

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

2004 SUSPENSION

Electronic Suspension Control (ESC) - SRX

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Position Sensor Nut	9 N.m	80 lb in
Rear Position Sensor Nut	9 N.m	80 lb in

SCHEMATIC AND ROUTING DIAGRAMS

SUSPENSION CONTROLS SCHEMATIC ICONS

Suspension Controls Schematic Icons

Icon	Icon Definition
	IMPORTANT: Twisted-pair wires provide an effective shield that helps protect sensitive electronic components from electrical interference. If the wires were covered with shielding, install new shielding. In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted-pair wires shown : • The wires must be twisted a minimum of 15 turns per 31 cm (12 in) as measured anywhere along the length of the wires • The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in)

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX



SUSPENSION CONTROLS SCHEMATICS

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

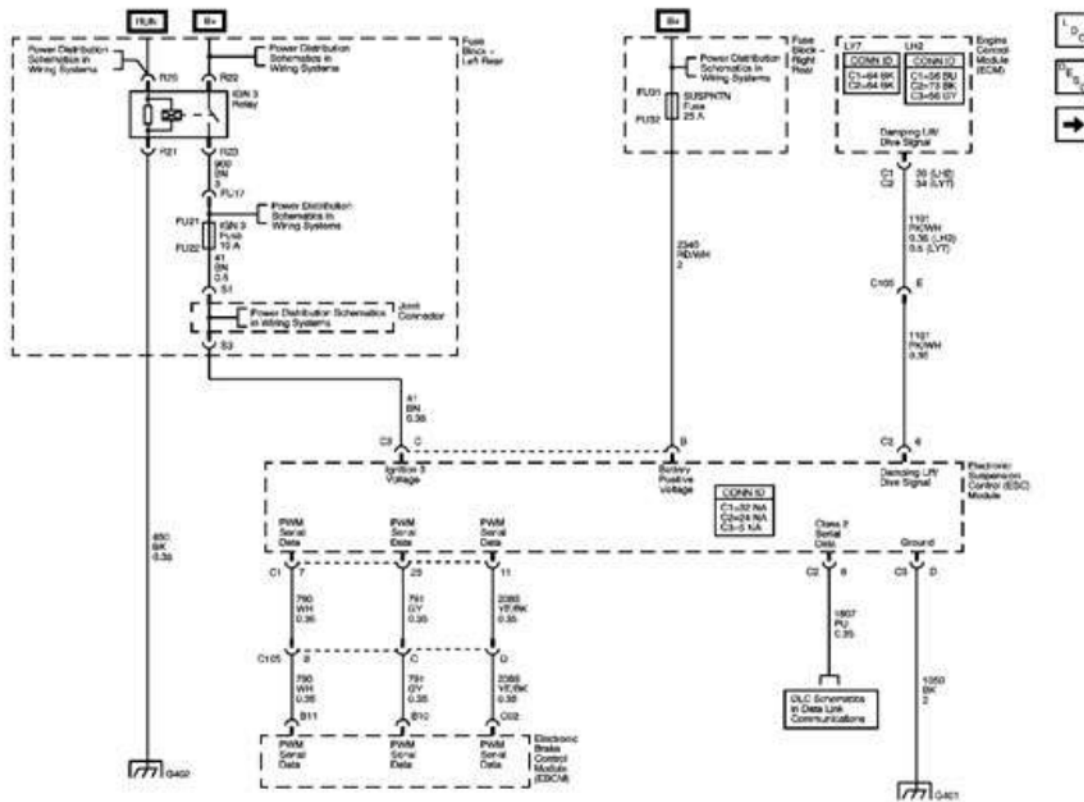


Fig. 1: Power, Grounds, Serial Data, & Controls Schematic
Courtesy of GENERAL MOTORS CORP.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

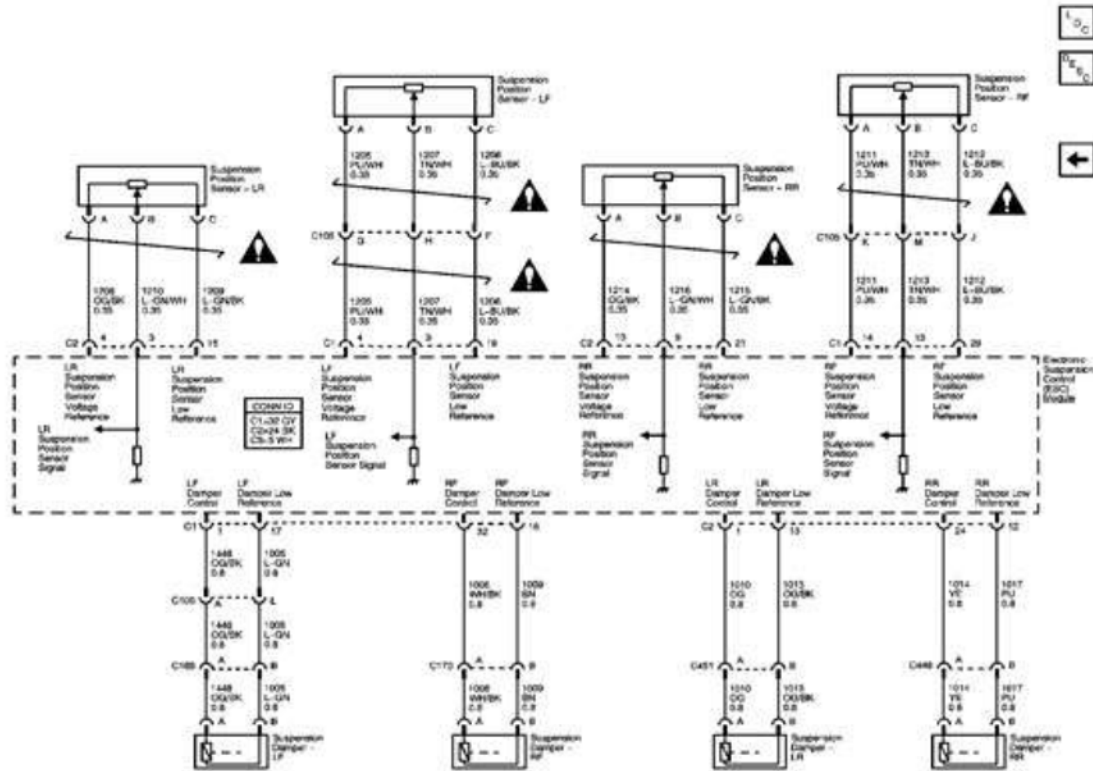


Fig. 2: Sensors & Dampers Schematic
 Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

SUSPENSION CONTROLS COMPONENT VIEWS

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

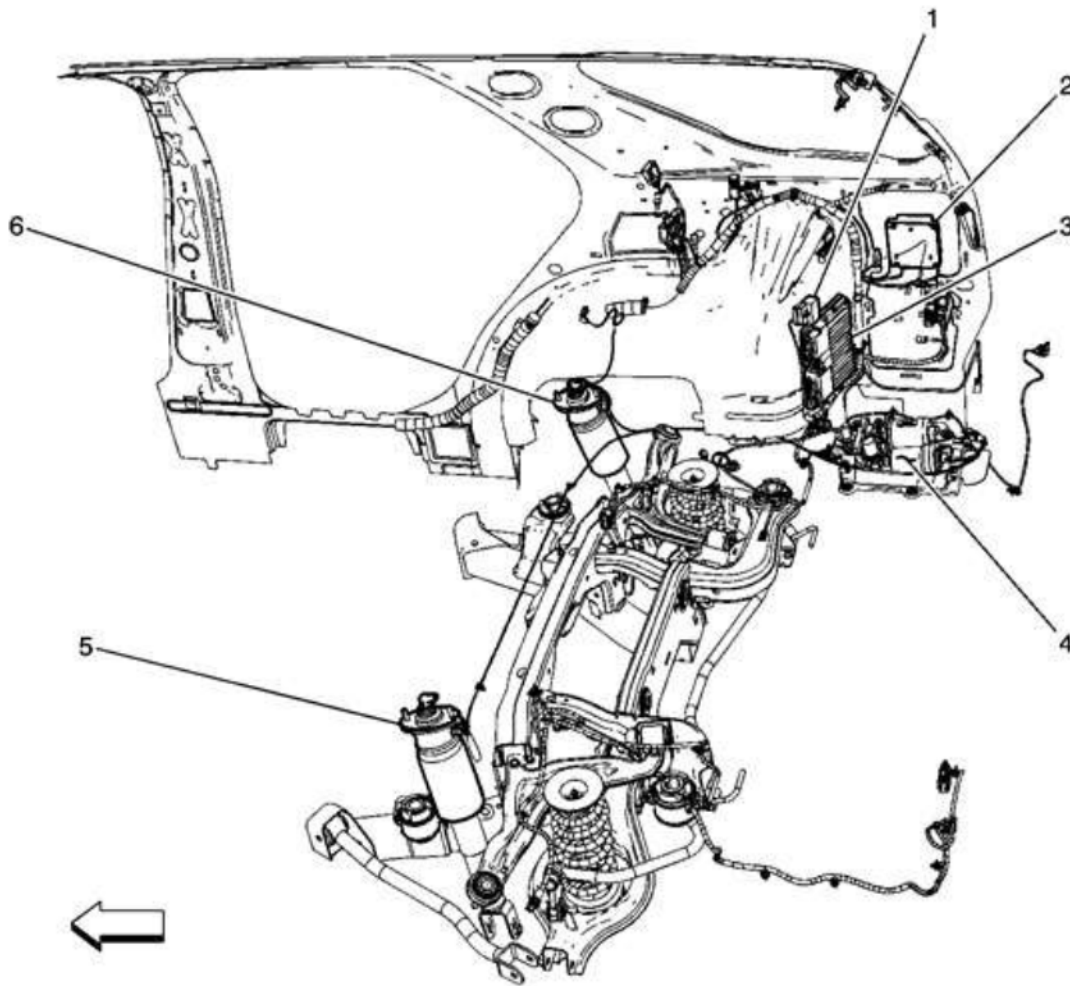


Fig. 3: Electronic Suspension Components (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Liftgate Lock/Unlock Relay
2	Digital Radio Receiver (U2K)
3	Electronic Suspension Control (ESC) Module
4	Automatic Level Control (ALC) Compressor
5	Suspension Damper - LR
6	Suspension Damper - RR

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

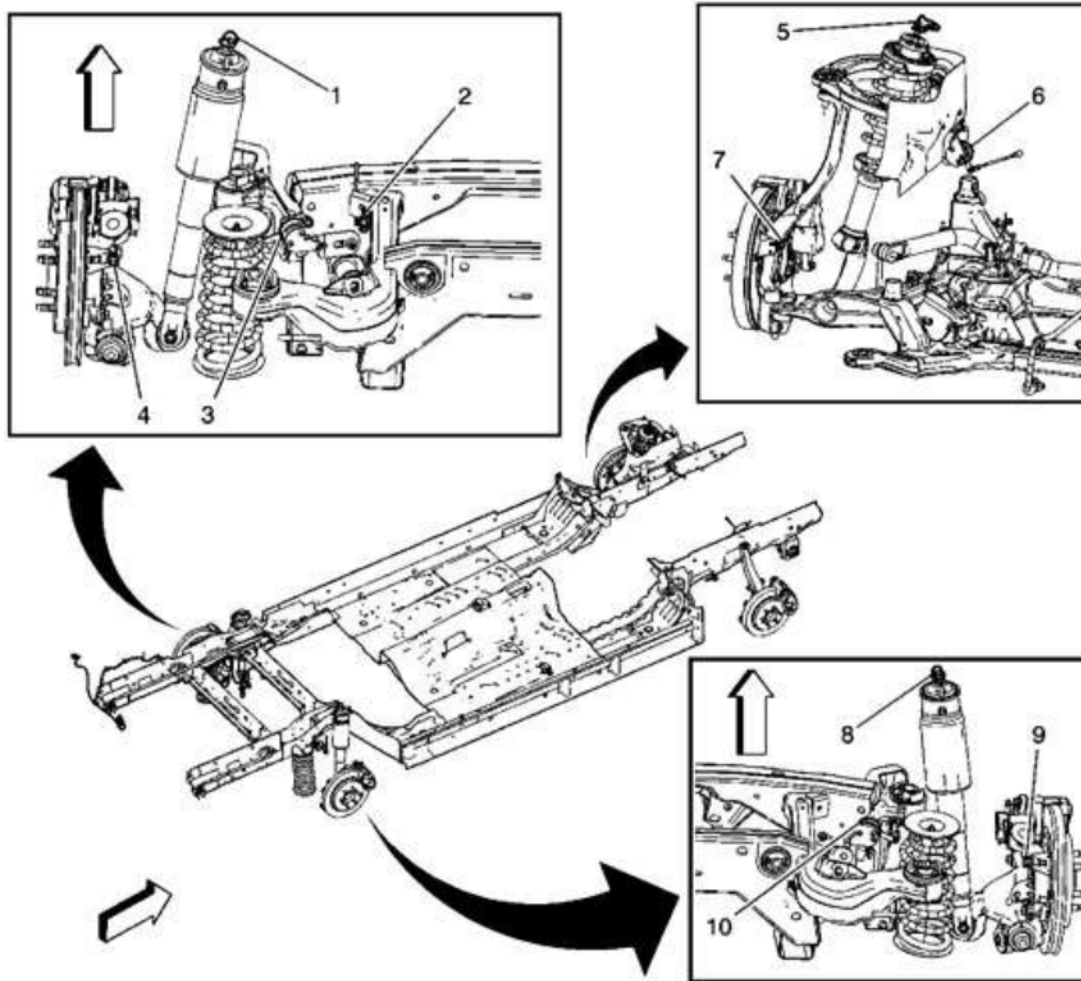


Fig. 4: Electronic Suspension Components (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	Suspension Damper - LR
2	Suspension Position Sensor Extension Harness Connector - LR
3	Suspension Position Sensor - LR
4	Wheel Speed Sensor (WSS) - LR
5	Suspension Damper - LF, RF Similar
6	Suspension Position Sensor - LF, RF Similar
7	Wheel Speed Sensor (WSS) - LF, RF Similar
8	Suspension Damper - RR
9	Suspension Position Sensor - RR
10	Wheel Speed Sensor (WSS) - RR

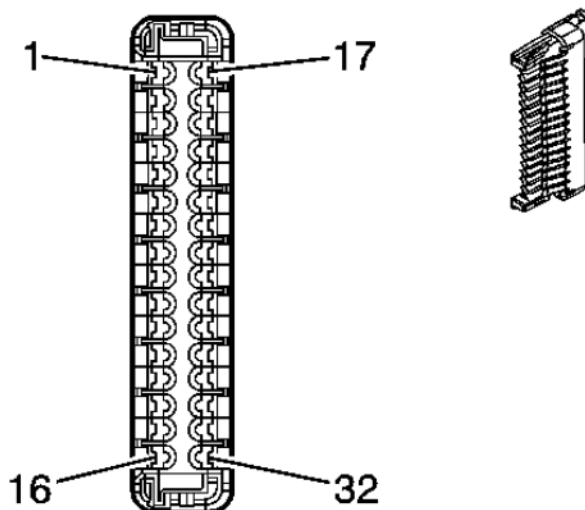
2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

9	Wheel Speed Sensor (WSS) - RR
10	Suspension Position Sensor - RR

SUSPENSION CONTROLS CONNECTOR END VIEWS

Electronic Suspension Control (ESC) Module (C1) Connector End View



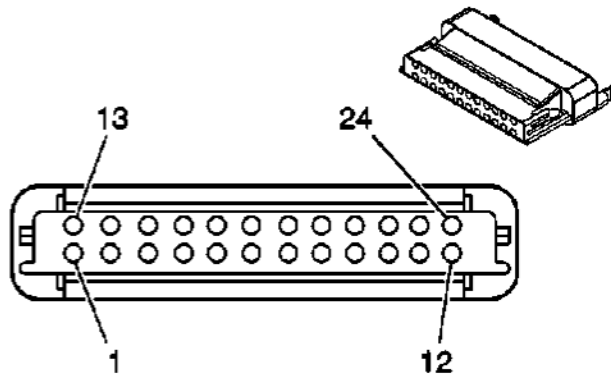
Connector Part Information		• 12129025 • 32-Way F Micro-Pack 100 Series (GY)	
Pin	Wire Color	Circuit No.	Function
1	OG/BK	1448	Left Front Damper Control
2	-	-	Not Used
3	TN/WH	1207	Left Front Suspension Position Sensor Signal
4	PU/WH	1205	Left Front Suspension Position Sensor Voltage Reference
5-6	-	-	Not Used
7	WH	790	PWM Serial Data
8-10	-	-	Not Used
11	YE/BK	2085	PWM Serial Data
12	YE	321	Automatic Level Control Relay Control

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

13	TN/WH	1213	Right Front Suspension Position Sensor Signal
14	PU/WH	1211	Right Front Suspension Position Sensor Voltage Reference
15	-	-	Not Used
16	BN	1009	Right Front Damper Low Reference
17	L-GN	1005	Left Front Damper Low Reference
18	L-BU/BK	1206	Left Front Suspension Position Sensor Low Reference
19-22	-	-	Not Used
23	GY	791	PWM Serial Data
24-27	-	-	Not Used
28	WH	320	Automatic Level Control Relay Control
29	L-BU/BK	1212	Right Front Suspension Position Sensor Low Reference
30-31	-	-	Not Used
32	WH/BK	1006	Right Front Damper Control

Electronic Suspension Control (ESC) Module (C2) Connector End View



Connector Part Information

- 12129225
- 24-Way F Micro-Pack 100 Series, Sealed (BK)

Pin	Wire Color	Circuit No.	Function
1	OG	1010	Left Rear Damper Control

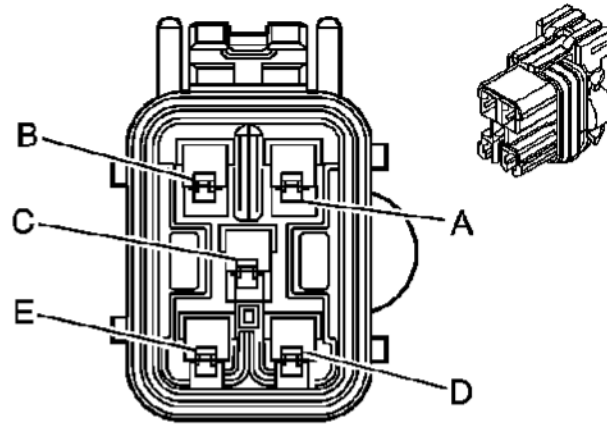
2004 Cadillac SRX**2004 SUSPENSION Electronic Suspension Control (ESC) - SRX**

2	-	-	Not Used
3	L-GN/WH	1210	Left Rear Suspension Position Sensor Signal
4	OG/BK	1208	Left Rear Suspension Position Sensor Voltage Reference
5	-	-	Not Used
6	PU	1807	Class 2 Serial Data
7-8	-	-	Not Used
9	L-GN/WH	1216	Right Rear Suspension Position Sensor Signal
10	OG/BK	1214	Right Rear Suspension Position Sensor Voltage Reference
11	-	-	Not Used
12	PU	1017	Right Rear Damper Low Reference
13	OG/BK	1013	Left Rear Damper Low Reference
14	-	-	Not Used
15	L-GN/BK	1209	Left Rear Suspension Position Sensor Low Reference
16-19	-	-	Not Used
20	PK/WH	1101	Damping Lift/Dive Signal
21	L-GN/BK	1215	Right Rear Suspension Position Sensor Low Reference
22-23	-	-	Not Used
24	YE	1014	Right Rear Damper Control

Electronic Suspension Control (ESC) Module (C3) Connector End View

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX



Connector Part Information

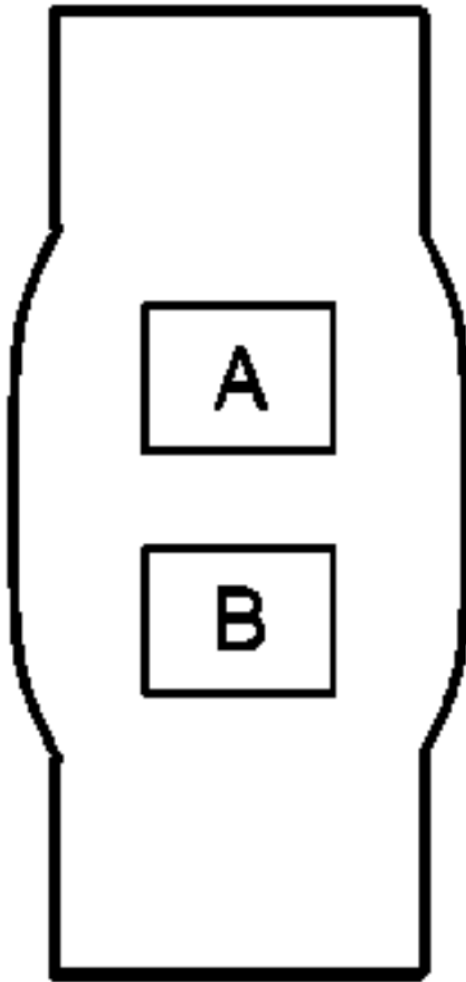
- 12146741
- 5-Way F Metri-Pack 280 Series (WH)

Pin	Wire Color	Circuit No.	Function
A	-	-	Not Used
B	RD/WH	2340	Battery Positive Voltage
C	BN	41	Ignition 3 Voltage
D	BK	1050	Ground
E	-	-	Not Used

Suspension Damper Connector End View - LF

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX



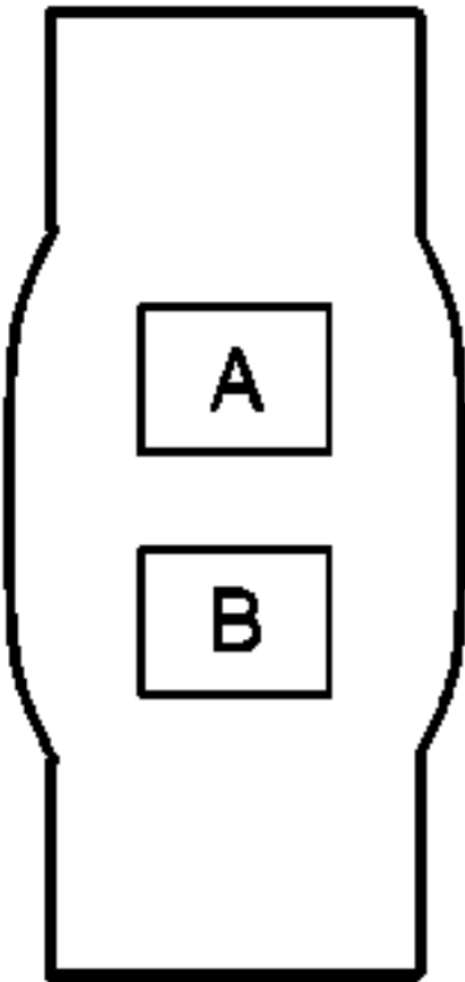
cardiagn.com

Connector Part Information

- 15305168
- 2-Way F Metri-Pack 150 Series, Sealed (GY)

Pin	Wire Color	Circuit No.	Function
A	OG/BK	1448	Left Front Damper Control
B	L-GN	1005	Left Front Damper Low Reference

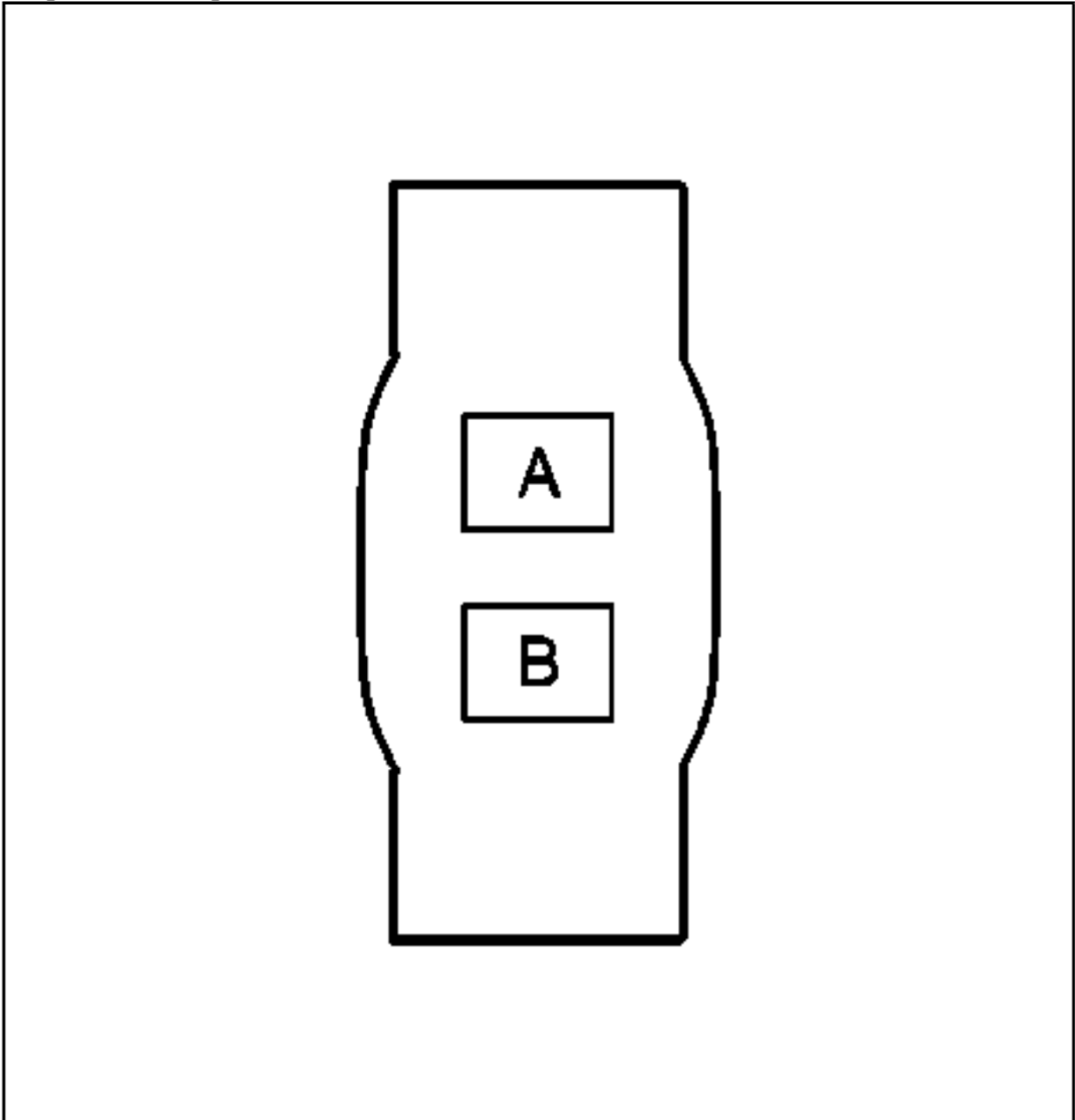
Suspension Damper Connector End View - LR



Connector Part Information		• 15305168 • 2-Way F Metri-Pack 150 Series, Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
A	OG	1010	Left Rear Damper Control

B	OG/BK	1013	Left Rear Damper Low Reference
---	-------	------	--------------------------------

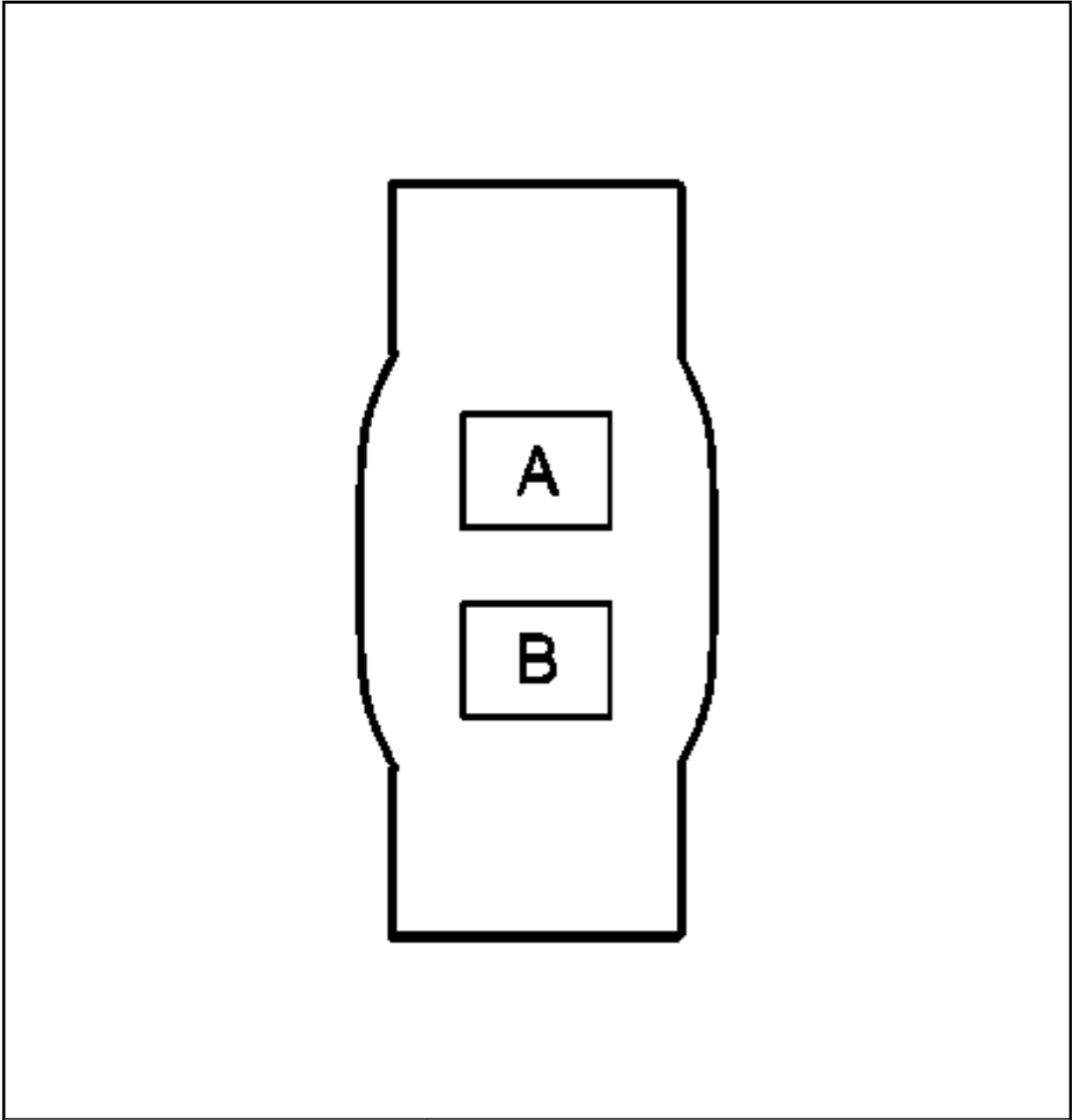
Suspension Damper Connector End View - RF



Connector Part Information	• 15305168 • 2-Way F Metri-Pack 150 Series, Sealed (GY)
----------------------------	---

Pin	Wire Color	Circuit No.	Function
A	WH/BK	1006	Right Front Damper Control
B	BN	1009	Right Front Damper Low Reference

Suspension Damper Connector End View - RR



2004 Cadillac SRX

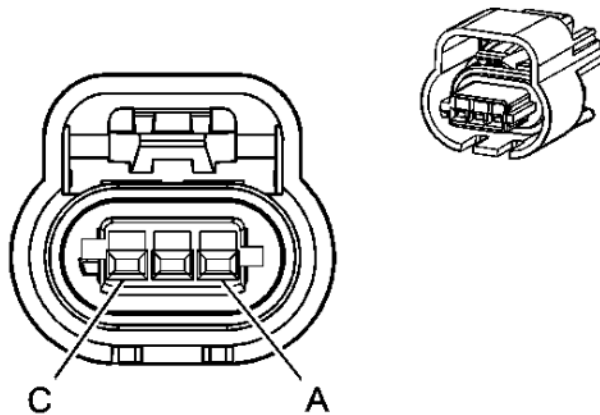
2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Connector Part Information

- 15305168
- 2-Way F Metri-Pack 150 Series, Sealed (GY)

Pin	Wire Color	Circuit No.	Function
A	YE	1014	Right Rear Damper Control
B	PU	1017	Right Rear Damper Low Reference

Suspension Position Sensor Connector End View - LF



Connector Part Information

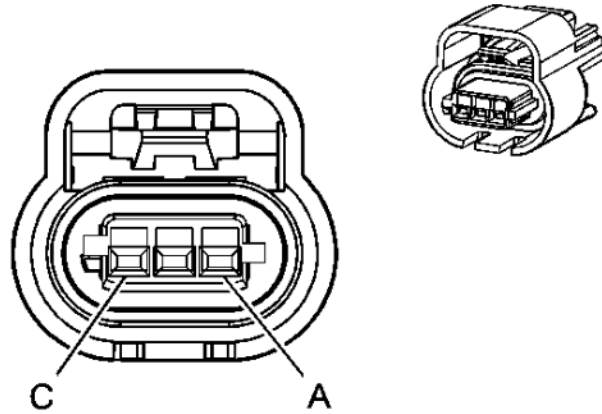
- 15326556
- 3-Way F GT 150 Series (BK)

Pin	Wire Color	Circuit No.	Function
A	PU/WH	1205	Left Front Suspension Position Sensor Voltage Reference
B	TN/WH	1207	Left Front Suspension Position Sensor Signal
C	L-BU/BK	1206	Left Front Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End View - LR

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

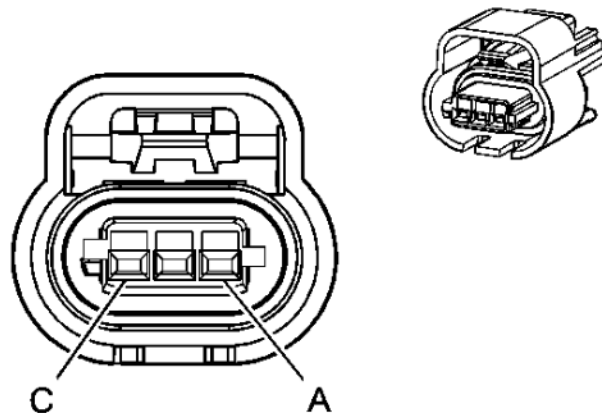


Connector Part Information

- 15326556
- 3-Way F GT 150 Series (BK)

Pin	Wire Color	Circuit No.	Function
A	OG/BK	1208	Left Rear Suspension Position Sensor Voltage Reference
B	L-GN/WH	1210	Left Rear Suspension Position Sensor Signal
C	L-GN/BK	1209	Left Rear Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End View - RF

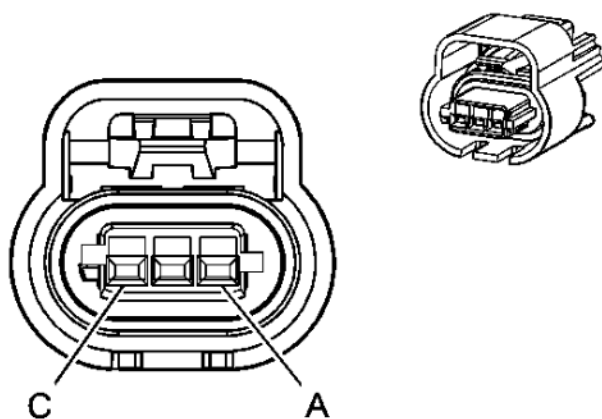


2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Connector Part Information		• 15326556 • 3-Way F GT 150 Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	PU/WH	1211	Right Front Suspension Position Sensor Voltage Reference
B	TN/WH	1213	Right Front Suspension Position Sensor Signal
C	L-BU/BK	1212	Right Front Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End View - RR



Connector Part Information		• 15326556 • 3-Way F GT 150 Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	OG/BK	1214	Right Rear Suspension Position Sensor Voltage Reference
B	L-GN/WH	1216	Right Rear Suspension Position Sensor Signal
C	L-GN/BK	1215	Right Rear Suspension Position Sensor Low Reference

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ELECTRONIC SUSPENSION CONTROL

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

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

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

DIAGNOSTIC SYSTEM CHECK - ELECTRONIC SUSPENSION CONTROL

Test Description

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

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

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

Diagnostic System Check - Electronic Suspension Control

Step	Action	Yes	No
1	Install a scan tool. Does the scan tool power up?	Go to Step 2	Go to <u>Scan Tool Does Not Power Up</u> in Data Link Communications
2	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communication with the following modules: • Electronic suspension control (ESC) module • Electronic brake control module (EBCM) • Powertrain control module (PCM)		Go to <u>Scan Tool Does Not Communicate with Class 2 Device</u> in Data

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

	Does the scan tool communicate with all of the listed control modules?	Go to Step 3	Link Communications
3	Select the display DTCs function on the scan tool for the following modules: • ESC module • EBCM • PCM Does the scan tool display any DTCs?	Go to Step 4	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems
4	Does the scan tool display any DTCs which begin with a "U"?	Go to <u>Scan Tool Does Not Communicate with Class 2 Device</u> in Data Link Communications	Go to Step 5
5	Does the scan tool display any PCM DTCs?	Go to <u>Diagnostic Trouble Code (DTC) List</u> <u>Diagnostic Trouble Code (DTC) List</u> in Engine Controls	Go to Step 6
6	Does the scan tool display any EBCM DTCs?	Go to <u>Diagnostic Trouble Code (DTC) List</u> in Antilock Brake System	Go to Step 7
7	Does the scan tool display DTC C0550?	Go to <u>DTC C0550</u>	Go to Step 8
8	Does the scan tool display DTC C0563?	Go to <u>DTC C0563</u>	Go to Step 9
9	Does the scan tool display DTC C0578, C0583, C0588 or C0593?	Go to <u>DTC C0578, C0583, C0588, or C0593</u>	Go to Step 10
		Go to <u>DTC</u>	

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

10	Does the scan tool display DTC C690, C0691 or C0693?	<u>C0690, C0691, or C0693</u>	Go to Step 11
11	Does the scan tool display DTC C0696?	Go to <u>DTC C0696</u>	Go to Step 12
12	Does the scan tool display DTC C0896?	Go to <u>DTC C0896</u>	Go to <u>Diagnostic Trouble Code (DTC) List</u>

SCAN TOOL OUTPUT CONTROLS

A scan tool may be used in order to command the strut or shock absorber solenoids ON or OFF, without the need for input information from other components. This can be very helpful in determining if a certain portion of a circuit or a component is in working order. The table below lists the tests that are available for the Electronic Suspension Control (ESC) system. The tests are listed in alphabetical order.

Using a scan tool, select the ESC Special Functions from the scan tool menu. The status of the output being cycled will be shown on the scan tool's display screen. The solenoids on the struts or shock absorbers can be cycled to turn ON or OFF by selecting Damper Actuator Test under Special Functions on the scan tool.

Using the LF shock absorber solenoid as an example, commanding the LF shock absorber solenoid ON can indicate whether the ESC system is able to correctly operate the LF shock absorber solenoid. This can determine if a DTC that pertains to that shock absorber solenoid is able to reset, and if the ESC module's internal circuitry is able to operate the LF shock absorber solenoid. For example, suppose the ESC system sets an intermittent DTC C0577. This DTC is the LF Shock Absorber Solenoid Short to Ground. In order to diagnose this condition using a scan tool, select the ESC Damper Actuator Test under Special Functions on the scan tool. Then, cycle the LF shock absorber solenoid while moving the suspected wiring/connector. Attempt to duplicate the malfunction conditions. This scan tool feature allows checks that could not be performed while driving the vehicle. This example can be applied to the other shock absorbers solenoids.

Also, the ESC module can be recalibrated using a scan tool. Select Recalibration function from the scan tool menu. Although the ESC recalibration function is not under Special Functions it is included with the rest of the information in the scan tool output controls table.

Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
--------------------------	------------------------------	-------------

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Damper Actuator Test	LF Damper Actuator	Commands the left front strut solenoid ON and OFF.
Damper Actuator Test	LR Damper Actuator	Commands the left rear shock solenoid ON and OFF.
Damper Actuator Test	RF Damper Actuator	Commands the right front strut solenoid ON and OFF.
Damper Actuator Test	RR Damper Actuator	Commands the right rear shock solenoid ON and OFF.
Damper Actuator Test	Select All Dampers	Commands all the solenoids ON and OFF.
Normal Force Test	LF Normal Force	Commands the left front force percentage sent to the EBCM.
Normal Force Test	RF Normal Force	Commands the right front force percentage sent to the EBCM.
Recalibration	Recalibration	Commands the recalibration of the ESC module after installation.

SCAN TOOL DATA LIST**Scan Tool Data List**

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON/Engine OFF/Steering wheel straight			
Battery Voltage Signal	Inputs	Volts	13.6 Volts
DSP Software Version ID	ID Information	Numeric	Varies
EEPROM Calibration ID	ID Information	Numeric	Varies
GM Part Number	ID Information	Numeric	Varies
GMSCM Software Version	ID Information	Numeric	Varies
LF Damper Actuator Command	Outputs	%	0 %
LF Normal Force	Outputs	%	20 %
LF Position Sensor	Inputs	Volts	4.8 Volts
LR Damper Actuator Command	Outputs	%	0 %
LR Position Sensor	Inputs	Volts	4.8 Volts
Lift/Dive Changed	Inputs	Change/No Change	Change
Lift/Dive Status	Inputs	Active/Inactive	Inactive
RF Damper Actuator Command	Outputs	%	0 %
RF Normal Force	Outputs	%	20 %

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

RF Position Sensor	Inputs	Volts	4.8 Volts
RR Damper Actuator Command	Outputs	%	0 %
RR Position Sensor	Inputs	Volts	4.8 Volts
Steering Position PWM	Inputs	Milliseconds	0.16 ms
Vehicle Speed	Inputs	Miles Per Hour	0 MPH

SCAN TOOL DATA DEFINITIONS

Electronic Suspension Control (ESC) Scan Tool Data Definitions:

The Electronic Suspension Control (ESC) Scan Tool Data Definitions contains a brief description of all ESC related parameters available on the scan tool.

Battery Voltage Signal

The scan tool displays 0-26.0 volts. The battery voltage represents the system voltage measured at the module battery input.

DSP Software Version

The scan tool displays the controller DSP software version number for service identification.

EEPROM Calibration ID

The scan tool displays the controller EEPROM calibration ID number for service identification.

GM Part Number

The scan tool displays the controller part number for service identification.

GMSCM Software Version

The scan tool displays the controller GMSCM software version number for service identification.

LF Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorbers. When the ESC system commands the shock absorbers ON, the percentage

will increase. When the ESC system commands the shock absorbers OFF, the percentage will decrease.

LF Normal Force

The scan tool displays 20-80%. This percentage represents a measured level of the road surface sent from the ESC module to the Electronic Brake Control Module (EBCM). The EBCM uses this information to improve braking during various rough road conditions.

LF Position Sensor

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

LR Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorbers. When the ESC system commands the shock absorbers ON, the percentage will increase. When the ESC system commands the shock absorbers OFF, the percentage will decrease.

LR Position Sensor

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

Lift/Dive Change

The scan tool displays Changed or Unchanged. The ESC system receives chassis pitch input from the PCM. When there is a change in chassis pitch status, the scan tool will display Changed. If there is not change, the scan tool will display Unchanged.

Lift/Dive Status

The scan tool displays Active or Inactive. The ESC system receives chassis pitch input from the PCM. The scan tool will display Active when the ESC system detects a change in chassis pitch status. When there is no change in chassis pitch, the scan tool will display Inactive.

RF Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorbers. When the ESC system commands the shock absorbers ON, the percentage will increase. When the ESC system commands the shock absorbers OFF, the percentage will decrease.

RF Normal Force

The scan tool displays 20-80%. This percentage represents a measured level of the road surface sent from the ESC module to the Electronic Brake Control Module (EBCM). The EBCM uses this information to improve braking during various rough road conditions.

RF Position Sensor

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

RR Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorbers. When the ESC system commands the shock absorbers ON, the percentage will increase. When the ESC system commands the shock absorbers OFF, the percentage will decrease.

RR Position Sensor

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

Steering Position PWM

The scan tool displays 0-10 ms. This PWM signal is sent by the ABS system which changes when the steering wheel is turned. The ESC system uses this PWM signal to determine the shock absorber control levels and will command a more firm setting if the vehicle is turning.

Vehicle Speed

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

The scan tool displays 0-255 km/h (0-159 mph). The ESC system obtains vehicle speed data from the PCM via Class 2.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Module(s)
<u>C0550</u>	ESC
<u>C0563</u>	ESC
<u>C0577, C0579, C0582, C0584, C0587, C0589, C0592, or C0594</u>	ESC
<u>C0578, C0583, C0588, or C0593</u>	ESC
<u>C0615, C0620, C0625 or C0630</u>	ESC
<u>C0635, C0638, C0640, C0643, C0249 or C0250</u>	ESC, EBCM
<u>C0665</u>	ESC
<u>C0690, C0691 or C0693</u>	ESC
<u>C0696</u>	ESC
<u>C0710</u>	ESC
<u>C0896</u>	ESC
<u>P1652</u>	PCM

DTC C0550

Circuit Description

The electronic suspension control (ESC) module performs internal checks of all internal program and data memory spaces. Additionally, various internal functions and data communications are monitored for valid operation.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set when the ESC module detects an internal hardware fault.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Depending upon which internal functions are affected by the fault condition, the ESC module will take one of two sets of actions:

- If the fault condition allows continued output operation, the system will enter a Speed Dependent Damping mode, in which all four corners of the vehicle are concurrently driven by a fixed PWM duty cycle, which increases as a function of vehicle speed. The SERVICE SUSPENSION SYS message will be displayed.
- If the fault is more severe, the control module will disable ALL dampers by commanding 0 percent PWM duty cycle, disabling the damper switched battery circuit, and sending a message to the Powertrain Control Module (PCM) to limit vehicle speed. The VEHICLE SPEED LIMITED TO XXX MPH and SERVICE SUSPENSION SYS messages will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer senses the hardware fault and the ignition is cycled OFF and ON. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Test Description

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

- 2:** This step checks to see if the fault condition is active or intermittent.
- 3:** This step checks to see if a history DTC C0550 will return.
- 4:** This step checks to see if the vehicle has a known intermittent condition.

DTC C0550

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check ?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	Inspect for DTC C0550. Is DTC C0550 displayed as a CURRENT fault (not a HISTORY fault)?	Go to Step 5	Go to Step 3

2004 Cadillac SRX**2004 SUSPENSION Electronic Suspension Control (ESC) - SRX**

3	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		
	Does the DTC reset?	Go to Step 5	Go to Step 4
4	Has this vehicle been serviced for DTC C0550 previously?	Go to Step 5	Go to Step 6
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> .		
	Did you complete the replacement?	Go to Step 6	-
6	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		
	Does the DTC reset?	Go to Step 2	System OK

DTC C0563**Circuit Description**

The electronic suspension control (ESC) module performs checks of internal calibration data, electronic bumpstop trimset data and steering autocenter data. If a fault condition is detected, the ESC module will set the fault DTC, and may, depending upon the fault type, turn on the SERVICE SUSPENSION SYS message. Additionally, depending upon the type of the internal fault, the system will either enter a Speed Dependent Damping mode or disable all dampers. In the latter case, a class 2 message will be sent to the powertrain control module (PCM) to cause the vehicle speed to be limited. Recovery from any controller fault condition is attempted only after the ignition is cycled ON and OFF.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set when any calibration faults internal to the ESC module are detected.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

Depending upon which of the internal functions are affected by the fault condition, the ESC module will take one of two sets of actions:

- If the fault condition allows continued output operation, the system will enter a Speed Dependent Damping mode, in which all four corners of the vehicle are concurrently driven by a fixed PWM duty cycle, which increases as a function of the vehicle speed. The SERVICE SUSPENSION SYS message will be displayed.
- If the fault is more severe, the control module will disable ALL dampers by commanding 0 percent PWM duty cycle, disabling the damper switched battery circuit, and sending a message to the PCM to limit vehicle speed. The SPEED LIMITED TO XXX and SERVICE SUSPENSION SYS messages will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as HISTORY when the ESC module no longer senses the hardware fault and the ignition is cycled OFF and ON.

Test Description

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

2: This step checks to see if the condition has cleared after the ESC module has been calibrated.

DTC C0563

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
	1. Install the scan tool. 2. Turn the ignition ON with the		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

2	engine OFF. 3. Calibrate the ESC module using the scan tool. 4. Use the scan tool to clear the DTCs. 5. 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
3	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> .		
	Did you complete the replacement?	Go to Step 4	-
4	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		
	Does the DTC reset?	Go to Step 2	System OK

DTC C0577, C0579, C0582, C0584, C0587, C0589, C0592, OR C0594**Circuit Description**

The strut actuator is controlled by the electronic suspension control (ESC) module with a pulse-width modulation (PWM) signal. Switching the voltage ON and OFF at a high frequency (2.0 kHz), or pulse width modulating, controls the amount of current delivered to the actuator. By controlling the amount of current to the actuator the ESC module controls the damping force in the strut. A higher level of damping force is achieved by providing correspondingly higher current levels, relating to higher percentages of PWM duty cycle. The default damper state, which is no battery voltage, is one that provides a minimum damping force.

The ESC module periodically commands each strut actuator to a preset PWM duty cycle in order to override the normal PWM command. During this preset PWM duty cycle, the ESC module is able to perform a diagnostic test on each strut actuator to determine if a malfunction is present.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

The preset PWM command can be either an OFF or ON state duty cycle.

DTC C0577, C0582, C0587, or C0592

In order to test for the conditions that set the DTC C0577, C0582, C0587, or C0592 the following must be present:

The ESC module must first command the strut actuator ON. If the voltage detected in the damper control circuit during the ON state is less than a preset value, the DTC will be set immediately.

DTC C0579, C0584, C0589, or C0594

In order to test for the conditions that set the DTC C0579, C0584, C0589, or C0594 the following must be present:

The ESC module must first command the solenoid ON. If the voltage detected in the damper control circuit during the ON state is between 2 preset values, the test is repeated. If the ESC module again detects voltage between two preset values, a DTC will be set.

Conditions for Running the DTC

DTC C0577, C0579, C0582, C0584, C0587, C0589, C0592, or C0594

The following conditions must be present to run the DTC:

- The ignition is ON.
- The ESC module is in command ON state.

Conditions for Setting the DTC

DTC C0577, C0582, C0587, or C0592

The following conditions must be present to set the DTC:

- The ESC module detects voltage less than a preset value during two consecutive ON state tests.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

DTC C0579, C0584, C0589, or C0594

The following conditions must be present to set the DTC:

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

- The ESC module detects voltage between two preset values during two consecutive ON state tests.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

DTC C0579, C0584, C0589, or C0594

- The SERVICE SUSPENSION SYS message will be displayed.
- ALL the strut actuators will be disabled by commanding 0 percent PWM duty cycle.
- The vehicle ride will be soft.

DTC C0577, C0582, C0587, or C0592

The following conditions must be present to run the DTC:

- The SERVICE SUSPENSION SYS and SPEED LIMITED TO XXX messages will be displayed.
- ALL the strut actuators will be disabled by commanding 0 percent PWM duty cycle.
- The damper relay control switch will be opened and the damper relay de-energized.
- The vehicle speed will be limited.
- The vehicle ride will be soft.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer detects the fault during two consecutive diagnostic tests. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

If the DTC is a history DTC, the fault may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

3: Tests for short to ground and short to B+ on the control circuit.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

4: Tests for continuity from the ESC module on the control circuit and the low reference circuit.

DTC C0577, C0579, C0582, C0584, C0587, C0589, C0592, or C0594

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
Connector End View Reference: <u>Suspension Controls Connector End Views</u>				
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Disconnect the strut actuator connector. 2. Measure the resistance of the strut actuator. Does the resistance measure within the specified value?	0.5-2.0 ohm	Go to Step 3	Go to Step 7
3	Test the damper control circuit of the actuator for a short to ground and short to battery. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 4
4	1. Disconnect the ESC module. 2. Check continuity from the ESC module to the damper actuator connector on both the control circuit and the reference low circuit. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 5
	Inspect for poor connections at the actuator. Refer to <u>Testing for Intermittent Conditions and Poor</u>			

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

5	<u>Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 6
6	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 9	Go to Step 8
7	Replace the strut/shock absorber. Refer to <u>Shock, Shock Component, and/or Spring Replacement</u> in Front Suspension or <u>Shock Absorber Replacement</u> in Rear Suspension. Did you complete the replacement?	-	Go to Step 9	-
8	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 9	-
9	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0578, C0583, C0588, OR C0593

Circuit Description

The electronic suspension control (ESC) module will detect ESC driver over current fault conditions and set DTC C0578, C0583, C0588 or C0593 by disabling the damper control relay. Although the ESC module will set these DTCs, each one represents a failure of the damper ESC driver within the ESC module which requires replacement of the ESC module.

Conditions for Running the DTC

The ignition is ON.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Conditions for Setting the DTC

- The DTC is set when the ESC module detects an internal driver fault.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

The control module will disable ALL dampers by commanding 0 percent PWM duty cycle, disabling the damper switched battery circuit, and sending a message to the powertrain control module (PCM) to limit vehicle speed. The VEHICLE SPEED LIMITED TO XXX MPH and SERVICE SUSPENSION SYS messages will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer senses the hardware fault and the ignition is cycled OFF and ON. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Test Description

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

- 2: This step checks to see if the fault condition is active or intermittent.
- 3: This step checks to see if a history DTC C0578, C0583, C0588 or C0593 will return.
- 4: This step checks to see if the vehicle has a known intermittent condition.

DTC C0578, C0583, C0588, or C0593

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check ?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	Inspect for DTC C0578, C0583, C0588 or C0593. Is DTC C0578, C0583, C0588 or C0593 displayed as a CURRENT fault (not a		

2004 Cadillac SRX**2004 SUSPENSION Electronic Suspension Control (ESC) - SRX**

	HISTORY fault)?	Go to Step 5	Go to Step 3
3	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	 Go to Step 5	 Go to Step 4
4	Has this vehicle been serviced for DTC C0578, C0583, C0588 or C0593 previously?	Go to Step 5	Go to Step 6
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	Go to Step 6	-
6	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	 Go to Step 2	 System OK

DTC C0615, C0620, C0625 OR C0630**Circuit Description**

The electronic suspension control (ESC) module supplies a 5.0 volt reference signal to the suspension position sensor. The suspension position sensor supplies an analog voltage (0.35-4.75 volts) back to the ESC module which represents the position between the body and the wheel. The sensor is also grounded through the ESC module.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set when the ESC module measures the position sensor signal voltage below 0.35 volts or above 4.75 volts for more than 1.0 second.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Action Taken When the DTC Sets

- The ESC module will enter the Speed Dependent damping mode.
- Both Left and Right Normal Force outputs will be set to the default output states.
- The SERVICE SUSPENSION SYS message will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees voltage outside the normal range. The DTC will clear if the fault does not return during 50 consecutive ignition cycles.

Diagnostic Aids

- If this fault condition is set along with DTC C0696, diagnose DTC C0696 first.
- If the DTC is a history DTC, the fault may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

- 3:** Tests for the proper operation of the circuit in the low voltage range.
- 4:** Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.
- 5:** Tests for a short to voltage in the 5-volt reference circuit.
- 6:** Tests for a high resistance or an open in the ground circuit.

DTC C0615, C0620, C0625 or C0630

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, observe the position sensor data parameter in the ESC module data list. Does the scan tool indicate that the position sensor data parameter is within the specified range?	0.35-4.75 V	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the position sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the position sensor data parameter. Does the scan tool indicate that the position sensor data parameter is less than the specified value?	0.35 V	Go to Step 4	Go to Step 10
4	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the position sensor and the signal circuit of the position sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the position sensor data parameter. Does the scan tool indicate that the position sensor data parameter is greater than the specified value?	4.75 V	Go to Step 5	Go to Step 8
	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference circuit of the position sensor and the low reference circuit			

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

5	of the position sensor. Does the voltage measure less than the specified value?	5 V	Go to Step 6	Go to Step 7
6	1. Turn OFF the ignition. 2. Measure the resistance from the low reference circuit of the position sensor to a good ground. Does the resistance measure less than the specified value?	5 ohm	Go to Step 12	Go to Step 11
7	Test the 5-volt reference circuit of the position sensor for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
8	Test the 5-volt reference circuit of the position sensor for a short to ground, a high resistance, or an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 9
9	Test the signal circuit of the position sensor for a short to ground, a high resistance, or an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
10	Test the signal circuit of the position sensor for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 13
11	1. Disconnect the ESC module. 2. Test the low reference circuit of the position sensor for a high resistance or an open. Refer to Circuit Testing and Wiring Repairs in	-		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

	Wiring Systems.		Go to Step 16	Go to Step 13
	Did you find and correct the condition?			
12	Inspect for poor connections at the harness connector of the position sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 14
13	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 16	Go to Step 15
14	Replace the position sensor. Refer to <u>Front Position Sensor Replacement - Electronic Suspension</u> or <u>Rear Position Sensor Replacement - Electronic Suspension</u> . Did you complete the replacement?	-	Go to Step 16	-
15	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 16	-
16	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 C0635, C0638, C0640, C0643, C0249, OR C0250

Circuit Description

The electronic suspension control (ESC) module estimates the road surface and communicates that information to the electronic brake control module (EBCM). The ESC module provides a

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

pulse width modulation (PWM) signal to the EBCM through the left and right normal force signal circuits. The ESC module sends each normal force value twice to the EBCM. The possible values of the PWM duty cycle are 20 percent, 40 percent, 60 percent and 80 percent, with the valid range from 10-90 percent. The EBCM uses this information to provide improved rough-road braking performance.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

DTC C0635 or C0640

The DTC is set when the ESC module measures a feedback voltage less than a preset value during five consecutive normal force signal output OFF state tests.

DTC C0638 or C0643

The DTC is set when the ESC module measures a feedback voltage greater than a preset value during five consecutive normal force signal output ON state tests.

DTC C0249 or C0250

The DTC is set if one of the following conditions is present for 5 seconds of any 10 second period:

- The PWM duty cycle is outside the valid range of 10-90 percent.
- The PWM duty cycle value does not match either the previous or the next PWM duty cycle value.

Action Taken When the DTC Sets

- Both the left and right normal force outputs are set to default output states.
- The EBCM disables the rough road detection function for the duration of the ignition cycle.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees an out of range feedback voltage during five consecutive normal force OFF states. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Diagnostic Aids

- The DTC may be caused by an open or a short in the normal force signal circuit. Refer to **Circuit Testing** in Wiring Systems.
- The DTC may be caused by a poor connection at the EBCM or ESC module connectors. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

2: This step tests for a valid duty cycle in the normal force signal circuit.

3: This step tests for normal voltage in the normal force signal circuit.

DTC C0635, C0638, C0640, C0643, C0249, or C0250

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Install a scan tool. 2. Start the engine. 3. Observe the Front Normal Force parameter in the VSES/ESC data list. Does the scan tool display within the specified range?	10-90%	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the ESC module connector. 3. Turn ON the ignition, with the engine OFF. 4. Measure the voltage from the	B+		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

	normal force signal circuit to a good ground. Does the voltage measure greater than the specified value?		Go to Step 5	Go to Step 4
4	Test the normal force signal circuit for high resistance, a short to ground, or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 6
5	Test the normal force signal circuit for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 7
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> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 9
7	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 8
8	Replace the EBCM. Refer to <u>Electronic Brake Control Module Replacement</u> in Antilock Brake System. Did you complete the replacement?	-	Go to Step 10	-
9	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 10	-
	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the			

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

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

DTC C0665

Circuit Description

The electronic suspension control (ESC) module monitors a lift/dive signal at the powertrain control module (PCM). Under normal conditions, the ESC module supplies a 12-volt reference voltage to the PCM. The PCM grounds this lift/dive circuit when the vehicle is accelerating rapidly or braking hard. When the lift/dive signal goes low to approximately 0 volts, the ESC module commands all four ESC dampers to a FIRM condition.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set if the ESC module does not detect the low-to-high transition on the lift/dive circuit within 31 seconds after the ignition is turned ON.
- The fault is detected during 3 consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

- The ESC lift/dive function will be disabled.
- The vehicle will pitch more during a braking or wide open throttle condition.
- The SERVICE SUSPENSION SYS message will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module sees the low-to-high transition on the lift/dive signal from the PCM during a valid test period. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

As part of the vehicle diagnostic system, the PCM toggles the lift/dive line within 31 seconds

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

after the ignition is turned ON. This allows the ESC module to determine if the line is faulted or not. A retry is attempted every four minutes until successful.

An intermittent short to ground or an open in the Lift/Dive Signal circuit may cause a random firm/soft ride condition.

Test Description

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

2: This step tests for normal function of the PCM, which is inactive.

3: This step tests for normal function of the PCM, which is active.

4: This step tests for an intermittent or poor connection at the PCM.

5: This step tests for a short to ground in the Lift/Dive Signal circuit.

DTC C0665

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the lift/dive parameter in the ESC module data list. Does the scan tool display inactive?	Go to Step 3	Go to Step 4
3	1. Activate the lift/dive input. 2. With the scan tool, observe the lift/dive data parameter. Does the lift/dive data parameter change state?	Go to Diagnostic Aids	Go to Step 4
	1. Turn OFF the ignition. 2. Disconnect the powertrain control module (PCM).		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

4	3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the lift/dive data parameter. Does the scan tool display inactive?	Go to Step 7	Go to Step 5
5	Test the signal circuit of the PCM for a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 6
6	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 8
7	Inspect for poor connections at the harness connector of the PCM. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 9
8	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u>. Did you complete the replacement?	Go to Step 10	-
9	Replace the PCM. Refer to <u>Engine Control Module (ECM) Replacement</u> in Engine Controls- 3.6L or <u>Engine Control Module (ECM) Replacement</u> in Engine Controls- 4.6L. Did you complete the 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 C0690, C0691, OR C0693**Circuit Description**

The damper control relay is located within the electronic suspension control (ESC) module. Although the module will set DTC C0690, C0691 or C0693, each one represents a failure of the damper control relay within the ESC module which requires replacement of the ESC module.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set when the ESC module detects an internal hardware fault.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

Depending upon which internal functions are affected by the fault condition, the ESC module will take one of two sets of actions:

- If the fault condition allows continued output operation, the system will enter a Speed Dependent Damping mode, in which all four corners of the vehicle are concurrently driven by a fixed PWM duty cycle, which increases as a function of vehicle speed. The SERVICE SUSPENSION SYS message will be displayed.
- If the fault is more severe, the control module will disable ALL dampers by commanding 0 percent PWM duty cycle, disabling the damper switched battery circuit, and sending a message to the powertrain control module (PCM) to limit vehicle speed. The VEHICLE SPEED LIMITED TO XXX MPH and SERVICE SUSPENSION SYS messages will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer senses the hardware fault and the ignition is cycled OFF and ON. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Test Description

2004 Cadillac SRX**2004 SUSPENSION Electronic Suspension Control (ESC) - SRX**

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

2: This step checks to see if the fault condition is active or intermittent.

3: This step checks to see if a history DTC C0690, C0691 or C0693 will return.

4: This step checks to see if the vehicle has a known intermittent condition.

DTC C0690, C0691, or C0693

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check ?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	Inspect for DTC C0690, C0691 or C0693. Is DTC C0690, C0691 or C0693 displayed as a CURRENT fault (not a HISTORY fault)?	Go to Step 5	Go to Step 3
3	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 5	Go to Step 4
4	Has this vehicle been serviced for DTC C0690, C0691 or C0693 previously?	Go to Step 5	Go to Step 6
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	Go to Step 6	-
6	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 2	System OK

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Circuit Description

The electronic suspension control (ESC) module provides a regulated 5 volts to each of the position sensors. The ESC module also monitors this voltage supply for a fault condition which prevents proper regulation.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The position sensor supply voltage is outside the valid range of 3.75 to 5.625 volts.
- The fault is detected for 1 second or more during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

- The ESC module will enter the Speed Dependent damping mode.
- Both Left and Right Normal Force outputs will be set to the default output states.
- The SERVICE SUSPENSION SYS message will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees a position sensor supply voltage outside the valid range of 3.75 to 5.625 volts. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Test Description

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

- 2:** Determines if the fault is due to a short to ground.
- 3:** Determines if the fault is due to a short to voltage.
- 4:** Checks for a short to ground in the position sensor supply circuits.
- 5:** Checks for a short between the position sensor supply and ground circuits.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

6: Checks for a short to voltage in the position sensor supply circuits.

DTC C0696

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?	-	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Turn ON the ignition, with the engine OFF. 2. Measure the voltage from the 5 V reference circuit of the ESC module to the left rear position sensor by backprobing the ESC module connector. Does the voltage measure less than the specified value?	3.75 V	Go to Step 4	Go to Step 3
3	Does the voltage measure greater than the specified value?	5.625 V	Go to Step 6	Go to Step 7
4	Test the 5 V reference circuit of each position sensor for a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 8	Go to Step 5
5	Test for a short between the 5 V reference circuit and the ground circuit of each position sensor. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 8	Go to Step 7
6	Test the 5 V reference circuit of each position sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems.	-		

2004 Cadillac SRX**2004 SUSPENSION Electronic Suspension Control (ESC) - SRX**

	Did you find and correct the condition?		Go to Step 8	Go to Step 7
7	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 8	-
8	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0710**Circuit Description**

The electronic suspension control (ESC) module receives a pulse-width modulation (PWM) steering position signal from the electronic brake control module (EBCM). The ESC module uses this signal in order to determine the shock absorber control levels and will command a more firm setting if the vehicle is in a turn. The ESC module monitors the PWM steering position circuit to determine if a valid signal is sent from the EBCM.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The ESC module does not detect a valid steering position signal from the EBCM for 5.0 seconds.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

- The ESC module ignores the steering position signal input.
- The ESC module continues to control the shock absorbers using the lateral acceleration data sent from the EBCM on the serial data line.
- The SERVICE SUSPENSION SYS message will be displayed.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module detects a valid steering position signal from the EBCM. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

- The following conditions may cause an intermittent malfunction:
 - An intermittent open circuit condition on the steering position sensor circuit.
 - A short to ground or to voltage in the steering position sensor circuit.
 - Intermittent operation of the EBCM.
- If the ESC module does not receive a valid steering position signal from the EBCM, the ESC system will still function, but will ignore the steering position signal. The ESC system uses lateral acceleration data sent from the EBCM on the serial data line in order to substitute for a loss of the steering position signal.
- An intermittent open circuit condition, or a short circuit condition to ground or voltage on the steering position sensor circuit may cause a random firm/soft ride condition.
- If the DTC is a history DTC, the problem may be intermittent. Using a scan tool, monitor the steering position sensor circuit while moving the related wiring and connectors. This can often cause the malfunction to appear.

Test Description

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

2: This step tests for normal function of the EBCM.

3: This step tests for normal function of the EBCM

4: This step tests for an intermittent or poor connection at the EBCM.

5: This step tests for a short to ground in the Steering Wheel Position Signal circuit.

DTC C0710

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
	Did you perform the Electronic Suspension Control (ESC) Diagnostic System Check?			Go to <u>Diagnostic System</u>

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

1		-	Go to Step 2	<u>Check - Electronic Suspension Control</u>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the Steering Position PWM parameter in the ESC module data list. Does the scan tool indicate that the Steering Position PWM Parameter is within the specified range?	0-10 ms	Go to Step 3	Go to Step 4
3	1. Activate the Steering Position PWM input. 2. With the scan tool, observe the Steering Position PWM data parameter while turning the steering wheel. Does the Steering Position PWM data parameter change state while the steering wheel is turned?	-	Go to Diagnostic Aids	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the EBCM. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the Steering Position PWM data parameter. Does the scan tool indicate that the Steering Position PWM Parameter is within the specified range?	0-10 ms	Go to Step 7	Go to Step 5
5	Test the signal circuit of the EBCM for a short to ground. Refer to <u>Circuit Testing</u>	-		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

	and Wiring Repairs in Wiring Systems. Did you find and correct the condition?		Go to Step 10	Go to Step 6
6	Inspect for poor connections at the harness connector of the ESC module. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 8
7	Inspect for poor connections at the harness connector of the EBCM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 10	Go to Step 9
8	Replace the ESC module. Refer to Electronic Suspension Control Module Replacement . Did you complete the replacement?	-	Go to Step 10	-
9	Replace the EBCM. Refer to Electronic Brake Control Module Replacement in Antilock Brake System. 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 C0896

Circuit Description

Voltage is supplied to the electronic suspension control (ESC) module in the battery positive voltage circuit and the ignition voltage circuit. The ESC module monitors the supplied voltage to determine if it is within a valid operating range.

Conditions for Running the DTC

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

The ignition is ON.

Conditions for Setting the DTC

- The DTC is set when the battery voltage is outside the normal range of 9 to 15.5 volts.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

DTC C0896 disables the ability to set most other ESC DTCs.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees battery voltage outside the normal range of 9 to 15.5 volts. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

DTC C0896 may set when the vehicle is placed on a battery charger, on fast charge, for a long period of time. It may also be set by an intermittent charging system malfunction.

Test Description

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

- 1: This test determines whether the malfunction is in the supply voltage or the ESC module.
- 2: Checks for high resistance, a short to ground, or an open in the battery positive voltage circuit.

DTC C0896

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	Measure the voltage in the ESC module battery positive voltage circuit. Does the voltage the measure within the specified values?	9-15.5 V	Go to Step 3	Go to Step 2
	Test for high resistance, a short to ground or an open in the battery positive voltage			Go to Diagnostic

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

2	circuit of the ESC module. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 7	<u>System Check - Engine Electrical</u>
3	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 4	Go to Step 6
4	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 7	Go to Step 5
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Did you complete the replacement?	-	Go to Step 7	-
6	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 7	Go to Diagnostic Aids
7	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC P1652

Circuit Description

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

The powertrain control module (PCM) uses output driver modules (ODMs) to control many functions of the engine, and the transaxle. The ODMs supply the ground path for the PCM controlled device when the PCM commands the device ON. Each ODM is able to control several outputs. Unlike the quad driver modules (QDMs) used in earlier model years, the ODMs are able to diagnose each output circuit. The PCM monitors the ODMs for circuit conditions that are incorrect for the commanded state of the ODM. If the PCM detects an improper circuit condition in the ODM that controls suspension Lift/Dive, DTC P1652 will set.

Conditions for Running the DTC

- The engine is running.
- The system voltage is between 8-16 volts.

Conditions for Setting the DTC

- The PCM detects a circuit condition that is incorrect for the commanded state of the ODM that controls suspension Lift/Dive.
- The condition is present for at least 10 seconds.

Action Taken When the DTC Sets

- The PCM will not illuminate the malfunction indicator lamp (MIL).
- The PCM will store the conditions present when the DTC set as Failure Records only.

Conditions for Clearing the MIL/DTC

- The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using the scan tool Clear DTC Information function.

Diagnostic Aids

If the condition is intermittent, refer to **Intermittent Conditions** in Engine Controls-3.6L or **Intermittent Conditions** in Engine Controls-4.6L.

DTC P1652

Step	Action	Values	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
	Did you perform the Engine Controls Diagnostic System Check?			Go to <u>Diagnostic System</u>

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

1		-	Go to Step 2	<u>Check - Engine Controls</u> in Engine Controls-3.6L <u>Diagnostic System Check - Engine Controls</u> in Engine Controls-4.6L.
2	1. Turn OFF the ignition. 2. Disconnect the Lift/Dive connector. 3. Connect test lamp between the Lift/Dive Signal Output circuit and ground. 4. Turn ON the ignition, with the engine OFF. Is the test lamp ON?	-	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Leave the Lift/Dive disconnected. 3. Disconnect the powertrain control module (PCM) connector. 4. Turn ON the ignition, with the engine OFF. 5. Test the Lift/Dive Signal Output circuit for a short to voltage. 6. If the condition is found, repair as necessary. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
	1. Leave the Lift/Dive disconnected. 2. Connect test lamp between B+ and			

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

4	the Lift/Dive Signal Output circuit. Is the test lamp ON?	-	Go to Step 5	Go to Step 6
5	1. Turn OFF the ignition. 2. Disconnect the PCM connector. 3. Test the Lift/Dive Signal Output circuit for a short to ground. 4. If the condition is found, repair as necessary. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
6	1. Turn OFF the ignition. 2. Reconnect the Lift/Dive connector. 3. Disconnect the PCM connector. 4. Turn ON the ignition, with the engine OFF. 5. Using DMM, measure the voltage between the Lift/Dive Signal Output circuit and ground. Does the DMM indicate a voltage near the specified value?	B+	Go to Step 7	Go to Step 8
7	1. Test for poor connections at the PCM. 2. If the condition is found, repair as necessary. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
8	1. Test the Lift/Dive Signal Output circuit for an open or poor connections at the electronic suspension control (ESC) module. 2. If the condition is found, repair as necessary. Refer to <u>Wiring Repairs</u>	-		

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

	in Wiring Systems.		Go to Step 11	Go to Step 9
9	Did you find and correct the condition? Replace the electronic suspension control (ESC) module. Refer to <u>Electronic Suspension Control Module Replacement</u> . Is the action complete?	-	Go to Step 11	-
10	IMPORTANT: The replacement PCM must be programmed. Replace the PCM. Refer to <u>Engine Control Module (ECM) Replacement</u> in Engine Controls-3.6L or <u>Engine Control Module (ECM) Replacement</u> in Engine Controls-4.6L.Is the action complete?	-	Go to Step 11	-
11	1. Review and record scan tool Fail Records data. 2. Clear DTCs. 3. Operate the vehicle within Fail Records conditions. 4. Using a scan tool, monitor Specific DTC information for DTC P1652 until the test runs. Does the scan tool indicate DTC P1652 passed?	-	System OK	Go to Step 2

REPAIR INSTRUCTIONS

ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT

Removal Procedure

1. Remove the right rear trim panel. Refer to **Garnish Molding Replacement - Body Side Rear Upper** in Interior Trim.
2. Disconnect the electronic suspension control module electrical connectors.

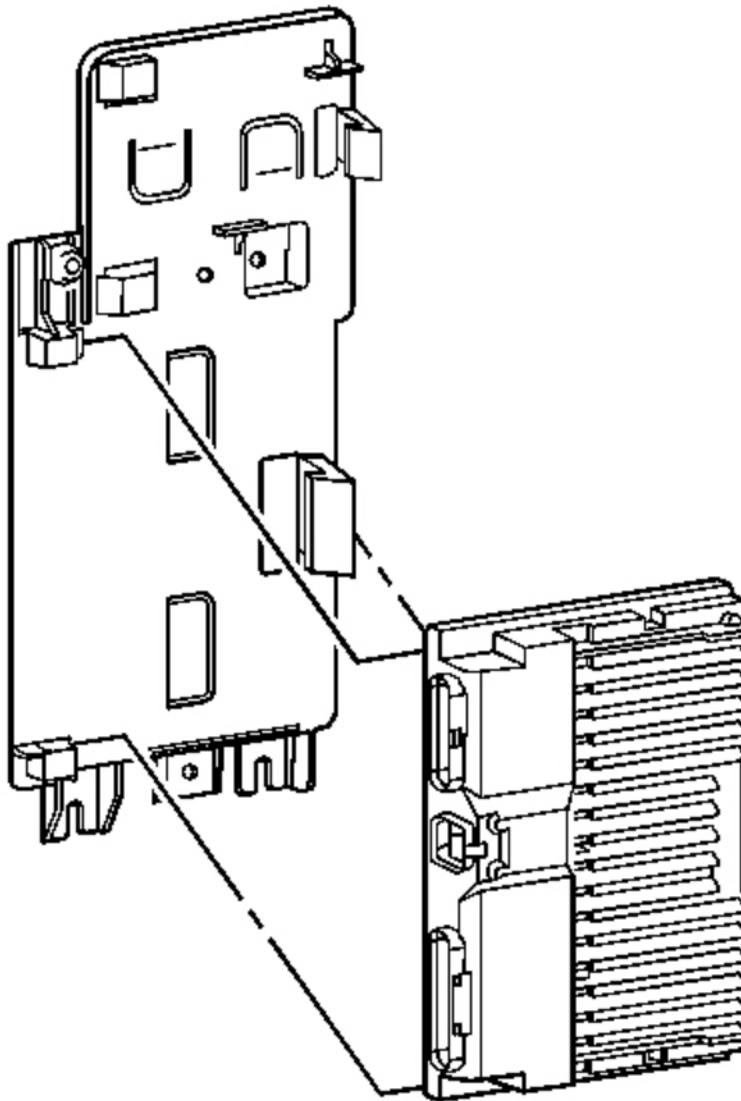


Fig. 5: View Of Electronic Suspension Control Module
Courtesy of GENERAL MOTORS CORP.

3. Remove the electronic suspension control module from the bay board.

1. Install the electronic suspension control module to the bay board.

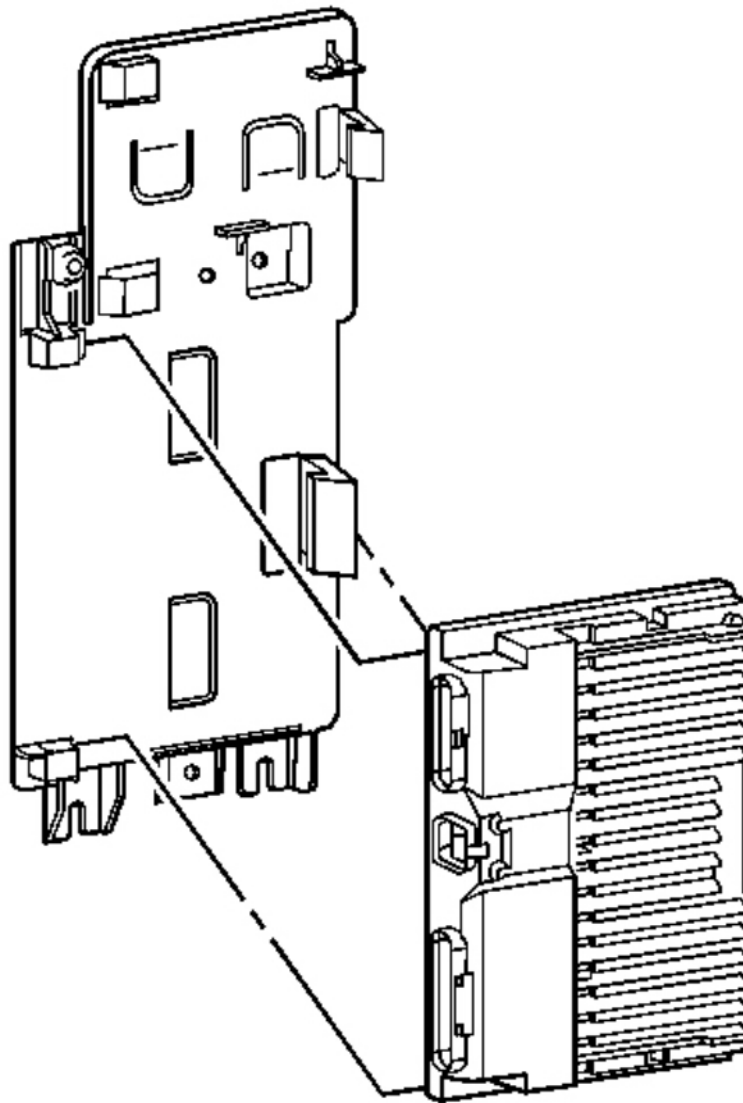


Fig. 6: View Of Electronic Suspension Control Module
Courtesy of GENERAL MOTORS CORP.

2. Connect the electronic suspension control module electrical connectors.

2004 Cadillac SRX

2004 SUSPENSION Electronic Suspension Control (ESC) - SRX

3. Install the right rear trim panel. Refer to **Garnish Molding Replacement - Body Side Rear Upper** in Interior Trim.

FRONT POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

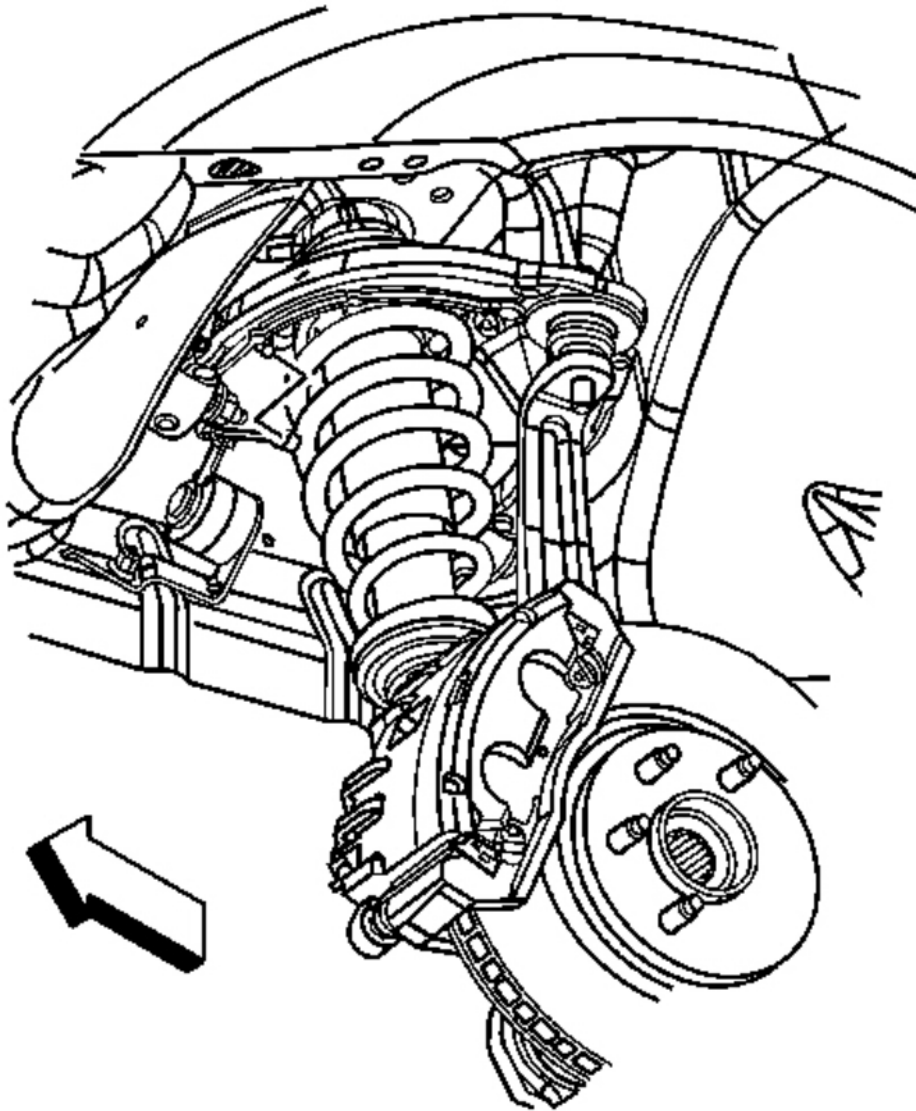


Fig. 7: Locating Front Ride Sensor Link
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the front ride sensor link from the upper control arm ball stud.
4. Disconnect the front ride sensor harness connector.

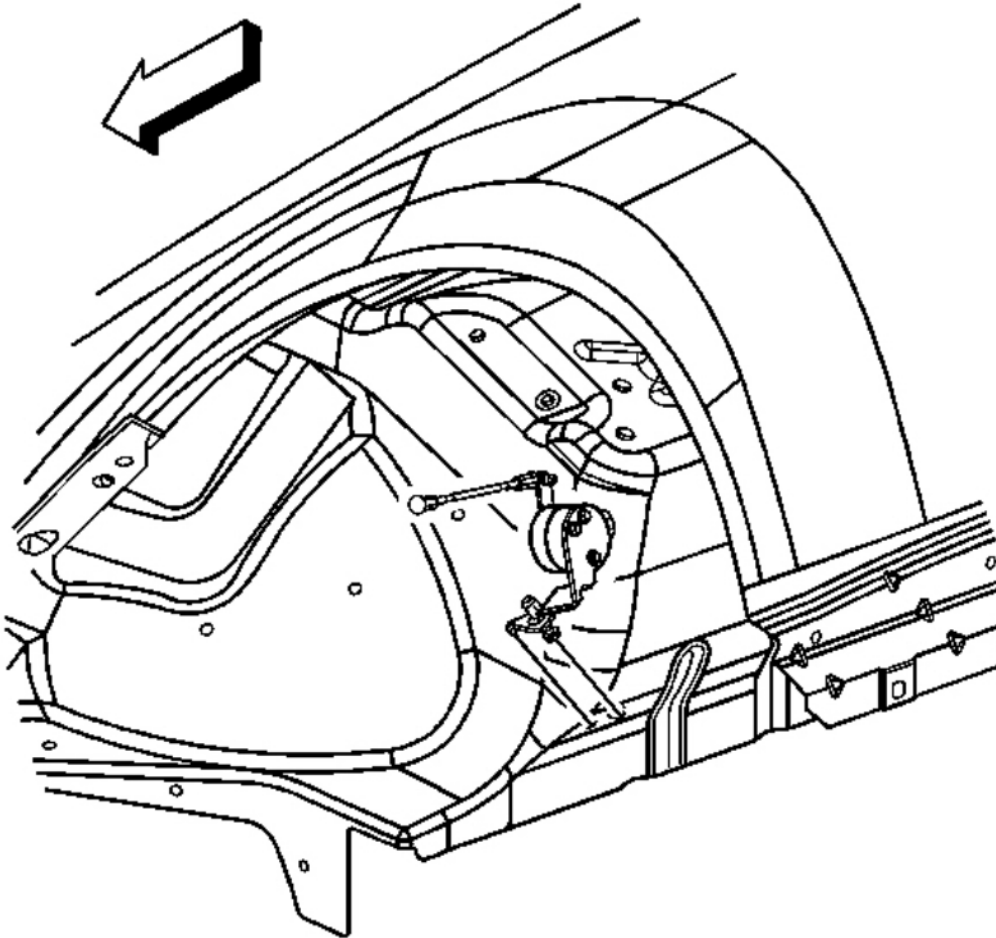


Fig. 8: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS CORP.

5. Loosen the front ride sensor retaining nut.
6. Gently tap the front ride sensor retaining stud in order to loosen the stud to fender connection.
7. Remove the front ride sender from the vehicle.

Installation Procedure

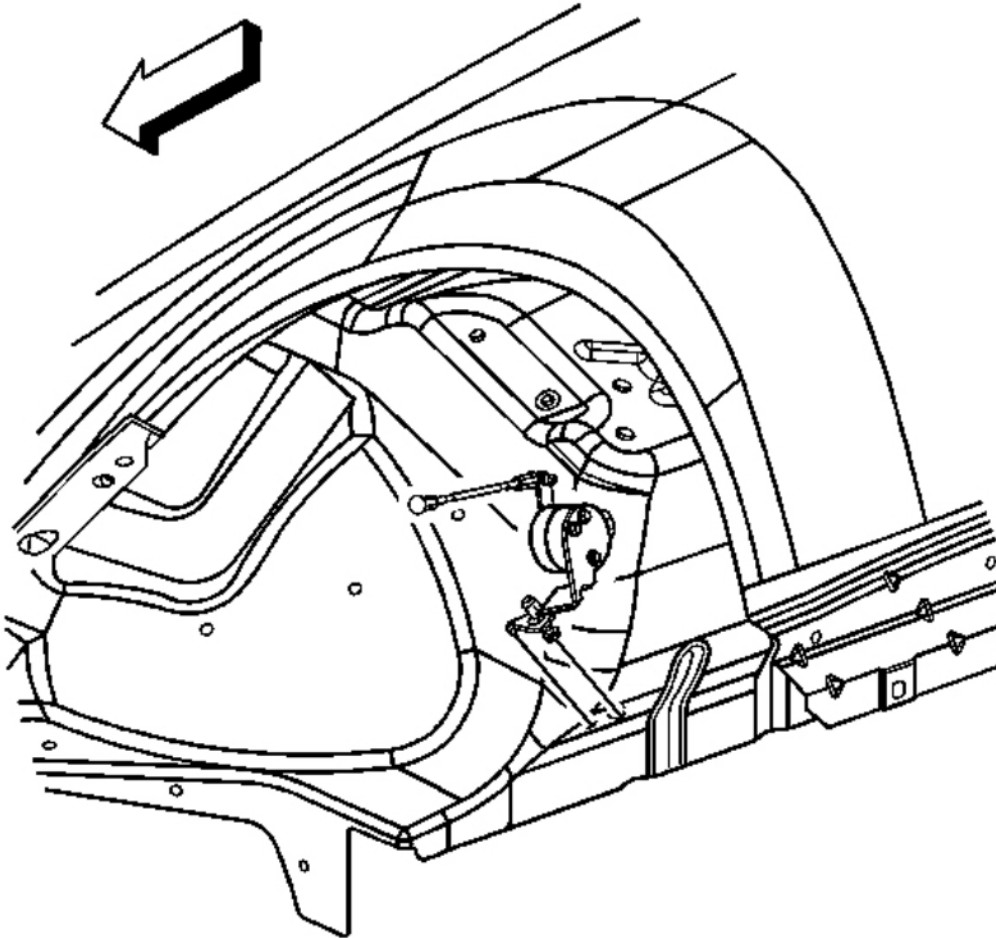


Fig. 9: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS CORP.

1. Position the sensor to the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the front ride sensor retaining nut.

Tighten: Tighten the nut to 9 N.m (80 lb in).

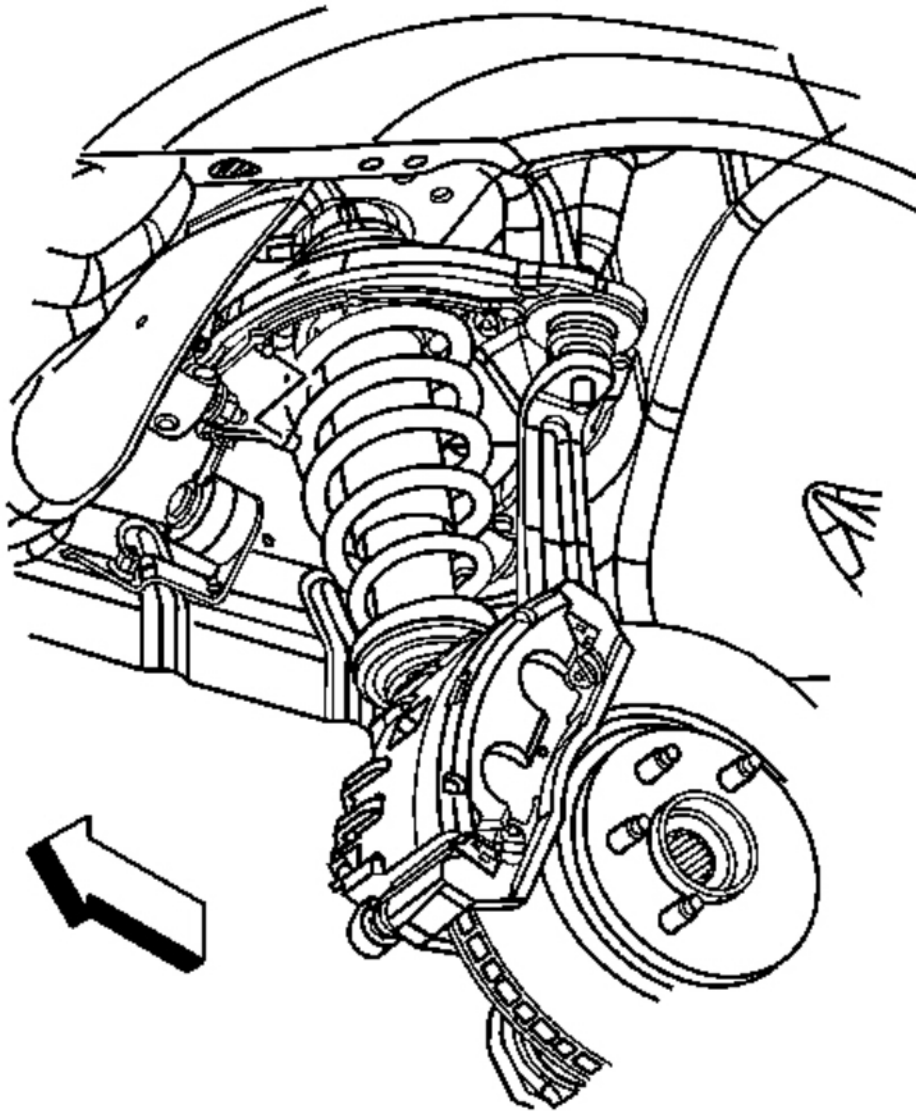


Fig. 10: Locating Front Ride Sensor Link
Courtesy of GENERAL MOTORS CORP.

3. Connect the front ride sensor link to the upper control arm ball stud.
4. Connect the front ride sensor harness connector.
5. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires

and Wheels.

6. Lower the vehicle.

REAR POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the tire and wheel. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
3. Disconnect the ride sensor link from the upper control arm ball stud.
4. Disconnect the ride sensor harness connector.

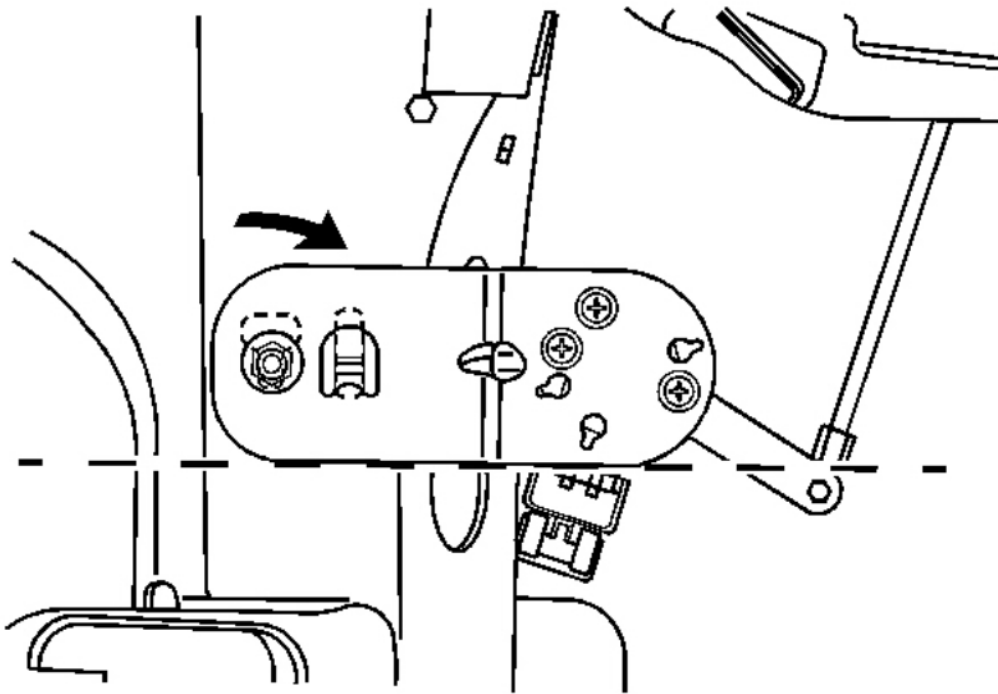


Fig. 11: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS CORP.

5. Loosen the rear ride sensor retaining nut.
6. Gently tap the rear ride sensor retaining stud in order to loosen the stud to frame connection.
7. Remove the rear ride sender from the vehicle.

Installation Procedure

1. Install the sensor to the vehicle.
2. Bottom out the captured stud in the key hole.
3. Rotate the sensor and bracket until the tab on the bracket bottoms out in the slot.

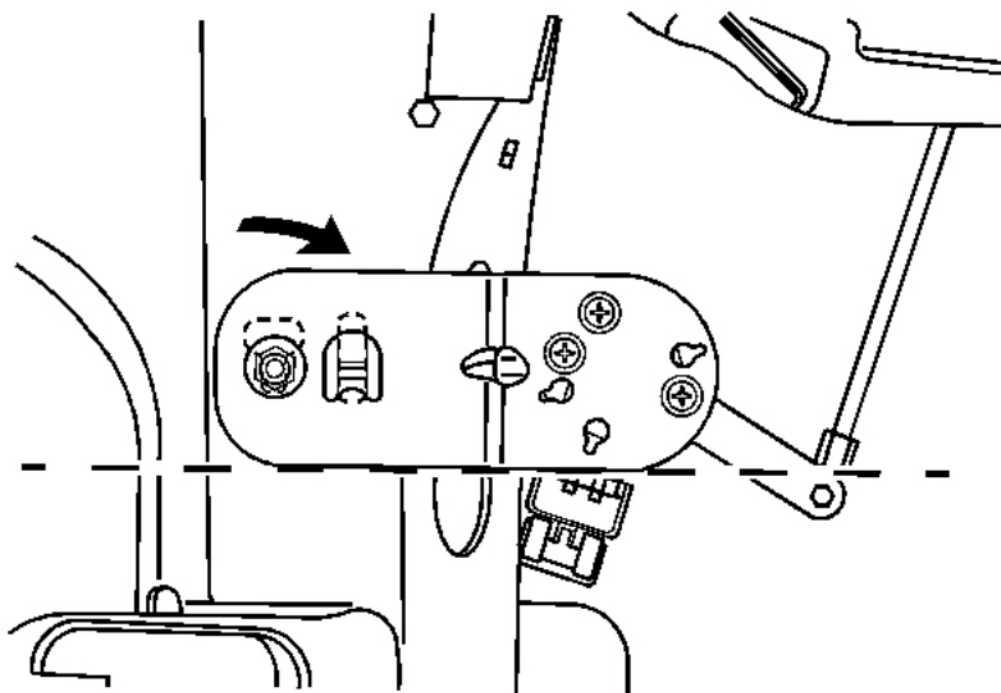


Fig. 12: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS CORP.

4. If the sensor bracket is not yet level, continue to rotate it allowing the captured stud to lift slightly from the bottom of the keyhole, until the sensor is level.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the rear ride height sensor retaining nut.

Tighten: Tighten the nut to 9 N.m (80 lb in).

6. Connect the ride sensor link to the upper control arm ball stud.

7. Connect the ride sensor harness connector.

8. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

9. Lower the vehicle.

DESCRIPTION AND OPERATION

ELECTRONIC SUSPENSION CONTROL DESCRIPTION AND OPERATION

The Electronic Suspension Control (ESC) system consists of the following components:

- ESC module.
- Four dampers contained in the 2 front struts and the 2 rear shock absorbers.
- Four positions sensors.
- ALC air compressor module.
- ELC relay.

The ESC system with rear Automatic Level Control (ALC) controls damping forces in the front struts and rear shock absorbers in response to various road and driving conditions. The rear ALC portion of the system maintains a proper vehicle trim height under various vehicle load conditions. For more information on the ALC, refer to **Automatic Level Control Description and Operation** in Automatic Level Control.

The ESC module receives the following inputs: wheel-to-body position, vehicle speed, and lift/dive. The ESC module evaluates these inputs and controls actuators in each of the dampers independently to provide varied levels of suspension control.

Electronic Suspension Control (ESC) Module

The ESC module is used to control how firm or soft each shock or strut should be to provide the best ride. The ESC module is also used to control the vehicles rear height. The ESC module is located on the right side of the rear seat back and is accessed through the trunk.

Position Sensors

The position sensors are 0 to 5 volt DC output devices that are used to measure wheel-to-body movement/position. There are four position sensors on the vehicle, one per corner. Each position sensor is mounted between a suspension control arm and the body.

Shock Absorber or Strut

An ESC damper is mounted at each corner of the vehicle. The four suspension dampers, 2 front struts and 2 rear shock absorbers, each contain an integral actuator that is controlled by the ESC module. The actuator provides a wide range of damping forces between soft and firm levels. Damping is controlled by the amount of current supplied to the actuator via pulse width modulation.

The ESC rear shock absorbers and front struts are a monotube type which provide damping by increasing magnetic flux to magnetic particles to resist suspension movement. The ESC shock absorber or strut has the capability of providing multiple modes or values of damping forces, in both compression and rebound direction.

The damping forces are achieved by increasing or decreasing the magnetic flux to the shock absorbers or struts.

Vehicle Speed

The ESC module receives a vehicle speed input. It is obtained over the CLASS 2 serial communication buss. Vehicle speed is used to determine the amount of damper control necessary.

Lift/Dive

Lift/Dive input is received from the PCM. When the ESC module receives an active lift/dive input, it will command a firm damping level on all four corners. The lift signal is calculated in the PCM based on throttle position, transmission gear, vehicle speed, and brake switch status. The dive signal, also calculated in the PCM, is based upon the rate of change with the vehicle speed.

Warning Messages

The DIC displays two different warning messages that are set if there is an electronic suspension control system fault(s). The warning messages are as follows:

- SERVICE SUSPENSION SYS
- SPEED LIMITED TO XXX

The DIC will display one, both or none, depending on the fault that was encountered. The warning message(s) will continue to be displayed, until the fault(s) has been corrected.