

SUSPENSION

Electronic Suspension Control - CTS Sedan

SCHEMATIC WIRING DIAGRAMS

ELECTRONIC SUSPENSION CONTROL WIRING SCHEMATICS

Electronic Suspension Control (F55)

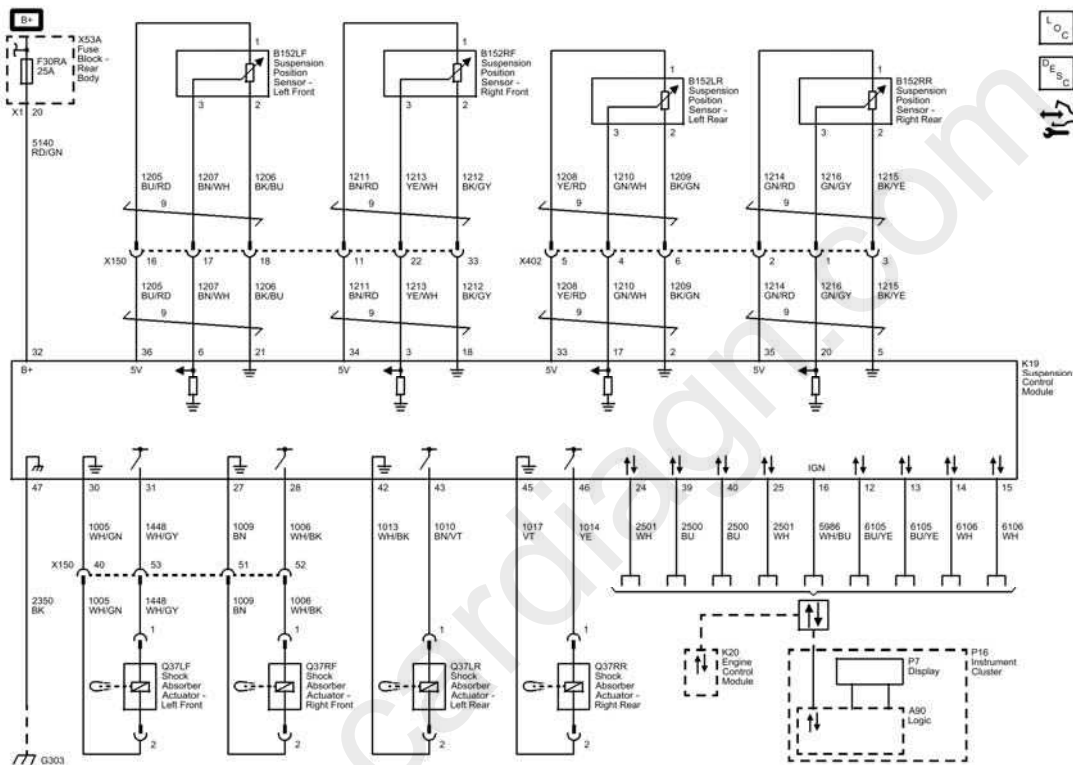


Fig. 1: Electronic Suspension Control (F55)

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC C056D	DTC C056D Electronic Control Unit Hardware
DTC C0574	DTC C0574 Printed Circuit Board Temperature Sensor
DTC C0575, C0580, C0585, or C0590	DTC C0575 Left Front Shock Absorber Actuator Circuit DTC C0580 Right Front Shock Absorber Actuator Circuit

	DTC C0585 Left Rear Shock Absorber Actuator Circuit DTC C0590 Right Rear Shock Absorber Actuator Circuit
<u>DTC C0615, C0620, C0625, or C0630</u>	DTC C0615 Left Front Suspension Position Sensor Circuit DTC C0620 Right Front Suspension Position Sensor Circuit DTC C0625 Left Rear Suspension Position Sensor Circuit DTC C0630 Right Rear Suspension Position Sensor Circuit
<u>DTC C0696</u>	DTC C0696 Position Sensor 5V Supply
<u>DTC C0800</u>	DTC C0800 Control Module Power Circuit

DTC C056D: ELECTRONIC CONTROL UNIT HARDWARE

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** provide an overview of each diagnostic category.

DTC Descriptors

DTC C056D

Electronic Control Unit Hardware

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

The internal fault detection is handled inside the suspension control module. The symptom byte listed in the DTC Descriptor is for engineering reference only. No external circuit diagnosis is involved. The suspension control module runs the program to detect an internal fault when power up is commanded. The only requirements are voltage and ground. This program runs even if the voltage is out of the valid operating range.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The suspension control module detects an internal hardware malfunction.

Action Taken When the DTC Sets

- The electric suspension control is disabled.
- A message and/or a warning indicator may be displayed.

Conditions for Clearing the DTC

- The suspension control module clears the history DTC when a current DTC is not detected in 40 ignition cycles.
- The condition for the DTC is no longer present.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics.

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN .

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C056D is not set.
 - **If the DTC is set**
 1. Program the K19 Suspension Control Module.
 - If the DTC is set, replace the K19 Suspension Control Module.
 - If the DTC is not set
 2. All OK.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair

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

DTC C0574: ELECTRONIC CONTROL UNIT HARDWARE

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** provide an overview of each diagnostic category.

DTC Descriptors

DTC C0574

Printed Circuit Board Temperature Sensor

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

The internal temperature sensor inside the suspension control module determines that the internal ECU temperature has become too high and out of range.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The suspension control module detects excessive ECU temperature.

Action Taken When the DTC Sets

- The electronic suspension dampening level is decreased or disabled.
- The Service Suspension System and Vehicle Speed Limited messages are displayed.

Conditions for Clearing the DTC

- The suspension control module clears the history DTC when a current DTC is not detected in 40 ignition cycles.
- The condition for the DTC is no longer present.

Diagnostic Aids

Depending on type of driving (rough road surfaces at high speed, etc.) and calibrations used, DTC may set to protect the ECU and not as a result of a failure in the electronics.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics.

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN .

Description and Operation

Electronic Suspension Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify DTC C0574 is not set
 - **If the DTC is set**

Replace K19 Suspension Control Module.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair

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

DTC C0575, C0580, C0585, OR C0590: SHOCK ABSORBER 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

Left Front Shock Absorber Actuator Circuit

DTC C0580

Right Front Shock Absorber Actuator Circuit

DTC C0585

Left Rear Shock Absorber Actuator Circuit

DTC C0590

Right Rear Shock Absorber Actuator Circuit

For symptom byte information, refer to **Symptom Byte List** .

Diagnostic Fault Information

Circuit	Short to Voltage	Short to Ground	Open/High Resistance	Signal Performance
Left Front Shock Absorber Actuator Control High	C0575 01	C0575 02	C0575 04	C0575 0D, C0575 0E, C0575 1A
Left Front Shock Absorber Actuator Control Low	C0575 01	C0575 02	C0575 04	C0575 0D, C0575 0E, C0575 1A
Right Front Shock Absorber Actuator Control High	C0580 01	C0580 02	C0580 04	C0580 0D, C0580 0E, C0580 1A
Right Front Shock Absorber Actuator Control Low	C0580 01	C0580 02	C0580 04	C0580 0D, C0580 0E, C0580 1A
Left Rear Shock Absorber Actuator Control High	C0585 01	C0585 02	C0585 04	C0585 0D, C0575 0E, C0575 1A
Left Rear Shock Absorber Actuator Control Low	C0585 01	C0585 02	C0585 04	C0585 0D, C0575 0E, C0575 1A
Right Rear Shock Absorber Actuator Control High	C0590 01	C0590 02	C0590 04	C0590 0D, C0575 0E, C0575 1A
Right Rear Shock Absorber Actuator Control Low	C0590 01	C0590 02	C0590 04	C0590 0D, C0575 0E, C0575 1A

Circuit/System Description

The suspension control module commands variable levels of current to each shock absorber actuator in response to rough road, braking or abrupt steering maneuver driving conditions. The current variation is performed by pulse width modulation (PWM) of the system voltage. The suspension control module continuously measures the actual current of each actuator. When a deviation between commanded and actual current is detected, a DTC is set.

Conditions for Running the DTC

System voltage is between 9-16 V.

Conditions for Setting the DTC

C0575 01, C0580 01, C0585 01, and C0590 01

- A short to voltage or short to ground on the control high circuit is detected.
- A short to ground on the control low circuit is detected.

C0575 02, C0580 02, C0585 02, and C0590 02

- An open or high resistance on the control high or control low circuit is detected.
- A short to voltage on the control low circuit is detected.

C0575 0D, C0575 0E, C0575 1A, C0580 0D, C0580 0E, C0580 1A, C0585 0D, C0585 0E, C0585 1A, C0590 0D, C0590 0E, C0590 1A

An erratic current on the actuator circuit is detected.

Action Taken When the DTC Sets

- The electronic suspension control is disabled for the duration of the ignition cycle.
- The driver information center displays the SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

A present DTC will clear on the next consecutive malfunction-free ignition cycle.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

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 Testing

1. Ignition OFF, disconnect the harness connector at the appropriate Q37 Shock Absorber Actuator, ignition ON.
2. Test for 9.5-11 V between the control circuit terminal 1 and ground.
 - **If less than 9.5 V**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module, ignition ON.
 4. Test for less than 2 ohms in the control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K19 Suspension Control Module.
 - **If greater than 11 V**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K19 Suspension Control Module.
 - **If between 9.5-11 V**
3. Test for greater than 9.5 V between the control circuit terminal 1 and the low control circuit terminal 2.
 - **If less than 9.5 V**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module.
 2. Test for less than 1 V between the low control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V
- 3. Test for less than 2 ohms in the low control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K19 Suspension Control Module.
 - **If greater than 9.5 V**
- 4. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module, ignition ON.
- 5. Test for infinite resistance between the low control circuit and ground.
 - **If less than infinite resistance**
 1. Repair the short to ground on the circuit.
 - **If infinite resistance**
- 6. Replace the Q37 Shock Absorber Actuator.
- 7. Verify the DTC does not set while operating the vehicle under Conditions for Running the DTC.
 - **If the DTC sets**

Replace the K19 Suspension Control Module.
 - **If the DTC does not set**
- 8. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Shock Absorber Replacement**
- **Control Module References** for suspension control module replacement, programming and setup.

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

For symptom byte information, refer to **Symptom Byte List** .

Diagnostic Fault Information

Circuit	Short to Voltage	Short to Ground	Open/High Resistance	Signal Performance
Left Front Position Sensor 5V Reference	C0696 00	C0696 00	C0615 06	C0615 55
Left Front Position Sensor Signal	C0615 01	C0615 06	C0615 06	C0615 55
Left Front Position Sensor Low Reference	-	-	C0615 06	-
Right Front Position Sensor 5V Reference	C0696 00	C0696 00	C0620 06	C0620 55
Right Front Position Sensor Signal	C0620 01	C0620 06	C0620 06	C0620 55
Right Front Position Sensor Low Reference	-	-	C0620 06	-
Left Rear Position Sensor 5V Reference	C0696 00	C0696 00	C0625 06	C0625 55
Left Rear Position Sensor Signal	C0625 01	C0625 06	C0625 06	C0625 55
Left Rear Position Sensor Low Reference	-	-	C0625 06	-
Right Rear Position Sensor 5V Reference	C0696 00	C0696 00	C0630 06	C0630 55
Right Rear Position Sensor Signal	C0630 01	C0630 06	C0630 06	C0630 55
Right Rear Position Sensor Low Reference	-	-	C0630 06	-

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

The suspension control module measures a position sensor signal less than 0.35 V or greater than 4.75 V for more than 5 s while the vehicle is operated under normal driving conditions.

Action Taken When the DTC Sets

- The suspension control module will enter the speed dependent damping mode.
- Both left and right normal force outputs will be set to the default output states.
- The suspension control module sends a message to the instrument panel cluster to display SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

A history DTC will clear after 40 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 - SEDAN

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 Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the appropriate B152 Suspension Position Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 2 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module.
 2. Test for less than 2 ohms in the low reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K19 Suspension Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 1 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module.
 2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the 5 V reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K19 Suspension Control Module.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module, ignition ON.
 2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K19 Suspension Control Module.
 - **If within 4.8-5.2 V**
5. Ignition OFF, disconnect the harness connector at the K19 Suspension Control Module, ignition ON.
6. Test for less than 1 V between the appropriate B152 Suspension Position Sensor signal circuit terminal 3 and ground.
 - **If greater than 1 V**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
7. Ignition OFF.
8. Test for infinite resistance between the appropriate B152 Suspension Position Sensor signal circuit terminal 3 and ground.
 - **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

9. Test for less than 2 ohms between the appropriate B152 Suspension Position Sensor signal circuit terminal 3 end to end.

- **If 2 ohms or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 ohms**

10. Replace the appropriate B152 Suspension Position Sensor.
11. Verify the DTC does not set while operating the vehicle under Conditions for Running the DTC.
 - **If the DTC sets**

Replace the K19 Suspension Control Module.

- **If the DTC does not set**

12. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

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

DTC C0696: POSITION SENSOR 5V SUPPLY

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 5V Supply

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

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Circuit	Short to Voltage	Short to Ground	Open/High Resistance	Signal Performance
Left Front Position Sensor 5V Reference	C0696 00	C0696 00	C0615 06	C0615 55
Left Front Position Sensor Signal	C0615 01	C0615 06	C0615 06	C0615 55
Left Front Position Sensor Low Reference	C0615 01	C0615 06	C0615 06	C0615 55
Right Front Position Sensor 5V Reference	C0696 00	C0696 00	C0620 06	C0620 55
Right Front Position Sensor Signal	C0620 01	C0620 06	C0620 06	C0620 55
Right Front Position Sensor Low Reference	C0620 01	C0620 06	C0620 06	C0620 55
Left Rear Position Sensor 5V Reference	C0696 00	C0696 00	C0625 06	C0625 55
Left Rear Position Sensor Signal	C0625 01	C0625 06	C0625 06	C0625 55
Left Rear Position Sensor Low Reference	C0625 01	C0625 06	C0625 06	C0625 55
Right Rear Position Sensor 5V Reference	C0696 00	C0696 00	C0630 06	C0630 55
Right Rear Position Sensor Signal	C0630 01	C0630 06	C0630 06	C0630 55
Right Rear Position Sensor Low Reference	C0630 01	C0630 06	C0630 06	C0630 55

Circuit/System Description

The suspension control module provides a common regulated reference voltage of approximately 5 V to all of the position sensors. The suspension control 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 V
- Ignition is ON

Conditions for Setting the DTC

- The suspension control module senses suspension position sensor supply voltage under 3.75 V or over 5.625 V.
- The condition is detected for 1 s in four consecutive ignition cycles.

Action Taken When the DTC Sets

- Commands speed dependent damping system and normal force signals to the default state.
- The suspension control module sends a message to the instrument panel cluster to display SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

- A history DTC will clear after 40 consecutive ignition cycles if the condition for the malfunction is no longer present.
- The suspension control module senses the correct sensor supply voltage.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

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 scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connectors at each of the B152 Suspension Position Sensors.
2. Disconnect the harness connector at the K19 Suspension Control Module. Ignition ON.
3. Test for less than 1 V between the following K19 Suspension Control Module 5V reference circuits and ground.
 - Terminal 33
 - Terminal 34
 - Terminal 35

- Terminal 36
- **If greater than 1 V**

Repair the short to voltage on the circuit.

- **If less than 1 V**

4. Ignition OFF.
5. Test for infinite resistance between the following K19 Suspension Control Module 5V reference circuits and ground.
 - Terminal 33
 - Terminal 34
 - Terminal 35
 - Terminal 36
 - **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

6. Ignition OFF, connect the harness connector at the K19 Suspension Control Module. Ignition ON.
7. Verify the scan tool Suspension Position 5V Reference parameter is greater than 4.75 V.
 - **If 4.75 V or less**

Replace the K19 Suspension Control Module.

- **If greater than 4.75 V**

8. Clear the DTCs.
9. Connect each B152 Suspension Position Sensors one at a time. Verify DTC C0696 is not set after each B152 Suspension Position Sensor is connected.
 - **If DTC C0696 is set**

Replace the B152 Suspension Position Sensor that set the DTC.

- **If DTC C0696 is not set**

10. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Electronic Suspension Front Position Sensor Replacement**
- **Electronic Suspension Rear Position Sensor Replacement**
- **Control Module References** suspension control module replacement, programming and setup.

DTC C0800: CONTROL MODULE POWER 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 C0800

Control Module Power Circuit

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

The suspension control module monitors continuous the battery voltage.

Conditions for Running the DTC

System voltage is not between 9-16 V.

Conditions for Setting the DTC

C0800 03

The suspension control module detects that the supply voltage is less then 9 V.

C0800 07

The suspension control module detects that the supply voltage is greater then 16.3 V.

Action Taken When the DTC Sets

- The electronic suspension control is disabled for the duration of the ignition cycle.
- The driver information center displays the SERVICE SUSPENSION SYSTEM message.

Conditions for Clearing the DTC

- A present DTC will clear on the next consecutive malfunction-free ignition cycle.

Reference Information

Schematic Reference

Electronic Suspension Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Electronic Suspension Control Description and Operation

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON
2. Engine running, accessories OFF
3. Test for 12.6-15.0 V between the battery positive terminal and negative terminal.
 - **If not within 12.6-15.0 V**

Refer to **Charging System Test**

- **If within 12.6-15.0 V**
4. Verify the scan tool Battery Voltage parameter of the affected control module is within 2 V of the battery terminal voltage.
 - **If not within 2 V**

Refer to Circuit/System Testing.

- **If within 2 V**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K19 Suspension Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the ground circuit terminal 47 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ground circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, repair the open/high resistance in the ground connection.
 - **If less than 10 ohms**
3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuit terminal 32 and ground:
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the B+ circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, verify the fuse is good and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K19 Suspension Control Module.
 - **If the test lamp illuminates**
5. Replace the K19 Suspension Control Module.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

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

REPAIR INSTRUCTIONS

ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT

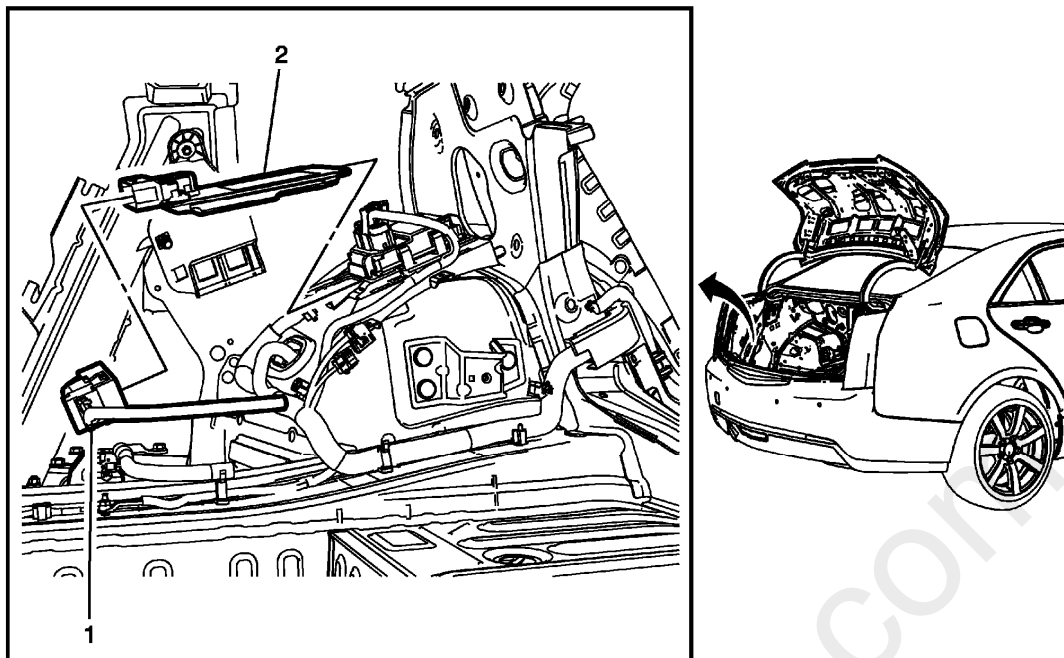


Fig. 2: Electronic Suspension Control Module
Courtesy of GENERAL MOTORS COMPANY

Electronic Suspension Control Module Replacement

Callout	Component Name
Preliminary Procedure Reposition the left rear compartment side trim panel. Refer to <u>Rear Compartment Side Trim Replacement - Left Side</u> .	
1	Electronic Suspension Control Module Electrical Connector Procedure Release the lock tab on the electrical connector and remove.
2	Electronic Suspension Control Module Procedure 1. Release the lock tab and remove the control module from the mounting bracket. 2. Reprogram the control module. Refer to .

ELECTRONIC SUSPENSION FRONT POSITION SENSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the applicable front wheel house liner. Refer to **Front Wheelhouse Liner Replacement** .

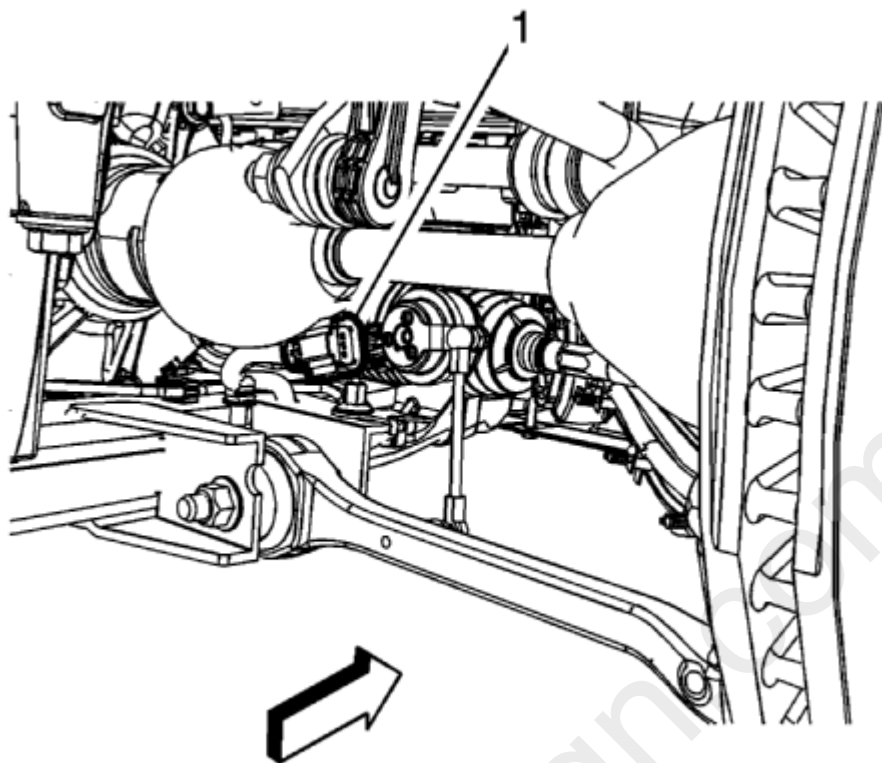


Fig. 3: Electronic Suspension Level Sensor
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the electrical connector (1) from the electronic level sensor.

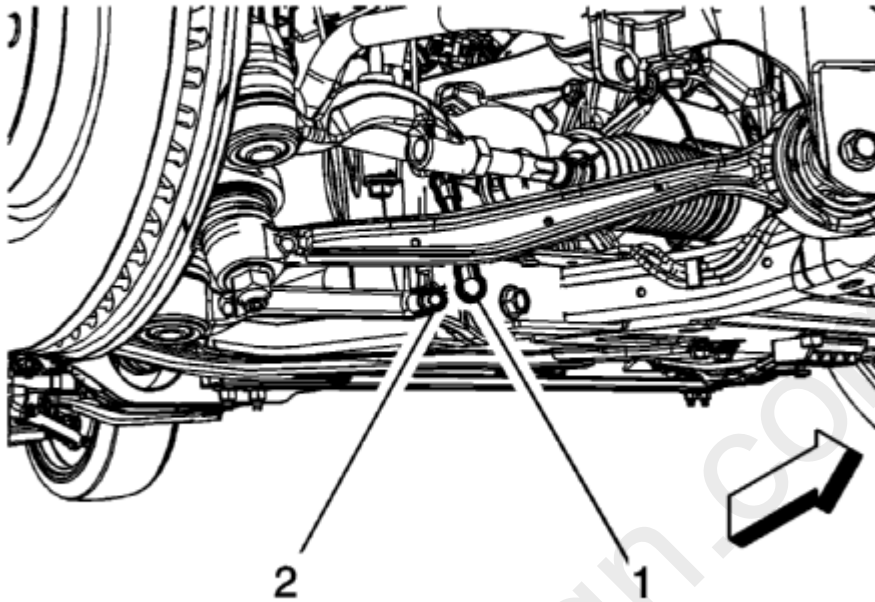


Fig. 4: Electronic Suspension Level Sensor And Lower Control Arm Ball Stud
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the level sensor link (1) from the lower control arm ball stud (2) .

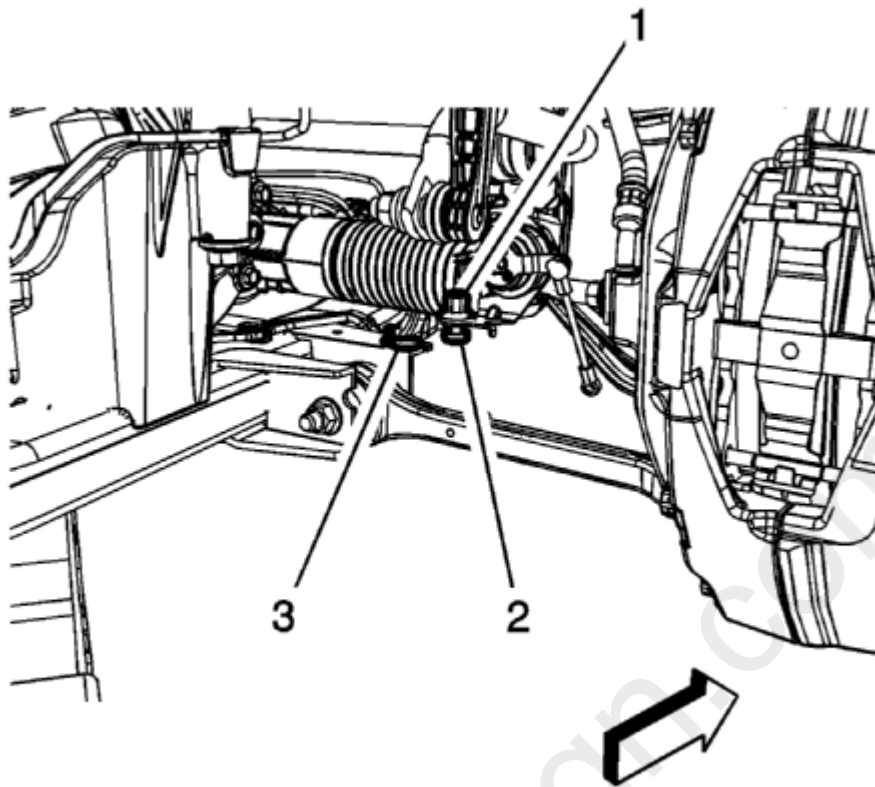


Fig. 5: Level Sensor Nut

Courtesy of GENERAL MOTORS COMPANY

5. Loosen the level sensor nut (1).
6. Remove the level sensor positioning stud (2) from the slot in the frame rail (3) by sliding it toward the control arm.

Installation

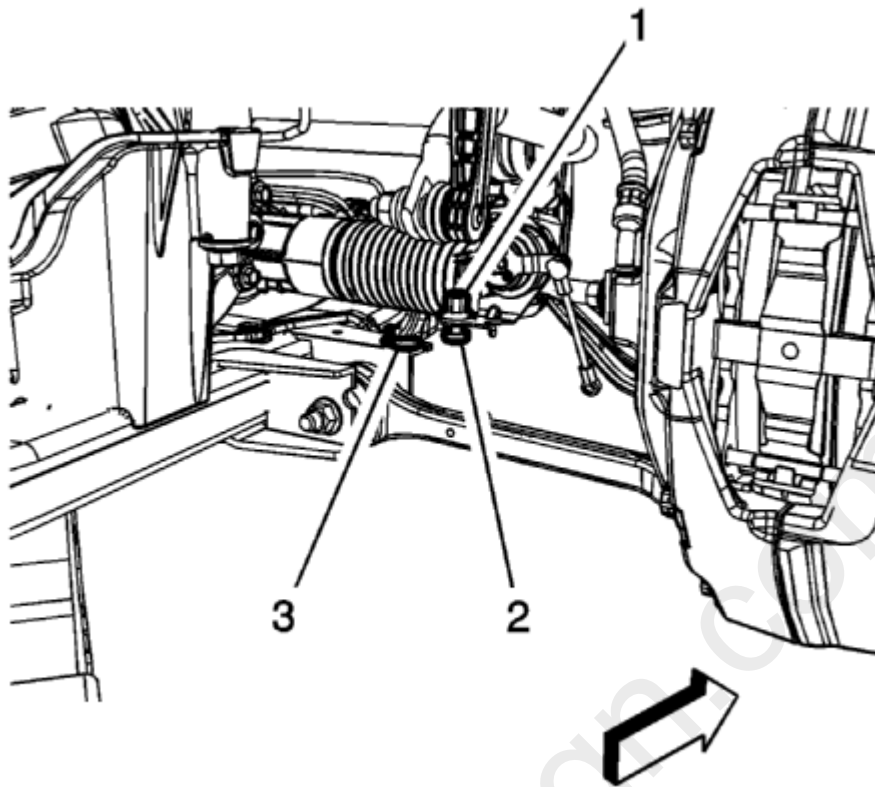


Fig. 6: Level Sensor Nut

Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure that the level sensor is properly seated on the frame rail.

1. Position the level sensor stud (2) into the slot in frame rail (3) slide it toward the engine.

CAUTION: Refer to Fastener Caution .

2. Tighten the level sensor nut (1) to 9 (80 lb in).

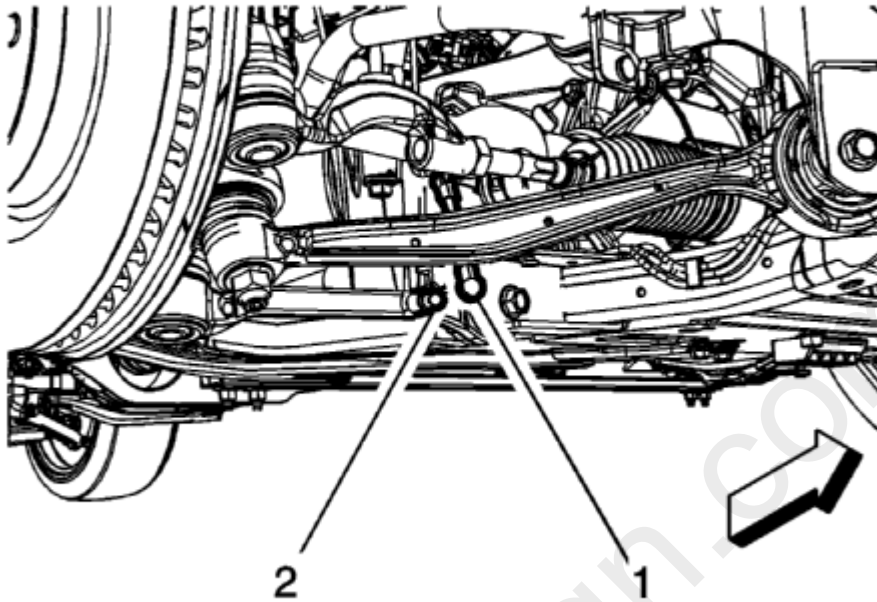


Fig. 7: Electronic Suspension Level Sensor And Lower Control Arm Ball Stud
Courtesy of GENERAL MOTORS COMPANY

3. Install the level sensor link (1) on the lower control arm ball stud (2).

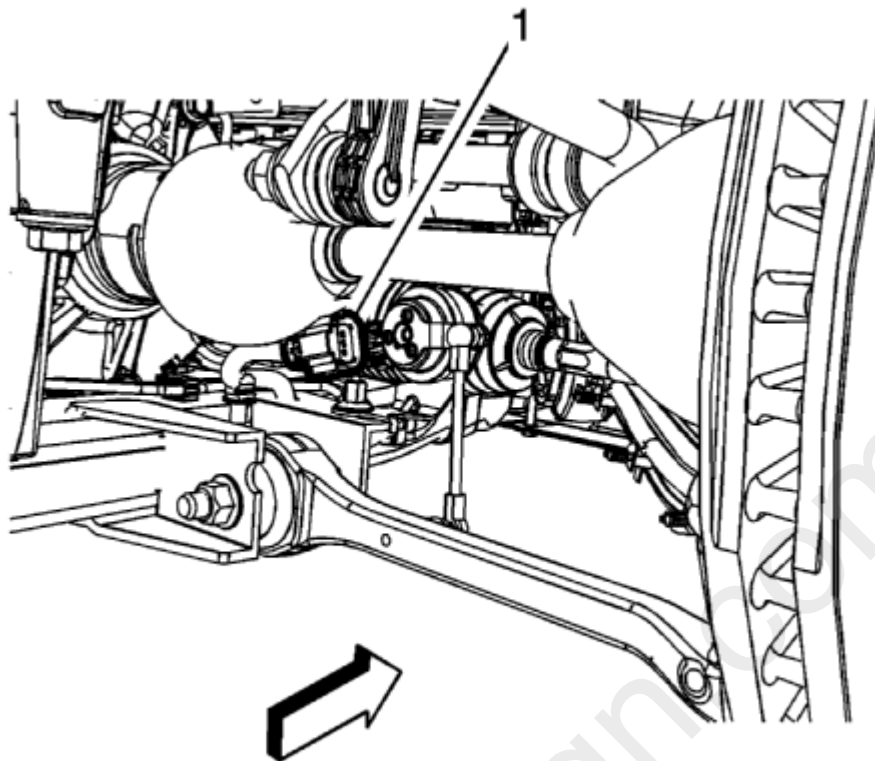


Fig. 8: Electronic Suspension Level Sensor
Courtesy of GENERAL MOTORS COMPANY

4. Reconnect the level sensor electrical connector (1) to the electronic level sensor.
5. Install the right front wheel house liner. Refer to **Front Wheelhouse Liner Replacement** .
6. Remove the support and lower the vehicle.
7. Reprogram the level sensor.

ELECTRONIC SUSPENSION REAR POSITION SENSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the rear suspension lower control arm cover. Refer to **Rear Suspension Lower Control Arm Cover Replacement** .

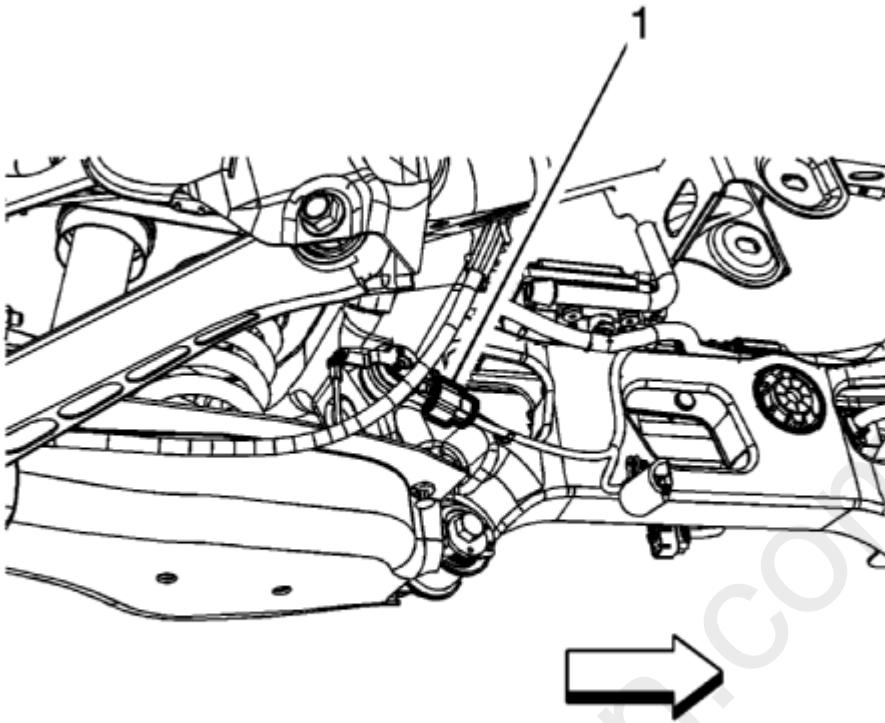


Fig. 9: Electronic Level Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the electrical connector (1) from the electronic level sensor.

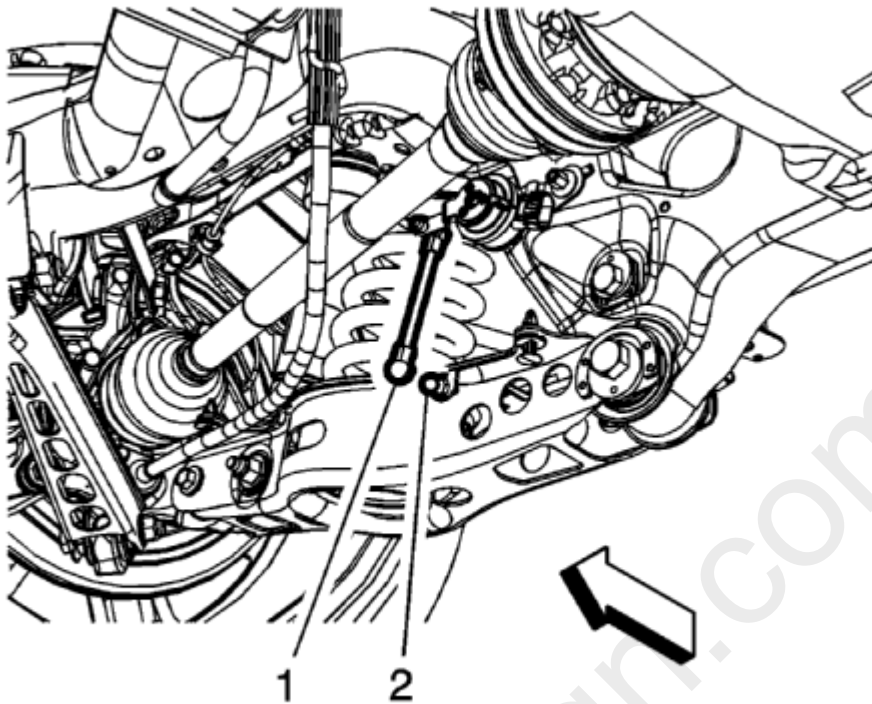


Fig. 10: Level Sensor Link And Lower Control Arm Ball Stud
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the level sensor link (1) from the lower control arm ball stud (2)..

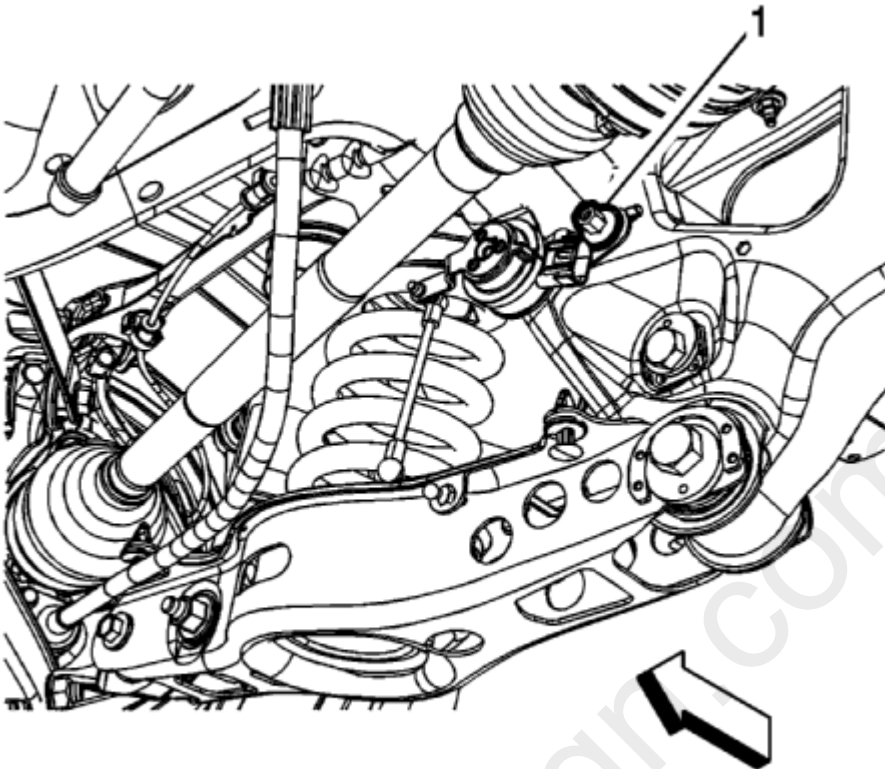


Fig. 11: Level Sensor Nut

Courtesy of GENERAL MOTORS COMPANY

5. Loosen the level sensor nut (1).

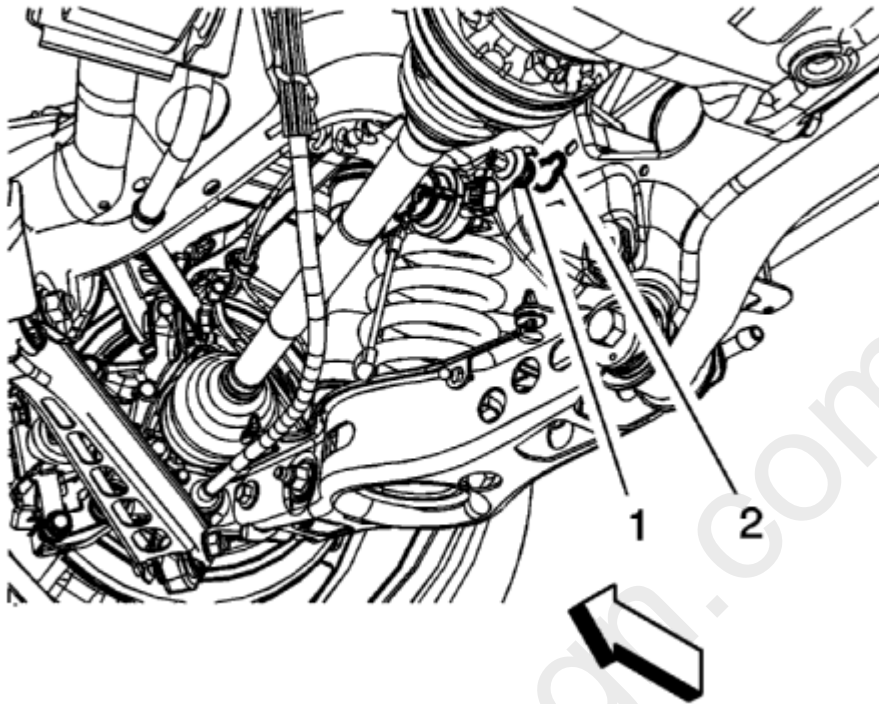


Fig. 12: Level Sensor Locating Stud And Slot In The Rear Suspension Support
Courtesy of GENERAL MOTORS COMPANY

6. Remove the level sensor locating stud (1) from the slot in the rear suspension support (2) .

Installation

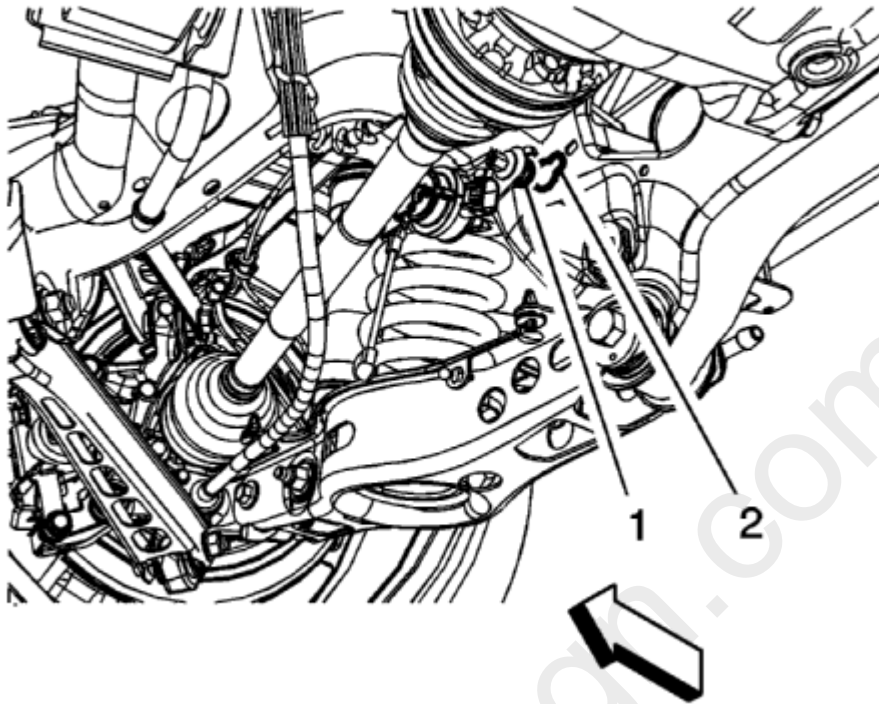


Fig. 13: Level Sensor Locating Stud And Slot In The Rear Suspension Support
Courtesy of GENERAL MOTORS COMPANY

1. Position the level sensor locating stud (1) in to the slot in the rear suspension support (2) .

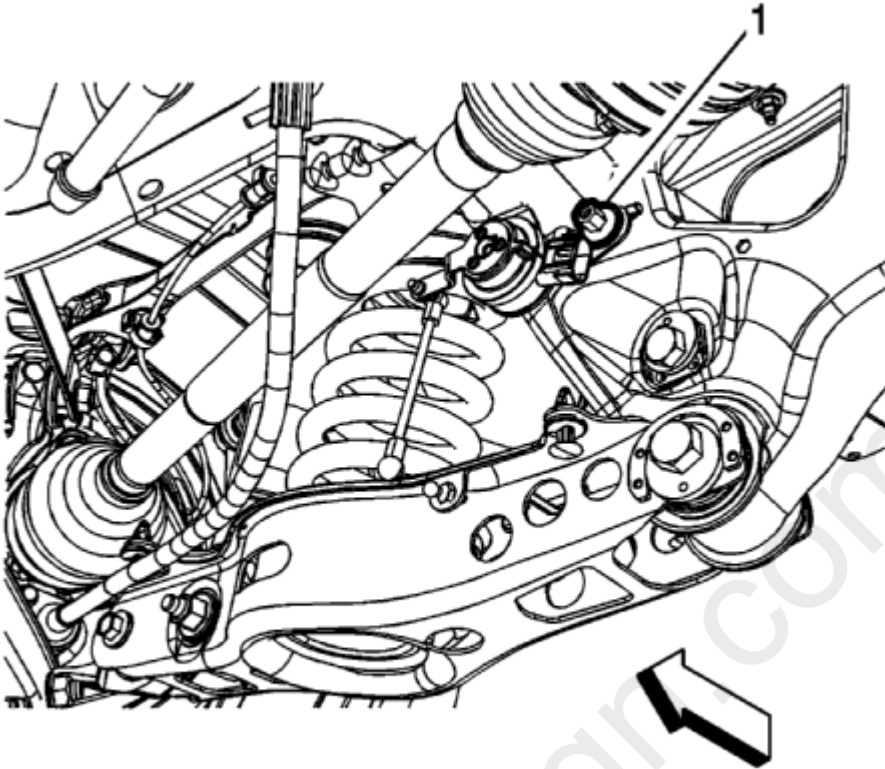


Fig. 14: Level Sensor Nut

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

NOTE: Ensure that the level sensor is properly seated on the rear suspension support before tightening to specifications.

2. Tighten the level sensor nut (1) to 9 (80 lb in).

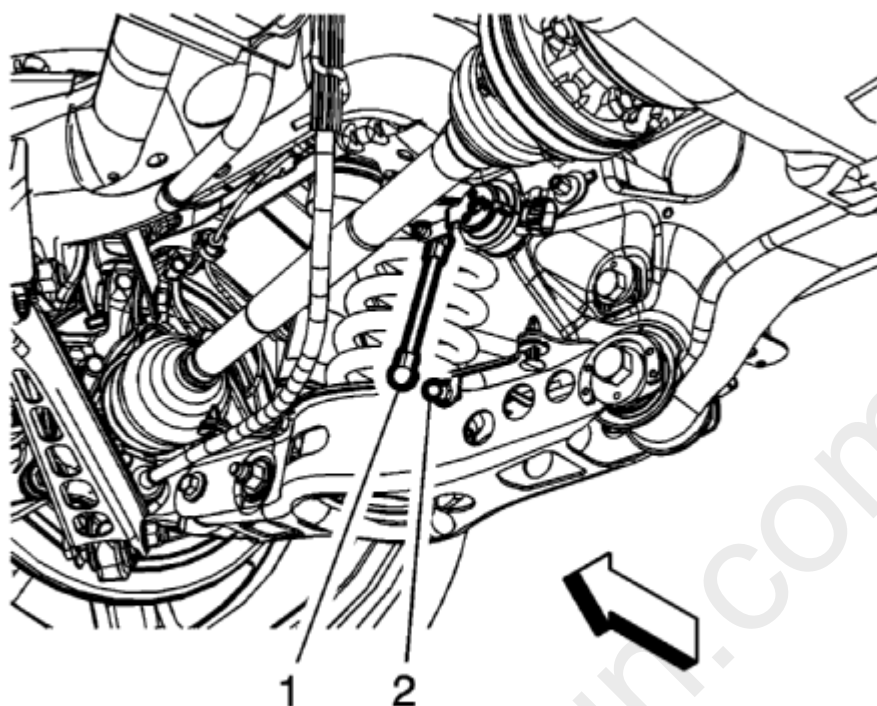


Fig. 15: Level Sensor Link And Lower Control Arm Ball Stud
Courtesy of GENERAL MOTORS COMPANY

3. Install the level sensor link (1) on the lower control arm ball stud (2).

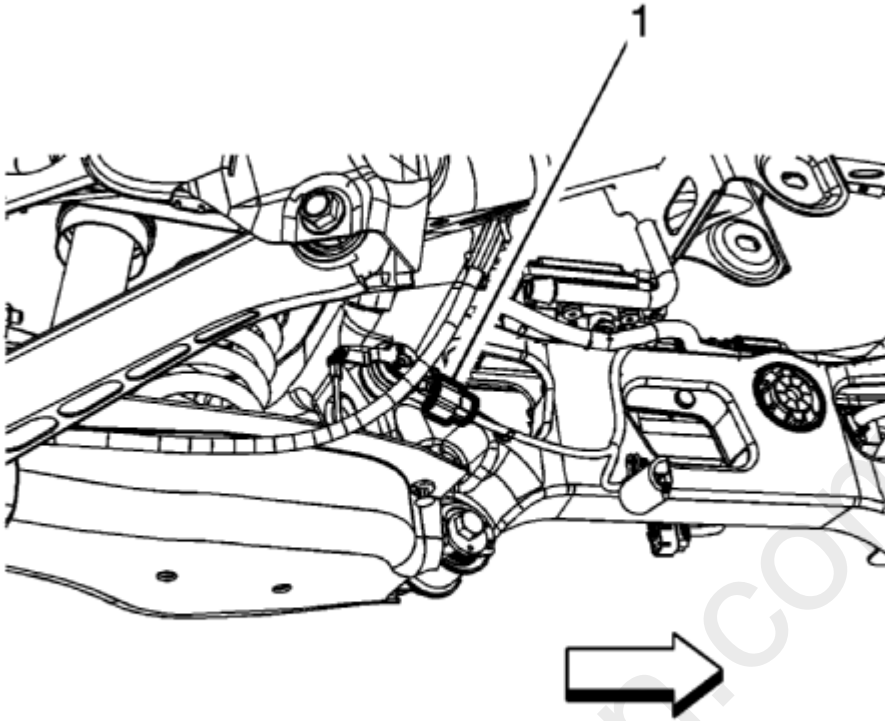


Fig. 16: Electronic Level Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Reconnect the level sensor electrical connector (1) to the electronic level sensor.
5. Install the rear suspension lower control arm cover. Refer to **Rear Suspension Lower Control Arm Cover Replacement**.
6. Remove the support and lower the vehicle.
7. Reprogram the level sensor.

ELECTRONIC SUSPENSION POSITION SENSOR TRIM HEIGHT CALIBRATION

Suspension Position Sensor Trim Height Calibration

The Suspension Position Sensor Trim Height Calibration must be performed anytime a Suspension Position Sensor is either removed/reinstalled or replaced.

1. Remove any excess weight from vehicle.
2. Connect scan tool
3. From scan tool menu, select Suspension Control Module,
4. Select Configuration/Reset Functions

5. Select Suspension Position Sensor Trim Height and follow the on screen instructions

DESCRIPTION AND OPERATION

ELECTRONIC SUSPENSION CONTROL DESCRIPTION AND OPERATION

Electronic Suspension Control Block Diagram

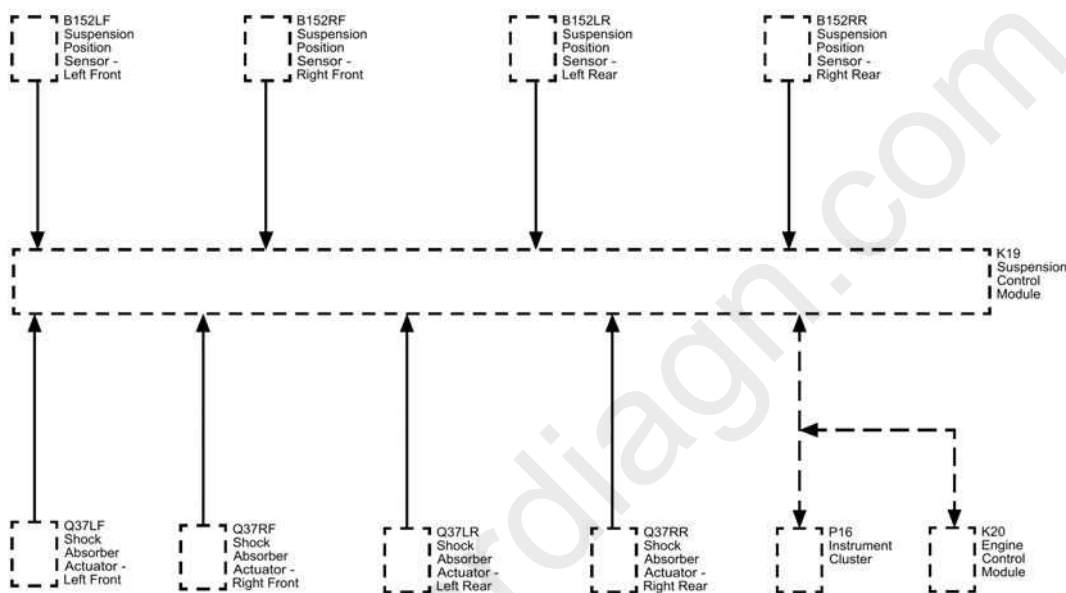


Fig. 17: Electronic Suspension Control Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired

HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
DA	Serial Data
B152LF	B152LF Suspension Position Sensor - Left Front
B152RF	B152RF Suspension Position Sensor - Right Front
B152LR	B152LR Suspension Position Sensor - Left Rear
B152RR	B152RR Suspension Position Sensor - Right Rear
K19	K19 Suspension Control Module
Q37LF	Q37LF Shock Absorber Actuator - Left Front
Q37RF	Q37RF Shock Absorber Actuator - Right Front
Q37LR	Q37LR Shock Absorber Actuator - Left Rear
Q37RR	Q37RR Shock Absorber Actuator - Right Rear
P16	P16 Instrument Cluster
K20	K20 Engine Control Module

The BWI electronic suspension control system, individually controls the damping force of each of the 4 shock absorbers in order to keep the vehicle's body as calm as possible. Changes of the damping forces can be accomplished within milliseconds. Suspension characteristics can be changed at any time by activating the sport mode or tour mode.

The electronic suspension control system consists of the following major components:

- The suspension control module
- Four corner height sensors
- Four shock absorber actuators, which are integrated within the shock absorbers

The suspension control module controls the damping forces according to the following factors:

- Vehicle speed
- Steering wheel position
- Engine torque
- Brake pressure

The suspension control 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.

Suspension Control Module

The suspension control module controls the system functions and detects failures. The suspension control module receives input information by the four suspension position sensors that are directly connected to the module and by other systems through the serial data. The suspension control module commands variable levels of current to each shock absorber actuator.

Suspension Position Sensors

The suspension control module supplies a common 5 V reference and a ground circuit to each of the four corner height sensors. The height sensors supply a signal of 0.25-4.75 V to the suspension control module.

Shock Absorber Actuators

The shock absorber actuators are integrated within the shock absorbers. The electronic suspension control system uses a proportional valve that is located in the external bypass of the displacement module.

Adjustment is performed by current control. The current range is 0-5 A. The actuators respond to commands of the suspension control module within milliseconds.

Driver Information Center Message

The electronic suspension control system uses the instrument cluster for the display functions instead. When the suspension control module detects a fault that sets a DTC, it sends a message on the serial data line to the instrument cluster, which will display the following message:

SERVICE SUSPENSION SYSTEM

The suspension control module has the ability to store DTCs as current or history codes. Most electronic suspension control system malfunctions will display a message in the instrument cluster and set a DTC. As long as the DTC is present, the message will be displayed.

Actions taken when a fault is detected will remain until the ignition is turned OFF, even if the fault condition is not present anymore.

If a fault is no longer present, the DTC will be stored as a history code. After 40 consecutive malfunction-free ignition cycles the DTC will be deleted.