

FASTENER SPECIFICATIONS

NOTE:

Application	Specification
	Metric (English)
Brake Pipe Fitting	19 N.m (14 lb ft)
Brake Pressure Modulator Valve Bracket Bolt	9 N.m (80 lb in)
Brake Pressure Modulator Valve Bracket Nut	9 N.m (80 lb in)
Brake Pressure Modulator Valve Nut	8 N.m (71 lb in)
Brake Pressure Modulator Valve Primary Pipe Fitting	32 N.m (24 lb ft)
Brake Pressure Modulator Valve Secondary Pipe Fitting	32 N.m (24 lb ft)
Electronic Brake Control Module Bolt	3 N.m (27 lb in)
Wheel Speed Sensor Bolt	10 N.m (89 lb in)

ANTILOCK BRAKE SYSTEM WIRING SCHEMATICS

Wheel Speed Sensors and Controls

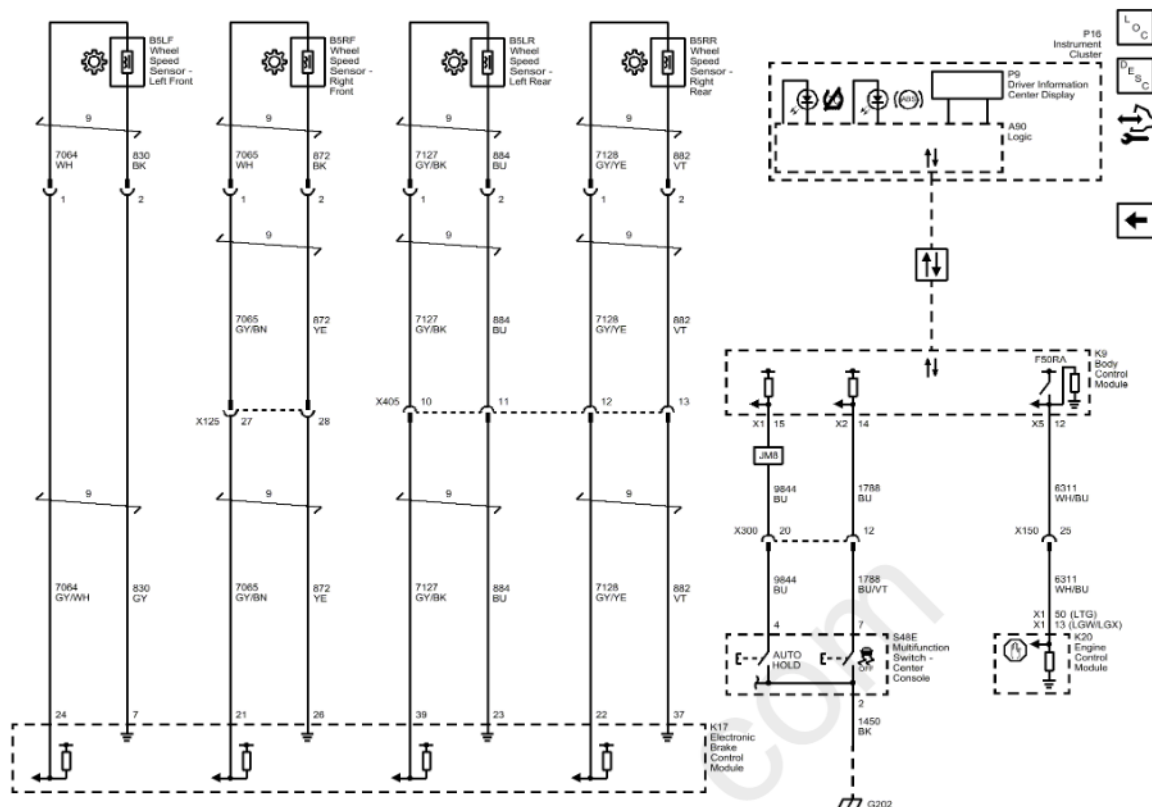


Fig. 2: Wheel Speed Sensors and Controls
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B0000: VEHICLE SPEED INFORMATION CIRCUIT

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 B0000

Vehicle Speed Information Circuit

For symptom byte information, refer to **Symptom Byte List**.

Circuit/System Description

The wheel speeds are detected by active wheel speed sensors. 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. The electronic brake control module sends the wheel speed information as a high speed serial data message. Some modules connected to the high speed bus monitor for the wheel speed information. The DTC is set when the wheel speed information has not been received.

Conditions for Running the DTC

Vehicle speed greater than 40 km/h (25 MPH).

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 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. Drive the vehicle in a straight line at a speed greater than 40 km/h (25 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.
 - **If each parameter is within 4 km/h (2.5 MPH) of each other**
3. All OK.

Circuit/System Testing

1. Ignition ON.
2. Verify that DTC U0121, U2099, C0035, C0040, C0045 or C0050 is not set.
 - **If any of the DTCs are set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If none of the listed DTCs are set**
3. Replace the K17 Electronic Brake Control Module.
4. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.

- If the DTC sets

Replace the module that set the DTC.

- 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.

DTC B2745: TRACTION CONTROL SWITCH CIRCUIT

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
Traction Control Switch Signal	B2745 02	1, P159F 00	1	-
Traction Control Switch Ground	-	1, P159F 00	-	-
1. Traction Control Switch Malfunction.				

Circuit/System Description

The body control module monitors the electronic stability control switch. When the electronic stability control switch is pressed once, the body control module will request the electronic brake control module via serial data to disable the traction control. When the electronic stability control switch is pressed and held for five S, the body control module will request the electronic brake control module to disable the stability control. The Electronic Brake Control Module will request the Instrument Cluster 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

- 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.

Schematic Reference

Antilock Brake System Schematics

Connector End View Reference

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ABS Description and Operation

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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 indicators listed below turn ON and OFF when commanding the All Indicators ON and OFF with a scan tool.
 - Traction Control Off indicator
 - Stability Control Off indicator
 - Traction/stability Control indicator
 - **If any indicator does not turn ON and OFF**

Replace the P16 Instrument Cluster.
 - **If all indicators turn ON and OFF**
3. Verify the scan tool Body Control Module, Traction Control Switch parameter changes between Active and Inactive while pressing and releasing the S48E Multifunction Switch.
 - **If the parameter does not change**

Refer to Circuit/System Testing.
 - **If the parameter changes**
4. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48E Multifunction Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 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.
 - **If less than 10 Ω**
3. Ignition ON.
 4. Verify the scan tool Body Control Module, Traction Control Switch parameter is Inactive.
 - **If Active**
 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.
 - **If Inactive**
 5. Install a 3 A fused jumper wire between the signal circuit terminal 7 and ground.
 6. Verify the scan tool Traction Control Switch parameter is Active.
 - **If Inactive**
 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.
 - 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.
 - **If Active**
 7. Test or replace the S48E Multifunction Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S48E Multifunction Switch.
2. Test for infinite resistance between the signal terminal 7 and the ground terminal 2 with the switch in the open position.
 - **If less than infinite resistance**
Replace the S48E Multifunction Switch.
 - **If infinite resistance**
3. Test for less than 2 Ω between the signal circuit terminal 7 and the ground terminal 2 with the switch in the closed position.
 - **If 2 Ω or greater**
Replace the S48E Multifunction Switch.
 - **If less than 2 Ω**
4. All OK.

Repair Instructions

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

- [Front Floor Console Trim Plate Replacement](#)
- [Control Module References](#) for Control Module or Instrument Cluster replacement, programming and setup.

DTC C0035-C0051: LEFT/RIGHT FRONT/REAR WHEEL SPEED SENSOR

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 C0036

Left Front Wheel Speed Sensor Range Performance

DTC C003A

Front Wheel Speed Sensor Circuit

DTC C0040

Right Front Wheel Speed Sensor Circuit

DTC C0041

Right Front Wheel Speed Sensor Range Performance

DTC C0045

Left Rear Wheel Speed Sensor Circuit

DTC C0046

Left Rear Wheel Speed Sensor Range Performance

DTC C0050

Right Rear Wheel Speed Sensor Circuit

DTC C0051

Right Rear Wheel Speed Sensor Range Performance

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 High - Left Front	C0035 00, C0035 02	C0035 00, C0035 06	C0245 00, C0245 01	C0035 18, C0035 0F, C0035 27
Signal Low - Left Front	C0035 00, C0035 02	C0035 00, C0035 06	C0035 00	C0035 18, C0035 0F, C0035 27
Signal High - Right Front	C0040 00, C0040 02	C0040 00, C0040 06	C0245 00, C0245 01	C0040 18, C0040 0F, C0040 27
Signal Low - Right Front	C0040 00, C0040 02	C0040 00, C0040 06	C0040 00	C0040 18, C0040 0F, C0040 27
Signal High - Left Rear	C0045 00, C0045 02	C0045 00, C0045 06	C0245 00, C0245 01	C0045 18, C0045 0F, C0045 27, C0055 67
Signal Low - Left Rear	C0045 00, C0045 02	C0045 00, C0045 06	C0045 00	C0045 18, C0045 0F, C0045 27, C0055 67
Signal High - Right Rear	C0050 00, C0050 02	C0050 00, C0050 06	C0245 00, C0245 01	C0050 18, C0050 0F, C0050 27, C0055 67
Signal Low - Right Rear	C0050 00, C0050 02	C0050 00, C0050 06	C0050 00	C0050 18, C0050 0F, C0050 27, C0055 67

Component	Condition	DTC Symptom Byte
Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or worn wheel bearing - Loose or improperly mounted sensor - Air gap between the wheel speed sensor and the encoder ring too large - Water intrusion in the wiring harness - Incorrect part wheel speed sensor installed - Wheel speed sensor installed on incorrect side of same axle	08, 0F, 27, 29, 66 or 67

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 7 mA (Low) and 14 mA (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

C0035 00 - C0050 00, C0035 18 - C0050 18 or C0035 27 - C0050 27

Ignition ON

C0035 0F - C0050 0F or C0035 5A - C0050 5A

Vehicle speed is greater than 60 km/h (37 MPH).

Conditions for Setting the DTC

C0035 00, C0040 00, C0045 00 or C0050 00

- A short to ground or open/high resistance on the wheel speed sensor signal high circuit is detected for 0.2 sec.
- A short to voltage, short to ground or open/high resistance on the wheel speed sensor signal low circuit is detected for 0.2 sec.

C0035 18, C0040 18, C0045 18 or C0050 18

- An erratic wheel speed sensor signal is detected.

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.
- Air gap between the wheel speed sensor and the encoder ring.
- Electrical magnetic interference with the wheel speed sensor harness.

C0035 27, C0040 27, C0045 27 or C0050 27

- Debris on the wheel speed sensor tone ring.
- Missing tooth or teeth on the wheel speed sensor tone ring.

- Air gap between the wheel speed sensor and the encoder ring too large.

C0035 67, C0040 67, C0045 67 or C0050 67

- An incorrect part wheel speed sensor signal is detected.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The traction/stability control indicator turns ON.
- A driver information center message may be displayed.
- The electronic brake control module disables the ABS, the traction control and the electronic stability program 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.
- Inspect the wheel encoder ring for rust or corrosion.
- Inspect the wheel speed sensors and components for the correct parts.
- If two or more wheel speed sensors are inoperative, diagnose each wheel speed sensor individually.
- If symptom code 0F, 27 or 5A is 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 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. Drive the vehicle in a straight line at a speed greater than 40 km/h (25 MPH).
2. Verify all scan tool Wheel Speed Sensor parameters are within 1.6 km/h (1 MPH) of each other.

- **If any parameter is not within 1.6 km/h (1 MPH) of each other.**

Refer to Circuit/System Testing.

- **If each parameter is within 1.6 km/h (1 MPH) of each other.**

3. All OK.

Circuit/System Testing

1. Inspect the appropriate B5 Wheel Speed Sensor and encoder ring for contamination, metallic particles, physical damage, incorrect installation and the correct component.

- **If contamination, physical damage, incorrect installation or the wrong component is diagnosed**

Repair or replace the applicable component.

- **If no contamination, physical damage, incorrect installation or the wrong component is not diagnosed**

2. 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.

3. 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 7 and terminal 24
- B5LR Wheel Speed Sensor - Left Rear - terminal 23 and terminal 39
- B5RF Wheel Speed Sensor - Right Front - terminal 26 and terminal 21
- B5RR Wheel Speed Sensor - Right Rear - terminal 37 and terminal 22
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

4. Ignition OFF.

5. 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 7 and terminal 24
- B5LR Wheel Speed Sensor - Left Rear - terminal 23 and terminal 39
- B5RF Wheel Speed Sensor - Right Front - terminal 26 and terminal 21
- B5RR Wheel Speed Sensor - Right Rear - terminal 37 and terminal 22
- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

6. 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 24
- B5LR Wheel Speed Sensor - Left Rear - terminal 39
- B5RF Wheel Speed Sensor - Right Front - terminal 21
- B5RR Wheel Speed Sensor - Right Rear - terminal 22
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

7. 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 7
- B5LR Wheel Speed Sensor - Left Rear - terminal 23
- B5RF Wheel Speed Sensor - Right Front - terminal 26
- B5RR Wheel Speed Sensor - Right Rear - terminal 37
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

8. Replace the B5 Wheel Speed Sensor.

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

- **If the DTC sets**

Replace the K17 Electronic Brake Control Module.

- **If the DTC does not set**

10. All OK.

Repair Instructions

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

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

DTC C0055: REAR WHEEL SPEED SENSOR CIRCUIT

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 C0055

Rear Wheel Speed Sensor Circuit

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

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 Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

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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.

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.

- **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.

- **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.

DTC C005A: SIMULTANEOUS MALFUNCTION OF BOTH WHEEL SPEED SENSORS ON ONE AXLE 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 C005A

Simultaneous Malfunction of Both Wheel Speed Sensors on One Axle Malfunction

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

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 module uses the frequency of the square wave signal to calculate the wheel speed.

Conditions for Running the DTC

- Vehicle in Service Mode or Vehicle ON
- Ignition voltage is greater than 10 V.
- Two wheel speeds are greater than 5 km/h (3 MPH).

Conditions for Setting the DTC

Simultaneous dropout of both wheel speed sensors on the same axle.

Actions Taken when the DTC Sets

- The ABS indicator turns ON.
- The red brake indicator turns ON.
- The traction control/stability control indicator turns ON.
- The Service Brake Assist and Service StabiliTrak messages are displayed on the driver information center.
- The electronic brake control module disables the antilock brake system, the dynamic rear proportioning, the traction control system and the electronic stability program for the duration of the drive cycle.

Conditions for Clearing the DTC

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

Reference Information

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Antilock Brake System Schematics

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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 C005A is not set.
 - **If the DTC is set**

Refer to [DTC C0035-C0051](#).
 - **If the DTC is not set**
3. All OK.

DTC C0110: PUMP MOTOR CIRCUIT 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 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 07	C0110 39, C0110 59
Ground	-	C0110 00	-	-

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

- 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

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

C0110 03

Low voltage is detected in the pump motor circuit.

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

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ABS Description and Operation

Electrical Information Reference

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- [Connector Repairs](#)
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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 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.
 - **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.
 - **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.
 - **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.

- **If the DTC does not set**

7. All OK.

Repair Instructions

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

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

DTC C0115: PUMP MOTOR STUCK

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 C0115 61

Pump Motor Stuck

Diagnostic Fault Information

Component	Condition	DTCs
Pump Motor	• Wear • Damage • Lock	C0115 61

Circuit/System Description

The pump motor is an integral part of the brake pressure modulator valve, 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 stability control operation is required, the electronic brake control module activates the pump motor relay and turns the pump motor ON.

Conditions for Running the DTC

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

Conditions for Setting the DTC

- 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

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

Diagnostic Aids

DTC C0115 61 may set due to extended operation of the ABS, traction control or the stability control system. Review with the customer the conditions under which the DTC set.

Reference Information

Schematic Reference

Antilock Brake System 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 C0110 is not set.
 - **If DTC C0110 is set**
Refer to **DTC C0110**.
 - **If DTC C0110 is not set**
3. Verify that DTC C0115 does not set while driving the vehicle under normal braking conditions.
 - **If DTC C0115 sets**
Replace the Q5 Brake Pressure Modulator.
 - **If DTC C0115 does not set**
4. All OK.

Repair Instructions

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

- **Brake Pressure Modulator Valve Replacement**
- **Control Module References** for Control Module replacement, programming and setup.

DTC C0116: PUMP MOTOR RELAY CIRCUIT

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 C0116

Pump Motor Relay Circuit

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

Diagnostic Fault Information

Component	Condition	DTCs
Pump motor relay	• Wear • Damage • Lock	C0116

Circuit/System Description

The pump motor is an integral part of the brake pressure modulator valve assembly, 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, traction control or stability control operation is required, the electronic brake control module activates the pump motor relay and turns the pump motor ON.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

- The pump motor relay has an internal failure
- The pump motor relay voltage is greater than threshold.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Antilock Brake System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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 C0110 is not set.
 - **If DTC C0110 is set**

Refer to **DTC C0110** to diagnose that DTC prior to this diagnostic.
 - **If DTC C0110 is not set**
3. Replace the K17 Electronic Brake Control Module.

Repair Instructions

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

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

DTC C0121: VALVE RELAY CIRCUIT 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 C0121

Valve Relay 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+	C0121 00	C0121 00	-	-
Ground	-	C0121 00	-	-

Circuit/System Description

The valve relay is an integral part of the electronic brake control module (EBCM), while the solenoid valves are integral to the brake pressure modulator valve assembly. The valve relay is engaged during normal system operation and provides voltage to the solenoid valves. When the ABS control operation is required, the EBCM controls the solenoid valves by providing ground to the active solenoid valves.

Conditions for Running the DTC

- Vehicle speed is greater than 6 km/h (4 MPH) with the brake pedal not applied.
- OR
- Vehicle speed is greater than 15 km/h (9 MPH) and the brake pedal is not actuated.

Conditions for Setting the DTC

- The EBCM is requesting valve activation and the relay output voltage is low.
- The EBCM is not requesting valve activation and the relay output voltage is B+.
- The EBCM detects 3 or more solenoid valve circuits are open or shorted during the self-test.
- A malfunction exists within the EBCM.

Action Taken When the DTC Sets

- The EBCM disables the ABS for the duration of the ignition cycle.
- The ABS indicator turns ON.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- The EBCM will turn OFF the indicator and enable the system functions in the next ignition cycle.

Reference Information

Schematic Reference

Antilock Brake System 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

Ignition ON, command the ABS Solenoid Valves On and Off with the scan tool. The solenoid valves should turn ON and OFF.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the K17 Electronic Brake Control Module (EBCM).
2. Test for less than 5 Ω between the ground circuit terminals listed below:
 - Ground circuit terminal 14 and ground.
 - Ground circuit terminal 46 and ground.

- **If greater than 5 Ω**

Test/repair the ground circuit for an open/high resistance.

- **If less than 5 Ω**

Replace the K17 Electronic Brake Control Module

Repair Instructions

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

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

DTC C0131: TRACTION CONTROL SYSTEM PRESSURE CIRCUIT

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

Schematic Reference

Antilock Brake System 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. 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](#) .
 - **If the brake stop lamps operate properly**
3. Verify that DTC C0131 is not set.
 - **If the DTC is set**
Replace K17 Electronic Brake Control Module.
 - **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: ANTILOCK BRAKING SYSTEM BRAKE SWITCH CIRCUIT

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

Antilock Braking System Brake Switch Circuit

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

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 stability 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 pedal position 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 six minutes and brake pressure is less than 15 bar (218 PSI).

Conditions for Clearing the DTC

A current DTC clears when the diagnostic runs and passes.

Action Taken When the DTC Sets

No actions are taken

Diagnostic Aids

This DTC may set if the brake pedal is applied while accelerating.

Reference Information

Schematic Reference

Antilock Brake System 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. Verify DTC C0277 or C0890 is not set.
 - **If either DTC is set**

Refer to [DTC C0277 or C0890](#) .
 - **If either DTC is not set**
3. Verify the brake pedal position sensor or the brake pedal is not binding causing residual brake pressure to be detected, while the brake lights operate properly.
 - **If a condition is found**

Repair or replace the applicable component.
 - **If a condition is not found**
4. Verify the scan tool Electronic Brake Control Module Brake Pedal Position Sensor parameter changes between Active and Inactive while applying and releasing the brake pedal.
 - **If the parameter does not change between Active and Inactive**

Refer to [Symptoms - Lighting](#) .
 - **If the parameter changes between Active and Inactive**
5. Refer to [Diagnostic Aids](#), All OK.

DTC C0179: BRAKE SYSTEM CALCULATED COMPONENT OVERHEAT PROTECTION TIME-OUT

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 C0179 59

Brake System Calculated Component Overheat Protection Time-Out

Circuit/System Description

The electronic brake control module monitors how often the traction control or the stability control system activates in order to calculate an estimate of the front brake discs temperature. In most cases the high temperatures are caused by extended traction control activation. If the electronic brake control module calculates that the front brake components temperatures are too high, the electronic brake control module will temporarily suspend the traction control system function until the front brake discs cool down.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The electronic brake control module detects the calculated temperature of the brake components is higher than 500Å,Å°C (932Å,Å°F).

Action Taken When the DTC Sets

- The traction/stability control indicator turns ON.

- The electronic brake control module disables the ABS, the traction control, the stability control and the electronic brake distribution for the duration of the ignition cycle.

Conditions for Clearing the DTC

- 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

DTC C0179 does not indicate a malfunction has occurred. This DTC indicates there was excessive ABS, traction control or stability control activation that caused the high temperatures.

Reference Information

Schematic Reference

Antilock Brake System 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

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

1. Allow the brakes to cool down before performing test.
2. Verify that no other DTCs are set.

- **If any other DTCs are set**

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

- **If no other DTCs are set**

3. Verify DTC C0179 does not set while driving the vehicle under normal braking conditions.

- **If the DTC sets**

Replace the K17 Electronic Brake Control Module.

- **If the 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 replacement, programming and setup.

DTC C0186, C018B, C0196, C019B, C027E OR C0287: LATERAL/LONGITUDINAL ACCELERATION SENSOR SIGNAL

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 (Electronic Brake Control Module)

DTC C018B

Lateral Acceleration Sensor Signal (Multi-axis Acceleration Sensor Module)

DTC C0196

Yaw Rate Signal (Electronic Brake Control Module)

DTC C019B

Yaw Rate Signal (Multi-axis Acceleration Sensor Module)

DTC C027E

Longitudinal Acceleration Sensor Signal (Multi-axis Acceleration Sensor Module)

DTC C0287

Longitudinal Acceleration Sensor Signal (Electronic Brake Control Module)

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 00 or C018B 5A

The lateral acceleration signal is out of the specified range.

C0186 5A

The lateral acceleration signal is not plausible with the yaw rate signal, steering angle signal and vehicle speed.

C0186 71

- The electronic brake control module received an invalid lateral acceleration signal.
- An open/high resistance is detected on the multi-axis acceleration ground circuit.
- A short to ground or open/high resistance is detected on the multi-axis acceleration ignition circuit.

C0196 00 or C019B 5A

The yaw rate signal is out of the specified range.

C0196 5A

- 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.

C0196 71

- A short to ground or open/high resistance is detected on the ignition circuit.
- The electronic brake control module received an invalid lateral acceleration signal.
- An open/high resistance is detected on the multi-axis acceleration ground circuit.

C027E 5A

The longitudinal acceleration signal is not plausible.

C0287 4B

The longitudinal acceleration sensor is not calibrated.

C0287 5A

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

C0287 71

- An open/high resistance is detected on the multi-axis acceleration ground circuit.
- The electronic brake control module received an invalid longitudinal acceleration signal.
- A short to ground or open/high resistance is detected on the multi-axis acceleration ignition circuit.

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 Schematics](#)

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 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.
 - **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**.
 - **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.
 - If the DTC does not set
 - 3. All OK.
 - **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: YAW RATE/LONGITUDINAL ACCELERATION SIGNAL

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

[Antilock Brake System 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 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.
 - **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](#).
 - **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.
 - If the DTC does not set
 3. All OK.
 - **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.

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

Engine 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 Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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](#).
 - **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.
 - **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: WHEEL SPEED SENSOR FREQUENCY

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

Wheel Speed Sensor Frequency

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

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	-

Component	Condition	DTC Symptom Byte
Wheel Speed Sensor	Wheel speed sensor incorrectly mounted	66

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 7 mA (Low) and 14 mA (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 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. 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.
 - **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.
 - If the DTC does not set
 - 4. All OK.
 - **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 Left Front Wheel Speed Sensor - terminal 7
- B5RF Right Front Wheel Speed Sensor - terminal 26
- B5LR Left Rear Wheel Speed Sensor - terminal 23
- B5RR Right Rear Wheel Speed Sensor - terminal 37
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

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 C0274: ISOLATION VALVE

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

Isolation Valve

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

- 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.

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 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

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** .
 - **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 is 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.
 - **If none of the DTCs are set**
6. 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 C0280: STABILITY SYSTEM ACTIVE TOO LONG

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 C0280

Stability System Active Too Long

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

Circuit/System Description

The solenoid valves are integral parts of the brake pressure modulator valve. The brake pressure modulator valve contains an isolation solenoid valve and a dump solenoid valve for each wheel and a traction/ stability control supply solenoid valve and 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 valves ON.

Conditions for Running the DTC

- Ignition ON
- Vehicle speed is greater than 22 km/h (13.7 MPH).

Conditions for Setting the DTC

Calculated solenoid valve temperature is greater than threshold.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- The traction/stability control indicator turns ON.
- A driver information center message may be displayed.
- 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.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

This DTC may set due to extended operation of the ABS, the traction control or the stability control system.

Reference Information

Schematic Reference

[Antilock Brake System 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 Testing

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

1. Ignition ON.
2. Verify that DTC C0186, C0196, C0287 or C0710 is not set.
 - **If any of the DTCs are set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If none of the DTCs are set**
3. Ignition OFF, allow the hydraulic brake modulator valve to cool down to ambient temperature, ignition ON.
4. Verify the DTC does not set while driving the vehicle under normal braking conditions.
 - **If the DTC sets**
 1. Replace the Q5 Brake Pressure Modulator.
 2. Verify DTC C0280 does not set while driving the vehicle under normal braking conditions.
 - If the DTC does set, replace the K17 Electronic Brake Control Module.
 - If the DTC does not set.
 3. All OK.
 - **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 replacement, programming and setup.

DTC C0561: SYSTEM DISABLED INFORMATION STORED

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 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.
 - If the DTC is not set

3. All OK.

- 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 C0569: SYSTEM CONFIGURATION

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 C0569

System Configuration

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 a 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

- 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

A newly replaced electronic brake control module can set one or more DTCs on its initial ignition ON cycle.

Reference Information

Schematic Reference

[Antilock Brake System 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. Ignition ON.
2. Verify that DTC C0569 is not set.
 - **If the DTC is set**
 1. Reprogram the K17 Electronic Brake Control Module. Refer to **Control Module References** .
 2. Verify DTC C0569 is not set.
 - If the DTC is set, replace the K17 Electronic Brake Control Module.
 - If the DTC is not set
 - 3. All OK.
 - **If the DTC 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 C0710: STEERING WHEEL ANGLE SIGNAL

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 $30^{\circ}/s$.

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 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. 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.
 - **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 U0131 are set.
 - **If DTCs U0126, U0130 or U0131 are set**
 Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTCs U0126, U0130 and U0131 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](#)
 - **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
 - **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

- 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 C1207, C1208, C1221, C1222, C1225, C1226, C1232 OR C1233: LEFT/RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT

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 C1207 00

Left Front Wheel Speed Sensor Circuit High Input Malfunction

DTC C1208 00

Right Front Wheel Speed Sensor Circuit High Input Malfunction

DTC C1221 00

Left Front Wheel Speed Sensor Circuit Malfunction

DTC C1222 00

Right Front Wheel Speed Sensor Circuit Malfunction

DTC C1225 00

Left Front Wheel Speed Sensor Circuit Performance Malfunction

DTC C1226 00

Right Front Wheel Speed Sensor Circuit Performance Malfunction

DTC C1232 00

Left Front Wheel Speed Sensor Circuit Low Input Malfunction

DTC C1233 00

Right Front Wheel Speed Sensor Circuit Low Input Malfunction

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 12 V reference 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 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 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 indicates 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

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

Reference Information

Schematic Reference

Antilock Brake System 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 C0035, C0040, C0045 or C0050 is not set.
 - **If any listed DTC is set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If none of the listed DTCs is 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.
 - **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.

DTC C124F OR C1250-C1254: LATERAL/LONGITUDINAL ACCELERATION SENSOR CIRCUIT

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

Lateral Acceleration Sensor Circuit High Voltage

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 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](#) .
 - **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.
 - **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 C1255: ELECTRONIC CONTROL UNIT PERFORMANCE 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 Descriptors

DTC C1255 00

Electronic Control Unit Performance Malfunction

Circuit/System Description

When the ignition is turned ON, the microprocessor runs a diagnostic program to detect an internal fault when power up is commanded. If an internal malfunction is detected, the control module will set a DTC.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The control module detects an internal malfunction.

Action Taken When the DTC Sets

Specific subsystems will not function or operate in degraded mode.

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 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 Testing

1. Ignition ON.
2. Verify DTC C1255 does not set while operating the vehicle within the Conditions for Running the DTC.
 - **If DTC sets**

Replace the module that set the DTC

- **If DTC does not set**

3. All OK.

Repair Instructions

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

DTC P0856: TRACTION CONTROL TORQUE REQUEST CIRCUIT

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 Circuit

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 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 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](#) .

- **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.

- **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: AUTOMATIC BRAKING ENGINE TORQUE REQUEST SIGNAL MESSAGE COUNTER INCORRECT

[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 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 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](#) .

- **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.

- **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: WHEEL SPEED SENSOR MESSAGE SEQUENCE INCORRECT

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 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

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.

- **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.

- **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 the ABS indicator ON for 5 s after the ignition is turned ON or when the electronic brake control module detects a fault it sends a serial data message to the instrument cluster commanding the indicator ON.

Reference Information

Schematic Reference

[Antilock Brake System 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 DTCs are set.
 - **If any DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If no DTCs are set**
3. Verify the Instrument Cluster ABS indicator turns ON and OFF when commanding the All Indicators ON and OFF with a scan tool.
 - **If ABS indicator does not turn ON and OFF**

Replace the P16 Instrument Cluster.
 - **If the ABS indicator turns ON and OFF**
4. Verify the ABS indicator turns OFF 5 s after the ignition is turned ON.
 - **If the ABS indicator does not turn OFF**

Replace the K17 Electronic Brake Control Module.
 - **If the ABS indicator turns OFF**
5. 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.

AUTOMATIC VEHICLE HOLD 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

Vehicles equipped with RPO JM8 have Automatic Vehicle Hold (AVH). AVH can be turned on by pressing the AVH button with the driver safety belt fastened, the driver door closed and the engine running. The AVH indicator will come on.

This feature will activate when the vehicle is stopped to prevent it from moving. After the brake pedal has been released and before the accelerator pedal has been pressed, AVH uses braking pressure to hold the vehicle stationary. In addition, the ABS pump motor may activate to build brake pressure to maintain the vehicle at a standstill if necessary.

If AVH is holding the vehicle, the AVH indicator will change to green. Once AVH is active it will hold the vehicle for a defined time period then engage the parking brake. While AVH is holding the vehicle, the parking brake will engage if the driver door is opened or the driver safety belt is unfastened. The AVH system does not set any DTCs.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

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. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48E Multifunction Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 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.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module, Automatic Vehicle Hold Switch parameter is Inactive.
 - **If Active**
 1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 15 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and ground.
6. Verify the scan tool Traction Control Switch parameter is Active.
 - **If Inactive**
 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.
 - 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.
 - **If Active**
7. Test or replace the S48E Multifunction Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S48E Multifunction Switch.
2. Test for infinite resistance between the signal terminal 4 and the ground terminal 2 with the switch in the open position.
 - **If less than infinite resistance**

Replace the S48E Multifunction Switch.

- **If infinite resistance**

3. Test for less than 2 Ω between the signal circuit terminal 4 and the ground terminal 2 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S48E Multifunction Switch.

- **If less than 2 Ω**

4. All OK.

Repair Instructions

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

- [Front Floor Console Trim Plate 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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Traction Control Switch Signal	B2745 02	1	1	-
Traction Control Switch Ground	-	1	-	-
1. Traction Control Switch Malfunction.				

Circuit/System Description

The instrument cluster illuminates the traction/stability control indicator, traction control off indicator and stability control off indicator for five seconds 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 traction/stability control indicator ON.

The body control module monitors the electronic stability control switch. When the electronic stability control switch is pressed once, the body control module will request the electronic brake control module via serial data to disable the traction control. When the electronic stability control switch is pressed and held for five seconds, the body control module will request the electronic brake control module to disable the stability control. The Electronic Brake Control Module will request the Instrument Cluster to turn the Traction Control Off and Stability Control Off indicator ON to notify the driver of the deactivation.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

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 Instrument Cluster indicators listed below turn ON and OFF when commanding the All Indicators ON and OFF with a scan tool.
 - Traction Control Off indicator
 - Stability Control Off indicator
 - Traction/stability Control indicator
 - **If any indicator does not turn ON and OFF**

Replace the P16 Instrument Cluster.
 - **If all indicators turn ON and OFF**
3. Verify the scan tool Body Control Module, Traction Control Switch parameter changes between Active and Inactive while pressing and releasing the S48A Multifunction Switch-Instrument Panel.
 - **If the parameter does not change**

Refer to Circuit/System Testing.
 - **If the parameter changes**
4. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch-Instrument Panel. 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 1 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.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Body Control Module, Traction Control Switch parameter is Inactive.
 - **If Active**
 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.

- **If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and ground.

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

- **If Inactive**

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.
- 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.

- **If Active**

7. Test or replace the S48A Multifunction Switch-Instrument Panel.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch-Instrument Panel.

2. Test for infinite resistance between the signal terminal 4 and the ground terminal 1 with the switch in the open position.

- **If less than infinite resistance**

Replace the S48A Multifunction Switch-Instrument Panel.

- **If infinite resistance**

3. Test for less than 2 Ω between the signal circuit terminal 4 and the ground terminal 1 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S48A Multifunction Switch-Instrument Panel.

- **If less than 2 Ω**

4. All OK.

Repair Instructions

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

- [Front Floor Console Trim Plate Replacement](#)
- [Control Module References](#) for Body Control Module or Instrument Cluster 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 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 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.
- 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.

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.

ANTILOCK BRAKE SYSTEM AUTOMATED BLEED

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

CAUTION: Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#).

NOTE: Before performing the ABS Automated Bleed Procedure, first perform a pressure bleed of the base brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) and/or [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

1. Raise and support the vehicle. Refer to [**Lifting and Jacking the Vehicle**](#) .

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.

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 \(Manual\)**](#) and/or [**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 \(Manual\)**](#) and/or [**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 [Master Cylinder Reservoir Filling](#) .

20. Road test the vehicle while inspecting that the pedal remains high and firm.

STEERING WHEEL ANGLE SENSOR CENTERING

The steering angle sensor does not require centering often. Centering of the 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
- Power steering control module replacement

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

1. Using the steering wheel, align and center the front wheels forward.
2. Apply the parking brake or set the transmission in Park.
3. Install the scan tool to the data link connector.
4. Vehicle in Service Mode.
5. With the scan tool select the Power Steering Control Module.
6. Select the Steering Wheel Angle Sensor Centering under Configuration/Reset Functions list.
7. Follow the scan tool directions to complete the learn procedure.
8. With the scan tool select the Electronic Brake Control Module.
9. Select the Steering Wheel Angle Sensor Centering under Configuration/Reset Functions list.
10. Follow the scan tool directions to complete the learn procedure.
11. Clear any DTCs that may be set.
12. Vehicle OFF.

ELECTRONIC BRAKE CONTROL MODULE 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. Engine Wiring Harness Fuse Block Bracket, Å» Remove - [Engine Wiring Harness Fuse Block Bracket Replacement](#)
3. Thoroughly clean the electronic brake control module (EBCM) to brake pressure modulator valve (BPMV) area of any accumulated dirt and debris.
4. Disconnect the EBCM electrical connector.
5. Brake Pressure Modulator Valve Primary Brake Pipe Fitting (1) Å» Disconnect

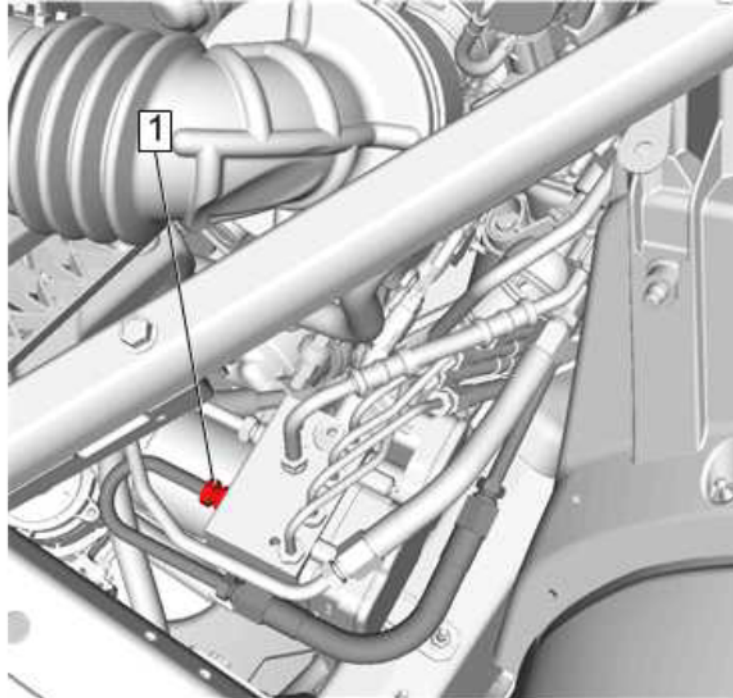


Fig. 3: Brake Pressure Modulator Valve Primary Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

6. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.
7. Electronic Brake Control Module Bolt (1) » Remove [4x]

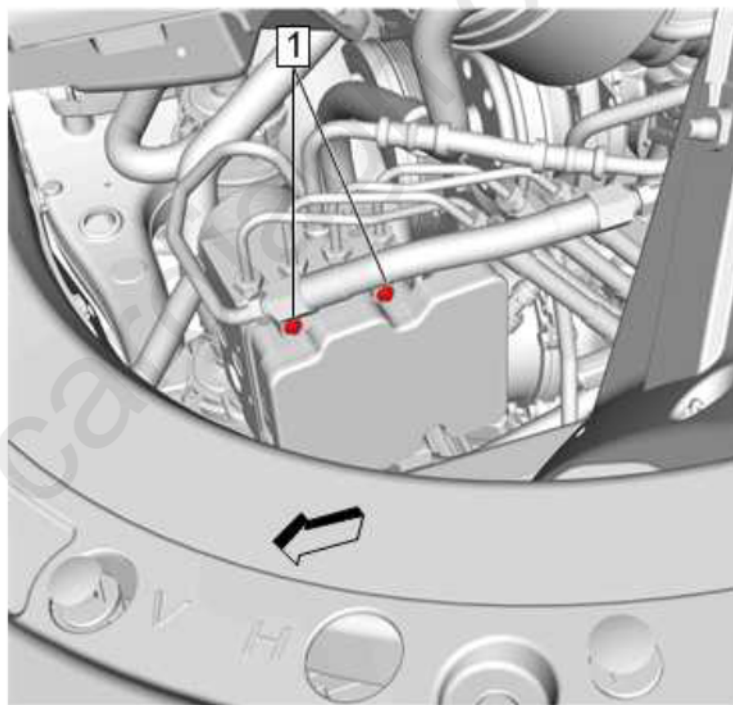


Fig. 4: Electronic Brake Control Module Bolt
 Courtesy of GENERAL MOTORS COMPANY

8. Electronic Brake Control Module (1) » Remove

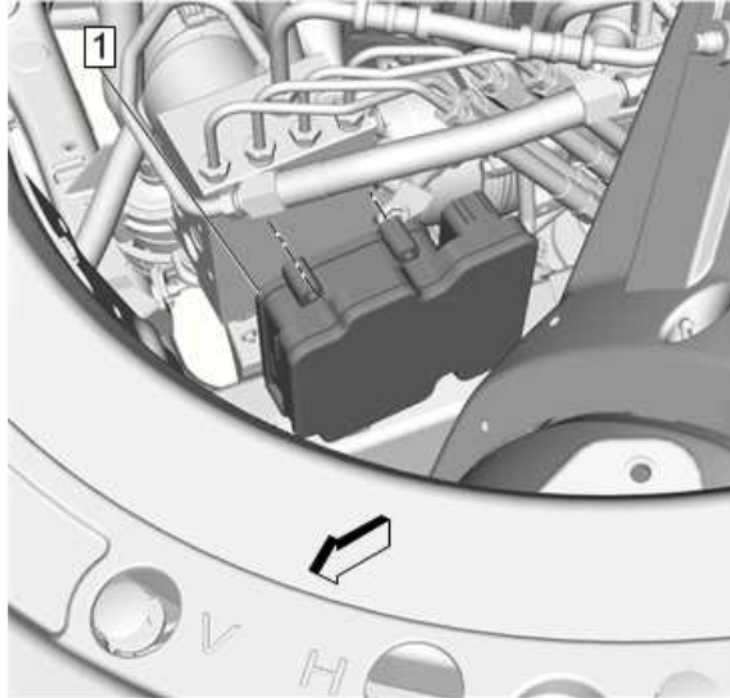


Fig. 5: Electronic Brake Control Module
 Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Electronic Brake Control Module (1)» Install

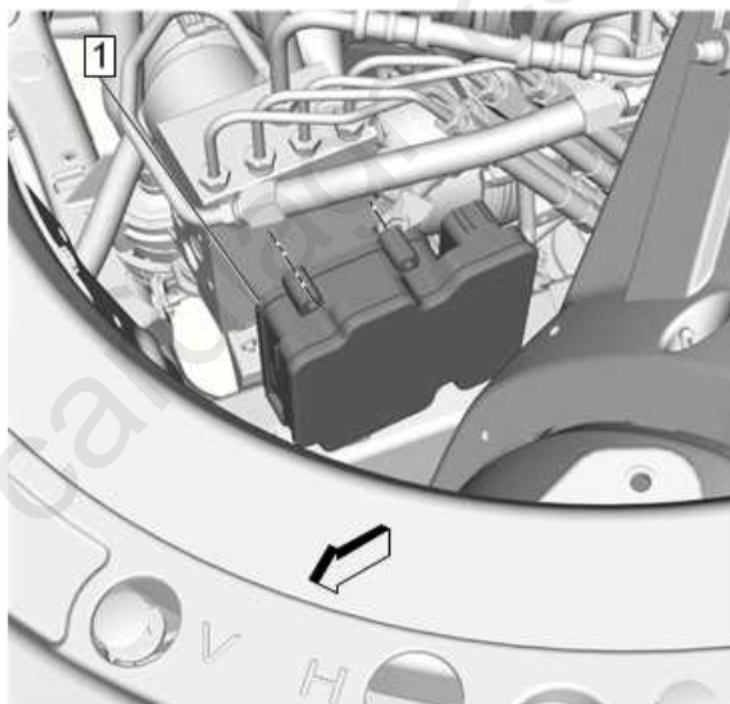


Fig. 6: Electronic Brake Control Module
 Courtesy of GENERAL MOTORS COMPANY

2. Electronic Brake Control Module Bolt (1)» Install and tighten 3 N.m (27 lb in) [4x]

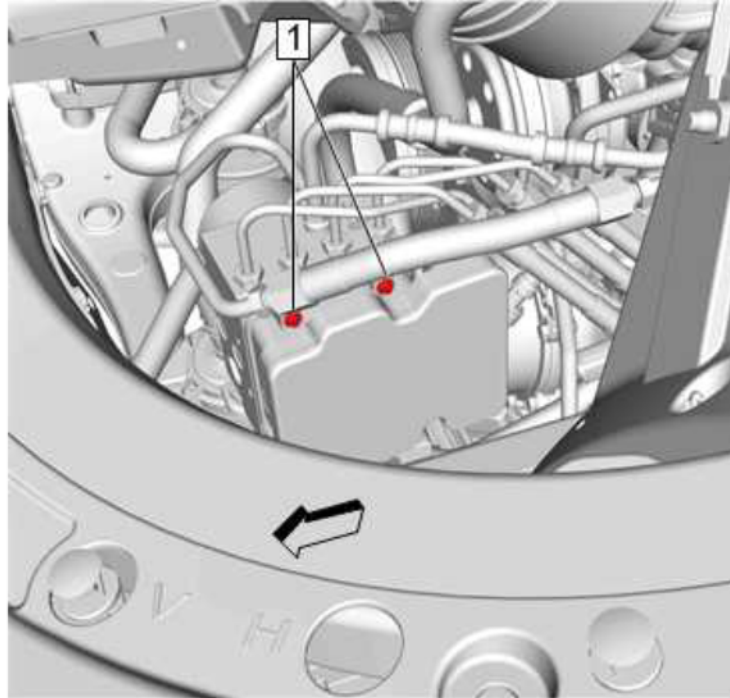


Fig. 7: Electronic Brake Control Module Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Brake Pressure Modulator Valve Primary Brake Pipe Fitting (1)» Install and tighten 32 N.m (24 lb ft)

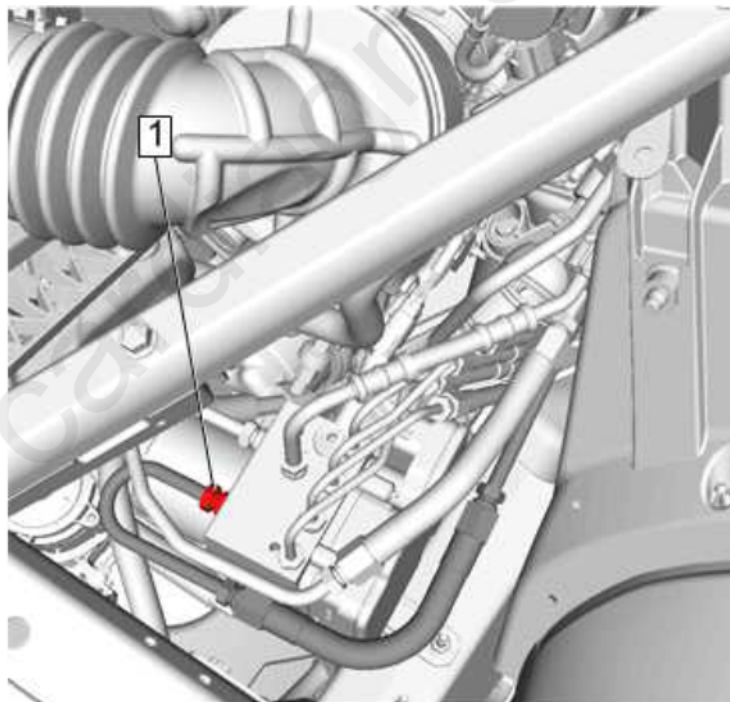


Fig. 8: Brake Pressure Modulator Valve Primary Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

4. Connect the EBCM electrical connector.
5. Bleed the brake system. Refer to [Antilock Brake System Automated Bleed](#)
6. Engine Wiring Harness Fuse Block Bracket» Install - [Engine Wiring Harness Fuse Block Bracket Replacement](#)
7. Program the EBCM. Refer to [Control Module References](#)
8. Center the steering angle sensor. Refer to [Steering Wheel Angle Sensor Centering](#)

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. Engine Wiring Harness Fuse Block Bracket - Remove - Engine Wiring Harness Fuse Block Bracket Replacement
3. Thoroughly clean the electronic brake control module (EBCM) to brake pressure modulator valve (BPMV) area of any accumulated dirt and debris.
4. Disconnect the EBCM electrical connector.
5. Brake Pressure Modulator Valve Primary Pipe Fitting (1) - Disconnect

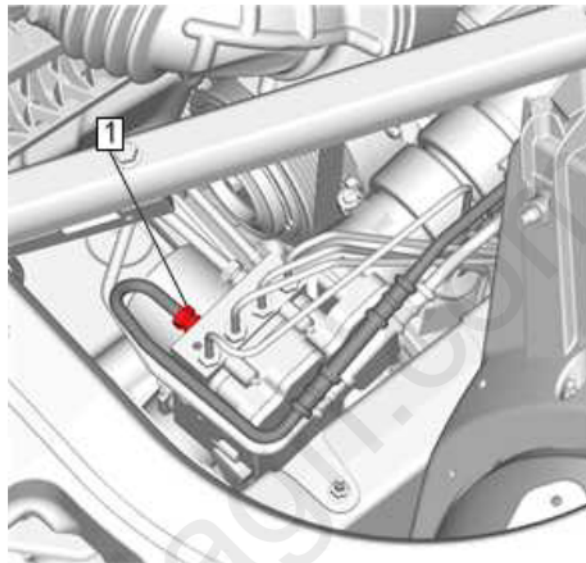


Fig. 9: Brake Pressure Modulator Valve Primary Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

6. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.
7. Brake Pressure Modulator Valve Secondary Pipe Fitting (1) - Disconnect

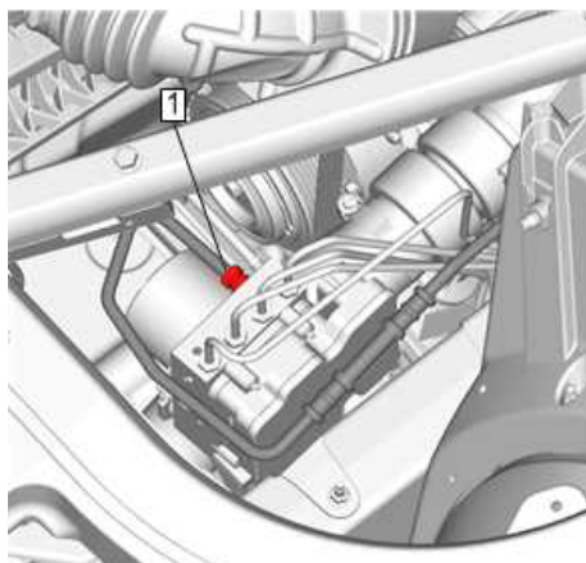


Fig. 10: Brake Pressure Modulator Valve Secondary Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

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

9. Left Rear Brake Pipe Fitting (1) » Disconnect

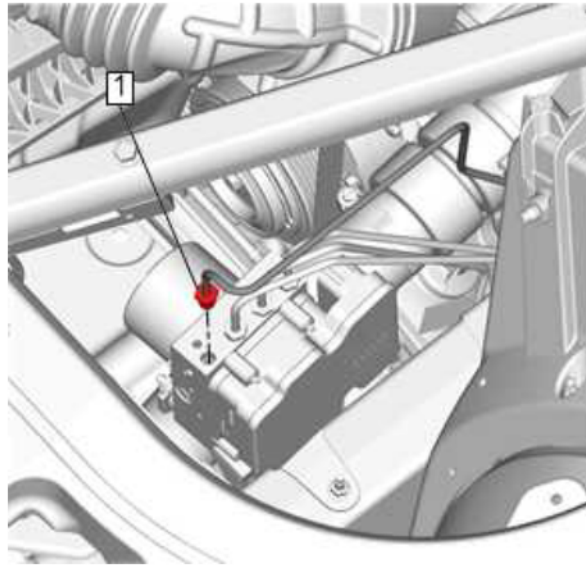


Fig. 11: Left Rear Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

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

11. Right Front Brake Pipe Fitting (1) » Disconnect

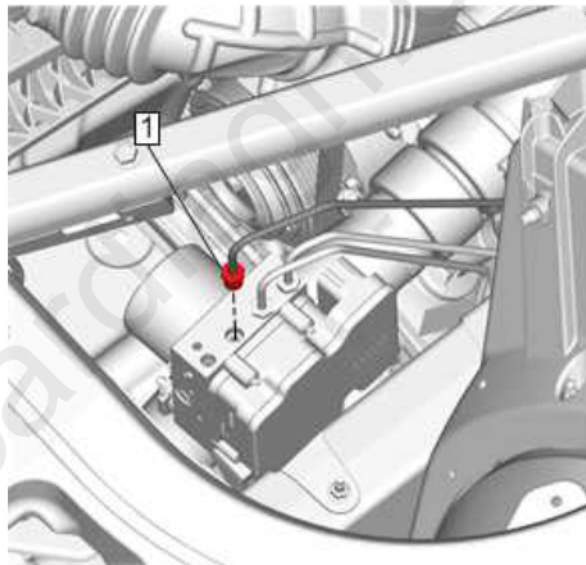


Fig. 12: Right Front Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

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

13. Left Front Brake Pipe Fitting (1) » Disconnect

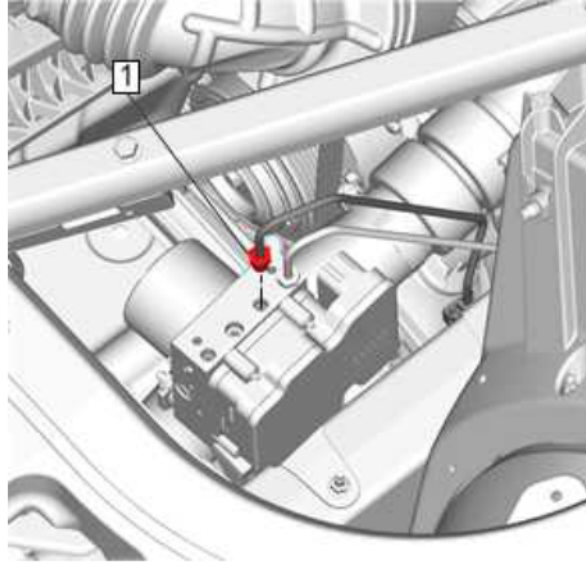


Fig. 13: Left Front Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

14. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
15. Right Rear Brake Pipe Fitting (1) » Disconnect

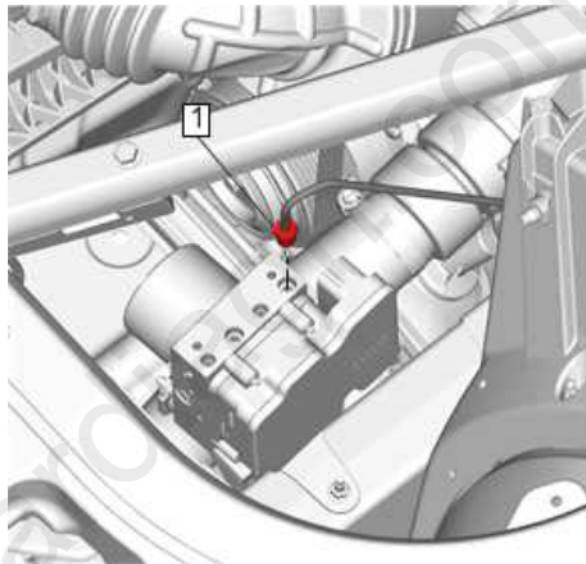


Fig. 14: Right Rear Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

16. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
17. Brake Pressure Modulator Valve Bracket Nut (1) » Remove

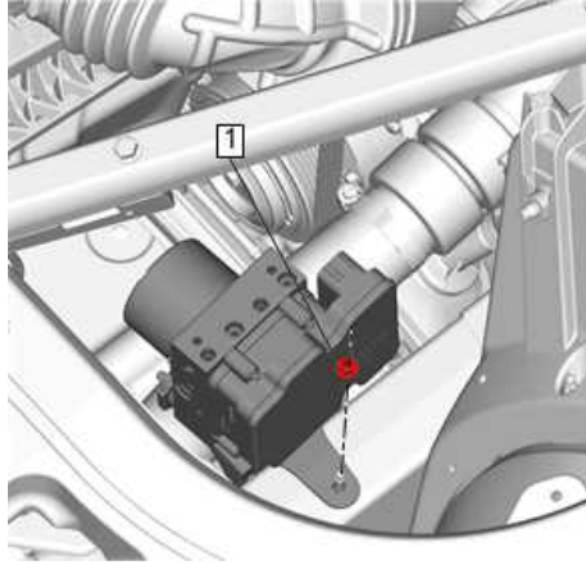


Fig. 15: Brake Pressure Modulator Valve Bracket Nut
 Courtesy of GENERAL MOTORS COMPANY

18. Brake Pressure Modulator Valve Bracket Bolt (1)» Loosen

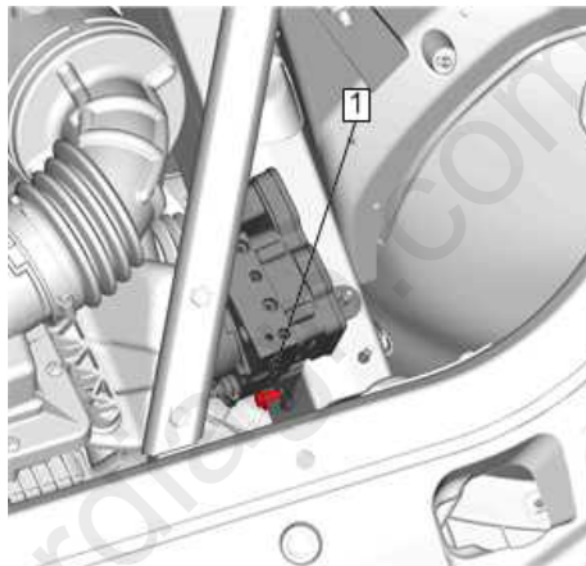


Fig. 16: Brake Pressure Modulator Valve Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

19. Brake Pressure Modulator Valve Bracket Bolt (1)» Loosen

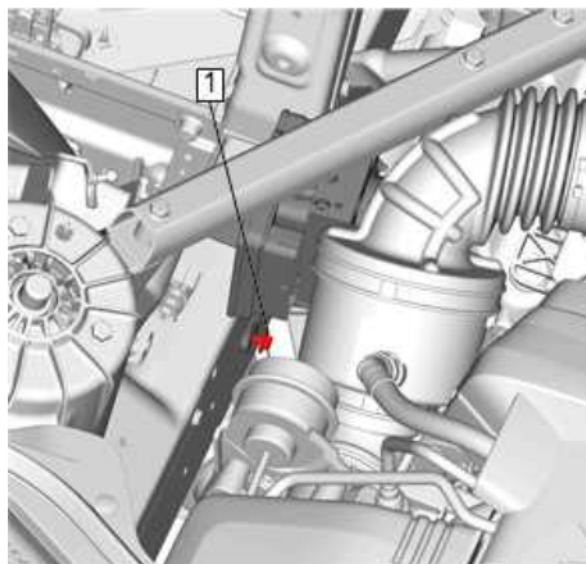


Fig. 17: Brake Pressure Modulator Valve Bracket Bolt
 Courtesy of GENERAL MOTORS COMPANY

20. Brake Pressure Modulator Valve Assembly (1)» Remove

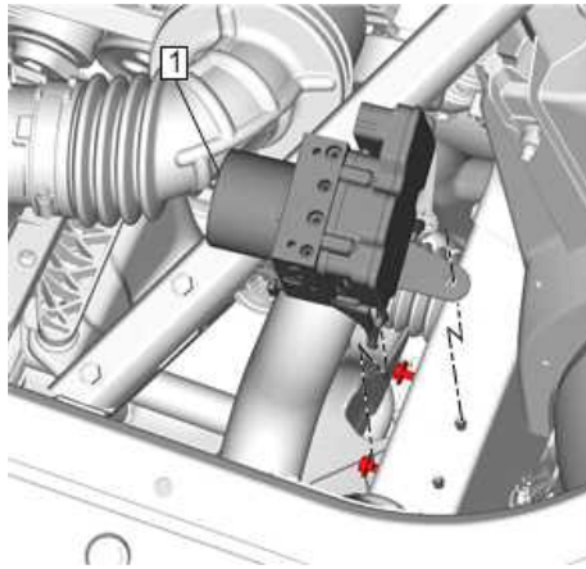


Fig. 18: Brake Pressure Modulator Valve Assembly
Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Brake Pressure Modulator Valve Assembly (1)» Install

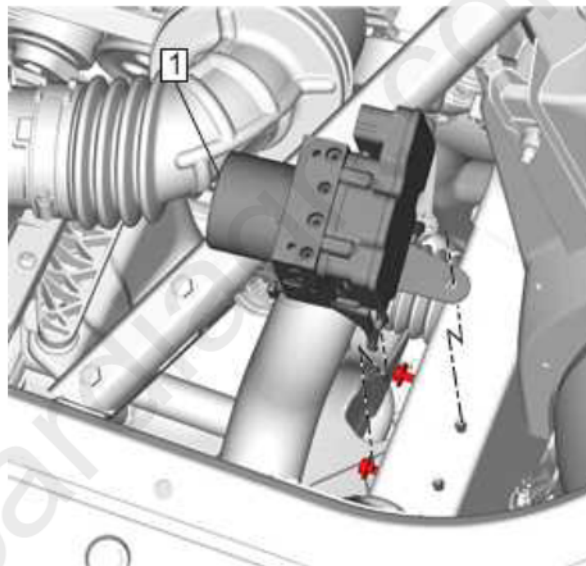
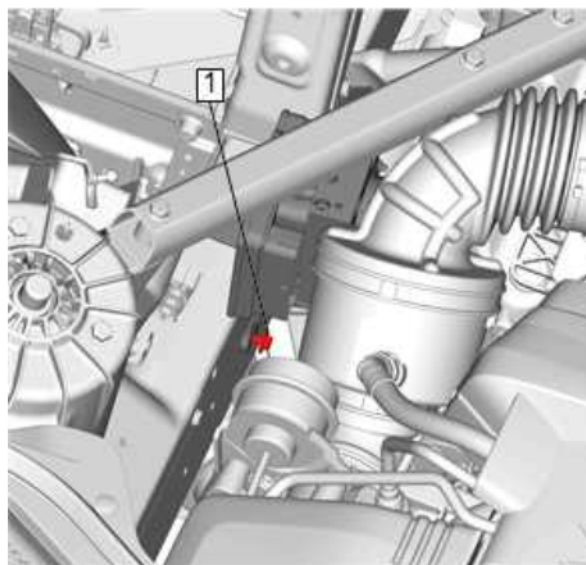


Fig. 19: Brake Pressure Modulator Valve Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Brake Pressure Modulator Valve Bracket Bolt (1)» Install and tighten 9 N.m (80 lb in)



CAUTION: **Fastener Caution**

3. Brake Pressure Modulator Valve Bracket Bolt (1)» Install and tighten 9 N.m (80 lb in)

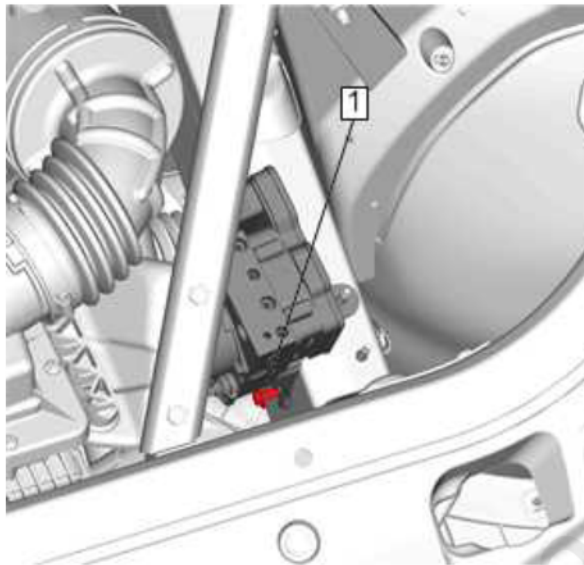


Fig. 21: Brake Pressure Modulator Valve Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Brake Pressure Modulator Valve Bracket Nut (1)» Install and tighten 9 N.m (80 lb in)

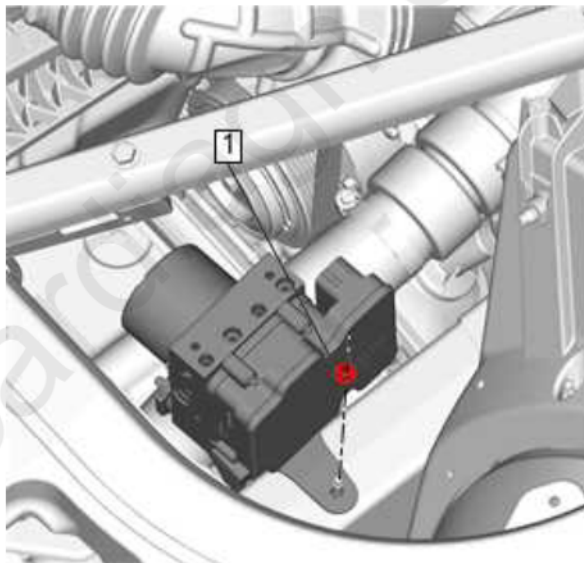


Fig. 22: Brake Pressure Modulator Valve Bracket Nut
Courtesy of GENERAL MOTORS COMPANY

5. Right Rear Brake Pipe Fitting (1)» Install and tighten 19 N.m (14 lb ft)

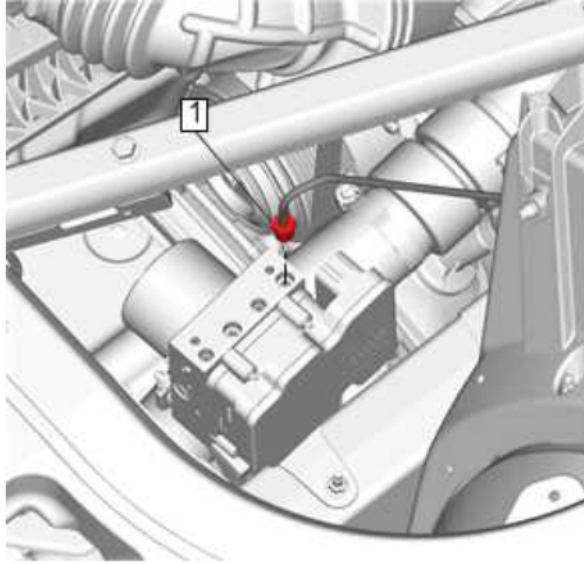


Fig. 23: Right Rear Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

6. Left Front Brake Pipe Fitting (1)» Install and tighten 19 N.m (14 lb ft)

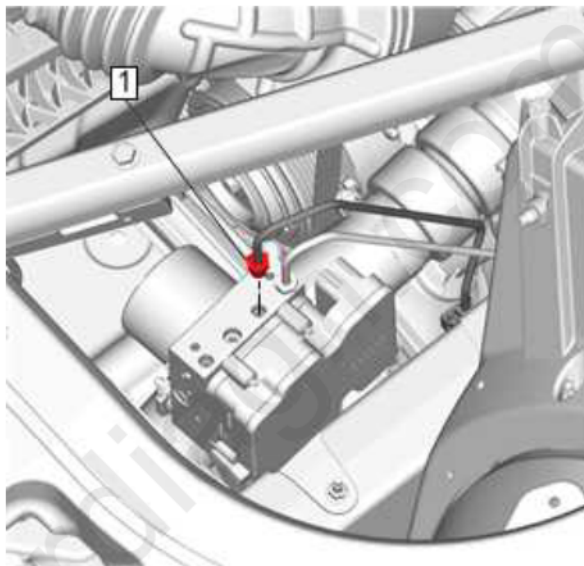


Fig. 24: Left Front Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

7. Right Front Brake Pipe Fitting (1)» Install and tighten 19 N.m (14 lb ft)

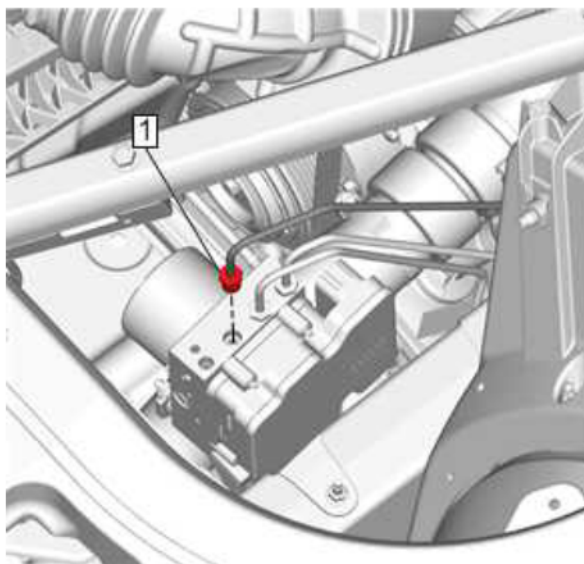


Fig. 25: Right Front Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

8. Left Rear Brake Pipe Fitting (1)» Install and tighten 19 N.m (14 lb ft)

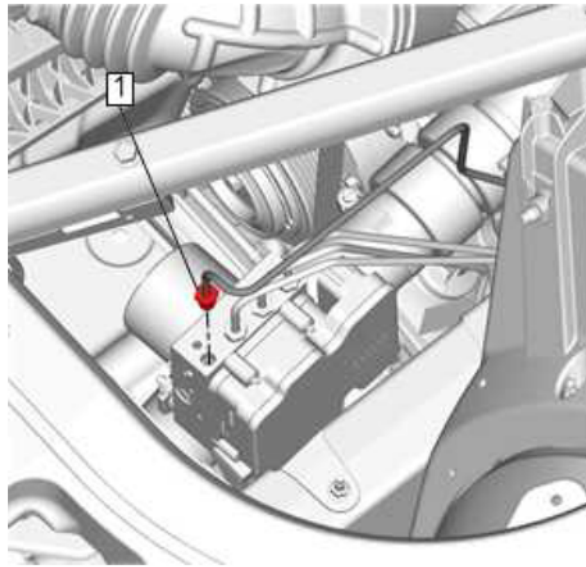


Fig. 26: Left Rear Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

9. Brake Pressure Modulator Valve Secondary Pipe Fitting (1)» Install and tighten 32 N.m (24 lb ft)

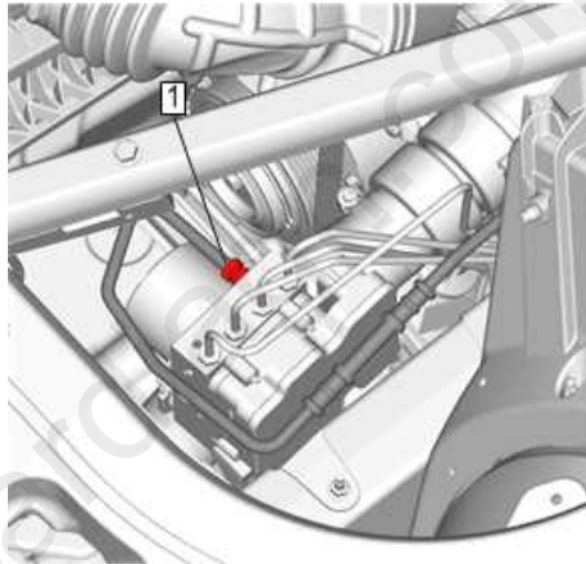


Fig. 27: Brake Pressure Modulator Valve Secondary Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

10. Brake Pressure Modulator Valve Primary Pipe Fitting (1)» Install and tighten 32 N.m (24 lb ft)

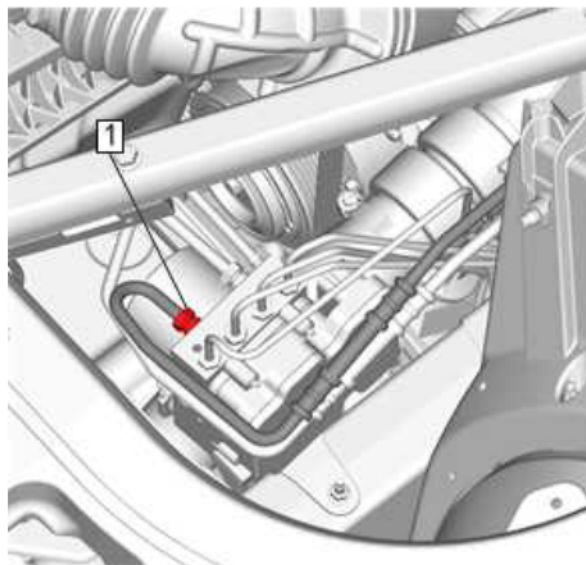


Fig. 28: Brake Pressure Modulator Valve Primary Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

11. Connect the EBCM electrical connector.
12. Bleed the brake system. Refer to [Antilock Brake System Automated Bleed](#)
13. Engine Wiring Harness Fuse Block Bracket» Install - [Engine Wiring Harness Fuse Block Bracket Replacement](#)
14. Program the EBCM. Refer to [Control Module References](#)
15. Center the steering angle sensor. Refer to [Steering Wheel Angle Sensor Centering](#)

BRAKE PRESSURE MODULATOR VALVE BRACKET REPLACEMENT

Removal Procedure

1. [Electronic Brake Control Module Replacement](#)» Remove
2. Brake Pressure Modulator Valve Nut (1)» Remove [2x]

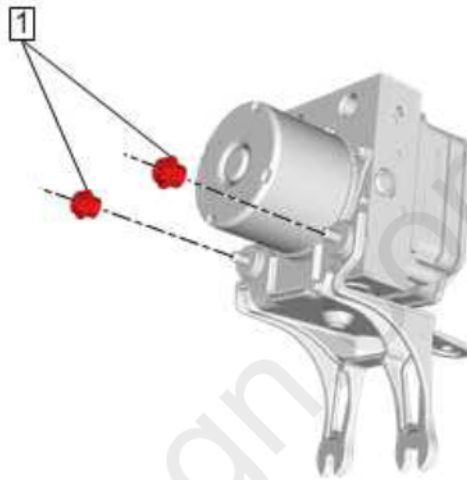


Fig. 29: Brake Pressure Modulator Valve Nut
Courtesy of GENERAL MOTORS COMPANY

3. Brake Pressure Modulator Valve Bracket (1)» Remove



Fig. 30: Brake Pressure Modulator Valve Bracket
Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Brake Pressure Modulator Valve Bracket (1)» Install

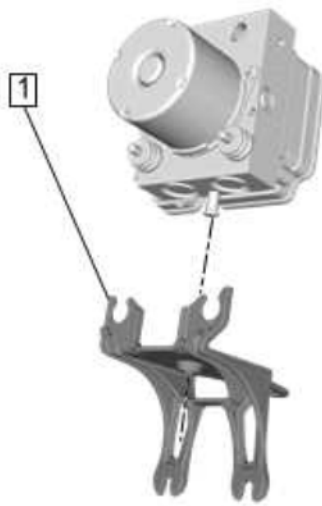


Fig. 31: Brake Pressure Modulator Valve Bracket
 Courtesy of GENERAL MOTORS COMPANY

NOTE: A small amount of denatured alcohol may be used to ease assembly.

2. Brake Pressure Modulator Valve Nut (1)» Install and tighten 8 N.m (71 lb in) [2x]

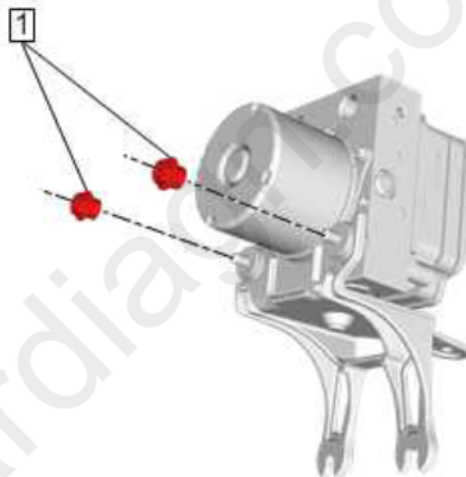


Fig. 32: Brake Pressure Modulator Valve Nut
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Electronic Brake Control Module Replacement» Install

FRONT WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

WARNING: Brake Dust Warning

1. Front Wheelhouse Liner Replacement » Remove
2. Wheel Speed Sensor Electrical Connector (1)» Disconnect

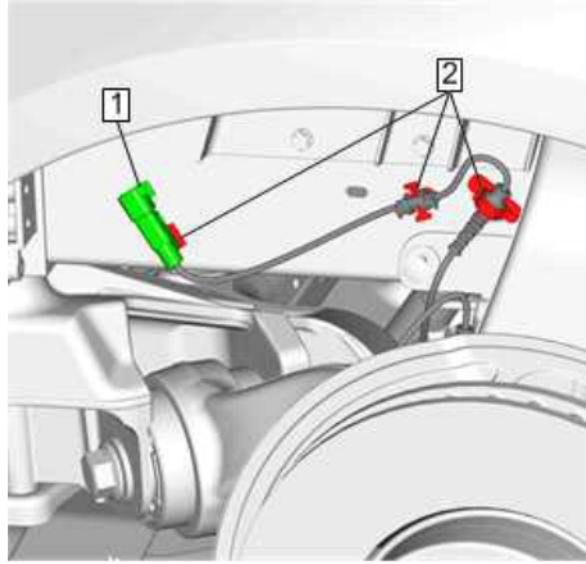


Fig. 33: Wheel Speed Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

- 3. Retainer (2) @ Side Rail» Release [3x]
- 4. Retainer (1) @ Steering Knuckle» Release

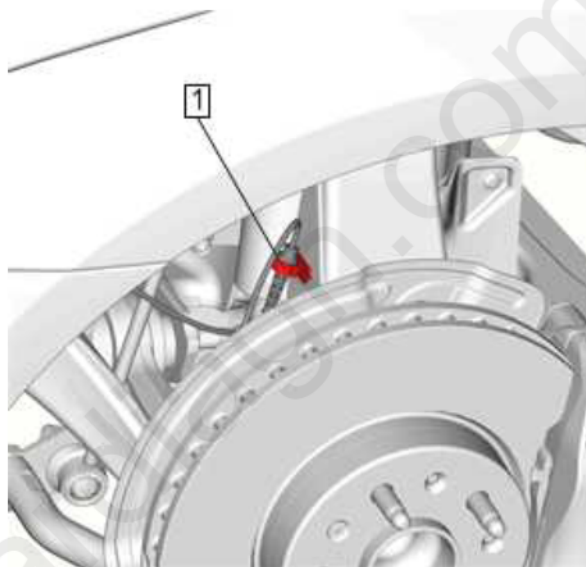


Fig. 34: Retainer
 Courtesy of GENERAL MOTORS COMPANY

- 5. Wheel Speed Sensor Bolt (1)» Remove

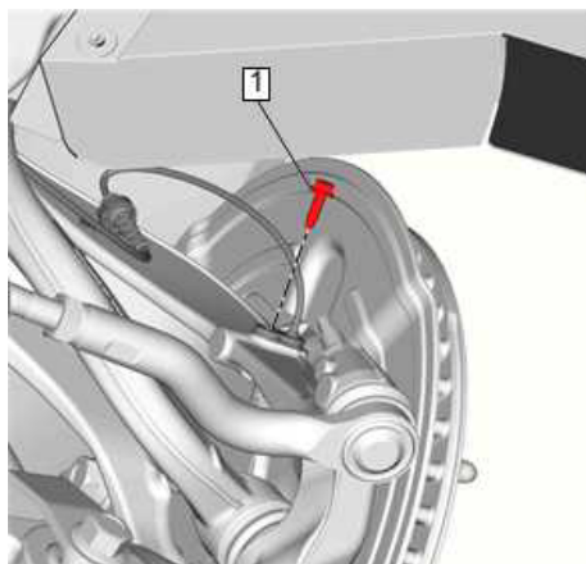


Fig. 35: Wheel Speed Sensor Bolt
 Courtesy of GENERAL MOTORS COMPANY

6. Wheel Speed Sensor (1)» Remove

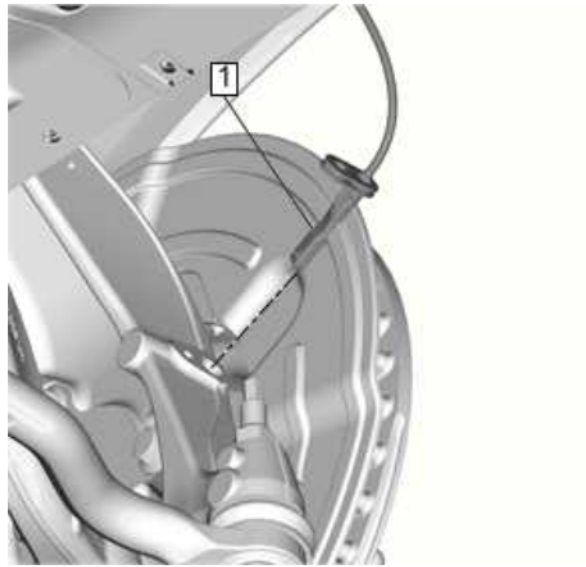


Fig. 36: Wheel Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Wheel Speed Sensor (1)» Install

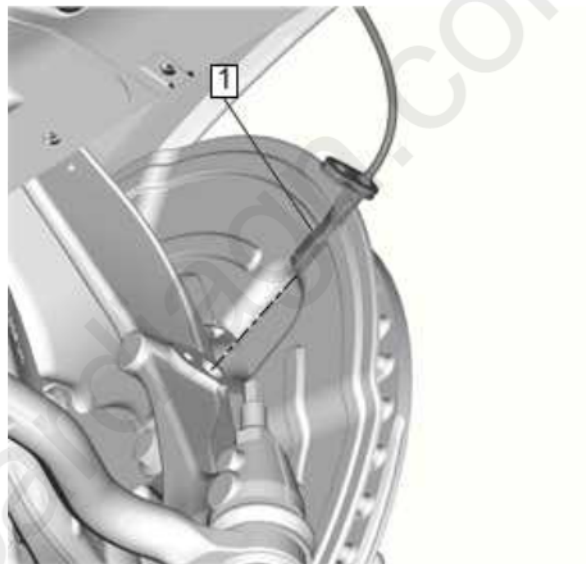
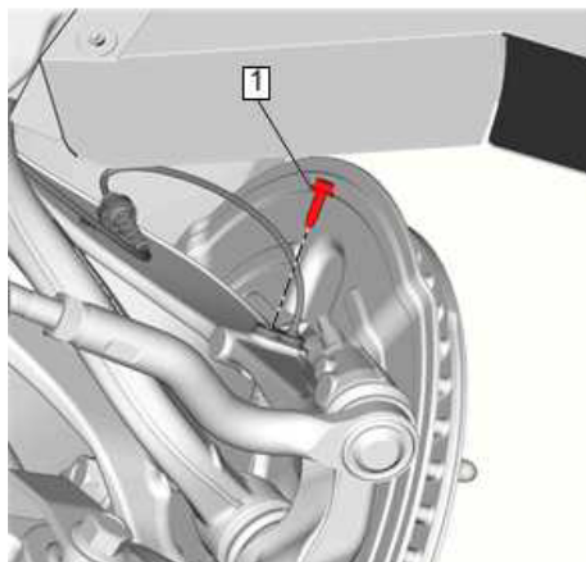


Fig. 37: Wheel Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

2. Wheel Speed Sensor Bolt (2)» Install and tighten 10 N.m (89 lb in)



CAUTION: Fastener Caution

3. Retainer (1) @ Steering Knuckle» Secure

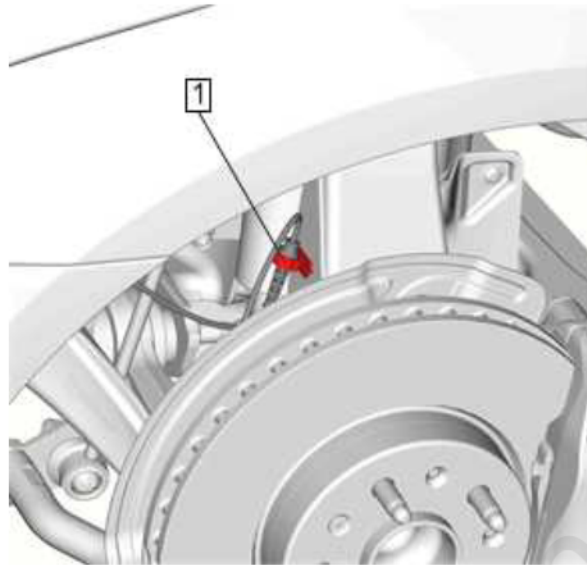


Fig. 39: Retainer
Courtesy of GENERAL MOTORS COMPANY

4. Wheel Speed Sensor Electrical Connector (1)» Connect

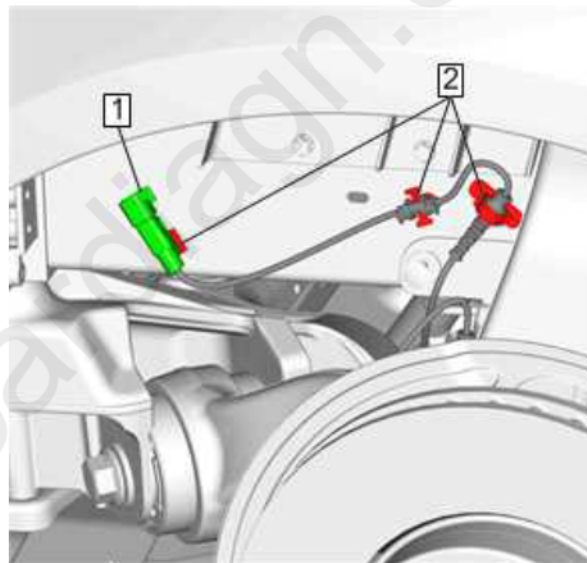


Fig. 40: Wheel Speed Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Retainer (2) @ Side Rail» Secure [3x]
6. Front Wheelhouse Liner Replacement » Install
7. Verify the repair is complete. Refer to Diagnostic Repair Verification

REAR WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

WARNING: Brake Dust Warning

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle
2. Tire and Wheel Removal and Installation » Remove
3. Wheel Speed Sensor Electrical Connector (1)» Disconnect

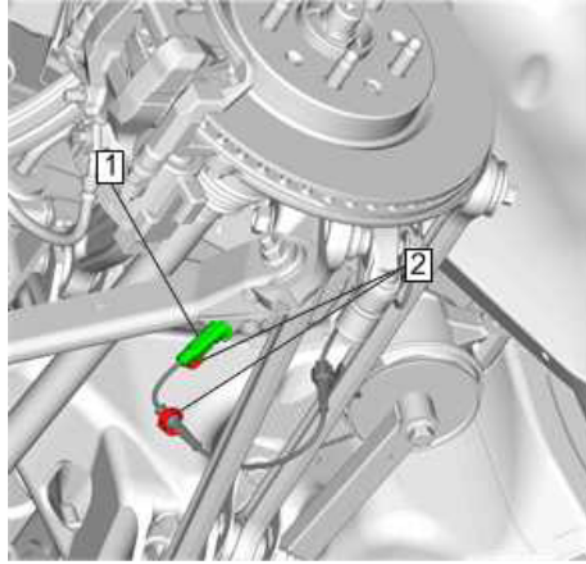


Fig. 41: Wheel Speed Sensor Electrical Connector
 Courtesy of GENERAL MOTORS COMPANY

- 4. Retainer (2) @ Rear Cradle» Release [2x]
- 5. Retainer (1) @ Rear Toe Link» Release [2x]

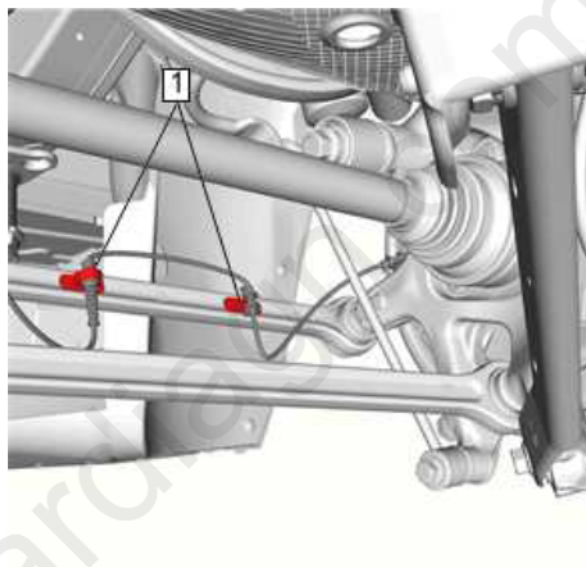


Fig. 42: Retainer And Rear Toe Link
 Courtesy of GENERAL MOTORS COMPANY

- 6. Retainer (1) @ Knuckle» Release

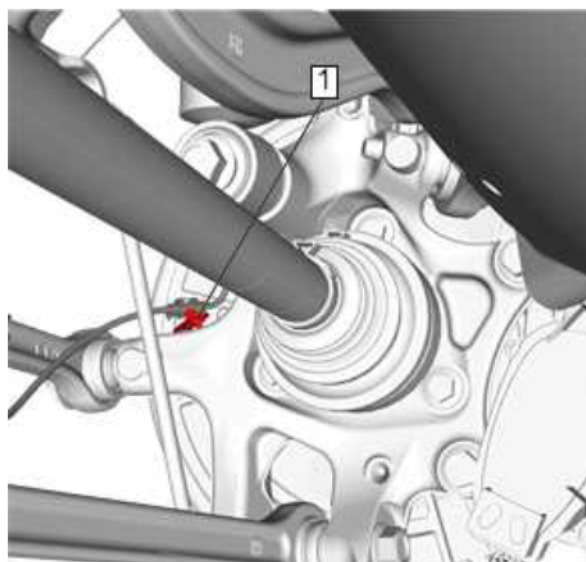


Fig. 43: Retainer And Knuckle
 Courtesy of GENERAL MOTORS COMPANY

7. Wheel Speed Sensor Bolt (1)» Remove

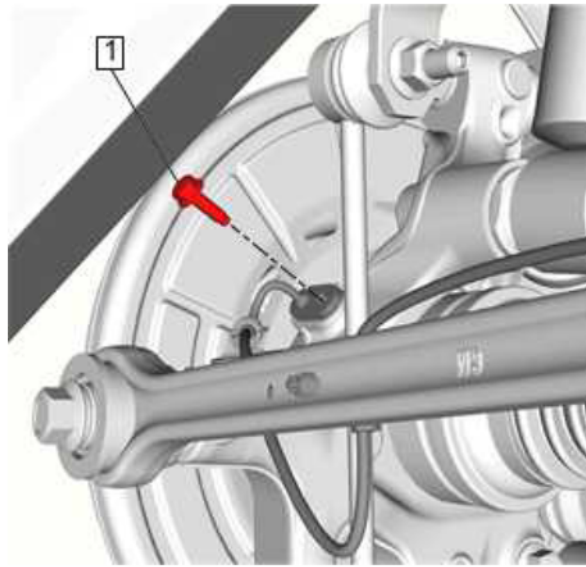


Fig. 44: Wheel Speed Sensor Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Wheel Speed Sensor (1)» Remove

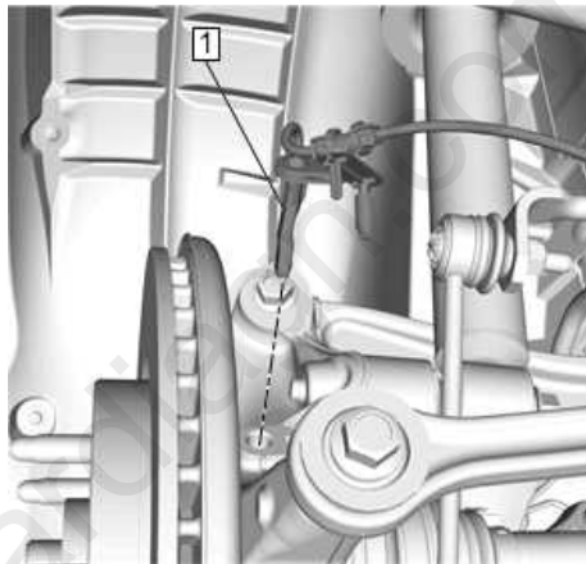


Fig. 45: Wheel Speed Sensor
Courtesy of GENERAL MOTORS COMPANY

Installation Procedure

1. Wheel Speed Sensor (1)» Install

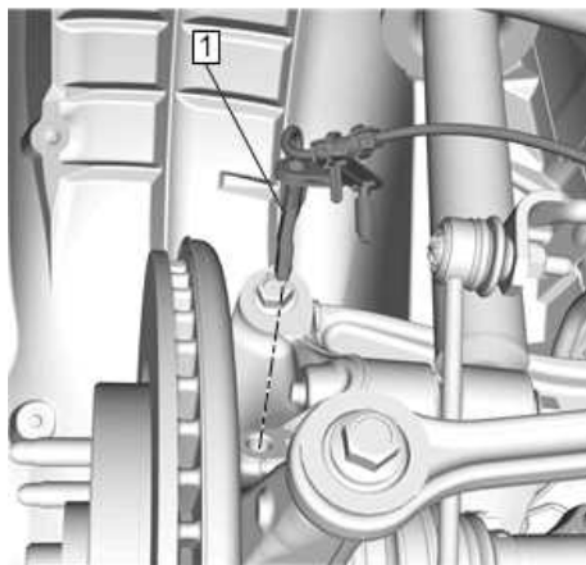


Fig. 46: Wheel Speed Sensor
Courtesy of GENERAL MOTORS COMPANY

2. Wheel Speed Sensor Bolt (1) » Install and tighten 10 N.m (89 lb in)

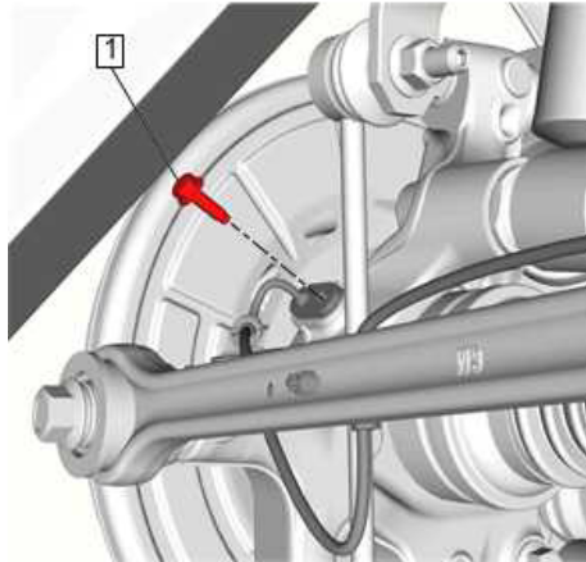


Fig. 47: Wheel Speed Sensor Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Retainer (1) @ Knuckle » Secure

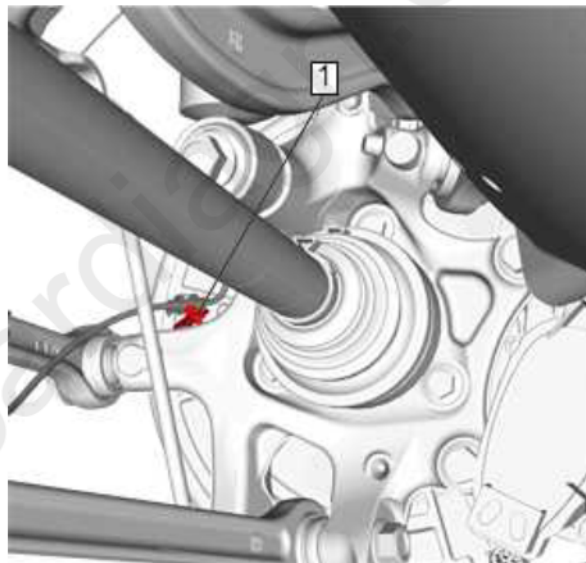


Fig. 48: Retainer And Knuckle
Courtesy of GENERAL MOTORS COMPANY

4. Retainer (1) @ Rear Toe Link » Secure [2x]

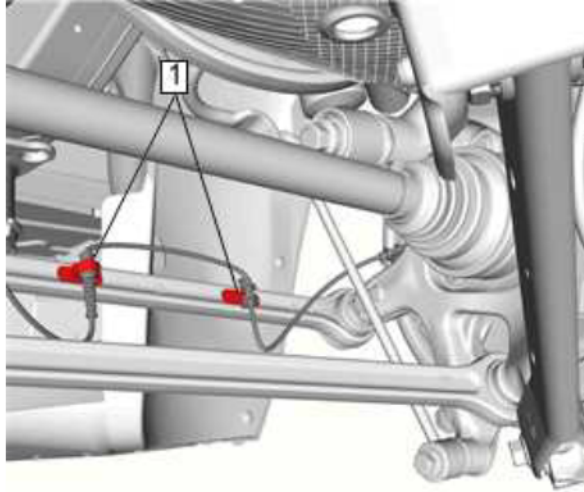


Fig. 49: Retainer And Rear Toe Link

Courtesy of GENERAL MOTORS COMPANY

5. Wheel Speed Sensor Electrical Connector (1) » Connect

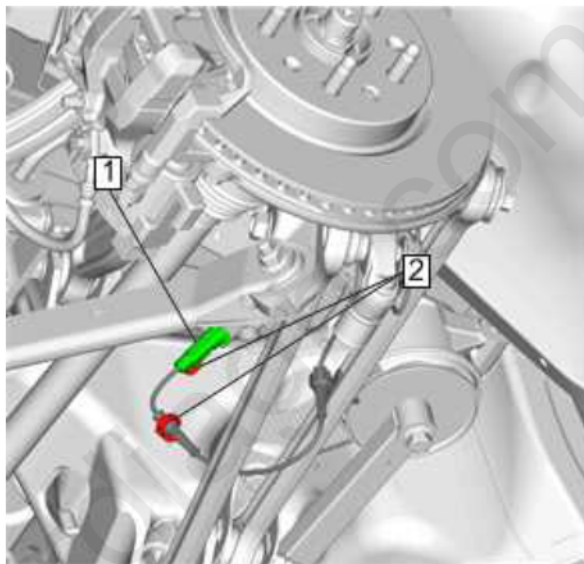


Fig. 50: Wheel Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

6. Retainer (2) @ Rear Cradle » Secure [2x]
7. **Tire and Wheel Removal and Installation** » Install
8. Verify the repair is complete. Refer to **Diagnostic Repair Verification**

VEHICLE STABILITY CONTROL SYSTEM SWITCH REPLACEMENT

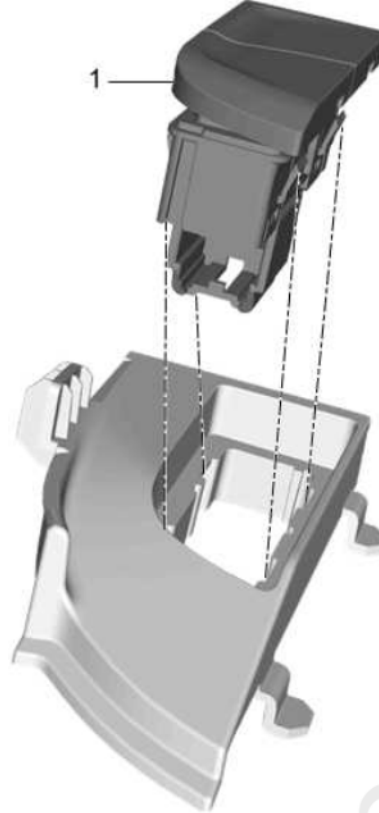


Fig. 51: Vehicle Stability Control System Switch
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Floor Console Accessory Switch Mount Plate Replacement	
1	Vehicle Stability Control System Switch Procedure Using a suitable tool, depress the tabs and release the switch from the cover.

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

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, engine OFF.
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

ABS D&O Block Diagram

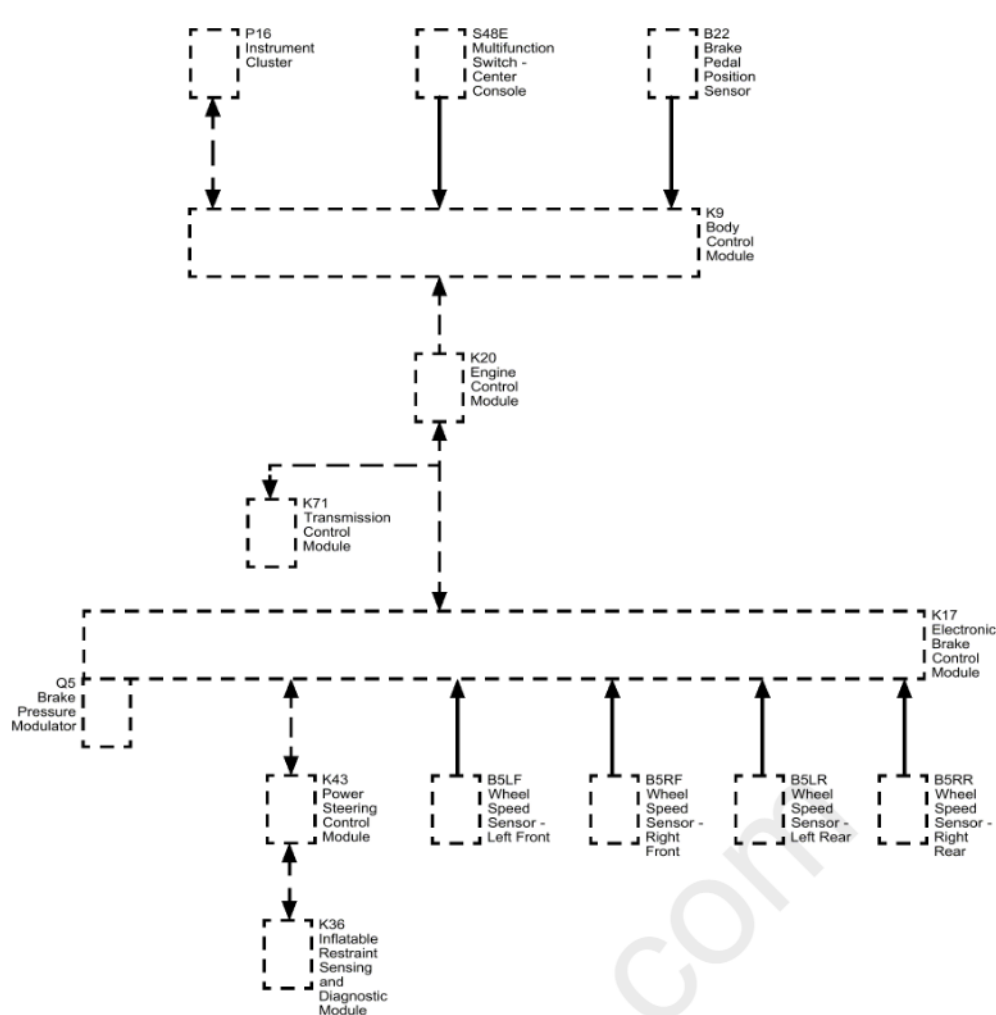


Fig. 52: ABS Description and Operation
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
B22	B22 Brake Pedal Position Sensor
S48E	S48E Multifunction Switch - Center Console
P16	P16 Instrument Cluster
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
K43	K43 Power Steering Control Module
B5LF	B5LF Wheel Speed Sensor - Left Front
B5RF	B5RF Wheel Speed Sensor - Right Front
B5LR	B5LR Wheel Speed Sensor - Left Rear
B5RR	B5RR Wheel Speed Sensor - Right Rear
K36	K36 Inflatable Restraint Sensing and Diagnostic Module

NOTE: EBCM terminal pin locations may differ between different RPO option brake systems.

This vehicle is equipped with a Bosch ABS 9.0 brake system. The electronic brake control module and the brake pressure modulator valve are serviced separately. The brake pressure modulator valve uses a four circuit configuration to control hydraulic pressure to each wheel independently.

The following vehicle performance enhancement systems are provided.

- ABS
- Brake Assist
- Electronic Brake Distribution
- Electronic stability control
- Hill start assist
- Traction control system
- Automatic Vehicle Hold (RPO JM8)

The following components are involved in the operation of the above systems:

- 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 valve - The brake pressure modulator valve contains the hydraulic valves and pump motor that are controlled electrically by the electronic brake control module. The brake pressure modulator uses a four circuit configuration with a diagonal split. The brake pressure modulator directs fluid from the reservoir of the master cylinder to the left front and right rear wheels and fluid from the other reservoir to the right front and left rear wheels. The diagonal circuits are hydraulically isolated so that a leak or malfunction in one circuit will allow continued braking ability on the other.

The brake pressure modulator contains the following components:

- Brake pressure sensor
- Four inlet valves (one per wheel)
- Four outlet valves (one per wheel)
- Pump motor
- Two traction/stability control supply valves
- Two traction/stability control isolation valves
- 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 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 angle sensor - The electronic brake control module receives serial data message inputs from the steering angle sensor. The steering angle sensor is integrated in the power steering control module. The steering angle sensor signal is used to calculate the desired yaw rate.
- 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 functions.

- Wheel speed sensors - This vehicle is equipped with unique directional wheel speed sensors that can detect wheel direction as well as zero wheel speed. The wheel speed sensors are Active sensors that receive a 12 V power supply voltage from the electronic brake control module and provides an output signal to the module. As the wheel spins, the wheel speed sensor sends the electronic brake control module a DC square wave signal. The electronic brake control module uses the frequency of the square wave signal to calculate the wheel speed.

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. 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 inlet valve and keeps the outlet valve closed in order to isolate the system when wheel slip occurs. This holds the pressure steady on the brake so that the hydraulic pressure does not increase or decrease.

Pressure Decrease

The electronic brake control module decreases the pressure to individual wheels during a deceleration when wheel slip occurs. The inlet valve is closed and the outlet valve is opened. The excess fluid is stored in the accumulator until the return pump can return the fluid to the master cylinder.

Pressure Increase

The electronic brake control module increases the pressure to individual wheels during a deceleration in order to reduce the speed of the wheel. The inlet valve is opened and the outlet valve is closed. The increased pressure is delivered from the master cylinder.

Brake Assist

The 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.

Electronic Brake Distribution

The electronic brake distribution function is designed to support the driver in emergency braking situations.

The electronic brake distribution is a control system that enhances the hydraulic proportioning function of the mechanical proportioning valve in the base brake system. The electronic brake distribution control system is part of the operation software in the electronic brake control module. The electronic brake distribution uses active control with existing ABS in order to regulate the vehicle's rear brake pressure.

Electronic Stability Control

The electronic stability control adds an additional level of vehicle control to the electronic brake control module.

Yaw rate is the rate of rotation about the vehicles vertical axis. The electronic 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 from the following parameters:

- The speed of the vehicle
- The position of the steering wheel
- The lateral acceleration of the vehicle

The difference between the desired yaw rate and the actual yaw rate is the yaw rate error, which is a measurement of over steer or under steer. If the yaw error becomes too large, the electronic brake control module attempts to correct the vehicles yaw rate motion by applying differential braking to the appropriate wheel. The amount of differential braking applied to the left or right front wheel is based on both the yaw rate error and side slip rate error.

The electronic stability control activations generally occur during aggressive driving, in turns or on bumpy roads without much use of the accelerator pedal. When braking during electronic stability control activation, the pedal pulsations feel different than the ABS pedal pulsations. The brake pedal pulsates at a higher frequency during vehicle stability enhancement system activation.

Hill Start Assist

When stopped on a hill, the hill start assist feature prevents the vehicle from rolling before driving off, whether facing uphill or downhill by holding the brake pressure during the transition between when the driver releases the brake pedal and starts to accelerate. The electronic brake control module calculates the brake pressure, which is needed to hold the vehicle on an incline or grade greater than 5% and locks that pressure for up to two seconds by commanding the appropriate solenoid valves ON and OFF when the brake pedal is released. The stop lamps will stay illuminated during the hill start assist operation even though the brake pedal is released, this is considered normal operation.

The hill start assist feature is determined by the electronic brake control module using the following inputs:

- Accelerator pedal position
- Brake pedal position sensor
- Brake pressure
- Clutch switch, if equipped
- Engine torque

- Longitudinal acceleration
- Multi-axis acceleration sensor
- Transmission gear information
- Vehicle speed

Traction Control System

When drive wheel slip is noted while the brake is not applied, 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 the serial data. The engine control module reduces torque to the drive wheels by retarding spark timing and turning off fuel injectors. The engine control module reports the amount of torque delivered to the drive wheels via the serial data circuit.

- Pressure hold
- Pressure increase
- Pressure decrease

Automatic Vehicle Hold (RPO JM8)

Automatic Vehicle Hold (AVH) can be turned on by pressing the AVH button with the driver safety belt fastened, the driver door closed and the engine running. The AVH indicator will come on.

This feature will activate when the vehicle is stopped to prevent it from moving. After the brake pedal has been released and before the accelerator pedal has been pressed, AVH uses braking pressure to hold the vehicle stationary. In addition, the ABS pump motor may activate to build brake pressure to maintain the vehicle at a standstill if necessary.

If AVH is holding the vehicle, the AVH indicator will change to green. Once AVH is active it will hold the vehicle for a defined time period then engage the parking brake. While AVH is holding the vehicle, the parking brake will engage if the driver door is opened or the driver safety belt is unfastened.

Driver Information Indicator

ABS Warning Indicator

The instrument cluster turns the ABS warning 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.

Brake Warning Indicator

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

- The instrument cluster performs the bulb check.
- The electronic brake control module detects a fault and sends a serial data message to the instrument cluster requesting illumination.
- The body control module detects that the park brake is engaged. The body control module sends a serial data message to the instrument cluster requesting illumination.

Traction/Stability Active Control Indicator

The instrument cluster turns the traction/stability active control system 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 control/stability control occurring and 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 electronic 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 system indicator ON when the following occurs:

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

Automatic Vehicle Hold Indicator (RPO JM8)

The instrument cluster turns the Automatic Vehicle Hold indicator ON when the following occurs:

- The instrument cluster performs the bulb check.
- The AVH button is depressed with the driver safety belt fastened, the driver door closed and the engine running.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

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