSORBERS



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**140 N. m (103 Ft. Lbs.)**	-
2	Shock Absorber Lower Bolt	**100 N. m (77 Ft. Lbs.)**	-

FRONT STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Nut	**115 N. m (85 Ft. Lbs.)**	-
2	Stabilizer Bar Link Lower Bolt	**90 N. m (66 Ft. Lbs.)**	-
3	Stabilizer Bar Bolts	**63 N. m (46 Ft. Lbs.)**	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
4	Stabilizer Bar Actuator Bolts	**25 N. m (18 Ft. Lbs.)**	-

ARM, LOWER CONTROL

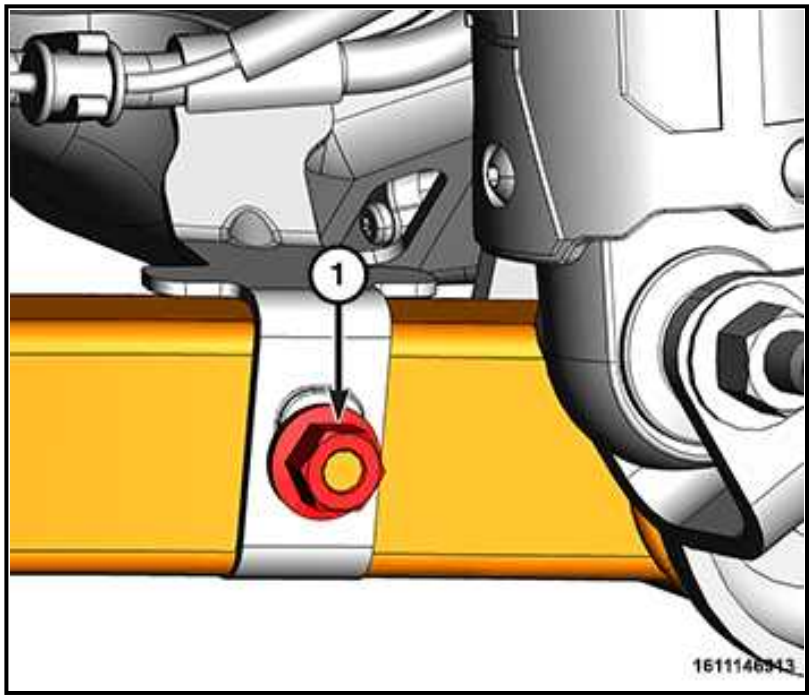
REMOVAL AND INSTALLATION

LOWER CONTROL ARM

REMOVAL

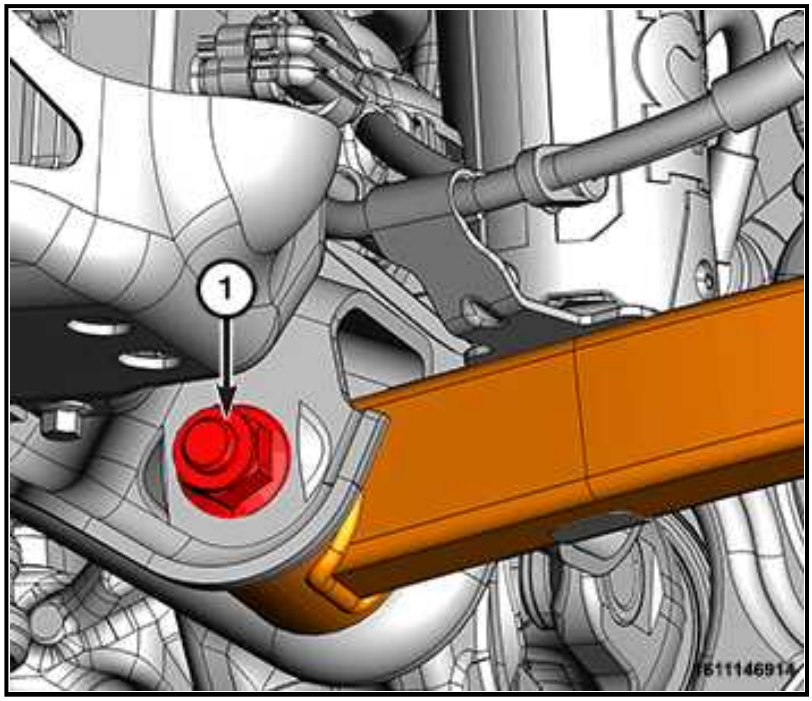
NOTE: **If the vehicle is equipped with a cam bolt service kit, paint or scribe marks on the cam adjuster and the control arm for installation reference.**

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Using a suitable stand support the front axle assembly.



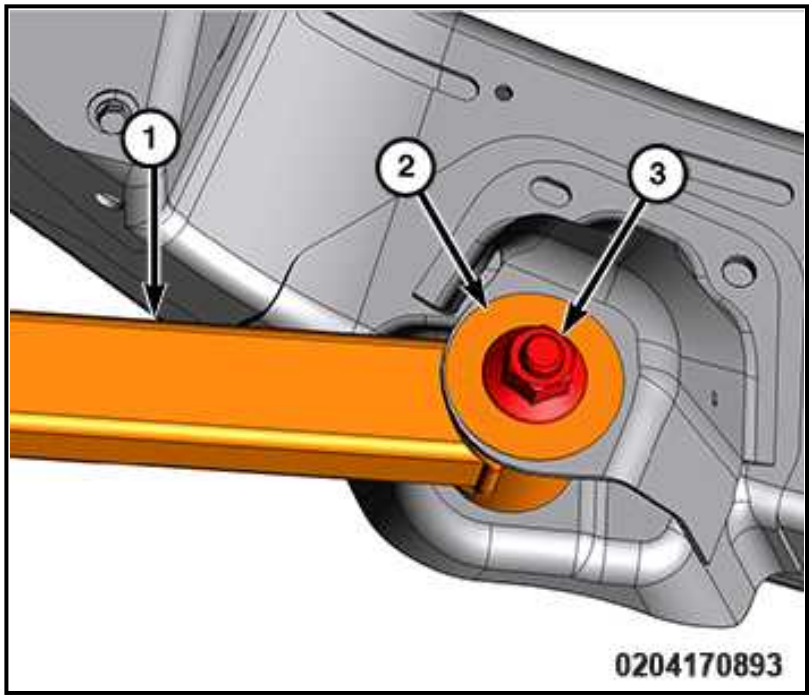
1 - Front Brake Hose Lower Control Arm Nut

3. Remove the front brake hose lower control arm nut and remove the bracket from the stud.



1 - Lower Control Arm Front Nut

4. Remove the lower control arm front nut and bolt.



5. Remove the lower control arm rear nut and bolt and the washer if equipped, then remove the lower control arm.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

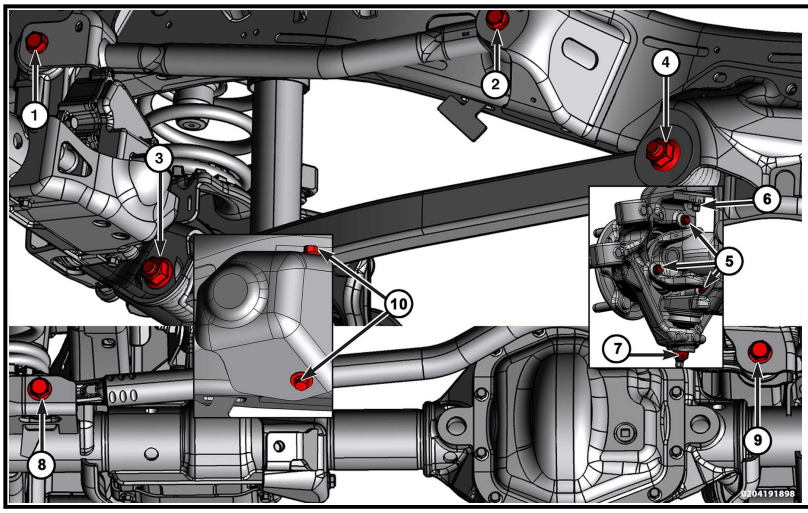
NOTE: **The paint dot located on the control arm should face outboard. If paint dot is not visible, the bend should point inboard, and the short end should attach to the axle side.**

NOTE: **All lower control arm bolts must be installed outboard to inboard.**

- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE**.

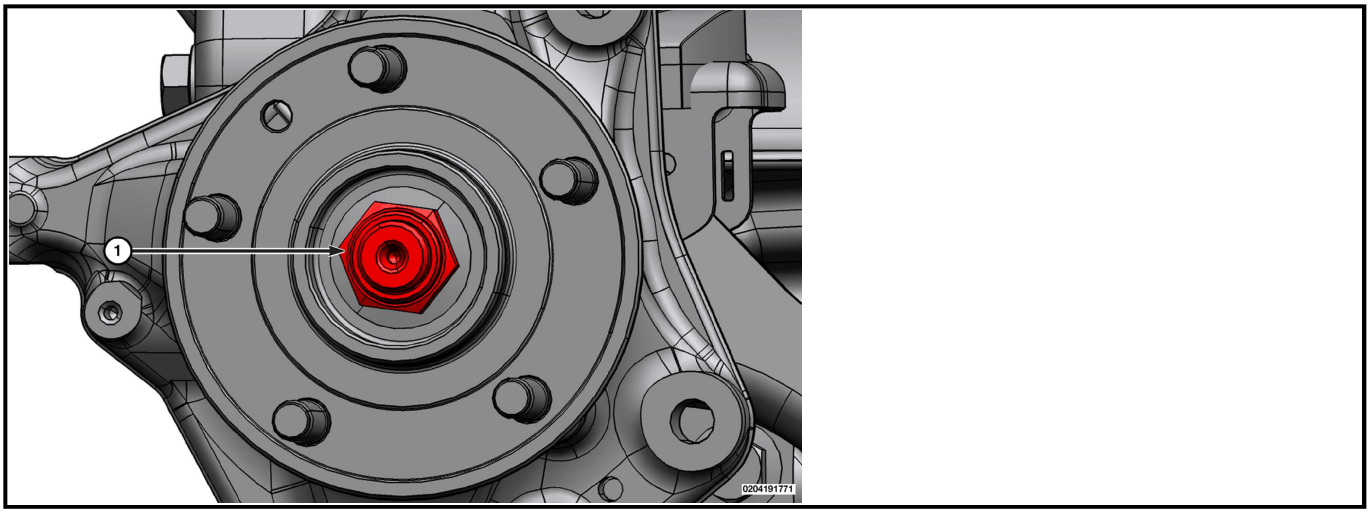
TORQUE SPECIFICATIONS

FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

ARM, UPPER CONTROL

REMOVAL AND INSTALLATION

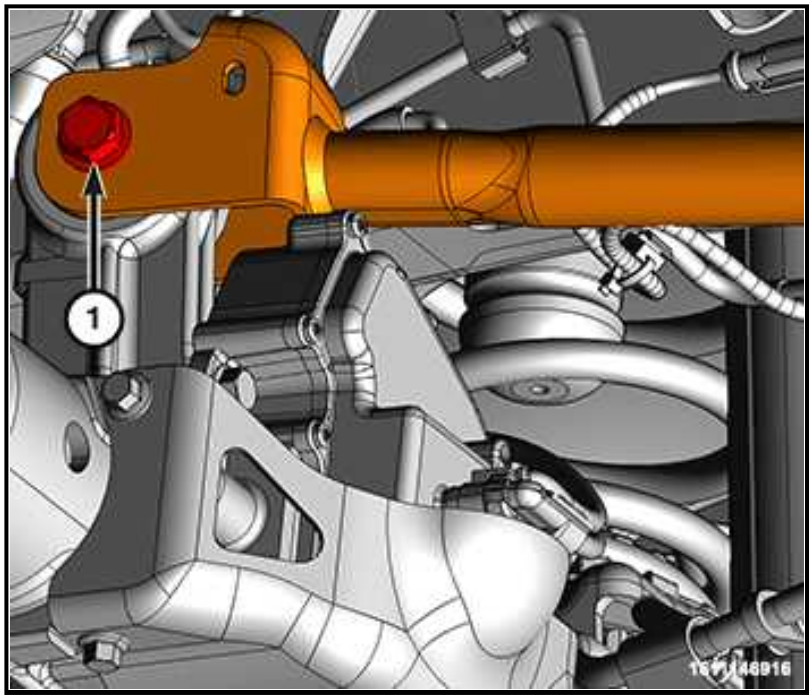
WITHOUT 3.0L DIESEL

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

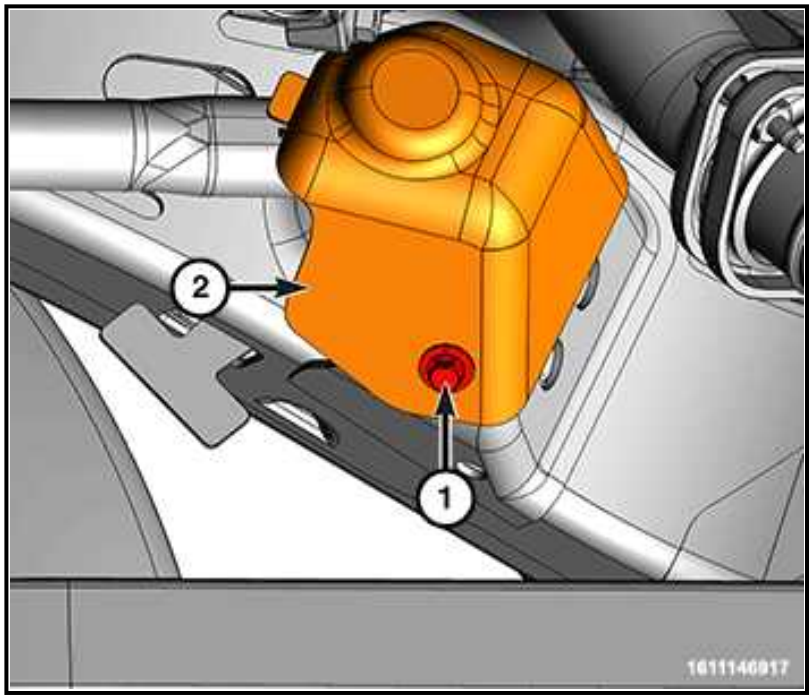
NOTE: **If the vehicle is equipped with a cam bolt service kit, paint or scribe marks on the cam adjuster and the control arm for installation reference.**

2. Using a suitable stand support the front axle assembly.



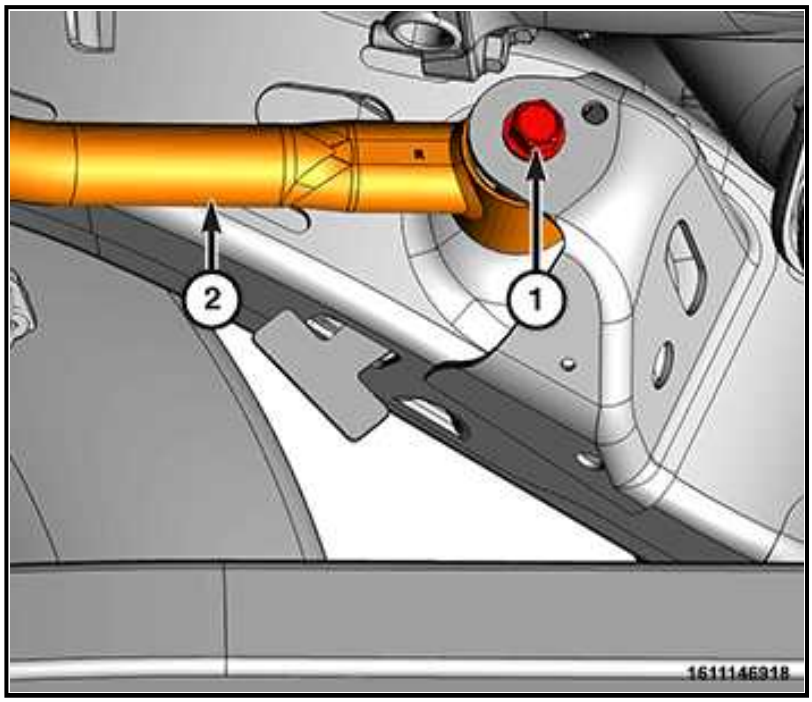
1 - Upper Control Arm Front Bolt

3. Remove the upper control arm front nut and the upper control arm front bolt.



1 - Heat Shield Bolts
2 - Heat Shield

4. Remove the two heat shield bolts and remove the heat shield.



1 - Upper Control Arm Rear Bolt
2 - Upper Control Arm

5. Remove the upper control arm rear bolt and retain the flag nut to be reused.
6. Remove the upper control arm.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

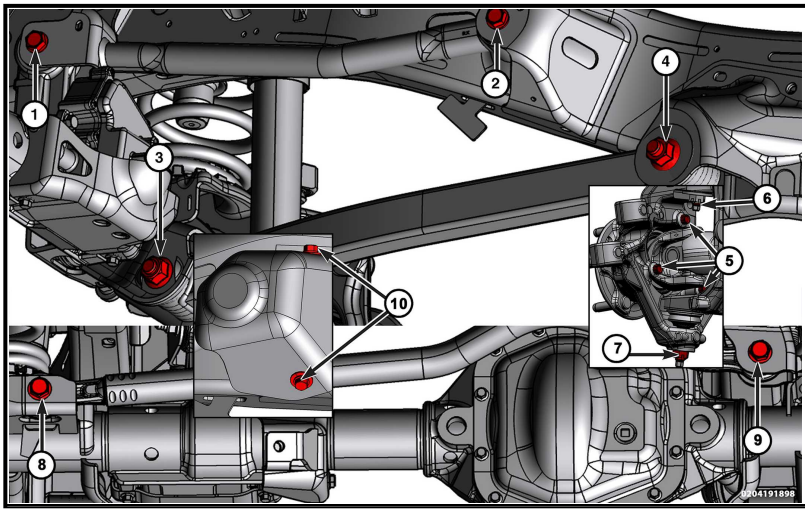
NOTE: **The paint dot located on the control arm should face outboard. If paint dot is not visible, the bend should point inboard, and the short end should attach to the axle side.**

NOTE: **All upper control arm bolts must be installed inboard to outboard.**

- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE**.

TORQUE SPECIFICATIONS

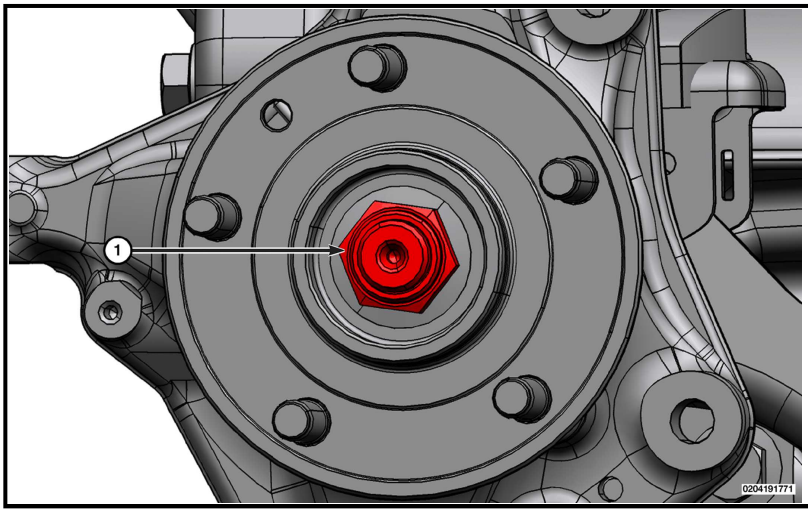
FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

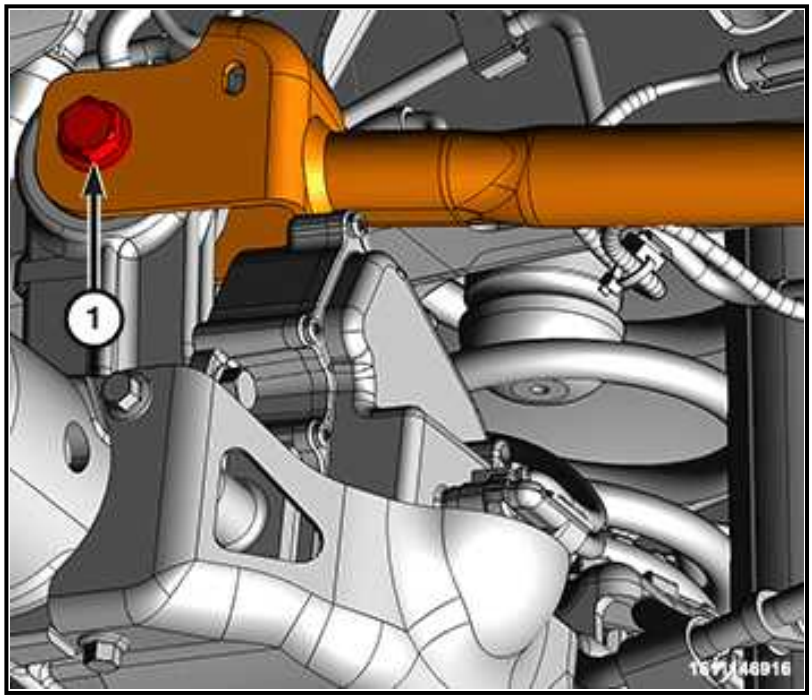
WITH 3.0L DIESEL

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

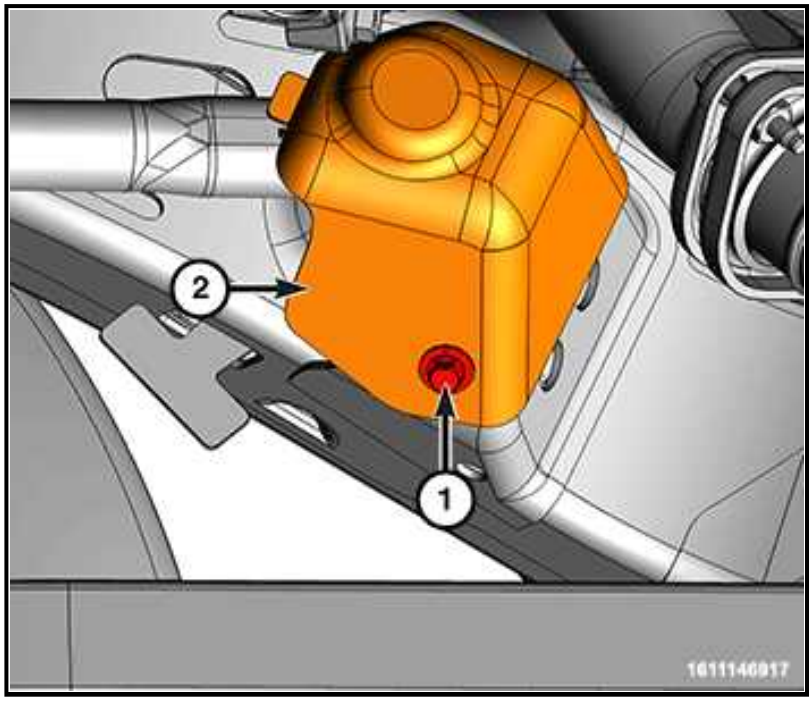
NOTE: **If the vehicle is equipped with a cam bolt service kit, paint or scribe marks on the cam adjuster and the control arm for installation reference.**

2. Using a suitable stand support the front axle assembly.



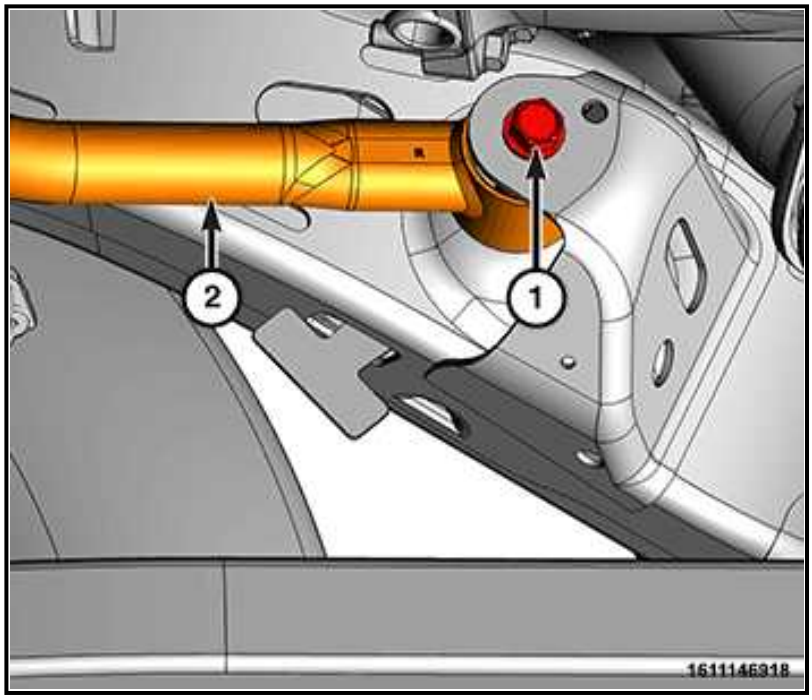
1 - Upper Control Arm Front Bolt

3. Remove the upper control arm front nut and the upper control arm front bolt.



1 - Heat Shield Bolts
2 - Heat Shield

4. Remove and **DISCARD** the two heat shield bolts and remove and **DISCARD** the heat shield.



1 - Upper Control Arm Rear Bolt
2 - Upper Control Arm

5. Unthread the upper control arm rear bolt and pull it out as far as possible, retain the flag nut to be reused.
6. Cut the upper control arm rear bolt to allow the bolt to be removed due to insufficient clearance to exhaust.
7. Remove the upper control arm.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

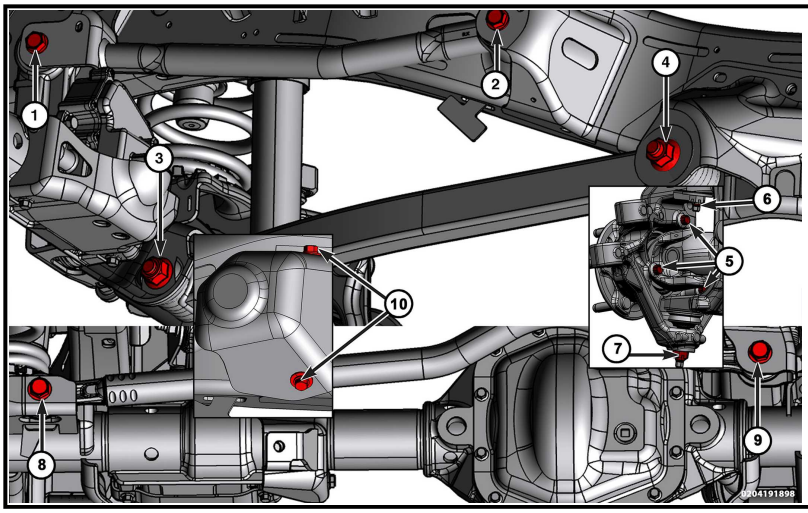
NOTE: **The paint dot located on the control arm should face outboard. If paint dot is not visible, the bend should point inboard, and the short end should attach to the axle side.**

NOTE: **All upper control arm bolts must be installed inboard to outboard.**

- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE**.

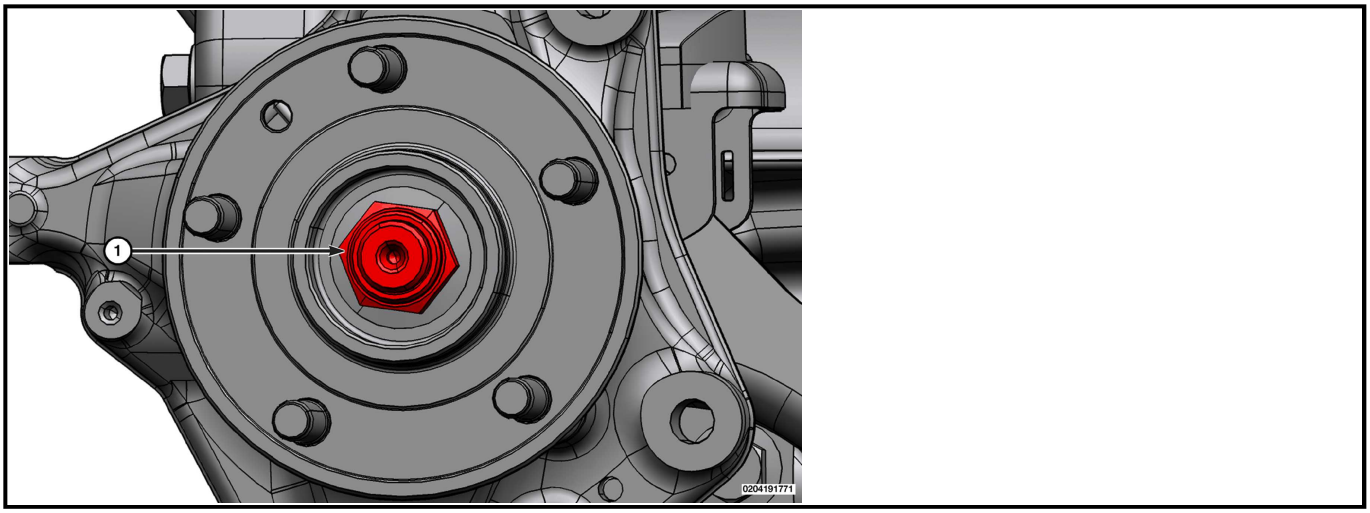
TORQUE SPECIFICATIONS

FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-

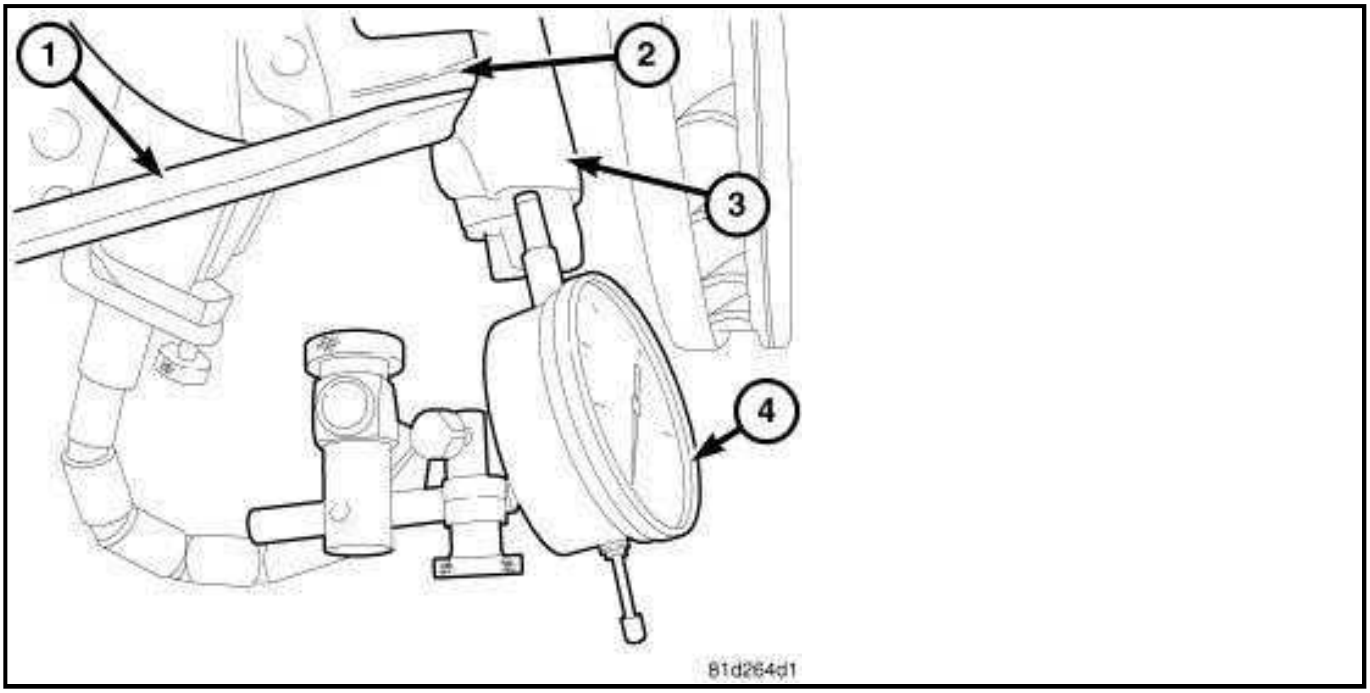


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

BALL JOINT, SUSPENSION, LOWER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - LOWER BALL JOINT



For proper diagnosis, the lower ball joint wear must be measured with a dial indicator.

The steering knuckle must be pried fully in both directions to accurately measure total ball joint movement.

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Attach a dial indicator (4) with the indicator resting on the flat part of the steering knuckle (3) by the lower ball stud.
3. Set the dial indicator (4) to zero.
4. Pry between the knuckle (3) and the axle tube yoke (2) next to the lower ball joint using a pry bar (1), record the reading on the dial indicator.
5. If lower ball joint wear is greater than 1.25 mm (0.050 in) then replacement of the lower ball joint is necessary. Refer to **BALL JOINT, SUSPENSION, LOWER, REMOVAL AND INSTALLATION**.

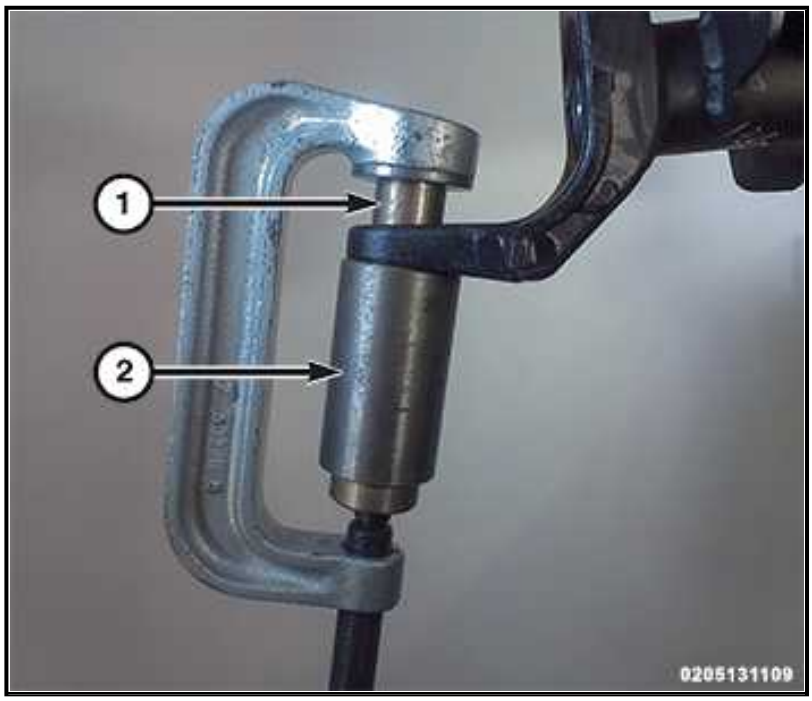
REMOVAL AND INSTALLATION

LOWER BALL JOINT

REMOVAL

CAUTION: **If the right front axle shaft is to be removed without removing the Front Axle Disconnect (FAD), the front axle must be placed in the four wheel drive position.**

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the axle shaft. Refer to **REMOVAL AND INSTALLATION** .
3. Remove the steering knuckle. Refer to **KNUCKLE, STEERING, REMOVAL AND INSTALLATION**.

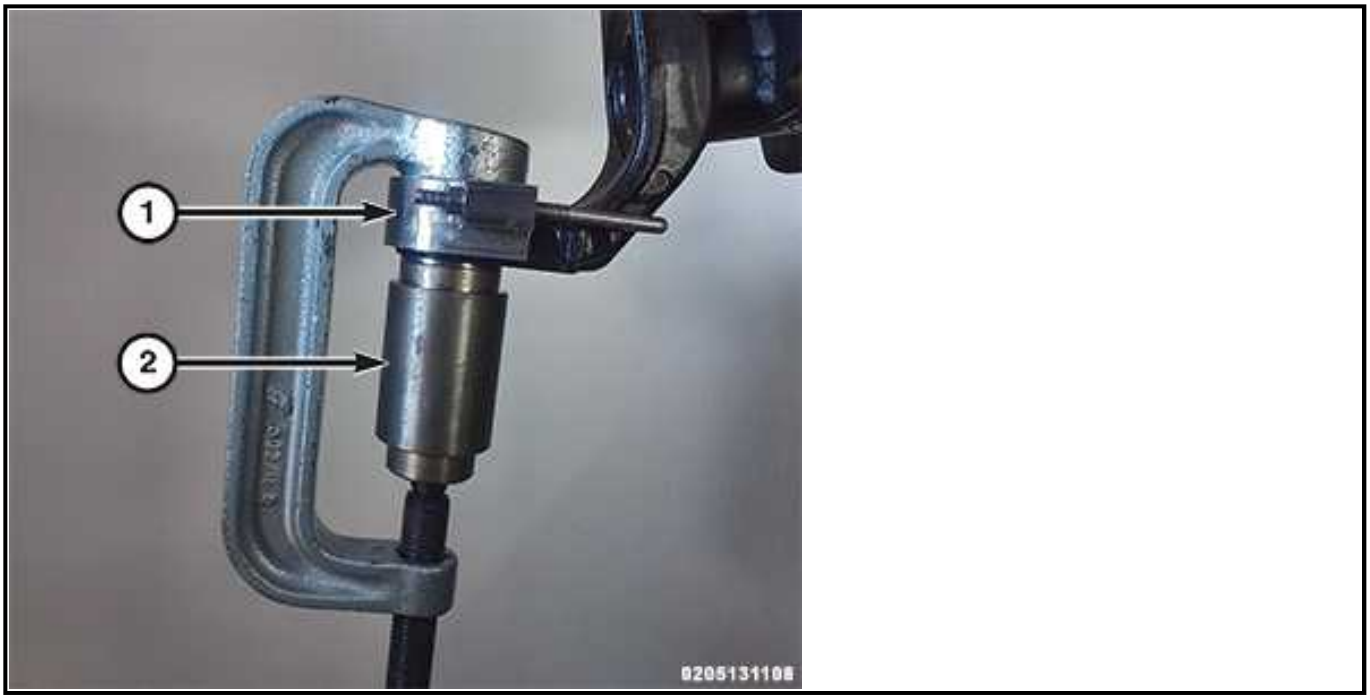


1 - Remover, Ball Joint 2050900030
2 - Receiver, Ball Joint Remover 2051000030

4. Position (special tool #2051000030, Receiver, Ball Joint Remover) and (special tool #2050900030, Remover, Ball Joint) with (special tool #C-4212F, Press, Ball Joint) as shown in illustration.
5. Thread the rod into the press until the lower ball joint is pressed fully out.

INSTALLATION

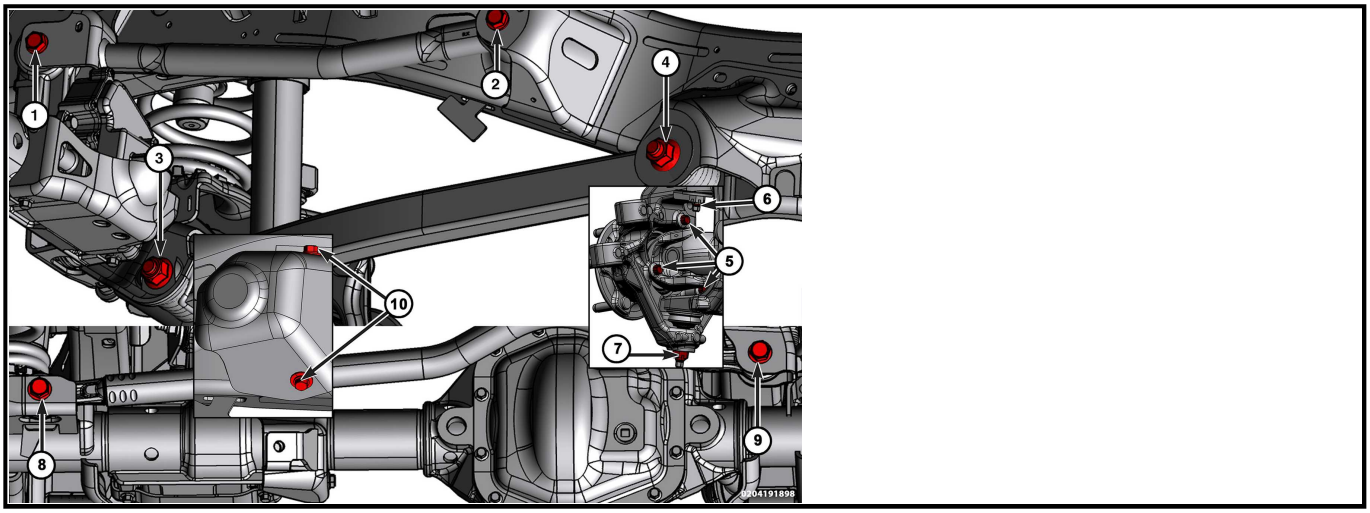
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.



- Position (special tool #2051100030, Installer, Ball Joint) (2) and (special tool #2051300030, Receiver, Ball Joint Upper Installation) (1) with (special tool #C-4212F, Press, Ball Joint) as shown in illustration.
- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE**.

TORQUE SPECIFICATIONS

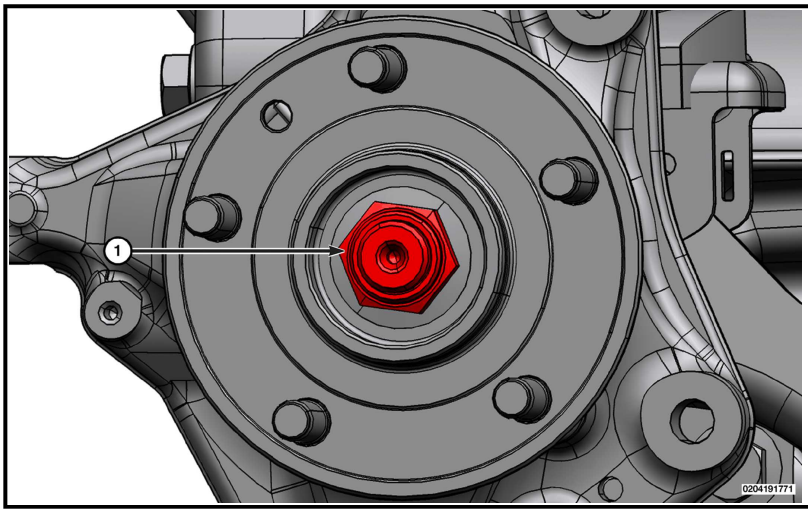
FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
	"IH" marking on the ball joint.		aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-

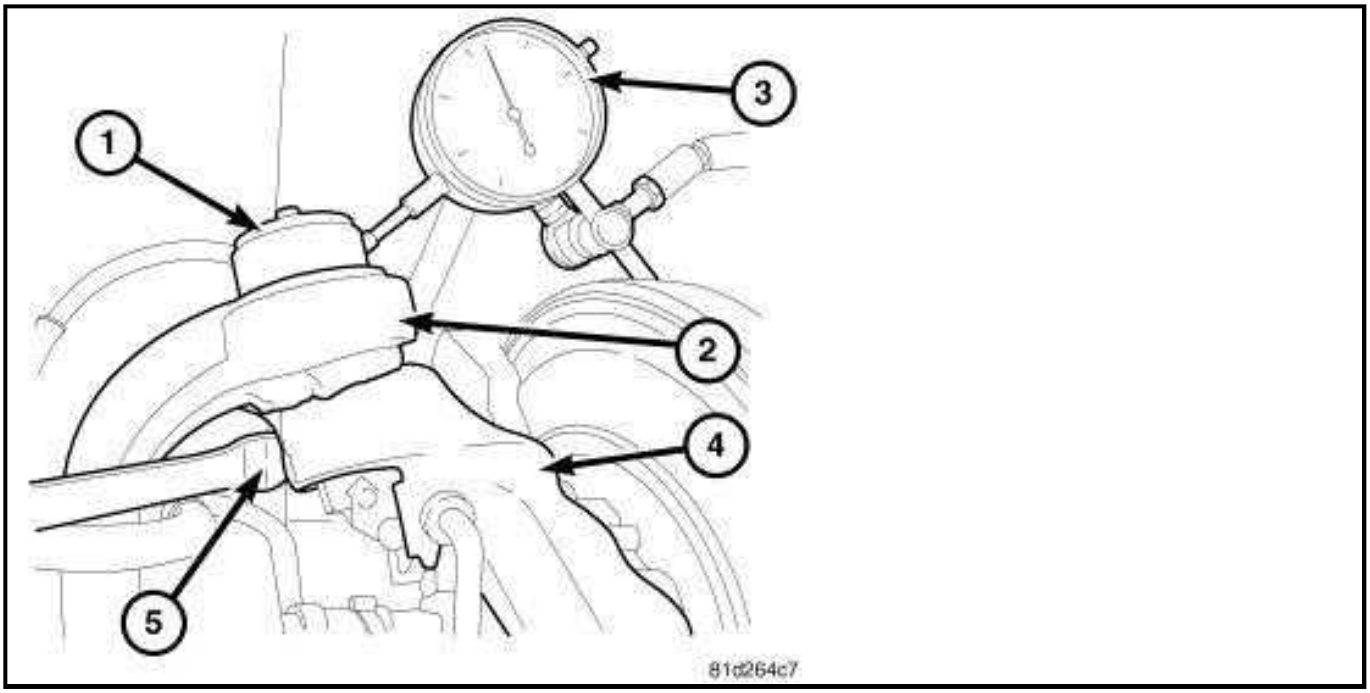


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

BALL JOINT, SUSPENSION, UPPER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING



To properly diagnose the upper ball joint readings from the dial indicator are necessary.

The knuckle must be pried fully in both directions to accurately measure total ball joint movement.

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Mount a dial indicator (3) to the rotor or knuckle with the indicator/plunger resting on the ball joint (1).
3. Set the dial indicator (3) to zero.
4. Insert a prybar (5) between the knuckle (4) and axle tube (2).
5. Record the radial upper ball joint movement. If this reading is above 1.5 mm (0.060 in) then replacement of the upper ball joint is necessary. Refer to **BALL JOINT, SUSPENSION, UPPER, REMOVAL AND INSTALLATION**.

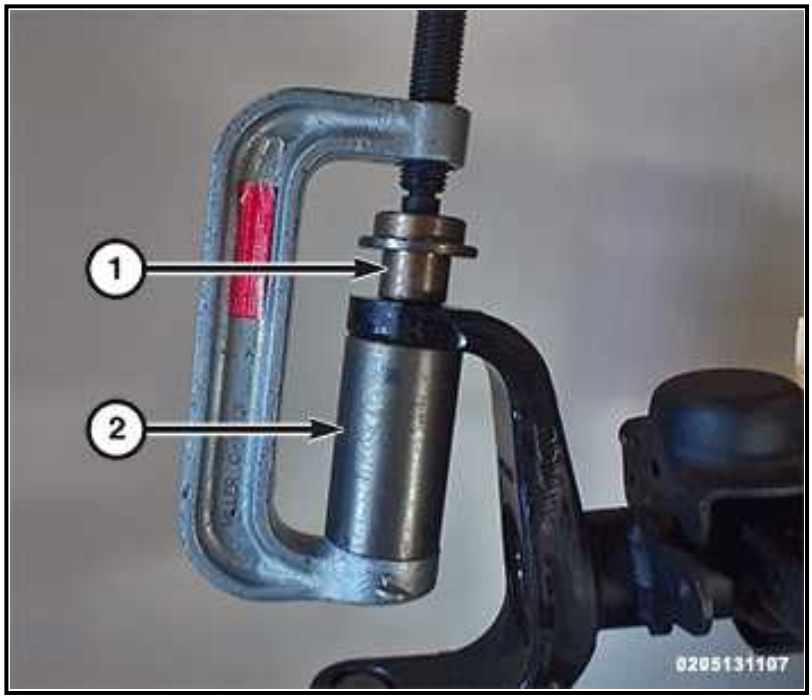
REMOVAL AND INSTALLATION

UPPER BALL JOINT

REMOVAL

CAUTION: **If the right front axle shaft is to be removed without removing the Front Axle Disconnect (FAD), the front axle must be placed in the four wheel drive position.**

1. Remove the hub and bearing. Refer to **HUB AND BEARING, REMOVAL AND INSTALLATION**.
2. Remove the axle shaft. Refer to **REMOVAL AND INSTALLATION** .
3. Remove the steering knuckle. Refer to **KNUCKLE, STEERING, REMOVAL AND INSTALLATION**.



1 - Press, Ball Joint C-4212F
2 - Receiver, Ball Joint Remover 2051000030

4. Position (special tool #2051000030, Receiver, Ball Joint Remover) and (special tool #2050900030, Remover, Ball Joint) with (special tool #C-4212F, Press, Ball Joint) as shown in illustration.
5. Thread the rod into the press until the upper ball joint is pressed fully out.

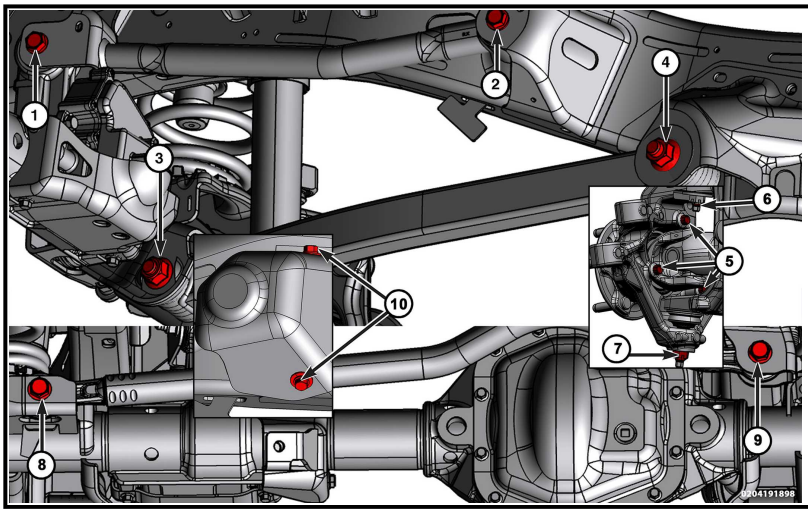
INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Position (special tool #2051100030, Installer, Ball Joint) and (special tool #2051200030, Receiver, Ball Joint Lower Installation) with (special tool #C-4212F, Press, Ball Joint) as shown in illustration.
- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE**.

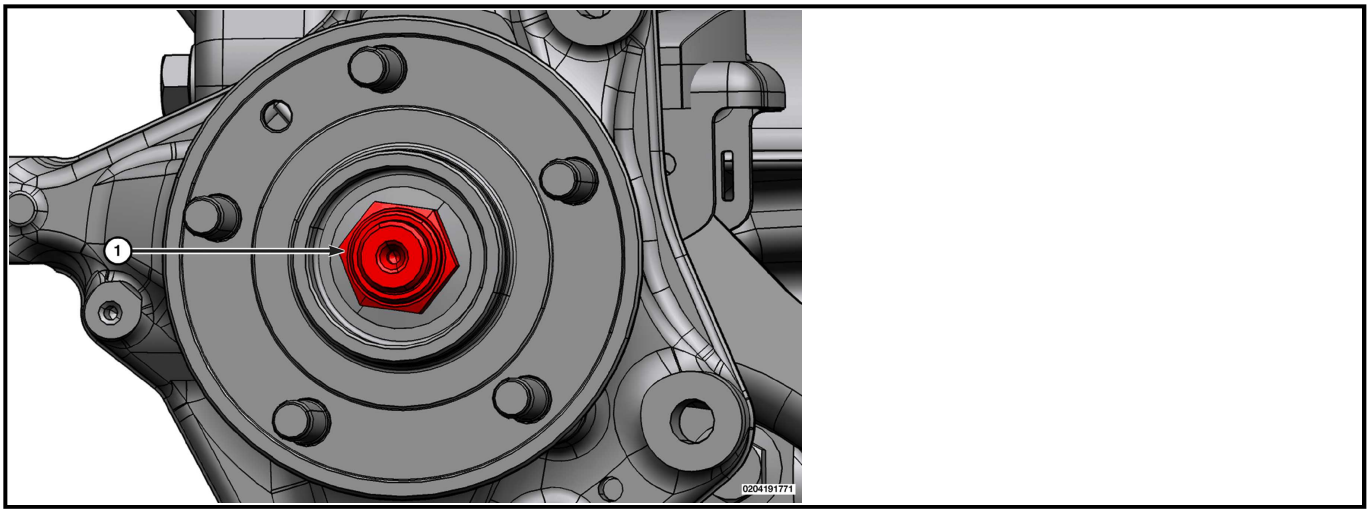
TORQUE SPECIFICATIONS

FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
			removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

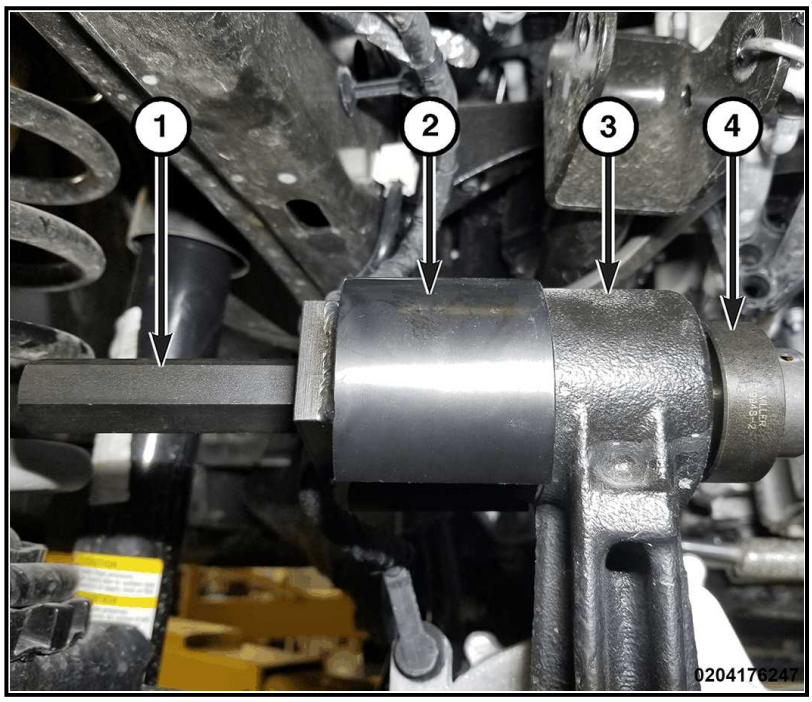
BUSHINGS, UPPER CONTROL ARM

REMOVAL AND INSTALLATION

AXLE BUSHINGS

REMOVAL

1. Disconnect the upper control arm from the axle. Refer to **ARM, UPPER CONTROL, REMOVAL AND INSTALLATION**.



1 - Nut, Special 9948-3
2 - Receiver 9948-1
3 - Axle Bracket
4 - Remover, Bushing 9948-2

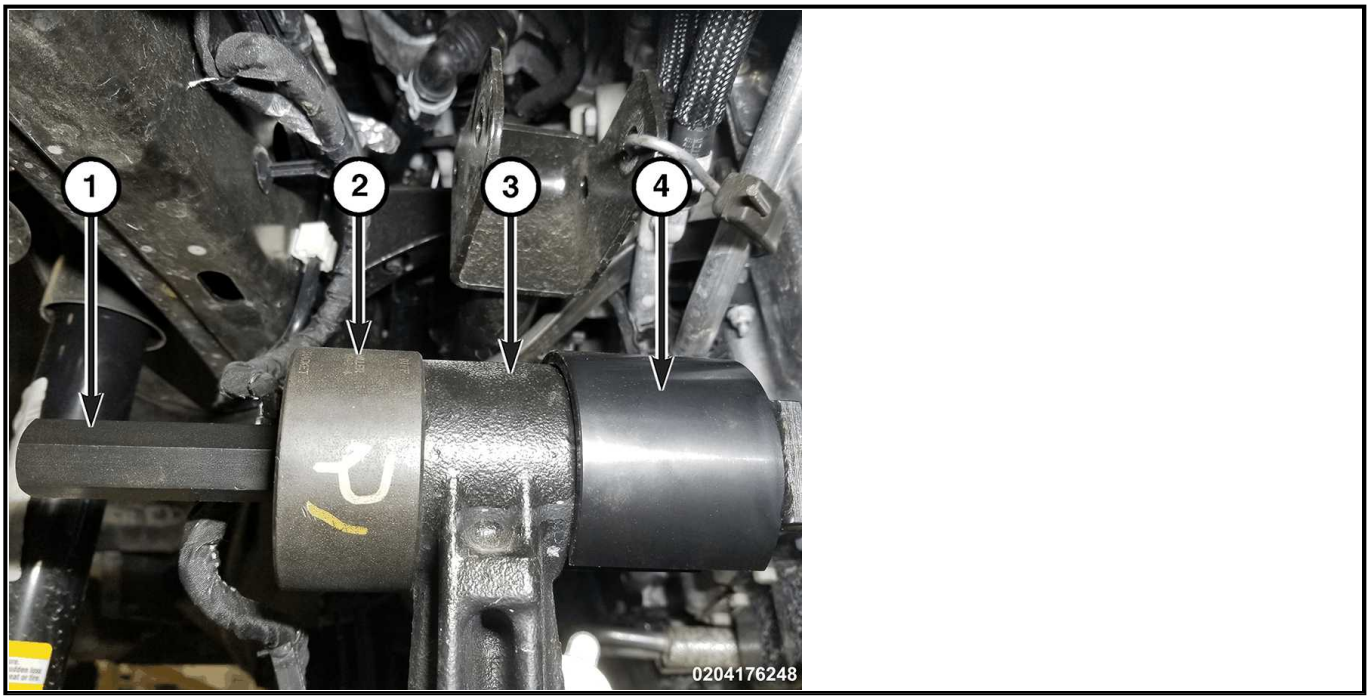
2. Assemble (special tool #9948, Remover/Installer, Bushing) as shown in illustration.
   - (special tool #9948-3, Nut, Special) Nut
   - (special tool #9948-1, Receiver) Receiver

- (special tool #9948-2, Remover, Bushing) Driver.

3. Press the bushing out of the axle bracket.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.



- Assemble (special tool #9948, Remover/Installer, Bushing) as shown in illustration.
  - (special tool #9948-3, Nut, Special) Nut
  - (special tool #9948-4, Installer, Bushing) Driver
  - (special tool #9948-1, Receiver) Receiver

HUB AND BEARING

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HUB AND BEARING NOISE

NOTE: **The wheel bearing is designed to last for the life of the vehicle and requires no type of periodic maintenance. If it becomes necessary to replace a faulty bearing, do not replace in pairs unless parts manual specifically states to do so.**

Bearings will produce noise if worn or damaged. The noise will generally change when the bearings are loaded. A road test of the vehicle is normally required to determine if there is a bearing noise, or if it is some other component. To assist in finding the location, the following procedure, together with the **DIAGNOSTIC TABLE** , should help determine if a bearing is causing the noise, and if so which one. Keep in mind that bearing noises are not typically intermittent. If a particular vehicle road test maneuver results in noise only part of the time, it is not likely a faulty bearing.

NOTE: **Wheel bearings normally purge a small amount of grease, sometimes resulting in wet appearance on or around the seals or adjoining knuckle. This is normal, and is not cause for replacement. The only circumstance requiring replacement solely for grease loss would be if a seal is visibly damaged. Evidence of only wetness, such as might be seen during an Inspection, is not cause for replacement.**

DIAGNOSTIC PROCEDURE:

1. Perform a drive evaluation. Find a smooth level road surface void of traffic or obstructions. Turn off any accessories which may cause background noise. Evaluate for noise at 50 km/h (30 mph) and 100 km/h (60 mph) and with vehicle in neutral to eliminate potential drivetrain noises. With vehicle at a constant speed, steer back and forth to left and right. This will load and unload the bearings and may change the noise level. When bearing damage is slight, the noise is sometimes noticeable at lower speeds and at other times is more noticeable at higher speeds.
2. Drive evaluation results: Did the noise increase when turning right which may indicate a problem with the left bearing? Did the noise increase when turning left which may indicate a problem with the right bearing?
3. Put vehicle up on a hoist. Grasp the tire by pushing in on the top center and pulling out on the bottom center to check for excessive movement in the bearing.
4. Check for potential rubbing on rotating components, such as rotor splash shields, heat shields touching driveshaft or halfshaft, wheel well liners contacting tire, wheel cover on wheel, etc. Any cyclic noise (once per wheel revolution for example) is not a wheel bearing fault.
5. Remove the wheel and tire assembly, disc brake caliper and brake rotor.
6. Rotate the wheel hub, checking for resistance or roughness.
7. Any roughness or resistance to rotation may indicate dirt intrusion or a failed hub bearing. If the bearing exhibits any of these conditions, the hub & bearing will require replacement. Do not attempt to disassemble the bearing for repair.
8. Rotate the wheel hub, utilize Chassis Ears (or stethoscope) to check for noise.
9. If none of the above checks indicate a bearing failure, refer to the **DIAGNOSTIC TABLE** for other possible causes.

DIAGNOSTIC TABLE

CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
FRONT END WHINE ON TURNS	1. Low Power Steering Fluid Level (if applicable)	1. Fill the power steering fluid reservoir to the proper level, check for leaks (make sure all air is bled from system fluid)
	2. Worn Tires or Incorrect Wheel Alignment	2. Replace the Tires, Check And Reset Wheel Alignment
	3. Defective Wheel Bearing	3. Replace the Wheel Bearing
	4. Wrong Power Steering Fluid (if applicable)	4. Replace With Correct Power Steering Fluid
FRONT END GROWL OR GRINDING ON TURNS	1. Loose Wheel Lug Nuts	1. Verify Wheel Lug Nut Torque
	2. Engine Mount Grounding Against Frame Or Body Of Vehicle	2. Check For Engine Mount Hitting Frame Rail And Reposition Engine As Required
	3. Worn Tires or Incorrect Wheel Alignment	3. Replace Tires, Check and Reset Wheel Alignment
	4. Defective Wheel Bearing	4. Replace the Wheel Bearing
	5. Worn or Broken C/V Joint	5. Replace the C/V Joint
	6. Engine Not Centered, Causing Axle Halfshaft to Bottom Out	6. Center the Engine
POPPING/CLICKING/SNAPPING DURING ACCELERATION AFTER	1. Insufficient Hub Nut Torque	1. Torque the Hub Nut to the Proper Specifications

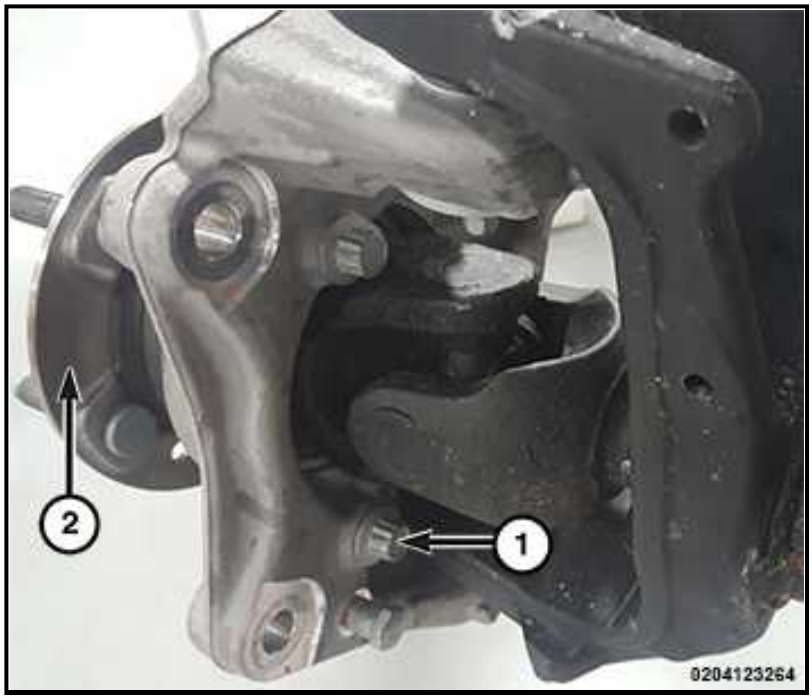
CONDITION	POSSIBLE CAUSES	POTENTIAL CORRECTIONS
DRIVE-TO-REVERSE SHIFT, REVERSE-TO-DRIVE SHIFT OR WHILE TURNING	2. Insufficient Grease on Mating Surface of Axle Halfshaft Outer C/V Joint to Wheel Hub/Bearing, or Worn/Damaged Gasket	2. Separate the Halfshaft From the Hub and Bearing and Wipe the Mating Surfaces Clean. Apply a Light Coating of Wheel Bearing Grease to C/V Joint Surface and Reassemble, or Replace Gasket. Torque the Hub Nut to the Proper Specifications
WHINE/HUM/ROAR WITH VEHICLE GOING STRAIGHT AT A CONSTANT SPEED	1. Worn Tires or Incorrect Wheel Alignment 2. Defective Wheel Bearing	1. Replace the Tires and Reset Wheel Alignment 2. Replace the Wheel Bearing
GROWL OR GRINDING WITH VEHICLE GOING STRAIGHT AT A CONSTANT SPEED	1. Engine Mount Grinding Against Frame or Body 2. Defective Wheel Bearing 3. Worn or Broken C/V Joint	1. Check and Reposition the Engine as Required 2. Replace the Wheel Bearing 3. Replace the C/V Joint

REMOVAL AND INSTALLATION

HUB AND BEARING

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the wheel and tire assembly. Refer to **REMOVAL AND INSTALLATION** .
3. Have a helper apply brake pressure, then remove the hub nut.
4. Remove the front brake rotor. Refer to **ROTOR, BRAKE, REMOVAL AND INSTALLATION** .
5. Remove the front wheel speed sensor. Refer to **SENSOR, WHEEL SPEED, FRONT, REMOVAL AND INSTALLATION** .



1 - Hub and Bearing Bolts
2 - Hub and Bearing

6. Remove the three hub and bearing bolts.
7. Slide the hub and bearing out of the steering knuckle.

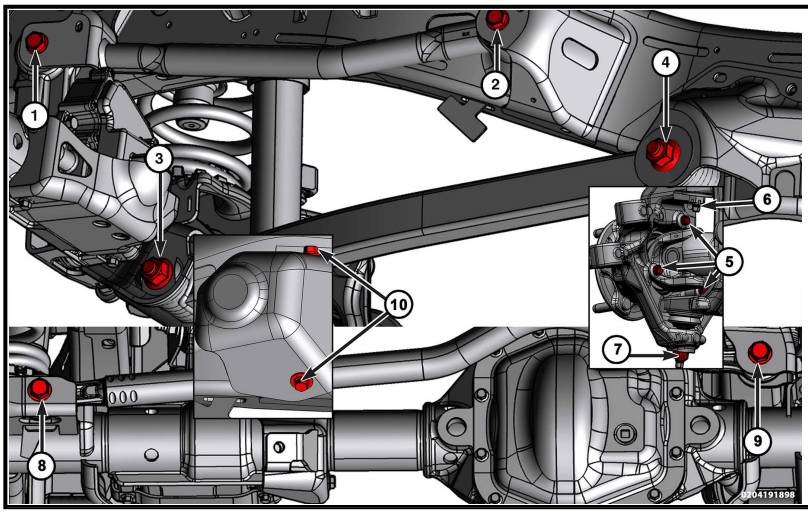
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATIONS

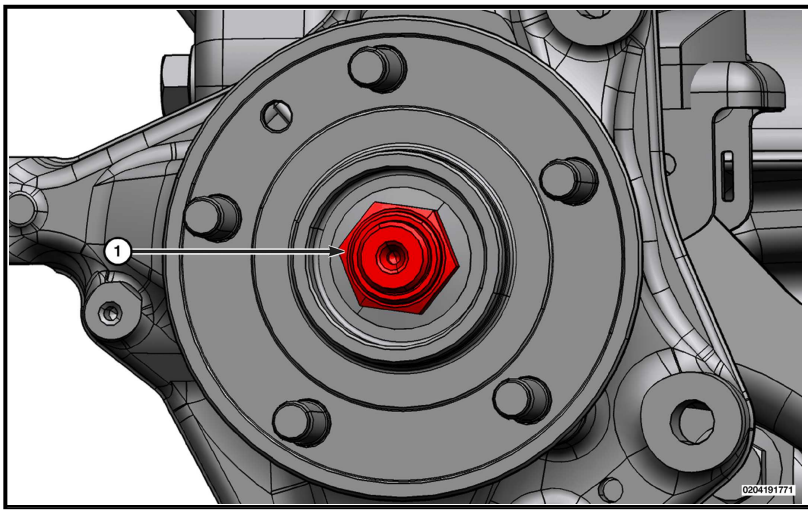
FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O	**20 N. m (15 Ft. Lbs.)**	-

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
	"IH" marking on the ball joint.		
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
			reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

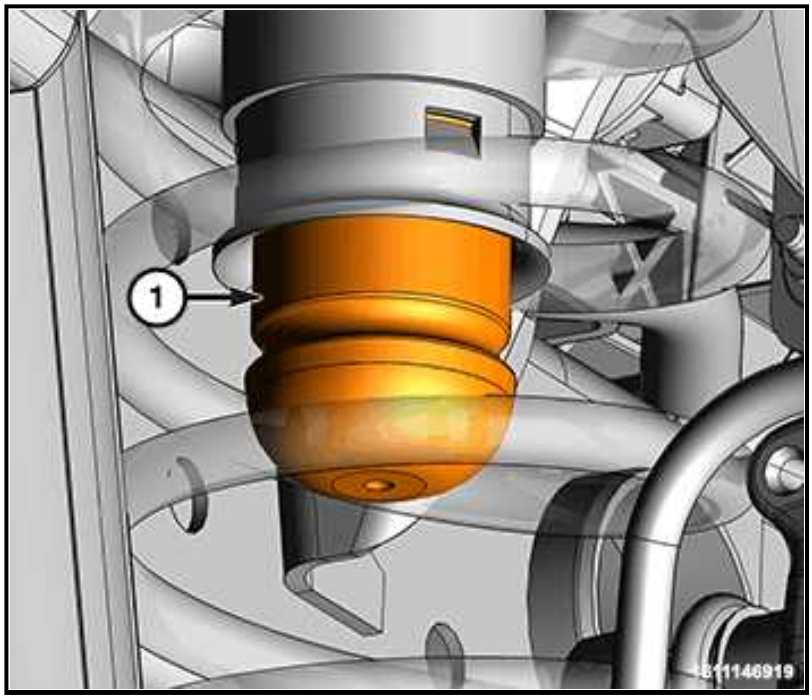
BUMPER, JOUNCE

REMOVAL AND INSTALLATION

JOUNCE BUMPER

REMOVAL

1. Remove the front coil spring. Refer to **SPRING, FRONT COIL, REMOVAL AND INSTALLATION**.



1 - Jounce Bumper

2. Remove the jounce bumper.

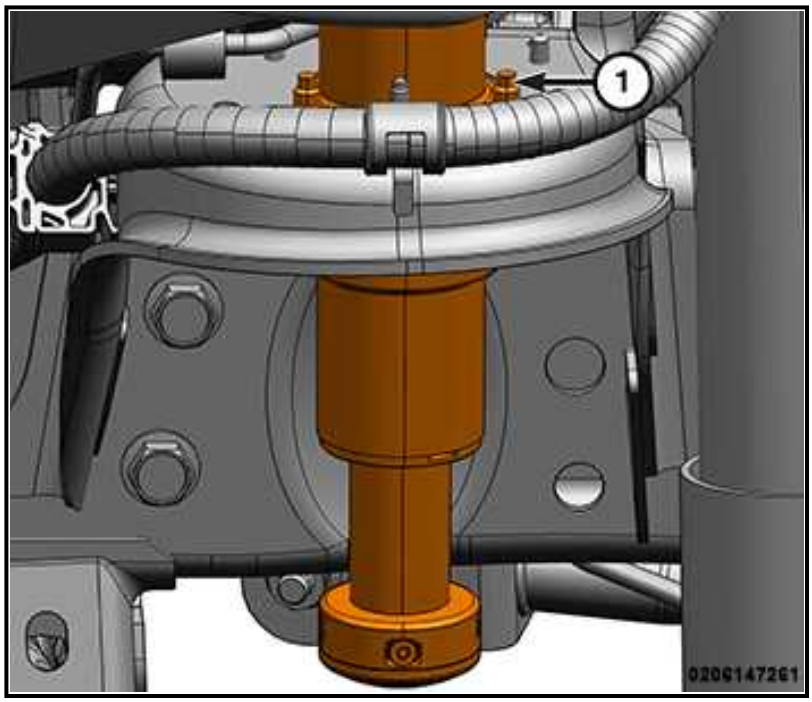
INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

ACTIVE JOUNCE BUMPER

REMOVAL

1. Remove the front coil spring. Refer to **SPRING, FRONT COIL, REMOVAL AND INSTALLATION**.



1 - Jounce Bumper Nuts

2. Remove the three jounce bumper nuts.

3. Remove the jounce bumper.

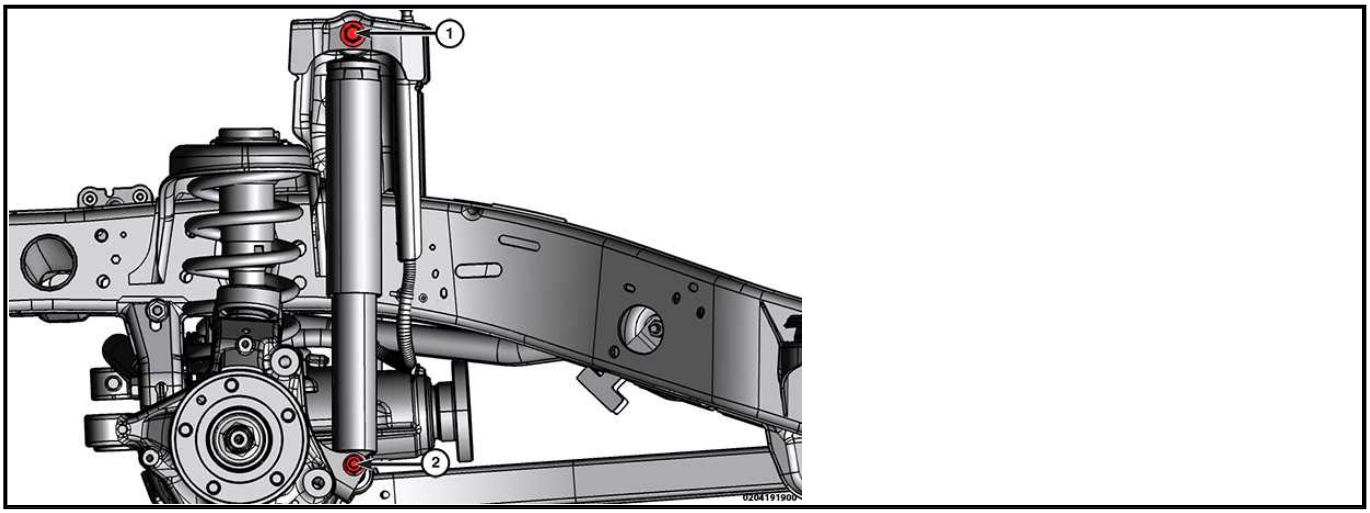
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATIONS

SHOCK ABSORBERS



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**140 N. m (103 Ft. Lbs.)**	-
2	Shock Absorber Lower Bolt	**100 N. m (77 Ft. Lbs.)**	-

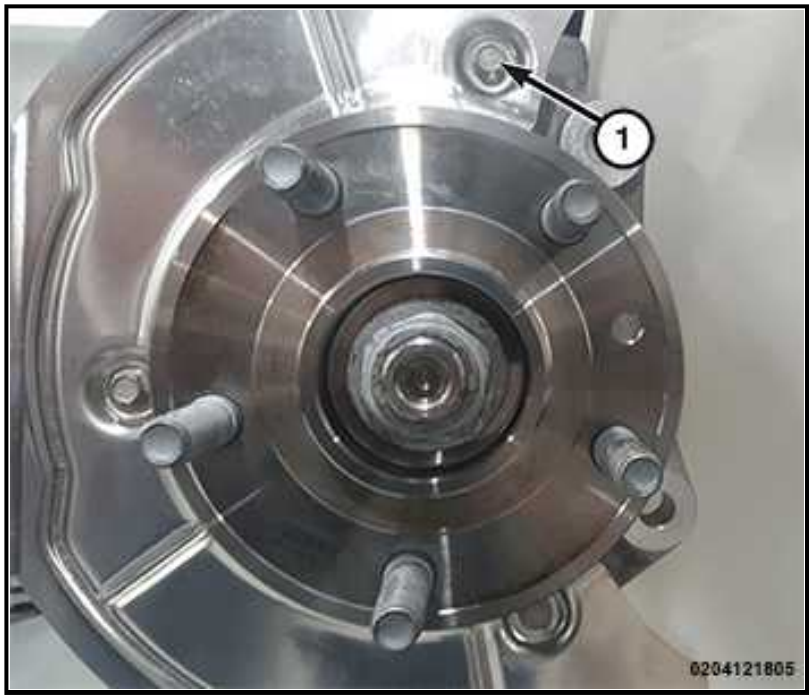
KNUCKLE, STEERING

REMOVAL AND INSTALLATION

STEERING KNUCKLE

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION** .
3. Disconnect the drag link from the steering knuckle **(Right side only)** . Refer to **DRAG LINK, STEERING, REMOVAL AND INSTALLATION** .
4. Disconnect the tie rod end from the steering knuckle. Refer to **END, TIE ROD, REMOVAL AND INSTALLATION** .
5. Remove the brake rotor. Refer to **ROTOR, BRAKE, REMOVAL AND INSTALLATION** .

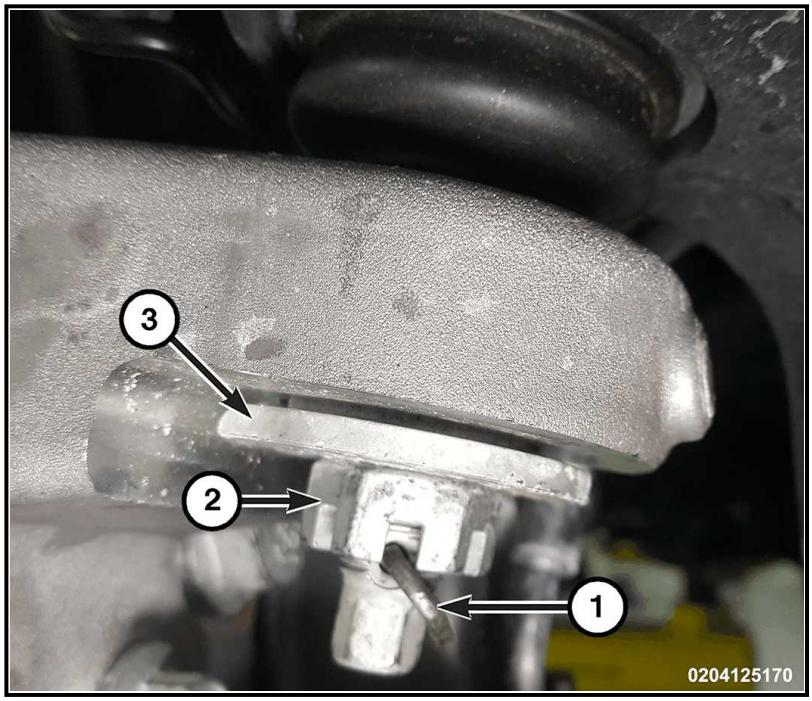


1 - Brake Rotor Splash Shield Bolts

6. Remove the three brake rotor splash shield bolts and remove the brake rotor splash shield.

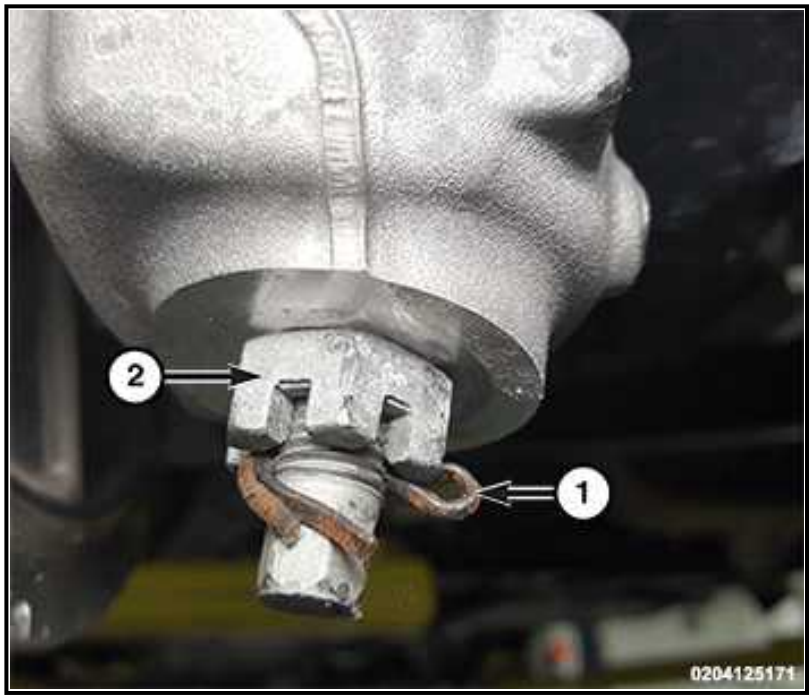
CAUTION: **If the right front axle shaft is to be removed without removing the Front Axle Disconnect (FAD), the front axle must be placed in the four wheel drive position.**

7. Remove the hub and bearing. Refer to **HUB AND BEARING, REMOVAL AND INSTALLATION**.
8. Remove the front axle shaft. Refer to **REMOVAL AND INSTALLATION** .



1 - Cotter Pin
2 - Upper Ball Joint Nut
3 - Camber Adjustment Sleeve

9. Remove and **DISCARD** the upper ball joint cotter pin and nut.

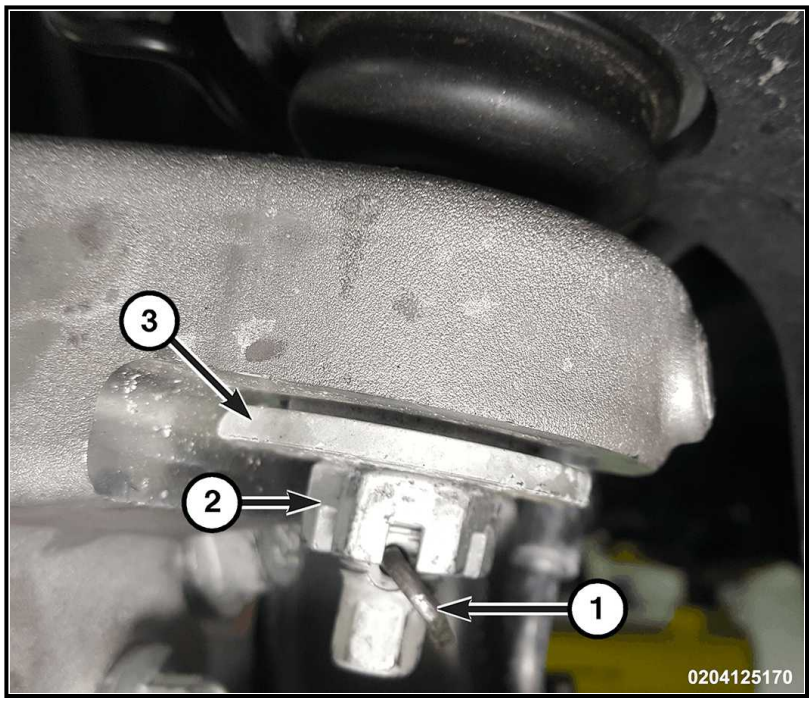


1 - Cotter Pin
2 - Lower Ball Joint Nut

10. Remove and **DISCARD** the lower ball joint cotter pin and nut.

NOTE: **Support the steering knuckle so that it does not fall during ball joint separation.**

11. Separate the lower ball joint from the knuckle using special tool (special tool #C-4150A, Press, Ball Joint) puller.
12. Separate the upper ball joint from the knuckle using special tool (special tool #9360, Remover, Ball Joint) separator.
13. Remove the steering knuckle.

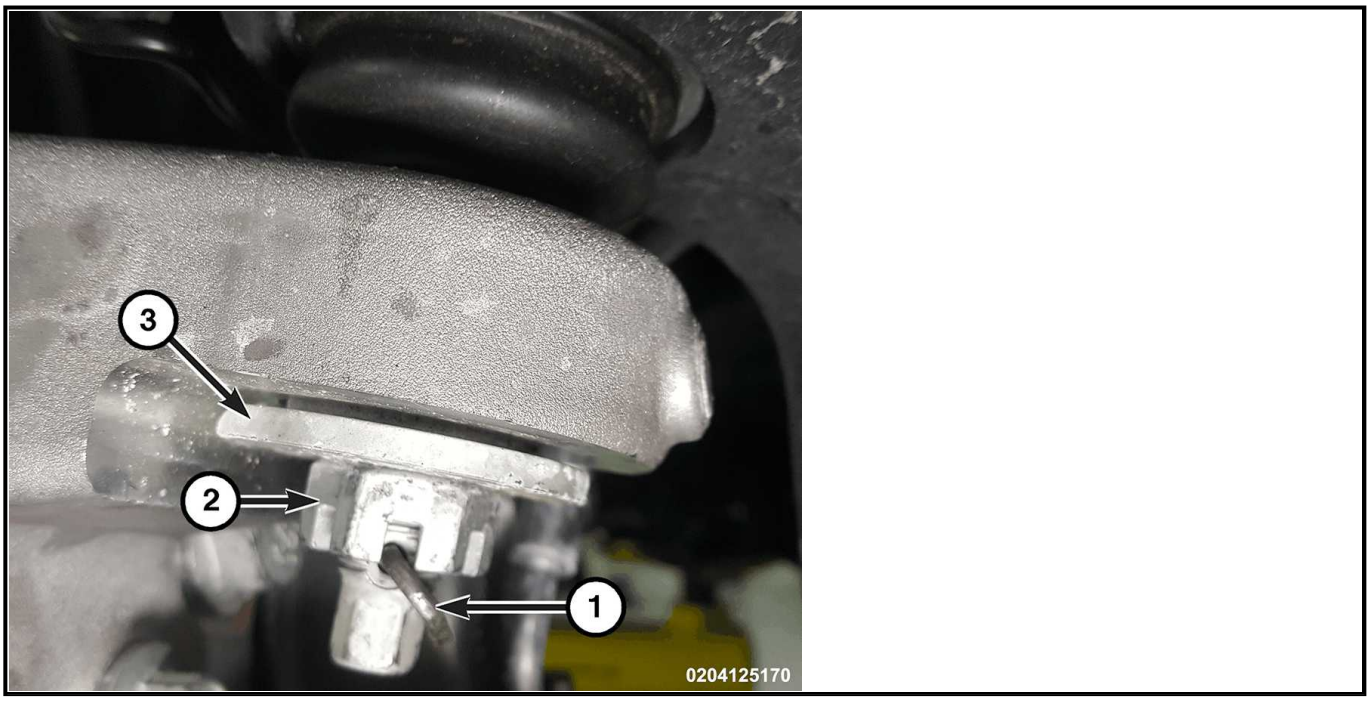


1 - Cotter Pin
2 - Upper Ball Joint Nut

3 - Camber Adjustment Sleeve

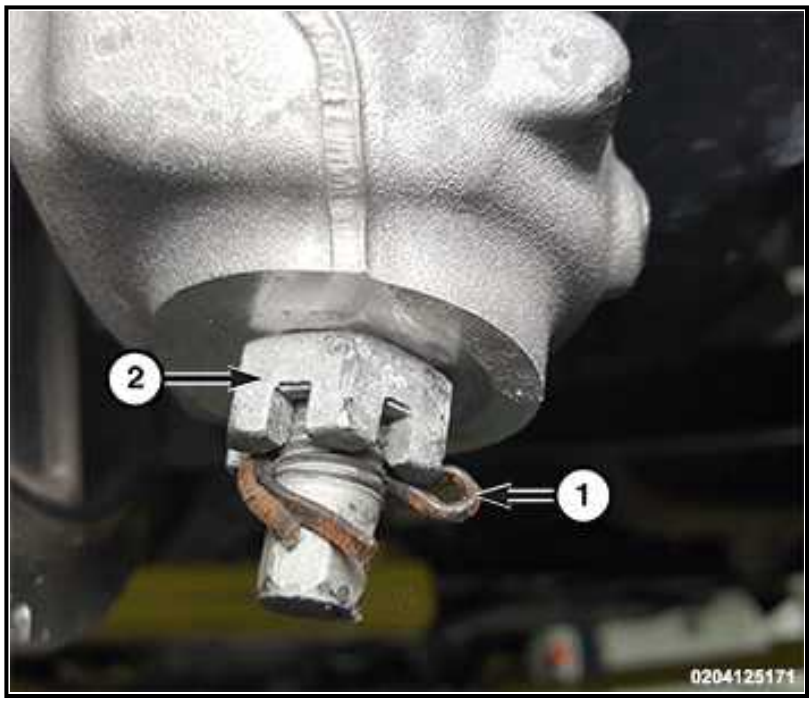
14. Remove the selective camber adjustment sleeve.

INSTALLATION



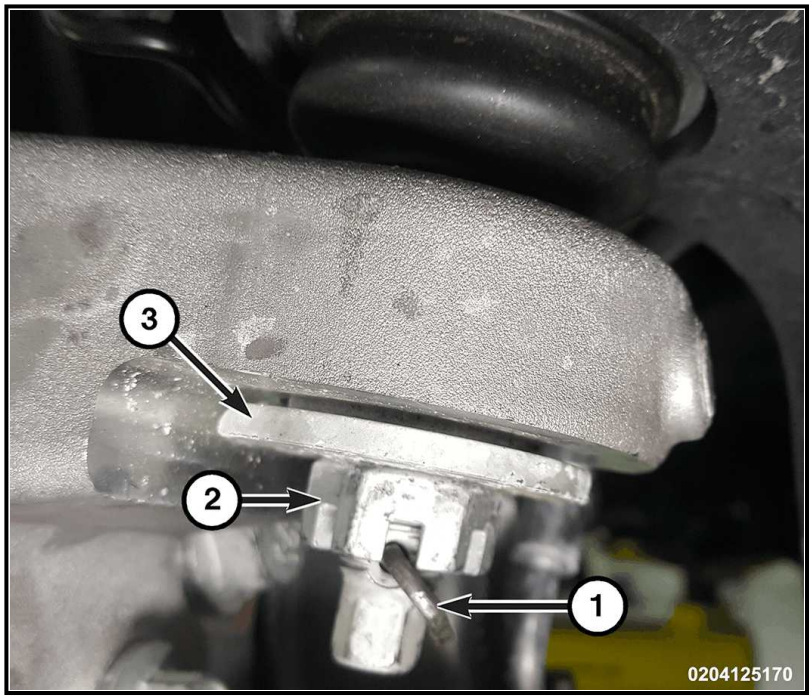
1 - Cotter Pin
2 - Upper Ball Joint Nut
3 - Camber Adjustment Sleeve

1. Install the selective camber adjustment sleeve.
2. Position the steering knuckle to the upper and lower ball joint studs.
3. Install the upper ball joint nut, do not torque at this time.



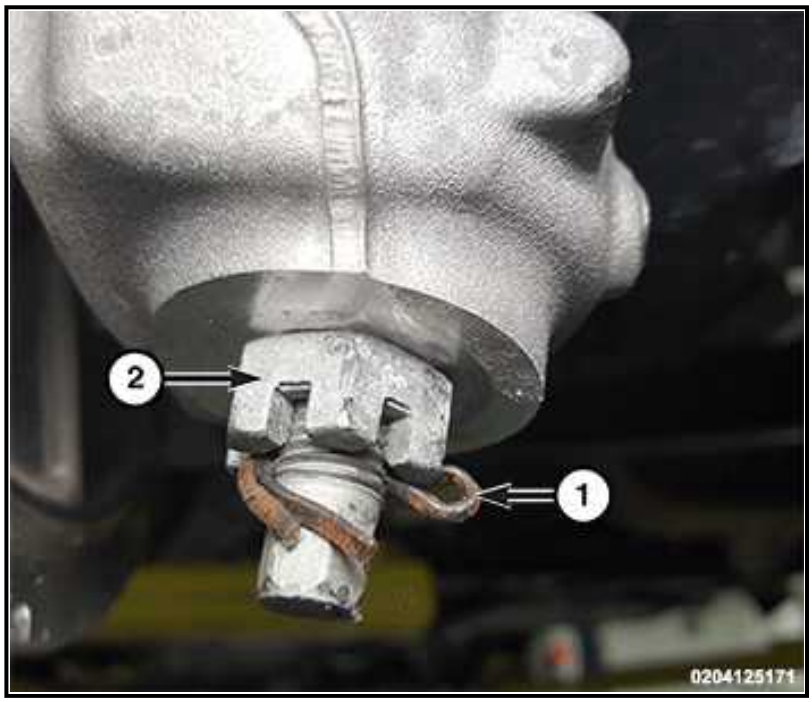
1 - Cotter Pin
2 - Lower Ball Joint Nut

4. Install the lower ball joint nut and apply the lower ball joint nut **initial torque** . Refer to **TORQUE SPECIFICATIONS** .



1 - Cotter Pin
2 - Upper Ball Joint Nut
3 - Camber Adjustment Sleeve

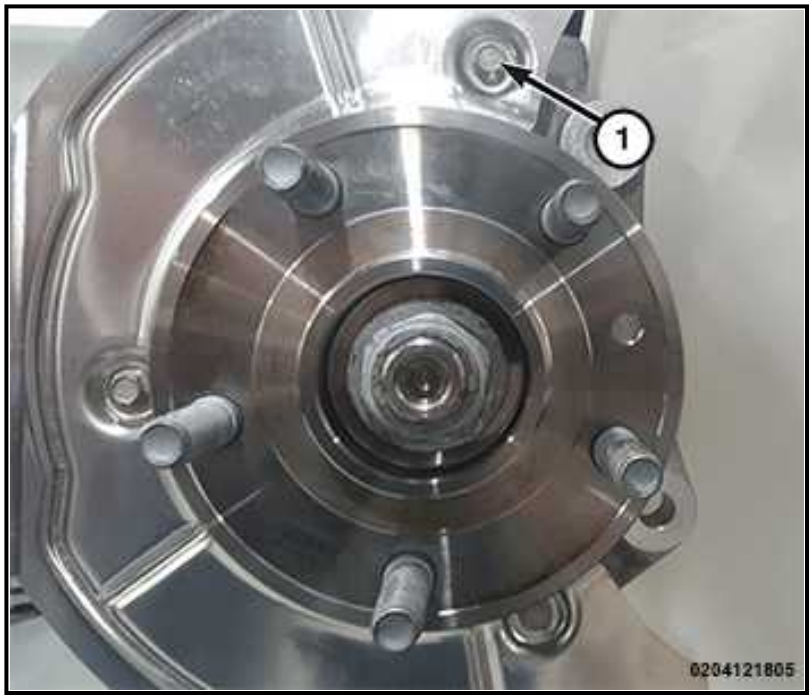
5. Tighten the upper ball joint nut to the proper then install a. Refer to **FRONT, TECHNICAL SPECIFICATIONS**.**NEW** cotter pin.



1 - Cotter Pin
2 - Lower Ball Joint Nut

6. Tighter the lower ball joint nut to the proper **final torque** then install a. Refer to **TORQUE SPECIFICATIONS** .**NEW** cotter pin.
7. Install the front axle shaft. Refer to **REMOVAL AND INSTALLATION** .

8. Install the front hub and bearing. Refer to **HUB AND BEARING, REMOVAL AND INSTALLATION**.

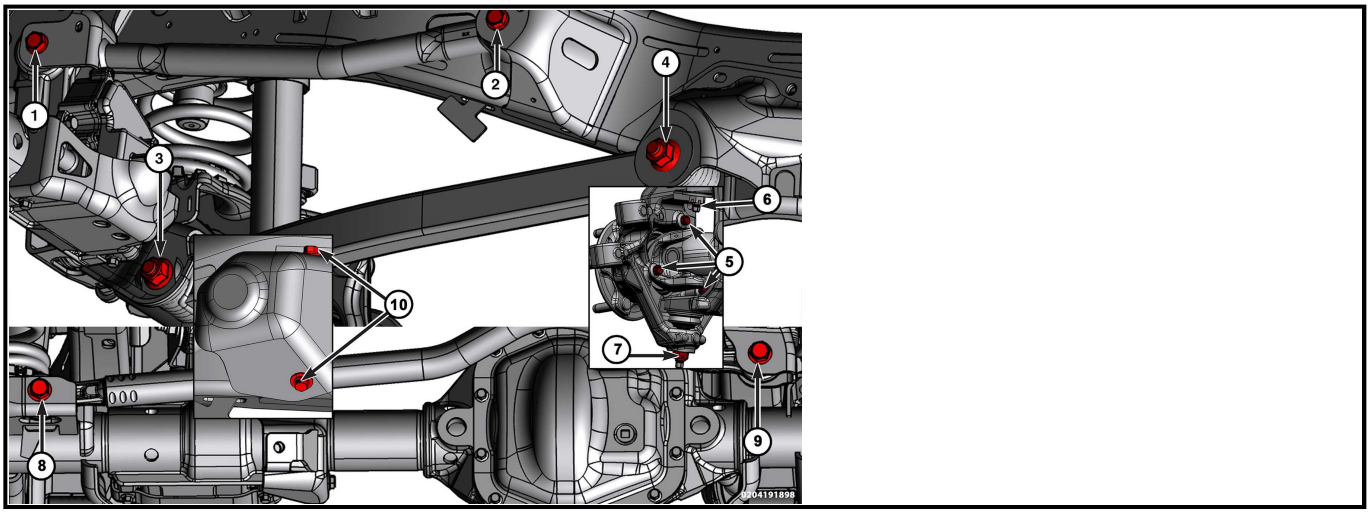


1 - Brake Rotor Splash Shield Bolts

9. Align the brake rotor splash shield to the steering knuckle.
10. Install the three brake rotor splash shield bolts and tighten to the proper. Refer to **TORQUE SPECIFICATIONS** .
11. Install the brake rotor. Refer to **ROTOR, BRAKE, REMOVAL AND INSTALLATION** .
12. Connect the drag link to the steering knuckle **(Right side only)** . Refer to **DRAG LINK, STEERING, REMOVAL AND INSTALLATION** .
13. Connect the tie rod end to the steering knuckle. Refer to **END, TIE ROD, REMOVAL AND INSTALLATION** .
14. Install the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION** .
15. Remove the support and lower the vehicle.

TORQUE SPECIFICATIONS

FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
			removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
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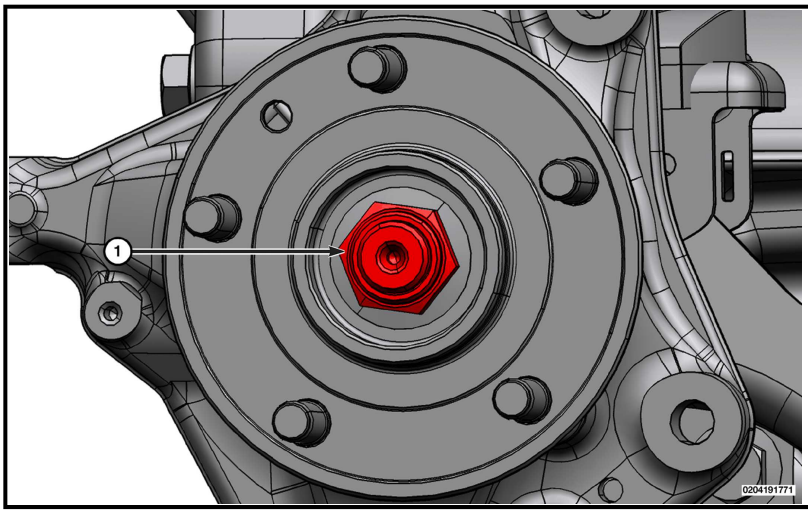
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

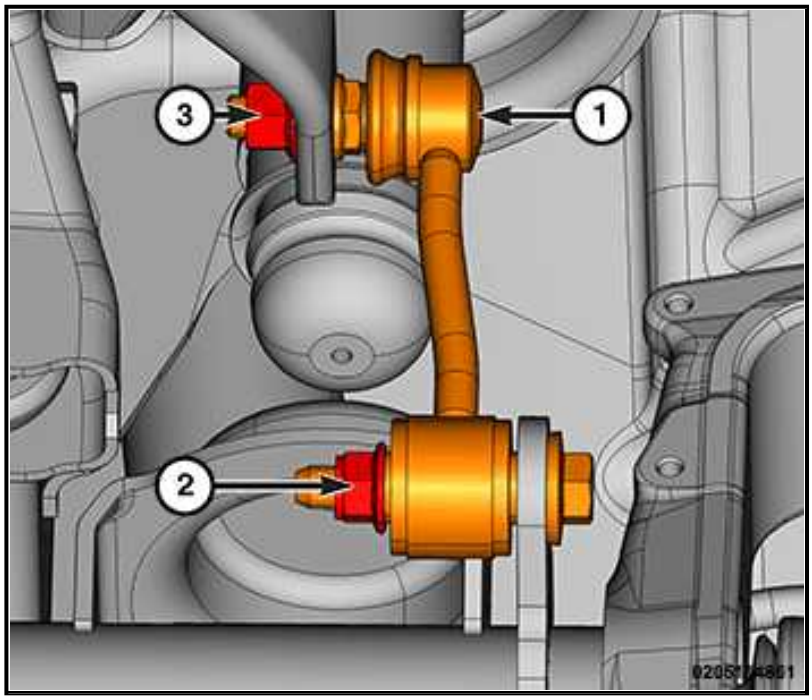
LINK, STABILIZER BAR

REMOVAL AND INSTALLATION

STABILIZER BAR LINK

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .



1 - Stabilizer Bar Link
2 - Stabilizer Bar Link Lower Nut
3 - Stabilizer Bar Link Upper Nut

2. Remove the stabilizer bar link lower nut.
3. Remove the stabilizer bar link upper nut.
4. Remove the stabilizer link.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

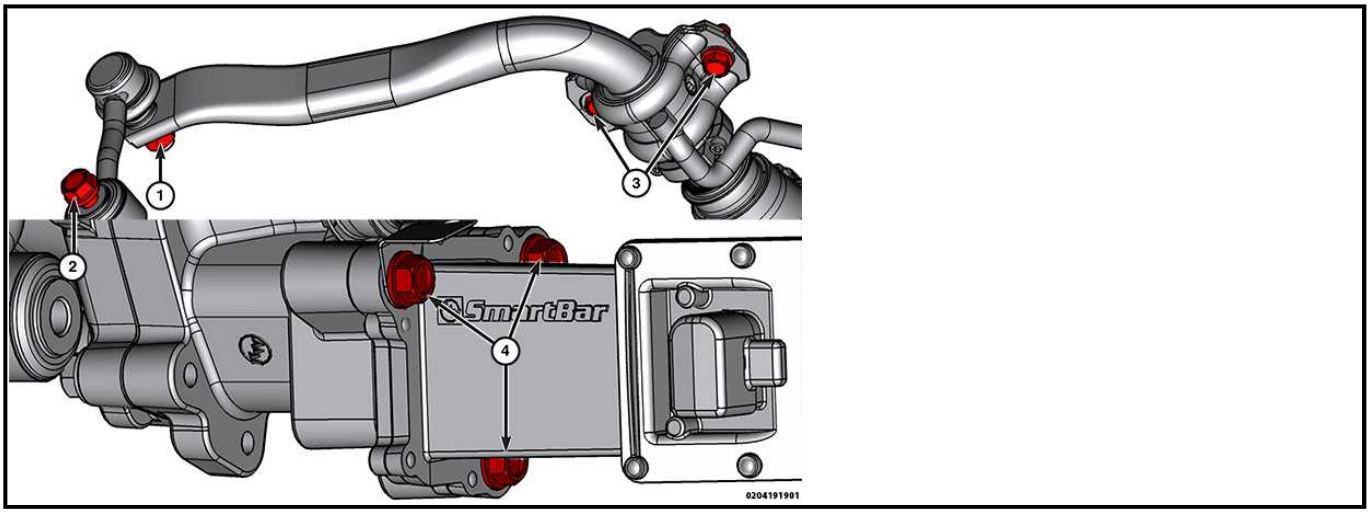
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

- Install the stabilizer bar link lower nut but do not tighten at this time.
- Tighten the stabilizer bar link upper nut to 74 N.m (55 ft. lbs.) then loosen the stabilizer bar link upper nut 180B° - 360B°.
- Tighten the stabilizer bar link upper nut to the proper torque specifications.

TORQUE SPECIFICATIONS

FRONT STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Nut	**115 N. m (85 Ft. Lbs.)**	-
2	Stabilizer Bar Link Lower Bolt	**90 N. m (66 Ft. Lbs.)**	-
3	Stabilizer Bar Bolts	**63 N. m (46 Ft. Lbs.)**	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
4	Stabilizer Bar Actuator Bolts	**25 N. m (18 Ft. Lbs.)**	-

SHOCK ABSORBER, SUSPENSION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - SHOCK ABSORBER

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

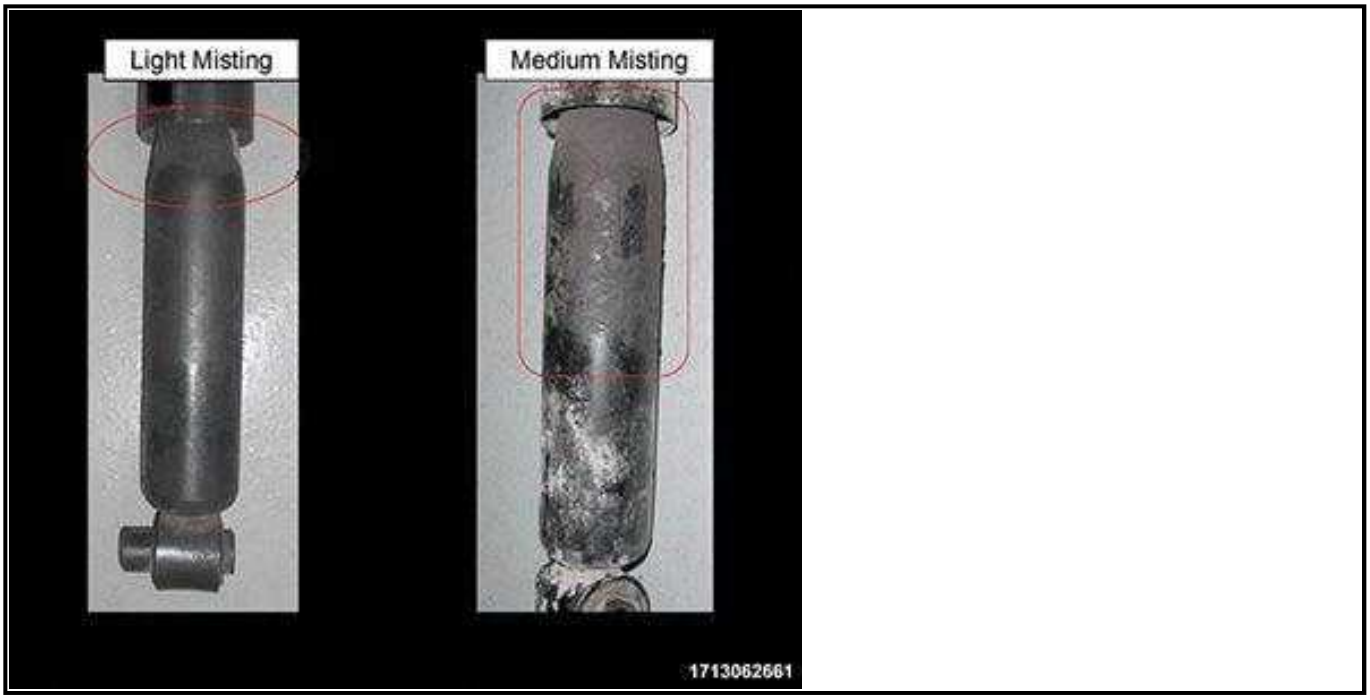
A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced.

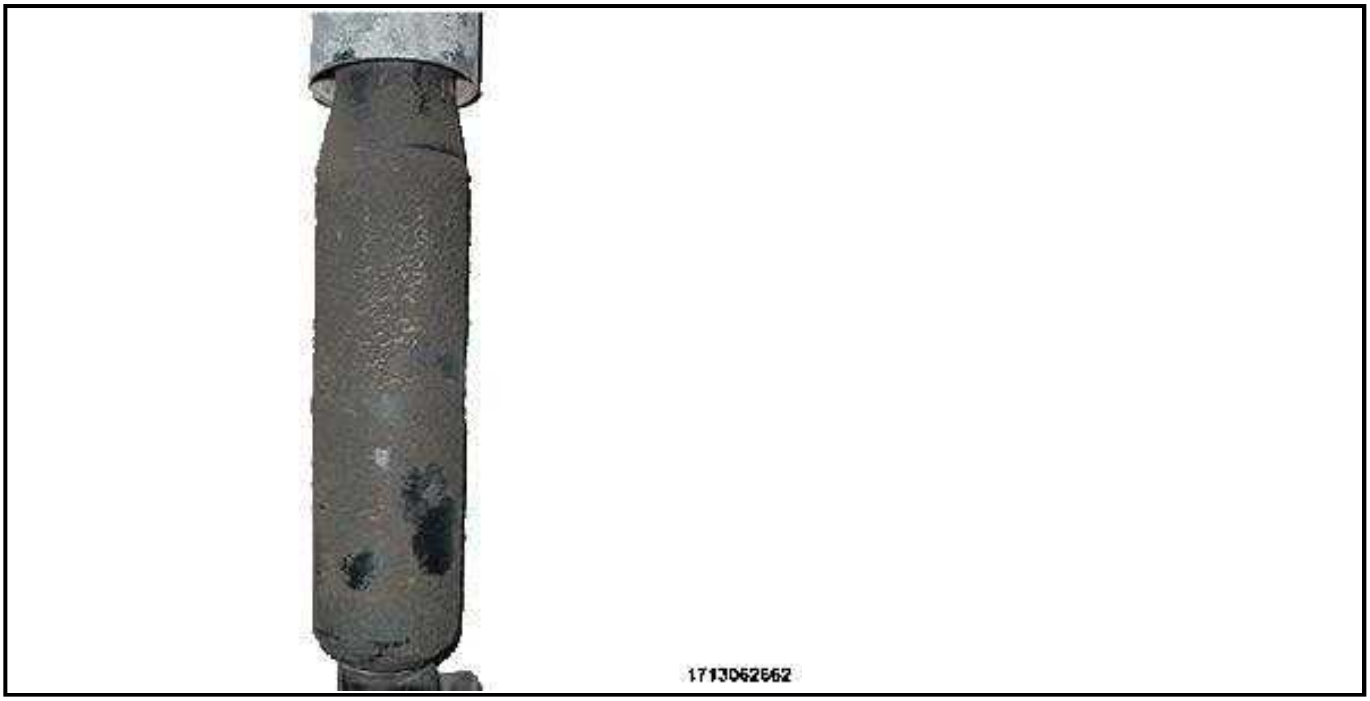
To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even. **This procedure does not apply to load leveling shocks.**

The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing.

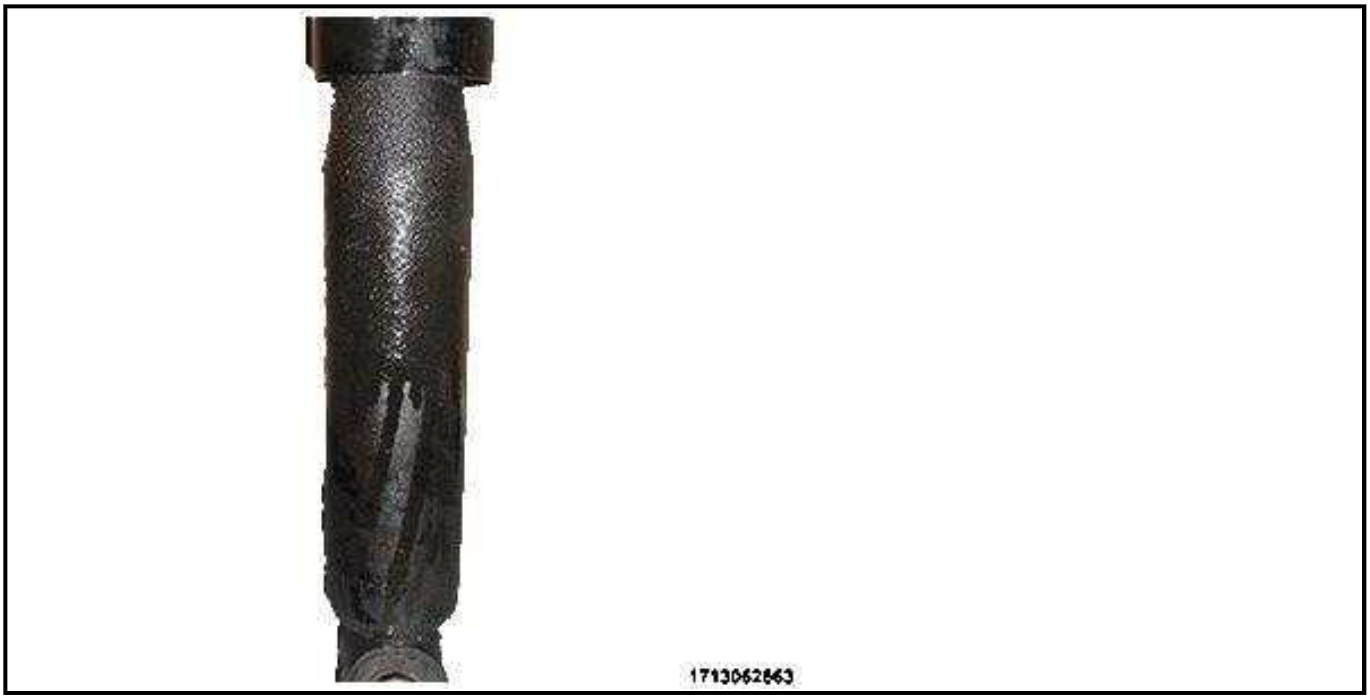
When checking the rear shock absorbers visual condition it should be noted that slight oil dampness or "misting" does not indicate the unit has failed. Below are examples of misting shocks and a failed leaking shock:



LIGHT and MEDIUM MISTING SHOCKS (DO NOT REPLACE)



HEAVY MISTING SHOCK (DO NOT REPLACE)



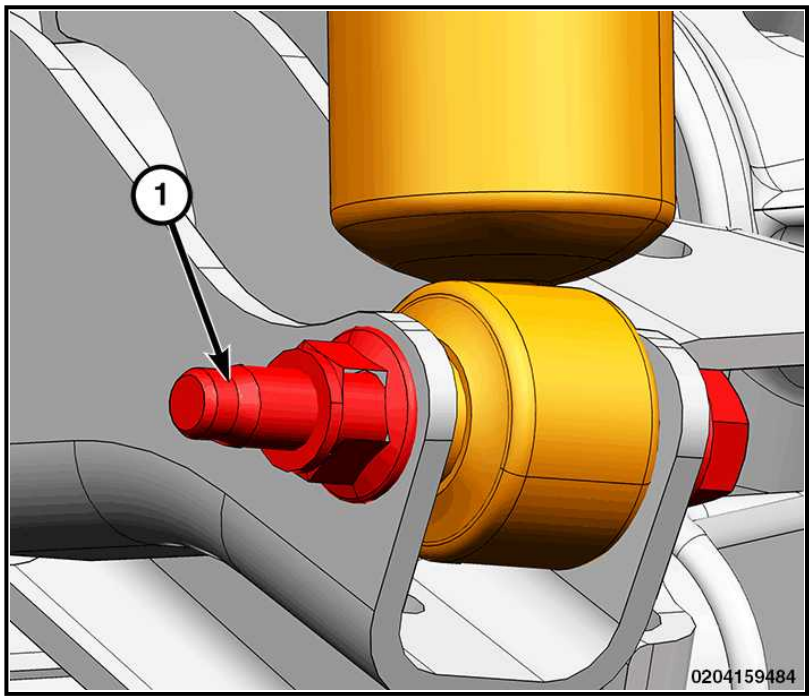
FAILED LEAKING SHOCK (REPLACE)

REMOVAL AND INSTALLATION

SHOCK ABSORBER

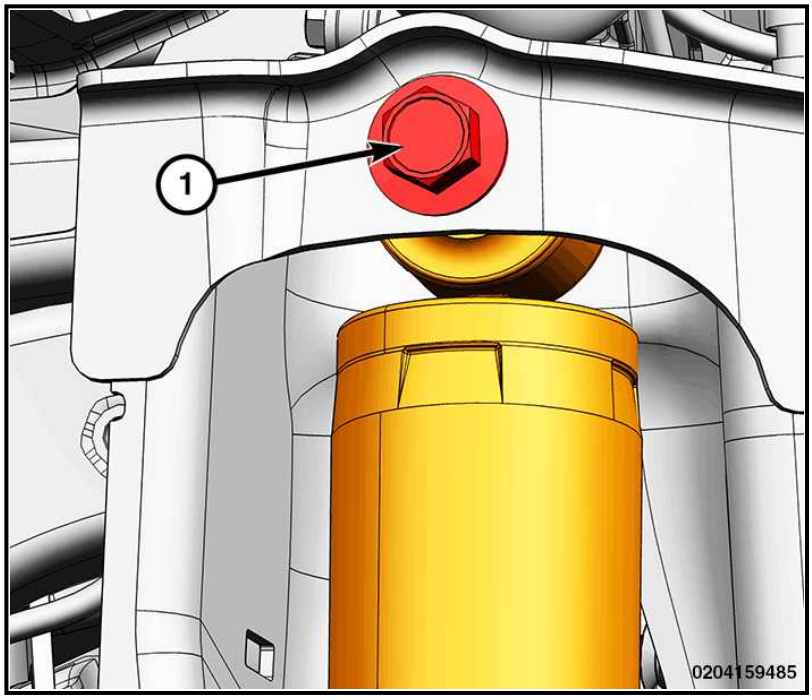
REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the axle assembly with an appropriate jack.



1 - Shock Absorber Lower Bolt

3. Hold the nut and remove the shock absorber lower bolt.



1 - Shock Absorber Upper Bolt

4. Remove the shock absorber upper bolt and remove the shock absorber.

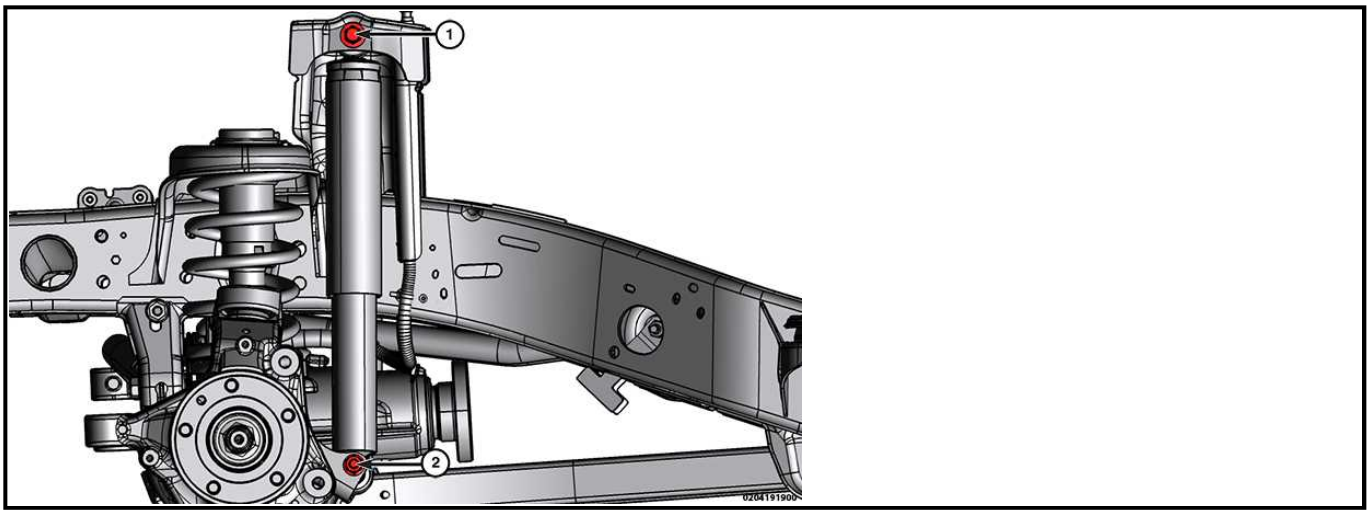
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATIONS

SHOCK ABSORBERS



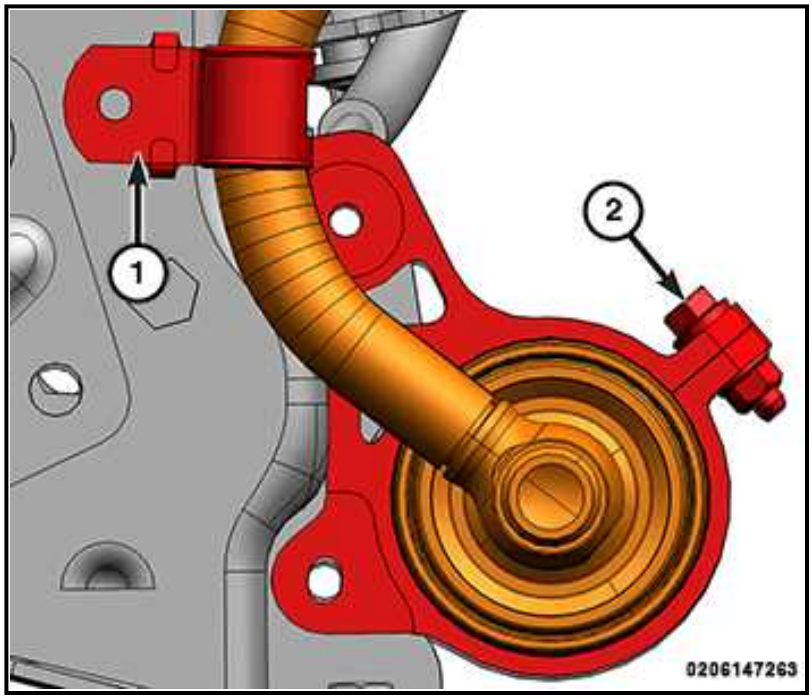
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**140 N. m (103 Ft. Lbs.)**	-
2	Shock Absorber Lower Bolt	**100 N. m (77 Ft. Lbs.)**	-

SHOCK ABSORBER WITH REMOTE RESERVOIR

REMOVAL

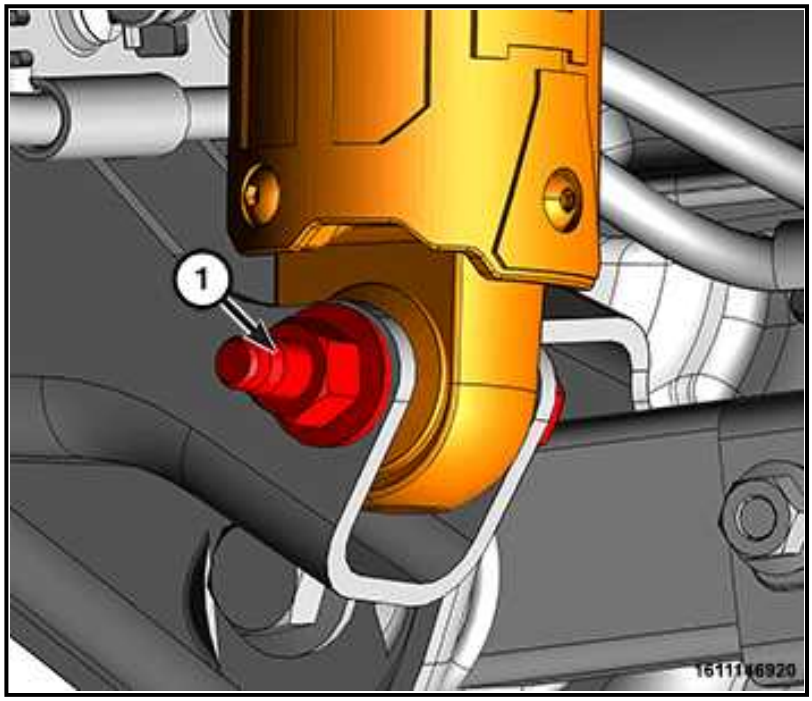
1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

2. Support the axle assembly with an appropriate jack.



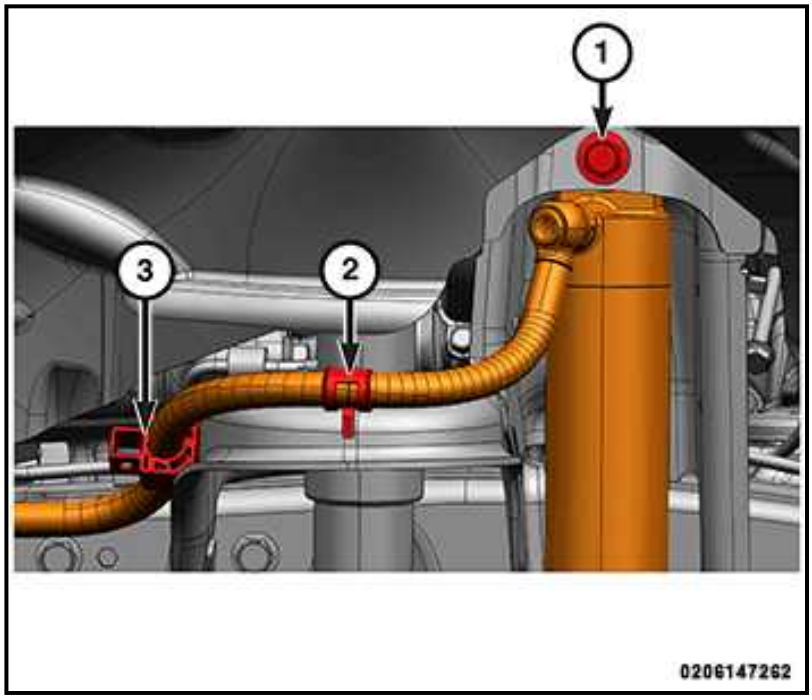
1 - Routing Clip
2 - Remote Reservoir Bolt

3. If equipped, disengage the line routing clip from the frame.
4. If equipped, remove the remote reservoir bolt.
5. If equipped, remove the remote reservoir from the bracket.



1 - Shock Absorber Lower Bolt

6. Hold the nut and remove the shock absorber lower bolt.



1 - Shock Absorber Upper Bolt
2 - Line Routing Clips
3 - Line Routing Clips

7. Disengage the line routing clips from the frame.
8. Remove the shock absorber upper bolt and remove the shock absorber.

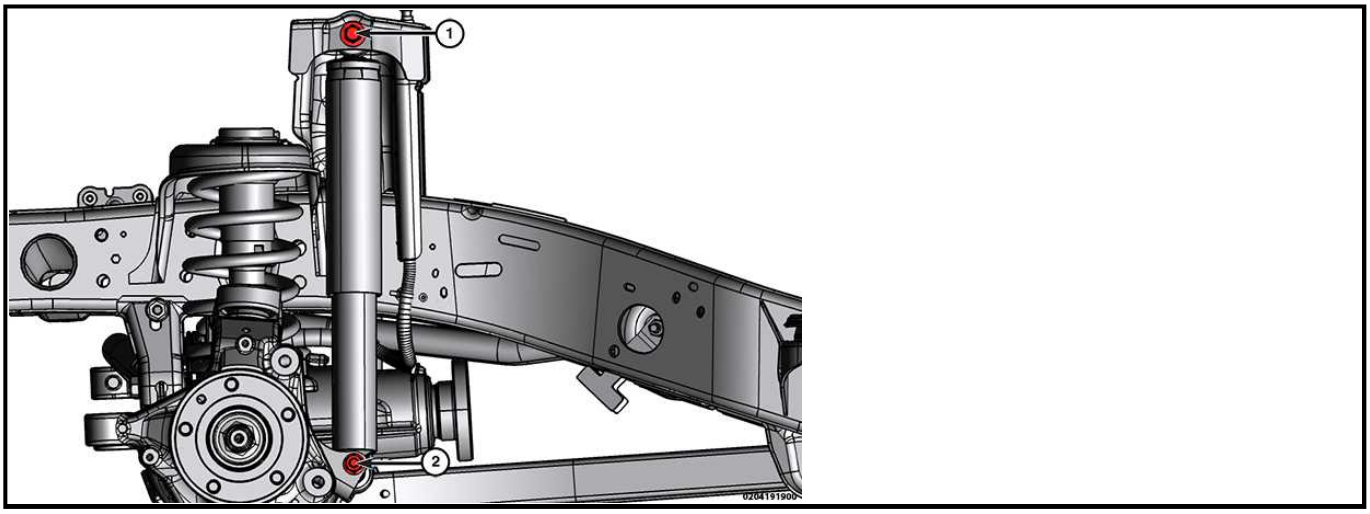
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATIONS

SHOCK ABSORBERS



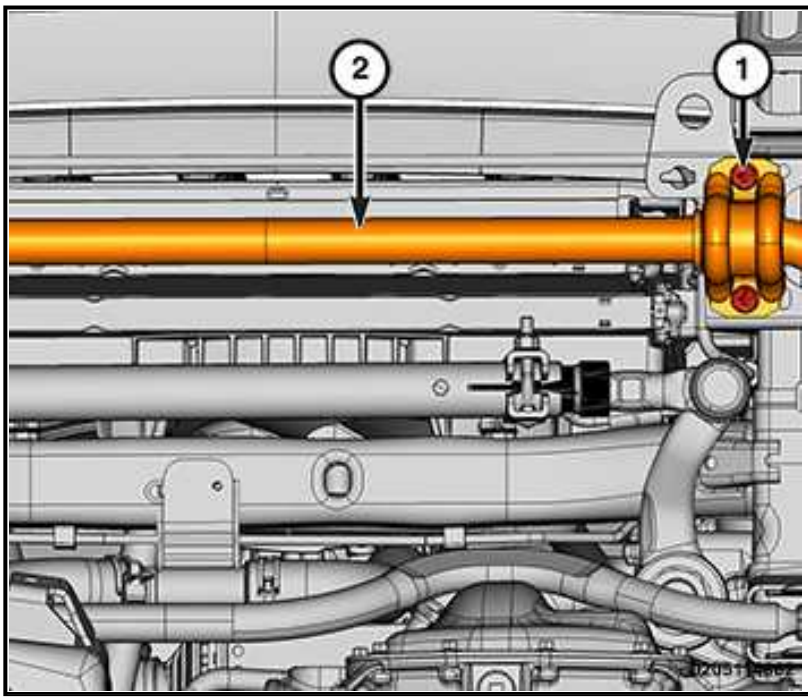
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**140 N. m (103 Ft. Lbs.)**	-
2	Shock Absorber Lower Bolt	**100 N. m (77 Ft. Lbs.)**	-

STABILIZER BAR, FRONT

REMOVAL AND INSTALLATION

STABILIZER BAR

REMOVAL



1 - Stabilizer Bar Bolts
2 - Stabilizer Bar

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the front air dam. Refer to **AIR DAM, FRONT, REMOVAL AND INSTALLATION** .
3. If equipped, disconnect the height sensor rod.
4. Disconnect both stabilizer bar links from the stabilizer bar. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.
5. Remove and **DISCARD** the four stabilizer bar bolts.
6. Remove the stabilizer bar.
7. Remove the left and right stabilizer bar bushings and retainers from the stabilizer bar.

INSTALLATION

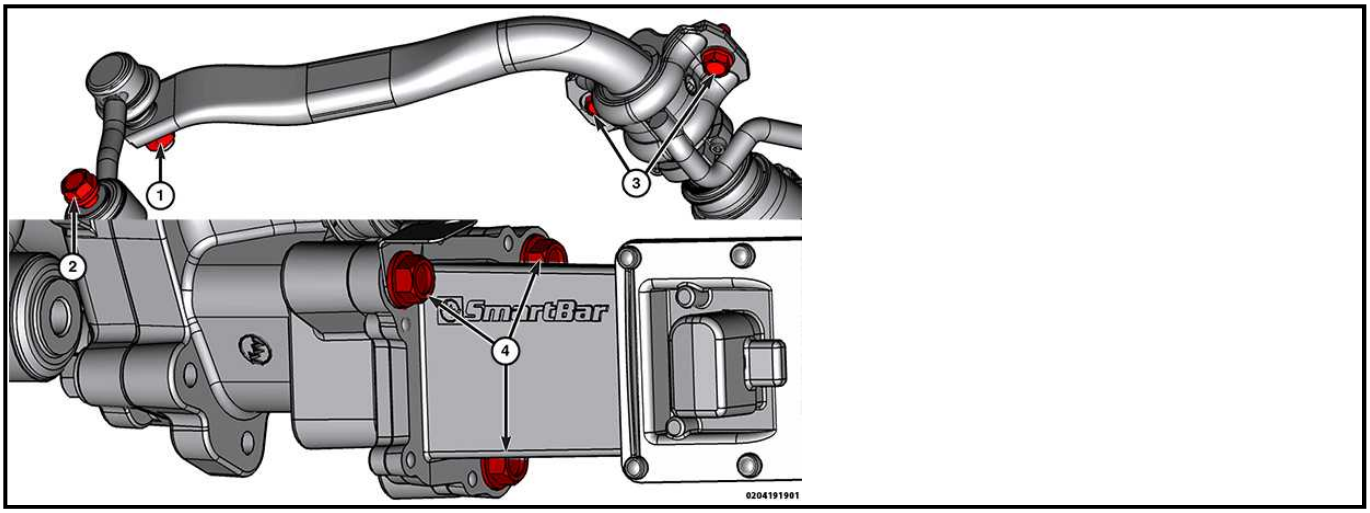
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- Install four **NEW** stabilizer bar bolts.

TORQUE SPECIFICATIONS

FRONT STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Nut	**115 N. m (85 Ft. Lbs.)**	-
2	Stabilizer Bar Link Lower Bolt	**90 N. m (66 Ft. Lbs.)**	-
3	Stabilizer Bar Bolts	**63 N. m (46 Ft. Lbs.)**	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
4	Stabilizer Bar Actuator Bolts	**25 N. m (18 Ft. Lbs.)**	-

ACTIVE STABILIZER BAR

REMOVAL

NOTE: **The stabilizer links, stabilizer bar retainers and bushings, and the stabilizer bar are serviceable. The new bar consists of the disconnecting unit and actuator attached as an assembly to the bar.**

1. Disconnect and isolate the negative battery cable(s). Refer to the appropriate service information .
2. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
3. Remove the front air dam. Refer to **AIR DAM, FRONT, REMOVAL AND INSTALLATION** .
4. If equipped, disconnect the height sensor rod.

1 - Stabilizer Bar Actuator Wire Harness Connector
2 - Stabilizer Bar Bolts

5. Disconnect both stabilizer bar links from the stabilizer bar. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.

NOTE: **Before disconnecting the stabilizer bar actuator wire harness connector from the actuator clean the outside of the connector with a cleaner and compressed air, to remove any dirt or debris.**

6. Disconnect the stabilizer bar actuator wire harness connector.
7. Remove and **DISCARD** the four stabilizer bar bolts from the frame rails and remove the stabilizer bar.
8. Remove the left and right stabilizer bar bushings and retainers from the stabilizer bar.

INSTALLATION

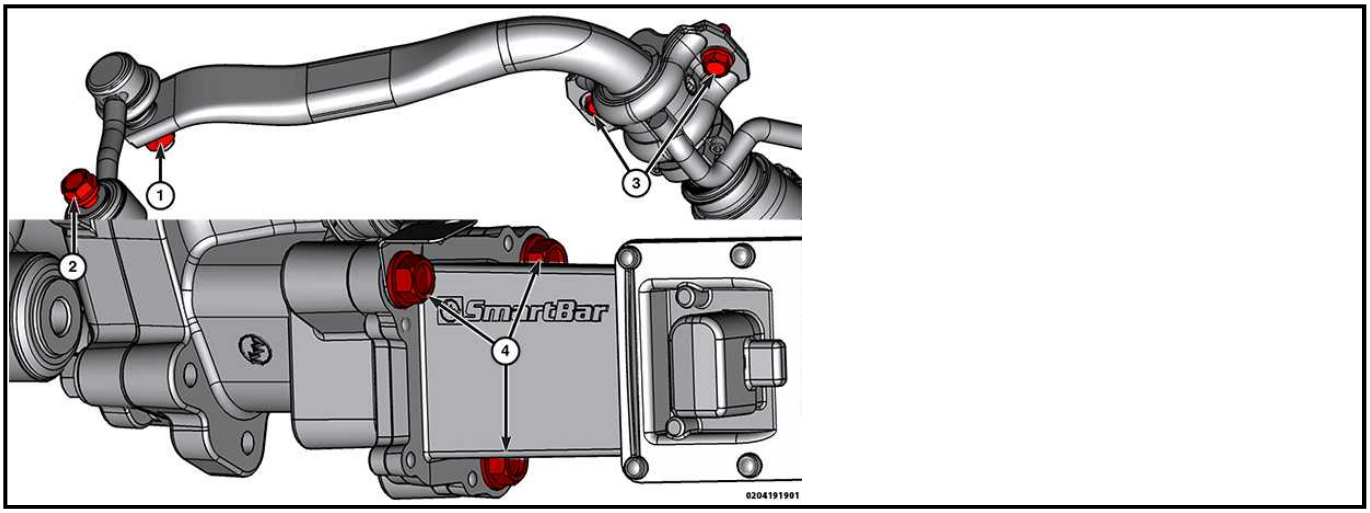
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

- To enable a new Active Stabilizer Bar System (ASBS) module road test the vehicle until all indicator lamps stop flashing, then verify proper operation of four wheel drive and disconnecting stabilizer bar functions by actuating them electrically.
- Install four **NEW** stabilizer bar bolts.

TORQUE SPECIFICATIONS

FRONT STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Nut	**115 N. m (85 Ft. Lbs.)**	-
2	Stabilizer Bar Link Lower Bolt	**90 N. m (66 Ft. Lbs.)**	-
3	Stabilizer Bar Bolts	**63 N. m (46 Ft. Lbs.)**	Do not reuse these fasteners. If removed, a new fastener must be installed and tightened to specifications.
4	Stabilizer Bar Actuator Bolts	**25 N. m (18 Ft. Lbs.)**	-

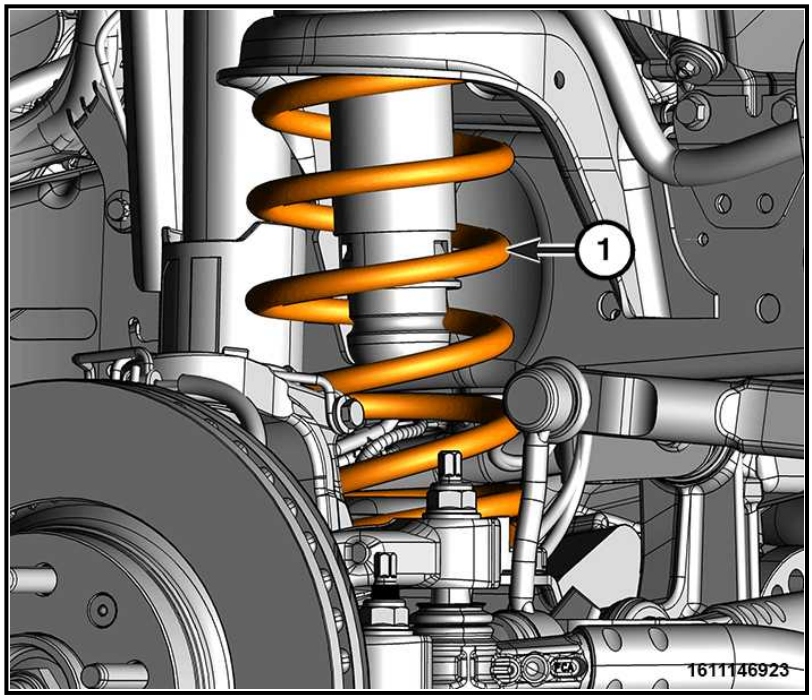
SPRING, FRONT COIL

REMOVAL AND INSTALLATION

COIL SPRING

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the axle assembly with an appropriate jack.
3. Remove the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION** .
4. Disconnect both the left and right stabilizer bar links from the axle. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.
5. Remove the front brake hose upper bolt and disconnect brake line bracket from frame the rail to provide slack.



1 - Coil Spring

6. Remove the front shock absorber lower nut and bolt. Refer to **SHOCK ABSORBER, SUSPENSION, REMOVAL AND INSTALLATION**.

NOTE: **Do not lower the axle further than the brake hose slack allows.**

7. Lower the axle until the spring is free from the upper mount.

NOTE: **Rotation of the spring and prying down slightly on the axle will aid in removal.**

8. Remove the coil spring.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

Rotation of the spring and prying down slightly on the axle will aid in installation.

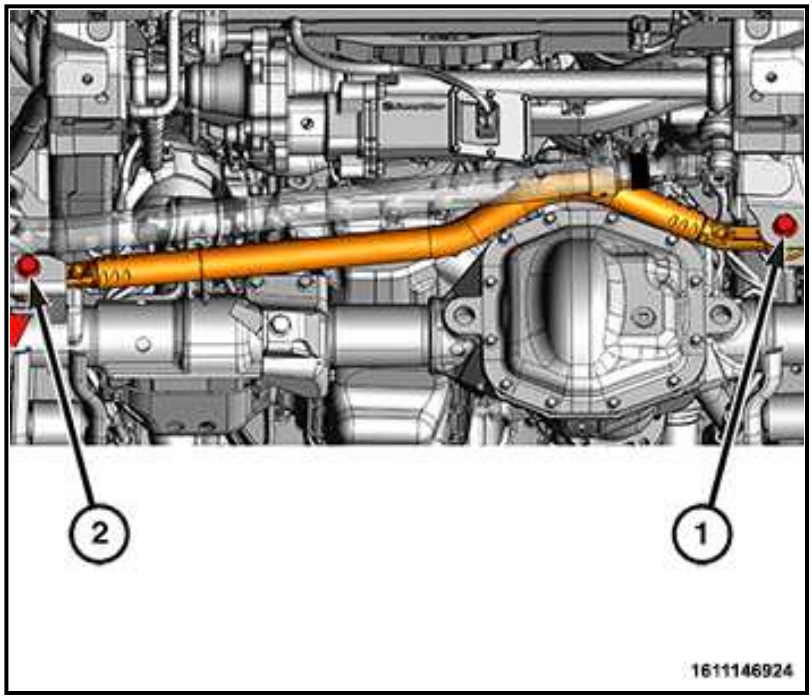
TRACK BAR, FRONT

REMOVAL AND INSTALLATION

TRACK BAR

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .



1 - Track Bar Frame Bolt
2 - Track Bar Axle Bolt

2. Remove the track bar frame nut and the track bar frame bolt.
3. Remove the track bar axle bolt and flag nut from the axle bracket.
4. Remove the track bar.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

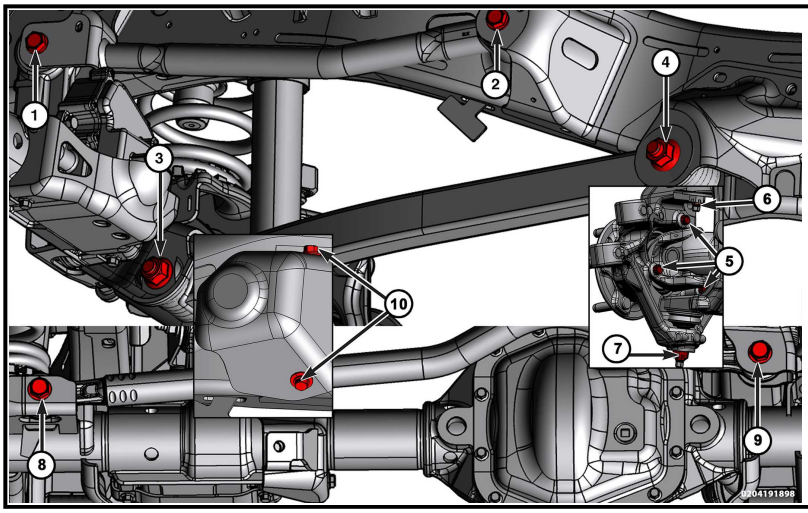
NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

NOTE: **It may be necessary to pry the axle assembly over to install the track bar at the frame rail.**

NOTE: **The track bar frame bolt must be installed from front to rear.**

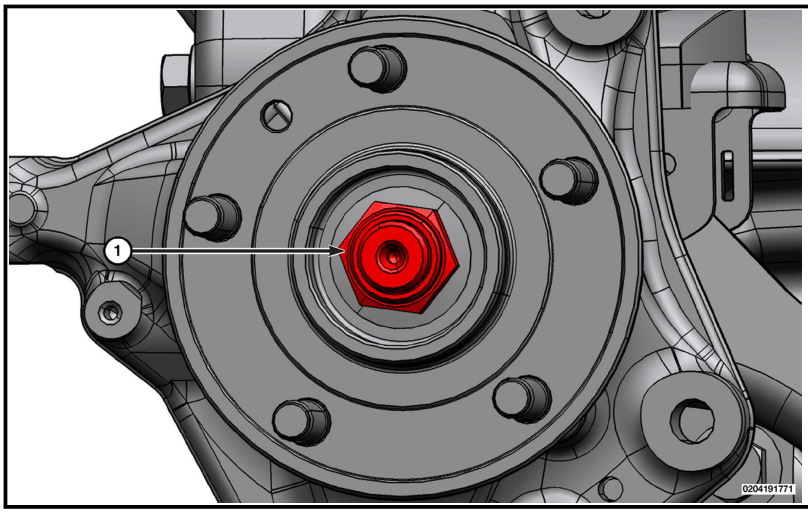
TORQUE SPECIFICATIONS

FRONT SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Front Bolt	**55 N. m Plus 185B° (41 Ft. Lbs. Plus 185B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Rear Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Nut	**140 N. m Plus 145B° (103 Ft. Lbs. Plus 145B°)**	Fastener must be torqued with the vehicle at normal ride height.
5	Hub And Bearing Bolts	**102 N. m (75 Ft. Lbs.)**	-
6	Upper Ball Joint Nut	**75 N. m (55 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
7	Lower Ball Joint Nut (aluminum knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**20 N. m (15 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (aluminum knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**80 N. m (59 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) "Early" NON induction hardened ball joint W/O "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
7	Lower Ball Joint Nut (cast iron knuckle) (initial torque) Induction hardened ball joint with "IH" marking on the ball joint.	**30 N. m (22 Ft. Lbs.)**	-
7	Lower Ball Joint Nut (cast iron knuckle) (final torque) Induction hardened ball joint with "IH" marking on the ball joint.	**65 N. m (48 Ft. Lbs.)**	Once final torque is reached, manually advance the castle nut to the next castle opening for the cotter pin to be inserted, even if the hole is aligned when final torque is reached. Do not reuse the cotter pin. If removed, a new cotter pin must be installed.
8	Track Bar Axle Bolt	**70 N. m Plus 155B° (52 Ft. Lbs. Plus 155)**	-
9	Track Bar Frame Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-
10	Heat Shield Bolt	**70 N. m Plus 115B° (52 Ft. Lbs. Plus 115)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Hub And Bearing Nut	**136 N. m (100 Ft. Lbs.)**	-

WHEEL ALIGNMENT SPECIFICATIONS

GLADIATOR (JT) MOJAVE

GLADIATOR (JT) Mojave

Measurement	Minimum	Preferred	Maximum
Left Front Caster (B°)	3.48	4.48	5.48
Right Front Caster (B°)	3.48	4.48	5.48
Left Front Camber (B°)	-0.62	-0.25	0.12
Right Front Camber (B°)	-0.62	-0.25	0.12
Front Toe (B°)	0.05	0.2	0.35
Left SAI (B°)	0	0	0
Right SAI (B°)	0	0	0
Left Rear Camber (B°)	-0.6	-0.1	0.4
Right Rear Camber (B°)	-0.6	-0.1	0.4
Rear Toe (B°)	0	0.3	0.6
Thrust Angle (B°)	0.3	0.3	0.3
Left Toe Out, Inward (B°)	0	0	0
Right Toe Out, Inward (B°)	0	0	0
Left Toe Out, Outward (B°)	0	0	0
Right Toe Out, Outward (B°)	0	0	0
Left Max Turn, Inward (B°)	0	0	0
Right Max Turn, Inward (B°)	0	0	0
Left Max Turn, Outward (B°)	0	0	0
Right Max Turn, Outward (B°)	0	0	0

GLADIATOR (JT) RUBICON

GLADIATOR (JT) Rubicon

Measurement	Minimum	Preferred	Maximum
Left Front Caster (B°)	3.45	4.45	5.45
Right Front Caster (B°)	3.45	4.45	5.45
Left Front Camber (B°)	-0.62	-0.25	0.12
Right Front Camber (B°)	-0.62	-0.25	0.12
Front Toe (B°)	0.05	0.2	0.35
Left SAI (B°)	0	0	0
Right SAI (B°)	0	0	0
Left Rear Camber (B°)	-0.6	-0.1	0.4
Right Rear Camber (B°)	-0.6	-0.1	0.4
Rear Toe (B°)	0	0.3	0.6
Thrust Angle (B°)	0.3	0.3	0.3
Left Toe Out, Inward (B°)	0	0	0
Right Toe Out, Inward (B°)	0	0	0
Left Toe Out, Outward (B°)	0	0	0
Right Toe Out, Outward (B°)	0	0	0
Left Max Turn, Inward (B°)	0	0	0
Right Max Turn, Inward (B°)	0	0	0

Measurement	Minimum	Preferred	Maximum
Left Max Turn, Outward (B°)	0	0	0
Right Max Turn, Outward (B°)	0	0	0

GLADIATOR (JT) SPORT

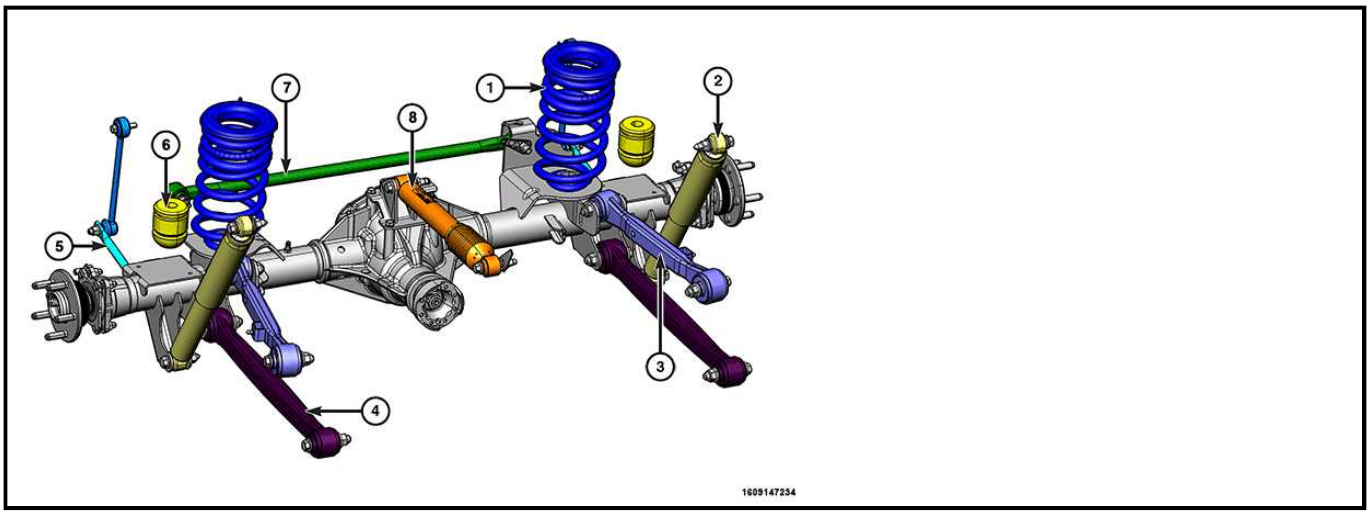
GLADIATOR (JT) Sport

Measurement	Minimum	Preferred	Maximum
Left Front Caster (B°)	3.65	4.65	5.65
Right Front Caster (B°)	3.65	4.65	5.65
Left Front Camber (B°)	-0.62	-0.25	0.12
Right Front Camber (B°)	-0.62	-0.25	0.12
Front Toe (B°)	0.05	0.2	0.35
Left SAI (B°)	0	0	0
Right SAI (B°)	0	0	0
Left Rear Camber (B°)	-0.6	-0.1	0.4
Right Rear Camber (B°)	-0.6	-0.1	0.4
Rear Toe (B°)	0	0.3	0.6
Thrust Angle (B°)	0.3	0.3	0.3
Left Toe Out, Inward (B°)	0	0	0
Right Toe Out, Inward (B°)	0	0	0
Left Toe Out, Outward (B°)	0	0	0
Right Toe Out, Outward (B°)	0	0	0
Left Max Turn, Inward (B°)	0	0	0
Right Max Turn, Inward (B°)	0	0	0
Left Max Turn, Outward (B°)	0	0	0
Right Max Turn, Outward (B°)	0	0	0

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The rear suspension is link and coil design.

The major components of the rear suspension are:

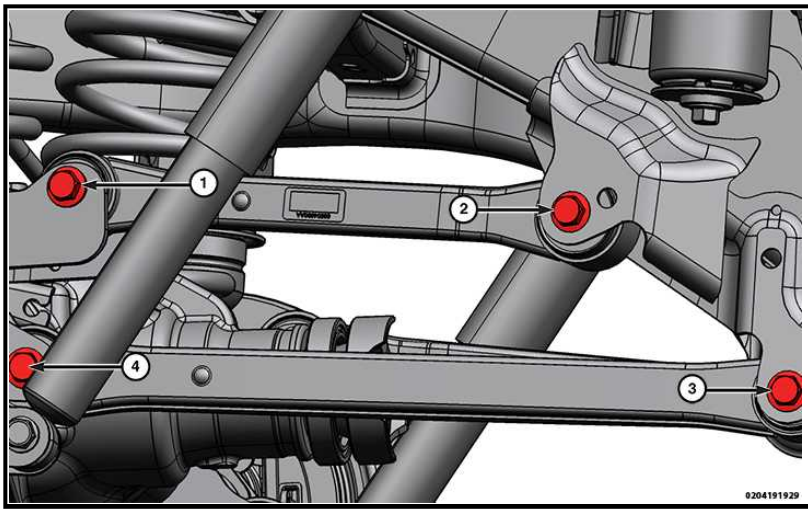
1. Coil Springs
2. Shock Absorbers
3. Upper Control Arms
4. Lower Control Arms
5. Stabilizer Bar
6. Jounce Bumpers
7. Track Bar
8. Power Hop Damper

CAUTION: **Suspension components with rubber/urethane bushings (except stabilizer bar) should be tightened with the full weight of the vehicle at normal ride height. It is important to have the springs supporting the full weight of the vehicle when the fasteners are torqued. This will maintain vehicle ride comfort and prevent premature bushing wear.**

TECHNICAL SPECIFICATIONS

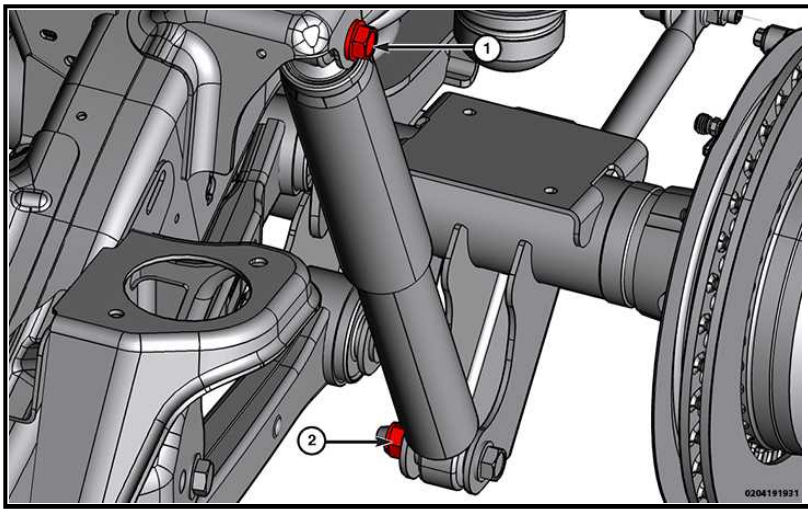
TORQUE SPECIFICATIONS

REAR SUSPENSION

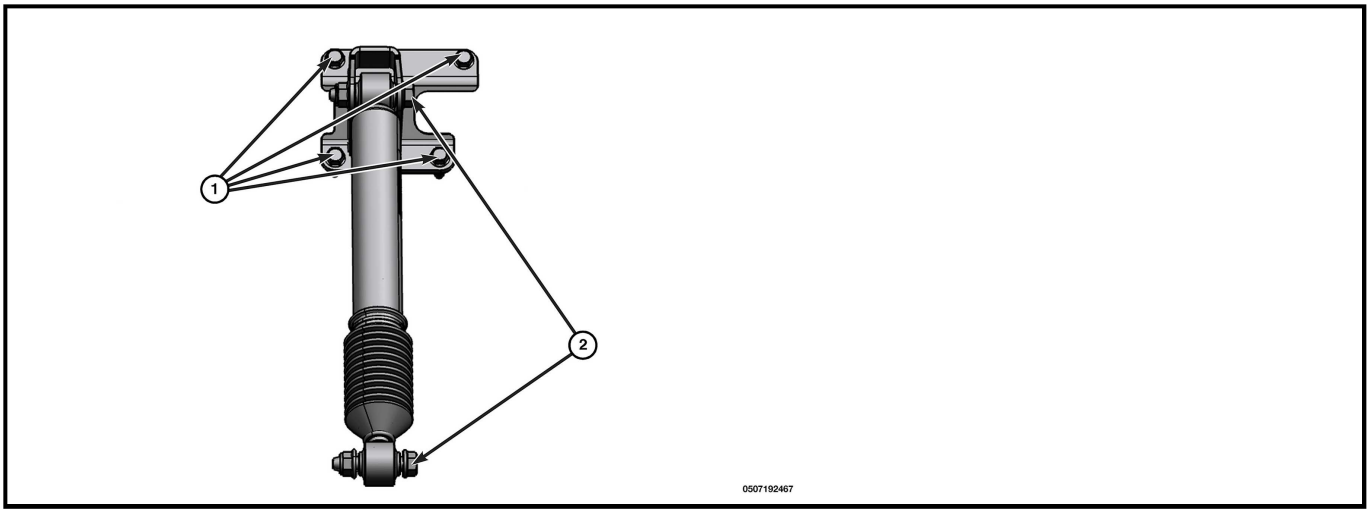


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Rear Bolt	**150 N. m Plus 90B° (111 Ft. Lbs. Plus 90B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Front Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Bolt	**150 N. m Plus 65B° (111 Ft. Lbs. Plus 65B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Bolt	**150 N. m Plus 60B° (111 Ft. Lbs. Plus 60B°)**	Fastener must be torqued with the vehicle at normal ride height.

REAR SHOCK

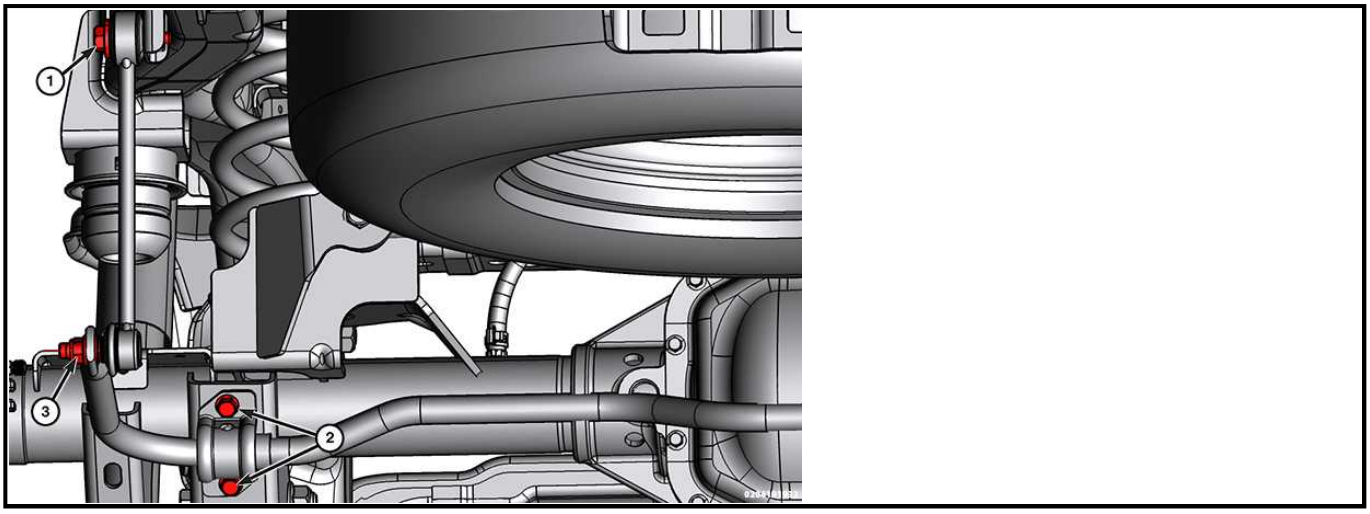


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**120 N. m (89 Ft. Lbs.)**	-
2	Shock Absorber Lower Nut	**120 N. m (89 Ft. Lbs.)**	-



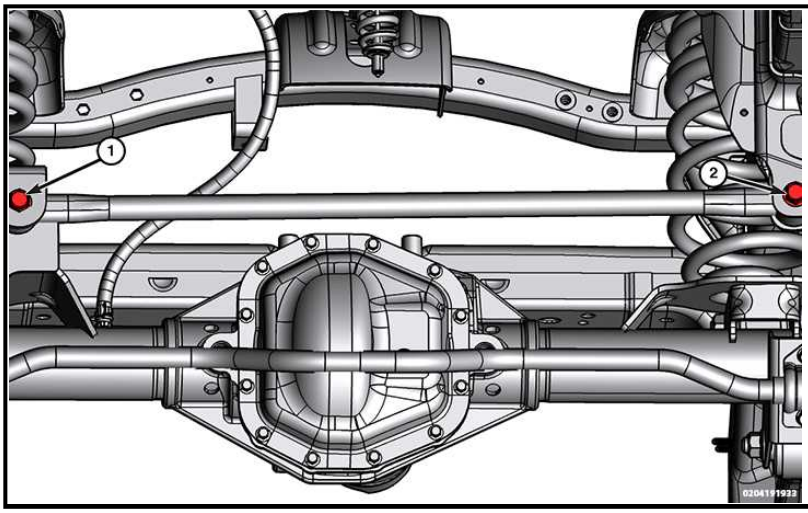
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Power Hop Damper Axle Bracket Bolts	**70 N. m (52 Ft. Lbs.)**	-
2	Power Hop Damper Bolts	**125 N. m (92 Ft. Lbs.)**	-

REAR STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Bolt	**110 N. m (81 Ft. Lbs.)**	-
2	Stabilizer Bar Bolts	**55 N. m (41 Ft. Lbs.)**	-
3	Stabilizer Bar Link Lower Nut	**95 N. m (70 Ft. Lbs.)**	-

REAR TRACK BAR



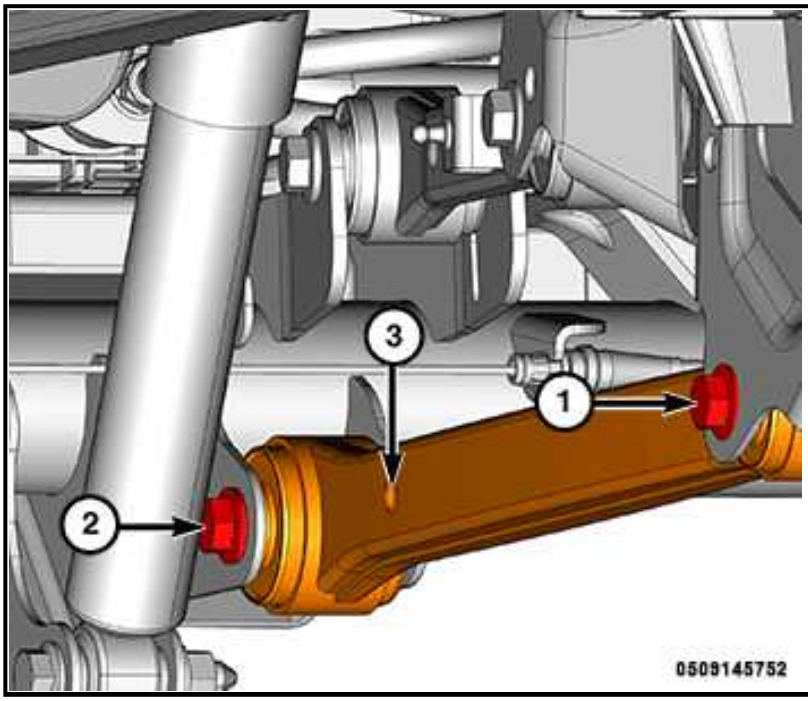
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Track Bar Bolt	**125 N. m (92 Ft. Lbs.)**	-
2	Lower Track Bar Bolt	**135 N. m (100 Ft. Lbs.)**	-

ARM, LOWER CONTROL

REMOVAL AND INSTALLATION

LOWER CONTROL ARM

REMOVAL



1 - Lower Control Arm Front Bolt
2 - Lower Control Arm Rear Bolt
3 - Lower Control Arm

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION** .
3. Hold the lower control arm rear nut and remove the lower control arm rear bolt.
4. Hold the lower control arm front nut and remove the lower control arm front bolt.
5. Remove the lower control arm.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

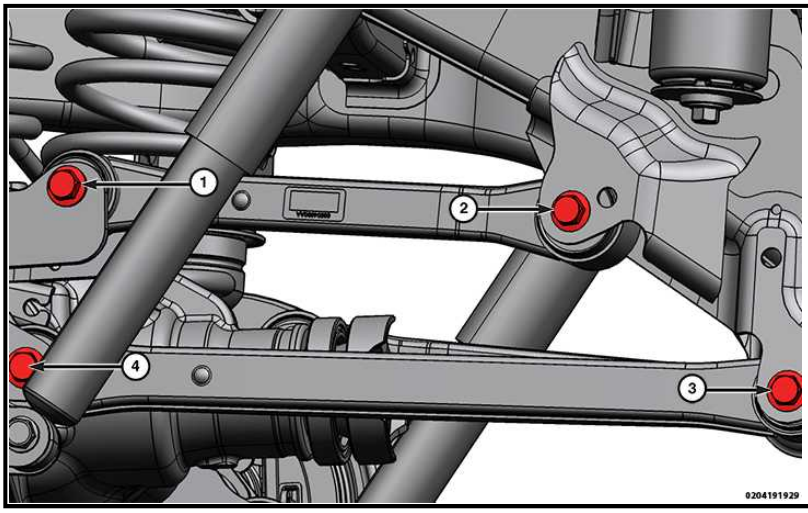
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE** .

TORQUE SPECIFICATIONS

REAR SUSPENSION



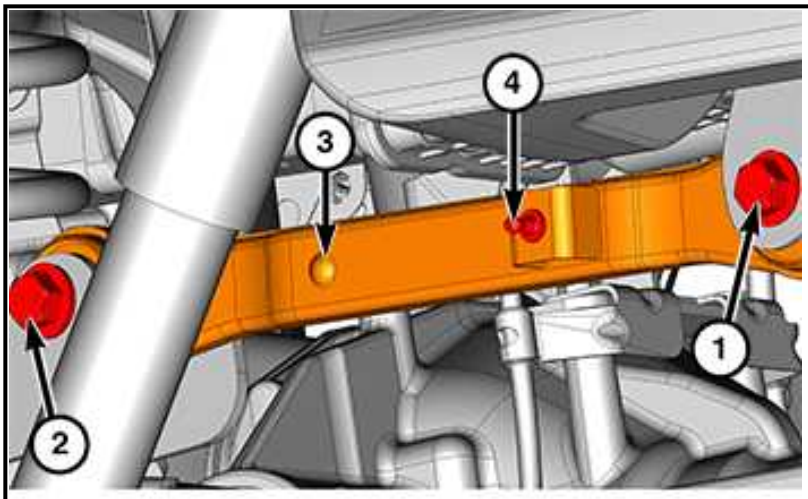
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Rear Bolt	**150 N. m Plus 90B° (111 Ft. Lbs. Plus 90B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Front Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Bolt	**150 N. m Plus 65B° (111 Ft. Lbs. Plus 65B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Bolt	**150 N. m Plus 60B° (111 Ft. Lbs. Plus 60B°)**	Fastener must be torqued with the vehicle at normal ride height.

ARM, UPPER CONTROL

REMOVAL AND INSTALLATION

UPPER CONTROL ARM

REMOVAL



1 - Upper Control Arm Front Bolt
2 - Upper Control Arm Rear Bolt
3 - Upper Control Arm
4 - Ball Stud

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION** .
3. For left side only, disconnect the height sensor rod from the ball stud, if equipped.
4. Hold the upper control arm rear nut and remove the upper control arm rear bolt.
5. Hold the upper control front nut and remove the upper control arm front bolt.
6. Remove the upper control arm.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

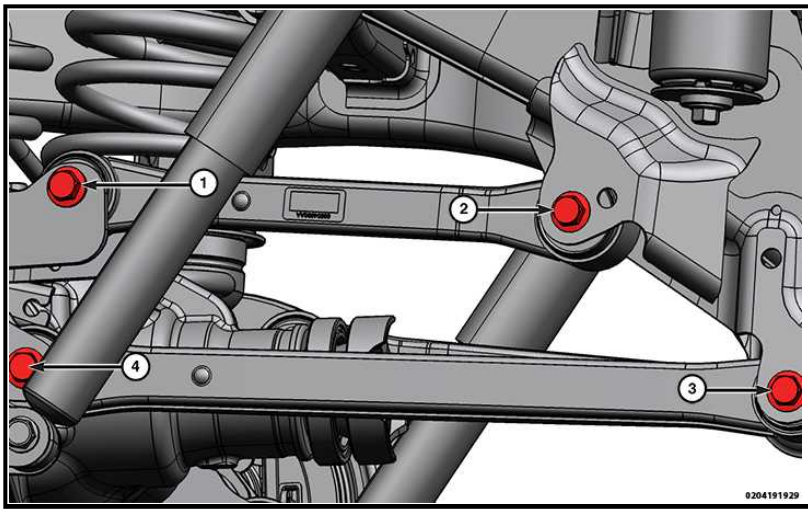
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

- Perform the wheel alignment procedure. Refer to **WHEEL ALIGNMENT, STANDARD PROCEDURE** .

TORQUE SPECIFICATIONS

REAR SUSPENSION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Control Arm Rear Bolt	**150 N. m Plus 90B° (111 Ft. Lbs. Plus 90B°)**	Fastener must be torqued with the vehicle at normal ride height.
2	Upper Control Arm Front Bolt	**150 N. m Plus 95B° (111 Ft. Lbs. Plus 95B°)**	Fastener must be torqued with the vehicle at normal ride height.
3	Lower Control Arm Front Bolt	**150 N. m Plus 65B° (111 Ft. Lbs. Plus 65B°)**	Fastener must be torqued with the vehicle at normal ride height.
4	Lower Control Arm Rear Bolt	**150 N. m Plus 60B° (111 Ft. Lbs. Plus 60B°)**	Fastener must be torqued with the vehicle at normal ride height.

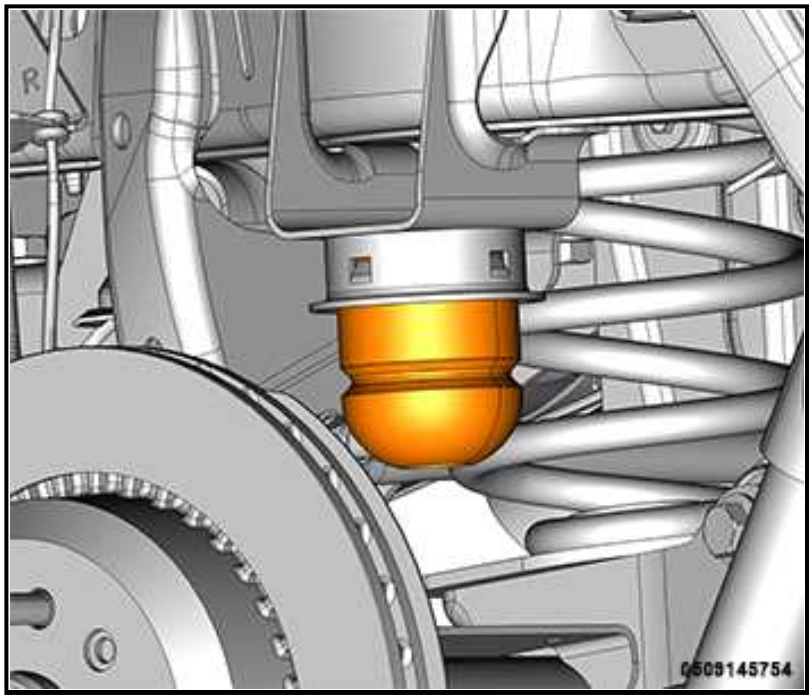
BUMPER, JOUNCE

REMOVAL AND INSTALLATION

JOUNCE BUMPER

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .



1 - Jounce Bumper

2. Remove the jounce bumper.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

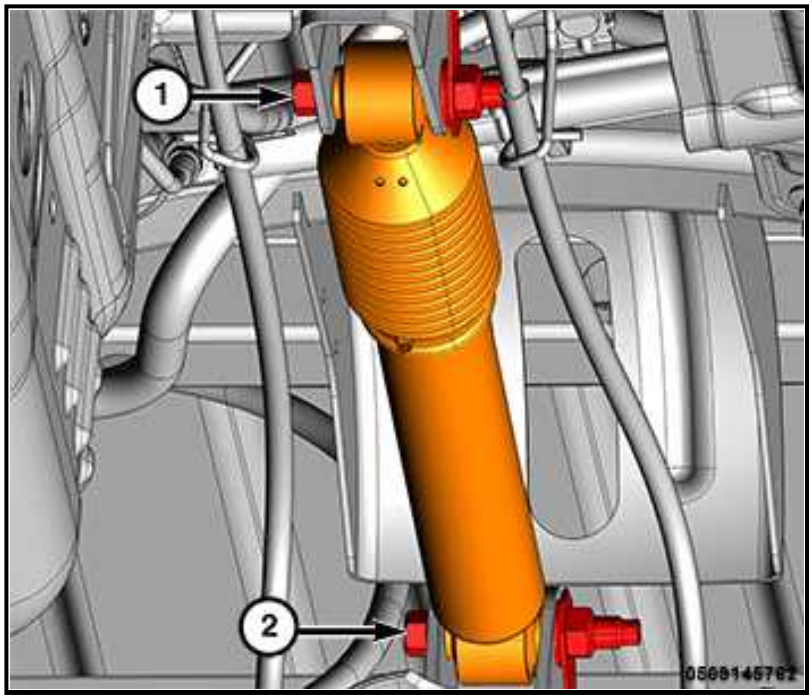
DAMPER, POWER HOP

REMOVAL AND INSTALLATION

POWER HOP DAMPER

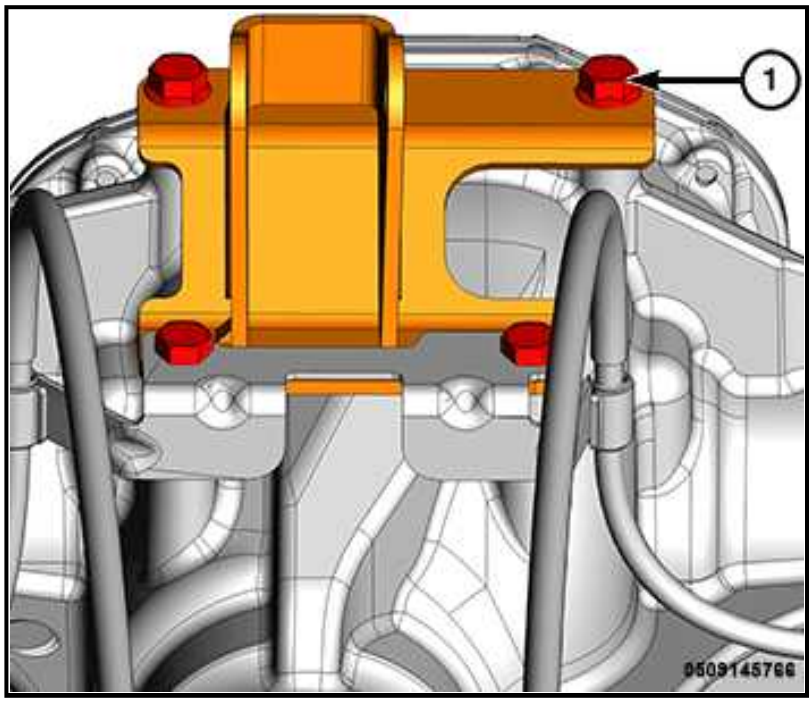
REMOVAL

1. Raise and support the vehicle Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the rear axle with a suitable holding fixture.



1 - Power Hop Damper Bolt
2 - Power Hop Damper Bolt

3. Remove the power hop damper bolt and nut.
4. Remove the power hop damper bolt and nut.
5. Remove the rear suspension power hop damper.



1 - Power Hop Damper Bracket Bolt

6. Remove the four power hop damper bracket bolts.
7. Remove the power hop damper bracket.

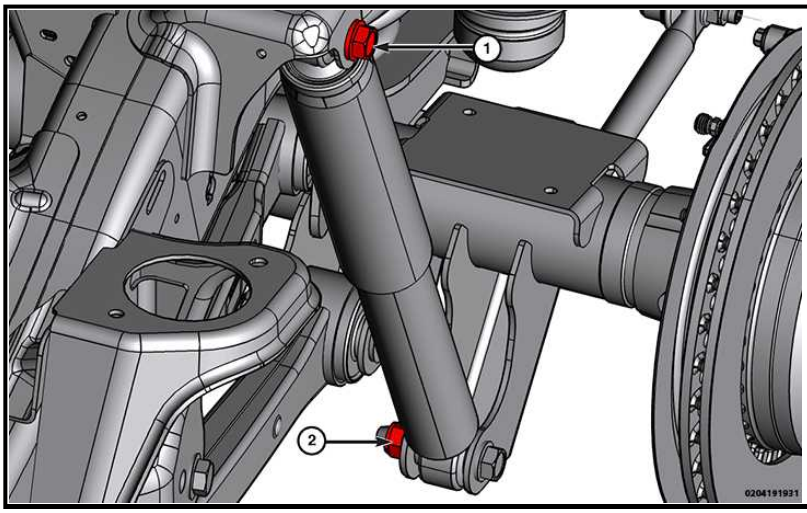
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

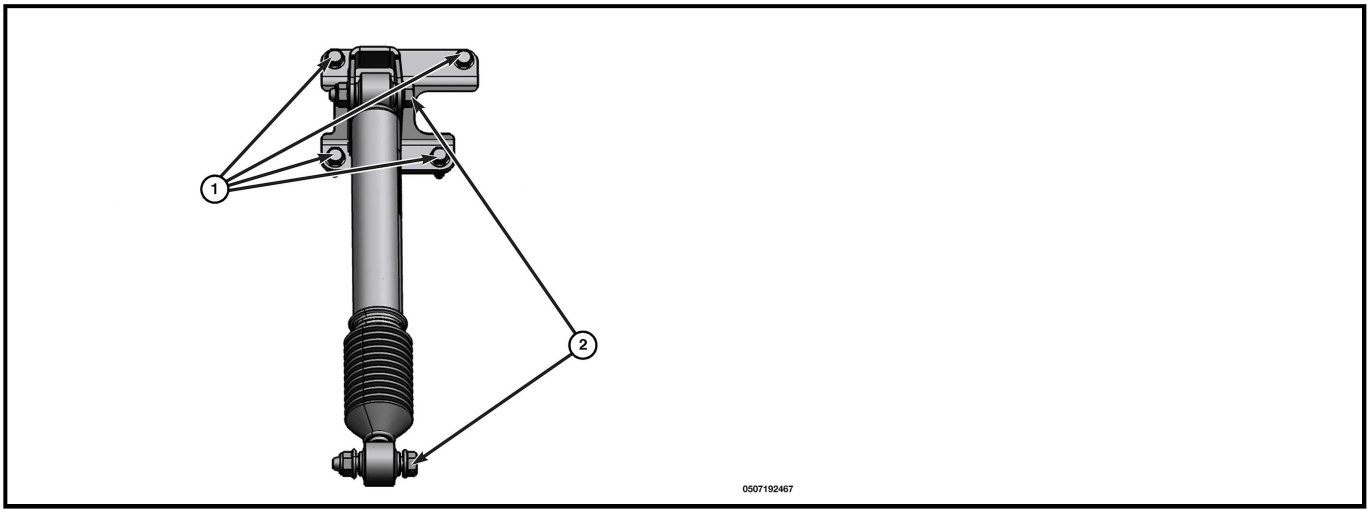
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

REAR SHOCK



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**120 N. m (89 Ft. Lbs.)**	-
2	Shock Absorber Lower Nut	**120 N. m (89 Ft. Lbs.)**	-



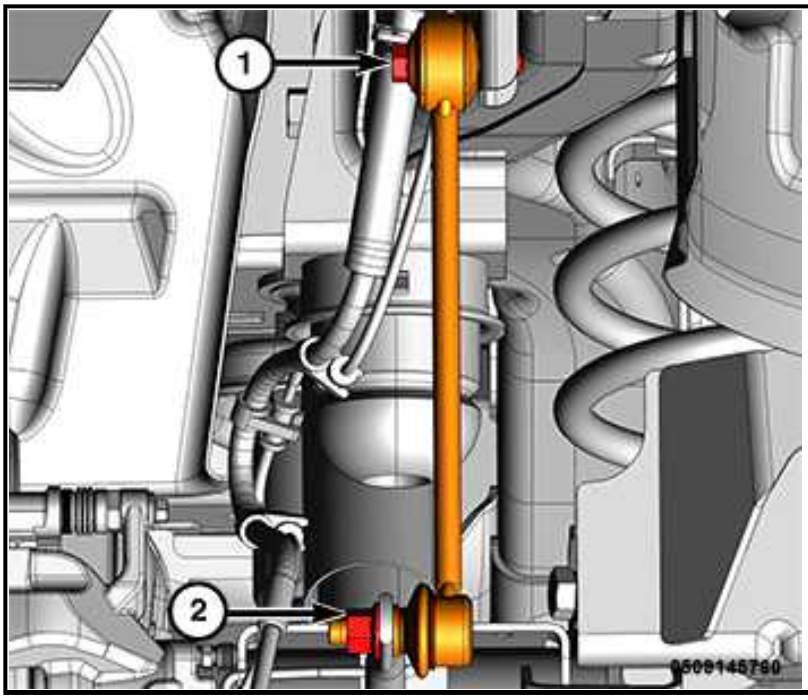
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Power Hop Damper Axle Bracket Bolts	**70 N. m (52 Ft. Lbs.)**	-
2	Power Hop Damper Bolts	**125 N. m (92 Ft. Lbs.)**	-

LINK, STABILIZER BAR

REMOVAL AND INSTALLATION

STABILIZER BAR LINK

REMOVAL



1 - Stabilizer Bar Link Upper Bolt
2 - Stabilizer Bar Link Lower Nut

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the stabilizer bar link upper bolt.
3. Remove the stabilizer bar link lower nut.
4. Remove stabilizer bar link.

INSTALLATION

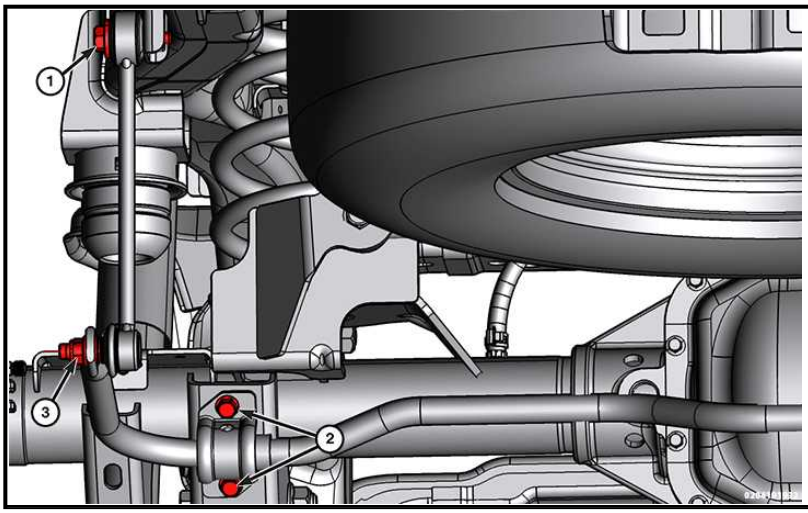
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

TORQUE SPECIFICATIONS

REAR STABILIZER BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Bolt	**110 N. m (81 Ft. Lbs.)**	-
2	Stabilizer Bar Bolts	**55 N. m (41 Ft. Lbs.)**	-
3	Stabilizer Bar Link Lower Nut	**95 N. m (70 Ft. Lbs.)**	-

SHOCK ABSORBER, SUSPENSION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - SHOCK ABSORBER

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

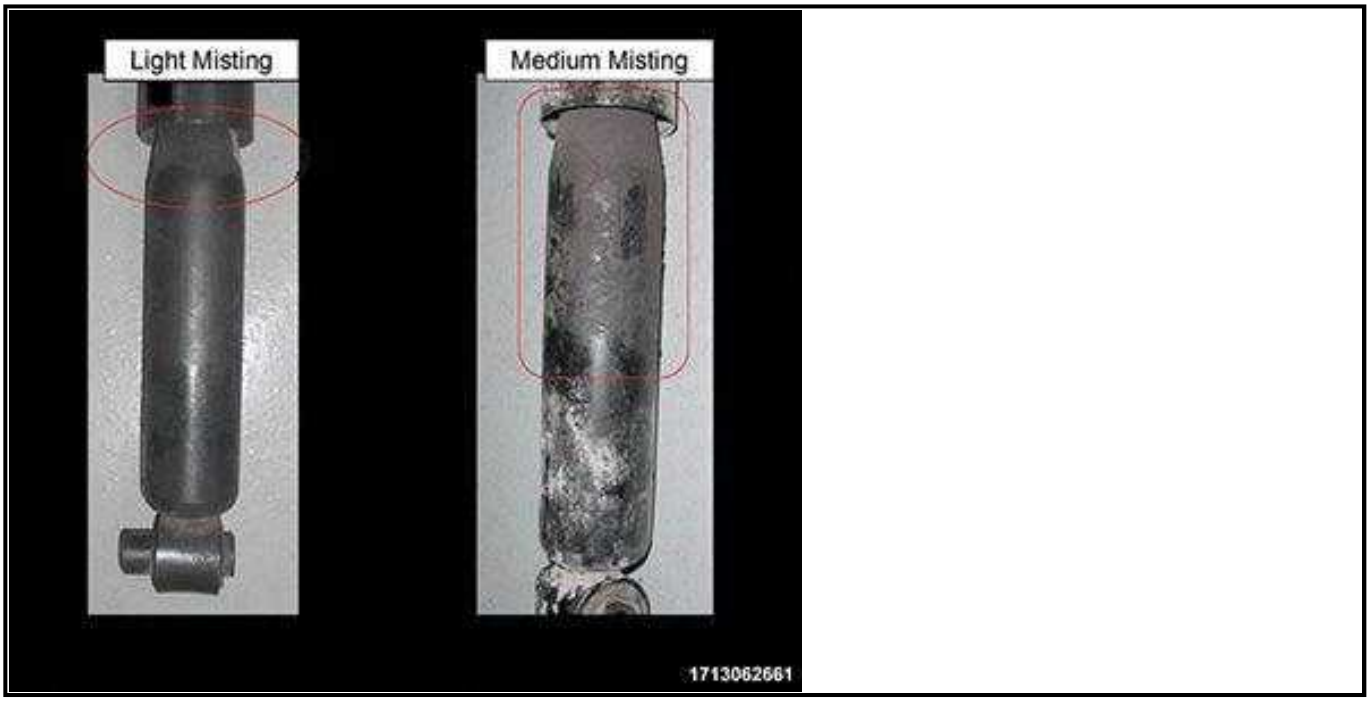
A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced.

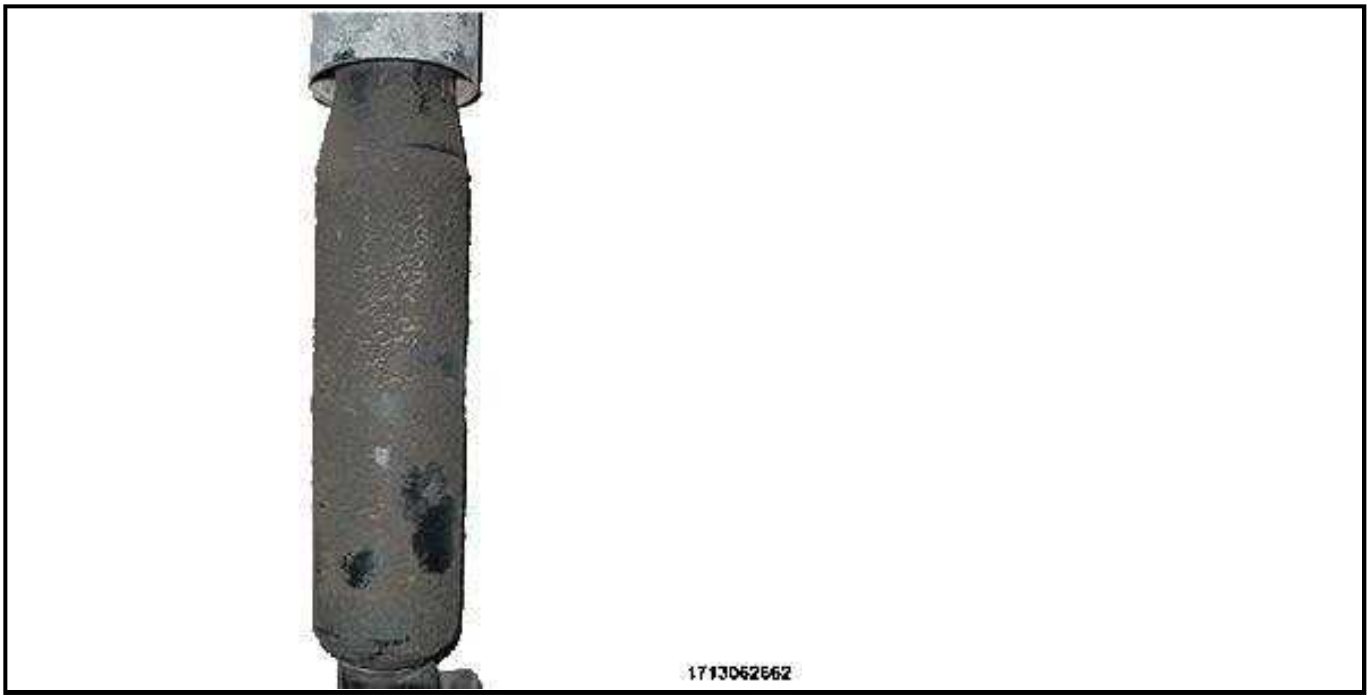
To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even. **This procedure does not apply to load leveling shocks.**

The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing.

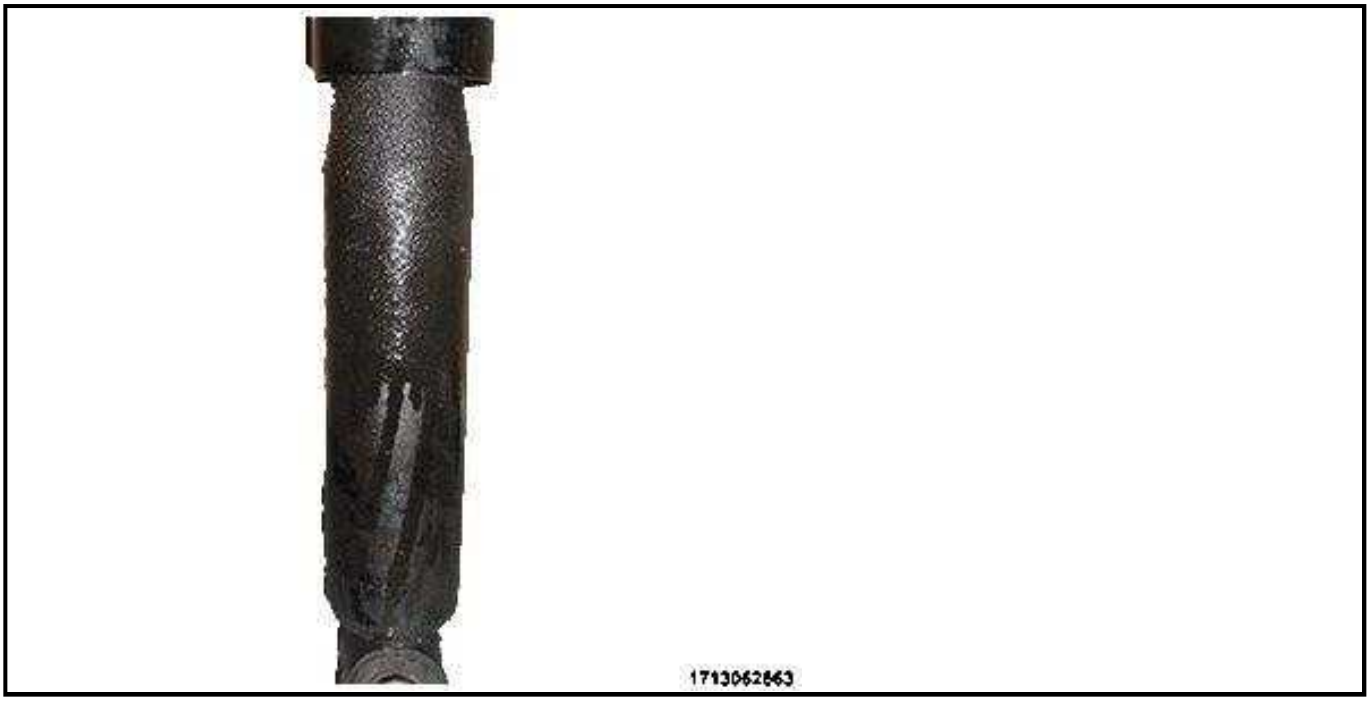
When checking the rear shock absorbers visual condition it should be noted that slight oil dampness or "misting" does not indicate the unit has failed. Below are examples of misting shocks and a failed leaking shock:



LIGHT and MEDIUM MISTING SHOCKS (DO NOT REPLACE)



HEAVY MISTING SHOCK (DO NOT REPLACE)

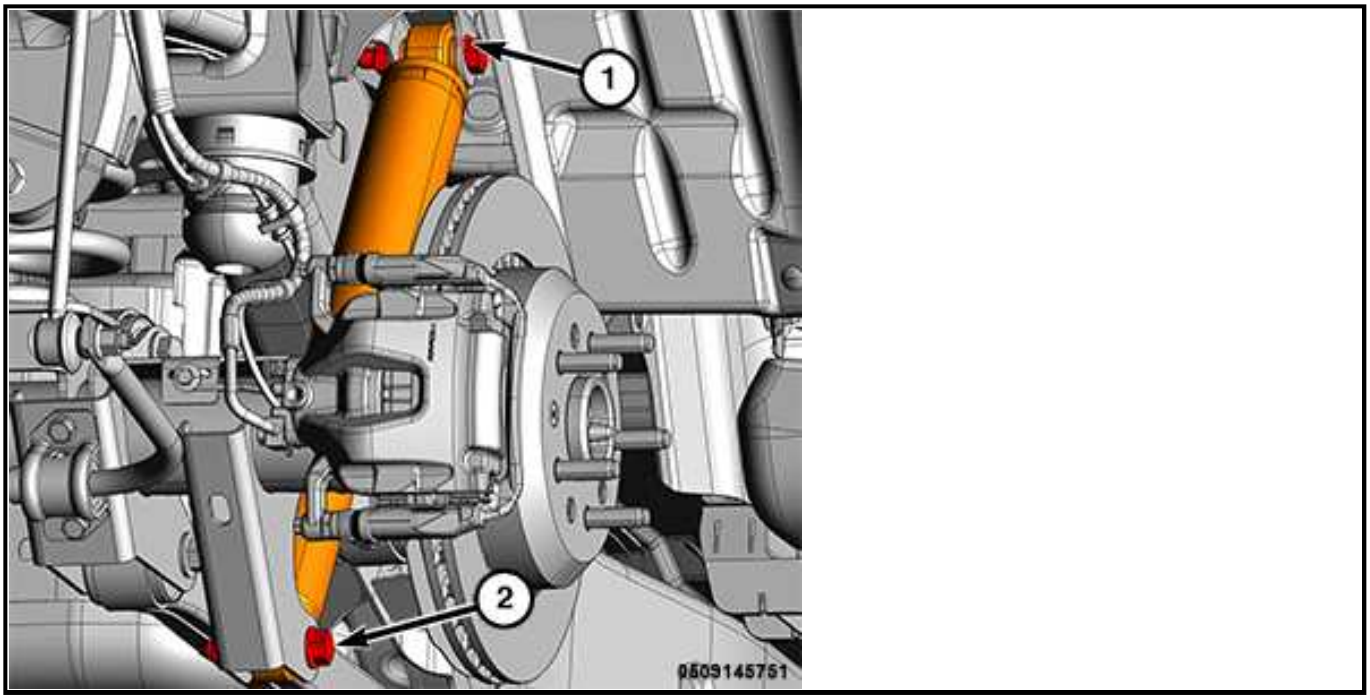


FAILED LEAKING SHOCK (REPLACE)

REMOVAL AND INSTALLATION

SHOCK ABSORBER

REMOVAL



1 - Shock Absorber Upper Bolt
2 - Shock Absorber Lower Bolt

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the axle assembly with an appropriate jack.
3. Hold the nut and remove the shock absorber upper bolt.
4. Remove the shock absorber lower nut and bolt from the axle bracket.
5. Remove the shock absorber.

INSTALLATION

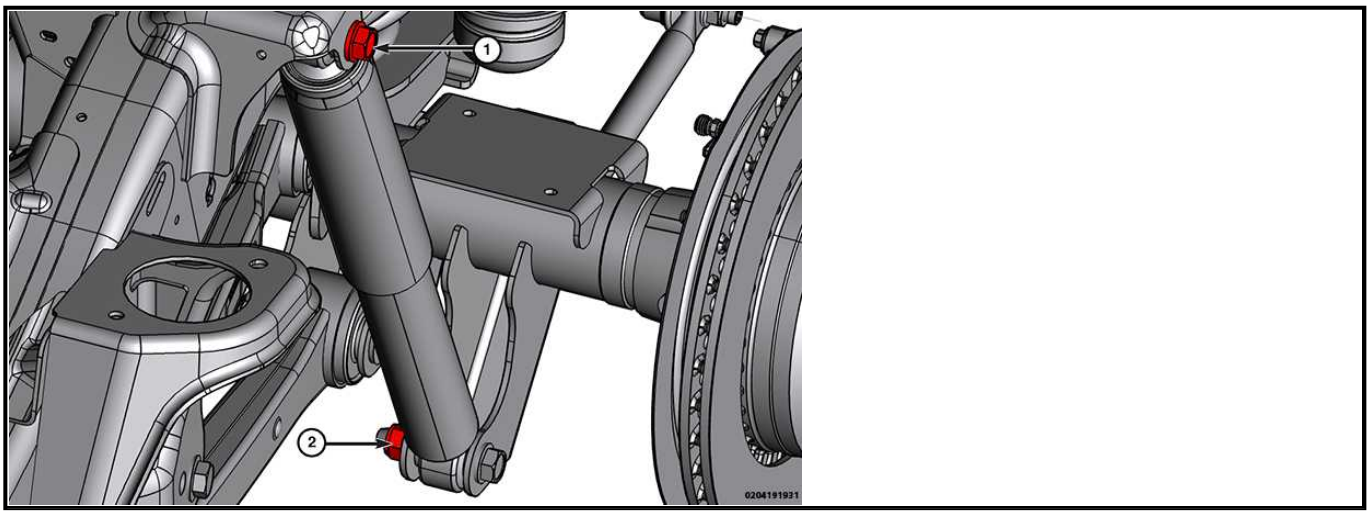
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

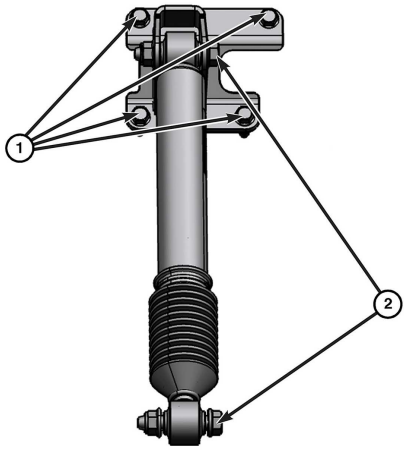
NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

TORQUE SPECIFICATIONS

REAR SHOCK



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**120 N. m (89 Ft. Lbs.)**	-
2	Shock Absorber Lower Nut	**120 N. m (89 Ft. Lbs.)**	-



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CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Power Hop Damper Axle Bracket Bolts	**70 N. m (52 Ft. Lbs.)**	-
2	Power Hop Damper Bolts	**125 N. m (92 Ft. Lbs.)**	-

SHOCK ABSORBER

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the axle assembly with an appropriate jack.

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1 - Shock Absorber Upper Bolt
2 - Shock Absorber Lower Bolt

3. Hold the nut and remove the shock absorber upper bolt.
4. Hold the nut and remove the shock absorber lower bolt.

5. Remove the shock absorber.

INSTALLATION

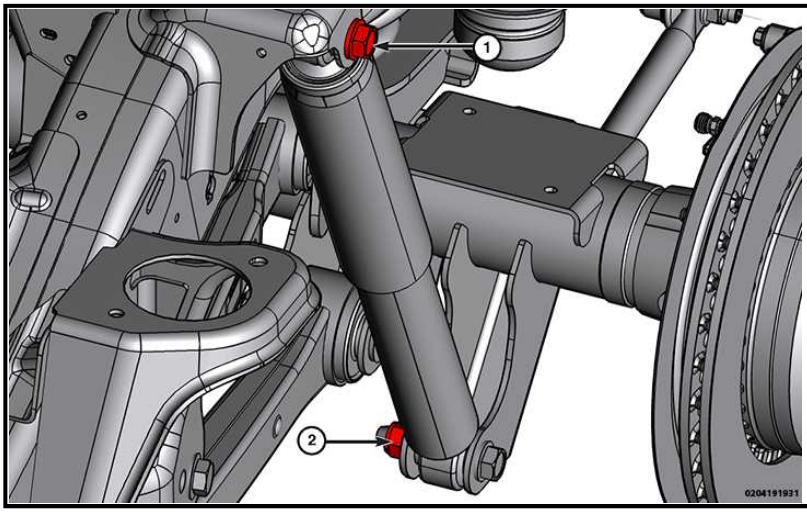
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

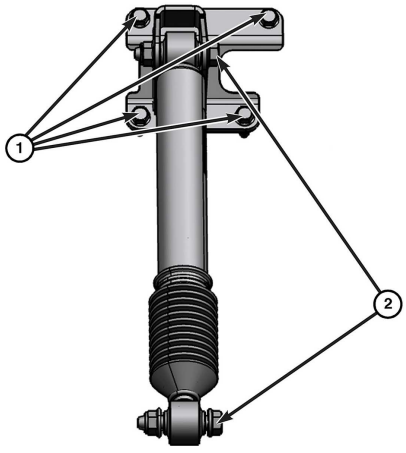
NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

TORQUE SPECIFICATIONS

REAR SHOCK



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Shock Absorber Upper Bolt	**120 N. m (89 Ft. Lbs.)**	-
2	Shock Absorber Lower Nut	**120 N. m (89 Ft. Lbs.)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Power Hop Damper Axle Bracket Bolts	**70 N. m (52 Ft. Lbs.)**	-
2	Power Hop Damper Bolts	**125 N. m (92 Ft. Lbs.)**	-

SPRING(S)

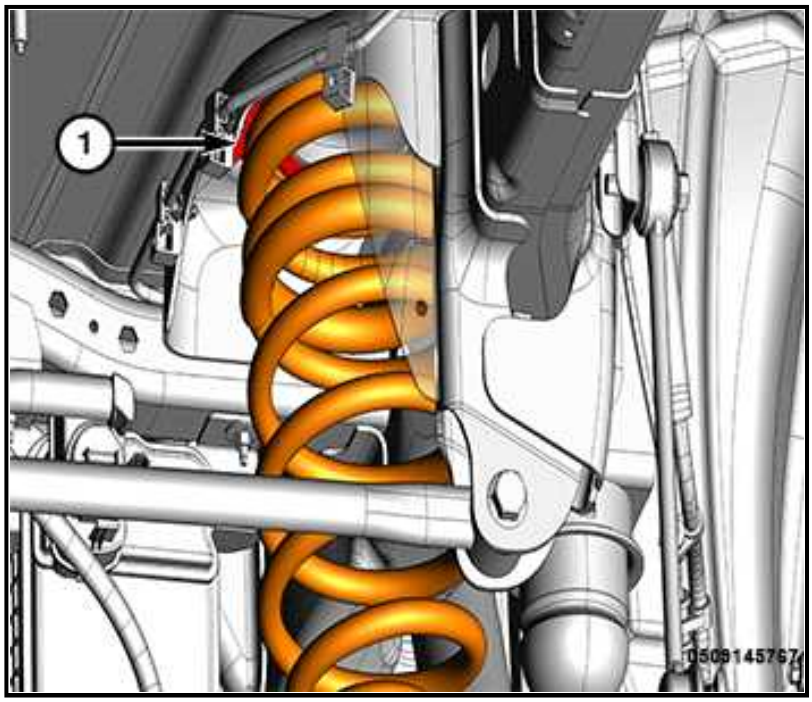
REMOVAL AND INSTALLATION

COIL SPRING

REMOVAL

1. Raise and support the vehicle Refer to **HOISTING, STANDARD PROCEDURE** .
2. Support the axle assembly with an appropriate jack.
3. Disconnect rear stabilizer bar link from the rear axle. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.
4. Disconnect the rear track bar from the frame. Refer to **TRACK BAR, REAR, REMOVAL AND INSTALLATION**.
5. Remove the rear shock absorber lower nut and bolt. Refer to **SHOCK ABSORBER, SUSPENSION, REMOVAL AND INSTALLATION**.

NOTE: **When releasing load from the coil spring use caution to prevent the coil spring from becoming a projectile.**



1 - Spring

6. Lower the axle until the spring is free from the upper mount.
7. Remove the spring.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

STABILIZER BAR, REAR SUSPENSION

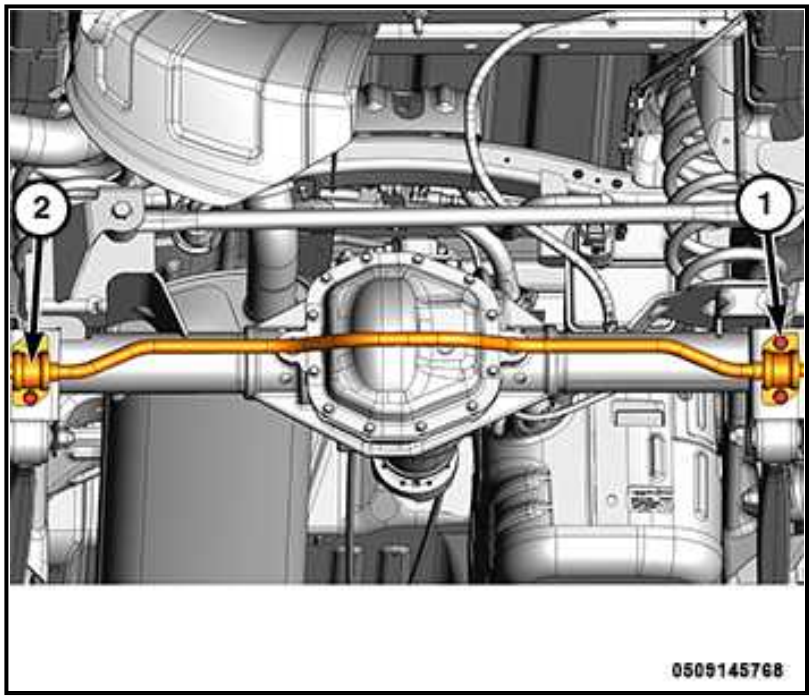
REMOVAL AND INSTALLATION

STABILIZER BAR

REMOVAL

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

2. Disconnect both stabilizer bar links from the axle. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.



1 - Stabilizer Bar Bolts
2 - Stabilizer Bar

3. Remove the four stabilizer bar bolts.
4. Remove the stabilizer bar with the brackets, bushings, and stabilizer bar links as an assembly.
5. Disconnect both stabilizer bar links from the stabilizer bar. Refer to **LINK, STABILIZER BAR, REMOVAL AND INSTALLATION**.
6. Remove the stabilizer bar brackets and bushings from the stabilizer bar.
7. Wipe the inside of the bushings with a clean rag. Inspect the inside of the bushings for excessive wear, if excessive wear exists replace the bushings.

INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

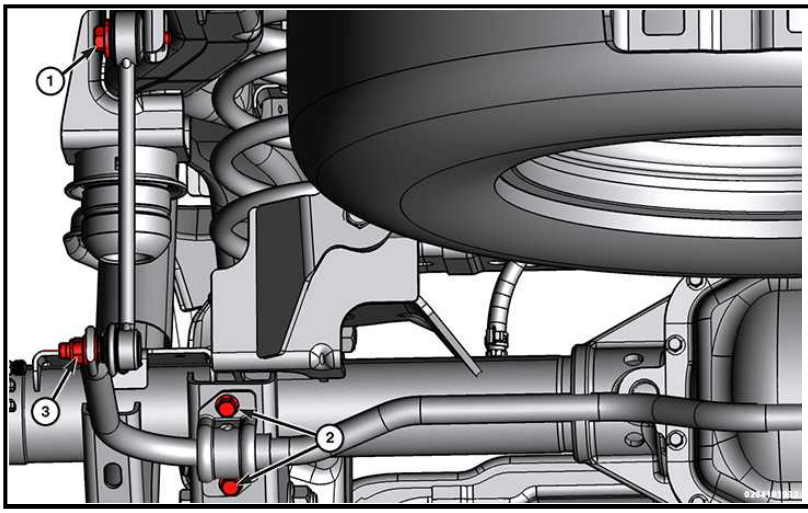
NOTE: **See the label on the stabilizer bar indicating the proper orientation of bar.**

NOTE: **Make sure the bar is centered with equal spacing on both sides and that the bushings have the slits positioned to the rear.**

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

TORQUE SPECIFICATIONS

REAR STABILIZER BAR



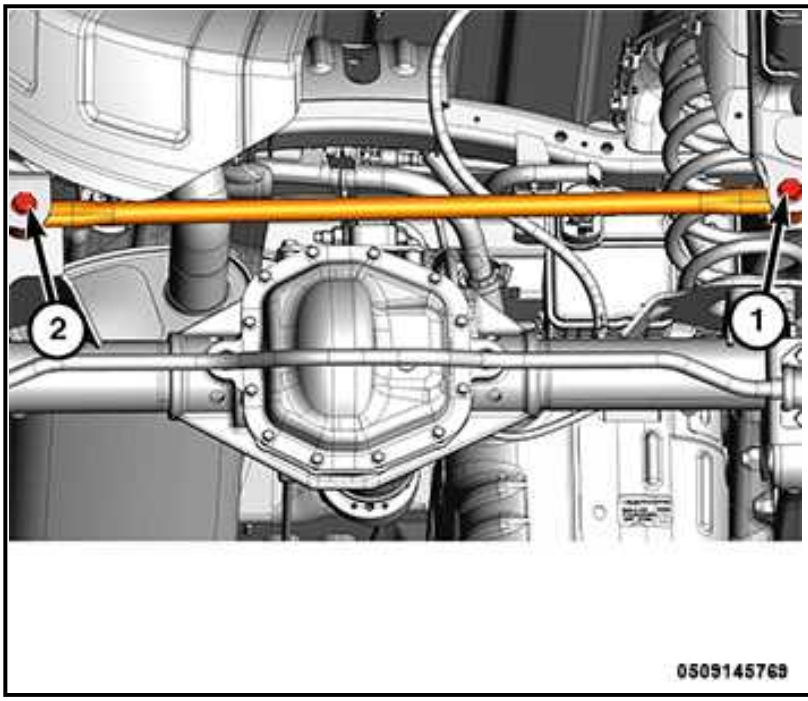
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Stabilizer Bar Link Upper Bolt	**110 N. m (81 Ft. Lbs.)**	-
2	Stabilizer Bar Bolts	**55 N. m (41 Ft. Lbs.)**	-
3	Stabilizer Bar Link Lower Nut	**95 N. m (70 Ft. Lbs.)**	-

TRACK BAR, REAR

REMOVAL AND INSTALLATION

STABILIZER BAR

REMOVAL



1 - Lower Track Bar Bolt
2 - Upper Track Bar Nut

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Position a jack under the axle to support the axle.
3. Remove the upper track bar bolt.

4. Remove the lower track bar bolt.
5. Remove the track bar.

INSTALLATION

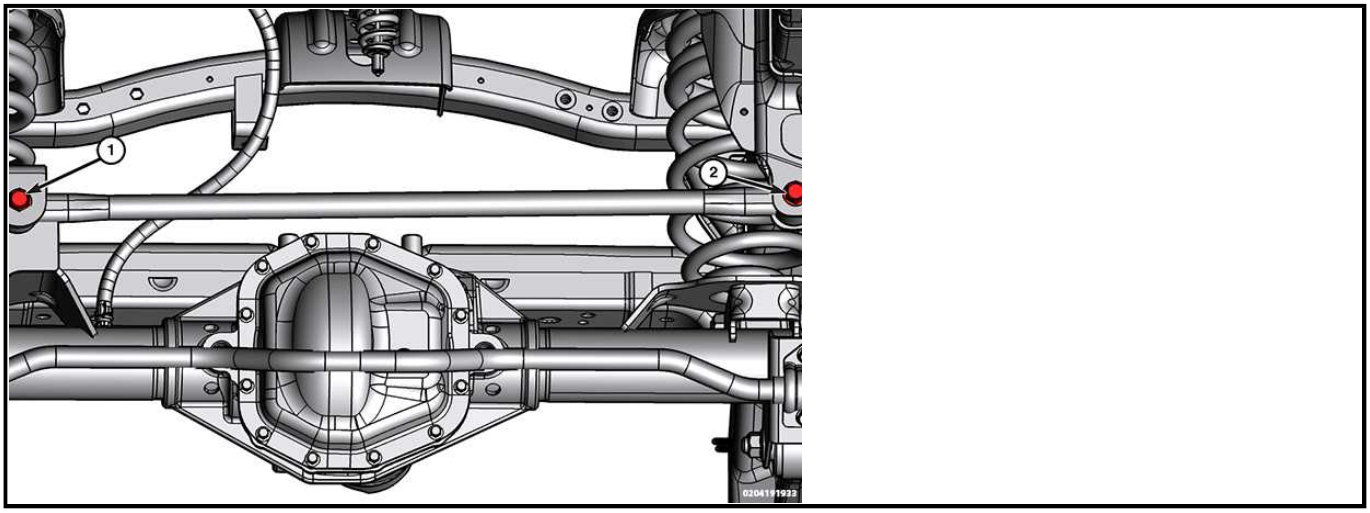
During installation, torque the fasteners to the specifications in the torque table(s) below.

Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

NOTE: **In any instance where a bolt is through a rubber bushing, the bolt must be torqued with the vehicle at normal ride height.**

TORQUE SPECIFICATIONS

REAR TRACK BAR



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Upper Track Bar Bolt	**125 N. m (92 Ft. Lbs.)**	-
2	Lower Track Bar Bolt	**135 N. m (100 Ft. Lbs.)**	-

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING

WHEEL BALANCE AND VIBRATION

Tire and wheel imbalance, wheel runout, and tire road force variation can cause vehicles to exhibit steering wheel vibration and or seat vibration.

VEHICLES WITH A VIBRATION OR SHAKE

The following procedure is to identify, prevent, and correct vibration.

Vehicle vibration or shake may have many root causes. It is important to properly identify the root cause in order to properly diagnose the vehicle. Typically the vibration may be felt in the steering wheel or seat and will be most noticeable at highway speeds 96 km/h (60 mph) and greater.

Tire pressure is often inflated to the maximum sidewall pressure at the vehicle assembly plant to prevent "flat spots" on tires during new vehicle shipping and vehicle storage. Inflating tires to the maximum sidewall tire pressure helps to preserve the integrity of the tire and reduces potential technical issues. Over inflation can cause unnecessary vehicle shake, therefore proper cold inflation pressure is critical to minimize vehicle shake.

Considerations:

- Where is the vibration felt? (seat, steering wheel, floor pan)
- At what speed does the vibration occur? (low or high mph)
- How many miles are on the vehicle? (higher mileage could indicate vehicle or suspension wear)
- Are there any suspension components that may require replacement of bushings, ball joints, or other suspension components? (see suspension diagnosis)
- When was the vibration first noticed? (at purchase or following a specific event, such as a pothole, off-road, or other collision)

VISUAL INSPECTION

Visual inspection of the vehicle is recommended prior to road testing or performing any other procedure.

Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

Inspect for the following:

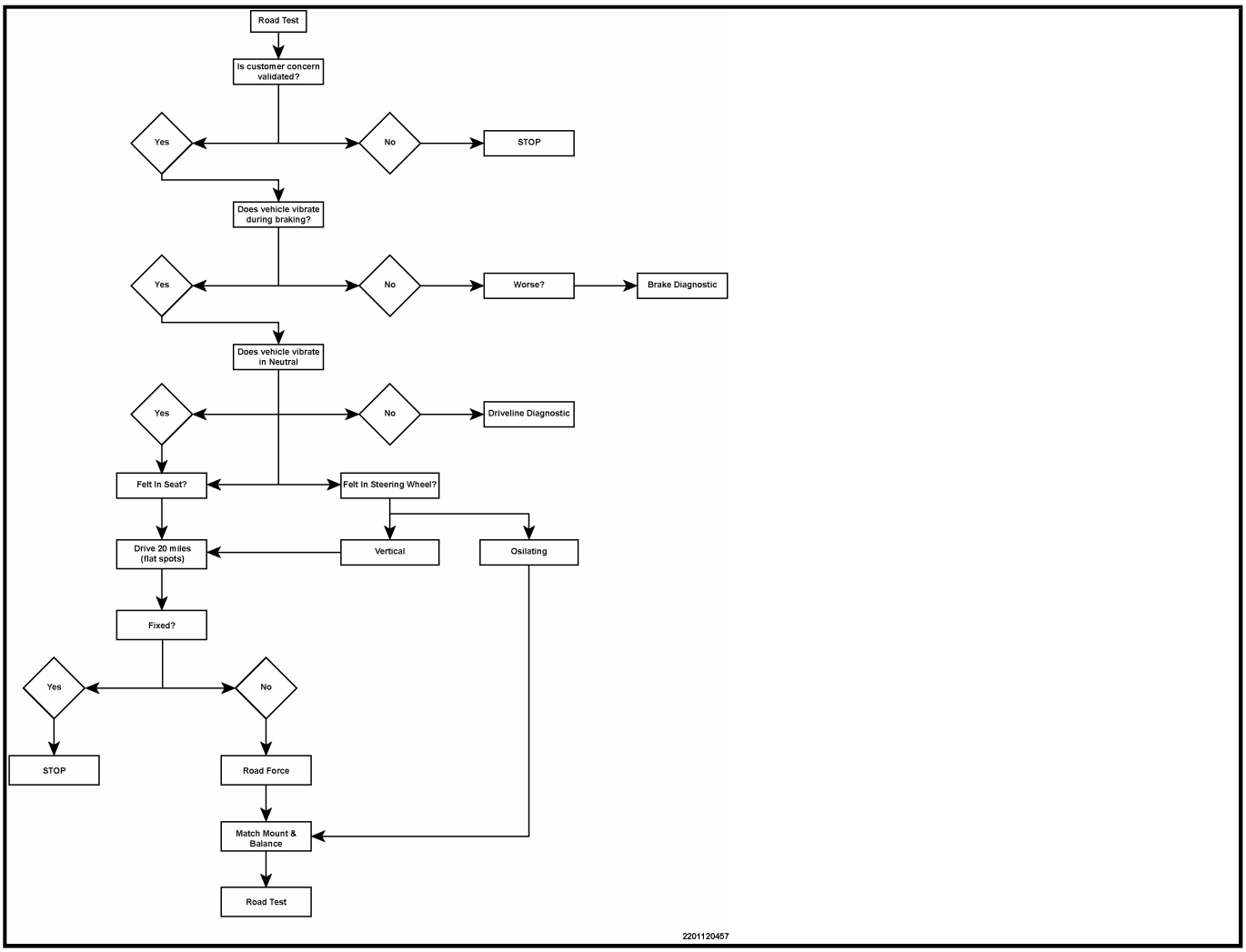
- Verify correct (OEM) wheel and tire, as well as presence of wheel weights.
- Inspect tires for side wall damage such as deformation, stones in tread, mud packing and unusual tread wear. Clean or correct as necessary. (refer to tire diagnostics section)
- Inspect wheels for mud/snow packing, bent rim flanges (outer or inner) and presence of balance weights. If balance weights are missing, rebalance wheel. Clean or correct as necessary.
- Check and adjust tire air pressure to the pressure listed on the label attached to the driver's door opening. Note that pressures may be different front to rear.
- If a wheel shows runout, move the wheel to a different position on the vehicle or to a wheel balancer to isolate the issue.
- If necessary or Half-Shaft/Diagnosis-and-Testing. Refer to **HUB AND BEARING, DIAGNOSIS AND TESTING** .

ROAD TEST

NOTE: **If a noise & vibration analyzer is available, use it to diagnosis the issue during the road test.**

NOTE: **If the vehicle has been sitting for an extended period of time it is recommended to drive to warm the tires.**

Use the following Vehicle Diagnosis and Correction Chart to diagnose and correct a vehicle with vibration or shake.



Road test vehicle on a smooth road at and near the designated speed where legal speed limits allow. Lightly place hands on steering wheel at the 10:00 and 2:00 positions and observe for:

- Steering wheel oscillation: clockwise/counterclockwise
- Steering wheel high frequency movement: rapid vibration up and down
- Seat high frequency movement: rapid vibration up and down

To rule out vibrations due to brakes or powertrain:

- Lightly apply brakes at the designated speed; if vibration occurs or is enhanced, vibration is likely due to a brake concern.
- Shift transmission into neutral while vibration is occurring; if vibration is eliminated, vibration is likely due to a powertrain (differential or driveline) concern.

TIRE/WHEEL BALANCE AND ROAD FORCE VARIATION

NOTE: **If wheel balance equipment is capable of testing tire road force variation and the tire/wheel assemblies are within specification, place the tires with the greater road force variation on the rear of the vehicle.**

Balance the tire and wheel assemblies as necessary, and if wheel balance equipment is capable, also test for tire and wheel runout and road force variation following the wheel balancer manufacturer's instructions and using the information listed in Tire And Wheel Balance. Refer to **STANDARD PROCEDURE**. Repeat the road test above to verify the vibration is repaired.

STANDARD PROCEDURE

TIRE AND WHEEL BALANCE

BACK CONE MOUNTING

FLANGE PLATE MOUNTING

CHROME/PLASTIC CLAD WHEEL SERVICE

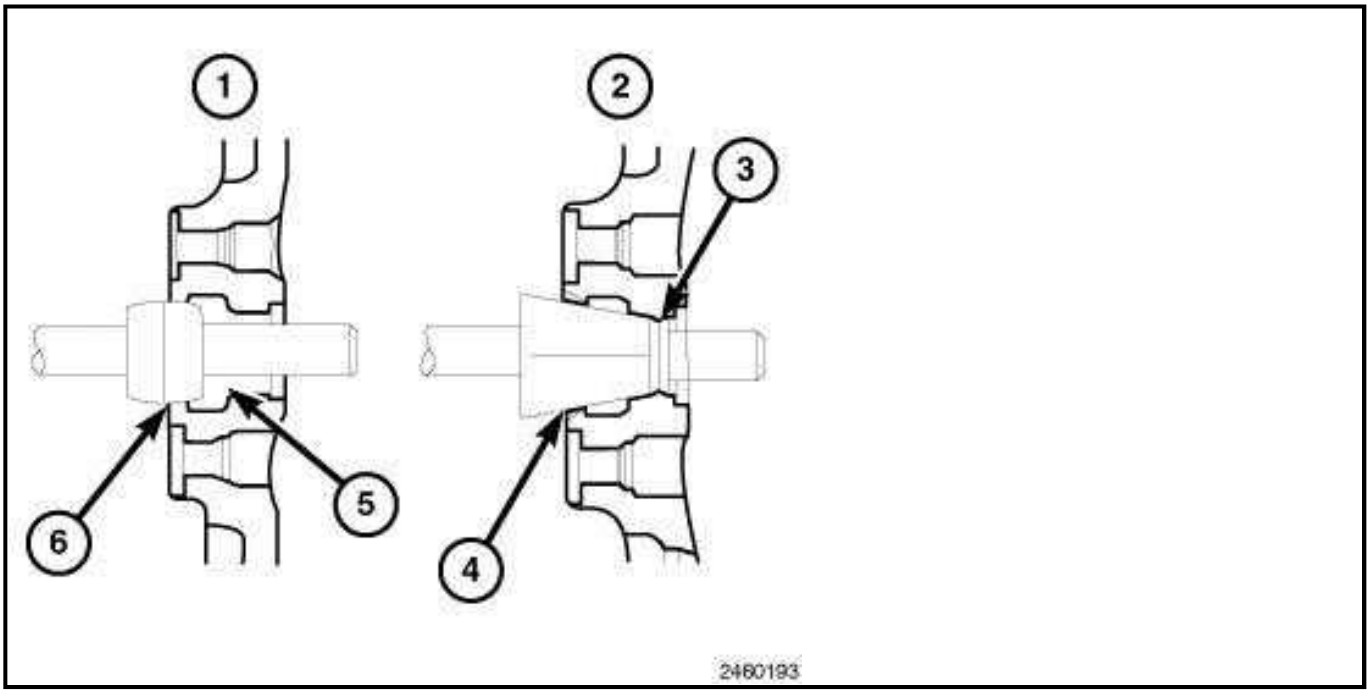
FORCE MATCHING

NOTE: **Always verify the wheel and tire balance before removing any wheel weights. If assembly is within specification and weights are not corroded or loose, do not remove weights. The process of removing and adding weight could damage wheel protective coating.**

NOTE: **Balance and road force variation equipment must be calibrated and maintained per equipment manufacturer's specifications.**

NOTE: **If a tire sealant & inflator kit was used to temporarily repair small punctures then the tire must be removed from wheel and all the sealant must be removed with a water damped cloth before repairing & balancing the assembly.**

NOTE: **Some wheels may not have an outer flange. Apply adhesive weights on midplane surface to balance.**

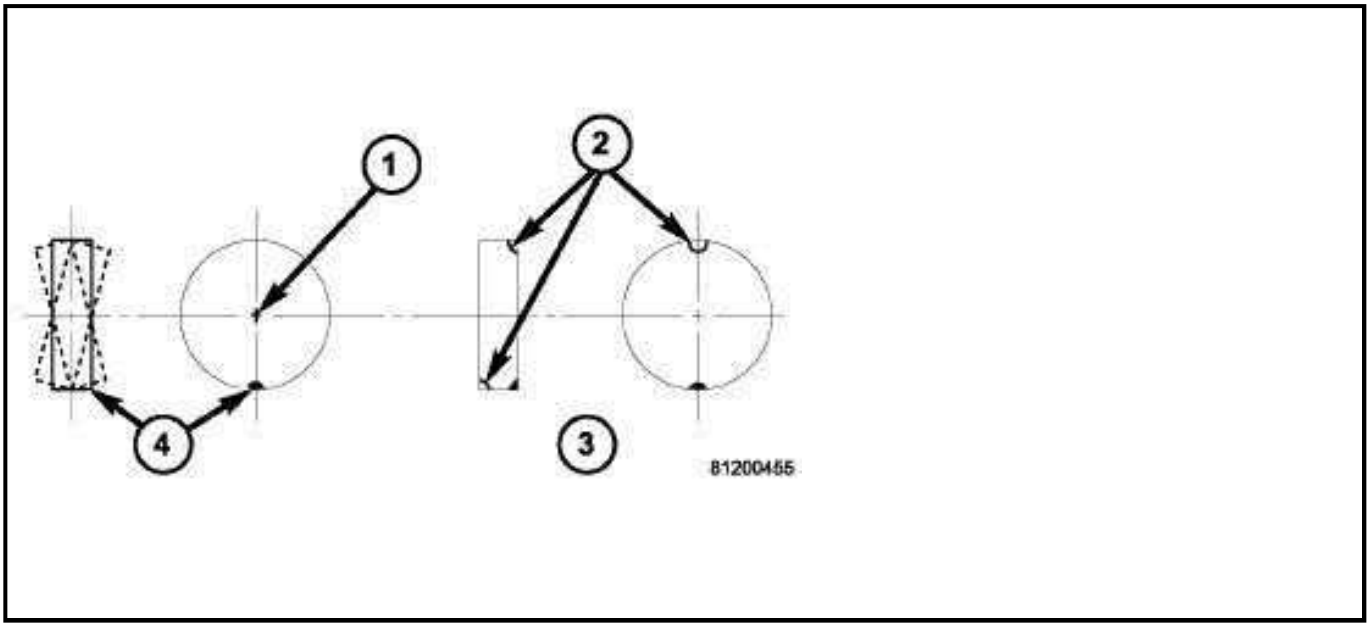


NOTE: **Use of the proper collet will prevent potential damage to the chrome clad wheels.**

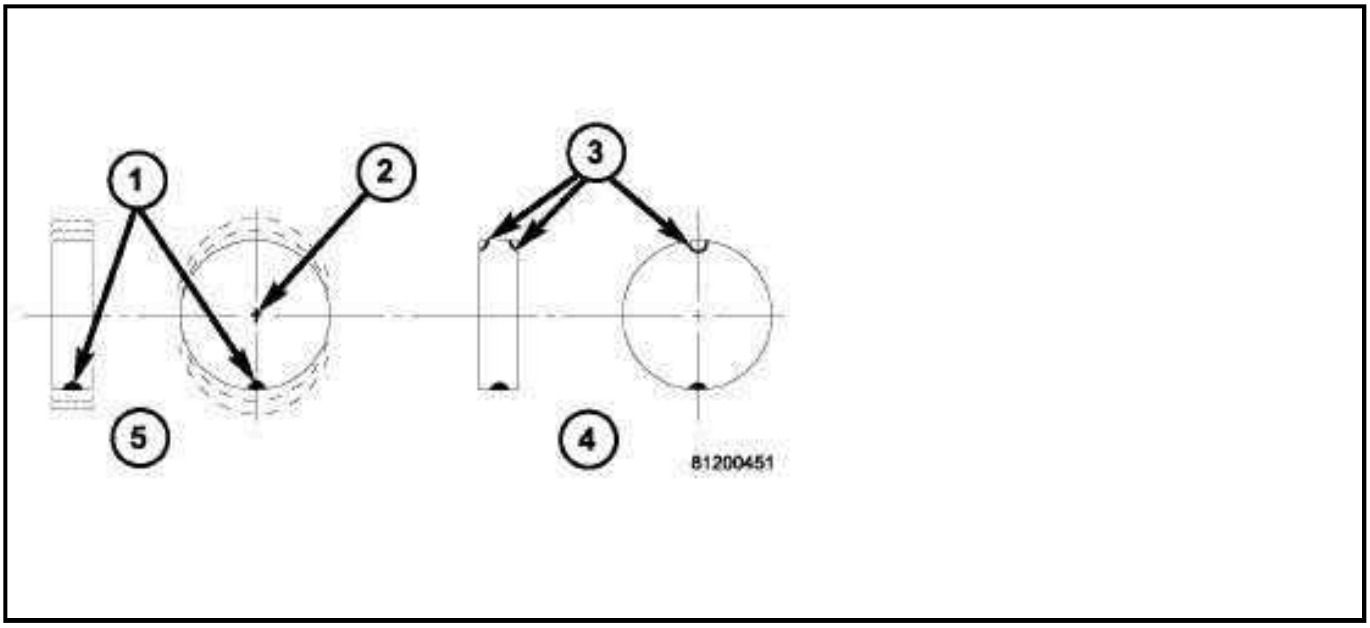
NOTE: **Balance equipment could read an incorrect balance result when measuring chrome clad wheels. This is caused by the equipments mounting cone/collet contacting the cladding or the cone/collet is not balanced. A dual-taper collet (1) type wheel centering tool is recommended as opposed to a high-taper cone (2) type wheel centering tool. Always use the manufacturer's recommended balance equipment.**

- **Dual-taper collet type (1)**
- **High-taper cone type (2)**
- **Possible obstruction (3)**
- **May not seat properly (4)**
- **No obstruction (5)**
- **Properly seated (6)**

NOTE: **If wheel balance equipment is capable of testing tire road force variation and the tire/wheel assemblies are within specification, place the tires with the greater road force variation on the rear of the vehicle.**



For dynamic balancing (**recommended**), the balance equipment is designed to indicate the location and amount of weight to be applied to both the inner and outer rim flanges (2).



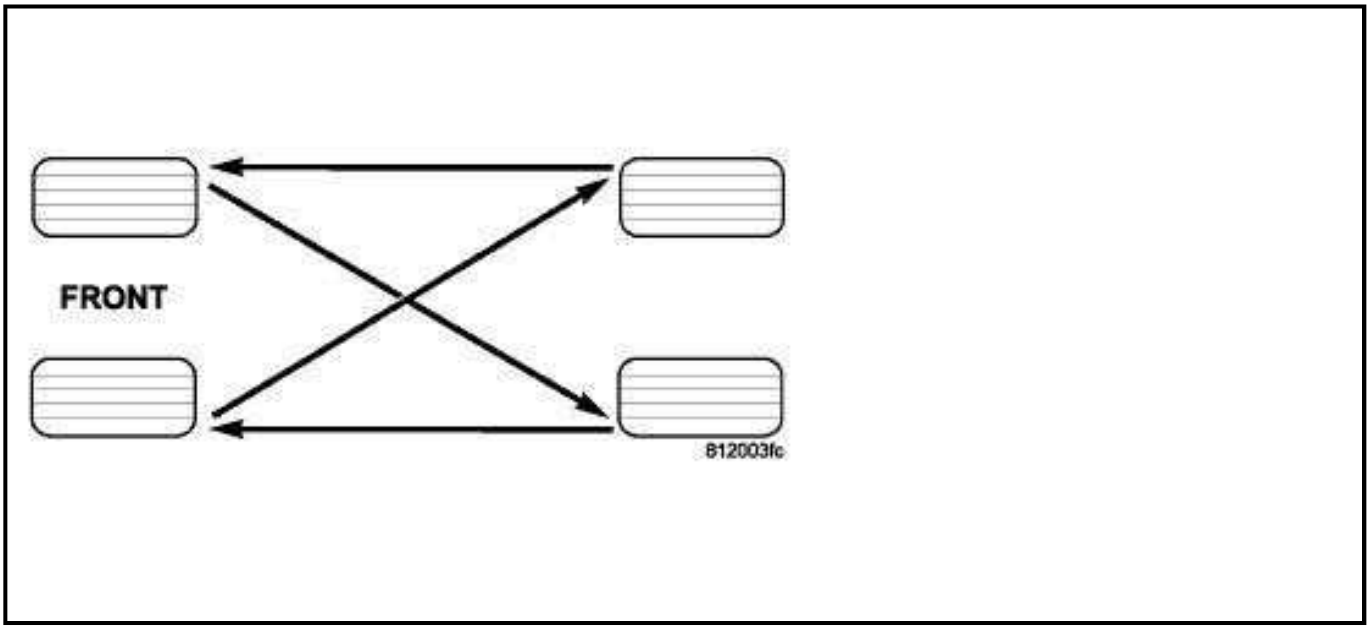
For static balancing (**not recommended**), find the location of the heavy spot causing the imbalance (1). Counter balance the wheel directly opposite the heavy spot. Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (3) at the predetermined spots.

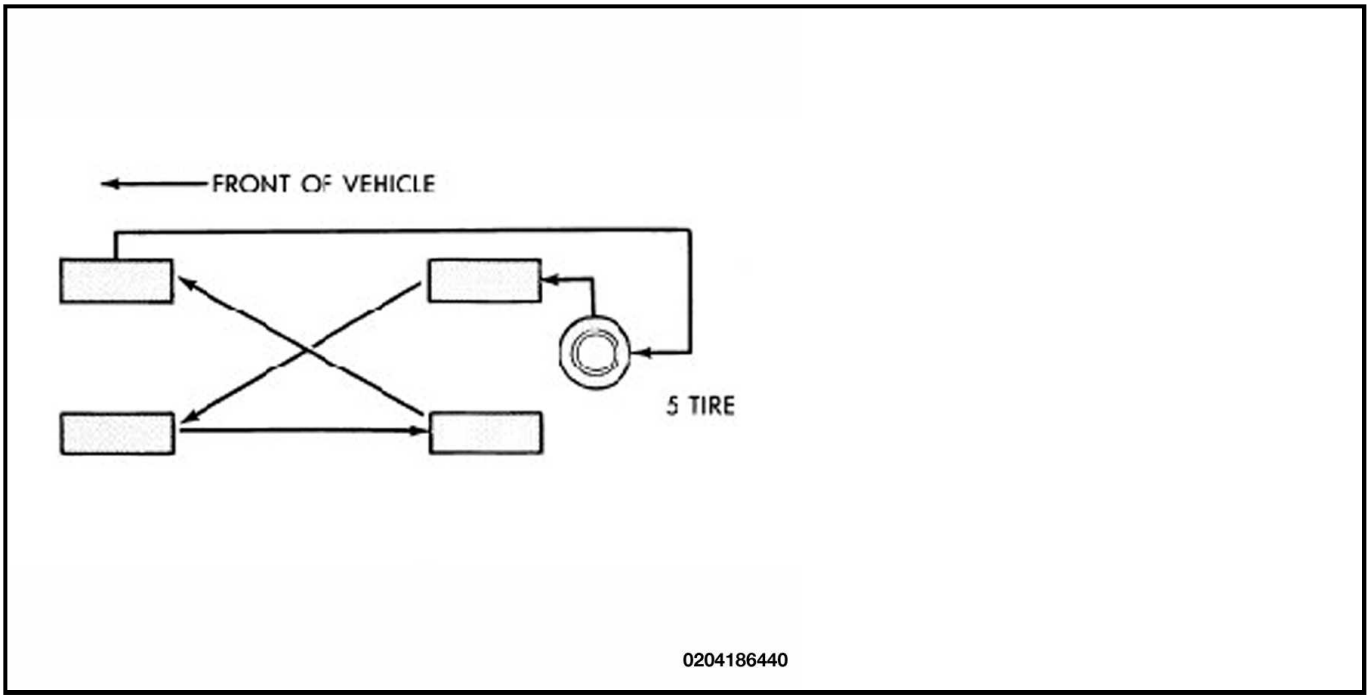
Aluminum wheels use a different type wheel weight than steel wheels. Be sure to use the correct wheel weight for the wheel type.

Always verify the balance. When using off-vehicle equipment, remount the tire and wheel assembly 180 degrees on the balancer spindle and recheck balance. Balance variation from one spot to the other should not be more than 0.125 (1/8) ounce. If variation is more than 0.125 ounce, balancing equipment could be malfunctioning, or the wrong collet/cone may have been used.

If difficult to balance, break down the tire and wheel assembly and check for loose debris inside the tire. Prior to disassembly, mark (index) the tire at the valve stem. Use this mark in order to remount the tire in its original orientation with respect to the wheel.

ROTATION





Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

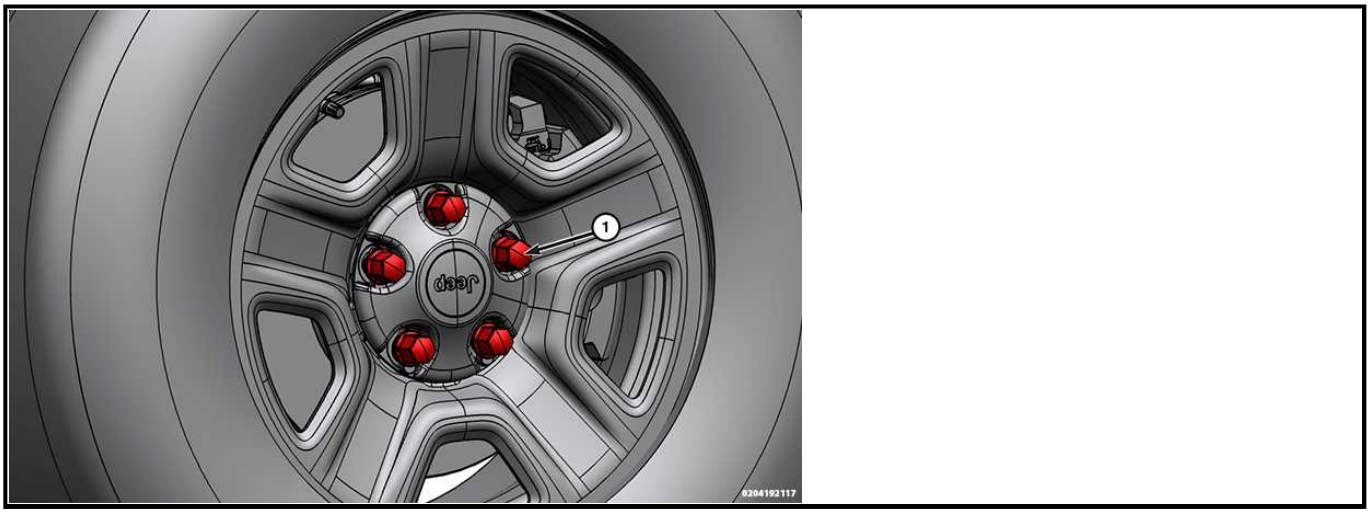
- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is shown in graphic. Other rotation methods can be used, but they will not provide all the tire longevity benefits.

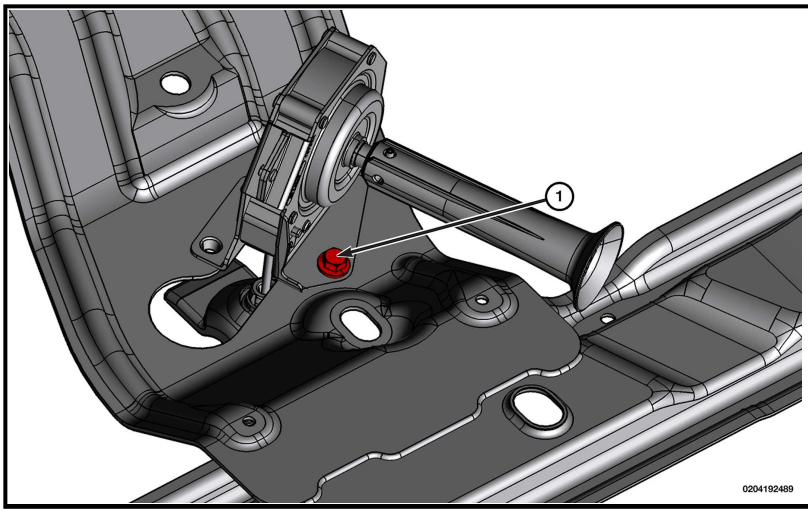
TECHNICAL SPECIFICATIONS

TORQUE SPECIFICATIONS

TIRE AND WHEEL



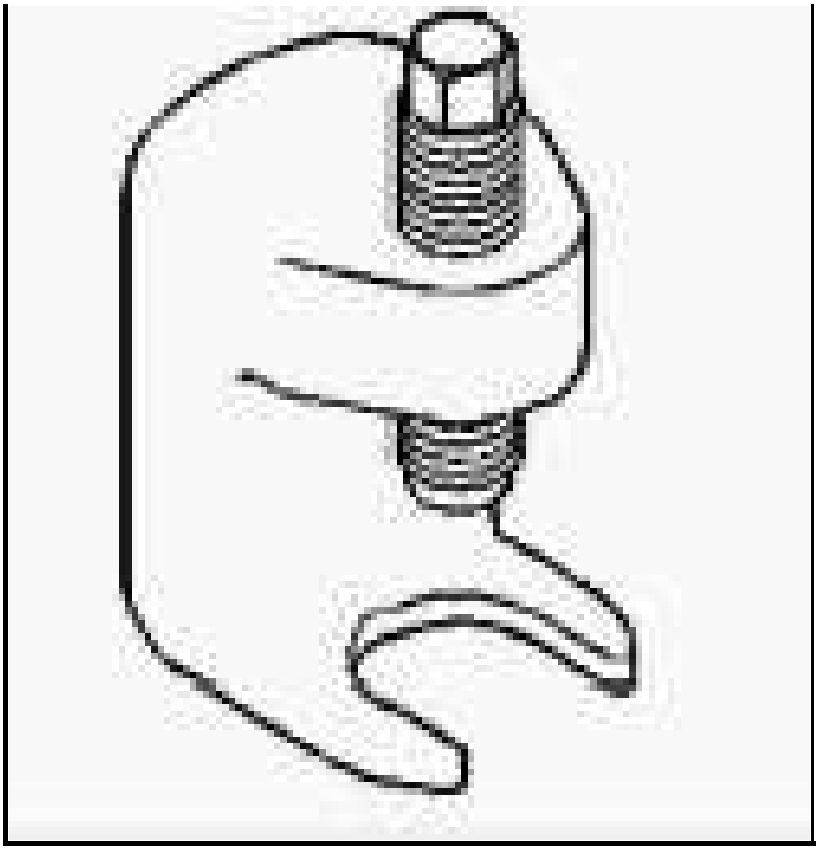
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Lug Nut	**176 N. m (130 Ft. Lbs.)**	-
-	Tire Pressure Monitoring (TPM) Module Bracket Fasteners	**7 N. m (62 In. Lbs.)**	-



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Spare Tire Winch Bolt	**20 N. m (15 Ft. Lbs.)**	-

SPECIAL TOOLS

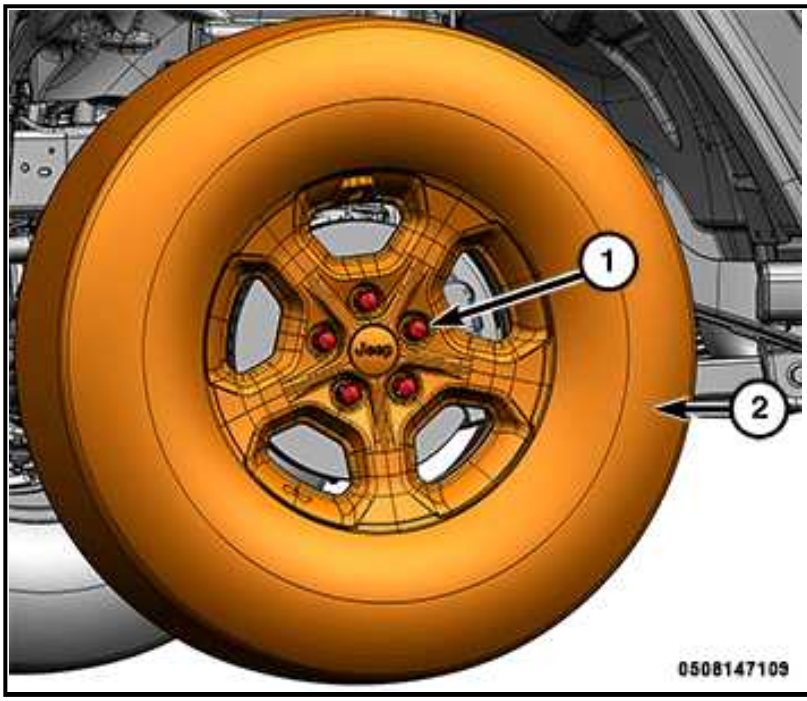
2046300080 - Kit, TPM/RKE ANALYZER

	C-4150A - Press, Ball Joint (Originally Shipped In Kit Number(s) 6672, 6745.)

REMOVAL AND INSTALLATION

TIRE AND WHEEL

REMOVAL



1 - Wheel Lug Nuts
2 - Tire and Wheel Assembly

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the five wheel lug nuts.
3. Remove the tire and wheel assembly.

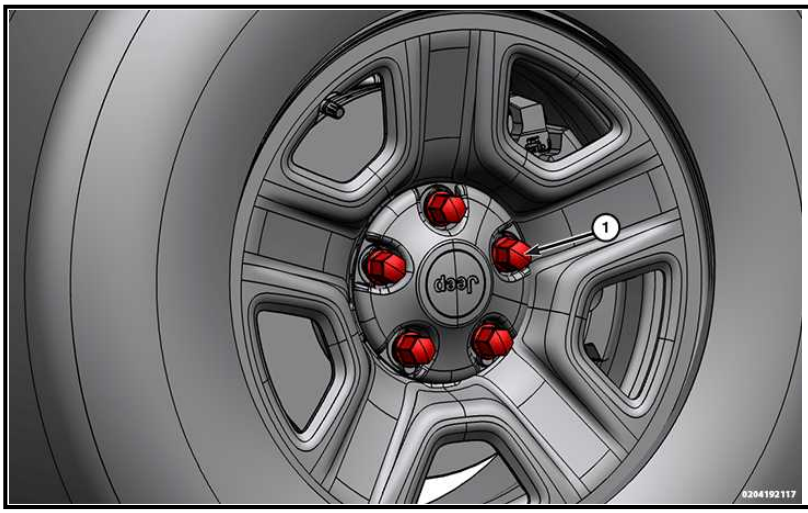
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

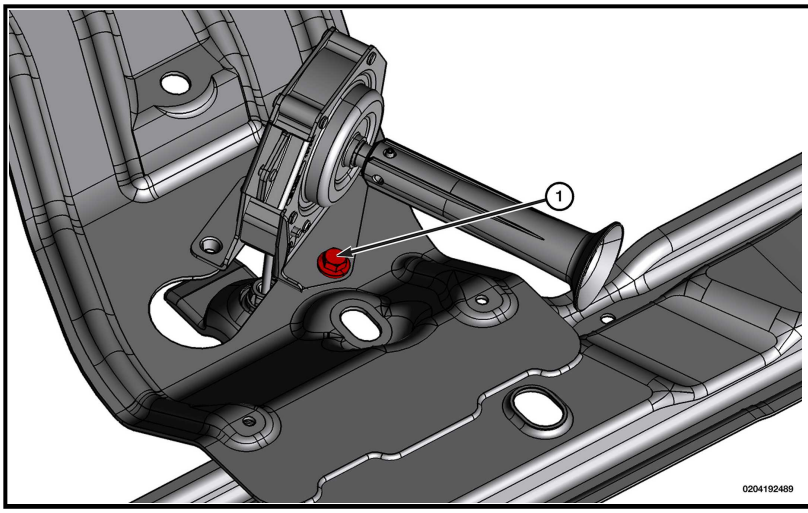
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

TIRE AND WHEEL



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Lug Nut	**176 N. m (130 Ft. Lbs.)**	-
-	Tire Pressure Monitoring (TPM) Module Bracket Fasteners	**7 N. m (62 In. Lbs.)**	-



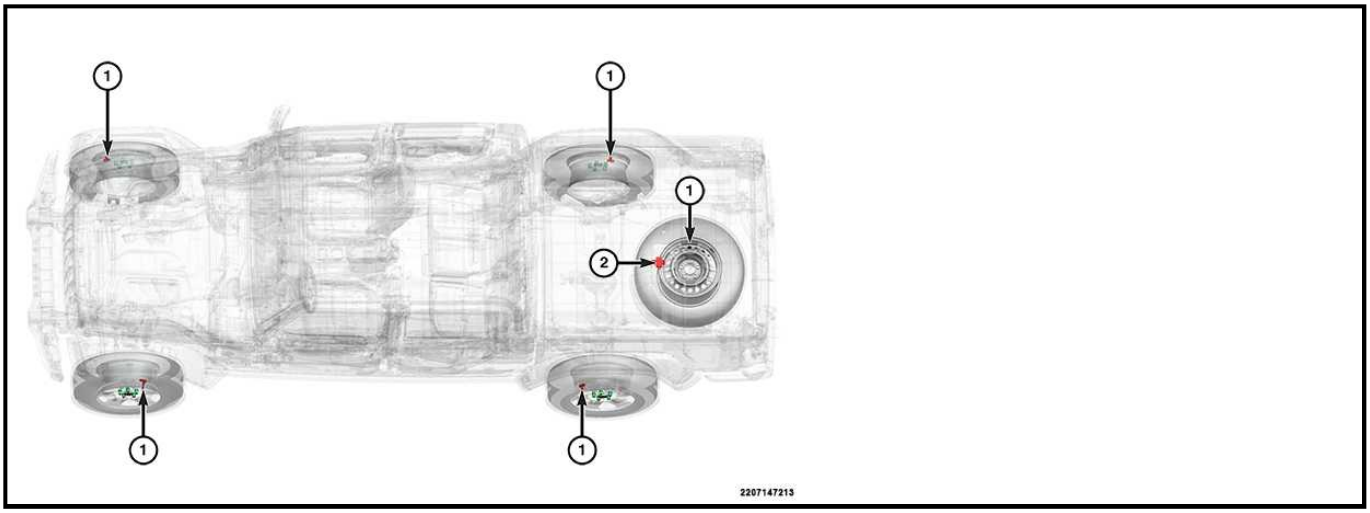
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Spare Tire Winch Bolt	**20 N. m (15 Ft. Lbs.)**	-

TIRE PRESSURE MONITORING

DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION

DESCRIPTION



The Tire Pressure Monitoring (TPM) system is made up of the following:

COMPONENT INDEX

1.	Refer to **TIRE PRESSURE SENSOR**.
2.	Refer to **TIRE PRESSURE MONITOR (TPM)**.
-	Refer to **INSTRUMENT PANEL CLUSTER (IPC)**.

OPERATION

Vehicles can be equipped with a **Base** or a **Premium** TPM System.

The system monitors the pressure of each tire and warns the driver, when either a low tire pressure conditions or a TPM system malfunctions exists, through the IPC.

The **Base** TPM system only uses the TPM telltale, which is an audible chime and non-positional text messages to indicate low pressure or system fault conditions.

The **Premium** TPM system uses the base system TPM telltale audible chime and the vehicle information display to display the actual tire pressure values or dashes for each of the four active road tires in the correct vehicle position. Various text messages, as required, shall also be displayed in the vehicle information display.

This system consists of the following components: one TPM, four or five TPM sensors.

The TPM receives the radio signals from the tire pressure sensors and sends the relevant values to the other modules via Controller Area Network - Chassis (CAN-C). The TPM identifies the sensor position, receives the sensor data, compares the pressure data with the standard pressure values stored in the non-volatile memory, determines whether there is a problem in the tire pressure and stores the warnings regarding tire pressure and system faults. The TPM used the Radio Frequency (RF) Data from the TPM sensor and the wheel speed data to determine the location of each tire pressure sensor. When a sensor is installed in a tire on the vehicle, the TPM can automatically identify the sensor and its location during the first ensuing drive cycle. Identification (ID) will take approximately 20 minutes but the speed of the vehicle must exceed 24 km/h (15 mph). The TPM/RKE ANALYZER 2046300080 can be used to program the new sensor ID number in the TPM. The sensor IDs can also be programmed using a diagnostic scan tool to scan each TPM sensor at each road wheel, and store each sensor ID in the correct location.

INSTRUMENT PANEL CLUSTER (IPC)

INSTRUMENT PANEL CLUSTER (IPC)

Refer to **COMPONENT INDEX**.

The IPC for this vehicle is located in the instrument panel above the steering column opening. The IPC gauges and indicators are visible through an opening in the cluster bezel and are protected by a clear plastic cluster lens that is secured to the cluster housing by integral latch formations. Several versions of the IPC are offered on

this vehicle. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle is offered. The IPC utilizes integrated circuitry and information carried on the CAN data buses and CAN-Interior High Speed (IHS) along with several hard wired inputs to monitor other sensors and switches in the vehicle. In response to those inputs, the internal circuitry and programming of the IPC allow it to monitor many electronic functions and features of the vehicle. The IPC receives and manages the messages coming from the compass module and the humidity sensor (if present) via the Local Interface Network (LIN) data bus.

The IPC performs the following functions:

- Receives TPM A1 message from TPM module
- Process the information received from the TPM module
- Gives warning to the driver through a dedicated lamp, text messages and chime activation
- Manages the TPM indicator lamp function, text message and chime activation function for a loss of CAN communication

The IPC provides the following:

INPUTS

- Tire pressure indication requests from TPM
- Chime request from TPM
- TPM warning request to IPC
- TPM error request to IPC

OUTPUTS

- Odometer reading to TPM

TIRE PRESSURE MONITOR (TPM)

Refer to **COMPONENT INDEX**.

The TPM is a module that is able to receive tire pressure, temperature, sensor ID and function code data via RF data transmitted from the sensors inside the wheel. The TPM stores all warning and fault conditions, placard pressure values, low pressure threshold values, all wheel sensor IDs and locations, and faults in memory that can be accessed through diagnostic communication. The TPM software is able to be re-flashed over the CAN bus through use of a diagnostic scan tool connected to the vehicle's diagnostic connector. The TPM controls the TPM indicator lamp function including conducting a bulb check operation at every ignition ON key cycle.

The unit has a CAN-C interface to connect it to the network and performs the following functions:

- Receives and processes RF signals from each TPM sensor
- Monitors TPM sensor status
- Manages internal power
- Performs self-test
- Implements algorithms and logic to generate low pressure and system malfunction warnings
- Transmits data from/to other modules on CAN-C
- Performs diagnostic functions via CAN bus

The TPM receives the following:

CAN-C INPUTS

- VSS signal supplied from the Anti-lock Brake System (ABS) Module

- Vehicle configuration supplied from Body Control Module (BCM)
- Ignition state supplied from BCM
- Averaged ambient temperature supplied from BCM
- Battery voltage input from BCM
- Current gear supplied by BCM
- Ambient air pressure (barometric pressure) supplied from Powertrain Control Module (PCM)
- Vehicle Identification Number (VIN) data and VIN message from PCM
- Odometer reading from IPC

The TPM provides the following:

CAN-C OUTPUTS

- Tire pressure indication requests to IPC
- TPM chime request to IPC
- TPM warning request to IPC
- TPM error request to IPC

The TPM receives the following:

RF INPUTS

- Left Front TPM Sensor
- Left Rear TPM Sensor
- Right Front TPM Sensor
- Right Rear TPM Sensor
- Spare Tire TPM Sensor (if equipped)

TIRE PRESSURE SENSOR

TIRE PRESSURE SENSOR

Refer to **COMPONENT INDEX**.

One tire pressure sensor is mounted to a valve stem specifically designed for mounting the pressure sensor in each wheel in place of the traditional tire valve stem. Each sensor has an internal battery that lasts up to 10 years. The battery is not serviceable. At the time of battery failure, the sensor must be replaced. The TPM sensor operates on a 433 MHz radio frequency. The tire pressure sensor valve stem looks similar to a standard valve stem with the tire mounted on the wheel. To visually identify a tire pressure sensor/valve stem, the valve stem cap is longer than a standard valve stem. This vehicle uses the 433 MHz TPM sensor. Although 315 MHz and 433 MHz sensors are identical in size and shape, they are not interchangeable. Always make sure the correct sensor is being used. A TPM/RKE ANALYZER 2046300080 can be used to determine the sensor's frequency without having to dismount the tire.

The battery operated tire pressure sensor is both a transmitter and a receiver. The TPM sensor can be forced to transmit if using a special tool such as a TPM/RKE ANALYZER 2046300080 Analyzer. The TPM/RKE ANALYZER 2046300080 Analyzer has the ability to change the sensor mode and to diagnose a faulty TPM sensor. Using a TPM/RKE ANALYZER 2046300080 Analyzer can take up to a minute to force a transmission from a sensor. Each sensor's (transmitter) broadcast is uniquely coded so that the module can monitor the state of each of the sensors on the four rotating road wheels. The module can automatically learn and store the sensor's ID while driving "within 10 minutes continuously above 24 km/h (15 mph)" after a sensor has been replaced. The vehicle must be stationary for more then 20 minutes in order to initiate the learning sequence. The sensor IDs can also be programmed using the TPM/RKE ANALYZER 2046300080 Analyzer Tool. Scan each TPM sensor at each road wheel, and store each Sensor ID in the correct location. (LEFT FRONT, LEFT REAR, RIGHT FRONT, and RIGHT REAR) Connect the TPM/RKE ANALYZER 2046300080 Analyzer Tool

to the scan tool. Then follow the programming steps outlined in the diagnostic scan tool for "Program Tire Pressure Sensor ID w/ TPM Tool".

The TPM sensor provides the following:

RF OUTPUTS

- Left Front TPM Sensor
- Left Rear TPM Sensor
- Right Front TPM Sensor
- Right Rear TPM Sensor
- Spare Tire TPM Sensor (if equipped)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - TIRE PRESSURE MONITORING

NOTE: **A false low pressure warning can take place if the Tire Pressure Monitoring system fails localization. This will result in the system defaulting to the value of 80 psi for all TPM sensor locations. Perform the TPM Diagnostic Verification Test standard procedure to correct for this condition.**

When diagnosing a tire pressure issue, first check the Tire Pressure Monitoring (TPM) indicator lamp in the instrument cluster during ignition key ON. From the OFF position, turn the key to ON and check the TPM indicator lamp to observe one of the following:

If after 10 seconds the indicator lamp is illuminating continuously (not flashing), proceed to LOW PRESSURE below.

If after 10 seconds the indicator lamp flashes on/off for 75 seconds, then remains on solid, there is a system fault detected. Proceed to SYSTEM FAULT below.

LOW PRESSURE

NOTE: **Tire pressure may increase from 14 to 41 kPa (2 to 6 psi) during normal driving conditions. Do not reduce this normal pressure build up.**

NOTE: **Tire pressure will vary with temperature by about 6.9 kPa (1 psi) for every 6.5B°C (12B°F) This means that when the outside temperature decreases, the tire pressure will also decrease. Tire pressure should always be set based on cold inflation tire pressure.**

NOTE: **If one tire is found at low pressure it is recommended to inflate back to the "Cold Placard Pressure" posted on the driver B-Pillar in order to avoid any gauge measurement error and properly turn OFF low pressure lamp.**

Check air pressure as necessary in all tires using a known accurate air gauge and adjust to the specification listed on the Tire Inflation Pressure Label (Placard) provided with the vehicle. After adjusting air pressure in a tire, the pressure displayed on the cluster should be updated automatically. If this is not the case, then drive the vehicle 5 minutes at a speed above 24 km/h (15 mph).

Refer to the table below for correct tire pressure values to turn ON/OFF the TPM indicator in cluster when a low tire condition is present in the vehicle:

Cold Placard Pressure kPa (PSI)	Low Pressure Warning ON Threshold kPa (PSI)	Low Pressure Warning OFF Threshold kPa (PSI)
241.3 (35)	193.1 (28)	234.4 (34)

248.2 (36)	199.9 (29)	241.3 (35)
255.1 (37)	199.9 (29)	248.2 (36)
262 (38)	206.8 (30)	255.1 (37)
268.9 (39)	213.7 (31)	262 (38)
275.8 (40)	220.6 (32)	268.9 (39)

If the pressure in any tire is close to the "Low Pressure Warning ON Threshold", according to the B-Pillar values specified and the table above, it could be triggering a low tire condition if the temperature goes down. In order to turn OFF the low tire lamp, the tire has to be reinflated at least to the values specified on the "Low Pressure Warning OFF Threshold".

If air pressure in any tire is low, inspect **all** the tires for leaks. A water "dunk tank" or other water test may be used to check for a leak around the sensor as long as any water at the valve core is removed once the procedure is completed. The water can be easily expelled from the core area by pushing in on the core for several seconds, allowing escaping air to drive out any moisture. Reinflate the tire as necessary.

Always make sure the original (special) valve stem cap is securely installed to keep moisture out of the sensor.

If the indicator lamp is still ON continuously, refer to the diagnostic tool for troubleshooting and issues description.

SYSTEM FAULT

If a system fault is detected, a chime will sound, and the TPM indicator (telltale) lamp will flash for 75 seconds and then remain on solid. A system fault can occur by many scenarios, including the following:

- Wiring connector to TPM module could be loose or not fully sitting. Check module connection and do one ignition cycle to restart module communication.
- Signal interference due to electronic devices or driving next to facilities emitting the same Radio Frequencies as the TPM sensors.
- Installing some aftermarket window tinting that affects radio wave signals.
- Accumulation of snow or ice around the wheels or wheel housings.
- Using tire chains on the vehicle.
- Using wheels not equipped with TPM sensors.

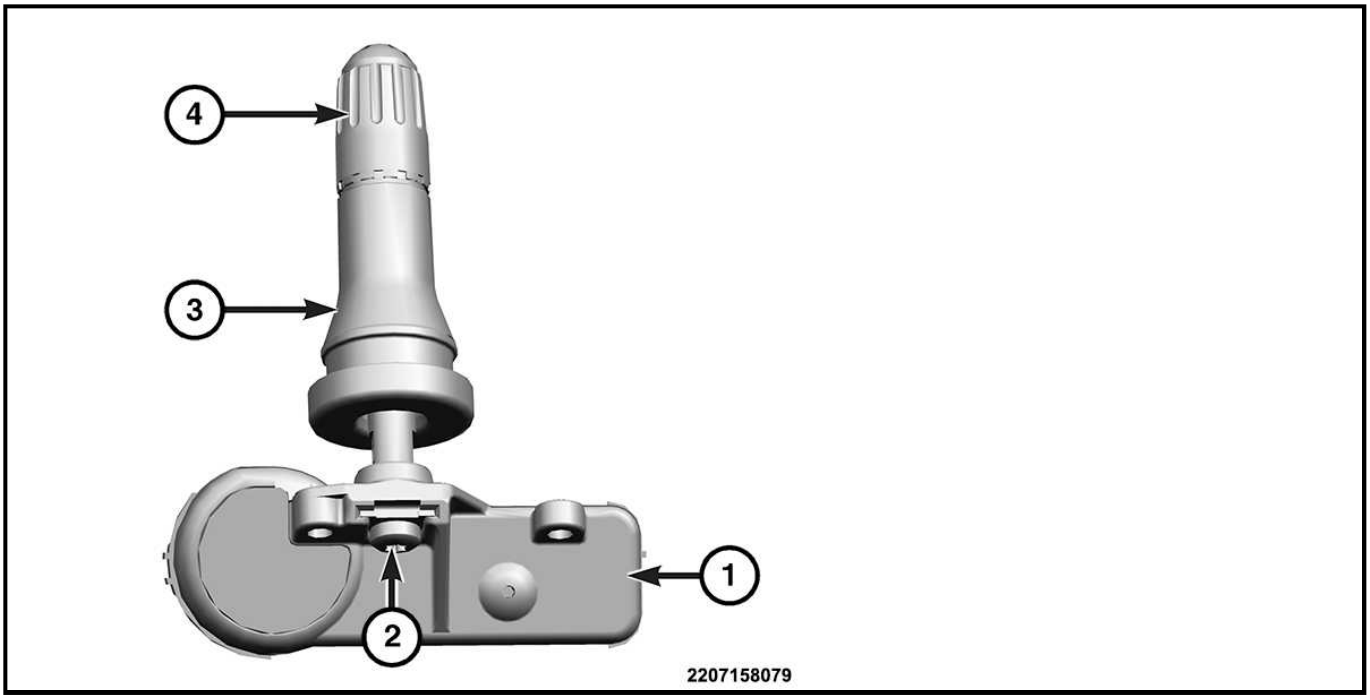
If the indicator lamp is still ON continuously, refer to the diagnostic tool for troubleshooting and issues description.

SENSOR, TIRE PRESSURE MONITORING (TPM)

REMOVAL AND INSTALLATION

TIRE PRESSURE MONITORING (TPM) SENSOR

REMOVAL



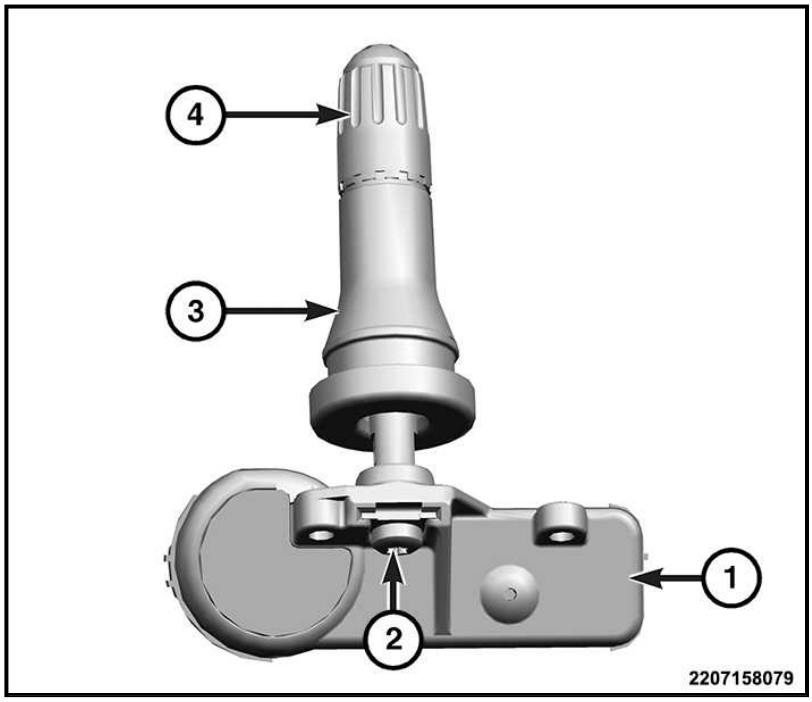
1 - Tire Pressure Sensor
2 - Tire Pressure Sensor Screw
3 - Valve Stem
4 - Cap

NOTE: **The tire pressure sensor, the valve stem, and all valve stem components including the cap and the valve core can be serviced and replaced individually.**

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .

NOTE: **When dismounting or mounting the tire on the wheel, follow the tire changer manufacturers instructions while paying special attention to avoid damaging the pressure sensor.**

2. Remove the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION**.
3. Dismount the tire from the wheel.



1 - Tire Pressure Sensor
2 - Tire Pressure Sensor Screw
3 - Valve Stem
4 - Cap

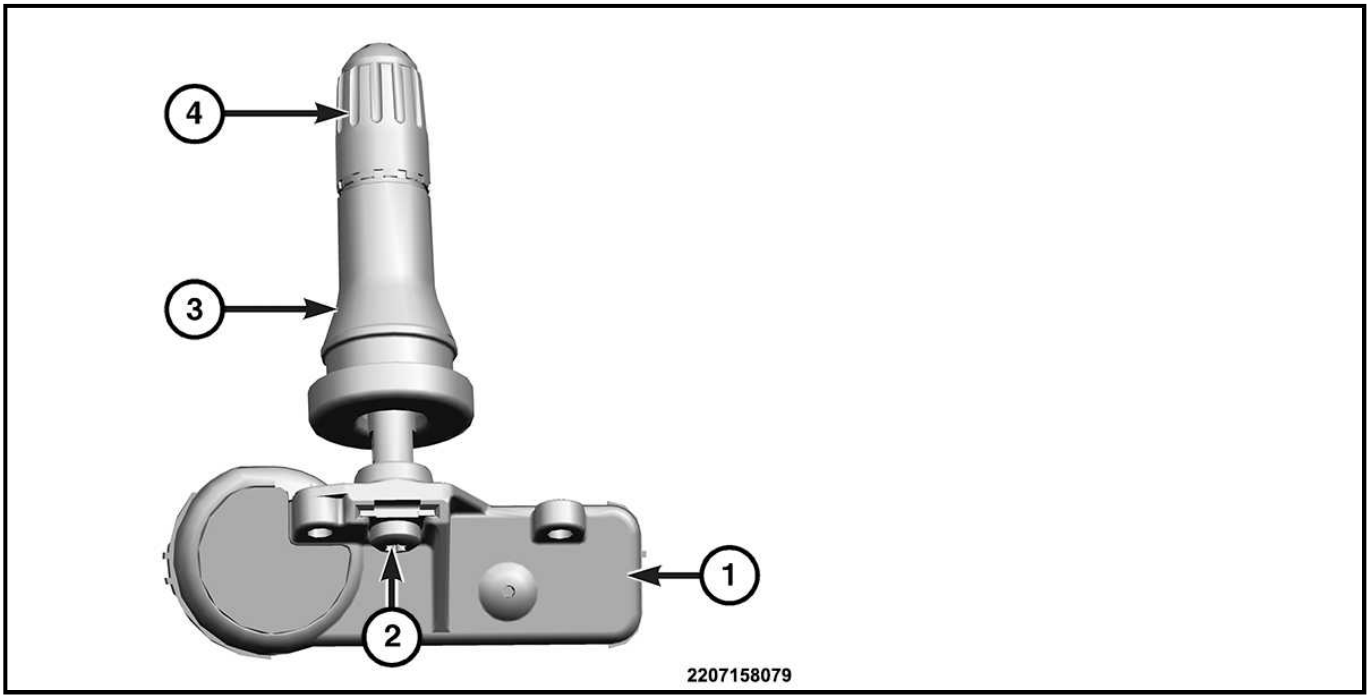
4. To remove the sensor from the valve stem, remove the valve stem mounting screw.

NOTE: **Replace the valve stem assembly with each tire change or when the tire is removed from the wheel.**

NOTE: **Install a NEW valve stem assembly if they are removed from the wheel or valve stem.**

5. Remove the valve stem from the wheel.

INSTALLATION



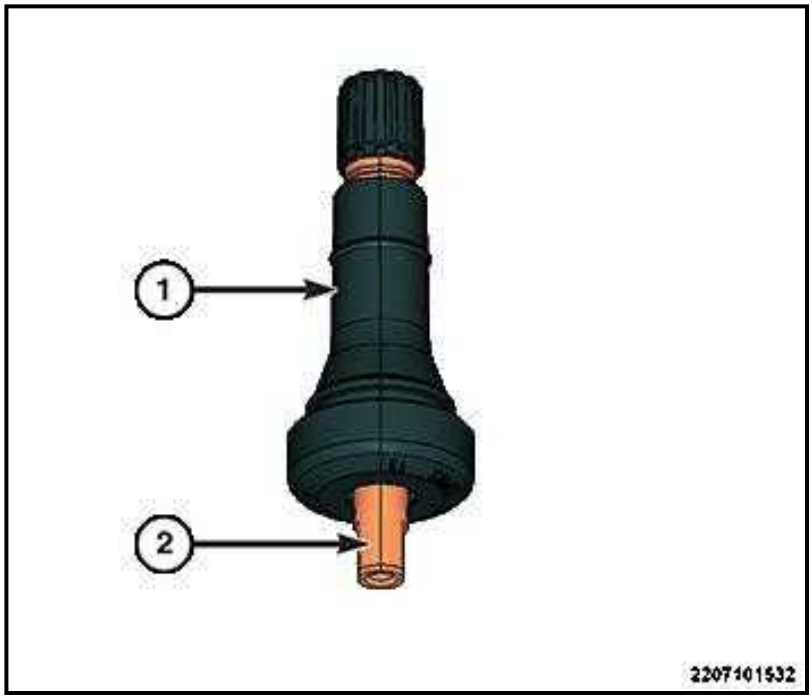
1 - Tire Pressure Sensor
2 - Tire Pressure Sensor Screw
3 - Valve Stem
4 - Cap

CAUTION: **Any time a sensor is to be reinstalled in a wheel, a new valve stem assembly must be installed to ensure air tight sealing.**

NOTE: **When installing a new valve stem assembly, do not install it with the sensor attached. If it is a new sensor, separate the valve stem from the sensor first then install the components separately.**

NOTE: **Replace the valve stem assembly with each tire change or when the tire is removed from the wheel.**

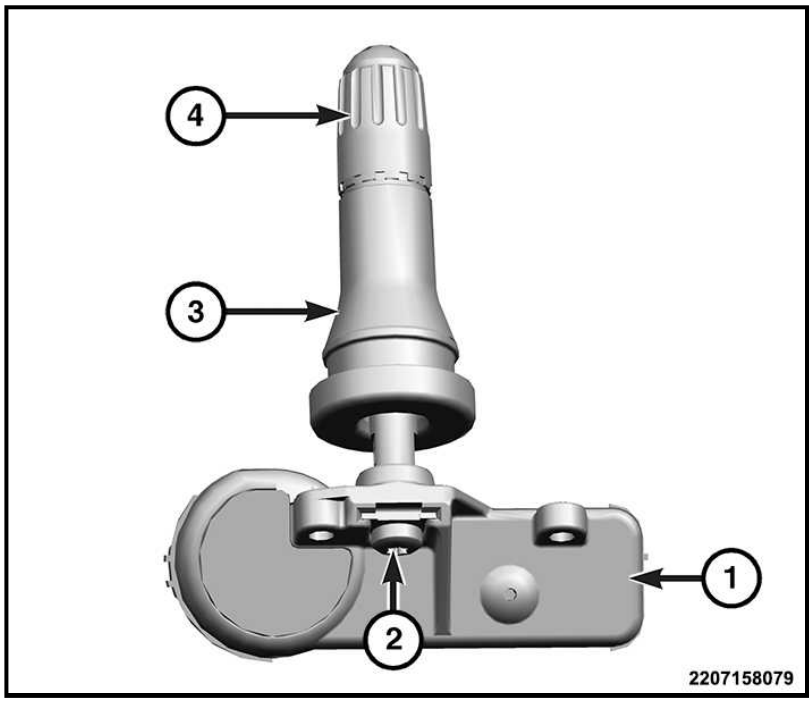
1. Wipe the area clean around the valve stem mounting hole in the wheel. Make sure surface of wheel is not damaged.



1 - Valve Stem
2 - Flats

NOTE: **When installing a new valve stem, water or water/soap solution should be used for proper installation into the wheel.**

2. Position the valve stem into the wheel mounting hole with the flats at a 90B° angle to the wheels lip, then pull through to seat with a standard valve stem installation tool.
3. Install the sensor to the valve stem by aligning the flats in the sensor to the flats on the valve stem.



1 - Tire Pressure Sensor
2 - Tire Pressure Sensor Screw
3 - Valve Stem
4 - Cap

4. Install and secure the tire pressure sensor to valve stem mounting screw.

NOTE: **When dismounting or mounting the tire on the wheel, follow the tire changer manufacturers instructions while paying special attention to avoid damaging the pressure sensor.**

5. Mount the tire on the wheel.
6. Install the tire and wheel assembly. Refer to **REMOVAL AND INSTALLATION**.
7. Adjust air pressure to that listed on tire inflation pressure label (placard) provided with vehicle (usually applied to driver's side B-pillar). Make sure original style valve stem cap is securely installed to keep moisture out of sensor.
8. Remove the support and lower the vehicle.
9. Perform one of the following to make the system learn the new sensor ID:
   - Use (special tool #2046300080, Kit, TPM/RKE ANALYZER), with the scan tool to program the module with the tire pressure sensor ID. This is part of the Tire Pressure Monitor (TPM) diagnostic verification test. Refer to **STANDARD PROCEDURE** .
   - Drive the vehicle for a minimum of 20 minutes while maintaining a continuous speed above 20 mph (32 km/h). During this time, the system will learn the new sensor ID. This is part of the TPM diagnostic verification test. Refer to **STANDARD PROCEDURE** .

NOTE: **If a sensor cannot be trained, refer to appropriate diagnostic information.**

TIRES

DESCRIPTION

TIRE

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles
- Operating vehicle with over or under inflated tire pressures

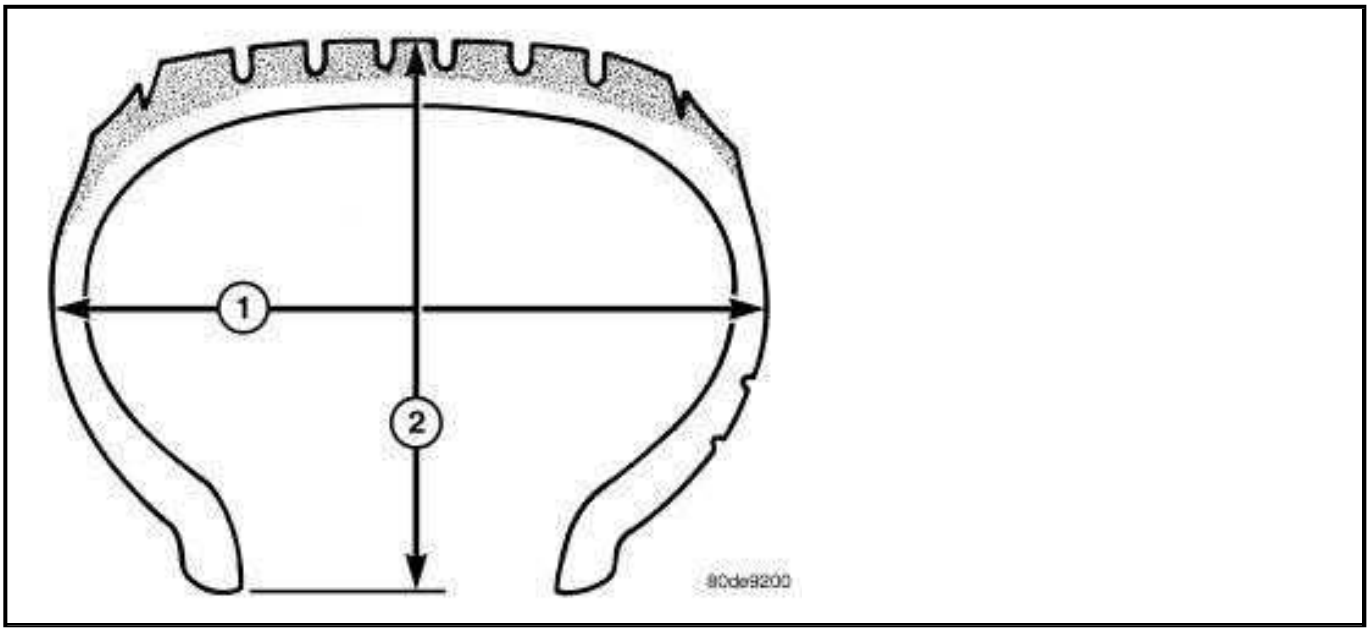
TIRE IDENTIFICATION

Tire type, size, load index and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the Tire Identification chart to decipher the code. For example purposes, the tire size P225/60 R 16 97 T is used in the chart. An All Season type tire will also have either M + S, M AND S, or M - S (indicating mud and snow traction) imprinted on the side wall. An Extra or Light Load marking "XL" or "LL" may also be listed on the sidewall. The absence of an "XL" or "LL" marking infers a standard load tire.

TIRE IDENTIFICATION

Reading Tire Codes		
B	B	B
P	TIRE TYPE (Not present on all tires)	P
B	B	T
B	B	C

Reading Tire Codes		
B	B	LT - Light Truck
225	SECTIONAL WIDTH	SHOWN IN MILLIMETERS
60	ASPECT RATIO	SHOWN IN PERCENTAGE*
R	CONSTRUCTION TYPE	R - RADIAL
		B - BIAS BELTED
		D - DIAGONAL (BIAS)
16	WHEEL DIAMETER	SHOWN IN INCHES
97	LOAD INDEX	**
T	SPEED RATING	**



1 - SECTIONAL WIDTH
2 - SECTIONAL HEIGHT

NOTE: *** Height (2) Γ· Width (1) = Aspect Ratio.**

NOTE: **** Consult the tire manufacturer regarding any questions on tire specifications or capabilities.**

TIRE CHAINS

Refer to the owners service information supplied with the vehicle to determine whether the use of tire chains is permitted on this vehicle.

REPLACEMENT TIRES

WARNING: **Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure.**

WARNING: **In order to maintain the speed capability of the vehicle, replacement tires must have speed ratings equal to or higher than those fitted to the vehicle as original equipment. If tires with lower speed ratings are fitted, the vehicle's handling may be affected and the speed capability of the vehicle may be lowered to the maximum speed capability of the replacement tires. To avoid an accident resulting in severe or fatal injury, consult the tire manufacturer in regards to maximum speed ratings.**

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The original equipment tires provide a proper combination of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

The use of tires smaller than the minimum tire size approved for the vehicle can result in tire overloading and failure.

Use tires that have the approved load rating for the vehicle and never overload them. Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure and loss of vehicle control.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

SPARE TIRE

A full size spare wheel and tire are standard equipment on this vehicle and is compatible with the road wheels and tires.

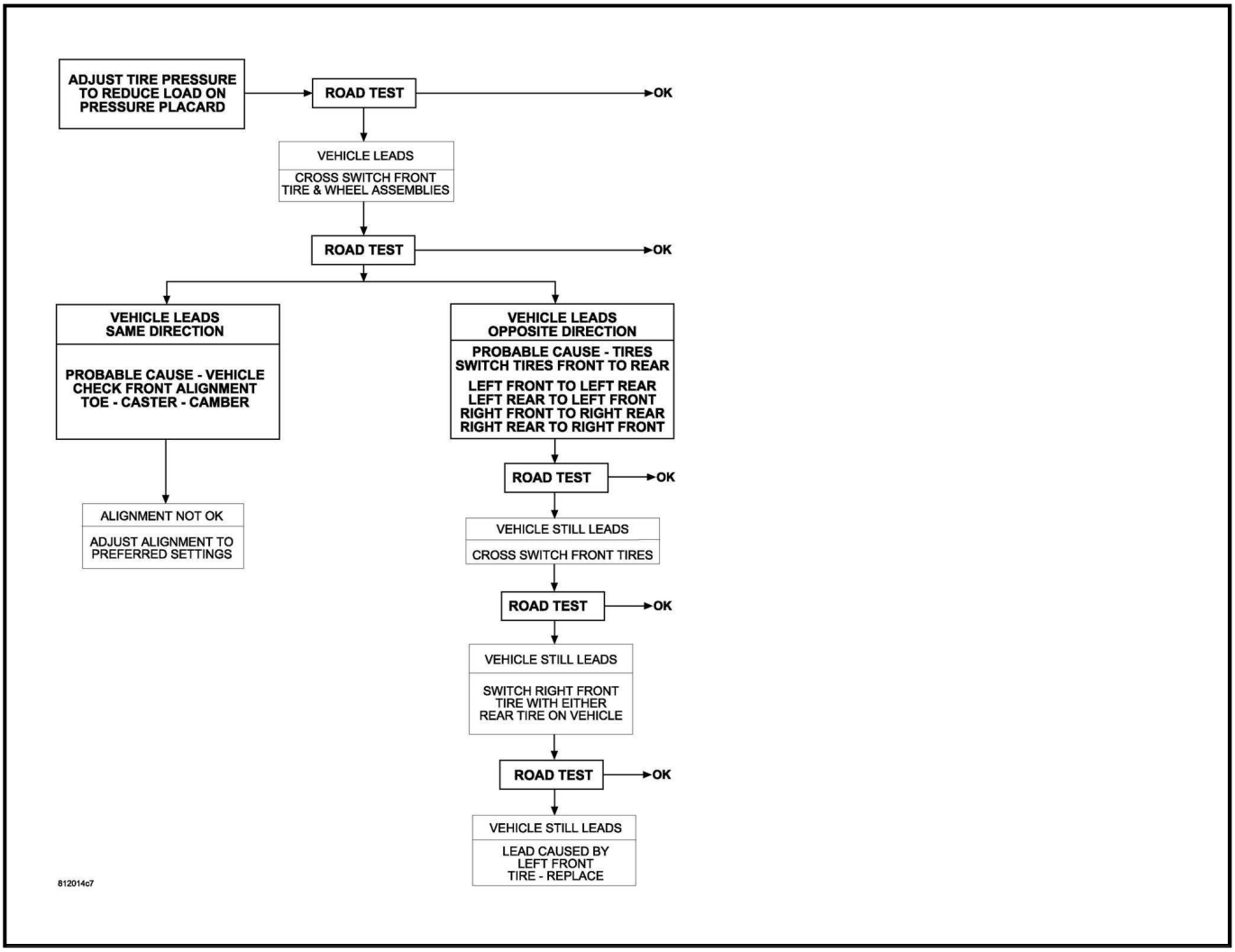
DIAGNOSIS AND TESTING

TIRE NOISE

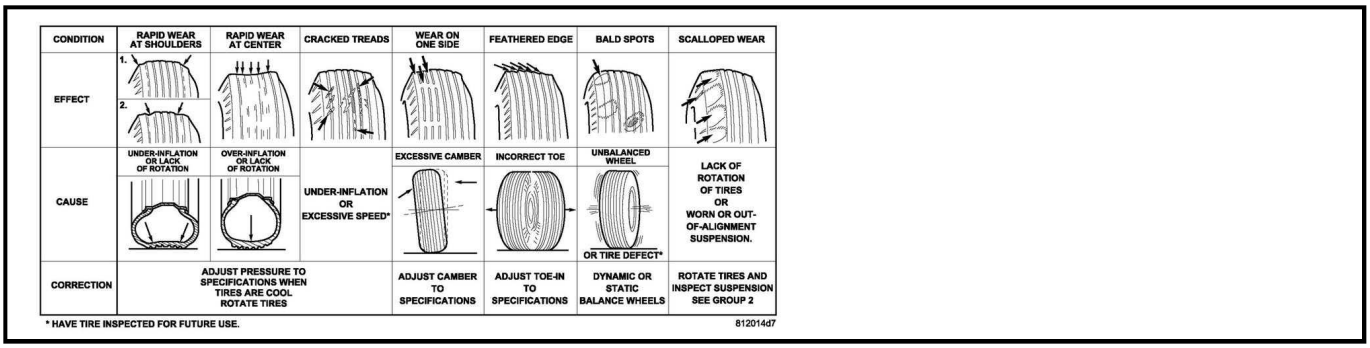
Unusual tire noise can be associated with tire and wheel vibration or irregular tire wear. For vibration issues. Refer to **DIAGNOSIS AND TESTING**. For irregular tire wear issues. Refer to **TIRES, DIAGNOSIS AND TESTING**.

VEHICLE LEAD

Use the following vehicle lead diagnosis and correction chart to diagnose and correct a vehicle lead or drift problem.



TIRE WEAR PATTERNS

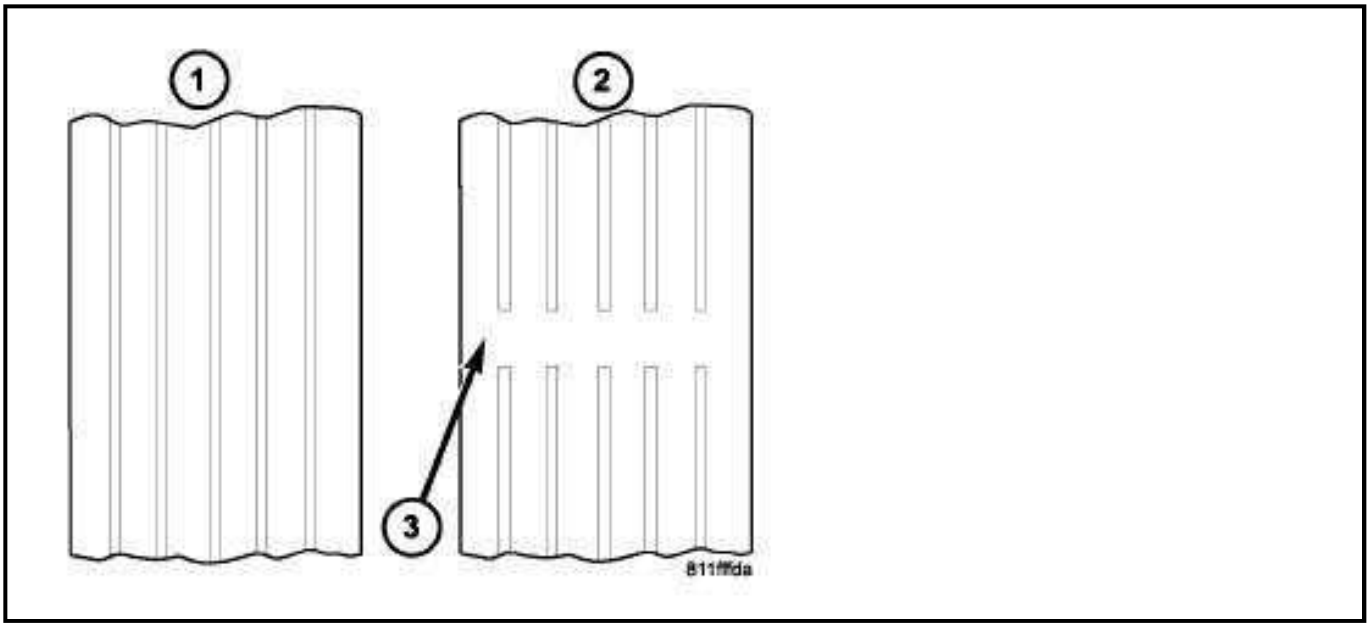


Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread.

TREAD WEAR INDICATORS



Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (3).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.

STANDARD PROCEDURE

TIRE INFLATION PRESSURES

WARNING: **Over or Under inflated tires can affect vehicle handling. The tire can fail suddenly, resulting in loss of vehicle control.**

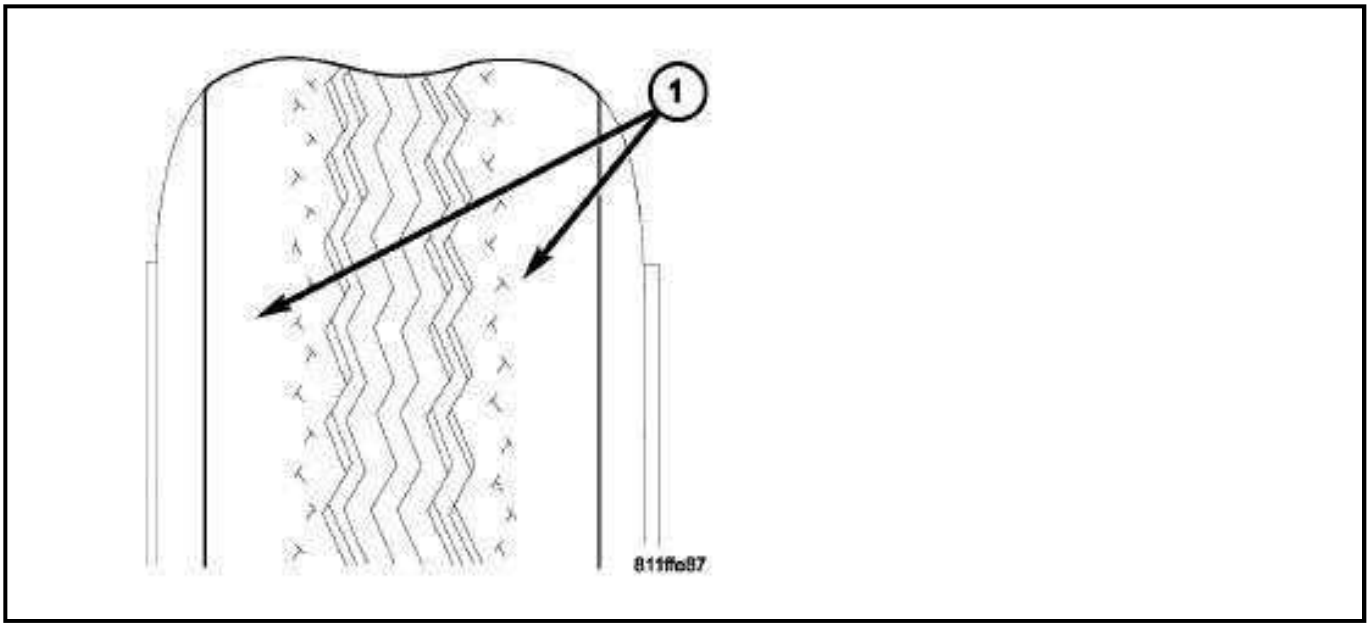
The specified tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. The proper tire pressure specification can be found on the vehicle placard label provided with the vehicle (usually on the driver door opening (B-pillar) or rear edge of the driver door).

A quality air pressure gauge is recommended to check tire air pressure. Tire pressure should be checked cold once per month. Check tire pressure more frequently when the weather temperature varies widely. Tire pressure will decrease when the outdoor temperature drops. After checking the tire pressure, replace valve cap finger tight.

Inflation pressures specified on the vehicle placard label are always the cold inflation pressure of the tire. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours, or the vehicle is driven less than one mile after being inoperative for 3 hours. Tire inflation pressures may increase from 2-6 PSI during operation. Do not reduce this normal pressure buildup.

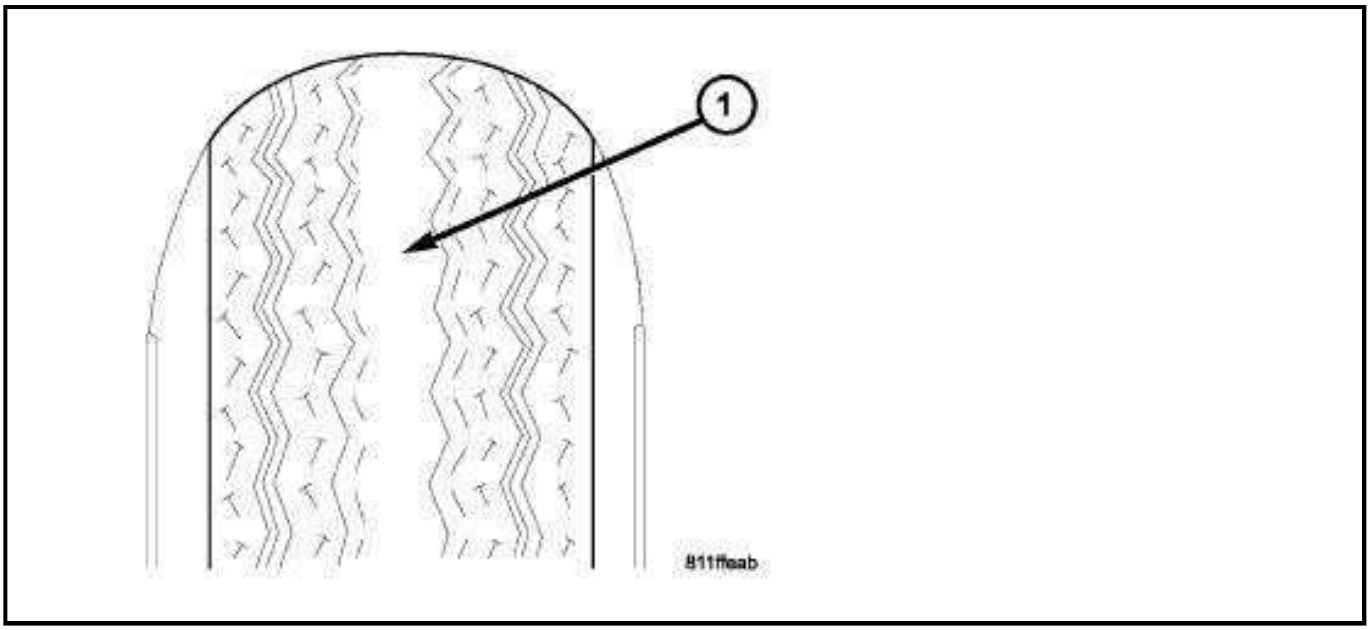
Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift



1 - Shoulder Wear

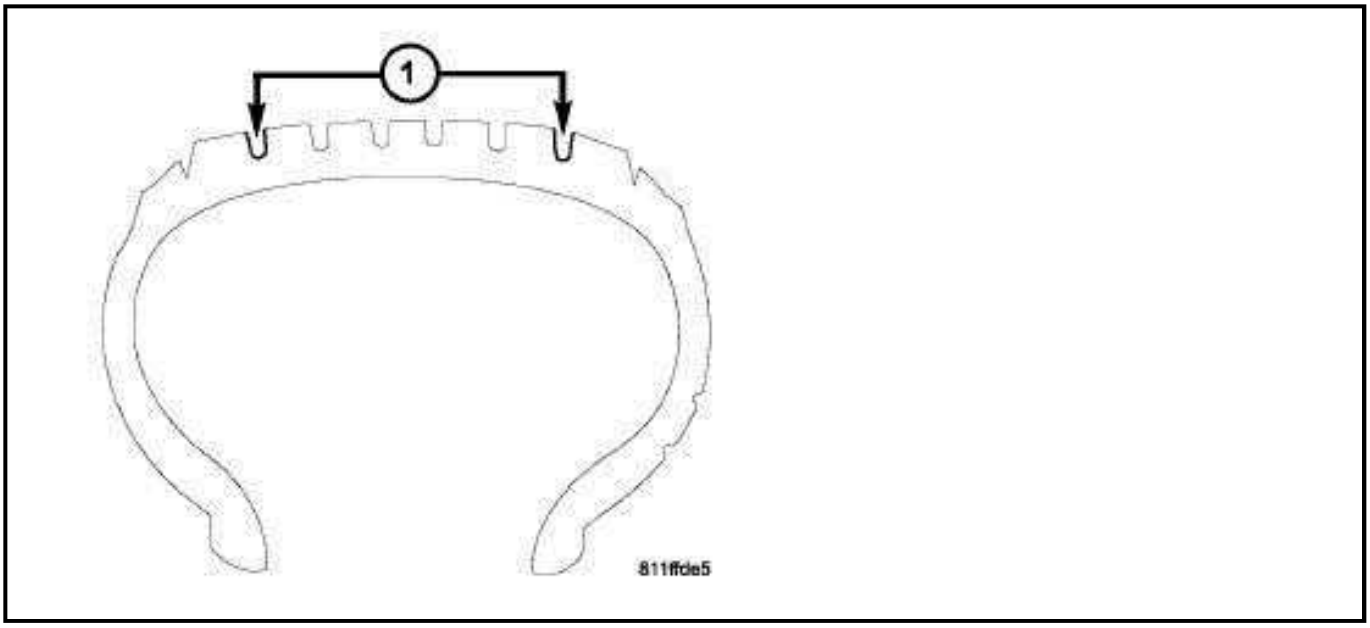
Under inflation causes rapid shoulder wear, tire flexing, and can result in tire failure.



1 - Center Wear

Over inflation causes rapid center wear and loss of the tire's ability to cushion shock.

TIRE LEAK REPAIRING



1 - Tread Area

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the issue, or puncture, is in the tread area (1). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before attempting to dismount the tire from the wheel. **Use a lubricant such as a mild soap solution when dismounting or mounting tire.** Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting the tire on the wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install the wheel on the vehicle.

WINCH, SPARE TIRE CARRIER

REMOVAL AND INSTALLATION

SPARE TIRE WINCH

REMOVAL

1 - Spare Tire Winch Bolt

NOTE: **Do NOT use impact tools on the spare tire winch assembly to raise or lower the spare tire.**

1. Raise and support the vehicle. Refer to **HOISTING, STANDARD PROCEDURE** .
2. Remove the spare tire.
3. Remove the spare tire winch bolt, then remove the winch.

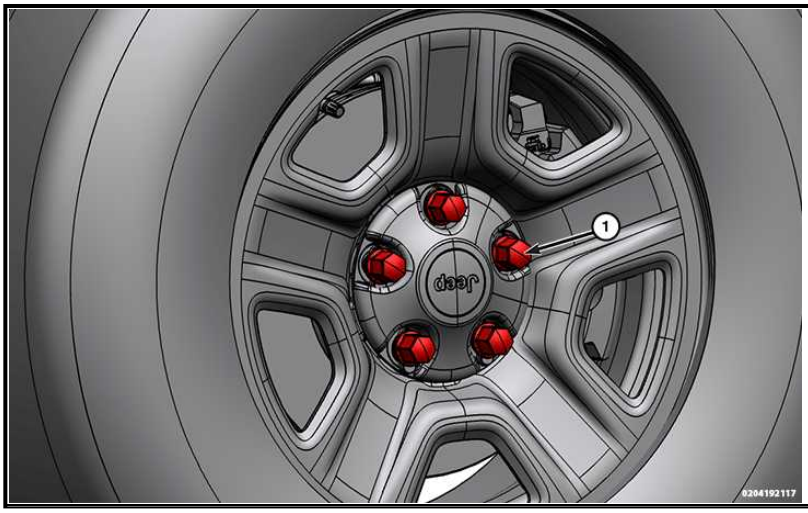
INSTALLATION

During installation, torque the fasteners to the specifications in the torque table(s) below.

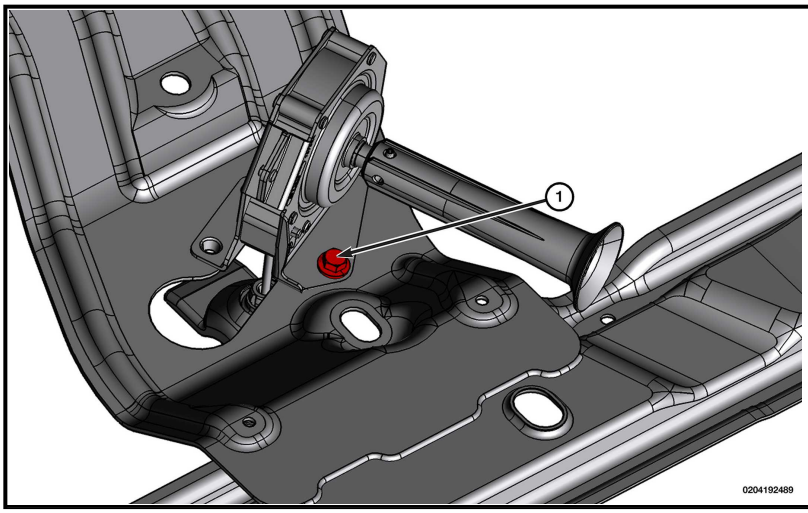
Follow the removal procedure in reverse for general reassembly of the components on the vehicle. The steps listed below are calling out specific procedures that should be followed during installation.

TORQUE SPECIFICATIONS

TIRE AND WHEEL



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Lug Nut	**176 N. m (130 Ft. Lbs.)**	-
-	Tire Pressure Monitoring (TPM) Module Bracket Fasteners	**7 N. m (62 In. Lbs.)**	-

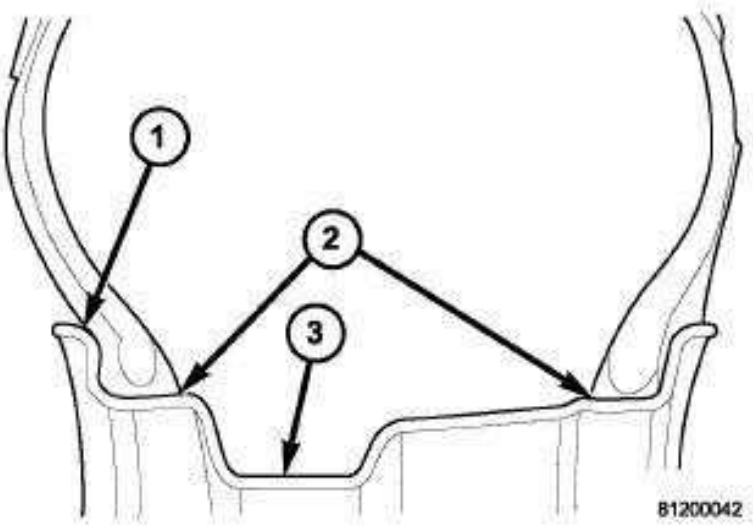


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Spare Tire Winch Bolt	**20 N. m (15 Ft. Lbs.)**	-

WHEELS

DESCRIPTION

DESCRIPTION AND OPERATION



1 - Rim Flanges
2 - Safety Humps
3 - Drop Well

All models use either steel or cast aluminum drop center wheels. The original equipment wheels are designed for proper operation at all loads up to the specified maximum vehicle capacity.

Every wheel has raised sections between the rim flanges and drop well called safety humps. In case of air loss, these raised sections help hold the tire in position on the wheel until the vehicle can be brought to a safe stop. When being installed on the wheel, initial inflation of the tire forces the tire bead over these raised sections into place.

The wheel studs and nuts are designed for specific wheel applications and must be replaced with equivalent parts. Do not use replacement parts of lesser quality or of a substitute design. All aluminum and steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - WHEEL INSPECTION

WARNING: **Failure to use equivalent replacement wheels may adversely affect the safety and handling of the vehicle.**

WARNING: **Replacement with used wheels is not recommended. The service history of the wheel may have included severe treatment or very high mileage. The rim could fail without warning.**

WARNING: **Stellantis does not recommend that customers use "reconditioned" wheels (wheels that have been damaged and repaired) because they can result in a**

sudden catastrophic wheel failure which could cause loss of control and result in injury or death. For clarification:

- **Cosmetic refinishing for the purpose of repairing a superficial flaw is an acceptable procedure providing it is limited to paint or clear coat only, the wheel is not modified in any way, and there is no exposure to paint curing heat over 93B°C (200B°F).**
- **Damaged wheels are those which have been bent, broken, cracked or sustained some other physical damage which may have compromised the wheel structure.**
- **Repaired indicates that the wheel has been modified through bending, welding, heating, straightening, or material removal to rectify damage.**
- **Re-plating of chrome plated wheels is not an acceptable procedure nor is chrome plating of original equipment painted or polished wheels, as this may alter mechanical properties and affect fatigue life.**

Inspect wheels for:

- Excessive runout
- Dents, cracks or irregular bends
- Damaged wheel stud (lug) holes
- Air Leaks

NOTE: **Do not attempt to repair a wheel by hammering, heating or welding.**

If a wheel is damaged, an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

CLEANING

CAUTION: **Avoid products or automatic car washes that use acidic solutions or strong alkaline additives or harsh brushes. These products and automatic car washes may damage the wheel's protective finish. Such damage is not covered by the New Vehicle Limited Warranty. Only car wash soap, MOPAR Wheel Cleaner or equivalent is recommended.**

All wheels and wheel trim, especially aluminum and chrome plated wheels, should be cleaned regularly using mild (neutral Ph) soap and water to maintain their luster and to prevent corrosion. Wash wheels with the same soap solution recommended for the body of the vehicle. Your wheels are susceptible to deterioration caused by salt, sodium chloride, magnesium chloride, calcium chloride, and others, and other road chemicals used to melt ice or control dust on dirt roads. Use a soft cloth or sponge and mild soap to wipe away promptly. Do not use harsh chemicals or a stiff brush. They can damage the wheel's protective coating that helps keep them from corroding and tarnishing.

CAUTION: **Do not use scouring pads, steel wool, a bristle brush, metal polishes or oven cleaner. These products may damage the wheel's protective finish. Such damage is not covered by the New Vehicle Limited Warranty. Only car wash soap, MOPAR Wheel Cleaner or equivalent is recommended.**

NOTE: **Many aftermarket wheel cleaners contain strong acids or strong alkaline additives that can harm the wheel surface.**

When cleaning extremely dirty wheels, including those with excessive brake dust, care must be taken in the selection of tire and wheel cleaning chemicals and equipment to prevent damage to the wheels. Mopar Wheel

Treatment or Mopar Chrome Cleaner or their equivalent is recommended or select a non-abrasive, non-acidic cleaner for aluminum or chrome wheels. Do not use any products on Dark Vapor or Black Satin Chrome Wheels. They will permanently damage this finish and such damage is not covered by the New Vehicle Limited Warranty.

NOTE: **If you intend parking or storing your vehicle for an extended period after cleaning the wheels with wheel cleaner, drive your vehicle for a few minutes before doing so. Driving the vehicle and applying the brakes when stopping will reduce the risk of brake rotor corrosion.**

Dark Vapor Or Black Satin Chrome Wheels

CAUTION: **If your vehicle is equipped with Dark Vapor or Black Satin Chrome wheels DO NOT USE wheel cleaners, abrasives or polishing compounds. They will permanently damage this finish and such damage is not covered by the New Vehicle Limited Warranty. USE ONLY MILD SOAP AND WATER WITH A SOFT CLOTH. Used on a regular basis this is all that is required to maintain this finish.**
