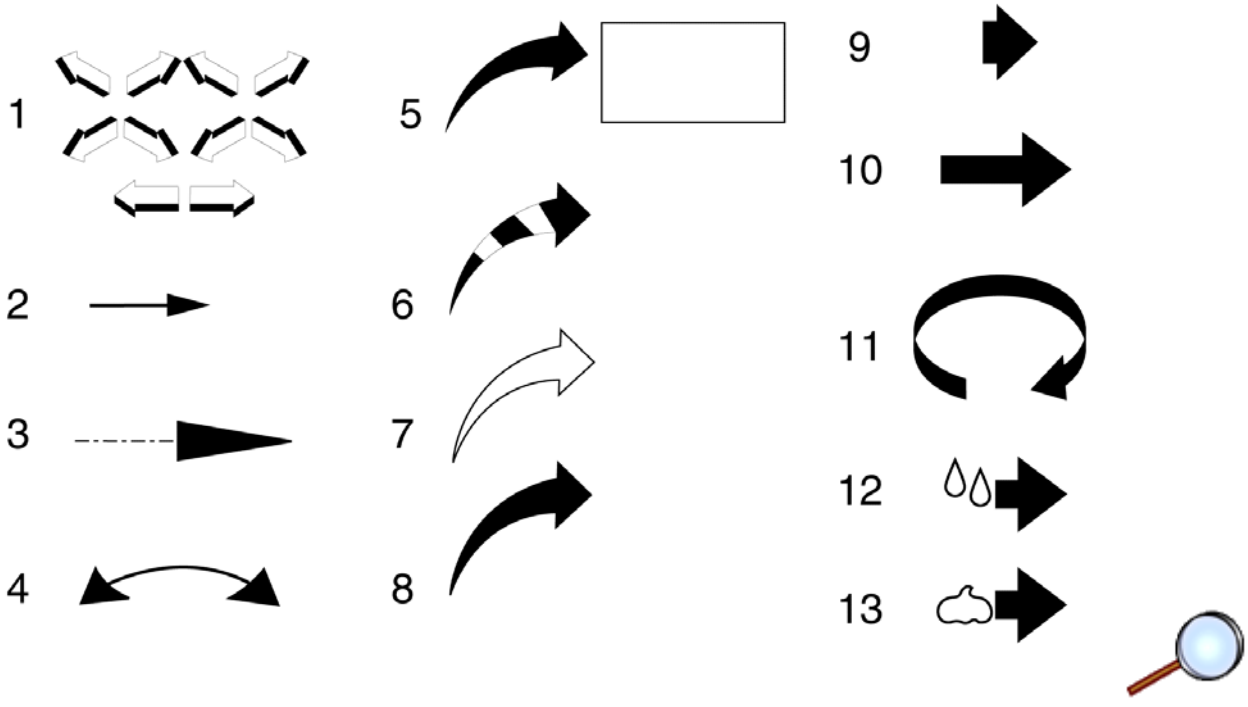
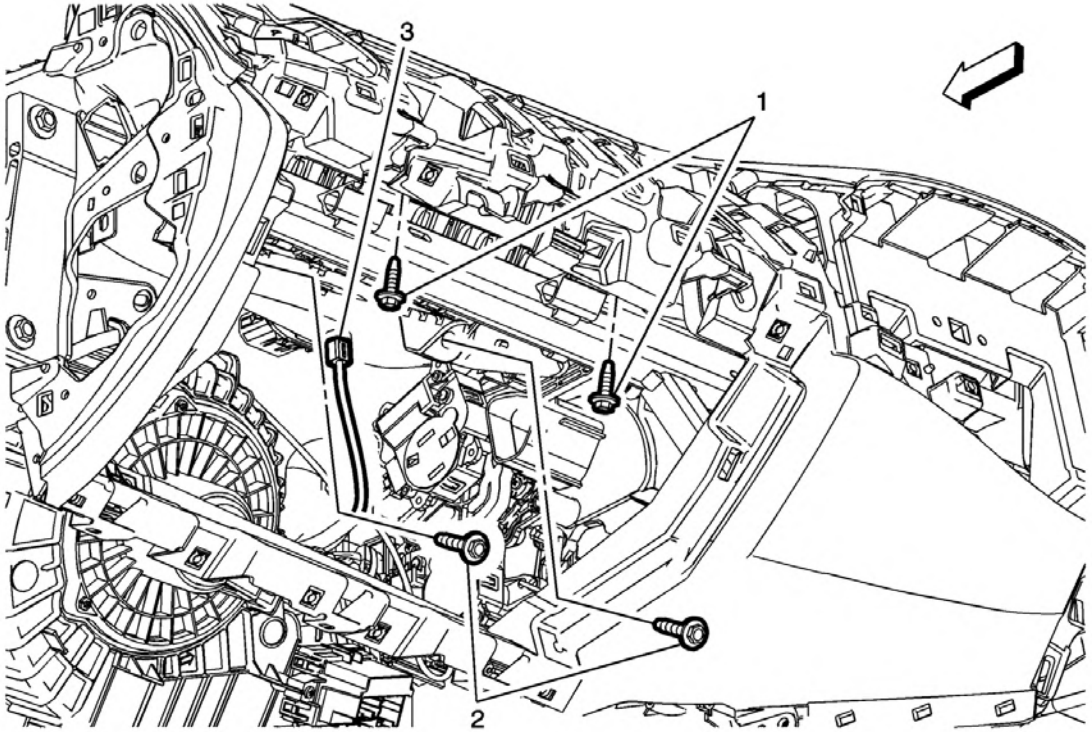
Arrows and Symbols

This service manual uses various symbols in order to describe different service operations.

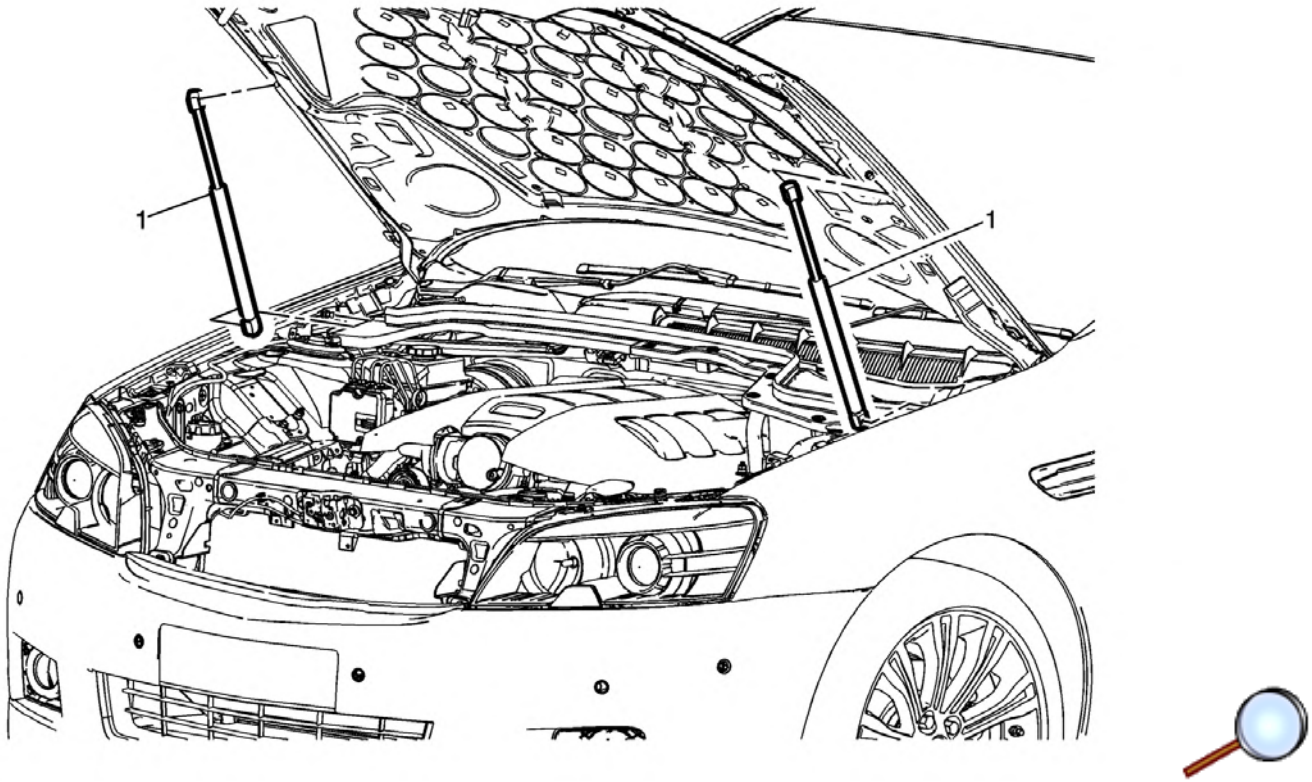


(1) Front of Vehicle
(2) Dimension (1:2)
(3) Sectioning (1:3)
(4) Multidirectional Arrow
(5) View Detail
(6) Ambient Air Mixed With Another Gas or Indicate Temperature Change
(7) Ambient/Clean Air Flow or Cool Air Flow
(8) Gas Other Than Ambient Air or Hot Air Flow
(9) View Angle
(10) Task Related
(11) Motion or Direction
(12) Lubrication Point— Oil or Fluid
(13) Lubrication Point— Grease or Jelly



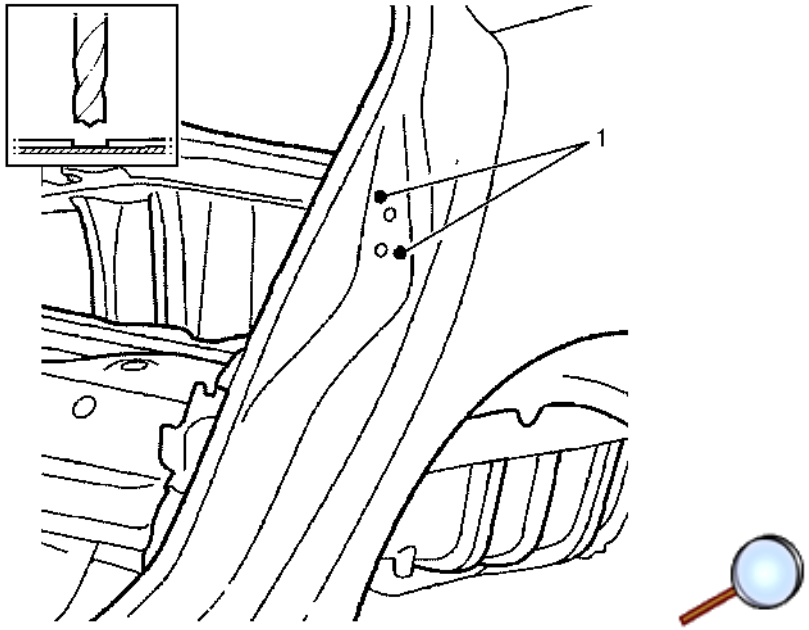
26. Remove the instrument panel assembly fasteners (1).
27. Remove the instrument panel inflatable restraint module airbag inflatable fasteners (2).
28. Remove the electrical connector to the instrument panel inflatable restraint module airbag inflatable.
29. Remove the upper left duct air temperature sensor connector (3).

Hood Strut Replacement (Long Wheelbase)



Hood Strut Replacement

Callout	Component Name
	Hood Strut (Qty 2) **Warning:** When a hood hold open device is being removed or installed, provide alternate support to avoid the possibility of damage to the vehicle or personal injury. **Caution:** Apply pressure only at the end of the liftgate/hood assist rod that you are removing or attaching. Do NOT apply pressure to the middle of the rod because damage or bending will result.



Note: Do not damage any inner panels or reinforcements.

Note: Note the number and location of the factory welds for installation of the quarter panel repair section.

47. Locate, mark, and drill out the factory welds (1) joining the body side outer panel to the rear door lock striker reinforcement bracket.

6.1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON.

6.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

6.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If Active**

7. Test or replace the S82 Windshield Wiper/Washer Switch.

Windshield Washer Pump Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the KR11 Windshield Washer Pump Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 87A and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is OK**

4.1. Ignition OFF, remove the test lamp.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 87A.
6. Verify the test lamp turns ON and OFF when commanding the Windshield Washer Relay Active and Inactive with a scan tool.

⇒ **If the test lamp is always OFF**

6.1. Ignition OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit terminal 14 X4 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

6.1. Ignition OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module, ignition ON.

6.2. Test for less than 1 V between the control circuit terminal 14 X4 and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

- After the ignition has been OFF for a sufficient amount of time to allow the radio to enter a low power/sleep state, the radio will re-enable the output on the following ignition cycle and the DTC will become history.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the radio/infotainment systems.
- The radio's current limiting logic will not re-enable the output on the entertainment remote enable circuit until after the radio performs a full power–down. It may be necessary to wait 5 minutes between each test attempt with the key OFF and retained accessory power OFF.

Reference Information

Schematic Reference

- Radio/Navigation System Schematics
- Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System 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

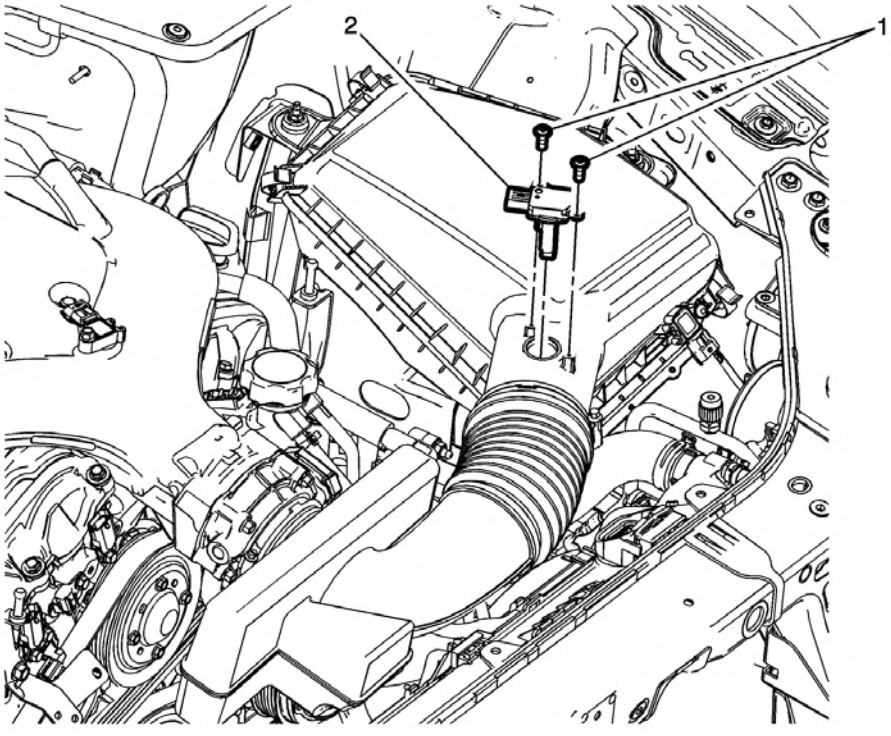
1. Ignition OFF, radio OFF, radio B+ fuse removed. Disconnect all of the harness connectors listed below:
   - T3 Audio Amplifier X1 (with UQG)
   - T3 Audio Amplifier X3 (with UQA)
   - P22E Video Display- Driver Seatback (if equipped)
   - P22F Video Display- Passenger Seatback (if equipped)
2. Install the radio B+ fuse. Ignition ON, A11 Radio ON.
3. Verify that a test lamp illuminates between the control circuit terminals listed below and ground:
   - T3 Audio Amplifier X1 terminal 7 (with UQG)
   - T3 Audio Amplifier X3 terminal 8 (with UQA)
   - P22E Video Display- Driver Seatback terminal 2 (if equipped)
   - P22F Video Display- Passenger Seatback terminal 2 (if equipped)

⇒ **If the test lamp does not illuminate.**

3.1. Ignition OFF, remove the test lamp. Disconnect the X1 harness at the A11 Radio.

3.2. Test for infinite resistance between the control circuit and ground.

Mass Airflow Sensor with Intake Air Temperature Sensor Replacement (LWR)



Mass Airflow Sensor with Intake Air Temperature Sensor Replacement

Callout	Component Name
Preliminary Procedure 1. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection. 2. Disconnect the mass air flow electrical connector.	
1	Mass Air Flow Sensor Fasteners (Qty: 2). **Caution:** Refer to Fastener Caution. **Tighten** 1 N•m(9 lb in)
2	Mass Air Flow Sensor.

DTC P0340 or P0341

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 P0340

Camshaft Position Sensor Circuit

DTC P0341

Camshaft Position Sensor Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0107, P0452, P0522, P0532, P0641	P0340	P0641	—
Signal	P0340	P0340	P0340	P0341
Low Reference	—	P0340	P0340	—

Circuit/System Description

The camshaft position sensor each has 3 circuits consisting of an engine control module (ECM) supplied 5 V reference circuit, low reference circuit, and an output signal circuit. The camshaft position sensor is an internally magnetic biased digital output integrated circuit sensing device. The sensor detects magnetic flux changes of the teeth and slots of a 4-tooth reluctor wheel attached to the camshaft. As each reluctor wheel tooth rotates past the camshaft position sensor, the resulting change in the magnetic field is used by the sensor electronics to produce a digital output pulse. The sensor returns a digital ON/OFF DC voltage pulse of varying frequency with 4 varying width output pulses per camshaft revolution that represent an image of the camshaft reluctor wheel. The frequency of the camshaft position sensor output depends on the velocity of the camshaft. The ECM decodes the narrow and wide tooth pattern to identify camshaft position. This information is then used to determine the optimum ignition and injection points of the engine. The ECM uses the camshaft position sensor to determine injector and ignition system synchronization. The camshaft position sensor is also used to determine camshaft to crankshaft relationship. The ECM also uses camshaft position sensor output information to determine the camshaft relative position to the crankshaft to control camshaft phasing and limp-home operation.

Conditions for Running the DTC

P0340 Condition 1

- DTCs P0101, P0102 and P0103 are not set.

Oil Pan Cleaning and Inspection

Special Tools

J 28410 Gasket Remover

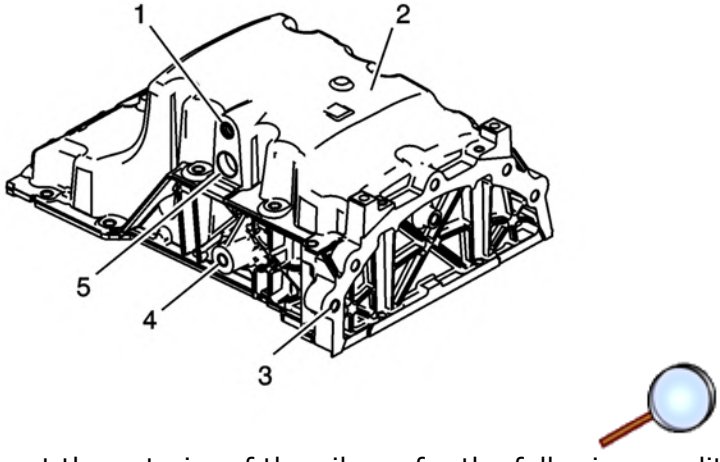
For equivalent regional tools, refer to Special Tools.

Cleaning Procedure

1. Remove any old thread sealant, gasket material or sealant using *J 28410* remover.
2. Clean the oil pan and oil pan components in solvent.
3. Clean out debris from the bolt holes.

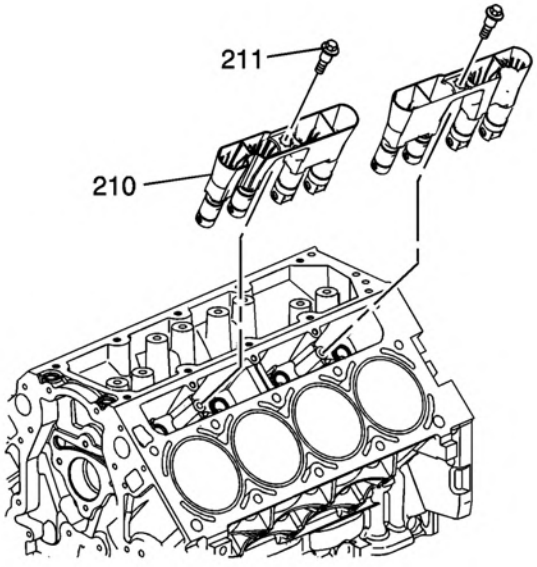
   Warning: Refer to Safety Glasses Warning.
4. Dry the oil pan and oil pan components with compressed air.

Inspection Procedure



1. Inspect the exterior of the oil pan for the following conditions:
   - Dents or damage to the exterior (2)
   - Damage to the drain plug or drain plug hole (1)
   - Damage to the brace mounting bosses (4)
   - Damage to the mounting bosses (3)
   - Damage to the engine oil level switch hole (5)

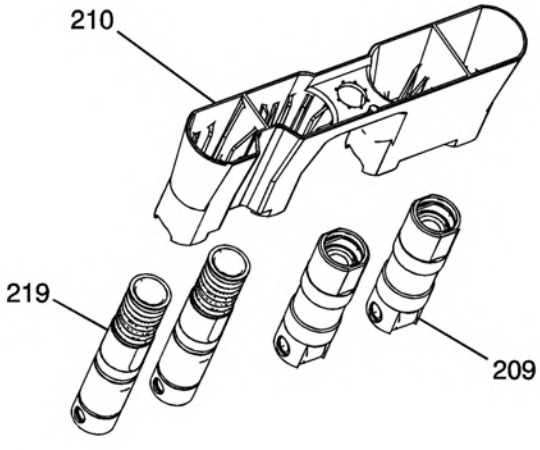
Valve Lifter Removal (L77)



1. Remove the bolts (211).

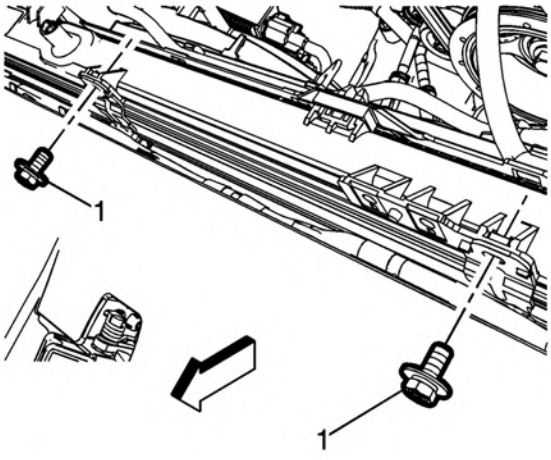
Note: Observe the installed position of the guides. The notched area of the guide is to align with the locating tab of the block.

2. Remove the guides (210) with lifters.

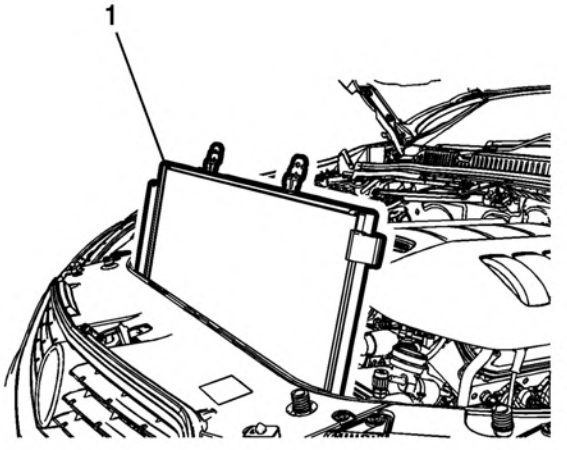


3. Remove the valve lifters (209, 219) from the guide (210).

15. Remove the air conditioning compressor hose (1) from the air conditioning condenser (3) and position aside.
16. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
17. Remove and discard the sealing washer (2).



18. Gently push the radiator and air conditioning condenser towards the engine to allow removal of the upper air conditioning condenser bolts (1).
19. Remove the upper air conditioning condenser bolts (1).



Caution: When removing/installing the Air Conditioning Condensor from the vehicle, use caution as to not damage surrounding components. Replacement of a damaged component will be required if damage has occurred.

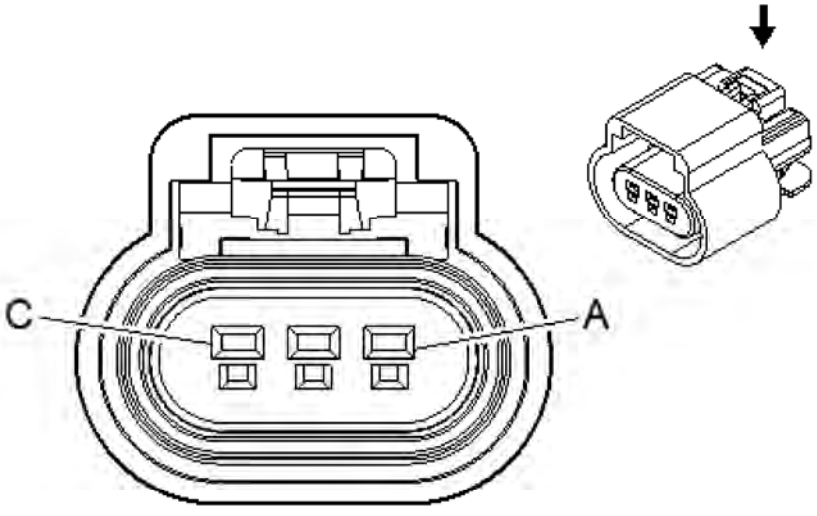
20. Remove the air conditioning condenser (1) by lifting it up between the radiator and radiator support.

Installation Procedure

Note: The receiver and dehydrator is a single use only component. A NEW receiver and dehydrator must be installed whenever a closed A/C system is opened or exposed to atmosphere. If the receiver and dehydrator has been replaced following a service/repair and it is deemed necessary to immediately re-open the A/C system it is not necessary to replace the receiver and dehydrator again providing the A/C system is plugged/capped correctly.

1. Replace the receiver and dehydrator. Refer to Receiver and Dehydrator Replacement.

B55 Hood Ajar Switch



Connector Part Information

- Harness Type: Forward Lamp
- OEM Connector: 19153104
- Service Connector: 13580871
- Description: 3-Way F 150 GT Series, Sealed BK

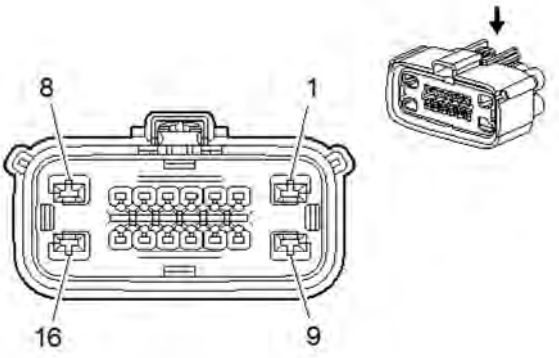
Terminal Part Information

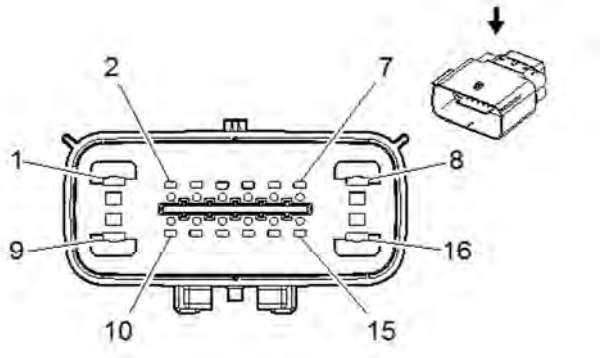
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not Available	J-35616-35 (VT)	Not Available

B55 Hood Ajar Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	-	-	-	Not Occupied	-	-
B	0.35	BN/GN	109	Hood Ajar Switch Signal	I	-
C	0.5	BK	550	Ground	I	-

X320 Body Harness to Fuel Harness (F19/F35/F69)





Connector Part Information

- Harness Type: Body
- OEM Connector: 55572154
- Service Connector: 13587961
- Description: 16-Way F 1.5, 2.8 Series, Sealed (BN)

Connector Part Information

- Harness Type: LPG Fuel
- OEM Connector: 55572155
- Service Connector: 13503540
- Description: 16-Way M 1.5, 2.8 Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Pending	Pending	Pending

X320 Body Harness to Fuel Harness (F19/F35/F69)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.75	BN/BK	3507	I	—	Liquid Petroleum Gas Fuel Shutoff Solenoid Control (2)	1	0.75	BN/BK	3507	I	—
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
3	0.35	BN/RD	7445	I	—	Fuel Line Pressure Sensor 5V Reference	3	0.5	BN/RD	7445	I	—
4-5	—	—	—	—	—	Not Occupied	4-5	—	—	—	—	—
6	0.35	BU/VT	1589	I	—	Primary Fuel Level Sensor Signal	6	0.5	BU/VT	1589	I	—
7	—	—	—	—	—	Not Occupied	7	—	—	—	—	—
8	3	GY	120	I	—	Fuel Pump Supply Voltage	8	2	GY	120	I	—
9	0.75	BK	2450	I	—	Ground	9	0.75	BK	2450	I	—
10	0.35	BU/WH	7446	I	—	Fuel Line Pressure Sensor Signal	10	0.5	BU/WH	7446	I	—
11	0.35	BK/YE	7447	I	—	Fuel Line Pressure Sensor Low Reference	11	0.5	BK/YE	7447	I	—
12-13	—	—	—	—	—	Not Occupied	12-13	—	—	—	—	—
14	0.35	BK/GN	6281	I	—	Fuel Level Sensor Low Reference	14	0.5	BK/GN	6281	I	—
15	0.5	BU	7443	I	—	Fuel System Control Module Shield Extension	15	0.5	BK	7443	I	—
16	3	BK/GN	1580	I	—	Fuel Pump Low Reference	16	2	PK	1580	I	—

DTC B096C or B096D

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 B096C

Parking Assist Side Sensor Left Front Circuit

DTC B096D

Parking Assist Side Sensor Right Front Circuit

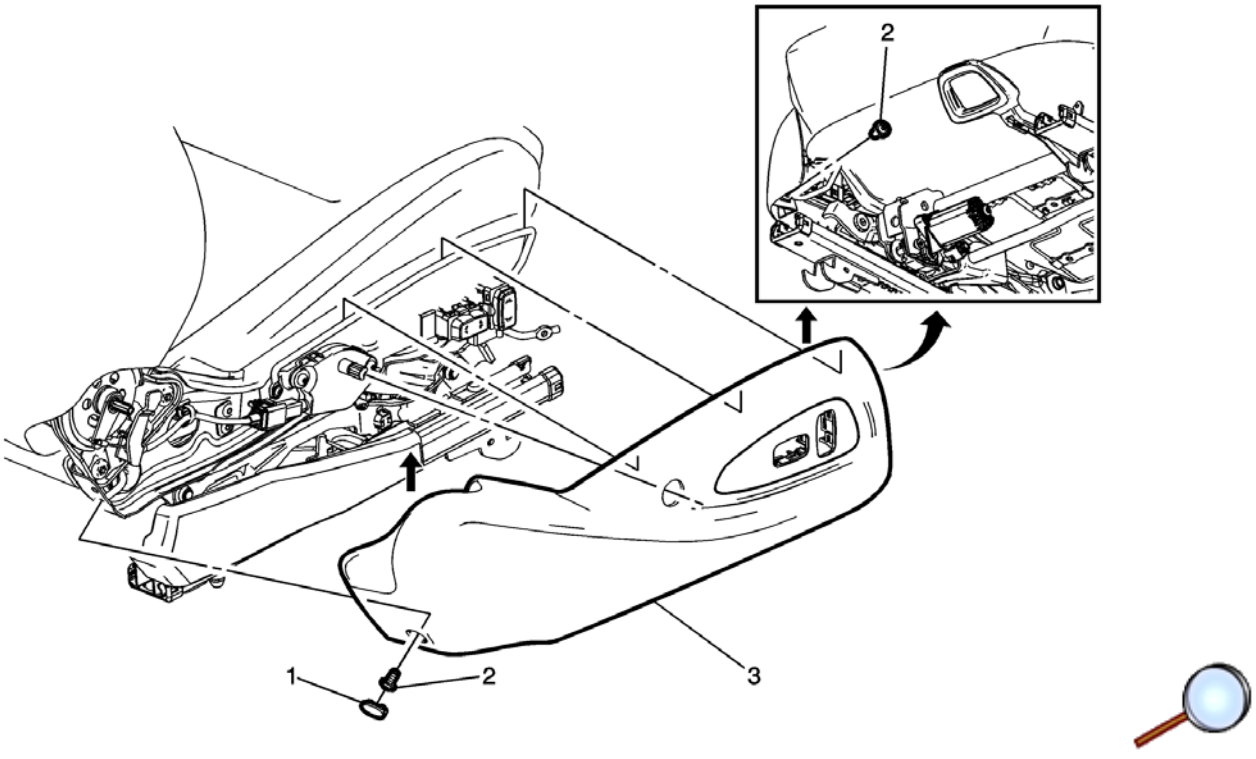
For symptom byte information, refer to Symptom Byte List.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12V Reference	B1405 02	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 03	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 07	—
Left Side Object Sensor Signal	B096C 06	B096C 06	B096C 01	B096C 08, B096C 21
Right Side Object Sensor Signal	B096D 06	B096D 06	B096D 01	B096D 08, B096D 21
Low Reference	—	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06	—	—

Circuit/System Description

Front Seat Cushion Outer Finish Cover Replacement



Front Seat Cushion Outer Finish Cover Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the front seat back recliner handle. Refer to Front Seat Back Recliner Handle Replacement. 2. Remove the front seat adjuster switch knobs, if equipped. Refer to Driver or Passenger Seat Adjuster Switch Replacement.	
1	Front Seat Cushion Outer Finish Cover Cap
2	Front Seat Cushion Outer Finish Cover Retainer (Qty: 2) **Caution:** Refer to Fastener Caution.
3	Driver or Passenger Seat Cushion Outer Finish Panel **Procedure** 1. Pull back the toe kick cover to gain access to the rear fastener. 2. Remove the outer finish panel by pulling upward near the retainer clip locations. 3. Disconnect the electrical connectors. 4. If replacing the finish panel, transfer components as necessary.