

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

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Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Horn Plate Switch Screws	5.5 N.m	49 lb in
HVAC Floor Duct Mounting Screw	1.9 N.m	17 lb in
Ignition Lock Cylinder Case Screws	7 N.m	62 lb in
Intermediate Shaft to the Steering Column Pinch Bolt	50 N.m	37 lb ft
Intermediate Shaft to the Steering Gear Pinch Bolt	40 N.m	29 lb ft
Steering Column Electrical Connector Screw	6 N.m	53 lb in
Steering Column Mounting Nuts	27 N.m	20 lb ft
Steering Column Trim Cover Screws Lower	3.5 N.m	31 lb in
Steering Column Trim Cover Screws Upper	1 N.m	9 lb in
Steering Wheel Nut	41 N.m	30 lb ft
Steering Wheel Shroud Screws	2 N.m	18 lb in
Turn Signal Multifunction Switch Screws Side	7 N.m	62 lb in
Turn Signal Multifunction Switch Screws Top	3 N.m	27 lb in
Upper Intermediate Shaft to Lower Intermediate Shaft Pinch Bolt	50 N.m	37 lb ft
Adapter Support Plate	7 N.m	62 lb in

SCHEMATIC AND ROUTING DIAGRAMS

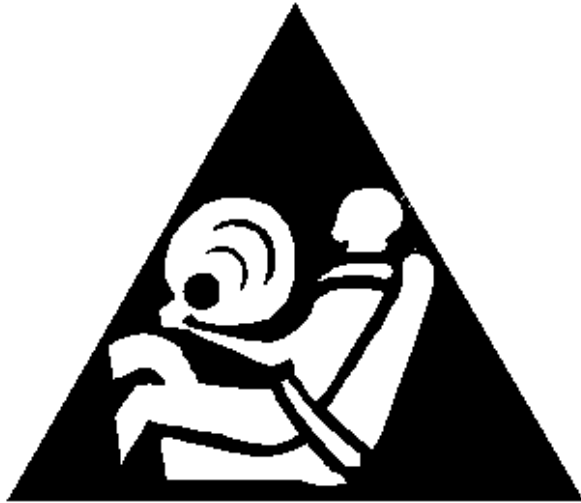
STEERING WHEEL AND COLUMN SCHEMATIC ICONS

Steering Wheel and Column Schematic Icons

Icon	Icon Definition
	CAUTION: When performing service on or near the SIR components or the SIR wiring, the SIR system

2006 Buick Rainier

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must be disabled. Refer to SIR Disabling and Enabling Zones. Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.

COLUMN/IGNITION LOCK SCHEMATICS

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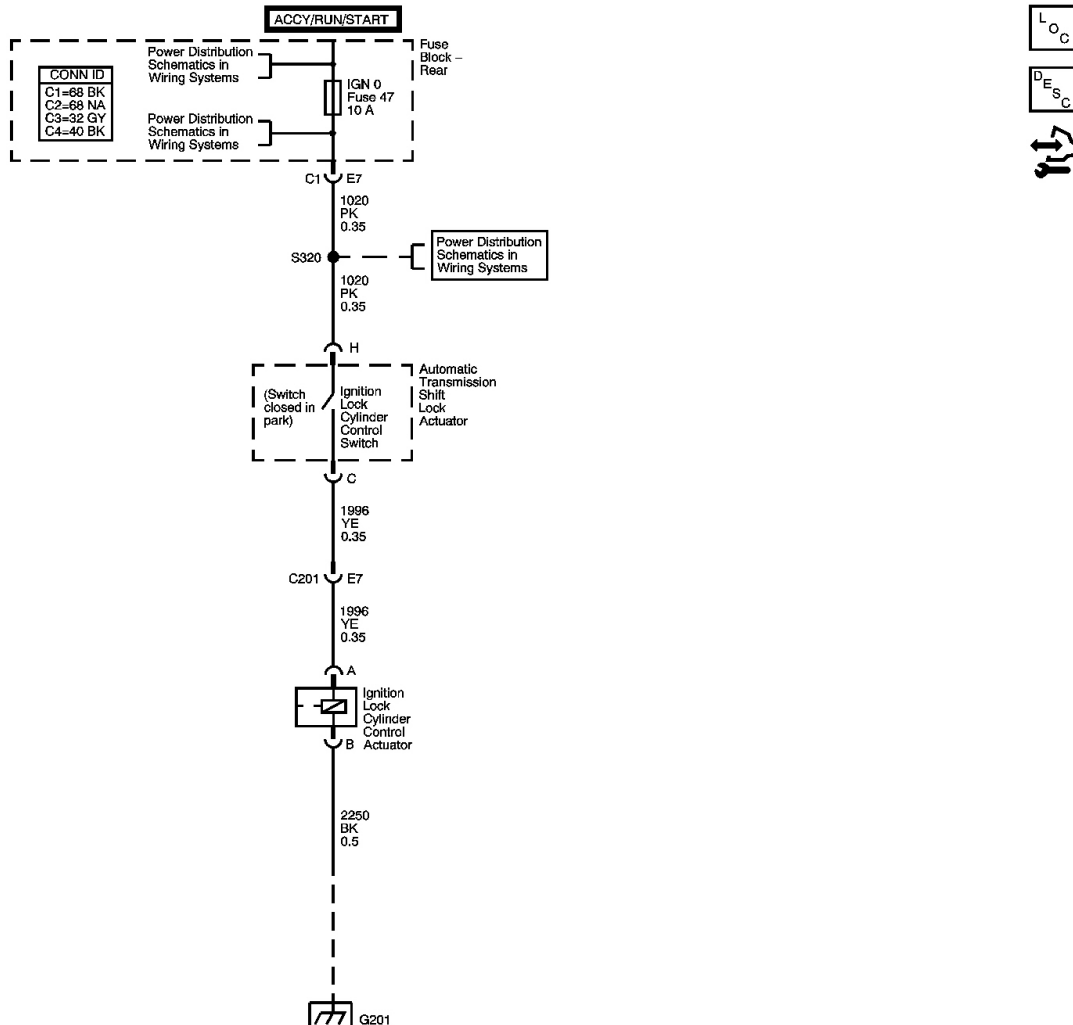


Fig. 1: Column/Ignition Lock Schematic
Courtesy of GENERAL MOTORS CORP.

STEERING WHEEL SCHEMATICS

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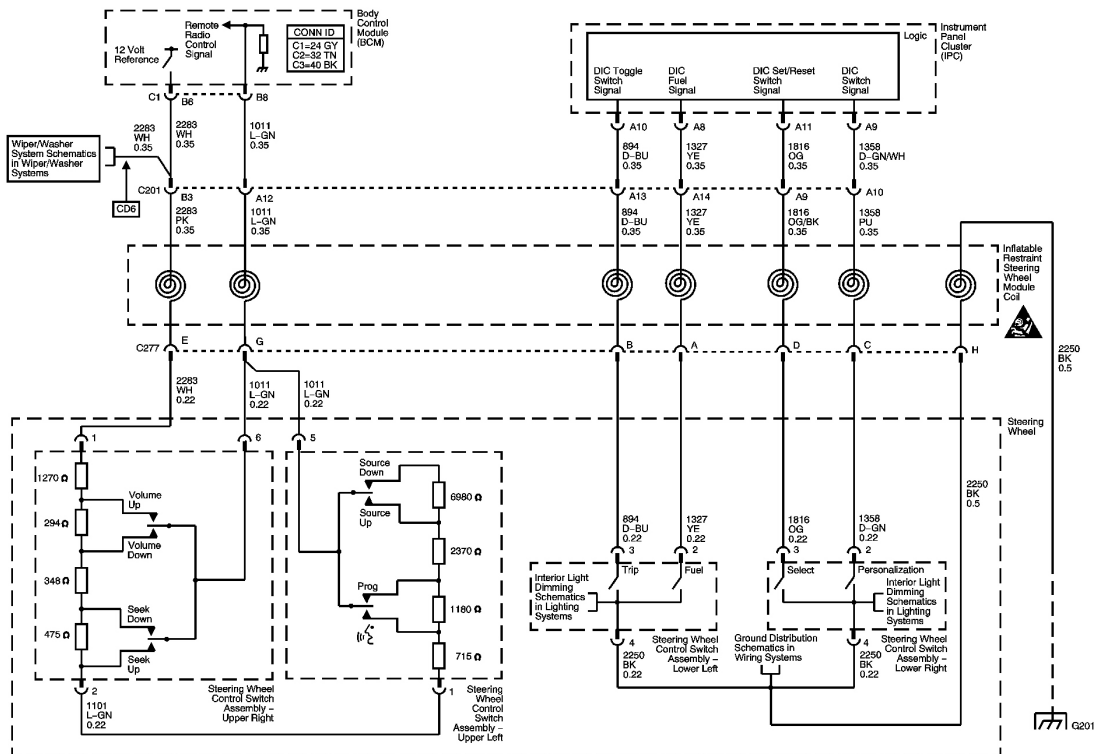


Fig. 2: Steering Wheel Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

STEERING COLUMN DISASSEMBLED VIEW

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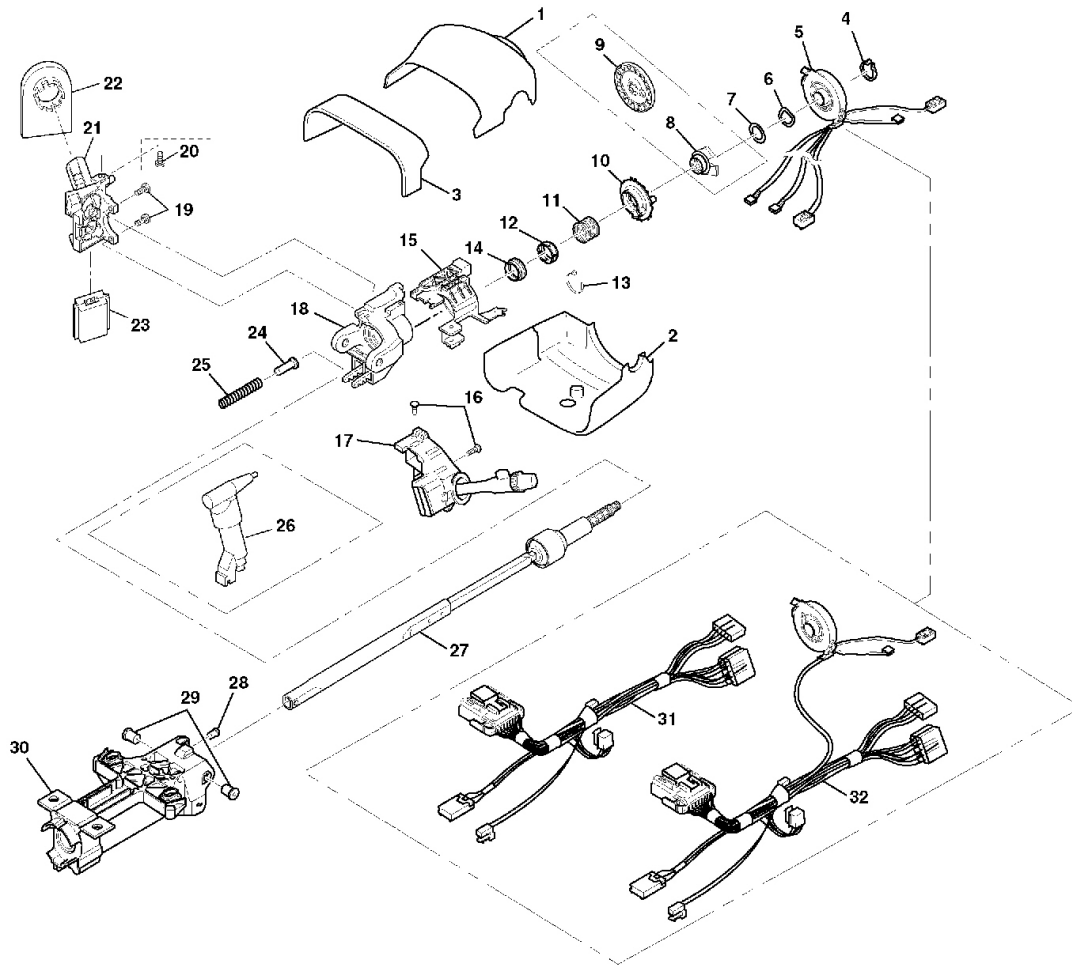


Fig. 3: Tilt Steering Column Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Upper Trim Cover
2	Lower Trim Cover
3	Steering Column Closeout Trim Cover
4	Retaining Ring
5	SIR Coil
6	Wave Washer
7	Bearing Retainer
8	Cam Orientation Plate

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

9	Shaft Lock Shield Assembly
10	Turn Signal Cancel Cam Assembly
11	Upper Bearing Spring
12	Upper Bearing Inner Race Seat
13	Wire Harness Strap
14	Inner Race
15	Signal Switch Housing
16	Pan Head Tapping Screws
17	Turn Signal and Multifunction Switch Assembly
18	Steering Column Tilt Head Assembly
19	Pan Head Tapping Screws
20	TORX® Head Screw
21	Ignition Lock Cylinder Case
22	Theft Deterrent Control Module
23	Ignition Switch Assembly
24	Spring Guide
25	Tilt Spring
26	Theft Deterrent Control Module Electric Park Lock
27	Steering Shaft Assembly
28	Tilt Bumper
29	Pivot Pins
30	Steering Column Support Assembly
31	Coil Wire Harness Assembly
32	Coil Wire Harness Assembly (Export)

STEERING WHEEL AND COLUMN COMPONENT VIEWS

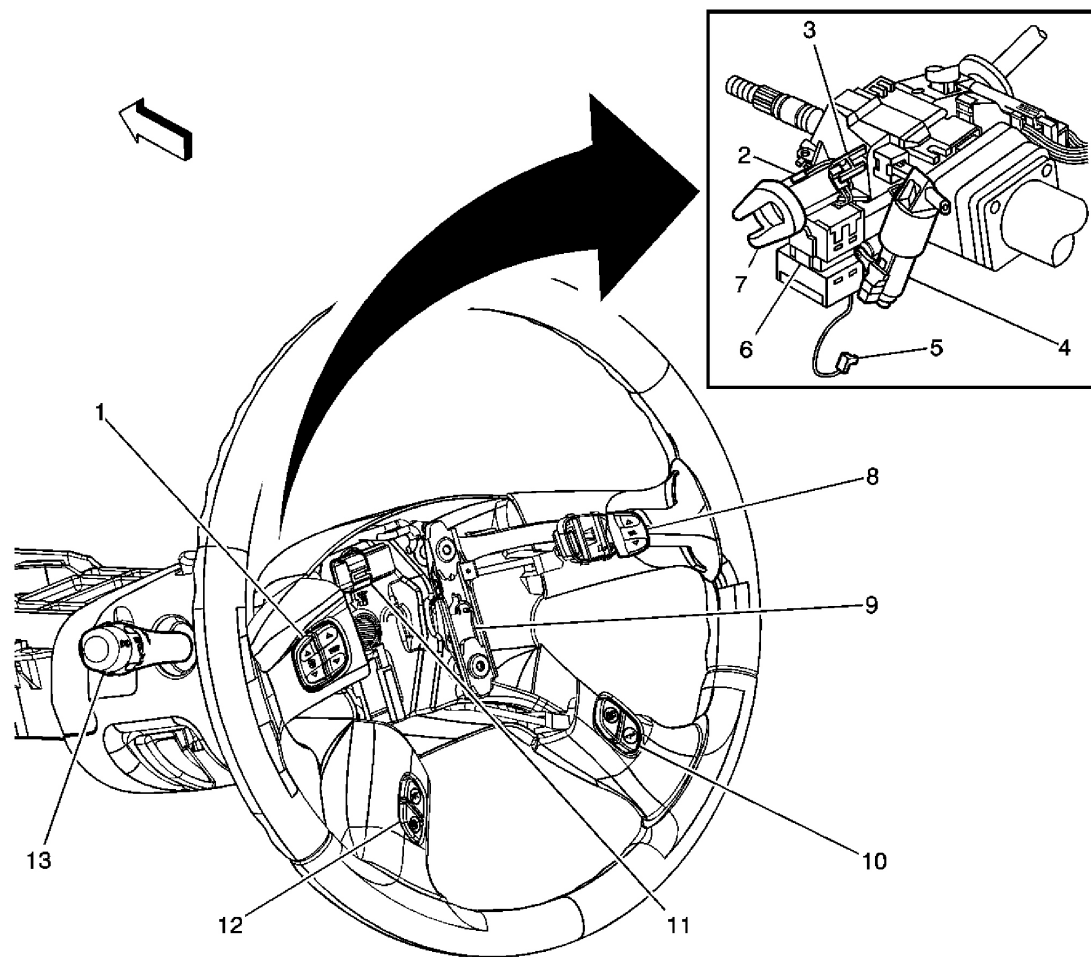


Fig. 4: Steering Wheel and Column Sub-System Component Views
 Courtesy of GENERAL MOTORS CORP.

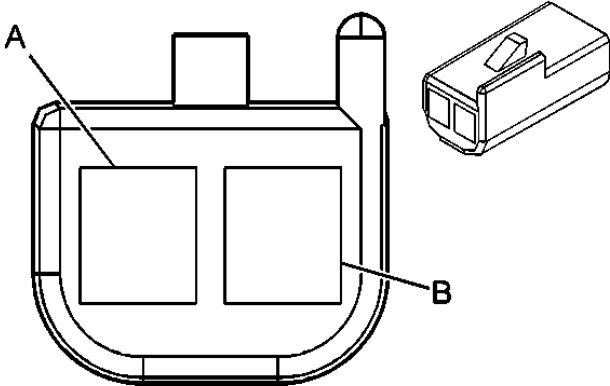
Callouts For Fig. 4

Callout	Component Name
1	Steering Wheel Control Switch Assembly - Upper Left (STW)
2	Passlock Sensor Connector
3	Ignition Key Alarm Switch
4	Ignition Lock Cylinder Control Actuator
5	Ignition Lock Cylinder Control Actuator Connector
6	Ignition Switch
7	Ignition Key Cylinder
8	Steering Wheel Control Switch Assembly - Upper Right (STW)
9	Horn Switch

10	Steering Wheel Control Switch Assembly - Lower Right (STW)
11	C277
12	Steering Wheel Control Switch Assembly - Lower Left (STW)
13	Turn Signal/Multifunction Switch

STEERING WHEEL AND COLUMN CONNECTOR END VIEWS

Ignition Lock Cylinder Control Actuator

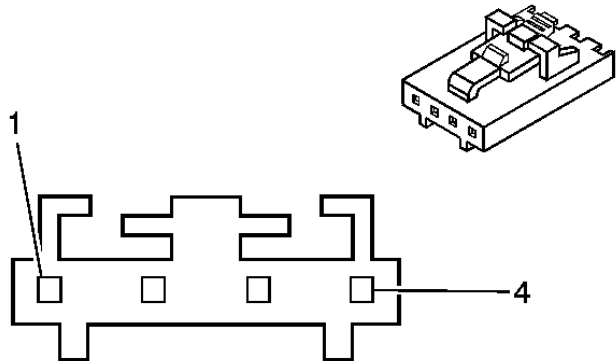


Connector Part Information		<ul style="list-style-type: none"> 12047662 2-Way F Metri-Pack 150 Series Unsealed (BK) 	
Pin	Wire Color	Circuit No.	Function
A	YE	1996	Remote Shift Selector Signal
B	BK	2250	Ground

Steering Wheel Control Switch Assembly - Lower Left (STW)

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

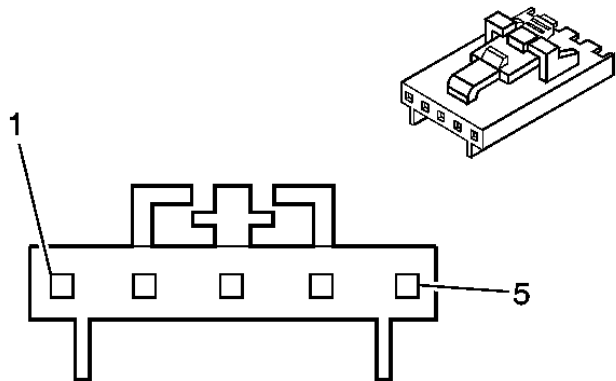


Connector Part Information

- 50-57-9404
- 4-Way F (BK)

Pin	Wire Color	Circuit Number	Function
1	BN	230	Instrument Panel Lamps Dimming Control
2	YE	1327	DIC Fuel Signal
3	D-BU	894	DIC Toggle Switch Signal
4	BK	2250	Ground

Steering Wheel Control Switch Assembly - Lower Right (STW)



Connector Part Information

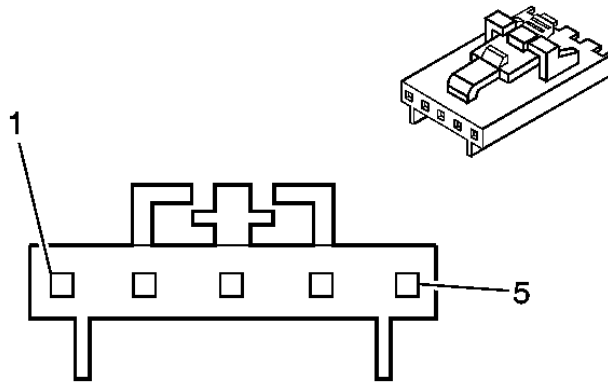
- 50-57-9405
- 5-Way F (BK)

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

Pin	Wire Color	Circuit No.	Function
1	BN	230	Instrument Panel Lamps Dimming Control
2	D-GN	1358	DIC Switch Signal
3	OG	1816	DIC Set/Reset Switch Signal
4	BK	2250	Ground
5	-	-	Not Used

Steering Wheel Control Switch Assembly - Upper Left (STW)



Connector Part Information

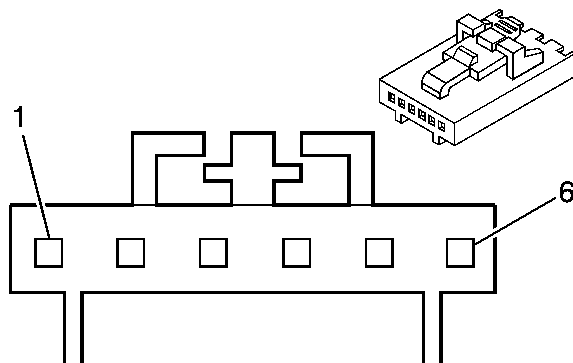
- 50-57-9405
- 5-Way F Molex (BK)

Pin	Wire Color	Circuit No.	Function
1	L-GN	1101	Remote Radio Control Signal
2	BN	230	Instrument Panel Lamps Dimming Control
3	BK	2250	Ground
4	-	-	Not Used
5	L-GN	1011	Remote Radio Control Signal

Steering Wheel Control Switch Assembly - Upper Right (STW)

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer



Connector Part Information		<ul style="list-style-type: none">• 50-57-9406• 6-Way F Molex (BK)	
Pin	Wire Color	Circuit No.	Function
1	WH	2283	12-Volt Reference
2	L-GN	1101	Remote Radio Control Signal
3	BN	230	Instrument Panel Lamps Dimming Control
4	-	-	Not Used
5	BK	2250	Ground
6	L-GN	1011	Remote Radio Control Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - STEERING WHEEL CONTROLS

Begin the system diagnosis with **Diagnostic System Check - Vehicle** . The Diagnostic System Check - Vehicle will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check - Vehicle will identify the correct procedure for diagnosing the system and where the procedure is located.

DTC B2815

DTC Descriptor**DTC B2815**

Steering Wheel Controls Illegal Resistance Value

Diagnostic Fault Information

Always perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

Circuit/System Description

The body control module (BCM) supplies 12 volts to the audio steering wheel control multiple momentary contact switches and monitors the return signal. Each switch is associated to a set resistance value, when pressed a specific voltage drop occurs through a series of resistors unique to that switch. The BCM identifies the selection, then sends a serial data message that is received by the component controlled, activating the feature.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The BCM detects a switch voltage that is higher than normal.

Action Taken When the DTC Sets

The BCM will ignore the switch command.

Conditions for Clearing the DTC

- The DTC will become history if the BCM no longer detects a circuit malfunction.
- The history DTC will clear after 100 fault-free ignition cycles.
- The DTC can be cleared with a scan tool.

Diagnostic Aids

- This diagnostic is for the audio steering wheel controls.
- Before diagnosis of the steering wheel controls, ensure the primary controls of the associated component are functioning properly.
- Review schematic when testing switch resistance values.

Reference Information**Schematic Reference****Steering Wheel Schematics****Connector End View Reference**

- **Steering Wheel and Column Connector End Views**
- **Computer/Integrating Systems Connector End Views**

Electrical Information Reference

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

Circuit/System Verification

Ignition ON, observe the scan tool steering wheel controls (SWC) Switch Voltage parameter in the body control module (BCM) data list. Pressing the switch should read voltage present, and drop to 0 volts when released.

Circuit/System Testing

It is recommended that Component Testing is performed before Circuit Testing when diagnosing steering wheel controls.

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the right steering wheel control connector.
2. Ignition ON, with a scan tool, verify the SWC Switch Voltage parameter is at 0 volts.
 - If over 0 volts, test the remote radio control signal circuit for a short to voltage. If the circuits test normal, replace the BCM.
3. If all circuits test normal, refer to Component Testing.

Component Testing

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the harness connector at the audio steering wheel control switches.
2. Test the switch for infinite resistance between the voltage supply terminal and the signal terminal with the switch in the open position.
 - If less than infinite resistance, replace the switch.
3. Test resistance values between the voltage supply terminal and the signal terminal with the switch closed in each position and verify readings are approximate to what the schematic reads.
 - If values do not, replace the switch.

Repair Instructions

Always perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup, and programming

STEERING WHEEL CONTROLS INOPERATIVE**Diagnostic Fault Information**

Always perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

Circuit/System Description

The body control module (BCM) supplies 12 volts to the audio steering wheel control multiple momentary contact switches and monitors the return signal. Each switch is associated to a set resistance value, when pressed a specific voltage drop occurs through a series of resistors unique to that switch. The BCM identifies the selection, then sends a serial data message that is received by the component controlled, activating the feature.

Diagnostic Aids

- This diagnostic is for the audio steering wheel controls.
- Before diagnosis of the steering wheel controls, ensure the primary controls of the associated component are functioning properly.
- Review with the schematic when testing switch resistance values.
- If a single switch function is inoperative, test the suspect switch. Refer to component testing.

- A poor connection at the right switch could cause the left switch to malfunction or be inoperative.

Reference Information**Schematic Reference****Steering Wheel Schematics****Connector End View Reference**

- **Steering Wheel and Column Connector End Views**
- **Computer/Integrating Systems Connector End Views**

Electrical Information Reference

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

Circuit/System Verification

Ignition ON, observe the scan tool steering wheel controls (SWC) Switch Voltage parameter in the BCM data list. Pressing the switch should read voltage present, and drop to 0 volts when released.

Circuit/System Testing

It is recommended that Component Testing is performed before Circuit Testing when diagnosing steering wheel controls.

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the harness connector at the audio steering wheel control switches.
2. Ignition ON, test for 12 volts between the voltage supply circuit and ground at the right switch harness connector.
 - If less than 10 volts, test the voltage supply circuit for a short to ground or an open/high resistance. If circuit tests normal, replace the BCM.

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

3. Install a 3-amp fused jumper wire at the right switch supply voltage circuit. Toggle the jumper wire to the signal circuits at the left and the right harness connectors. Verify DTC B2815 sets.
 - If DTC B2815 does not set, test the signal circuits for a short to ground or an open/high resistance. If circuits test normal, replace the BCM.
4. Remove the 3-amp fused jumper wire.
5. Ignition OFF, test the jumper wire for less than 1.0 ohm of resistance between the left and right switch connectors.
 - If greater than 1.0 ohm, test the jumper wire circuit for an open/high resistance.
6. If circuit tests normal, test or replace the switch.

Component Testing

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the harness connector at the suspect audio steering wheel control switch.
2. Test the switch for infinite resistance between the supply voltage terminal and the signal terminal with the switch in the open position.
 - If less than infinite resistance, replace the switch.
3. Test resistance values between the supply voltage terminal and the signal terminal with the switch closed in each position and verify readings are approximate to what the schematic reads.
 - If values do not, replace the switch.

Repair Instructions

Always perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup, and programming

SYMPTOMS - STEERING WHEEL AND COLUMN

Review the system description and operation in order to familiarize yourself with the system functions. Refer to **Steering Wheel and Column Description and Operation**.

Visual/Physical Inspection

2006 Buick Rainier

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- Inspect for aftermarket devices which could affect the operation of the steering wheel and column.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Symptoms List

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

- **Lock System Does Not Unlock**
- **Lock System Does Not Lock**
- **Lock System Sticks in Start**
- **Ignition Key Cannot Be Removed from the Ignition Lock Cylinder**
- **Ignition Key Cannot Turn or Sticks in Any Position**
- **Noise in Steering Column**
- **High Shift Effort**
- **Looseness in Steering Column**
- **Steering Column Tilt Function Inoperative**
- **Ignition Can/Cannot Be Turned Off with Transmission in Any Gear**

SYMPTOMS - STEERING WHEEL CONTROLS

- IMPORTANT:**
1. Perform the **Diagnostic System Check - Vehicle** , before using the Symptom Tables in order to verify that all of the following conditions are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
 2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Steering Wheel Controls Description and Operation**.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the Steering Wheel Controls System. Refer to **Checking Aftermarket Accessories** .

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

- Inspect for easily accessible or visible system components for obvious damage or conditions which may 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 **Steering Wheel Controls Inoperative** in order to diagnose the symptom.

LOCK SYSTEM DOES NOT UNLOCK

Lock System Does Not Unlock

Step	Action	Yes	No
DEFINITION: The lock system does not allow the key to rotate out of the OFF position.			
1	Did you review the Steering Wheel and Column Description and Operation?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify that the lock system does not unlock. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect for an incorrect, worn, or damaged key. Is the key incorrect, worn, or damaged?	Go to Step 7	Go to Step 4
4	Inspect for a faulty lock cylinder. Is the lock cylinder damaged?	Go to Step 8	Go to Step 5
5	Inspect the ignition lock cylinder case assembly for looseness. Is the ignition lock cylinder case assembly loose?	Go to Step 9	Go to Step 6
6	Inspect the ignition switch assembly for damage. Is the ignition switch assembly damaged?	Go to Step 10	Go to Step 3
7	Replace the key. Refer to <u>Key and Lock Cylinder Coding</u> in General Information. Did you complete the repair?	Go to Step 11	-
	Replace the lock cylinder. Refer to <u>Ignition</u>		

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

8	<u>Lock Cylinder Replacement.</u> Did you complete the repair?	Go to Step 11	-
9	Tighten the ignition lock cylinder case assembly. Refer to <u>Fastener Tightening Specifications.</u> Did you complete the repair?	Go to Step 11	-
10	Replace the ignition switch. Refer to <u>Ignition Switch Replacement.</u> Did you complete the repair?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

STEERING COLUMN TILT FUNCTION INOPERATIVE

Steering Column Tilt Function Inoperative

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>Steering Wheel and Column Description and Operation</u>
2	Verify that the steering column tilt function is inoperative. Does the steering column tilt function operate normally?	System OK	Go to Step 3
3	Verify that the shoe is not seized on the pivot pin. Is the shoe seized on the pivot pin?	Go to Step 9	Go to Step 4
4	Inspect the shoe grooves for dirt, burrs, or rust. Are the shoe grooves free of dirt, burrs, and rust?	Go to Step 9	Go to Step 5
5	Inspect for a weak or broken shoe lock spring. Is the shoe lock spring weak or broken?	Go to Step 9	Go to Step 6
6	Inspect the pivot pins for binding. Are the pivot pins binding?	Go to Step 10	Go to Step 7
7	Inspect for a weak or broken wheel tilt spring. Is the wheel tilt spring weak or broken?	Go to Step 11	Go to Step 8
	Inspect the steering column wiring harness for		

2006 Buick Rainier

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8	tightness. Is the steering column wiring harness too tight?	Go to Step 12	Go to Step 3
9	Replace the tilt head. Refer to <u>Steering Column Tilt Head Housing Replacement</u> . Is the repair complete?	Go to Step 13	-
10	Replace the pivot pins. Refer to <u>Steering Column Tilt Head Housing Replacement</u> . Is the repair complete?	Go to Step 13	-
11	Replace the tilt spring. Refer to <u>Tilt Spring Replacement</u> . Is the repair complete?	Go to Step 13	-
12	Reroute the steering column wiring harness to the correct location. Is the steering column wiring harness routed properly?	Go to Step 13	-
13	Operate the steering column tilt function in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

IGNITION CAN/CANNOT BE TURNED OFF WITH TRANSMISSION IN ANY GEAR

Ignition Can/Cannot Be Turned Off with Transmission in Any Gear

Step	Action	Yes	No
Schematic Reference: <u>Column/Ignition Lock Schematics</u>			
Connector End View Reference: <u>Steering Wheel and Column Connector End Views</u>			
1	Did you review the Steering Wheel and Column Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	1. Push the ignition lock cylinder control actuator release button which is on the underside of the ignition key cylinder. 2. Turn the key to the OFF position and remove the key. Were you able to turn the key to the OFF position and remove the key?	Go to Step 3	Go to <u>Lock System Does Not Lock</u>

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

3	<p>Verify the fault is present. Does the system operate normally?</p>	<p>Go to <u>Testing for Intermittent Conditions and Poor Connections</u> in Wiring Systems</p>	Go to Step 4
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the ignition lock cylinder control actuator. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the battery positive voltage and ground circuits of the ignition lock cylinder control actuator. 5. Cycle the gear shift from Park to Drive. <p>Does the test lamp turn ON and OFF with each cycle?</p>	Go to Step 12	Go to Step 5
5	<p>Connect a test lamp between the ground circuit of the ignition lock cylinder control actuator and B+ voltage. Does the test lamp illuminate?</p>	Go to Step 6	Go to Step 8
6	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Reconnect the ignition lock cylinder control actuator. 3. Disconnect the floor shift control connector. 4. Turn ON the ignition, with the engine OFF. 5. Connect a test lamp between the battery positive voltage and ground circuits of the ignition lock cylinder control switch. <p>Does the test lamp illuminate?</p>	Go to Step 11	Go to Step 7
7	<p>Connect a test lamp between battery positive circuit of the ignition lock cylinder control switch and a good ground.</p>		

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

	Does the test lamp illuminate?	Go to Step 10	Go to Step 9
8	Repair the open in the ground circuit of the ignition lock cylinder control actuator circuit. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 15	-
9	Repair the open or short to ground of the ignition lock cylinder control switch battery positive voltage circuit. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 15	-
10	Repair the open, short to ground, or short to voltage of the ignition lock cylinder control switch signal circuit. Refer to <u>Wiring Repairs</u> in Wiring Systems. Did you complete the repair?	Go to Step 15	-
11	Inspect for poor connections at the ignition lock cylinder control switch. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 15	Go to Step 13
12	Inspect for poor connections at the ignition lock cylinder control actuator. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems. Did you find and correct the condition?	Go to Step 15	Go to Step 14
13	Replace the ignition lock cylinder control switch. Refer to <u>Ignition Switch Replacement</u> . Did you complete the replacement?	Go to Step 15	-
14	Replace the ignition lock cylinder control actuator. Refer to <u>Steering Wheel Theft Deterrent Lock Replacement</u> . Did you complete the replacement?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 4

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

LOCK SYSTEM DOES NOT LOCK**Lock System Does Not Lock**

Step	Action	Yes	No
DEFINITION: The lock system will not allow the key to be turned to the OFF lock position.			
1	Did you review the Steering Wheel and Column Description and Operation?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify that the lock system does not lock. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect for a faulty lock cylinder or release button. Is the lock cylinder or release button damaged?	Go to Step 6	Go to Step 4
4	Inspect the shift cable adjustment. Is the shift cable adjusted incorrectly?	Go to Step 7	Go to Step 5
5	Inspect the ignition switch for damage. Is the ignition switch damaged?	Go to Step 8	Go to Step 6
6	Replace the lock cylinder. Refer to <u>Ignition Lock Cylinder Replacement</u> . Did you complete the repair?	Go to Step 9	-
7	Adjust the shift cable. Refer to <u>Automatic Transmission Range Selector Cable Adjustment</u> in Automatic Transmission - 4L60-E/4L65-E. Did you complete the repair?	Go to Step 9	-
8	Replace the ignition switch. Refer to <u>Ignition Switch Replacement</u> . Did you complete the repair?	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

LOCK SYSTEM STICKS IN START**Lock System Sticks in Start**

Step	Action	Yes	No

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

1	Did you review the Steering Wheel and Column Description and Operation?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify that the lock system sticks in the START position. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect the ignition lock cylinder case assembly for damage. Is the ignition lock cylinder case assembly damaged?	Go to Step 6	Go to Step 4
4	Inspect the lock cylinder for damage. Is the lock cylinder damaged?	Go to Step 7	Go to Step 5
5	Inspect the ignition switch for damage. Is the ignition switch damaged?	Go to Step 8	Go to Step 3
6	Replace the ignition lock cylinder case assembly. Refer to <u>Ignition Switch Replacement</u> . Did you complete the repair?	Go to Step 9	-
7	Replace the lock cylinder. Refer to <u>Ignition Lock Cylinder Replacement</u> . Did you complete the repair?	Go to Step 9	-
8	Replace the ignition switch. Refer to <u>Ignition Switch Replacement</u> . Did you complete the repair?	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

IGNITION KEY CANNOT BE REMOVED FROM THE IGNITION LOCK CYLINDER

Ignition Key Cannot Be Removed from the Ignition Lock Cylinder

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

2	Verify that the key cannot be removed from the lock cylinder in the OFF position. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect for incorrect, worn, or damaged key. Is the key incorrect, worn, or damaged?	Go to Step 5	Go to Step 4
4	Inspect for a faulty lock cylinder or release button. Is the lock cylinder or release button damaged?	Go to Step 6	Go to Step 3
5	Replace the key. Refer to Key and Lock Cylinder Coding in General Information. Did you complete the repair?	Go to Step 7	-
6	Replace the lock cylinder. Refer to Ignition Lock Cylinder Replacement . 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

IGNITION KEY CANNOT TURN OR STICKS IN ANY POSITION

Ignition Key Cannot Turn or Sticks in Any Position

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation?	Go to Step 2	Go to Steering Wheel and Column Description and Operation
2	Verify that the lock system has a high lock effort. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect for an incorrect, worn, or damaged key. Is the key incorrect, worn, or damaged?	Go to Step 7	Go to Step 4
4	Inspect for a faulty lock cylinder. Is the lock cylinder damaged?	Go to Step 8	Go to Step 5
5	Inspect the ignition lock cylinder case assembly for damage. Is the ignition lock cylinder case assembly damaged?	Go to Step 9	Go to Step 6
	Inspect the ignition switch assembly for		

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

6	damage. Is the ignition switch assembly damaged?	Go to Step 10	Go to Step 7
7	Replace the key. Refer to <u>Key and Lock Cylinder Coding</u> in General Information. Did you complete the repair?	Go to Step 11	-
8	Replace the lock cylinder. Refer to <u>Ignition Lock Cylinder Replacement</u> . Did you complete the repair?	Go to Step 11	-
9	Replace the ignition lock cylinder case assembly. Refer to <u>Ignition Switch Replacement</u> . Did you complete the repair?	Go to Step 11	-
10	Replace the ignition switch. Refer to <u>Ignition Switch Replacement</u> . Did you complete the repair?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

NOISE IN STEERING COLUMN

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 <u>Steering Wheel and Column Description and Operation</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 components for looseness. Is the steering column components loose?	Go to Step 9	Go to Step 4
4	Inspect the SIR coil for noise. Is the SIR coil noisy?	Go to Step 10	Go to Step 5
5	Inspect the horn contact ring for lubrication. Is the horn contact ring lubricated?	Go to Step 11	Go to Step 6

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

6	<p>Inspect the lock plate retaining ring for the correct installation.</p> <p>Is the lock plate retaining ring installed properly?</p>	Go to Step 12	Go to Step 7
7	<p>Inspect the shaft bearing for the following conditions:</p> <ul style="list-style-type: none"> • Damage • Lubrication • Wear • Proper seating <p>Are the bearings in need of repair or replacement?</p>	Go to Step 13	Go to Step 8
8	<p>Inspect the steering column coupling for looseness.</p> <p>Is the steering column coupling loose?</p>	Go to Step 13	Go to Step 3
9	<p>Tighten the steering column components to specifications. Refer to <u>Fastener Tightening Specifications</u>.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
10	<p>Replace the SIR coil. Refer to <u>Inflatable Restraint Steering Wheel Module Coil Replacement</u> in SIR.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
11	<p>Lubricate the horn contact ring.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
12	<p>Install the lock plate retaining ring properly.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
13	<p>Repair the shaft bearings as necessary. Refer to <u>Steering Column Shaft Replacement</u>.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
14	<p>Tighten the steering column coupling to specifications. Refer to <u>Fastener Tightening Specifications</u>.</p> <p>Did you complete the repair?</p>	Go to Step 15	-
	<p>Operate the system in order to verify the repair.</p>		

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

15 Did you correct the condition?

System OK

Go to **Step 3****HIGH SHIFT EFFORT****High Shift Effort**

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and operation?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify that a high shift effort is required in order to shift out of the PARK position. Does the shifter operate normally?	System OK	Go to Step 3
3	Inspect for worn or damaged shift linkage components. Are the shift linkage components worn or damaged?	Go to Step 5	Go to Step 4
4	Inspect the shift cable for binding or misadjustment. Is the shift cable binding or misadjusted?	Go to Step 6	Go to Step 3
5	Replace the shift cable. Refer to <u>Automatic Transmission Range Selector Cable Replacement</u> in Automatic Transmission - 4L60-E/4L65-E. Did you complete the repair?	Go to Step 7	-
6	Adjust the shift cable. Refer to <u>Automatic Transmission Range Selector Cable Adjustment</u> in Automatic Transmission - 4L60-E/4L65-E. 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

LOOSENESS IN STEERING COLUMN**Looseness in Steering Column**

Step	Action	Yes	No

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</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 brackets for looseness. Are the steering column mounting brackets loose?	Go to Step 8	Go to Step 4
4	Verify that the steering column bracket capsule is not sheared. Is the steering column bracket capsule sheared?	Go to Step 9	Go to Step 5
5	Inspect the support screws for looseness. Are the support screws loose?	Go to Step 10	Go to Step 6
6	Inspect the intermediate shaft for worn joints or looseness. Is the intermediate joint worn or loose?	Go to Step 11	Go to Step 7
7	Inspect the tilt head, support and pivot pins for looseness. Are there any loose components?	Go to Step 12	Go to Step 2
8	Tighten the brackets to specifications. Refer to <u>Fastener Tightening Specifications</u> . Did you complete the repair?	Go to Step 13	-
9	Replace the jacket assembly. Refer to <u>Steering Column Jacket Replacement</u> . Did you complete the replacement?	Go to Step 13	-
10	Tighten the support screws to specifications. Refer to <u>Fastener Tightening Specifications</u> . Did you complete the repair?	Go to Step 13	-
11	Tighten or replace the intermediate shaft as needed. Refer to <u>Intermediate Steering Shaft Replacement - Upper</u> and <u>Intermediate Steering Shaft Replacement - Lower</u> . Did you complete the repair?	Go to Step 13	-
	Repair or replace the tilt head, support and pivot pins as necessary. Refer to <u>Steering</u>		

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

12	<u>Column Tilt Head Housing Replacement.</u> Did you complete the replacement?	Go to Step 13	-
13	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 REPLACEMENT - UPPER

Tools Required

J 42640 Steering Column Lock Pin. See **Special Tools**.

Removal Procedure

NOTE: The front wheels of the vehicle must be maintained in the straight ahead position and the steering column must be in the LOCK position before disconnecting the steering column or intermediate shaft. Failure to follow these procedures will cause improper alignment of some components during installation and result in damage to the SIR coil assembly.

1. Turn the steering wheel so that the front wheels are pointing straight ahead.
2. Turn the ignition switch to the lock position and remove the key.

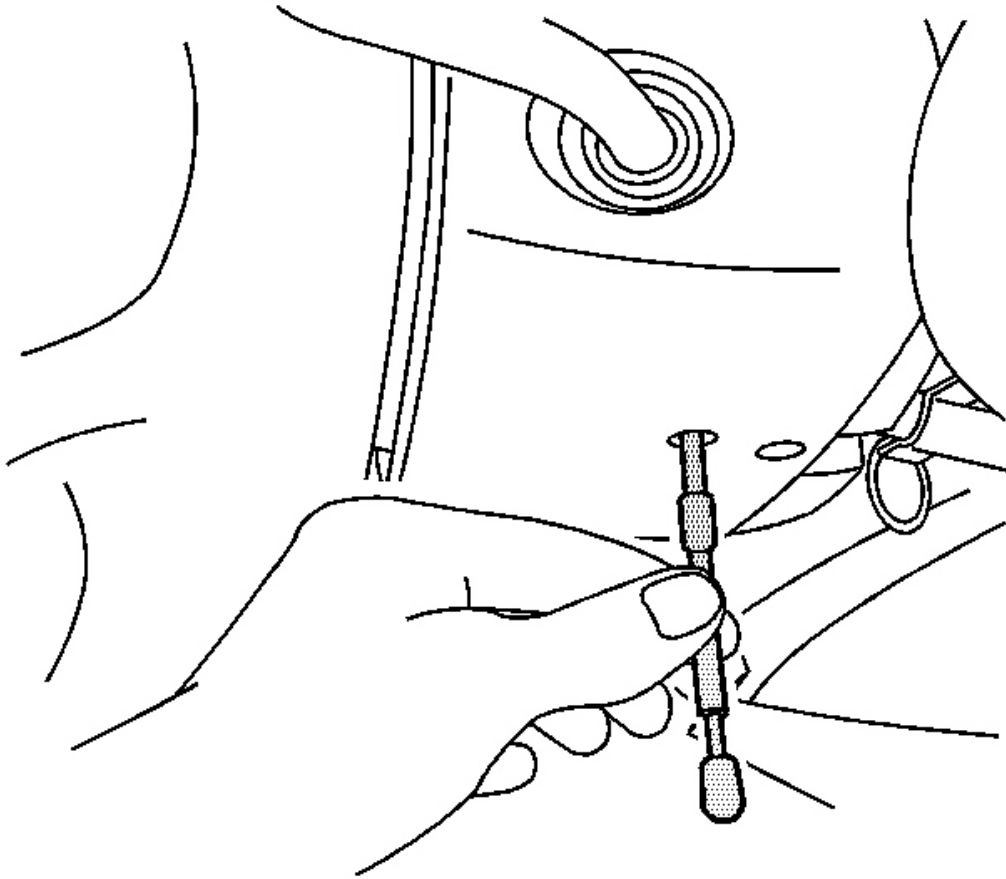


Fig. 5: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

3. Lock the steering column through the access hole in the lower steering column trim cover using the **J 42640** . See **Special Tools**.
4. Remove the air outlet duct. Refer to **Air Outlet Duct Replacement - Floor, LH** in Heating, Ventilation, and Air Conditioning.

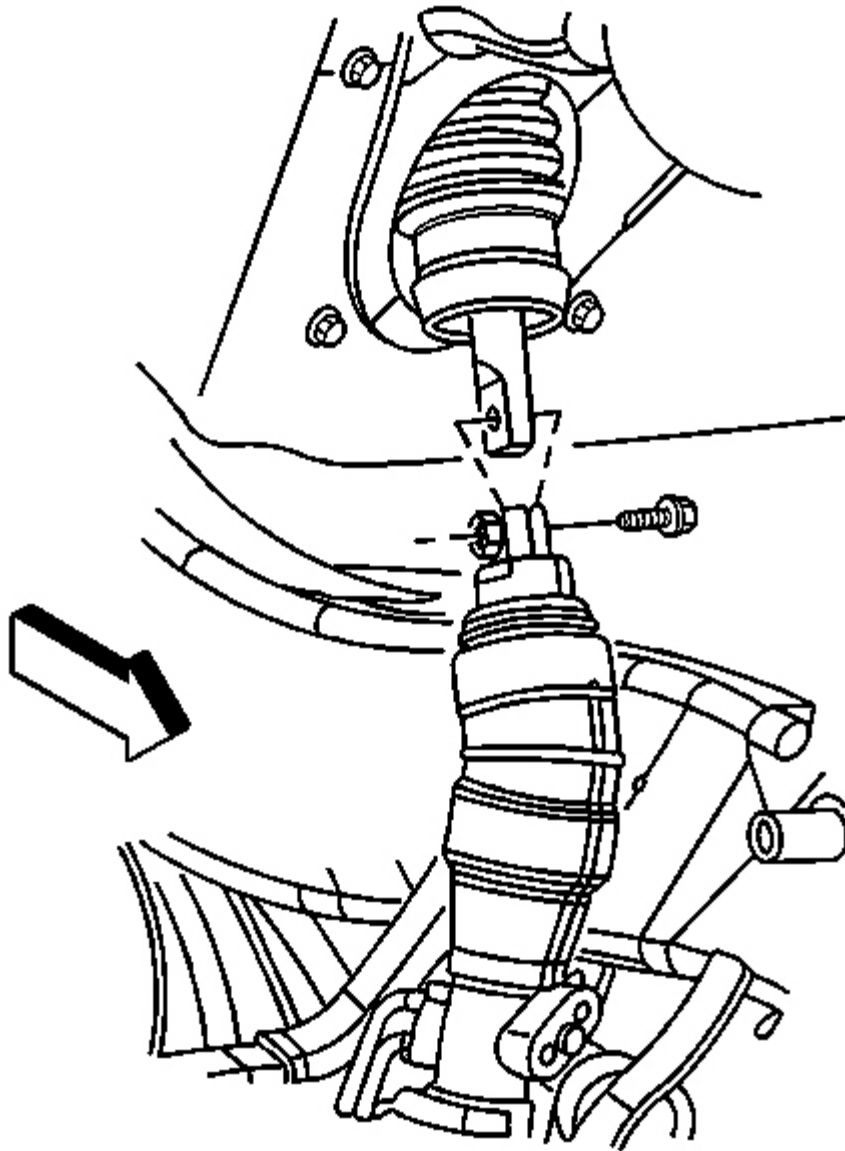


Fig. 6: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the upper intermediate shaft boot from the lower intermediate shaft boot to gain access to the upper intermediate shaft to lower intermediate pinch bolt.

6. Remove the upper intermediate shaft to lower intermediate shaft pinch bolt.
7. Disconnect the upper intermediate shaft from the lower intermediate shaft.

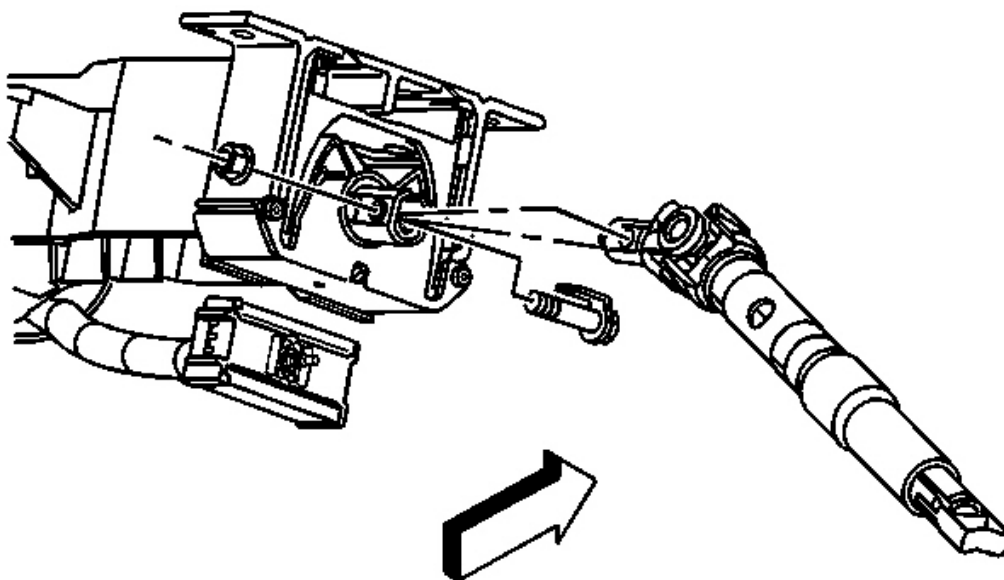


Fig. 7: View Of Steering Column & Upper Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the direction of upper intermediate shaft to steering column pinch bolt for installation. The bolt must be installed in the same direction it was removed.

8. Remove the upper intermediate shaft to steering column pinch bolt.
9. Disconnect the upper intermediate shaft from the steering column.
10. Remove the upper intermediate shaft from the vehicle.

Installation Procedure

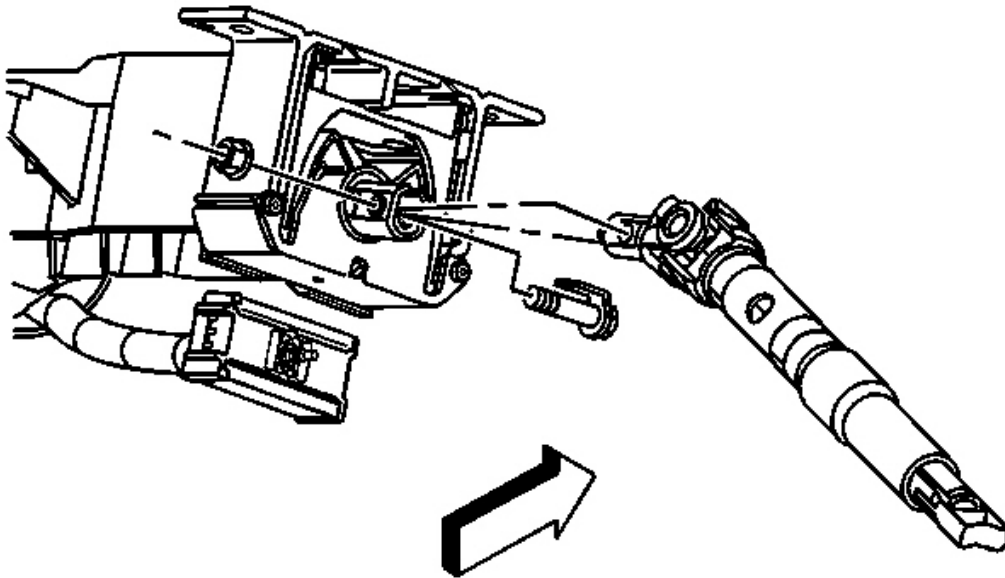


Fig. 8: View Of Steering Column & Upper Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the upper intermediate shaft to the vehicle.
2. Connect the upper intermediate shaft to the steering column.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: The upper intermediate shaft to the steering column pinch bolt must be installed in the same direction it was removed or the pinch bolt will contact the steering column housing.

3. Install the upper intermediate shaft to the steering column pinch bolt and nut.

Tighten: Tighten the upper intermediate shaft to the steering column pinch bolt nut to 50 N.m (37 lb ft).

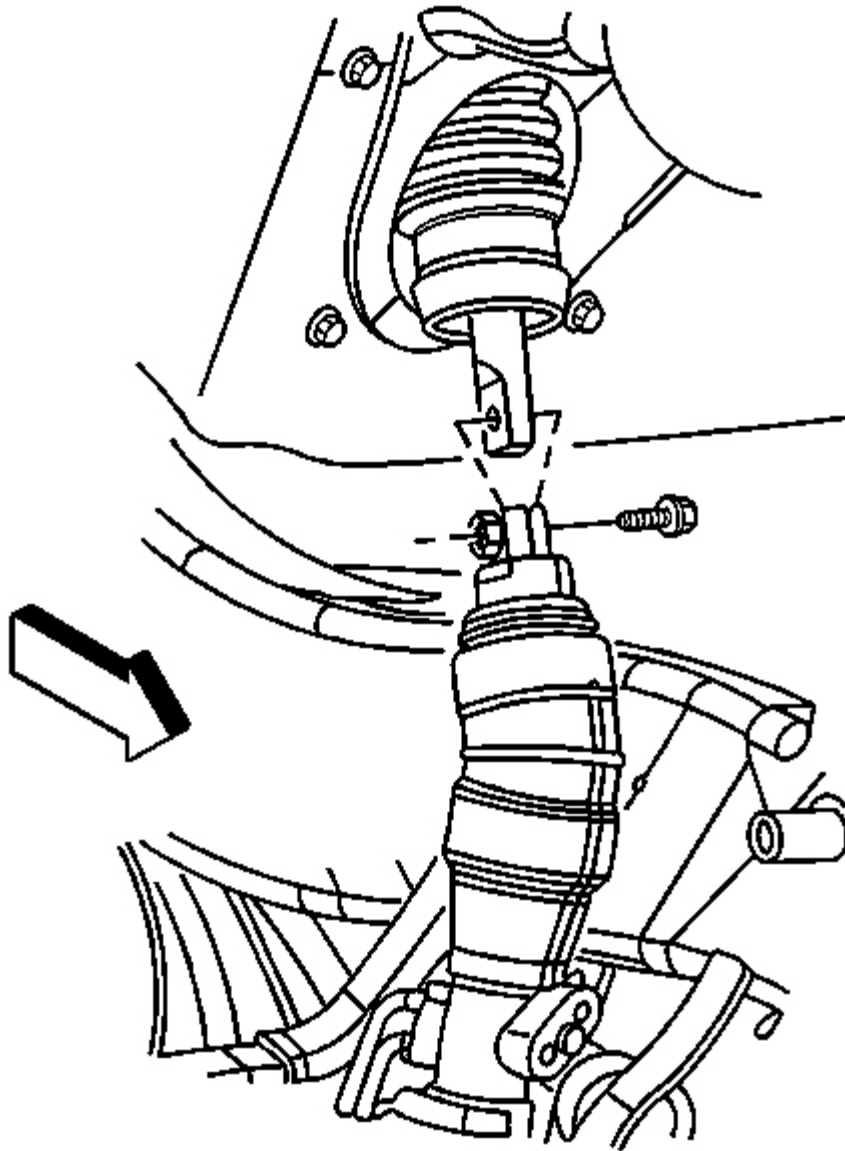


Fig. 9: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

4. Connect the upper intermediate shaft to the lower intermediate shaft.
5. Install the upper intermediate shaft to the lower intermediate shaft pinch bolt.

Tighten: Tighten the upper intermediate shaft to the lower intermediate shaft pinch bolt to 50 N.m (37 lb ft).

IMPORTANT: The upper intermediate shaft boot must completely cover the white insert of the lower intermediate shaft boot to ensure proper sealing.

6. Connect the upper intermediate shaft boot to the lower intermediate shaft boot.
7. Install the air outlet duct. Refer to **Air Outlet Duct Replacement - Floor, LH** in Heating, Ventilation, and Air Conditioning.

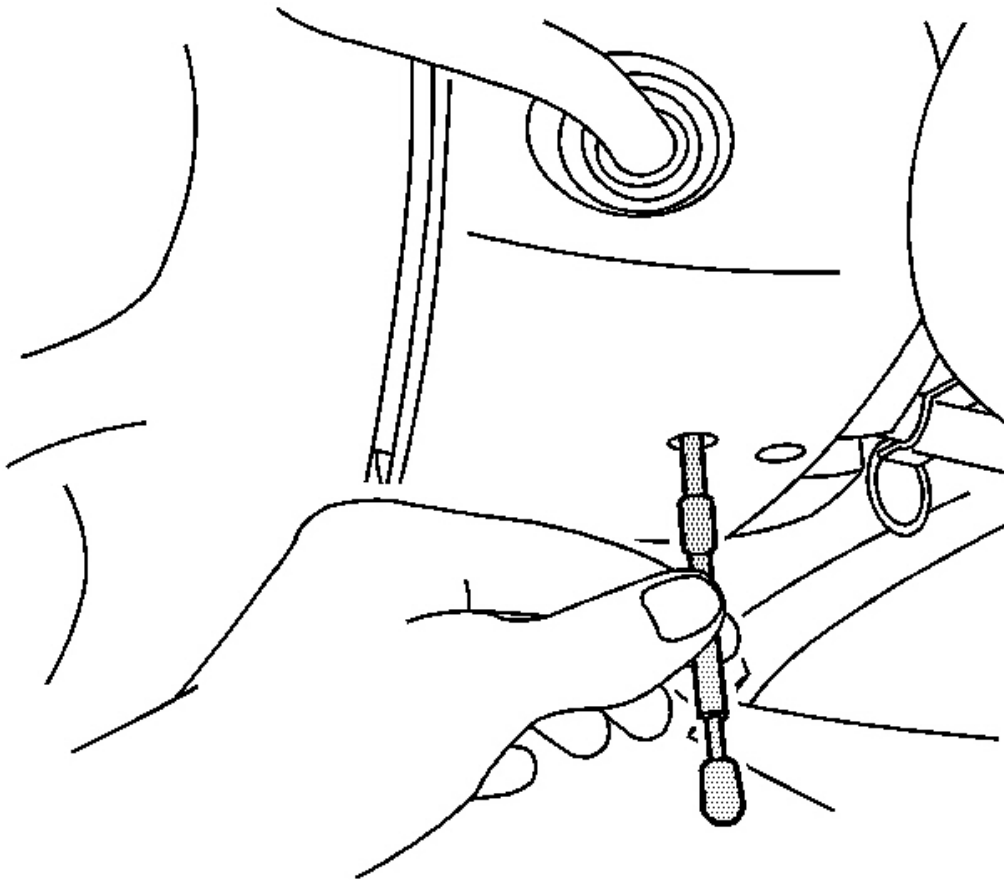


Fig. 10: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

8. Unlock the steering column by removing **J 42640** from the steering column lower trim cover access hole. See **Special Tools**.

INTERMEDIATE STEERING SHAFT REPLACEMENT - LOWER

Tools Required

J 42640 Steering Column Lock Pin. See **Special Tools**.

Removal Procedure

NOTE: The front wheels of the vehicle must be maintained in the straight ahead position and the steering column must be in the LOCK position before disconnecting the steering column or intermediate shaft. Failure to follow these procedures will cause improper alignment of some components during installation and result in damage to the SIR coil assembly.

1. Turn the steering wheel so that the front wheels are pointing straight ahead.
2. Turn the ignition switch to the lock position and remove the key.

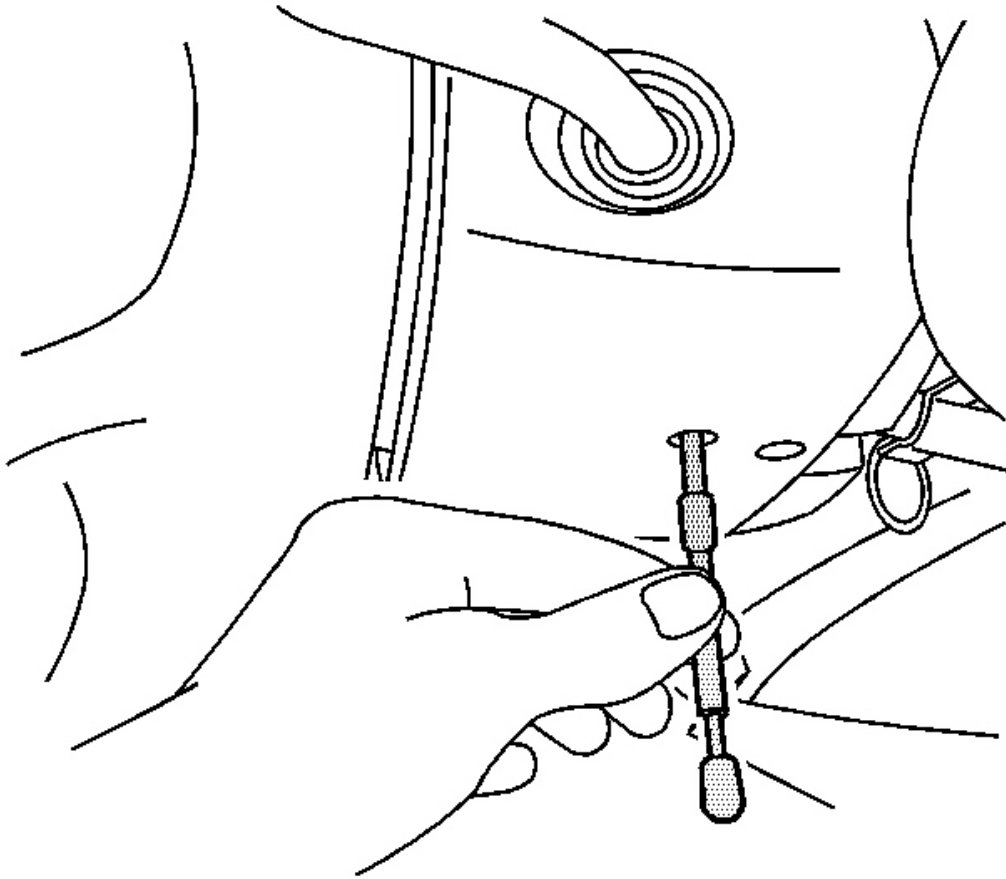


Fig. 11: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

3. Lock the steering column through the access hole in the lower steering column trim cover using **J 42640** . See **Special Tools**.

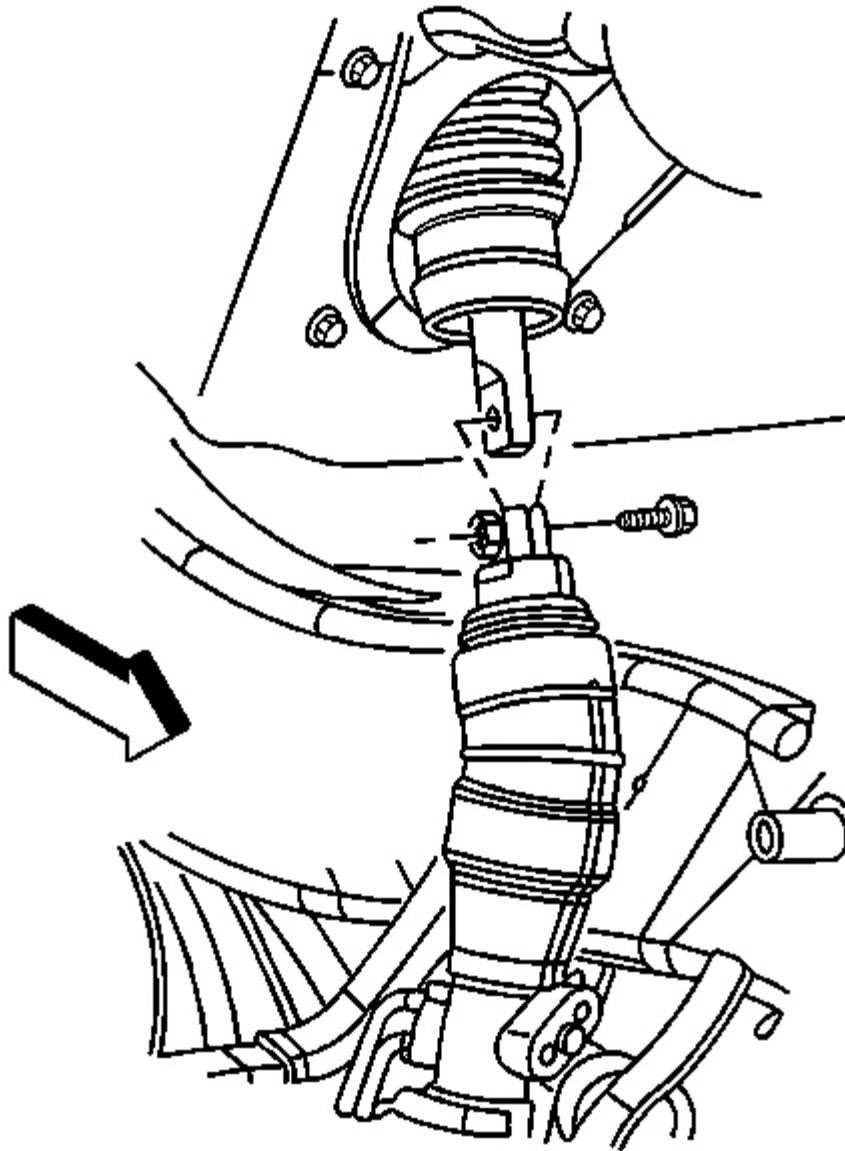


Fig. 12: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the upper intermediate shaft boot from the lower intermediate shaft boot to gain access to the upper intermediate shaft to lower intermediate pinch bolt.

5. Remove the lower intermediate shaft to upper intermediate shaft pinch bolt.
6. Disconnect the lower intermediate shaft from the upper intermediate shaft.

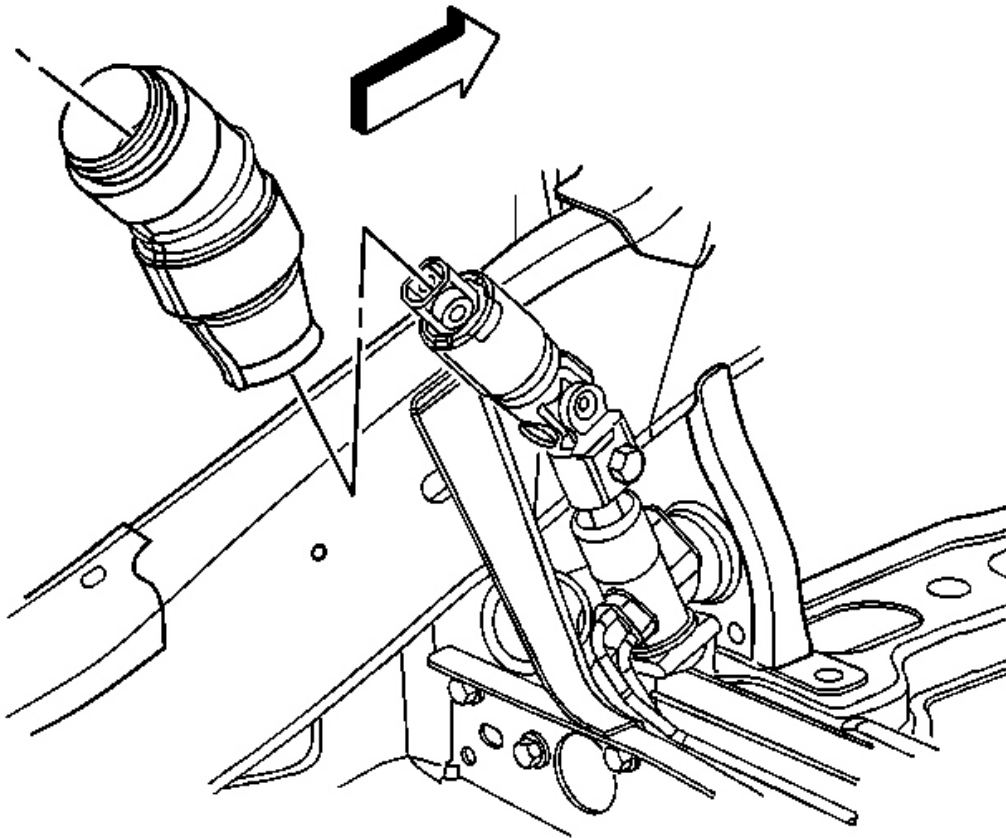


Fig. 13: Removing/Installing Intermediate Shaft Boot
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the lower intermediate shaft boot from the power steering gear and remove intermediate shaft boot from the vehicle.

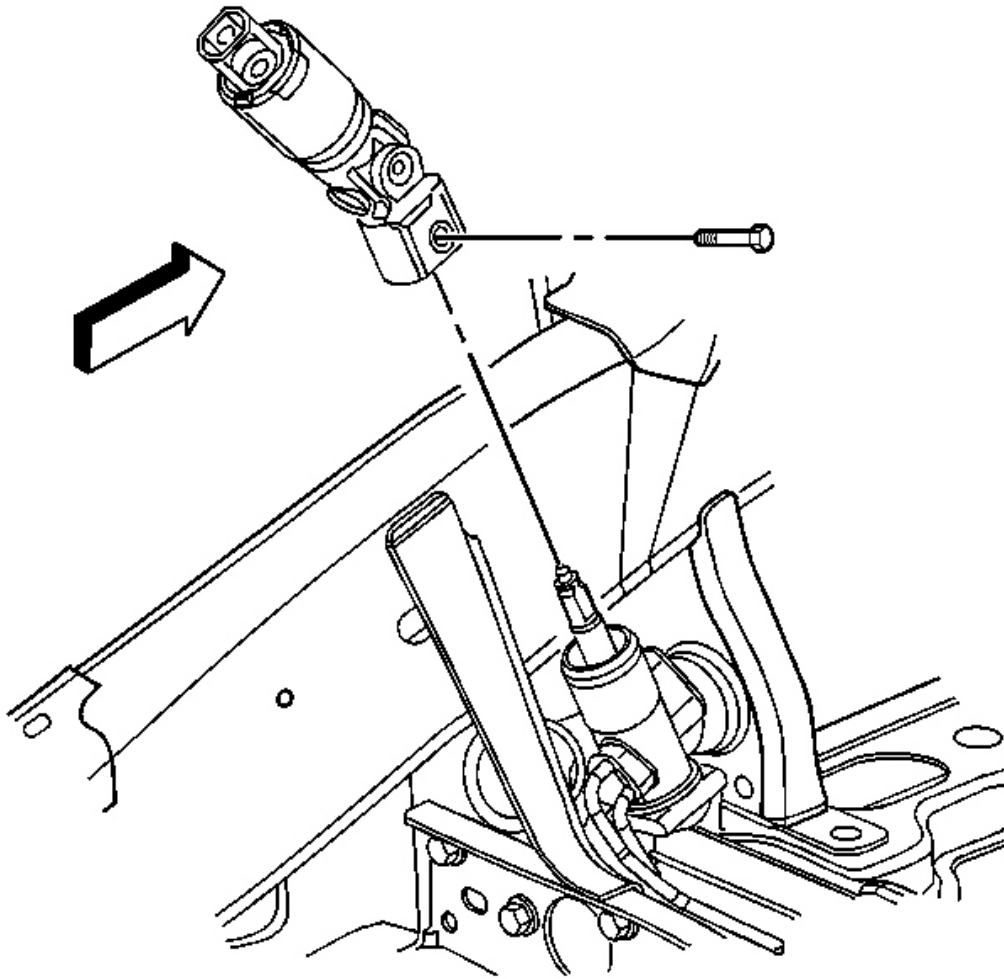


Fig. 14: Removing/Installing Lower Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

8. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

IMPORTANT: Note the relationship of the intermediate shaft to the power steering gear and the intermediate shaft to the steering column in order to ensure proper installation.

9. Remove the lower intermediate shaft to the power steering gear input shaft pinch bolt.

10. Disconnect the lower intermediate shaft from the power steering gear.
11. Remove the lower intermediate shaft from the vehicle.

Installation Procedure

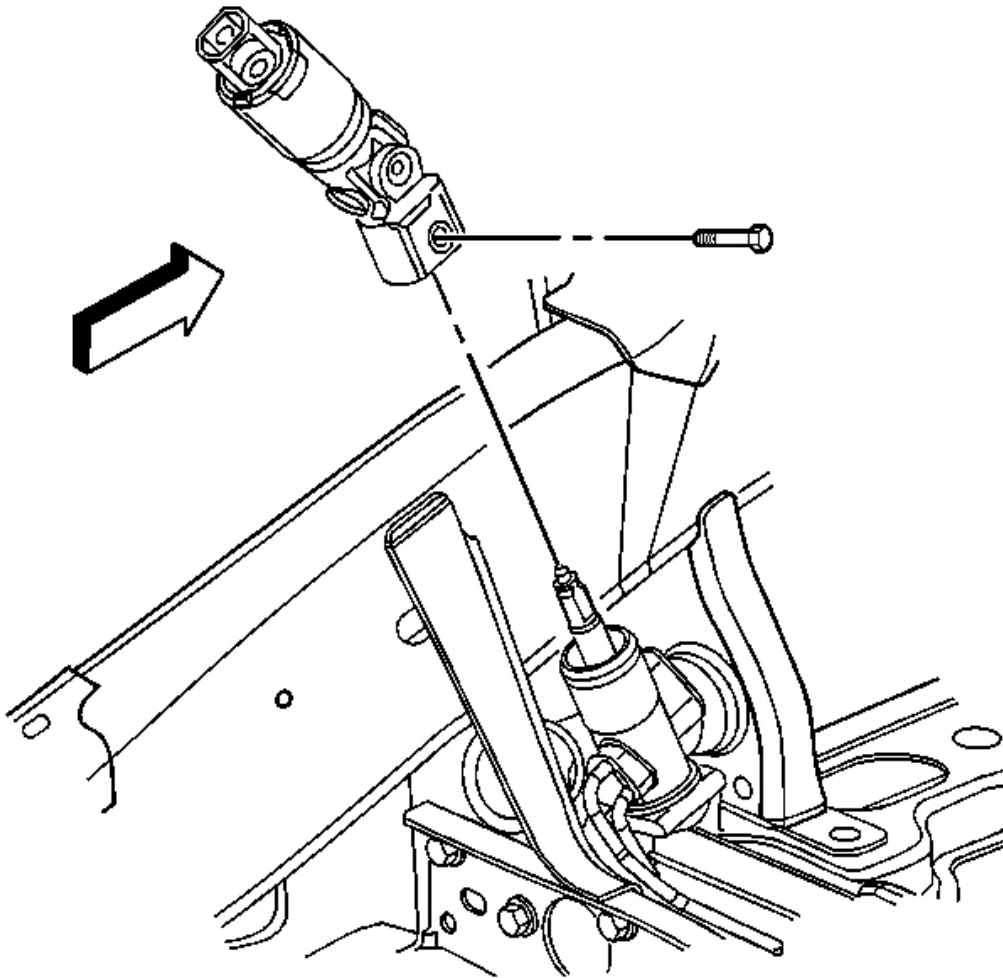


Fig. 15: Removing/Installing Lower Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the lower intermediate shaft to the vehicle.
2. Connect the lower intermediate shaft to the power steering gear.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the lower intermediate shaft to the power steering gear input shaft pinch bolt.

Tighten: Tighten the lower intermediate shaft to the power steering gear input shaft pinch bolt to 40 N.m (29 lb ft).

4. Lower the vehicle.

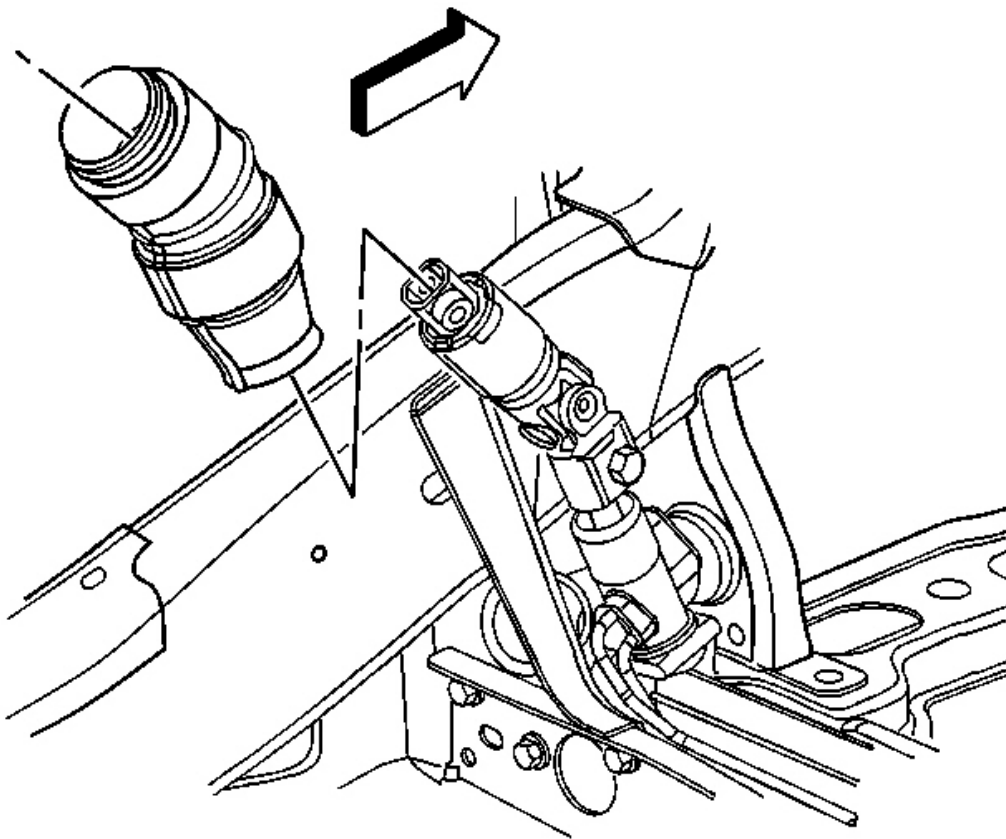


Fig. 16: Removing/Installing Intermediate Shaft Boot
Courtesy of GENERAL MOTORS CORP.

5. Install the lower intermediate shaft boot and connect the lower intermediate shaft boot to the power steering gear.

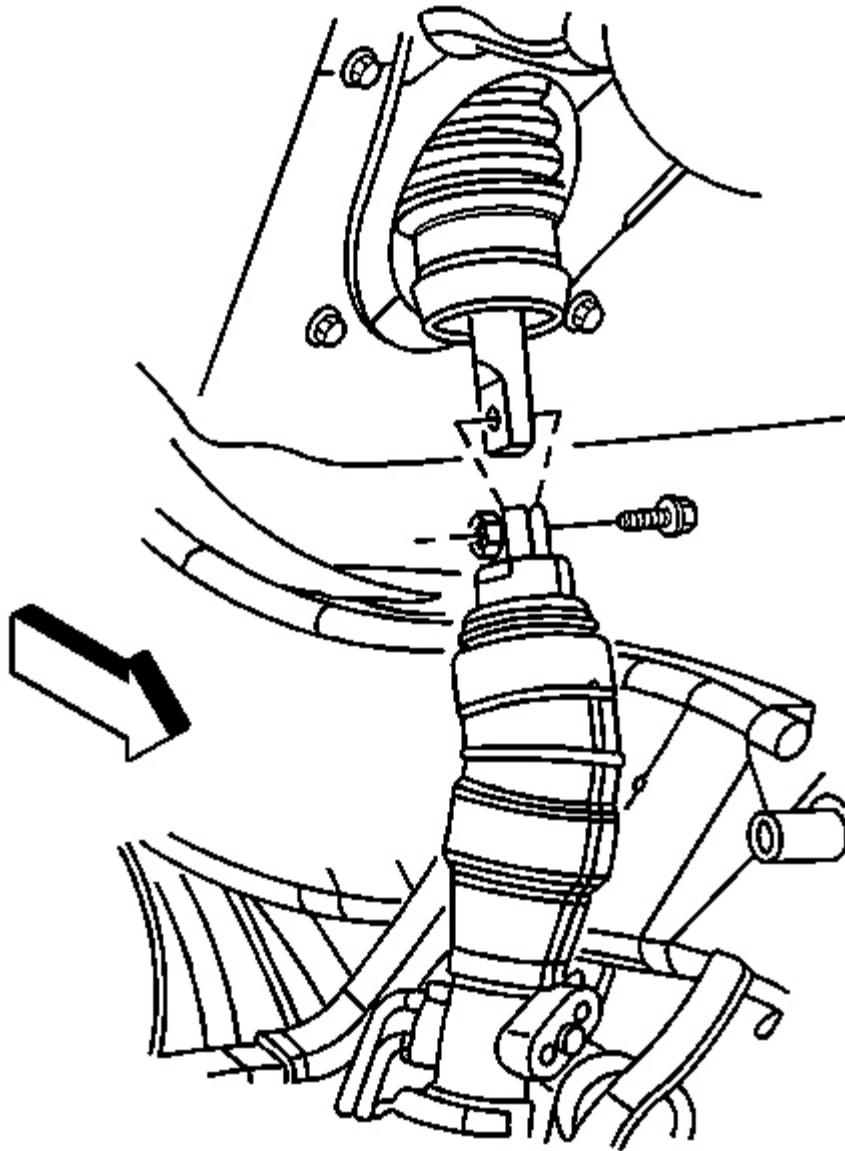


Fig. 17: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

6. Connect the lower intermediate shaft to the upper intermediate shaft.
7. Install the lower intermediate shaft to the upper intermediate shaft pinch bolt.

Tighten: Tighten the lower intermediate shaft to the upper intermediate shaft pinch bolt to 50 N.m (37 lb ft).

IMPORTANT: The upper intermediate shaft boot must completely cover the white insert of the lower intermediate shaft boot to ensure proper sealing.

8. Connect the upper intermediate shaft boot to the lower intermediate shaft boot.

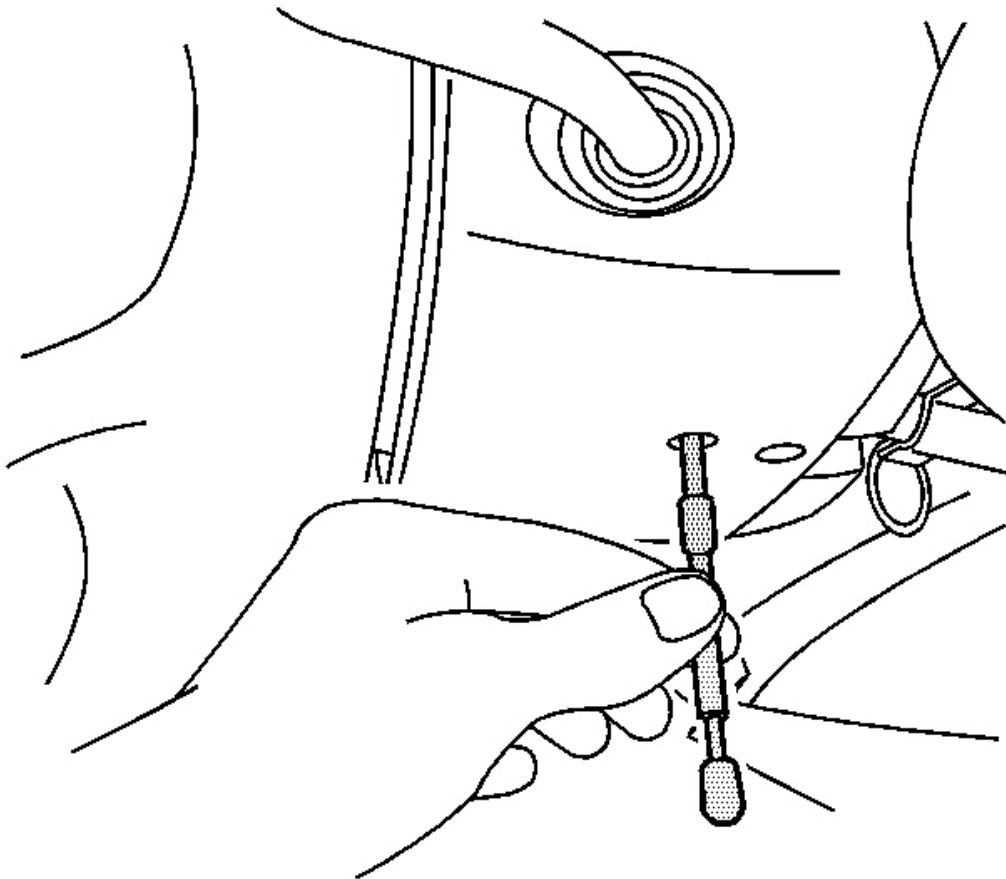


Fig. 18: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

9. Unlock the steering column by removing **J 42640** from the steering column lower trim cover

access hole. See **Special Tools**.

STEERING COLUMN ACCIDENT DAMAGE INSPECTION

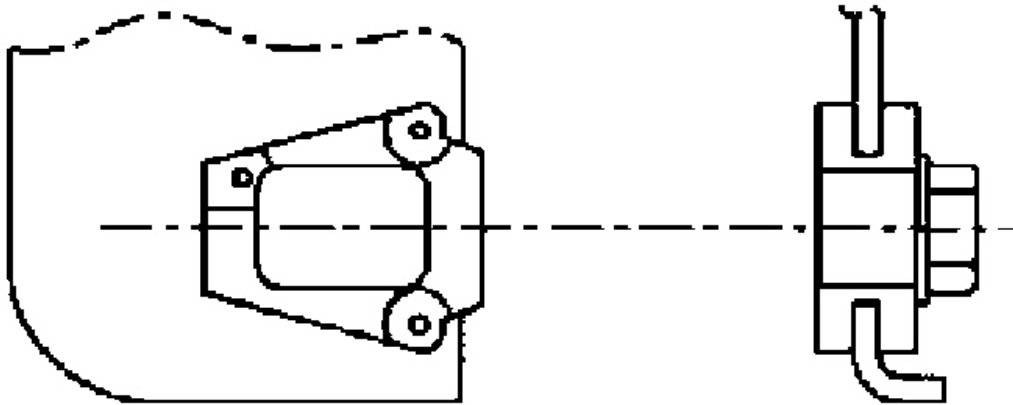


Fig. 19: Inspecting Capsules On Steering Column Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

- Vehicles involved in accidents involving the following conditions may also have a damaged or misaligned steering column:
 - Frame damage
 - Major body or sheet metal damage
 - Where the steering column has been impacted
 - Where supplemental inflatable restraint systems 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.
- Observe how the bracket is attached to the jacket assembly.
 - If the capsules are not securely seated and the bracket is bolted to the jacket assembly, replace only the bracket.
 - If the capsules are not securely seated and the bracket is welded to the jacket assembly, replace only the jacket assembly.

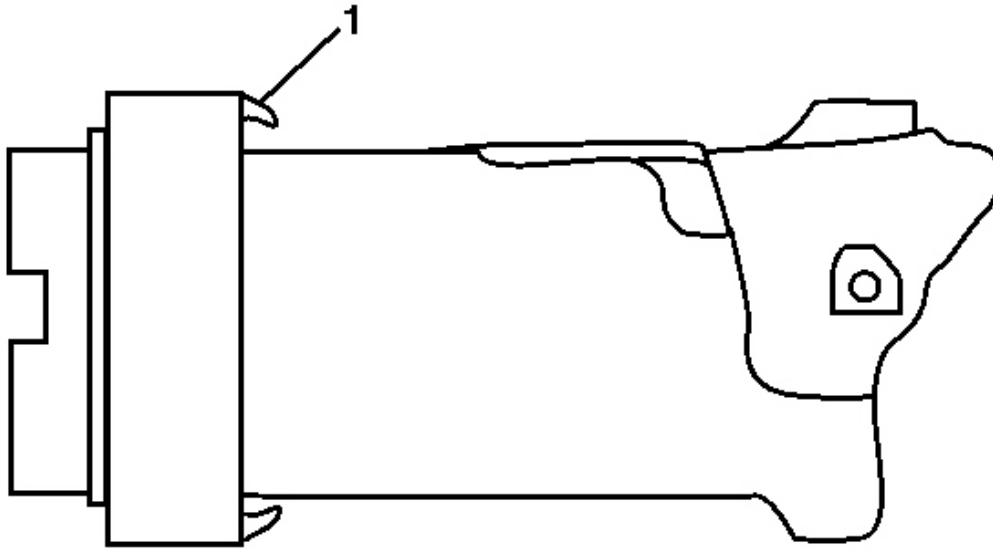


Fig. 20: Inspecting Bearing & Adapter Assembly Tab For Breakage
Courtesy of GENERAL MOTORS CORP.

- Inspect for tab (1) breakage on the bearing and adapter assembly.

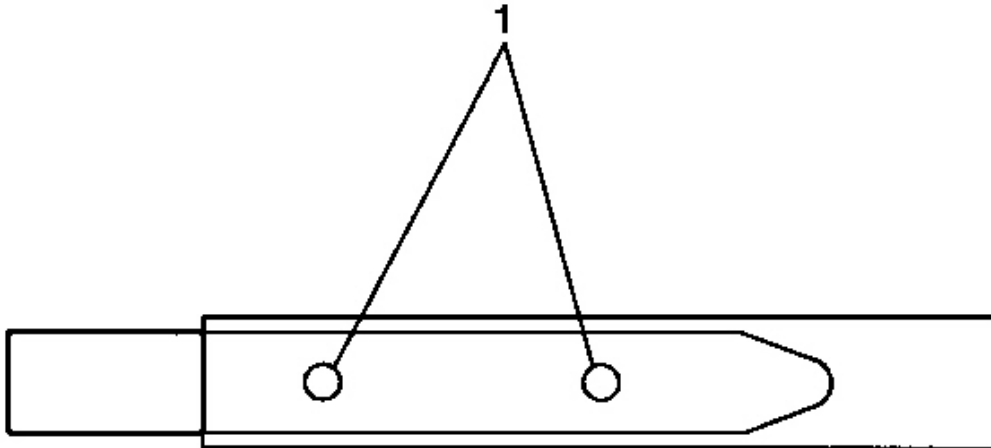


Fig. 21: Inspecting Steering Shaft For Sheared Injected Plastic
Courtesy of GENERAL MOTORS CORP.

- Visually inspect the steering shaft for sheared injected plastic (1). If the steering shaft shows sheared plastic, replace the steering shaft.
- 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. The runout must not exceed 1.60 mm (0.06 in).

STEERING COLUMN TRIM COVERS REPLACEMENT

Removal Procedure

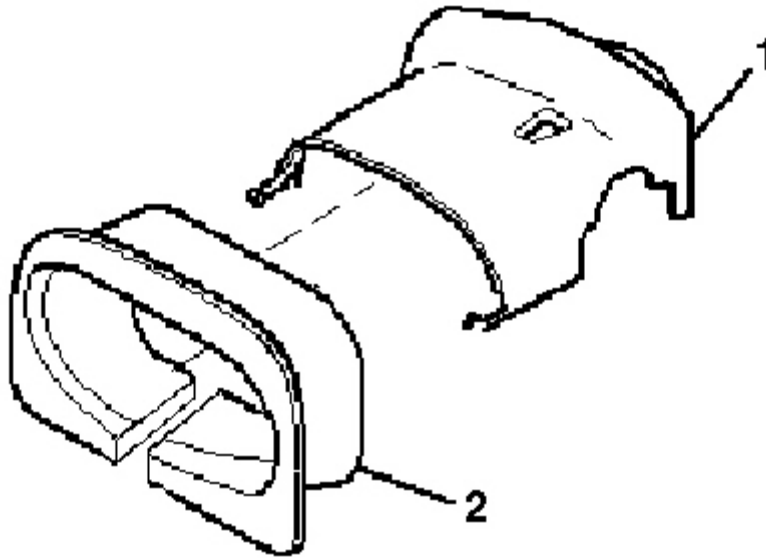


Fig. 22: Closeout Trim Cover & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to SIR Disabling and Enabling Zone 3 in SIR.
2. Remove the steering wheel. Refer to Steering Wheel Replacement.
3. Remove the tilt lever. Refer to Tilt Lever Replacement.

NOTE: Remove the closeout trim cover following the exact procedure listed below in order not to damage the snaps on the upper trim cover.

4. Disengage the closeout trim cover (2) from the upper trim cover (1) in the following order:
 1. Stand in front of the column from the drivers point of view.
 2. On the left side, gently pull downwards on the left side of the closeout trim cover to loosen 1 snap. Do NOT fully remove the closeout trim cover.

3. On the right side, gently pull downwards on the right side of the closeout trim cover to loosen 1 snap. Do NOT fully remove the closeout trim cover.
4. Starting from the left side of the trim covers, gently roll the closeout trim cover to the right to disengage the remaining 4 snaps.

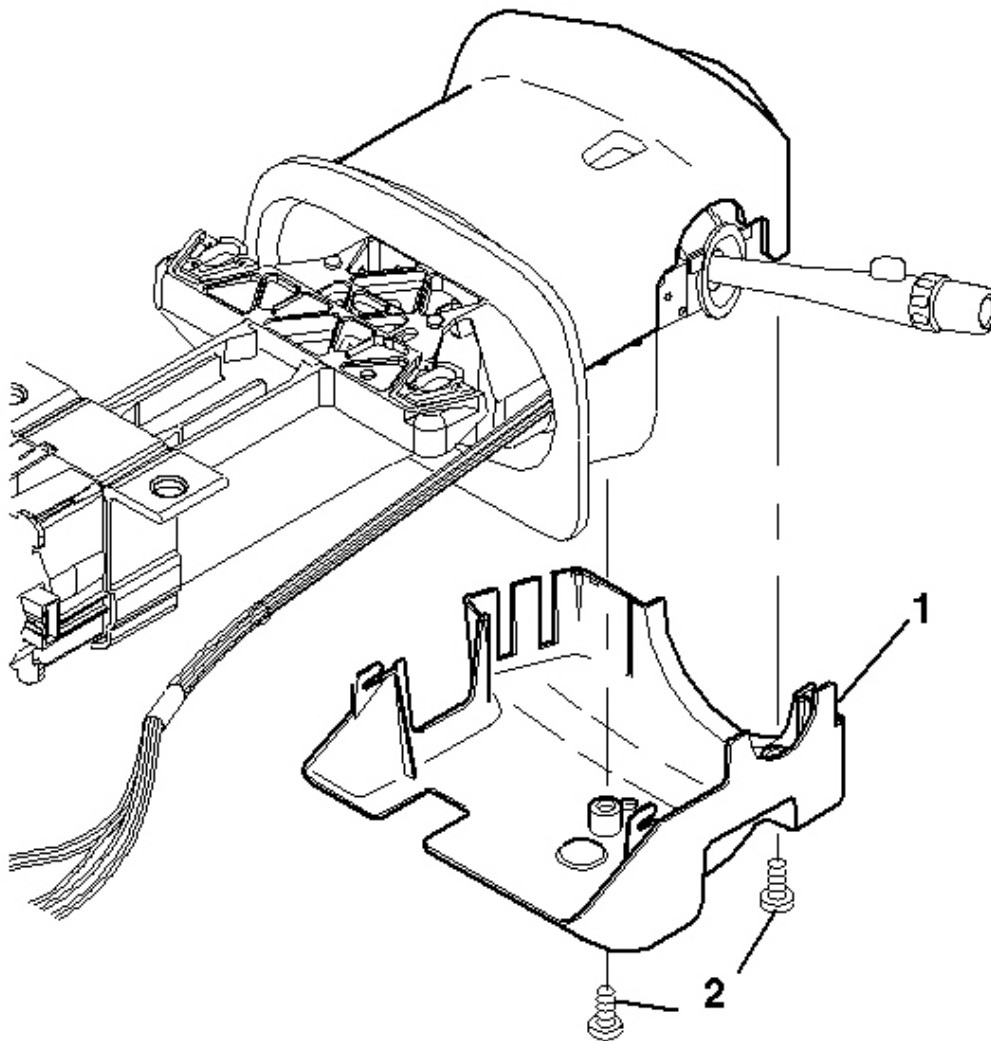


Fig. 23: Lower Steering Column Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: You must inspect for 2 pan head tapping screws (2) in the lower trim cover (1) before removal.

5. If necessary, remove the 2 pan head tapping screws (2) from the lower trim cover (1). Remove the lower trim cover (1).
6. If no screws are present in the lower trim cover, proceed to the next step.

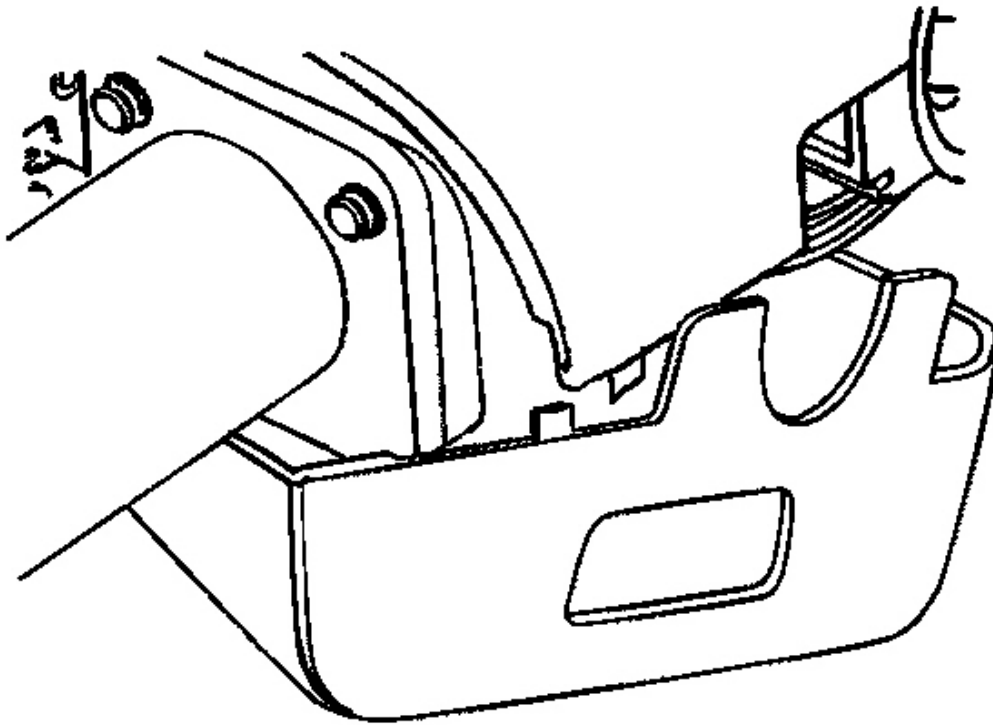


Fig. 24: View Of Lower Trim Cover At Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

7. Gently unsnap the lower trim cover from the upper trim cover.

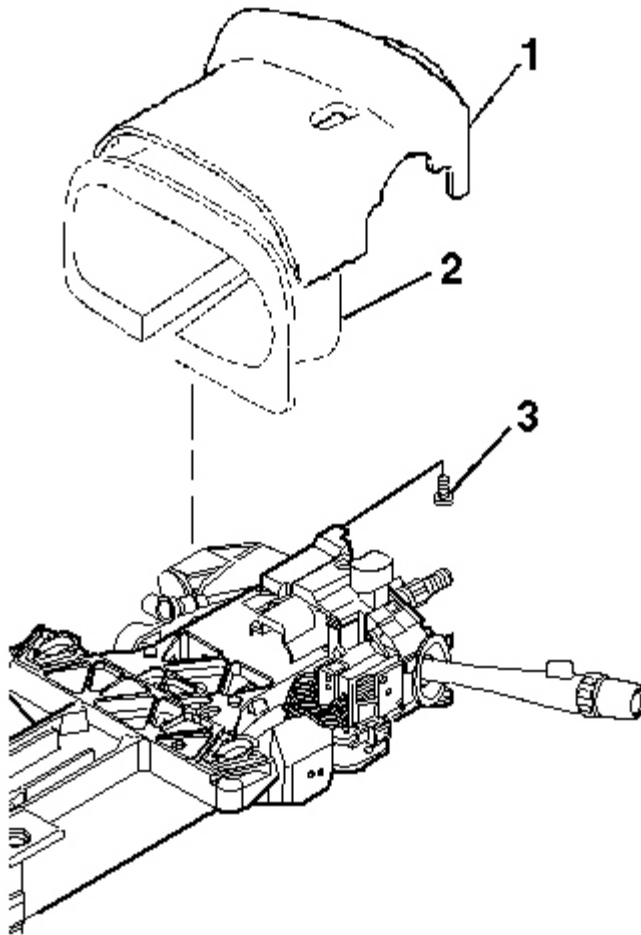


Fig. 25: View Of Upper Steering Column
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: You must inspect for 1 TORX® head screw (3) in the upper trim cover (1) before removal.

8. If necessary, remove 1 TORX® head screw (3) from the upper trim cover (1) and the closeout trim cover (2) for removal.
9. If no screw is present, remove the upper trim cover (1) with the closeout trim cover (2).

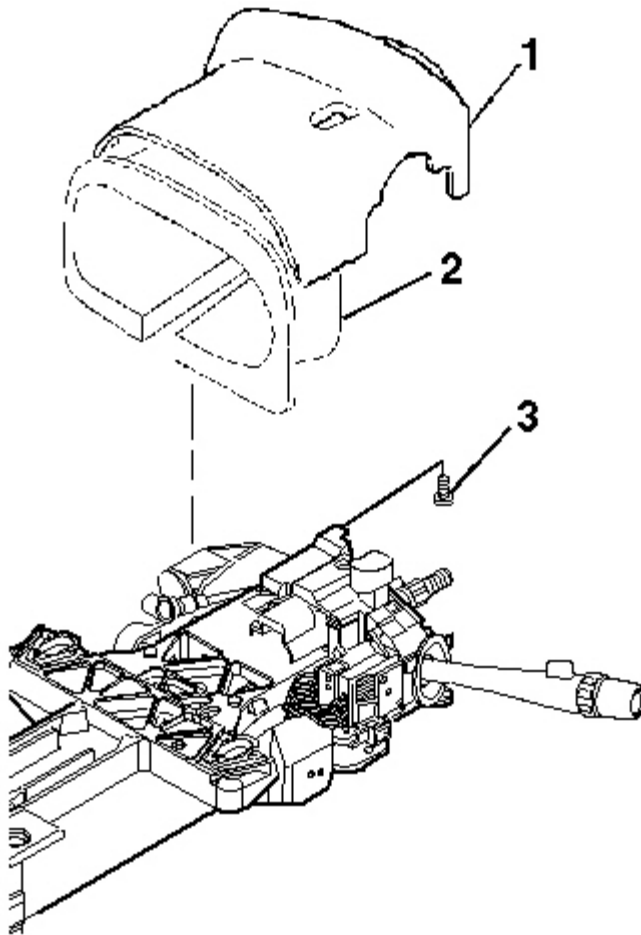


Fig. 26: View Of Upper Steering Column
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: If the snap on/off feature on the trim covers was damaged during the removal procedure, you must use screws for the installation procedure. If screws were present in the trim covers before the removal procedure, you must use the screws during the installation procedure.

If there was not any damage done to the trim covers during the removal procedure and no screws were present, proceed to step 6.

1. Install the upper trim cover (1) with the closeout trim cover (2) and secure by using 1 TORX® head screw (3).

Tighten: Tighten the screw to 1 N.m (9 lb in).

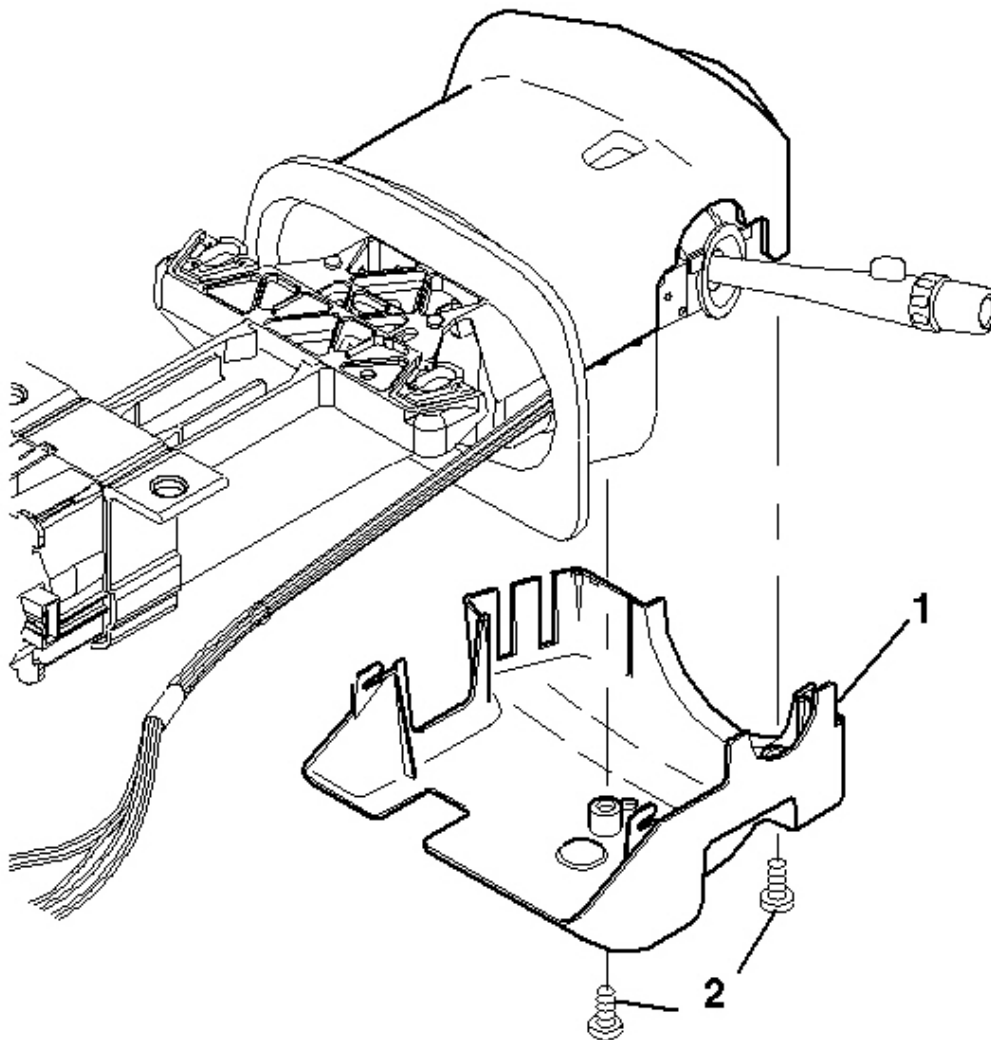


Fig. 27: Lower Steering Column Cover
Courtesy of GENERAL MOTORS CORP.

2. Install the lower trim cover (1).
3. Connect the lower trim cover (1) to the closeout trim cover.
4. Install 2 pan head tapping screws (2).

Tighten: Tighten the screws to 3.5 N.m (31 lb in).

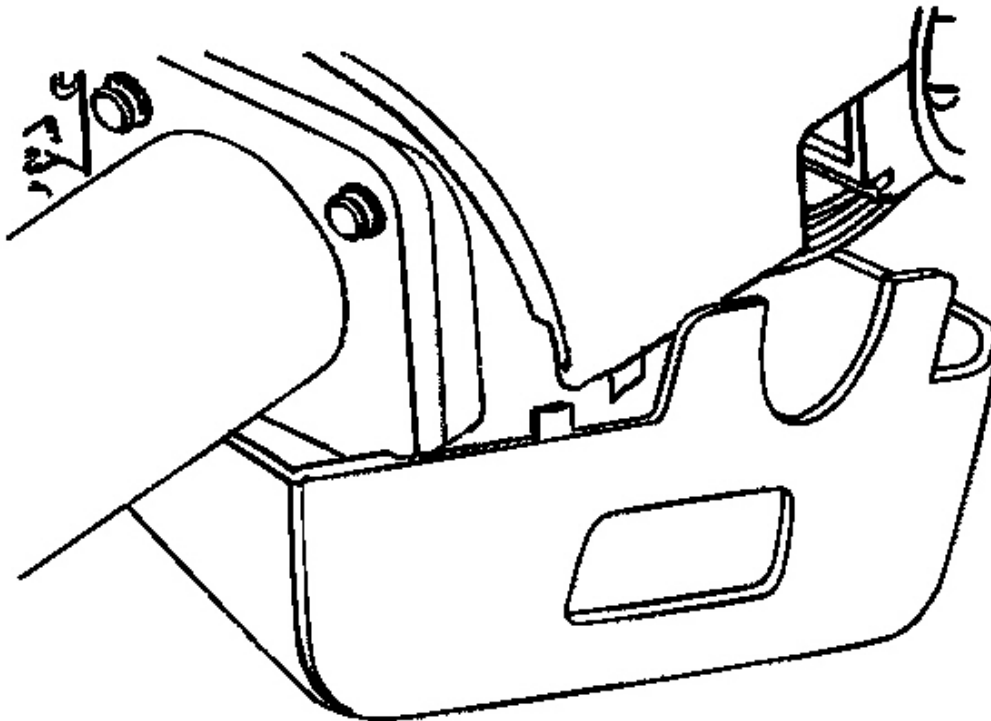


Fig. 28: View Of Lower Trim Cover At Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

5. Install the upper and lower trim covers onto the steering column.
6. Gently snap the upper and lower trim covers together.

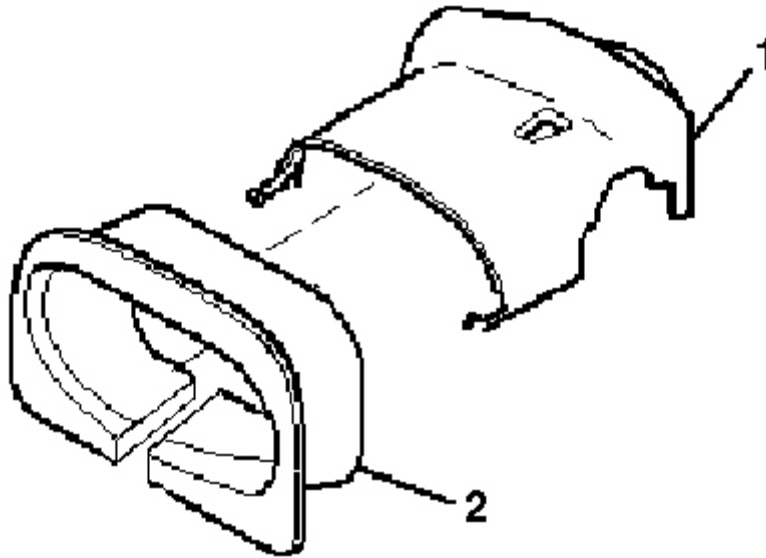


Fig. 29: Closeout Trim Cover & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

7. Install the closeout trim cover (2) onto the upper trim cover (1).
8. Install the tilt lever. Refer to **Tilt Lever Replacement**.
9. Install the steering wheel. Refer to **Steering Wheel Replacement**.
10. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

IGNITION SWITCH REPLACEMENT

Tools Required

J 42759 Ignition Switch Connector Release Tool. See **Special Tools**.

Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

CAUTION: Refer to SIR Caution in Cautions and Notices.

2. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
3. Remove the hush and knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages, and Console.
4. Remove the steering column trim covers. Refer to **Steering Column Trim Covers Replacement**.
5. With the key installed, turn the key to the RUN position.

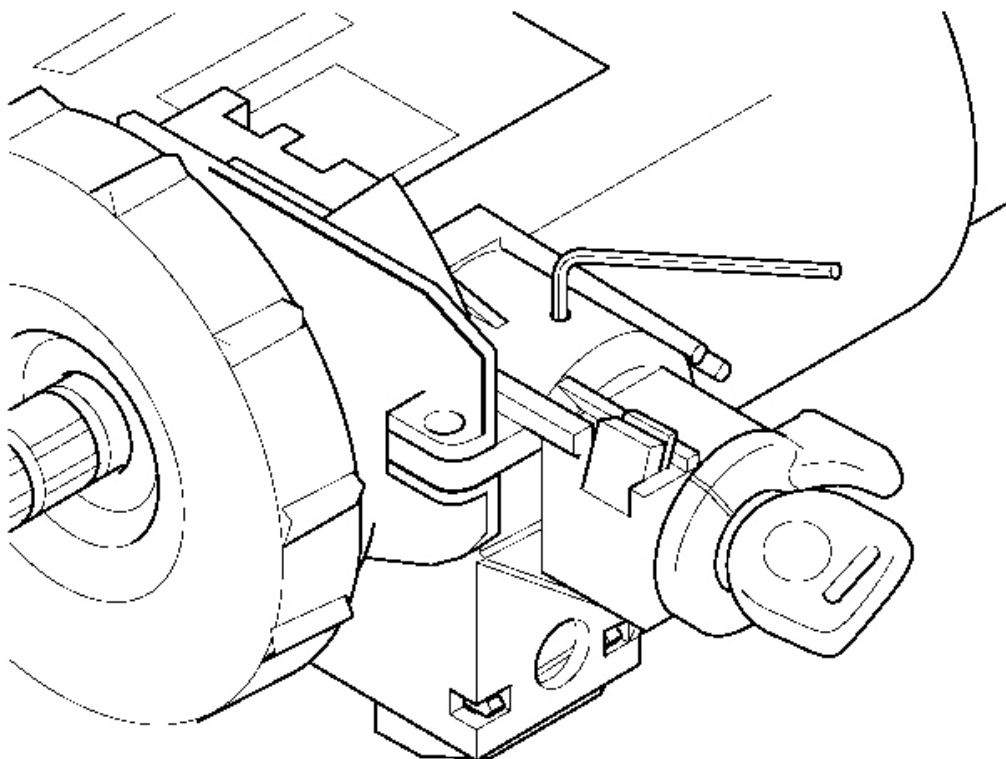


Fig. 30: Releasing/Installing Lock Cylinder Using Allen Wrench
Courtesy of GENERAL MOTORS CORP.

6. Install an Allen wrench into the hole on top of the lock cylinder housing.

Push down on the Allen wrench to release the tab on the lock cylinder inside the lock cylinder housing.

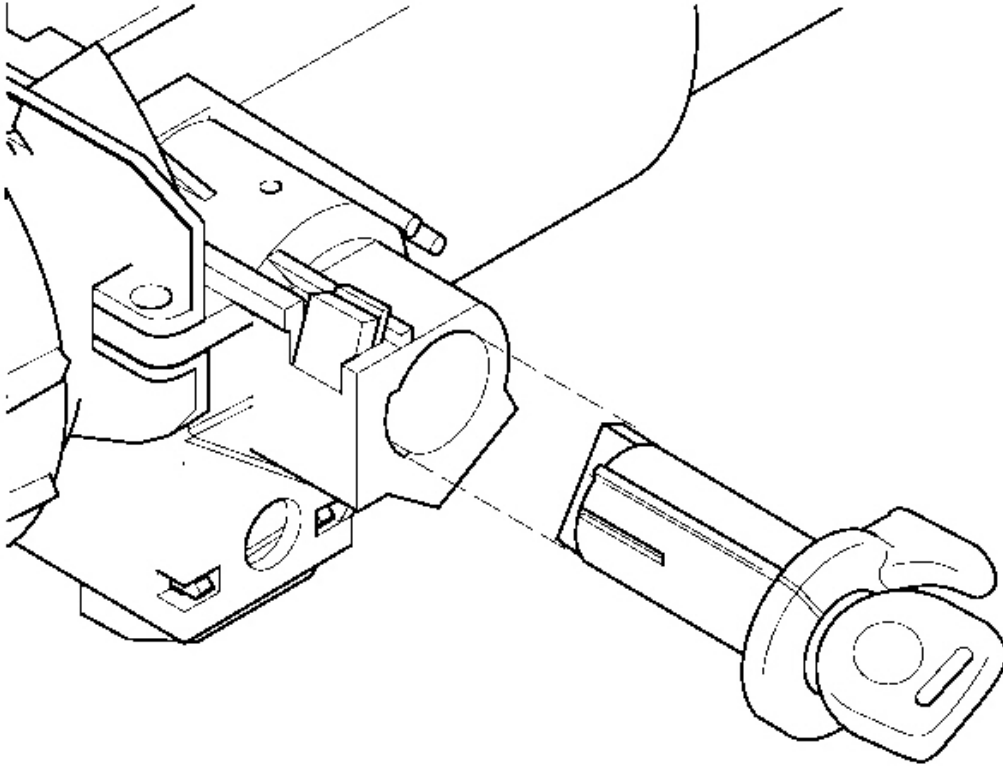


Fig. 31: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

7. Slide the lock cylinder out of the lock cylinder housing.
8. Disconnect the passlock and key buzzer from the lock cylinder housing.

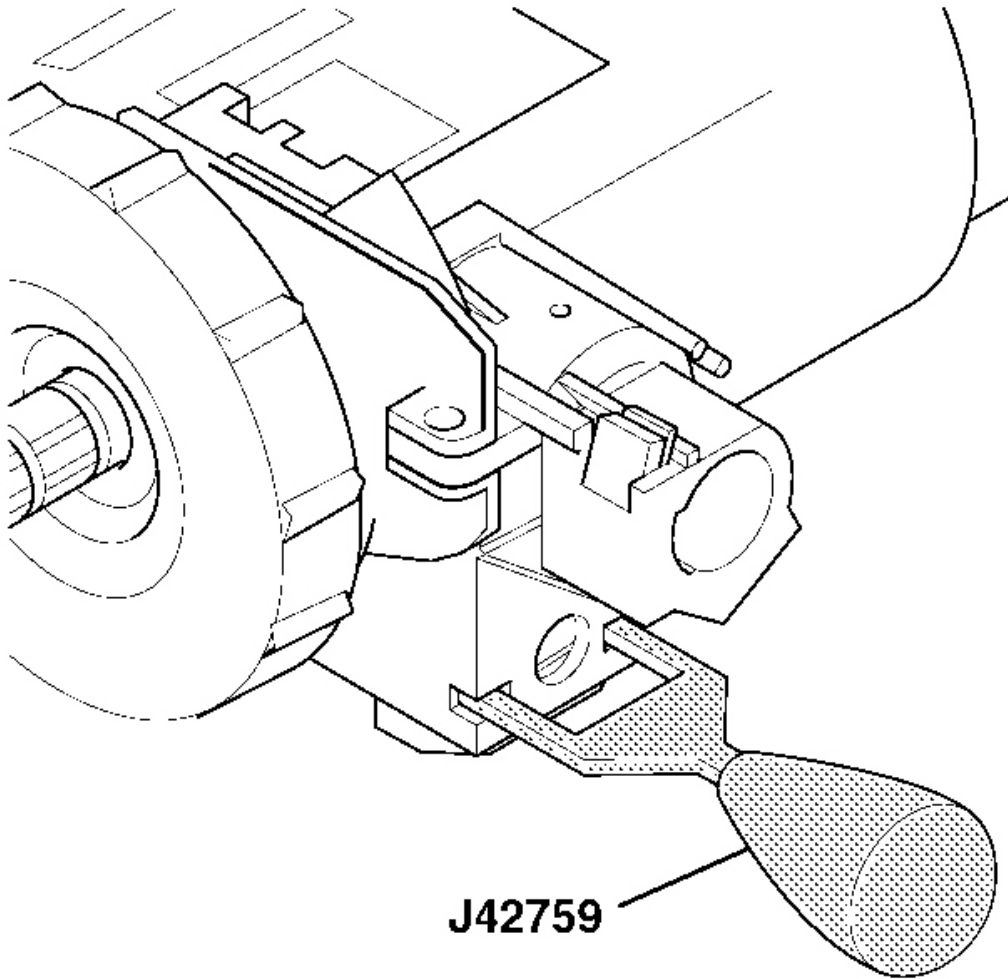


Fig. 32: Inserting J 42759 Into The Lock Cylinder Housing To Release The Tabs On The Ignition Switch
Courtesy of GENERAL MOTORS CORP.

9. Insert **J 42759** into the lock cylinder housing to release the tabs on the ignition switch. See **Special Tools**.
10. Pull the ignition switch out of the lock cylinder housing.
11. Disconnect the connector from the ignition switch.

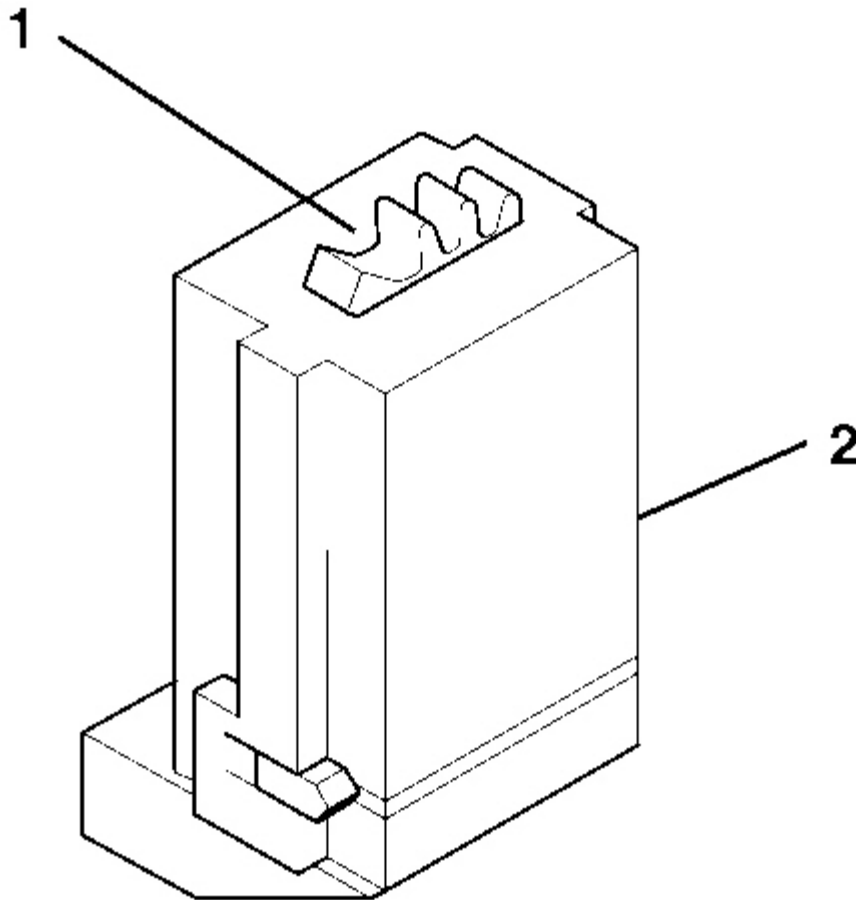


Fig. 33: Aligning Gear In The Ignition Switch
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The gears between the ignition switch and the lock cylinder housing must be in the correct position. Failure to do so will cause a misalignment of the gears in the ignition switch and the lock cylinder housing, which may result in a NO START or BATTERY DRAIN.

1. Verify the alignment of the gear (1) in the ignition switch (2). If gear (1) is not in position shown, turn gear in ignition switch (2) until you reach the correct position.

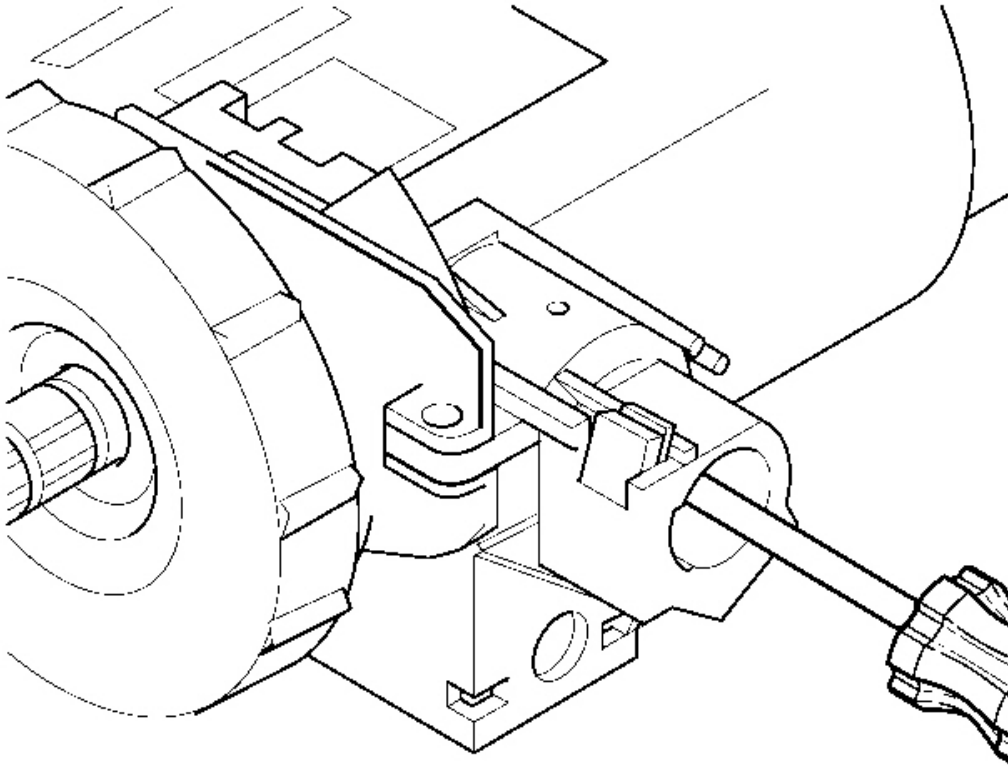


Fig. 34: Using Screwdriver To Rotate The Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: In order to reach a stop while rotating the lock cylinder housing gear you **MUST** push and hold in the solenoid on the electric park lock.

2. Use a screwdriver to rotate the lock cylinder housing gear counterclockwise until it hits a stop.
3. Connect the connector to the ignition switch.

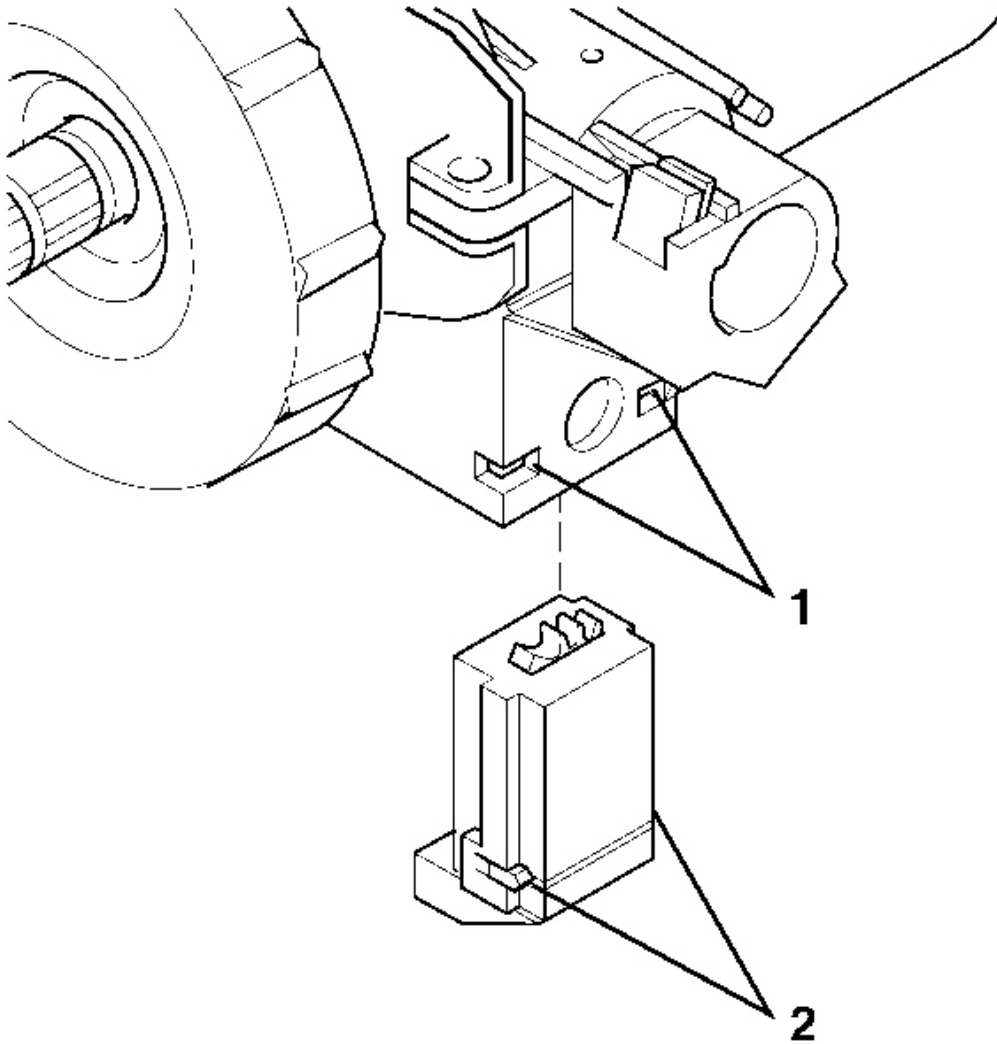


Fig. 35: Inserting Ignition Switch Into The Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

4. Insert the ignition switch into the lock cylinder housing. The tabs (2) on the ignition switch **MUST** be seated inside the lock cylinder housing (1) for proper installation.

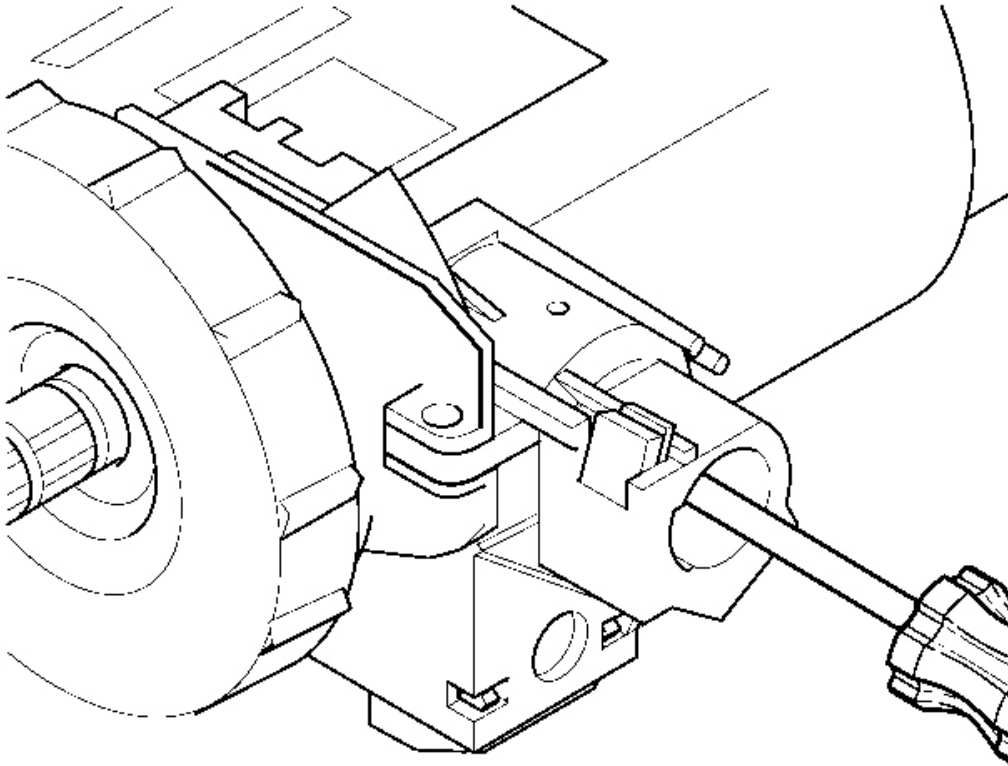


Fig. 36: Using Screwdriver To Rotate Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

5. Use a screwdriver to rotate the lock cylinder housing gear clockwise to the START position - allowing it to spring return into the RUN position.

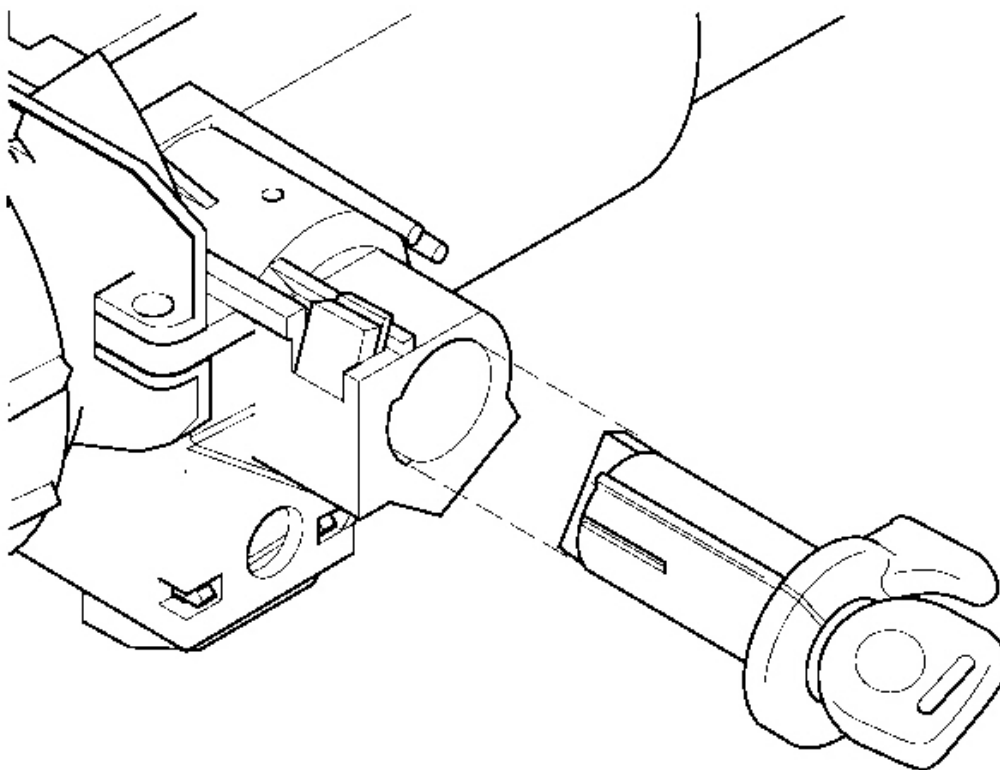


Fig. 37: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

6. Align the lock cylinder and install the lock cylinder into the lock cylinder housing.
7. Connect the passlock and key buzzer into the lock housing.
8. Install the steering column trim covers. Refer to **Steering Column Trim Covers Replacement**.
9. Install the hush and knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages, and Console.
10. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
11. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

Removal Procedure

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

CAUTION: Refer to **SIR Caution** in Cautions and Notices.

2. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
3. Lower the hush and knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gauges, and Console.
4. Remove the steering column trim covers. Refer to **Steering Column Trim Covers Replacement**.
5. With the key installed, turn the key to the RUN position.

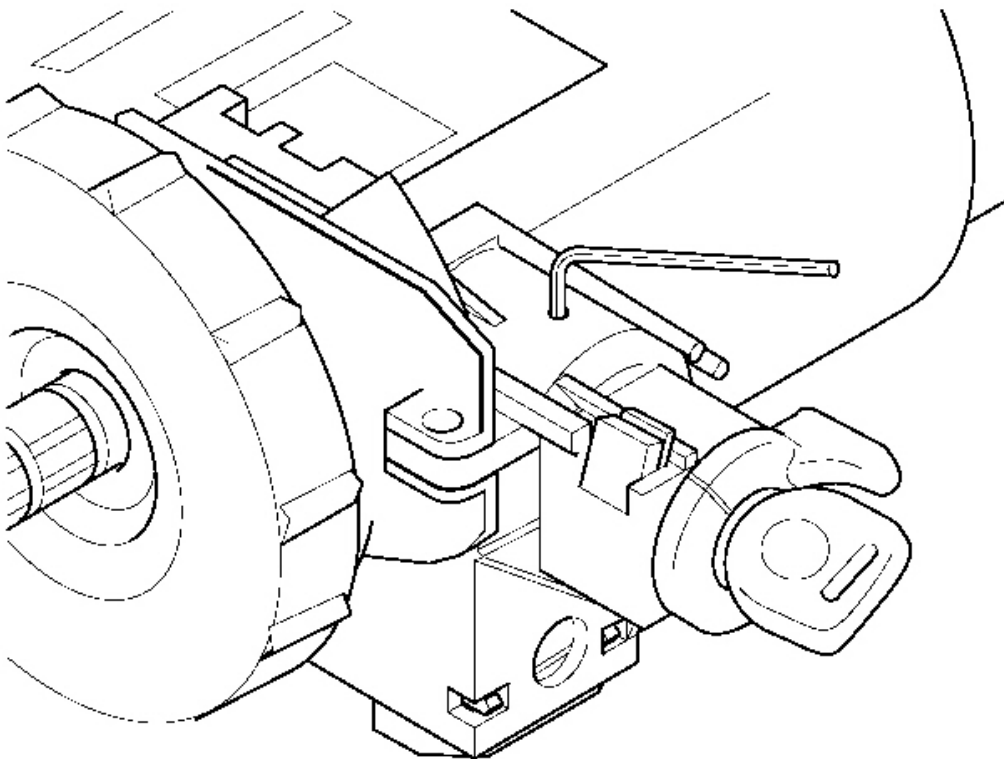


Fig. 38: Releasing/Installing Lock Cylinder Using Allen Wrench

Courtesy of GENERAL MOTORS CORP.

6. Install an Allen wrench into the hole on top of the lock cylinder housing.

Push down on the Allen wrench to release the tab on the lock cylinder inside the lock cylinder housing.

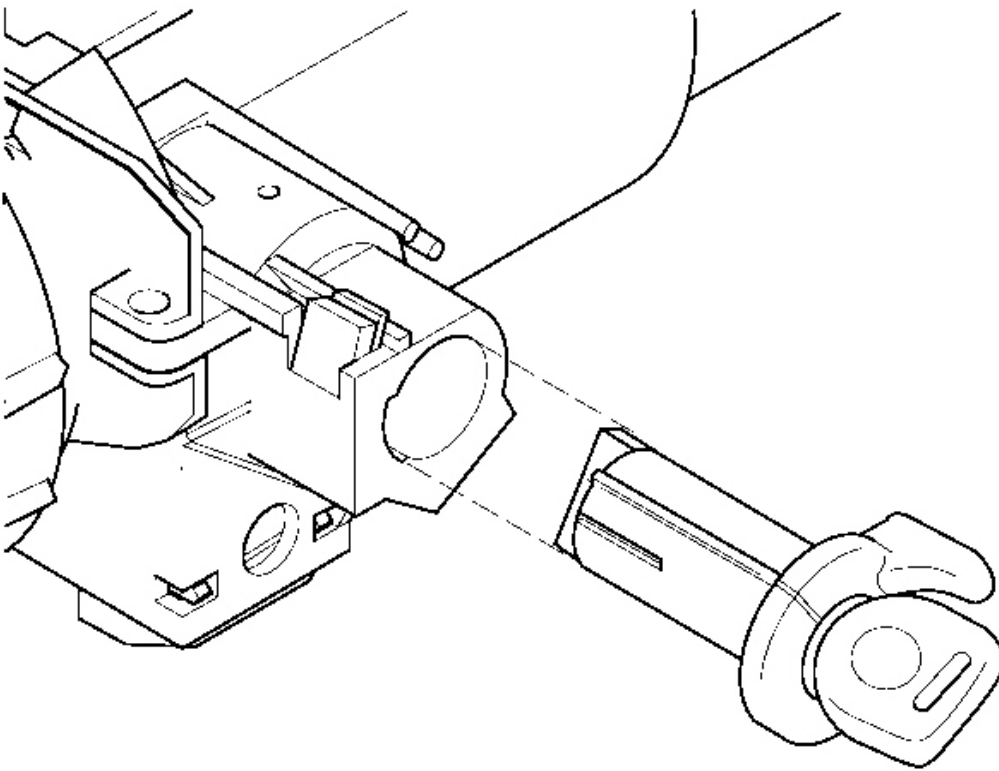


Fig. 39: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

7. Slide the lock cylinder out of the lock cylinder housing.

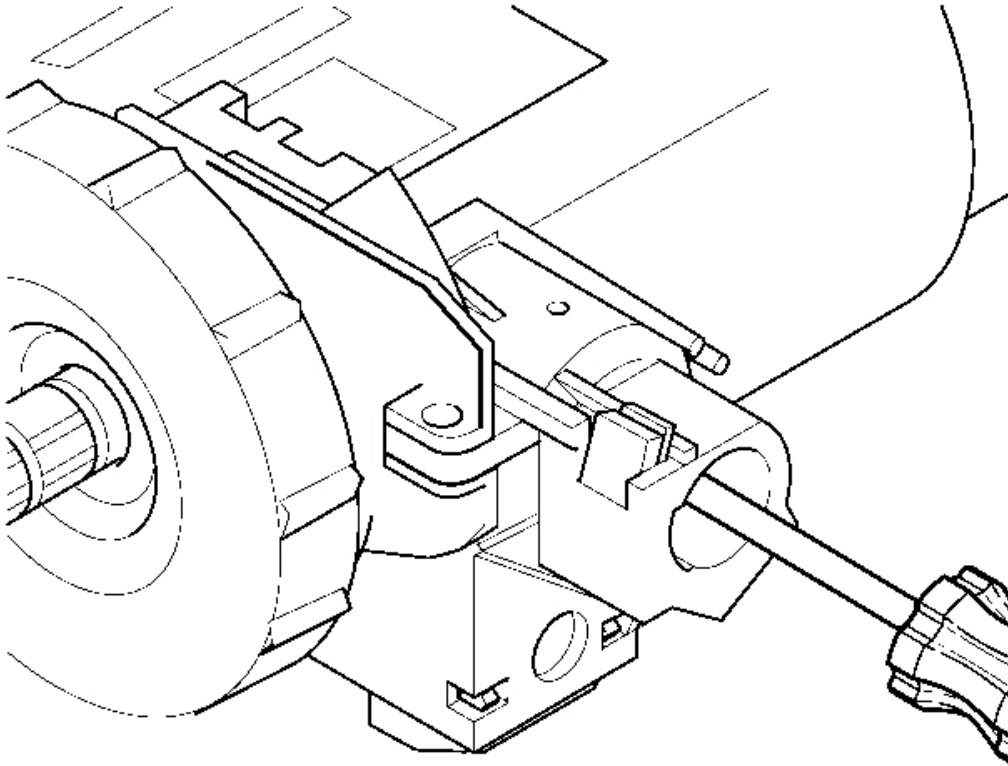


Fig. 40: Using Screwdriver To Rotate Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

1. Install the key into the lock cylinder.

IMPORTANT: The gears between the ignition switch and the lock cylinder housing must be in the correct position. Failure to do so will cause a misalignment of the gears in the ignition switch and the lock cylinder housing, which may result in a NO START or BATTERY DRAIN.

2. Use a screwdriver to rotate the lock cylinder housing gear clockwise to the start position - allowing it to spring return into the RUN position.

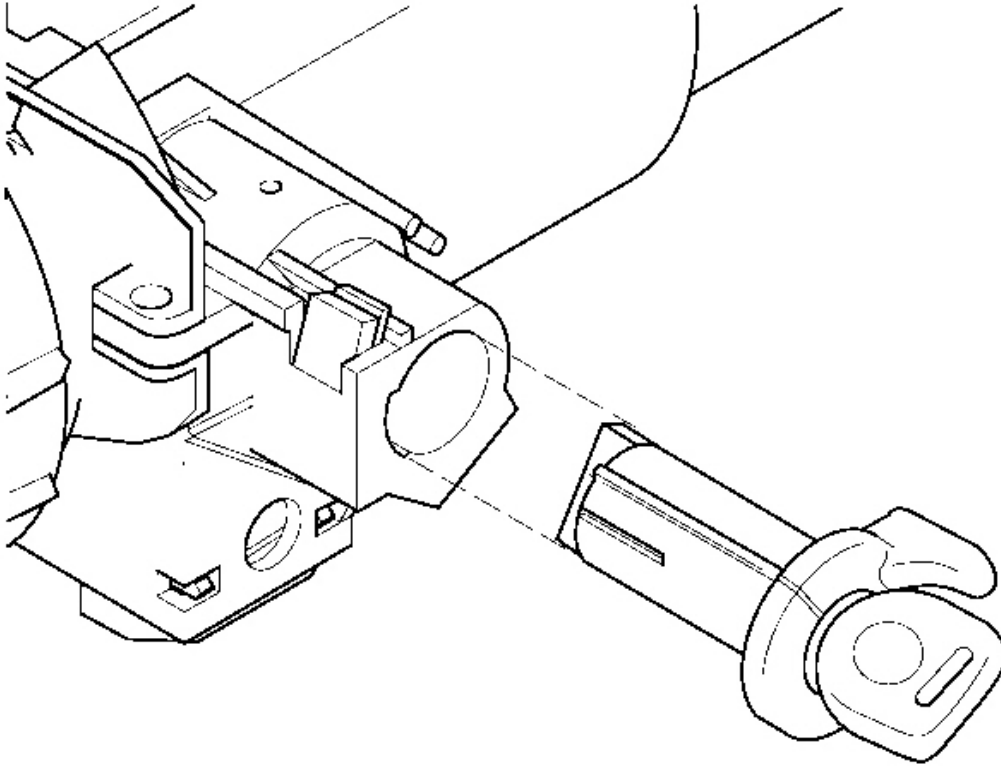


Fig. 41: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

3. Align the lock cylinder and install into the lock cylinder housing.
4. Install the steering column trim covers. Refer to **Steering Column Trim Covers Replacement**.
5. Install the hush and knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gauges, and Console.
6. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
7. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

IGNITION LOCK CYLINDER CASE REPLACEMENT

Removal Procedure

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the ignition switch. Refer to **Ignition Switch Replacement**.
3. Remove the turn signal cancel cam. Refer to **Steering Column Tilt Head Housing Replacement**.
4. Remove the park lock cable from the lock cylinder housing.

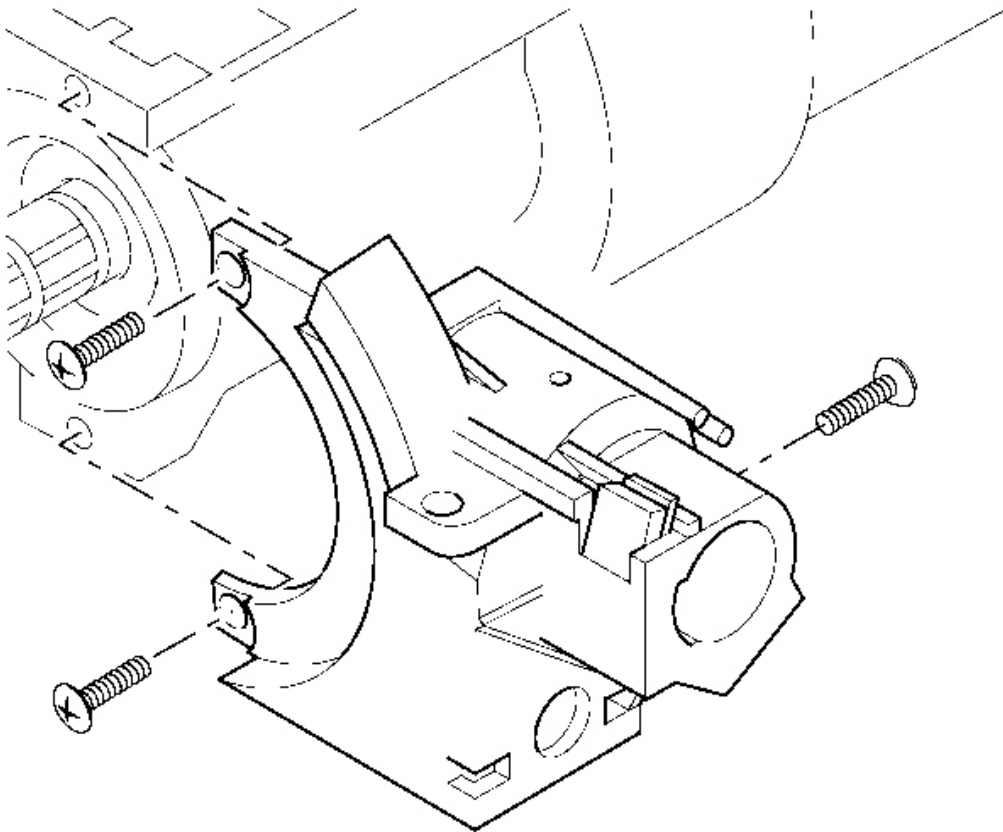


Fig. 42: View Of Lock Cylinder Housing TORX Screws
Courtesy of GENERAL MOTORS CORP.

5. Remove 3 TORX® screws.

6. Remove the lock cylinder housing from the steering column.

Installation Procedure

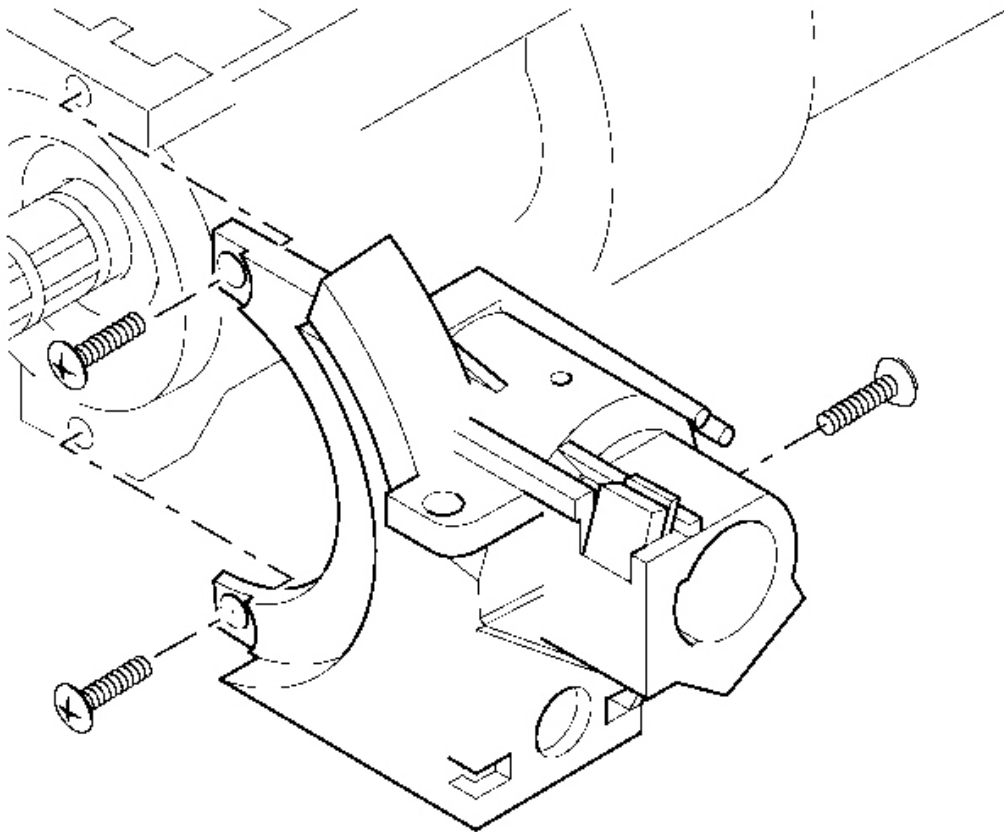


Fig. 43: View Of Lock Cylinder Housing TORX Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install 3 TORX® screws into the lock cylinder housing.

Tighten: Tighten the TORX® screws to 7 N.m (62 lb in).

2. Install the turn signal cancel cam. Refer to Steering Column Tilt Head Housing Replacement.

3. Install the park lock cable into the lock cylinder housing.
4. Install the ignition switch. Refer to **Ignition Switch Replacement**.
5. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

MULTIFUNCTION TURN SIGNAL SWITCH HOUSING REPLACEMENT

Removal Procedure

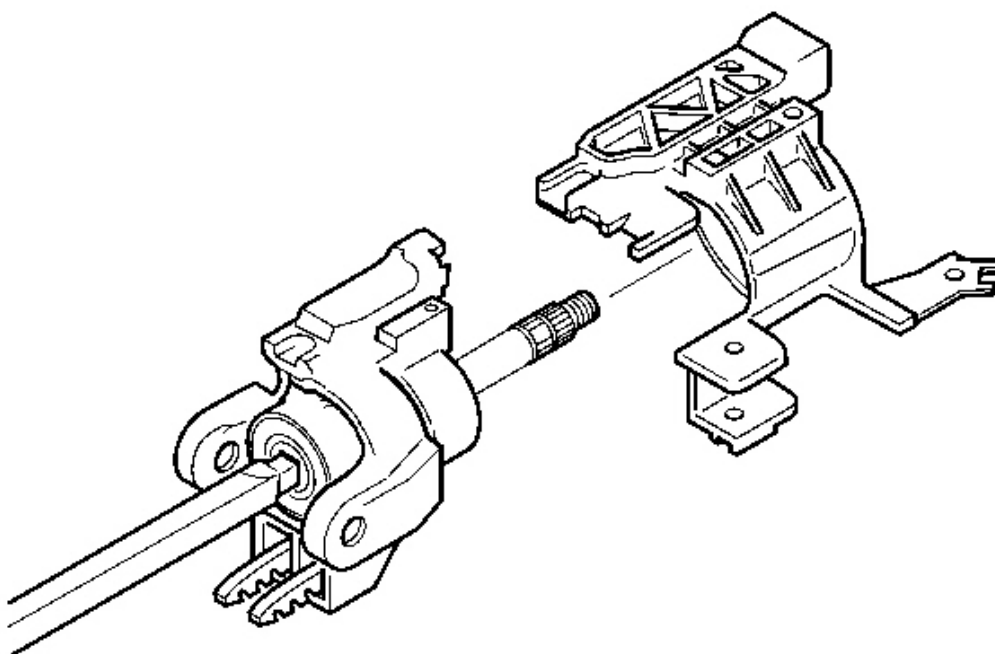


Fig. 44: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to **SIR Caution** in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the steering wheel from the column. Refer to **Steering Wheel Replacement**.
3. Remove the ignition lock cylinder case assembly. Refer to **Ignition Lock Cylinder Case**

Replacement.

4. Remove the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement.**
5. Slide the turn signal switch housing off of the steering column shaft assembly.

Installation Procedure

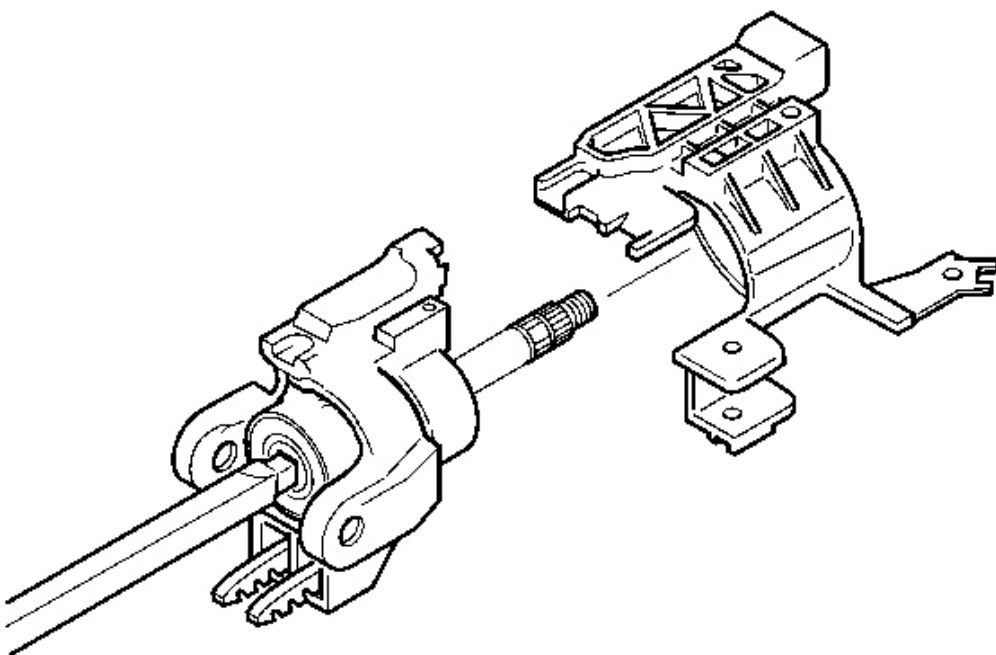


Fig. 45: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The turn signal switch housing must be pressed firmly against the steering column tilt head in order for the screws from the turn signal and multifunction switch assembly screws to line up.

1. Slide the turn signal switch housing onto the steering column shaft assembly.
2. Install the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement.**

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

3. Install the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
4. Install the steering wheel onto the column. Refer to **Steering Wheel Replacement**.
5. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

TURN SIGNAL CANCEL CAM AND STEERING SHAFT UPPER BEARING SPRING REPLACEMENT

Tools Required

- **J 23653-SIR** Steering Column Lock Plate Compressor
- **J 42137** Steering Column Lock Plate Compressor Adapter. See **Special Tools**.

Removal Procedure

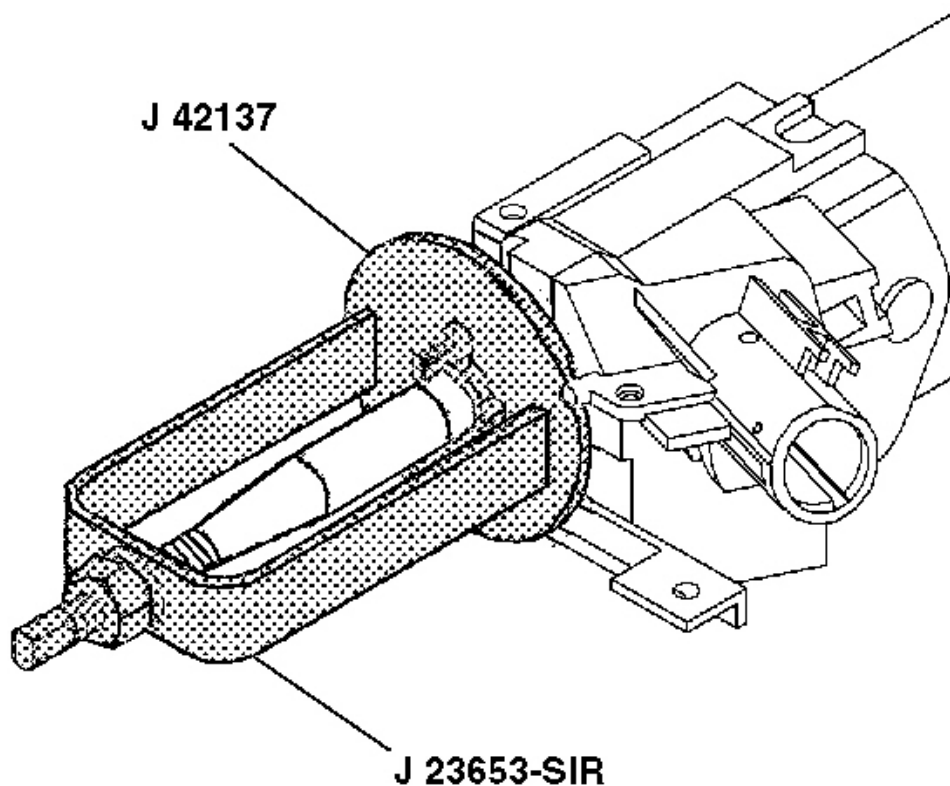


Fig. 46: Depressing Lock Plate Using J 23653-SIR And J 42137
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement** in SIR.
3. Remove and discard the bearing retainer using **J 23653-SIR** and **J 42137** . See **Special Tools**.

4. Remove **J 23653-SIR** and **J 42137** from the steering shaft. See **Special Tools**.

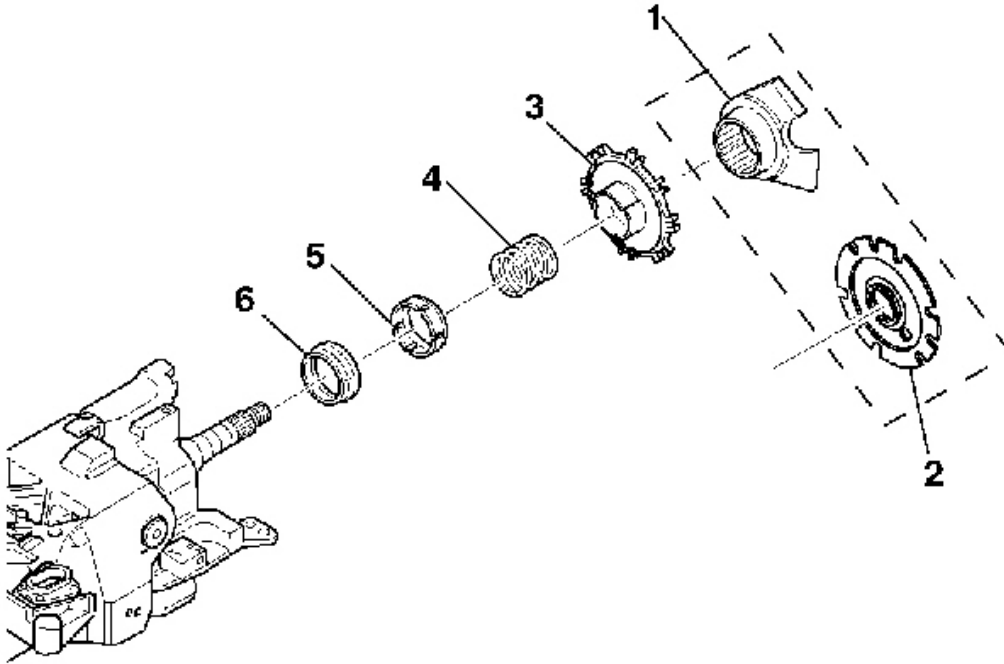


Fig. 47: View Of Turn Signal Cancel Cam, Upper Bearing Inner Race & Components

Courtesy of GENERAL MOTORS CORP.

5. Remove the shaft lock (2) or the cam orientation plate (1).

IMPORTANT: Do not wipe the lubricant off the turn signal cancel cam assembly.

6. Remove the turn signal cancel cam assembly (3).
7. Remove the upper bearing spring (4).
8. Remove the upper bearing inner race seat (5).
9. Remove the inner race (6).

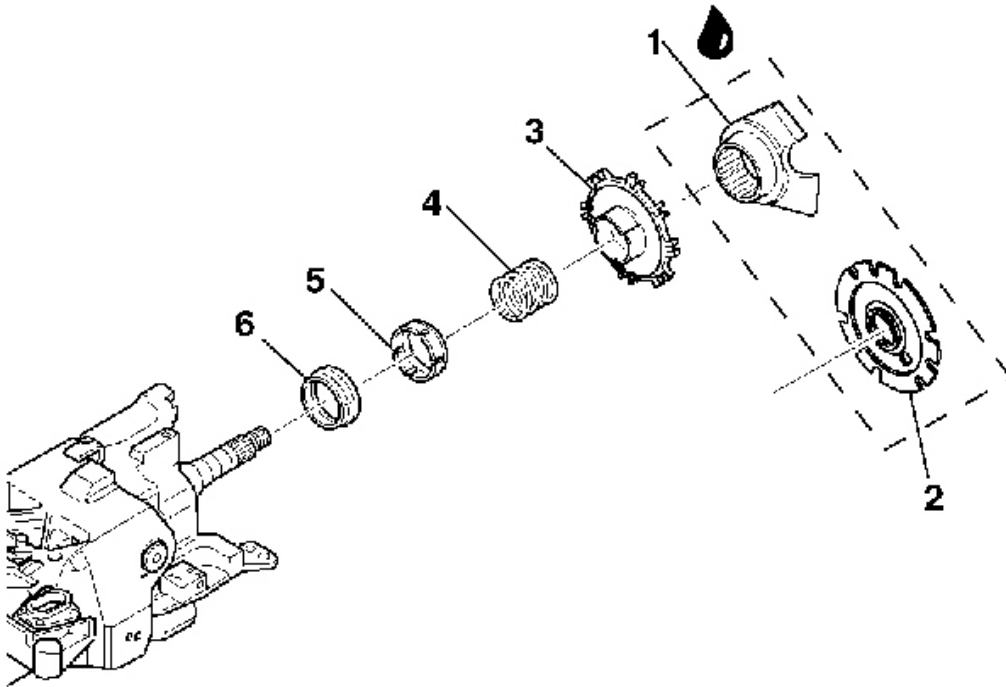


Fig. 48: Installing Inner Race, Upper Bearing Inner Race Seat & Upper Bearing Spring

Courtesy of GENERAL MOTORS CORP.

1. Install the inner race (6).
2. Install the upper bearing inner race seat (5).
3. Install the upper bearing spring (4).

IMPORTANT: The electrical contact of the turn signal and multifunction switch assembly must rest on the turn signal cancel cam assembly.

4. If replacing the turn signal cancel cam (3), lubricate the new turn signal cancel cam with GM P/N 12377900 (Canadian P/N 10953529).

Install the turn signal cancel cam assembly (3).

5. Install the shaft lock (2) or the cam orientation plate (1).

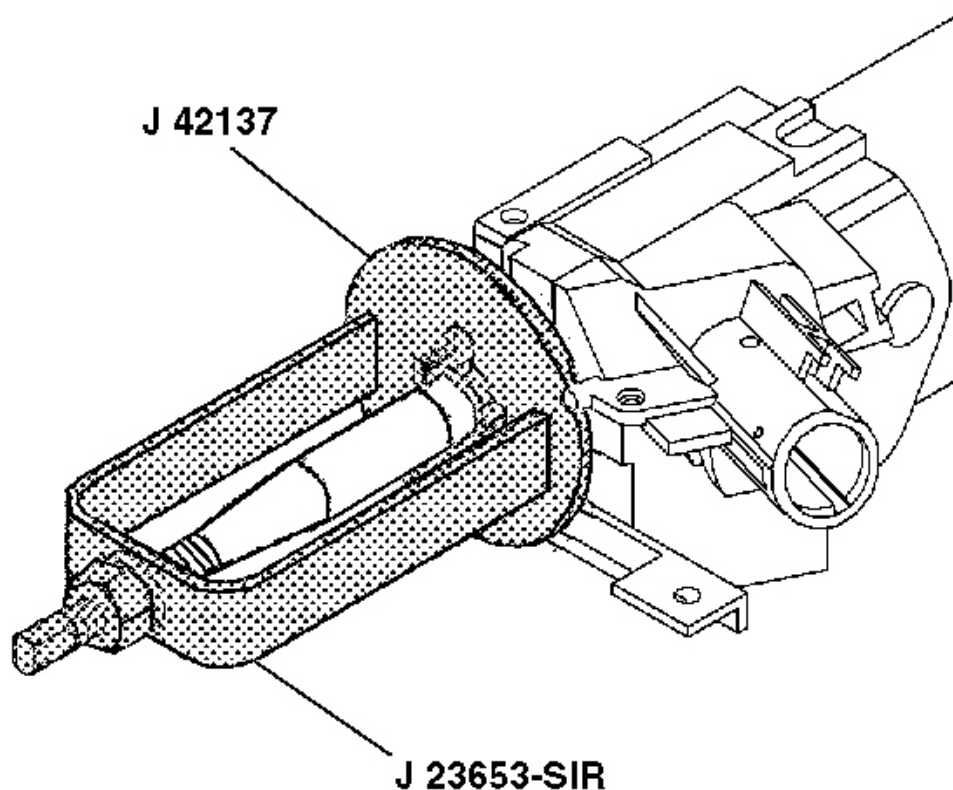


Fig. 49: Depressing Lock Plate Using J 23653-SIR And J 42137
Courtesy of GENERAL MOTORS CORP.

6. Install the new bearing retainer using **J 23653-SIR** and **J 42137** . See Special Tools.
7. Remove **J 23653-SIR** and **J 42137** from the steering shaft. See Special Tools.

CAUTION: Refer to SIR Inflator Module Coil Caution in Cautions and Notices.

8. Install the SIR coil. Refer to Inflatable Restraint Steering Wheel Module Coil

Replacement in SIR.

9. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

MULTIFUNCTION, TURN SIGNAL SWITCH REPLACEMENT

Removal Procedure

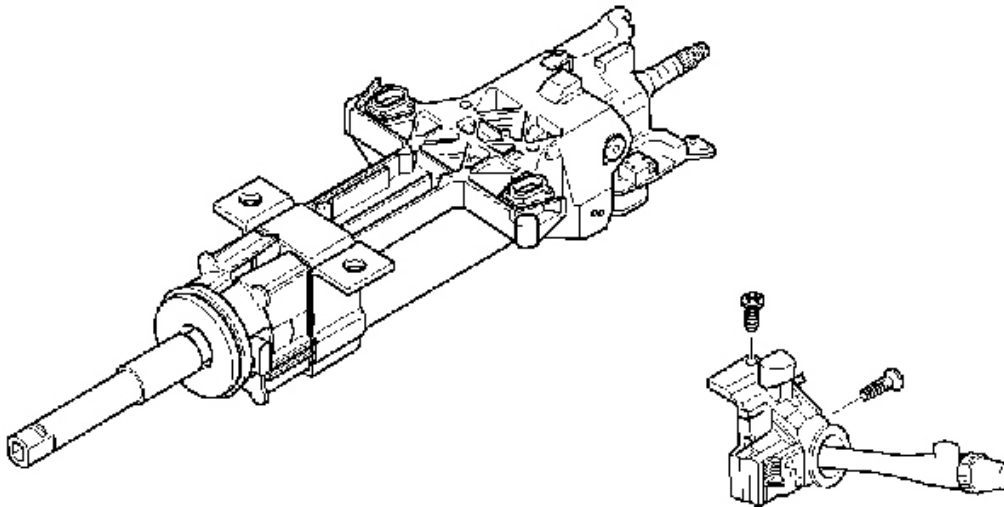


Fig. 50: Removing/Installing Turn Signal Switch Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to **SIR Caution** in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
3. Tilt the column to the CENTER position.
4. Disconnect the connectors from the turn signal and multifunction switch assembly.
5. Remove the turn signal and multifunction switch assembly.
6. Remove 2 pan head tapping screws from the turn signal and multifunction switch assembly.

Installation Procedure

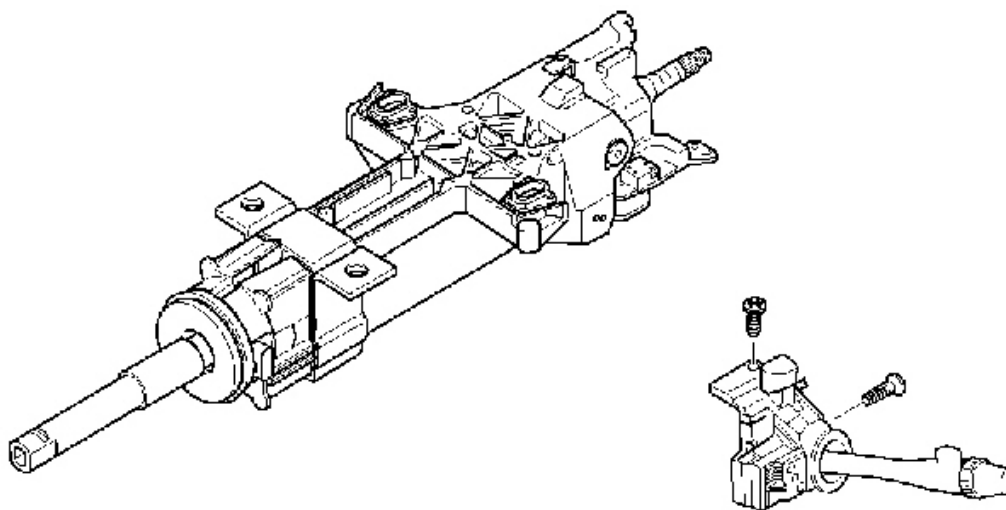


Fig. 51: Removing/Installing Turn Signal Switch Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The electrical contact on the turn signal and multifunction switch assembly must rest on the turn signal cancel cam assembly.

1. Install the turn signal and multifunction switch assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Secure by using 2 pan head tapping screws.

Tighten:

- Tighten the screw on the top of the column to 3 N.m (27 lb in).
- Tighten the screw on the side to 7 N.m (62 lb in).

3. Connect the connectors to the turn signal and multifunction switch assembly.
4. Install the upper and lower trim covers. Refer to Steering Column Trim Covers

Replacement.

5. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

TILT LEVER REPLACEMENT

Removal Procedure

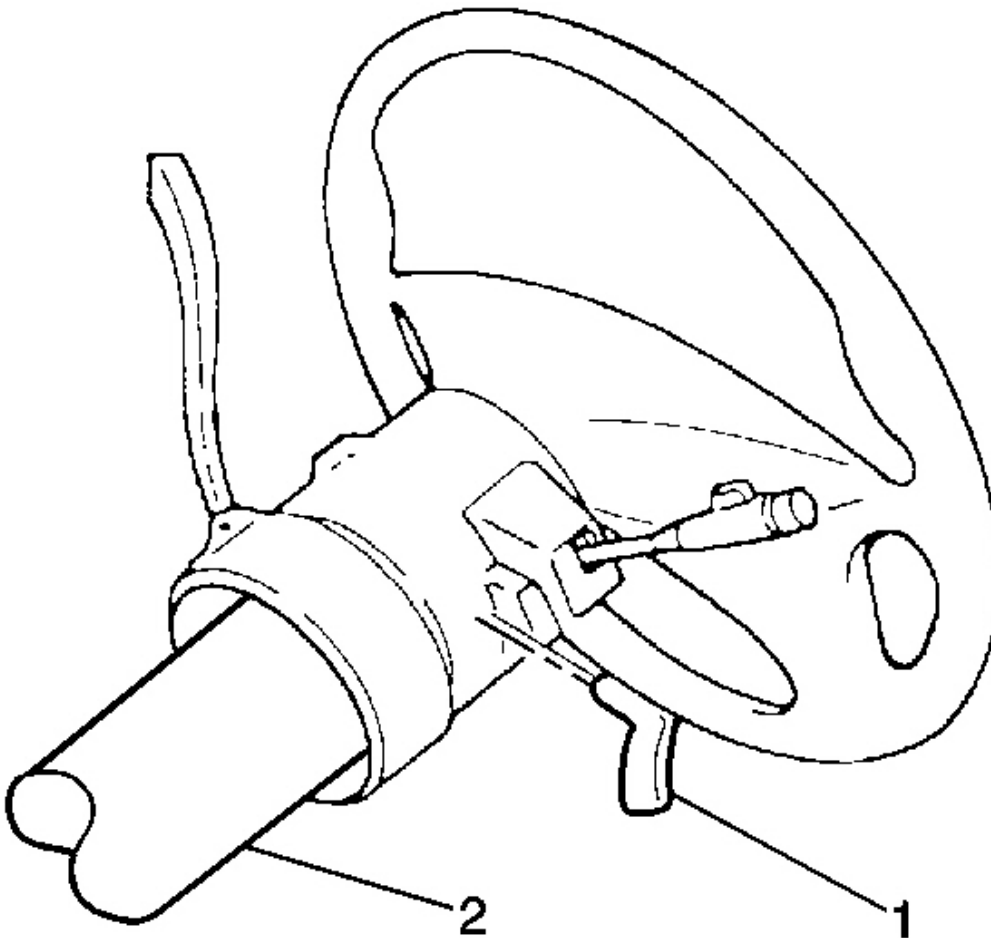


Fig. 52: View Of Upper Steering Column With Tilt Lever
Courtesy of GENERAL MOTORS CORP.

Pull the tilt steering column lever (1) out from the steering column (2).

Installation Procedure

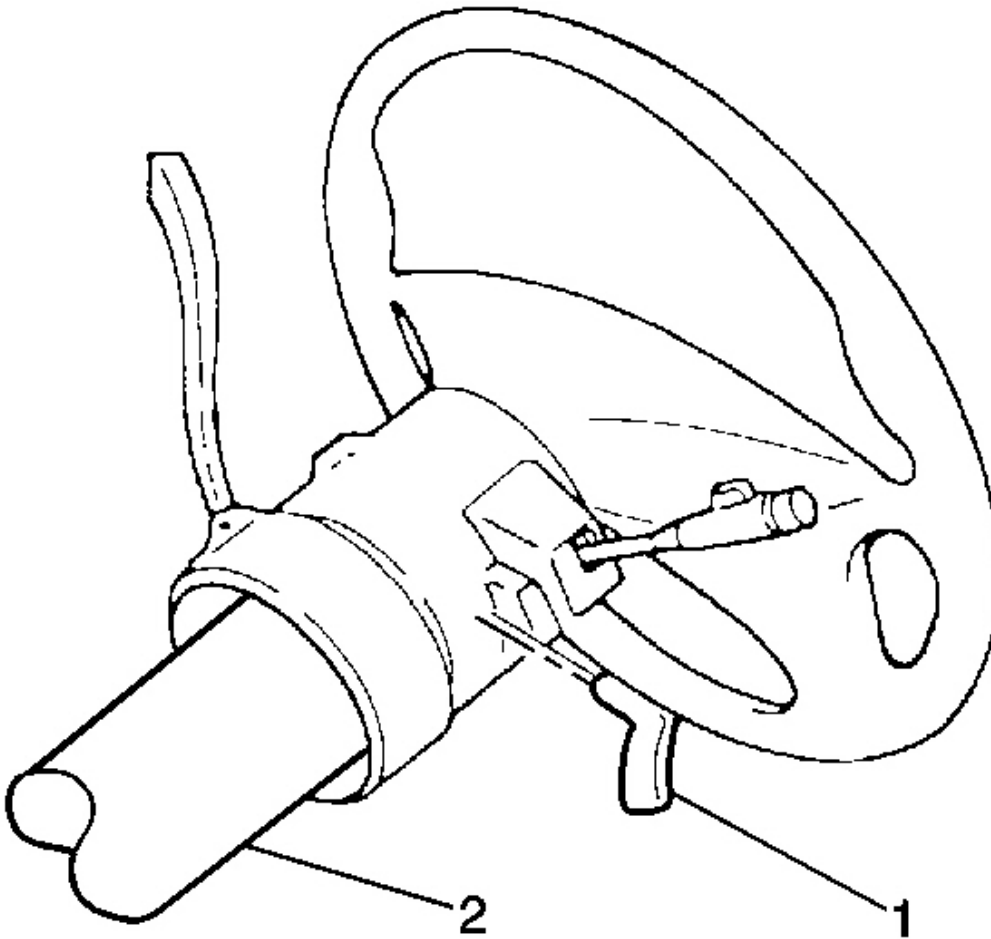


Fig. 53: View Of Upper Steering Column With Tilt Lever
Courtesy of GENERAL MOTORS CORP.

Align the tilt steering column lever (1) and push the lever into the steering column (2).

HORN SWITCH REPLACEMENT

Removal Procedure

CAUTION: Refer to Servicing the SIR System Caution in Cautions

and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the Inflatable Restraint Steering Wheel module. Refer to **Inflatable Restraint Steering Wheel Module Replacement** in SIR.

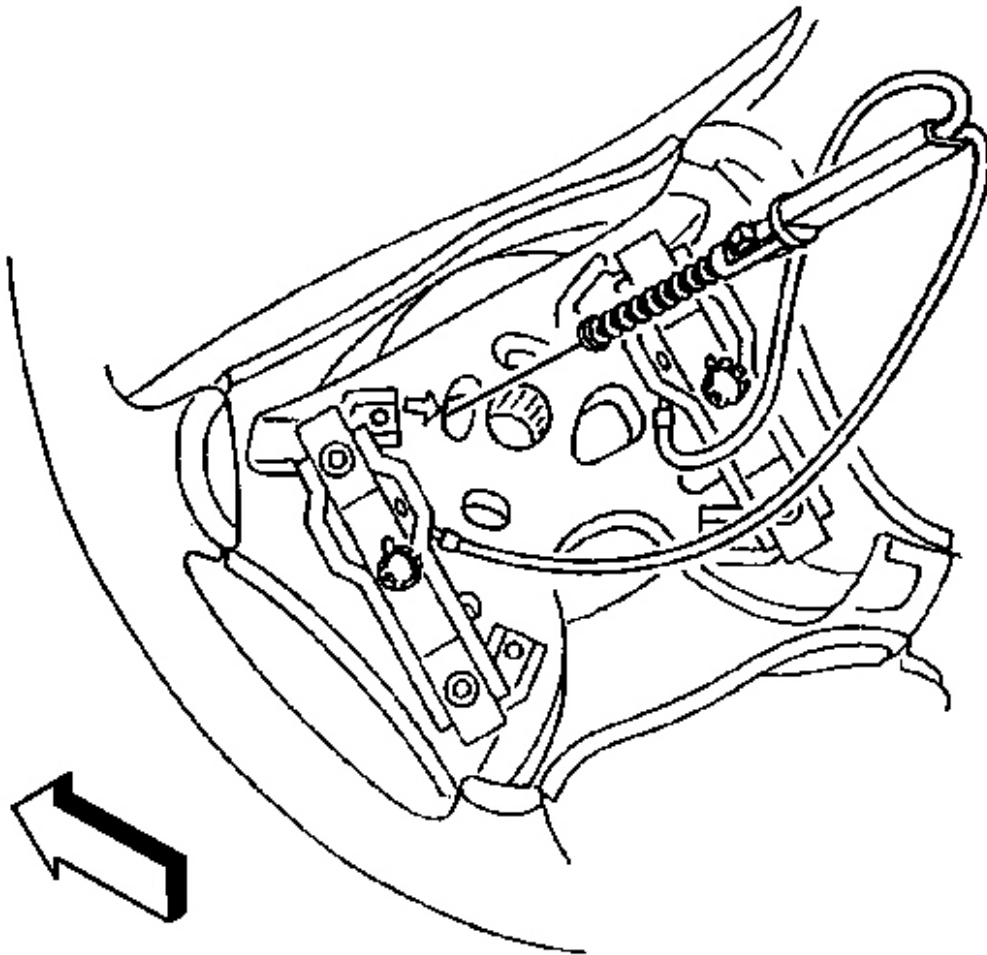


Fig. 54: View Of Horn Plunger At Steering Column
Courtesy of GENERAL MOTORS CORP.

3. Remove the horn plunger from the steering column by pressing inward to the stop and by

rotating the plunger 90 degrees.

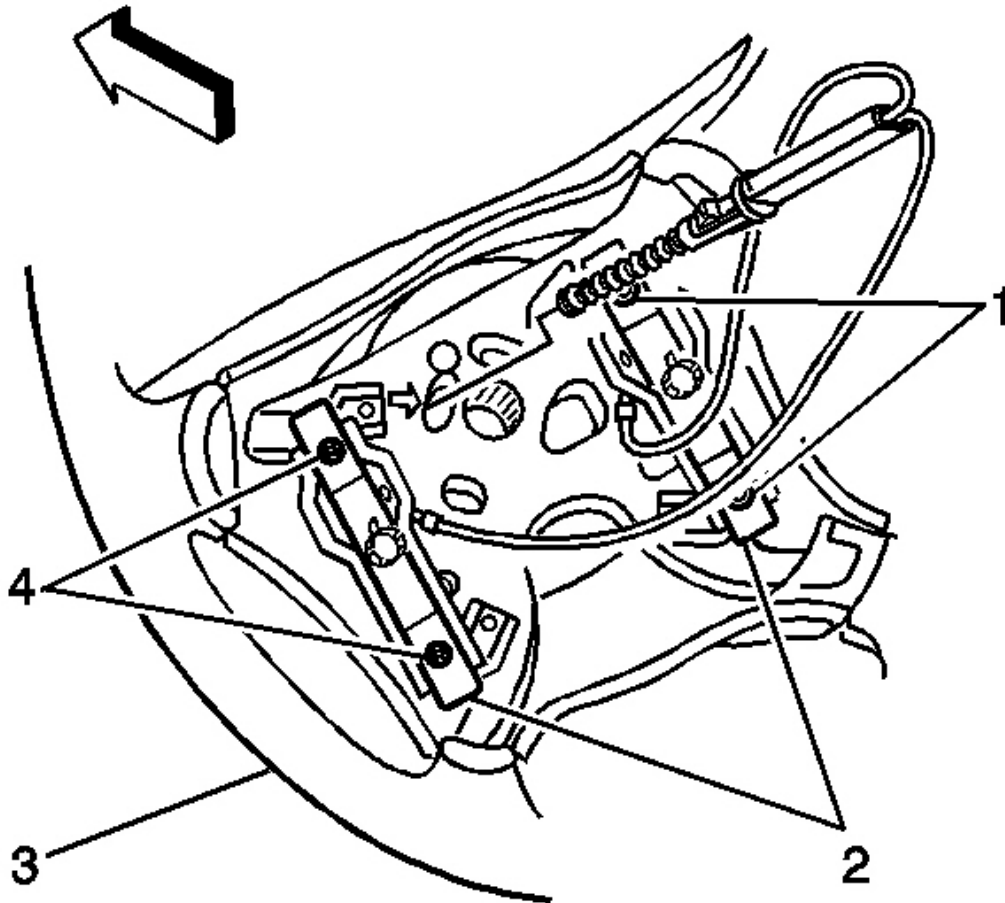


Fig. 55: View of Horn Contact Plate, Steering Wheel & Screws
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the screws (1,4) from the steering wheel (3).
5. Remove the horn switch (2) from the steering wheel (3).

Installation Procedure

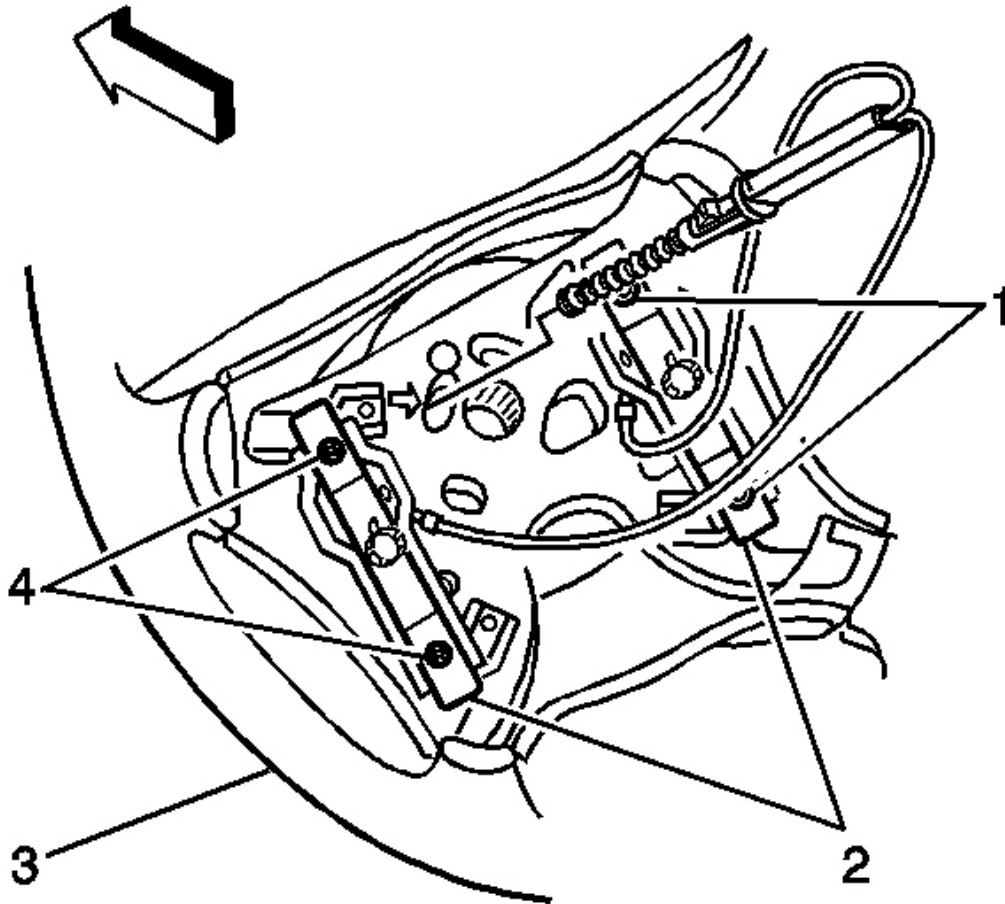


Fig. 56: View of Horn Contact Plate, Steering Wheel & Screws
Courtesy of GENERAL MOTORS CORP.

1. Install the horn switch (2) to the steering wheel (3).

NOTE: Refer to **Fastener Notice** in **Cautions and Notices**.

2. Connect the screws (1,4) that secure the contact plate to the steering wheel (3).

Tighten: Tighten the screws to 5.5 N.m (49 lb in).

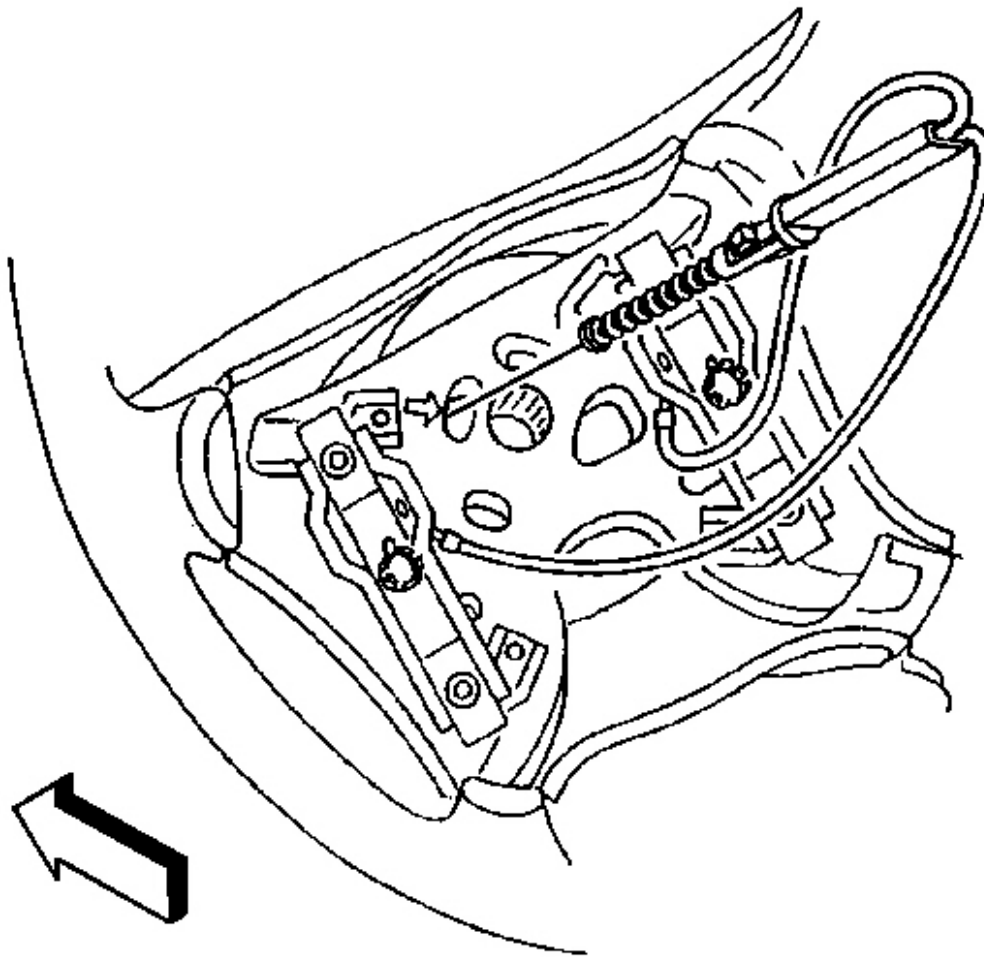


Fig. 57: View Of Horn Plunger At Steering Column
Courtesy of GENERAL MOTORS CORP.

3. Install the horn plunger to the steering column.
4. Install the inflator module. Refer to **Inflatable Restraint Steering Wheel Module Replacement** in SIR.
5. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING WHEEL CONTROL SWITCH ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the steering wheel. Refer to Steering Wheel Replacement.

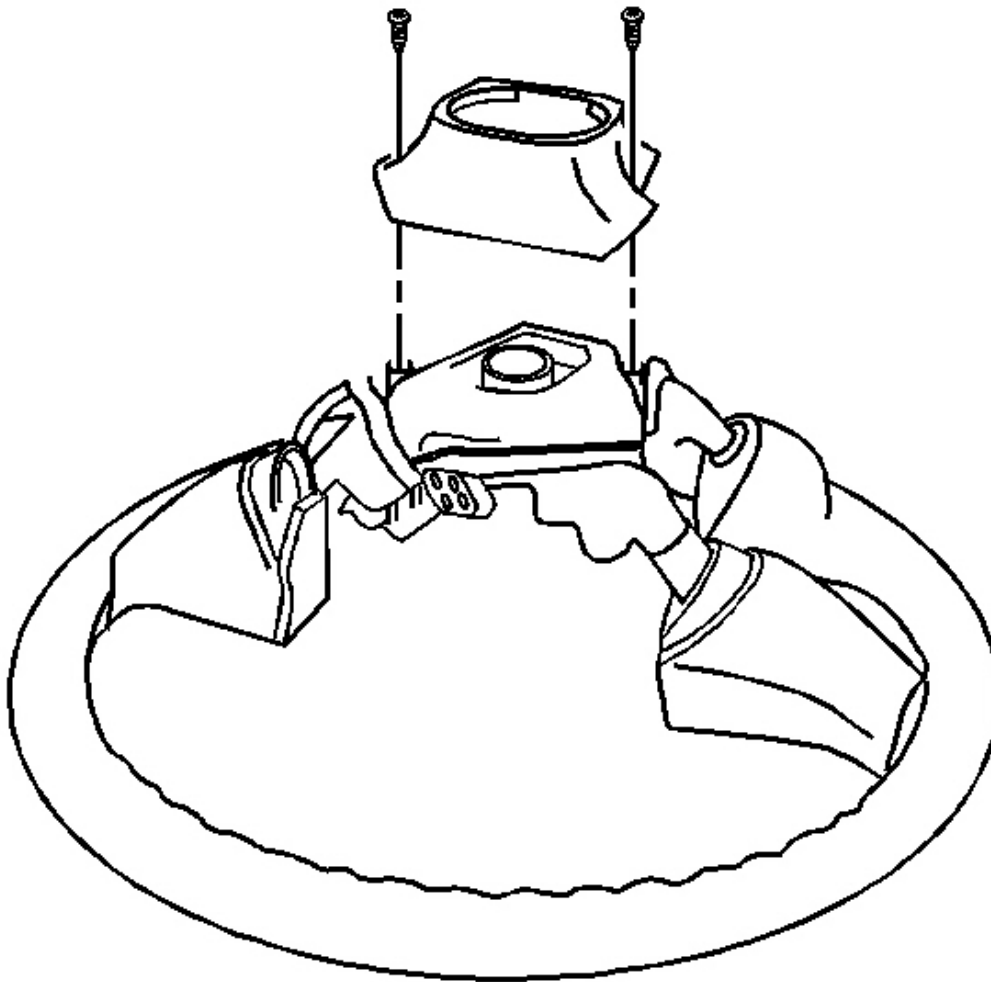


Fig. 58: View Of Shroud & Screws
Courtesy of GENERAL MOTORS CORP.

2. Remove the shroud retaining screws from the back of the steering wheel.
3. Remove the shroud from the steering wheel.

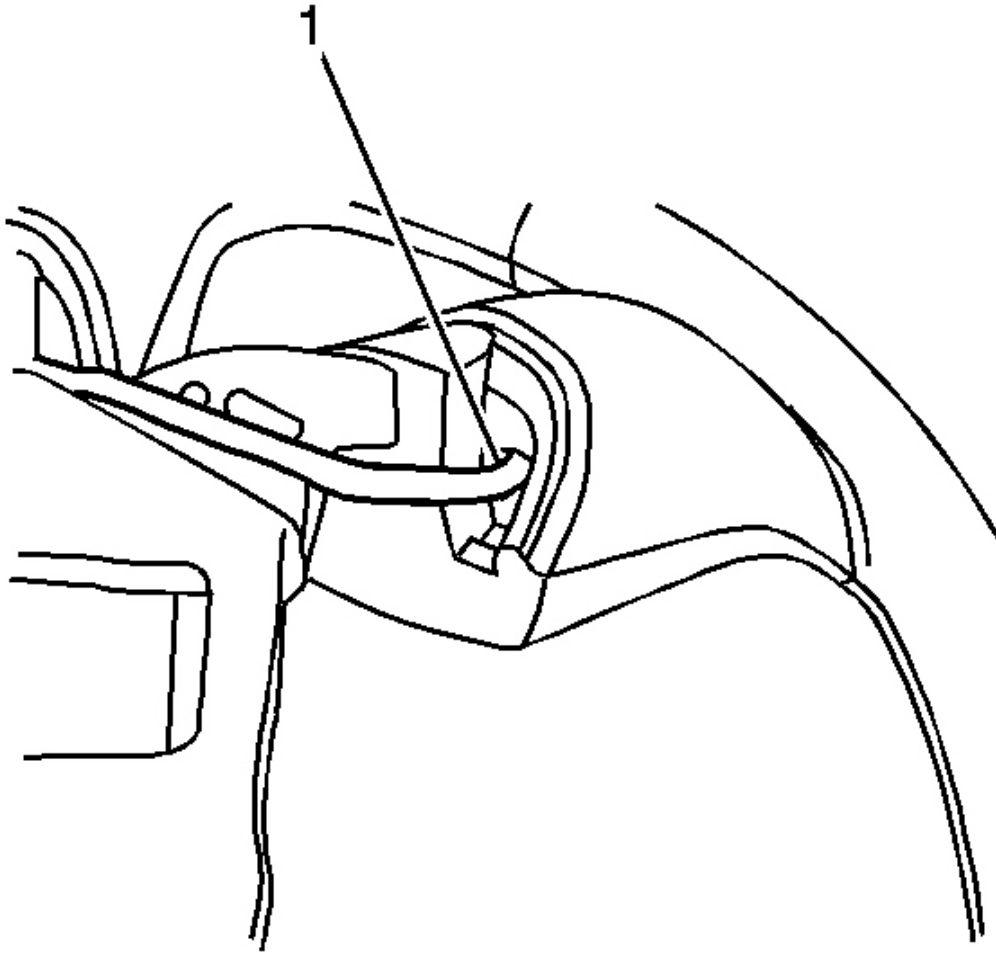


Fig. 59: Positioning A Blunt Ended Tool Into The Wire Harness Cavity
Courtesy of GENERAL MOTORS CORP.

4. Position a blunt ended tool into the wire harness cavity (1) and apply moderate pressure in order to partially remove the steering wheel control switch from the steering wheel.

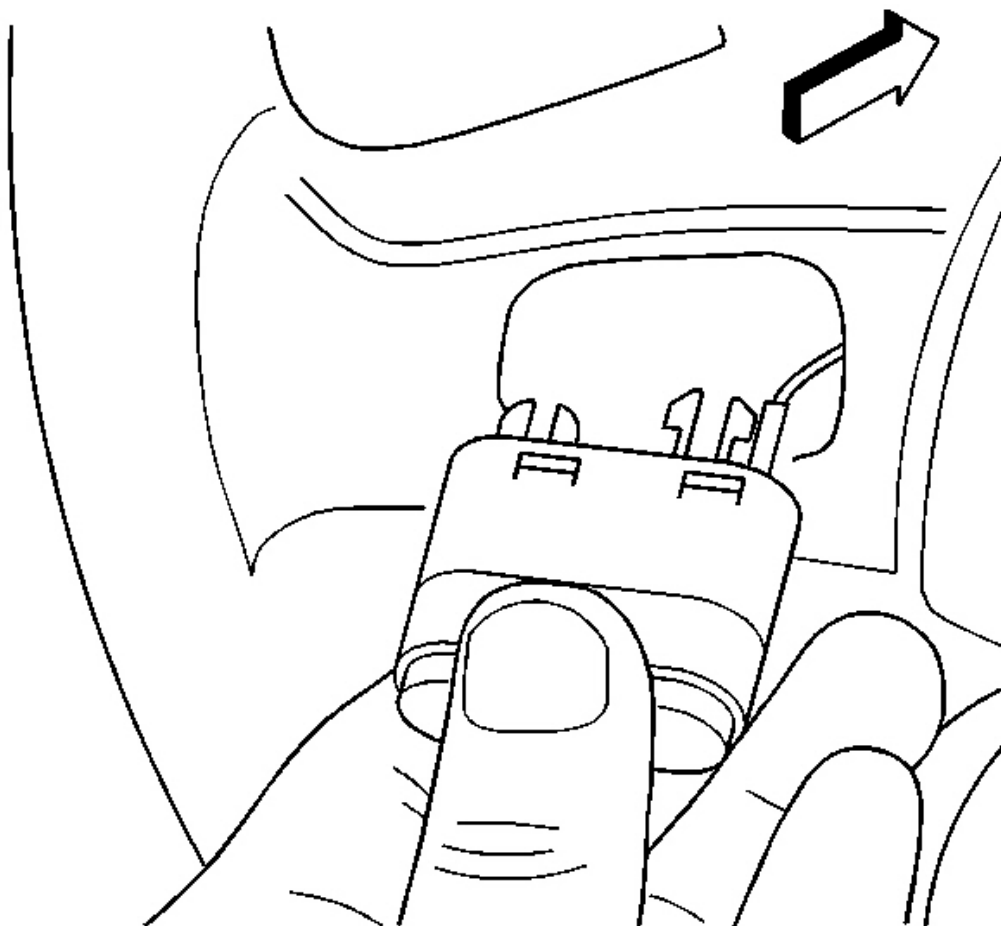


Fig. 60: View Of Steering Wheel Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the steering wheel control switch electrical connector.

IMPORTANT: The bulbs in the steering wheel control switches are not serviceable. The switches should be replaced only as an assembly.

6. Remove the steering wheel control switch from the steering wheel.

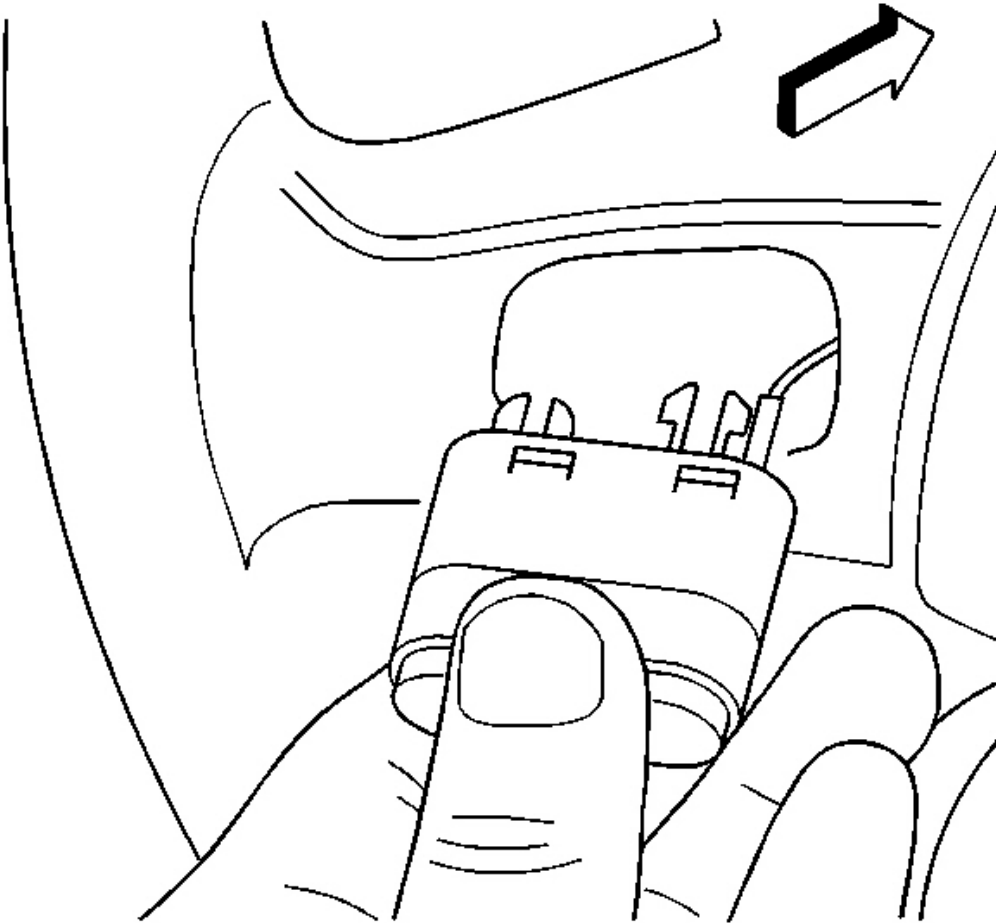


Fig. 61: View Of Steering Wheel Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Position the steering wheel control switch to the steering wheel.
2. Connect the electrical connector to the steering wheel control switch.
3. Install the steering wheel control switch into the steering wheel, ensuring the retaining tabs are fully seated.

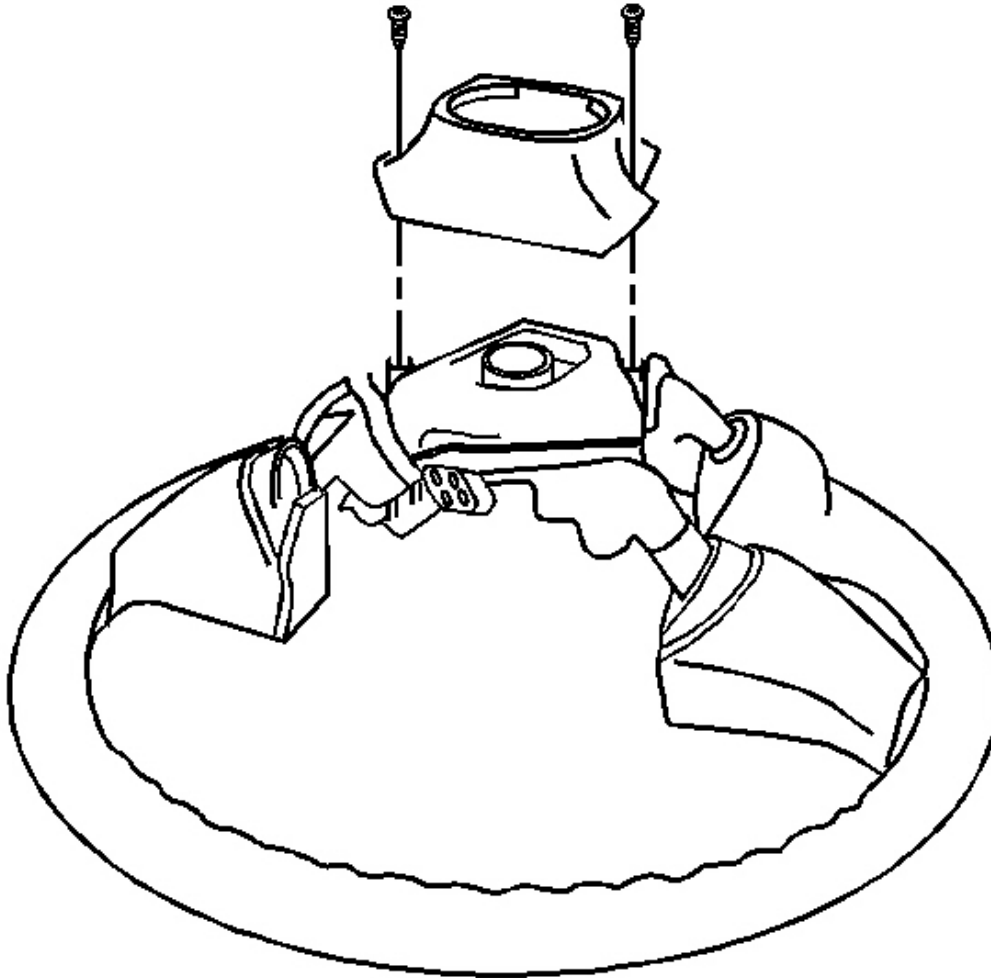


Fig. 62: View Of Shroud & Screws
Courtesy of GENERAL MOTORS CORP.

4. Install the shroud to the steering wheel.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the shroud retaining screws to the steering wheel.

Tighten: Tighten the screws to 2 N.m (18 lb in).

2006 Buick Rainier
2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

6. Install the steering wheel. Refer to **Steering Wheel Replacement**.

STEERING WHEEL REPLACEMENT

Tools Required

- **J 1859-A** Steering Wheel Puller. See **Special Tools**.
- **J-36541-A** Steering Wheel Puller Adapter
- **J 42578** Steering Wheel Puller Legs. See **Special Tools**.

Removal Procedure

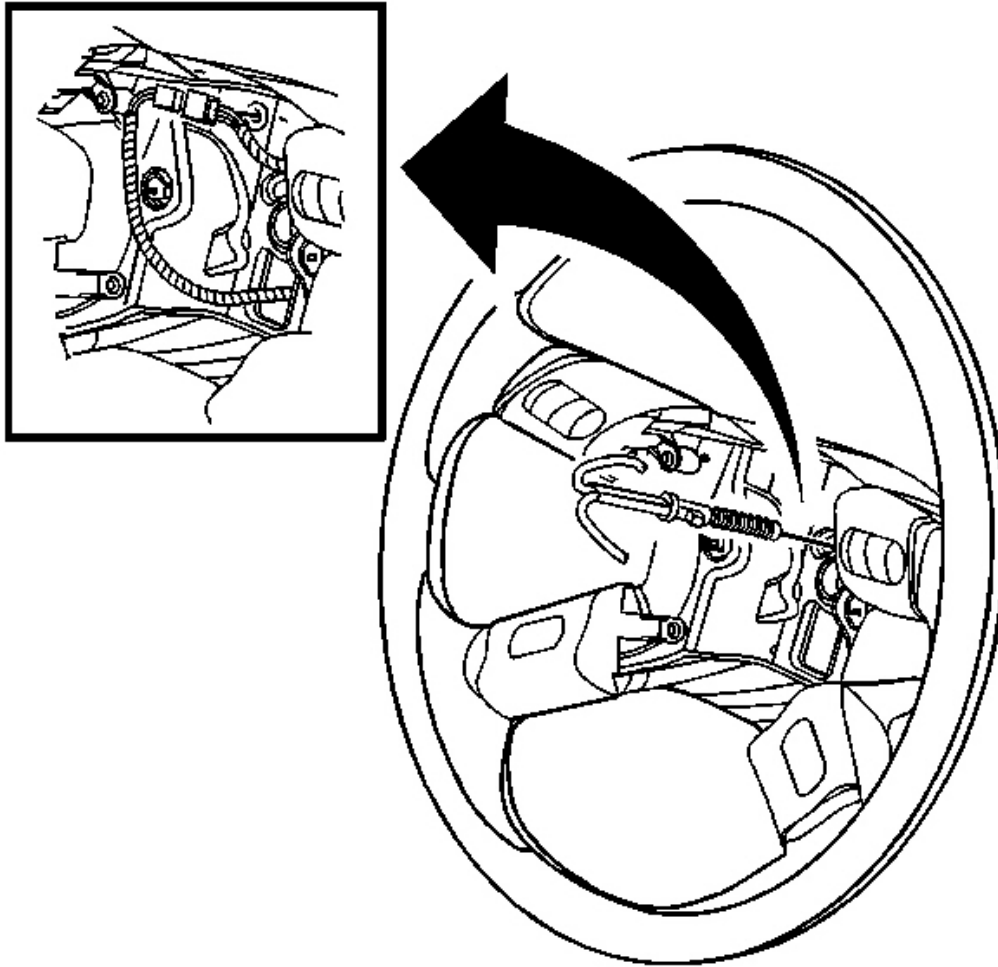


Fig. 63: Steering Wheel Electrical Connector
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Servicing the SIR System Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the inflator module. Refer to **Inflatable Restraint Steering Wheel Module Replacement** in SIR.
3. Remove the horn plunger from the steering column by pressing inward to the stop and

rotating horn plunger 90 degrees.

4. Disconnect the steering wheel electrical connector.

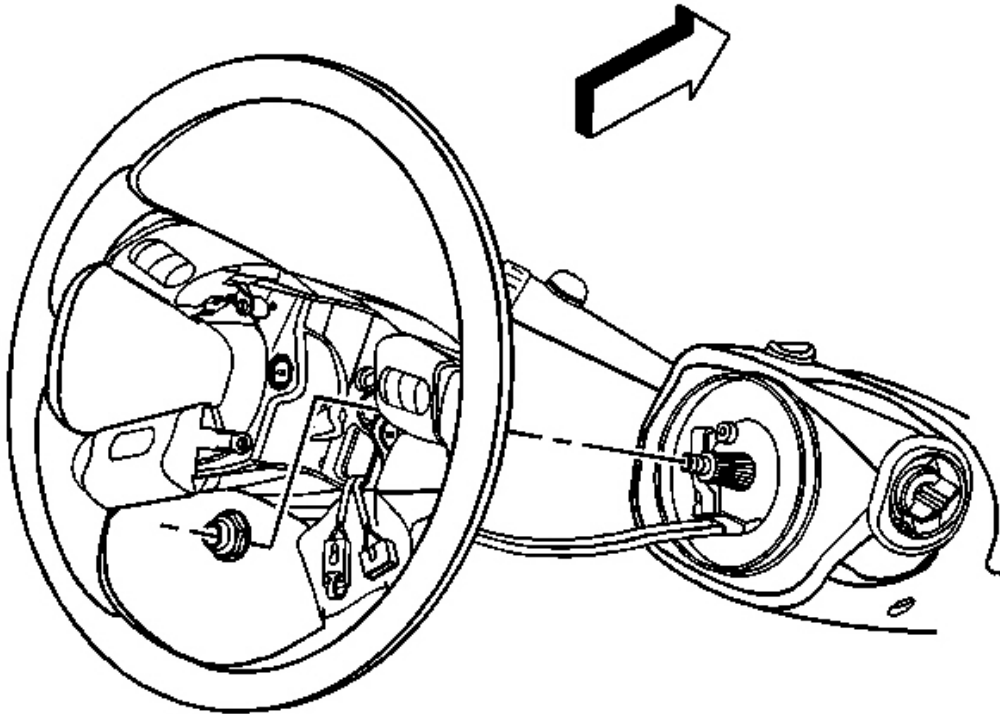


Fig. 64: Steering Wheel & Steering Wheel Shaft
Courtesy of GENERAL MOTORS CORP.

5. Remove the retaining nut which secures the steering wheel to the steering wheel shaft.

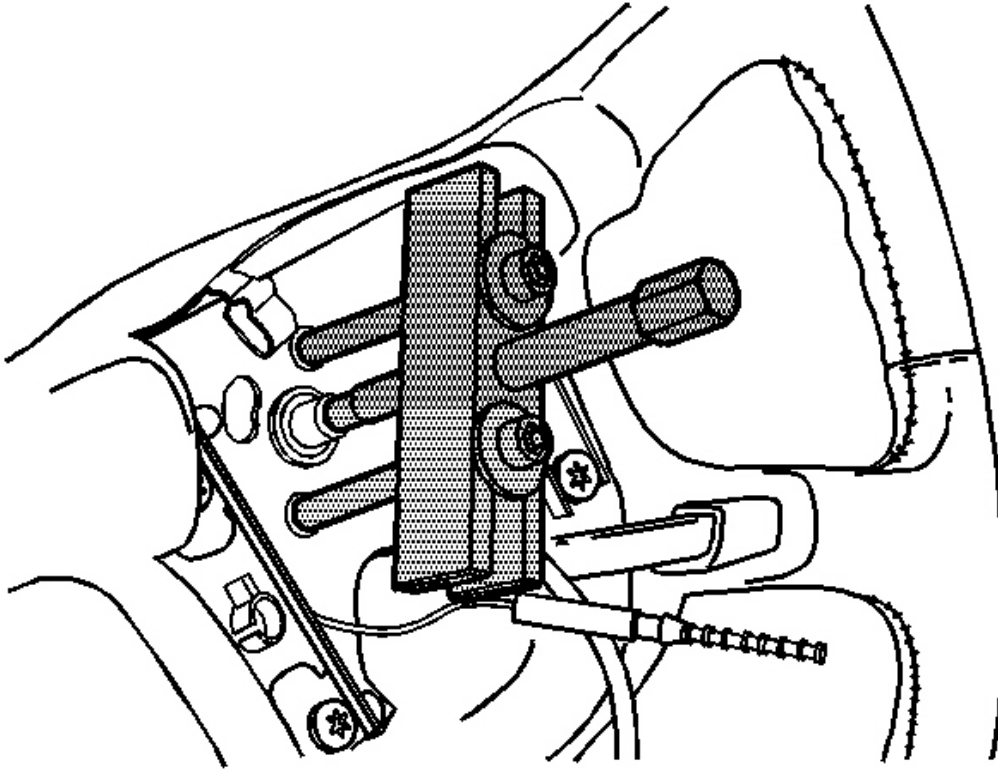


Fig. 65: Removing Steering Wheel Using J 1859-A With J-36541-A Or J 42578
Courtesy of GENERAL MOTORS CORP.

NOTE: When removing the steering wheel, use only the specified steering wheel puller. Do not hammer on the end of the steering column shaft. Hammering could loosen the plastic injections which maintain the steering column rigidity.

6. Install **J 1859-A** with **J-36541-A** or **J 42578** to the steering wheel. See **Special Tools**.
7. Remove the steering wheel using **J 1859-A** with **J-36541-A** or **J 42578** . See **Special Tools**.

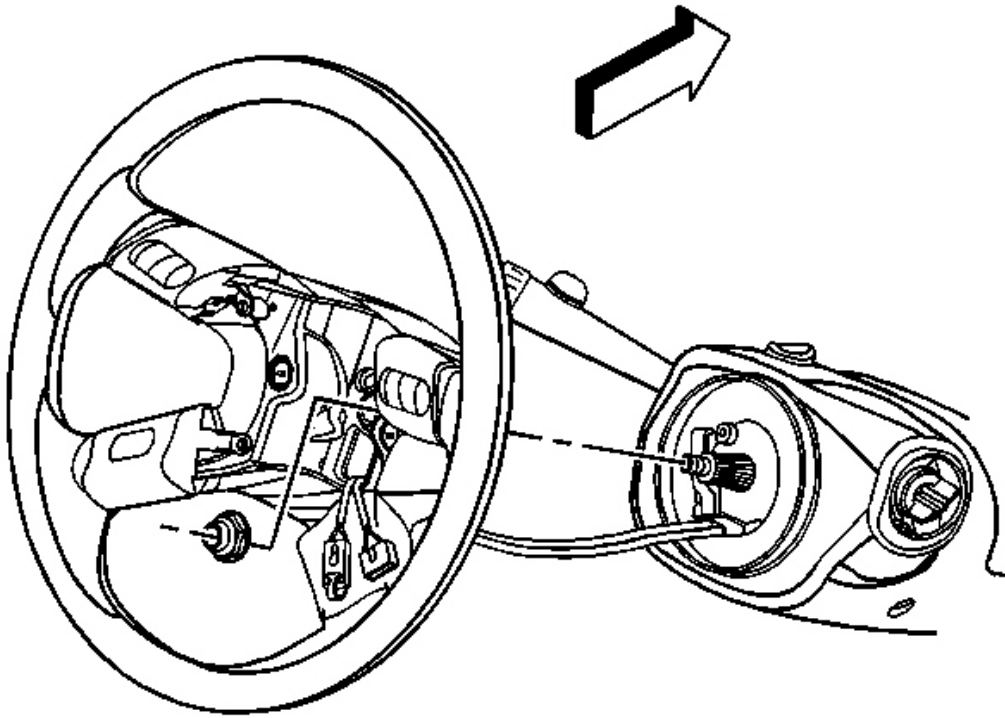


Fig. 66: Steering Wheel & Steering Wheel Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the steering wheel to the steering wheel shaft.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the retaining nut that secures the steering wheel to the steering wheel shaft.

Tighten: Tighten the retaining nut to 41 N.m (30 lb ft).

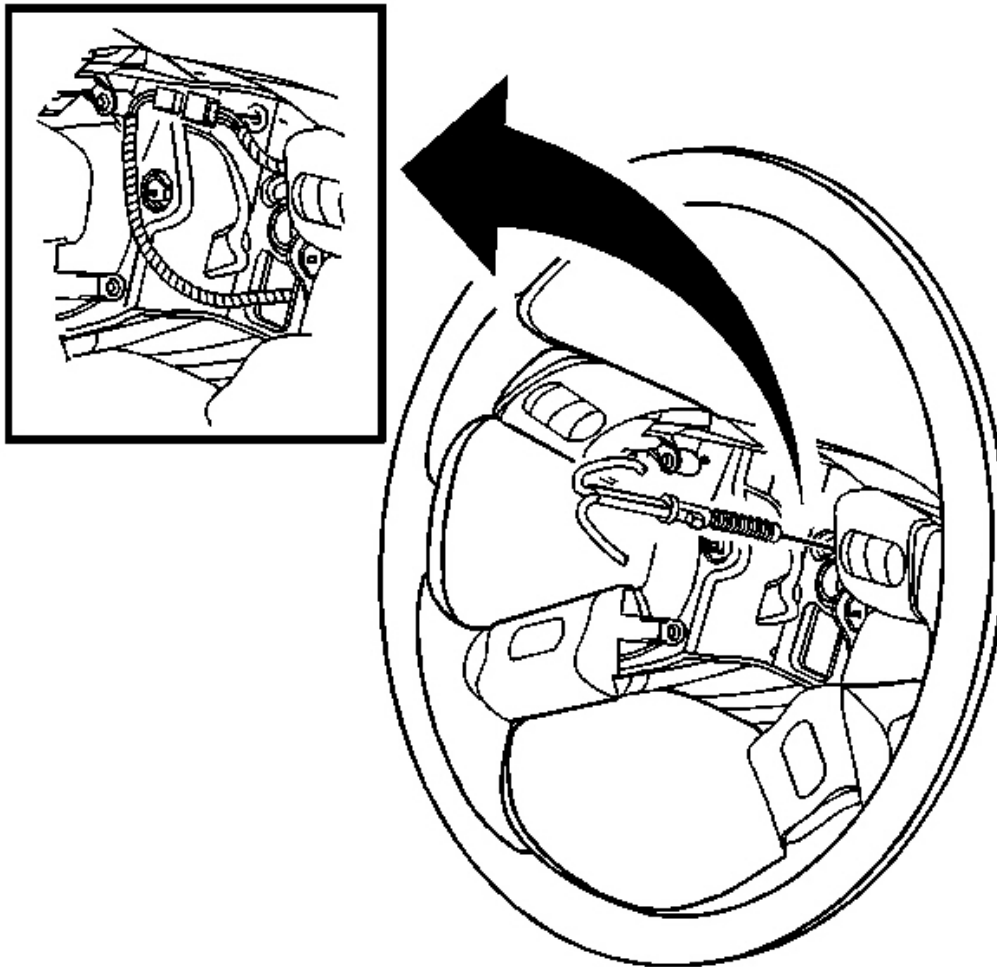


Fig. 67: Steering Wheel Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the steering wheel electrical connector.
4. Install the horn plunger to the steering column.
5. Install the inflator module. Refer to **Inflatable Restraint Steering Wheel Module Replacement** in SIR.
6. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

Removal Procedure

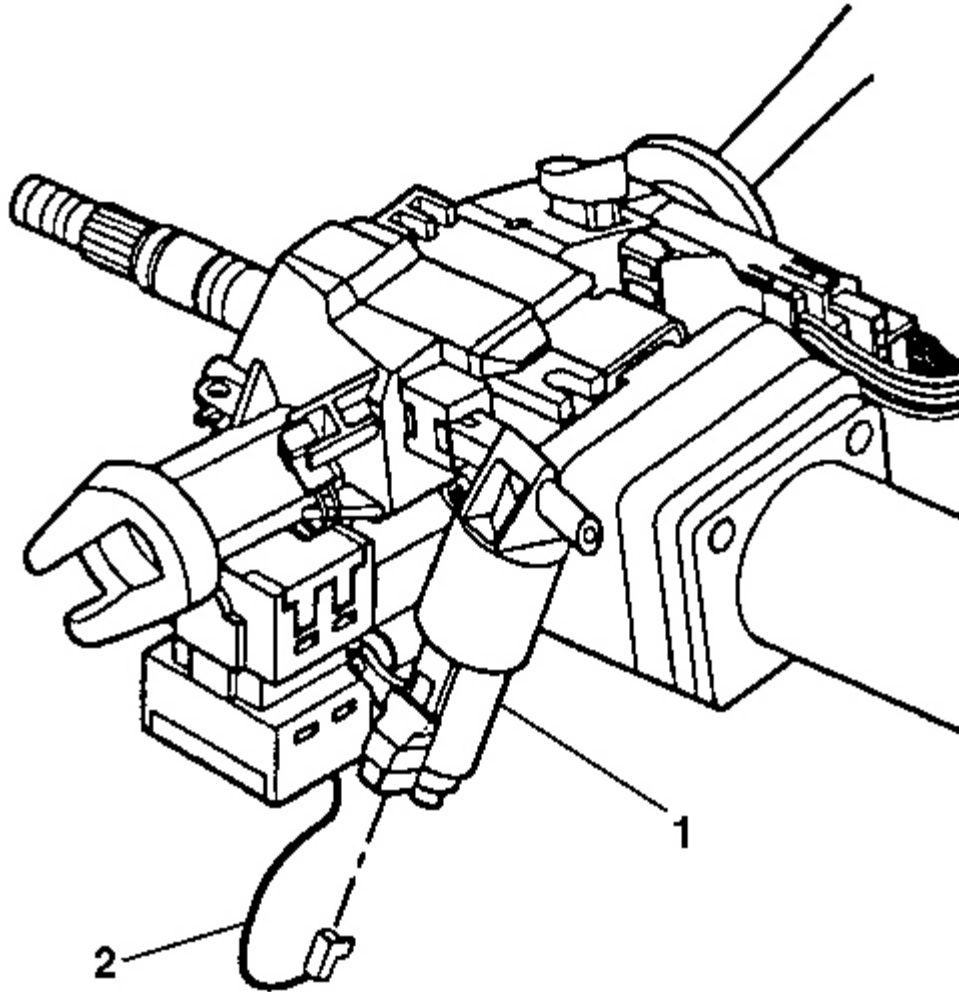


Fig. 68: Electric Park Lock & Connector
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to SIR Disabling and Enabling Zone 3 in SIR.

2. Remove the upper and lower trim covers. Refer to Steering Column Trim Covers Replacement.
3. Remove the connector (2) from the lock (1).

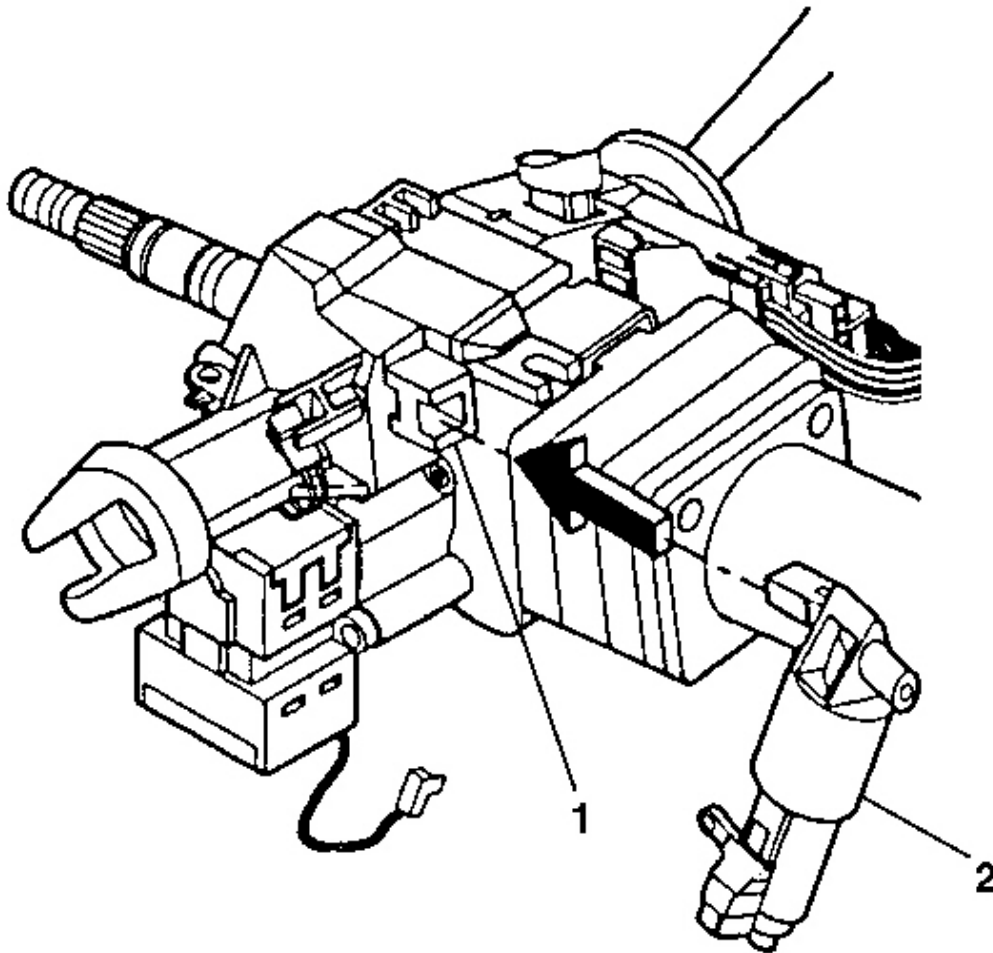


Fig. 69: View Of Electric Park Lock & Ignition Lock Cylinder Case Assembly
Courtesy of GENERAL MOTORS CORP.

4. Pry the electric park lock (2) off of the ignition lock cylinder case assembly (1).

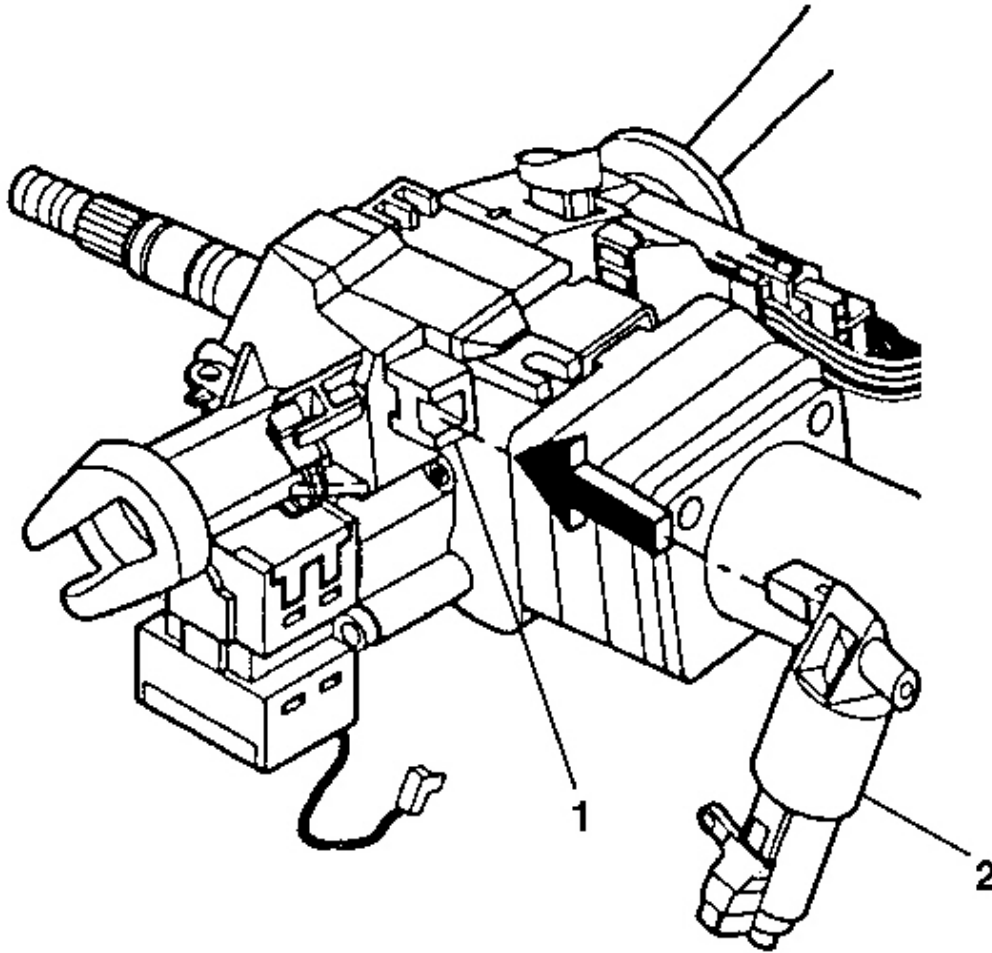


Fig. 70: View Of Electric Park Lock & Ignition Lock Cylinder Case Assembly
Courtesy of GENERAL MOTORS CORP.

1. Snap the electric park lock (2) onto the ignition lock cylinder case assembly (1).

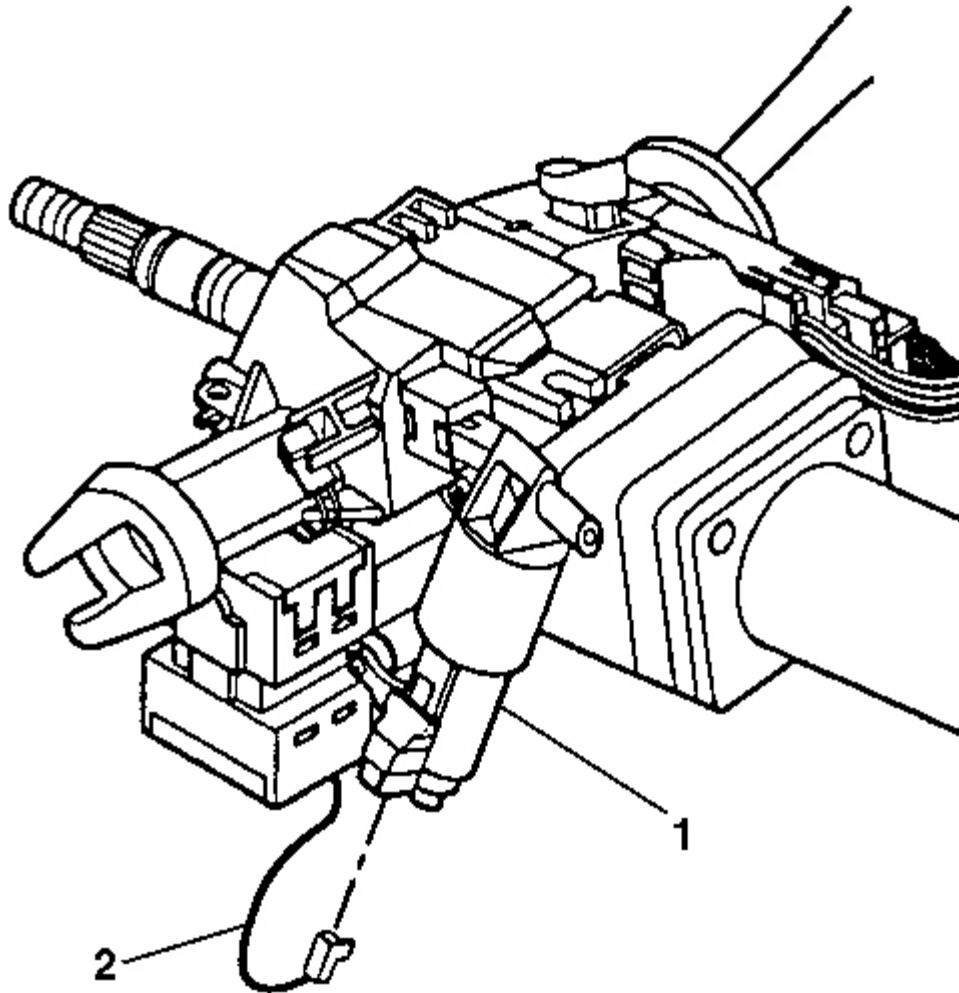


Fig. 71: Electric Park Lock & Connector
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Inflator Module Coil Caution in Cautions and Notices.

2. Reconnect the connector (2) to the electric park lock (1).
3. Install the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.

4. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

TILT SPRING REPLACEMENT

Removal Procedure

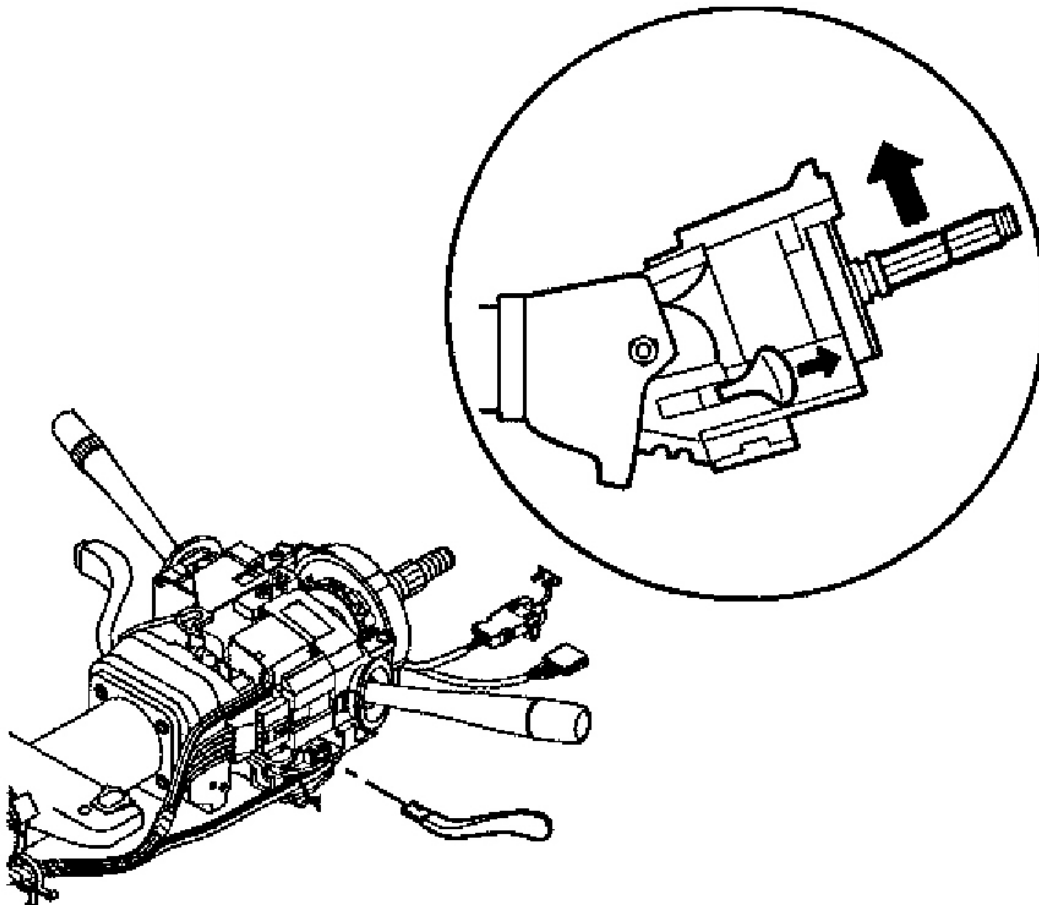


Fig. 72: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to **SIR Caution** in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the upper and lower trim covers. Refer to **Steering Column Trim Covers**

Replacement.

3. Install the tilt lever onto the steering column tilt head assembly.
4. Use the tilt lever to tilt the column to the UP position.

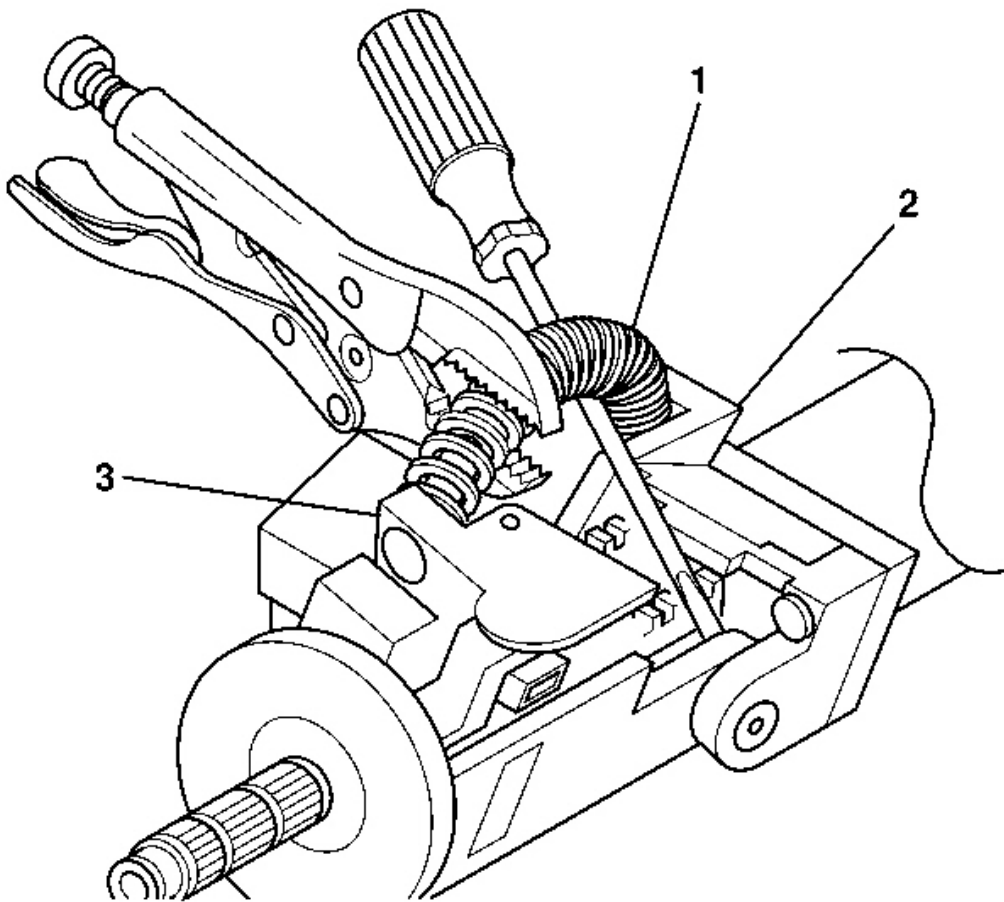


Fig. 73: Removing Tilt Spring From Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The tilt spring and the spring guide are under pressure. The tilt spring and the spring guide may become a projectile. Secure the spring with locking pliers during removal. Secure the spring with locking pliers during installation. Bodily injury may result during removal and

installation of the tilt spring and the spring guide. Always use caution during removal and installation of the tilt spring and the spring guide.

5. Remove the tilt spring (1) from the steering column support assembly (2) and from the steering column tilt head assembly (3) by using the following procedure:
 1. Pry up the tilt spring (1) until a bulge occurs and most of the tilt spring tension is removed.
 2. Secure the tilt spring (1) with locking pliers.
 3. Continue prying up the tilt spring (1) until the tilt spring disengages from the post on the steering column support assembly (2) and from the steering column tilt head assembly (3).

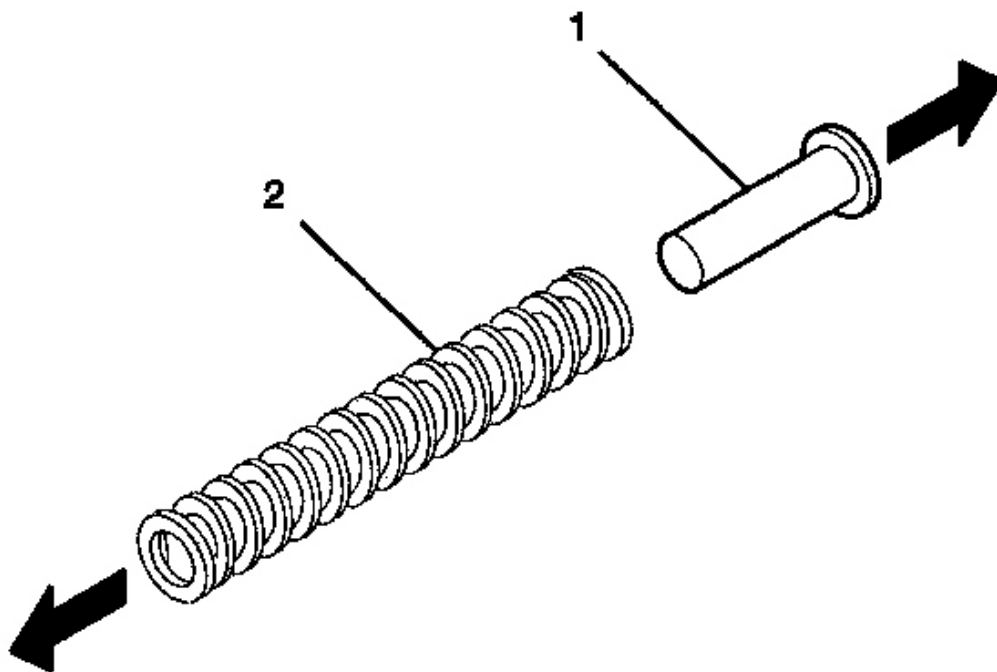


Fig. 74: Identifying Spring Guide Components
Courtesy of GENERAL MOTORS CORP.

6. Remove the spring guide (1) from the tilt spring (2).

Installation Procedure

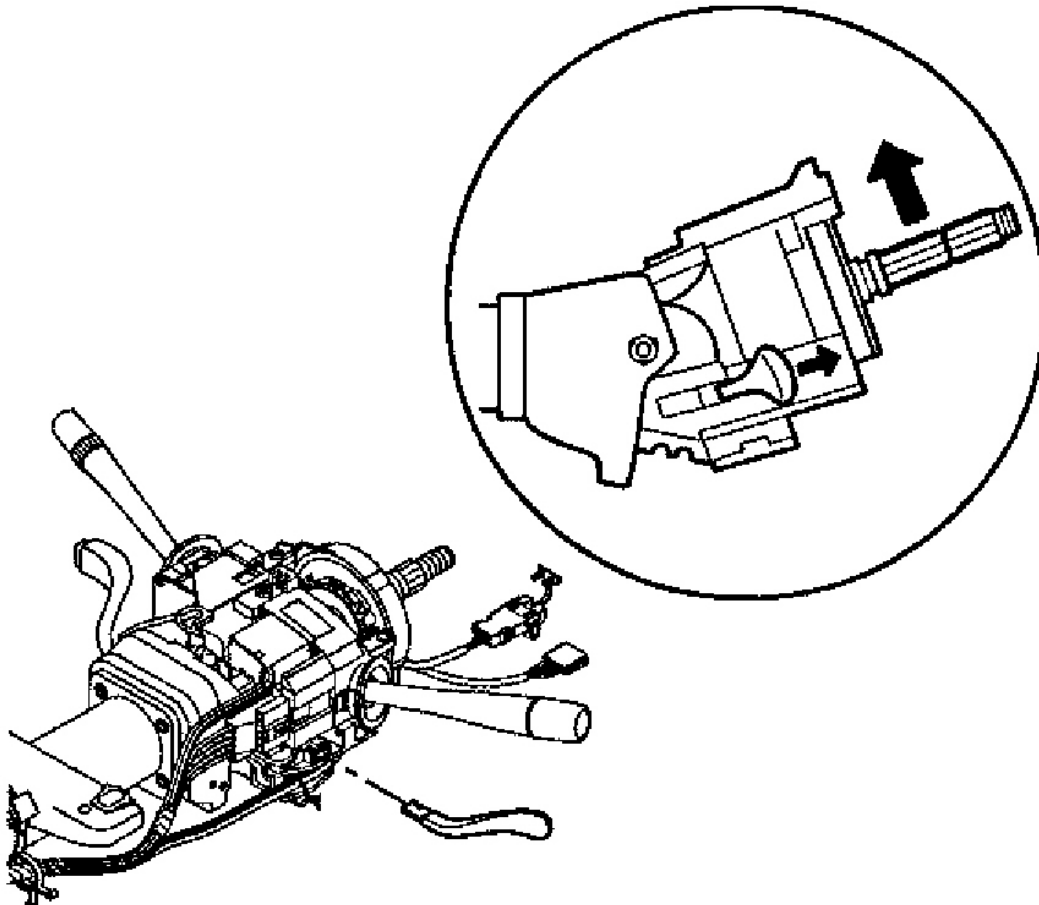


Fig. 75: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

1. Use the tilt lever to tilt the column to the UP position.

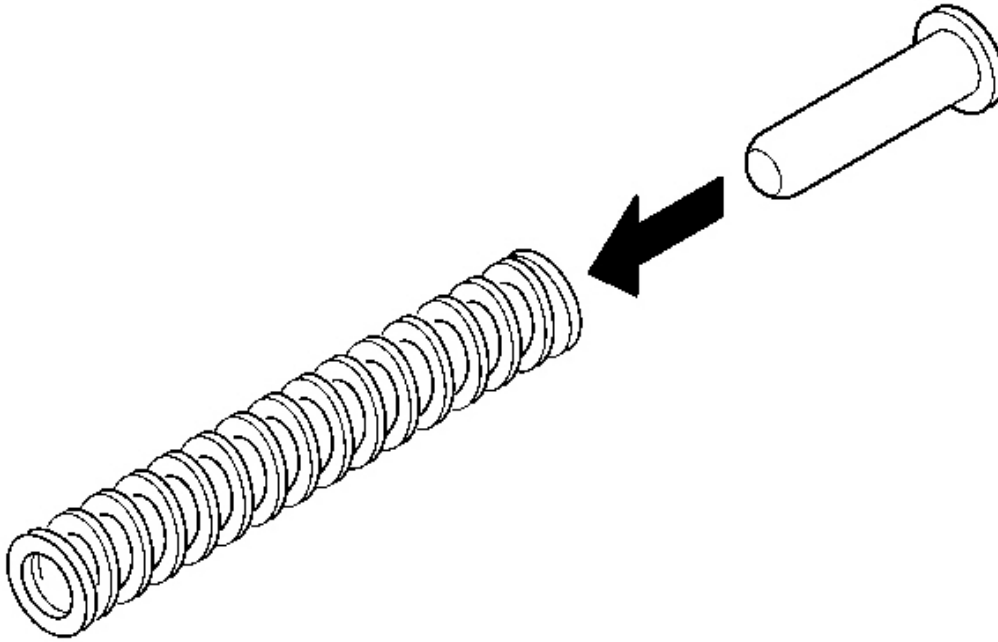


Fig. 76: Spring Guide & Tilt Spring
Courtesy of GENERAL MOTORS CORP.

2. Install the spring guide into the tilt spring.

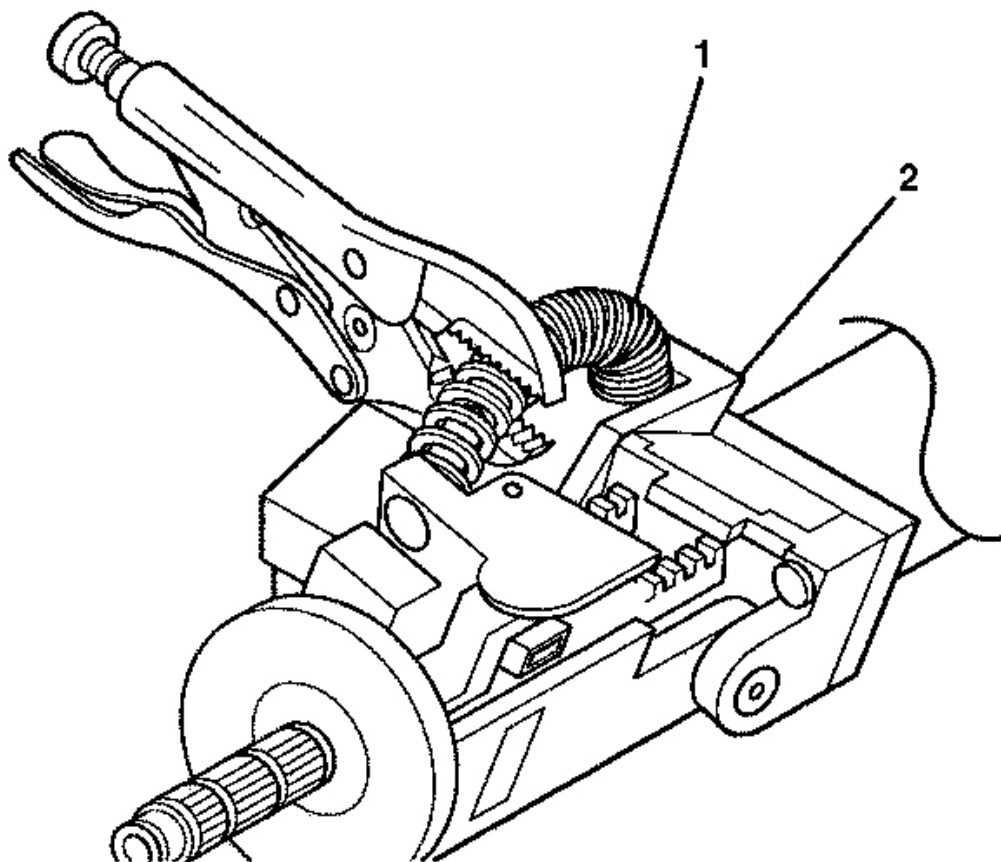


Fig. 77: Installing Tilt Spring Onto The Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The tilt spring and the spring guide are under pressure. The tilt spring and the spring guide may become a projectile. Secure the spring with locking pliers during removal. Secure the spring with locking pliers during installation. Bodily injury may result during removal and installation of the tilt spring and the spring guide. Always use caution during removal and installation of the tilt spring and the spring guide.

3. Install the tilt spring (1) onto the steering column support assembly (2) and onto the steering

2006 Buick Rainier

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column tilt head assembly by using the following procedure:

1. Install the tilt spring (1) onto the steering column tilt head assembly.
2. Install the tilt spring (1) onto the post on the steering column support assembly (2).
4. Install the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
5. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN TILT HEAD HOUSING REPLACEMENT

Tools Required

J 21854-01 Pivot Pin Remover. See **Special Tools**.

Removal Procedure

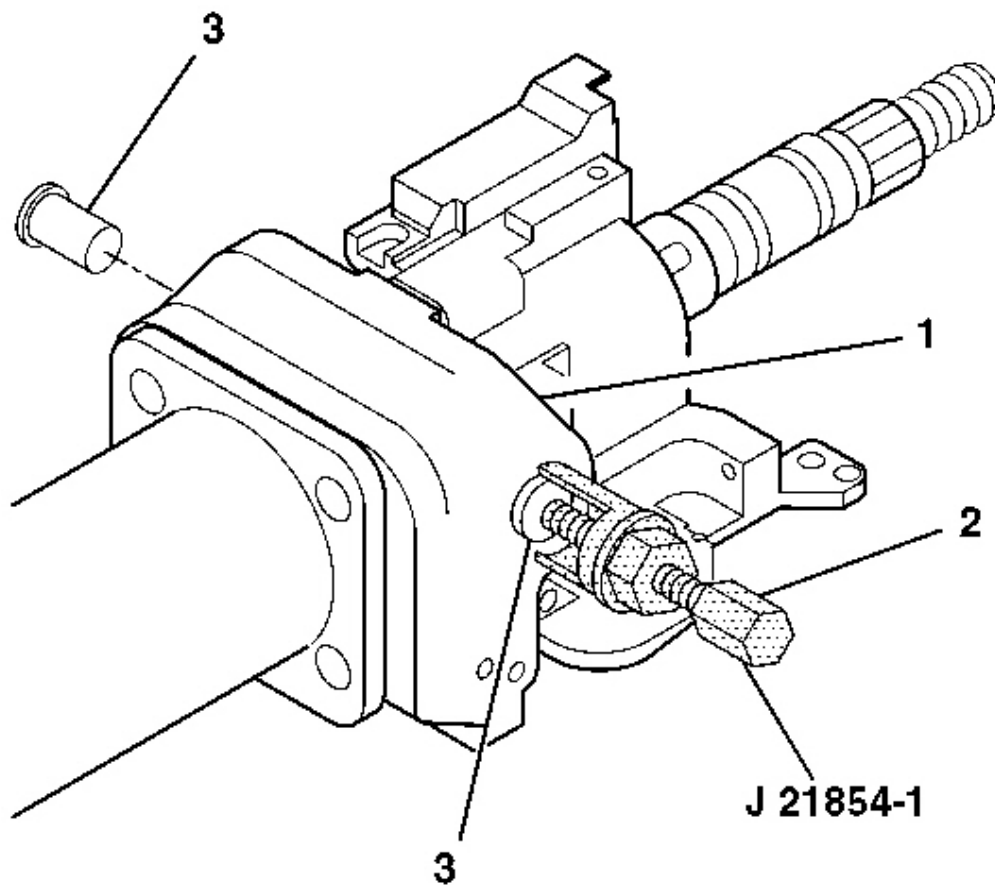


Fig. 78: View Of Pivot Pins To Steering Column Tilt Head Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the steering column from the vehicle. Refer to **Steering Column Replacement**.
3. Remove the ignition lock cylinder case assembly. Refer to **Ignition Lock Cylinder Case Replacement**.
4. Remove the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn**

Signal Switch Replacement.

5. Remove the turn signal switch housing. Refer to **Multifunction Turn Signal Switch Housing Replacement.**
6. Remove the tilt spring. Refer to **Tilt Spring Replacement.**
7. Remove the 2 pivot pins (3) from the steering column tilt head assembly (1) using **J 21854-01** . See **Special Tools.**

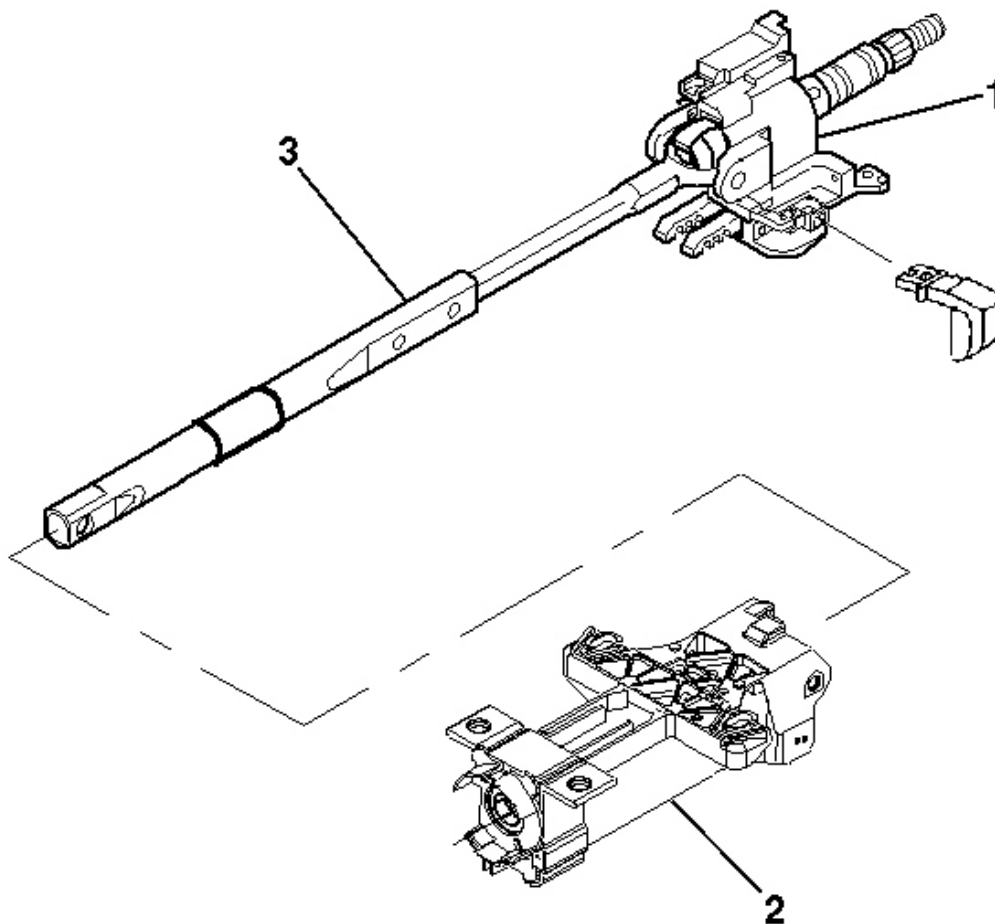


Fig. 79: View Of Upper Steering Column Components
Courtesy of GENERAL MOTORS CORP.

8. Install the tilt lever into the steering column tilt head assembly (1).

9. Pull back on the tilt lever and at the same time pull the steering column tilt head assembly (1) down and away from the steering column.
10. Remove the steering column tilt head assembly (1) with the steering shaft assembly (3) from the steering column jacket assembly (2).
11. Remove the tilt lever.

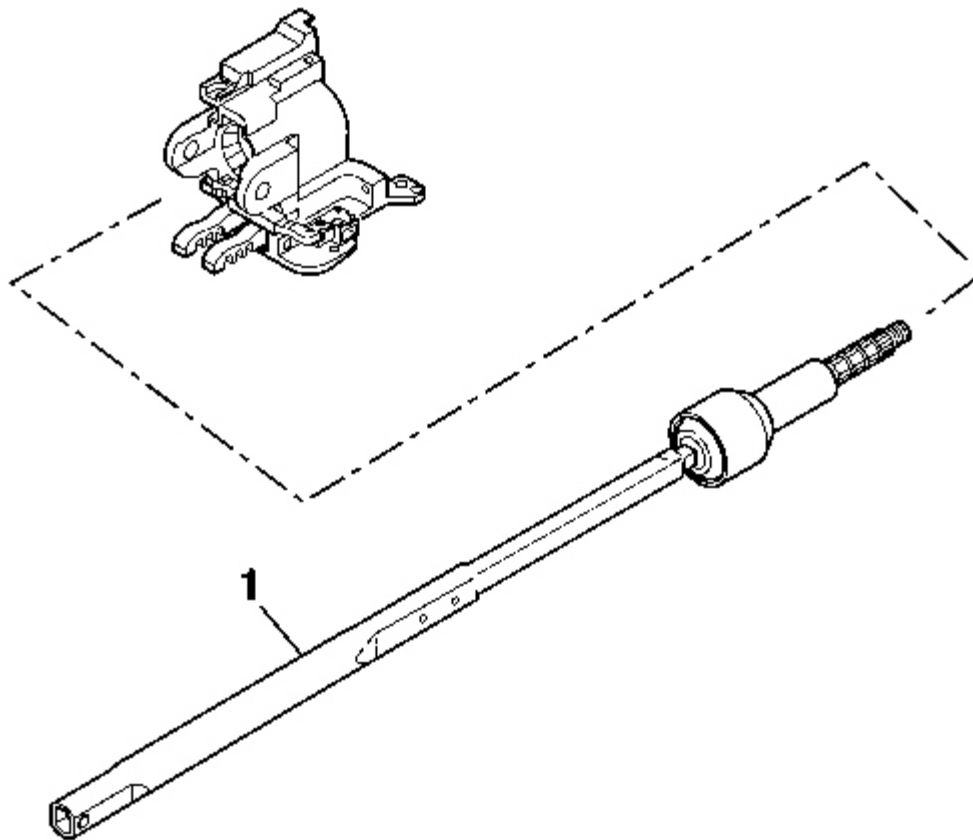


Fig. 80: Identifying Steering Shaft
Courtesy of GENERAL MOTORS CORP.

12. Remove the steering shaft (1) from the steering column tilt head assembly.

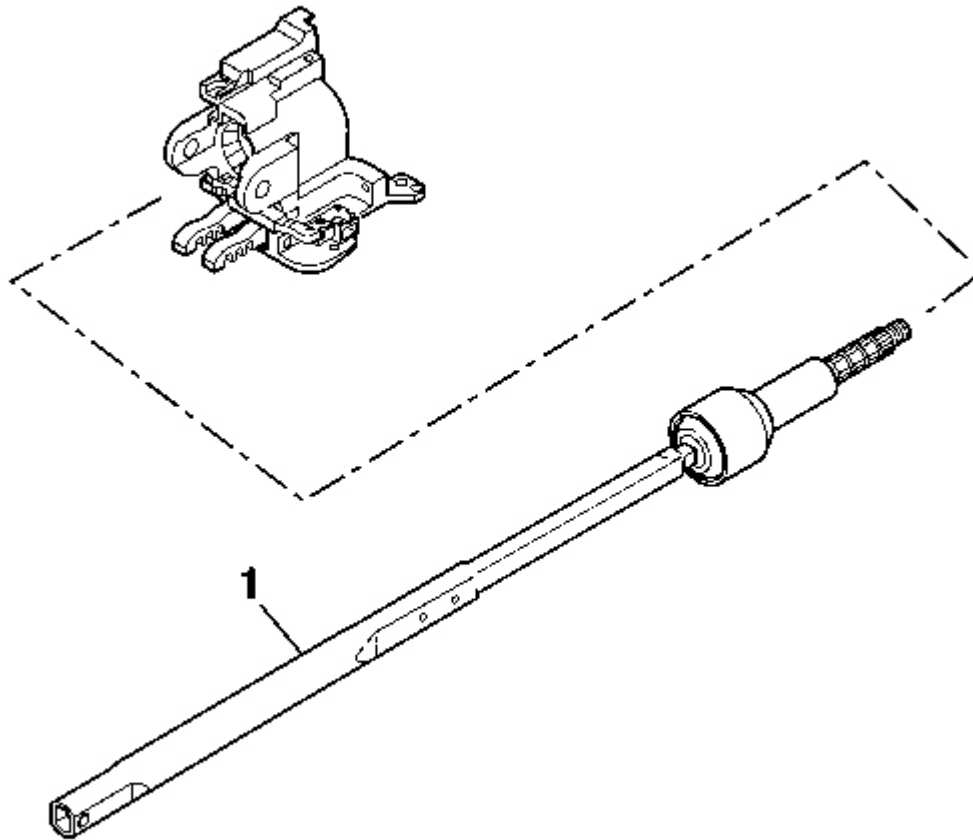


Fig. 81: Identifying Steering Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the steering shaft (1) into the steering column tilt head assembly.

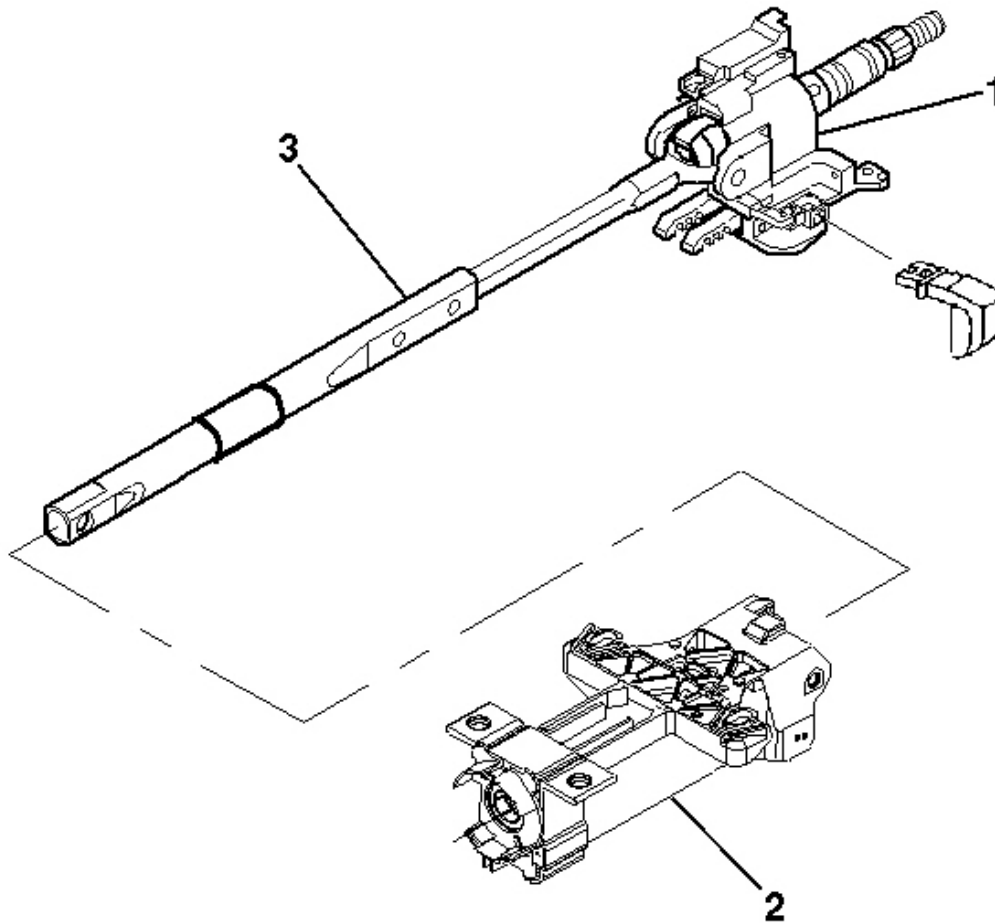


Fig. 82: View Of Upper Steering Column Components
Courtesy of GENERAL MOTORS CORP.

2. Install the steering shaft (3) into the steering column tilt head assembly (1).
3. Install the tilt head assembly (1) and the steering shaft (3) into the steering column jacket assembly (2).

IMPORTANT: The steering wheel lock shoes teeth must be resting on the bar in the steering column jacket assembly.

4. Align the steering column tilt head assembly with the pivot pin holes on the steering column

jacket assembly.

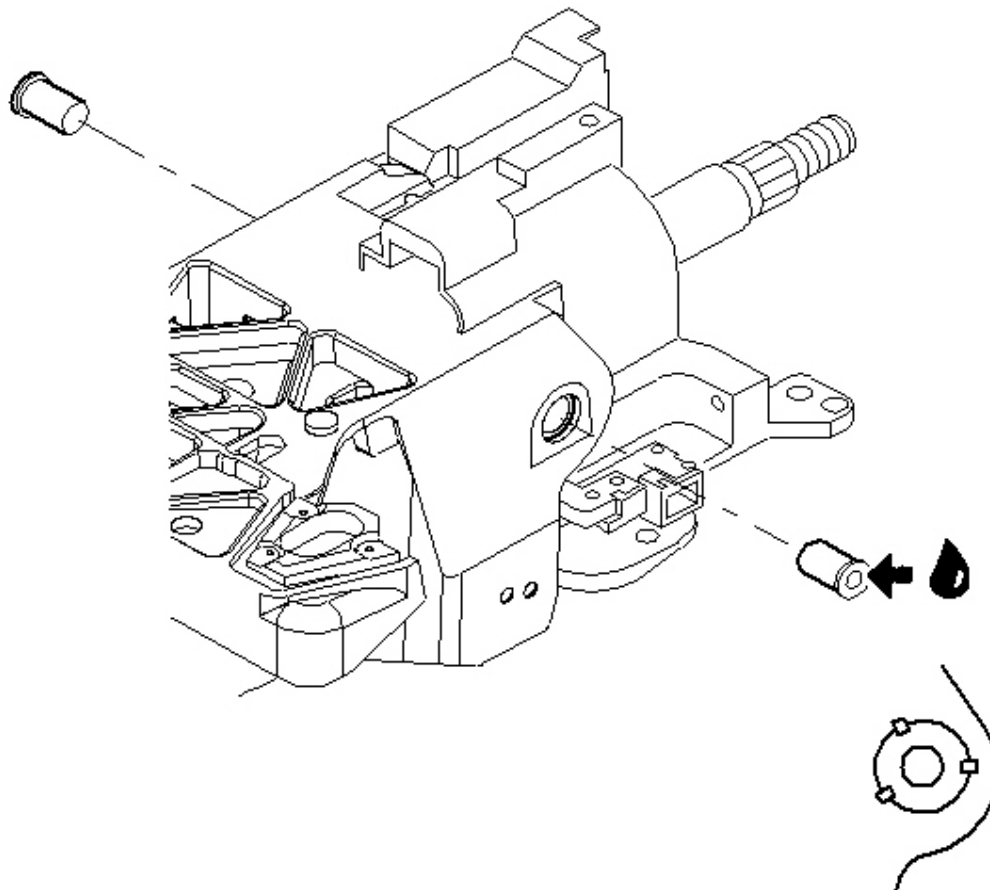


Fig. 83: Identifying Pivot Pin Locations
Courtesy of GENERAL MOTORS CORP.

5. Lubricate the pivot pins with GM P/N 12346293 (Canadian P/N 992723).

Install the 2 pivot pins into the steering column support assembly.

6. Stake the pins in 3 places.
7. Install the tilt spring assembly only. Refer to **Tilt Spring Replacement**.
8. Install the turn signal switch housing only. Refer to **Multifunction Turn Signal Switch**

Housing Replacement.

9. Install the turn signal and multifunction switch assembly only. Refer to **Multifunction, Turn Signal Switch Replacement.**
10. Install the ignition lock cylinder case assembly. Refer to **Ignition Lock Cylinder Case Replacement.**
11. Install the steering column to the vehicle. Refer to **Steering Column Replacement.**
12. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN REPLACEMENT

Tools Required

J 42640 Steering Column Lock Pin. See **Special Tools.**

Removal Procedure

NOTE: 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.

NOTE: The front wheels of the vehicle must be maintained in the straight ahead position and the steering column must be in the LOCK position before disconnecting the steering column or intermediate shaft. Failure to follow these procedures will cause improper alignment of some components during installation and result in damage to the SIR coil assembly.

CAUTION: Refer to **SIR Caution** in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

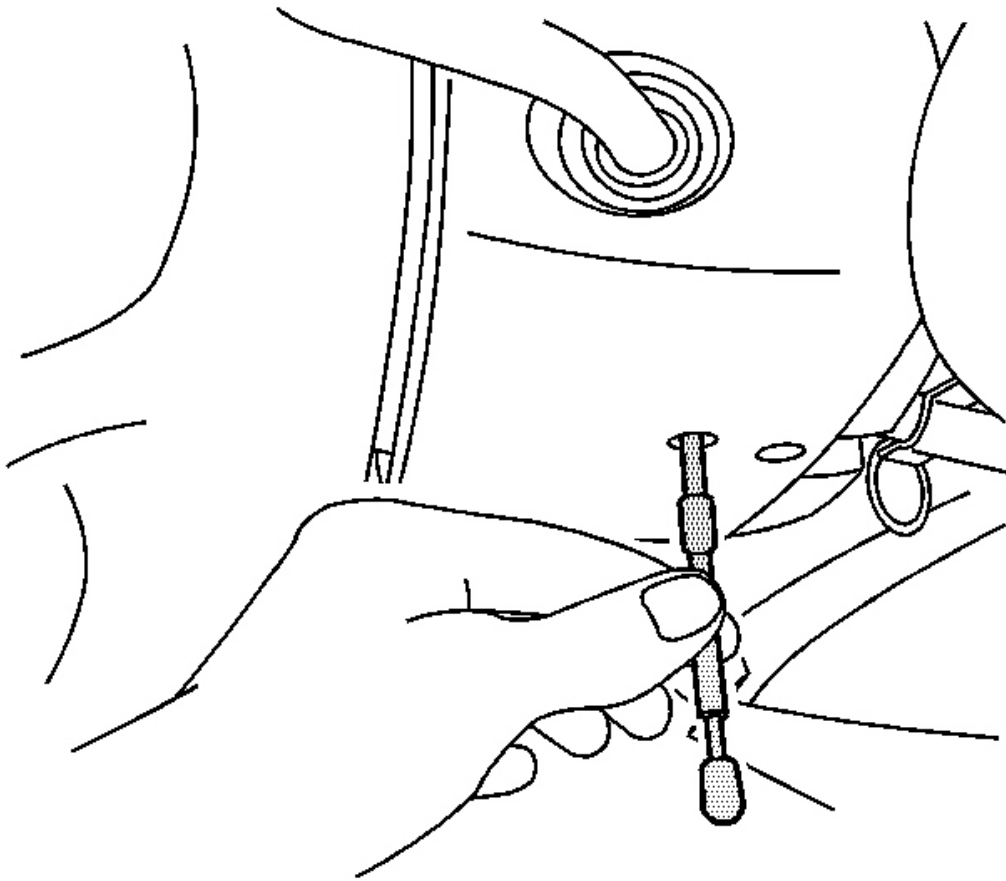


Fig. 84: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

2. Lock the steering column through the access hole in the lower steering column trim cover using **J 42640** . See **Special Tools**.
3. Remove the steering wheel. Refer to **Steering Wheel Replacement**.
4. Remove the knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages and Console.

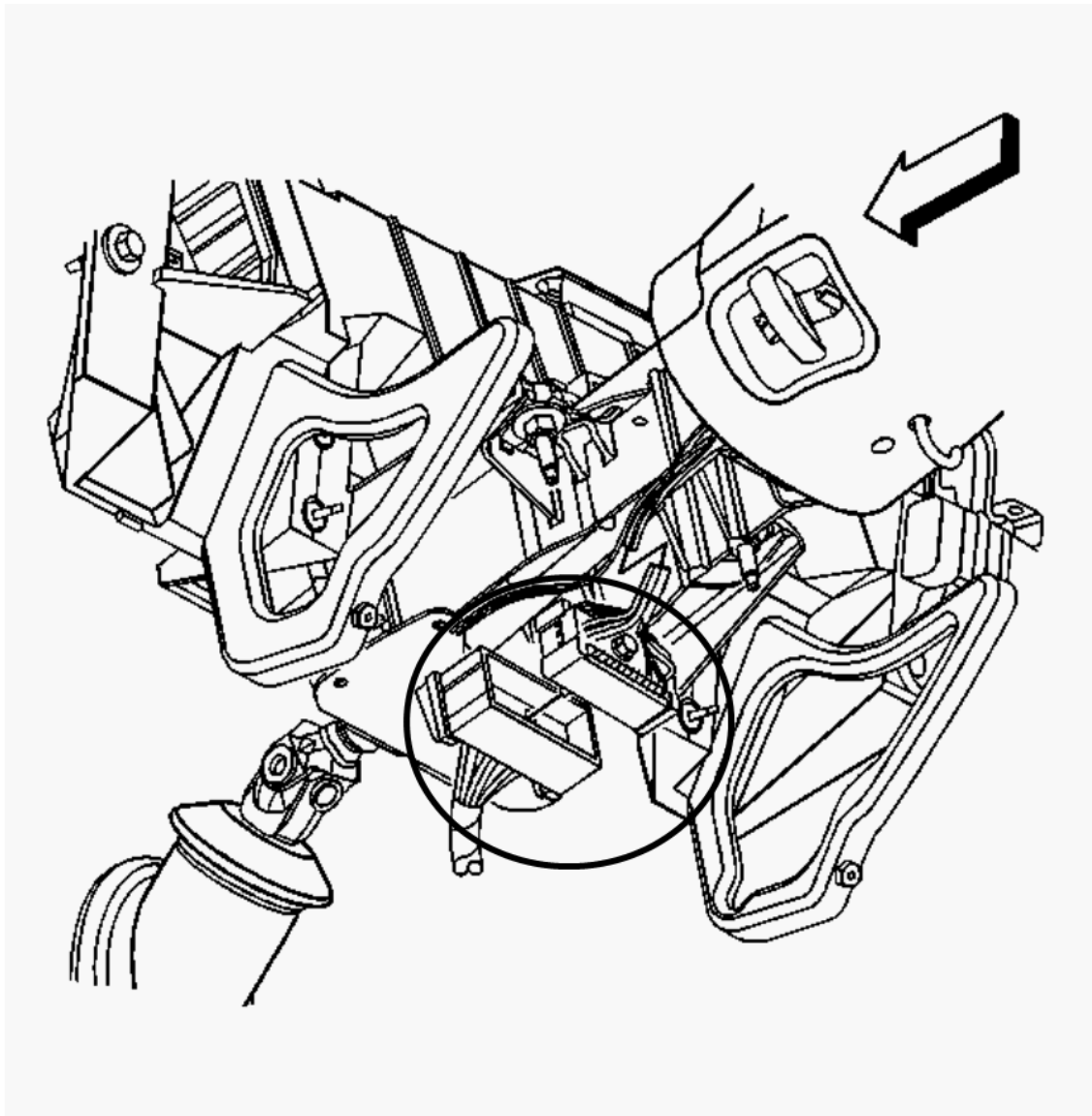


Fig. 85: Disconnecting/Reconnecting Steering Column Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the steering column electrical connector.
6. Disconnect the body wiring harness connector from the steering column lower bracket.

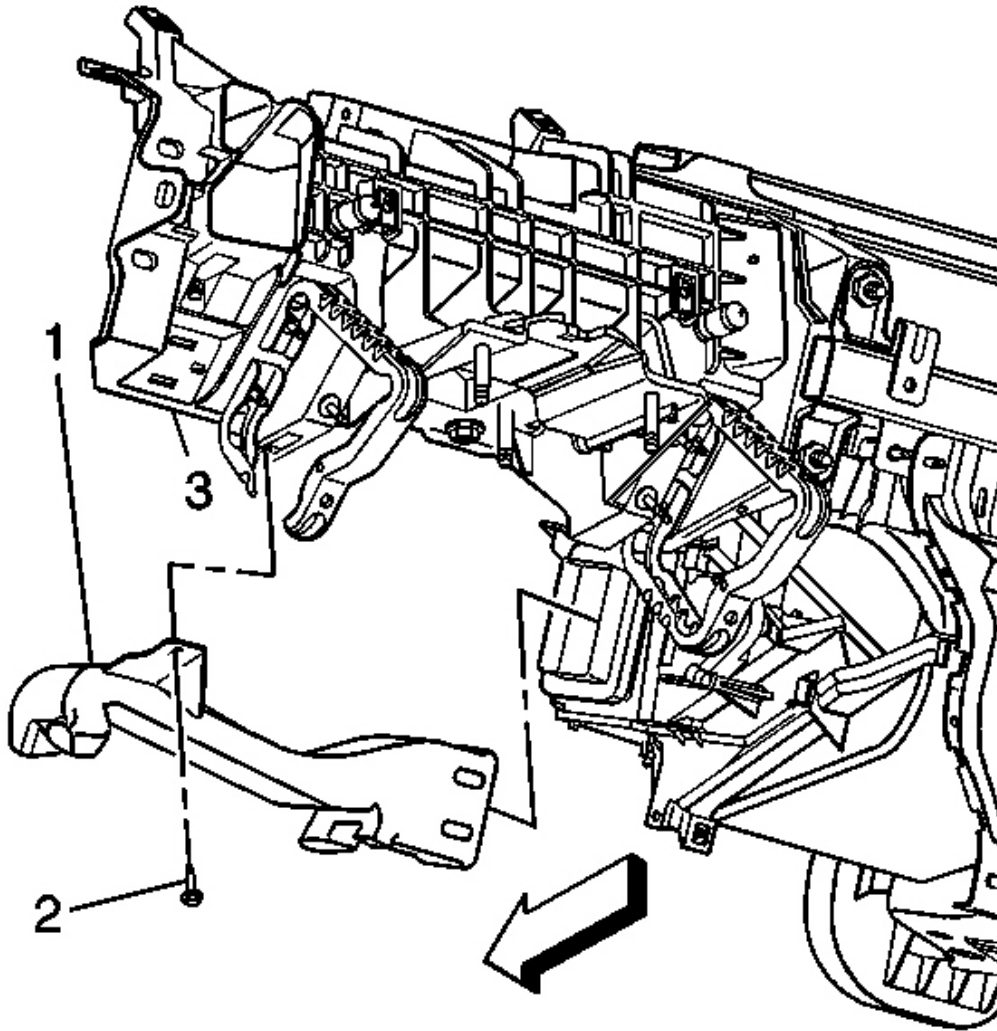


Fig. 86: Removing/Installing Left Side HVAC Floor Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

7. Remove the retaining screw (2) from the left HVAC floor duct (1).
8. Disconnect the left HVAC floor duct temperature sensor and remove the left HVAC floor duct.

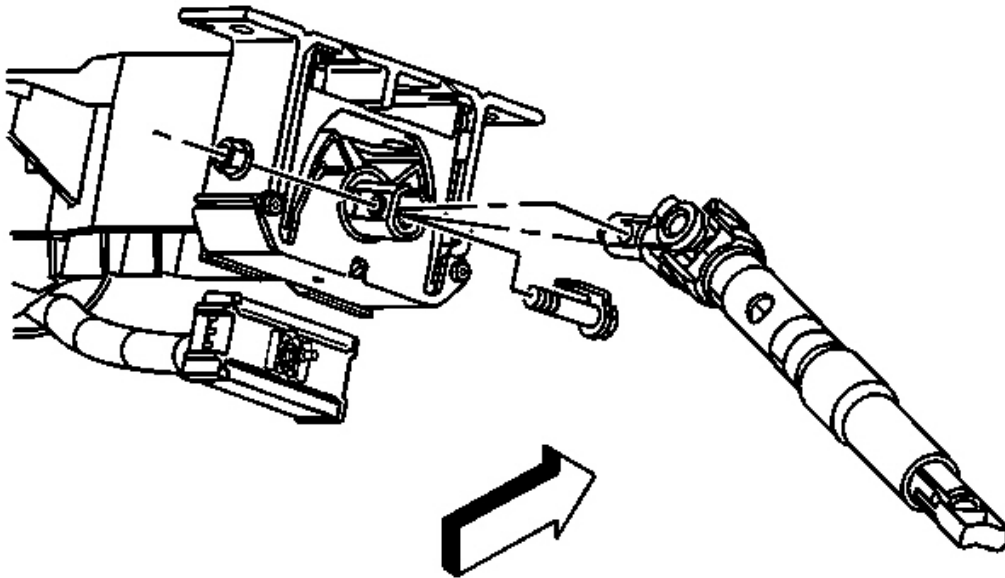


Fig. 87: View Of Steering Column & Upper Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

9. Remove the intermediate shaft bolt from the steering column.

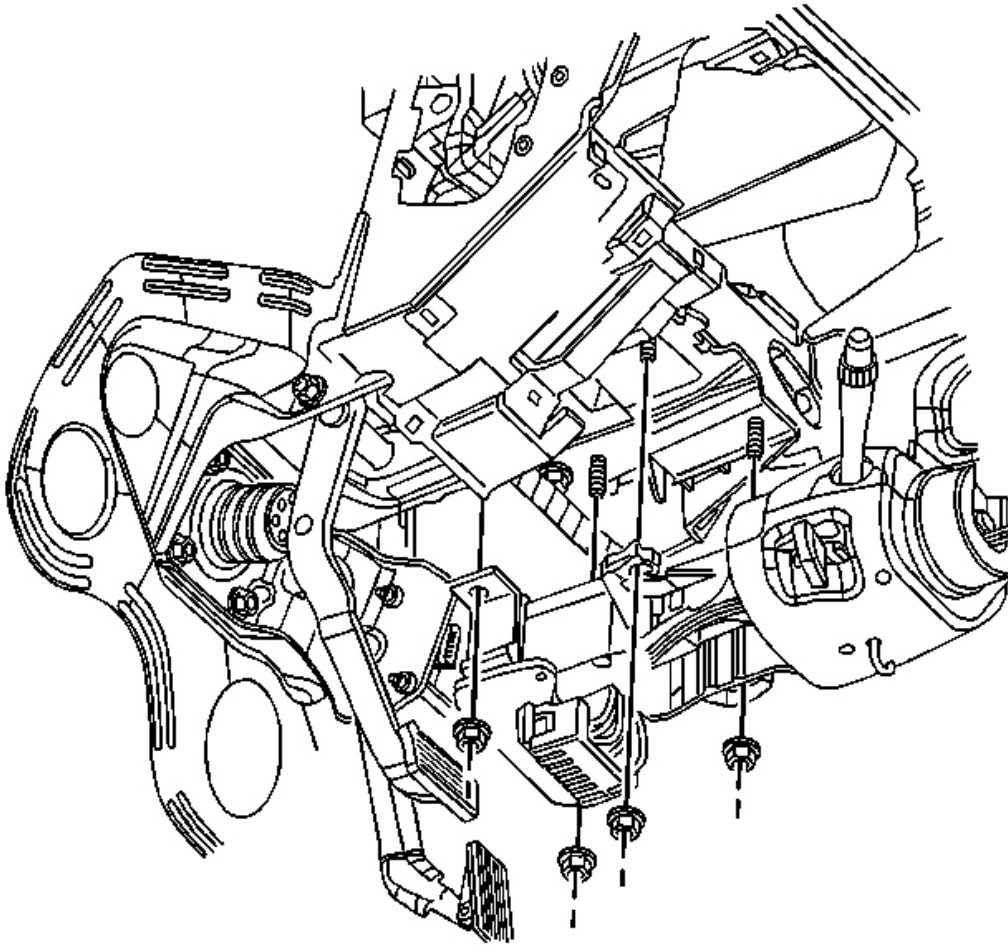


Fig. 88: View Of Steering Column Assembly
Courtesy of GENERAL MOTORS CORP.

10. Remove the steering column mounting nuts.
11. Remove the steering column from the vehicle.

Installation Procedure

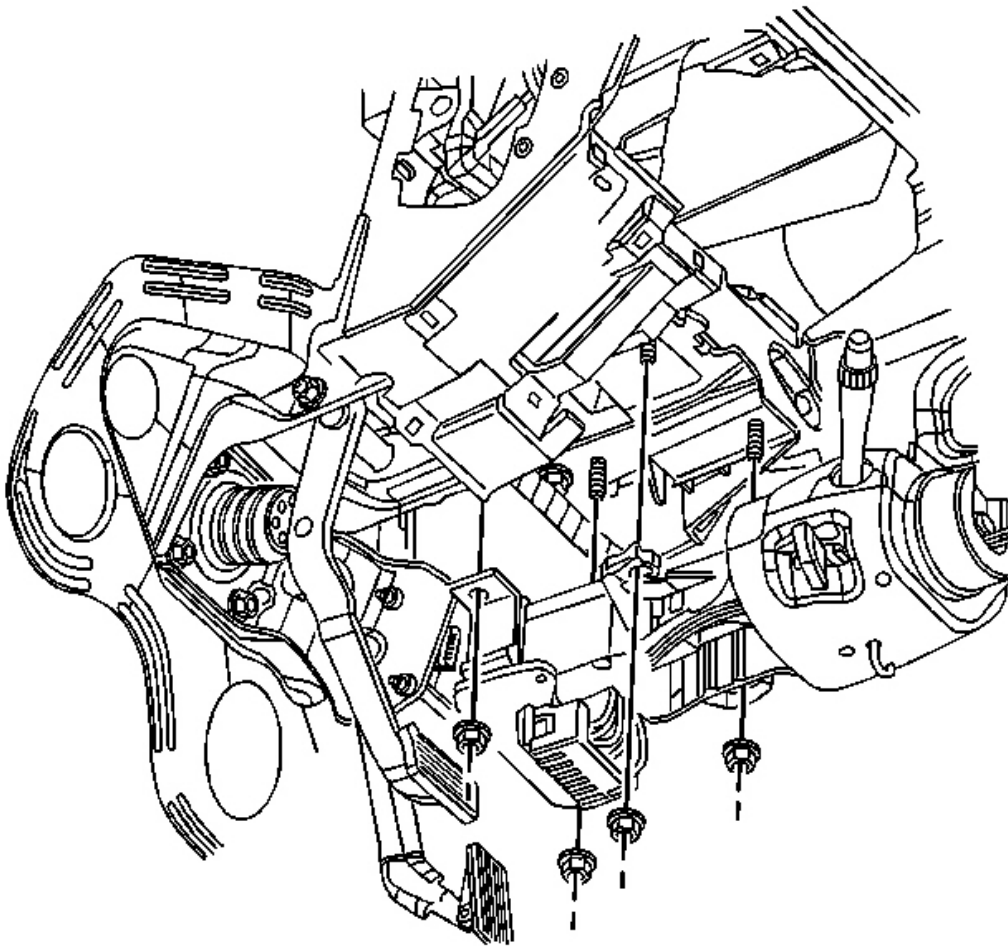


Fig. 89: View Of Steering Column Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the steering column to the vehicle and connect the column to the intermediate shaft.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the steering column mounting nuts.

Tighten: Tighten the nuts to 27 N.m (20 lb ft).

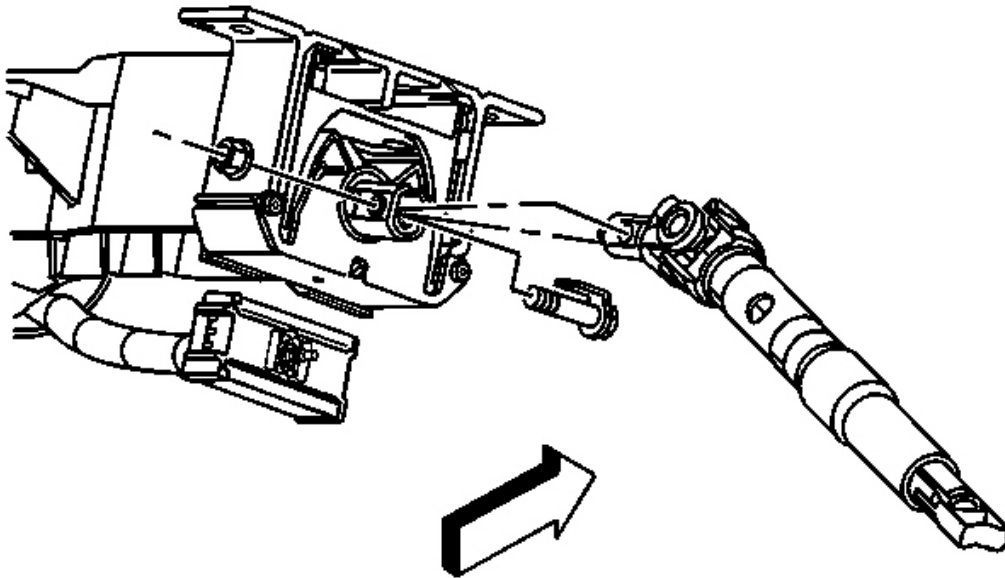


Fig. 90: View Of Steering Column & Upper Intermediate Shaft
Courtesy of GENERAL MOTORS CORP.

3. Install the intermediate shaft bolt to the steering column.

Tighten: Tighten the bolt to 50 N.m (37 lb ft).

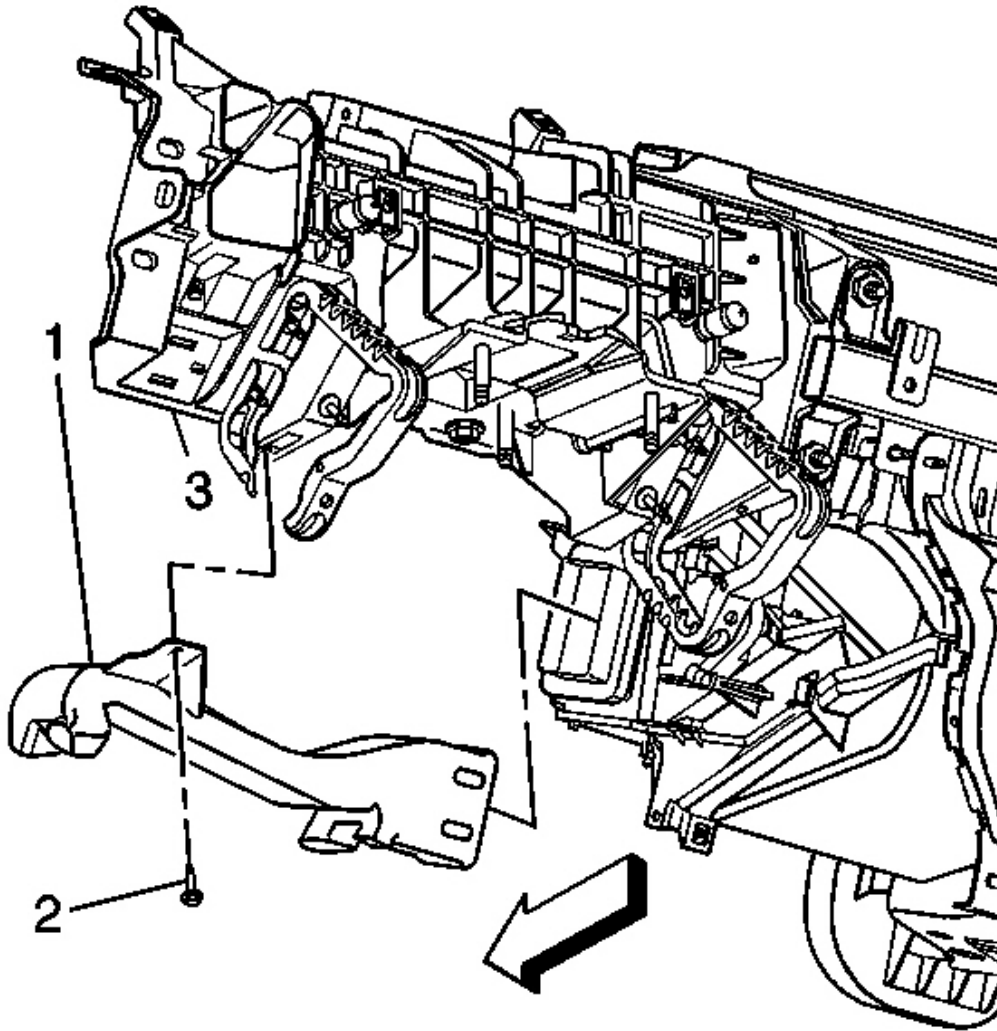


Fig. 91: Removing/Installing Left Side HVAC Floor Air Outlet Duct
Courtesy of GENERAL MOTORS CORP.

4. Connect the left HVAC floor duct temperature sensor and install the left HVAC floor duct (1).
5. Install the mounting screw (2) to the left HVAC floor duct.

Tighten: Tighten the screw to 1.9 N.m (17 lb in).

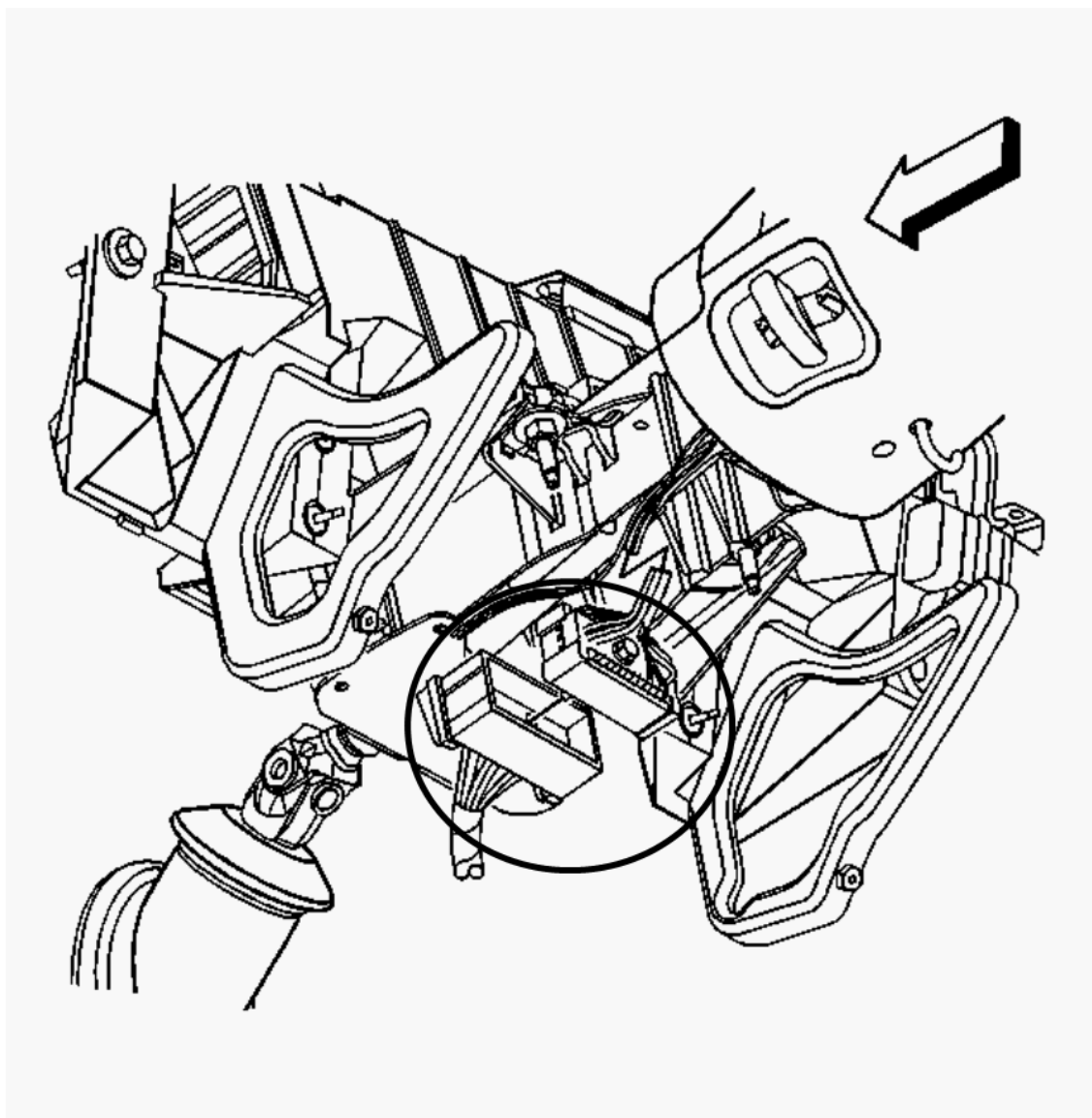


Fig. 92: Disconnecting/Reconnecting Steering Column Electrical Connector
Courtesy of GENERAL MOTORS CORP.

6. Connect the body wiring harness connector to the steering column lower bracket.
7. Connect the steering column electrical connector to the vehicle wiring harness.

Tighten: Tighten the screw to 6 N.m (53 lb ft).

8. Install the knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages and Console.
9. Install the steering wheel. Refer to **Steering Wheel Replacement**.
10. Unlock the steering column by removing **J 42640** from the lower trim cover access hole.

See **Special Tools**.

11. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN SEAL REPLACEMENT

Tools Required

J 42640 Steering Column Lock Pin. See **Special Tools**.

Removal Procedure

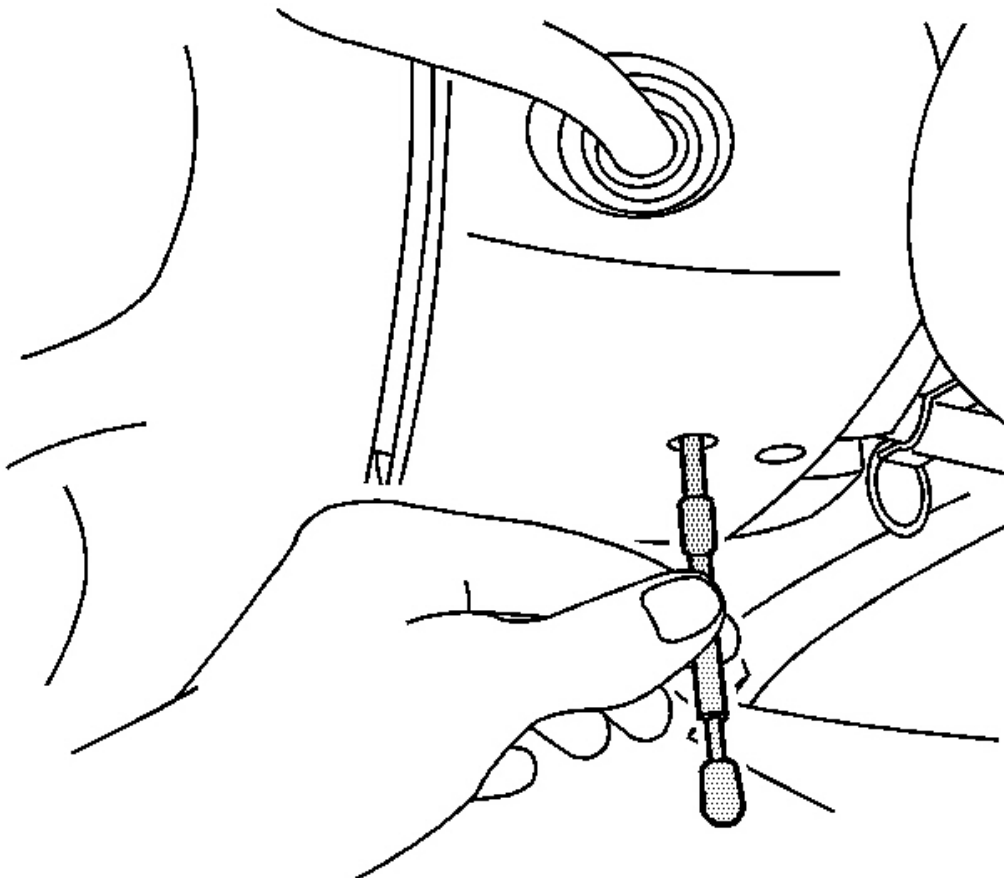


Fig. 93: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

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NOTE: The front wheels of the vehicle must be maintained in the straight ahead position and the steering column must be in the LOCK position before disconnecting the steering column or intermediate shaft. Failure to follow these procedures will cause improper alignment of some components during installation and result in damage to the SIR coil assembly.

1. Turn the steering wheel so that the front wheels are pointing straight ahead.
2. Turn the ignition switch to the lock position and remove the key.
3. Lock the steering column through the access hole in the lower steering column trim cover using **J 42640** . See **Special Tools**.

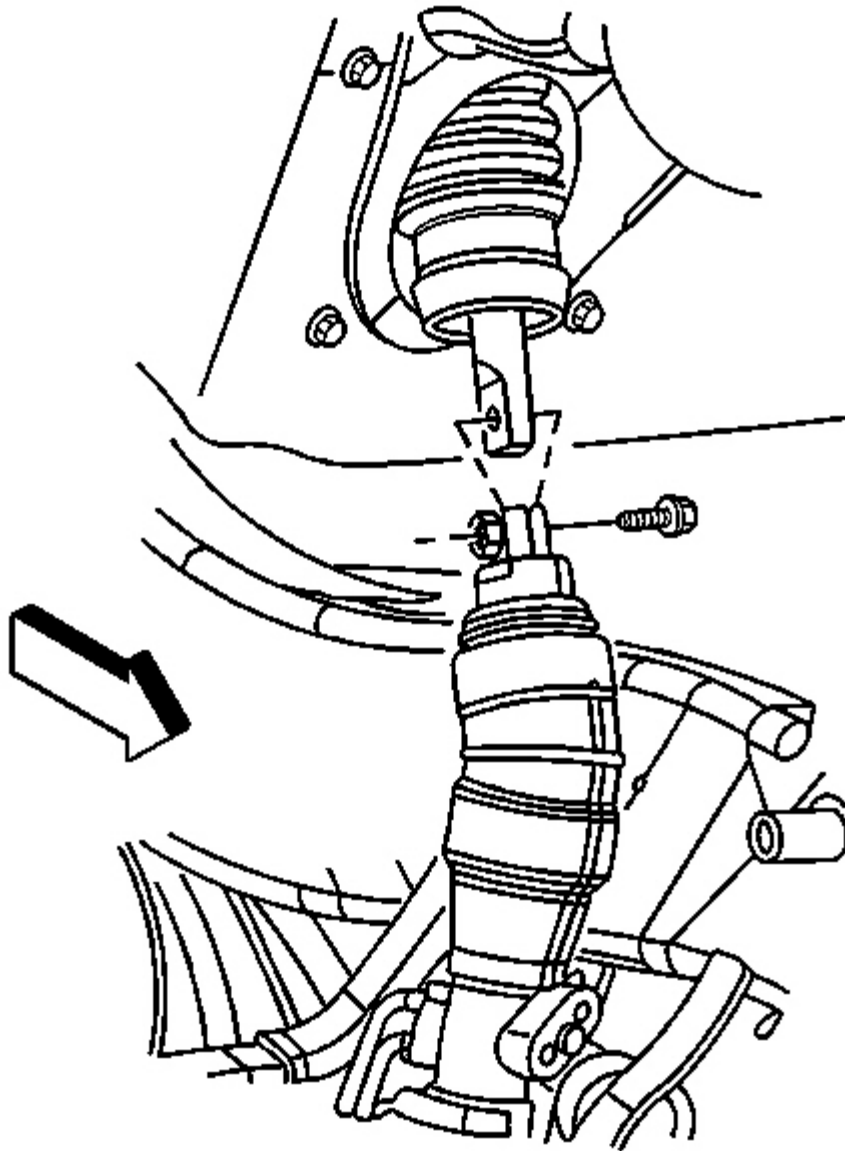


Fig. 94: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the upper intermediate shaft boot from the lower intermediate shaft boot to gain access to the upper intermediate shaft to lower intermediate pinch bolt.

2006 Buick Rainier
2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

5. Remove the lower intermediate shaft to upper intermediate shaft pinch bolt.
6. Disconnect the lower intermediate shaft from the upper intermediate shaft.
7. Remove the steering column seal by rolling lip of seal from inside vehicle pushing it down the upper intermediate shaft.

Installation Procedure

1. Install steering column seal by rolling seal lip to inside vehicle.

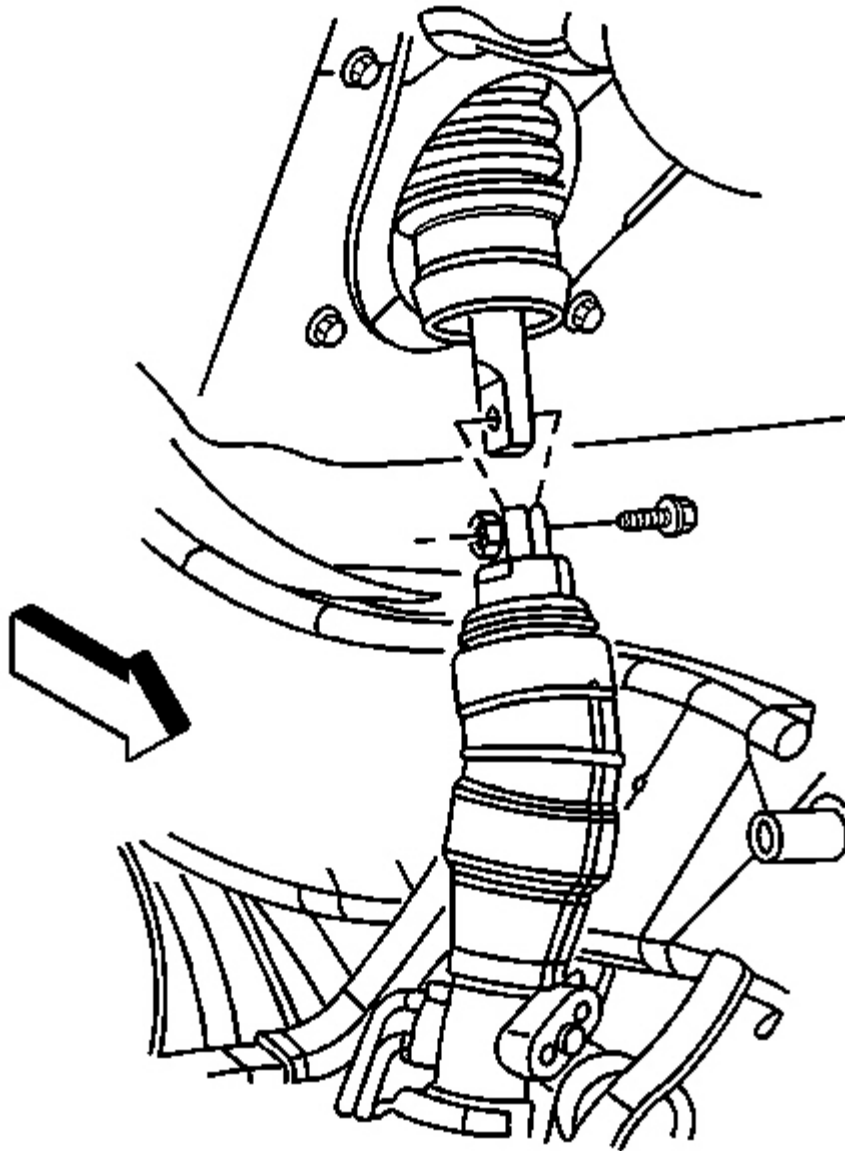


Fig. 95: Steering Column To Steering Gear Connection
Courtesy of GENERAL MOTORS CORP.

2. Connect the lower intermediate shaft to the upper intermediate shaft.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the lower intermediate shaft to the upper intermediate shaft pinch bolt.

Tighten: Tighten the lower intermediate shaft to the upper intermediate shaft pinch bolt to 50 N.m (37 lb ft).

IMPORTANT: The upper intermediate shaft boot must completely cover the white insert of the lower intermediate shaft boot to ensure proper sealing.

4. Connect the upper intermediate shaft boot to the lower intermediate shaft boot.

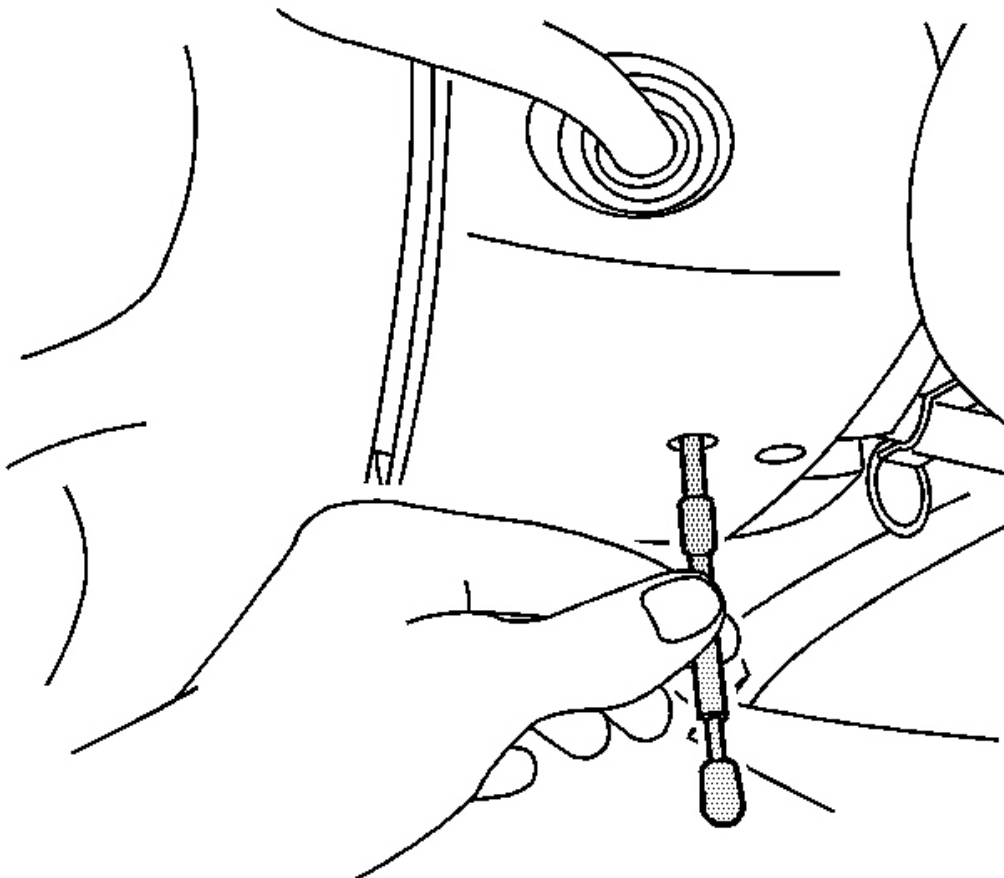


Fig. 96: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

5. Unlock the steering column by removing **J 42640** from the steering column lower trim cover access hole. See **Special Tools**.

STEERING COLUMN JACKET REPLACEMENT

Removal Procedure

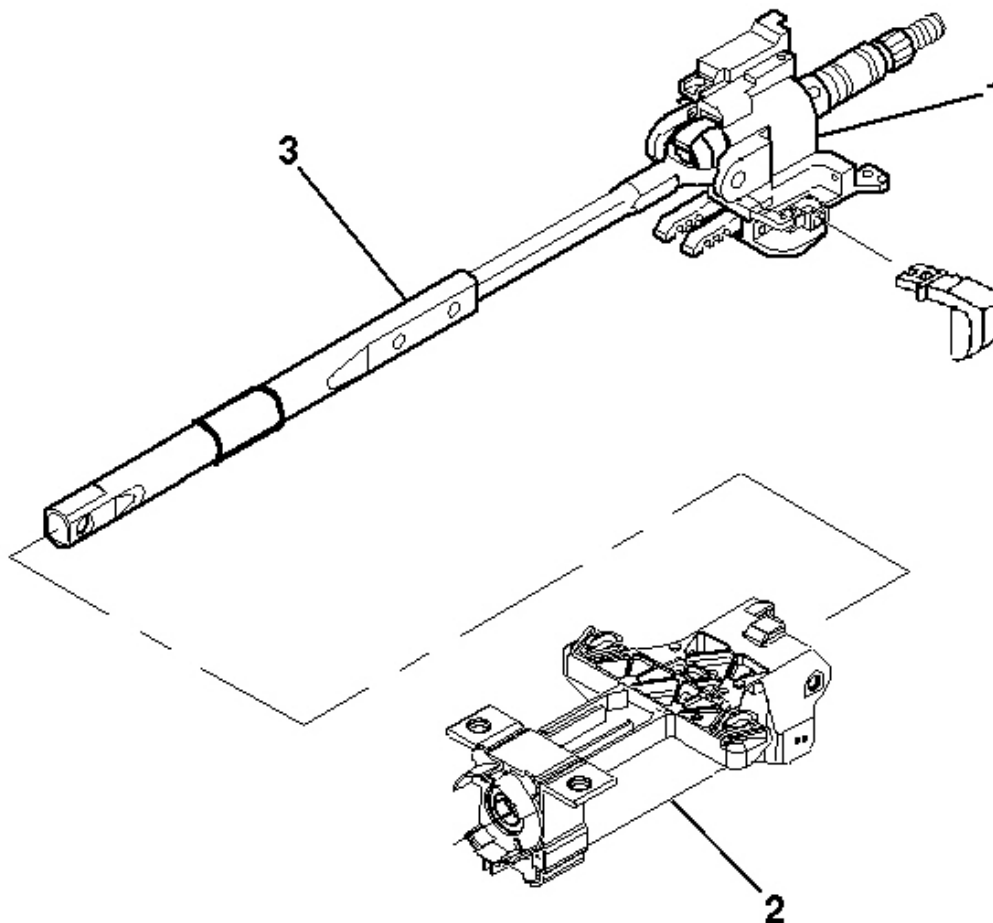


Fig. 97: View Of Upper Steering Column Components

Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the steering column from the vehicle. Refer to **Steering Column Replacement**.
3. Inspect the steering column for accident damage. Refer to **Steering Column Accident Damage Inspection**.
4. Remove the steering column tilt head. Refer to **Steering Column Tilt Head Housing Replacement**.
5. Remove the jacket (2).

Installation Procedure

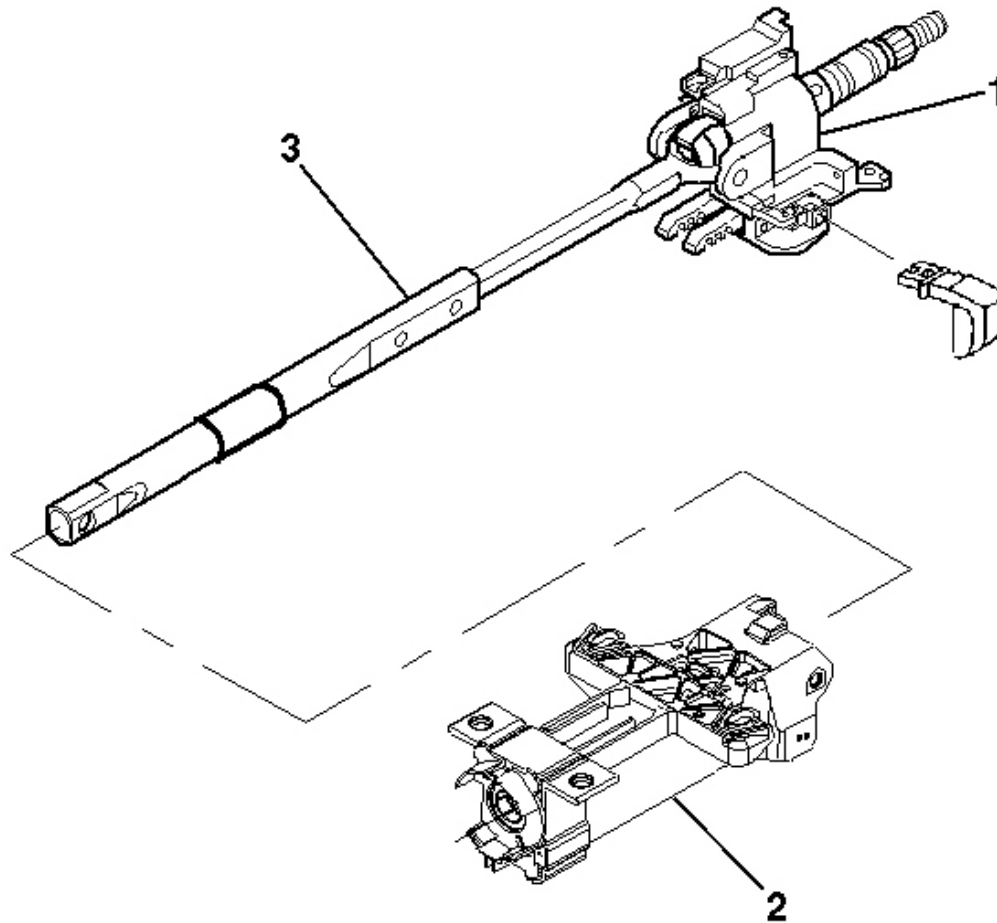


Fig. 98: View Of Upper Steering Column Components
Courtesy of GENERAL MOTORS CORP.

1. Install the jacket (2).
2. Install the steering column tilt head (1). Refer to **Steering Column Tilt Head Housing Replacement**.
3. Install the steering column to the vehicle. Refer to **Steering Column Replacement**.
4. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN SHAFT REPLACEMENT

Removal Procedure

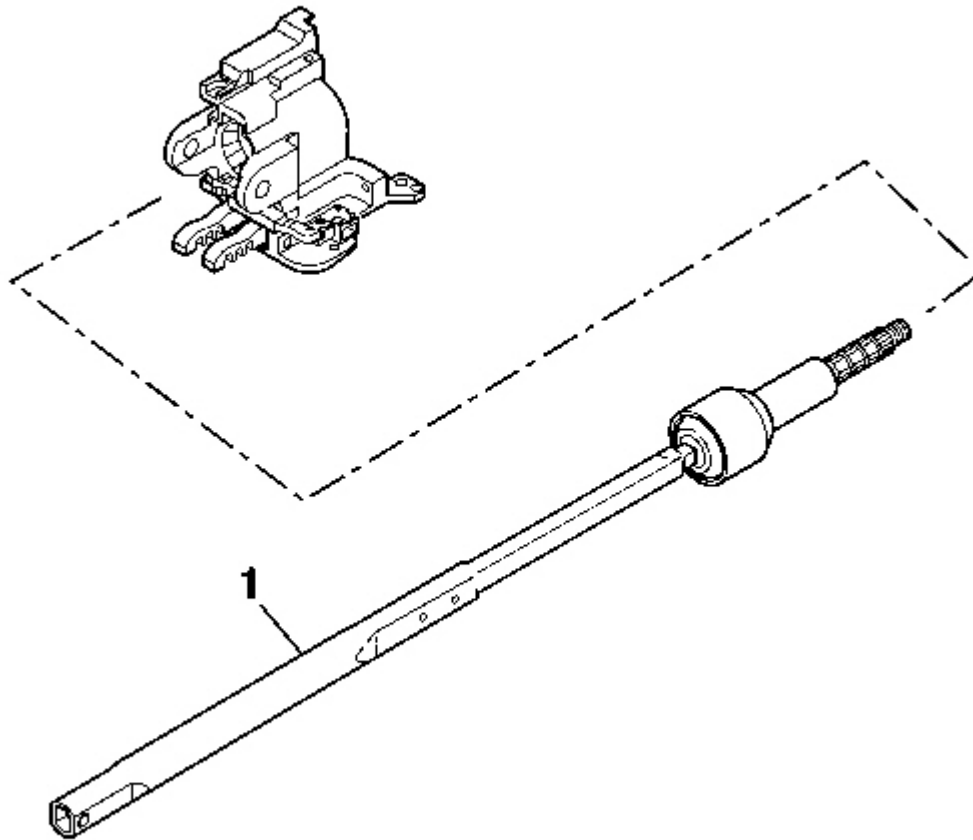


Fig. 99: Identifying Steering Shaft
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the steering column tilt head. Refer to **Steering Column Tilt Head Housing Replacement**.
3. Remove the steering shaft (1) from the steering column tilt head assembly.
4. Inspect the steering column for accident damage. Refer to **Steering Column Accident Damage Inspection**.

Installation Procedure

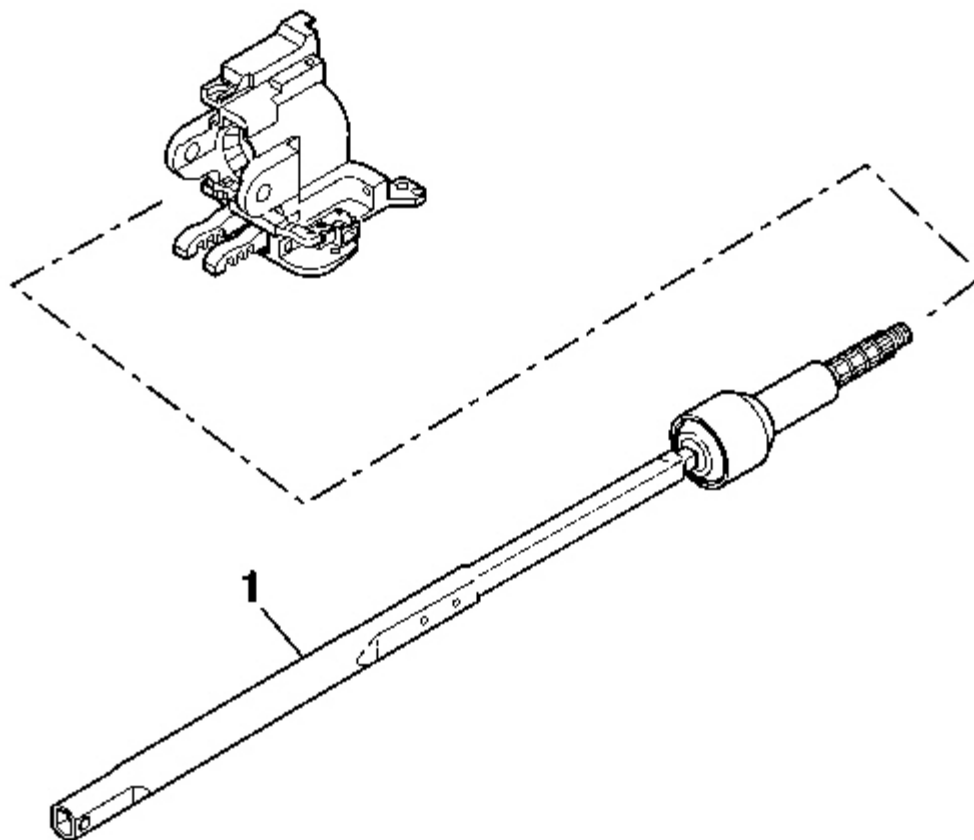


Fig. 100: Identifying Steering Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the steering shaft (1) into the steering column tilt head assembly.
2. Install the steering column tilt head. Refer to **Steering Column Tilt Head Housing Replacement**.
3. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN WIRE HARNESS ASSEMBLY REPLACEMENT

Removal Procedure

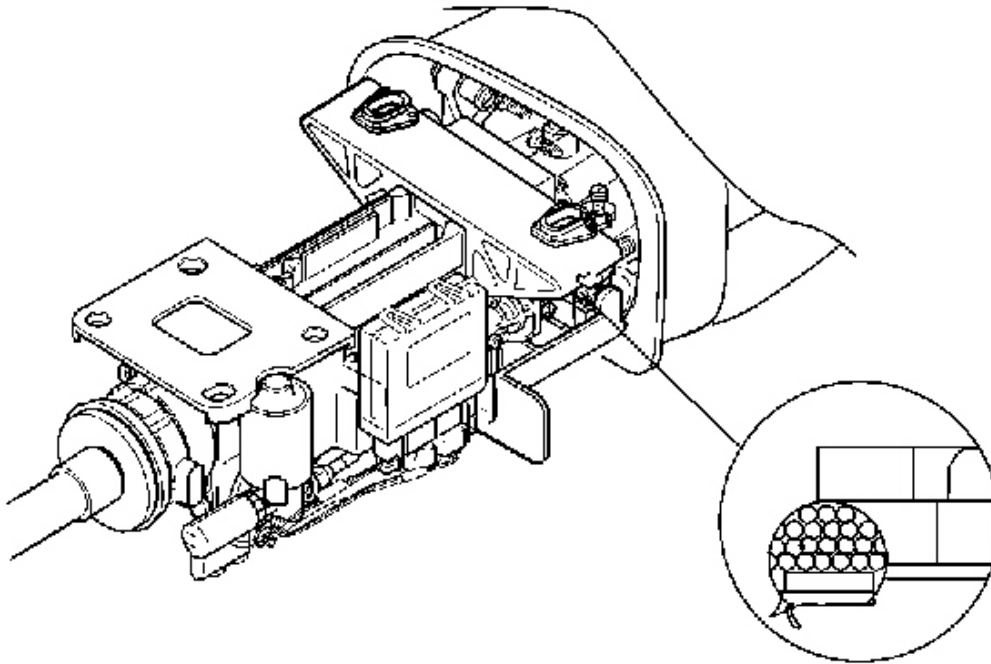


Fig. 101: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to SIR Disabling and Enabling Zone 3 in SIR.
2. Remove the upper and lower trim covers. Refer to Steering Column Trim Covers Replacement.
3. Remove the wire harness strap.

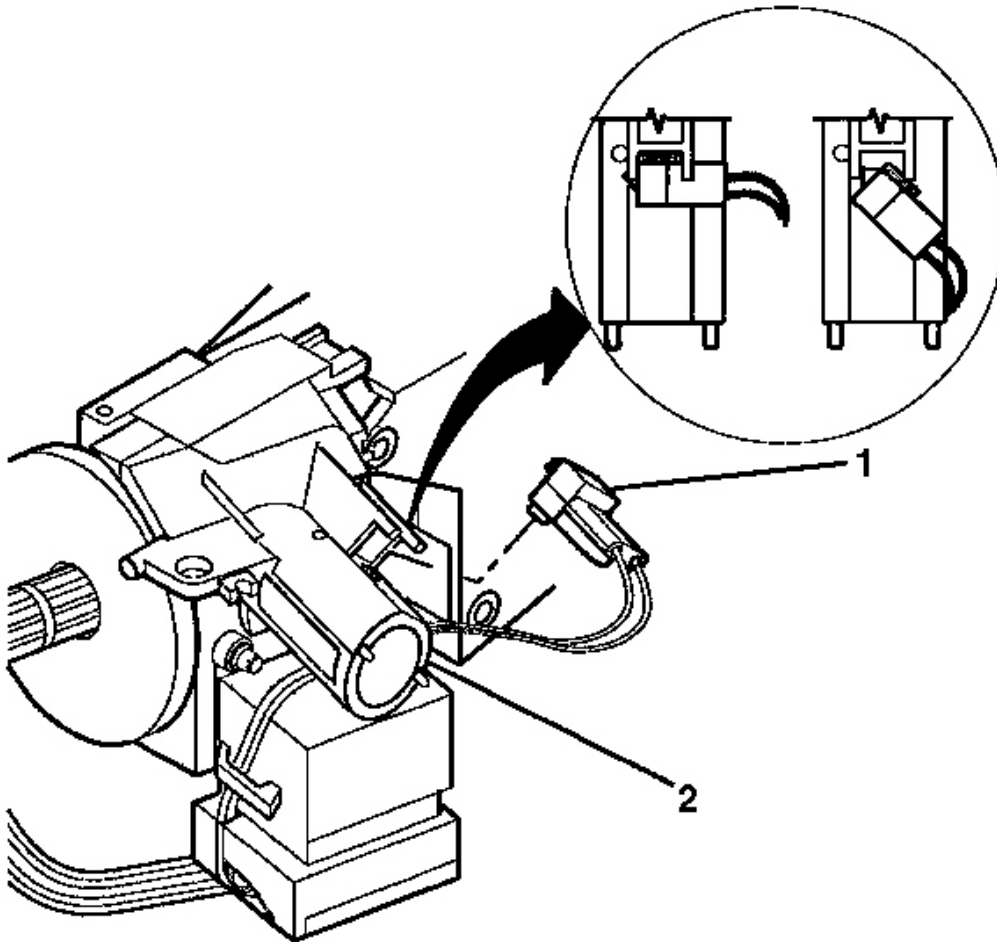


Fig. 102: Identifying Key Alarm Connector At Ignition Lock Cylinder Case
Courtesy of GENERAL MOTORS CORP.

4. Remove the steering wheel theft deterrent lock. Refer to **Steering Wheel Theft Deterrent Lock Replacement**.
5. Rotate the key alarm connector (1) 90 degrees.
6. Gently pull the key alarm connector (1) out of the ignition lock cylinder case assembly (2).
7. Disconnect the connector from the ignition switch assembly.
8. Remove the wires encased in the ignition switch clip, which is located on the side of the ignition switch.

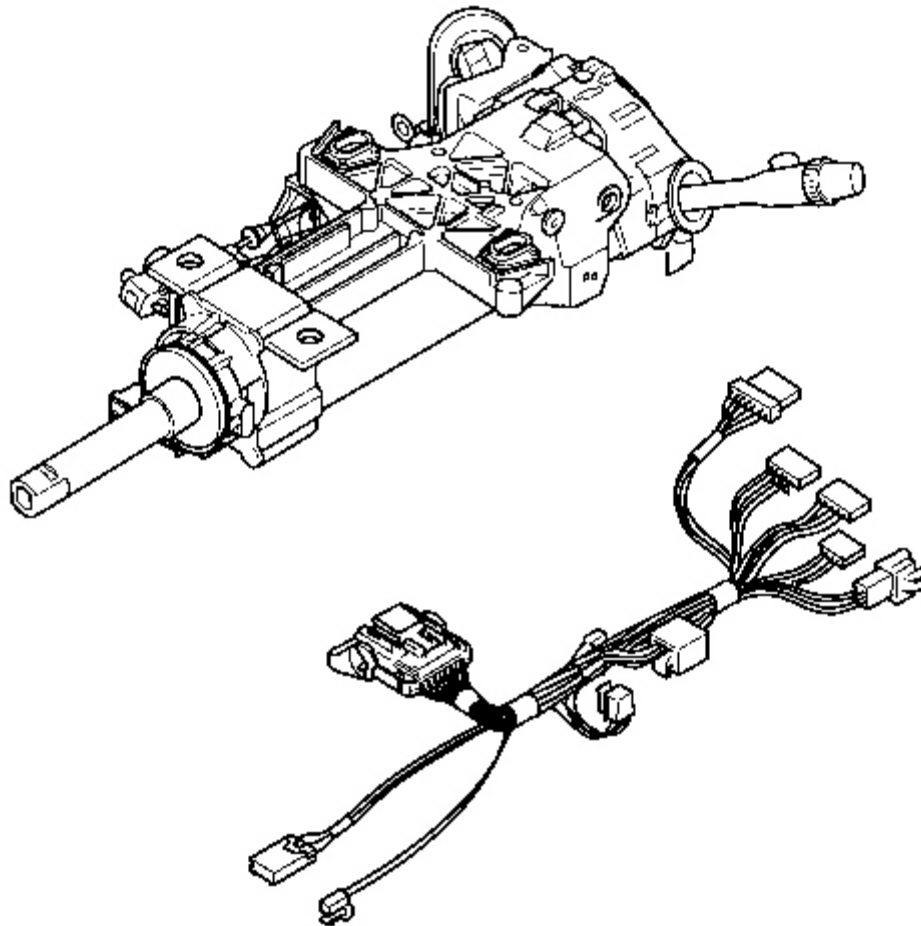


Fig. 103: View Of Steering Column And Wire Harness Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the steering wheel has steering wheel controls, the SIR coil and the wire harness assembly must come off as one piece. Refer to Inflatable Restraint Steering Wheel Module Coil Replacement in SIR.

9. Disconnect all connectors attached to the wire harness assembly.

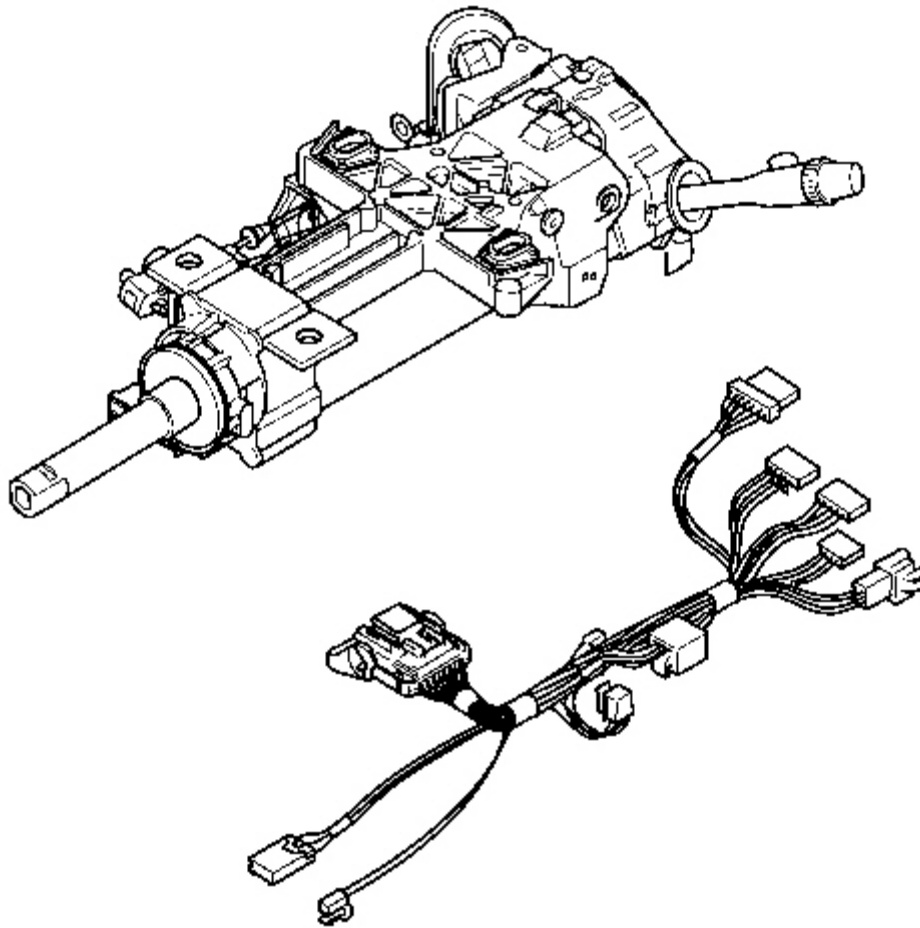


Fig. 104: View Of Steering Column And Wire Harness Assembly
Courtesy of GENERAL MOTORS CORP.

1. If the steering wheel has steering wheel controls, install the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement** in SIR.
2. Connect all of the connectors from the new wire harness assembly.

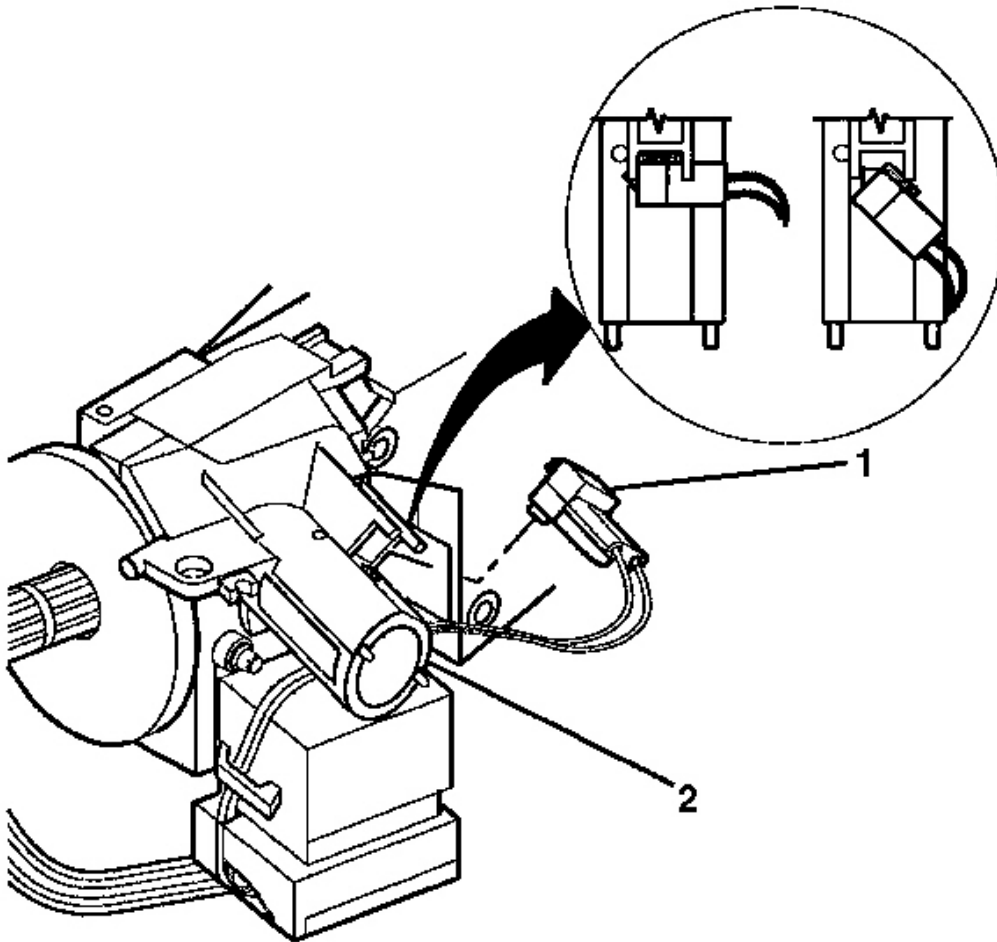


Fig. 105: Identifying Key Alarm Connector At Ignition Lock Cylinder Case
Courtesy of GENERAL MOTORS CORP.

3. Push the key alarm connector (1) into the ignition lock cylinder case assembly (2).
4. Rotate the key alarm connector (1) 90 degrees so that the key alarm connector (1) locks into place.
5. Install the steering wheel theft deterrent lock. Refer to **Steering Wheel Theft Deterrent Lock Replacement**.

CAUTION: Refer to SIR Inflator Module Coil Caution in Cautions and Notices.

6. Install the wires back into the ignition switch clip, located on the side of the ignition switch.

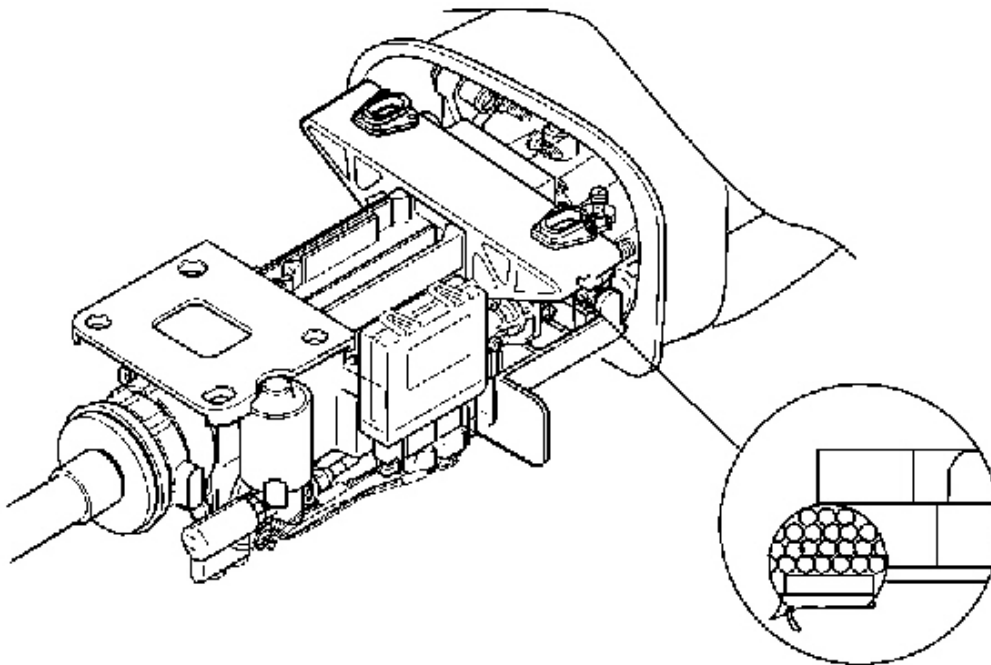


Fig. 106: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

7. Install the wire harness strap.
8. Install the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
9. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING WHEEL POSITION SENSOR OR STEERING SHAFT LOWER BEARING REPLACEMENT

Removal Procedure

CAUTION: Caution: Refer to **SIR CAUTION** in Cautions and Notices

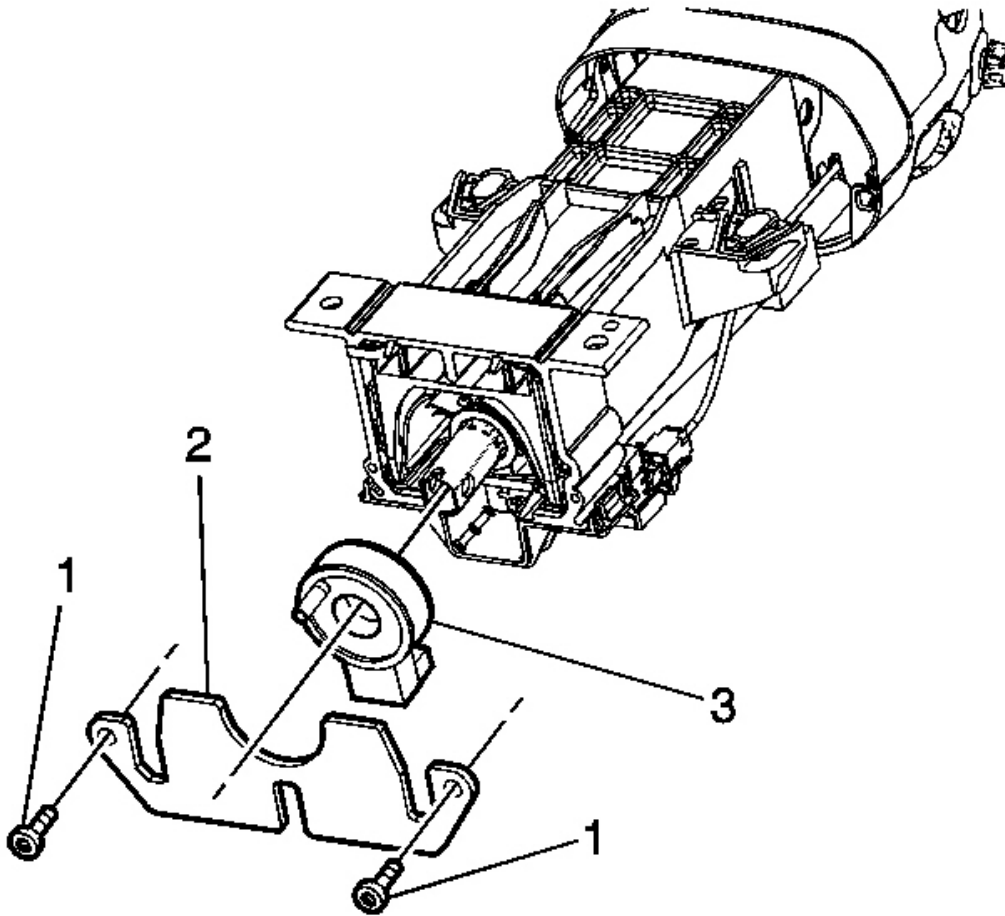


Fig. 107: View Of Steering Wheel Position Sensor And Steering Shaft Lower Bearing
Courtesy of GENERAL MOTORS CORP.

1. Disable the SIR system. Refer to **SIR DISABLING AND ENABLING ZONES**

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the SIR coil assembly to become uncentered, which may cause damage to the coil assembly.

2. Position the front wheels straight ahead and lock the steering column to prevent rotation of

the steering wheel

3. Remove the intermediate shaft from the steering column. Refer to **Intermediate Steering Shaft Replacement - Upper**
4. Remove the steering wheel position sensor retainer screws (1).
5. Remove the steering wheel position sensor retainer (2) from the base of the steering column
6. Disconnect the electrical connector from the steering wheel position sensor
7. Remove the steering wheel position sensor (3) from the steering column.

Installation Procedure

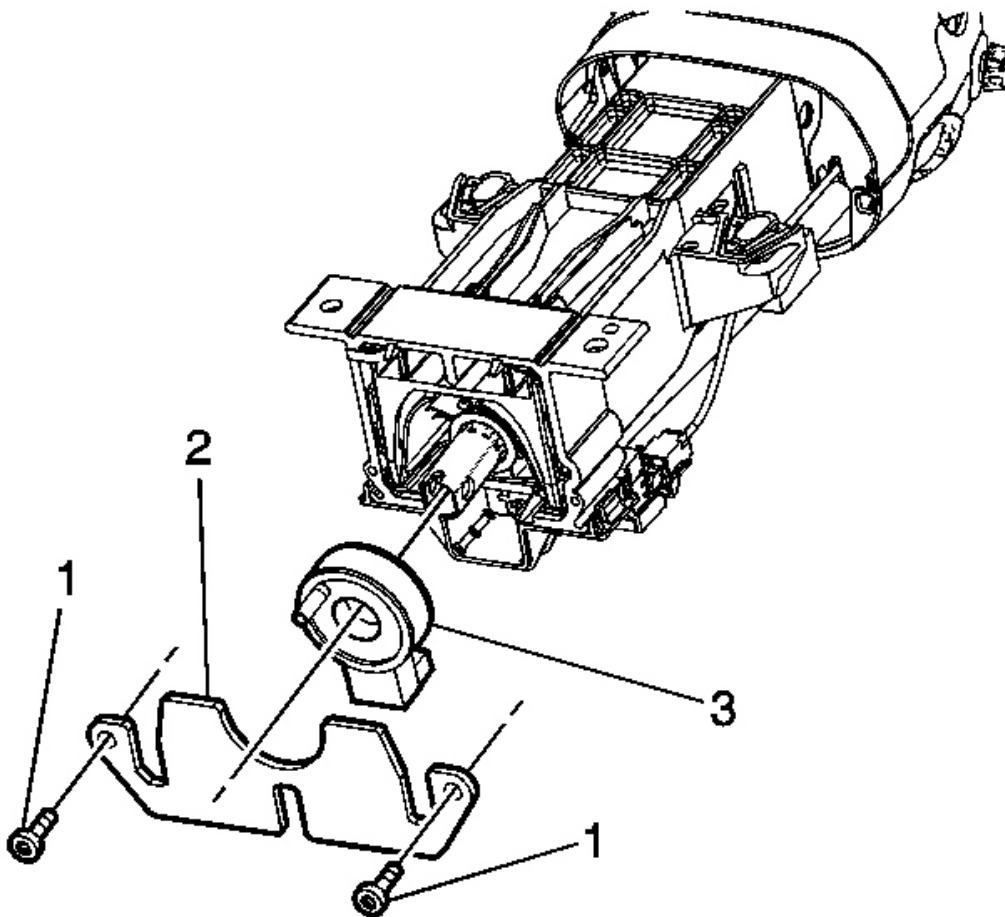


Fig. 108: View Of Steering Wheel Position Sensor And Steering Shaft Lower Bearing
Courtesy of GENERAL MOTORS CORP.

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

1. Position the steering wheel sensor (3) to the steering column
2. Position the steering wheel sensor retainer plate (2) to the steering column.

NOTE: Refer to **FASTENER NOTICE** in **Cautions and Notices**

3. Install the steering wheel position sensor retainer screws (1).

Tighten the screws to 10 N.m (89 lb in).

4. Remove the steering wheel position sensor anti rotation pin from the sensor
5. Connect the electrical connector to the steering wheel position sensor.
6. Connect the electrical connector to the steering wheel position sensor.
7. Enable the SIR system. Refer to **SIR DISABLING AND ENABLING ZONES**

INFLATABLE RESTRAINT STEERING WHEEL MODULE COIL CENTERING

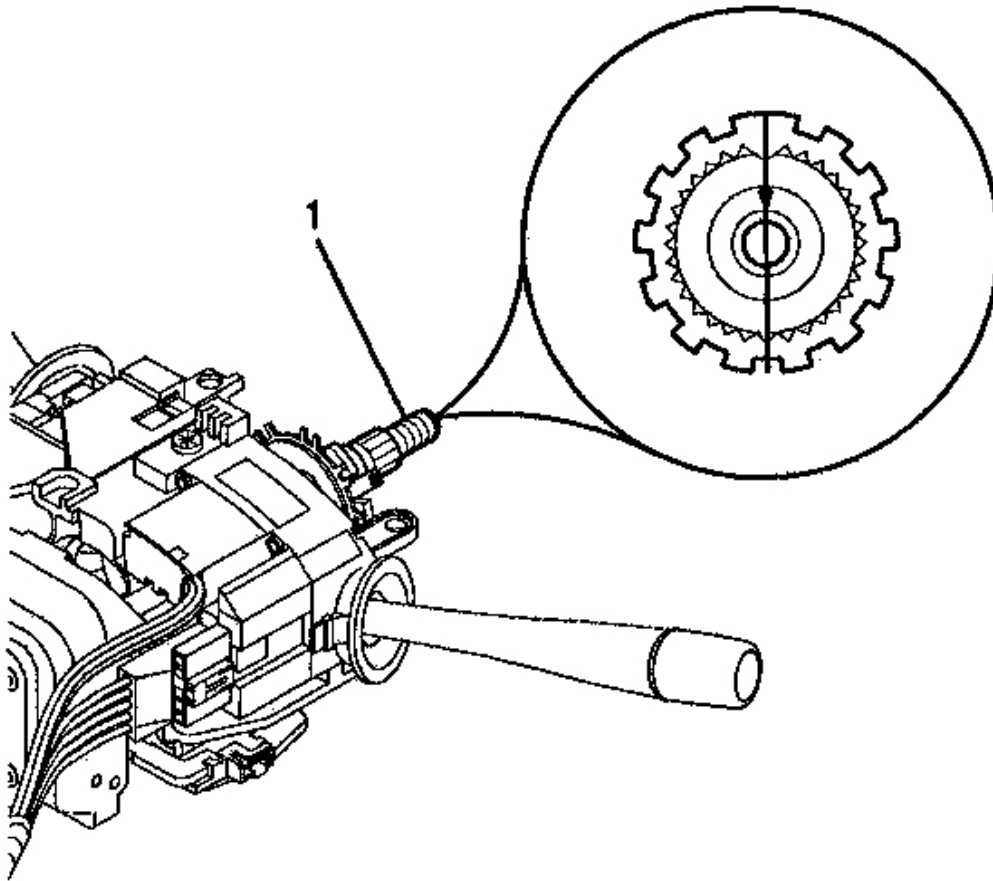


Fig. 109: View Of Block Tooth Of Steering Shaft Assembly In 12 O'clock Position
Courtesy of GENERAL MOTORS CORP.

NOTE: The new SIR coil assembly will be centered. Improper alignment of the SIR coil assembly may damage the unit, causing an inflatable restraint malfunction.

1. Verify the following conditions before centering the SIR coil:
 - The wheels on the vehicle are straight ahead.
 - The block tooth (1) of the steering shaft assembly is in the 12 o'clock position.
 - The ignition switch assembly is in the LOCK position.

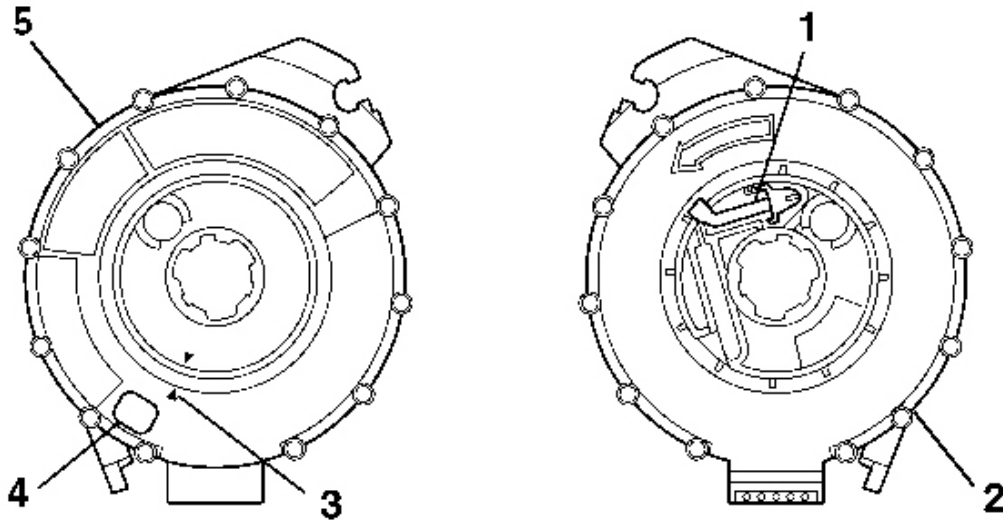


Fig. 110: Centering SIR Coil (With Centering Window & Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

2. If the front (5) of the SIR coil has a centering window (4), and the back side (2) has a spring service lock (1), perform the following steps:
 1. Hold the coil with the face up.
 2. While depressing the spring service lock, rotate the coil hub clockwise until the coil ribbon stops.
 3. Rotate the coil hub slowly, counterclockwise, until the centering window appears yellow and both arrows (3) line up.
 4. Release the spring service lock between the locking tab. The SIR coil is now centered.
 5. Align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.

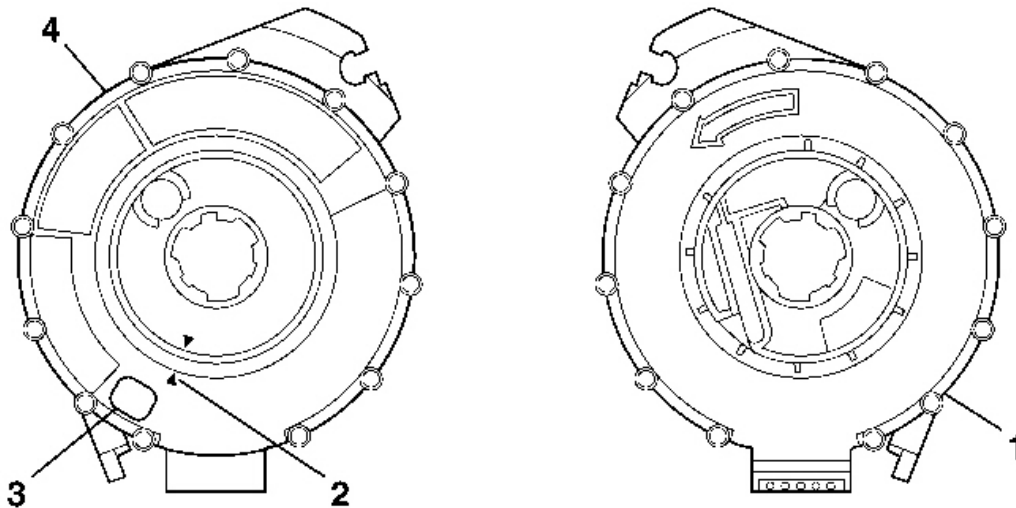


Fig. 111: Centering SIR Coil (With Centering Window, Without Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

3. If the front (4) of the SIR coil has a centering window (3) and the back side (1) has NO spring service lock, perform the following steps:
 1. Hold the coil with the face up.
 2. Rotate the coil hub clockwise until the coil ribbon stops.
 3. Rotate the coil hub slowly, counterclockwise until the centering window appears yellow and both arrows (2) line up. This is the CENTER position.
 4. While holding the coil hub in the CENTER position, align the coil with the horn tower and slide the coil onto the steering shaft assembly.

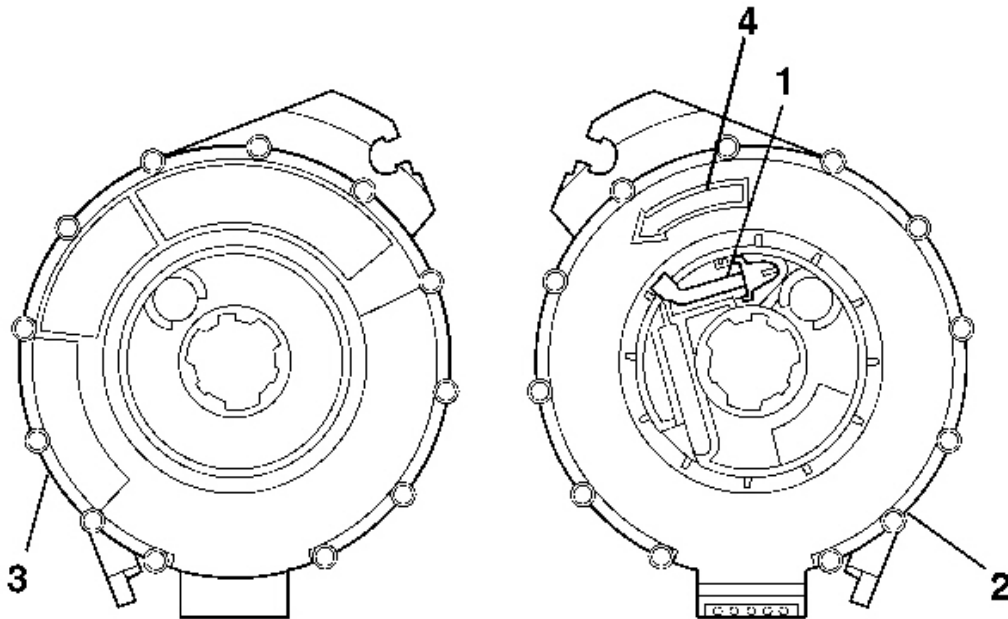


Fig. 112: Centering SIR Coil (No Centering Window, But Back Side Includes A Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

4. If no centering window is present on the front side (3) of the SIR coil, but a spring service lock (1) is on the back side (2), perform the following steps:
 1. Hold the coil with the back side up.
 2. While depressing the spring service lock, rotate the coil hub in the direction of the arrow (4) until the coil ribbon stops.
 3. Still pressing the spring service lock, rotate the coil hub in the opposite direction 21/2 revolutions.
 4. Release the spring service lock between the locking tabs. The SIR coil is now centered.
 5. Align the centered coil with the horn tower and slide the coil onto the steering shaft assembly.

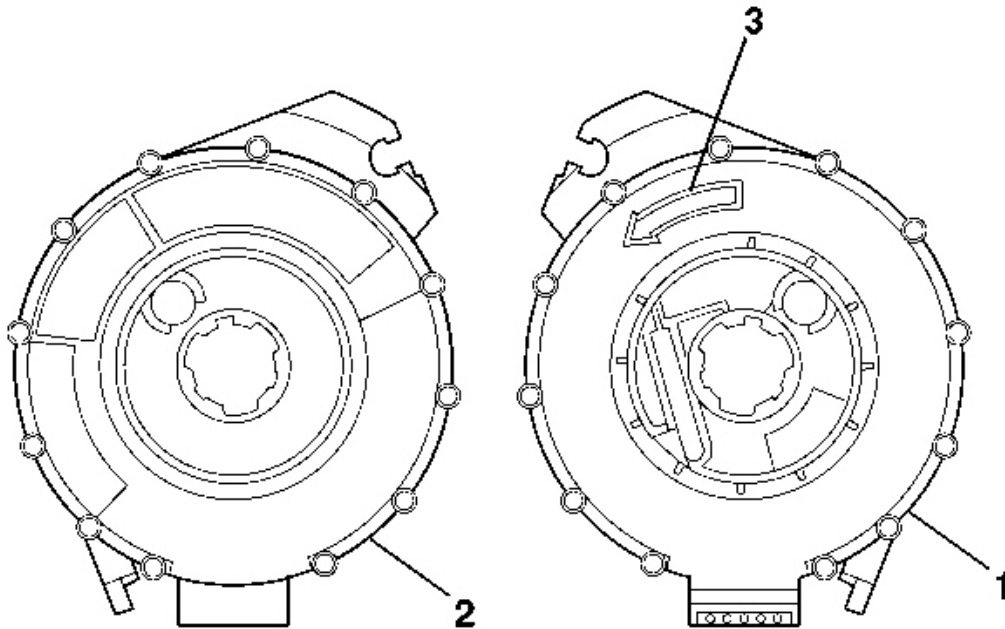


Fig. 113: Centering SIR Coil (Without Centering Window, Without Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

5. If no centering window appears on the front side (2) of the SIR coil and no spring service lock exists on the back side (1), perform the following steps:
 1. Hold the coil with the face up.
 2. Rotate the coil hub in the direction of the arrow until the coil ribbon stops.
 3. Rotate the coil hub, slowly, counterclockwise, for $2\frac{1}{2}$ revolutions. This is the CENTER position.
 4. While maintaining the coil hub in the CENTER position, align the centered coil with the horn tower and slide the coil onto the steering shaft assembly.

DESCRIPTION AND OPERATION

STEERING WHEEL CONTROLS DESCRIPTION AND OPERATION

The steering wheel control switches duplicate the function of the primary controls of the

associated component, through a network of multiple momentary contact switches and a series of resistors. The body control module (BCM) supplies voltage to the switches and monitors the return signal for when a switch is pressed, a specific voltage drop occurs. The BCM identifies the one selected, then sends a serial data message that is received by the component controlled, activating the feature.

This section is intended to diagnosis the circuits between the BCM and the steering wheel control switches. If the primary control for the device is inoperative, refer to the appropriate section for the component the steering wheel control switch is functioning.

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.

Vehicle Security-Some Vehicle Models

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

Driver Convenience

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

- The turn signal switch
- The hazard switch

2006 Buick Rainier

2006 STEERING Steering Wheel & Column - Ascender, Envoy, Rainier & TrailBlazer

- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad/cruise control switch
- The redundant radio/entertainment system controls
- The tilt or tilt/telescoping functions
- The navigation/OnStar® features
- The HVAC controls

Driver Safety

The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The mounting capsules break away from the mounting bracket in the event of an accident.

Ignition Lock Cylinder Control Actuator

If the vehicle is equipped with a floor mounted console gear shifter, it has a ignition lock cylinder control actuator system in the steering column as an added safety feature. The ignition lock cylinder control actuators purpose is to prevent the steering wheel from being locked when the transmission is in gear and the vehicle may still be moving. The column ignition lock system consists of a ignition lock cylinder control actuator, and a park position switch that is located in the A/T shift lock control switch. The ignition lock cylinder control actuator contains a pin that is spring loaded out to mechanically prevent the ignition key cylinder from being turned to the lock position when vehicle transmission is not in the Park position. If vehicle power is lost, and/or the transmission is not in the Park position the operator will not be able to turn the ignition key to the lock position and will not be able to remove the ignition key from the column.

SPECIAL TOOLS AND EQUIPMENT

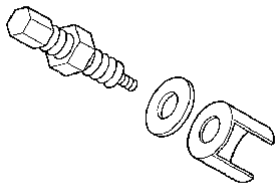
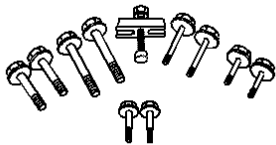
SPECIAL TOOLS

Special Tools

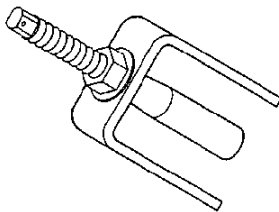
Illustration	Tool Number/Description
	J 1859-A Steering Wheel Puller

2006 Buick Rainier

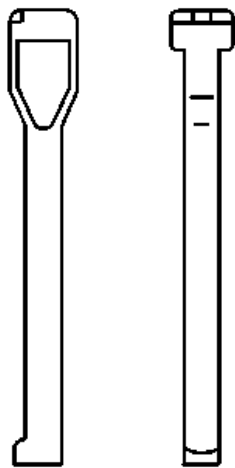
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J 21854-01
Pivot Pin Remover



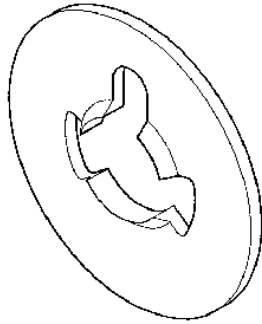
J 23653-SIR
Steering Column Lock Plate Compressor



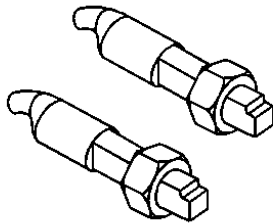
J 36541-A
Steering Wheel Puller Adapter

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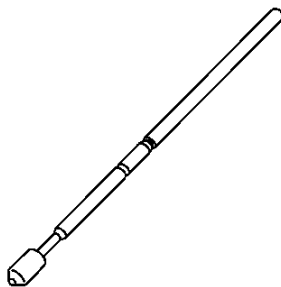
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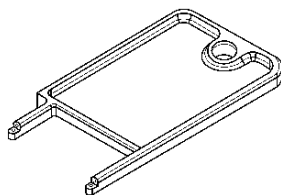
J 42137
Cam Orientation Plate Adapter



J 42578
Steering Wheel Puller Legs



J 42640
Steering Column Anti-Rotation Pin



J 42759
Ignition Switch Connector Release Tool