

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2006 BRAKES

Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
BPMV to Bracket	11 N.m	97 lb in
Bracket Mounting Bolts	20 N.m	15 lb ft
Brake Lines to Fittings	25 N.m	18 lb ft
EBCM to BPMV	3 N.m	26 lb in
Front Wheel Speed Sensor Mounting Bolt	18 N.m	13 lb ft
Rear Wheel Speed Sensor Mounting Bolt	18 N.m	13 lb ft
Steering Knuckle to Front Hub/Bearing Mounting Bolts	180 N.m	133 lb ft
Yaw/Lateral Sensor	10 N.m	89 lb in

SCHEMATIC & ROUTING DIAGRAMS

ABS SCHEMATIC ICONS

ABS Schematic Icons

Icon	Icon Definition
	<p>IMPORTANT:</p> <p>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.</p> <p>In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted-pair wires shown :</p> <ul style="list-style-type: none">• The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires.• The outside diameter of the twisted wires must not

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

exceed 6.0 mm (0.25 in).



ABS SCHEMATICS

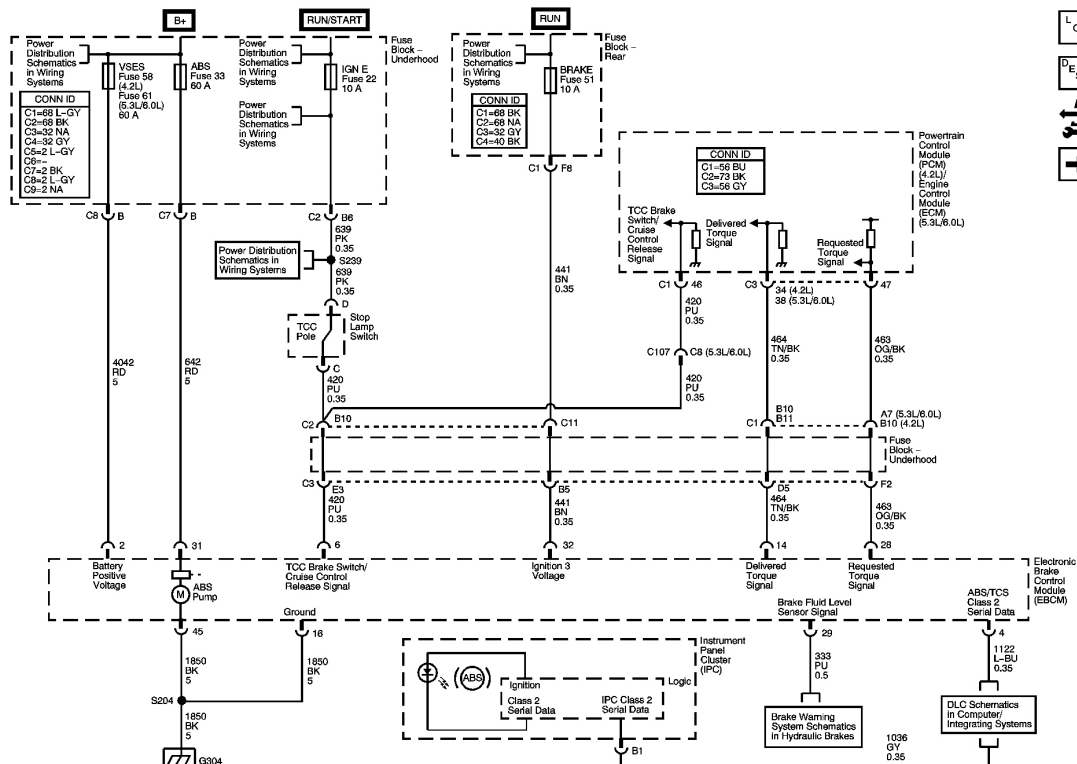


Fig. 1: EBCM, Power, Ground, Serial Data, Indicator & Signal Circuits
Courtesy of GENERAL MOTORS CORP.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

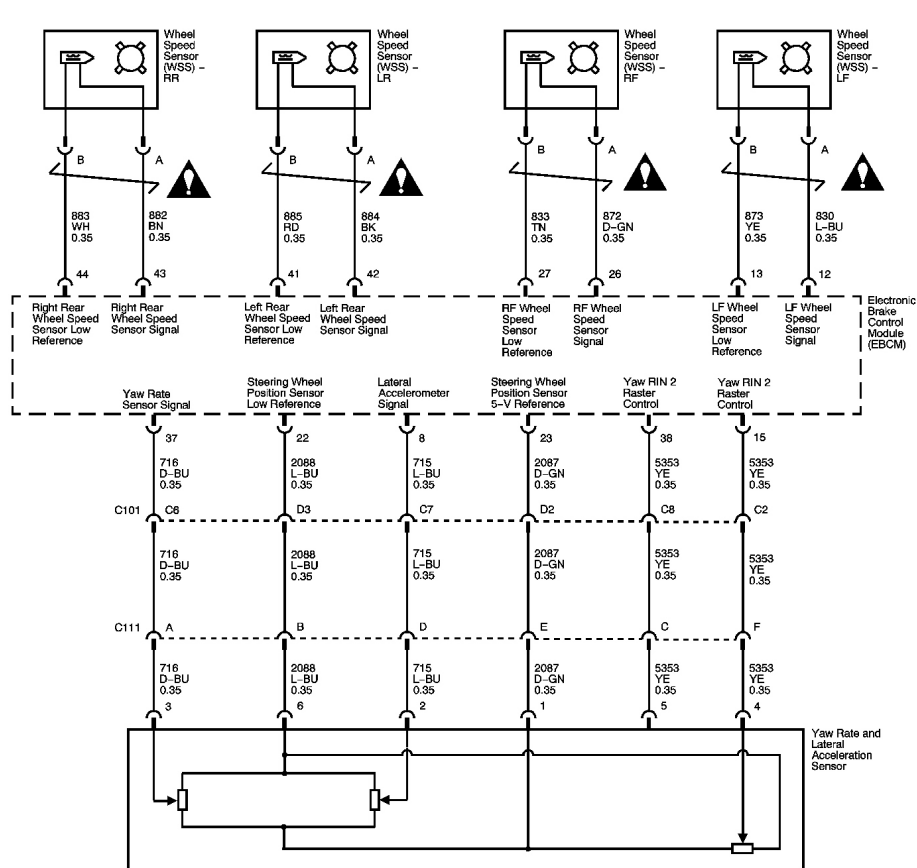


Fig. 2: Wheel Speed Sensors and Yaw Rate/Lateral Acceleration Sensor
Courtesy of GENERAL MOTORS CORP.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

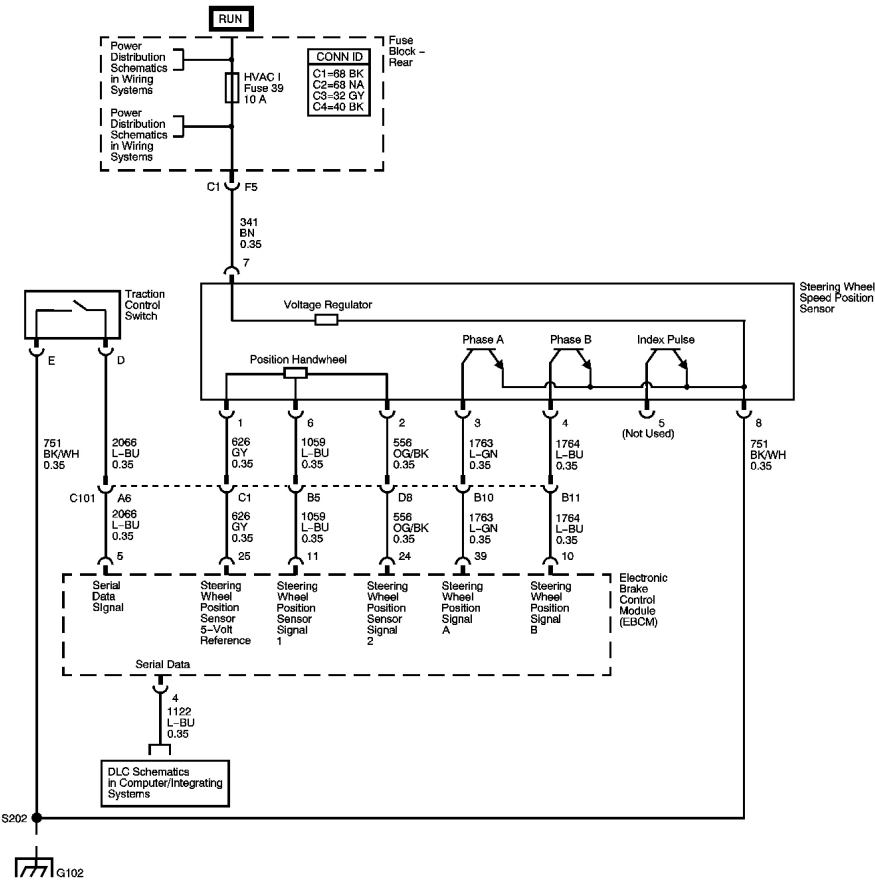


Fig. 3: Steering Wheel Speed Position Sensor & Traction Control Switch
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

ABS COMPONENT VIEWS

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

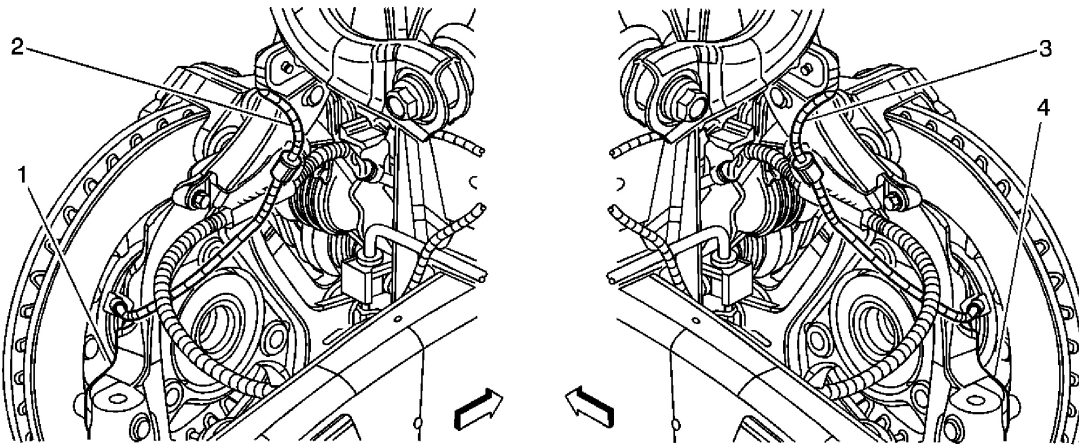


Fig. 4: Front Hubs And Rotors Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	LH Steering Knuckle
2	Wheel Speed Sensor - LF
3	Wheel Speed Sensor - RF
4	RH Steering Knuckle

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

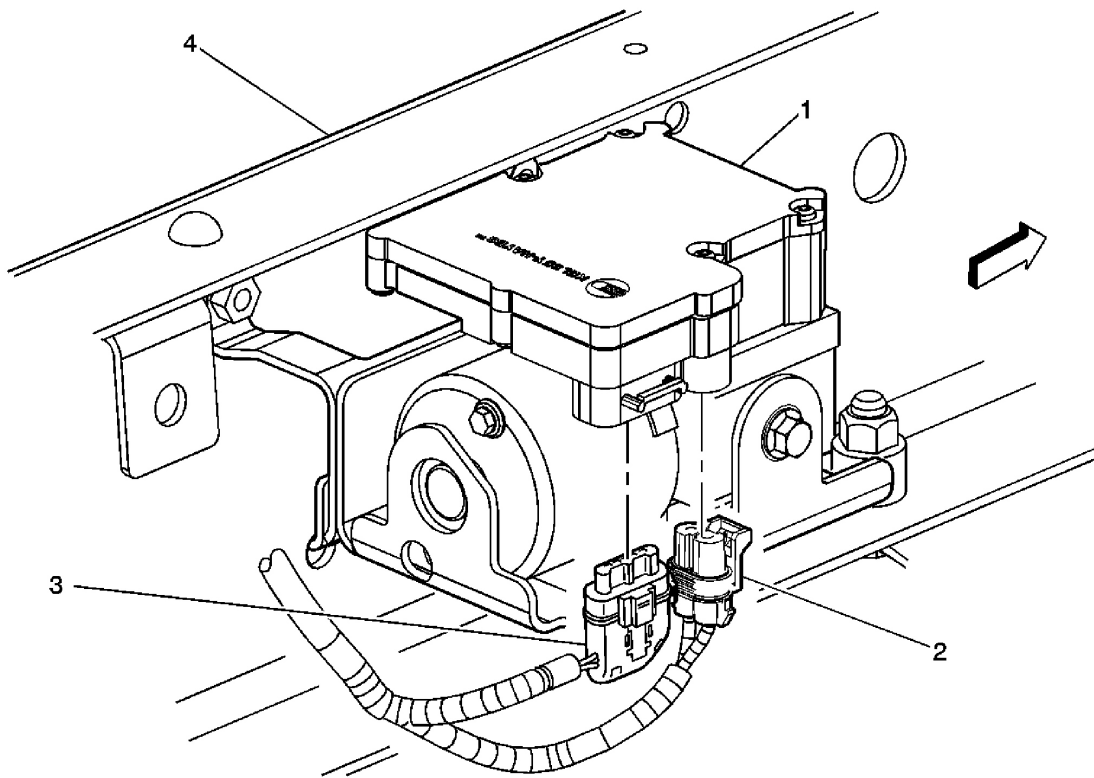


Fig. 5: Electronic Brake Control Module (EBCM) Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Electronic Brake Control Module (EBCM)
2	Electronic Brake Control Module (EBCM) Electrical Connector - C1
3	Electronic Brake Control Module (EBCM) Electrical Connector - C2
4	Frame

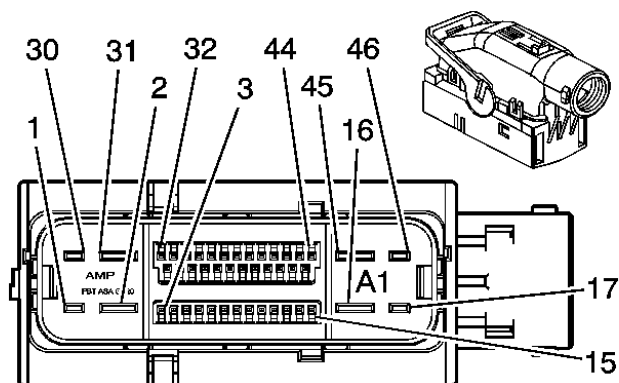
ABS CONNECTOR END VIEWS

Electronic Brake Control Module (EBCM)



2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer



Connector Part Information

- 13551457
- 46-Way F EBC-440 (BK)

Pin	Wire Color	Circuit No.	Function
1	-	-	Not Used
2	RD	4042	Battery Positive Voltage
3-4	-	-	Not Used
5	L-BU	2066	Serial Data Signal
6	PU	420	TCC Brake Switch/Cruise Control Release Signal
7	-	-	Not Used
8	L-BU	715	Lateral Accelerometer Signal
9	-	-	Not Used
10	L-BU	1764	Steering Wheel Position Signal B
11	L-BU	1059	Steering Wheel Position Sensor Signal 1
12	L-BU	830	Left Front Wheel Speed Sensor Signal
13	YE	873	Left Front Wheel Speed Sensor Low Reference
14	TN/BK	464	Delivered Torque Signal
15	YE	5353	Yaw Ring Raster Control
16	BK	1850	Ground
117-21	-	-	Not Used
22	L-BU	2088	Steering Wheel Position Sensor Low Reference

2006 Buick Rainier

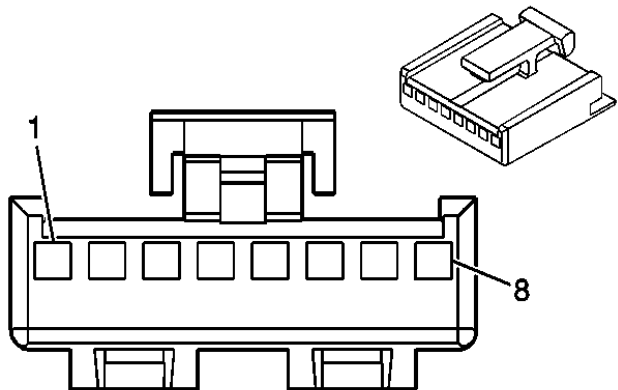
2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

23	D-GN	2087	Steering Wheel Position Sensor 5-Volt Reference
24	OG/BK	556	Steering Wheel Position Sensor Signal 2
25	GY	626	Steering Wheel Position Sensor 5-Volt Reference
26	D-GN	872	Right Front Wheel Speed Sensor Signal
27	TN	833	Right Front Wheel Speed Sensor Low Reference
28	OG/BK	463	Requested Torque Signal
29	PU	333	Brake Fluid Level Sensor Signal
30	-	-	Not Used
31	RD	642	Battery Positive Voltage
32	BN	441	Ignition 3 Voltage
33-36	-	-	Not Used
37	D-BU	716	Yaw Rate Sensor Signal
38	YE	5353	Yaw Ring Raster Control
39	L-GN	1763	Steering Wheel Position Signal A
40	-	-	Not Used
41	RD	885	Left Rear Wheel Speed Sensor Low Reference
42	BK	884	Left Rear Wheel Speed Sensor Signal
43	BN	882	Right Rear Wheel Speed Sensor Signal
44	WH	883	Right Rear Wheel Speed Sensor Low Reference
45	BK	1850	Ground
46	-	-	Not Used

Steering Wheel Speed/Position Sensor

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer



Connector Part Information

- **12052444**
- **8-Way F Micro-Pack 100 Series Unsealed (BK)**

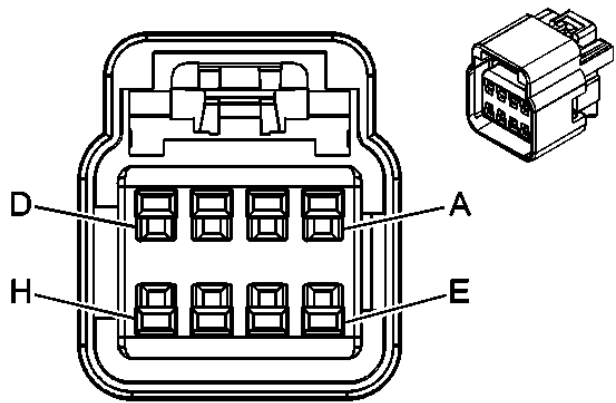
Pin	Wire Color	Circuit No.	Function
1	GY	626	Steering Wheel Position Sensor 5-Volt Reference
2	OG/BK	556	Steering Wheel Position Sensor Signal 2
3	L-GN	1763	Steering Wheel Position Signal A
4	L-BU	1764	Steering Wheel Position Signal B
5	-	-	Not Used
6	L-BU	1059	Steering Wheel Position Sensor Signal 1
7	BN	341	Ignition 3 Voltage
8	BK/WH	751	Ground

Traction Control Switch



2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

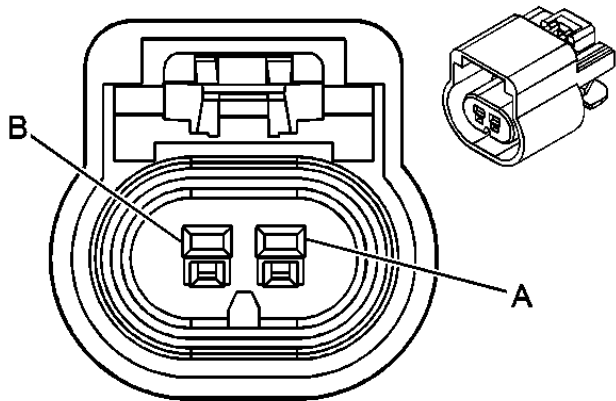


Connector Part Information

- 15332145
- 8-Way F GT 150 Series Unsealed (BK)

Pin	Wire Color	Circuit No.	Function
A-C	-	-	Not Used
D	L-BU	2066	Serial Data Signal
E	BK/WH	751	Ground
F-H	-	-	Not Used

Wheel Speed Sensor - LF



Connector Part Information

- 15326801
- 2-Way F GT 150 Series Sealed (BK)

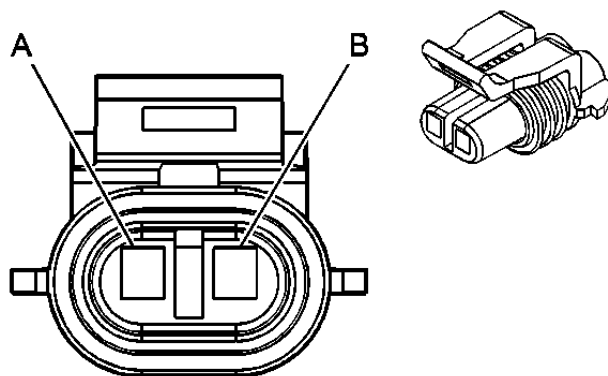
--	--	--	--

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Pin	Wire Color	Circuit No.	Function
A	L-BU	830	Left Front Wheel Speed Sensor Signal
B	YE	873	Left Front Wheel Speed Sensor Low Reference

Wheel Speed Sensor - LR



Connector Part Information

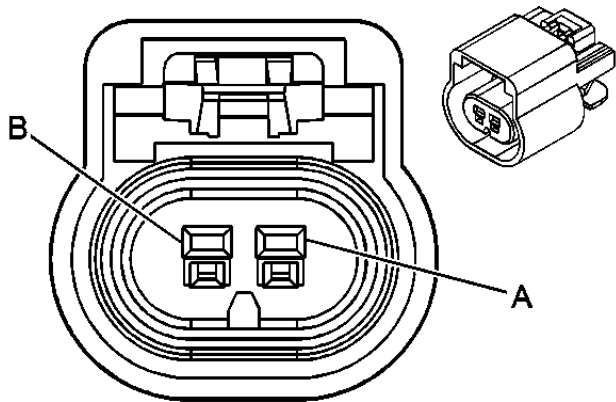
- **12052641**
- **2-Way F Metri-Pack 150 Series Sealed (BK)**

Pin	Wire Color	Circuit No.	Function
A	BK	884	Left Rear Wheel Speed Sensor Signal
B	RD	885	Left Rear Wheel Speed Sensor Low Reference

Wheel Speed Sensor - RF

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

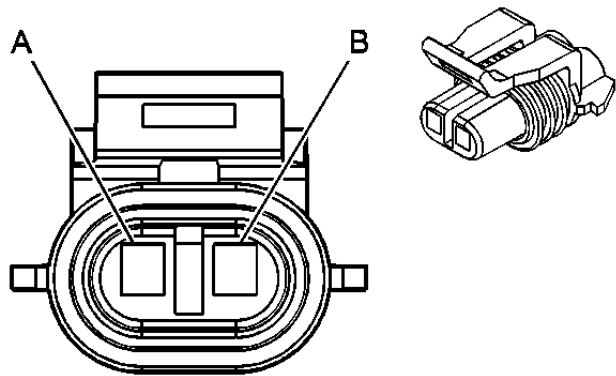


Connector Part Information

- 15326801
- 2-Way F GT 150 Series Sealed (BK)

Pin	Wire Color	Circuit No.	Function
A	D-GN	872	Right Front Wheel Speed Sensor Signal
B	TN	833	Right Front Wheel Speed Sensor Low Reference

Wheel Speed Sensor - RR



Connector Part Information

- 12052641
- 2-Way F Metri-Pack 150 Series Sealed (BK)

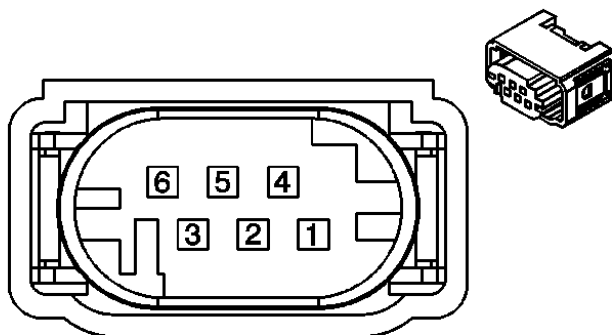
Pin	Wire Color	Circuit No.	Function

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

A	BN	882	Right Rear Wheel Speed Sensor Signal
B	WH	883	Right Rear Wheel Speed Sensor Low Reference

Yaw Rate and lateral Acceleration Sensor



Connector Part Information		<ul style="list-style-type: none">• 15383156• 6-Way F Quadlock Micro Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
1	D-GN	2087	Steering Wheel Position Sensor 5-V Reference
2	L-BU	715	Lateral Accelerometer Signal
3	D-BU	716	Yaw Rate Sensor Signal
4	YE	5353	Yaw Ring Raster Control
5	YE	5353	Yaw Ring Raster Control
6	L-BU	2088	Steering Wheel Position Sensor Low Reference

DIAGNOSTIC INFORMATION & PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC C0035 or C0040</u>	Front Wheel Speed Sensor Circuit
<u>DTC C0045 or C0050</u>	Rear Wheel Speed Sensor Circuit
<u>DTC C0110</u>	Pump Motor Circuit

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

<u>DTC C0131</u>	Anti-Lock Brake System (ABS)/Traction Control System (TCS) Pressure Circuit
<u>DTC C0161</u>	Anti-Lock Brake System (ABS)/Traction Control System (TCS) Brake Switch Circuit
<u>DTC C0186</u>	Lateral Accelerometer Circuit
<u>DTC C0196</u>	Yaw Rate Circuit
<u>DTC C0201</u>	Anti-Lock Brake System (ABS) Enable Relay Contact Circuit
<u>DTC C0240</u>	EBCM Malfunction
<u>DTC C0244 or P1689</u>	Pulse Width Modulated (PWM) Delivered Torque/Traction Control Delivered Torque Output Circuit
<u>DTC C0245</u>	Wheel Speed Sensor Frequency Error
<u>DTC C0283</u>	Mode Switch Circuit Malfunction
<u>DTC C0287</u>	Longitudinal Accelerometer Circuit
<u>DTC C0290 or C0292</u>	Devise Voltage Reference Output/Input Circuit
<u>DTC C0455</u>	Front Steering Position Sensor Circuit
<u>DTC C0550</u>	Electronic Control Unit (ECU) Performance
<u>DTC C0558</u>	Calibration Data Not Programmed

DIAGNOSTIC STARTING POINT - ANTI-LOCK BRAKE SYSTEM

Begin the system diagnosis with **Diagnostic System Check - Vehicle** in Vehicle DTC Information. 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.

SCAN TOOL OUTPUT CONTROLS (W/NW7)

Scan Tool Output Controls (W/NW7)

Scan Tool Output Control	Additional Menu Selections	Description
Refer to the scan tool manual for complete scan tool operating instructions.		
		The Electronic Brake Control Module (EBCM) commands the system relay, valve solenoids, and

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Function Test	-	pump motor ON and OFF. The EBCM sets a DTC if a malfunction is detected.
Automated Bleed	-	The EBCM commands each valve solenoid and the pump motor ON and OFF in a special sequence in order to bleed air out of the brake pressure modulator valve (BPMV). Refer to ABS Automated Bleed Procedure for a step-by-step procedure.
ABS Motor	-	This function allows the technician to command the ABS pump motor ON and OFF.
System Identification	-	The scan tool displays the hardware and software revision of the EBCM.
Tire Size Calibration	<ul style="list-style-type: none"> • Read Tire Calibration • New Tire Size 	<p>IMPORTANT: The Powertrain Control Module (PCM) must also be programmed with the correct tire size calibration when different size tires are installed on the vehicle. Refer to Service Programming System (SPS) in Programming and Setup.</p> <p>This function allows the technician to read the tire size calibration of the EBCM or calibrate the EBCM to the correct tire size. Calibration must be performed when the EBCM is replaced or when different size tires are installed on the vehicle.</p>
Lamp Tests	<ul style="list-style-type: none"> • ABS Lamp • Brake Lamp 	This function allows the technician to command the ABS indicator or the red BRAKE warning indicator ON and OFF.
Solenoid Tests	<ul style="list-style-type: none"> • Left Front Isolation Valve • Left Front Dump Valve • Right Front Isolation Valve 	<p>This function allows the technician to command a selected valve solenoid ON and OFF. Use the procedure below in order to verify proper operation of the EBCM and BPMV.</p> <p>Solenoid Test Procedure</p> <ol style="list-style-type: none"> 1. Raise the vehicle so the wheels are about 15 cm (6 in) off the floor. Refer to Lifting and Jacking the Vehicle in General Information. 2. Select the desired Solenoid Test on the scan tool.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	<ul style="list-style-type: none"> • Right Front Dump Valve • Rear Isolation Valve • Rear Dump Valve 	<p>IMPORTANT: Steps 3, 4 and 5 must be performed within a 5-second time period. The EBCM will only energize a solenoid for 5 seconds.</p> <ol style="list-style-type: none"> 3. Command the solenoid ON. 4. Apply the brake. 5. Have an assistant attempt to spin the wheel of the brake circuit being tested. The wheel should spin even though the brake is being applied.
ABS Relay	-	This function allows the technician to command the system relay ON and OFF.
Low TRAC Lamp	-	This function allows the technician to command the LOW TRACTION indicator ON and OFF.
Traction Off Lamp	-	This function allows the technician to command the TRACTION OFF indicator ON and OFF.
Requested Torque	-	This function allows the technician to turn OFF the engine torque reduction in order to verify proper operation of the Traction Control System.

SCAN TOOL DATA LIST

Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON, Engine OFF and Brake released			
4WD Status	ABS	Two wheel drive/Four wheel drive	Varies
ABS Lamp Command	ABS	On/Off	Off
ABS Pump Motor	ABS	On/Off	Off
ABS Relay Command	ABS	On/Off	ON
ABS Stop State	<ul style="list-style-type: none"> • ABS • Traction Assist 	On/Off	Off
	<ul style="list-style-type: none"> • ABS 		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Brake Switch Status	<ul style="list-style-type: none"> • Traction Assist 	On/Off	Off
Brake Warning Lamp Command	ABS	On/Off	Off
Diff. Pressure/Fluid Level Switch	ABS	Ok/Low	Ok
Delivered Torque	Traction Assist	%	35%
DRP Active	ABS	Yes/No	No
Left Front Wheel Speed	<ul style="list-style-type: none"> • ABS • Traction Assist 	km/h or mph	5 km/h/3 mph
LF Dump Valve Command	ABS	On/Off	Off
LF Dump Valve Feedback	ABS	On/Off	Off
LF ISO Valve Command	ABS	On/Off	Off
LF ISO Valve Feedback	ABS	On/Off	Off
Low Traction Lamp Command	Traction Assist	On/Off	Off
Rear Dump Valve Command	ABS	On/Off	Off
Rear Dump Valve Feedback	ABS	On/Off	Off
Rear ISO Valve Command	ABS	On/Off	Off
Rear ISO Valve Feedback	ABS	On/Off	Off
Rear Wheel Speed	<ul style="list-style-type: none"> • ABS • Traction Assist 	km/h or mph	5 km/h/3 mph
Requested Torque	Traction Assist	%	91%
RF Dump Valve Command	ABS	On/Off	Off
RF Dump Valve Feedback	ABS	On/Off	Off
RF ISO Valve Command	ABS	On/Off	Off
RF ISO Valve Feedback	ABS	On/Off	Off
Right Front Wheel Speed	<ul style="list-style-type: none"> • ABS • Traction Assist 	km/h or mph	5 km/h/3 mph
Traction Control Active	Traction Assist	Yes/No	No
Traction Control Enabled	Traction Assist	Yes/No	Varies
Traction Control Equipped	Traction Assist	Yes/No	Yes
Traction Control Slip	Traction Assist	Yes/No	No
Traction Off Lamp Command	Traction Assist	On/Off	Off

SCAN TOOL DATA DEFINITIONS

The ABS scan tool data definitions contain a brief description of all ABS related parameters available on the scan tool. The parameters available on the scan tool are listed below in alphanumeric order.

4WD Status

The scan tool displays Two wheel drive/Four wheel drive. The scan tool displays Two wheel drive when the transfer case is shifted into two wheel drive.

ABS Lamp Command

The scan tool displays On/Off. The scan tool displays On when the ABS indicator is commanded on.

ABS Pump Motor

The scan tool displays On/Off. The scan tool displays On when the ABS pump motor is commanded on.

ABS Relay Command

The scan tool displays On/Off. The scan tool displays On when the system relay is commanded on.

ABS Stop State

The scan tool displays On/Off. The scan tool displays On when the ABS is active.

Brake Switch Status

The scan tool displays On/Off. The scan tool displays On when the brake is applied.

Brake Warning Lamp Command

The scan tool displays On/Off. The scan tool displays On when the red brake warning indicator is commanded on.

Diff. Pressure/Fluid Level Switch

The scan tool displays Ok/Low. The scan tool displays Ok when the brake fluid reservoir

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

has an adequate fluid level.

Delivered Torque

The scan tool displays 25-95%. The scan tool displays 25% when the PCM provides the minimum percentage of available torque in an attempt to eliminate wheel slip.

DRP Active

The scan tool displays Yes/No. The scan tool displays Yes when the DRP is active.

Left Front Wheel Speed

The scan tool displays 5-257 km/h (3-160 mph). The scan tool displays 5 km/h (3 mph) when the vehicle is not moving or is moving at speeds less than or equal to 5 km/h (3 mph).

LF Dump Valve Command

The scan tool displays On/Off. The scan tool displays On when the left front dump valve solenoid is commanded on.

LF Dump Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the left front dump valve solenoid is energized.

LF ISO Valve Command

The scan tool displays On/Off. The scan tool displays On when the left front isolation valve solenoid is commanded on.

LF ISO Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the left front isolation valve solenoid is energized.

Low Traction Lamp Command

The scan tool displays On/Off. The scan tool displays On when the low traction indicator is commanded on.

Rear Dump Valve Command

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

The scan tool displays On/Off. The scan tool displays On when the rear dump valve solenoid is commanded on.

Rear Dump Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the rear dump valve solenoid is energized.

Rear ISO Valve Command

The scan tool displays On/Off. The scan tool displays On when the rear isolation valve solenoid is commanded on.

Rear ISO Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the rear isolation valve solenoid is energized.

Rear Wheel Speed

The scan tool displays 5-257 km/h (3-160 mph). The scan tool displays 5 km/h (3 mph) when the vehicle is not moving or moving at speeds less than or equal to 5 km/h (3 mph).

Requested Torque

The scan tool displays 40-95%. The scan tool displays 40% when the EBCM requests the minimum percentage of available torque in an attempt to eliminate wheel slip.

RF Dump Valve Command

The scan tool displays On/Off. The scan tool displays On when the right front dump valve solenoid is commanded on.

RF Dump Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the right front dump valve solenoid is energized.

RF ISO Valve Command

The scan tool displays On/Off. The scan tool displays On when the right front isolation valve solenoid is commanded on.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

RF ISO Valve Feedback

The scan tool displays On/Off. The scan tool displays On when the right front isolation valve solenoid is energized.

Right Front Wheel Speed

The scan tool displays 5-257 km/h (3-160 mph). The scan tool displays 5 km/h (3 mph) when the vehicle is not moving or moving at speeds less than or equal to 5 km/h (3 mph).

Traction Control Active

The scan tool displays Yes/No. The scan tool displays Yes when the traction control system is active.

Traction Control Enabled

The scan tool displays Yes/No. The scan tool displays Yes when the traction control system is enabled.

Traction Control Equipped

The scan tool displays Yes/No. The scan tool displays Yes when the vehicle is equipped with traction control.

Traction Control Slip

The scan tool displays Yes/No. The scan tool displays Yes when the rear wheel slip occurs during acceleration.

Traction Off Lamp Command

The scan tool displays On/Off. The scan tool displays On when the traction off indicator is commanded on.

DTC C0035 OR C0040

Circuit Description

As the wheels spin, each wheel speed sensor produces an AC signal. The Electronic Brake Control Module (EBCM) uses the frequency of the AC signals to calculate each wheel speed.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC C0035 Left Front Wheel Speed Sensor Circuit
- DTC C0040 Right Front Wheel Speed Sensor Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle speed is greater than 13 km/h (8 mph).

Conditions for Setting the DTC

Any of the following occurrences may cause the DTC to set.

- The EBCM detects an open or shorted wheel speed sensor circuit for 500 milliseconds.
- The EBCM detects the absence of a wheel speed sensor signal for 5 seconds. If more than one absent wheel speed sensor signal is detected, the condition must be present for 120 seconds to set DTCs.
- The EBCM detects an erratic wheel speed sensor signal for 200 milliseconds.

Action Taken When the DTC Sets

- The EBCM disables the ABS and may disable the dynamic rear proportion (DRP) if more than one wheel speed sensor DTC is set.
- The ABS indicator turns ON.
- The brake warning indicator may turn ON.

The actions above are maintained during subsequent ignition cycles until the EBCM completes a power up self-test. This test concludes when the vehicle achieves a speed greater than 13 km/h (8 mph) and the wheel speeds are verified by the EBCM.

Conditions for Clearing the DTC

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

Diagnostic Aids

Thoroughly inspect connections or circuitry that may cause an intermittent malfunction. Refer to the following:

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

- **Testing for Intermittent Conditions and Poor Connections**
- **Connector Repairs**
- **Testing for Electrical Intermittents**
- **Wiring Repairs**

If the customer's concern is that the ABS indicator is on only during humid conditions such as rain, snow or vehicle wash, thoroughly inspect the wheel speed sensor circuits for signs of water intrusion. Use the following procedure in order to help isolate the problem area:

1. Spray the suspected area with a 5 percent salt water solution.
2. Operate the vehicle at a speed greater than 13 km/h (8 mph) for at least 30 seconds.

Repair or replace the suspect harness if the DTC sets.

DTC C0035 or C0040

Step	Action	Values	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 - Vehicle</u>
2	1. Use a scan tool in order to clear the DTCs. 2. Operate the vehicle at a speed greater than the specified value. Does the DTC set?	13 km/h (8 mph)	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 3. Disconnect the wheel speed sensor connector. 4. Use a DMM in order to measure the resistance across the wheel speed sensor.	700-10,000 ohms		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Does the resistance measure within the specified range?		Go to Step 4	Go to Step 8
4	<ol style="list-style-type: none"> 1. Slowly spin the wheel by hand. 2. Use a DMM in order to measure the A/C voltage across the wheel speed sensor as the wheel spins. <p>Does the A/C voltage measure greater than the specified value?</p>	100 mV	Go to Step 5	Go to Step 8
5	<p>Inspect for poor connections at the harness connector of the wheel speed sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and to <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 10	Go to Step 6
6	<ol style="list-style-type: none"> 1. Disconnect from the Electronic Brake Control Module (EBCM), the harness connector containing the wheel speed sensor circuits. 2. Test the wheel speed sensor circuits for the following: <ul style="list-style-type: none"> • An open • A short to ground • A short to voltage • Shorted together <p>Refer to <u>Circuit Testing</u> and to <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 10	Go to Step 7
7	<p>Inspect for poor connections at the harness connector for the EBCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and to <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 10	Go to Step 9
8	<p>Replace the wheel speed sensor. Refer to <u>Wheel Speed Sensor Replacement</u>.</p>	-	Go to Step	

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Did you complete the replacement?		10	-
9	Replace the EBCM. Refer to <u>Control Module References</u> for replacement, setup and programming. Did you complete the replacement?	-	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 C0045 OR C0050

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.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC C0045 Left Rear Wheel Speed Sensor Circuit
- DTC C0050 Right Rear Wheel Speed Sensor Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle speed is greater than 13 km/h (8 mph).

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set.

- The EBCM detects an open wheel speed sensor circuit for 500 milliseconds.
- The EBCM detects a shorted wheel speed sensor circuit for 500 milliseconds.
- The EBCM detects the absence of a wheel speed sensor signal for 5 seconds. If more than one absent wheel speed sensor signal is detected, the condition must be present for 120

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

seconds to set DTCs.

- The EBCM detects an erratic wheel speed sensor signal for 200 milliseconds.

Action Taken When the DTC Sets

- The EBCM disables Anti-Lock Brake System (ABS)/Traction Control System (TCS)/Vehicle Stability Enhancement System (VSES) and may disable dynamic rear proportion (DRP) if more than one wheel speed sensor DTC is set.
- The ABS indicator turns ON.
- The traction off indicator turns ON.
- The message center displays the service stability system message.
- The brake warning indicator may turn ON.
- An ECE 13 response may occur. Refer to **ABS Description and Operation** for a complete description of ECE 13.

Conditions for Clearing the DTC

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

Diagnostic Aids

Thoroughly inspect connections or circuitry that may cause an intermittent malfunction. Refer to the following:

- **Testing for Intermittent Conditions and Poor Connections**
- **Connector Repairs**
- **Testing for Electrical Intermittents**
- **Wiring Repairs**

If the customer's concern is that the ABS indicator is on only during humid conditions such as rain, snow or vehicle wash, thoroughly inspect the wheel speed sensor circuits for signs of water intrusion. Use the following procedure in order to help isolate the problem area:

1. Spray the suspected area with a 5 percent salt water solution.
2. Operate the vehicle at a speed greater than 13 km/h (8 mph) for at least 30 seconds.

Repair or replace the suspect harness if the DTC sets.

DTC C0045 or C0050

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

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 - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	13 km/h (8 mph)	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 3. Disconnect the wheel speed sensor connector. 4. Use a DMM in order to measure the resistance across the wheel speed sensor. Does the resistance measure within the specified range?	3,500-6,800 ohms	Go to Step 4	Go to Step 9
3	1. Slowly spin the wheel by hand. 2. Use a DMM in order to measure the AC voltage across the wheel speed sensor as the wheel spins. 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 harness connector of the wheel speed sensor. Refer			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

5	to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	-	Go to Step 11	Go to Step 6
6	<ol style="list-style-type: none"> 1. Disconnect the Electronic Brake Control Module (EBCM) harness connector. 2. Test the wheel speed sensor circuits for the following: <ul style="list-style-type: none"> • An open • A short to ground • A short to voltage • Shorted together Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .Did you find and correct the condition?	-	Go to Step 11	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> . Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
8	<ol style="list-style-type: none"> 1. Remove the wheel speed sensor from the axle tube. Refer to <u>Wheel Speed Sensor Replacement</u>. 2. Inspect the wheel speed sensor tone ring, which is located on the axle, for damage. Did you find and correct the condition?	-	Go to Step 11	Go to Step 9
9	Replace the wheel speed sensor. Refer to <u>Wheel Speed Sensor Replacement</u> . Did you complete the replacement?	-	Go to Step 11	-
	IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

10	Tire Size Calibration procedure. Replace the EBCM. Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 11	-
11	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0110

Circuit Description

Ground is continuously supplied to the low side of the ABS pump motor. The Electronic Brake Control Module (EBCM) activates the ABS pump by supplying battery voltage to the high side of the motor.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0110 Pump Motor Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle speed is greater than 6 km/h (4 mph).

Conditions for Setting the DTC

The EBCM detects an open pump motor circuit, a shorted pump motor, or a seized pump motor or ABS pump.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Action Taken When the DTC Sets

- The EBCM disables the ABS/vehicle Stability Enhancement System (VSES).
- The Traction Control System (TCS) operates with engine torque reduction ability only.
- The ABS indicator turns ON.
- The stability indicator turns ON.
- An ECE 13 response may occur. Refer to **ABS Description and Operation** for a complete description of ECE 13.

Conditions for Clearing the DTC

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

Diagnostic Aids

Separate the EBCM from the brake pressure modulator valve (BPMV) in order to inspect for corrosion or any other condition that may cause a poor connection at the pump motor connector. Refer to **Electronic Brake Control Module Replacement** and **Testing for Intermittent Conditions and Poor Connections** . If severe corrosion or other damage exists, the BPMV or the EBCM may need to be replaced.

Test Description

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

4: This step tests for high resistance in the battery positive voltage circuit by verifying that an excessive voltage drop does not occur in the circuit.

DTC C0110

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 - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
	1. Use a scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds.			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2	<p>3. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.</p> <p>Does the DTC set?</p>	-	Go to Step 3	Go to Diagnostic Aids
3	<p>1. Disconnect the Electronic Brake Control Module (EBCM) harness connector.</p> <p>2. Connect a test lamp between the battery positive voltage circuit to the ABS pump motor, and a good ground.</p> <p>Does the test lamp illuminate?</p>	-	Go to Step 4	Go to Step 5
4	<p>IMPORTANT: Using a test lamp other than that which is approved for performing diagnostic procedures on GM vehicles, may cause an inaccurate result when performing this step. It is also imperative that the ground to which the test lamp is connected be clean and provide no resistance to battery ground. Refer to <u>Troubleshooting with a Test Lamp</u> for more information.</p> <p>With the test lamp still connected and illuminated, use a DMM to measure the voltage between the high side of the test lamp and a good ground. Does the voltage measure greater than the specified value?</p>	12 V	Go to Step 6	Go to Step 5
5	<p>Repair the high resistance in the battery positive voltage circuit. Ensure that total circuit resistance is not greater than the specified value. Refer to Circuit Testing and Wiring Repairs .</p> <p>Did you complete the repair?</p>	0.2 ohms	Go to Step 13	-
6	<p>Test the ABS motor ground circuit for an open or high resistance. Refer to Circuit Testing and Wiring Repairs .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 13	Go to Step 7

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

7	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Separate the EBCM from the brake pressure modulator valve (BPMV). Refer to <u>Control Module References</u> . 3. Connect a test lamp between the ABS pump motor power and ground circuits at the pump motor connector of the EBCM. 4. Turn ON the ignition. 5. Use the scan tool in order to clear the DTCs. <p>Does the DTC clear and then remain cleared while the test lamp is connected?</p>	-		Go to Step 8	Go to Step 10
8	<ol style="list-style-type: none"> 1. Select the vehicle Stability Enhancement System (VSES) Special Functions menu on the scan tool. 2. Command the ABS Motor ON. <p>Does the test lamp illuminate for 5 seconds and then turn OFF?</p>	-		Go to Step 9	Go to Step 12
9	<p>Inspect for poor connections at the pump motor connector.</p> <p>Did you find and correct the condition?</p>	-		Go to Step 13	Go to Step 11
10	<p>IMPORTANT: Following the EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?</p>	-		Go to Step 13	-
11	<p>Replace the BPMV. Refer to <u>Control Module References</u> .</p>	-		Go to Step	-

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Did you complete the replacement?		13	
12	IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure. Replace the EBCM and the BPMV. Refer to Control Module References .Did you complete the replacements?	-	Go to Step 13	-
13	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 3	System OK

DTC C0131

Circuit Description

The master cylinder pressure sensor is located within the brake pressure modulator valve (BPMV). The master cylinder pressure sensor signal, to the Electronic Brake Control Module (EBCM), increases as hydraulic pressure in the front brake circuit increases.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0131 Anti-Lock Brake System (ABS)/Traction Control System (TCS) Pressure Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle Stability Enhancement System (VSES) sensors have been successfully initialized or the message center has displayed the stability system disabled message due to

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

an unsuccessful initialization attempt. Refer to [ABS Description and Operation](#) for a complete explanation of VSES sensor initialization.

- The vehicle is being driven relatively straight and level at a speed greater than 36 km/h (23 mph).
- The transmission is not shifted into neutral or low gear.
- The parking brake is released.

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set.

- The EBCM detects open master cylinder pressure sensor circuitry.
- The EBCM detects shorted master cylinder pressure sensor circuitry.
- The master cylinder pressure sensor self-test, which occurs at power-up, fails.
- The zero-pressure signal voltage is not within an acceptable range.
- The master cylinder pressure is not within an expected tolerance based on deceleration rate and other data available to the EBCM.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The TCS operates with engine torque reduction only.
- The stability indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Test Description

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

3: This step is required for vehicles equipped with a hydro-boost brake assist system only. If

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

the vehicle being serviced has vacuum assisted brakes, proceed to step 4.

DTC C0131

Step	Action	Yes	No
IMPORTANT: Use the scan tool to read both current and history DTCs before proceeding. If DTC C0292 is set, diagnose that DTC before proceeding with diagnostics for C0131. If DTC C0161 is set, diagnose that DTC before proceeding with diagnostics for C0131.			
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 - Vehicle</u>
2	Inspect the vehicle for the following and ensure that there is no base brake failure: <ul style="list-style-type: none">• Dragging brakes• Faulty parking brake switch• Brake fluid leakage• Air in hydraulic system• Seized brake calipers• Swollen, kinked or otherwise damaged brake hoses Did you find and correct the condition?	Go to Step 9	Go to Step 3
3	Drive the vehicle in order to verify that the brakes do not self-apply during turning maneuvers. Do the brakes self-apply during turning maneuvers?	Go to <u>Symptoms - Hydraulic Brakes</u>	Go to Step 4
4	<ol style="list-style-type: none">1. Use the scan tool to clear the DTCs.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		Go to

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Does the DTC reset?	Go to Step 5	Diagnostic Aids
5	<ol style="list-style-type: none"> 1. Select the vehicle Stability Enhancement System (VSES) Data Display function on the scan tool. 2. Observe the Brake Switch Status parameter while pressing and releasing the brake pedal. <p>Does the Brake Switch Status change while pressing and releasing the brake?</p>	Go to Step 6	Go to <u>DTC C0161</u>
6	<ol style="list-style-type: none"> 1. Remove the Electronic Brake Control Module (EBCM) from the vehicle. Refer to <u>Control Module References</u> . 2. Inspect the master cylinder pressure sensor connector within the EBCM for damage or corrosion. <p>Is there connector damage or corrosion present?</p>	Go to Step 7	Go to Step 8
7	<p>IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?</p>	Go to Step 9	-
8	<p>IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM and the brake pressure modulator valve (BPMV). Refer to <u>Control Module References</u> .Did you complete the replacements?</p>	Go to Step 9	-
	<ol style="list-style-type: none"> 1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules. 2. Turn OFF the ignition for 5 seconds. 		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

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

DTC C0161

Circuit Description

The brake switch informs the Electronic Brake Control Module (EBCM) when the brake is depressed. The brake switch is normally closed, supplying 12 volts to the EBCM when the brake is released. When the brake pedal is pressed, voltage on the torque converter clutch (TCC) brake switch signal circuit is 0 volts.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0161 Anti-Lock Brake System (ABS)/Traction Control System (TCS) Brake Switch Circuit

Conditions for Running the DTC

Any of the following conditions may cause the DTC to run.

- The vehicle accelerates from 0 km/h (0 mph) to a speed greater than 56 km/h (35 mph).
- The vehicle experiences an ABS event involving all hydraulic circuits.

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set:

- Voltage on the TCC brake switch signal circuit is always low.
- Voltage on the TCC brake switch signal circuit is always high.

Action Taken When the DTC Sets

The EBCM stores this information-only DTC for as long as the condition is present:

Conditions for Clearing the DTC

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

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

Diagnostic Aids

Thoroughly inspect connections or circuitry that may cause an intermittent malfunction. Refer to the following:

- **Testing for Intermittent Conditions and Poor Connections**
- **Connector Repairs**
- **Testing for Electrical Intermittents**
- **Wiring Repairs**

Test Description

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

4: This step tests for a shorted stop lamp switch.

5: This step tests for an open stop lamp switch.

DTC C0161

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 - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Install a scan tool. 2. Select the 4WAL 3 Sensor Data Display function. 3. Observe the Brake Switch Status on the scan tool. Does the scan tool display Off?	Go to Step 3	Go to Step 5
3	1. Apply the brake. 2. Observe the Brake Switch Status on the scan tool.		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Does the scan tool display On?	Go to Diagnostic Aids	Go to Step 4
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the stop lamp switch. Refer to <u>Stop Lamp Switch Replacement</u> . 3. Turn ON the ignition. 4. Observe the Brake Switch Status on the scan tool. 		
	Does the scan tool display On?	Go to Step 9	Go to Step 7
5	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the stop lamp switch. Refer to <u>Stop Lamp Switch Replacement</u> . 3. Connect a fused jumper wire between the ignition 3 voltage circuit and the torque converter clutch (TCC) brake switch signal circuit at the stop lamp switch harness connector. Refer to <u>Using Fused Jumper Wires</u> . 4. Turn ON the ignition. 5. Observe the Brake Switch Status on the scan tool. 		
	Does the scan tool display Off?	Go to Step 9	Go to Step 6
6	<p>Test the ignition 3 voltage circuit and the TCC brake switch signal circuit for an open or a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 12	Go to Step 8
7	<p>Test the TCC brake switch signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 12	Go to Step 8
8	<p>Inspect for poor connections at the harness connector of the Electronic Brake Control Module (EBCM). Refer to <u>Testing for Intermittent Conditions and Poor</u></p>		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	<u>Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 12	Go to Step 10
9	Inspect for poor connections at the harness connector of the stop lamp switch. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 12	Go to Step 11
10	IMPORTANT: Following EBCM replacement, use the scan tool to perform the Tire Size Calibration procedure. Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?	Go to Step 12	-
11	Replace the stop lamp switch. Refer to <u>Stop Lamp Switch Replacement</u> . Did you complete the replacement?	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 C0186**Circuit Description**

The Electronic Brake Control Module (EBCM) supplies 5 volts to the yaw rate sensor/lateral accelerometer. When the vehicle is not moving, or is being driven in a stable, straight line, lateral acceleration is 0 m/sec/sec (0 ft/sec/sec) and the lateral accelerometer signal voltage is very near 2.5 volts. This is referred to as lateral accelerometer bias voltage. Making a turning maneuver causes the lateral accelerometer signal voltage to increase, or decrease, depending on the direction of the turn. The sharper the turn, the greater the change in signal voltage.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0186 Lateral Accelerometer Circuit

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Conditions for Running the DTC

- The ignition is ON.
- The vehicle Stability Enhancement System (VSES) sensors have been successfully initialized or the message center has displayed the stability system disabled message due to an unsuccessful initialization attempt. Refer to [ABS Description and Operation](#) for a complete explanation of VSES sensor initialization.
- The vehicle is being driven relatively straight and level at a speed greater than 11 km/h (7 mph), before performing a stable turning maneuver.

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set:

- Open lateral accelerometer circuitry is detected.
- Shorted lateral accelerometer circuitry is detected.
- An erratic lateral accelerometer signal is detected.
- The EBCM detects that the lateral accelerometer sensor signal does not correspond with signals from other sensors.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The stability indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Inspect the vehicle for proper wheel alignment. Ensure the vehicle does not pull toward the left or right while driving straight forward on a level surface.
- Communicate with the customer to determine the conditions under which the message center displays the Service Stability System message. Learning the conditions under which the DTC sets may help you duplicate the failure.
- Use the Snapshot function on the scan tool in order to assist you in locating an intermittent malfunction.

Test Description

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

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

3: This step tests the sensor circuitry in the high voltage range.

4: This step tests the sensor circuitry in the low voltage range.

DTC C0186

Step	Action	Values	Yes	No
IMPORTANT: If DTC C0292 is set, diagnose C0292 before proceeding with diagnostics for C0186. If DTC C0196 is set, diagnose C0196 before proceeding with diagnostics for C0186. Always use connector test adapters when performing tests to avoid damage to delicate connector terminals. Do not turn OFF the ignition during this diagnostic procedure unless the step in the table instructs you to do so. The scan tool may display some incorrect data if the ignition is cycled. 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 - Vehicle?	-	Go to Step 2	Go to <u><u>Diagnostic System Check - Vehicle</u></u>
2	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 3	Go to Diagnostic Aids
	1. Turn OFF the ignition. 2. Disconnect the yaw rate sensor/lateral accelerometer harness connector. Refer to <u><u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u></u> . 3. Turn ON the ignition. 4. Select the vehicle Stability			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

3	<p>Enhancement System (VSES) Data Display function on the scan tool.</p> <p>5. Connect a 3-amp fused jumper wire between the yaw rate sensor/lateral accelerometer 5-volt reference circuit and the lateral accelerometer signal circuit. Refer to <u>Using Fused Jumper Wires</u> .</p> <p>6. Observe the Lateral Accelerometer Sensor Input on the scan tool.</p> <p>Is the Lateral Accelerometer Sensor Input voltage greater than the specified value?</p>	4.4 V	Go to Step 4	Go to Step 5
4	<p>1. Remove the fused jumper wire from the yaw rate sensor/lateral accelerometer harness connector.</p> <p>2. Observe the Lateral Accelerometer Sensor Input on the scan tool.</p> <p>Is the Lateral Accelerometer Sensor Input voltage less than the specified value?</p>	0.6 V	Go to Step 6	Go to Step 9
5	<p>Test the lateral accelerometer signal circuit for the following conditions:</p> <ul style="list-style-type: none"> • An open • A high resistance • A short to ground <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 10	Go to Step 7
6	<p>1. Inspect for poor connections at the harness connector of the yaw rate sensor/lateral accelerometer. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p>	-		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	<p>2. Ensure the yaw rate sensor/lateral accelerometer is mounted securely and that the mounting bracket is not bent or otherwise damaged.</p> <p>Did you find and correct the condition?</p>		Go to Step 10	Go to Step 8
7	<p>Inspect for poor connections at the harness connector of the Electronic Brake Control Module (EBCM). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 10	Go to Step 9
8	<p>IMPORTANT: The Yaw Rate Reference Table Reset Procedure must be performed when you are instructed to do so during the Yaw Rate Sensor/Lateral Accelerometer Replacement procedure.</p> <p>Replace the yaw rate sensor/lateral accelerometer. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>Did you complete the replacement?</p>	-	Go to Step 10	-
9	<p>IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?</p>	-	Go to Step 10	-
10	<p>1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.</p> <p>2. Turn OFF the ignition for 5 seconds.</p> <p>3. Turn ON the ignition.</p> <p>4. Operate the vehicle within the</p>	-		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Conditions for Running the DTC as specified in the supporting text.			
Does the DTC reset?		Go to Step 3	System OK

DTC C0196

Circuit Description

The Electronic Brake Control Module (EBCM) supplies 5 volts to the yaw rate sensor/lateral accelerometer. When the vehicle is not moving, or is being driven in a stable, straight line, yaw rate is 0 degrees/second and the yaw rate sensor signal voltage is very near 2.5 volts. This is referred to as sensor bias voltage. Performing a turning maneuver causes the yaw rate sensor signal voltage to increase, or decrease, depending on the direction of the turn. The sharper the turn, the greater the change in signal voltage. Since the yaw rate signal is affected by temperature, the EBCM also monitors a Hz frequency signal from the yaw rate sensor/lateral accelerometer which is proportionate to the approximate temperature of the yaw rate sensor.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0196 Yaw Rate Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle Stability Enhancement System (VSES) sensors have been successfully initialized or the message center has displayed the stability system disabled message due to an unsuccessful initialization attempt. Refer to [ABS Description and Operation](#) for a complete explanation of VSES sensor initialization.
- The vehicle is being driven relatively straight and level at a speed greater than 11 km/h (7 mph), before performing a stable turning maneuver.

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set:

- Open yaw rate sensor circuitry is detected.
- Shorted yaw rate sensor circuitry is detected.
- An erratic yaw rate sensor signal is detected.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

- The EBCM detects that the yaw rate sensor signal does not correspond with signals from other sensors.
- The EBCM detects that the yaw rate sensor frequency signal is not within the valid range.
- A voltage near 5 volts is detected on the yaw rate sensor test circuit at all times.
- A voltage near 0 volts is detected on the yaw rate sensor test circuit at all times.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The stability indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

- The following scenario may cause this DTC to set when no actual malfunction exists:
 - The vehicle is driven in a straight line in reverse at a speed greater than 13 km/h (8 mph).
 - The transmission is shifted into neutral while the vehicle continues to coast backward.
 - A turning maneuver is performed after the above conditions are met and the vehicle speed is still greater than 13 km/h (8 mph).
- This DTC may also set falsely if the yaw rate sensor is replaced without first following the diagnostic table below. Whenever a new yaw rate sensor is installed, the old sensor must be disconnected, the ignition turned ON for 5 seconds and then OFF, and then the new sensor connected.
- Inspect the vehicle for proper wheel alignment. Ensure the vehicle does not pull toward the left or right while driving straight forward on a level surface.
- Communicate with the customer to determine the conditions under which the message center displays the service stability system message. Learning the conditions under which the DTC sets may help you duplicate the failure.
- Use the Snapshot function on the scan tool in order to assist you in locating an intermittent malfunction.

Test Description

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

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

12: This step tests for a shorted resistor in the EBCM or a short to voltage within the circuit, by verifying that a large voltage drop occurs in the circuit when the test lamp is placed in parallel with the DMM.

DTC C0196

Step	Action	Values	Yes	No
IMPORTANT: If DTC C0292 is set, diagnose C0292 before proceeding with diagnostics for C0196. Always use connector test adapters when performing tests to avoid damage to delicate connector terminals.				
Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the yaw rate sensor/lateral accelerometer harness connector. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u> . 3. Turn ON the ignition. 4. Select the vehicle Stability Enhancement System (VSES) Data Display function on the scan tool. 5. Observe the Yaw Rate Sensor Input	0.6 V		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	on the scan tool.			
	Is the Yaw Rate Sensor Input less than the specified value?		Go to Step 4	Go to Step 19
4	<ol style="list-style-type: none"> 1. Connect a fused jumper wire between the yaw rate sensor/lateral accelerometer 5-volt reference circuit and the yaw rate signal circuit. Refer to <u>Using Fused Jumper Wires</u> . 2. Observe the Yaw Rate Sensor Input on the scan tool. <p>Is the Yaw Rate Sensor Input greater than the specified value?</p>	4.4 V		
			Go to Step 5	Go to Step 7
5	<ol style="list-style-type: none"> 1. Disconnect the fused jumper wire. 2. Use a DMM to measure the voltage between the yaw rate sensor/lateral accelerometer 5-volt reference circuit and the yaw rate sensor/lateral accelerometer low reference circuit. <p>Does the voltage measure greater than the specified value?</p>	4.75 V		
			Go to Step 9	Go to Step 6
6	<p>Test the yaw rate sensor/lateral accelerometer low reference circuit for an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 17
7	<p>Test the yaw rate signal circuit for the following conditions:</p> <ul style="list-style-type: none"> • An open • A high resistance • A short to ground <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p>	-	Go to Step	

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Did you find and correct the condition?		20	Go to Step 8
8	Test the yaw rate sensor/lateral accelerometer 5-volt reference circuit for a high resistance or an open. Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	-	Go to Step 20	Go to Step 17
9	Use a DMM to measure the voltage on the yaw rate frequency circuit. Does the voltage measure greater than the specified value?	4.75 V	Go to Step 10	Go to Step 13
10	Use a DMM to measure the voltage on the yaw rate sensor test circuit. Does the voltage measure greater than the specified value?	4.75 V	Go to Step 11	Go to Step 15
11	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Reconnect the yaw rate sensor/lateral accelerometer harness connector. 3. Disconnect the Electronic Brake Control Module (EBCM) harness connector. 4. Install a J 39700 Universal Breakout Box and a J 39700-325 Adapter Cable. Install the equipment between the EBCM and the EBCM harness connector. 5. Turn ON the ignition. 6. At the breakout box, use a DMM to measure the Hz frequency between the yaw rate frequency circuit and a ground circuit. Does the HZ frequency signal measure within the specified range?	13.37-14.36 kHz	Go to Step 16	Go to Step 12
	<ol style="list-style-type: none"> 1. With the DMM still connected to monitor the yaw rate frequency circuit, set the DMM to measure DC voltage. 			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

12	<p>2. Connect one end of a test lamp to a good ground.</p> <p>3. Connect the other end of the test lamp to the positive lead of the DMM.</p> <p>Does the voltage measure less than the specified value?</p>	0.15 V	Go to Step 16	Go to Step 14
13	<p>Test the yaw rate frequency circuit for an open or a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 17
14	<p>Test the yaw rate frequency circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 19
15	<p>Test the yaw rate sensor test circuit for a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 17
16	<p>1. Inspect for poor connections at the harness connector of the yaw rate sensor/lateral accelerometer. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>2. Ensure the yaw rate sensor/lateral accelerometer is mounted securely and that the mounting bracket is not bent or otherwise damaged.</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 18
17	<p>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> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 19
	IMPORTANT:			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

18	<p>The Yaw Rate Reference Table Reset Procedure must be performed when you are instructed to do so during the Yaw Rate Sensor/Lateral Accelerometer Replacement procedure.</p> <p>Replace the yaw rate sensor/lateral accelerometer. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>. Did you complete the replacement?</p>	-	Go to Step 20	-
19	<p>IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> . Did you complete the replacement?</p>	-	Go to Step 20	-
20	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. <p>Does the DTC reset?</p>	-	Go to Step 3	System OK

DTC C0201

Circuit Description

The system relay, located within the Electronic Brake Control Module (EBCM), supplies battery voltage to all of the valve solenoids and to the precharge pump motor. When the relay contacts close, the EBCM monitors the voltage supplied to the valve solenoids and compares this voltage to monitored ignition voltage.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0201 Anti-Lock Brake System (ABS) Enable Relay Contact Circuit

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

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

- The EBCM detects that the voltage supplied to the valve solenoids is less than 65 percent of the monitored ignition voltage for 50 milliseconds.
- The EBCM detects that the relay contacts do not open when the relay is not energized.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- The EBCM disables the ABS/Traction Control System (TCS)/Vehicle Stability Enhancement System (VSES)/Dynamic Rear Proportion (DRP).
- The ABS indicator turns ON.
- The stability indicator turns ON.
- The brake warning indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

Refer back to the diagnostic table, steps 3-7, if this DTC continues to set intermittently.

Test Description

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

3: A shorted ABS pump motor may damage the contacts within the system relay. It is imperative that the steps in the table be followed to prevent damage to a replacement

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

EBCM.

DTC C0201

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 - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. Does the DTC reset?	-	Go to Step 3	Go to Diagnostic Aids
3	1. Separate the Electronic Brake Control Module (EBCM) from the brake pressure modulator valve (BPMV). Refer to <u>Electronic Brake Control Module Replacement</u> . 2. Use a DMM in order to measure the resistance across the ABS pump motor. Does the resistance measure within the specified range?	0.3-1 ohms	Go to Step 4	Go to Step 6
4	Use a DMM in order to measure the resistance between the high side of the pump motor and a good ground. Does the resistance measure less than the specified value?	OL	Go to Step 6	Go to Step 5
5	IMPORTANT: Following the EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.	-		-

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?		Go to Step 7	
6	IMPORTANT: Following the EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure. Replace the EBCM and the BPMV. Refer to <u>Control Module References</u> .Did you complete the replacements?	-	Go to Step 7	-
7	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. Does the DTC reset?	-	Go to Step 3	System OK

DTC C0240

Circuit Description

The Powertrain Control Module (PCM) and the Electronic Brake Control Module (EBCM) communicate on the serial data link whenever the ignition is ON.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0240 EBCM Malfunction

Conditions for Running the DTC

- The ignition is ON.
- The engine is running at a speed greater than 450 RPM for 5-20 seconds.

Conditions for Setting the DTC

The EBCM receives a serial data message stating that the PCM has lost the ability to reduce engine torque.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Action Taken When the DTC Sets

- The EBCM disables the vehicle Stability Enhancement System (VSES).
- Engine torque reduction is disabled.
- The traction off indicator turns ON.
- The message center displays the service stability system or stability system disabled message.

Conditions for Clearing the DTC

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

Diagnostic Aids

A requested torque signal malfunction is only one possible cause for setting this DTC. DTC C0240 may set due to engine overheating, throttle actuator control failure, loss of ignition timing control by the PCM, etc. If DTC P0856 has not set, refer to **Diagnostic System Check - Vehicle** in order to identify other possible causes of DTC C0240.

DTC C0240

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Is DTC P0856 set?	-	Go to <u>Symptoms - Engine Controls</u>	Go to Diagnostic Aids

DTC C0244 OR P1689

Circuit Description

Traction Control is simultaneously controlled by the Electronic Brake Control Module (EBCM) and the Powertrain Control Module (PCM). The PCM sends a DELIVERED TORQUE message via a pulse width modulated (PWM) signal to the EBCM confirming the delivered torque level for proper Traction Control system operation. The EBCM supplies the pull up voltage.

DTC Descriptors

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

This diagnostic procedure supports the following DTCs:

- DTC C0244 Pulse Width Modulated (PWM) Delivered Torque
- DTC P1689 Traction Control Delivered Torque Output Circuit

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC C0244 can be set anytime when ignition voltage is present. A malfunction exists, if the PWM signal is out of range, or no signal is received for a period of 2 seconds.

Action Taken When the DTC Sets

If equipped, the following actions occur:

- A malfunction DTC is stored.
- The Traction Control System (TCS) is disabled.
- The TRAC OFF indicator is turned 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 EBCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

- It is very important that a thorough inspection of the wiring and connectors be performed. Failure to carefully and fully inspect wiring and connectors may result in misdiagnosis, causing part replacement with reappearance of the malfunction.
- If an intermittent malfunction exists, refer to **Checking Aftermarket Accessories** .
- Possible causes for DTC C0244 to set:
 - An open in the torque delivered control circuit
 - Torque Delivered Control circuit shorted to ground or voltage
 - A communication frequency problem
 - A communication duty cycle problem

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

- Torque delivered control circuit has a wiring problem, terminal corrosion, or poor connections
- EBCM not receiving information from the PCM

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 PCM which uses an electrically erasable programmable read only memory (EEPROM). When replacing the PCM, the replacement PCM must be programmed.

DTC C0244 or P1689

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 Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Inspect the Electronic Brake Control Module (EBCM) ground and Powertrain Control Module (PCM) ground, making sure each ground is clean and torqued to the proper specification. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> . Did you find and correct the condition?	-	Go to Step 11	Go to Step 3
3	1. Install a scan tool. 2. Start the engine. 3. With a scan tool, observe the PCM to EBCM Delivered parameter in the Powertrain Control Module data list. Does the scan tool display the specified	90%		Go to <u>Testing for Intermittent Conditions and Poor</u>

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	value?		Go to Step 4	<u>Connections</u>
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the EBCM harness connector. 3. Install the J 39700 Universal Breakout Box using the J J 39700-325 Cable Adapter to the EBCM harness connector and the EBCM connector. 4. Disconnect the PCM 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. <p>Does the voltage measure near the specified value?</p>	B+		
			Go to Step 5	Go to Step 6
5	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the cable adapter from the EBCM connector. 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>. <p>Did you find and correct the condition?</p>	-	Go to Step 11	Go to Step 7
	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the J 39700-325 from the EBCM connector. 3. Test the delivered torque signal circuit for the following conditions: <ul style="list-style-type: none"> • An open 			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

6	<ul style="list-style-type: none"> • A short to ground • A high resistance <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 11	Go to Step 8
7	<p>Inspect for poor connections the harness connector of the PCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 11	Go to Step 9
8	<p>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> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 11	Go to Step 10
9	<p>IMPORTANT: The replacement PCM must be programmed.</p> <p>Replace the PCM. Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the repair?</p>	-	Go to Step 11	-
10	<p>Replace the EBCM. Refer to <u>Control Module References</u> for replacement, setup, and programming.</p> <p>Did you complete the repair?</p>	-	Go to Step 11	-
11	<ol style="list-style-type: none"> 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. <p>Does the DTC reset?</p>	-	Go to Step 2	System OK

DTC C0245

Circuit Description

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

As the front wheels spin, each wheel speed sensor produces an AC signal. The Electronic Brake Control Module (EBCM) uses the frequency of the AC signals to calculate each wheel speed. The Powertrain Control Module (PCM) converts the signal from the Vehicle Speed Sensor (VSS) to a 128k pulses/mile signal. The EBCM uses the vehicle speed signal from the PCM to calculate the rear wheel speed.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0245 Wheel Speed Sensor Frequency Error

Conditions for Running the DTC

- The ignition is ON.
- The vehicle speed is greater than 8 km/h (4 mph).
- No brake application or deceleration is detected.
- No wheel slip is detected.
- No turning maneuvers are detected.

Conditions for Setting the DTC

- At least one wheel speed sensor signal is 15 percent less than or greater than, other wheel speed sensor signals.
- All of the conditions for running and setting the DTC are present for a cumulative time of 3 minutes during a single ignition cycle.

Action Taken When the DTC Sets

- The EBCM disables the ABS/dynamic rear proportion (DRP).
- The ABS indicator turns ON.
- The brake warning indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

Installing one tire of significantly different size on the vehicle causes this DTC to set. Operating

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

the vehicle with a tire that has very low air pressure may also set this DTC. Inspect the vehicle for an incorrect or damaged wheel speed sensor or VSS if the tires and the EBCM and PCM calibrations are OK.

Test Description

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

4: If the front tires are not the same size as the rear tires, the EBCM calibration must match the FRONT tire size and the PCM calibration must match the REAR tire size.

DTC C0245

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Inspect both of the front tires on the vehicle to ensure that both tires are of equal size. Are both of the front tires of equal size?	Go to Step 3	Go to Diagnostic Aids
3	Inspect both of the rear tires on the vehicle to ensure that both tires are of equal size. Are both of the rear tires of equal size?	Go to Step 4	Go to Diagnostic Aids
4	Verify the Electronic Brake Control Module (EBCM) and the Powertrain Control Module (PCM) both have the correct tire size calibration. Use the scan tool in order to view the EBCM tire size calibration or perform the Tire Size Calibration procedure and refer to <u>Control Module References</u> . Did you find and correct the condition?	Go to Step 5	Go to Diagnostic Aids
5	1. Use a scan tool in order to clear the DTCs. 2. Operate the vehicle for at least 3 minutes within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 2	System OK

DTC C0283

Circuit Description

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

The mode switch is a momentary-contact, normally-open switch that can be used to disable the vehicle Stability Enhancement System (VSES). The mode switch is directly monitored by the Electronic Brake Control Module (EBCM). Each time the mode switch is pressed, the VSES enabled/disabled status changes. When VSES is disabled, the EBCM sends serial data messages to the Instrument Panel Cluster (IPC) to turn ON the stability indicator.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0283 Mode Switch Circuit Malfunction

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM detects low voltage on the traction control switch signal circuit for 8 seconds.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The stability indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

Thoroughly inspect connections or circuitry that may cause an intermittent malfunction. Refer to the following:

- **Testing for Electrical Intermittents**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**
- **Connector Repairs**

Test Description

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

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

4: This step tests the traction control switch circuitry. If the fuse opens when you perform this test, the traction control switch signal circuit is shorted to ground.

DTC C0283

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 - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	<ol style="list-style-type: none">1. Use a scan tool in order to clear the DTCs.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition for up to 20 seconds. Does the DTC set?	Go to Step 3	Go to Diagnostic Aids
3	<ol style="list-style-type: none">1. Turn OFF the ignition.2. Disconnect the mode switch harness connector. Refer to <u>Traction Control Switch Replacement (GMC, Chevrolet)</u> or <u>Traction Control Switch Replacement (Buick)</u>.3. Turn ON the ignition.4. Connect a test lamp between the ignition 3 voltage circuit and a good ground. Does the test lamp illuminate?	Go to Step 4	Go to Step 8
4	<ol style="list-style-type: none">1. Use the scan tool in order to clear the DTCs.2. Turn OFF the ignition.3. Connect a fused jumper wire between the ignition 3 voltage circuit and the traction control switch signal circuit at the mode switch harness connector.4. Turn ON the ignition for up to 20 seconds. Does the DTC set?	Go to Step 5	Go to Step 9

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

5	Test the traction control switch signal circuit for an open or a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> . Did you find and correct the condition?	Go to Step 11	Go to Step 6
6	Inspect for poor connections at the harness connector of the Electronic Brake Control Module (EBCM). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 11	Go to Step 7
7	IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure. Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?	Go to Step 11	-
8	Repair the open in the ignition 3 voltage circuit. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> . Did you complete the repair?	Go to Step 11	-
9	Inspect for poor connections at the harness connector of the mode switch. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 11	Go to Step 10
10	Replace the mode switch. Refer to <u>Traction Control Switch Replacement (GMC, Chevrolet)</u> or <u>Traction Control Switch Replacement (Buick)</u> . Did you complete the replacement?	Go to Step 11	-
11	<ol style="list-style-type: none">1. Use the scan tool to clear the DTCs.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Does the DTC reset?

Go to **Step 3**

System OK

DTC C0287

Circuit Description

The Electronic Brake Control Module (EBCM) provides power 5-volt reference to the longitudinal accelerometer. The longitudinal accelerometer converts the change in vehicle motion, or inertia, into a voltage signal. This signal is sent to the EBCM.

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

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0287 Longitudinal Accelerometer Circuit

Conditions for Running the DTC

- The ignition is ON.
- The vehicle Stability Enhancement System (VSES) sensors have been successfully initialized or the message center has displayed the stability system disabled message due to an unsuccessful initialization attempt. Refer to [ABS Description and Operation](#) for a complete explanation of VSES sensor initialization.
- The vehicle is being driven relatively straight and level at a speed greater than 11 km/h (7 mph), before performing a stable turning maneuver.

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set:

- Open Longitudinal accelerometer circuitry is detected.
- Shorted Longitudinal accelerometer circuitry is detected.
- An erratic Longitudinal accelerometer signal is detected.
- The EBCM detects that the Longitudinal accelerometer sensor signal does not correspond

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

with signals from other sensors.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The stability indicator turns ON.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Inspect the vehicle for proper wheel alignment. Ensure the vehicle does not pull toward the left or right while driving straight forward on a level surface.
- Communicate with the customer to determine the conditions under which the message center displays the Service Stability System message. Learning the conditions under which the DTC sets may help you duplicate the failure.
- Use the Snapshot function on the scan tool in order to assist you in locating an intermittent malfunction.

Test Description

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

3: This step tests the sensor circuitry in the high voltage range.

4: This step tests the sensor circuitry in the low voltage range.

DTC C0287

Step	Action	Values	Yes	No
IMPORTANT: If DTC C0292 is set, diagnose C0292 before proceeding with diagnostics for C0186. If DTC C0196 is set, diagnose C0196 before proceeding with diagnostics for C0186. Always use connector test adapters when performing tests to avoid damage to delicate connector terminals. Do not turn OFF the ignition during this diagnostic procedure unless the step in the table instructs you to do so. The scan tool may display some incorrect data if the ignition is cycled. Schematic Reference: <u>ABS Schematics</u> Connector End View Reference: <u>ABS Connector End Views</u>				
	Did you perform the ABS Diagnostic			Go to

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

1	System Check - Vehicle?	-	Go to Step 2	<u>Diagnostic System Check - Vehicle</u>
2	<ol style="list-style-type: none"> 1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. <p>Does the DTC reset?</p>	-	Go to Step 3	Go to Diagnostic Aids
3	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the yaw rate sensor/Longitudinal accelerometer harness connector. 3. Turn ON the ignition. 4. Select the vehicle Stability Enhancement System (VSES) Data Display function on the scan tool. 5. Connect a 3-amp fused jumper wire between the yaw rate sensor/Longitudinal accelerometer 5-volt reference circuit and the Longitudinal accelerometer signal circuit. Refer to <u>Using Fused Jumper Wires</u> . 6. Observe the Longitudinal Accelerometer Sensor Input on the scan tool. <p>Is the Longitudinal Accelerometer Sensor Input voltage greater than the specified value?</p>	4.4 V	Go to Step 4	Go to Step 5
	<ol style="list-style-type: none"> 1. Remove the fused jumper wire from the yaw rate sensor/Longitudinal accelerometer harness connector. 			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

4	<p>2. Observe the Longitudinal Accelerometer Sensor Input on the scan tool.</p> <p>Is the Longitudinal Accelerometer Sensor Input voltage less than the specified value?</p>	0.6 V		
			Go to Step 6	Go to Step 9
5	<p>Test the Longitudinal accelerometer signal circuit for the following conditions:</p> <ul style="list-style-type: none"> • An open • A high resistance • A short to ground <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-		
			Go to Step 10	Go to Step 7
6	<p>1. Inspect for poor connections at the harness connector of the yaw rate sensor/Longitudinal accelerometer. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>2. Ensure the yaw rate sensor/Longitudinal accelerometer is mounted securely and that the mounting bracket is not bent or otherwise damaged.</p> <p>Did you find and correct the condition?</p>	-		
			Go to Step 10	Go to Step 8
7	<p>Inspect for poor connections at the harness connector of the Electronic Brake Control Module (EBCM). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-		
			Go to Step 10	Go to Step 9
	<p>IMPORTANT:</p> <p>The Yaw Rate Reference Table Reset</p>			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

8	<p>Procedure must be performed when you are instructed to do so during the Yaw Rate Sensor/Longitudinal Accelerometer Replacement procedure.</p> <p>Replace the yaw rate sensor/Longitudinal accelerometer. Refer to.Did you complete the replacement?</p>	-	Go to Step 10	-
9	<p>IMPORTANT: Following EBCM replacement, perform the set-up procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?</p>	-	Go to Step 10	-
10	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. <p>Does the DTC reset?</p>	-	Go to Step 3	System OK

DTC C0290 OR C0292

Circuit Description

The Electronic Brake Control Module (EBCM) supplies a reference voltage of 5 volts to the yaw rate sensor/lateral accelerometer, the steering wheel position sensor and the master cylinder pressure sensor. The sensor supply voltage is monitored via an internal feedback circuit to the EBCM microprocessor.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

- DTC C0290 Devise Voltage Reference Output Circuit
- DTC C0292 Devise Voltage Reference Input Circuit

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM detects that the sensor supply voltage is less than 4.75 volts or greater than 5.25 volts for 30 milliseconds.

Action Taken When the DTC Sets

- The EBCM disables the vehicle Stability Enhancement System (VSES).
- The stability system caution indicator turns ON.

Test Description

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

5: This step tests for a shorted yaw rate sensor/lateral accelerometer or steering wheel position sensor.

6: This step tests for a shorted master cylinder pressure sensor. The presence of DTC C0110 is normal during this step.

DTC C0290 or C0292

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 - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. Does the DTC reset?	Go to Step 3	Go to Diagnostic Aids
	1. Turn OFF the ignition.		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

3	<ol style="list-style-type: none"> 2. Disconnect the yaw rate sensor/lateral accelerometer harness connector. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>. 3. Disconnect the steering wheel position sensor harness connector. <u>STEERING WHEEL POSITION SENSOR OR STEERING SHAFT LOWER BEARING REPLACEMENT</u> 4. Disconnect the Electronic Brake Control Module (EBCM) harness connector. Refer to. 5. Test the yaw rate sensor/lateral accelerometer 5-volt reference circuit and the steering wheel position sensor 5-volt reference circuit for a short to ground. <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .Did you find and correct the condition?</p>	Go to Step 12	Go to Step 4
4	<ol style="list-style-type: none"> 1. Turn ON the ignition. 2. Test the following circuits for a short to voltage: <ul style="list-style-type: none"> • Yaw rate sensor/lateral accelerometer 5-volt reference circuit • Steering wheel position sensor 5-volt reference circuit • Yaw rate sensor signal circuit • Lateral accelerometer signal circuit <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 12	Go to Step 5
	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Reconnect only the EBCM harness connector. 		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

5	<p>3. Turn ON the ignition.</p> <p>4. Use the scan tool to clear any DTCs.</p> <p>Does the DTC reset?</p>	Go to Step 6	Go to Step 8
6	<p>1. Turn OFF the ignition.</p> <p>2. Reconnect the yaw rate sensor/lateral accelerometer harness connector.</p> <p>3. Reconnect the steering wheel position sensor harness connector.</p> <p>4. Separate the EBCM from the brake pressure modulator valve (BPMV), leaving the EBCM harness connector connected. Refer to <u>Control Module References</u> .</p> <p>5. Turn ON the ignition.</p> <p>Does the DTC reset?</p>	Go to Step 11	Go to Step 7
7	<p>Replace the BPMV. Refer to <u>Control Module References</u> .</p> <p>Did you complete the replacement?</p>	Go to Step 12	-
8	<p>Reconnect the steering wheel position sensor harness connector.</p> <p>Does the DTC reset?</p>	Go to Step 10	Go to Step 9
9	<p>IMPORTANT: The Yaw Rate Reference Table Reset Procedure must be performed when you are instructed to do so during the Yaw Rate Sensor/Lateral Accelerometer Replacement procedure.</p> <p>Replace the yaw rate sensor/lateral accelerometer. Refer to <u>Yaw Rate Sensor/Lateral Accelerometer Replacement</u>. Did you complete the replacement?</p>	Go to Step 12	-
10	<p>Replace the steering wheel position sensor. Refer to <u>Control Module References</u> .</p> <p>Did you complete the replacement?</p>	Go to Step 12	-
	<p>IMPORTANT: Following EBCM replacement, perform the setup</p>		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

11	<p>procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to Control Module References .Did you complete the replacement?</p>	Go to Step 12	-
12	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. <p>Does the DTC reset?</p>	Go to Step 3	System OK

DTC C0455

Circuit Description

The Electronic Brake Control Module (EBCM) receives several inputs from the steering wheel position sensor. Three digital square wave signal inputs are wired directly to the EBCM harness connector, however, only signals A and B are used or monitored. The failure of the index pulse signal does not effect vehicle Stability Enhancement System (VSES) function. The EBCM also receives an analog steering wheel position input on the steering wheel position sensor signal 1 circuit. Ignition voltage is supplied to the digital portion of the steering wheel position sensor. The analog portion of the steering wheel position sensor is supplied a 5-volt reference from the EBCM.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0455 Front Steering Position Sensor Circuit

Conditions for Running the DTC

- The ignition is ON.
- The VSES sensors have been successfully initialized. Refer to **ABS Description and Operation** for a complete explanation of VSES sensor initialization.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Conditions for Setting the DTC

Any of the following conditions may cause the DTC to set:

- The analog steering wheel position signal does not correlate with the digital steering wheel position signals.
- When driven forward in a straight line, the centered steering angle differs by more than 30 degrees from the centered steering angle when the sensors are initialized.
- The EBCM detects an erratic signal from steering wheel position signal A or signal B.
- The EBCM detects an open or shorted steering wheel position analog signal.
- The EBCM detects an erratic steering wheel position analog signal.
- The EBCM detects an open or shorted steering wheel position signal A or signal B, after having received a valid signal during the same ignition.

Action Taken When the DTC Sets

- The EBCM disables the VSES.
- The stability system caution indicator is illuminated.

Conditions for Clearing the DTC

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

Diagnostic Aids

- DTC C0455 may be falsely set if you did not turn OFF the ignition for 5 seconds after clearing DTCs from the EBCM. This is why all diagnostic tables which apply to this system always instruct you to turn OFF the ignition for 5 seconds after clearing DTCs. If this DTC has set after you cleared DTCs from the EBCM or used the scan tool to clear all DTCs from all modules and you did not cycle the ignition afterward, it is likely that no actual malfunction exists.
- Whenever any one of the steering signals to the EBCM is lost, the scan tool displays a fixed steering wheel position, which indicates the last known steering wheel position. This can aid you in diagnosing an intermittent malfunction.
- If the DTC does not reset during step 2 or 3 of the diagnostic procedure, the stability system not ready indicator may be displayed due to an unsuccessful initialization. This occurs if the EBCM does not receive any signal from one or both of the digital inputs during the entire ignition cycle.
- Inspect the vehicle for proper wheel alignment. Ensure the vehicle does not pull toward the

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

left or right while driving straight forward on a level surface.

- Communicate with the customer to determine the conditions under which the Instrument Panel Cluster (IPC) illuminates the stability system caution indicator. Learning the conditions under which the DTC sets may help you duplicate the failure.
- Use the Snapshot function on the scan tool in order to assist you in locating an intermittent malfunction.

Test Description

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

2: If the DTC sets without turning the steering wheel or driving the vehicle, a malfunction exists in the analog steering wheel position signal to the EBCM.

DTC C0455

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 - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	IMPORTANT: Center the steering wheel before proceeding with this step. Do not rotate the steering wheel while performing this step. 1. Use the scan tool to clear the DTCs. 2. Turn OFF the ignition for 5 seconds. 3. Turn ON the ignition. 4. Wait approximately 5 seconds to verify whether or not the DTC sets. Does the DTC set?	-	Go to Step 3	Go to Step 10
	1. Turn OFF the ignition. 2. Disconnect the steering wheel position sensor harness connector.			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

3	<p>3. Turn ON the ignition.</p> <p>4. Select the vehicle Stability Enhancement System (VSES) Data Display on the scan tool.</p> <p>5. Observe the Analog SWPS Signal parameter on the scan tool.</p> <p>Does the scan tool indicate that the steering wheel position sensor data parameter is less than specified value?</p>	0.15 V	Go to Step 4	Go to Step 9
4	<p>1. Connect a 3-amp fused jumper wire between the steering wheel position 5-volt reference circuit and the analog steering signal circuit.</p> <p>2. Observe the Analog SWPS Signal parameter on the scan tool.</p> <p>Does the scan tool indicate that the steering wheel position sensor data parameter is greater than specified value?</p>	4.75 V	Go to Step 5	Go to Step 6
5	<p>Use a DMM to measure the voltage between the steering wheel position 5-volt reference circuit and the steering wheel position low reference circuit.</p> <p>Does the voltage measure greater than the specified value?</p>	4.75 V	Go to Step 16	Go to Step 8
6	<p>Test the 5-volt reference circuit of the steering wheel position sensor for an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 19	Go to Step 7
7	<p>Test the signal circuit of the steering wheel position sensor for an open or a short to ground. Refer to <u>Testing for Short to Ground</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	-	Go to Step 19	Go to Step 16
	<p>Test the low reference circuit of the steering wheel position sensor for an open.</p>			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

8	Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> . Did you find and correct the condition?	-	Go to Step 19	Go to Step 16
9	Test the signal circuit of the steering wheel position sensor for a short to voltage. Refer to <u>Testing for Short to Ground</u> and <u>Wiring Repairs</u> . Did you find and correct the condition?	-	Go to Step 19	Go to Step 16
10	Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC set?	-	Go to Step 11	Go to Diagnostic Aids
11	<ol style="list-style-type: none"> 1. Select the VSES Data Display on the scan tool. 2. Center the steering wheel and verify that the front wheels are straight ahead. 3. Observe the Analog SWPS Signal parameter. Does the scan tool display an Analog SWPS Signal within the specified range?	2.3-2.7 V	Go to Step 12	Go to Step 17
12	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the steering wheel position sensor harness connector. Refer to <u>STEERING WHEEL POSITION SENSOR OR STEERING SHAFT LOWER BEARING REPLACEMENT</u> 3. Disconnect the Electronic Brake Control Module (EBCM) harness connector. Refer to <u>Control Module References</u> . 4. Turn ON the ignition. 5. Test the steering wheel position circuits, signal A and signal B for the following conditions: 	-		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	<ul style="list-style-type: none"> • Intermittently open • Intermittently shorted to ground • Intermittently shorted together • Intermittently shorted to voltage <p>Refer to <u>Testing for Electrical Intermittents</u> and <u>Wiring Repairs</u> .</p>		Go to Step 19	Go to Step 13
	Did you find and correct the condition?			
13	Test the battery positive voltage circuit to the steering wheel position sensor for an intermittent open. Refer to <u>Testing for Electrical Intermittents</u> and <u>Wiring Repairs</u> .	-	Go to Step 19	Go to Step 14
	Did you find and correct the condition?			
14	Test both of the steering wheel position sensor ground circuits for an intermittent open. Refer to <u>Testing for Electrical Intermittents</u> and <u>Wiring Repairs</u> .	-	Go to Step 19	Go to Step 15
	Did you find and correct the condition?			
15	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> .	-	Go to Step 19	Go to Step 17
	Did you find and correct the condition?			
16	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> .	-	Go to Step 19	Go to Step 18
	Did you find and correct the condition?			
17	Replace the steering wheel position sensor. Refer to <u>STEERING WHEEL POSITION SENSOR OR STEERING SHAFT LOWER BEARING REPLACEMENT</u>	-	Go to Step 19	-
	Did you complete the replacement?			

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

18	<p>IMPORTANT: Following EBCM replacement, perform the setup procedure for the EBCM and perform the Yaw Rate Reference Table Reset Procedure. Use the scan tool to perform the Tire Size Calibration procedure.</p> <p>Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?</p>	-	Go to Step 19	-
19	<ol style="list-style-type: none">1. Use the scan tool Clear All Class 2 DTCs function to clear all of the DTCs from all modules.2. Turn OFF the ignition for 5 seconds.3. Turn ON the ignition.4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. <p>Does the DTC reset?</p>	-	Go to Step 2	System OK

DTC C0550

Circuit Description

The Electronic Brake Control Module (EBCM) performs several self-tests for any internal problems which may affect proper operation.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0550 Electronic Control Unit (ECU) Performance

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM detects an internal malfunction.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Action Taken When the DTC Sets

The following actions may occur:

- The EBCM disables the ABS/dynamic rear proportion (DRP).
- The ABS indicator turns ON.
- The brake warning indicator turns ON.

Conditions for Clearing the DTC

Certain failures that may cause this DTC to set cannot be cleared. Other failures that may cause this DTC to set may be cleared, at least temporarily, by using the scan tool Clear DTCs function.

Diagnostic Aids

Replace the EBCM if this DTC continues to set intermittently.

DTC C0550

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Use a scan tool in order to clear the DTCs. Can the DTC be cleared?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Turn ON the ignition. Does the DTC reset?	Go to Step 4	Go to Diagnostic Aids
4	IMPORTANT: Following Electronic Brake Control Module (EBCM) replacement, use the scan tool to perform the Tire Size Calibration procedure. Replace the EBCM. Refer to <u>Control Module References</u> .Did you complete the replacement?	Go to Step 5	-
5	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		

	Does the DTC reset?	Go to Step 3	System OK
--	---------------------	---------------------	-----------

DTC C0558

Circuit Description

A replacement Electronic Brake Control Module (EBCM) is supplied with generic software and must be programmed to match the specific vehicle application.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC C0558 Calibration Data Not Programmed

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM is not programmed with complete software.

Action Taken When the DTC Sets

- The EBCM disables the ABS/dynamic rear proportion (DRP)/Vehicle Stability Enhancement System (VSES).
- The ABS indicator turns ON.
- The brake warning indicator turns ON.
- The stability indicator turns ON.

Conditions for Clearing the DTC

The DTC clears when software programming is complete.

DTC C0558

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2	Perform the set-up procedure for the Electronic Brake Control Module (EBCM). Refer to <u>Control Module References</u> . Did you complete the action?	Go to <u>Diagnostic System Check - Vehicle</u>	-
---	---	---	---

SYMPTOMS - ANTI-LOCK BRAKE SYSTEM

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

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

Visual/Physical Inspection

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

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

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

- **ABS Indicator Always On**
- **ABS Indicator Inoperative**

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

ABS INDICATOR ALWAYS ON

Circuit Description

The Instrument Panel Cluster (IPC) illuminates the ABS indicator by supplying ground to the lamp. The Electronic Brake Control Module (EBCM) sends serial data messages to the IPC to command the indicator ON or OFF.

Diagnostic Aids

The malfunction must be present during diagnosis in order to prevent unnecessary parts replacement. Always begin diagnosis with **Diagnostic System Check - Vehicle** .

Test Description

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

3: This step tests if the IPC is able to turn OFF the ABS indicator.

ABS Indicator Always On

Step	Action	Yes	No
IMPORTANT: An ECE 13 response may cause the ABS indicator to remain ON when no DTCs are set. It is necessary to verify that ECE 13 is not causing the ABS indicator to remain illuminated, prior to performing this diagnostic. Refer to ABS Description and Operation for a complete description of the ECE 13 response.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the ABS indicator. Does the ABS indicator illuminate for approximately 2 seconds and then turn OFF?	Go to Diagnostic Aids	Go to Step 3
3	1. Select the Instrument Panel Cluster Special Functions menu on the scan tool. 2. Select Lamp Tests. 3. Command the IPC indicator lamps Off.		

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

	Does the ABS indicator turn OFF?	Go to Step 5	Go to Step 4
4	Replace the Instrument Panel Cluster (IPC). Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 6	-
5	Replace the Electronic Brake Control Module (EBCM). Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 6	-
6	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the ABS indicator. Does the ABS indicator illuminate for approximately 2 seconds and then turn OFF?	System OK	Go to Step 3

ABS INDICATOR INOPERATIVE

Circuit Description

The Instrument Panel Cluster (IPC) illuminates the ABS indicator by supplying ground to the lamp. The Electronic Brake Control Module (EBCM) sends class 2 serial data messages to the IPC in order to command the indicator ON or OFF.

Diagnostic Aids

Replace the Instrument Panel Cluster if the ABS indicator intermittently fails to operate during the bulb check.

Test Description

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

2: This step tests if the IPC is able to illuminate the ABS indicator during the bulb check.

ABS Indicator Inoperative

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?		Go to <u>Diagnostic System Check -</u>

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

		Go to Step 2	<u>Vehicle</u>
2	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the ABS indicator. Does the ABS indicator illuminate?	Go to Diagnostic Aids	Go to Step 3
3	Replace the Instrument Panel Cluster (IPC). Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 4	-
4	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the ABS indicator. Does the ABS indicator illuminate?	System OK	Go to Step 3

TRACTION OFF INDICATOR ALWAYS ON

Circuit Description

The Instrument Panel Cluster (IPC) illuminates the traction off indicator by supplying ground to the lamp. The Electronic Brake Control Module (EBCM) sends serial data messages to the IPC to command the indicator ON or OFF.

Diagnostic Aids

The malfunction must be present during diagnosis in order to prevent unnecessary parts replacement. Always begin diagnosis with **Diagnostic System Check - Vehicle** .

Test Description

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

3: This step tests if the IPC is able to turn OFF 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>			
	Did you perform the Diagnostic System Check -		Go to

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

1	Vehicle?	Go to Step 2	<u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the traction off indicator. Does the traction off indicator illuminate for approximately 2 seconds and then turn OFF?	Go to Diagnostic Aids	Go to Step 3
3	1. Select the Instrument Panel Cluster Special Functions menu on the scan tool. 2. Select Lamp Tests. 3. Command the Instrument Panel Cluster (IPC) indicator lamps Off. Does the traction off indicator turn OFF?	Go to Step 5	Go to Step 4
4	Replace the IPC. Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 6	-
5	Replace the Electronic Brake Control Module (EBCM). Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 6	-
6	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the traction off indicator. Does the traction off indicator illuminate for approximately 2 seconds and then turn OFF?	System OK	Go to Step 3

TRACTION OFF INDICATOR INOPERATIVE

Circuit Description

The Instrument Panel Cluster (IPC) illuminates the traction off indicator by supplying ground to the lamp. The Electronic Brake Control Module (EBCM) sends serial data messages to the IPC to command the indicator ON or OFF.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

Diagnostic Aids

Replace the IPC if the traction off indicator intermittently fails to illuminate during the bulb check.

Test Description

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

2: This step tests if the IPC is able to illuminate the traction off indicator during the bulb check.

Traction Off Indicator Inoperative

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the traction off indicator. Does the traction off indicator illuminate?	Go to Diagnostic Aids	Go to Step 3
3	Replace the Instrument Panel Cluster (IPC). Refer to <u>Control Module References</u> for replacement, setup, and programming. Did you complete the replacement?	Go to Step 4	-
4	1. Turn OFF the ignition for 5 seconds. 2. Turn ON the ignition while observing the traction off indicator. Does the traction off indicator illuminate?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

ABS AUTOMATED BLEED PROCEDURE

Two - Person Procedure

IMPORTANT: • Use the two-person bleed procedure under the following

conditions:

- **Installing a new Electro-Hydraulic Control Unit (EHCU) or new Brake Pressure Modulator Valve (BPMV).**
- **Air is trapped in the valve body.**
- **Do not drive the vehicle until the brake pedal feels firm.**
- **Do not reuse brake fluid that is used during bleeding.**
- **Use the vacuum, the pressure and the gravity bleeding procedures only for base brake bleeding.**

1. Raise the vehicle in order to access the system bleed screws.
2. Bleed the system at the right rear wheel first.
3. Install a clear hose on the bleed screw.
4. Immerse the opposite end of the hose into a container partially filled with clean DOT 3 brake fluid.
5. Open the bleed screw 1/2 to 1 full turn.
6. Slowly depress the brake pedal. While the pedal is depressed to its full extent, tighten the bleed screw.
7. Release the brake pedal and wait 10-15 seconds for the master cylinder pistons to return to the home position.
8. Repeat the previous steps for the remaining wheels. The brake fluid which is present at each bleed screw should be clean and free of air.
9. This procedure may use more than a pint of fluid per wheel. Check the master cylinder fluid level every four to six strokes of the brake pedal in order to avoid running the system dry.
10. Press the brake pedal firmly and run the Scan Tool Automated Bleed Procedure. Release the brake pedal between each test.
11. Bleed all four wheels again using Steps 3-9. This will remove the remaining air from the brake system.
12. Evaluate the feel of the brake pedal before attempting to drive the vehicle.
13. Bleed the system as many times as necessary in order to obtain the appropriate feel of the pedal.

ELECTRONIC BRAKE CONTROL MODULE REPLACEMENT

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

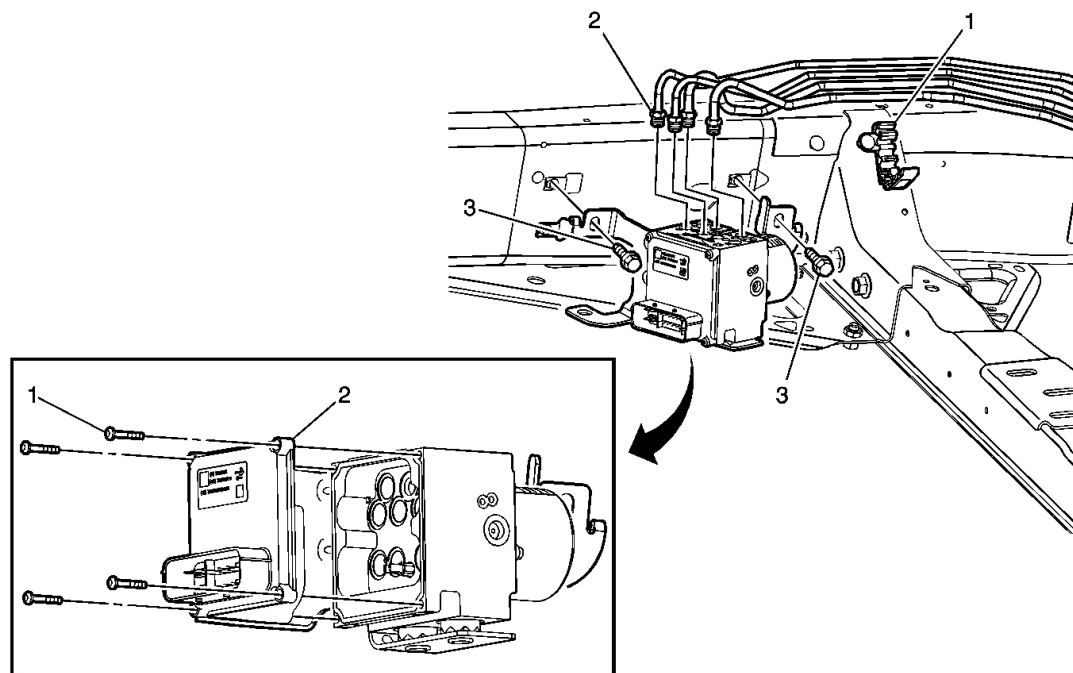


Fig. 6: Locating Electronic Brake Control Module
Courtesy of GENERAL MOTORS CORP.

Electronic Brake Control Module Replacement

Callout	Component Name
CAUTION: Refer to <u>Brake Fluid Effects on Paint and Electrical Components Notice</u> .	
CAUTION: Refer to <u>Brake Fluid Irritant Caution</u> .	
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Remove the raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Clip Tip: Before working on the brake pipes, release the locking tab on the retaining clip.
	Fittings (Qty: 4)

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2	<p>Tip:</p> <ol style="list-style-type: none">1. Before remove removing the brake pipes from the ABS module, remove all dirt and debris from the ABS module.2. Cap or plug the brake pipes to prevent contamination of the brake system and fluid leaks. <p>Tightening Specification: Tighten to 25 N.m (18 lb ft).</p>
3	<p>Bolt (Qty: 2)</p> <p>Tightening Specification: Tighten to 20 N.m (15 lb ft).</p>
4	<p>Screw (Qty: 4)</p> <p>Tightening Specification: Tighten to 3 N.m (26 lb in).</p>
5	<p>Electronic Brake Control Modulator Valve (EBCM)</p> <p>Tip:</p> <ol style="list-style-type: none">1. Disconnect the electrical connector for the EBCM.2. After separating the EBCM from the BPMV, cover the BPMV with a lint free towel to prevent it from becoming contaminated.3. Bleed the system. <p><u>ABS Automated Bleed Procedure</u></p>

BRAKE PRESSURE MODULATOR VALVE (BPMV) REPLACEMENT

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

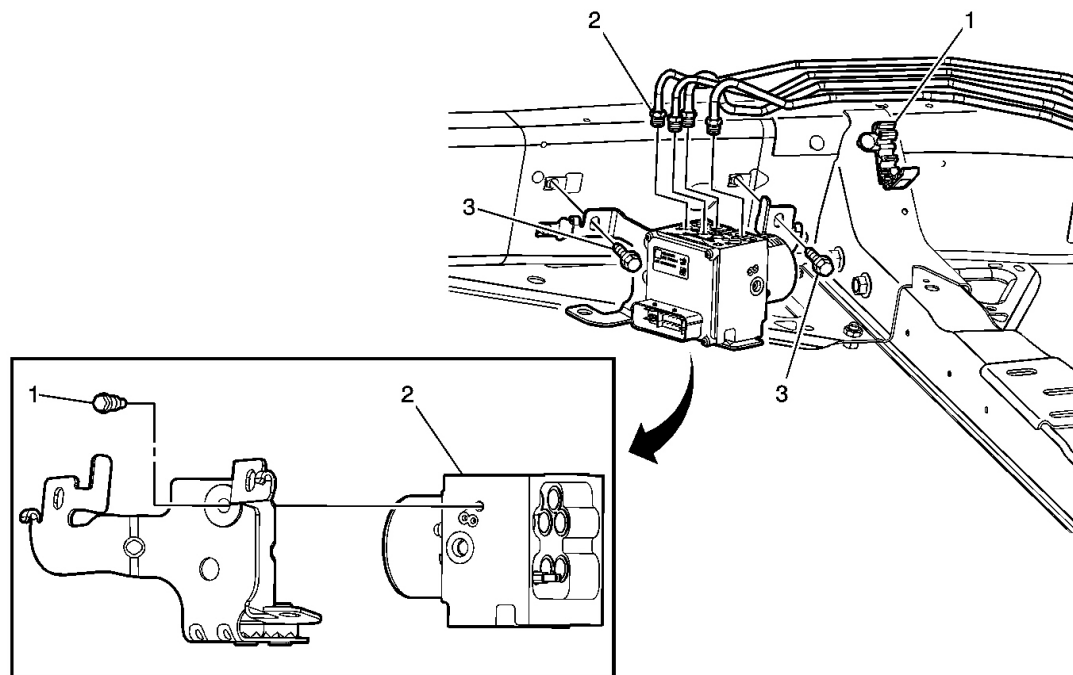


Fig. 7: Replacing Brake Pressure Modulator Valve (BPMV)
Courtesy of GENERAL MOTORS CORP.

Brake Pressure Modulator Valve (BPMV) Replacement

Callout	Component Name
CAUTION: Refer to <u>Brake Fluid Effects on Paint and Electrical Components Notice</u> .	
CAUTION: Refer to <u>Brake Fluid Irritant Caution</u> .	
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Remove the raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Clip Tip: Before working on the brake pipes, release the locking tab on the retaining clip.
	Fittings (Qty: 4)

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2	<p>Tip:</p> <ol style="list-style-type: none">1. Before remove removing the brake pipes from the ABS module, remove all dirt and debris from the ABS module.2. Cap or plug the brake pipes to prevent contamination of the brake system and fluid leaks. <p>Tightening Specification: Tighten to 25 N.m (18 lb ft).</p>
3	<p>Bolt (Qty: 2)</p> <p>Tightening Specification: Tighten to 20 N.m (15 lb ft).</p>
4	<p>Bolt</p> <p>Tightening Specification: Tighten to 11 N.m (97 lb in).</p>
5	<p>Brake Pressure Modulator Valve (BPMV)</p> <p>Tip:</p> <ul style="list-style-type: none">• Disconnect the electrical connector for the BPMV.• Refer to EBCM, refer to <u>Electronic Brake Control Module Replacement</u>.

BRAKE PRESSURE MODULATOR VALVE (BPMV) BRACKET REPLACEMENT

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

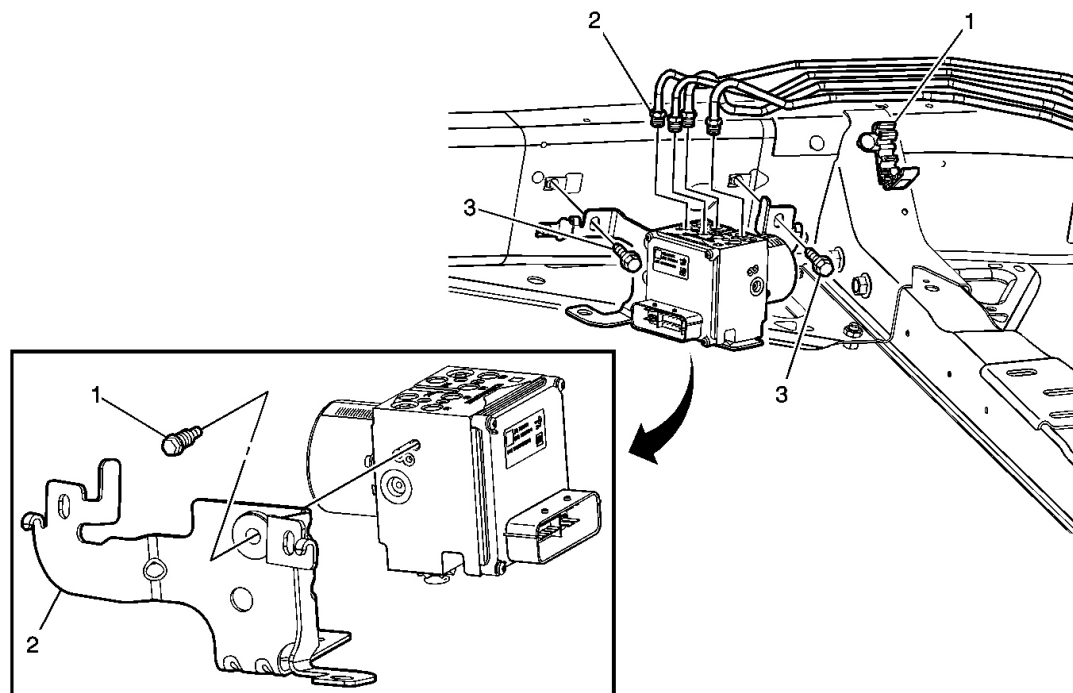


Fig. 8: Brake Pressure Modulator Valve (BPMV) Bracket
Courtesy of GENERAL MOTORS CORP.

Brake Pressure Modulator Valve (BPMV) Bracket Replacement

Callout	Component Name
CAUTION: Refer to <u>Brake Fluid Effects on Paint and Electrical Components Notice</u> .	
CAUTION: Refer to <u>Brake Fluid Irritant Caution</u> .	
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Remove the raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Clip Tip: Before working on the brake pipes, release the locking tab on the retaining clip.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

2	<p>Fittings (Qty: 4)</p> <p>Tip:</p> <ol style="list-style-type: none">1. Before remove removing the brake pipes from the ABS module, remove all dirt and debris from the ABS module.2. Cap or plug the brake pipes to prevent contamination of the brake system and fluid leaks.3. Bleed the brake system. Refer to <u>ABS Automated Bleed Procedure</u> <p>Tightening Specification: Tighten to 25 N.m (18 lb ft).</p>
3	<p>Bolt (Qty: 2)</p> <p>Tightening Specification: Tighten to 20 N.m (15 lb ft).</p>
4	<p>Bolt</p> <p>Tightening Specification: Tighten to 11 N.m (97 lb in).</p>
5	<p>Bracket</p>

WHEEL SPEED SENSOR REPLACEMENT

Removal Procedure

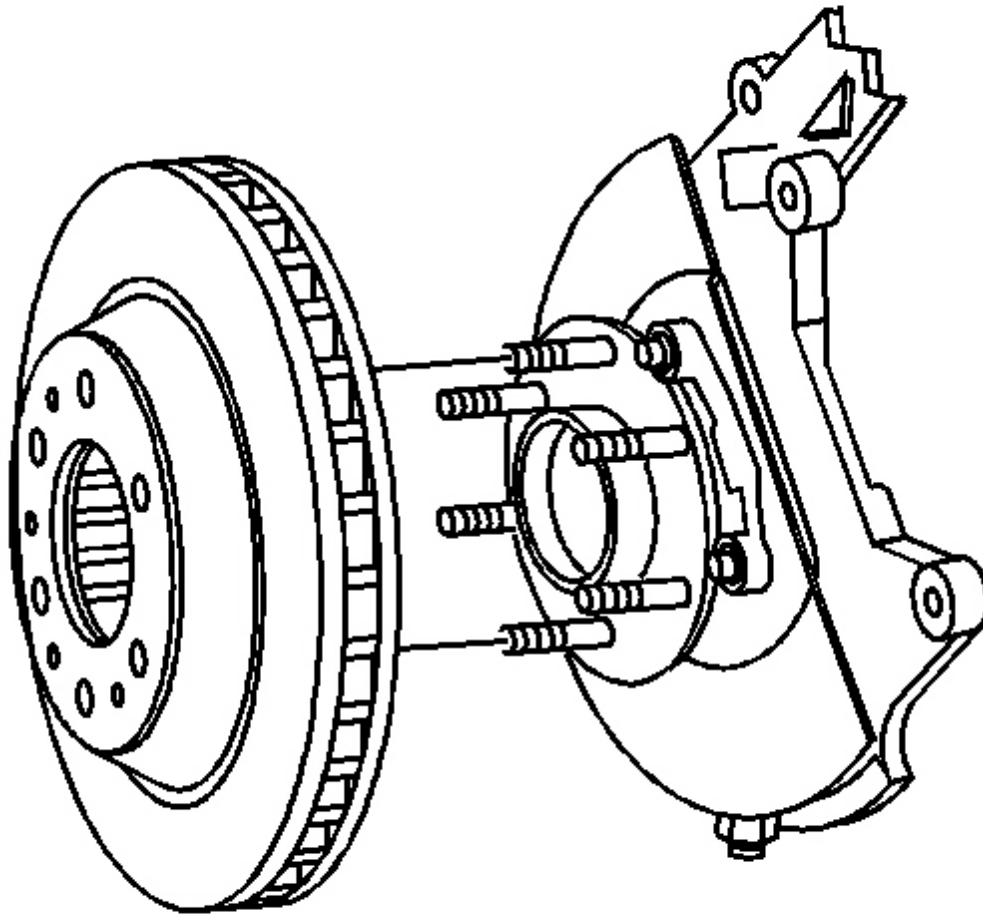


Fig. 9: Brake Rotor Removed From Hub
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brake.

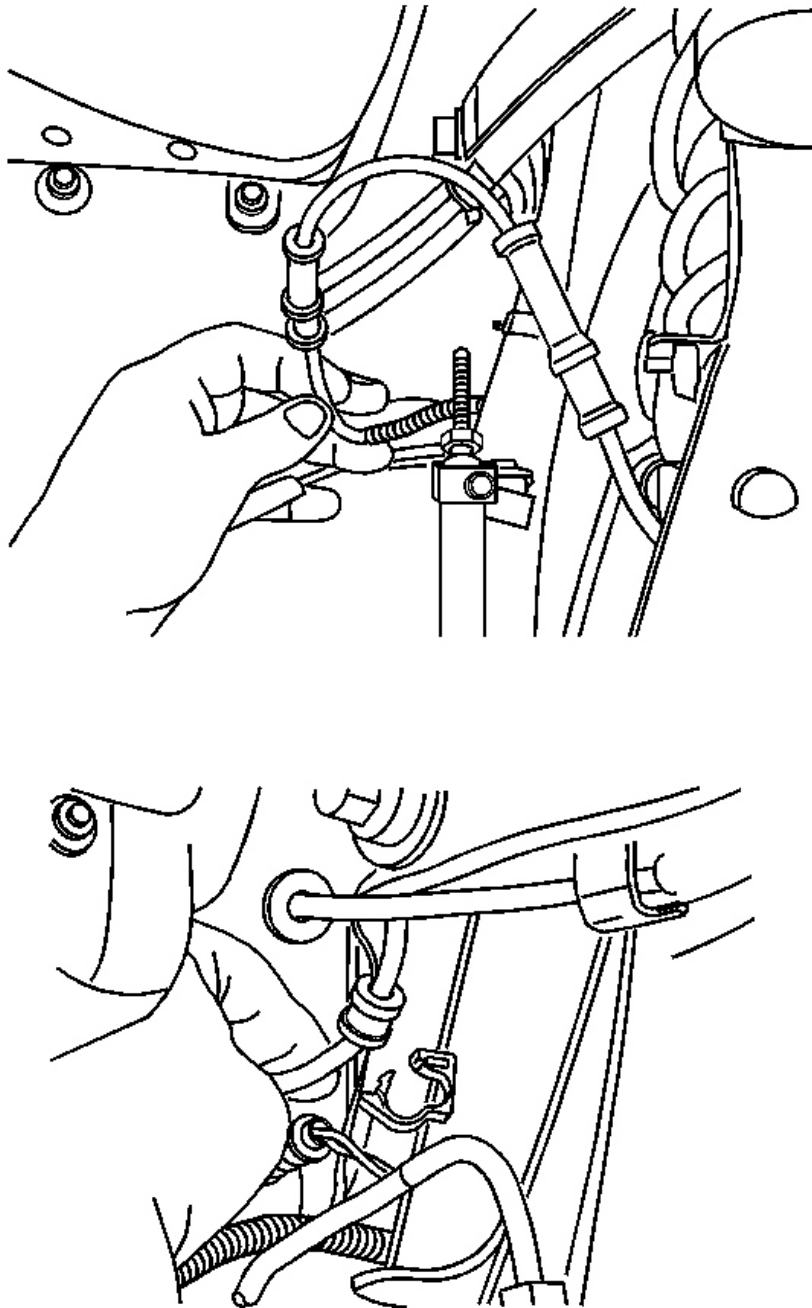


Fig. 10: Identifying Wheel Speed Sensor Wiring Harness
Courtesy of GENERAL MOTORS CORP.

4. Remove wheel speed sensor wiring harness the retainers.

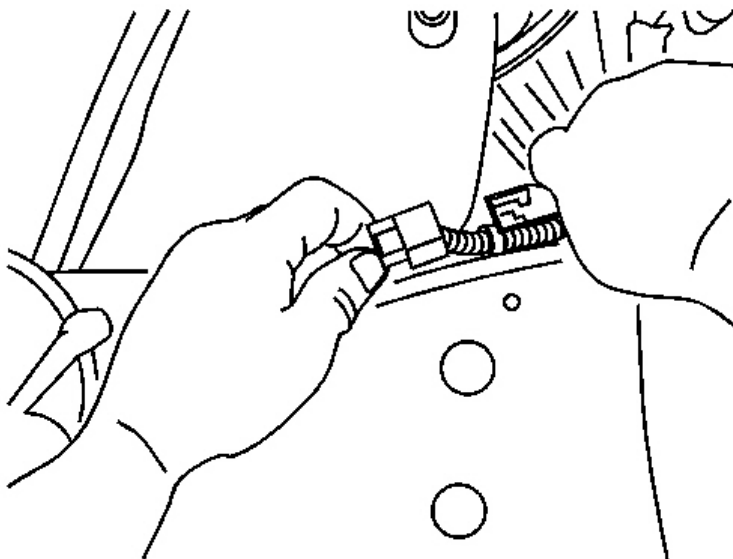
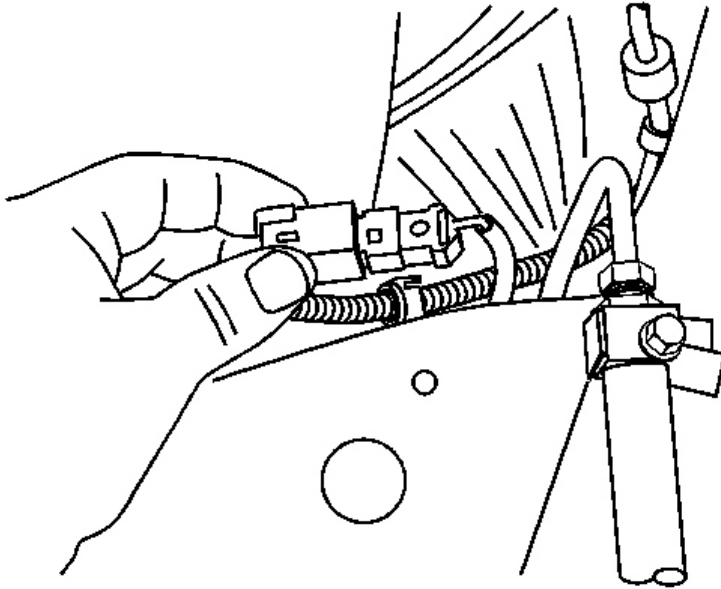


Fig. 11: Locating Connector

Courtesy of GENERAL MOTORS CORP.

5. Disconnect the wheel speed sensor electrical connector.

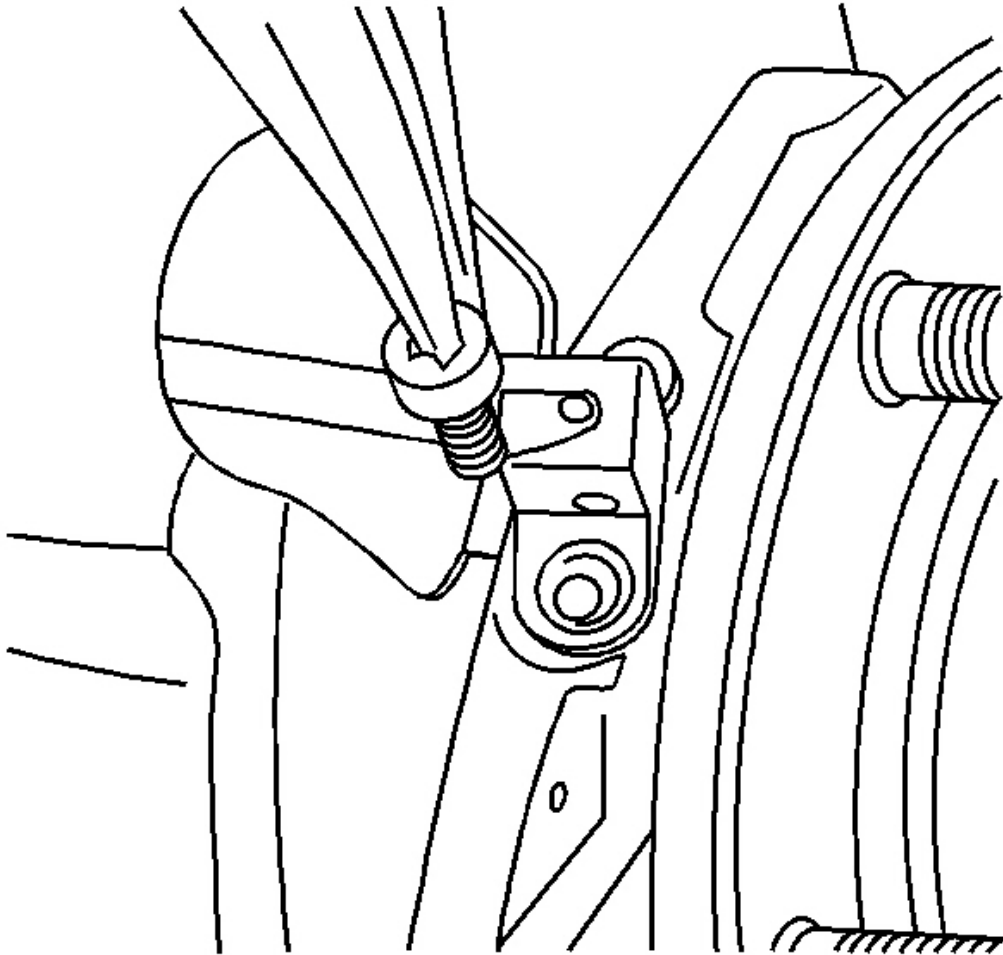


Fig. 12: Removing/Installing Sensor Mounting Screw
Courtesy of GENERAL MOTORS CORP.

6. Remove the sensor mounting screw.

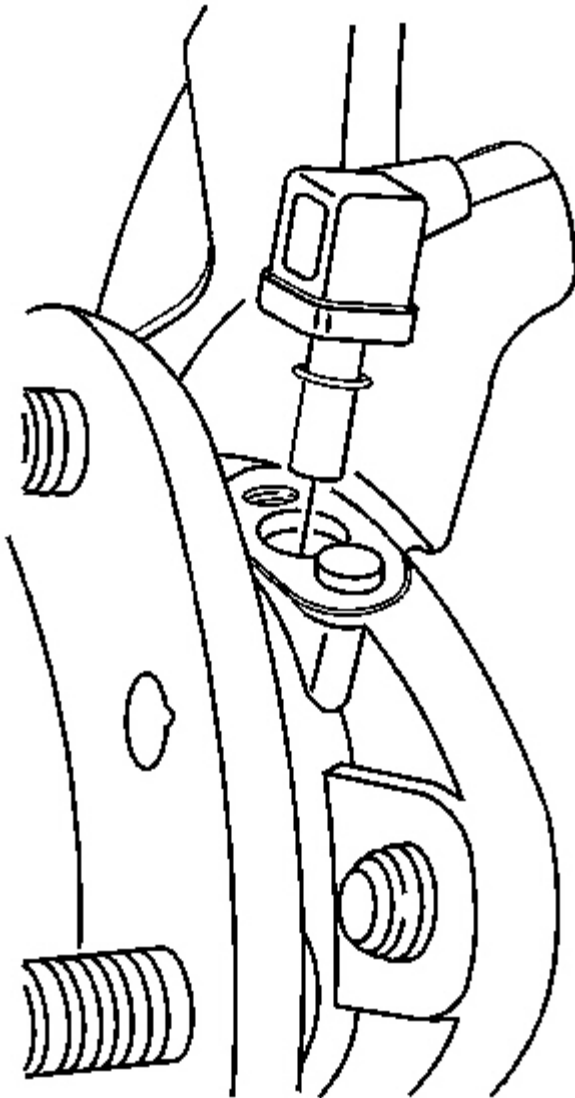


Fig. 13: Removing/Installing Speed Sensor
Courtesy of GENERAL MOTORS CORP.

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

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

NOTE: Do not attempt to remove the stainless steel shim from the bearing assembly. The shim is permanently attached. If the shim is damaged or bent, replace the bearing assembly. Failure to comply will result in diminished sensor and ABS performance.

IMPORTANT: The wheel speed sensor mounts into a bore that leads to the center of the sealed bearing. Use caution when cleaning or working around the bore. Do not contaminate the lubricant inside the sealed bearing. Failure to do so can lead to premature bearing failure.

7. Remove wheel speed sensor from hub and bearing assembly.

Installation Procedure

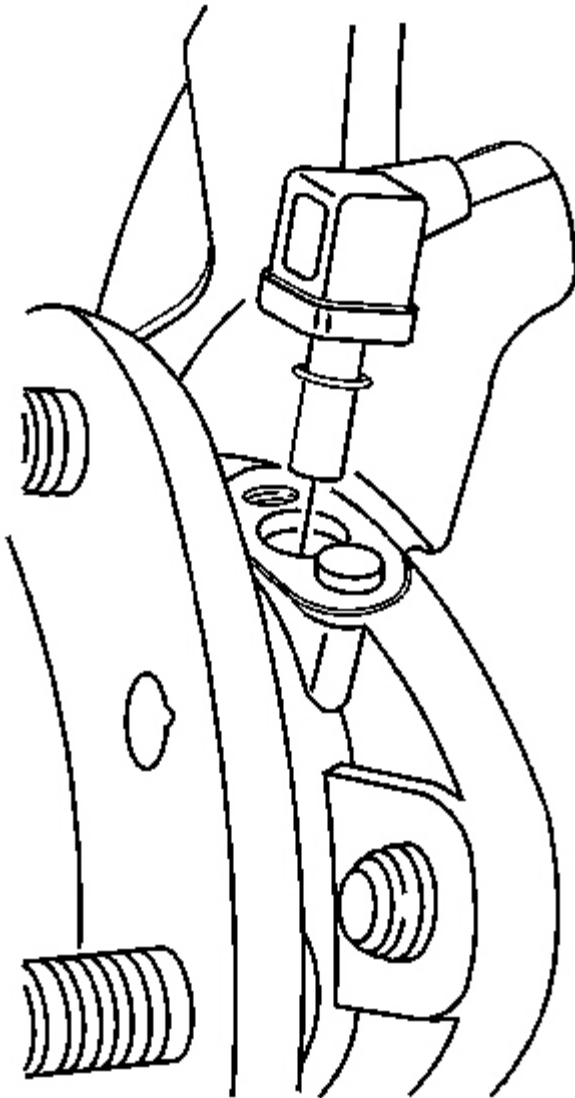


Fig. 14: Removing/Installing Speed Sensor
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The new speed sensor will have a new O-ring. Dispose of the old O-ring. Lubricate the new O-ring lightly with bearing grease prior to installation. You may also lubricate the

sensor just above and below the new O-ring. DO NOT lubricate the bore.

1. Install the speed sensor into the hub and bearing assembly.

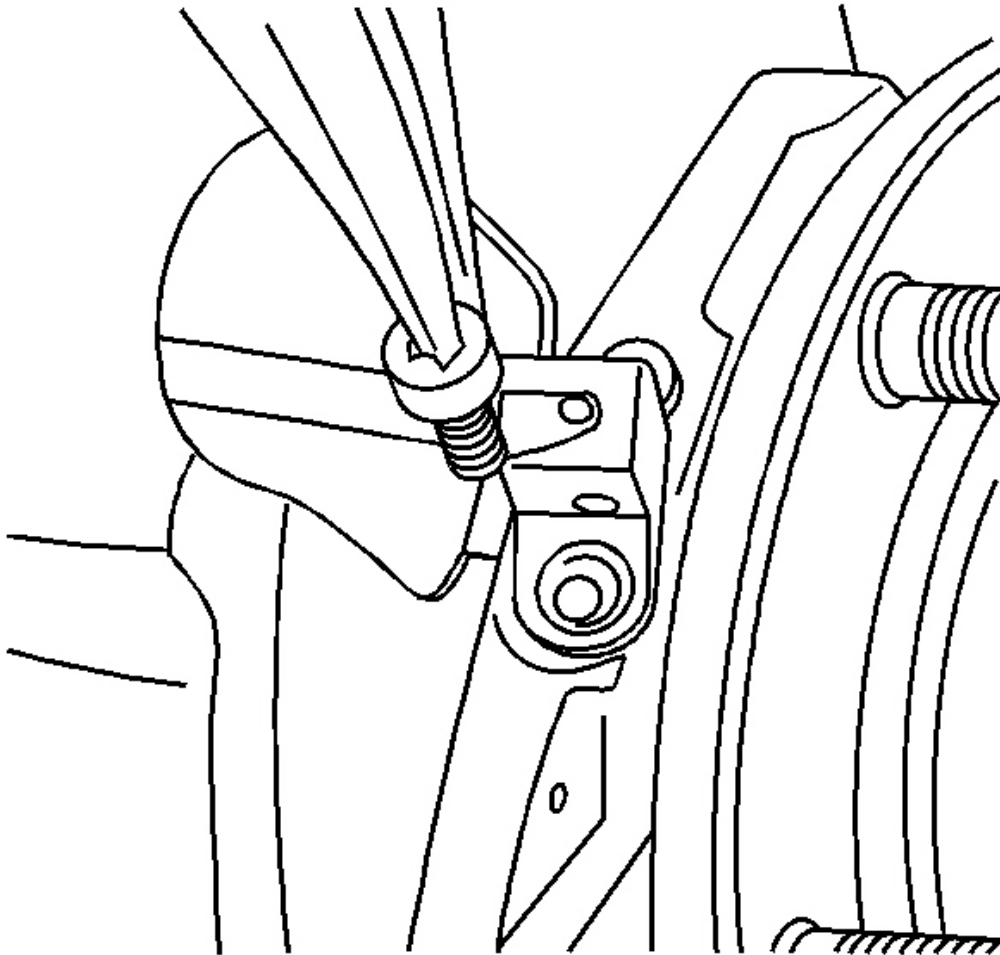


Fig. 15: Removing/Installing Sensor Mounting Screw
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the speed sensor mounting screw.

Tighten: Tighten the speed sensor mounting screw to 17 N.m (12 lb ft).

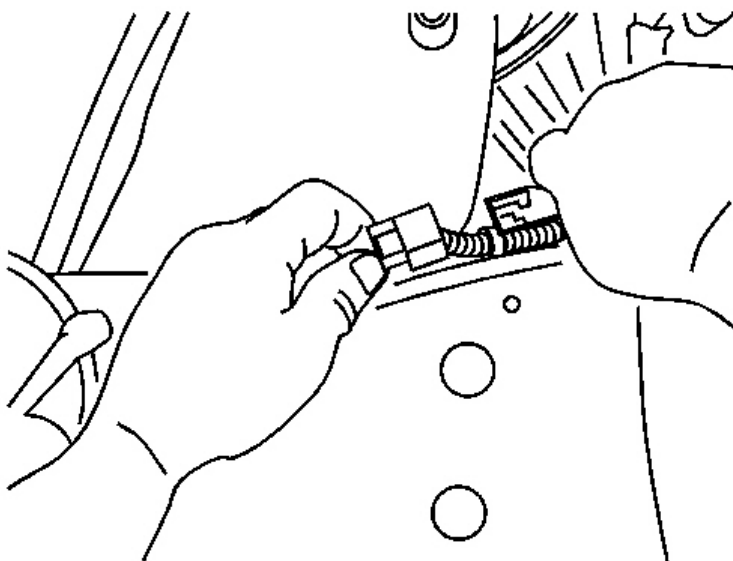
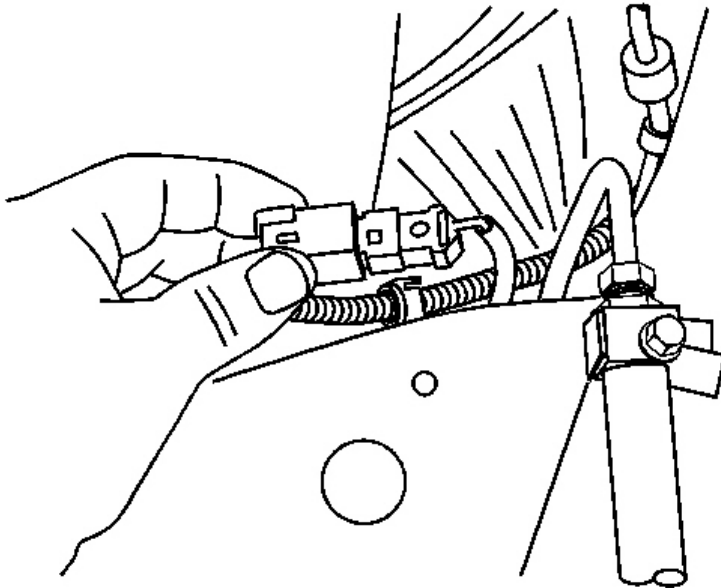


Fig. 16: Locating Connector
Courtesy of GENERAL MOTORS CORP.

3. Reconnect the wheel speed sensor electrical connector.

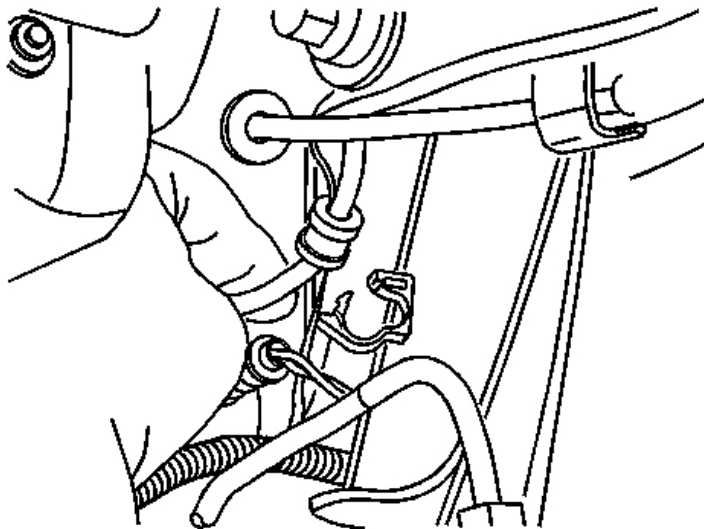
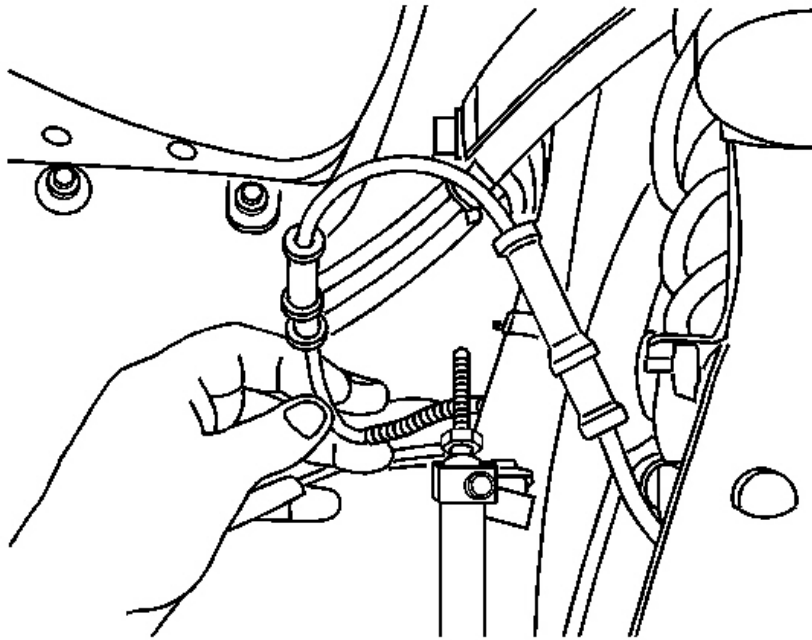


Fig. 17: Identifying Wheel Speed Sensor Wiring Harness

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The new speed sensor has new mounting clips already installed on the wire. **DO NOT** reuse the old clips.

4. Install wheel speed sensor wiring harness to the frame and control arm.

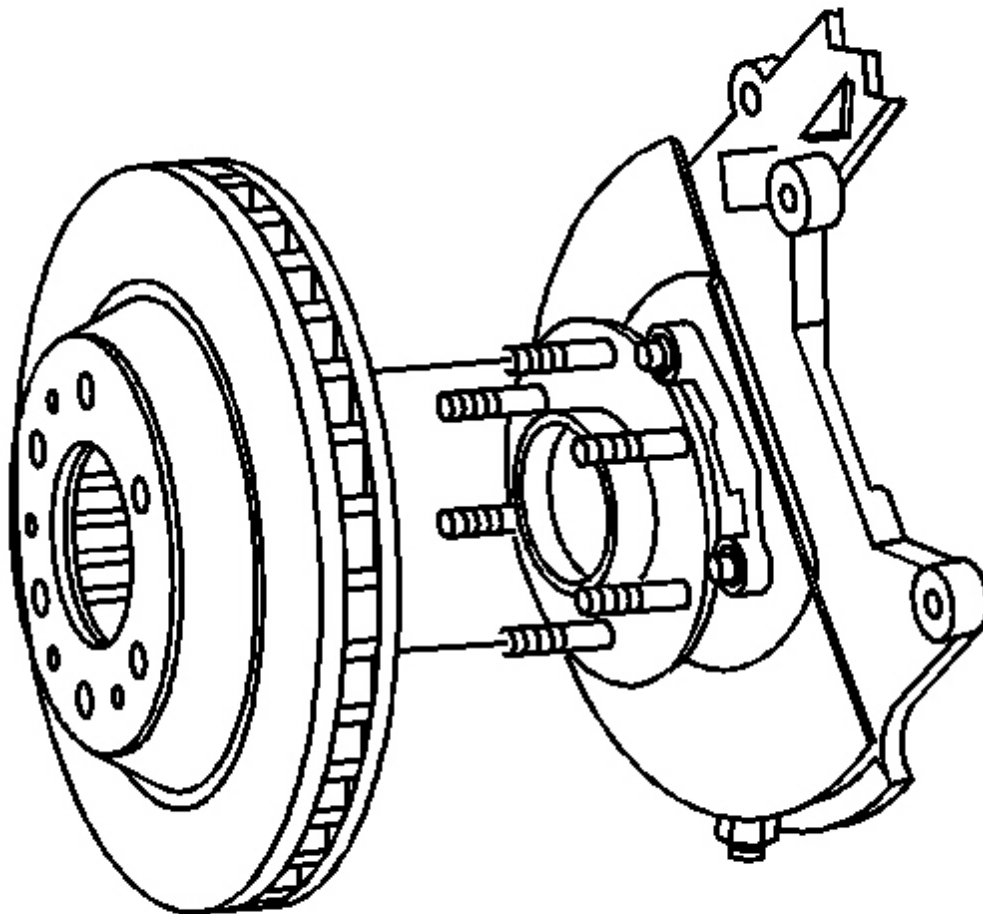


Fig. 18: Brake Rotor Removed From Hub
Courtesy of GENERAL MOTORS CORP.

5. Install the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brake.

6. Install tire and wheel. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRACTION CONTROL SWITCH REPLACEMENT (GMC, CHEVROLET)

Removal Procedure

1. Remove the accessory trim plate. Refer to **Trim Plate Replacement - Instrument Panel (I/P) Accessory (GMC)** or **Trim Plate Replacement - Instrument Panel (I/P) Accessory (Buick)** or **Bezel Replacement - Instrument Panel (I/P) Cluster (Chevrolet)** or **Bezel Replacement - Instrument Panel (I/P) Cluster (GMC, Buick)** in Instrument Panel, Gages, and Console.

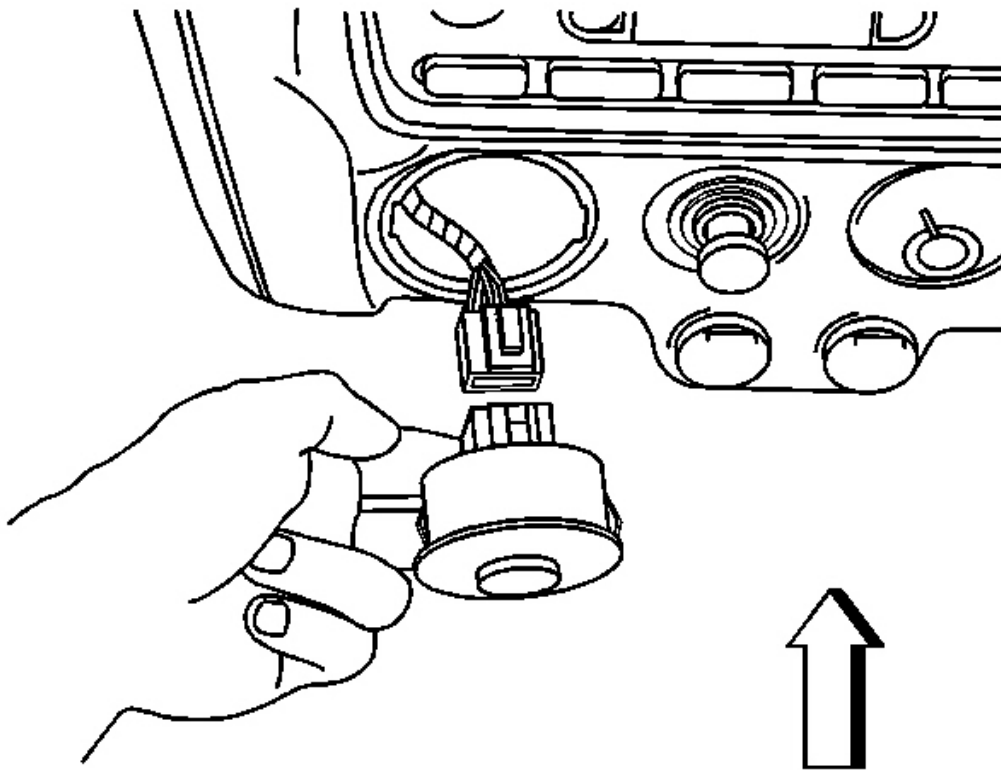


Fig. 19: Removing/Installing Traction Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector from the traction control switch.

3. Release the traction control switch locking tabs located behind the trim plate.
4. Remove the traction control switch from the trim plate

Installation Procedure

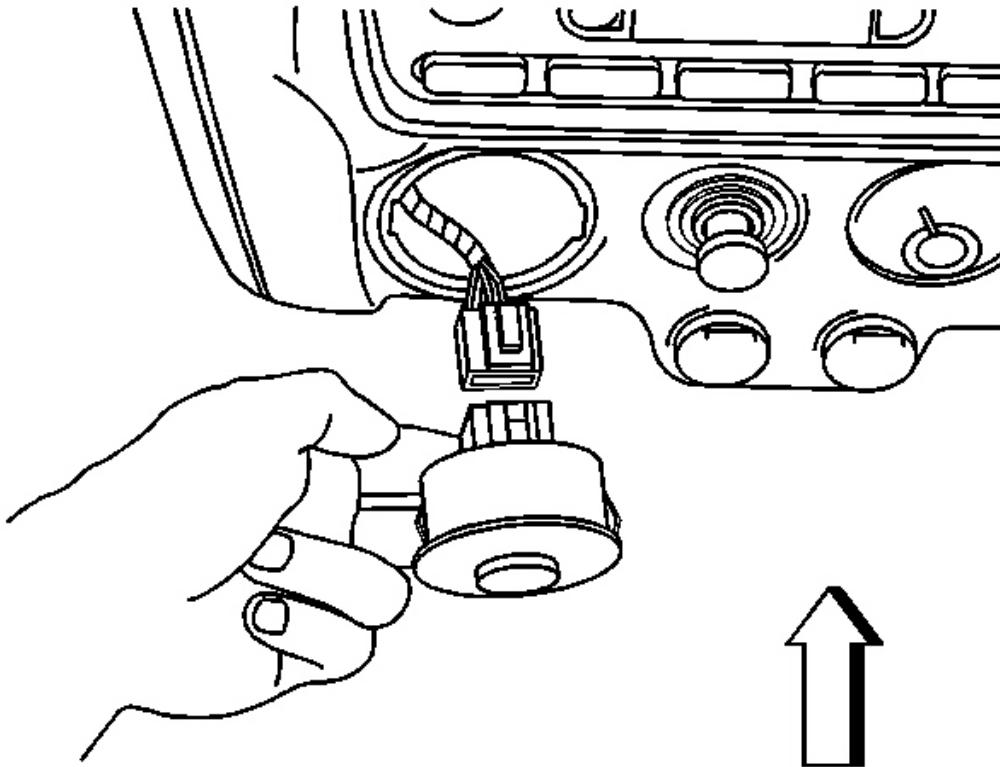


Fig. 20: Removing/Installing Traction Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Position the traction control switch to the trim plate
2. Install the traction control switch to the instrument panel trim plate by seating the locking tabs.
3. Connect the electrical connector to the traction control switch.
4. Install the accessory trim plate. Refer to **Trim Plate Replacement - Instrument Panel (I/P) Accessory (GMC)** or **Trim Plate Replacement - Instrument Panel (I/P) Accessory (Buick)** or **Bezel Replacement - Instrument Panel (I/P) Cluster (Chevrolet)**

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

or **Bezel Replacement - Instrument Panel (I/P) Cluster (GMC, Buick)** in Instrument Panel, Gages, and Console.

TRACTION CONTROL SWITCH REPLACEMENT (BUICK)

Removal Procedure

IMPORTANT: The console shift lever bezel must be removed prior to removing the traction control switch.

1. Remove the shift lever bezel. Refer to **Console Shift Lever Bezel Replacement (Buick)** in Instrument Panel, Gages, and Console.

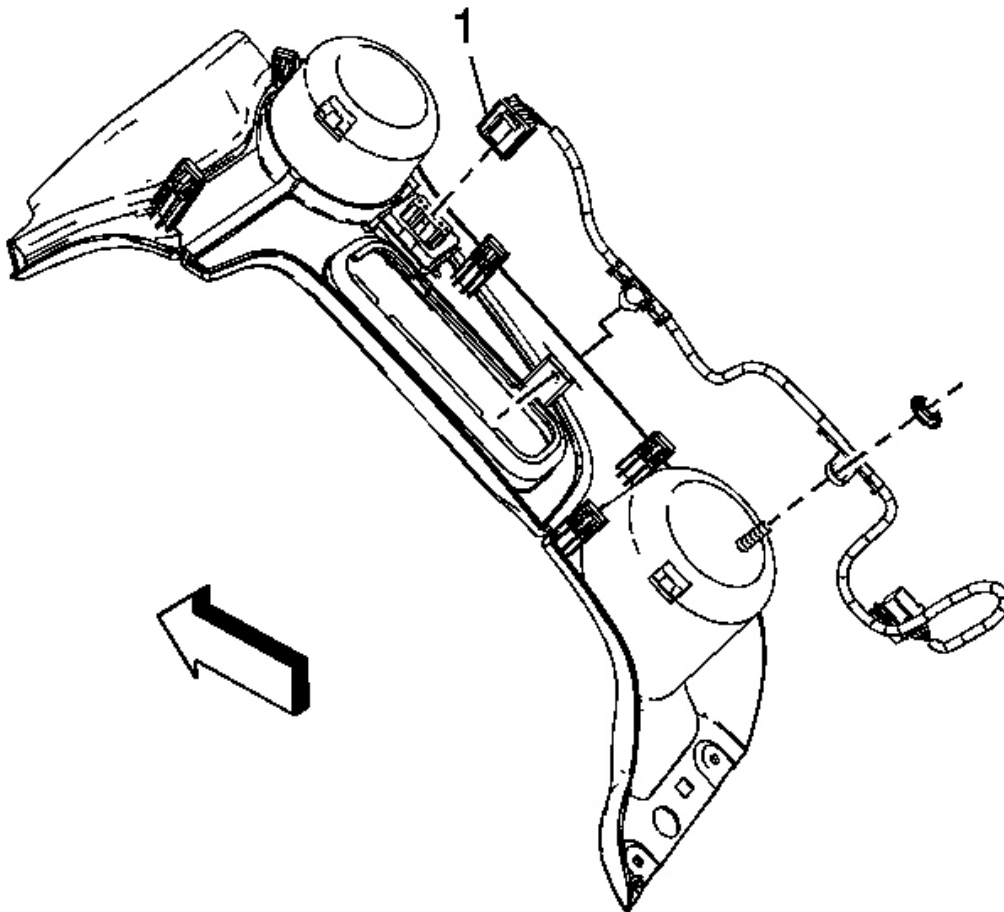


Fig. 21: Traction Control Switch Electrical Connector (Oldsmobile, Buick)
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector (1) from the switch.

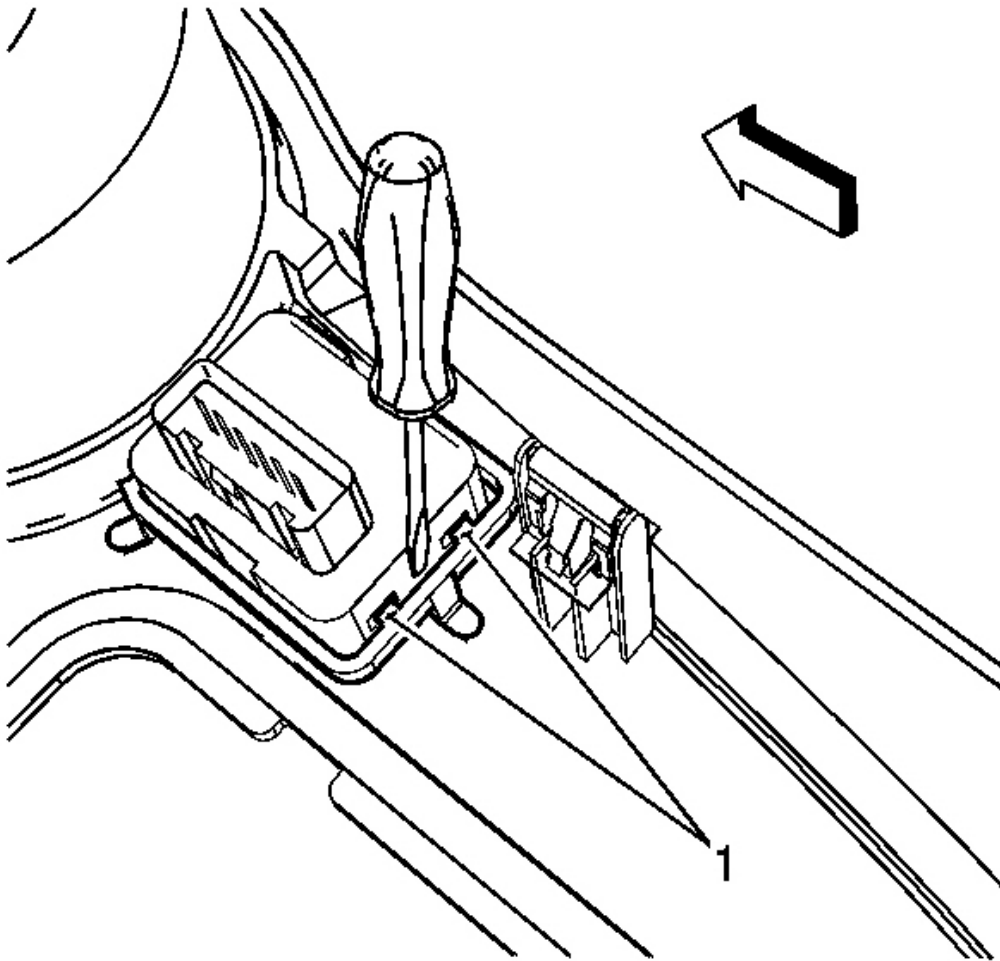


Fig. 22: Releasing Traction Control Switch Ring Tabs (Oldsmobile, Buick)
Courtesy of GENERAL MOTORS CORP.

3. Use a flat-bladed tool to release the ring tabs (1).

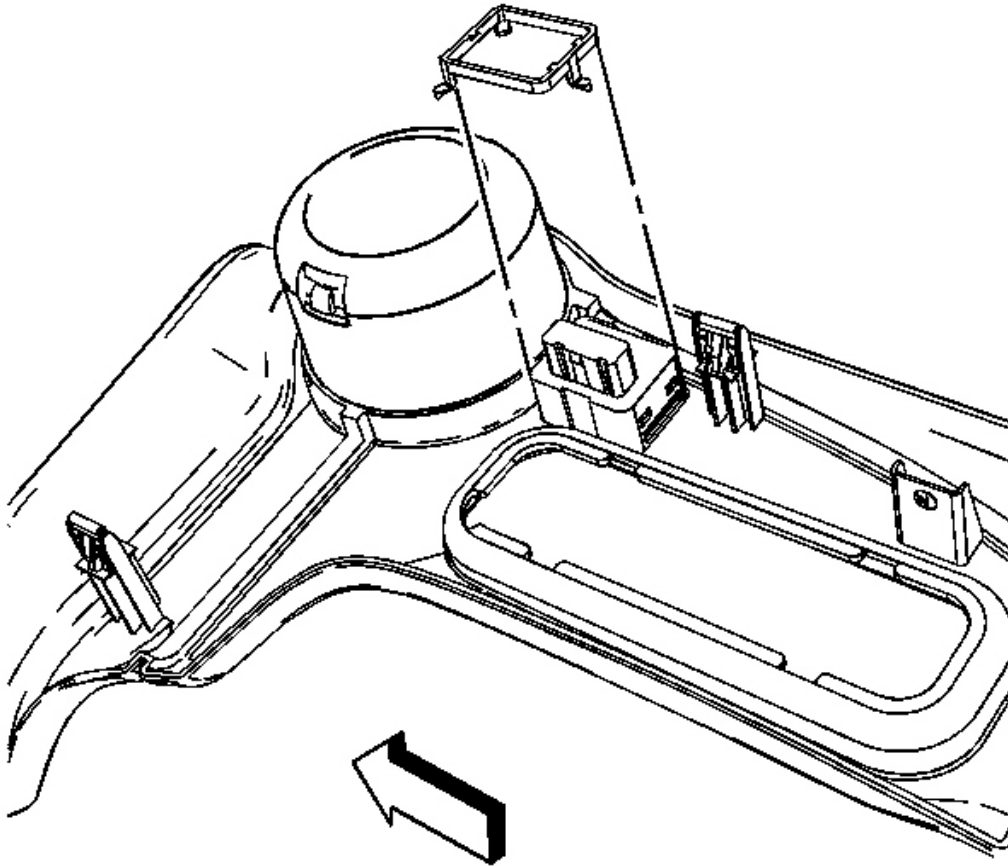


Fig. 23: Removing/Installing Traction Control Switch Retaining Ring (Oldsmobile, Buick)

Courtesy of GENERAL MOTORS CORP.

4. Remove the retaining ring from the switch.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

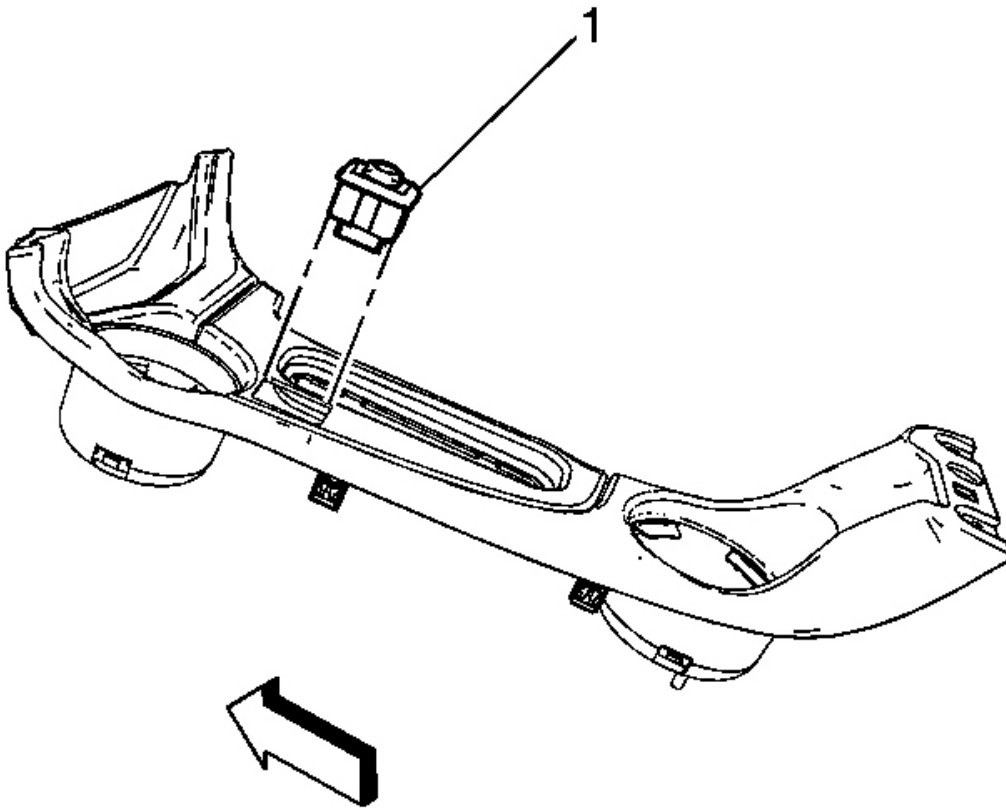


Fig. 24: Removing/Installing Traction Control Switch (Oldsmobile, Buick)
Courtesy of GENERAL MOTORS CORP.

5. Remove the switch (1) from the trim plate.

Installation Procedure

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

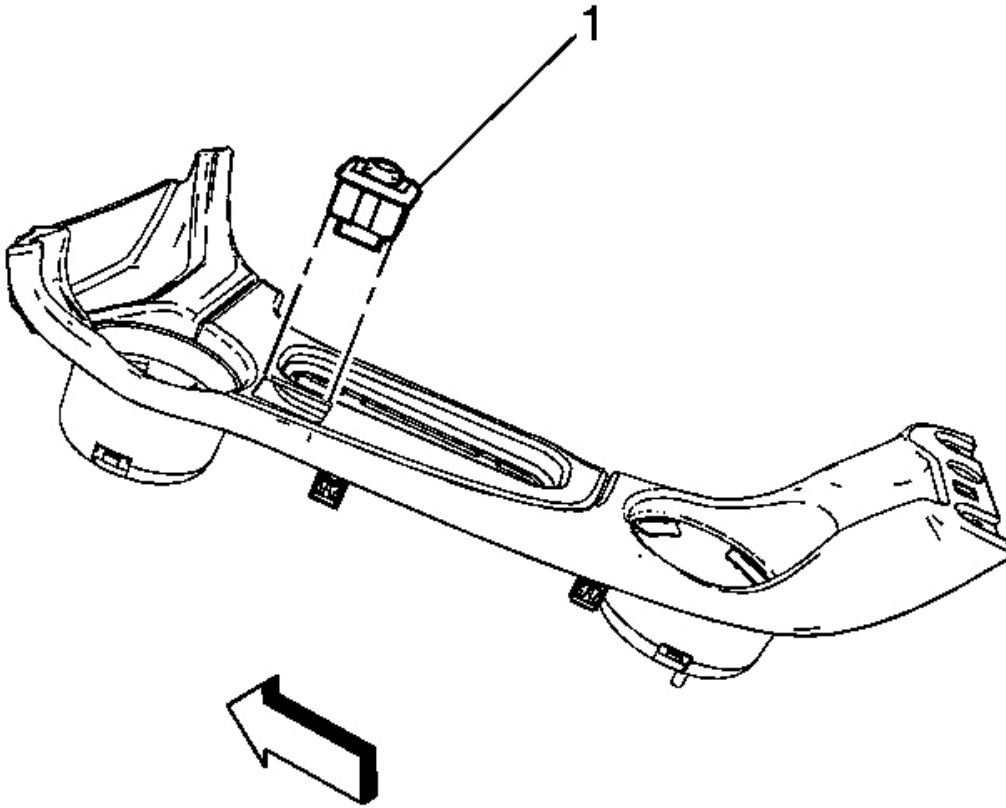


Fig. 25: Removing/Installing Traction Control Switch (Oldsmobile, Buick)
Courtesy of GENERAL MOTORS CORP.

1. Install the switch (1) to the trim plate.

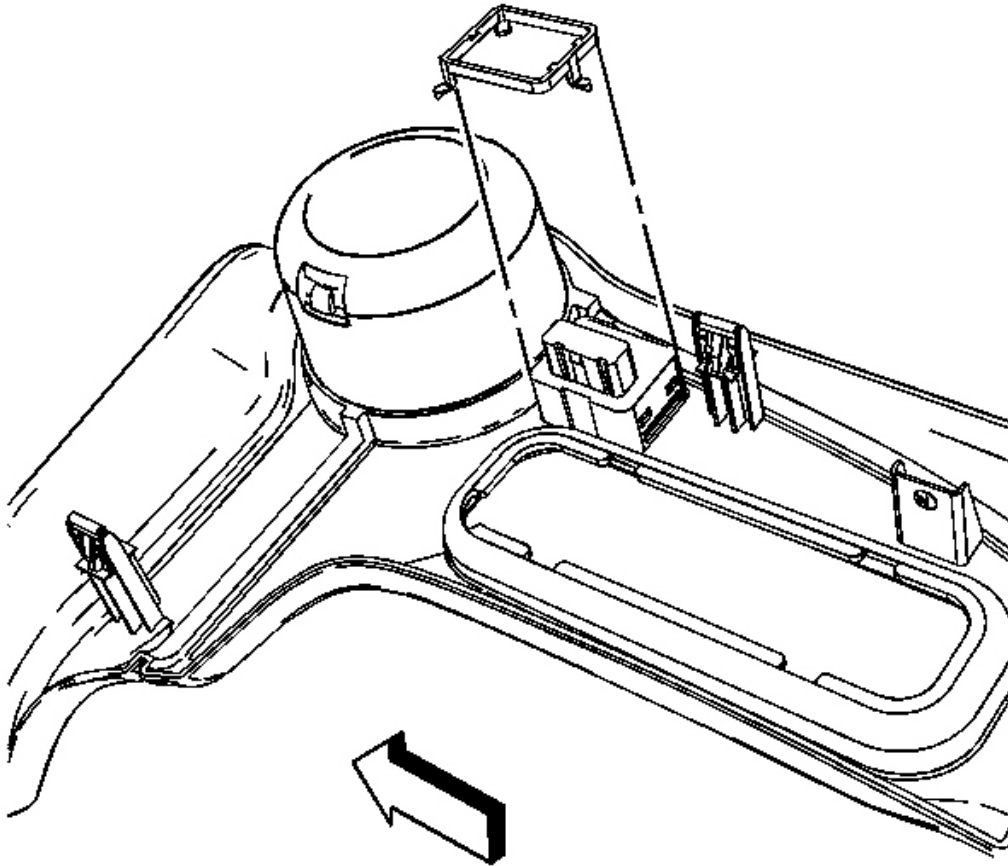


Fig. 26: Removing/Installing Traction Control Switch Retaining Ring (Oldsmobile, Buick)

Courtesy of GENERAL MOTORS CORP.

2. Install the retaining ring to the switch, ensuring the ring tabs are fully seated.

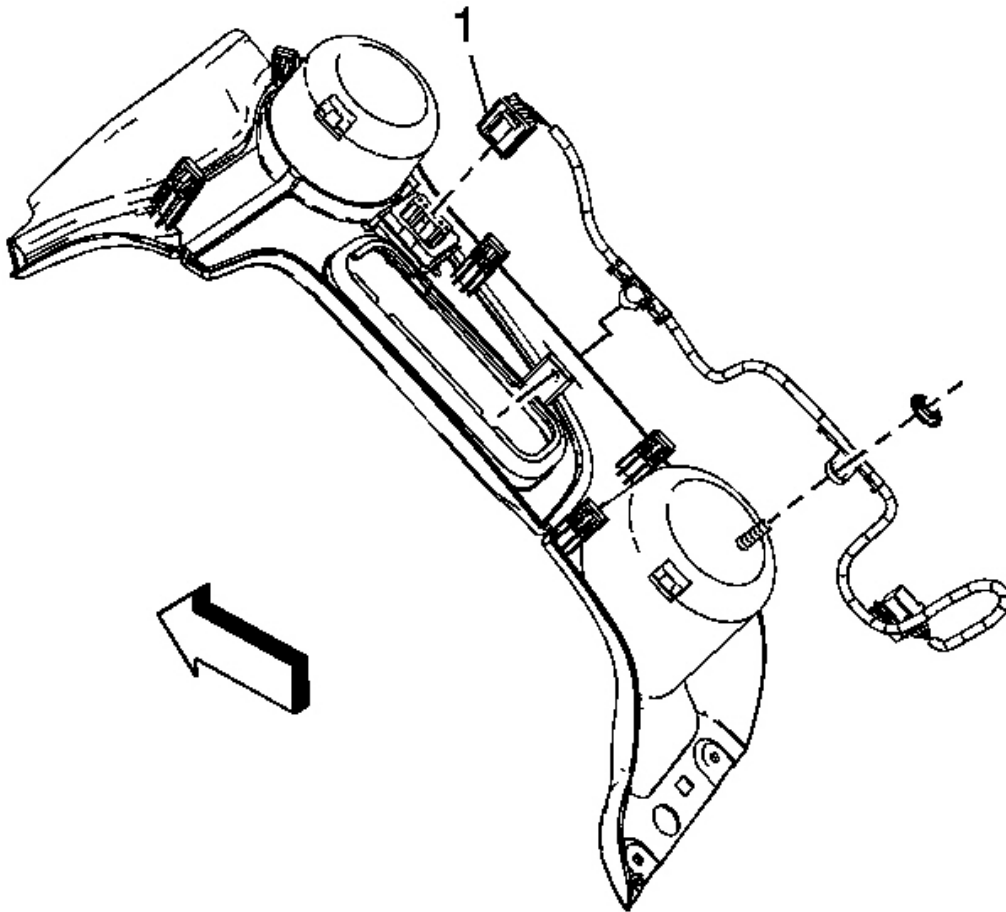


Fig. 27: Traction Control Switch Electrical Connector (Oldsmobile, Buick)
Courtesy of GENERAL MOTORS CORP.

3. Connect the electrical connector (1) to the switch.
4. Install the shift lever bezel. Refer to **Console Shift Lever Bezel Replacement (Buick)** in Instrument Panel, Gages, and Console.

YAW RATE REFERENCE TABLE RESET PROCEDURE

Circuit Description

Optimum vehicle Stability Enhancement System (VSES) function is dependent on many variables. The characteristics of a specific vehicle, that affect vehicle handling or input signals to

the Electronic Brake Control Module (EBCM), ultimately determine how the VSES operates. The basic EBCM software must be fine tuned as the vehicle is operated. This logic is referred to as adaptive learning.

Adaptive learning is accomplished by maintaining a yaw rate sensor/lateral accelerometer data table in the EBCM memory. As the vehicle is operated, the table is populated with data that is later referenced, and sometimes modified, to allow the EBCM to provide the best possible stability control for the specific vehicle.

IMPORTANT: If the data in the yaw rate sensor/lateral accelerometer data table becomes unreliable, false activations of the VSES, poor VSES performance, or false setting of DTC C0186 or C0196 may result. A replacement EBCM may have some unreliable data stored in the yaw rate sensor/lateral accelerometer data table. For this reason, it is important to perform the yaw rate reference table reset procedure after replacing the EBCM. Replacement of the yaw rate sensor/lateral accelerometer or the installation of different size tires may also the data stored in the table to become unreliable. Therefore, the yaw rate reference table reset procedure must be performed. This procedure is to be used only for vehicles equipped with VSES (JL4).

1. Turn OFF the ignition.
2. Disconnect the yaw rate sensor/lateral accelerometer harness connector.
3. Start the engine.
4. Apply firm and steady pressure to the brake pedal for at least 10 seconds.
5. Turn OFF the ignition.
6. Reconnect the yaw rate sensor/lateral accelerometer harness connector.
7. Turn ON the ignition and use the scan tool to clear the DTCs.

YAW RATE SENSOR/LATERAL ACCELEROMETER REPLACEMENT

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

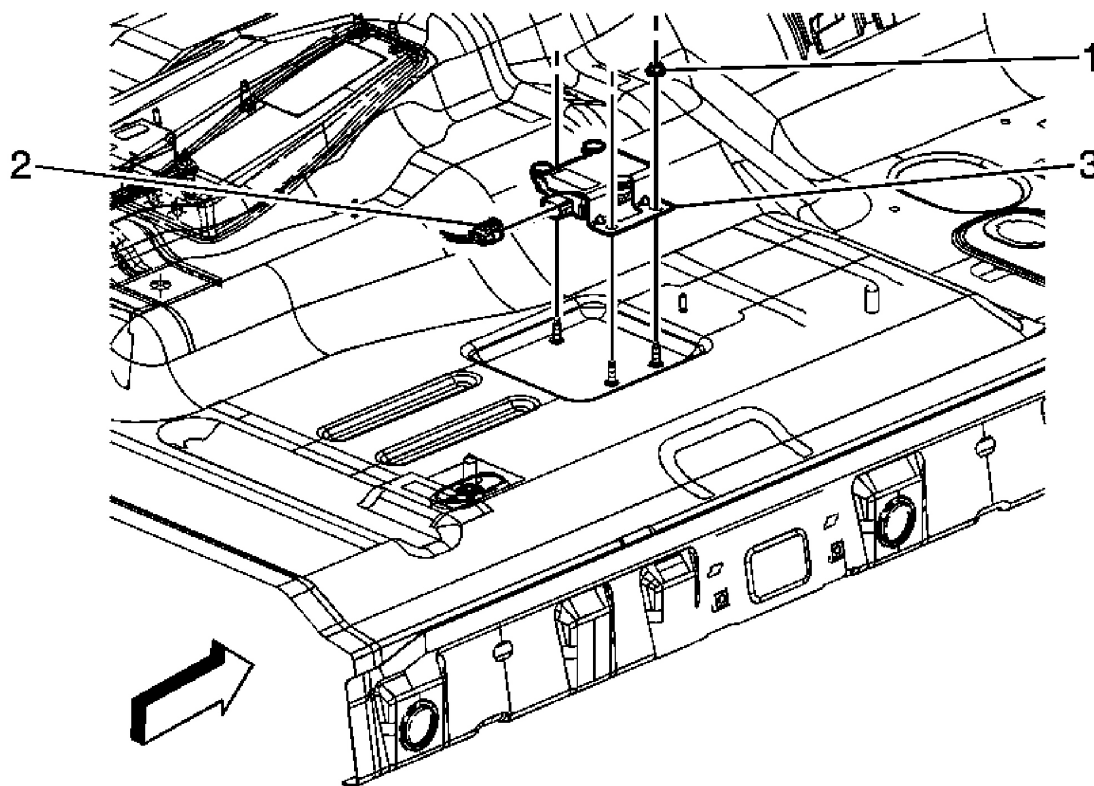


Fig. 28: Locating Yaw Rate Sensor/Lateral Accelerometer
Courtesy of GENERAL MOTORS CORP.

Yaw Rate Sensor/Lateral Accelerometer Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Remove the seat. Refer to <u>Seat Replacement - Front Bucket</u> .	
1	Nut (Qty: 3) Tightening Specifications: Tighten to 10 N.m (89 lb in).
2	Connector
3	Sensor

DESCRIPTION & OPERATION

ABS DESCRIPTION AND OPERATION

Vehicles with RPO JL4 are equipped with an EBC 445V ABS/DRP/TCS/VSES module.

This module provides the following vehicle performance enhancement systems.

- Anti-Lock Brake System (ABS)
- Dynamic Rear Proportioning (DRP)
- Traction Control System (TCS)
- Vehicle Stability Enhancement System (VSES)

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

- Electronic Brake Control Module (EBCM) - The EBCM controls the system functions and detects failures.

The EBCM contains the following components.

- System relay - The system relay is internal to the EBCM. The system relay is energized when the ignition is ON. The system relay supplies battery positive voltage to the valve solenoids and to the ABS pump motor. This voltage is referred to as system voltage.
- Solenoids - The solenoids are commanded ON and OFF by the EBCM to operate the appropriate valves in the Brake Pressure Modulator Valve (BPMV).
- Longitudinal accelerometer - The EBCM uses the longitudinal accelerometer to determine the actual straight-line acceleration of the vehicle.
- BPMV-The BPMV uses a 4-circuit configuration to control hydraulic pressure to each wheel independently.

The BPMV contains the following components.

- ABS pump motor and pump
- Four isolation valves
- Four dump valves
- Two TC isolation valves
- Two TC supply valves
- A master cylinder pressure sensor
- A front low-pressure accumulator
- A rear low-pressure accumulator

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

- Wheel speed sensors (WSS) - As the wheels spin, toothed rings interrupt magnetic fields in the wheel speed sensors. This causes each wheel speed sensor to generate an AC signal. The EBCM uses these AC signals to calculate the wheel speed. Any imperfections in the toothed ring, such as a missing or damaged tooth, can cause an inaccurate WSS signal.
- Traction control switch - VSES and the engine torque reduction function of TCS are manually disabled by pressing and holding the traction control switch for at least 5 seconds. These functions can be re-enabled with a quick press and release of the TC switch.
- Lateral accelerometer - The EBCM uses the lateral accelerometer to determine the sideways acceleration of the vehicle. The lateral accelerometer is packaged with the yaw rate sensor as a single component.
- Master cylinder pressure sensor - The master cylinder pressure sensor is located within the BPMV. The master cylinder pressure sensor uses a 5-volt reference and generates an output signal proportionate to the hydraulic fluid pressure which is present in the front brake circuit at the master cylinder.
- Yaw rate sensor - The EBCM uses the yaw rate sensor to determine the rate of rotation along the vehicle's vertical axis. The yaw rate sensor is packaged with the lateral accelerometer as a single component.
- Steering wheel position sensor - The EBCM receives several inputs from the steering wheel position sensor. Three digital square wave signal inputs are wired directly to the EBCM harness connector, however, only signals A and B are used or monitored. The failure of the index pulse signal does not effect VSES function. The EBCM also monitors an analog steering wheel position sensor signal. Battery voltage is supplied to the digital portion of the steering wheel position sensor by the ignition 1 circuit. The analog portion of the steering wheel position sensor is supplied a 5-volt reference from the EBCM.
- Precharge pump motor and pump - The precharge pump assembly is used to assist the ABS pump in rapidly building hydraulic pressure needed during certain TCS or VSES events.

Anti-Lock Brake System (ABS)

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

During anti-lock braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the Electronic Brake Control Module (EBCM) responds to wheel speed sensor inputs and attempts to prevent

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

wheel slip. These pedal pulsations are present only during anti-lock braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During anti-lock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during anti-lock operation.

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

Pressure Hold

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

Pressure Decrease

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

Pressure Increase

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

Dynamic Rear Proportioning (DRP)

The Dynamic Rear Proportioning (DRP) is a control system that enhances 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 Electronic Brake Control Module (EBCM). The DRP uses active control with existing ABS in order to regulate the vehicle's rear brake pressure.

Traction Control System (TCS)

Traction is maintained by limiting the amount of torque produced by the drivetrain and also by applying brake pressure to slipping wheels during acceleration. This causes power to transfer

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

through the driveline to wheels which are not slipping. The transfer case used on 4-wheel drive vehicles equipped with vehicle Stability Enhancement System (VSES) does not contain a viscous coupling and therefore allows the front and rear driveshafts to turn at substantially different speeds. This front to rear differential must be kept within acceptable parameters by the VSES. The 2 methods of traction control are performed as follows.

Engine Torque Reduction

The Electronic Brake Control Module (EBCM) uses a 5-volt pulse width modulated (PWM) signal to request that the Powertrain Control Module (PCM) reduce the amount of torque to the drive wheels. The PCM reduces torque to the drive wheels by retarding spark timing and commanding the throttle actuator control. The PCM uses a 12-volt PWM signal to report to the EBCM the amount of torque that is being delivered to the drive wheels. Engine torque reduction is mostly used to reduce vehicle speed during VSES events and during Traction Control System (TCS) events when the brakes are in danger of being overheated or when the driven wheels are slipping at the same rate. Engine torque reduction can be disabled by pressing the traction control switch.

Brake Pressure Application

The EBCM uses brake pressure application to control traction by transferring torque through the driveline to wheels which are not slipping. The precharge pump motor, ABS pump motor and appropriate valve solenoids are commanded ON and OFF to apply brake pressure to the slipping wheels. Brake pressure application is used in an attempt to maintain equal WSS signals at the driven wheels.

The EBCM does not allow excessive brake pressure application due to the fact that the solenoid coils or the brakes may become overheated, damaging the EBCM or reducing the driver's ability to stop the vehicle. Estimated coil and brake temperatures are determined by a calculation in the EBCM software. Overheated solenoid coils cause all brake pressure application to become disabled and the stability system disabled message to be displayed. Overheated brakes cause brake pressure application during TCS events to disable, yet the VSES remains functional and as long as the engine torque reduction is enabled, there is no indication to the driver when this occurs and no DTC sets.

Vehicle Stability Enhancement System (VSES)

The vehicle Stability Enhancement System (VSES) provides added stability during aggressive maneuvers. Yaw rate is the rate of rotation about the vehicle's vertical axis. The VSES is activated when the Electronic Brake Control Module (EBCM) determines that the desired yaw rate does not match the actual yaw rate as measured by the yaw rate sensor.

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer

The desired yaw rate is calculated by the EBCM using, primarily, the following inputs.

- 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. When a yaw rate error is detected, the EBCM attempts to correct the vehicle's yaw motion by applying brake pressure to one or more of the wheels. The amount of brake pressure which is applied varies, depending on the correction required. The engine torque may be reduced also, if it is necessary to slow the vehicle while maintaining stability.

VSES activations generally occur in turns during aggressive driving. When braking during VSES activation, the pedal may pulsate. The brake pedal pulsates at a higher frequency during VSES activation than during ABS activation.

System Pre-Fill

This vehicle is equipped with a 4-wheel disc brake system. Disc brake calipers are designed so that when hydraulic pressure is not being applied, the caliper piston lip seal causes the piston to retract, creating measurable clearance between the brake pads and the rotor. Since a small amount of brake fluid must be delivered to the calipers before any actual braking occurs, the vehicle Stability Enhancement System (VSES) uses system pre-fill to prevent delayed brake application and enhance system performance. If the Electronic Brake Control Module (EBCM) determines that a brake application is likely to be needed, the ABS pump motor runs momentarily to take up any clearances between the brake pads and the rotor. By monitoring the master cylinder pressure sensor feedback signal, the EBCM can determine when the brake pads are contacting the rotor. The EBCM then holds this small amount of pressure in the system. A VSES brake application may or may not occur after pre-fill is complete. If the EBCM determines that a brake application is no longer pending, the pre-fill pressure is released and the VSES system returns to the normal, monitoring state. The reason that we must understand system pre-fill is that pre-fill may lead to customer concerns. Any time the ABS pump motor is active, the motor draws a large amount of current, and may cause the vehicle lighting systems to dim noticeably. When ABS activity occurs, most drivers understand that this activity is the cause of noises and dimming lights. Likewise, when an actual VSES event occurs, the Stability System Active message is displayed, which helps drivers understand why these other conditions occur. Since pre-fill is not an actual VSES event, but preparation for a pending event, no message is displayed. Also, system noise during pre-fill is very minimal. A customer may become concerned with what is perceived to be an electrical problem, due to the intermittent dimming lights, when, in fact, no malfunction

exists and the condition is normal.

Precharge Pump

The Traction Control System (TCS) and vehicle Stability Enhancement System (VSES) are dependent on the precharge pump to assist the ABS pump in building hydraulic pressure to perform brake pressure application. This is because the passages from the master cylinder reservoir to the ABS pump inlet are restrictive, and do not supply adequate fluid to the ABS pump. The precharge pump is used mostly at the beginning of brake pressure applications since once some pressure is built, the ABS pump is usually able to continue building pressure and maintain the application. The precharge pump inlet is fed by a flexible hose which draws fluid directly from a port on the master cylinder reservoir. When the precharge pump is activated, fluid is pumped into the combination valve, slightly pressurizing the front and rear brake circuits between the master cylinder and the Brake Pressure Modulator Valve (BPMV). It is important to note that during this time, the EBCM must isolate of the all wheels except for those to which the brake pressure application is directed. The portion of the pressurized fluid that is not drawn into the ABS pump inlet, passes through the bypass ports in the master cylinder and returns to the reservoir. Some of the pressurized fluid is supplied to the ABS pump inlet when the Electronic Brake Control Module (EBCM) commands ON a supply valve in the BPMV. Since the fluid at the ABS pump inlet is slightly pressurized, the ABS pump is able to function with higher efficiency. The precharge pump, however, is not always used during TCS or VSES events due to the fact that the precharge pump motor must be protected from overheating. During a long series of brake pressure applications, the precharge pump may be disabled by the EBCM for up to 12 seconds. Although the driver may be able to detect a change in the vehicle stability during this time, the TCS and VSES do remain functional. No indication is given to the driver if the precharge pump is disabled due to overheating.

Power-up Self-Test

The Electronic Brake Control Module (EBCM) is able to detect many malfunctions whenever the ignition is ON. However, certain failures cannot be detected unless active diagnostic tests are performed on the components. Shorted solenoid coil or motor windings, for example, cannot be detected until the components are commanded ON by the EBCM. Therefore, a power-up self-test is required at the beginning of each ignition cycle to verify correct operation of components before the various control systems can be enabled. The EBCM performs the first phase of the power-up self-test when the ignition is first turned ON. The system relay, solenoids and the ABS pump motor are commanded ON and OFF to verify proper operation and the EBCM verifies the ability to return the system to base braking in the event of a failure. The master cylinder pressure sensor performs a self-test by sending a series of specific voltage signals to the EBCM, each for a predetermined amount of time. This phase of the power-up self-test may be heard by the driver, depending on how soon the engine is cranked and started after turning ON the ignition. The

second phase of the power-up self-test begins when the vehicle is driven at a speed greater than 16 km/h (10 mph) and the EBCM has not detected any Traction Control System (TCS)/Vehicle Stability Enhancement System (VSES) related malfunctions thus far. During this phase, the precharge pump is tested to verify the ability to build adequate pressure to perform brake pressure application during certain TCS and VSES events. When the brake switch indicates that the brake is not applied and the master cylinder pressure is detected as being low, the EBCM proceeds with the test. The EBCM isolates all of the wheels by closing the 4 isolation valves. The precharge pump is then commanded ON while the EBCM monitors the master cylinder pressure sensor input. The precharge pump must build approximately 248 kPa (36 psi) of hydraulic pressure within 1 second or the test is failed. If the EBCM uses brake pressure application to perform TCS or VSES prior to the second phase of the power-up self-test, the precharge pump is tested at this time and the second phase of the test is not required. Due to the fact that all of the wheels are isolated during the second phase of the test, the test must be aborted if the brake is applied while the test is being performed. Occasionally, the driver may detect this by experiencing a momentary hard pedal.

VSES Sensors Initialization

The vehicle Stability Enhancement System (VSES) sensors values may vary slightly due to differences in temperature, sensor mounting, connector resistances, manufacturing, etc. Since the VSES is a very sensitive and precise control system, it is imperative that the Electronic Brake Control Module (EBCM) be able to accurately equate a given sensor voltage with an actual unit of measurement. For example, the yaw rate signal of one vehicle may be 2.64 volts at +18.0 deg/sec yaw rate while the yaw rate signal of another vehicle may be 2.64 volts at +17.5 deg/sec yaw rate. Therefore, at the beginning of each ignition cycle, the EBCM must perform an initialization procedure to observe how the VSES sensors are correlated with each other and also to determine what each sensor value is when the applicable unit of measurement equals 0. This voltage is referred to as the sensor bias voltage. Although some activation of the VSES system may occur if required prior to full initialization, the system does not give optimum performance until the sensors are fully initialized.

The following VSES sensors require initialization.

- The yaw rate sensor
- The lateral accelerometer
- The longitudinal accelerometer
- The master cylinder pressure sensor
- The steering wheel position sensor

When the vehicle speed is greater than 25 km/h (15 mph), full sensor initialization must occur

during 3 km (1.8 mi) of driving or 1 km (0.6 mi) of straight and stable driving, whichever occurs first. Although an attempt at initialization may fail due to driving conditions, such as driving on a very winding road, failed initialization is usually caused by a sensor bias voltage which is not within an acceptable range. Often, a DTC sets soon after a failed initialization attempt. The stability system not ready indicator illuminates when sensor initialization fails.

ECE 13 Response

The Electronic Brake Control Module (EBCM) illuminates the ABS indicator when a malfunction which disables ABS is detected. Usually, the ABS indicator is turned OFF during the following ignition cycle unless the fault is detected during that ignition cycle. However, the setting of a wheel speed sensor related DTC causes the ABS indicator to remain illuminated during the following ignition cycle until the vehicle is operated at a speed greater than 13 km/h (8 mph). This allows the EBCM to verify that no malfunction exists, before turning OFF the ABS indicator. This reaction occurs even if the ABS indicator turns OFF when the scan tool is used to clear the DTCs. When repairing these vehicles, it is important to ensure that the ECE 13 response has occurred and that the ABS indicator does not illuminate after returning the vehicle to the customer. It is also important to verify that ECE 13 is not the cause of an ABS indicator which is illuminated when no DTCs are set, before attempting to diagnose other possible causes.

Driver Information Indicators and Messages

The following indicators are used to inform the driver of several different factors.

Brake Warning Indicator

The Instrument Panel Cluster (IPC) illuminates the brake warning indicator when the following occurs.

- The Body Control Module (BCM) detects that the park brake is engaged. The IPC receives a serial data message from the BCM requesting illumination. The brake warning indicator flashes at a rate of approximately twice per second when the park brake is engaged.
- The Electronic Brake Control Module (EBCM) detects a low brake fluid condition or a base brake pressure differential and sends a serial data message to the IPC requesting illumination.
- The IPC performs the bulb check.
- The EBCM detects an ABS-disabling malfunction which also disables dynamic rear proportioning (DRP) and sends a serial data message to the IPC requesting illumination.

ABS Indicator

The IPC illuminates the ABS indicator when the following occurs.

- The EBCM detects an ABS-disabling malfunction and sends a serial data message to the IPC requesting illumination.
- The IPC performs the bulb check.
- The IPC detects a loss of serial data communication with the EBCM.
- A DTC is set during the previous ignition cycle which requires an ECE 13 response at the beginning of the current ignition cycle. The EBCM sends a serial data message to the IPC requesting illumination.

Traction Off Indicator

The IPC illuminates the traction off indicator when the following occurs.

- The EBCM disables engine torque reduction due to a malfunction and sends a serial data message to the IPC requesting illumination.
- The IPC performs the bulb check.
- The driver manually disables VSES and engine torque reduction by pressing the traction control switch. The EBCM sends a serial data message to the IPC requesting illumination.
- The IPC flashes the traction off indicator if wheel slip is detected while engine torque reduction and brake pressure application are both disabled.

Service Brake System Message

The service brake system message is displayed whenever the red brake warning indicator is illuminated.

Stability System Active Message

The message center displays the stability system active message when a TCS or VSES event occurs. The EBCM sends a serial data message to the IPC request this display.

Stability System Disabled Message

The message center displays the stability system disabled message when one or more of the following conditions exists.

- The transfer case is shifted into 4 LO. The EBCM sends a serial data message to the IPC requesting illumination
- The driver manually disables the VSES and engine torque reduction by pressing the traction control switch. The EBCM sends a serial data message to the IPC requesting illumination.

- The estimated temperature of any solenoid coil exceeds an acceptable limit. The EBCM sends a serial data message to the IPC requesting this display
- The EBCM detects a failed brake switch. The EBCM sends a serial data message to the IPC requesting this display. A DTC sets when this condition exists.
- The Powertrain Control Module (PCM) is not able to perform engine torque reduction. The EBCM sends a serial data message to the IPC requesting illumination. DTCs set when this condition exists.
- The EBCM detects that the brake fluid level is low or a base brake pressure differential exists. These two conditions are not distinguishable by the EBCM. The EBCM sends a serial data message to the IPC requesting this display.
- VSES sensor initialization time is excessive. The EBCM sends a serial data message to the IPC requesting this display.
- Serial data communication between the EBCM and any of several other control modules is interrupted. The EBCM sends a serial data message to the IPC requesting this display or the IPC displays the message when communication with the EBCM is interrupted.
- The PCM is not able to perform engine torque reduction. The EBCM sends a serial data message to the IPC requesting this display. DTCs set when this condition exists.
- The EBCM detects an excessively low or excessively high ignition voltage. The EBCM sends a serial data message to the IPC requesting this display.

Service Stability System Message

The message center displays the service stability system message when any one of many VSES-disabling DTCs is set. The EBCM sends a serial data message to the IPC requesting this display.

Traction Active Message

The drive information center displays the traction active message when engine torque reduction or brake pressure application is required to maintain traction. The EBCM sends a serial data message to the IPC requesting this display.

SPECIAL TOOLS & EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description

2006 Buick Rainier

2006 BRAKES Anti-Lock Brake System - Ascender, Envoy, Rainier & TrailBlazer



J 39700
100-Pin Breakout Box