SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
EBCM to BPMV Torx Bolts	5 N.m	39 lb in
EHCU Bracket to Frame Bolts	25 N.m	18 lb ft
EHCU to Bracket	9 N.m	7 lb ft
Front Brake Lines to BPMV	25 N.m	18 lb ft
Front Wheel Speed Sensor Mounting Bolt	17 N.m	12 lb ft
Longitudinal Accelerometer Screw	10 N.m	89 lb in
Master Cylinder Brake Lines to BPMV	25 N.m	18 lb ft
Rear Brake Line to BPMV	25 N.m	18 lb ft
Rear Wheel Speed Sensor Mounting Bolt	14 N.m	124 lb in

SCHEMATIC AND ROUTING DIAGRAMS

ABS SCHEMATIC ICONS

ABS Schematic Icons

Icon	Icon Definition
	IMPORTANT: **Twisted-pair wires provide an effective shield that helps protect sensitive electronic components from electrical interference. If the wires were covered with shielding, install new shielding.** **In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted-pair wires shown :** • **The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires.**

- **The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in).**

ABS SCHEMATICS

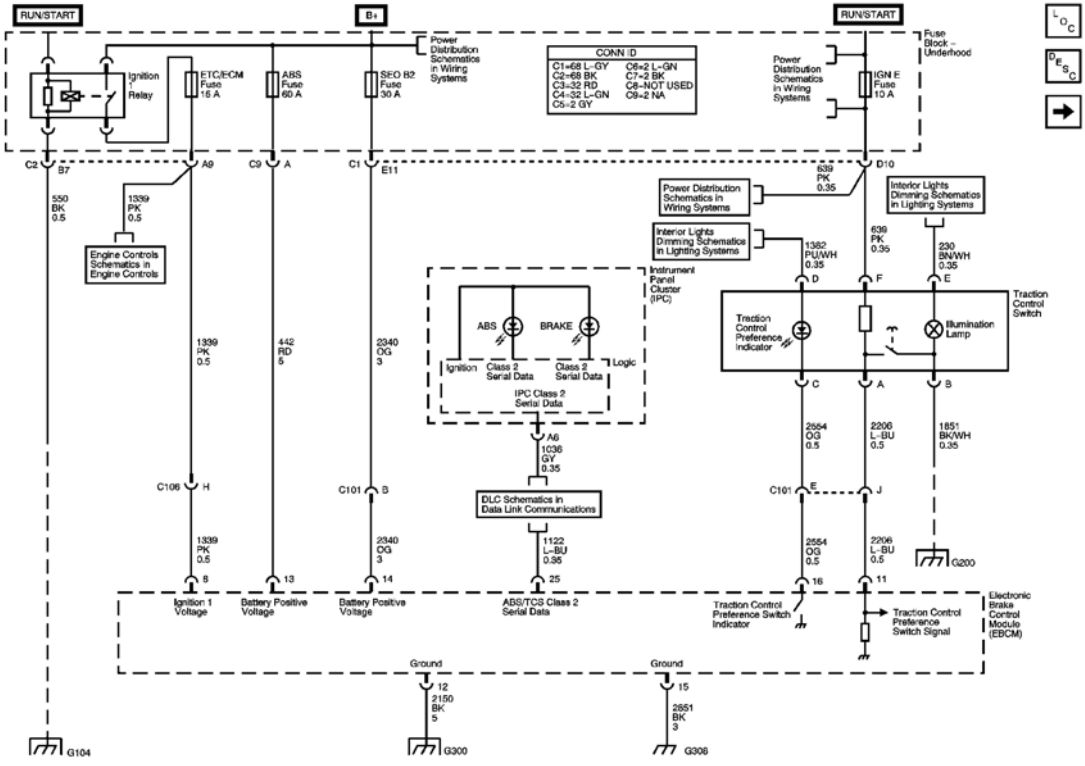


Fig. 1: EBCM Power, Ground, DLC, Indicator Lamps, and Traction Control Switch
Courtesy of GENERAL MOTORS CORP.

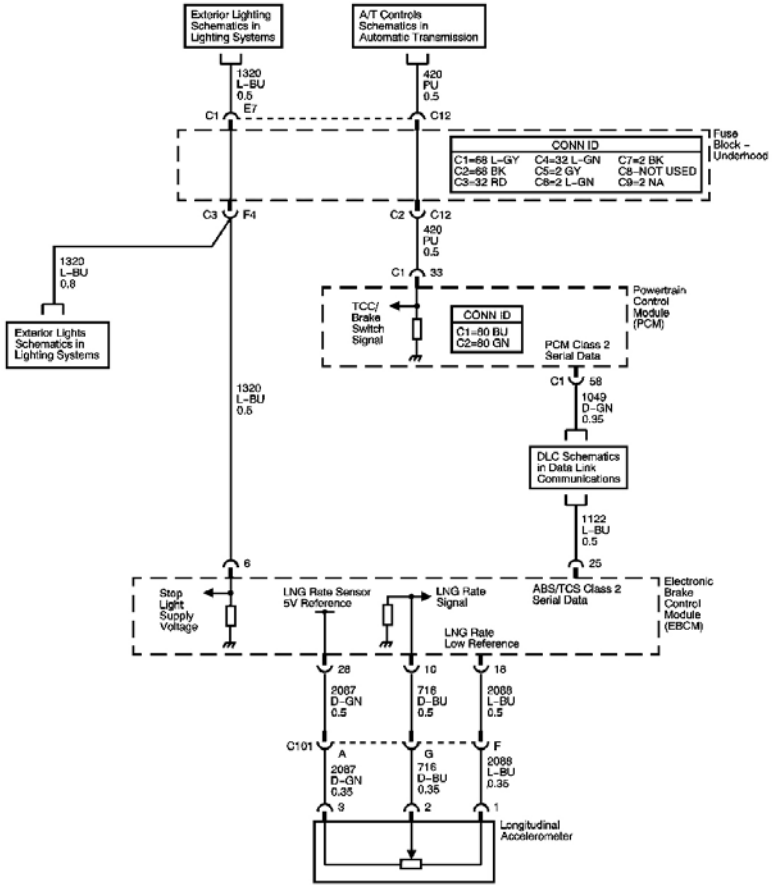


Fig. 2: Stoplamp Switch and Longitudinal Accelerometer Inputs
Courtesy of GENERAL MOTORS CORP.

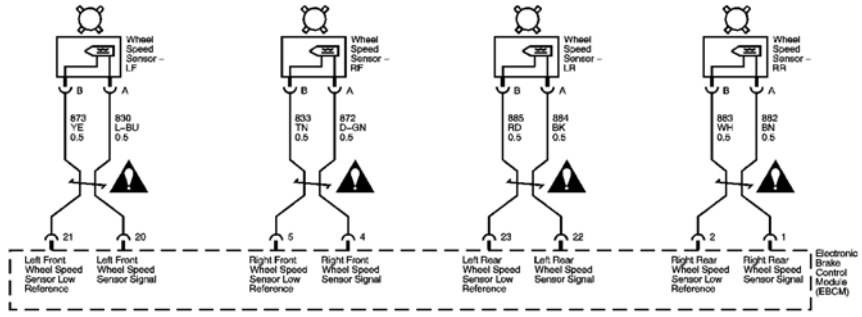


Fig. 3: Wheel Speed Sensor Inputs
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

ABS COMPONENT VIEWS

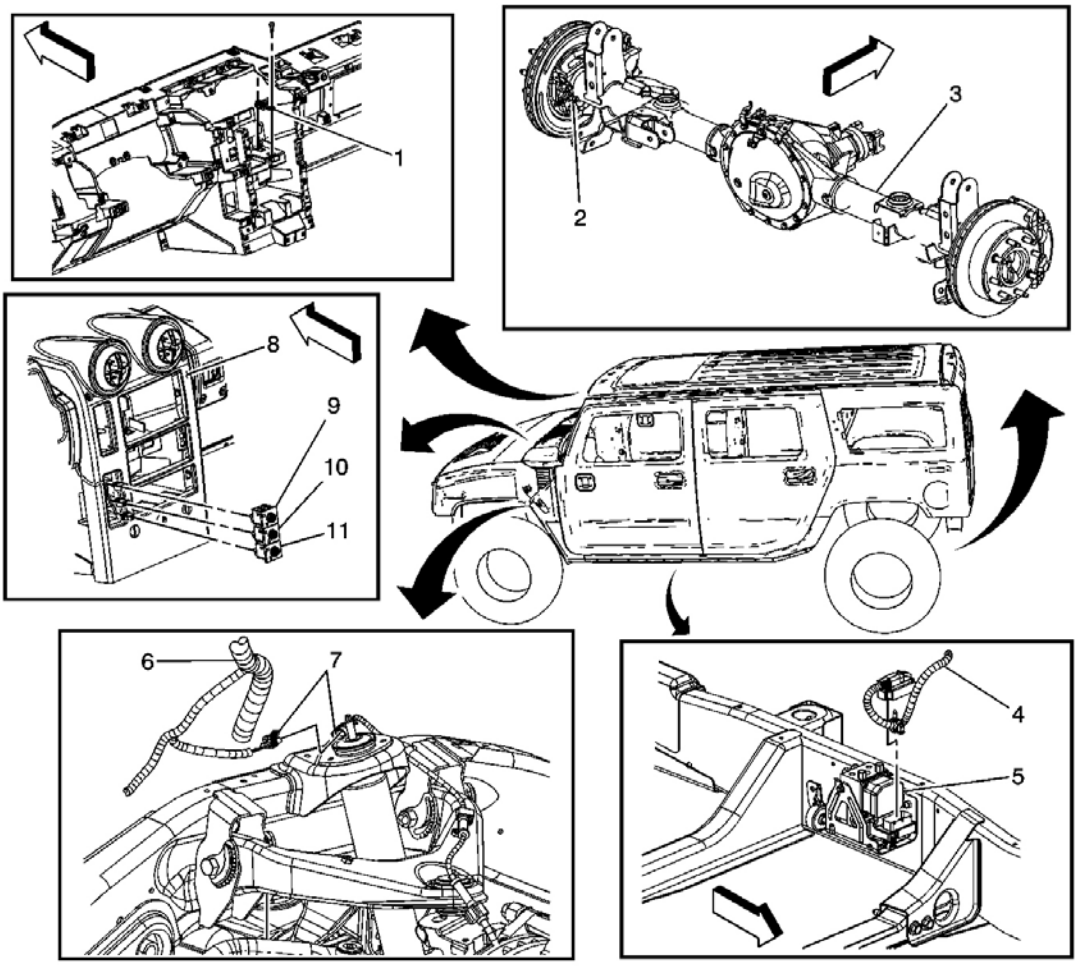


Fig. 4: ABS Component Views
Courtesy of GENERAL MOTORS CORP.

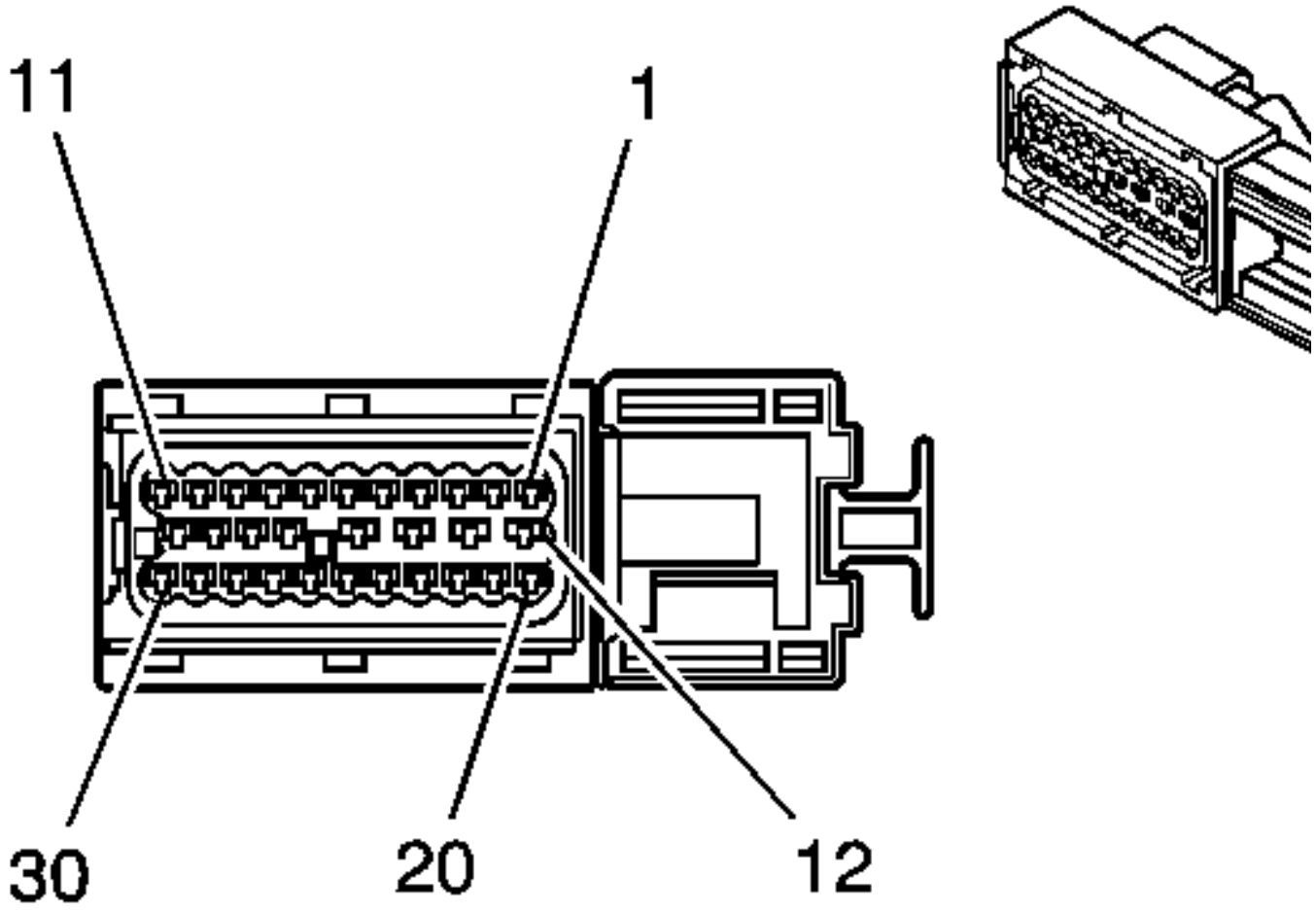
Callouts For Fig. 4

Callout	Component Name
1	Longitudinal Accelerometer
2	Wheel Speed Sensor (WSS) - LR (RR Similar)
3	Rear Axle Assembly
4	Chassis Harness
5	Electronic Brake Control Module (EBCM)
6	Chassis Harness
7	Wheel Speed Sensor (WSS) Connector - LF (RF Similar)
8	Front Console
9	Traction Control Switch
10	Tow/Haul Switch

11	Selectable Ride Switch

ABS CONNECTOR END VIEWS

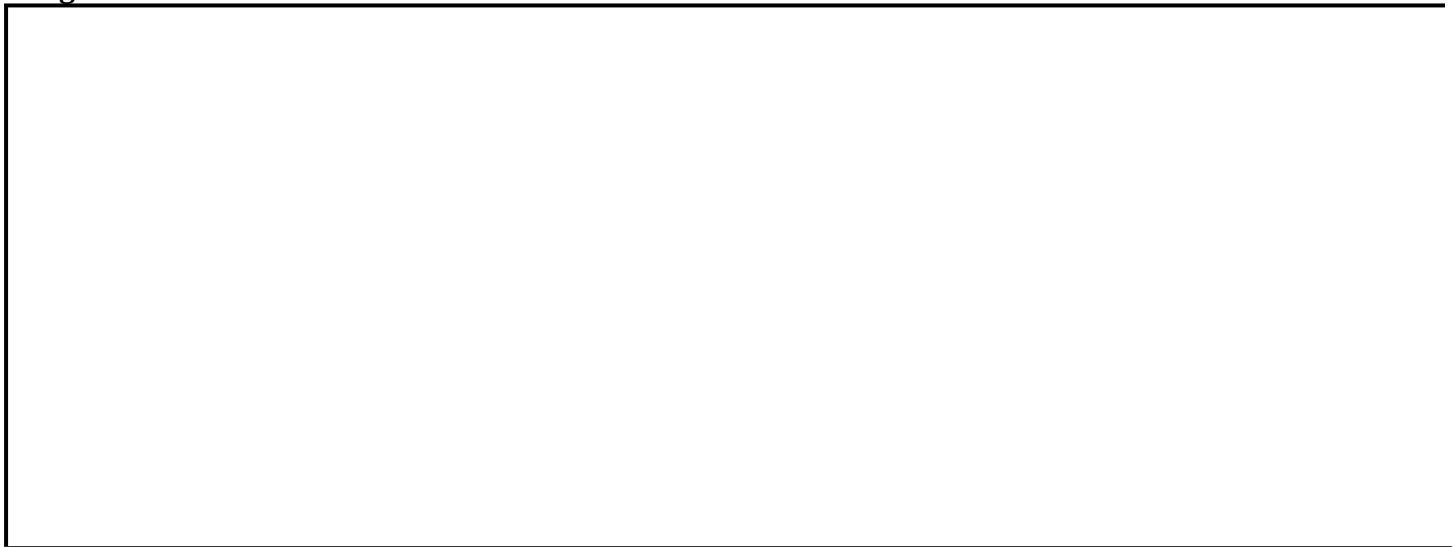
Electronic Brake Control Module Terminal Identification (EBCM)

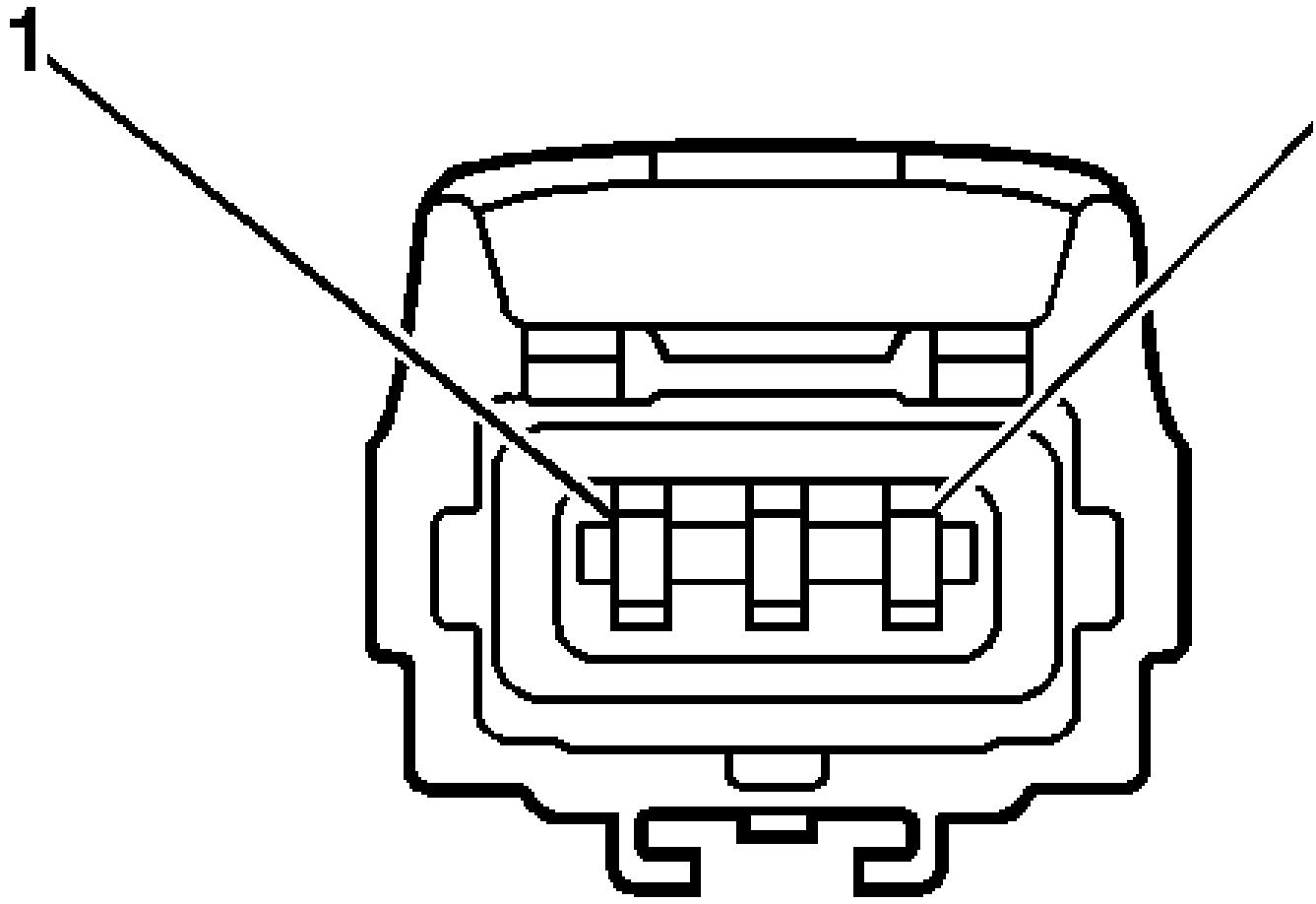


or Connector Part Information		• 12191495 • 30-Way F GT 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	BN	882	Right Rear Wheel Speed Sensor Signal

2	WH	883	Right Rear Wheel Speed Sensor Low Reference
3	-	-	Not Used
4	D-GN	872	Right Front Wheel Speed Sensor Signal
5	TN	833	Right Front Wheel Speed Sensor Low Reference
6	L-BU	1320	CHMSL Supply Voltage/Stop Lamp Supply Voltage
7	-	-	Not Used
8	PK	1339	Ignition 1 Voltage
9	PU	333	Brake Fluid Level Sensor Signal
10	D-BU	716	LNG Rate Signal
11	L-BU	2206	Traction Control Preference Switch Signal
12	BK	2150	Ground
13	RD	442	Battery Positive Voltage
14	OG	2340	Battery Positive Voltage
15	BK	2851	Ground
16	OG	2554	Traction Control Preference Switch Indicator
17	-	-	Not Used
18	L-BU	2088	LNG Rate Low Reference
19	-	-	Not Used
20	L-BU	830	Left Front Wheel Speed Sensor Signal
21	YE	873	Left Front Wheel Speed Sensor Low Reference
22	BK	884	Left Rear Wheel Speed Sensor Signal
23	RD	885	Left Rear Wheel Speed Sensor Low Reference
24	-	-	Not Used
25	L-BU	1122	ABS/TCS Class 2 Serial Data
26-27	-	-	Not Used
28	D-GN	2087	LNG Rate Sensor 5 Volt Reference

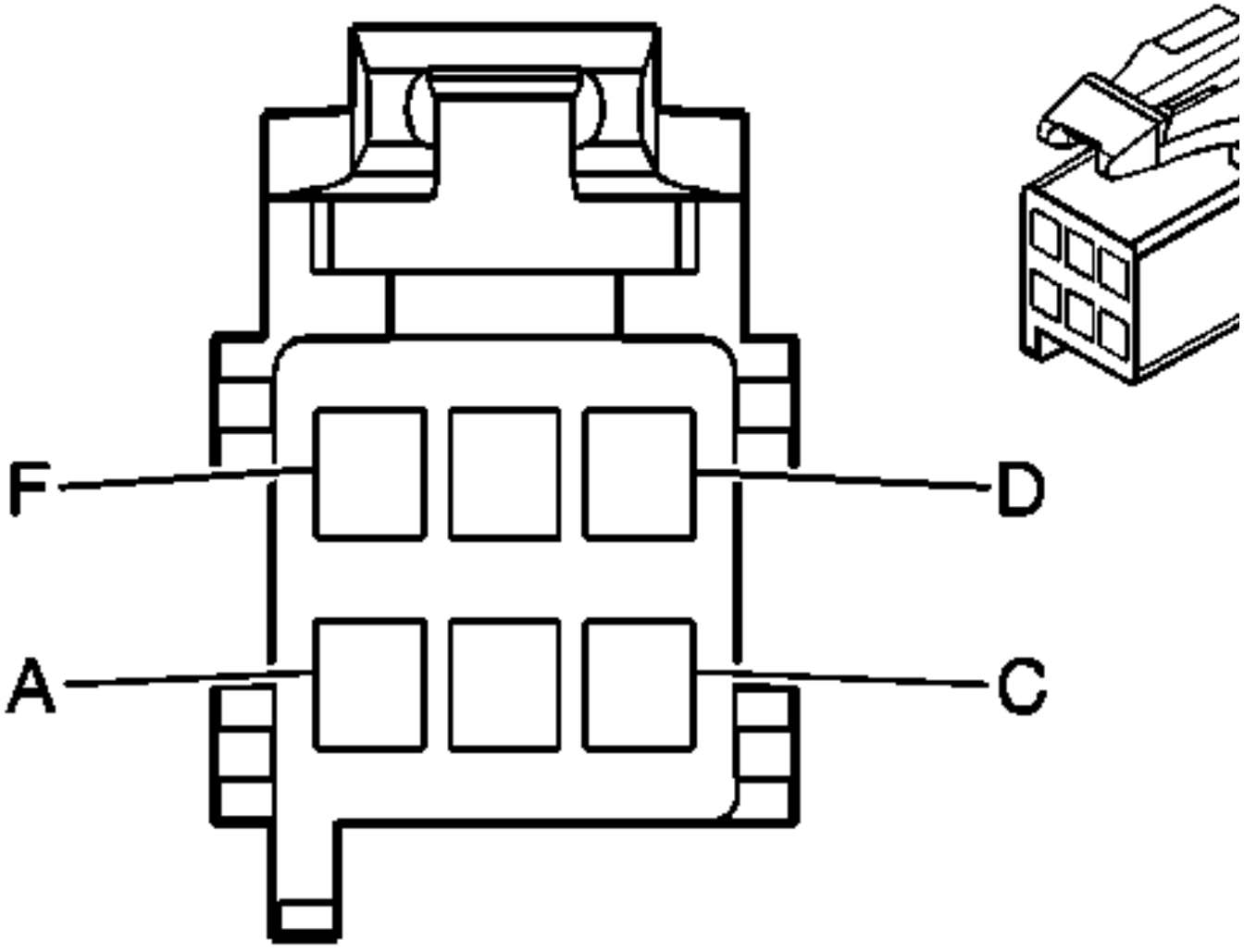
Longitudinal Terminal Identification Accelerometer





Connector Part Information		• 10723270 • 3-Way F Bosch SLD (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
1	L-BU	2088	LNG Rate Low Reference
2	D-BU	716	LNG Rate Signal
3	D-GN	2087	LNG Rate Sensor 5 Volt Reference

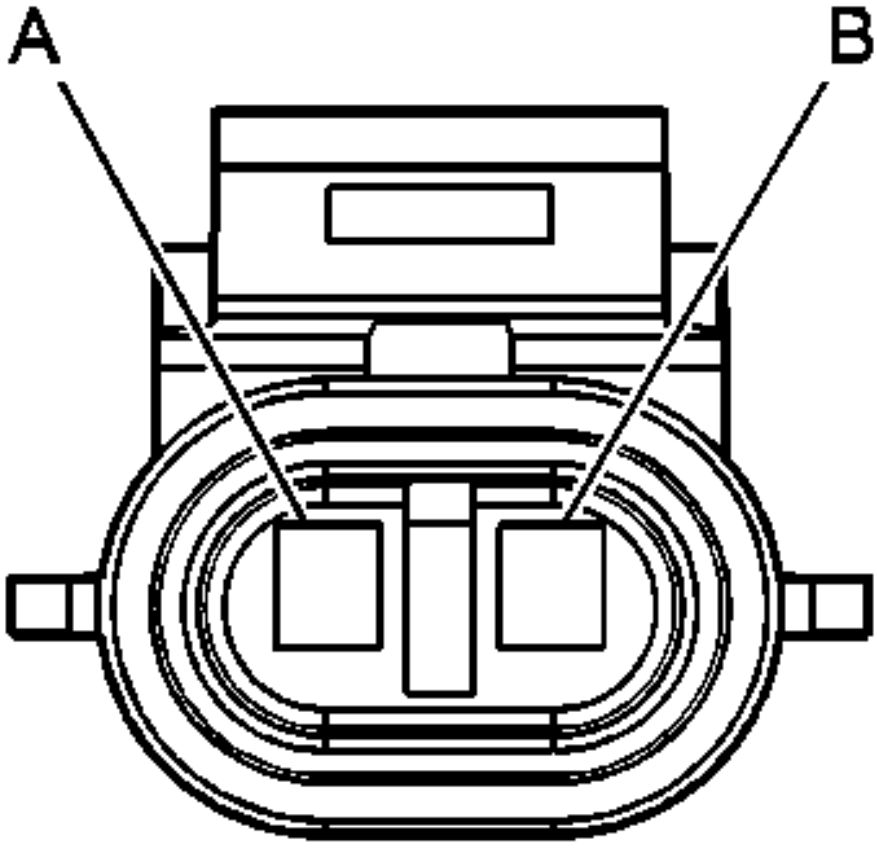
Traction Terminal Identification Control Switch

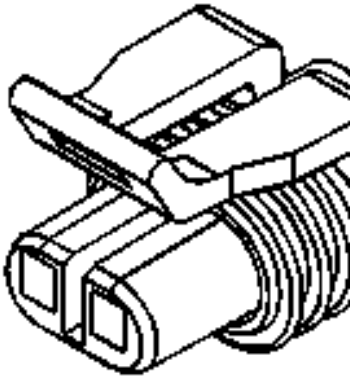


Connector Part Information		• 12177195 • 6-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	L-BU	2206	Traction Control Preference Switch Signal
B	BK/WH	1851	Ground
C	OG	2554	Traction Control Preference Switch Indicator

D	PU/WH	1382	LED Dimming Signal/LED Dimming Supply
E	BN/WH	230	Instrument Panel Lamps Dimming Control
F	PK	639	Ignition 1 Voltage

Wheel Terminal Identification Speed Sensor (WSS) - LF

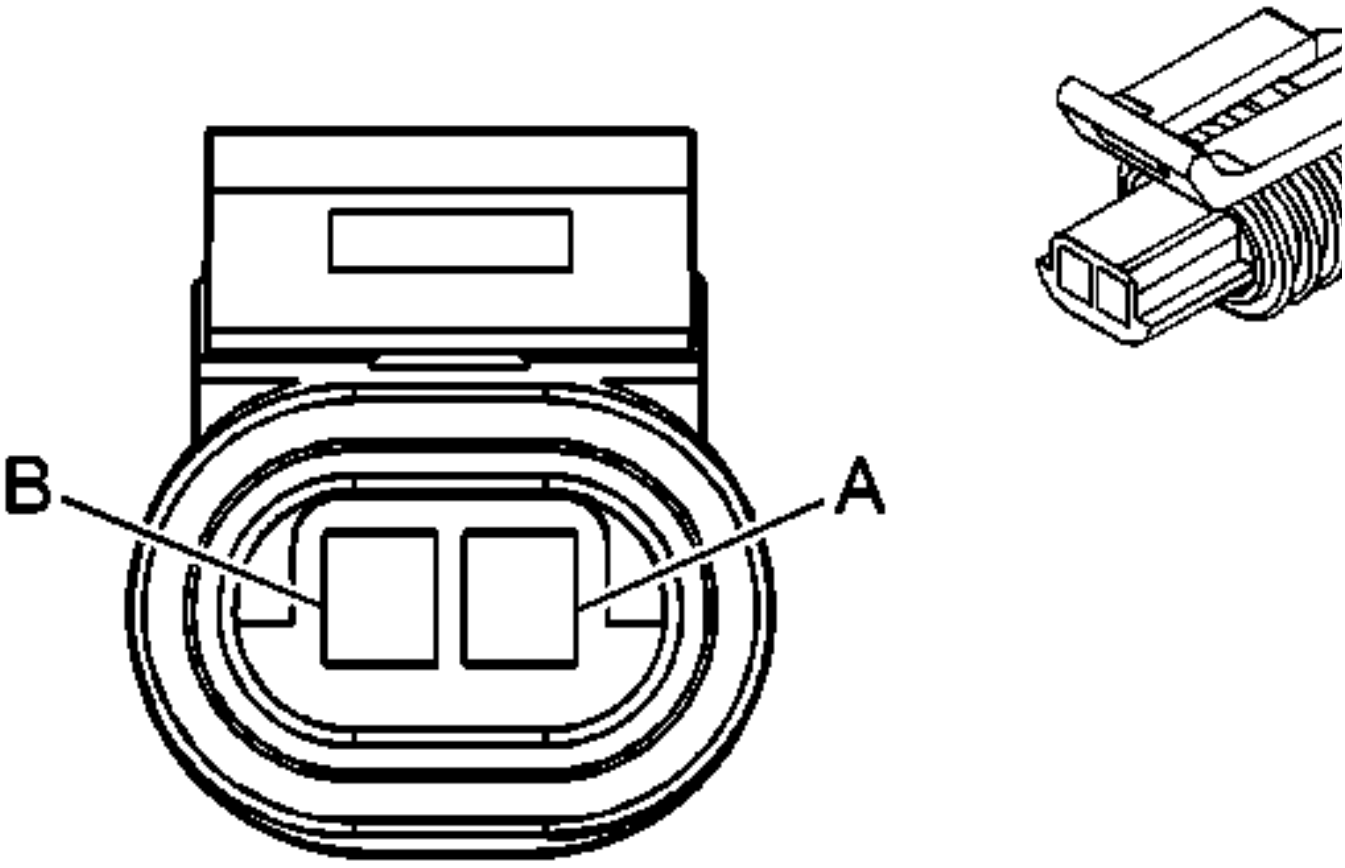




Connector Part Information		• 12052641 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	L-BU	830	Left Front Wheel Speed Sensor Signal

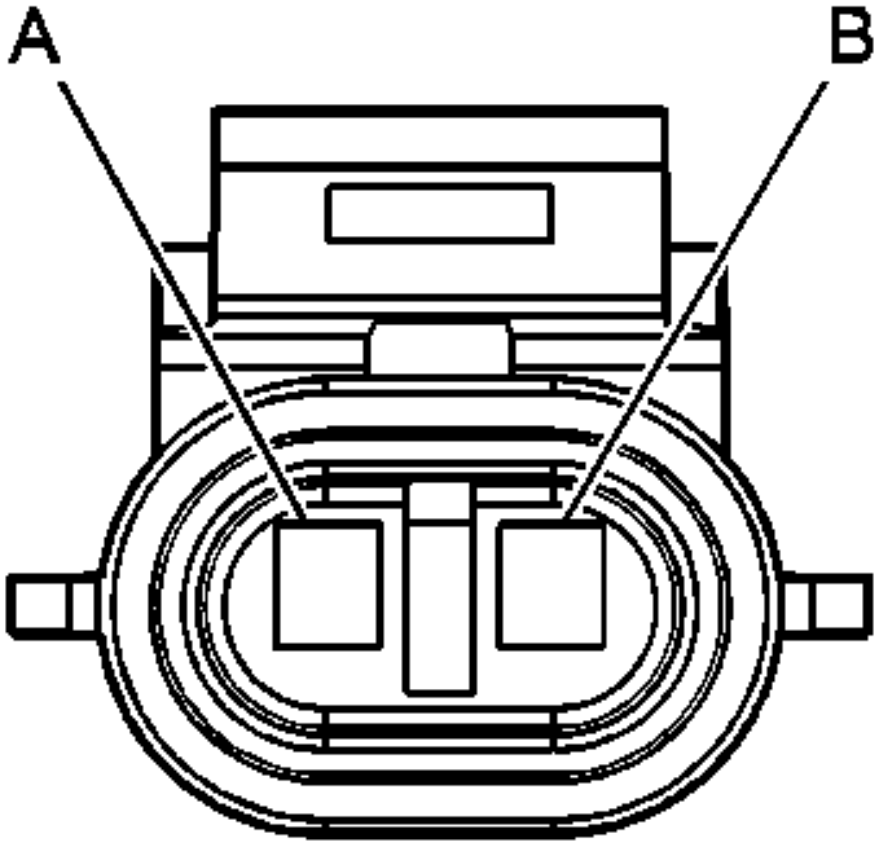
B	YE	873	Left Front Wheel Speed Sensor Low Reference

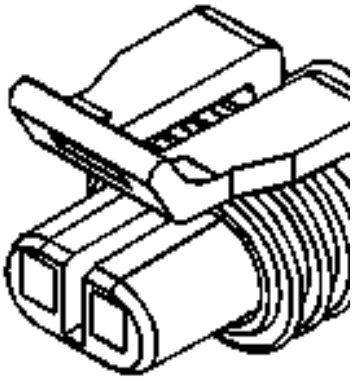
Wheel Terminal Identification Speed Sensor (WSS) - LR



Connector Part Information		• 12162193 • 2-Way F Metri-Pack 150.2 Series Sealed Pull To Seat (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BK	884	Left Rear Wheel Speed Sensor Signal
B	RD	885	Left Rear Wheel Speed Sensor Low Reference

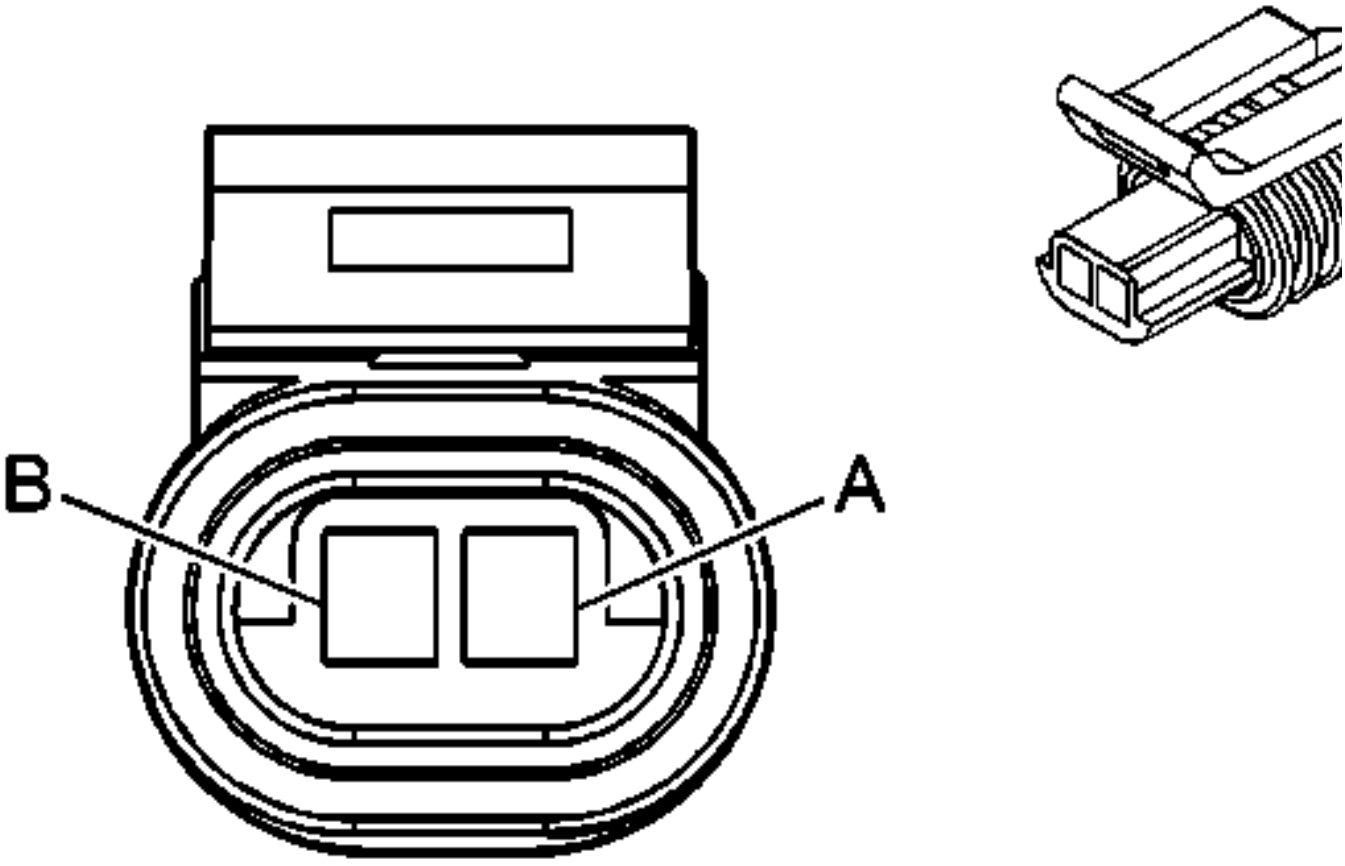
Wheel Terminal Identification Speed Sensor (WSS) - RF





Connector Part Information		• 12052641 • 2-Way F Metri-Pack 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	D-GN	872	Right Front Wheel Speed Sensor Signal
B	TN	833	Right Front Wheel Speed Sensor Low Reference

Wheel Terminal Identification Speed Sensor (WSS) - RR



Connector Part Information		• 12162193 • 2-Way F Metri-Pack 150.2 Series Sealed Pull To Seat (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BN	882	Right Rear Wheel Speed Sensor Signal
B	WH	883	Right Rear Wheel Speed Sensor Low Reference

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ANTI-LOCK BRAKE SYSTEM

Begin the system diagnosis with **Diagnostic System Check - ABS** . The Diagnostic System Check will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the system and where the procedure is located.

DIAGNOSTIC SYSTEM CHECK - ABS

Circuit Description

The ABS Diagnostic System Check is an organized approach to identify problems associated with the EBCM. This check must be the starting point for any EBCM complaint, and will direct you to the next logical step in diagnosing the complaint. The EBCM is a very reliable component and is not likely the cause of the malfunction. Most system complaints are linked to faulty wiring, connectors, and occasionally to components. Understanding the ABS system and using the tables correctly will reduce diagnostic time and prevent unnecessary parts replacement.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Lack of communication may be due to a partial malfunction of the class 2 serial data circuit or due to a total malfunction of the class 2 serial data circuit. The specified procedure will determine the particular condition.

4: The presence of DTCs which begin with "U" indicate some other module is not communicating. The specified procedure will compile all the available information before tests are performed.

Diagnostic System Check - ABS

Step	Action	Yes	No
1	Install a scan tool. Does the scan tool power up?	Go to **Step 2**	Go to **Scan Tool Does Not Power Up** in Data Link Communications
2	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communications with the following control modules. • Electronic brake control module (EBCM) • Powertrain control		

	module (PCM) Does the scan tool communicate with all control modules?	Go to **Step 3**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
3	Select the display DTCs function on the scan tool for the following control modules: • Electronic brake control module (EBCM) • Powertrain control module (PCM) Does the scan tool display any DTCs?	Go to **Step 4**	Go to **Symptoms - Anti-lock Brake System**
4	Does the scan tool display any DTCs which begin with a "U"?	Go to **Diagnostic Trouble Code (DTC) List** in Data Link Communications	Go to **Step 5**
5	Does the scan tool display DTCs which begin with a "B"?	Go to **Diagnostic Trouble Code (DTC) List** in Body Control System	Go to **Step 6**
6	Does the scan tool display DTCs which begin with a "P"?	Go to **Diagnostic Trouble Code (DTC) List** in Engine Electrical	Go to **Diagnostic Trouble Code (DTC) List**

SCAN TOOL OUTPUT CONTROLS

Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
Automated Bleed Procedure	-	Used in order to bleed ABS hydraulics. Refer to **ABS Automated Bleed Procedure** .
ABS Warning Lamp	-	Commands the ABS indicator ON and OFF.
LF Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LF Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LR Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LR Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RF Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.

RF Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RR Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RR Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.

SCAN TOOL DATA LIST

The EBCM Scan Tool Data Lists contain all the anti-lock brake system related parameters that are available on the scan tool. The parameters on the list are arranged in alphabetical order. The "Column" data list shows the location of the parameter on the scan tool displayed menu selections.

Use the EBCM Scan Tool Data Lists as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all the diagnostic procedures with the ABS Diagnostic Starting Point. Use the EBCM Scan Tool Data Lists only after the following is determined:

- There is no published DTC procedure nor published symptom procedure for the customer concern.

  OR

- The DTC or symptom diagnostic procedure indicated by the diagnostic system check does not resolve the customer concern.

The Typical Data Values are obtained from a properly operating vehicle under the conditions specified in the first row of the Scan Tool Data List table. Comparison of the parameter values from the suspect vehicle with the Typical Data Values may reveal the source of the customer concern.

EBCM Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition is ON, engine OFF, and vehicle is stationary			
ABS Active	ABS	Yes/No	No
Brake Fluid Level	ABS	OK/Low	OK
Brake Switch	ABS	Applied/Released	Released
DRP Active	ABS	Yes/No	No
DRP Disabled	ABS	Yes/No	No
Front TCS Isolation Solenoid	TCS	Active/Inactive	Inactive
Front TCS Prime Solenoid	TCS	Active/Inactive	Inactive
Ignition Voltage Signal	ABS	Volts	B+
Left Front Wheel Speed	ABS	km/h or mph	0
Left Rear Wheel Speed	ABS	km/h or mph	0
LF Inlet Valve Solenoid	ABS	Active/Inactive	Inactive
LF Outlet Valve Solenoid	ABS	Active/Inactive	Inactive
Longitudinal Accelerometer	TCS	Volts	0

Loose Surface Mode (TC2)	TCS	Disabled/Enabled	Disabled
LR Inlet Valve Solenoid	ABS	Active/Inactive	Inactive
LR Outlet Valve Solenoid	ABS	Active/Inactive	Inactive
Pump Motor Relay Command	ABS	On/Off	Off
Rear TCS Isolation Solenoid	TCS	Active/Inactive	Inactive
Rear TCS Prime Solenoid	TCS	Active/Inactive	Inactive
RF Inlet Valve Solenoid	ABS	Active/Inactive	Inactive
RF Outlet Valve Solenoid	ABS	Active/Inactive	Inactive
Right Front Wheel Speed	ABS	km/h or mph	0
RR Inlet Valve Solenoid	ABS	Active/Inactive	Inactive
RR Outlet Valve Solenoid	ABS	Active/Inactive	Inactive
Right Rear Wheel Speed	ABS	km/h or mph	0
Solenoid Valve Relay Command	ABS	On/Off	On
TCS Active	TCS	Yes/No	No

SCAN TOOL DATA DEFINITIONS

Data Display/Definitions

The Scan Tool Data Display/Definitions contains a brief description of all the ABS/TCS data parameters. The menus available depend on the number and type of system on the vehicle and are listed below in alphanumeric order.

- ABS DATA
- TCS DATA

ABS Active

The scan tool displays Yes or No. The scan tool will display Yes when the ABS is active and No during normal vehicle operation.

Brake Fluid Level

The scan tool will display OK/Low depending on the state of the Master Cylinder Fluid Level Switch.

Brake Switch

The scan tool will display Applied or Released depending on the state of the brake switch.

DRP Active

The scan tool will display Yes/No depending on the state of the DRP.

DRP Disabled

The scan tool will display Yes/No depending on the state of the DRP.

Front TCS Isolation Solenoid

The scan tool will display Active/Inactive. This displays the commanded state of the solenoid valve.

Front TCS Prime Solenoid

The scan tool will display Active/Inactive. This displays the commanded of the solenoid valve.

Ignition Voltage

The scan tool displays 0-17 Volts. The scan tool displays the level of ignition voltage at the EBCM.

Left Front Wheel Speed

The scan tool displays 0-255 km/h or (0-158 mph). The scan tool displays the actual speed of the left front wheel.

Left Rear Wheel Speed

The scan tool displays 0-255 km/h or (0-158 mph). The scan tool displays the actual speed of the left rear wheel.

LF Inlet Valve Solenoid Inactive

The scan tool will display Active or Inactive. The scan tool displays the commanded state of the LF inlet solenoid valve.

LF Outlet Valve Solenoid Inactive

The scan tool will display Active or Inactive. The scan tool displays the commanded state of the LF outlet solenoid valve.

Longitudinal Accelerometer Sensor

The scan tool will display Volts. The scan tool displays the longitudinal accelerometer signal received from the sensor.

Loose Service Mode

The scan tool displays Disabled/Enabled. The scan tool displays the switch state.

LR Inlet Valve Solenoid Inactive

The scan tool displays Active or Inactive. The scan tool displays the commanded state of the LR inlet

solenoid valve.

LR Outlet Valve Solenoid Inactive

The scan tool displays Active or Inactive. The scan tool displays the commanded state of the LR outlet solenoid valve.

Pump Motor Relay Command

The scan tool display On/Off. This is the commanded state of the relay.

Rear TCS Isolation Solenoid

The scan tool will display Active/Inactive. This will be the commanded state of the solenoid valve.

Rear TCS Prime Solenoid

The scan tool will display Active/Inactive. This will be the commanded state of the solenoid valve.

RF Inlet Valve Solenoid Inactive

The scan tool displays Active or Inactive. The scan tool displays the commanded state of the RF inlet solenoid valve.

RF Outlet Valve Solenoid Inactive

The scan tool displays Active or Inactive. The scan tool displays the commanded state of the RF outlet solenoid valve.

Right Front Wheel Speed

The scan tool displays 0-255 km/h or (0-158 mph). The scan tool displays the actual speed of the right front wheel.

RR Inlet Valve Solenoid Inactive

The scan tool displays Active or Inactive - The scan tool displays the commanded state of the RR inlet solenoid valve.

RR Outlet Valve Solenoid Inactive

The scan tool displays Active or Inactive - The scan tool displays the commanded state of the RR outlet solenoid valve.

Right Rear Wheel Speed

The scan tool displays 0-255 km/h or (0-158 mph). The scan tool displays the actual speed of the right rear wheel.

Solenoid Relay Command

The scan tool will display On/Off depending on the state of the relay.

TCS Active

The scan tool will display Off or On. The scan tool displays On if the TCS indicator is currently being commanded ON.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Description	Module (s)
DTC B3626	TC2 Mode Switch	BCM
DTC C0035	Left Front Wheel Speed Circuit Malfunction	EBCM
DTC C0036	LF Wheel Speed Circuit Range/Performance	EBCM
DTC C0040	Right Front Wheel Speed Circuit Malfunction	EBCM
DTC C0041	Right Front Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
DTC C0045	Left Rear Wheel Speed Circuit Malfunction	EBCM
DTC C0046	Left Rear Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
DTC C0050	Right Rear Wheel Speed Circuit Malfunction	EBCM
DTC C0051	LF Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
DTC C0110	Pump Motor Circuit Malfunction	EBCM
DTC C0121	Valve Relay Circuit Malfunction	EBCM
DTC C0161	ABS/TCS Brake Switch Circuit Malfunction	EBCM
DTC C0192	Longitudinal Accelerometer Sensor Circuit Malfunction	EBCM
DTC C0245	Wheel Speed Sensor Frequency Error	EBCM

DTC C0267	Pump Motor Circuit Open/Shorted	EBCM
DTC C0550	ECU Malfunction - internal write / checksum malfunction	EBCM
DTC C0896	Electronic Suspension Control (ESC) voltage is outside the normal range of 9 to 15.5 volts	EBCM
DTC U1000	Class 2 Communication Malfunction	Class 2
DTC U1300	Class 2 Short to Ground	Class 2
DTC U1301	Class 2 Short to Battery	Class 2

ENHANCED DIAGNOSTICS

History Data

Enhanced diagnostic information is found in the History Data function of the scan tool. Enhanced diagnostic information provides the service technician with specific malfunction occurrence information.

The scan tool will display the last 3 DTCs to occur, one at a time. The DTC with the most recent occurrence will be displayed first. Each DTC will include the following:

- The number of drive cycles since the DTC last occurred.
- The number of occurrences for the DTC since the scan tool DTC information was last cleared.

The most recent DTC will also display various data parameters with values from the time of the DTC occurrence.

Diagnostic Strategy

In difficult diagnostic situations use the above information to identify malfunction occurrence trends. Ask questions such as the following:

- Did the malfunction only occur once over a large number of drive cycles, indicating an unusual condition present when it occurred?
- Does the malfunction occur infrequently over a large number of drive cycles, indicating that special diagnostic techniques may be required to identify the source of the malfunction?

A malfunction that occurs more frequently increases the odds of finding the cause of the malfunction.

Use the information in order to determine if a DTC is intermittent. Use the information in order to determine if the DTC has not set for long periods of time due to weather changes or a repair prior to this visit.

DTC B3626

Circuit Description

The TC2 mode switch is a momentary-contact switch that can be used to limit the traction control function. Each time the TC2 mode switch is pressed, the TC2 switch full traction limited status changes. When the TC2 mode switch is released, voltage on the TC2 mode switch signal circuit is approximately 12 volts. When the TC2 mode switch is pressed, voltage on the TC2 mode switch signal circuit is approximately 0.5 volts.

Conditions for Running the DTC

In order to detect a continuously low or high TC2 mode switch signal:

The ignition is ON.

OR:

In order to detect a continuously pressed TC2 mode switch:

- The ignition is ON.
- The engine speed is greater than 450 RPM.

Conditions for Setting the DTC

Either of the following conditions may cause DTC B3626 to set:

- The TC2 mode switch signal is detected as excessively low or high for 200 milliseconds.
- The TC2 mode switch is detected as pressed for 60 seconds.

Action Taken When the DTC Sets

- The EBCM disables the traction assist.
- The TCS LED switch telltale is disable.

Conditions for Clearing the DTC

The conditions for setting the DTC are no longer present and you use the scan tool Clear DTCs function.

Diagnostic Aids

Press and release the TC2 mode switch several times while observing the traction LED switch telltale in order to verify that the TC2 full traction limited status changes each time the switch is pressed and that DTC B3626 does not set. Using the scan tool in order to observe the Mode Switch Pressed or Released status may also be helpful in diagnosing an intermittent fault within the switch.

Thoroughly inspect connections or circuitry that may cause an intermittent malfunction. Refer to **Testing for Electrical Intermittents** , **Testing for Intermittent Conditions and Poor Connections** , **Wiring Repairs** and **Connector Repairs** in Wiring Systems.

Test Description

The number below refers to the step number on the diagnostic table.

4: This step tests for voltage on the TC2 mode switch signal circuit indicating an unpressed TC2 mode switch.

5: This step tests for voltage on the TC2 mode switch signal circuit indicating a pressed TC2 mode switch.

DTC B3626

Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference:ABS Connector End Views**				
1	Did you perform the ABS Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Use a scan tool in order to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Start the engine. 4. Observe the scan tool for up to 60 seconds in order to verify the DTC resets. Does the DTC set?	-	Go to **Step 3**	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the TC2 mode switch harness connector. 3. Turn ON the ignition. 4. Connect a test lamp between the IGN 1 voltage circuit, IGN E fuse, and a good ground. Does the test lamp illuminate?	-	Go to **Step 4**	Go to **Step 11**
4	1. Turn OFF the ignition. 2. Reconnect the TC2 mode switch harness connector. 3. Turn ON the ignition. 4. Backprobe the TC2 mode switch harness connector in order to connect a DMM between the TC2 mode switch signal circuit and a good ground. Refer to **Probing Electrical Connectors** in Wiring Systems. 5. Measure the DC voltage on the TC2 mode switch signal circuit. Does the TC2 mode switch signal measure with in the specified	12 V	Go to	

	range?		**Step 5**	Go to **Step 6**
5	1. Press and hold the TC2 mode switch. 2. Use a DMM in order to measure the DC voltage on the TC2 mode switch signal circuit. Does the TC2 mode switch signal measure within the specified range?	0.5 V	Go to **Step 7**	Go to **Step 13**
6	Test the TC2 mode switch signal circuit for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
7	1. Turn OFF the ignition. 2. Disconnect the wiring harness connector from the EBCM. 3. Connect the **J 39700** universal pinout box using the. See **Special Tools and Equipment** . J 39700-530 cable adapter to the EBCM harness connector only. 4. Turn ON the ignition. 5. Use a DMM in order to measure the DC voltage on the TC2 mode switch signal circuit. Does the TC2 mode switch signal measure within the specified range?	12 V	Go to **Step 9**	Go to **Step 8**
8	Repair the open in the TC2 mode switch signal circuit. Refer to **Wiring Repairs** in Wiring Systems. Did you complete the repair?	-	Go to **Step 14**	-
9	Inspect for poor connections at the harness connector of the EBCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 10**
10	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 14**	-
11	Repair the open or short to ground in the IGN 1 voltage circuit, IGN E fuse. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you complete the repair?	-	Go to **Step 14**	-
12	Inspect for open in the TC2 switch ground circuit or poor connections at the harness connector of the TC2 mode switch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 13**
13	Replace the TC2 mode switch. Refer to **Traction Control Switch Replacement** Did you complete the replacement?	-	Go to **Step 14**	-

14	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 3**	System OK

DTC C0035-C0051

Circuit Description

As the wheel spins, the wheel speed sensor produces an AC signal. The electronic brake control module (EBCM) uses the frequency of the AC signal to calculate the wheel speed.

Conditions for Running the DTC

C0035 C0040 C0045 C0050

The ignition is ON.

C0036 C0041 C0046 C0051

- Vehicle speed is over 40 km/h (25 mph).
- The brake pedal is not pressed.
- The ABS is not active.

Conditions for Setting the DTC

C0035 C0040 C0045 C0050

One of the following conditions exists for 0.02 seconds:

- A short to voltage in the wheel speed sensor signal circuit.
- An open in the wheel speed sensor signal circuit.

C0036 C0041 C0046 C0051

All of the following conditions exists for 0.01 seconds:

- The suspect wheel speed equals zero.
- The other wheel speeds are greater than 40 km/h (25 mph) for 0.01 seconds.
- The suspect wheel equals zero during drive off, and the other wheels are greater than 18 km/h (11 mph).
- A short to ground the wheel speed sensor signal circuit is shorted to ground.
- A deviation of 2 wheel speeds at either side of the vehicle greater than 6 km/h (4 mph), or at the front axle greater than 10 km/h (6 mph) for a time period of 10 to 20 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The electronic brake control module (EBCM) disables the anti-lock brake system (ABS)/traction control system (TCS) for the duration of the ignition cycle.
- A DTC malfunction will set.
- The ABS indicator turns ON.
- The Red BRAKE Warning indicator could turn ON.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

C0035 C0040 C0045 C0050

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

1. Spray the suspected area with a 5 percent saltwater solution. To create a 5 percent saltwater solution, add 2 teaspoons of salt to 354 ml (12 oz) 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. If the DTC returns, replace the suspected wheel speed sensor or repair the wheel speed sensor wiring.
4. Rinse the are thoroughly when completed.

C0036 C0041 C0046 C0051

Under the following conditions, 2 Wheel Speed Sensor Input is 0 DTCs are set:

- The 2 suspect wheel speeds equal zero for 10-20 seconds.
- The other wheel speeds are greater than 16 km/h (10 mph).
- The other wheel speeds are within 11 km/h (7 mph) of each other.

Diagnose each wheel speed sensor individually.

C0036 C0041 C0046 C0051

A possible cause of this DTC is electrical noise on the wheel speed sensor harness wiring. Electrical noise could result from the wheel speed sensor wires being routed to close to high energy ignition system components, such

as spark plug wires.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3: This step tests the wheel speed sensor for the proper resistance value.

4: This step ensures that the wheel speed sensor generates the proper voltage.

DTC C0035-C0051

Step or	Action	Value(s)	Yes	No
Schematic Reference: ABS Schematics Connector End View Reference:ABS Connector End Views				
1	Did you perform the ABS Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Install a scan tool. 2. Turn ON the ignition. 3. Set up the scan tool snap shot feature to trigger for this DTC. 4. Drive the vehicle at a speed greater than the specified value. Does the scan tool indicate that this wheel speed DTC set?	40 km/h (25 mph)	Go to **Step 3**	Go to Diagnostic Aids
3	1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information. 2. Disconnect the wheel speed sensor connector. 3. Measure the resistance across the wheel speed sensor. Does the resistance measure within the specified range?	Front Wheels 800-1600 ohm Rear Wheels 4500-5400 ohm	Go to **Step 4**	Go to **Step 8**
4	1. Spin the wheel. 2. Measure the AC voltage across the wheel speed sensor. Does the AC voltage measure greater than the specified value?	100 mV	Go to **Step 5**	Go to **Step 8**
5	Inspect for poor connections at the harness connector of the wheel speed sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 10**	Go to **Step 6**

6	1. Disconnect the electronic brake control module (EBCM) harness connector. 2. Install the **J 39700** using. See **Special Tools and Equipment** . J 39700-530 to the EBCM harness connector only. 3. Test the wheel speed sensor circuits for the following: • An open • A short to ground • A short to voltage • Shorted together Refer to **Testing for Intermittent Conditions and Poor Connections** and **Wiring Repairs** in Wiring Systems.Did you find and correct the condition?	-	Go to **Step 10**	Go to **Step 7**
7	Inspect for poor connections at the harness connector for the EBCM. Refer **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 10**	Go to **Step 9**
8	Replace the wheel speed sensor. Refer to **Wheel Speed Sensor Replacement - Front** or **Wheel Speed Sensor Replacement - Rear** in Rear Suspension. Did you complete the replacement?	-	Go to **Step 10**	-
9	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Did you complete the repair?	-	Go to **Step 10**	-
10	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC C0110

Circuit Description

The pump motor is an integral part of the BPMV, while the pump motor relay is integral to the EBCM. The pump motor relay is not engaged during normal system operation. When ABS or TCS operation is required the EBCM activates the pump motor relay and battery power is provided to the pump motor.

Conditions for Running the DTC

- The ignition switch is in the ON position.
- Initialization is complete.

Conditions for Setting the DTC

- Pump motor voltage is not present 60 milliseconds after activation of the pump motor relay.
- Pump motor voltage is present for more than 2.5 seconds with no activation of the pump motor relay.
- Pump motor voltage is not present for 40 milliseconds after the pump motor relay is commanded off.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS for the duration of the ignition cycle.
- A malfunction DTC will set.
- The ABS indicator turns ON.
- The Red BRAKE Warning indicator could turn on.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

The number below refers to the step number on the diagnostic table.

3: Tests the pump motor circuits of the BPMV for a short to the housing of the BPMV. The wiring from the BPMV to the EBCM should not be repaired.

DTC C0110

Step	Action	Value (s)	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference:ABS Connector End Views**				
1	Did you perform the ABS Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Disconnect the EBCM harness connector. 2. Connect the **J 39700** Universal Pinout Box using the. See **Special Tools and Equipment** . J 39700-530 Cable Adapter to the EBCM harness connector only. 3. Test both ground circuits of the EBCM including the EBCM ground for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. 4. Test the Battery Positive Voltage circuits for an open, high resistance, or a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. orDid you find and correct the condition?	-	Go to **Step 8**	Go to **Step 3**
3	1. Disconnect the pump motor harness pigtail connector of the BPMV. 2. Measure the resistance between each pump motor control circuit and the housing of the BPMV at the pump motor harness pigtail connector of the BPMV. Does the resistance measure less than the specified value?	5 ohm	Go to **Step 4**	Go to **Step 5**
4	Inspect for poor connections at the pump motor harness pigtail connector of the BPMV. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 8**	Go to **Step 6**
5	Inspect for poor connections at the harness connector of the EBCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 8**	Go to **Step 7**
6	Replace the BPMV. Refer to **Brake Pressure Modulator Valve (BPMV) Replacement** . Did you complete the repair?	-	Go to **Step 8**	-
7	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** .	-	Go to	

	Did you complete the repair?		**Step 8**	-
8	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC C0121

Circuit Description

The solenoid valve relay supplies power to the solenoid valve coils in the EBCM. The solenoid valve relay, located in the EBCM, is activated whenever the ignition switch is in the RUN position and no faults are present. The solenoid valve relay remains engaged until the ignition is turned OFF or a failure is detected.

Conditions for Running the DTC

The ignition switch is in the ON position.

Conditions for Setting the DTC

- DTC C0121 will set anytime the solenoid valve relay is commanded on and the EBCM does not see battery voltage at the solenoid valves.
- DTC C0121 will set anytime the EBCM commands the solenoid valve relay off and battery voltage is still present at the solenoid valves.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS/DRP for the duration of the ignition cycle.
- A malfunction DTC is set.
- The ABS indicator turns ON.
- The TRAC Off indicator turns ON.
- The Red BRAKE Warning indicator could turn on.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to

carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.

- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists, refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.
- The solenoid valve relay is an integral part of the EBCM and is not serviced separately.

Test Description

The number below refers to step number on the diagnostic table.

2: This step determines if the DTC is current.

DTC C0121

Step	Action	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference:ABS Connector End Views**			
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Use the scan tool in order to clear the DTCs. Does the DTC reset?	Go to **Step 3**	Go to Diagnostic Aids
3	1. Connect the **J 39700** universal pinout box using the. See **Special Tools and Equipment** . J 39700-530 cable adapter to the EBCM harness connector only. 2. Test the battery positive voltage circuit for an open, high resistance, or a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems.		

	Did you find and correct the condition?	Go to **Step 5**	Go to **Step 4**
4	Replace the Electronic Brake Control Module (EBCM). Refer to **Electronic Brake Control Module Replacement** . Did you complete the replacement?	Go to **Step 5**	-
5	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

DTC C0161

Circuit Description

The stoplamp switch is a normally open switch, when the brake pedal is depressed the EBCM will sense battery voltage. This allows the EBCM to determine the state of the brake lamps. The EBCM sources 5 volts on the stop lamp switch signal circuit when the stop lamp switch is inactive. The voltage is supplied a ground path through the stop lamp bulbs.

Conditions for Running the DTC

The ignition switch is ON.

Conditions for Setting the DTC

- EBCM detects open in the brake signal circuit.
- Both brake lamps are faulty.
- The stoplamp switch input voltage is between 6.6 and 9 volts for 0.5 second.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- A malfunction DTC will set.
- The EBCM stores this information-only DTC for as long as the condition is present.
- The ABS remains functional.
- The ABS indicator remains OFF.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- Possible causes of this DTC are the following conditions:
  - A signal circuit of the stop lamp switch is open
  - The stop lamp switch is misadjusted
  - Verify proper stop lamp switch operation using the data list of the scan tool. As the brake is applied, the data list displays the stop lamp switch ON within 2.54 cm (1 in) of travel
  - All brake lamps are open
  - All brake lamp grounds are open
  - Circuit has a wiring problem, terminal corrosion, or poor connections
  - Loose or corroded EBCM ground
- If an intermittent malfunction exists refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3: This DTC detects an open stop lamp switch signal circuit from the stop lamp side of the splice pack to the EBCM.

4: The EBCM sources 5 volts on the stop lamp switch signal circuit. This small voltage has a ground path through the stop lamp bulbs. This DTC sets if the path to ground is open.

DTC C0161

Step	Action	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference: ABS Connector End Views or Lighting Systems Connector End Views** in Lighting Systems			
1	Did you perform the ABS Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
	1. Press the brake pedal.		

2	2. With the scan tool, observe the Brake Switch Status parameter in the ABS data list. Does the Brake Switch Status parameter display Applied?	Go to **Step 4**	Go to **Step 3**
3	Test the signal circuit of the stop lamp switch for an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 9**	Go to **Step 7**
4	Press the brake pedal. Are all of the stoplamps OFF?	Go to **Step 5**	Go to Diagnostic Aids
5	Test the feed circuit of the stop lamps for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 9**	Go to **Step 6**
6	Test the ground circuit of the stop lamps for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 9**	Go to Diagnostic Aids
7	Inspect for poor connections at the harness connector of the EBCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
8	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Did you complete the replacement?	Go to **Step 9**	-
9	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

DTC C0191

Circuit Description

The EBCM provides power 5 volts reference to the longitudinal accelerometer. The longitudinal accelerometer converts the change in vehicle motion, or inertia, into a voltage signal. This signal is sent to the EBCM.

The voltage signal ranges, from 2.4 to 2.6 volts at zero speed change, constant motion, or stationary. The longitudinal accelerometer voltage signal drops when the vehicle is under acceleration. The longitudinal accelerometer voltage signal increases when the vehicle is under deceleration. The usable output voltage range for the longitudinal accelerometer is 0.48-4.82 volts. The longitudinal accelerometer sensor bias compensates for sensor mounting alignment errors and electronic signal errors.

Conditions for Running the DTC

- The ignition is ON.

- The DTC can be set after system initialization.

Conditions for Setting the DTC

Voltage at the longitudinal accelerometer signal output to the EBCM falls outside the 0.48 V - 4.82 V range for more than 100 milliseconds.

Action Taken When the DTC Sets

- A malfunction DTC is set
- TCS is disabled
- The ABS warning indicator turns ON.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.
- Using a scan tool.

Diagnostic Aids

- A thorough inspection of the wiring system and connectors be performed. Failure to carefully and fully inspect the wiring system and connectors may result in misdiagnosis which may result in replacing good parts and the reappearance of the malfunction.
- Inspection for poor connections, broken insulation, or a wire that is broken inside the insulation.
- If an intermittent malfunction exists refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2: Tests for specified voltage on the LNG accelerometer signal circuit.
3: Checks to see if voltage was below or above specified voltage.
4: Checks to see if voltage was above specified voltage.
5: Checks to see if voltage was below specified voltage.
6: Checks to see if voltage was above specified voltage.
7: Checks to see if resistance of ground circuit is less than 5 ohms.
8: Tests for a short to voltage on the 5 volt reference circuit.
9: Tests for a short to ground, a high resistance, or an open in the 5 volt reference circuit.
10: Tests for a short to ground, a high resistance, or an open in the lateral accelerometer signal circuit.
11: Tests for a short to voltage in the lateral accelerometer signal circuit.

12: Tests for a high resistance or an open in the ground circuit.

13: Checks the LNG accelerometer sensor connector for poor connections.

DTC C0191

Step	Action	Value (s)	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference:ABS Connector End Views**				
1	Did you perform the ABS Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Turn OFF the ignition. 2. Disconnect the EBCM. 3. Install the **J 39700** universal pinout box with the. See **Special Tools and Equipment** . J 39700-530 cable adapter between the EBCM and the EBCM harness connector. 4. Turn ON the ignition, with the engine OFF. 5. Using the **J 39200** , measure the voltage between pin 10 and pin 15 of the **J 39700** universal pinout box. See **Special Tools and Equipment** . Is the voltage within the specified value?	0.48 V - 4.82 V	Go to Diagnostic Aids	Go to **Step 3**
3	1. Reconnect the LNG accelerometer sensor. 2. Using a **J 39200** , measure the voltage between pin 10 and pin 15 of the **J 39700** universal pinout box. See **Special Tools and Equipment** . Is the voltage less than the specified value?	4.82 V	Go to **Step 4**	Go to **Step 11**
4	Using a DMM, measure the voltage between pin 10 and pin 15 of the **J 39700** universal pinout box. See **Special Tools and Equipment** . Is the voltage greater than the specified value?	0.48 V	Go to **Step 5**	Go to **Step 10**
5	Using a DMM, measure the voltage between the 5 volt reference circuit pin 28 and the ground circuit pin 15 on the **J 39700** universal pinout box. See **Special Tools and Equipment** . Does the voltage measure less than the specified value?	2 V	Go to **Step 9**	Go to **Step 6**
6	Using a DMM, measure the voltage between the 5 volt reference circuit pin 28 and ground circuit pin 15 on the **J 39700** universal pinout box. See **Special Tools and Equipment** .	3 V		

	Does the voltage measure greater than the specified voltage?		Go to **Step 8**	Go to **Step 7**
7	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. 3. Measure the resistance from the ground circuit of the LNG accelerometer to a good ground. Does the resistance measure less than the specified value?	5 ohm	Go to **Step 14**	Go to **Step 12**
8	Test the 5 volt reference circuit of the LNG accelerometer sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 13**
9	Test the 5 volt reference circuit of the LNG accelerometer sensor for a short to ground, a high resistance, or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 10**
10	Test the LNG accelerometer signal circuit of the LNG accelerometer sensor for a short to ground, a high resistance, or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 13**
11	Test the LNG accelerometer signal circuit of the yaw/lateral accelerometer sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 13**
12	1. Disconnect the EBCM. 2. Test the ground circuit of the LNG accelerometer sensor for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 13**
13	Inspect for poor connections at the harness connector of the LNG accelerometer sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 15**
14	Inspect for poor connections at the harness connector of the EBCM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 16**

15	Replace the vehicle LNG accelerometer sensor. Refer to **Longitudinal Accelerometer Replacement** . Did you complete the replacement?	-	Go to **Step 17**	-
16	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 17**	-
17	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC C0192

Circuit Description

The vehicle uses the longitudinal accelerometer input when calculating the desired traction control. The usable output voltage range for the longitudinal accelerometer 0.48-4.84 volts. The scan tool will report zero longitudinal acceleration as 2.5 volts with no sensor bias present.

The longitudinal accelerometer sensor bias compensates for sensor mounting alignment errors and electronic signal errors.

Conditions for Running the DTC

- The ignition is ON.
- The vehicle speed is greater than 40 km/h (25 mph).

Conditions for Setting the DTC

- If during stable driving conditions, the longitudinal accelerometer signal becomes larger than 0.26 g, the EBCM controller will disregard the signal so that a false EBCM intervention is prevented. A malfunction is detected if this condition continues for more than two seconds.
- Under normal driving conditions, the long time filtered driving direction is straight ahead. The long time filtered longitudinal accelerometer value is called the offset. If the offset value is higher than 0.23 g, a malfunction is detected. Malfunction time depends on driving distance, vehicle speed and the amount of malfunctioning longitudinal accelerometer signal.
- The longitudinal accelerometer signal is limited to an electrical stop of 1.8 g. If the longitudinal accelerometer signal is greater than 1.5 g for more than 500 milliseconds, a malfunction is detected.
- At a standstill, the range of the longitudinal accelerometer signal is less than 0.7 g. If the longitudinal accelerometer signal is greater than 0.7 g at standstill, a malfunction is detected.
- longitudinal accelerometer signal cannot change rapidly under normal driving conditions. If the longitudinal accelerometer signal is changing faster than 55 g per second, a malfunction is detected.

Action Taken When the DTC Sets

- A malfunction DTC is set
- TCS is disabled for the duration of the ignition cycle
- ABS remains functional
- ABS lamp indicators turn on

Conditions for Clearing the DTC

- The condition for the DTC is no longer present
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.
- Using a scan tool.

Diagnostic Aids

Any circuitry that is suspected of causing an intermittent complaint should be thoroughly checked for improper mating, improperly formed or damaged terminals, poor terminal to wiring connections, or physical damage to the wiring harness. If an intermittent condition exists, refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Checks for specified voltage on the longitudinal accelerometer signal circuit.

3: Checks for specified 5-volt reference on the longitudinal accelerometer reference circuit.

DTC C0192

Step	Action	Value (s)	Yes	No
Schematic Reference: ABS Schematics Connector End View Reference:ABS Connector End Views				
1	Did you perform the ABS Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Turn OFF the ignition. 2. Disconnect the EBCM connector. 3. Install the **J 39700** universal pinout box with the. See **Special Tools and Equipment** . J 39700-530 cable adapter between the EBCM and the EBCM harness connector. 4. Turn the ignition ON, with the engine OFF.	2.3-2.7 V		

	5. Using the DMM, measure the voltage between pin 10 and pin 15 of the **J 39700** universal pinout box. See **Special Tools and Equipment** . Is the voltage within the specified value?		Go to **Step 3**	Go to **Step 6**
3	Using the DMM, measure the voltage between pin 28 and pin 15 of the **J 39700** universal pinout box. See **Special Tools and Equipment** . Is the voltage within the specified value?	4.5-5 V	Go to **Step 4**	Go to **Step 6**
4	1. Use the scan tool in order to clear the DTCs. 2. Perform the Diagnostic Test Drive. Does the DTC reset?	-	Go to **Step 5**	Go to Diagnostic Aids
5	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Did you complete the replacement?	-	Go to **Step 7**	-
6	Replace the vehicle longitudinal accelerometer sensor. Refer to **Longitudinal Accelerometer Replacement** . Did you complete the repair?	-	Go to **Step 7**	-
7	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC C0245

Circuit Description

The speed sensors used on the front of this vehicle are multiple pole and the rear uses a single pole magnetic pickup. This sensor produces an AC signal that the EBCM uses the frequency from to calculate the wheel speed.

Conditions for Running the DTC

- The ignition switch is ON.
- The DTC can be set after system initialization.

Conditions for Setting the DTC

- The EBCM detects a deviation between two wheel speeds at either side of the vehicle greater than 6 km/h (3.75 mph) at a vehicle speed of less than 100 km/h (62 mph).
- The EBCM detects a deviation between the left and right front wheel speeds of greater than 10 km/h (6.25 mph) at a vehicle speed of less than 100 km/h (62 mph).

- The EBCM detects a deviation between the left and right front wheel speeds of greater than 4 km/h (2.5 mph) plus 6 percent of the vehicle speed at greater than 100 km/h (62 mph).

This DTC will set when the EBCM cannot specifically identify which wheel speed sensor is causing the malfunction. If the EBCM can identify the specific wheel speed sensor causing the malfunction, DTC C0245 will become a history DTC, and the DTC associated with the sensor DTC C0036, DTC C0041, DTC C0046, DTC C0051, will be set concurrent with DTC C0245.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS if the exact fault can be determined and after ABS control has terminated.
- A malfunction DTC will set.
- The ABS indicator turns on.
- The TCS indicator turns on.
- The Red BRAKE Warning indicator turns on.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If the customer's comments reflect that the amber ABS/TCS indicator is on only during moist environmental conditions (rain, snow, vehicle wash), inspect all the wheel speed sensor circuitry 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 procedure:

1. Spray the suspected area with a five percent saltwater solution.

   Add two teaspoons of salt to twelve ounces of water to make a five percent saltwater solution.

2. Test drive the vehicle over various road surfaces (bumps, turns, etc.) above 40 km/h (25 mph) for at least 30 seconds.
3. If the DTC returns, replace the suspected harness.

- If an intermittent malfunction exists refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

The numbers below refer to step numbers on the diagnostic table.

2: If DTC C0245 is a history code, this step checks if a specific Wheel Speed Circuit Malfunction DTC is set concurrently with DTC C0245.

7: This step checks if the wheel speed sensor harness is routed in close proximity to the spark plug wires.

9: In this step, if the scan tool can record any erroneous wheel speed sensor signals, diagnose that sensors first.

DTC C0245

Step	Action	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference:ABS Connector End Views**			
1	Did you perform the diagnostic system check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	Is the following DTCs set concurrently with a history DTC C0245? • DTC C0036 • DTC C0041 • DTC C0046 • DTC C0051	Go to DTC **Diagnostic Trouble Code (DTC) List**	Go to **Step 3**
3	Inspect the WSS for physical damage. Is physical damage of the WSS evident?	Go to **Step 4**	Go to **Step 5**
4	Replace the WSS. Refer to **Wheel Speed Sensor Replacement - Front** or **Wheel Speed Sensor Replacement - Rear** . Is the replacement complete?	Go to **Step 14**	-
	Inspect the wiring harness for physical damage.		

5	Is physical damage of the wiring harness evident?	Go to **Step 6**	Go to **Step 7**
6	Repair the wiring harness. Refer to **Wiring Repairs** and **Connector Repairs** in Wiring Systems. Is the replacement complete?	Go to **Step 14**	-
7	Check for proper routing of the wheel speed sensor harness. Check that the wheel speed sensor harness is routed away from the spark plug wires. Refer to **Harness Routing Views** in Wiring Systems. Is the wheel speed sensor harness properly routed?	Go to **Step 9**	Go to **Step 8**
8	Reroute the wheel speed sensor harness away from the spark plug wires. Is the reroute complete?	Go to **Step 14**	-
9	1. Install a scan tool. 2. Turn the ignition switch to the RUN position. 3. Set the scan tool to Snap Shot Auto Trigger mode and monitor the wheel speed sensors. 4. Carefully drive the vehicle above 12 km/h (8 mph) for several minutes Did the scan tool trigger on any of the wheel speed sensors?	Go to **Step 10**	Go to **Step 11**
10	Note which wheel speed sensor triggered the scan tool. Follow the appropriate Wheel Speed Sensor Malfunction DTC table for the wheel speed sensor that triggered. Refer to **Diagnostic Trouble Code (DTC) List** . Is the repair complete?	Go to **Step 14**	-
11	1. Reconnect all previously disconnected components. 2. Using a scan tool clear the DTC. 3. Remove the scan tool from the DLC. 4. Carefully drive the vehicle above 12 km/h (8 mph) for several minutes. Does the DTC reset as a current DTC?	Go to **Step 13**	Go to **Step 12**
12	Malfunction is intermittent. Inspect all connectors and harnesses for damage that may result in an open or high resistance when connected. Refer to **Connector Repairs** and **Wiring Repairs** in Wiring Systems. Is the repair complete?	Go to **Step 14**	-
13	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Step 14**	-
14	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the conditions for running the DTC as specified in the supporting text.		

	Does the DTC reset?	Go to **Step 2**	System OK

DTC C0550

Circuit Description

This DTC identifies a malfunction within the EBCM.

Conditions for Running the DTC

The ignition switch is in the ON position.

Conditions for Setting the DTC

DTC C0550 is set when an internal EBCM or solenoid malfunction exists.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS for the duration of the ignition cycle.
- A malfunction DTC will set.
- The ABS indicator turns on.
- The TCS indicator turns on.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and you used the scan tool Clear DTC function.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

DTC C0550

Step	Action	Yes	No
Schematic Reference:ABS Schematics **Connector End View Reference:ABS Connector End Views**			
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	Are any other DTC(s) present besides C0550?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Step 3**
3	Replace the EBCM. Refer to **Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Step 4**	-
	1. Use the scan tool in order to clear the DTCs.		

4	2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

DTC C0896

Circuit Description

The EBCM is required to operate within a specified range of voltage to function properly. During ABS and TCS operation, there are current requirements that will cause the voltage to drop. Because of this, voltage is monitored out of ABS/TCS control to indicate a good charging system condition, and also during ABS/TCS control when voltage may drop significantly. The EBCM also monitors for high voltage conditions which could damage the EBCM.

Conditions for Running the DTC

- The ignition switch is ON.
- The DTC can be set after system initialization.

Conditions for Setting the DTC

- The EBCM operating voltage falls below 9.4 volts out of ABS/TCS control, or 8.8 volts during ABS/TCS control.
- The EBCM operating voltage rises above 17.4 volts.
- The low voltage or the high voltage is detected for more than 500 milliseconds with the vehicle speed above 6 km/h (3.6 mph).

Action Taken When the DTC Sets

If equipped, the following actions occur:

- A malfunction DTC is stored.
- The ABS and the Traction Control indicators are turned on.
- The ABS/TCS is disabled.
- The Brake warning indicator turns on.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.
- The electronic brake control module (EBCM) automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists, refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems for further diagnosis.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2: This step checks if the voltage is above the maximum of the range.

4: Step 4 checks if the voltage is below the minimum of the range.

6: This step checks for the integrity of the ground circuit.

DTC C0896

Step	Action	Value (s)	Yes	No
Schematic Reference: ABS Schematics **Connector End View Reference: ABS Connector End Views** or **Powertrain Control Module (PCM) Connector End Views**				
1	Did you perform the Diagnostic System Check?	-	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Turn all the accessories off. 2. Install a scan tool. 3. Start the engine. 4. Use the scan tool to monitor the battery voltage while running the engine at approximately 2000 RPM. Is the monitored battery voltage within the specified	0-17.4 V	Go to	

	range?		**Step 4**	Go to **Step 3**
3	Use a **J 39200** to measure the voltage between the battery positive terminal and ground. Is the voltage within the specified range?	0-17.4 V	Go to **Step 5**	Go to **Symptoms - Engine Electrical** in Engine Electrical
4	Continue to monitor the battery voltage with the scan tool while running the engine at approximately 2000 RPM. Is the monitored battery voltage within the specified range?	0-9.4 V	Go to **Step 6**	Go to **Step 5**
5	1. Turn the ignition switch to the OFF position. 2. Disconnect the scan tool if still connected. 3. Test drive the vehicle above 6 km/h (3.5 mph). Did DTC C0896 reset?	-	Go to **Step 10**	Go to **Diagnostic System Check - ABS**
6	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM connector. 3. Install the **J 39700** with the. See **Special Tools and Equipment** . J 39700-530 to the EBCM harness connector only. 4. Use a **J 39200** to measure the resistance between the **J 39700** terminal 15 and a good ground. See **Special Tools and Equipment** . Is the resistance within the specified range?	0-5 ohm	Go to **Step 8**	Go to **Step 7**
7	Repair open or high resistance in the ground circuit. Refer to **Circuit Testing** and **Wiring Repairs** Wiring Repairs. Is the repair complete?	-	Go to **Step 11**	-
8	1. Turn the ignition switch to the RUN position. 2. Use a **J 39200** to measure the voltage between the **J 39700** terminal 8 and 15. See **Special Tools and Equipment** . Is the voltage within the specified range?	Above 9.4 V	Go to **Step 9**	Go to **Symptoms - Engine Electrical** in Engine Electrical
9	1. Turn the ignition switch to the OFF position. 2. Reconnect the EBCM connector. 3. Disconnect the scan tool if the scan tool is still connected. 4. Test drive the vehicle above 6 km/h (3.5 mph). Did DTC C0896 reset?	-	Go to **Step 10**	Go to **Step 11**
	Replace the EBCM. Refer to **Electronic Brake**		Go to	

10	**Control Module Replacement** . Is the repair complete?	-	**Step 11**	-
11	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

SYMPTOMS - ANTI-LOCK BRAKE SYSTEM

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

1. Perform the **Diagnostic System Check - ABS** before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **ABS Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the anti-lock brake system. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
- 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 proper 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** in Wiring Systems.

Symptom List

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

- **ABS Indicator Always On**
- **ABS Indicator Inoperative**
- **Traction Off Indicator Always On**
- **Traction Off Indicator Inoperative**

ABS INDICATOR ALWAYS ON

Circuit Description

The instrument panel cluster (IPC) turns the anti-lock brake system (ABS) indicator ON during the IPC bulb check for approximately 3 seconds when the ignition switch is turned to the ON position. If the electronic brake control module (EBCM) sets a diagnostic trouble code (DTC) the EBCM sends the IPC the command to turn the ABS indicator ON

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists refer to **Inducing Intermittent Fault Conditions** in Wiring Systems.

Test Description

The numbers below refer to step numbers on the diagnostic table.

2: Checks if the IPC has the ability to turn the ABS indicator OFF or if the EBCM is sending an incorrect command to turn the ABS indicator ON.

ABS Indicator Always On

Step	Action	Yes	No
Schematic Reference:ABS Schematics **Connector End View Reference:Instrument Panel, Gauges, and Console Connector End Views**			
1	Did you perform the anti-lock brake system (ABS) Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	Using a scan tool in the Instrument Panel Cluster (IPC) Special Functions attempt to turn OFF the ABS indicator. Did the ABS indicator turn OFF?	Go to **Step 3**	Go to **Step 4**
	Replace the electronic brake control module (EBCM). Refer to		

3	**Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Step 5**	-
4	Replace the IPC. Refer to **Instrument Panel Cluster (IPC) Replacement** in Instrument Panel, Gauges and Console. Is the replacement complete?	Go to **Step 5**	-
5	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

ABS INDICATOR INOPERATIVE

Circuit Description

The instrument panel cluster (IPC) turns the anti-lock brake system (ABS) indicator ON during the IPC bulb check for approximately 3 seconds when the ignition switch is turned to the ON position. If the electronic brake control module (EBCM) sets a diagnostic trouble code (DTC) the EBCM sends the IPC the command to turn the ABS indicator ON.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists refer to **Inducing Intermittent Fault Conditions** in Wiring Systems.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Checks if the scan tool can turn ON and OFF all the indicator lamps in the IPC.

4: Checks if the circuits going to the IPC or the IPC is at fault.

ABS Indicator Inoperative

Step	Action	Yes	No
Schematic Reference:ABS Schematics **Connector End View Reference:Instrument Panel, Gauges, and Console Connector End Views**			
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Using a scan tool, select the Instrument Panel Cluster (IPC) Special Functions mode. 2. Go to Lamp Test. 3. In the Lamp Test mode you can turn ON or OFF the instrument panel indicators. All indicators will turn ON when commanded ON. Does the anti-lock brake system (ABS) indicator turn ON then OFF?	Go to **Step 3**	Go to **Step 4**
3	Replace the electronic brake control module (EBCM). Refer to **Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Diagnostic System Check - ABS**	-
4	1. Disconnect the IPC and connect a Test Light across the appropriate power and ground terminals. 2. Test Light OFF, repair open in power or ground circuit to IPC. 3. Test Light ON, check connector for poor connection to the IPC. 4. If OK, replace the IPC. Refer to **Instrument Panel Cluster (IPC) Replacement** in Instrument Panel, Gauges, and Console. Is the IPC replacement complete?	Go to **Diagnostic System Check - ABS**	-

TRACTION OFF INDICATOR ALWAYS ON

Circuit Description

The traction control system (TCS) TRAC OFF indicator is controlled by the instrument panel cluster (IPC) via class 2 serial data messages from the electronic brake control module (EBCM). When the EBCM sees the TCS switch fault, the EBCM then disables the TCS and sends a message to the IPC to turn the TRAC OFF indicator ON. Each time the ignition is cycled from OFF to ON, the TCS is enabled.

The following conditions will cause the TRAC OFF indicator to illuminate:

- The EBCM has disabled the TCS due to a DTC.
- The EBCM has disabled the TCS due to a overheated ABS/TCS hydraulic unit.
- The IPC bulb check. When the ignition switch is turned to ON, the TRAC OFF indicator will turn ON for approximately 5 seconds and then turn OFF.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists refer to **Inducing Intermittent Fault Conditions** in Wiring Systems.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Checks if the scan tool can turn ON and OFF all the indicator lamps in the IPC.

4: Checks if the circuits going to the IPC or the IPC is at fault.

Traction Off Indicator Always On

Step	Action	Yes	No
Schematic Reference:ABS Schematics **Connector End View Reference:Instrument Panel, Gauges, and Console Connector End Views**			
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
	1. Using a scan tool, select the Instrument Panel		

2	Cluster (IPC) Special Functions mode. 2. Go to Displays Test in Output Control. 3. In the Displays Test mode you can turn ON or OFF the instrument panel indicators. All indicators will turn ON when commanded ON. Does the TRAC OFF indicator turn ON then OFF?	Go to **Step 3**	Go to **Step 4**
3	Replace the electronic brake control module (EBCM). Refer to **Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Diagnostic System Check - ABS**	-
4	1. Disconnect the IPC and connect a Test Light across the appropriate power and ground terminals. 2. Test Light OFF, repair open in power or ground circuit to IPC. 3. Test Light ON, check connector for poor connection to IPC. 4. If OK, replace the IPC. Refer to **Instrument Panel Cluster (IPC) Replacement** in Instrument Panel, Gauges, and Console. Is the IPC replacement complete?	Go to **Diagnostic System Check - ABS**	-

TRACTION OFF INDICATOR INOPERATIVE

Circuit Description

The traction control system (TCS) TRAC OFF indicator is controlled by the instrument panel cluster (IPC) via class 2 serial data messages from the electronic brake control module (EBCM). When the EBCM sees the TCS switch fault, the EBCM then disables the TCS, and sends a message to the IPC to turn the TRAC OFF indicator ON. Each time the ignition is cycled from OFF to ON, the TCS is enabled.

The following conditions will cause the TRAC OFF indicator to illuminate:

- The EBCM has disabled the TCS due to a DTC.
- The EBCM has disabled the TCS due to a overheated ABS/TCS hydraulic unit.
- The IPC bulb check. When the ignition switch is turned to ON, the TRAC OFF indicator will turn ON for approximately 5 seconds and then turn OFF.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- Thoroughly inspect any circuitry that may be causing the complaint for the following conditions:
  - Backed out terminals
  - Improper mating
  - Broken locks
  - Improperly formed or damaged terminals
  - Poor terminal-to-wiring connections
  - Physical damage to the wiring harness
- The following conditions may cause an intermittent malfunction:
  - A poor connection
  - Rubbed-through wire insulation
  - A broken wire inside the insulation
- If an intermittent malfunction exists refer to **Inducing Intermittent Fault Conditions** in Wiring Systems.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Checks if the scan tool can turn ON and OFF all the indicator lamps in the IPC.

4: Checks if the circuits going to the IPC or the IPC is at fault.

Traction Off Indicator Inoperative

Step	Action	Yes	No
Schematic Reference:ABS Schematics **Connector End View Reference:Instrument Panel, Gauges, and Console Connector End Views**			
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - ABS**
2	1. Using a scan tool, select the Instrument Panel Cluster (IPC) Special Functions mode. 2. Go to Displays Test in Output Control. 3. In the Displays Test mode you can turn ON or OFF the instrument panel indicators. All indicators will turn ON when commanded ON. Does the TRAC OFF Indicator turn ON then OFF?	Go to **Step 3**	Go to **Step 4**

3	Replace the electronic brake control module (EBCM). Refer to **Electronic Brake Control Module Replacement** . Is the replacement complete?	Go to **Diagnostic System Check - ABS**	-
4	1. Disconnect the IPC and connect a Test Light across the appropriate power and ground terminals. 2. Test Light OFF, repair open in power or ground circuit to IPC. 3. Test Light ON, check connector for poor connection to the IPC. 4. If OK, replace the IPC. Refer to **Instrument Panel Cluster (IPC) Replacement** in Instrument Panel, Gauges, and Console. Is the IPC replacement complete?	Go to **Diagnostic System Check - ABS**	-

REPAIR INSTRUCTIONS

ABS AUTOMATED BLEED PROCEDURE

NOTE: When adding fluid to the brake master cylinder reservoir, use only Delco Supreme 11(R), GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT-3 brake fluid from a clean, sealed brake fluid container. The use of any type of fluid other than the recommended type of brake fluid, may cause contamination which could result in damage to the internal rubber seals and/or rubber linings of hydraulic brake system components.

NOTE: Refer to Brake Fluid Effects on Paint and Electrical Components Notice in Cautions and Notices.

IMPORTANT: The base hydraulic brake system must be bled before performing this automated bleeding procedure. If you have not yet performed the base hydraulic brake system bleeding procedure, refer to Hydraulic Brake System Bleeding (Manual) or Hydraulic Brake System Bleeding (Pressure) in Hydraulic Brakes before proceeding.

1. Install a scan tool to the vehicle.
2. Start the engine and allow the engine to idle.
3. Using the scan tool, begin the automated bleed procedure.
4. Follow the instructions on the scan tool to complete the automated bleed procedure. Apply the brake pedal when instructed by the scan tool.
5. Turn the ignition OFF.

6. Remove the scan tool from the vehicle.
7. Fill the brake master cylinder reservoir to the maximum-fill level with Delco Supreme 11(R), GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT-3 brake fluid from a clean, sealed brake fluid container.
8. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding (Pressure)** in Hydraulic Brakes.
9. With the ignition OFF, apply the brakes 3-5 times, or until the brake pedal becomes firm, in order to deplete the brake booster power reserve.
10. Slowly depress and release the brake pedal. Observe the feel of the brake pedal.
11. If the brake pedal feels spongy, repeat the automated bleeding procedure. If the brake pedal still feels spongy after repeating the automated bleeding procedure inspect the brake system for external leaks. Refer to **Brake System External Leak Inspection** in Hydraulic Brakes.
12. Turn the ignition key ON, with the engine OFF; check to see if the brake system warning lamp remains illuminated.
13. If the brake system warning lamp remains illuminated, DO NOT allow the vehicle to be driven until it is diagnosed and repaired. Refer to **Symptoms - Hydraulic Brakes** in Hydraulic Brakes.
14. Drive the vehicle to exceed 13 km/h (8 mph) to allow ABS initialization to occur. Observe brake pedal feel.
15. If the brake pedal feels spongy, repeat the automated bleeding procedure until a firm brake pedal is obtained.

ELECTRONIC BRAKE CONTROL MODULE REPLACEMENT

Removal Procedure

NOTE: To prevent equipment damage, never connect or disconnect the wiring harness connection from the EBCM with the ignition switch in the ON position.

1. Turn the ignition switch to the OFF position.
2. Raise the Vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Disconnect the EBCM harness connector.
4. Remove any dirt/debris from the assembly.

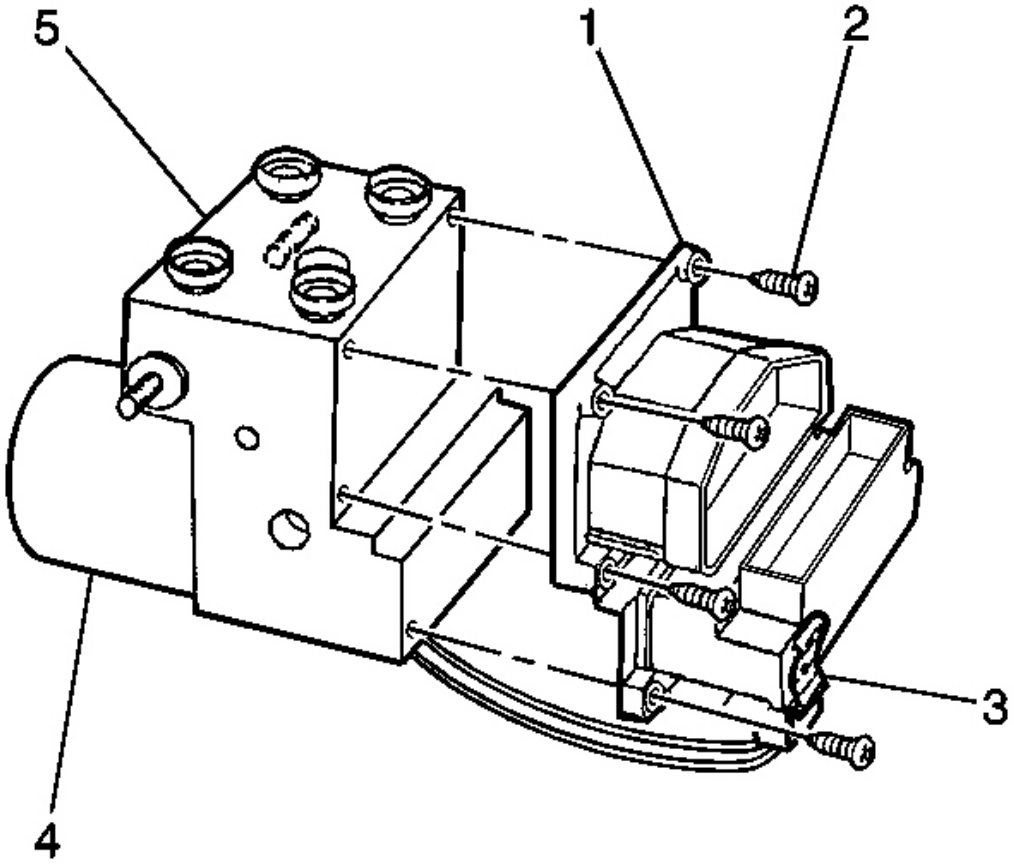


Fig. 5: EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

5. Remove the 6 retainers (2) that connect the EBCM to the BPMV.

IMPORTANT: Do not pry apart using a tool. Be careful not to damage the BPMV surface.

IMPORTANT: Do NOT damage the solenoid valves when you remove the EBCM from the BPMV.

6. Separate the EBCM (1) from the BPMV (4) by gently pulling apart until separated.
7. Disconnect the pump motor connector (3) at the bottom of the EBCM.

Installation Procedure

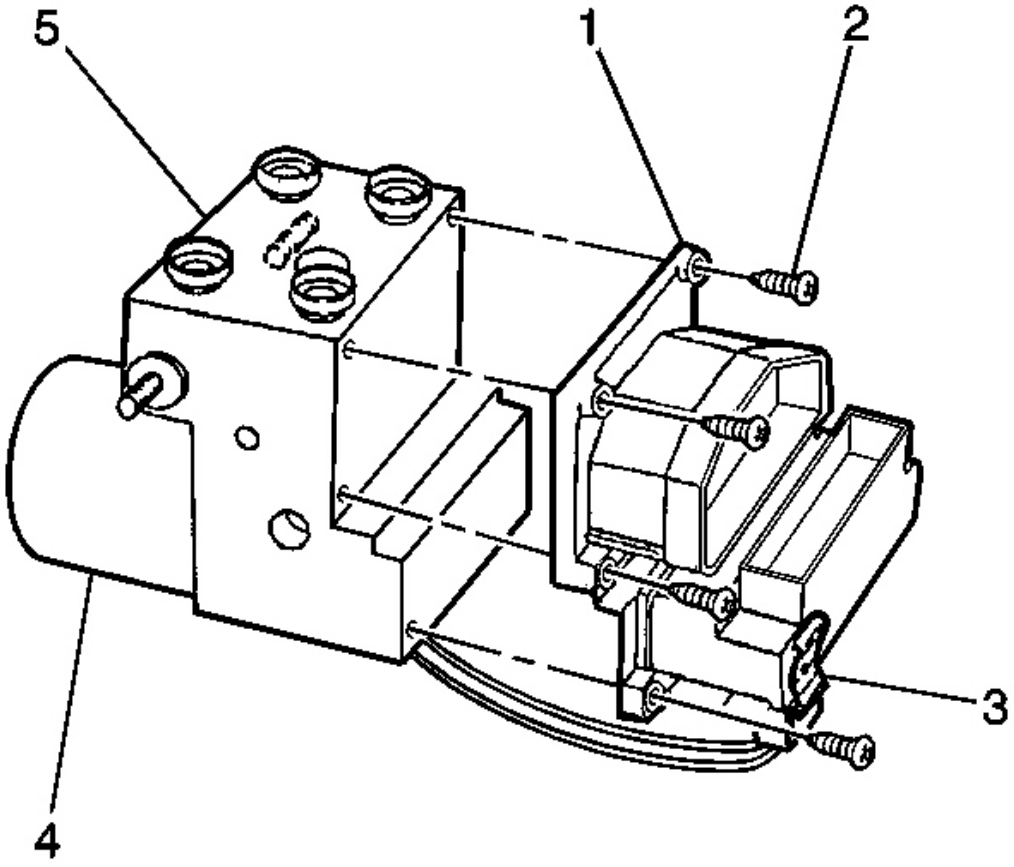


Fig. 6: EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

1. Connect the pump motor connector (3) to the bottom of the EBCM.
2. Install the EBCM (1) to the BPMV (4).

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the 6 retainers (2) which connect the EBCM to the BPMV.

   Tighten: Tighten the retainers to 2.9 N.m (26 lb in).

4. Connect the EBCM harness connector.
5. Lower the vehicle.
6. Turn the ignition switch to the RUN position. Do NOT start the engine.

7. Perform the diagnostic system check. Refer to **Diagnostic System Check - ABS** .

BRAKE PRESSURE MODULATOR VALVE (BPMV) REPLACEMENT

CAUTION: Refer to Brake Fluid Irritant Caution in Cautions and Notices.

NOTE: Refer to Brake Fluid Effects on Paint and Electrical Components Notice in Cautions and Notices.

Removal Procedure

CAUTION: For safety reasons, the Brake Pressure Modulator Valve (BPMV) must not be repaired, the complete unit must be replaced. With the exception of the EBCM/EBTCM, no screws may be loosened. If screws are loosened, it will not be possible to get the brake circuits leak-tight and personal injury may result.

1. Turn the ignition switch to the OFF position.
2. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Disconnect the EBCM harness connector.

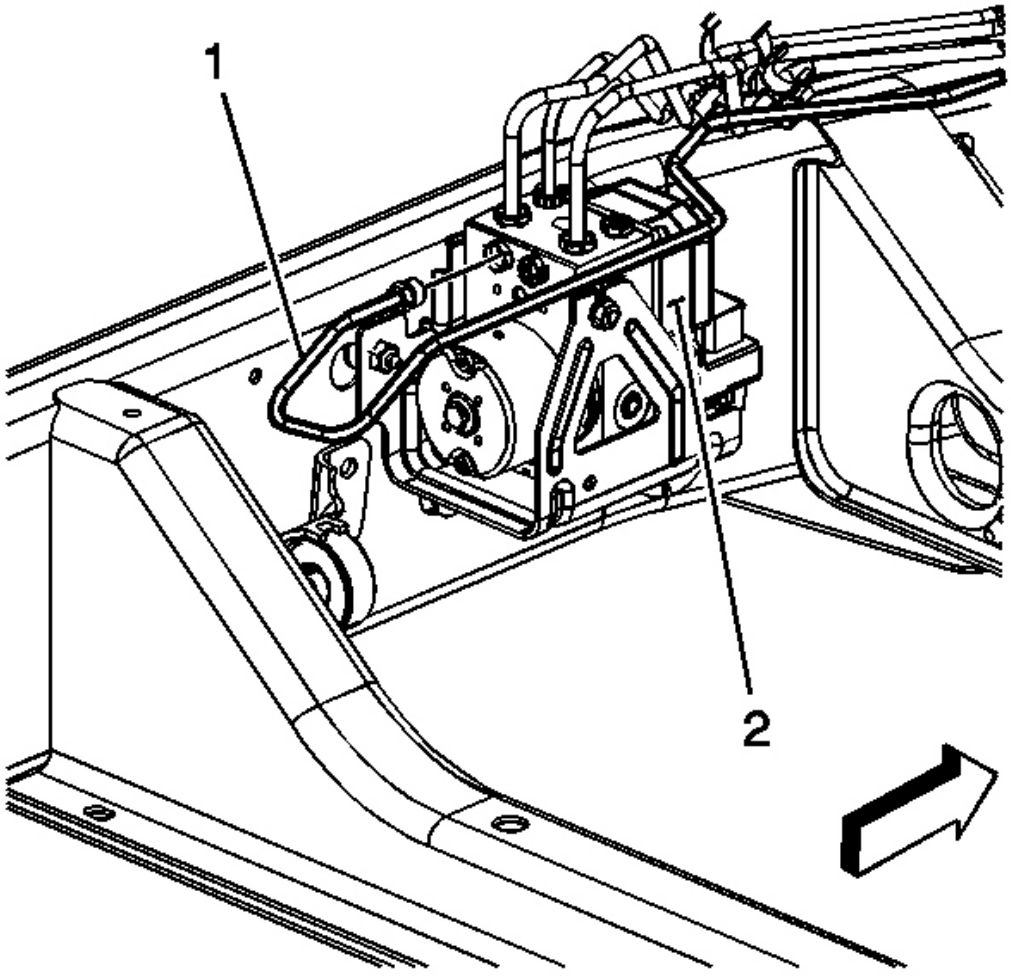


Fig. 7: Right Front Brake Pipe & BPMV
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the locations of the brake pipes in order to aid in installation.

4. Disconnect the right front brake pipe (1) from the BPMV (2).

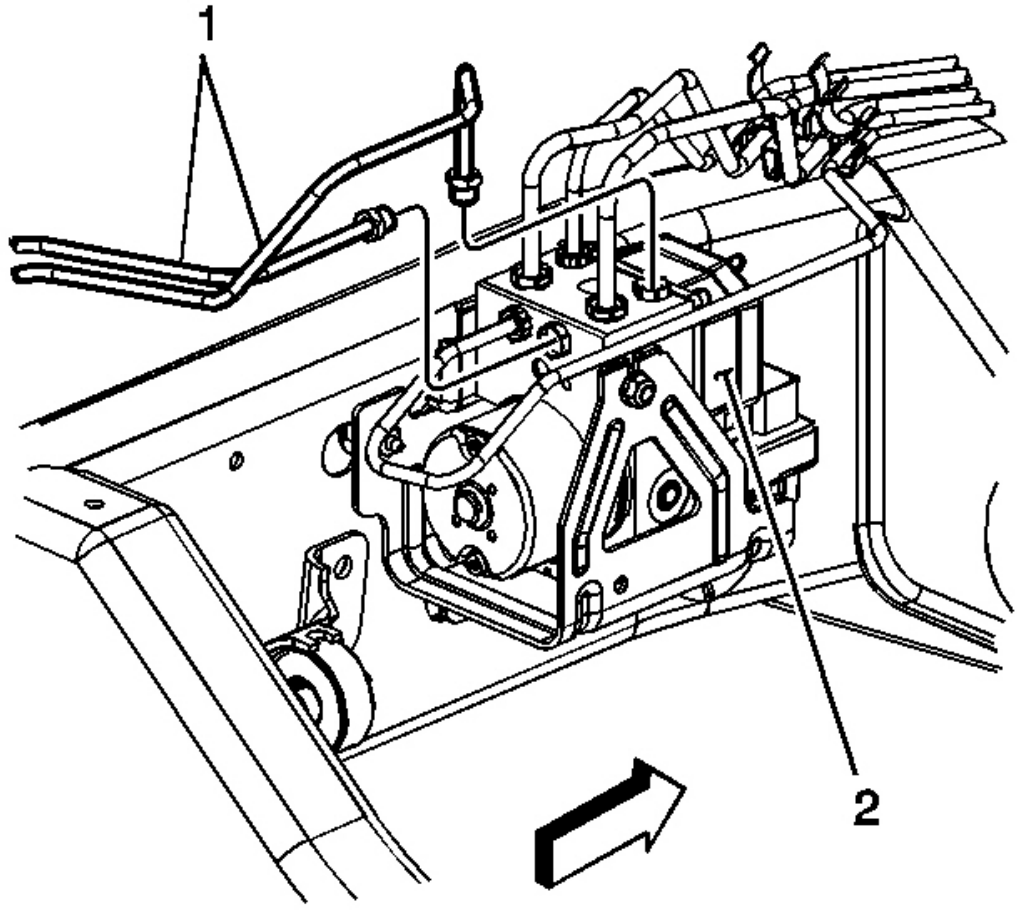


Fig. 8: Rear Brake Pipes & BPMV
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the rear brake pipes (1) from the BPMV (2).

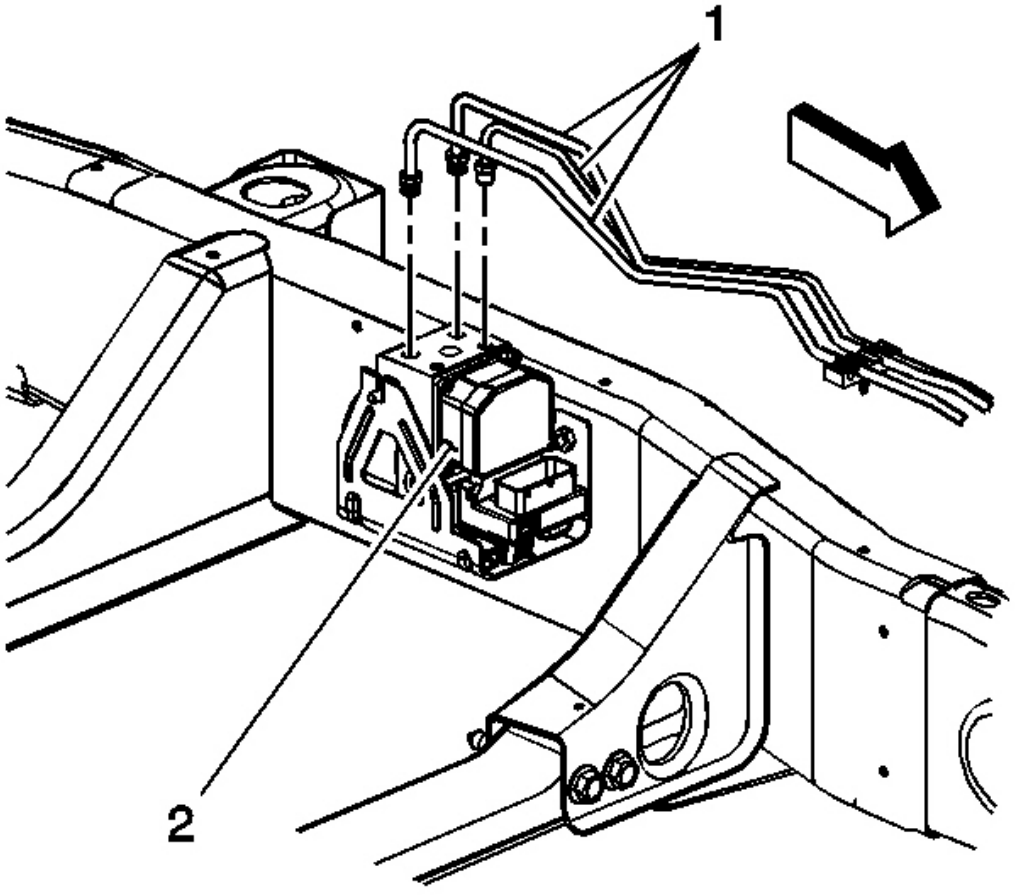


Fig. 9: Identifying BPMV
Courtesy of GENERAL MOTORS CORP.

6. Disconnect the left front and the master cylinder brake pipes (1) from the BPMV (2).
7. Remove the 2 nuts that connect the BPMV to the BPMV bracket.
8. Remove the BPMV (2) and EBCM as an assembly from the vehicle.
9. Remove EBCM if replacing the BPMV only. Refer to **Electronic Brake Control Module Replacement** .

Installation Procedure

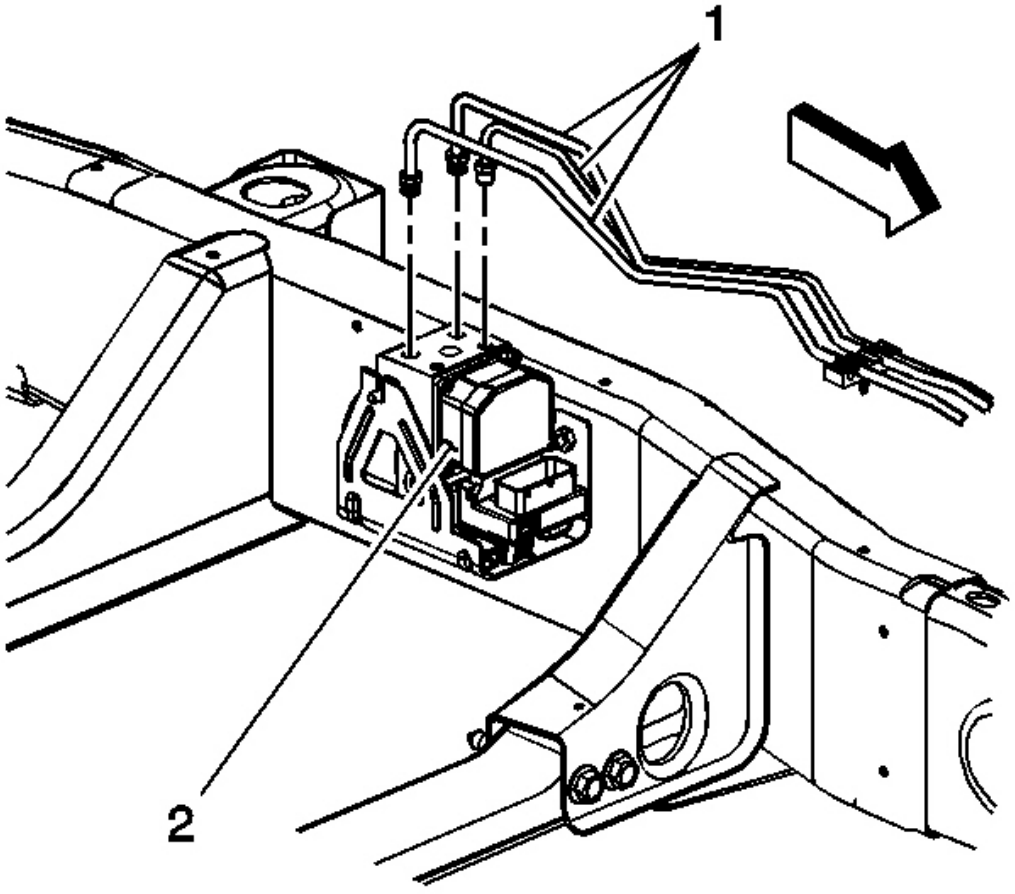


Fig. 10: Identifying BPMV
Courtesy of GENERAL MOTORS CORP.

1. Install EBCM if replacing the BPMV only. Refer to **Electronic Brake Control Module Replacement** .
2. Install BPMV (2) and EBCM as an assembly into the BPMV bracket. Align the flats of the studs on the BPMV with the BPMV bracket.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the 2 BPMV to BPMV bracket nuts.

Tighten: Tighten the 2 BPMV to BPMV bracket nuts to 12 N.m (8 lb ft).

CAUTION: Make sure brake pipes are correctly connected to brake pressure

modulator valve. If brake pipes are switched by mistake, wheel lockup will occur and personal injury may result. The only two ways this condition can be detected are by using a Scan Tool or by doing an Anti-lock stop.

IMPORTANT: If a new BPMV is being installed, remove the shipping plugs from the valve openings in the compartment during the next step.

IMPORTANT: Use the locations noted during removal.

4. Connect the left front and the master cylinder brake pipes (1) to the BPMV (2).

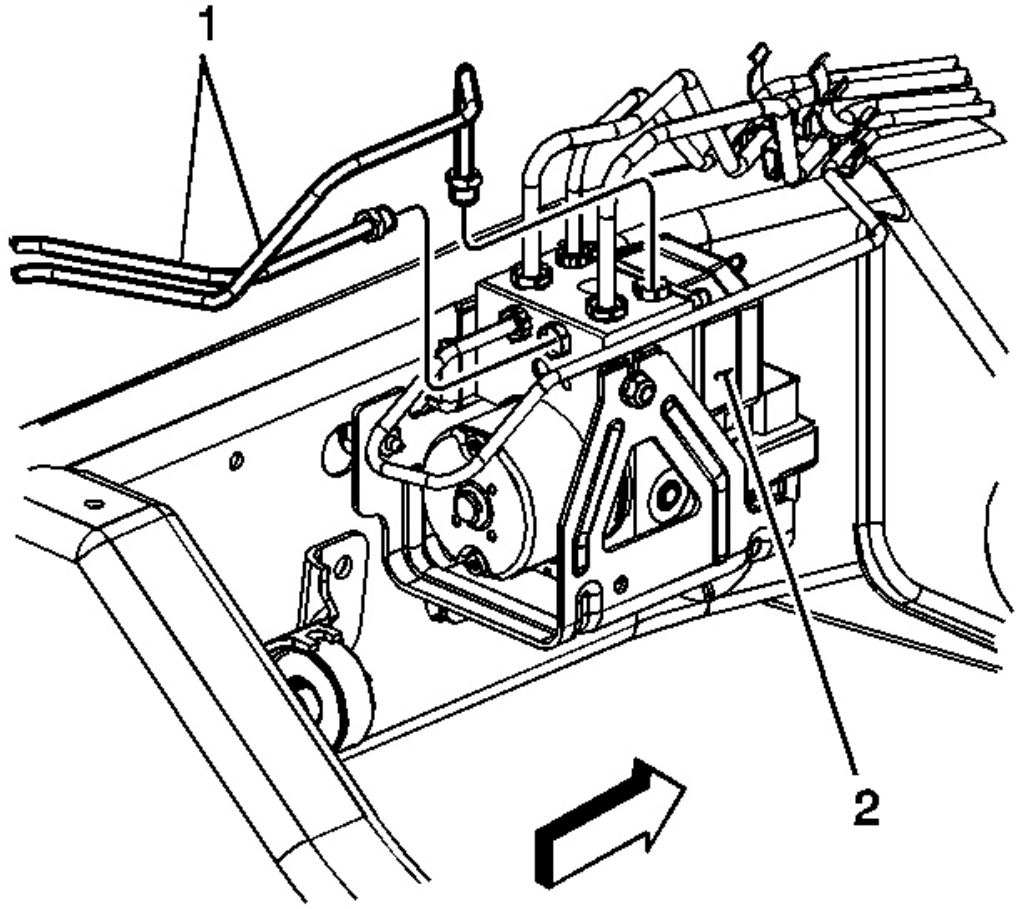


Fig. 11: Rear Brake Pipes & BPMV
Courtesy of GENERAL MOTORS CORP.

5. Connect the rear brake pipes (1) to the BPMV (2).

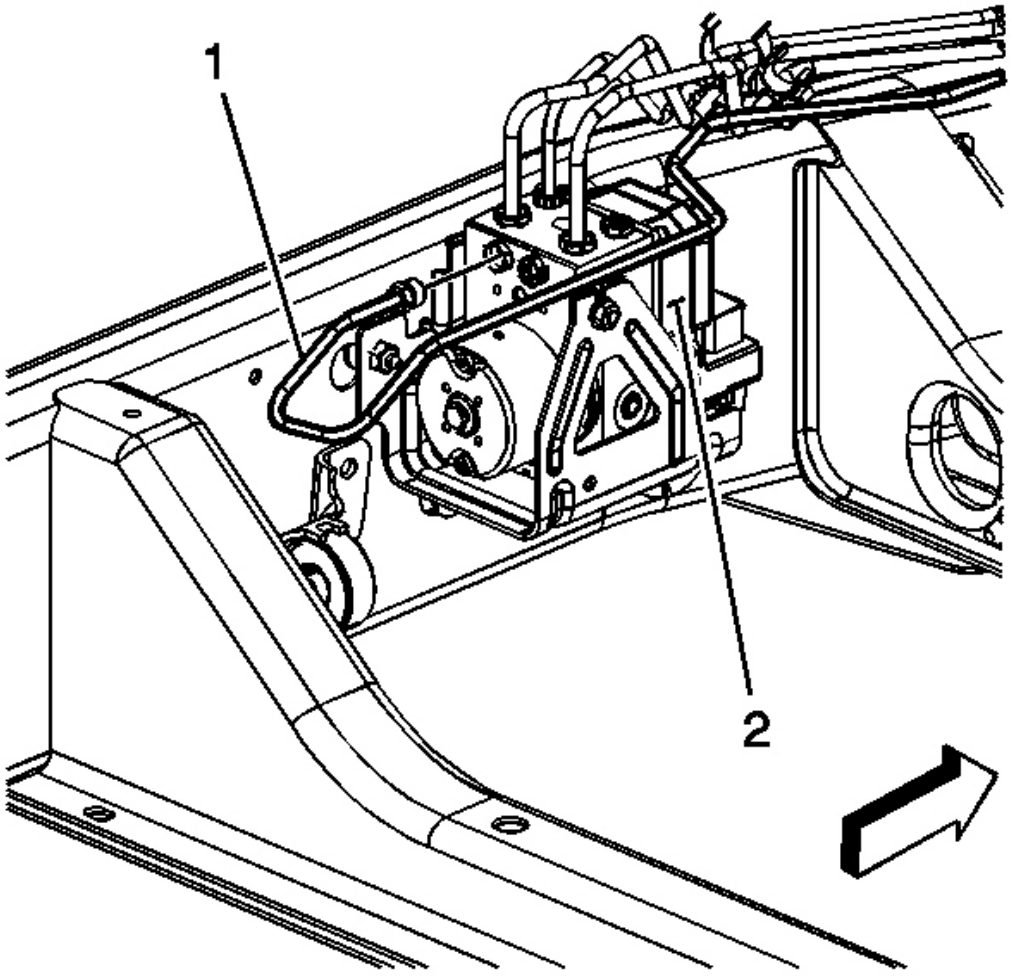


Fig. 12: Right Front Brake Pipe & BPMV
Courtesy of GENERAL MOTORS CORP.

6. Connect the right front brake pipe (1) to the BPMV (2).

   Tighten: Tighten all of the brake pipe fittings to 15 N.m (11 lb ft).

7. Connect the EBCM harness connector.
8. Lower the vehicle.
9. Fill and bleed the brake hydraulic system. Refer to **Hydraulic Brake System Bleeding (Manual)** or

Hydraulic Brake System Bleeding (Pressure) in Hydraulic Brakes.

10. Turn the ignition switch to the RUN position, engine off.
11. Perform the **Diagnostic System Check - ABS** .

WHEEL SPEED SENSOR REPLACEMENT - FRONT

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

Removal Procedure

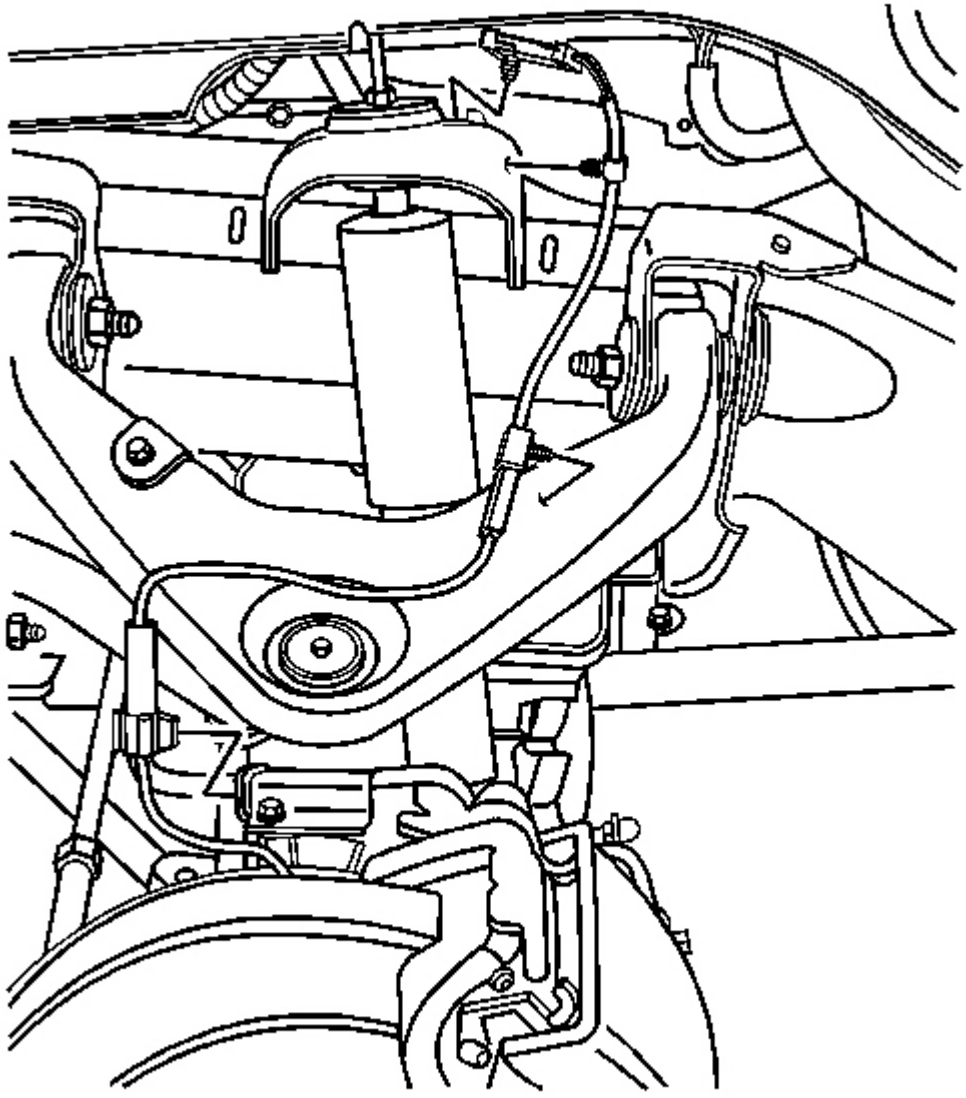


Fig. 13: Front Wheel Speed Sensor Cable
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
4. Remove the WSS cable mounting clip from the knuckle.

5. Remove the WSS cable mounting clip from the upper control arm.
6. Remove the WSS cable mounting clip from the frame attachment point.
7. Disconnect the WSS cable electrical connector.

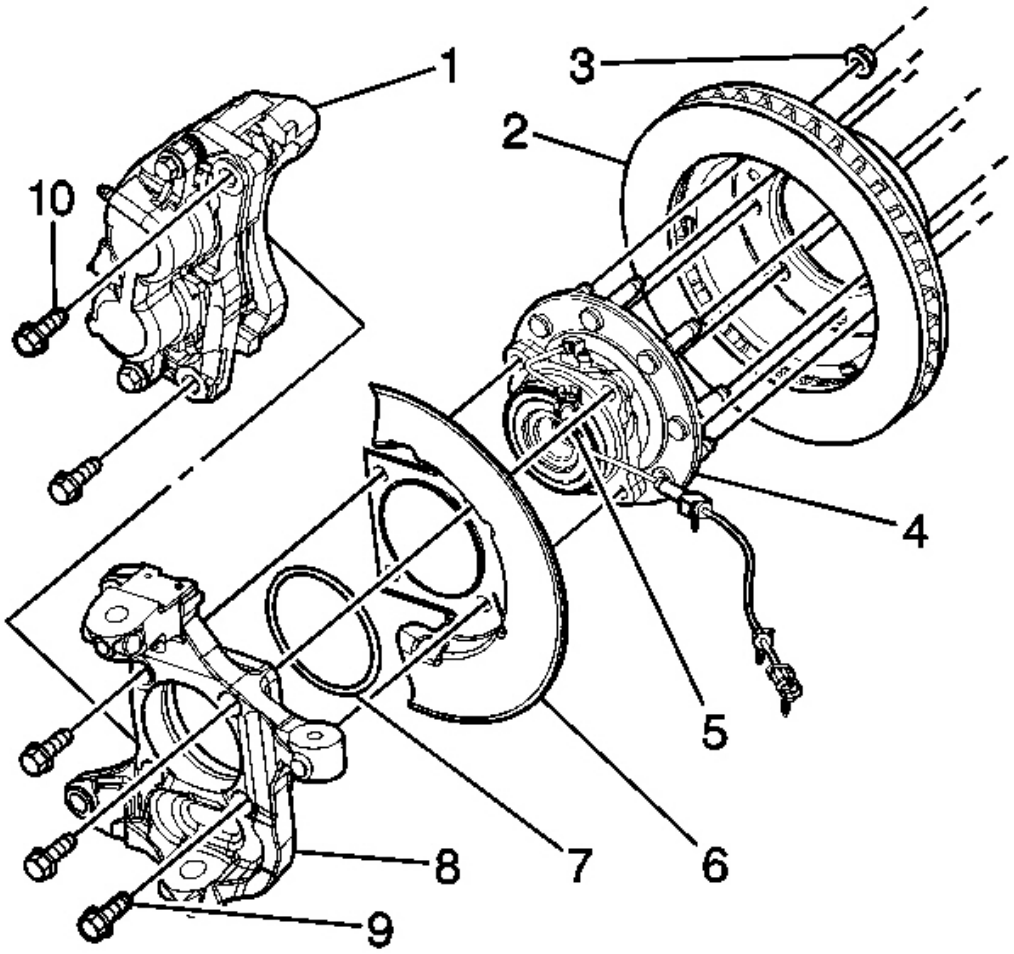


Fig. 14: Wheel Hub And Bearing (RWD, 25/35 Series)
Courtesy of GENERAL MOTORS CORP.

8. Remove the wheel speed sensor (WSS) mounting bolt.

NOTE: Carefully remove the sensor by pulling it straight out of the bore. DO NOT use a screwdriver, or other device to pry the sensor out of the bore. Prying will cause the sensor body to break off in the bore.

9. Remove the wheel speed sensor (5) from the hub/bearing assembly (4).

Installation Procedure

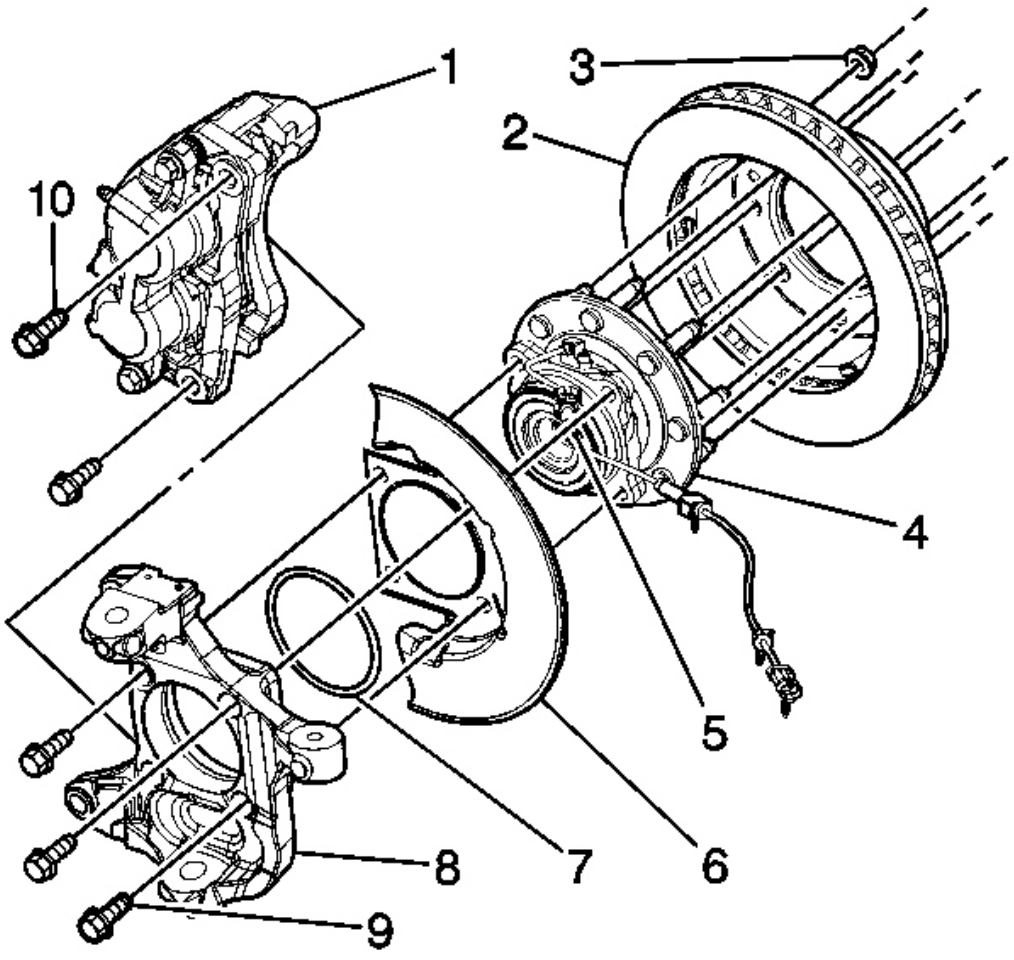


Fig. 15: Wheel Hub And Bearing (RWD, 25/35 Series)
Courtesy of GENERAL MOTORS CORP.

1. Install the WSS (5) into the hub/bearing assembly (4).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the WSS mounting bolt.

Tighten: Tighten the WSS mounting bolt to 18 N.m (13 lb ft).

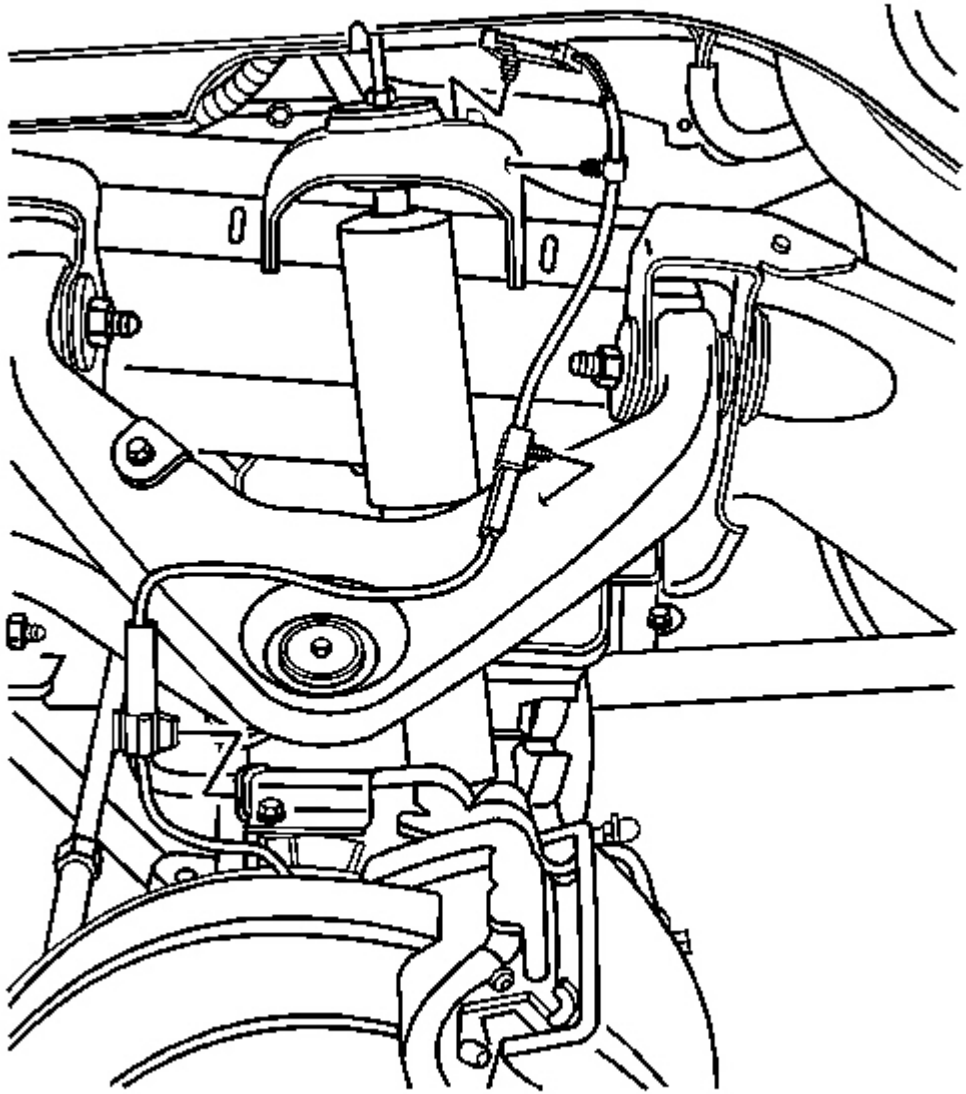


Fig. 16: Front Wheel Speed Sensor Cable
Courtesy of GENERAL MOTORS CORP.

3. Install the WSS cable mounting clip to the knuckle.
4. Install the WSS cable mounting clip to the upper control arm.
5. Install the WSS cable mounting clip to the frame attachment point.

6. Connect the WSS cable electrical connector.
7. Install the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
8. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
9. Return to **Diagnostic Starting Point - Anti-lock Brake System** .

WHEEL SPEED SENSOR REPLACEMENT - REAR

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

Removal Procedure

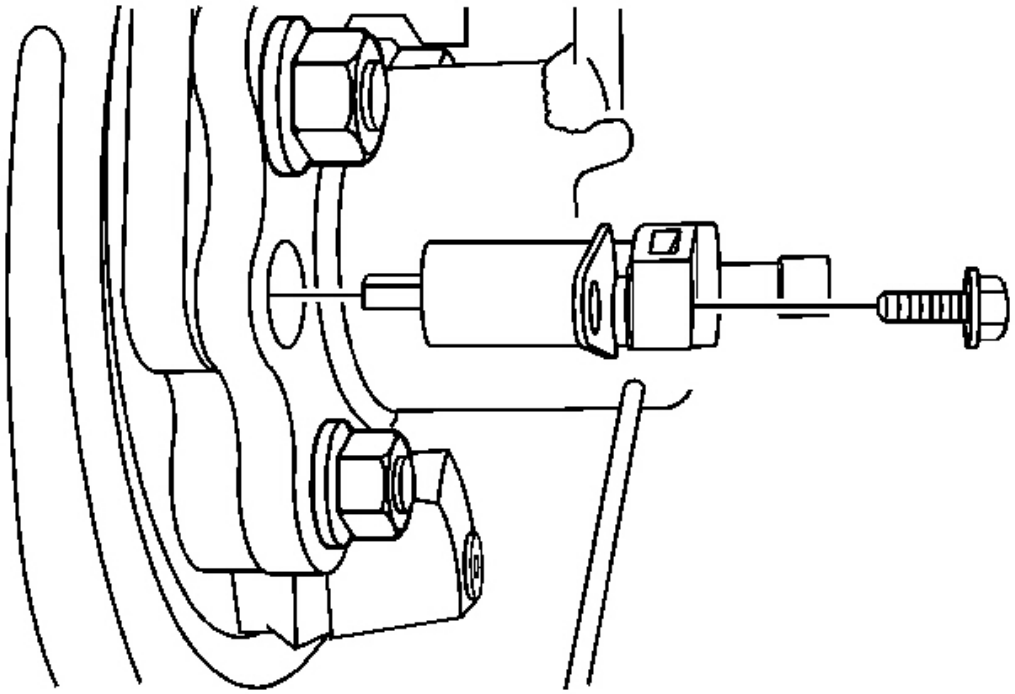


Fig. 17: Rear Wheel Speed Sensor & Shim
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the electrical connector.
3. Remove the wheel speed sensor retaining bolt.

IMPORTANT: If a shim was removed when the wheel speed sensor was removed, it must be reinstalled to ensure proper operation.

4. Remove the wheel speed sensor and shim if present.

Installation Procedure

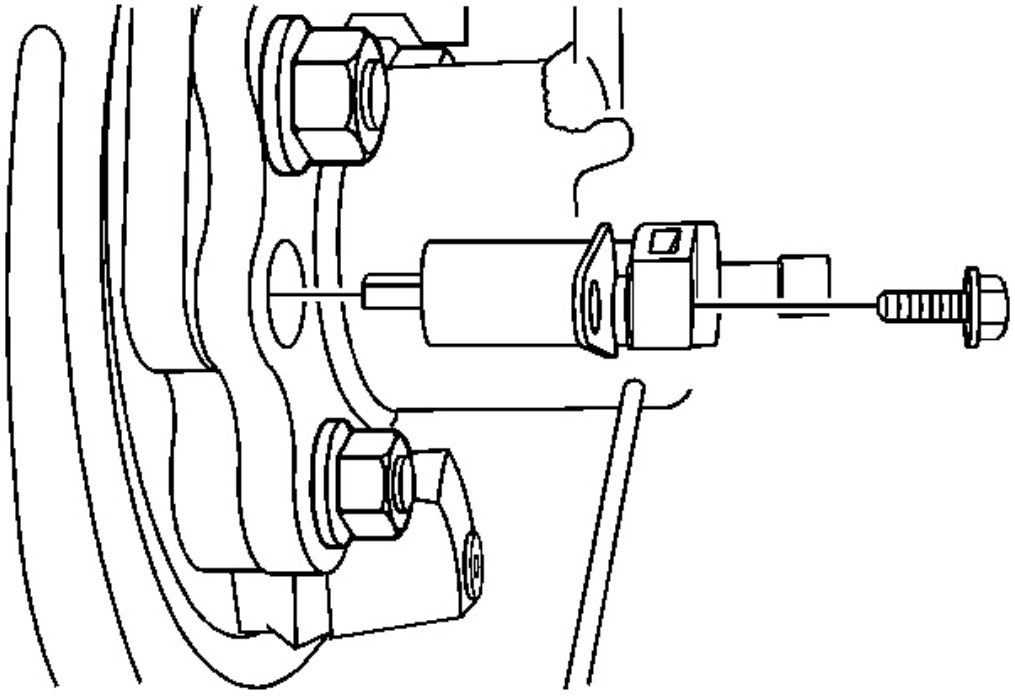


Fig. 18: Rear Wheel Speed Sensor & Shim
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If a shim was removed when the wheel speed sensor was removed, it must be reinstalled to ensure proper operation.

1. Install the shim, if removed with the sensor, and the wheel speed sensor.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the wheel speed sensor retaining bolt.

Tighten: Tighten the bolt to 14 N.m (124 lb in).

3. Connect the electrical connector.
4. Lower the vehicle.
5. Perform a low speed test to ensure the wheel speed sensor is functioning properly:
    A. Start the engine and allow it to idle.
    B. Check to see if the ABS indicator or the traction assist indicator remains illuminated.
    C. If the ABS indicator or the traction assist indicator remains illuminated, DO NOT proceed to drive the vehicle until it is diagnosed and repaired. Check the wheel speed sensor electrical connector to ensure it is not damaged and is installed properly. If the lamp remains illuminated, refer to **Symptoms - Anti-lock Brake System** .
    D. Select a smooth, dry, clean, and level road or large lot that is as free of traffic and obstacles as possible.
    E. Drive the vehicle and maintain a speed of at least 16 km/h (10 mph) for at least 5 seconds.
    F. Stop the vehicle and check to see if the ABS indicator or the traction assist indicator is illuminated.
    G. If an indicator is illuminated, refer to **Diagnostic Starting Point - Anti-lock Brake System** .

TRACTION CONTROL SWITCH REPLACEMENT

Removal Procedure

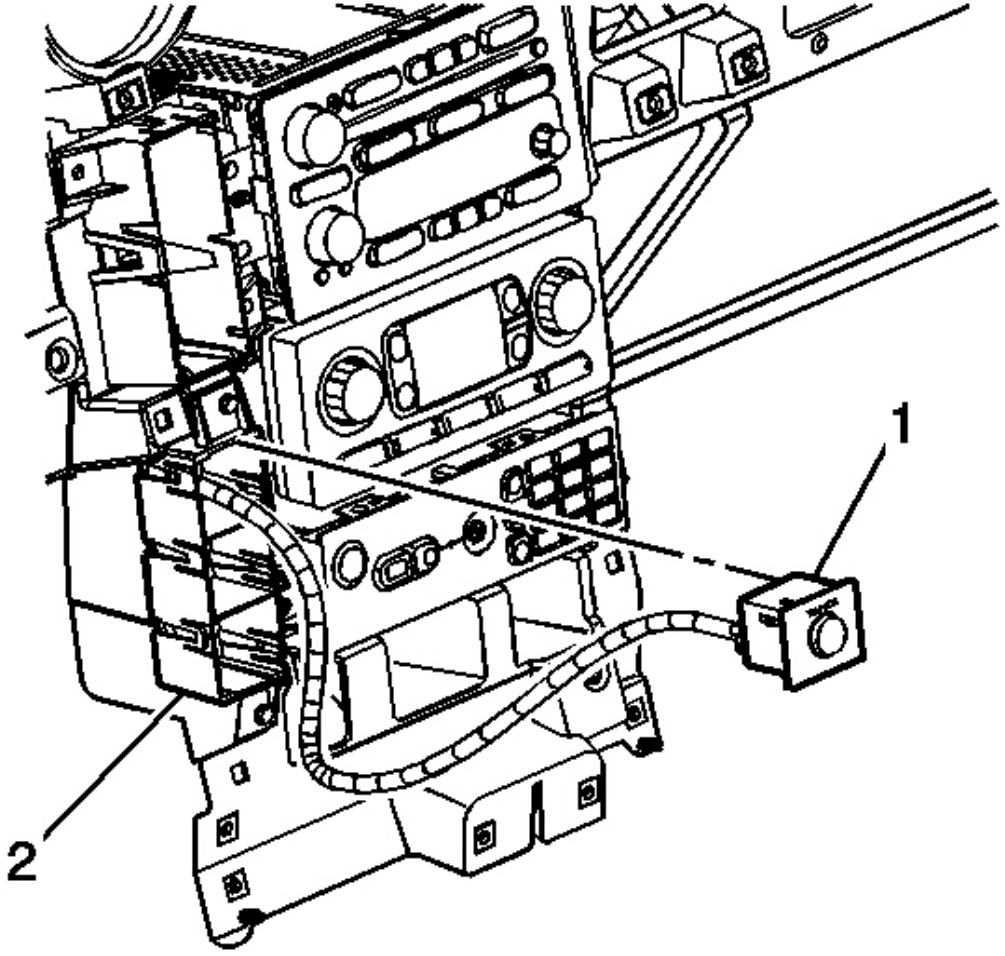


Fig. 19: Traction Control Switch & I/P Assembly
Courtesy of GENERAL MOTORS CORP.

1. Remove the center I/P trim panel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.
2. Gently lift the retaining tabs and remove the traction control switch (1) from the instrument panel (I/P) assembly (2).
3. Disconnect the harness connector from the traction control switch (1).

Installation Procedure

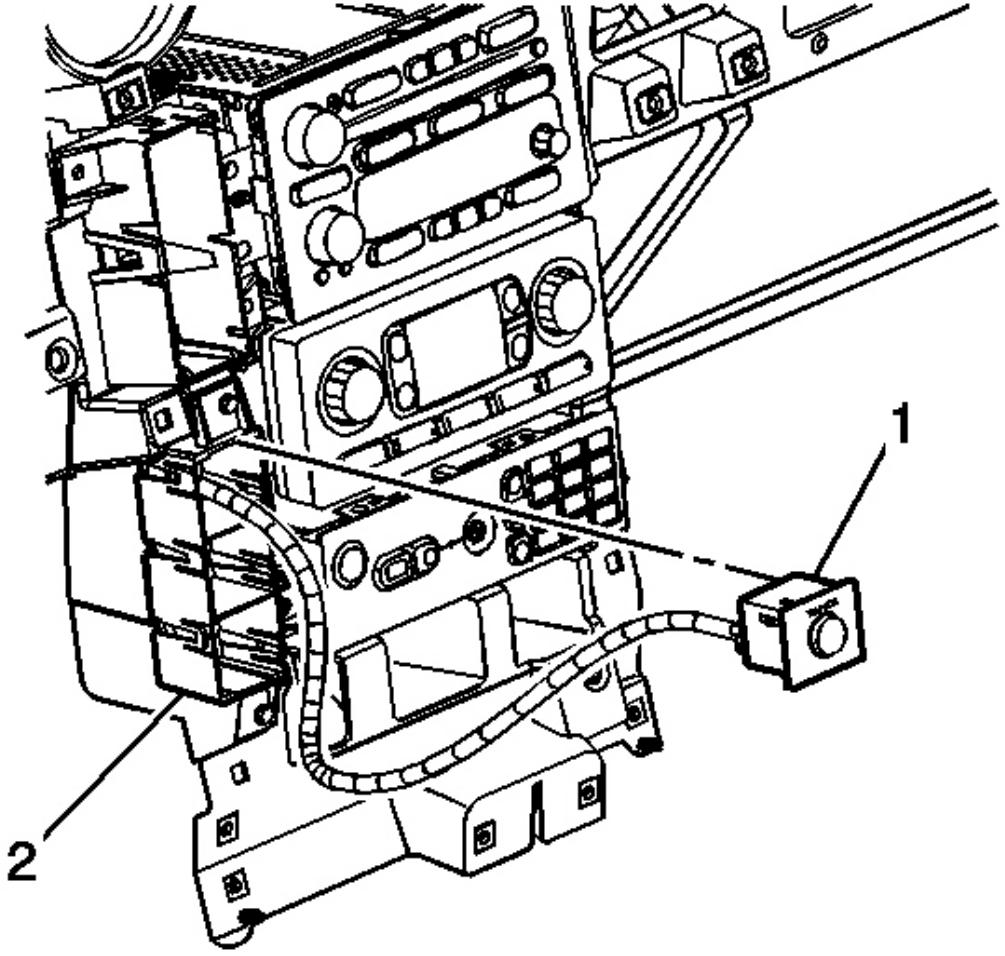


Fig. 20: Traction Control Switch & I/P Assembly
Courtesy of GENERAL MOTORS CORP.

1. Connect the harness connector to the traction control switch (1).
2. Install the traction control switch (1) into the I/P assembly (2).
3. Ensure that the switch (1) is secure into both retaining tabs.
4. Install I/P bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.

LONGITUDINAL ACCELEROMETER REPLACEMENT

Removal Procedure

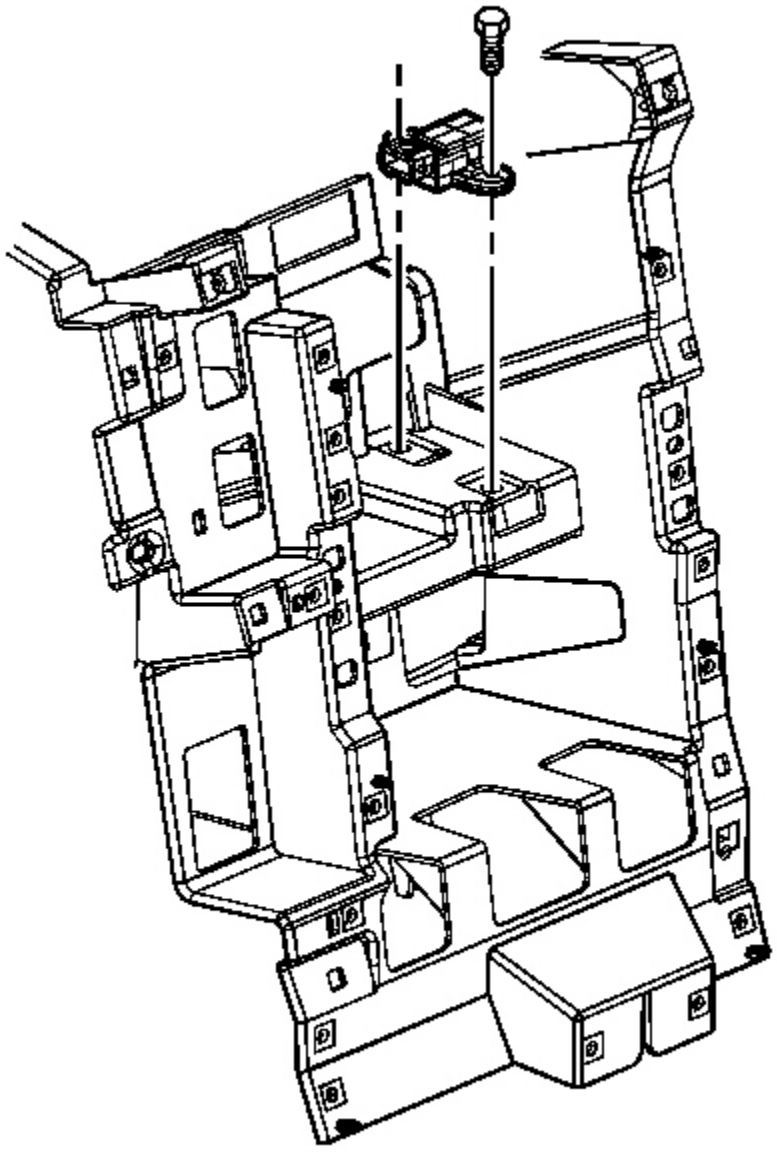


Fig. 21: Longitudinal Accelerometer
Courtesy of GENERAL MOTORS CORP.

1. Remove the center I/P trim panel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.
2. Remove the longitudinal accelerometer retaining screws.

3. Remove the longitudinal accelerometer.

Installation Procedure

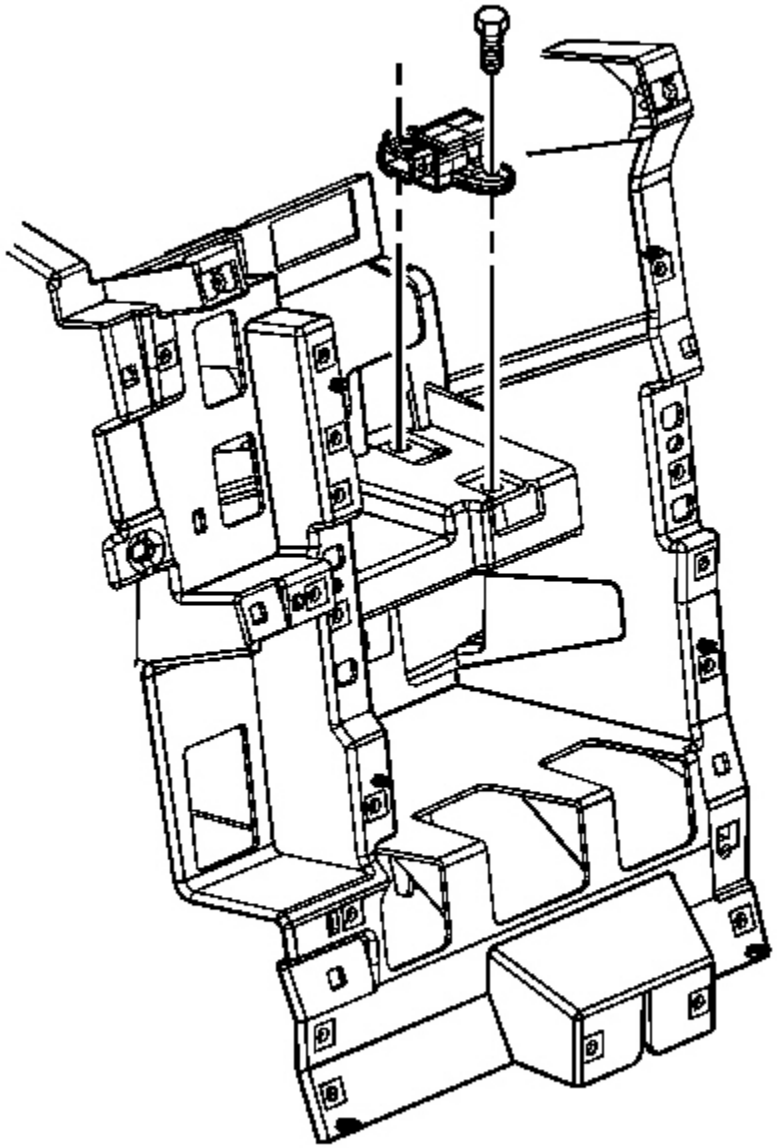


Fig. 22: Longitudinal Accelerometer
Courtesy of GENERAL MOTORS CORP.

1. Install the longitudinal accelerometer.

   NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the longitudinal accelerometer retaining screws.

   Tighten: Tighten the screws to 2 N.m (18 lb in).

3. Install I/P bezel. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Center** in Instrument Panel, Gauges and Console.

DESCRIPTION AND OPERATION

ABS DESCRIPTION AND OPERATION

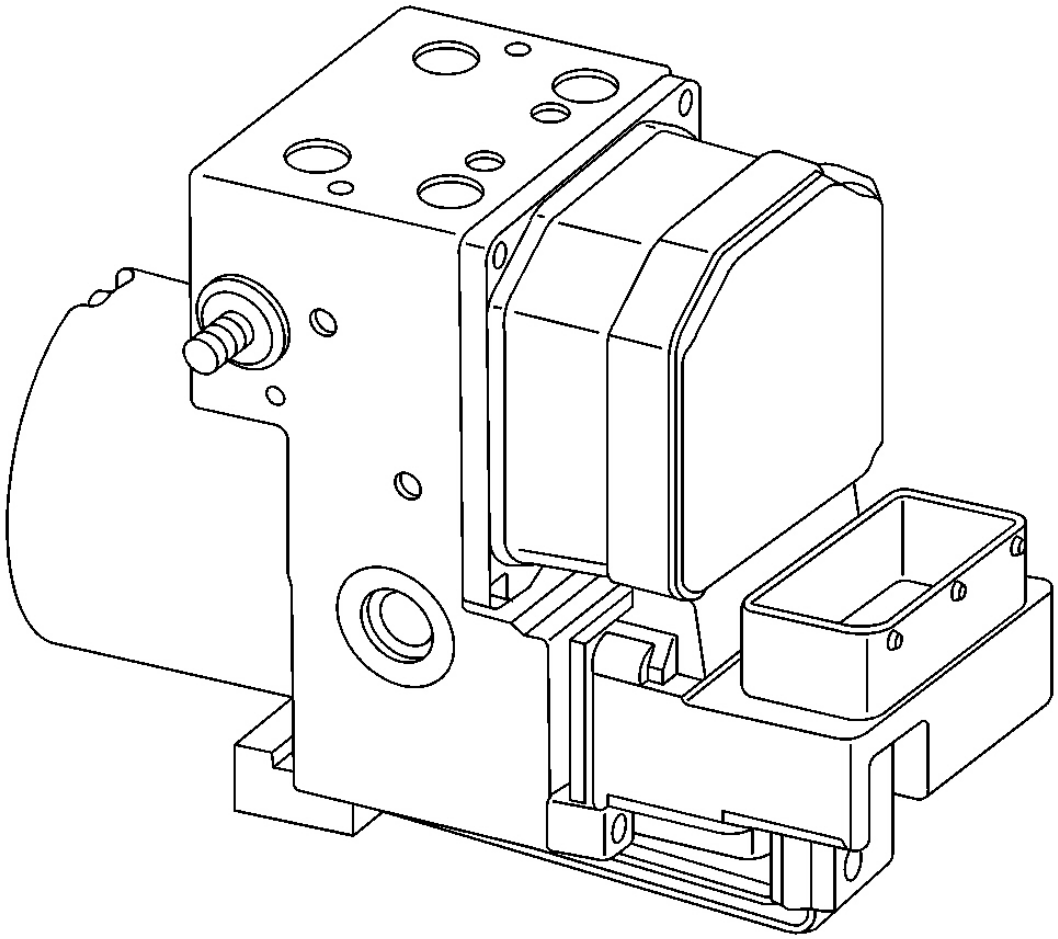


Fig. 23: BPMV & EBCM
Courtesy of GENERAL MOTORS CORP.

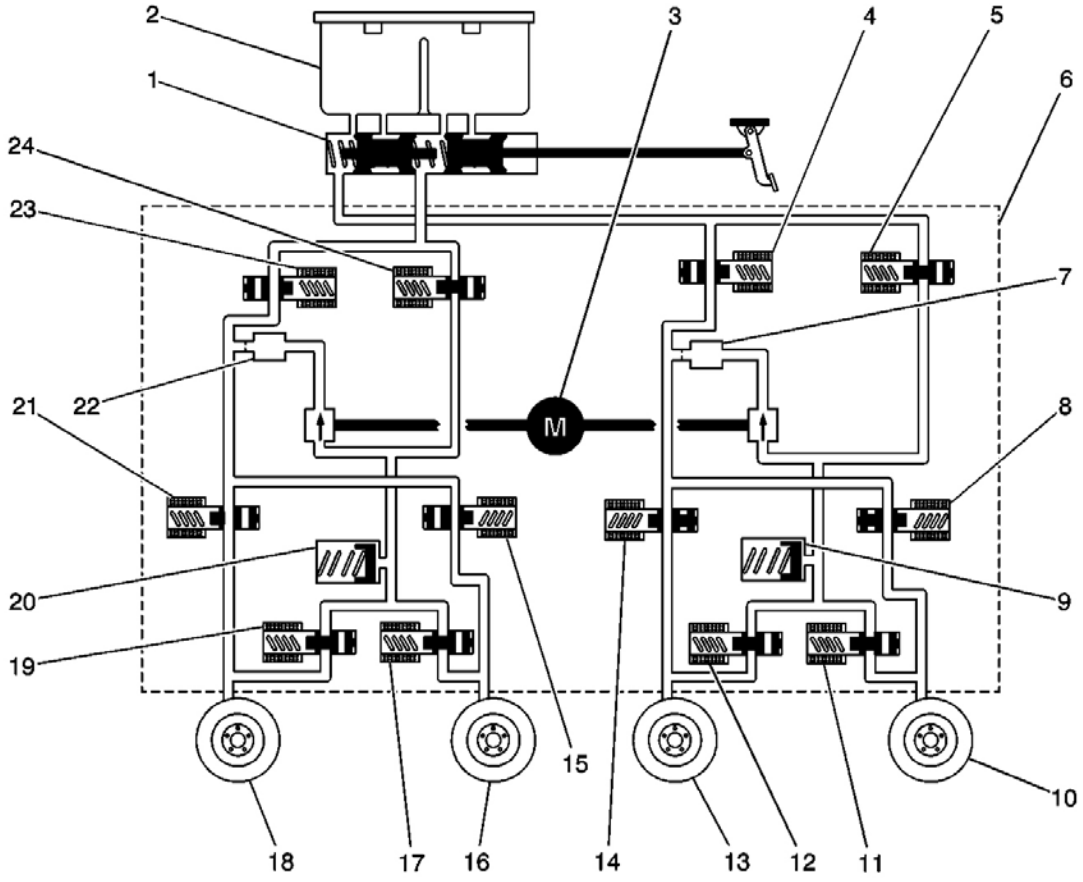


Fig. 24: BPMV Hydraulic Flow
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 24

Callout	Component Name
1	Master Cylinder
2	Master Cylinder Reservoir
3	Pump
4	Rear Master Cylinder Isolation Valve
5	Rear Prime Valve
6	Brake Pressure Modulator Valve (BPMV)
7	Damper
8	Right Rear Inlet Valve
9	Accumulator

10	Right Rear Brake
11	Right Rear Outlet Valve
12	Left Rear Outlet Valve
13	Left Rear Brake
14	Left Rear Inlet Valve
15	Left Front Inlet Valve
16	Left Front Brake
17	Left Front Outlet Valve
18	Right Front Brake
19	Right Front Outlet Valve
20	Accumulator
21	Right Front Inlet Valve
22	Damper
23	Front Master Cylinder Isolation Valve
24	Front Prime Valve

This vehicle is equipped with the Bosch 5.3 anti-lock braking system.

The vehicle is equipped with the following braking systems:

- Anti-lock Brake System (ABS)
- Dynamic Rear Proportioning (DRP)
- Traction Control System TC2 (w/NW9)

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.

  The EBCM contains the following components:

  - System Relay - The system relay is energized when the ignition is ON and no ABS DTCs are present. It supplies battery positive voltage to the solenoid valves and pump motor.
  - Vent Tube - The vent tube, located in the EBCM connector, is an opening to the internal cavity of the EBCM. It allows ventilation of the EBCM internals.
- Brake Pressure Modulator Valve (BPMV) - The BPMV contains the hydraulic valves and pump motor that are controlled electrically by the EBCM. The vehicle is equipped with traction control The BPMV uses a 4 circuit configuration with a front/rear split. The BPMV directs fluid from the reservoir of the master cylinder to the front wheels and fluid from the other reservoir to the rear wheels. The circuits are hydraulically isolated so that a leak or malfunction in one circuit will allow continued braking ability on the other.

IMPORTANT: There is a rubber isolator located under the BPMV and on the mounting

studs. The rubber isolators protect the BPMV and the EBCM from vehicle vibrations.

The BPMV contains the following components:

  - Pump Motor
  - Inlet Valves (one per wheel)
  - Outlet Valves (one per wheel)
  - Master Cylinder Isolation Valves (w/NW9) (one per drive wheel)
  - Prime Valves (w/NW9) (one per drive wheel)

- Longitudinal accelerometer (W/NW9) - The longitudinal accelerometer is used to determine straight-line acceleration. This information is used for Traction Control in the AWD, 4WD applications.
- Stoplamp Switch - The EBCM uses the stoplamp switch as an indication that the brake pedal is applied.
- Traction Control Switch, TC2 (w/NW9) - The TC2 is manually operated to enabled loose surface or road mode.
- Wheel Speed Sensors (WSS) - As the wheel spins, the wheel speed sensor produces an AC signal. The EBCM uses this AC signal to calculate wheel speed. Any imperfections in the toothed ring, such as a missing or damaged tooth, can cause an inaccurate WSS signal.

Initialization Sequence

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

Both of the following conditions occur:

- The EBCM receives that there is a minimum of 500 rpm from the PCM via class 2 serial data message.
- The stoplamp switch is not applied.

OR

Both of the following conditions occur:

- The vehicle speed is greater than 16 km/h (10 mph).
- The stoplamp switch is applied.

The initialization sequence may also be commanded with a scan tool.

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.

Anti-lock Brake System

When wheel slip is detected during a brake application, the ABS enters anti-lock mode. During anti-lock 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 anti-lock 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 anti-lock 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 anti-lock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during anti-lock 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.

Dynamic Rear Proportioning (DRP)

The dynamic rear proportioning (DRP) is a control system that replaces the hydraulic proportioning function of the mechanical proportioning valve in the base brake system. The DRP control system is part of the operation software in the EBCM. The DRP 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 dynamic rear proportioning function is disabled.

Traction Control (TCS) NW9

The primary function of the Traction Control System (TCS) is to optimize vehicle performance with varying vehicle load and changing road conditions by controlling wheel slip at the driven wheels during an acceleration maneuver. The wheel slip is controlled by actively applying braking force. This modulation is applied and occur under all throttle input conditions where the difference between wheel speed' and vehicle speed indicate a loss of longitudinal traction.

TCS operation for each mode of driveline operation include the following. When high range is selected for the transfer case, the system controls wheel slip in the order of stability and acceleration. When low range is selected for the transfer case, the system controls wheel slip in the order of acceleration and stability.

A traction mode switch (TC2) is included to improve traction system performance on loose surfaces. The mode switch will have a momentary action and resets when the switch is pressed again or the ignition is cycled. The switch will have two states, one state is Road, and the other state is Loose Surface. When the switch is in the Road mode, the traction system will preform at its maximum, and in the loose surface mode will be adjusted for road conditions.

The braking is accomplished by closing the TCS Master Cylinder Isolating Valve, this isolates the master cylinder from the rest of the system. The TCS Prime valve opens to allow the pump to get brake fluid to build pressure for braking. The drive wheel circuit solenoids are energized as needed to allow for pressure hold, pressure increase, or pressure decrease.

ABS Indicator

The IPC illuminates the ABS indicator when the following occurs:

- The electronic brake control module (EBCM) detects a malfunction with the anti-lock brake system. The IPC receives a class 2 message from the EBCM requesting illumination.
- The IPC performs the displays test at the start of each ignition cycle. The indicator illuminates for approximately 3 seconds.
- The IPC detects a loss of class 2 communications with the EBCM.

Brake System Indicator(s)

Brake Warning Indicator

The IPC illuminates the BRAKE indicator when the following occurs:

- The IPC detects that the park brake switch is closed (park brake set).
- The IPC detects a low brake fluid condition.
- The IPC performs the displays test at the start of each ignition cycle.
- The EBCM senses a base brake failure.
- The IPC detects a loss of class 2 communications with the EBCM.

Traction Assist

The IPC illuminates the traction assist indicator when the following occurs:

- The electronic brake control module (EBCM) detects a malfunction with the anti-lock brake system. The IPC receives a class 2 message from the EBCM requesting illumination.
- The IPC performs the displays test at the start of each ignition cycle. The indicator illuminates for approximately 3 seconds.
- The IPC detects a loss of class 2 communications with the EBCM.

Loose Surface Switch LED

The EBCM illuminates the LED indicator, part of the TC2 switch, when the following occurs:

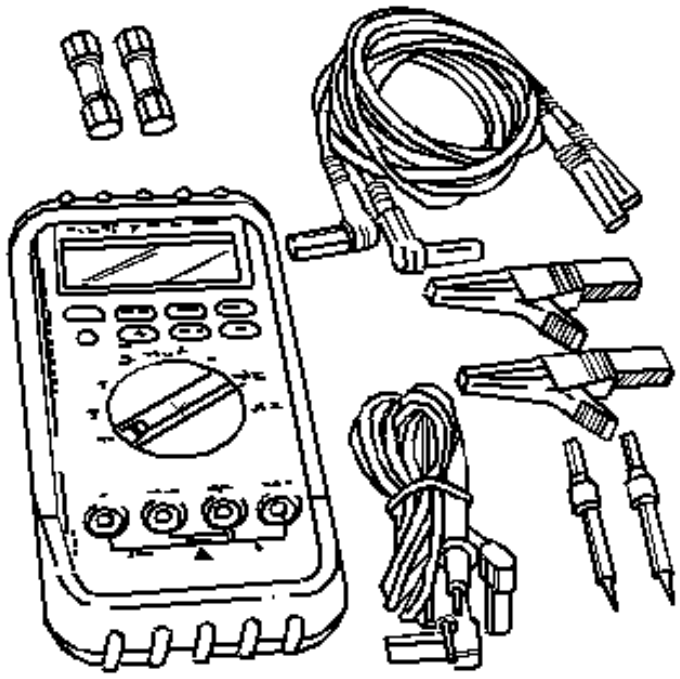
- The EBCM performs the displays test at the start of each ignition cycle. The LED indicator illuminates for approximately 3 seconds.
- The EBCM flashes the Loose Surface Switch LED during the transition between modes. Once the transition is complete, the EBCM does not flash the LED.
- Entering Loose Surface Mode, the LED remains illuminated.
- Entering normal Surface Mode, the LED remains off.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

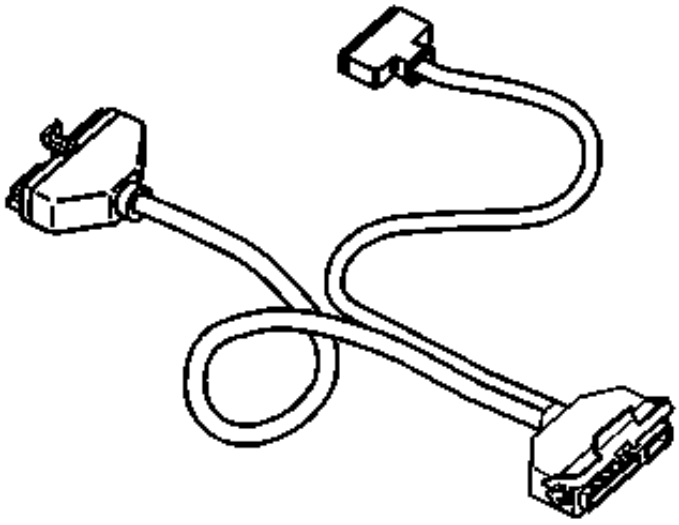
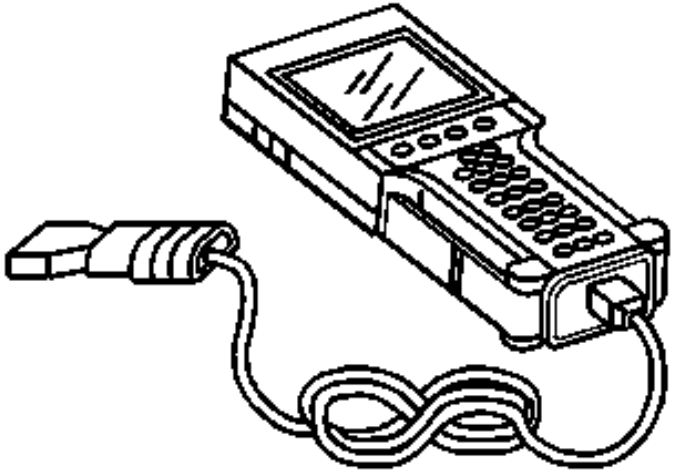
Special Tools

Illustration	Tool Number/Description
	J 39200 Digital Multimeter



J 39700
Universal Pinout Box

	
	J 39700-530 Cable Adapter

	
	Tech 2 Scan Tool