

2017 STEERING

Steering Wheel and Column - Bolt EV

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Instrument Panel Steering Column Lower Trim Cover Bolt	2.5 N.m (22 lb in)
Intermediate Steering Shaft Lower Bolt	57 N.m (42 lb ft)
Intermediate Steering Shaft Middle Bolt	49 N.m (36 lb ft)
Intermediate Steering Shaft Upper Bolt	49 N.m (36 lb ft)
Steering Column Lower Support Bracket Bolt	22 N.m (16 lb ft)
Steering Column Upper Support Bracket Nut	22 N.m (16 lb ft)
Steering Wheel Bolt	45 N.m (33 lb ft)

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Steering Wheel Bolt	Thread Locking Adhesive	12345382	10953489

SCHEMATIC WIRING DIAGRAMS

STEERING WHEEL WIRING SCHEMATICS

Heated Steering Wheel (UVD)

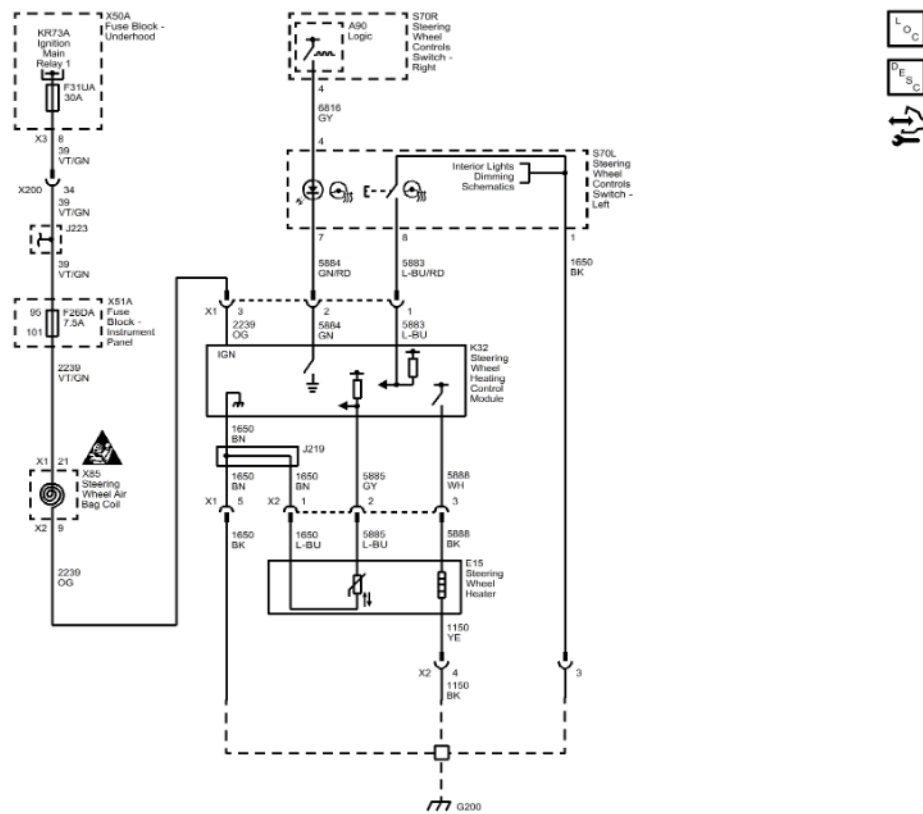


Fig. 1: Heated Steering Wheel (UVD)
Courtesy of GENERAL MOTORS COMPANY

COLUMN LOCK WIRING SCHEMATICS

Column Lock (NO6)

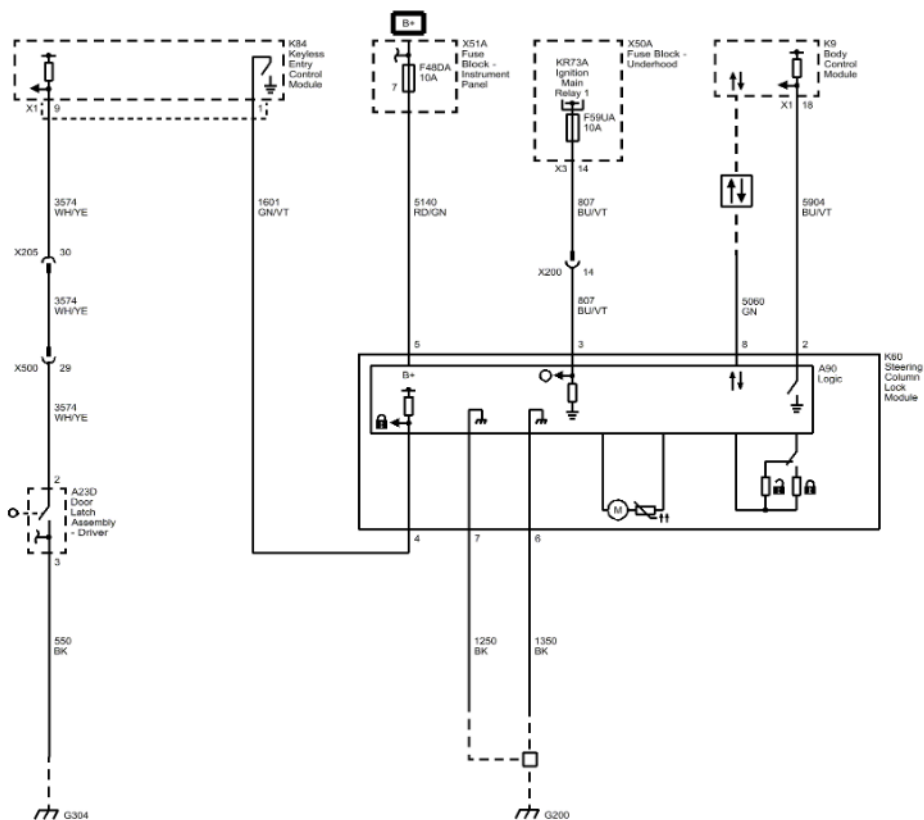


Fig. 2: Column Lock (NO6)
Courtesy of GENERAL MOTORS COMPANY

SYMPTOMS - STEERING WHEEL AND COLUMN

NOTE: Review the system operation in order to familiarize yourself with the system functions.

Refer to [Steering Wheel and Column Description and Operation](#).

Symptoms List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [High Effort While Tilting Column](#)
- [Noise in Steering Column](#)
- [Looseness in Steering Column](#)

HEATED STEERING WHEEL INDICATOR 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
Ignition	1	1	-	-
Switch Signal	2	1	-	-
LED Control	3	3	4	-
Switch and LED Ground	-	1	-	-
Module Ground	-	1	-	-
1. Heated Steering Wheel System Inoperative 2. Heated Steering Wheel Always ON 3. LED Inoperative 4. LED Always ON				

Circuit/System Description

The Steering Wheel Heating Control Module controls the heated steering wheel and the heated steering wheel ON indicator based on an input from the heated steering wheel switch. When the heated steering wheel switch is pressed, the switch signal circuit is pulled to ground. This indicates to the heating steering wheel control module that steering wheel heat is requested. When the request is seen, the heated steering module supplies voltage to the indicator lamp and supplies voltage to the heating elements, which are internal to the steering wheel.

Reference Information

Schematic Reference

[Steering Wheel Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Steering Wheel and Column Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Circuit/System Verification

1. Ignition ON, heated steering wheel OFF.
2. Verify the steering wheel heater indicator on the S70L Steering Wheel Controls Switch - Left is not illuminated and the steering wheel is not warm.
 - **If the steering wheel is warm**
Refer to [Heated Steering Wheel Malfunction](#)
 - **If the steering wheel is not warm and the steering wheel heater indicator is illuminated**
Refer to Circuit/System Testing
 - **If the steering wheels heater indicator is not illuminated and the steering wheel is not warm**
3. Verify the steering wheel heater indicator turns ON and OFF and the left and right sides of the steering wheel become warm when pressing and releasing the steering wheel heater switch on the S70L Steering Wheels Controls Switch - Left.
 - **If the steering wheel does not become warm**
Refer to [Heated Steering Wheel Malfunction](#)
 - **If the steering wheel becomes warm, but the steering wheel heater indicator does not turn ON and OFF**
Refer to Circuit/System Testing
 - **If the steering wheel becomes warm and the steering wheel heater indicator turns ON and OFF**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X2 harness connector at the X85 Steering Wheel Airbag Coil.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 9 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch](#).
 - If 2 Ω or greater
3. Verify the in-line fuse is OK and there is voltage at the fuse.
 - If the in-line fuse is open, replace the K32 Steering Wheel Heating Control Module.

- If the in-line fuse is OK, repair the open/high resistance in the circuit.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition voltage circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K32 Steering Wheel Heating Control Module.
 - **If the test lamp illuminates**
- 5. Ignition OFF, connect the X2 harness connector at the X85 Steering Wheel Airbag Coil.
Disconnect the harness connector at the S70L Steering Wheel Control Switch - Left. Ignition ON.
- 6. Test for B+ between the control circuit terminal 4 and ground.
 - **If less than B+**
 1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Control Switch - Right.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S70R Steering Wheel Control Switch - Right.
 - **If B+**
- 7. Ignition OFF, connect the harness connector at the S70L Steering Wheel Control Switch - Left.
Disconnect the harness connector at the K32 Steering Wheel Heating Control Module.

NOTE: Verify the instrument panel dimming control is set to bright.

8. Install a 3 A fused jumper wire between the control circuit terminal 2 and ground. Ignition ON.
9. Verify the steering wheel heat indicator is illuminated.
 - **If the steering wheel heat indicator does not illuminate**
Replace the S70L Steering Wheel Control Switch - Left
 - **If the steering wheel heat indicator illuminates**
10. Replace the K32 Steering Wheel Heating Control Module.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Cruise Control Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

HEATED STEERING WHEEL 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
Ignition	1	1	-	-
Switch Signal	2	1	-	-
Switch and LED Ground	-	1	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Temperature Sensor Signal	3	3	3	-
Temperature Sensor Ground	-	3	-	-
Heater Element Control	3	3	2	-
Heater Element Ground	-	3	-	-
Module Ground	-	1	-	-
1. Heated Steering Wheel System Inoperative 2. Heated Steering Wheel Always ON 3. Heated Steering Wheel Inoperative				

Circuit/System Description

The heated steering wheel control module controls the heated steering wheel and the heated steering wheel ON indicator based on an input from the heated steering wheel switch. When the heated steering wheel switch is pressed, the switch signal circuit is pulled to ground. This indicates to the heating steering wheel control module that steering wheel heat is requested. When the request is seen, the heated steering wheel control module supplies voltage to the indicator lamp and supplies voltage to the heating elements, which are internal to the steering wheel.

Diagnostic Aids

- Before replacing the steering wheel for complaints of not getting hot enough, a reliable infrared temperature gun should be used to measure the temperature at various points around the rim. The steering wheel's normal operating temperature is 32°C (89.6°F) and takes approximately 10 min to reach that temperature. It may take up to 20 min for the normal operating temperature to stabilize within the steering wheel rim. There may be spike in temperature during the first 3 - 4 min before it stabilizes at normal operating temperature. The steering wheel will take longer to heat up if the vehicle temperature is below -21°C (-5.8°F). The steering wheel heater will not operate when the steering wheel temperature is above 32°C (89.6°F).

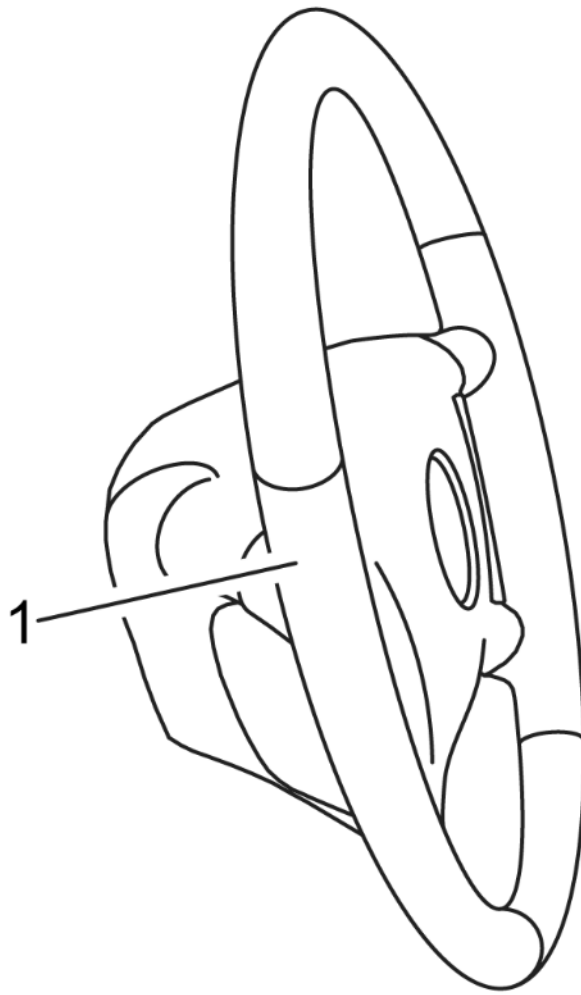


Fig. 3: Steering Wheel Rim Measurement Point
Courtesy of GENERAL MOTORS COMPANY

- The infrared measurements are made at the rim (1) at the 3 and 9 o'clock positions of the steering wheel.

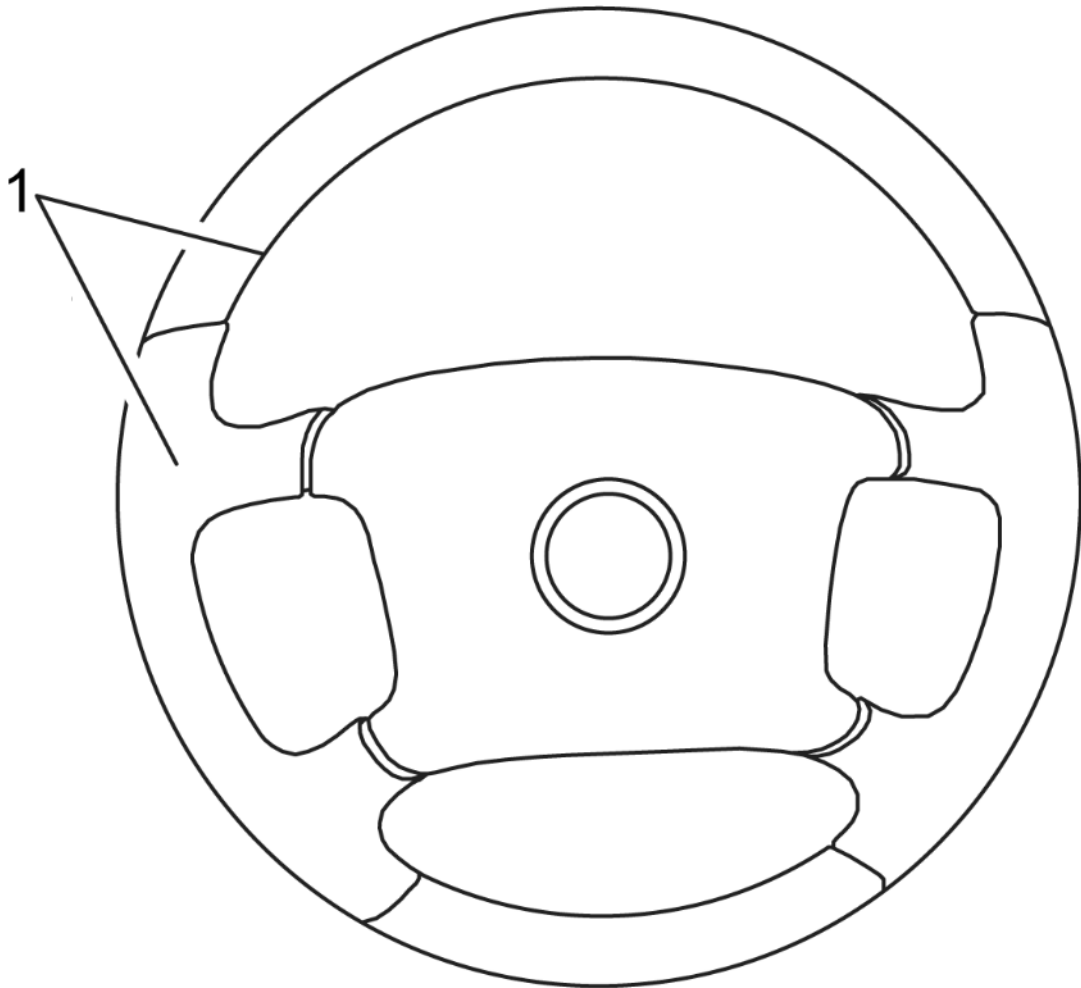


Fig. 4: Temperature Measurement Points
Courtesy of GENERAL MOTORS COMPANY

- The wood sections and the stitching are not heated. Temperature measurements should not be made on the face (1) to insure accurate temperature readings.

Reference Information

Schematic Reference

Steering Wheel Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation

Electrical Information Reference

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

Circuit/System Verification

Using an Infrared Temperature Gun

1. Engine running, all accessories OFF.
2. Verify the steering wheel heater switch is OFF and the steering wheel heater indicator should not be illuminated.

- **If the heater indicator is illuminated**

Refer to [Heated Steering Wheel Indicator Malfunction](#)

- **If the heater indicator is not illuminated**

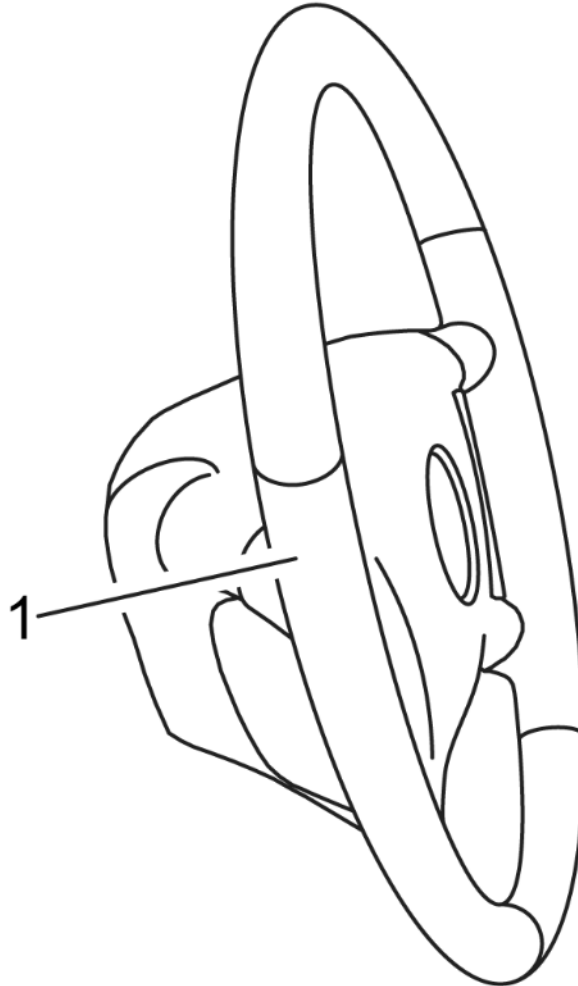


Fig. 5: Steering Wheel Rim Measurement Point

Courtesy of GENERAL MOTORS COMPANY

NOTE: The Infrared Temperature Gun should be within 50.8mm (2 in) and parallel to the steering wheel rim when taking temperature readings.

3. Measure the temperature readings at the 3 and 9 o'clock positions on the steering wheel rim (1).
4. Verify that the steering wheel temperature is 25°C (77°F) or below.

- **If the steering wheel temperature is greater than 25°C (77°F)**

Allow the steering wheel to cool before proceeding to next step.

- **If the steering wheel temperature is 25°C (77°F) or below**

5. Press and release the steering wheel heater switch. The steering wheel heater indicator should illuminate. Allow the steering wheel to heat for a minimum of 10 min so that the temperature stabilizes.

- **If the heater indicator does not illuminate**

Refer to [Heated Steering Wheel Indicator Malfunction](#)

- If the heater indicator illuminates

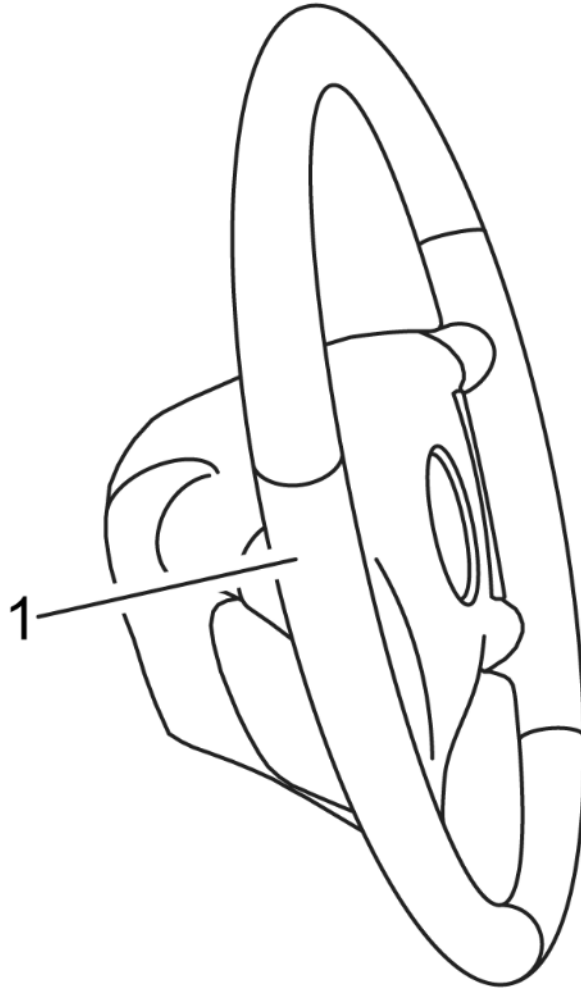


Fig. 6: Steering Wheel Rim Measurement Point

Courtesy of GENERAL MOTORS COMPANY

NOTE: The Infrared Temperature Gun should be within 50.8mm (2 in) and parallel to the steering wheel rim when taking temperature readings.

6. Measure the temperature readings at the 3 and 9 o'clock positions on the steering wheel rim (1).
7. Verify that the steering wheel temperature is greater than 28°C (82.4°F) within 20 min.
 - If after 20 minutes the measured temperature is less than 28°C (82.4°F)
Refer to Circuit System Testing.
 - If after 20 minutes the measured temperature is 28°C (82.4°F) or greater
8. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X2 harness connector at the X85 Steering Wheel Airbag Coil.
2. Test for less than $10\ \Omega$ between the ground circuit terminal 1 and ground.
 - If $10\ \Omega$ or greater
 1. Ignition OFF.
 2. Test for less than $2\ \Omega$ in the ground circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, repair the open/high resistance in the ground connection.
 - If less than $10\ \Omega$

3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 9 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to **Power Mode Mismatch**.
 - If 2 Ω or greater
 3. Verify the in-line fuse is OK and there is voltage at the fuse.
 - If the in-line fuse is open, replace the K32 Steering Wheel Heating Control Module.
 - If the in-line fuse is OK, repair the open/high resistance in the circuit.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition voltage circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K32 Steering Wheel Heating Control Module.
 - **If the test lamp illuminates**
5. Ignition OFF, connect the X2 harness connector at the X85 Steering Wheel Airbag Coil. Disconnect the harness connector at the S70L Steering Wheel Control Switch - Left.
6. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
7. Ignition ON.
8. Test for B+ between the signal circuit terminal 8 and ground.
 - **If less than B+**
 1. Ignition OFF, disconnect the in-line harness connector at the K32 Steering Wheel Heating Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K32 Steering Wheel Heating Control Module.
 - **If B+**
9. Test for infinite resistance between the S70L Steering Wheel Control Switch - Left signal terminal 8 and the ground terminal 1 with the steering wheel heater switch released.
 - **If less than infinite resistance**

Replace the S70L Steering Wheel Controls Switch - Left.
 - **If infinite resistance**
10. Test for less than 40 Ω between the S70L Steering Wheel Control Switch - Left signal terminal 8 and the ground terminal 1 with the steering wheel heater switch pressed.
 - **If 40 Ω or greater**

Replace the S70L Steering Wheel Controls Switch - Left
 - **If less than 40 Ω**

11. Connect the harness connector at the S70L Steering Wheel Control Switch - Left. Disconnect the harness connector at the E15 Steering Wheel Heater.
12. Test for less than 10 Ω between the ground circuits listed below and ground.
 - Terminal 1
 - Terminal 4
 - **If 10 Ω or greater**
Repair the open/high resistance in the circuit.
 - **If less than 10 Ω**
13. Test for 1.5 - 3.0 Ω between the control circuit terminal 3 and the ground terminal 4.
 - **If not within the specified range**
Replace the E15 Steering Wheel Heater.
 - **If within the specified range**
14. Test for 9 - 11k Ω between the signal circuit terminal 1 and the ground terminal 2.
 - **If not within the specified range**
Replace the E15 Steering Wheel Heater.
 - **If within the specified range**
15. Replace the K32 Steering Wheel Heating Control Module.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Cruise Control Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

HIGH EFFORT WHILE TILTING COLUMN

Condition	Action
The pivot bolt is damaged or misaligned.	If necessary, replace the steering column. Refer to Steering Column Replacement .

NOISE IN STEERING COLUMN

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Steering Wheel and Column
2	Verify that noise is present in the steering column during operation. Is noise present in the steering column during operation?	Go to Step 3	System OK
3	Inspect the steering column mounting features for the following conditions: • Steering column mounting fasteners for looseness • Steering column mounting features are sheared Are the steering column mounting features loose?	Go to Step 9	Go to Step 4
4	Inspect the SIR/SRS coil for noise. Is the SIR/SRS coil noisy?	Go to Step 10	Go to Step 5

Step	Action	Yes	No
5	Inspect the lock plate retaining ring for correct installation. Is the lock plate retaining ring installed incorrectly?	Go to Step 11	Go to Step 6
6	Inspect the steering column upper and lower bearings for the following conditions: • Damage • Lubrication • Wear • Proper seating Are the bearings in need of repair or replacement?	Go to Step 12	Go to Step 7
7	Does the tilt joint need to be lubricated?	Go to Step 13	Go to Step 8
8	NOTE: This is best evaluated while driving the vehicle, turning the steering and applying the brake pedal. Inspect the intermediate steering shaft for noise. Is the intermediate steering shaft noisy?	Go to Step 14	Go to Step 15
9	NOTE: If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to Steering Column Replacement. Tighten the steering column mounting fasteners to specifications. Refer to Fastener Specifications . Did you complete the repair?	Go to Step 15	-
10	Replace the SIR/SRS coil. Refer to Steering Wheel Airbag Coil Replacement . Did you complete the repair?	Go to Step 15	-
11	Install the lock plate retaining ring correctly. Did you complete the repair?	Go to Step 15	-
12	NOTE: If the steering column upper and/or lower bearings are not serviceable, the steering column will need to be replaced. Refer to Steering Column Replacement. Replace the upper and/or lower bearing, if serviceable. Did you complete the repair?	Go to Step 15	-
13	Lubricate the tilt joint. Did you complete the repair?	Go to Step 15	-
14	Replace the appropriate intermediate steering shaft component. Refer to Intermediate Steering Shaft Replacement . Did you complete the repair?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

LOOSENESS IN STEERING COLUMN

Step	Action	Yes	No

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and perform the necessary inspections?	Go to Step 2	Go to Steering Column Replacement
2	Verify that the steering column is loose. Is the steering column loose?	Go to Step 3	System OK
3	Inspect the steering column mounting features for the following conditions. - Steering column mounting fasteners for looseness - Steering column mounting features are sheared Are the steering column mounting features loose?	Go to Step 5	Go to Step 4
4	Inspect the upper and/or lower bearings for looseness. Are any of the bearings worn or loose?	Go to Step 6	Go to Step 7
5	NOTE: If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to Steering Column Replacement. Tighten the steering column mounting fastener to specifications. Refer to Fastener Specifications . Did you complete the repair?	Go to Step 7	-
6	NOTE: If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to Steering Column Replacement. Replace the upper and/or lower bearings, if serviceable. Did you complete the repair?	Go to Step 7	-
7	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

INTERMEDIATE STEERING SHAFT INNER BOOT REPLACEMENT

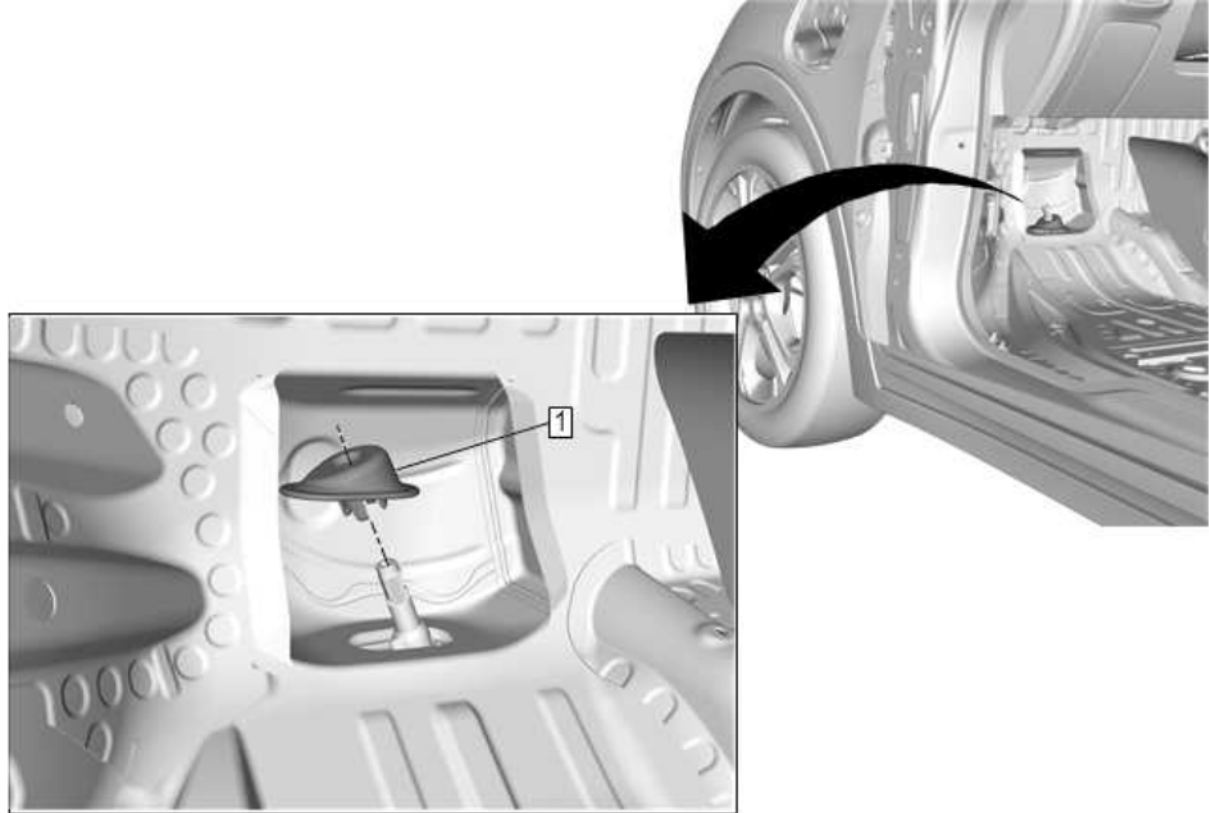


Fig. 7: Intermediate Steering Shaft Inner Boot
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Intermediate Steering Shaft at Steering Gear Pinion Shaft - Disconnect - <u>Intermediate Steering Shaft Replacement</u>	
1	Intermediate Steering Shaft Inner Boot Procedure 1. Ensure that the steering wheel is set in a straight ahead position and centered. 2. Lift the rubber lip of the intermediate steering shaft inner boot upward to reduce the friction when the intermediate steering shaft inner boot is rotated. 3. Push the intermediate steering shaft inner boot and then rotate it about 45 degrees counterclockwise to release the lock. 4. Remove the intermediate steering shaft inner boot from the steering gear. 5. Position the intermediate steering shaft inner boot over the steering gear and on the dash panel. Ensure the lip on the seal is positioned correctly.

INTERMEDIATE STEERING SHAFT REPLACEMENT

Removal Procedure

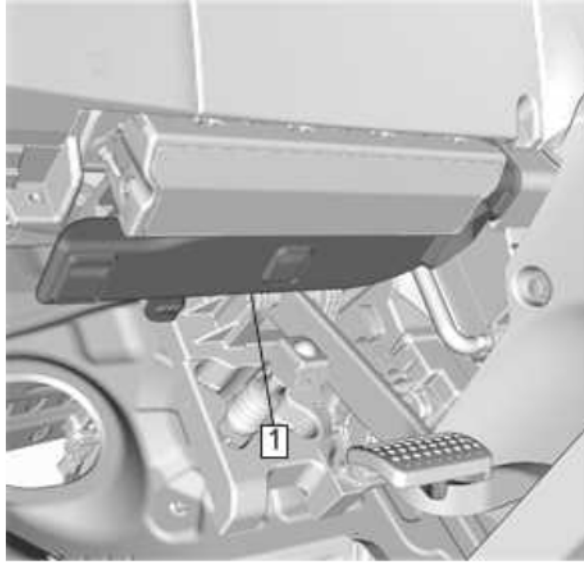


Fig. 8: Floor Front Air Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

1. Floor Front Air Outlet Duct - Left Side - Remove - **Floor Front Air Outlet Duct Replacement - Left Side**

CAUTION: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The intermediate shaft(s)
- The steering gear

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has become un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

2. Turn the steering wheel to the straight ahead position and secure the steering wheel from moving.

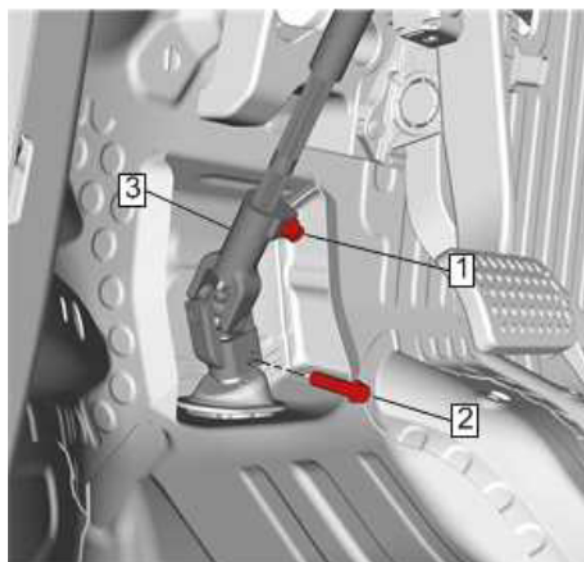


Fig. 9: Intermediate Steering Shaft Middle Bolt
 Courtesy of GENERAL MOTORS COMPANY

3. Intermediate Steering Shaft Middle Bolt - Loosen
4. Intermediate Steering Shaft Lower Bolt - Remove
5. Intermediate Steering Shaft at Steering Gear Pinion Shaft - Disconnect

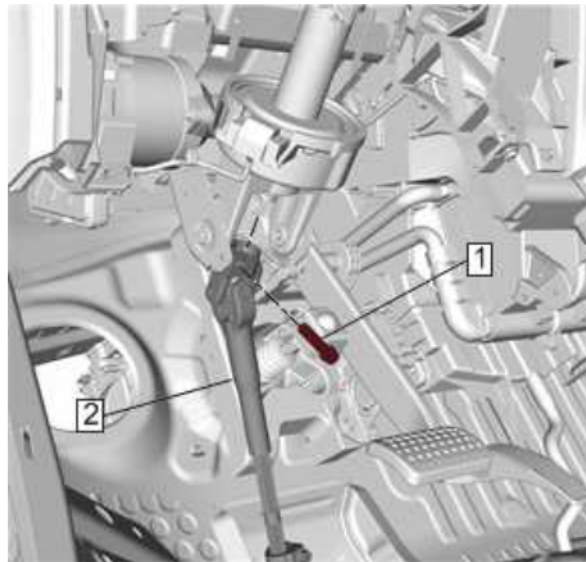


Fig. 10: Intermediate Steering Shaft Upper Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Intermediate Steering Shaft Upper Bolt - Remove
7. Intermediate Steering Shaft at Steering Column Shaft - Disconnect
8. Intermediate Steering Shaft at Vehicle - Remove

Installation Procedure

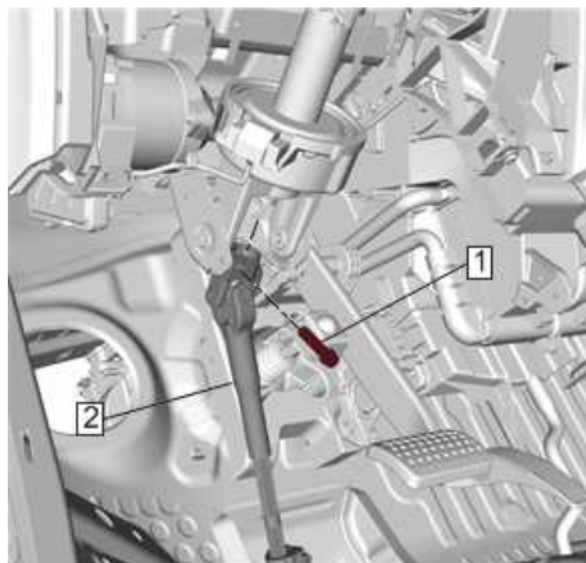


Fig. 11: Intermediate Steering Shaft Upper Bolt
Courtesy of GENERAL MOTORS COMPANY

1. Intermediate Steering Shaft at Vehicle - Install

NOTE: The recess of the fine tooth in the universal joint have to be precisely aligned to the recess of the fine tooth on the steering column shaft. The bore in the universal joint have to be aligned to the groove on the steering column shaft.

2. Intermediate Steering Shaft at Steering Column Shaft - Connect

CAUTION: Refer to **Fastener Caution** .

3. Intermediate Steering Shaft Upper Bolt - Install and tighten to 49 N.m (36 lb ft)

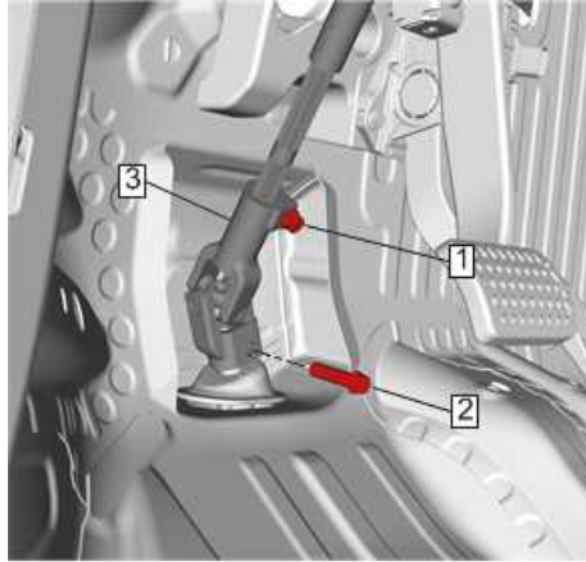


Fig. 12: Intermediate Steering Shaft Middle Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE: The recess of the fine tooth in the universal joint have to be precisely aligned to the recess of the fine tooth on the steering gear pinion. The bore in the universal joint have to be aligned to the groove on the steering gear pinion.

4. Intermediate Steering Shaft at Steering Gear Pinion Shaft - Connect
5. Intermediate Steering Shaft Lower Bolt - Install and tighten to 57 N.m (42 lb ft)
6. Intermediate Steering Shaft Middle Bolt - Tighten to 49 N.m (36 lb ft)

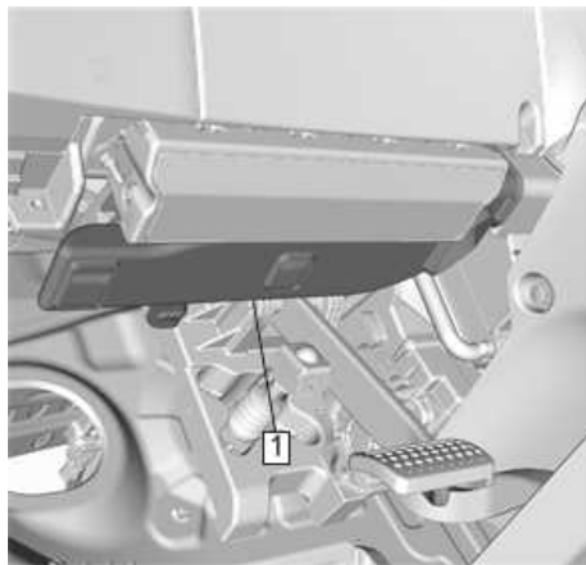


Fig. 13: Floor Front Air Outlet Duct - Left Side
Courtesy of GENERAL MOTORS COMPANY

7. Floor Front Air Outlet Duct - Left Side - Install - **Floor Front Air Outlet Duct Replacement - Left Side**

STEERING COLUMN UPPER TRIM COVER REPLACEMENT

Removal Procedure

1. Instrument Panel Trim Pad-Left Side at Vehicle - Remove - **Instrument Panel Trim Pad Replacement - Left Side**

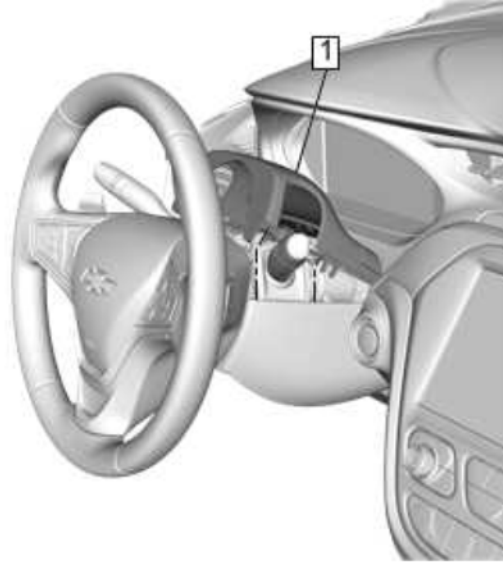


Fig. 14: Instrument Panel Steering Column Upper Trim Cover
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Use a flat bladed plastic trim tool.

2. Instrument Panel Steering Column Upper Trim Cover at Instrument Panel Steering Column Lower Trim Cover - Unclip

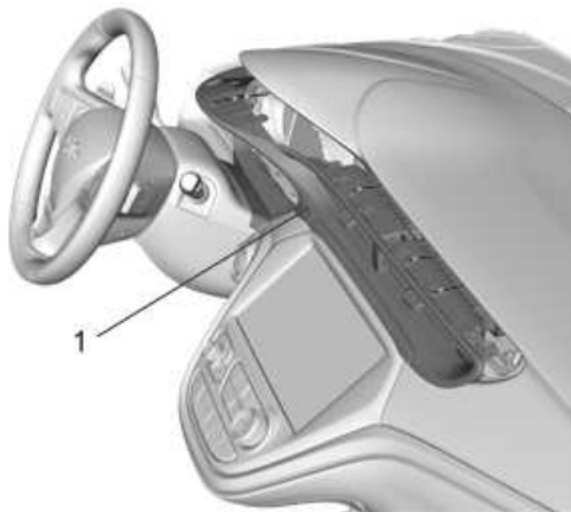


Fig. 15: Instrument Panel Accessory Bezel
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Use a flat bladed plastic trim tool.

3. Instrument Panel Accessory Bezel at Instrument Panel - Unclip



Fig. 16: Instrument Panel Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

4. Instrument Panel Steering Column Upper Trim Cover at Vehicle - Remove

Installation Procedure



Fig. 17: Instrument Panel Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

1. Instrument Panel Steering Column Upper Trim Cover at Vehicle - Install

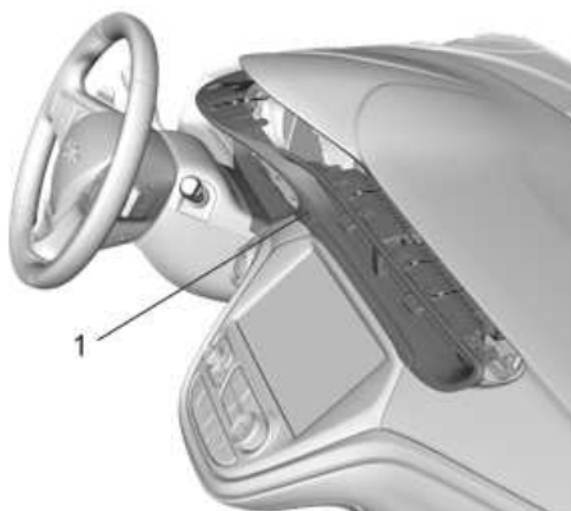


Fig. 18: Instrument Panel Accessory Bezel
Courtesy of GENERAL MOTORS COMPANY

2. Instrument Panel Accessory Bezel at Instrument Panel - Install



Fig. 19: Instrument Panel Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

- 3. Instrument Panel Steering Column Upper Trim Cover at Instrument Panel Steering Column Lower Trim Cover - Install
- 4. Instrument Panel Trim Pad-Left Side at Vehicle - Install - **Instrument Panel Trim Pad Replacement - Left Side**

STEERING COLUMN LOWER TRIM COVER REPLACEMENT

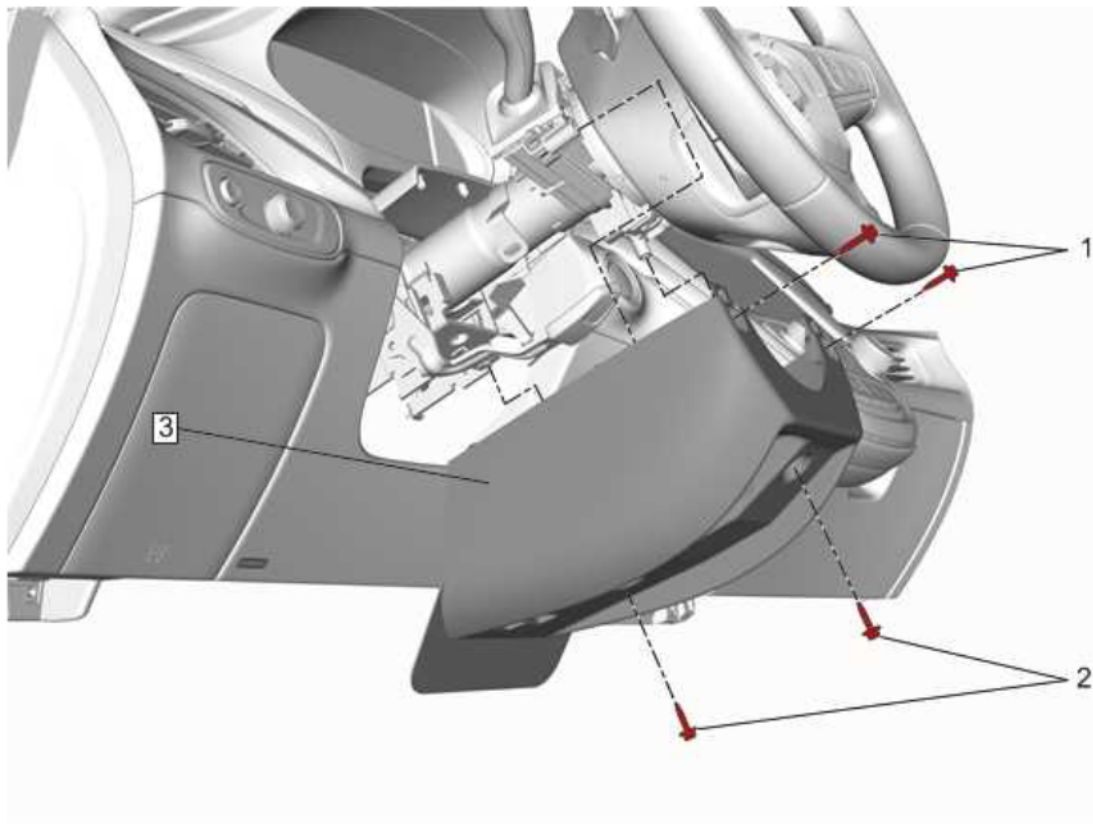


Fig. 20: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Instrument Panel Steering Column Upper Trim Cover at Instrument Panel Steering Column Lower Trim Cover - Separate - <u>Steering Column Upper Trim Cover Replacement</u>	

Callout	Component Name
1	Instrument Panel Steering Column Lower Trim Cover Bolt CAUTION: Refer to Fastener Caution . Procedure Rotate the steering wheel left and right to access the fasteners securing the lower trim cover to the turn signal switch bracket. Tighten 2.5 N.m (22 lb in)
2	Instrument Panel Steering Column Lower Trim Cover Bolt Tighten 2.5 N.m (22 lb in)
3	Instrument Panel Steering Column Lower Trim Cover

TURN SIGNAL SWITCH REPLACEMENT

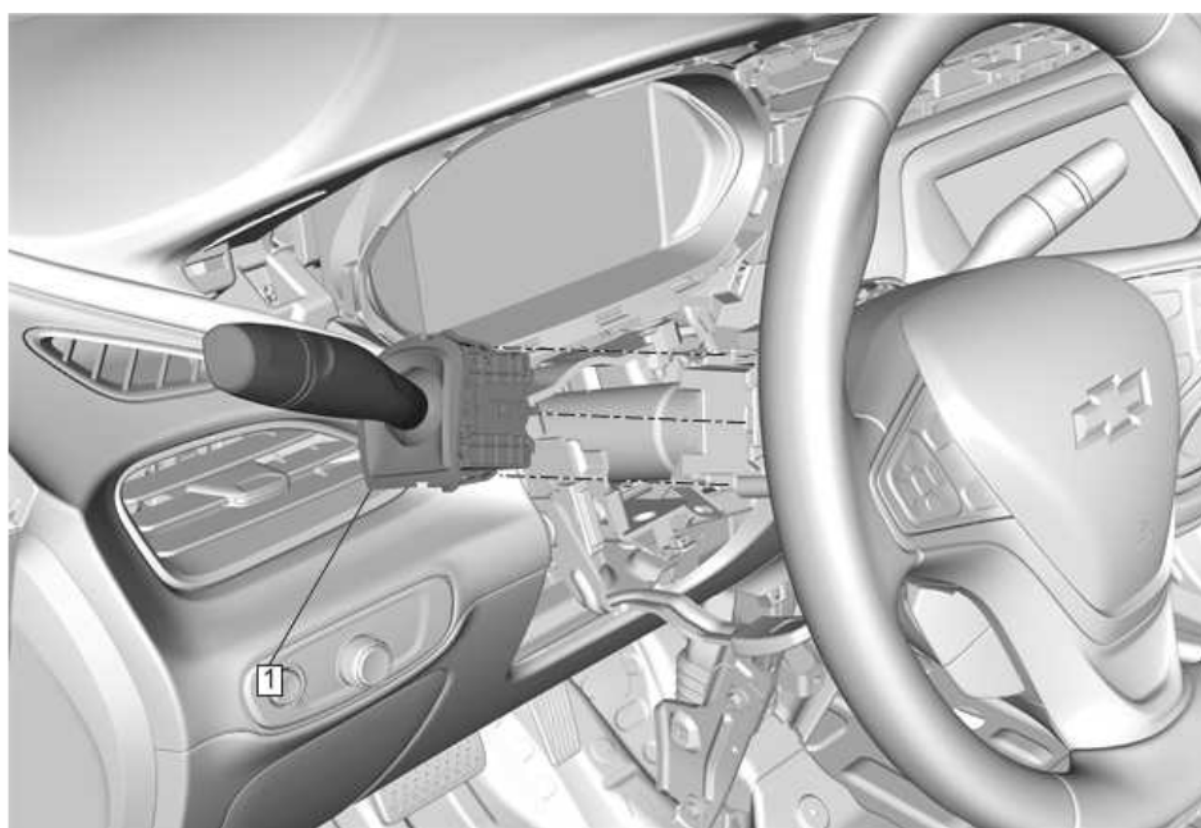


Fig. 21: Turn Signal Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Steering Column Lower Trim Cover Replacement	
1	Turn Signal Switch Procedure 1. Disconnect the electrical connector. 2. Release the retaining tabs and remove the turn signal switch from the turn signal switch bracket.

TURN SIGNAL SWITCH BRACKET REPLACEMENT

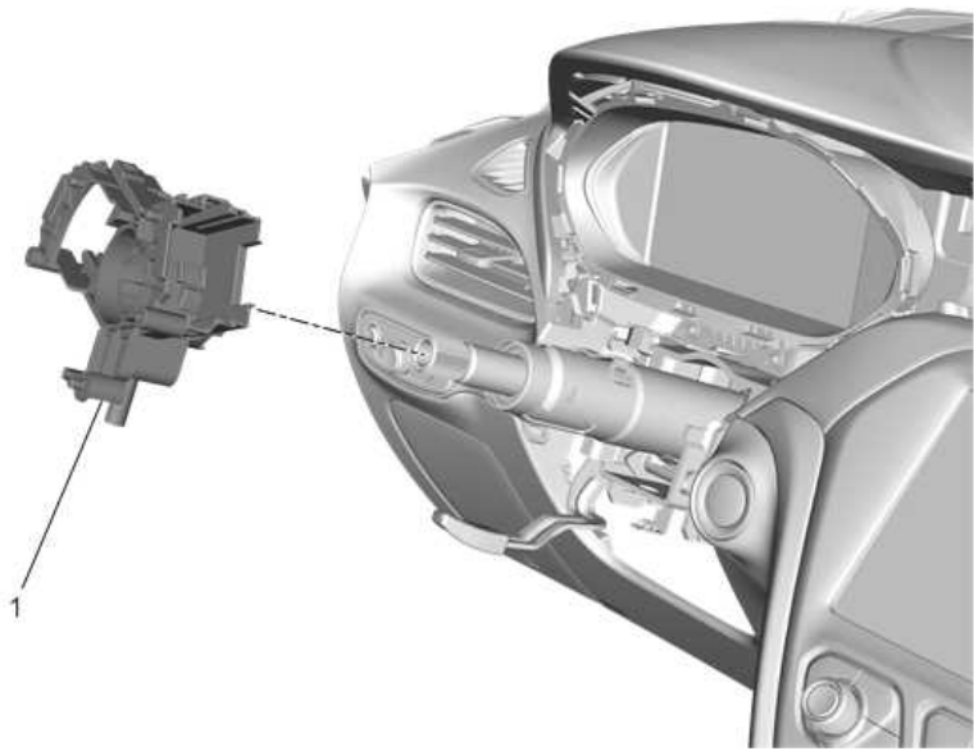


Fig. 22: Turn Signal Switch Bracket
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. <u>Steering Wheel Airbag Coil Replacement</u> 2. <u>Turn Signal Switch Replacement</u> 3. <u>Windshield Wiper and Washer Switch Replacement</u>	
1	Turn Signal Switch Bracket Procedure Release the retaining tabs and remove the turn signal switch bracket from the steering column.

STEERING WHEEL HEAT CONTROL MODULE REPLACEMENT

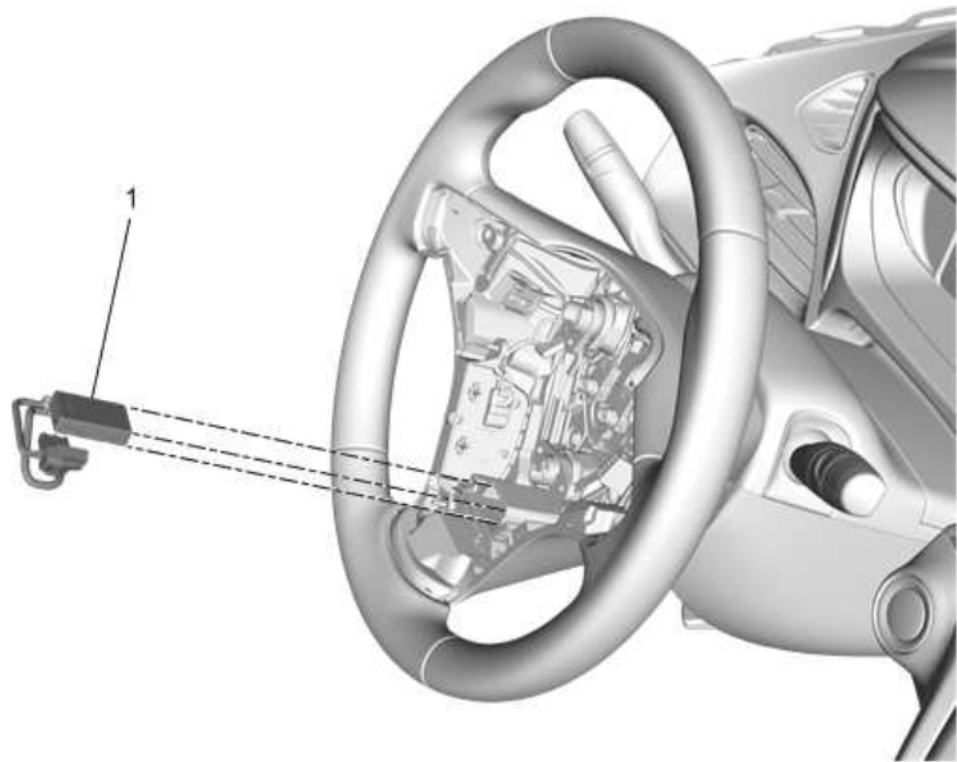


Fig. 23: Steering Wheel Heat Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Steering Wheel Spoke Lower Cover Replacement</u>	
1	Steering Wheel Heat Control Module Procedure 1. Remove the steering wheel heat control module in order to expose the electrical connectors. 2. Disconnect the electrical connectors. 3. Remove the steering wheel heat control module from the steering wheel.

STEERING WHEEL REPLACEMENT

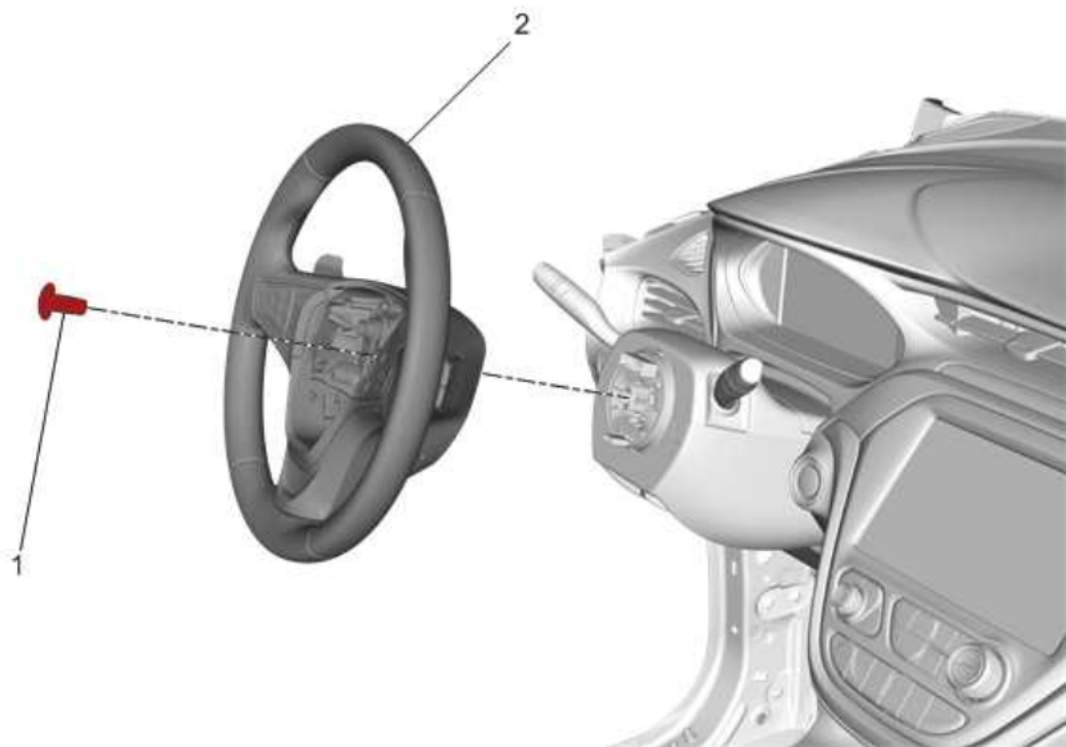


Fig. 24: Steering Wheel

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to SIR Warning . WARNING: Refer to SIR Inflator Module Handling and Storage Warning . Preliminary Procedures 1. SIR Disabling and Enabling 2. Steering Wheel Airbag Replacement	
1	Steering Wheel Bolt CAUTION: Refer to Fastener Caution . Procedure 1. Clean the threads of the bolt with denatured alcohol or equivalent and allow to dry. 2. Apply thread locking adhesive to the bolt. Adhesives, Fluids, Lubricants, and Sealers Tighten 45 N.m (33 lb ft)
cardiagn.com	

Callout	Component Name
2	Steering Wheel Procedure 1. Disconnect the electrical connectors. 2. Install the steering wheel bolt until 2 to 3 threads are engaged. 3. Wiggle the steering wheel until the wheel disengages completely. 4. Steering Wheel Bolt - Remove 5. Steering Wheel - Remove 6. Transfer components as necessary.

STEERING WHEEL SPOKE COVER REPLACEMENT

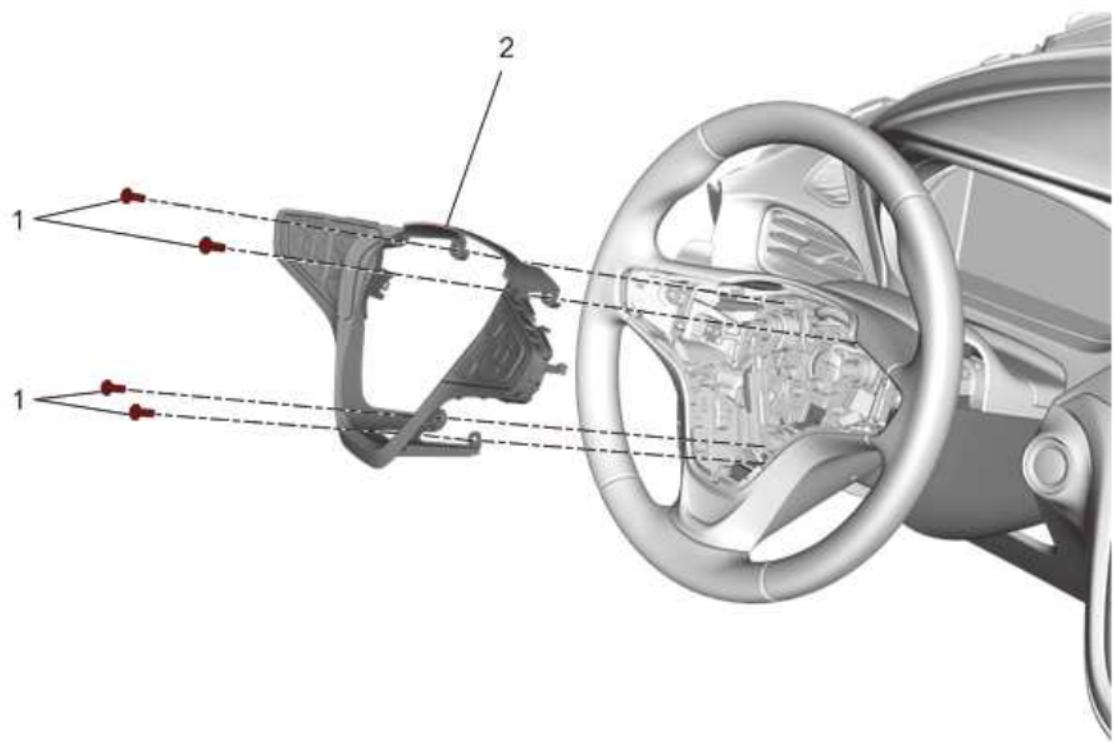


Fig. 25: Steering Wheel Spoke Cover
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Steering Wheel Airbag Replacement	
1	Steering Wheel Spoke Cover Bolt
2	Steering Wheel Spoke Cover Procedure 1. Use the appropriate trim tool to release the steering wheel spoke cover from the steering wheel. 2. Disconnect the electrical connectors. 3. Transfer components as necessary.

STEERING WHEEL SPOKE LOWER COVER REPLACEMENT

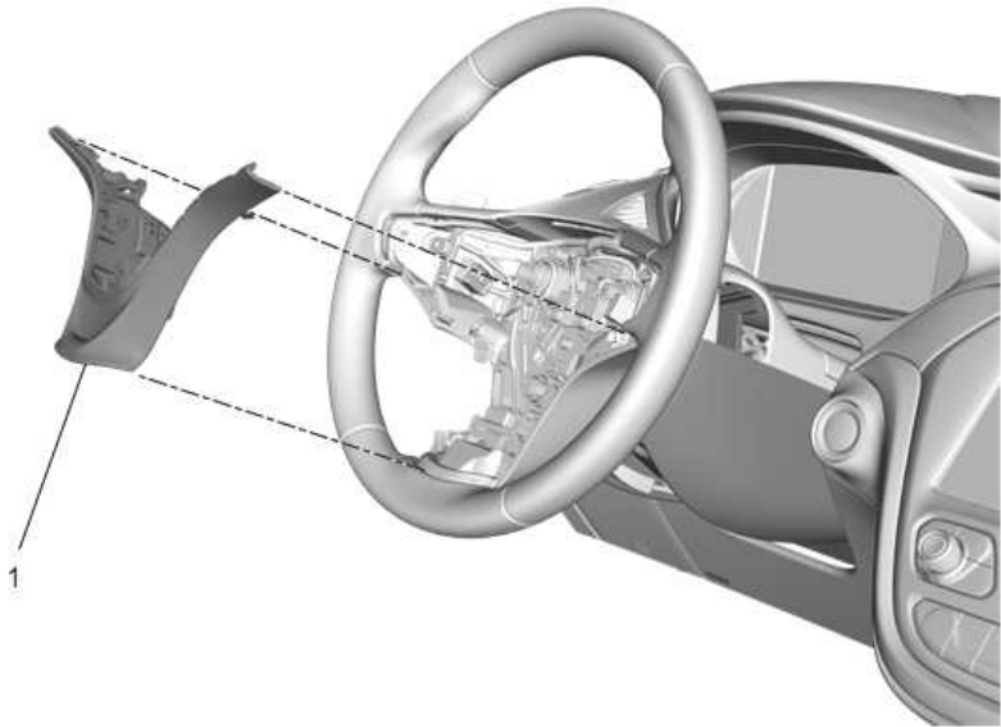


Fig. 26: Steering Wheel Spoke Lower Cover
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Steering Wheel Airbag Replacement Steering Wheel Spoke Cover Replacement	
1	Steering Wheel Spoke Lower Cover Procedure - Use the appropriate trim tool to release the steering wheel spoke lower cover from the steering wheel. - Disconnect the electrical connectors. - Transfer components as necessary.

STEERING COLUMN REPLACEMENT

Removal Procedure

WARNING: Refer to [SIR Warning](#) .

WARNING: Refer to [SIR Inflator Module Handling and Storage Warning](#) .

- Disable the SIR system. [SIR Disabling and Enabling](#)
- Steering Wheel Airbag - Remove - [Steering Wheel Airbag Replacement](#)
- Turn the steering wheel to the straight ahead position.
- Steering Wheel - Remove - [Steering Wheel Replacement](#)
- Steering Column Upper Trim Cover at Steering Column Lower Trim Cover - Separate - [Steering Column Upper Trim Cover Replacement](#)

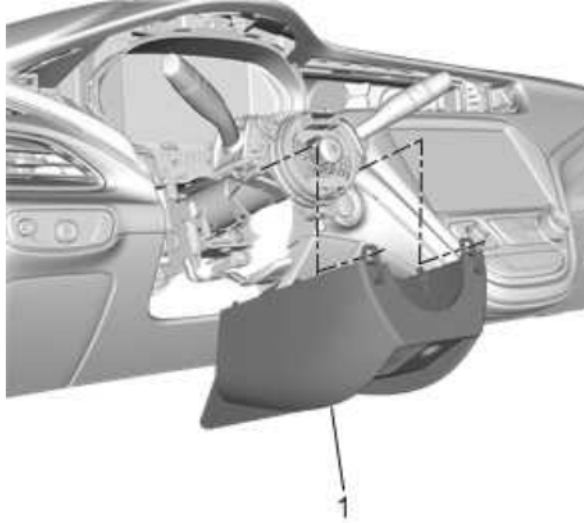


Fig. 27: Steering Column Lower Trim Cover

Courtesy of GENERAL MOTORS COMPANY

6. Steering Column Lower Trim Cover - Remove - **Steering Column Lower Trim Cover Replacement**

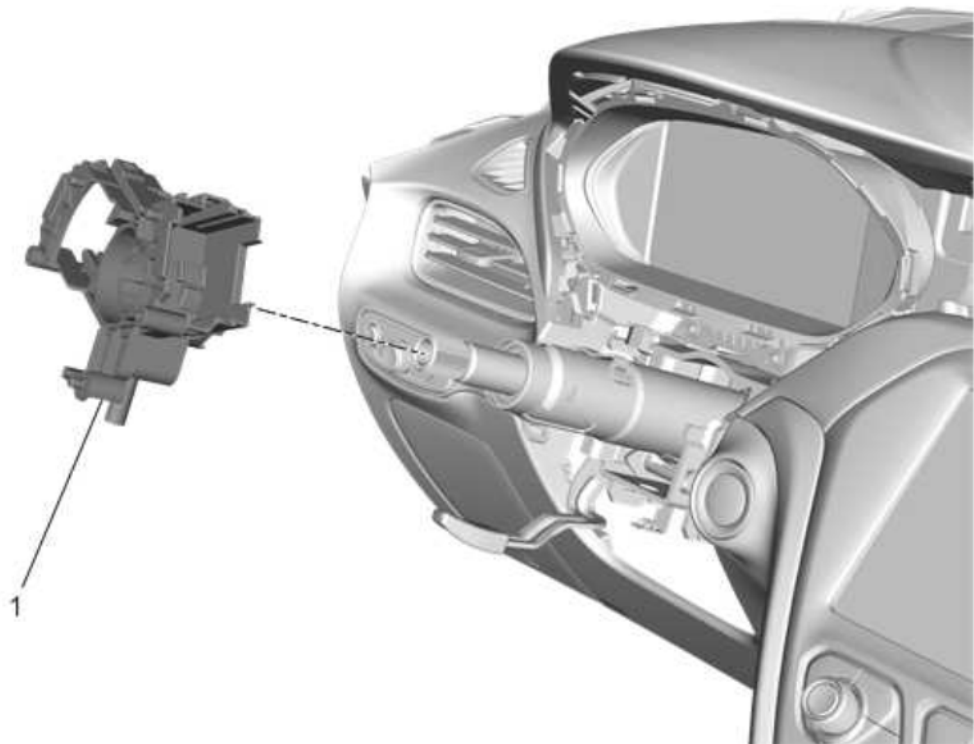


Fig. 28: Turn Signal Switch Bracket

Courtesy of GENERAL MOTORS COMPANY

7. Turn Signal Switch Bracket - Remove - **Turn Signal Switch Bracket Replacement**

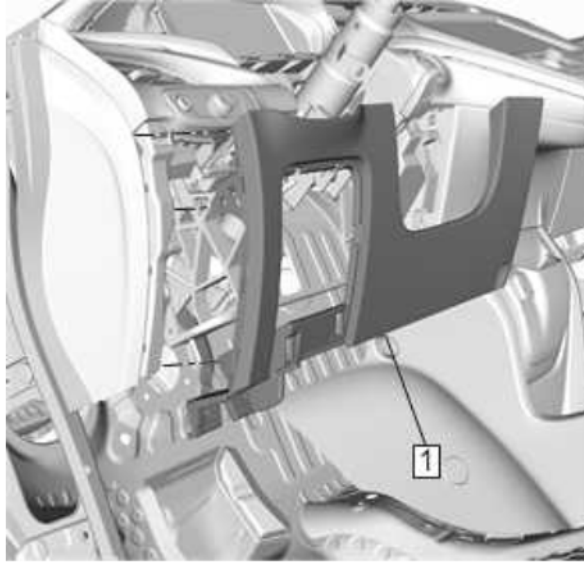


Fig. 29: Instrument Panel Knee Bolster

Courtesy of GENERAL MOTORS COMPANY

8. Instrument Panel Knee Bolster - Remove - [**Instrument Panel Knee Bolster Replacement**](#)

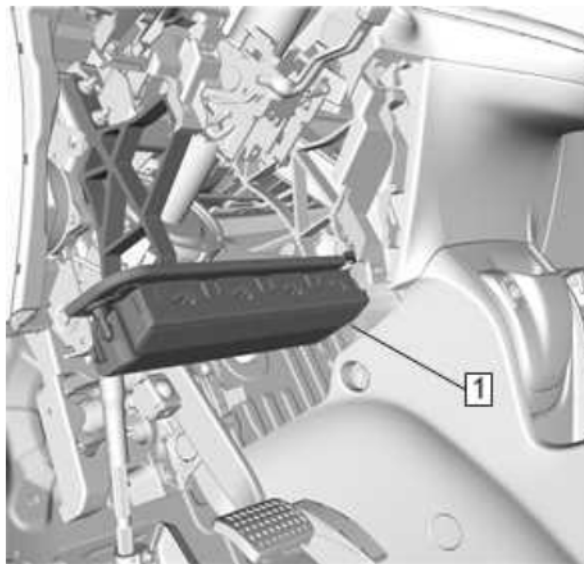


Fig. 30: Instrument Panel Lower Airbag and Bracket Assembly

Courtesy of GENERAL MOTORS COMPANY

9. Instrument Panel Lower Airbag and Bracket Assembly - Remove - [**Instrument Panel Lower Airbag Bracket Replacement**](#)

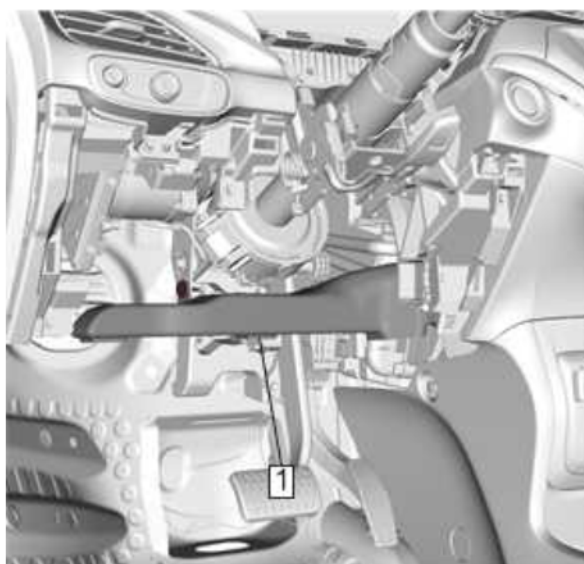


Fig. 31: Floor Front Air Outlet Duct - Left Side

Courtesy of GENERAL MOTORS COMPANY

10. Floor Front Air Outlet Duct - Left Side - Remove - [Floor Front Air Outlet Duct Replacement - Left Side](#)

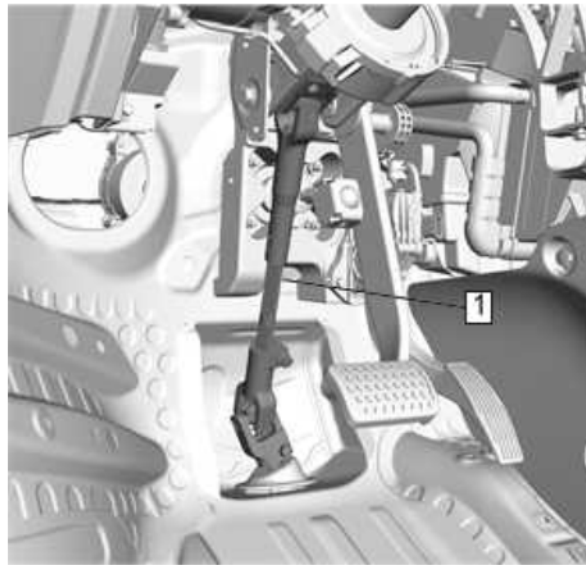


Fig. 32: Intermediate Steering Shaft

Courtesy of GENERAL MOTORS COMPANY

11. Intermediate Steering Shaft - Remove - [Intermediate Steering Shaft Replacement](#)
12. Disconnect the electric connectors from the steering column.
13. Remove the instrument panel wiring harness clips from the steering column.

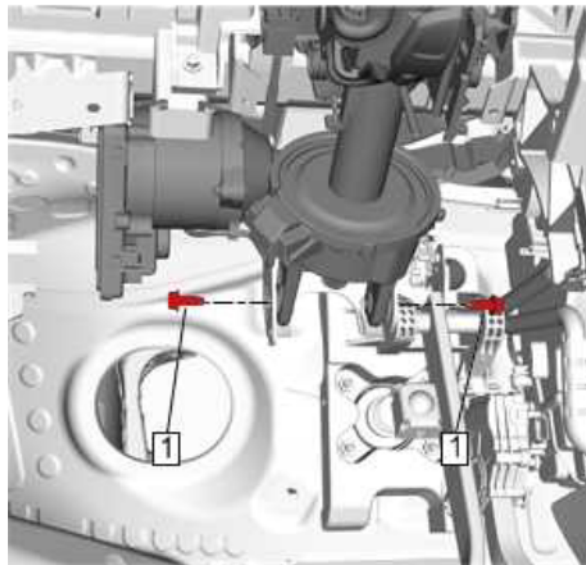


Fig. 33: Steering Column Lower Support Bracket Bolt

Courtesy of GENERAL MOTORS COMPANY

14. Steering Column Lower Support Bracket Bolt - Remove

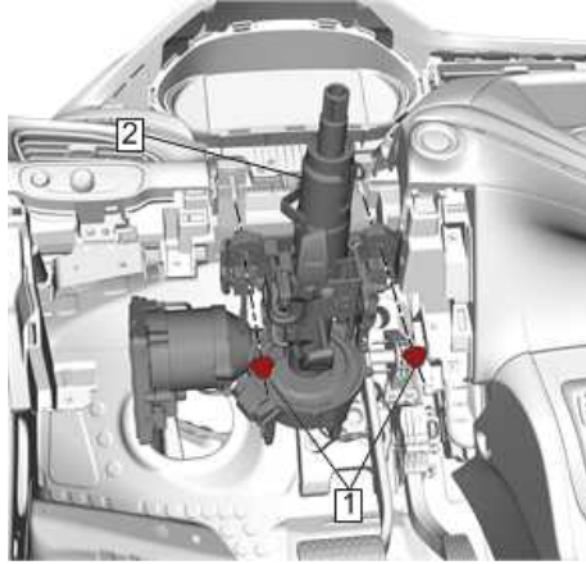


Fig. 34: Steering Column Support Bracket Nuts
Courtesy of GENERAL MOTORS COMPANY

NOTE: Support the steering column before removing the steering column support bracket nuts.

CAUTION: Once the steering column is removed from the vehicle, the column is extremely susceptible to damage. Dropping the column assembly on the end could collapse the steering shaft or loosen the plastic injections, which maintain column rigidity. Leaning on the column assembly could cause the jacket to bend or deform. Any of the above damage could impair the columns collapsible design. Do NOT hammer on the end of the shaft, because hammering could loosen the plastic injections, which maintain column rigidity. If you need to remove the steering wheel, refer to the Steering Wheel Replacement procedure in this section.

15. Steering Column Upper Support Bracket Nut - Remove
16. Steering Column at Vehicle - Remove

Installation Procedure

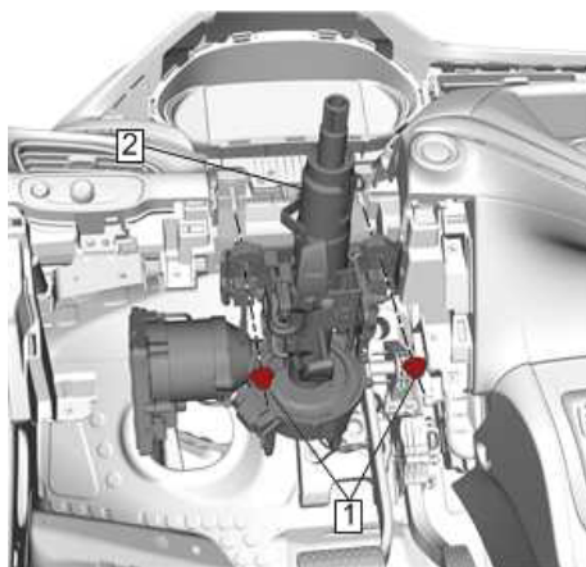


Fig. 35: Steering Column Support Bracket Nuts
Courtesy of GENERAL MOTORS COMPANY

1. Steering Column at Vehicle - Install

CAUTION: Refer to [Fastener Caution](#) .

2. Steering Column Upper Support Bracket Nut - Install and tighten to 22 N.m (16 lb ft)

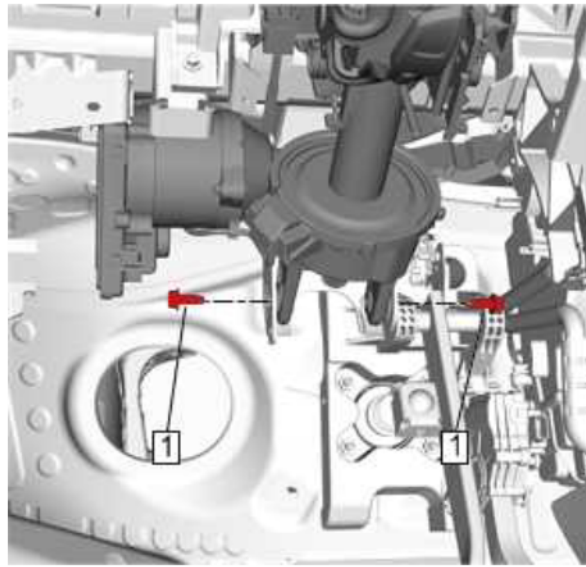


Fig. 36: Steering Column Lower Support Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Steering Column Lower Support Bracket Bolt - Install and tighten to 22 N.m (16 lb ft)
4. Install the instrument panel wiring harness clips to the steering column.
5. Connect the electric connectors to the steering column.

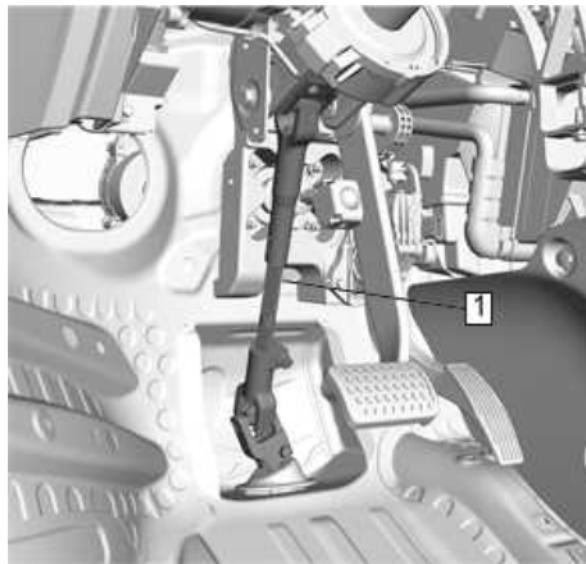


Fig. 37: Intermediate Steering Shaft
Courtesy of GENERAL MOTORS COMPANY

6. Intermediate Steering Shaft - Install - [Intermediate Steering Shaft Replacement](#)

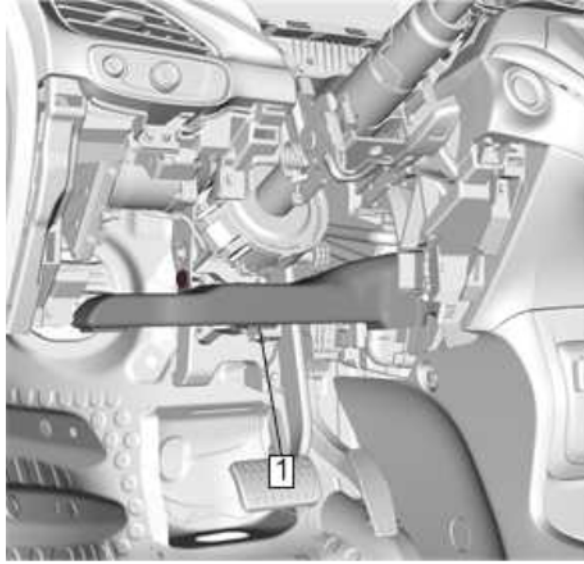


Fig. 38: Floor Front Air Outlet Duct - Left Side
 Courtesy of GENERAL MOTORS COMPANY

7. Floor Front Air Outlet Duct - Left Side - Install - **Floor Front Air Outlet Duct Replacement - Left Side**

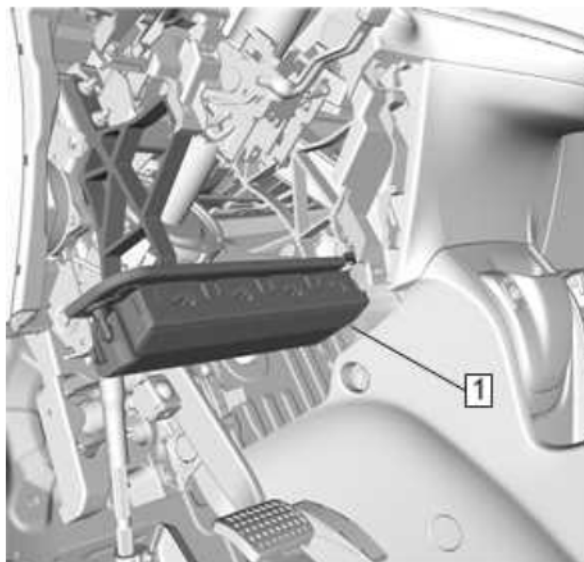
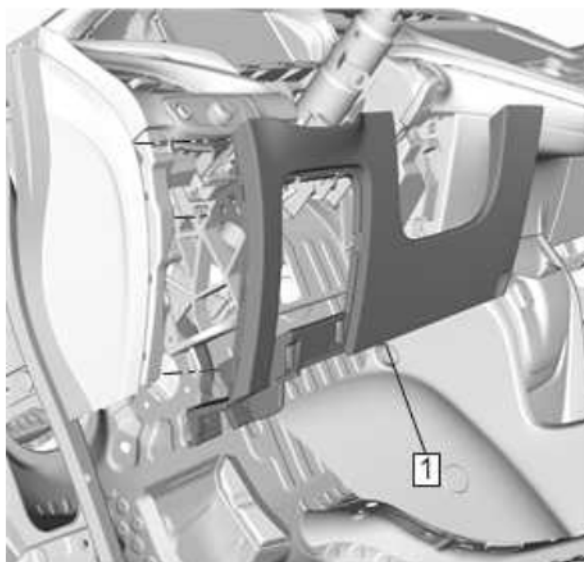


Fig. 39: Instrument Panel Lower Airbag and Bracket Assembly
 Courtesy of GENERAL MOTORS COMPANY

8. Instrument Panel Lower Airbag and Bracket Assembly - Install - **Instrument Panel Lower Airbag Bracket Replacement**



9. Instrument Panel Knee Bolster - Install - [**Instrument Panel Knee Bolster Replacement**](#)

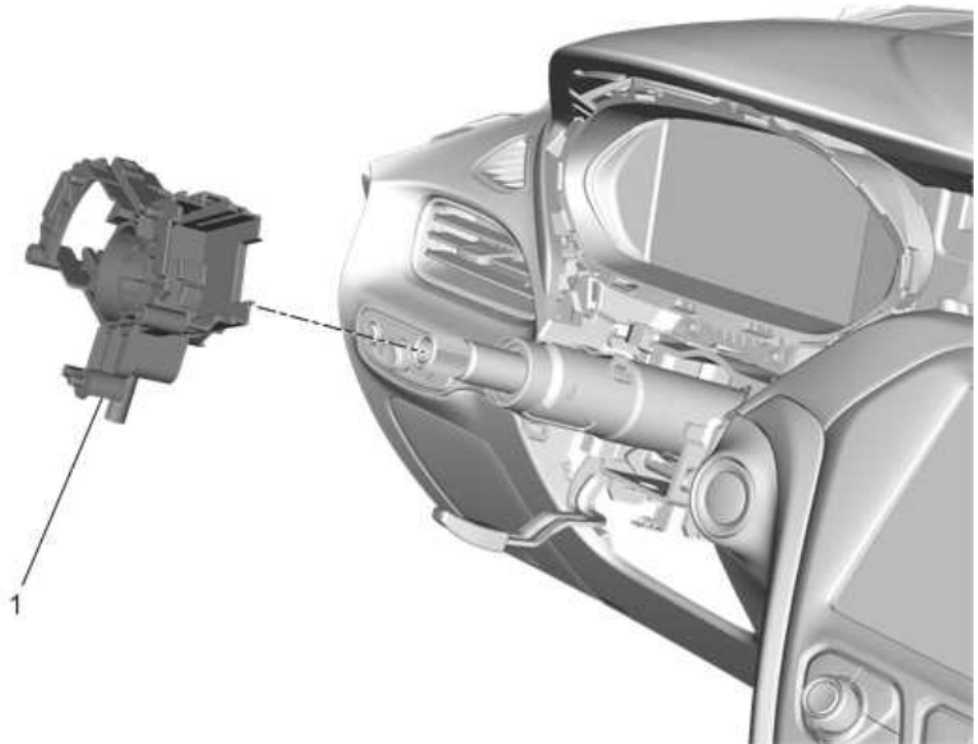


Fig. 41: Turn Signal Switch Bracket
Courtesy of GENERAL MOTORS COMPANY

10. Turn Signal Switch Bracket - Install - [**Turn Signal Switch Bracket Replacement**](#)

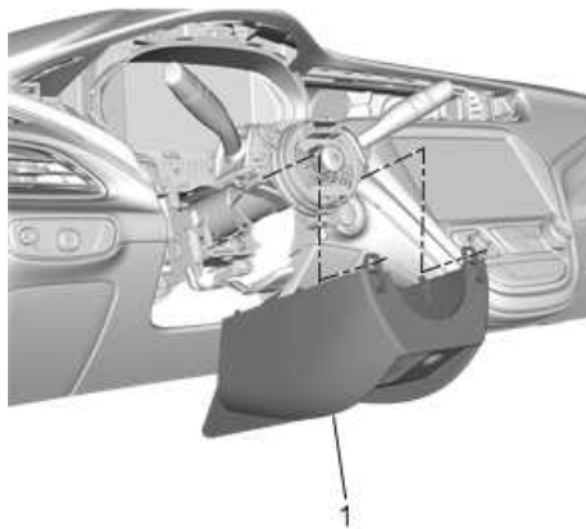


Fig. 42: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

11. Steering Column Lower Trim Cover - Install - [**Steering Column Lower Trim Cover Replacement**](#)
12. Steering Column Upper Trim Cover at Steering Column Lower Trim Cover - Install - [**Steering Column Upper Trim Cover Replacement**](#)
13. Steering Wheel - Install - [**Steering Wheel Replacement**](#)
14. Steering Wheel Airbag - Install - [**Steering Wheel Airbag Replacement**](#)
15. Enable the SIR System. [**SIR Disabling and Enabling**](#)
16. Program the electronic power steering control module. [**Control Module References**](#)

DESCRIPTION AND OPERATION

STEERING WHEEL AND COLUMN DESCRIPTION AND OPERATION

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

Vehicle Steering

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

The steering column can be adjusted vertically and longitudinally.

Vehicle Security

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch
- The steering column lock
- The ignition cylinder
- The theft deterrent immobilizer module, if equipped

Driver Convenience

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on the steering wheel or column.

- The turn signal switch
- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad
- The redundant radio/entertainment system controls
- The tilt functions
- The telephone system controls

Driver Safety

The steering wheel and column has safety features to protect the driver. The following components may be mounted on or near the steering column:

Energy-Absorbing Steering Column: The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The energy-absorbing feature, collapsible steering shaft, and break away mounting features help reduce the injury in the event of an accident.

SIR Coil and Module: For additional information on the operation of the SIR coil and module, refer to [Supplemental Inflatable Restraint System Description and Operation](#) .

Steering Wheel Angle Sensor: The steering wheel angle sensor is located somewhere along the steering shaft assembly. The sensor measures the position of the steering wheel and the speed at which it is rotated. A signal representing this measurement is provided to the electronic stability control (ESC) in the ABS module.

The Theft Deterrent Immobilizer Module: The immobilizer module is mounted in the steering column lock on cars without Passive Entry Passive Start system (PEPS). Refer to [Immobilizer Description and Operation](#) .
