

2004 Cadillac SRX

2004 BRAKES Antilock Brake System - SRX

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Antilock Brake System - SRX

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Fluid Pressure Sensor	17 N.m	13 lb ft
Brake Pressure Modulator Valve (BPMV) Bracket Mounting Bolts	12 N.m	106 lb in
BPMV Brake Pipes	27 N.m	20 lb ft
BPMV to Bracket Mounting Nuts	10 N.m	89 lb in
Electronic Brake Control Module (EBCM) to BPMV Mounting Screws	5 N.m	44 lb in
Traction Control Switch Mounting Screws	2 N.m	18 lb in
Yaw Rate Sensor/Lateral Accelerometer Nuts	9 N.m	80 lb in
Yaw Rate Sensor/Lateral and Longitudinal Accelerometer Nuts	9 N.m	80 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

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any repairs to the twisted-pair wires shown :

- The wires must be twisted a minimum of 10 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

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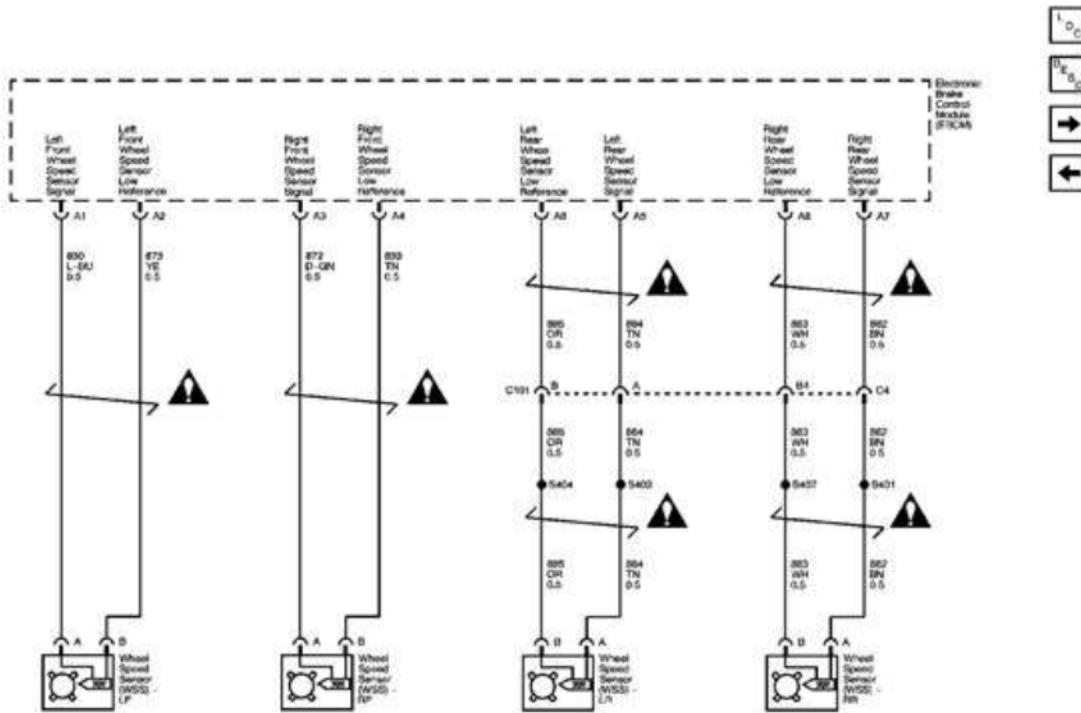


Fig. 2: Wheel Speed Sensors
Courtesy of GENERAL MOTORS CORP.

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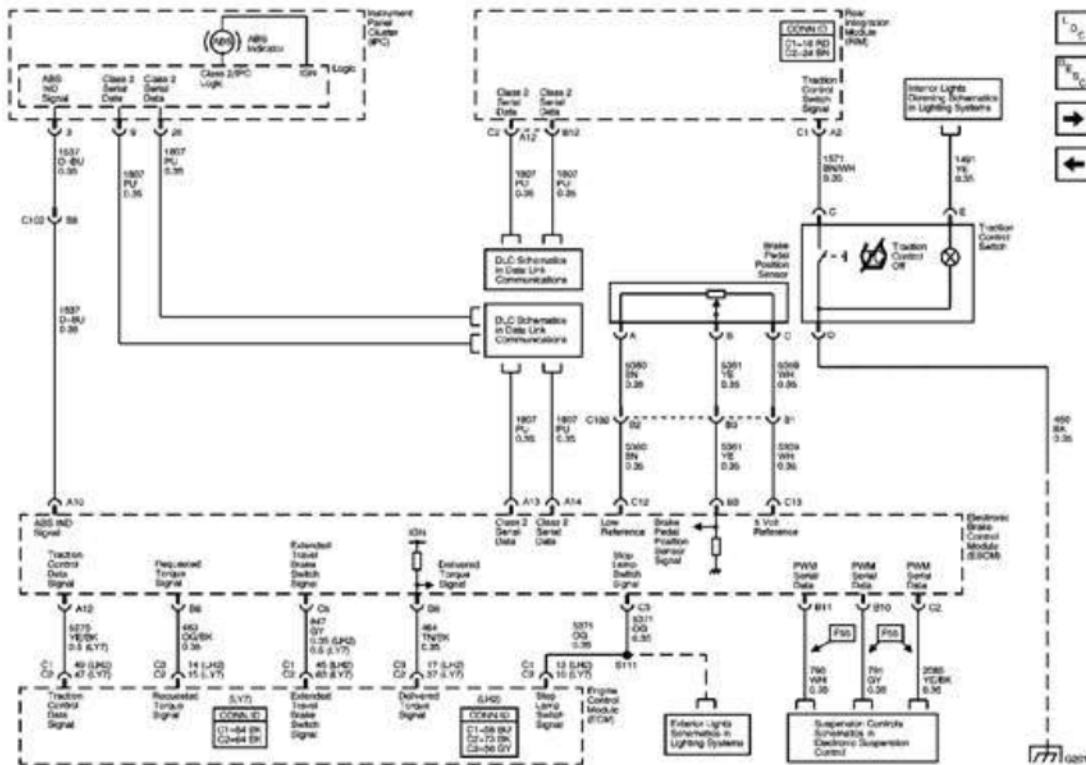


Fig. 3: Indicator, Traction Control, & Brake Pedal Position
Courtesy of GENERAL MOTORS CORP.

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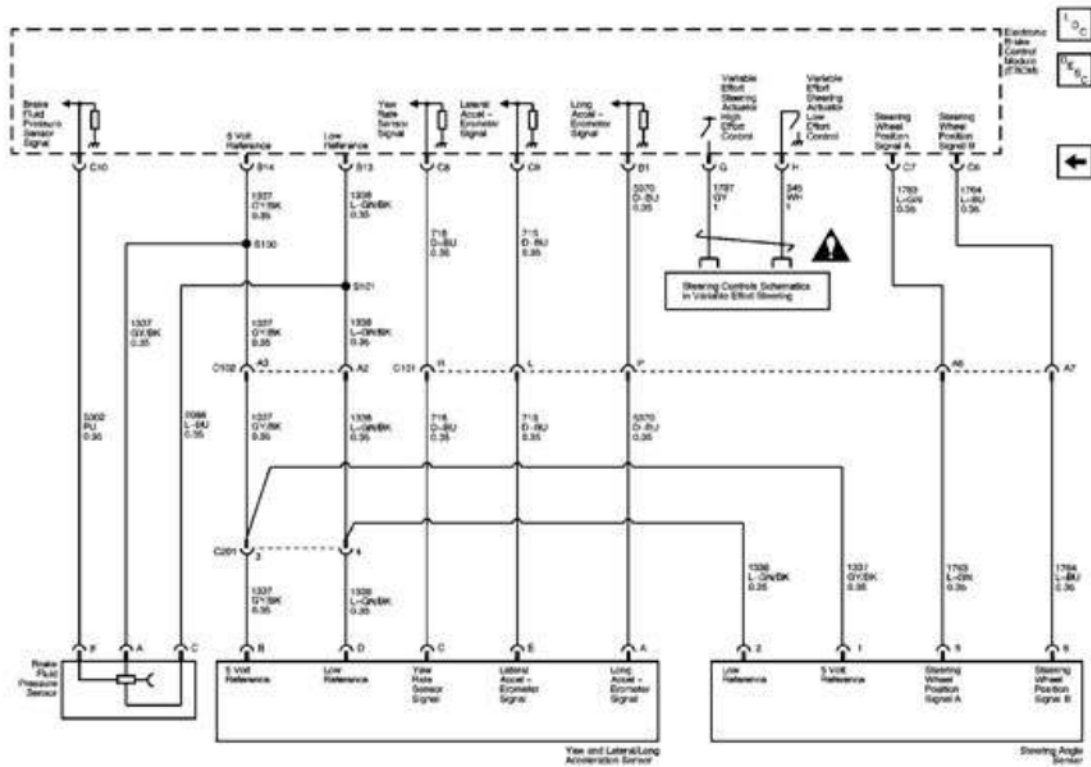


Fig. 4: Stability Control System & Brake Fluid Pressure Sensor
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

ABS COMPONENT VIEWS

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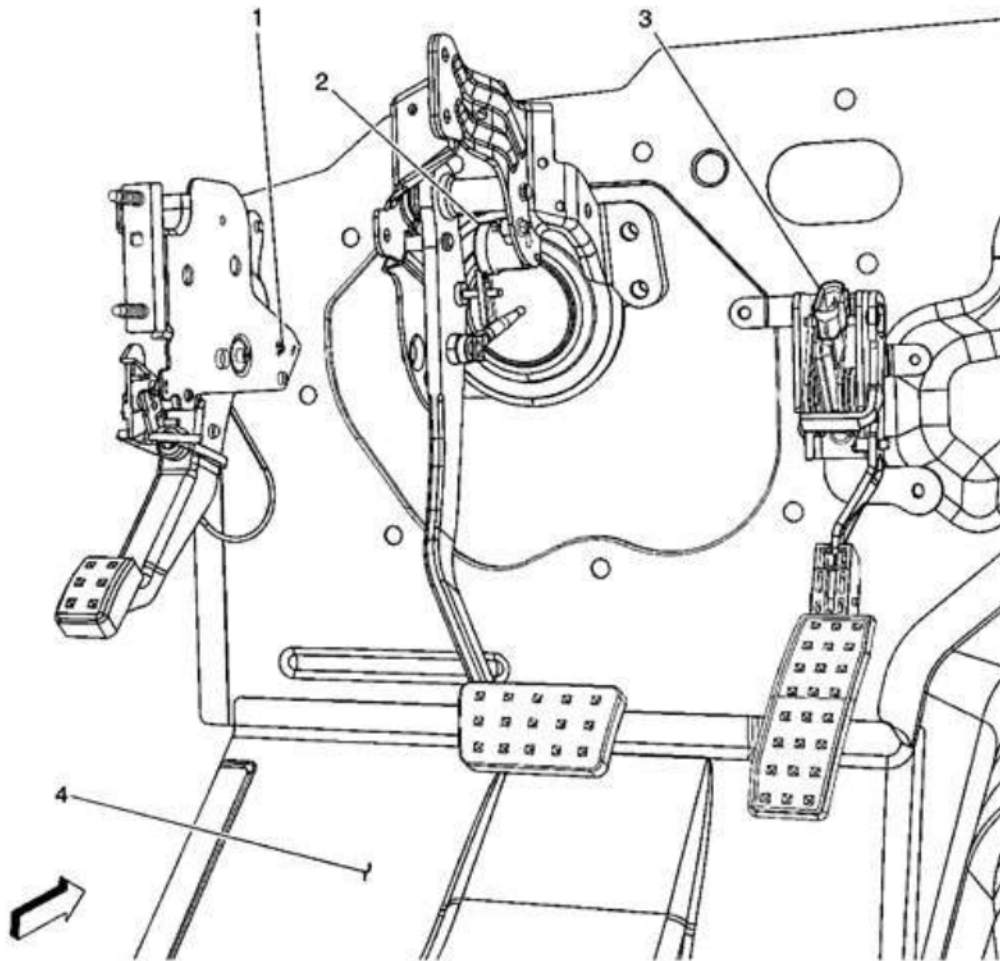


Fig. 5: Pedal Switches & Sensors Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Park Brake Switch
2	Brake Pedal Position Sensor
3	Accelerator Pedal Position (APP) Sensor
4	Left Front Floor Panel

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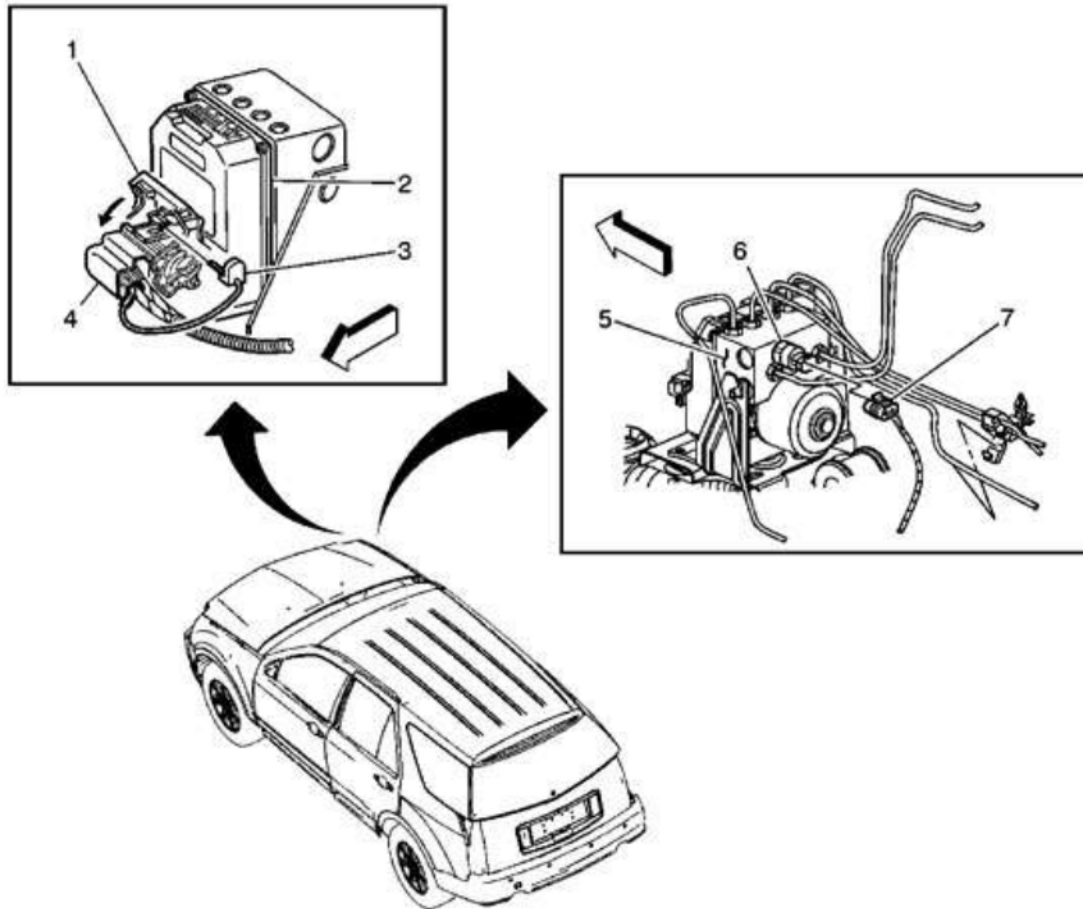


Fig. 6: Right Front Of Vehicle Near Right Front Wheel Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

Callout	Component Name
1	EBCM Connector Lock
2	Electronic Brake Control Module (EBCM)
3	EBCM Connector Position Assurance Retainer
4	EBCM Connector
5	Brake Pressure Modulator Valve (BPMV)
6	Brake Fluid Pressure Sensor
7	Brake Fluid Pressure Sensor Connector

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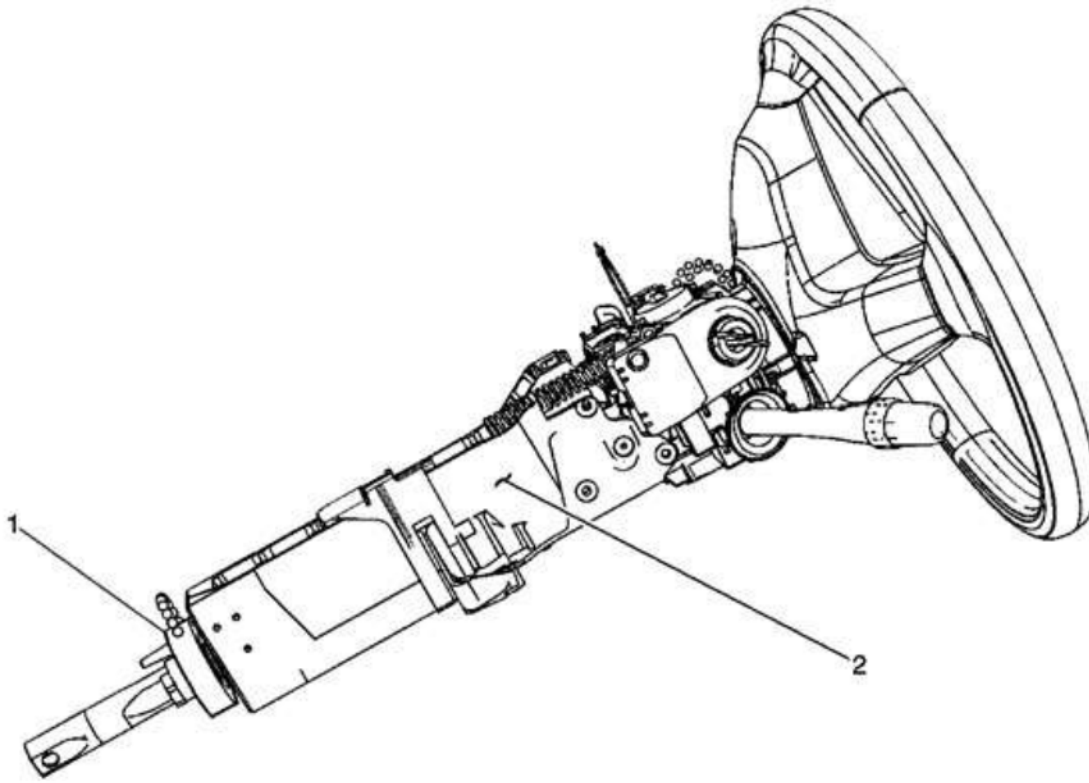


Fig. 7: Steering Wheel Position Sensor Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	Steering Angle Sensor
2	Steering Column

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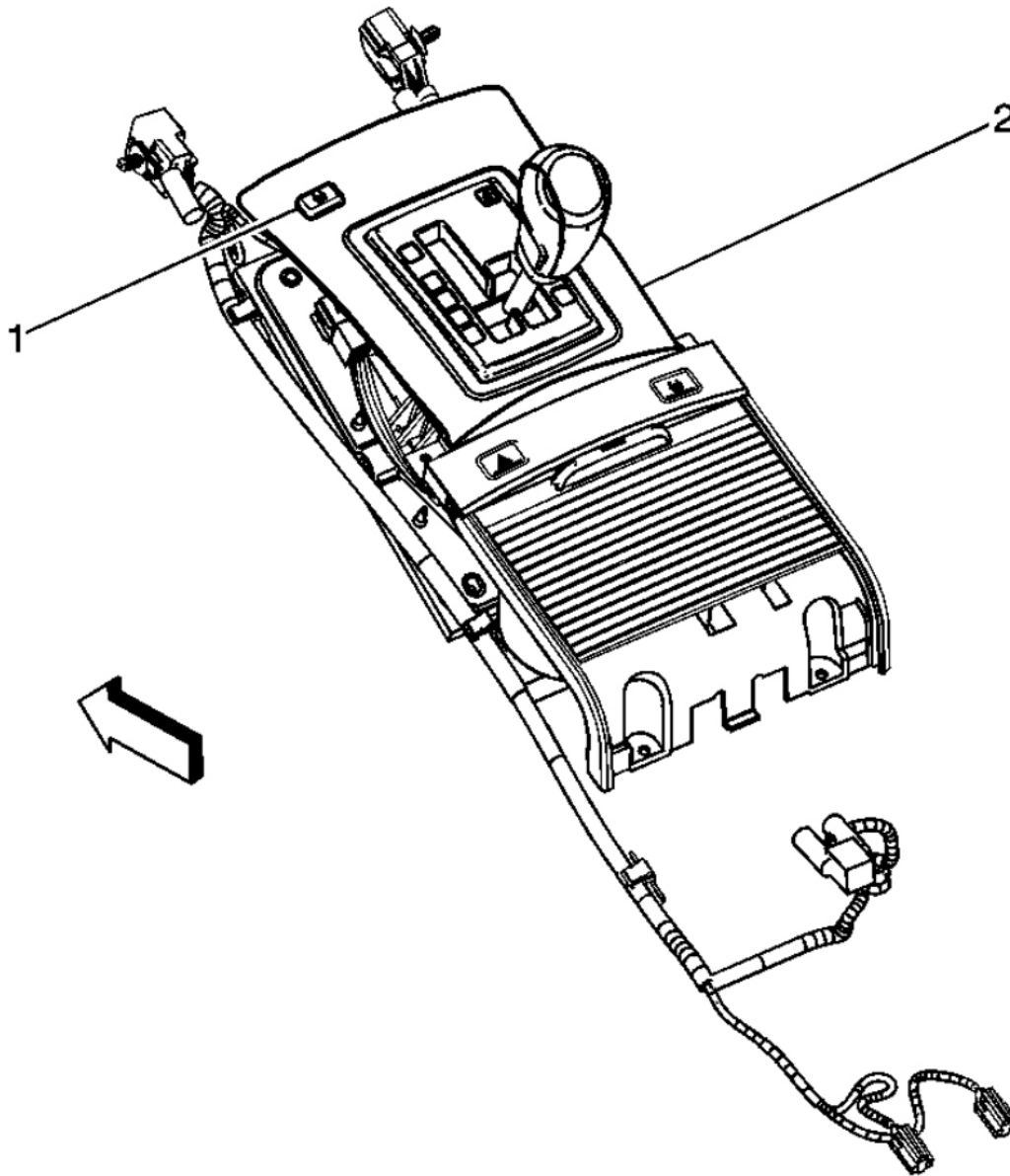


Fig. 8: Traction Control Switch Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Traction Control Switch

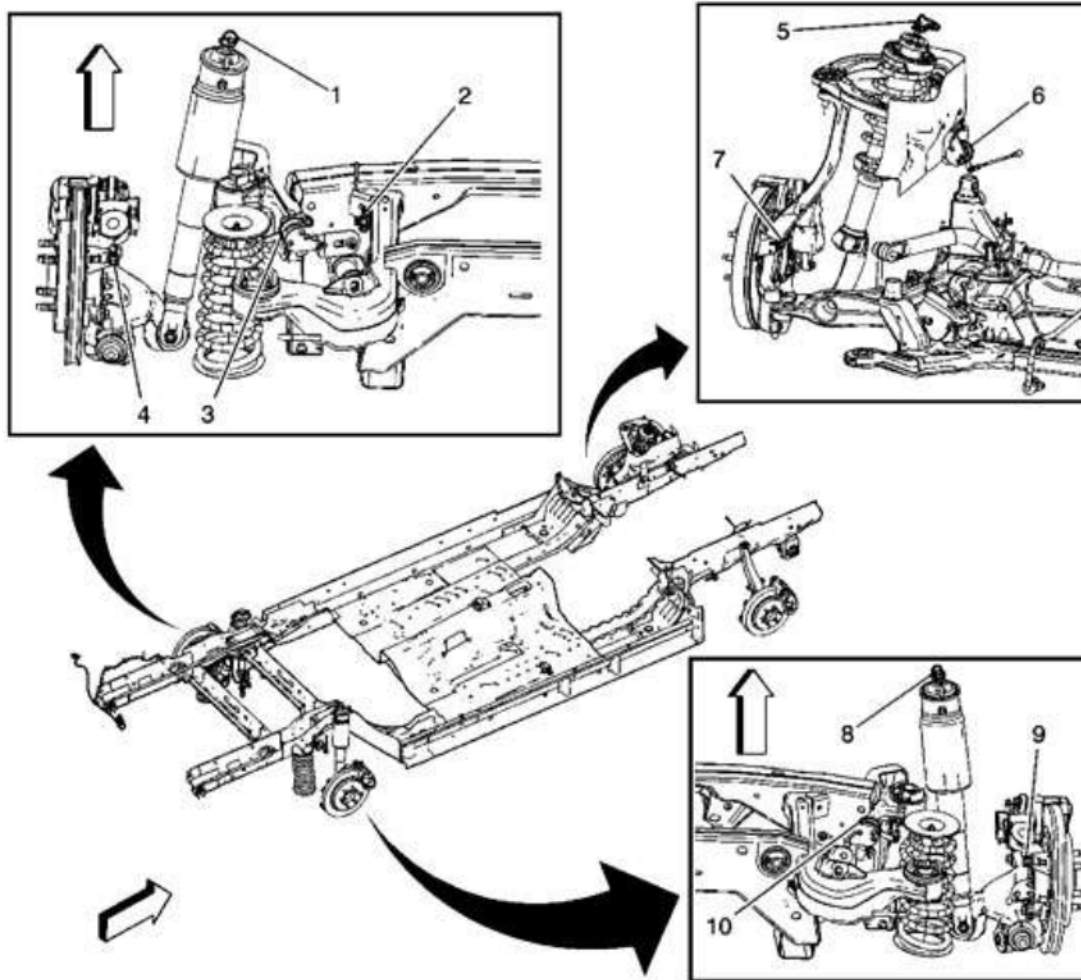


Fig. 9: Wheel Speed Sensors Component View
 Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	Suspension Damper - LR
2	Suspension Position Sensor Extension Harness Connector - LR
3	Suspension Position Sensor - LR
4	Wheel Speed Sensor (WSS) - LR
5	Suspension Damper - LF
6	Suspension Position Sensor - LF

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7	Wheel Speed Sensor (WSS) - LF (RF Similar)
8	Suspension Damper - RR
9	Wheel Speed Sensor (WSS) - RR
10	Suspension Position Sensor - RR

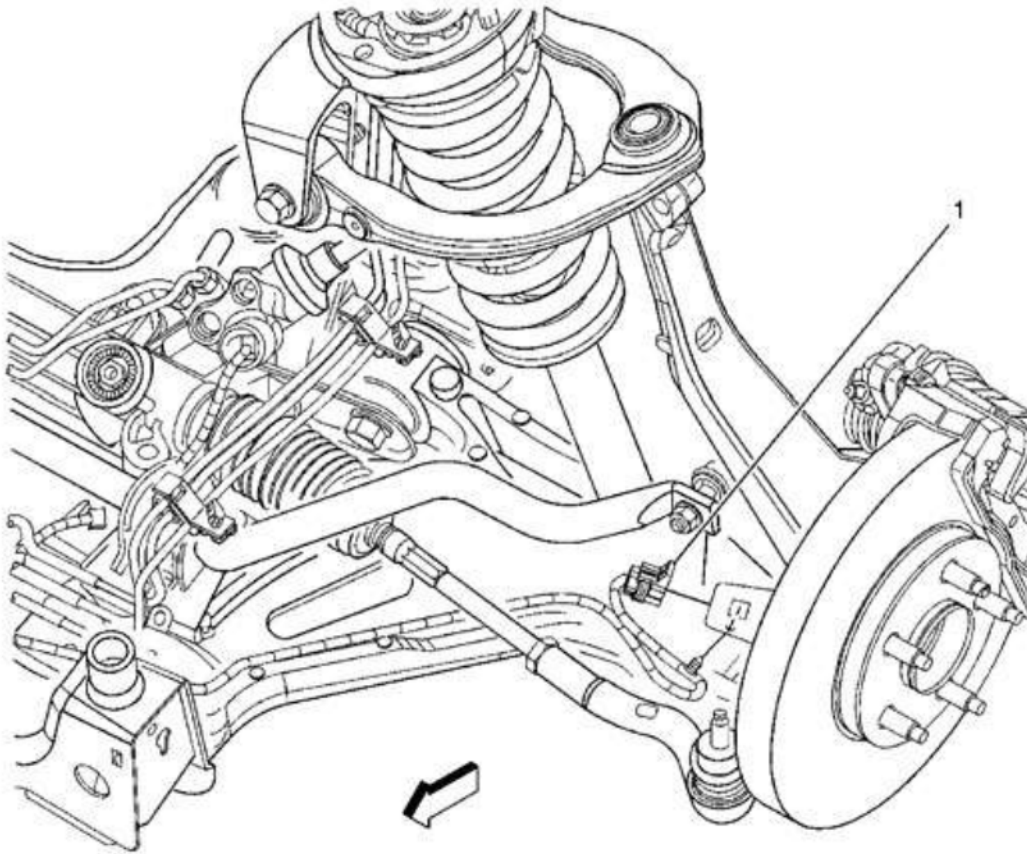


Fig. 10: Left Front Of Vehicle Near Wheel Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 10

Callout	Component Name
1	Wheel Speed Sensor - Left Front (Right Front Side Similar)

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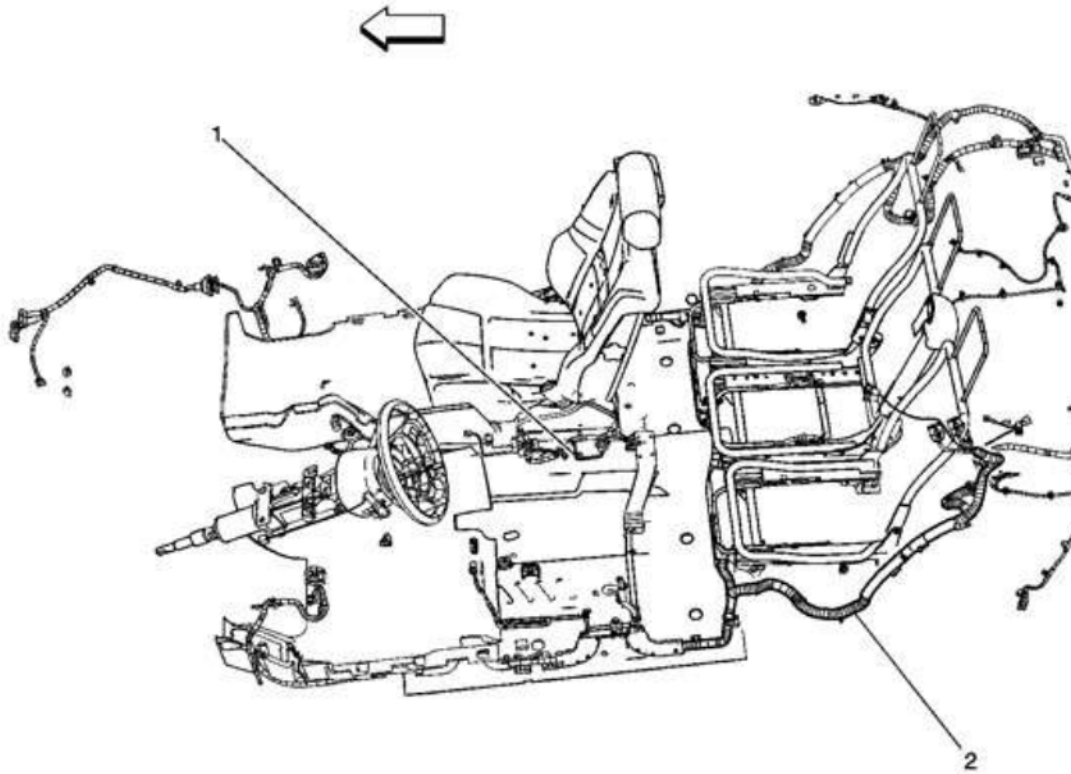


Fig. 11: Yaw & Lateral/Longitudinal Acceleration Sensor Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 11

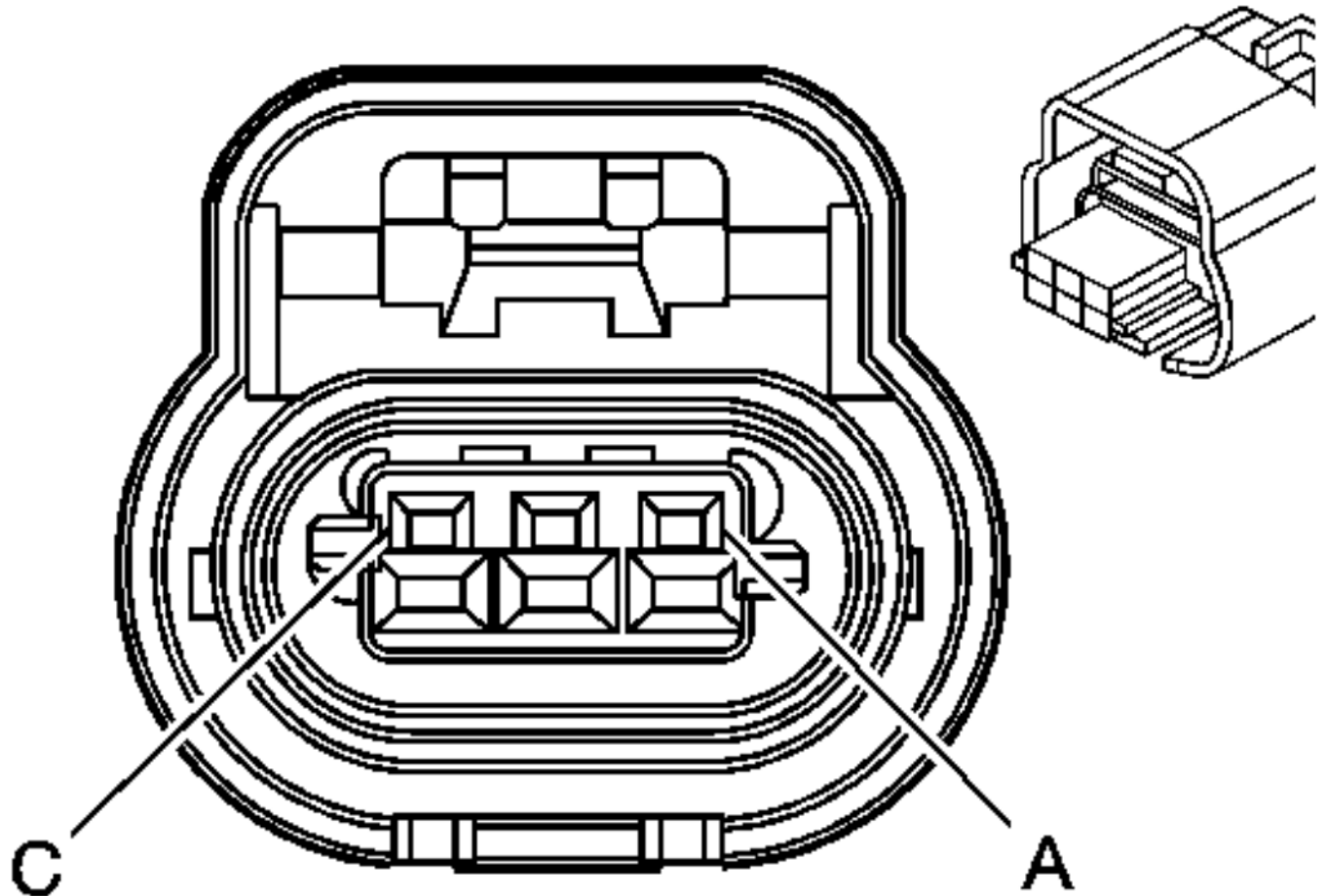
Callout	Component Name
1	Yaw and Lateral/Longitudinal Acceleration Sensor
2	Body Harness

ABS CONNECTOR END VIEWS

Brake Fluid Pressure Sensor Terminal Identification

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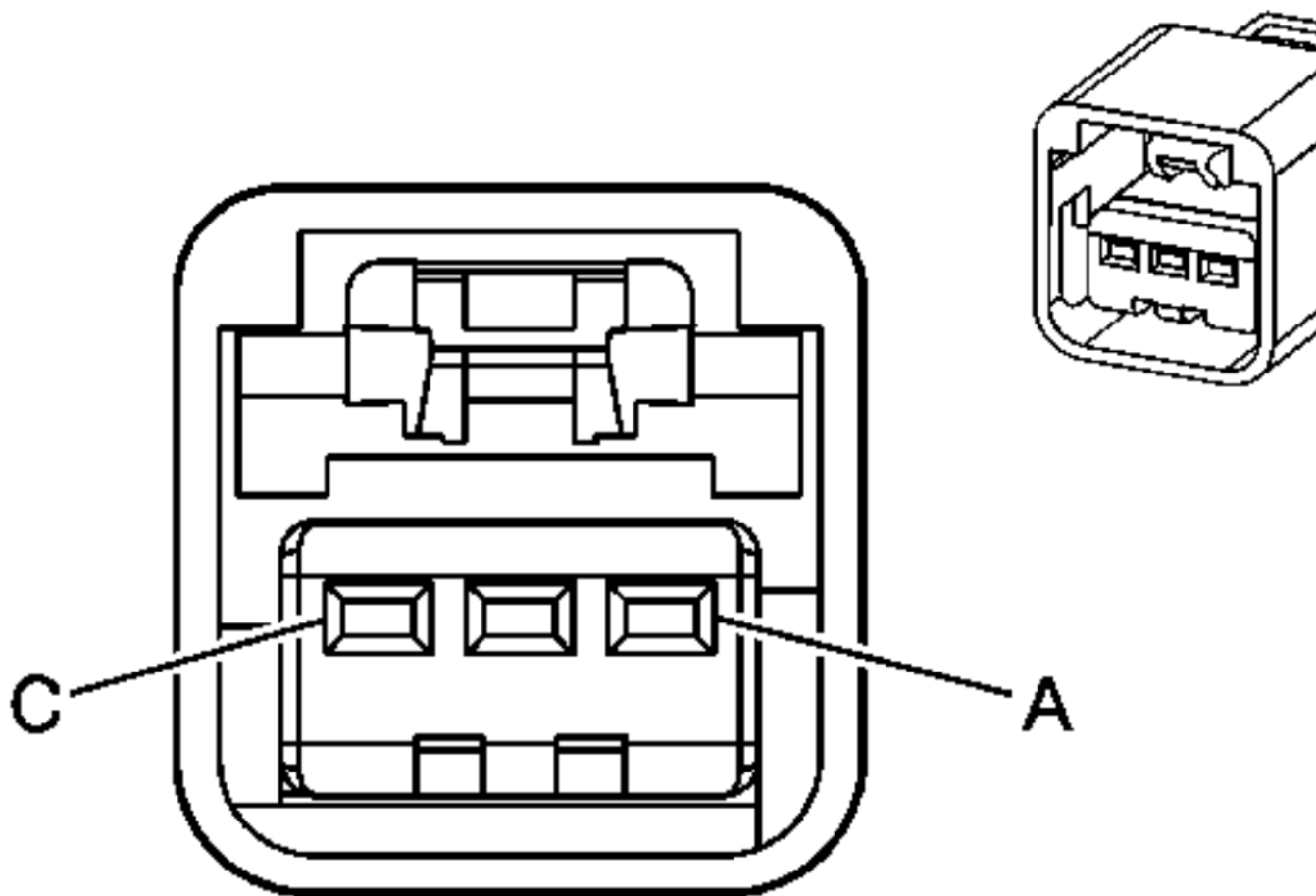


Connector Part Information		• 15393906 • 3-Way F GT 150 Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	GY/BK	1337	5-Volt Reference
B	PU	5002	Brake Fluid Pressure Sensor Sign
C	L-GN/BK	1338	Low Reference

Brake Pedal Position Sensor Terminal Identification

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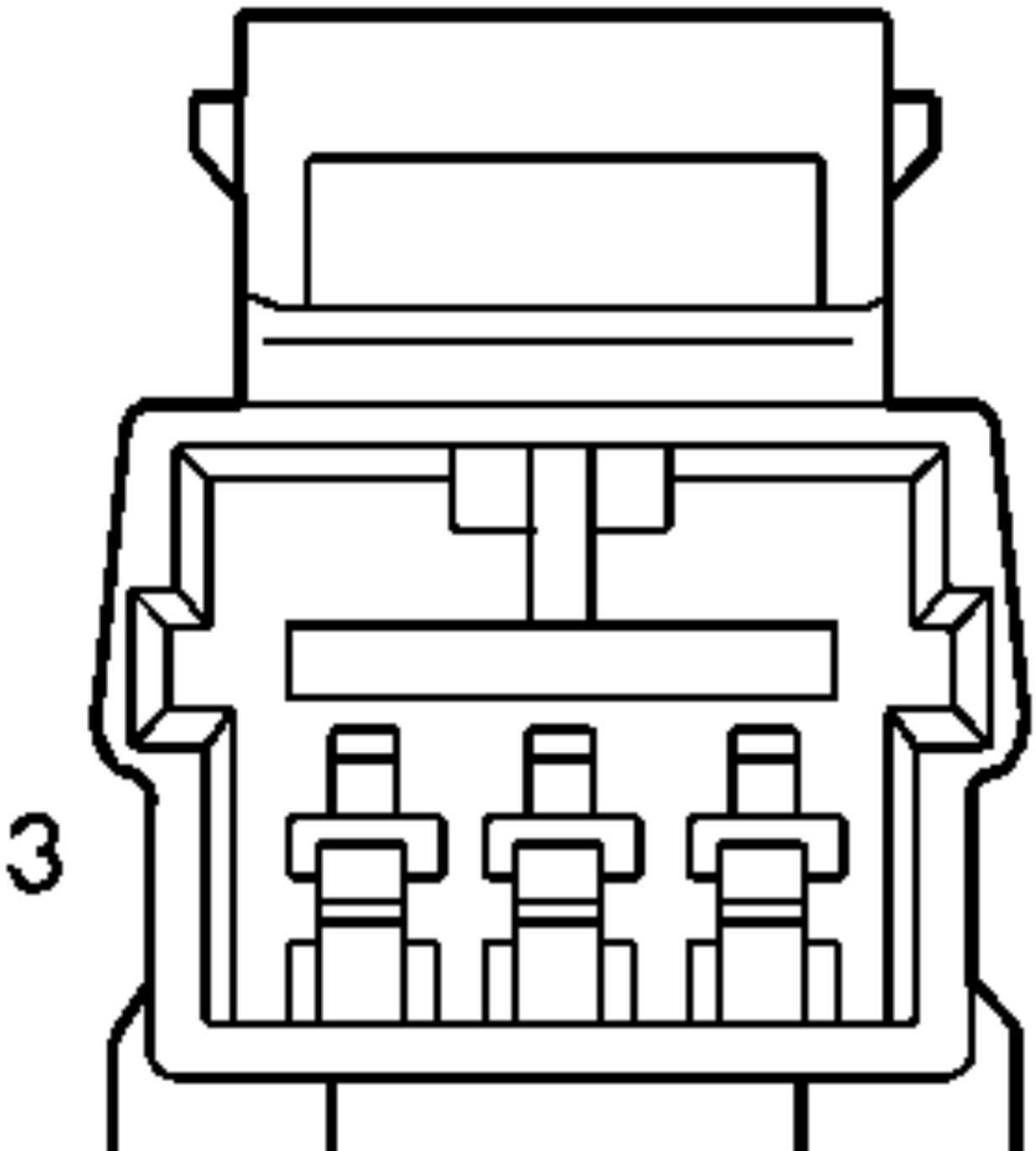


Connector Part Information		• 15332132 • 3-Way F GT 150 Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	BN	5360	Low Reference
B	YE	5361	Brake Pedal Position Sensor Sign
C	WH	5359	5-Volt Reference

Electronic Brake Control Module (EBCM) Terminal Identification

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Connector Part Information		15411019 50-Way F Mixed Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	RD/BK	342	Battery Positive Voltage
B	RD/BK	342	Battery Positive Voltage
C	PK	39	Ignition 1 Voltage
D	-	-	Not Used
E	BK	1150	Ground
F	BK	1150	Ground
G	GY	1787	Variable Effort Steering Actuator Control
H	WH	345	Variable Effort Steering Actuator Control
A1	L-BU	830	Left Front Wheel Speed Sensor S
A2	YE	873	Left Front Wheel Speed Sensor L
A3	D-GN	872	Right Front Wheel Speed Sensor
A4	TN	833	Right Front Wheel Speed Sensor Reference
A5	TN	884	Left Rear Wheel Speed Sensor Si
A6	OG	885	Left Rear Wheel Speed Sensor Lc
A7	BN	882	Right Rear Wheel Speed Sensor S
A8	WH	883	Right Rear Wheel Speed Sensor I
A9	-	-	Not Used
A10	D-BU	1537	ABS Indicator Signal
A11	-	-	Not Used
A12	YE/BK	5270	Traction Control Data Signal
A13	PU	1807	Class 2 Serial Data
A14	PU	1807	Class 2 Serial Data
B1	D-BU	5370	Long Accelerometer Signal
B2	-	-	Not Used
B3	YE	5361	5-Volt Reference
B4-B5	-	-	Not Used
B6	TN/BK	464	Delivered Torque Signal
B7	-	-	Not Used
B8	OG/BK	463	Requested Torque Signal

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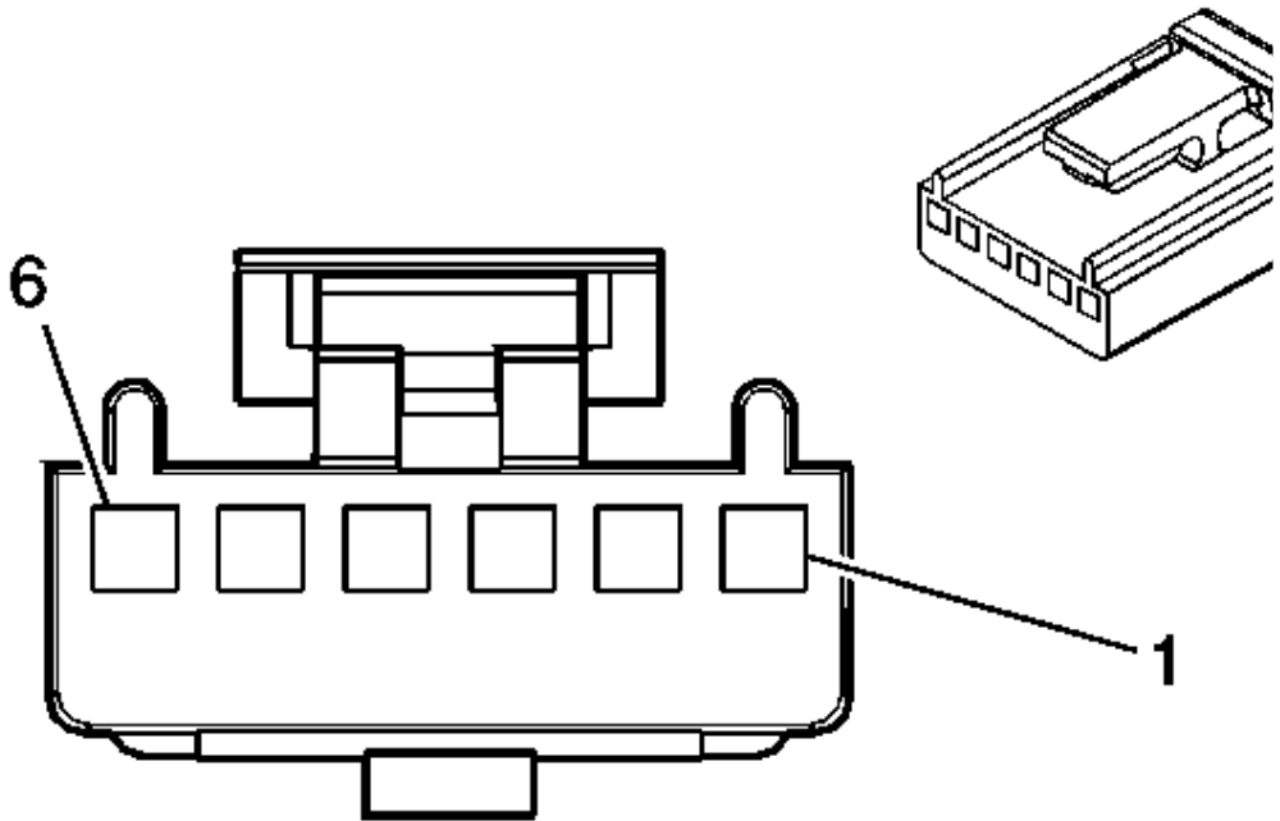
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B9	-	-	Not Used
B10	GY	791	PWM Serial Data (F55)
B11	WH	790	PWM Serial Data (F55)
B12	-	-	Not Used
B13	L-GN/BK	1338	Yaw Rate Sensor Signal
B14	GY/BK	1337	5-Volt Reference
C1	-	-	Not Used
C2	YE/BK	2085	PWM Serial Data (F55)
C3	OG	5371	Stop Lamp Switch Signal
C4	-	-	Not Used
C5	GY	847	Extended Travel Brake Switch Si
C6	L-BU	1764	Steering Wheel Position Signal B
C7	L-GN	1763	Steering Wheel Position Signal A
C8	D-BU	716	Yaw Rate Sensor Signal
C9	L-BU	715	Lateral Accelerometer Signal
C10	PU	5002	Brake Fluid Pressure Sensor Sign
C11	-	-	Not Used
C12	BN	5360	Low Reference
C13	WH	5359	Brake Pedal Position Sensor Sign
C14	-	-	Not Used

Steering Angle Sensor Terminal Identification

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Connector Part Information

• 12064978

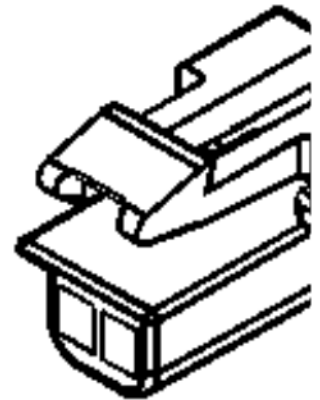
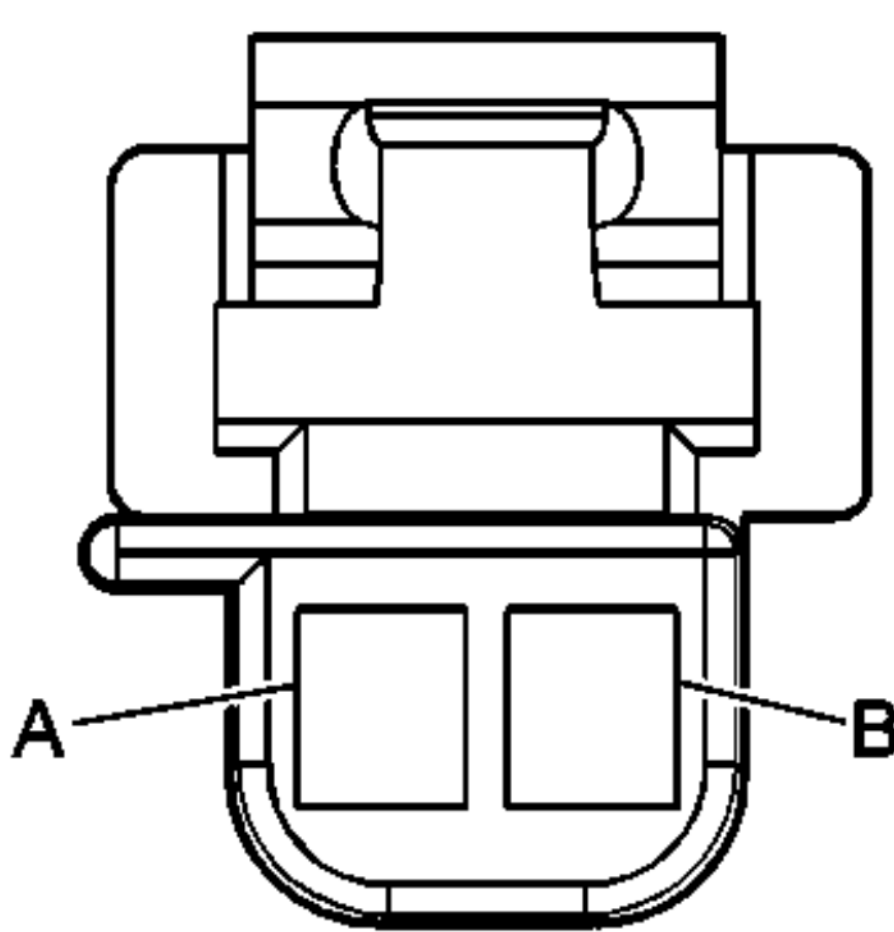
• 6-Way F Micro-Pack 100 Series (GY)

Pin	Wire Color	Circuit No.	Function
1	GY/BK	1337	5-Volt reference
2	L-GN/BK	1338	Low Reference
3-4	-	-	Not Used
5	L-GN	1763	Steering Wheel Position Signal A
6	L-BU	1764	Steering Wheel Position Signal B

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Traction Control Switch Terminal Identification



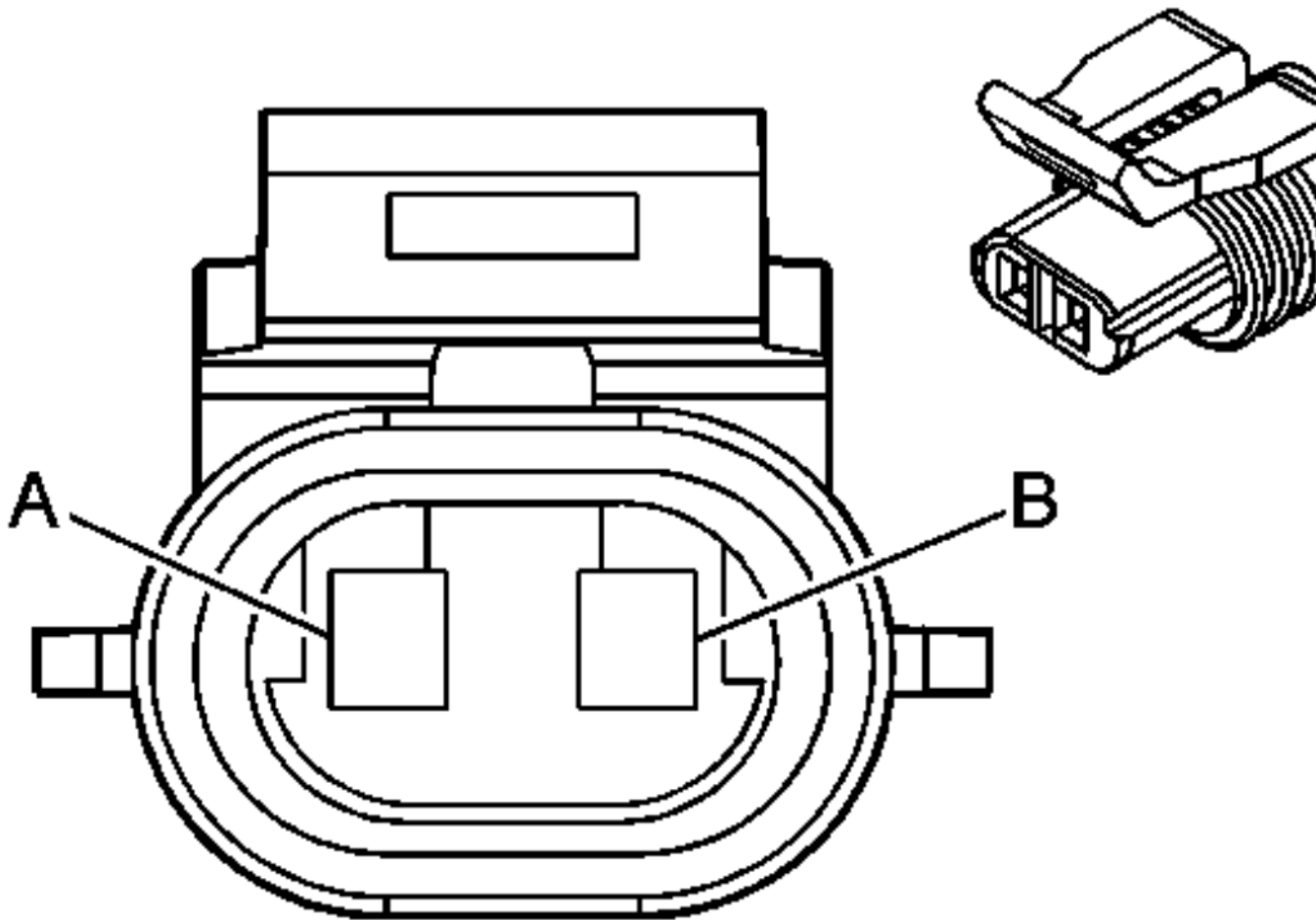
Connector Part Information

- 12059800
- 5-Way F Metri-Pack 150 Series (BK)

Pin	Wire Color	Circuit No.	Function
A-B	-	-	Not Used
C	BN/WH	1571	Traction Control Switch Signal
D	BK	450	Ground

E	YE	1491	Backlight Lamps Control
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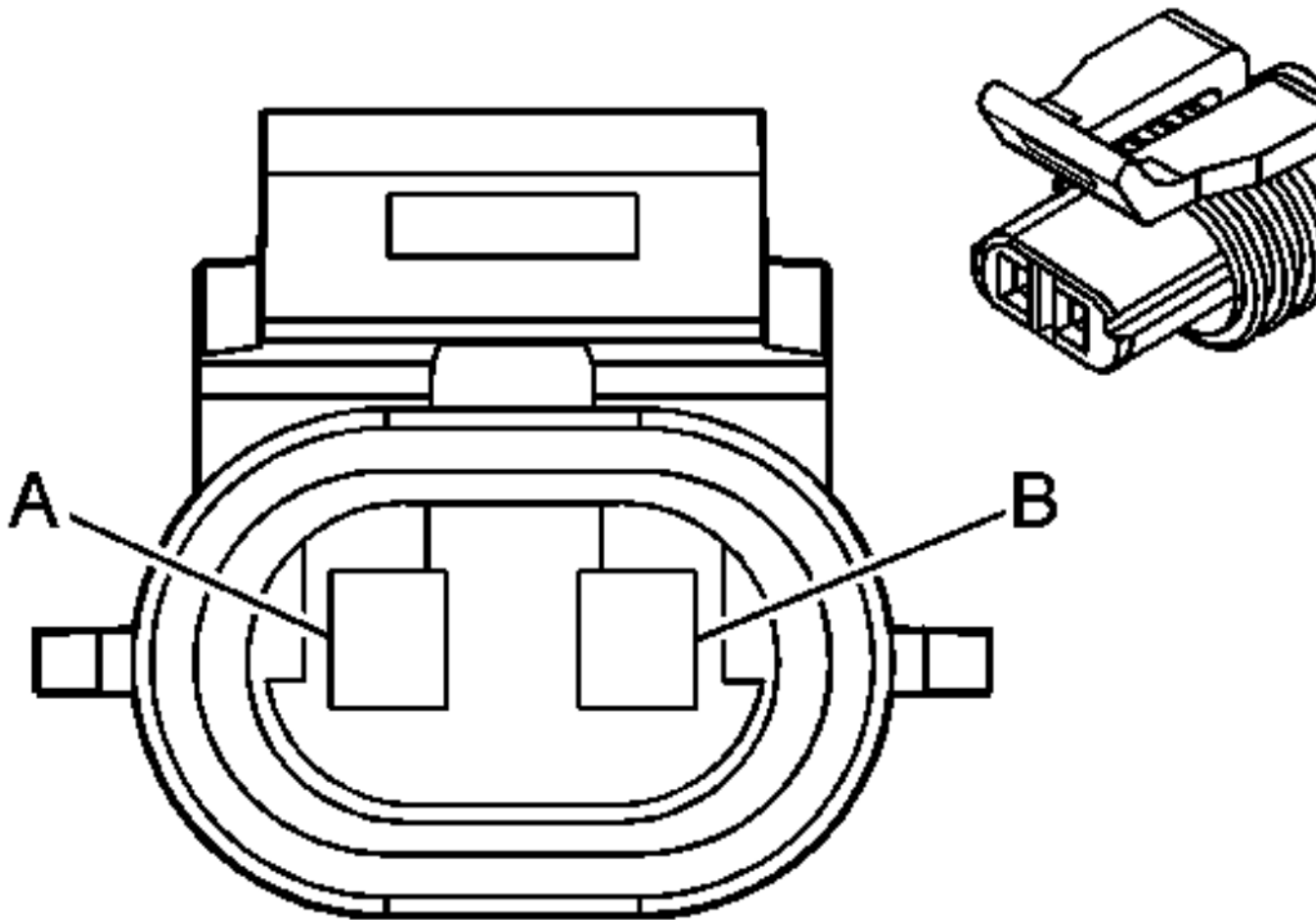
Wheel Speed Sensor (WSS) Terminal Identification - LF



Connector Part Information		• 12052644 • 2-Way F Metri-Pack 150 Series, Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
A	L-BU	830	Left Front Wheel Speed Sensor S

B	YE	873	Left Front Wheel Speed Sensor L
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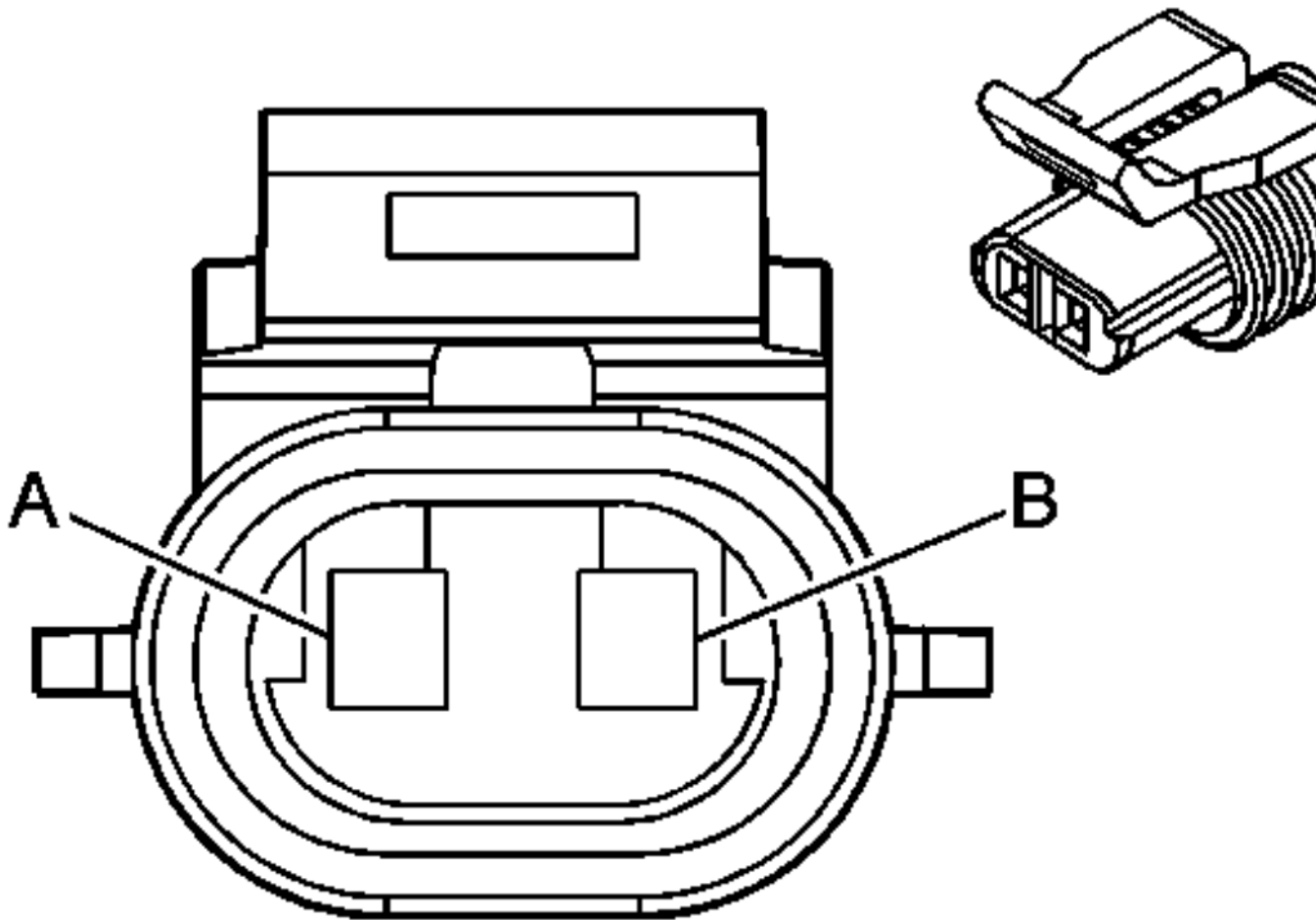
Wheel Speed Sensor (WSS) Terminal Identification - LR



Connector Part Information		12052644 2-Way F Metri-Pack 150 Series, Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
A	TN	884	Left Rear Wheel Speed Sensor Si

B	OG	885	Left Rear Wheel Speed Sensor Lc
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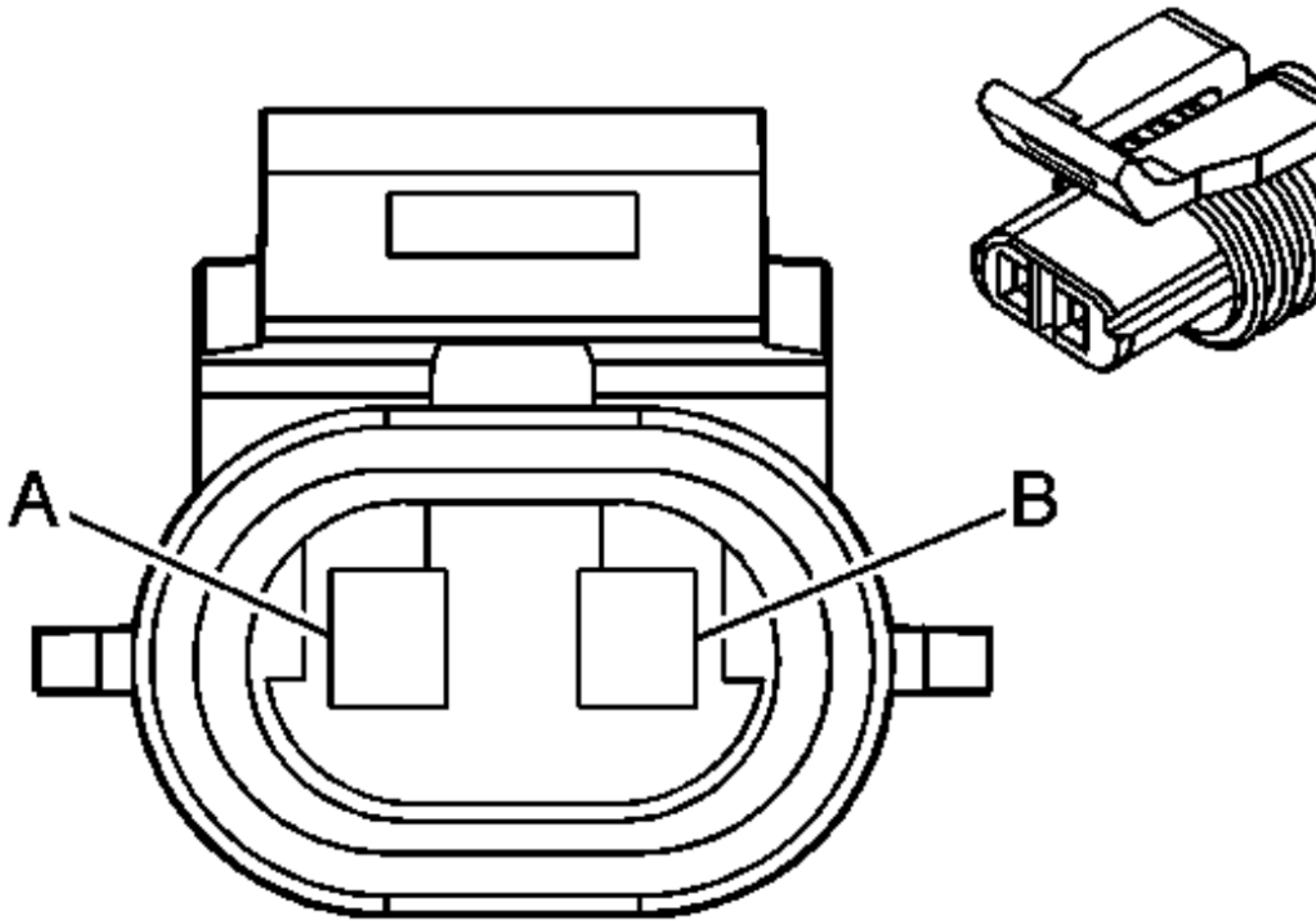
Wheel Speed Sensor (WSS) Terminal Identification - RF



Connector Part Information		12052644 2-Way F Metri-Pack 150 Series, Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
A	D-GN	872	Right Front Wheel Speed Sensor

B	TN	833	Right Front Wheel Speed Sensor : Reference
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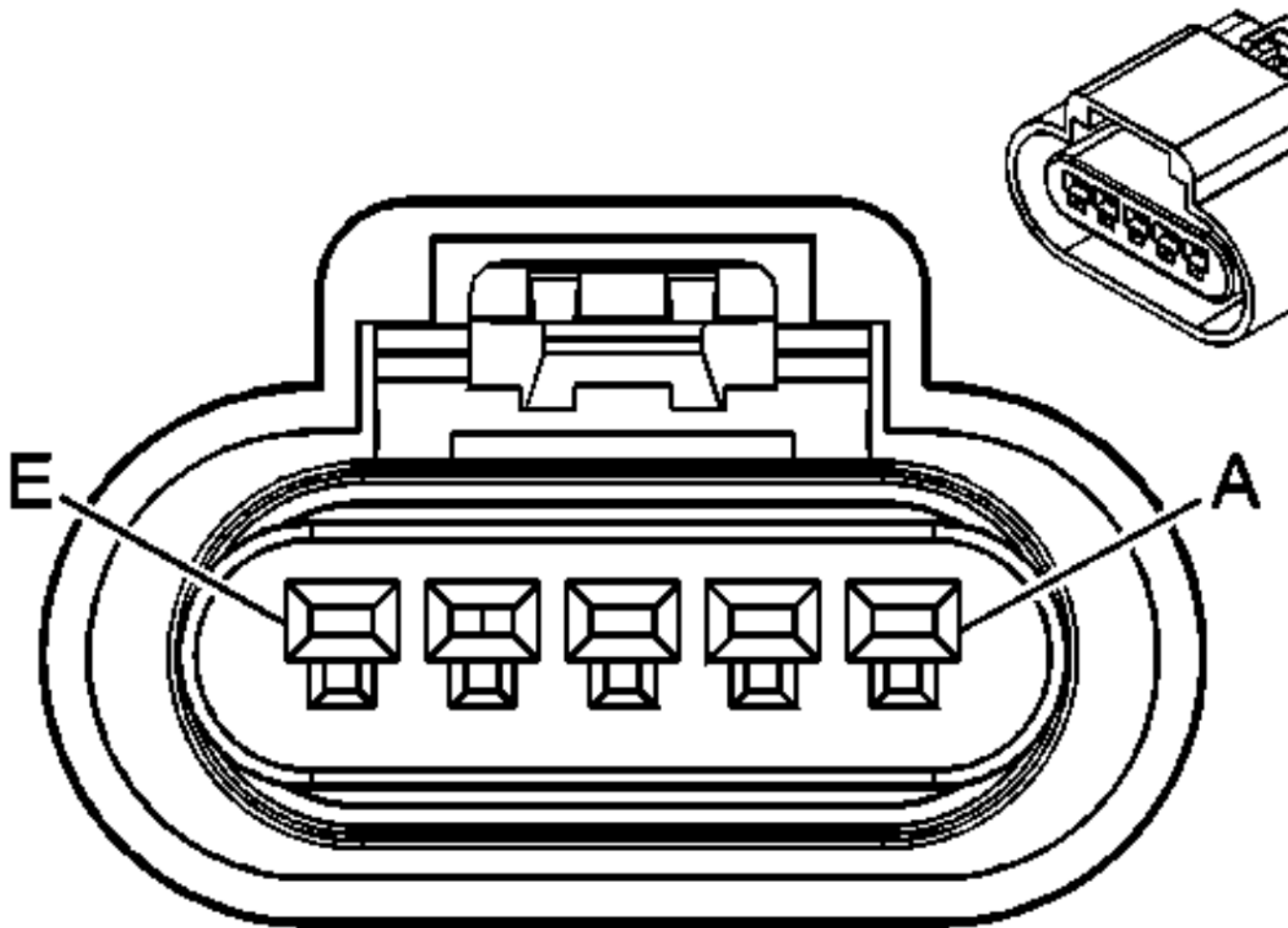
Wheel Speed Sensor (WSS) Terminal Identification - RR



Connector Part Information		• 12052644 • 2-Way F Metri-Pack 150 Series, Sealed (GY	
Pin	Wire Color	Circuit No.	Function

A	BN	882	Right Rear Wheel Speed Sensor S
B	WH	883	Right Rear Wheel Speed Sensor I

Yaw and Lateral/Long Acceleration Sensor Terminal Identification



Connector Part Information	• 15326822 • 5-Way F GT 150 Series, Sealed (BK)
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Pin	Wire Color	Circuit No.	Function
A	D-BU	5370	Long Accelerometer Signal
B	GY/BK	1337	5-Volt Reference
C	D-BU	716	Yaw Rate Sensor Signal
D	L-GN/BK	1338	Low Reference
E	L-BU	715	Lateral Accelerometer Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ANTILOCK 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 serial data circuit or due to a total malfunction of the 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

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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 <u>Scan Tool Does Not Power Up</u> in Data Link Communications
2	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communication with the following control modules: • Dash integration module (DIM) • Electronic brake control module (EBCM) • Instrument panel cluster (IPC) • Powertrain control module (PCM) • Rear integration module (RIM) Does the scan tool communicate with all control modules?	Go to Step 3	Go to <u>Scan Tool Does Not Communicate with Class 2 Device</u> in Data Link Communications
3	Select the display DTCs function on the scan tool for the following control modules: • Dash integration module (DIM) • Electronic brake control module (EBCM) • Instrument panel cluster (IPC) • Powertrain control module (PCM) • Rear integration module (RIM) Does the scan tool display any DTCs?	Go to Step 4	Go to <u>Symptoms - Antilock Brake System</u>
	Does the scan tool display any DTCs which begin with a "U"?	Go to <u>Scan Tool Does Not Communicate</u>	

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4		with Class 2 Device in Data Link Communications	Go to Step 5
5	Does the scan tool display DTC B1000, B1004, B1007, B1009, or B1020?	Go to Diagnostic Trouble Code (DTC) List in Body Control System	Go to Step 6
6	Does the scan tool display DTC B1327, B1328, B1513, or B1514?	Go to Diagnostic Trouble Code (DTC) List in Engine Electrical	Go to Diagnostic Trouble Code (DTC) List

SCAN TOOL OUTPUT CONTROLS

Electronic Brake Control Module (EBCM)

Scan Tool Output Control	Additional Menu Selection(s)	Description
ABS Active Indicator	Normal Mode Eavesdrop / No Phase	Displays the status of the ABS indicator.
ABS Failed Lamp Command	Normal Mode Eavesdrop / Phase 1-4	Displays the status of the ABS indicator.
ABS Reference Speed	Normal Mode Eavesdrop / Phase 1-4	Displays the vehicle speed from the average of all four wheel speeds.
Automated Bleed	-	Used to bleed the ABS hydraulics. Refer to ABS Automated Bleed Procedure .
Automated Test	-	Cycles each solenoid valve and the pump motor in order to verify component operation. This test is identical to the Initialization Sequence. If a malfunction is detected, the EBCM will set the appropriate DTCs. The DTCs will be displayed upon completion of the test.
BPP Sensor	Normal Mode Eavesdrop / Phase 1-	Displays the current status of the BPP sensor.

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	4	
BPP Sensor Calibration	-	Calibrates the BPP sensor.
CVRSS Equipped	Normal Mode Eavesdrop / Phase 1-4	Indicates if the vehicle is equipped with road sensing suspension.
Engine RPM	Normal Mode Eavesdrop / Phase 1-4	Displays the crankshaft rotation speed.
Engine Type	Normal Mode Eavesdrop / Phase 1-4	Displays the type of engine in the vehicle.
Estimated Trans. Gear	Normal Mode Eavesdrop / Phase 1-4	Displays the estimated state of the transmission gear.
Lateral Acceleration	Normal Mode Eavesdrop / Phase 1-4	Displays the lateral acceleration from the lateral accelerometer signal.
LF Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LF Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LF TCS Isolation Valve	Solenoid Test	Commands the solenoid ON and OFF.
LF TCS Prime Valve	Solenoid Test	Commands the solenoid ON and OFF.
LR Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
LR Valve Outlet Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
		Monitors the serial data messages that relate to system operation. The normal mode eavesdrop is a list of data parameters. The normal mode eavesdrop function has the following 2 modes: • Phase 1-4-The term phase refers to the ignition switch changing states. The data parameters shown will display a value only

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Normal Mode Eavesdrop	-	when there is a change in the ignition state. Otherwise, the scan tool displays all asterisks next to each parameter. No Phase-The data parameters shown are not affected by the changing of ignition states. The scan tool will display a value only when there is a serial data message that relates to the individual parameter. Otherwise, the scan tool displays all asterisks next to each parameter.
Powertrain TCS Failure	Normal Mode Eavesdrop / Phase 1-4	Indicates if the PCM has suspended TCS due to a malfunction related to TCS.
Pump Motor Test	-	Commands the pump motor ON and OFF.
Red Brake Warning Indicator	Normal Mode Eavesdrop / Phase 1-4	Displays the status of the Red Brake Warning indicator.
RF Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RF Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RF TCS Isolation Valve	Solenoid Test	Commands the solenoid ON and OFF.
RF TCS Prime Valve	Solenoid Test	Commands the solenoid ON and OFF.
Rough Road Parameter	Normal Mode Eavesdrop / Phase 1-4	Displays the EBCM calculation of the road surface.
RR Inlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
RR Outlet Valve Solenoid	Solenoid Test	Commands the solenoid ON and OFF.
Service Stability System	Normal Mode Eavesdrop / Phase 1-4	Displays the status of the Service Stability System message.
Service Steering System	Normal Mode Eavesdrop / Phase 1-4	Displays the status of the Service Steering System message.

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Stability System Active	Normal Mode Eavesdrop / No Phase	Displays the active status of the VSES.
State of Health Present	Normal Mode Eavesdrop / Phase 1-4	Indicates if the EBCM is sending the proper state of health message.
Steering Position Sensor Test	-	Tests the steering wheel position sensor (SWPS) ability to provide a valid input.
Suspension Failure Status	Normal Mode Eavesdrop / No Phase	Displays the status of the road sensing suspension.
System Power Mode	Normal Mode Eavesdrop / Phase 1-4	Displays the current state of the ignition as reported by the dash integration module (DIC).
TCC/Brake Switch Active	Normal Mode Eavesdrop / Phase 1-4	Displays the status of the brake switch.
TCS Active Message Command	Normal Mode Eavesdrop / No Phase	Indicates if the EBCM is commanding the Traction Active indicator ON.
TCS Equipped	Normal Mode Eavesdrop / Phase 1-4	Indicates if the vehicle is equipped with TCS.
TCS Failed Lamp Command	Normal Mode Eavesdrop / Phase 1-4	Indicates if the EBCM is commanding the Traction Off indicator ON.
TCS Off Lamp Command	Normal Mode Eavesdrop / No Phase	Displays the status of the Traction message.
TCS On/Off Switch	Normal Mode Eavesdrop / No Phase	Displays the state of the traction control switch.
TCS On/Off Test	-	Commands the traction control system ON and OFF. Performs the same function as the traction control switch.
TCS Test	-	Runs the pump motor in order to apply fluid pressure to the front wheel circuits.
	Normal Mode	Indicates if the EBCM has suspended the TCS

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Temporary Inhibit of TCS	Eavesdrop / Phase 1-4	due to a malfunction of the driver using the traction control switch.
TPS - Pedal Position	Normal Mode Eavesdrop / Phase 1-4	Displays the percentage of throttle that is currently being applied.
Transmission Type	Normal Mode Eavesdrop / Phase 1-4	Displays the type of transmission in the vehicle.
VIN Packet No. 2	Normal Mode Eavesdrop / Phase 1-4	Displays the VIN packet No. 2.
VSES Active	Normal Mode Eavesdrop / Phase 1-4	Displays the current status of the VSES.
VSES Enabled	Normal Mode Eavesdrop / Phase 1-4	Displays if VSES is currently enabled.
VSES Equipped	Normal Mode Eavesdrop / Phase 1-4	Indicates if the vehicle is equipped with VSES.
VSES On/Off Switch	• Normal Mode Eavesdrop / Phase 1-4 • Normal Mode Eavesdrop / Phase 1-4	Indicates the current state of the VSES switch.
VSES Ready	Normal Mode Eavesdrop / Phase 1-4	Indicates that the steering wheel has been centered and the VSES is ready.

SCAN TOOL DATA LIST

Dash Integration Module (DIM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON, engine OFF.			
Battery Voltage	Data	Volts	12

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Electronic Brake Control Module (EBCM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON, engine OFF, and steering wheel straight.			
ABS Active	DRP/ABS/TCS Data	Yes/No	No
ABS Failed	DRP/ABS/TCS Data	Yes/No	No
ABS Reference Speed	• DRP/ABS/TCS Data • VES Data	km/h or mph	0
ABS Warning Indicator	DRP/ABS/TCS Data	On/Off	Off
Brake Fluid	DRP/ABS/TCS Data	Normal/Low	Normal
Brake Temp Status	DRP/ABS/TCS Data	Normal/Over Temp	Normal
Delivered Torque PWM Duty Cycle	DRP/ABS/TCS Data	%	10
DRP Active	DRP/ABS/TCS Data	Yes/No	No
DRP Disabled	DRP/ABS/TCS Data	Yes/No	No
DRP Switched Battery Voltage	DRP/ABS/TCS Data	Volts	12
Dual Analog SWPS Input A	VSES Data	Volts	Varies 0-5
Dual Analog SWPS Input B	VSES Data	Volts	Varies 0-5
Engine Drag Control Active	DRP/ABS/TCS Data	Yes/No	No
Engine Drag Control Failed	DRP/ABS/TCS Data	Yes/No	No
Extended Travel Brake Switch	DRP/ABS/TCS Data	Applied/Released	Released
Ignition Voltage	• DRP/ABS/TCS Data • VES	Volts	12
Lateral Accelerometer Input	VSES Data	Volts	2.5
Lateral Accelerometer - Engineering Units	VSES Data	g	0
LF Rotor Temperature	DRP/ABS/TCS Data	°C/°F	24°C (75°F)
LF Wheel Speed	• DRP/ABS/TCS Data • VES Data	km/h or mph	0
LR Rotor Temperature	DRP/ABS/TCS Data	°C/°F	24°C (75°F)

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LR Wheel Speed	• DRP/ABS/TCS Data • VES Data	km/h or mph	0
Longitudinal Accelerometer Sensor	VSES Data	Volts	2.5
Longitudinal Accelerometer-Engineering Units	VSES Data	g	0
Panic Brake Assist	DRP/ABS/TCS Data	On/Off	Off
Pump Motor Feedback Voltage	DRP/ABS/TCS Data	Volts	12
Pump Motor Commanded State	DRP/ABS/TCS Data	On/Off	Off
Pump Motor PWM	DRP/ABS/TCS Data	On/Off	Off
Red Brake Warning Indicator	DRP/ABS/TCS Data	On/Off	Off
Requested Torque PWM Duty Cycle	DRP/ABS/TCS Data	%	90
Rough Road Parameter	DRP/ABS/TCS Data	On/Off	Off
RF Rotor Temperature	DRP/ABS/TCS Data	°C/°F	24°C (75°F)
RF Wheel Speed	• DRP/ABS/TCS Data • VES	km/h or mph	0
RR Rotor Temperature	DRP/ABS/TCS Data	°C/°F	24°C (75°F)
RR Wheel Speed	• DRP/ABS/TCS Data • VES	km/h or mph	0
Solenoid Relay Commanded State	DRP/ABS/TCS Data	On/Off	On
Solenoid Relay Feedback State	DRP/ABS/TCS Data	On/Off	On
Steering Sensor Output to CVRSS	VSES/CVRSS Data	%	2
Steering Sensor is Centered	VSES Data	Yes/No	No
Steering Source	VSES Data	V	0
Steering Wheel Angle	VSES Data	°	0
Stop Lamp Switch	DRP/ABS/TCS Data	Applied/Released	Released
SWPS PWM Output to CVRSS	VSES Data	°	0
Switched System Battery	• DRP/ABS/TCS Data	Volts	12

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	• VES		
TCS Active	DRP/ABS/TCS Data	Yes/No	No
TCS Active Indicator/Message	DRP/ABS/TCS Data	On/Off	Off
TCS Failed	DRP/ABS/TCS Data	Yes/No	No
TCS Warning Indicator/Message	DRP/ABS/TCS Data	On/Off	Off
Vehicle Yaw Rate - Engineering Units	VSES Data	°/sec	0
VES Failed	VES	Yes/No	No
VES Commanded Current	VES	On/Off	Off
VES Feedback Current	VES	On/Off	Off
VES Indicator Message	VES	On/Off	Off
VSES Active	VSES Data	Yes/No	No
VSES Active Indicator/Message	VSES Data	On/Off	Off
VSES Failed	VSES Data	Yes/No	No
VSES Failed Indicator/Message	VSES Data	On/Off	Off
VSES Is Centered	VSES Data	Yes/No	No
VSES On/Off Status	VSES Data	On/Off	Off
Yaw Rate Error	VSES Data	Yes/No	No
Yaw Rate Sensor Input	VSES Data	Volts	2.5
Yaw Rate Steering is Centered	VSES Data	Yes/No	No

HVAC Control Module (Instrument Panel Module)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON, engine OFF.			
TCS Switch	Non-HVAC Data	Off/On	Off

Powertrain Control Module (PCM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON, engine OFF.			
Traction Control Status	Engine Data 2	Active/Inactive	Inactive
Torque Delivered Signal	Engine Data 2	%	10
Torque Request Signal	Engine Data 2	%	90

SCAN TOOL DATA DEFINITIONS

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ABS Active

The scan tool displays Yes or No. The active status of the ABS. Indicates if ABS is currently active.

ABS Failed

The scan tool displays Yes or No. The failed status of the ABS. Indicates if the EBCM disabled ABS due to a malfunction.

ABS Failed Lamp Command

The scan tool displays Off or On. Indicates if the EBCM is commanding the ABS indicator ON.

ABS Reference Speed

The scan tool displays 0 to 255 km/h (0 to 159 mph). The vehicle speed from the average of all four wheel speeds.

ABS Warning Indicator

The scan tool displays Off or On. Indicates if the EBCM is commanding the ABS indicator.

Battery Voltage

The scan tool displays 0-30 Volts. The voltage measured between the modules battery positive voltage circuit and ground circuit.

Brake Fluid Level

The scan tool displays OK or Low. The status of the brake fluid level sensor signal.

Brake Temp Status

The scan tool displays Normal or Over Temp. The status of the brake temperature. Indicates if the brake temperature is above the traction control thermal cutoff point. If brake temperatures are above the thermal cutoff point, Over Temp is displayed and traction control is temporarily suspended until the brake temperature cools below the cutoff. This feature is used to maintain braking effectiveness if the base braking system is required. Overly heated brakes could result in brake fade.

Delivered Torque PWM Duty Cycle

The scan tool displays 0 to 100%. The duty cycle of the delivered torque signal. The duty cycle of the signal is used to transmit how much engine torque the PCM is delivering. Normal values are between 10 and 90 percent duty cycle. The signal is at low values (approximately 10 percent) at idle and at higher values under driving conditions.

DRP Active

The scan tool displays Yes or No. The active status of the DRP. Indicates if DRP is currently active.

DRP Disabled

The scan tool displays Yes or No. The failed status of the DRP. Indicates if the EBCM disabled DRP due to a malfunction.

Dual Analog SWPS Input A

The scan tool displays 0 to 5 volts. The steering wheel position signal A input.

Dual Analog SWPS Input B

The scan tool displays 0 to 5 volts. The steering wheel position signal B input.

Engine Drag Control Active

The scan tool displays Yes or No. The active status of the EDC. Indicates if EDC is currently active.

Engine Drag Control Failed

The scan tool displays Yes or No. The failed status of the EDC. Indicates if the EBCM disabled EDC due to a malfunction.

Extended Travel Brake Switch

The scan tool displays Applied or Released. The state of the extended travel brake switch.

Ignition Voltage

The scan tool displays 0 to 17 volts. The level of ignition voltage at the EBCM.

Lateral Accelerometer Input

The scan tool displays 0 to 5 volts. The lateral accelerometer signal from the lateral accelerometer sensor, roughly 2.5 volts equals 0 g lateral acceleration.

Lateral Accelerometer - Engineering Units

The scan tool displays -1.2 to +1.2 g. The lateral acceleration of the lateral accelerometer signal.

LF Normal Force

The scan tool displays 20%, 40%, 60%, and 80% High. The percent duty cycle of the left front normal force signal sent by the electronic suspension control module.

LF Rotor Temperature

The scan tool displays -40 to +650°C (-40 to +1202°F). The estimated temperature of the left front brake rotor.

LF Wheel Speed

The scan tool displays 0 to 255 km/h (0 to 159 mph). The actual speed of the left front wheel.

Longitudinal Accelerometer Sensor

The scan tool displays 0 to 5 volts. The scan tool displays the longitudinal accelerometer signal received from the sensor.

LR Normal Force

The scan tool displays 20%, 40%, 60%, and 80% High. The percent duty cycle of the left front normal force signal sent by the electronic suspension control module.

LR Rotor Temperature

The scan tool displays -40 to +650°C (-40 to +1202°F). The estimated temperature of the left front brake rotor.

LR Wheel Speed

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The scan tool displays 0 to 255 km/h (0 to 159 mph). The actual speed of the left rear wheel.

Pump Motor Feedback Voltage

The scan tool displays 0 to 17 volts. The voltage available to the pump motor when the pump motor control relay is energized.

Pump Motor Commanded State

The scan tool displays Off or On. Indicates the commanded state of the pump motor control.

Pump Motor PWM

The scan tool displays 0 to 100%. The duty cycle of the pump motor.

Red Brake Warning Indicator

The scan tool displays Off or On. Indicates if the red Brake warning indicator is currently ON.

Requested Torque PWM Duty Cycle

The scan tool displays 0 to 100%. The duty cycle of the requested torque signal. The duty cycle of the signal is used to transmit how much torque the EBCM is requesting the PCM to deliver. Normal values are between 10 and 90 percent duty cycle. The signal should be at 90 percent duty cycle when traction control is not active and at lower values (approximately 10 percent) when traction control is active.

RF Normal Force

The scan tool displays 20%, 40%, 60%, and 80% High. The percent duty cycle of the right front normal force signal sent by the electronic suspension control module.

RF Rotor Temperature

The scan tool displays -40 to +650°C (-40 to +1202°F). The estimated temperature of the right front brake rotor.

RF Wheel Speed

The scan tool displays 0 to 255 km/h (0 to 159 mph). The actual speed of the right front

wheel.

Rough Road Parameter

The scan tool displays 0 to 1 g. The EBCM calculation of the road surface, this information is sent to the PCM via serial data messages. The PCM uses this information for misfire detection.

RR Normal Force

The scan tool displays 20%, 40%, 60%, and 80% High. The percent duty cycle of the right front normal force signal sent by the electronic suspension control module.

RR Rotor Temperature

The scan tool displays -40 to +650°C (-40 to +1202°F). The estimated temperature of the right front brake rotor.

RR Wheel Speed

The scan tool displays 0 to 255 km/h (0 to 159 mph). The actual speed of the right rear wheel.

Solenoid Relay Commanded State

The scan tool displays Off or On. Indicates the commanded state of the system relay.

Solenoid Relay Feedback State

The scan tool displays Off or On. Indicates the actual state of the system relay.

Steering Sensor Output to CVRSS

The scan tool displays 0 to 100%. The percent duty cycle of the steering wheel position signal sent by the EBCM to the electronic suspension control module.

Steering Wheel Angle

The scan tool displays -720 to +720 degrees. The angle that the steering wheel is turned in degrees.

Stop Lamp Switch

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The scan tool displays Applied or Released. The state of the brake switch.

Switched System Battery Voltage

The scan tool displays 0 to 17 volts. The level of the internal EBCM switched battery voltage available to the solenoid valves and pump motor.

TCS Active

The scan tool displays Yes or No. The active status of the TCS. Indicates if TCS is currently active.

TCS Active Indicator/Message

The scan tool displays Off or On. Indicates if the EBCM is commanding the Traction Engaged message to be displayed by the DIC.

TCS Equipped

The scan tool displays Yes or No. Indicates if the vehicle is equipped with TCS.

TCS Failed

The scan tool displays Yes or No. The failed status of the TCS. Indicates if the EBCM disabled TCS due to a malfunction.

TCS Switch

Display Off or On. Indicates the status of the traction control switch.

TCS Warning Indicator/Message

The scan tool displays Off or On. Indicates if the EBCM is commanding the Traction Control indicator ON.

Torque Delivered Signal

The scan tool displays 0 to 100%. The duty cycle of the delivered torque signal. The duty cycle of the signal is used to transmit how much engine torque the PCM is delivering. Normal values are between 10 and 90 percent duty cycle. The signal is at low values (approximately 10 percent) at idle and at higher values under driving conditions.

Torque Request Signal

The scan tool displays 0 to 100%. The duty cycle of the requested torque signal. The duty cycle of the signal is used to transmit how much torque the EBCM is requesting the PCM to deliver. Normal values are between 10 and 90 percent duty cycle. The signal should be at 90 percent duty cycle when traction control is not active and at lower values (approximately 10 percent) when traction control is active.

Traction Control Status

The scan tool displays Active or Inactive. The active status of the TCS. Indicates if TCS is currently active.

Vehicle Yaw Rate - Engineering Units

The scan tool displays -75 to 75°/second. The yaw rate of the yaw rate signal.

VIN Packet No. 2

The scan tool displays the VIN packet No. 2.

VSES Active

The scan tool displays Yes or No. The active status of the VSES. Indicates if VSES is currently active.

VSES Active Indicator/Message

The scan tool displays Off or On. Indicates if the EBCM is commanding the Stability System Active message to be displayed by the DIC.

VSES Failed

The scan tool displays Yes or No. The failed status of the VSES. Indicates if the EBCM disabled VSES due to a malfunction.

VSES Failed Indicator/Message

The scan tool displays Yes or No. Indicates if the EBCM is commanding the Service Stability System message to be displayed by the DIC.

VSES Is Centered

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The scan tool displays Yes or No. Indicates if the steering wheel is centered.

VSES On/Off Status

The scan tool displays Off or On. The status of the VSES On/Off switch signal.

Yaw Rate Sensor Input

The scan tool displays 0 to 5 volts. The yaw rate signal from the yaw rate sensor, roughly 2.5 volts equals 0°/second yaw rate.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Description	Modules
<u>DTC B0665</u>	ABS Indicator Signal Circuit Voltage	EBCM
<u>DTC C0035</u>	Left Front Wheel Speed Circuit Malfunction	EBCM
<u>DTC C0036</u>	LF Wheel Speed Circuit Range/Performance	EBCM
<u>DTC C0040</u>	Right Front Wheel Speed Circuit Malfunction	EBCM
<u>DTC C0041</u>	Right Front Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
<u>DTC C0045</u>	Left Rear Wheel Speed Circuit Malfunction	EBCM
<u>DTC C0046</u>	Left Rear Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
<u>DTC C0050</u>	Right Rear Wheel Speed Circuit Malfunction	EBCM
<u>DTC C0051</u>	LF Wheel Speed Sensor Circuit Range/Performance (EBCM)	EBCM
<u>DTC C0114</u>	Valve Relay Malfunction	EBCM
<u>DTC C0115</u>	ABS Wheel Speed Sensor Malfunction	EBCM
<u>DTC C0121</u>	Valve Relay Circuit Malfunction	EBCM
<u>DTC C0136</u>	Base Brake System Pressure Circuit EBCM	EBCM
<u>DTC C0138</u>	Brake Fluid Pressure Sensor Fault	EBCM
<u>DTC C0139</u>	Brake Fluid Pressure Sensor Fault	EBCM
<u>DTC C0163</u>	Brake Pedal Position Sensor Fault	EBCM
<u>DTC C0164</u>	Brake Pedal Position Sensor Fault	EBCM
<u>DTC C0179</u>	System Thermal High EBCM	EBCM
<u>DTC C0186</u>	Lateral Accelerometer Circuit EBCM Malfunction	EBCM
<u>DTC C0187</u>	Lateral Accelerometer Circuit EBCM Malfunction	EBCM

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<u>DTC C0192</u>	Longitudinal Accelerometer Malfunction	EBCM
<u>DTC C0196</u>	Yaw Rate Circuit	EBCM
<u>DTC C0220</u>	ABS Channel in Release Too Long	EBCM
<u>DTC C0221</u>	Right Front Wheel Speed Sensor Circuit Open	EBCM
<u>DTC C0222</u>	Right Front Wheel Speed Signal Missing	EBCM
<u>DTC C0223</u>	Right Front Wheel Speed Signal Erratic	EBCM
<u>DTC C0225</u>	Left Front Wheel Speed Sensor Circuit Open	EBCM
<u>DTC C0226</u>	Left Front Wheel Speed Signal Missing	EBCM
<u>DTC C0227</u>	Left Front Wheel Speed Signal Erratic	EBCM
<u>DTC C0228</u>	ABS Channel in Release Too Long	EBCM
<u>DTC C0229</u>	Drop Out of Front Wheel Speed Signals	EBCM
<u>DTC C0241</u>	EBCM Control Valve Circuit	EBCM
<u>DTC C0245</u>	Wheel Speed Sensor Frequency Error	EBCM
<u>DTC C0254</u>	EBCM Control Valve Circuit	EBCM
<u>DTC C0281</u>	Brake Switch Circuit	EBCM
<u>DTC C0460</u>	Steering Wheel Position Sensor	EBCM
<u>DTC C0461</u>	Steering Wheel Position Sensor	EBCM
<u>DTC C0550</u>	ECU Malfunction - Internal Write/Checksum Malfunction	EBCM
<u>DTC C0551</u>	Option Configuration Error	EBCM
<u>DTC C0561</u>	System Disabled Information Stored EBCM	EBCM
<u>DTC C0565</u>	Vehicle Identification Number (VIN) Information Error EBCM	EBCM
<u>DTC C0820</u>	EBCM Case Voltage	EBCM
<u>DTC C0870</u>	Device Voltage Reference Output 1 Circuit EBCM	EBCM
<u>DTC C0899</u>	Device 1 Voltage Low EBCM	EBCM
<u>DTC C0900</u>	Device 1 Voltage High EBCM	EBCM
<u>DTC P0856</u>	Traction Control Input Signal	PCM
<u>DTC P1575</u>	Extended Travel Brake Switch Circuit	EBCM
<u>DTC P1689</u>	Traction Control Delivered Torque Output Circuit	PCM

DIAGNOSTIC TEST DRIVE

When servicing vehicles with the vehicle stability enhancement system (VSES), test drives will be necessary to allow all tests to be run, and all system functions to be enabled and exercised. A test drive may also be required to duplicate specific DTCs covered in this section. The diagnostic

system check (including test drive) should be run when vehicle repairs are complete in order to verify the repair. The diagnostic test drive will vary for ABS, TCS, or VSES concerns.

The following is a suggested VSES diagnostic test drive.

1. Read the Diagnostic Aids and the Conditions for Setting the DTC.
2. Turn OFF the ignition.
3. Reconnect any previously disconnected components.
4. Start the engine.
5. Install a scan tool.
6. With the scan tool, observe the VSES Is Centered parameter in the VSES data list. The scan tool will indicate Yes with the steering wheel centered. Drive the vehicle in a straight line for 45 seconds at 24 km/h (15 mph) while monitoring the scan tool.
7. Remove the scan tool.

IMPORTANT: Do not perform any unlawful or unsafe maneuvers.

8. Drive the vehicle under the following conditions for at least 10 minutes.
 - Highway driving
 - Rough roads
 - Perform turning maneuvers (curved freeway entrance ramp, parking lot maneuvers) and high steering angles and yaw rates at low speeds.
 - Verify the customers concern and duplicate driving conditions
9. With the engine still running, use the scan tool in order to check for DTCs. If any DTCs are set, refer to **Diagnostic Trouble Code (DTC) List**.

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.

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- 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 question 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 B0665

Circuit Description

The instrument cluster controls the operation of the ABS indicator. The electronic brake control module (EBCM) reports the desired status of the ABS indicator via serial data messages. The ABS indicator signal circuit is a back-up reporting circuit to the serial data messages. The EBCM supplies ground through the circuit when the ABS is operating properly. When there is a problem with ABS that should turn on the ABS indicator, the EBCM opens the ABS indicator signal circuit. If there is a problem with the ABS serial data messages, the instrument cluster uses the ABS indicator signal to determine if the ABS indicator should be illuminated. Using the serial data messages and back-up circuit, the instrument cluster decides whether to turn on the ABS indicator.

Conditions for Running the DTC

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

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Conditions for Setting the DTC

One of the following conditions exist for 0.3 seconds:

- The ABS indicator signal circuit voltage is greater than 9 volts when the ABS indicator is commanded ON.
- The ABS indicator signal circuit voltage is less than 3 volts when the ABS indicator is commanded OFF.

Action Taken When the DTC Sets

- 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

The following conditions may cause this concern:

- Open, short to ground, or short to voltage.
- Internal EBCM failure.
- Internal IPC failure.

Test Description

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

- 2: Use the scan tool to verify the normal state of the ABS indicator signal circuit.
- 3: Ensure that the instrument panel cluster can operate the ABS indicator.

DTC B0665

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> or <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages and Console			
	Did you perform the ABS Diagnostic System		Go to Diagnostic

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1	Check?	Go to Step 2	<u>System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the ABS Warning Indicator parameter in the DRP/ABS/TCS/VSES data list. Does the scan tool display Off?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the ABS indicator on the instrument panel cluster (IPC) during the bulb check. Does the ABS indicator illuminate during the bulb check?	Go to Step 4	Go to Step 6
4	Test the ABS indicator signal circuit of the EBCM for the following conditions: • An open • A short to ground • A short to voltage Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 5
5	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 7
6	Inspect for poor connections at the harness connector of the instrument panel cluster. Refer to <u>Testing for Intermittent Conditions and</u>		

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	Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 8
7	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to Electronic Brake Control Module Replacement . Did you complete the repair?	Go to Step 9	-
8	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement in Instrument Panel, Gages and Console. Did you complete the repair?	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 C0035-C0052

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, or C0050

The ignition is ON.

C0036, C0037, C0041, C0042, C0046, C0047, C0051, or C0052

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- DTCs C0035, C0040, C0045, or C0050 are not set.
- The brake pedal is not pressed.
- The ABS is not active.

Conditions for Setting the DTC

C0035, C0040, C0045, or C0050

One of the following conditions exists for 0.02 seconds:

- A short to voltage - the wheel speed sensor signal circuit and wheel speed sensor return circuit voltages are both greater than 4.25 volts.
- A short to ground - the wheel speed sensor signal circuit and wheel speed sensor return circuit voltages are both less than 0.75 volts.
- An open - the wheel speed sensor signal circuit voltage is greater than 4.25 volts and wheel speed sensor return circuit voltage is less than 0.75 volts.

C0036, C0041, C0046, or C0051

The EBCM detects a rapid variation in the wheel speed. The wheel speed changes by 16 km/h (10 mph) or more in 0.01 second. The change must occur 3 times with no more than 0.2 seconds between occurrences.

C0037, C0042, C0047, or C0052

All of the following conditions exists for 2.5 seconds:

- The suspect wheel speed equals zero.
- The other wheel speeds are greater than 8 km/h (5 mph).
- The other wheel speeds are within 11 km/h (7 mph) of each other.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS/VSES for the duration of the ignition cycle.
- The DRP does not function optimally.
- The ABS indicator turns ON.
- The Traction Control indicator turns ON.
- The DIC displays the Service Stability System message.

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Conditions for Clearing the DTC

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

Diagnostic Aids

C0035, C0040, C0045, or 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 (9.9 ml) 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 area thoroughly when completed.

C0036, C0041, C0046, or 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 too close to high energy ignition system components, such as spark plug wires.

C0037, C0042, C0047, or C0052

One of the following conditions may exist:

- The wheel speed sensor inputs are shorted together.
- Internal malfunction of the wheel speed sensor.
- The other wheel speeds are within 11 km/h (7 mph) of each other.

Diagnose each wheel speed sensor individually.

Test Description

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

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3: Measure the resistance of the wheel speed sensor in order to determine if the sensor has a valid resistance value.

4: Ensures that the wheel speed sensor is generating a valid AC voltage output.

DTC C0035-C0052

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
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?	8 km/h (5 mph)	Go to Step 3	Go to Diagnostic Aids
3	1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 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?	850-1350 ohms	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
	Inspect for poor connections at the			

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5	harness connector of the wheel speed sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 6
6	1. Disconnect the EBCM harness connector. 2. Install the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 3. Test the wheel speed sensor circuits for the following: • An open • A short to ground • A short to voltage • Shorted together Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> 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 to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> 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 the appropriate procedure: • <u>Wheel Bearing/Hub Replacement - Front (AWD)</u> or <u>Wheel Bearing/Hub Replacement - Front (RWD)</u> in Front Suspension • <u>Wheel Bearing/Hub Replacement - Rear</u> in Rear Suspension	-		

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	Did you complete the repair?		Go to Step 10	-
9	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . 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.	-	Go to Step 2	System OK
	Does the DTC reset?			

DTC C0113-C0115

Circuit Description

The system relay is energized when the ignition is ON. The system relay supplies voltage to the solenoid valves and the pump motor. This voltage is referred to as the system voltage.

The electronic brake control module (EBCM) controls each solenoid valve by grounding the solenoid.

The EBCM controls the pump motor by grounding the control circuit. The pump serves 2 purposes:

- Transfers brake fluid from the brake calipers to the master cylinder reservoir during pressure decrease events.
- Transfers brake fluid from the master cylinder reservoir to the brake calipers during pressure increase events.

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Conditions for Running the DTC

- The pump motor is commanded ON.
- The system voltage is greater than 8 volts.

Conditions for Setting the DTC

One of the following conditions exists for 0.5 seconds:

- With the commanded pump motor voltage less than the system voltage, the actual pump motor voltage is 3 volts less than the commanded voltage.
- With the commanded pump motor voltage greater than the system voltage, the actual pump motor voltage is less than 8 volts.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS/VSES for the duration of the ignition cycle.
- The DRP does not function optimally.
- The ABS indicator turns ON.
- The Traction Control indicator turns ON.
- The DIC displays the Service Stability System message.

Conditions for Clearing the DTC

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

Diagnostic Aids

The pump motor is integral to the BPMV. The pump motor is not serviceable.

Test Description

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

3: Tests the ability of the EBCM to control the pump motor. If the test lamp illuminates, the pump motor circuit within the EBCM is good.

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Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
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. 4. With the scan tool, perform the Automated Test. Does the DTC reset?	Go to Step 3	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems
3	1. Turn OFF the ignition. 2. Disconnect the pump motor harness pigtail connector of the BPMV. 3. Connect a test lamp between the pump motor circuits at the pump motor connector of the EBCM using the J 35616 connector test adapter kit. 4. Use the scan tool in order to clear the DTCs. 5. With the scan tool, perform the Pump Motor Test. Does the test lamp illuminate?	Go to Step 5	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Connect the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 4. Test both ground circuits of the EBCM including the EBCM ground for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring		

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	Systems.		
	Did you find and correct the condition?	Go to Step 9	Go to Step 6
5	Inspect for poor connections at the pump motor harness pigtail connector of the BPMV. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 7
6	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 8
7	Replace the BPMV. Refer to <u>Brake Pressure Modulator Valve (BPMV) Replacement</u> . Did you complete the repair?	Go to Step 9	-
8	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	Go to Step 9	-
9	1. Use the scan tool in order to clear the DTCs. 2. With the scan tool, perform the Automated Test. Does the DTC reset?	Go to Step 2	System OK

DTC C0121

Circuit Description

The system relay is energized when the ignition is ON. The system relay supplies voltage to the

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solenoid valves and the pump motor. This voltage is referred to as the system voltage.

The electronic brake control module (EBCM) controls each solenoid valve by grounding the solenoid.

The EBCM controls the pump motor by grounding the control circuit. The pump serves 2 purposes:

- Transfers brake fluid from the brake calipers to the master cylinder reservoir during pressure decrease events.
- Transfers brake fluid from the master cylinder reservoir to the brake calipers during pressure increase events.

Conditions for Running the DTC

- The ignition voltage is greater than 10.5 volts.
- The system relay is commanded ON.

Conditions for Setting the DTC

The system voltage is less than 8 volts for 0.23 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the DRP/ABS/TCS/VSES for the duration of the ignition cycle.
- The ABS indicator turns ON.
- The Traction Control indicator turns ON.
- The DIC displays the Service Stability System message.
- The EBCM will also set DTC C0281.
- 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 EBCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

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The system relay is integral to the EBCM. The relay is not serviceable.

Test Description

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

2: Determines whether the DTC is current.

DTC C0121

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
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. 4. With the scan tool, perform the Automated Test. Does the DTC reset as a current DTC?	-	Go to Step 3	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems
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 DMM display the specified value?	OL	Go to Step 5	Go to Step 4
4	Replace the EBCM and the BPMV. Refer to <u>Electronic Brake Control Module Replacement</u> and <u>Brake</u>	-		

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	<u>Pressure Modulator Valve (BPMV) Replacement.</u> Did you complete the repair?		Go to Step 6	-
5	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement.</u> Did you complete the repair?	-	Go to Step 6	-
6	1. Use the scan tool in order to clear the DTCs. 2. With the scan tool, perform the Automated Test. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0136**Circuit Description**

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

Conditions for Running the DTC

The ignition is ON for 1.0 second.

Conditions for Setting the DTC

One of the following conditions exists for 0.1 seconds.

- The brake fluid pressure sensor signal is greater than 4.9 volts.
- The brake fluid pressure sensor signal is less than 0.15 volts.

Action Taken When the DTC Sets

- The EBCM disables the VSES for the duration of the ignition cycle.
- ACC braking function disabled.
- TCS is degraded.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the Service Active Handling message.

Conditions for Clearing the DTC

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- 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

- Find out from the driver under what conditions the DTC was set (when the DIC displayed the Service Stabilitrak message). This information will help to duplicate the failure.
- The Snapshot function on the scan tool can help find an intermittent DTC.
- A deceleration cycle consists of the following sequence:
 1. The vehicle speed is greater than 24 km/h (15 mph).
 2. The vehicle decelerates more than 8 km/h/second (5 mph/second) for 2 seconds.
 3. The vehicle speed decelerates to less than 16 km/h (10 mph).

Test Description

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

3: Tests for the proper operation of the circuit in the low voltage range.

4: Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

5: Tests for a short to voltage in the 5-volt reference circuit.

6: Tests for a high resistance or an open in the low reference circuit.

DTC C0136

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the Brake Pressure Sensor parameter in the	0.14-4.9 V		

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	VSES data list.			
	Does the scan tool display that the Brake Pressure Sensor parameter is within the specified range?		Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the brake fluid pressure sensor connector. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Brake Pressure Sensor parameter. Does the scan tool indicate that the Brake Pressure Sensor parameter is less than the specified value?	0.14 V		
			Go to Step 4	Go to Step 10
4	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the brake fluid pressure sensor and the signal circuit of the brake fluid pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Brake Pressure Sensor parameter. Does the scan tool indicate that the Brake Pressure Sensor parameter is greater than the specified value?	4.9 V		
			Go to Step 5	Go to Step 8
5	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference circuit of the brake fluid pressure sensor and the low reference circuit of the brake fluid pressure sensor.	5 V		

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	Does the voltage measure less the specified value?		Go to Step 6	Go to Step 7
6	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. Refer to <u>Battery Negative Cable Disconnect/Connect Procedure</u> in Engine Electrical. 3. Measure the resistance from the low reference circuit of the brake fluid pressure sensor to a good ground. Does the resistance measure less than the specified value?	5 ohms		
7	Test the 5-volt reference circuit of the brake fluid pressure sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 11
8	Test the 5-volt reference circuit of the brake fluid pressure sensor for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 9
9	Test the signal circuit of the brake fluid pressure sensor for the following conditions: • An open • A short to ground • A high resistance	-		

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 16	Go to Step 13
10	Test the signal circuit of the brake fluid pressure sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
11	1. Disconnect the EBCM harness connector. 2. Install the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u> . 3. Test the low reference circuit of the brake fluid pressure sensor for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
12	Inspect for poor connections at the harness connector of the brake fluid pressure sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 14
13	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 15
14	Replace the brake fluid pressure sensor. Refer to <u>Brake Fluid Pressure Sensor Replacement</u> .	-		-

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	Did you complete the repair?		Go to Step 16	
15	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 16	-
16	1. Clear the DTCs using the scan tool. 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 C0138 OR C0139

Circuit Description

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

Conditions for Running the DTC

DTC C0138

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

DTC C0139

- The ignition is ON.
- Ignition voltage is greater than 8 volts.
- The vehicle speed is greater than 16 km/h (10 mph).

Conditions for Setting the DTC

DTC C0138

The vehicle speed exceeds 25 km/h (15 mph) then decelerates by 11.5 km/h (7 mph) per second and the brake pressure never increases.

DTC C0139

One of the following conditions occur:

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- Brake pressure does not change after brake pedal has been applied twice.
- While brake pressure is greater than 50 psi, the vehicle speed exceeds 40 km/h (24 mph) and vehicle acceleration exceeds 8 km/h (5 mph) per second twice.

Action Taken When the DTC Sets

- The EBCM disables the PBA/TCS/VSES for the duration of the ignition cycle.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the Service Stability System message.
- The ABS remains functional.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Find out from the driver under what conditions the DTC was set (when the DIC displayed the Service Active Handling message). This information will help to duplicate the failure.
- The Snapshot function on the scan tool can help find an intermittent DTC.
- Brake pressure sensor internal malfunction.

Test Description

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

3: Tests for the proper operation of the circuit in the low voltage range.

4: Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

5: Tests for a short to voltage in the 5 volt reference circuit.

6: Tests for a high resistance or an open in the low reference circuit.

DTC C0138 or C0139

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				
	Did you perform the Diagnostic System			Go to

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1	Check - ABS?	-	Go to Step 2	<u>Diagnostic System</u> <u>Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the Brake Fluid Pressure Sensor Input parameter in the VSES data list. Does the scan tool display that the Brake Fluid Pressure Sensor Input parameter is within the specified range?	0.14-4.9 V	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the brake fluid pressure sensor connector. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Brake Fluid Pressure Sensor Input parameter. Does the scan tool indicate that the Brake Fluid Pressure Sensor Input parameter is less than the specified value?	0.14 V	Go to Step 4	Go to Step 10
4	1. Turn OFF the ignition. 2. Connect a 3 amp fused jumper wire between the 5 volt reference circuit of the brake fluid pressure sensor and the signal circuit of the brake fluid pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Brake Fluid Pressure Sensor Input parameter.	4.9 V		

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	Does the scan tool indicate that the Brake Fluid Pressure Sensor Input parameter is greater than the specified value?		Go to Step 5	Go to Step 8
5	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5 volt reference circuit of the brake fluid pressure sensor and the low reference circuit of the brake fluid pressure sensor. Does the voltage measure less the specified value?	5 V	Go to Step 6	Go to Step 7
6	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. Refer to <u>Battery Negative Cable Disconnect/Connect Procedure</u> in Engine Electrical. 3. Measure the resistance from the low reference circuit of the brake fluid pressure sensor to a good ground. Does the resistance measure less than the specified value?	5 ohms	Go to Step 12	Go to Step 11
7	Test the 5 volt reference circuit of the brake fluid pressure sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
8	Test the 5 volt reference circuit of the brake fluid pressure sensor for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring</u>	-		

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	<u>Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 16	Go to Step 9
9	Test the signal circuit of the brake fluid pressure sensor for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
10	Test the signal circuit of the brake fluid pressure sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
11	1. Disconnect the EBCM harness connector. 2. Install the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 3. Test the low reference circuit of the brake fluid pressure sensor for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
12	Inspect for poor connections at the harness connector of the brake fluid pressure sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems.	-		

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	Did you find and correct the condition?		Go to Step 16	Go to Step 14
13	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 15
14	Replace the brake fluid pressure sensor. Refer to <u>Brake Fluid Pressure Sensor Replacement</u> . Did you complete the repair?	-	Go to Step 16	-
15	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 16	-
16	1. Clear the DTCs using the scan tool. 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 C0163 OR C0164

Circuit Description

The brake pedal position sensor (BPP) is an input to the electronic brake control module (EBCM). The brake pedal position sensor is a potentiometer type sensor with a 5-volt reference circuit and a low reference circuit. The BCM supplies the 5-volt reference to the BPP.

Conditions for Running the DTC

DTC C0163

The ignition is ON.

DTC C0164

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

Conditions for Setting the DTC

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DTC C0163

The brake pedal position sensor input voltage is between 1.87 volts and 5.03 volts for 2 seconds.

DTC C0164

The brake pedal position sensor input was active for 2 consecutive ignition cycles.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the TCS/VSES for the duration of the ignition cycle.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the following messages:
 - Service Traction System
 - Service Active Handling
- The ABS remains functional.

Conditions for Clearing the DTC

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

Diagnostic Aids

DTC C0163

Possible causes of this DTC are the following conditions:

- A signal circuit of the brake pedal position sensor is open.
- The BPP sensor needs calibration.
- All brake lamps are open.
- All brake lamp grounds are open.
- An internal EBCM problem.

DTC C0164

Possible causes of this DTC are the following conditions:

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- The brake pedal position sensor circuit is shorted to voltage.
- The brake pedal position sensor is misadjusted.
- The brake pedal position sensor is stuck closed.
- A brake pedal that is binding.

Test Description

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

2: Test for the current state of the BPP sensor.

DTC C0163 or C0164

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the ABS Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the BPP Sensor parameter in the TCS data list. Does the scan tool display Released?	Go to Step 3	Go to Step 4
3	1. Press the brake pedal. 2. With a scan tool, observe the BPP Sensor parameter. Does the BPP Sensor parameter change state?	Go to Diagnostic Aids	Go to Step 4
4	1. Turn OFF the ignition. 2. Inspect the brake pedal position sensor and adjust and/or calibrate if needed. Refer to <u>Brake Pedal Position Sensor Replacement</u> in Lighting Systems. Did you find and correct the condition?	Go to Step 11	Go to Step 5
	1. Turn OFF the ignition.		

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5	2. Disconnect the brake pedal position sensor connector. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the BPP Sensor parameter. Does the scan tool display Released?	Go to Step 8	Go to Step 6
6	Test the brake pedal position sensor signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 11	Go to Step 7
7	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 11	Go to Step 9
8	Inspect for poor connections at the harness connector of the brake pedal position sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 11	Go to Step 10
9	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	Go to Step 11	-
10	Replace the brake pedal position sensor. Refer to <u>Brake Pedal Position Sensor Replacement</u> in Lighting Systems. Did you complete the repair?	Go to 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.		

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Does the DTC reset?

Go to **Step 2**

System OK

DTC C0179

Circuit Description

The electronic brake control module (EBCM) monitors vehicle speed deceleration, system activation, and brake pedal position sensor active times in order to calculate an estimate of the brake rotor temperatures. If the EBCM calculates that the brake rotor temperatures have exceeded the thermal cutoff point, the EBCM will temporarily suspend the traction control system (TCS) function until the brake rotors cool. This feature is used to maintain braking effectiveness if normal base braking is required. An overly heated brake system could result in brake fade.

The EBCM continues calculating the brake rotor temperatures after the ignition is turned OFF. The EBCM remains awake until the EBCM calculates that the brake rotors cooled sufficiently. The cooling period may take up to 30 minutes.

Conditions for Running the DTC

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

Conditions for Setting the DTC

This DTC sets when the estimated brake rotor temperature exceeds 375°C (700°F). When the estimated brake rotor temperature exceeds 375°C (700°F) during normal braking or ABS operations, the DTC does not set until the next TCS activation. The EBCM does not disable TCS until the end of the TCS event.

Action Taken When the DTC Sets

- The EBCM disables the TCS until the DTC becomes a history DTC.
- The ABS remains functional.
- The Traction Control indicator turns ON.

Conditions for Clearing the DTC

- The current DTC becomes history when the estimated brake rotor temperatures of both drive wheels decreases below 275°C (530°F). The following actions also occur:
 - The EBCM enables TCS.

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- The DIC displays the Traction Ready message.
- The condition for the DTC is no longer present (the DTC is not current) and you used the scan tool Clear DTC function.
- The condition for the DTC is no longer present (the DTC is not current) and you used the On-Board Diagnostics Clear DTC function.
- The EBCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- With TCS temporarily disabled, the EBCM continues calculating the brake rotor temperatures after the ignition is turned OFF. Turning ON the ignition again while TCS is temporarily disabled will not re-enable TCS.
- The temperature is an estimate calculated by the EBCM.
- Possible causes of this DTC are the following conditions:
 - The brake usage is excessive.
 - The TCS usage is excessive.
 - The brake pedal position sensor is damaged or not calibrated.
 - The brake pressure sensor is damaged.

Test Description

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

4: Use the scan tool in order to verify that the Brake Thermal Model is exceeded.

DTC C0179

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the display DTCs function on the scan tool for the EBCM.		

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	Does the scan tool display that this DTC is set current?	Go to Step 4	Go to Step 3
3	Since most occurrences of this DTC are caused by excessive braking, review with the customer to verify the conditions under which the DTC set. Did vehicle operation cause this DTC to set?	Go to Diagnostic Aids	Go to Step 4
4	1. Allow 30 minutes from the last time you drove the vehicle for the cooling of the brake rotors. 2. With a scan tool, observe the Brake Temp Status parameter in the ABS data list. Does the scan tool display Normal?	Go to Step 6	Go to Step 5
5	Calibrate the brake pedal position sensor. Refer to <u>Brake Pedal Position Sensor Calibration Description and Operation</u> in Lighting Systems. Did you find and correct the condition?	Go to Step 8	Go to Step 6
6	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 as a current DTC?	Go to Step 7	System OK
7	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	Go to Step 8	-

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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 C0186 OR C0187

Circuit Description

The electronic brake control module (EBCM) uses the lateral accelerometer signal to determine the lateral forces acting on a vehicle during a turn or a skid. The EBCM uses the signal from the lateral accelerometer as one of the inputs to operate the vehicle stability enhancement system (VSES).

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC C0186 Lateral Accelerometer Circuit
- DTC C0187 Lateral Accelerometer Circuit Range/Performance

Conditions for Running the DTC

C0186

Ignition voltage is greater than 8 volts.

C0187

- Ignition voltage is greater than 8 volts.
- No yaw rate DTCs are present.
- Vehicle yaw rate is centered.

Conditions for Setting the DTC

C0186

Lateral accelerometer signal voltage is less than 0.18 volt or above 4.84 volts.

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C0187

The EBCM will set the DTC when one or more of the following conditions have occurred:

- The lateral acceleration signal changes to rapidly based on vehicle dynamics.
- The internal calibration in the lateral accelerometer is out of range.
- The lateral accelerometer has failed and internal self check test.

Action Taken When the DTC Sets

If equipped, the following actions will occur:

- The EBCM disables VSES for the duration of the ignition cycle.
- The driver information center (DIC) displays the Service Stability System message.

Conditions for Clearing the DTC

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

Diagnostic Aids

The lateral accelerometer is packaged with the yaw rate sensor as a single component.

Test Description

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

- 2:** Tests for the proper voltage output on the 5-volt reference circuit and the proper operation of the signal circuit.
- 3:** Tests for possible low 5-volt reference output or a problem with the signal circuit.
- 4:** Tests for a short to voltage on the 5-volt reference circuit. If a short to voltage exists, other DTCs may be set for the vehicle stability system.
- 8:** Tests for a problem with the low reference circuit. If a short to voltage exists, other DTCs may be set for the vehicle stability system.

DTC C0186 or C0187

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				

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1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Turn OFF the ignition. 2. Disconnect the yaw and lateral acceleration sensor harness connector. 3. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the yaw and lateral acceleration sensor and the signal circuit of the yaw and lateral acceleration sensor. 4. Turn ON the ignition, with the engine OFF. 5. With the scan tool, observe the lateral acceleration signal voltage. Does the scan tool indicate that the lateral acceleration signal parameter is in between the specified voltage range?	4.5-5.5 V	Go to Step 8	Go to Step 3
3	With the 3-amp fused jumper wire still connected, does the scan tool indicate that the lateral acceleration sensor parameter is below the specified voltage value?	4.5 V	Go to Step 5	Go to Step 4
4	Test the 5-volt reference circuit of the yaw and lateral acceleration sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 7
5	Test the 5-volt reference circuit of the yaw and lateral acceleration sensor for the following conditions: • An open • A short to ground • A high resistance	-		

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 12	Go to Step 6
6	Test the lateral accelerometer signal circuit for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 11
7	Test the lateral accelerometer signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 11
8	Test the low reference circuit of the yaw and lateral acceleration sensor for the following conditions: • An open • A short to voltage • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 9
9	Inspect for poor connections at the harness connector of the yaw and lateral acceleration sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems.	-	Go to Step	

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	Did you find and correct the condition?		12	Go to Step 10
10	Replace the yaw and lateral acceleration sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the replacement?	-	Go to Step 12	-
11	Replace the electronic brake control module (EBCM). Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 12	-
12	1. Clear the DTCs using the scan tool. 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 longitudinal accelerometer is used to determine straight-line acceleration. This information is used when calculating the desired Traction Control in AWD applications.

Conditions for Running the DTC

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

Conditions for Setting the DTC

One of the following conditions exist:

- The yaw rate sensor input voltage is less than 0.15 volts.
- The yaw rate sensor input voltage is greater than 4.85 volts for 1 seconds.
- The longitudinal accelerometer bias exceeds 0.5 g.
- The longitudinal accelerometer signal is not increased by 0.5 volts during longitudinal accelerometer self test.

Action Taken When the DTC Sets

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- TCS is degraded.
- The TCS indicators turn ON.
- The ABS remains functional.

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

The following conditions can cause this concern:

- The longitudinal accelerometer circuit is open, shorted to ground, or shorted to battery.
- Internal longitudinal accelerometer malfunction.
- Internal EBCM malfunction.

Test Description

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

3: Tests for the proper operation of the circuit in the low voltage range.

4: Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

5: Tests for a short to voltage in the 5-volt reference circuit.

6: Tests the bias voltage of the longitudinal accelerometer sensor.

DTC C0192

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
	1. Install a scan tool. 2. Turn ON the ignition, with the			

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2	engine OFF. 3. With a scan tool, observe the Longitudinal Accelerometer Sensor Input parameter in the VSES data list. Does the scan tool display within the specified range?	0.15-4.85 V	Go to Step 6	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the yaw rate/lateral/longitudinal accelerometer sensor connector. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Longitudinal Accelerometer Sensor Input parameter. Does the scan tool display a voltage less than the specified value?	0.15 V	Go to Step 4	Go to Step 10
4	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor and the signal circuit of the yaw rate/lateral/longitudinal accelerometer sensor. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Longitudinal Accelerometer Sensor Input parameter. Does the scan tool display a voltage greater than the specified value?	4.85 V	Go to Step 5	Go to Step 8
	1. Disconnect the fused jumper wire.			

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5	2. Use a DMM to measure the voltage between the 5-volt reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor and the low reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor. Does the voltage measure less the specified value?	5 V	Go to Step 12	Go to Step 7
6	Does the scan tool display that the Longitudinal Accelerometer Sensor Input parameter is within the specified range?	2.3-2.7 V	Go to Diagnostic Aids	Go to Step 11
7	Test the 5-volt reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
8	Test the 5-volt reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 9
9	Test the signal circuit of the yaw rate/lateral/longitudinal accelerometer sensor for the following conditions: • An open • A short to ground • A high resistance	-		

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 16	Go to Step 13
10	Test the signal circuit of the yaw rate/lateral/longitudinal accelerometer sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
11	Test the low reference circuit of the yaw rate/lateral/longitudinal accelerometer sensor for the following conditions: • An open • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 12
12	Inspect for poor connections at the harness connector of the yaw rate/lateral/longitudinal accelerometer sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 14
13	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 15
14	Replace the yaw rate/lateral/longitudinal accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the repair?	-	Go to Step 16	-

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15	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 16	-
16	1. Clear the DTCs using the scan tool. 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 C0196

Circuit Description

The electronic brake control module (EBCM) uses the yaw rate signal to determine the directional angle of the vehicle during a turn or a skid. The EBCM uses the signal from the yaw rate as one of the inputs to operate the vehicle stability enhancement system (VSES).

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0196 Yaw Rate Circuit

Conditions for Running the DTC

The ignition voltage is greater than 8 volts.

Conditions for Setting the DTC

The EBCM will set the DTC when one or more of the following conditions have occurred:

- The yaw rate signal is less than 0.18 volt or greater than 4.84 volts.
- The yaw rate signal changes to rapidly based on vehicle dynamics.
- The internal calibration in the yaw rate is out of range.
- The yaw and lateral acceleration sensor has failed and internal self check test.

Action Taken When the DTC Sets

If equipped, the following actions will occur:

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- The EBCM disables VSES for the duration of the ignition cycle.
- The driver information center (DIC) displays the Service Stability System message.

Conditions for Clearing the DTC

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

Diagnostic Aids

The lateral accelerometer is packaged with the yaw rate sensor as a single component.

Test Description

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

- 2:** Tests for the proper voltage output on the 5-volt reference circuit and the proper operation of the signal circuit.
- 3:** Tests for possible low 5-volt reference output or a problem with the signal circuit.
- 4:** Tests for a short to voltage on the 5-volt reference circuit. If a short to voltage exists, other DTCs may be set for the vehicle stability system.
- 8:** Tests for a problem with the low reference circuit. If a short to voltage exists, other DTCs may be set for the vehicle stability system.

DTC C0196

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
	1. Turn OFF the ignition. 2. Disconnect the yaw and lateral acceleration sensor harness connector. 3. Connect a 3-amp fused jumper wire between the 5-volt reference circuit			

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2	of the yaw and lateral acceleration sensor and the signal circuit of the yaw and lateral acceleration sensor. 4. Turn ON the ignition, with the engine OFF. 5. With the scan tool, observe the yaw rate signal voltage. Does the scan tool indicate that the yaw rate signal parameter is in between the specified voltage range?	4.5-5.5 V	Go to Step 8	Go to Step 3
3	With the 3-amp fused jumper wire still connected, does the scan tool indicate that the Yaw Rate Sensor parameter is below the specified voltage value?	4.5 V	Go to Step 5	Go to Step 4
4	Test the 5-volt reference circuit of the yaw and lateral acceleration 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 12	Go to Step 7
5	Test the 5-volt reference circuit of the yaw and lateral acceleration sensor for the following conditions: • An open • A short to ground • A high resistance Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 6
6	Test the yaw rate signal circuit for the following conditions: • An open • A short to ground • A high resistance	-		

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 12	Go to Step 11
7	Test the yaw rate signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 11
8	Test the low reference circuit of the yaw and lateral acceleration sensor for the following conditions: • An open • A short to voltage • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 9
9	Inspect for poor connections at the harness connector of the yaw and lateral acceleration sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 10
10	Replace the yaw and lateral acceleration sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the replacement?	-	Go to Step 12	-
11	Replace the electronic brake control module (EBCM). Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 12	-
	1. Clear the DTCs using the scan tool. 2. Operate the vehicle within the			

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12	Conditions for Running the DTC as specified in the supporting text.	-		
	Does the DTC reset?		Go to Step 2	System OK

DTC C0220-C0229

Circuit Description

The system relay is energized when the ignition is ON. The system relay supplies voltage to the valve relay. The electronic brake control module (EBCM) activates the valve relay to supply voltage to the valve solenoids. This voltage is referred to as the system voltage. The EBCM microprocessor activates individual valve solenoids by grounding the valve solenoid control circuits.

Conditions for Running the DTC

- The ignition is ON.
- The vehicle is experiencing an ABS event.

Conditions for Setting the DTC

This code is set when the following criteria are met.

- The EBCM is commanding a valve solenoid to release brake pressure.
- The wheel that is commanded to release brake pressure has a speed below 5 km/h (3 mph) for 1.25 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur.

- The EBCM disables ABS/TCS.
- ACC Braking is degraded.
- VSES is disabled.
- The ABS indicator turns ON.
- The traction off 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.

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- 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

The solenoid valve circuit is internal to the EBCM. The solenoid valve circuit is not diagnosable external to the EBCM. The DTC sets when there is a malfunction in the solenoid circuit internal to the EBCM.

Possible causes for this concern:

- Intermittent wheel speed sensor
- Wheel speed sensor is equal to 0 km/h (0 mph)
- Contaminated hydraulic unit

Test Description

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

2: Determines whether the DTC is current.

DTC C0220-C0229

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
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. 4. Use the scan tool to perform the Automated Test. Refer to <u>Scan Tool Output Controls</u> . Does the DTC reset as a current DTC?	Go to Step 3	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems
3	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	Go to Step 4	-
	1. Use the scan tool in order to clear the DTCs		

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4	2. With the scan tool, perform the Automated Test.		
	Does the DTC reset?	Go to Step 3	System OK

DTC C0241 OR P0856

Circuit Description

The electronic brake control module (EBCM) and the engine control module (ECM) simultaneously control the traction control. The ECM reduces the amount of torque supplied to the drive wheels by retarding spark timing and selectively turning OFF fuel injectors. The EBCM actively applies the brakes to the front wheels in order to reduce torque.

The EBCM sends a requested torque message via a pulse width modulated (PWM) signal to the ECM. The duty cycle of the signal is used to determine how much engine torque the EBCM is requesting the ECM to deliver. Normal values are between 10-90 percent duty cycle. The signal should be at 90 percent when traction control is not active and at lower values during traction control activations. The ECM supplies a pull up voltage of 12 volts that the EBCM switches to ground to create the signal.

The ECM sends a delivered torque message via a PWM signal to the EBCM. The duty cycle of the signal is used to determine how much engine torque the ECM is delivering. Normal values are between 10-90 percent duty cycle. The signal should be at low values, around 10 percent, at idle and higher values under driving conditions. The EBCM supplies a pull up voltage of 12 volts that the ECM switches to ground to create the signal.

When certain ECM DTCs are set, the ECM will not be able to perform the torque reduction portion of traction control. A serial data message is sent to the EBCM indicating that traction control is not allowed.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

The PCM diagnoses the requested torque signal circuit and sends a serial data message to the EBCM indicating that torque reduction is not allowed.

Action Taken When the DTC Sets

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- The EBCM disables the EDC/TCS for the duration of the ignition cycle.
- The Traction Off indicator turns ON.
- The ABS remains functional.

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.
- The PCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive warm-up cycles.

Diagnostic Aids

The following conditions can cause this concern:

- An open in the delivered torque circuit.
- An short to ground or voltage in the delivered torque circuit.
- A wiring problem, terminal corrosion, or poor connection in the delivered torque circuit.
- A communication frequency problem.
- A communication duty cycle problem.
- The EBCM is not receiving information from the PCM.
- Loose or corroded EBCM ground or PCM ground.

Test Description

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

- 2:** Use the scan tool in order to determine if the requested torque signal has a valid duty cycle.
- 3:** Measure the requested torque signal in order to determine if the signal has a valid duty cycle.
- 4:** Measure the requested torque signal in order to determine if the signal has a valid frequency.
- 10:** This vehicle is equipped with a ECM which uses an Electrically Erasable Programmable Read Only Memory (EEPROM). When replacing the ECM, the replacement ECM must be programmed.

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DTC C0241 or P0856

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> , <u>Engine Controls Connector End Views</u> in Engine Controls - 3.6L, or <u>Engine Controls Connector End Views</u> in Engine Controls - 4.6L				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Start the engine. 3. With a scan tool, observe the Torque Request Signal parameter in the Powertrain Control Module data list. Does the scan display less than the specified value?	100%	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Install the J 39700 universal breakout box using the J 39700-300 cable adapter to the EBCM harness connector and the EBCM connector. See <u>Special Tools and Equipment</u> . 4. Start the engine. 5. Measure the DC duty cycle between the requested torque signal circuit and a good ground. Is the duty cycle within the specified range?	5-95%	Go to Step 4	Go to Step 5
	Measure the DC frequency between the requested torque signal circuit and a	121-134		

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4	good ground. Does the frequency measure within the specified range?	Hz	Go to Step 7	Go to Step 5
5	1. Turn OFF the ignition. 2. Disconnect the J 39700-300 cable adapter from the EBCM connector. See <u>Special Tools and Equipment</u>. 3. Turn ON the ignition, with the engine OFF. 4. Measure the voltage from the requested torque signal circuit to a good ground. Does the voltage measure near the specified value?	B+	Go to Step 9	Go to Step 6
6	1. Turn OFF the ignition. 2. Disconnect the engine control module (ECM) harness connector. 3. Test the requested torque signal circuit for the following conditions: • A short to voltage • A short to ground Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 9
7	1. Turn OFF the ignition. 2. Disconnect the engine control module (ECM) harness connector. 3. Test the requested torque signal circuit for the following conditions: • An open • A high resistance	-		

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 12	Go to Step 8
8	Inspect for poor connections the harness connector of the ECM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 10
9	Inspect for poor connections the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 12	Go to Step 11
10	IMPORTANT: The replacement ECM must be programmed. Replace the ECM. Refer to <u>Engine Control Module (ECM) Replacement</u> in Engine Controls - 3.6L, or <u>Engine Control Module (ECM) Replacement</u> in Engine Controls - 4.6L. Did you complete the repair?	-	Go to Step 12	-
11	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 12	-
12	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 C0242

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

The PCM diagnoses a condition preventing the engine control portion of the traction control function and sends a serial data message to the EBCM indicating that torque reduction is not allowed. The PCM will typically set a DTC and the EBCM will set this DTC.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the TCS/VSES for the duration of the ignition cycle.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the following messages:
 - Service Traction System
 - Service Active Handling
- The ABS remains functional.

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

This DTC is for information only. As an aid to the technician, this DTC indicates that there are no problems in the ABS/TCS system.

DTC C0242

Step	Action	Yes	No
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Schematic Reference: ABS Schematics

1	Did you perform the Diagnostic System Check - ABS?	-	Go to <u>Diagnostic System Check</u> <u>- ABS</u>
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DTC C0243

Circuit Description

The electronic brake control module (EBCM) sends an engine drag control (EDC) request via a dedicated data line. The engine control module (ECM) supplies a pull up voltage of 12 volts that the EBCM switches to ground to create the signal.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

The EBCM receives a serial data message from the PCM indicating that the EDC circuit has failed.

Action Taken When the DTC Sets

- The EBCM disables the EDC for the duration of the ignition cycle.
- The DIC displays the Service Stability System message.
- The ABS/TCS remains functional.

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

The following conditions can cause this concern:

- An open in the EDC control circuit.
- An short to ground or voltage in the EDC control circuit.
- A wiring problem, terminal corrosion, or poor connection in the EDC control circuit.

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Test Description

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

9: This vehicle is equipped with a ECM which uses an Electrically Erasable Programmable Read Only Memory (EEPROM). When replacing the ECM, the replacement ECM must be programmed.

DTC C0243

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Inspect the EBCM ground and ECM ground, making sure each ground is clean and torqued to the proper specification. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 3
3	1. Disconnect the EBCM harness connector. 2. Install the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector and the EBCM connector. See Special Tools and Equipment . 3. Disconnect the engine control module (ECM) harness connector. 4. Turn ON the ignition, with the engine OFF. 5. Measure the voltage from the engine drag control signal circuit to a good ground. Does the voltage measure near the	B+	Go to Step	

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	specified value?		4	Go to Step 5
4	1. Turn OFF the ignition. 2. Disconnect the J 39700-300 cable adapter from the EBCM connector. See <u>Special Tools and Equipment</u>. 3. Turn ON the ignition, with the engine OFF. 4. Test the engine drag control signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 6
5	1. Turn OFF the ignition. 2. Disconnect the J 39700-300 cable adapter from the EBCM connector. See <u>Special Tools and Equipment</u>. 3. Test the engine drag control signal circuit for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 7
6	Inspect for poor connections the harness connector of the ECM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 8
7	Inspect for poor connections the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems.	-	Go to Step	

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	Did you find and correct the condition?		10	Go to Step 9
8	IMPORTANT: The replacement ECM must be programmed. Replace the ECM. Refer to <u>Engine Control Module (ECM) Replacement</u> in Engine Controls - 3.6L, or <u>Engine Control Module (ECM) Replacement</u> in Engine Controls - 4.6L. Did you complete the repair?	-	Go to Step 10	-
9	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . 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 C0244 OR P1689

Circuit Description

The electronic brake control module (EBCM) and the engine control module (ECM) simultaneously control the traction control. The ECM reduces the amount of torque supplied to the drive wheels by retarding spark timing and selectively turning OFF fuel injectors. The EBCM actively applies the brakes to the front wheels in order to reduce torque.

The EBCM sends a requested torque message via a pulse width modulated (PWM) signal to the ECM. The duty cycle of the signal is used to determine how much engine torque the EBCM is requesting the ECM to deliver. Normal values are between 10-90 percent duty cycle. The signal should be at 90 percent when traction control is not active and at lower values during traction control activations. The ECM supplies a pull up voltage of 12 volts that the EBCM switches to ground to create the signal.

The ECM sends a delivered torque message via a PWM signal to the EBCM. The duty cycle of the signal is used to determine how much engine torque the ECM is delivering. Normal values are between 10-90 percent duty cycle. The signal should be at low values, around 10 percent, at idle

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and higher values under driving conditions. The EBCM supplies a pull up voltage of 12 volts that the ECM switches to ground to create the signal.

When certain ECM DTCs are set, the ECM will not be able to perform the torque reduction portion of traction control. A serial data message is sent to the EBCM indicating that traction control is not allowed.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

C1276

One of the following conditions exists:

- The EBCM detects that delivered torque signal is out of the valid range.
- The EBCM does not receive the delivered torque signal.

P1644 or P1689

The PCM detects that the delivered torque signal voltage is invalid.

Action Taken When the DTC Sets

- The EBCM disables the TCS for the duration of the ignition cycle.
- The PCM will store conditions which were present when the DTC set as Fail Records data only.
- The Traction Off indicator turns ON.
- The ABS remains functional.

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.
- The PCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive warm-up cycles.

Diagnostic Aids

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The following conditions can cause this concern:

- An open in the delivered torque circuit.
- An short to ground or voltage in the delivered torque circuit.
- A wiring problem, terminal corrosion, or poor connection in the delivered torque circuit.
- A communication frequency problem.
- A communication duty cycle problem.
- The EBCM is not receiving information from the PCM.
- Loose or corroded EBCM ground or PCM ground.

Test Description

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

3: Use the scan tool in order to determine if the delivered torque signal has a valid duty cycle.

9: This vehicle is equipped with a ECM which uses an Electrically Erasable Programmable Read Only Memory (EEPROM). When replacing the ECM, the replacement ECM must be programmed.

DTC C0244 or P1689

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> or <u>Engine Electrical Connector End Views</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Inspect the EBCM ground and ECM ground, making sure each ground is clean and torqued to the proper specification. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 3
	1. Install a scan tool. 2. Start the engine.			Go to <u>Testing for Intermittent</u>

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3	3. With a scan tool, observe the Delivered Torque parameter in the DRP/ABS/TCS data list. Does the scan tool display the specified value?	90%	Go to Step 4	<u>Conditions and Poor Connections</u> in Wiring Systems
4	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Install the J 39700 universal breakout box using the J 39700-300 cable adapter to the EBCM harness connector and the EBCM connector. See <u>Special Tools and Equipment</u>. 4. Disconnect the engine control module (ECM) harness connector. 5. Turn ON the ignition, with the engine OFF. 6. Measure the voltage from the delivered torque signal circuit to a good ground. Does the voltage measure near the specified value?	B+	Go to Step 5	Go to Step 6
5	1. Turn OFF the ignition. 2. Disconnect the J 39700-300 cable adapter from the EBCM connector. See <u>Special Tools and Equipment</u>. 3. Turn ON the ignition, with the engine OFF. 4. Test the delivered torque signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems.	-	Go to Step	

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	Did you find and correct the condition?		11	Go to Step 7
6	1. Turn OFF the ignition. 2. Disconnect the J 39700-300 cable adapter from the EBCM connector. See Special Tools and Equipment. 3. Test the delivered torque signal circuit for the following conditions: • An open • A short to ground • A high resistance Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 8
7	Inspect for poor connections the harness connector of the ECM. 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 11	Go to Step 9
8	Inspect for poor connections 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 11	Go to Step 10
9	IMPORTANT: The replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement in Engine Controls - 3.6L or Engine Control Module (ECM) Replacement in Engine Controls - 4.6L. Did you complete the repair?	-	Go to Step 11	-
	IMPORTANT:			

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10	Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550. Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	-	Go to 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

DTC C0252

Circuit Description

The vehicle stability enhancement system (VSES) is activated by the electronic brake control module (EBCM) calculating the desired yaw rate and comparing it to the actual yaw rate input. The desired yaw rate is calculated from measured steering wheel position, vehicle speed, and lateral acceleration. The difference between the desired yaw rate and actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. If the yaw rate error becomes too large, the EBCM will attempt to correct the vehicle's yaw motion by applying differential braking to the left or right front wheel.

The amount of differential braking applied to the left or right front wheel is based on both the yaw rate error and side slip rate error. The side slip rate error is a function of the lateral acceleration minus the product of the yaw rate and vehicle speed. The yaw rate error and side slip rate error are combined to produce the total delta velocity error. When the delta velocity error becomes too large and the VSES system activates, the drivers steering inputs combined with the differential braking will attempt to bring the delta velocity error toward zero.

The VSES activations generally occur during aggressive driving, in the turns or bumpy roads

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without much use of the accelerator pedal. When braking during VSES activation, the brake pedal will feel different than the ABS pedal pulsation. The brake pedal pulsates at a higher frequency during VSES activation.

Conditions for Running the DTC

- The steer angle has been centered.
- The VSES is active.
- The direction (understeer or oversteer) of the yaw rate error has not changed.
- The centered lateral acceleration value is less than 0.5 g.
- The yaw rate error is less than 6 degrees/second.
- The side slip error is greater than 1.8 meters/second*second.

Conditions for Setting the DTC

One of the following conditions exists:

- The yaw rate error is greater than 10 degrees/second with the vehicle speed less than 60 km/h (37 mph) and the acceleration pedal is pressed more than 25 percent of the pedal travel range for 1 second during the VSES activation.
- With the yaw rate less than 8 degrees/second, the side slip error is greater than 4.9 meters/second² for 5 seconds.

Action Taken When the DTC Sets

- The EBCM disables the VSES for the duration of the ignition cycle.
- The DIC displays the Service Stability System message.
- The ABS/TCS remains functional.

Conditions for Clearing the DTC

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

Diagnostic Aids

The following conditions can cause this concern:

- Improper steering alignment.

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- Open, short to ground, or short to voltage.
- Internal lateral accelerometer failure.
- EBCM internal failure.

Test Description

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

2: Perform the Steering Position Sensor Test in order to verify that the steering wheel position sensor (SWPS) is operating properly.

3: Verify that the lateral accelerometer input parameter is within the valid range.

4: Verify that the yaw rate input parameter is within the valid range.

DTC C0252

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Step 3	Go to Step 7
3	With a scan tool, observe the Lateral Accelerometer Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 4	Go to Step 8
4	With a scan tool, observe the Yaw Rate Sensor Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 5	Go to Step 8

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5	1. Use the scan tool in order to clear the DTCs. 2. Perform the Diagnostic Test Drive. Refer to <u>Diagnostic Test Drive</u>. Does the DTC reset?	-	Go to Step 6	Go to Diagnostic Aids
6	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	-	Go to Step 9	-
7	Replace the steering wheel position sensor (SWPS). Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the replacement?	-	Go to Step 9	-
8	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>. 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

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Circuit Description

The electronic brake control module (EBCM) calibrates the steering sensor output so that the output reads zero when the steering wheel is centered. Using the yaw rate input, lateral accelerometer input, and the wheel speed sensor inputs, the initial steering center position is calculated after driving greater than 10 km/h (6 mph) for more than 10 seconds in a straight line on a level surface.

Conditions for Running the DTC

C0253

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

C0254

- The ignition is ON.
- Ignition voltage is greater than 8 volts.
- The steer angle has been centered.

Conditions for Setting the DTC

C0253

The vehicle speed is greater than 40 km/h (25 mph) for 10 minutes without completing steer angle centering.

C0254

The steering sensor bias moves greater than 40 degrees after steer centering was accomplished.

Action Taken When the DTC Sets

- The EBCM disables the vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- The driver information center (DIC) displays the Service Stability System message.
- The ABS remains functional.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present and the DTC is cleared with a scan tool.

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- 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

- Check the vehicle for proper alignment. The car should not pull in either direction while driving straight on a level surface.
- The Snapshot function on the scan tool can help find an intermittent DTC.

Test Description

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

2: Perform the Steering Position Sensor Test in order to verify that the steering wheel position sensor (SWPS) is operating properly.

3: Verify that the lateral accelerometer input parameter is within the valid range.

4: Verify that the yaw rate input parameter is within the valid range.

DTC C0253 or C0254

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check</u> <u>- ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Step 3	Go to Step 7
3	With a scan tool, observe the Lateral Accelerometer Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 4	Go to Step 8
	With a scan tool, observe the Yaw Rate Sensor Input parameter in the VSES data			

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4	list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 5	Go to Step 8
5	1. Use the scan tool in order to clear the DTCs. 2. Perform the Diagnostic Test Drive. Refer to <u>Diagnostic Test Drive</u> . Does the DTC reset?	-	Go to Step 6	Go to Diagnostic Aids
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 9	-
7	Replace the steering wheel position sensor (SWPS). Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the replacement?	-	Go to Step 9	-
8	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . 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 C0281

Circuit Description

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 operating software in the EBCM. The DRP uses active control with the existing ABS in order to regulate the vehicle's rear brake pressure.

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Conditions for Running the DTC

One or more faults have been detected by the EBCM in the ABS/TCS systems.

Conditions for Setting the DTC

One of the following conditions exists:

- DTC C0121, C0113, C0114, C0115, C0900, or C0550 sets.
- Two wheel speed sensor DTCs on the same axle set.

Action Taken When the DTC Sets

- The EBCM disables the DRP for the duration of the ignition cycle.
- 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

This DTC is for information only. As an aid to the technician, this DTC indicates that another DTC exists that fails DRP.

Test Description

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

2: Verifies whether other ABS/TCS/VSES DTCs are set.

DTC C0281

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>

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2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the display DTCs function on the scan tool for the EBCM.	Go to <u>Diagnostic System Check - ABS</u>	Go to Step 3
	Does the scan tool display any ABS/TCS/VSES DTCs?		
3	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.	Go to Step 2	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring System
	Does the DTC reset?		

DTC C0460 OR C0461

Circuit Description

The steering wheel position sensor supplies 2 analog inputs, Phase A and Phase B, to the electronic brake control module (EBCM). The 2 input signals are approximately 90 degrees out of phase. By interpreting the relationship between the 2 inputs, the EBCM can determine the position of the steering wheel and the direction of the steering wheel rotation.

Conditions for Running the DTC

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

Conditions for Setting the DTC

C0460

One of the following conditions exists:

- Both Phase A and Phase B are greater than 4.9 volts or less than 0.2 volts for 1.6 seconds.
- The changes in Phase A or Phase B is greater than 36 degrees between consecutive scans of the signal.

C0461

The difference in the phase angle between Phase A and Phase B is greater than 16 degrees continuously for 0.25 seconds.

Action Taken When the DTC Sets

- The EBCM disables the vehicle stability enhancement system (VSES) for the duration of the ignition cycle.
- The driver information center (DIC) displays the Service Stability System message.
- The ABS remains functional.

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

- Check the vehicle for proper alignment. The car should not pull in either direction while driving straight on a level surface.
- The Snapshot function on the scan tool can help find an intermittent DTC.

Test Description

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

- 2:** Perform the Steering Position Sensor Test in order to verify if the steering wheel position sensor (SWPS) is operating properly.
- 3:** Tests for the proper operation of the steering wheel position signal A circuit in the low voltage range.
- 4:** Tests for the proper operation of the steering wheel position signal B circuit in the low voltage range.
- 5:** Tests for the proper operation of the steering wheel position signal A circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.
- 6:** Tests for the proper operation of the steering wheel position signal B circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.
- 7:** Tests for a short to voltage in the 5-volt reference circuit.

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8: Tests for a high resistance or an open in the low reference circuit.

DTC C0460 or C0461

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check-ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the steering wheel position sensor (SWPS) connector. 3. Turn ON the ignition, with the engine OFF. 4. With the scan tool, observe the Dual Analog SWPS Input A parameter in the VSES data list. Does the scan tool indicate the Dual Analog SWPS Input A parameter is less than the specified value?	0.2 V	Go to Step 4	Go to Step 13
4	With the scan tool, observe the Dual Analog SWPS Input B parameter. Does the scan tool indicate the Dual Analog SWPS Input B parameter is less than the specified value?	0.2 V	Go to Step 5	Go to Step 14
	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit			

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5	of the steering wheel position sensor (SWPS) and the signal A circuit of the steering wheel position sensor (SWPS). - Turn ON the ignition, with the engine OFF. - With the scan tool, observe the Dual Analog SWPS Input A parameter. Does the scan tool indicate that the Dual Analog SWPS Input A parameter is greater than the specified value?	4.9 V	Go to Step 6	Go to Step 10
6	- Turn OFF the ignition. - Disconnect the fused jumper wire. - Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the steering wheel position sensor (SWPS) and the signal B circuit of the steering wheel position sensor (SWPS). - Turn ON the ignition, with the engine OFF. - With the scan tool, observe the Dual Analog SWPS Input B parameter. Does the scan tool indicate that the Dual Analog SWPS Input B parameter is greater than the specified value?	4.9 V	Go to Step 7	Go to Step 10
7	- Disconnect the fused jumper wire. - Measure the voltage between the 5-volt reference circuit of the steering wheel position sensor (SWPS) and the low reference circuit of the steering wheel position sensor (SWPS). Does the voltage measure less the specified value?	5 V	Go to Step 8	Go to Step 9

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8	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. Refer to <u>Battery Negative Cable Disconnect/Connect Procedure</u> in Engine Electrical. 3. Measure the resistance from the low reference circuit of the steering wheel position sensor (SWPS) to a good ground. Does the resistance measure less than the specified value?	5 ohms		Go to Step 16	Go to Step 15
9	Test the 5-volt reference circuit of the steering wheel position sensor (SWPS) for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-		Go to Step 20	Go to Step 17
10	Test the 5-volt reference circuit of the steering wheel position sensor (SWPS) for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-		Go to Step 20	Go to Step 11
11	Test the signal A circuit of the steering wheel position sensor (SWPS) for the following conditions: • An open • A short to ground • A high resistance	-			

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	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?		Go to Step 20	Go to Step 12
12	Test the signal B circuit of the steering wheel position sensor (SWPS) for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 20	Go to Step 17
13	Test the signal A circuit of the steering wheel position sensor (SWPS) for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 20	Go to Step 17
14	Test the signal B circuit of the steering wheel position sensor (SWPS) for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 20	Go to Step 17
15	1. Disconnect the EBCM harness connector. 2. Install the J 39700 universal pinout box using the J 39700-300 cable adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 3. Test the low reference circuit of the steering wheel position sensor (SWPS) for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems.	-		

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	Did you find and correct the condition?		Go to Step 20	Go to Step 17
16	Inspect for poor connections at the harness connector of the steering wheel position sensor (SWPS). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 20	Go to Step 18
17	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 20	Go to Step 19
18	Replace the steering wheel position sensor (SWPS). Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the repair?	-	Go to Step 20	-
19	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 20	-
20	1. Clear the DTCs using the scan tool. 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

The electronic brake control module (EBCM) detects an internal malfunction or loss of ground.

Conditions for Running the DTC

The ignition switch is in the ON position.

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Conditions for Setting the DTC

- An internal EBCM malfunction exists.
- System voltage is less than half the ignition voltage continuously for 0.04 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The Antilock Brake System (ABS)/adaptive cruise control (ACC)/dynamic rear proportion (DRP)/engine drag control (EDC)/tire pressure monitor (TPM)/variable effort steering (VES)/Vehicle Stability Enhancement System (VSES) are disabled.
- Traction Control System (TCS) is degraded.
- The ABS/TCS indicators turn ON.
- The red BRAKE Warning indicator turns ON.

The driver information center (DIC) displays the following:

- Service ABS
- Service Traction System
- Service Stabilitrak
- Service Radar Cruise

Conditions for Clearing the DTC

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

Diagnostic Aids

When a EBCM has been replaced, but has not been programmed, DTC C0550 will set.

Possible causes of this DTC:

- Open ground at the EBCM
- Internal malfunction in the EBCM

Test Description

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

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2: Tests for a proper ground to the EBCM.

DTC C0550

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Test both of the ground circuits of the electronic brake control module (EBCM) for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 5	Go to Step 3
3	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 5	Go to Step 4
4	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	Go to Step 5	-
5	1. Use the scan tool 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 C0551

Circuit Description

When the electronic brake control module (EBCM) is replaced, software and calibrations are flash programmed into the EBCM. The EBCM receives the vehicle powertrain options information from the powertrain control module (PCM) in order for the EBCM to automatically calibrate to the vehicle.

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Conditions for Running the DTC

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

Conditions for Setting the DTC

One or more of the following conditions are present:

- The incorrect EBCM is installed on the vehicle.
- The incorrect software or calibrations have been flash programmed into the EBCM.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EDC/TCS are disabled.
- The TCS indicator turns ON.

The DIC displays the Service Traction System message.

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

If the DTC was set after EBCM replacement, verify that the replacement EBCM and software are correct for the vehicle.

DTC C0551

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Is the EBCM the correct module for the vehicle?	Go to Step 4	Go to Step 3
	Replace the EBCM. Refer to <u>Electronic</u>		

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3	<u>Brake Control Module Replacement.</u> Did you complete the repair?	Go to Step 5	Go to Step 4
4	Reprogram the EBCM. Refer to <u>Service Programming System (SPS)</u> in Programming. Did you complete the repair?	Go to Step 5	-
5	1. Use the scan tool in order to clear the DTCs. 2. Turn ON the ignition. Does the DTC reset?	Go to Step 2	System OK

DTC C0561

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

The PCM or BCM diagnoses a condition preventing the engine control portion of the traction control function and sends a serial data message to the EBCM indicating that torque reduction is not allowed. The PCM or BCM will typically set a DTC and the EBCM will set this DTC.

Action Taken When the DTC Sets

- The EBCM disables the TCS until the DTC becomes a history DTC.
- The Traction Off indicator turns ON.
- The ABS remains functional.

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.

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Diagnostic Aids

This DTC is for information only. As an aid to the technician, this DTC indicates that there are no problems in the ABS/TCS system.

DTC C0561

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - ABS?	-	Go to <u>Diagnostic System Check - ABS</u>

DTC C0565

Circuit Description

When the electronic brake control module (EBCM) is replaced, software and calibrations are flash programmed into the EBCM. The EBCM receives the vehicle identification number information from the vehicle in order for the EBCM to automatically calibrate to the vehicle.

Conditions for Running the DTC

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

Conditions for Setting the DTC

One or more of the following conditions are present:

- The incorrect EBCM is installed on the vehicle.
- The incorrect software or calibrations have been flash programmed into the EBCM.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EDC/TCS are disabled.
- The TCS indicator turns ON.

The DIC displays the Service Traction System message.

Conditions for Clearing the DTC

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- 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

If the DTC was set after EBCM replacement, verify that the replacement EBCM and software are correct for the vehicle.

DTC C0565

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Is the EBCM the correct module for the vehicle?	Go to Step 4	Go to Step 3
3	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	Go to Step 5	Go to Step 4
4	Reprogram the EBCM. Refer to <u>Service Programming System (SPS)</u> in Programming. Did you complete the repair?	Go to Step 5	-
5	1. Use the scan tool in order to clear the DTCs. 2. Turn ON the ignition. Does the DTC reset?	Go to Step 2	System OK

DTC C0820

Circuit Description

The electronic brake control module (EBCM) monitors the voltage level of the EBCMs case. If the voltage level is too high, damage may result in the system. When the EBCM detects a high voltage condition, the EBCM turns OFF the system relay which removes battery voltage from the solenoid valves and pump motor.

Conditions for Running the DTC

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The ignition is ON.

Conditions for Setting the DTC

The case voltage is greater than 2 volts for 0.1 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/ACC/VSES for the duration of the ignition cycle.
- The DRP and TCS are degraded.
- The ABS indicator turns ON.
- The Traction Control indicator turns ON.
- The DIC displays the Service Stability System message.
- 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

Possible causes of this DTC are the following conditions:

- Internal short in the pump motor.
- External battery supply shorted to case.
- Internal EBCM battery supply shorted to case.

The pump motor is integral to the BPMV. The pump motor is not serviceable.

Test Description

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

3: Tests the ability of the EBCM to control the pump motor. If the test lamp illuminates, the pump motor circuit within the EBCM is good.

DTC C0820

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Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>			
1	Did you perform the Diagnostic System Check - ABS?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
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. 4. With the scan tool, perform the Automated Test. Does the DTC reset?	Go to Step 3	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems
3	1. Turn OFF the ignition. 2. Disconnect the pump motor harness pigtail connector of the BPMV. 3. Connect a test lamp between the pump motor circuits at the pump motor connector of the EBCM using the J 35616 Connector Test Adapter Kit. 4. Use the scan tool in order to clear the DTCs. 5. With the scan tool, perform the Pump Motor Test. Does the test lamp illuminate?	Go to Step 5	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Connect the J 39700 Universal Pinout Box using the J 39700-300 Cable Adapter to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 4. Test both ground circuits of the EBCM		

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	including the EBCM ground for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems.		
	Did you find and correct the condition?	Go to Step 9	Go to Step 6
5	Inspect for poor connections at the pump motor harness pigtail connector of the BPMV. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 7
6	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 9	Go to Step 8
7	Replace the BPMV. Refer to <u>Brake Pressure Modulator Valve (BPMV) Replacement</u> . Did you complete the repair?	Go to Step 9	-
8	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	Go to Step 9	-
9	1. Use the scan tool in order to clear the DTCs. 2. With the scan tool, perform the Automated Test. Does the DTC reset?	Go to Step 2	System OK

DTC C0870**Circuit Description**

The electronic brake control module (EBCM) supplies voltage to the brake pressure sensor, steering angle sensor, and yaw rate/lateral accelerometer sensor. This voltage is monitored by the EBCM for an over or under voltage condition.

Conditions for Running the DTC

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

Conditions for Setting the DTC

One of the follow conditions exists for 0.1 seconds:

- The sensor supply voltage is greater than 5.2 volts.
- The sensor supply voltage is less than 4.8 volts.

Action Taken When the DTC Sets

- The EBCM disables the VSES for the duration of the ignition cycle.
- ACC braking function disabled.
- TCS is degraded.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the Service Active Handling message.

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

The following conditions can cause this concern:

- The sensor supply circuit is open, shorted to ground, or shorted to battery.
- Internal sensor malfunction.
- Internal EBCM malfunction.

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Test Description

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

5: Tests for a short at the brake pressure sensor.

6: Tests for a short at the steering wheel position sensor.

7: Tests for a short at the yaw rate/lateral accelerometer sensor.

DTC C0870

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Test the 5-volt reference circuit from the EBCM for the following conditions: • An open • A short to ground • A high resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 3
3	Test the 5-volt reference circuit from the EBCM for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 4
	1. Turn OFF the ignition. 2. Disconnect the EBCM. 3. Install the J 39700 Universal Pinout Box (see <u>Special Tools and Equipment</u>) with the J 39700-530 Cable Adapter between the EBCM			

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4	and the EBCM harness connector. - Turn ON the ignition, with the engine OFF. - Using the DMM, measure the voltage between the 5 volt reference circuit and ground. Is the voltage within the specified value?	4.8-5.2 V	Go to Diagnostic Aids	Go to Step 5
5	- Turn OFF the ignition. - Disconnect the brake pressure sensor. - Turn ON the ignition, with the engine OFF. - Using the DMM, measure the voltage between the 5 volt reference circuit and ground. Is the voltage within the specified value?	4.8-5.2 V	Go to Step 8	Go to Step 6
6	- Turn OFF the ignition. - Disconnect the steering wheel position sensor connector - Turn ON the ignition, with the engine OFF. - Using the DMM, measure the voltage between the 5 volt reference circuit and ground. Is the voltage within the specified value?	4.8-5.2 V	Go to Step 9	Go to Step 7
7	- Turn OFF the ignition. - Disconnect the yaw rate/lateral accelerometer sensor connector - Turn ON the ignition, with the engine OFF. - Using the DMM, measure the voltage between the 5 volt reference circuit and ground.	4.8-5.2 V		

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	Is the voltage within the specified value?		Go to Step 10	Go to Step 11
8	Inspect for poor connections at the harness connector of the brake pressure sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 12
9	Inspect for poor connections at the harness connector of the steering wheel position sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
10	Inspect for poor connections at the harness connector of the yaw rate/lateral accelerometer sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 14
11	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 15
12	Replace the brake pressure sensor. Refer to <u>Brake Fluid Pressure Sensor Replacement</u> . Did you complete the repair?	-	Go to Step 16	
13	Replace the steering wheel position sensor. Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the repair?	-	Go to Step 16	

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14	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the repair?	-	Go to Step 16	
15	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 16	
16	1. Clear the DTCs using the scan tool. 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 C0899

Circuit Description

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

Conditions for Running the DTC

- The vehicle speed is greater than 8 km/h (5 mph).
- The system relay is commanded ON.

Conditions for Setting the DTC

One of the following conditions exists for 0.72 seconds:

- During initialization or when the system is inactive, the system voltage is less than 10.8 volts.
- During the system operation, the system voltage is less than 9.0 volts.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/ACC/VES/VSES for the duration of the ignition cycle.
- The ABS indicator turns ON.

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- The traction control indicator turns ON.
- The DIC displays the Service Stabilitrak and Service ABS messages.
- DRP and TCS are degraded.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Test the charging system. Refer to **Diagnostic System Check - ABS**.
- Possible causes of this DTC are the following conditions:
 - A charging system malfunction
 - An excessive battery draw
 - A weak battery
 - A faulty system ground

Test Description

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

- 2:** Use the scan tool in order to inspect the voltage to the EBCM.
- 3:** Use the scan tool in order to inspect the voltage to the body control module (BCM). A low voltage value in multiple modules indicates a concern in the charging system.
- 5:** Verifies that the condition is still present.

DTC C0899

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
	1. Install a scan tool. 2. Start the engine.			

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2	3. With a scan tool, observe the Switched System Battery Voltage parameter in the ABS data list. Does the scan tool indicate the voltage is greater than the specified value?	10.5 V	Go to Diagnostic Aids	Go to Step 3
3	With a scan tool, observe the Battery Volts parameter in the body control module data list. Does the scan tool indicate the voltage is greater than the specified value?	10.5 V	Go to Step 4	Go to <u>Diagnostic System Check - ABS</u>
4	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Install the J 39700 Universal Pinout Box using the J 39700-300 Cable Adaptor to the EBCM harness connector only. See <u>Special Tools and Equipment</u>. 4. Test the ground circuits of the EBCM including the EBCM ground for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 7	Go to Step 5
5	1. Connect the EBCM harness connector. 2. Turn ON the ignition, with the engine OFF. 3. Use the scan tool in order to clear the DTCs. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.	-		Go to Diagnostic

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	Does the DTC reset?		Go to Step 6	Aids
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . 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 C0900

Circuit Description

The electronic brake control module (EBCM) monitors the voltage level available for system operation. If the voltage level is too high, damage may result in the system. When the EBCM detects a high voltage condition, the EBCM turns OFF the system relay which removes battery voltage from the solenoid valves and pump motor.

Conditions for Running the DTC

The vehicle speed is greater than 8 km/h (5 mph).

Conditions for Setting the DTC

The system voltage is greater than 17 volts for 0.72 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/TCS/VSES for the duration of the ignition cycle.
- The DRP does not function optimally.
- The ABS indicator turns ON.
- The Traction Control and Active Handling indicator turns ON.
- The DIC displays the following messages:
 - Service ABS
 - Service Traction System

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- Service Active Handling

Conditions for Clearing the DTC

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

Diagnostic Aids

A possible cause of this DTC is overcharging.

Test Description

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

- 2:** Use the scan tool in order to inspect the voltage to the EBCM.
- 3:** Use the scan tool in order to inspect the voltage to the body control module (BCM). A high voltage value in multiple modules indicates a concern in the charging system.
- 4:** Verifies that the condition is still present.

DTC C0900

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Turn OFF all of the accessories. 2. Install a scan tool. 3. Start the engine 4. Run the engine at approximately 2,000 RPM. 5. With a scan tool, observe the Switched System Battery Voltage parameter in the ABS data list. Does the scan tool indicate that the voltage is greater than the specified	16.3 V		Go to Diagnostic

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	value?		Go to Step 3	Aids
3	With a scan tool, observe the Battery Volts parameter in body control module data list. Does the scan tool indicate the voltage is greater than the specified value?	16.3 V	Go to <u>Diagnostic System Check - ABS</u>	Go to Step 4
4	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 test. Does the DTC reset?	-	Go to Step 5	Go to Diagnostic Aids
5	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 6	-
6	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 test. Does the DTC reset?	-	Go to Step 2	System OK

DTC P1575

Circuit Description

The EBCM uses the BPP Sensor to determine if an extended brake travel event has occurred. If an extended brake travel condition exists, the EBCM will provide a 5 volt output via the extended brake travel circuit to the ECM.

Conditions for Running the DTC

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

Conditions for Setting the DTC

One of the following conditions exist:

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- The extended brake travel voltage is less than 0.8 volts when extended brake travel is ON.
- The extended brake travel voltage is greater than 2.0 volts when extended brake travel is OFF.

Action Taken When the DTC Sets

All systems remain functional.

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

One of the following may cause this concern:

- An open in the extended brake travel circuit.
- A short to ground or voltage in the extended brake travel circuit.

Test Description

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

3: Measure the extended brake travel circuit in order to determine if the extended brake travel signal has a valid voltage.

4: Measure the extended brake travel signal in order to determine if the EBCM is functioning properly.

8: This vehicle is equipped with a ECM which uses an electrically erasable programmable read only memory (EEPROM). When replacing the ECM, the replacement ECM must be programmed.

DTC P1575

Step	Action	Values	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u> , <u>Engine Control Module (ECM) Connector End Views in Engine Controls - 3.6L</u> , or <u>Engine Control Module (ECM) Connector End Views in Engine Controls - 4.6L</u>				
	Did you perform the Diagnostic System			Go to

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1	Check - ABS?	-	Go to Step 2	<u>Diagnostic System Check</u> - <u>ABS</u>
2	Test the extended brake travel circuit of the EBCM for the following conditions: • An open • A short to ground • A short to battery Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Install the J 39700 Universal Pinout Box using the J 39700-300 Cable Adapter to the EBCM harness connector and the EBCM connector. See <u>Special Tools and Equipment</u>. 4. Turn ON the ignition, with the engine OFF. 5. With the brake pedal released, measure the voltage between the extended brake travel circuit and a good ground. Is the voltage greater than the specified value?	2 V	Go to Step 5	Go to Step 4
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, observe the BPP Sensor Displacement parameter in the BPP System Data data list while			

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4	applying pressure to the brake pedal. 4. With the BPP Sensor Displacement parameter reading 50 percent, measure the voltage between the extended brake travel circuit and a good ground. Is the voltage of the extended brake travel signal greater than the specified value?	0.8 V	Go to Step 6	Go to Step 5
5	Inspect for poor connections the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 7
6	Inspect for poor connections the harness connector of the ECM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 8
7	IMPORTANT: Perform the setup procedure for the EBCM. An unprogrammed EBCM will result in the following conditions: • Inoperative or poorly functioning system operations • The EBCM sets DTC C0281 and DTC C0550 Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	-	Go to Step 9	
8	IMPORTANT: The replacement ECM must be programmed. Replace the ECM. Refer to <u>Engine Control Module (ECM) Replacement</u>	-		

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	in Engine Controls - 3.6L or Engine Control Module (ECM) Replacement in Engine Controls - 4.6L. Did you complete the repair?		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.	-	Go to Step 2	System OK
	Does the DTC reset?			

SYMPTOMS - ANTILOCK 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 module(s) 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 antilock 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

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

- **ABS Indicator Always On**
- **ABS Indicator Inoperative**
- **Traction Control Indicator Always On**
- **Traction Control Indicator Inoperative**
- **Traction Off Indicator Inoperative**
- **Vehicle Stability Enhancement System Inoperative**
- **Vehicle Stability Enhancement System Unwanted Activation**
- **Vehicle Stability Enhancement System Excessive Brake Pulsation**

ABS INDICATOR ALWAYS ON

Circuit Description

The instrument cluster controls the operation of the ABS indicator. The electronic brake control module (EBCM) reports the desired status of the ABS indicator via serial data messages. The ABS indicator signal circuit is a back-up reporting circuit to the serial data messages. The EBCM supplies ground through the circuit when the ABS is operating properly. When there is a problem with ABS that should turn on the ABS indicator, the EBCM opens the ABS indicator signal circuit. If there is a problem with the ABS serial data messages, the instrument cluster uses the ABS indicator signal to determine if the ABS indicator should be illuminated. Using the serial data messages and back-up circuit, the instrument cluster decides whether to turn on the ABS indicator.

Test Description

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

3: Use the scan tool to check the normal state of the ABS indicator control circuit.

4: Ensures that the instrument panel cluster (IPC) can operate the ABS indicator.

ABS Indicator Always On

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
Connector End View Reference: <u>ABS Connector End Views</u> or <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages, and Console				
	Did you perform the ABS Diagnostic			Go to

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1	System Check?	-	Go to Step 2	<u>Diagnostic System Check - ABS</u>
2	Inspect the EBCM ground, making sure the ground is clean and torqued to the proper specification. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 3
3	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the ABS Warning Indicator parameter in the DRP/ABS/TCS data list. Does the scan tool display Off?	-	Go to Step 4	Go to Step 5
4	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the ABS indicator on the instrument panel cluster (IPC) during the displays test. Does the ABS indicator illuminate during the displays test and then turn OFF?	-	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 6
5	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 7
6	Inspect for poor connections at the harness connector of the IPC. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems.	-		

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	Did you find and correct the condition?		Go to Step 9	Go to Step 8
7	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 9	-
8	IMPORTANT: Perform the setup procedure for the replacement IPC. Replace the instrument panel cluster (IPC). Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the repair?	-	Go to Step 9	-
9	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 cluster controls the operation of the ABS indicator. The electronic brake control module (EBCM) reports the desired status of the ABS indicator via serial data messages. The ABS indicator signal circuit is a back-up reporting circuit to the serial data messages. The EBCM supplies ground through the circuit when the ABS is operating properly. When there is a problem with ABS that should turn on the ABS indicator, the EBCM opens the ABS indicator signal circuit. If there is a problem with the ABS serial data messages, the instrument cluster uses the ABS indicator signal to determine if the ABS indicator should be illuminated. Using the serial data messages and back-up circuit, the instrument cluster decides whether to turn on the ABS indicator.

Test Description

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

3: Use the scan tool to check the normal state of the ABS indicator control circuit.

4: Ensures that the instrument panel cluster (IPC) can operate the ABS indicator.

ABS Indicator Inoperative

Step	Action	Value(s)	Yes	No
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Schematic Reference: ABS Schematics

Connector End View Reference: ABS Connector End Views or Instrument Panel, Gages, and Console Connector End Views in Instrument Panel, Gages, and Console

1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Inspect the EBCM ground, making sure the ground is clean and torqued to the proper specification. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 3
3	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the ABS Warning Indicator parameter in the DRP/ABS/TCS data list. Does the scan tool display Off?	-	Go to Step 4	Go to Step 5
4	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the ABS indicator on the instrument panel cluster (IPC) during the displays test. Does the ABS indicator illuminate during the displays test and then turn OFF?	-	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 6
5	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 7

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6	Inspect for poor connections at the harness connector of the IPC. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 8
7	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 9	-
8	IMPORTANT: Perform the setup procedure for the replacement IPC. Replace the instrument panel cluster (IPC). Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the repair?	-	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

TRACTION CONTROL INDICATOR ALWAYS ON

Circuit Description

The Traction Control indicator is controlled by the instrument cluster (IPC) via serial data messages from the EBCM. The EBCM send a serial data message to the IPC to illuminate the Traction Control indicator when the EBCM has disabled TCS due to a DTC. The Traction Control indicator will also turn ON during the instrument cluster bulb check. When the ignition switch is turned to ON, the Traction Control indicator will turn ON for approximately 3 seconds and then turn OFF.

Test Description

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

- 2:** Use the scan tool to check the normal state of the Traction Control indicator control.
- 3:** Ensures that the instrument cluster can operate the Traction Control indicator.

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Traction Control Indicator Always On

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> or <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages, and Console			
1	Did you perform the ABS Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the TCS Warning Indicator/Message parameter in the DRP/ABS/TCS data list. Does the scan tool display Off?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Traction Control indicator on the instrument cluster (IPC) during the bulb check. Does the Traction Control indicator illuminate during the bulb check and then turn OFF?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 5
4	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> 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 instrument cluster (IPC). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 8	Go to Step 7

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6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	Go to Step 8	-
7	Replace the instrument cluster (IPC). Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the repair?	Go to Step 8	-
8	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

TRACTION CONTROL INDICATOR INOPERATIVE

Circuit Description

The Traction Control indicator is controlled by the instrument cluster (IPC) via serial data messages from the EBCM. The EBCM send a serial data message to the IPC to illuminate the Traction Control indicator when the EBCM has disabled TCS due to a DTC. The Traction Control indicator will also turn ON during the instrument cluster bulb check. When the ignition switch is turned to ON, the Traction Control indicator will turn ON for approximately 3 seconds and then turn OFF.

Test Description

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

2: Use the scan tool to check the normal state of the Traction Control indicator control.

3: Ensures that the instrument cluster can operate the Traction Control indicator.

Traction Control Indicator Inoperative

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> or <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages, and Console			
1	Did you perform the ABS Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
	1. Install a scan tool.		

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2	2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the TCS Warning Indicator/Message parameter in the DRP/ABS/TCS data list. Does the scan tool display Off?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Traction Control indicator on the instrument cluster (IPC) during the bulb check. Does the Traction Control indicator illuminate during the bulb check and then turn OFF?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 5
4	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> 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 instrument cluster (IPC). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 8	Go to Step 7
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	Go to Step 8	-
7	Replace the instrument cluster (IPC). Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the repair?	Go to Step 8	-
8	Operate the system in order to verify the repair.		

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Did you correct the condition?

System OK

Go to **Step 2**

TRACTION OFF INDICATOR ALWAYS ON

Circuit Description

The Traction Off indicator is controlled by the instrument cluster via serial data messages from the EBCM. When the RIM sees the traction control switch input grounded through the momentary traction control switch, it sends a serial data message to the EBCM that tells the EBCM that the traction control switch has been pressed. The EBCM then disables traction control and sends a serial data message to the instrument cluster to turn on the Traction Off indicator on the instrument panel. Each time the ignition is cycled from OFF to ON, the traction control system is enabled.

Test Description

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

2: Use the scan tool to check the normal state of the Traction Off indicator control.

3: Ensures that the instrument cluster can operate the Traction Off indicator.

Traction Off Indicator Always On

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u>			
Connector End View Reference: <u>ABS Connector End Views</u> or <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages, and Console			
1	Did you perform the ABS Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the TCS Warning Indicator/Message parameter in the DRP/ABS/TCS data list.		
	Does the scan tool display Off?	Go to Step 3	Go to Step 4
	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine		

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3	OFF. 3. Observe the Traction Off indicator on the instrument panel cluster (IPC) during the bulb check. Does the Traction Off indicator illuminate during the bulb check and then turn OFF?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 5
4	Inspect for poor connections at the harness connector of the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> 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 instrument panel cluster (IPC). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 8	Go to Step 7
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u>. Did you complete the repair?	Go to Step 8	-
7	Replace the instrument panel cluster (IPC). Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the repair?	Go to Step 8	-
8	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

TRACTION OFF INDICATOR INOPERATIVE

Circuit Description

The Traction Off indicator is controlled by the instrument cluster via serial data messages from the EBCM. When the RIM sees the traction control switch input grounded through the momentary traction control switch, it sends a serial data message to the EBCM that tells the EBCM that the traction control switch has been pressed. The EBCM then disables traction

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control and sends a serial data message to the instrument cluster to turn on the Traction Off indicator on the instrument panel. Each time the ignition is cycled from OFF to ON, the traction control system is enabled.

Test Description

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

2: Use the scan tool to check the normal state of the Traction Off control.

3: Ensures that the instrument cluster can operate the Traction Off indicator.

Traction Off Indicator Inoperative

Step	Action	Yes	No
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u> , <u>Instrument Panel, Gages, and Console Connector End Views</u> in Instrument Panel, Gages, and Console or <u>Body Control System Connector End Views</u> in Body Control System			
1	Did you perform the ABS Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the TCS Warning Indicator/Message parameter in the DRP/ABS/TCS data list. Does the scan tool display Off?	Go to Step 3	Go to Step 10
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Traction Off indicator on the instrument panel cluster (IPC) during the bulb check. Does the Traction Off indicator illuminate during the bulb check and then turn OFF?	Go to Step 4	Go to Step 11
	1. Turn OFF the ignition.		

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4	2. Install a scan tool. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the TCS On/Off Switch parameter in the Rear Integration Module data list. 5. Activate the traction control switch. Does the TCS On/Off Switch parameter change state?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 5
5	1. Turn OFF the ignition. 2. Disconnect the traction control switch connector. 3. Connect a 3 amp fused jumper from the signal circuit of the traction control switch to the ground circuit of the traction control switch. 4. Turn ON the ignition, with the engine OFF. 5. With a scan tool, observe the TCS Switch State parameter. Does the scan tool display On?	Go to Step 9	Go to Step 6
6	Test the signal circuit of the traction control switch for an open or high resistance. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 16	Go to Step 7
7	Test the ground circuit of the traction control switch for an open or high resistance. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 16	Go to Step 8
8	Inspect for poor connections at the harness connector of the rear integration module (RIM). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and		

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	Connector Repairs in Wiring Systems. Did you find and correct the condition?	Go to Step 16	Go to Step 12
9	Inspect for poor connections at the harness connector of the traction control 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 16	Go to Step 13
10	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 16	Go to Step 14
11	Inspect for poor connections at the harness connector of the instrument panel cluster (IPC). 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 16	Go to Step 15
12	Replace the rear integration module (RIM). Refer to Rear Integration Module Replacement in Body Control System. Did you complete the replacement?	Go to Step 16	-
13	Replace the traction control switch. Did you complete the replacement?	Go to Step 16	-
14	Replace the EBCM. Refer to Electronic Brake Control Module Replacement . Did you complete the repair?	Go to Step 16	-
15	Replace the instrument panel cluster (IPC). Refer to Instrument Panel Cluster (IPC) Replacement in Instrument Panel, Gages and Console. Did you complete the repair?	Go to Step 16	-
16	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

VEHICLE STABILITY ENHANCEMENT SYSTEM INOPERATIVE**Circuit Description**

The vehicle stability enhancement system (VSES) is activated by the electronic brake control module (EBCM) calculating the desired yaw rate and comparing it to the actual yaw rate input. The desired yaw rate is calculated from measured steering wheel position, vehicle speed, and lateral acceleration. The difference between the desired yaw rate and actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. If the yaw rate error becomes too large, the EBCM will attempt to correct the vehicle's yaw motion by applying differential braking to the left or right front wheel.

Test Description

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

- 3:** Perform the Steering Position Sensor Test in order to verify if the steering wheel position sensor (SWPS) is operating properly.
- 4:** Verify that the lateral accelerometer input parameter is within the valid range.
- 5:** Verify that the yaw rate input parameter is within the valid range.

Vehicle Stability Enhancement System Inoperative

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Start the engine. 3. Observe the VSES Is Centered parameter in the VSES data list. 4. Perform the Diagnostic Test Drive. Refer to <u>Diagnostic Test Drive</u> . Did the scan tool display Yes within the specified value?	30 seconds	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
	With the scan tool, perform the With			

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3	the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Step 4	Go to Step 7
4	With a scan tool, observe the Lateral Accelerometer Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 5	Go to Step 8
5	With a scan tool, observe the Yaw Rate Sensor Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 6	Go to Step 8
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 9	-
7	Replace the steering wheel position sensor (SWPS). Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the replacement?	-	Go to Step 9	-
8	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the replacement?	-	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

VEHICLE STABILITY ENHANCEMENT SYSTEM UNWANTED ACTIVATION

Circuit Description

The vehicle stability enhancement system (VSES) is activated by the electronic brake control module (EBCM) calculating the desired yaw rate and comparing it to the actual yaw rate input. The desired yaw rate is calculated from measured steering wheel position, vehicle speed, and

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lateral acceleration. The difference between the desired yaw rate and actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. If the yaw rate error becomes too large, the EBCM will attempt to correct the vehicle's yaw motion by applying differential braking to the left or right front wheel.

Test Description

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

6: Perform the Steering Position Sensor Test in order to verify if the steering wheel position sensor (SWPS) is operating properly.

Vehicle Stability Enhancement System Unwanted Activation

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u>				
1	Did you perform the ABS Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	Inspect the mounting of the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you find and correct the condition?	-	Go to Step 15	Go to Step 3
3	1. Install a scan tool. 2. Start the engine. 3. With a scan tool, observe the Yaw Rate Sensor Input parameter in the VSES data list. 4. Perform the Diagnostic Test Drive. Refer to <u>Diagnostic Test Drive</u>. Does the scan tool display suddenly increase or decrease without rapid turning of the vehicle?	-	Go to Step 4	Go to Step 5
4	Perform the diagnosis for DTC C0252. Refer to <u>DTC C0252</u> . Did you find and correct the condition?	-	Go to Step 15	Go to Step 12

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5	1. Straighten the front wheels. 2. Observe the Dual Analog SWPS Input A and Dual Analog SWPS Input B in the DRP/ABS/TCS data list. 3. Slowly rotate the steering wheel in both directions. Does the scan tool display change states as the steering wheel was rotated?	-	Go to Step 6	Go to Step 14
6	With the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Step 7	Go to Step 14
7	1. Place the vehicle on a level surface. 2. With a scan tool, observe the Lateral Accelerometer Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 9	Go to Step 8
8	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>. Did you find and correct the condition?	-	Go to Step 15	Go to Step 9
9	Inspect the EBCM for the proper part number. Did you find the correct part number?	-	Go to Step 10	Go to Step 12
10	Inspect the power steering gear for the proper part number. Did you find the correct part number?	-	Go to Step 11	Go to Step 13
11	Inspect the alignment of the vehicle. Refer to <u>Measuring Wheel Alignment</u> in Wheel Alignment. Did you find and correct the condition?	-	Go to Step	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring

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			15	Systems
12	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the repair?	-	Go to Step 15	-
13	Replace the power steering gear. Refer to <u>Power Steering Gear Replacement</u> in Power Steering System. Did you complete the repair?	-	Go to Step 15	-
14	Replace the steering wheel position sensor (SWPS). Did you complete the repair?	-	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

VEHICLE STABILITY ENHANCEMENT SYSTEM EXCESSIVE BRAKE PULSATION

Circuit Description

The vehicle stability enhancement system (VSES) is activated by the electronic brake control module (EBCM) calculating the desired yaw rate and comparing it to the actual yaw rate input. The desired yaw rate is calculated from measured steering wheel position, vehicle speed, and lateral acceleration. The difference between the desired yaw rate and actual yaw rate is the yaw rate error, which is a measurement of oversteer or understeer. If the yaw rate error becomes too large, the EBCM will attempt to correct the vehicle's yaw motion by applying differential braking to the left or right front wheel.

Test Description

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

- 3:** Perform the Steering Position Sensor Test in order to verify if the steering wheel position sensor (SWPS) is operating properly.
- 4:** Verify that the lateral accelerometer input parameter is within the valid range.
- 5:** Verify that the yaw rate input parameter is within the valid range.

Vehicle Stability Enhancement System Excessive Brake Pulsation

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>ABS Schematics</u>				

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1	Did you perform the Diagnostic System Check - ABS?	-	Go to Step 2	Go to <u>Diagnostic System Check - ABS</u>
2	1. Install a scan tool. 2. Start the engine. 3. Observe the VSES Is Centered parameter in the VSES data list. 4. Perform the Diagnostic Test Drive. Refer to <u>Diagnostic Test Drive</u>. Did the scan tool display Yes within the specified value?	30 seconds	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
3	With the scan tool, perform the Steering Position Sensor Test. Did the SWPS pass the test?	-	Go to Step 4	Go to Step 7
4	With a scan tool, observe the Lateral Accelerometer Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 5	Go to Step 8
5	With a scan tool, observe the Yaw Rate Sensor Input parameter in the VSES data list. Does the scan tool display within the specified range?	2.3-2.7 V	Go to Step 6	Go to Step 8
6	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 9	-
7	Replace the steering wheel position sensor (SWPS). Refer to <u>Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement</u> in Steering Wheel and Column. Did you complete the replacement?	-	Go to Step 9	-

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8	Replace the yaw rate/lateral accelerometer sensor. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . Did you complete the replacement?	-	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

REPAIR INSTRUCTIONS

ABS AUTOMATED BLEED PROCEDURE

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.

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

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

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

Performing the Automated Bleed Procedure

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

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

15. Remove the scan tool.
16. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
17. Inspect the brake fluid level. Refer to **Master Cylinder Reservoir Filling** in Hydraulic Brakes.
18. Road test the vehicle while inspecting that the pedal remains high and firm.

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 OFF the ignition.
2. Raise and support vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Remove the air deflector shield. Refer to **Air Deflector Replacement - Front** in Body front End.
4. Remove the right front wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** in Body Front End.

IMPORTANT: It is not necessary to remove the washer solvent container from the vehicle.

5. Remove the washer solvent container bracket. Refer to **Washer Solvent Container Replacement** in Wipers/Washers Systems.

IMPORTANT: The area around the electronic brake control module (EBCM) must be free from loose dirt to prevent contamination of disassembled ABS components.

6. Thoroughly clean all of the contaminants from and around the EBCM assembly.

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

7. Press the retainer on the EBCM electrical connector (1).

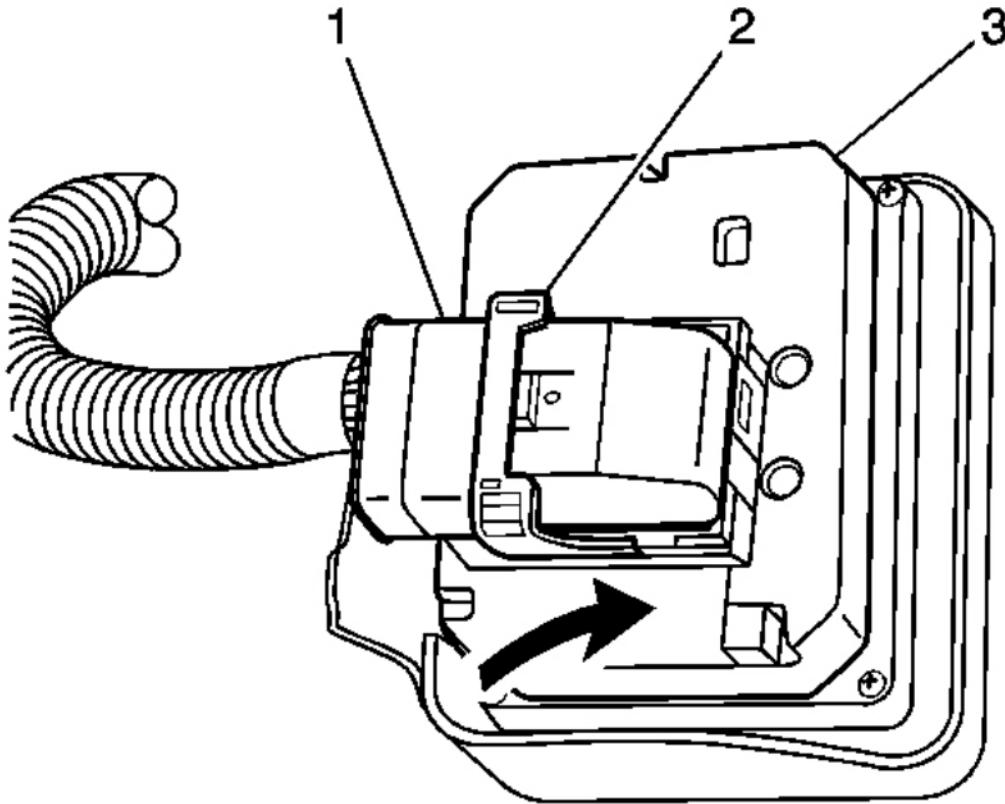


Fig. 12: View Of EBCM And Electrical Connector
Courtesy of GENERAL MOTORS CORP.

8. Rotate the EBCM connector tab (2) forward to the unlocked position.
9. Disconnect the EBCM electrical connector (1) from the EBCM and position out of the way.

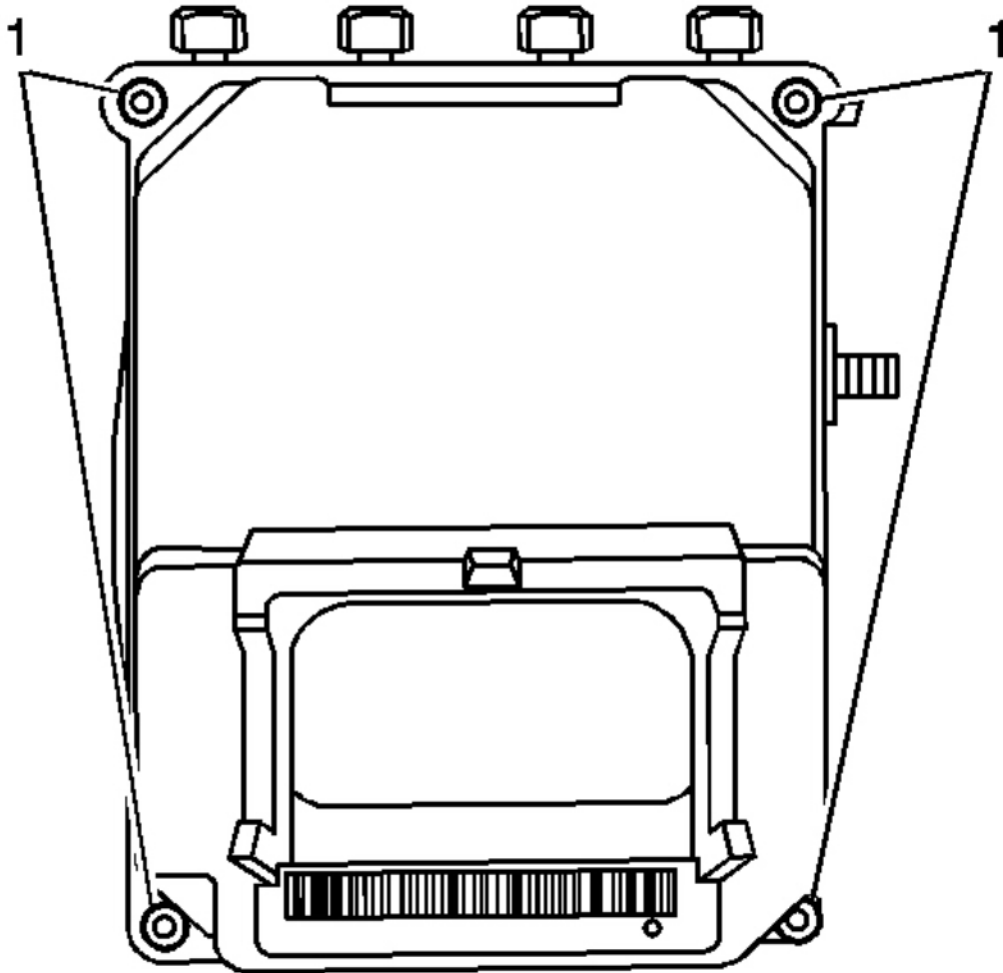


Fig. 13: Locating EBCM-To-BPMV Screws
Courtesy of GENERAL MOTORS CORP.

10. Remove and discard the 4 EBCM to brake pressure modulator valve (BPMV) screws (1).

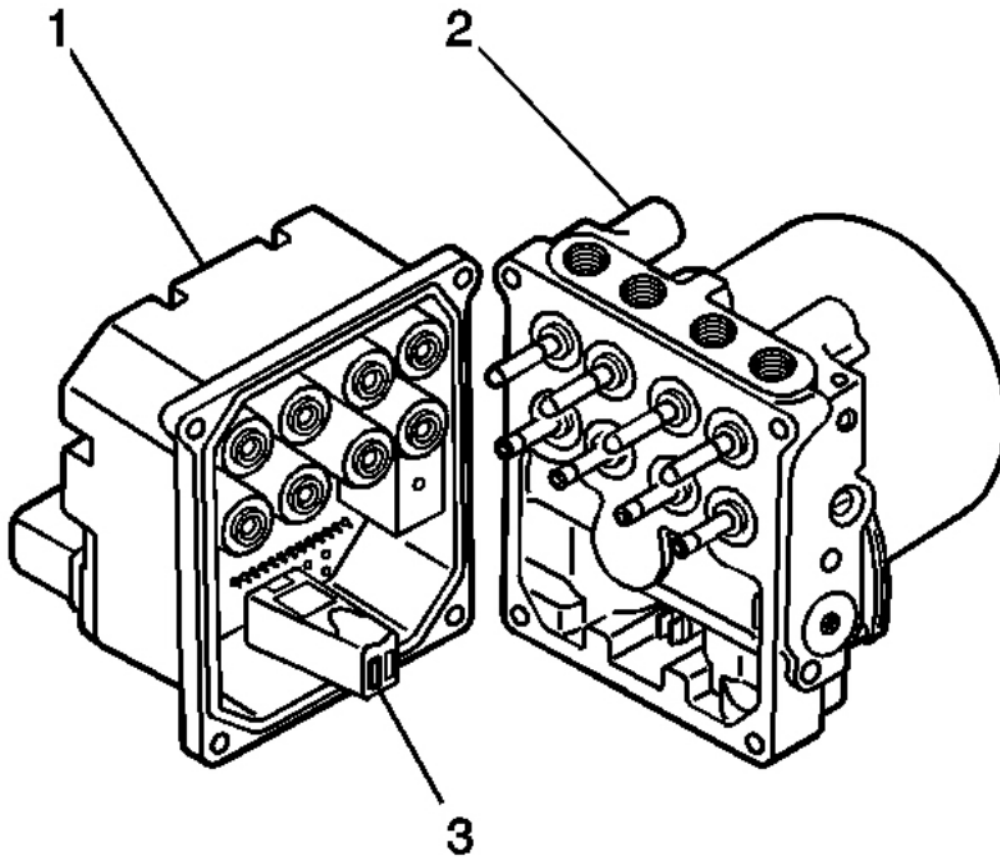


Fig. 14: View Of EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

11. Clean the surface of the EBCM/BPMV assembly.

IMPORTANT: The EBCM cannot be repaired. If faulty, the unit must be replaced.

12. Separate the EBCM (1) from the BPMV (2).

Installation Procedure

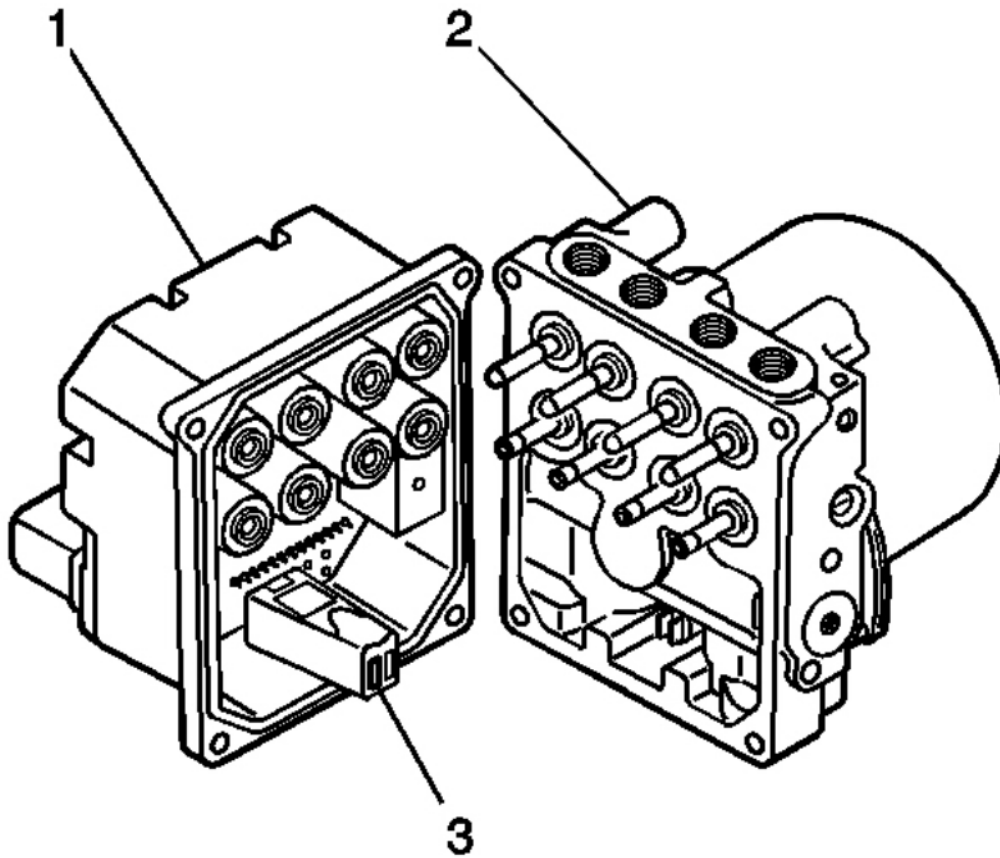


Fig. 15: View Of EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

1. Clean the seal surface of the BPMV (2).
2. Install the EBCM (1) to the BPMV (2).
3. Make sure that the internal pump motor connector (3) is installed into the new EBCM (1) prior to EBCM replacement.

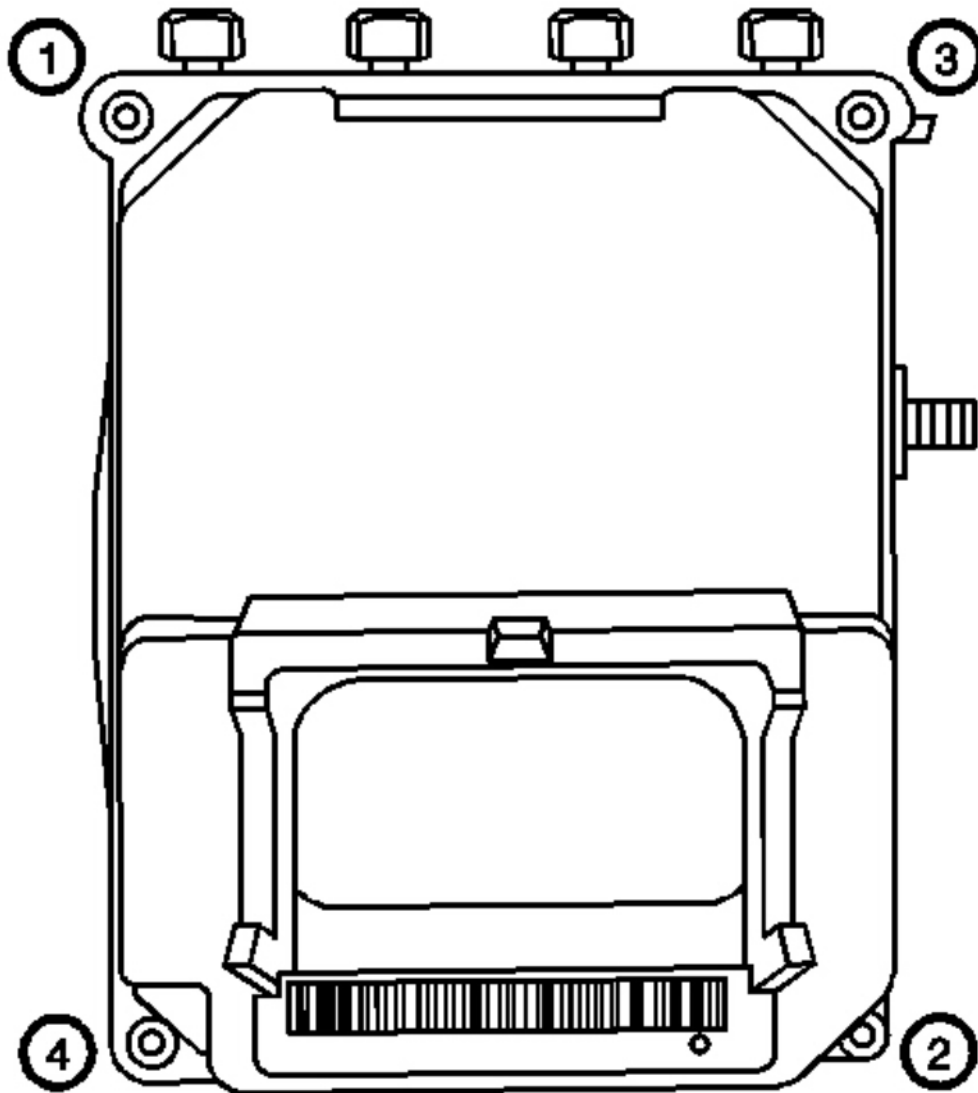


Fig. 16: Installing EBCM To BPMV Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Use New EBCM/BPMV screws after separating the EBCM

from the BPMV.

4. Install the 4 NEW EBCM to BPMV screws.

Tighten: Tighten the (4) NEW EBCM to BPMV screws in sequence (1-4) to 5 N.m (44 lb in).

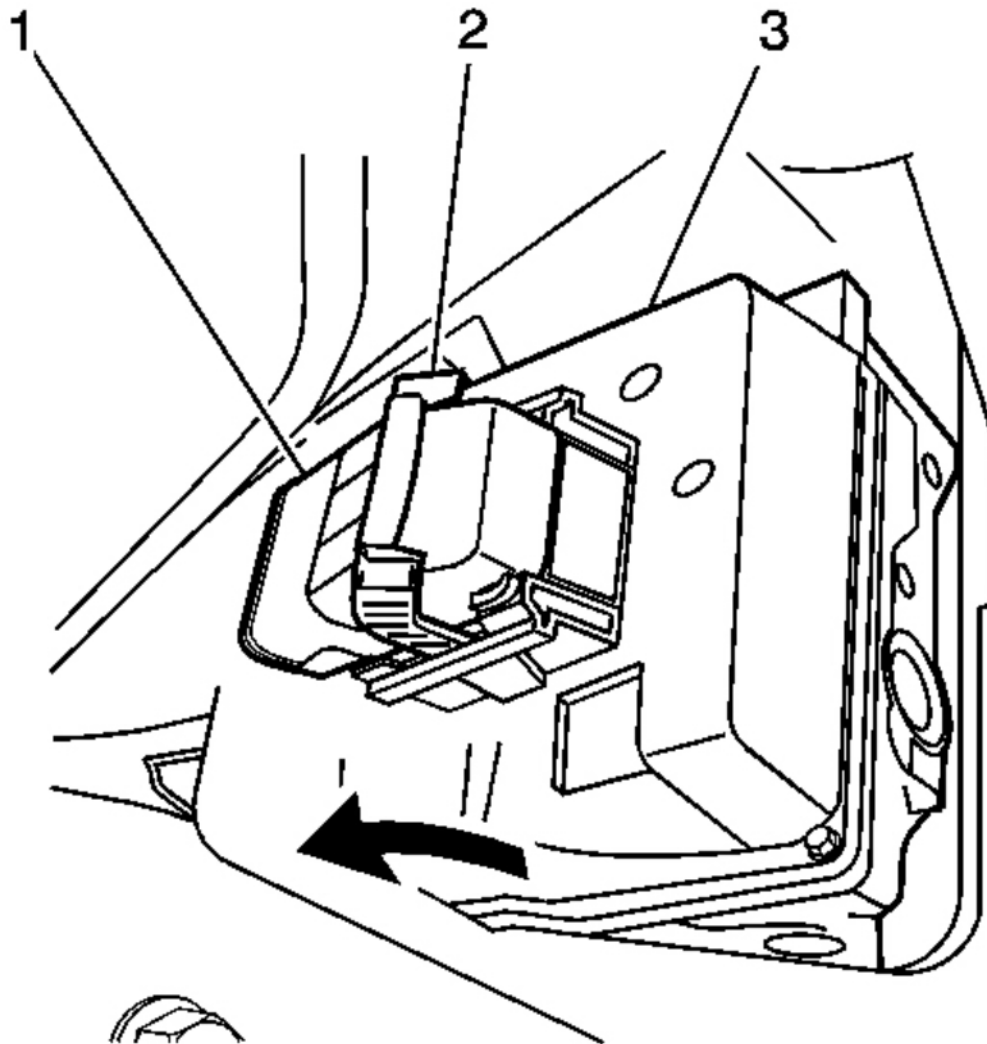


Fig. 17: View Of EBCM, Electrical Connector & Connector Tab

Courtesy of GENERAL MOTORS CORP.

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

5. Connect the EBCM electrical connector (1) to the EBCM (3).
6. Rotate the EBCM connector tab (2) rearward to the locked position.
7. Install the washer solvent container bracket. Refer to Washer Solvent Container Replacement in Wipers/Washers Systems.
8. Install the wheelhouse liner. Refer to Wheelhouse Liner Replacement - Front in Body Front End.
9. Install the air deflector shield. Refer to Air Deflector Replacement - Front in Body Front End.
10. Lower the vehicle.
11. Use the scan tool in order to clear the DTCs.
12. If installing a new EBCM it is necessary to program the EBCM. Refer to Service Programming System (SPS) in Programming.
13. Perform the ABS Diagnostic System Check. Refer to Diagnostic System Check - ABS.
14. Recalibrate the brake pedal position sensor. Refer to Brake Pedal Position Sensor Replacement in Lighting Systems.

BRAKE PRESSURE MODULATOR VALVE (BPMV) REPLACEMENT

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

Removal Procedure

CAUTION: For safety reasons, the brake pressure modulator valve assembly must not be repaired, the complete unit must be replaced. With the exception of the EBCM, no screws on the brake pressure modulator valve assembly 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 OFF the ignition.

IMPORTANT: The area around the electronic brake control module (EBCM) must be free from loose dirt to prevent contamination of disassembled ABS components.

2. Thoroughly clean all contaminants from around the EBCM.

CAUTION: Brake fluid may irritate eyes and skin. In case of contact, take the following actions:

- Eye contact-rinse thoroughly with water.
- Skin contact-wash with soap and water.
- If ingested-consult a physician immediately.

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

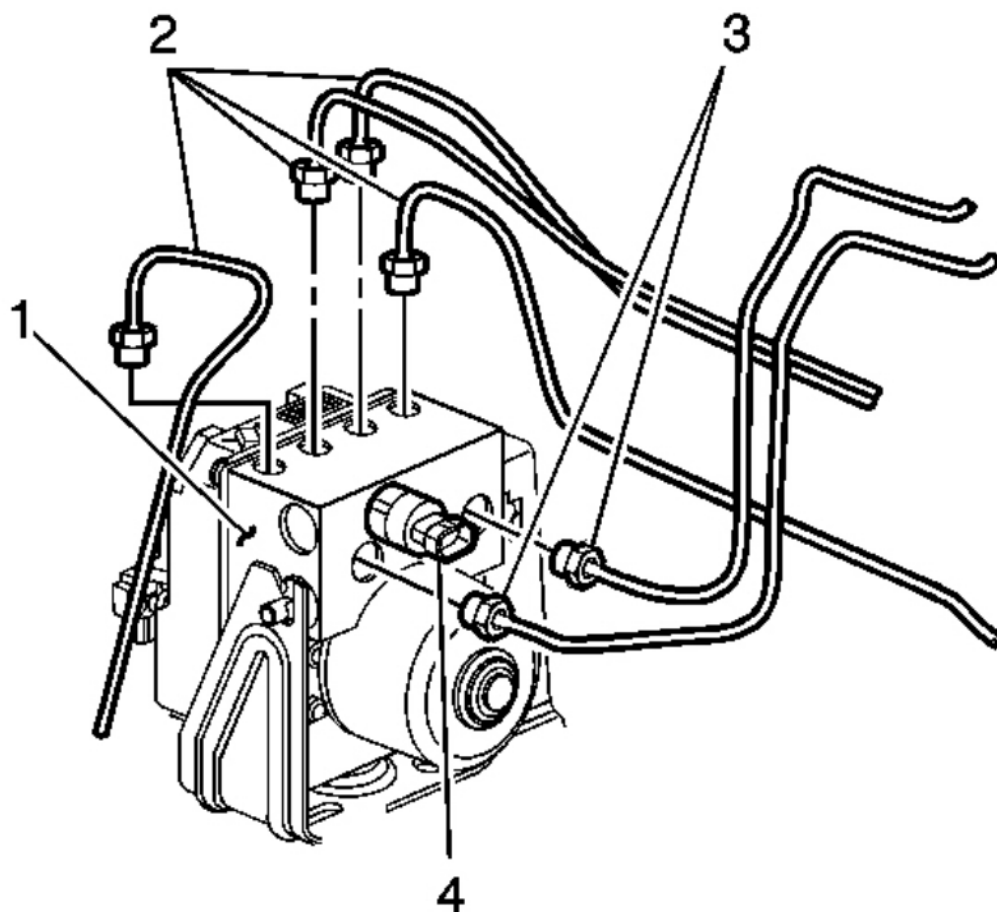


Fig. 18: View Of BPMV & Brake Pipes
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Record the location of all brake pipes to the brake pressure modulator valve (BPMV) for use as an aid during installation.

3. Remove the 2 master cylinder brake pipes (3) from the BPMV (1).
4. Clean any brake fluid spillage from the BPMV (1).
5. Raise and support vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
6. Remove the air deflector shield. Refer to **Air Deflector Replacement - Front** in Body

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Front End.

7. Remove the wheelhouse liner. Refer to Wheelhouse Liner Replacement - Front in Body Front End.

IMPORTANT: It is not necessary to remove the washer solvent container from the vehicle.

8. Remove the washer solvent container bracket. Refer to Washer Solvent Container Replacement in Wipers/Washers Systems.
9. Remove the 4 wheel brake pipes (2) from the BPMV (1).

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

10. Press the retainer on the EBCM electrical connector (1).

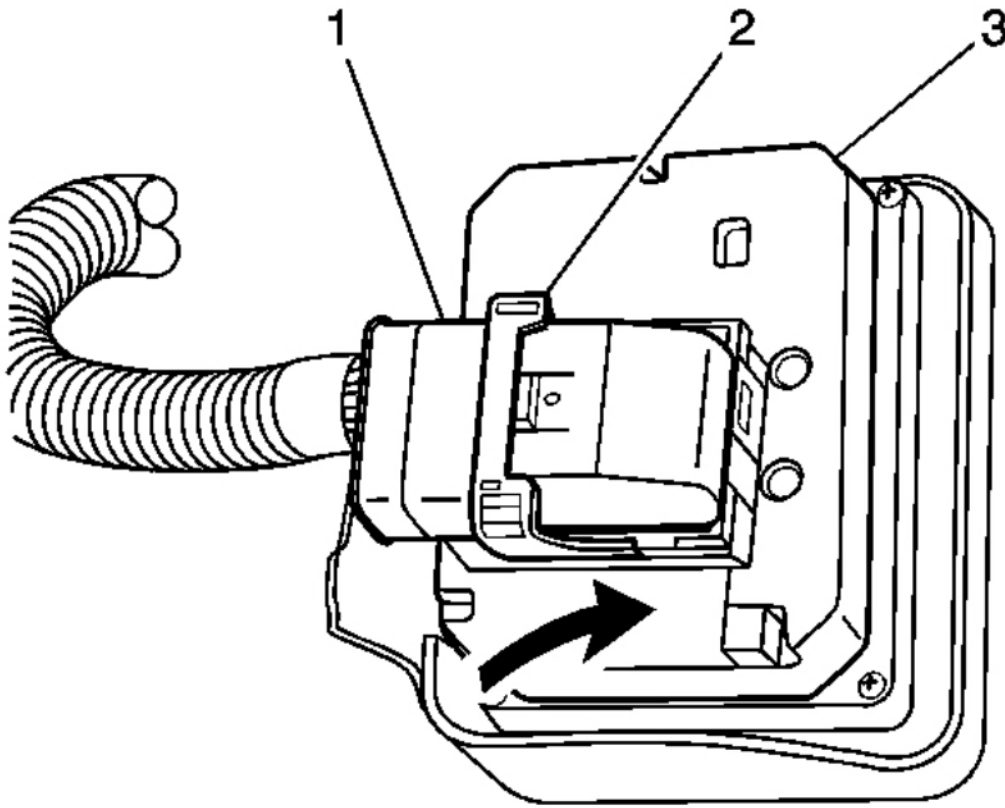


Fig. 19: View Of EBCM And Electrical Connector
Courtesy of GENERAL MOTORS CORP.

11. Rotate the EBCM connector tab (2) forward to the unlocked position.
12. Disconnect the EBCM electrical connector (1) from the EBCM and position out of the way.
13. Remove the front BPMV bracket nuts.
14. Remove the EBCM/BPMV assembly (1) from the BPMV bracket.
15. Remove and discard the 4 EBCM to BPMV screws.

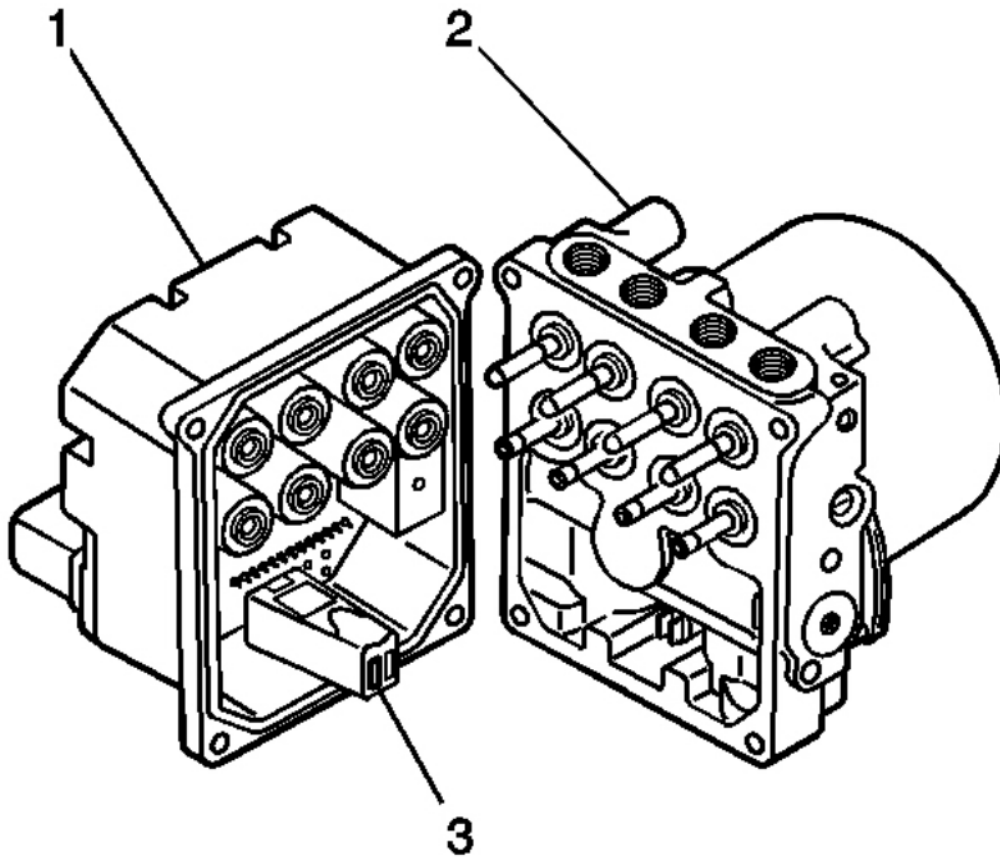


Fig. 20: View Of EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

16. Clean the surface of the EBCM/BPMV assembly.
17. Remove the EBCM (1) from the BPMV (2).

Installation Procedure

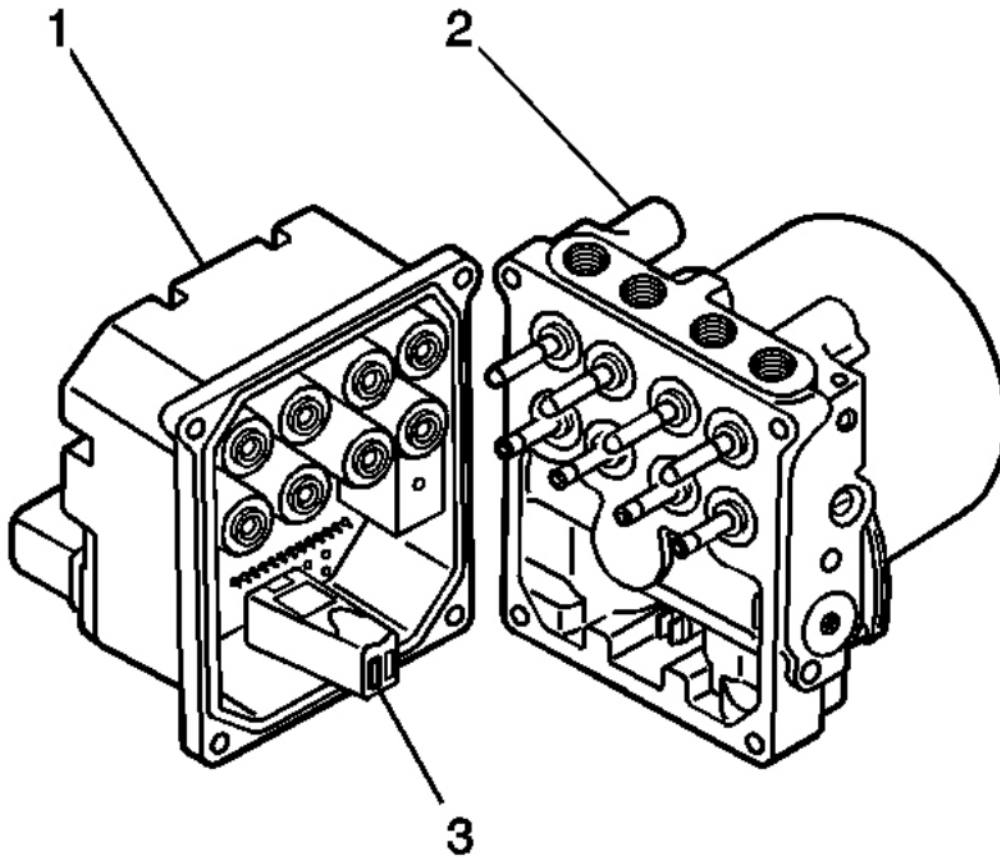


Fig. 21: View Of EBCM & BPMV
Courtesy of GENERAL MOTORS CORP.

1. Clean the seal surface of the BPMV.
2. Install the EBCM (1) to the BPMV (2).
3. Make sure that the internal pump motor connector (3) is installed into the new EBCM (1) prior to EBCM replacement.

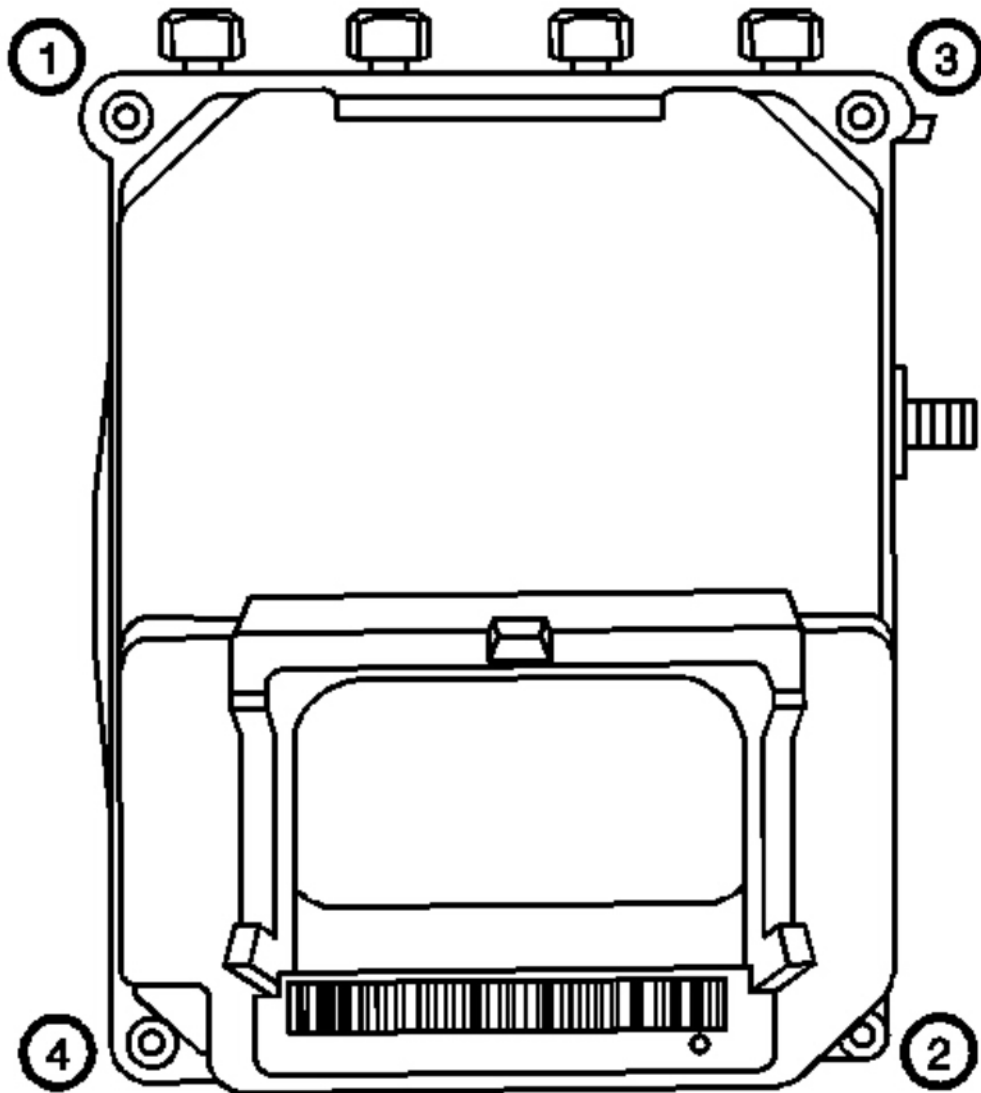


Fig. 22: Installing EBCM To BPMV Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Use New EBCM/BPMV screws after separating the EBCM

from the BPMV.

4. Install the 4 NEW EBCM to BPMV screws.

Tighten: Tighten the (4) NEW EBCM to BPMV screws in sequence (1-4) to 5 N.m (44 lb in).

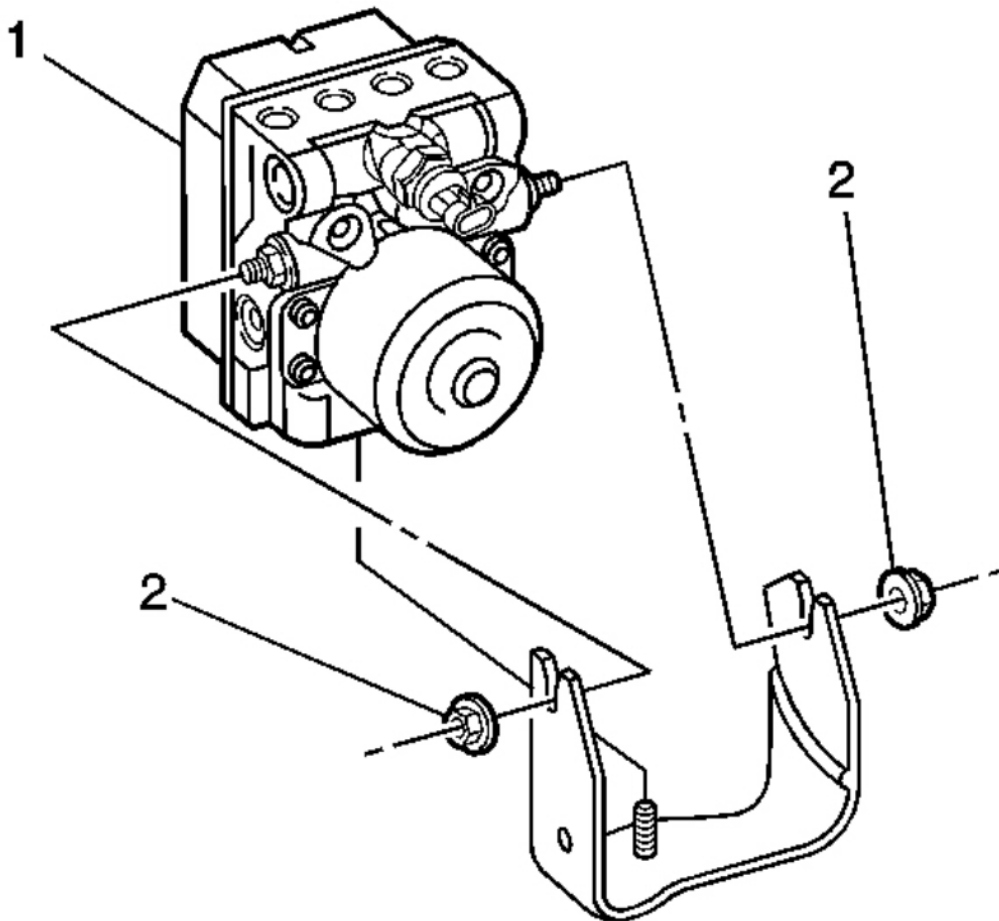


Fig. 23: View Of BPMV Bracket
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Make sure that the rubber isolator is installed on the BPMV.
The isolator protects the EBCM/BPMV assembly from vehicle

vibrations.

5. Install the EBCM/BPMV assembly (1) to the BPMV bracket.
6. Install the BPMV bracket nuts (2).

Tighten: Tighten the BPMV nuts to 10 N.m (89 lb in).

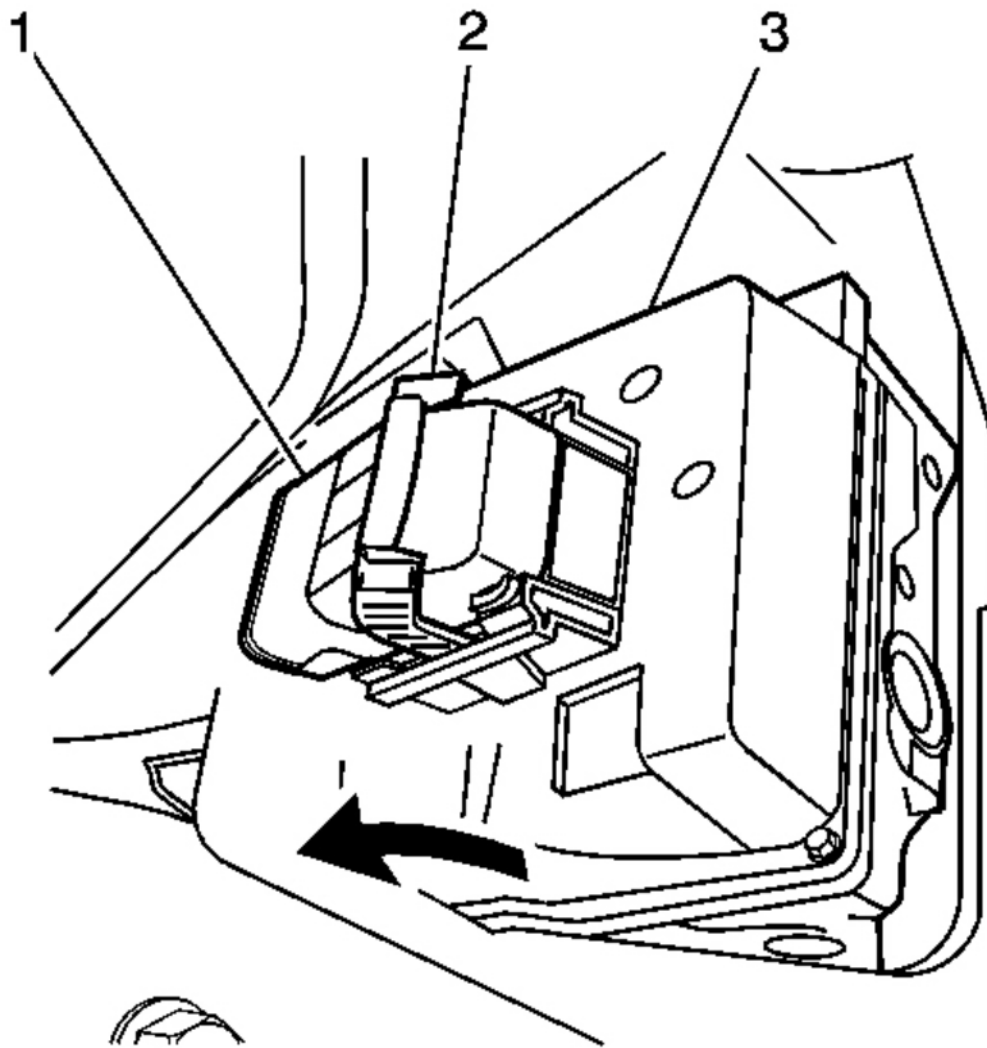


Fig. 24: View Of EBCM, Electrical Connector & Connector Tab

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Courtesy of GENERAL MOTORS CORP.

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

7. Connect the EBCM electrical connector (1) to the EBCM (2).
8. Rotate the EBCM connector tab (2) rearward to the locked position.

CAUTION: The brake pipes must be fully installed to the brake pipe mounting retainers on the frame. Failure to properly retain the brake pipes may cause the pipes to contact the frame and/or the transmission resulting in possible loss of brake fluid and personal injury.

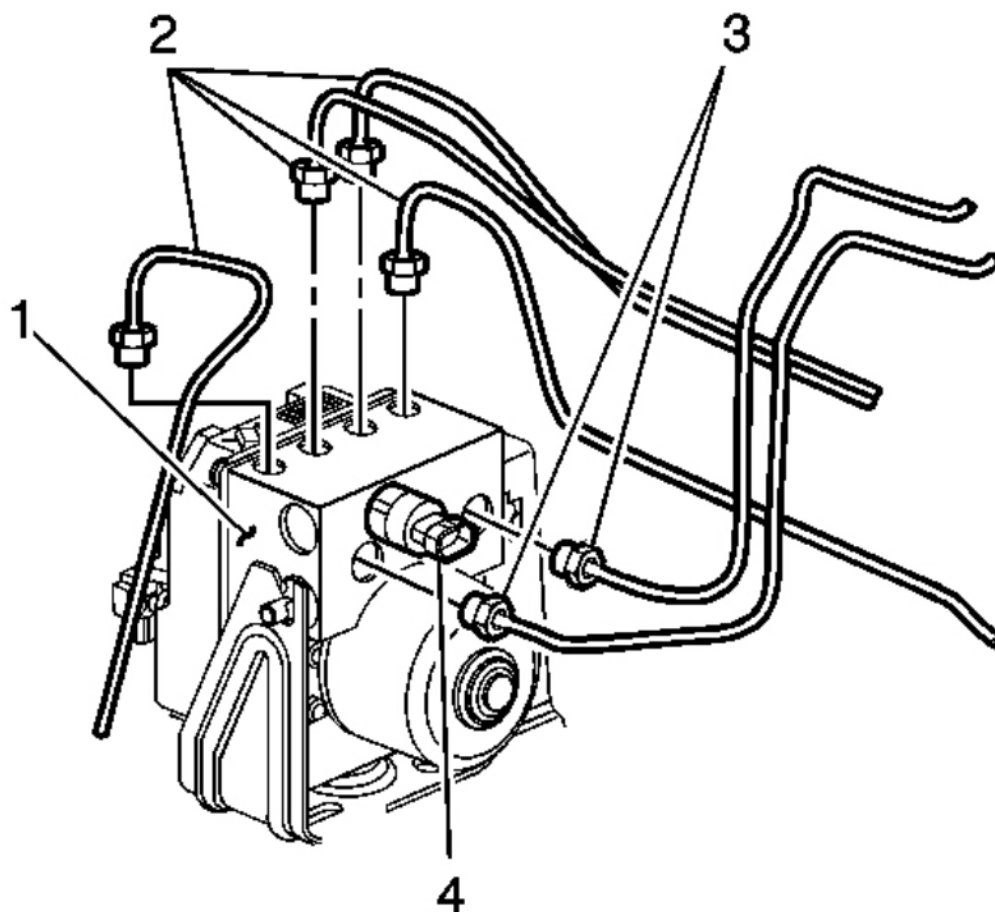


Fig. 25: View Of BPMV & Brake Pipes
Courtesy of GENERAL MOTORS CORP.

CAUTION: Make sure brake pipes are correctly connected to BPMV. If brake pipes are switched by mistake Inlet vs. Outlet, wheel lockup will occur and personal injury may result.

IMPORTANT: If a new BPMV is being installed, remove the shipping plugs from the valve openings.

9. Install the 4 wheel brake pipes (2) to the BPMV (1) using the locations recorded during the removal procedure.

Tighten: Tighten the wheel brake pipes to 27 N.m (20 lb ft).

10. Install the washer solvent container bracket. Refer to Washer Solvent Container Replacement in Wipers/Washers Systems.
11. Install the wheelhouse liner. Refer to Wheelhouse Liner Replacement - Front in Body Front End.
12. Install the air deflector shield. Refer to Air Deflector Replacement - Front in Body Front End.
13. Lower the vehicle.
14. Install the 2 master cylinder brake pipes (3) to the BPMV (1) using the locations recorded during the removal procedure.

Tighten: Tighten the master cylinder brake pipes to 27 N.m (20 lb ft).

15. If equipped with a brake fluid pressure sensor (4), connect the electrical connector.
16. Fill and bleed the hydraulic brake system. Refer to Master Cylinder Reservoir Filling and Hydraulic Brake System Bleeding (Manual) or Hydraulic Brake System Bleeding (Pressure) in Hydraulic Brakes.
17. Perform the Auto Bleed Procedure. Refer to ABS Automated Bleed Procedure.
18. Perform the ABS Diagnostic System Check. Refer to Diagnostic System Check - ABS.

BRAKE FLUID PRESSURE SENSOR REPLACEMENT

Removal Procedure

IMPORTANT: The area around the electronic brake control module (EBCM) must be free from loose dirt to prevent contamination of disassembled ABS components.

1. Thoroughly clean all contaminants from around the EBCM.

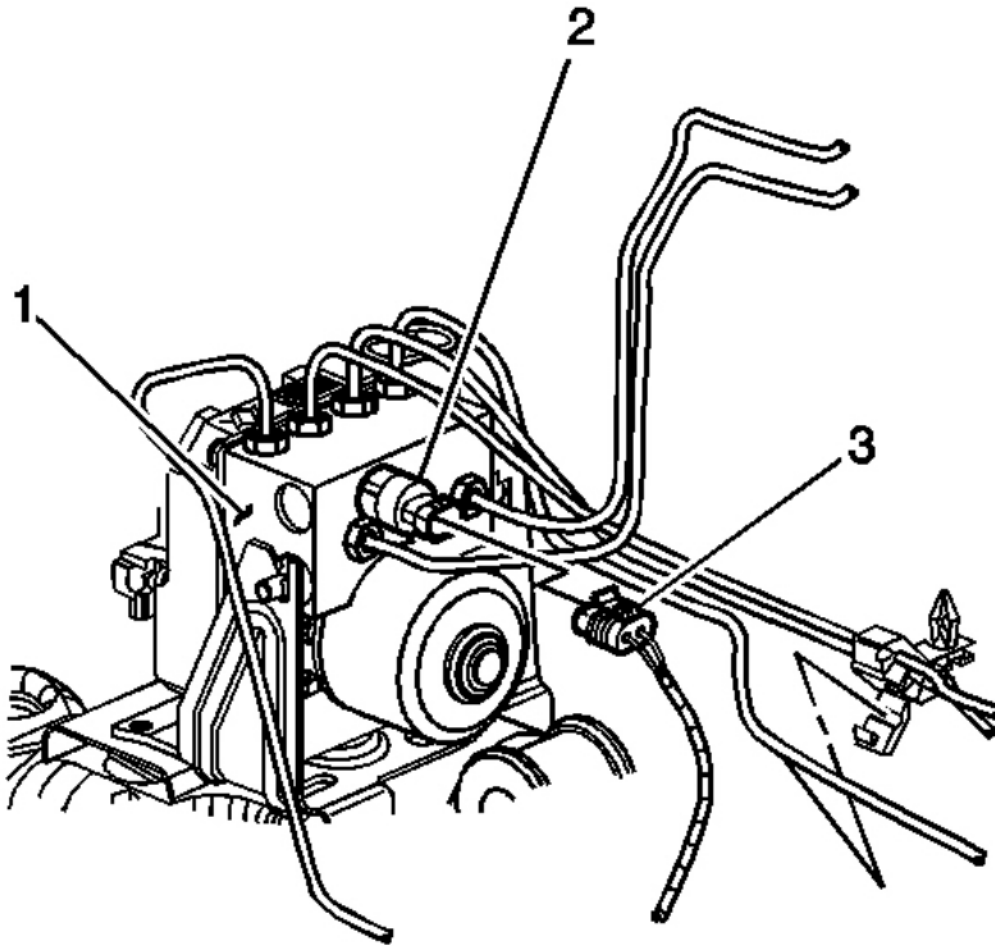


Fig. 26: View Of Brake Fluid Pressure Sensor & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the brake fluid pressure sensor electrical connector (3) from the brake fluid pressure sensor (2).
3. Remove the brake fluid pressure sensor (2) from the electronic brake control module (EBCM) (1).

Installation Procedure

NOTE: Refer to Fastener Notice in Cautions and Notices.

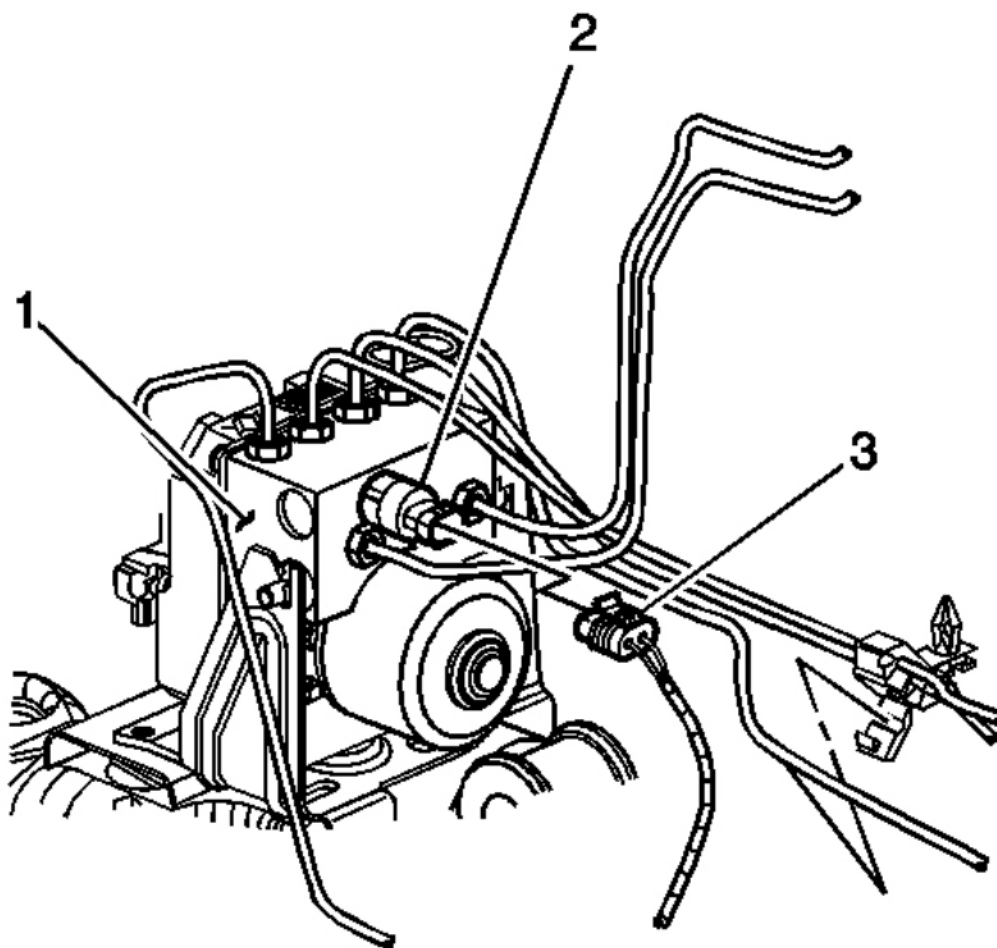


Fig. 27: View Of Brake Fluid Pressure Sensor & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Install the brake fluid pressure sensor (2) to the EBCM (1).

Tighten: Tighten the brake fluid pressure sensor to 17 N.m (13 lb ft).

2. Connect the brake fluid pressure sensor electrical connector (3) to the brake fluid pressure sensor (2).
3. Fill and bleed the hydraulic brake system. Refer to **Master Cylinder Reservoir Filling** and **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding**

(Pressure) in Hydraulic Brakes.

4. Perform the Auto Bleed Procedure. Refer to **ABS Automated Bleed Procedure**.
5. Perform the ABS Diagnostic System Check. Refer to **Diagnostic System Check - ABS**.

TRACTION CONTROL SWITCH REPLACEMENT

Removal Procedure

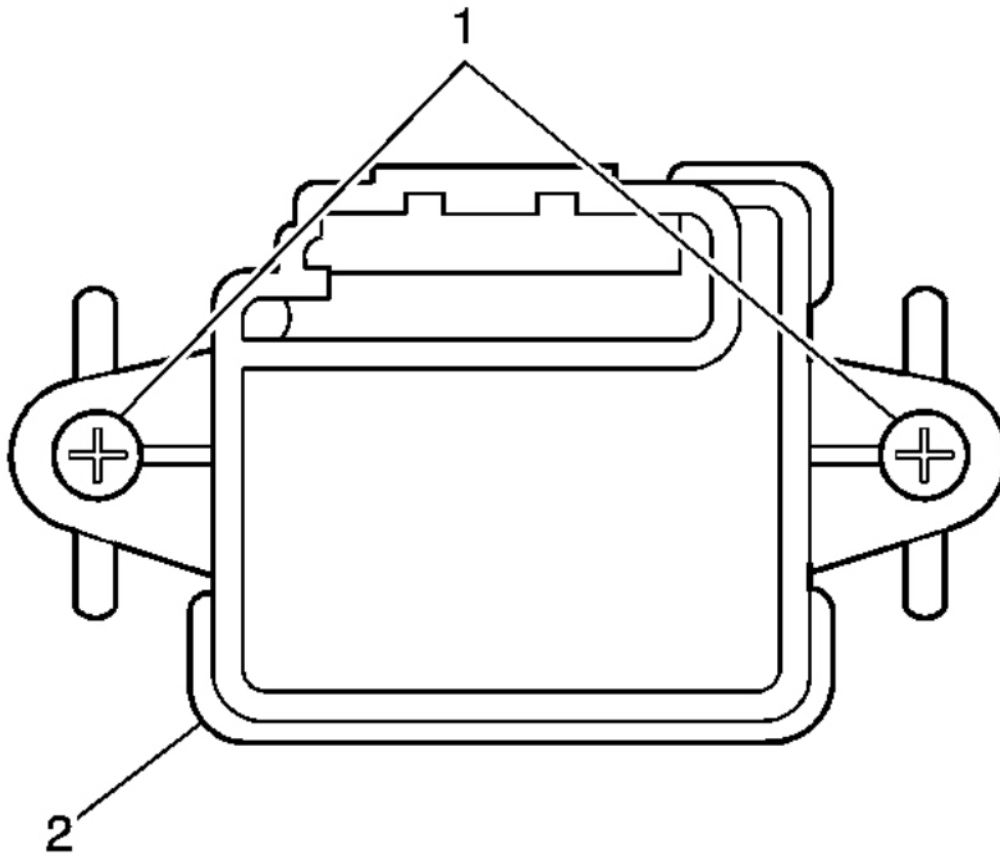


Fig. 28: View Of Traction Control Switch & Mounting Screws
Courtesy of GENERAL MOTORS CORP.

1. Remove the console shift lever bezel. Refer to **Console Shift Lever Bezel Replacement** in Instrument Panel, Gages, and Console.
2. Disconnect the traction control electrical connector.

3. Remove the trim plate.
4. Remove the two traction control mounting screws (1).
5. Remove the traction control switch (2).

Installation Procedure

1. Install the traction control switch (2) to the trim plate.

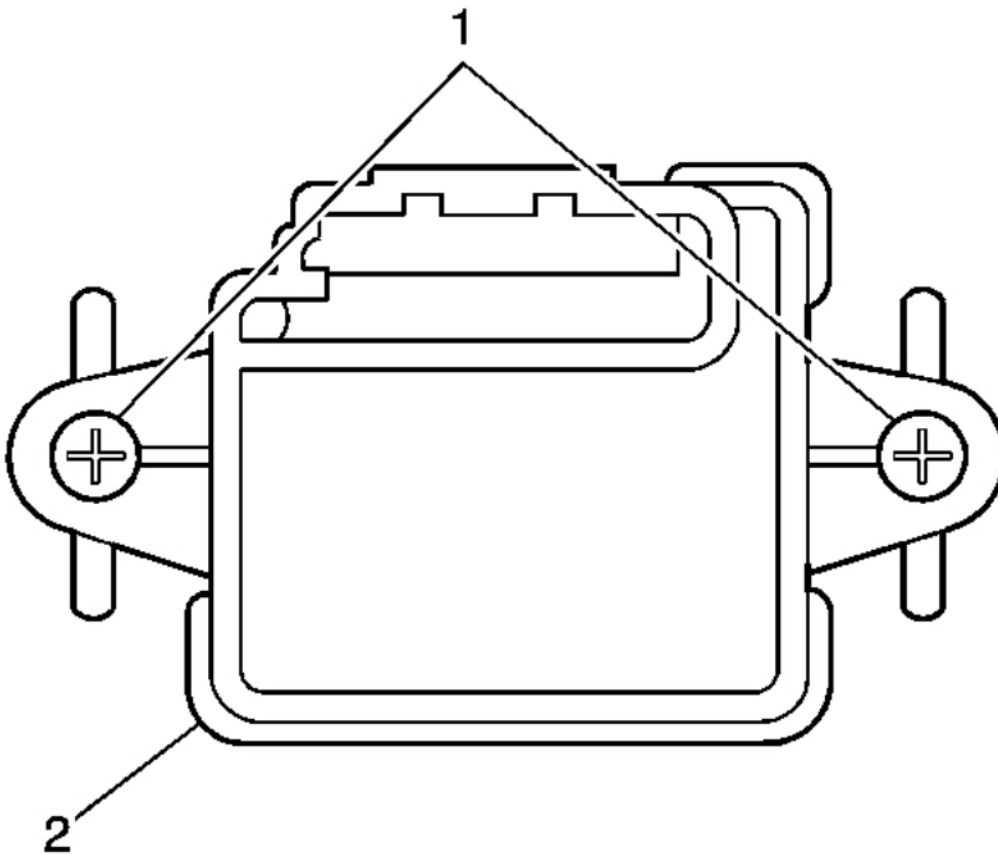


Fig. 29: View Of Traction Control Switch & Mounting Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the two traction control mounting screws (1).

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Tighten: Tighten the two traction control mounting screws to 2 N.m (18 lb in).

3. Connect the traction control electrical connector.
4. Install the console shift lever bezel. Refer to **Console Shift Lever Bezel Replacement** in Instrument Panel, Gages, and Console.

YAW RATE SENSOR/LATERAL ACCELEROMETER REPLACEMENT

Removal Procedure

1. Turn OFF the ignition.
2. To access the yaw rate sensor/lateral accelerometer move the passenger seat rearward.
3. Carefully lift the carpet by the seam.

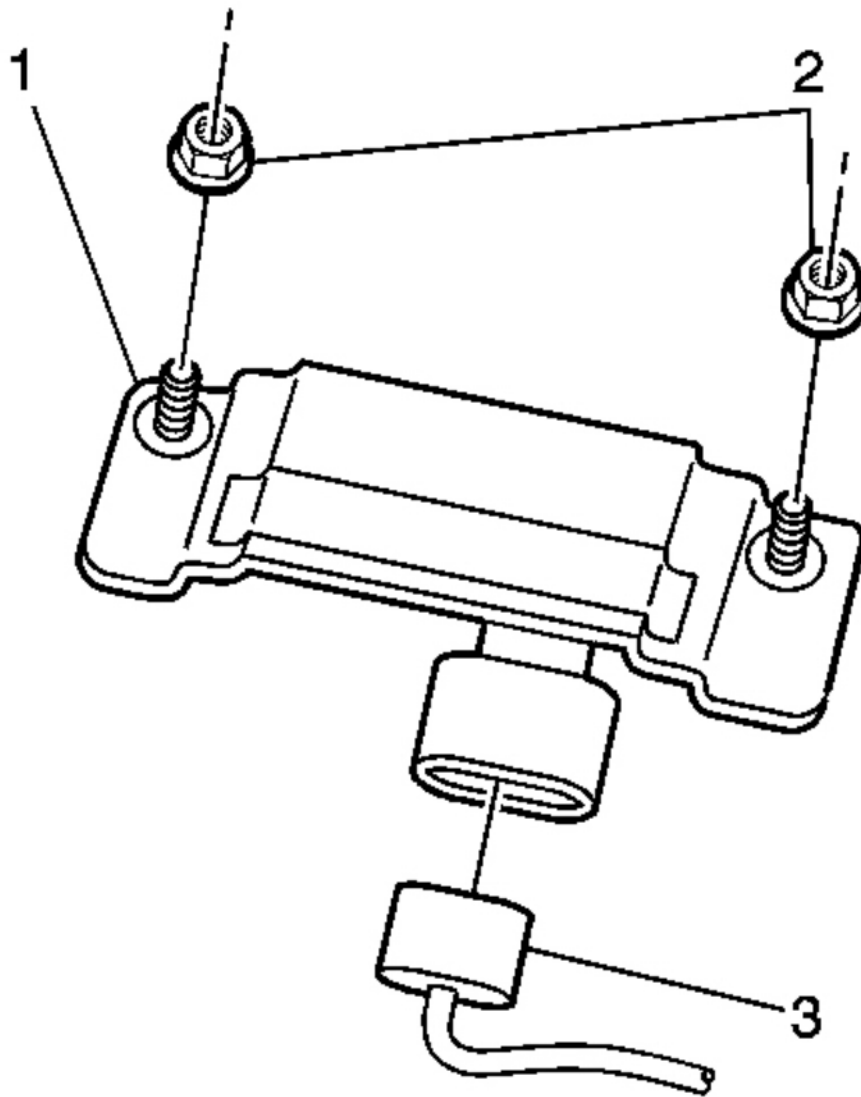


Fig. 30: View Of Yaw Rate Sensor/Lateral Accelerometer & Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

4. Remove the 2 yaw rate sensor/lateral accelerometer mounting nuts (2).

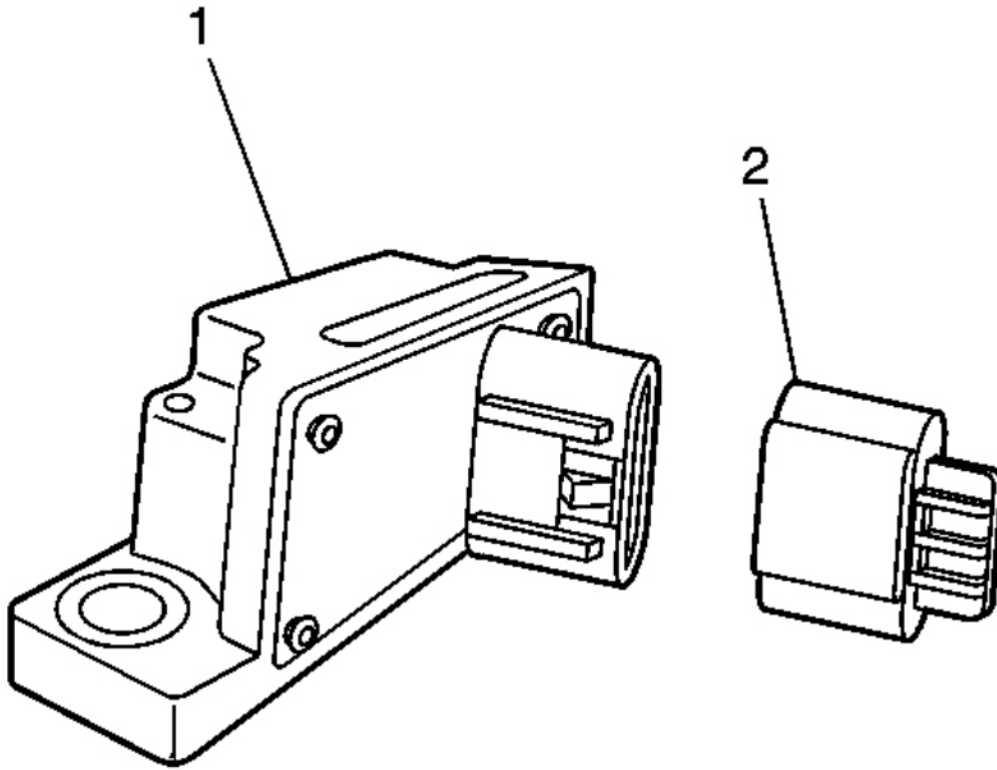


Fig. 31: View Of Yaw Rate Sensor/Lateral Accelerometer & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the yaw rate sensor/lateral accelerometer electrical connector (2) from the yaw rate sensor/lateral accelerometer.
6. Remove the yaw rate sensor/lateral accelerometer (1).

Installation Procedure

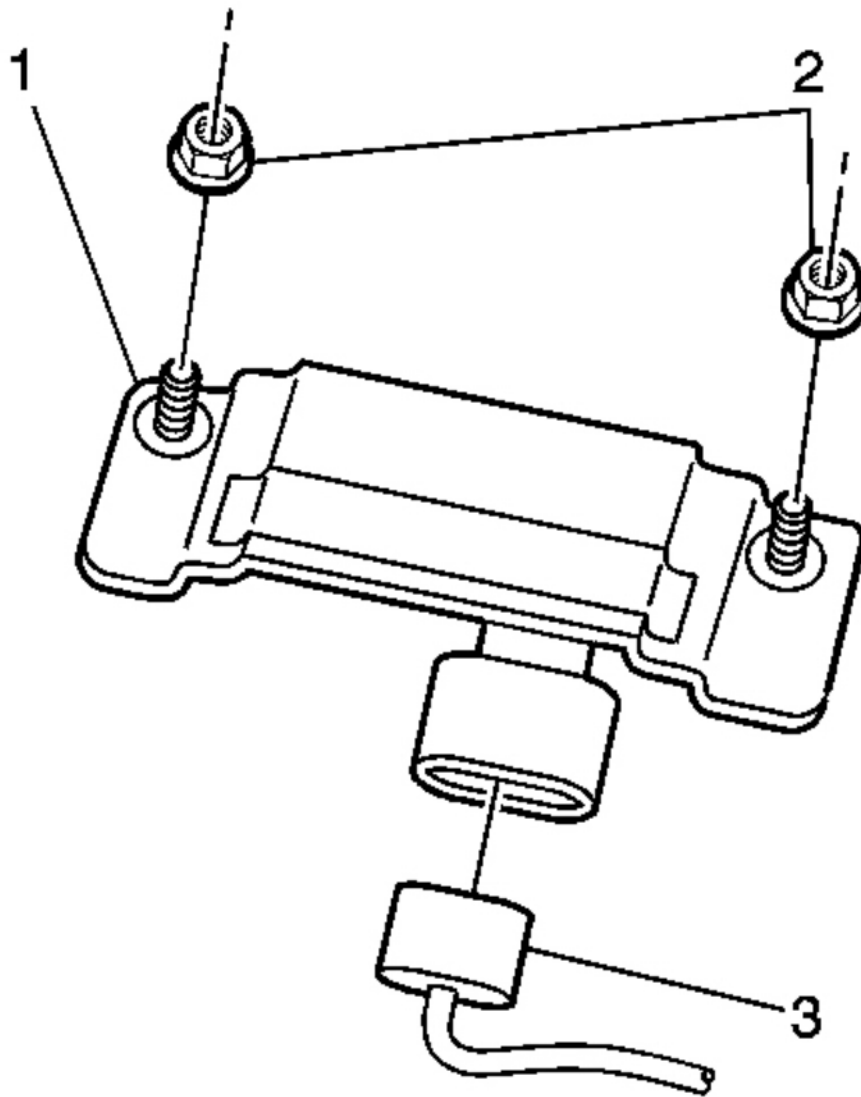


Fig. 32: View Of Yaw Rate Sensor/Lateral Accelerometer & Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the yaw rate sensor/lateral accelerometer (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the 2 yaw rate sensor/lateral accelerometer nuts (2).

Tighten: Tighten the yaw rate sensor/lateral accelerometer mounting nuts to 9 N.m (80 lb in).

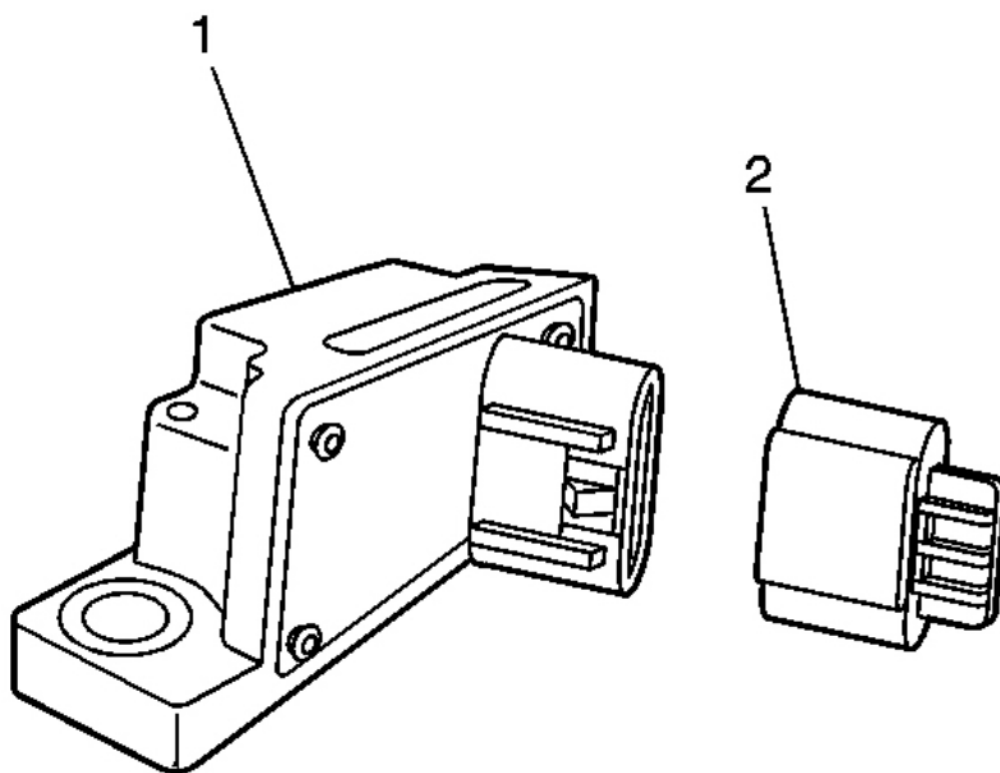


Fig. 33: View Of Yaw Rate Sensor/Lateral Accelerometer & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the yaw rate sensor/lateral accelerometer electrical connector (2) to the yaw rate sensor/lateral accelerometer (1).
4. Perform the ABS Diagnostic System Check. Refer to **Diagnostic System Check - ABS.**

YAW RATE SENSOR/LATERAL AND LONGITUDINAL ACCELEROMETER REPLACEMENT

Removal Procedure

1. Turn OFF the ignition.
2. To access the yaw rate sensor/lateral and longitudinal accelerometer move the passenger seat rearward.
3. Carefully lift the carpet by the seam.

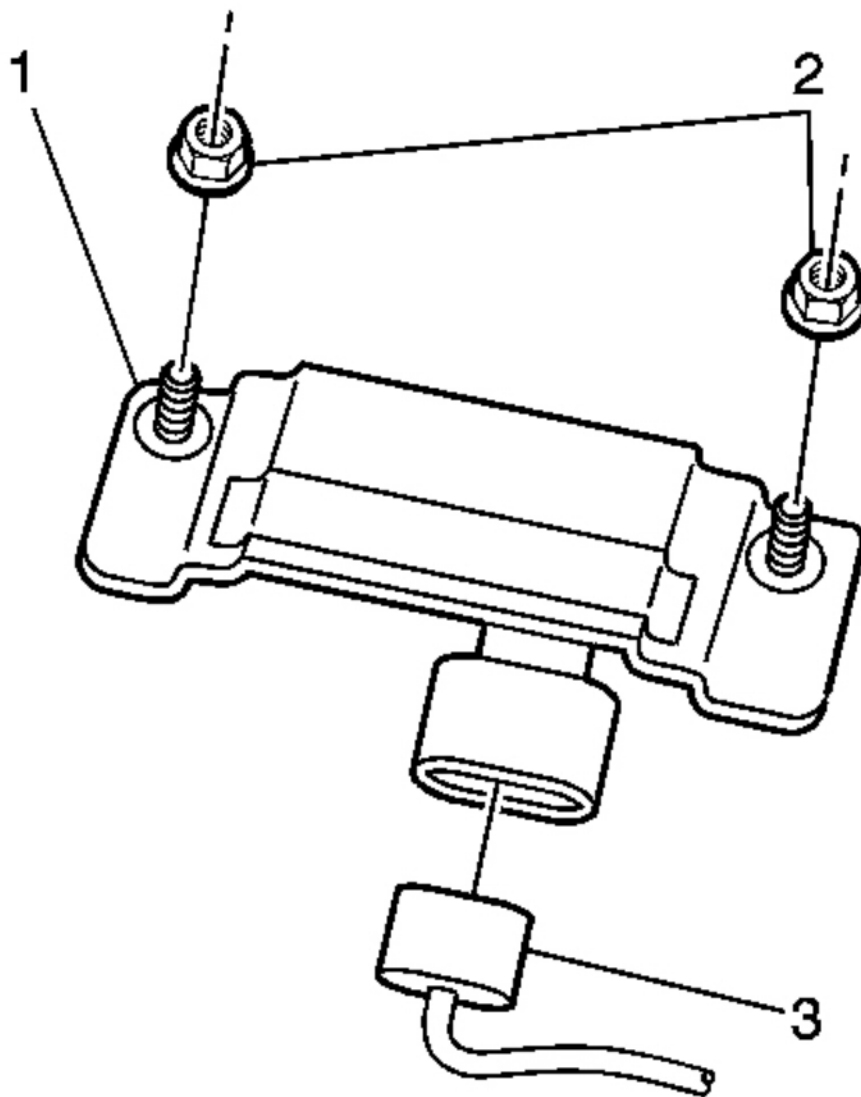


Fig. 34: View Of Yaw Rate Sensor/Lateral Accelerometer & Mounting Nuts

Courtesy of GENERAL MOTORS CORP.

4. Remove the 2 yaw rate sensor/lateral and longitudinal accelerometer mounting nuts (2).

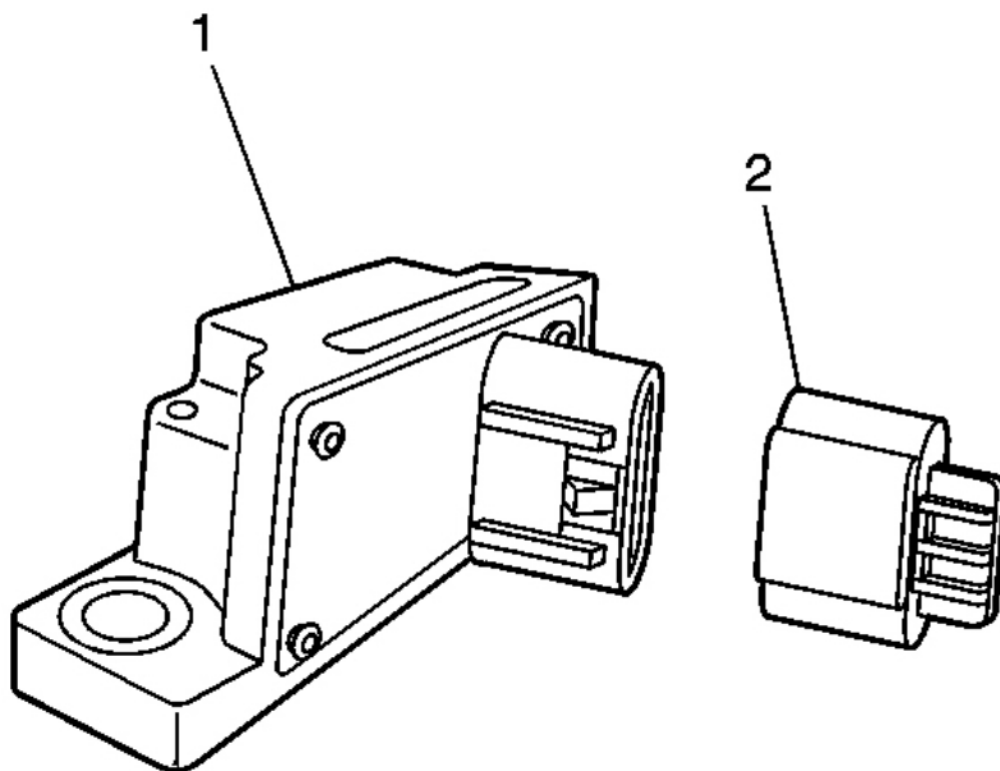


Fig. 35: View Of Yaw Rate Sensor/Lateral Accelerometer & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the yaw rate sensor/lateral and longitudinal accelerometer electrical connector (2) from the yaw rate sensor/lateral and longitudinal accelerometer.
6. Remove the yaw rate sensor/lateral and longitudinal accelerometer (1).

Installation Procedure

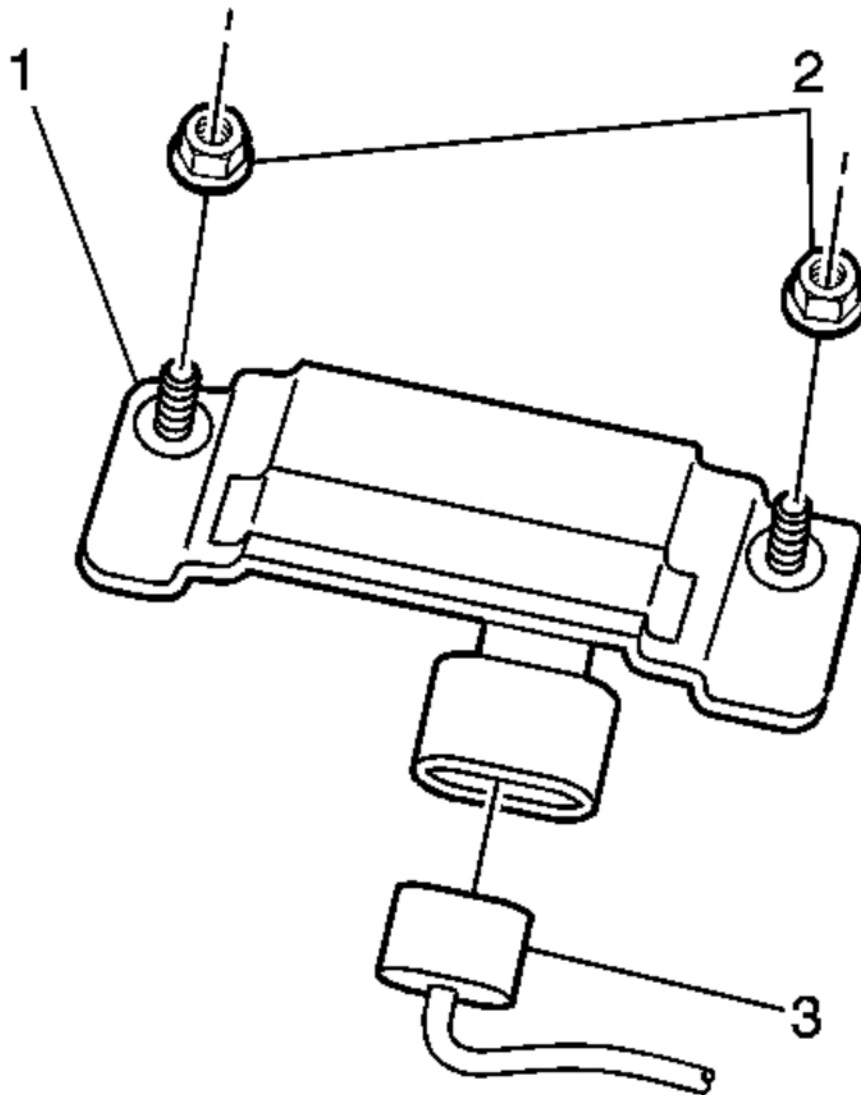


Fig. 36: View Of Yaw Rate Sensor/Lateral Accelerometer & Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the yaw rate sensor/lateral and longitudinal accelerometer (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the 2 yaw rate sensor/lateral and longitudinal accelerometer nuts (2).

Tighten: Tighten the yaw rate sensor/lateral and longitudinal accelerometer mounting nuts to 9 N.m (80 lb in).

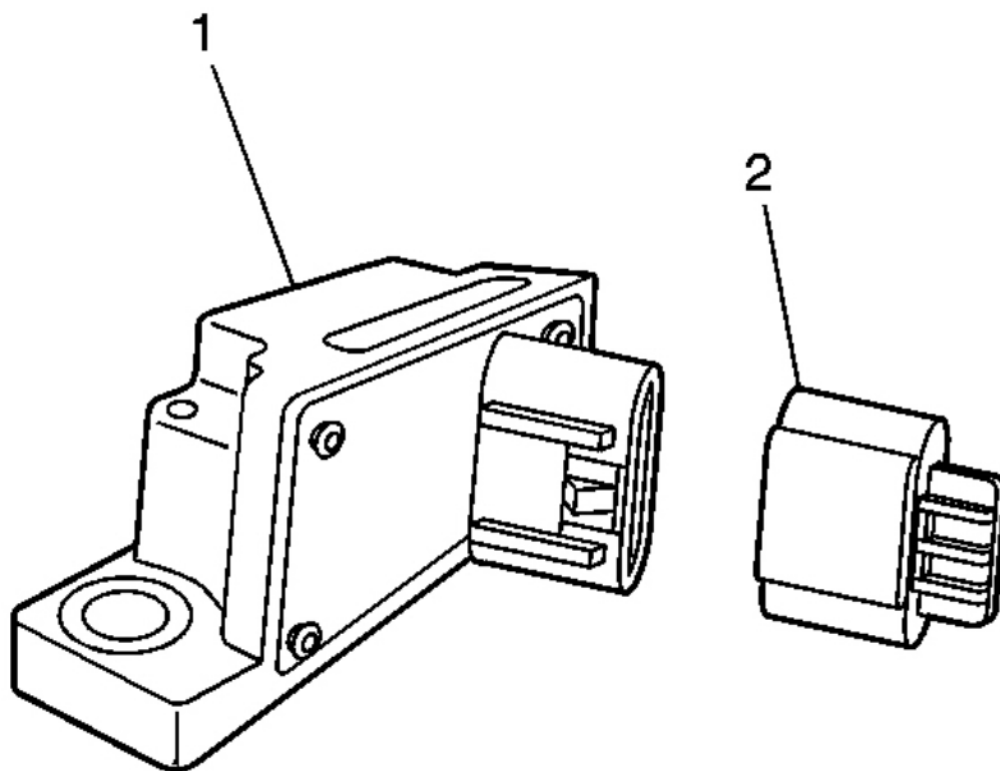


Fig. 37: View Of Yaw Rate Sensor/Lateral Accelerometer & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the yaw rate sensor/lateral and longitudinal accelerometer electrical connector (2) to the yaw rate sensor/lateral and longitudinal accelerometer (1).
4. Perform the ABS diagnostic system check. Refer to **Diagnostic System Check - ABS**.

DESCRIPTION AND OPERATION

ABS DESCRIPTION AND OPERATION

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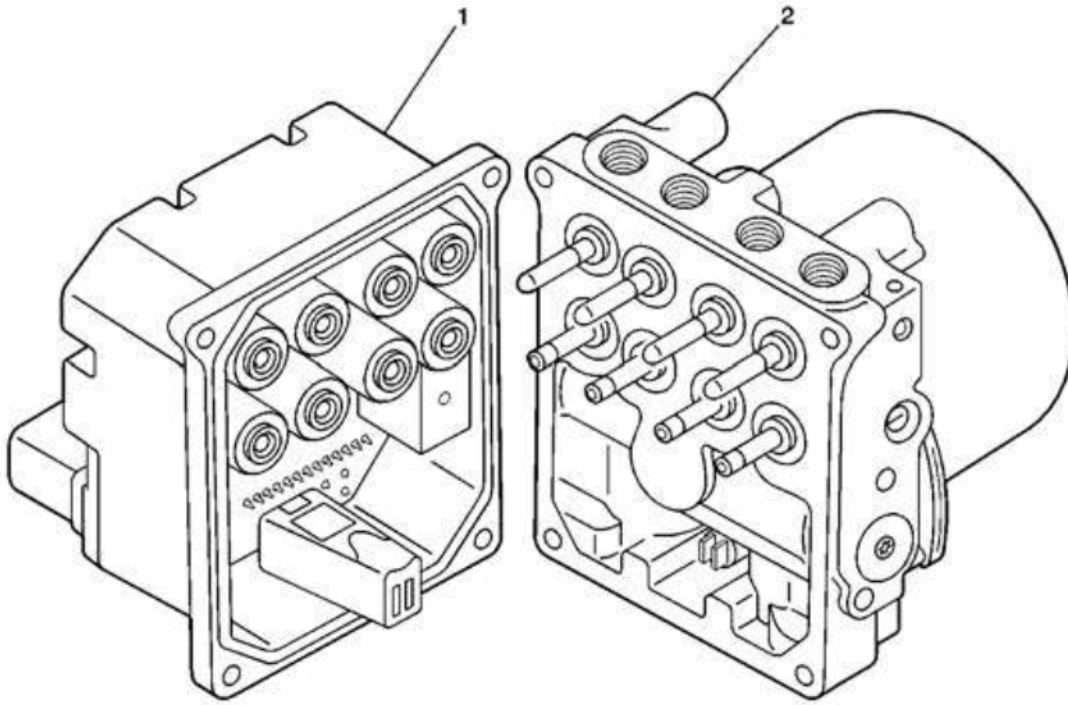


Fig. 38: EBCM & BPMV

Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 38

Callout	Component Name
1	Electronic Brake Control Module (EBCM)
2	Brake Pressure Modulator Valve (BPMV)

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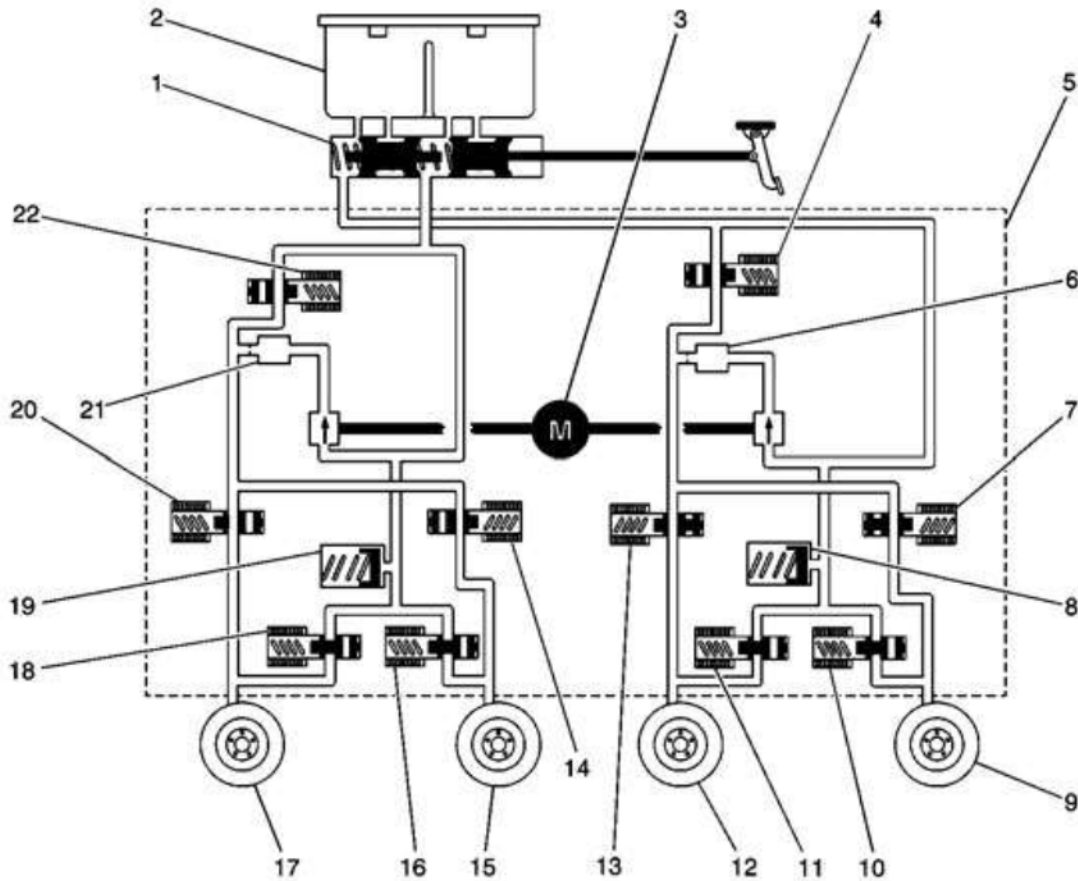


Fig. 39: BPMV Hydraulic Flow
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 39

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

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11	Left Front Outlet Valve
12	Left Front Brake
13	Left Front Inlet Valve
14	Left Rear Inlet Valve
15	Left Rear Brake
16	Left Rear Outlet Valve
17	Right Front Brake
18	Right Front Outlet Valve
19	Accumulator
20	Right Front Inlet Valve
21	Damper
22	Right Front TCS Valve

This vehicle is equipped with the DBC7.2 antilock braking system.

The vehicle is equipped with the following braking systems:

- Antilock Brake System (ABS)
- Engine Drag Control (EDC)
- Dynamic Rear Proportioning (DRP)
- Traction Control System (TCS)
- Vehicle Stability Enhancement System (VSES) (w/JL4)

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 BPMV uses a 4 circuit configuration with a diagonal split. The BPMV directs fluid from the reservoir of the master

cylinder to the left front and right rear wheels and fluid from the other reservoir to the right front and left rear wheels. The diagonal circuits are hydraulically isolated so that a leak or malfunction in one circuit will allow continued braking ability on the other.

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 (one per drive wheel)
- Prime Valves (one per drive wheel)
- 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. The wheel speed sensors are replaceable only as part of the wheel hub and bearing assemblies.
- Traction Control Switch - The TCS is manually disabled or enabled using the traction control switch.
- Stoplamp Switch - The EBCM uses the stoplamp switch as an indication that the brake pedal is applied.
- Lateral Accelerometer Sensor (w/JL4) - The EBCM uses the lateral accelerometer sensor as an indication of the lateral acceleration of the vehicle.
- Yaw Rate Sensor (w/JL4) - The EBCM uses the yaw rate sensor as an indication of the yaw rate of the vehicle.
- Steering Wheel Position Sensor (SWPS) (w/JL4) - The EBCM uses the SWPS as an indication of the position and rotation of the steering wheel.

Initialization Sequence

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

Both of the following conditions occur:

- The EBCM detects that there is a minimum of 500 RPM from the PCM via a serial data message.

- The stop lamp switch is not applied.

OR

Both of the following conditions occur:

- The vehicle speed is greater than 16 km/h (10 mph).
- The stop lamp 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.

Antilock Brake System

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

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

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

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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.

Engine Drag Control (EDC)

When the driver releases the throttle, and the drag from the engine overcomes the frictional force between the tire and the road, EDC becomes active.

The EBCM sends a torque request signal to the PCM, which increases the torque at the wheels. This stabilizes the wheels by reducing the slip at the driven wheels.

When EDC is active, the driven wheels are controlled to a target below the non-driven wheels.

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 System (TCS) (NW9)

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

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First, the EBCM requests the PCM to reduce the amount of torque to the drive wheels via the requested torque signal circuit. The PCM reduces torque to the drive wheels by retarding spark timing and turning off fuel injectors. The PCM reports the amount torque delivered to the drive wheels via the delivered torque signal circuit.

If the engine torque reduction does not eliminate drive wheel slip, the EBCM will actively apply the drive wheel brakes. During traction control braking, hydraulic pressure in each drive wheel circuit is controlled to prevent the drive wheels from slipping. The master cylinder isolation valve closes in order to isolate the master cylinder from the rest of the hydraulic system. The prime valve then opens in order to allow the pump to accumulate brake fluid in order to build hydraulic pressure for braking. The drive wheel inlet and outlet solenoid valves then open and close in order to perform the following functions:

- Pressure hold
- Pressure increase
- 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 antilock 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 5 seconds.
- The IPC detects a loss of class 2 communications with the EBCM.

Traction Control System Indicator

TRAC OFF

The IPC illuminates the TRAC OFF indicator when the following occurs:

- The electronic brake control module (EBCM) inhibits the traction control system due to a malfunction in the traction control system. The IPC receives a class 2 message from the EBCM requesting illumination.
- The rear integration module (RIM) detects that the traction control switch has been pressed (signal circuit is low). The RIM sends a class 2 message to the EBCM in order to disable traction control. The IPC receives a class 2 message from the EBCM requesting illumination. The RIM sends a class 2 message to the radio in order to activate an audible warning.

Vehicle Stability Enhancement System (VSES)

The vehicle stability enhancement system (VSES) adds an additional level of vehicle control to the EBCM.

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

The desired yaw rate is calculated from the following parameters:

- The position of the steering wheel
- The speed of the vehicle
- The lateral, or sideways acceleration of the vehicle

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

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/ Description

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J 39700
Universal Pinout Box

J 39700-300
Cable Adapter

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