

2004 Cadillac Escalade

2004 SUSPENSION Electronic Suspension Control (ESC) - C/K SUV

2004 SUSPENSION

Electronic Suspension Control (ESC) - C/K SUV

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Compressor to Frame Nuts	15 N.m	11 lb ft
Air Line Tube Repair Nut	8 N.m	70 lb in
Electronic Suspension Control Module to Bracket	1.6 N.m	14 lb in
Front Position Sensor Link Bracket Bolt	9 N.m	80 lb in
Front Position Sensor Mounting Bolt	12 N.m	106 lb in
Rear Position Sensor Link Bracket Bolt	25 N.m	18 lb ft
Rear Position Sensor Mounting Bolt	12 N.m	106 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)

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SUSPENSION CONTROLS SCHEMATICS

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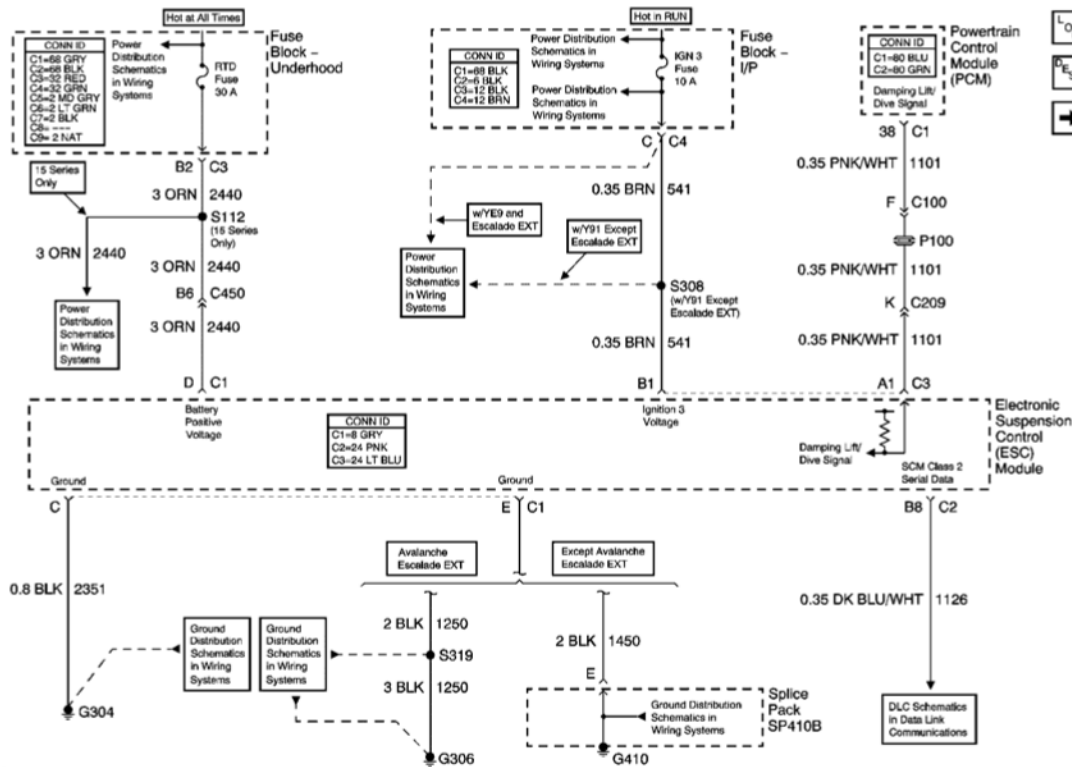


Fig. 1: Power, Ground, and Serial Data
 Courtesy of GENERAL MOTORS CORP.

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Fig. 2: Steering Wheel Speed/Position Sensor Inputs
Courtesy of GENERAL MOTORS CORP.

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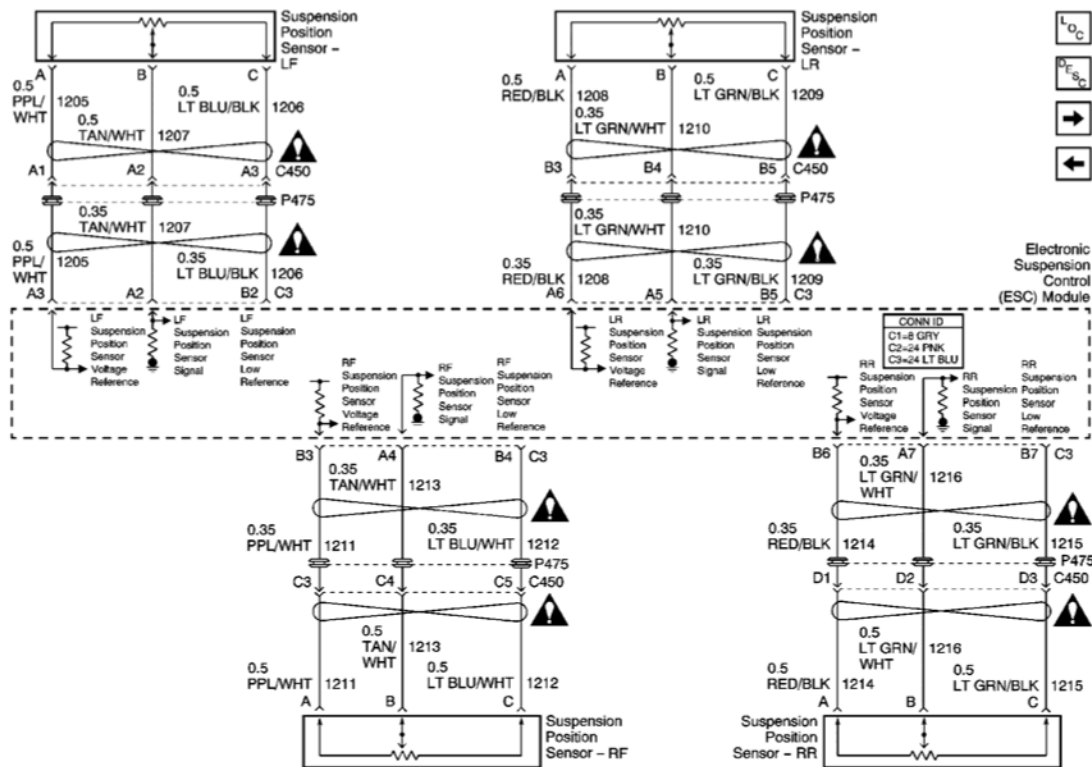


Fig. 3: Suspension Position Sensors
Courtesy of GENERAL MOTORS CORP.

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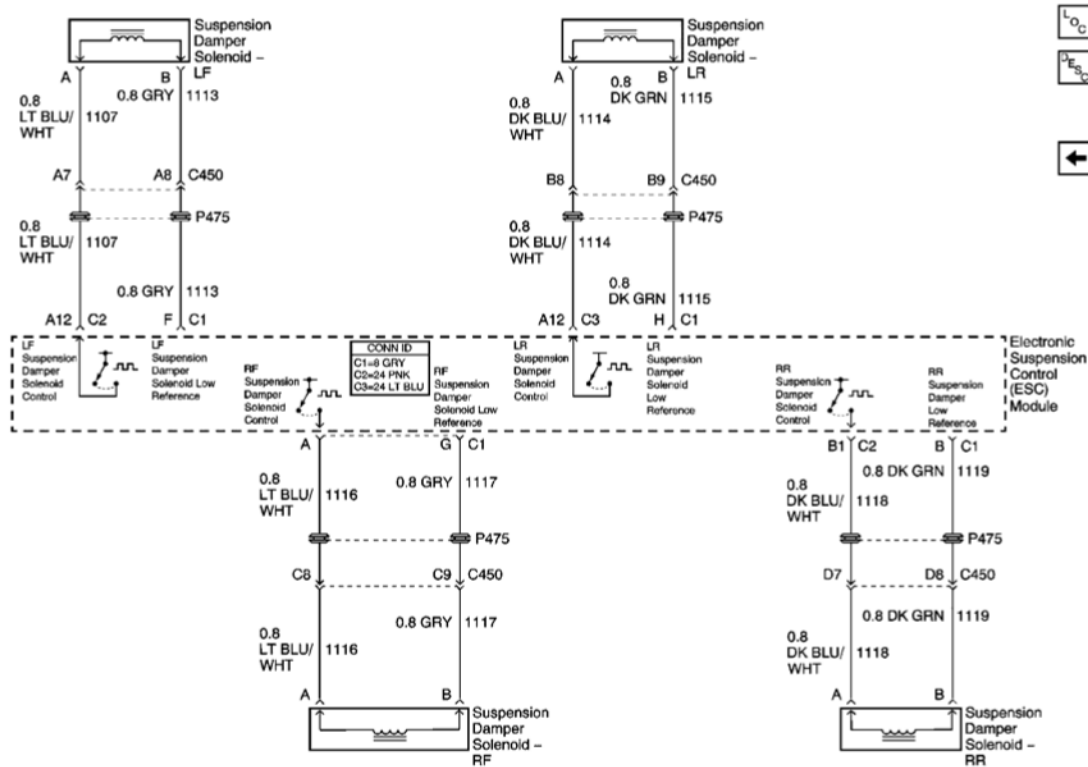


Fig. 4: Suspension Dampers Solenoids
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

SUSPENSION CONTROLS COMPONENT VIEWS

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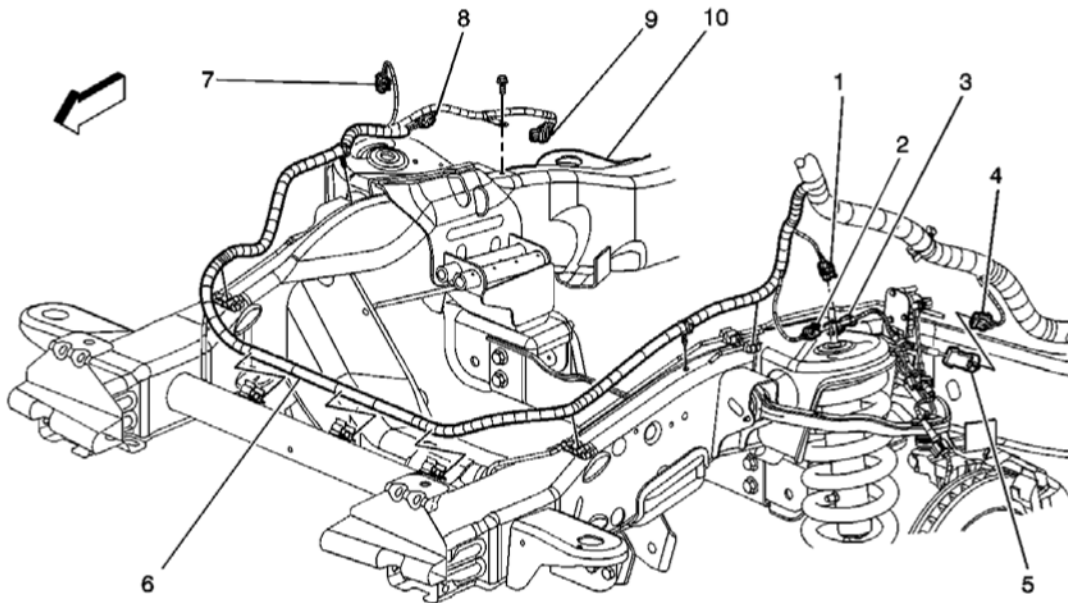


Fig. 5: Front of the Frame Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Suspension Damper Solenoid - LF Connector
2	Wheel Speed Sensor (WSS) - LF Chassis Connector
3	Wheel Speed Sensor (WSS) - LF Pigtail Connector
4	Suspension Position Sensor - LF Chassis Connector
5	Suspension Position Sensor - LF Pigtail Connector
6	Chassis Harness
7	Suspension Damper Solenoid - RF Connector
8	Wheel Speed Sensor (WSS) - RF Chassis Connector
9	Suspension Position Sensor - RF Chassis Connector
10	Frame

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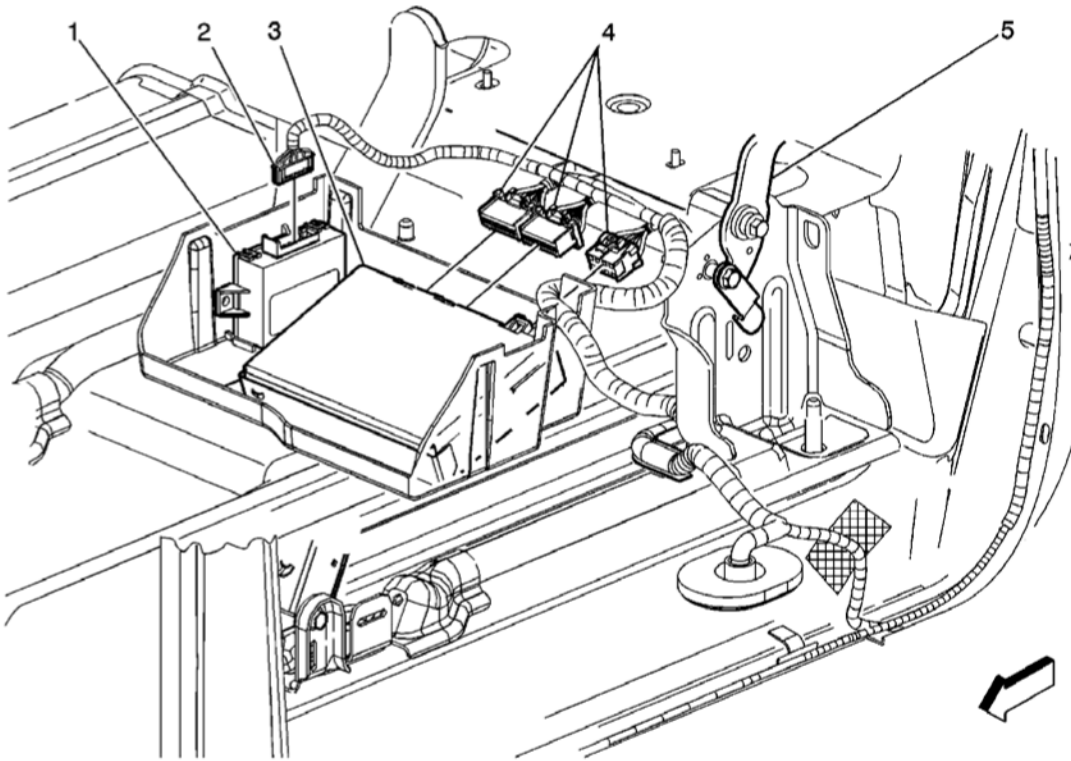


Fig. 6: LR of the Passenger Compartment (Escalade EXT) Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

Callout	Component Name
1	Rear Object Sensor Control Module
2	Rear Object Sensor Control Module Connector
3	Electronic Suspension Control (ESC) Module
4	Electronic Suspension Control (ESC) Module Connectors
5	LR Passenger Seat Bracket

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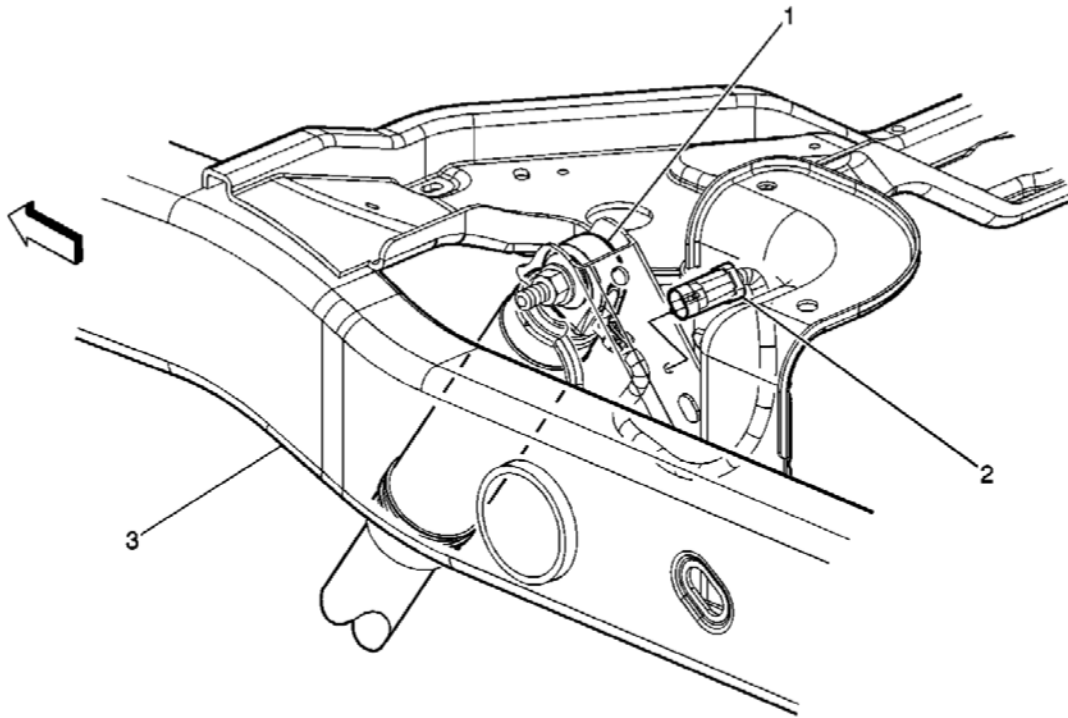


Fig. 7: LR Suspension Component Views (2500 Series)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	Shock Absorber - LR
2	Suspension Damper Solenoid - LR Connector
3	Frame

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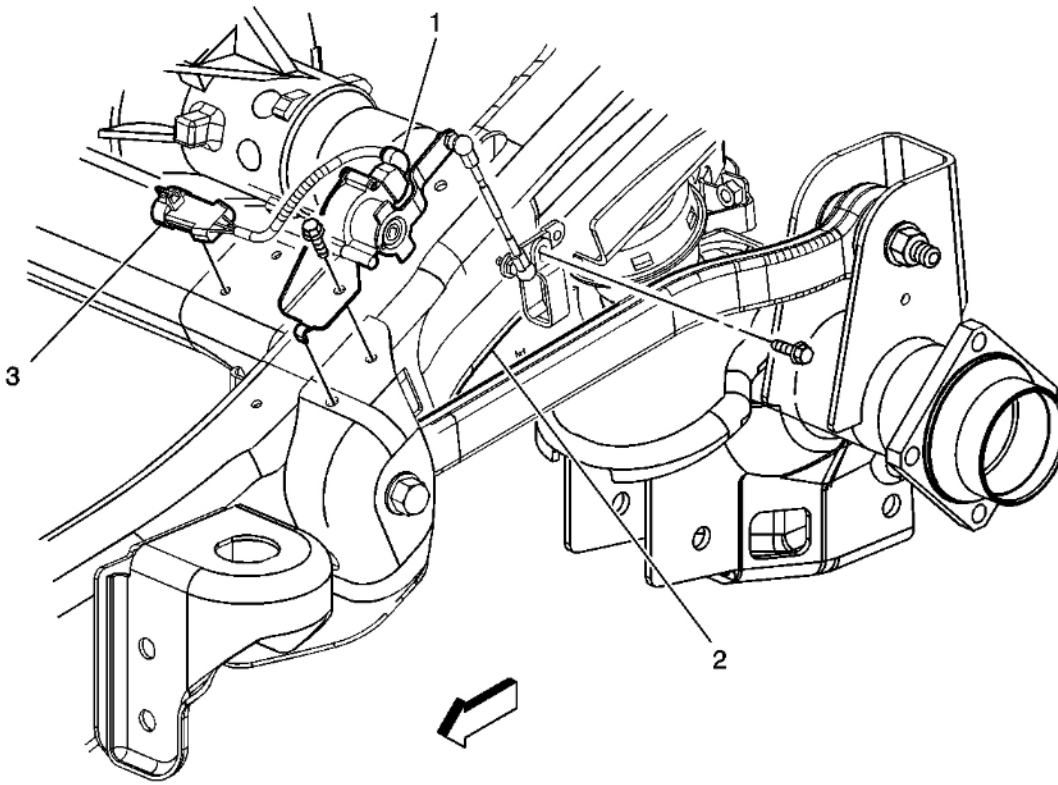


Fig. 8: LR Suspension Component Views (1500 Series)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Suspension Position Sensor - LR
2	Frame
3	Suspension Position Sensor - LR Connector

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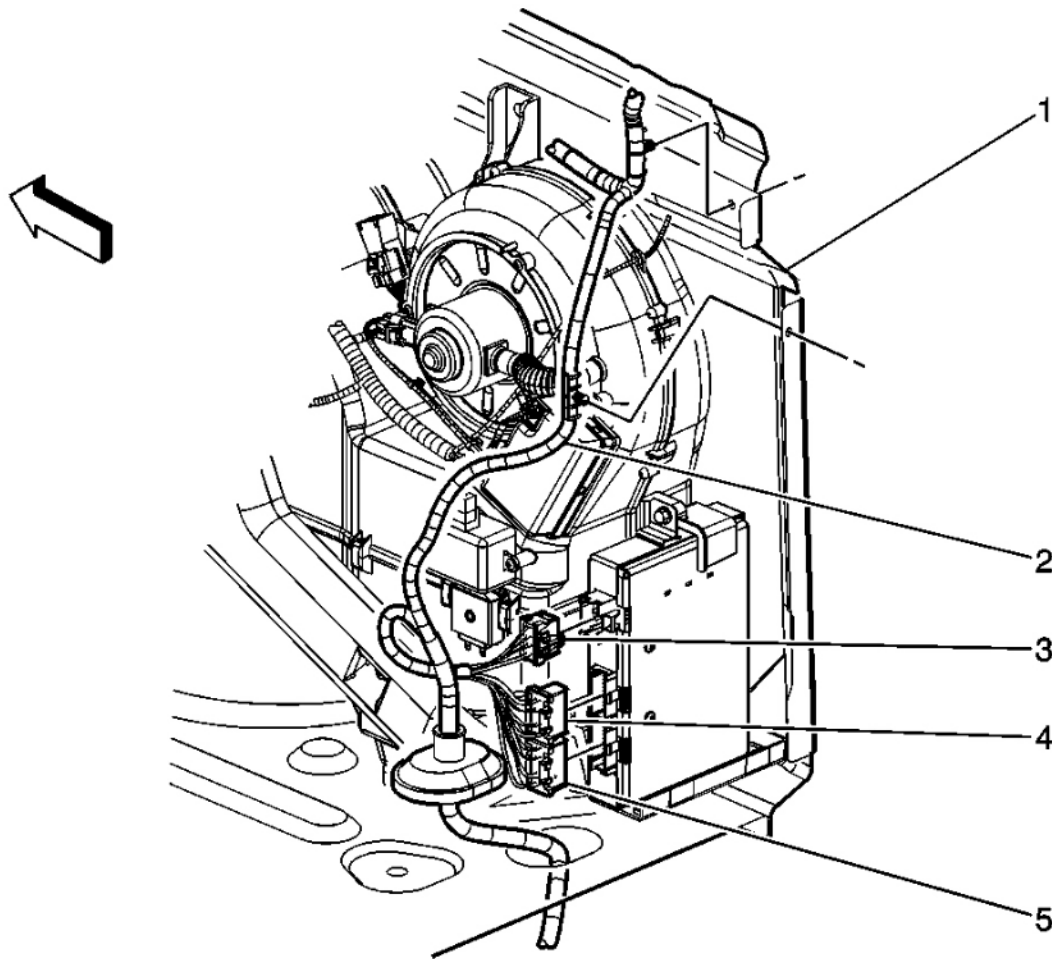


Fig. 9: RR of the Passenger Compartment Component Views (Except Avalanche/Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	Body Side Inner Panel
2	Body Wiring Harness
3	Electronic Suspension Control (ESC) Module Connector C1
4	Electronic Suspension Control (ESC) Module Connector C2
5	Electronic Suspension Control (ESC) Module Connector C3

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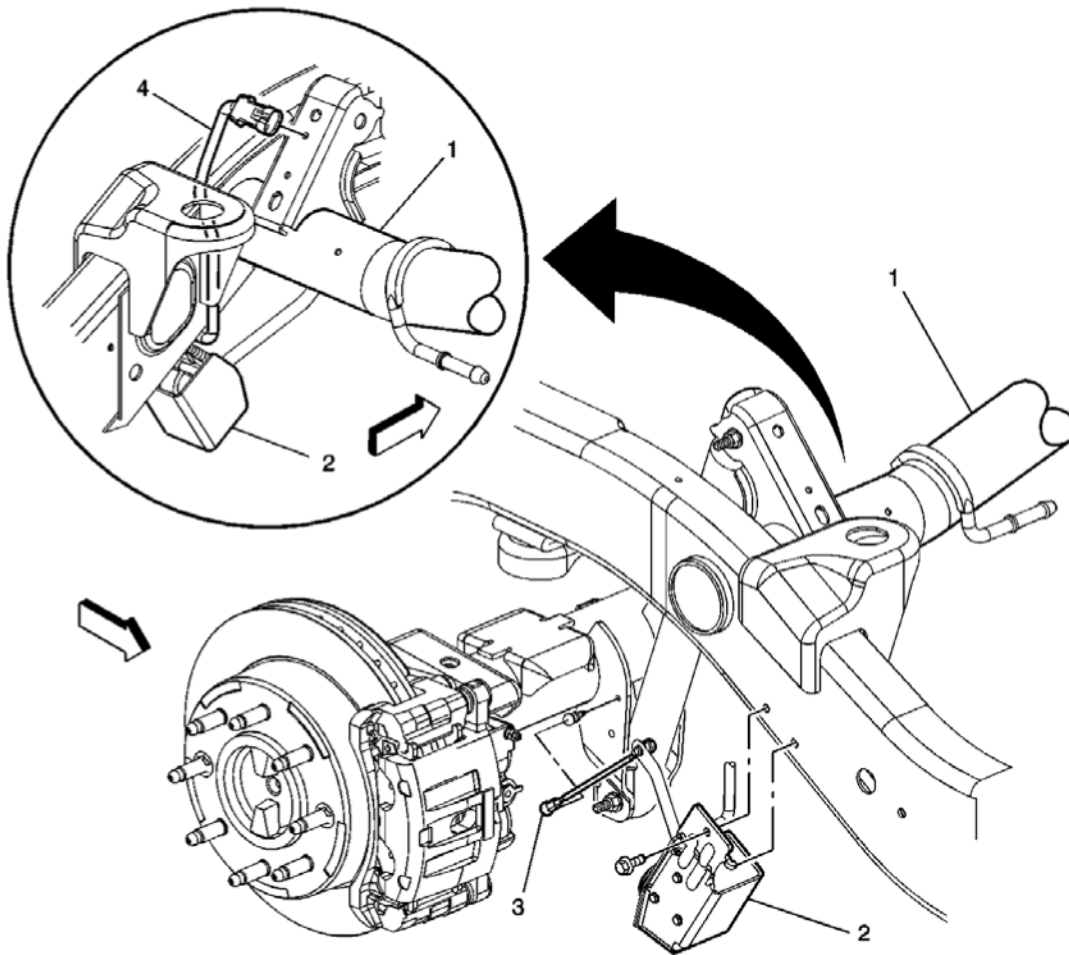


Fig. 10: RR Suspension Component Views (2500 Series)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 10

Callout	Component Name
1	Axle
2	Suspension Position Sensor - RR
3	Sensor Arm
4	Suspension Position Sensor - RR Connector

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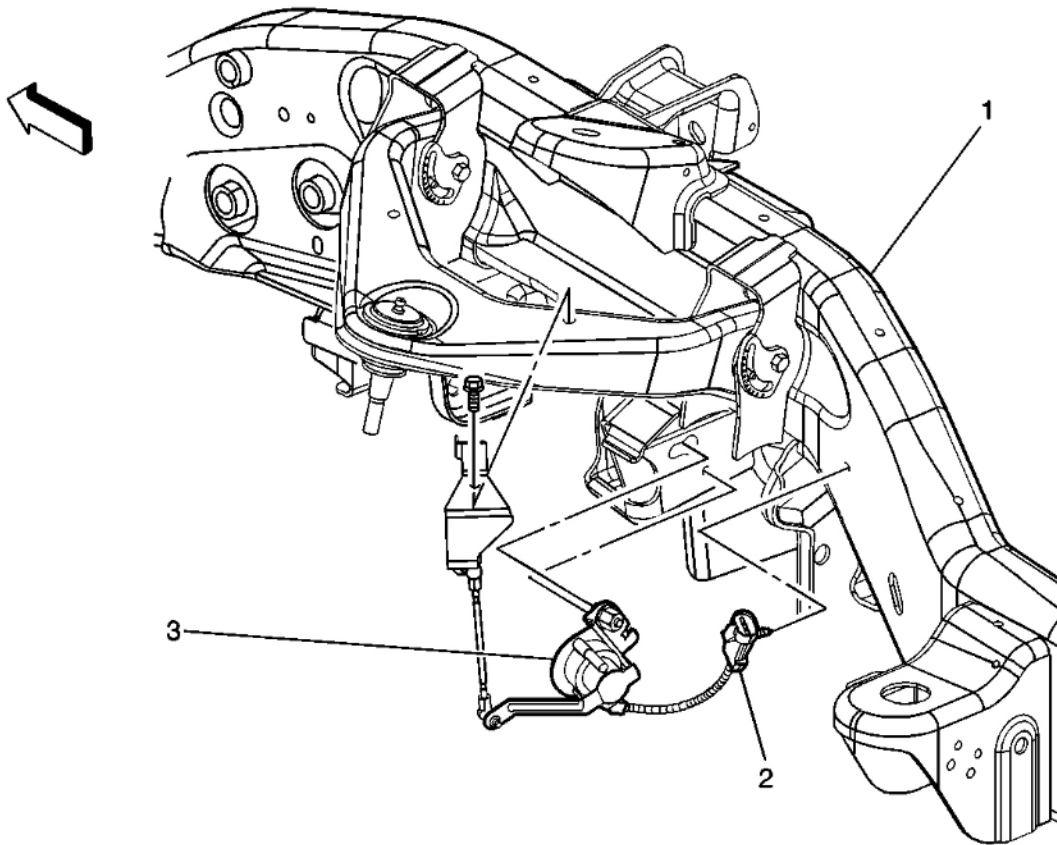


Fig. 11: Suspension Position Sensor Component Views - LF (Suburban/Yukon XL)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 11

Callout	Component Name
1	Frame
2	Suspension Position Sensor - LF Connector
3	Suspension Position Sensor - LF

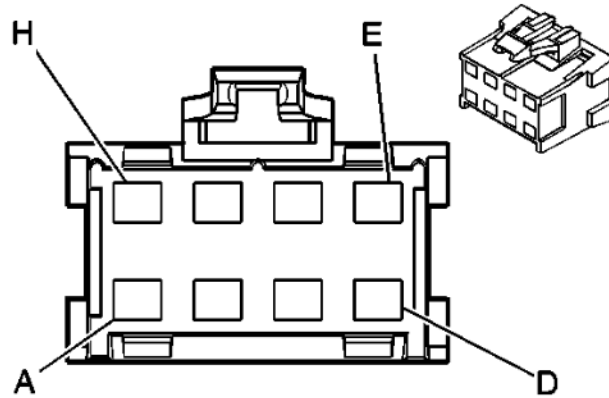
SUSPENSION CONTROLS CONNECTOR END VIEWS

Electronic Suspension Control (ESC) Module - C1 Connector End Views



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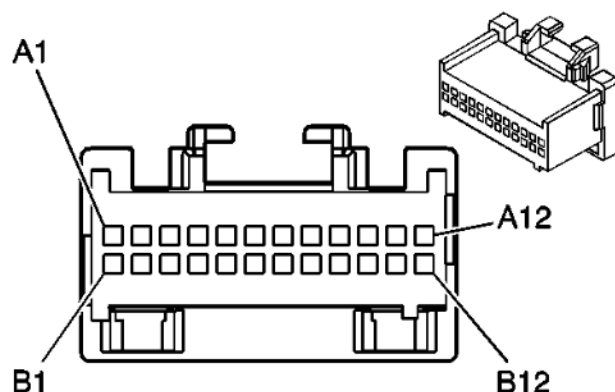


Connector Part Information		• 12110626 • 8-Way F Metri-Pack 280 Series (GRY)	
Pin	Wire Color	Circuit No.	Function
A	LT BLU/WHT	1116	Right Front Suspension Damper Solenoid Control
B	DK GRN	1119	Right Rear Suspension Damper Solenoid Low Reference
C	BLK	2351	Ground
D	ORN	2440	Battery Positive Voltage
E	BLK	1450	Ground - Except Avalanche and Escalade EXT
	BLK	1250	Ground - Avalanche and Escalade EXT
F	GRY	1113	Left Front Suspension Damper Solenoid Low Reference
G	GRY	1117	Right Front Suspension Damper Solenoid Low Reference
H	DK GRN	1115	Left Rear Suspension Damper Solenoid Low Reference

Electronic Suspension Control (ESC) Module - C2 Connector End Views

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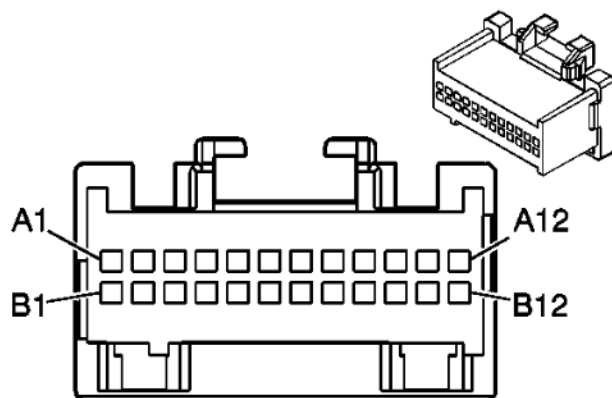


Connector Part Information		12110244 24-Way F Micro-Pack (PNK)	
Pin	Wire Color	Circuit No.	Function
A1-A8	-	-	Not Used
A9	GRY	416	5-Volt Reference
A10	LT BLU	2248	Real Time Damping Compressor Relay Control
A11	-	-	Not Used
A12	LT BLU/ WHT	1107	Left Front Suspension Damper Solenoid Control
B1	DK BLU/ WHT	1118	Right Rear Suspension Damper Solenoid Control
B2	WHT	1765	Steering Wheel Position Marker Pulse Signal
B3	-	-	Not Used
B4	LT BLU	1764	Steering Wheel Position Signal B
B5	DK BLU	2249	Real Time Damping Compressor Exhaust Control
B6	LT GRN	1763	Steering Wheel Position Signal A
B7	-	-	Not Used
B8	DK BLU/ WHT	1126	SCM Class 2 Serial Data
B9	-	-	Not Used
B10	BLK	407	Low Reference
B11-B12	-	-	Not Used

Electronic Suspension Control (ESC) Module - C3 Connector End Views

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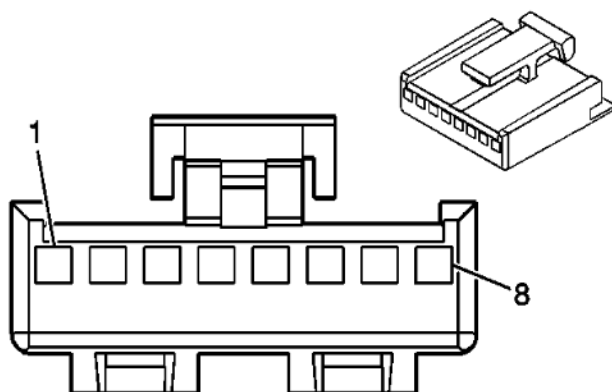
Connector Part Information		• 121102206 • 24-Way F Micro-Pack (LT BLU)	
Pin	Wire Color	Circuit No.	Function
A1	PNK/WHT	1101	Damping Lift/Dive Signal
A2	TAN/WHT	1207	Left Front Suspension Position Sensor Signal
A3	PPL/WHT	1205	Left Front Suspension Position Sensor Voltage Reference
A4	TAN/WHT	1213	Right Front Suspension Position Sensor Signal
A5	LT GRN/ WHT	1210	Left Rear Suspension Position Sensor Signal
A6	RED/BLK	1208	Left Rear Suspension Position Sensor Voltage Reference
A7	LT GRN/ WHT	1216	Right Rear Suspension Position Sensor Signal
A8-A11	-	-	Not Used
A12	DK BLU/ WHT	1114	Left Rear Suspension Damper Solenoid Control
B1	BRN	541	Ignition 3 Voltage
B2	LT BLU/ BLK	1206	Left Front Suspension Position Sensor Low Reference
B3	PPL/WHT	1211	Right Front Suspension Position Sensor Voltage Reference
B4	LT BLU/ BLK	1212	Right Front Suspension Position Sensor Low Reference
B5	LT GRN/ BLK	1209	Left Rear Suspension Position Sensor Low Reference
B6	RED/BLK	1214	Right Rear Suspension Position Sensor

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			Voltage Reference
B7	LT GRN/ BLK	1215	Right Rear Suspension Position Sensor Low Reference
B8-B10	-	-	Not Used
B11	TAN	2252	Leveling Pressure Sensor Signal
B12	-	-	Not Used

Steering Wheel Speed/Position Sensor Connector End Views



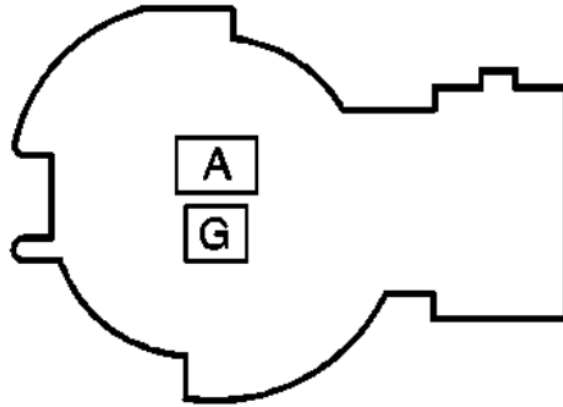
Connector Part Information		12052444 8-Way F Micro-Pack 100 Series (BLK)	
Pin	Wire Color	Circuit No.	Function
1	GRY	1056	Steering Wheel Position Sensor 5-Volt Reference Voltage
2	BLK	1835	Low Reference
3	LT GRN	1763	Steering Wheel Position Signal A
4	LT BLU	1764	Steering Wheel Position Signal B
5	WHT	1765	Steering Wheel Position Marker Pulse Signal
6	LT BLU	1059	Steering Wheel Position Sensor Signal
7	PNK	41	Ignition 3 Voltage
8	BLK	1851	Ground

Suspension Damper Solenoid Connector End Views - LF



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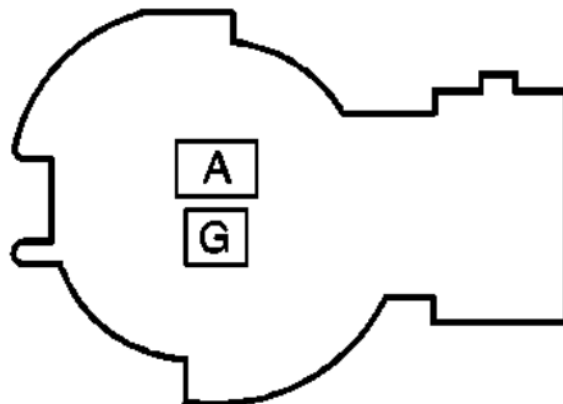


Connector Part Information

- 15336746
- 2-Way F Micro-Pack 100W (BLK)

Pin	Wire Color	Circuit No.	Function
A	LT BLU/WHT	1107	Left Front Suspension Damper Solenoid Control
G	GRY	1113	Left Front Suspension Damper Solenoid Low Reference

Suspension Damper Solenoid Connector End Views - RF

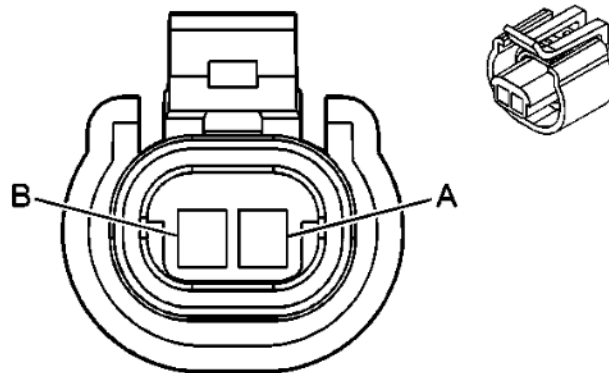


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Connector Part Information		• 15336746 • 2-Way F Micro-Pack 100W (BLK)	
Pin	Wire Color	Circuit No.	Function
A	LT BLU/WHT	1116	Right Front Suspension Damper Solenoid Control
G	GRY	1117	Right Front Suspension Damper Solenoid Low Reference

Suspension Damper Solenoid Connector End Views - LR (10 Series)

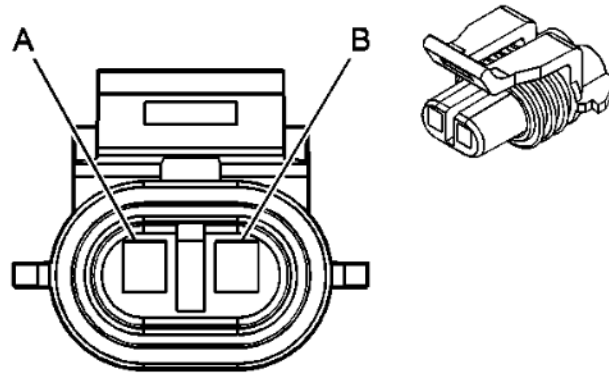


Connector Part Information		• 15355009 • 2-Way F 150.2 P2S Series (BLK)	
Pin	Wire Color	Circuit No.	Function
A	DK BLU/WHT	1114	Left Rear Suspension Damper Solenoid Control
B	DK GRN	1115	Left Rear Suspension Damper Solenoid Low Reference

Suspension Damper Solenoid Connector End Views - LR (20 Series)

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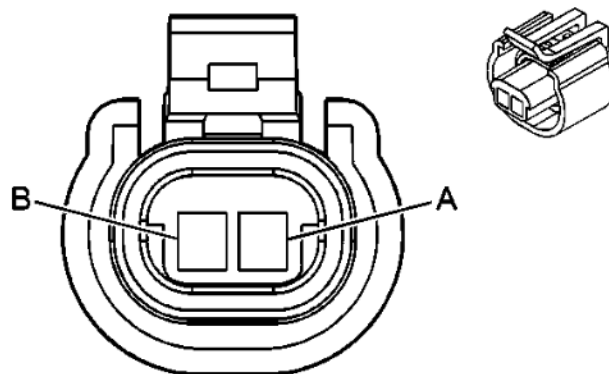


Connector Part Information

- 12052641
- 2-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU/ WHT	1114	Left Rear Suspension Damper Solenoid Control
B	DK GRN	1115	Left Rear Suspension Damper Solenoid Low Reference

Suspension Damper Solenoid Connector End Views - RR



Connector Part Information

- 15355009
- 2-Way F 150.2 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	DK BLU/ WHT	1118	Right Rear Suspension Damper Solenoid Control
			Right Rear Suspension Damper Solenoid

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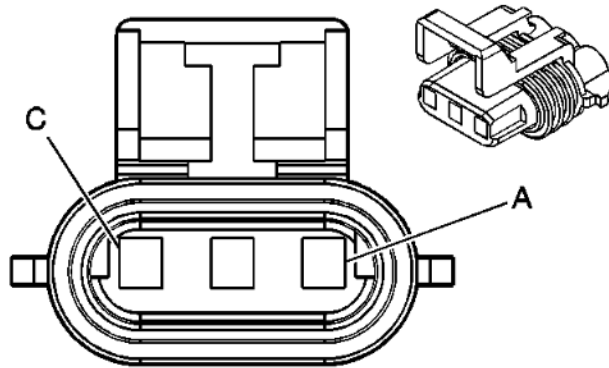
B

DK GRN

1119

Low Reference

Suspension Position Sensor Connector End Views - LF

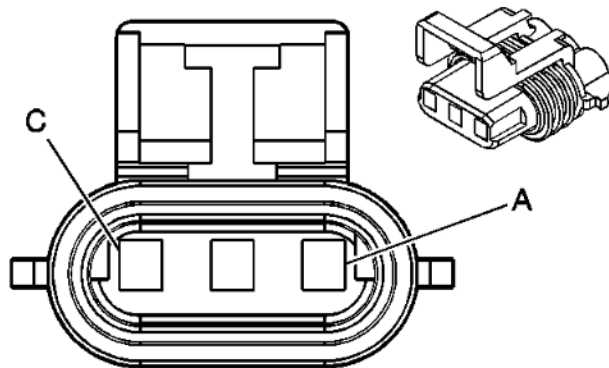


Connector Part Information

- 12110293
- 3-Way F Metri-Pack 150 Series (BLK)

Pin	Wire Color	Circuit No.	Function
A	PPL/WHT	1205	Left Front Suspension Position Sensor Volt Reference
B	TAN/WHT	1207	Left Front Suspension Position Sensor Signal
C	LT BLU/BLK	1206	Left Front Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End Views - RF



Connector Part Information

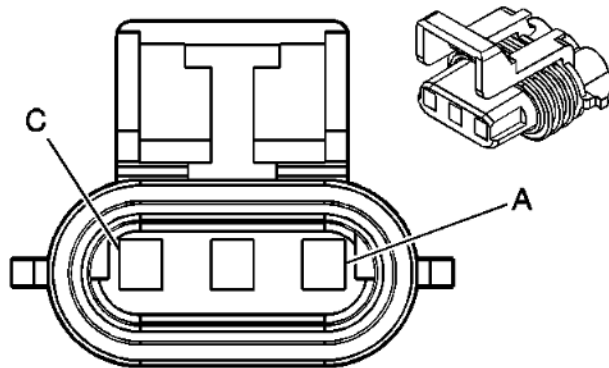
- 12110293
- 3-Way F Metri-Pack 150 Series (BLK)

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Pin	Wire Color	Circuit No.	Function
A	PPL/WHT	1211	Right Front Suspension Position Sensor Volt Reference
B	TAN/WHT	1213	Right Front Suspension Position Sensor Signal
C	LT BLU/ BLK	1212	Right Front Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End Views - LR

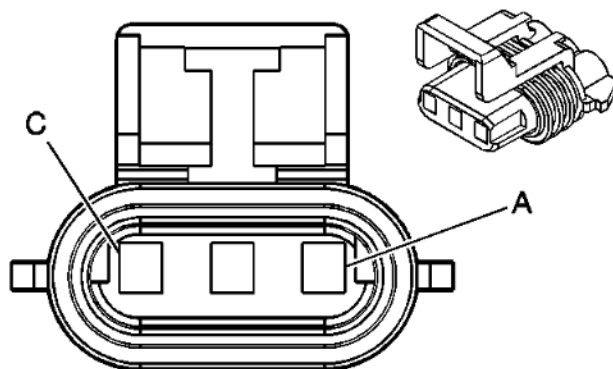


Connector Part Information		• 12110293 • 3-Way F Metri-Pack 150 Series (BLK)	
Pin	Wire Color	Circuit No.	Function
A	RED/BLK	1208	Left Rear Suspension Position Sensor Volt Reference
B	LT GRN/ WHT	1210	Left Rear Suspension Position Sensor Signal
C	LT GRN/ BLK	1209	Left Rear Suspension Position Sensor Low Reference

Suspension Position Sensor Connector End Views - RR

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Connector Part Information		• 12110293 • 3-Way F Metri-Pack 150 Series (BLK)	
Pin	Wire Color	Circuit No.	Function
A	RED/BLK	1214	Right Rear Suspension Position Sensor Volt Reference
B	LT GRN/ WHT	1216	Right Rear Suspension Position Sensor Signal
C	LT GRN/ BLK	1215	Right Rear Suspension Position Sensor Low Reference

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ELECTRONIC SUSPENSION CONTROL

Begin the system diagnosis with the **Diagnostic System Check - Electronic Suspension Control** . You may want to review the **Electronic Suspension Control Description and Operation** before beginning the diagnosis. The Diagnostic System Check will provide the following information:

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

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

DIAGNOSTIC SYSTEM CHECK - ELECTRONIC SUSPENSION CONTROL

Test Description

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

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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.

3: 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.

4: Check for the presence of DTCs.

5: Check for the presence of DTCs.

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 electronic suspension control (ESC) module, instrument cluster (IPC) and the powertrain control module (PCM). Does the scan tool communicate with each of the modules?	Go to Step 3	Go to <u>Scan Tool Does Not Communicate with Class 2 Device</u> in Data Link Communications
3	Select the display DTCs function on the scan tool. 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 4
4	Select the Powertrain Control module display DTCs function on the scan tool. Does the scan tool display any DTCs for VSS, TP Sensor or System Voltage?	Go to <u>Diagnostic Trouble Code (DTC) List</u> in Engine Controls - 4.8L, 5.3L, and 6.0L or <u>Diagnostic Trouble Code (DTC) List</u> in Engine Controls - 8.1L	Go to Step 5
5	Select the ESC module display DTCs function on the scan tool. Does the scan tool display any DTCs?	Go to Step 6	Go to <u>Symptoms - Electronic Suspension Control</u>
	1. Start the engine.		

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6	2. Use the scan tool in order to clear the DTCs. IMPORTANT: Do not turn the ignition OFF after clearing the DTCs. 3. With the scan tool, command all the dampers ON and OFF 5 times or continuously for 1 minute. 4. Road test vehicle. 5. Select the ESC module display DTCs function on the scan tool. Does the scan tool display any DTCs?	Go to Step 7	System OK
7	Does the scan tool display DTC C0550 or C0551?	Go to <u>Diagnostic Trouble Code (DTC) List</u>	Go to Step 8
8	Does the scan tool display DTC C0870?	Go to <u>DTC C0870</u>	Go to Step 9
9	Does the scan tool display all of the following DTCs C0575, C0580, C0585 and C0590?	Go to <u>DTC C0690</u>	Go to Step 10
10	Does the scan tool display any of the following DTCs C0575, C0580, C0585 or C0590?	Go to Step 11	Go to <u>Diagnostic Trouble Code (DTC) List</u>
11	1. Visual inspect the electrical connections at the suspect shock. 2. Disconnect the suspension damper solenoid connector of the suspect shock and inspect the connector. 3. Connect the connector. IMPORTANT: Do not turn the ignition OFF after clearing the DTCs. 4. Use the scan tool in order to clear the DTCs. 5. With the scan tool, command all the dampers ON and OFF 5 times or continuously for 1 minute. 6. Select the ESC module display DTCs function on the scan tool. Does the DTC reset?	Go to <u>Diagnostic Trouble Code (DTC) List</u>	Go to <u>Symptoms - Electronic Suspension Control</u>

SCAN TOOL OUTPUT CONTROLS

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Use the scan tool Special Functions in order to perform certain tests and functions in the electronic suspension control (ESC) system and the automatic level control (ALC) system. The SERVICE RIDE CONTROL message can also be turned On and Off in the message center in the I/P. The table below lists the tests and functions that are available for the ESC system. The tests and functions are listed in alphabetical order.

Electronic Suspension Control Module

Scan Tool Output Control	Additional Menu Selection(s)	Description
ALC Trim Set	-	Performs the trim set of the ALC system.
Compressor Test	-	Commands the ALC compressor On and Off.
Exhaust Solenoid	-	Commands the compressor exhaust solenoid On and Off.
Left Front Solenoid Valve Test	-	Commands the suspension damper solenoid ON and OFF.
Left Rear Solenoid Valve Test	-	Commands the suspension damper solenoid ON and OFF.
Ride Control Lamp Test	-	Commands the ride control lamp ON and OFF.
Right Front Solenoid Valve Test	-	Commands the suspension damper solenoid ON and OFF.
Right Rear Solenoid Valve Test	-	Commands the suspension damper solenoid ON and OFF.

SCAN TOOL DATA LIST

The electronic suspension control (ESC) scan tool data list contains all the electronic suspension control system related parameters that are available on the scan tool. The parameters in the list are arranged in alphabetical order. The column, Data List, indicates the location of the parameter within the scan tool menu selections.

Use the ESC scan tool data list as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all of the diagnostic procedures with the Diagnostic System Check. Use the ESC scan tool data list only after the following is determined:

- The ESC Diagnostic System Check is complete.
- The on board diagnostics are operating correctly.
- No diagnostic trouble codes (DTCs) are displayed.

The typical scan tool data values are an average of the displayed values recorded from normally operating vehicles. The typical scan tool data values are intended to represent what a normally functioning system would display with certain preliminary settings. The values you get may vary slightly due to a low battery charge or other reasons. But the values should be very close.

Use only the parameters listed in the tables for diagnosis. If a scan tool reads other parameters, the values are not recommended for use in diagnosis. Refer to **Scan Tool Data Definitions** for further detailed information.

Data Display

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The scan tool's input display function can be helpful in determining if the electronic suspension control (ESC) module is receiving the correct input status. This can assist in determining if the ESC system is actually commanding a suspension damper solenoid.

Cycle Outputs

A scan tool may be used in order to command the suspension damper solenoids and SERVICE RIDE CONTROL message ON or OFF. This can be very helpful in determining if a certain portion of a circuit or a component is in working order. The following tests are available under the Special Functions selection. The following can be commanded ON or OFF:

- Suspension damper solenoids
- SERVICE RIDE CONTROL message

Electronic Suspension Control (ESC) Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Park brake set with the ignition switch ON/Ignition Switch in RUN/Engine running/Automatic Transmission in PARK/Air Conditioning is OFF			
Battery Voltage Signal	Data	Volts	12.0-14.7 Volts - varies with the vehicle
Compressor Signal, if equipped	Data	ON/OFF	OFF
Digital SWPS Phase A	Data	High/Low	Low
Digital SWPS Phase B	Data	High/Low	Low
Exhaust Signal, if equipped	Data	ON/OFF	OFF
Left Front Damper Actuator	Data	ON/OFF	OFF
Left Rear Damper Actuator	Data	ON/OFF	OFF
LF Position Sensor	Data	Volts	0.25 to 4.75
LR Position Sensor	Data	Volts	0.25 to 4.75
Marker Pulse	Data	High/Low	Low
Rear Leveling Air Pressure, if equipped	Data	PSI	-16.0 to 187.8
Rear Leveling Air Pressure, if equipped	Data	Volts	0.15 to 4.85
Right Front Damper Actuator	Data	ON/OFF	OFF
Right Rear Damper Actuator	Data	ON/OFF	OFF
RF Position Sensor	Data	Volts	0.25 to 4.75
RR Position Sensor	Data	Volts	0.25 to 4.75
Sensor Supply Voltage	Data	Volts	4.85
Vehicle Speed	Data	MPH	0

SCAN TOOL DATA DEFINITIONS

The electronic suspension control (ESC) scan tool data display values and definition information that can assist

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in diagnosing ESC related problems, especially when no diagnostic trouble codes (DTC) are stored in memory. A vehicle's scan tool data can be compared with the data display values from a known good vehicle in the scan tool data display table. When data from the vehicle differs from the typical data display value, the data definition information will help in understanding the nature of the difference and the source of the problem. This list is in alphanumeric order.

Data Definitions

Battery Voltage Signal-Range 10.0-16.0 Volts

This data refers to the battery system voltage as measured by the suspension control module.

Compressor Signal, if equipped - ON/OFF

This data indicates when the compressor relay is activated.

Digital SWPS Phase A-High/Low

This data indicates the state of phase A in the steering wheel position sensor.

Digital SWPS Phase B-High/Low

This data indicates the state of phase B in the steering wheel position sensor.

Exhaust Signal, if equipped - ON/OFF

This data indicates when the exhaust solenoid is commanded On or Off.

Left Front Damper Actuator-ON/OFF

This data refers to the state of the suspension damper solenoid contained within the shock absorber.

Left Rear Damper Actuator-ON/OFF

This data refers to the state of the suspension damper solenoid contained within the shock absorber.

LF Position Sensor-Range 0.25-4.75 volts

This data refers to the vehicle height measured in volts.

LR Position Sensor-Range 0.25-4.75 volts

This data refers to the vehicle height measured in volts.

Marker Pulse-High Low

This data indicates the state of marker pulse in the steering wheel position sensor.

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Rear Leveling Air Pressure, if equipped - psi/kpa

This data indicates the system pressure in psi.

Rear Leveling Air Pressure, if equipped - Volts

This data indicates the system pressure in volts.

Right Front Damper Actuator-ON/OFF

This data refers to the state of the suspension damper solenoid contained within the shock absorber.

Right Rear Damper Actuator-ON/OFF

This data refers to the state of the suspension damper solenoid contained within the shock absorber.

RF Position Sensor-Range 0.25-4.75 volts

This data refers to the vehicle height measured in volts.

RR Position Sensor-Range 0.25-4.75 volts

This data refers to the vehicle height measured in volts.

Sensor Supply Voltage - Volts

This data indicates the voltage being supplied to the sensors from the ESC module.

Vehicle Speed - Range -193 km/h (0-120 mph)

This is the ESC module measurement of the vehicle's speed from a discrete output from the powertrain control module (PCM).

DIAGNOSTIC TROUBLE CODE (DTC) LIST

DIAGNOSTIC TROUBLE CODE (DTC) LIST

DTC	Description	Module
<u>C0455</u>	Steering Position Sensor Circuit Malfunction (VES)	ESC
<u>C0550</u>	ECU Malfunction	ESC
<u>C0551</u>	Option Configuration Error	ESC
<u>C0575</u>	Left Front Solenoid Circuit	ESC
<u>C0580</u>	Right Front Solenoid Circuit	ESC
<u>C0585</u>	Left Rear Solenoid Circuit	ESC
<u>C0590</u>	Right Rear Solenoid Circuit	ESC
<u>C0615</u>	Left Front Position Sensor Circuit	ESC

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C0620	Right Front Position Sensor Circuit	ESC
C0625	Left Rear Position Sensor Circuit	ESC
C0630	Right Rear Position Sensor Circuit	ESC
C0690	Damper Control Relay Circuit Malfunction	ESC
C0870	Device Voltage Reference Output 1 Circuit Malfunction	ESC

DTC C0455: STEERING POSITION SENSOR CIRCUIT MALFUNCTION (VES)

Circuit Description

The digital steering wheel position sensor inputs to the electronic suspension control (ESC) module consists of 3 digital input circuits, phase A, phase B and index marker pulse. The steering wheel position sensor supply voltage is between 4.9-5.1 volts. The information that the ESC module receives from the steering wheel position sensor is used to calculate steering angle, steering velocity and lateral acceleration. These values are used in the control of the suspension dampers.

The digital steering wheel position sensor phase A and phase B circuits are digital pulse signals whose output represents one degree of steering wheel rotation. When observing the phase A data and the phase B data parameters on the scan tool, the parameters will not have the same value at the same time. When the steering wheel is rotated, the phase A data and the phase B data parameters will be shown as high or low on the scan tool.

The index marker pulse is a digital pulse that is displayed as high on the scan tool for 20 degrees only when the steering wheel angle is between -10 and +10 degrees.

Conditions for running the DTC

Turn ON the ignition, with engine ON.

Conditions for Setting the DTC

- The index marker pulse data parameter is high for less than 20 degrees of the steering wheel angle.
- The index marker pulse data parameter is high for greater than 20 degrees of the steering wheel angle.
- The index marker pulse data parameter is high when the steering wheel angle parameter is greater than +90 degrees.
- The index marker pulse data parameter is high when the steering wheel angle parameter is less than -90 degrees.
- The steering wheel position sensor phase A circuit is shorted to ground, open or shorted to voltage.
- The steering wheel position sensor phase B circuit is shorted to ground, open or shorted to voltage.
- The index marker pulse is shorted to ground, open or shorted to voltage.

Action Taken When the DTC Sets

- The code is displayed on the scan tool as DTC C0455.
- The suspension control defaults to firm.

Conditions for Clearing the DTC

- Conditions for DTC are not currently present.
- The module receives a clear code command from the scan tool.
- The DTC clears after 100 malfunction free ignition cycles.

Diagnostic Aids

The following conditions are possible causes:

- A malfunctioning steering wheel position sensor is present.
- A steering wheel position sensor circuit is open.
- A steering wheel position sensor circuit was shorted.

Perform an inspection of the wiring and of the connectors. Failure to carefully inspect the wiring and the connectors may result in misdiagnosis. Misdiagnosis causes part replacement with reappearance of the malfunction.

Steering Wheel Position Sensor - Digital Signal

- 3 outputs used - Phase A, Phase B, Index Marker Pulse
- Phase A & Phase B

Offset PWM wave forms created when turning the wheel

- Index marker pulse

Signal is present only when steering wheel is within 10 degrees either side of center

Output is used to determine Direction of Rotation and Rate of Rotation

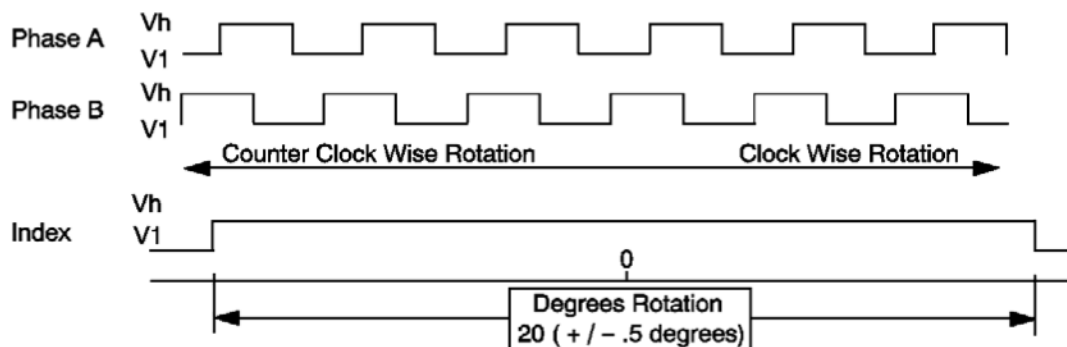


Fig. 12: Steering Wheel Position Sensor-Digital Signal

Courtesy of GENERAL MOTORS CORP.

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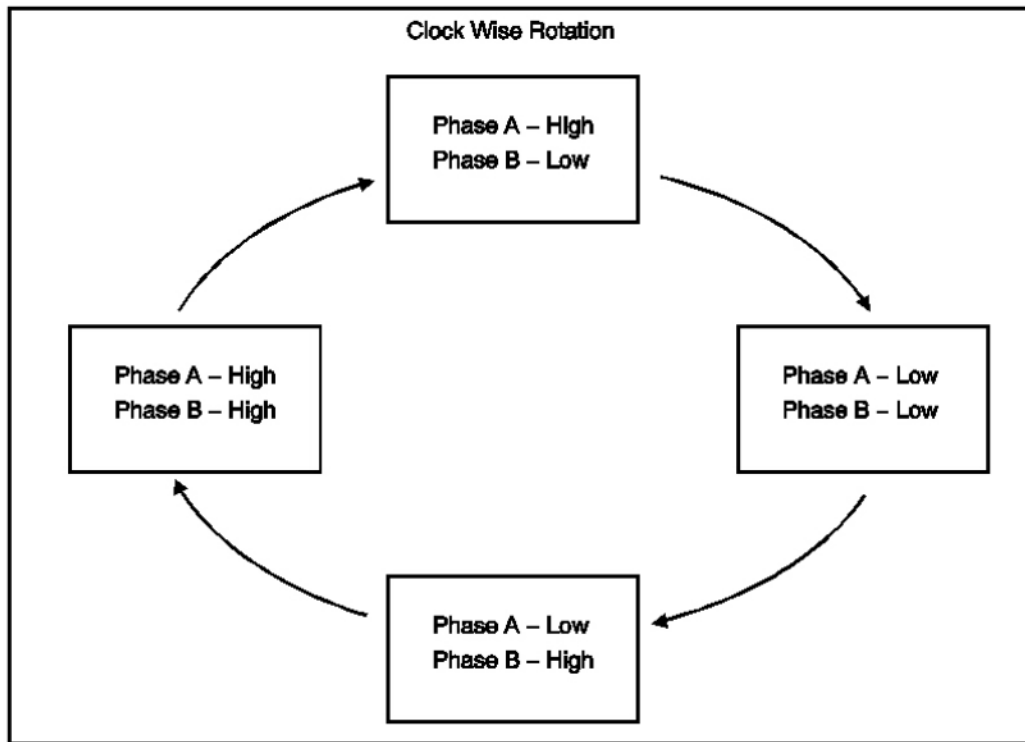


Fig. 13: Steering Wheel Position Sensor-A and B Phase
Courtesy of GENERAL MOTORS CORP.

Test Description

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

- 3: Test for the proper operation of the phase A circuit.
- 5: Test for the proper operation of the phase B circuit.
- 7: Test for the proper operation of the index marker pulse circuit.

DTC C0455

Step	Action	Values	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 <u>Diagnostic System Check - Electronic Suspension</u>

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			Go to Step 2	<u>Control</u>
2	1. Install a scan tool. 2. Turn the ignition switch to the ON position, with the engine ON. 3. With a scan tool observe the phase A, the phase B and index marker pulse parameters while slowly turning the steering wheel to the left and to the right. Do all of the parameters change?	-	Go to Diagnostic Aids	Go to Step 3
3	With a scan tool, observe the phase A parameter, while turning the steering wheel. Does the phase A data parameter change state?	high/low	Go to Step 5	Go to Step 4
4	Does the scan tool indicate that the phase A data parameter is high?	-	Go to Step 10	Go to Step 9
5	With a scan tool, observe the phase B parameter, while turning the steering wheel. Does the phase B data parameter change state?	high/low	Go to Step 7	Go to Step 6
6	Does the scan tool indicate that the phase B data parameter is high?	-	Go to Step 10	Go to Step 9
7	With a scan tool, observe the index marker pulse data parameter while turning the steering wheel. Does the index marker pulse data parameter change state?	high/low	Go to Step 15	Go to Step 8
8	Does the scan tool indicate that the index marker pulse data parameter is high?	-	Go to Step 10	Go to Step 9
9	Test the steering wheel position sensor phase A, phase B or index marker pulse circuit 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 15	Go to Step 11
10	Test the steering wheel position sensor phase A, phase B or index marker pulse circuit for an open or 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 15	Go to Step 11
11	Inspect for poor connections at the harness connector of the digital steering wheel position sensor connector. 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 15	Go to Step 13
	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing</u>			

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12	for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	-	Go to Step 15	Go to Step 14
13	Replace the digital steering wheel position sensor. Refer to Steering Wheel Position Sensor or Steering Shaft Lower Bearing Replacement in Steering Wheel and Column. Did you complete the replacement?	-	Go to Step 15	-
14	Replace the electronic ESC module. Refer to Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade) Electronic Suspension Control Module Replacement (Escalade EXT) . Did you complete the replacement?	-	Go to Step 15	-
15	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0550: ECU MALFUNCTION

Circuit Description

The electronic suspension control (ESC) module performs internal checks on hardware and software calibrations to ensure valid operation.

Conditions for Running the DTC

Upon key on with the ignition in the ON/RUN position.

Conditions for Setting the DTC

The ESC module detects an error with its microprocessor.

Action Taken When the DTC Sets

- Disable all functions, rear leveling and ESC.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0550 in the ESC module memory.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Program the ESC module and cycle the ignition Off and On to see if DTC C0550 resets. Repeat 2 times before replacement.
- The replacement ESC module must be programmed when replacement is necessary.

Test Description

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

2: Checking to verify the DTC will not reset.

3: Replace the ESC module and program.

DTC C0550

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the ESC Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Use the scan tool in order to clear the DTCs. 2. Use the scan tool to perform the programming procedure for the ESC module, located under SPECIAL FUNCTIONS - Recalibration. Also perform the ALC trim set, located under SPECIAL FUNCTIONS - ALC Trim set, if applicable. 3. Turn OFF the ignition and wait 45 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Select the ESC module display DTCs function on the scan tool. Does the scan tool display DTC C0550?	Go to Step 3	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
3	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade) Electronic Suspension Control Module Replacement (Escalade EXT)</u> . Did you complete the replacement?	System OK	-

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DTC C0551: OPTION CONFIGURATION ERROR

Circuit Description

The electronic suspension control (ESC) module performs internal checks on the software calibrations contained in the EEPROM to ensure valid operation.

Conditions for Running the DTC

Upon key on and reset.

Conditions for Setting the DTC

The ESC module detects internal problems with software calibrations.

Action Taken When the DTC Sets

- Disable all functions, Rear Leveling and ESC.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0551 in the ESC module memory.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Program the ESC module twice before replacement and cycle the ignition off and on to see if the DTC C0551 resets.
- The replacement ESC module must be programmed when replacement is necessary. If the ESC module is not programmed after replacement, DTC C0551 is stored in the ESC module memory and will not clear until the module is programmed.

Test Description

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

2: Checks for other stored DTCs.

3: Checking to verify the DTC will not reset.

DTC C0551

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

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1		Go to Step 2	<u>System Check - Electronic Suspension Control</u>
2	1. Connect a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Select the ESC module display DTCs function on the scan tool. Are there any other DTCs than C0551?	Go to <u>Diagnostic Trouble Code (DTC) List</u>	Go to Step 3
3	1. Use the scan tool in order to clear the DTCs. 2. Use the scan tool to perform the programming procedure for the ESC module, located under SPECIAL FUNCTIONS - Recalibration. Also perform the ALC trim set, located under SPECIAL FUNCTIONS - ALC Trim set, if applicable. 3. Road test the vehicle. 4. Select the ESC module display DTCs function on the scan tool. Does the scan tool display DTC C0551?	Go to Step 4	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
4	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade) Electronic Suspension Control Module Replacement (Escalade EXT)</u> . Did you complete the replacement?	System OK	-

DTC C0575: LEFT FRONT SOLENOID CIRCUIT; C0580: RIGHT FRONT SOLENOID CIRCUIT; C0585: LEFT REAR SOLENOID CIRCUIT; C0590: RIGHT REAR SOLENOID CIRCUIT

Circuit Description

The suspension damper solenoid is driven ON and OFF by the electronic suspension control (ESC) module. To activate the suspension damper solenoid it is initially subjected to full battery voltage for a short period of time. Once the suspension damper solenoid is pulled-in the supply voltage is pulse width modulated (PWM). The amount the suspension damper solenoid valve is activated is based on inputs from the driver Tow/Haul Switch, road inputs, position sensor inputs and the powertrain control module (PCM).

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC C0575 Left Front Solenoid Circuit

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- DTC C0580 Right Front Solenoid Circuit
- DTC C0585 Left Rear Solenoid Circuit
- DTC C0590 Right Rear Solenoid Circuit

Conditions for Running the DTC

The ESC module performs a test on each suspension damper solenoid during both the ON and OFF states.

Conditions for Setting the DTC

- A short to ground in the control circuit of the suspension damper solenoid
- A short to voltage in the control circuit of the suspension damper solenoid
- An open in the control circuit of the suspension damper solenoid
- An open in the solenoid low reference circuit of the suspension damper solenoid
- A short to voltage in the solenoid low reference circuit of the suspension damper solenoid

Action Taken When the DTC Sets

- The suspension damper solenoid will be disabled.
- All suspension damper solenoids will be disabled.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0575, C0580, C0585 or C0590 in the ESC module memory.

Conditions for Clearing the DTC

- The ESC module no longer detects a problem in the low reference circuit or the control circuit of the suspension damper solenoid.
- Using the scan tool.
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.

Diagnostic Aids

IMPORTANT: Ignition cycle counting is used by the ESC module to detect faults in the system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display the "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

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If DTC C0870 or C0690 is present, repair the malfunction for these DTCs before diagnosing DTC C0575, C0580, C0585 or C0590.

It may be necessary to check **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:** Tests for low reference circuit of the suspension damper solenoid. The ESC module supplies ground of the suspension damper solenoid.
- 3:** Verifies that the resistance of the suspension damper solenoid.
- 4:** Tests the control circuit to the suspension damper solenoid for an open and short to voltage.
- 5:** Tests the control circuit for a short to ground.
- 10:** Replace and program the ESC module.

DTC C0575, C0580, C0585, or C0590

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	IMPORTANT: If DTC C0870 or DTC C0690 is present, perform the diagnosis for these DTCs first. Did you perform the 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. Probe the low reference circuit of the suspension damper solenoid with a test lamp that is connected to a positive battery voltage circuit. Refer to <u>Circuit Testing</u> in Wiring Systems. Does the test lamp illuminate?	-	Go to Step 3	Go to Step 8
3	1. Turn OFF ignition. 2. Disconnect the suspension damper solenoid connector at the shock absorber. 3. Measure the resistance from the control circuit of the suspension damper solenoid to the low reference circuit of the suspension damper solenoid on the shock absorber. Does the resistance of the shock absorber measure within the specified value?	1.5-3.3 ohm	Go to Step 4	Go to Step 6

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4	Test the control circuit of the suspension damper solenoid for a short to voltage and 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 11	Go to Step 5
5	Test the control circuit of the suspension damper solenoid 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 11	Go to Step 7
6	Inspect for poor connections at the suspension damper solenoid. 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 11	Go to Step 10
8	Test the low reference circuit of the suspension damper solenoid for an open and short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
9	Replace the shock absorber. Refer to <u>Shock Absorber Replacement</u> in Front Suspension or <u>Shock Absorber Replacement (15 Series)</u> <u>Shock Absorber Replacement (25 Series)</u> in Rear Suspension. Did you complete the replacement?	-	Go to Step 11	-
10	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade)</u> <u>Electronic Suspension Control Module Replacement (Escalade EXT)</u> . Did you complete the replacement?	-	Go to Step 11	-
11	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to Step 2	System OK

DTC C0615: LEFT FRONT POSITION SENSOR CIRCUIT; C0620: RIGHT FRONT POSITION

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SENSOR CIRCUIT; C0625: LEFT REAR POSITION SENSOR CIRCUIT; C0630: RIGHT REAR POSITION SENSOR CIRCUIT

Circuit Description

The suspension position sensor provides an analog signal voltage between 0.25 and 4.75 volts to the electronic suspension control (ESC) module. This signal voltage represents the wheel's position relative to the body. The ESC module provides a reference and a low reference to the sensor.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC C0615 Left Front Position Sensor Circuit
- DTC C0620 Right Front Position Sensor Circuit
- DTC C0625 Left Rear Position Sensor Circuit
- DTC C0630 Right Rear Position Sensor Circuit

Conditions for Running the DTC

Under normal driving conditions.

Vehicle speed greater than 0 km/h (0 mph).

Conditions for Setting the DTC

The ESC module senses a position signal voltage below 0.25 volts or above 4.75 volts.

Action Taken When the DTC Sets

- All 4 suspension damper solenoids will be commanded to their OFF state.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0615, C0620, C0625 or C0630 in the ESC module memory.

Conditions for Clearing the DTC

- The ESC module no longer senses a position signal voltage out of range with vehicle speed greater than 0 km/h (0 mph).
- Using a scan tool.
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.

Diagnostic Aids

IMPORTANT: Ignition cycle counting is used by the ESC module to detect faults in the

system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

IMPORTANT: Before proceeding with the diagnosis, do a visual inspection of the mechanical aspects of the suspension position sensor and its components. Ensure the suspension position sensor and the suspension position sensor link is not bent, disconnected, or insulation on wires are not rubbed through or damaged in any way. If DTC C0870 is present, repair the malfunction for this DTC before diagnosing DTC C0615, C0620, C0625 or C0630.

- A faulty suspension position sensor voltage reading may result if the vehicle is or has been on a hoist that allows the suspension to hang free.
- The following conditions may cause the malfunction to occur:
 - A short to voltage on the 5-volt reference circuit
 - A short to ground on the 5-volt reference circuit
 - An open in the 5-volt reference circuit to the suspension position sensor
 - A short to voltage on the suspension position sensor signal circuit
 - A short to ground on the suspension position sensor signal circuit
 - An open in the suspension position sensor signal circuit
 - An open in the suspension position sensor low reference circuit
 - A malfunctioning suspension position sensor
 - A disconnected, bent or damaged suspension position sensor link

Test Description

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

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

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DTC C0615, C0620, C0625 or C0630

Step	Action	Value(s)	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>				
1	IMPORTANT: If DTC C0870 is present, perform the diagnosis for DTC C0870 first. 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 suspension position sensor data parameter in the ESC module data list. Does the scan tool indicate that the suspension position sensor data parameter is within the specified range?	0.25-4.75 V	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the suspension position sensor connector. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the suspension position sensor data parameter. Does the scan tool indicate that the suspension position sensor data parameter is less than the specified value?	0.25 V	Go to Step 4	Go to Step 8
4	Measure the voltage between the 5-volt reference circuit of the position sensor and a good ground. Does the voltage measure near the specified value?	5 V	Go to Step 5	Go to Step 6
5	1. Turn OFF the ignition. 2. Connect a 3 amp fused jumper wire between the 5 volt reference circuit of the suspension position sensor and the signal circuit of the suspension position sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the suspension position sensor data parameter.	4.75 V		

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	Does the scan tool indicate that the suspension position sensor data parameter is greater than the specified value?		Go to Step 7	Go to Step 9
6	Does the voltage measure greater than specified value?	5.75 V	Go to Step 10	Go to Step 11
7	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 of the position sensor. Does the voltage measure less than the specified value.	3.5 V		
			Go to Step 12	Go to Step 13
8	Test the signal circuit of the suspension position sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 17	Go to Step 14
9	Test the signal circuit of the suspension position sensor for the following: 1. An open 2. A high resistance 3. 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 17	Go to Step 14
10	Test the 5-volt reference circuit of the suspension position sensor for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	-	Go to Step 17	Go to Step 14
11	Test the 5-volt reference circuit of the suspension position sensor for the following: • An open • A high resistance • 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 17	Go to Step 14

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12	Test the low reference circuit of the suspension position sensor for high resistance or a 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 17	Go to Step 14
13	Inspect for poor connections at the harness connector of the suspension 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 17	Go to Step 15
14	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 17	Go to Step 16
15	Replace the suspension position sensor. Refer to <u>Front Position Sensor Link Assembly Replacement - Electronic Suspension</u> , <u>Rear Position Sensor Replacement - Electronic Suspension - Left (15 Series)</u> <u>Rear Position Sensor Replacement - Electronic Suspension - Left (25 Series)</u> or <u>Rear Position Sensor Replacement - Electronic Suspension - Right</u> . Did you complete the replacement?	-	Go to Step 17	-
16	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade)</u> <u>Electronic Suspension Control Module Replacement (Escalade EXT)</u> . Did you complete the replacement?	-	Go to Step 17	-
17	1. Reconnect any previously disconnected components. 2. Use the scan tool in order to clear the DTCs. 3. 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: DAMPER CONTROL RELAY CIRCUIT MALFUNCTION

Circuit Description

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The electronic suspension control (ESC) module provides a common low reference for all four of the suspension damper solenoids. The ESC module internally monitors the return voltage on the low reference circuit for a voltage out of range condition.

Conditions for Running the DTC

Continuously with the ignition on.

Conditions for Setting the DTC

The ESC module internally senses a low reference voltage out of range condition.

Action Taken When the DTC Sets

- Disable all suspension damper solenoid outputs.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0690 in the ESC module memory.

Conditions for Clearing the DTC

- The ESC module senses the correct voltage on the low reference circuit upon the next ignition cycle.
- Using a scan tool.
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.

Diagnostic Aids

IMPORTANT: Ignition cycle counting is used by the ESC module to detect faults in the system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display the "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

Most occurrences of this DTC are caused by connector C450 not full seated, backed out or has a bent terminal.

The following conditions may cause a malfunction to occur:

- An open in all four low reference circuits of the suspension damper solenoids
- An open in the solenoid ground circuit at the ESC module
- An open in G410 or SP410

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- An open in G304 or G305

Test Description

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

- 2: Tests whether the condition has been corrected or identified as specified in the supporting text.
- 3: Tests all 4 low reference circuits of the suspension damper solenoids for an open.
- 4: Tests all 4 control circuits of the suspension damper solenoids for an open.
- 5: Tests the solenoid ground circuit at the ESC module, should be less than 0.5 ohm.
- 7: Clear DTCs and checks to see if DTC will reset.

DTC C0690

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the ESC Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within normal operating conditions. Does the DTC reset?	Go to Step 3	Go to Diagnostic Aids
3	Test all 4 suspension damper solenoid low reference circuits for an open between the suspension damper solenoids and the ESC module. Refer to <u>Circuit Testing</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 7	Go to Step 4
4	Test all 4 suspension damper solenoid control circuits for an open between the suspension damper solenoids and the ESC module. Refer to <u>Circuit Testing</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 7	Go to Step 5
5	1. Turn OFF the ignition. 2. Disconnect the ESC module connectors. 3. Test the resistance of the solenoid ground circuit at the ESC module. The resistance should be less than 0.5 ohm. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 7	Go to Step 6

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

DTC C0870: DEVICE VOLTAGE REFERENCE OUTPUT 1 CIRCUIT MALFUNCTION

Circuit Description

The electronic suspension control (ESC) module provides a common regulated voltage of approximately 5 volts to all four of the body-to-wheel suspension position sensors and air pressure sensor. The ESC module monitors this reference voltage for any malfunctions that could prevent it from outputting a regulated 5 volts.

Conditions for Running the DTC

Continuously with the ignition on.

Conditions for Setting the DTC

The ESC module senses a sensor reference voltage of less than 4.0 volts or greater than 6.0 volts.

Action Taken When the DTC Sets

- Disable all compressor leveling functions, and assume default pressure.
- Disable all suspension damper solenoid outputs.
- The SERVICE RIDE CONTROL message will be displayed.
- Stores a DTC C0870 in the ESC module memory.

Conditions for Clearing the DTC

- The ESC module senses the correct voltage output to the suspension position sensors upon the next ignition cycle.
- Using a scan tool.
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.

Diagnostic Aids

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IMPORTANT: Ignition cycle counting is used by the ESC module to detect faults in the system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display the "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

- The following conditions may cause a malfunction to occur:
 - A short to voltage in any one of the body-to-wheel suspension position sensor reference voltage circuit
 - A short to ground in any one of the body-to-wheel suspension position sensor reference voltage circuit
- If the circuit is shorted to ground, the scan tool will display all suspension position sensor voltage as zero.
- If the circuit is shorted to an unwanted voltage source, the scan tool may display all suspension position sensor voltage as that voltage.
- A short to voltage in the 5 volt reference of the air pressure sensor
- A short to ground in the 5 volt reference of the air pressure sensor
- An intermittent malfunction or DTC may cause a random firm/soft ride condition.

Test Description

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

3: Tests all suspension position sensors reference voltage circuits.

4: Tests the 5 volt reference circuit of the air pressure sensor for a short to ground and a short to voltage.

6: Clear DTCs and checks to see if DTC will reset.

DTC C0870

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

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2	3. With a scan tool, observe the suspension position sensors and air pressure sensor 5 volt reference data parameters in the ESC module data list. Does the scan tool indicate that all the above mentioned data parameters are less than 4 volts or greater than 6 volts?	Go to Step 3	Go to Diagnostic Aids
3	Test all 4 body-to-wheel suspension position sensor 5 volt reference circuits for a short to ground and 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 6	Go to Step 4
4	Test the air pressure sensor 5 volt reference circuit for a short to ground and 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 6	Go to Step 5
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade)</u> <u>Electronic Suspension Control Module Replacement (Escalade EXT)</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

SYMPTOMS - ELECTRONIC SUSPENSION CONTROL

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

1. Perform the **Diagnostic System Check - Electronic Suspension Control** before using the symptom table 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 **Electronic Suspension Control Description and Operation** .

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the ESC System. Refer to **Checking**

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Aftermarket Accessories in Wiring Systems.

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the connectors to be properly seated and free of corrosion.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Check 38 way connector C405 for intermittents. Refer to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems.

Symptom List

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

- **Service Ride Control Indicator Always On**
- **Service Ride Control Indicator Inoperative**

SERVICE RIDE CONTROL INDICATOR ALWAYS ON

Service Ride Control Indicator Always On

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the ESC Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	Verify the fault is present. Does the system operate normally?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
3	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Using a scan tool, access the ESC Special Functions menu and command the SERVICE RIDE CONTROL message OFF. Does the message go off when commanded?	Go to Step 5	Go to Step 4
4	Replace the instrument cluster. Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the replacement?	Go to Step 6	-
	Replace the ESC module. Refer to Electronic		

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5	<u>Suspension Control Module Replacement (Tahoe/Yukon/Escalade) Electronic Suspension Control Module Replacement (Escalade EXT) .</u> Did you complete the replacement?	Go to Step 6	-
6	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

SERVICE RIDE CONTROL INDICATOR INOPERATIVE

Service Ride Control Indicator Inoperative

Step	Action	Yes	No
Schematic Reference: <u>Suspension Controls Schematics</u>			
1	Did you perform the ESC Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Electronic Suspension Control</u>
2	Verify the fault is present. Does the system operate normally?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems	Go to Step 3
3	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, in IPC, command the SERVICE RIDE CONTROL message ON. Does the message come on when commanded?	Go to Step 5	Go to Step 4
4	Replace the instrument cluster. Refer to <u>Instrument Panel Cluster (IPC) Replacement</u> in Instrument Panel, Gages and Console. Did you complete the replacement?	Go to Step 6	-
5	Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement (Tahoe/Yukon/Escalade) Electronic Suspension Control Module Replacement (Escalade EXT) .</u> Did you complete the replacement?	Go to Step 6	-
6	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

REPAIR INSTRUCTIONS

ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT (TAHOE/YUKON/ESCALADE)

Removal Procedure

1. Remove the right side interior trim panel. Refer to Trim Panel Replacement - Rear Quarter - Right (Utility) Trim Panel Replacement - Rear Quarter - Right (Suburban) in Interior Trim.

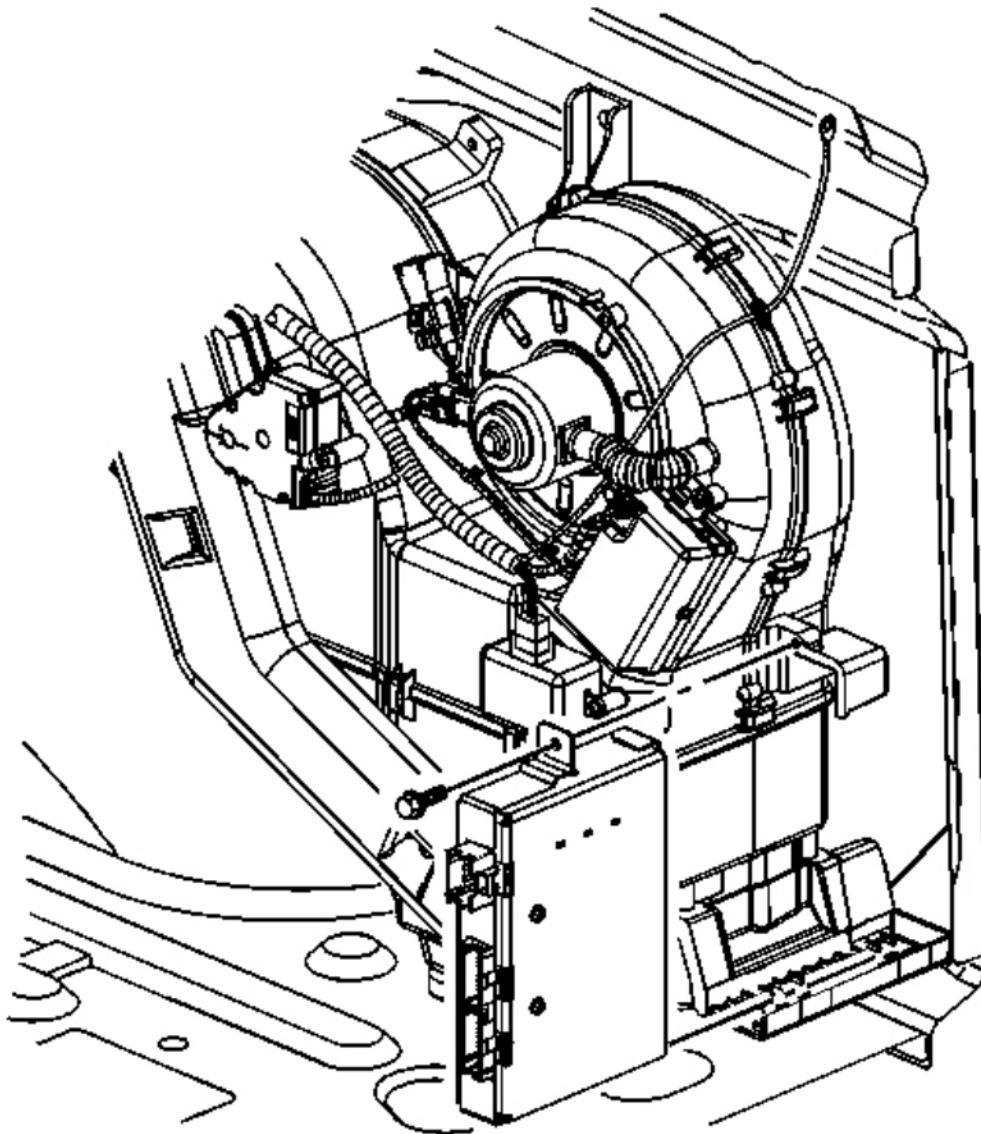


Fig. 14: Electronic Suspension Control Module (Tahoe/Yukon/Escalade)

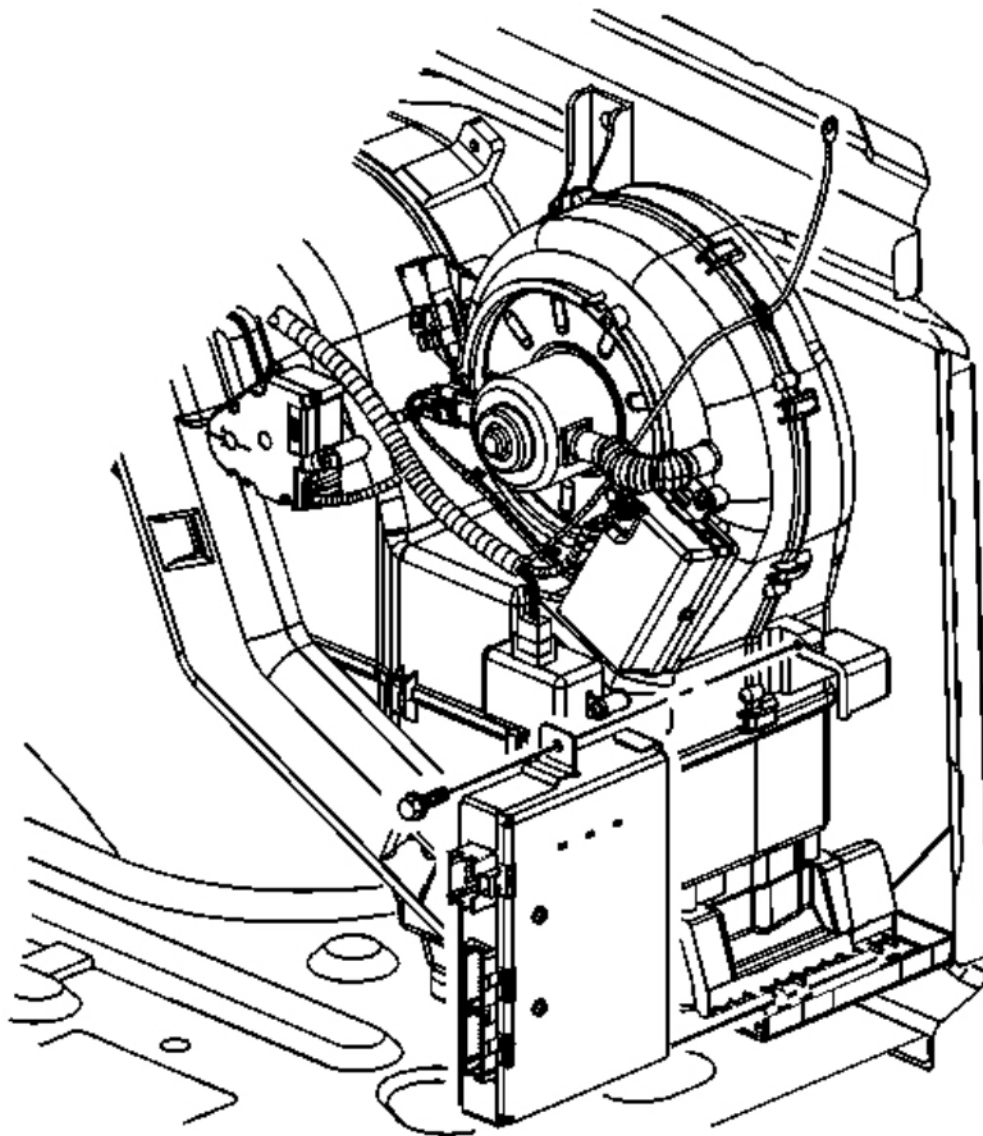
Courtesy of GENERAL MOTORS CORP.

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2. Disconnect the electrical connectors from the module.
3. Remove the screw.
4. Slide the module from the bracket and remove the module from the vehicle.

Installation Procedure



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Fig. 15: Electronic Suspension Control Module (Tahoe/Yukon/Escalade)
Courtesy of GENERAL MOTORS CORP.

1. Install the module to the vehicle by sliding the module into the bracket.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the screw.

Tighten: Tighten the screw to 1.6 N.m (14 lb in).

3. Connect the electrical connectors to the module.
4. If you are replacing the module you must recalibrate the module by performing the following procedure:
 - Connect the scan tool to the data link connector (DLC).
 - Turn the ignition ON with the engine OFF. Select the SPECIAL FUNCTIONS for the RTD module on the scan tool.
 - Select the Recalibration line under SPECIAL FUNCTIONS and follow the instructions on the scan tool and techline terminal to complete the RTD module programming.
 - After completion of programming, return to SPECIAL FUNCTIONS on the scan tool, select ALC Trimset and follow the instructions displayed to perform the ALC trimset.
5. Install the right side interior trim panel. Refer to **Trim Panel Replacement - Rear Quarter - Right (Utility)** **Trim Panel Replacement - Rear Quarter - Right (Suburban)** in Interior Trim.

ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT (ESCALADE EXT)

Removal Procedure

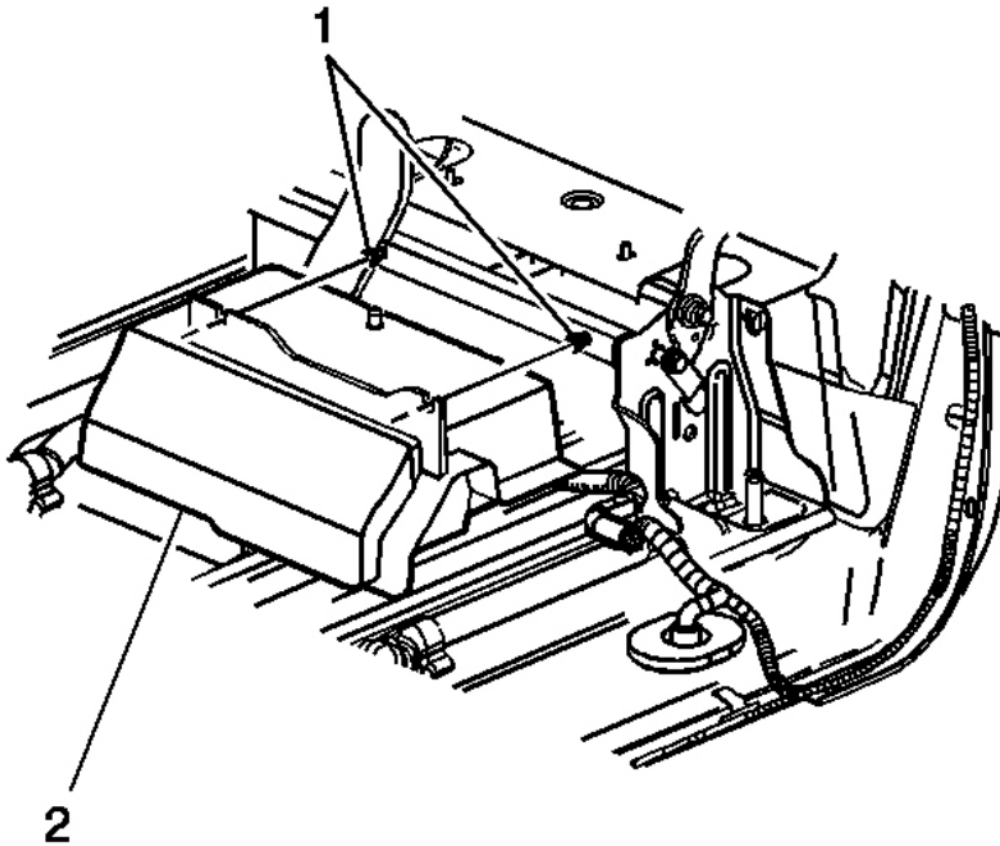


Fig. 16: Electronic Suspension Control Module Cover & Retainers (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

1. Pull up on the handle at the rear of the seat to gain access to the control module.
2. Remove the retainers (1) from the control module cover (2).

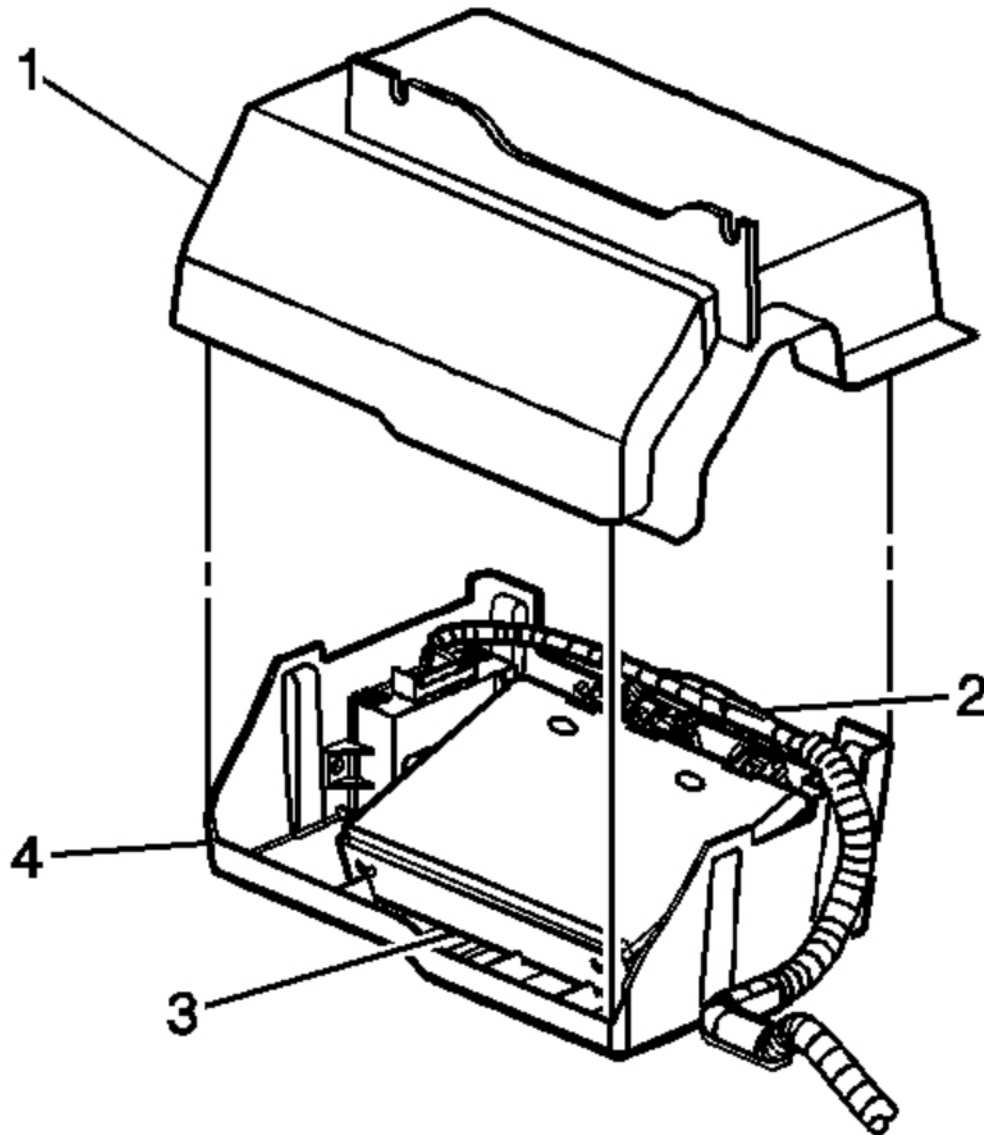


Fig. 17: Electronic Suspension Control Module, Cover & Wiring Harness (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

3. Remove the cover (1) from the vehicle.
4. Disconnect the wiring harness (2) from the control module (3).

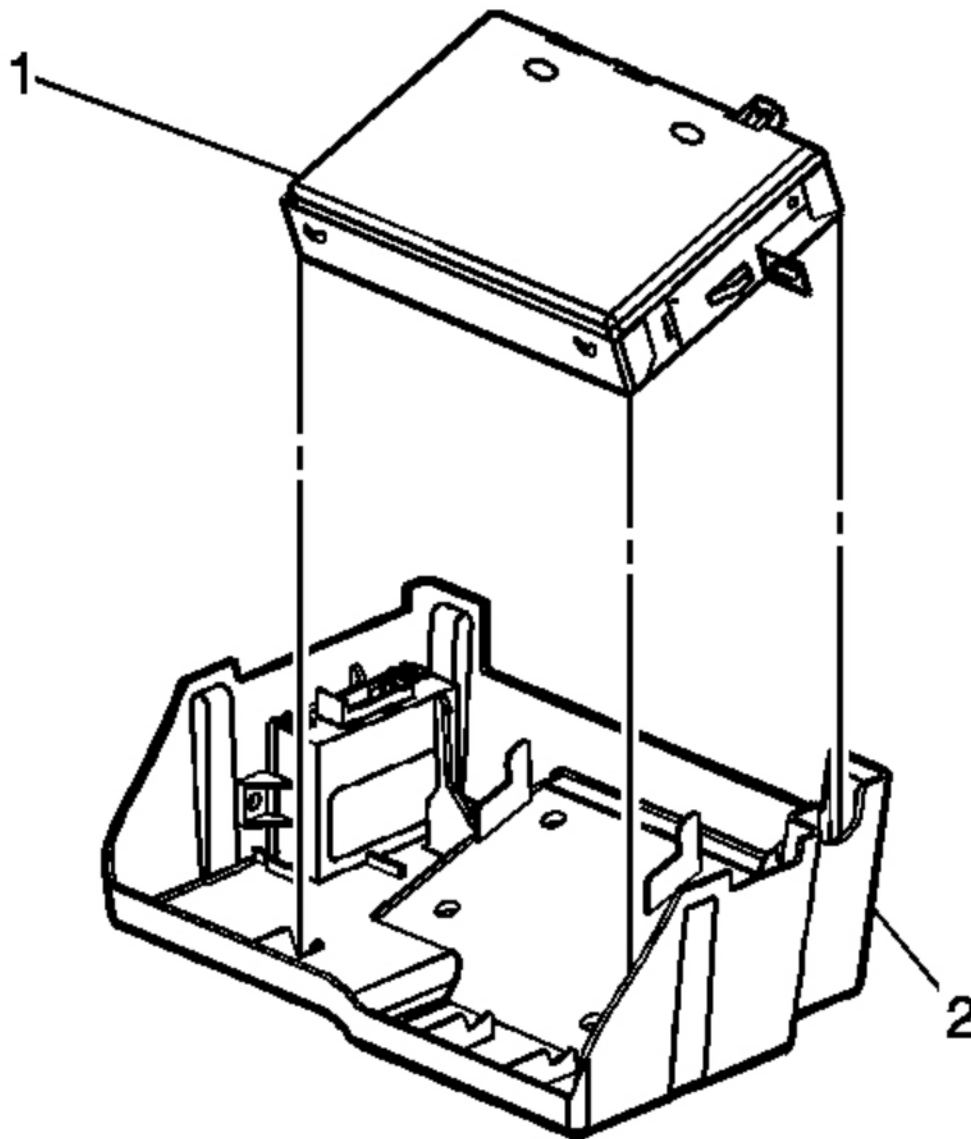


Fig. 18: Electronic Suspension Control Module (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

5. Remove the control module (1) from the vehicle.

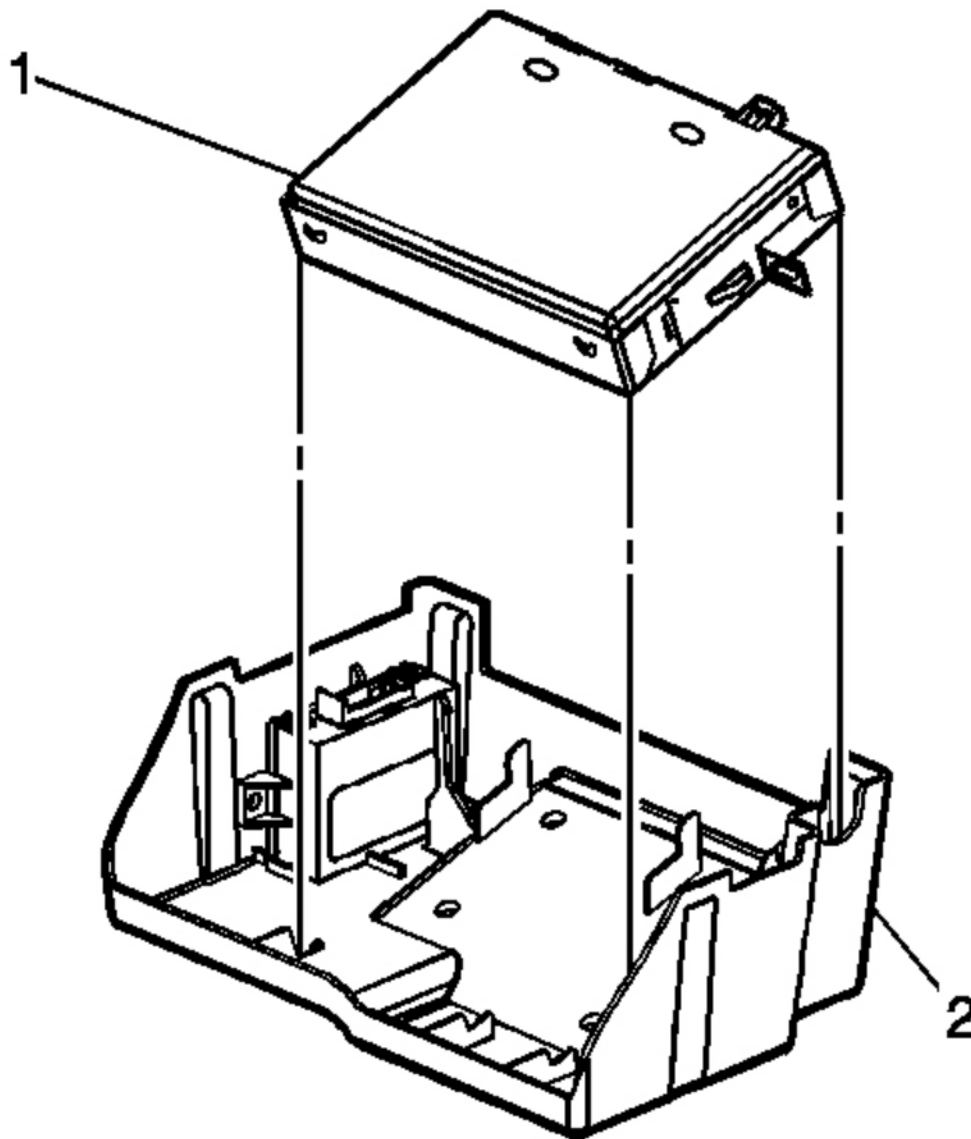


Fig. 19: Electronic Suspension Control Module (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

1. Install the control module (1) to the vehicle.

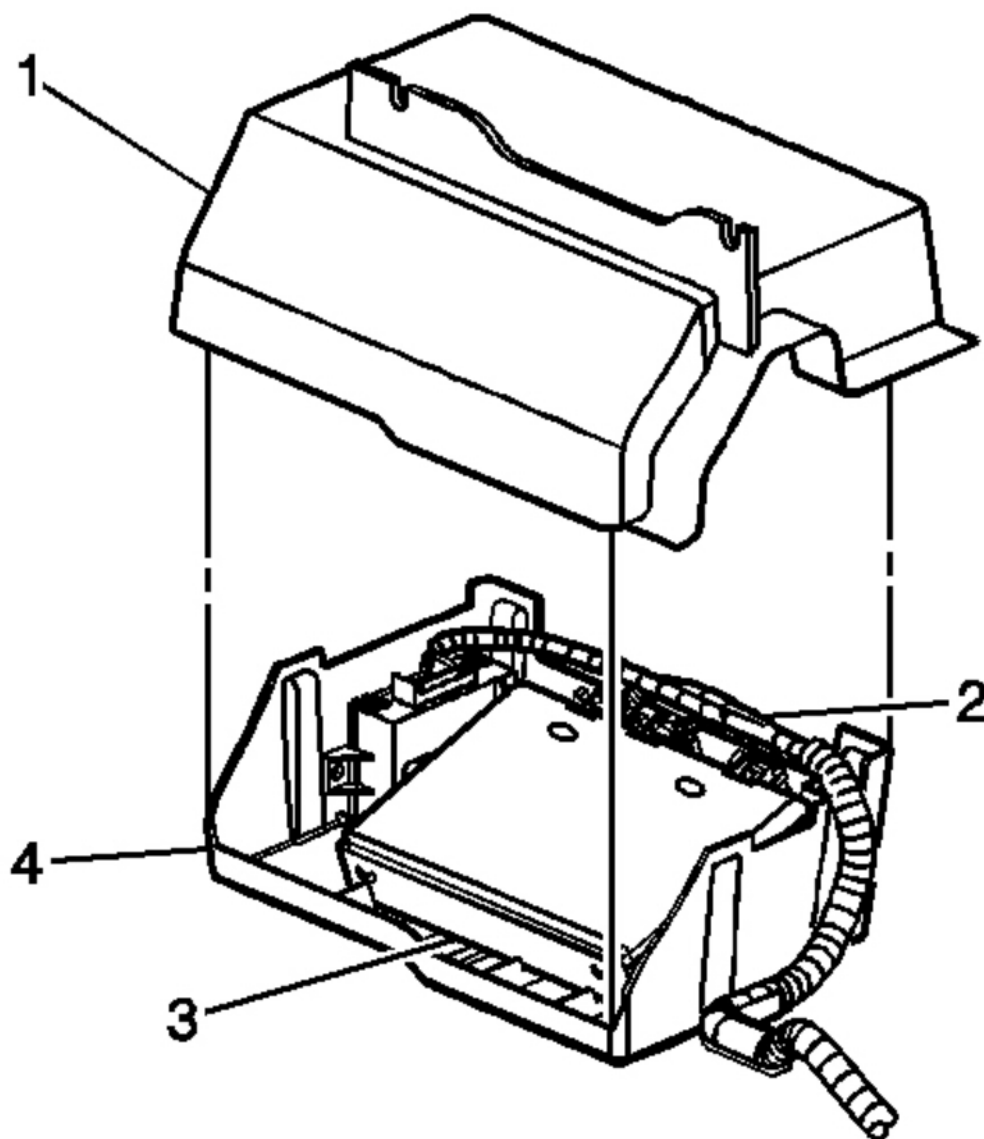


Fig. 20: Electronic Suspension Control Module, Cover & Wiring Harness (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If you are replacing the module, you must program the module by performing the following procedure.

2. Connect the wiring harness (2) to the control module (3).

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- Connect the scan tool to the data link connector (DLC).
 - Turn the ignition ON with the engine OFF. Select the SPECIAL FUNCTIONS for the RTD module on the scan tool.
 - Select the Recalibration line under SPECIAL FUNCTIONS and follow the instructions on the scan tool and techline terminal to complete the RTD module programming.
 - After completion of programming, return to SPECIAL FUNCTIONS on the scan tool, select ALC Trimset and follow the instructions displayed to perform the ALC trimset.
3. Install the cover (1) to the vehicle.

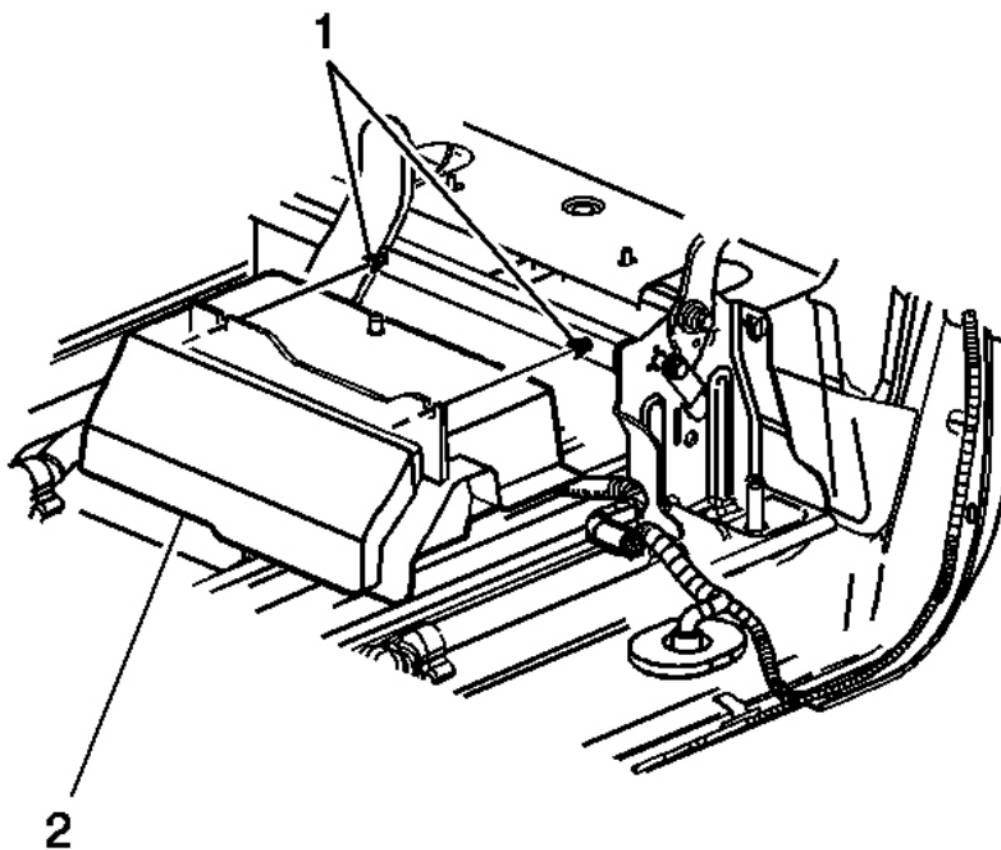


Fig. 21: Electronic Suspension Control Module Cover & Retainers (Escalade EXT)
Courtesy of GENERAL MOTORS CORP.

4. Install the retainers (1) to the control module cover (2).
5. Roll the seat downward in order to secure the seat in the original location.

FRONT POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION (15 SERIES)

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

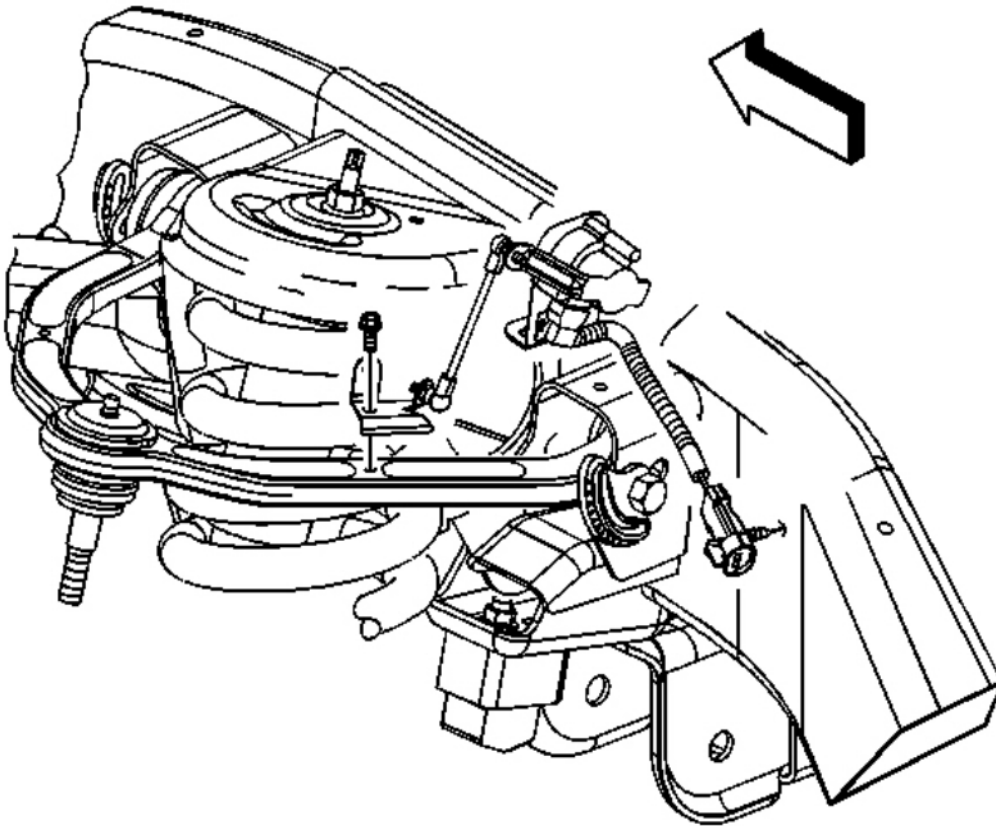


Fig. 22: Wheel Speed Sensor Wire & ESC Sensor Link Bracket Bolt At Upper Control Arm (15 series)

Courtesy of GENERAL MOTORS CORP.

2. Disconnect the sensor harness connector from the vehicle harness connector.
3. Remove the wheel speed sensor wire from the electronic suspension control (ESC) sensor bracket.
4. Remove the wheel speed sensor wire from the ESC sensor bracket.
5. Remove the ESC sensor link bracket bolt from the upper control arm.

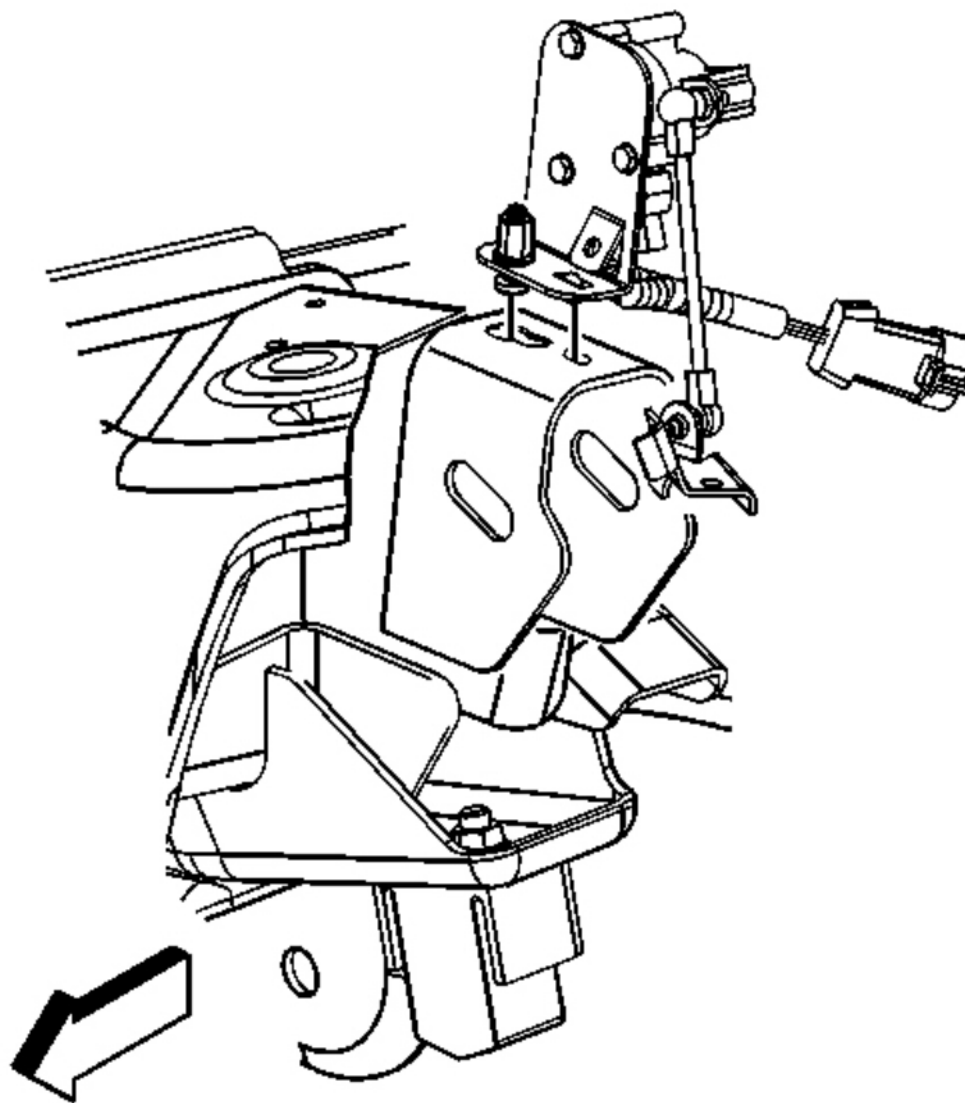


Fig. 23: Front Position Sensor & Bolt (15 series)
Courtesy of GENERAL MOTORS CORP.

6. Remove the bolt from the frame.
7. Remove the position sensor from the vehicle.

Installation Procedure

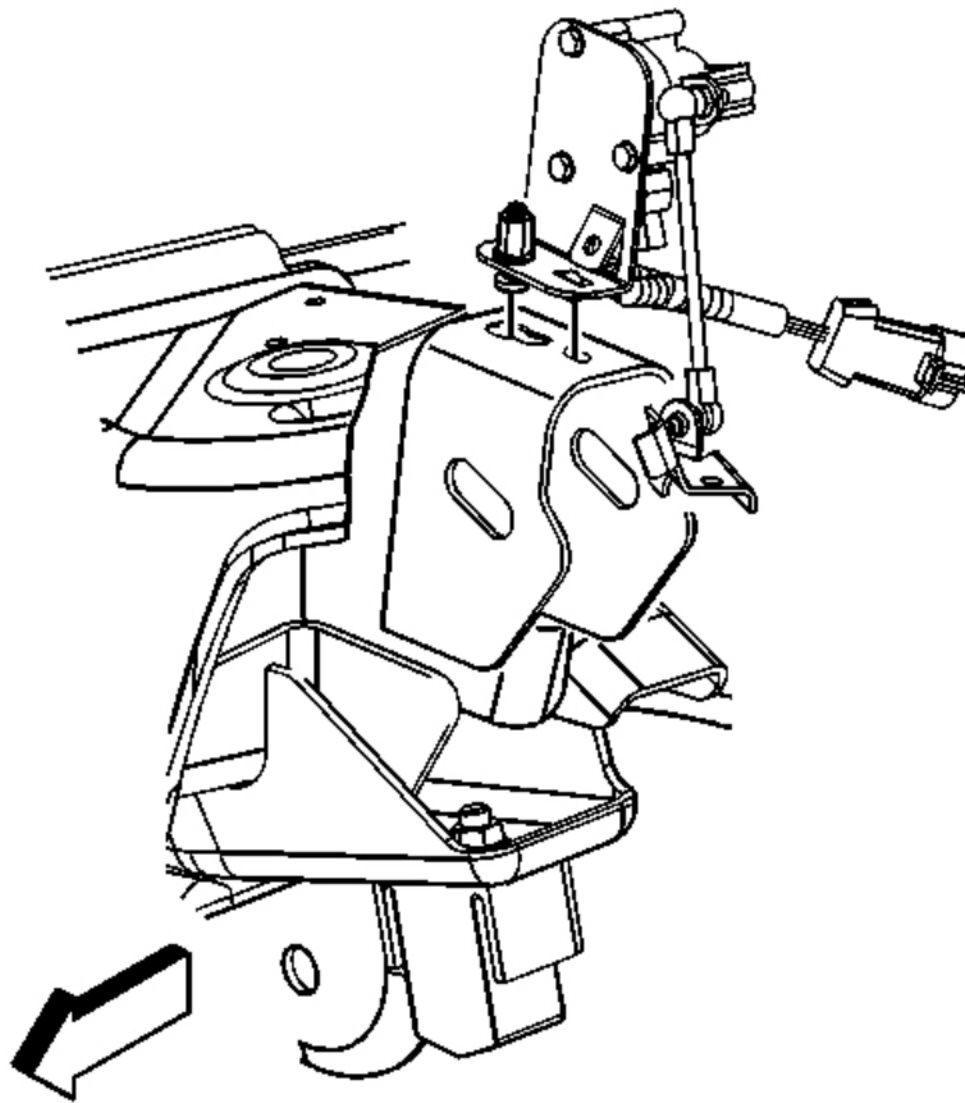


Fig. 24: Front Position Sensor & Bolt (15 series)
Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor on the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolt to the frame.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

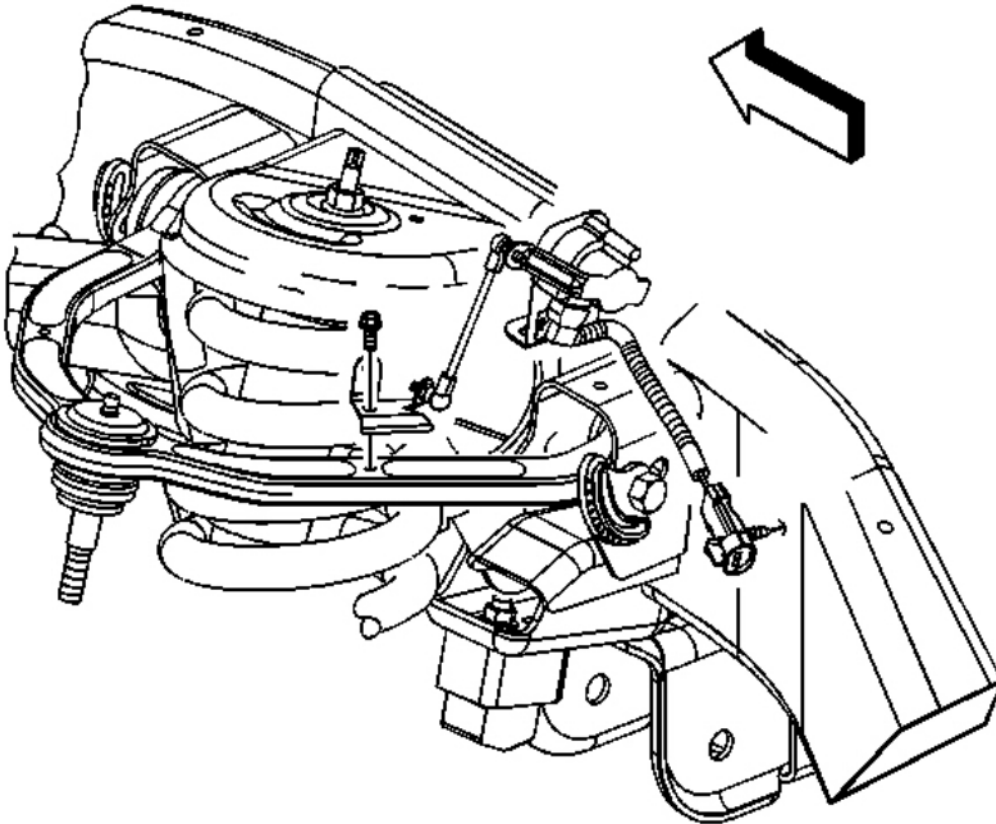


Fig. 25: Wheel Speed Sensor Wire & ESC Sensor Link Bracket Bolt At Upper Control Arm (15 series)

Courtesy of GENERAL MOTORS CORP.

3. Install the ESC sensor link bracket bolt to the upper control arm.

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

4. Install the wheel speed sensor wire from the ESC sensor bracket.
5. Install the wheel speed sensor wire to the ESC sensor bracket.
6. Connect the sensor harness connector to the vehicle harness connector.
7. Remove the safety stands.
8. Lower the vehicle.

FRONT POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION (25 SERIES 2WD)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

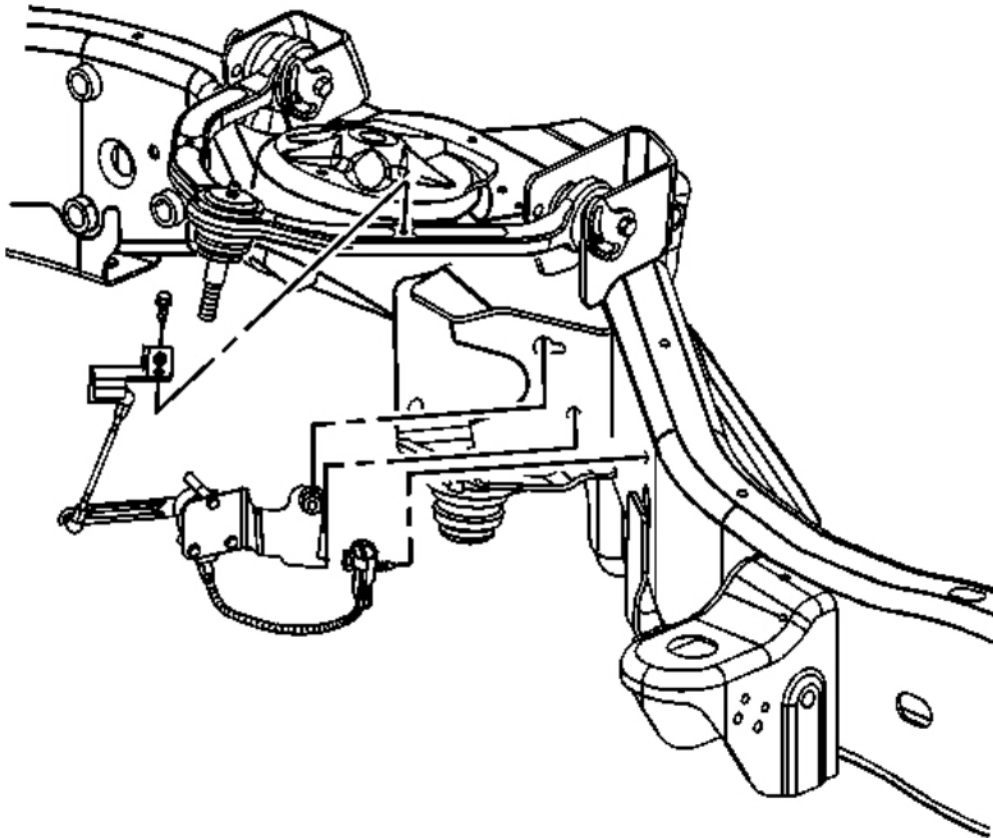


Fig. 26: Front Position Sensor & Bolt (25 Series 2WD)
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the sensor harness connector from the vehicle harness connector.
3. Remove the wheel speed sensor wire from the electronic suspension control (ESC) sensor bracket.
4. Remove the ESC sensor link bracket bolt from the upper control arm.
5. Remove the bolt from the frame.
6. Remove the position sensor from the vehicle.

Installation Procedure

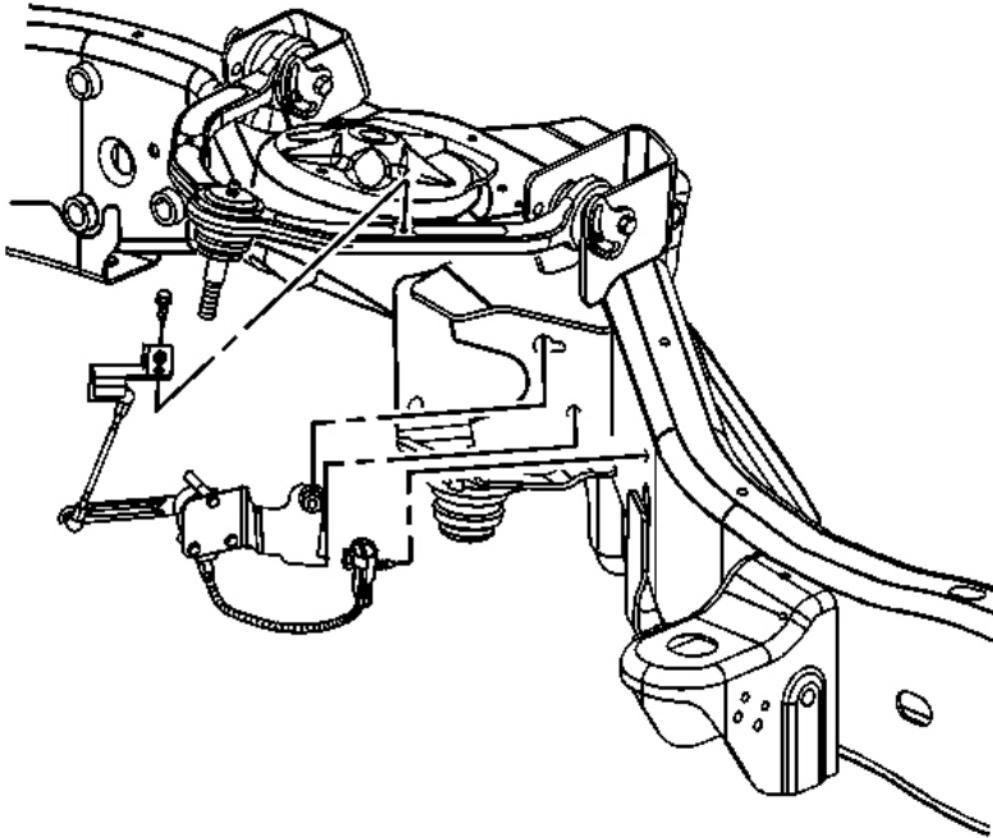


Fig. 27: Front Position Sensor & Bolt (25 Series 2WD)
Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor to the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolt to the frame.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

3. Install the ESC sensor link bracket bolt to the upper control arm.

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

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4. Connect the sensor harness connector to the vehicle harness connector.
5. Install the wheel speed sensor wire to the ESC sensor bracket.
6. Install the ESC sensor link bracket bolt to the upper control arm.
7. Lower the vehicle.

FRONT POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION (25 SERIES 4WD)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.

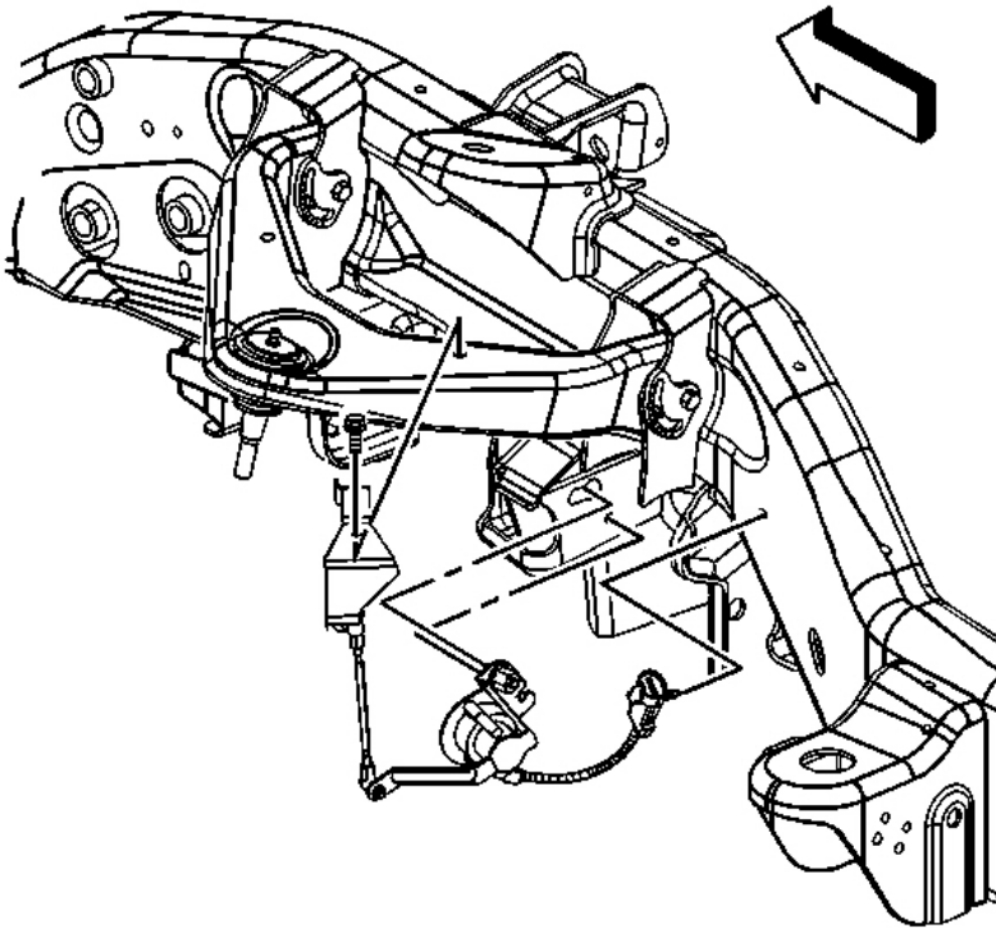


Fig. 28: Front Position Sensor Replacement (25 series 4WD)
Courtesy of GENERAL MOTORS CORP.

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2. Disconnect the sensor harness connector from the vehicle harness connector.
3. Remove the wheel speed sensor wire from the electronic suspension control (ESC) sensor bracket.
4. Remove the ESC sensor link bracket bolt from the upper control arm.
5. Remove the bolt from the frame.
6. Remove the position sensor from the vehicle.

Installation Procedure

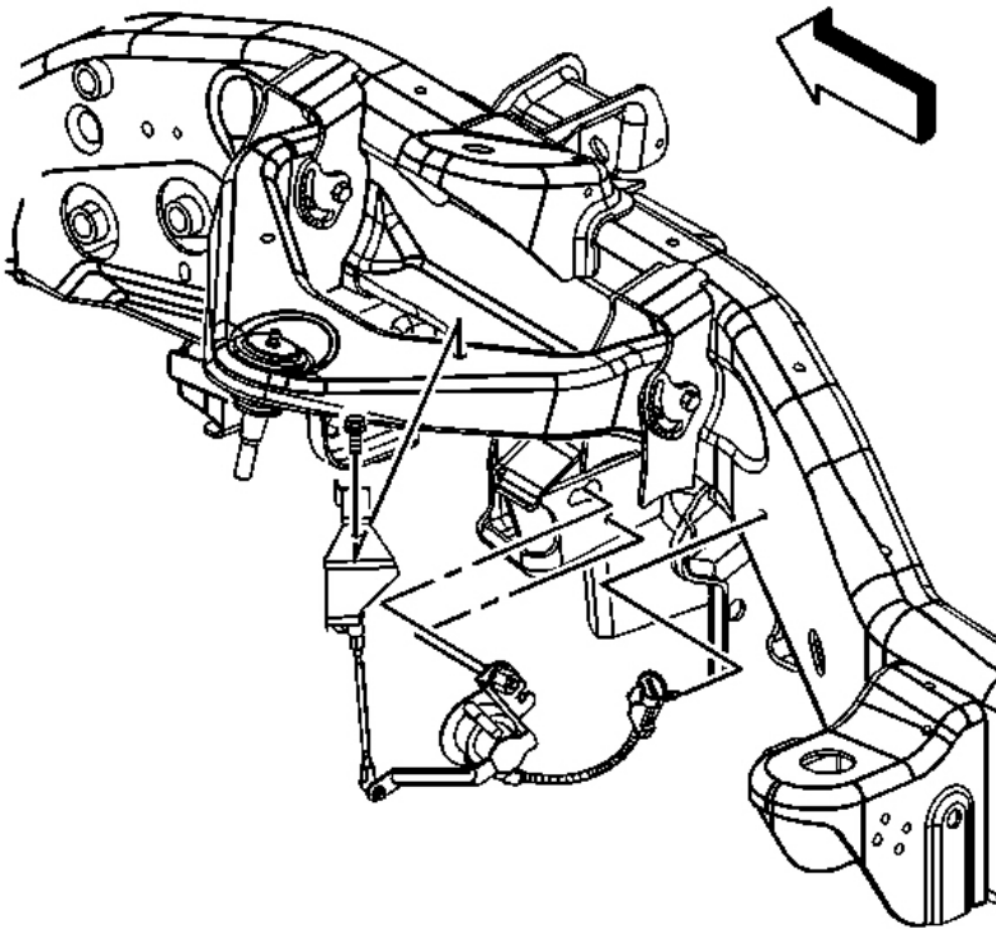


Fig. 29: Front Position Sensor Replacement (25 series 4WD)
Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor on the vehicle.

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NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolt to the frame.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

3. Install the ESC sensor link bracket bolt to the upper control arm.

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

4. Install the wheel speed sensor wire to the ESC sensor bracket.
5. Connect the sensor harness connector to the vehicle harness connector.
6. Lower the vehicle.

FRONT POSITION SENSOR LINK ASSEMBLY REPLACEMENT - ELECTRONIC SUSPENSION

Tools Required

J 38185 Spring Hose Clamp Pliers

Removal Procedure

IMPORTANT: Do not attempt to pry the link rod from the electronic suspension control (ESC) ball stud. If the link rod needs to be replaced or disconnected, you must use the following procedure.

1. Remove the ESC sensor from the vehicle. Refer to **Front Position Sensor Replacement - Electronic Suspension (15 series)** **Front Position Sensor Replacement - Electronic Suspension (25 series 2WD)** **Front Position Sensor Replacement - Electronic Suspension (25 series 4WD)** .
2. While supporting the sensor lever by hand, twist the link rod to remove it from the ball stud.
3. Remove the link rod from the mounting bracket ball stud.

Installation Procedure

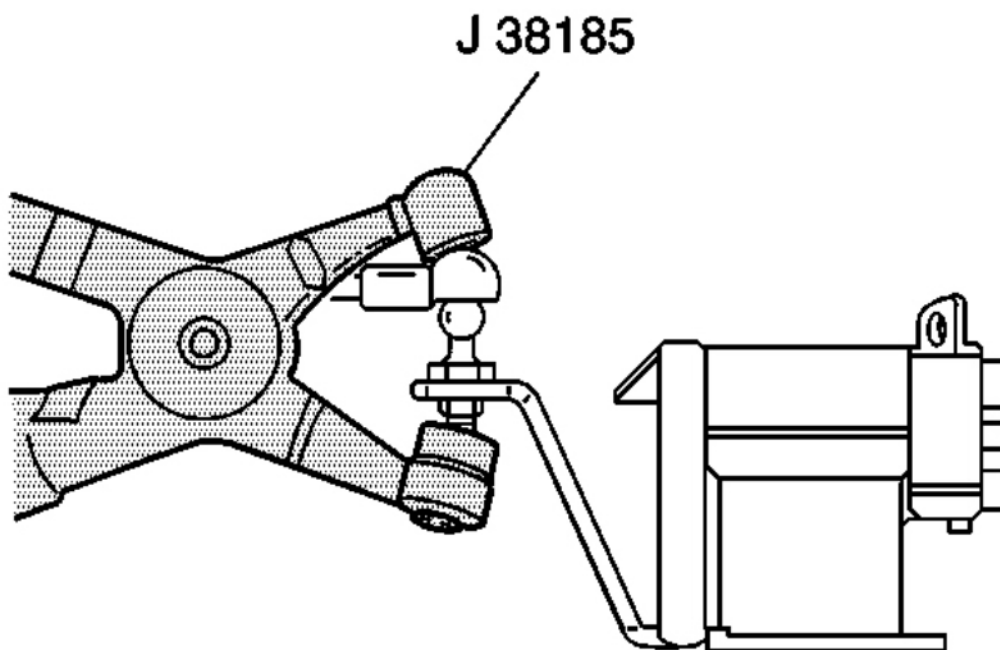


Fig. 30: Installing Link Rod To Sensor Lever & Mounting Bracket Ball Stud Using J 38185
Courtesy of GENERAL MOTORS CORP.

1. Using the **J 38185** install to link rod to the ball stud on the sensor lever and the mounting bracket.
2. Install the ESC sensor to the vehicle. Refer to **Front Position Sensor Replacement - Electronic Suspension (15 series)** **Front Position Sensor Replacement - Electronic Suspension (25 series 2WD)** **Front Position Sensor Replacement - Electronic Suspension (25 series 4WD)** .

REAR POSITION SENSOR LINK ASSEMBLY REPLACEMENT - ELECTRONIC SUSPENSION

Tools Required

J 38185 Spring Hose Clamp Pliers

Removal Procedure

IMPORTANT: Do not attempt to pry the link rod from the electronic suspension control (ESC) ball stud. If the link rod needs to be replaced or disconnected, you must use the following procedure.

1. Remove the ESC sensor from the vehicle. Refer to **Rear Position Sensor Replacement - Electronic**

Suspension - Left (15 Series) or Rear Position Sensor Replacement - Electronic Suspension - Left (25 Series) or Rear Position Sensor Replacement - Electronic Suspension - Right .

2. While supporting the sensor lever by hand, twist the link rod to remove it from the ball stud.
3. Remove the link rod from the frame bracket ball stud.

Installation Procedure

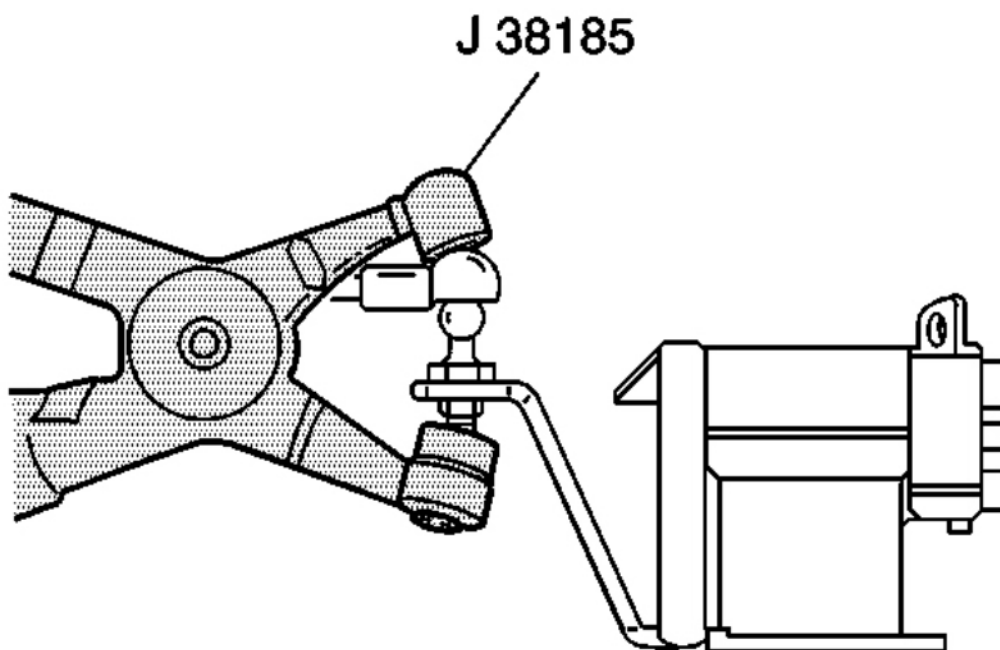


Fig. 31: Installing Link Rod To Sensor Lever & Mounting Bracket Ball Stud Using J 38185
Courtesy of GENERAL MOTORS CORP.

1. Using the **J 38185** install to link rod to the ball stud on the sensor lever and the frame bracket.
2. Install the ESC sensor to the vehicle. Refer to **Rear Position Sensor Replacement - Electronic Suspension - Left (15 Series) Rear Position Sensor Replacement - Electronic Suspension - Left (25 Series) or Rear Position Sensor Replacement - Electronic Suspension - Right .**

REAR POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION - LEFT (15 SERIES)

Removal Procedure

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

Installation in Tires and Wheels.

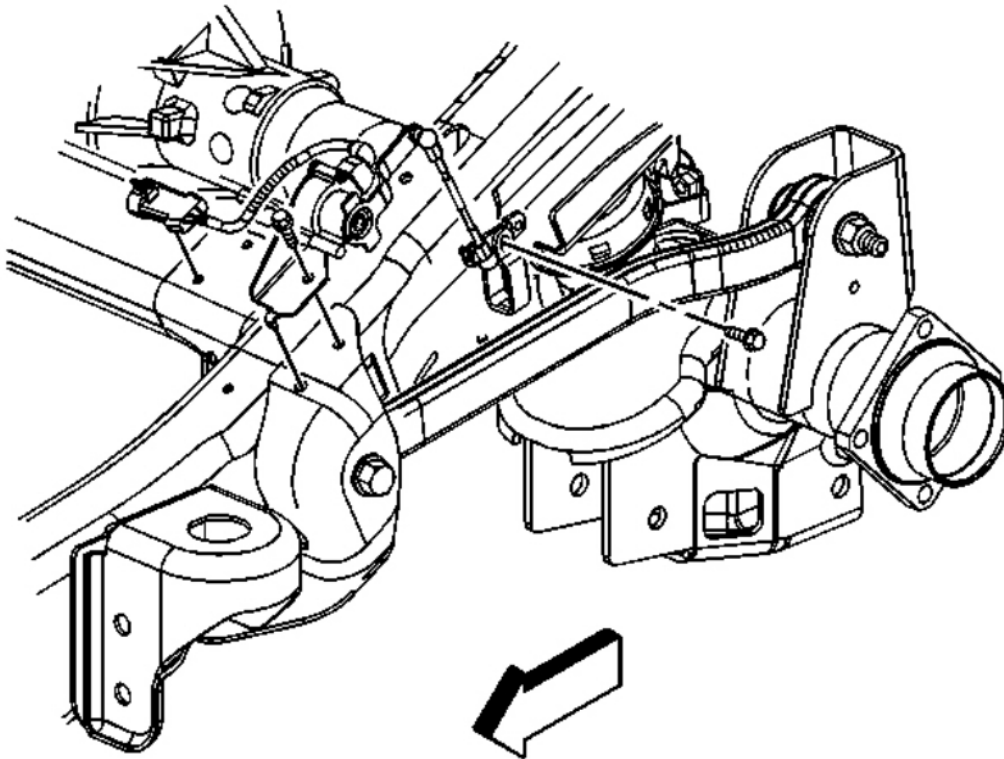


Fig. 32: Rear Position Sensor (15 Series)
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the sensor harness connector from the vehicle harness connector.
4. Remove the bolt from the electronic suspension control (ESC) sensor link bracket.
5. Spread the bracket open until the bracket can be removed from the upper control arm.
6. Remove the bolts from the frame.
7. Remove the position sensor from the vehicle.

Installation Procedure

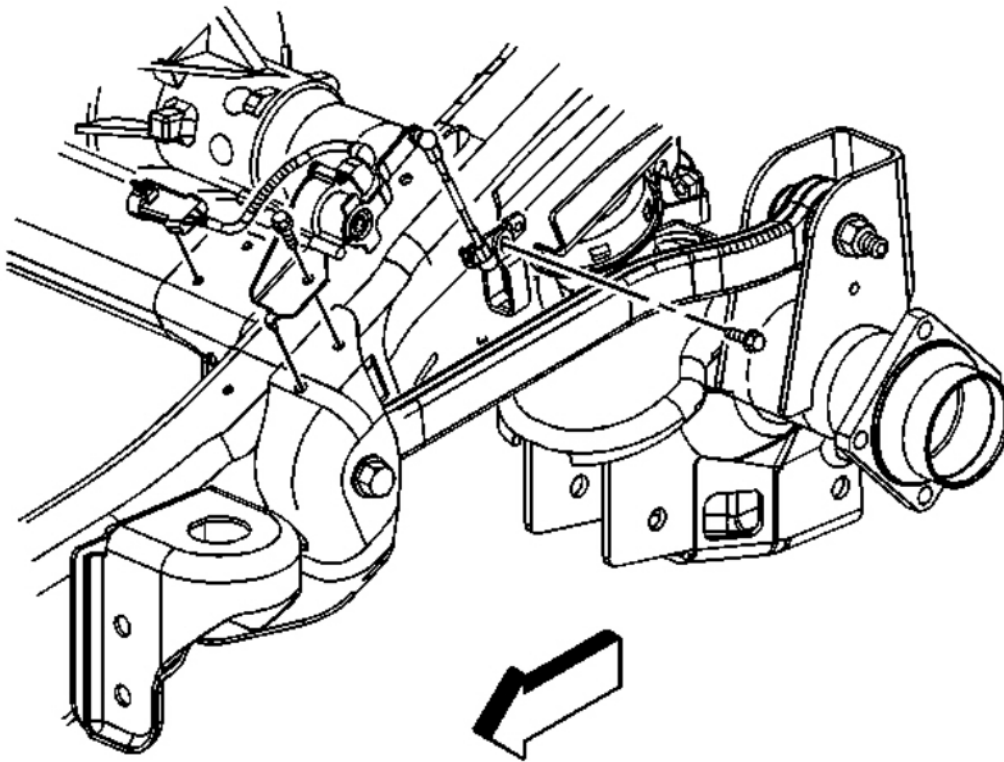


Fig. 33: Rear Position Sensor (15 Series)
Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor on the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolts to the frame.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

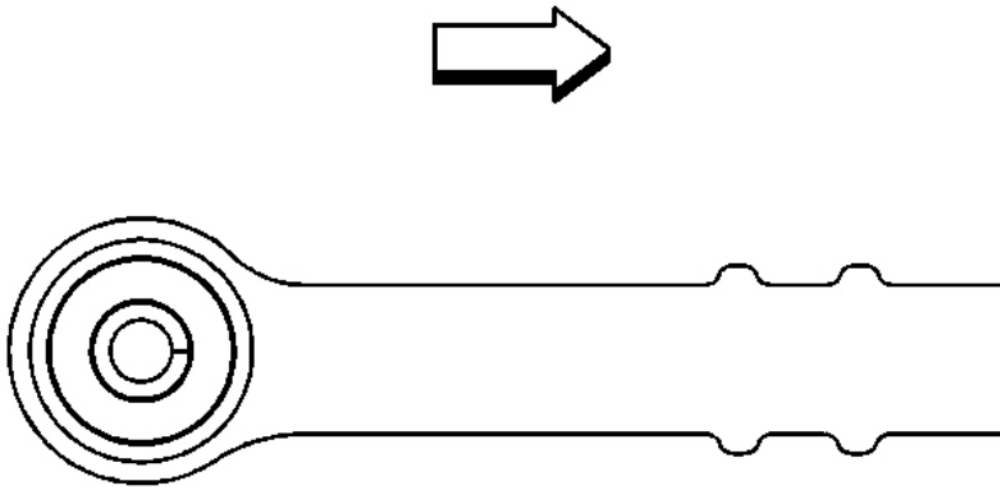


Fig. 34: View Of Upper Control Arm & Bracket (15 Series)
Courtesy of GENERAL MOTORS CORP.

3. Close the bracket around the upper control arm making sure the bracket rests between the locating stops.
4. Install the bolt.

Tighten: Tighten the bolt to 25 N.m (18 lb ft).

5. Connect the sensor harness connector to the vehicle harness connector.
6. Install the wheel and tire assembly to the vehicle. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
7. Lower the vehicle.

REAR POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION - LEFT (25 SERIES)

Removal Procedure

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

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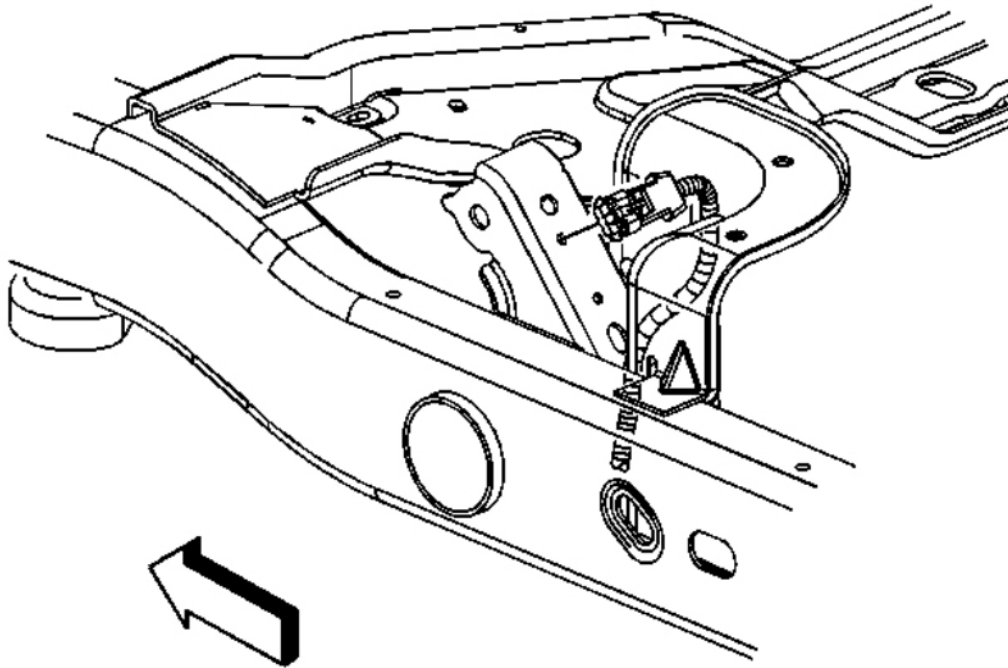


Fig. 35: Rear Left Position Sensor Harness Connector (25 Series)
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the sensor harness connector from the vehicle harness connector.

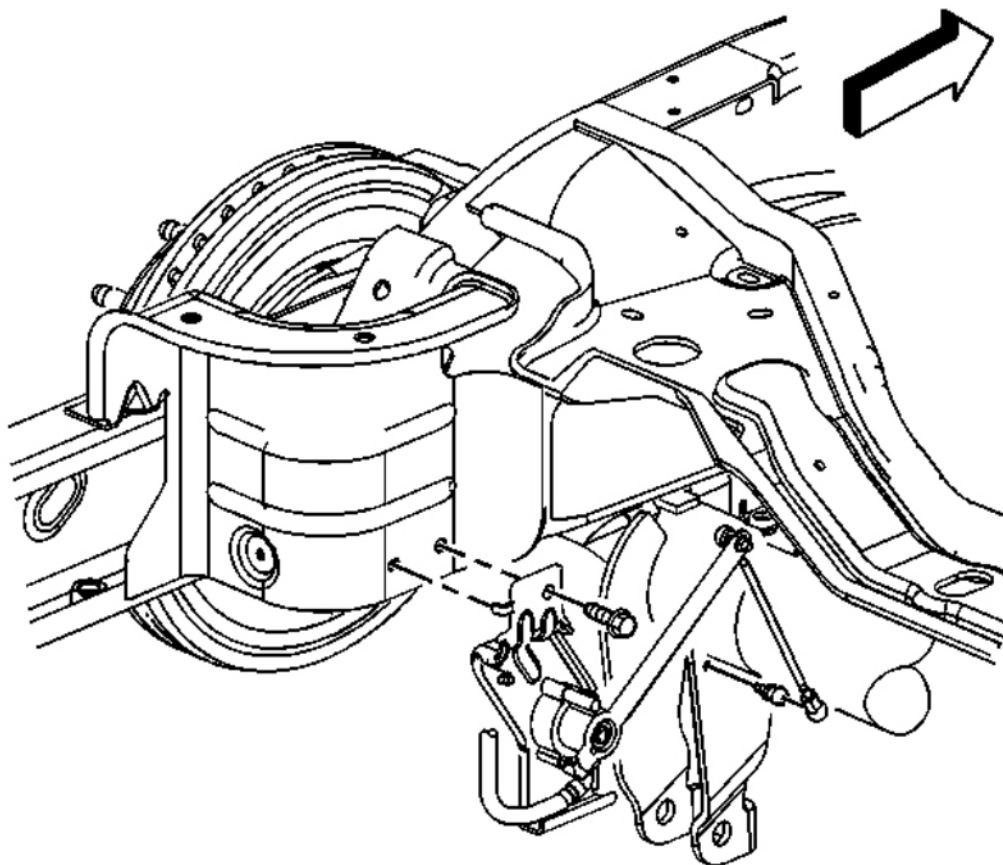


Fig. 36: Rear Left Position Sensor & Bolts (25 Series)
Courtesy of GENERAL MOTORS CORP.

4. Remove the bolts.
5. Remove the position sensor from the vehicle.
6. Disconnect the sensor link from the ball stud.

Installation Procedure

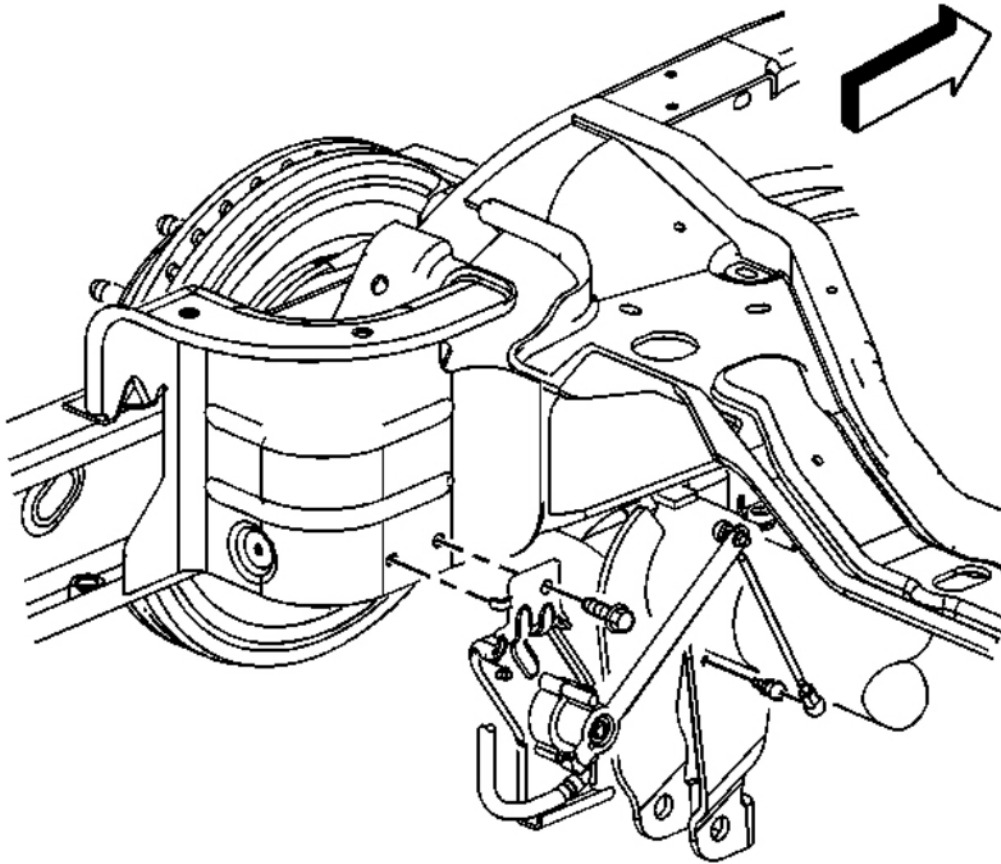


Fig. 37: Rear Left Position Sensor & Bolts (25 Series)

Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor on the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolts.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

3. Connect the sensor link to the ball stud.

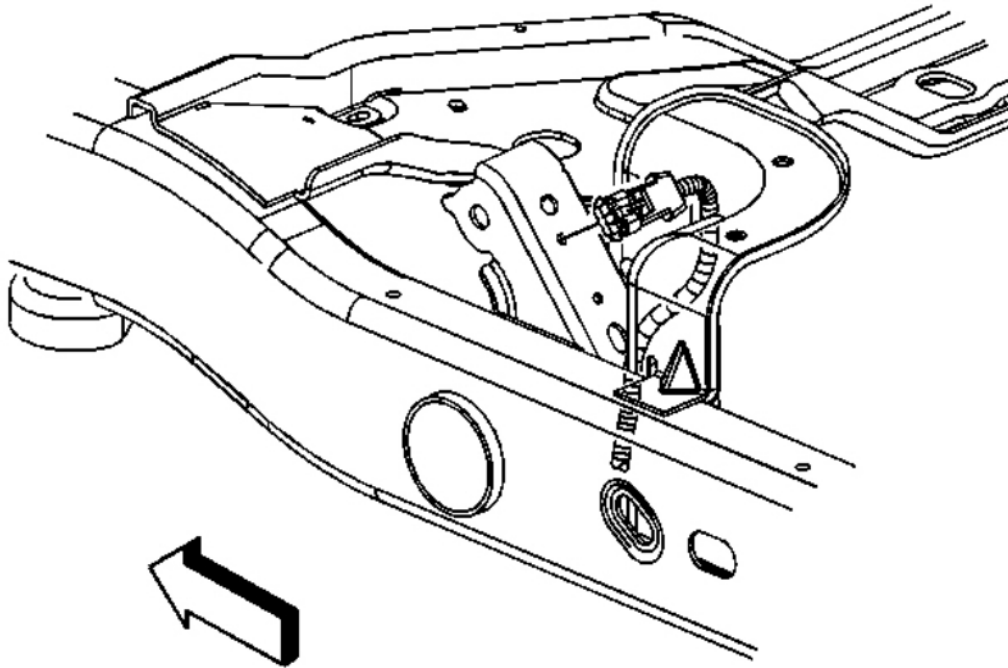


Fig. 38: Rear Left Position Sensor Harness Connector (25 Series)
Courtesy of GENERAL MOTORS CORP.

4. Connect the sensor harness connector to the vehicle harness connector.
5. Install the wheel to the vehicle. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
6. Lower the vehicle.

REAR POSITION SENSOR REPLACEMENT - ELECTRONIC SUSPENSION - RIGHT

Removal Procedure

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

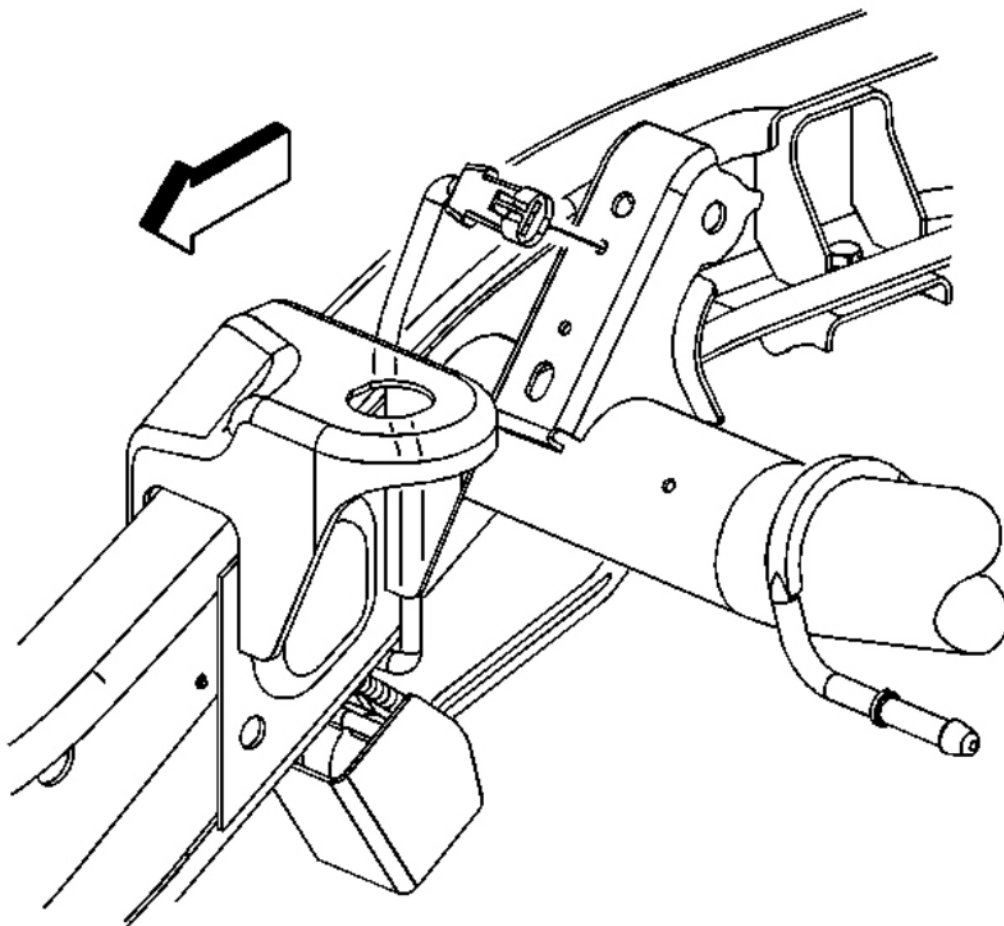


Fig. 39: Rear Right Position Sensor Harness Connector
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the sensor harness connector from the vehicle harness connector.
4. Disconnect the sensor link from the ball stud.

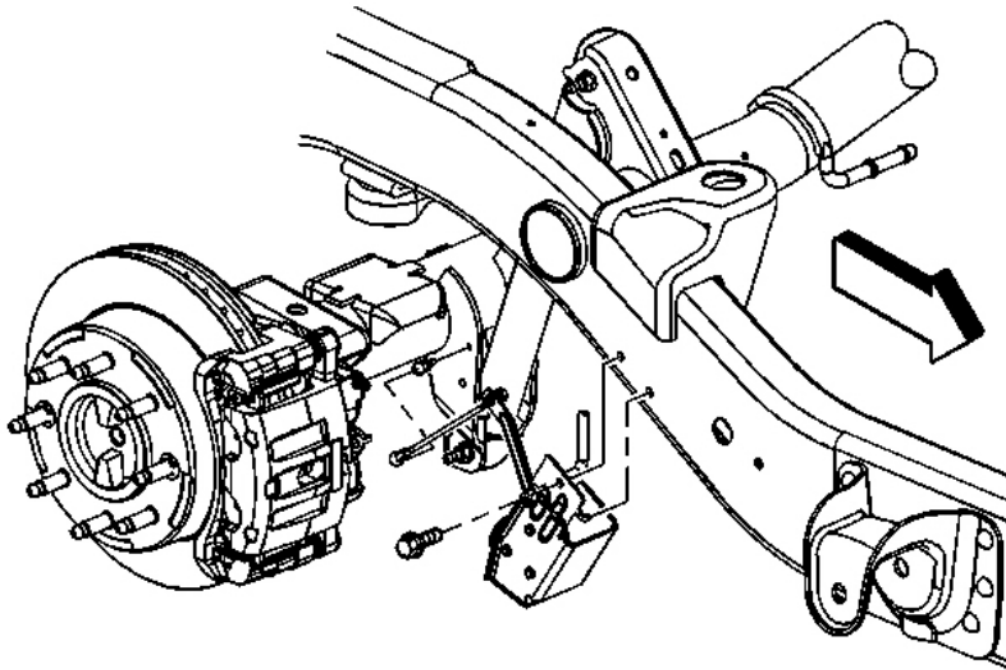


Fig. 40: Rear Right Position Sensor & Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the bolts.
6. Remove the position sensor from the vehicle.

Installation Procedure

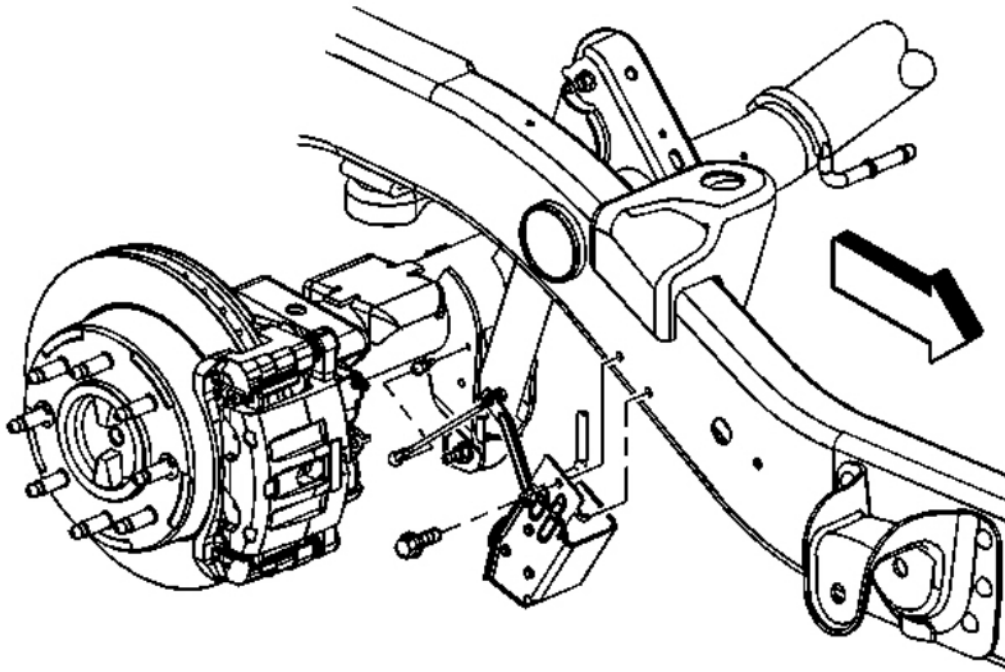


Fig. 41: Rear Right Position Sensor & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the position sensor on the vehicle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the bolts.

Tighten: Tighten the bolts to 12 N.m (106 lb in).

3. Connect the sensor link to the ball stud.

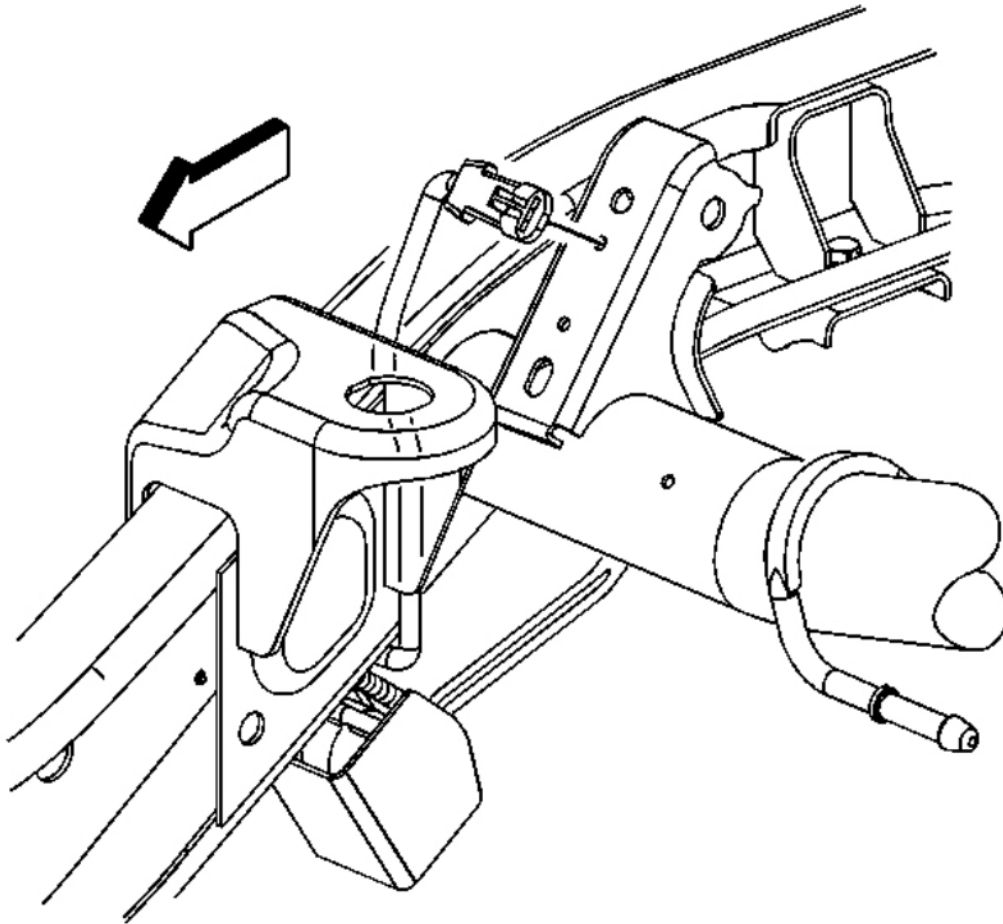


Fig. 42: Rear Right Position Sensor Harness Connector
Courtesy of GENERAL MOTORS CORP.

4. Connect the sensor harness connector to the vehicle harness connector.
5. Install the wheel to the vehicle. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
6. Lower the vehicle.

DESCRIPTION AND OPERATION

ELECTRONIC SUSPENSION CONTROL DESCRIPTION AND OPERATION

The electronic suspension control (ESC) system is bi-state real time damping system. The ESC module controls the suspension damper solenoids and suspension position sensors, along with parts of the automatic level

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control (ALC) system, if 1500 series.

The ESC system consists of the following:

- The ESC module
- The compressor/leveling module, if 1500 series
 - The air pressure sensor, if 1500 series
 - The exhaust solenoid, if 1500 series
- The compressor motor relay, if 1500 series
- The steering handwheel speed/position sensor
- The suspension damper solenoids
- The suspension position sensors

Electronic Suspension Control (ESC) Module

The objective of the ESC module is to provide ride and handling results that are superior to a passive damper system, both on and off road at all load conditions. The ESC module monitors body-to-wheel height, vehicle speed, handwheel position/speed, lift/dive status and a driver tow/haul input switch status in real time and instantly selects a "normal" or "firm" mode. This is done for each of the front and rear shock absorbers in order to adjust the vehicle for specific road and driving conditions.

The ESC module will also use the rear body-to-wheel displacements and vehicle speed inputs to keep the rear trim height of the vehicle at its desired level. The ESC module will stay awake for approximately ten minutes after ignition off on 1500 series equipped with Automatic Level Control. For more information on the ALC system, refer to **Automatic Level Control Description and Operation** in Automatic Level Control.

Ignition cycle counting is used by the ESC module to detect faults in the system. The objective is to eliminate false/intermittent codes while maintaining an acceptable level of system performance. The operation of the ignition cycle counting requires that a fault condition be present for four consecutive ignition cycles before it will set the fault code and display the "SERVICE RIDE CONTROL" message. If a fault code is present (without a fault being current), the system will go into one or more degraded modes without displaying a message. Resetting the ignition cycle counter is done by clearing codes with a scan tool. Clearing codes will override ignition cycle counting for one ignition cycle. Therefore, a fault condition will set the fault code immediately if it occurs on the first ignition cycle after the codes are cleared.

Position Sensors

The ESC module provides a common regulated voltage of approximately 5 volts to all 4 of the body-to-wheel suspension position sensors and to the air pressure sensor. The ESC module receives vehicle speed sensor (VSS) discrete output from the PCM. The suspension position sensors provide an analog signal voltage between 0.5 and 4.5 volts to the ESC module. This signal voltage represents the wheel's position relative to the body. The ESC module provides a 5 volt reference and a low reference to the suspension position sensors.

Shock Absorbers

The damper consists of an in-piston two position solenoid with a 1.5-3.3 ohm coil. The response time of the

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damper is less than 40 ms. The damper is using movement of oil through an orifice for the damping effect.

The suspension damper solenoid is driven ON and OFF by the ESC module. To activate the solenoid, it is initially subjected to full battery voltage for a short period of time. Once the solenoid is pulled-in, the supply voltage is pulse width modulated (PWM). The amount the suspension damper solenoid is activated is based on inputs from the driver Tow/Haul switch, road inputs, position sensor inputs and the powertrain control module (PCM). The ESC module provides a common ground for all 4 of the suspension damper solenoids.

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.

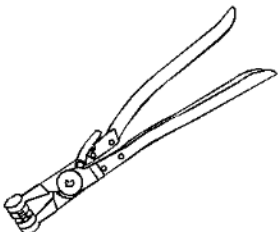
Warning Message

The SERVICE RIDE CONTROL message is displayed in the IPC message center, depending on the fault that has been encountered. The warning message will be continued to be displayed, until the fault has been corrected.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/ Description
	J 38185 Spring Hose Clamp Pliers