

2018 BRAKES

Antilock Brake System - Traverse

SPECIFICATIONS

FASTENER SPECIFICATIONS

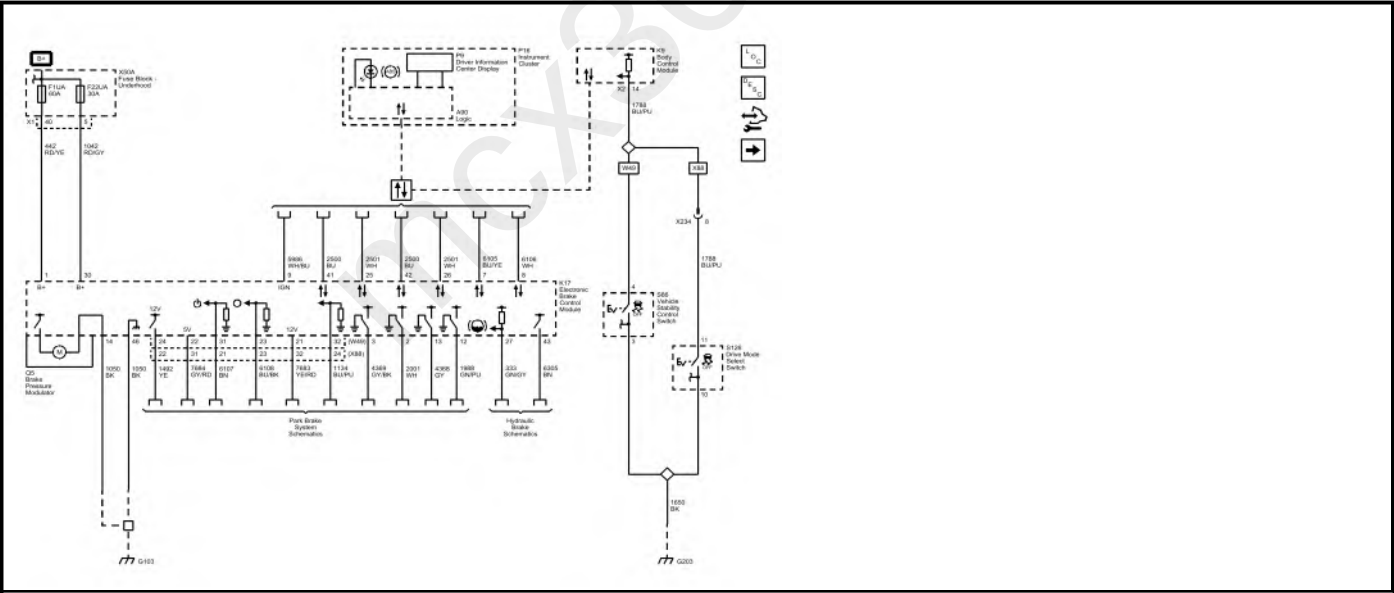
Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Brake Pipe Fitting	18 N.m (13 lb ft)
Brake Pressure Modulator Valve Bolt	11 N.m (97 lb in)
Brake Pressure Modulator Valve Bracket Bolt	22 N.m (16 lb ft)
Electronic Brake Control Module Bolt	Electronic Brake Control Module Replacement
Refer to procedure for tightening sequence and torque values.	
Wheel Speed Sensor Bolt	9 N.m (80 lb in)

SCHEMATIC WIRING DIAGRAMS

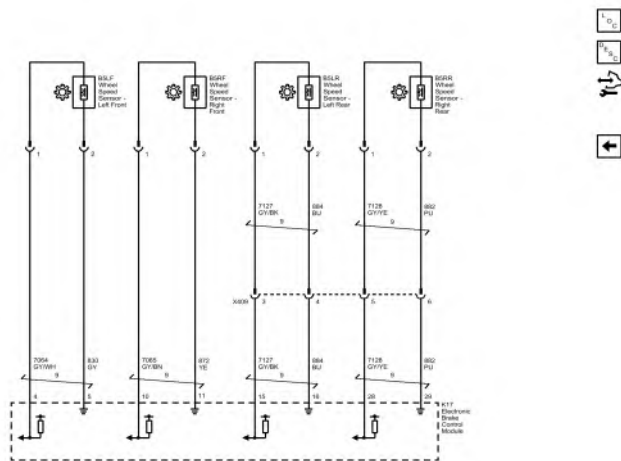
ANTILOCK BRAKE SYSTEM WIRING SCHEMATICS

Power, Ground, Serial Data, Traction Control and References



Wheel Speed Sensors





DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B273A

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B273A

Hill Descent Control Switch

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	U0422 71, B273A 02	1	1	-
Ground	-	1	-	-
1. Hill descent control switch inoperative				

Circuit/System Description

The body control module monitors the signal circuit from the hill descent control switch. The hill descent switch is a momentary switch that is normally open. When the hill descent control switch is pressed once, the body control module will request the electronic brake control module via serial data to disable or enable the hill descent control. When activated, the switch grounds the hill descent control system signal circuit. The electronic brake control module then enables or disables the hill descent control system. The electronic brake control module will request the instrument cluster via serial data to turn the hill descent indicator ON or OFF to notify the driver.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

The body control module detects a short to ground on the signal circuit.

Action Taken When the DTC Sets

The body control module ignores the hill descent switch signal input.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

- [Antilock Brake System Wiring Schematics](#)
- [Hydraulic Brake Wiring Schematics](#)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Body Control Module Hill Descent Control Switch parameter changes between Inactive and Active when pressing and releasing the hill descent control switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing.
 - **Go to next step: If the parameter changes**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S126 Drive Mode Select Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the ground circuit terminal 10 and ground.
 - **If 5 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 5 Ω**
3. Ignition ON.
4. Verify the scan tool Hill Descent Control Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 10 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.

- **Go to next step: If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 11 and the ground circuit terminal 10.
6. Verify the scan tool Hill Descent Control Switch parameter is Active.

- **If not Active**

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - Go to next step: If less than 1 V
3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If Active**

7. Test or replace the S126 Drive Mode Select Switch.

Component Testing

1. Ignition OFF, disconnect the X1 harness connector at the S126 Drive Mode Select Switch.
2. Test for infinite resistance between the signal terminal 11 and the ground terminal 10 with the switch in the open position.

- **If less than infinite resistance**

Replace the S126 Drive Mode Select Switch.

- **Go to next step: If infinite resistance**

3. Test for less than 2 Ω between the signal terminal 11 and the ground terminal 10 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S126 Drive Mode Select Switch.

- **Go to next step: If less than 2 Ω**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for control module replacement, programming and setup.

DTC B2745

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B2745

Traction Control Switch Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B2745 02	1, P159F 00	1	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ground	-	1, P159F 00	-	-
1. Traction control switch malfunction				

Circuit/System Description

The body control module monitors the signal circuit from the traction control switch. When the traction control switch is pressed once, the body control module requests the electronic brake control module via serial data to disable the traction control. The electronic brake control module commands the instrument cluster via serial data to turn the traction control off indicator ON to notify the driver of the deactivation.

When the traction control switch is pressed and held for five seconds, the body control module requests the electronic brake control module to disable the electronic stability control. The electronic brake control module commands the instrument cluster via serial data to turn the traction control off and stability control off indicator ON to notify the driver of the deactivation.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The body control module detects a short to ground on the signal circuit.

Action Taken When the DTC Sets

The body control module ignores the traction control switch signal input.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Body Control Module, Traction Control Switch parameter changes between Active and Inactive when pressing and releasing the traction control switch.

- **If the parameter does not change**

Refer to Circuit/System Testing.

- **Go to next step: If the parameter changes**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S126 Drive Mode Select Switch. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.
2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

3. Ignition ON.

4. Verify the scan tool Body Control Module, Traction Control Switch parameter is Inactive.

- **If not Inactive**

1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the signal circuit terminal 14 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.

- **Go to next step: If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 11 and the ground circuit terminal 10.

6. Verify the scan tool Traction Control Switch parameter is Active.

- **If not Active**

1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - Go to next step: If less than 1 V
3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If Active**

7. Test or replace the S126 Drive Mode Select Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S126 Drive Mode Select Switch.
2. Test for infinite resistance between the signal terminal 11 and the ground terminal 10 with the switch in the open position.

- **If less than infinite resistance**

Replace the S126 Drive Mode Select Switch.

- **Go to next step: If infinite resistance**

3. Test for less than 5 Ω between the signal circuit terminal 11 and the ground circuit terminal 10 with the switch in the closed position.

- **If 5 Ω or greater**

Replace the S126 Drive Mode Select Switch.

- **Go to next step: If less than 5 Ω**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Ride Control Switch Replacement - Center Console](#)
- [Control Module References](#) for Control Module replacement, programming and setup.

DTC C0035, C0040, C0045, OR C0050

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0035

Left Front Wheel Speed Sensor Circuit

DTC C0040

Right Front Wheel Speed Sensor Circuit

DTC C0045

Left Rear Wheel Speed Sensor Circuit

DTC C0050

Right Rear Wheel Speed Sensor Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Wheel Speed Sensor Ignition	C0035 05	C0035 04, P174C 00	C0035 05	C0035 08, C0035 18, C0035 0F
Left Front Wheel Speed Sensor Signal	-	C0035 04, P174C 00	C0035 05	C0035 08, C0035 18, C0035 0F, C0035 3A
Right Front Wheel Speed Sensor Ignition	C0040 05	C0040 04, P174C 00	C0040 05	C0040 08, C0040 18, C0040 0F
Right Front Wheel Speed Sensor Signal	-	C0040 04, P174C 00	C0040 05	C0040 08, C0040 18, C0040 0F, C0040 3A
Left Rear Wheel Speed Sensor Ignition	C0045 05	C0045 04, P174C 00	C0045 05	C0045 08, C0045 18, C0045 0F
Left Rear Wheel Speed Sensor Signal	-	C0045 04, P174C 00	C0045 05	C0045 08, C0045 18, C0045 0F, C0045 3A
Right Rear Wheel Speed Sensor Ignition	C0050 05	C0050 04, P174C 00	C0050 05	C0050 08, C0050 18, C0050 0F
Right Rear Wheel Speed Sensor Signal	-	C0050 04, P174C 00	C0050 05	C0050 08, C0050 18, C0050 0F, C0050 3A

Component	Condition	DTC Symptom Bytes
Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or improperly mounted sensor - Air gap between the wheel speed sensor and the encoder ring too large - Water intrusion in the wiring harness	08, 18, or 0F

Circuit/System Description

The wheel speeds are detected by active wheel speed sensors and encoder rings. The encoder ring consists of permanent magnets. Each wheel speed sensor receives ignition voltage from the electronic brake control module and provides an alternating current square wave signal to the electronic brake control module. As the wheel spins, the electronic brake control module uses the frequency of the square wave signal to calculate the wheel speed.

Conditions for Running the DTC

C0035 04, C0040 04, C0045 04, and C0050 04

Ignition ON

C0035 05, C0040 05, C0045 05, and C0050 05

- Ignition ON
- Vehicle speed is greater than 16 km/h (10 MPH).

C0035 08, C0040 08, C0045 08, and C0050 08

- No electrical faults are detected.
- Vehicle speed is greater than 16 km/h (10 MPH).

C0035 17, C0040 17, C0045 17, and C0050 17

- Ignition ON

C0035 18, C0040 18, C0045 18, and C0050 18

- Ignition ON
- Vehicle speed is greater than 12.9 km/h (8 MPH).

C0035 21, C0040 21, C0045 21, and C0050 21

- Ignition ON

C0035 26, C0040 26, C0045 26, and C0050 26

- Ignition ON

C0035 27, C0040 27, C0045 27, and C0050 27

- Ignition ON

C0035 0F, C0040 0F, C0045 0F, and C0050 0F

- Ignition ON
- Vehicle speed is greater than 12.9 km/h (8 MPH).

C0035 3A, C0040 3A, C0045 3A, and C0050 3A

- Ignition ON

- Vehicle speed is greater than 15 km/h (10 MPH).

C0035 5A, C0040 5A, C0045 5A, and C0050 5A

- Ignition ON
- EBCM supply voltage greater than 9V but less than 16V.

Conditions for Setting the DTC

C0035 04, C0040 04, C0045 04, or C0050 04

- A open or high resistance is detected on the wheel speed sensor ignition circuit.
- A open or high resistance is detected on the wheel speed sensor signal circuit.

C0035 05, C0040 05, C0045 05, or C0050 05

- A short to ground or a short to voltage is detected on the wheel speed sensor ignition circuit.
- A short to ground or a short to voltage is detected on the wheel speed sensor signal circuit.

C0035 08, C0040 08, C0045 08, or C0050 08

- A high resistance is detected in the wiring harness.
- A short to voltage is detected on the high side wheel speed sensor circuit.

C0035 17, C0040 17, C0045 17, or C0050 17

- The wheel speed signal shape/waveform is out of range.

C0035 18, C0040 18, C0045 18, or C0050 18

- The tone ring may be demagnetized.
- Incorrectly mounted wheel speed sensor.
- An erratic wheel speed sensor signal is detected.
- Air gap between the wheel speed sensor and the tone ring is too large.

C0035 21, C0040 21, C0045 21, or C0050 21

- The wheel speed pulse is out of range.

C0035 26, C0040 26, C0045 26, or C0050 26

- The EBCM detects low speed pulse input.

C0035 27, C0040 27, C0045 27, or C0050 27

- The EBCM detects fast speed pulse input.

C0035 0F, C0040 0F, C0045 0F, or C0050 0F

- Incorrectly mounted wheel speed sensor.
- Debris on the wheel speed sensor or the tone ring.
- Missing tooth or teeth on the wheel speed sensor tone ring.
- Electrical magnetic interference with the wheel speed sensor harness.

C0035 3A, C0040 3A, C0045 3A, or C0050 3A

- The wrong hub or tone ring may be installed.
- A incompatible wheel speed sensor may be installed.

C0035 5A, C0040 5A, C0045 5A, or C0050 5A

- The EBCM detects that the wheel speed velocities are not within 15% of the slowest valid wheel.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The adaptive cruise control is inhibited.
- The traction/stability control indicator turns ON.
- The Service Stabilitrak message is displayed on the driver information center.
- The electronic brake control module disables the ABS, the traction control, the hill start assist, the electronic stability control, and the trailer sway control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Diagnostic Aids

- Do not use a magnet to clean the encoder ring.
- Inspect the encoder ring for rust or corrosion.
- If more than one wheel speed DTC is set, diagnose each wheel speed sensor individually.
- If any of the symptom byte codes 08, 18, or 0F are set, refer to the Diagnostic Fault Information table for possible mechanical faults or conditions.
- If the customer comments that the ABS indicator is ON only during moist environmental conditions (rain, snow, vehicle wash, etc.), inspect the wheel speed sensor wiring for signs of water intrusion.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Test drive the vehicle at speeds greater than 16 km/h (10 MPH).
2. Verify all scan tool Wheel Speed Sensor parameters are within 4 km/h (2.5 MPH) of each other.
 - **If any parameter is not within 4 km/h (2.5 MPH) of each other**

Refer to Circuit/System Testing.
 - **Go to next step: If each parameter is within 4 km/h (2.5 MPH) of each other**
3. Verify DTC C0035, C0040, C0045, or C0050 is not set.
 - **If any of the DTCs are set**

Diagnose each wheel speed sensor individually, refer to Circuit/System Testing.

- **Go to next step: If none of the DTCs are set**

4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connectors at the appropriate B5 Wheel Speed Sensor and the harness connector at the K17 Electronic Brake Control Module, ignition ON.
2. Test for less than 1 V between the appropriate K17 Electronic Brake Control Module harness connector terminals listed below and ground:

- B5LF Wheel Speed Sensor - Left Front - terminal 4 and terminal 5
- B5LR Wheel Speed Sensor - Left Rear - terminal 15 and terminal 16
- B5RF Wheel Speed Sensor - Right Front - terminal 10 and terminal 11
- B5RR Wheel Speed Sensor - Right Rear - terminal 28 and terminal 29
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

3. Ignition OFF.
4. Test for infinite resistance between the K17 Electronic Brake Control Module harness connector terminals listed below and ground:

- B5LF Wheel Speed Sensor - Left Front - terminal 4 and terminal 5
- B5LR Wheel Speed Sensor - Left Rear - terminal 15 and terminal 16
- B5RF Wheel Speed Sensor - Right Front - terminal 10 and terminal 11
- B5RR Wheel Speed Sensor - Right Rear - terminal 28 and terminal 29
- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **Go to next step: If infinite resistance**

5. Test for less than 2 Ω between the B5 Wheel Speed Sensor harness connector terminal 1 and the K17 Electronic Brake Control Module harness connector terminal listed below:

- B5LF Wheel Speed Sensor - Left Front - terminal 4
- B5LR Wheel Speed Sensor - Left Rear - terminal 15
- B5RF Wheel Speed Sensor - Right Front - terminal 10
- B5RR Wheel Speed Sensor - Right Rear - terminal 28
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **Go to next step: If less than 2 Ω**

6. Test for less than 2 Ω between the B5 Wheel Speed Sensor harness connector terminal 2 and the K17 Electronic Brake Control Module harness connector terminal listed below:

- B5LF Wheel Speed Sensor - Left Front - terminal 5
- B5LR Wheel Speed Sensor - Left Rear - terminal 16
- B5RF Wheel Speed Sensor - Right Front - terminal 11
- B5RR Wheel Speed Sensor - Right Rear - terminal 29
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **Go to next step: If less than 2 Ω**

7. Replace the B5 Wheel Speed Sensor.
 8. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
- **If the DTC sets**

Replace the K17 Electronic Brake Control Module.

- **Go to next step: If the DTC does not set**

9. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Front Wheel Speed Sensor Replacement - Left Side](#)
- [Front Wheel Speed Sensor Replacement - Right Side](#)
- [Rear Wheel Speed Sensor Replacement](#)
- [Control Module References](#) for Control module replacement, programming and setup.

DTC C0110

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0110

Pump Motor Circuit Malfunction

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	C0110 03	C0110 00, C0110 04, C0110 06	C0110 07	C0110 39, C0110 59
Ground	-	C0110 00, C0110 04, C0110 06	-	-

Component	Condition	DTC
Pump Motor	• Wear • Damage • Lock	C0110 61

Circuit/System Description

The pump motor is an integral part of the brake pressure modulator, while the pump motor relay is integral to the electronic brake control module. The pump motor relay is not engaged during normal system operation. When the ABS, the traction control or the electronic stability control operation is required, the module activates the pump motor relay and turns the pump motor on.

Conditions for Running the DTC

C0110 00, C0110 04, or C0110 06

- Ignition ON
- The pump motor is commanded ON.

C0110 03, or C0110 07

- Ignition ON

- Vehicle speed is greater than 30 km/h (18.6 MPH) for 7 s.

C0110 39, C0110 59, or C0110 61

- Ignition ON
- Vehicle speed is greater than 60 km/h (37.3 MPH) for 5 s.

Conditions for Setting the DTC

C0110 00, C0110 04, or C0110 06

An open/high resistance is detected on the pump motor switch circuit.

C0110 03

Worn out pump motor brushes are detected.

C0110 07

A short to voltage is detected on the pump motor ground circuit.

C0110 39

A shorted circuit is detected in the pump motor circuit.

C0110 59

The pump motor is overheating.

C0110 61

- The pump motor is mechanically blocked.
- The pump motor is actuated but no generated motor voltage is detected.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The red brake indicator turns ON.
- The traction/stability control indicator turns ON.
- The driver information center may display a message.
- The electronic brake control module disables the ABS, the traction control and the stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- When the condition for setting the DTC is no longer present.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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ABS Description and Operation

Electrical Information Reference

- **Circuit Testing**

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- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the ABS pump motor turns On and Off when commanding the ABS Motor On and Off with a scan tool.
 - **If the pump motor does not turn On and Off**
Refer to Circuit/System Testing.
 - **Go to next step: If the pump motor turns On and Off**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K17 Electronic Brake Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 14 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify that a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance the in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF, remove the test lamp.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the Q5 Brake Pressure Modulator.
 - **Go to next step: If the test lamp illuminates**
5. Replace the Q5 Brake Pressure Modulator.
6. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If the DTC sets**
Replace the K17 Electronic Brake Control Module.
 - **Go to next step: If the DTC does not set**
7. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement](#)

- [Control Module References](#) for Control Module replacement, programming and setup.

DTC C0131

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0131

Traction Control System Pressure Circuit

For symptom byte information refer to [Symptom Byte List](#)

Circuit/System Description

The electronic brake control module monitors the brake pressure sensor which is integral to the brake pressure modulator. The body control module monitors the brake pedal position sensor signal when the brake pedal is applied and sends a serial data message to the electronic brake control module indicating the brake pedal position. The electronic brake control module compares the brake pressure to the actual brake pedal position and uses this information for vehicle stability control.

Conditions for Running the DTC

- The engine is running.
- The brake pedal has been applied and released.

Conditions for Setting the DTC

C0131 00

The electronic brake control module detects an invalid or erratic brake pressure sensor signal.

C0131 1A

The offset value of the pressure sensor is out of the specified range.

C0131 3B

The brake pressure sensor is not calibrated.

C0131 5A

- The brake pressure sensor offset is out of the specified range.
- The electronic brake control module detected an invalid or erratic brake pressure.
- The brake pressure is not plausible with the vehicle acceleration or deceleration.

Action Taken When the DTC Sets

- The traction/stability control indicator turns ON.
- The electronic brake control module disables the traction/stability for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

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Connector End View Reference

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Scan Tool Reference

[Control Module References](#) for scan tool information

[Circuit/System Verification](#)

1. Ignition ON.
2. Apply and release brake pedal. Verify the brake stop lamps operate properly.
 - **If the brake stop lamps do not operate properly**
Refer to [Symptoms - Lighting](#) .
 - **Go to next step: If the brake stop lamps operate properly**
3. Verify that DTC C0131 is not set.
 - **If the DTC is set**
 1. Perform the [Brake Pressure Modulator Valve Pressure Sensor Calibration](#).
 2. Verify the DTC does not set.
 - If the DTC sets, replace the K17 Electronic Brake Control Module with the Brake Pressure Modulator.
 - Go to next step: If the DTC does not set
 3. All OK.
 - **Go to next step: If the DTC is not set**
4. All OK.

[Repair Instructions](#)

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Control Module References](#) for control module replacement, programming and setup.

DTC C0161

[Diagnostic Instructions](#)

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

[DTC Descriptor](#)

DTC C0161 5A

Antilock Braking System Brake Switch Circuit Not Plausible

DTC C0161 71

Circuit/System Description

When the brake pedal is applied, the body control module sends a serial data message to the electronic brake control module in reference to the brake pedal positions. The electronic brake control module compares the correlation between the brake pedal position and the amount of brake pressure it senses from the brake pressure sensor, which is internal to the brake pressure modulator. It uses this information to control the vehicle during an electronic stability control event.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

- The electronic brake control module detects four accelerations from standstill to a vehicle speed greater 40 km/h (26 MPH) without any brake light switch signal changes.
- The electronic brake control module detects the vehicle speed is greater than 20 km/h (13 MPH), the brake pedal is applied for 360 seconds, and brake pressure is less than 1500 kPa (218 psi).

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Action Taken When the DTC Sets

No actions are taken.

Diagnostic Aids

The DTC C0161 5A can be set if the brake pedal is applied while accelerating.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0277 or C0890 is not set.
 - If either DTC is set

Refer to [DTC C0277 or C0890](#) .

- **Go to next step: If the DTC is not set**

3. Verify the B22 Brake Pedal Position Sensor or the brake pedal are not binding causing residual brake pressure to be detected.

- **If a condition is found**

Repair or replace the appropriate component.

- **Go to next step: If a condition is not found**

4. Verify the scan tool Electronic Brake Control Module BPP Signal parameter changes between Applied and Released while applying and releasing the brake pedal.

- **If the parameter does not change between Applied and Released**

Refer to [Symptoms - Lighting](#) .

- **Go to next step: If the parameter changes between Applied and Released**

5. All OK, refer to Diagnostic Aids.

DTC C0186, C0187, C018A, C018B, C0196, C019A, C019B, C027E, C027F, OR C0287

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0186

Lateral Acceleration Sensor Signal Malfunction

DTC C0187

Multi-Axis Acceleration Sensor Circuit

DTC C018A

Lateral Acceleration Sensor 2 Signal Malfunction

DTC C018B

Lateral Acceleration Sensor Signals 1 - 2 Not Plausible Malfunction

DTC C0196

Yaw Rate Signal

DTC C019A

Yaw Rate 2 Signal Malfunction

DTC C019B

Yaw Rate Signal 1 - 2 Not Plausible Malfunction

DTC C027E

Longitudinal Acceleration Sensor 2 Signal Malfunction

DTC C027F

Longitudinal Acceleration Signals 1 - 2 Not Plausible Malfunction

Longitudinal Acceleration Sensor Signal

For symptom byte information refer to [Symptom Byte List](#)

Circuit/System Description

The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The multi-axis acceleration sensor communicates with the electronic brake control module via serial data. The electronic brake control module activates the stability control function depending on the multi-axis acceleration sensor input. The inflatable restraint sensing and diagnostic module uses the multi-axis acceleration sensor to determine if the vehicle is in a roll over or near collision incident.

Conditions for Running the DTC

- Ignition ON begins the initialization of the brake system power-up self test.
- Drive the vehicle at speeds greater than 16 km/h (10 MPH) to complete the active brake system test.

Conditions for Setting the DTC

C0186

The lateral acceleration signal is out of the specified range.

C0187

- The yaw/lateral combination sensor reports an internal failure.
- If a calculated offset at the yaw/lateral combination sensor signal is out of the specified range.

C018A

The lateral acceleration signal 2 is out of the specified range.

C018B

Correlation concern between lateral acceleration signals 1 and 2.

C0196

- The yaw rate signal offset is out of the specified range.
- The yaw rate signal is not plausible with the lateral acceleration signal, the steering angle signal and the vehicle speed.

C019A

The yaw rate signal 2 is out of the specified range.

C019B

Correlation concern between yaw rate signals 1 and 2.

C027E

The longitudinal acceleration signal is not plausible.

C027F

Correlation concern between longitudinal acceleration signals 1 and 2.

C0287

The longitudinal acceleration signal is not plausible with the vehicle speed.

Action Taken When the DTC Sets

- The traction control Off indicator turns ON.
- The traction/stability control indicator turns ON.
- A Traction Control Off message may be displayed.
- A Service Stabilitrak message may be displayed.
- The electronic brake control module disables the traction control and the stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

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Antilock Brake System Wiring Schematics

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- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Verify DTC B101D is not set current or history in the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **If DTC B101D is set current or history in the K36 Inflatable Restraint and Sensing Diagnostic Module**
 Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **Go to next step: If DTC B101D is not set current or history in the K36 Inflatable Restraint and Sensing Diagnostic Module**
2. Verify DTC C0186, C0196, or C0287 is not set in the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **If any of the DTCs are set**
 Perform the [Vehicle Yaw Sensor Learn](#).
 - **Go to next step: If none of the DTCs are set**
3. Verify DTC C0187, C0196, or C0287 is not set in the K17 Electronic Brake Control Module.
 - **If any of the DTCs are set**
 1. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.
 2. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC sets, replace the K17 Electronic Brake Control Module.
 - Go to next step: If the DTC does not set

3. All OK.

- **Go to next step: If none of the DTCs are set**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Control Module References](#) for Electronic Brake Control Module replacement, programming and setup

DTC C018A, C019A, OR C027F

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C018A

Yaw Rate Signal

DTC C019A

Yaw Rate 2 Signal

DTC C027F

Longitudinal Acceleration Signals 1 - 2 Not Plausible

For symptom byte information refer to [Symptom Byte List](#)

Circuit/System Description

The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The multi-axis acceleration sensor communicates with the electronic brake control module via serial data. The electronic brake control module activates the stability control function depending on the multi-axis acceleration sensor input. The inflatable restraint sensing and diagnostic module uses the multi-axis acceleration sensor to determine if the vehicle is in a roll over or near collision incident.

Conditions for Running the DTC

- Ignition ON begins the initialization of the brake system power-up self test.
- Drive the vehicle at speeds greater than 16 km/h (10 MPH) to complete the active brake system test.

Conditions for Setting the DTC

C018A

The lateral acceleration signal 2 is out of the specified range.

C019A

The yaw rate signal 2 is out of the specified range.

C027F

Correlation concern between longitudinal acceleration signals 1 and 2.

Action Taken When the DTC Sets

- The traction control Off indicator turns ON.

- The traction/stability control indicator turns ON.
- A Traction Control Off message may be displayed.
- A Service Stabilitrak message may be displayed.
- The electronic brake control module disables the traction control and the stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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Description and Operation

ABS Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Verify DTC B101D is not set current or history in the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **If DTC B101D is set current or history in the K36 Inflatable Restraint and Sensing Diagnostic Module**

Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **Go to next step: If DTC B101D is not set current or history in the K36 Inflatable Restraint and Sensing Diagnostic Module**
2. Verify DTC C0186, C0196, or C0287 is not set in the K36 Inflatable Restraint Sensing and Diagnostic Module.
 - **If any of the DTCs are set**

Perform the Vehicle Yaw Sensor Learn.
 - **Go to next step: If none of the DTCs are set**
3. Verify DTC C0187, C0196, or C0287 is not set in the K17 Electronic Brake Control Module.
 - **If any of the DTCs are set**
 1. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.
 2. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC sets, replace the K17 Electronic Brake Control Module.
 - Go to next step: If the DTC does not set
3. All OK.

- Go to next step: If none of the DTCs are set

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Control Module References](#) for Electronic Brake Control Module replacement, programming and setup

DTC C0242

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0242

Powertrain Control Module Indicated Traction Control

For symptom byte information refer to [Symptom Byte List](#).

Circuit/System Description

The electronic brake control module and the engine control module simultaneously control the traction control. The electronic brake control module sends a serial data message to the engine control module requesting torque reduction. When certain engine control module DTCs are set, the engine control module will not be able to perform the torque reduction for traction control. A serial data message is sent to the electronic brake control module indicating that traction control is not allowed.

Conditions for Running the DTC

Engine running

Conditions for Setting the DTC

The engine control module detects a fault that prevents it from performing a traction control function and sends a serial data message to the electronic brake control module indicating that torque reduction is not allowed.

Action Taken When the DTC Sets

The electronic brake control module sends a serial data message to illuminate the appropriate warning/indicator message.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The electronic brake control module clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- Inspect for proper transmission operation.
- Inspect the exhaust system for a possible restriction.
- Inspect for lack of engine power, hesitation, stumble or rough idle.
- Some intermittent communication concerns may be caused by fretting corrosion on the serial data circuit terminals. Inspect all connectors at the control module that set the communication DTC, the control module that the communication DTC was set against, and any inline harness connectors between the two control modules. Do not replace a control module based only on fretting corrosion.

Reference Information

Schematic Reference

[Antilock Brake System Wiring Schematics](#)

Connector End View Reference

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Description and Operation

[ABS Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify that no other DTCs are set except for C0242.
 - **If any other DTCs are set**

Refer to the [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If no other DTCs are set**
3. Replace the K20 Engine Control Module.
4. Verify that DTC C0242 does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If DTC sets**

Replace the K17 Electronic Brake Control Module.
 - **Go to next step: If DTC does not set**
5. All OK.

[Repair Instructions](#)

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for electronic brake control module or engine control module replacement, programming and setup

DTC C0245

[Diagnostic Instructions](#)

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

[DTC Descriptor](#)

DTC C0245 00

Wheel Speed Sensor Frequency Malfunction

[Diagnostic Fault Information](#)

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal High - Left Front	C0035 00	C0035 00	C0245 00	-
Signal High - Right Front	C0040 00	C0040 00	C0245 00	-
Signal High - Left Rear	C0045 00	C0045 00	C0245 00	-
Signal High - Right Rear	C0050 00	C0050 00	C0245 00	-

Circuit/System Description

Each wheel speed sensor receives ignition voltage through the signal high circuit from the electronic brake control module. Wheel speeds are detected by active wheel speed sensors and encoder rings. The magnetic encoder rings consists of multiple north and south pole pairs surrounding the outer circumference. When the encoder ring rotates and passes by the wheel speed sensor; it generates a sign wave in the wheel speed sensor. The sensor converts the signal to a digital square wave; the square wave values switch between 7mA (Low) and 14mA (High) DC current. As the wheel spins, the module uses the frequency of the square wave signal to calculate the wheel speed.

Conditions for Running the DTC

- DTC C0035, C0040, C0045, or C0050 is not present.
- Vehicle speed is between 20 km/h (13 MPH) and 50 km/h (31 MPH).
- While driving a curve with a yaw-rate of $3\hat{A},\hat{A}^{\circ}$ per second for greater than 9 s.

Conditions for Setting the DTC

- A short to voltage on any one of the wheel speed sensor ignition circuits.
- A electrical magnetic interference with the wheel speed sensor harness.
- Difference between the fastest and slowest wheel speed is greater than 6 km/h (4 MPH).
- If two or more wheel speed sensor faults are detected without the ABS warning lamp being turned ON.
- The electronic brake control module cannot determine a specific wheel speed sensor signal because of electrical interference.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The traction control Off indicator turns ON.
- The stability control Off indicator turns ON.
- The traction/stability control indicator turns ON.
- The driver information center displays the Service StabiliTrak message.
- The electronic brake control module disables the ABS, the traction control, and the stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- When the condition for setting the DTC is no longer present.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Diagnostic Aids

- Do not use a magnet to clean the encoder ring.
- Check for electrical magnetic interference with the wheel speed sensor harness.
- If two or more wheel speed sensors are inoperative, diagnose each wheel speed sensor individually.
- If the customer comments that the ABS indicator is ON only during moist environmental conditions (rain, snow, vehicle wash, etc.), inspect the wheel speed sensor wiring for signs of water intrusion.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

Description and Operation

ABS Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that all tires have the proper air pressure.
 - **If not the proper air pressure**

Adjust all tire air pressures to the stated cold air pressure as identified on the tire placard or specification.
 - **Go to next step: If the proper air pressure**
2. Verify that all tires are of uniform size and matching brand.
 - **If not of uniform size or matching brand**
 1. Replace the mis-sized or non-matching brand tire.
 2. Ignition ON.
 3. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC set, replace the K17 Electronic Brake Control Module.
 - Go to next step: If the DTC does not set
 4. All OK.
 - **Go to next step: If all tires are of uniform size and matching brand**
3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K17 Electronic Brake Control Module, ignition ON.
2. Test for less than 1 V between the K17 Electronic Brake Control Module harness connector terminals listed below and ground:
 - B5LF Wheel Speed Sensor - Left Front - terminal 5
 - B5LR Wheel Speed Sensor - Left Rear - terminal 16
 - B5RF Wheel Speed Sensor - Right Front - terminal 11
 - B5RR Wheel Speed Sensor - Right Rear - terminal 29
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

Control Module References for Control Module replacement, programming and setup.

DTC C0252

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0252 00

Vehicle Stability Control Module Sensors Correlation Malfunction

Circuit/System Description

The Yaw Rate, Lateral Acceleration and Longitudinal Acceleration Sensors are combined into one Multi-axis Acceleration Sensor. The Multi-axis Acceleration Sensor is located internal to the Airbag Sensing and Diagnostic Module. The Electronic Brake Control Module controls the stability control by monitoring the inputs of the Multi-axis Acceleration Sensor and the Steering Wheel Angle Sensor. The readings are compared to an internal calibrated value so it knows if the vehicle is having an instability condition to activate the stability control.

Conditions for Running the DTC

The vehicle is operated at a speed greater than 13 km/h (8 MPH).

Conditions for Setting the DTC

When the vehicle is driven in a straight line the Multi-axis Acceleration Sensor, the Steering Wheel Angle Sensor, and the vehicle speed correlation is not recognized after a distance of 2.5 km (1.5 mi).

Action Taken When the DTC Sets

- The Traction/stability Control indicator turns ON.
- The Electronic Brake Control Module disables the traction control, the stability control and the Hill Start Assist for the duration of the ignition cycle.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Diagnostic Aids

The following conditions can cause this concern:

- An improperly mounted or loose Multi-axis Acceleration Sensor (located internally in the Airbag Sensing and Diagnostic Module).
- The car should not pull in either direction causing the Steering Wheel to be off center while driving in a straight line on a level surface.

Reference Information

Schematic Reference

[Antilock Brake System Wiring Schematics](#)

Connector End View Reference

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- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0187, C0196, C0287, or C0710 is not set.
 - **If any of the DTCs are set**
 Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If none of the DTCs are set**
3. Perform the [Vehicle Yaw Sensor Learn](#), and [Steering Wheel Angle Sensor Centering](#).
4. Ignition ON.
5. Verify DTC C0252 does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If the DTC is set**
 1. Replace the B99 Steering Wheel Angle Sensor.
 2. Ignition ON
 3. Verify DTC C0252 does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC is set
 4. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module
 5. Ignition ON.
 6. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC sets, replace the K17 Electronic Brake Control Module.
 - **Go to next step: If the DTC is not set**
6. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Electronic Brake Control Module replacement, Inflatable Restraint Sensing and Diagnostic Module, programming and setup.

DTC C0274, C0275, OR C0280

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0274 54

Isolation Valve High Temperature

DTC C0275 54

Dump Valve High Temperature

DTC C0280 54

Circuit/System Description

The solenoid valves are integral parts of the brake pressure modulator. The brake pressure modulator contains an isolation solenoid valve and a dump solenoid valve for each wheel. A traction/stability control supply solenoid valve and a isolation solenoid valve for each brake circuit. The solenoid valves are not engaged during normal system operation. When the ABS, the traction control or the stability control operation is required the electronic brake control module turns the required solenoid ON.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

The calculated solenoid valve temperature is greater than the threshold.

Action Taken When the DTC Sets

C0274 54 or C0275 54

- The ABS indicator turns ON.
- The traction/stability control indicator turns ON.
- The electronic brake control module disables the ABS, the traction control, the stability control and the hill start assist for the duration of the ignition cycle.

C0280 54

- The traction/stability control indicator turns ON.
- The electronic brake control module disables the stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

DTCs may set due to extended operation of the ABS, the traction control or the stability control.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

NOTE: Since most occurrences of this DTC are caused by excessive ABS or traction control usage, review with the customer the conditions under which the DTC set.

1. Ignition ON.
2. Verify that DTC C0186, C0187, C0196, C0287, or C0710 is not set.
 - **If any of the DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **Go to next step: If none of the DTCs are set**
3. Ignition OFF, allow the hydraulic brake pressure modulator to cool down to ambient temperature.
 4. Ignition ON.
 5. Verify that DTC C0274 54, C0275 54, or C0280 54 are not set while driving the vehicle within normal braking conditions.
 - **If any of the DTCs are set**

Replace the K17 Electronic Brake Control Module with Brake Pressure Modulator.

- **Go to next step: If none of the DTCs are set**
6. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement](#)
- [Control Module References](#) for electronic brake control module replacement, programming and setup

DTC C0558

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0558 46

Calibration Data Configuration Not Programmed

Circuit/System Description

The electronic brake control module receives serial data messages from other modules. The electronic brake control module must be configured with the vehicle identification number (VIN), configuration data and vehicle options. If not properly configured after installation, the electronic brake control module may set this DTC.

The internal fault detection is handled inside the control module. No external circuits are involved.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The electronic brake control module is not programmed.

Action Taken When the DTC Sets

- The traction/stability control indicator turns ON.

- The electronic brake control module disables the traction control, the stability control and the hill start assist for the duration of the ignition cycle.

Conditions for Clearing the DTC

A current DTC clears when the diagnostic runs and passes.

Diagnostic Aids

A newly replaced electronic brake control module may set this DTC on its initial ignition ON cycle.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0558 46 is not set.
 - **If DTC C0558 46 is set**
 1. Program the K17 Electronic Brake Control Module.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the K17 Electronic Brake Control Module.
 - Go to next step: If the DTC does not set
 3. All OK.
 - **Go to next step: If DTC C0558 46 is not set**
3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

Control Module References for electronic brake control module replacement, programming and setup

DTC C0561

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DTC Descriptor

DTC C0561

System Disabled Information Stored

For symptom byte information refer to [Symptom Byte List](#)

Circuit/System Description

The electronic brake control module disables the electronic stability control when other electronic control modules set DTCs for components that effect the operation of the traction control system.

Conditions for Running the DTC

Engine running.

Conditions for Setting the DTC

The electronic brake control module receives an invalid serial data message from another module more than ten times.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The traction/stability control indicator turns ON.
- The electronic brake control module disables the ABS, the traction control, and the electronic stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Diagnostic Aids

This DTC indicates there are no problems in the antilock brake system. The body control module, the engine control module, and the transmission control module should be checked for a possible fault first.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0561 is not set.
 - **If the DTC is set**
 1. Reprogram the K17 Electronic Brake Control Module. Refer to [Control Module References](#).
 2. Verify DTC C0561 is not set.
 - If the DTC is set, replace the K17 Electronic Brake Control Module.
 - Go to next step: If the DTC is not set
 3. All OK.
 - **Go to next step: If the DTC is not set**
3. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Control Module replacement, programming and setup.

DTC C0710

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0710

Steering Wheel Angle Signal

For symptom byte information refer to [Symptom Byte List](#)

Circuit/System Description

The steering wheel angle sensor is integrated into the steering gear assembly. The steering wheel angle sensor identifies the position and direction of the steering wheel rotation.

The electronic brake control module receives high speed serial data inputs from the steering angle sensor identifying the position and direction of the steering wheel rotation. The electronic brake control module utilizes this signal to calculate the driver intended driving direction.

Conditions for Running the DTC

C0710 11

Drive the vehicle straight ahead with a constant speed no greater than 15 km/h (9.32 MPH) for a distance at least 1.6 km (1 mi).

C0710 09

Vehicle ON or Vehicle in Service Mode.

C0710 0A

Vehicle stopped turn the steering wheel through its entire range of motion from right to left.

C0710 0B

The EBCM detects the steering angle sensor is unprogrammed.

Conditions for Setting the DTC

C0710 09

The steering wheel angle sensor signal rate of change is too fast greater than 30°/s.

C0710 11

The steering wheel angle sensor signal is above the maximum specification.

C0710 0A

The steering wheel angle sensor signal has not changed.

C0710 0B

The EBCM detects the steering angle sensor is unprogrammed.

Action Taken When the DTC Sets

- The traction/stability control indicator turns ON.
- A Service StabiliTrak message may displayed on the driver information center.
- A Service Brake Assist message may displayed on the driver information center.
- A Service Power Steering Drive with Care message may displayed on the driver information center.
- The electronic brake control module disables the traction control and the electronic stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Diagnostic Aids

- Check and adjust all tires to the stated cold air pressure as identified on the tire placard.
- The car should not pull in either direction causing the steering wheel to be off center while driving in a straight line on a level surface.
- Confirm that all tires are of the proper size and matching brands. If a mis-sized or non-matching brand tire is present, inform the customer that in order for the vehicle stability enhanced system to function normally, tires need to be a uniform size and rolling diameter.
- Inspect the serial data circuits and connections at the power steering control module and the electronic brake control module. They should be free from sources of electromagnetic interference and the connections should be clean and tight.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Circuit/System Verification

1. Ignition ON.
2. With a scan tool check the Power Steering Control Module for any DTCs.
 - **If any DTCs are present in the Power Steering Control Module**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) in Power Steering Diagnostic Information and Procedures.

- **Go to next step: If there are no DTCs present in the Power Steering Control Module**

1. With a scan tool check to see if DTCs U0126, U0130, or U0130 are set.

- **If DTCs U0126, U0130, or U0131 are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **Go to next step: If DTCs U0126, U0130, and U0130 are not set**

2. With a scan tool check to see if DTCs C0035 - C0050 are set in the Electronic Brake Control Module

- **If DTCs C0035 - C0050 are set in the Electronic Brake Control Module**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **Go to next step: If DTCs C0035 - C0050 are not set in the Electronic Brake Control Module**

3. Perform the [Steering Wheel Angle Sensor Centering](#) procedure.

- **If the Steering Angle Sensor Centering procedure corrected the DTC**

Proceed to step 6

- **Go to next step: If the Steering Angle Sensor Centering procedure did not correct the DTC**

4. Replace the Steering Gear Assembly.

- **If steering gear assembly replacement corrected the DTC**

Proceed to step 6

- **Go to next step: If steering gear assembly replacement did not correct the DTC**

5. Replace the Electronic Brake Control module.

6. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Electric Belt Drive Rack and Pinion Steering Gear Replacement](#)
- [Control Module References](#) for module replacement, programming and setup.

DTC C124F OR C1250, C1251, C1252, C1253, OR C1254

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C124F

Lateral Acceleration Sensor Circuit Low Voltage

DTC C1250

DTC C1251

Lateral Acceleration Sensor Performance

DTC C1252

Longitudinal Acceleration Sensor Circuit Low Voltage

DTC C1253

Longitudinal Acceleration Sensor Circuit High Voltage

DTC C1254

Longitudinal Acceleration Sensor Performance

For symptom byte information refer to [Symptom Byte List](#) .

Circuit/System Description

The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The multi-axis acceleration sensor communicates with the electronic brake control module and trans control module via serial data. The electronic brake control module activates the stability control function depending on the multi-axis acceleration sensor input. The inflatable restraint sensing and diagnostic module uses the multi-axis acceleration sensor to determine if the vehicle is in a roll over or near collision incident. The transmission control module sets these DTCs.

Conditions for Running the DTC

Vehicle speed is greater than 16 km/h (10 MPH).

Conditions for Setting the DTC

The transmission control module detects a fault that prevents it from performing a hill hold start assist function.

Action Taken When the DTC Sets

- The air bag indicator turns ON.
- The traction/stability control indicator turns ON.
- The electronic brake control module disables the stability control and the hill hold start assist for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)

- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that no other DTCs are set.
 - **If any other DTCs are set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
 - **Go to next step: If no other DTCs are set**
3. Replace the K71 Transmission Control Module.
4. Verify that the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If the DTC sets**
Replace the K17 Electronic Brake Control Module.
 - **Go to next step: If the DTC does not set**
5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Electronic Brake Control Module or Transmission Control Module replacement, programming, and setup

DTC P0856

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC P0856

Traction Control Torque Request Signal Message Counter Incorrect

Circuit/System Description

When traction control is active, the electronic brake control module sends a serial data message to the engine control module requesting torque reduction. When certain electronic brake control module DTCs are set, the engine control module will not be able to perform the torque reduction for traction control. A serial data message is sent to the electronic brake control module indicating that traction control is not allowed.

Conditions for Running the DTC

Engine running.

Conditions for Setting the DTC

The engine control module detects a fault that prevents it from performing a traction control function and sends a serial data message to the electronic brake control module indicating that torque reduction is not allowed.

Action Taken When the DTC Sets

- The traction/stability control indicator turns ON.
- The electronic brake control module disables the traction control and stability control for the duration of the ignition cycle.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- The electronic brake control module will turn OFF the indicator in the next ignition cycle.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Verify that no other DTCs are set except for P0856.
 - **If any other DTCs are set**
 Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If only DTC P0856 is set**
2. Replace the K20 Engine Control Module.
3. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If DTC sets**
 Replace the K17 Electronic Brake Control Module.
 - **Go to next step: If DTC does not set**
4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for electronic brake control module and engine control module replacement, programming and setup

DTC P15F8

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.

- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC P15F8

Automatic Braking Engine Torque Request Signal Message Counter Incorrect

Circuit/System Description

The electronic brake control module and the engine control module simultaneously control the vehicle performance. During a automatic brake event the electronic brake control module sends a serial data message to the engine control module requesting torque reduction. If the engine control module receives corrupt data from the electronic brake control module, DTC P15F8 will set in the engine control module. The engine control module then sends a serial data message to the electronic brake control module that torque reduction is not allowed.

Conditions for Running the DTC

- The ignition is ON.
- Ignition voltage is greater than 8 V.

Conditions for Setting the DTC

The engine control module detects a corrupted data message from the electronic brake control module.

Action Taken When the DTC Sets

- The ABS remains functional.
- DTC P15F8 is a Type B DTC.
- The traction Off indicator turns ON.
- The traction/stability control indicator turns ON.
- The Service Stabilitrak message may be displayed on the driver information center.

Conditions for Clearing the DTC

DTC P15F8 is a Type B DTC.

Diagnostic Aids

Inspect the serial data circuits and connections at the engine control module and the electronic brake control module. They should be free from sources of electromagnetic interference and the connections should be clean and tight.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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ABS Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Circuit/System Testing

1. Verify that no other DTCs are set except for DTC P15F8.

- **If any other DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **Go to next step: If only DTC P15F8 is set**

2. Replace the K17 Electronic Brake Control Module.

3. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.

- **If DTC sets**

Replace the K20 Engine Control Module.

- **Go to next step: If DTC does not set**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for electronic brake control module and engine control module replacement, programming and setup

DTC P15FD

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC P15FD

Wheel Speed Sensor Message Sequence Incorrect

Circuit/System Description

The wheel speeds are detected by active wheel speed sensors. Each wheel speed sensor receives a 12 V reference voltage from the electronic brake control module (EBCM) and provides an alternating current square wave signal to the EBCM. As the wheel spins, the EBCM uses the frequency of the square wave signal to calculate the wheel speed. The EBCM sends the wheel speed information as a high speed controller area network (CAN) serial data message.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

A supervised periodic message that includes the wheel speed serial data has not been received.

Action Taken When the DTC Sets

Specific subsystems will not function or operate in degraded mode.

Conditions for Clearing the DTC

A current DTC clears when the diagnostic runs and passes.

Reference Information

Schematic Reference

[Antilock Brake System Wiring Schematics](#)

Connector End View Reference

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Description and Operation

[ABS Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Diagnostic Aids

- This DTC can be set due to an incorrect part wheel speed sensor installed.
- Inspect the wheel encoder ring for rust or corrosion.
- If the customer comments that the ABS indicator is ON only during moist environmental conditions (rain, snow, vehicle wash, etc.), inspect the wheel speed sensor wiring for signs of water intrusion.

Circuit/System Verification

Ignition ON, observe the scan tool EBCM Wheel Speed Sensor parameters. The reading should be the same speed on all sensors when driving in a straight line at a speed greater than 20 km/h (13 MPH).

Circuit/System Testing

1. Ignition ON.
2. Verify that DTC C0035, C0040, C0045, or C0050 is not set in the EBCM.
 - **If any listed DTC is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) to diagnose that DTC prior to this diagnostic.
 - **Go to next step: If any listed DTC is not set**
3. Replace the K17 Electronic Brake Control Module.
4. Verify the DTC does not set while operating the vehicle under the Conditions for Running the DTC.
 - **If the DTC sets**

Replace the module that set the DTC.
 - **Go to next step: If the DTC does not set**
5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for control module replacement, programming and setup

SYMPTOMS - ANTILOCK BRAKE SYSTEM

NOTE: The following steps must be completed before using the symptom tables.

1. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system description and operation in order to familiarize yourself with the system functions. Refer to [ABS Description and Operation](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the ABS. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components, for obvious damage or conditions, which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [ABS Indicator Malfunction](#)
- [Traction Control/Stability Control Indicator Malfunction](#)
- [Brake Warning Indicator Malfunction](#)

ABS INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The instrument cluster turns On the ABS indicator for five seconds after the ignition is ON or when the electronic brake control module detects a fault and sends a serial data message to the instrument cluster commanding the ABS indicator ON.

Reference Information

Schematic Reference

[Antilock Brake System Wiring Schematics](#)

Connector End View Reference

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Electrical Information Reference

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- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Circuit/System Verification

1. Ignition ON.
2. Verify the Instrument Cluster ABS Indicator turns On and Off when commanding the All Indicators On and Off with a scan tool.
 - **If the ABS indicator does not turn On and Off**

Replace the P16 Instrument Cluster.
 - **Go to next step: If the ABS indicator turns On and Off**
3. Verify the ABS Indicator turns Off five seconds after the ignition is turned On.
 - **If the ABS indicator does not turn Off**

Replace the K17 Electronic Brake Control Module.
 - **Go to next step: If the ABS indicator turns Off**
4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Electronic Brake Control Module or Instrument Cluster replacement, programming and setup

HILL DESCENT CONTROL INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	U0422 71, B273A 02	1	1	-
Ground	-	1	-	-
1. Hill descent control switch malfunction				

Circuit/System Description

The instrument cluster illuminates the hill descent indicator and hill descent control off indicator for 5 s after the ignition is turned ON. When the electronic brake control module detects a fault it sends a serial data message to the instrument cluster commanding the hill descent control indicator ON.

The body control module monitors the signal circuit from the hill descent control switch. The hill descent switch is a momentary switch that is normally open. When the hill descent control switch is pressed once, the body control module will request the electronic brake control module via serial data to disable or enable the hill descent control. When activated, the switch grounds the hill descent control system signal circuit. The electronic brake control module then enables or disables the hill descent control system. The electronic brake control module will request the instrument cluster via serial data to turn the hill descent indicator ON or OFF to notify the driver.

Reference Information

Schematic Reference

- [Antilock Brake System Wiring Schematics](#)
- [Hydraulic Brake Wiring Schematics](#)

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- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the instrument cluster hill descent control indicator turns On and Off when commanding the All Indicators On and Off with a scan tool.
 - **If any indicator does not turn On and Off**
Replace the P16 Instrument Cluster.
 - **Go to next step: If all indicators turn On and Off**
3. Verify the scan tool Body Control Module Hill Descent Control Switch parameter changes between Inactive and Active when pressing and releasing the hill descent control switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing.
 - **Go to next step: If the parameter changes**
4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S48E Multifunction Switch - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the ground circuit terminal 1 and ground.
 - **If 5 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 5 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module Hill Descent Control Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 10 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **Go to next step: If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 11 and the ground circuit terminal 1.

6. Verify the scan tool Hill Descent Control Switch parameter is Active.

- **If not Active**

1. Ignition OFF, disconnect the X4 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - Go to next step: If less than 1 V
3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

- **Go to next step: If Active**

7. Test or replace the S48E Multifunction Switch - Instrument Panel.

Component Testing

1. Ignition OFF, disconnect the X1 harness connector at the S48E Multifunction Switch - Instrument Panel.
2. Test for infinite resistance between the signal terminal 11 and the ground terminal 1 with the switch in the open position.

- **If less than infinite resistance**

Replace the S48E Multifunction Switch - Instrument Panel.

- **Go to next step: If infinite resistance**

3. Test for less than 2 Ω between the signal terminal 11 and the ground terminal 1 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S48E Multifunction Switch - Instrument Panel.

- **Go to next step: If less than 2 Ω**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Front Floor Console Cup Holder Plate Replacement](#) for multifunction switch replacement.
- [Control Module References](#) for control module or instrument cluster replacement, programming and setup.

TRACTION CONTROL/STABILITY CONTROL INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B2745

Traction Control Switch Circuit

For symptom byte information refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B2745 02	1, P159F 00	1	-
Ground	-	1, P159F 00	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
1. Traction control switch malfunction				

Circuit/System Description

The body control module monitors the signal circuit from the traction control switch. When the traction control switch is pressed once, the body control module requests the electronic brake control module via serial data to disable the traction control. The electronic brake control module commands the instrument cluster via serial data to turn the traction control off indicator ON to notify the driver of the deactivation.

When the traction control switch is pressed and held for five seconds, the body control module requests the electronic brake control module to disable the electronic stability control. The electronic brake control module commands the instrument cluster via serial data to turn the traction control off and stability control off indicator ON to notify the driver of the deactivation.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The body control module detects a short to ground on the signal circuit.

Action Taken When the DTC Sets

The body control module ignores the traction control switch signal input.

Conditions for Clearing the DTC

- The DTC clears when the diagnostic runs and passes.
- The history DTC will clear after 40 consecutive fault-free ignition cycles have occurred.

Reference Information

Schematic Reference

Antilock Brake System Wiring Schematics

Connector End View Reference

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Description and Operation

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Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Body Control Module, Traction Control Switch parameter changes between Active and Inactive when pressing and releasing the traction control switch.
 - **If the parameter does not change**

Refer to Circuit/System Testing.

- **Go to next step: If the parameter changes**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S126 Drive Mode Select Switch. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module, Traction Control Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 14 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **Go to next step: If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 11 and the ground circuit terminal 10.
6. Verify the scan tool Traction Control Switch parameter is Active.
 - **If not Active**
 1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - Go to next step: If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **Go to next step: If Active**
7. Test or replace the S126 Drive Mode Select Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S126 Drive Mode Select Switch.
2. Test for infinite resistance between the signal terminal 11 and the ground terminal 10 with the switch in the open position.
 - **If less than infinite resistance**

Replace the S126 Drive Mode Select Switch.
 - **Go to next step: If infinite resistance**
3. Test for less than 5 Ω between the signal circuit terminal 11 and the ground circuit terminal 10 with the switch in the closed position.
 - **If 5 Ω or greater**

Replace the S126 Drive Mode Select Switch.
 - **Go to next step: If less than 5 Ω**
4. All OK.

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Ride Control Switch Replacement - Center Console](#)
- [Control Module References](#) for Control Module replacement, programming and setup.

REPAIR INSTRUCTIONS

CONNECTOR RECONNECTION - WHEEL SPEED SENSOR

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to [Special Tools](#) .

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Loose, corroded, or painted terminal stud/fastener
- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- A terminal not seated all the way into the connector body
- Poor terminal to wire connection - Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required, in order to verify the customer concern.
- Refer to [Testing for Electrical Intermittents](#) for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to [Scan Tool Snapshot Procedure](#) for advanced intermittent diagnosis and Vehicle Data Recorder operation.

Testing for Terminal Fretting

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface.

To correct a fretting condition disconnect the suspect connector and add dielectric grease/lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

Testing for Proper Terminal Contact

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the **EL-35616** kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Testing for Proper Terminal Contact in Bussed Electrical Centers

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center. Use the **EL-35616** kit to test for proper terminal contact. Failure to use the **EL-35616** kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

1. Separate the connector halves.
2. Visually inspect the connector halves for contamination. Contamination may result in a white or green build-up within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
3. Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

1. Remove the component in question.
2. Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
3. Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
4. Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

Control Module/Component Voltage and Grounds

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#) , and [Power Distribution Wiring Schematics](#) .
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point (screw or stud). Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to [Circuit Testing](#) , and [Ground Distribution Wiring Schematics](#) .

Temperature Sensitivity

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
 - High ambient temperatures
 - Underhood/engine generated heat
 - Circuit generated heat due to a poor connection, or high electrical load
 - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
 - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
 - The condition only occurs on a cold start.
 - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to [Inducing Intermittent Fault Conditions](#) in order to duplicate the conditions required.

Electromagnetic Interference and Electrical Noise

Some electrical components/circuits are sensitive to electromagnetic interference or other types of electrical noise. Inspect for the following conditions:

- A mis-routed harness that is too close to high voltage/high current devices such as secondary ignition components, motors, generator etc. - These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch - These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. - These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to [Checking Aftermarket Accessories](#) .
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

Incorrect Control Module

- There are only a few situations where reprogramming a control module is appropriate:
 - A new service control module is installed.
 - A control module from another vehicle is installed.
 - Revised software/calibration files have been released for this vehicle.

NOTE: **DO NOT re-program the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.**

- Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to [Control Module References](#) for replacement, setup, and programming.

ANTILOCK BRAKE SYSTEM AUTOMATED BLEED

WARNING: Refer to [Brake Fluid Irritant Warning](#) .

NOTE:

Before performing the ABS Automated Bleed Procedure, first perform a pressure bleed of the base brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) . The automated bleed procedure is recommended when one of the following conditions exist:

- Base brake system bleeding does not achieve the desired pedal height or feel
- Extreme loss of brake fluid has occurred
- Air ingestion is suspected in the secondary circuits of the brake modulator assembly

The ABS Automated Bleed Procedure uses a scan tool to cycle the system solenoid valves and run the pump in order to purge any air from the secondary circuits. These circuits are normally closed off, and are only opened during system initialization at vehicle start up and during ABS operation. The automated bleed procedure opens these secondary circuits and allows any air trapped in these circuits to flow out toward the brake corners.

Performing the Automated Bleed Procedure

CAUTION:

The Auto Bleed Procedure may be terminated at any time during the process by pressing the EXIT button. No further Scan Tool prompts pertaining to the Auto Bleed procedure will be given. After exiting the bleed procedure, relieve bleed pressure and disconnect bleed equipment per manufacturers instructions. Failure to properly relieve pressure may result in spilled brake fluid causing damage to components and painted surfaces.

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove all four tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#) .
3. Inspect the brake system for leaks and visual damage. Repair or replace components as needed.
4. Lower the vehicle.
5. Inspect the battery state of charge.
6. Install a scan tool.
7. Turn the ignition ON, with the engine OFF.
8. If the vehicle is equipped with push button start, place the ignition in Service Only Mode.
 - Do not apply the brake pedal.
 - Press and hold the ignition mode switch for a minimum of 5 seconds.
 - Release the ignition mode switch when the switch indicator illuminates green.
9. With the scan tool, establish communications with the ABS system. Select Control Functions. Select Automated Bleed from the Control Functions menu.
10. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
11. Following the directions given on the scan tool, pressure bleed the base brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) .
12. Follow the scan tool directions until the desired brake pedal height is achieved.
13. If the bleed procedure is aborted, a malfunction exists. Perform the following steps before resuming the bleed procedure:
 - If a DTC is detected, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) , and diagnose the appropriate DTC.
 - If the brake pedal feels spongy, perform the conventional brake bleed procedure again. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) .
14. When the desired pedal height is achieved, press the brake pedal to inspect for firmness.
15. Lower the vehicle.
16. Remove the scan tool.
17. If the vehicle is equipped with push button start, remove the vehicle from Service Only Mode.
 - Do not apply the brake pedal.
 - Press the ignition mode switch once and release.

- The ignition mode switch will no longer be illuminated.
- The vehicle may be started normally.

18. Install the tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
19. Inspect the brake fluid level. Refer to [Brake Master Cylinder Reservoir Filling](#).
20. Road test the vehicle while inspecting that the pedal remains high and firm.

STEERING WHEEL ANGLE SENSOR CENTERING

WARNING: An inaccurate or not centered steering angle sensor could limit the operation of the electric power steering and may result in personal injury.

NOTE: The GDS2 calibration software must be updated to the latest diagnostic package for the scan tool Reset and Learn functions to work correctly.

Centering of the external steering angle sensor might be required after certain service procedures are performed. Some of these procedures are as follows:

- Wheel alignment
- Steering gear replacement
- Steering column replacement
- Collision or other physical damage

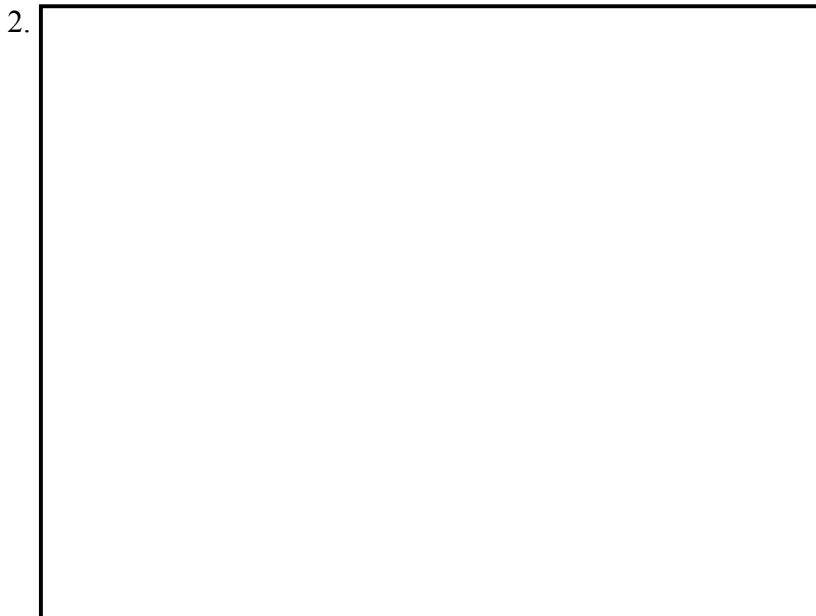
The steering angle sensor centering procedure can be completed with a scan tool using the following steps:

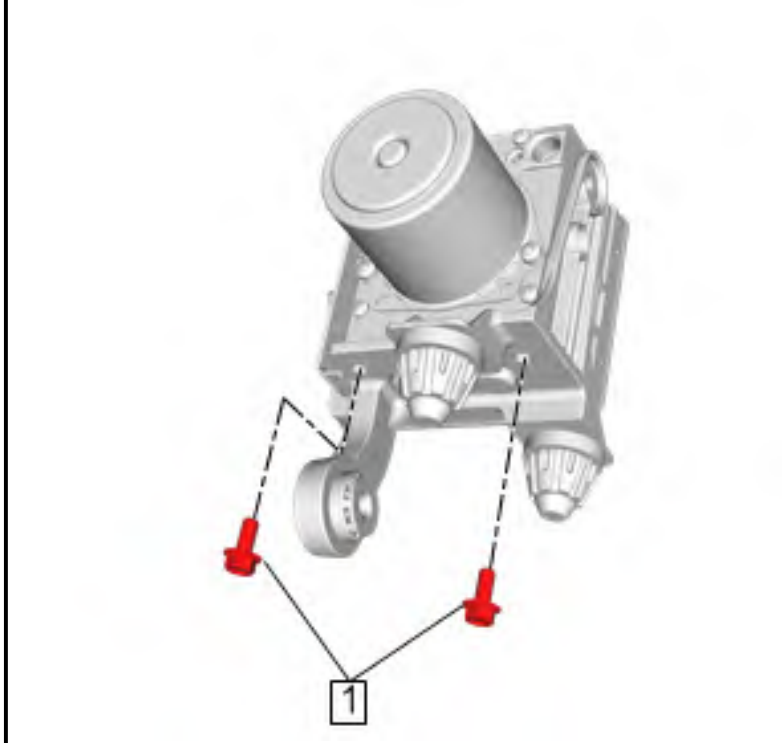
1. Using the steering wheel, align the front wheels forward.
2. Apply the parking brake, or set the transmission in the Park position.
3. Install the scan tool to the data link connector.
4. Ignition ON, engine OFF
5. Select Steering Wheel Angle Sensor Centering in the Electronic Power Steering Module Configuration/Reset Functions list.
6. Follow the scan tool directions to complete the Centering procedure.
7. Select Steering Wheel Angle Sensor Learn in the Electronic Brake Control Module Configuration/Reset Functions list.
8. Follow the scan tool directions to complete the learn procedure.
9. Clear any DTCs that may be set.

ELECTRONIC BRAKE AND TRACTION CONTROL MODULE BRACKET REPLACEMENT

Removal Procedure

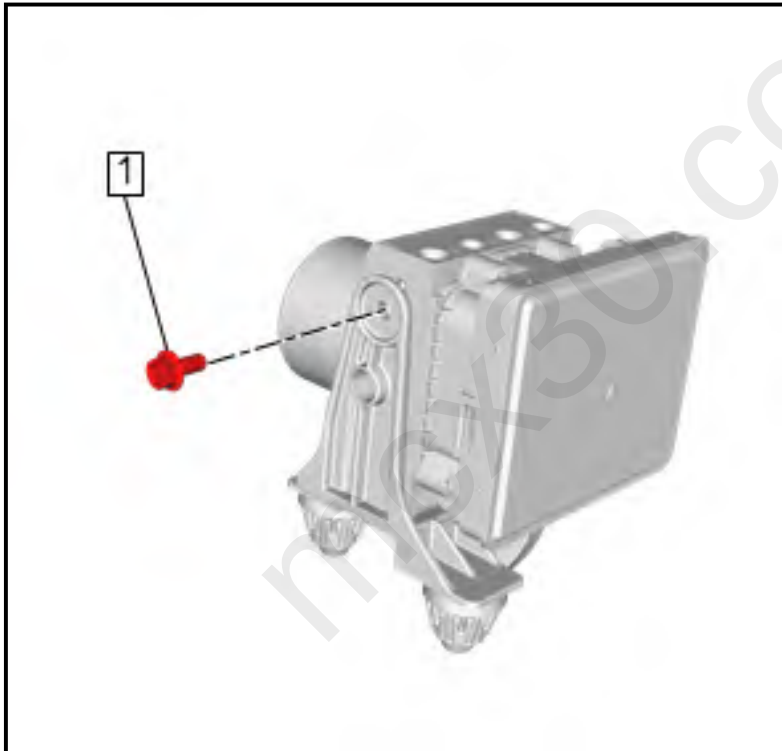
1. Electronic Brake Control Module with Brake Pressure Modulator Valve - Remove - [Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement](#)





Brake Pressure Modulator Valve Bolt (1) - Remove [2x]

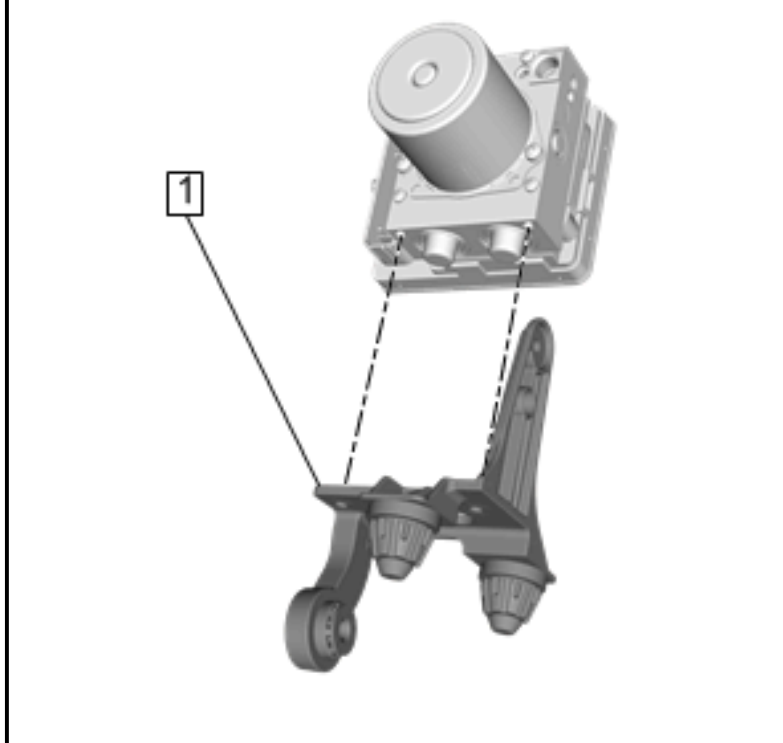
3.



Brake Pressure Modulator Valve Bolt (1) - Remove

4.

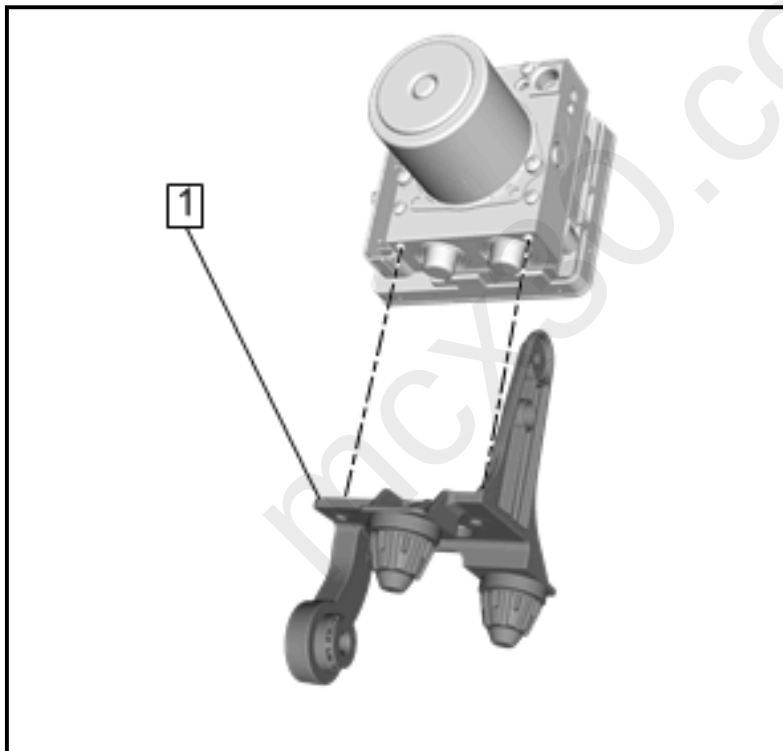




Brake Pressure Modulator Valve Bracket (1) - Remove

Installation Procedure

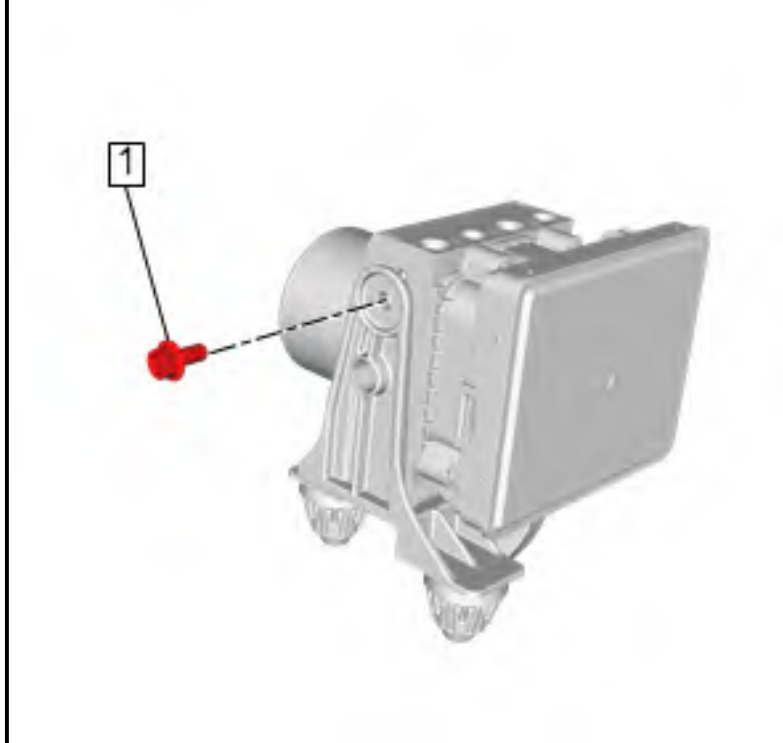
1.



Brake Pressure Modulator Valve Bracket (1) - Install

2.

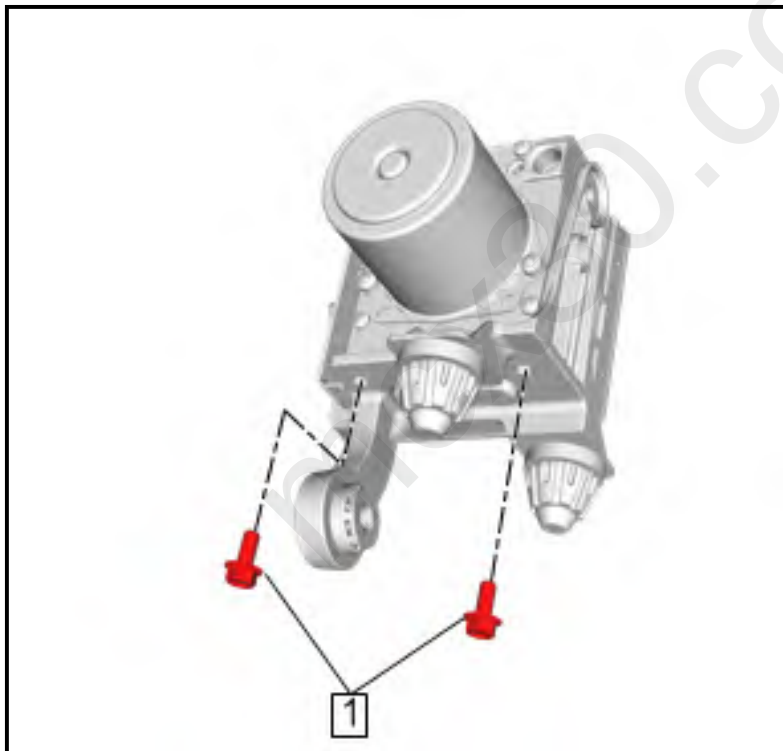




CAUTION: Fastener Caution

Brake Pressure Modulator Valve Bolt (1) - Install and tighten 11 N.m (97 lb in)

3.



Brake Pressure Modulator Valve Bolt (1) - Install and tighten 11 N.m (97 lb in) [2x]

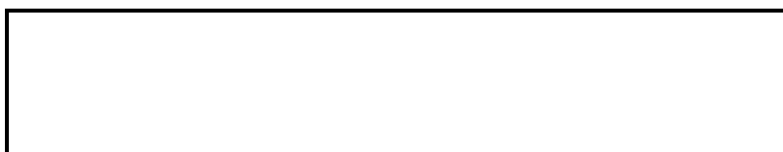
4. Electronic Brake Control Module with Brake Pressure Modulator Valve - Install - [Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement](#)

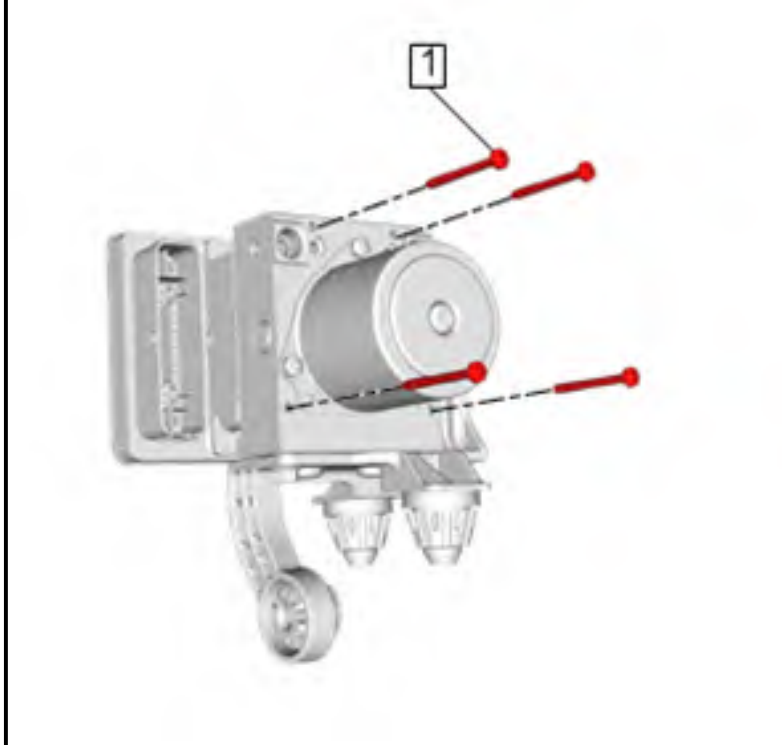
ELECTRONIC BRAKE CONTROL MODULE REPLACEMENT

Removal Procedure

1. Electronic Brake Control Module with Brake Pressure Modulator Valve - Remove - [Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement](#)

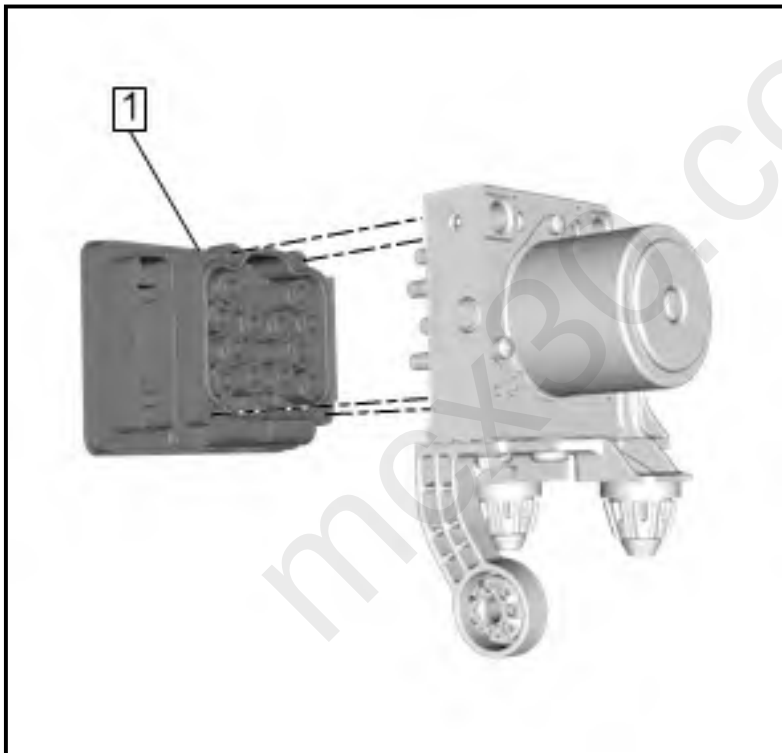
2.





Electronic Brake Control Module Bolt (1) - Remove [4x]

3.

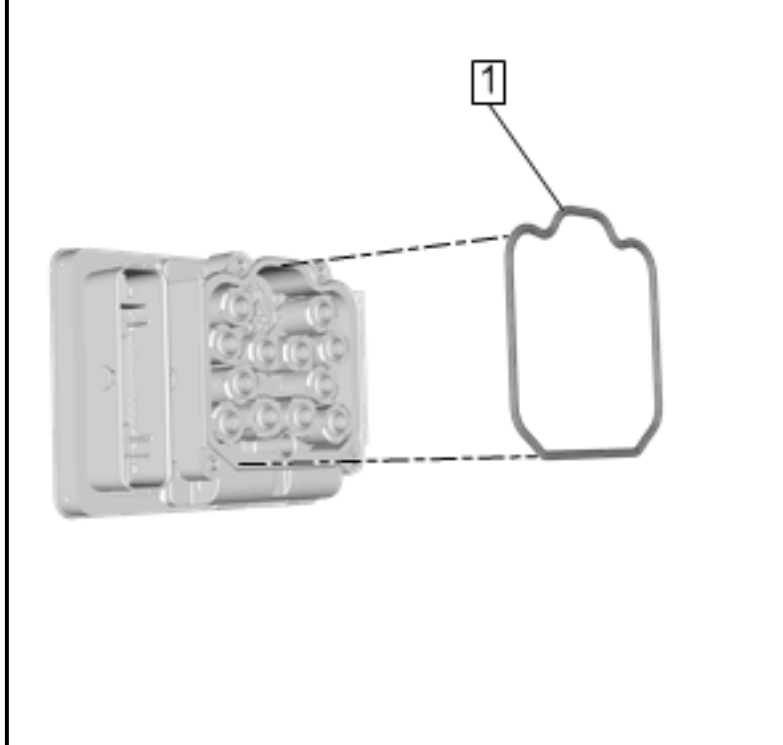


NOTE: Do NOT pry the components apart.

Electronic Brake Control Module (1) - Remove

4.

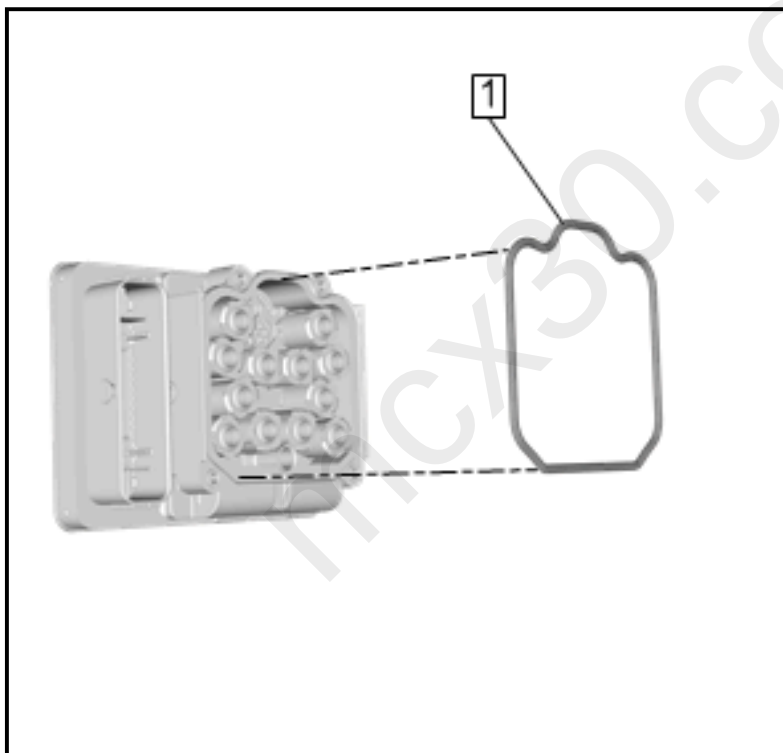




Seal (1) - Remove

Installation Procedure

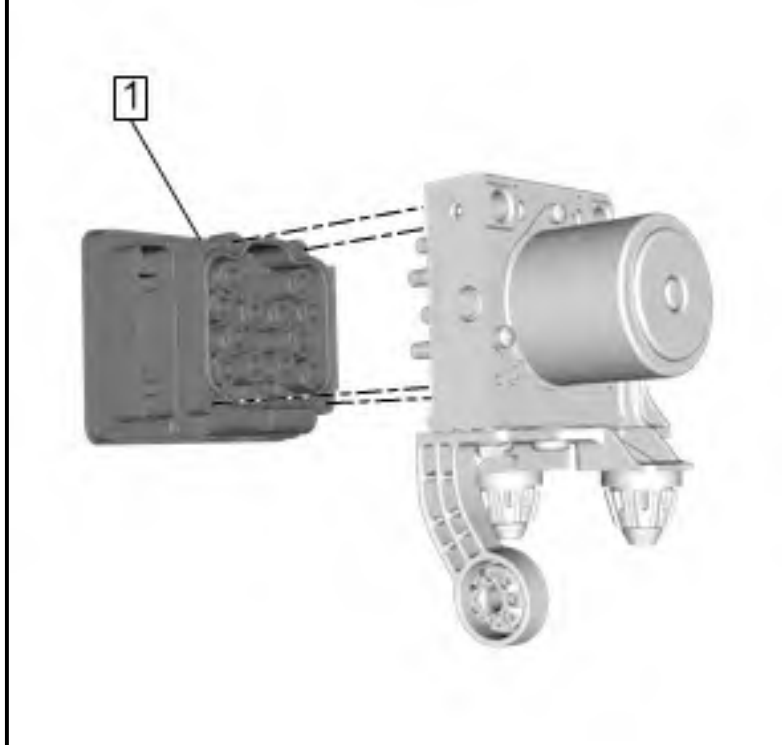
1.



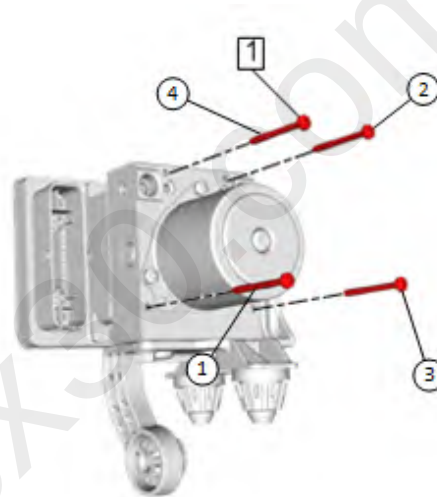
Seal (1) - Install

2.





Electronic Brake Control Module (1) - Install



3.

Fig. 1: Electronic Brake Control Module Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

NOTE: A new EBCM may not have threaded inserts. Refer to the Electronic Parts Catalog and use new self tapping fasteners to form the threads.

Electronic Brake Control Module Bolt (1) - Install and tighten in sequence [4x]

1. First Pass: 1.5 N.m (13 lb in)
2. Second Pass: 2.5 N.m (22 lb in)
3. Final Pass: 3.5 N.m (31 lb in)
4. Electronic Brake Control Module with Brake Pressure Modulator Valve - Install - **Electronic Brake Control Module with Brake Pressure Modulator Valve Replacement**
5. Program the EBCM. **Control Module References**

ELECTRONIC BRAKE CONTROL MODULE WITH BRAKE PRESSURE MODULATOR VALVE REPLACEMENT

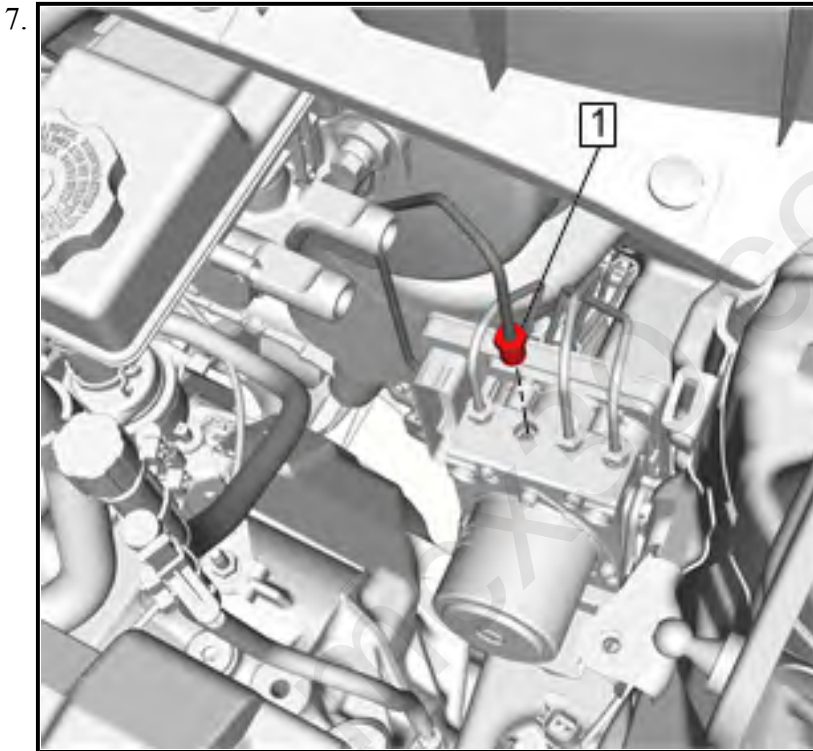
Removal Procedure

WARNING: Brake Fluid Irritant Warning

CAUTION: Brake Fluid Effects on Paint and Electrical Components Caution

CAUTION: Always connect or disconnect the wiring harness connector from the EBCM/EBTCM with the ignition switch in the OFF position. Failure to observe this precaution could result in damage to the EBCM/EBTCM.

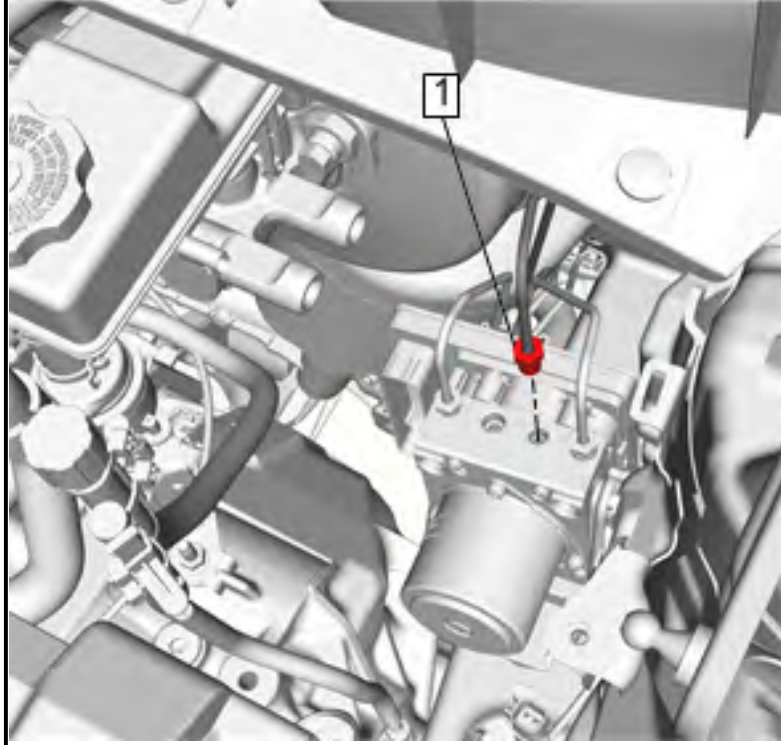
1. Place the ignition switch in the OFF position.
2. Without draining the engine coolant and without disconnecting the hoses, remove and position aside the radiator surge tank. - Radiator Surge Tank Replacement (LFY) Radiator Surge Tank Replacement (LTG)
3. Brake Pressure Modulator Valve Master Cylinder Reservoir Front Pipe - Remove - Brake Pressure Modulator Valve Master Cylinder Reservoir Front Pipe Replacement
4. Brake Pressure Modulator Valve Master Cylinder Reservoir Rear Pipe - Remove - Brake Pressure Modulator Valve Master Cylinder Reservoir Rear Pipe Replacement
5. Thoroughly clean the electronic brake control module (EBCM) to brake pressure modulator valve (BPMV) area of any accumulated dirt and debris.
6. Disconnect the EBCM electrical connector.



Left Front Brake Pipe Fitting (1) - Disconnect

8. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.

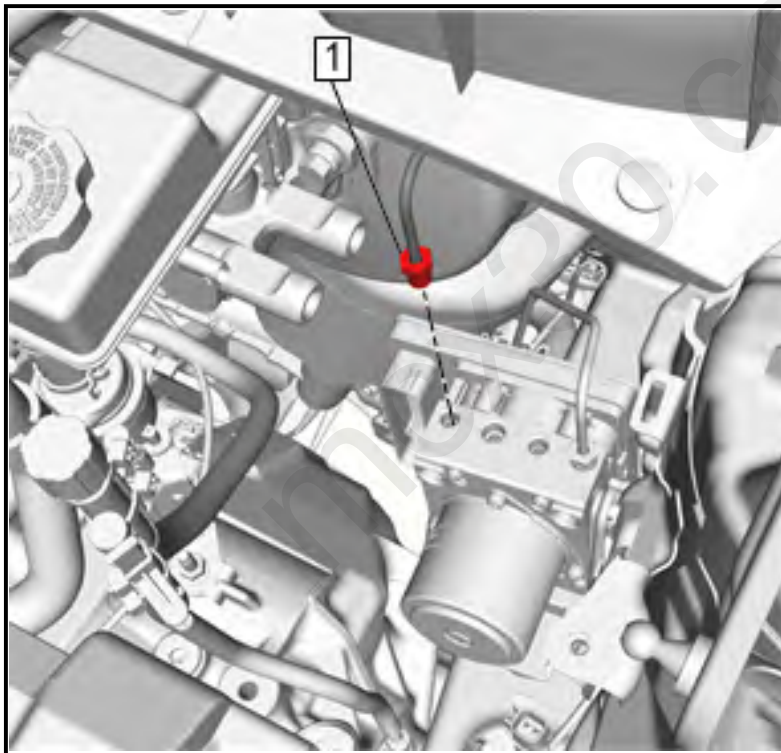




Right Front Brake Pipe Fitting (1) - Disconnect

10. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.

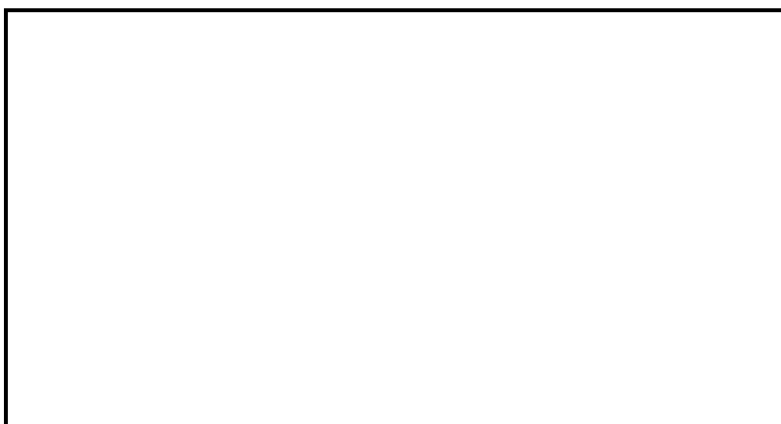
11.

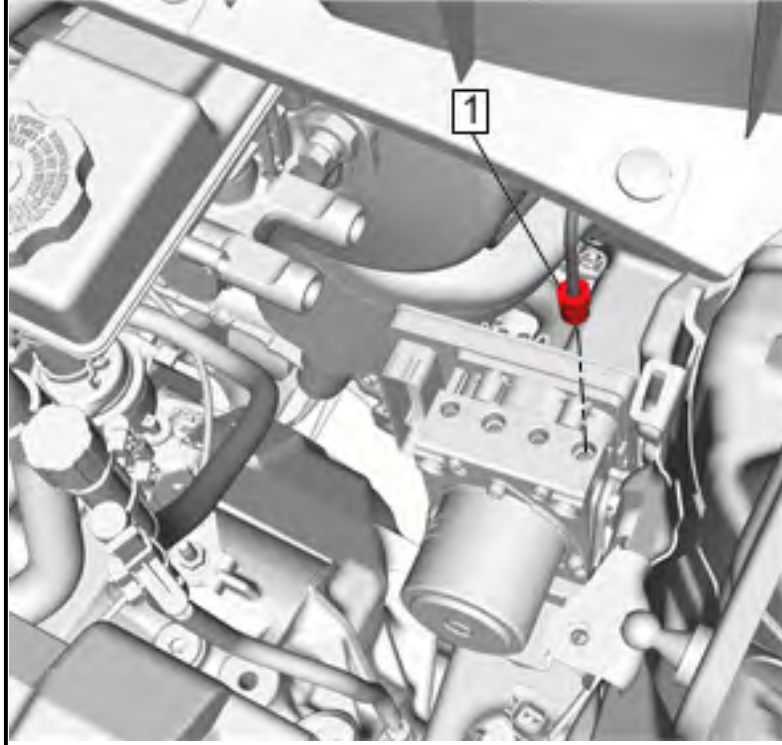


Right Rear Brake Pipe Fitting (1) - Disconnect

12. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.

13.

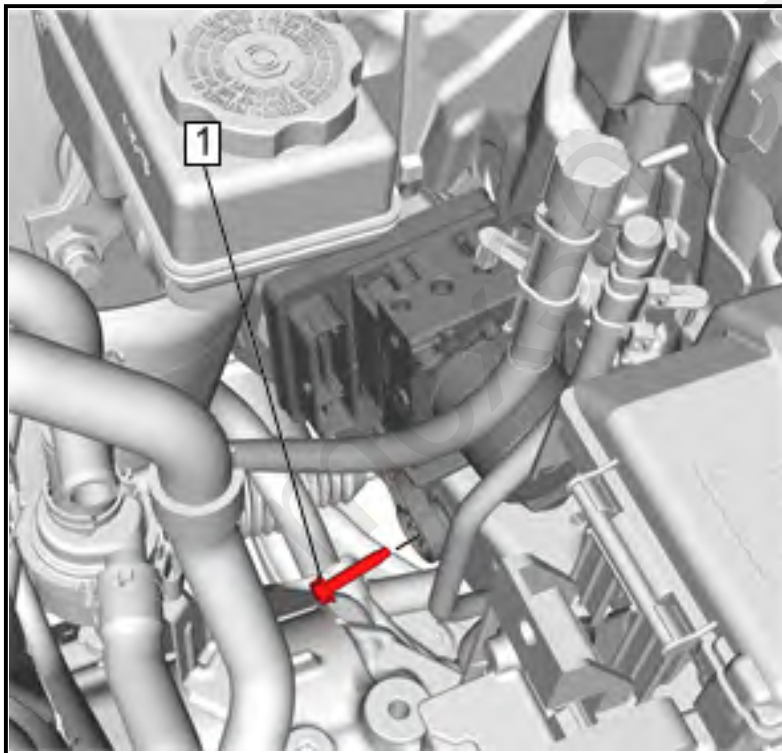




Left Rear Brake Pipe Fitting (1) - Disconnect

14. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.

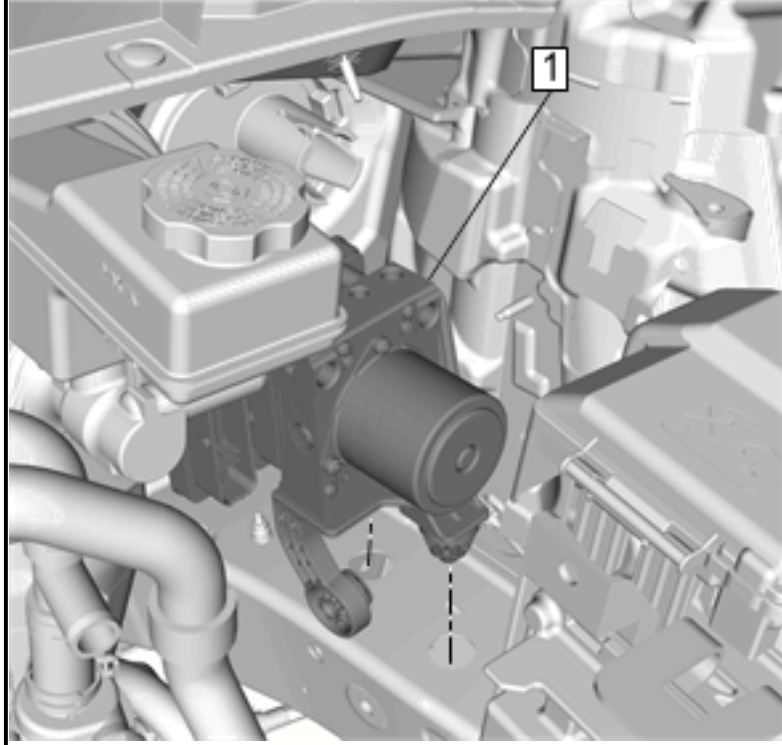
15.



Brake Pressure Modulator Valve Bracket Bolt (1) - Remove

16.



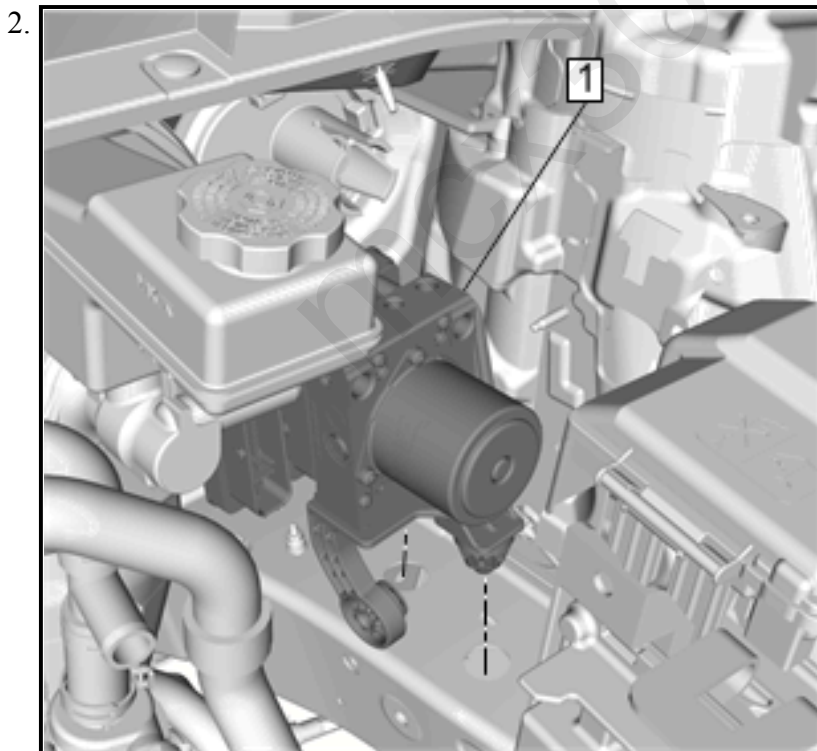


Electronic Brake Control Module with Brake Pressure Modulator Valve Assembly (1) - Remove

17. Electronic Brake and Traction Control Module Bracket - Remove - [Electronic Brake and Traction Control Module Bracket Replacement](#)

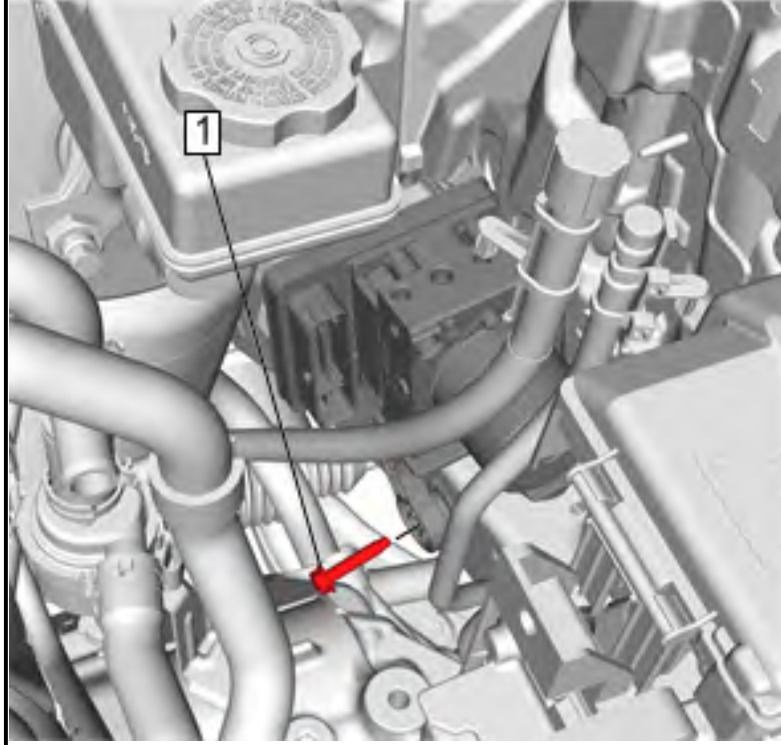
Installation Procedure

1. Electronic Brake and Traction Control Module Bracket - Install - [Electronic Brake and Traction Control Module Bracket Replacement](#)



Electronic Brake Control Module with Brake Pressure Modulator Valve Assembly (1) - Install

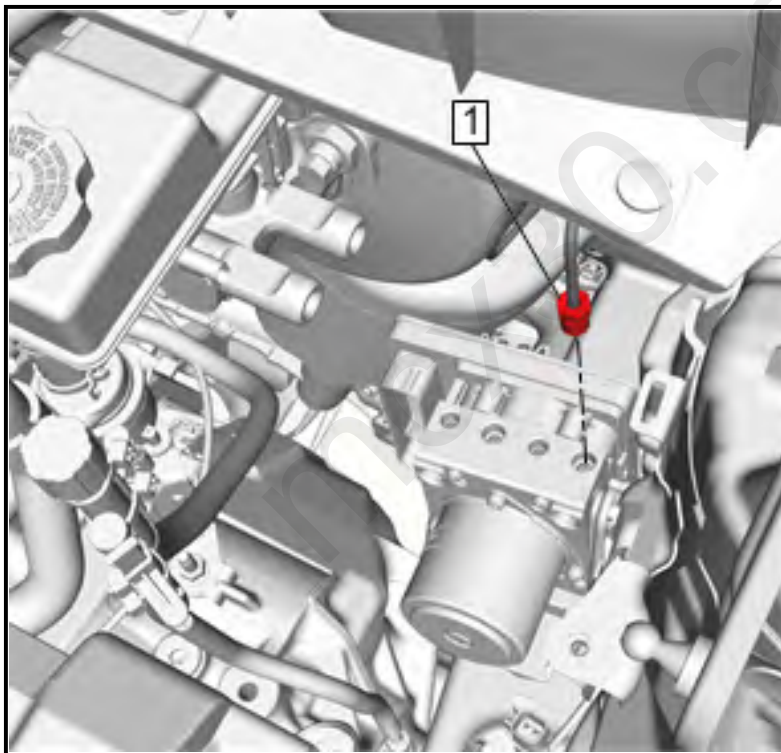




CAUTION: Fastener Caution

Brake Pressure Modulator Valve Bracket Bolt (1) - Install and tighten 22 N.m (16 lb ft)

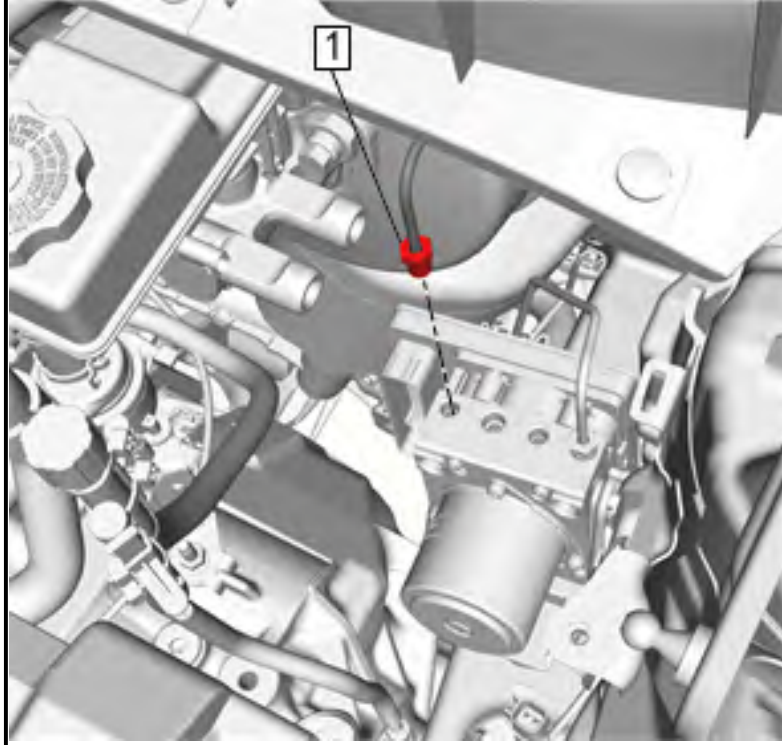
4.



Left Rear Brake Pipe Fitting (1) - Install and tighten 18 N.m (13 lb ft)

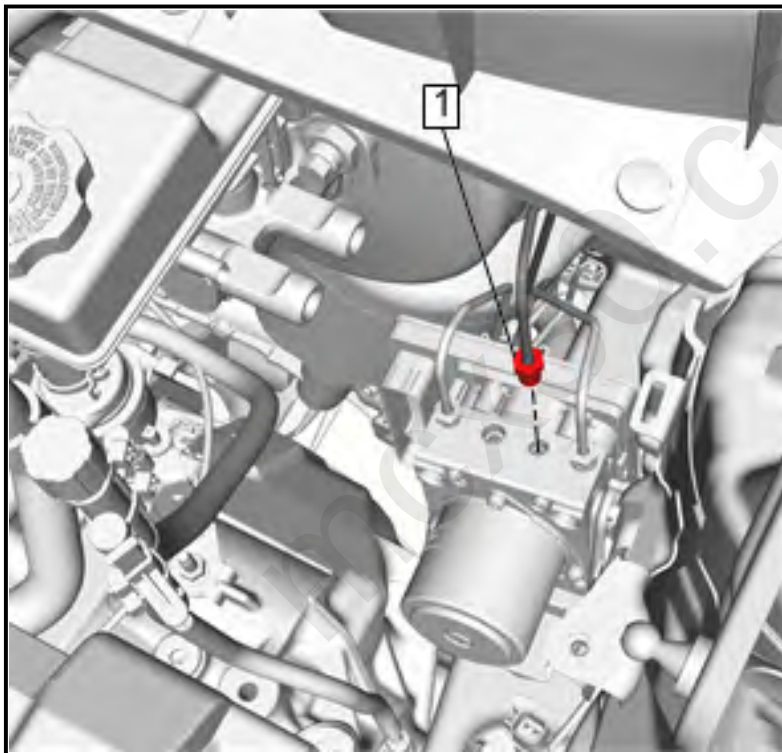
5.





Right Rear Brake Pipe Fitting (1) - Install and tighten 18 N.m (13 lb ft)

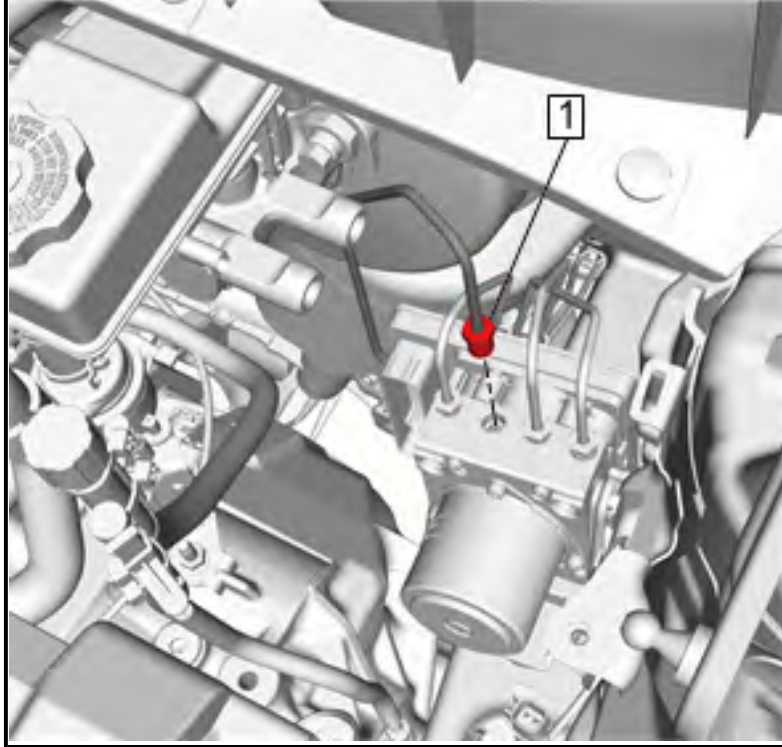
6.



Right Front Brake Pipe Fitting (1) - Install and tighten 18 N.m (13 lb ft)

7.





Left Front Brake Pipe Fitting (1) - Install and tighten 18 N.m (13 lb ft)

8. Connect the EBCM electrical connector.
9. Brake Pressure Modulator Valve Master Cylinder Reservoir Rear Pipe - Install - [Brake Pressure Modulator Valve Master Cylinder Reservoir Rear Pipe Replacement](#)
10. Brake Pressure Modulator Valve Master Cylinder Reservoir Front Pipe - Install - [Brake Pressure Modulator Valve Master Cylinder Reservoir Front Pipe Replacement](#)
11. Reposition and install the radiator surge tank. - [Radiator Surge Tank Replacement \(LFY\)](#) [Radiator Surge Tank Replacement \(LTG\)](#)
12. Bleed the brake system. [Antilock Brake System Automated Bleed](#)
13. Program the EBCM. [Control Module References](#)
14. Center the steering angle sensor. [Steering Wheel Angle Sensor Centering](#)

BRAKE PRESSURE MODULATOR VALVE ADAPTIVE PRESSURE CALIBRATION

The adaptive pressure control learn is not required the learn will automatically perform a maintenance run every 200 - 300 ignition cycles at vehicle speeds between (40 - 50 mph). If a customer is concerned about an intermittent humming or buzzing noise perform this adaptive pressure control learn to determine if this is what the customer heard.

The adaptive pressure control learn can be completed with a scan tool using the following steps:

1. Place the vehicle on a flat level surface.
2. Maintain the system voltage by connecting a battery charger.
3. Apply the parking brake, or set the transmission in the Park.
4. Release the brake pedal.
5. Install the scan tool to the data link connector.
6. Engine running
7. Turn Off or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
8. Select Adaptive Pressure Control Learn in the Brake System Control Module Configuration/Reset Functions list.
9. Follow the scan tool directions to complete the calibration learn procedure.
10. Clear any DTCs that may be set.

BRAKE PRESSURE MODULATOR VALVE PRESSURE SENSOR CALIBRATION

The brake pressure sensor does not require calibration often. Calibration of the brake pressure sensor might be required after certain service procedures are performed. Some of these procedures are as follows:

- Electronic brake control module (EBCM) replacement.
- Brake pressure modulator valve assembly replacement

The Brake Pressure Sensor Calibration procedure can be completed with a scan tool using the following steps:

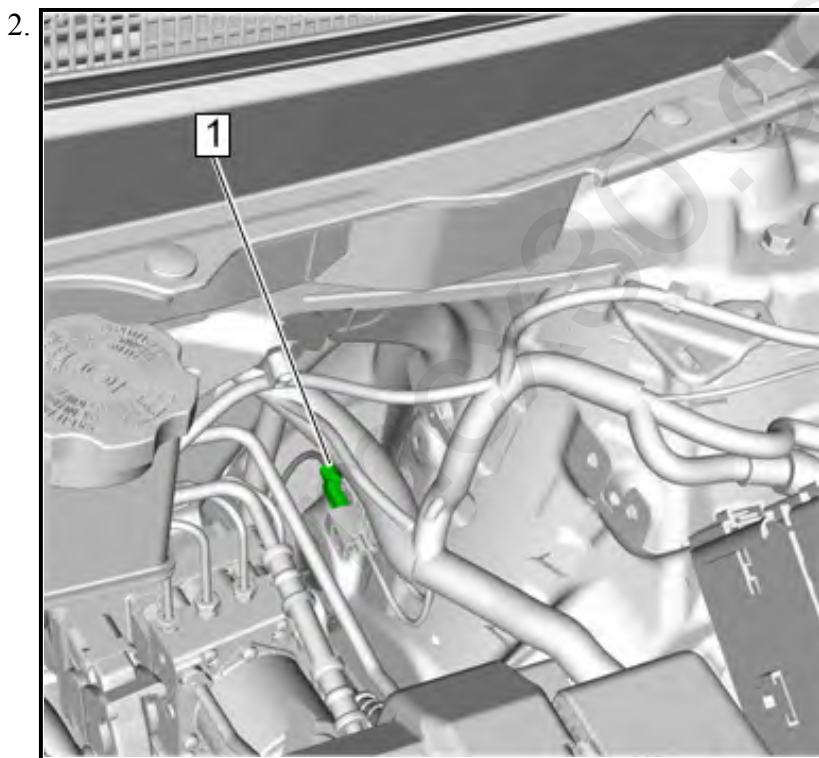
1. Apply the parking brake, or set the transmission in the P position.
2. Release the brake pedal.
3. Install the scan tool to the data link connector.
4. Ignition ON/Vehicle in Service Mode
5. Select Brake Pressure Sensor Calibration in the EBCM Configuration/Reset Functions list.
6. Follow the scan tool directions to complete the calibration procedure.
7. Clear any DTCs that may be set.

FRONT WHEEL SPEED SENSOR REPLACEMENT - LEFT SIDE

Removal Procedure

WARNING: Brake Dust Warning

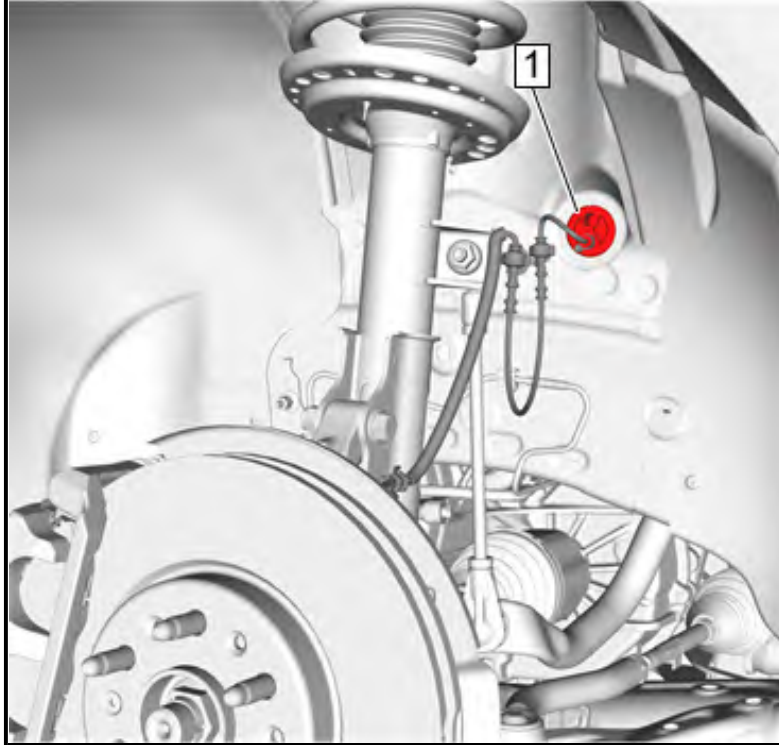
1. Without draining the engine coolant and without disconnecting the hoses, remove and position aside the radiator surge tank. Radiator Surge Tank Replacement (LFY). Radiator Surge Tank Replacement (LTG).



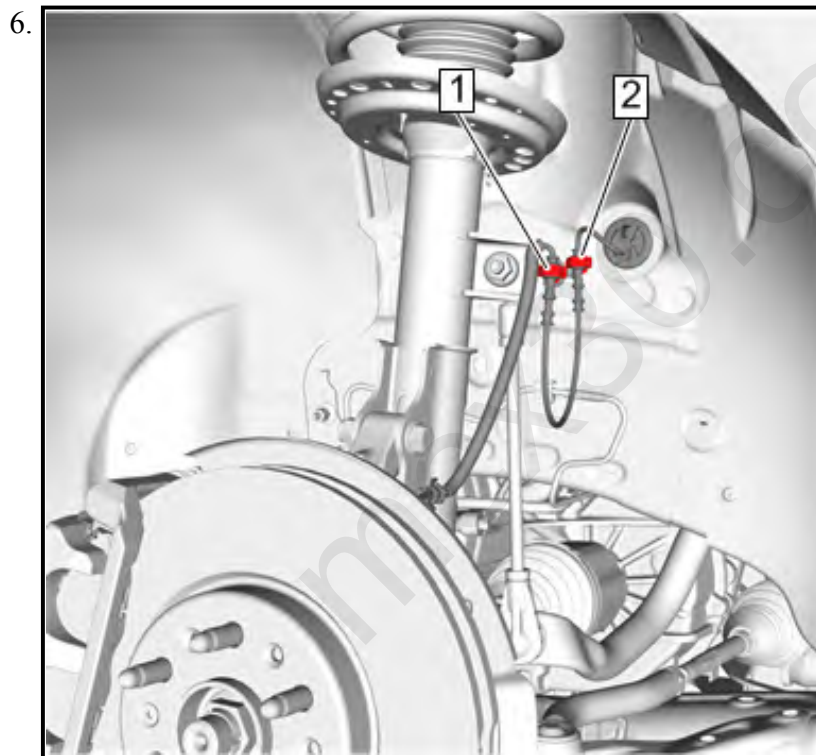
Wheel Speed Sensor Electrical Connector (1) - Disconnect

3. Raise and support the vehicle. Lifting and Jacking the Vehicle
4. Remove the tire and wheel assembly. Tire and Wheel Removal and Installation
- 5.





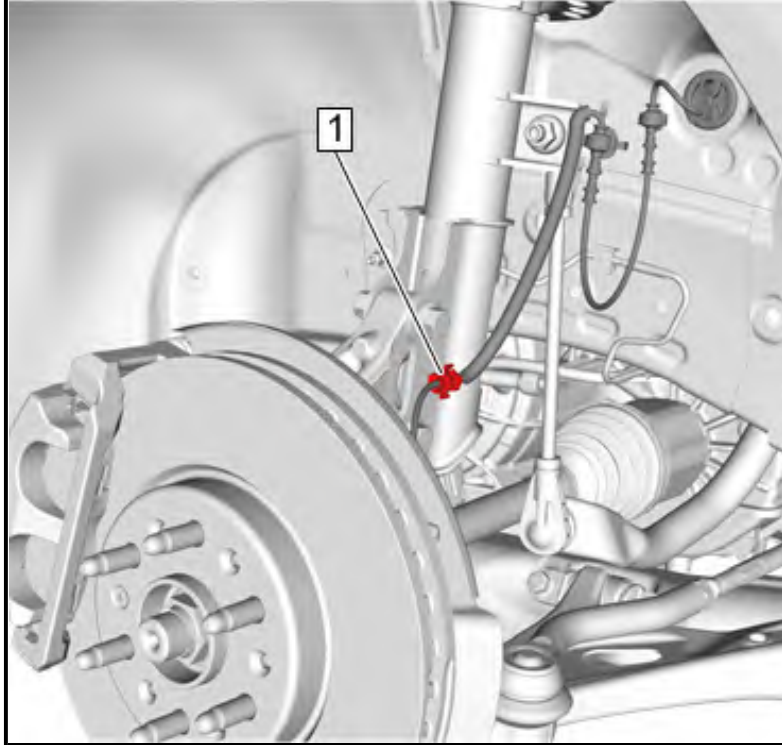
Wheel Speed Sensor Harness Pass Through Grommet (1) - Release



Retainer (1) @ Strut Assembly - Release

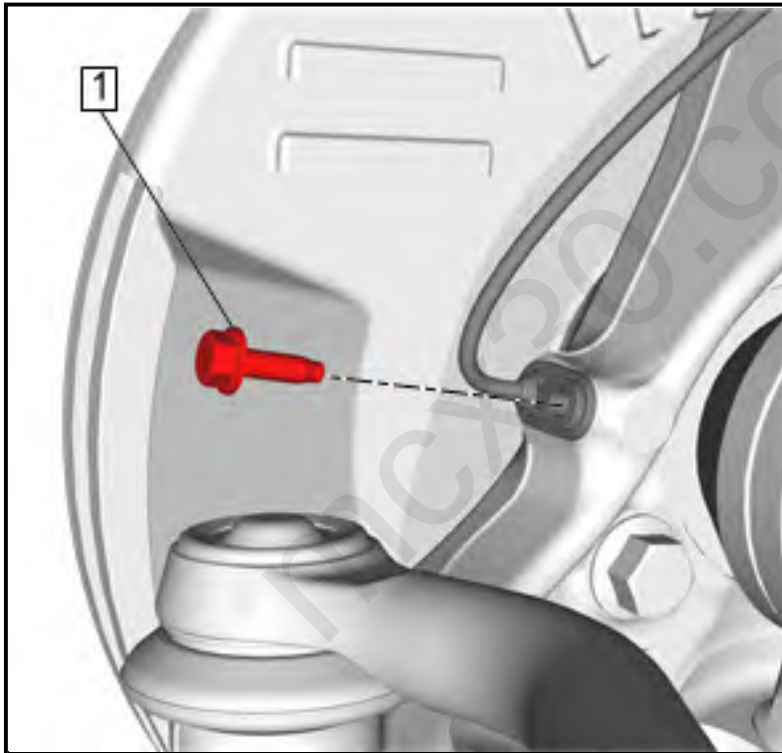
7. Retainer (2) @ Wheelhouse - Release





Retainer (1) @ Strut Assembly - Release

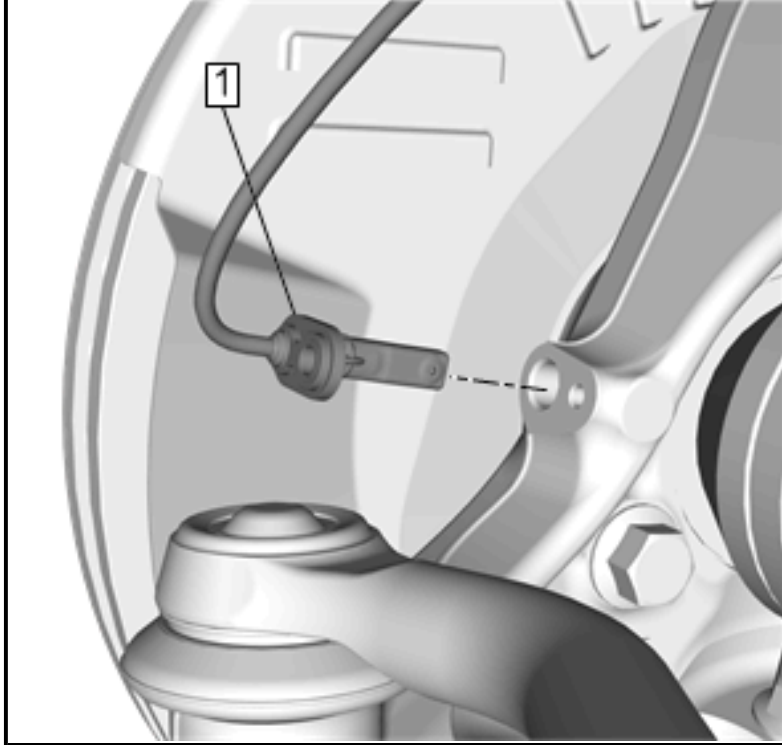
9.



Wheel Speed Sensor Bolt (1) - Remove

10.

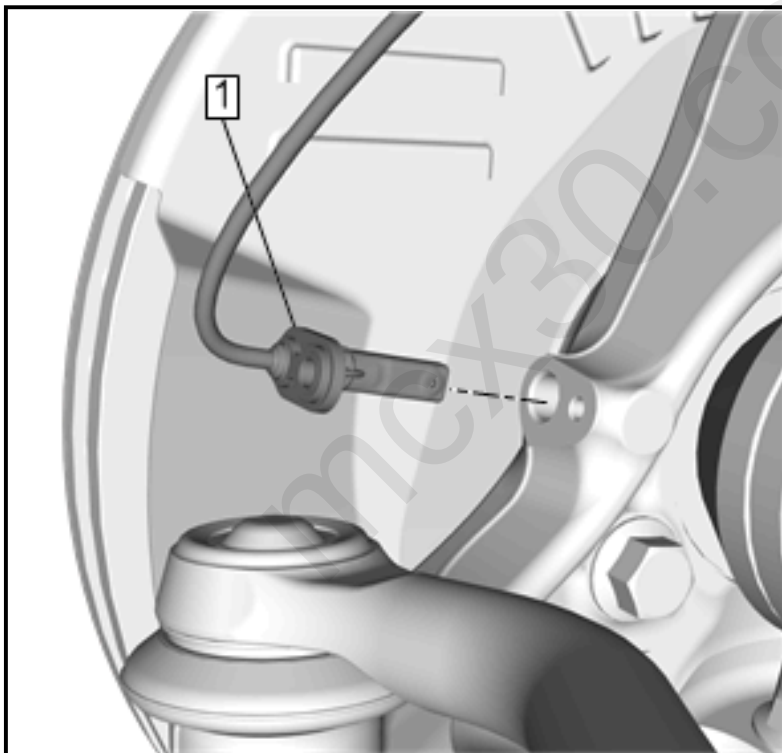




Wheel Speed Sensor (1) - Remove

Installation Procedure

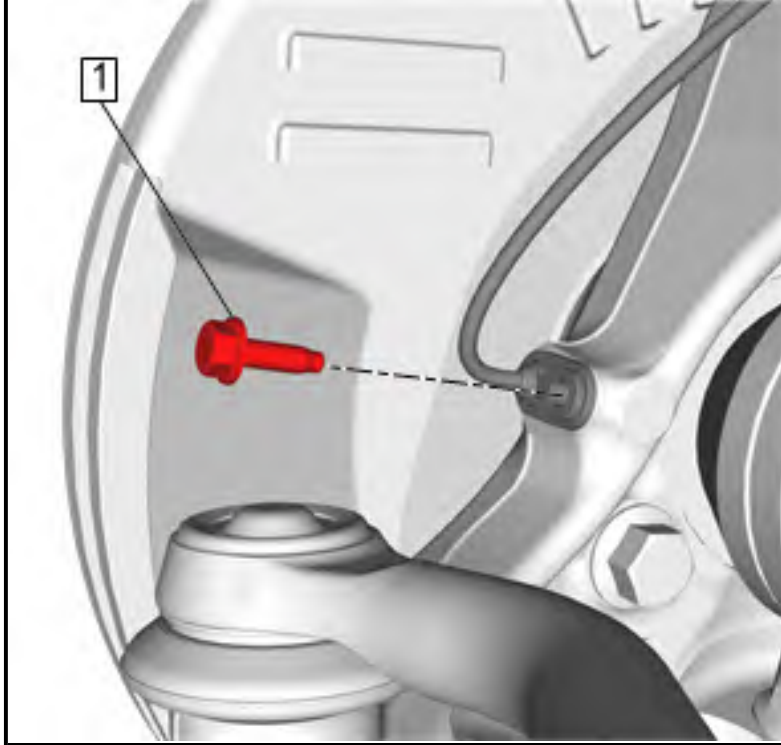
1.



Wheel Speed Sensor (1) - Install

2.

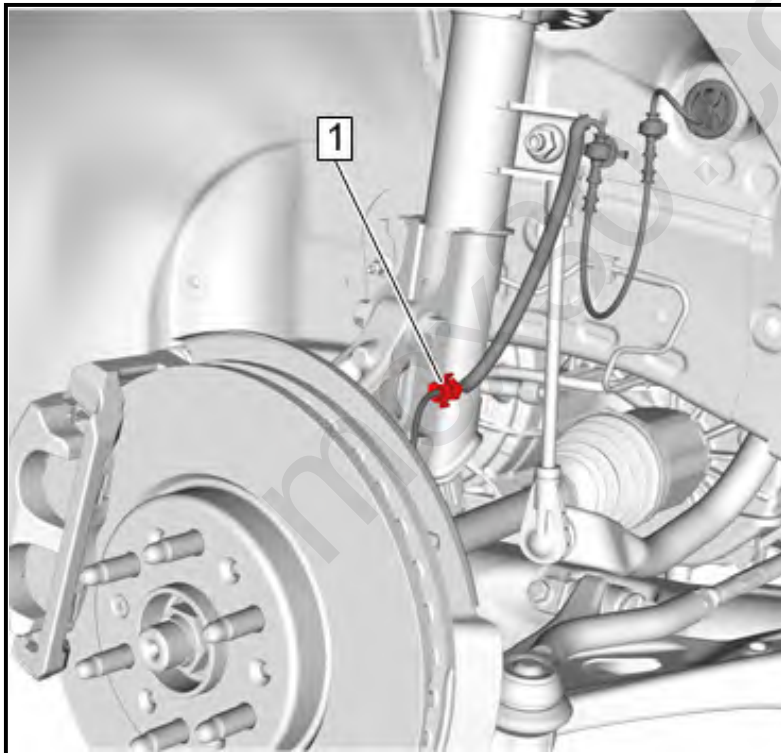




CAUTION: Fastener Caution

Wheel Speed Sensor Bolt (1) - Install and tighten 9 N.m (80 lb in)

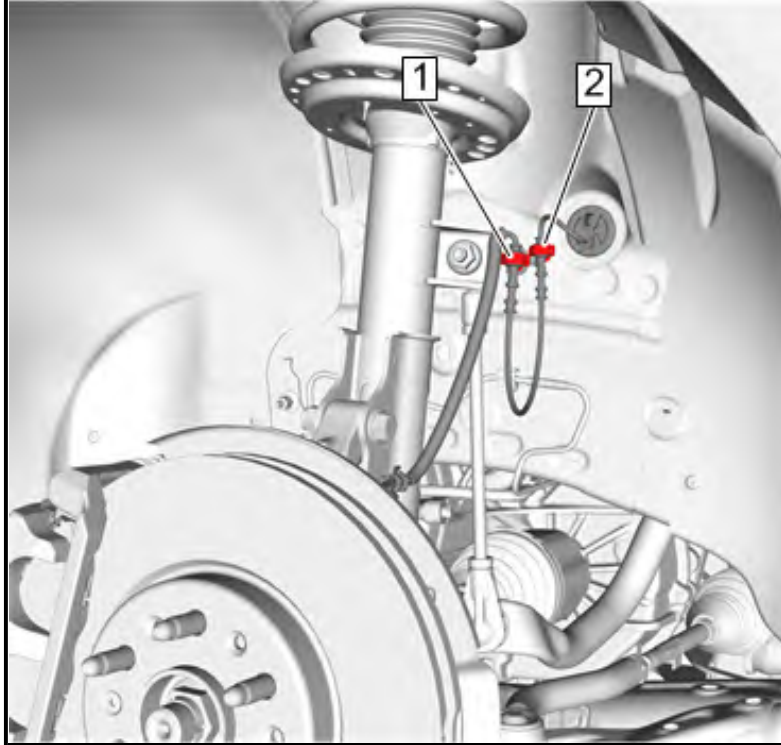
3.



Retainer (1) @ Strut Assembly - Secure

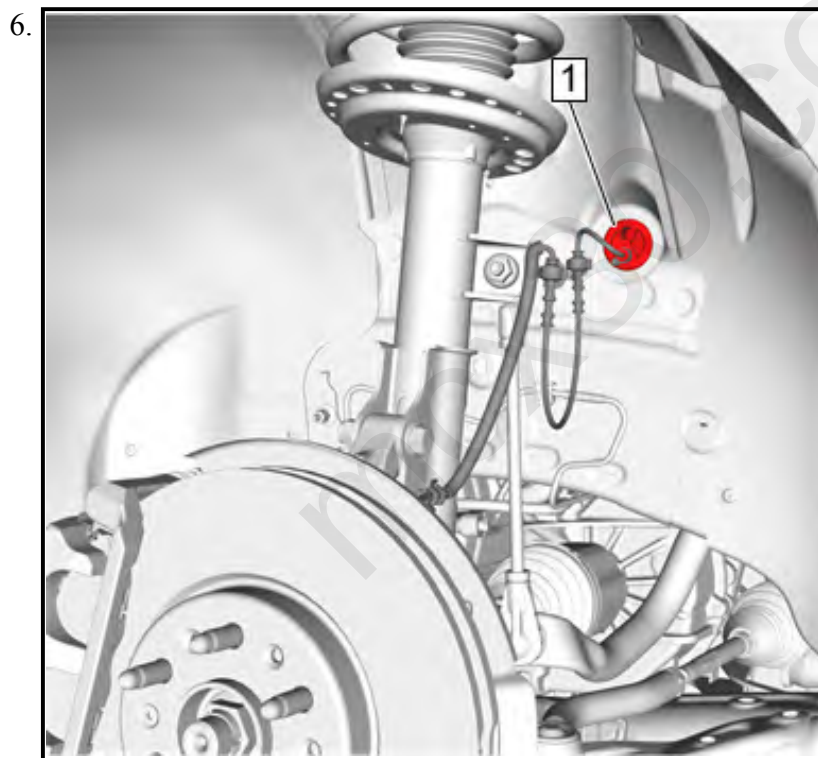
4.





Retainer (1) @ Strut Assembly - Secure

5. Retainer (2) @ Wheelhouse - Secure

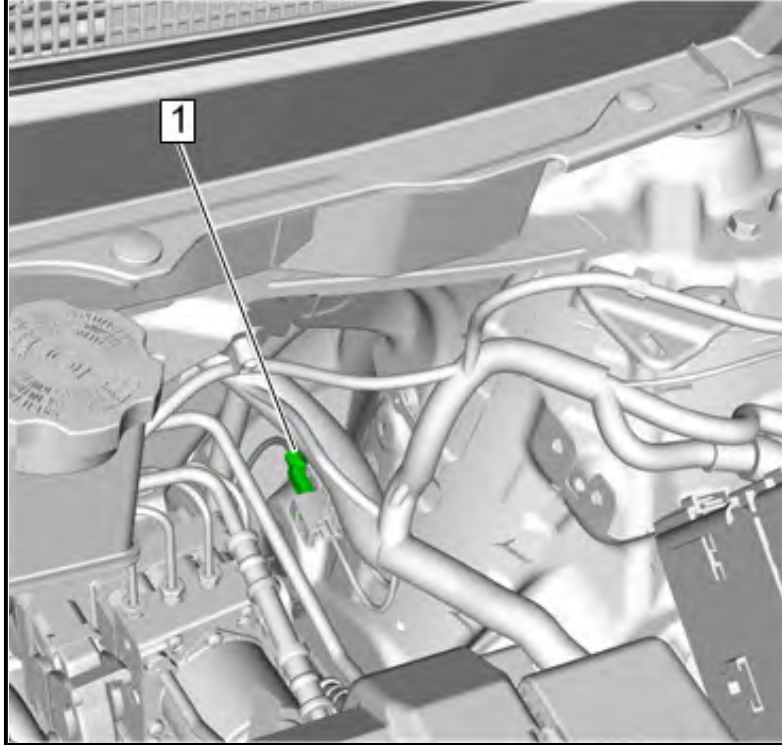


Wheel Speed Sensor Harness Pass Through Grommet (1) - Secure

7. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

8. Lower the vehicle.





Wheel Speed Sensor Electrical Connector (1) - Connect

10. Reposition and install the radiator surge tank. [Radiator Surge Tank Replacement \(LFY\)](#), [Radiator Surge Tank Replacement \(LTG\)](#)
11. Verify the repair is complete. [Diagnostic Repair Verification](#)

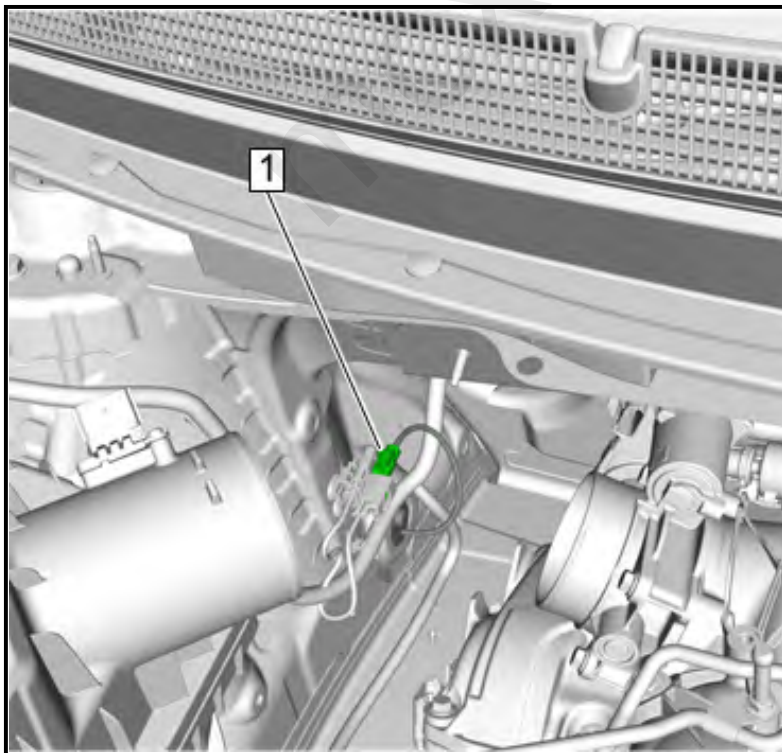
FRONT WHEEL SPEED SENSOR REPLACEMENT - RIGHT SIDE

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Air Cleaner Outlet Duct - Remove - [Air Cleaner Outlet Duct Replacement](#)

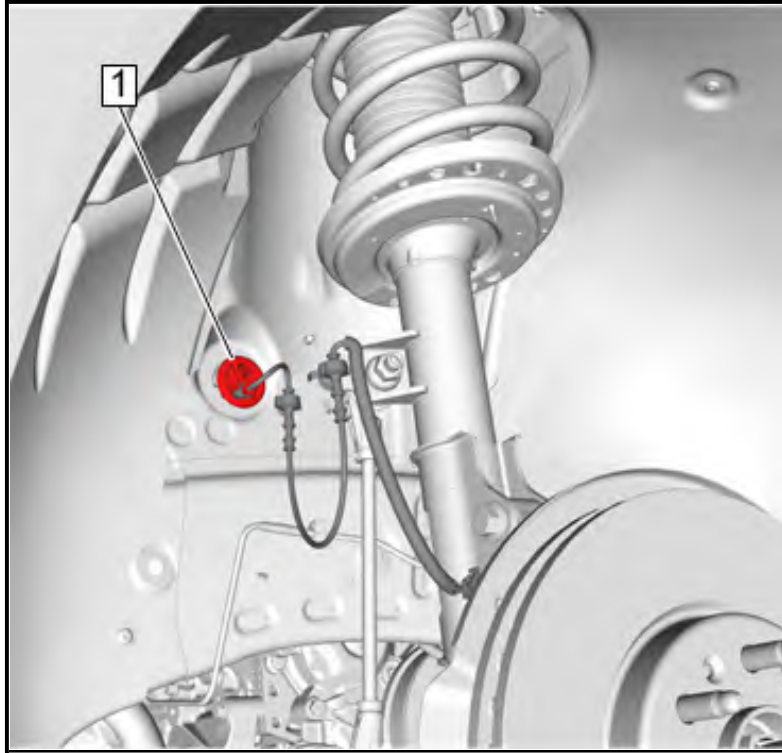
2.



Wheel Speed Sensor Electrical Connector (1) - Disconnect

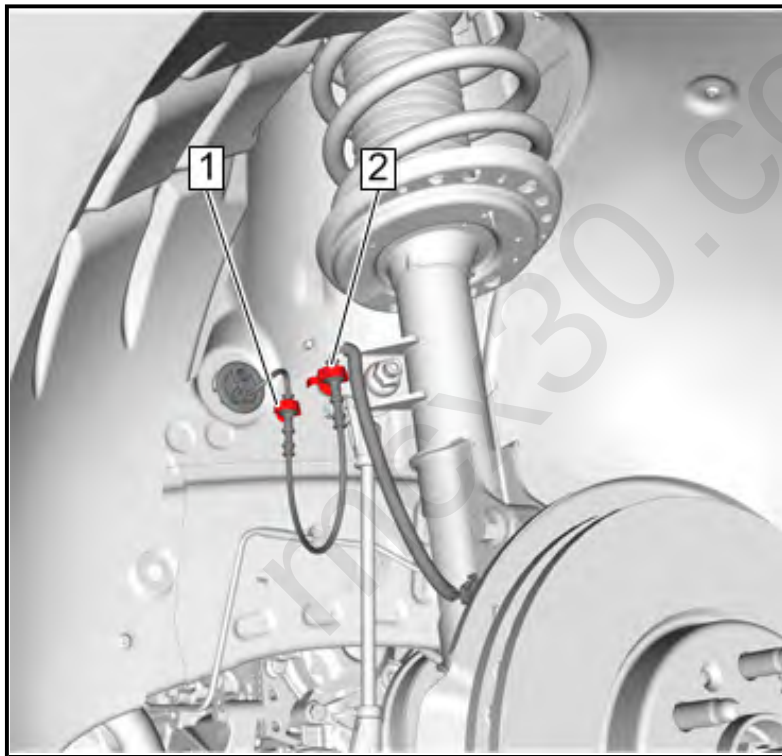
3. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
4. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

5.



Wheel Speed Sensor Harness Pass Through Grommet (1) - Release

6.

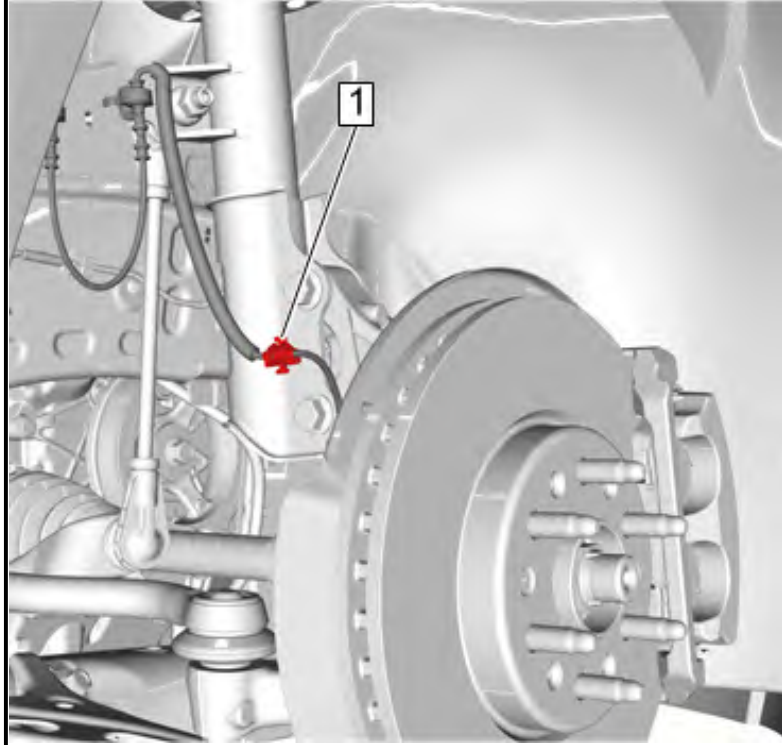


Retainer (1) @ Wheelhouse - Release

7. Retainer (2) @ Strut Assembly - Release

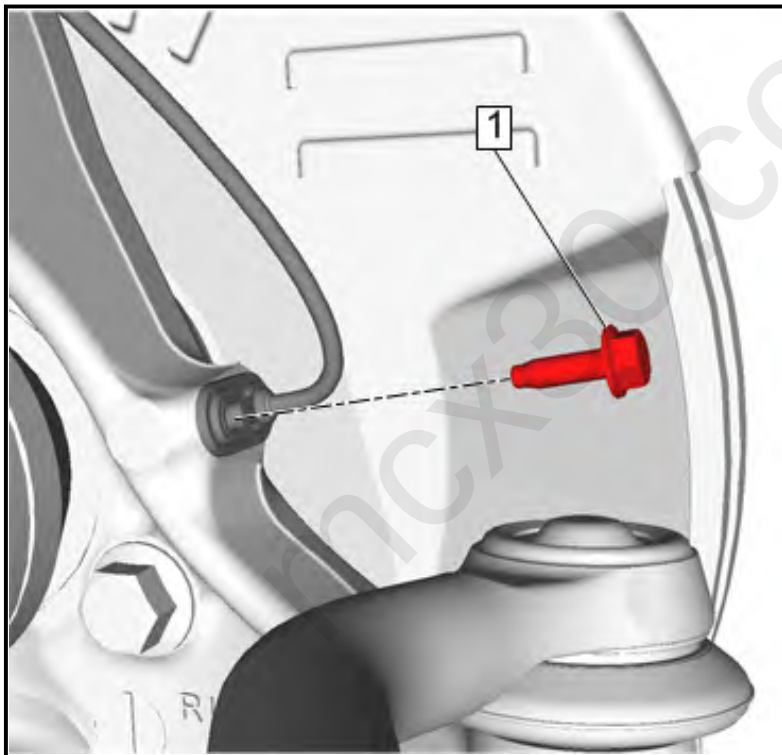
8.





Retainer (1) @ Strut Assembly - Release

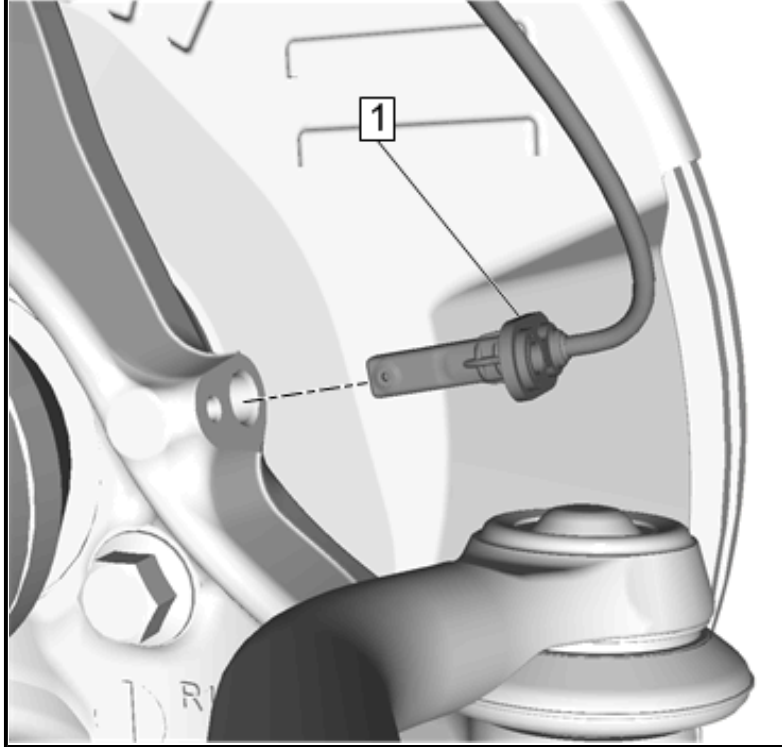
9.



Wheel Speed Sensor Bolt (1) - Remove

10.

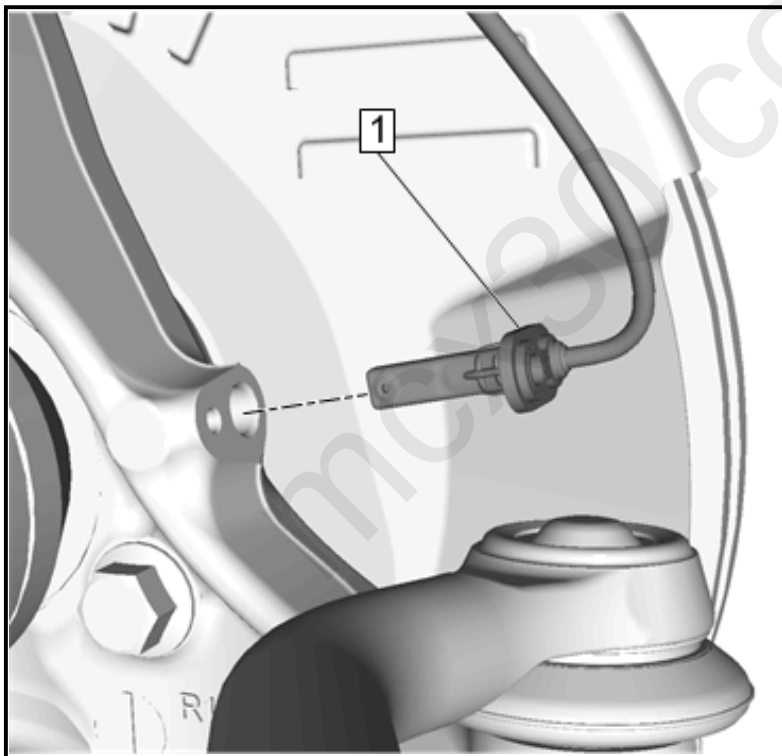




Wheel Speed Sensor (1) - Remove

Installation Procedure

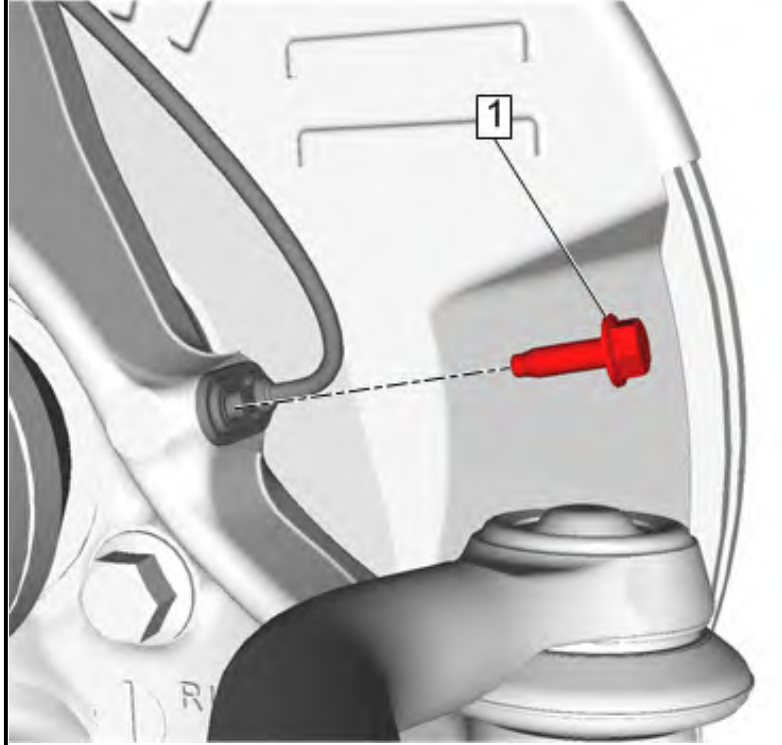
1.



Wheel Speed Sensor (1) - Install

2.

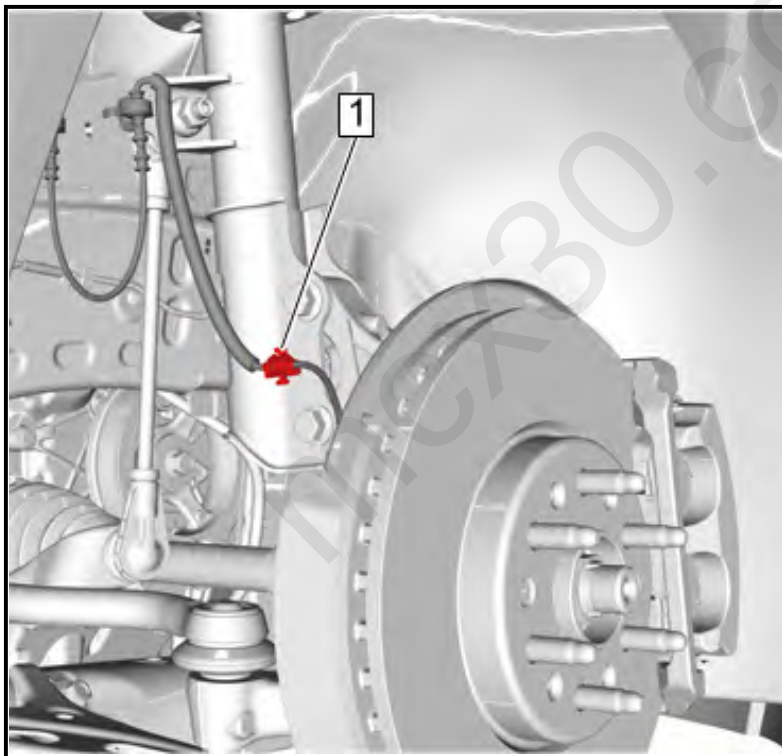




CAUTION: Fastener Caution

Wheel Speed Sensor Bolt (1) - Install and tighten 9 N.m (80 lb in)

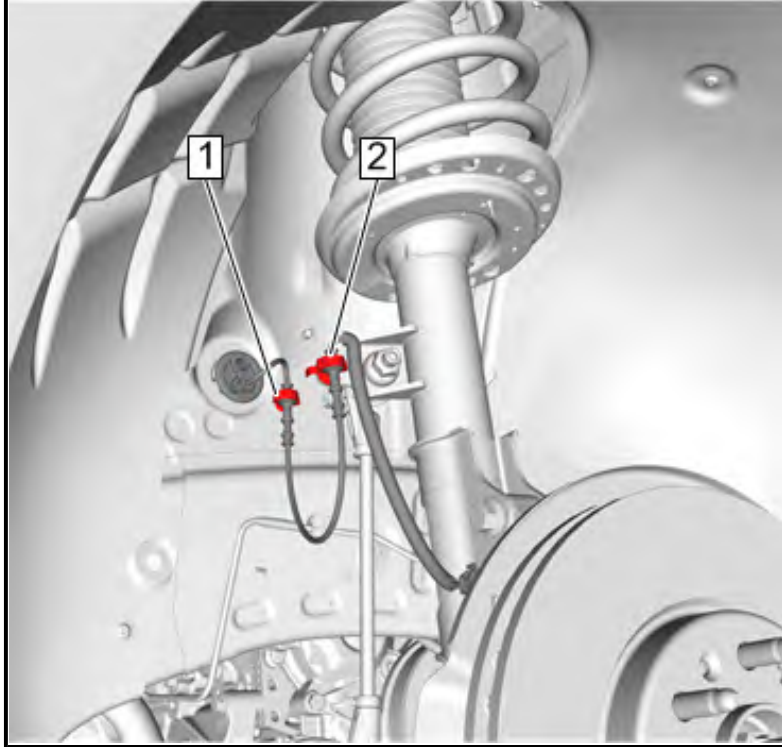
3.



Retainer (1) @ Strut Assembly - Secure

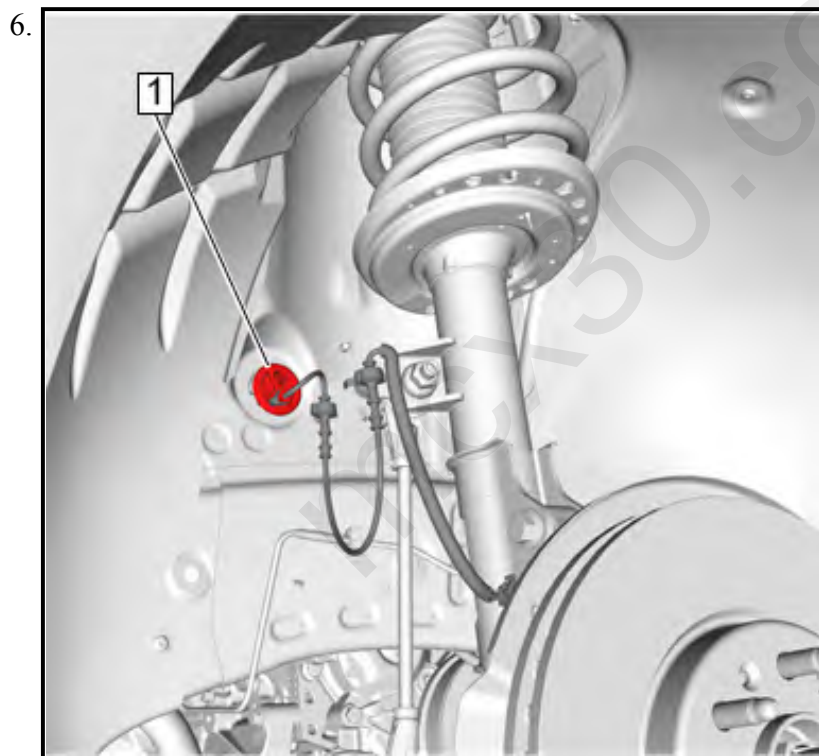
4.





Retainer (1) @ Wheelhouse - Secure

5. Retainer (2) @ Strut Assembly - Secure

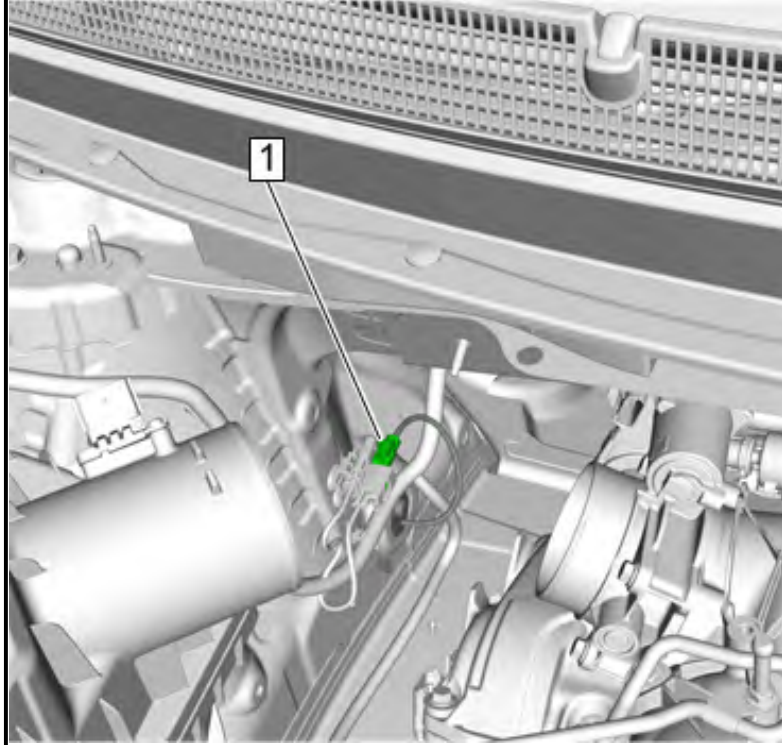


Wheel Speed Sensor Harness Pass Through Grommet (1) - Secure

7. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

8. Lower the vehicle.





Wheel Speed Sensor Electrical Connector (1) - Connect

10. Air Cleaner Outlet Duct - Install - [Air Cleaner Outlet Duct Replacement](#)
11. Verify the repair is complete. [Diagnostic Repair Verification](#)

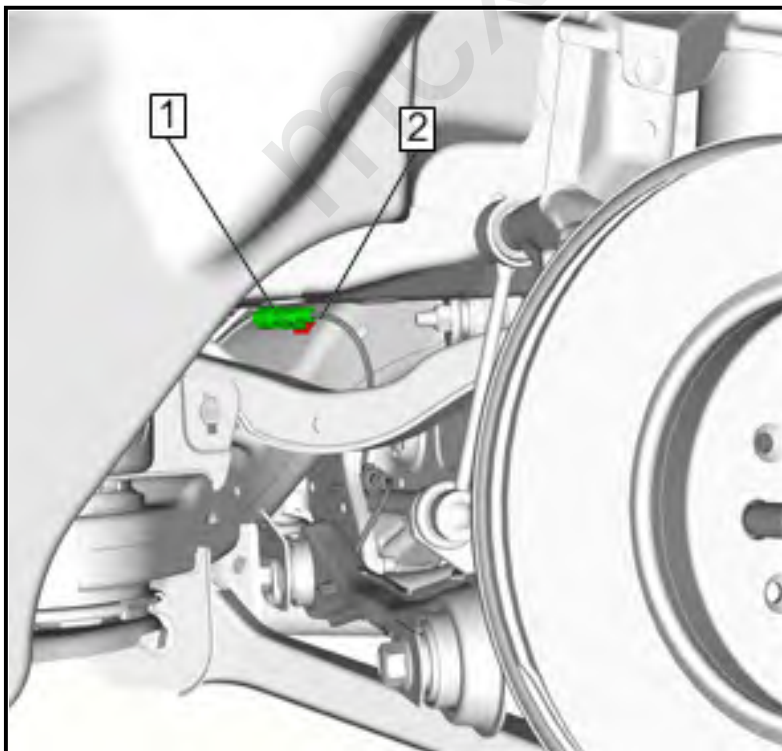
REAR WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

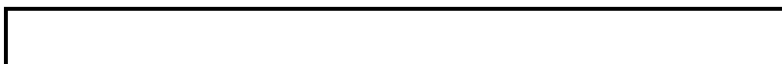
3.

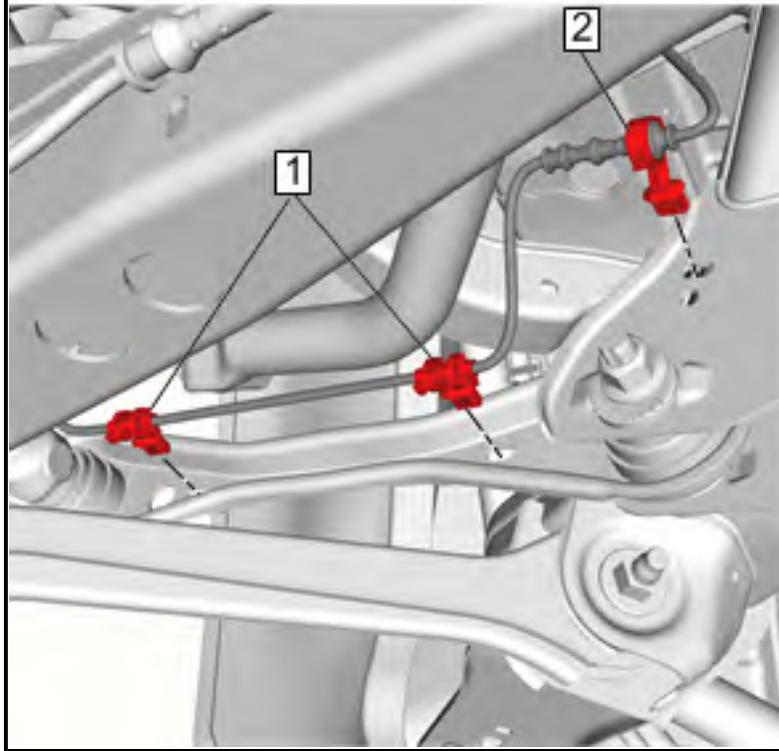


Wheel Speed Sensor Electrical Connector (1) - Disconnect

4. Retainer (2) @ Rear Cradle - Release

5.

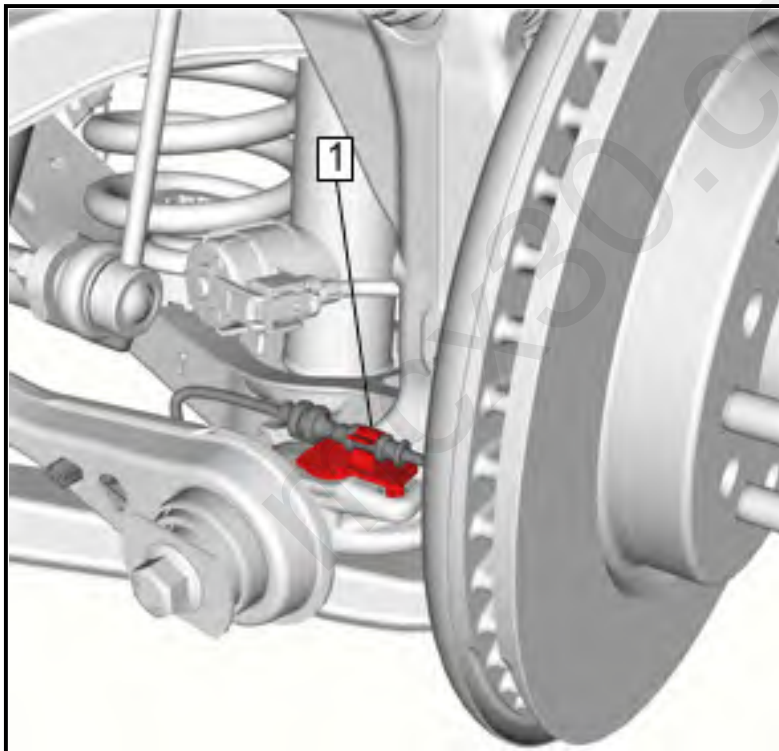




Retainer (1) @ Rear Toe Link - Release [2x]

6. Retainer (2) @ Rear Toe Link Bracket - Release

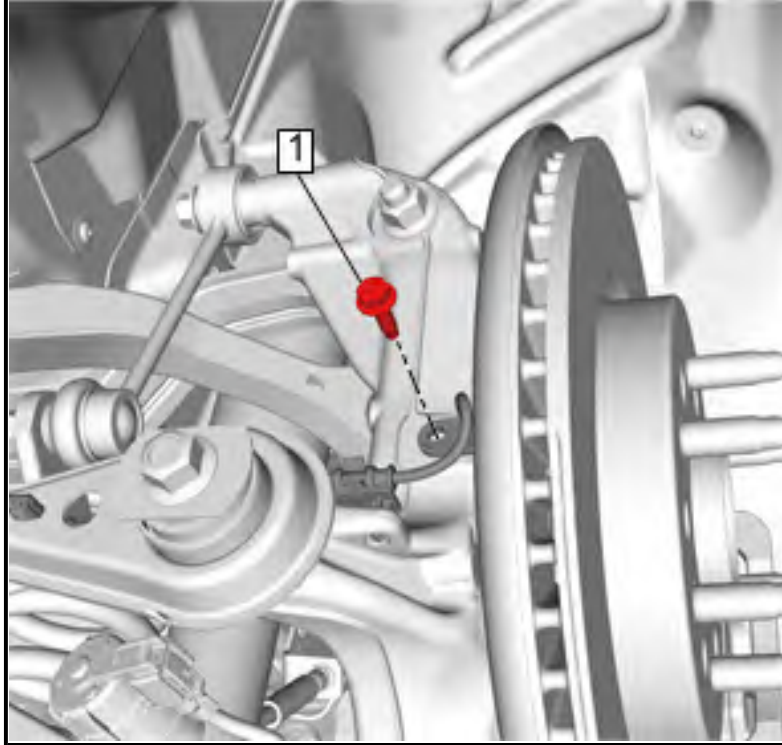
7.



Retainer (1) @ Knuckle - Release

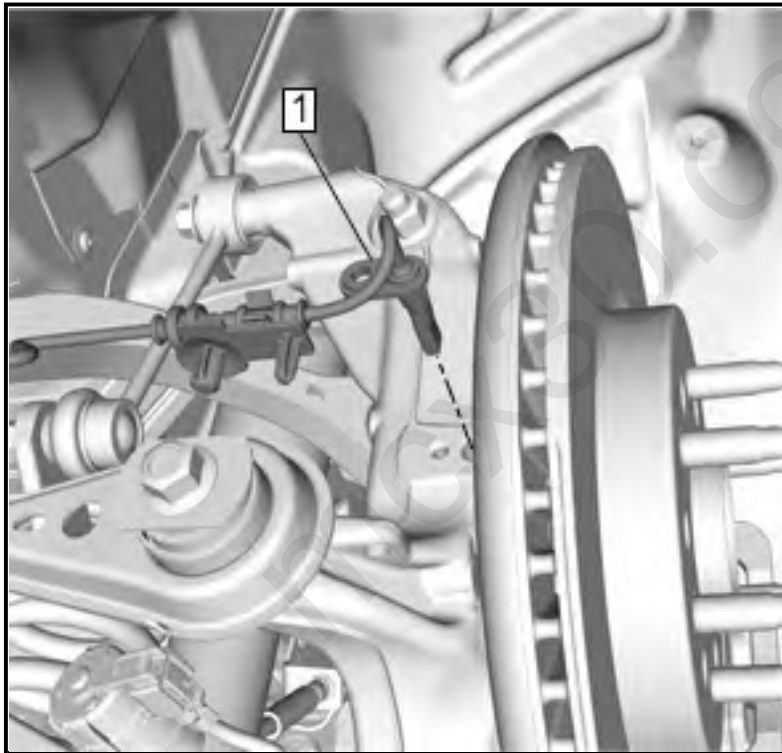
8.





Wheel Speed Sensor Bolt (1) - Remove

9.

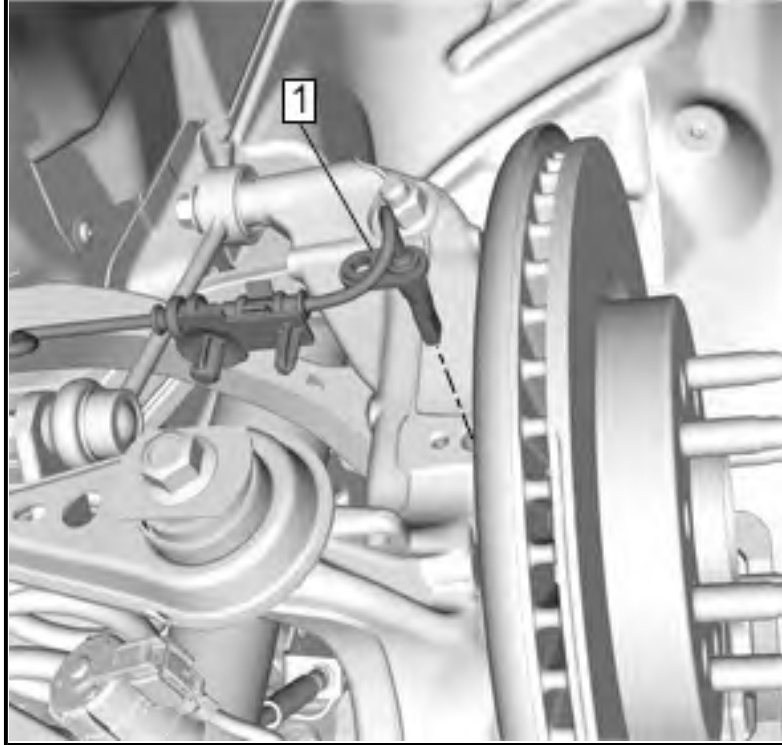


Wheel Speed Sensor (1) - Remove

Installation Procedure

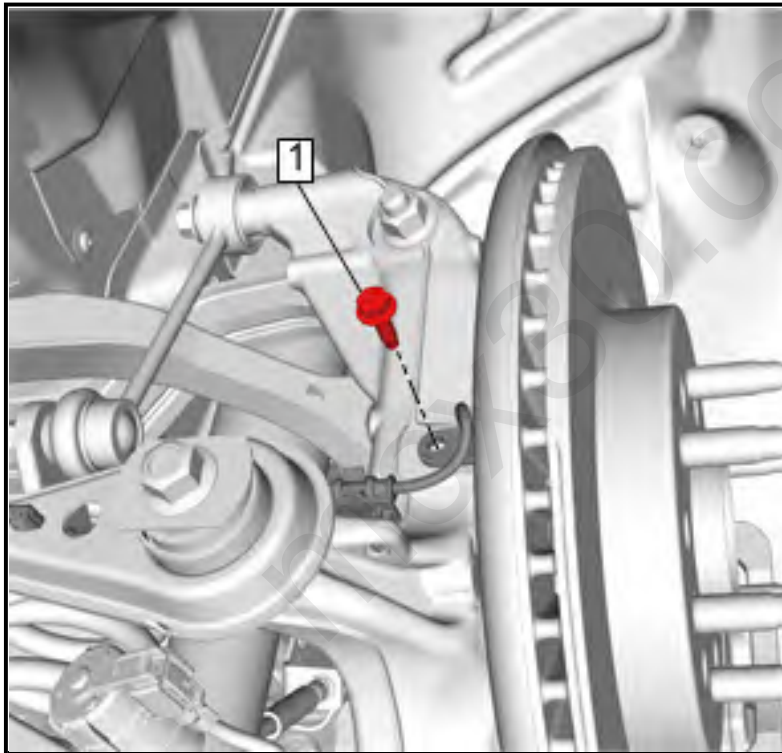
1.





Wheel Speed Sensor (1) - Install

2.

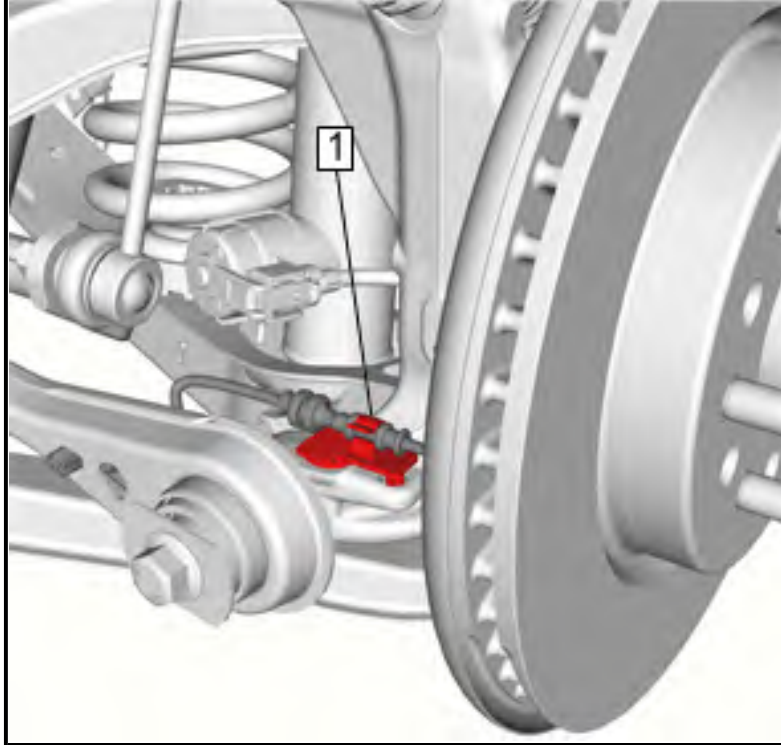


CAUTION: Fastener Caution

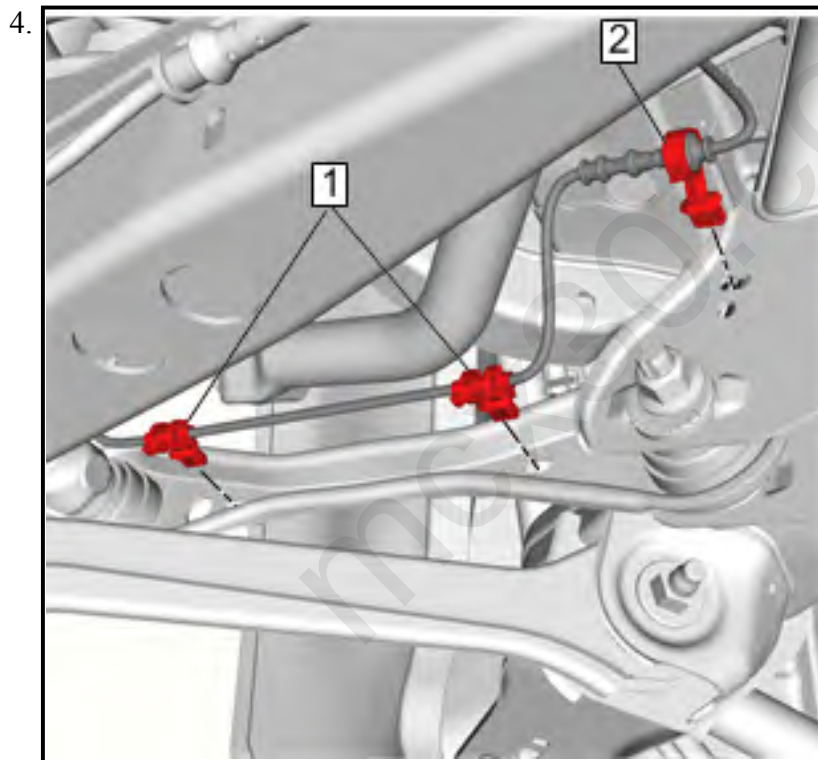
Wheel Speed Sensor Bolt (1) - Install and tighten 9 N.m (80 lb in)

3.





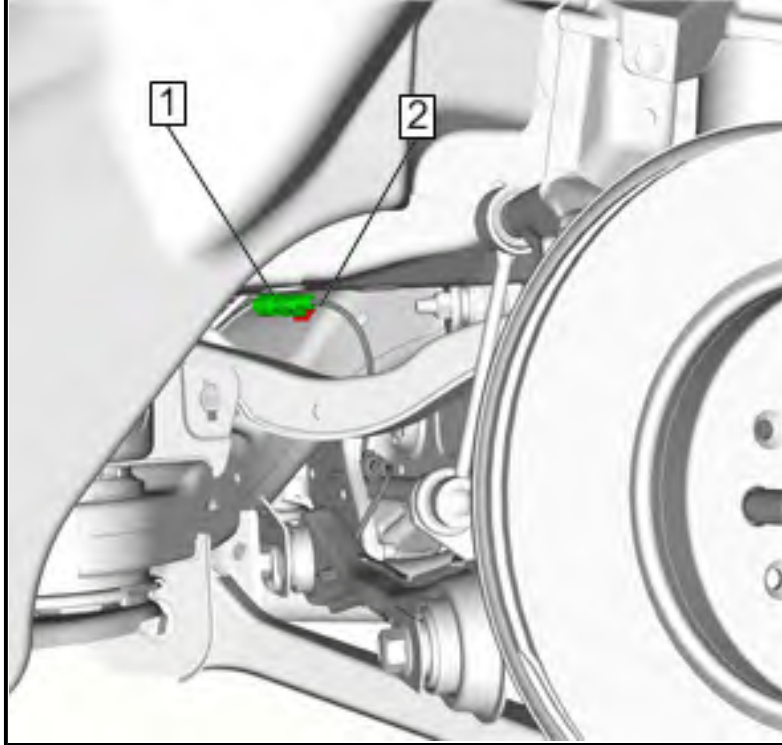
Retainer (1) @ Knuckle - Secure



Retainer (1) @ Rear Toe Link - Secure [2x]

5. Retainer (2) @ Rear Toe Link Bracket - Secure





Wheel Speed Sensor Electrical Connector (1) - Connect

7. Retainer (2) @ Rear Cradle - Secure
8. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
9. Verify the repair is complete. [Diagnostic Repair Verification](#)

VEHICLE YAW SENSOR LEARN

The yaw rate sensor does not require calibration often. Calibrating the yaw rate sensor might be required after certain service procedures are performed. Some of these procedures are as follows:

- Yaw Rate Sensor replacement
- Electronic Brake Control Module replacement
- Inflatable Restraint Sensing and Diagnostic Module replacement
- Multi-axis Acceleration Sensor Module replacement (UGN)

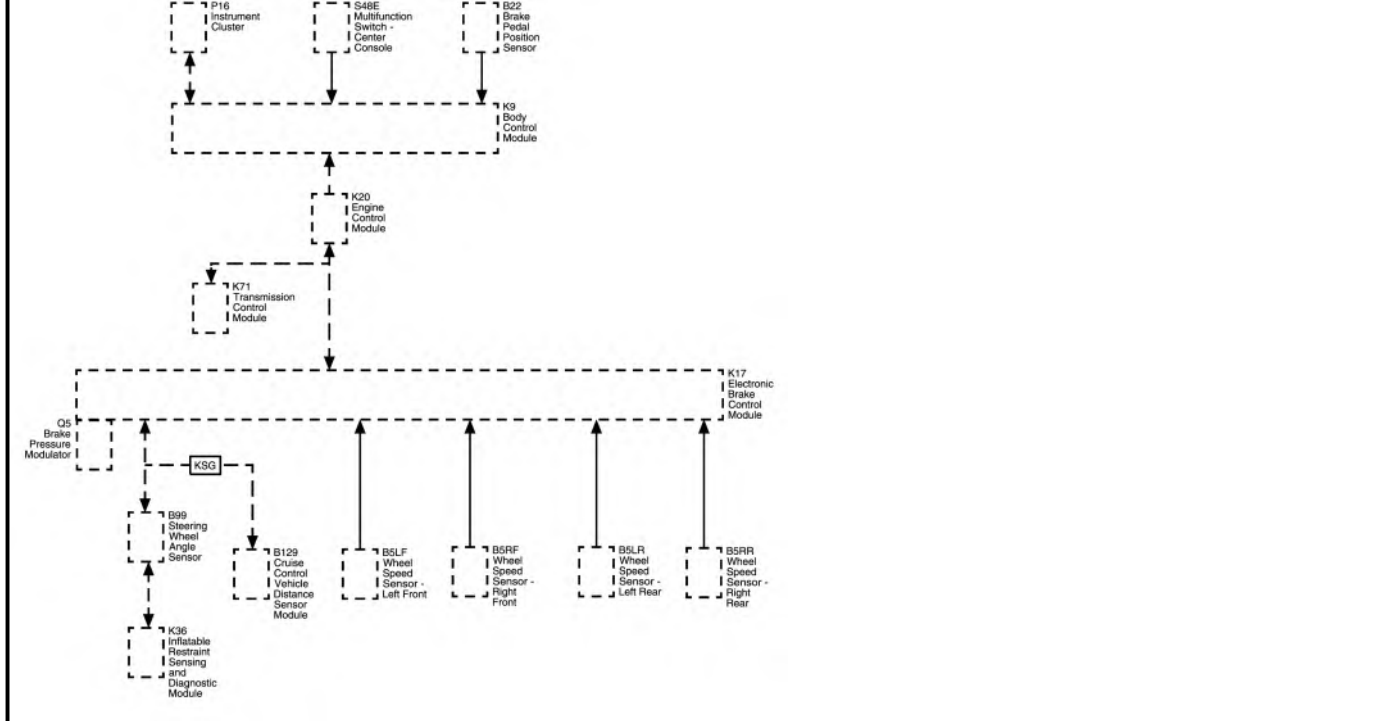
The yaw rate sensor learn procedure can be completed with a scan tool using the following steps:

1. Place vehicle on a level surface
2. Apply the parking brake, or set the transmission in the Park position.
3. Install the scan tool to the data link connector.
4. Ignition ON/Vehicle in Service Mode.
5. Select Yaw Rate Sensor Learn in the Electronic Brake Control Module Configuration/Reset Functions list.
6. Follow the scan tool directions to complete the calibration procedure.
7. Clear any DTCs that may be set.

DESCRIPTION AND OPERATION

ABS DESCRIPTION AND OPERATION





Callout	Component Name
KSG	CRUISE CONTROL: AUTOMATIC, ADAPTIVE, WITH STOP/GO
P16	P16 Instrument Cluster
S48E	S48E Multifunction Switch - Center Console
B22	B22 Brake Pedal Position Sensor
K9	K9 Body Control Module
K20	K20 Engine Control Module
K71	K71 Transmission Control Module
K17	K17 Electronic Brake Control Module
Q5	Q5 Brake Pressure Modulator
B5RR	B5RR Wheel Speed Sensor - Right Rear
B5LR	B5LR Wheel Speed Sensor - Left Rear
B5RF	B5RF Wheel Speed Sensor - Right Front
B5LF	B5LF Wheel Speed Sensor - Left Front
B129	B129 Cruise Control Vehicle Distance Sensor Module
B99	B99 Steering Wheel Angle Sensor
K36	K36 Inflatable Restraint Sensing and Diagnostic Module

This vehicle is equipped with a TRW EBC460 brake system. The electronic brake control module and the brake pressure modulator are serviced separately. The brake pressure modulator uses a four circuit configuration to control hydraulic pressure to each wheel independently.

Depending on options, the following vehicle performance enhancement systems are provided.

- ABS
- Traction Control
- Stability Control
- Dynamic Rear Proportioning
- Hill Descent Control System
- Hill Hold Start Assist
- Cornering Brake Control
- Hydraulic Brake Assist
- Optimized Hydraulic Braking System
- Intelligent Brake Assist
- Trailer Brake Control System
- Trailer Sway Control

The following components listed below are involved in the operation of the brake system:

- Electronic brake control module - The electronic brake control module controls the system functions and detects failures. It supplies voltage to the solenoid valves and pump motor.
- Brake pressure modulator - The brake pressure modulator contains the following components:
 - Brake pressure sensor
 - Hydraulic pump with pump motor
 - Four isolation valves
 - Four dump valves
 - Two traction/stability control supply valves
 - Two traction/stability control isolation valves
 - High pressure accumulator
 - Low pressure accumulator
- Body control module monitors the brake pedal position sensor signal when the brake pedal is applied and sends a high speed serial data message to the electronic brake control module indicating the brake pedal position.
- Brake pressure sensor is used to sense the action of the driver application of the brake pedal. The sensor provides an analog voltage signal that will increase as the brake pedal is applied. The electronic brake control module monitors the brake pressure sensor which is integral to the brake pressure modulator.
- Instrument cluster - The instrument cluster displays the vehicle speed based on the information from the engine control module. The engine control module sends the vehicle speed information via a high speed serial data to the body control module. The body control module then sends the vehicle speed information via a low speed serial data to the instrument cluster in order to display the vehicle speed, either in kilometers or miles, based on the vehicle requirements.
- Multi-axis acceleration sensor - The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The electronic brake control module receives serial data message inputs from the yaw rate, lateral acceleration and longitudinal acceleration sensor and activates stability control and hill hold start assist function depending on multi-axis acceleration sensor input.
- Multifunction switch - The traction control switch is a multifunction momentary switch. The body control module monitors the signal circuit from the traction control switch and sends a high speed serial data message to the electronic brake control module indicating the switch position. The traction control and stability control are manually disabled or enabled by pressing the traction control switch.
- Steering wheel angle sensor - The electronic brake control module receives serial data message inputs from the steering angle sensor. The steering wheel angle sensor signal is used to calculate the intended driving direction.

The steering wheel angle sensor is installed as an internal part of the power steering gear.

- Transmission control module - The electronic brake control module receives high speed serial data message inputs from the transmission control module indicating the gear position of the transmission for hill start assist or hill hold functions.
- Active wheel speed sensors - The electronic brake control module supplies a ignition voltage to each wheel speed sensor. As the wheel spins, the wheel speed sensor produces an alternating current square wave signal. The electronic brake control module uses the frequency of the square wave signal to calculate the wheel speed. The electronic brake control module sends the wheel speed information via high speed serial data to the engine control module.

Power-Up-Self Test

The electronic brake control module is able to detect many malfunctions whenever the ignition is ON. However, certain failures cannot be detected unless active diagnostic tests are performed on the components. Shorted solenoid coil or motor windings, for example, cannot be detected until the components are commanded ON by the electronic brake control module. Therefore, a power-up self-test is performed to verify correct operation of system components. The electronic brake control module performs the first phase of the power-up self-test when the ignition is first turned ON. This phase consists of internal self-testing of the electronic brake control module along with electrical checks of system sensors and circuits.

Initialization Sequence

The initialization sequence cycles each solenoid valve and the pump motor, as well as the necessary relays, for approximately forty milliseconds to check component operation. One of the checks performed is the adaptive pressure calibration that occurs when the engine is running and the brake pedal is not applied. The adaptive pressure calibration will cycle each of the six isolation valves to verify valve operation. The initialization sequence may be heard and felt while it is taking place, and is considered part of normal system operation. The active test is initiated by the electronic brake control module at the start of the ignition cycle and the speed of the fastest wheel exceeds 16 km/h (10 MPH). If a fault condition is detected the electronic brake control module sets a DTC.

ABS

When wheel slip is detected during a brake application, an ABS event occurs. During ABS braking, hydraulic pressure in the individual wheel circuits is controlled to prevent any wheel from slipping. A separate hydraulic line and specific solenoid valves are provided for each wheel. The ABS can decrease, hold, or increase hydraulic pressure to each wheel. The ABS does not, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking.

During ABS braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the electronic brake control module responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during ABS braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During ABS braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during ABS operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal. Brake pedal operation during normal braking is no different than that of previous non-ABS systems. Maintaining a constant force on the brake pedal provides the shortest stopping distance while maintaining vehicle stability. The typical ABS activation sequence is as follows.

Pressure Hold

The electronic brake control module closes the isolation valve and keeps the dump valve closed in order to isolate the slipping wheel when wheel slip occurs. This holds the pressure steady on the brake so that the hydraulic pressure does not increase or decrease.

Pressure Decrease

If a pressure hold does not correct the wheel slip condition, a pressure decrease occurs. The electronic brake control module decreases the pressure to individual wheels during deceleration when wheel slip occurs. The isolation valve is closed and the dump valve is opened. The excess fluid is stored in the accumulator until the pump can return the fluid to the master cylinder or fluid reservoir.

Pressure Increase

After the wheel slip is corrected, a pressure increase occurs. The electronic brake control module increases the pressure to individual wheels during deceleration in order to reduce the speed of the wheel. The isolation valve is opened and the dump valve is closed. The increased pressure is delivered from the master cylinder.

Traction Control

When drive wheel slip is noted, the electronic brake control module will enter traction control mode.

First, the electronic brake control module requests the engine control module to reduce the amount of torque to the drive wheels via a serial data message. The engine control module reduces torque to the drive wheels and reports the amount of delivered torque.

If the engine torque reduction does not reduce drive wheel slip, the electronic brake control module will actively apply the brakes on the slipping drive wheel. During traction control braking, hydraulic pressure in each drive wheel circuit is controlled to prevent the drive wheels from slipping. The electronic brake control module commands the pump motor and appropriate solenoid valves ON and OFF to apply brake pressure to the slipping wheel.

Traction control can be manually disabled or enabled by pressing the traction control switch.

Stability Control

Stability control provides added stability during aggressive maneuvers. Yaw rate is the rate of rotation about the vehicle's vertical axis. The stability control is activated when the electronic brake control module determines that the desired yaw rate does not match the actual yaw rate as measured by the yaw rate sensor.

The desired yaw rate is calculated by the electronic brake control module using the following inputs:

- Steering wheel position
- Vehicle speed
- Lateral acceleration

The difference between the desired yaw rate and the actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. When a yaw rate error is detected, the electronic brake control module attempts to correct the vehicle's yaw motion by applying brake pressure to one or more of the wheels. The amount of applied brake pressure varies, depending on the correction required. The engine torque may be reduced also, if it is necessary to slow the vehicle while maintaining stability.

Stability control activations generally occur in turns during aggressive driving. When braking during stability control activation, the brake pedal may pulsate.

Stability control can be manually disabled or enabled by pressing and holding the traction control switch for five seconds.

Dynamic Rear Proportioning

The dynamic rear proportioning is a control system that replaces the mechanical proportioning valve. Under certain driving conditions the electronic brake control module will reduce the rear wheel brake pressure by commanding the appropriate solenoid valves ON and OFF.

Hill Descent Control System (RPO JHD)

The hill descent control system allows a smooth and controlled hill descent in rough terrain without the driver needing to touch the brake pedal. The vehicle will automatically decelerate to a low speed and remain at that speed while activated. Some noise or vibration from the brake system may be apparent when the system is active. The descent control system may be activated, if equipped, by pressing the button on the console. To activate, press the button when traveling at speeds less than 50 km/h (30 MPH). To deactivate, press the button on the console, the brake pedal, or the accelerator. Descent control enables the vehicle to descend using the ABS to control each wheel's speed. If the vehicle accelerates without driver input, the system automatically applies the brakes to slow the vehicle down to the desired speed.

Hill Hold Start Assist

The hill hold start assist allows the driver to launch the vehicle without a roll back while moving the foot from the brake pedal to the accelerator pedal. The electronic brake control module calculates the brake pressure, which is needed to hold the vehicle on an incline and locks that pressure for a certain time by commanding the appropriate solenoid valves ON and OFF when the brake pedal is released. Hill hold start assist is activated when the electronic brake control module determines that the driver wishes to move the vehicle up-hill, either backwards or forwards.

The following inputs are used for hill hold start assist feature:

- Accelerator pedal position
- Brake switch
- Brake pressure
- Clutch switch, if equipped
- Engine torque
- Longitudinal acceleration
- Transmission gear information
- Vehicle speed

Cornering Brake Control

Cornering brake control is a slip control function that is intended to improve the vehicle's lateral/yaw stability during combined braking and cornering situations.

The electronic brake control module will reduce the brake pressure to the inside wheels by commanding the appropriate solenoid valves ON and OFF.

Hydraulic Brake Assist

The hydraulic brake assist function is designed to support the driver in emergency braking situations.

The electronic brake control module receives inputs from the brake pressure sensor. When the electronic brake control module senses an emergency braking situation, the electronic brake control module will actively increase the brake pressure to a specific maximum.

Intelligent Brake Assist

The intelligent brake assist function is designed to provide limited braking to help prevent front and rear low speed collisions.

The electronic brake control module receives inputs from the brake pedal position sensor, wheel speed sensors, short range radar and ultrasonic sensors to detect a collision. When the electronic brake control module senses a possible collision, it will actively increase the hydraulic brake pressure to apply the brakes.

Optimized Hydraulic Braking System

With some engines the electronic brake control module monitors the vacuum in the brake booster with a vacuum sensor and controls a brake booster vacuum pump depending on vacuum sensor input. It also has a hydraulic brake boost feature which supplements the brake system to maintain consistent brake performance under conditions of low brake booster vacuum. Low brake booster vacuum conditions can include initial start up after the vehicle has been parked for several hours, very frequent brake stops, or high altitude driving. The hydraulic brake boost system activates only during a brake apply under low vacuum conditions. In this case the electronic brake control module will actively increase and control the hydraulic brake pressure by turning the pump motor ON and the appropriate solenoid valves ON and OFF. When hydraulic brake boost is active, a series of rapid pulsations is felt in the brake pedal.

Trailer Brake Control System

A trailer brake control system is used to control the amount of trailer braking power that is made available to trailers with brakes that require a controlled output electrical signal for actuation. The trailer brake control system determines the trailer brake type (Electric Brake or Electric Over Hydraulic Brake) automatically.

Trailer Sway Control

The trailer sway control will detect any vehicle yaw instability, caused by an attached trailer. When instability is detected, the electronic brake control module attempts to correct the vehicle's yaw motion by applying brake pressure to one or more of the wheels. The engine torque may be reduced also, if it is necessary to slow down the vehicle.

Driver Information Indicators

Brake Warning Indicator

The instrument cluster turns the brake warning indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The body control module detects that the parking brake is engaged. The instrument cluster receives a serial data message from the body control module requesting illumination.
- The electronic brake control module detects a faulty pump motor, solenoid valves, an internal hardware failure or a too high or too low battery voltage and sends a serial data message to the instrument cluster requesting illumination.

ABS Indicator

The instrument cluster turns the ABS indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The electronic brake control module detects a malfunction which disables the ABS and sends a serial data message to the instrument cluster requesting illumination.

Hill Descent Control Indicator (RPO JHD)

The instrument cluster turns the hill descent control indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The driver manually enables or disables the hill descent control by pressing the hill descent control switch. The electronic brake control module sends a serial data message to the instrument cluster requesting illumination.

Traction Control Off Indicator

The instrument cluster turns the traction control off indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The driver manually disables the traction control by pressing the traction control switch. The electronic brake control module sends a serial data message to the instrument cluster requesting illumination.

Stability Control Off Indicator

The instrument cluster turns the stability control off indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The driver manually disables the stability control by pressing and holding the traction control switch for five seconds. The electronic brake control module sends a serial data message to the instrument cluster requesting illumination.

Traction/Stability Control Indicator

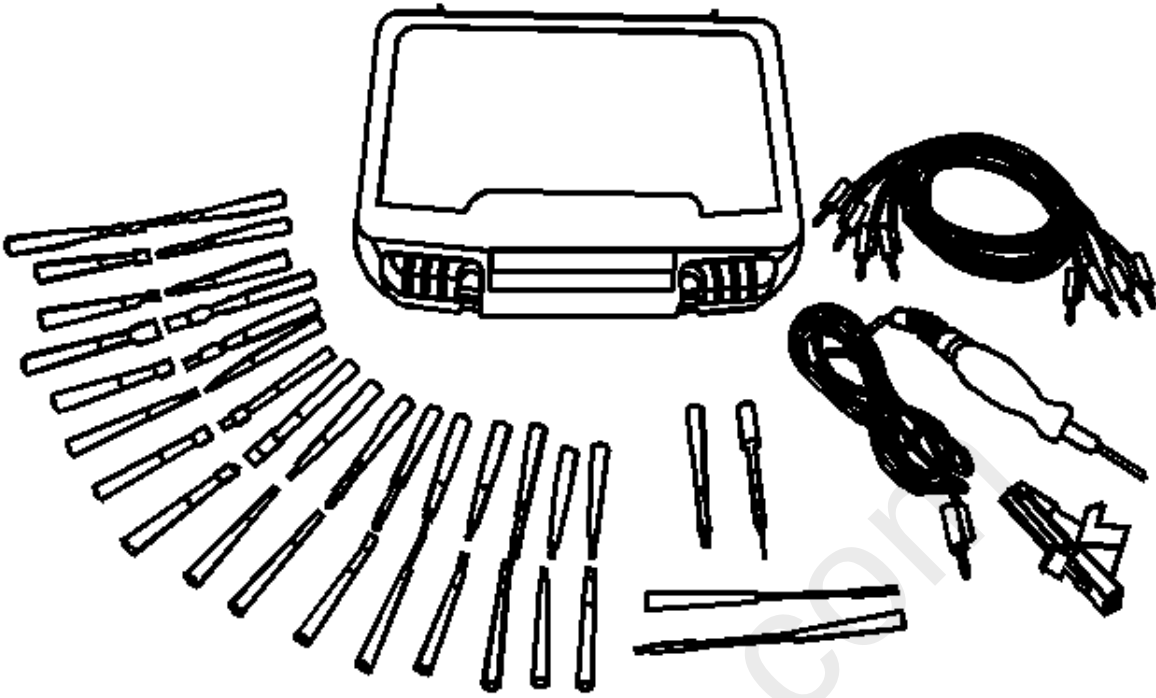
The instrument cluster turns the traction/stability control indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The ABS system is in traction control or stability control mode.
- The electronic brake control module detects a traction/stability control disabling malfunction and sends a serial data message to the instrument cluster requesting illumination.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description

Illustration	Tool Number/Description
	EL 35616-F J 35616 Terminal Test Kit