

STEERING

Steering Wheel and Column - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Instrument Panel Steering Column Lower Trim Cover Fastener	2.5 N.m	22 lb in
Intermediate Steering Shaft Lower Bolt	50 N.m	37 lb ft
Intermediate Steering Shaft Upper Bolt	50 N.m	37 lb ft
Steering Column Bracket Bolt	25 N.m	18 lb ft
Steering Column Control Module Bolt	7 N.m	62 lb in
Steering Column Control Module Bracket Bolt	7 N.m	62 lb in
Steering Column Electronic Lock Bolt	8 N.m	71 lb in
Steering Column Lock Control Module Bolt (Front)	8 N.m	71 lb in
Steering Column Lock Control Module Bolt (Side)	8 N.m	71 lb in
Steering Column Telescope Actuator Bracket Bolt (Lower)	14 N.m	10 lb ft
Steering Column Telescope Actuator Bracket Bolt (Middle)	5 N.m	44 lb in
Steering Column Telescope Actuator Bracket Bolt (Upper)	8 N.m	71 lb in
Steering Column Tilt Wheel Actuator Bracket Bolt	14 N.m	10 lb ft
Steering Wheel Bolt	30 N.m	22 lb ft

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Steering Column Telescope Actuator Bracket Bolt (Upper)	Threadlocker	12345382	10953489
Steering Wheel Bolt	Threadlocker	12345382	10953489

SCHEMATIC WIRING DIAGRAMS

COLUMN LOCK WIRING SCHEMATICS

cardiaqn.com

Steering Column Lock (ULS) Wiring Schematics

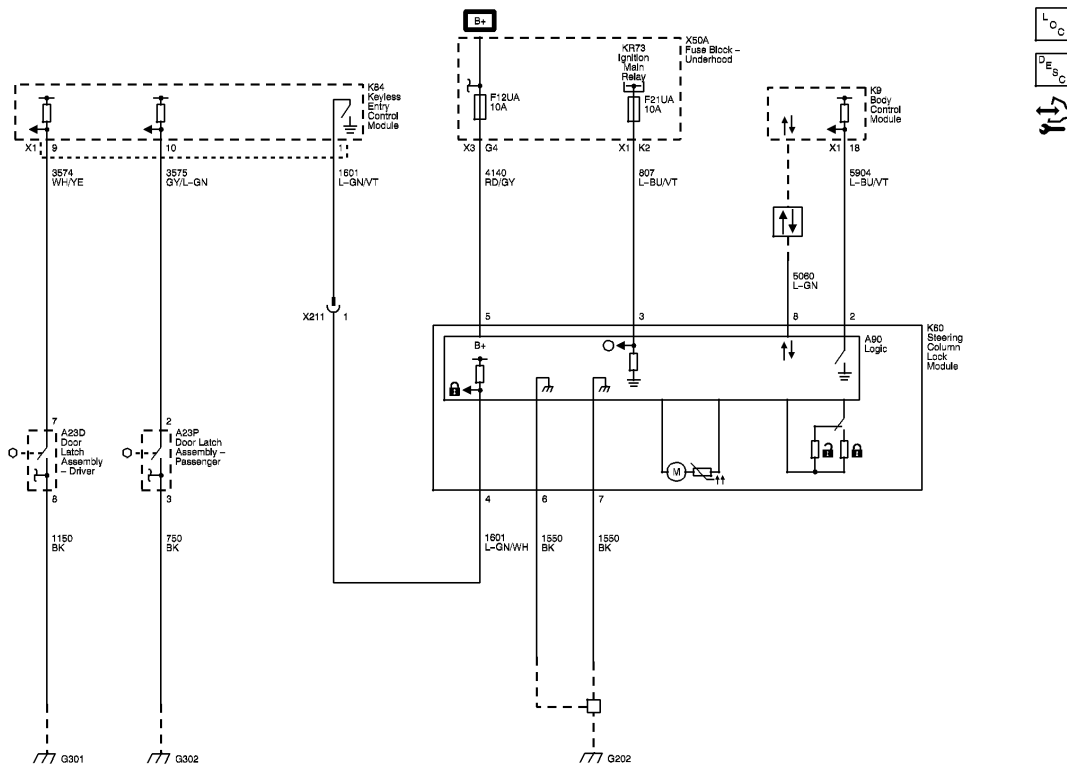


Fig. 1: Steering Column Lock (ULS) Wiring Schematic
 Courtesy of GENERAL MOTORS COMPANY

TILT/TELESCOPING STEERING COLUMN WIRING SCHEMATICS

Tilt/Telescoping Steering Column Wiring Schematics

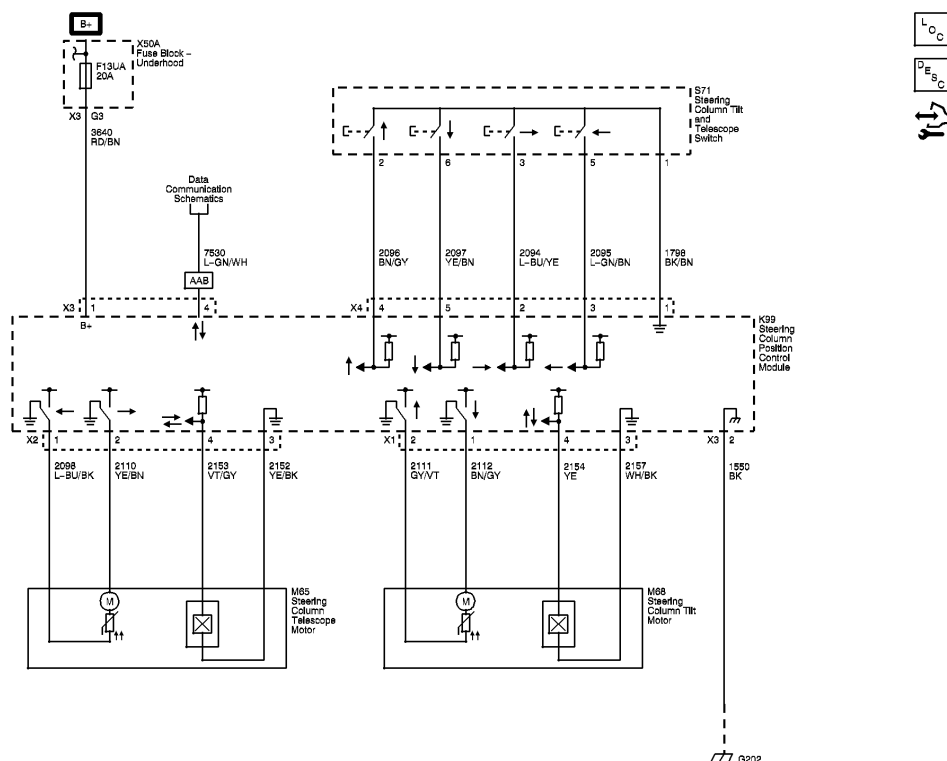


Fig. 2: Tilt/Telescoping Steering Column Wiring Schematics
 Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B1023</u>	DTC B1023 00 Integral Switch Malfunction
<u>DTC B144C</u>	DTC B144C 01 Inverted Run/Start Power Relay Circuit Short to Battery
	DTC B144C 06 Inverted Run/Start Power Relay Circuit Low Voltage/Open
<u>DTC B2515</u>	DTC B2515 5A Steering Column Lock Motor Feedback Circuit Not Plausible
<u>DTC B285A</u>	DTC B285A 39 Steering Column Position Module Internal Malfunction
	DTC B285A 4B Steering Column Position Module Calibration Not Learned
<u>DTC B2897</u>	DTC B2897 02 Steering Column Lock Motor

	DTC B2897 05 Steering Column Lock Motor Lock Circuit High Voltage/Open
<u>DTC B2910</u>	DTC B2910 00 Steering Column Lock Password Incorrect
<u>DTC B305A</u>	DTC B305A 00 No Response From Steering Column Lock Received

DTC B1023: INTEGRAL SWITCH 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.

DTC Descriptor

DTC B1023 00

Integral Switch Malfunction

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

The steering column lock module detects an internal sensor malfunction resulting in lock status of invalid to be transmitted on serial data.

Action Taken When the DTC Sets

- DTC B1023 is stored in memory.
- The driver information center displays the service column lock system warning message.
- The steering column lock indicator is ON.

Conditions for Clearing the DTC

- No steering column lock module internal sensor malfunction so lock status of valid is transmitted on serial data.
- The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Column Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

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. Clear all DTCs.
2. Verify that the DTC does not set while operating the integral switch at the steering column lock within the conditions for running the DTC.
 - **If the DTC sets**

Replace the K60 Steering Column Lock Module.
 - **If the DTC does not set**
3. All OK.

Repair Instructions

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

Control Module References for steering column lock module replacement, programming and setup.

DTC B144C: INVERTED RUN/START POWER RELAY

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B144C 01

Inverted Run/Start Power Relay Circuit Short to Battery

DTC B144C 06

Inverted Run/Start Power Relay Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B144C 06	B144C 06	B144C 01	-

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering column electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The system voltage is between 9-16 V.
- The DTC can only run when the steering column lock module is awake.

Conditions for Setting the DTC

B144C 01

The steering column lock module detects a short to voltage when the power mode is in the RUN or CRANK for greater than 5 s.

B144C 06

The steering column lock control detects a short to ground or an open in the ignition circuit when the power mode is in the OFF/ACC for greater than 3 s.

Action Taken When the DTC Sets

- The steering column lock module will command the driver information center to display the service column lock warning message.
- The steering column lock module indicator is ON.

Conditions for Clearing the DTC

- The DTC will be current for as long as the fault is present.
- The DTC will be a history DTC when the voltage is present and the power mode is OFF or ACC or when voltage is not present and the power mode is RUN or CRANK.
- A history DTC will clear after 50 ignition cycles.

Reference Information

Schematic Reference

- **Column Lock Schematics**
- **Power Moding Schematics**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

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 that DTC B144B is not set.

- **If DTC B144B is set**

Refer to **DTC B144B**

- **If DTC B144B is not set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

B144C 01

1. Ignition OFF, disconnect the harness connector at the K60 Steering Column Lock Module.
2. Test for less than 1 V between the ignition circuit terminal 3 and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

3. Replace the K60 Steering Column Lock Module.

B144C 06

1. Ignition OFF, disconnect the harness connector at the K60 Steering Column Lock Module.
2. Connect a test lamp between the ignition circuit terminal 3 and ground. Ignition ON.
3. Verify that a test lamp illuminates between the ignition circuit terminal 3 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 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, verify the fuse is not open and there is voltage at the fuse. Refer to **Power Mode Mismatch**

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF, remove the test lamp
2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K60 Steering Column Lock Module.

- **If the test lamp illuminates**

4. Replace the K60 Steering Column Lock Module.

Repair Instructions

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

Control Module References for the steering column lock module replacement, programming and setup.

DTC B2515: STEERING COLUMN LOCK MOTOR FEEDBACK

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B2515 5A

Steering Column Lock Motor Feedback Circuit Not Plausible

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

The body control module (BCM) detects a not plausible feedback from the steering column lock module.

Action Taken When the DTC Sets

- DTC B2515 is stored in memory.
- The driver information center displays the service column lock system warning message.
- The steering column lock indicator is ON.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The BCM detects a plausible feedback from the steering column lock module.

Reference Information

Schematic Reference

Column Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

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. Clear all DTCs.
2. Verify DTC B2515 does not set while operating the steering column lock module within the conditions for running the DTC.
 - **If DTC B2515 sets**

Refer to Circuit/System Testing.
 - **If DTC B2515 does not set**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the K60 Steering Column Lock Module.
2. Test for less than 1 V between the control circuit terminal 2 and ground.
 - **If 1 V or greater**
 1. Disconnect the harness connector at the K9 Body Control Module. Ignition ON.
 2. Test for less than 1 V between the control circuit terminal 2 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.

- **If less than 1 V**

3. Ignition ON.

4. Test for B+ between the control circuit terminal 2 and ground.

- **If less than B+**

1. Disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 ohms in the signal circuit terminal 2 end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms

4. Replace the K9 Body Control Module.

- **If B+**

5. Replace the K60 Steering Column Lock Module.

Repair Instructions

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

Control Module References for steering column lock control module and body control module replacement, programming and setup.

DTC B285A: STEERING COLUMN POSITION MODULE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B285A 39

Steering Column Position Module Internal Malfunction

DTC B285A 4B

Steering Column Position Module Calibration Not Learned

The steering column has a tilt/telescoping control system that consists of an steering column position control module capable of serial data communication, a steering column power assembly with positioning motors and sensors, and a steering column tilt and telescope switch. The steering column position control module will wake up either by the serial data or by the steering column tilt and telescope switch.

Two position sensors are hall effect sensors and are used by the steering column position control module. The steering column position control module provides a 5 V reference voltage and a ground to both the tilt and telescoping position sensors. The sensor feedback circuit voltage varies from 0-5 V. Each sensor is part of the motor assembly. The steering column position control module monitors the feedback voltage to determine the column position.

All DTCs and data from steering column position control module is communicated through the serial data and stored in the seat memory control module.

Reference Information

Schematic Reference

Tilt/Telescoping Steering Column Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

Electrical Information Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC B285A 39 or B285A 4B is not set.
 - **DTC B285A 39 is set**

Replace the K99 Steering Column Position Control Module.
 - **DTC B285A 4B is set**

Steering Column Tilt Wheel and Telescope Control Module Learn

2. Verify that DTC B285A 39 does not reset.
 - DTC B285A 4B is set, replace the K99 Steering Column Position Control Module.
 - DTC B285A 4B is not set
3. All OK
 - **DTC B285A 39 or B285A 4B is not set.**
3. All OK.

Repair Instructions

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

Control Module References for steering column position control module replacement, programming, and setup.

DTC B2897: STEERING COLUMN LOCK MOTOR

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B2897 02

Steering Column Lock Motor Lock Circuit Short to Ground

DTC B2897 05

Steering Column Lock Motor Lock Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Steering Column Lock Motor Lock Signal	B2897 02	B2897 05	B2897 05	-

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is

unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B2897 02

The steering column lock enable input circuit is shorted to ground.

B2897 05

The steering column lock enable input circuit is open or shorted to battery.

Action Taken When the DTC Sets

- DTC B2897 is stored in the steering column lock module memory.
- The steering column lock module will command the driver information center to display the Service Column Lock warning message.
- The steering column lock module indicator is ON.

Conditions for Clearing the DTC

The steering column lock module has received a lock command and detects no longer a malfunction in the steering column lock circuit.

Reference Information

Schematic Reference

Column Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

Electrical Information Reference

- **Circuit Testing**

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the K60 Steering Column Lock Module. Ignition ON.
2. Test for less than 1 V between the control circuit terminal 4 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**
3. Ignition OFF.
 4. Test for infinite resistance between the control circuit terminal 4 and ground.
 - **If less than infinite resistance**
 1. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
 2. Test for infinite resistance between the control circuit terminal 4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K84 Keyless Entry Control Module.
 - **If infinite resistance**
 5. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
 6. Test for less than 2 ohms in the harness connector control circuit terminal 4 at the K60 Steering Column Lock Module end to end.
 - **If 2 ohms or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 ohms**
7. Replace the K60 Steering Column Lock Module.

Repair Instructions

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

Control Module References for steering column lock module or keyless entry control module replacement, programming and setup.

DTC B2910: STEERING COLUMN LOCK PASSWORD INCORRECT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B2910 00

Steering Column Lock Password Incorrect

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

The steering column lock module has not received the correct password or did not receive a password with the command to unlock the steering column.

Action Taken When the DTC Sets

- DTC B2910 is stored in memory.
- The driver information center displays the Service Column Lock warning message.
- The steering column lock indicator is ON.
- The engine will not crank.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The steering column lock module has received the correct password with the command to unlock the steering column.

Diagnostic Aids

This DTC may set if the BCM was replaced and the steering column lock module was not programmed.

Reference Information

Schematic Reference

Column Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

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. Clear all DTCs.
2. Verify DTC B2910 does not set while operating the steering column lock module within the conditions for running the DTC.
 - **If DTC B2910 sets**
 1. Program the K60 Steering Column Lock Module.
 2. Ignition ON. Clear all DTCs.
 3. Verify DTC B2910 does not set while operating the steering column lock module within the conditions for running the DTC.
 - If DTC B2910 sets, replace the K60 Steering Column Lock Module.
 - If DTC B2910 does not set
 4. All OK.
 - **If DTC B2910 does not set**
3. All OK.

Repair Instructions

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

Control Module References for steering column lock module replacement, programming and setup.

DTC B305A: STEERING COLUMN LOCK PASSWORD INCORRECT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B305A 00

No Response From Steering Column Lock Received

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Steering Column Lock Status Signal	B305A 00	B305A 00	B305A 00	-

Circuit/System Description

The vehicle theft deterrent subsystem provides the capability to lock or unlock the steering electrically. The steering column lock module is allowed to unlock when power mode transitions to a non off power mode and an authenticated driver identification device is present. Once the column is unlocked, a crank request can be allowed.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

The body control module (BCM) has not received any response from the steering column lock module.

Action Taken When the DTC Sets

- DTC B305A is stored in the BCM memory.
- The driver information center displays the Service Steering Column Lock message.
- The steering column lock indicator is ON.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The BCM has received response from the steering column lock module.

Reference Information

Schematic Reference

Column Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

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. Clear all DTCs.
2. Verify DTC B305A does not set while operating the steering column lock module within the conditions for running the DTC.
 - **If DTC B305A sets**

Refer to Circuit/System Testing.
 - **If DTC B305A does not set**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the K60 Steering Column Lock Module.

2. Test for less than 1 V between the control circuit terminal 2 and ground.
 - **If 1 V or greater**
 1. Disconnect the harness connector at the K9 Body Control Module. Ignition ON.
 2. Test for less than 1 V between the control circuit terminal 2 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If less than 1 V**
3. Ignition ON.
4. Test for B+ between the control circuit terminal 2 and ground.
 - **If less than B+**
 1. Disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the signal circuit terminal 2 end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms
 4. Replace the K9 Body Control Module.
 - **If B+**
5. Replace the K60 Steering Column Lock Module.

Repair Instructions

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

Control Module References for steering column lock module and body control module replacement, programming and setup.

SYMPTOMS - STEERING WHEEL AND COLUMN

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

- Refer to **Diagnostic Starting Point - Vehicle** .
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to **Steering Wheel and Column Description and Operation (N38)**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the telescoping steering

column or the steering wheel theft deterrent lock system. 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 a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Steering Column Tilt/Telescoping Malfunction (N38)**
- **Noise in Steering Column**
- **Looseness in Steering Column**

STEERING COLUMN TILT/TELESCOPING MALFUNCTION (N38)

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	-	-
Tilt Switch Signal UP	2	2	-	-
Tilt Switch Signal DOWN	2	2	-	-
Telescope Switch Signal FORWARD	3	3	-	-
Telescope Switch Signal REARWARD	3	3	-	-
Tilt Motor Control	-	2	-	-
Telescope Motor Control	-	3	-	-
Tilt Motor Position Signal	4	4	-	4
Telescope Motor Position Signal	5	5	-	5
Switch Ground	-	1	-	-
Module Ground	-	1	-	-

- | |
|---|
| <ol style="list-style-type: none">2. Column Tilt Inoperative3. Column Telescope Inoperative4. Column Tilt Motor Inoperative\Erratic5. Column Telescope Motor Inoperative\Erratic |
|---|

Circuit/System Description

The steering column has a tilt/telescoping control system that consists of an steering column position control module capable of serial data communication, a steering column power assembly with positioning motors and sensors, and a steering column tilt and telescope switch. The steering column position control module will wake up either by the serial data or by the steering column tilt and telescope switch.

Two position sensors are hall effect sensors and are used by the steering column position control module. The steering column position control module provides a 5 V reference voltage and a ground to both the tilt and telescoping position sensors. The sensor feedback circuit voltage varies from 0-5 V. Each sensor is part of the motor assembly. The steering column position control module monitors the feedback voltage to determine the column position.

If the vehicle has memory seat option, all DTCs and data from steering column position control module is communicated through the serial data and stored in the seat memory control module. With the steering column at the Forward and Up soft stops, the steering column position voltage readings will be 5.0 V. With the steering column at the Rearward and Down soft stops, the steering column position voltage readings will be 0 V.

Diagnostic Aids

A bad hall effect will cause a tilt or telescope motor to move for only .5 s.

Reference Information

Schematic Reference

Tilt/Telescoping Steering Column Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel and Column Description and Operation (N38)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**

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

Circuit/System Verification

1. Ignition ON.

NOTE: Operate the steering column switch in each direction for more than 1 s.

NOTE: When performing the following tests, make sure that the steering column is not already in the position the test is attempting to produce.

2. Verify the steering column directional motors listed below operate while operating the S71 Steering Column Tilt and Telescope Switch in all directions.

- M65 Steering Column Telescope Motor
- M68 Steering Column Tilt Motor
- **If the M65 Steering Column Telescope Motor moves for only.5 s FORWARD or REARWARD**

1. Wait 5 s.

2. Operate the S71 Steering Column Tilt and Telescope Switch FORWARD and REARWARD.

- If the M65 Steering Column Telescope Motor moves for only.5 s FORWARD or REARWARD, replace the M65 Steering Column Telescope Motor

- **If the M65 Steering Column Telescope Motor does not operate FORWARD and REARWARD**

Refer to Circuit/System Testing - Steering Column Telescope Motor Control Circuit Test.

- **If the M68 Steering Column Tilt Motor moves for only.5 s UP and DOWN**

1. Wait 5 s.

2. Operate the S71 Steering Column Tilt and Telescope Switch UP and DOWN.

- If the M68 Steering Column Tilt Motor moves for only.5 s UP or DOWN, replace the M68 Steering Column Tilt Motor.

- **If the M68 Steering Column Tilt Motor does not operate UP and DOWN**

Refer to Circuit/System Testing - Steering Column Tilt Motor Control Circuit Test.

- **If both the M65 Steering Column Telescope Motor and the M68 Steering Column Tilt Motor do not operate in any direction**

Refer to Circuit/System Testing - Steering Column Tilt and Telescope Motor Control Circuit Test.

- **If both the M65 Steering Column Telescope Motor and the M68 Steering Column Tilt Motor operate**

3. All OK.

Circuit/System Testing

Steering Column Telescope Motor Control Circuit Test

1. Ignition OFF, disconnect the harness connector at the S71 Steering Column Tilt and Telescope Switch.
2. Test for less than 10 ohms between the low reference circuit terminal G 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, replace the K99 Steering Column Position Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Test for B+ between the signal circuits listed below and ground:
 - Terminal A
 - Terminal F
 - **If less than B+**
 1. Ignition OFF, disconnect the X4 harness connector at the K99 Steering Column Control Module.
 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
 3. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K99 Steering Column Position Control Module.
 - **If B+**

NOTE: When performing the following test, make sure that the steering column is not already in the position the test is attempting to produce.

5. Install a 3 A fused jumper wire between the signal circuits listed below and the ground circuit terminal G. Verify the steering column telescopes FORWARD and REVERSE to the soft stop.
 - Terminal A
 - Terminal F
 - **If the M65 Steering Column Telescope Motor does not operate**

1. Ignition OFF, disconnect the X2 harness connector at the K99 Steering Column Position Control Module.
2. Test for 0.6-1.0 ohms between terminal 1 and terminal 2.
 - If not within the specified range, replace the M65 Steering Column Telescope Motor.
 - If within the specified range, replace the K99 Steering Column Position Control Module.
 - **If the M65 Steering Column Telescope Motor operates**
6. Test or replace the S71 Steering Column Tilt and Telescope Switch.

Steering Column Tilt Motor Control Circuit Test

1. Ignition OFF, disconnect the harness connector at the S71 Steering Column Tilt and Telescope Switch.
2. Test for less than 10 ohms between the low reference circuit terminal G 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, replace the K99 Steering Column Position Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Test for B+ between the signal circuits listed below and ground:
 - Terminal B
 - Terminal C
 - **If less than B+**
 1. Ignition OFF, disconnect the X4 harness connector at the K99 Steering Column Position Control Module.
 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
 3. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K99 Steering Column Position Control Module.
 - **If B+**

NOTE: When performing the following test, make sure that the steering column is not already in the position the test is attempting to produce.

5. Install a 3 A fused jumper wire between the signal circuits listed below and the low reference circuit terminal G. Verify the steering column tilts UP and DOWN to the soft stop.

- Terminal B
- Terminal C

- **If the M68 Steering Column Tilt Motor does not operate**

1. Ignition OFF, disconnect the X1 harness connector at the K99 Steering Column Position Control Module.
2. Test for 0.6-1.0 ohms between terminal 1 and terminal 2.
 - If not within the specified range, replace the M68 Steering Column Tilt Motor.
 - If within the specified range, replace the K99 Steering Column Position Control Module.

- **If the M68 Steering Column Tilt Motor operates**

6. Test or replace the S71 Steering Column Tilt and Telescope Switch.

Steering Column Tilt and Telescope Motor Control Circuit Test

1. Ignition OFF and all vehicle systems OFF, disconnect the X3 harness connector at the K99 Steering Column Position Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the ground circuit terminal 2 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ground circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, repair the open/high resistance in the ground connection.
 - **If less than 10 ohms**
3. Ignition ON.
4. Verify a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the B+ circuit end to end.
 - If less than 2 ohms, verify the fuse is OK and there is voltage at the fuse.
 - If 2 ohms or greater
 3. Verify the fuse is OK and there is voltage at the fuse.
 - If the fuse is open, replace the K99 Steering Column Position Control Module.
 - If the 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 B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K99 Steering Column Position Control Module.

- **If the test lamp illuminates**
- 5. Ignition OFF, connect the X3 harness connector at the K99 Steering Column Position Control Module. Disconnect the harness connector at the S71 Steering Column Tilt and Telescope Switch.
- 6. Test for less than 10 ohms between the low reference circuit terminal G 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, replace the K99 Steering Column Position Control Module.
 - **If less than 10 ohms**
- 7. Replace the K99 Steering Column Position Control Module.

Component Testing

Steering Column Tilt/Telescope Switch Test

1. Ignition OFF, disconnect the harness connector at the S71 Steering Column Tilt and Telescope Switch.
2. Test for infinite resistance between the low reference terminal G and each signal terminal with the S71 Steering Column Tilt and Telescope Switch in the released position.
 - **If less than infinite resistance**

Replace the S71 Steering Column Tilt and Telescope Switch.

- **If infinite resistance**
- 3. Test for less than 2 ohms between the ground terminal G and each signal terminal with the S71 Steering Column Tilt and Telescope Switch in the pressed position.
 - **If 2 ohms or greater**

Replace the S71 Steering Column Tilt and Telescope Switch.

- **If less than 2 ohms**
- 4. All OK.

Steering Column Telescope Motor Test

1. Ignition OFF, disconnect the X2 harness connector at the K99 Steering Column Position Control Module.
2. Test for 0.6-1.0 ohms between terminal 1 and terminal 2.
 - **If not within the specified range**

- **If within the specified range**

3. All OK.

Steering Column Tilt Motor Test

1. Ignition OFF, disconnect the X1 harness connector at the K99 Steering Column Position Control Module.
2. Test for 0.6-1.0 ohms between terminal 1 and terminal 2.

- **If not within the specified range**

Replace the M68 Steering Column Tilt Motor.

- **If within the specified range**

3. All OK.

Repair Instructions

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

- **Steering Column Tilt Wheel and Telescope Switch Replacement**
-
-
- **Control Module References** for steering column position control module replacement, programming and setup.

NOISE IN STEERING COLUMN

Noise in Steering Column

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Steering Wheel and Column</u>
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: • The steering column mounting fasteners are loose. • The 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
5	If equipped, 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: Inspect the intermediate shaft for noise while driving the vehicle, turning the steering wheel, and applying the brakes. Inspect the intermediate shaft for noise. Is the intermediate shaft noisy?	Go to Step 14	Go to Step 15
9	NOTE: If the steering column mounting feature is damaged or sheared, replace the steering column. Refer to <u>Steering Column Replacement (Without Electronic Steering Column Lock)</u>, <u>Steering Column Replacement (With Electronic Steering Column Lock)</u>. Tighten the steering column mounting fastener to specifications. Refer to <u>Fastener Tightening Specifications</u> . Did you complete the repair?	Go to Step 15	-
10	Replace the SIR/SRS coil. Refer to <u>Steering Wheel Airbag Coil Replacement</u> . 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	-
	NOTE:		

12	If the steering column upper and/or lower bearings are not serviceable, replace the steering column. Refer to <u>Steering Column Replacement (Without Electronic Steering Column Lock)</u>, <u>Steering Column Replacement (With Electronic Steering Column Lock)</u>. Replace the upper and/or lower bearings, if serviceable. Did you complete the replacement?	Go to Step 15	-
13	Lubricate the tilt joint. Did you complete the repair?	Go to Step 15	-
14	Replace the appropriate steering intermediate shaft component. 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

Looseness in Steering Column

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Steering Wheel and Column</u>
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. - The steering column mounting fasteners are loose. - The 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 feature is damaged or sheared, replace the steering column. Refer to <u>Steering Column Replacement (Without Electronic Steering Column Lock)</u>, <u>Steering Column Replacement (With Electronic Steering</u>		

	<u>Column Lock</u>). Tighten the steering column mounting fastener to specifications. Refer to <u>Fastener Tightening Specifications</u>. Did you complete the repair?	Go to Step 7	-
6	NOTE: If the steering column upper and/or lower bearings are not serviceable, replace the steering column. Refer to <u>Steering Column Replacement (Without Electronic Steering Column Lock)</u>, <u>Steering Column Replacement (With Electronic Steering Column Lock)</u>. Replace the upper and/or lower bearings, if serviceable. Did you complete the repair?	Go to Step 7	-
7	Operate the steering column in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

INTERMEDIATE STEERING SHAFT REPLACEMENT

Special Tools

J-42640 Steering Column Anti-Rotation Pin

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the power vacuum brake booster. Refer to **Power Vacuum Brake Booster Replacement**.
2. Turn the steering wheel to the left to gain access to the intermediate steering shaft lower bolt (1).

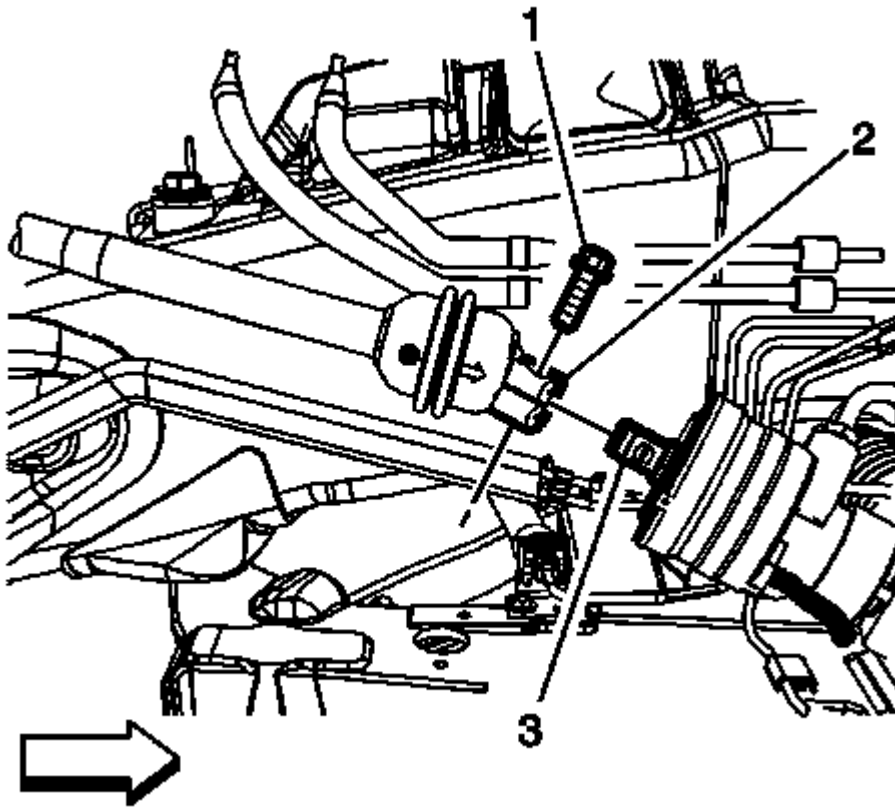


Fig. 3: Intermediate Steering Shaft Lower Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Remove the intermediate steering shaft lower bolt (1).
4. Straighten the steering wheel and center the front wheels of the vehicle.

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

has become un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

5. Use the **J-42640** anti-rotation pin to lock the steering column.

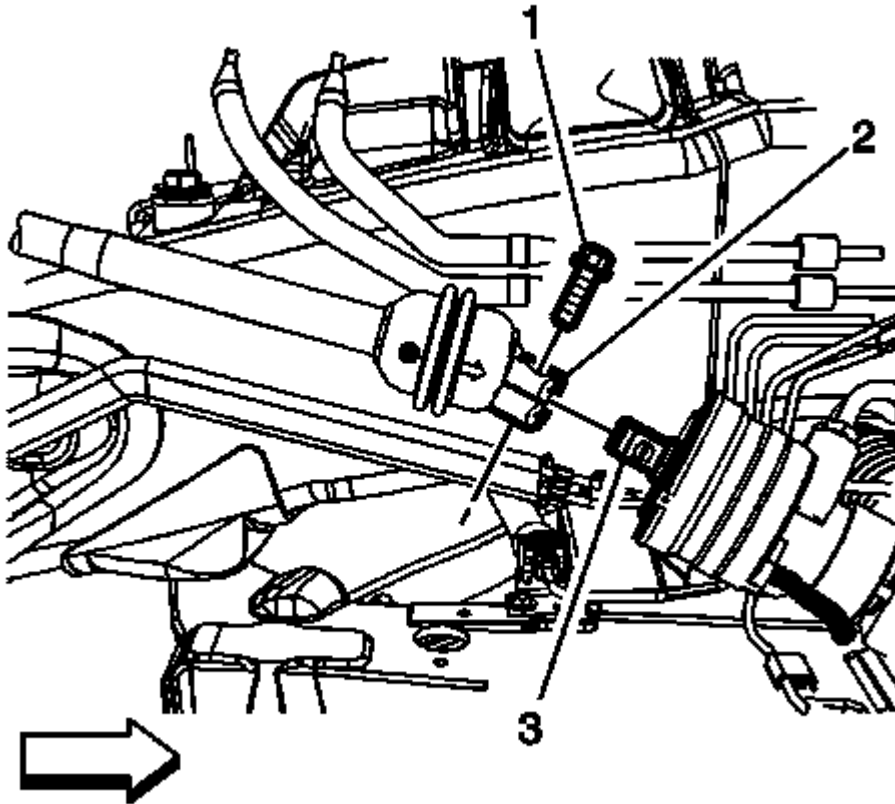


Fig. 4: Intermediate Steering Shaft Lower Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the intermediate steering shaft (2) from the steering gear (3).
7. Remove the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement**.

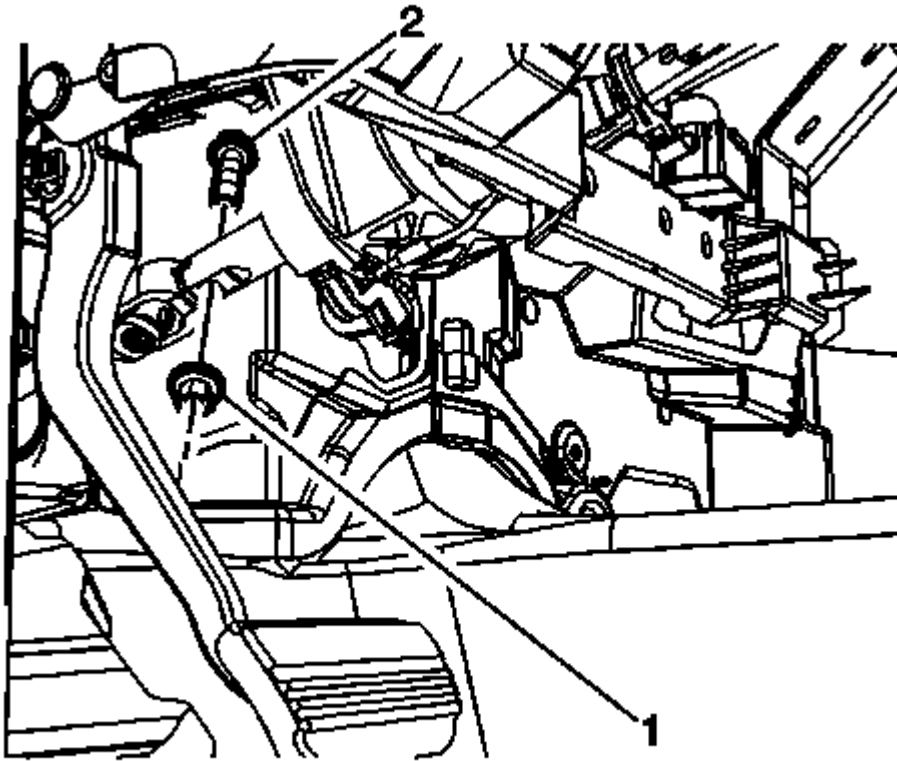


Fig. 5: Upper Steering Gear Coupling Nut And Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Remove the intermediate steering shaft upper nut (1) and bolt (2) and disconnect the intermediate steering shaft from the steering column.
9. Release the intermediate steering shaft seal and remove the intermediate steering shaft from the passenger compartment.

Installation Procedure

1. Position the intermediate steering shaft in the vehicle through the passenger compartment and secure the intermediate steering shaft seal.
2. Connect the intermediate steering shaft to the steering column.

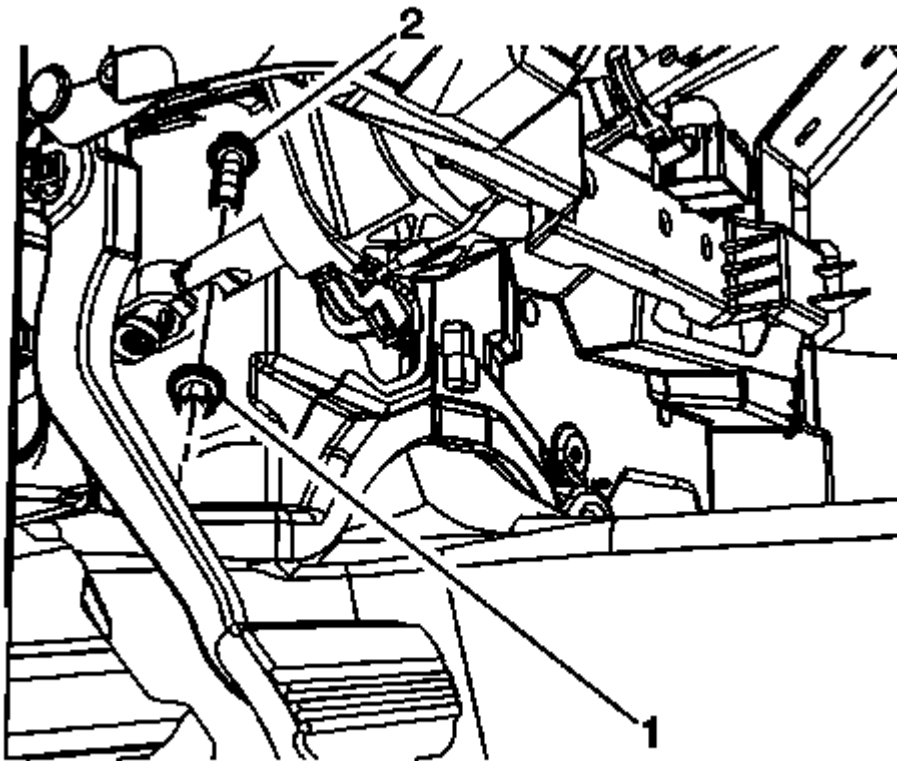


Fig. 6: Upper Steering Gear Coupling Nut And Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the intermediate steering shaft upper bolt (2) and nut (1) and tighten the bolt to 50 N.m (37 lb ft).
4. Install the instrument panel knee bolster. Refer to Instrument Panel Knee Bolster Replacement .

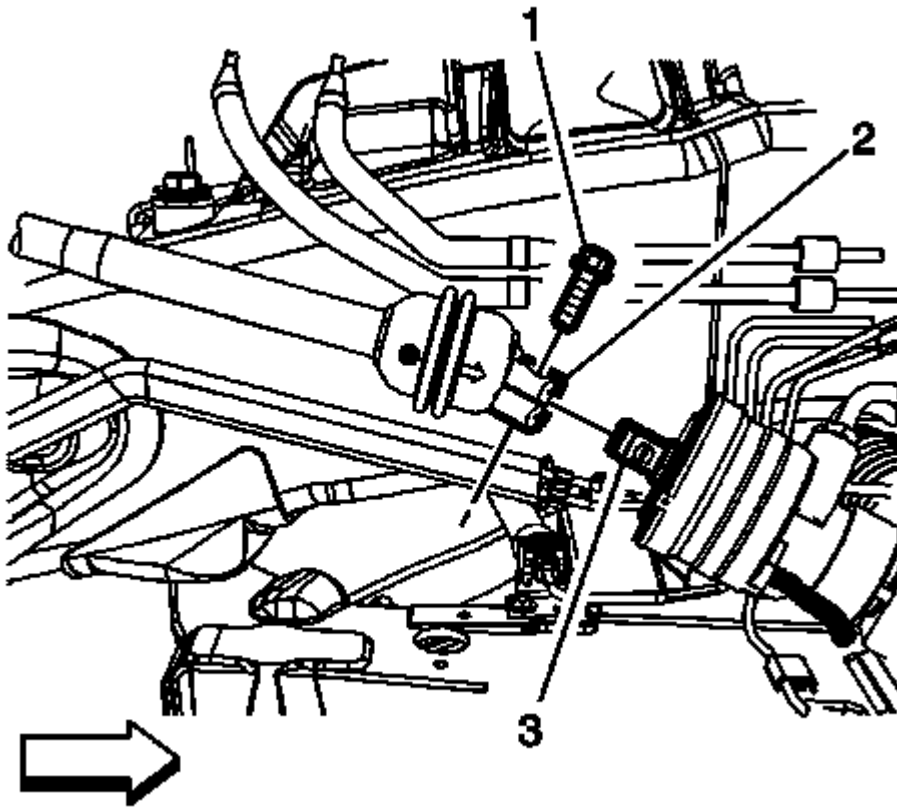


Fig. 7: Intermediate Steering Shaft Lower Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Connect the intermediate steering shaft (2) to the steering gear (3).
6. Remove the **J-42640** anti-rotation pin from the steering column.

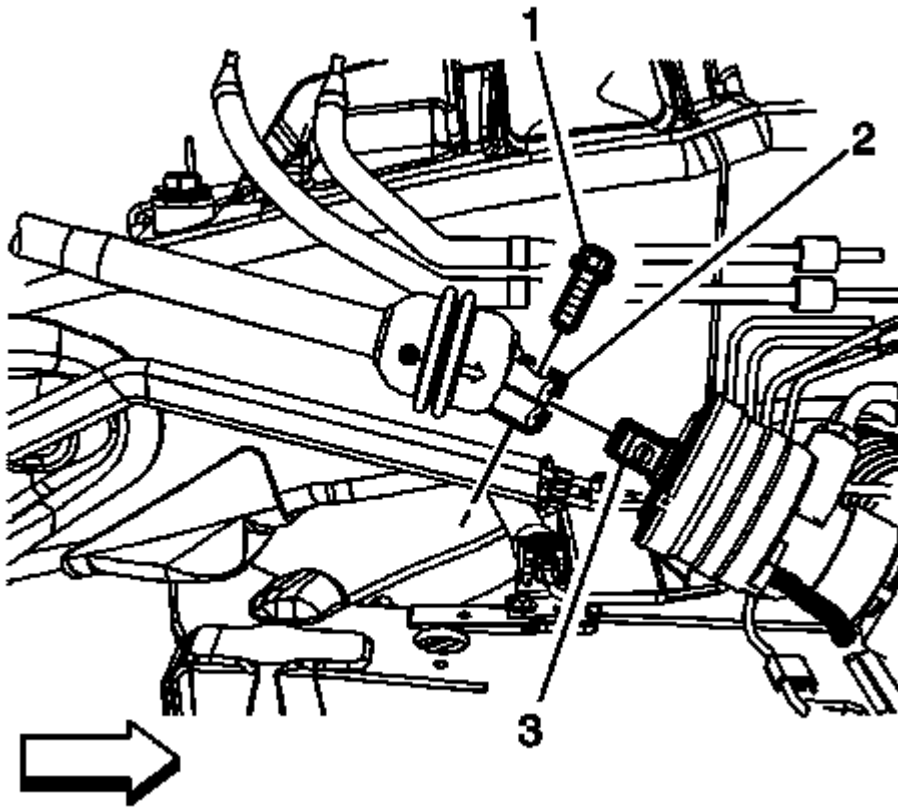


Fig. 8: Intermediate Steering Shaft Lower Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Turn the steering wheel as necessary and install the intermediate steering shaft lower bolt (1).
8. Tighten the intermediate steering shaft lower bolt (1) to 50 N.m (37 lb ft).
9. Install the power vacuum brake booster. Refer to **Power Vacuum Brake Booster Replacement** .

STEERING COLUMN ACCIDENT DAMAGE INSPECTION

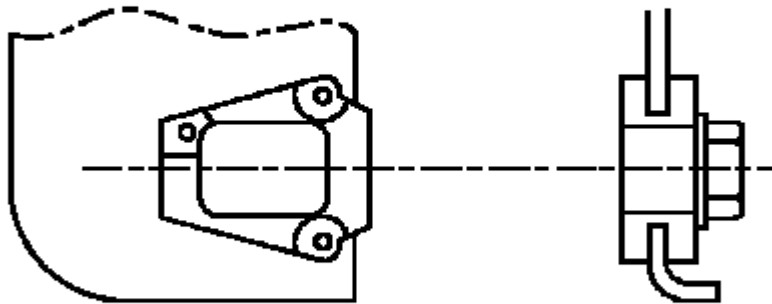


Fig. 9: Inspecting Capsules On Steering Column Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Vehicles involved in accidents that result in any of the following kinds of damage or situations, may also have a damaged or misaligned steering column:

- Frame damage
 - Major body damage
 - Sheet metal damage
 - If the steering column has been impacted
 - If the supplemental inflatable restraints system was deployed
-
- Inspect the capsules on the steering column bracket assembly. All capsules must be securely seated in the bracket slots and inspected for any loose conditions when pushed or pulled by hand.
 - If the capsules are not securely seated, replace the column assembly.
 - Any frame damage that could cause a bent steering shaft must have the steering shaft runout checked. Using a dial indicator at the lower end of the steering shaft, rotate the steering wheel.

STEERING COLUMN UPPER TRIM COVER REPLACEMENT

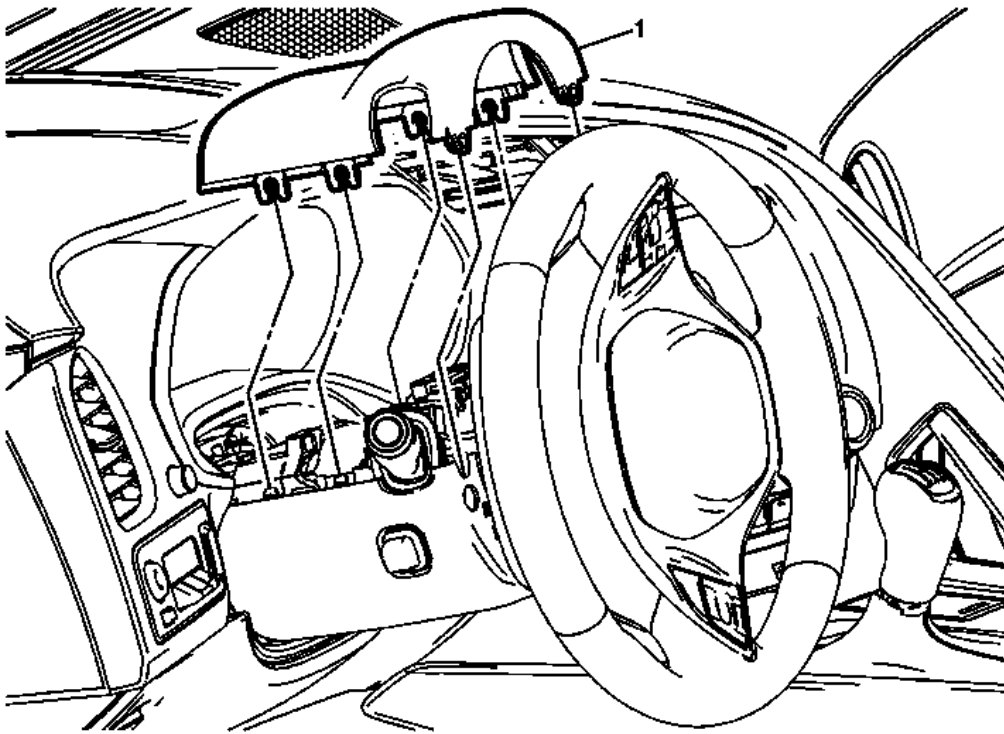


Fig. 10: Steering Column Upper Trim Cover
Courtesy of GENERAL MOTORS COMPANY

Steering Column Upper Trim Cover Replacement

Callout	Component Name
	Instrument Panel Steering Column Upper Trim Cover
1	Procedure 1. Telescope the steering column to its most extended position. 2. Turn the steering wheel for access. 3. Use a flat bladed plastic trim tool in order to release the tabs securing the upper trim cover to the lower trim cover.

STEERING COLUMN LOWER TRIM COVER REPLACEMENT

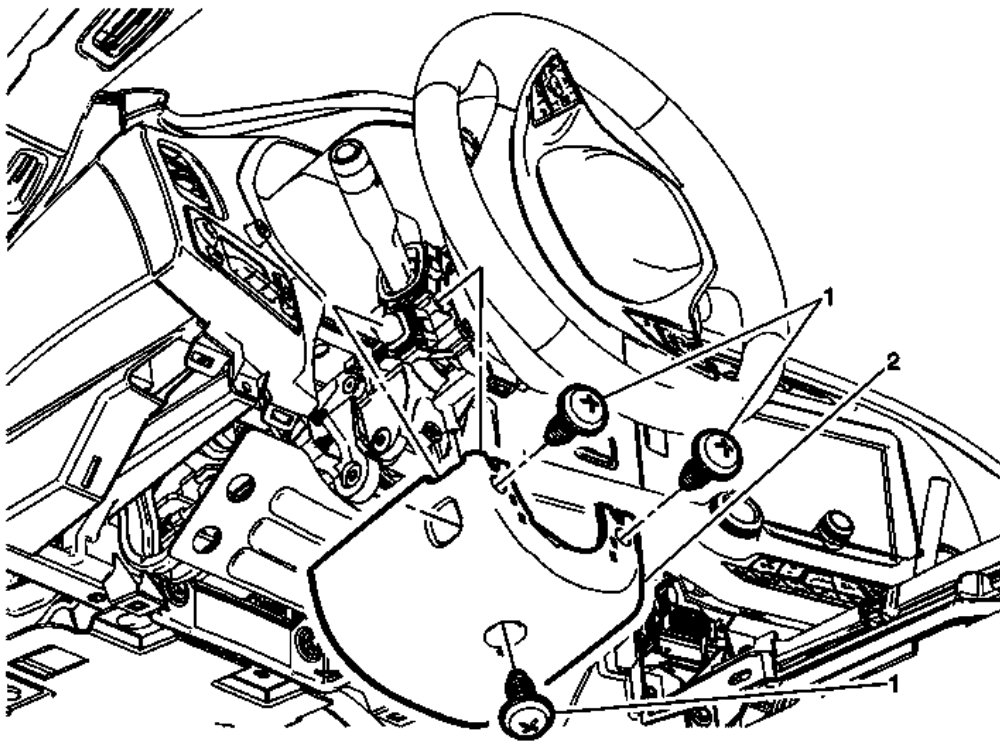


Fig. 11: Steering Column Lower Trim Cover
Courtesy of GENERAL MOTORS COMPANY

Steering Column Lower Trim Cover Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the steering column upper trim cover. Refer to <u>Steering Column Upper Trim Cover Replacement</u>. 2. Remove the instrument panel knee bolster. Refer to <u>Instrument Panel Knee Bolster Replacement</u>.	
1	Instrument Panel Steering Column Lower Trim Cover Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 (22 lb in)
2	Instrument Panel Steering Column Lower Trim Cover Procedure Turn the steering wheel left and right to access the fasteners securing the lower trim cover to the turn signal switch bracket.

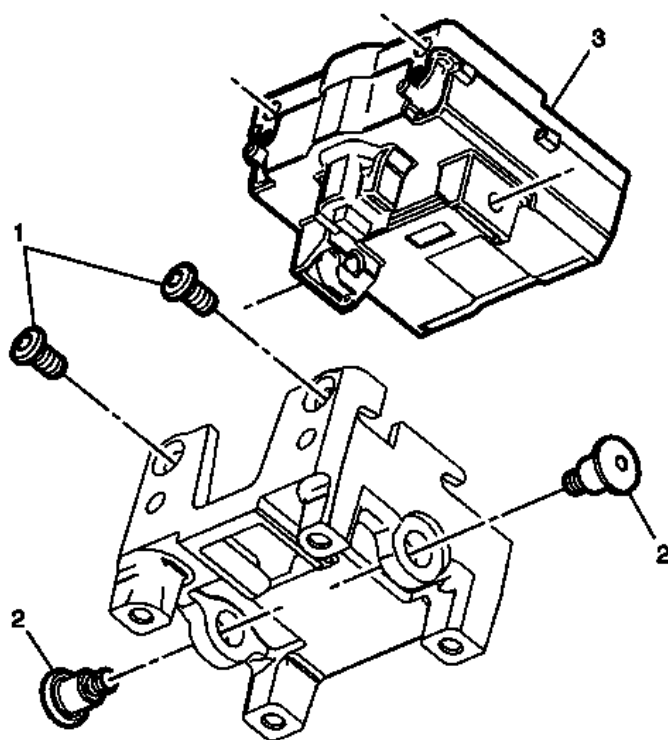


Fig. 12: Steering Column Lock Control Module
 Courtesy of GENERAL MOTORS COMPANY

Steering Column Lock Control Module Replacement

Callout	Component Name
Preliminary Procedures Remove the steering column electronic lock. Refer to <u>Steering Column Electronic Lock Replacement</u> .	
1	Steering Column Lock Control Module Front Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 8 N.m (71 lb in)
2	Steering Column Lock Control Module Side Bolt (Qty: 2) Tighten 8 N.m (71 lb in)
3	Steering Column Lock Control Module

STEERING COLUMN CONTROL MODULE REPLACEMENT

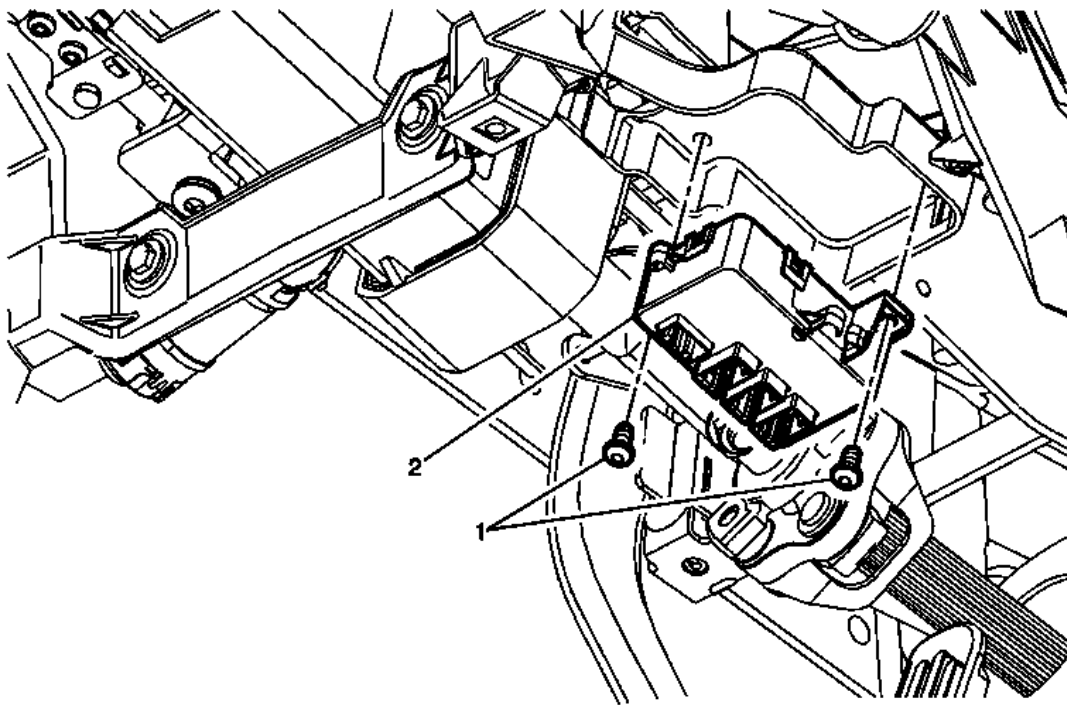


Fig. 13: Steering Column Control Module
Courtesy of GENERAL MOTORS COMPANY

Steering Column Control Module Replacement

Callout	Component Name
Preliminary Procedures Remove the left side instrument panel insulator panel. Refer to <u>Instrument Panel Insulator Panel Replacement - Left Side</u> .	
1	Steering Column Control Module Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 7 N.m (62 lb in)
2	Steering Column Control Module

STEERING COLUMN CONTROL MODULE BRACKET REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .

Panel Replacement - Left Side .

3. Remove the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement** .
4. Disconnect the electrical connectors from the steering column control module and bracket.

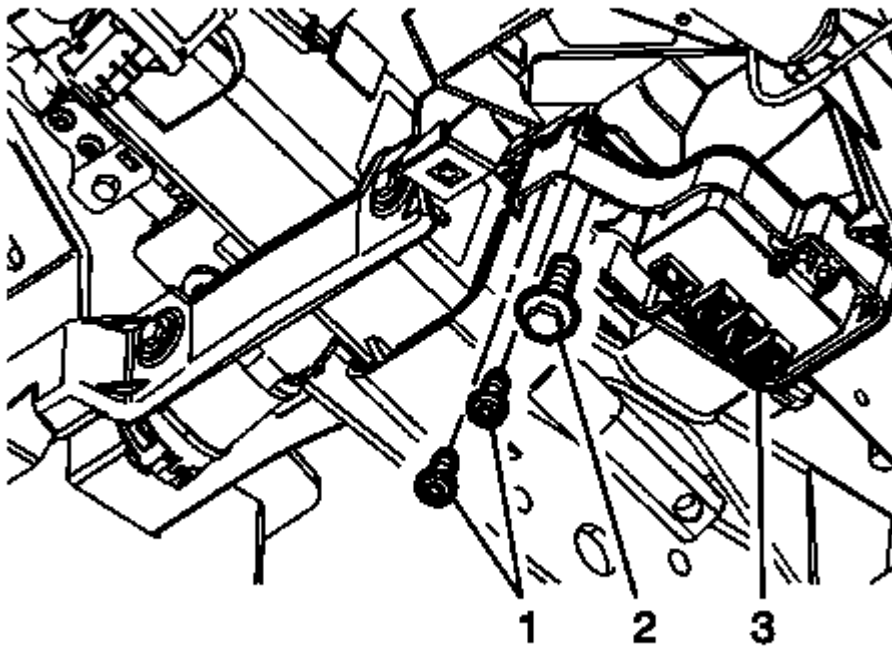


Fig. 14: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the steering column control module bracket bolts (1).
6. Remove the steering column bracket bolt (2) and steering column control module bracket (3).
7. Transfer components as necessary.

Installation Procedure

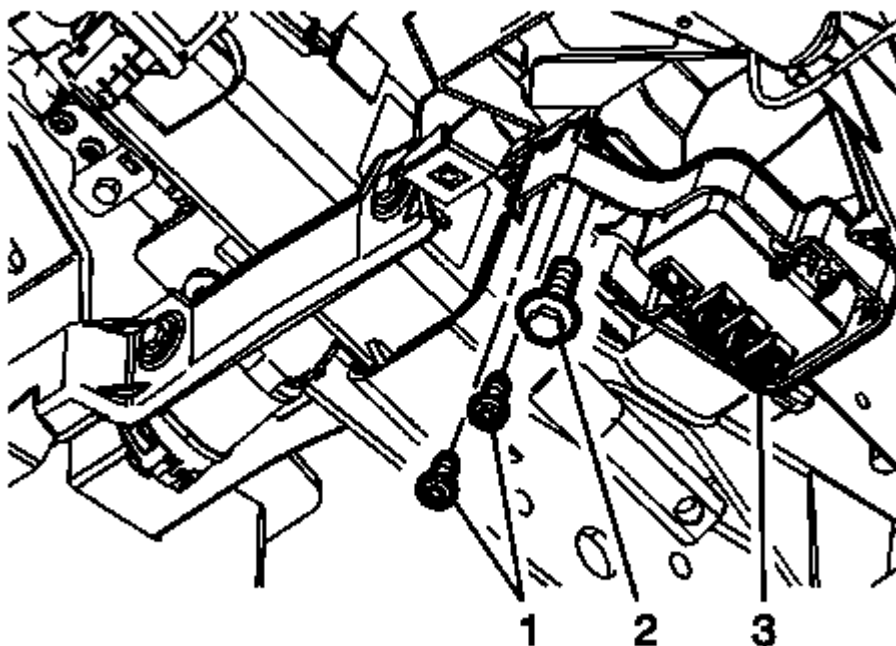


Fig. 15: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Position the steering column control module bracket (3).
2. Start the steering column bracket bolt (2) and steering column control module bracket bolts (1).

CAUTION: Refer to Fastener Caution .

3. Tighten the steering column bracket bolt (2) to 25 N.m (18 lb ft).
4. Tighten the steering column control module bracket bolts (1) to 7 N.m (62 lb in).
5. Connect the electrical connectors to the steering column control module and bracket.
6. Install the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement** .
7. Install the left side instrument panel insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Left Side** .
8. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .

TURN SIGNAL SWITCH BRACKET REPLACEMENT

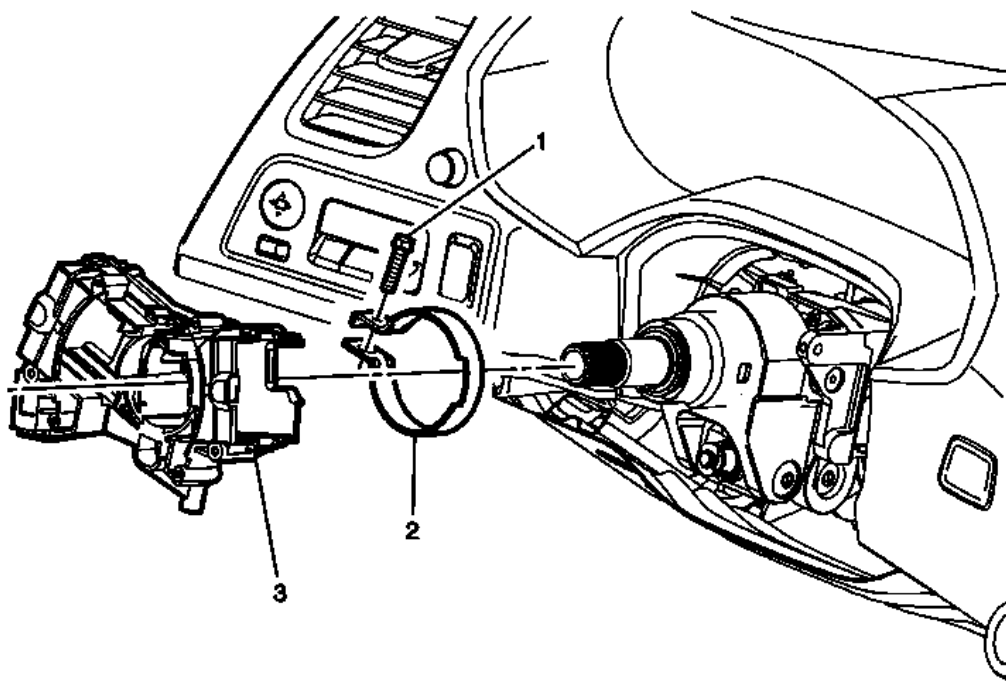


Fig. 16: Turn Signal Switch Bracket
Courtesy of GENERAL MOTORS COMPANY

Turn Signal Switch Bracket Replacement

Callout	Component Name
Preliminary Procedure	
1. Remove the steering wheel airbag coil. Refer to <u>Steering Wheel Airbag Coil Replacement</u> .	
2. Remove the steering column tilt wheel and telescope switch. Refer to <u>Steering Column Tilt Wheel and Telescope Switch Replacement</u> .	
3. Remove the turn signal multifunction switch. Refer to <u>Turn Signal Multifunction Switch Replacement</u> .	
4. Remove the windshield wiper and washer switch. Refer to <u>Windshield Wiper and Washer Switch Replacement</u> .	
1	Turn Signal Switch Bracket Retainer Bolt CAUTION: Refer to <u>Fastener Caution</u> .
2	Turn Signal Switch Bracket Retainer
3	Turn Signal Switch Bracket

TURN SIGNAL MULTIFUNCTION SWITCH REPLACEMENT

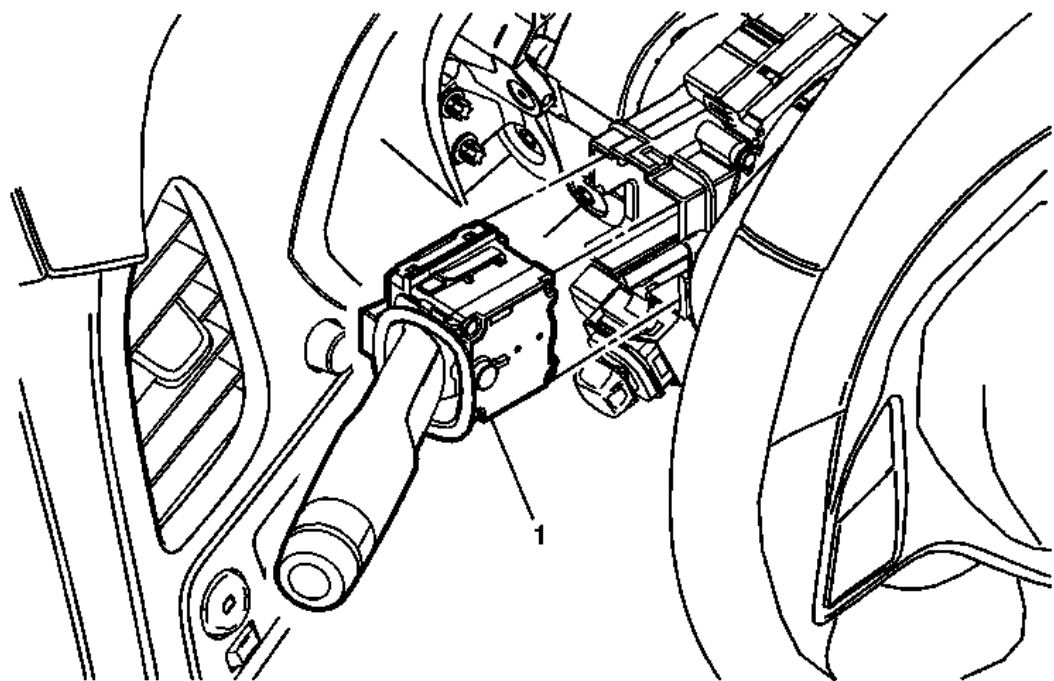


Fig. 17: Turn Signal Multifunction Switch
Courtesy of GENERAL MOTORS COMPANY

Turn Signal Multifunction Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the steering column upper and lower trim covers. Refer to <u>Steering Column Lower Trim Cover Replacement</u> .	
1	Turn Signal Multifunction Switch Procedure 1. Disconnect the electrical connector. 2. Release the retaining tabs and remove the turn signal multifunction switch from the turn signal switch bracket.

STEERING COLUMN TILT WHEEL ACTUATOR MOTOR REPLACEMENT

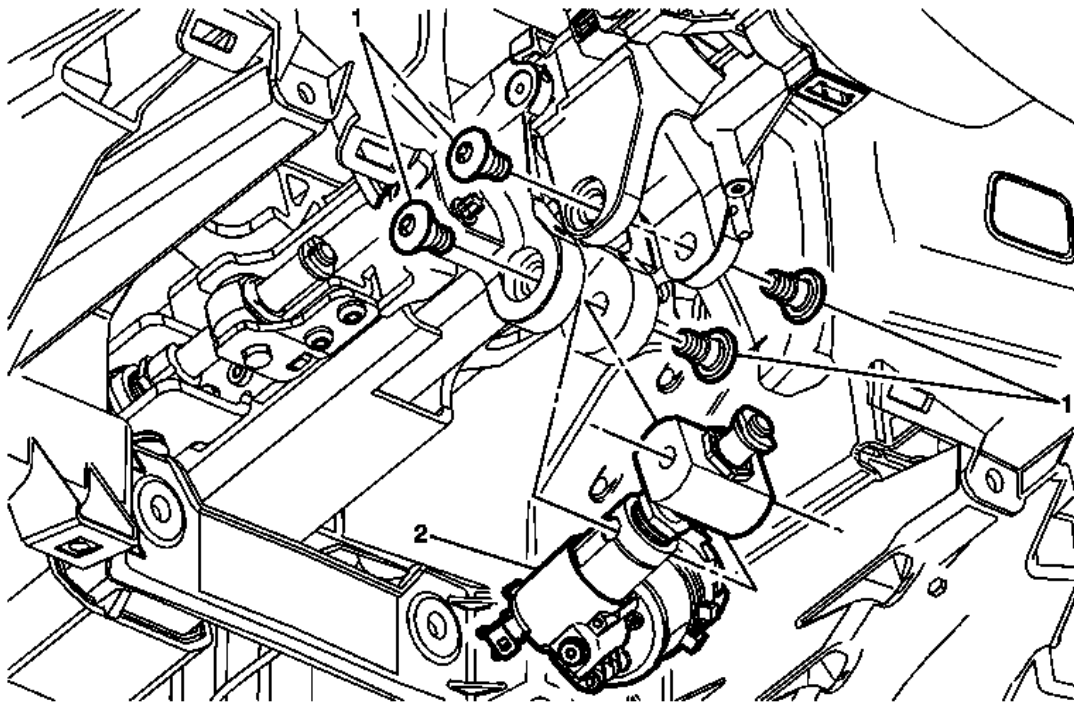


Fig. 18: Steering Column Tilt Wheel Actuator Motor
Courtesy of GENERAL MOTORS COMPANY

Steering Column Tilt Wheel Actuator Motor Replacement

Callout	Component Name
Preliminary Procedures Remove the instrument panel driver knee bolster deflector bracket. Refer to <u>Instrument Panel Driver Knee Bolster Deflector Bracket Replacement</u> .	
1	Steering Column Tilt Wheel Actuator Bracket Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 14 N.m (10 lb ft)
2	Steering Column Tilt Wheel Actuator Motor Procedure Disconnect the electrical connector.

STEERING WHEEL HORN SWITCH HARNESS REPLACEMENT

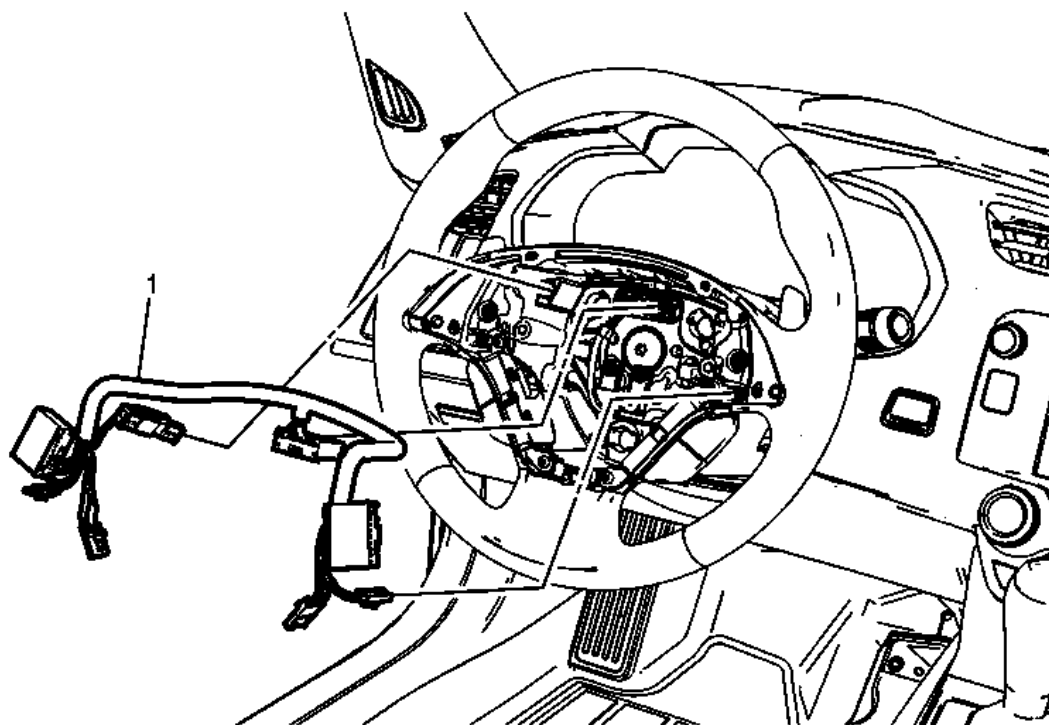


Fig. 19: Steering Wheel Horn Switch Harness
Courtesy of GENERAL MOTORS COMPANY

Steering Wheel Horn Switch Harness Replacement

Callout	Component Name
Preliminary Procedure Remove the steering wheel spoke cover. Refer to <u>Steering Wheel Spoke Cover Replacement</u> .	
1	Steering Wheel Horn Switch Harness Procedure Disconnect all the connectors and release the harness from the tabs on the steering wheel.

STEERING WHEEL REPLACEMENT

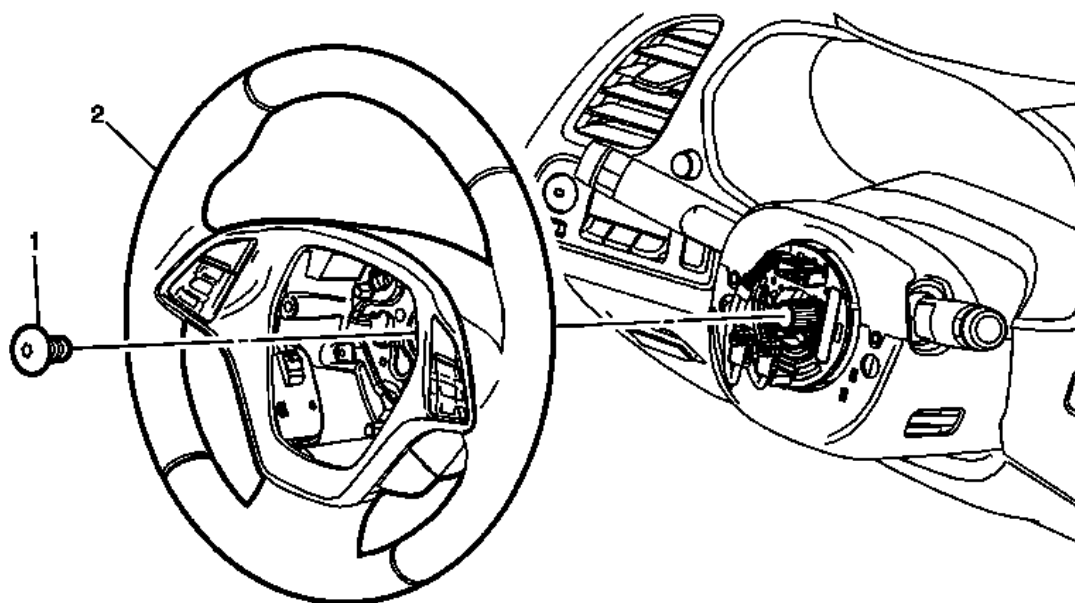


Fig. 20: Steering Wheel
 Courtesy of GENERAL MOTORS COMPANY

Steering Wheel Replacement

Callout	Component Name
Preliminary Procedures	
Remove the steering wheel airbag. Refer to Steering Wheel Airbag Replacement .	
1	Steering Wheel Bolt
	CAUTION: Refer to Fastener Caution .
	Procedure 1. After removing the bolt, inspect for damage. Replace if necessary. 2. If reusing the bolt, clean all OLD threadlocker from the bolt threads and apply NEW threadlocker. Refer to Adhesives, Fluids, Lubricants, and Sealers .
	NOTE: A NEW bolt will come with threadlocker already applied to the bolt threads.
	Tighten 30 N.m (22 lb ft)

Steering Wheel	
Procedure	
2	1. Disconnect the electrical connectors. 2. Loosen the steering wheel bolt until 2 to 3 threads are left engaged. 3. Wiggle the steering wheel until the wheel disengages completely. 4. Remove the steering wheel bolt and wheel. 5. Transfer components as necessary.

STEERING WHEEL SPOKE COVER REPLACEMENT

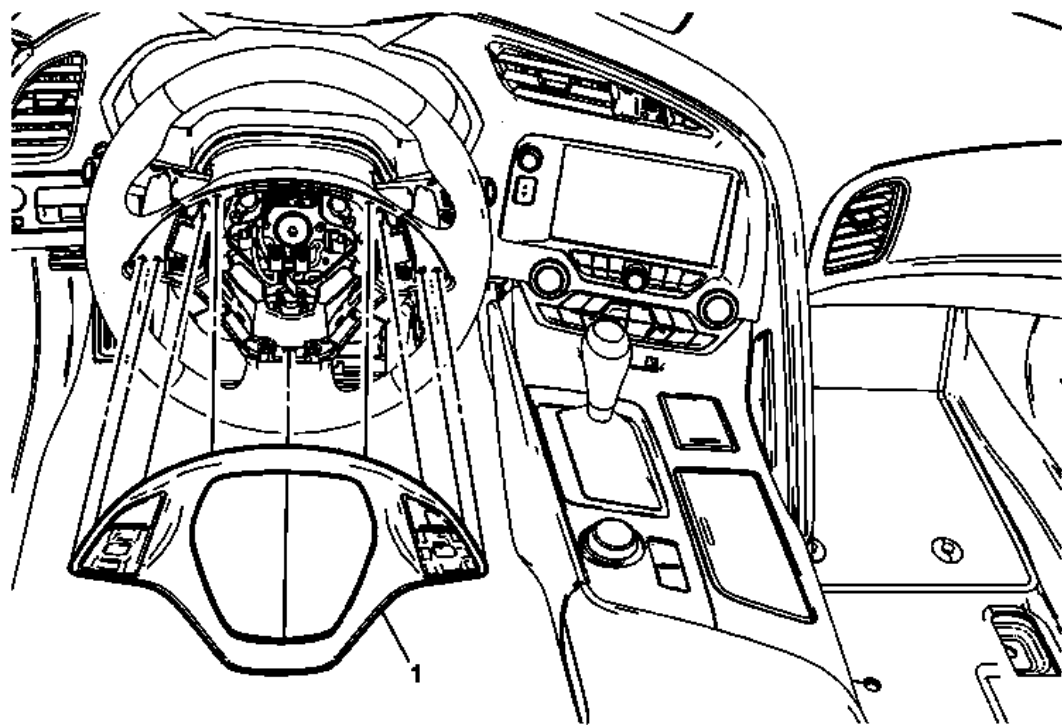


Fig. 21: Steering Wheel Spoke Cover
Courtesy of GENERAL MOTORS COMPANY

Steering Wheel Spoke Cover Replacement

Callout	Component Name
Preliminary Procedure	
Remove the steering wheel airbag. Refer to <u>Steering Wheel Airbag Replacement</u> .	
	Steering Wheel Spoke Cover
Procedure	

1

NOTE:

Gently release tabs one by one, using care to avoid snapping the tab off.

2. Disconnect the electrical connections.

STEERING COLUMN TILT WHEEL AND TELESCOPE SWITCH REPLACEMENT

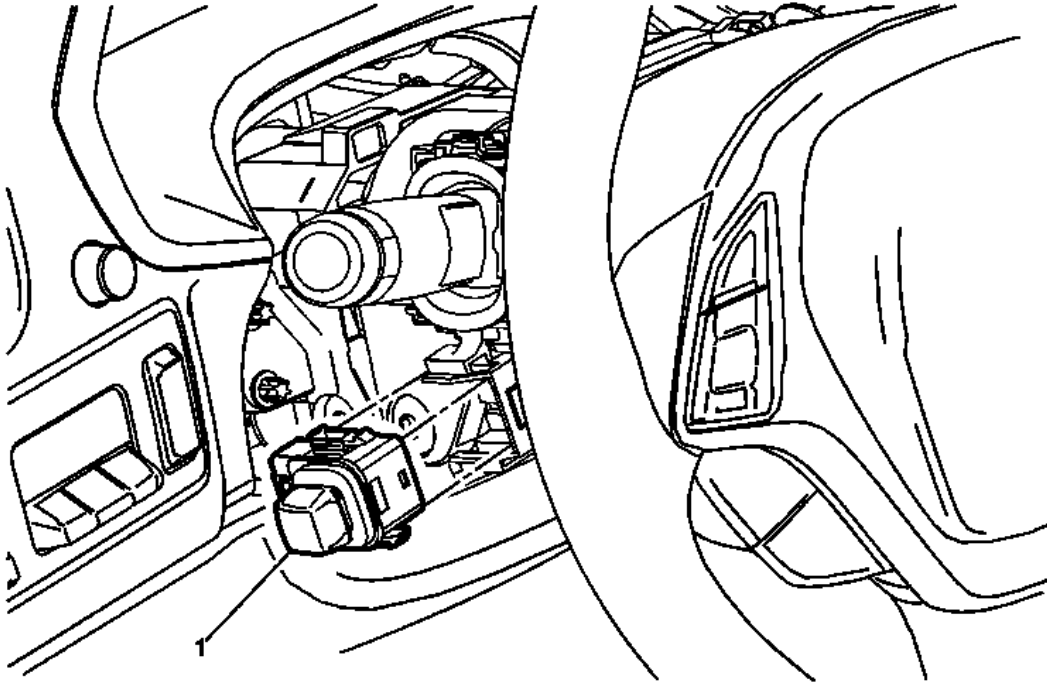


Fig. 22: Steering Column Tilt Wheel and Telescope Switch
Courtesy of GENERAL MOTORS COMPANY

Steering Column Tilt Wheel and Telescope Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the steering column upper and lower trim covers. Refer to <u>Steering Column Lower Trim Cover Replacement</u> .	
1	Steering Column Tilt Wheel and Telescope Switch Procedure 1. Disconnect the electrical connector. 2. Release the retaining tabs and remove the steering column tilt wheel and telescope switch from the turn signal switch bracket.

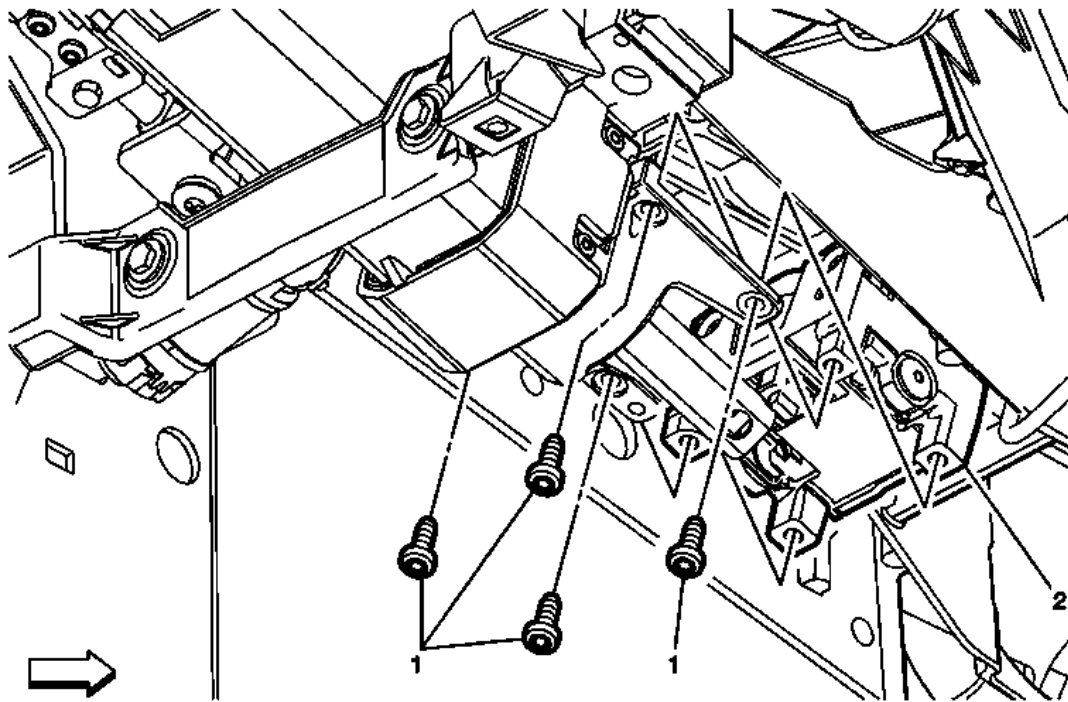


Fig. 23: Steering Column Electronic Lock
Courtesy of GENERAL MOTORS COMPANY

Steering Column Electronic Lock Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the instrument panel knee bolster. Refer to <u>Instrument Panel Knee Bolster Replacement</u>. 2. Disconnect the intermediate steering shaft from the steering column and collapse the shaft as far as possible. Refer to <u>Intermediate Steering Shaft Replacement</u>. 3. Remove the steering column control module bracket. Refer to <u>Steering Column Control Module Bracket Replacement</u>.	
1	Steering Column Electronic Lock Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 8 N.m (71 lb in)
2	Steering Column Electronic Lock Procedure Disconnect the electrical connector.

STEERING COLUMN REPLACEMENT (WITHOUT ELECTRONIC STEERING COLUMN LOCK)

Special Tools

J-42640 Steering Column Anti-Rotation Pin

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the driver seat. Refer to **Driver or Passenger Seat Removal and Installation** .
2. Remove the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement** .
3. Remove the instrument panel driver knee bolster deflector bracket. Refer to **Instrument Panel Driver Knee Bolster Deflector Bracket Replacement** .
4. Remove the steering column lower trim cover. Refer to **Steering Column Lower Trim Cover Replacement**.
5. Extend the steering column fully.

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.

6. Install the **J-42640** anti-rotation pin and lock the steering column.
7. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
8. Disconnect any electrical connectors as necessary.
9. Disconnect the intermediate steering shaft from the steering column. Refer to **Intermediate Steering Shaft Replacement**.

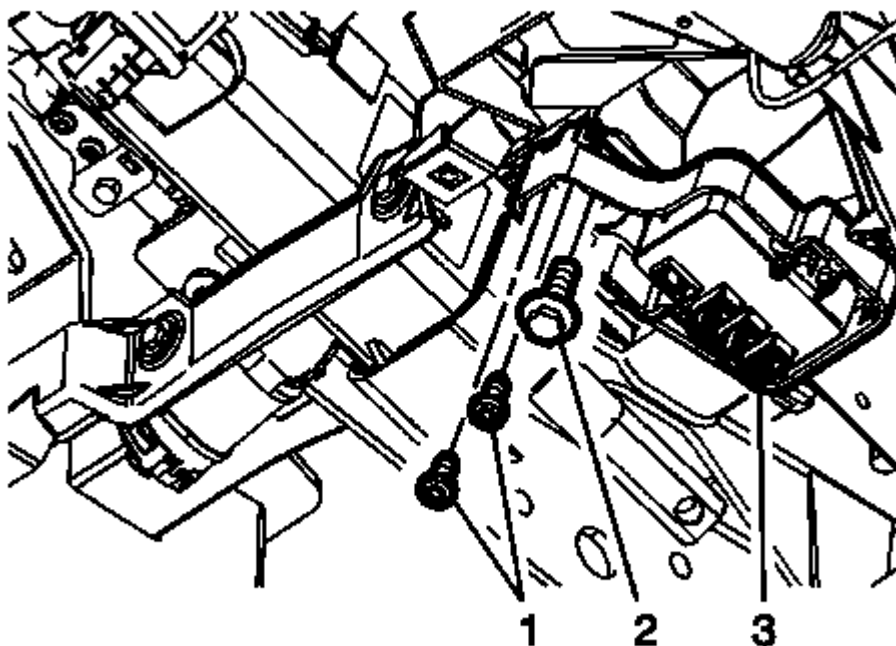


Fig. 24: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Remove the steering column control module bracket bolts (1).
11. Remove the steering column bracket bolt (2) and steering column control module bracket (3).

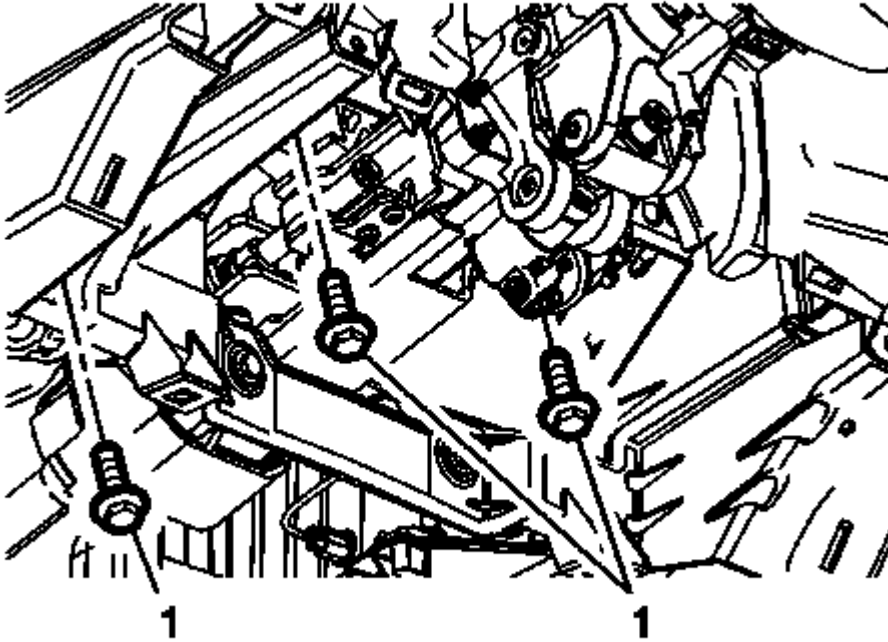


Fig. 25: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

12. Remove the remaining steering column bracket bolts (1).

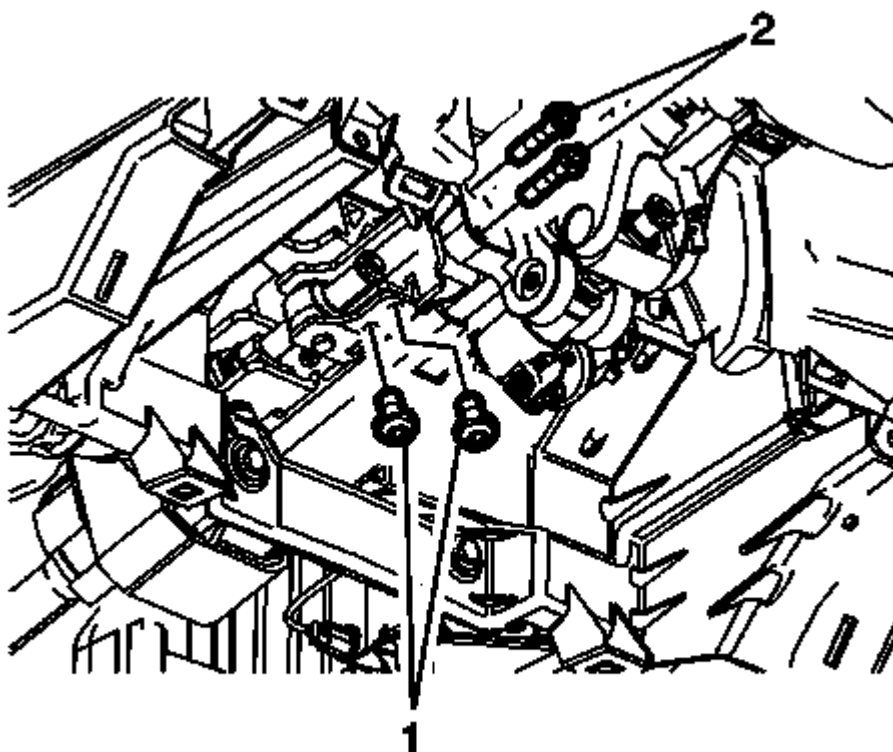


Fig. 26: Middle And Upper Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

13. Remove the middle and upper steering column telescope actuator bracket bolts (1, 2).

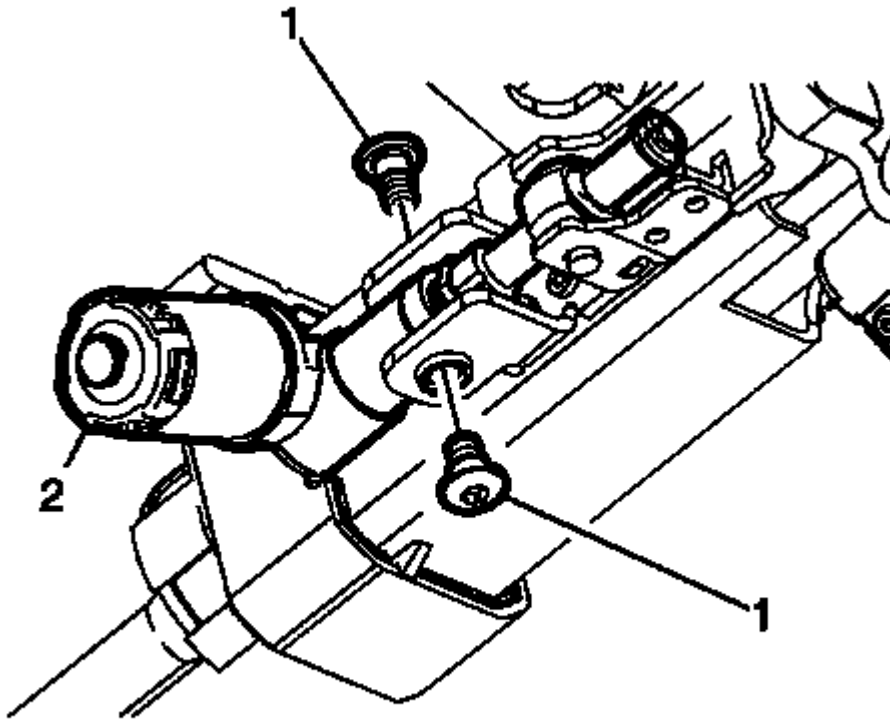


Fig. 27: Lower Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

14. Guide the steering column downward into the dash until the lower steering column telescope actuator bracket bolts (1) are accessible. Remove the bolts.
15. Remove the steering column telescope actuator motor (2) from the vehicle.

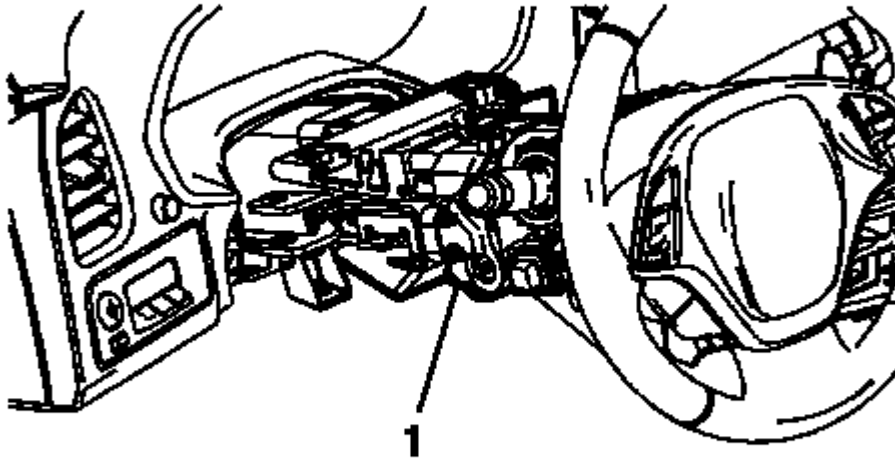


Fig. 28: Steering Column

Courtesy of GENERAL MOTORS COMPANY

16. Remove the steering column (1) from the vehicle.
17. If replacing the steering column, transfer all necessary components.

Installation Procedure

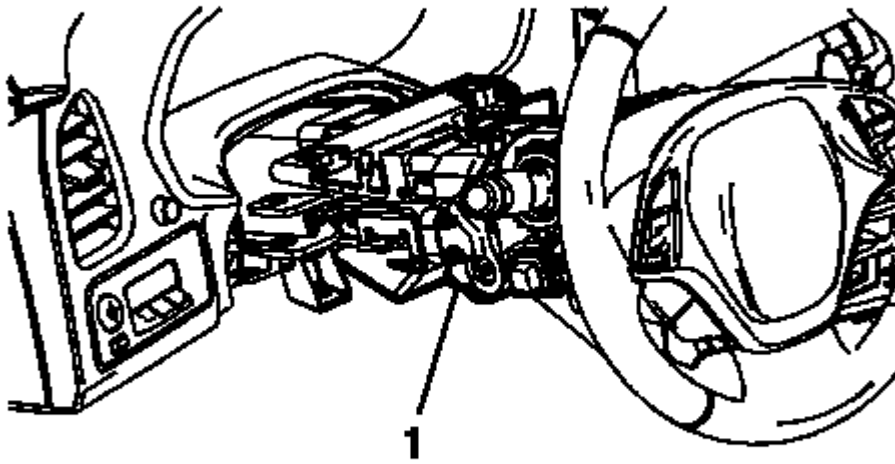


Fig. 29: Steering Column

Courtesy of GENERAL MOTORS COMPANY

1. Position the steering column (1) in the vehicle.

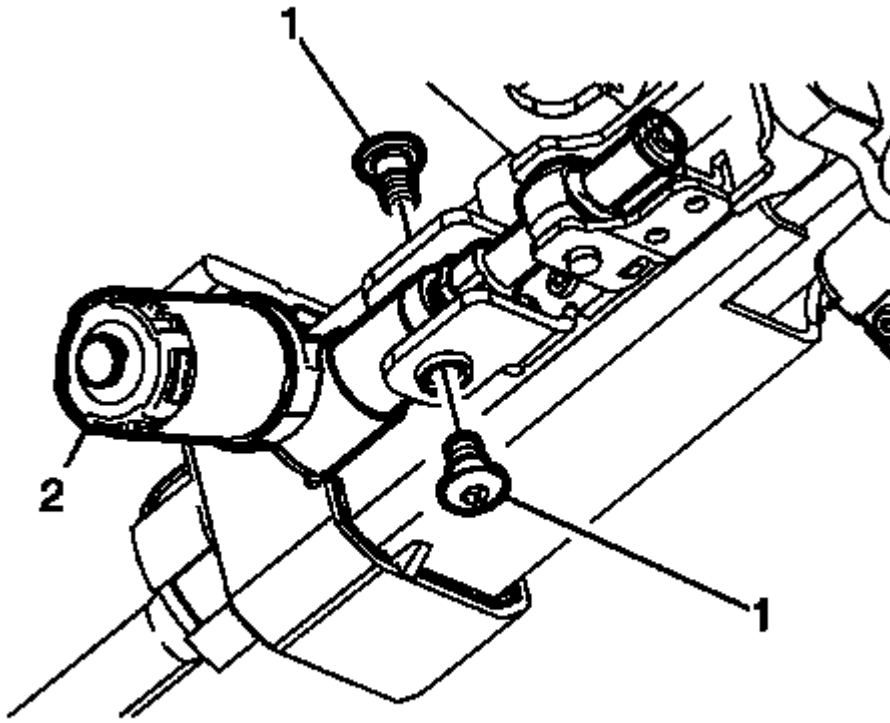


Fig. 30: Lower Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Guide the steering column downward into the dash until the lower steering column telescope actuator bracket bolts (1) can be installed.
3. Position the steering column telescope actuator motor (2) on the steering column.

CAUTION: Refer to Fastener Caution .

4. Install the lower steering column telescope actuator bracket bolts (1) and tighten to 14 N.m (10 lb ft).

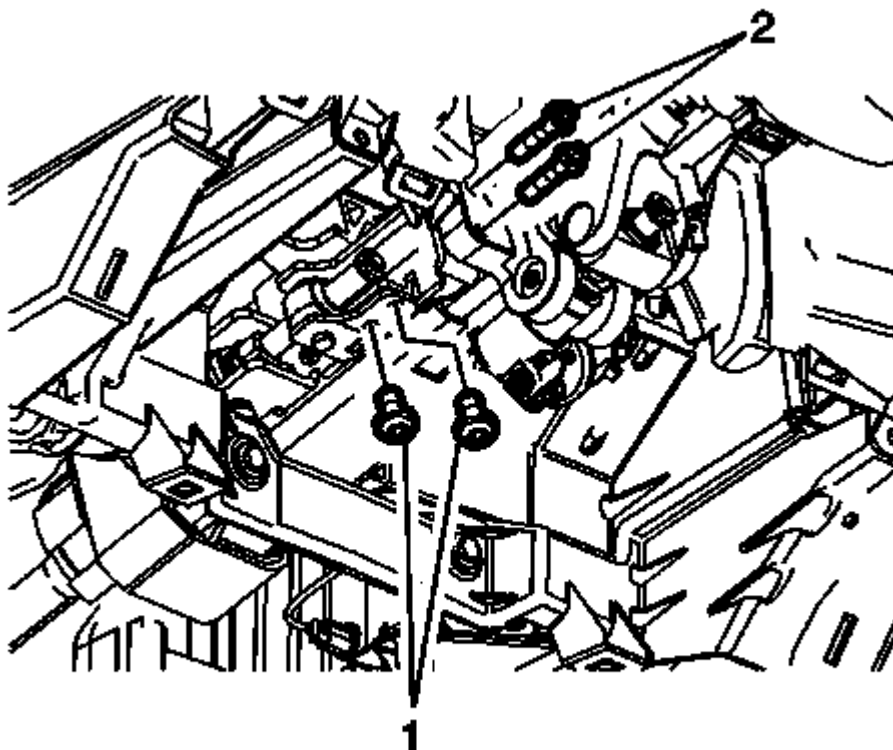


Fig. 31: Middle And Upper Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Guide the steering column near to the mounting position and install the middle and upper steering column telescope actuator bracket bolts (1, 2). Ensure the upper bolts have NEW threadlocker applied before installing. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
6. Tighten the middle steering column telescope actuator bracket bolts (1) to 5 N.m (44 lb in).
7. Tighten the upper steering column telescope actuator bracket bolts (2) to 8 N.m (71 lb in).

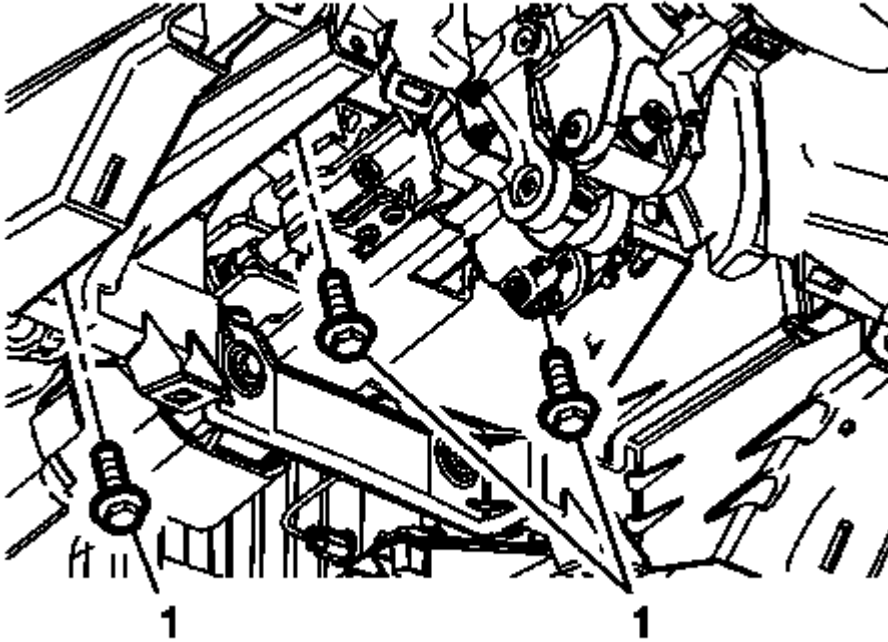


Fig. 32: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Position the steering column in the steering column bracket and start the three steering column bracket bolts (1) previously removed but do not completely tighten.

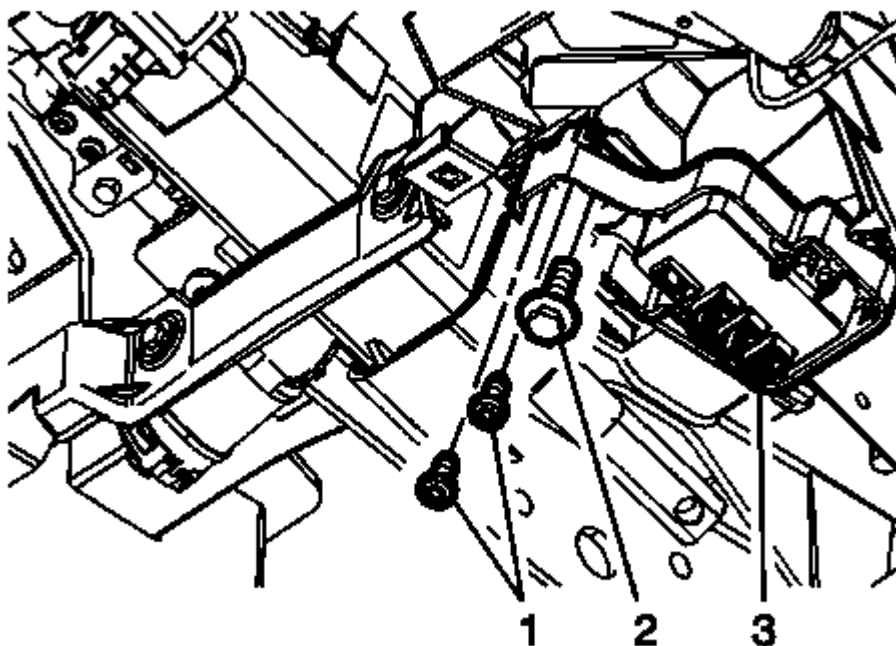


Fig. 33: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Position the steering column control module bracket (3) and install the steering column bracket bolt (2).
10. Install the steering column control module bracket bolts (1).
11. Tighten the steering column bracket bolt (2) to 25 N.m (18 lb ft).
12. Tighten the steering column control module bracket bolts (1) to 7 N.m (62 lb in).

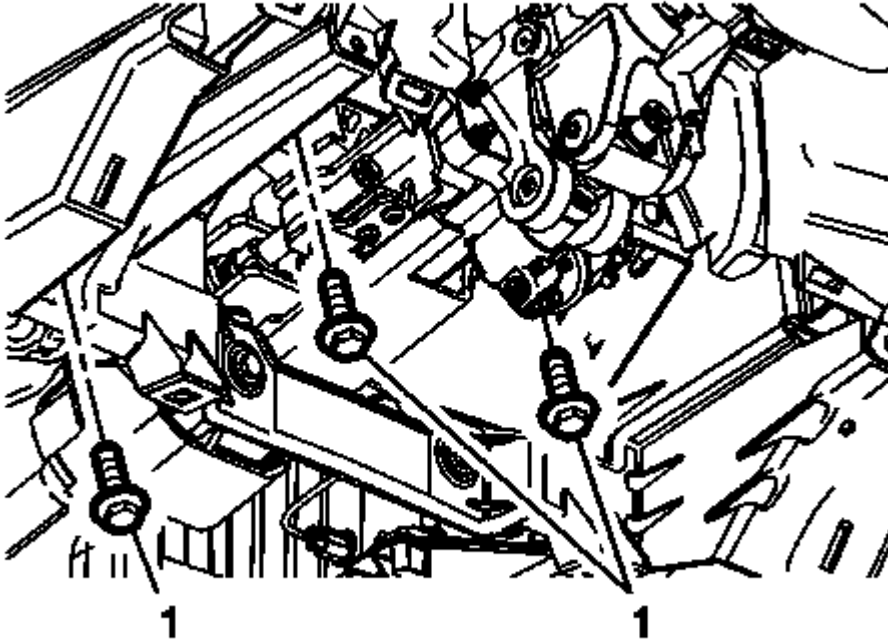


Fig. 34: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

13. Tighten the remaining steering column bracket bolts (1) to 25 N.m (18 lb ft).
14. Connect the intermediate steering shaft to the steering column. Refer to **Intermediate Steering Shaft Replacement**.
15. Connect any electrical connectors previously disconnected.
16. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.
17. Remove the J-42640 anti-rotation pin from the steering column.
18. Install the steering column lower trim cover. Refer to **Steering Column Lower Trim Cover Replacement**.
19. Install the instrument panel driver knee bolster deflector bracket. Refer to **Instrument Panel Driver Knee Bolster Deflector Bracket Replacement**.
20. Install the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement**.
21. Install the driver seat. Refer to **Driver or Passenger Seat Removal and Installation**.

STEERING COLUMN REPLACEMENT (WITH ELECTRONIC STEERING COLUMN LOCK)

Special Tools

J-42640 Steering Column Anti-Rotation Pin

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the driver seat. Refer to **Driver or Passenger Seat Removal and Installation** .
2. Remove the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement** .
3. Remove the instrument panel driver knee bolster deflector bracket. Refer to **Instrument Panel Driver Knee Bolster Deflector Bracket Replacement** .
4. Remove the steering column lower trim cover. Refer to **Steering Column Lower Trim Cover Replacement**.
5. Extend the steering column fully.

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.

6. Install the **J-42640** anti-rotation pin and lock the steering column.
7. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
8. Disconnect any electrical connectors as necessary.
9. Disconnect the intermediate steering shaft from the steering column. Refer to **Intermediate Steering Shaft Replacement**.

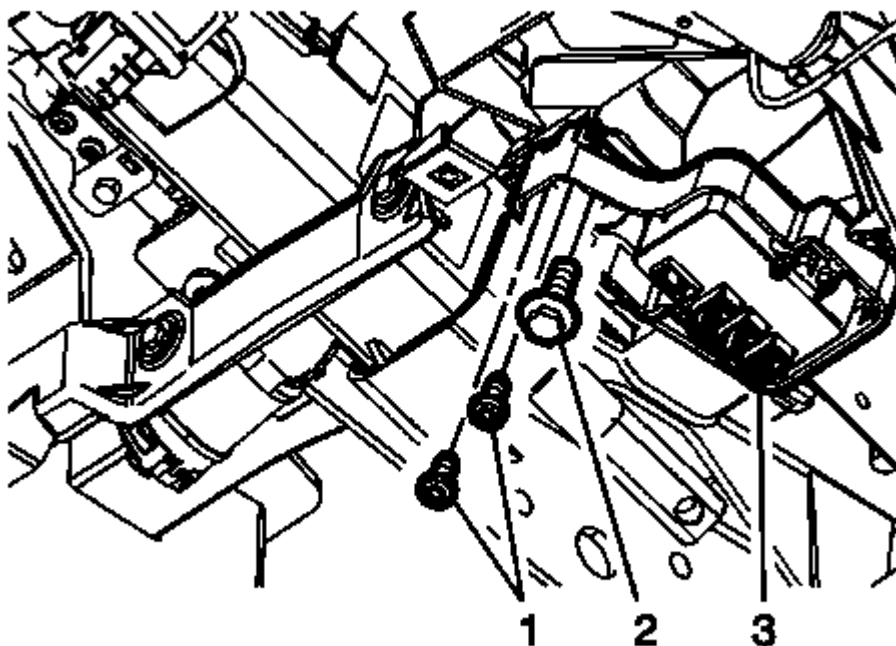


Fig. 35: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Remove the steering column control module bracket bolts (1).
11. Remove the steering column bracket bolt (2) and steering column control module bracket (3).

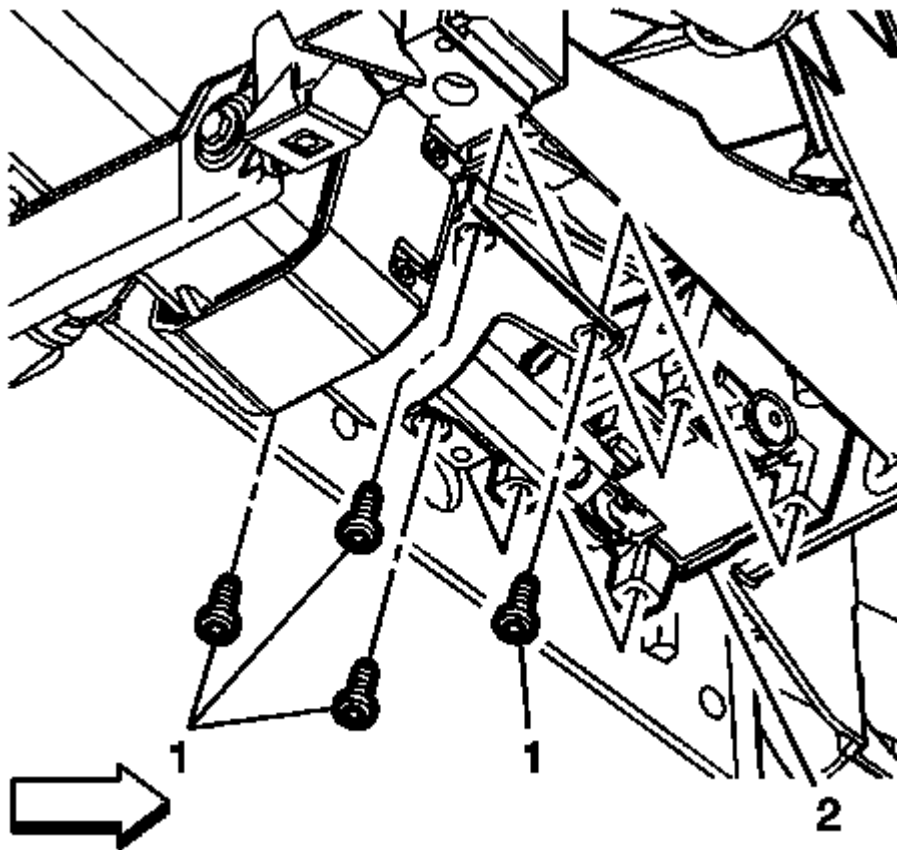


Fig. 36: Steering Column Electronic Lock Bolts
Courtesy of GENERAL MOTORS COMPANY

12. Remove the steering column electronic lock bolts (1) and lock (2).

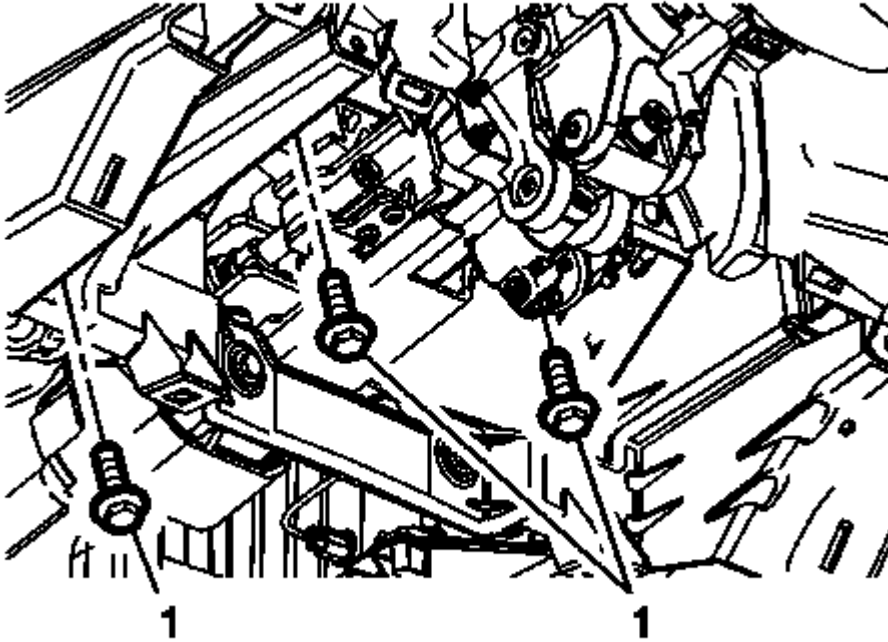


Fig. 37: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

13. Remove the remaining steering column bracket bolts (1).

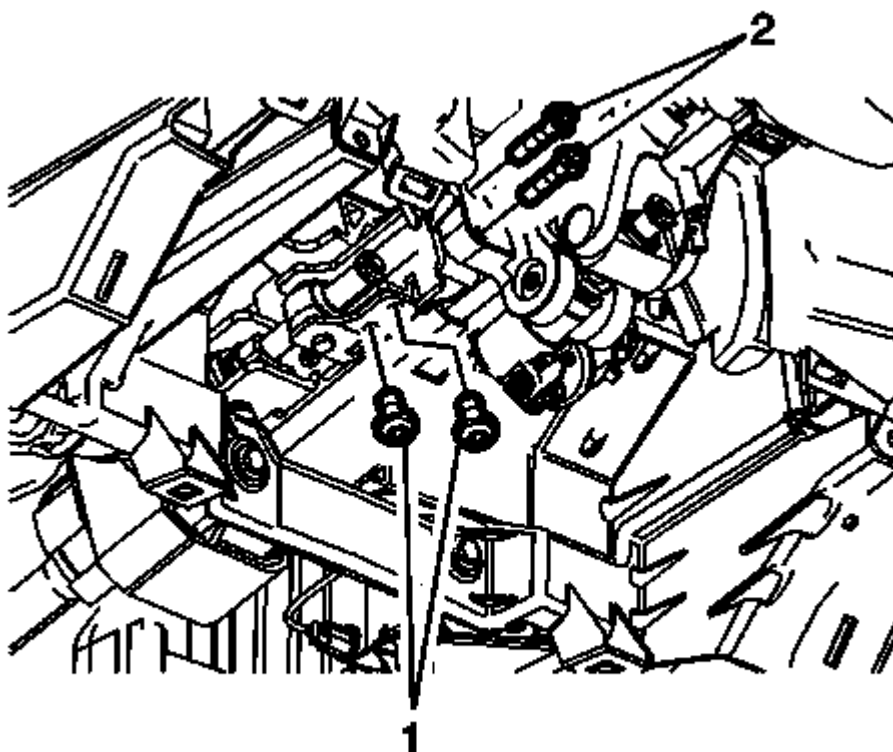


Fig. 38: Middle And Upper Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

14. Remove the middle and upper steering column telescope actuator bracket bolts (1, 2).

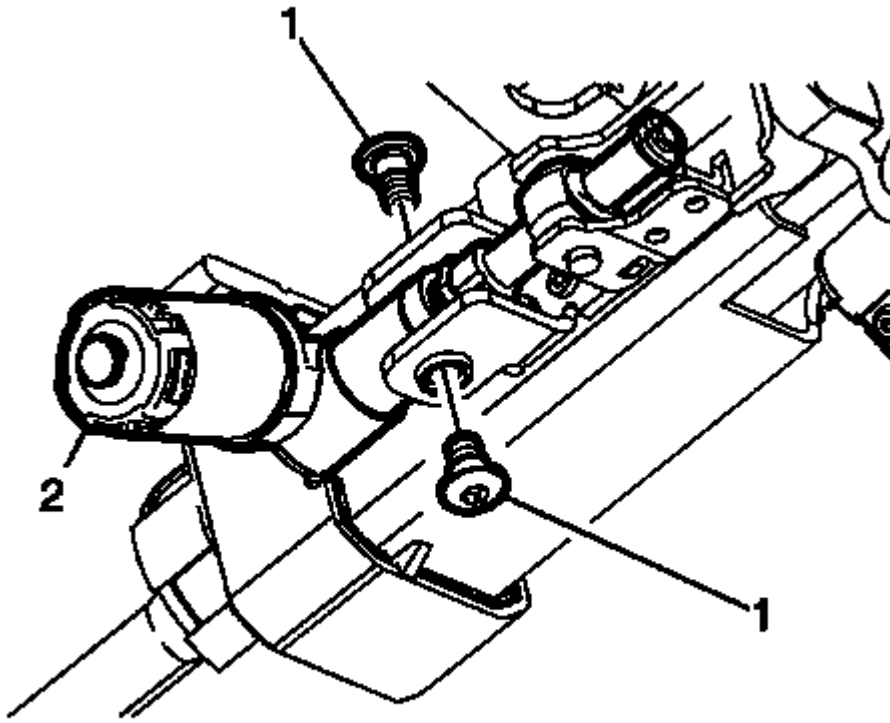


Fig. 39: Lower Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

15. Guide the steering column downward into the dash until the lower steering column telescope actuator bracket bolts (1) are accessible. Remove the bolts.
16. Remove the steering column telescope actuator motor (2) from the vehicle.

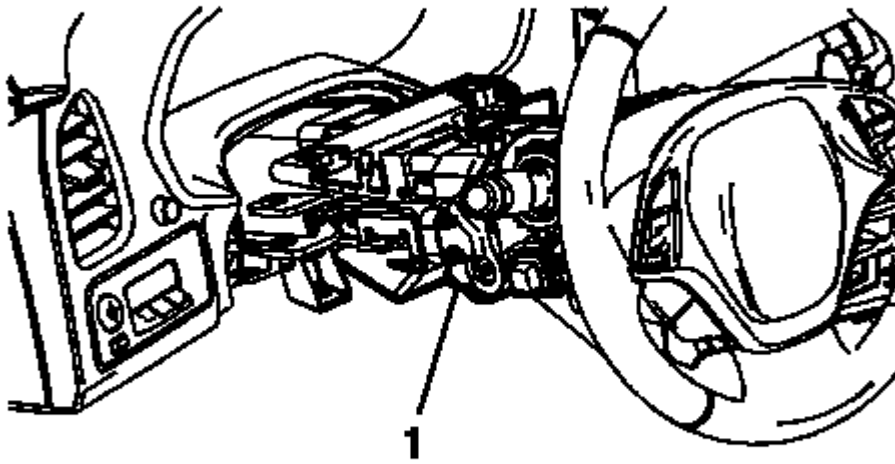


Fig. 40: Steering Column

Courtesy of GENERAL MOTORS COMPANY

17. Remove the steering column (1) from the vehicle.
18. If replacing the steering column, transfer all necessary components.

Installation Procedure

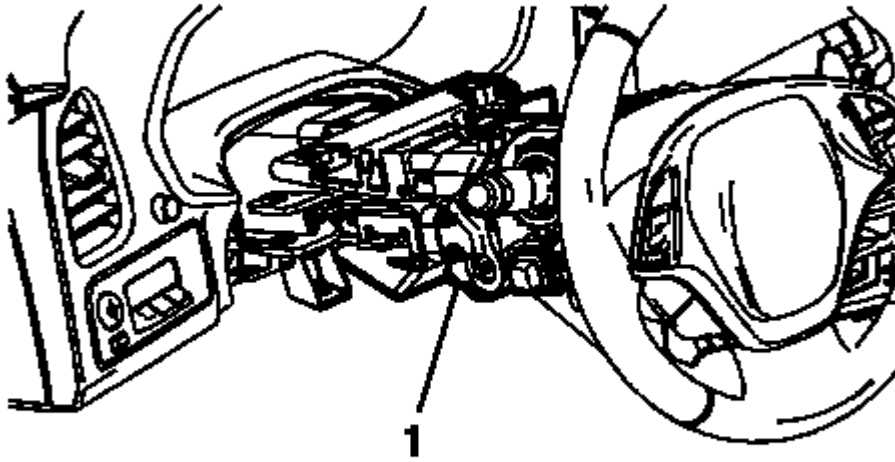


Fig. 41: Steering Column

Courtesy of GENERAL MOTORS COMPANY

1. Position the steering column (1) in the vehicle.

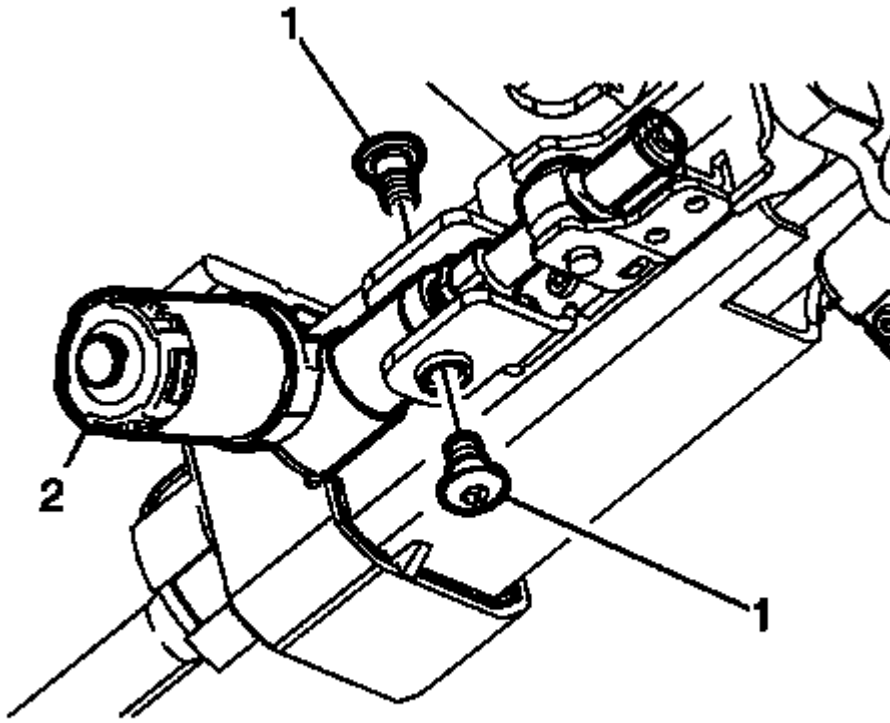


Fig. 42: Lower Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Guide the steering column downward into the dash until the lower steering column telescope actuator bracket bolts (1) can be installed.
3. Position the steering column telescope actuator motor (2) on the steering column.

CAUTION: Refer to Fastener Caution .

4. Install the lower steering column telescope actuator bracket bolts (1) and tighten to 14 N.m (10 lb ft).

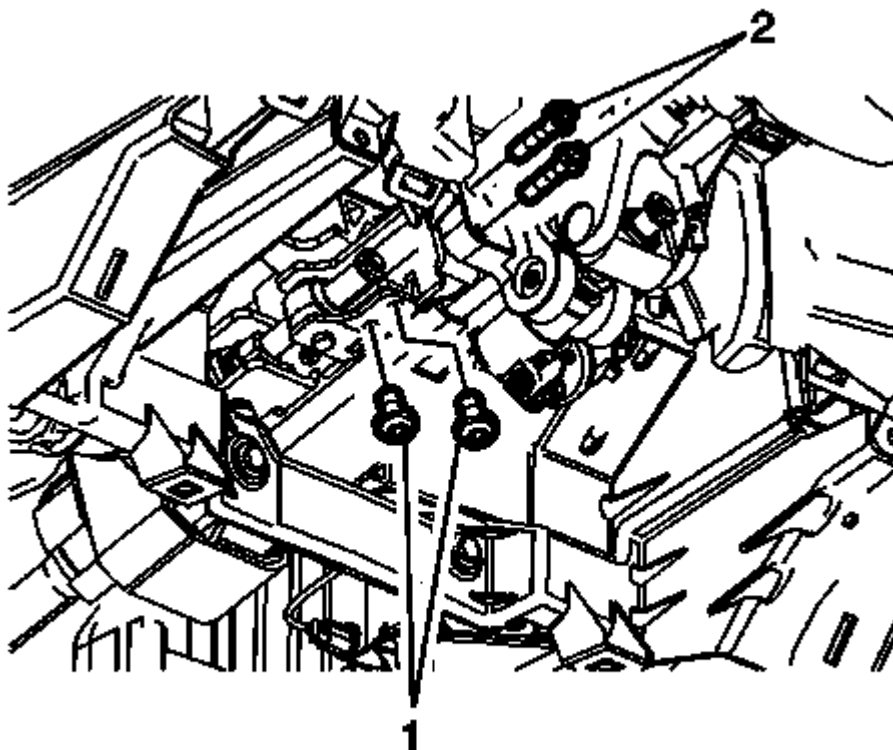


Fig. 43: Middle And Upper Steering Column Telescope Actuator Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Guide the steering column near to the mounting position and install the middle and upper steering column telescope actuator bracket bolts (1, 2). Ensure the upper bolts have NEW threadlocker applied before installing. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
6. Tighten the middle steering column telescope actuator bracket bolts (1) to 5 N.m (44 lb in).
7. Tighten the upper steering column telescope actuator bracket bolts (2) to 8 N.m (71 lb in).

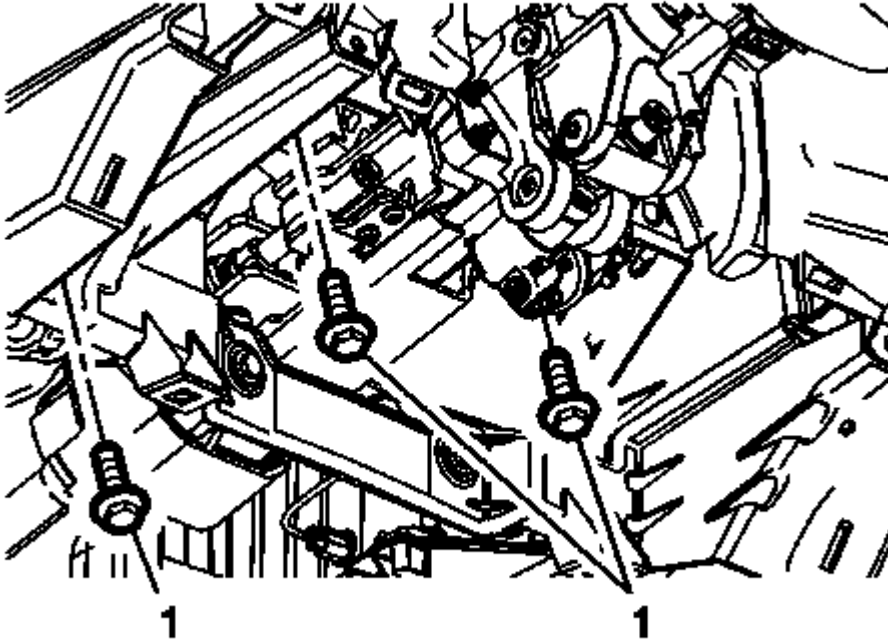


Fig. 44: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Position the steering column in the steering column bracket and start the three steering column bracket bolts (1) previously removed but do not completely tighten.

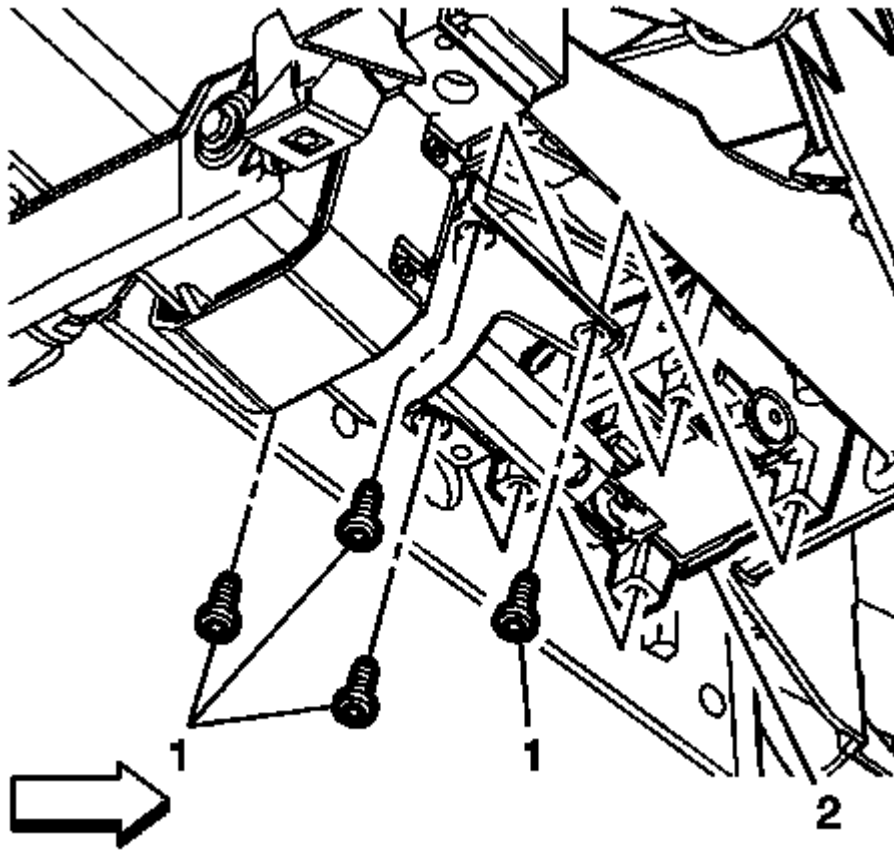


Fig. 45: Steering Column Electronic Lock Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Install the steering column electronic lock (2) and bolts (1).
10. Tighten the steering column electronic lock bolts (1) to 8 N.m (71 lb in).

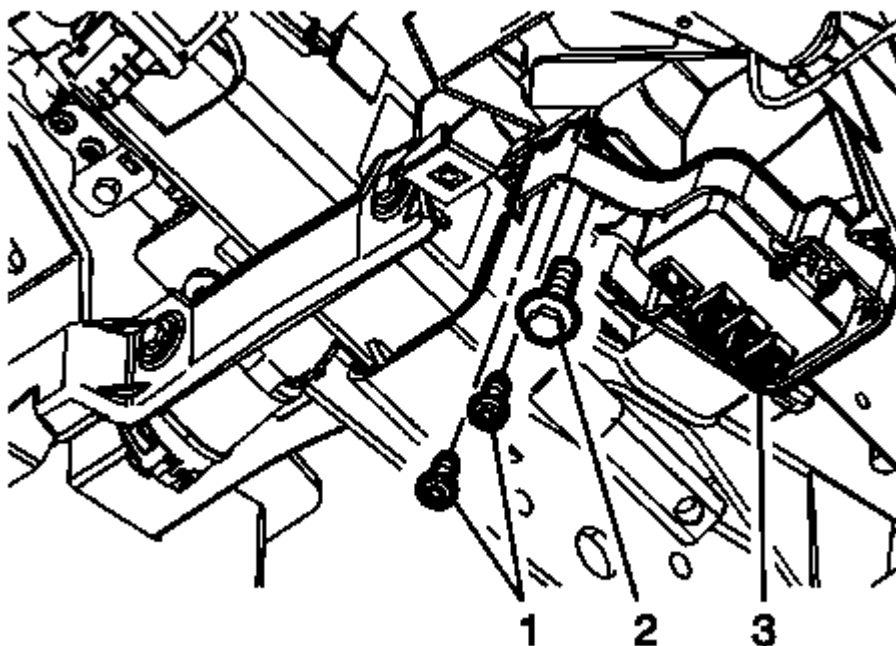


Fig. 46: Steering Column Control Module Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Position the steering column control module bracket (3) and install the steering column bracket bolt (2).
12. Install the steering column control module bracket bolts (1).
13. Tighten the steering column bracket bolt (2) to 25 N.m (18 lb ft).
14. Tighten the steering column control module bracket bolts (1) to 7 N.m (62 lb in).

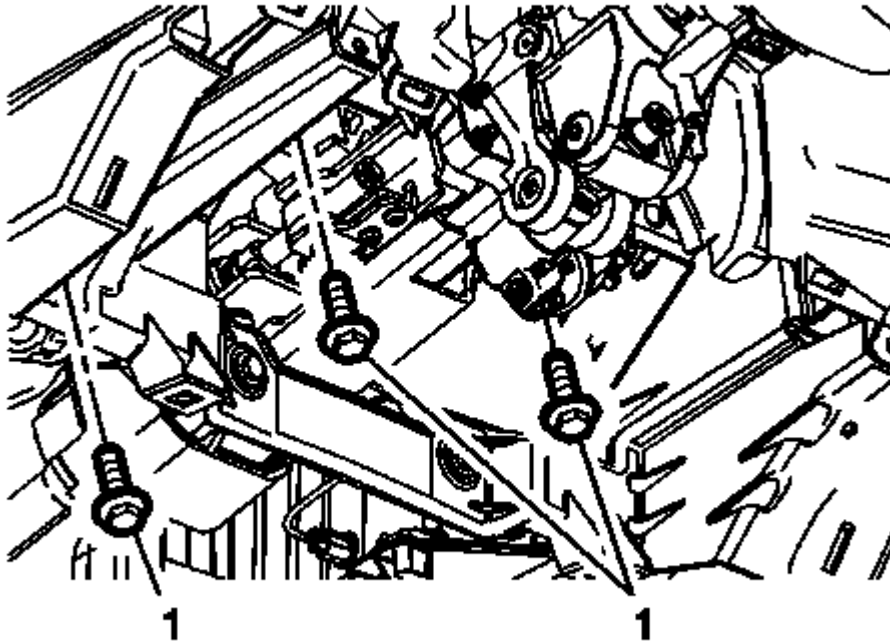


Fig. 47: Remaining Steering Column Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

15. Tighten the remaining steering column bracket bolts (1) to 25 N.m (18 lb ft).
16. Connect the intermediate steering shaft to the steering column. Refer to **Intermediate Steering Shaft Replacement**.
17. Connect any electrical connectors previously disconnected.
18. Connect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.
19. Remove the J-42640 anti-rotation pin from the steering column.
20. Install the steering column lower trim cover. Refer to **Steering Column Lower Trim Cover Replacement**.
21. Install the instrument panel driver knee bolster deflector bracket. Refer to **Instrument Panel Driver Knee Bolster Deflector Bracket Replacement**.
22. Install the instrument panel knee bolster. Refer to **Instrument Panel Knee Bolster Replacement**.
23. Install the driver seat. Refer to **Driver or Passenger Seat Removal and Installation**.

STEERING COLUMN TILT WHEEL AND TELESCOPE CONTROL MODULE LEARN

The Steering Column Tilt Wheel and Telescope Control Module Learn procedure must be completed when the following components are replaced:

- Steering Column Tilt Wheel and Telescope Control Module
- Steering Column Tilt Motor
- Steering Column Telescope Motor

The Steering Column Tilt Wheel and Telescope Control Module Learn procedure can be completed without a scan tool using the following steps:

1. Ignition ON, engine OFF.

NOTE: To perform the learn procedure, the directional order does not require a specific sequence. Reaching the mechanical hard stop of each direction is the only requirement.

2. Using the steering column tilt and telescope switch, actuate the column to each mechanical hard stop in each direction listed below;
 - Tilt column full up
 - Tilt column full down
 - Telescope column full forward
 - Telescope column full rearward
3. Ignition OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.

DESCRIPTION AND OPERATION

STEERING WHEEL AND COLUMN DESCRIPTION AND OPERATION (N38)

Tilt/Telescoping Description

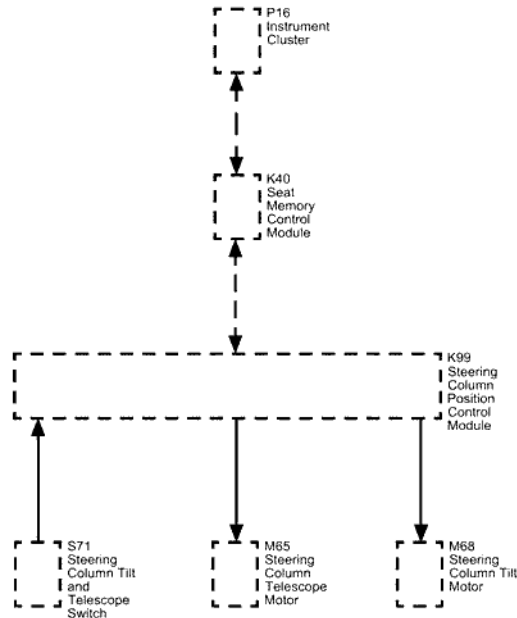


Fig. 48: Tilt/Telescoping Schematic Graph
Courtesy of GENERAL MOTORS COMPANY

The steering column has a tilt/telescoping control system that consists of an electronic control module capable of LIN message communication, a steering column power assembly with positioning motors and sensors, and a steering column control switch.

Column Position Module has two versions of operation:

1. N38 - Power Steering Column-Tilt/Telescope, and A45 - Memory Seats

The column position module will wake up either by the LIN bus or by the tilt/telescope steering column switch. The memory seat module is the master and column position module is the slave. All DTCs and the data from column position module are reported through the LIN bus and stored in the memory seat module.

2. N38 - Power Steering Column-Tilt/Telescope Only

The column position module will wake up with the tilt/telescope steering column switch. No DTCs or data is available. Vehicle symptoms will cause the customer to bring the vehicle in for service.

Tilt/Telescoping Switch Operation

The tilt/telescope steering column has a four-position switch. The switch may be used to adjust the

position of the steering wheel in or out which is telescope and up or down which is tilt. The position of the column may be changed as follows:

- Press the switch up to tilt the column up.
- Press the switch down to tilt the column down.
- Press the switch forward and the column moves toward the front of the vehicle.
- Press the switch rearward and the column moves toward the rear of the vehicle.

Motors

Both the tilt and telescoping motors are reversible. For example, the tilt motor moves the column both up and down. When the column position module receives an input to move the column up, the column position module supplies battery positive voltage and ground to the tilt motor in order to move the column up. When the column position module receives a column down input, the column position module supplies battery positive voltage and ground to the same motor, but with reverse polarity. When the voltage polarity is reversed, the motor runs in the opposite direction and moves the column down.

Position Sensors with A45 Memory Seats

Two position sensors are Hall Effect sensors and are used by the column position module. The column position module provides a 5 V reference voltage and a ground to both the tilt and telescoping position sensors. The sensor feedback circuit voltage varies from 0-5 V. Each sensor is part of the motor assembly. When the motor rotates, the voltage of the sensor varies on the scan tool. The column position module monitors the feedback voltage to determine the column position.

Without the A45 Memory Seat option, scan tool data is not available.

Tilt/Telescoping Memory with A45 Memory Seats

Memory settings and the personalization of steering wheel positions are available with the tilt/telescoping steering column only with the A45 Memory Seat option. The data stored consists of entry positions and exit positions. The entry position is the position that the steering column moves in when the ignition is turned ON. The exit position is the direction that the steering column moves in when the ignition is turned OFF and the driver's door is opened. The memory seat module stores memory positions and commands column position module to move motors to specific positions through a LIN message.

An initial memory setting is set in the memory seat module at the assembly plant. This setting may be changed by the customer at any time.

Without the A45 Memory Seat option, memory settings, personalization, and the entry and exit function is not available.

Driver Safety

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.

Heated Steering Wheel

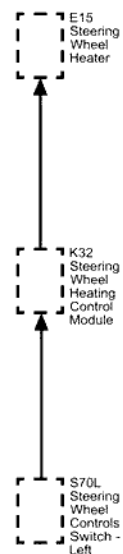
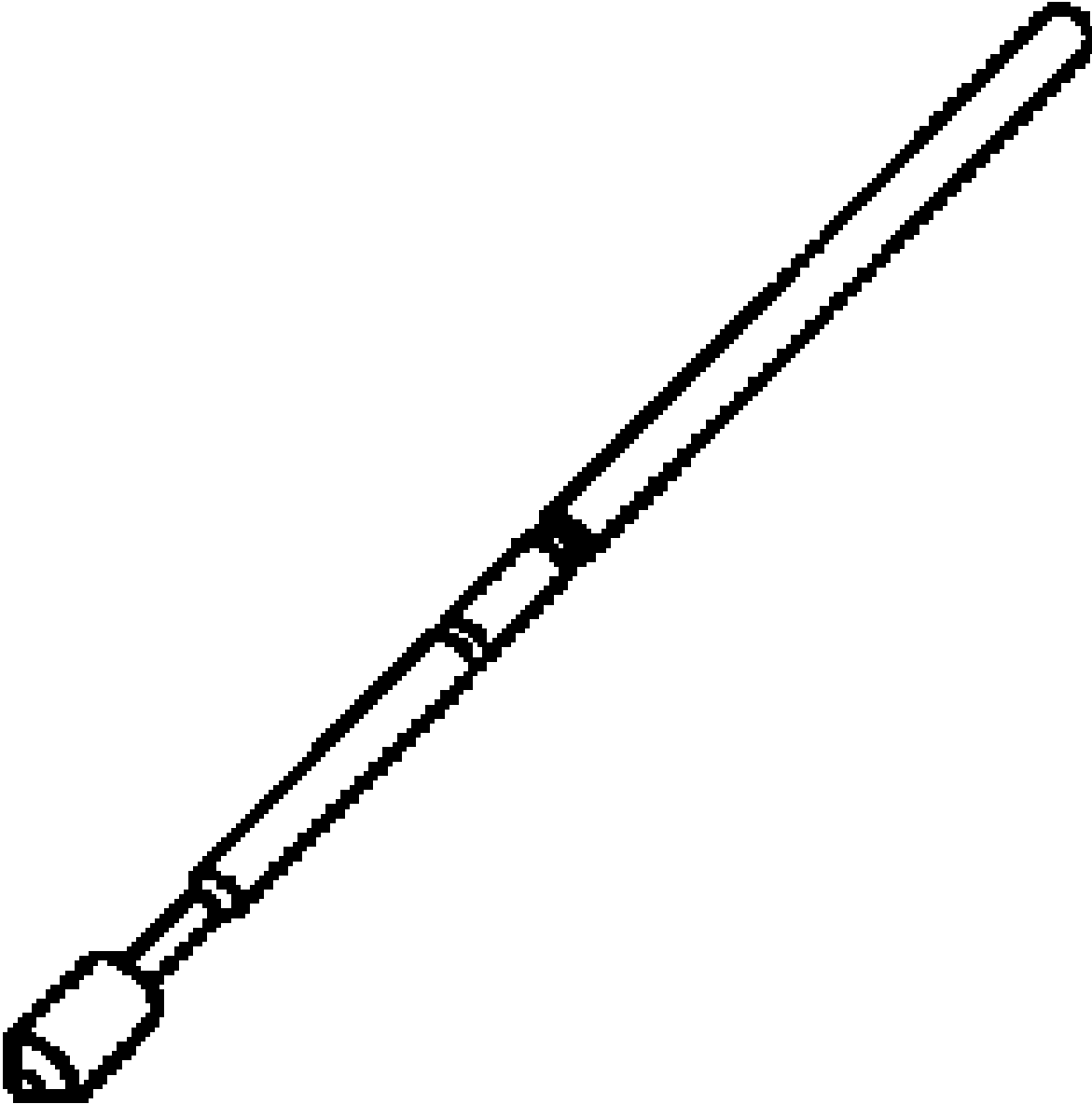


Fig. 49: Heated Steering Wheel Schematic Graph
Courtesy of GENERAL MOTORS COMPANY

The heated steering wheel system consists of a heated steering wheel, a heated steering wheel switch, and a steering wheel heat module. The heated steering wheel includes non-serviceable heating elements and a temperature sensor. The heating elements and sensor are located in the left and right sides of the rim of the steering wheel. The heated steering wheel switch is located in the left steering wheel control switch assembly. The steering wheel heat control module is located at the bottom of the steering wheel center hub. When the switch is pressed, the switch signal circuit is grounded and the heat module turns the heated steering wheel on. The system then remains on until the customer turns it off. The wheel's normal operating temperature is 32°C (89.6°F). The wheel takes approximately 3 to 4 minutes to reach the normal operating temperature. The wheel will take longer to heat up if the vehicle temperature is below -21°C (-5.8°F). The built-in temperature sensor provides input to the controller to limit the temperature to the normal operating temperature. The wheel will not operate if the vehicle temperature is at or above 32°C (89.6°F).

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	CH-42640 J-42640 Steering Column Anti- Rotation Pin