

BRAKES

Antilock Brake System - Canyon, Colorado

SPECIFICATIONS

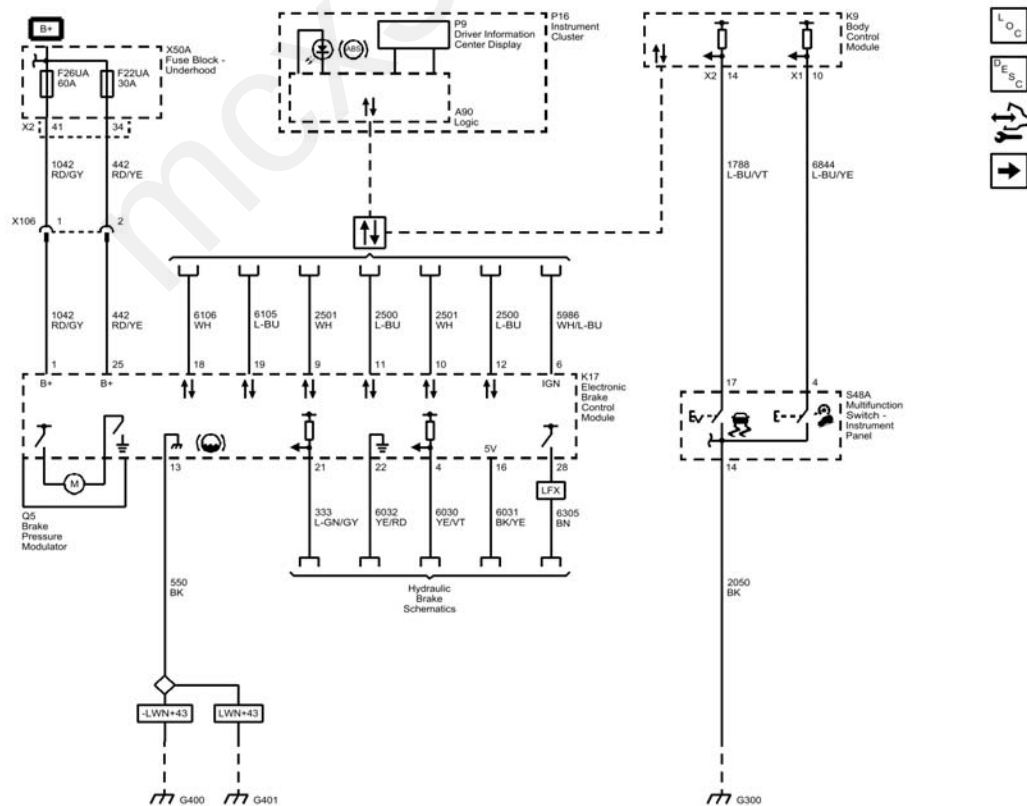
FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Brake Pipe Fitting	18 N.m	13 lb ft
Brake Pipe Fitting - Master Cylinder Inlet Pipe	32 N.m	24 lb ft
Brake Pressure Modulator Valve Bolt	9 N.m	80 lb in
Brake Pressure Modulator Valve Bracket Bolt	25 N.m	18 lb ft
Electronic Brake Control Module Bolt	3 N.m	27 lb in
Wheel Speed Sensor Bolt - Front	6 N.m	53 lb in
Wheel Speed Sensor Bolt - Rear	9 N.m	80 lb in
Wheel Speed Sensor Bracket Bolt	9 N.m	80 lb in
Vehicle Stability Control System Switch Fastener	2.5 N.m	22 lb in

SCHEMATIC WIRING DIAGRAMS

ANTILOCK BRAKE SYSTEM SCHEMATICS

Power, Ground, Serial Data, Traction Control and References



Wheel Speed Signals

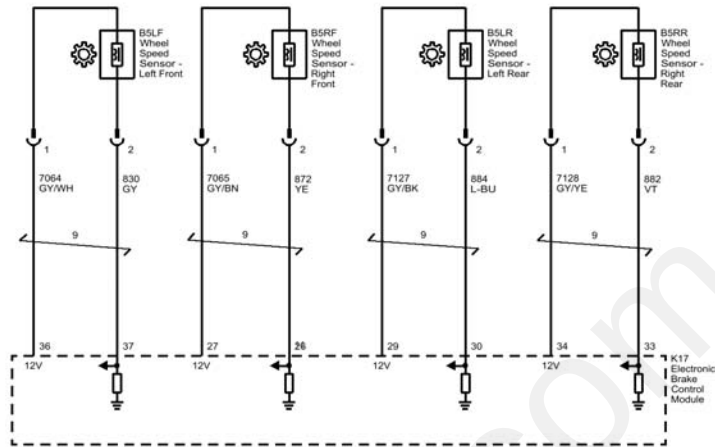


Fig. 2: Wheel Speed Signals

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

ids 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.

each parameter is within 4 km/h (2.5 MPH) of each other	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
3. All OK	Circuit			

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 B273A: HILL DESCENT CONTROL SWITCH SHORT TO GROUND

Diagnostic Instructions

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

DTC Descriptor

DTC B273A 02

Hill Descent Control Switch Short to Ground

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Body Control Module Hill Descent Control Switch parameter changes between Inactive and Active when pressing and releasing the hill descent control switch.

the parameter does not change

Refer to Circuit/System Testing.

- **If the parameter changes**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the ground circuit terminal 14 and ground.

- **If 5 Ω or greater**

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

- **If less than 5 Ω**

3. Ignition ON.
4. Verify the scan tool Hill Descent Control Switch parameter is Inactive.

- **If not Inactive**

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the signal circuit terminal 10 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.

- **If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the ground circuit terminal 14.
6. Verify the scan tool Hill Descent Control Switch parameter is Active.

- **If not Active**

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - 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 X1 harness connector at the S48A Multifunction Switch - Instrument Panel.
2. Test for infinite resistance between the signal terminal 4 and the ground terminal 14 with the switch in the open position.

- **If less than infinite resistance**

Replace the S48A Multifunction Switch - Instrument Panel.

• If infinite resistance	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
---------------------------------	------------------------	-----------------------------	-------------------------	---------------------------

3. Test for less than 2 Ω between the signal terminal 4 and the ground terminal 14 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.

- [Vehicle Stability Control System Switch Replacement](#)
- [Control Module References](#) for body control module replacement, programming and setup

DTC B2745: TRACTION CONTROL SWITCH CIRCUIT SHORT TO GROUND

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 02

Traction Control Switch Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B2745 02	1	1	-
Ground	-	1	-	-
1. Traction control switch inoperative				

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

ol module detects a short to ground on the signal circuit.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Antilock Brake System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

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

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch 1 - 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 14 and ground.
 - **If 10 Ω or greater**

ition 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 not Inactive**

1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the signal circuit terminal 14 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K9 Body Control Module.

- **If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 17 and the ground circuit terminal 14.

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

- **If not Active**

1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- 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 1 - Instrument Panel.

Component Testing

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

2. Test for infinite resistance between the signal terminal 17 and the ground terminal 14 with the switch in the open position.

- **If less than infinite resistance**

Replace the S48A Multifunction Switch 1 - Instrument Panel.

- **If infinite resistance**

3. Test for less than 5 Ω between the signal terminal 17 and the ground terminal 14 with the switch in the closed position.

- **If 5 Ω or greater**

Replace the S48A Multifunction Switch 1 - Instrument Panel.

- **If less than 5 Ω**

4. All OK.

Repair Instructions

agnostic Repair Verification after completing the repair.

- Vehicle Stability Control System Switch Replacement
- Control Module References for Body Control Module replacement, programming and setup

DTC C0035, C0040, C0045, OR C0050: 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 06

Left Front Wheel Speed Sensor Circuit Low Voltage/Open

DTC C0035 08

Left Front Wheel Speed Sensor Circuit Performance - Signal Invalid

DTC C0035 0E

Left Front Wheel Speed Sensor Circuit Low Resistance

DTC C0035 0F

Left Front Wheel Speed Sensor Circuit Signal Erratic

DTC C0035 18

Left Front Wheel Speed Sensor Circuit Low Signal Amplitude

DTC C0035 3A

Left Front Wheel Speed Sensor Circuit Incorrect Component Installed

DTC C0035 5A

Left Front Wheel Speed Sensor Circuit Not Plausible

DTC C0040 06

Right Front Wheel Speed Sensor Circuit Low Voltage/Open

DTC C0040 08

Right Front Wheel Speed Sensor Circuit Performance - Signal Invalid

DTC C0040 0E

Right Front Wheel Speed Sensor Circuit Low Resistance

DTC C0040 0F

Front Wheel Speed Sensor Circuit Signal Erratic

DTC C0040 18

Right Front Wheel Speed Sensor Circuit Low Signal Amplitude

DTC C0040 3A

Right Front Wheel Speed Sensor Circuit Incorrect Component Installed

DTC C0040 5A

Right Front Wheel Speed Sensor Circuit Not Plausible

DTC C0045 06

Left Rear Wheel Speed Sensor Circuit Low Voltage/Open

DTC C0045 08

Left Rear Wheel Speed Sensor Circuit Performance - Signal Invalid

DTC C0045 0E

Left Rear Wheel Speed Sensor Circuit Low Resistance

DTC C0045 0F

Left Rear Wheel Speed Sensor Circuit Signal Erratic

DTC C0045 18

Left Rear Wheel Speed Sensor Circuit Low Signal Amplitude

DTC C0045 3A

Left Rear Wheel Speed Sensor Circuit Incorrect Component Installed

DTC C0045 5A

Left Rear Wheel Speed Sensor Circuit Not Plausible

DTC C0050 06

Right Rear Wheel Speed Sensor Circuit Low Voltage/Open

DTC C0050 08

Right Rear Wheel Speed Sensor Circuit Performance - Signal Invalid

DTC C0050 0E

Right Rear Wheel Speed Sensor Circuit Low Resistance

DTC C0050 0F

Right Rear Wheel Speed Sensor Circuit Signal Erratic

Component	Short to Ground	Open/High Resistance	Short to Voltage	DTC Symptom Bytes
Right Rear Wheel Speed Sensor Circuit Low Signal Amplitude				

DTC C0050 3A

Right Rear Wheel Speed Sensor Circuit Incorrect Component Installed

DTC C0050 5A

Right Rear Wheel Speed Sensor Circuit Not Plausible

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Wheel Speed Sensor Signal	C0035 06	C0035 06	C0035 06	C0035 0E, C0035 0F, C0035 08, C0035 18, C0035 3A, C0035 5A
Left Front Wheel Speed Sensor Low Reference	-	C0035 06	C0035 06	C0035 0E, C0035 0F, C0035 08, C0035 18, C0035 3A, C0035 5A
Right Front Wheel Speed Sensor Signal	C0040 06	C0040 06	C0040 06	C0040 0E, C0040 0F, C0040 08, C0040 18, C0040 3A, C0040 5A
Right Front Wheel Speed Sensor Low Reference	-	C0040 06	C0040 06	C0040 0E, C0040 0F, C0040 08, C0040 18, C0040 3A, C0040 5A
Left Rear Wheel Speed Sensor Signal	C0045 06	C0045 06	C0045 06	C0045 0E, C0045 0F, C0045 08, C0045 18, C0045 3A, C0045 5A
Left Rear Wheel Speed Sensor Low Reference	-	C0045 06	C0045 06	C0045 0E, C0045 0F, C0045 08, C0045 18, C0045 3A, C0045 5A
Right Rear Wheel Speed Sensor Signal	C0050 06	C0050 06	C0050 06	C0050 0E, C0050 0F, C0050 08, C0050 18, C0050 3A, C0050 5A
Right Rear Wheel Speed Sensor Low Reference	-	C0050 06	C0050 06	C0050 0E, C0050 0F, C0050 08, C0050 18, C0050 3A, C0050 5A

Component	Condition	DTC Symptom Bytes

Component	Condition	DTC Symptom Bytes
Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the tone ring - Loose or improperly mounted sensor - Air gap between the wheel speed sensor and the tone ring too large - Water intrusion in the wiring harness	0F, 08, 18, 3A, or 5A

Circuit/System Description

The wheel speeds are detected by active wheel speed sensors. The tone ring consists of permanent magnets. Each wheel speed sensor receives signal 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 high and low signals to calculate the wheel speed.

Conditions for Running the DTC

C0035 06, C0040 06, C0045 06, and C0050 06

Ignition ON.

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

- Ignition ON
- Vehicle speed is greater than 35 km/h (22 MPH).

C0035 0E, C0040 0E, C0045 0E, and C0050 0E

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

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

- Ignition ON
- Vehicle speed is greater than 35 km/h (22 MPH).

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

- Ignition ON
- Vehicle speed is greater than 10 km/h (6 MPH).

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

- Ignition ON
- Vehicle speed is greater than 20 km/h (13 MPH).

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

- Ignition ON
- Vehicle speed is greater than 20 km/h (13 MPH).

Conditions for Setting the DTC

C0035 06, C0040 06, C0045 06, or C0050 06

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

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

- Electromagnetic interference with the wheel speed sensor harness.
- A missing or false wheel speed signal is detected with a change in rotational direction.

C0035 0E, C0040 0E, C0045 0E, or C0050 0E

A detection of wheel speed sensor signal noise.

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

An erratic wheel speed sensor signal is detected.

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

A missing wheel speed sensor signal is detected.

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

The wheel speed sensor is not mounted correctly or the wrong sensor is installed.

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

The difference between fastest and slowest wheel speed is greater than fifty percent.

Action Taken When the DTC Sets

- The ABS indicator turns ON.
- 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.
- The electronic brake control module disables the ABS, and the traction control and 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.

Diagnostic Aids

- Do not use a magnet to clean the tone ring.
- Inspect the sensor and ring for rust or corrosion.
- If two or more wheel speed sensors are inoperative, diagnose each wheel speed sensor individually.
- If any of the symptom codes 0F, 08, 18, 3A, or 5A are set, refer to the Diagnostic Fault Information table for possible mechanical faults or conditions.

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. Test 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. 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 37 and terminal 36

- B5LR Wheel Speed Sensor - Left Rear - terminal 30 and terminal 29
- B5RF Wheel Speed Sensor - Right Front - terminal 26 and terminal 27
- B5RR Wheel Speed Sensor - Right Rear - terminal 33 and terminal 34
- **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 37 and terminal 36
- B5LR Wheel Speed Sensor - Left Rear - terminal 30 and terminal 29
- B5RF Wheel Speed Sensor - Right Front - terminal 26 and terminal 27
- B5RR Wheel Speed Sensor - Right Rear - terminal 33 and terminal 34
- **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 36
- B5LR Wheel Speed Sensor - Left Rear - terminal 29
- B5RF Wheel Speed Sensor - Right Front - terminal 27
- B5RR Wheel Speed Sensor - Right Rear - terminal 34
- **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 37
- B5LR Wheel Speed Sensor - Left Rear - terminal 30
- B5RF Wheel Speed Sensor - Right Front - terminal 26
- B5RR Wheel Speed Sensor - Right Rear - terminal 33
- **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.

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 Electronic Brake Control Module replacement, programming and setup

DTC C0060-C0095, C0121, C0141, C0146, C0151, OR C0156: ANTILOCK BRAKE SYSTEM SOLENOID/TRACTION CONTROL SYSTEM

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 C0060 00

Left Front Antilock Braking System Solenoid

DTC C0065 00

Left Front Antilock Brake System Solenoid 2

DTC C0070 00

Right Front Antilock Braking System Solenoid

DTC C0075 00

Right Front Antilock Brake System Solenoid 2

DTC C0080 00

Left Rear Antilock Braking System Solenoid

DTC C0085 00

Left Rear Antilock Brake System Solenoid 2

DTC C0090 00

Right Rear Antilock Braking System Solenoid

DTC C0095 00

Right Rear Antilock Brake System Solenoid 2

DTC C0131 00

Control System Pressure Circuit

DTC C0131 5A

Traction Control System Pressure Circuit Not Plausible

DTC C0141 00

Traction Control Left Front Prime Solenoid Valve

DTC C0146 00

Traction Control Left Front/Right Rear Isolation

DTC C0151 00

Traction Control Right Front Prime Solenoid Valve

DTC C0156 00

Traction Control Right Front/Left Rear Isolation

Circuit/System Description

The valve relay is located within the electronic brake control module and supplies battery voltage to all of the solenoid valves when commanded On. 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. It also contains a traction/stability control prime 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/stability operation is required the electronic brake control module turns the required solenoid valves ON or OFF.

Conditions for Running the DTC

- The valve relay is commanded ON.
- The ignition voltage is greater than 10 V.
- 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

- The electronic brake control module detects a valve or solenoid malfunction.
- The electronic brake control module detects an open in the B+ circuit to the valve relay.

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, and the traction/stability 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.

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 that DTC C0060, C0065, C0070, C0075, C0080, C0085, C0090, C0095, C0131, C0141, C0146, C0151, or C0156 is not set.
 - **If any of the DTCs are set**

Replace the K17 Electronic Brake Control Module with the Brake Pressure Modulator.
 - **If none of the DTCs are set**
3. All OK.

[Repair Instructions](#)

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

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

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 Descriptors](#)

Component	Short to Ground	Open/High Resistance	Short to Voltage	DTCs
Circuit	Ground	Resistance	Voltage	Performance

Pump Motor Circuit Malfunction

DTC C0110 04

Pump Motor Circuit Open

DTC C0110 61

Pump Motor Stuck

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	C0110 00, C0110 04	C0110 00, C0110 04	-	C0110 61
Ground	-	C0110 00, C0110 04	-	-

Component	Condition	DTCs
Pump Motor	- Wear - Damage - Lock	C0110 00 or 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, and the traction/stability 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 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

- A faulty pump motor or pump motor relay is detected.
- An open/high resistance is detected on the pump motor ground circuit.
- A short to ground or an open/high resistance circuit is detected.

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, and the traction/stability 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 and enable the system functions in the next ignition cycle after driving at a speed of greater than 16 km/h (10 MPH) with no faults detected.

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 the ABS Pump Motor turns ON and OFF when commanding the ABS Pump Motor Increase and Decrease 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 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 13 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 open high/resistance in the ground connection.

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.

2. Test for less than 2 Ω in the B+ circuit end to end.

- If 2 Ω or greater, repair the open/high resistance 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.

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 K17 Electronic Brake Control Module with the Brake Pressure Modulator.

- **If the test lamp illuminates**

5. All OK.

Repair Instructions

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

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

DTC C0131: TRACTION CONTROL SYSTEM

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 00

Traction Control System Pressure Circuit Malfunction

DTC C0131 5A

Traction Control System Pressure Circuit Not Plausible

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 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

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

C0131 00

The electronic brake control module detects the brake pressure is out of the specified range.

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.

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**

1. Perform the [Brake Pressure Modulator Valve Pressure Sensor Calibration](#).

2. Verify the DTC does not set.

- If the DTC sets, replace the K17 Electronic Brake Control Module with the Brake Pressure Modulator.
- If the DTC does not set

3. All OK.

- **If the DTC is 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 Electronic Brake 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 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

ronic 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

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Apply and release the 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 DTC C0277 or C0890 is not set.
 - **If either DTC is set**

Refer to DTC C0277 or C0890 .

either DTC is not set

4. 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 appropriate component.

- **If a condition is not found**

5. All OK.

DTC C0186, C0196, OR C0287: LATERAL ACCELERATION SENSOR SIGNAL/ YAW RATE SIGNAL/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 00

Lateral Acceleration Sensor Signal Malfunction (Inflatable Restraint Sensing and Diagnostic Module)

DTC C0186 4B

Lateral Acceleration Sensor Signal Calibration Not Learned (Electronic Brake Control Module)

DTC C0186 5A

Lateral Acceleration Sensor Signal Not Plausible (Electronic Brake Control Module)

DTC C0186 71

Lateral Acceleration Sensor Signal Invalid Data (Electronic Brake Control Module)

DTC C0196 00

Yaw Rate Signal Malfunction (Electronic Brake Control Module and/or Inflatable Restraint Sensing and Diagnostic Module)

DTC C0196 5A

Yaw Rate Signal Not Plausible (Electronic Brake Control Module)

DTC C0196 71

Yaw Rate Signal Invalid Data (Electronic Brake Control Module)

DTC C0287 00

Longitudinal Acceleration Sensor Malfunction (Inflatable Restraint Sensing and Diagnostic Module)

DTC C0287 4B

DTC C0287 5A

Longitudinal Acceleration Sensor Signal Not Plausible (Electronic Brake Control Module)

DTC C0287 71

Longitudinal Acceleration Sensor Signal Invalid Data (Electronic Brake Control Module)

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.

Conditions for Setting the DTC

C0186 00

The lateral acceleration signal is out of the specified range.

C0186 4B

The lateral acceleration sensor is not calibrated.

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 signal ground circuit.
- A short to ground or open/high resistance is detected on the multi-axis acceleration ignition circuit.

C0196 00

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.

ronic brake control module received an invalid lateral acceleration signal.

- An open/high resistance is detected on the multi-axis acceleration signal ground circuit.

C0287 00

The longitudinal acceleration signal is out of the specified range.

C0287 4B

The longitudinal acceleration sensor is not calibrated.

C0287 5A

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

C0287 71

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

Action Taken When the DTC Sets

C0186 00, C0196 00 and C287 00 set in Inflatable Restraint Sensing and Diagnostic Module

- The Air Bag Indicator turns ON.
- The traction/stability control Off Indicator turns ON.
- The electronic brake control module disables the traction/stability for the duration of the ignition cycle.

C0186 4B, C0186 5A, C0186 71, C0196 00, C0196 5A, C0196 71, C0287 4B, C0287 5A, and C0287 71 set in Electronic Brake Control Module

- The traction/stability control Off 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

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 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 or Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

DTC C025F, C0274, C0275, OR C0280: BRAKE MASTER CYLINDER/STABILITY SYSTEM ACTIVE/DUMP VALVE HIGH TEMPERATURE

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.

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

DTC Descriptors

DTC C025F 00

Brake Master Cylinder Inlet and Isolation Valves Calibration Not Learned

DTC C0274 4B

Isolation Valve Calibration Not Learned

DTC C0275 54

Dump Valve High Temperature

DTC C0280 00

Stability System Active Too Long Malfunction

DTC C0280 54

Stability System Active Too Long High Temperature

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 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, 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

C0274 54, C0280 00, or C0280 54

The calculated solenoid valve temperature is greater than the threshold.

C025F 00 or C0274 4B

The isolation solenoid valve is not learned.

Action Taken When the DTC Sets

C025F 00, C0274 4B or C0275 54

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

C0280 54

ion/stability control Off indicator turns ON.

- The electronic brake control module disables the traction and the stability 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 ABS, traction control or stability control.
- 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.

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 C0186, C0187, C018B, C0196, C019B, 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 Q5 Brake Pressure Modulator to cool down to ambient temperature.
 4. Ignition ON.
 5. Verify that DTC C056D 00, C025F 00, or C0274 4B is not set.
 - **If any of the DTCs are set**

program the K17 Electronic Brake Control Module.

- **If none of the DTCs are set**

6. Verify that no DTCs 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**

7. All OK.

Repair Instructions

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

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

DTC C124F, C1250, OR C1251: LATERAL ACCELERATION 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 C124F

Lateral Acceleration Sensor Circuit Low Voltage

DTC C1250

Lateral Acceleration Sensor Circuit High Voltage

DTC C1251

Lateral 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. 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).

Setting the DTC

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

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**

place 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 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

[e 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 P1513: TRACTION CONTROL DRAG REDUCTION 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](#)

Traction Control Drag Reduction 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 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/stability 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

at no other DTCs are set except for P1513.

- **If any other DTCs are set**

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

- **If only DTC P1513 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

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**

place 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

I 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

- ANTILOCK BRAKE SYSTEM

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

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

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

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

ABS INDICATOR MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

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

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

1 Operation Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
------------------------	--------------------	-------------------------	---------------------	-----------------------

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 ABS Indicator turns On and Off when commanding the All Indicators On and Off with a scan tool.
 - **If the ABS indicator does not turn On and Off**
Replace the P16 Instrument Cluster.
 - **If the ABS indicator turns On and Off**
3. Verify the ABS Indicator turns Off five seconds after the ignition is turned On.
 - **If the ABS indicator does not turn Off**
Replace the K17 Electronic Brake Control Module.
 - **If the ABS indicator turns Off**
4. All OK.

Repair Instructions

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

Control Module References for Electronic Brake Control Module or Instrument Cluster replacement, programming and setup

HILL DESCENT CONTROL INDICATOR MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

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

Circuit/System Description

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

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

Reference Information

Schematic Reference

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the instrument cluster hill descent control indicator turns On and Off when commanding the All Indicators On and Off with a scan tool.
 - **If any indicator does not turn On and Off**

Replace the P16 Instrument Cluster.

all indicators turn On and Off

3. Verify the scan tool Body Control Module Hill Descent Control Switch parameter changes between Inactive and Active when pressing and releasing the hill descent control switch.

- **If the parameter does not change**

Refer to Circuit/System Testing.

- **If the parameter changes**

4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 5 Ω between the ground circuit terminal 14 and ground.

- **If 5 Ω or greater**

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **If less than 5 Ω**

3. Ignition ON.

4. Verify the scan tool Body Control Module Hill Descent Control Switch parameter is Inactive.

- **If not Inactive**

1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the signal circuit terminal 10 X1 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K9 Body Control Module.

- **If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the ground circuit terminal 14.

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

- **If not Active**

1. Ignition OFF, disconnect the X4 harness connector at the K9 Body Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- 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 X1 harness connector at the S48A Multifunction Switch - Instrument Panel.

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

- **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 terminal 4 and the ground terminal 14 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.

- [Vehicle Stability Control System Switch Replacement](#)
- [Control Module References](#) for body 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
Signal	B2745 02	1	1	-
Ground	-	1	-	-
1. Traction/stability 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 s after the ignition is turned ON. When the electronic brake control module detects a fault it sends a serial data message to the instrument cluster commanding the traction/stability control indicator ON.

The body control module monitors the signal circuit from the traction control switch. When the traction control switch is pressed once, the body control module requests the electronic brake control module via serial data to disable the traction control and notify the driver of the deactivation by turning the traction control off. When the traction control switch is pressed and held for five s, the body control module requests the electronic brake control module to disable the electronic stability control and notify the driver of the deactivation by turning the stability control off indicator ON.

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

Replace the P16 Instrument Cluster.
 - **If all indicator turn ON and OFF**
3. Verify the scan tool Body Control Module Traction Control Switch parameter changes between Active and Inactive when pressing and releasing the traction control switch.
 - **If the parameter does not change**

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

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch 1 - Instrument Panel. 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 14 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.

st 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 not Inactive**

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

- **If Inactive**

5. Install a 3 A fused jumper wire between the signal circuit terminal 17 and the ground circuit terminal 14.

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

- **If not Active**

1. Ignition OFF, disconnect the X2 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - 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 1 - Instrument Panel.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch 1 - Instrument Panel.
2. Test for infinite resistance between the signal terminal 17 and the ground terminal 14 with the switch in the open position.

- **If less than infinite resistance**

Replace the S48A Multifunction Switch 1 - Instrument Panel.

- **If infinite resistance**

3. Test for less than 5 Ω between the signal circuit terminal 17 and the ground circuit terminal 14 with the switch in the closed position.

- **If 5 Ω or greater**

Replace the S48A Multifunction Switch 1 - Instrument Panel.

- **If less than 5 Ω**

4. All OK.

Repair Instructions

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

Stability Control System Switch 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:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- 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.

ting 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.

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. 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](#) .

in open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.

- The generator may be allowing AC noise into the electrical system.

Incorrect Control Module

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

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

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

ANTILOCK BRAKE SYSTEM AUTOMATED BLEED

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

NOTE: The base hydraulic brake system must be bled before performing this automated bleeding procedure. If you have not yet performed the base hydraulic brake system bleeding procedure, refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) before proceeding.

1. Install a scan tool to the vehicle.
2. Start the engine and allow the engine to idle.
3. Using the scan tool, begin the automated bleed procedure.
4. Follow the instructions on the scan tool to complete the automated bleed procedure. Apply the brake pedal when instructed by the scan tool.
5. Turn the ignition OFF.
6. Remove the scan tool from the vehicle.
7. Fill the brake master cylinder reservoir to the maximum-fill level with Delco Supreme 11^Å®, GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT-3 brake fluid from a clean, sealed brake fluid container.
8. Bleed the hydraulic brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) .
9. With the ignition OFF, apply the brakes 3-5 times, or until the brake pedal becomes firm, in order to deplete the brake booster power reserve.
10. Slowly depress and release the brake pedal. Observe the feel of the brake pedal.
11. If the brake pedal feels spongy, repeat the automated bleeding procedure. If the brake pedal still feels spongy after repeating the automated bleeding procedure inspect the brake system for external leaks. Refer to [Brake System External Leak Inspection](#) .
12. Turn the ignition key ON, with the engine OFF; check to see if the brake system warning lamp remains illuminated.

ke system warning lamp remains illuminated, DO NOT allow the vehicle to be driven until it is diagnosed and repaired. Refer to [Symptoms - Hydraulic Brakes](#) .

14. Drive the vehicle to exceed 13 km/h (8 mph) to allow ABS initialization to occur. Observe brake pedal feel.
15. If the brake pedal feels spongy, repeat the automated bleeding procedure until a firm brake pedal is obtained.

STEERING 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
- Electronic brake 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. Ignition ON.
5. With the scan tool select the Power Steering Control Module.
6. Select the Steering Wheel Angle Sensor Reset under Configuration/Reset Functions list.
7. Follow the scan tool directions to complete the reset procedure.
8. Select the Steering Wheel Angle Sensor Learn under Configuration/Reset Functions list.
9. Follow the scan tool directions to complete the learn procedure.
10. With the scan tool select the Electronic Brake Control Module.
11. Select the Steering Wheel Angle Sensor Learn under Configuration/Reset Functions list.
12. Follow the scan tool directions to complete the learn procedure.
13. Clear any DTCs that may be set.
14. Ignition OFF.

ELECTRONIC BRAKE CONTROL MODULE REPLACEMENT

Removal Procedure

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. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
3. Remove the transfer case skid shield, if equipped. Refer to [Transfer Case Skid Shield Replacement](#) .
4. Clean the area surrounding the electronic brake control module (EBCM) and brake pressure modulator valve (BPMV) assembly of any accumulated dirt and debris.
5. Disconnect the EBCM electrical connector.

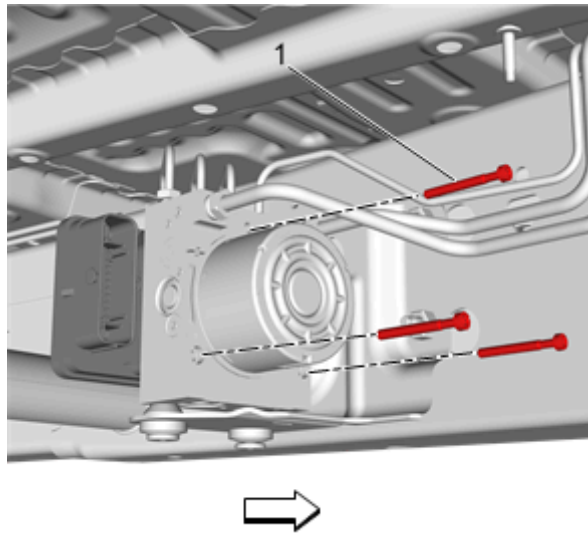


Fig. 3: EBCM Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove the EBCM bolts (1).

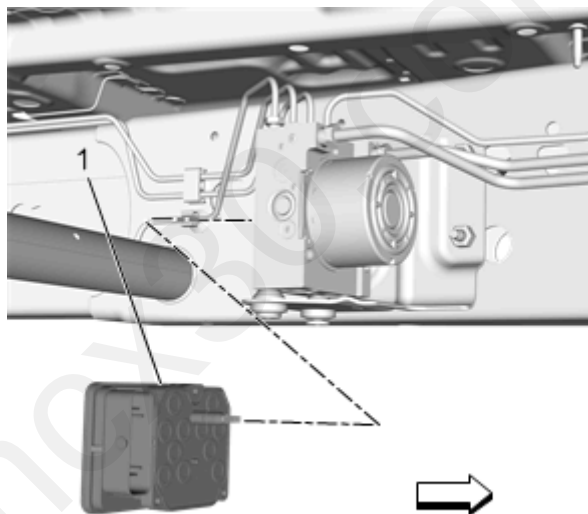


Fig. 4: EBCM

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not attempt to pry or lever against the EBCM.

7. Carefully separate the EBCM (1) from the brake pressure modulator valve (BPMV) by pulling straight away from the BPMV.

Installation Procedure

1. Clean the sealing surfaces of the EBCM and the BPMV with denatured alcohol and allow to dry.

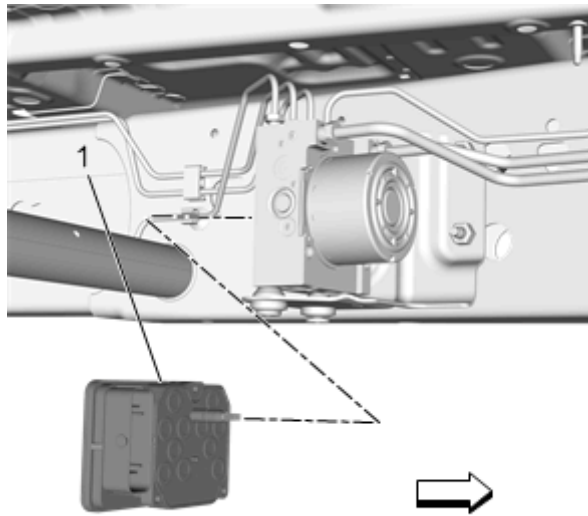


Fig. 5: EBCM

Courtesy of GENERAL MOTORS COMPANY

2. Install the EBCM (1) to the BPMV.

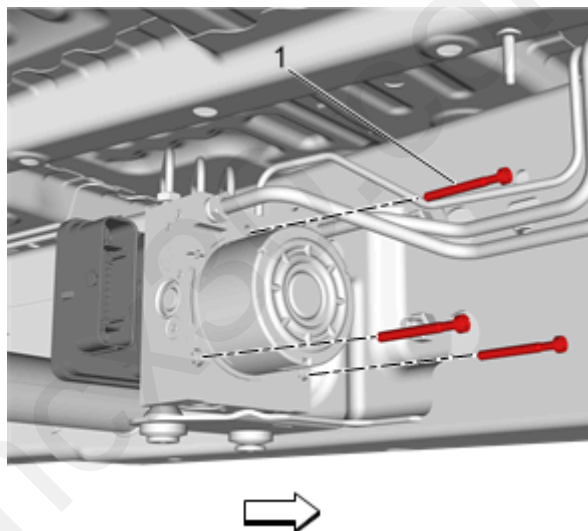


Fig. 6: EBCM Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

3. Install the EBCM bolts (1) and tighten in a cross pattern to 3 N.m (27 lb in).
4. Connect the EBCM electrical connector.
5. Install the transfer case skid shield, if equipped. Refer to [Transfer Case Skid Shield Replacement](#) .
6. Program the EBCM. Refer to [Electronic Brake Control Module Programming and Setup](#) .

BRAKE PRESSURE MODULATOR VALVE REPLACEMENT

Removal Procedure

CAUTION: Refer to [Brake Fluid Effects on Paint and Electrical Components 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. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
3. Remove the transfer case skid shield, if equipped. Refer to [Transfer Case Skid Shield Replacement](#) .
4. Clean the area surrounding the electronic brake control module (EBCM) and brake pressure modulator valve (BPMV) assembly of any accumulated dirt and debris.
5. Disconnect the EBCM electrical connector.

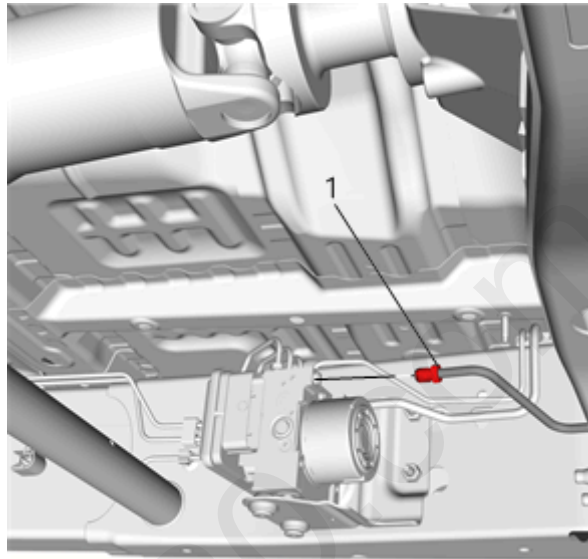


Fig. 7: Master Cylinder Primary Inlet Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the master cylinder primary brake pipe fitting (1).
7. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

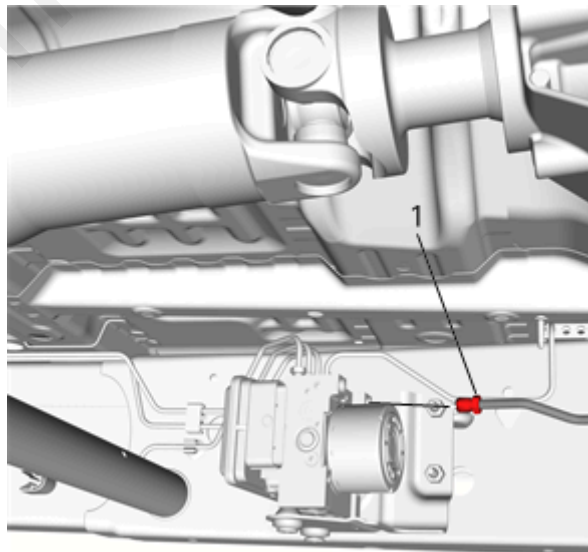


Fig. 8: Master Cylinder Secondary Inlet Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

Disconnect the master cylinder secondary brake pipe fitting (1).

9. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

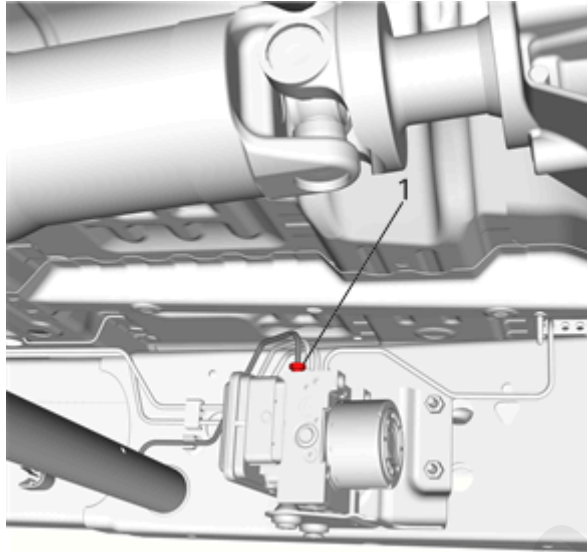


Fig. 9: Right Front Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

10. Disconnect the right front brake pipe fitting (1).

11. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

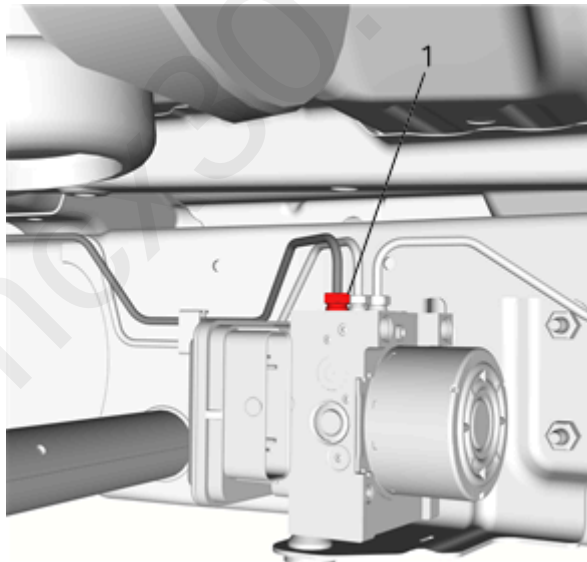


Fig. 10: Left Rear Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

12. Disconnect the left rear brake pipe fitting (1).

13. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

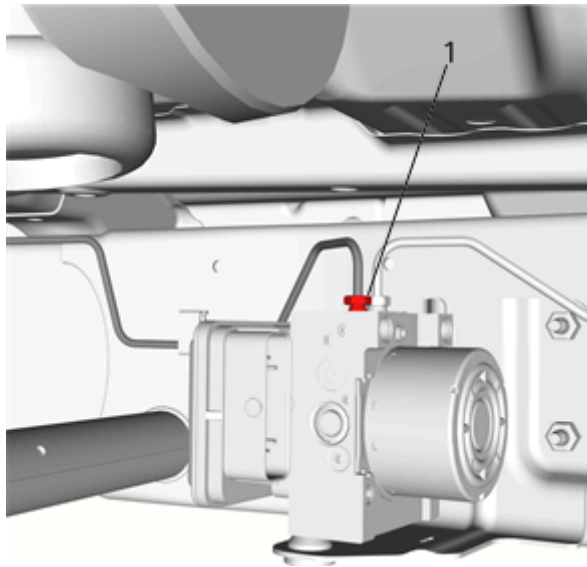


Fig. 11: Right Rear Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

14. Disconnect the right rear brake pipe fitting (1).
15. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

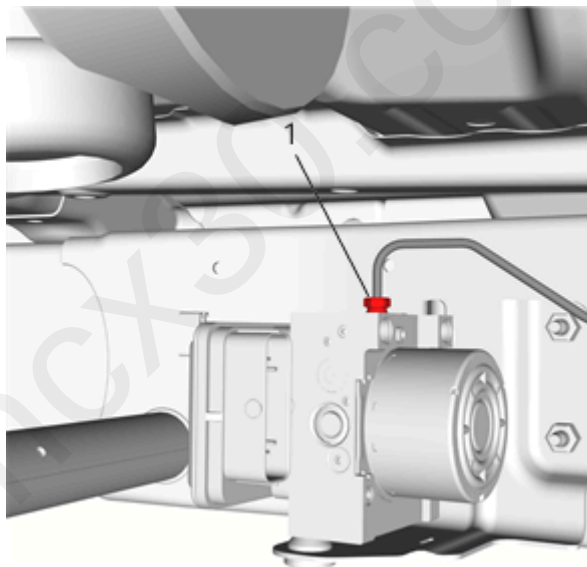


Fig. 12: Left Front Brake Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

16. Disconnect the left front brake pipe fitting (1).
17. Cap the brake pipe fitting to prevent brake fluid loss and contamination.

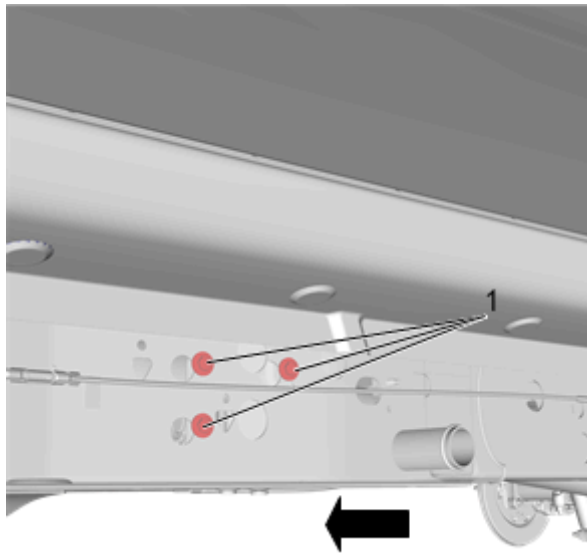


Fig. 13: BPMV Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: It is not necessary to remove the BPMV bracket bolts.

18. Through the outboard, left frame rail, loosen, but do not remove, the BPMV bracket bolts (1).
19. Slide the BPMV and bracket assembly toward the rear of the vehicle and remove the assembly.
20. If necessary, remove the BPMV bracket. Refer to [Brake Pressure Modulator Valve Bracket Replacement](#).
21. Remove the EBCM, if necessary. Refer to [Electronic Brake Control Module Replacement](#).

Installation Procedure

1. Install the EBCM, if removed. Refer to [Electronic Brake Control Module Replacement](#).
2. Install the BPMV to the bracket, if removed. Refer to [Brake Pressure Modulator Valve Bracket Replacement](#).
3. Install the BPMV and bracket assembly to the frame rail and slide the BPMV and bracket assembly toward the front of the vehicle.

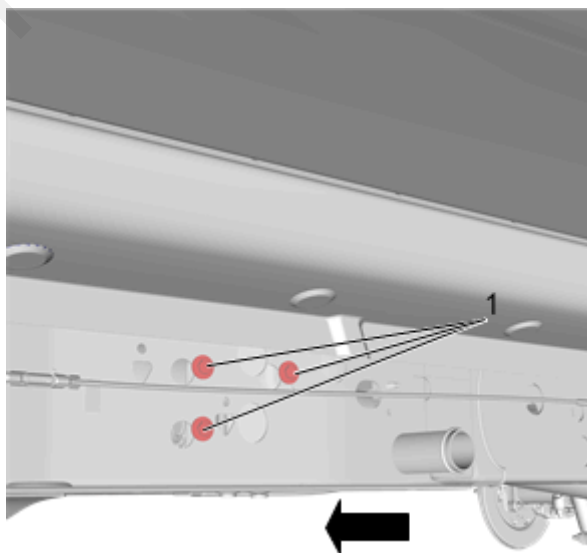


Fig. 14: BPMV Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

DN: Refer to **Fastener Caution** .

4. Keep the BPMV and bracket assembly firmly seated in the slots of the frame rail and tighten the BPMV bracket bolts (1) to 25 N.m (18 lb ft).

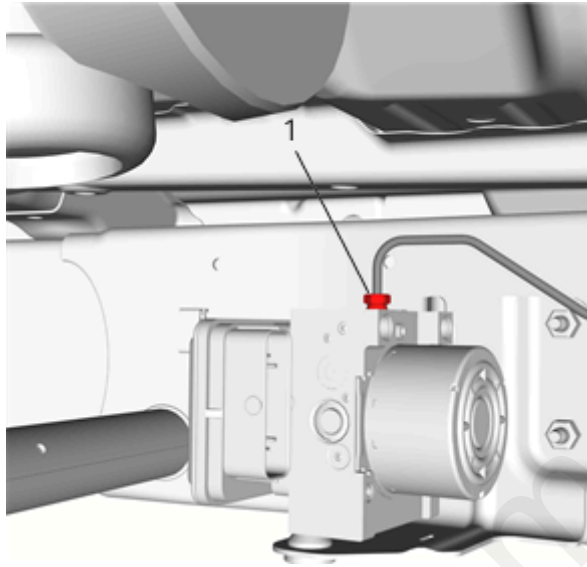


Fig. 15: Left Front Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

5. Connect the left front brake pipe fitting (1) and tighten the fitting to 18 N.m (13 lb ft).

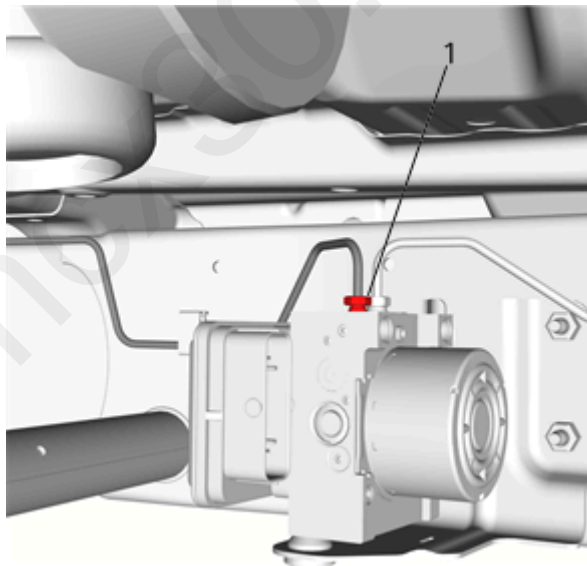


Fig. 16: Right Rear Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

6. Connect the right rear brake pipe fitting (1) and tighten the fitting to 18 N.m (13 lb ft).

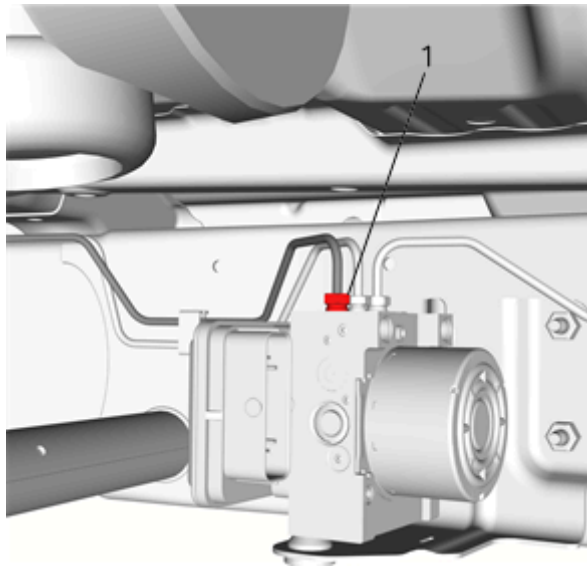


Fig. 17: Left Rear Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

7. Connect the left rear brake pipe fitting (1) and tighten the fitting to 18 N.m (13 lb ft).

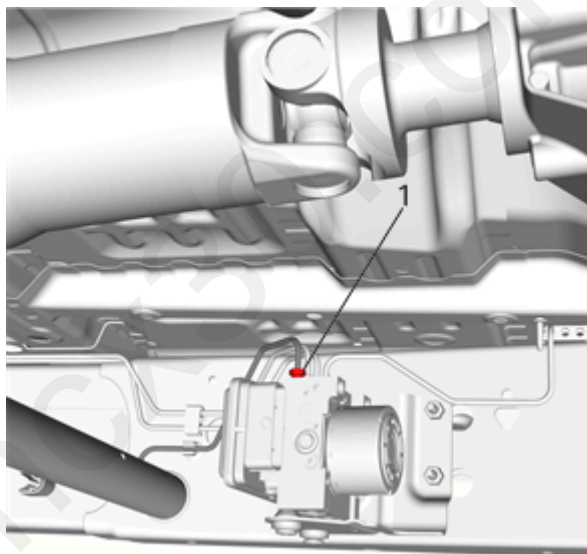


Fig. 18: Right Front Brake Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

8. Connect the right front brake pipe fitting (1) and tighten the fitting to 18 N.m (13 lb ft).

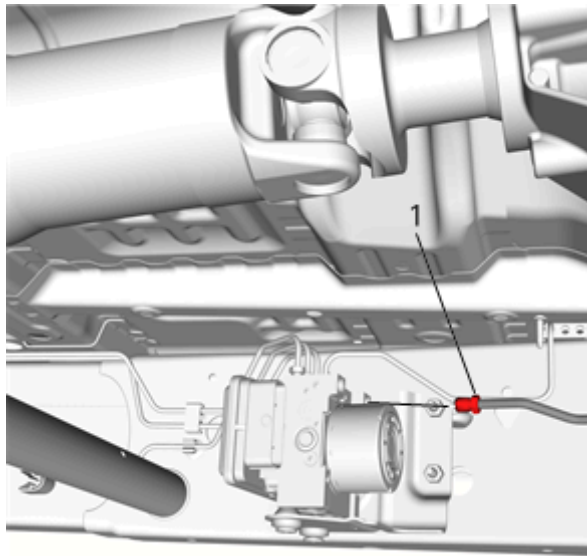


Fig. 19: Master Cylinder Secondary Inlet Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

9. Connect the master cylinder secondary brake pipe fitting (1) and tighten the fitting to 32 N.m (24 lb ft).

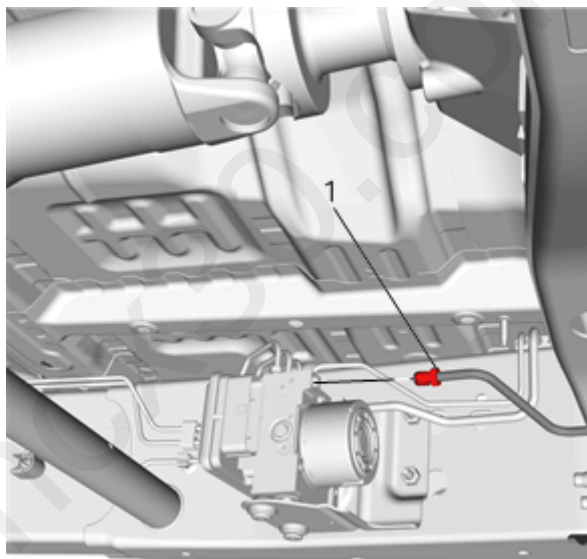


Fig. 20: Master Cylinder Primary Inlet Brake Pipe Fitting
 Courtesy of GENERAL MOTORS COMPANY

10. Connect the master cylinder primary brake pipe fitting (1) and tighten the fitting to 32 N.m (24 lb ft).
11. Connect the EBCM electrical connector.
12. Install the transfer case skid shield, if equipped. Refer to [Transfer Case Skid Shield Replacement](#) .
13. Bleed the antilock brake system. Refer to [Antilock Brake System Automated Bleed](#).
14. Program the EBCM. Refer to [Electronic Brake Control Module Programming and Setup](#) .
15. Calibrate the BPMV pressure sensor. Refer to [Brake Pressure Modulator Valve Pressure Sensor Calibration](#).

BRAKE PRESSURE MODULATOR VALVE PRESSURE SENSOR CALIBRATION

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

c brake control module (EBCM) replacement

- Brake pressure modulator valve assembly replacement

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

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

BRAKE PRESSURE MODULATOR VALVE BRACKET REPLACEMENT

Removal Procedure

1. Place the ignition switch in the OFF position.
2. Remove the brake pressure modulator valve (BPMV) assembly. Refer to [Brake Pressure Modulator Valve Replacement](#).

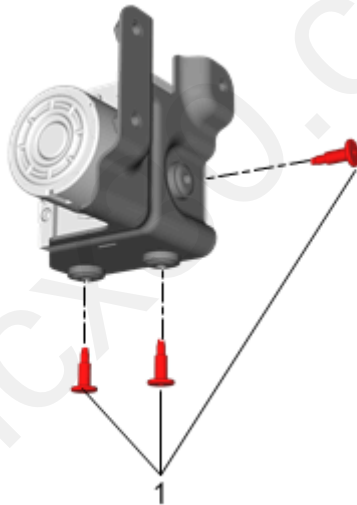


Fig. 21: BPMV Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Remove the BPMV bolts (1).

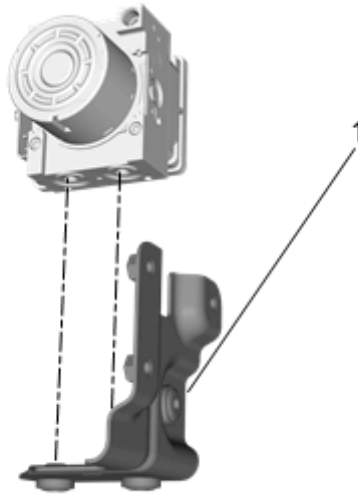


Fig. 22: BPMV Bracket

Courtesy of GENERAL MOTORS COMPANY

4. Carefully separate the BPMV assembly from the BPMV bracket insulators and remove the BPMV bracket (1).
5. Inspect the insulators for damage and replace, if necessary.

Installation Procedure

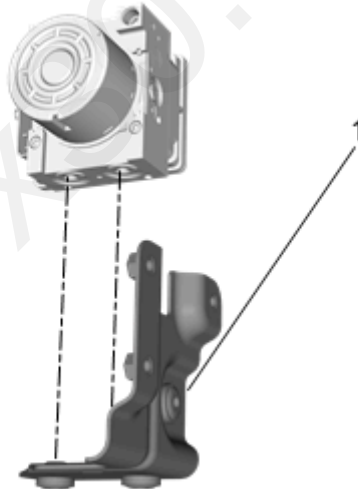


Fig. 23: BPMV Bracket

Courtesy of GENERAL MOTORS COMPANY

1. Install the BPMV bracket (1).

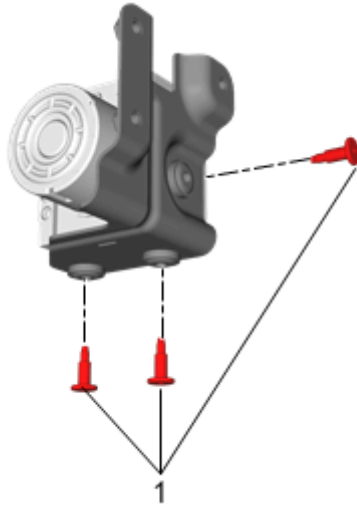


Fig. 24: BPMV Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install the BPMV bolts (1) and tighten to 9 N.m (80 lb in).
3. Install the BPMV assembly. Refer to [Brake Pressure Modulator Valve Replacement](#).

FRONT WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

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

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

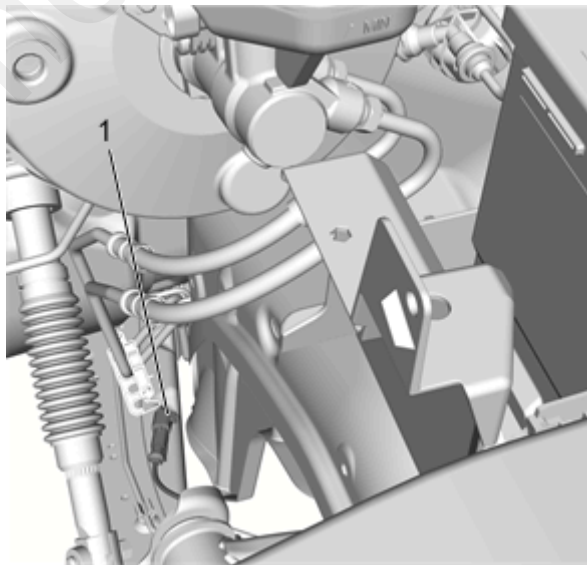


Fig. 25: Wheel Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

Disconnect the wheel speed sensor electrical connector and release the connector (1) from the retainer on the frame rail.

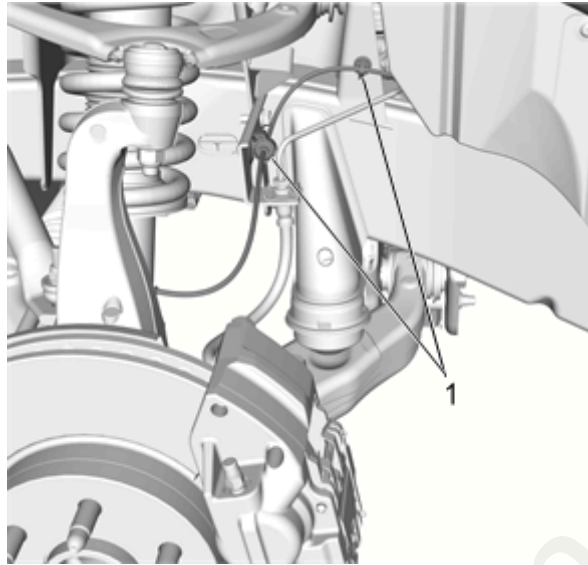


Fig. 26: Front Wheel Speed Sensor Harness Clips
Courtesy of GENERAL MOTORS COMPANY

4. Release the front wheel speed sensor harness clips (1) from the vehicle frame.

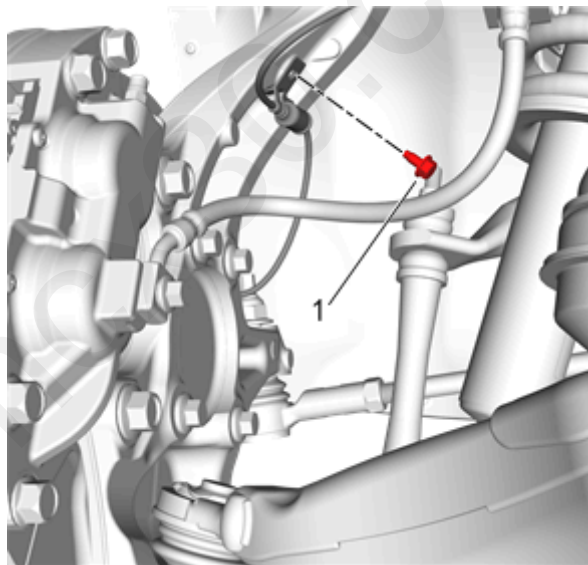


Fig. 27: Front Wheel Speed Sensor Harness Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Remove the front wheel speed sensor harness bracket bolt (1).

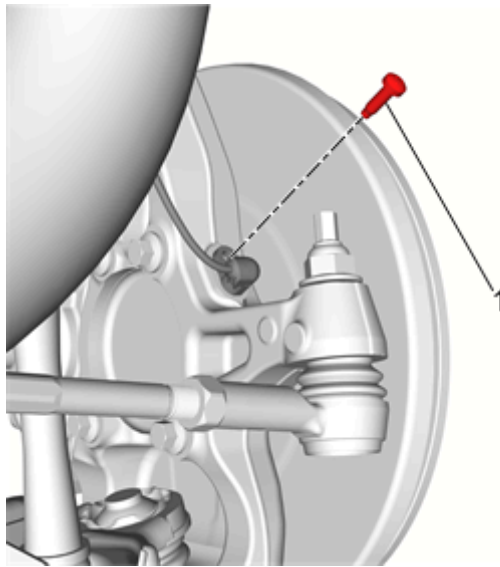


Fig. 28: Wheel Speed Sensor Bolt

Courtesy of GENERAL MOTORS COMPANY

6. Thoroughly clean the wheel speed sensor mounting area of the steering knuckle of any dirt and debris.
7. Remove the front wheel speed sensor bolt (1).

NOTE: Do not pry or lever against the wheel speed sensor to remove.

8. Carefully remove the wheel speed sensor from the suspension knuckle by pulling straight outward.

Installation Procedure

1. Install the wheel speed sensor to the suspension knuckle.

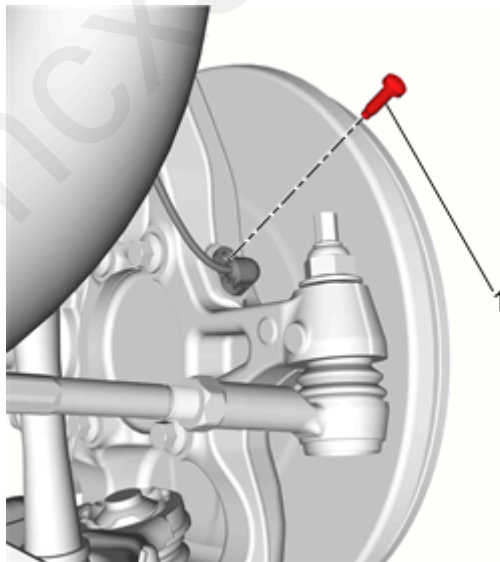


Fig. 29: Wheel Speed Sensor Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install the front wheel speed sensor bolt (1) and tighten to 6 N.m (53 lb in).

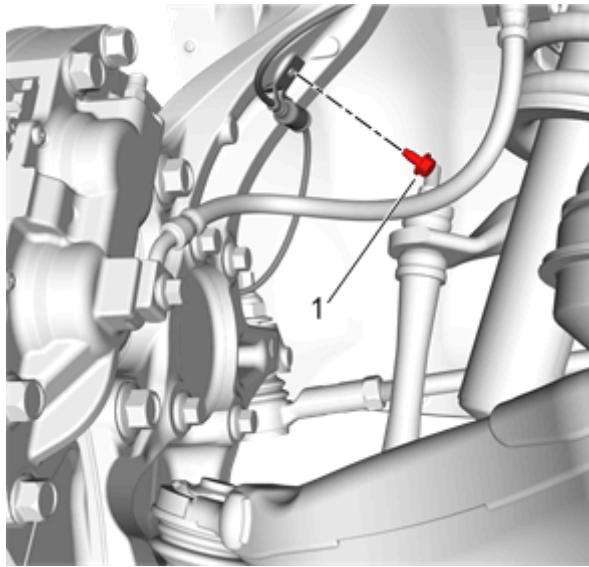


Fig. 30: Front Wheel Speed Sensor Harness Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install the front wheel speed sensor bracket bolt (1) and tighten to 9 N.m (80 lb in).

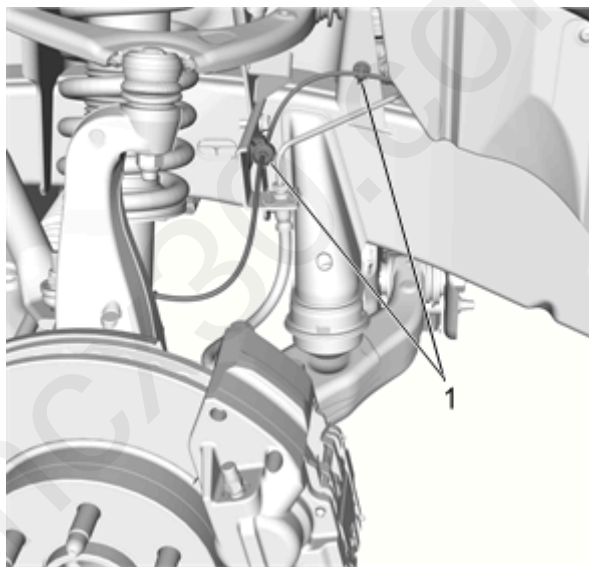


Fig. 31: Front Wheel Speed Sensor Harness Clips
Courtesy of GENERAL MOTORS COMPANY

4. Install the front wheel speed sensor harness clips (1) to the vehicle frame.

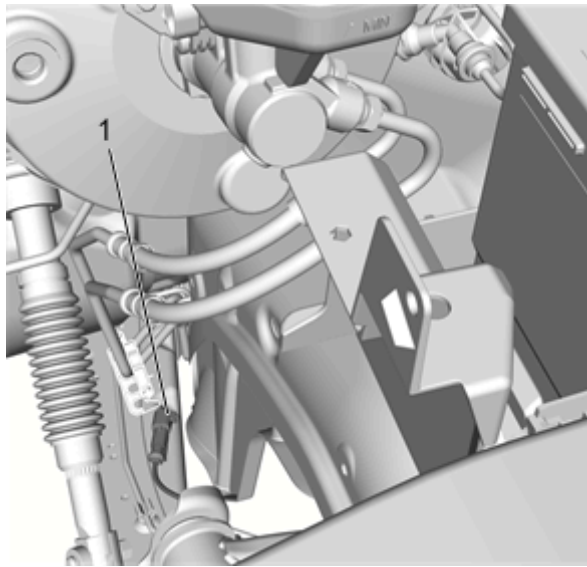


Fig. 32: Wheel Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

5. Install the front wheel speed sensor harness connector retainer (1) to the vehicle frame.
6. Connect the front wheel speed sensor electrical connector.
7. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

REAR WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

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

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

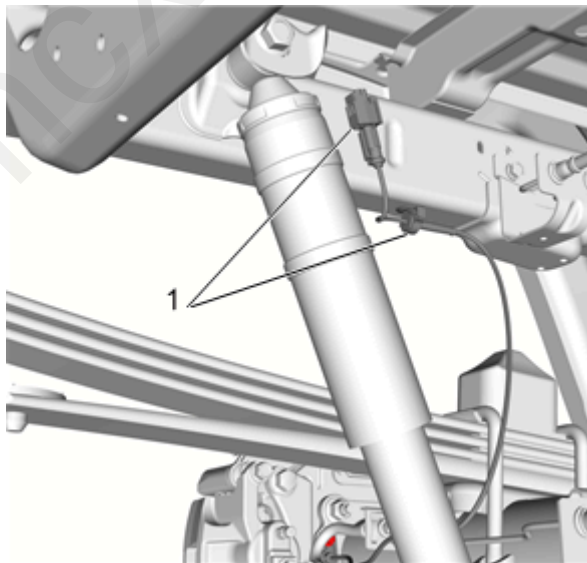


Fig. 33: Retaining Clips

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the wheel speed sensor harness electrical connector.
3. Release the wheel speed sensor harness from the retaining clips (1) on the vehicle frame.

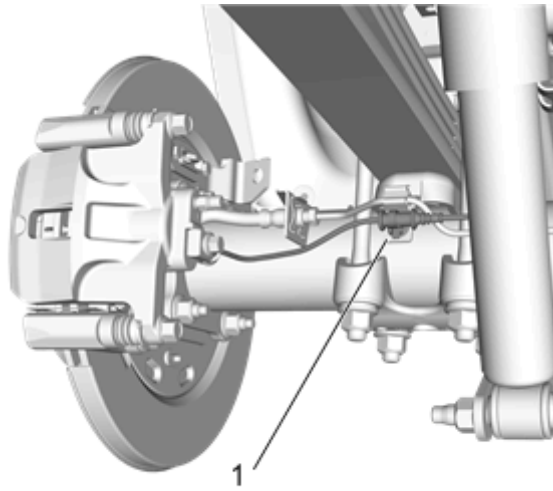


Fig. 34: Wheel Speed Sensor Harness Clip

Courtesy of GENERAL MOTORS COMPANY

4. Release the wheel speed sensor harness clip (1) from the rear axle.

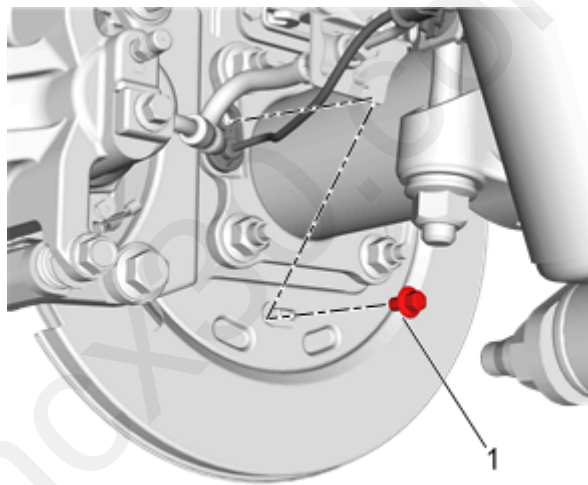


Fig. 35: Rear Wheel Speed Sensor Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Thoroughly clean the wheel speed sensor mounting area of the rear axle of any dirt and debris.
6. Remove the rear wheel speed sensor bolt (1).
7. Carefully remove the wheel speed sensor from the rear axle by pulling straight outward.

Installation Procedure

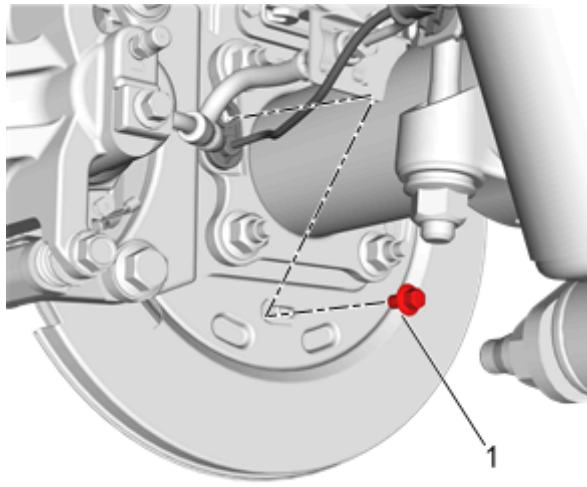


Fig. 36: Rear Wheel Speed Sensor Bolt

Courtesy of GENERAL MOTORS COMPANY

1. Install the rear wheel speed sensor to the rear axle.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the rear wheel speed sensor bolt (1) and tighten to 9 N.m (80 lb in).

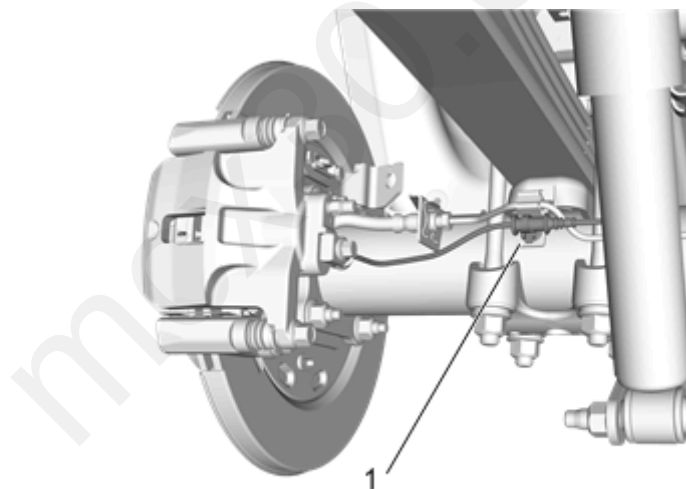


Fig. 37: Wheel Speed Sensor Harness Clip

Courtesy of GENERAL MOTORS COMPANY

3. Install the wheel speed sensor harness clip (1) to the rear axle.

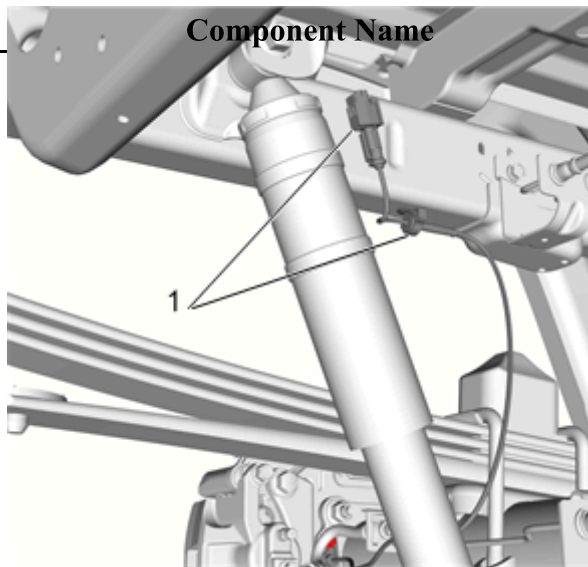


Fig. 38: Retaining Clips

Courtesy of GENERAL MOTORS COMPANY

4. Install the wheel speed sensor harness to the retaining clips (1) on the vehicle frame.
5. Connect the wheel speed sensor harness electrical connector.

VEHICLE STABILITY CONTROL SYSTEM SWITCH REPLACEMENT

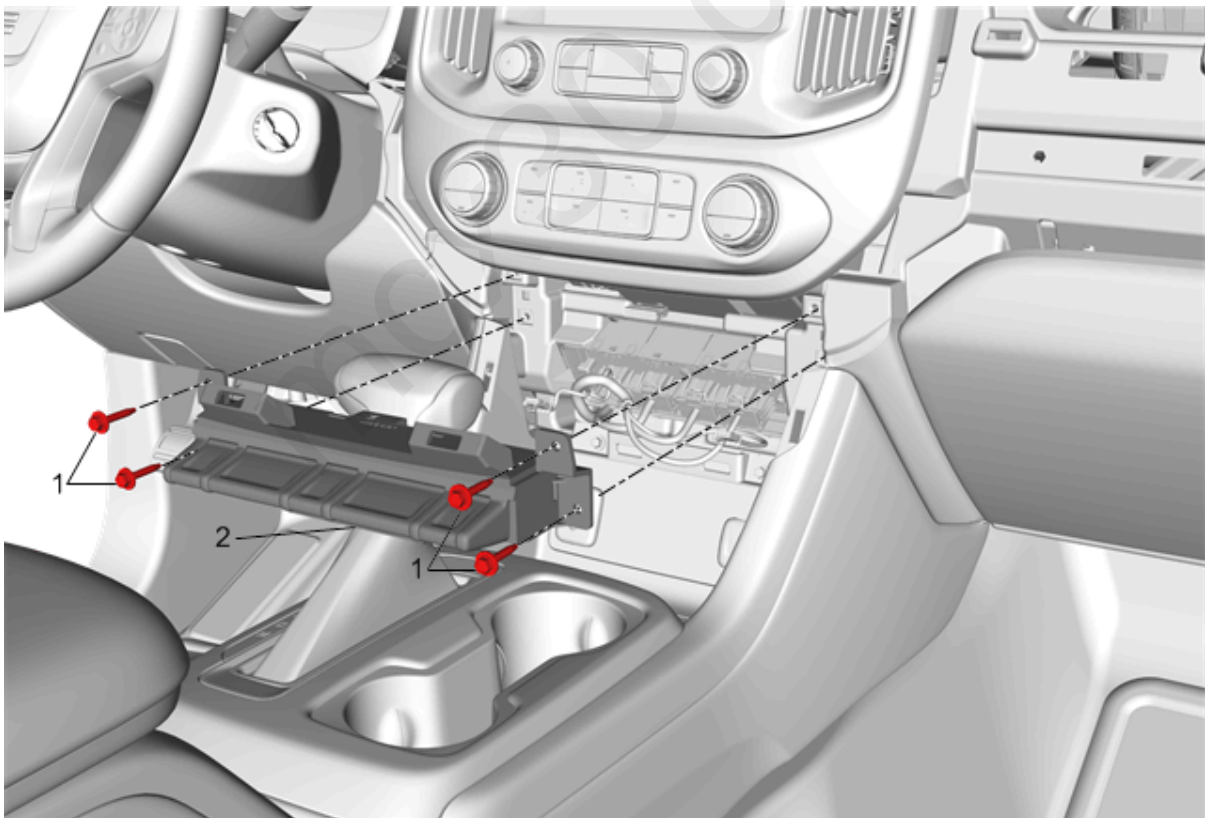


Fig. 39: Vehicle Stability Control System Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Component Name

Preliminary Procedure

1. Remove the instrument panel assembly. Refer to [Instrument Panel Assembly Replacement](#) .
2. Remove the instrument panel accessory bezel. Refer to [Instrument Panel Accessory Bezel Replacement](#) .

1	Vehicle Stability Control System Switch Fastener (Qty 4) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Vehicle Stability Control System Switch Procedure Disconnect the electrical connector.

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

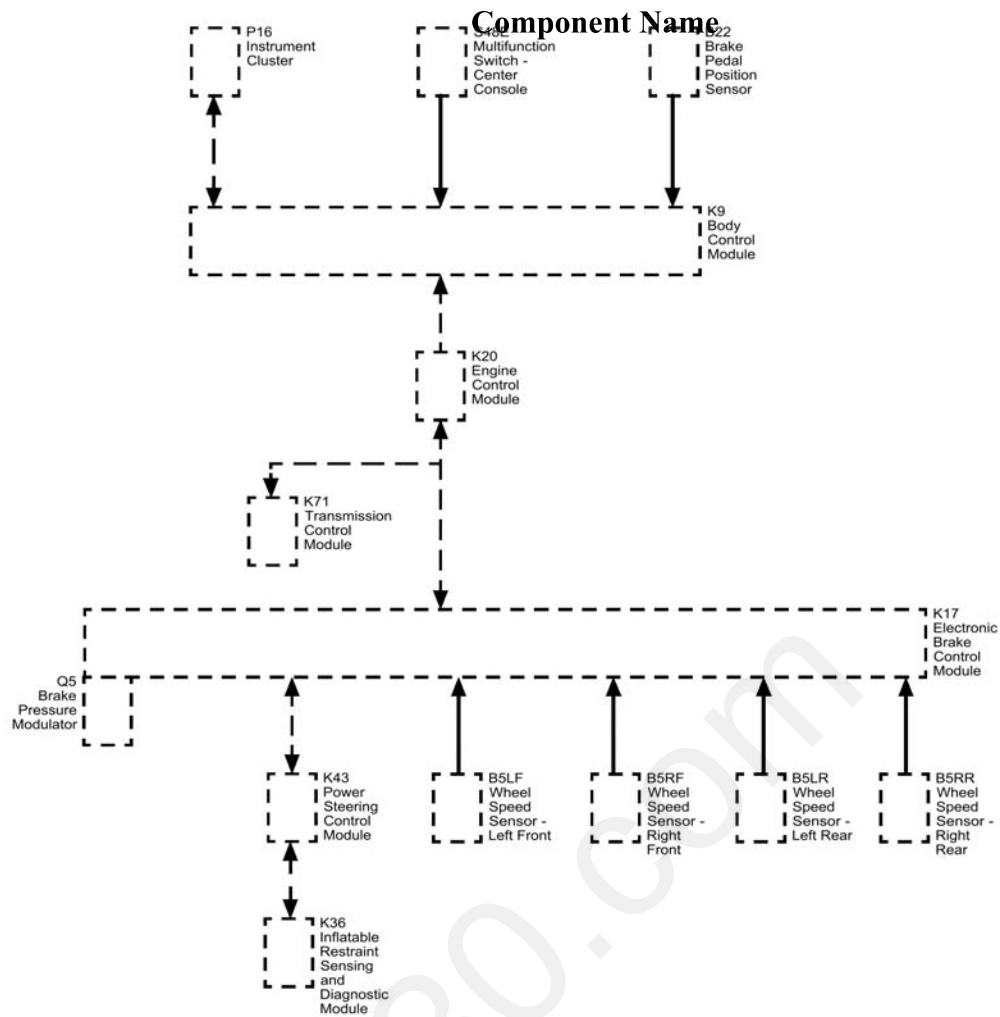


Fig. 40: ABS Description and Operation
Courtesy of GENERAL MOTORS COMPANY

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

equipped with a Continental Teves Mk100 ABS, traction control, electronic stability control and a hydraulic brake system with diagonal brake circuit split.

The electronic brake control module and the brake pressure modulator is serviced separately. The brake pressure modulator uses a four circuit configuration to control hydraulic pressure to each wheel independently.

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

- ABS
- Traction control
- Stability control
- Dynamic rear proportioning
- Hill hold start assist
- Hydraulic brake assist
- Intelligent brake assist
- Optimized hydraulic braking system

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

- Electronic brake control-The electronic brake control module controls the system functions and detects failures. It supplies voltage to the solenoid valves and pump motor.
- Brake pressure modulator-The brake pressure modulator contains the following components:
 - Hydraulic pump with pump motor
 - Four isolation valves
 - Four dump valves
 - Two traction/stability control supply valves
 - Two traction/stability control isolation valves
 - Brake pressure sensor
- 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.
- Steering wheel angle sensor-This sensor measures the rotation angle, angle velocity and direction of the steering wheel, providing serial data message inputs to the electronic brake control module. The steering wheel angle sensor signal is used to calculate the intended driving direction. This sensor is internal to the electric power steering gear.
- Traction control switch-The traction control system is manually disabled or enabled by pressing the traction control switch.
- Traction/Stability control switch-The electronic stability control is manually disabled or enabled by pressing and holding the traction control switch for five seconds.
- Active wheel speed sensors-The electronic brake control module sends a signal voltage to each wheel speed sensor. As the wheel spins, the wheel speed sensor produces an alternating current square wave signal. The electronic brake control module uses the frequency of the square wave signal to calculate the wheel speed.

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

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 thirty milliseconds to check component operation. The electronic brake control module sets a DTC if any error is detected. The initialization sequence may be heard and felt while it is taking place, and is considered part of normal system operation. The active test is initiated by the electronic brake control module at the start of the ignition cycle and the speed of the fastest wheel exceeds 10 km/h (7 MPH).

ABS

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

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

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

Pressure Hold

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

Pressure Decrease

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

Pressure Increase

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

Traction Control

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

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

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

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

Stability Control

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

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

- Steering wheel position
- Vehicle speed
- Lateral acceleration

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

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

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

Dynamic Rear Proportioning

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

Hill Hold Start Assist

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

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

- Accelerator pedal position
- Brake switch

essure

- Clutch switch, if equipped
- Engine torque
- Longitudinal acceleration
- Reverse gear information
- Vehicle speed

Hydraulic Brake Assist

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

The electronic brake control module receives inputs from the brake pressure sensor. When the electronic brake control module senses an emergency braking situation, it will actively increase the hydraulic brake pressure to a specific maximum by turning the pump motor ON.

Intelligent Brake Assist

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

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

Optimized Hydraulic Braking System

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

Driver Information Indicators

Brake Warning Indicator

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

- The instrument cluster performs the bulb check.
- The 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 instrument cluster receives a serial data message from the body control module requesting illumination.

ABS Indicator

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

- The instrument cluster performs the bulb check.

ronic brake control module detects a malfunction which disables the ABS and sends a serial data message to the instrument cluster requesting illumination.

Illustration	Tool Number/ Description
Traction/Stability Control Indicator	

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

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

Hill Descent Control Indicator

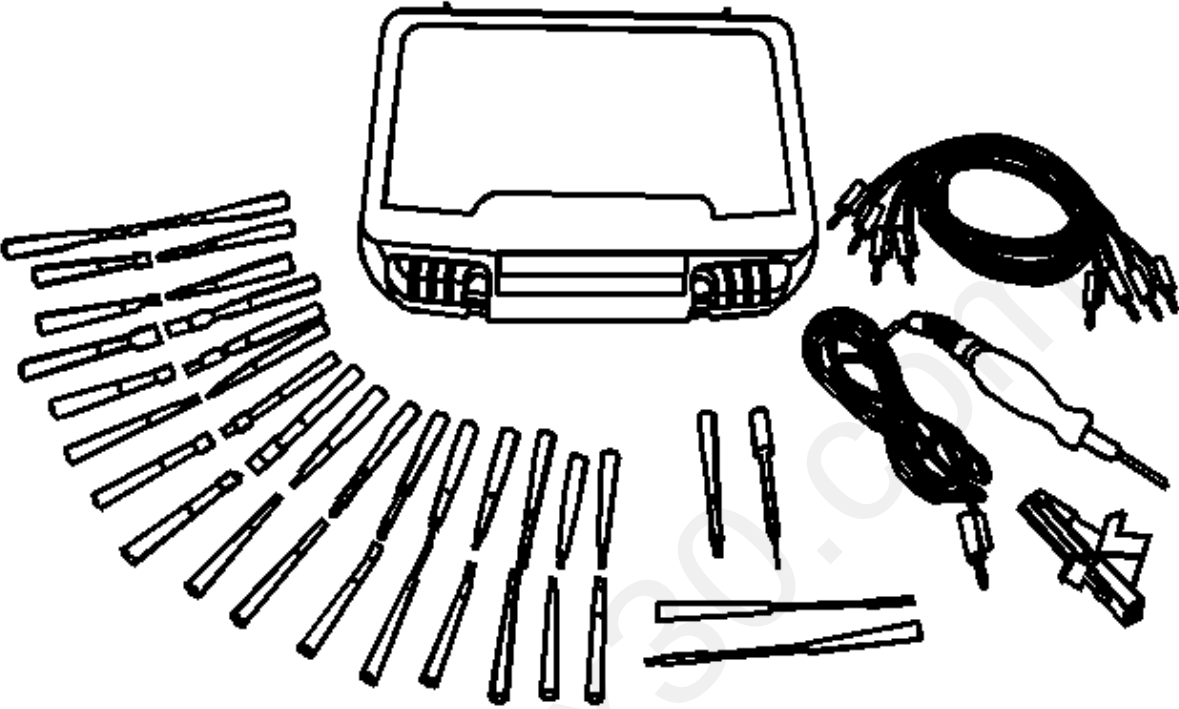
The instrument cluster turns the hill descent control indicator ON when the following occurs:

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description

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