

ACCESSORIES & EQUIPMENT

Sunroof - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Sunroof Actuator Motor Bolts	4 N.m	35 lb in
Sunroof Frame Front Bolts	9 N.m	80 lb in
Sunroof Frame Rear Bolts	9 N.m	80 lb in
Sunroof Frame Side Bolts	9 N.m	80 lb in
Sunroof Sunshade Bolts	4 N.m	35 lb in
Sunroof Sunshade Motor Bolts	4 N.m	35 lb in
Sunroof Window Screws	5 N.m	44 lb in

SCHEMATIC WIRING DIAGRAMS

SUNROOF WIRING SCHEMATICS

Sunroof (C3U)

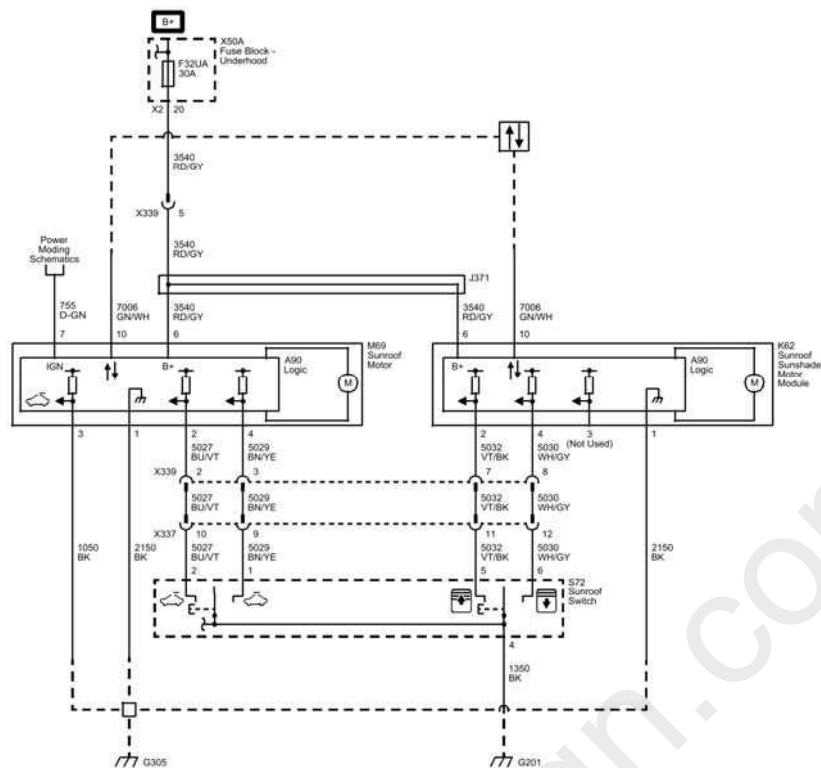


Fig. 1: Sunroof (C3U)

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

SYMPTOMS - ROOF

IMPORTANT: The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic System Check - Vehicle** before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Sunroof Description and Operation**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. Refer to **Checking Aftermarket Accessories**.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could 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

Refer to **Power Sunroof/Sunshade Malfunction** in order to diagnose the symptom.

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, 2	1, 2	-	-
Ignition	1, 2	1, 2	3	-
Serial Data	1, 2	1, 2	1, 2	-
Sunroof Switch Close Signal	1	1	1	-
Sunroof Switch Open Signal	1	1	1	-
Sunroof Shade Switch Close Signal	2	2	2	-
Sunroof Shade Switch Open Signal	2	2	2	-
Sunroof Switch Ground	-	1, 2	-	-
Sunroof Motor Ground	-	1, 2	-	-
Sunroof Shade Motor Module Ground	-	2	-	-
1. Power Sunroof Malfunction 2. Power Sunshade Malfunction 3. Power Sunroof and Sunshade Operate With Ignition Off				

Circuit/System Description

Ignition voltage is supplied to the Sunroof Motor and Sunroof Sunshade Motor Module by the BCM. B+ is applied to the Sunroof Motor and Sunroof Sunshade Motor Module via the SUNROOF fuse. The Sunroof Motor and Sunroof Sunshade Motor Module supply each of the switch signal circuits with a voltage reference. When a switch is pressed the signal circuit is pulled low signaling the sunroof or sunshade open or close request. The modules determine the motor direction based on inputs received from the switches. When the modules reverse the polarity of the applied voltage, the motors reverse direction. The Sunroof Sunshade Motor

Module contains the logic for opening and closing the sunshade based on serial data from the Sunroof Motor.

The Sunroof Sunshade Motor Module contains the logic for opening and closing the sunshade based on serial data received from the Sunroof Motor. The Sunroof Sunshade Motor Module internally applies voltage and ground to the appropriate circuits of the reversible sunshade motor in order to move the sunshade panel to the open or closed positions.

Diagnostic Aids

If the sunroof and/or sunshade are experiencing an intermittent inoperative condition, check the sunroof switch ground circuit for an open condition. If the sunroof switch ground circuit is open, the switch may take a redundant path to ground through the switch illumination circuit. When the lights are turned ON, the redundant path is removed, and the sunroof and/or sunshade will become inoperative.

Reference Information

Schematic Reference

Sunroof Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Sunroof Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the sunroof opens and closes when pressing the open and close sunroof switch.
 - **If the sunroof does not open or close**

Refer to Circuit/System Testing - Power Sunroof Malfunction.

- **If the sunroof opens and closes**
- 3. Verify the sunroof opens and closes to the vent position when pressing the open and close sunroof vent switch.
 - **If the sunroof does not open or close to the vent position**
 - Refer to Circuit/System Testing - Power Sunroof Malfunction.
 - **If the sunroof opens and closes to the vent position**
- 4. Verify the sunshade opens and closes when pressing the open and close sunshade switch.
 - **If the sunshade does not open or close**
 - Refer to Circuit/System Testing - Power Sunshade Malfunction.
 - **If the sunshade opens and closes**
- 5. All OK.

Circuit/System Testing

NOTE: Because of limited accessibility to the M69 Sunroof Motor and K62 Sunroof Sunshade Motor Module, perform the Switch Component Testing before beginning Circuit/System Testing.

Power Sunroof Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the S72 Sunroof Switch. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 ohms between the ground circuit terminal 4 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. Connect the harness connector at the S72 Sunroof Switch. Disconnect the harness connector at the M69 Sunroof Motor.
4. Test for less than 10 ohms between the ground circuit terminals listed below and ground:
 - Ground Circuit terminal 1
 - Ground Circuit terminal 3
 - **If 10 ohms or greater**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the appropriate 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**
- 5. Verify a test lamp illuminates between the B+ circuit terminal 6 and ground.
 - **If 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 not open 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 M69 Sunroof Motor.
 - **If the test lamp illuminates**
- 6. Ignition ON.
- 7. Verify a test lamp illuminates between the ignition circuit terminal 7 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ignition circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, refer to **Retained Accessory Power Malfunction** .
 - **If the test lamp illuminates**
- 8. Test for less than 1 V between the circuit terminals listed below and ground:
 - Signal circuit terminal 4
 - Signal circuit terminal 2
 - **If 1 V or greater**
 1. Disconnect the harness connector at the S72 Sunroof Switch.
 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, test or replace the S72 Sunroof Switch.
 - **If less than 1 V**
- 9. Ignition OFF.
- 10. Test for infinite resistance between the circuit terminals listed below and ground:
 - Signal circuit terminal 4
 - Signal circuit terminal 2
 - **If less than infinite resistance**
 1. Disconnect the harness connector at the S72 Sunroof Switch.
 2. Test for infinite resistance between the signal circuit and ground:

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the S72 Sunroof Switch.

- **If infinite resistance**

11. Disconnect the harness connector at the S72 Sunroof Switch.
12. Test for less than 2 ohms between the circuit terminals listed below:
 - S72 Sunroof Switch signal circuit terminal 1 and M69 Sunroof Motor signal circuit terminal 4
 - S72 Sunroof Switch signal circuit terminal 2 and M69 Sunroof Motor signal circuit terminal 2
- **If greater than 2 ohms**

Repair the open/high resistance in the circuit.

- **If less than 2 ohms**

13. Ignition ON.
14. Test for less than 1 V between the serial data circuit terminal 10 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

15. Ignition OFF.
16. Test for infinite resistance between the serial data circuit terminal 10 and ground:
 - **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

17. Test for less than 2 ohms between the M69 Sunroof Motor serial data circuit terminal 10 and the K62 Sunroof Sunshade Motor Module serial data circuit terminal 10.
 - **If 2 ohms or greater**

Repair the open/high resistance in the circuit.

- **If less than 2ohms**

18. Replace the M69 Sunroof Motor.

Power Sunshade Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the S72 Sunroof Switch. It may take up to 2 minutes for all vehicle systems to power down.
 2. Test for less than 10 ohms between the ground circuit terminal 4 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. Connect the harness connector at the S72 Sunroof Switch. Disconnect the harness connector at the K62 Sunroof Sunshade Motor Module.
4. Test for less than 10 ohms between the ground circuit terminal 1 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K62 Sunroof Sunshade Motor Module.
 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**
5. Verify a test lamp illuminates between the B+ circuit terminal 6 and ground.
 - **If 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 not open 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 K62 Sunroof Sunshade Motor Module.
 - **If the test lamp illuminates**
6. Ignition ON.
7. Verify a test lamp illuminates between the ignition circuit terminal 7 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ignition circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, refer to **Retained Accessory Power Malfunction** .
 - **If the test lamp illuminates**
8. Test for less than 1 V between the circuit terminals listed below and ground:
 - Signal circuit terminal 2
 - Signal circuit terminal 4
 - **If 1 V or greater**
 1. Disconnect the harness connector at the S72 Sunroof Switch.

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, test or replace the S72 Sunroof Switch.
 - **If less than 1 V**
9. Ignition OFF.
10. Test for infinite resistance between the circuit terminals listed below and ground:
 - Signal circuit terminal 2
 - Signal circuit terminal 4
 - **If less than infinite resistance**
 1. Disconnect the harness connector at the S72 Sunroof Switch.
 2. Test for infinite resistance between the signal circuit and ground:
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, test or replace the S72 Sunroof Switch.
 - **If infinite resistance**
11. Disconnect the harness connector at the S72 Sunroof Switch.
12. Test for less than 5 ohms between the circuit terminals listed below:
 - S72 Sunroof Switch signal circuit terminal 5 and K62 Sunroof Sunshade Motor Module signal circuit terminal 2
 - S72 Sunroof Switch signal circuit terminal 6 and K62 Sunroof Sunshade Motor Module signal circuit terminal 4
 - **If greater than 5 ohms**

Repair the open/high resistance in the circuit.

 - **If less than 5 ohms**
13. Disconnect the harness connector at the M69 Sunroof Motor, ignition ON.
14. Test for less than 1 V between the serial data circuit terminal 10 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

 - **If less than 1 V**
15. Ignition OFF.
16. Test for infinite resistance between the serial data circuit terminal 10 and ground:
 - **If less than infinite resistance**

Repair the short to ground on the circuit.

 - **If infinite resistance**
17. Test for less than 2 ohms between the K62 Sunroof Sunshade Motor Module serial data circuit terminal 10 and the M69 Sunroof Motor serial data circuit terminal 10.

- **If 2 ohms or greater**

Repair the open/high resistance in the circuit.

- **If less than 2ohms**

18. Replace the K62 Sunroof Sunshade Motor Module.

Component Testing

Sunroof Switch

1. Ignition OFF, disconnect the harness connector at the S72 Sunroof Switch.
2. Test for infinite resistance between the control terminals listed below and the ground terminal 4.
 - S72 Sunroof Switch terminal 1
 - S72 Sunroof Switch terminal 2
 - S72 Sunroof Switch terminal 5
 - S72 Sunroof Switch terminal 6

- **If less than infinite resistance**

Replace the S72 Sunroof Switch.

- **If infinite resistance**

3. Test for less than 5 ohms between the control terminals listed below and the ground terminal 4 with the switch in the appropriate position.
 - S72 Sunroof Switch terminal 1, sunroof switch CLOSE position
 - S72 Sunroof Switch terminal 2, sunroof switch OPEN position
 - S72 Sunroof Switch terminal 5, sunshade switch OPEN position
 - S72 Sunroof Switch terminal 6, sunshade switch CLOSE position

- **If not less than 5 ohms**

Replace the S72 Sunroof Switch.

- **If less than 5 ohms**

4. All OK.

Repair Instructions

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

- **Sunroof Sunshade Motor Replacement**
- **Sunroof Switch Replacement**
- **Sunroof Window Motor Replacement**
- **Sunroof Sunshade Switch Replacement**

- **Control Module References** for Sunroof Motor replacement, programming and setup

REPAIR INSTRUCTIONS

SUNROOF AIR DEFLECTOR REPLACEMENT

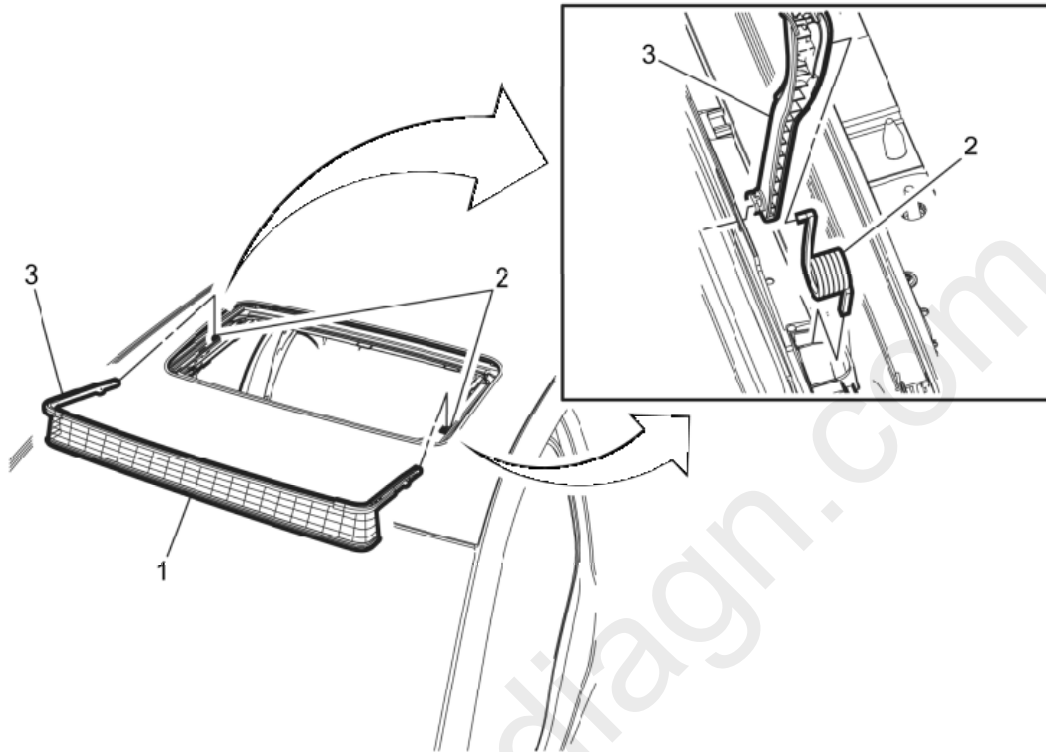


Fig. 2: Sunroof Air Deflector
Courtesy of GENERAL MOTORS COMPANY

Sunroof Air Deflector Replacement

Callout	Component Name
1	Sunroof Air Deflector Lower Retainer Rubber Strip Procedure 1. Place sunshade in the full open position. 2. Place air deflector in the straight up position and release lower rubber strip.
2	Sunroof Air Deflector Spring (Qty :2) Procedure Release air deflector springs from air deflector.
3	Sunroof Air Deflector Procedure

- | |
|---|
| <ol style="list-style-type: none">1. Slide air deflector to align "T" shape tab on air deflector to guide.2. Pull outward on air deflector in order to disengage air deflector from guides on sunroof frame. |
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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 center of the pillar between the door hinges. 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 (With Sunroof)** , **Headlining Trim Panel Replacement (Without Sunroof)** .
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

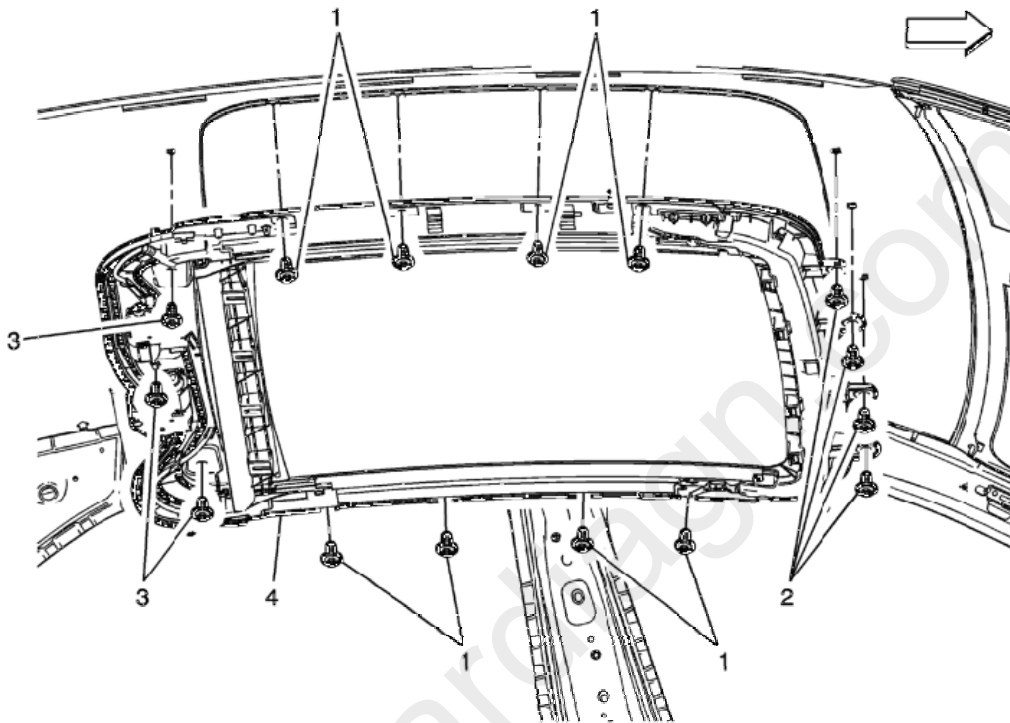


Fig. 3: Sunroof Frame
Courtesy of GENERAL MOTORS COMPANY

Sunroof Frame Replacement

Callout	Component Name
Preliminary Procedures	
1.	Remove the rear sunroof window. Refer to <u>Sunroof Window Replacement (Rear)</u> , <u>Sunroof Window Replacement (Front)</u> .
2.	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 <u>Headlining Trim Panel Replacement (With Sunroof)</u> , <u>Headlining Trim Panel Replacement (Without Sunroof)</u> .
3.	Disconnect the sunroof harness electrical connectors.
4.	Disconnect the drain hoses from the sunroof frame . Refer to <u>Sunroof Housing Front Drain Hose Replacement</u> , and <u>Sunroof Housing Rear Drain Hose Replacement</u> .

Do not remove the drain hoses from the vehicle, disconnect the drain hoses at all the corners of the sunroof frame spigot only.

1	Sunroof Frame Side Bolt (Qty: 8) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Leave the two center bolts until last. 2. Recline the seats all the way rearward. 3. With an assistant, remove the sunroof frame from the vehicle and place it on a clean and dry prepared surface. Tighten 9 (80 lb in)
2	Sunroof Frame Front Bolt (Qty: 4) Tighten 9 (80 lb in)
3	Sunroof Frame Rear Bolt (Qty: 3) Tighten 9 (80 lb in)
4	Sunroof Frame Procedure 1. After the sunroof frame has been removed mark the motor to ensure proper locate for reinstalling. Refer to <u>Sunroof Window Motor Replacement</u>. 2. Transfer all necessary components to the new sunroof frame assembly and reinstall to vehicle. 3. Verify the sunroof motor initialization operation. Refer to <u>Sunroof Window Motor Initialization</u>. 4. Water test vehicle before installing the trim to ensure No leaks.

SUNROOF HOUSING FRONT DRAIN HOSE REPLACEMENT

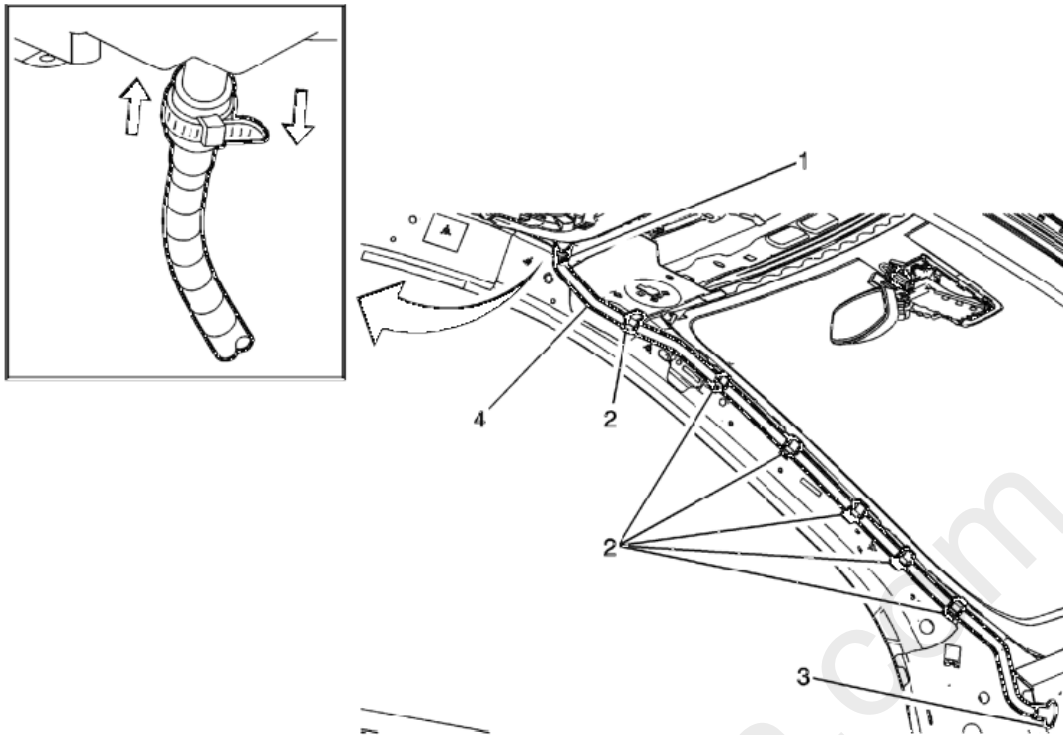


Fig. 4: Sunroof Housing Front Drain Hose
Courtesy of GENERAL MOTORS COMPANY

Sunroof Housing Front Drain Hose Replacement

Callout	Component Name
Preliminary Procedures	
- 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 <u>Headlining Trim Panel Replacement (With Sunroof)</u> , <u>Headlining Trim Panel Replacement (Without Sunroof)</u> . - Remove the instrument panel tie bar. Refer to <u>Instrument Panel Tie Bar Replacement</u> .	
1	Sunroof Housing Front Drain Hose Tie Strap to Sunroof Frame Procedure Disconnect the sunroof drain hose from the sunroof frame spigot. NOTE: If the drain hoses are retained with a tie strap it will be necessary to replace them when reinstalling.
2	Sunroof Housing Front Drain Hose Retainer (Qty:6) NOTE: Disengage the retaining clips on the A-pillar.
	Sunroof Housing Front Drain Hose Grommet

3	Procedure 1. Reposition the cowl panel pad as necessary to access the drain hose grommet. 2. Grasp the grommet and pull rearward to release it from the cowl panel.
4	Sunroof Housing Front Drain Hose Procedure 1. When installing the drain hose, ensure that the routing of the end of the drain hose and grommet are installed through the access hole in the cowl panel to prevent interior water leaks. Water test the sunroof before installing instrument panel carrier. 2. Install the retainers that secure the drain hose to the windshield pillar. 3. Water test vehicle to ensure No leaks.

SUNROOF HOUSING REAR DRAIN HOSE REPLACEMENT

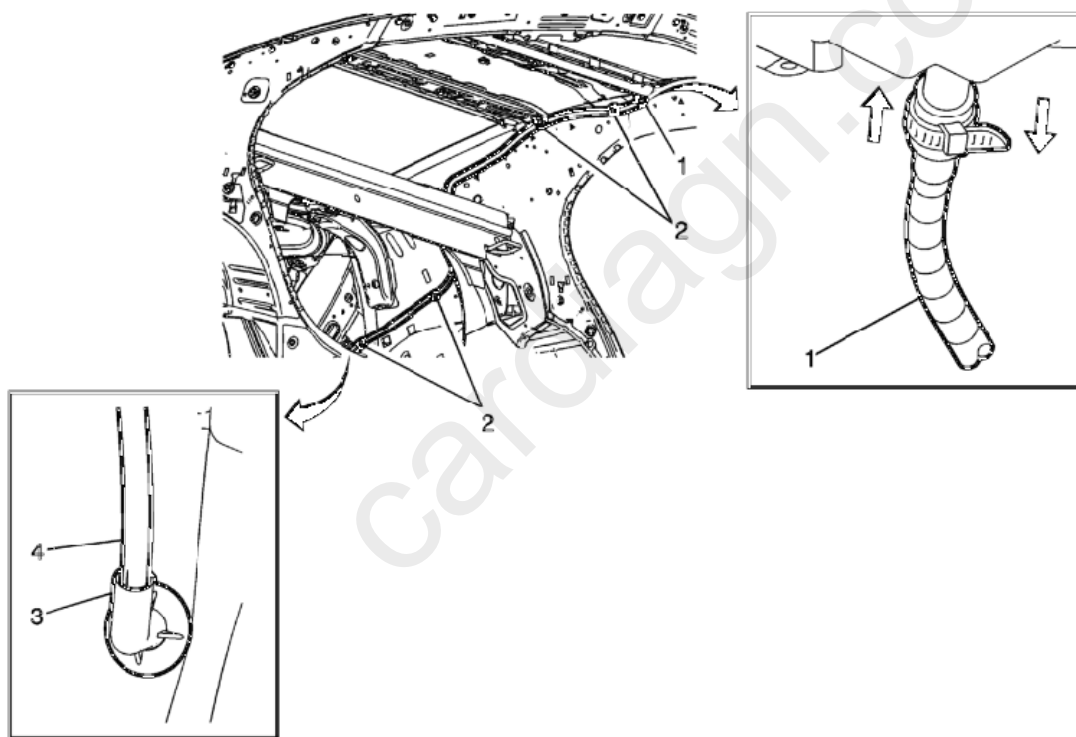


Fig. 5: Sunroof Housing Rear Drain Hose
 Courtesy of GENERAL MOTORS COMPANY

Sunroof Housing Rear Drain Hose Replacement

Callout	Component Name
Preliminary 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 (With Sunroof)** , **Headlining Trim Panel Replacement (Without Sunroof)** .

2. Remove the rear compartment side trim panel. Refer to **Rear Compartment Side Trim Replacement - Left Side** , or **Rear Compartment Side Trim Replacement - Right Side** .

NOTE:

It is not necessary to completely remove the rear compartment side trim panels. Reposition side trim panels to allow access to the drain hose retainers and grommet.

1	Sunroof Housing Rear Drain Hose Tie Strap to Sunroof Frame Procedure Disconnect the sunroof drain hose from the sunroof frame spigot. NOTE: If the drain hoses are retained with a tie strap it will be necessary to replace them when reinstalling.
2	Sunroof Housing Rear Drain Hose Retainer (Qty: 4) NOTE: Disengage the retaining clips.
3	Sunroof Housing Rear Drain Hose Grommet NOTE: Grasp the grommet pull rearward to releasing it from the quarter panel.
4	Sunroof Housing Rear Drain Hose Procedure 1. When installing the drain hose, ensure that the routing of the end of the drain hose and grommet are installed through the access hole in the quarter panel to prevent rear compartment water leaks. Water test the sunroof before installing trim. 2. Install the retainers that secure the drain hose to the upper sill panel and rear compartment . 3. Water test vehicle to ensure No leaks.

SUNROOF WINDOW MOTOR REPLACEMENT

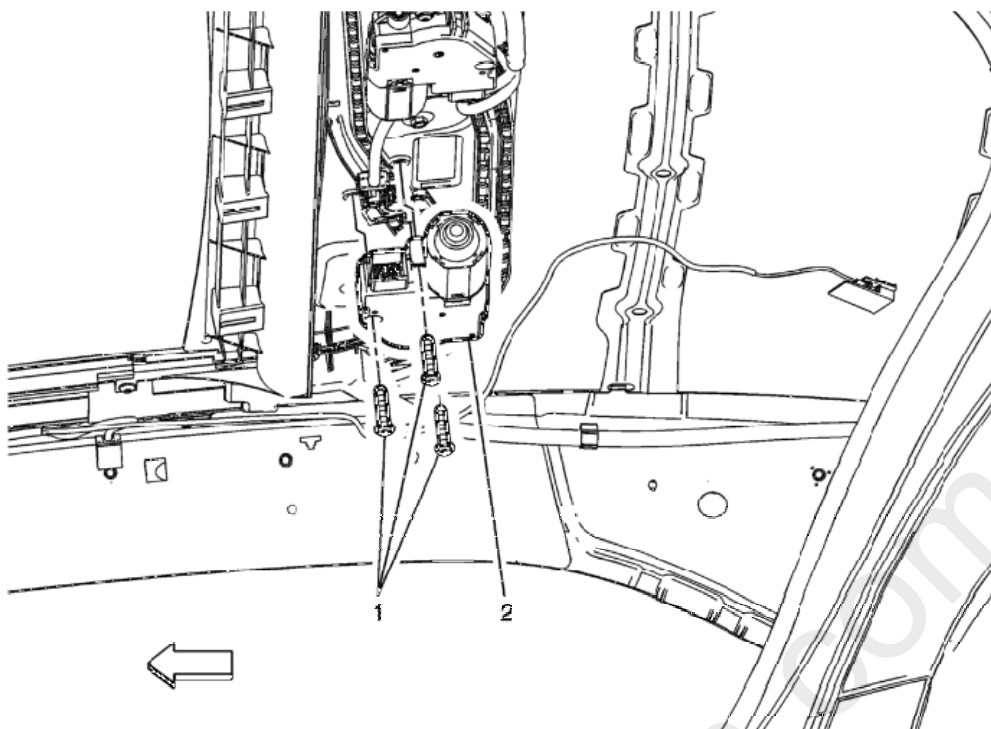


Fig. 6: Sunroof Window Motor
 Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Motor Replacement

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 (With Sunroof)</u> , <u>Headlining Trim Panel Replacement (Without Sunroof)</u> .	
1	Sunroof Actuator Motor Bolt (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Disconnect the electrical connector. 2. With a turning motion, pull downward on the sunroof window motor. Disengage the motor from the drive cables. 3. Install the sunroof window motor to the frame with a turning motion. Push upward. This will engage the motor into the drive cables. Tighten 4 N.m (35 lb in)

2	Sunroof Window Motor Procedure 1. Verify the sunroof window motor operation. 2. After installing the sunroof window motor, refer to <u>Sunroof Window Motor Initialization.</u>
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SUNROOF SUNSHADE MOTOR REPLACEMENT

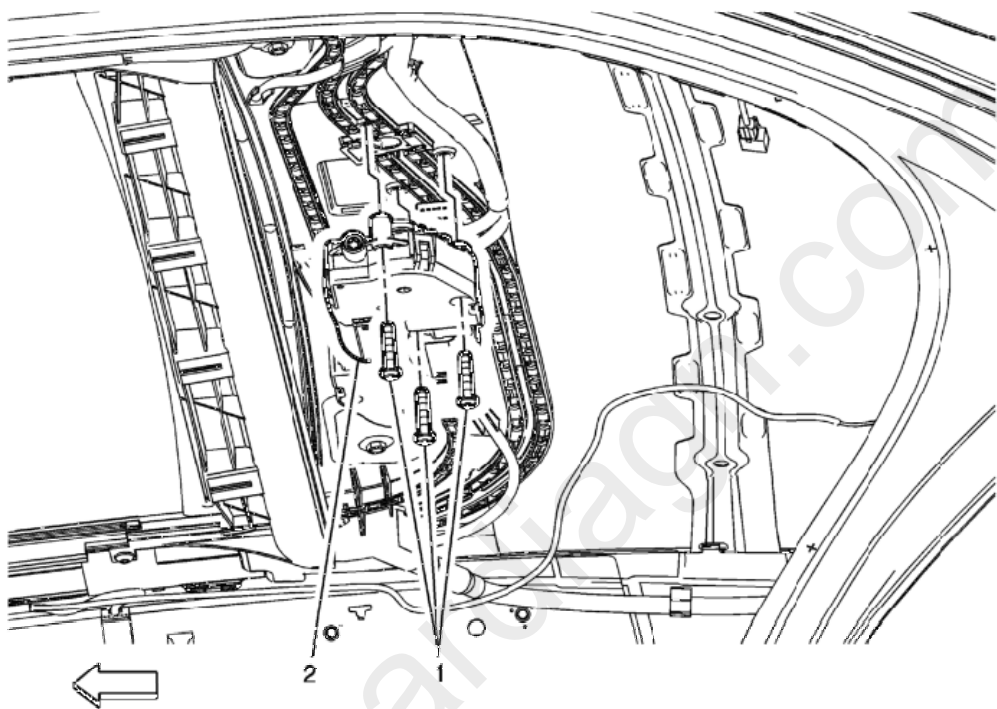


Fig. 7: Sunroof Sunshade Motor
Courtesy of GENERAL MOTORS COMPANY

Sunroof Sunshade Motor Replacement

Callout	Component Name
Preliminary Procedure Remove the headliner. Refer to <u>Headlining Trim Panel Replacement (With Sunroof)</u> , <u>Headlining Trim Panel Replacement (Without Sunroof)</u> .	
	Sunroof Sunshade Motor Bolt (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure

1	1. Disconnect the electrical connector. 2. With a turning motion, pull downward on the sunroof sunshade motor. Disengage the motor from the drive cables. 3. Install the sunroof sunshade motor to the frame with a turning motion. Push upward. This will engage the motor into the drive cables. Tighten 4 N.m (35 lb in)
2	Sunroof Sunshade Motor Procedure 1. Verify the sunroof sunshade motor operation. 2. After installing the sunroof shade motor, refer to <u>Sunroof Window Motor Initialization</u>.

SUNROOF SUNSHADE REPLACEMENT

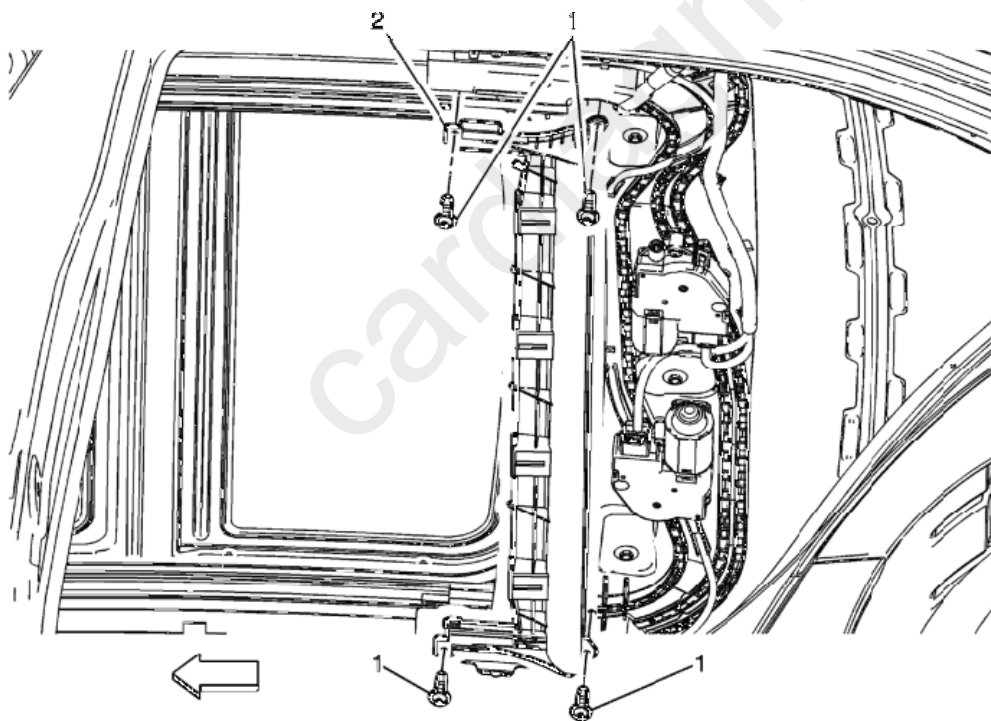


Fig. 8: Sunroof Sunshade
Courtesy of GENERAL MOTORS COMPANY

Sunroof Sunshade Replacement

Callout	Component Name

Preliminary Procedures

1. Open sunshade to the full open position.
2. Remove the headliner. Refer to **Headlining Trim Panel Replacement (With Sunroof)** , **Headlining Trim Panel Replacement (Without Sunroof)** .

1	Sunroof Sunshade Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 4 N.m (35 lb in)
2	Sunroof Sunshade Procedure 1. Install the 2 rear sunshade bolts first for proper alignment of the sunshade. 2. After installing the sunroof sunshade motor, initialize the sunshade motor. Refer to <u>Sunroof Window Motor Initialization</u>. 3. Verify the sunroof sunshade motor operation.

SUNROOF WINDOW SEAL REPLACEMENT (WINDOW TO ROOF)

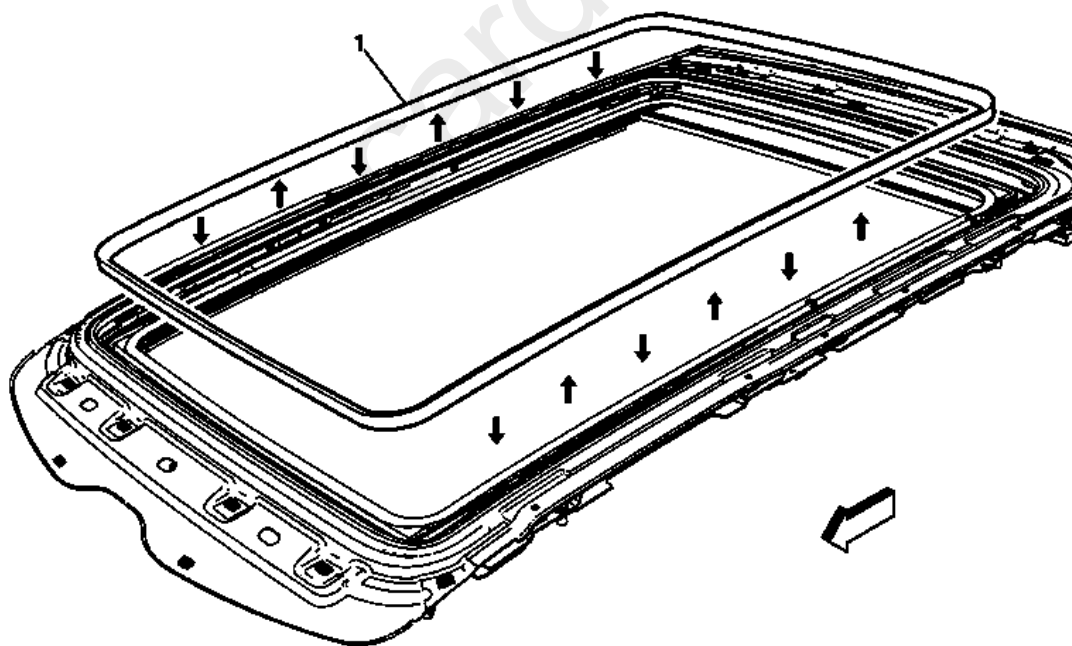


Fig. 9: Sunroof Window Seal (Window to Roof)
Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Seal Replacement (Window to Roof)

Callout	Component Name
Preliminary Procedures Remove both sunroof windows. Refer to <u>Sunroof Window Replacement (Rear)</u> , <u>Sunroof Window Replacement (Front)</u> .	
1	Sunroof Window Seal - Window to Roof Procedures 1. Start at one end of the seal, pulling up and away from the frame. 2. Remove all traces of old sealer, clean around the edge of the inside surface of the module with a 50/50 mixture of isopropyl alcohol and water by volume on a dampened lint-free cloth. 3. Water test the vehicle before installing the headliner.

SUNROOF WINDOW SEAL REPLACEMENT (FRAME TO ROOF)

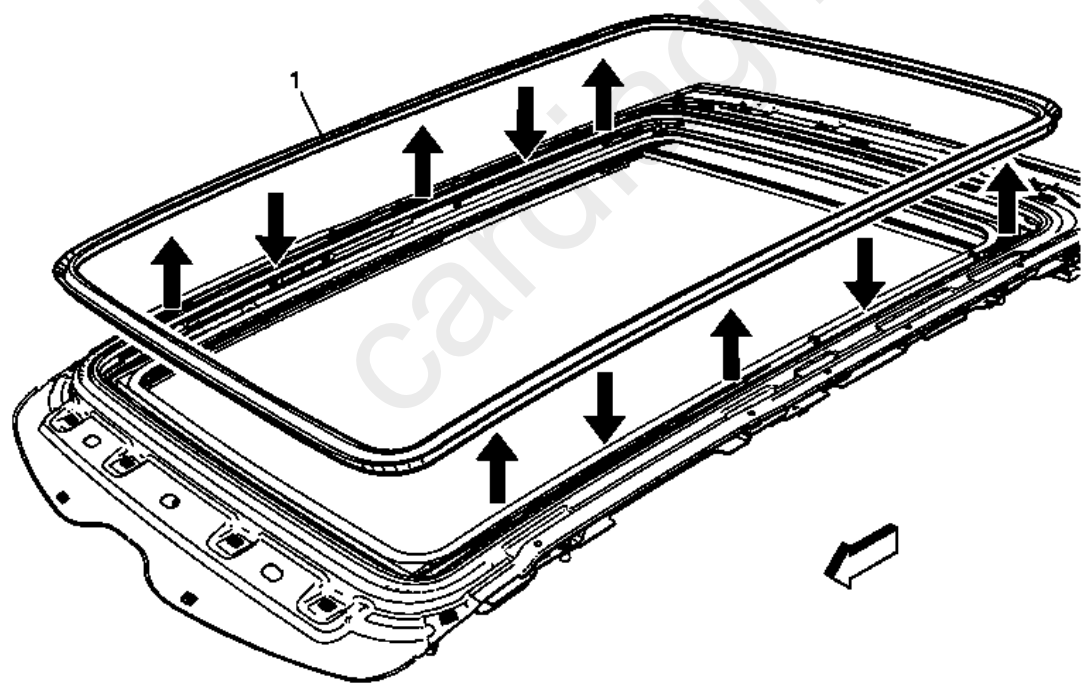


Fig. 10: Sunroof Window Seal (Frame to Roof)
Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Seal Replacement (Frame to Roof)

Callout	Component Name
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Preliminary Procedure

Remove the sunroof frame. Refer to **Sunroof Frame Replacement**.

	Sunroof Window Seal - Frame to Roof
1	Procedures 1. Promoter will only be visible at the front and both sides of the glass panel. Inspect the rear window, by using your thumb, apply a light downward pressure on the front and both sides of the rear window seal. If the rear window seal separates from the window frame it will be necessary to reseal it. 2. Start at one end of the seal, pulling up and away from the module. 3. Remove all traces of old sealer, clean around the edge of the inside surface of the module with a 50/50 mixture of isopropyl alcohol and water by volume on a dampened lint-free cloth. 4. Cut and dry fit the new seal before applying the moulding adhesion promoter. 5. Using scissors, or equivalent tool, trim each end of the seal to create a butt joint with the step in the encapsulation window frame. The gap of the butt joint created must be 1 mm (.04 in) or less. 6. Apply dielectric lubricant, P/N 12377900 United States, P/N 10953529 Canada, to the front and around the corners of the window seal. 7. There is no seal promoter applied to the frame of the sunroof window. 8. Use caution not to get adhesion promoter on the glass. Use only Kent Products KT 13788 Moulding Adhesion Promoter to complete this repair. Do NOT substitute the Kent Products KT 13788 Moulding Adhesion Promoter with another adhesive promoter to ensure there is a proper bond between the rear window encapsulation and the rear window seal. 9. Water test the vehicle Only after following manufactures instructions for curing time.

SUNROOF WINDOW SEAL REPLACEMENT (REAR)

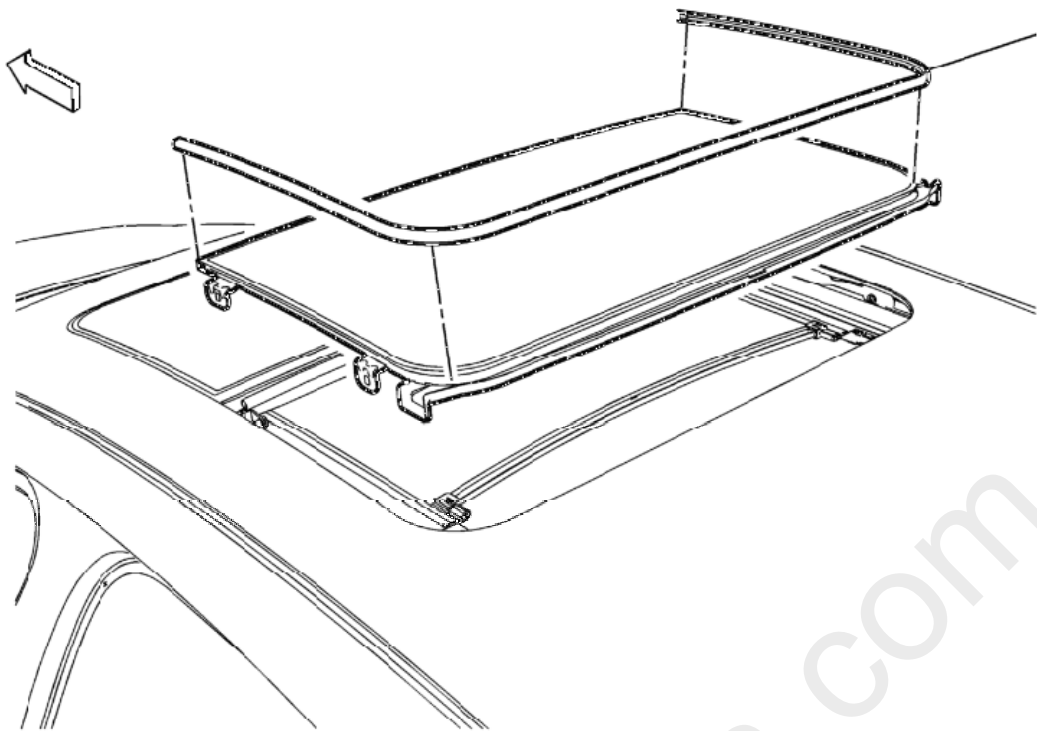


Fig. 11: Sunroof Window Seal - Rear
 Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Seal Replacement (Rear)

Callout	Component Name
Preliminary Procedure Remove the rear sunroof window. Refer to <u>Sunroof Window Replacement (Rear)</u> , <u>Sunroof Window Replacement (Front)</u> .	
1	Sunroof Window Seal - Rear Procedure 1. Open the sunshade. 2. Place the front sunroof window panel on a protect cover. 3. Remove the window seal from the window panel frame by pulling the seal away from the front edge and continuing around the perimeter of the frame. 4. Clean around the edge of the window and inside seat with a 50/50 mixture of isopropyl alcohol and water by volume on a dampened lint free cloth. 5. Wipe the perimeter with a clean dampened cloth using window cleaner GM P/N 1050427 (Canadian P/N 992727) or equivalent in order to clean the surface of the perimeter. Allow to air dry.

6. Position the sunroof window seal in gutter of the window frame, start in the center working out ward edge working it around the perimeter.
7. Firmly press the window seal into place. A small rubber hammer will help in the installation.
8. Ensure that the seal is properly seated around the entire perimeter of the window frame.
9. Sunroof window height and opening fit adjustment. Refer to **Sunroof Window Height and Opening Fit Adjustment**.
10. Water test and inspect sunroof for proper operation.

SUNROOF WINDOW REAR SEAL REPLACEMENT (TROUGH SEAL)

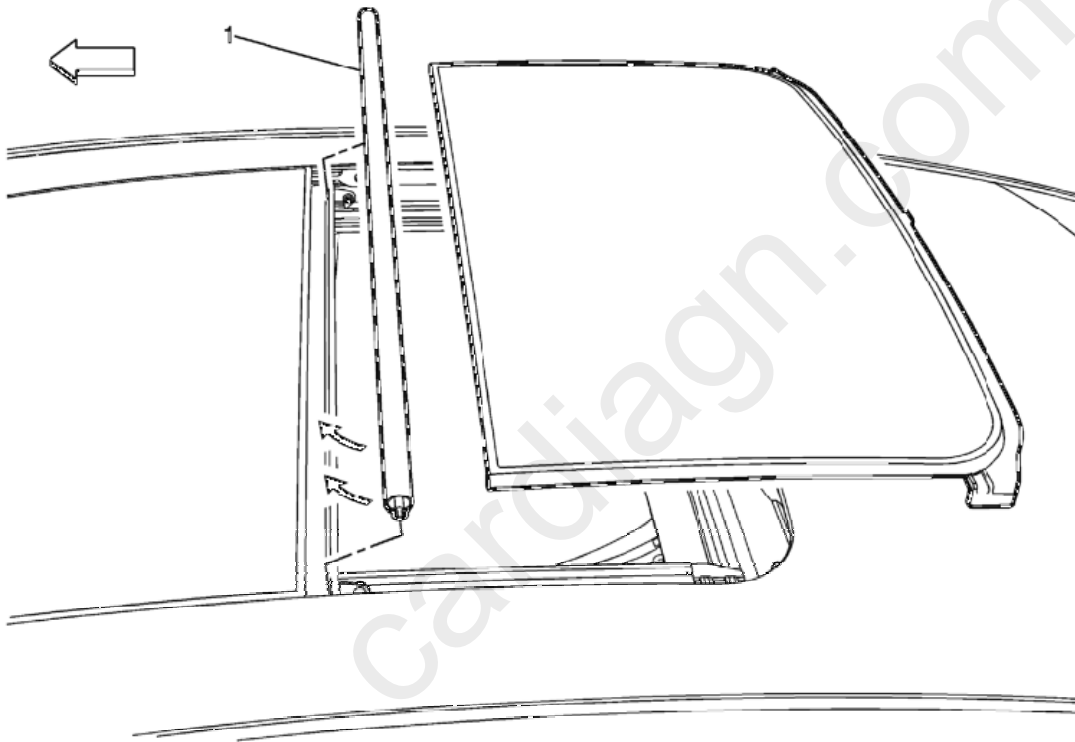


Fig. 12: Sunroof Window Rear Seal (Trough Seal)
Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Rear Seal Replacement (Trough Seal)

Callout	Component Name
	Sunroof Window Rear Seal - Trough Seal
Procedure	
	1. Remove the rear sunroof window. Refer to <u>Sunroof Window Replacement (Rear)</u> , <u>Sunroof Window Replacement (Front)</u> .
	2. Remove the sunroof window rear seal from the drain gutter, starting on the left side,

1	grasp the front edge of the seal and pull upward and away from the retainer.
	3. Clean around the edge of the window and inside seat with a 50/50 mixture of isopropyl alcohol and water by volume on a dampened lint free cloth.
	4. When installing the sunroof window rear seal work it back and forth in the drain gutter retainer until fully seated.
	5. Place the window in the closed position, ensure a tight seal at the front edge of the window to the sunroof window rear seal.
	6. Water test vehicle to ensure No leaks.

SUNROOF SUNSHADE SWITCH REPLACEMENT

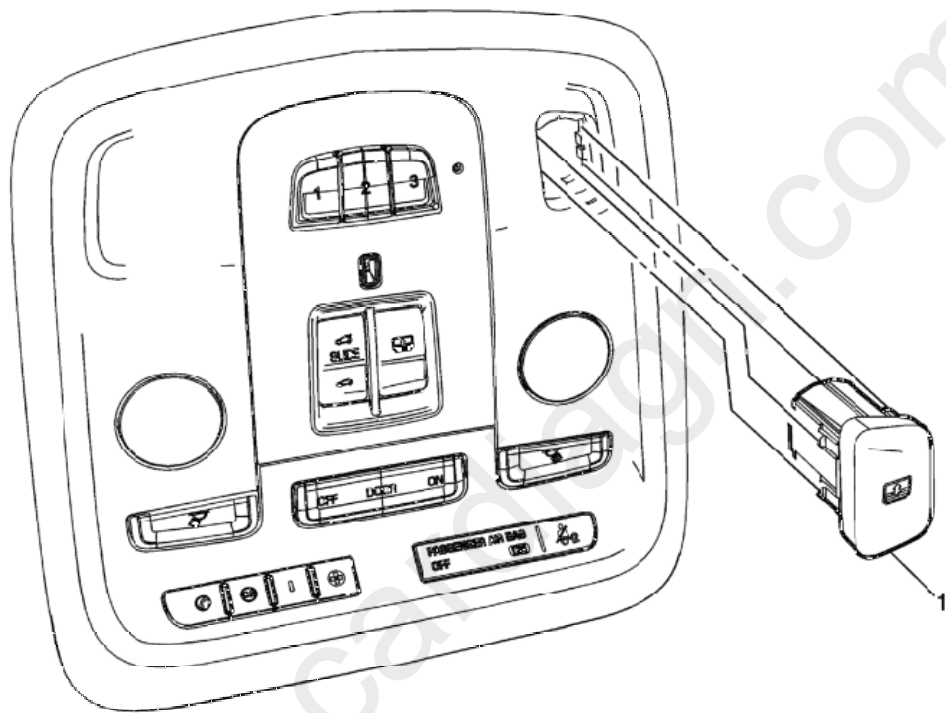


Fig. 13: Sunroof Sunshade Switch
Courtesy of GENERAL MOTORS COMPANY

Sunroof Sunshade Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the roof console. Refer to Roof Console Replacement .	
1	Sunroof Sunshade Switch Procedure Depress the four tabs on the switch to remove from the roof console.

SUNROOF SWITCH REPLACEMENT

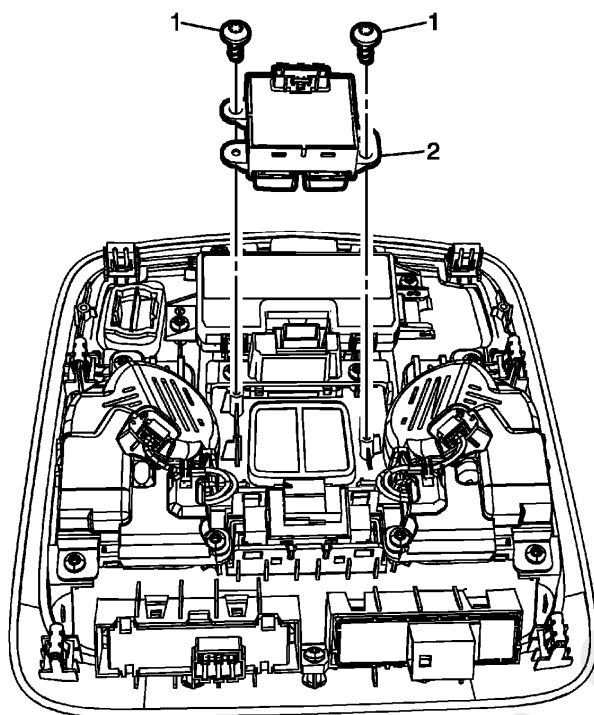


Fig. 14: Sunroof Switch & Fasteners
 Courtesy of GENERAL MOTORS COMPANY

Sunroof Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the roof console. Refer to <u>Roof Console Replacement</u> .	
1	Sunroof Switch Fasteners (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .
2	Sunroof Switch

SUNROOF WINDOW HEIGHT AND OPENING FIT ADJUSTMENT

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

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

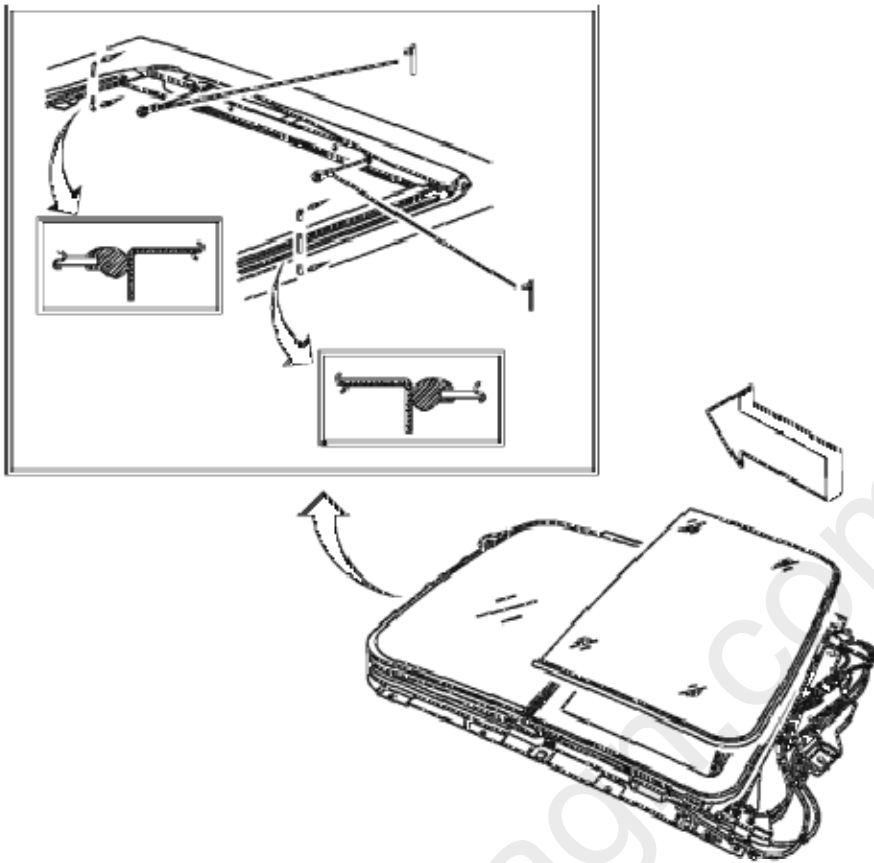


Fig. 15: Adjusting Sunroof Window Height & Opening Fit
 Courtesy of GENERAL MOTORS COMPANY

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

To ensure proper adjustment on the sunroof windows all four (8) screws (1) Must be loosen.

3. Loosen the adjusting screws (1) on left and right sides of the window to guide cables.
4. Adjust sunroof window (2) to a uniform seal tension fore/aft and panel to panel.
5. Adjust the corners of the sunroof window using the following guidelines:
 - Adjust the front edge of the sunroof window (2) to 0.0 mm - 1.5 mm (0.0 in - 0.06 in) below the top surface of the roof panel.
 - Adjust the rear edge of the sunroof window (2) to the roof 0.0 mm +1.0 mm (0.0 in + .04 in).

CAUTION: Refer to Fastener Caution .

6. Tighten the adjusting screws (1) on left and right sides of the sunroof windows to 5 (44 lb in).

7. Cycle sunroof window to vent, then close. Cycle the sunroof window from full open to closed position.
8. Using 0.25 mm (0.01 in) shim or a similar item to check the sunroof window seal for even compression around the seal opening.
9. Inspect the sunroof window adjustment. Adjust if necessary.
10. Water test the sunroof window to ensure No leaks.

SUNROOF WINDOW REPLACEMENT (REAR)

Removal Procedure

NOTE: The front sunroof window **MUST** be removed. The rear sunroof window cannot be removed by simply pushing upward as in the front sunroof window.

1. Remove the front sunroof window. Refer to [Sunroof Window Replacement \(Rear\)](#), [Sunroof Window Replacement \(Front\)](#).

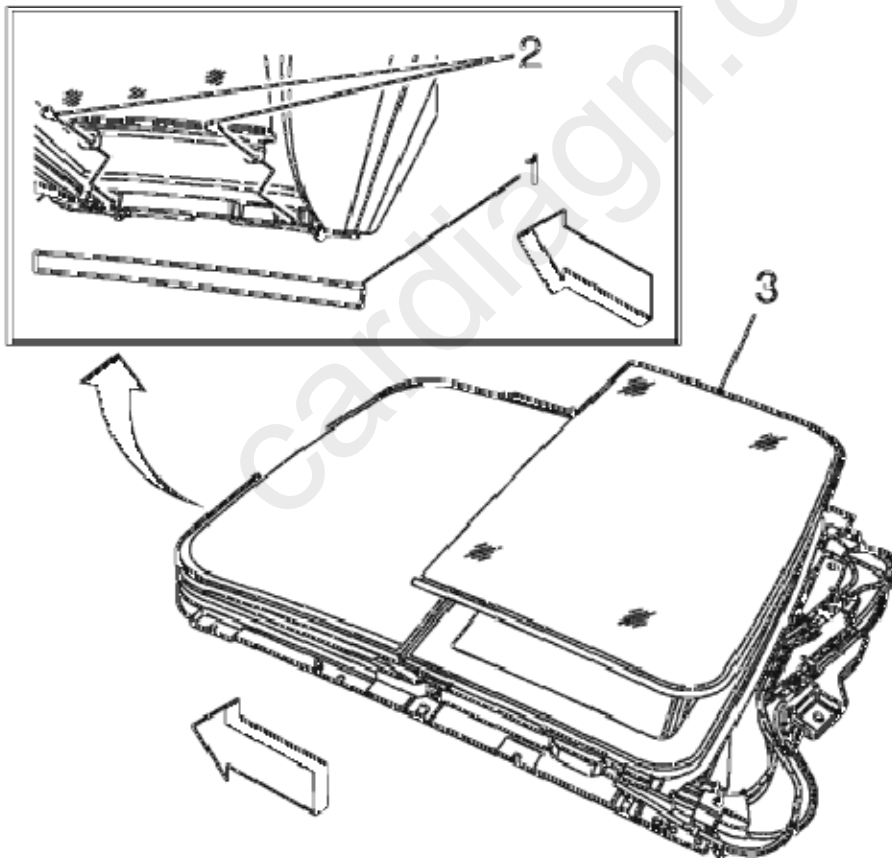


Fig. 16: Sunroof Window Replacement - Rear
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Use masking tape to tape off the sunroof opening. Do Not scratch the roof with the sunroof window brackets on the bottom side of the sunroof window.
- Push down on the inner seal to access the screws.

2. Remove the screws (2) from the left and right sides of the rear sunroof window (3) that attach the window to the sides of the module.
3. Rear sunroof window is loose in the module.

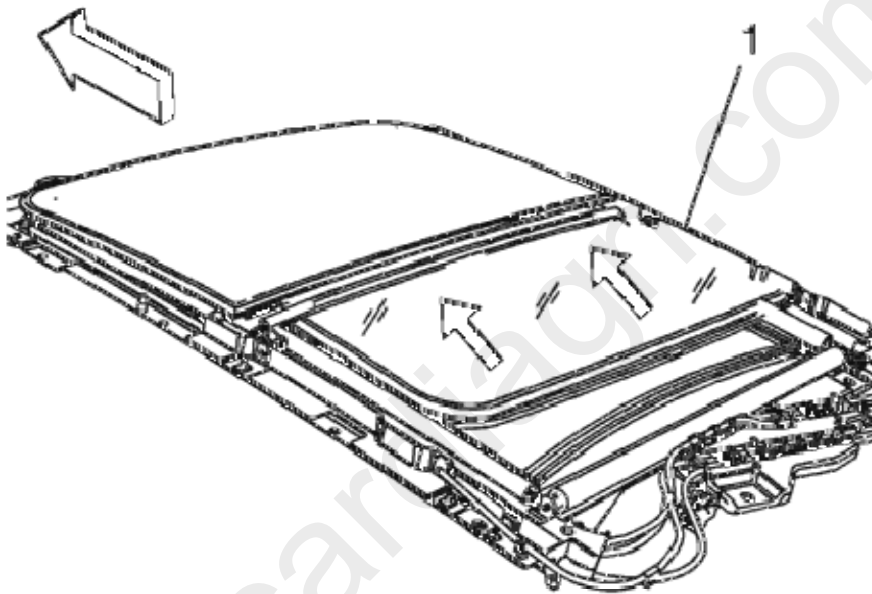


Fig. 17: Moving Rear Sunroof Window Forward
Courtesy of GENERAL MOTORS COMPANY

4. Move the rear sunroof window (1) forward in the opening approximately 76.2 mm (3 in).

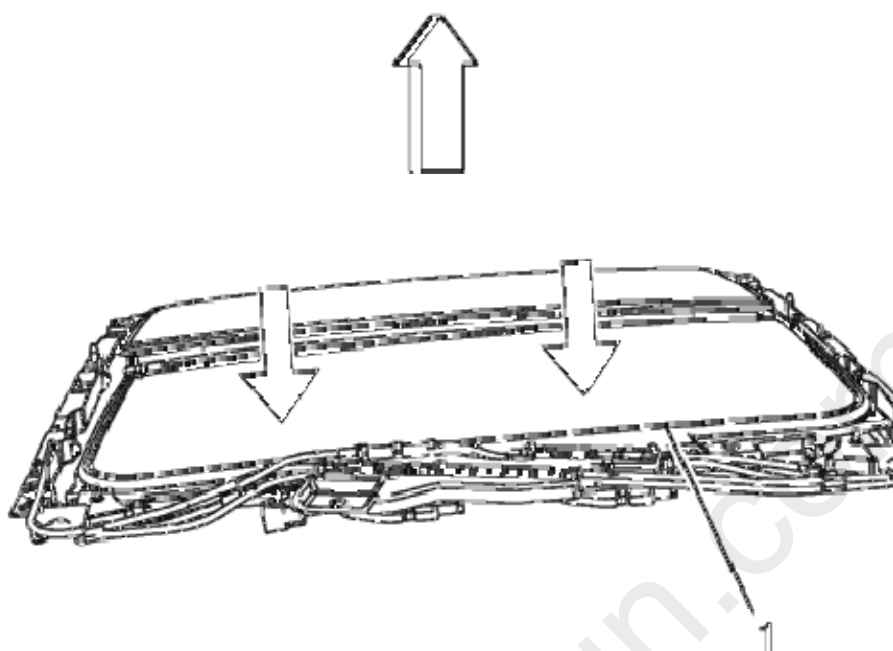


Fig. 18: Removing Rear Sunroof Window
Courtesy of GENERAL MOTORS COMPANY

5. Remove the rear sunroof window (1) by pushing downward.

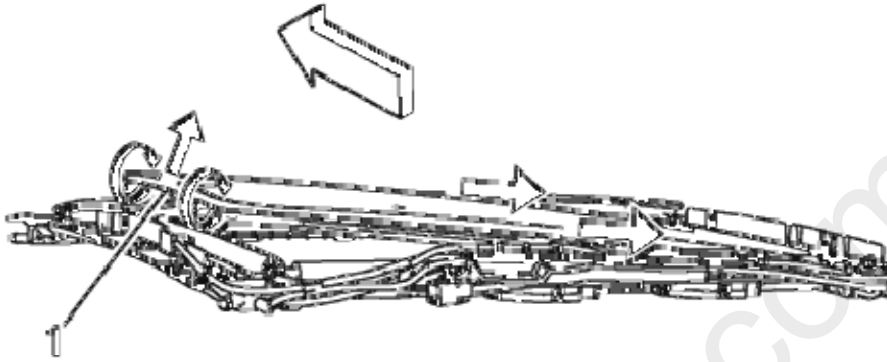


Fig. 19: Removing Sunroof Window
Courtesy of GENERAL MOTORS COMPANY

6. Slide the sunroof window (1) to the right side under the roof flange. This will allow the left edge of the sunroof window to be lifted high enough to clear the top side of the roof panel.
7. Remove the sunroof window from the vehicle.

Installation Procedure

NOTE: Use masking tape to tape off the sunroof opening. Do Not scratch the roof with the sunroof window brackets on the bottom side of the sunroof window.

1. Position the rear sunroof window into the roof opening.

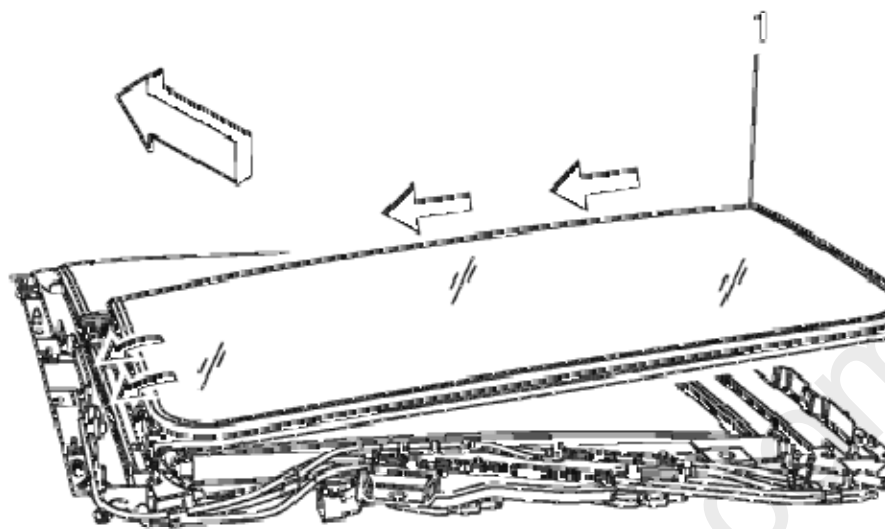


Fig. 20: Installing left Side Of Sunroof Window
Courtesy of GENERAL MOTORS COMPANY

2. Install the left side of the sunroof window (1) under flange until the right side clears the sunroof module opening.
3. Position the sunroof window brackets into the module.

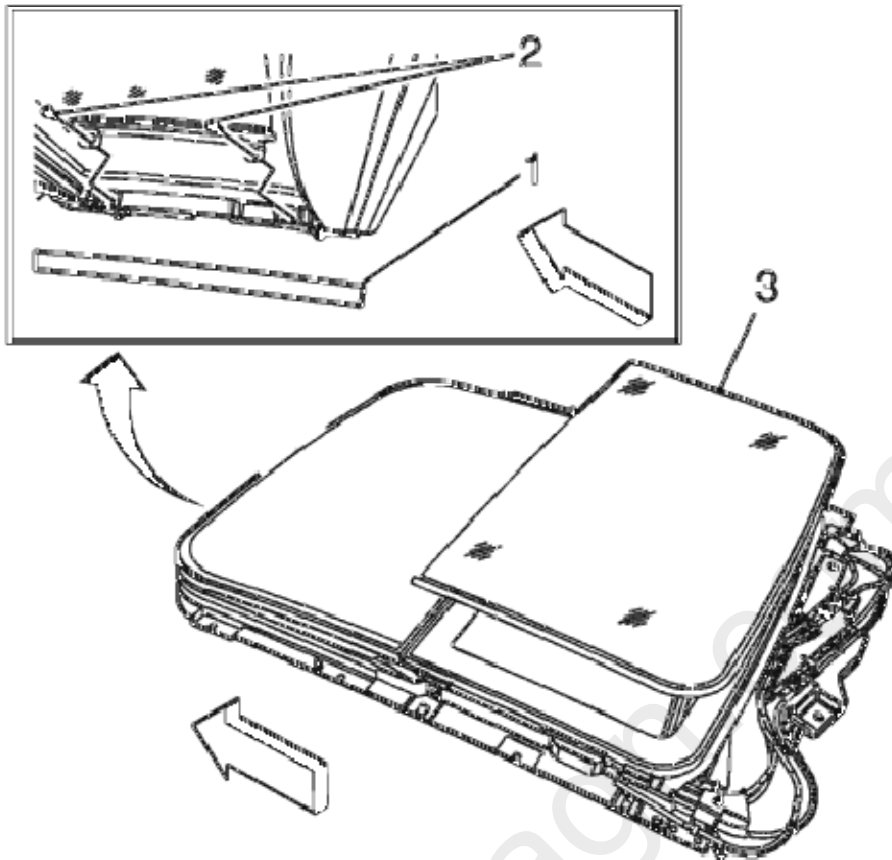


Fig. 21: Sunroof Window Replacement - Rear
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Install the screws (2) to the left and right sides of the rear sunroof window (3) that attach the window to the sides of the module and tighten to 5 N.m (44 lb in).
5. Remove masking tape from the sunroof window opening.
6. Install the front sunroof window. Refer to Sunroof Window Replacement (Rear), Sunroof Window Replacement (Front).
7. Adjust the sunroof windows as needed. Refer to Sunroof Window Height and Opening Fit Adjustment.
8. Inspect the sunroof windows for proper operation.

SUNROOF WINDOW REPLACEMENT (FRONT)

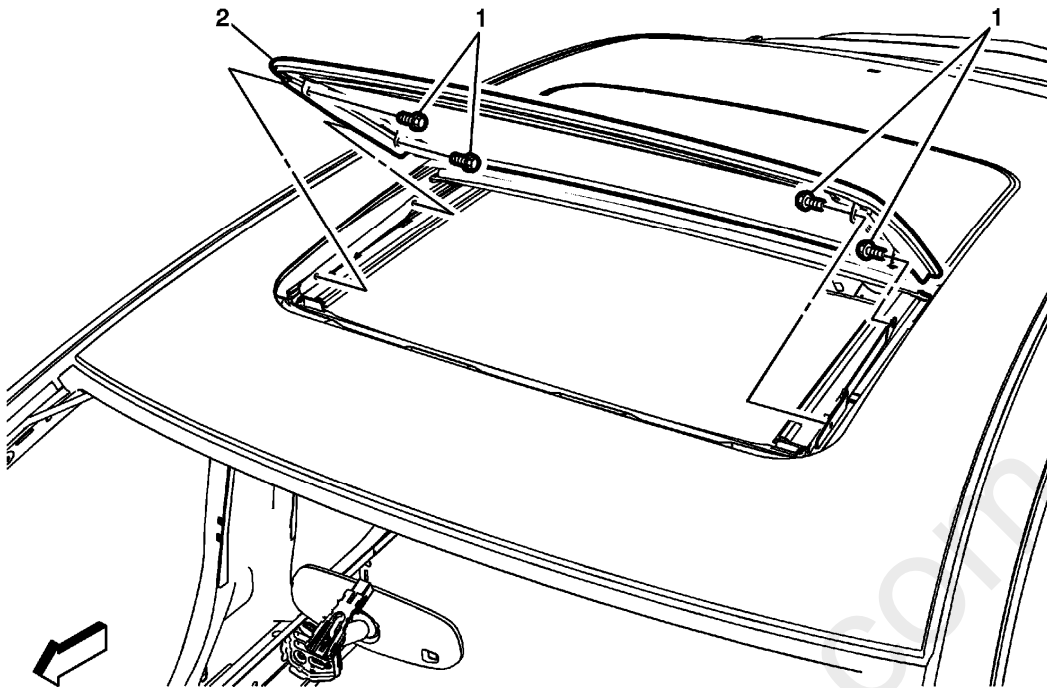


Fig. 22: Sunroof Window & Screws - Front
 Courtesy of GENERAL MOTORS COMPANY

Sunroof Window Replacement (Front)

Callout	Component Name
1	Front Sunroof Window Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Open the sunshade to the full open position. 2. Place the sunroof in the vent position to access the screws. 3. Reposition sunroof seal as needed to access screws. 4. Lift the sunroof window out of the frame. Tighten 5 N.m (44 lb in)
2	Front Sunroof Window Procedure

- | |
|--|
| <ol style="list-style-type: none">1. Sunroof window height and opening fit adjustment. Refer to <u>Sunroof Window Height and Opening Fit Adjustment</u>.2. Water test to ensure that sunroof window and window seal is fitting properly in the close position. |
|--|

DESCRIPTION AND OPERATION

SUNROOF DESCRIPTION AND OPERATION

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
- Serial Data Bus

The sunroof electrical system uses a master/slave configuration utilizing a serial data 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 serial data 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 serial data message commands from the system master.

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

Sunroof System Block Diagram

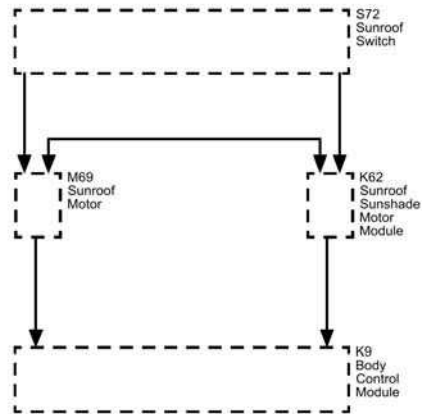


Fig. 23: Sunroof System Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
S72	S72 Sunroof Switch
M69	M69 Sunroof Motor
K62	K62 Sunroof Sunshade Motor Module
K9	K9 Body Control Module

Sunroof 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 its 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 serial data 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.

SUNROOF WINDOW MOTOR INITIALIZATION

Initialization/Teach Procedure, Manual Method, New/First Time Installation

Perform the initialization/teach procedure at first operation test of the sunroof. Ensure the electrical harness on the headliner is connected to the large roof, battery power is applied, and the ignition switch is on.

1. Press the sunroof switch to the open position until the window stalls at the rear hard stop in the full open position, and the power sunshade stalls at the rear hard stop position and then moves slightly to the soft stop position. Release the button. This is the initialization portion.
2. Within 3 seconds, press and hold the sunroof switch open again. The sunroof window will move to flush and open/close again. The sunshade will move to the flush position and stop. This is the teach portion.
3. Verify the operation of the sunroof.

The initialization teach procedure is not completed if one of the following events occurs before the initialization/teach cycle is done:

- The sunroof switch is not held in the open position.
- Ignition and/or battery power has been removed.
- The window panel has not reached the close position, and/or the sunshade has not reached the close position.

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

Re-Initialization/Teach Procedure, Manual Method, Reinstallation

Perform the initialization/teach procedure at first operation test of the sunroof. Ensure the electrical harness on the headliner is connected to the large roof, battery power is applied, and the ignition switch is on.

1. Press the sunroof switch to the open position until the window reaches the open soft stop position and

release. Press the sunroof switch open and hold for approximately 10 seconds, until the window stalls at the rear hard stop in the open position and then moves slightly to the soft stop position, and the power sunshade stalls at rear open hard stop and moves slightly to soft stop. Release the button. This is the initialization portion.

2. Within 3 seconds, press and hold the sunroof switch open again. The sunroof window will move to flush and open/close again. The sunshade will move to the flush position and stop. This is the teach portion.
3. Verify the operation of the sunroof.

The initialization teach procedure is not completed if one of the following events occurs before the initialization/teach cycle is done:

- The sunroof switch is not held in the open position.
- Ignition and/or battery power has been removed.
- The window panel has not reached the close position, and/or the sunshade has not reached the close position.

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