

Antilock Brake System

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Description and Operation

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ABS Description and Operation

This vehicle is equipped with the MGH 60Mando antilock brake system. The electronic brake control module (EBCM) and the brake pressure modulator valve (BPMV) are serviced separately. The BPMV uses a 4-circuit configuration to control hydraulic pressure to each wheel independently.

The following vehicle performance enhancement systems are provided.

- Antilock brake system (ABS)
- Electronic brake distribution (EBD)
- Traction Control System (TCS)
- Vehicle Stability Enhancement System (VSES)

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

- Electronic brake control module (EBCM) – The EBCM controls the system functions and detects failures.
- Brake pressure modulator valve (BPMV) – The brake pressure modulator valve contains the hydraulic valves and pump motor that are controlled electrically by the EBCM. The BPMV uses a 4-circuit configuration with a diagonal split. The brake pressure modulator valve directs fluid from the reservoir of the master cylinder to the left front and right rear wheels and fluid from the other reservoir to the right front and left rear wheels. The diagonal circuits are hydraulically isolated so that a leak or malfunction in one circuit will allow continued braking ability on the other.
- The brake pressure modulator valve contains the following components:
 -
 - Pump motor
 - Inlet valves (one per wheel)
 - Outlet valves (one per wheel)
 - Two traction control/stability control supply valves
 - Two traction control/stability control isolation valves
 - Pressure Sensor
- Wheel speed sensor (WSS) – The wheel speed sensor receives a 12-volt power supply voltage from the electronic brake control module (EBCM) and provides an output signal to the EBCM. As the wheel spins, the wheel speed sensor sends the EBCM a DC square wave signal. The EBCM uses the frequency of the square wave signal to calculate the wheel speed.
- Traction Control Switch (TCS) – VSES and the engine torque reduction function of the TCS are manually disabled or enabled by pressing the traction control switch.
- Steering angle sensor – The EBCM receives serial data message inputs from the steering angle sensor. The steering angle sensor signal is used to calculate the desired yaw rate.
- Multi-axis acceleration sensor – The yaw rate and lateral acceleration sensors are combined into one multi-axis acceleration sensor, external to the EBCM. The EBCM receives serial data message inputs from the yaw rate and lateral acceleration sensor and activates stability control depending on multi-axis acceleration sensor input.

Initialization Sequence

The EBCM performs 1 initialization test each ignition cycle. The initialization of the EBCM occurs when both the following conditions occur:

- The vehicle speed is greater than 20 km/h (12 mph).
- The stop lamp switch is not applied.

The initialization sequence cycles each solenoid valve and the pump motor, as well as the necessary relays, for approximately 1.5 seconds to

check component operation. The EBCM 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 EBCM defines a drive cycle as the completion of the initialization sequence.

Antilock Brake System

When wheel slip is detected during a brake application, the ABS enters antilock mode. During antilock 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 brake. The ABS cannot, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking.

During antilock 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 EBCM responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during antilock 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 antilock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during antilock 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.

Pressure Hold

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

Pressure Decrease

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

Pressure Increase

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

Electronic Brake Distribution

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

The red brake warning indicator is illuminated when the electronic brake distribution function is disabled.

Traction Control System

When drive wheel slip is noted while the brake is not applied, the electronic brake control module (EBCM) will enter traction control mode.

First, the EBCM requests the engine control module (ECM) to reduce the amount of torque to the drive wheels via the serial data. The ECM reduces torque to the drive wheels by retarding spark timing and turning off fuel injectors. The ECM reports the amount of torque delivered to the drive wheels via the serial data circuit.

- Pressure hold
- Pressure increase
- Pressure decrease

Vehicle Stability Enhancement System

The Vehicle Stability Enhancement System adds an additional level of vehicle control to the EBCM.

Yaw rate is the rate of rotation about the vehicle's vertical axis. The vehicle stability enhancement system is activated when the EBCM determines that the desired yaw rate does not match the actual yaw rate as measured by the yaw rate sensor.

The desired yaw rate is calculated from the following parameters:

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

The difference between the desired yaw rate and the actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. If the yaw error becomes too large, the EBCM attempts to correct the vehicle's yaw rate motion by applying differential braking to the appropriate wheel. The amount of differential braking applied to the left or right front wheel is based on both the yaw rate error and side slip rate error.

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

Driver Information Indicator

Brake Warning Indicator

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

- The instrument cluster performs the bulb check.
- The EBCM detects some faults, such as more than two wheel speed sensors are defective or the failure relating to the basic brake system occurs and sends a serial data message to the instrument cluster requesting illumination.
- The park brake is engaged or the brake fluid level is low.

ABS Warning Indicator

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

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

TCS/ESC Warning Indicator

The instrument panel cluster turns the TCS/ESC warning indicator ON when the following occurs:

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

TCS/ESC OFF Indicator

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

Diagnostic Information and Procedures

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DTC B2745

Diagnostic Instructions

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

DTC Descriptor

DTC B2745 02

Traction Control Switch Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Traction Control Switch Signal	B2745 02	1	1	â€”
Traction Control Switch Ground	â€”	1	â€”	â€”
1. Traction Control Switch Inoperative				

Circuit/System Description

The electronic brake control module (EBCM) monitors the traction control switch. When the traction control switch is pressed once, the EBCM will sense that the traction control is disabled. When the traction control switch is pressed once again, the EBCM will sense that the stability control is disabled. The EBCM will send the signal to the instrument cluster to turn the traction control off and stability control off indicator ON to notify the driver of the deactivation.

Conditions for Running the DTC

- Ignition ON.
- Ignition voltage is greater than 8.0 volts.

Conditions for Setting the DTC

The EBCM detects the traction control system (TCS)/VSES switch is activated for 20â€”seconds or more.

Action Taken When the DTC Sets

- The EBCM stores DTC.
- The ABS/TCS/vehicle stability enhancement system (VSES) may work as before.

Conditions for Clearing the DTC

- The conditions for setting the DTC are no longer present.
- The EBCM clears the history DTC when a current DTC is not detected in 40â€”consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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, with a scan tool command the IPC display test ON and OFF. The StabiliTrak indicator should turn ON and OFF.
2.
 - If the indicator does not turn ON and OFF, replace the IPC.
3. Observe the scan tool EBCM Traction Control Switch parameter while pressing and releasing the traction control switch. The reading should change between Active and Inactive.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the traction control switch.
2. Test for less than 1 Ω between the ground circuit terminal $\text{\textcircled{4}}$ and ground.
3.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify the scan tool Traction Control Switch parameter is Inactive.
5.
 - If not the specified value, test the signal circuit terminal $\text{\textcircled{2}}$ for a short to ground.
6. Install a 3A $\text{\textcircled{fused}}$ jumper wire between the signal circuit terminal $\text{\textcircled{2}}$ and the ground circuit terminal $\text{\textcircled{4}}$. Verify the scan tool Traction Control Switch parameter is Active.
7.
 - If not the specified value, test the signal circuit for a short to voltage or an open/high resistance.
8. If all circuits test normal, test or replace the traction control switch. If the DTC resets, replace the EBCM.

Component Testing

1. Ignition OFF, disconnect the harness connector at the traction control switch.
2. Test for infinite resistance between the signal terminal $\text{\textcircled{2}}$ and the ground terminal $\text{\textcircled{4}}$ with the switch in the open position.
3.
 - If not the specified value, replace the traction control switch.
4. Test for less than 3 Ω between the signal terminal $\text{\textcircled{2}}$ and the ground terminal $\text{\textcircled{4}}$ with the switch in the closed position.
5.
 - If greater than the specified range, replace the traction control switch.

Repair Instructions

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

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

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DTC C0035, C0040, C0045, or C0050

Diagnostic Instructions

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

DTC Descriptors

DTC C0035

Left Front Wheel Speed Sensor Electrical Failure

DTC C0035

Left Front Wheel Speed Sensor Circuit Erratic Signal

DTC C0035

Left Front Wheel Speed Sensor Circuit Signal Amplitude Less Than Minimum

DTC C0035

Left Front Wheel Speed Sensor Plausibility Error

DTC C0040

Right Front Wheel Speed Sensor Electrical Failure

DTC C0040

Right Front Wheel Speed Sensor Circuit Erratic Signal

DTC C0040

Right Front Wheel Speed Sensor Circuit Signal Amplitude Less Than Minimum

DTC C0040

Right Front Wheel Speed Sensor Plausibility Error

DTC C0045

Left Rear Wheel Speed Sensor Electrical Failure

DTC C0045

Left Rear Wheel Speed Sensor Circuit Erratic Signal

DTC C0045

Left Rear Wheel Speed Sensor Circuit Signal Amplitude Less Than Minimum

DTC C0045

Left Rear Wheel Speed Sensor Plausibility Error

DTC C0050

Right Rear Wheel Speed Sensor Electrical Failure

DTC C0050

Right Rear Wheel Speed Sensor Circuit Erratic Signal

Right Rear Wheel Speed Sensor Circuit Erratic Signal

DTCâ€‰C0050â€‰18

Right Rear Wheel Speed Sensor Circuit Signal Amplitude Less Than Minimum

DTCâ€‰C0050â€‰5A

Right Rear Wheel Speed Sensor Plausibility Error

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Sensor 12-Volt Reference Circuit	C0035â€‰06	C0035â€‰06	C0035â€‰06	C0035â€‰0F, 18
Left Front Sensor Low Reference Circuit	C0035â€‰06	C0035â€‰06	C0035â€‰06	C0035â€‰0F, 18
Right Front Sensor 12-Volt Reference Circuit	C0040â€‰06	C0040â€‰06	C0040â€‰06	C0040â€‰0F, 18
Right Front Sensor Low Reference Circuit	C0040â€‰06	C0040â€‰06	C0040 â€‰06	C0040â€‰0F, 18
Left Rear Sensor 12-Volt Reference Circuit	C0045â€‰06	C0045â€‰06	C0045â€‰06	C0045â€‰0F, 18
Left Rear Sensor Low Reference Circuit	C0045â€‰06	C0045â€‰06	C0045â€‰06	C0045â€‰0F, 18
Right Rear Sensor 12-Volt Reference Circuit	C0050â€‰06	C0050â€‰06	C0050â€‰06	C0050â€‰0F, 18
Right Rear Sensor Low Reference Circuit	C0050â€‰06	C0050â€‰06	C0050â€‰06	C0050â€‰0F, 18

Component	Condition	DTCs
Left Front Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or improperly mounted sensor - Loose or worn wheel bearing - Air gap between the wheel speed sensor and the encoder ring too large	C0035â€‰5A
Right Front Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or improperly mounted sensor - Loose or worn wheel bearing - Air gap between the wheel speed sensor and the encoder ring too large	C0040â€‰5A
Left Rear Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or improperly mounted sensor - Loose or worn wheel bearing - Air gap between the wheel speed sensor and the encoder ring too large	C0045â€‰5A
Right Rear Wheel Speed Sensor	- Physical damage - Debris on the wheel speed sensor or the encoder ring - Loose or improperly mounted sensor - Loose or worn wheel bearing - Air gap between the wheel speed sensor and the encoder ring too large	C0050â€‰5A

Circuit/System Description

The wheel speed sensor receives a 12-volt power supply voltage from the electronic brake control module (EBCM) and provides a DC square wave signal back to the EBCM. As the wheel spins, the EBCM uses the frequency of the square wave signal to calculate the wheel speed.

Conditions for Running the DTC

C0035â€“C0050â€“06

- The ignition is ON.
- Ignition voltage is greater than 8.0â€“volts.

C0035â€“C0050â€“0F

- The ignition is ON.
- Ignition voltage is greater than 8.0â€“volts.

C0035â€“C0050â€“18

- The ignition is ON.
- Ignition voltage is greater than 8.0â€“volts.
- No other wheel speed circuit DTCs are set.
- At least two other wheel speed circuits are not 0â€“km/h.

C0035â€“C0050â€“5A

- The ignition is ON.
- Ignition voltage is greater than 8.0â€“volts.
- The vehicle speed is greater than 20â€“km/h (12â€“mph).

Conditions for Setting the DTC

C0035â€“C0050â€“06

- An open is detected on the wheel speed sensor signal circuit.
- A short to ground is detected on the wheel speed sensor signal circuit.
- A short to voltage is detected on the wheel speed sensor signal circuit.

C0035â€“C0050â€“0F

EBCM detects a rapid variation in the wheel speed. The wheel speed changes 20â€“km/h (12â€“mph) or more in 0.007â€“seconds. The change must occur 56â€“times with no more than 0.07â€“seconds between occurrences.

C003â€“C0050â€“18

- One wheel speed is less than 2â€“km/h (1.2â€“mph).
- The remaining wheel speeds are greater than 10â€“km/h (6.2â€“mph) for 0.154â€“seconds.
- The difference between the remaining wheel speeds is less than 4â€“km/h (2.5â€“mph) from each other.

OR

- The 2â€“wheel speed is less than 2â€“km/h (1.2â€“mph).
- The other wheel speeds are greater than 10â€“km/h (6.2â€“mph) for 20â€“seconds.
- The difference between the remaining wheel speeds is less than 4â€“km/h (2.5â€“mph) from each other.

C0035â€“C0050â€“5A

An erratic signal output of the wheel speed sensor is detected.

Action Taken When the DTC Sets

- The EBCM disables the antilock brake system (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.

- The electronic brake distribution (EBD) does not function optimally with multiple wheel speed faults.
- The ABS indicator turns ON.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.
- The DTC can be cleared using a scan tool.

Diagnostic Aids

If 2 or more wheel speed sensors are inoperative diagnose each wheel speed sensor individually.

If the customer comments that the ABS indicator is ON only during moist environmental condition: rain, snow, vehicle wash, etc., inspect the wheel speed sensor wiring for signs of water intrusion. If the DTC is not current, clear all DTCs and simulate the effects of water intrusion by using the following procedures:

1. Spray the suspected area with a 5 percent saltwater solution. To create a 5 percent saltwater solution, add 2 teaspoons of salt to 8 FL oz of water (10 g of salt to 200 ml of water).
2. Test drive the vehicle over various road surfaces: bumps, turns, etc., above 40 km/h (25 mph) for at least 30 seconds.
3. Rinse the area thoroughly when completed.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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[ABS Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

With the scan tool installed drive the vehicle in a straight line at a speed greater than 15 km/h (10 mph), all wheel speed sensors should read the same kilometers per hour.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connectors at the appropriate B5 Wheel Speed Sensor and the harness connector at the K17 Electronic Brake Control Module, ignition ON.
2. Test for less than 1 V between the appropriate K17 Electronic Brake Control Module harness connector terminals listed below and ground:
- 3.

- B5LFâ€™Left Front Wheel Speed Sensor â€™ terminalâ€™33 and terminalâ€™20
- B5RFâ€™Right Front Wheel Speed Sensor â€™ terminalâ€™19 and terminalâ€™32
- B5LRâ€™Left Rear Wheel Speed Sensor â€™ terminalâ€™34 and terminalâ€™21
- B5RRâ€™Right Rear Wheel Speed Sensor â€™ terminalâ€™18 and terminalâ€™31

4.

- **If 1â€™V or greater**
- Repair the short to voltage on the circuit.

5.

- **If less than 1â€™V**

6. Ignition OFF.

7. Test for infinite resistance between the K17â€™Electronic Brake Control Module harness connector terminals listed below and ground:

8.

- B5LFâ€™Left Front Wheel Speed Sensor â€™ terminalâ€™33 and terminalâ€™20
- B5RFâ€™Right Front Wheel Speed Sensor â€™ terminalâ€™19 and terminalâ€™32
- B5LRâ€™Left Rear Wheel Speed Sensor â€™ terminalâ€™34 and terminalâ€™21
- B5RRâ€™Right Rear Wheel Speed Sensor â€™ terminalâ€™18 and terminalâ€™31

9.

- **If less than infinite resistance**
- Repair the short to ground on the circuit.

10.

- **If infinite resistance**

11. Test for less than 2â€™â„¸ between the B5â€™Wheel Speed Sensor harness connector terminalâ€™1 and the K17â€™Electronic Brake Control Module harness connector terminal listed below:

12.

- B5LFâ€™Left Front Wheel Speed Sensor â€™ terminalâ€™33
- B5RFâ€™Right Front Wheel Speed Sensor â€™ terminalâ€™19
- B5LRâ€™Left Rear Wheel Speed Sensor â€™ terminalâ€™34
- B5RRâ€™Right Rear Wheel Speed Sensor â€™ terminalâ€™18

13.

- **If 2â€™â„¸ or greater**
- Repair the open/high resistance in the circuit.

14.

- **If less than 2â€™â„¸**

15. Test for less than 2â€™â„¸ between the B5â€™Wheel Speed Sensor harness connector terminalâ€™2 and the K17â€™Electronic Brake Control Module harness connector terminal listed below:

16.

- B5LFâ€™Left Front Wheel Speed Sensor â€™ terminalâ€™20

- B5RFâ€™%Right Front Wheel Speed Sensor â€™“ terminalâ€™%32
- B5LRâ€™%Left Rear Wheel Speed Sensor â€™“ terminalâ€™%21
- B5RRâ€™%Right Rear Wheel Speed Sensor â€™“ terminalâ€™%31

17.

- **If 2â€™%â„,| or greater**
- Repair the open/high resistance in the circuit.

18.

- **If less than 2â€™%â„,|**

19. Replace the B5â€™%Wheel Speed Sensor.

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

21.

- **If the DTC sets**
- Replace the K17â€™%Electronic Brake Control Module.

22.

- **If the DTC does not set**

23. All OK.

Repair Instructions

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

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

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DTC C0110

Diagnostic Instructions

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

DTC Descriptors

DTC C011004

Pump Motor Circuit Open Circuit

DTC C011006

Pump Motor Circuit Short to Ground

DTC C011061

Pump Motor Stuck Mechanically

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
ABS Pump Motor Power Circuit	C011006	C011004	â€”	â€”
ABS Pump Motor Ground Circuit	â€”	C011004	â€”	â€”
ABS Pump Motor Mechanical Fault	â€”	â€”	â€”	C011061

Circuit/System Description

The pump motor is an integral part of the brake pressure modulator valve (BPMV), while the pump motor relay is integral to the electronic brake control module (EBCM). The pump motor relay is not engaged during normal system operation. When antilock brake system (ABS) operation is required the EBCM activates the pump motor relay and a battery power is provided to the pump motor.

Conditions for Running the DTC

C011004, C011006

- The ignition is ON.
- Initialization is complete.

C011061

- The test is initiated once per ignition cycle, when the vehicle speed is greater than 15 km/h (9 mph), and a fault was set on the last ignition cycle.
- The vehicle speed is greater than 20 km/h (12.5 mph), and brake is not applied.

Conditions for Setting the DTC

C011004, C011006

The EBCM detects a low voltage in the pump motor supply circuit when the feedback voltage is less than 6 volts for more than 0.049 seconds, and the pump motor is not activated. The ground circuit is open, and the feedback voltage is greater than 4 volts for 0.5 seconds, the pump is not activated.

C011061

The pump motor continues to rotate briefly after activation creating a feedback voltage. The EBCM sets the code if the measured feedback voltage indicates a binding or stalled pump motor.

Action Taken When the DTC Sets

- The EBCM disables the antilock brake system (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- The ABS indicator turns ON.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.
- The DTC can be cleared using a scan tool.

Diagnostic Aids

The pump motor is integral to the BPMV. The pump motor is not serviceable. Inspect the power and ground circuits for correct connection.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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[ABS Description and Operation](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

Ignition ON, command the Pump Motor test with a scan tool and listen/feel the pump motor turns on.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EBCM.
2. Test for less than 1 ohm between the ground circuit terminals listed below and ground.
3.
 - Terminal 13
 - Terminal 38
4.
 - If greater than the specified range, test the ground circuit for an open/high resistance.

5. Ignition ON, verify that a test lamp illuminates between B+ circuit terminals listed below and ground.
6.
 - Terminal 25
 - Terminal 1
7.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance. If the circuits test normal and the B+ circuit fuse is open, test or replace the BPMV.
8. Ignition OFF, remove the EBCM from the BPMV.
9. Inspect the EBCM to BPMV connector for conditions such as damage, corrosion, or presence of brake fluid.
10.
 - If connector corrosion or damage is evident, replace BPMV and/or EBCM as necessary.
 - If brake fluid is present, replace both BPMV and EBCM.
11. Connect the EBCM harness connector with the BPMV still separated.
12. Connect a test lamp between the pump motor circuits terminals.
13. Command the Pump Motor Test with a scan tool, the test lamp should illuminate when commanded.
14.
 - If test lamp does not illuminate, replace the EBCM. If the DTC resets, replace the BPMV.
15. If all circuits test normal, replace the BPMV.

Repair Instructions

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

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

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DTC C0131

Diagnostic Instructions

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

DTC Descriptors

DTC C0131 00

Pressure Sensor Electrical Failure

DTC C0131 5A

Pressure Sensor Signal Not Plausible

Circuit/System Description

The electronic brake control module (EBCM) uses input from the brake pressure sensor for more accurate control during a vehicle stability enhancement system (VSES) event.

Conditions for Running the DTC

- Ignition ON.
- Ignition voltage is greater than 8.0 volts.

Conditions for Setting the DTC

- Pressure signal does not correlate to estimated pressure over time.
- Brake Signal does not correlate to pressure signal.
- Signal is erratic and changes faster than physically allowed.

Action Taken When the DTC Sets

- The EBCM disables the traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle, and the ABS remains functional.
- A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- Conditions for Clearing the DTC
- The EBCM clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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](#)

Circuit/System Verification

1. Apply and release brake pedal. Verify brake lamps operate properly.
2.
 - If brake lamps do not operate properly, refer to [Symptoms - Lighting](#).
3. Ignition ON, observe the scan tool EBCM brake switch signal parameter while applying and releasing the brake pedal. The reading should change between Active and Inactive.
4.
 - If the parameter does not change between active and inactive, replace the EBCM assembly.

Repair Instructions

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

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

1. BRAKES
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DTC C0161

Diagnostic Instructions

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

DTC Descriptor

DTC C0161 5A

Antilock Brake System Brake Switch Circuit

Circuit/System Description

The electronic brake control module (EBCM) detects the brake signal inputs from the brake switch and calculates the vehicle speed from the 4 wheel speed sensors. When the vehicle is stopping the EBCM monitors for the brake pedal is pressed, with the brake pressure increasing and the vehicle is slowing down, or when the vehicle is accelerating, the brake pedal is not pressed and brake pressure is not increasing.

Conditions for Running the DTC

- Ignition ON.
- Ignition voltage is greater than 8.0 volts.

Conditions for Setting the DTC

- The vehicle speed is not reducing, the brake pressure is not increasing, when the brake pedal is detected as applied.
- The vehicle speed is reducing, the brake pressure is increasing, when the brake pedal is not detected as applied.

Action Taken When the DTC Sets

A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- The conditions for setting the DTC are no longer present.
- The EBCM clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

Description and Operation

[ABS Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)

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

Scan Tool Reference

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

Circuit/System Verification

Ignition ON, observe the scan tool EBCM brake switch signal parameter. The reading should be released and change between applied and released when pressing and releasing the brake pedal.

- If not within the specified value, check the brake switch diagnostic.

Repair Instructions

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

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

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1. BRAKES
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DTC C0179

Diagnostic Instructions

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

DTC Descriptor

DTC C0179 54

System Thermal High

Circuit/System Description

The electronic brake control module (EBCM) monitors the duration and how many times antilock brakes or the traction control is activated to calculate an estimated temperature of the brake components to prevent overheating.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The EBCM detects the temperature of the brakes is too high.

Action Taken When the DTC Sets

- The EBCM disables the traction control system (TCS)/vehicle stability enhancement system (VSES).
- A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- The EBCM calculates the brakes have cooled sufficiently.
- The EBCM clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

DTC C0179 does not indicate a malfunction has occurred. This DTC indicates there was excessive ABS or Traction Control activation that could cause high temperatures.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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](#)

Circuit/System Verification

Verify that the DTC sets outside of the Conditions for Running and Setting. Since most occurrences of this DTC are caused by an excessive braking or Traction Control usage, review with the customer the conditions under which the DTC set.

- If the DTC set within the Conditions for Running and Setting, the brake system is operating as designed.

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DTC C0186

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 C0186 5A

Lateral Acceleration Sensor Plausibility Failure

DTC C0186 71

Lateral Acceleration Sensor Invalid Serial Data Received

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition Voltage	C0186 71	C0186 71	â€”	C0186 5A, C0186 71
Low Reference	â€”	C0186 71	C0186 71	C0186 5A, C0186 71
CAN Bus High Serial Data	C0186 71	C0186 71	C0186 71	C0186 5A, C0186 71
CAN Bus Low Serial Data	C0186 71	C0186 71	C0186 71	C0186 5A, C0186 71

Circuit/System Description

The lateral accelerometer and the yaw rate sensors are combined into one sensor external to the electronic brake control module (EBCM). The vehicle stability enhancement system (VSES) uses the lateral accelerometer input when calculating the desired yaw rate. The yaw rate/lat sensor communicates with the EBCM via discrete CAN Bus High and CAN Bus Low serial data circuits.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The yaw/lateral combination sensor reports an internal failure.
- The yaw/lateral combination sensor learns a wrong offset value.
- Incorrectly mounted yaw/lateral sensor.

Action Taken When the DTC Sets

- The EBCM disables the vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The EBCM clears the history DTC when a current DTC is not detected in 40â€”consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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](#)

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the yaw rate/lateral acceleration sensor.
2. Ignition OFF, test for less than 1â€™ohm between the low reference circuit terminalâ€™6 and ground.
3.
 - If greater than the specified range, test the low reference circuit for an open/high resistance.
4. Ignition ON, test for ignition voltage between the ignition voltage circuit terminalâ€™5 and ground.
5.
 - If not within the specified range, test the ignition voltage circuit for a short to ground or open/high resistance.
6. Ignition OFF, disconnect the harness connector at the EBCM.
7. Ignition ON, test for less than 1â€™volt between the following terminal listed below and ground.
8.
 - CAN Bus High serial data circuit terminalâ€™12
 - CAN Bus Low serial data circuit terminalâ€™24
9.
 - If greater than the specified value, test the appropriate serial data circuit for a short to voltage.
10. Ignition OFF, test for infinite resistance between the following terminal listed below and ground.
11.
 - CAN Bus High serial data circuit terminalâ€™12
 - CAN Bus Low serial data circuit terminalâ€™24
12.
 - If not the specified value, test the appropriate serial data circuit for a short to ground.
13. Test for less than 1â€™ohm between the appropriate serial data circuit terminals listed below.
14.
 - CAN Bus High serial data circuit terminalâ€™12 at the EBCM harness connector and terminalâ€™3 at the yaw rate/lateral acceleration sensor harness connector

- CAN Bus Low serial data circuit terminalâ€™%24 at the EBCM harness connector and terminalâ€™%1 at the yaw rate/lateral acceleration sensor harness connector

15.

- If greater than the specified range, test the appropriate serial data circuit for an open/high resistance.

16. Test for infinite resistance between the CAN Bus High serial data circuit terminalâ€™%12 and the CAN Bus Low serial data circuit terminalâ€™%24.

17.

- If not the specified value, repair the serial data circuits for a short together.

18. If all circuits test normal, replace the yaw rate/lateral acceleration sensor. If the DTC resets, replace the EBCM.

Repair Instructions

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

- [Vehicle Yaw Sensor Replacement](#)
- [Control Module References](#)

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DTC C0196

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 C0196 5A

Yaw Rate Sensor Plausibility Failure

DTC C0196 71

Yaw Rate Sensor Invalid Serial Data Received

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition Voltage	C0196 71	C0196 71	â€”	C0196 5A, C0196 71
Low Reference	â€”	C0196 71	C0196 71	C0196 5A, C0196 71
CAN Bus High Serial Data	C0196 71	C0196 71	C0196 71	C0196 5A, C0196 71
CAN Bus Low Serial Data	C0196 71	C0196 71	C0196 71	C0196 5A, C0196 71

Circuit/System Description

The yaw rate and the lateral accelerometer sensors are combined into one sensor, external to the electronic brake control module (EBCM). The vehicle stability enhancement system (VSES) uses the lateral accelerometer input when calculating the desired yaw rate. The yaw rate/lat sensor communicates with the EBCM via discrete CAN Bus High and CAN Bus Low serial data circuits.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The yaw rate/lateral acceleration combination sensor reports an internal failure.
- The yaw rate/lateral acceleration combination sensor learns a wrong offset value.
- Incorrectly mounted yaw rate/lateral acceleration sensor.

Action Taken When the DTC Sets

- The EBCM disables the vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The EBCM clears the history DTC when a current DTC is not detected in 40â€”consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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](#)

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the yaw rate/lateral acceleration sensor.
2. Ignition OFF, test for less than 1â€™ohm between the low reference circuit terminalâ€™6 and ground.
3.
 - If greater than the specified range, test the low reference circuit for an open/high resistance.
4. Ignition ON, test for ignition voltage between the ignition voltage circuit terminalâ€™5 and ground.
5.
 - If not within the specified range, test the ignition voltage circuit for a short to ground or open/high resistance.
6. Ignition OFF, disconnect the harness connector at the EBCM.
7. Ignition ON, test for less than 1â€™volt between the following terminal listed below and ground.
8.
 - CAN Bus High serial data circuit terminalâ€™12
 - CAN Bus Low serial data circuit terminalâ€™24
9.
 - If greater than the specified value, test the appropriate serial data circuit for a short to voltage.
10. Ignition OFF, test for infinite resistance between the following terminal listed below and ground.
11.
 - CAN Bus High serial data circuit terminalâ€™12
 - CAN Bus Low serial data circuit terminalâ€™24
12.
 - If not the specified value, test the appropriate serial data circuit for a short to ground.
13. Test for less than 1â€™ohm between the appropriate serial data circuit terminals listed below.
14.
 - CAN Bus High serial data circuit terminalâ€™12 at the EBCM harness connector and terminalâ€™3 at the yaw rate/lateral acceleration sensor harness connector

- CAN Bus Low serial data circuit terminalâ€™%24 at the EBCM harness connector and terminalâ€™%1 at the yaw rate/lateral acceleration sensor harness connector

15.

- If greater than the specified range, test the appropriate serial data circuit for an open/high resistance.

16. Test for infinite resistance between the CAN Bus High serial data circuit terminalâ€™%12 and the CAN Bus Low serial data circuit terminalâ€™%24.

17.

- If not the specified value, repair the serial data circuits for a short together.

18. If all circuits test normal, replace the yaw rate/lateral acceleration sensor. If the DTC resets, replace the EBCM.

Repair Instructions

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

- [Vehicle Yaw Sensor Replacement](#)
- [Control Module References](#)

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DTC C0201

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 C0201

Pump Motor Fuse Circuit Failure

Circuit/System Description

The pump motor fuse, located within the electronic brake control module (EBCM), supplies battery voltage to all of the valve solenoids.

Conditions for Running the DTC

- Ignition ON.
- Ignition voltage is greater than 8 volts.

Conditions for Setting the DTC

Pump motor supply voltage is less than 4 volts.

Action Taken When the DTC Sets

- The EBCM disables the antilock brake system (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- ABS warning indicator turns ON.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.
- The DTC can be cleared using a scan tool.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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 OFF, disconnect the harness connector at the EBCM.
2. Test for less than 1â€‰ohm between the ground circuit terminals listed below and ground.
3.
 - Terminalâ€‰13
 - Terminalâ€‰38
4.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
5. Ignition ON, verify that a test lamp illuminates between B+ circuit terminals listed below and ground.
6.
 - Terminalâ€‰25
 - Terminalâ€‰1
7.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
8. If all circuits test normal, replace the EBCM.

Repair Instructions

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

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

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DTC C0242 or P0856

Diagnostic Instructions

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

DTC Descriptors

DTC C0242

Engine Control Module Indicated Traction Control Malfunction

DTC P0856

Traction Control Torque Request Signal Message Counter Incorrect

Circuit/System Description

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

Conditions for Running the DTC

Engine running

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

Description and Operation

[ABS Description and Operation](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify that no other DTCs are set except for C0242 or P0856.
3.
 - **If any other DTCs are set**
 - Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
4.
 - **If no other DTCs are set**
5. Replace the K20â€œEngine Control Module.
6. Verify that DTCâ€œC0242 or P0856 does not set while operating the vehicle within the Conditions for Running the DTC.
7.
 - **If DTC C0242 or P0856 is set**
 - Replace the K17â€œElectronic Brake Control Module.
8.
 - **If DTC C0242 or P0856 is not set**
9. All OK.

Repair Instructions

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

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

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DTC C0292

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 C0292 1A

VSES Combination Sensor Supply Voltage Out of Range

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Yaw and Lateral Accelerometer Sensor 12-Volt Reference	â€”	C0292 1A	C0292 1A	â€”
Yaw and Lateral Accelerometer Sensor Low Reference	â€”	C0292 1A	â€”	â€”

Circuit/System Description

The electronic brake control module (EBCM) supplies a reference voltage of 12â€‰%V to the yaw rate sensor/lateral acceleration sensor and the steering angle sensor. The sensor supply voltage is monitored via an internal feedback circuit to the EBCM microprocessor.

Conditions for Running the DTC

- Ignition ON
- Ignition voltage is greater than 8.0â€‰%volts.

Conditions for Setting the DTC

The EBCM detects that the sensor supply voltage feedback indicates that the voltage level is less or greater than 1.0â€‰%V for more than 100â€‰%msec, a fault is set.

Action Taken When the DTC Sets

- The EBCM turns OFF the 12â€‰%V reference circuit, until the ignition is cycled.
- The EBCM disables the vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- A warning indicator on the information display module may be displayed.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present and the DTC is cleared with a scan tool.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40â€‰%consecutive drive cycles.

Diagnostic Aids

If the yaw and lateral accelerometer sensor is disconnected, DTCs will set and the EBCM will not provide 12â€‰%V reference.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

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- [Connector Repairs](#)
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- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

Circuit/System Testing

1. Ignition OFF, disconnect the yaw rate and lateral acceleration sensor connector.
2. Ignition OFF, test for less than 1â€™ohm between the low reference circuit terminalâ€™6 and ground.
3.
 - If greater than 1â€™ohm, test the circuit between the low reference circuit terminalâ€™6 and the ground G200 or G201 for an open/high resistance. If the circuits test normal, replace the yaw rate sensor/lateral acceleration sensor.
4. Test the lateral accelerometer 12â€™V reference circuit terminalâ€™5, for an open/high resistance or a short to voltage or ground.
5.
 - If all circuits test normal, replace the yaw rate sensor/lateral acceleration sensor.
 - If the DTC sets again after replacing the yaw rate sensor/lateral acceleration sensor, replace the EBCM.

Repair Instructions

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

- [Control Module References](#)
- [Vehicle Yaw Sensor Replacement](#)

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DTC C0561

Diagnostic Instructions

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

DTC Descriptor

DTC C0561

System Disabled Information Stored Engine Speed Invalid Data

DTC C0561

System Disabled Information Stored Acceleration Pedal Invalid Data

DTC C0561

System Disabled Information Stored Transmission Gear Invalid Data

Circuit/System Description

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

Conditions for Running the DTC

Engine running.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

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Description and Operation

[ABS Description and Operation](#)

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

Scan Tool Reference

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

Circuit/System Verification

C0561â€%77 or C0561â€%78

1. Ignition ON.
2. Verify that no other DTCs are set.
3.
 - **If any other DTCs are set**
 - Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
4.
 - **If no other DTCs are set**
5. Replace the K20â€%Engine Control Module.
6. Verify the DTC does not set while operating the vehicle under the Conditions for Running the DTC.
7.
 - **If the DTC sets**
 - Replace the K17â€%Electronic Brake Control Module.
8.
 - **If the DTC does not set**
9. All OK.

C0561â€%79

1. Ignition ON.
2. Verify that no other DTCs are set.
3.
 - **If any other DTCs are set**
 - Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
4.
 - **If no other DTCs are set**

5. Replace the K71â€™Transmission Control Module.
6. Verify the DTC does not set while operating the vehicle under the Conditions for Running the DTC.
7.
 - **If the DTC sets**
 - Replace the K17â€™Electronic Brake Control Module.
8.
 - **If the DTC does not set**
9. All OK.

Repair Instructions

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

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

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DTC C056D

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 C056D

Electronic Control Unit Hardware Internal Error

Circuit/System Description

The electronic control module (EBCM) detects an internal malfunction.

Conditions for Running the DTC

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

Conditions for Setting the DTC

The EBCM detects an internal malfunction.

Action Taken When the DTC Sets

- The EBCM disables the antilock brake system (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- ABS warning indicator may be displayed.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.
- The DTC can be cleared using a scan tool.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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

Verify DTC P056D is not set.

- If DTC is set, replace the EBCM.

Repair Instructions

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

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

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DTC C056E

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 C056E

Vehicle Identification Number (VIN) Not Programmed

Conditions for Running the DTC

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

Conditions for Setting the DTC

The EBCM detects an internal calibration failure.

Action Taken When the DTC Sets

The EBCM enables the antilock brake system (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.

Conditions for Clearing the DTC

- The EBCM delete the DTC as soon as the fault condition is recovered.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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

Verify DTC P056E is not set.

- If DTC is set, program the EBCM. If the DTC resets, replace the EBCM.

Repair Instructions

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

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

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DTC C0710

Diagnostic Instructions

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

DTC Descriptor

DTC C0710 4B

Steering Position Signal Calibration not Learned

DTC C0710 5A

Steering Position Signal Plausibility Failure

DTC C0710 71

Steering Position Signal Invalid Serial Data Received

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12-Volt Reference	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	â€”	C0710 4B, C0710 5A, C0710 71
Steering Angle Sensor Low Reference	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71
CAN Bus High Serial Data	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71
CAN Bus Low Serial Data	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71	C0710 4B, C0710 5A, C0710 71

Circuit/System Description

The steering angle sensor receives a 12â€”V reference voltage from the electronic brake control module (EBCM). The EBCM receives high speed controller area network (CAN) message inputs from the steering angle sensor identifying the position and direction of the steering wheel rotation. The EBCM utilizes this signal to calculate the driver intended driving direction.

Conditions for Running the DTC

- The ignition is ON.
- Ignition voltage is greater than 8â€”volts.

Conditions for Setting the DTC

C0710 4B

Steering Wheel Position Sensor not calibrated after installation.

C0710 5A

- The steering angle sensor signal is out of specified range.
- The steering angle sensor offset is out of specified range.

C0710 71

The steering angle sensor signal is not plausible with the yaw rate sensor signal and lateral acceleration sensor signal.

Action Taken When the DTC Sets

- The EBCM disables the traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- A warning indicator on the information display module may be displayed.
- The ABS remains functional.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The electronic brake control module (EBCM) clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

- Inspect the vehicle for proper alignment. The car should not pull in either direction while driving straight on a level surface.
- The Snapshot function on the scan tool can help find an intermittent DTC.
- Possible causes for this DTC are the following conditions:
 -
 - One of the steering wheel position sensor inputs are open, shorted to ground, or shorted to battery.
 - Internal steering angle sensor malfunction
 - Noise on the steering wheel position signal circuits
 - Yaw and lateral acceleration sensor malfunction causing drifting signal outputs
 - Internal EBCM malfunction

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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](#)

Circuit/System Verification

1. With the scan tool perform the Steering Angle Sensor Centering.
2. Verify the DTC does not reset.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the steering angle sensor.
2. Test for less than 1â€™ohm of resistance between the low reference circuit terminalâ€™6 and ground.
3.
 - If greater than the specified range, test for an open/high resistance in the ground circuit.
4. Ignition ON, verify that a test lamp illuminates between the B+ circuit terminalâ€™5 and ground.
5.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
6. Ignition OFF, disconnect the harness connector at the EBCM.
7. Ignition ON, test for 0â€™volts between the EBCM Bus-communication terminalâ€™24 and ground.
8.
 - If greater than the specified value, test the communication circuit for a short to voltage.
9. Test for 0â€™volts between the EBCM Bus- communication circuit terminalâ€™12 and ground.
10.
 - If greater than the specified value, test the communication circuit for a short to voltage.
11. Ignition OFF, test for infinite resistance between the EBCM Bus-communication circuit terminalâ€™24 and ground.
12.
 - If not the specified value, test the communication circuit for a short to ground.
13. Test for infinite resistance between the EBCM Bus-communication circuit terminalâ€™12 and ground.
14.
 - If not the specified value, test the communication circuit for a short to ground.
15. Test for less than 1â€™ohm of resistance between the EBCM communication circuit terminalâ€™24 and Yaw/Lateral Accelerometer Sensor terminalâ€™1.
16.
 - If greater than the specified range, test the communication circuits for an open/high resistance.
17. Test for less than 1â€™ohm of resistance between the EBCM communication circuit terminalâ€™12 and Yaw/Lateral Accelerometer terminalâ€™3.
18.
 - If greater than the specified range, test the communication circuits for an open/high resistance.
19. Test for infinite resistance between the EBCM communication circuit terminalâ€™24 and terminalâ€™12.
20.
 - If not the specified value, test the communication circuits for a short together.
21. If all circuits test normal, replace the steering wheel position sensor.
22. If the DTC is reset again after replacing steering wheel position, replace the EBCM.

Repair Instructions

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

- [Control Module References](#)

- [Steering Angle Sensor Replacement](#)

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DTC C0800

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

DTCâ€™%C0800â€™%03

Power Supply Circuit Low Voltage

DTCâ€™%C0800â€™%07

Power Supply Circuit High Voltage

Circuit Description

The electronic brake control module (EBCM) monitors the voltage level available for system operation. A low voltage condition prevents the system from operating correctly.

If the voltage level is too high, damage may result in the system. When the EBCM detects a high voltage condition, the EBCM turns OFF the system relay which removes battery voltage from the solenoid valves and pump motor.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

C0800â€™%03

One of the following conditions exists for 0.5â€™%seconds:

- When the system is inactive, the system voltage is less than 8.8â€™%volts.
- When the system is active or standstill, the system voltage is less than 8.4â€™%volts.

C0800â€™%07

One of the following conditions exists:

- When the system is inactive, the system voltage is greater than 17â€™%volts for 2â€™%seconds.
- When the system is active or standstill, the system voltage is greater than 19â€™%volts for 0.5 â€™%seconds.

Action Taken When the DTC Sets

- The EBCM disables the Antilock Brake System (ABS)/traction control system (TCS)/vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- The ABS indicator turns ON.
- The BRAKE Warning indicator turns ON.

Conditions for Clearing the DTC

- The EBCM will automatically delete the DTCâ€™%C0800â€™%03 when the fault condition is recovered.
- The DTC is not deleted even though low voltage condition is disappeared during control.

Diagnostic Aids

- Test the charging system. Refer to [Charging System Test](#).
- Possible causes of this DTC are the following conditions:
- - A charging system malfunction
 - Too much battery draw
 - A weak battery
 - A faulty system ground

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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

With scan tool installed, clear the DTCs then drive the vehicle in a straight line at a speed greater than 20â€‰km/h (13â€‰mph).

Circuit/System Testing

1. Measure the voltage at the battery terminals.
2. With a scan tool, observe the Switched System Battery Voltage parameter in the ABS data list. Verify that battery terminal voltage and ignition voltage readings do not differ more than 1â€‰volt.
3.
 - If more than 1â€‰volt, test the ground circuit of the EBCM for high resistance. If the circuit tests normal, test or replace the EBCM.
4. Start the engine and allow to idle, using a scan tool check if DTC is set to current.
5.
 - If the DTC is set to current, continue next step.
6. Ignition OFF, disconnect the EBCM harness connector.
7. Test for less than 1â€‰ohm of resistance between the ground circuit terminals and ground.
- 8.

- If greater than the specified range, test the ground circuits for an open/high resistance.
9. Connect a DMM between the supply voltage circuit terminals and the ground circuit terminals.
- 10.
- If 12±%volts is present, replace the EBCM.

Repair Instructions

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

[Electronic Brake Control Module Replacement](#)

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Symptoms - Antilock Brake System

1. Note:

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

2. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables in order to verify that all of the following are true:
3.
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
4. Review the system operation in order to familiarize yourself with the system functions. Refer to [ABS Description and Operation](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the antilock brake system. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components, for obvious damage or conditions, which could cause the symptom.
- Inspect the master cylinder reservoir for the correct brake fluid level.

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](#)

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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 panel cluster (IPC) momentarily illuminates the antilock brake system (ABS) indicator during the bulb check when the ignition is cycled ON. When the electronic brake control module (EBCM) detects a fault requiring ABS indicator ON, it sends the signal to the IPC to illuminate the ABS indicator.

Reference Information

Schematic Reference

[Antilock Brake System Schematics](#)

Connector End View Reference

[Master Electrical Component List](#)

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. With a scan tool, command the IPC display test ON and OFF. The ABS indicator should turn ON and OFF.
2.
 - If the ABS indicator does not turn ON and OFF when commanded, inspect the IPC.
3. If the IPC is normal, replace the EBCM.

Repair Instructions

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

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

Repair Instructions

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Antilock Brake System Automated Bleed

Warning:

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

Caution:

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

Note:

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

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

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

Caution:

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove all four tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
3. Inspect the brake system for leaks and visual damage. Refer to [Symptoms - Hydraulic Brakes](#) , repair or replace components as needed.
4. Lower the vehicle.
5. Inspect the battery state of charge. Refer to [Battery Inspection/Test](#).
6. Install a scan tool.
7. Turn the ignition ON, with the engine OFF.
8. With the scan tool, establish communications with the ABS system. Select Control Functions. Select Automated Bleed from the Control Functions menu.
9. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
10. Following the directions given on the scan tool, pressure bleed the base brake system. Refer to [Hydraulic Brake System Bleeding](#).
11. Follow the scan tool directions until the desired brake pedal height is achieved.
12. If the bleed procedure is aborted, a malfunction exists. Perform the following steps before resuming the bleed procedure:
13.
 - If a DTC is detected, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) , and diagnose the appropriate DTC.
 - If the brake pedal feels spongy, perform the conventional brake bleed procedure again. Refer to [Hydraulic Brake System Bleeding](#).
14. When the desired pedal height is achieved, press the brake pedal to inspect for firmness.

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

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Steering Wheel Angle Sensor Centering

The steering angle sensor does not require centering often. Centering of the steering angle sensor might be required after certain service procedures are performed. Some of these procedures are as follows:

- Wheel alignment
- Steering gear replacement
- Steering column replacement
- Collision or other physical damage
- Power steering control module replacement
- Electronic brake control module replacement
- Vehicle battery disconnection

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, engine OFF.
5. With the scan tool select the Power Steering Control Module.
6. Select the Steering Wheel Angle Sensor Centering under Configuration/Reset Functions list.
7. Follow the scan tool directions to complete the learn procedure.
8. With the scan tool select the Electronic Brake Control Module.
9. Select the Steering Wheel Angle Sensor Learn under Configuration/Reset Functions list.
10. Follow the scan tool directions to complete the learn procedure.
11. Clear any DTCs that may be set.

Related Part Information

Part Name	Catalog Name	Part Code
Steering Angle Sensor	SENSOR,STRG ANGLE	8110A

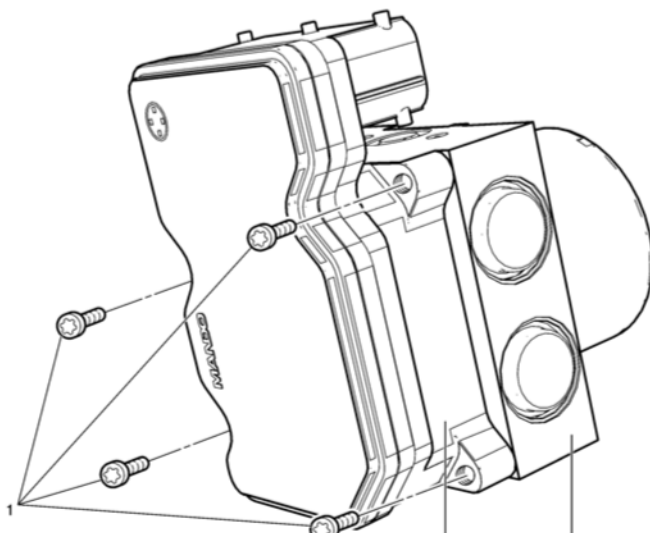
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Electronic Brake Control Module Replacement



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Callout	Component Name
Warning: Refer to Brake Fluid Irritant Warning. 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. Preliminary Procedure Remove the EBCM/BPMV assembly from the vehicle. Refer to Brake Pressure Modulator Valve Replacement.	

Callout	Component Name
1	Electronic Brake Control Module Bolt (Qty: 4) Caution: Refer to Fastener Caution. Tighten 2.8 N-m (25 lb-in)
2	Brake Pressure Modulator Valve
3	Electronic Brake Control Module Procedure 1. Separate the EBCM from the BPMV by carefully pulling apart. DO NOT pry the components apart. 2. If a new EBCM is being installed, program the EBCM. Refer to Control Module References

Related Part Information

Part Name	Catalog Name	Part Code
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/ FRT 2CH HYD ONLY)	0086A
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/BRKT & HYD BOOS & EMU & ECU)	0088A
Electronic Brake Control Module	MODULE, ELEK BRK CONT	0099X
Electronic Brake Control Module	MODULE KIT,ELEK BRK CONT	0099Z
Electronic Brake Control Module	MODULE,ELEK BRK CONT	0100A
Electronic Brake Control Module	MODULE,ELEK BRK CONT	0100B
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/O BOOT PRGM)	0100E
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/O FIRMWARE)	0100H
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/ DEFAULT CALN)	0103A
Electronic Brake Control Module	MODULE KIT,ELEK BRK CONT (W/BRK PRESS MOD VLV)	0115Z
Electronic Brake Control Module	MODULE,ELEK BRK CONT (W/BRK PRESS MOD VLV)	0116A

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Brake Pressure Modulator Valve Replacement

Removal Procedure

Warning:

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

Caution:

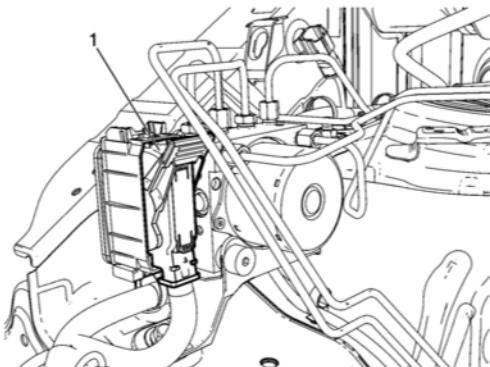
Always connect or disconnect the wiring harness connector from the EBCM/EBTCM with the ignition switch in the OFF position. Failure to observe this precaution could result in damage to the EBCM/EBTCM.

1. Turn the ignition switch to the OFF position.

2. Note:

The area around the EBCM/BPMV assembly must be free from loose dirt to prevent contamination of disassembled ABS components.

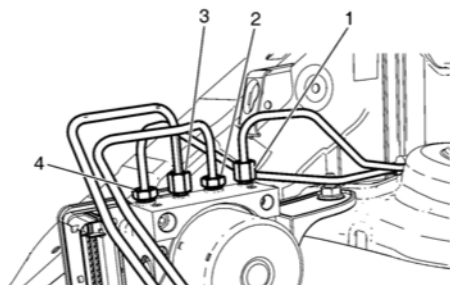
3. Clean the electronic brake control module (EBCM) to the brake pressure modulator valve (BPMV) area of any accumulated dirt and foreign material.



4.

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5. Disconnect the electrical connector(1) from the EBCM.

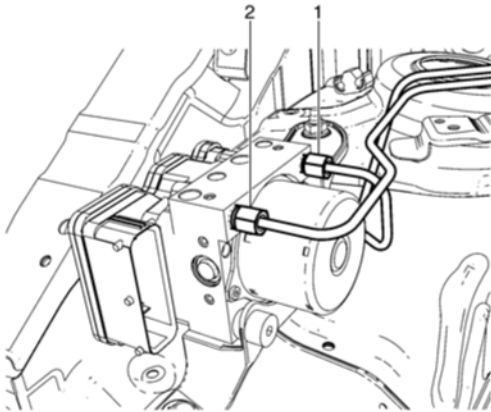




6.

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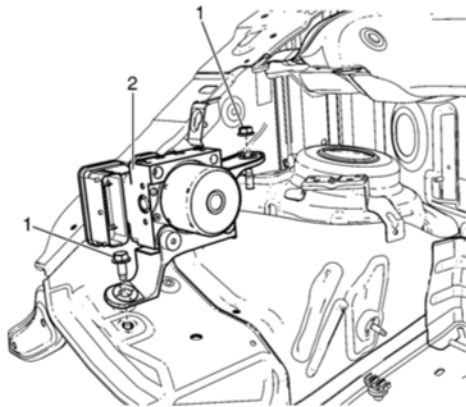
7. Disconnect the RF brake pipe fitting(1) from the BPMV.
8. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
9. Disconnect the LR brake pipe fitting(2) from the BPMV.
10. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
11. Disconnect the RR brake pipe fitting(3) from the BPMV.
12. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
13. Disconnect the LF brake pipe fitting(4) from the BPMV.
14. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.



15.

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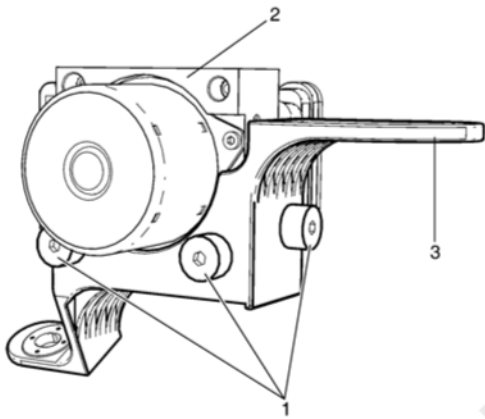
16. Disconnect the master cylinder primary brake pipe fitting (1) from the BPMV.
17. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.
18. Disconnect the master cylinder secondary brake pipe fitting (2) from the BPMV.
19. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.



20.

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21. Remove the EBCM/BPMV bracket bolt/nut(1).
22. Remove the EBCM/BPMV bracket assembly(2) from the vehicle.



23.

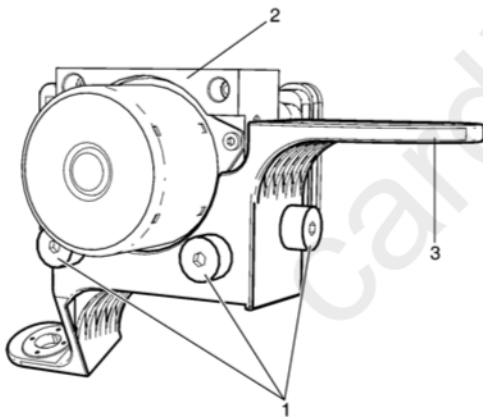
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24. Remove the EBCM/BPMV assembly to the EBCM/BPMV assembly bracket retaining bolts(1).

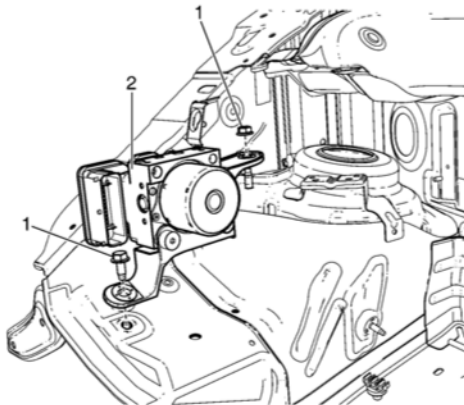
25. Remove the EBCM/BPMV assembly (2) from the bracket (3).
26. If installing a new BPMV, remove the EBCM. Refer to [Electronic Brake Control Module Replacement](#).

Installation Procedure

1. If installing a new BPMV, install the EBCM. Refer to [Electronic Brake Control Module Replacement](#).



2.
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3. Install the EBCM/BPMV assembly(2) to the EBCM/BPMV assembly bracket(3).
4. Caution:
Refer to [Fastener Caution](#).
5. Install the EBCM/BPMV assembly to EBCM/BPMV assembly bracket retaining bolts(1) and tighten to 11 N-m (97 lb-in).

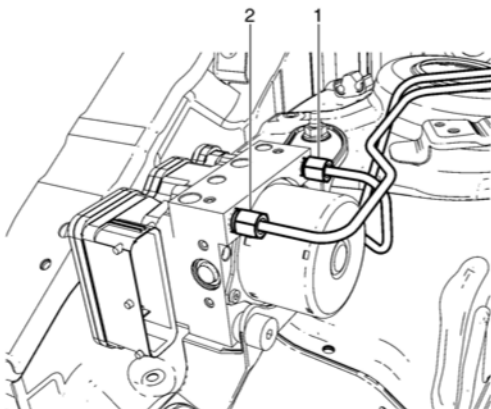


6.

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7. Install the EBCM/BPMV bracket assembly(2) to the vehicle.

8. Install the EBCM/BPMV bracket bolt/nut(1) and tighten to 22â€‰N-m (16â€‰lbâ€‰ft).



9.

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10. Connect the master cylinder primary brake pipe fitting(1) to the BPMV.

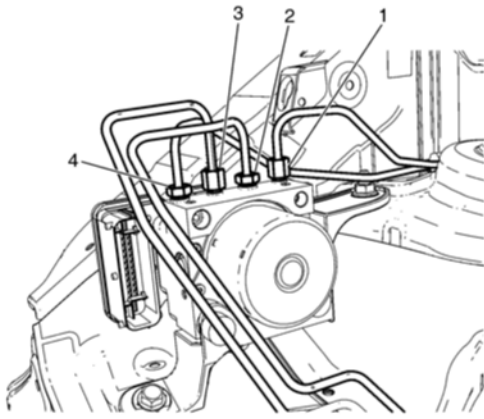
11. Tighten

- For only ABS, tighten the fitting to 18â€‰N-m (13â€‰lbâ€‰ft).
- For ESC, tighten the fitting to 25â€‰N-m (18â€‰lbâ€‰ft).

12. Connect the master cylinder secondary brake pipe fitting(2) to the BPMV.

13. Tighten

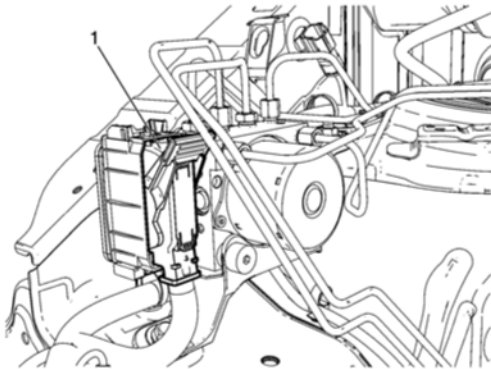
- For only ABS, tighten the fitting to 18â€‰N-m (13â€‰lbâ€‰ft).
- For ESC, tighten the fitting to 25â€‰N-m (18â€‰lbâ€‰ft).



14.

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15. Connect the LF brake pipe fitting (4) to the BPMV and tighten to 18 N-m (13 lb-ft).
16. Connect the RR brake pipe fitting (3) to the BPMV and tighten to 18 N-m (13 lb-ft).
17. Connect the LR brake pipe fitting (2) to the BPMV and tighten to 18 N-m (13 lb-ft).
18. Connect the RF brake pipe fitting (1) to the BPMV and tighten to 18 N-m (13 lb-ft).



19. [Click here for full size](#)
20. Connect the EBCM electrical connector to the EBCM.
21. Bleed the hydraulic brake system. Refer to [Hydraulic Brake System Bleeding](#).
22. Perform the Diagnostic System Check “Vehicle”. Refer to [Diagnostic System Check - Vehicle](#).
23. Observe the brake pedal feel after performing the diagnostic system check. If the pedal now feels spongy, air may have been in the secondary hydraulic circuit of the brake modulator which may have been introduced into the primary circuit. If the pedal feels spongy, perform the Antilock Brake System Automated Bleed Procedure. Refer to [Antilock Brake System Automated Bleed](#).

Related Part Information

Part Name

Catalog Name

Part Code

Part Name	Catalog Name	Part Code
Power Brake Booster Pump Pressure Switch	SWITCH,P/B BOOS PUMP PRESS	4127B
Brake Pressure Modulator Valve	VALVE,BRK PRESS MOD (W/ELEK BRK CONT MDL)	0596A
Brake Pressure Modulator Valve	VALVE,BRK PRESS MOD (W/ELEK BRK & TRACT CONT MDL)	0598A
Brake Pressure Modulator Valve	VALVE KIT,BRK PRESS MOD	0599Z
Brake Pressure Modulator Valve	VALVE,BRK PRESS MOD	0600A

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Brake Pressure Modulator Valve Bracket Replacement

Removal Procedure

1. Warning:

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

2. Caution:

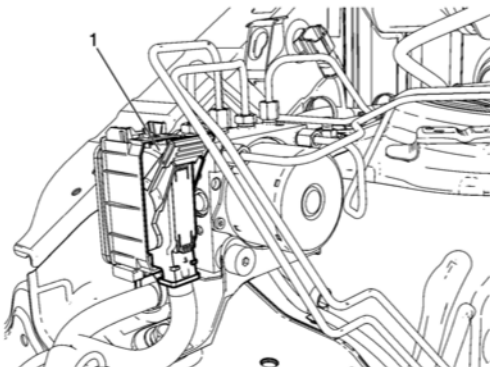
Always connect or disconnect the wiring harness connector from the EBCM/EBTCM with the ignition switch in the OFF position. Failure to observe this precaution could result in damage to the EBCM/EBTCM.

3. Turn the ignition switch to the OFF position.

4. Note:

The area around the EBCM/BPMV assembly must be free from loose dirt to prevent contamination of disassembled ABS components.

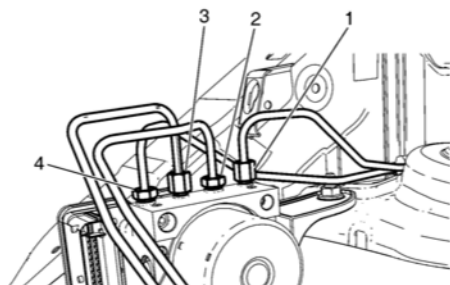
5. Clean the electronic brake control module (EBCM) to the brake pressure modulator valve (BPMV) area of any accumulated dirt and foreign material.



6.

[Click here for full size](#)

7. Disconnect the electrical connector(1) from the EBCM.

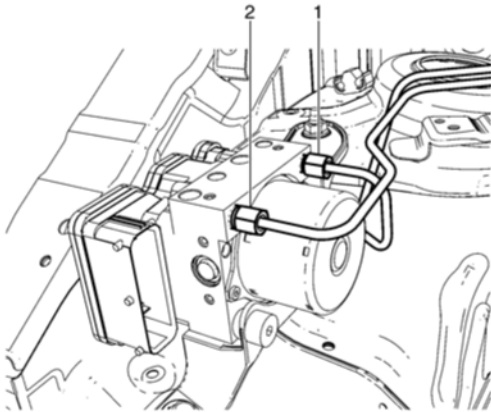




8.

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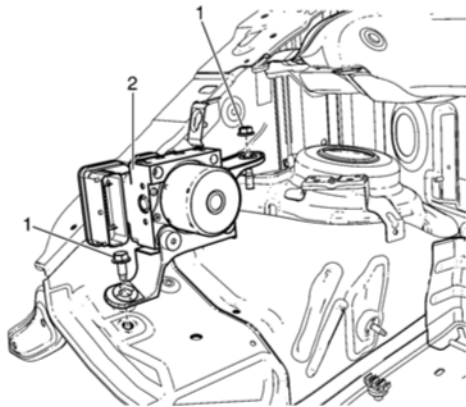
9. Disconnect the RF brake pipe fitting (1) from the BPMV.
10. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
11. Disconnect the LR brake pipe fitting (2) from the BPMV.
12. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
13. Disconnect the RR brake pipe fitting (3) from the BPMV.
14. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.
15. Disconnect the LF brake pipe fitting (4) from the BPMV.
16. Cap the brake pipe fitting and plug the BPMV outlet port to prevent brake fluid loss and contamination.



17.

[Click here for full size](#)

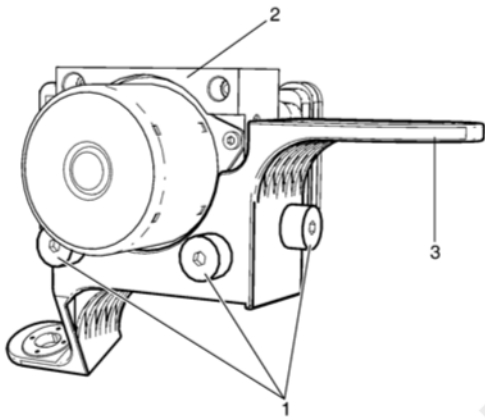
18. Disconnect the master cylinder primary brake pipe fitting (1) from the BPMV.
19. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.
20. Disconnect the master cylinder secondary brake pipe fitting (2) from the BPMV.
21. Cap the brake pipe fitting and plug the BPMV inlet port to prevent brake fluid loss and contamination.



22.

[Click here for full size](#)

23. Remove the EBCM/BPMV bracket bolt/nut(1).
24. Remove the EBCM/BPMV bracket assembly(2) from the vehicle.



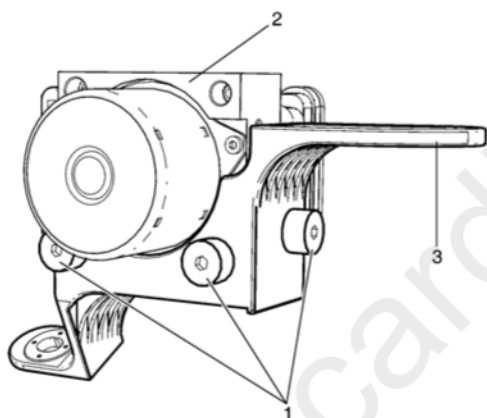
25.

[Click here for full size](#)

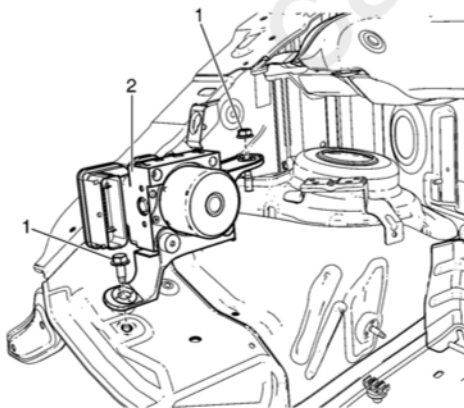
26. Remove the EBCM/BPMV assembly to the EBCM/BPMV assembly bracket retaining bolts(1).

27. Remove the EBCM/BPMV assembly bracket(3) from the EBCM/BPMV assembly(2).

Installation Procedure



1.
[Click here for full size](#)
2. Install the EBCM/BPMV assembly bracket(3) to the EBCM/BPMV(2) assembly.
3. Caution:
Refer to [Fastener Caution](#).
4. Install the EBCM/BPMV assembly to EBCM/BPMV assembly bracket retaining bolts(1) and tighten to 11 N-m (97 lb-in).

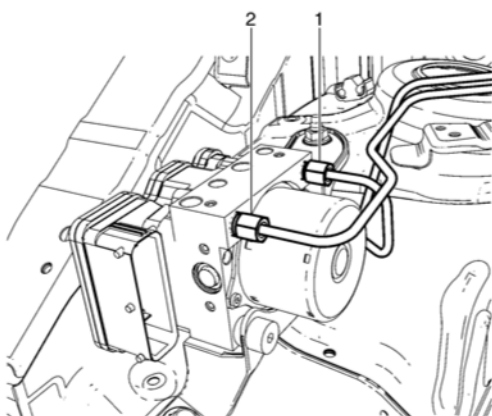


5.

[Click here for full size](#)

6. Install the EBCM/BPMV bracket assembly(2) to the vehicle.

7. Install the EBCM/BPMV bracket bolt/nut(1) and tighten to 22â€%N-m (16â€%lbâ€%ft).



8.

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9. Connect the master cylinder primary brake pipe fitting(1) to the BPMV.

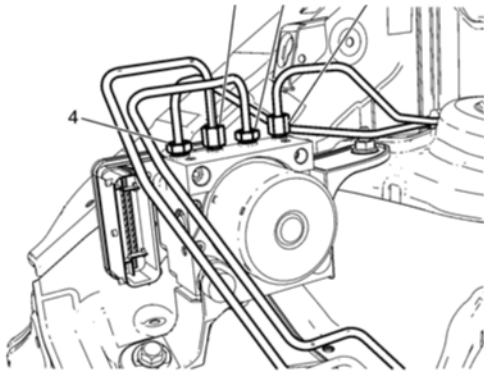
10. Tighten

- For only ABS, tighten the fitting to 18â€%N-m (13â€%lbâ€%ft).
- For ESC, tighten the fitting to 25â€%N-m (18â€%lbâ€%ft).

11. Connect the master cylinder secondary brake pipe fitting(2) to the BPMV.

12. Tighten

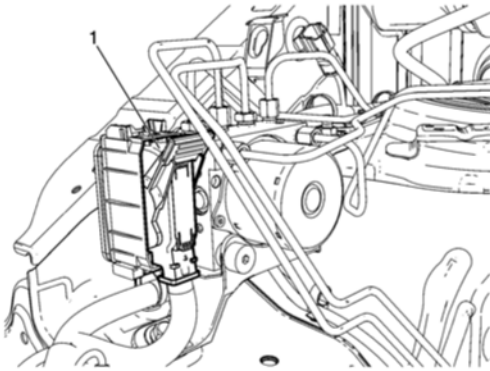
- For only ABS, tighten the fitting to 18â€%N-m (13â€%lbâ€%ft).
- For ESC, tighten the fitting to 25â€%N-m (18â€%lbâ€%ft).



13.

[Click here for full size](#)

14. Connect the LF brake pipe fitting(4) to the BPMV and tighten to 18â€%N-m (13â€%lbâ€%ft).
15. Connect the RR brake pipe fitting(3) to the BPMV and tighten to 18â€%N-m (13â€%lbâ€%ft).
16. Connect the LR brake pipe fitting(2) to the BPMV and tighten to 18â€%N-m (13â€%lbâ€%ft).
17. Connect the RF brake pipe fitting(1) to the BPMV and tighten to 18â€%N-m (13â€%lbâ€%ft).



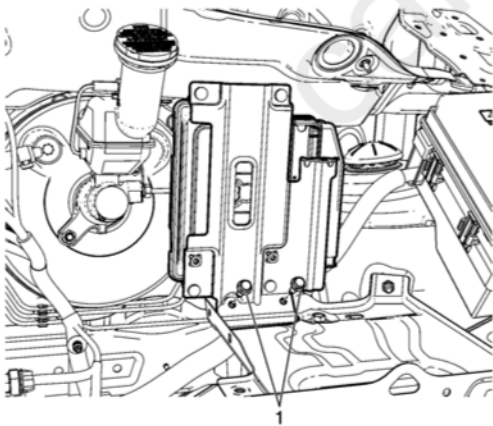
18. [Click here for full size](#)
19. Connect the EBCM electrical connector (1) to the EBCM.
20. Bleed the hydraulic brake system. Refer to [Hydraulic Brake System Bleeding](#).
21. Perform the Diagnostic System Check – Vehicle. Refer to [Diagnostic System Check - Vehicle](#).
22. Observe the brake pedal feel after performing the diagnostic system check. If the pedal now feels spongy, air may have been in the secondary hydraulic circuit of the brake modulator which may have been introduced into the primary circuit. If the pedal feels spongy, perform the Antilock Brake System Automated Bleed Procedure. Refer to [Antilock Brake System Automated Bleed](#).

1. BRAKES
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Front Wheel Speed Sensor Replacement (Left Side)

Removal Procedure

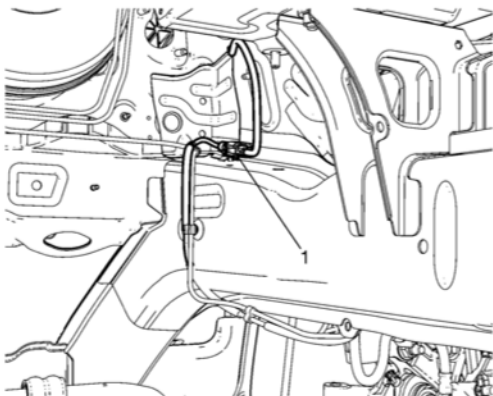
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the battery. Refer to [Battery Replacement](#).



4.

[Click here for full size](#)

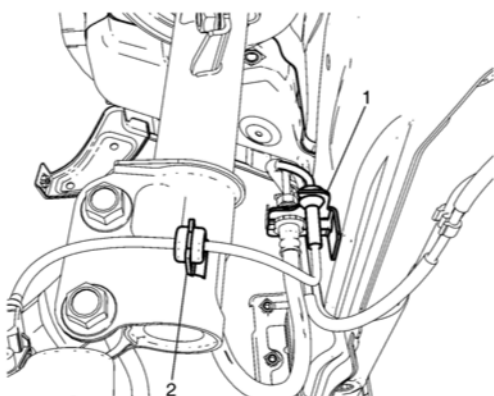
5. Remove the ECM bracket bolts (1), and then position the ECM and ECM bracket aside. Refer to [Engine Control Module Replacement](#).



6.

[Click here for full size](#)

7. Disconnect the wheel speed sensor electrical connector (1).

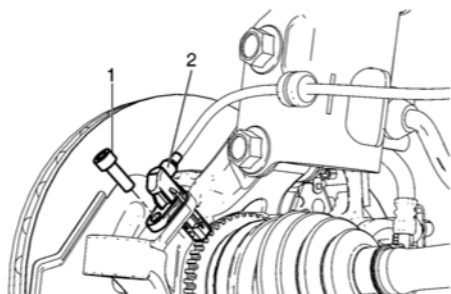


8.

[Click here for full size](#)

9. Detach the wheel speed sensor harness from the body frame mounted bracket(1).

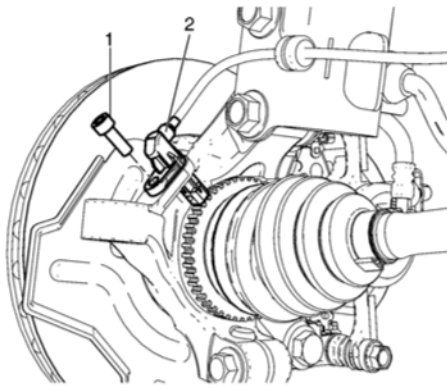
10. Detach the wheel speed sensor harness from the front strut mounted bracket(2).



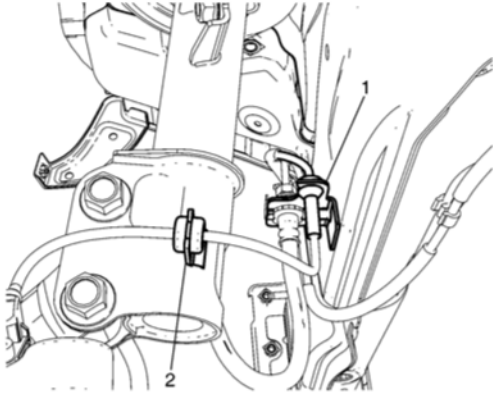


11. [Click here for full size](#)
12. Remove the wheel speed sensor to knuckle retaining bolt(1).
13. Remove the wheel speed sensor(2) from the steering knuckle.

Installation Procedure



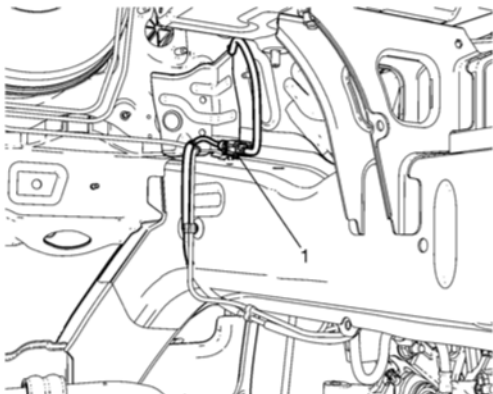
1. [Click here for full size](#)
2. Install the wheel speed sensor(2) to the knuckle.
3. Caution:
Refer to [Fastener Caution](#).
4. Install the wheel speed sensor to knuckle retaining bolt(1) and tighten to 8.5â€‰N-m (75â€‰lbâ€‰in).



5.

[Click here for full size](#)

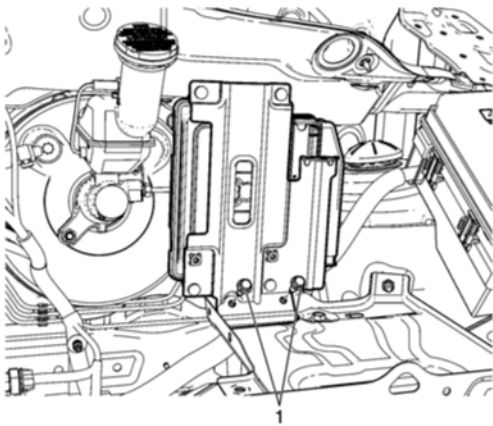
6. Attach the wheel speed sensor harness to the front strut mounted bracket(2).
7. Attach the wheel speed sensor harness to the body frame mounted bracket(1).



8.

[Click here for full size](#)

9. Connect the wheel speed sensor electrical connector(1).



10. [Click here for full size](#)
11. Position the ECM and ECM bracket to the original place, and install the ECM bracket bolts (1). Refer to [Engine Control Module Replacement](#).
12. Install the battery. Refer to [Battery Replacement](#).
13. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).

14. Lower the vehicle.

Related Part Information

Part Name	Catalog Name	Part Code
Front Wheel Speed Sensor	SENSOR KIT,FRT WHL SPD	0494Z
Front Wheel Speed Sensor	SENSOR,FRT WHL SPD(W/BRK SHLD)	0495A
Front Wheel Speed Sensor	SENSOR,FRT WHL SPD (RH PROC)	0495B
Front Wheel Speed Sensor	SENSOR,FRT WHL SPD	0496A
Front Wheel Speed Sensor	SENSOR,FRT WHL SPD (RPR)	0496L

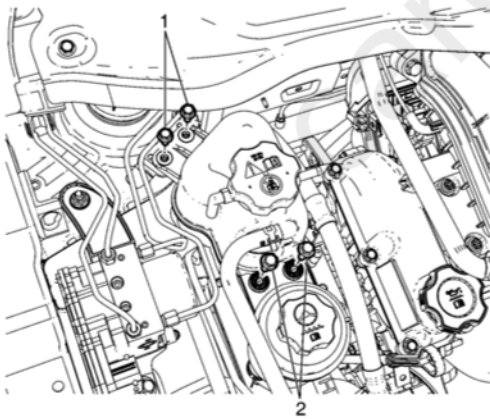
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1. BRAKES
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Front Wheel Speed Sensor Replacement (Right Side)

Removal Procedure

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](#).



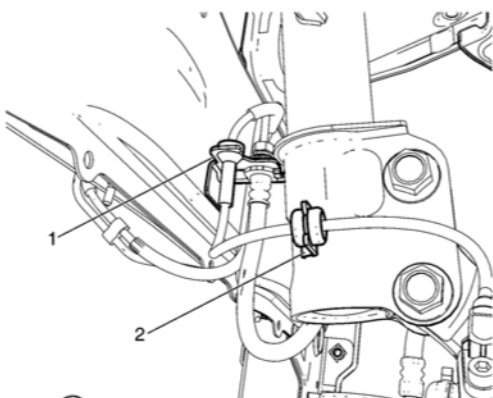
3. [Click here for full size](#)
4. If equipped with the electrical power steering, remove the radiator surge tank mounting bolts (1), and detach the radiator surge tank without disconnecting the coolant hose, and position it aside to get a hand access. If equipped with the hydraulic power steering, remove the radiator surge tank mounting bolts (1) and the power steering fluid reservoir mounting bolts (2), and detach the radiator surge tank and power steering fluid reservoir without disconnecting the coolant hose and the power steering hose, and position aside. Refer to [Radiator Surge Tank Replacement](#) and [Power Steering Fluid Reservoir Replacement](#).



5.

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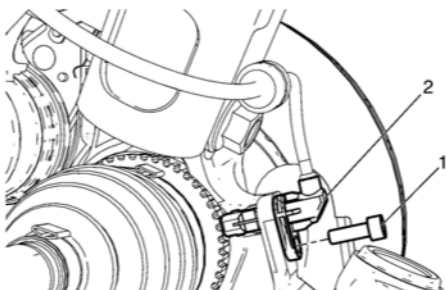
6. Disconnect the wheel speed sensor electrical connector(1).



7.

[Click here for full size](#)

8. Detach the wheel speed sensor harness from the body frame mounted bracket(1).
9. Detach the wheel speed sensor harness from the front strut mounted bracket(2).





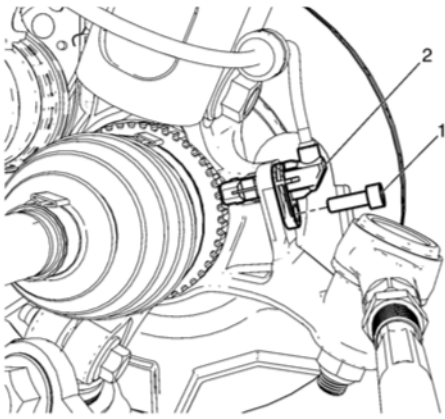
10.

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11. Remove the wheel speed sensor to knuckle retaining bolt(1).
12. Remove the wheel speed sensor(2) from the steering knuckle.

Installation Procedure





1.

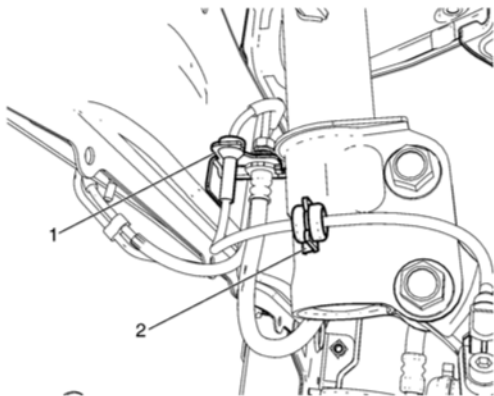
[Click here for full size](#)

2. Install the wheel speed sensor(2) to the steering knuckle.

3. Caution:

Refer to [Fastener Caution](#).

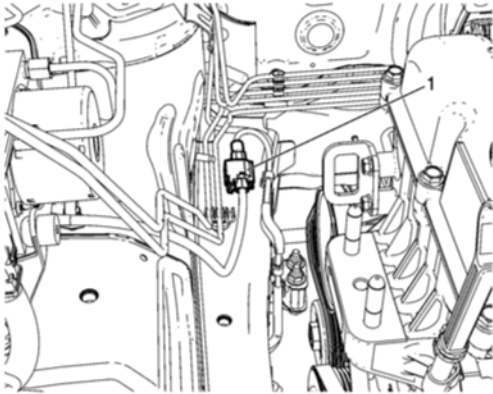
4. Install the wheel speed sensor to knuckle retaining bolt(1) and tighten to 8.5N-m (75lb-in).



5.

[Click here for full size](#)

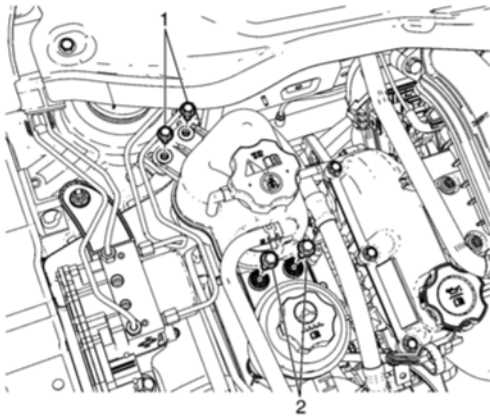
6. Attach the wheel speed sensor harness to the front strut mounted bracket(2).
7. Attach the wheel speed sensor harness to the body frame mounted bracket(1).



8.

[Click here for full size](#)

9. Connect the wheel speed sensor electrical connector(1).



10. [Click here for full size](#)
11. If equipped with the electrical power steering, position the radiator surge tank to the original place, and install the radiator tank mounting bolts (1). If equipped with the hydraulic power steering, position the radiator surge tank and the power steering fluid reservoir to the original place, and install the radiator surge tank mounting bolts (1) and the power steering fluid reservoir mounting bolts (2). Refer to [Radiator Surge Tank Replacement](#) and [Power Steering Fluid Reservoir Replacement](#).

12. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
13. Lower the vehicle.

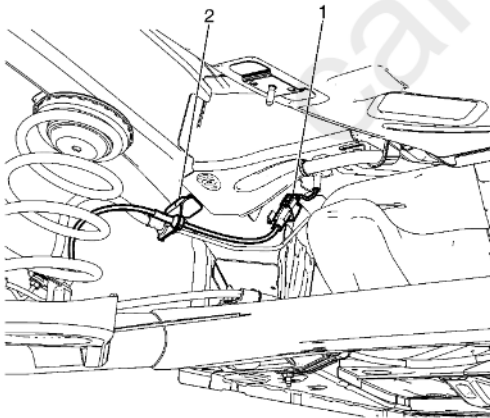
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1. BRAKES
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Rear Wheel Speed Sensor Replacement

Removal Procedure

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

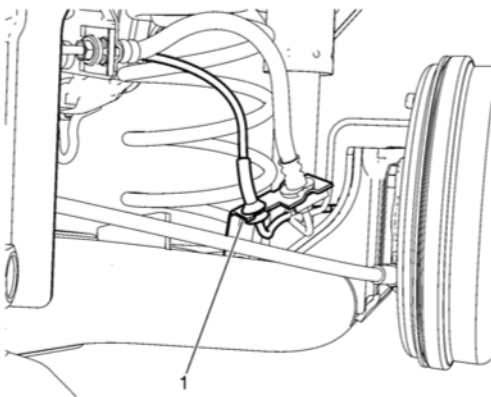


3.

[Click here for full size](#)

4. Disconnect the wheel speed sensor electrical connector(1).

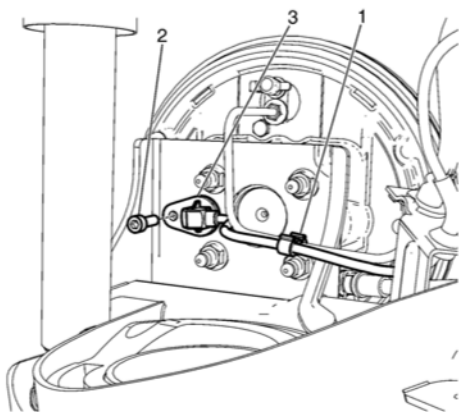
5. Detach the wheel speed sensor harness from the body frame mounted bracket(2).



6.

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7. Detach the wheel speed sensor harness from the rear axle mounted bracket (1).

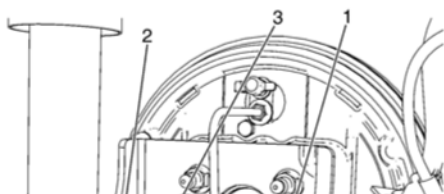


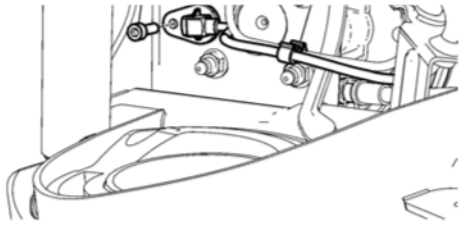
8.

[Click here for full size](#)

9. Remove the wheel speed sensor harness from the retaining clip(1).
10. Remove the wheel speed sensor to knuckle retaining bolt(2).
11. Remove the wheel speed sensor(3) from the knuckle.

Installation Procedure





1.

[Click here for full size](#)

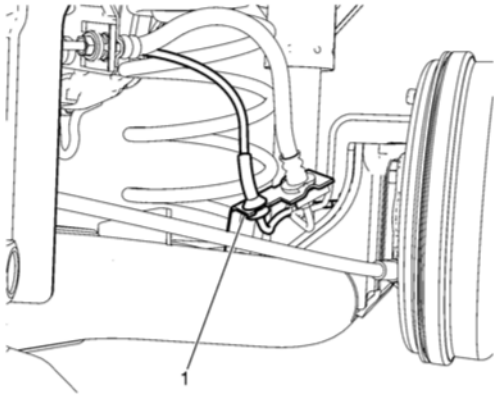
2. Install the wheel speed sensor(3) to the knuckle.

3. Caution:

Refer to [Fastener Caution](#).

4. Install the wheel speed sensor to knuckle retaining bolt(2) and tighten to 8.5N-m (75lb-in).

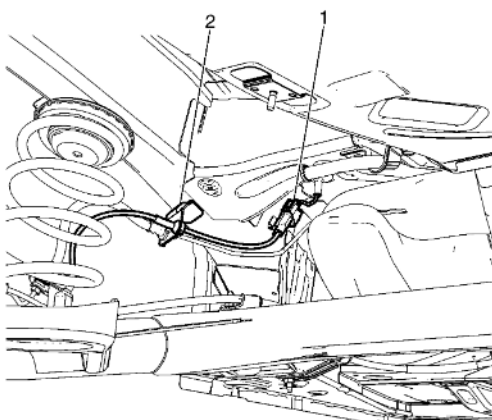
5. Install the wheel speed sensor harness to the retaining clip(1).



6.

[Click here for full size](#)

7. Attach the wheel speed sensor harness to the rear axle mounted bracket (1).



8.

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9. Attach the wheel speed sensor harness to from the body frame mounted bracketâ€“(2).

10. Connect the wheel speed sensor electrical connectorâ€“(1).

11. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).

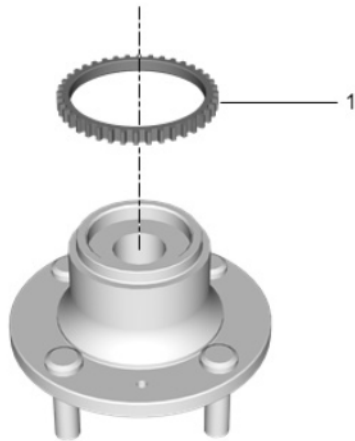
12. Lower the vehicle.

Related Part Information

Part Name	Catalog Name	Part Code
Rear Wheel Speed Sensor	SENSOR KIT,RR WHL SPD	0497Z
Rear Wheel Speed Sensor	SENSOR,RR WHL SPD	0498A
Rear Wheel Speed Sensor	SENSOR,RR WHL SPD (RH PROC)	0498G

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Wheel Speed Sensor Reluctor Ring Replacement



[Click here for full size](#)

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the rear wheel hub assembly. Refer to Rear Wheel Bearing and Hub Replacement .	
1	Wheel Speed Sensor Reluctor Ring Procedure 1. Use the big fat driver and hammer to remove the reluctor ring from the hub. 2. Tap the reluctor ring with the rubber hammer to install the reluctor ring to the hub. Note: The wheel speed sensor reluctor ring has a chamfer, which has to be pre-inserted to the hub to make better pre-fit in.

Specifications

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Fastener Specifications

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
Note:	
All fasteners listed in this table can be reused after removal.	
Brake Pipe Fitting** LF, RF, LR, and RR	18â€‰N-mâ€‰(13â€‰lb-ft)
Brake Pipe Fitting** Primary and Secondary	
• ABS	18â€‰N-mâ€‰(13â€‰lb-ft)
• ESC	25â€‰N-mâ€‰(18â€‰lb-ft)
EBCM/BPMV Bracket Bolt/Nut	22â€‰N-mâ€‰(16â€‰lb-ft)
EBCM/BPMV to Mounting Bracket Retaining Bolt	11â€‰N-mâ€‰(97â€‰lb-in)
EBCM to BPMV Retaining Bolt	2.8â€‰N-mâ€‰(25â€‰lb-in)
Wheel Speed Sensor Retaining Bolt	8.5â€‰N-mâ€‰(75â€‰lb-in)
Yaw Sensor Retaining Nut	9â€‰N-mâ€‰(80â€‰lb-in)

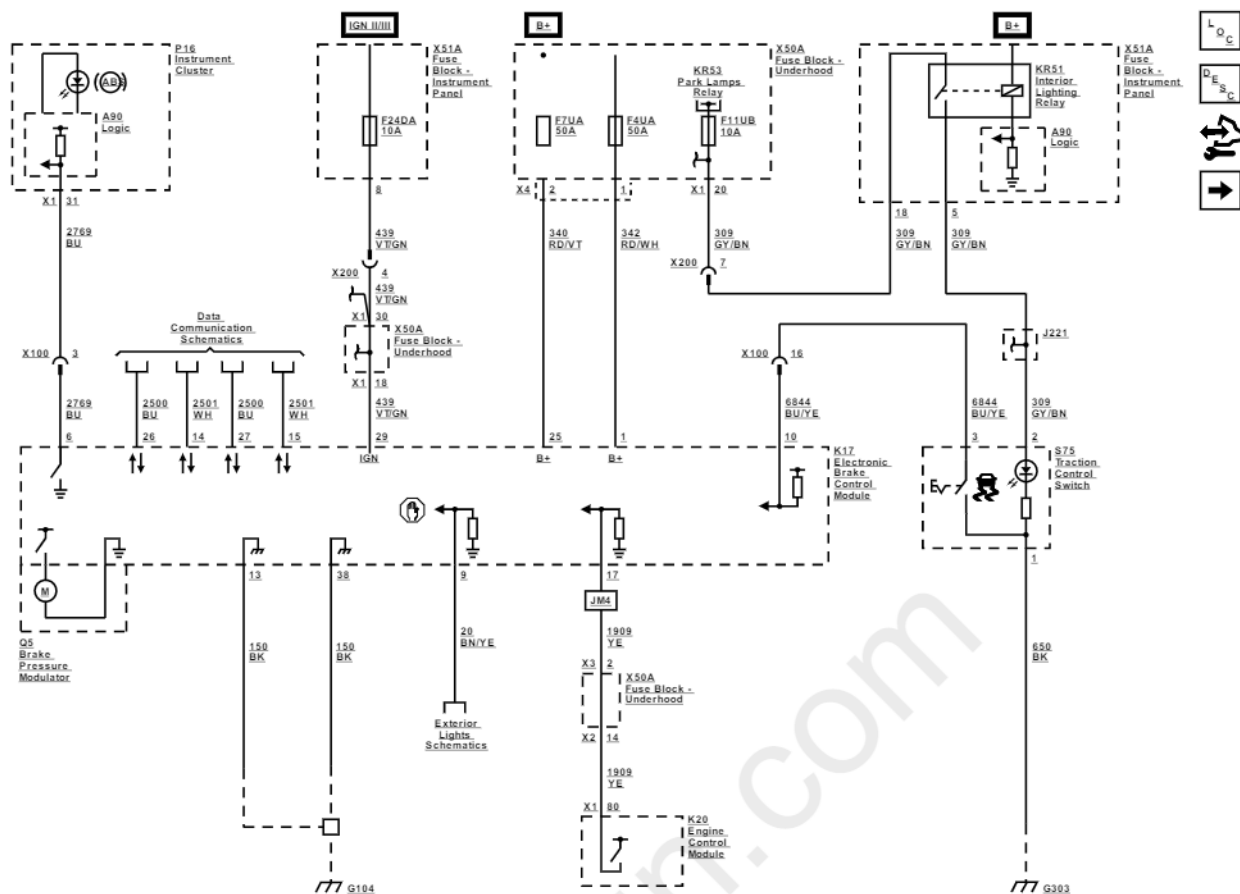
Schematic and Routing Diagrams

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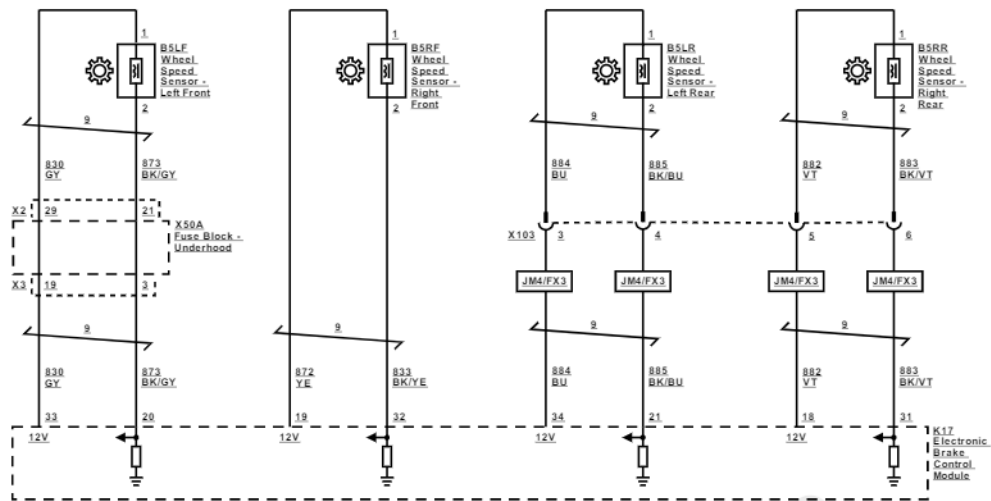
Antilock Brake System Schematics

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Wheel Speed Sensors



L_{OC}

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