

Electronic Suspension Control System - Coupe & Wagon

FASTENER TIGHTENING SPECIFICATIONS

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

ELECTRONIC SUSPENSION CONTROL WIRING SCHEMATICS

Fig. 1: F55
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC C0558</u>	DTC C0558 Calibration Data Not Programmed
<u>DTC C0575, C0580, C0585, or C0590</u>	DTC C0575 01 Left Front Actuator Circuit - Short To Battery DTC C0575 02 Left Front Actuator Circuit - Short To Ground DTC C0575 04 Left Front Actuator Circuit - Open Circuit DTC C0580 01 Right Front Actuator Circuit - Short To Battery DTC C0580 02 Right Front Actuator Circuit - Short To Ground DTC C0580 04 Right Front Actuator Circuit - Open Circuit DTC C0585 01 Left Rear Actuator Circuit - Short To Battery DTC C0585 02 Left Rear Actuator Circuit - Short To Ground DTC C0585 04 Left Rear Actuator Circuit - Open Circuit DTC C0590 01 Right Rear Actuator Circuit - Short To Battery DTC C0590 02 Right Rear Actuator Circuit - Short To Ground DTC C0590 04 Right Rear Actuator Circuit - Open Circuit
<u>DTC C0615, C0620, C0625, or C0630</u>	DTC C0615 08 Left Front Position Sensor Circuit - Signal Invalid DTC C0615 55 Left Front Position Sensor Circuit - Expected Number Of Transitions Not Reached DTC C0620 08 Right Front Position Sensor Circuit - Signal Invalid DTC C0620 55 Right Front Position Sensor Circuit - Expected Number Of Transitions Not Reached DTC C0625 08 Left Rear Position Sensor Circuit - Signal Invalid DTC C0625 55 Left Rear Position Sensor Circuit - Expected Number Of Transitions Not Reached DTC C0630 08 Right Rear Position Sensor Circuit - Signal Invalid DTC C0630 55 Right Rear Position Sensor Circuit - Expected Number Of Transitions Not Reached
<u>DTC C0696</u>	DTC C0696 Position Sensor Overcurrent

DTC C0558: CALIBRATION DATA NOT PROGRAMMED

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0558

Calibration Data Not Programmed

Circuit/System Description

The electronic suspension control module(ESCM) performs checks of internal calibration data. If a fault condition is detected, the ESCM will set the fault DTC, and may, depending upon the fault type, have a SERVICE RIDE CONTROL or SERVICE SUSPENSION SYSTEM message displayed on the driver Information center (DIC). Recovery from any controller fault condition is attempted only after the ignition is cycled ON and OFF.

Conditions for Running the DTC

- Battery voltage is between 9-16 volts
- Ignition is ON.

Conditions for Setting the DTC

- The DTC is set when any calibration faults internal to the ESCM are detected.
- The fault is detected during 3 consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with the scan tool.

Action Taken When the DTC Sets

- The ESCM disables all system functionality.
- The ESCM sends a message to the instrument panel cluster (IPC) to display a SERVICE RIDE CONTROL or SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

- A current DTC will clear when the ESCM no longer senses the malfunction and the ignition is cycled ON and OFF.
- The DTC will remain in history until 50 ignition cycles have occurred.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Verify that DTC C0558 is not set.

- If the DTC resets replace the ESCM.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for electronic suspension control module replacement, programming and setup.

DTC C0575, C0580, C0585, OR C0590: ACTUATOR CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0575 01

Left Front Actuator Circuit - Short To Battery

DTC C0575 02

Left Front Actuator Circuit - Short To Ground

DTC C0575 04

Left Front Actuator Circuit - Open Circuit

DTC C0580 01

Right Front Actuator Circuit - Short To Battery

DTC C0580 02

Right Front Actuator Circuit - Short To Ground

DTC C0580 04

Right Front Actuator Circuit - Open Circuit

DTC C0585 01

Left Rear Actuator Circuit - Short To Battery

DTC C0585 02

Left Rear Actuator Circuit - Short To Ground

DTC C0585 04

Left Rear Actuator Circuit - Open Circuit

DTC C0590 01

Right Rear Actuator Circuit - Short To Battery

DTC C0590 02

Right Rear Actuator Circuit - Short To Ground

DTC C0590 04

Right Rear Actuator Circuit - Open Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Suspension Damper Control Terminal A	C0575 02	C0575 04	C0575 01	-
Left Front Suspension Damper Control Terminal B	-	C0575 04	-	-
Right Front Suspension Damper Control Terminal A	C0580 02	C0580 04	C0580 01	-
Right Front Suspension Damper Control Terminal B	-	C0580 04	-	-
Left Rear Suspension Damper Control Terminal A	C0585 02	C0585 04	C0585 01	-

Left Rear Suspension Damper Control Terminal B	-	C0585 04	-	-
Right Rear Suspension Damper Control Terminal A	C0590 02	C0590 04	C0590 01	-
Right Rear Suspension Damper Control Terminal B	-	C0590 04	-	-

Circuit/System Description

The electronic suspension control module (ESCM) commands variable levels of pulse width modulated current to each damper in response to rough road, or abrupt steering maneuver driving conditions. The ESC module continuously compares each dampers command state with the state of their feedback circuits to ensure they agree.

Conditions for Running the DTC

- Battery voltage is between 9-16 volts
- Ignition ON for 30 seconds

Conditions for Setting the DTC

- The damper coil or the circuits to the coil are shorted to ground, shorted to voltage, or open for 3 consecutive ignition ON cycles.
- The vehicle must be driven over 4.8 km/h (3 mph).

Action Taken When the DTC Sets

- The driver information center (DIC) displays a SERVICE RIDE CONTROL or SERVICE SUSPENSION SYSTEM message.
- If the DTC symptom 01 is stored, the electronic suspension control (ESC) system is disabled.
- If the DTC symptom 02 or 04 is stored, the suspect damper is disabled.

Conditions for Clearing the DTC

- A current DTC will clear on the next consecutive malfunction-free ignition cycle.
- A history DTC will clear after 50 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, command the damper actuator ON and OFF while jouncing the vehicle in the front and rear. Suspension should change stiffness when commanded between the ON and OFF state.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate suspension damper.
2. Perform this setup step in the following order:
 1. Connect a test lamp between the damper connector control circuit terminal A and control circuit terminal B.
 2. Ignition ON, with a scan tool, clear all ESC module DTCs.
3. Command the damper ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit terminal A for a short to voltage. If the circuit tests normal, replace the ESC module.
 - If the test lamp is always OFF, test the control circuits listed below. If all circuits test normal, replace the ESC module.
 - Control circuit terminal A for a short to ground or open/high resistance.
 - Control circuit terminal B for an open/high resistance or short to voltage.
4. If all circuits test normal, test or replace the suspension damper.

Component Testing

1. Ignition OFF, disconnect the harness connector at the appropriate suspension damper.
2. Test for 0.7-3.3ohms between the control circuit terminal A and the control circuit terminal B of the suspension damper.
 - If not within the specified range, replace the suspension damper.

Repair Instructions

- **Shock Absorber Replacement**
- **Control Module References** for ESC replacement, setup, and programming

Repair Verification

1. Install any components or connectors that have been removed or replaced during diagnosis.
2. Perform any adjustment, programming or setup procedures that are required when a component or module is removed or replaced.
3. Clear the DTCs.
4. Use the scan tool Diagnostic Counter Reset output control function to bypass the 3 consecutive ignition cycle requirement for setting a DTC. This will ensure that if a DTC was to be reset during the repair verification process, it will be displayed on the scan tool.
5. Turn OFF the ignition for 60 seconds.
6. Turn ON the ignition.
7. If the repair was related to a DTC, duplicate the Conditions for Running the DTC and use the Freeze Frame/Failure Records, if applicable, in order to verify the DTC does not reset. If the DTC resets or another DTC is present, refer to the and perform the appropriate diagnostic procedure

DTC C0615, C0620, C0625, OR C0630: SUSPENSION POSITION SENSOR

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0615 08

Left Front Position Sensor Circuit - Signal Invalid

DTC C0615 55

Left Front Position Sensor Circuit - Expected Number Of Transitions Not Reached

DTC C0620 08

Right Front Position Sensor Circuit - Signal Invalid

DTC C0620 55

Right Front Position Sensor Circuit - Expected Number Of Transitions Not Reached

DTC C0625 08

Left Rear Position Sensor Circuit - Signal Invalid

DTC C0625 55

Left Rear Position Sensor Circuit - Expected Number Of Transitions Not Reached

DTC C0630 08

Right Rear Position Sensor Circuit - Signal Invalid

DTC C0630 55

Right Rear Position Sensor Circuit - Expected Number Of Transitions Not Reached

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Strut Position Sensor 5-Volt Reference	C0696 00	C0615 08	C0696 00	-
Left Front Strut Position Sensor Signal	C0615 08	C0615 08	C0615 08, C0696 00	C0615 55
Left Front Strut Position Sensor Low Reference	-	C0615 08	-	-
Right Front Strut Position Sensor 5-Volt Reference	C0696 00	C0620 08	C0696 00	-
Right Front Strut Position Sensor Signal	C0620 08	C0620 08	C0620 08, C0696 00	C0620 55
Right Front Strut Position Sensor Low Reference	-	C0620 08	-	-
Left Rear Strut Position Sensor 5-Volt Reference	C0696 00	C0625 08	C0696 00	-
Left Rear Strut Position Sensor Signal	C0625 08	C0625 08	C0625 08, C0696 00	C0625 55
Left Rear Strut Position Sensor Low Reference	-	C0625 08	-	-
Right Rear Strut Position Sensor 5-Volt Reference	C0696 00	C0630 08	C0696 00	-
Right Rear Strut Position Sensor Signal	C0630 08	C0630 08	C0630 08, C0696 00	C0630 55
Right Rear Strut Position Sensor Low Reference	-	C0630 08	-	-

Circuit/System Description

The electronic suspension control (ESC) module supplies a 5-volt reference signal to each suspension position sensor. The suspension position sensors supply a signal of 0.35-4.75 volts to the ESC module which represents the position between the body and the wheel. The sensors are also grounded through the ESC module.

Conditions for Running the DTC

- Battery voltage is between 9-16 volts.
- Ignition is ON.

Conditions for Setting the DTC

- The DTC is set when the ESC module measures a position sensor signal less than 0.35 volt or greater than 4.75 volts for more than 1 second while the vehicle is operated under normal driving conditions.
- The fault is detected during 3 consecutive ignition cycles, or during the same ignition cycle after clearing the DTC with a scan tool.

Action Taken When the DTC Sets

- The ESC will enter the speed dependent damping mode.
- Both left and right normal force outputs will be set to the default output states.
- The ESC sends a message to the instrument panel cluster (IPC) to display a SERVICE RIDE CONTROL or SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

A history DTC will clear after 50 consecutive ignition cycles if the condition for the malfunction is no longer present.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**

- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, observe the scan tool Position Sensor Data parameters while the vehicle is jounced. The readings should vary between 0.35-4.75 volts.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate suspension position sensor.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit terminal C and ground.
 - If greater than the specified range, test the low reference circuit for an open/high resistance. If circuit tests normal, replace the ESC module.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal A and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ESC module.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ESC module.
4. Verify the scan tool position sensor parameter is less than 0.35 volt.
 - If greater than the specified range, test the signal circuit terminal B for a short to voltage. If the circuit tests normal, replace the ESC module.
5. Install a 3A fused jumper wire between the signal circuit terminal B and the 5-volt reference circuit terminal A. Verify the scan tool position sensor parameter is greater than 4.75 volts.
 - If less than the specified range, test the signal circuit for a short to ground or an open high resistance. If all circuits test normal replace the ESC module.
6. If all circuits test normal, test or replace the applicable suspension position sensor.

Component Testing

1. Install a 3A fused jumper wire between the 5-volt reference terminal A and 5 volts. Install a jumper wire between the low reference terminal C and ground.
2. Sweep the suspension position sensor through the entire range while monitoring the voltage between the signal terminal B and the low reference terminal C. The range should vary between 0.35-4.75 volts without any spikes or dropouts.
 - If not within the specified range or if it is erratic, replace the suspension position sensor.

Repair Instructions

- **Electronic Suspension Front Position Sensor Replacement**

- **Electronic Suspension Rear Position Sensor Replacement**
- **Control Module References** for ESC replacement, setup, and programming

Repair Verification

1. Install any components or connectors that have been removed or replaced during diagnosis.
2. Perform any adjustment, programming or setup procedures that are required when a component or module is removed or replaced.
3. Clear the DTCs.
4. Use the scan tool Diagnostic Counter Reset output control function to bypass the 3 consecutive ignition cycle requirement for setting a DTC. This will ensure that if a DTC was to be reset during the repair verification process, it will be displayed on the scan tool.
5. Turn OFF the ignition for 60 seconds.
6. Turn ON the ignition.
7. If the repair was related to a DTC, duplicate the Conditions for Running the DTC and use the Freeze Frame/Failure Records, if applicable, in order to verify the DTC does not reset. If the DTC resets or another DTC is present, refer to the and perform the appropriate diagnostic procedure.

DTC C0696: POSITION SENSOR OVERCURRENT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0696

Position Sensor Overcurrent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Strut Position Sensor 5-Volt Reference	C0696 00	C0615 08	C0696 00	-
Left Front Strut Position Sensor Signal	C0615 08	C0615 08	C0615 08, C0696 00	C0615 55
Left Front Strut Position Sensor Low Reference	-	C0615 08	-	-
Right Front Strut Position Sensor 5-Volt Reference	C0696 00	C0620 08	C0696 00	-

Right Front Strut Position Sensor Signal	C0620 08	C0620 08	C0620 08, C0696 00	C0620 55
Right Front Strut Position Sensor Low Reference	-	C0620 08	-	-
Left Rear Strut Position Sensor 5-Volt Reference	C0696 00	C0625 08	C0696 00	-
Left Rear Strut Position Sensor Signal	C0625 08	C0625 08	C0625 08, C0696 00	C0625 55
Left Rear Strut Position Sensor Low Reference	-	C0625 08	-	-
Right Rear Strut Position Sensor 5-Volt Reference	C0696 00	C0630 08	C0696 00	-
Right Rear Strut Position Sensor Signal	C0630 08	C0630 08	C0630 08, C0696 00	C0630 55
Right Rear Strut Position Sensor Low Reference	-	C0630 08	-	-

Circuit/System Description

The electronic suspension control (ESC) module provides a common regulated reference voltage of approximately 5 volts to all of the position sensors. The ESC module monitors this power supply for a malfunction that could prevent it from correctly regulating the supply voltage.

Conditions for Running the DTC

- Battery voltage is between 9-16 volts
- Ignition is ON

Conditions for Setting the DTC

- The ESC module senses suspension position sensor supply voltage under 4.75 volts or over 5.25 volts.
- The condition is detected for 1 second in 4 consecutive ignition cycles.

Action Taken When the DTC Sets

- Commands speed dependent damping system and normal force signals to the default state.
- The ESC sends a message to the instrument panel cluster (IPC) to display a SERVICE RIDE CONTROL or SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.
- The ESC module senses the correct sensor supply voltage.
- The IPC clearing DTC feature.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, observe the scan tool Position Sensor Data parameters while the vehicle is jounced. The readings should vary between 0.35-4.75 volts.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at all 4 suspension position sensors.
2. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal A and ground at each sensor connector.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If all circuits test normal, replace the ESC module.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ESC module.
3. Test for less than .35 volts between the signal circuit terminal B and ground.
 - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the ESC module.
4. Reinstall each sensor one at a time. Test for 4.8-5.2 volts between the 5-volt reference circuit terminal A and ground of the last sensor connector to be connected.
 - If the voltage is not within the specified range when one of the 3 sensors are connected, test or

replace the suspect suspension position sensor.

5. Test or replace the last remaining suspect suspension position sensor.

Component Testing

1. Install a 3A fused jumper wire between the 5-volt reference terminal A and 5 volts. Install a jumper wire between the low reference terminal C and ground.
2. Sweep the suspension position sensor through the entire range while monitoring the voltage between the signal terminal B and the low reference terminal C. The range should vary between 0.35-4.75 volts without any spikes or dropouts.
 - If not within the specified range or if it is erratic, replace the applicable suspension position sensor.

Repair Instructions

- **Electronic Suspension Front Position Sensor Replacement**
- **Electronic Suspension Rear Position Sensor Replacement**
- **Control Module References** for ESC module replacement, setup, and programming

Repair Verification

1. Install any components or connectors that have been removed or replaced during diagnosis.
2. Perform any adjustment, programming or setup procedures that are required when a component or module is removed or replaced.
3. Clear the DTCs.
4. Use the scan tool Diagnostic Counter Reset output control function to bypass the 3 consecutive ignition cycle requirement for setting a DTC. This will ensure that if a DTC was to be reset during the repair verification process, it will be displayed on the scan tool.
5. Turn OFF the ignition for 60 seconds.
6. Turn ON the ignition.
7. If the repair was related to a DTC, duplicate the Conditions for Running the DTC and use the Freeze Frame/Failure Records, if applicable, in order to verify the DTC does not reset. If the DTC resets or another DTC is present, refer to the and perform the appropriate diagnostic procedure.

REPAIR INSTRUCTIONS

ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT

Removal Procedure

1. Remove the left rear trim panel.

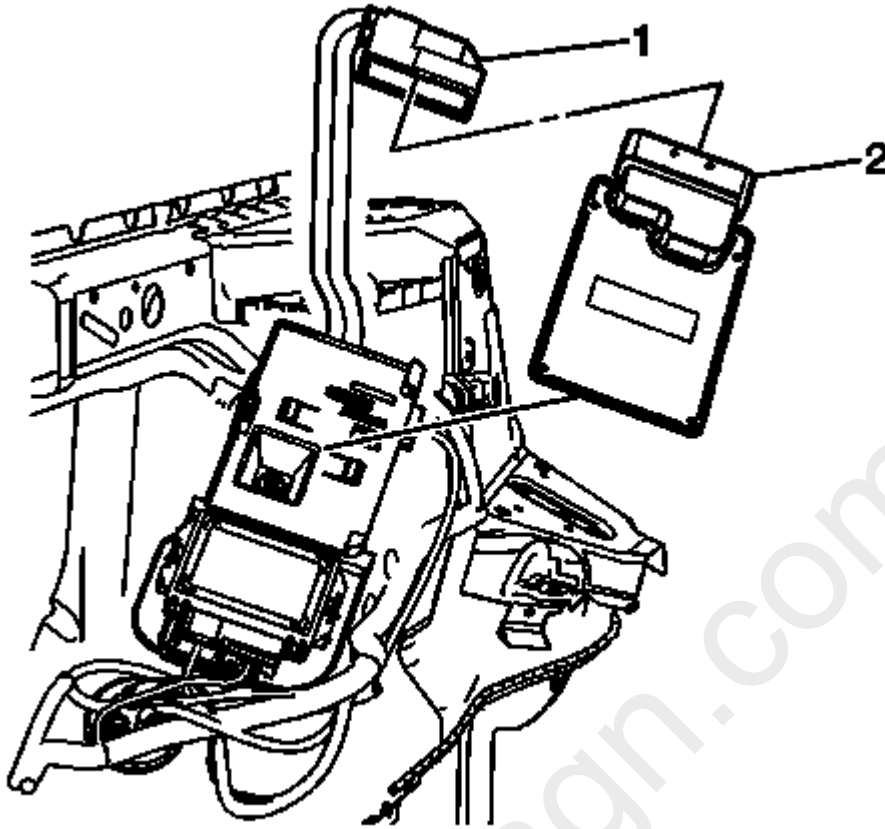


Fig. 2: Identifying ESC Module And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

2. Loosen the electronic suspension control (ESC) module nuts.
3. Disconnect the ESC module electrical connector (1).
4. Remove the ESC module (2).

Installation Procedure

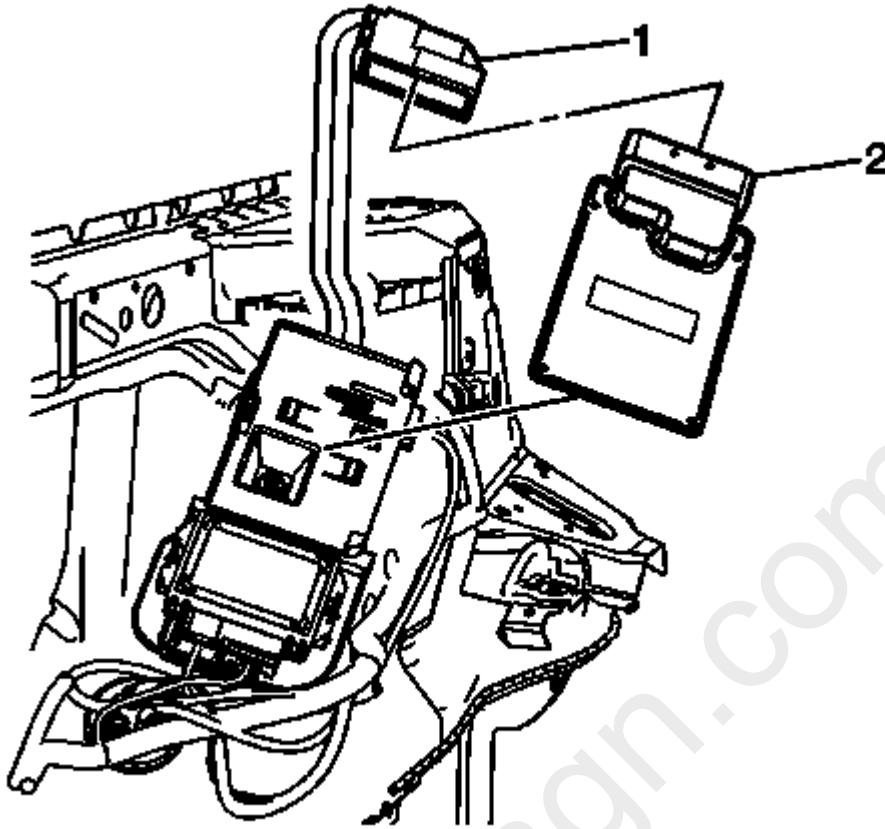


Fig. 3: Identifying ESC Module And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

1. Install the ESC module (2).
2. Connect the ESC module electrical connector (1).

CAUTION: Refer to Fastener Caution .

3. Tighten the ESC module nuts to 9 N.m (80 lb in).
4. Install the left rear trim panel.
5. Refer to **Control Module References** for programming and setup information.

ELECTRONIC SUSPENSION FRONT POSITION SENSOR REPLACEMENT

Removal Procedure

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

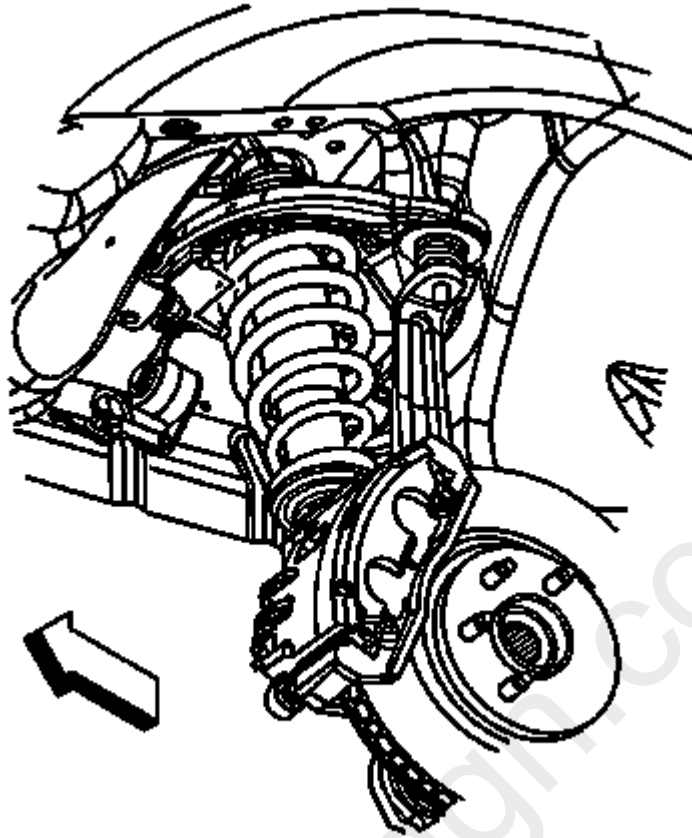


Fig. 4: Locating Front Ride Sensor Link
Courtesy of GENERAL MOTORS COMPANY

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

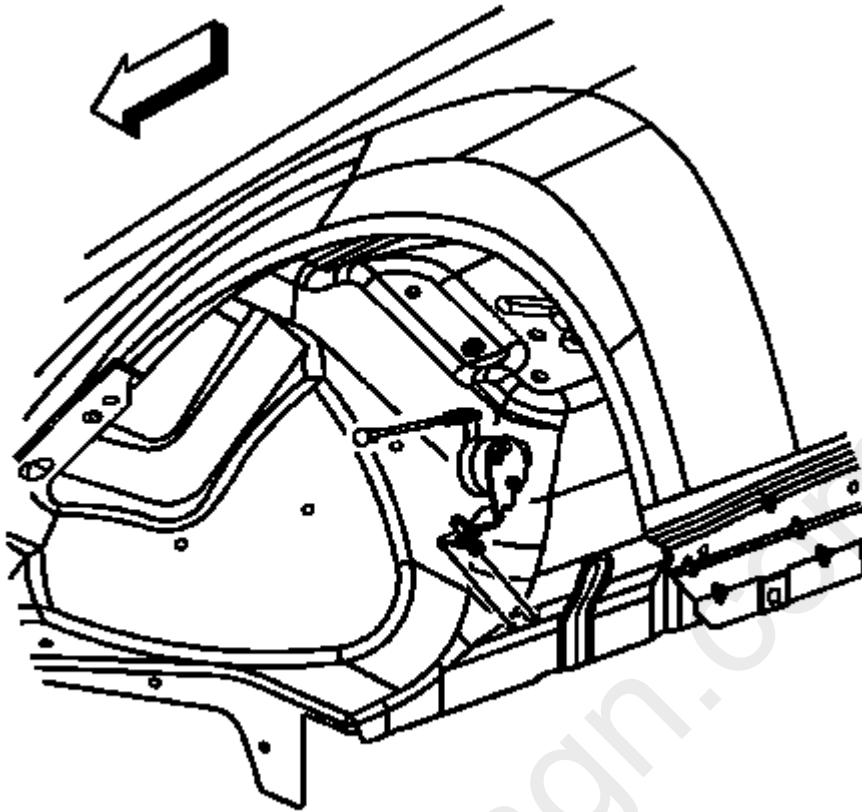


Fig. 5: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

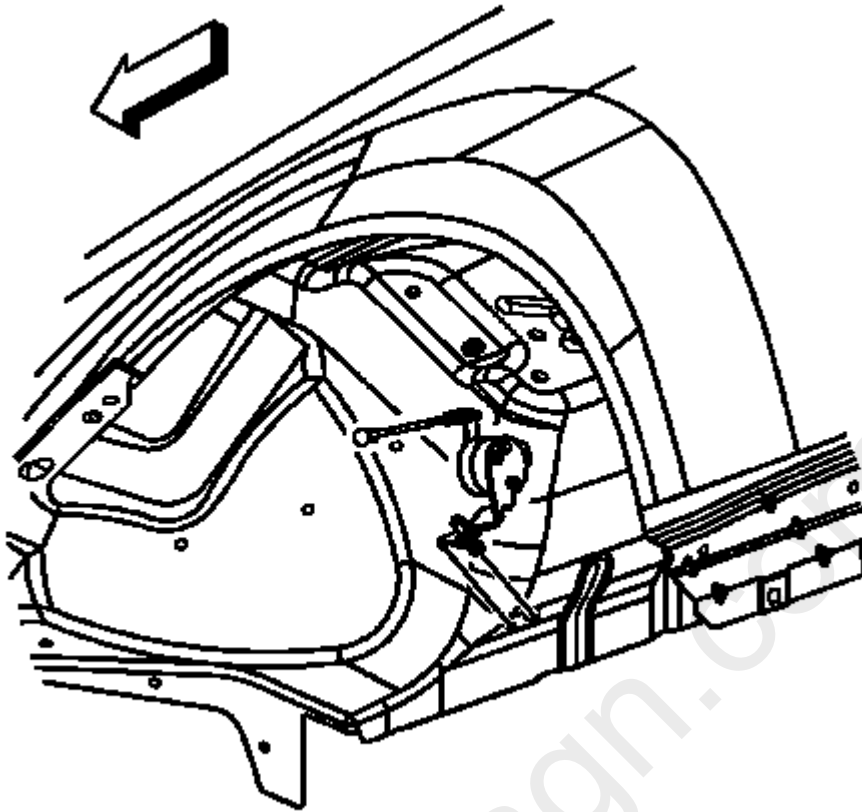


Fig. 6: View Of Front Ride Sensor
Courtesy of GENERAL MOTORS COMPANY

1. Position the sensor to the vehicle.

CAUTION: Refer to Fastener Caution .

2. Install the front ride sensor retaining nut and tighten to 9 N.m (80 lb in).

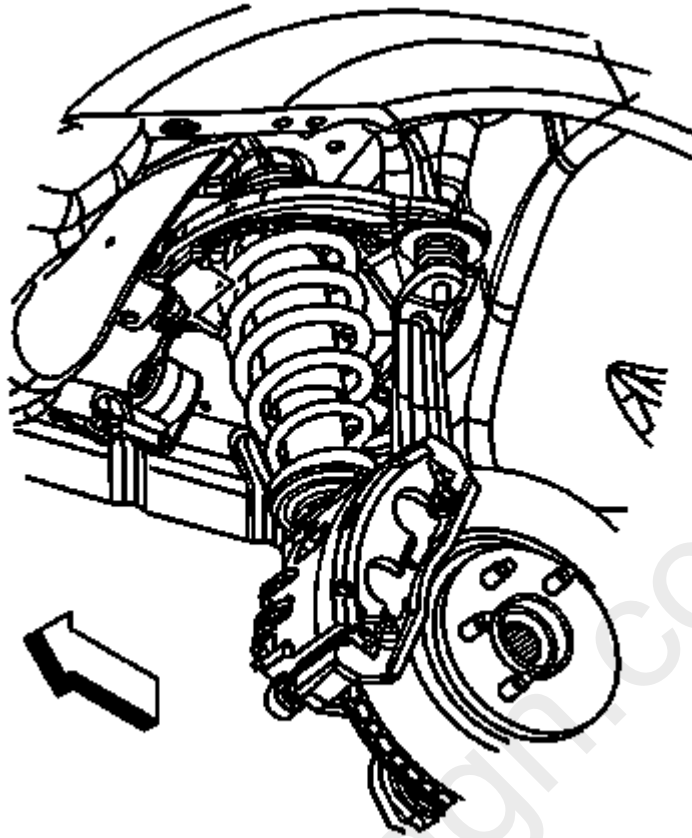


Fig. 7: Locating Front Ride Sensor Link
Courtesy of GENERAL MOTORS COMPANY

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** .
6. Lower the vehicle.

ELECTRONIC SUSPENSION REAR POSITION SENSOR REPLACEMENT

Removal Procedure

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

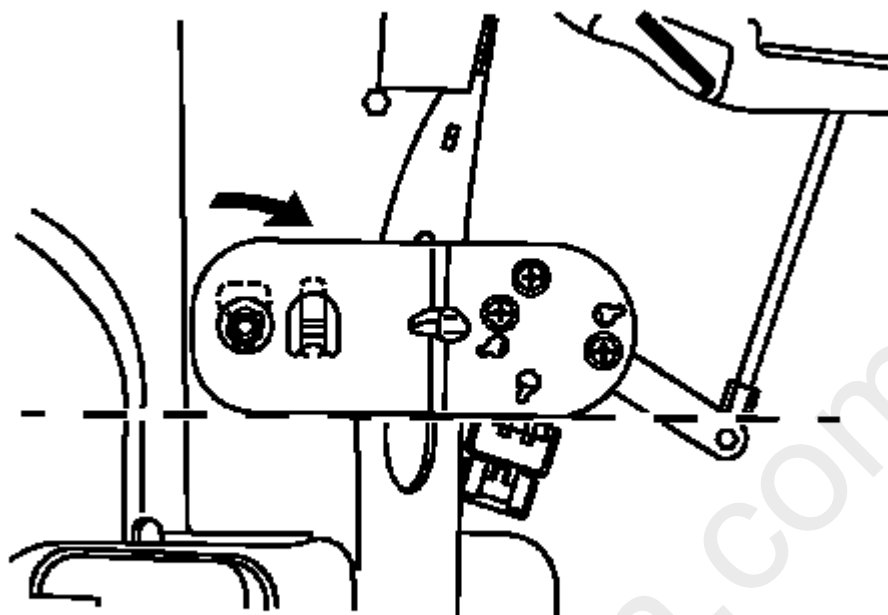


Fig. 8: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

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

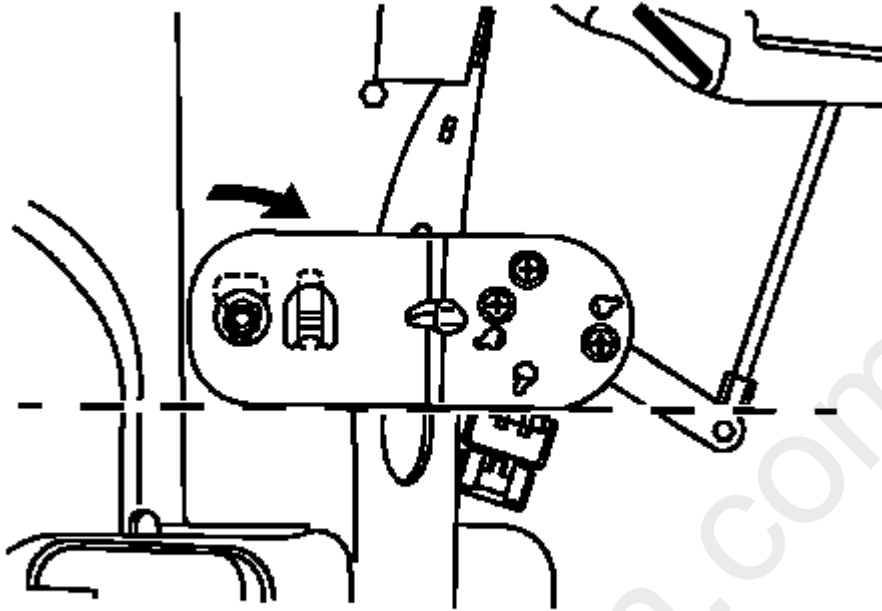


Fig. 9: View Of Rear Ride Sensor
Courtesy of GENERAL MOTORS COMPANY

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.

CAUTION: Refer to Fastener Caution .

5. Install the rear ride height sensor retaining nut and tighten 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** .
9. Lower the vehicle.

DESCRIPTION AND OPERATION

ELECTRONIC SUSPENSION CONTROL DESCRIPTION AND OPERATION

Electronic Suspension Control Description

The electronic suspension control system independently controls each of the 4 shock absorbers in order to control the vehicle ride characteristics. The electronic suspension control (ESC) system is capable of making these changes within milliseconds. The ESC system consists of the following major components:

- The electronic suspension (ESC) module
- The front/rear position sensors
- The front/rear adjustable shock absorbers
- The shock absorber electrical actuators, which are integrated within the shock absorbers

The ESC controls the damping mode selection according to the following factors:

- The vehicle speed
- The chassis pitch input
- The steering position
- The body to wheel displacement

The ESC module evaluates these inputs in order to separately control the shock absorbers, providing an enhanced ride and comfort level over the widest possible range of operating conditions.

Electronic Suspension Control Module

The electronic suspension control (ESC) module provides electronic control logic and output drive for each shock absorber. The ESC module makes decisions due to road and driving conditions based on various inputs. The ESC module receives input information by sensors that are directly connected to the ESC module or by other systems through the serial data line and uses these inputs to independently control the shock absorbers at each corner.

Electronic Suspension Control Position Sensors

The electronic suspension control (ESC) position sensors provide the ESC module with the body to wheel displacement input. The ESC module uses this and other inputs in order to control the stiffness of the shock absorber. If any body or wheel motion is detected, the ESC module will determine how soft or firm each shock absorber should be to provide the best ride. The ESC position sensors are mounted at each corner of the vehicle between the control arm and the body/frame.

Electronic Suspension Control Shock Absorber or Strut

The electronic suspension control (ESC) shock absorbers provide variable damping to resist suspension movement. The ESC shock absorber has the capability of providing multiple modes or values of damping forces, in both compression and rebound direction. The damping forces are modified utilizing electrical actuators located internally within the shock absorbers.

Electronic Suspension Control Operation

The electronic suspension control (ESC) system uses the information from other systems in order to execute certain functions.

The ESC system does not have a malfunction indicator lamp, but instead uses the instrument panel cluster (IPC) for the display functions. When the ESC system detects a malfunction that sets a DTC, the ESC system sends a message on the serial data line directly or through the powertrain control module (PCM) to the IPC, which will display one of the following messages:

- SHOCKS INOPERATIVE
- SERVICE SUSPENSION SYSTEM or SERVICE RIDE CONTROL
- SPEED LIMITED

The SHOCKS INOPERATIVE message will only be displayed if the ESC system detects a malfunction that sets a DTC and causes the ESC system to disable all 4 shock absorbers. The ESC system will send a message on the serial data line to the IPC to display this message.

The SERVICE SUSPENSION SYSTEM or SERVICE RIDE CONTROL message will only be displayed if the ESC system detects any malfunction that sets a DTC. The ESC system will send a message on the serial data line to the IPC to display this message.

The SPEED LIMITED message will only be displayed if the ESC system detects a malfunction that sets a DTC and causes the ESC system to disable all 4 shock absorbers. The ESC system will send a message on the serial data line to the PCM indicating that all 4 shock absorbers were disabled. The PCM then sends a message to the IPC to display this message.

The ESC module has the ability to store DTCs as current or history codes. Most ESC system malfunctions will display a message in the IPC and set a DTC. The message will remain ON until the RESET button is pressed on the driver information center (DIC). As long as the DTC is current, the message will be displayed after every ignition cycle and the RESET button must be pressed to bypass the message.

The ESC system uses an ignition cycling diagnostic approach in order to reduce the occurrence of false or intermittent DTCs that do not affect the functionality of the ESC system. This allows for the fail-soft actions to be taken whenever a malfunction condition is current, but requires the malfunction to be current for a certain number of ignition cycles before the corresponding malfunction code and message will be stored or displayed.

If the ESC detects a malfunction, the ESC system defaults with a fail-soft action. A fail-soft action refers to any specific action the ESC system takes in order to compensate for a detected malfunction. A typical ESC fail-soft action would be if the ESC system detects a malfunction with a shock absorber.