

2004 Cadillac SRX

2004 SUSPENSION Automatic Level Control - SRX

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Automatic Level Control - SRX

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Compressor Bracket to Body Bolts	9 N.m	80 lb in
Air Compressor Shield Bolt/Screw	3 N.m	27 lb in
Air Compressor to Bracket Bolt/Screw	9 N.m	80 lb in
Air Dryer Mounting Screw	6 N.m	53 lb in
Height Sensor Ball Stud	4 N.m	35 lb in
Height Sensor Bracket Nut	9 N.m	80 lb in

SCHEMATIC AND ROUTING DIAGRAMS

AUTOMATIC LEVEL CONTROL SUSPENSION SCHEMATICS

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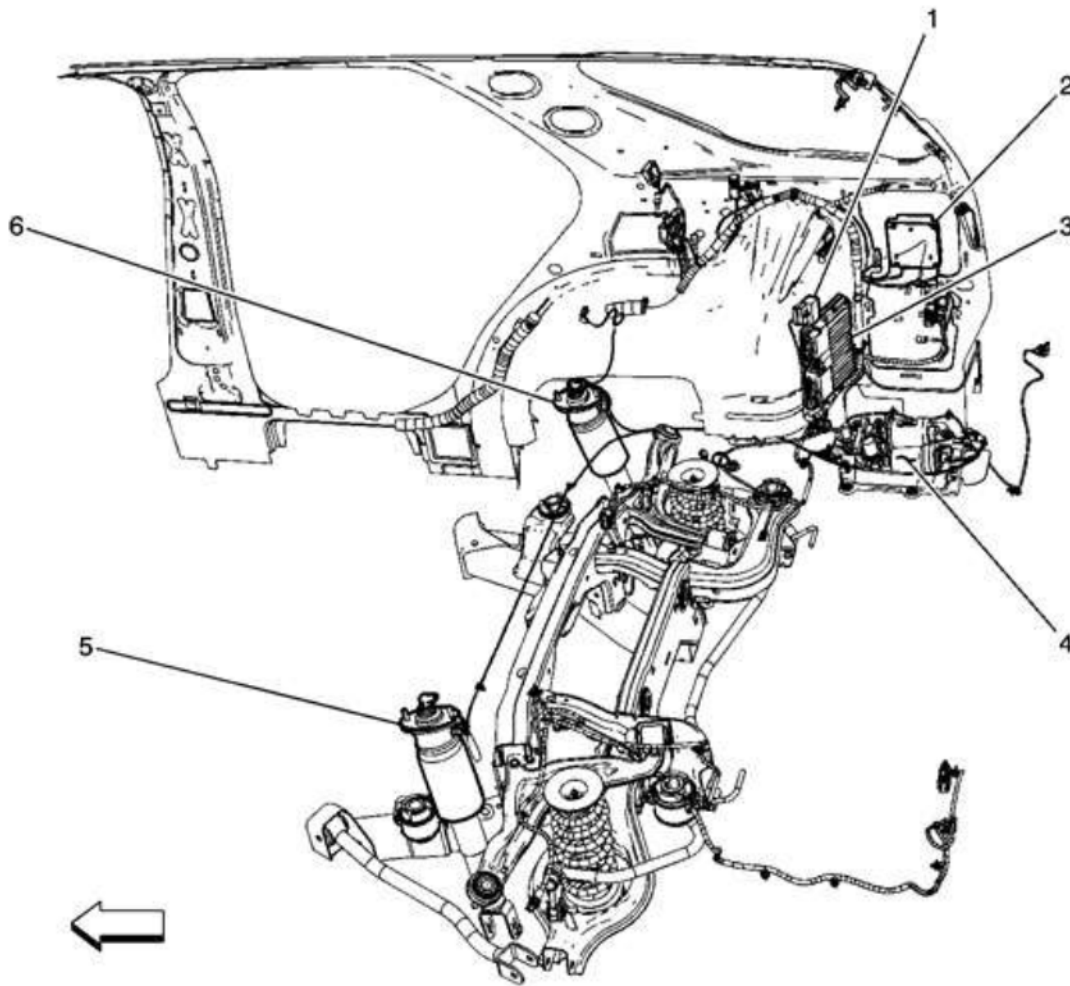


Fig. 2: Rear Suspension Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

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

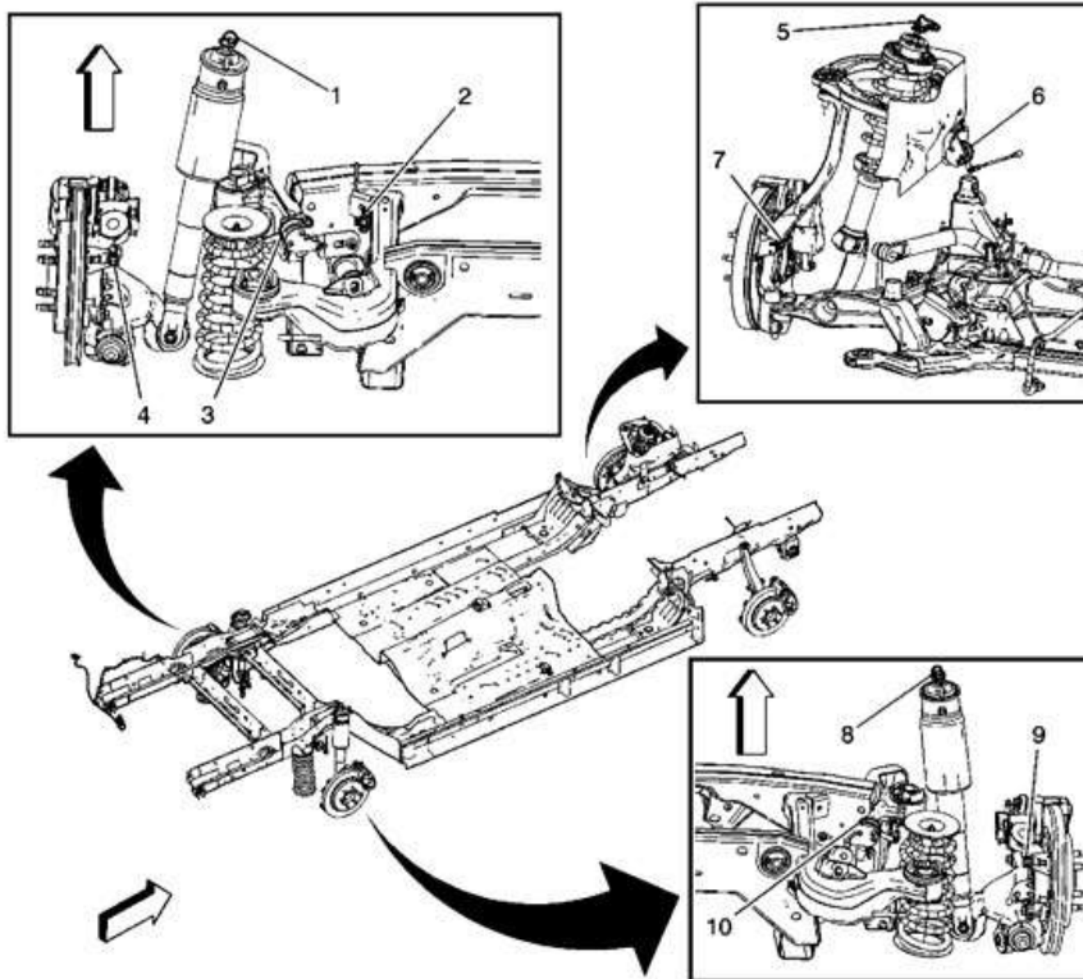


Fig. 3: Suspension Components
 Courtesy of GENERAL MOTORS CORP.

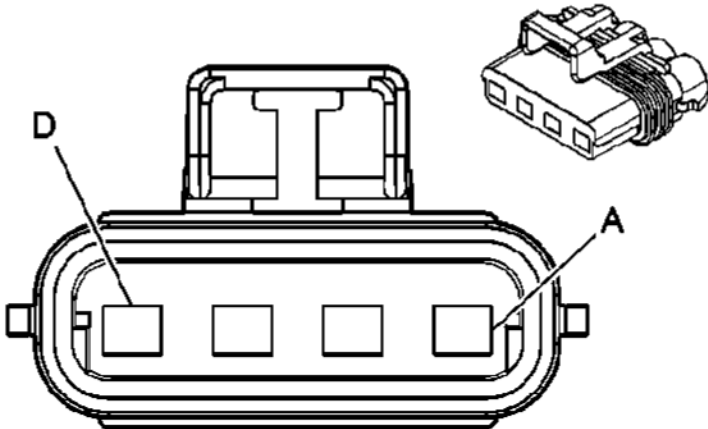
Callouts For Fig. 3

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

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

AUTOMATIC LEVEL CONTROL SUSPENSION CONNECTOR END VIEWS

Automatic Level Control (ALC) Compressor Terminal Identification



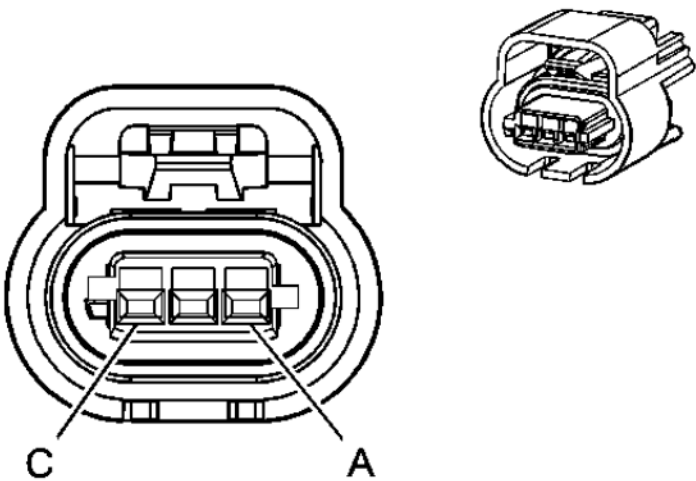
Connector Part Information		• 12129565 • 4-Way F Metri-Pack 280 Series, Sealed (GY)	
Pin	Wire Color	Circuit No.	Function
A	WH	320	Automatic Level Control Exhaust Solenoid Control
B	D-GN	322	Automatic Level Control Compressor Motor Supply Voltage
C	RD/WH	1340	Battery Positive Voltage
D	BK	450	Ground

Suspension Position Sensor Terminal Identification - LR

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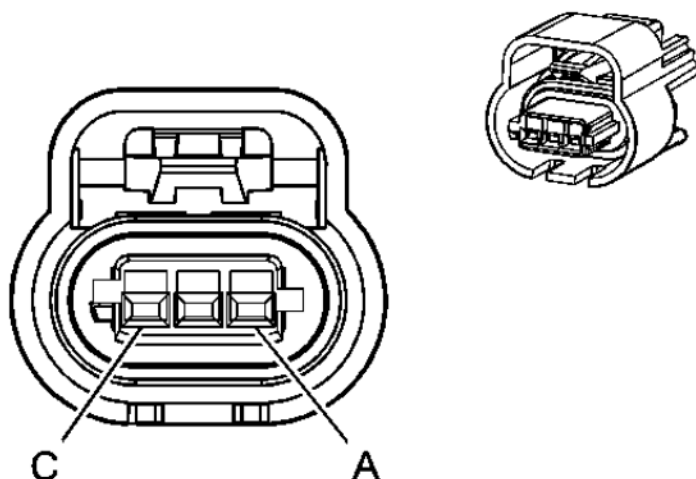
Connector Part Information		• 15326556 • 3-Way F GT 150 Series (BK)	
Pin	Wire Color	Circuit No.	Function
A	OG/BK	1208	Left Rear Suspension Position Sensor Voltage Reference
B	L-GN/WH	1210	Left Rear Suspension Position Sensor Signal
C	L-GN/BK	1209	Left Rear Suspension Position Sensor Low Reference

Suspension Position Sensor Terminal Identification - RR

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

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - AUTOMATIC LEVEL CONTROL

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

- The identification of the control module which command the system.
- The ability of the control module 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 - AUTOMATIC LEVEL CONTROL**Test Description**

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

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

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

Diagnostic System Check - Automatic Level Control

Step	Action	Yes	No
1	Install a scan tool. Does the scan tool power up?	Go to Step 2	Go to <u>Scan Tool Does Not Power Up</u> in Data Link Communications
2	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communication with the following modules: • Electronic suspension control module (ESCM) • Electronic brake control module (EBCM) • Powertrain control module (PCM) Does the scan tool communicate with all of the listed control modules?	Go to Step 3	Go to <u>Scan Tool Does Not Communicate with Class 2 Device</u> in Data Link Communications
	IMPORTANT: The engine may start during the following step. Turn OFF the engine		

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3	as soon as you have observed the Crank power mode. 1. Access the Ignition Switch parameter in the body control module (BCM) inputs data display list. 2. Rotate the ignition switch through all positions while observing the ignition switch power mode parameter. Does the ignition switch parameter reading match the ignition switch position for all switch positions?	Go to Step 4	Go to <u>Power Mode Mismatch</u> in Body Control System
4	Select the display DTCs function on the scan tool for the following modules: • Electronic suspension control module (ESCM) • Electronic brake control module (EBCM) • Powertrain control module (PCM) Does the scan tool display any DTCs?	Go to Step 5	Go to <u>Symptoms - Automatic Level Control</u>
5	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 6
	Does the scan tool display any PCM DTCs?	Go to <u>Diagnostic System Check - Engine Controls</u> in Engine Controls -	

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6		3.6L, <u>Diagnostic System Check - Engine Controls</u> in Engine Controls - 4.6L	Go to Step 7
7	Does the scan tool display any EBCM DTCs?	Go to <u>Diagnostic Trouble Code (DTC) List</u> in Anti-Lock Brake System	Go to Step 8
8	Does the scan tool display any of the following DTCs? • C0657 • C0658 • C0662 • C0663	Go to <u>Diagnostic Trouble Code (DTC) List</u>	Go to <u>Diagnostic Trouble Code (DTC) List</u> in Electronic Suspension Control

SCAN TOOL OUTPUT CONTROLS

Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection	Description
Automatic Level Control Test	Automatic Level Control Compressor Test	Commands the compressor ON and OFF.
Automatic Level Control Test	Automatic Level Control Exhaust Valve Test	Commands the exhaust valve ON and OFF.
Recalibration	ALC Trimset	Commands the recalibration of the Suspension Control Module for ride height.

SCAN TOOL DATA LIST

Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON/Engine OFF			
ALC Compressor	Outputs	Inactive/Active	Inactive

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ALC Exhaust Solenoid	Outputs	Inactive/Active	Inactive
Battery Voltage Signal	Inputs	Volts	10-16 Volts
DSP Software Version	Module Information	Varies	Varies
EEPROM Calibration	Module Information	Varies	Varies
GM Part Number	Module Information	Varies	Varies
GMSCM Software Version	Module Information	Varies	Varies

SCAN TOOL DATA DEFINITIONS

Automatic Level Control Scan Tool Data Definitions:

The Automatic Level Control (ALC) Scan Tool Data Definitions contains a brief description of all scan tool parameters.

ALC Compressor

The scan tool displays Inactive/Active. The scan tool will display Active when the vehicle trim height is below a preset value. The ALC Compressor inflates the rear airlift shocks until the vehicle reaches the desired trim height. When the vehicle is at the desired trim height, the scan tool will display Inactive.

ALC Exhaust Solenoid

The scan tool displays Inactive/Active. The scan tool will display Active when the vehicle trim height is above a preset value. The ALC Exhaust Solenoid deflates the rear airlift shocks until the vehicle reaches the desired trim height. When the vehicle is at the desired trim height, the scan tool will display Inactive.

Battery Voltage Signal

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

DSP Software Version

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

EEPROM Calibration ID

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

GM Part Number

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

GMSCM Software Version

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

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Module(s)
<u>C0657 or C0658</u>	ESC
<u>C0662 or C0663</u>	ESC

DTC C0657 OR C0658

Circuit Description

The Automatic Level Control compressor is switched ON and OFF using an Electronic Level Control (ELC) compressor relay which is controlled by the Electronic Suspension Control (ESC) module. The ESC module circuitry provides a switched path to ground whenever compressor activity is required. This drive circuit is also continually monitored to determine if the voltage level agrees with the commanded state.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

DTC C0657

The following conditions must be present to set the DTC:

- The ESC module detects voltage less than a preset value in the compressor motor control

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circuit during a compressor OFF state test.

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

DTC C0658

The following conditions must be present to set the DTC:

- The ESC module detects voltage greater than a preset value in the compressor motor control circuit during a compressor ON state test.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

The ELC compressor relay output drive is disabled for the remainder of the ignition cycle.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees an out of range voltage condition in the compressor motor control circuit. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

These DTCs are set only by electrical problems with the ELC compressor relay coil circuit. Compressor motor problems and pneumatic leakage problems do not set these DTCs.

Test Description

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

2: Tests for voltage in the Automatic Level Control relay coil supply voltage circuit.

3: Tests for a short to voltage in the Automatic Level Control relay coil supply voltage circuit.

DTC C0657 or C0658

Step	Action	Yes	No
Schematic Reference: <u>Automatic Level Control Suspension Schematics</u>			
	Did you perform the Automatic Level Control		Go to Diagnostic

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1	Diagnostic System Check?	Go to Step 2	<u>System Check - Automatic Level Control</u>
2	1. Disconnect the ESC module connector. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the Automatic Level Control (ALC) relay coil supply voltage circuit and a good ground. Does the test lamp illuminate?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Disconnect the ELC Relay. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the ALC relay coil supply voltage circuit and a good ground. Does the test lamp illuminate?	Go to Step 7	Go to Step 6
4	Test the ALC relay coil supply voltage circuit for a short to ground or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 5
5	Inspect for poor connections at the ELC Relay. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 8
6	Inspect for poor connections at the harness connector of the ESC module. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 10	Go to Step 9

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7	Repair the short to voltage in the ALC relay coil supply voltage circuit. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 10	-
8	Replace the ELC Relay. Did you complete the replacement?	Go to Step 10	-
9	IMPORTANT: Perform the set up procedure for the ESC module. Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> in Electronic Suspension Control. Did you complete the replacement?	Go to Step 10	-
10	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 2	System OK

DTC C0662 OR C0663**Circuit Description**

The Automatic Level Control exhaust solenoid valve is switched ON or OFF by the Electronic Suspension Control (ESC) module. The ESC module provides a ground whenever exhaust activity is required and during a head-relief sequence which occurs before each compressor start-up. This drive output from the ESC module is continually monitored to determine if the voltage level agrees with the commanded state.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC**DTC C0662**

The following conditions must be present to set the DTC:

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- The ESC module detects voltage less than a preset value in the exhaust solenoid control circuit during an exhaust solenoid valve OFF state test.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

DTC C0663

The following conditions must be present to set the DTC:

- The ESC module detects voltage greater than a preset value in the exhaust solenoid control circuit during an exhaust solenoid valve ON state test.
- The fault is detected during three consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

- ALL rear leveling activity for the remainder of the ignition cycle will be disabled.
- The SERVICE SUSPENSION SYSTEM message will be displayed.

Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees an out of range voltage condition in the exhaust solenoid control circuit. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

Diagnostic Aids

These DTCs are set only by electrical problems with the ELC exhaust solenoid control circuit. Pneumatic blockage problems do not set these DTCs.

A temporary compressor overload, such as high head pressure during a cold start, may cause the ELC fuse to open. This is one possible cause of DTC C0662.

Test Description

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

- 2:** Tests for voltage in the ALC exhaust solenoid control circuit.
- 3:** Tests for a short to voltage in the ALC exhaust solenoid control circuit.
- 4:** Tests for voltage in the battery positive voltage circuit of the ALC compressor in order to

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isolate a short to ground or an open.

DTC C0662 or C0663

Step	Action	Yes	No
Schematic Reference: <u>Automatic Level Control Suspension Schematics</u>			
1	Did you perform the Automatic Level Control Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Automatic Level Control</u>
2	1. Disconnect the ESC module connector. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the ALC exhaust solenoid control circuit and a good ground. Does the test lamp illuminate?	Go to Step 3	Go to Step 4
3	1. Turn OFF the ignition. 2. Disconnect the ALC compressor connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the ALC exhaust solenoid control circuit and a good ground. Does the test lamp illuminate?	Go to Step 9	Go to Step 7
4	1. Turn OFF the ignition. 2. Disconnect the ALC compressor connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the battery positive voltage circuit of the ALC compressor and a good ground. Does the test lamp illuminate?	Go to Step 5	Go to Step 8

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5	Test the ALC exhaust solenoid control circuit for a short to ground or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 12	Go to Step 6
6	Inspect for poor connections at the ALC compressor 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 12	Go to Step 10
7	Inspect for poor connections at 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 12	Go to Step 11
8	Repair the short to ground or the open in the battery positive voltage circuit of the ALC compressor connector. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 12	-
9	Repair the short to voltage in the ALC exhaust solenoid control circuit. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 12	-
10	Replace the ALC compressor. Refer to <u>Air Compressor Replacement</u> . Did you complete the replacement?	Go to Step 12	-
11	IMPORTANT: Perform the set up procedure for the ESC module. Replace the ESC module. Refer to <u>Electronic Suspension Control Module Replacement</u> in Electronic Suspension Control.Did you complete the replacement?	Go to Step 12	-
	1. Use the scan tool in order to clear the		

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12	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 - AUTOMATIC LEVEL CONTROL

Review the system operation in order to familiarize yourself with the system functions. Refer to **Automatic Level Control Description and Operation** .

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the automatic level control suspension. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for binding or damaged shock absorbers.

Intermittent

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

Symptom List

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

- **Air Compressor Leak Test**
- **Automatic Level Control System Leak Test**
- **Rear of Vehicle High**
- **Rear of Vehicle Low**

AIR COMPRESSOR LEAK TEST

Tools Required

- **J 22124-B** Pressure Gage (0-300 psi). See **Special Tools and Equipment** .

• **J 22124-91** Pressure Gage Adapter. See **Special Tools and Equipment** .

1. Attach the **J 22124-91** pressure gage adapter to the air dryer. See **Special Tools and Equipment** .
2. Attach the **J 22124-B** pressure gage to the **J 22124-91** pressure gage adapter with the toggle valve on the opposite side of the air compressor. See **Special Tools and Equipment** . Close the toggle valve.
3. Apply air pressure at the schrader valve. Pressurize until the **J 22124-B** pressure gage reads 690 kPa (100 psi). See **Special Tools and Equipment** .
4. Check the following areas using soap bubbles:
 - Solenoid valve - Replace the air compressor head if leaking.
 - Air dryer to compressor head O-ring - Replace the air dryer if leaking.
 - Air dryer cover - Replace the air dryer if leaking.
 - Air compressor head gasket - Replace the air compressor head if leaking.
 - Air compressor head cover gasket - Tighten the cover bolts to 5.6 N.m (50 lb in) if the head cover gasket is leaking. If the leak persists, replace the air compressor head.

AUTOMATIC LEVEL CONTROL SYSTEM LEAK TEST

Automatic Level Control System Leak Test

Step	Action	Yes	No
1	Did you review the Automatic Level Control System Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Automatic Level Control</u>
2	1. Disconnect the air tube from the air dryer. 2. Connect the air tube to the J 22124-B Pressure Gage on the side opposite the toggle valve. See <u>Special Tools and Equipment</u> . 3. Close the toggle valve. 4. Apply service air pressure to J 22124-B service valve until the gage reads 550 kPa (80 psi). See <u>Special Tools and Equipment</u> . 5. Monitor the J 22124-B gage pressure for		

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	1 minute. See <u>Special Tools and Equipment</u> .		
	Does the system maintain pressure?	System OK	Go to Step 3
3	Inspect the shock absorber air sleeves for air leakage using soapy water. Did you find an air leak?	Go to Step 5	Go to Step 4
4	Inspect the air tubes and connections for air leakage using soapy water. Did you find and correct the condition?	Go to Step 6	-
5	Replace the shock absorbers. Refer to <u>Shock Absorber Replacement</u> in Rear Suspension. 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

REAR OF VEHICLE HIGH

Rear of Vehicle High

Step	Action	Yes	No
Schematic Reference: <u>Automatic Level Control Suspension Schematics</u>			
1	Did you perform the Automatic Level Control (ALC) Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Automatic Level Control</u>
2	1. Turn the ignition ON with the engine OFF. 2. Listen for the ALC air compressor to activate. Is the ALC air compressor running for more than 5 minutes?	Go to Step 3	Go to Step 6
3	1. Turn the ignition OFF. 2. Remove the ALC compressor relay. 3. Turn the ignition ON with the engine OFF.		

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	Is the air compressor running?	Go to Step 4	Go to Step 5
4	1. Turn the ignition OFF. 2. Reinstall the ALC compressor relay. 3. Repair the short to voltage in the ALC air compressor motor control circuit.		
	Is the repair complete?	Go to Step 13	-
5	1. Turn the ignition OFF. 2. Replace the ALC air compressor relay.		
	Is the repair complete?	Go to Step 13	-
6	Inspect the left and right rear position sensors for damage and disconnected links. Are any damaged sensors or disconnected links present?	Go to Step 7	Go to Step 8
7	Replace the damaged rear position sensor or reconnect the link. Is the repair complete?	Go to Step 13	-
8	1. Remove the ALC intake filter from the vehicle body. Do not remove it from the ALC air compressor or hose. 2. Using the scan tool, cycle ALC air compressor. 3. After 1 minute, stop cycling. 4. Cycle the ALC exhaust solenoid while checking to see if air is exiting the ALC intake air filter.		
	Is air exiting the ALC intake air filter?	Go to Step 11	Go to Step 9
9	1. Disconnect the air tubes from both rear shock absorbers. 2. Connect the J 22124-B ALC pressure gage between both air tubes. See <u>Special Tools and Equipment</u> . 3. Open the gage toggle valve. 4. Disconnect the air tube from the ALC air		

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	dryer. 5. Apply shop air to the gage schrader valve. Is air exiting both of the air tubes at the ALC air dryer connection?	Go to Step 10	Go to Step 12
10	1. Turn the ignition OFF. 2. Replace the ALC air compressor assembly. Refer to <u>Air Compressor Replacement</u> . 3. Install the ALC intake air filter on the vehicle body. Are all of the replacements and/or installations complete?	Go to Step 13	-
11	1. Turn the ignition OFF. 2. Connect the scan tool. 3. Turn the ignition ON with the engine OFF. 4. Perform the ESC/ALC recalibration procedure. Has the recalibration procedure been completed?	Go to Step 13	-
12	Replace the air tube going from the air dryer to both rear shock absorbers. Refer to <u>Air Tube Replacement</u> . Is the repair complete?	Go to Step 13	-
13	1. Turn the ignition OFF. 2. Turn the ignition ON with the engine OFF. 3. Wait for at least 5 minutes. Is the rear of the vehicle at trim level?	Go to Step 14	Go to Step 2
14	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

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REAR OF VEHICLE LOW

Rear of Vehicle Low

Step	Action	Yes	No
Schematic Reference: <u>Automatic Level Control Suspension Schematics</u>			
1	Did you perform the Automatic Level Control (ALC) Diagnostic System Check?	Go to Step 2	Go to <u>Diagnostic System Check - Automatic Level Control</u>
2	1. Turn the ignition ON with the engine OFF. 2. Listen for the ALC air compressor to activate. Does the air compressor come on within 30 seconds?	Go to Step 8	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the ALC connector from the ALC air compressor assembly. 3. Disconnect the Electronic Suspension Module connector. 4. Turn the ignition ON. 5. Connect a fused jumper between the ALC relay coil supply voltage circuit and ground. 6. Measure the voltage between the ALC compressor motor control circuit and ground. Does the voltmeter display a voltage greater than 10 volts?	Go to Step 4	Go to Step 6
4	1. Remove the fused jumper wire. 2. Turn the ignition OFF. 3. Test the ground circuit of the ALC air compressor connector for a ground. Did you find and correct the condition?	Go to Step 13	Go to Step 5

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5	Replace the ALC air compressor assembly. Refer to <u>Air Compressor Replacement</u> . Is the repair complete?	Go to Step 11	-
6	1. Remove the fused jumper wire. 2. Turn the ignition OFF. 3. Check for the following: • Open ELC fuse • Bad ELC relay • Open circuit in ALC air compressor motor control circuit • Open circuit in ALC relay coil supply voltage circuit Was a problem found?	Go to Step 7	-
7	IMPORTANT: An open fuse may indicate: • No head relief-check for ALC codes • A faulty air compressor • A short to ground in the exhaust solenoid battery positive circuit Repair the short to ground in the ALC compressor battery positive circuit or replace the fuse.Is the repair complete?	Go to Step 13	-
8	Inspect the left and right rear position sensors for damage and disconnected links. Are any damaged sensors or disconnected links present?	Go to Step 12	Go to Step 9
9	Perform the ALC System Leak Test. Is a leak present?	Go to Step 10	Go to Step 11
10	Repair the leak in the ALC System. Is the repair complete?	Go to Step 13	-
11	1. Turn the ignition OFF. 2. Connect the scan tool. 3. Turn the ignition ON with engine OFF.		

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	4. Perform the CVRSS/ALC recalibration procedure.		
	Has the recalibration been completed?	Go to Step 13	-
12	Replace the damaged rear position sensor or reconnect the link. Is the replacement complete?	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 1

REPAIR INSTRUCTIONS

AUTOMATIC LEVEL CONTROL AIR COMPRESSOR AIR FILTER REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the compressor assembly. Refer to **Air Compressor Replacement** .

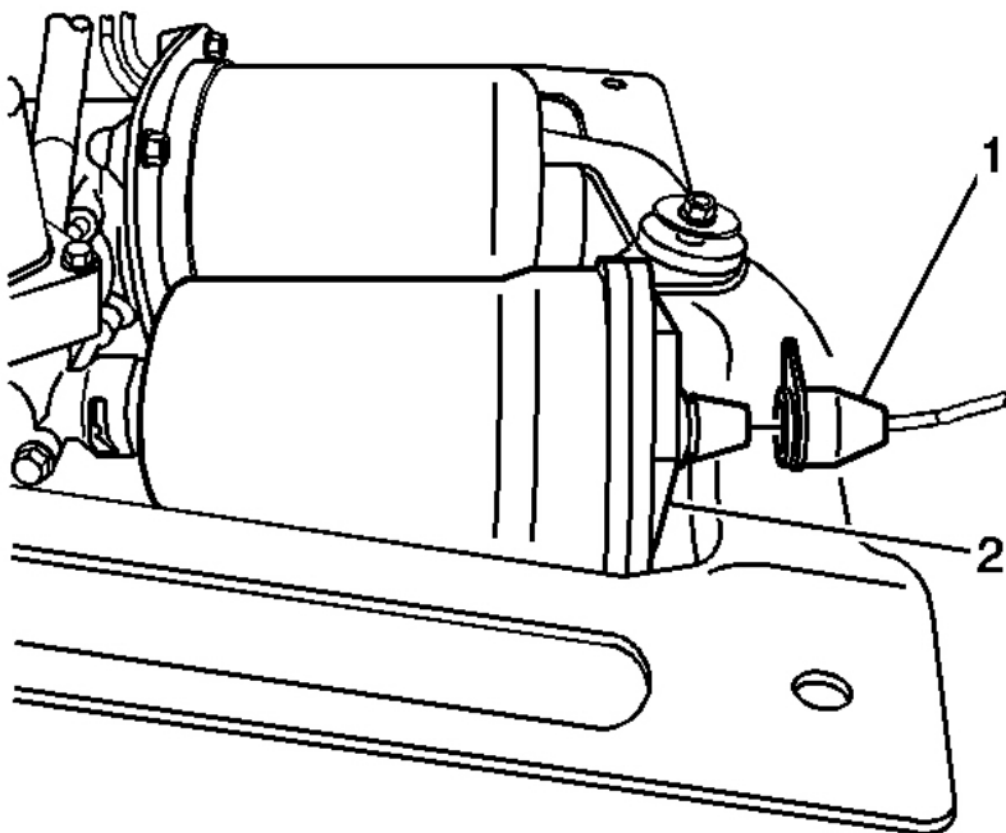


Fig. 4: View Of Air Dryer & Hose
Courtesy of GENERAL MOTORS CORP.

3. Remove the hose (1) from the air dryer (2).

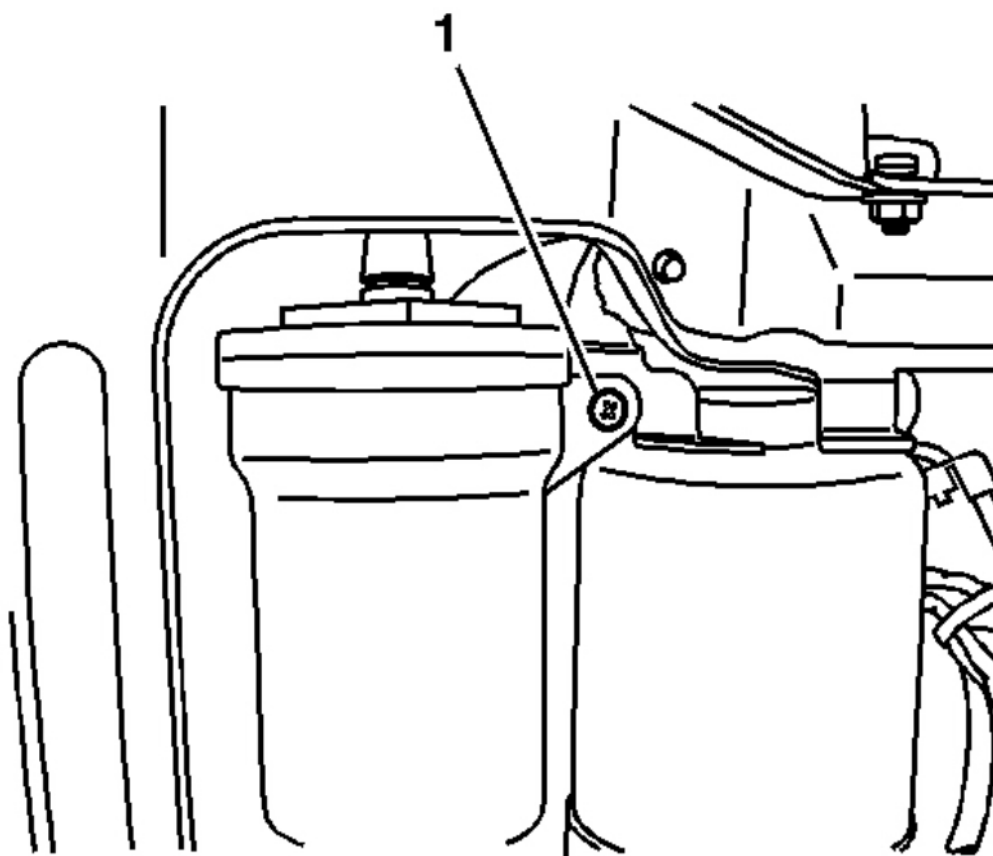


Fig. 5: Locating Air Dryer Mounting Screw
Courtesy of GENERAL MOTORS CORP.

4. Remove the mounting screw (1).

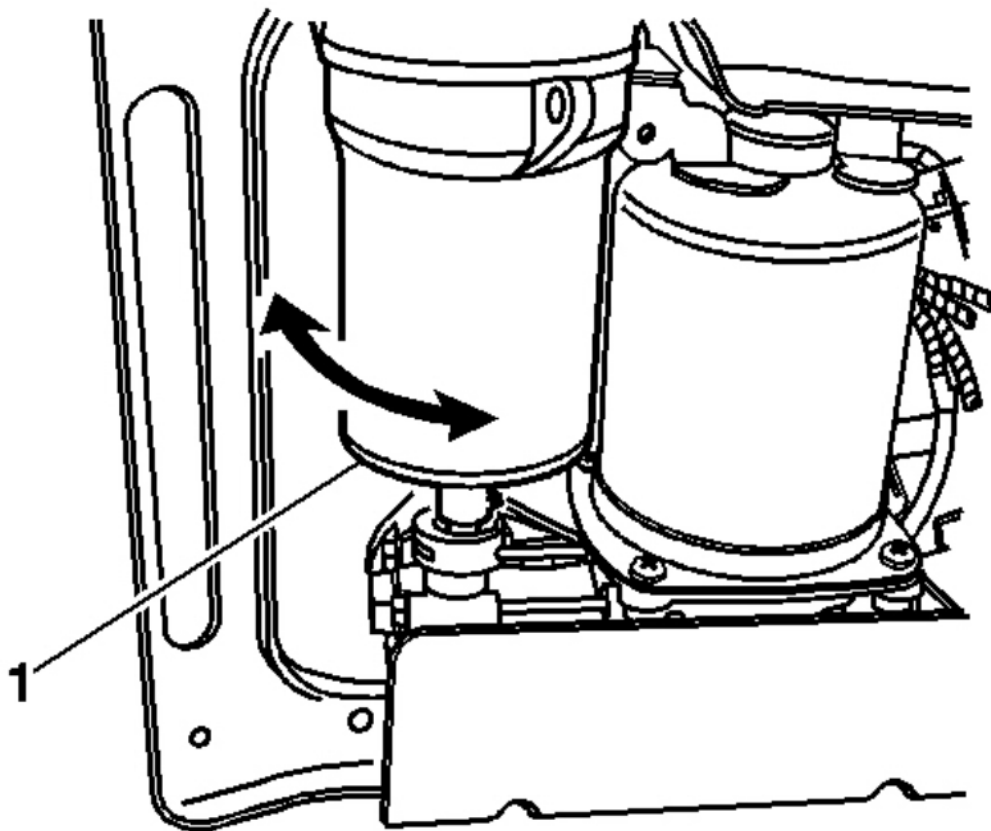


Fig. 6: View Of Air Dryer

Courtesy of GENERAL MOTORS CORP.

5. Rotate the air dryer (1) to remove from compressor.

Installation Procedure

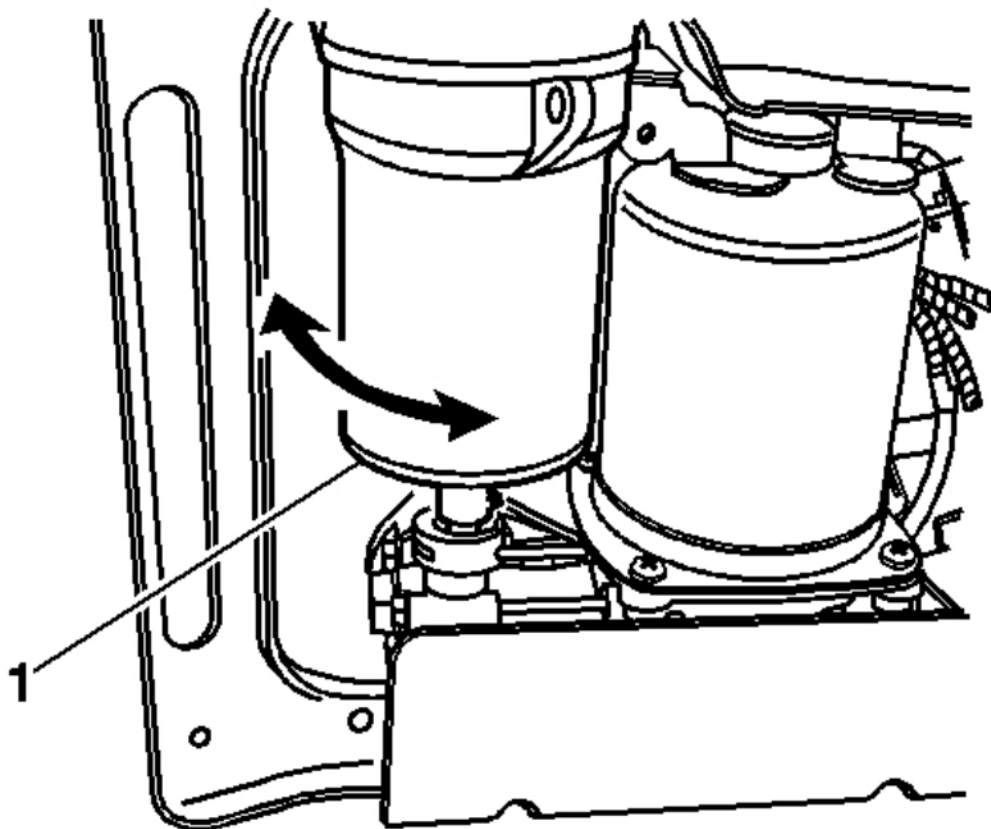


Fig. 7: View Of Air Dryer

Courtesy of GENERAL MOTORS CORP.

1. Install the air dryer (1) to the compressor.

NOTE: Refer to Fastener Notice in Cautions and Notices.

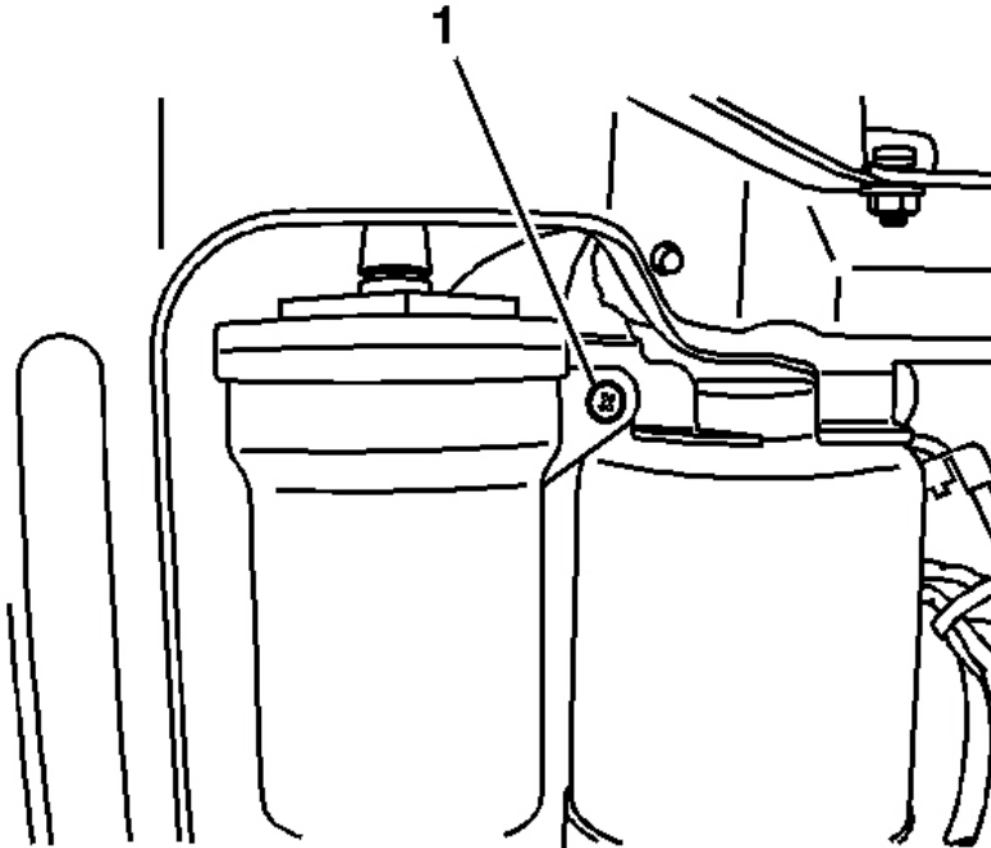


Fig. 8: Locating Air Dryer Mounting Screw
Courtesy of GENERAL MOTORS CORP.

2. Install the air dryer mounting screw (1).

Tighten: Tighten the bolts to 6 N.m (53 lb in).

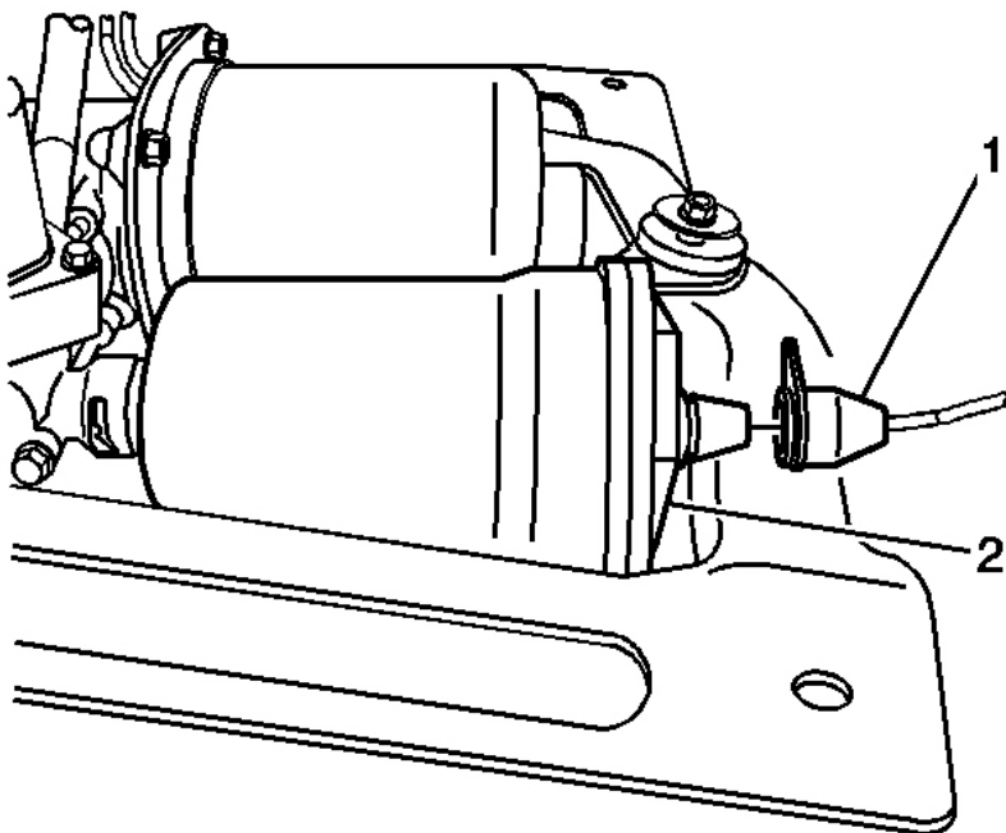


Fig. 9: View Of Air Dryer & Hose
Courtesy of GENERAL MOTORS CORP.

3. Install the hose (1) onto the air dryer (2).
4. Install the compressor to the vehicle. Refer to **Air Compressor Replacement** .
5. Lower the vehicle.

AUTOMATIC LEVEL CONTROL SENSOR AND BRACKET REPLACEMENT (FRONT)

Removal Procedure

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

and Wheels.

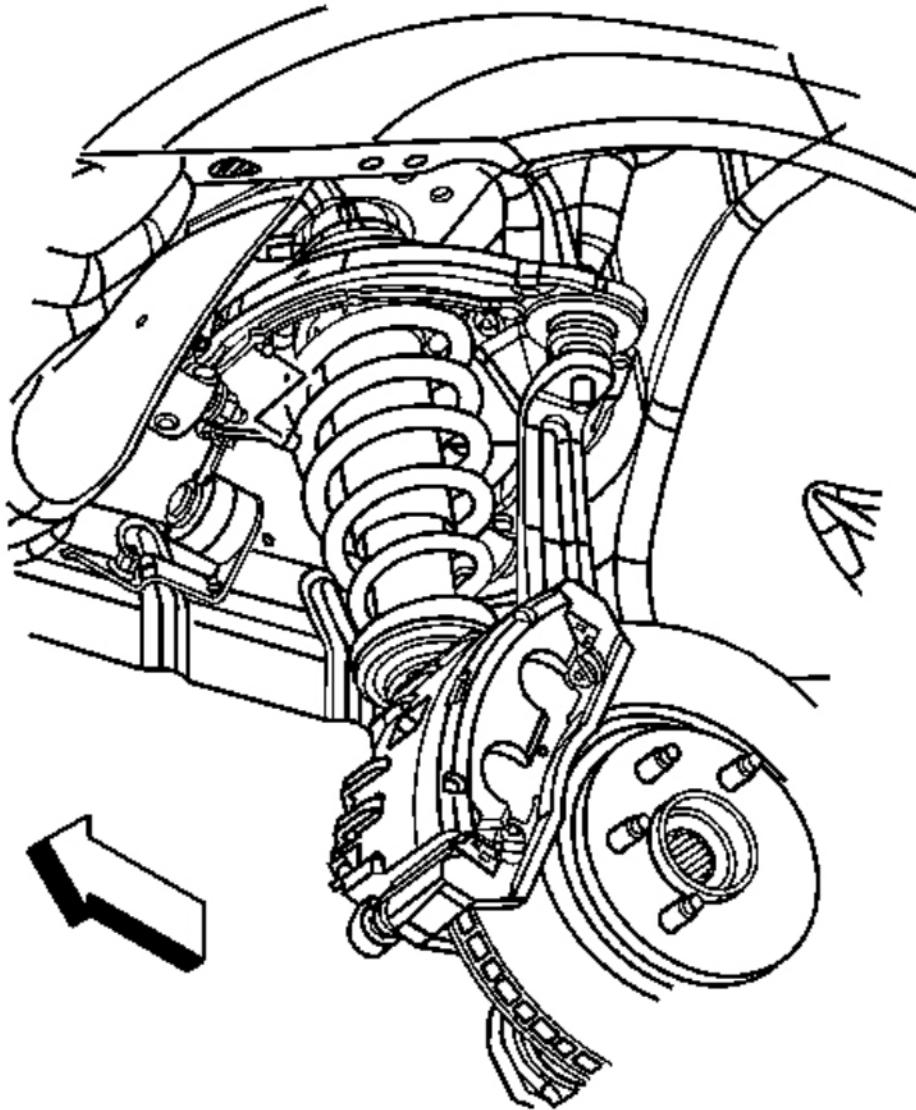


Fig. 10: Locating Front Ride Sensor Link
Courtesy of GENERAL MOTORS CORP.

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

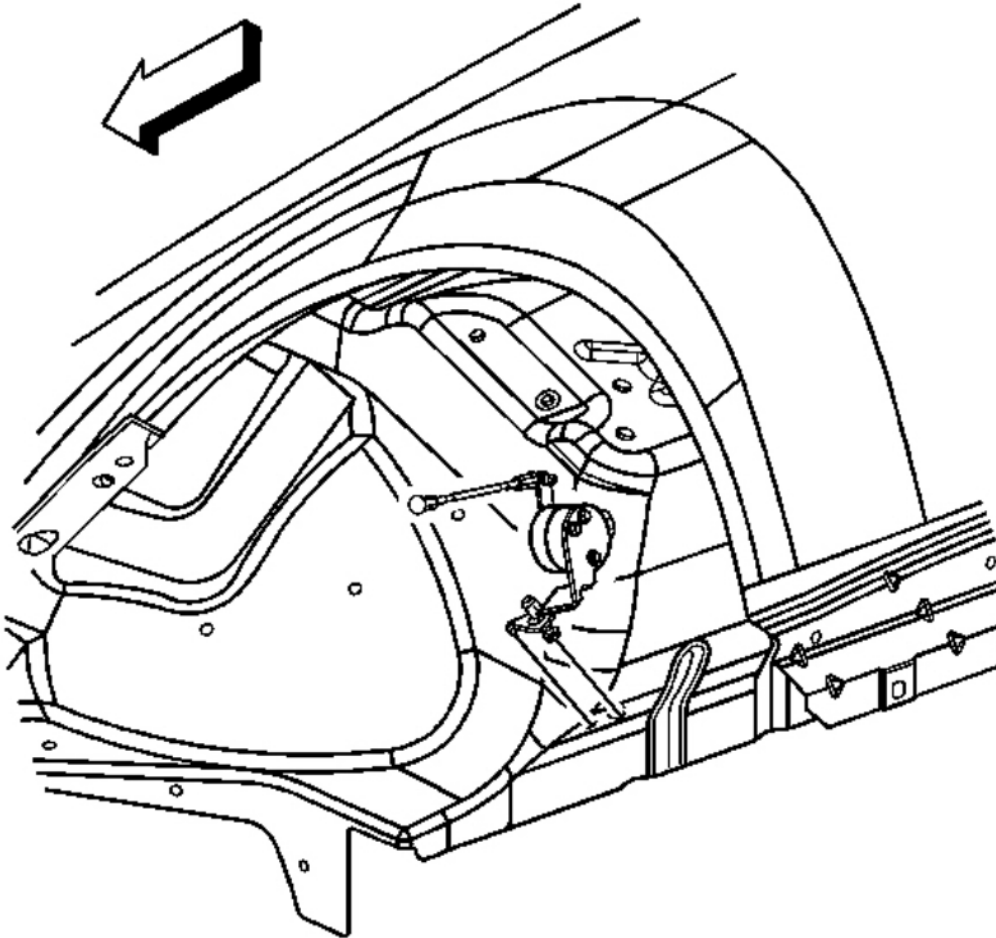


Fig. 11: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

1. Position the sensor to the vehicle.

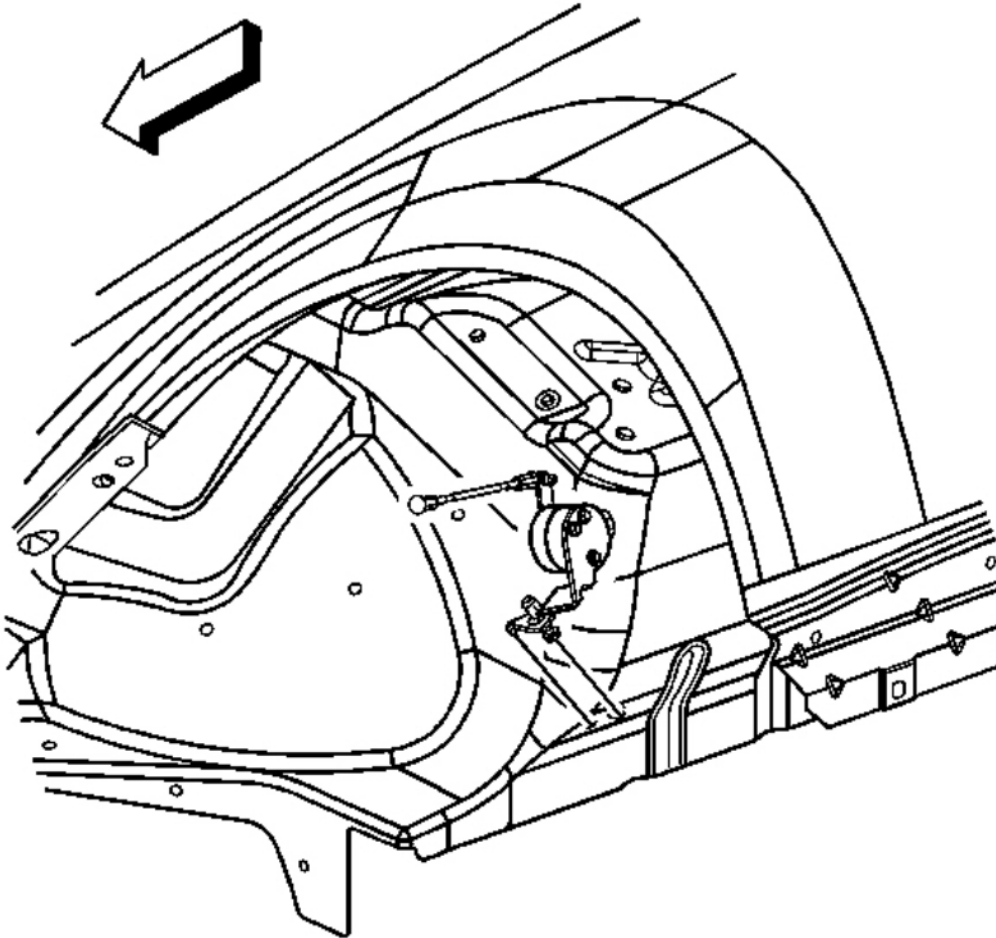


Fig. 12: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the front ride sensor retaining nut.

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

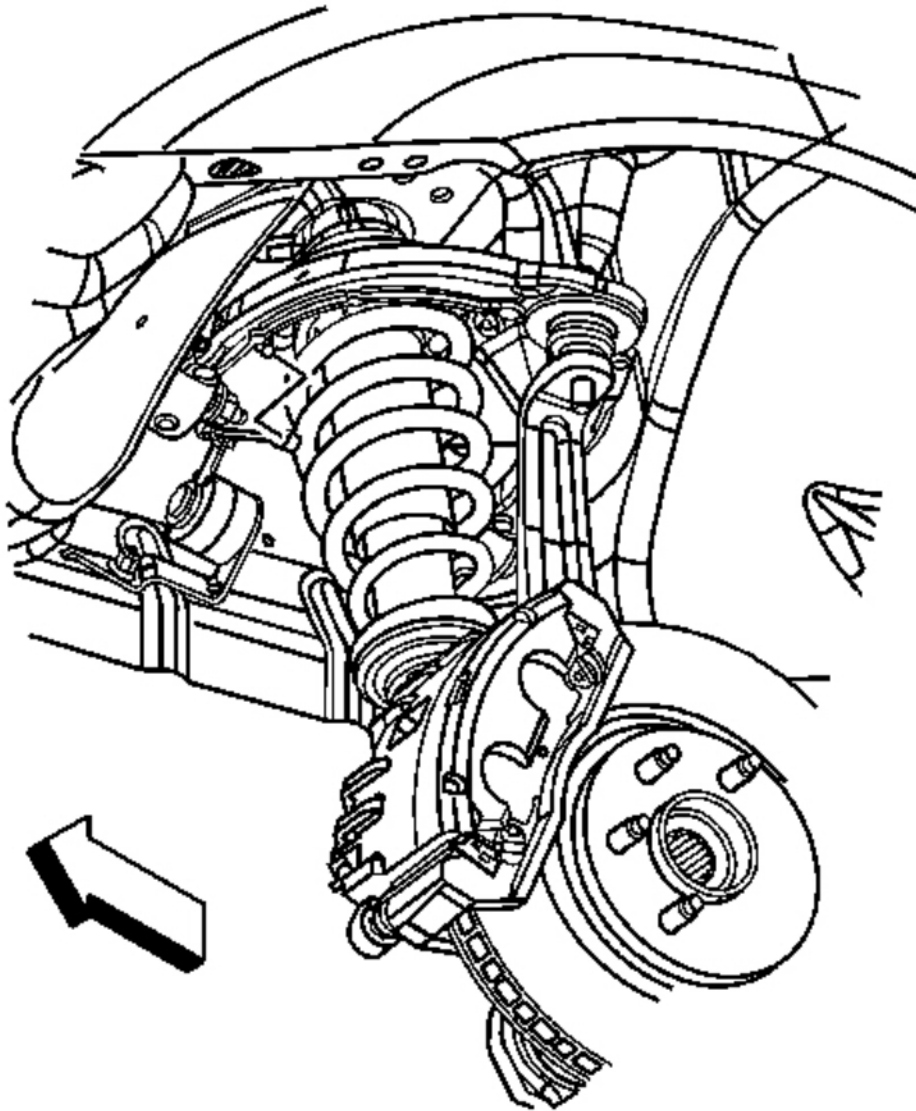


Fig. 13: View Of Front Ride Sensor Link
Courtesy of GENERAL MOTORS CORP.

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

and Wheels.

6. Lower the vehicle.

AUTOMATIC LEVEL CONTROL SENSOR AND BRACKET REPLACEMENT (REAR)

Removal Procedure

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

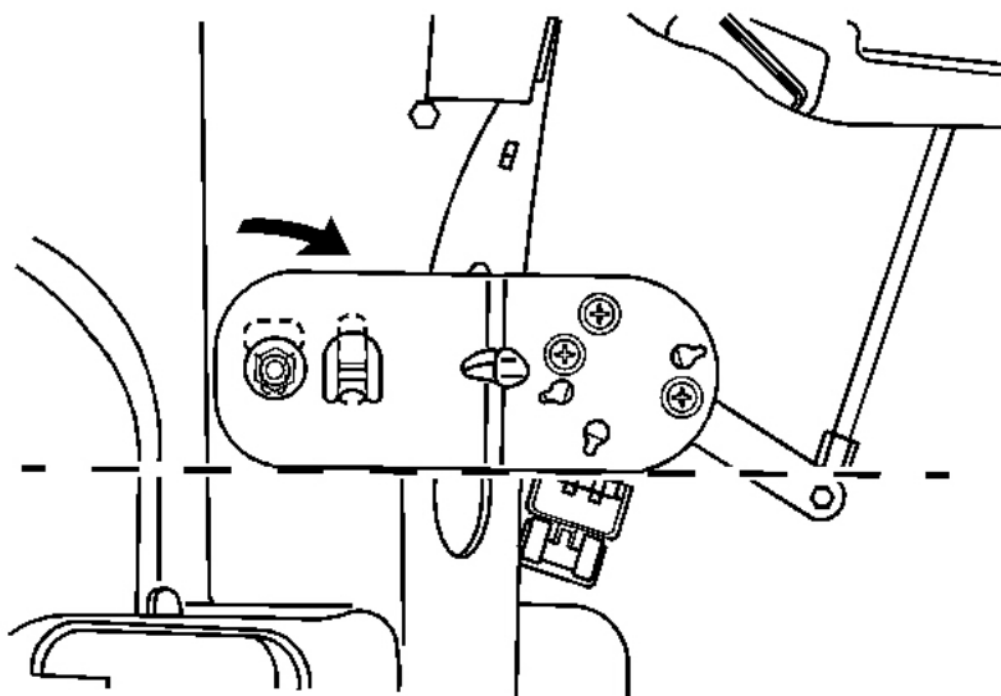


Fig. 14: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

1. Install the sensor to the vehicle.
2. Bottom out the captured stud in the key hole.

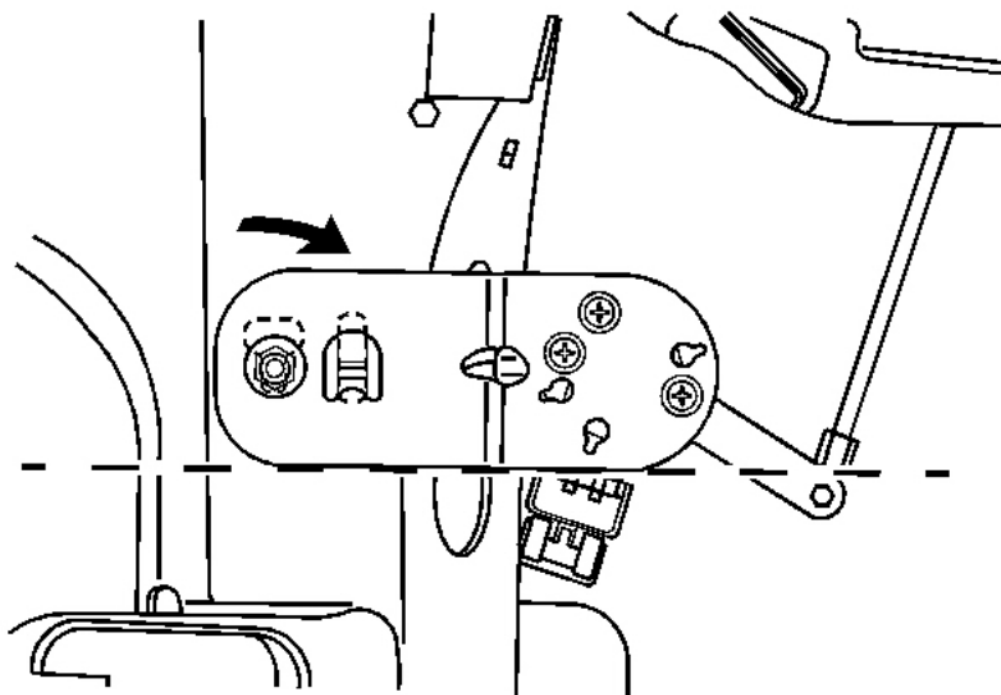


Fig. 15: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS CORP.

3. Rotate the sensor and bracket until the tab on the bracket bottoms out in the slot.
4. If the sensor bracket is not yet level, continue to rotate it allowing the captured stud to lift slightly from the bottom of the keyhole, until the sensor is level.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the rear ride height sensor retaining nut.

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

6. Connect the ride sensor link to the upper control arm ball stud.
7. Connect the ride sensor harness connector.
8. Install the tire and wheel. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
9. Lower the vehicle.

AIR TUBE REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Twist the air tube seal connection on the rear shocks.
3. Disconnect the air tube from the rear shock absorber.
4. Disconnect the exhaust system from the rear exhaust hangers. Support the exhaust.
5. Remove the automatic level control compressor with the bracket attached. Refer to Air Compressor Replacement.
6. Disconnect the air tube from the right wheel house liner clip.
7. Remove the wheelhouse liner screw in order to position the liner to access the air tube.
8. Remove the air tube from the frame at the right wheel house liner.
9. Remove the fuel filler neck bolt and reposition the air tubes.
10. Remove the air tubes from the vehicle.

Installation Procedure

1. Install the air tubes to the vehicle.
2. Position the air tubes at the fuel filler neck.
3. Install the fuel filler neck bolt. Refer to Filler Tube Replacement in Engine Controls - 3.6L or Filler Tube Replacement in Engine Controls - 4.6L.
4. Install the air tubes to the frame at the right wheelhouse liner.
5. Install the right wheelhouse liner screw. Refer to Wheelhouse Liner Panel Replacement -

Rear in Body Rear End.

6. Connect the air tube to the right wheel house liner clip.
7. Install the automatic level control (ALC) compressor with bracket. Refer to **Air Compressor Replacement** .
8. Connect the exhaust system to the rear exhaust hangers. Remove the exhaust support.
9. Connect the air tube to the rear shocks.
10. Lower the vehicle.

AIR COMPRESSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the exhaust system from the rear exhaust hangers.
3. Remove the automatic level control (ALC) compressor bracket mounting bolts.
4. Carefully lower the ALC compressor assembly.
5. Twist the air tube at the ALC compressor clamp.
6. Disconnect the air tube from the ALC compressor.
7. Disconnect the ALC electrical harness connector.

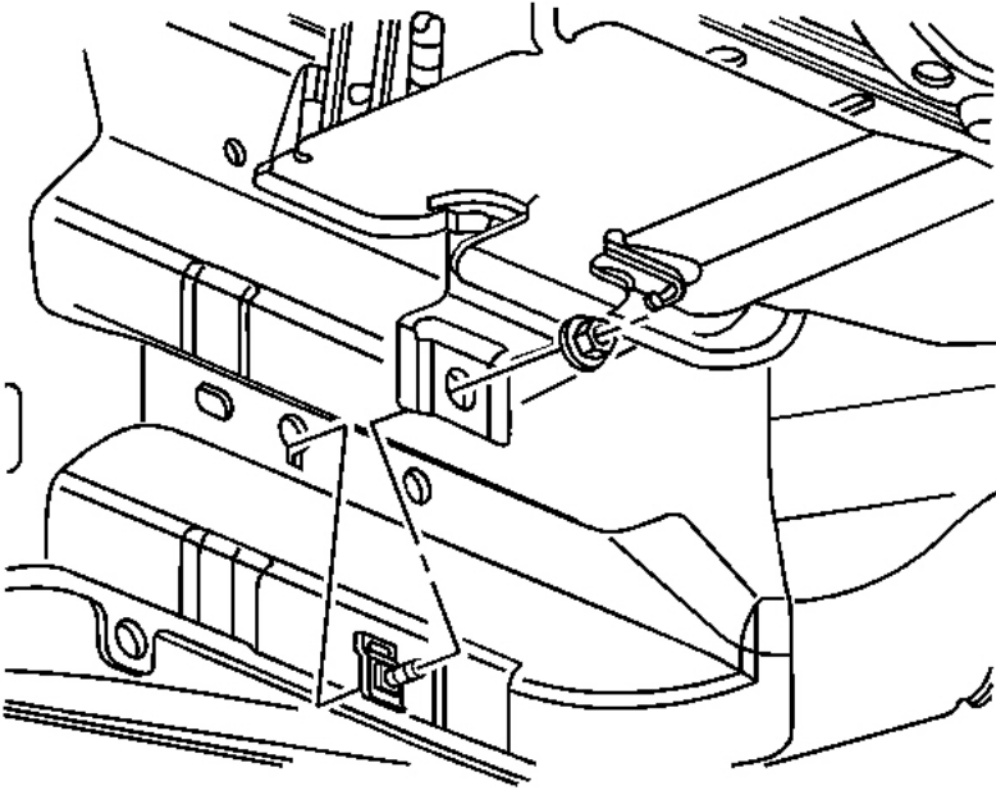


Fig. 16: View Of ALC Bracket Side Mounting Nut
Courtesy of GENERAL MOTORS CORP.

8. Remove the ALC compressor bracket side mounting nut.
9. Remove the ALC compressor with the bracket from the vehicle.

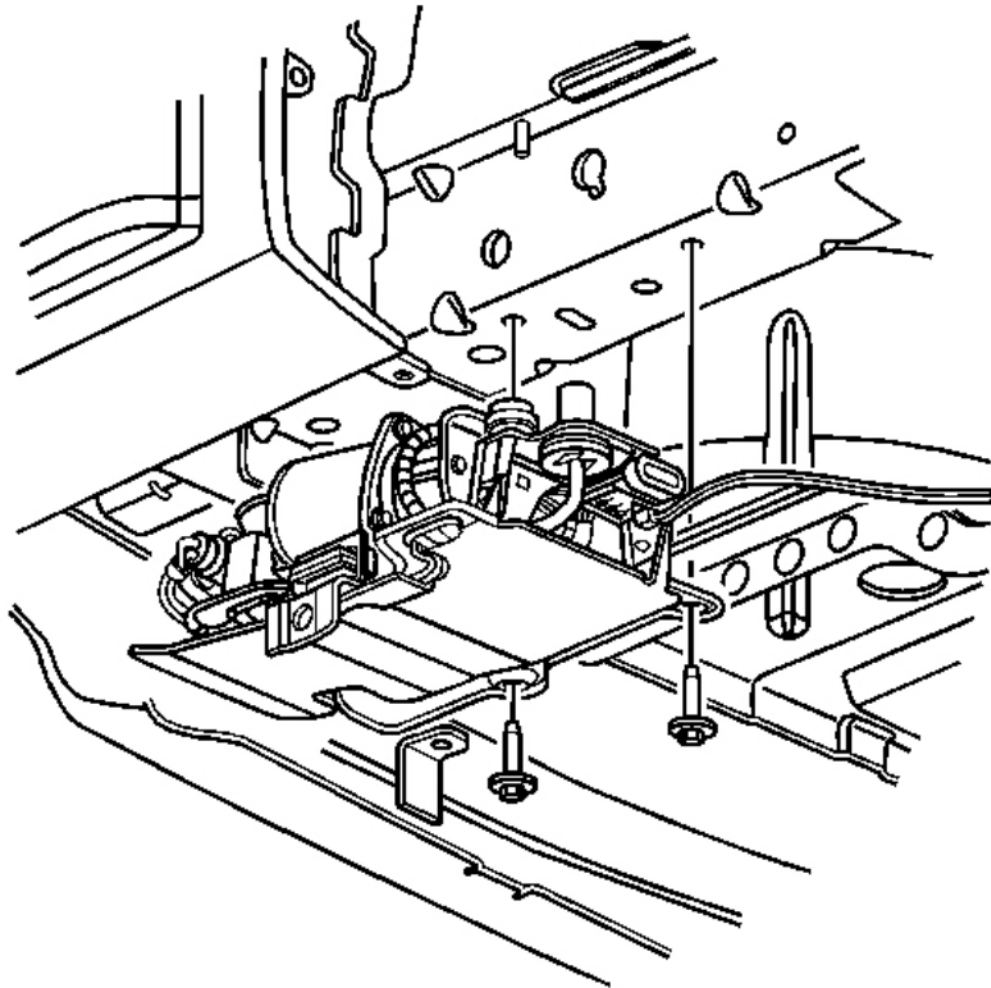


Fig. 17: View Of ALC Compressor
Courtesy of GENERAL MOTORS CORP.

10. Remove the ALC compressor top bracket mounting screw.
11. Remove the electrical harness connector from the ALC bracket.
12. Disconnect the bleed hose from the clip.
13. Remove the ALC bracket to ALC compressor screws.
14. Remove the ALC bracket from the ALC compressor.

Installation Procedure

1. Position the ALC bracket to the ALC compressor

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the ALC bracket to ALC compressor screws.

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

3. Connect the bleed hose to the clip.
4. Install the electrical connector to the ALC compressor bracket.
5. Connect the air tube to the ALC compressor.
6. Connect the ALC electrical harness connector.

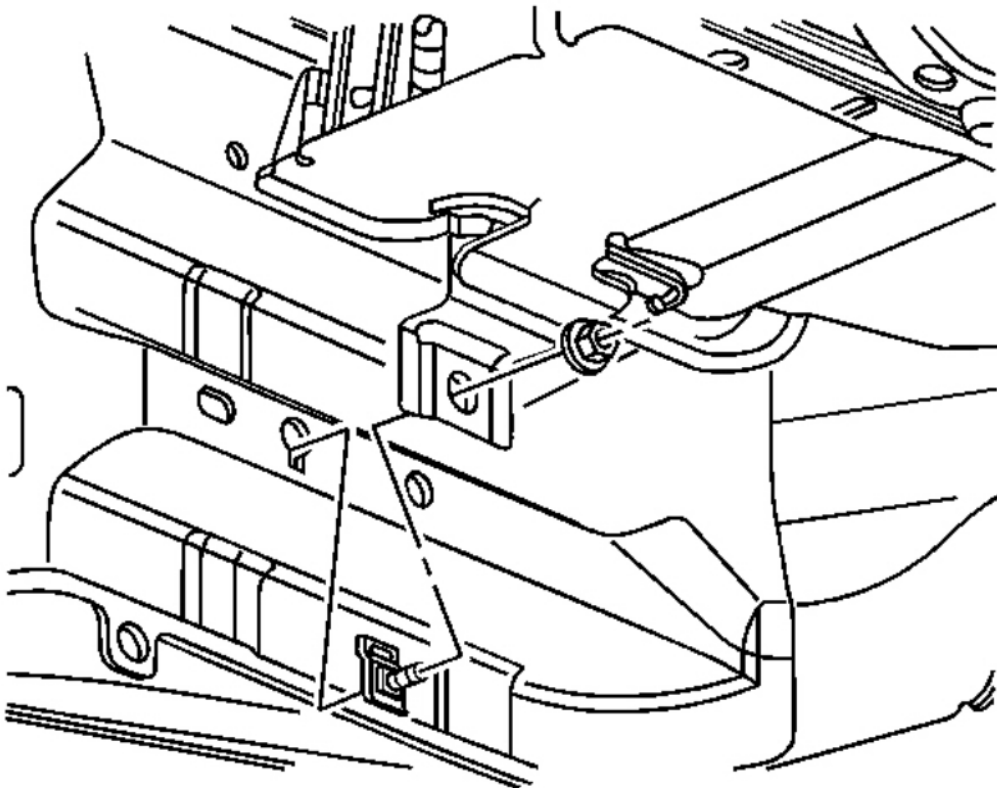


Fig. 18: View Of ALC Bracket Side Mounting Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the ALC bracket side mounting nut.

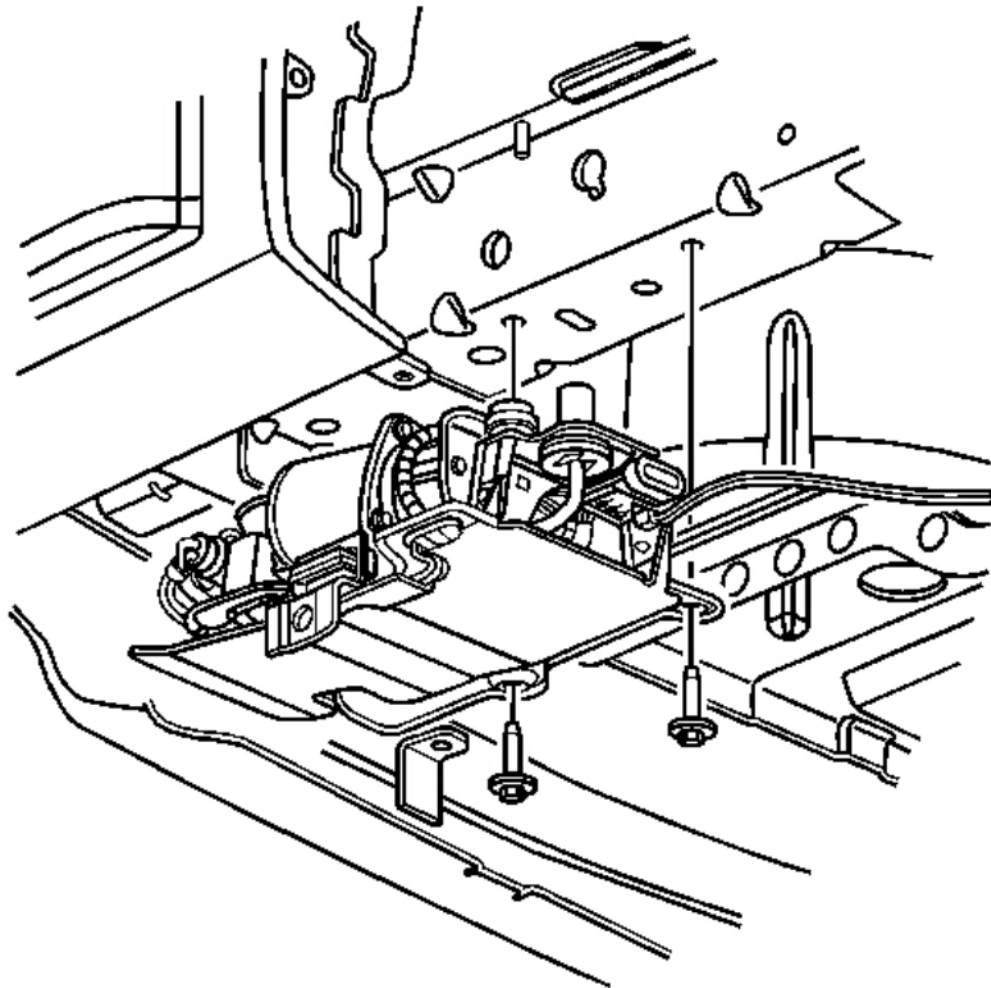


Fig. 19: View Of ALC Compressor
Courtesy of GENERAL MOTORS CORP.

8. Install the ALC bracket mounting bolts.

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

9. Connect the exhaust system the rear exhaust hangers.
10. Lower the vehicle.

DESCRIPTION AND OPERATION

AUTOMATIC LEVEL CONTROL DESCRIPTION AND OPERATION

General Description

The Automatic Level Control (ALC) system automatically adjusts the rear height of the vehicle in response to changes in vehicle loading.

The ALC system consists of the Electronic Suspension Control module, 2 position sensors, an air compressor assembly, an ALC compressor relay, an intake hose and filter, an air tube, and 2 rear shock absorbers. The air compressor assembly consists of an air compressor and an air dryer mounted on a bracket. The air compressor head is a replaceable part of the air compressor. The exhaust solenoid is a non-replaceable part of the air compressor head.

The vehicles rear vertical height is measured by the 2 position sensors. These 2 position sensors convert this rear height measurement into an analog voltage which is read by the ESC module. The ESC module then determines what action exhaust, compress, or no action shall take place. To compress, the ESC module switches the ELC compressor relay to ground.

The compressor is activated when the ignition is on, and weight is added to the vehicle. The exhaust solenoid is connected directly to the battery (+), enabling the system to exhaust with the ignition on or off when excess weight is removed.

Raising the Vehicle

When a load is added to the vehicle, the vehicle body moves down causing the sensor actuating arm to rotate upward. The upward arm movement activates an internal timing circuit and, after an initial fixed delay, the ESC module provides a ground to complete the compressor relay circuit. The battery positive circuit to the compressor is then complete and the compressor runs, sending pressurized air to the shock absorbers through the air tubes.

As the shock absorbers inflate, the vehicle body moves upward rotating the actuating arm towards its original position. Once the body reaches its trim height, the compressor relay circuit is opened and the compressor is turned off.

Air Compressor Head Relief Sequence

In order to reduce current draw during air compressor starting, the ESC module performs an air compressor head relief sequence before air compressor operation. This sequence reduces the air pressure in the air compressor cylinder during start-up. The air compressor head relief sequence occurs as follows:

- Exhaust solenoid is activated.
- Air compressor is activated 1.3 seconds after the exhaust solenoid is activated.
- Exhaust solenoid is de-activated 0.5 seconds after the air compressor is activated.

Lowering the Vehicle

When a load is removed from the rear of the vehicle, the body rises, causing the sensor actuating arm to rotate downward. This again activates the internal timing circuit. After the initial fixed delay, the ESC module provides a ground to complete the exhaust solenoid circuit, activating the solenoid. Now, air starts exhausting out of the shock absorbers, back through the air dryer and exhaust solenoid valve, and into the atmosphere.

As the vehicle body lowers, the actuating arm rotates to its original position. When the vehicle body reaches its trim height, the exhaust solenoid is deactivated, which closes the exhaust solenoid and prevents air from escaping.

Air Replenishment Cycle

An air replenishment cycle (ARC) is commanded after each ignition-ON cycle. The purpose of the ARC is to ensure that the ALC system is operating at or above minimum air pressure. The ARC occurs as follows:

- The EXHAUST SOLENOID IS ACTIVATED 20 seconds after the ignition has been turned on.
- The AIR COMPRESSOR IS ACTIVATED 1.3 seconds after the exhaust solenoid is energized.
- The EXHAUST SOLENOID IS DE-ACTIVATED 0.5 seconds after the air compressor is activated.
- The AIR COMPRESSOR IS DEACTIVATED 3.2 seconds after the exhaust solenoid is de-energized.

Air Compressor Description

The air compressor is a positive displacement air pump, powered by a 12 volt DC permanent-magnet motor. The air compressor head contains intake and exhaust ports plus a solenoid-operated exhaust valve that releases air from the ALC system when activated. Air compressor

2004 Cadillac SRX

2004 SUSPENSION Automatic Level Control - SRX

intake air is drawn through an intake air hose and filter, mounted in the body rail. The air compressor is a serviceable part and is mounted on a bracket. The bracket is mounted to the underbody behind the right rear wheel well.

Air Dryer Description

The air dryer is attached to the air compressor head assembly at the pressure outlet and provides a dual function:

- It contains a moisture-absorbing desiccant chemical that absorbs moisture from the compressed air before it is delivered to the rear struts. Moisture is removed from the air dryer and returned to the atmosphere when air is exhausted out of the struts during lowering.
- It contains valving that maintains a system residual pressure of 48 to 97 kPa (7 to 14 psi). This system pressure is maintained for improved ride characteristics and improved air sleeve reliability.

Exhaust Solenoid Description

The exhaust solenoid is a non-serviceable part of the air compressor head and provides a dual function:

- When activated, it exhausts air from the rear struts.
- It acts as a relief valve to limit the maximum air pressure output of the compressor.

Automatic Level Control Sensor Description

The 2 position sensors that are utilized by the ALC system are mounted on the body, one sensor over each upper control arm of the rear suspension. Each rear position sensor has a link that is connected to corresponding rear suspension upper control arm.

The ESC module provides supply voltage of 5 volts and ground to the position sensors. The position sensors then supply an analog output voltage of 0.35 to 4.75 volts back to the ESC control module. The amount of voltage is dictated by the vertical height of the rear of the vehicle.

Air Shock Absorber or Strut Description

The rear air adjustable shock absorbers are constructed with a rubber-like air sleeve attached to the dust tube and reservoir. This sleeve forms a flexible chamber which extends the shock absorber when pressure in the chamber is increased. When air pressure is reduced, the weight of the vehicle collapses the shock absorber. In order to maintain proper operation and reliability of the air adjustable shock absorbers, a system pressure from 48-97 kPa (7-14 psi) must be maintained at all times.

Air Lines and Connectors Description

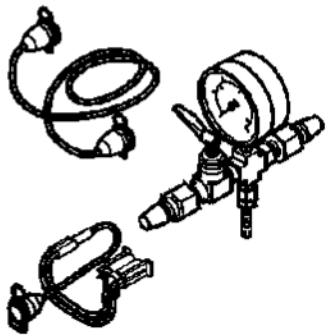
The air tube is a non-serviceable item consisting of the following:

- One connector at the ALC air dryer
- Two tubes between the ALC air dryer and the 2 rear shock absorbers
- Two connectors with spring clips, 1 at each rear shock absorber

At the rear shock absorbers, the air tube connectors are held on with spring clips which snap into the grooves of the shock absorber air fittings. Air tube connectors are sealed using 2 O-rings.

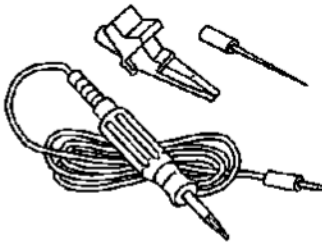
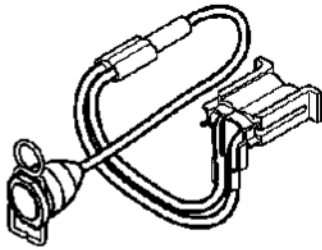
Although the tubes are flexible, care should be taken not to kink them and to keep them from contacting the exhaust system.

SPECIAL TOOLS AND EQUIPMENT**SPECIAL TOOLS****Special Tools**

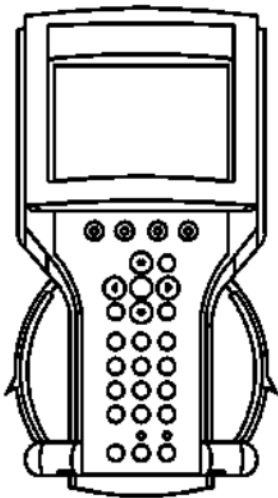
Illustration	Tool Number/ Description
	J 22124-B Pressure Gage
	J 22124-91 Pressure Gage Adaptor

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2004 SUSPENSION Automatic Level Control - SRX



J 34142-B
12-V Unpowered Test Lamp



Tech 2