

2010 ACCESSORIES & EQUIPMENT

Sunroof - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Sunroof Drain Channel Screws	2 N.m	18 lb in
Sunroof Module Bolts	8 N.m	71 lb in
Sunroof Motor/Actuator Screws	6 N.m	53 lb in
Sunroof Window Adjusting Screws	5 N.m	44 lb in
Sunroof Window Screws	5 N.m	44 lb in

SCHEMATIC AND ROUTING DIAGRAMS

SUNROOF SCHEMATICS

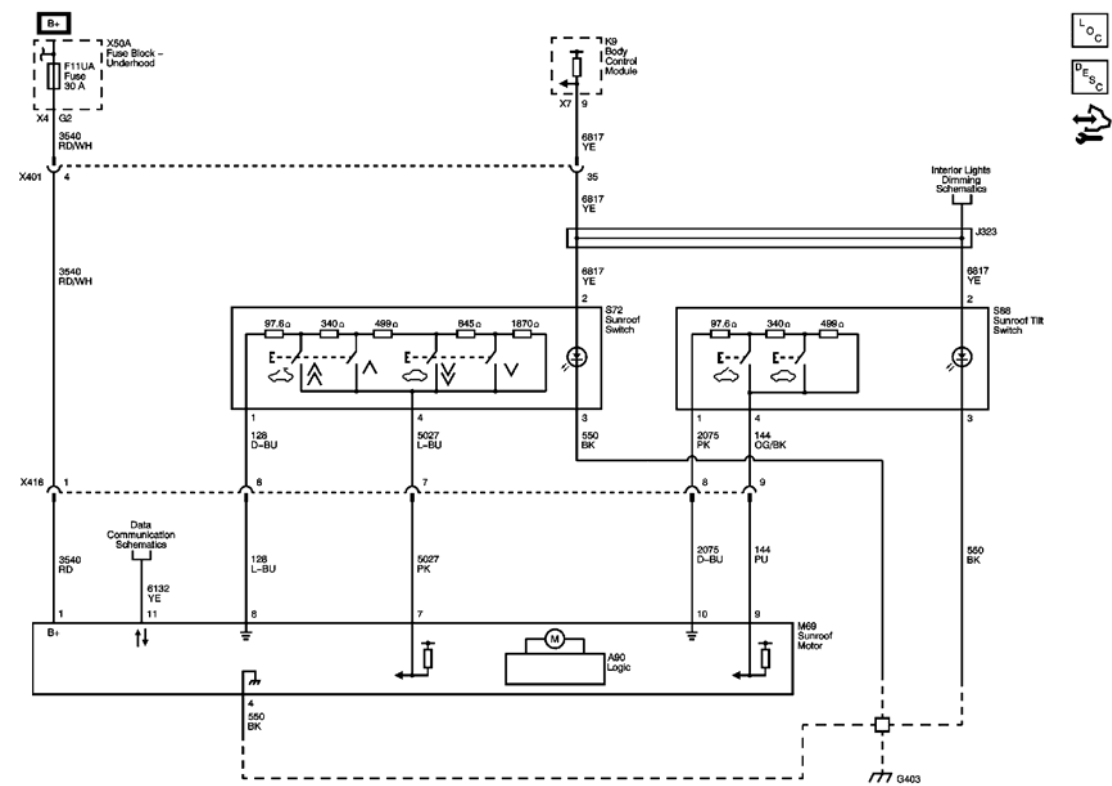


Fig. 1: Sunroof Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B3664</u>	B3664 02: Sunroof Position Select Switch High Signal Circuit Short to Ground B3664 05: Sunroof Position Select Switch High Signal Circuit High Voltage/Open B3664 59: Sunroof Position Select Switch High Signal Circuit Protection Time-Out
<u>DTC B3697</u>	B3697 00: Sunroof Actuator Malfunction B3697 39: Sunroof Actuator Internal Malfunction B3697 42: Sunroof Actuator Calibration Not Programmed B3697 4B: Sunroof Actuator Calibration Not Learned
<u>DTC B369C</u>	B369C 02: Sunroof Ventilation Position Select Switch Circuit Short to Ground B369C 05: Sunroof Ventilation Position Select Switch Circuit High Voltage/Open B369C 59: Sunroof Ventilation Position Select Switch Circuit Protection Time-Out

DTC B3664

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 B3664 02

Sunroof Position Select Switch High Signal Circuit Short to Ground

DTC B3664 05

Sunroof Position Select Switch High Signal Circuit High Voltage/Open

DTC B3664 59

Sunroof Position Select Switch High Signal Circuit Protection Time-Out

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Sunroof Position Select Switch Control	B3664 02	B3664 05	B3664 05	-
Sunroof Position Select Switch Low Reference	-	1	1	-
1. Power Sunroof/Sunshade Malfunction				

Circuit/System Description

The sunroof position select switch is connected directly to the controller. The sliding glass switch provide detent positions for open, express open, off, close, and express close. The sunroof position select switch completes the circuit between two signals provided by the control module, a reference ground input and a pull-up voltage provided by an analog to digital switch input. The control switch places a different resistor ladder network in the circuit depending on the function selected.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

B3664 02

The sunroof module has detected and reported via the LIN-Bus that the sunroof position select switch high signal circuit is shorted to ground.

B3664 05

The sunroof module has detected and reported via the LIN-Bus that the sunroof position select switch high signal circuit is open or shorted to voltage.

B3664 59

The sunroof module has detected and reported via the LIN-Bus that the sunroof position select switch high signal has been the same active position for 20 s after the glass has stopped moving in the requested direction due to reaching the end of the allowable motion.

Action Taken When the DTC Sets

DTC B3664 is stored in the body control module (BCM) memory.

Conditions for Clearing the DTC

The BCM no longer detects a malfunction in the sunroof position select switch high signal circuit.

Reference Information

Schematic Reference

Sunroof Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Sunroof Description and Operation (Tilt and Slide System)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Testing

NOTE: Because of the accessibility of the sunroof switch, perform the component testing before beginning the Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the S72 Sunroof Switch.
2. Test for less than 5 ohms between the ground circuit terminal 1 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Ignition ON, verify the scan tool sunroof slide switch is short to battery.
 - If not the specified value, test the signal circuit terminal 4 for a short to ground. If the circuit tests normal, replace the K61 Sunroof Control Module.
4. Install a 5 A fused jumper wire between the signal circuit terminal 4 and the ground circuit terminal 1. Verify the scan tool sunroof slide switch is short to ground.
 - If not the specified value, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the K61 Sunroof Control Module.
5. If all circuits test normal, test or replace the S72 Sunroof Switch.

Component Testing

Static Test

1. Ignition OFF, disconnect the harness connector at the S72 Sunroof Switch.

2. Test for 3.6-3.7 kohms between the switch terminals 1 and 4.
 - If not within the specified range, replace the S72 Sunroof Switch.
3. Test for 430-440 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the open switch.
 - If not within the specified range, replace the S72 Sunroof Switch.
4. Test for 96-100 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the express open switch.
 - If not within the specified range, replace the S72 Sunroof Switch.
5. Test for 1.7-1.8 kohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the close switch.
 - If not within the specified range, replace the S72 Sunroof Switch.
6. Test for 930-940 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the express close switch.
 - If not within the specified range, replace the S72 Sunroof Switch.

Repair Procedures

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

- **Sunroof Switch Replacement**
- **Sunroof Motor/Actuator Replacement**
- **Control Module References**

DTC B3697

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 B3697 00

Sunroof Actuator Malfunction

DTC B3697 39

Sunroof Actuator Internal Malfunction

DTC B3697 42

Sunroof Actuator Calibration Not Programmed

DTC B3697 4B

Sunroof Actuator Calibration Not Learned

Circuit/System Description

The sunroof glass is controlled by its own integrated motor/controller containing the necessary electronics, motor, hall effect position sensors, as well as the interface to the driver control switches. The motor/controller is capable of controlling motion based on control switch activation and LIN-Bus message commands from the body control module (BCM).

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

B3697 00

The sunroof module has detected and reported via the LIN-Bus that the sunroof actuator has a malfunction.

B3697 39

The sunroof module has detected and reported via the LIN-Bus that the sunroof actuator has a internal malfunction.

B3697 42

The sunroof module has detected and reported via the LIN-Bus that the sunroof actuator is not programmed.

B3697 4B

The sunroof module has detected and reported via the LIN-Bus that the sunroof actuator calibration is not learned.

Action Taken When the DTC Sets

DTC B3697 is stored in the BCM memory.

Conditions for Clearing the DTC

The BCM no longer detects a malfunction in the sunroof actuator.

Reference Information

Schematic Reference

Sunroof Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Sunroof Description and Operation (Tilt and Slide System)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify that DTC B3697 42 or DTC B3697 4B is not set.
 - If the DTC is set, program or calibrate the K61 Sunroof Control Module. If the DTC resets, replace the K61 Sunroof Control Module.
2. Replace the K61 Sunroof Control Module.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Sunroof Motor/Actuator Replacement
- Control Module References

DTC B369C

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 B369C 02

Sunroof Ventilation Position Select Switch Circuit Short to Ground

DTC B369C 05

Sunroof Ventilation Position Select Switch Circuit High Voltage/Open

DTC B369C 59

Sunroof Ventilation Position Select Switch Circuit Protection Time-Out

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Sunroof Ventilation Position Select Switch Control	B369C 02	B369C 05	B369C 05	-
Sunroof Ventilation Position Select Switch Low Reference	-	1	1	-
1. Power Sunroof/Sunshade Malfunction				

Circuit/System Description

The sunroof ventilation position select switch is connected directly to the controller and provide detent positions for open, off and close. The control switch completes the circuit between two signals provided by the control module, a reference ground Input and a pull-up voltage provided by the analog to digital switch input. The control switch places a different resistor ladder network in the circuit depending on the function selected. The controllers analog to digital switch input reads the resulting voltage range and determines the function.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

B369C 02

The sunroof module has detected and reported via the LIN-Bus that the sunroof ventilation position select switch circuit is shorted to ground.

B369C 05

The sunroof module has detected and reported via the LIN-Bus that the sunroof ventilation position select switch circuit is open or shorted to voltage.

B369C 59

The sunroof module has detected and reported via the LIN-Bus that the sunroof ventilation position select switch has been the same active position for 20 s after the glass has stopped moving in the requested direction due to reaching the end of the allowable motion.

Action Taken When the DTC Sets

DTC B369C is stored in the body control module (BCM) memory.

Conditions for Clearing the DTC

The BCM no longer detects a malfunction in the sunroof ventilation position select switch circuit.

Reference Information

Schematic Reference

Sunroof Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Sunroof Description and Operation (Tilt and Slide System)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S88 Sunroof Ventilation Switch.
2. Test for less than 5 ohms between the ground circuit terminal 1 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Ignition ON, verify the scan tool sunroof tilt switch is short to battery.
 - If not the specified value, test the signal circuit terminal 4 for a short to ground. If the circuit tests normal, replace the K61 Sunroof Control Module.
4. Install a 5 A fused jumper wire between the signal circuit terminal 4 and the ground circuit terminal 1. Verify the scan tool sunroof tilt switch is short to ground.
 - If not the specified value, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the K61 Sunroof Control Module.

5. If all circuits test normal, test or replace the S88 Sunroof Ventilation Switch.

Component Testing

Static Test

1. Ignition OFF, disconnect the harness connector at the S88 Sunroof Ventilation Switch.
2. Test for 930-940 kohms between the switch terminals 1 and 4.
 - If not within the specified range, replace the S88 Sunroof Ventilation Switch.
3. Test for 96-100 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the open switch.
 - If not within the specified range, replace the S88 Sunroof Ventilation Switch.
4. Test for 430-440 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the close switch.
 - If not within the specified range, replace the S88 Sunroof Ventilation Switch.

Repair Procedures

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

- **Sunroof Switch Replacement**
- **Sunroof Motor/Actuator Replacement**
- **Control Module References**

SYMPTOMS - ROOF

NOTE: Complete the following procedures before using the symptom tables.

1. Perform the **Diagnostic System Check - Vehicle** in order to verify that all of the following conditions are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system description and operation in order to learn the system functions. Refer to **Sunroof Description and Operation (Tilt and Slide System)**.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the power sunroof system. Refer to **Checking Aftermarket Accessories**.
- Inspect the accessible system components for obvious damage or for conditions which can cause the symptom.

Intermittent

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

Symptom List

Power Sunroof/Sunshade Malfunction

POWER SUNROOF/SUNSHADE MALFUNCTION

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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	1	1	-	-
Sunroof Switch Close Signal	B3664 02	B3664 05	B3664 05	-
Sunroof Switch Open Signal	B3664 02	B3664 05	B3664 05	-
Sunroof Tilt Switch Open Signal	B369C 02	B369C 05	B369C 05	-
Sunroof Tilt Switch Close Signal	B369C 02	B369C 05	B369C 05	-
Sunroof Module Ground	-	1	-	-
1. Power Sunroof Malfunction				

Circuit/System Description

The sunroof electrical system uses a master/slave configuration utilizing a LIN-Bus based system for communication. The body control module (BCM) is designated as the master, while the sunroof control module is configured as the slave.

As the system master, the BCM uses the LIN-Bus communication bus to enable or disable sunroof operation, communicate vehicle information to each controller, and request sunroof movement. The sunroof controller provide system status and diagnostic information to the BCM for diagnostic reporting and operational purposes. The control switches places a different resistor ladder network in the circuit depending on the function selected. The controllers analog to digital switch input reads the resulting voltage range and determines the function.

Reference Information

Schematic Reference

Sunroof Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Sunroof Description and Operation (Tilt and Slide System)

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

Sunroof

Ignition ON, press the sunroof switch to the open and close positions. The sunroof should open and close when changing between the commanded states.

Ventilation

Ignition ON, press the sunroof tilt switch to the open and close positions. The sunroof should move up and down when changing between the commanded states.

Circuit/System Testing

NOTE: **Because of the accessibility of the switches, perform the switch component testing before beginning the circuit/system testing.**

1. Ignition OFF, disconnect the harness connector at the K61 Sunroof Control Module.
2. Test for less than 5 ohms between the ground circuit terminal 4 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Verify that a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance. If the circuit tests normal and the B+ circuit fuse is open, determine if the K61 Sunroof Control Module is causing the fuse to open. Replace the K61 Sunroof Control Module.
4. Ignition ON, verify that a test lamp does not illuminate between the circuit terminals listed below and ground:
 - Terminal 7
 - Terminal 8

- Terminal 9
 - Terminal 10
 - If the test lamp does illuminate, test the appropriate circuit for a short to voltage.
5. Ignition OFF, verify that a test lamp does not illuminate between the circuit terminals listed below and B+:
- Terminal 7
 - Terminal 8
 - Terminal 9
 - Terminal 10
 - If the test lamp does illuminate, test the appropriate circuit for a short to ground.
6. Disconnect the harness connector at the S72 Sunroof Switch or the S88 Sunroof Tilt Switch.
7. Test for less than 5 ohms between the circuit terminals listed below:
- S72 Sunroof Switch terminal 1 and K61 Sunroof Control Module terminal 8
 - S72 Sunroof Switch terminal 4 and K61 Sunroof Control Module terminal 7
 - S88 Sunroof Tilt Switch terminal 1 and K61 Sunroof Control Module terminal 10
 - S88 Sunroof Tilt Switch terminal 4 and K61 Sunroof Control Module terminal 9
 - If greater than the specified value, test the appropriate circuit for an open/high resistance.
8. If all circuits test normal, test or replace the K61 Sunroof Control Module.

Component Testing

Static Test - Sunroof Switch

1. Ignition OFF, disconnect the harness connector at the appropriate sunroof switch.
2. Test for 3.6-3.7 kohms between the switch terminals 1 and the low reference circuit terminal 4.
 - If not within the specified range, replace the appropriate switch.
3. Test for 430-440 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the open switch.
 - If not within the specified range, replace the appropriate switch.
4. Test for 96-100 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the express open switch.
 - If not within the specified range, replace the appropriate switch.
5. Test for 1.7-1.8 kohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the close switch.
 - If not within the specified range, replace the appropriate switch.
6. Test for 930-940 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the express close switch.
 - If not within the specified range, replace the appropriate switch.

Static Test - Sunroof Tilt Switch

1. Ignition OFF, disconnect the harness connector at the S88 Sunroof Tilt Switch.
2. Test for 930-940 ohms between the switch terminals 1 and the low reference circuit terminal 4.
 - If not within the specified range, replace the S88 Sunroof Tilt Switch.
3. Test for 96-100 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the open switch.
 - If not within the specified range, replace the S88 Sunroof Tilt Switch.
4. Test for 430-440 ohms between the signal terminal 1 and the low reference circuit terminal 4 while pressing the close switch.
 - If not within the specified range, replace the S88 Sunroof Tilt Switch.

Repair Procedures

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

- **Sunroof Switch Replacement**
- **Sunroof Tilt Position Switch Replacement**
- **Sunroof Motor/Actuator Replacement**
- **Control Module References** for sunroof motor/actuator replacement, setup, and programming

REPAIR INSTRUCTIONS

SUNROOF PANEL SIDE OPENING CLOSEOUT COVER REPLACEMENT

Removal Procedure

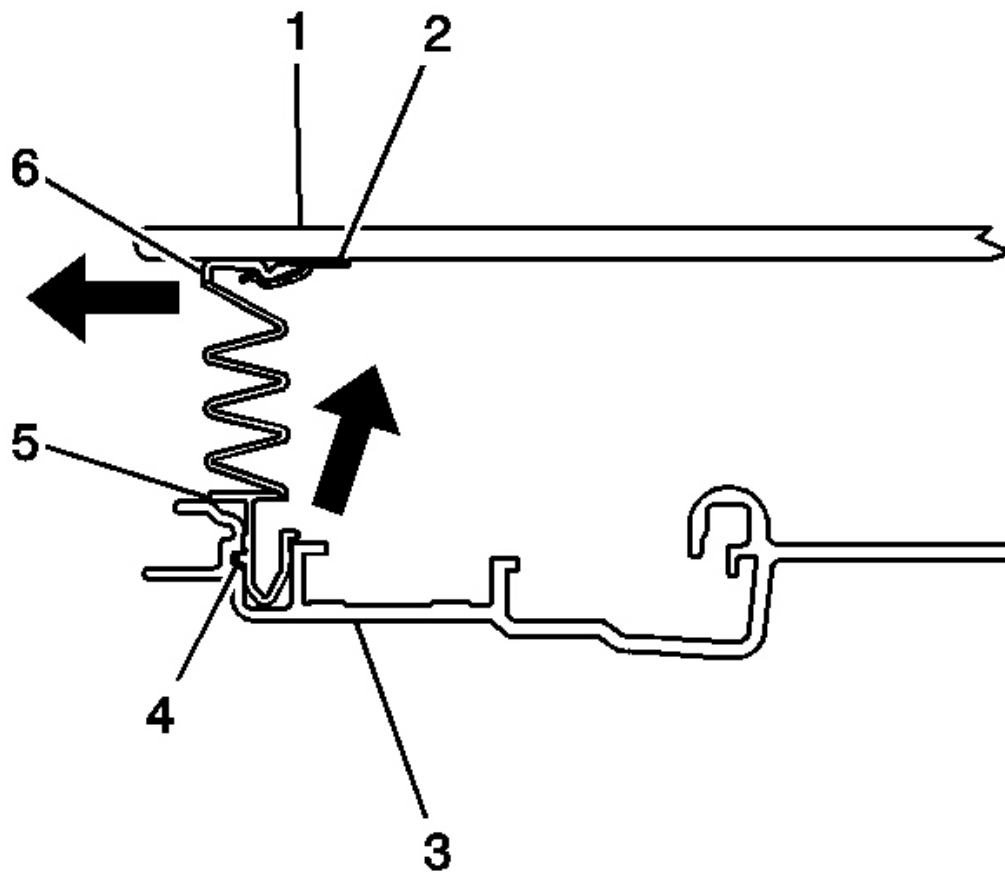


Fig. 2: Removing & Installing Sunroof Panel Side Opening Cover
Courtesy of GENERAL MOTORS CORP.

1. Open the sunshade to the full rearward position.
2. Open the sunroof window (1) to the vent position.
3. Detach both sides of the sunroof side opening closeout panel covers (6) from the sunroof window clips (2).
4. Open the sunroof to the full open position.
5. Using a flat-bladed tool, press the locking tab (4) outward, from inside the roof opening, in order to detach the side opening closeout panel cover from the sunroof track channel (3).
6. With the lock tab (4) depressed, lift the front edge of the side opening closeout panel cover from the track, working towards the rear of the sunroof opening.
7. Repeat the steps for the entire length of the side opening closeout panel cover (6).
8. Remove the sunroof side opening closeout panel cover from the sunroof module track assembly.

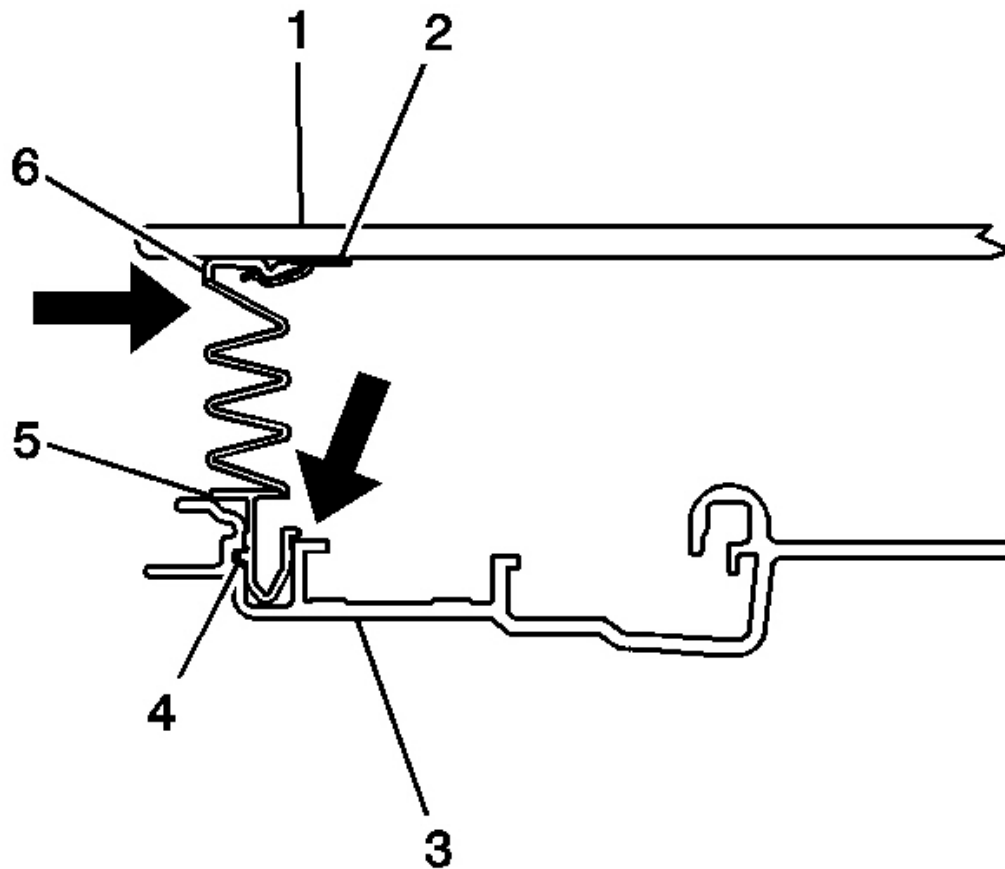


Fig. 3: Removing/Installing Sunroof Panel Side Opening Cover
Courtesy of GENERAL MOTORS CORP.

1. Place in position, the new sunroof side opening closeout panel cover (6) to the sunroof module track assembly (3).
2. Hold the lower part (5) of the side opening closeout panel cover firmly and press the locking tab (4) into the track assembly.
3. Ensure the entire length of the side opening closeout panel cover (6) is secure to the sunroof assembly track.
4. Close the sunroof window (1).
5. Open the sunroof window to the vent position.
6. Secure the sunroof side opening closeout panel cover (6) to the 3 clips (2) located on the inside edge of the sunroof window.

- 7. Close the sunroof window.
- 8. Cycle the sunroof window to the vent position and full open positions in order to ensure the sunroof side opening closeout panel covers are secure to the attachment clips.
- 9. Close the sunroof window.
- 10. Close the sunshade.

SUNROOF AIR DEFLECTOR REPLACEMENT

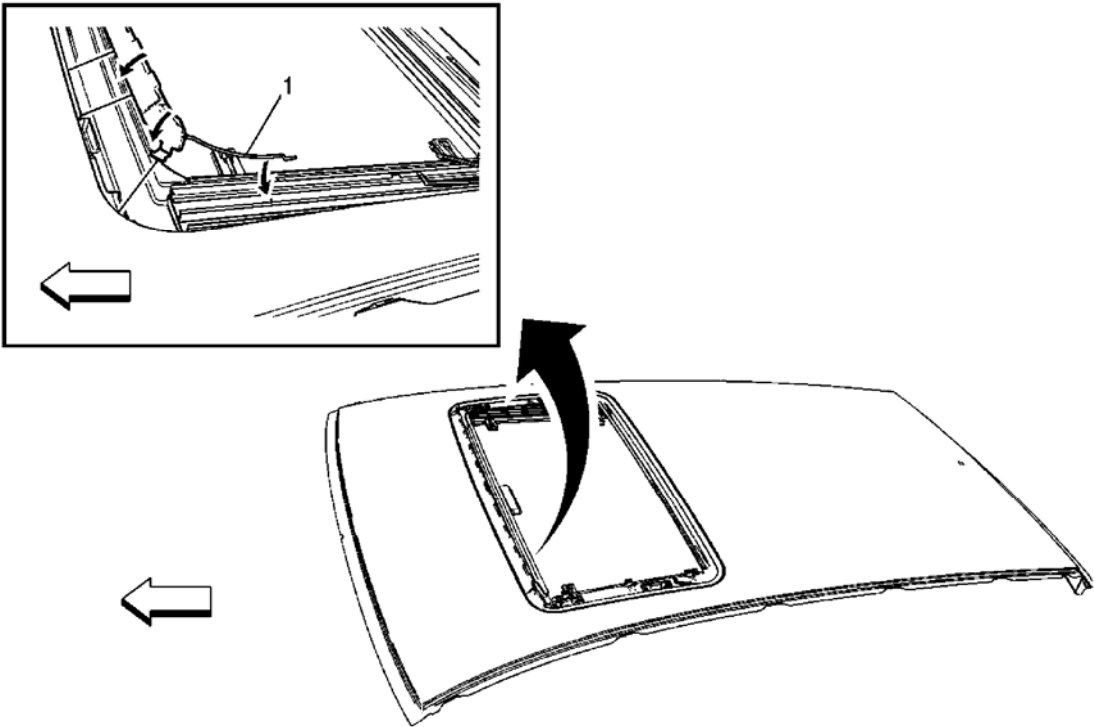


Fig. 4: Sunroof Air Deflector
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Open the sunroof window.	
1	Sunroof Air Deflector Procedure 1. Push down on the right front side of the air deflector. 2. While pushing down on the right front side of air deflector. Lift up on the air deflector, releasing air deflector from the roof. 3. Remove the air deflector springs for the sunroof frame on both sides.

Tip: Do not lift up on the spring of the air deflector with a strong force, it could bend.

SUNROOF DRAIN INSPECTION AND CLEANING

Drain Hose Routing

NOTE: If the headliner is wet **DO NOT** remove any interior trim. Do the Plugged Drain Hose test first.

A drain trough encircles the sunroof window panel and water is drained off by the drain hoses located at each corner of the housing. A drain channel spans across the sunroof module at the rear of the window panel and directs water into the trough.

1. The front drain hoses are routed down the windshield pillars and out the plenum upper panel (wiper pocket). The front hoses are installed in a rubber grommet and retained by clips.
2. The rear drain hoses are routed through the rear pillars and out of the rocker panel. In some vehicle the drain hoses are routed out through the metal roof slots and routed to the lower wheelhouse to drain out of the vehicle. The rear hoses are installed in a rubber grommet and retained by clips.

Plugged Drain Hose

If a waterleak has occurred check for a plugged drain hose at each corner of drainage system.

1. Open the sunroof window.
2. To test for blockage, pour a small container of water into the module housing drain trough. Check each corner to confirm the drain hose is draining water.

WARNING: Wear safety glasses in order to avoid eye damage.

3. Use compressed air, 241 kPa (35 psi) or less to blow out any drain hose that is plugged.
4. Test the system again.
5. If the hose remains plugged, check to see it is properly routed and does not have a kink. Refer to **Sunroof Housing Front Drain Hose Replacement** or **Sunroof Housing Rear Drain Hose Replacement**.
6. Remove the blockage using the following steps.
 1. Push mechanics wire through the hose to remove the obstruction.
 2. Use compressed air in order to blow out any remaining material.

Disconnected Drain Hose

Inspect the drainage system for disconnected drain hoses. Complete the following steps in order to obtain partial access to drain hoses and check for a disconnected hose.

1. Open the sunroof window panel.

2. Lower the headliner as needed. Refer to **Headlining Trim Panel Replacement** .
3. Connect any disconnected hoses.
4. Ensure that the rear drain hoses are properly routed in the metal roof slot and taped in place.

SUNROOF FRAME REPLACEMENT

Removal Procedure

1. It is only necessary to lower the headliner. Only do those step in headliner replacement that will lower the headliner enough to gain access to the part. Refer to **Headlining Trim Panel Replacement** .

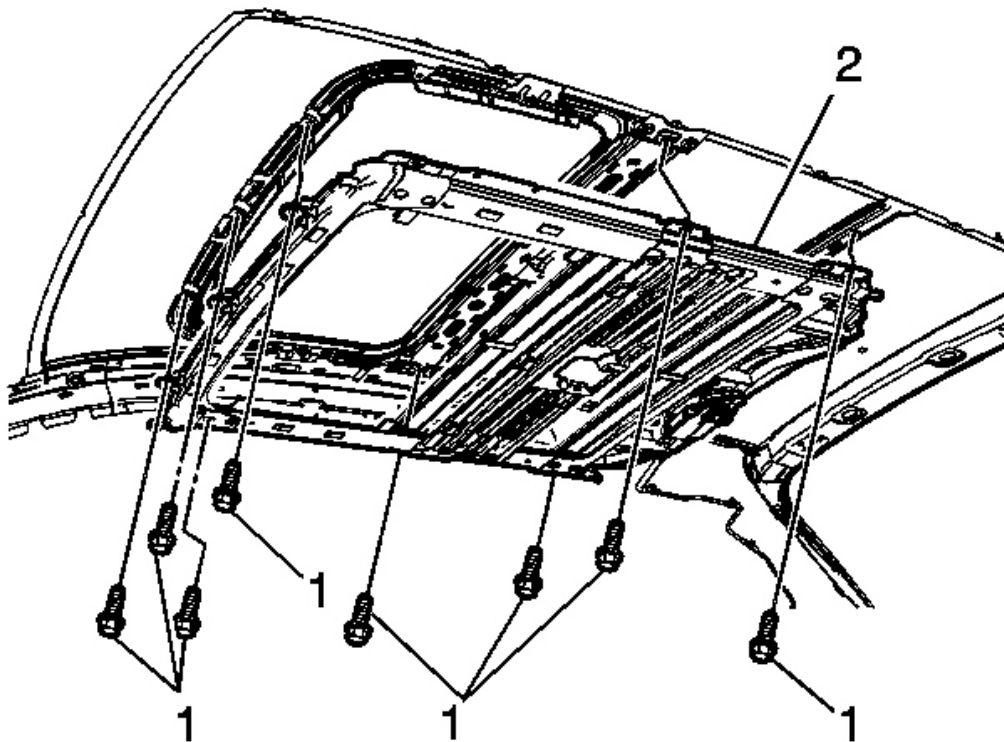


Fig. 5: View Of Sunroof Module Assembly
Courtesy of GENERAL MOTORS CORP.

2. Remove the sunroof window. Refer to **Sunroof Window Replacement**.
3. Disconnect the electrical connector from the sunroof frame.
4. Disconnect the front and rear sunroof drain hoses. Refer to **Sunroof Housing Front Drain Hose Replacement** and **Sunroof Housing Rear Drain Hose Replacement**.

5. With the aid of an assistant, remove the bolts (1) that secure the sunroof frame (2).

Installation Procedure

1. Before transferring any parts perform the timing/synchronization of the sunroof frame. Refer to **Sunroof Track Timing/Synchronization**.
2. Transfer all necessary parts to the new frame.

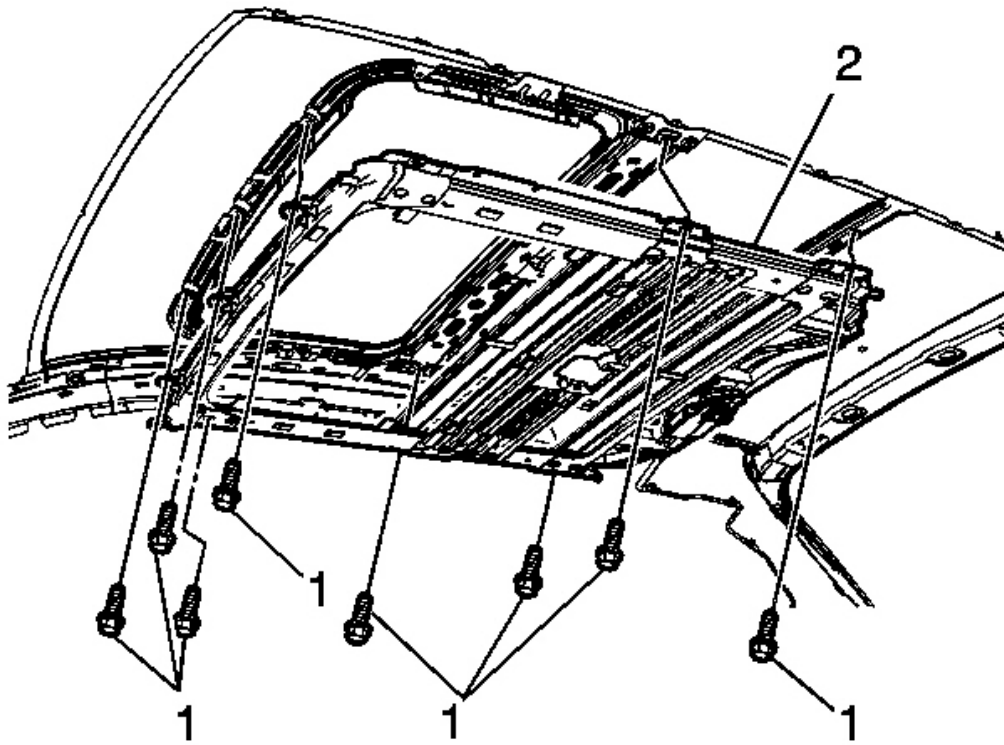


Fig. 6: View Of Sunroof Module Assembly
Courtesy of GENERAL MOTORS CORP.

3. With the aid of an assistant, position the new sunroof frame (2) into the roof opening.

CAUTION: Refer to **Fastener Caution** .

4. With the aid of an assistant, install the bolts (1) that secure the sunroof frame (2) to the roof.

Tighten: Tighten the bolts to 8 N.m (70 lb in).

5. Connect the front and rear sunroof drain hoses. Refer to **Sunroof Housing Front Drain Hose Replacement** and **Sunroof Housing Rear Drain Hose Replacement**.
6. Connect the electrical connectors to the sunroof frame.
7. Install and adjust the sunroof window. Refer to **Sunroof Window Replacement**.
8. Ensure the motor/actuator initialization/teach process has been done. Refer to **Sunroof Motor/Actuator Initialization/Teach Process**.
9. Verify the proper operation of the sunroof before installing the headliner.
10. Install the headliner. Refer to **Headlining Trim Panel Replacement** .

SUNROOF HOUSING FRONT DRAIN HOSE REPLACEMENT

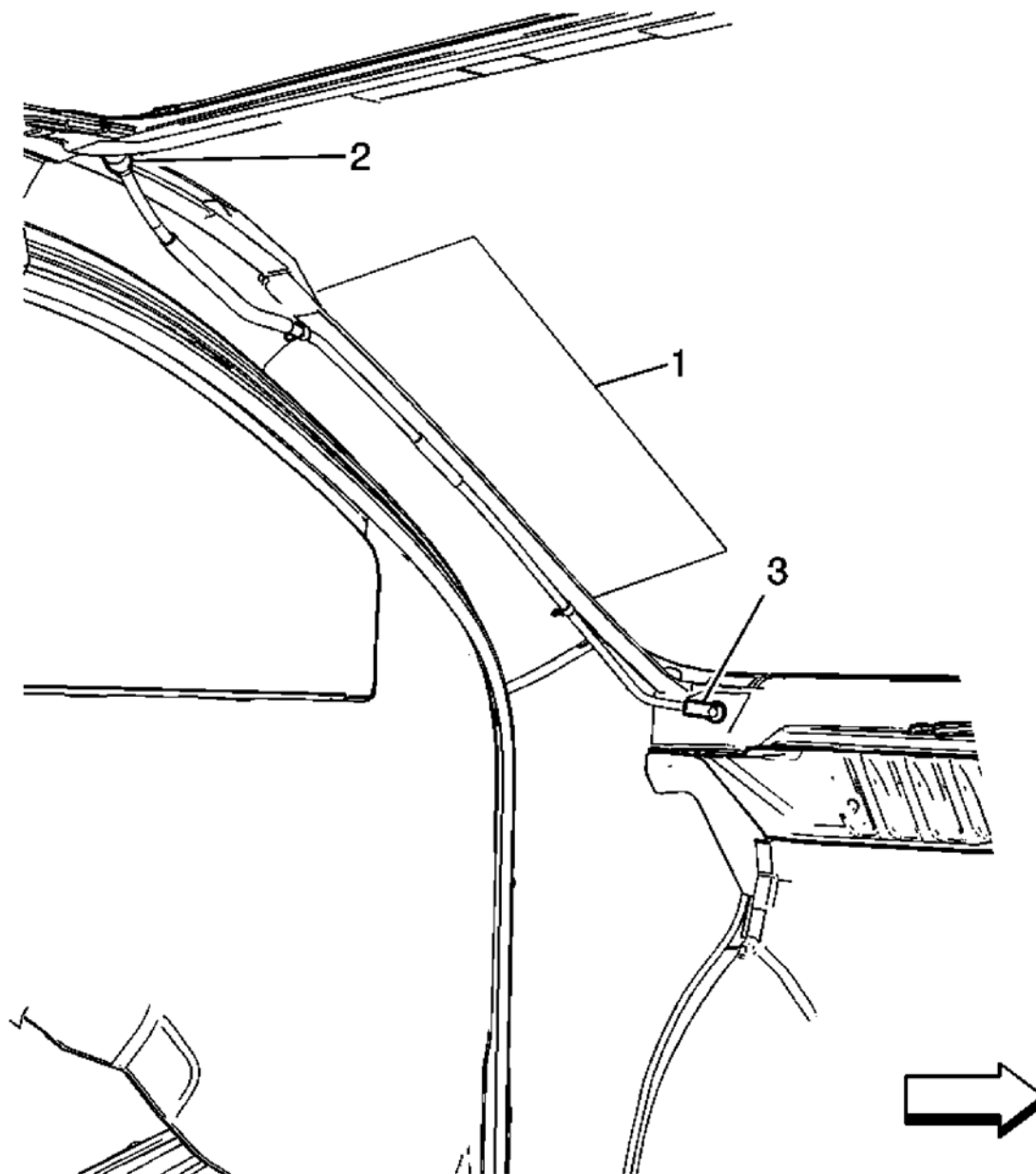


Fig. 7: Sunroof Housing Front Drain Hose
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	It is only necessary to lower the headliner. Only do those steps in headliner replacement that will lower the headliner enough to gain access to the part. Refer to Install the headliner. Refer to <u>Headlining Trim Panel Replacement</u>
2.	Remove the instrument panel. Refer to <u>Lower Trim Pad Retainer Replacement (Equinox)</u> or

Lower Trim Pad Retainer Replacement (Terrain)

3. Remove the air inlet grille panel. Refer to **Air Inlet Grille Panel Extension Replacement (Equinox)** or **Air Inlet Grille Panel Extension Replacement (Terrain)**
4. When servicing the sunroof housing front left drain hose it will be necessary to remove the wiper transmission. Refer to **Windshield Wiper Transmission Replacement (Equinox)** or **Windshield Wiper Transmission Replacement (Terrain)** .

1	Sunroof Housing Front Drain Hose Retainers (Qty : 2)
2	Sunroof Housing Front Drain Hose to Frame Procedures: Remove the sunroof housing front hose tie strap to release the hose from the frame spout.
3	Sunroof Housing Front Drain Hose and Grommet Procedures 1. Replace the sunroof housing front drain hose retainers to the A-pillar if damaged when removing. 2. Secure the sunroof housing front drain hose to the frame spout with a new tie strap. 3. Ensure that the grommet is fully seated into the plenum to prevent water leaks. Do the following: 1. Pour a cup of water in the sunroof housing front frame spout. 2. Ensure that the frame spout to hose and hose to the plenum grommet is not leaking in the vehicle. 3. Ensure that the water is draining in the plenum and out of the vehicle before installing the headliner and instrument panel.

SUNROOF HOUSING REAR DRAIN HOSE REPLACEMENT

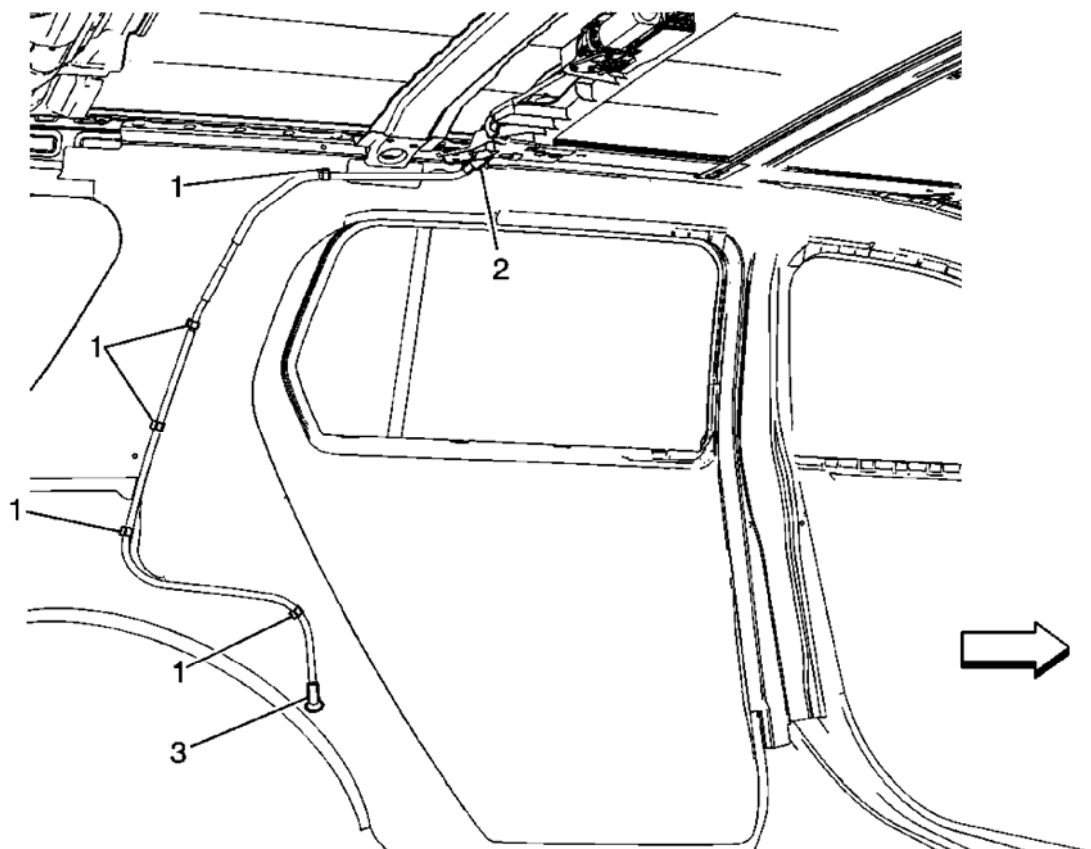


Fig. 8: Sunroof Housing Rear Drain Hose
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the quarter window trim finish panel. Refer to <u>Quarter Window Trim Finish Panel Replacement</u>. 2. Remove the body side trim panel. Refer to <u>Body Side Trim Panel Replacement - Left Side</u> or <u>Body Side Trim Panel Replacement - Right Side</u>. 3. It is only necessary to lower the headliner. Only do those steps in headliner replacement that will lower the headliner enough to gain access to the part. Refer to <u>Headlining Trim Panel Replacement</u>.	
1	Sunroof Housing Rear Drain Hose Retainers (Qty: 5)
2	Sunroof Housing Rear Drain Hose to Frame Procedures: Remove the sunroof housing rear hose tie strap to release the hose from the frame spout.
	Sunroof Housing Rear Drain Hose and Grommet

Procedures

3

1. Replace the sunroof housing rear drain hose retainers to the quarter panel if damaged when removing.
2. Secure the sunroof housing rear drain hose to the frame spout with a new tie strap.
3. Ensure that the sunroof housing rear drain hose grommet is fully seated into the lower quarter panel to prevent water leaks, do the following:
 1. Pour a cup of water in the sunroof housing rear frame spout.
 2. Ensure that the frame spout to hose and hose to the lower quarter panel and grommet is not leaking in the vehicle.
 3. Ensure that the water is draining out of the lower quarter panel of the vehicle before installing the headliner, quarter window trim finish panel and body side trim panel.

SUNROOF MOTOR/ACTUATOR INITIALIZATION/TEACH PROCESS

NOTE: If the sunroof motor is new, cycle the sunroof seven (7) times to teach the motor/actuator initialization process.

1. Perform the initialization/teach process on a new or reinstalled motor as follows:
 1. Ensure that the headliner electrical harness is connected to the sunroof motor.
 2. Put the vehicle Park Brake On.
 3. Ensure that the vehicle is in Park.
 4. Engine running.

NOTE: If the sunroof window doesn't go to the vent open position first time, release the switch and press the switch again.

2. Press and hold the sunroof switch to the vent open position until the sunroof window stops in the vent open position.
3. Again press and hold the sunroof switch to the vent open position for at least 10 seconds, then the window should move slightly.
4. Verify the sunroof operation.

If the initialization/teach procedure is not carried out completely, it has to be started again.

SUNROOF MOTOR/ACTUATOR REPLACEMENT

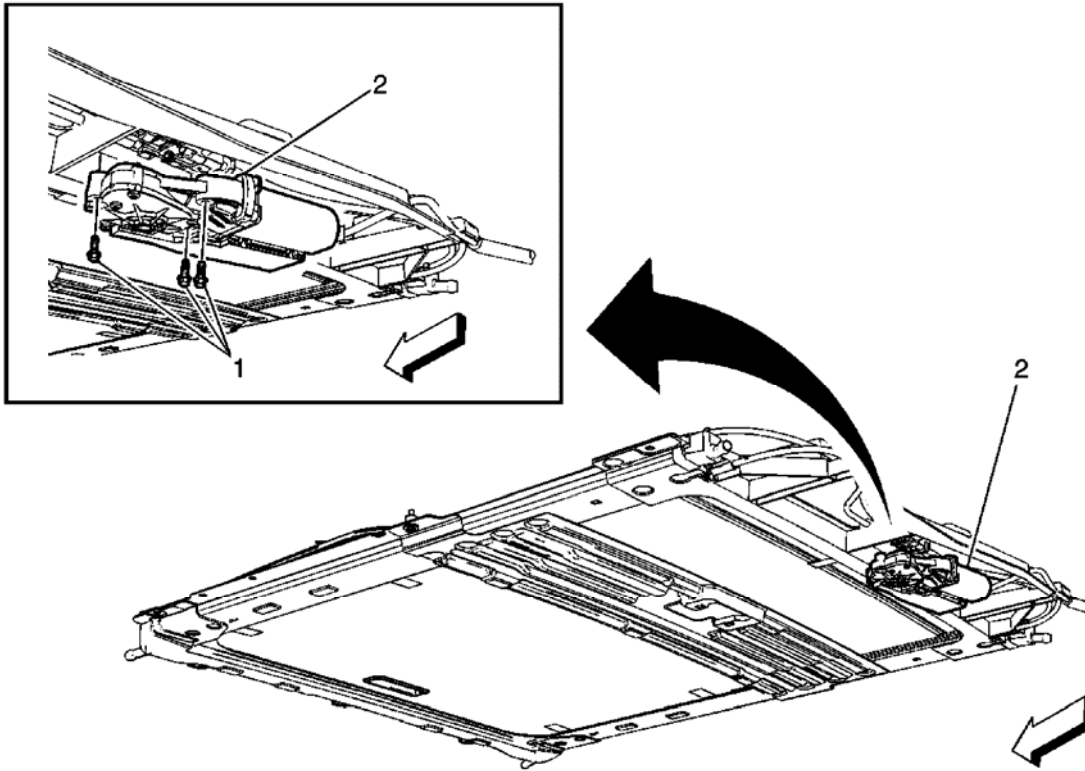


Fig. 9: Identifying Sunroof Motor/Actuator
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: It is only necessary to lower the headliner. Only perform the steps in the headliner replacement procedure that will lower the headliner enough to gain access to the part. Refer to <u>Headlining Trim Panel Replacement</u> .	
1	Sunroof Motor/Actuator Screw (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. The sunroof window must be in the fully closed position before disconnecting the harness, to ensure synchronization of the sunroof motor to the sunroof module. 2. Disconnect the electrical connector from the sunroof motor. Tighten: 5 N.m (44 lb in).
	Sunroof Motor/Actuator

Procedure

2

1. Pull downward to disengage the motor/actuator from the sunroof module.
2. Perform the timing/synchronization of the sunroof frame. Refer to **Sunroof Track Timing/Synchronization**.
3. Install the motor, verify the sunroof operation.
4. Ensure the motor/actuator initialization/teach process has been done. Refer to **Sunroof Motor/Actuator Initialization/Teach Process**.
5. Verify the proper operation of the sunroof before installing the headliner.
6. Install the headliner. Refer to **Headlining Trim Panel Replacement** .

SUNROOF SUNSHADE REPLACEMENT

Removal Procedure

1. Remove the sunroof window. Refer to **Sunroof Window Replacement**.
2. Remove the screws from the sunroof drain channel.

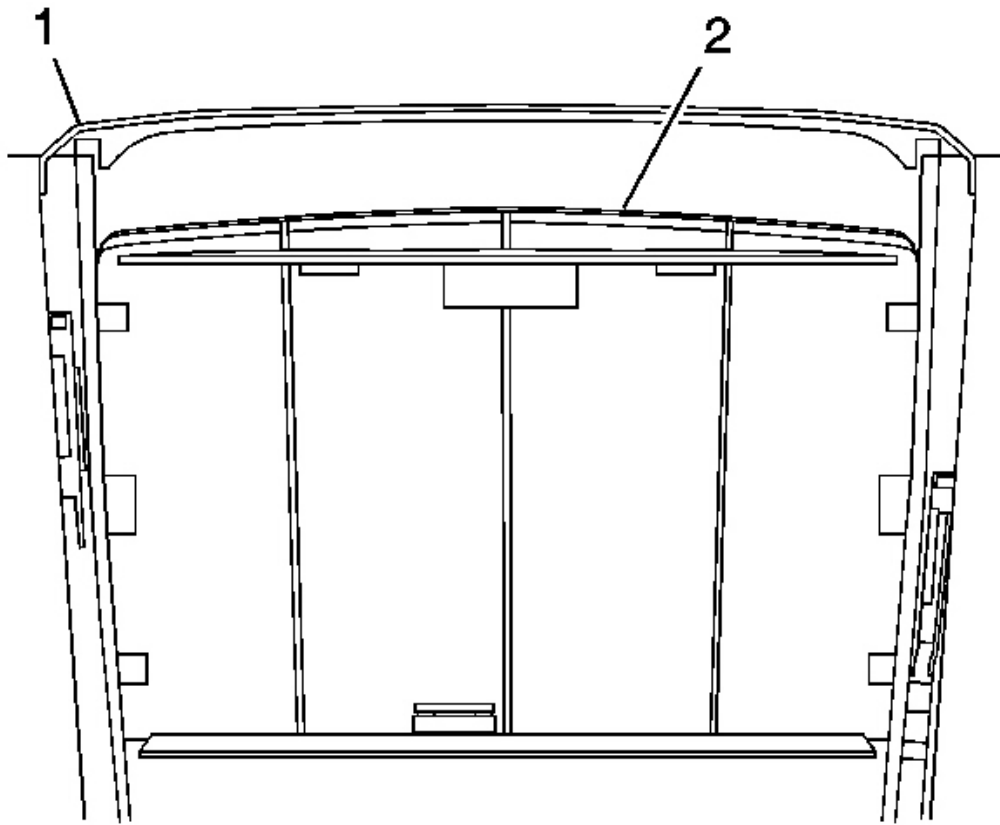


Fig. 10: Identifying Sunshade & Sunroof Frame
Courtesy of GENERAL MOTORS CORP.

3. Remove the sunroof drain channel.

Slide the sunshade (2) forward to the closed position.

4. Apply slight upward pressure to the rear of the sunshade flange close to either left or right of the guide track to disengage the tab.
5. Rotate the rear of the sunshade toward the guide tab was disengaged until all tabs release.
6. Remove the sunshade (2) from the sunroof frame (1).

Installation Procedure

1. Engage one front tab of the sunshade by positioning it into the lower guide track.

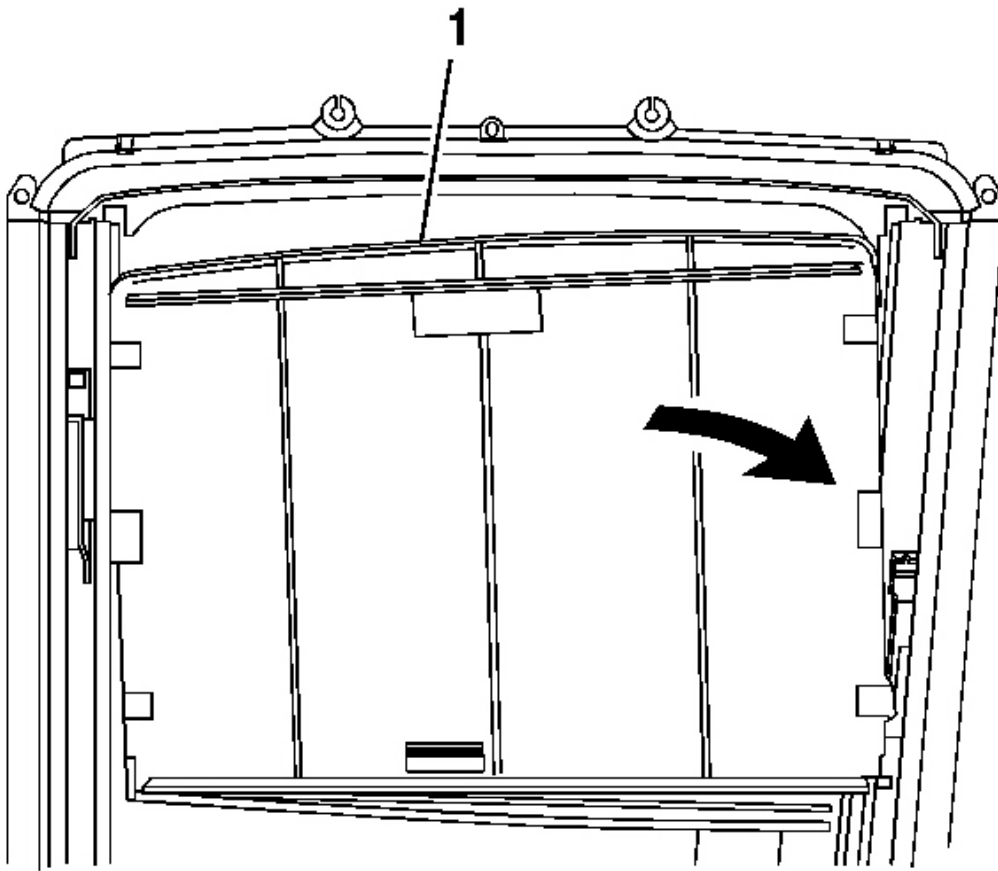


Fig. 11: Rotating Sunshade

Courtesy of GENERAL MOTORS CORP.

2. Rotate the sunshade (1) toward opposite guide to engage other front tab while ensuring rear tab of first side engaged.
3. Gently apply upward pressure to the rear sunshade flange to engage last tab.
4. Slide the sunshade back and forth to ensure proper operation.
5. Slide the sunshade to the half closed position.

CAUTION: Refer to Fastener Caution .

6. Install the rear drain channel, large flange to rear. Tighten the bolts to 2 N.m (18 lb in).
7. Install the sunroof window. Refer to **Sunroof Window Replacement**.

SUNROOF TILT POSITION SWITCH REPLACEMENT

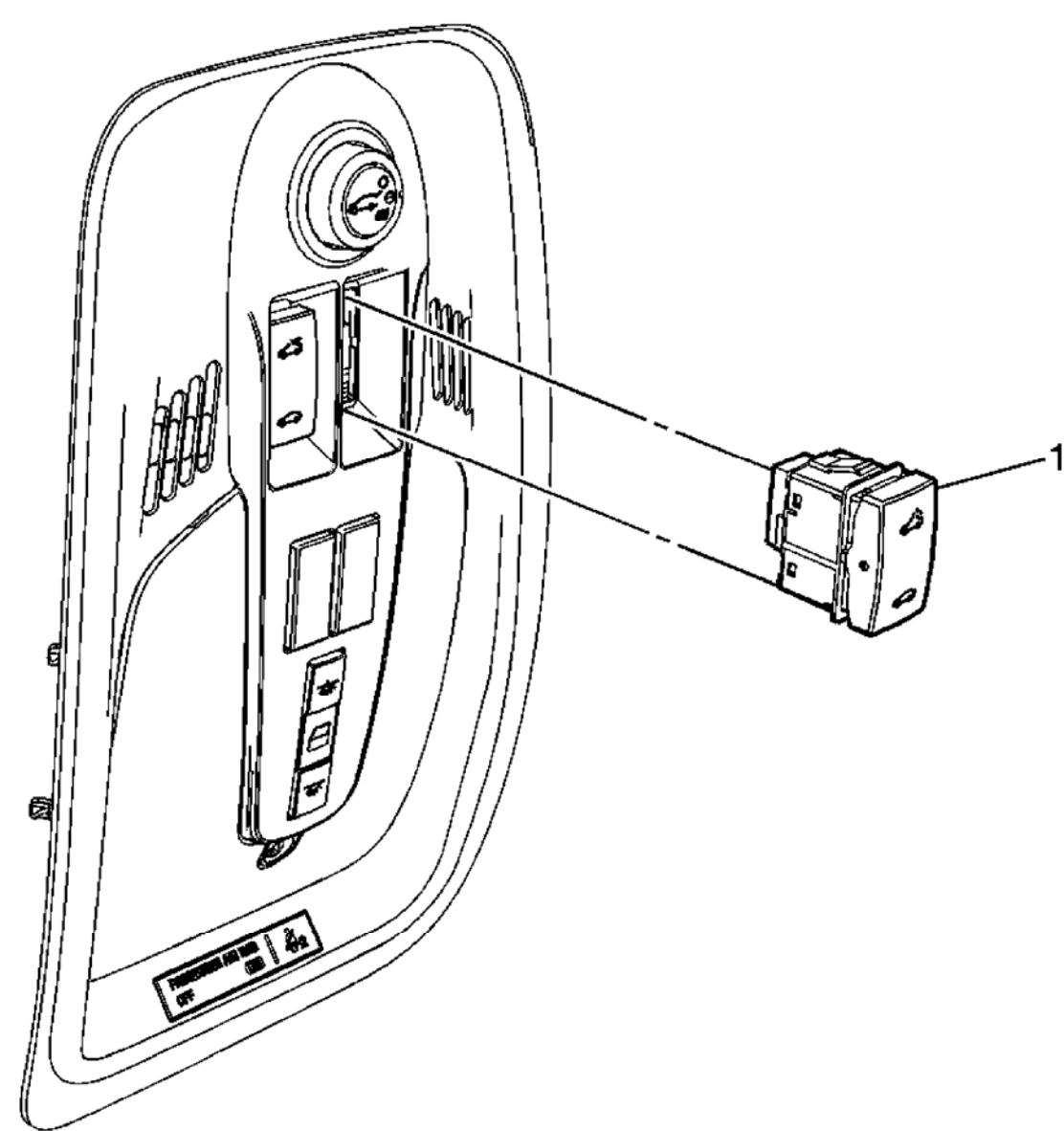


Fig. 12: Sunroof Tilt Position Switch
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the roof console. Refer to Roof Console Replacement .	
1	Sunroof Tilt Position Switch
Procedure	

1. Disconnect electrical connector.
2. Press tabs together and remove switch.

SUNROOF SWITCH REPLACEMENT

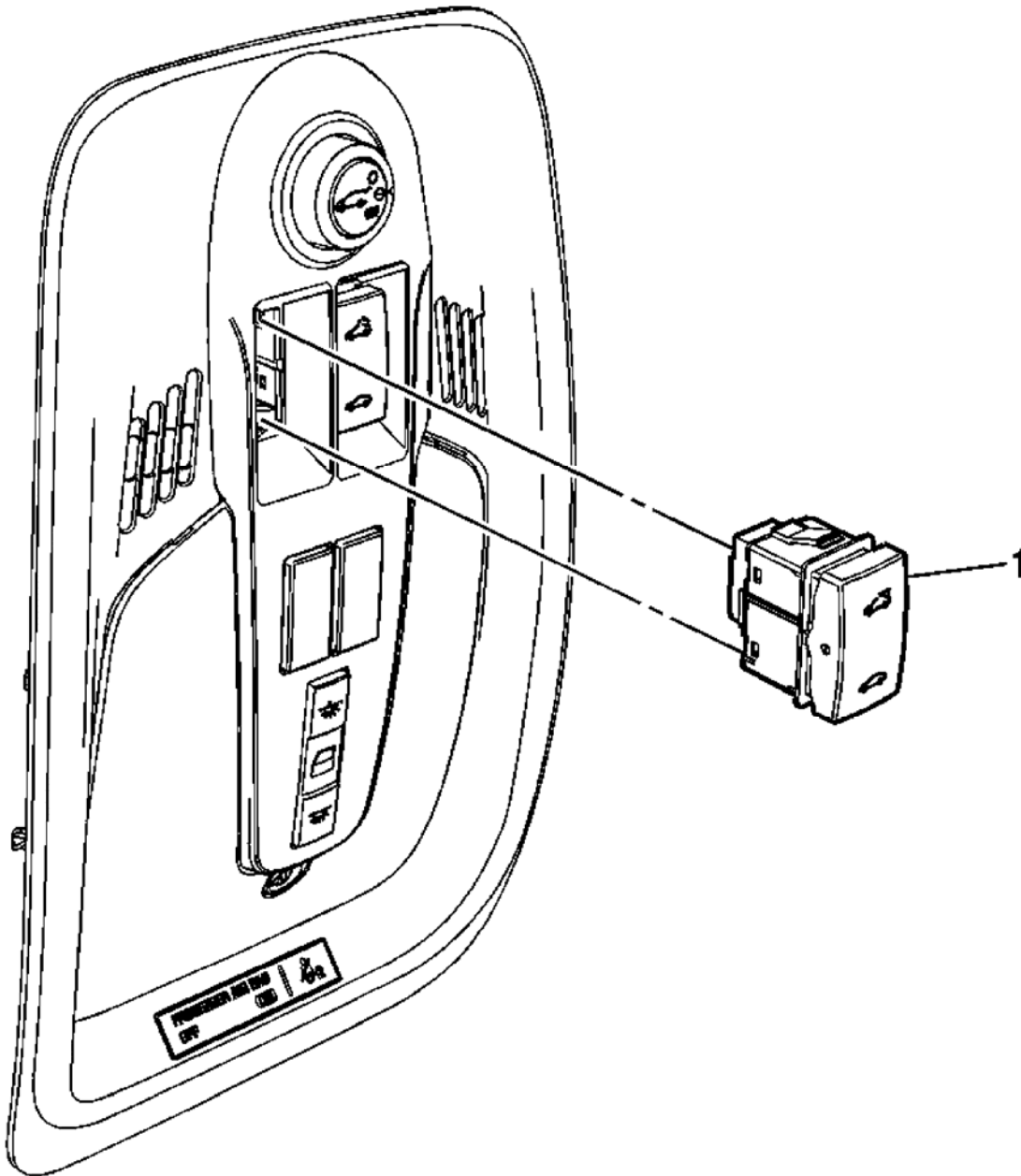


Fig. 13: Sunroof Switch
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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Preliminary Procedure:

Remove the roof console. Refer to **Roof Console Replacement** .

1	Sunroof Switch Procedure 1. Disconnect electrical connector. 2. Press tabs together and remove switch.
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SUNROOF TRACK TIMING/SYNCHRONIZATION

1. It is only necessary to lower the headliner. Only do those steps in the headliner replacement procedure that will lower the headliner enough to gain access to the part. Refer to **Headlining Trim Panel Replacement** .
2. Place the sunroof window in the vent/open position.
3. Remove the screws from the motor/actuator.
4. Disengage the motor/actuator from the drive cables and module.

NOTE: After the motor/actuator has been remove it will be necessary to align the module tracks.

5. Remove the sunroof window. Refer to **Sunroof Window Replacement**.

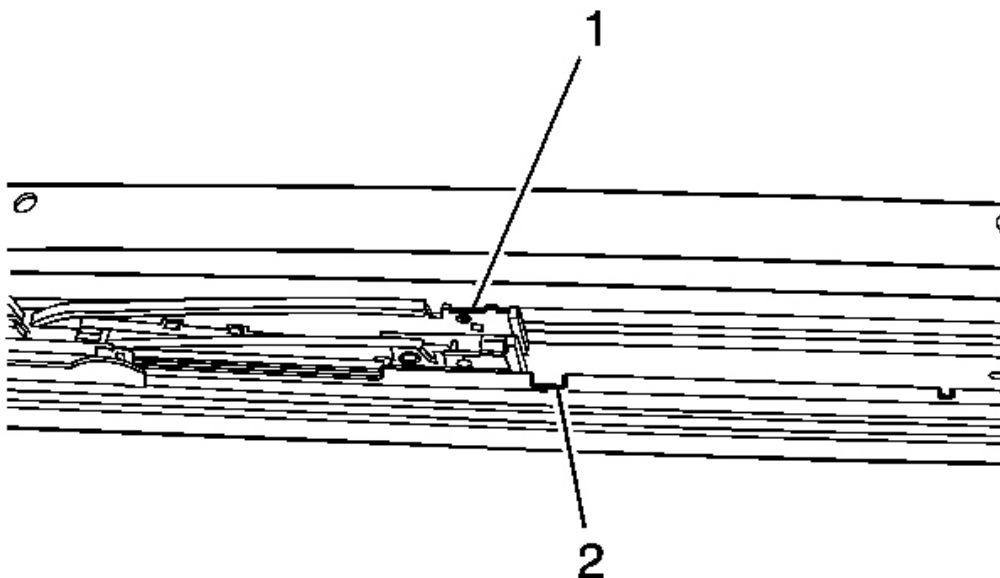


Fig. 14: Sliding Drive Cable Plates On Left And Right Forward Until First Stop Is Made
Courtesy of GENERAL MOTORS CORP.

6. Sliding the drive cable plates (1) on the left and right forward until the first stop is made (2), this will lock the sliding bracket and release drive cable plate.

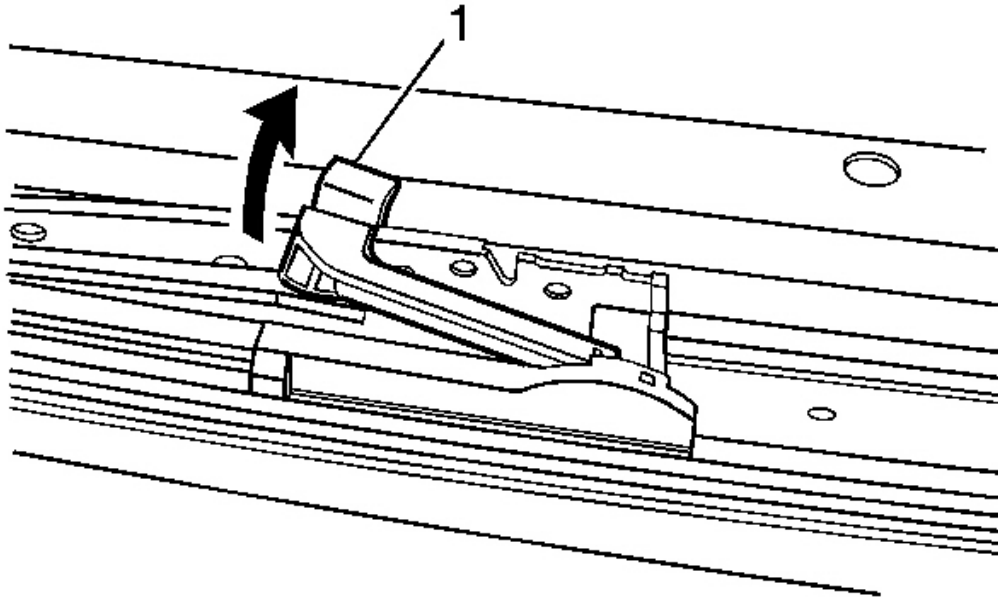


Fig. 15: Adjusting Drive Cable Plates On Left And Right Sides
Courtesy of GENERAL MOTORS CORP.

7. Manually adjust the drive cable plates (1) on the left and right sides, by sliding them forward until contact is made to the guide crimp (timing hard stop).
8. Install the sunroof motor/actuator. Refer to **Sunroof Motor/Actuator Replacement**.
9. Install the sunroof window. Refer to **Sunroof Window Replacement**.
10. Ensure the motor/actuator initialization/teach process has been done. Refer to **Sunroof Motor/Actuator Initialization/Teach Process**.
11. Verify the sunroof for proper operation.
12. Install the headliner. Refer to **Headlining Trim Panel Replacement**.

SUNROOF WINDOW HEIGHT AND OPENING FIT ADJUSTMENT

1. Remove the sunroof panel side opening closeout covers. Refer to **Sunroof Panel Side Opening Closeout Cover Replacement**.

NOTE: Correct adjustment cannot be achieved if the sunroof window is closed from vent position.

2. Cycle the sunroof window from full open to closed position.

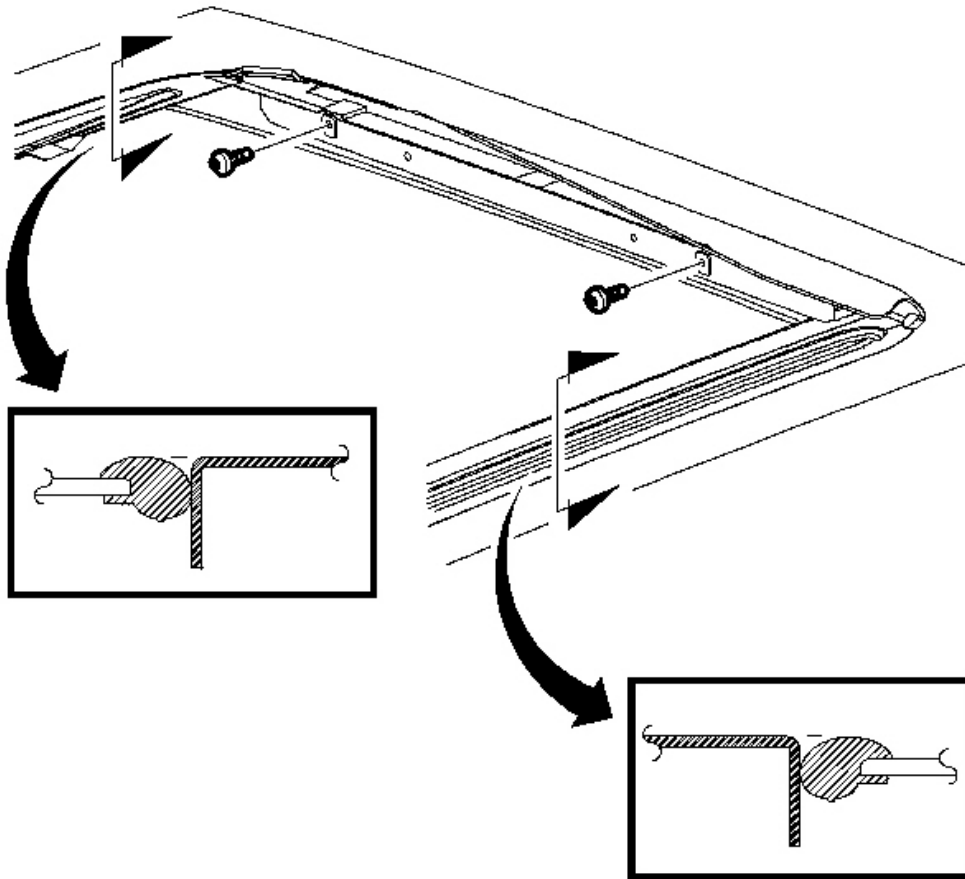


Fig. 16: View Of Sunroof Window & Opening Fit
Courtesy of GENERAL MOTORS CORP.

NOTE: Do Not remove or lower headliner to access sunroof window screws.

3. Loosen the adjusting screws on the window.
4. Adjust the corners of the front window panel using the following guidelines:

- Adjust the front of the sunroof window to 0.0 mm-1.0 mm (0.0 in-0.04 in) below the top surface of the roof panel.
- Adjust the rear center line of the sunroof window to 2 mm-3 mm (0 .08 in-0.12 in) below the top surface of the roof panel.

CAUTION: Refer to Fastener Caution .

5. Tighten the sunroof window adjustment screws to 5 N.m (44 lb in).
6. Cycle sunroof window through all positions.
7. Inspect the sunroof window adjustment. Adjust if necessary.
8. Install the sunroof panel side opening closeout covers. Refer to **Sunroof Panel Side Opening Closeout Cover Replacement**.

SUNROOF WINDOW REPLACEMENT

Removal Procedure

CAUTION: In order to prevent damage to the paint, mask the roof panel in front of the sunroof opening using masking tape and paper.

1. Cycle the sunroof window to the vent position.
2. Slide the sunshade rearward.
3. Remove the sunroof panel side opening closeout covers. Refer to **Sunroof Panel Side Opening Closeout Cover Replacement**.

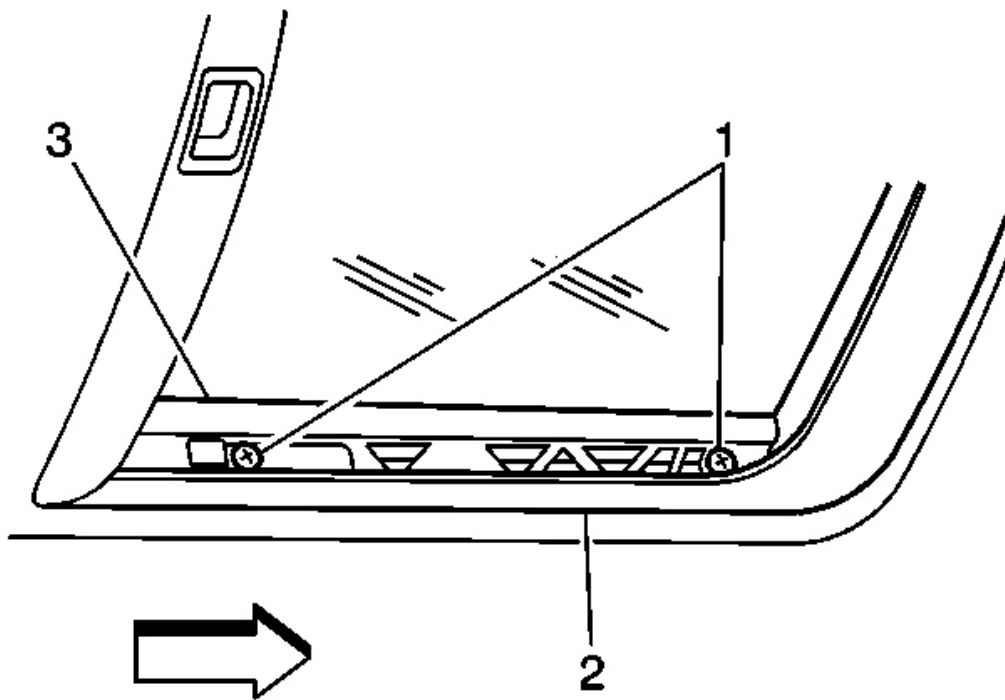


Fig. 17: Identifying Sunroof, Housing And Adjusting Screws
Courtesy of GENERAL MOTORS CORP.

4. Remove the sunroof window screws (1) on both sides.

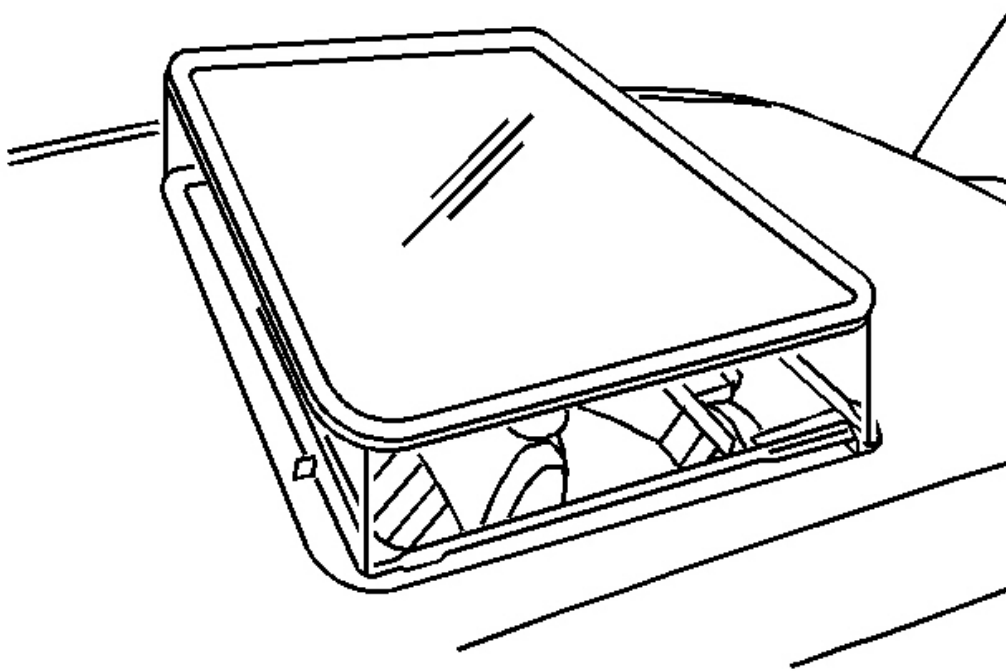


Fig. 18: Sunroof Window
Courtesy of GENERAL MOTORS CORP.

NOTE: If operating the sunroof without the window, refer to Sunroof Air Deflector Replacement.

5. Lift the sunroof window from the sunroof opening.

Installation Procedure

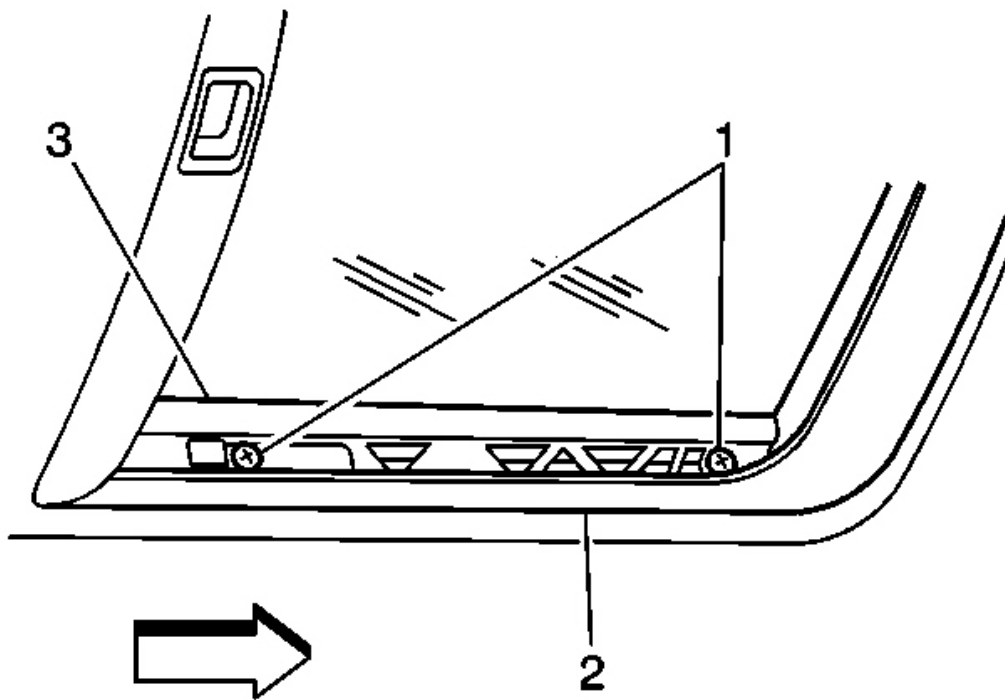


Fig. 19: Identifying Sunroof, Housing And Adjusting Screws
Courtesy of GENERAL MOTORS CORP.

1. Position the sunroof window into the opening.
2. Install the sunroof window screws (1). Do not tighten the screws.
3. Carefully close the sunroof window from the vent position to the full closed position.
4. Adjust the sunroof window. Refer to **Sunroof Window Height and Opening Fit Adjustment**.

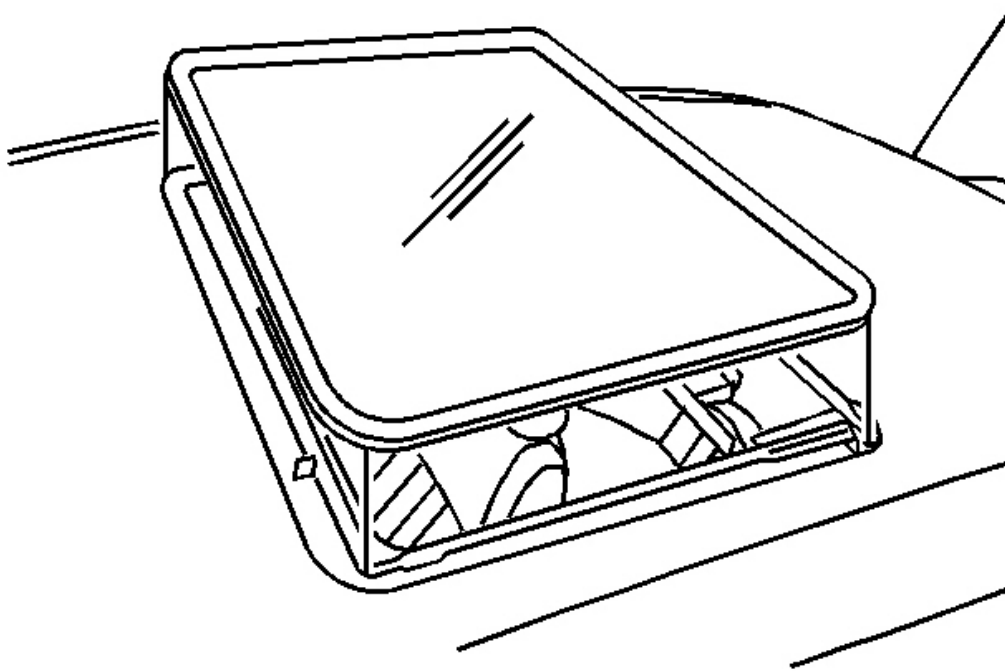


Fig. 20: Sunroof Window
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

5. Tighten the sunroof window screws to 5 N.m (44 lb in).
6. Install the sunroof panel side opening closeout covers. Refer to **Sunroof Panel Side Opening Closeout Cover Replacement**.
7. Operate the window to ensure that the window seal properly to the frame.

DESCRIPTION AND OPERATION

SUNROOF DESCRIPTION AND OPERATION (TILT AND SLIDE SYSTEM)

The tilt/slide sunroof consists of a moving glass panel and a manual sunshade. In the tilt/slide sunroof system the rear of the glass tilts up for venting and slides between the head liner and roof panel as it slides open. The glass is controlled by an integrated motor/controller. The sunshade has a mechanical connection to the glass causing it to open with the glass and keeping it from closing more than the glass.

The electrical portion of the tilt/slide sunroof system consists of:

- Body control module (BCM)
- Sunroof glass control module
- Sunroof control switch assembly
- Vent control switch assembly
- Local interconnected network (LIN-Bus)

The sunroof electrical system uses a master/slave configuration utilizing a LIN-Bus based system for communication. The BCM is designated as the master, while the sunroof control module is configured as the slave.

As the system master, the BCM uses the LIN-Bus communication bus to enable or disable sunroof operation, communicate vehicle information to the sunroof controller, and request sunroof movement. The sunroof controller provides system status and diagnostic information to the BCM for diagnostic reporting and operational purposes.

The sunroof glass is controlled by a integrated motor/controller containing the necessary electronics, motor, hall effect position sensors, as well as the interface to the driver control switches. The motor/controller is capable of controlling motion based on control switch activation and LIN-Bus message commands from the system master.

The operational calibrations for the sunroof integrated motor/controller are loaded over the LIN-Bus communication bus by the sunroof system master, the BCM.

Sunroof Glass and Sunshade Control Switches

The sunroof control switches are connected directly to the controller. The sliding glass switches provide detent positions for open, express open, off, close, and express close. The vent switches provide detent positions for open, off, and close. The control switch completes the circuit between two signals provided by the control module, a reference ground input and a pull-up voltage provided by an analog to digital switch input. The control switches place a different resistor ladder network in the circuit depending on the function selected. The controller's analog to digital switch input reads the resulting voltage range and determines the function as indicated in the included charts.

System Protection Functions

Normal operation of the sunroof system may be altered by one of the following events.

Obstacle or Blockage Detection

When enabled, obstacle detection is active only while the sunroof opening is approximately 4-200 mm (0.16-7.87 in) when moving in the closing direction. When an obstacle is detected in this range, the motion in the closing direction will stop and the sunroof will reverse direction for a short distance. The reversal shall complete regardless of operating Mode. If the travel is outside the range defined above, the sunroof will try to continue closing until it detects a motor stall condition or the system is at one of it's defined stops.

Motor Stall

If the sunroof is moving in the open or close direction and stops moving for 350 ms while the switch or LIN-

Bus command is active, and no obstacle has been detected, the motor shall be turned off to prevent overheating.

Sunroof System Thermal Protection

The sunroof controllers have a thermal protection algorithm to protect the sunroof controller and motor from damage due to overheating conditions resulting from immoderately switch actuations. The thermal protection algorithm will cause any new sunroof open commands to be ignored until the motor is allowed to cool. A number of close requests during an over temperature condition will be allowed. If the thermal protection is triggered during an obstacle detection event, the sunroof reversal shall be finished.

Sunroof Operation

Open to Vent Position

When the sunroof is closed or in a partial vent position and the sunroof vent open switch becomes active, the sunroof shall begin to express open to the vent position. Sunroof motion shall cease when the sunroof reaches the vent position or if the sunroof sliding glass switch becomes active.

Close from Vent

When the sunroof is in the vent position and the sunroof vent switch enters the Close state, the sunroof will begin to express close the sunroof. Motion will continue until the sunroof has reached its fully closed position or if the sunroof sliding glass switch becomes active.

Normal Open (Non-Express)

When the sunroof is not in a vent position and the sunroof sliding glass switch is held in the Open position, the sunroof will begin opening. Motion will continue until the switch returns to the Off state or the vent switch transitions to any active state.

Sunroof Express Open

When the sunroof control switch transitions to the Express Open state and the sunroof is not in a vent position, the sunroof will express open until the controller determines the sunroof has reached the comfort stop position or the fully Open position, the switch transitions to another state after first returning to the Off position, or the vent switch transitions to an active state.

Normal Close (Non-Express)

When the sunroof switch is in the Close state and the sunroof is not in the vent position, the controller will begin moving the sunroof in the close direction. If the vent switch becomes active the motor will be turned off.

Sunroof Express Close

When the sunroof switch is in the Express Close state and the sunroof is not in a vent position, the sunroof will express close until the controller determines the sunroof has reached the fully closed position, or the switch transitions to another state after first returning to the Off position. The sunroof motion will cease if the switch transitions back to the Close or Express Close state after returning to the Off position first or the vent switch transitions to any active state.