2004 STEERING

Steering Wheel & Column - C/K SUV

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Column Support Bracket Nuts	30 N.m	22 lb ft
Horn Contact Plate Screws	5.5 N.m	50 lb in
Ignition Lock Cylinder Case Screws	7 N.m	62 lb in
Intermediate Shaft to the Steering Column Pinch Bolt	62 N.m	46 lb ft
Intermediate Shaft to the Steering Gear Pinch Bolt	47 N.m	35 lb ft
Knee Bolster Deflector	9 N.m	80 lb in
Linear Shift Assembly to Steering Column Mounting Screws	10 N.m	89 lb in
Shift Lever Screw	1.5 N.m	13 lb in
Steering Column Bulkhead Connector Screw	6 N.m	53 lb in
Steering Column Seal Nuts	3 N.m	27 lb in
Steering Column Support Screws	17 N.m	13 lb ft
Steering Column Trim Cover Screw Lower	2 N.m	18 lb in
Steering Column Trim Cover Screw Lower	3.5 N.m	31 lb in
Steering Column Trim Cover Screw Upper	1.5 N.m	13 lb in
Steering Wheel Nut	40 N.m	29 lb ft
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

COMPONENT LOCATOR

STEERING COLUMN DISASSEMBLED VIEW (COLUMN SHIFT LEAN SHAFT)

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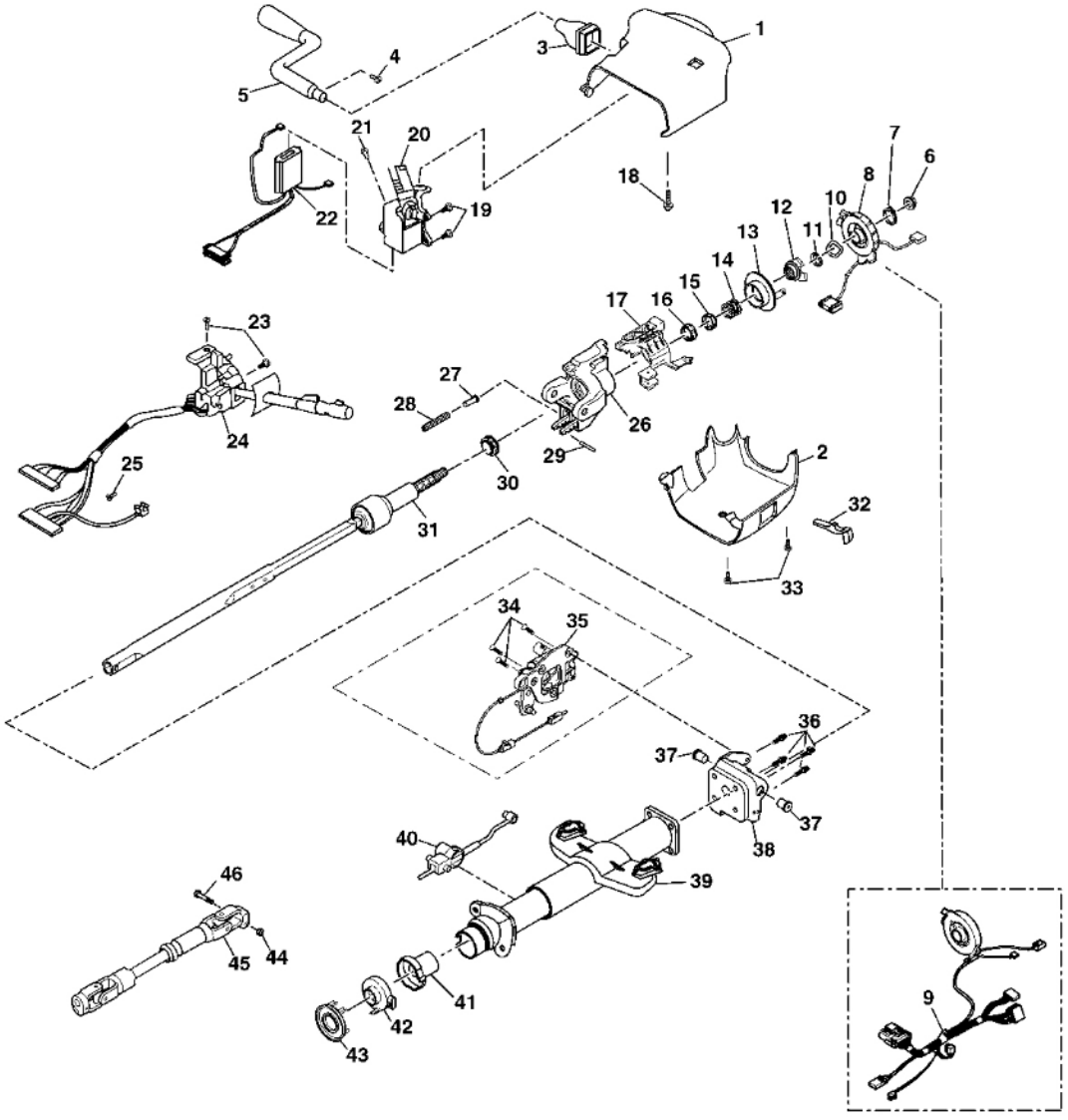


Fig. 1: Tilt Steering Column Disassembled View (Column Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Upper Trim Cover
2	Lower Trim Cover
3	Shift Lever Seal
4	Shift Lever Screw
5	Shift Lever
6	Flanged Prevailing Torque Nut

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7	Retaining Ring
8	SIR Coil
9	SIR Coil and Harness Assembly
10	Wave Washer
11	Bearing Retainer
12	Cam Orientation Plate
13	Turn Signal Cancel Cam Assembly
14	Upper Bearing Spring
15	Upper Bearing Inner Race Seat
16	Inner Race
17	Turn Signal Switch Housing
18	TORX® Head Screw
19	Pan Head Tapping Screws
20	Ignition Lock Cylinder Case Assembly
21	Pan Head Tapping Screw
22	Ignition Switch Assembly
23	Pan Head Tapping Screws
24	Turn Signal and Multifunction Switch Assembly
25	Axial Position Assurance Connector
26	Steering Column Tilt Head Assembly
27	Spring Guide
28	Tilt Spring
29	Release Lever Pin
30	Bearing Assembly
31	Steering Column Shaft Assembly
32	Pan Head Tapping Screws
33	Tilt Knob
34	Oval Head Soc Tap Screws
35	Linear Shift Assembly
36	TORX® Head Screws
37	Pivot Pins
38	Steering Column Support Assembly
39	Steering Column Jacket Assembly
40	Automatic Transmission Shift Lock Control
41	Adapter and Bearing Assembly
42	Steering Wheel Position Sensor Assembly
43	Sensor Retainer
44	Hexagon Head Nut
45	Intermediate Shaft
46	Bolt and Retainer Assembly

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STEERING COLUMN DISASSEMBLED VIEW (FLOOR SHIFT LEAN SHAFT)

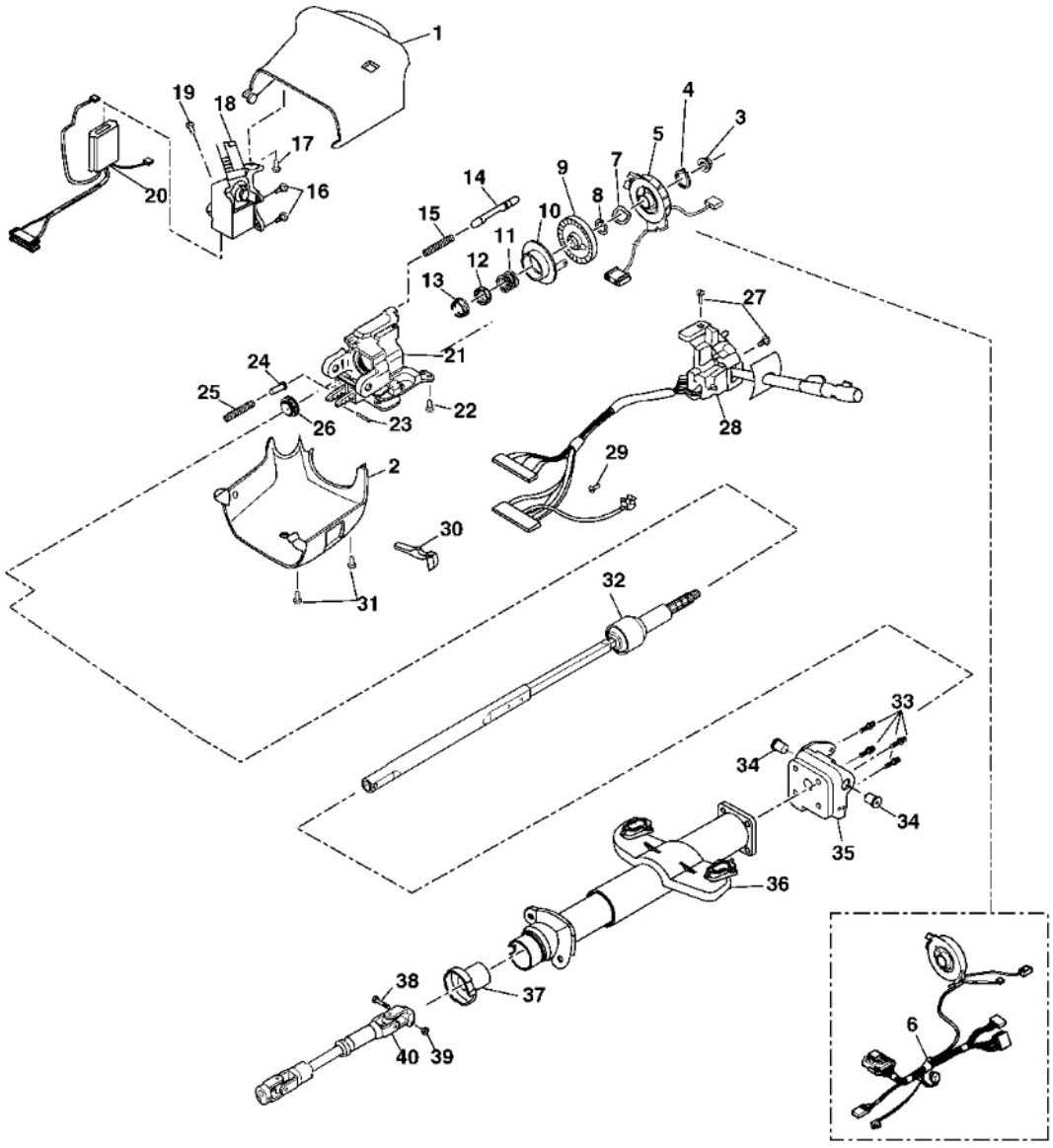


Fig. 2: Tilt Steering Column Disassembled View (Floor Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Upper Trim Cover
2	Lower Trim Cover
3	Flanged Prevailing Torque Nut

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4	Retaining Ring
5	SIR Coil
6	SIR Coil and Harness Assembly
7	Wave Washer
8	Bearing Retainer
9	Shaft Lock Shield Assembly
10	Turn Signal Cancel Cam Assembly
11	Upper Bearing Spring
12	Upper Bearing Inner Race Seat
13	Inner Race
14	Lock Bolt
15	Lock Bolt Spring
16	Pan Head Tapping Screws
17	TORX® Head Screw
18	Ignition Lock Cylinder Case Assembly
19	Pan Head Tapping Screw
20	Ignition Switch Assembly
21	Steering Column Tilt Head Assembly
22	TORX® Head Screw
23	Release Lever Pin
24	Spring Guide
25	Tilt Spring
26	Bearing Assembly
27	Pan Head Tapping Screws
28	Turn Signal and Multifunction Switch Assembly
29	Axial Position Assurance Connector
30	Tilt Knob
31	Pan Head Tapping Screws
32	Steering Column Shaft Assembly
33	TORX® Head Screws
34	Pivot Pins
35	Steering Column Support Assembly
36	Steering Column Jacket Assembly
37	Adapter and Bearing Assembly
38	Bolt and Retainer Assembly
39	Hexagon Head Nut
40	Intermediate Shaft Assembly

STEERING COLUMN DISASSEMBLED VIEW (COLUMN SHIFT STANDARD)

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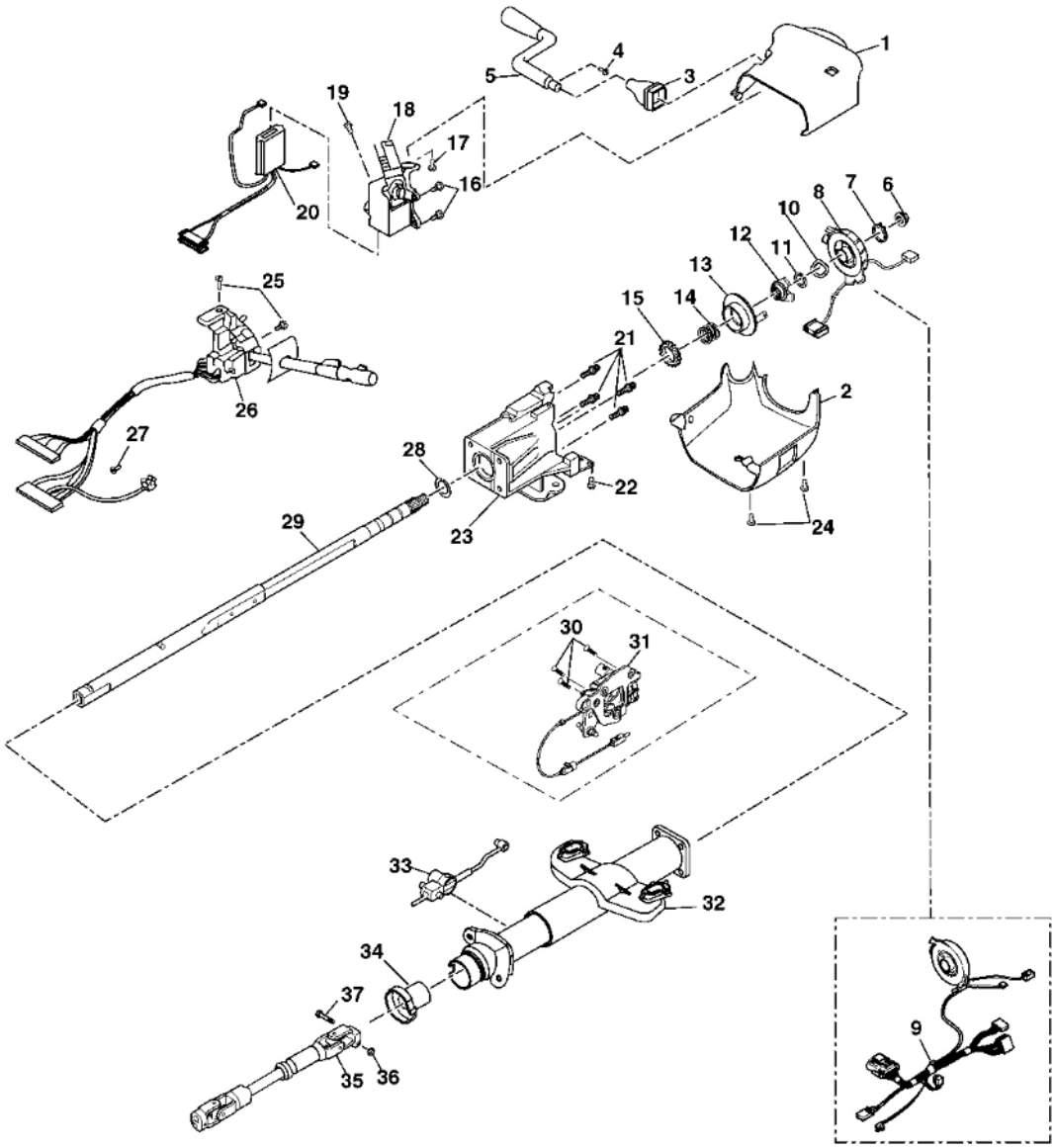


Fig. 3: Standard Steering Column Disassembled View (Column Shift Standard)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Upper Trim Cover
2	Lower Trim Cover
3	Shift Lever Seal
4	Shift Lever Screw
5	Shift Lever Assembly

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6	Flanged Prevailing Torque Nut
7	Snap Ring
8	SIR Coil
9	SIR Coil and Harness Assembly
10	Wave Washer
11	Bearing Retainer
12	Cam Orientation Plate
13	Turn Signal Cancel Cam Assembly
14	Upper Bearing Spring
15	Thrust Washer
16	Pan Head Tapping Screws
17	TORX® Head Screw
18	Ignition Lock Cylinder Case Assembly
19	Pan Head Tapping Screw
20	Ignition Switch Assembly
21	TORX® Head Screws
22	TORX® Head Screw
23	Steering Column Housing Assembly
24	Pan Head Tapping Screws
25	Pan Head Tapping Screws
26	Turn Signal and Multifunction Switch Assembly
27	Axial Position Assurance Connector
28	Bearing Retainer
29	Steering Shaft Assembly
30	Oval Head Soc Tap Screws
31	Linear Shift Assembly
32	Steering Column Jacket Assembly
33	Automatic Transmission Shift Lock Control
34	Adapter and Bearing Assembly
35	Intermediate Shaft
36	Hexagon Head Nut
37	Bolt and Retainer Assembly

STEERING COLUMN DISASSEMBLED VIEW (FLOOR SHIFT STANDARD)

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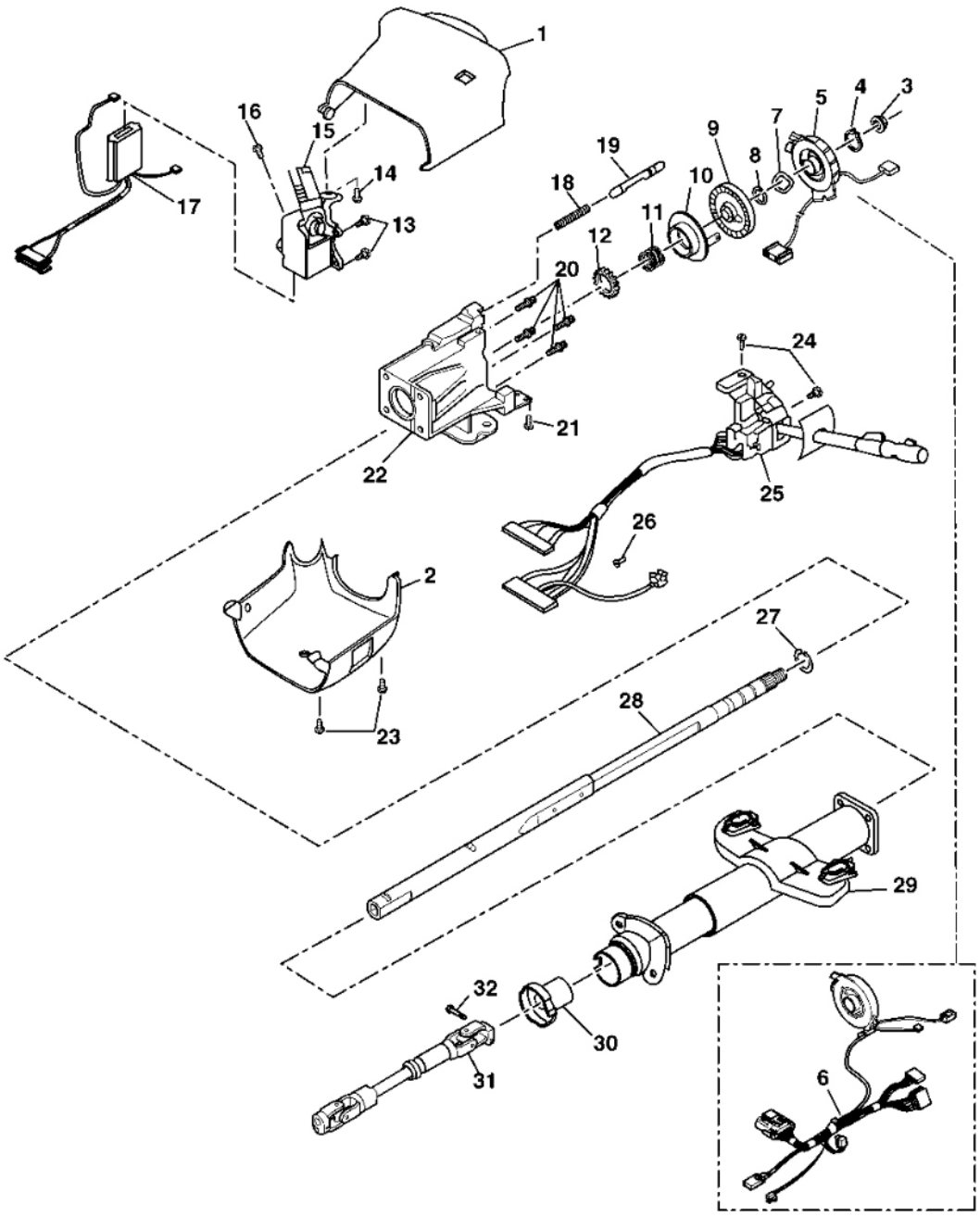


Fig. 4: Standard Steering Column Disassembled View (Floor Shift Standard)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	Upper Trim Cover

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2	Lower Trim Cover
3	Flanged Prevailing Torque Nut
4	Retaining Ring
5	SIR Coil
6	SIR Coil and Harness Assembly
7	Wave Washer
8	Bearing Retainer
9	Shaft Lock
10	Turn Signal Cancel Cam
11	Upper Bearing Spring
12	Thrust Washer
13	Pan Head Tapping Screws
14	TORX® Head Screw
15	Ignition Lock Cylinder Case
16	Pan Head Tapping Screw
17	Ignition Switch Assembly
18	Lock Bolt Spring
19	Lock Bolt
20	TORX® Head Screws
21	Pan Head Tapping Screw
22	Steering Column Housing Assembly
23	Pan Head Tapping Screws
24	Pan Head Tapping Screws
25	Turn Signal Multifunction Switch Assembly
26	Axial Position Assurance Connector
27	Bearing Retainer
28	Steering Shaft Assembly
29	Steering Column Jacket Assembly
30	Adapter and Bearing Assembly
31	Intermediate Steering Shaft Assembly
32	Bolt and Retainer Assembly

DIAGNOSTIC INFORMATION AND PROCEDURES

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

- Inspect for aftermarket devices which could affect the operation of the steering wheel and column.

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- 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:

- **Steering Column Tilt Function Inoperative**
- **Lock System Does Not Unlock**
- **Lock System Does Not Lock**
- **Lock System Sticks in Start**
- **Key Cannot Be Removed in the Off Lock Position**
- **High Lock Effort**
- **Noise in Steering Column**
- **High Shift Effort**
- **Looseness in Steering Column**

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 **Steering Wheel and Column Description and Operation**
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 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**
8	Inspect the steering column wiring harness for tightness. Is the steering column wiring harness too tight?	Go to **Step 12**	Go to **Step 3**
	Replace the tilt head. Refer to **Steering Column Tilt**		

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9	**Head Housing Replacement (Tilt)** or **Steering Column Tilt Head Housing Replacement (Standard)**. Is the repair complete?	Go to **Step 13**	-
10	Replace the pivot pins. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**. Is the repair complete?	Go to **Step 13**	-
11	Replace the tilt spring. Refer to **Tilt Spring Replacement**. 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**

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 **Steering Wheel and Column Description and Operation**
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 damage. Is the ignition lock cylinder case assembly damaged?	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 **Key and Lock Cylinder Coding** in General Information.		

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	Did you complete the repair?	Go to **Step 11**	-
8	Replace the lock cylinder. Refer to **Ignition Lock Cylinder Replacement**. Did you complete the repair?	Go to **Step 11**	-
9	Replace the ignition lock cylinder case assembly. Refer to **Ignition Lock Cylinder Case Replacement**. Did you complete the repair?	Go to **Step 11**	-
10	Replace the ignition switch. Refer to **Ignition Switch Replacement**. 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**

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 **Steering Wheel and Column Description and Operation**
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 7**	Go to **Step 4**
4	Inspect the shift cable adjustment. Is the shift cable adjusted incorrectly?	Go to **Step 8**	Go to **Step 5**
5	Inspect the ignition switch for damage. Is the ignition switch damaged?	Go to **Step 9**	Go to **Step 6**
6	Inspect the linear shift for damage. Is the linear shift control damaged?	Go to **Step 10**	Go to **Step 7**
7	Replace the lock cylinder. Refer to **Ignition Lock Cylinder Replacement**. Did you complete the repair?	Go to **Step 11**	-
8	Adjust the shift cable. Refer to **Automatic Transmission Range Selector Cable Adjustment** in Automatic Transmission - 4L60-E/4L65-E or to **Automatic Transmission Range Selector Cable Adjustment** in Automatic Transmission - 4L80-E/4L85-E. Did you complete the repair?	Go to **Step 11**	-
9	Replace the ignition switch. Refer to **Ignition Switch Replacement**. Did you complete the repair?	Go to **Step 11**	-

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10	Replace the linear shift assembly. Refer to **Linear Shift Assembly Replacement**. 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**

LOCK SYSTEM STICKS IN START

Lock System Sticks In Start

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 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. Refer to **Ignition Lock Cylinder Case Replacement**. Did you complete the repair?	Go to **Step 9**	-
7	Replace the lock cylinder. Refer to **Ignition Lock Cylinder Replacement**. Did you complete the repair?	Go to **Step 9**	-
8	Replace the ignition switch. Refer to **Ignition Switch Replacement**. 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**

KEY CANNOT BE REMOVED IN THE OFF LOCK POSITION

Key Cannot Be Removed In The Off Lock 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**

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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**

HIGH LOCK EFFORT

High Lock Effort

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**
6	Inspect the ignition switch assembly for damage. Is the ignition switch assembly damaged?	Go to **Step 10**	Go to **Step 7**
7	Replace the key. Refer to **Key and Lock Cylinder Coding** in General Information. Did you complete the repair?	Go to **Step 11**	-
8	Replace the lock cylinder. Refer to **Ignition Lock Cylinder Replacement**. Did you complete the repair?	Go to **Step 11**	-
9	Replace the ignition lock cylinder case assembly. Refer to **Ignition Lock Cylinder Case Replacement**. Did you complete the repair?	Go to **Step 11**	-

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10	Replace the ignition switch. Refer to **Ignition Switch Replacement**. 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 Operation and perform the necessary inspections?	Go to **Step 2**	Go to **Steering Wheel and Column Description and Operation**
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 10**	Go to **Step 4**
4	Inspect the SIR/SRS coil for noise. Is the SIR/SRS coil noisy?	Go to **Step 11**	Go to **Step 5**
5	Inspect the horn contact ring for lubrication. Is the horn contact ring lubricated?	Go to **Step 12**	Go to **Step 6**
6	Inspect the lock plate retaining ring for the correct installation. Is the lock plate retaining ring installed properly?	Go to **Step 13**	Go to **Step 7**
7	Inspect the shaft bearing for the following conditions: • Damage • Lubrication • Wear • Proper seating Are the bearings in need of repair or replacement?	Go to **Step 14**	Go to **Step 8**
8	Inspect the spherical joint for lubrication. Is the spherical joint lubricated?	Go to **Step 15**	Go to **Step 9**
9	Inspect the steering column coupling for looseness. Is the steering column coupling loose?	Go to **Step 16**	Go to **Step 3**
10	Tighten the steering column components to specifications. Refer to **Fastener Tightening Specifications**. Did you complete the repair?	Go to **Step 17**	-

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11	Replace the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in SIR. Did you complete the repair?	Go to **Step 17**	-
12	Lubricate the horn contact ring. Did you complete the repair?	Go to **Step 17**	-
13	Install the lock plate retaining ring properly. Did you complete the repair?	Go to **Step 17**	-
14	Repair the shaft bearings as necessary. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**. Did you complete the repair?	Go to **Step 17**	-
15	Lubricate the spherical joints. Did you complete the repair?	Go to **Step 17**	-
16	Tighten the steering column coupling to specifications. Refer to **Fastener Tightening Specifications**. Did you complete the repair?	Go to **Step 17**	-
17	Operate the system in order to verify the repair. 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 **Steering Wheel and Column Description and Operation**
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 6**	Go to **Step 4**
4	Inspect for a damaged linear shift assembly. Is the linear shift assembly damaged?	Go to **Step 7**	Go to **Step 5**
5	Inspect the shift cable for binding or misadjustment. Is the shift cable binding or misadjusted?	Go to **Step 8**	Go to **Step 3**
	Replace the shift cable. Refer to **Automatic Transmission Range Selector Cable Replacement** in		

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6	Automatic Transmission - 4L60-E/4L65-E or to **Automatic Transmission Range Selector Cable Replacement** in Automatic Transmission - 4L80-E/4L85-E. Did you complete the repair?	Go to **Step 9**	-
7	Replace the linear shift assembly. Refer to **Linear Shift Assembly Replacement**. Did you complete the repair?	Go to **Step 9**	-
8	Adjust the shift cable. Refer to **Automatic Transmission Range Selector Cable Adjustment** in Automatic Transmission - 4L60-E/4L65-E or to **Automatic Transmission Range Selector Cable Adjustment** in Automatic Transmission - 4L80-E/4L85-E. 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**

LOOSENESS IN STEERING COLUMN

Looseness In Steering Column

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to **Step 2**	Go to **Steering Wheel and Column Description and Operation**
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 **Fastener Tightening Specifications**. Did you complete the repair?	Go to **Step 13**	-

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9	Replace the jacket assembly. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**. Did you complete the replacement?	Go to **Step 13**	-
10	Tighten the support screws to specifications. Refer to **Fastener Tightening Specifications**. Did you complete the repair?	Go to **Step 13**	-
11	Tighten or replace the intermediate shaft as needed. Refer to the following procedures: • **Intermediate Steering Shaft Replacement - Upper** • **Intermediate Steering Shaft Replacement - Lower** Did you complete the repair?	Go to **Step 13**	-
12	Repair or replace the tilt head, support and pivot pins as necessary. Refer to **Steering Column Tilt Head Housing Replacement (Tilt)** or **Steering Column Tilt Head Housing Replacement (Standard)**. 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 Anti-Rotation Pin. See **Special Tools and Equipment**.

Removal Procedure

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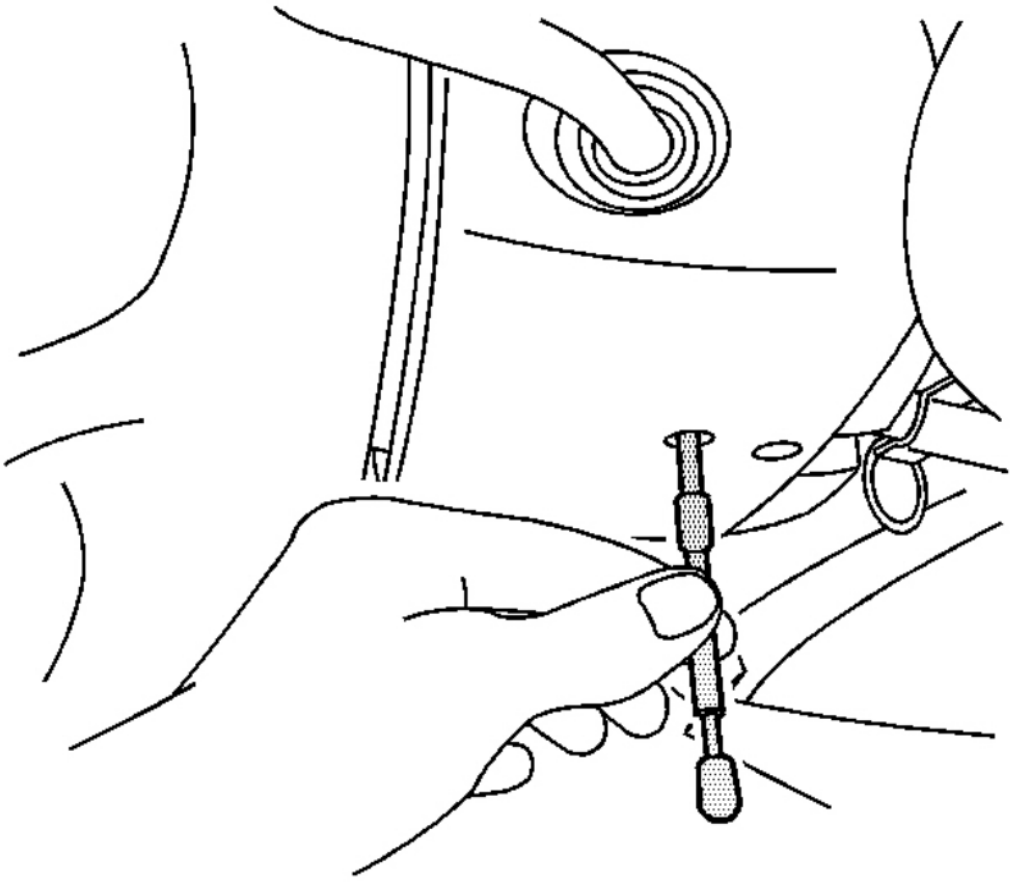


Fig. 5: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

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.

1. Install the **J 42640** in the steering column lower access hole. See **Special Tools and Equipment**.

IMPORTANT: Mark the relationship of the intermediate shaft components in order to assure proper installation.

2. Mark the relationships of the following components:

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- Mark the relationship of the bolt and clamp at both ends of the upper intermediate shaft.
- Mark the relationship of the upper intermediate shaft to the lower intermediate shaft.

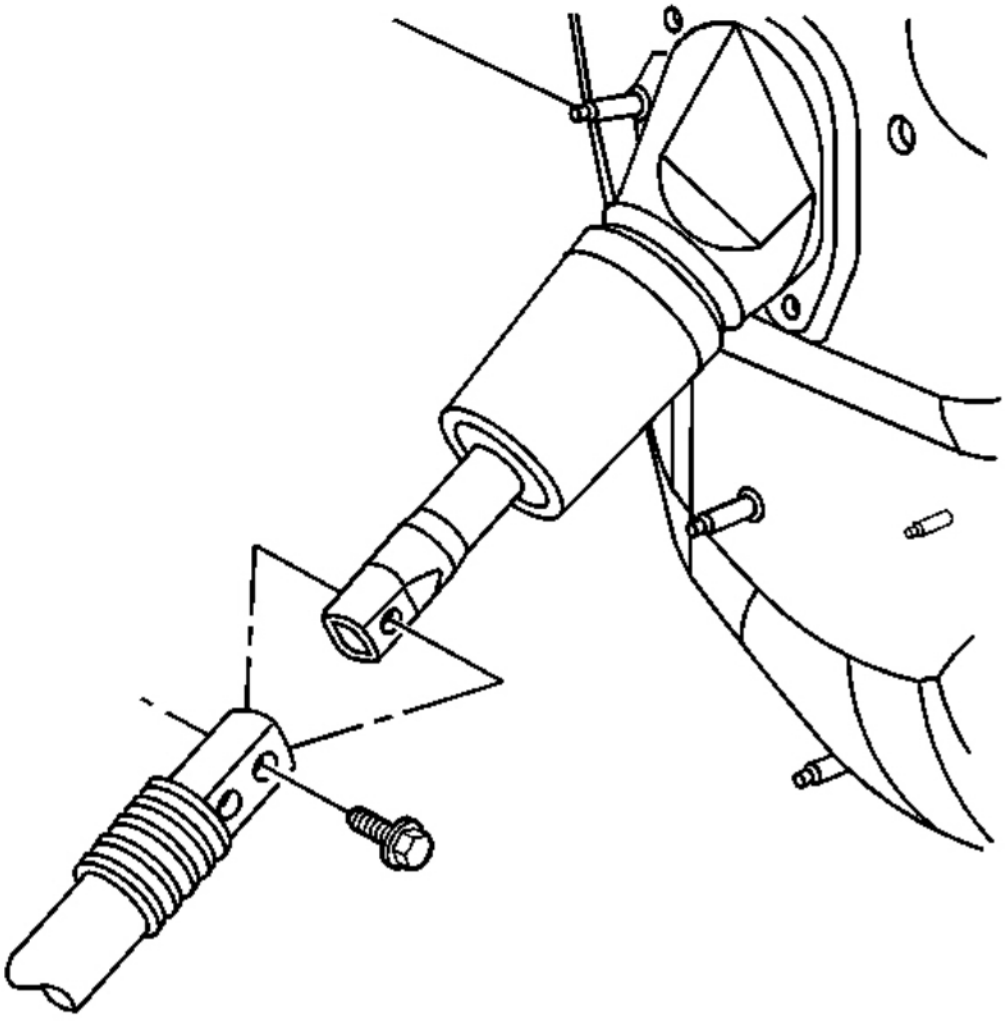


Fig. 6: View Of Nut & Bolt At Lower Shaft To Upper Shaft Connection
Courtesy of GENERAL MOTORS CORP.

3. Remove the nut and bolt from the lower shaft to upper shaft connection.

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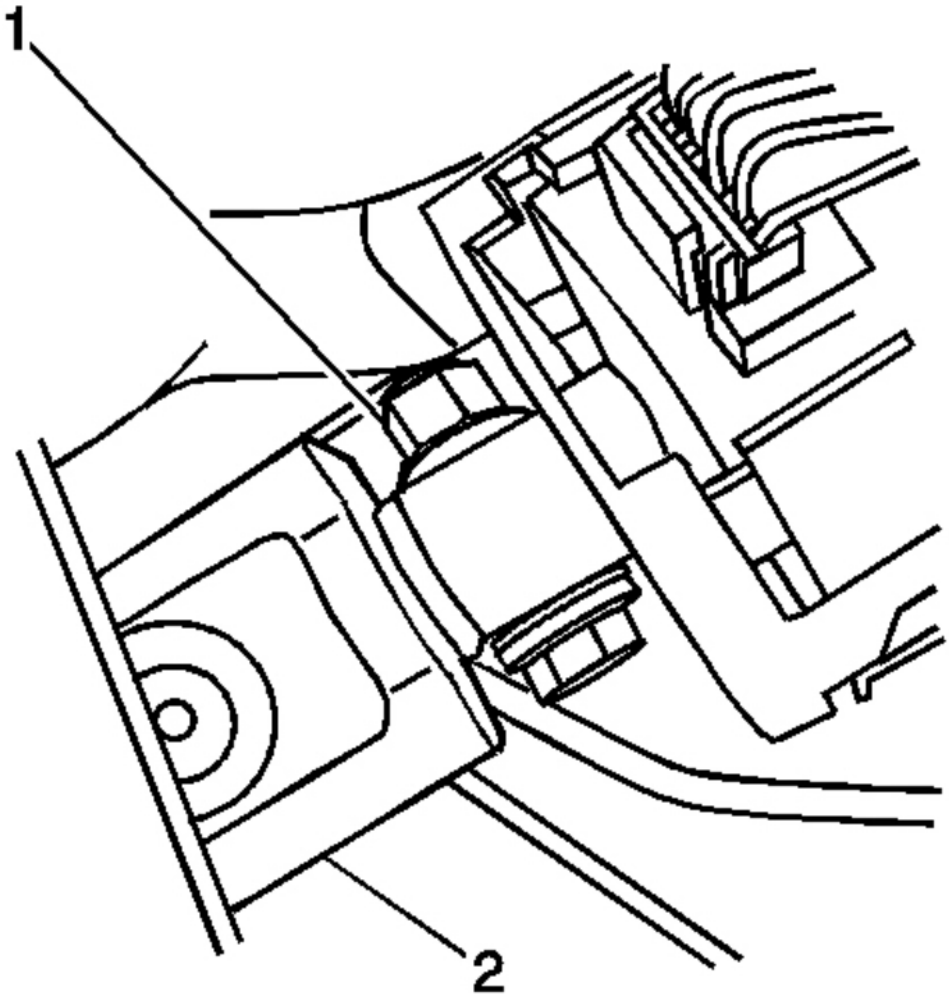


Fig. 7: View Of Upper Shaft To Steering Column Nut Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the nut and bolt (1) from the upper shaft (2) to steering column connection.
5. Slide the intermediate shaft down, out of the steering column connection.
6. Remove the accelerator pedal position sensor. Refer to **Accelerator Pedal Position (APP) Sensor Replacement** or **Accelerator Pedal Position (APP) Sensor Replacement** in Engine Controls.
7. Slide the upper intermediate shaft towards the instrument panel, out of the lower intermediate shaft, and remove the shaft from the vehicle.

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Installation Procedure

IMPORTANT: If you are installing the same shaft, align the marks and the relationship of the bolt and clamp made during the removal procedure.

1. Install the lower end of the upper intermediate shaft through the bulkhead, into the lower shaft.

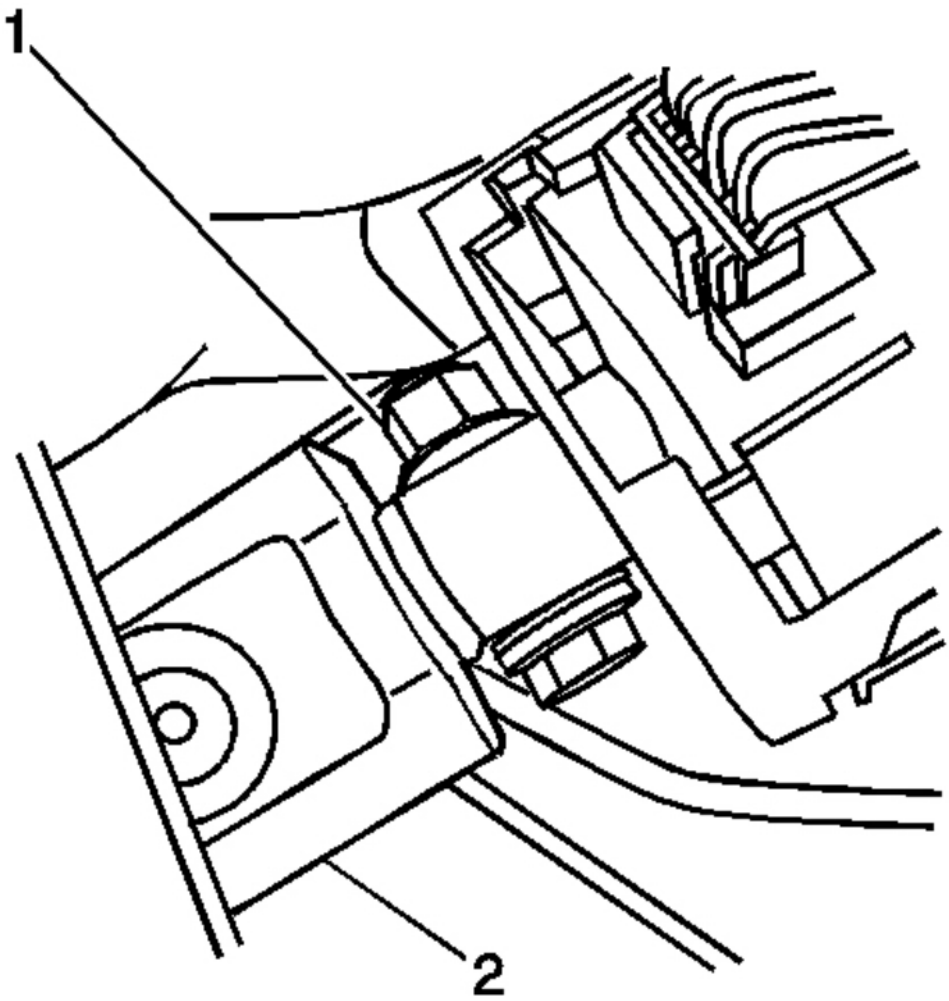


Fig. 8: View Of Upper Shaft To Steering Column Nut Bolt
Courtesy of GENERAL MOTORS CORP.

2. Install the upper end of the upper intermediate shaft (2) to the steering column.

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NOTE: **Refer to Fastener Notice .**

3. Install the bolt and nut (1) at the connection of the upper intermediate shaft to the steering column.

   Tighten: Tighten the nut to 62 N.m (46 lb ft).

4. Install the accelerator pedal position sensor. Refer to **Accelerator Pedal Position (APP) Sensor Replacement** or **Accelerator Pedal Position (APP) Sensor Replacement** in Engine Controls.

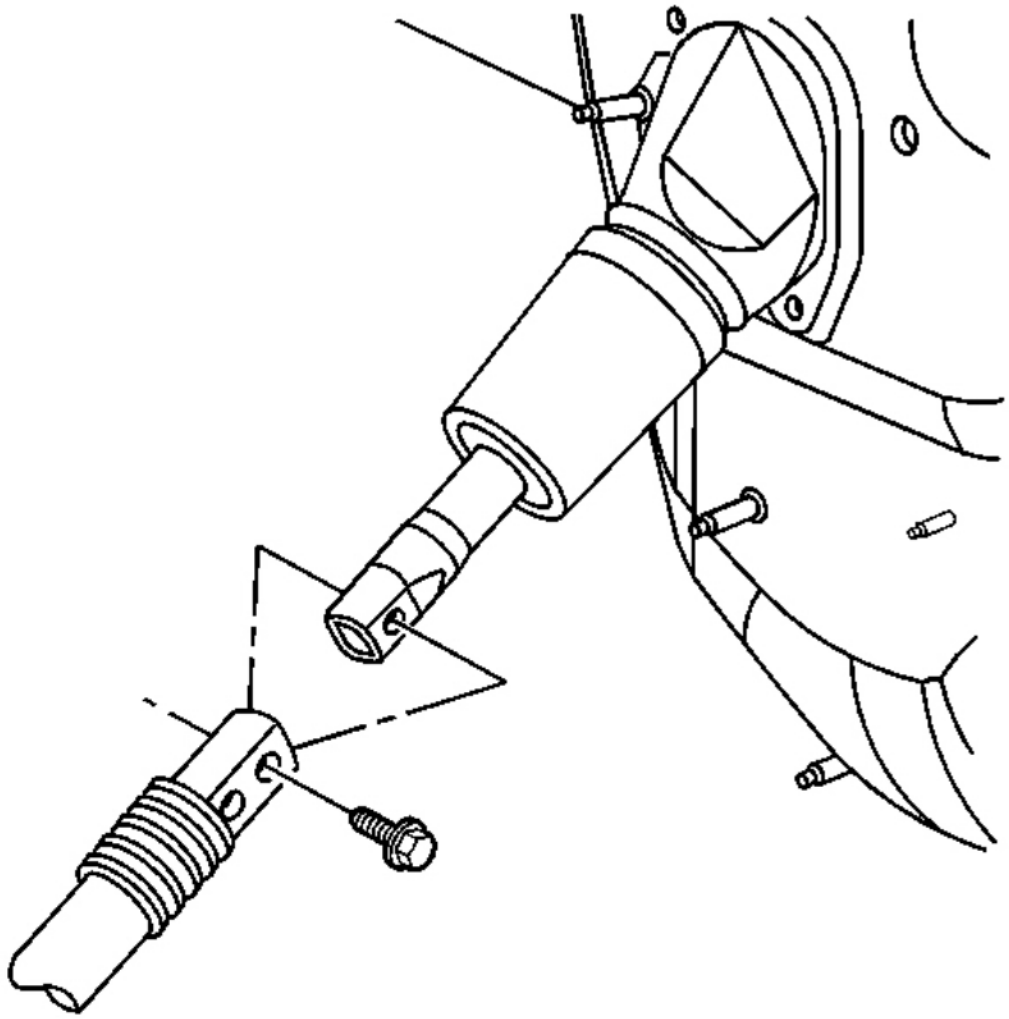


Fig. 9: View Of Nut & Bolt At Lower Shaft To Upper Shaft Connection
Courtesy of GENERAL MOTORS CORP.

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5. Install the bolt and nut at the connection of the upper intermediate shaft to the lower intermediate shaft.

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

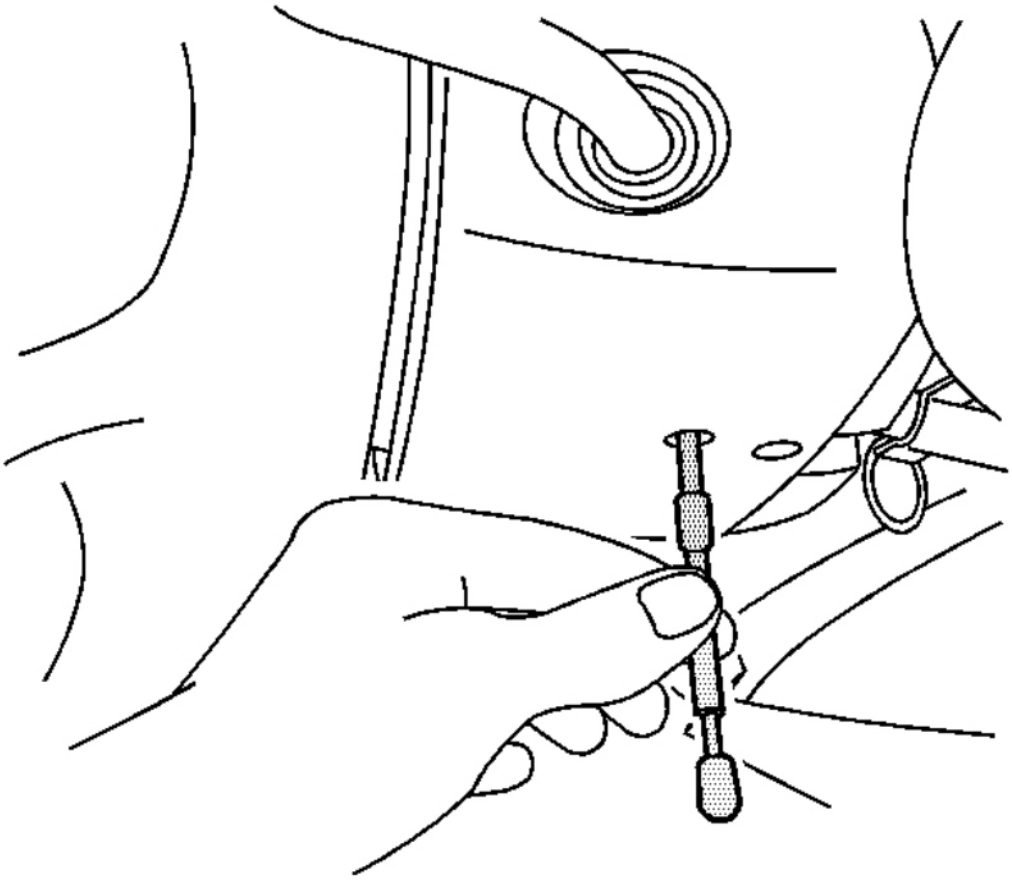


Fig. 10: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

6. Remove the **J 42640** from the steering column lower access hole. See **Special Tools and Equipment**.

INTERMEDIATE STEERING SHAFT REPLACEMENT - LOWER

Tools Required

J 42640 Steering Column Anti-Rotation Pin. See **Special Tools and Equipment**.

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Removal Procedure

CAUTION: Refer to SIR Caution in Cautions and Notices.

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.

1. Set the front wheels in the straight-ahead position.

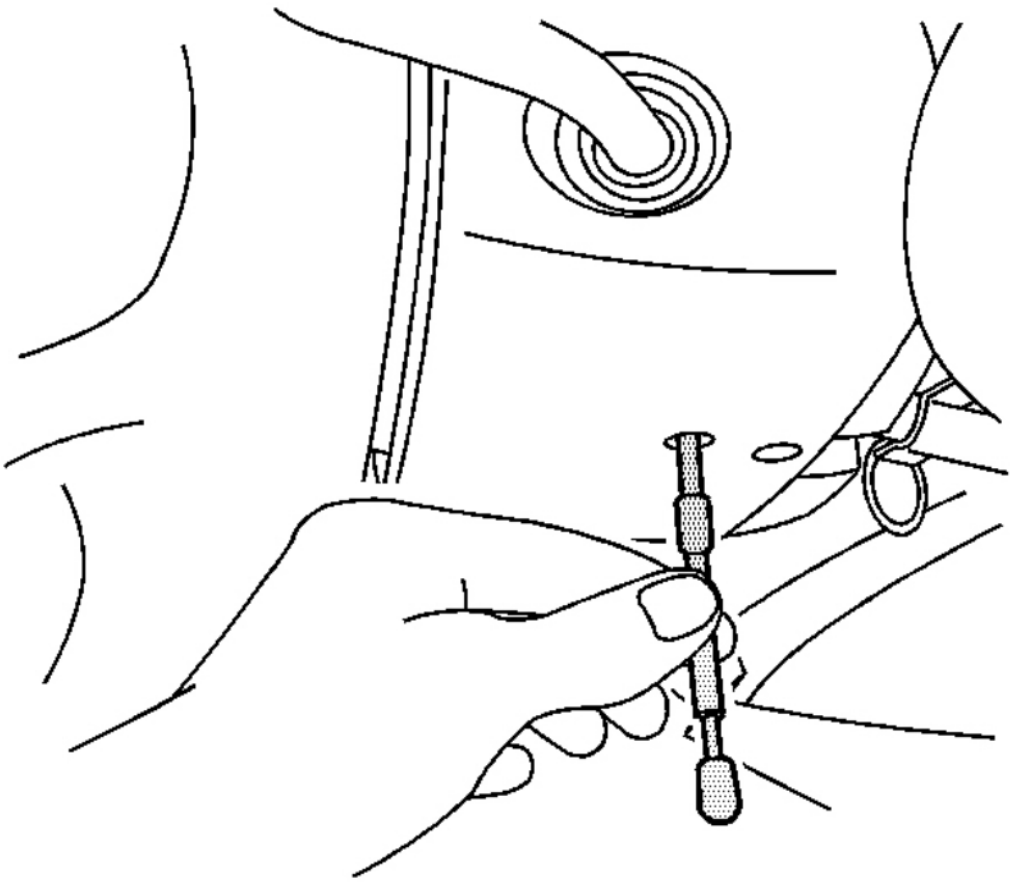


Fig. 11: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

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2. Install the **J 42640** in the steering column lower access hole. See **Special Tools and Equipment**.
3. Mark the relationship of the intermediate shaft components in order to assure proper installation.
    1. Mark the relationship of the upper intermediate shaft to the lower intermediate shaft.
    2. Mark the relationship of the lower shaft coupler to the steering gear input shaft.

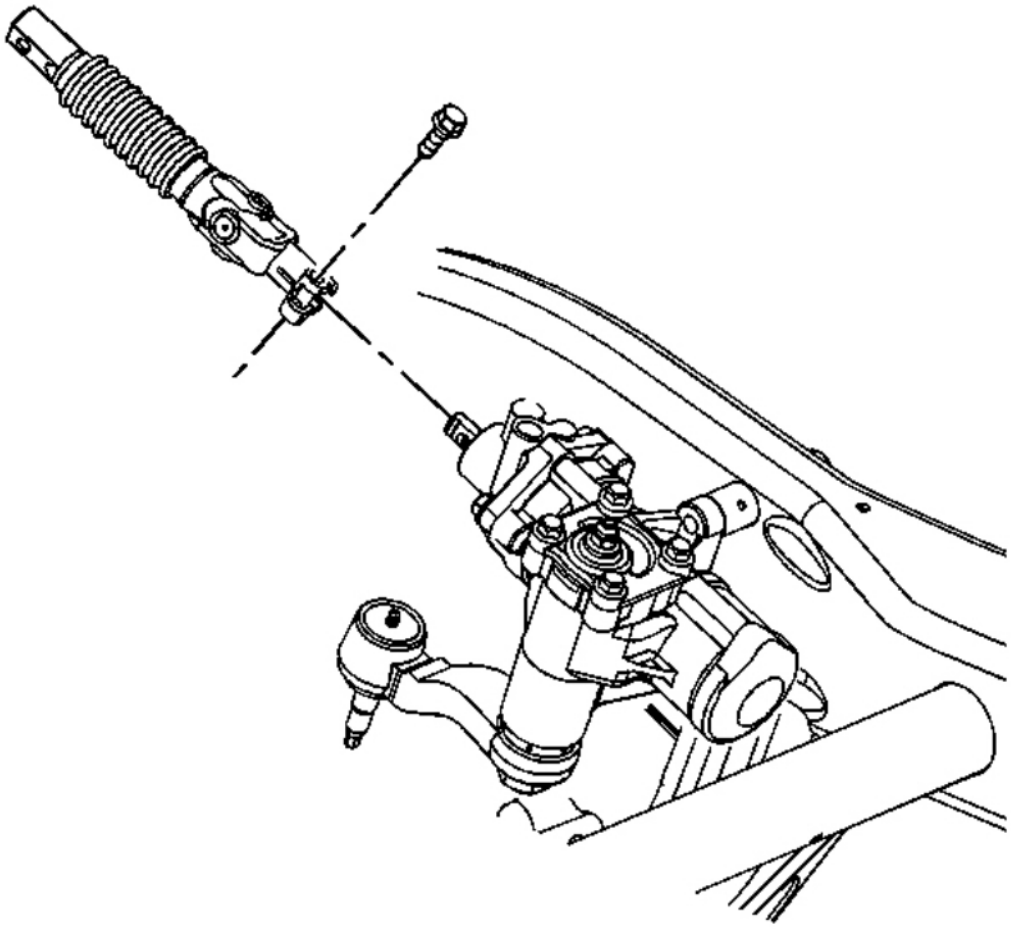


Fig. 12: View Of Lower Intermediate Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

4. Remove the bolt from the upper to lower shaft connection.
5. Remove the bolt from the lower shaft coupler.
6. Remove the intermediate shaft assembly.

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Slide the shaft towards the dash in order to get the lower shaft coupler clear of the steering gear input shaft.

7. Slide the intermediate shaft down out of the upper shaft.

Installation Procedure

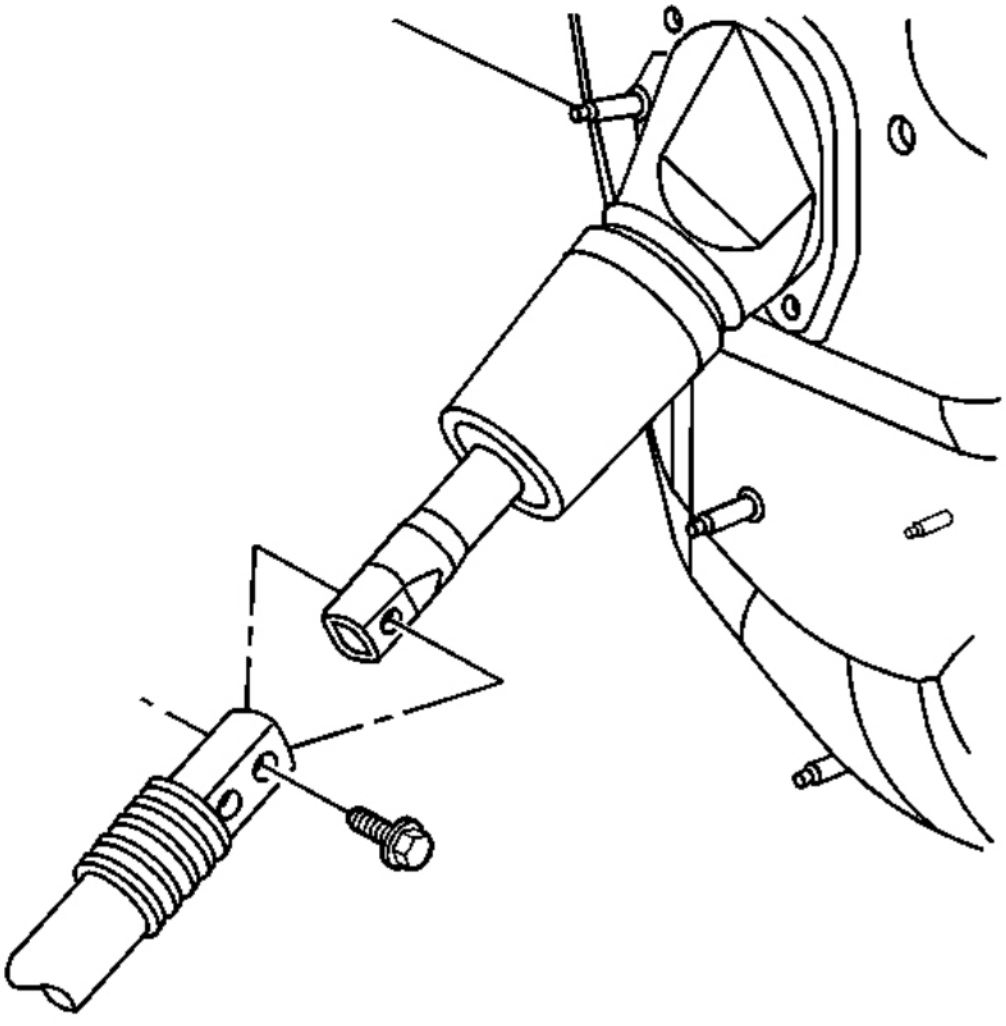


Fig. 13: View Of Nut & Bolt At Lower Shaft To Upper Shaft Connection
Courtesy of GENERAL MOTORS CORP.

1. Install the upper end of the intermediate shaft into the upper shaft.

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2. Install the lower end of the intermediate shaft coupler.
    1. If you are reinstalling the same shaft, align the marks made during the removal procedure.
    2. Install the lower end of the intermediate shaft coupler onto the steering gear worm shaft.
3. Install the bolt to the lower shaft coupler.

NOTE: **Refer to Fastener Notice .**

4. Install the bolt to the upper end of the shaft.

Tighten:

- Tighten the upper bolt to 47 N.m (35 lb ft).
- Tighten the coupler pinch bolt to 50 N.m (37 lb ft).

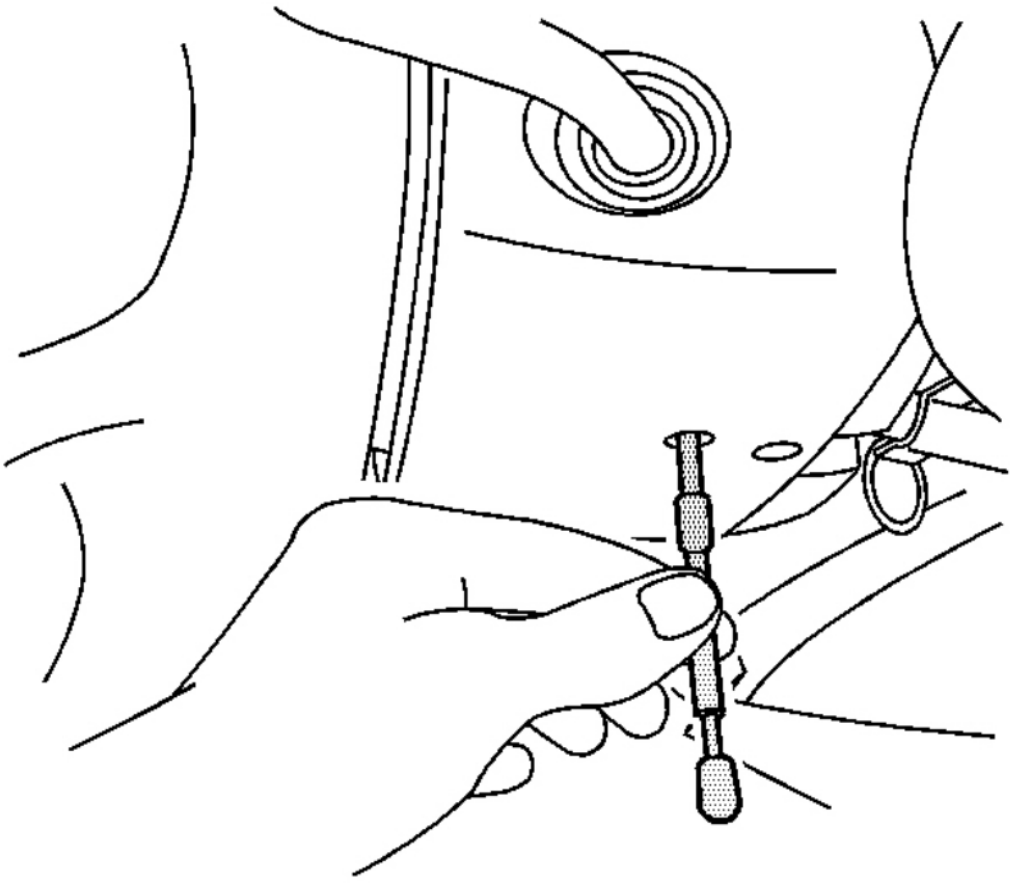


Fig. 14: Identifying J 42640

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Courtesy of GENERAL MOTORS CORP.

5. Remove the **J 42640** from the steering column lower access hole. See **Special Tools and Equipment**.

STEERING COLUMN ACCIDENT DAMAGE INSPECTION

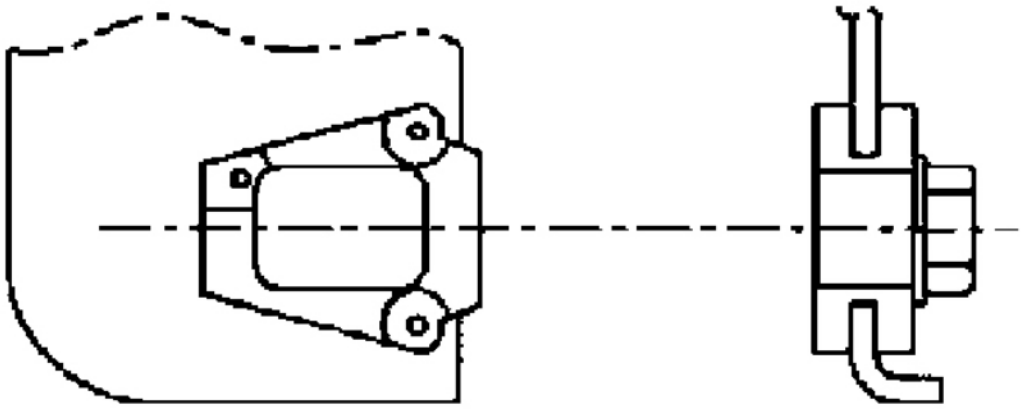


Fig. 15: Inspecting Capsules On Steering Column Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

- Vehicles involved in accidents which result in 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 checked for any loose conditions when pushed or pulled by hand. If not, the bracket should be replaced if bolted to the jacket assembly. If the bracket is welded to the jacket assembly replace the jacket assembly.

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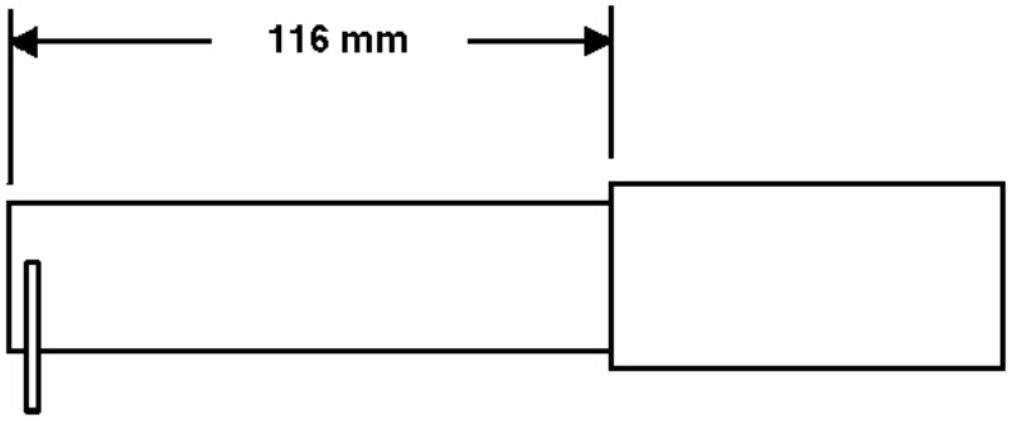


Fig. 16: Inspecting Jacket Assembly Collapse
Courtesy of GENERAL MOTORS CORP.

- Inspect for jacket assembly collapse by measuring the distance from the lower edge of the upper jacket to a defined point on the lower jacket. Replace the jacket assembly if the measured dimensions are not within specifications.

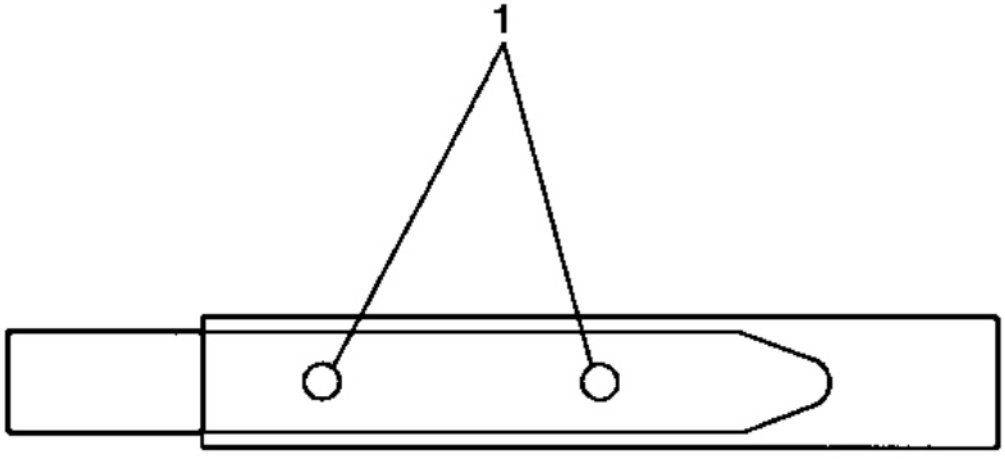


Fig. 17: Inspecting Steering Shaft For Sheared Injected Plastic

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Courtesy of GENERAL MOTORS CORP.

- Remove the SIR coil from the steering column and allow the coil to hang freely before the shaft is rotated. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in SIR.
- Visually inspect the steering shaft for sheared injected plastic (1). If the steering shaft shows sheared plastic, replace the steering shaft.
- Inspect the steering shaft runout for any frame damage that could cause a bent steering shaft. Using a dial indicator at the lower end of the steering shaft, rotate the steering wheel. The runout must not exceed 1.60 mm (0.0625 in).

STEERING COLUMN TRIM COVERS REPLACEMENT

Removal Procedure

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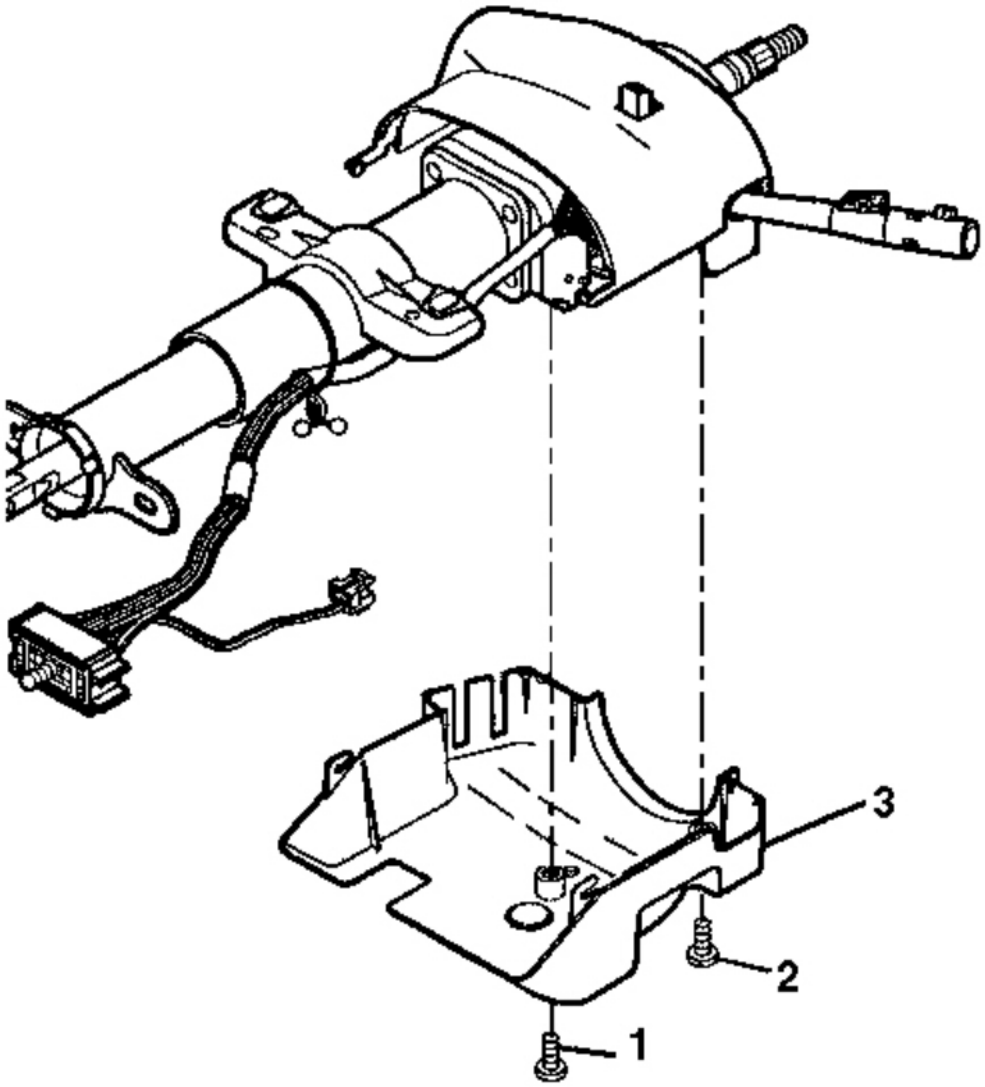


Fig. 18: View Of Lower Trim Cover Assembly
Courtesy of GENERAL MOTORS CORP.

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**

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3. Remove the tilt lever from the lower trim cover. Refer to **Tilt Lever Replacement**.
4. If necessary, remove the 2 pan head tapping screws (1, 2) from the lower trim cover (3). Remove the lower trim cover (3).

   If screws are not present in the lower trim cover, proceed to the next step.

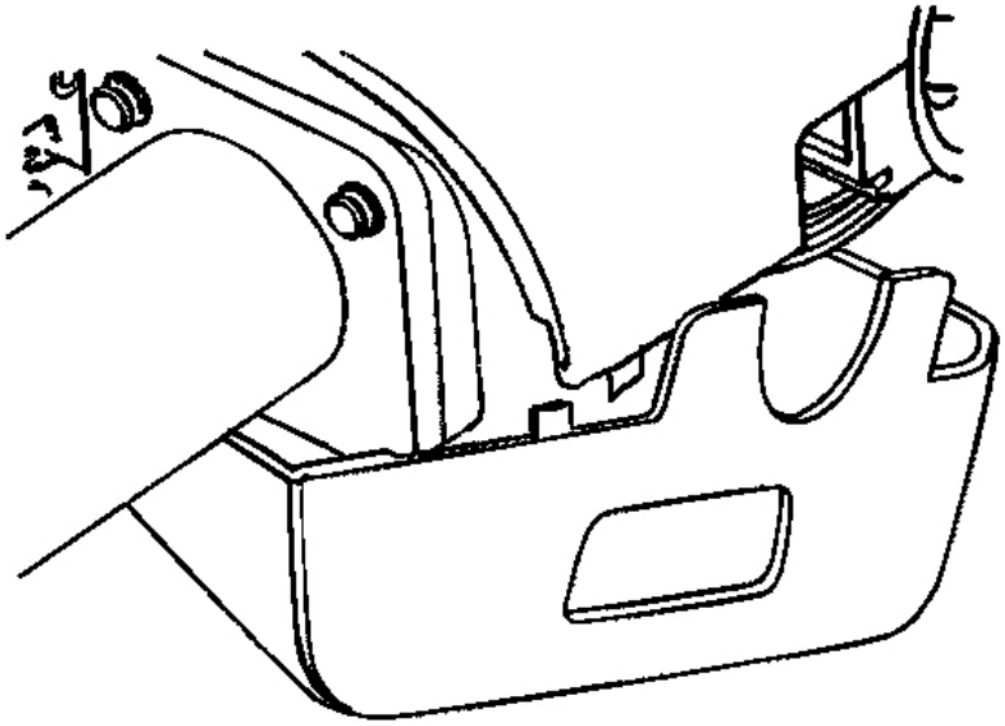


Fig. 19: View Of Lower Trim Cover At Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

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

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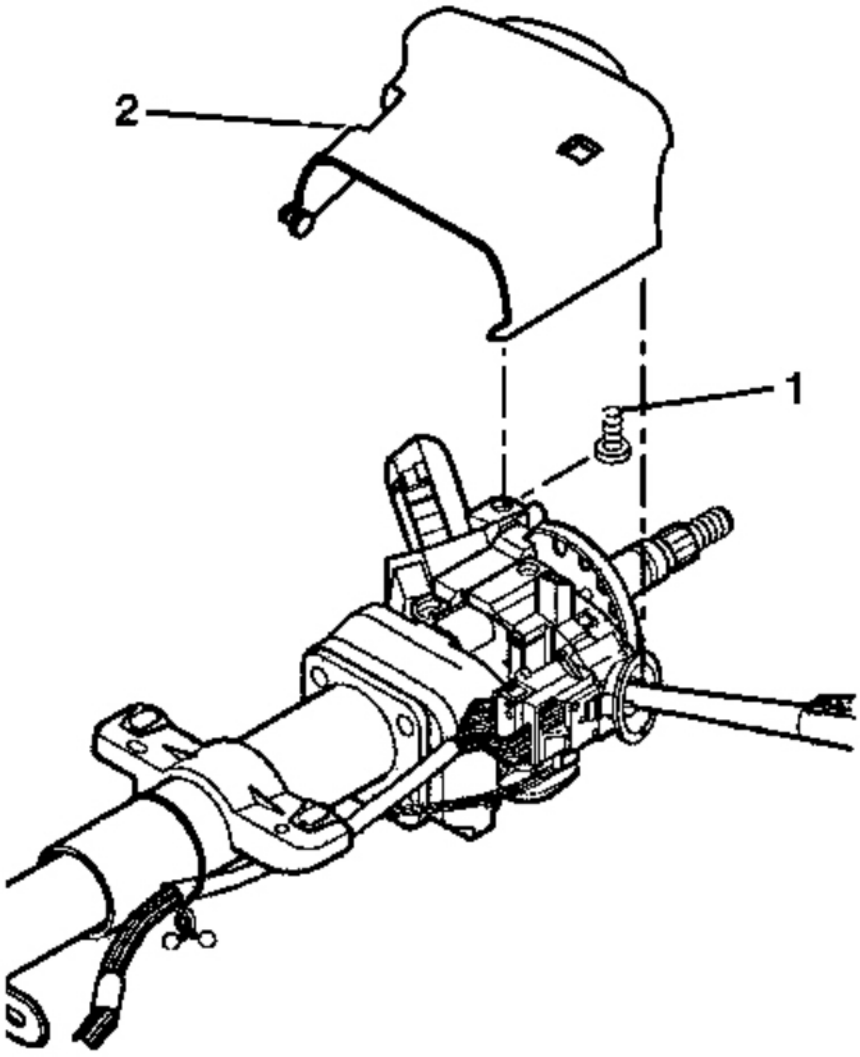


Fig. 20: View Of TORX(R) Head Screw & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: You must check for 1 pan head tapping screw (1) in the upper trim cover (2) before removal.

6. If necessary, remove 1 TORX® head screw (1) from the upper trim cover (2).

   If a screw is not present, remove the upper trim cover (2).

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Installation Procedure

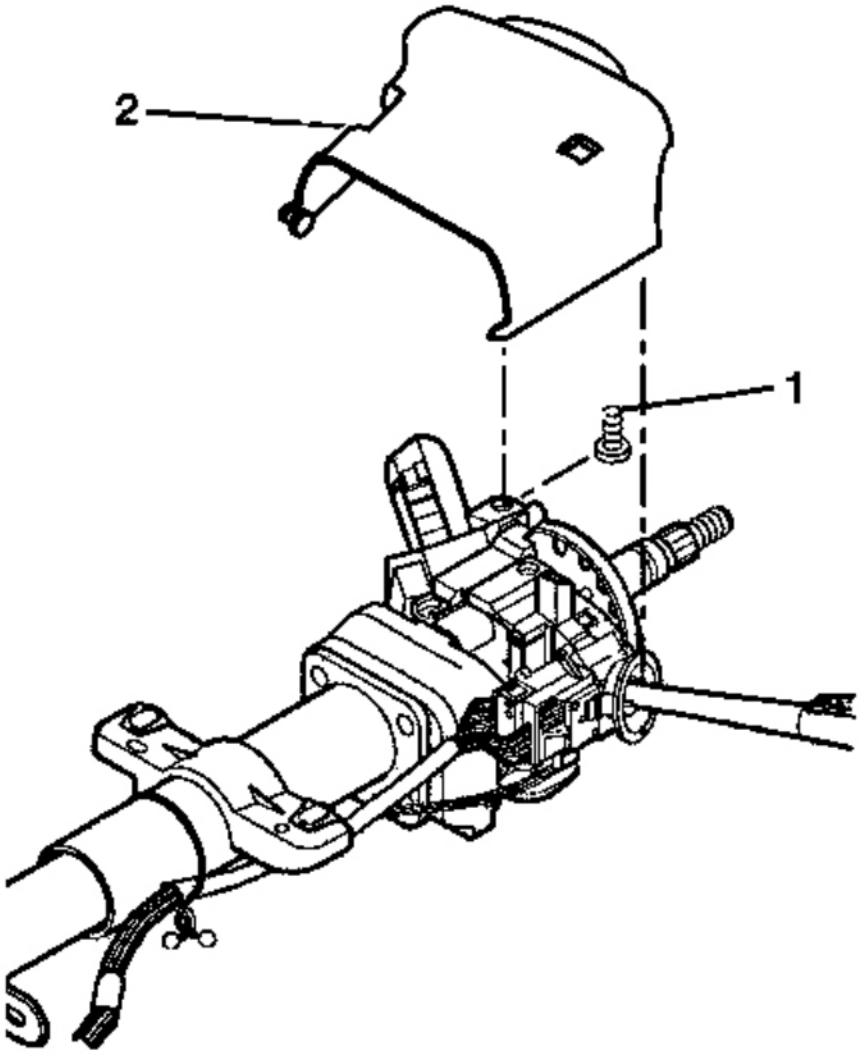


Fig. 21: View Of TORX(R) Head Screw & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

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

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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 3.

1. Install the upper trim cover (2) onto the steering column. Install 1 TORX® head screw (1) into the upper trim cover (2).

   Tighten: Tighten the screw to 1.5 N.m (13 lb in).

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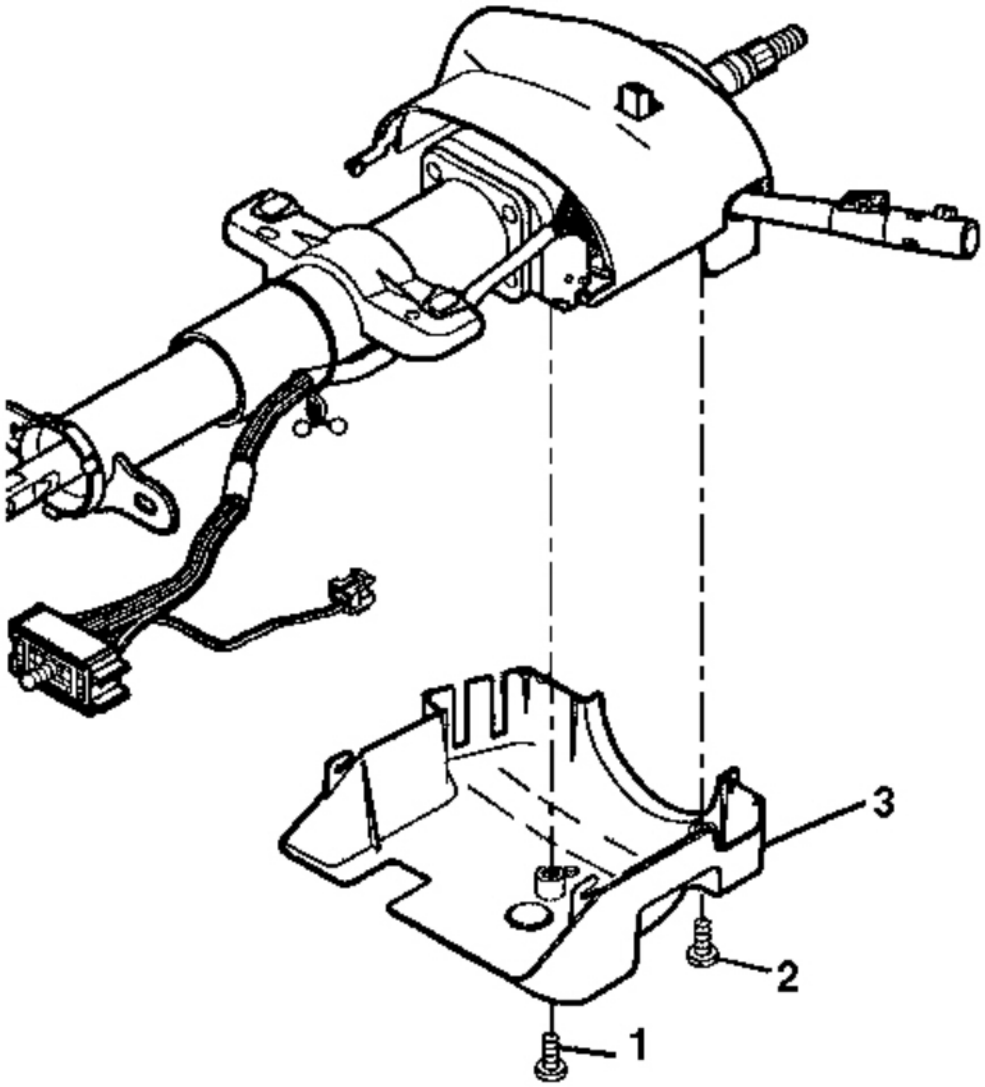


Fig. 22: View Of Lower Trim Cover Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the lower trim cover (3) onto the steering column. Install 2 pan head tapping screws (1, 2) into the lower trim cover (3).

Tighten

- Tighten 1 pan head tapping screw (1) to 3.5 N.m (31 lb in)

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- Tighten 1 pan head tapping screw (2) to 2 N.m (18 lb in).

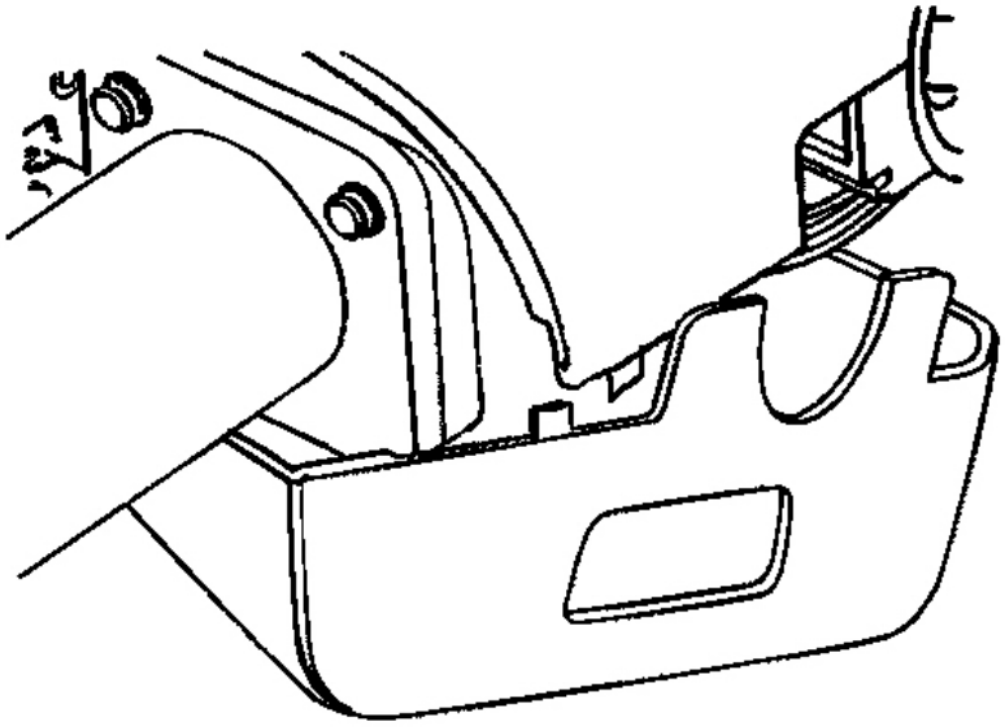


Fig. 23: View Of Lower Trim Cover At Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

3. Install the upper and lower trim covers onto the steering column.

IMPORTANT: If column shift, the shift lever seal must be seated in the trim covers.

4. Slide the shift lever seal down the shift lever.
5. Gently snap the upper and lower trim covers together.
6. Install the tilt lever into the lower trim cover. Refer to **Tilt Lever Replacement**.
7. Install the steering wheel onto the steering column. Refer to **Steering Wheel Replacement**.
8. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

IGNITION SWITCH REPLACEMENT

Tools Required

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

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.

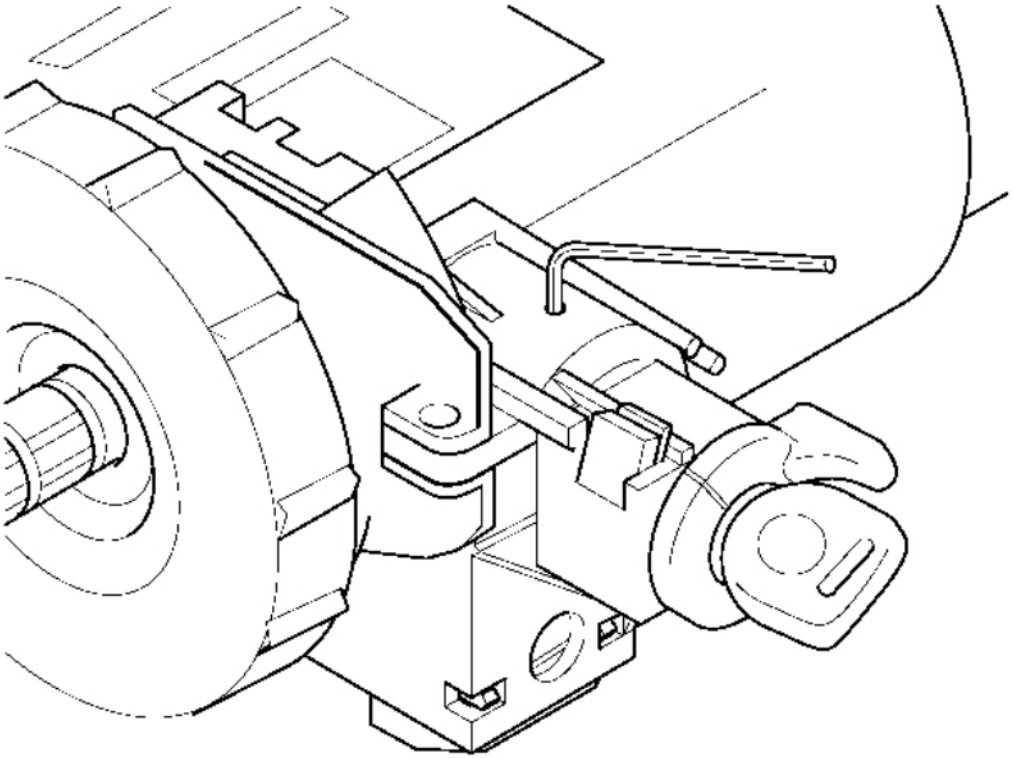


Fig. 24: Releasing/Installing Lock Cylinder Using Allen Wrench
Courtesy of GENERAL MOTORS CORP.

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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.

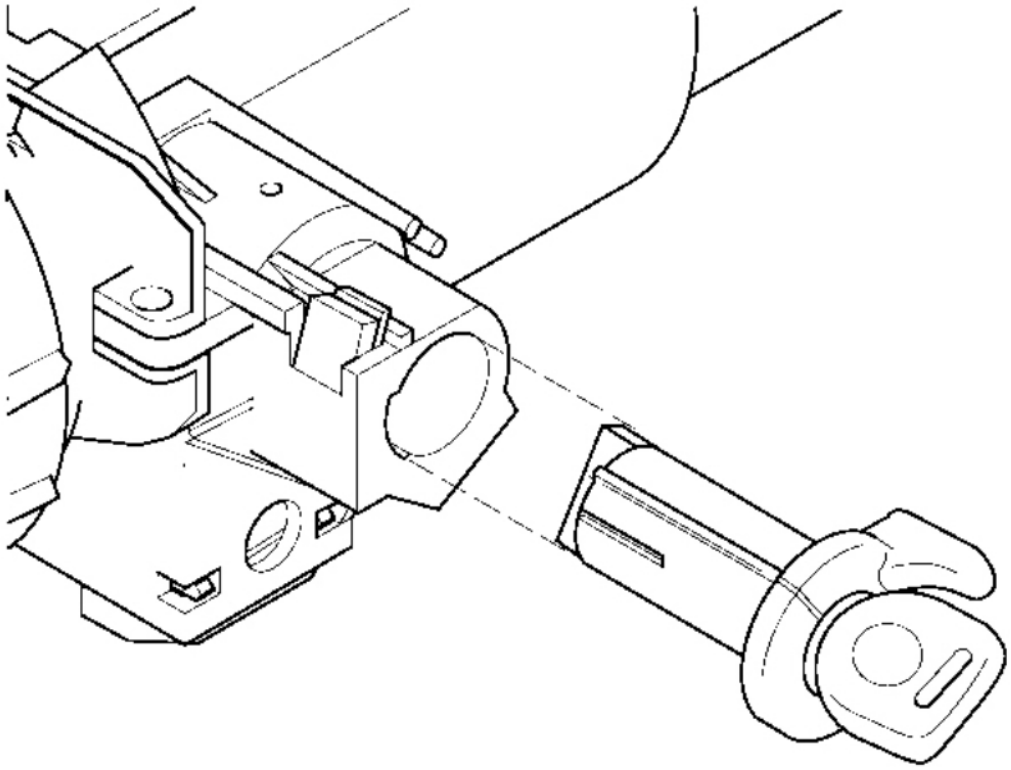


Fig. 25: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

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

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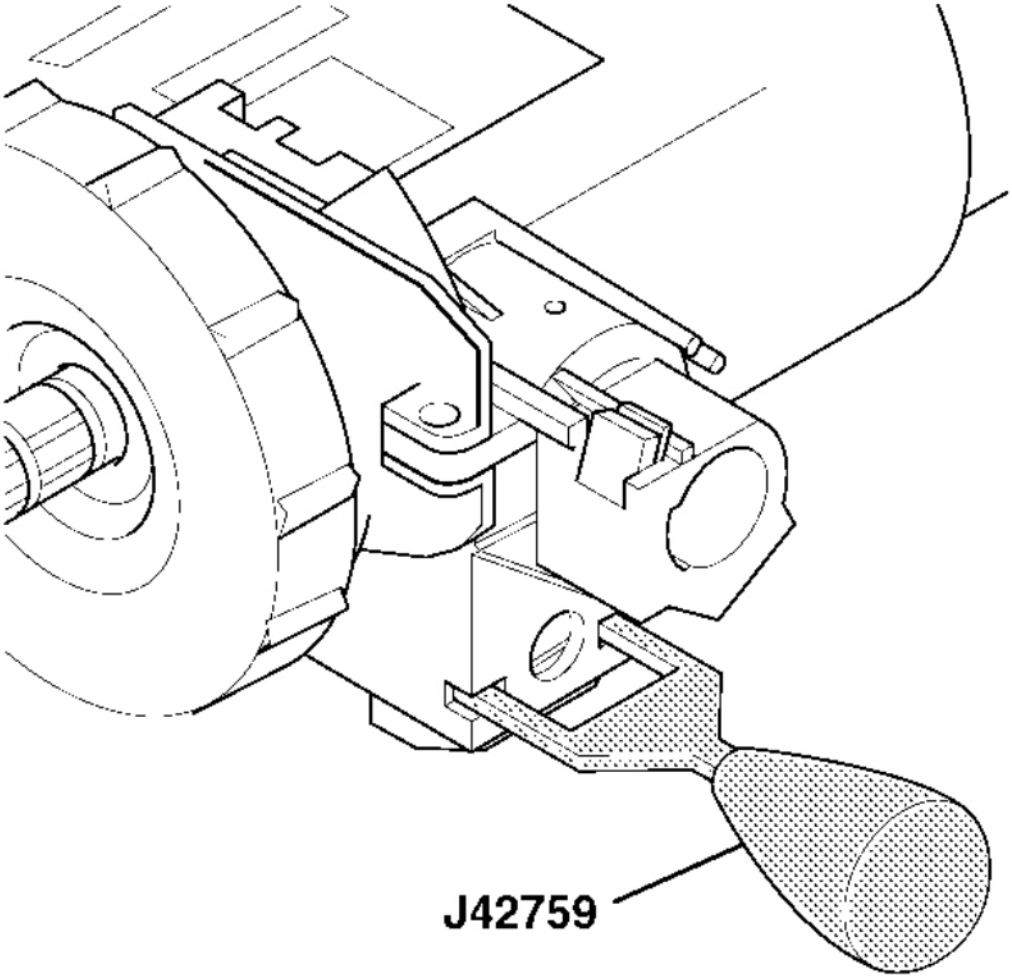


Fig. 26: Inserting J 42759 Into The Lock Cylinder Housing To Release The Tabs On The Ignition Switch
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

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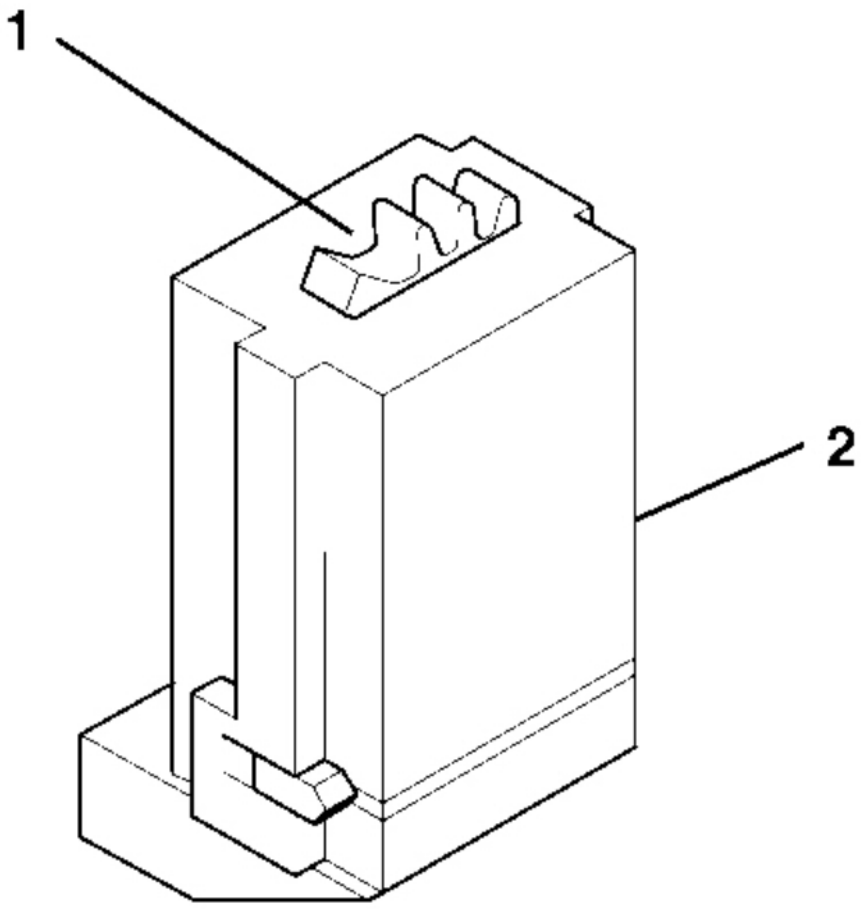


Fig. 27: Aligning Gear In The Ignition Switch
Courtesy of GENERAL MOTORS CORP.

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.

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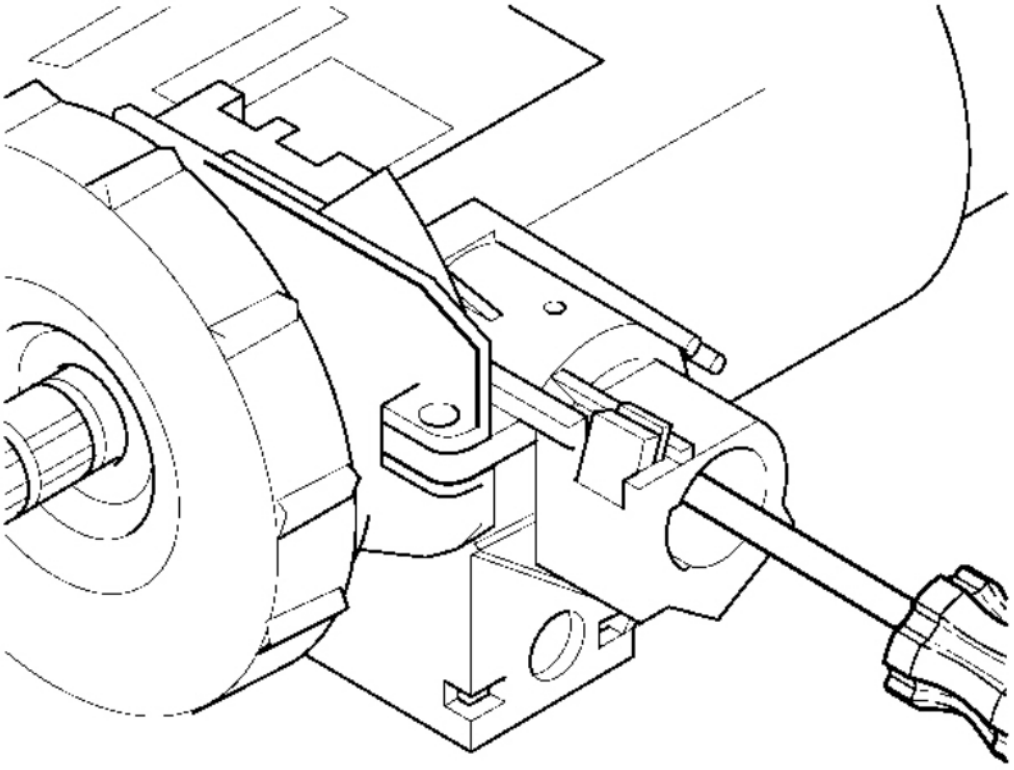


Fig. 28: Using Screwdriver To Rotate The Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

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.

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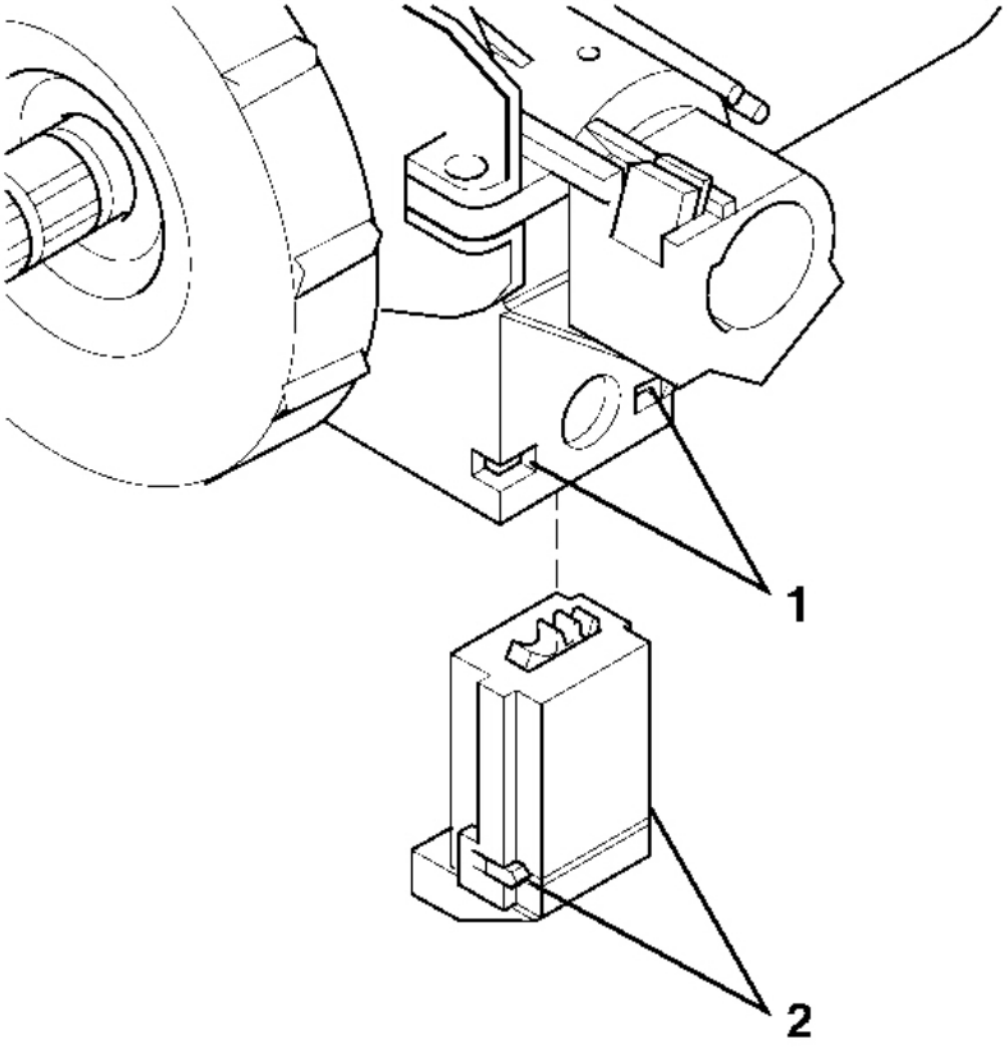


Fig. 29: Inserting Ignition Switch Into The Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

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.

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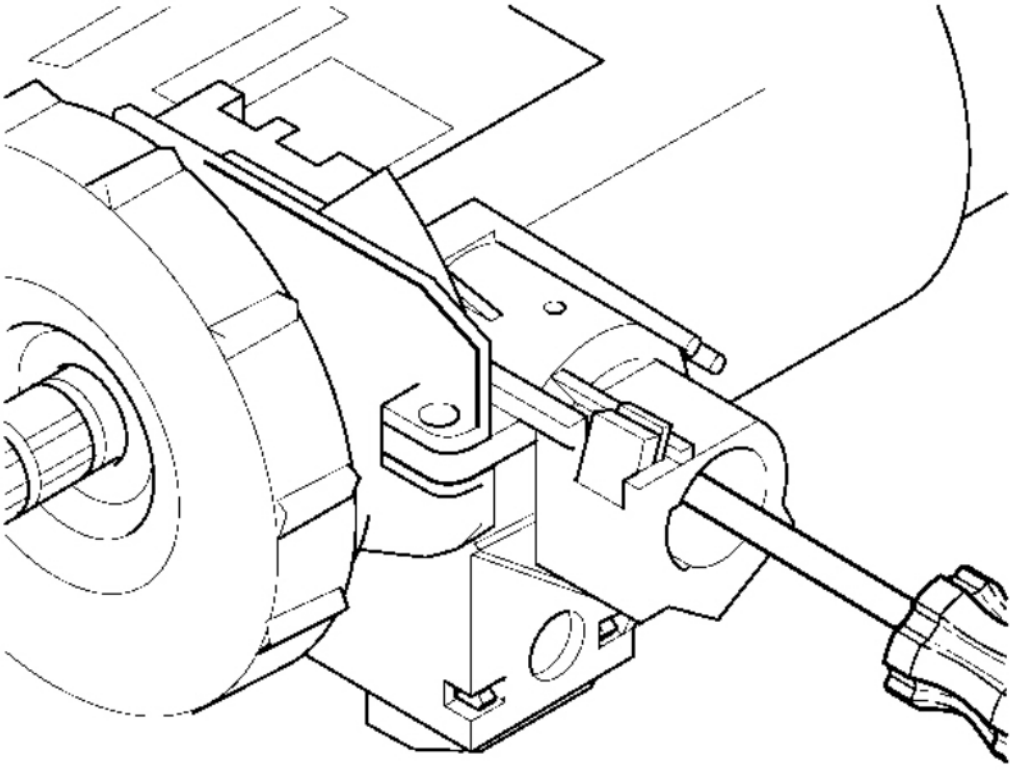


Fig. 30: Using Screwdriver To Rotate Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

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.

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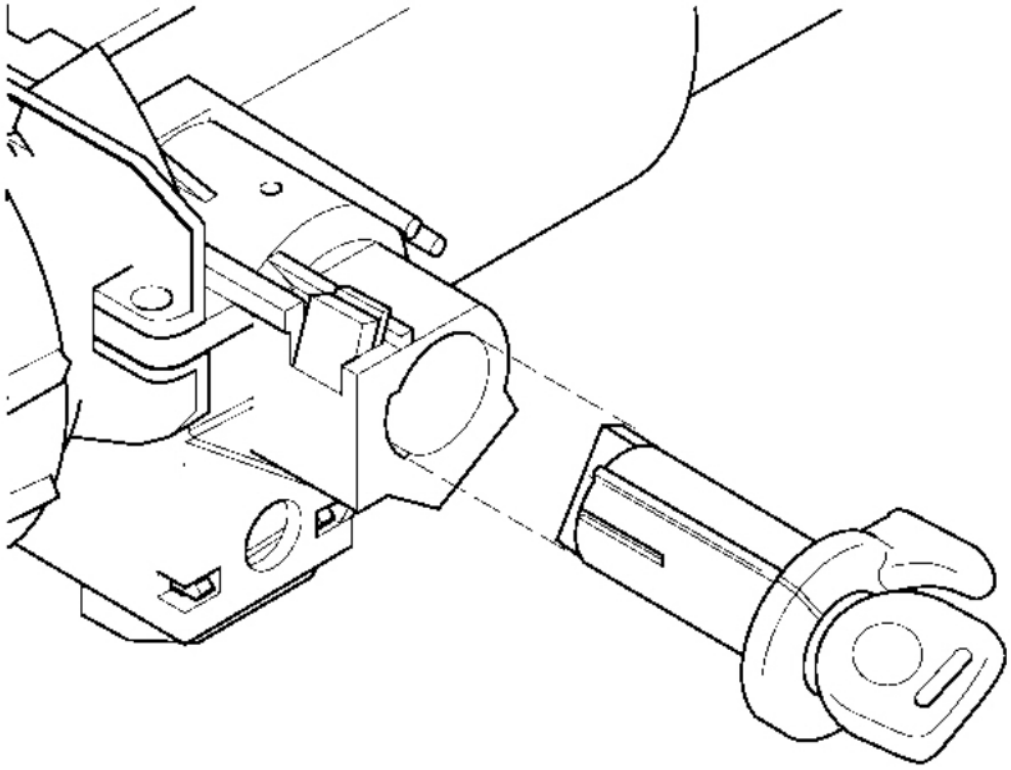


Fig. 31: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

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.

IGNITION LOCK CYLINDER REPLACEMENT

Removal Procedure

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

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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.

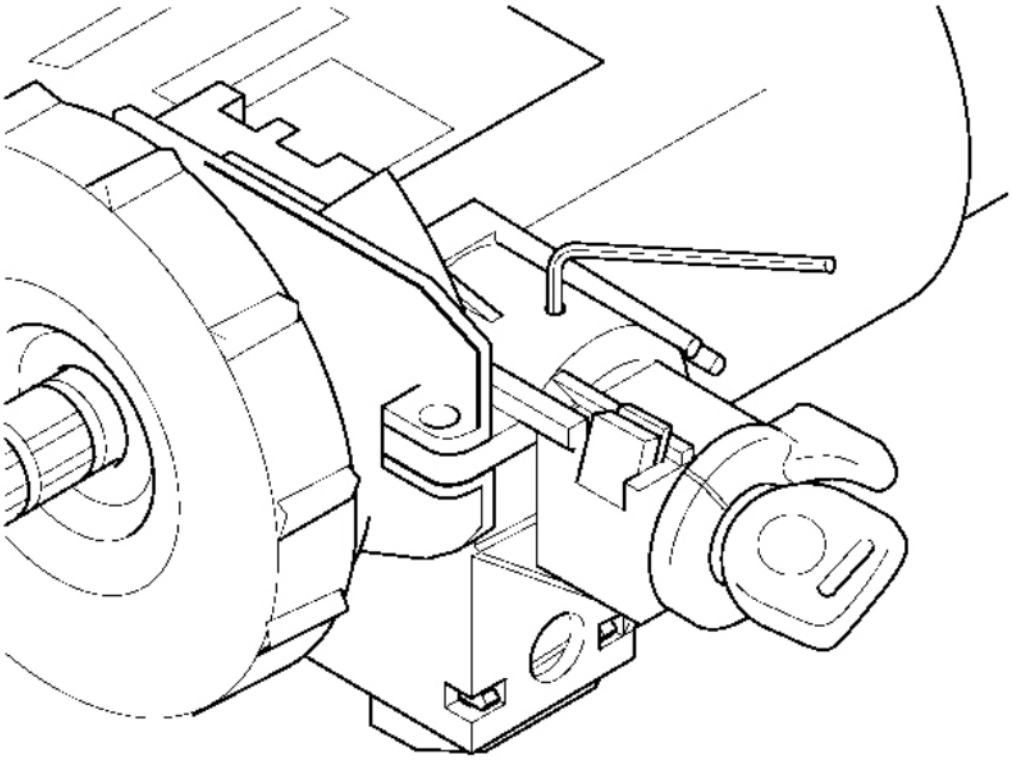


Fig. 32: Releasing/Installing Lock Cylinder Using Allen Wrench
Courtesy of GENERAL MOTORS CORP.

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.

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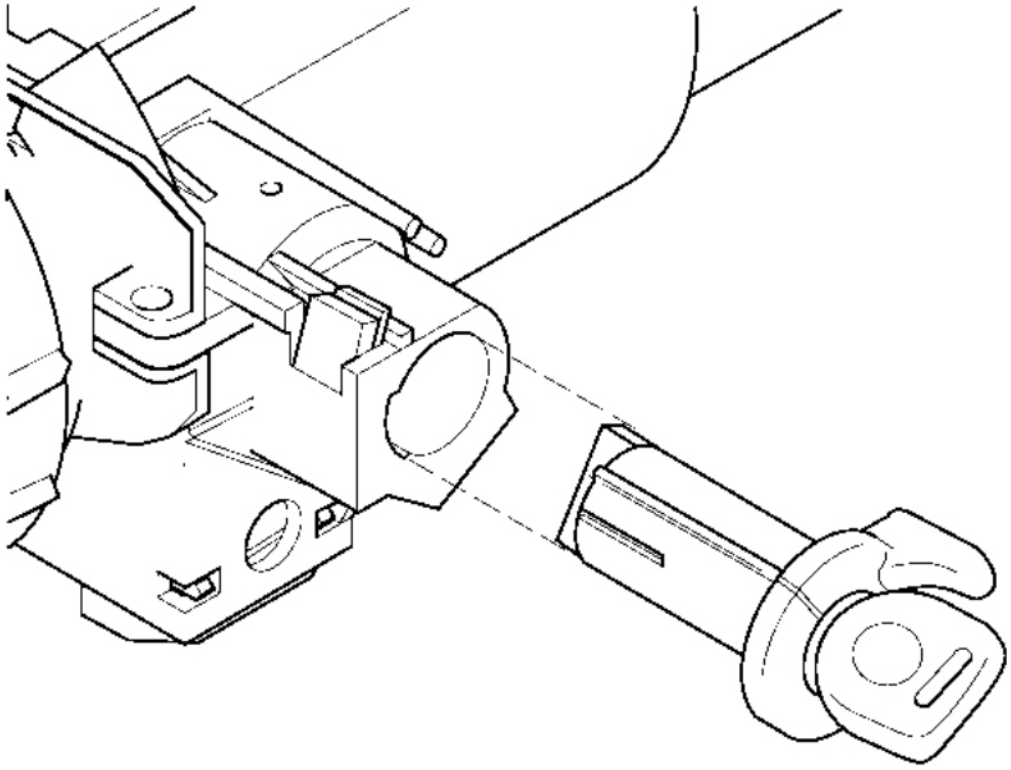


Fig. 33: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

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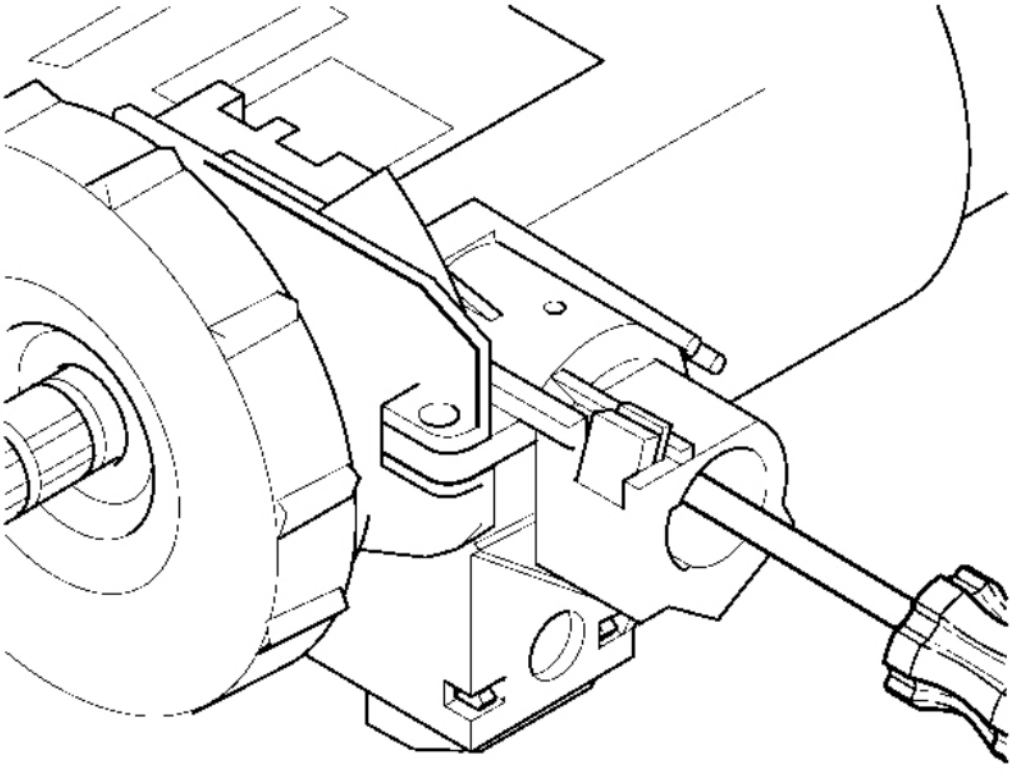


Fig. 34: Using Screwdriver To Rotate Lock Cylinder Housing Gear
Courtesy of GENERAL MOTORS CORP.

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.

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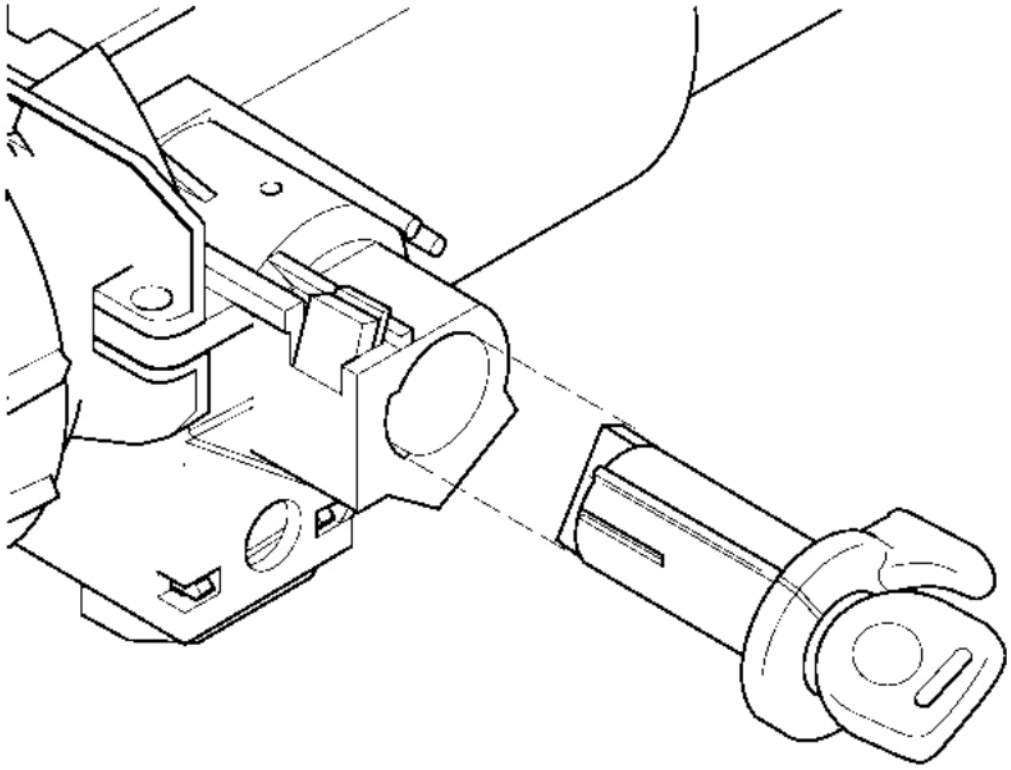


Fig. 35: View Of Lock Cylinder At Lock Cylinder Housing
Courtesy of GENERAL MOTORS CORP.

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.

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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 (Tilt)** or **Steering Column Tilt Head Housing Replacement (Standard)**.
4. Remove the park lock cable from the lock cylinder housing.

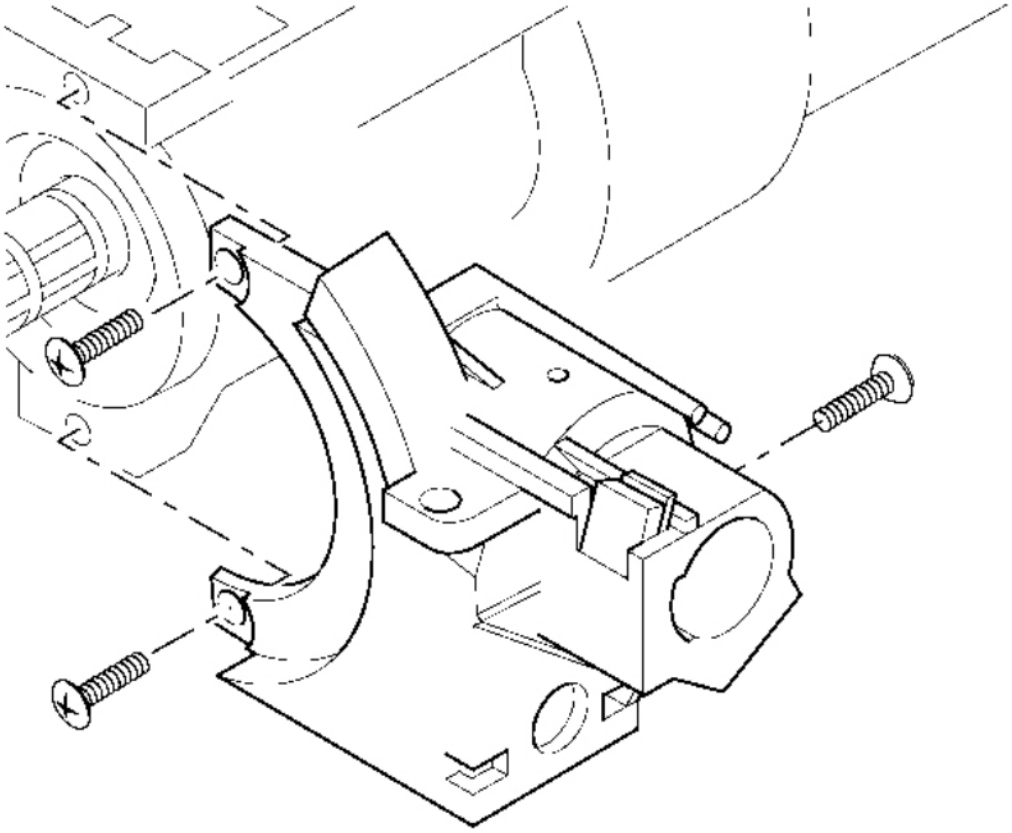


Fig. 36: View Of Lock Cylinder Housing TORX Screws
Courtesy of GENERAL MOTORS CORP.

5. Remove 3 TORX® screws.
6. Remove the lock cylinder housing from the steering column.

Installation Procedure

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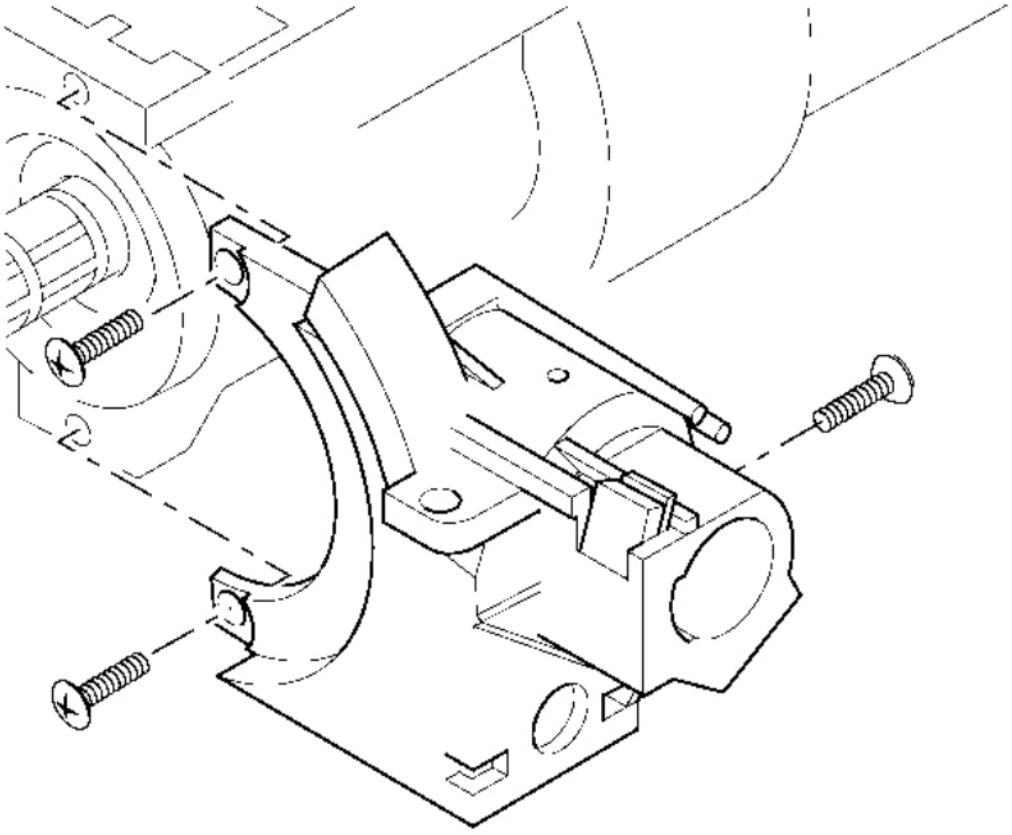


Fig. 37: View Of Lock Cylinder Housing TORX Screws
Courtesy of GENERAL MOTORS CORP.

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 (Tilt)** or **Steering Column Tilt Head Housing Replacement (Standard)**.
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 REPLACEMENT

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Removal Procedure

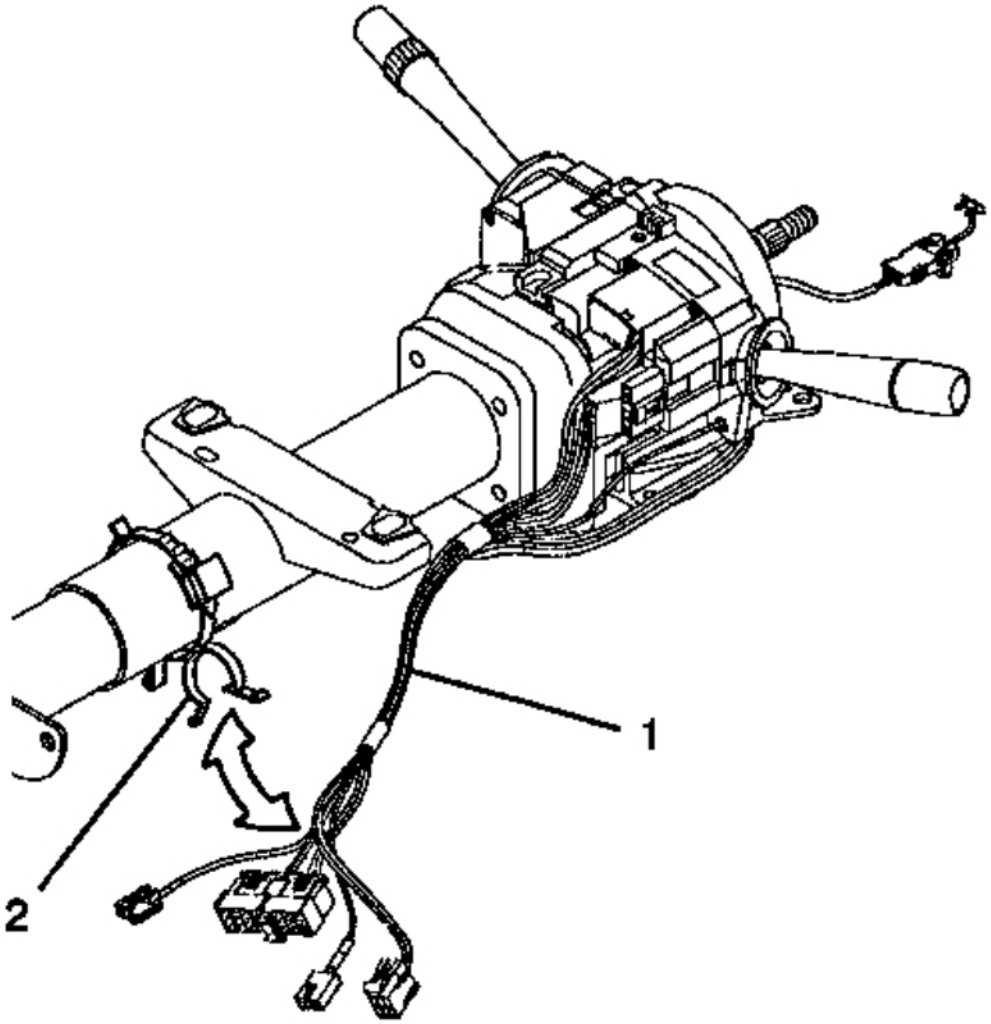


Fig. 38: View Of Steering Column Wire Harness Assembly & Wire Harness Strap
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

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

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2. Remove the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.

IMPORTANT: The abrasion sleeve located on the steering column wire harness assembly must be reinstalled. Make note of what connector is coming out of the abrasion sleeve for installation purposes.

3. Remove the wire harness assembly (1) from the wire harness strap (2).
4. Disconnect the turn signal and multifunction switch assembly connector from the SIR system coil connector.

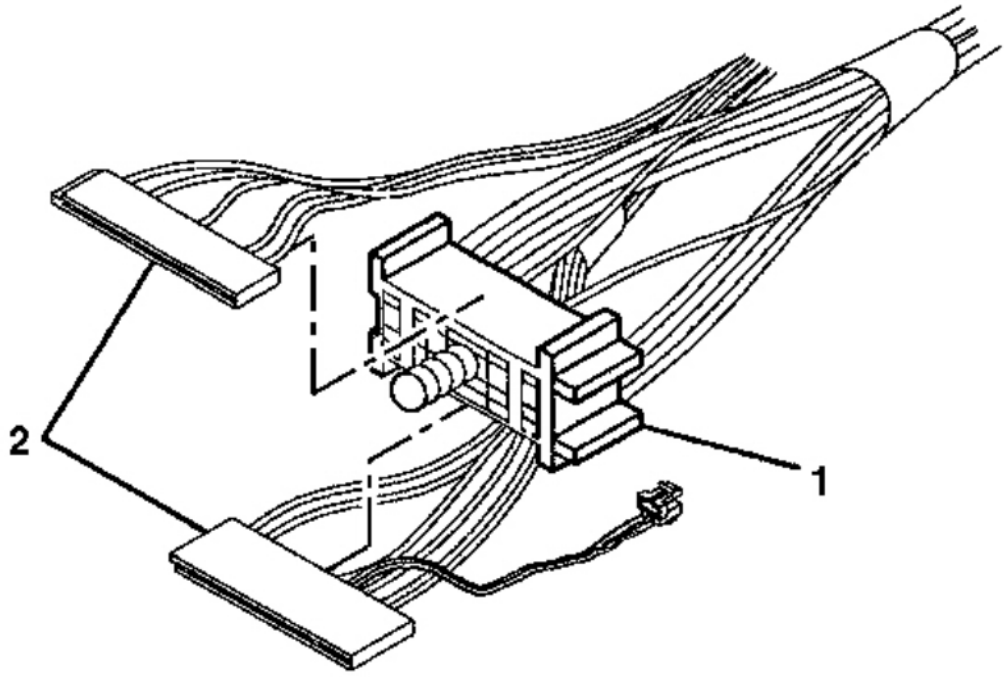


Fig. 39: Turn Signal & Multifunction Switch Assembly Connectors
Courtesy of GENERAL MOTORS CORP.

5. Slide the 2 connectors (2) of the turn signal and multifunction switch assembly out of the bulkhead connector (1).

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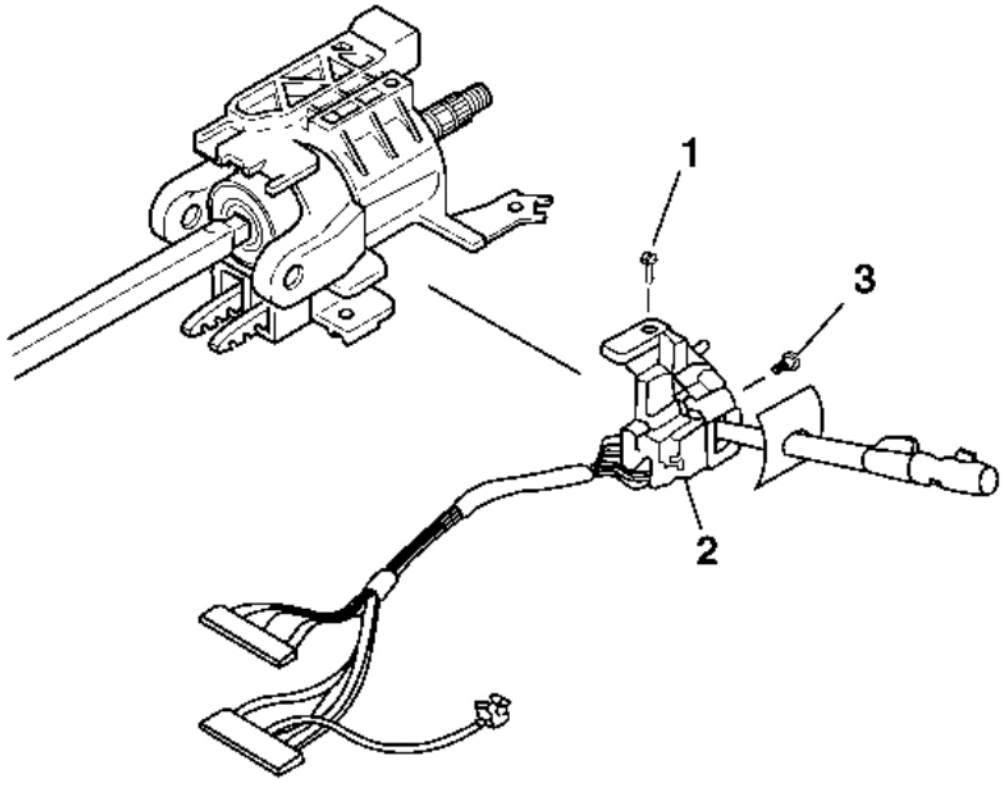


Fig. 40: View Of Turn Signal & Multifunction Switch Assembly
Courtesy of GENERAL MOTORS CORP.

6. Remove the 2 pan head tapping screws (1) and (3) from the turn signal and multifunction switch assembly (2).
7. Remove the turn signal and multifunction switch assembly (2) from the steering column tilt head assembly.

Installation Procedure

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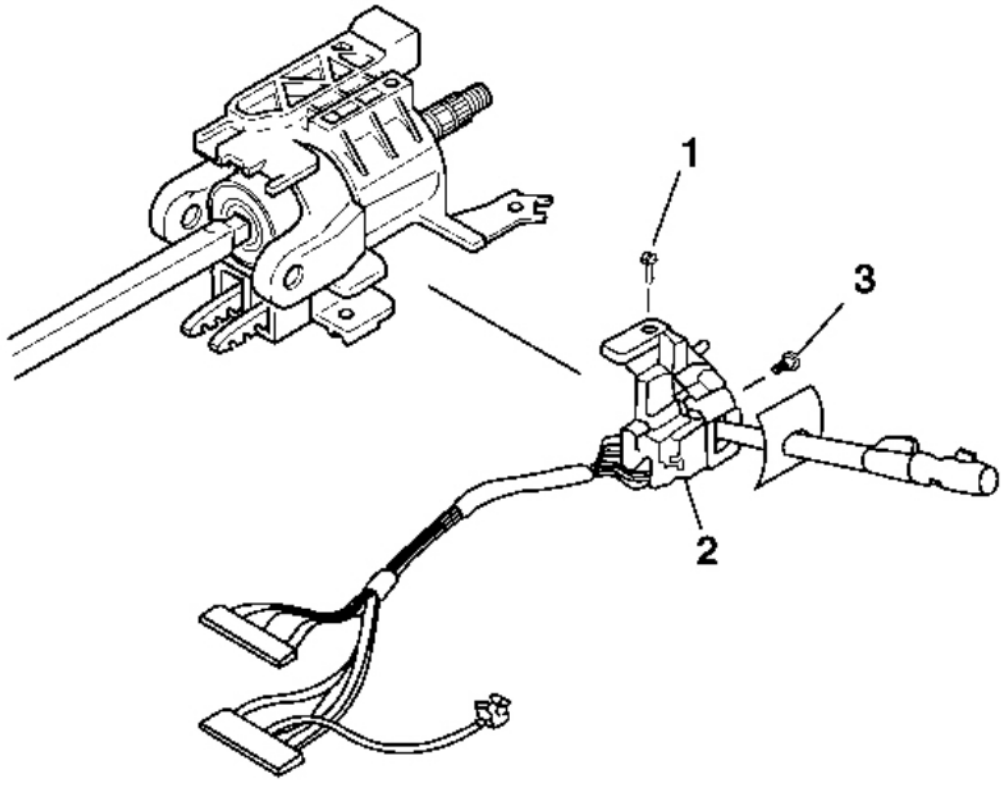


Fig. 41: View Of Turn Signal & Multifunction Switch Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the turn signal and multifunction switch assembly (2) onto the steering column tilt head assembly.

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

IMPORTANT: Be sure that the electrical contact of the turn signal and multifunction switch assembly (2) rests on the turn signal cancel cam assembly.

2. Screw the 2 pan head tapping screws (1) and (3) into the turn signal and multifunction assembly (2).

Tighten

- Tighten the top pan head tapping screw (1) to 3 N.m (27 lb in).
- Tighten the side pan head tapping screw (3) to 7 N.m (62 lb in).

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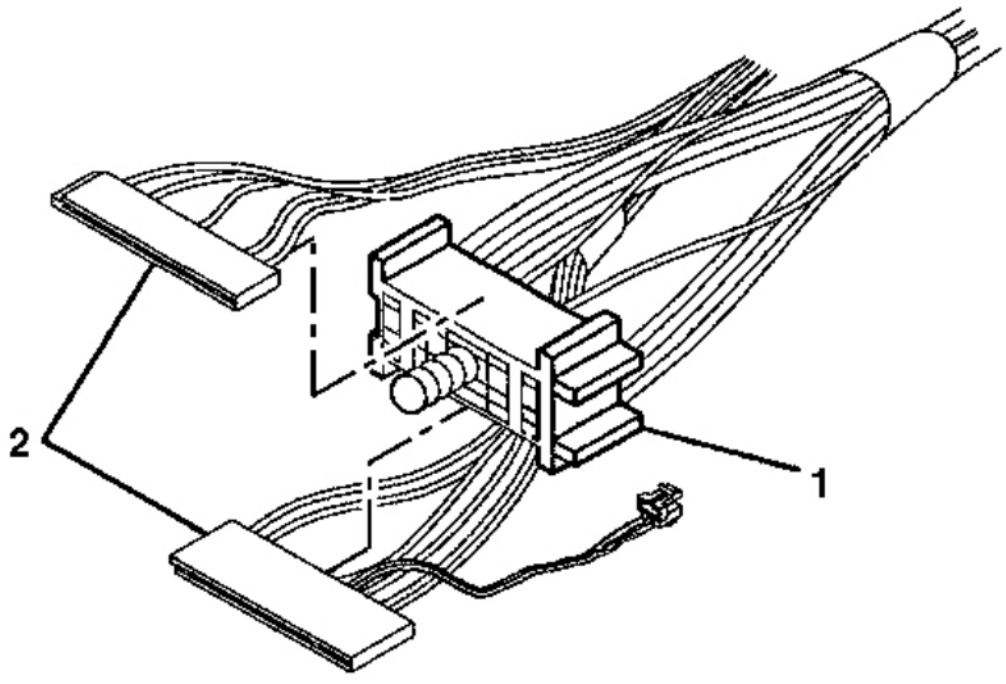


Fig. 42: Turn Signal & Multifunction Switch Assembly Connectors
Courtesy of GENERAL MOTORS CORP.

3. Slide the 2 connectors (2) of the turn signal and multifunction switch assembly into the bulkhead connector (1).

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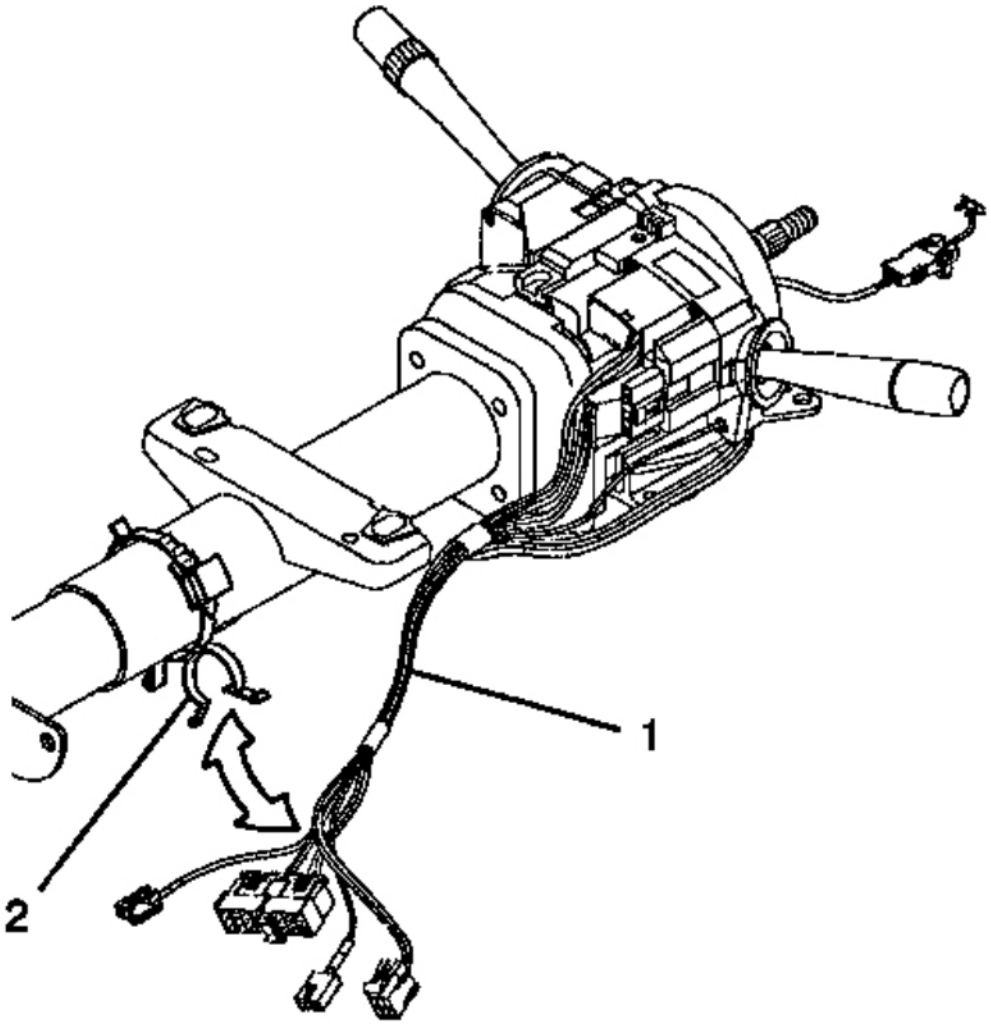


Fig. 43: View Of Steering Column Wire Harness Assembly & Wire Harness Strap
Courtesy of GENERAL MOTORS CORP.

4. Connect the turn signal and multifunction switch assembly connector to the SIR coil connector.

IMPORTANT: The abrasion sleeve must be installed back onto the steering column wire harness assembly. The ignition lock cylinder case wires and connector must be hanging out of the middle of the abrasion sleeve.

5. Install the wire harness assembly (1) into the wire harness strap (2).

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

SHIFT LEVER REPLACEMENT (WITH TOW/HAUL SWITCH)

Removal Procedure

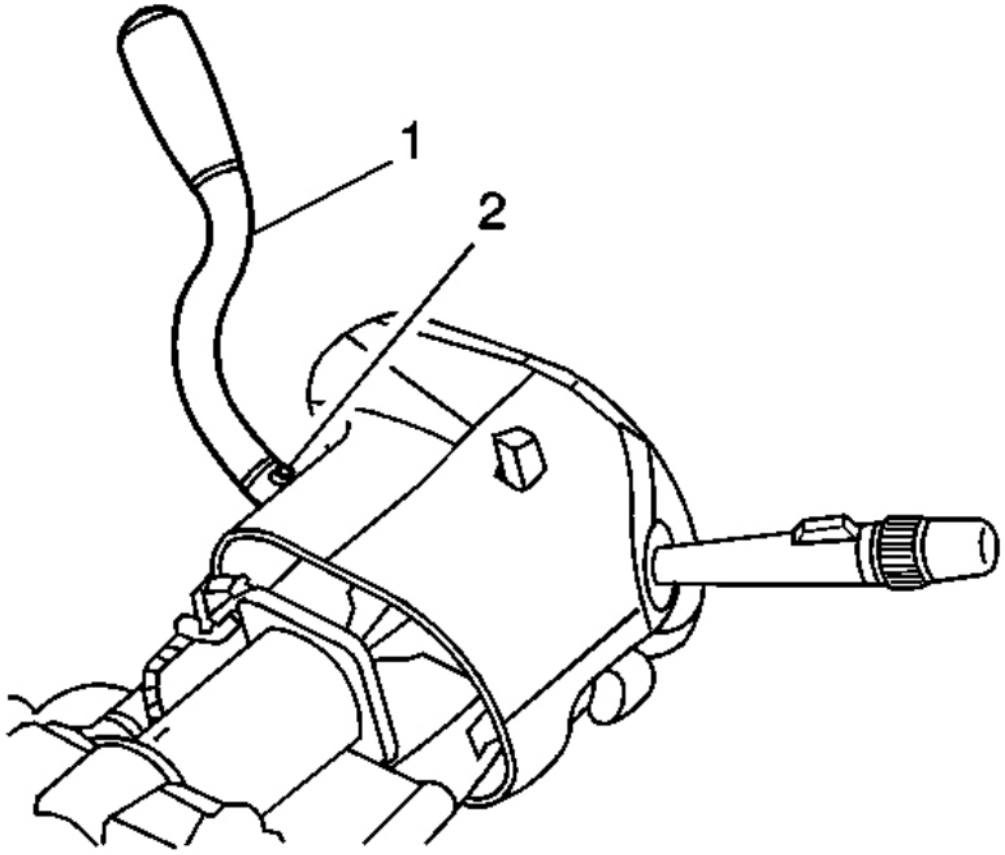


Fig. 44: Locating Seal On The Shift Lever And TORX Head Shift Lever Screw (With Tow/Haul Switch)
Courtesy of GENERAL MOTORS CORP.

1. Remove the trim covers. Refer to **Steering Column Trim Covers Replacement**.
2. Roll back the seal on the shift lever (1) until the TORX® head shift lever screw (2) is exposed.
3. Remove the TORX® head shift lever screw (2).

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4. Remove the knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages and Console.

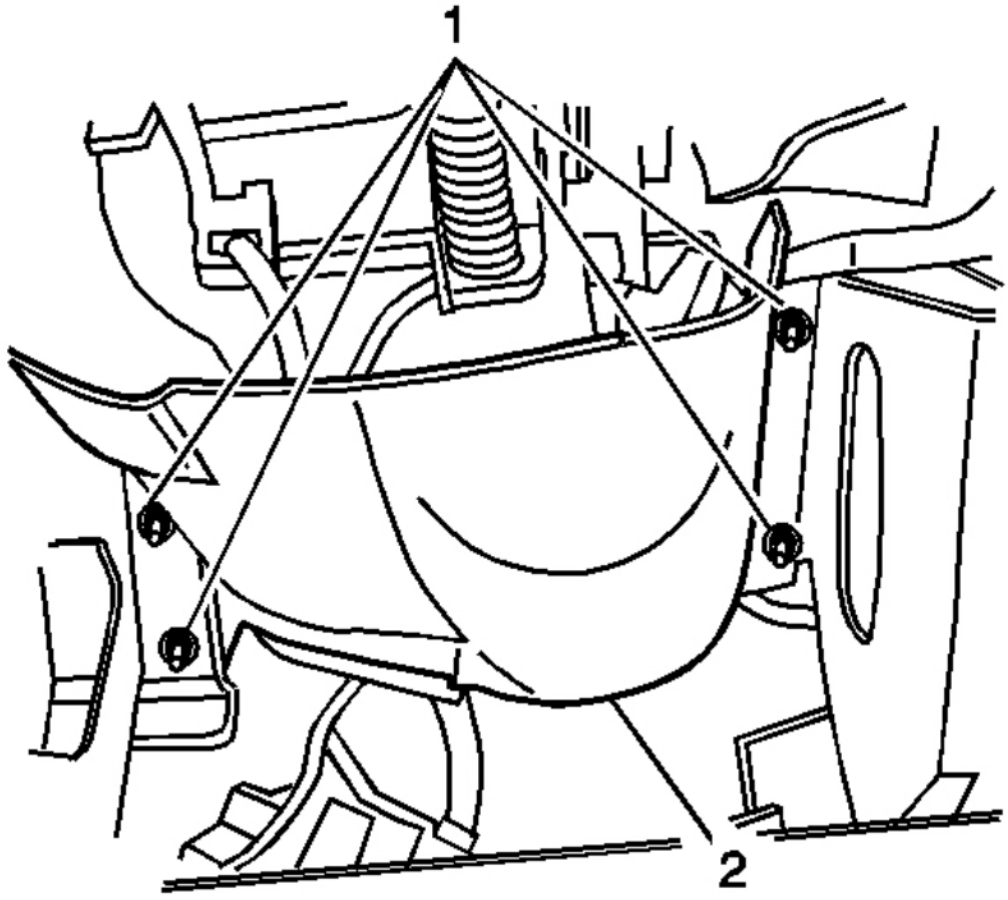


Fig. 45: View Of Knee Bolster Deflector & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Remove the nuts (1) from the knee bolster deflector bracket.

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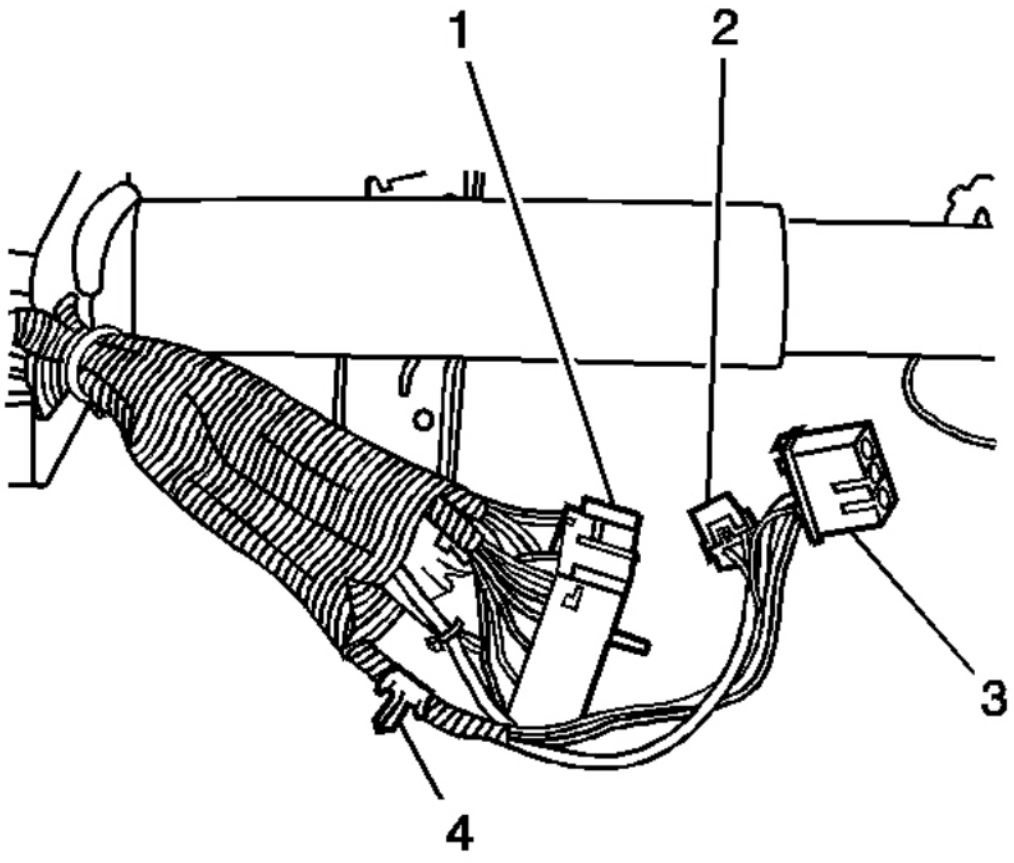


Fig. 46: View Of Wiring Harness Retaining Pin
Courtesy of GENERAL MOTORS CORP.

NOTE: During removal of the steering column the wire harness retaining clip must be removed and reinstalled after installing the steering column or damage may occur to the wire harness.

6. Remove the wiring harness retaining pin (4) from the instrument panel.
7. Remove the wire straps and open the harness insulation to gain access to the electrical wiring.
8. Remove the wiring from the electrical connector.
9. Remove the shift lever.

Installation Procedure

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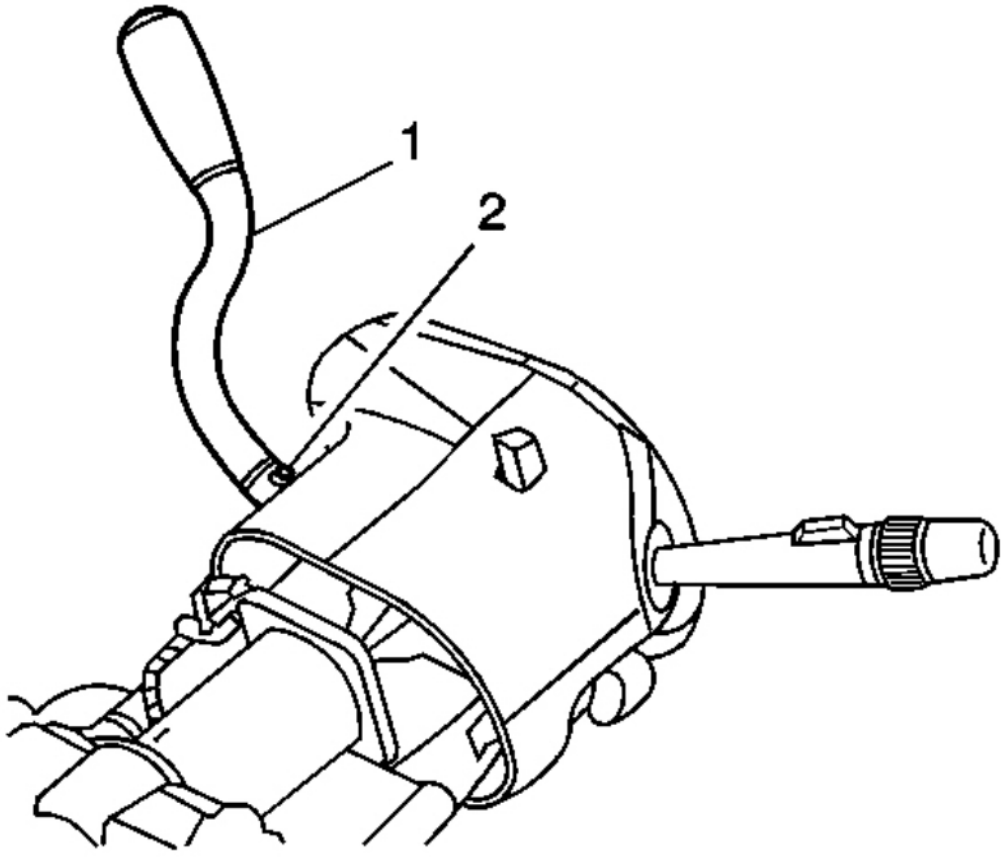


Fig. 47: Locating Seal On The Shift Lever And TORX Head Shift Lever Screw (With Tow/Haul Switch)
Courtesy of GENERAL MOTORS CORP.

1. Install the shift lever (1).
2. Connect the shifter electrical connector.
3. Install the wire straps to the harness.

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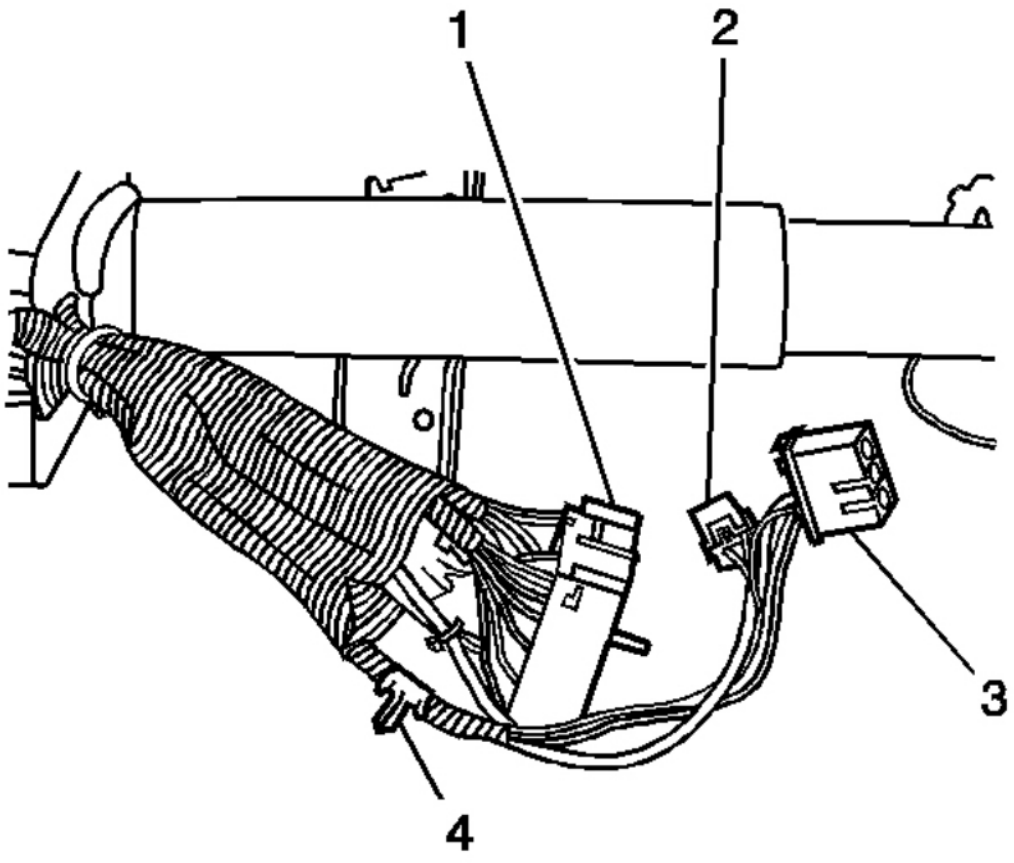


Fig. 48: View Of Wiring Harness Retaining Pin
Courtesy of GENERAL MOTORS CORP.

4. Install the harness retaining pin (4) to the instrument panel.

NOTE: Refer to Fastener Notice in Cautions and Notices.

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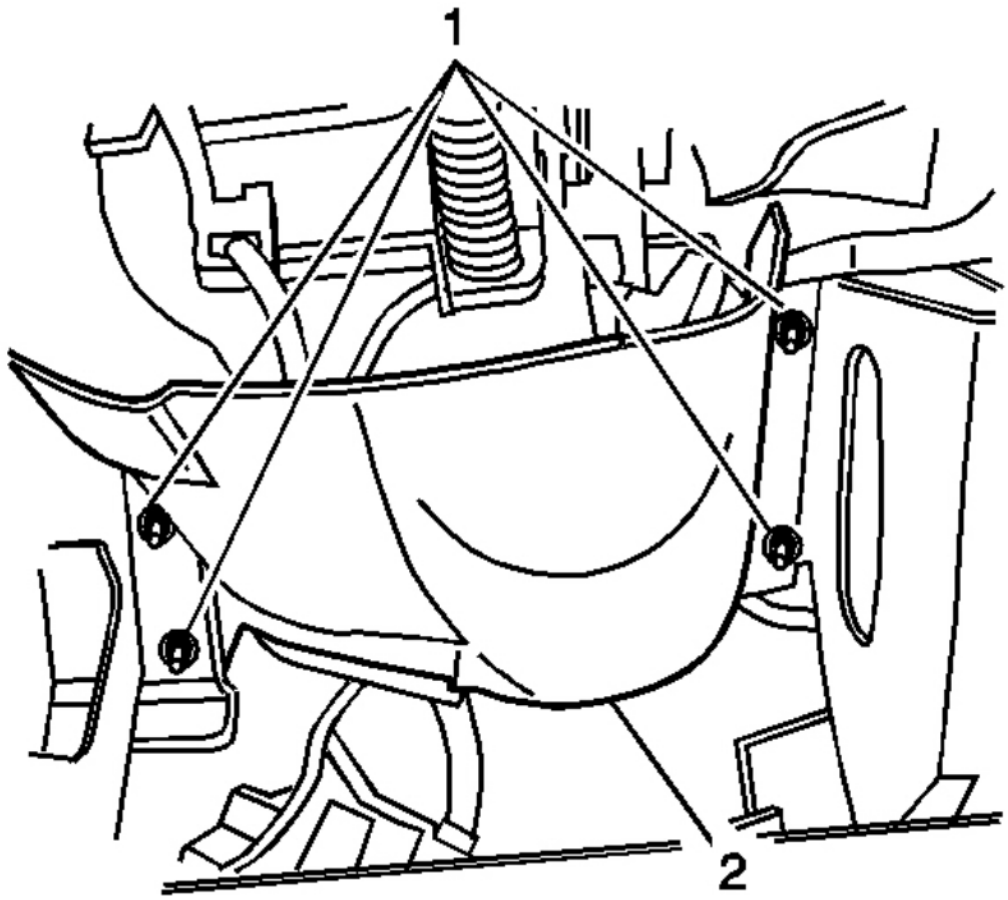


Fig. 49: View Of Knee Bolster Deflector & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Install the knee bolster deflector bracket and nuts (1).

   Tighten: Tighten the nuts to 9 N.m (80 lb in).

6. Install the knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages and Console.
7. Install the TORX® head shift lever screw.

   Tighten: Tighten the screw to 20 N.m (15 lb ft).

8. Roll the seal over the TORX® head shift lever screw.
9. Install the 2 TORX® head screws to the lower column trim cover.

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10. Install the trim covers. Refer to **Steering Column Trim Covers Replacement**.

SHIFT LEVER REPLACEMENT (WITHOUT TOW/HAUL SWITCH)

Removal Procedure

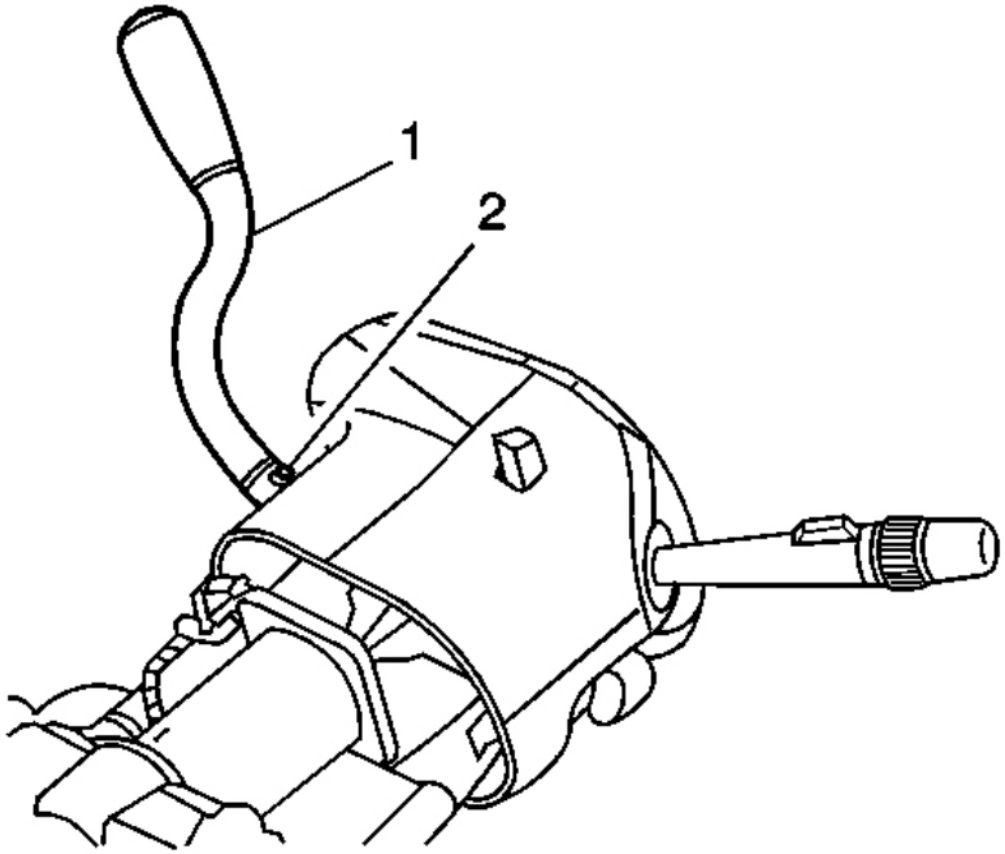


Fig. 50: Locating Seal On The Shift Lever And TORX Head Shift Lever Screw (With Tow/Haul Switch)
Courtesy of GENERAL MOTORS CORP.

1. Roll back the seal until the TORX® head shift lever screw (2) is exposed.
2. Remove the TORX® head shift lever screw (2).
3. Remove the shift lever.

Installation Procedure

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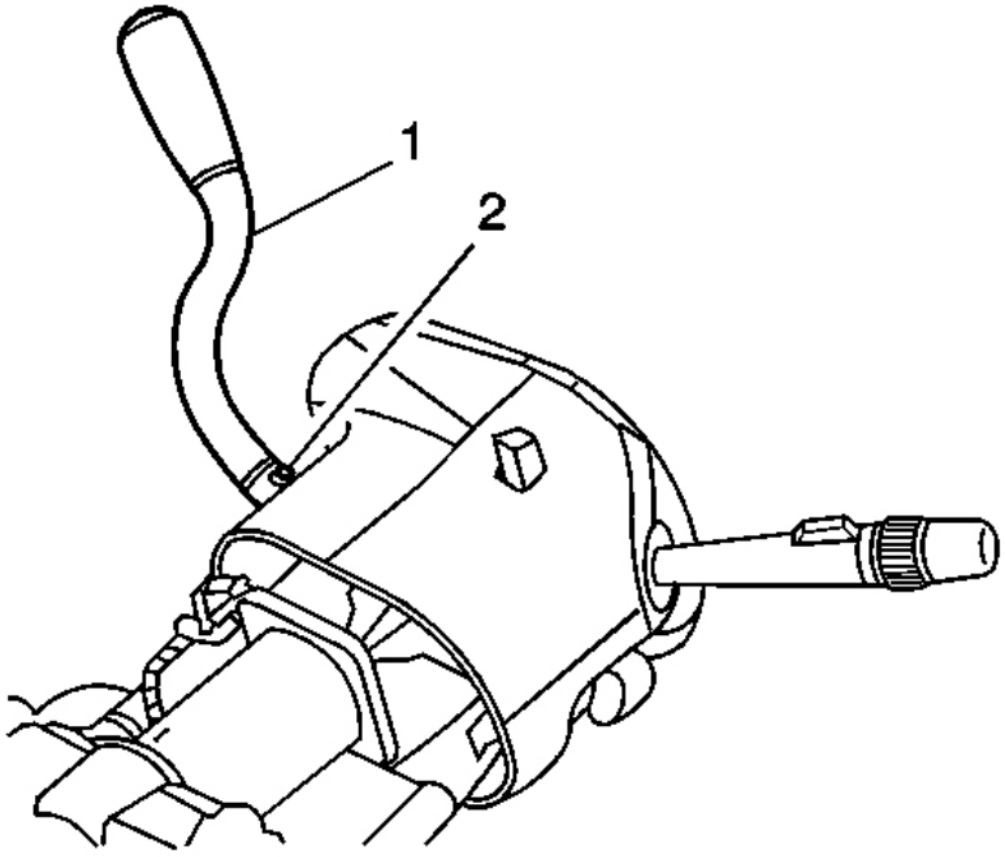


Fig. 51: Locating Seal On The Shift Lever And TORX Head Shift Lever Screw (With Tow/Haul Switch)
Courtesy of GENERAL MOTORS CORP.

1. Install the shift lever (1).

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

2. Install the TORX® head shift lever screw (2).

   Tighten: Tighten the screw to 20 N.m.

3. Roll the seal over the TORX® head shift lever screw (2).

LINEAR SHIFT ASSEMBLY REPLACEMENT

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Removal Procedure

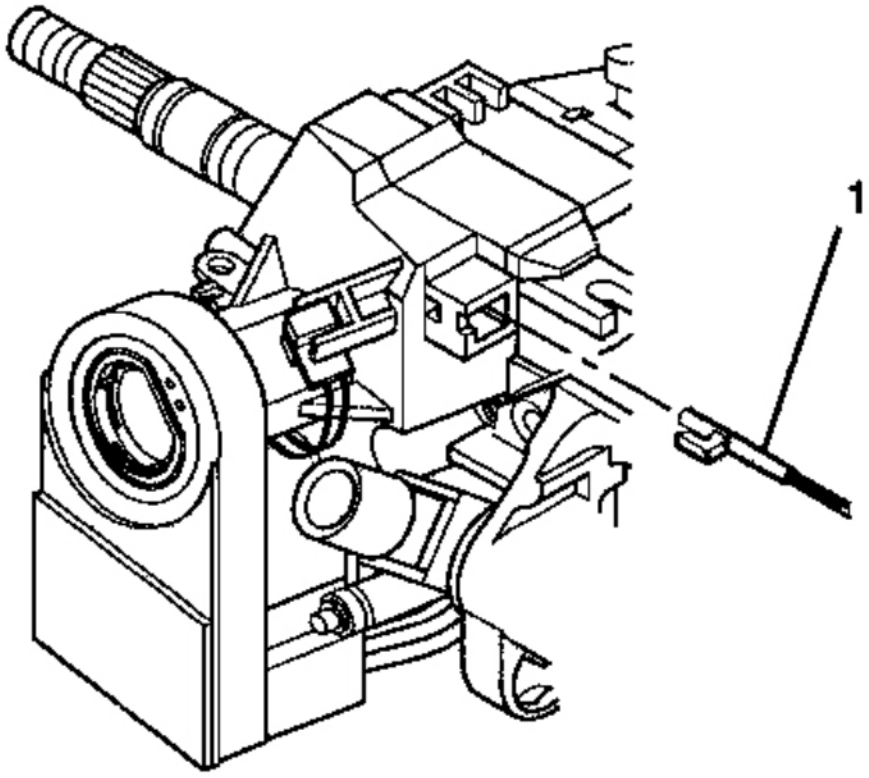


Fig. 52: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

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 shift lever. Refer to **Shift Lever Replacement (With Tow/Haul Switch)** or **Shift Lever Replacement (Without Tow/Haul Switch)**.
3. Remove the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
4. Disconnect the park lock cable assembly (1).
5. The steering column lock cylinder set should be in the OFF-LOCK position.
6. Insert a small screwdriver into the slot on the ignition lock cylinder case and push against the locking tab

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to remove.

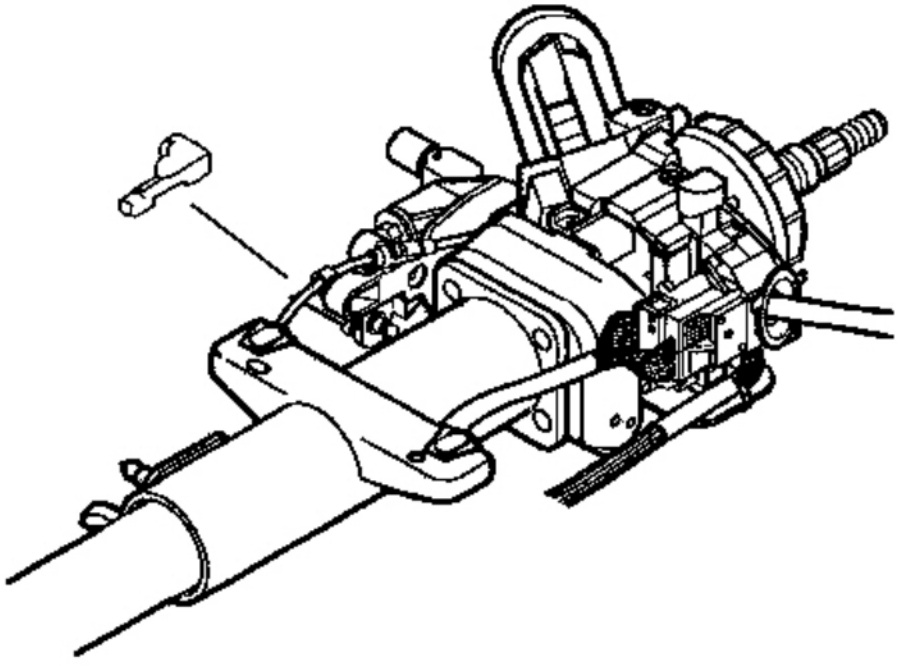


Fig. 53: View Of Park Position Switch Assembly
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the automatic transmission shift lock control connector from the park position switch assembly.
8. Slide the park position switch assembly off of the linear shift assembly.

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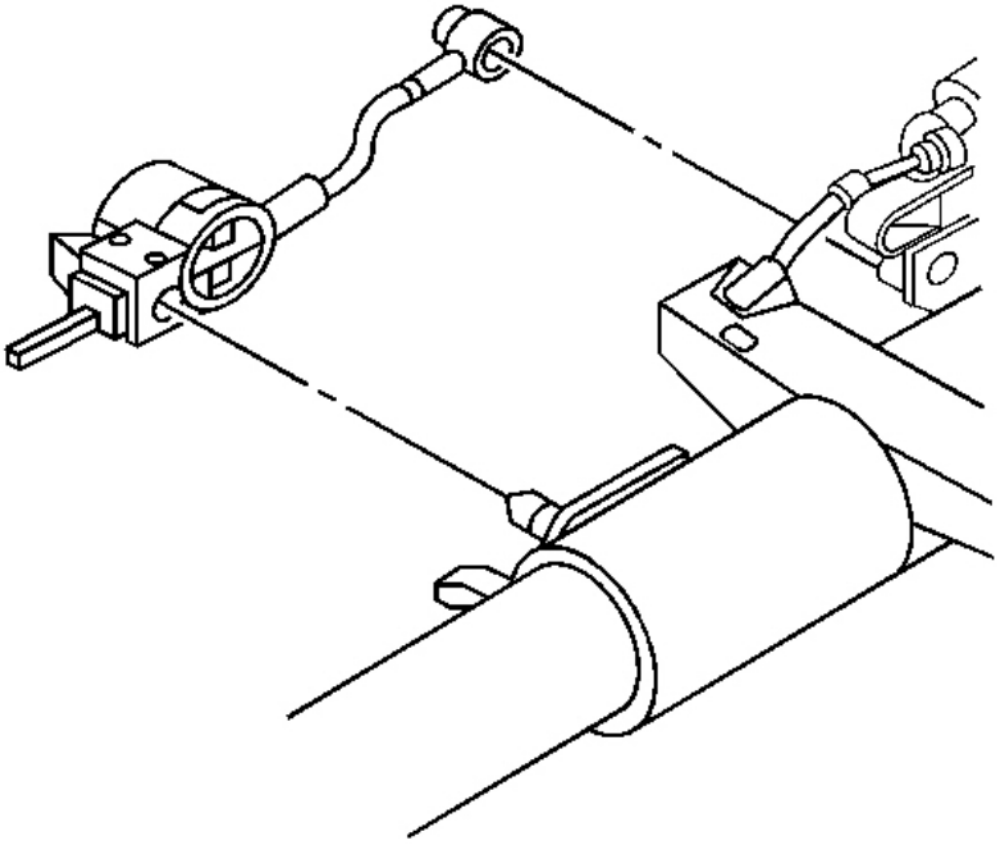


Fig. 54: View Of Automatic Transmission Shift Lock Control Actuator
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not use excessive force when removing the automatic transmission shift lock control from the steering column. Using excessive force may cause damage to the automatic transmission shift lock control and/or the steering column.

9. Remove the automatic transmission shift lock control from the steering column.
10. Use a small screwdriver to pry the automatic transmission shift lock control from the steering column jacket assembly.

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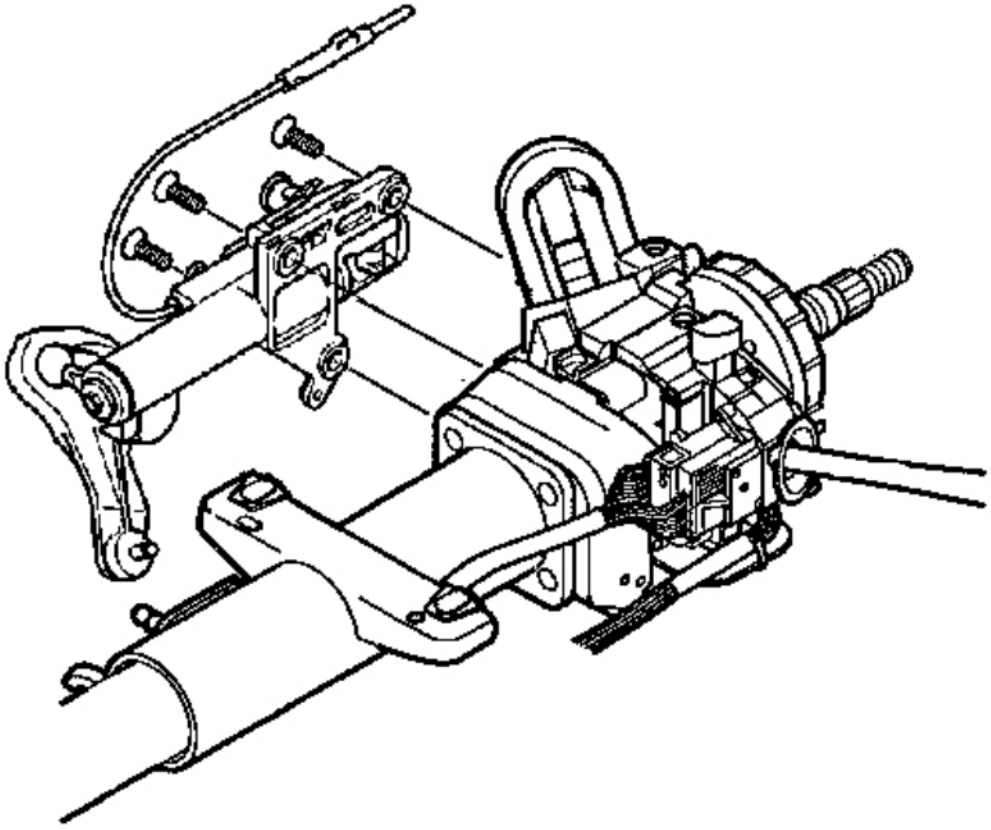


Fig. 55: View Of Linear Shift Assembly And Retaining Screws
Courtesy of GENERAL MOTORS CORP.

11. Remove the 3 TORX® screws from the linear shift assembly.
12. Remove the linear shift assembly from the steering column support assembly.

Installation Procedure

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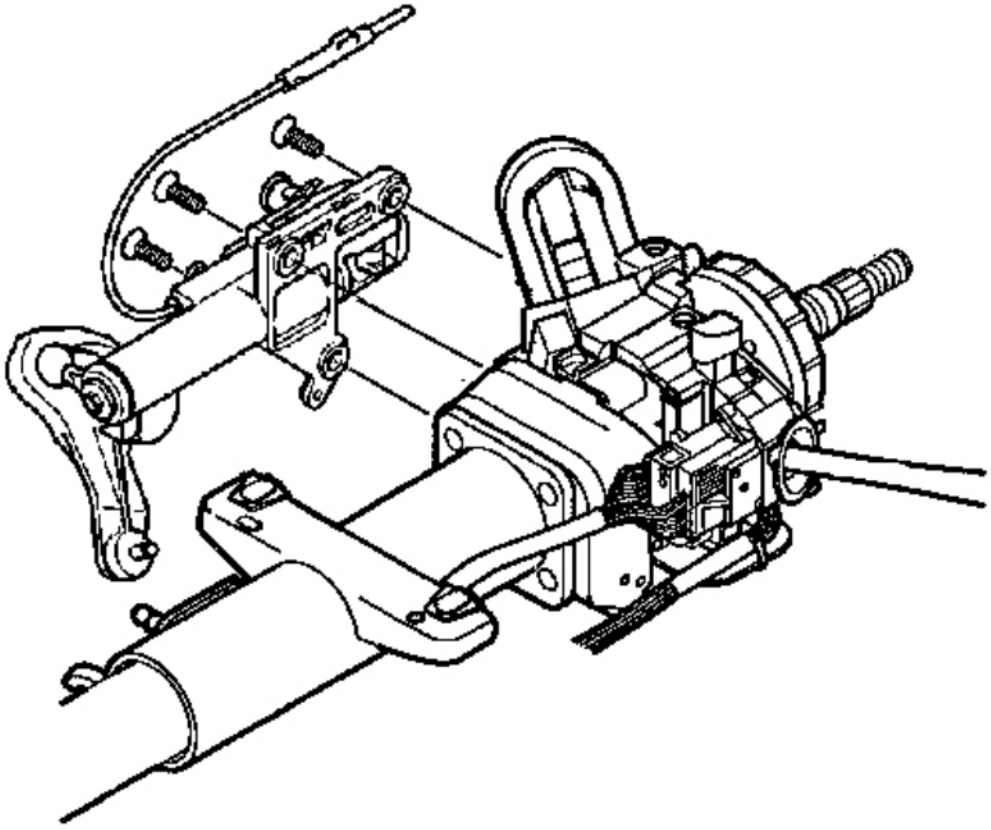


Fig. 56: View Of Linear Shift Assembly And Retaining Screws
Courtesy of GENERAL MOTORS CORP.

1. Install the linear shift assembly onto the steering column support assembly.

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

2. Secure the linear shift assembly to the steering column assembly with the 3 flat head tapping screws.

   Move the linear shift assembly out of the PARK position to install the lower socket tapping screw.

   Tighten: Tighten the 3 TORX® screws to 10 N.m (89 lb in).

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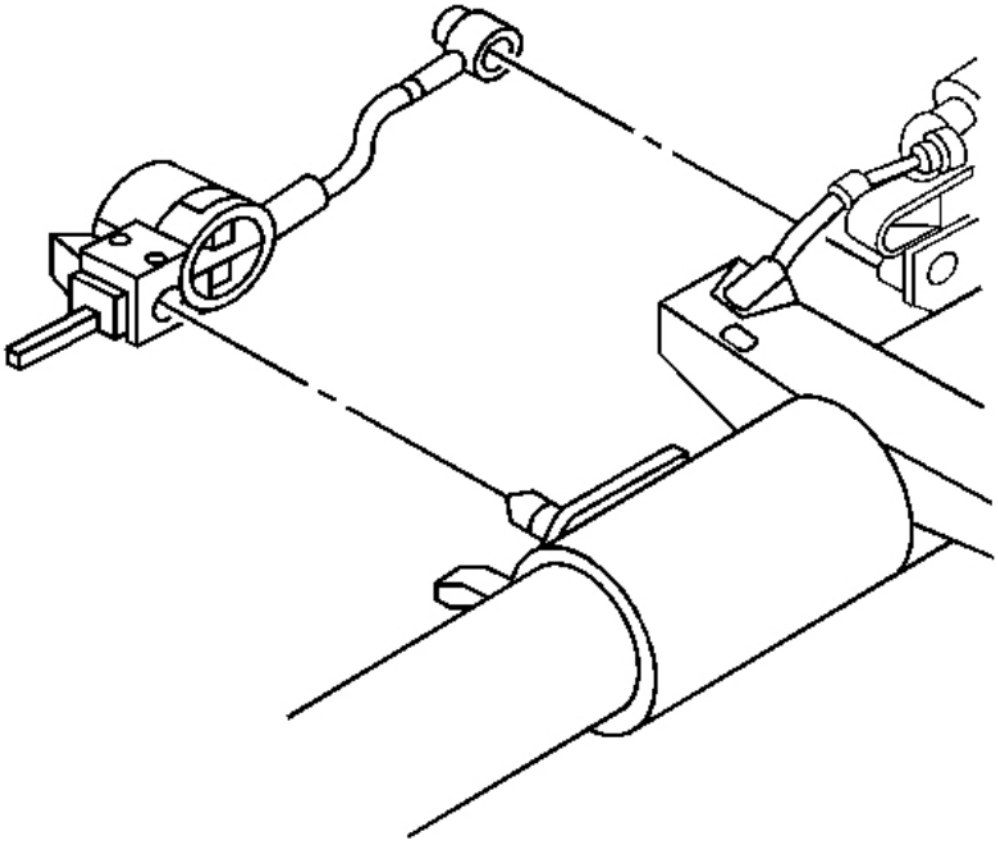


Fig. 57: View Of Automatic Transmission Shift Lock Control Actuator
Courtesy of GENERAL MOTORS CORP.

3. Install the automatic transmission shift lock control.
4. Install the shift lever clevis and put the column in the neutral position.
5. The neutral position is 2 positions from the park position.

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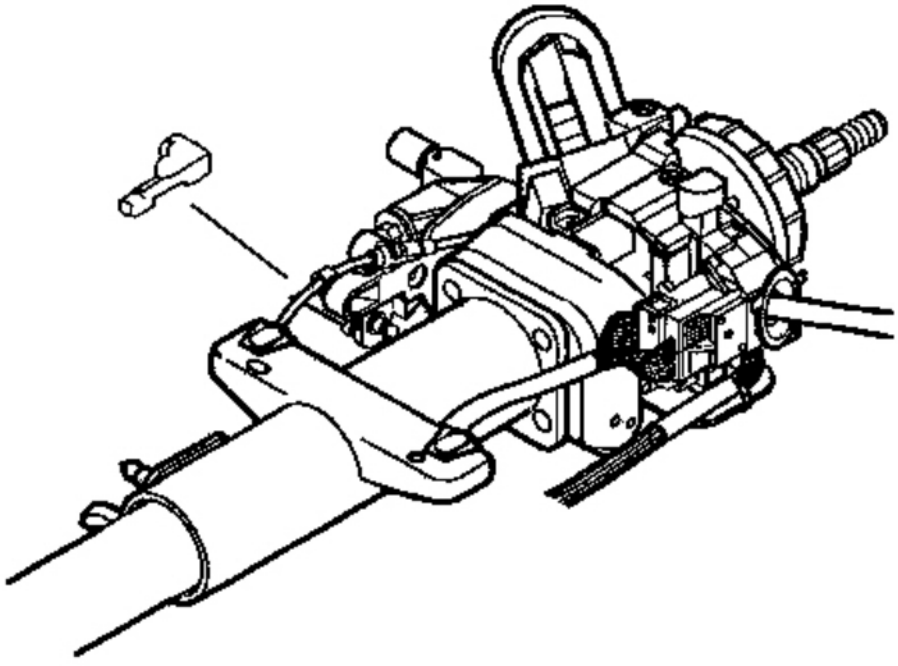


Fig. 58: View Of Park Position Switch Assembly
Courtesy of GENERAL MOTORS CORP.

6. Slide the park position switch assembly onto the linear shift assembly.
7. Connect the automatic transmission shift lock control connector onto the park position switch assembly.

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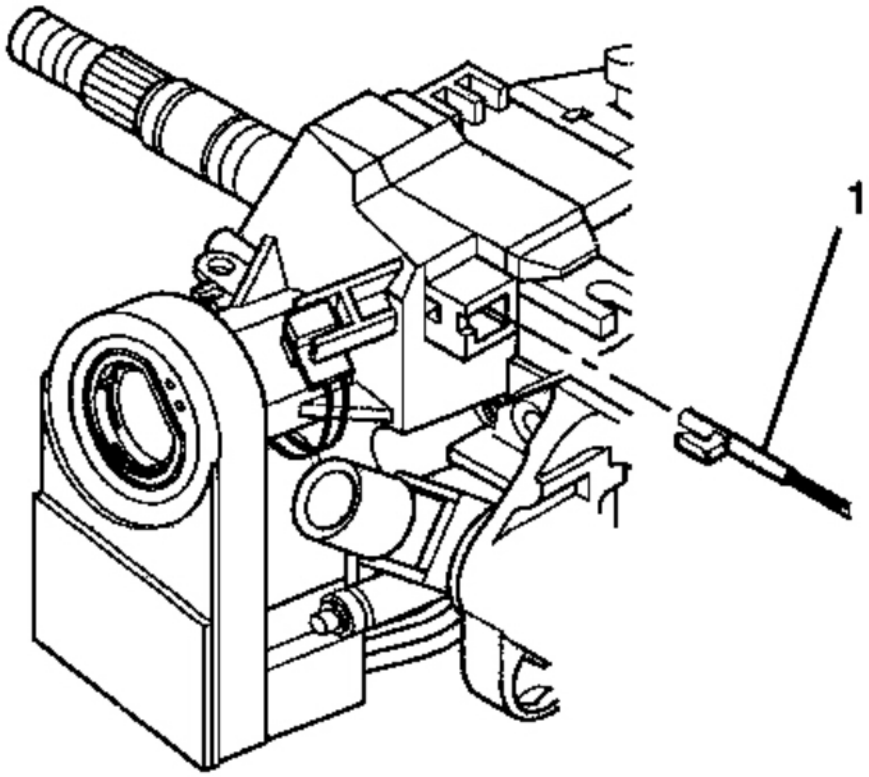


Fig. 59: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

8. Connect the park lock cable assembly (1) to the ignition lock cylinder case in the following way:
    1. Place the steering column lock cylinder set into the off position.
    2. Place the shift lever clevis into the park position.
    3. Press the locking tab on the end of the park lock cable assembly (1) into the slot in the ignition lock cylinder case.
9. Install the shift lever. Refer to **Shift Lever Replacement (With Tow/Haul Switch)** or **Shift Lever Replacement (Without Tow/Haul Switch)**.
10. Install the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
11. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

TILT LEVER REPLACEMENT

Removal Procedure

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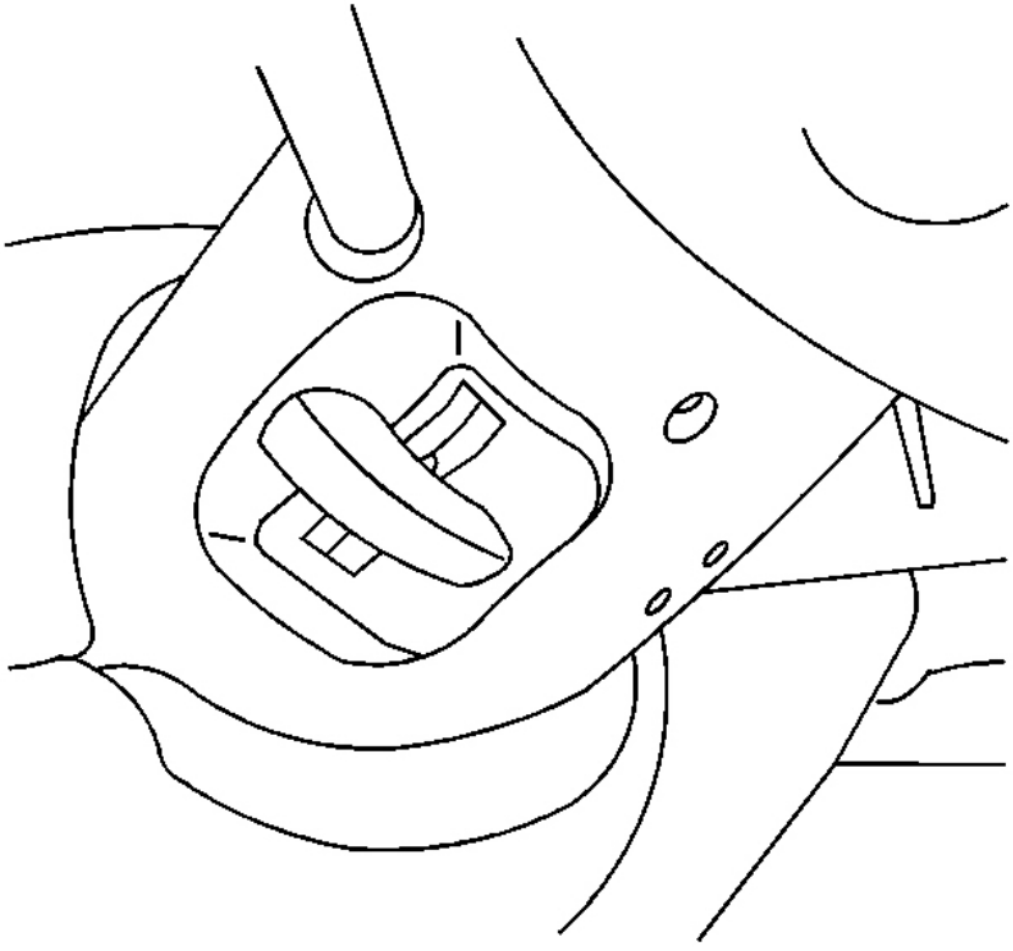


Fig. 60: View Of Tilt Lever In The Steering Column
Courtesy of GENERAL MOTORS CORP.

Pull the lever out of the steering column.

Installation Procedure

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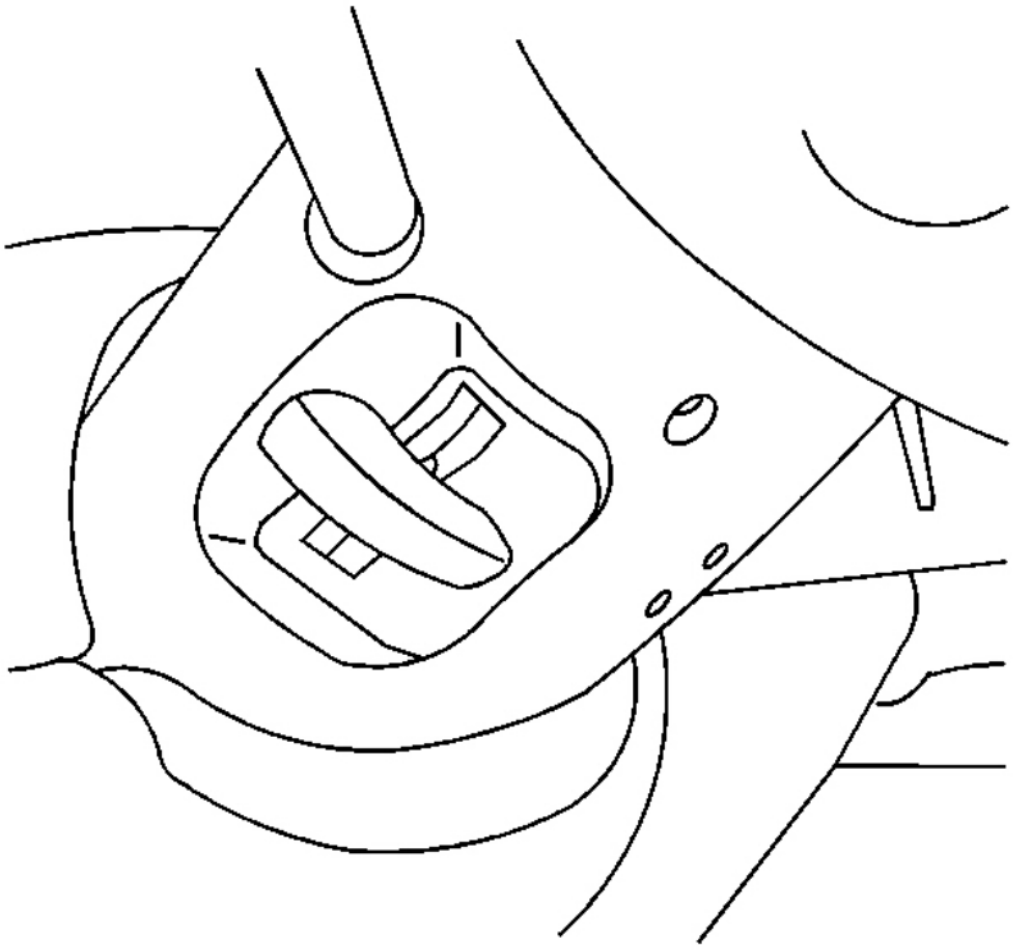


Fig. 61: View Of Tilt Lever In The Steering Column
Courtesy of GENERAL MOTORS CORP.

1. Align the lever in the steering column.
2. Push the lever into the steering column.

HORN SWITCH REPLACEMENT

Removal Procedure

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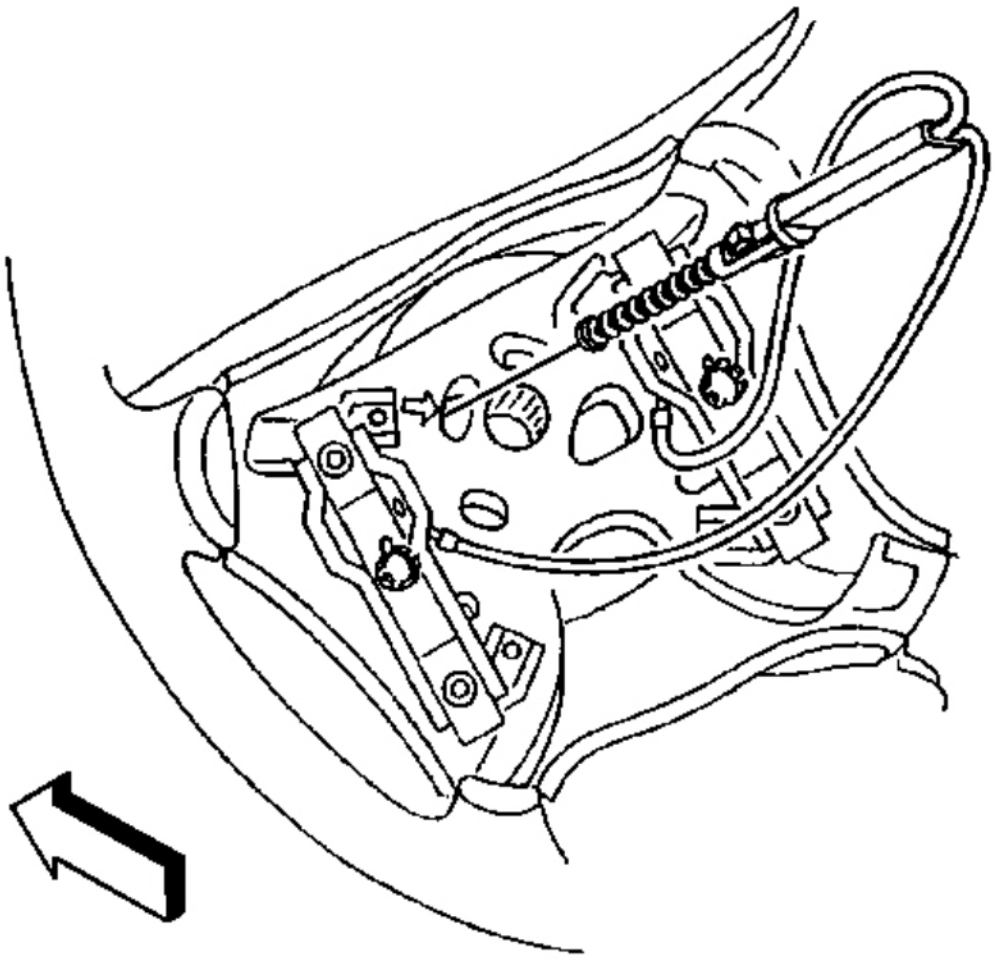


Fig. 62: View Of Horn Plunger At Steering Column
Courtesy of GENERAL MOTORS CORP.

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 inflatable restraint steering wheel 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 the horn plunger 90 degrees.

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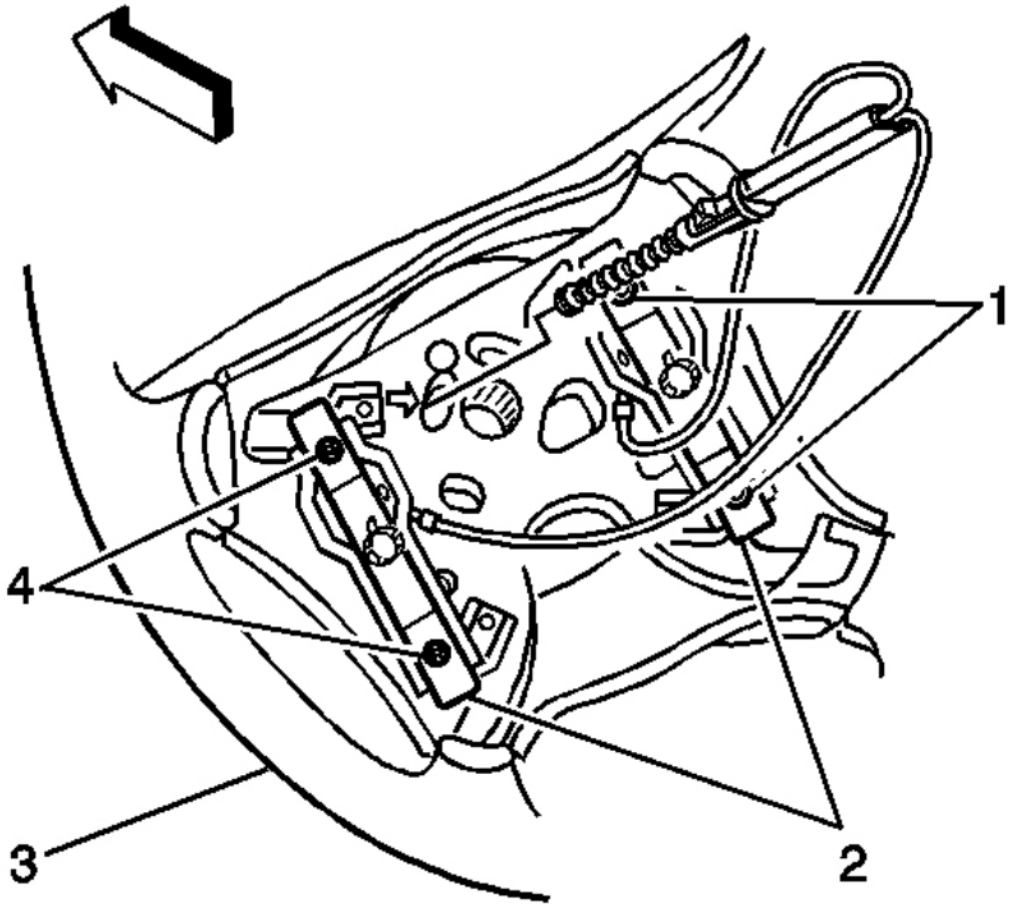


Fig. 63: View of Horn Contact Plate, Steering Wheel & Screws
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

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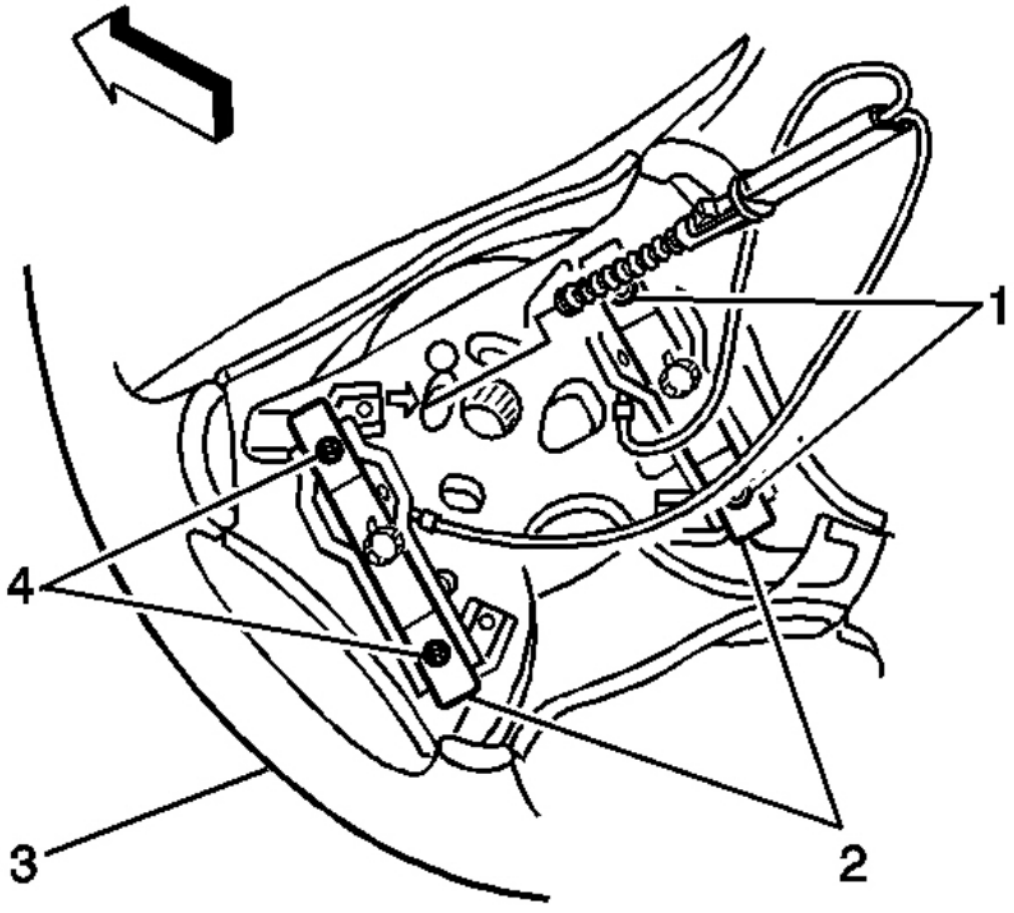


Fig. 64: View of Horn Contact Plate, Steering Wheel & Screws
Courtesy of GENERAL MOTORS CORP.

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

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Connect the captured screws (1,4) from the horn contact plate (2) to the steering wheel (3).

Tighten: Tighten the screws to 5.5 N.m (50 lb in).

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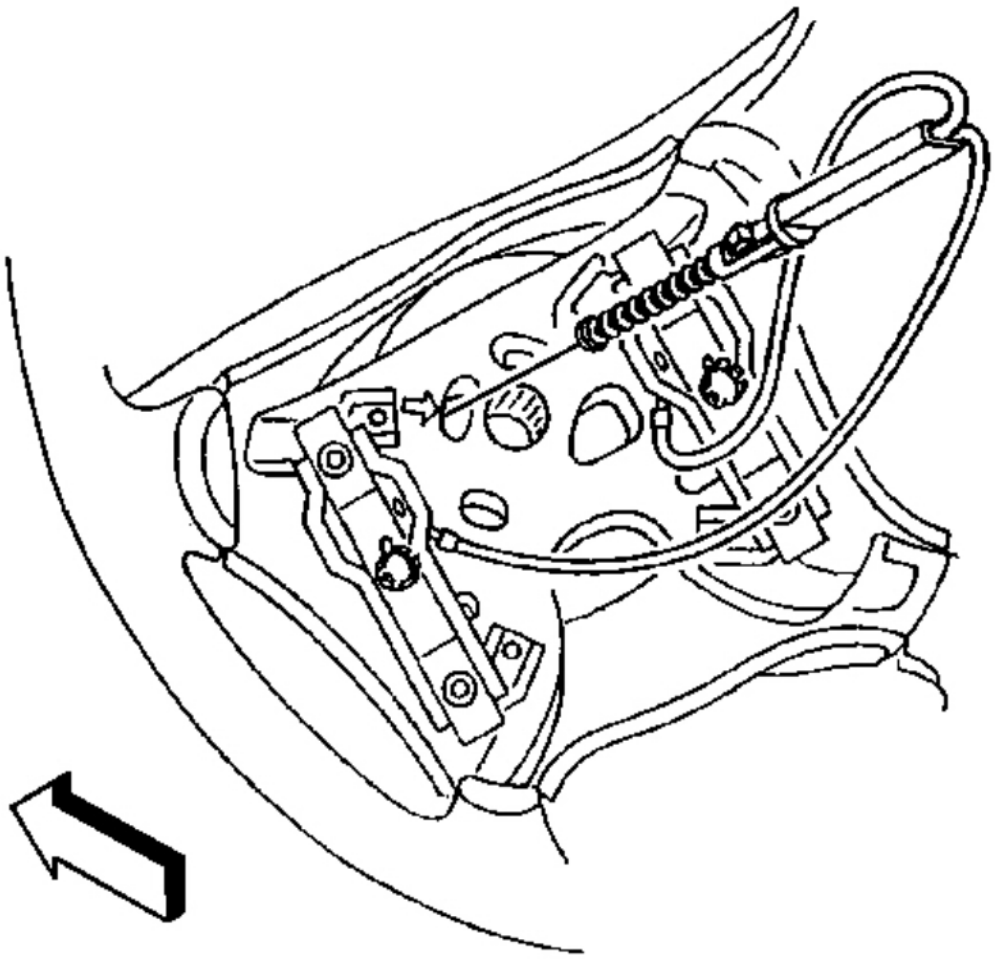


Fig. 65: View Of Horn Plunger At Steering Column
Courtesy of GENERAL MOTORS CORP.

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**.

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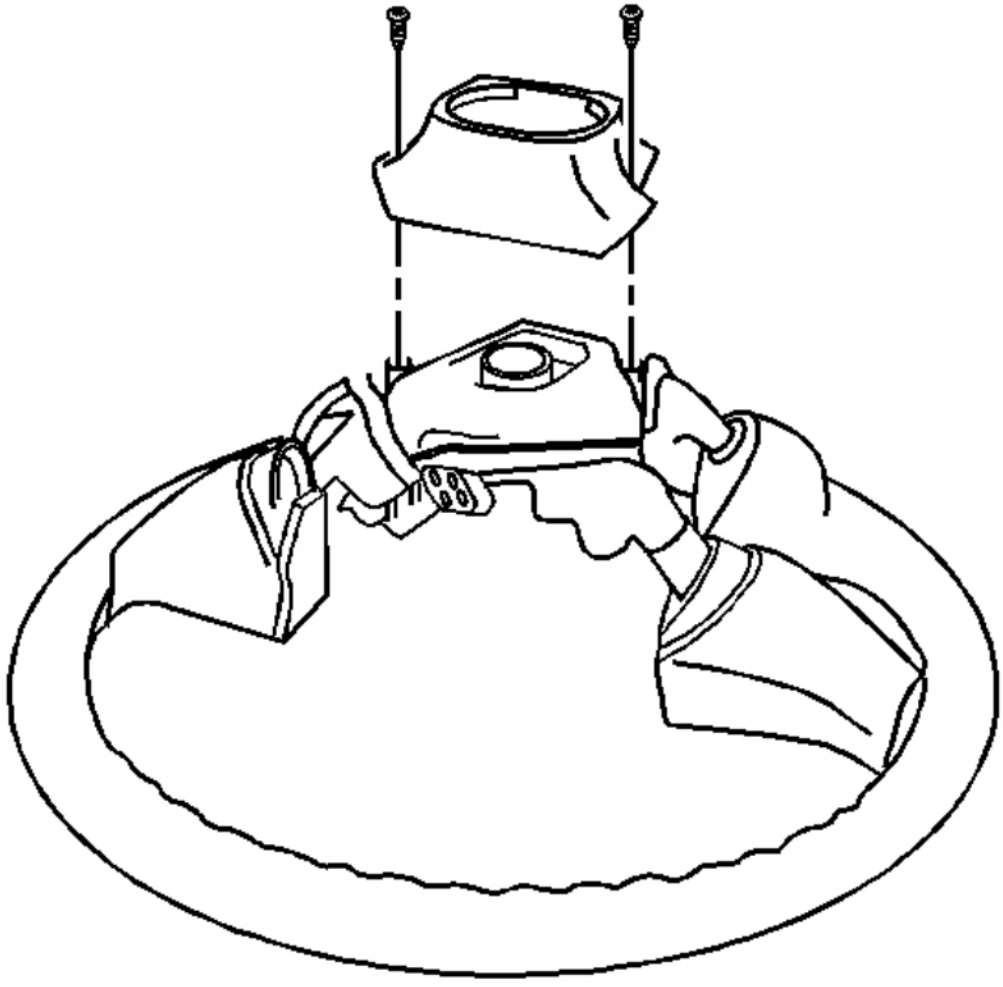


Fig. 66: View Of Shroud & Screws
Courtesy of GENERAL MOTORS CORP.

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

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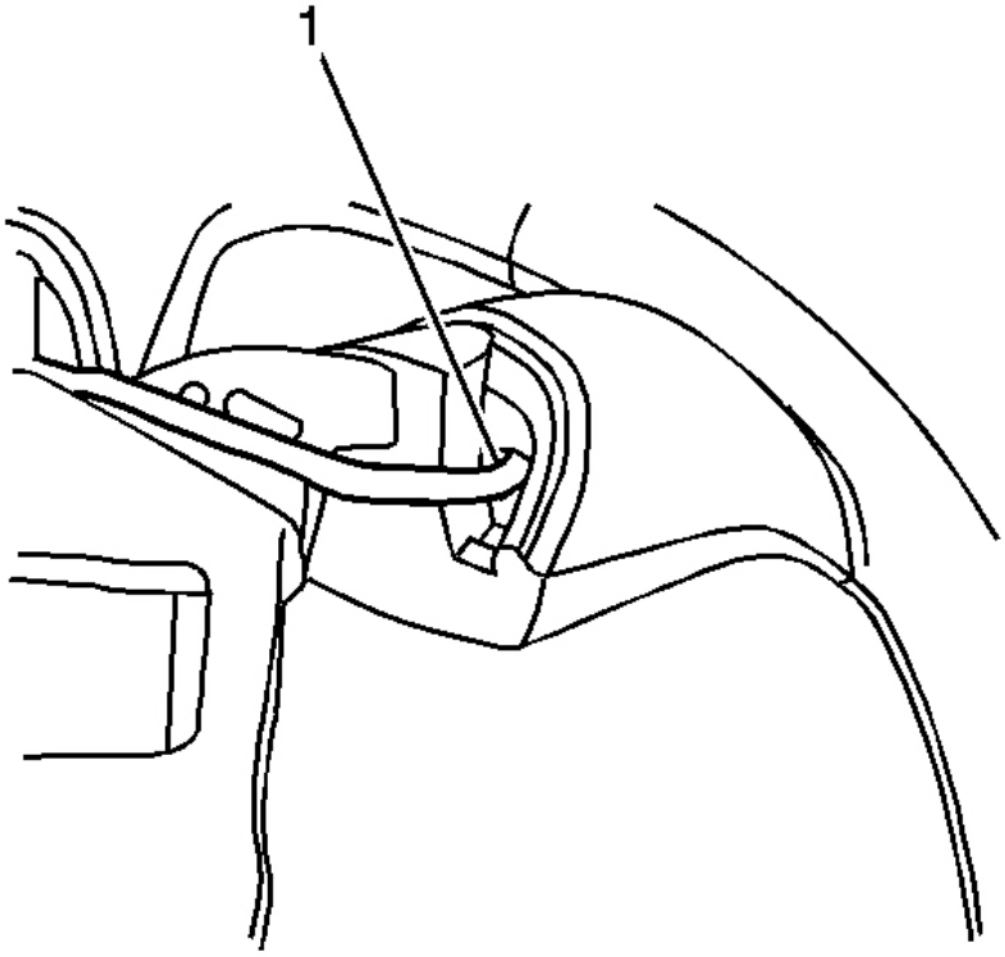


Fig. 67: View Of Wire Harness Cavity
Courtesy of GENERAL MOTORS CORP.

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.

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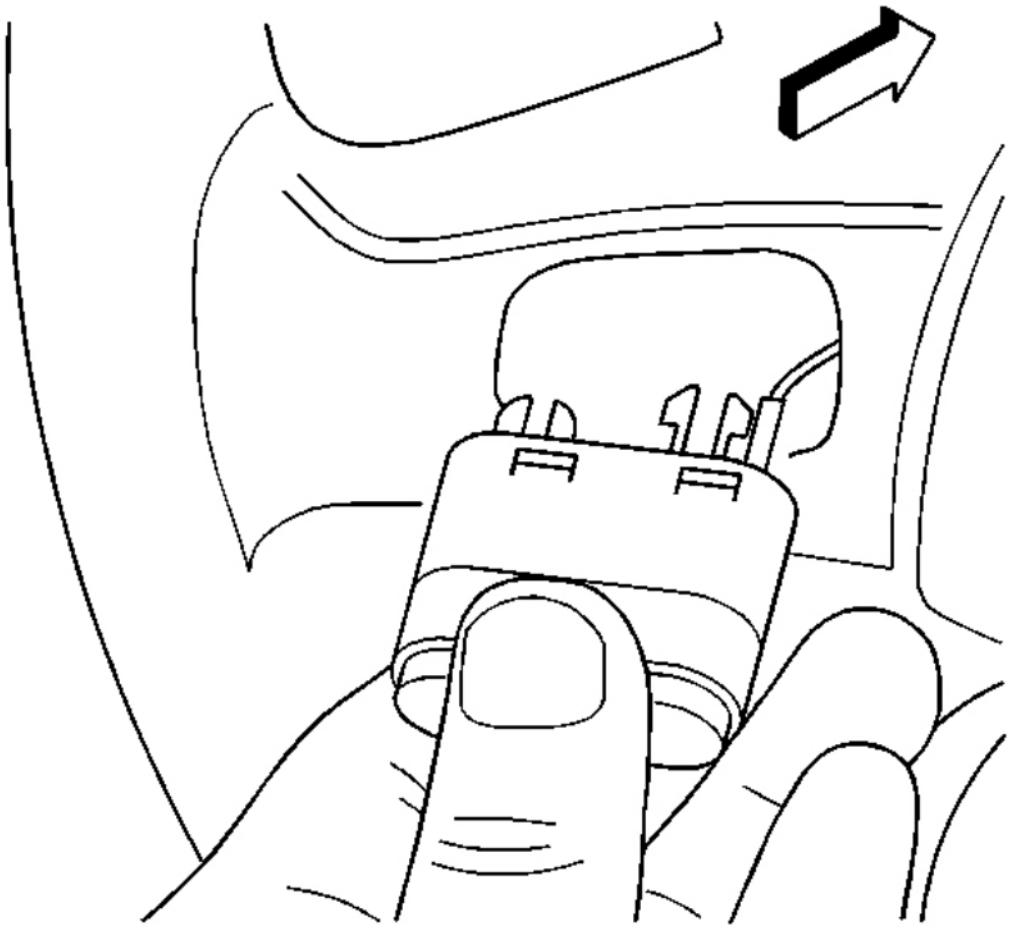


Fig. 68: View Of Steering Wheel Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

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.

Installation Procedure

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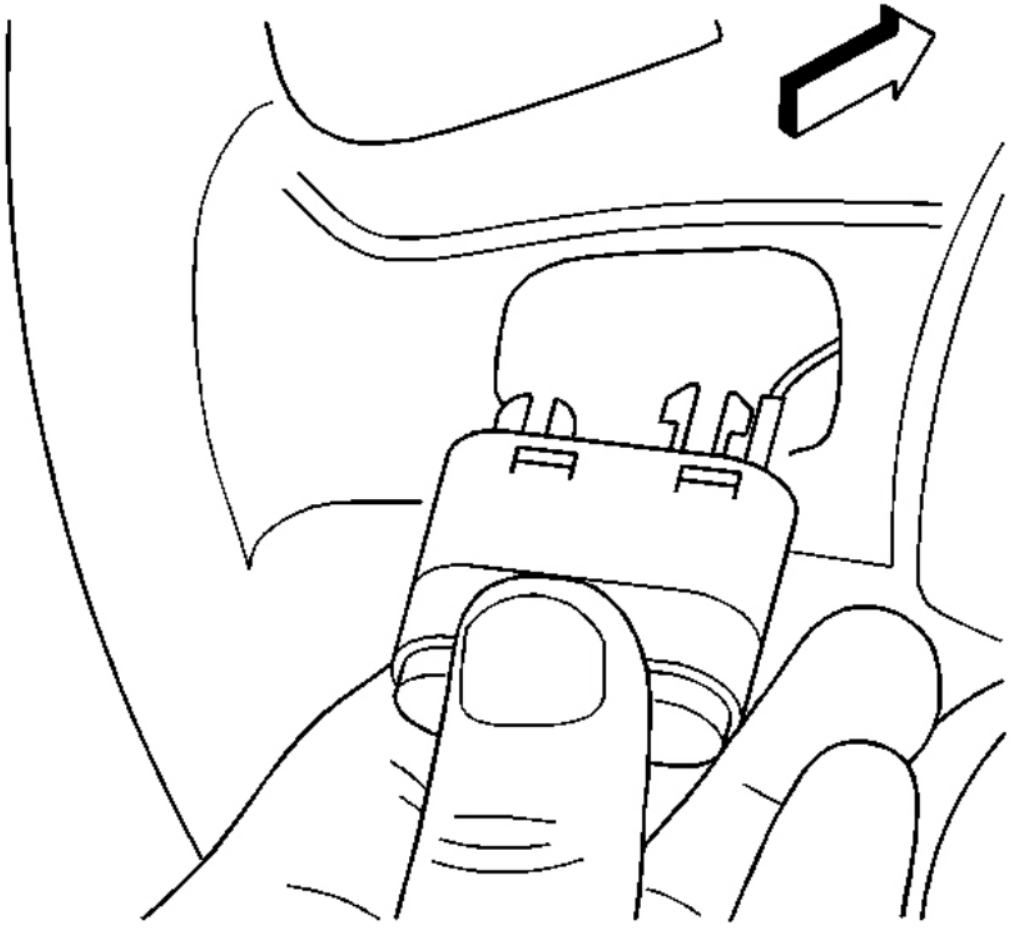


Fig. 69: View Of Steering Wheel Control Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

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.

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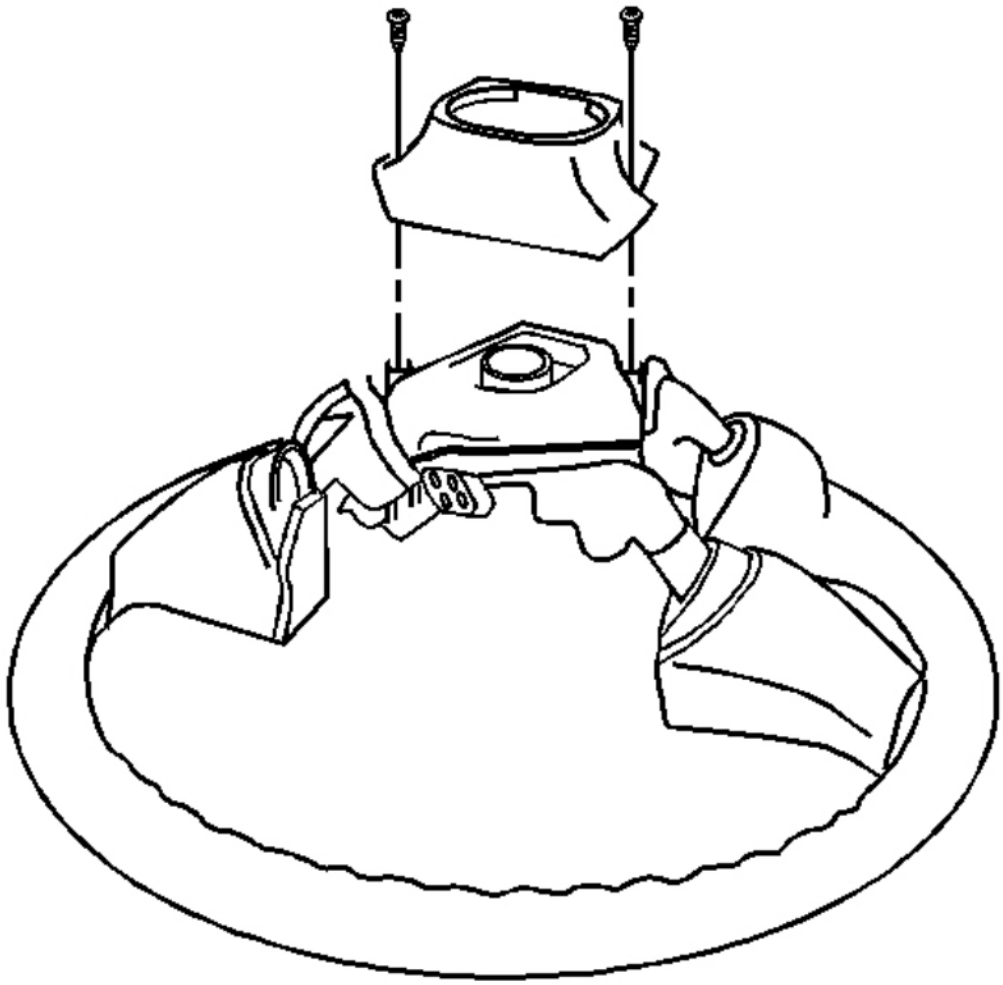


Fig. 70: View Of Shroud & Screws
Courtesy of GENERAL MOTORS CORP.

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).

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

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STEERING WHEEL REPLACEMENT

Tools Required

J 1859-A Steering Wheel Puller. See **Special Tools and Equipment**.

J-36541-A Steering Wheel Puller Adapter. See **Special Tools and Equipment**.

J 42578 Steering Wheel Puller Legs. See **Special Tools and Equipment**.

Removal Procedure

1. Disable the supplemental inflatable restraint (SIR) system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the inflator module. Refer to **Horn Switch Replacement** in SIR.
3. Remove the horn switch. Refer to **Horn Switch Replacement**.
4. Make an alignment mark in order to note the relationship of the steering wheel to the steering shaft.
5. Remove the steering wheel nut.

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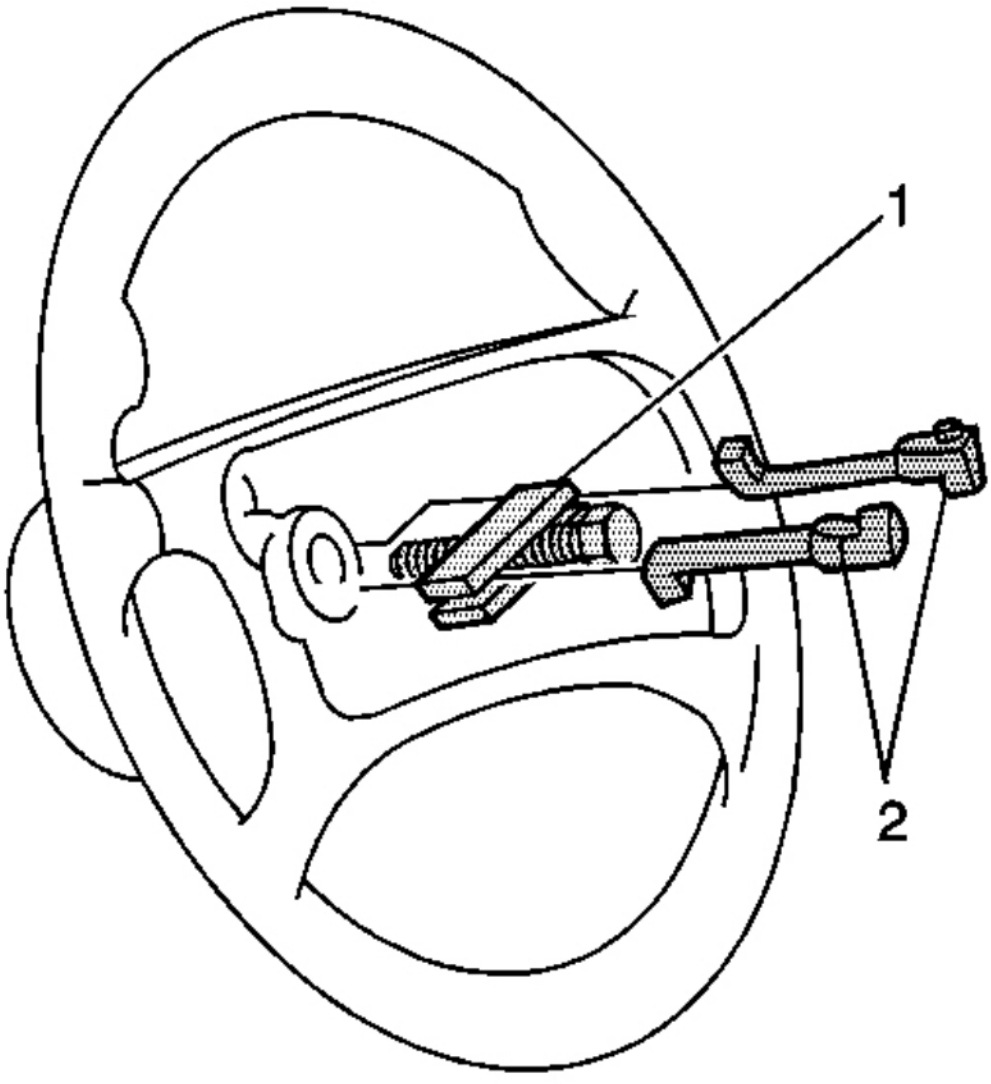


Fig. 71: Removing Steering Wheel Using J 1859-A & J-36541-A Or J 42578
Courtesy of GENERAL MOTORS CORP.

6. Remove the steering wheel using:
   - **J 1859-A** (1) with
   - **J-36541-A** (2) or **J 42578** (2). See **Special Tools and Equipment**.

Installation Procedure

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1. Align the marks made during the removal of the steering shaft and the steering wheel.

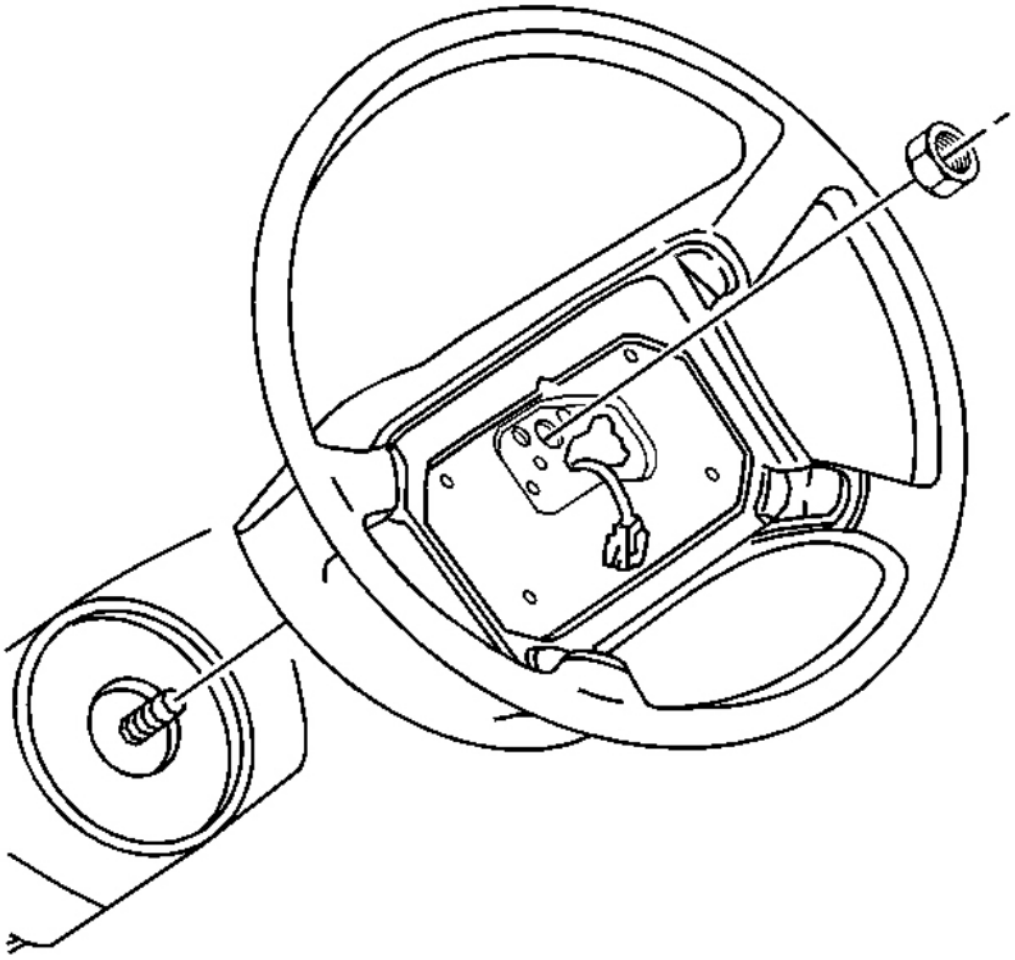


Fig. 72: View Of Steering Wheel & Nut
Courtesy of GENERAL MOTORS CORP.

2. Install the steering wheel onto the steering shaft.

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

3. Install the steering wheel nut to the steering shaft.

Tighten: Tighten the nut to 40 N.m (29 lb ft).

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4. Install the horn switch. Refer to **Horn Switch Replacement**.
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.

REPAIRING SCRATCHED WOOD STEERING WHEELS

Repair Procedure

1. Remove the steering wheel. Refer to **Steering Wheel Replacement**.
2. Wash the wood section of the wheel with wax and grease remover.
3. Mask off the non-wood area of the steering wheel.

IMPORTANT: Do NOT sand through the clear.

4. Sand with 400 grit sand paper first. Finish sanding with 600 grit.
5. Wash the wood section of the wheel again with wax and grease remover.
6. Clear coat the steering wheel. Refer to the 2003 GM Approved Refinish Materials Booklet, GM 4901 M-D-2003 (English) or M-D-F2003 (French).
7. Install the steering wheel. Refer to **Steering Wheel Replacement**.

TILT SPRING REPLACEMENT

Removal Procedure

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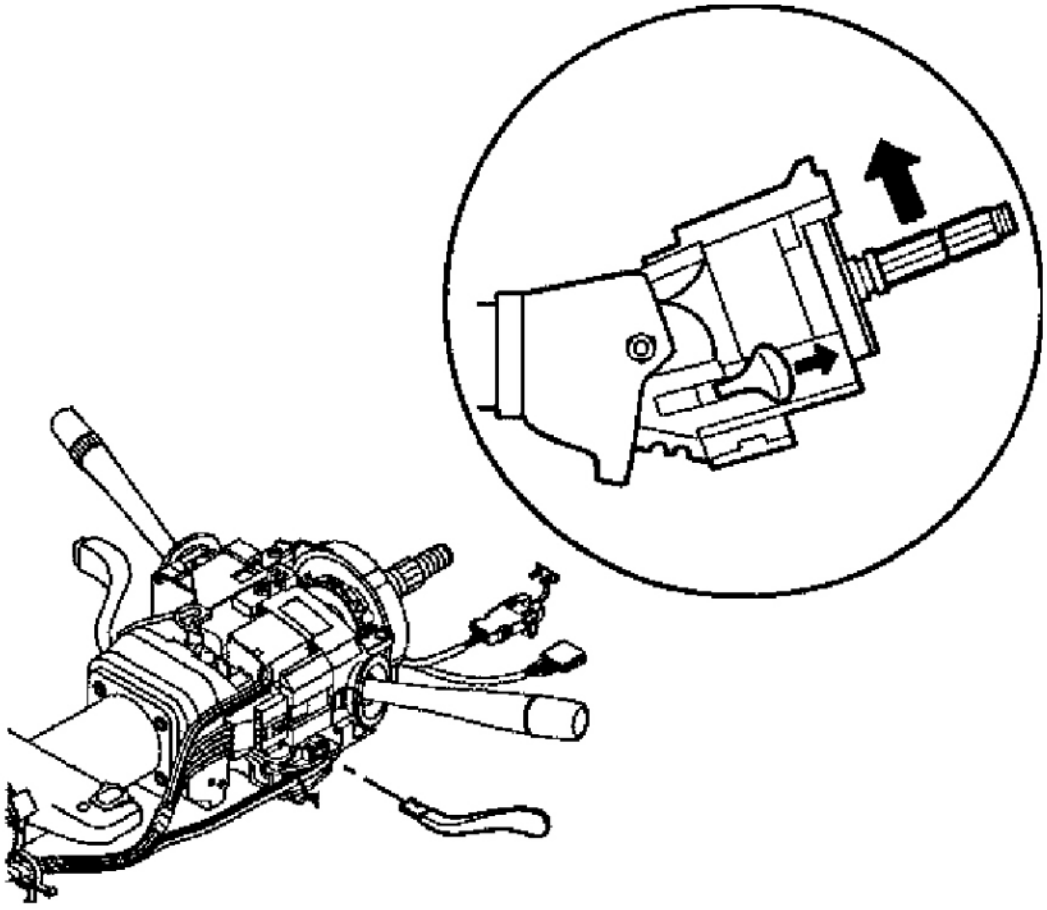


Fig. 73: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

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.

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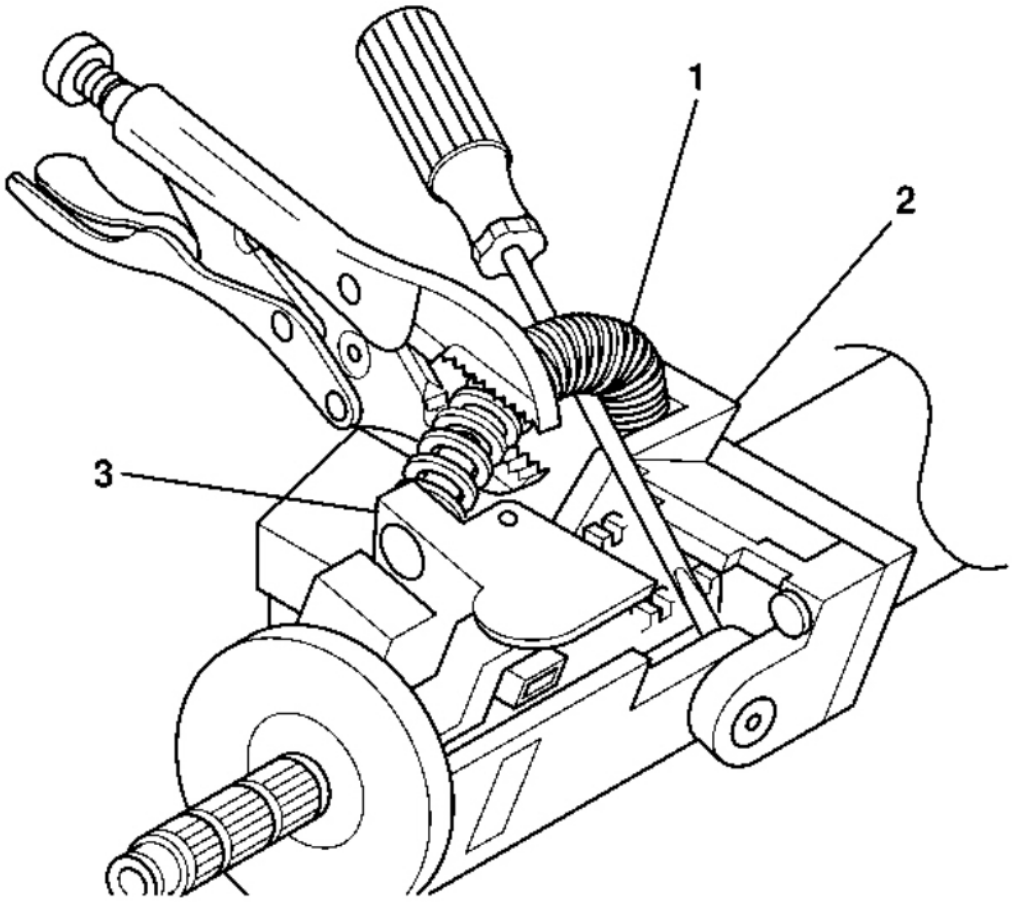


Fig. 74: Removing Tilt Spring From Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

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.

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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).

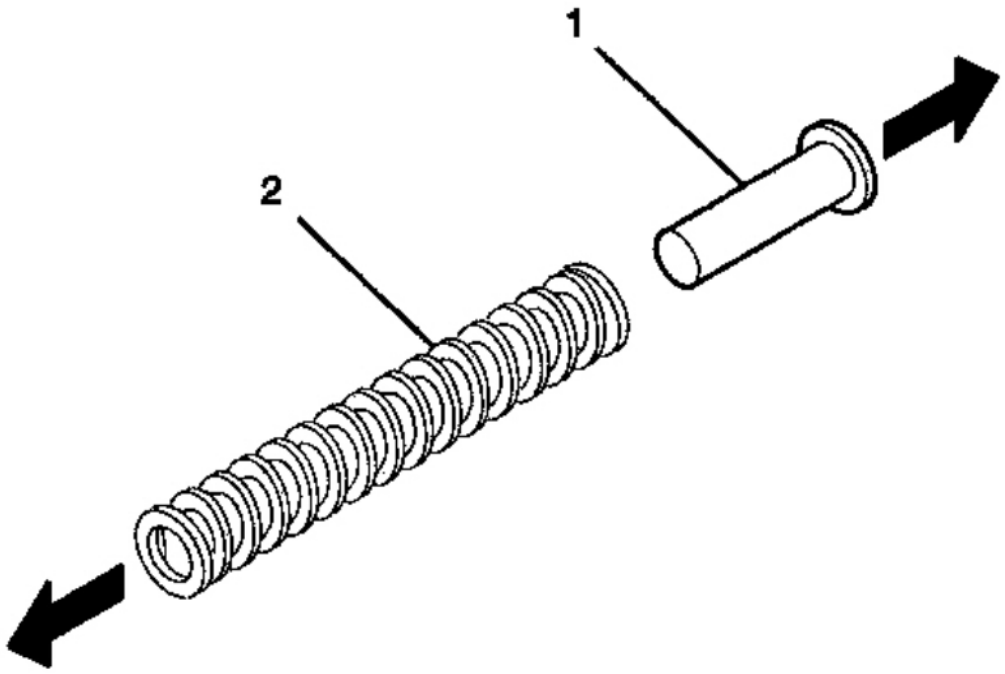


Fig. 75: Identifying Spring Guide Components
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

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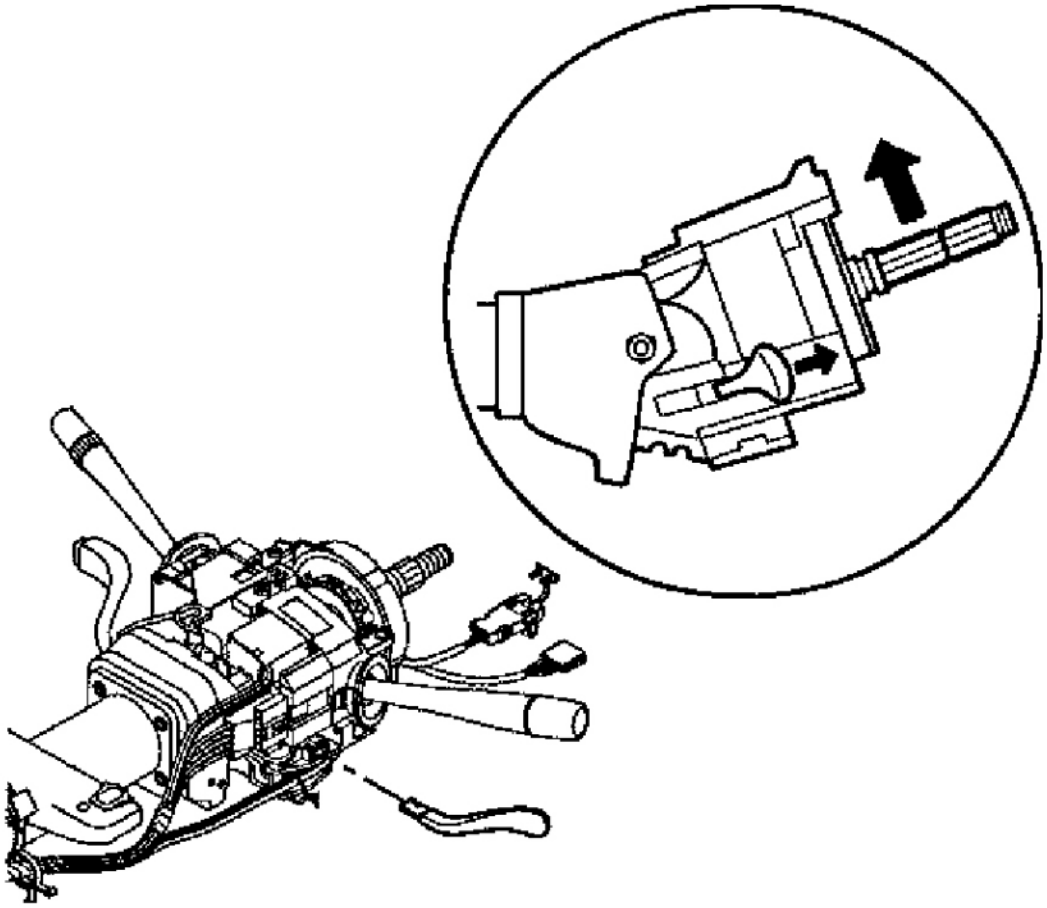


Fig. 76: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

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

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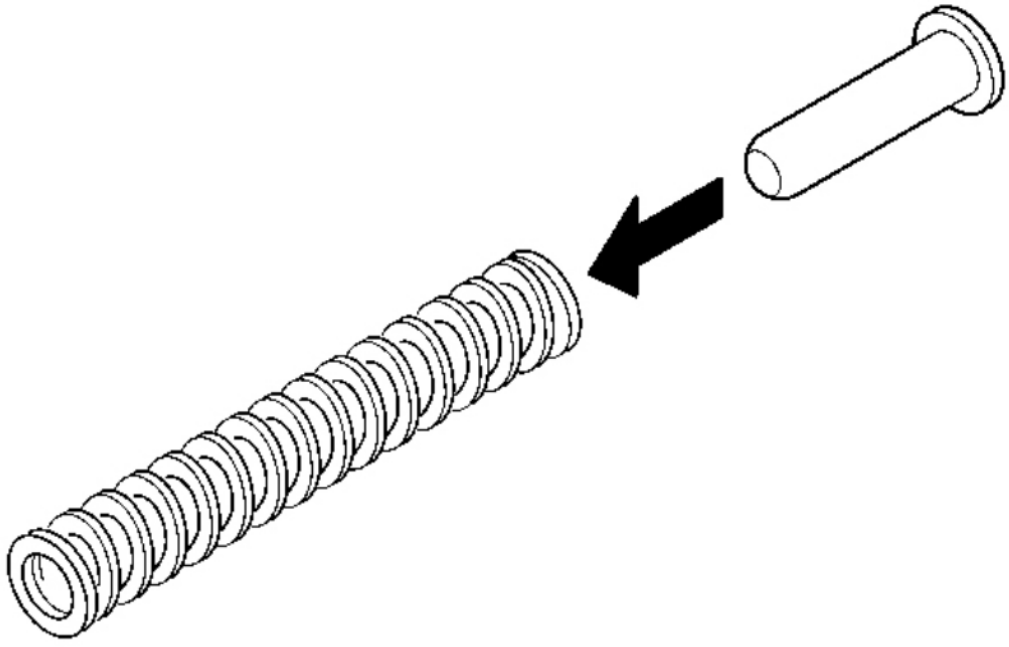


Fig. 77: Spring Guide & Tilt Spring
Courtesy of GENERAL MOTORS CORP.

2. Install the spring guide into the tilt spring.

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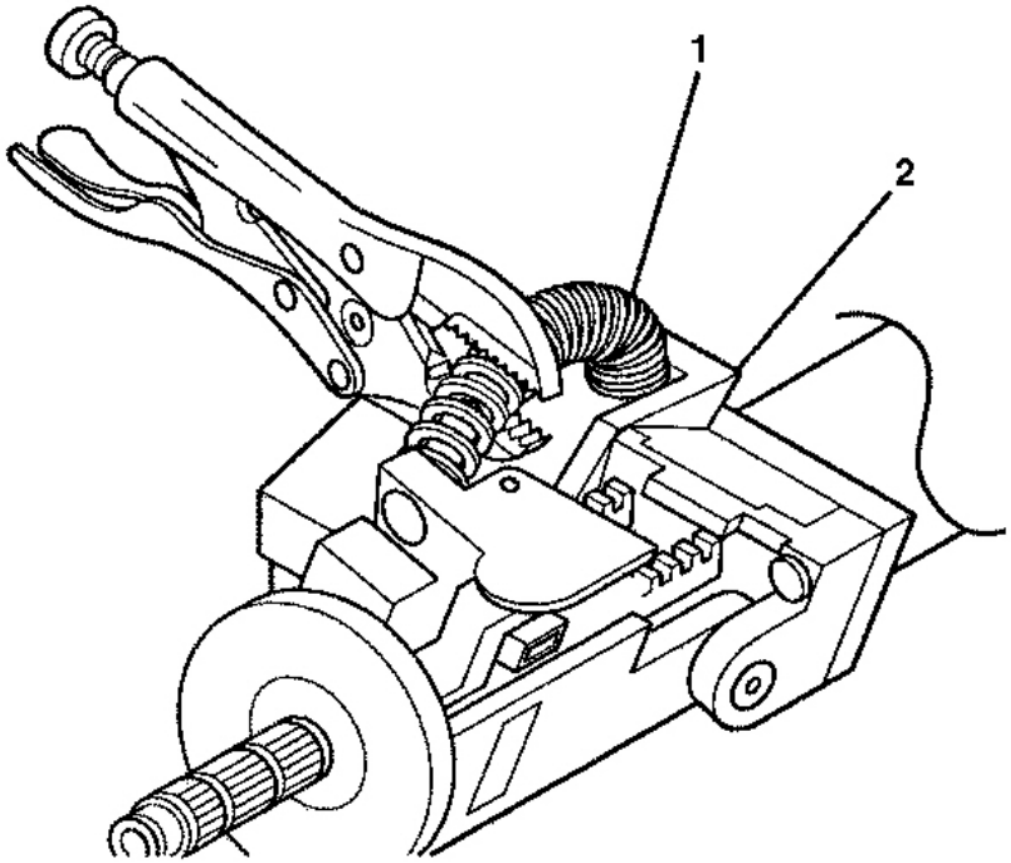


Fig. 78: Installing Tilt Spring Onto The Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

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 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).

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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 (TILT)

Removal Procedure

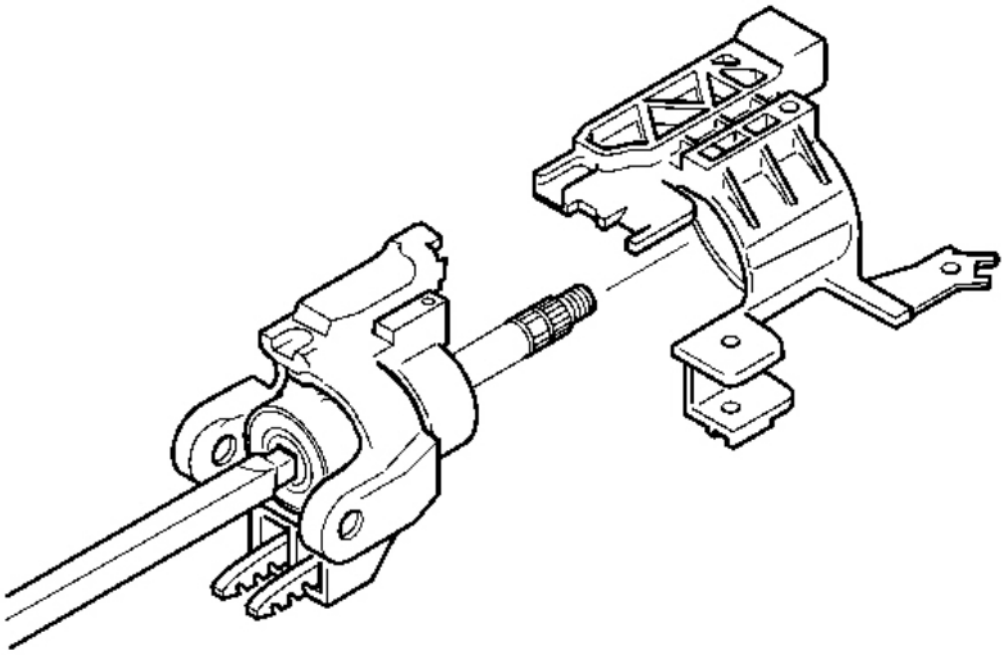


Fig. 79: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

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 turn signal cancel cam assembly. Refer to **Turn Signal Cancel Cam and Upper Bearing Thrust Washer**.
3. Remove the turn signal and multifunction switch assembly only. Refer to **Multifunction, Turn Signal Switch Replacement**.
4. Slide the turn signal switch housing off of the steering column shaft assembly.

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5. Remove the tilt head housing and steering shaft as an assembly. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**.
6. Remove the tilt head from the steering shaft.

Installation Procedure

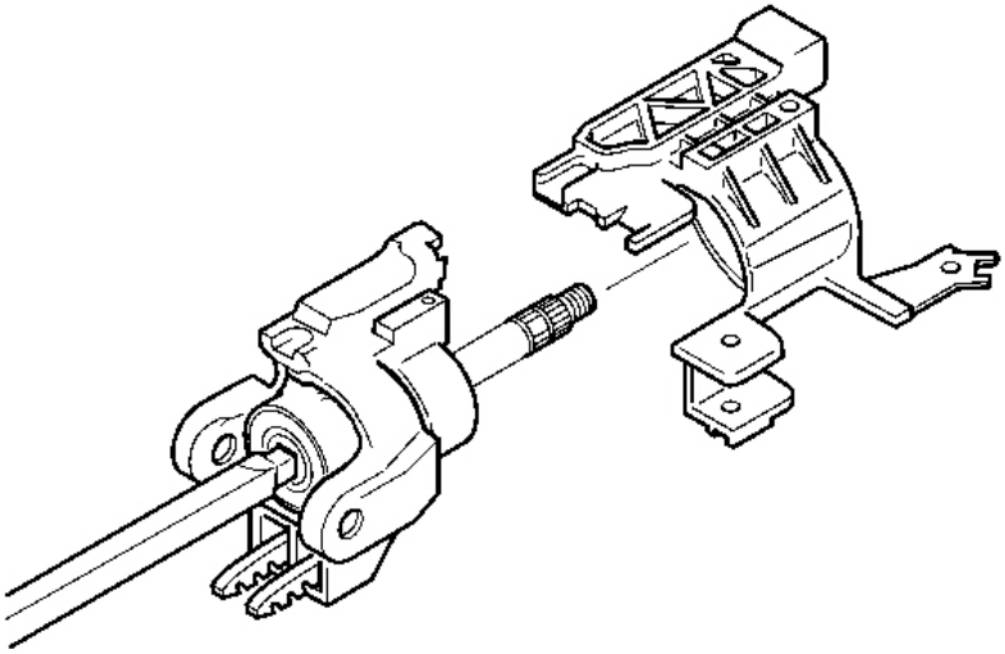


Fig. 80: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the tilt head onto the steering shaft.
2. Install the tilt head housing and steering shaft as an assembly. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**.

IMPORTANT: The switch mounting bracket must be pressed firmly against the steering

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column tilt head.

3. Slide the turn signal switch housing onto the steering column shaft assembly.
4. Install the turn signal and multifunction switch assembly only. Refer to **Multifunction, Turn Signal Switch Replacement**.
5. Install the turn signal cancel cam assembly. Refer to **Turn Signal Cancel Cam and Upper Bearing Thrust Washer**.
6. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN TILT HEAD HOUSING REPLACEMENT (STANDARD)

Tools Required

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

Removal Procedure

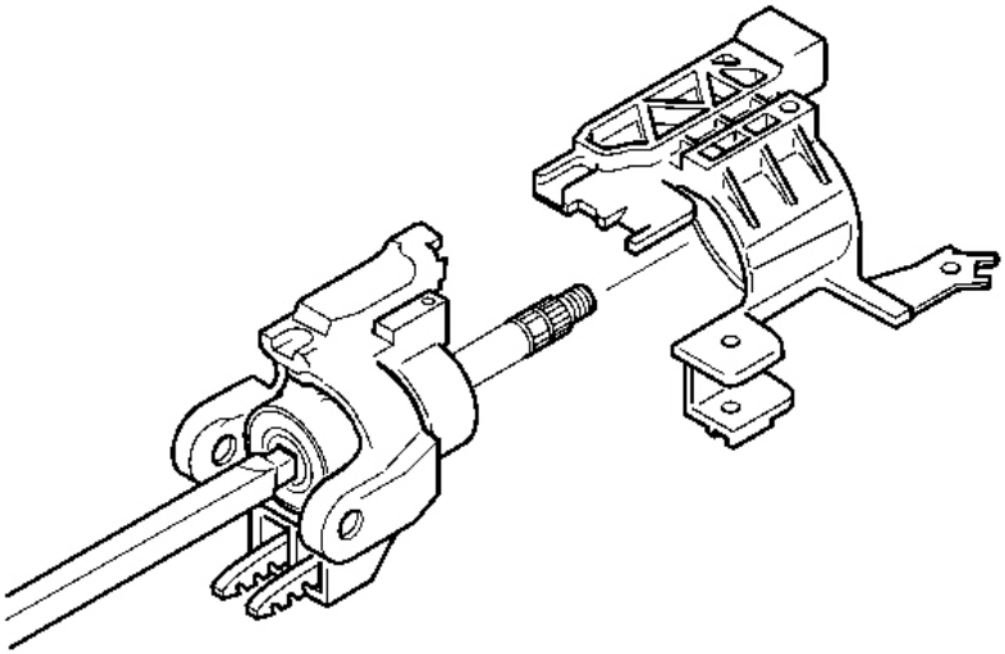


Fig. 81: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

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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 turn signal cancel cam and upper bearing thrust washer. Refer to **Turn Signal Cancel Cam and Upper Bearing Thrust Washer**.
3. Remove the turn signal and multifunction switch assembly only. Refer to **Multifunction, Turn Signal Switch Replacement**.
4. Slide the turn signal switch housing off of the steering column shaft assembly.

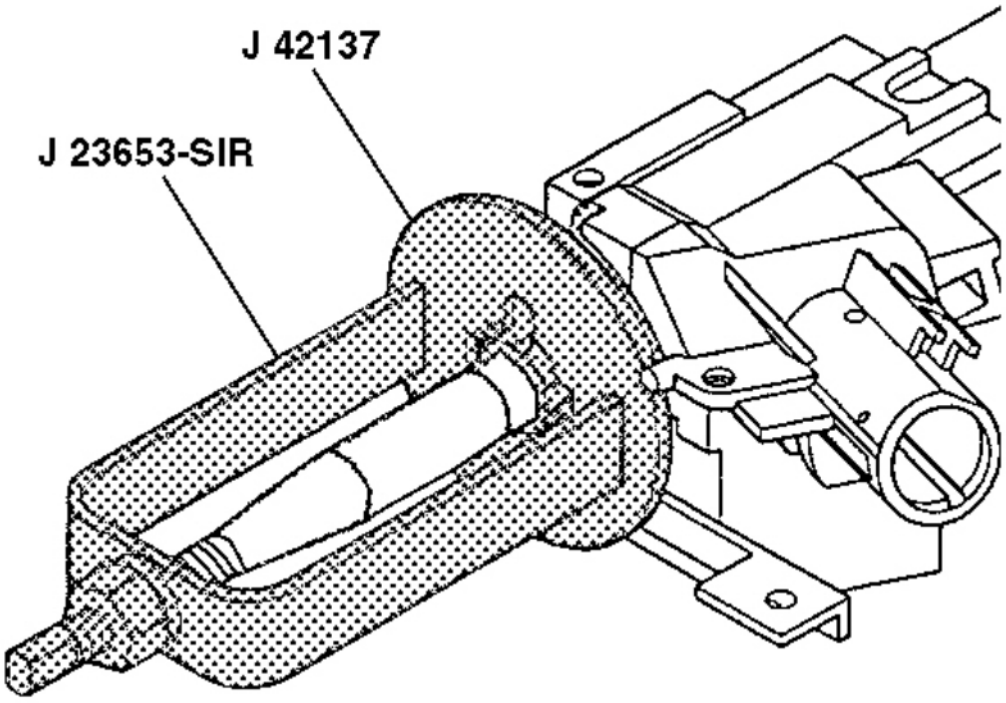


Fig. 82: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

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IMPORTANT: Let the SIR coil hang freely after removal.

5. Remove the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in SIR.
6. Compress the cam orientation plate using **J 23653-SIR** and **J 42137** . See **Special Tools and Equipment**.
7. Remove the bearing retainer using **J 23653-SIR** and **J 42137** from the steering column shaft assembly. See **Special Tools and Equipment**.
8. Remove **J 23653-SIR** and **J 42137** from the steering column shaft assembly. See **Special Tools and Equipment**.
9. Discard the bearing retainer.

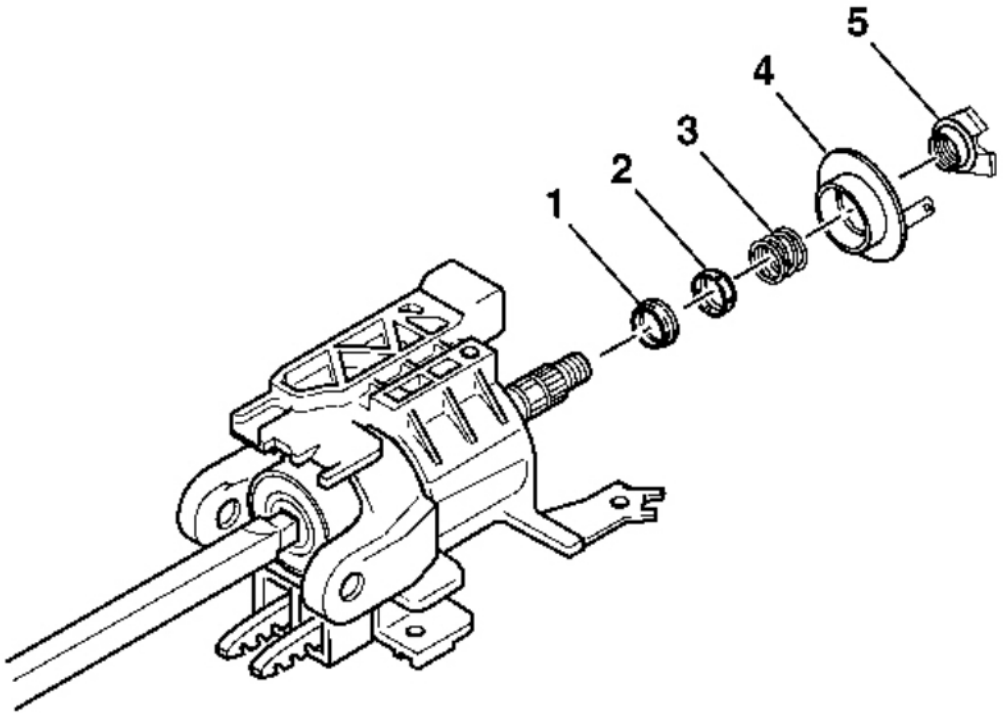


Fig. 83: Removing Steering Column Shaft Assembly Components
Courtesy of GENERAL MOTORS CORP.

10. Remove the following parts from the steering column shaft assembly:
    1. The cam orientation plate (5)
    2. The turn signal cancel cam assembly (4)

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3. The upper bearing spring (3)
4. The upper bearing inner race seat (2)
5. The inner race (1)
6. Remove the tilt head housing and steering shaft as an assembly. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**.
7. Remove the tilt head from the steering shaft.

Installation Procedure

1. Install the tilt head onto the steering shaft.
2. Install the tilt head housing and steering shaft as an assembly. Refer to **Lower Bearing and Steering Column Jacket Replacement (Column Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Lean Shaft)** or **Lower Bearing and Steering Column Jacket Replacement (Column Shift Standard)** or **Lower Bearing and Steering Column Jacket Replacement (Floor Shift Standard)**.

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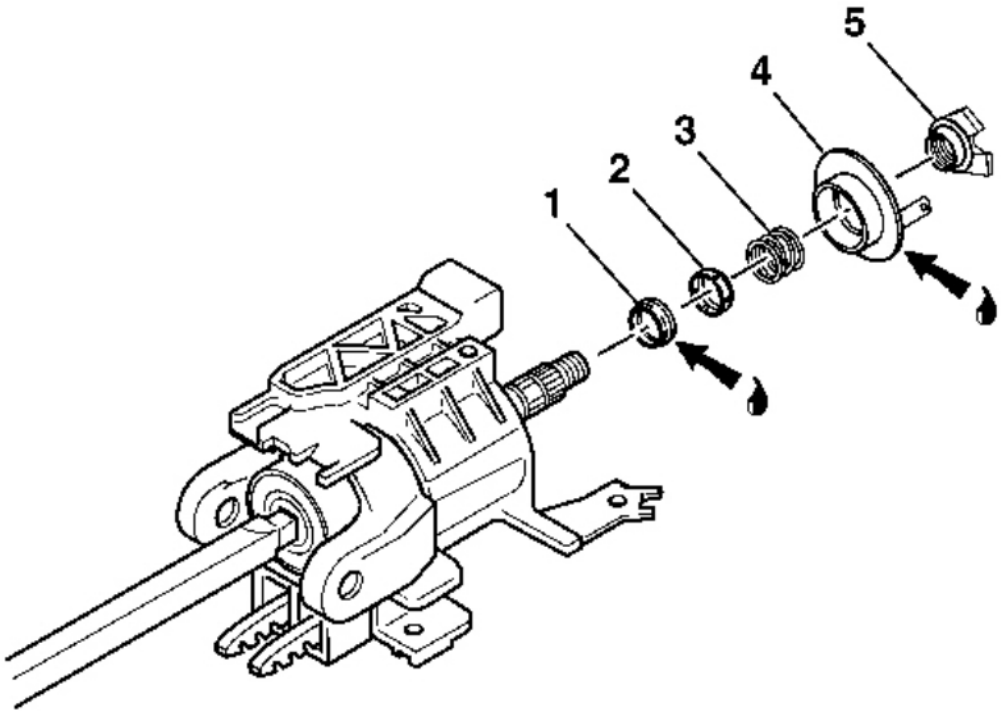


Fig. 84: View Of Upper Steering Column Components
Courtesy of GENERAL MOTORS CORP.

3. Lubricate the lower brass surface of the turn signal cancel cam assembly with GM P/N 12377900 (Canadian P/N 10953529).

   Lubricate the inner race with GM P/N 12345718 (Canadian P/N 10953516)

4. Install the following parts onto the steering column shaft assembly:
   1. The inner race (1)
   2. The upper bearing inner race seat (2)
   3. The upper bearing spring (3)
   4. The turn signal cancel cam assembly (4)
   5. The cam orientation plate (5)

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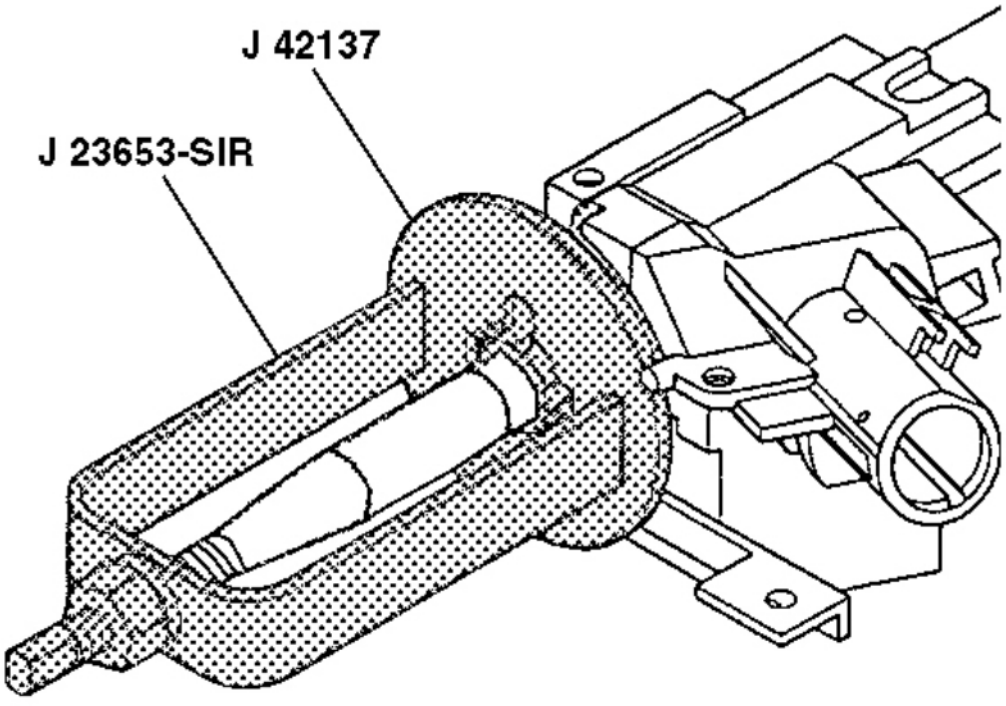


Fig. 85: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

5. Install the new bearing retainer onto the steering column shaft assembly.
6. Compress the cam orientation plate using **J 23653-SIR** and **J 42137** . See **Special Tools and Equipment**.

   Firmly seat the bearing retainer into the groove on the steering column shaft assembly.

7. Remove **J 23653-SIR** from the steering column shaft assembly.
8. Install the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in SIR.

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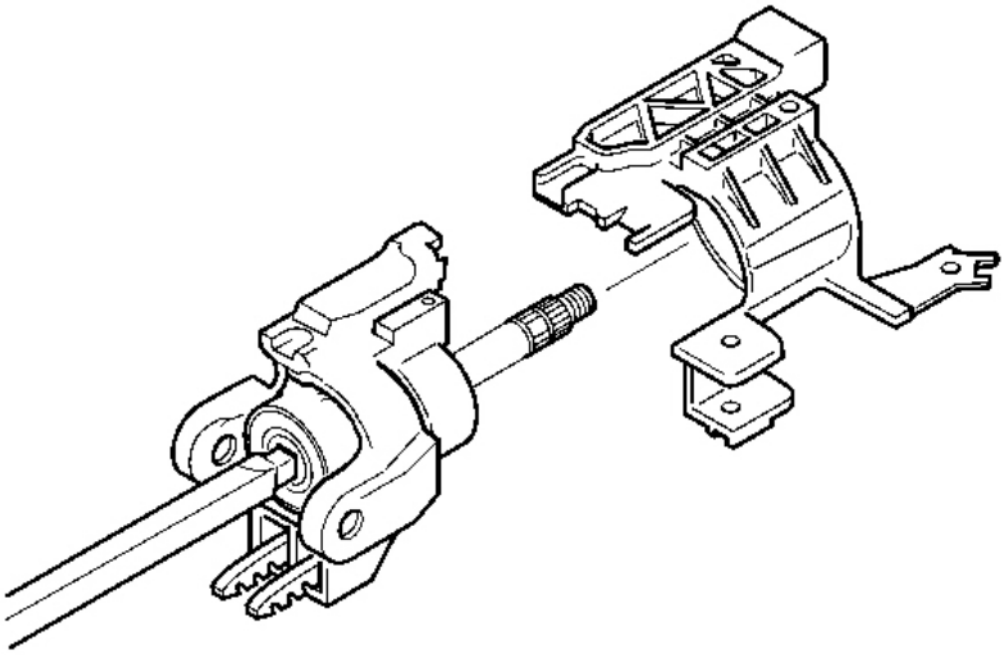


Fig. 86: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The switch mounting bracket must be pressed firmly against the steering column tilt head.

9. Slide the turn signal switch housing onto the steering column shaft assembly.
10. Install the turn signal and multifunction switch assembly only. Refer to **Multifunction, Turn Signal Switch Replacement**.
11. Install the turn signal cancel cam and upper bearing thrust. Refer to **Turn Signal Cancel Cam and Upper Bearing Thrust Washer**.
12. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

TURN SIGNAL CANCEL CAM AND UPPER BEARING THRUST WASHER

Tools Required

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

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Removal Procedure

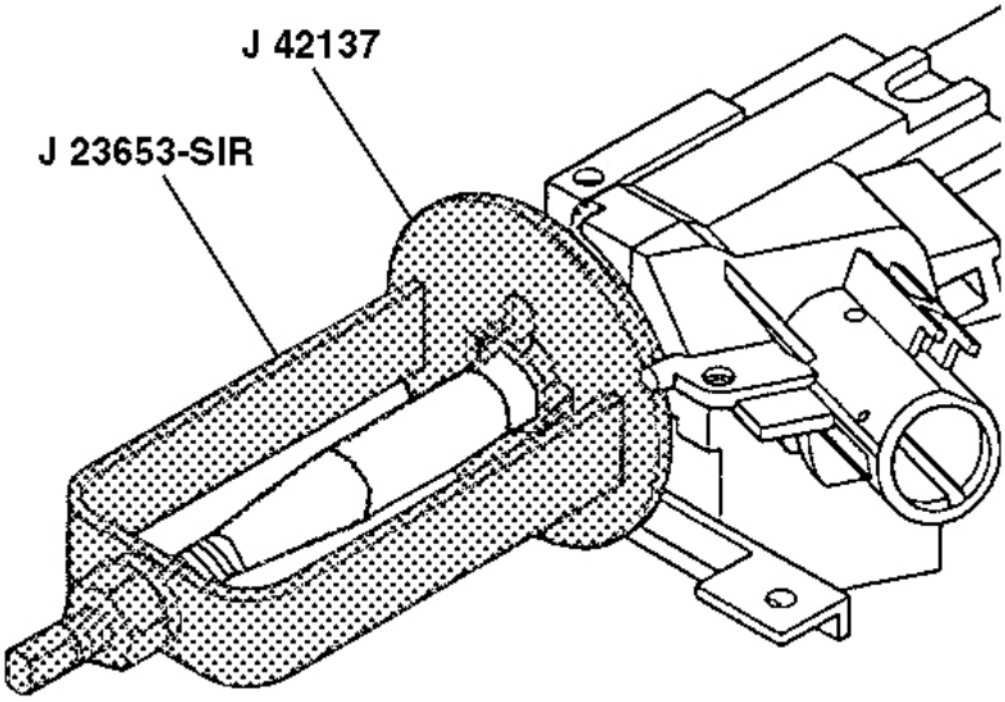


Fig. 87: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

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

IMPORTANT: Let the SIR coil hang freely after removal.

2. Remove the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in

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SIR.

3. Remove and discard the bearing retainer using **J 23653-SIR** and **J 42137** . See **Special Tools and Equipment**.

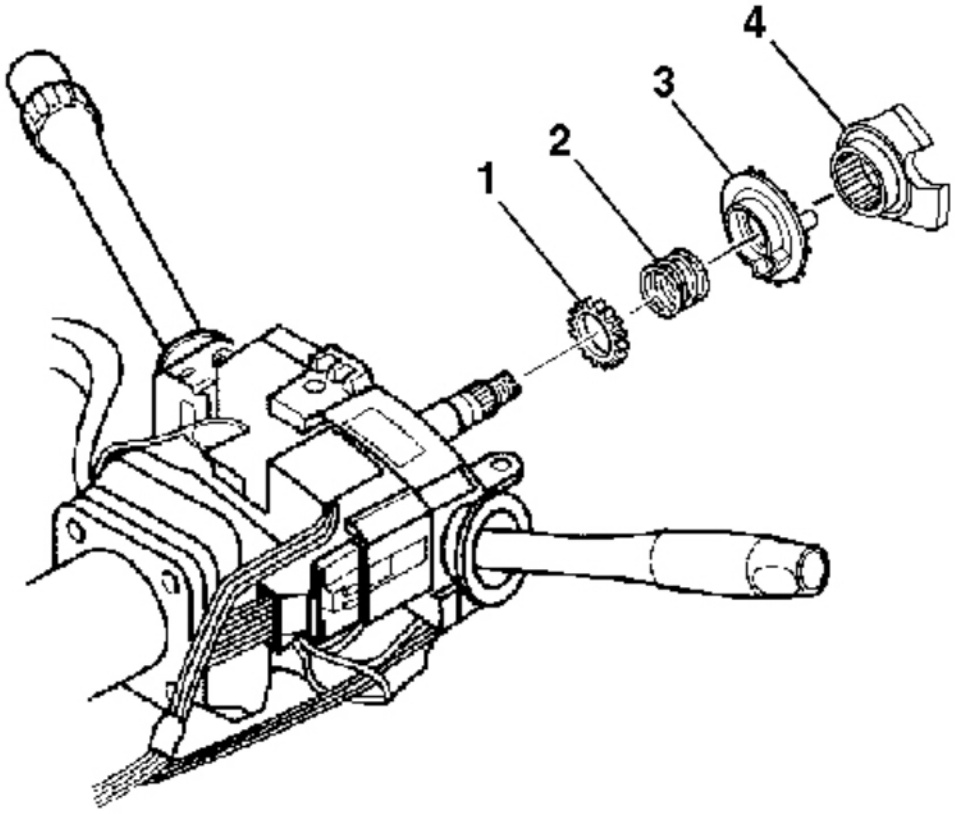


Fig. 88: Removing Steering Shaft Assembly Components (Standard)
Courtesy of GENERAL MOTORS CORP.

4. If standard column, remove the following parts from the steering shaft assembly:
    1. The cam orientation plate (4)
    2. The turn signal cancel cam assembly (3)
    3. The upper bearing spring (2)
    4. The thrust washer (1)

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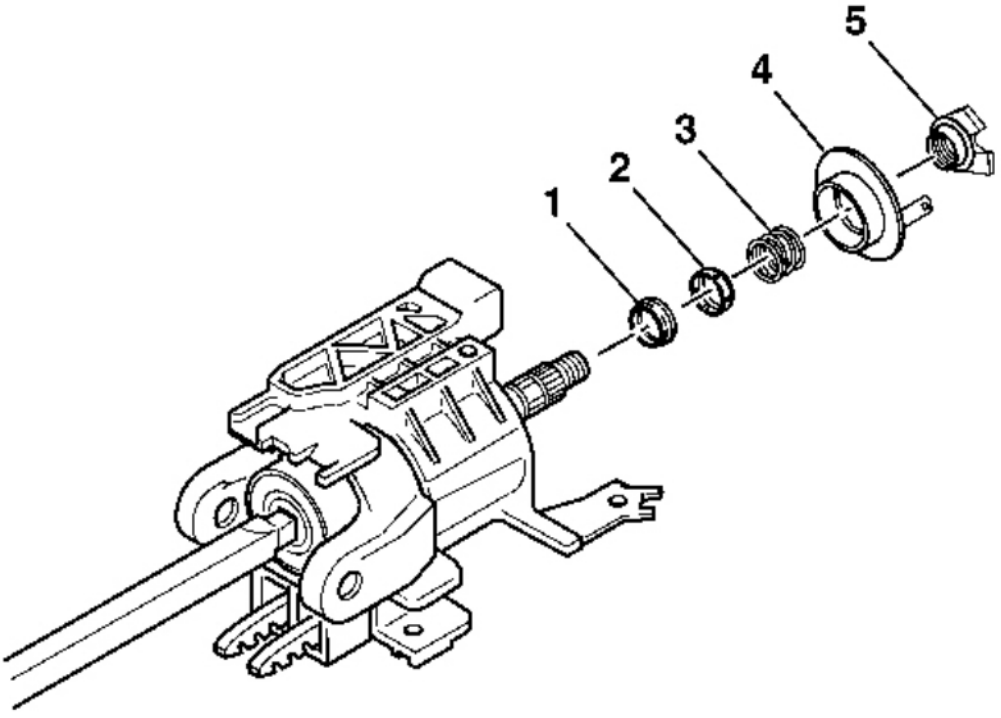


Fig. 89: Removing Steering Column Shaft Assembly Components
Courtesy of GENERAL MOTORS CORP.

5. If tilt column, remove the following parts from the steering column shaft assembly:
    1. The cam orientation plate (5)
    2. The turn signal cancel cam assembly (4)
    3. The upper bearing spring (3)
    4. The upper bearing inner race seat (2)
    5. The inner race (1)

Installation Procedure

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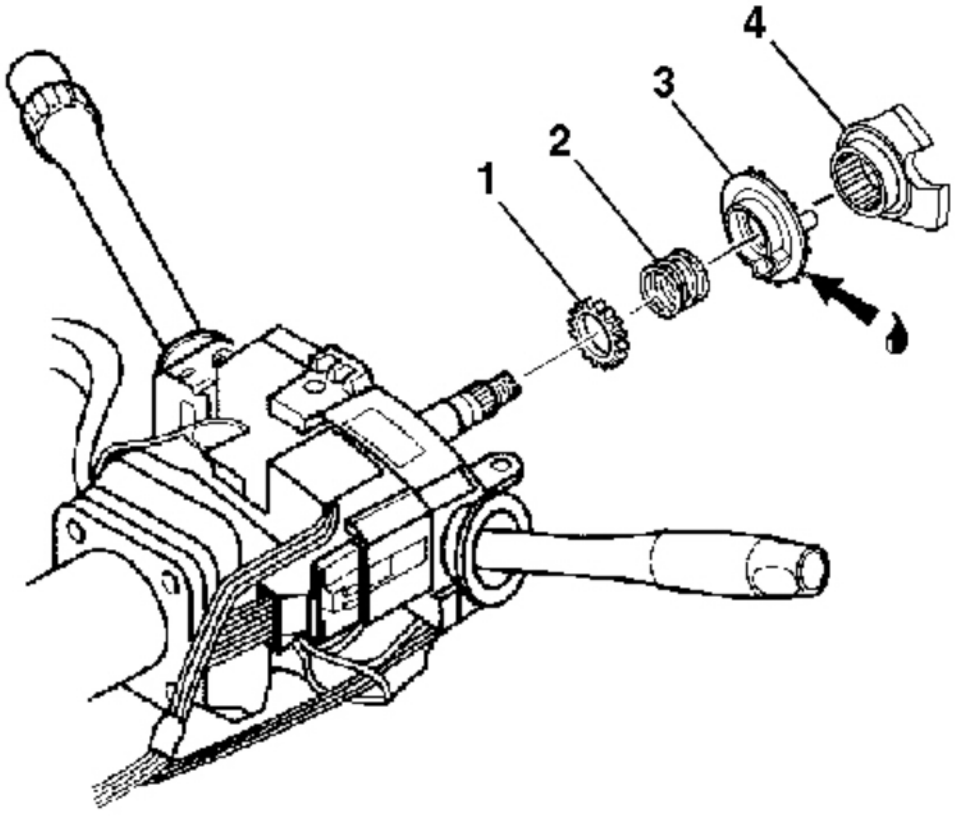


Fig. 90: Installing Steering Shaft Assembly Components (Standard)
Courtesy of GENERAL MOTORS CORP.

1. If standard column, install the following parts onto the steering shaft assembly:
    1. The thrust washer (1)
    2. The upper bearing spring (2)
    3. Lubricate the turn signal cancel cam assembly (3) with GM P/N 12377900 (Canadian P/N 10953529).
    4. The turn signal cancel cam assembly (3) onto the steering shaft assembly
    5. The cam orientation plate (4) onto the steering shaft assembly

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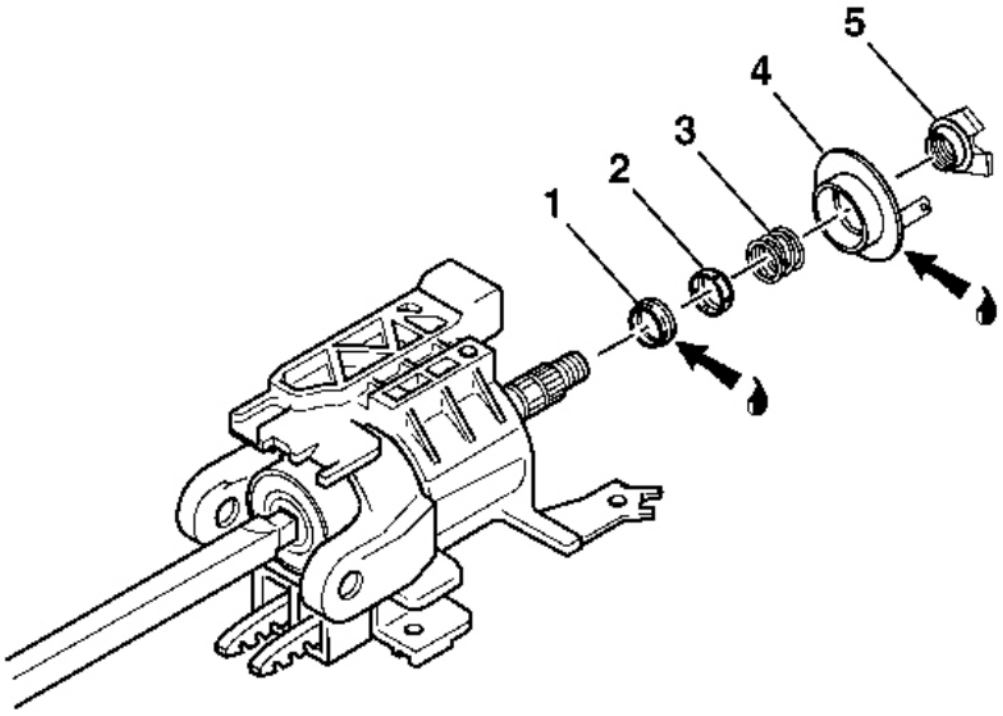


Fig. 91: View Of Upper Steering Column Components
Courtesy of GENERAL MOTORS CORP.

2. If tilt column, install the following parts onto the steering column shaft assembly:
    1. Lubricate the inner race (1) with GM P/N 12345718 (Canadian P/N 10953516)
    2. The inner race (1)
    3. The upper bearing inner race seat (2)
    4. The upper bearing spring (3)
    5. Lubricate the turn signal cancel cam assembly (4) with GM P/N 12377900 (Canadian P/N 10953529).
    6. The turn signal cancel cam assembly (4) onto the steering shaft assembly
    7. The cam orientation plate (5)

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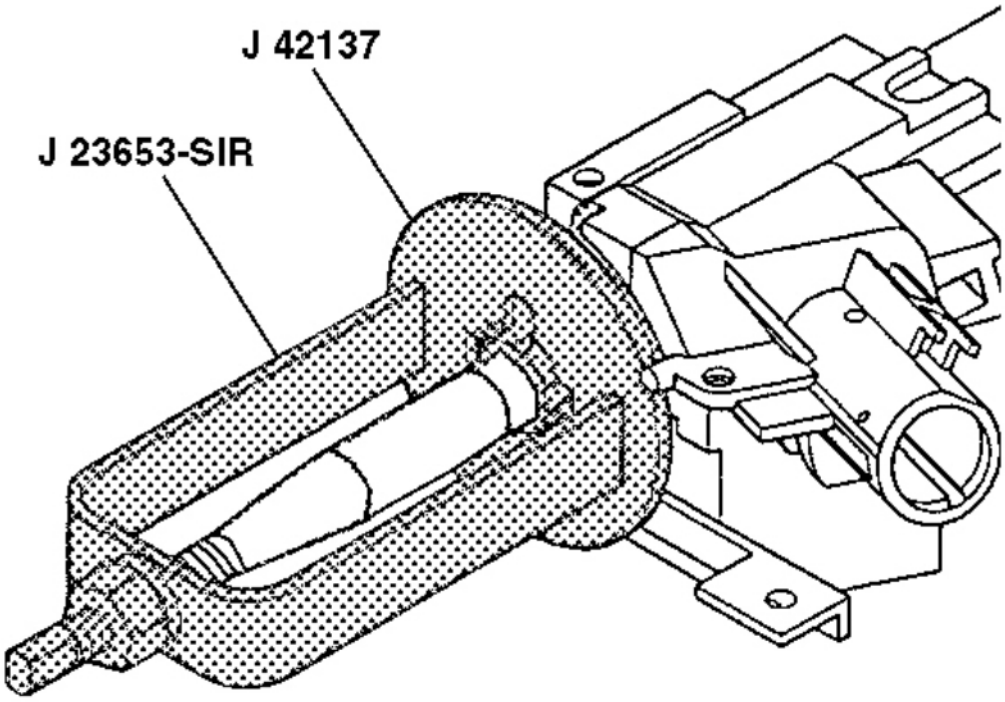


Fig. 92: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

3. Install the new bearing retainer onto the steering shaft assembly.
4. Compress the cam orientation plate using **J 23653-SIR** and **J 42137** . See **Special Tools and Equipment**.
5. Firmly seat the bearing retainer into the groove on the steering shaft assembly.
6. Remove **J 23653-SIR** . See **Special Tools and Equipment**.
7. Install the SIR coil. Refer to **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil)** or **Inflatable Restraint Steering Wheel Module Coil Replacement (Coil and Harness Assembly)** in SIR.
8. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING COLUMN REPLACEMENT

Tools Required

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J 42640 Steering Column Anti-Rotation Pin. See **Special Tools and Equipment**.

Removal Procedure

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the supplemental inflatable restraint (SIR) system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.
2. Remove the knee bolster. Refer to **Knee Bolster Replacement** in Instrument Panel, Gages and Console.

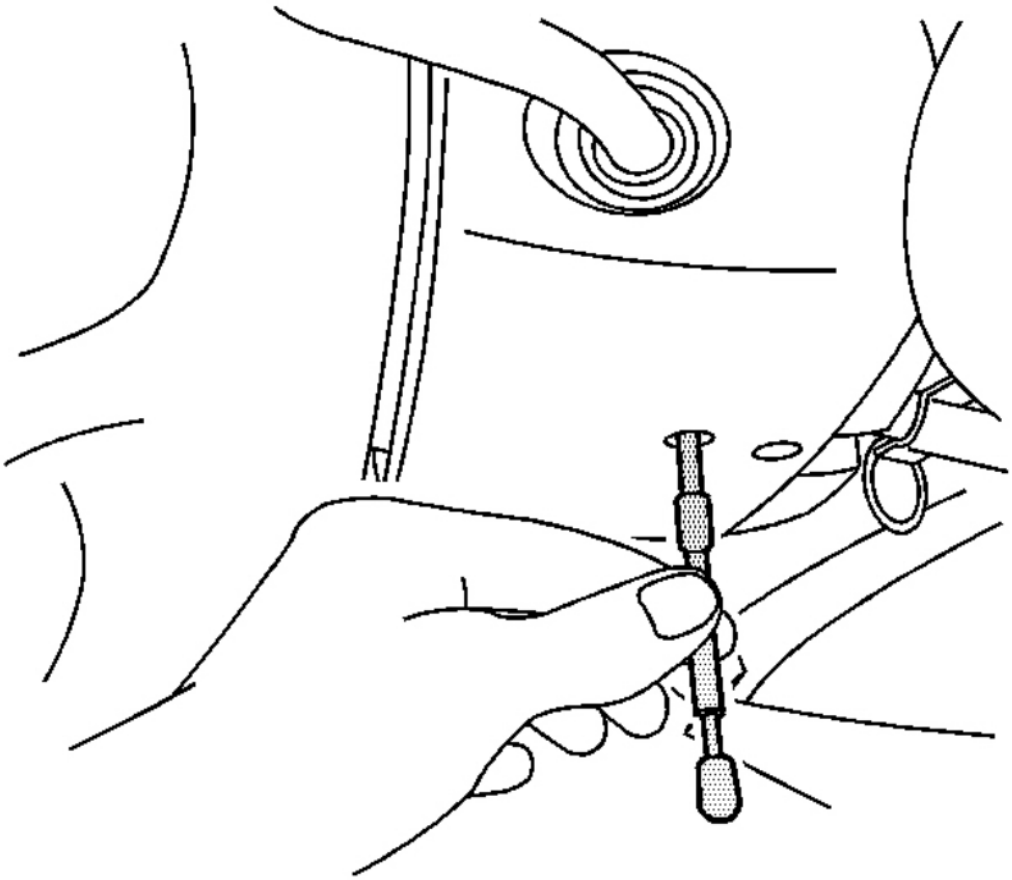


Fig. 93: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

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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.**

3. Lock the steering column through the access hole in the lower trim cover using **J 42640** . See **Special Tools and Equipment**.
4. Remove the body control module bracket. Do not disconnect the harness from the body control module. Refer to **Body Control Module Replacement** in Body Control System.

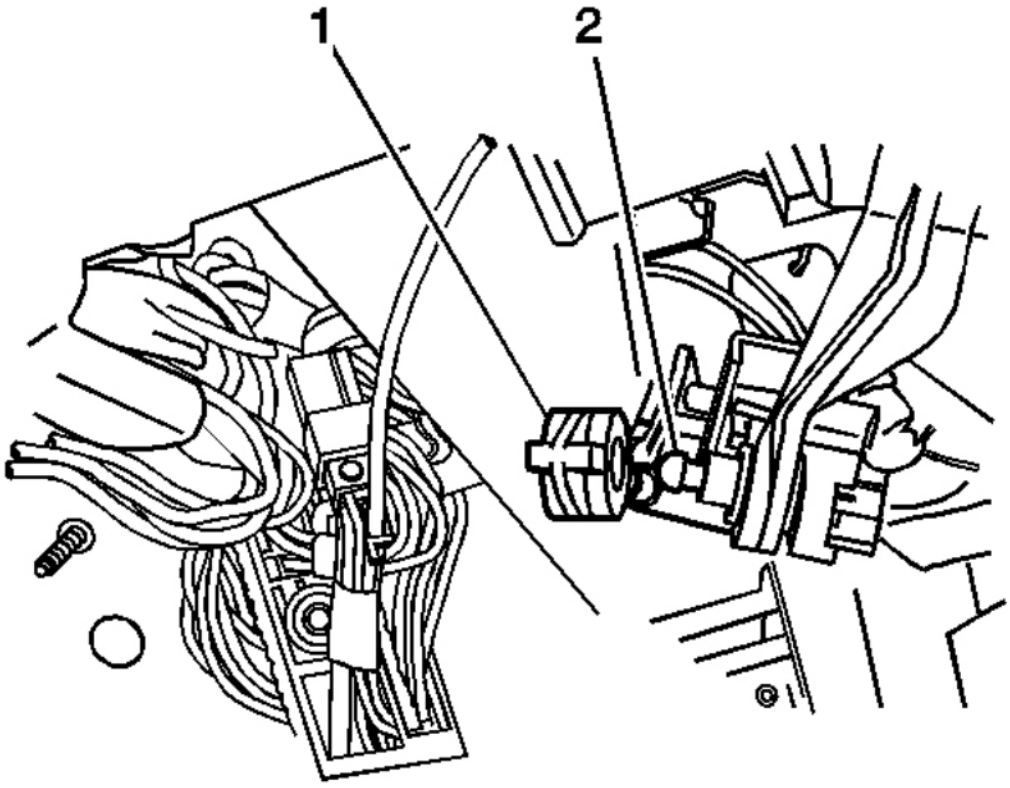


Fig. 94: Transmission Shift Cable To The Steering Column
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the transmission shift cable (1) from the column.

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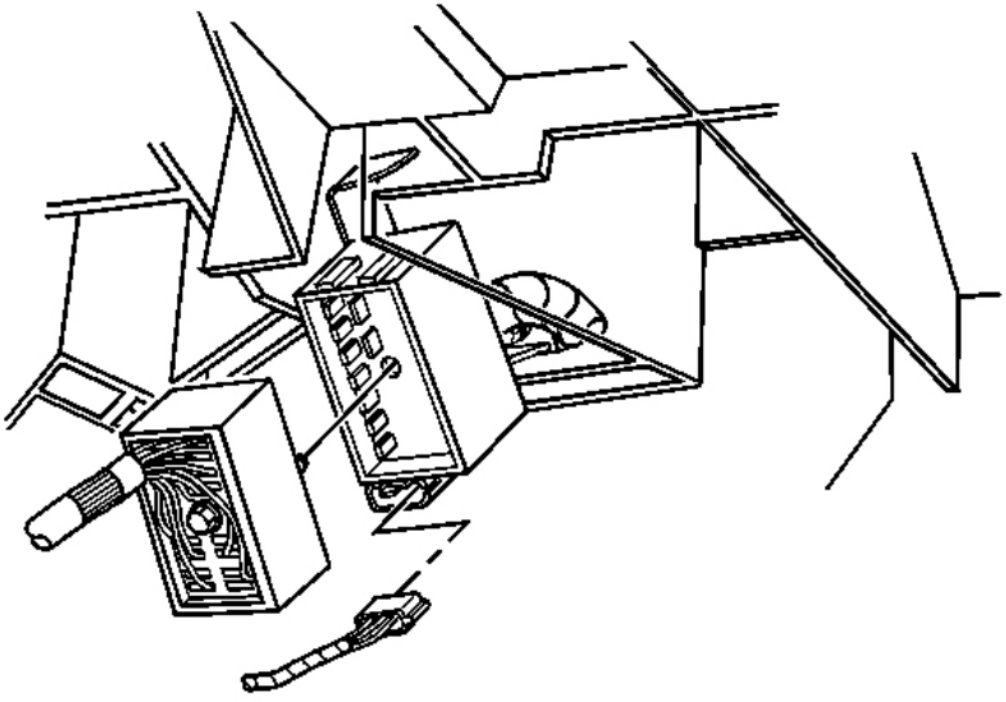


Fig. 95: View Of Steering Column Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

6. Disconnect the steering column electrical connectors.

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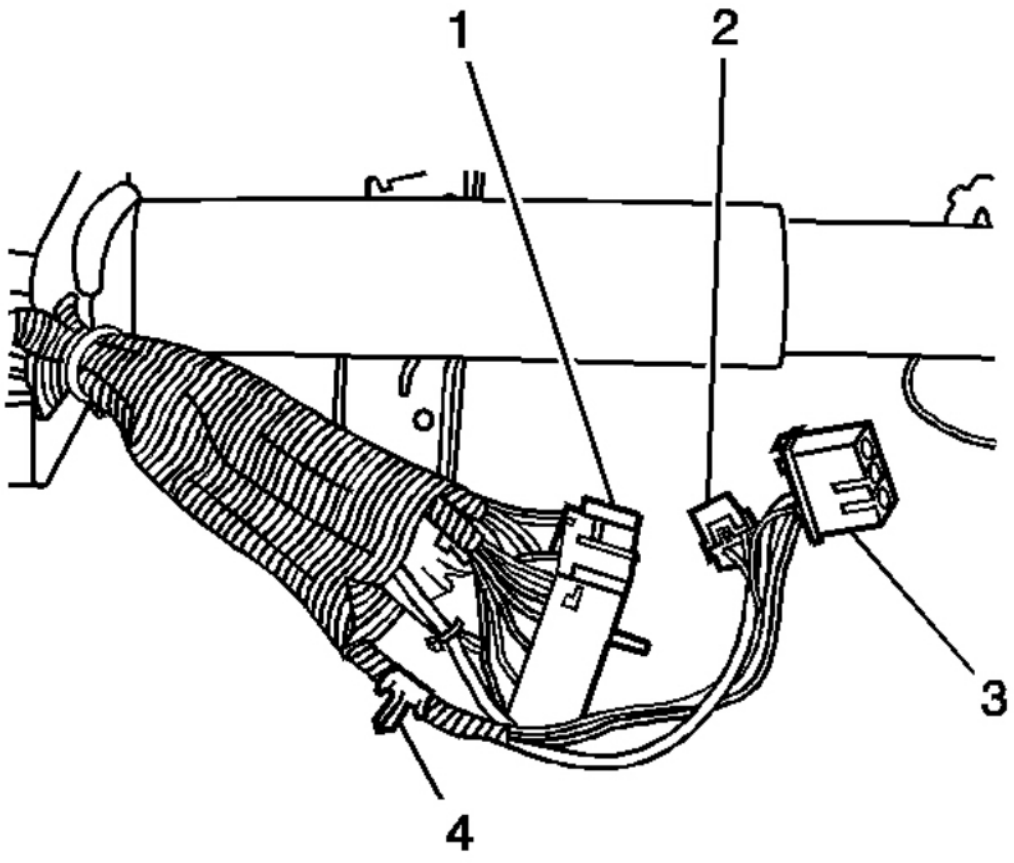


Fig. 96: View Of Wiring Harness Retaining Pin
Courtesy of GENERAL MOTORS CORP.

NOTE: During removal of the steering column the wire harness retaining clip must be removed and reinstalled after installing the steering column or damage may occur to the wire harness.

7. Remove the wiring harness retaining pin (4) from the instrument panel.

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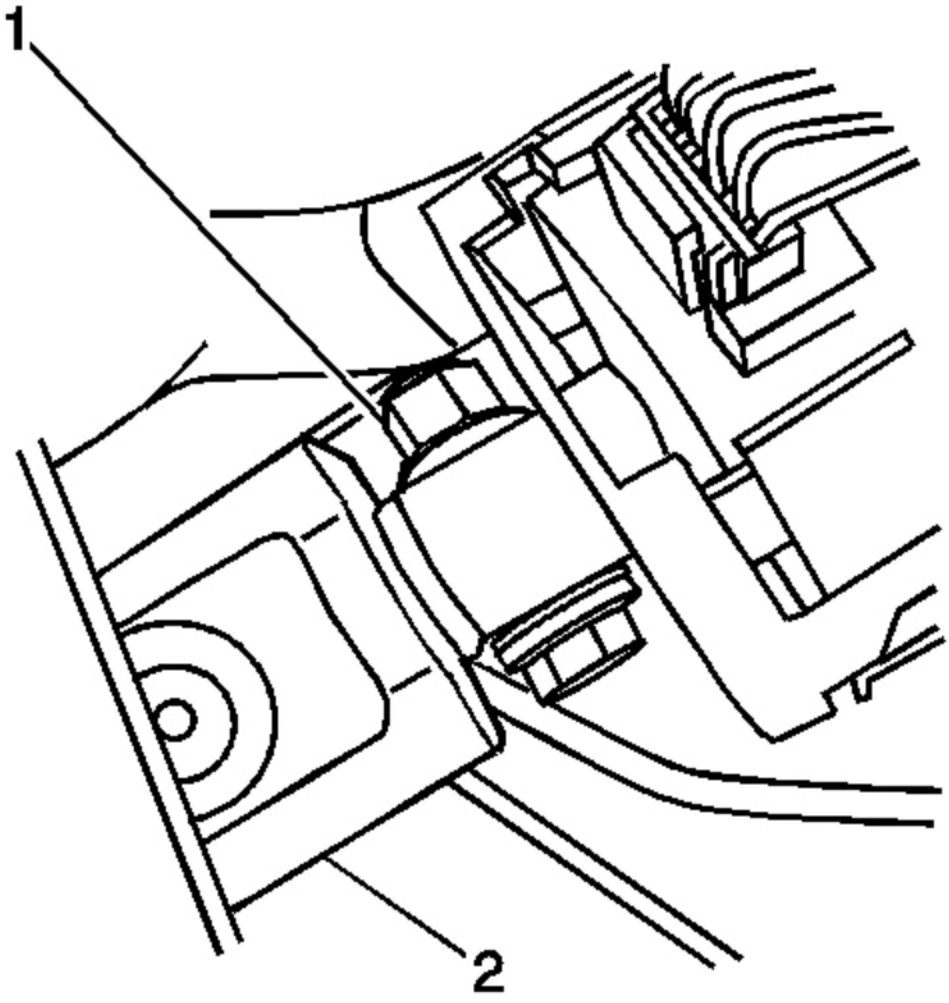


Fig. 97: View Of Upper Shaft To Steering Column Nut Bolt
Courtesy of GENERAL MOTORS CORP.

8. Remove the upper intermediate shaft pinch bolt (1) from the steering column, and remove the shaft from the steering column.

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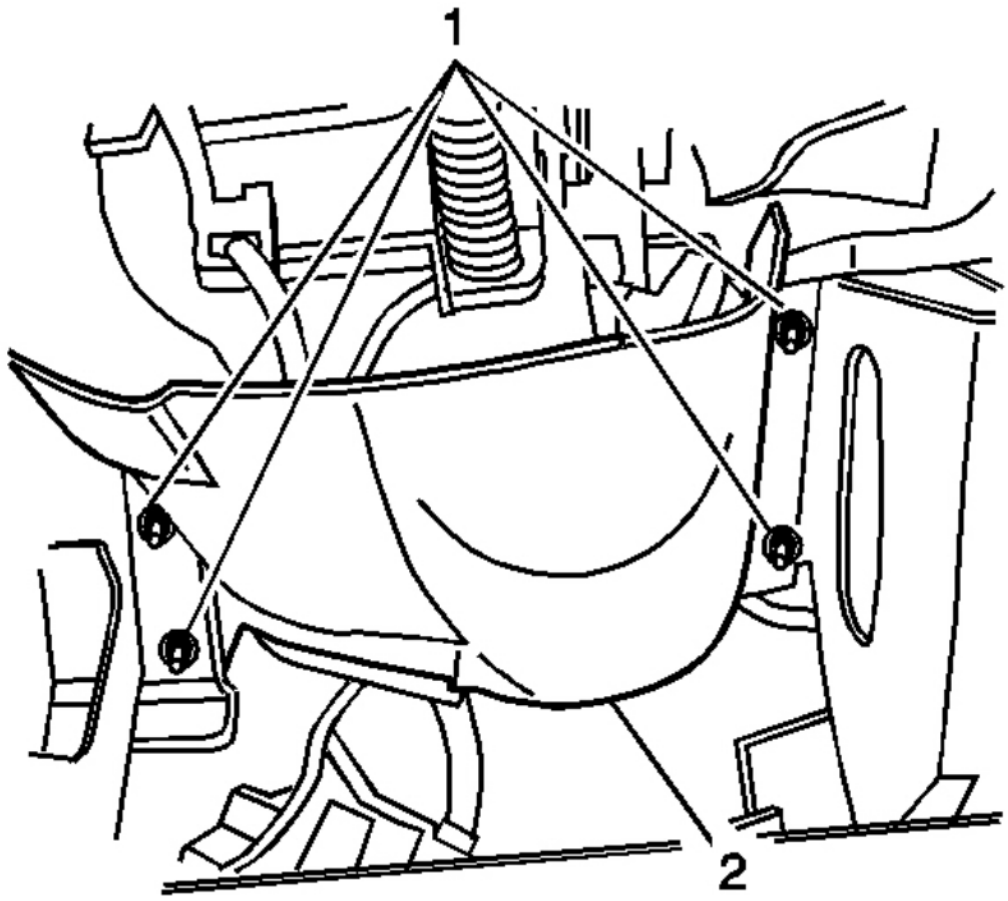


Fig. 98: View Of Knee Bolster Deflector & Nuts
Courtesy of GENERAL MOTORS CORP.

9. Remove the nuts (1) from the knee bolster deflector.

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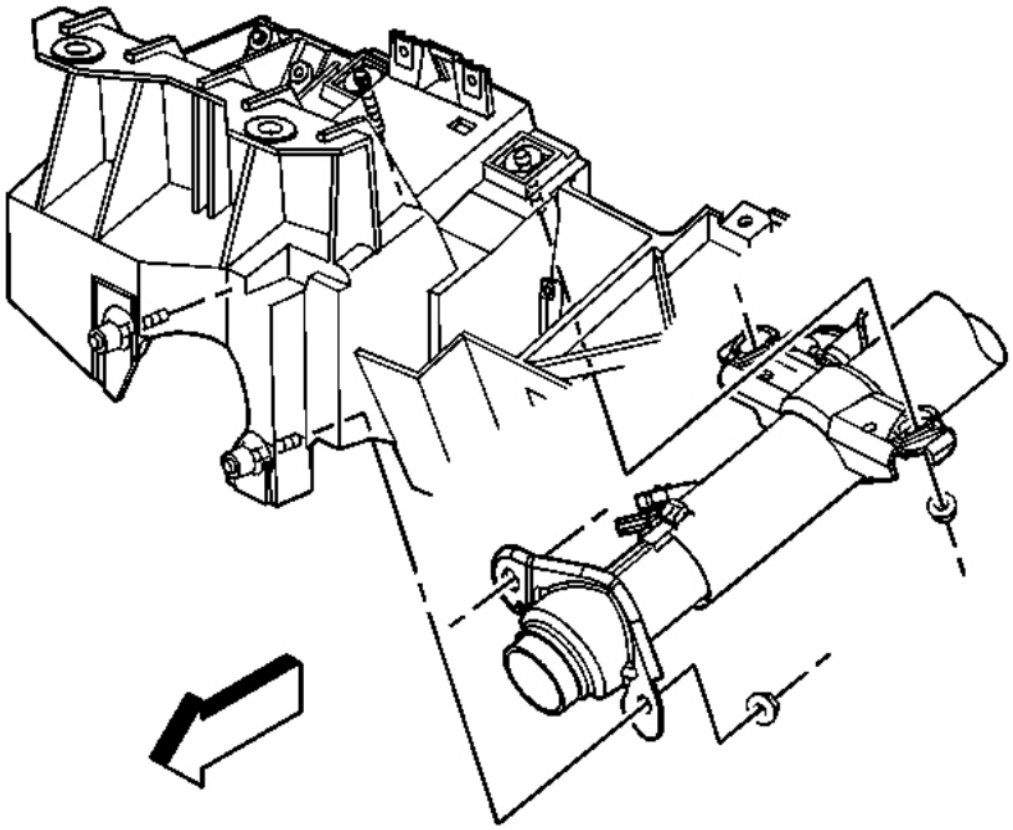


Fig. 99: View Of Steering Column, Upper & Lower Support Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

10. Remove the nuts from the upper support brackets.
11. Remove the nuts from the lower support brackets.

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.

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12. Remove the steering column from the vehicle.

Installation Procedure

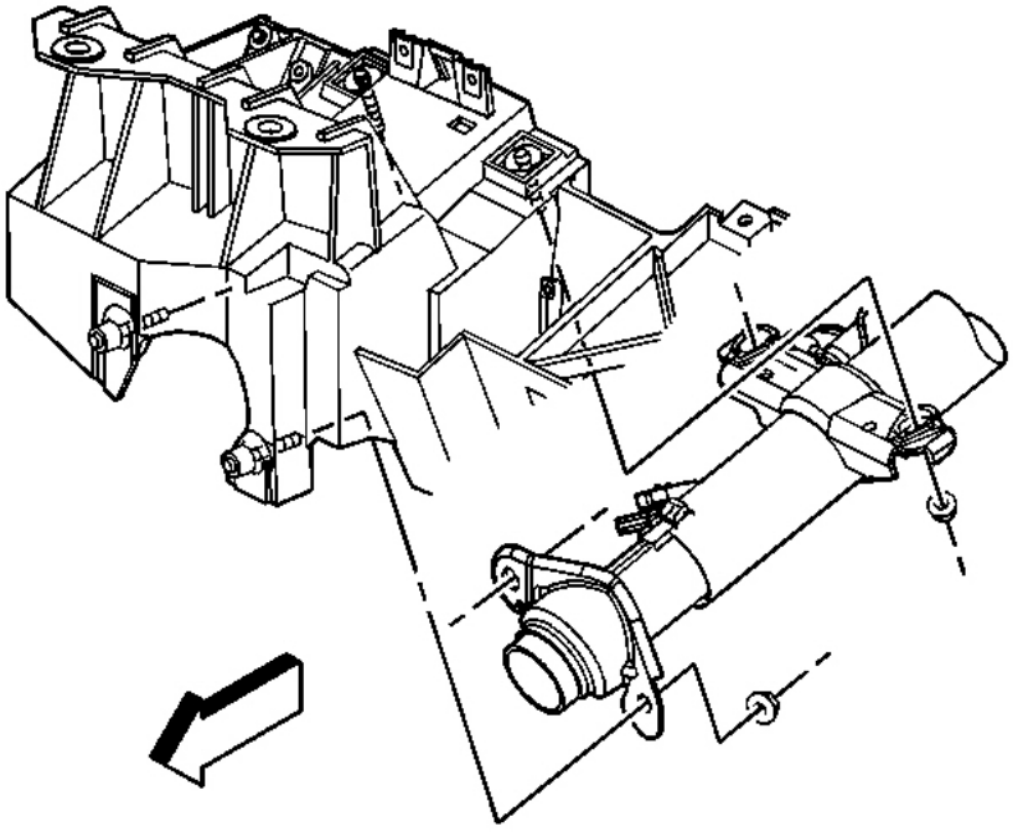


Fig. 100: View Of Steering Column, Upper & Lower Support Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: In order to ensure the intended function of the steering column in a vehicle during a crash and in order to avoid personal injury to the driver, perform the following:

- **Tighten the steering column lower fasteners before you tighten the steering column upper fasteners. Failure to do this can damage the steering column.**
- **Tighten the steering column fasteners to the specified torque. Overtightening the upper steering column fasteners could affect**

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the steering column collapse.

1. Install the steering column to the vehicle.

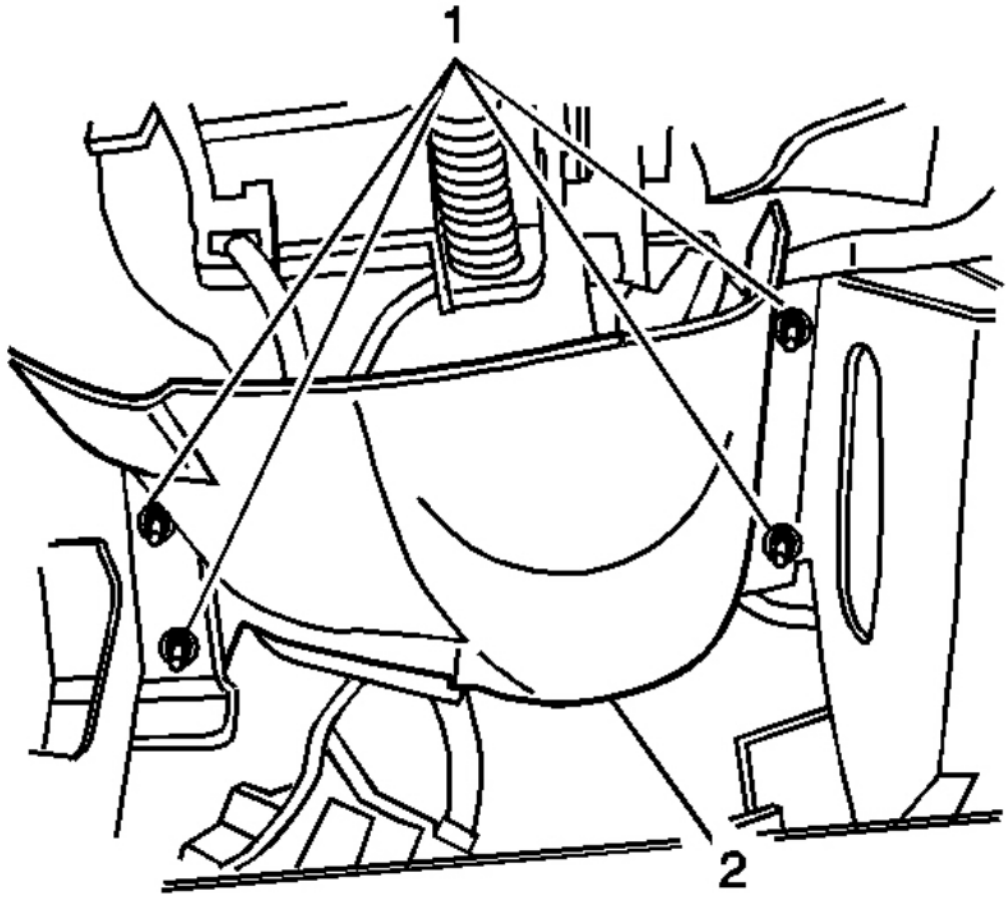
   NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the lower column nuts.

   Tighten: Tighten the nuts to 30 N.m (22 lb ft).

3. Install the nuts to upper support brackets.

   Tighten: Tighten the nuts to 30 N.m (22 lb ft).



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Fig. 101: View Of Knee Bolster Deflector & Nuts
Courtesy of GENERAL MOTORS CORP.

4. Install the nuts (1) which retain the knee bolster deflector to the instrument panel.

   Tighten: Tighten the retaining nuts to 9 N.m (80 lb in).

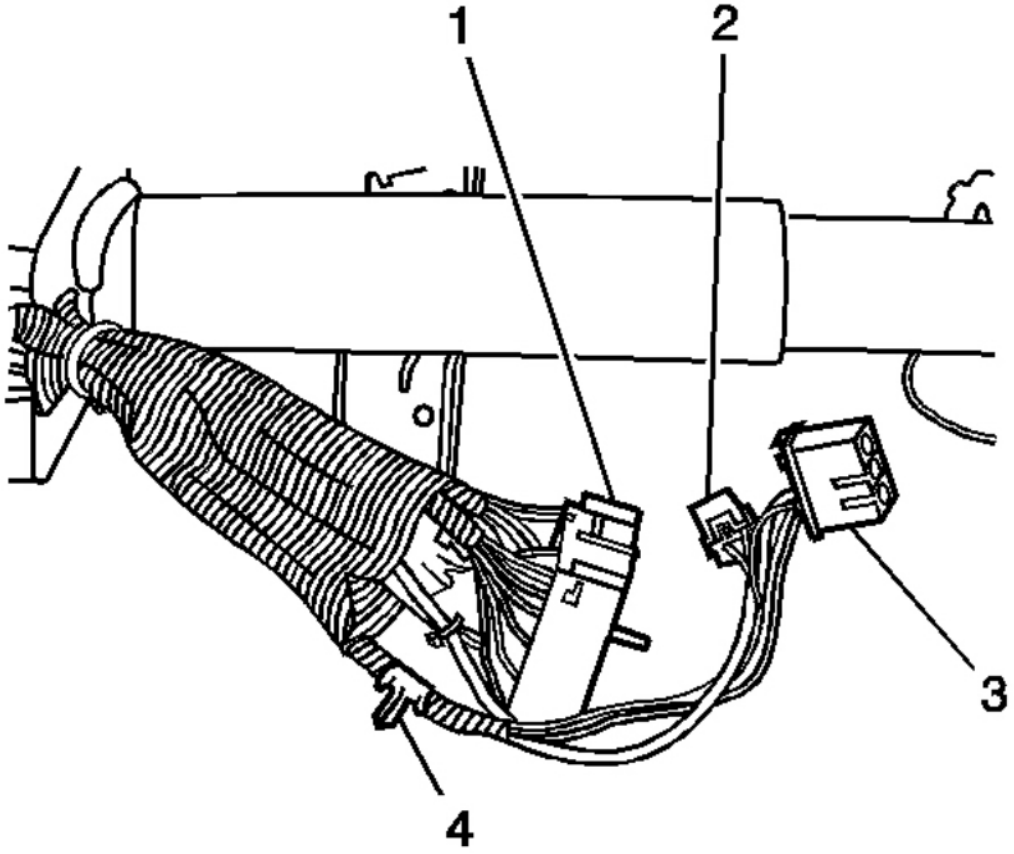


Fig. 102: View Of Wiring Harness Retaining Pin
Courtesy of GENERAL MOTORS CORP.

5. Install the wiring harness retaining (4) pin to the instrument panel.

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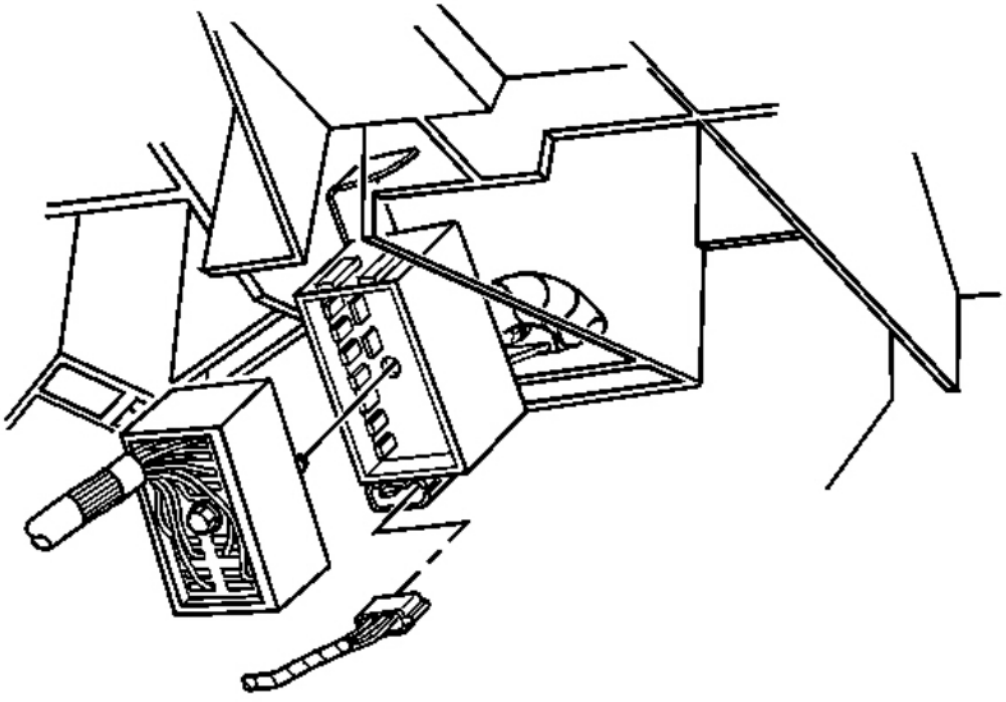


Fig. 103: View Of Steering Column Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

6. Connect the steering column electrical connectors to the vehicle wiring harness.

   Tighten: Tighten the connector to 6 N.m (53 lb in).

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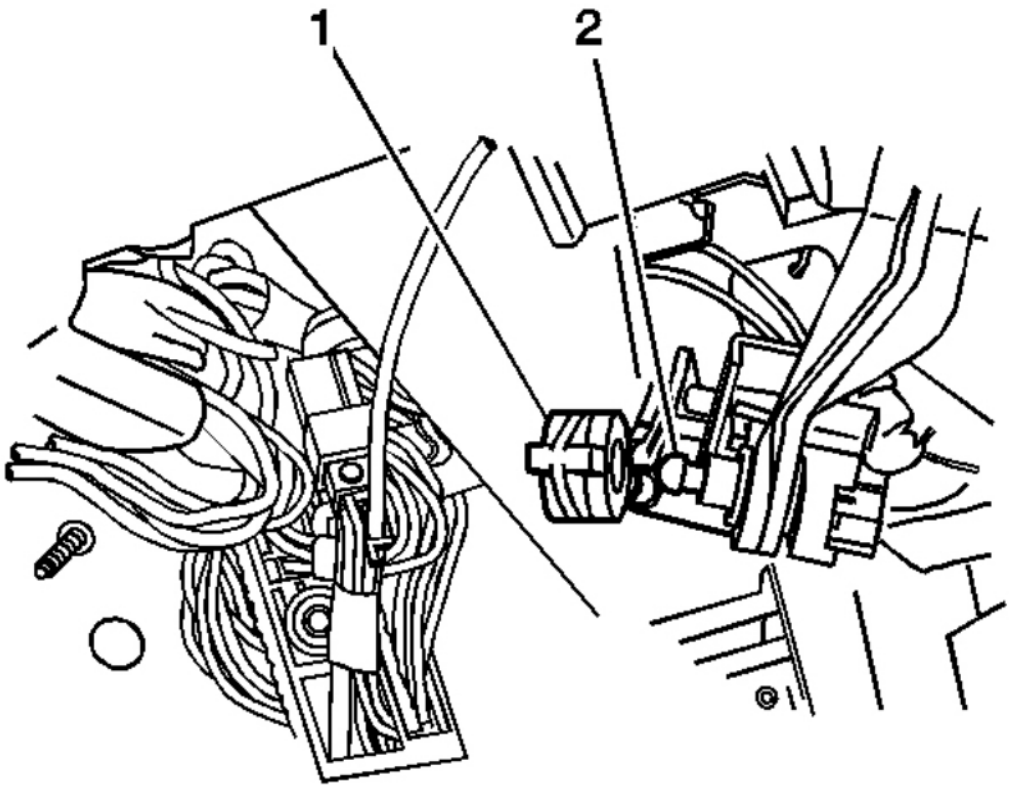


Fig. 104: Transmission Shift Cable To The Steering Column
Courtesy of GENERAL MOTORS CORP.

7. Connect the transmission shift cable (1) to the steering column.
8. Install the body control module bracket. Refer to **Body Control Module Replacement** in Body Control System.
9. Install the 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.

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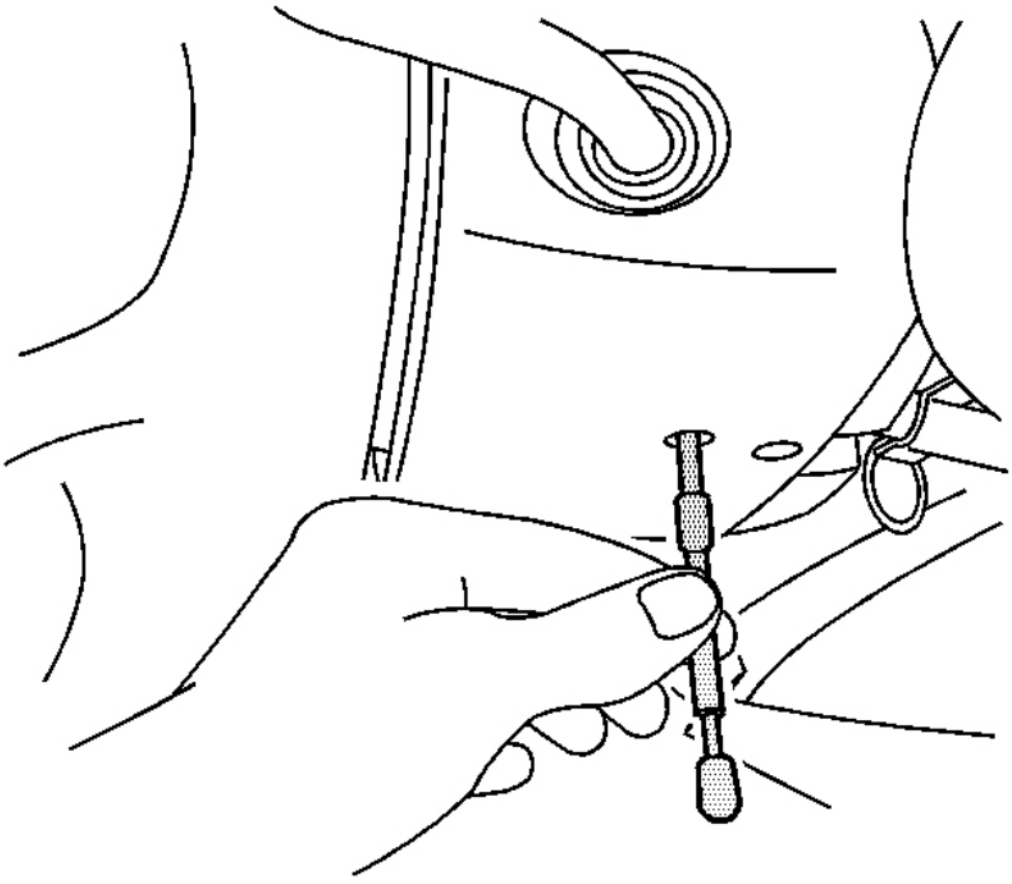


Fig. 105: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

11. Remove **J 42640** from the steering column. See **Special Tools and Equipment**.

STEERING COLUMN SEAL REPLACEMENT

Removal Procedure

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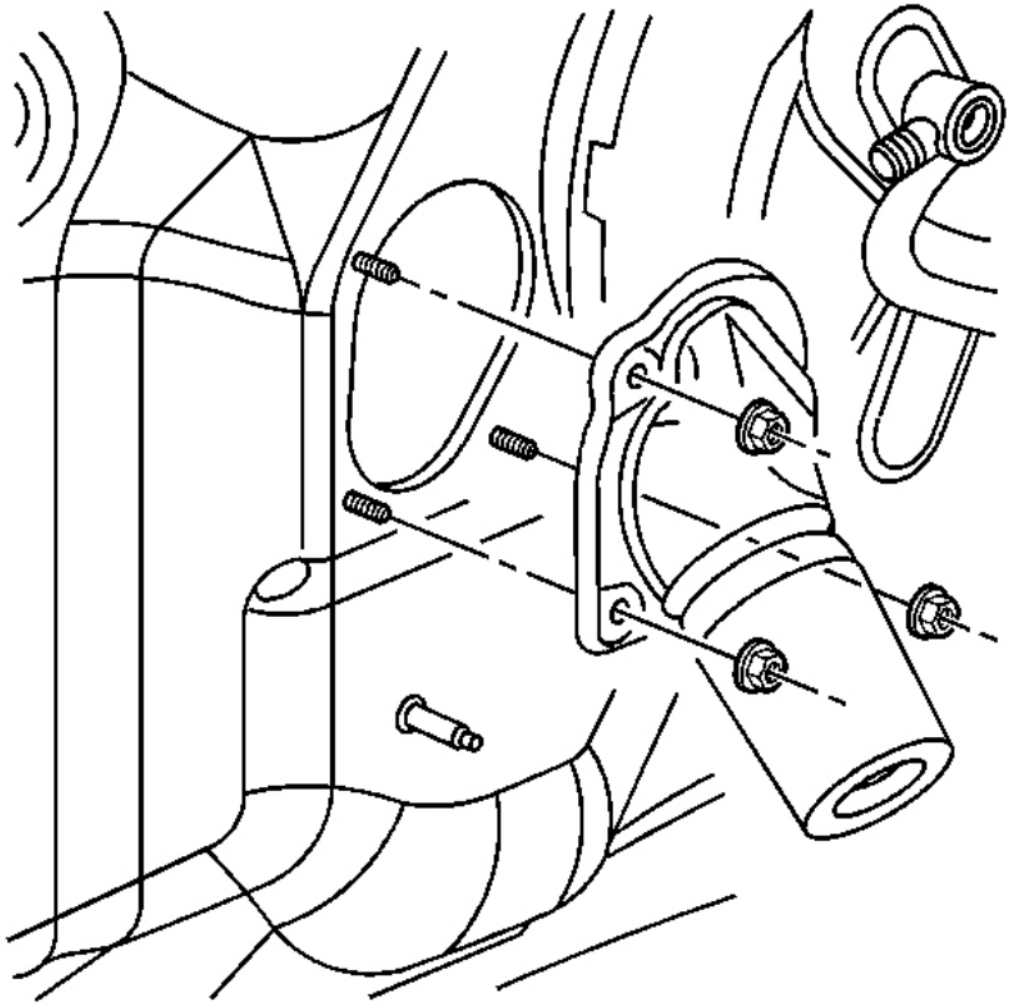


Fig. 106: View Of Steering Column Seal & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Set the front wheels in the straight-ahead position.
2. Set the steering wheel in the LOCK position.
3. Remove the intermediate shaft. Refer to **Intermediate Steering Shaft Replacement - Lower**.
4. Remove the nuts from the studs.
5. Remove the seal from the vehicle.

Installation Procedure

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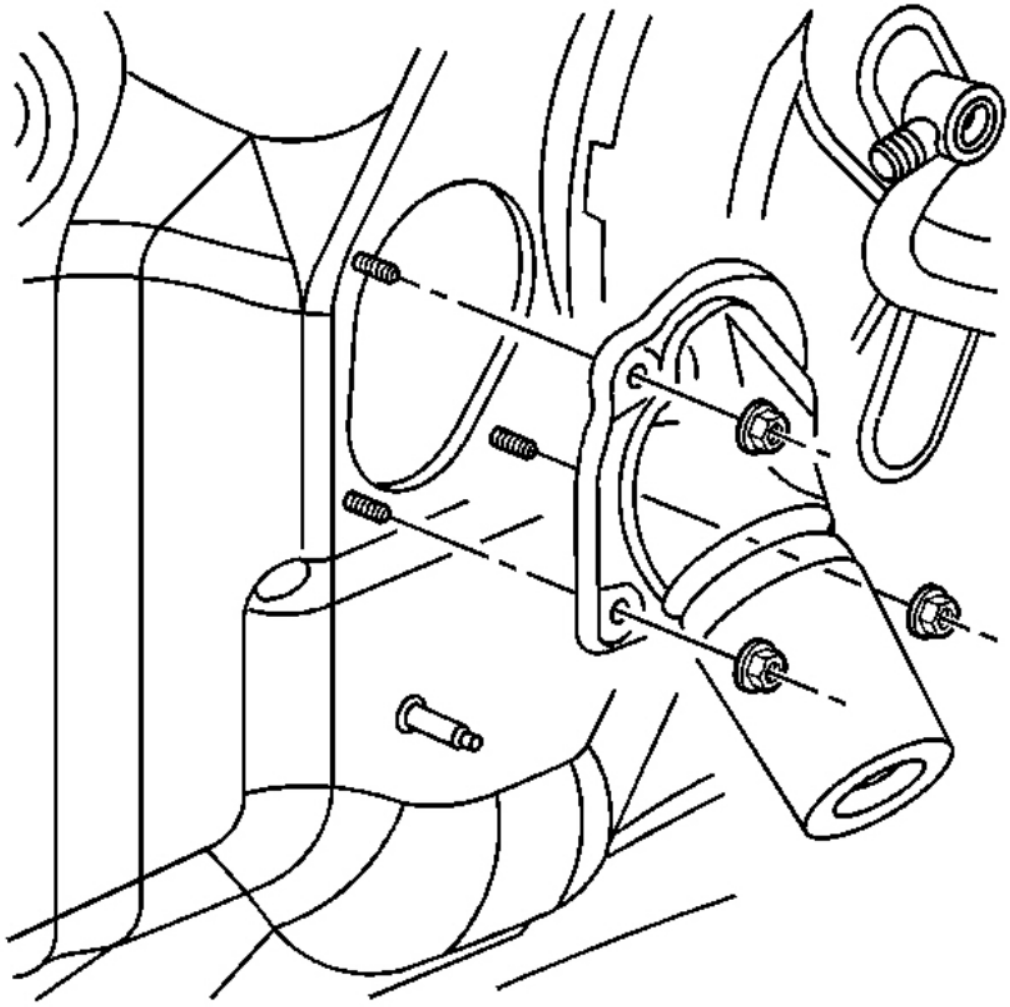


Fig. 107: View Of Steering Column Seal & Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the seal to the vehicle.
2. Install the nuts to the studs.

   Tighten: Tighten the nuts to 3 N.m (27 lb in).

3. Install the intermediate shaft. Refer to **Intermediate Steering Shaft Replacement - Lower**.

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LOWER BEARING AND STEERING COLUMN JACKET REPLACEMENT (COLUMN SHIFT LEAN SHAFT)

Tools Required

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

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 steering column from the vehicle. Refer to **Steering Column Replacement**.
3. Remove the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
4. Remove the tilt spring assembly only. Refer to **Tilt Spring Replacement**.
5. Remove the linear shift and the automatic shift lock control. Refer to **Linear Shift Assembly Replacement**.
6. Inspect the steering column for accident damage. Refer to **Steering Column Accident Damage Inspection**.

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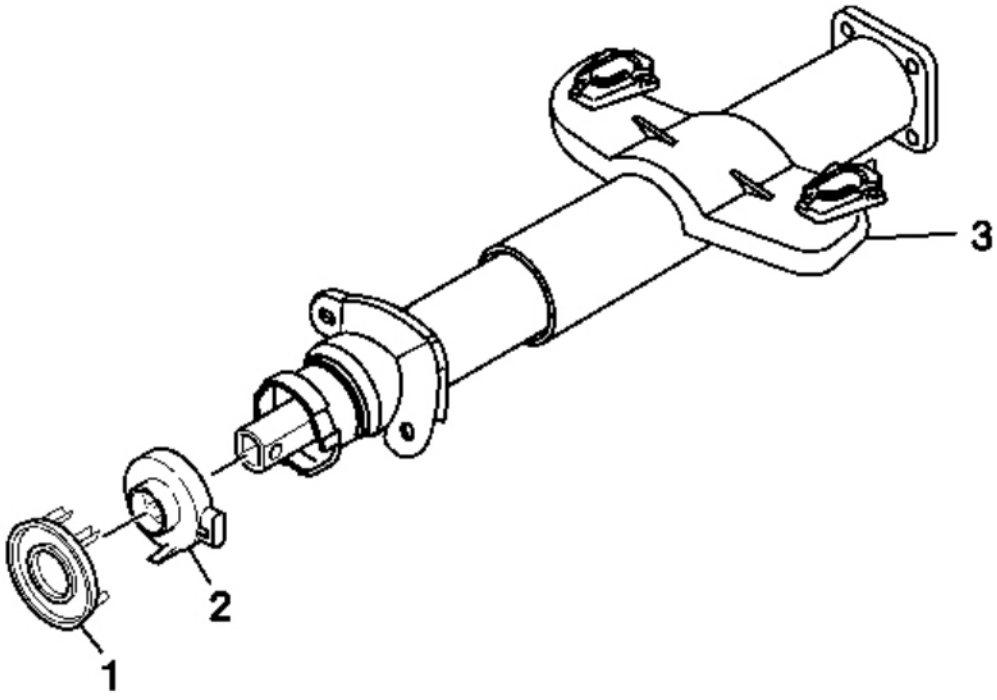


Fig. 108: View Of Steering Column Jacket Assembly, Steering Shaft Position Sensor & Sensor Retainer
Courtesy of GENERAL MOTORS CORP.

7. Remove the sensor retainer (1) from the steering column jacket assembly (3).
8. Remove the steering shaft position sensor (2) from the steering column jacket assembly (3).

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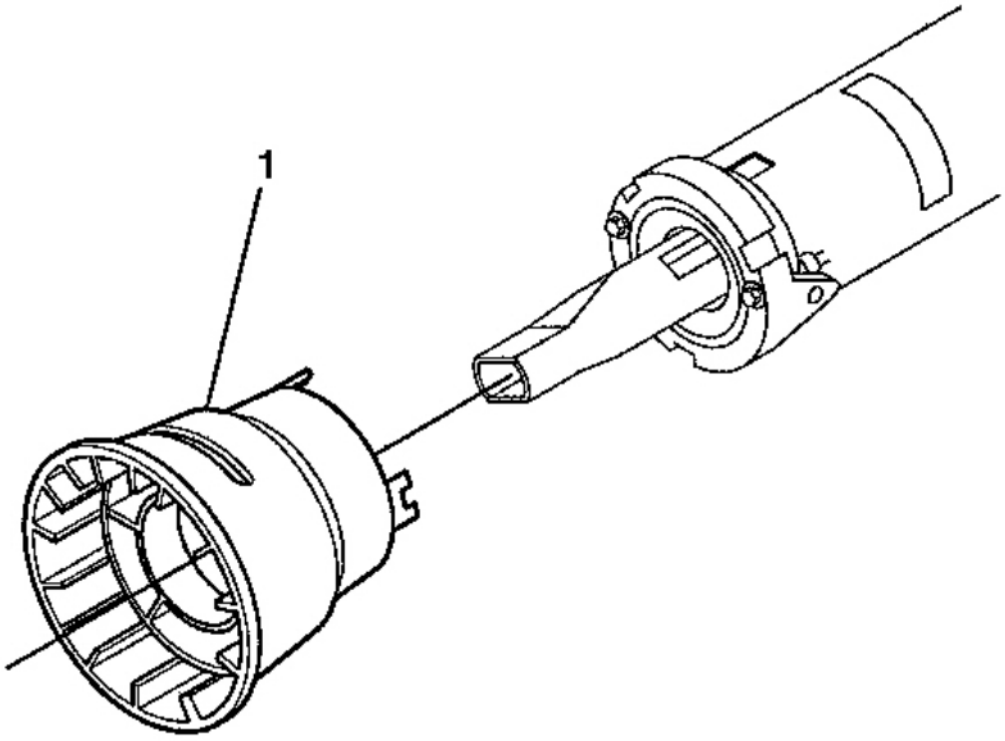


Fig. 109: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

9. Gently pull the adapter and bearing assembly (1) from the steering shaft assembly.

   If the cage and balls separate from the adapter and bearing assembly, you may install them back together in the installation procedure.

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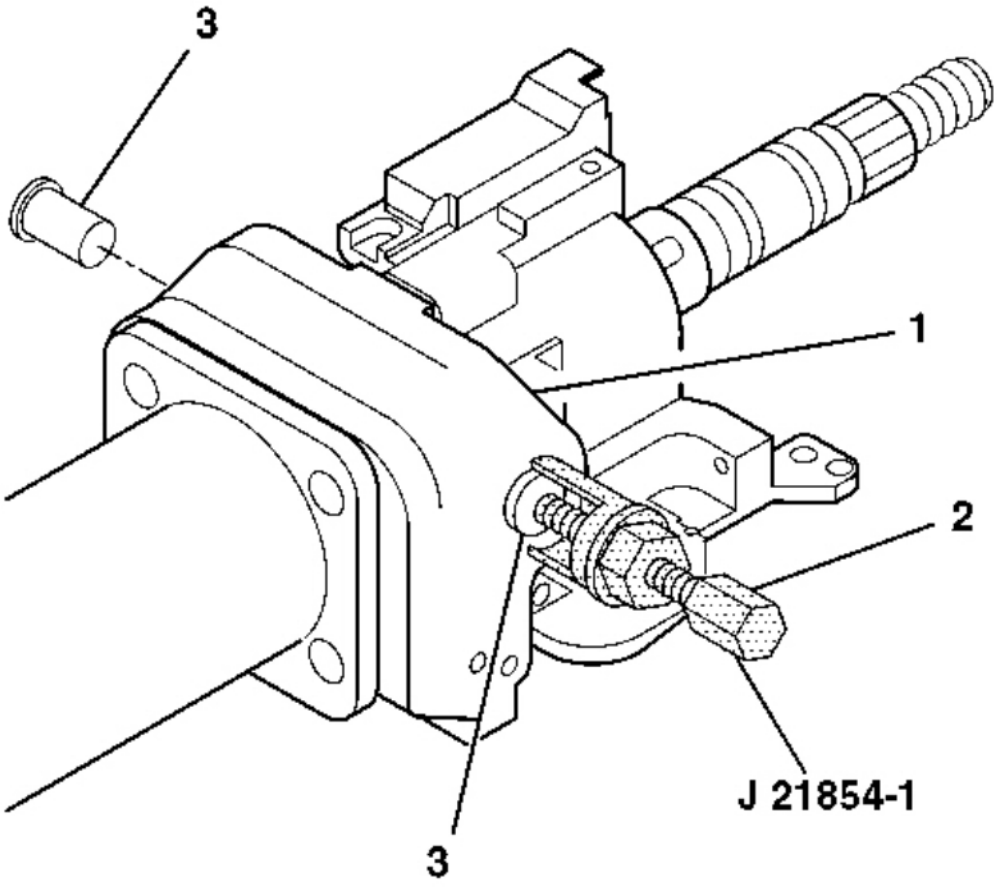


Fig. 110: View Of Pivot Pins To Steering Column Tilt Head Assembly
Courtesy of GENERAL MOTORS CORP.

10. Remove the 2 pivot pins (3) from the steering column tilt head assembly (1) by using **J 21854-01** . See **Special Tools and Equipment**.

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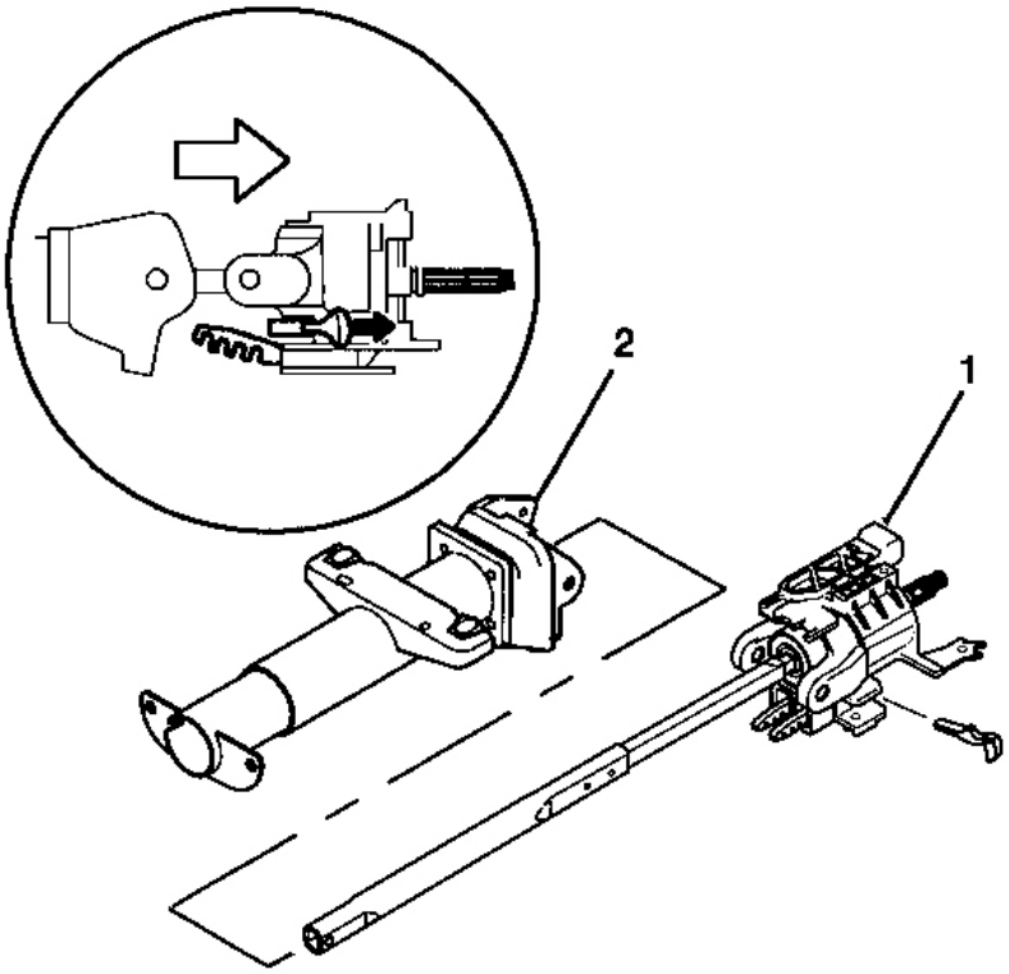


Fig. 111: View Of Steering Column Tilt Head Assembly & Steering Column Jacket Assembly (Column Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

11. Install the tilt lever into the steering column tilt head assembly (1).
12. 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.
13. Remove the steering column tilt head assembly (1) with the steering column shaft assembly from the steering column jacket assembly (2).
14. Remove the tilt lever.

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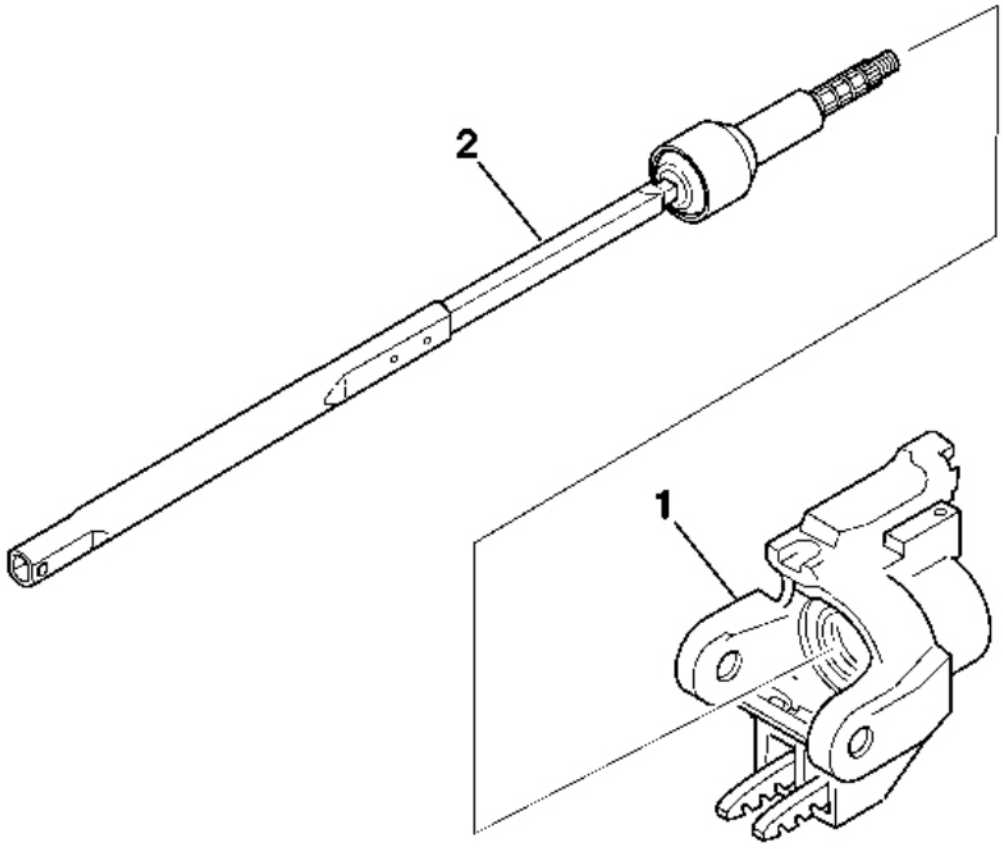


Fig. 112: View Of Steering Column Shaft Assembly & Steering Column Tilt Head Assembly (Column Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

15. Remove the steering column shaft assembly (2) from the steering column tilt head assembly (1).

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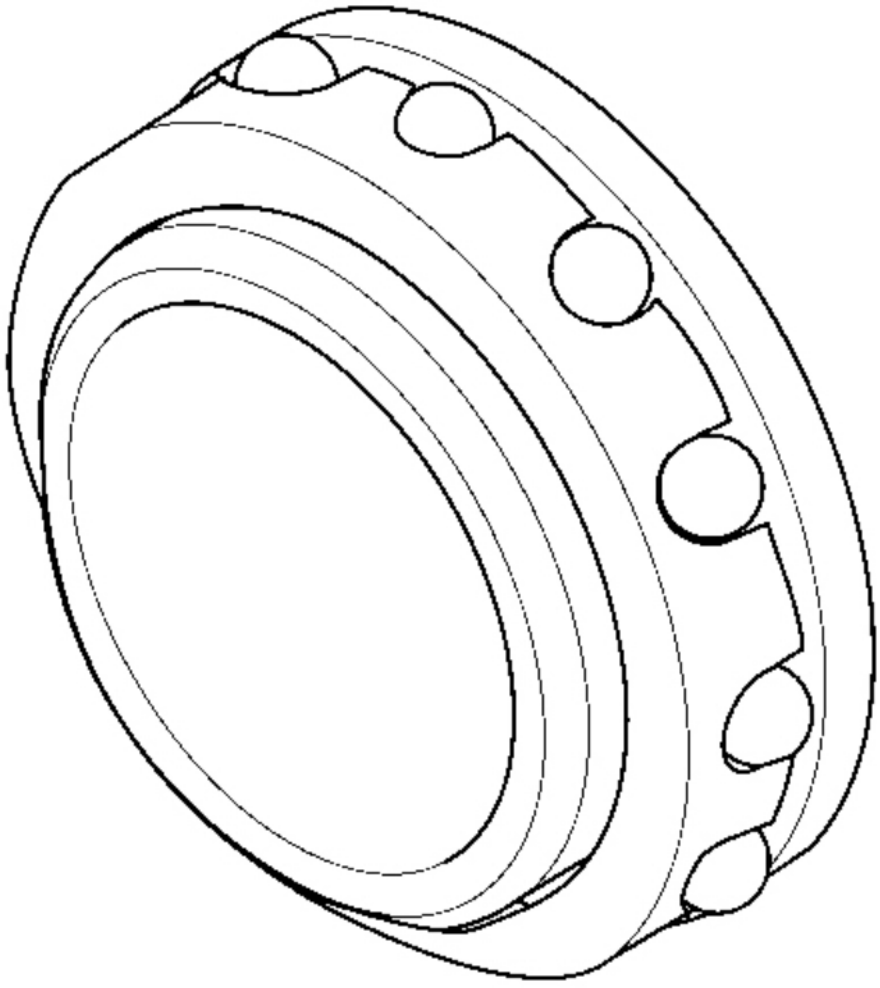


Fig. 113: View Of Upper Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

16. Remove the upper bearing assembly.

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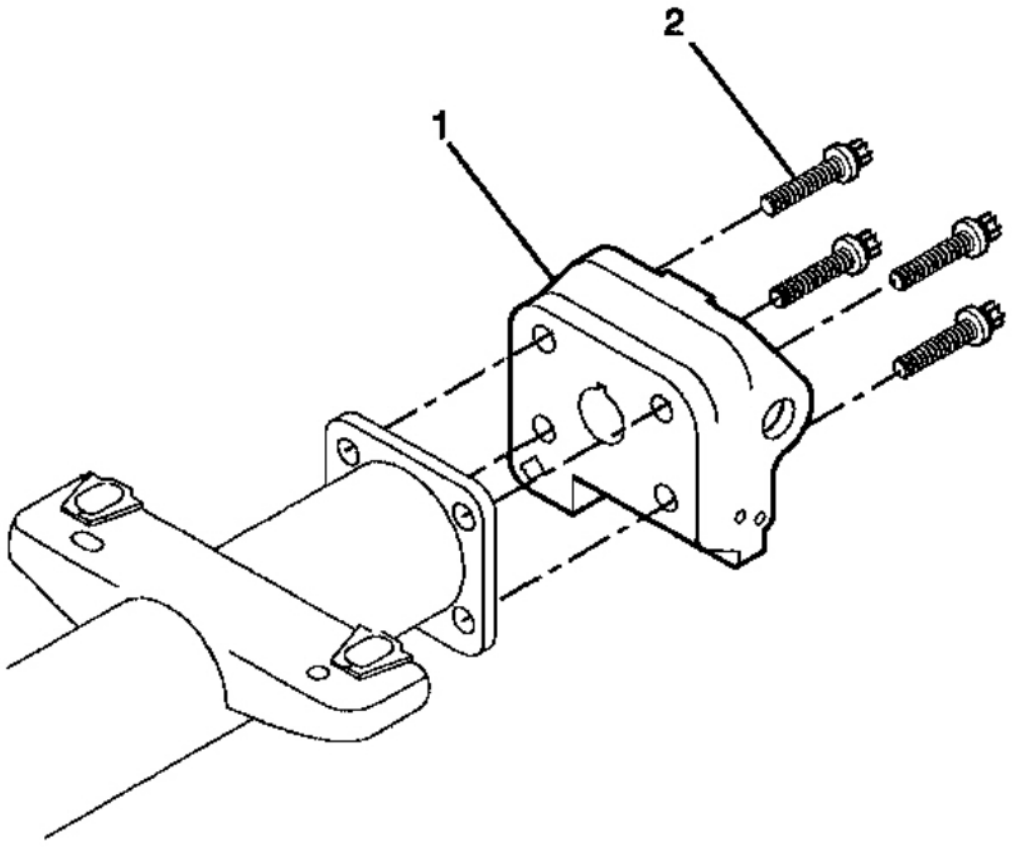


Fig. 114: View Of Steering Column Support Assembly & TORX(R) Head Screws
Courtesy of GENERAL MOTORS CORP.

17. Remove the 4 TORX® head screws (2) from the steering column support assembly (1).
18. Discard the 4 TORX® head screws.
19. Remove the steering column support assembly (1) from the steering column jacket assembly.

Installation Procedure

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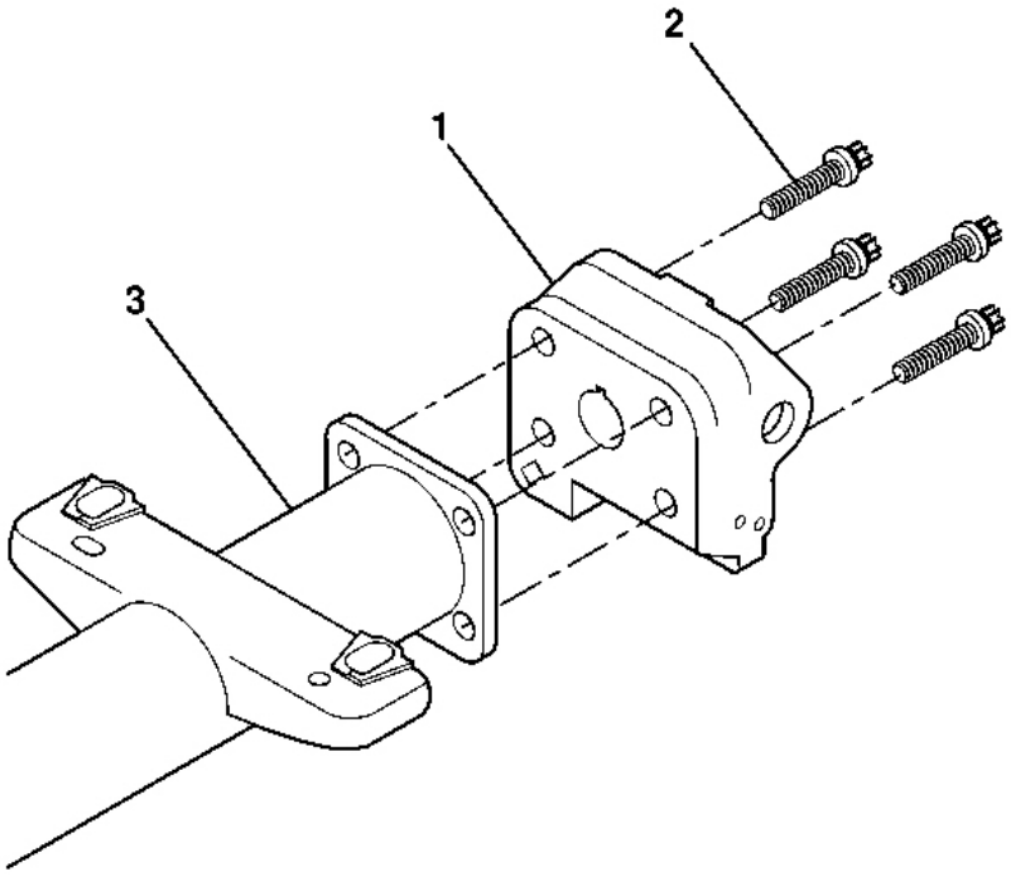


Fig. 115: View Of Steering Column Support Assembly, Steering Column Jacket Assembly & Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Replace the steering column support assembly (1) if the steering column support assembly (1) has been staked 3 times.

1. Attach the steering column support assembly (1) to the steering column jacket assembly (3) with 4 TORX® head screws (2).

   Tighten: Tighten the screws to 17 N.m (13 lb ft).

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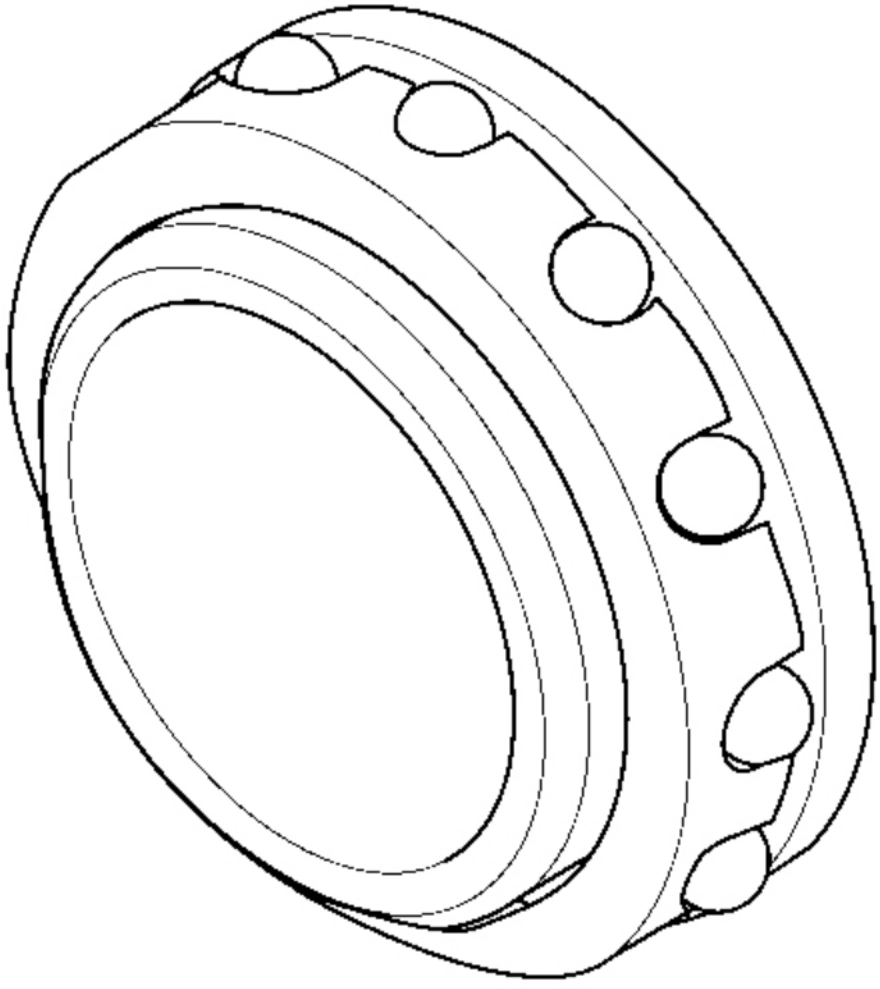


Fig. 116: View Of Upper Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the upper bearing assembly.

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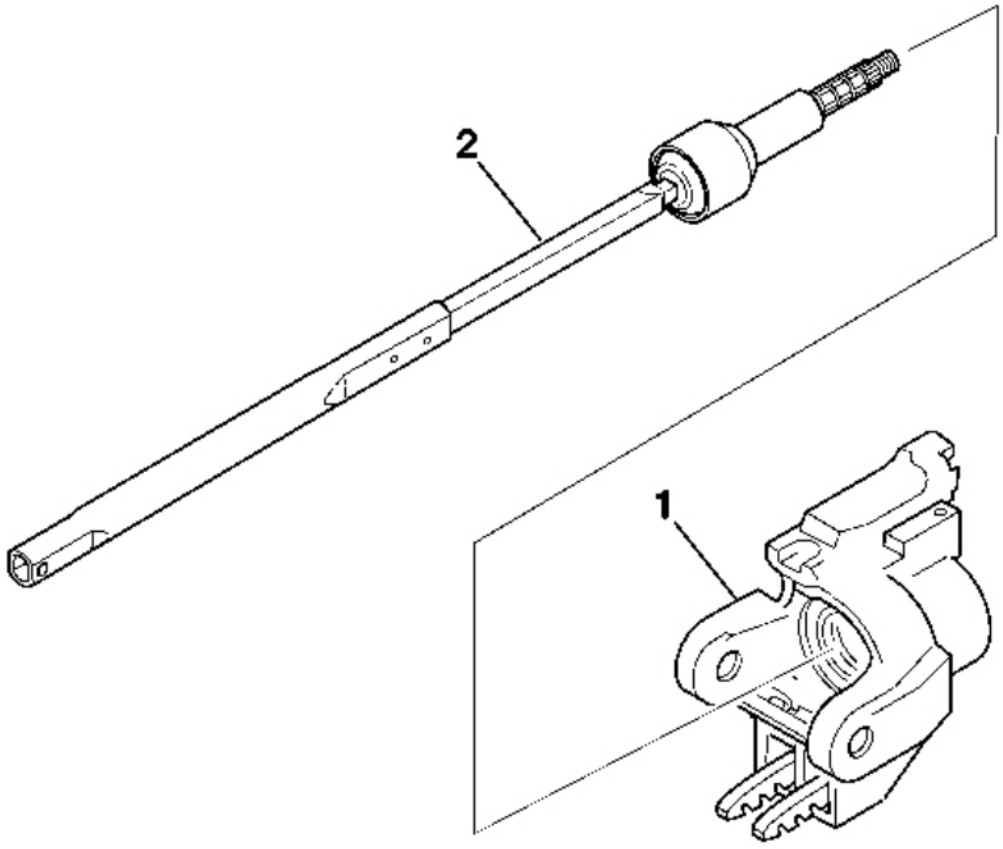


Fig. 117: View Of Steering Column Shaft Assembly & Steering Column Tilt Head Assembly (Column Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

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

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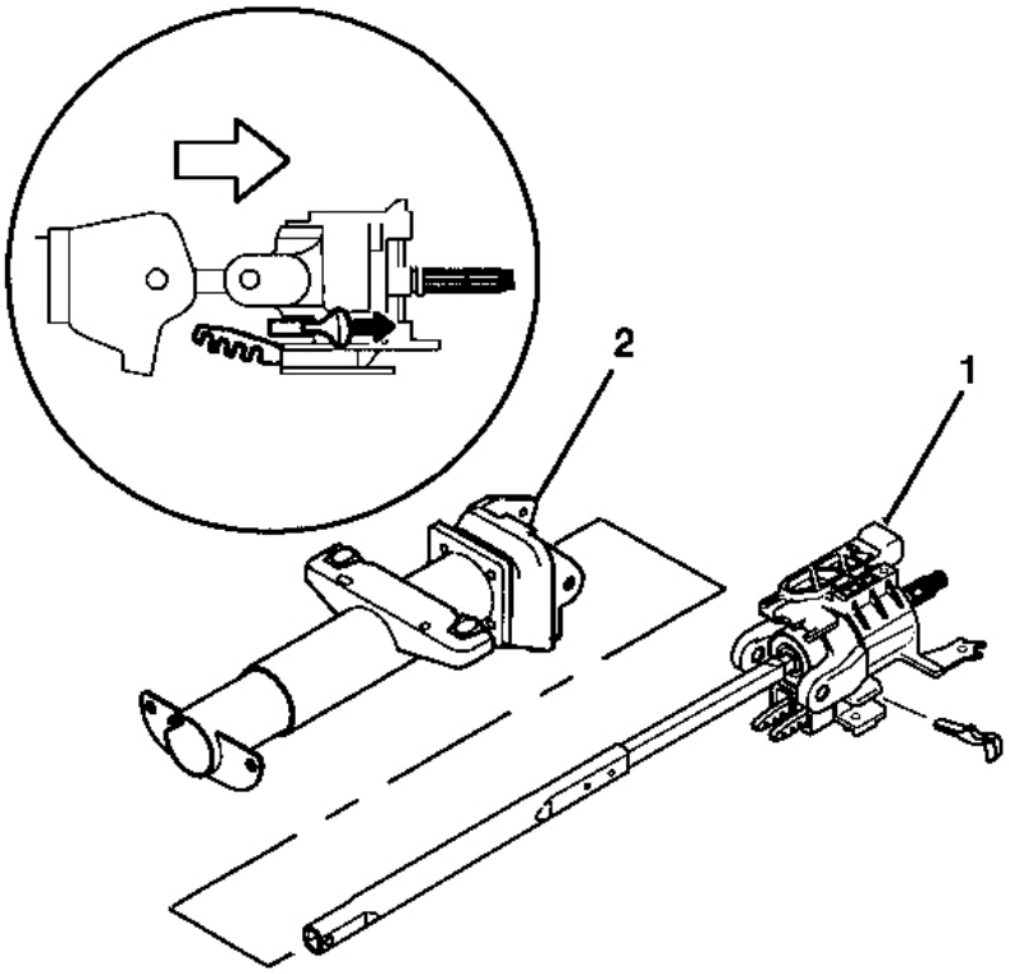


Fig. 118: View Of Steering Column Tilt Head Assembly & Steering Column Jacket Assembly (Column Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

4. Install the steering column shaft assembly with the steering column tilt head assembly (1) into the steering column jacket assembly (2).
5. Maneuver the tilt knob and push the steering column tilt head assembly (1) up towards the steering column in order to lock the steering wheel lock shoes in place.

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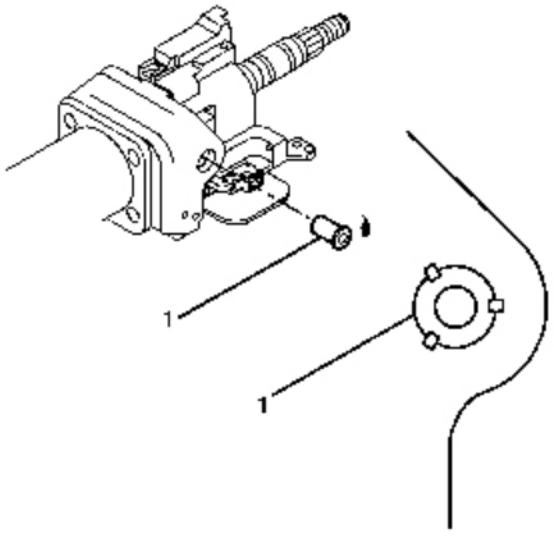


Fig. 119: View Of Pivot Pins At Steering Column Assembly
Courtesy of GENERAL MOTORS CORP.

6. Lubricate the pivot pins (1) with GM P/N 12346293 (Canadian P/N 992723).
7. Firmly seat each pivot pin (1) into the steering column tilt head assembly.
8. Stake the steering column support assembly in 3 locations around each pivot pin.

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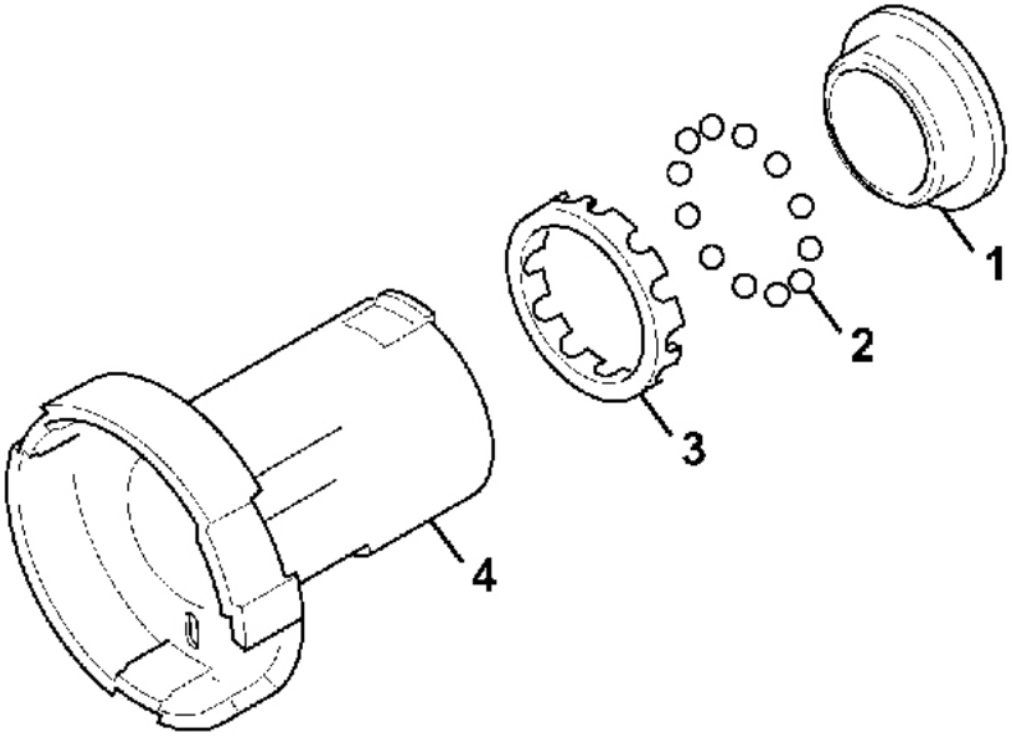


Fig. 120: Installing The Balls Into The Cage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify that all 12 balls are present and that NO foreign debris is present in the inner race, cage, balls or outer race. The orientation of the cage MUST be as shown to install properly.

9. If necessary, install the balls (2) into the cage (3).

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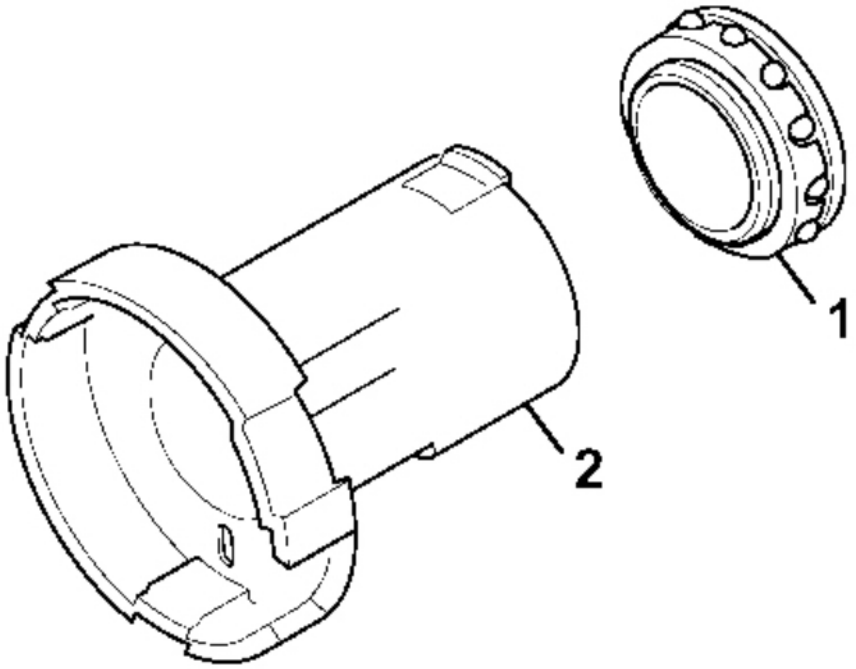


Fig. 121: Installing Race Into The Ball And Cage Assembly
Courtesy of GENERAL MOTORS CORP.

10. Install the race (1) into the ball and cage assembly.
11. Install the race, cage and balls into the adapter and bearing assembly (2).

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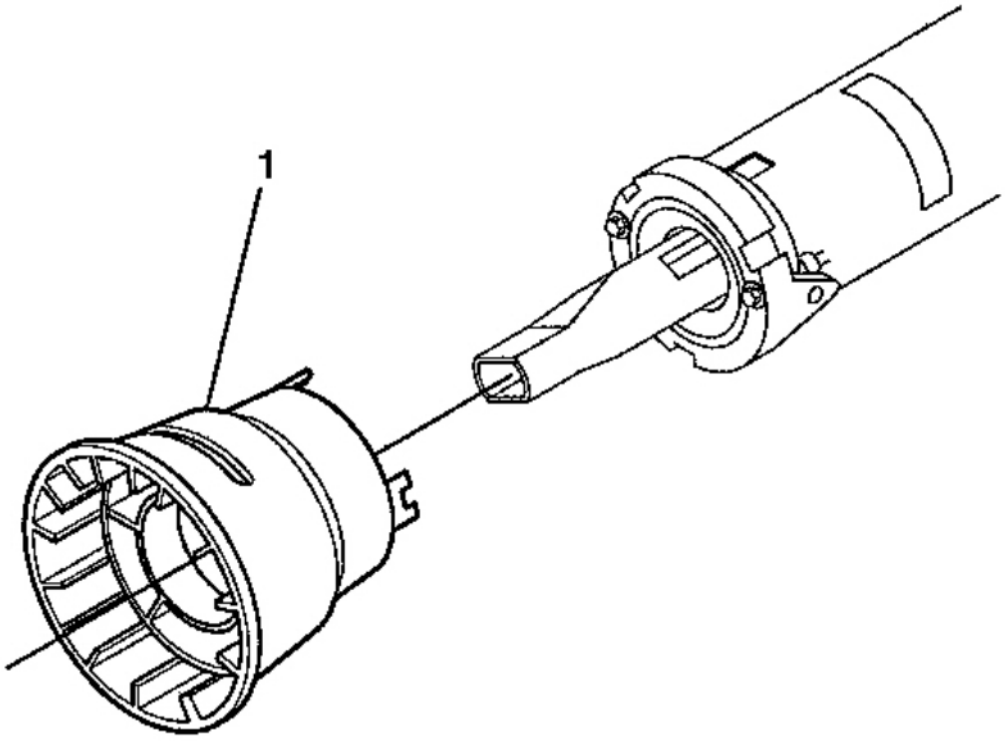


Fig. 122: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

12. Install the adapter and bearing assembly (1) onto the steering column jacket assembly by performing the following steps:
    1. Align the tab on the adapter and bearing assembly (1) with the slot in the steering column jacket assembly.
    2. Push the adapter and bearing assembly (1) onto the steering column shaft assembly until the tab snaps into the slot.

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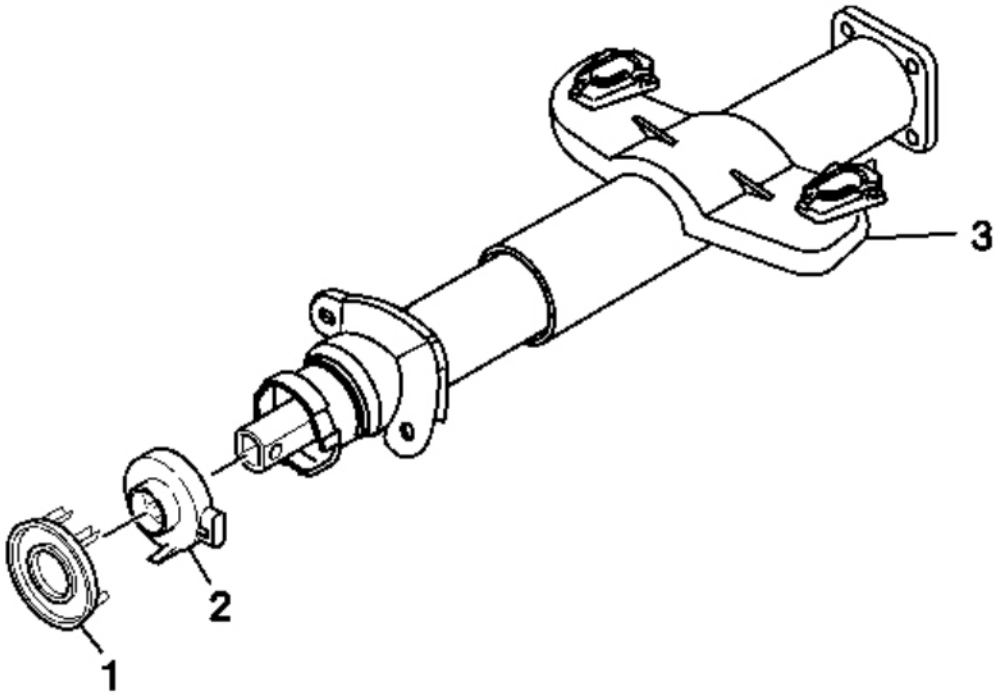


Fig. 123: View Of Steering Column Jacket Assembly, Steering Shaft Position Sensor & Sensor Retainer
Courtesy of GENERAL MOTORS CORP.

13. Install the steering shaft position sensor (2) onto the steering column jacket assembly (3).
14. Install the sensor retainer (1) onto the steering column jacket assembly (3).
15. Install the linear shift and the automatic transmission shift lock control only. Refer to **Linear Shift Assembly Replacement**.
16. Install the tilt spring only. Refer to **Tilt Spring Replacement**.
17. Install the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
18. Install the steering column into the vehicle. Refer to **Steering Column Replacement**.
19. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

LOWER BEARING AND STEERING COLUMN JACKET REPLACEMENT (FLOOR SHIFT LEAN SHAFT)

Tools Required

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

Removal Procedure

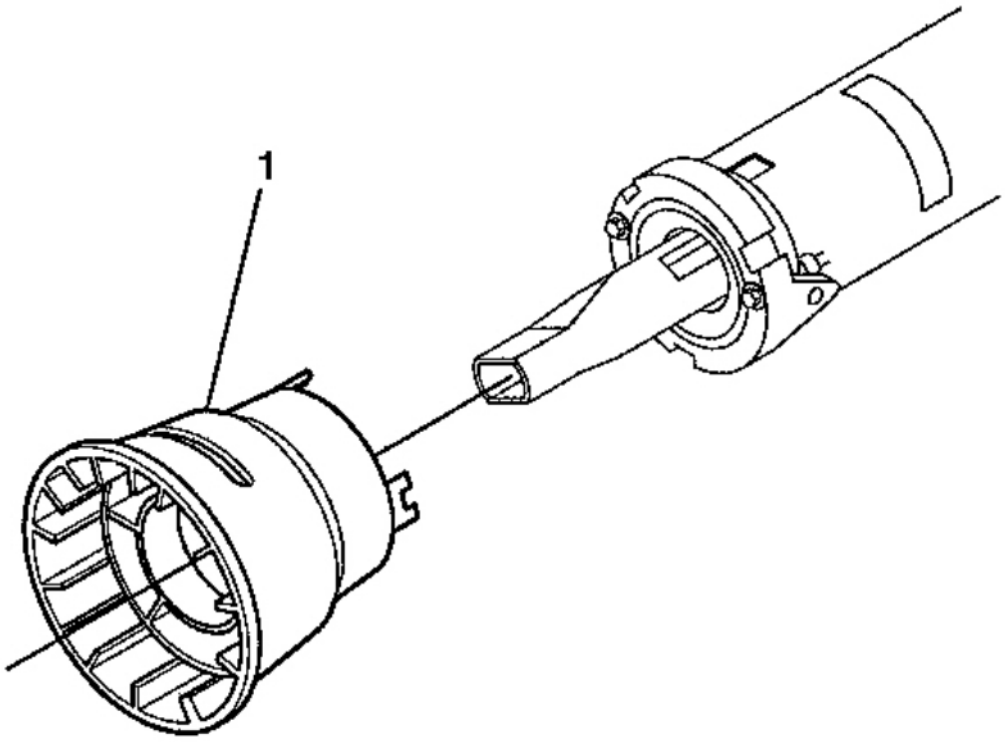


Fig. 124: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

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. Refer to **Ignition Lock Cylinder Case Replacement**.
4. Remove the tilt spring only. Refer to **Tilt Spring Replacement**.
5. Inspect the steering column for accident damage. Refer to **Steering Column Accident Damage Inspection**.
6. Gently pull the adapter and bearing assembly (1) from the steering shaft assembly.

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If the cage and balls separate from the adapter and bearing assembly, you may install them back together in the installation procedure.

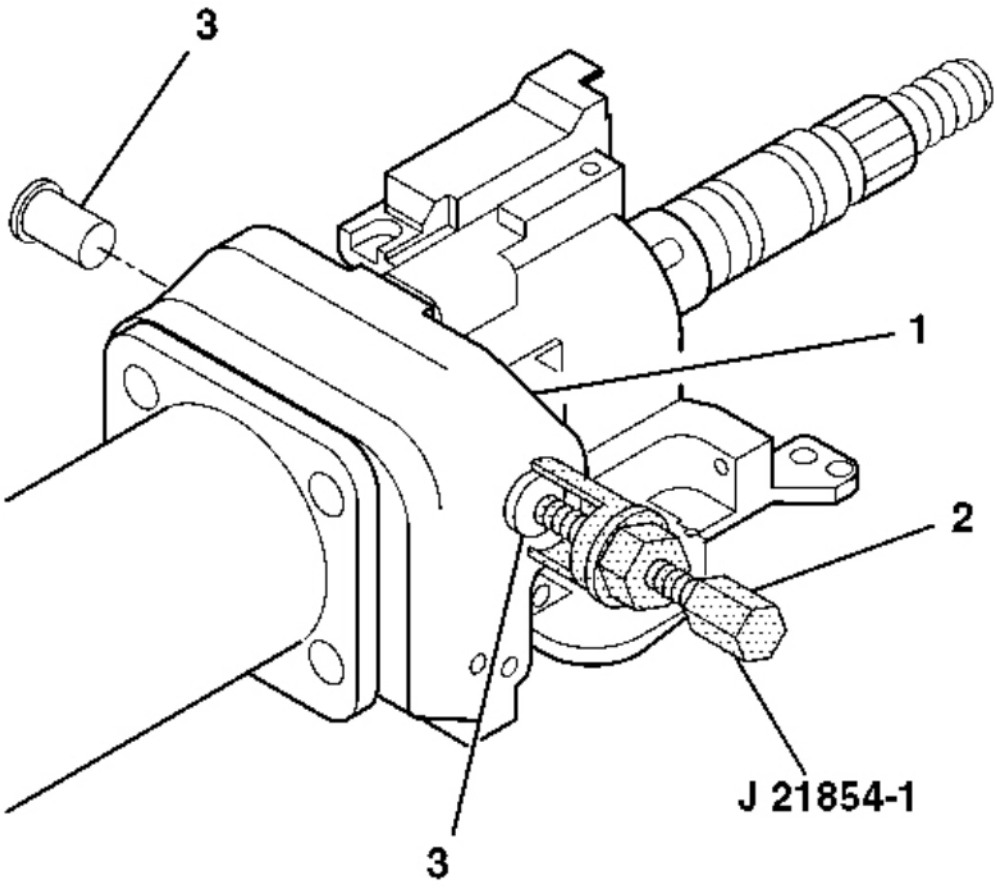


Fig. 125: View Of Pivot Pins To Steering Column Tilt Head Assembly
Courtesy of GENERAL MOTORS CORP.

7. Remove the 2 pivot pins (3) from the steering column tilt head assembly (1) by using **J 21854-01** . See **Special Tools and Equipment**.

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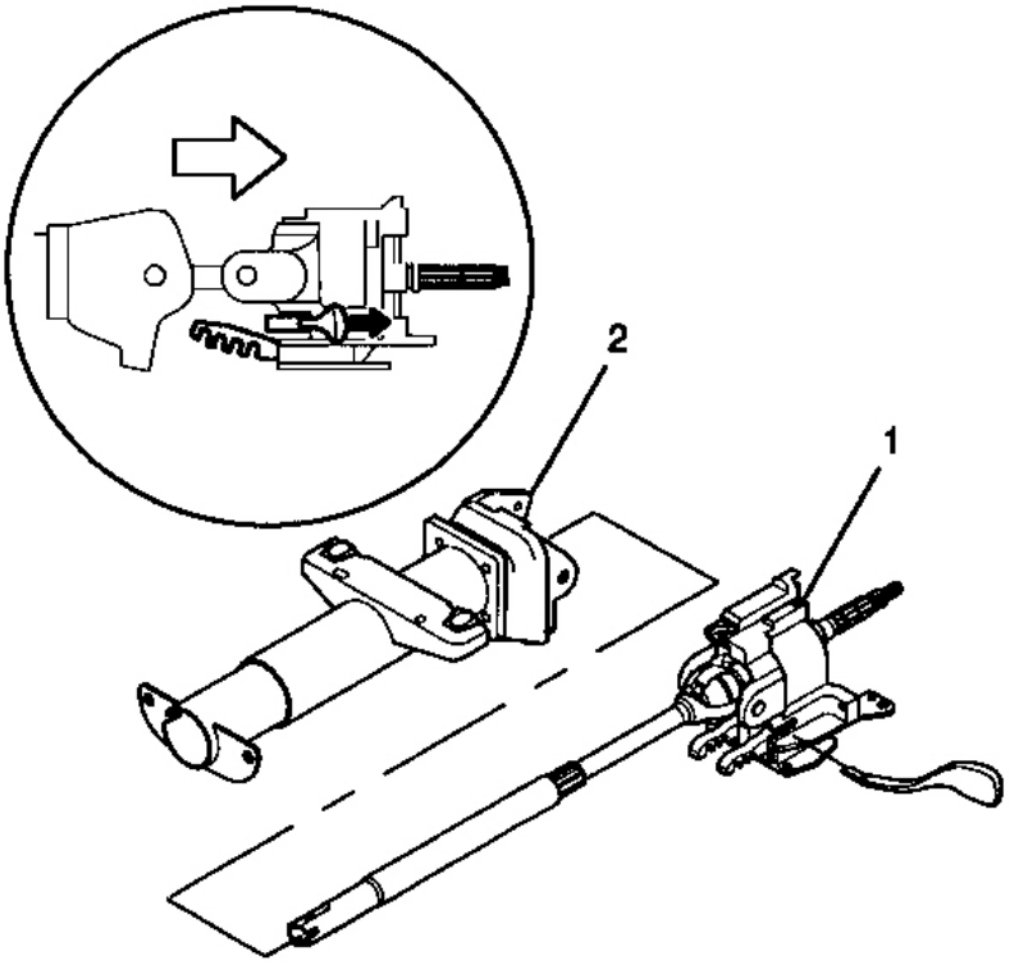


Fig. 126: Installing Steering Column Shaft Assembly Into The Steering Column Support Assembly (Floor Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

8. Install the tilt knob into the steering column tilt head assembly (1).
9. Pull back on the tilt knob 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 from the steering column support assembly (2).
11. Remove the tilt knob.

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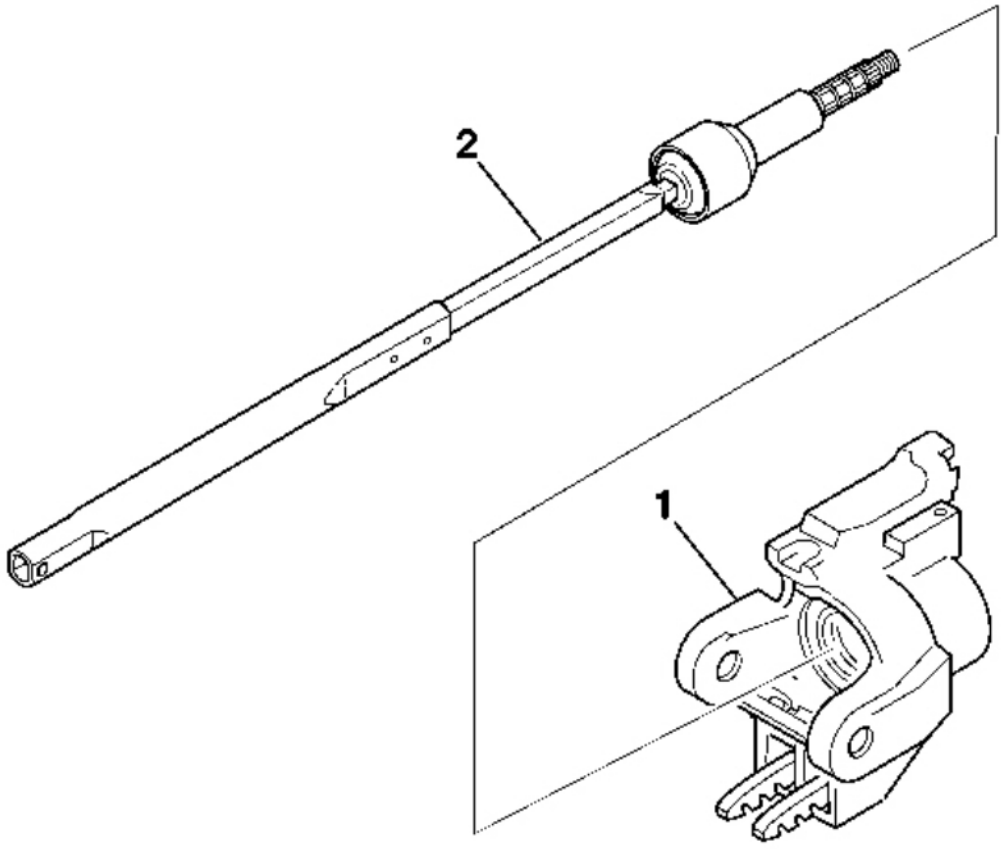


Fig. 127: View Of Steering Column Shaft Assembly & Steering Column Tilt Head Assembly
Courtesy of GENERAL MOTORS CORP.

12. Remove the steering shaft assembly (2) from the steering column tilt head assembly (1).

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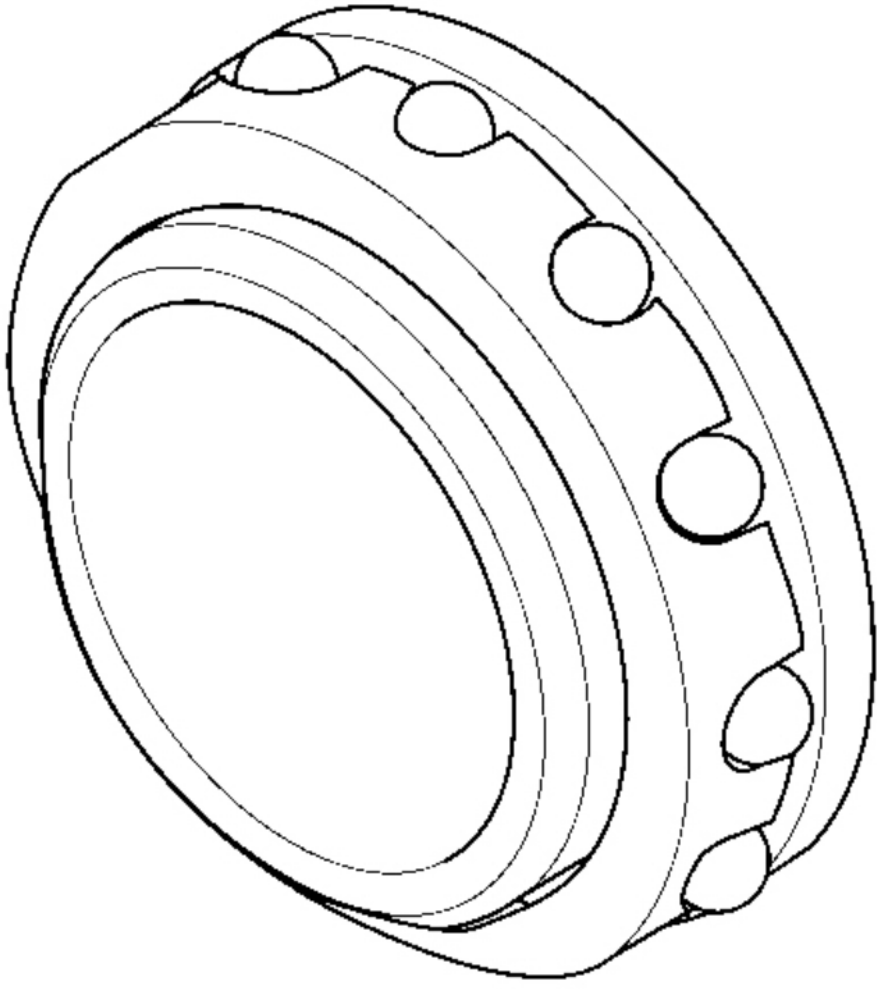


Fig. 128: View Of Upper Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

13. Remove the upper bearing assembly.

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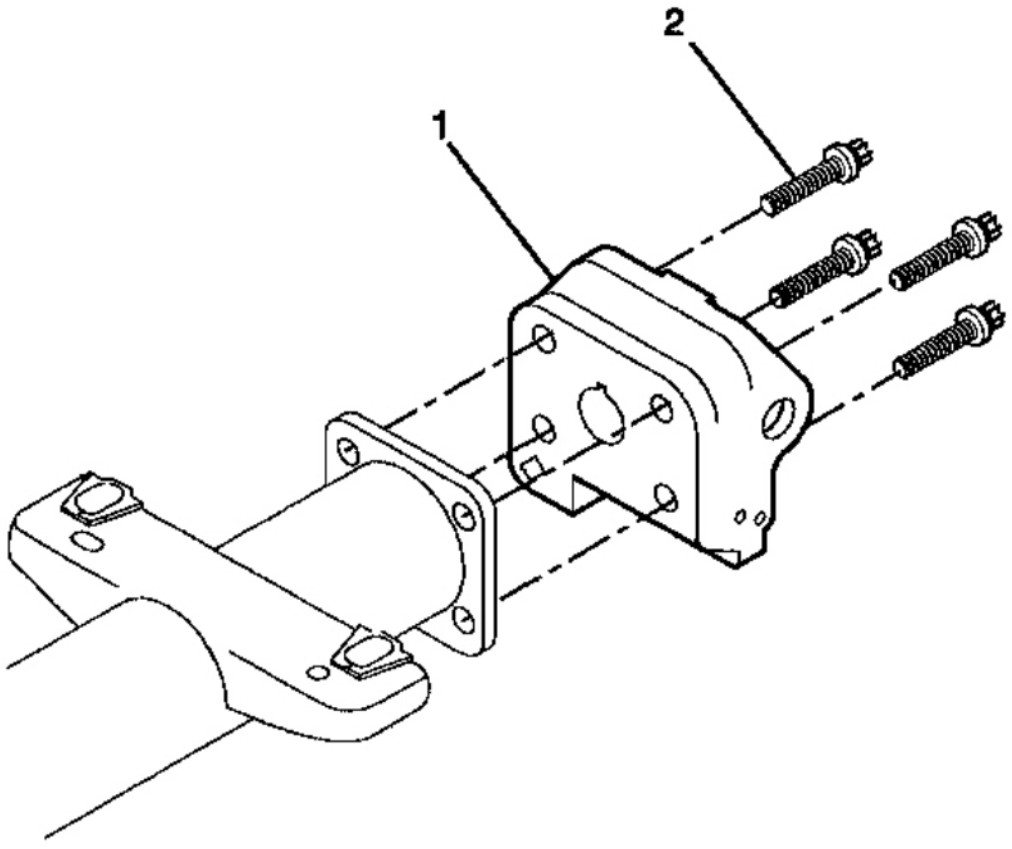


Fig. 129: View Of Steering Column Support Assembly & TORX(R) Head Screws
Courtesy of GENERAL MOTORS CORP.

14. Remove the 4 TORX® head screws (2) from the steering column support assembly (1).
15. Discard the 4 TORX® head screws.
16. Remove the steering column support assembly (1) from the steering column jacket assembly.

Installation Procedure

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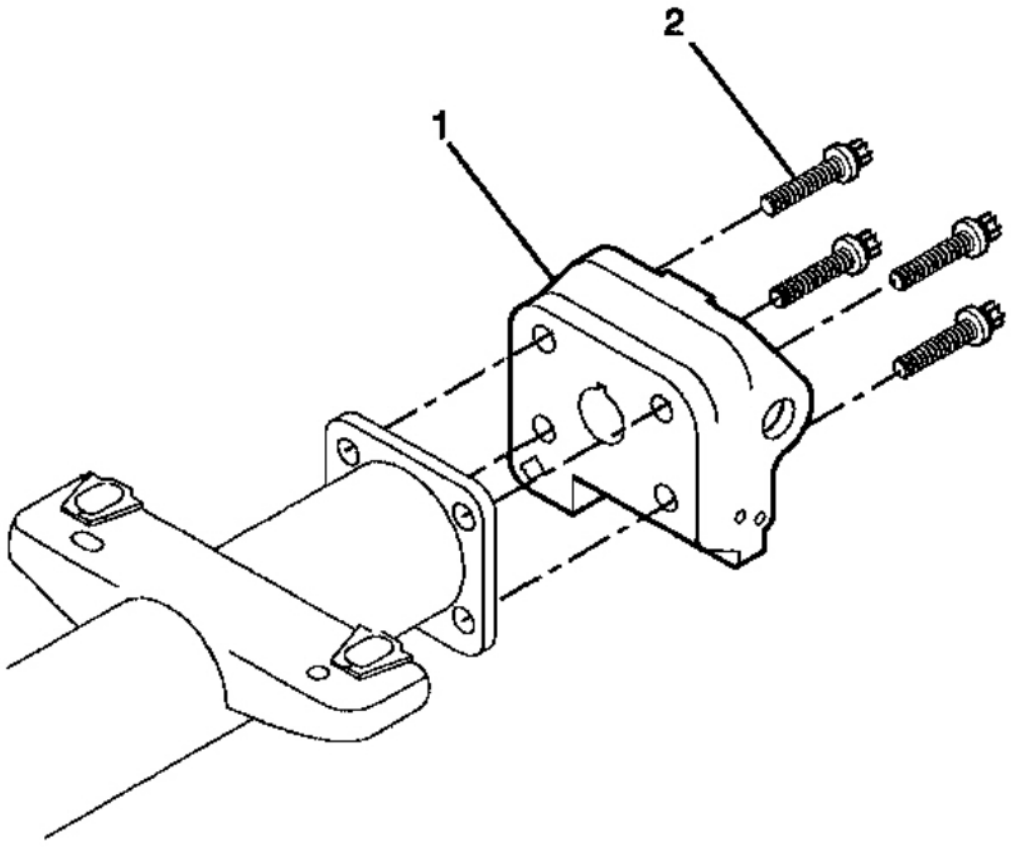


Fig. 130: View Of Steering Column Support Assembly & TORX(R) Head Screws
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT: Replace the steering column support assembly if the steering column support assembly has been staked 3 times.

1. Attach the steering column support assembly (1) to the steering column jacket assembly with 4 new TORX® head screws (2).

   Tighten: Tighten the screws to 17 N.m (13 lb ft).

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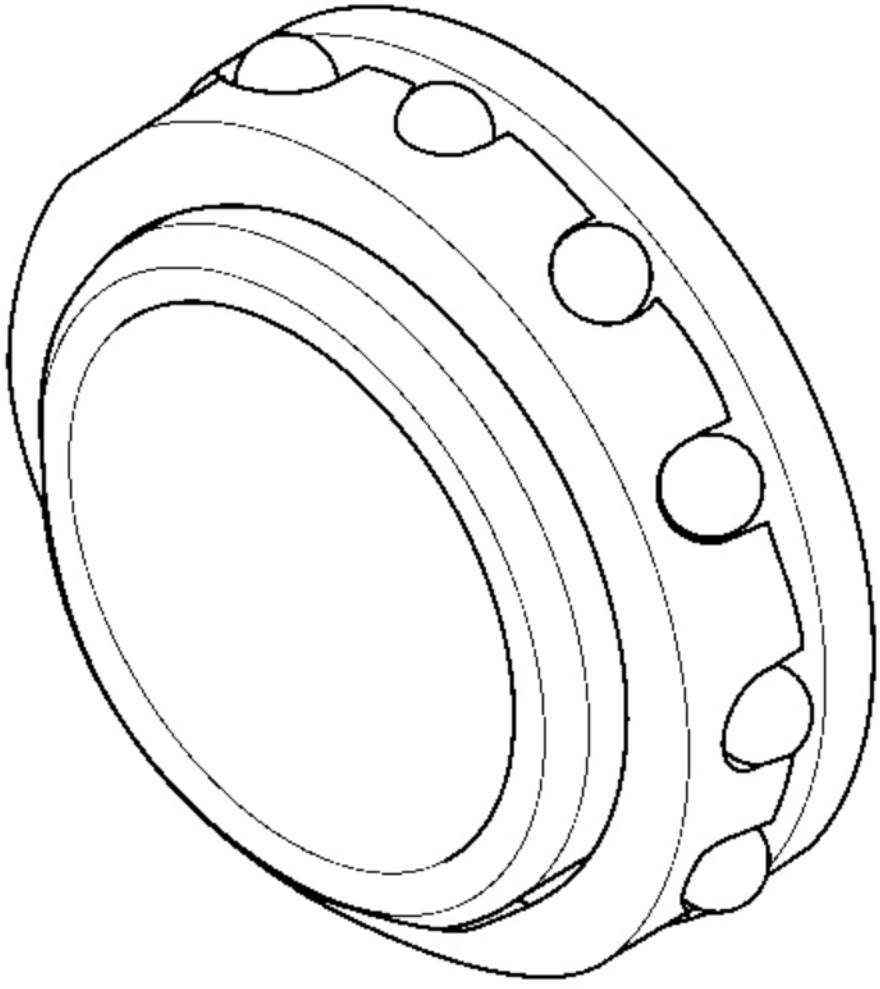


Fig. 131: View Of Upper Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the upper bearing assembly.

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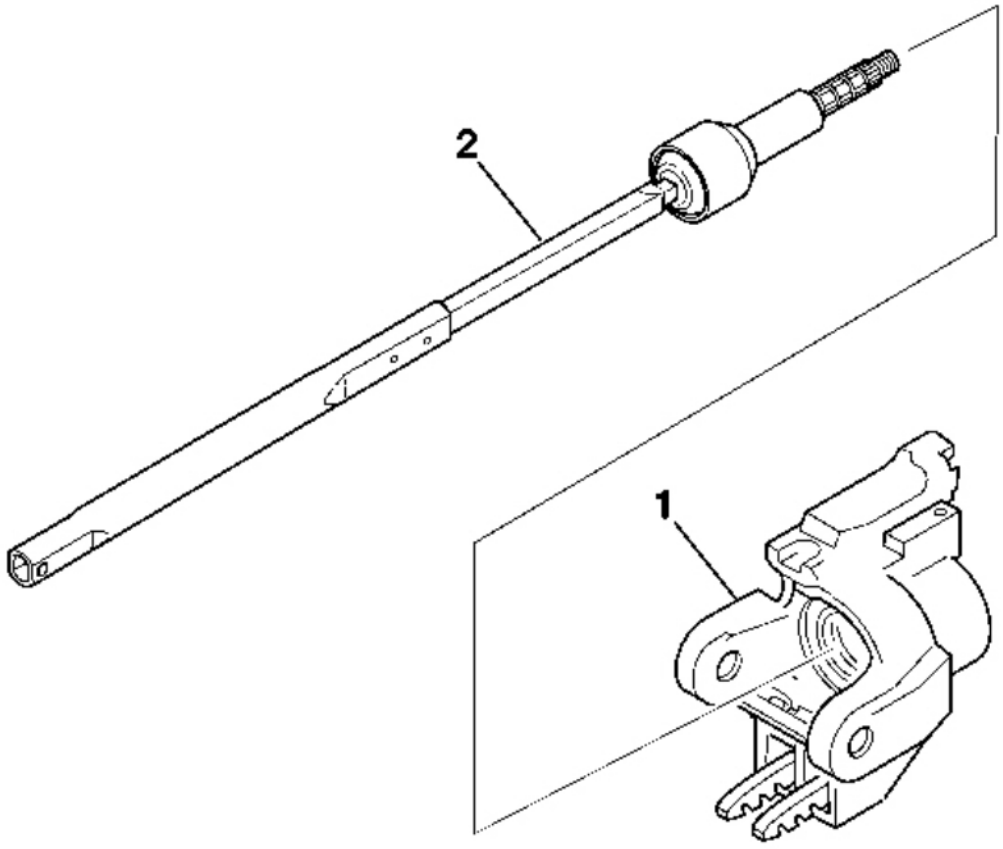


Fig. 132: View Of Steering Column Shaft Assembly & Steering Column Tilt Head Assembly
Courtesy of GENERAL MOTORS CORP.

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

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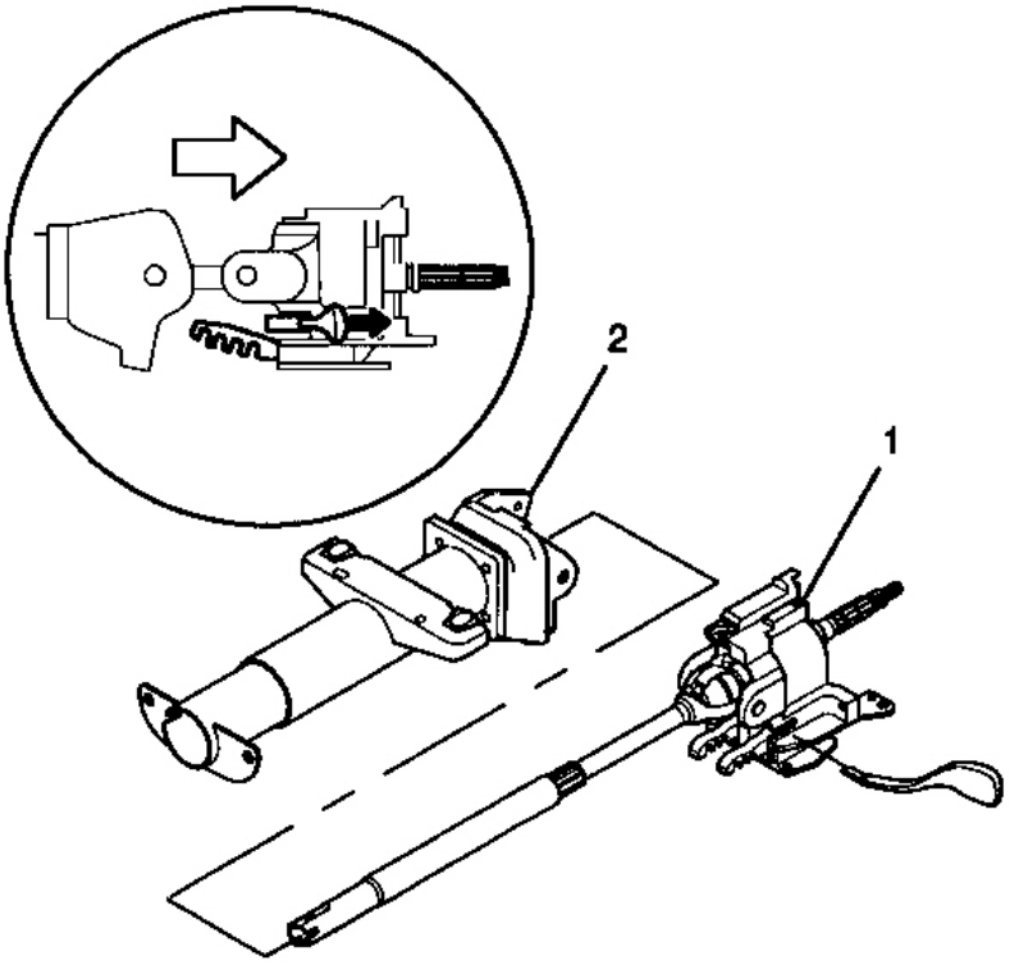


Fig. 133: Installing Steering Column Shaft Assembly Into The Steering Column Support Assembly (Floor Shift Lean Shaft)
Courtesy of GENERAL MOTORS CORP.

4. Install the steering column shaft assembly with the steering column tilt head assembly (1) into the steering column support assembly (2).
5. Move the tilt knob and push the steering column tilt head assembly up towards the steering column in order to lock the steering wheel lock shoes in place.

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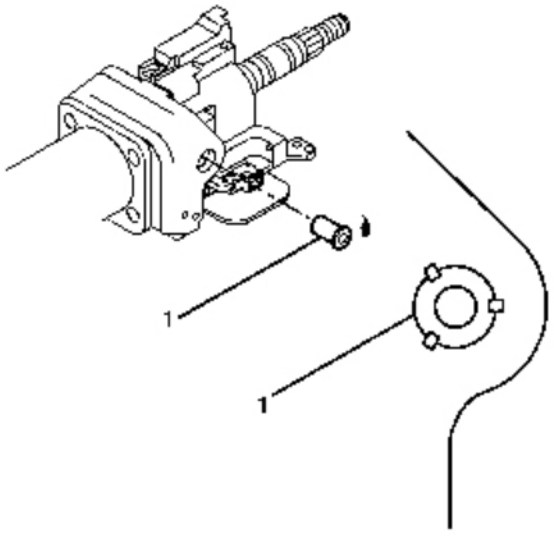


Fig. 134: View Of Pivot Pins At Steering Column Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Replace the steering column support assembly if the steering column support assembly has been staked 3 times.

6. Lubricate the pivot pins (1) with GM P/N 12346293 (Canadian P/N 992723).
7. Firmly seat each pivot pin (1) into the steering column tilt head assembly.
8. Stake the steering column support assembly in 3 locations around each pivot pin (1).

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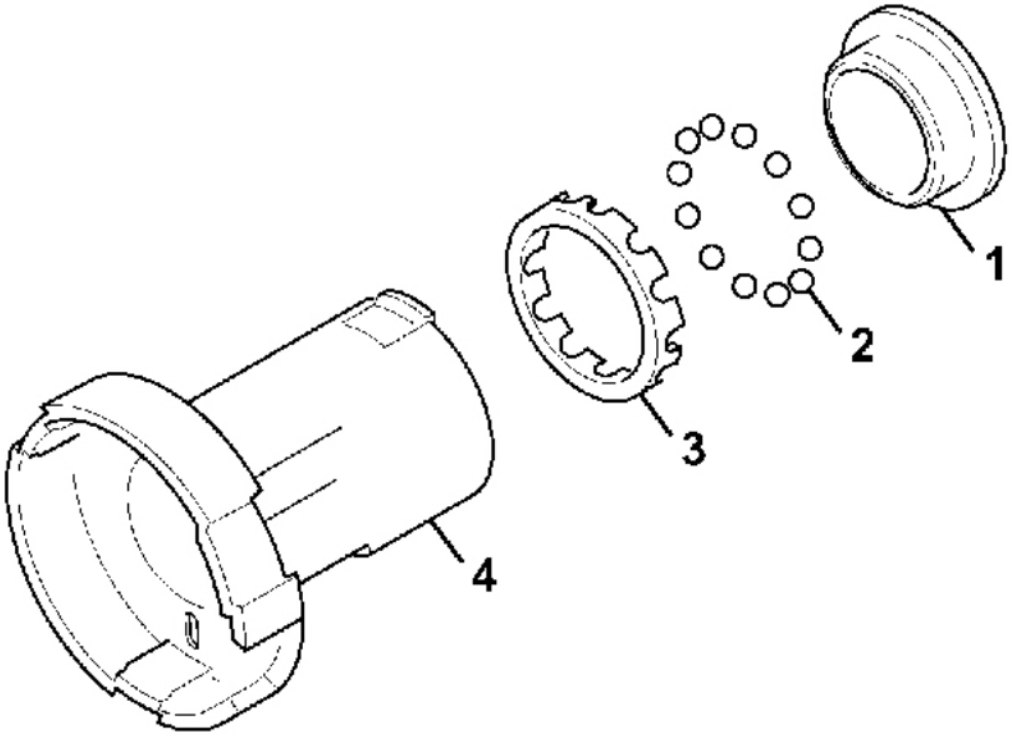


Fig. 135: Installing The Balls Into The Cage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify that all 12 balls are present and that NO foreign debris is present in the inner race, cage, balls or outer race. The orientation of the cage MUST be as shown to install properly.

9. If necessary, install the balls (2) into the cage (3).

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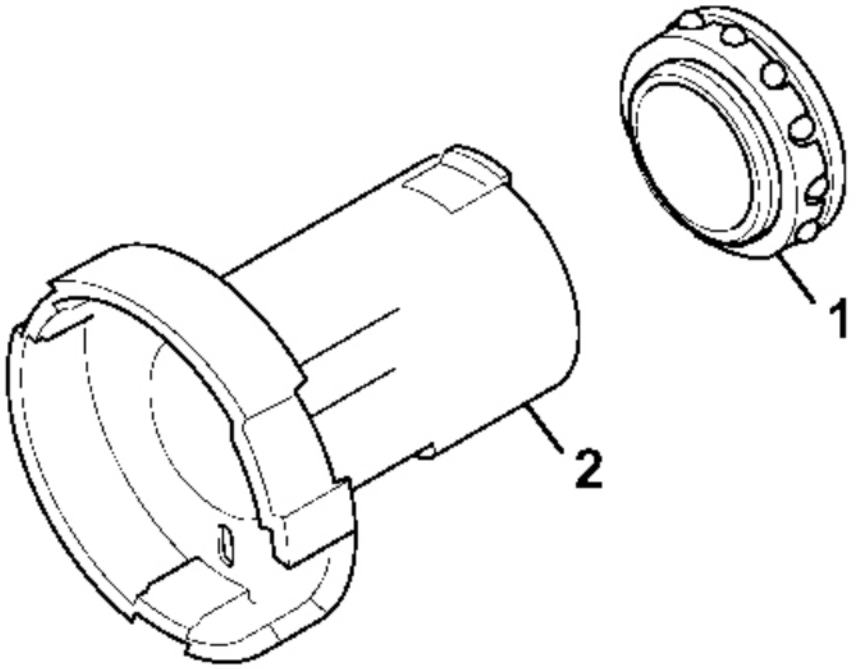


Fig. 136: Installing Race Into The Ball And Cage Assembly
Courtesy of GENERAL MOTORS CORP.

10. Install the race (1) into the ball and cage assembly.
11. Install the race, cage and balls into the adapter and bearing assembly (2).

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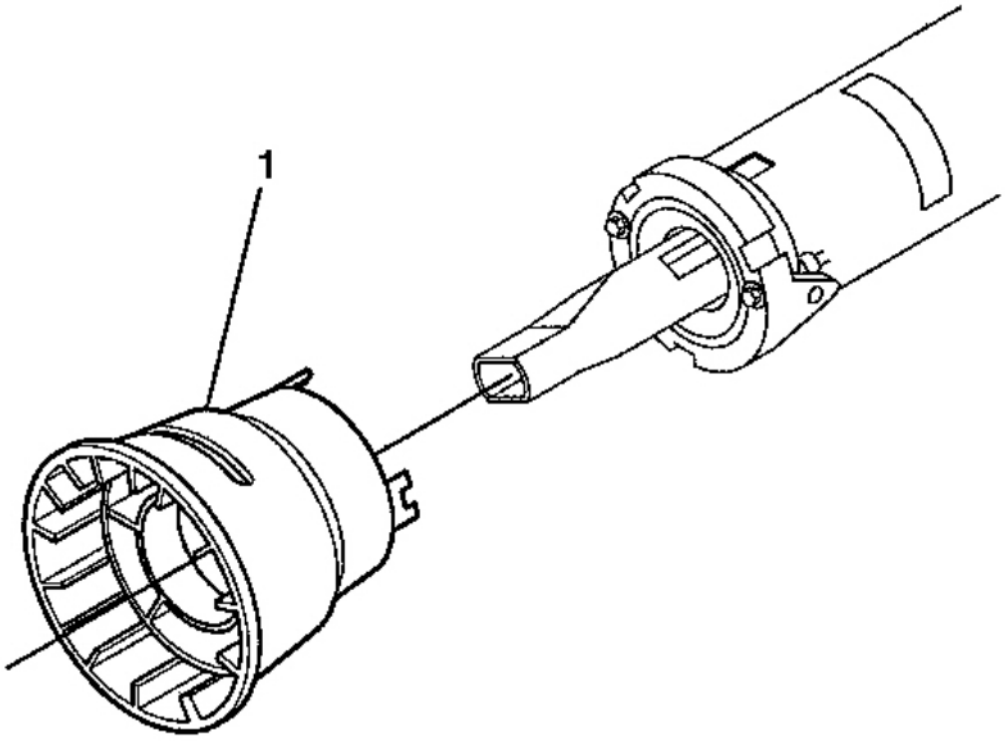


Fig. 137: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

12. Install the adapter and bearing assembly (1) onto the steering column jacket assembly by performing the following steps:
    1. Align the tab on the adapter and bearing assembly (1) with the slot in the steering column jacket assembly.
    2. Push the adapter and bearing assembly (1) onto the steering column shaft assembly until the tab snaps into the slot.

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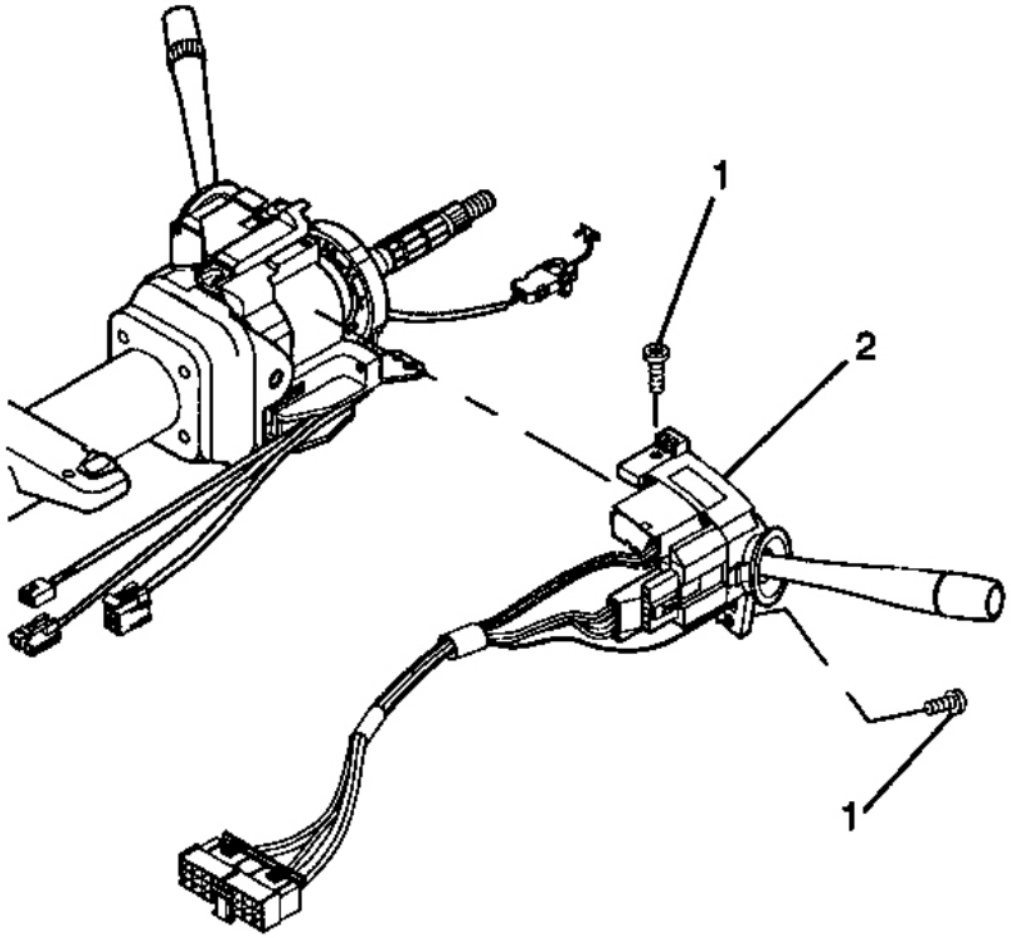


Fig. 138: Installing Turn Signal & Multifunction Switch Assembly & Screws
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Be sure that the electrical contact of the turn signal and multifunction switch assembly (2) rests on the turn signal cancel cam assembly.

13. Install the turn signal and multifunction switch assembly (2) onto the steering column tilt head assembly.
14. Screw the 2 pan head tapping screws (1) into the turn signal and multifunction switch assembly (2).

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

15. Install the tilt spring only. Refer to **Tilt Spring Replacement**.
16. Install the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.

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17. Install the steering column into the vehicle. Refer to **Steering Column Replacement**.
18. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

LOWER BEARING AND STEERING COLUMN JACKET REPLACEMENT (COLUMN SHIFT STANDARD)

Removal Procedure

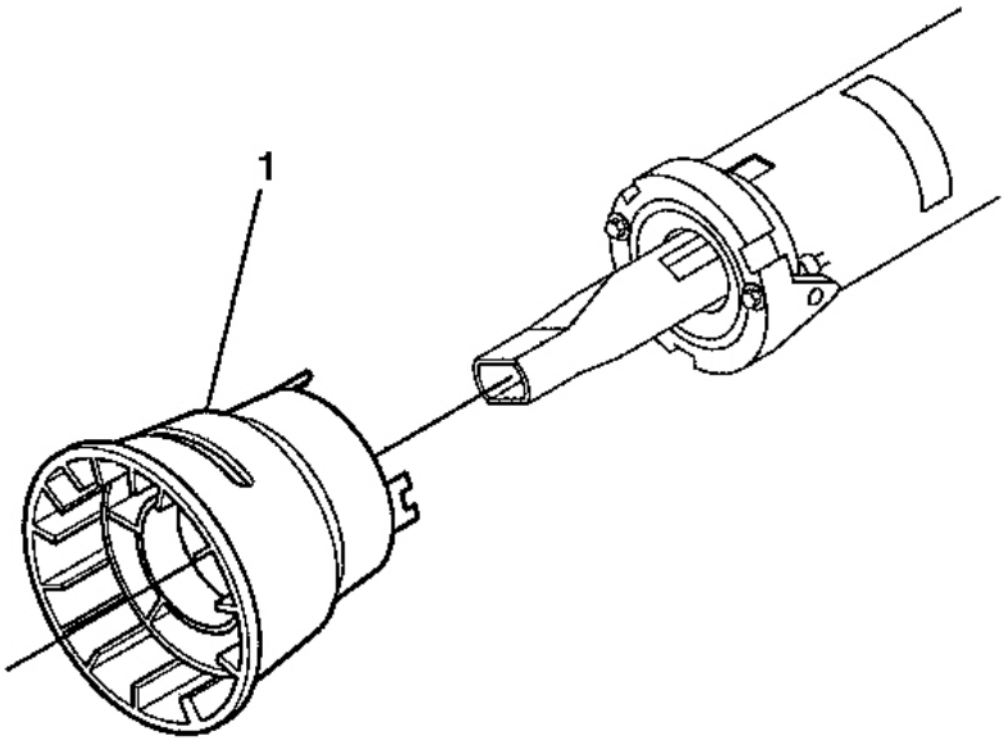


Fig. 139: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

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 steering column from the vehicle. Refer to **Steering Column Replacement**.

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4. Remove the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
5. Remove the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement**.
6. Remove the linear shift assembly. Refer to **Linear Shift Assembly Replacement**.
7. Inspect the steering column for accident damage. Refer to **Steering Column Accident Damage Inspection**.
8. Gently pull the adapter and bearing assembly (1) from the steering shaft assembly.

   If the cage and balls separate from the adapter and bearing assembly, you may install them back together in the installation procedure.

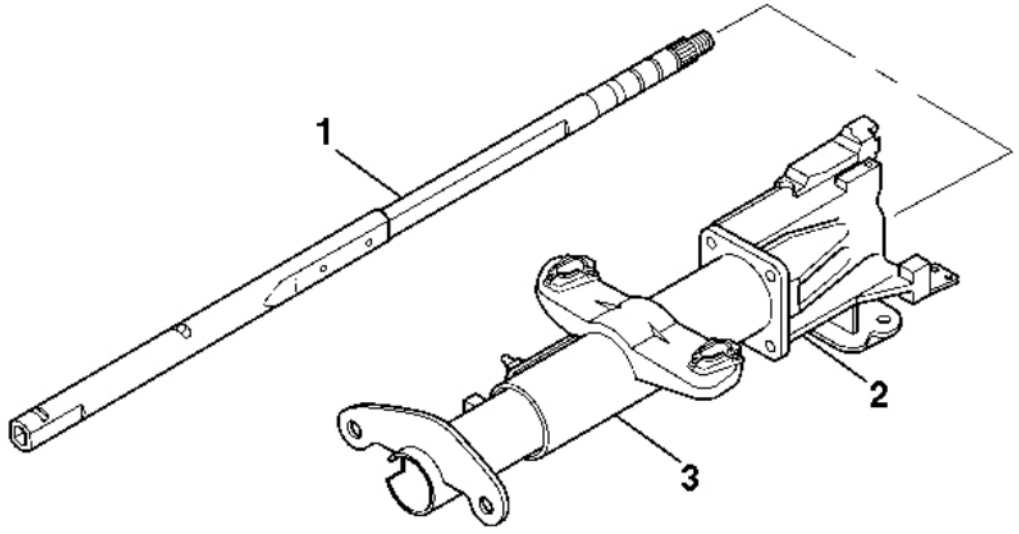


Fig. 140: View Of Steering Shaft Assembly, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

9. Remove the steering shaft assembly (1) from the steering column support assembly (2) and the steering column jacket assembly (3).

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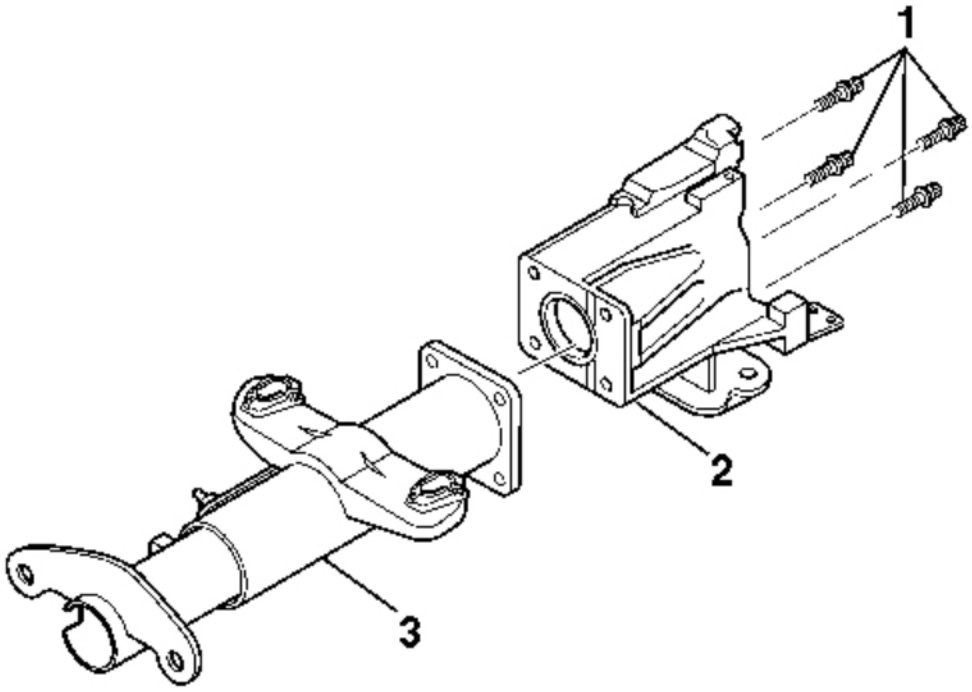


Fig. 141: View Of TORX(R) Head Screws, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

10. Remove the 4 TORX® head screws (1) from the steering column support assembly (2).
11. Discard the 4 TORX® head screws (1).
12. Remove the steering column support assembly (2) from the steering column jacket assembly (3).

Installation Procedure

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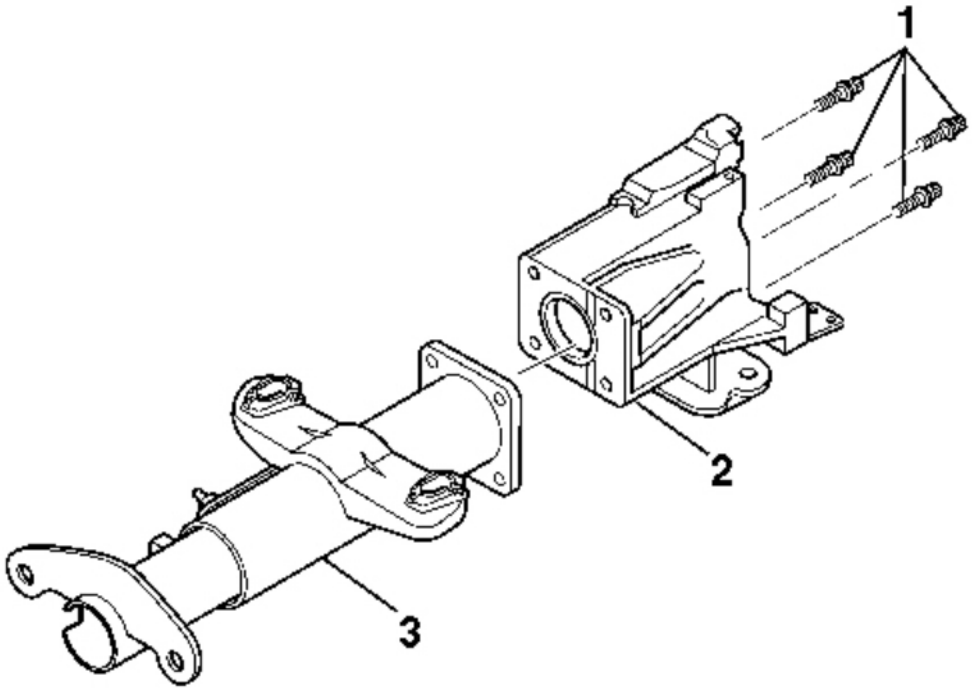


Fig. 142: View Of TORX(R) Head Screws, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Attach the steering column support assembly (2) to the steering column jacket assembly (3) with 4 TORX® head screws (1).

   Tighten: Tighten the screws to 17 N.m (13 lb ft).

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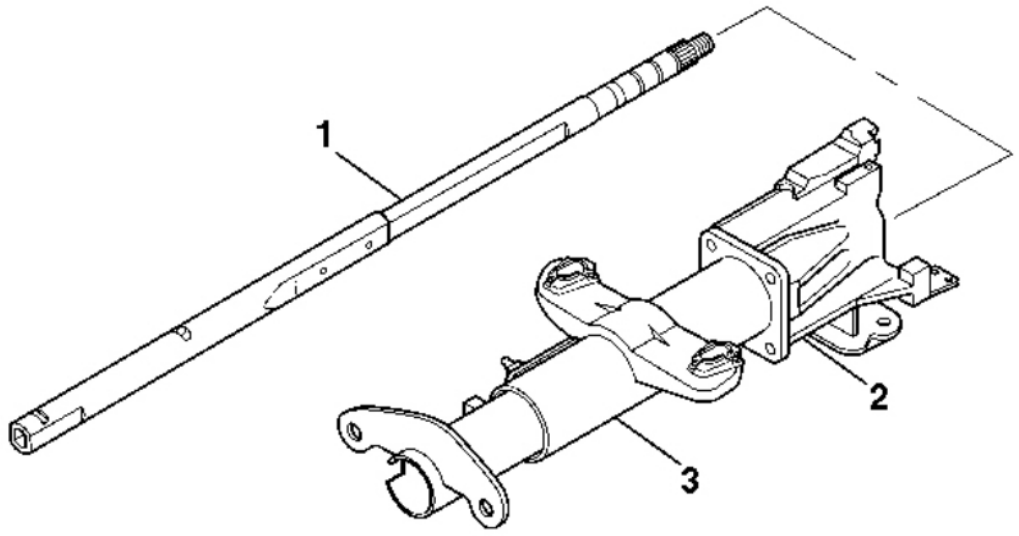


Fig. 143: View Of Steering Shaft Assembly, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the steering shaft assembly (1) into the steering column support assembly (2).

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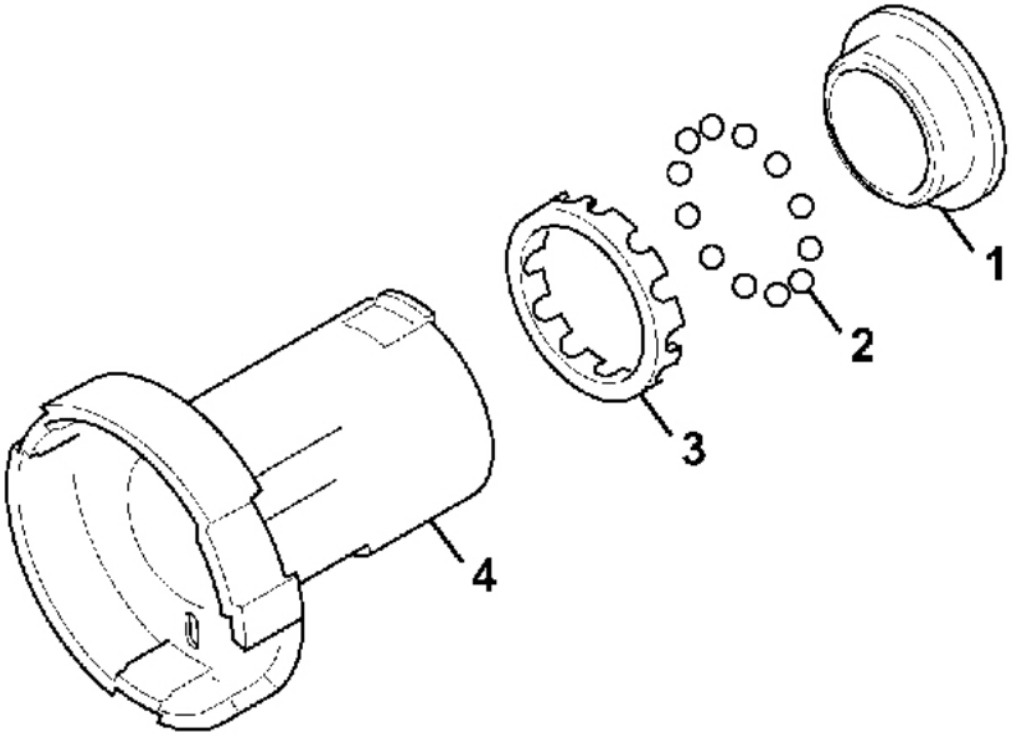


Fig. 144: Installing The Balls Into The Cage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify that all 12 balls are present and that NO foreign debris is present in the inner race, cage, balls or outer race. The orientation of the cage MUST be as shown to install properly.

3. If necessary, install the balls (2) into the cage (3).

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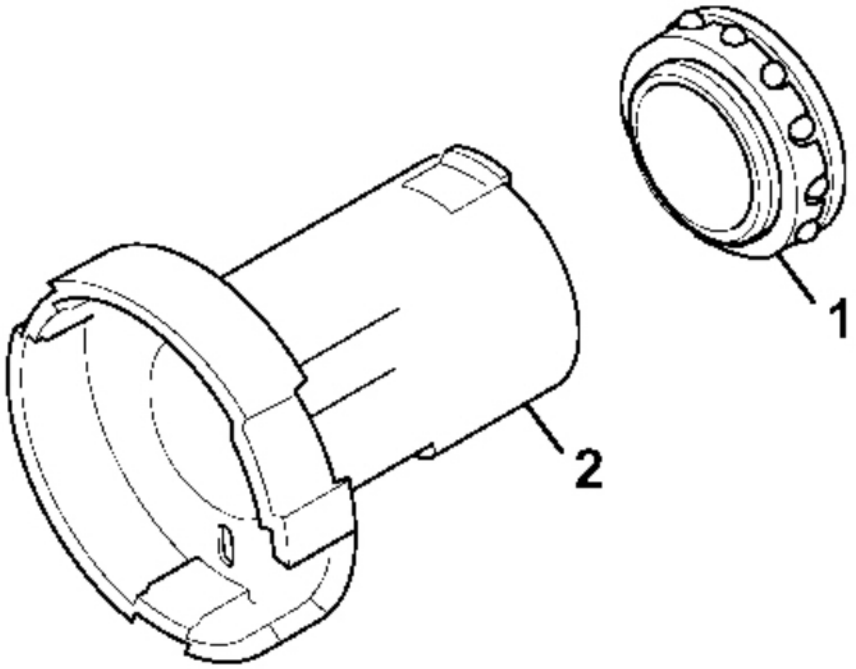


Fig. 145: Installing Race Into The Ball And Cage Assembly
Courtesy of GENERAL MOTORS CORP.

4. Install the race (1) into the ball and cage assembly.
5. Install the race, cage and balls into the adapter and bearing assembly (2).

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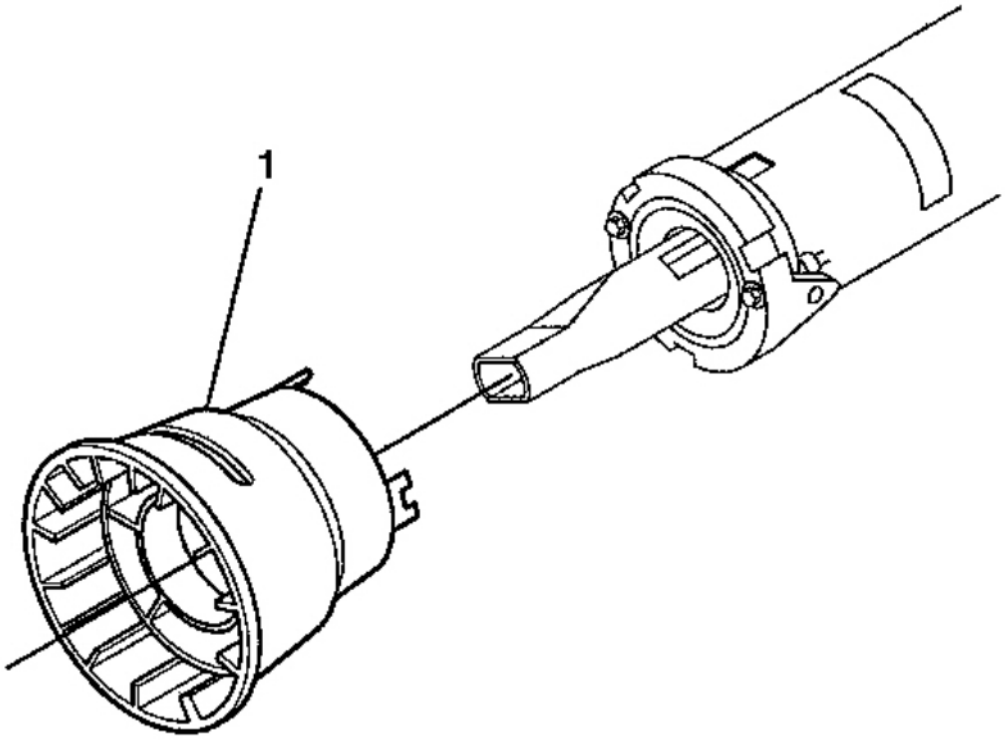


Fig. 146: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

6. Install the adapter and bearing assembly (1) onto the steering column jacket assembly.
7. Install the linear shift assembly. Refer to **Linear Shift Assembly Replacement**.
8. Install the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement**.
9. Install the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
10. Install the steering column into the vehicle. Refer to **Steering Column Replacement**.
11. Install the steering wheel onto the steering column. Refer to **Steering Wheel Replacement**.
12. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

LOWER BEARING AND STEERING COLUMN JACKET REPLACEMENT (FLOOR SHIFT STANDARD)

Removal Procedure

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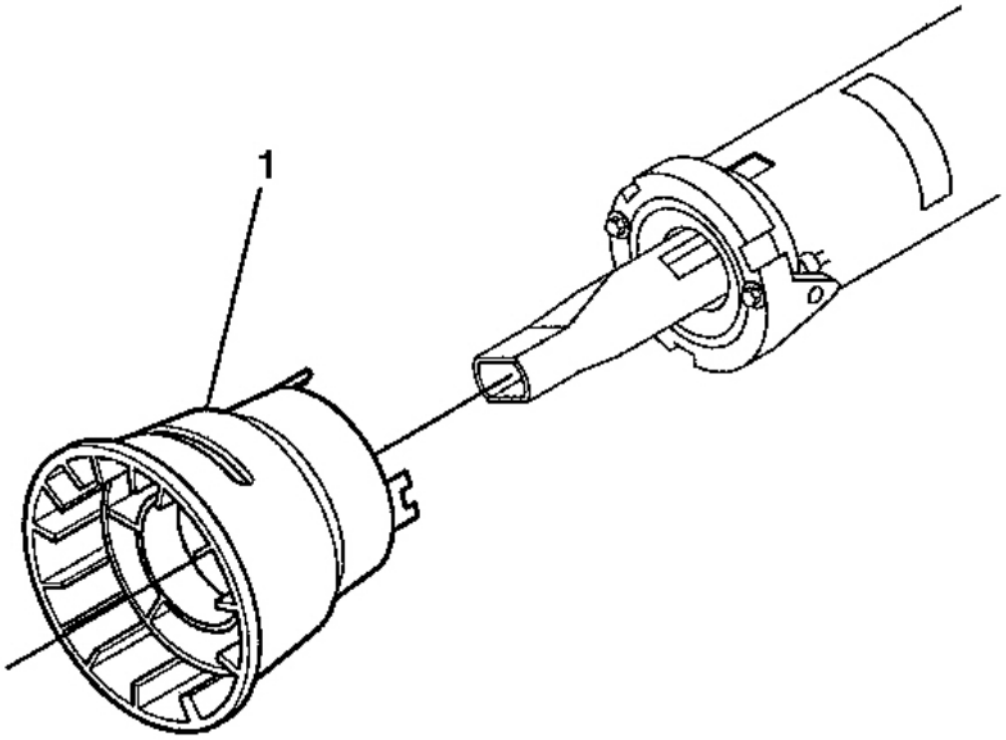


Fig. 147: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

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 steering column from the vehicle. Refer to **Steering Column Replacement**.
4. Remove the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
5. Remove the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement**.
6. Inspect the steering column assembly for accident damage. Refer to **Steering Column Accident Damage Inspection**.
7. Gently pull the adapter and bearing assembly (1) from the steering shaft assembly.

If the cage and balls separate from the adapter and bearing assembly, you may install them back together

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in the installation procedure.

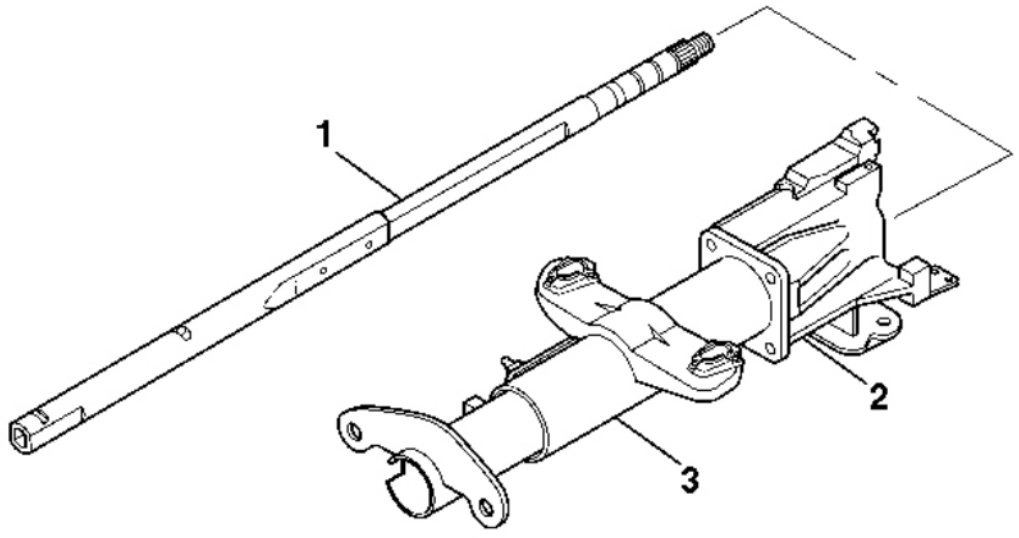


Fig. 148: View Of Steering Shaft Assembly, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

8. Remove the steering shaft assembly (1) from the steering column support assembly (2) and the steering column jacket assembly (3).

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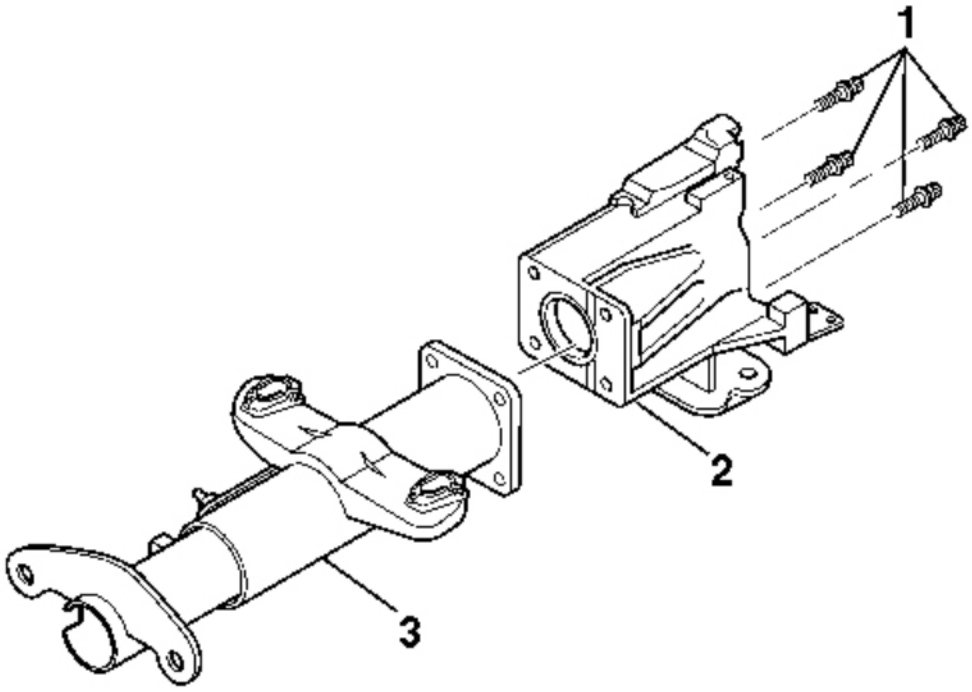


Fig. 149: View Of TORX(R) Head Screws, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

9. Remove the 4 TORX® head screws (1) from the steering column support assembly (2).
10. Discard the 4 TORX® head screws (1).
11. Remove the steering column support assembly (2) from the steering column jacket assembly (3).

Installation Procedure

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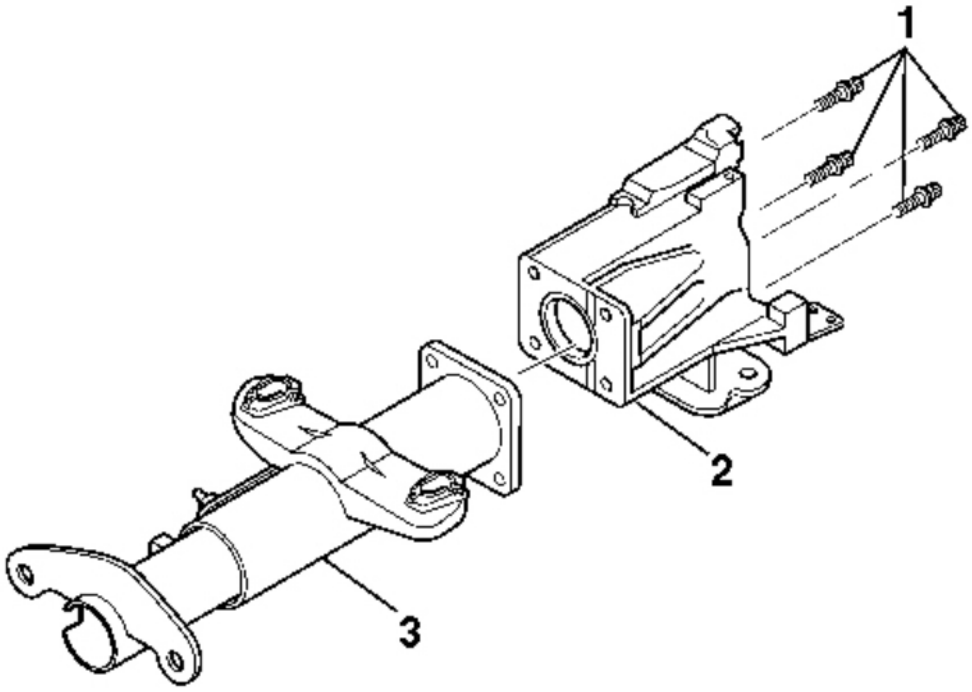


Fig. 150: View Of TORX(R) Head Screws, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Attach the steering column support assembly (2) to the steering column jacket assembly (3) with 4 new TORX® head screws (1).

   Tighten: Tighten the screws to 17 N.m (13 lb ft).

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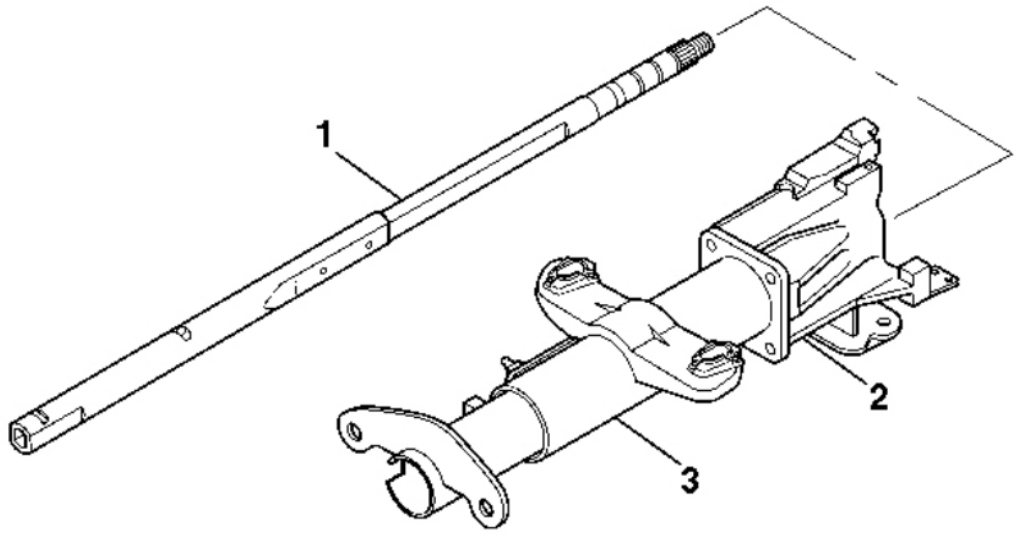


Fig. 151: View Of Steering Shaft Assembly, Steering Column Support Assembly & Steering Column Jacket Assembly
Courtesy of GENERAL MOTORS CORP.

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

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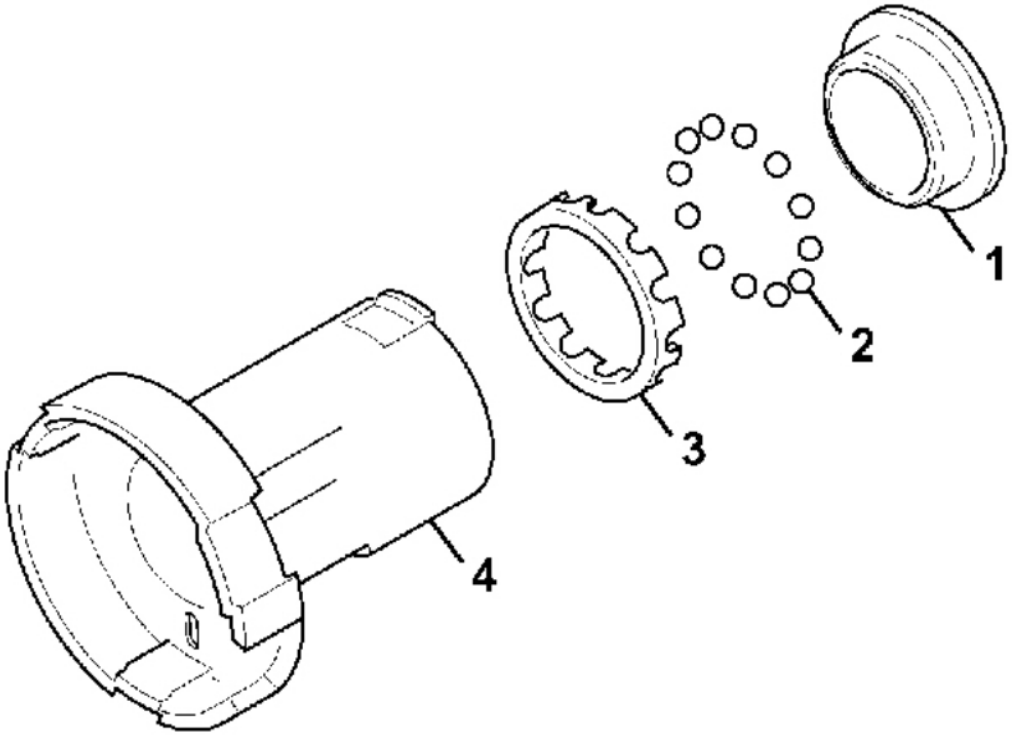


Fig. 152: Installing The Balls Into The Cage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify that all 12 balls are present and that NO foreign debris is present in the inner race, cage, balls or outer race. The orientation of the cage MUST be as shown to install properly.

3. If necessary, install the balls (2) into the cage (3).

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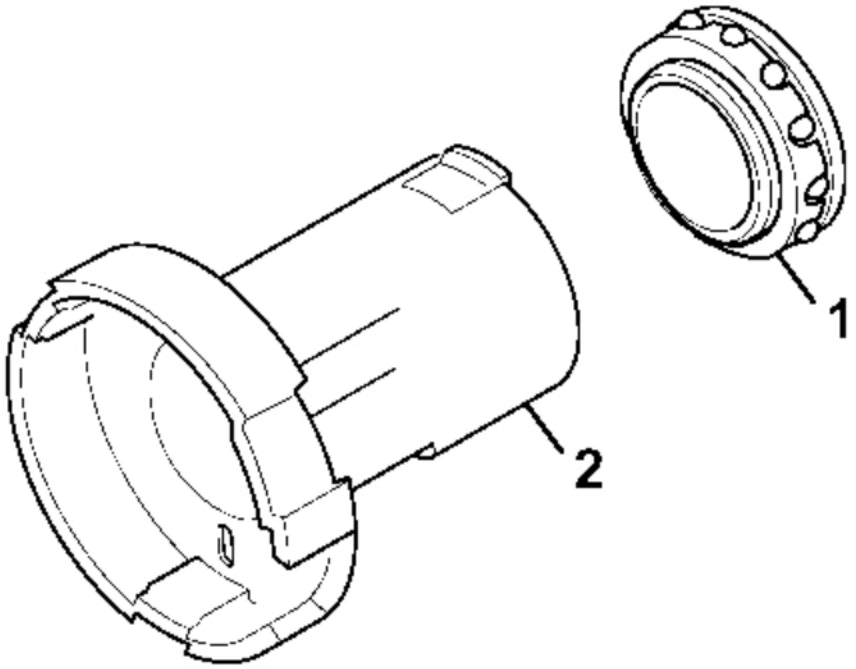


Fig. 153: Installing Race Into The Ball And Cage Assembly
Courtesy of GENERAL MOTORS CORP.

4. Install the race (1) into the ball and cage assembly.
5. Install the race, cage and balls into the adapter and bearing assembly (2).

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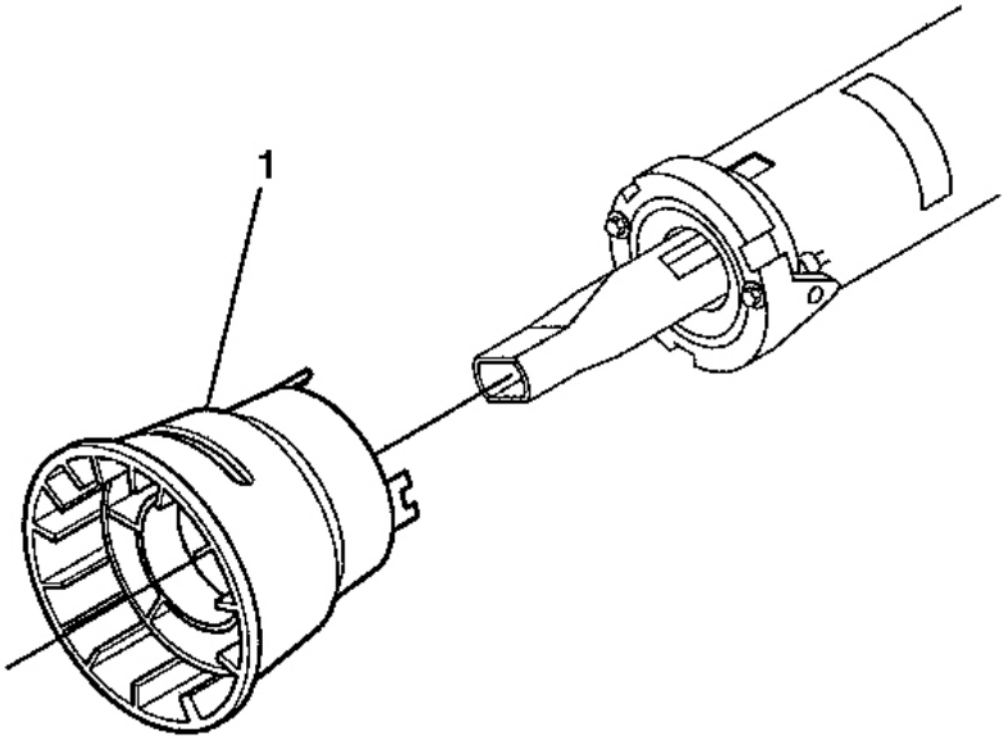


Fig. 154: View Of Adapter & Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

6. Install the adapter and bearing assembly (1) onto the steering column jacket assembly.
    1. Align the tab on the adapter and bearing assembly (1) with the slot in the steering column jacket assembly.
    2. Push the adapter and bearing assembly (1) onto the steering shaft assembly until the tab snaps into the slot.
7. Install the turn signal and multifunction switch assembly. Refer to **Multifunction, Turn Signal Switch Replacement**.
8. Install the ignition lock cylinder case. Refer to **Ignition Lock Cylinder Case Replacement**.
9. Install the steering column into the vehicle. Refer to **Steering Column Replacement**.
10. Install the steering wheel onto the steering column. Refer to **Steering Wheel Replacement**.
11. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** in SIR.

STEERING WHEEL POSITION SENSOR OR STEERING SHAFT LOWER BEARING REPLACEMENT

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Tools Required

J 42640 Steering Column Anti-Rotation Pin. See **Special Tools and Equipment**.

Removal Procedure

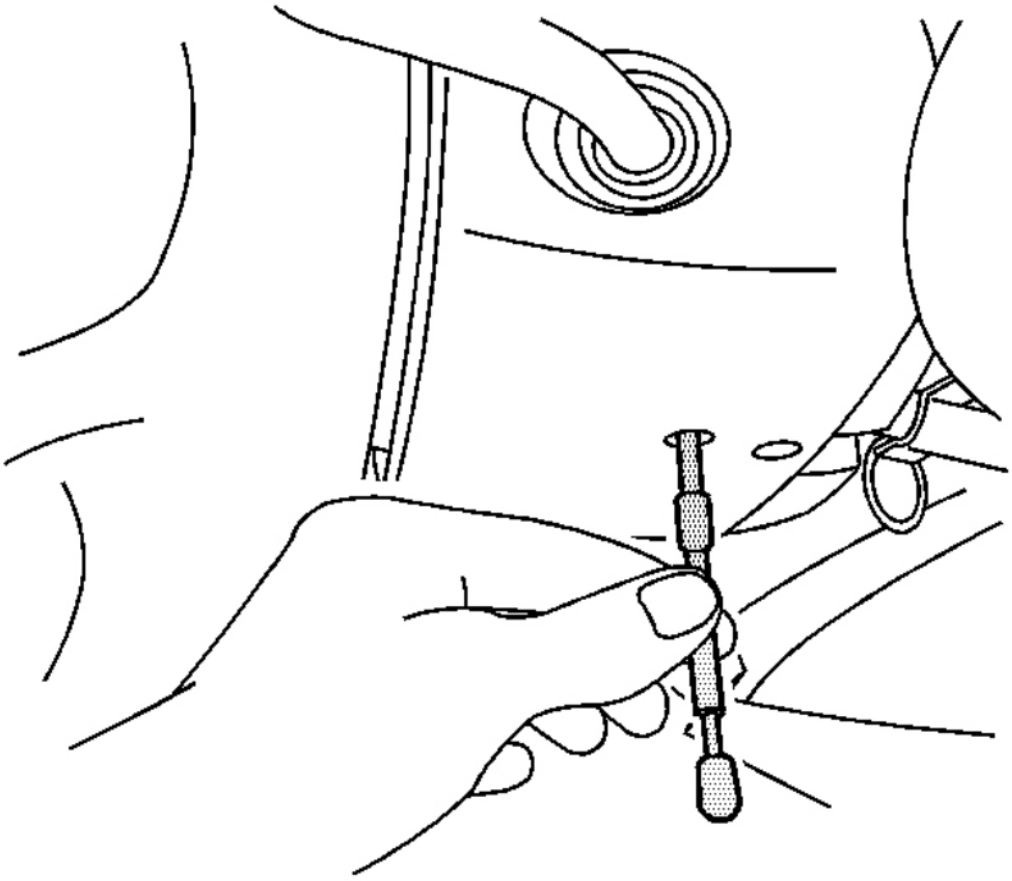


Fig. 155: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

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

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

NOTE: The front wheels of the vehicle must be maintained in the straight ahead

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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.

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

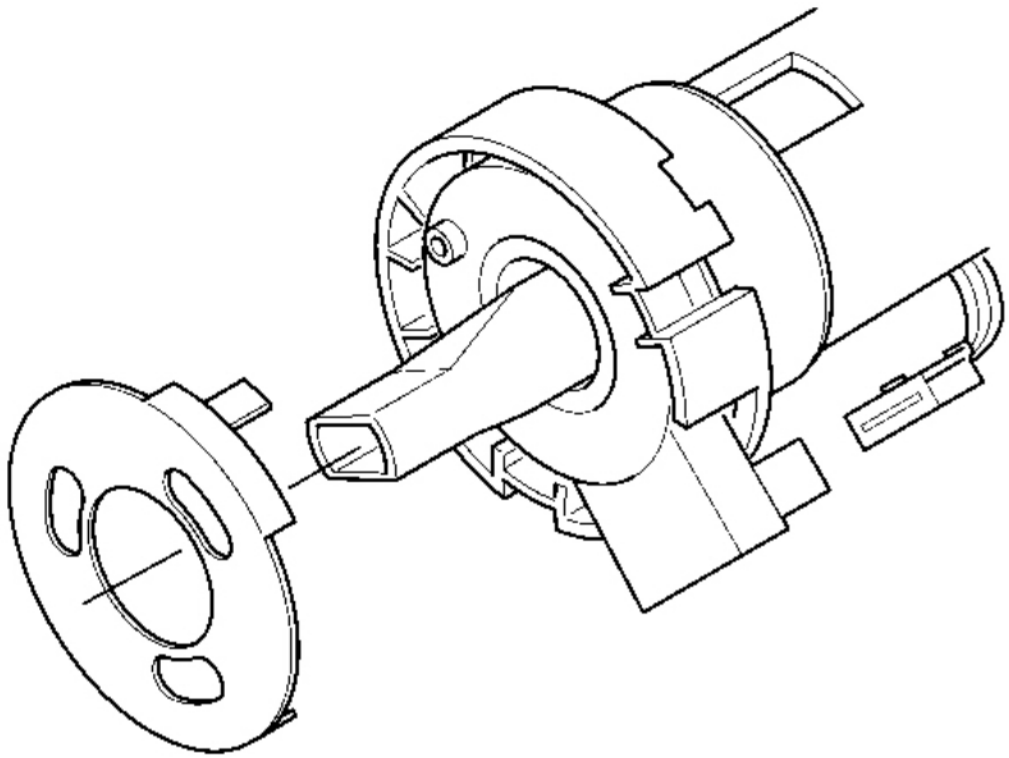


Fig. 156: Removing Sensor Retainer From Steering Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: A new sensor must come with a pin installed. If pin is not installed, return and reorder sensor. Do not apply force to the sensor and the bearing assembly in a sideways direction.

3. Remove the steering column from the vehicle. Refer to **Steering Column Replacement**.
4. Remove the sensor connector by using a suitable tool in order to pull the connector down around the right side of the steering column for accessibility.

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5. Remove the sensor retainer from the steering shaft.

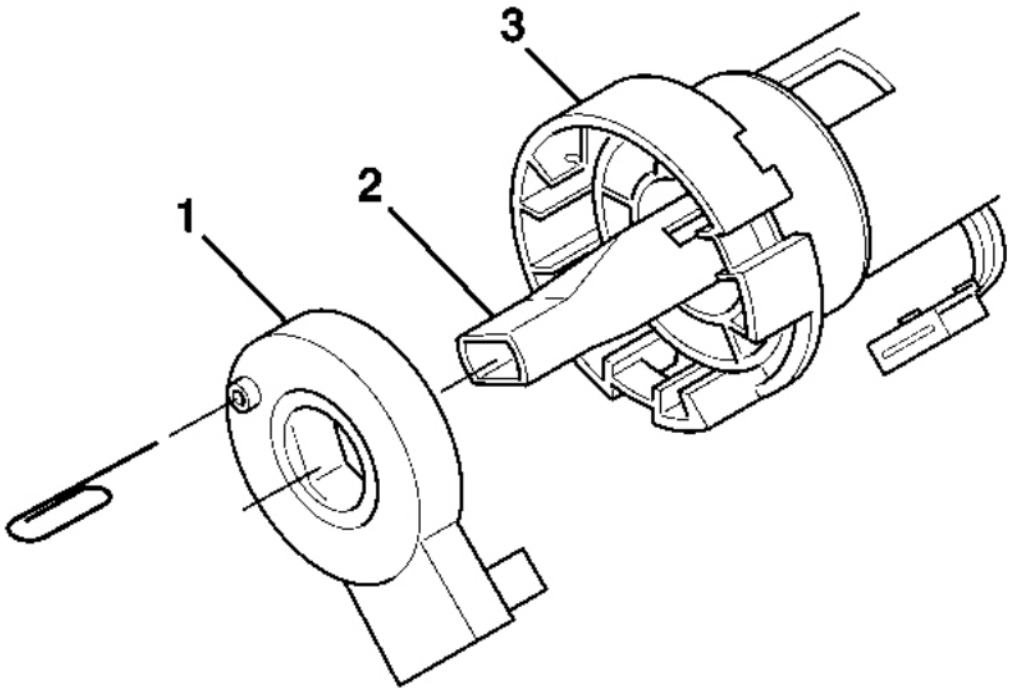


Fig. 157: View Of Sensor, Steering Shaft & Bearing Adapter
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: When reusing the sensor (1) you must install a pin into the sensor before it is removed from the steering shaft. By not installing a pin into the sensor it will cause the sensor to lose its centering position and must be discarded.
Pin diameter must be in the range of 1-2 mm.
Do not remove the bearing adapter (3).

6. If reusing the sensor (1), remove the position sensor by pulling the sensor straight out from the bearing adapter (3) until the sensor is almost off the steering shaft (2). Install a pin into the sensor before removing from the steering shaft (2). Do not remove the pin until the sensor is re-installed.
7. If replacing the sensor (1), remove the sensor by pulling the sensor straight out from the bearing adapter (3) and off the steering shaft.

Installation Procedure

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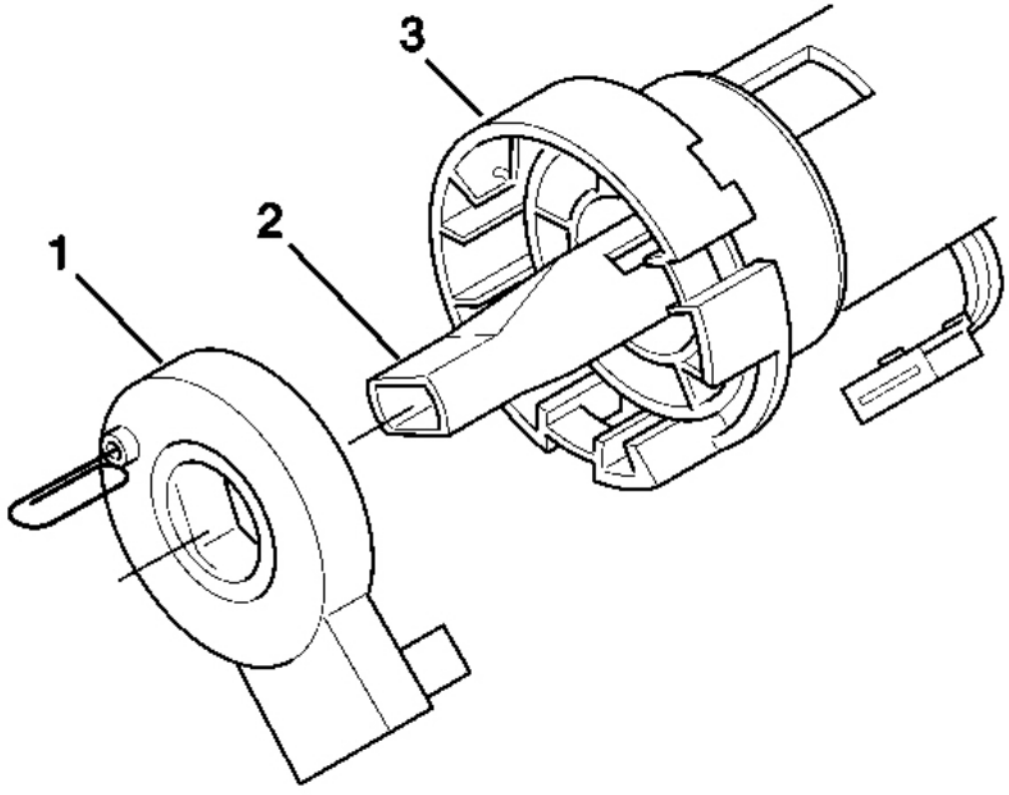


Fig. 158: Installing Sensor Onto Steering Shaft & Bearing Adapter
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not apply force to the sensor (1) or the bearing adapter (3) in a sideways direction.

1. If reusing the sensor, with the pin still installed, align the sensor onto the steering shaft (2) and into the bearing adapter (3).

IMPORTANT: If installing a new sensor the sensor will come precentered. Do not remove the pin until installation is complete.

2. Install the sensor onto the steering shaft (2) and into the bearing adapter (3).

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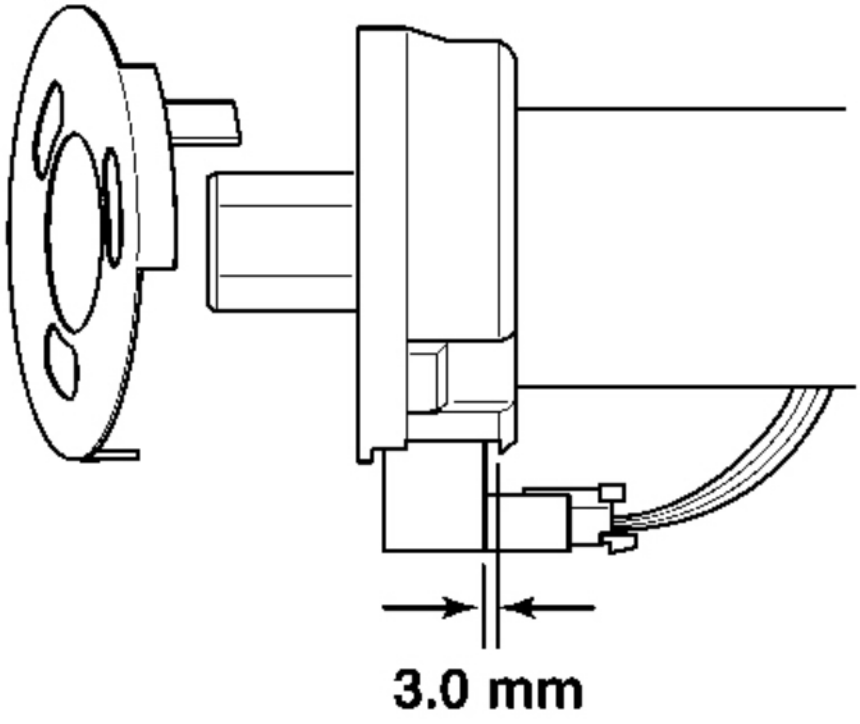


Fig. 159: Ensuring Proper Gap Between Sensor & Bearing Adapter
Courtesy of GENERAL MOTORS CORP.

3. The sensor must be set to approximately 3 mm gap between the sensor and the bearing adapter.
4. Install the sensor connector.
5. Remove the pin from the sensor.
6. Install the sensor retainer onto the steering shaft.

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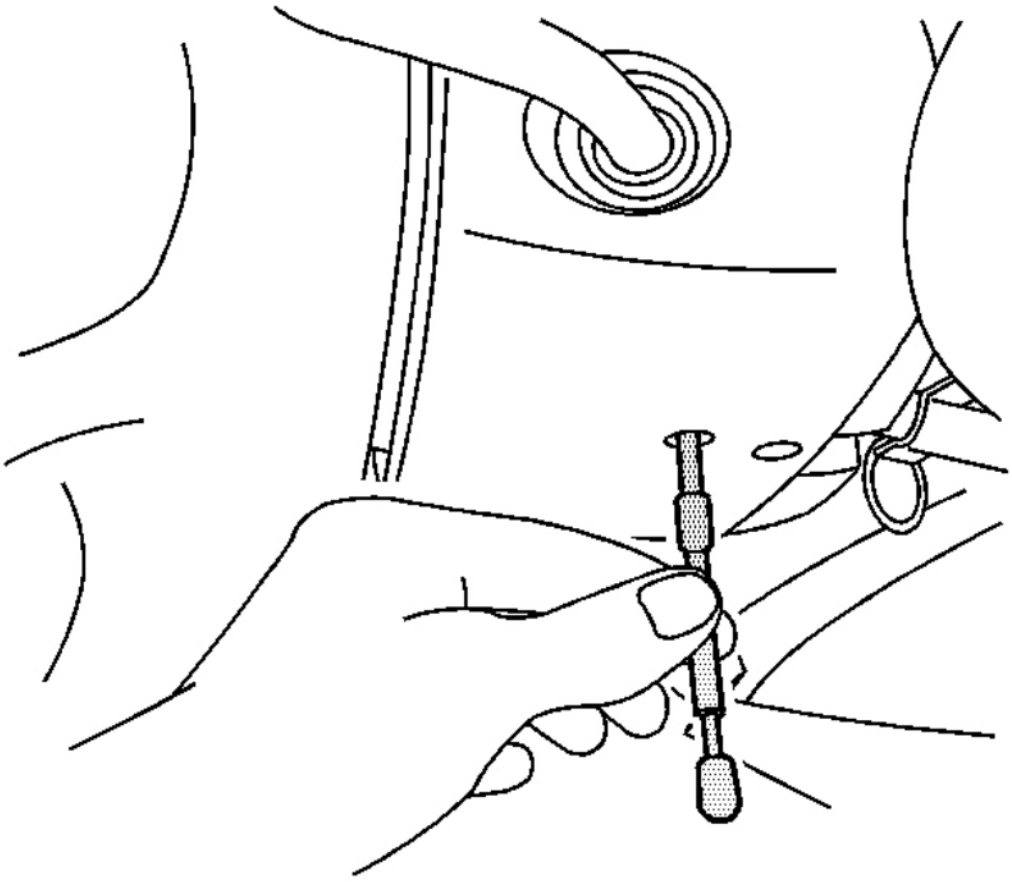


Fig. 160: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

7. Install the steering column to the vehicle. Refer to **Steering Column Replacement**.
8. Remove **J 42640** from the steering column. See **Special Tools and Equipment**.
9. Enable the SIR system. Refer to **SIR Disabling and Enabling Zone 3** .

STEERING WHEEL POSITION SENSOR CENTERING

Removal Procedure

IMPORTANT: Identify the type of steering wheel position sensor from the illustrations shown BEFORE removing the sensor from the steering column. Once you have identified the steering wheel position sensor, follow the instructions listed in the removal procedure.

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1. Verify the type of steering wheel position sensor.

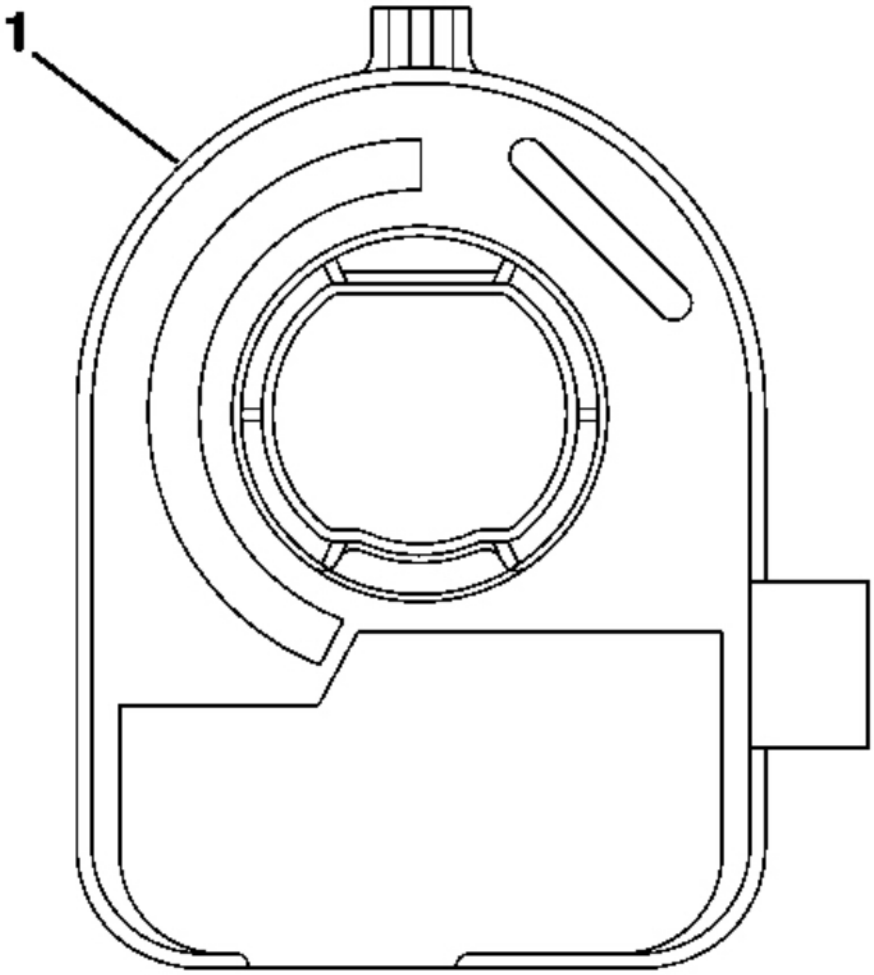


Fig. 161: FRONT Of The Sensor Connector Is On The Right
Courtesy of GENERAL MOTORS CORP.

2. From the technicians point of view, the FRONT of the sensor (1) connector will be on the right.

IMPORTANT: If reusing the existing sensor, you do not have to align the sensor before removal. Centering is not required when it is time to reinstall.

3. Remove the connector from the sensor.

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4. Remove the sensor (1) from the adapter and bearing assembly.
5. To install the sensor, proceed to step 1 in the installation section.

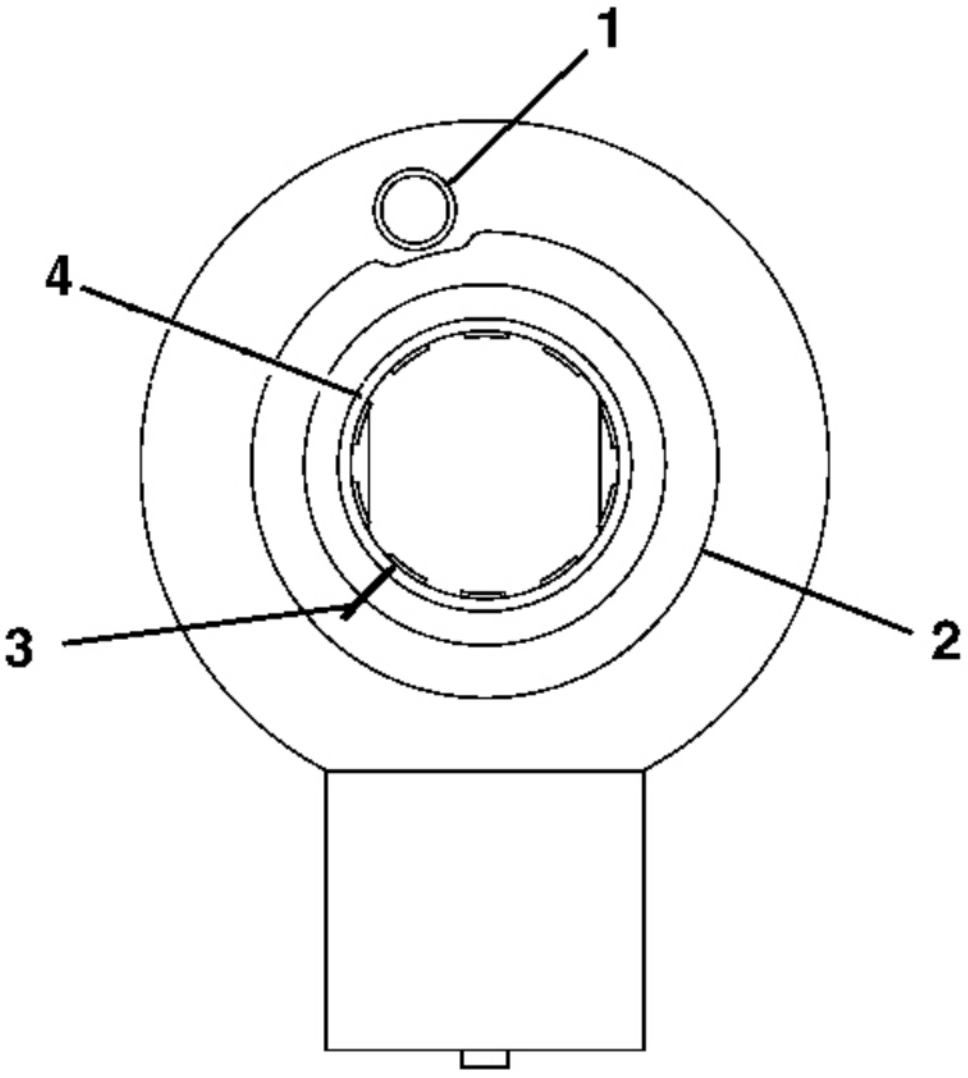


Fig. 162: Steering Wheel Position Sensor Foam Ring, Pin Hole And Rotor Flange Cuff
Courtesy of GENERAL MOTORS CORP.

6. From the technicians point of view, the FRONT of the sensor will have:
   - A foam ring (2)

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- A pin hole (1) for centering the pin. Note the location of the pin hole.
- A flush rotor flange cuff (4)

IMPORTANT: If reusing the existing sensor, you must make an alignment mark on the rotor flange cuff (3) before removing the sensor. Failure to do so will cause misalignment when installing the sensor. A new sensor will be required if misaligned.

7. Make an alignment mark on the flush rotor flange cuff (3).
8. Remove the connector from the sensor.
9. Remove the sensor from the adapter and bearing assembly.
10. To install the sensor, proceed to step 5 in the installation procedure.

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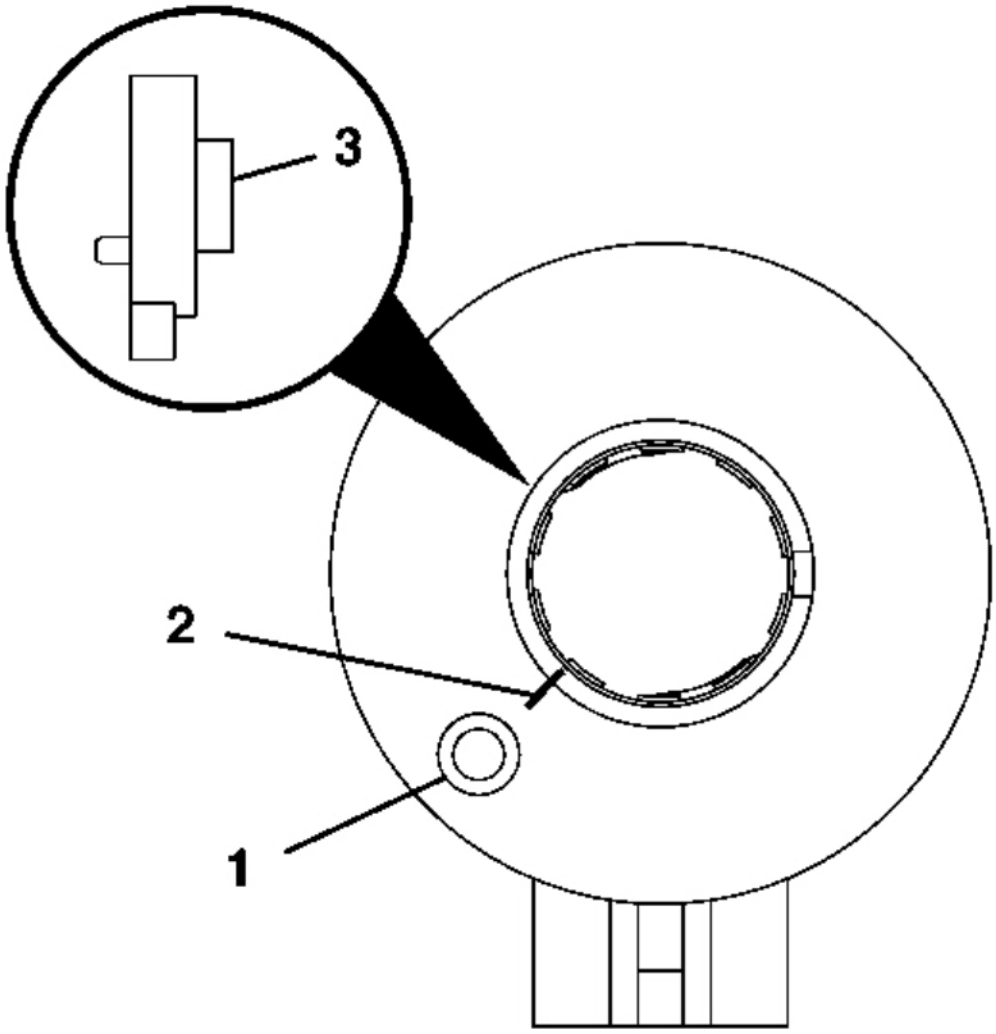


Fig. 163: Steering Wheel Position Sensor Alignment Mark
Courtesy of GENERAL MOTORS CORP.

11. From the technicians point of view, the FRONT of the sensor will have:
    - A raised rotor flange cuff (3)
    - An alignment mark (2) on the rotor flange cuff (3) for installation
    - A pin hole (1) for the centering pin. Note the location of the pin hole.
12. Remove the connector from the sensor.
13. Remove the sensor from the adapter and bearing assembly.

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14. To install the sensor, proceed to step 9 in the installation procedure.

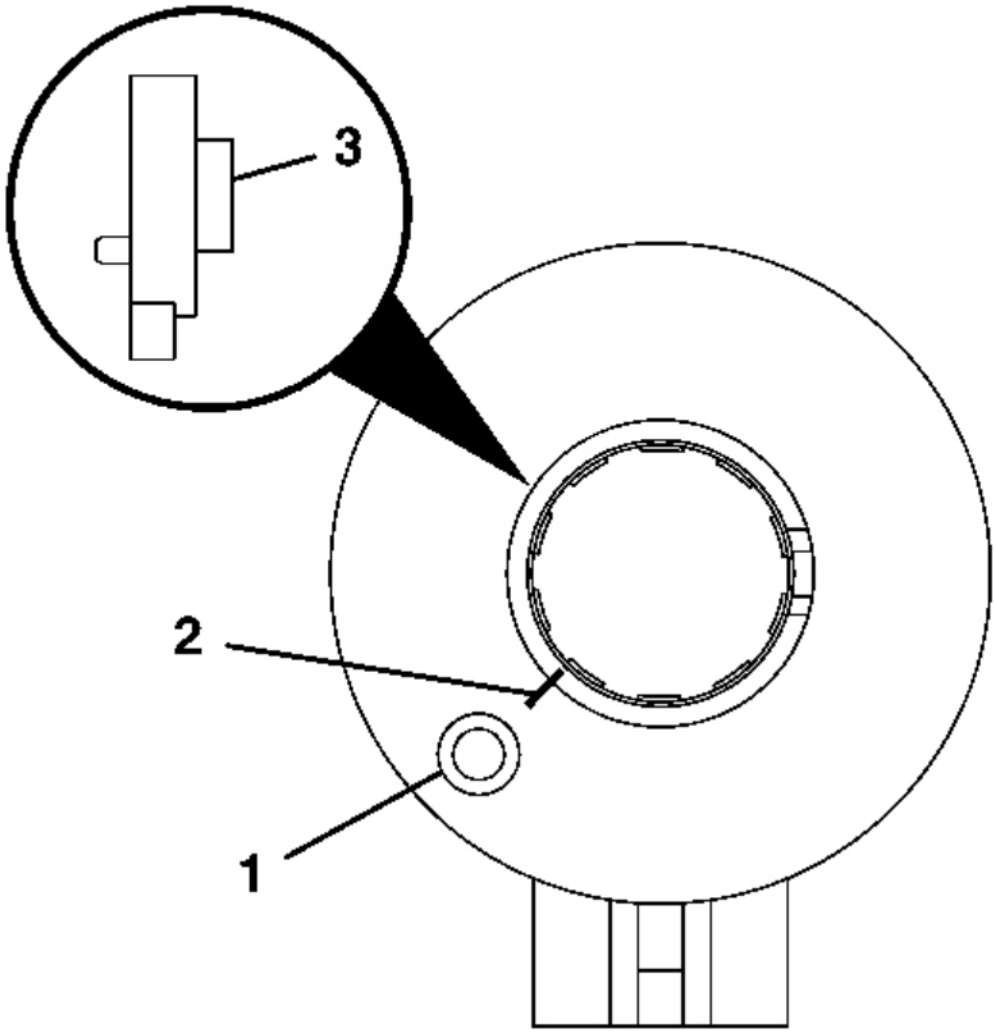


Fig. 164: Steering Wheel Position Sensor Alignment Mark
Courtesy of GENERAL MOTORS CORP.

15. From the technicians point of view, the FRONT of the sensor will have:
    - A raised rotor flange cuff (3)
    - An alignment mark (2) on the rotor flange cuff (3) for installation
    - A pin hole (1) for the centering pin. Note location of the pin hole.

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- A sensor clip in FRONT of the sensor

16. Remove the connector from the sensor.
17. Remove the sensor clip from the sensor.
18. Remove the sensor from the adapter and bearing assembly.
19. To install the sensor, proceed to step 13 in the installation procedure.

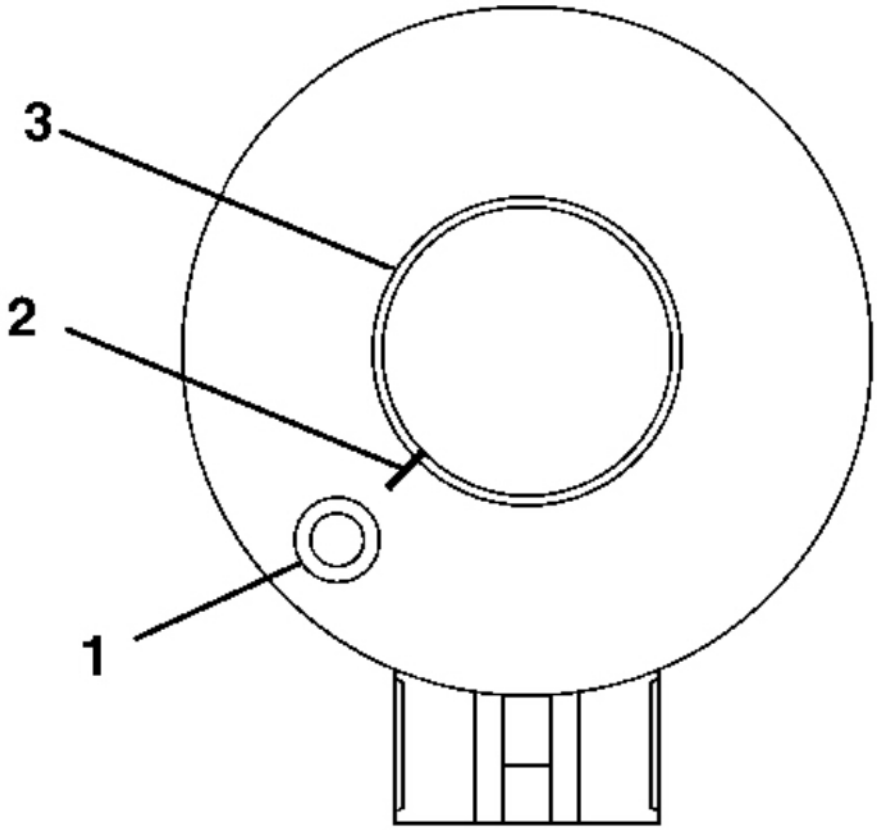


Fig. 165: Steering Wheel Position Sensor Rotor Flange Cuff, Centering Pin Hole And Alignment Mark
Courtesy of GENERAL MOTORS CORP.

20. From the technicians point of view, the FRONT of the sensor will have:
    - A flush rotor flange cuff (3)
    - A pin hole (1) for the centering pin. Note the location of the pin hole.
    - An alignment mark (2) on the flush rotor flange cuff (3) for installation

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21. Remove the connector from the sensor.
22. Remove the sensor from the adapter and bearing assembly.
23. To install the sensor, proceed to step 17 in the installation procedure.

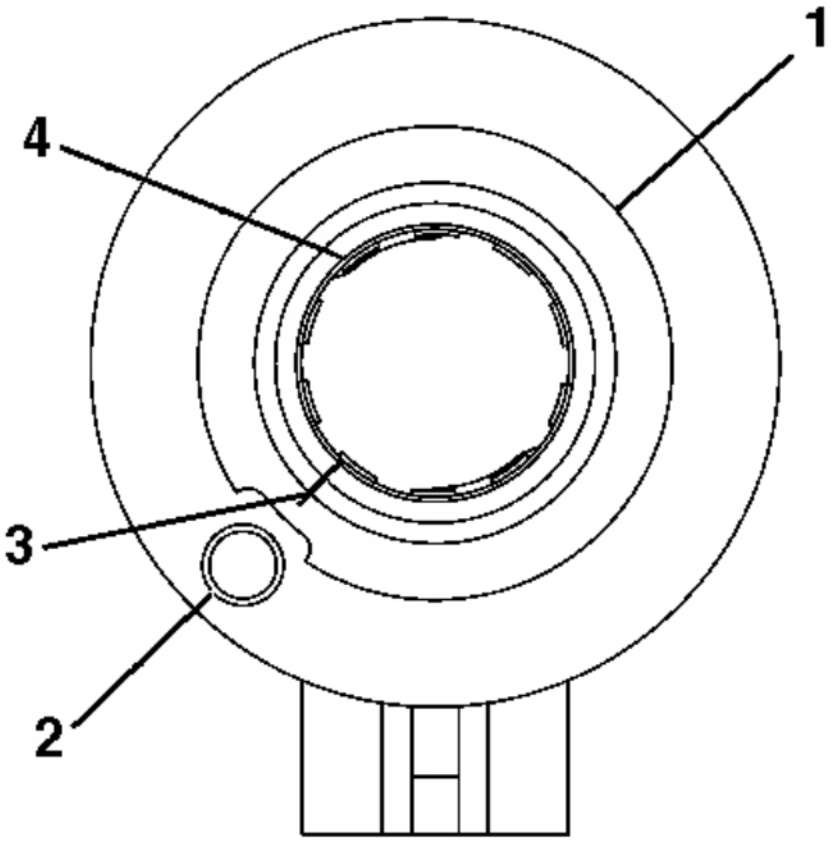


Fig. 166: Steering Wheel Position Sensor Rotor Flange Cuff, Centering Pin Hole, Alignment Mark And Foam Ring
Courtesy of GENERAL MOTORS CORP.

24. From the technicians point of view, the FRONT of the sensor will have:
    - A flush rotor flange cuff (4)
    - A pin hole (2) for the centering pin- Note the location of the pin hole.
    - An alignment mark (3) on the flush rotor flange cuff (4) for installation
    - A foam ring (1)

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25. Remove the connector from the sensor.
26. Remove the sensor from the adapter and bearing assembly.
27. To install the sensor, proceed to step 21 in the installation procedure.

Installation Procedure

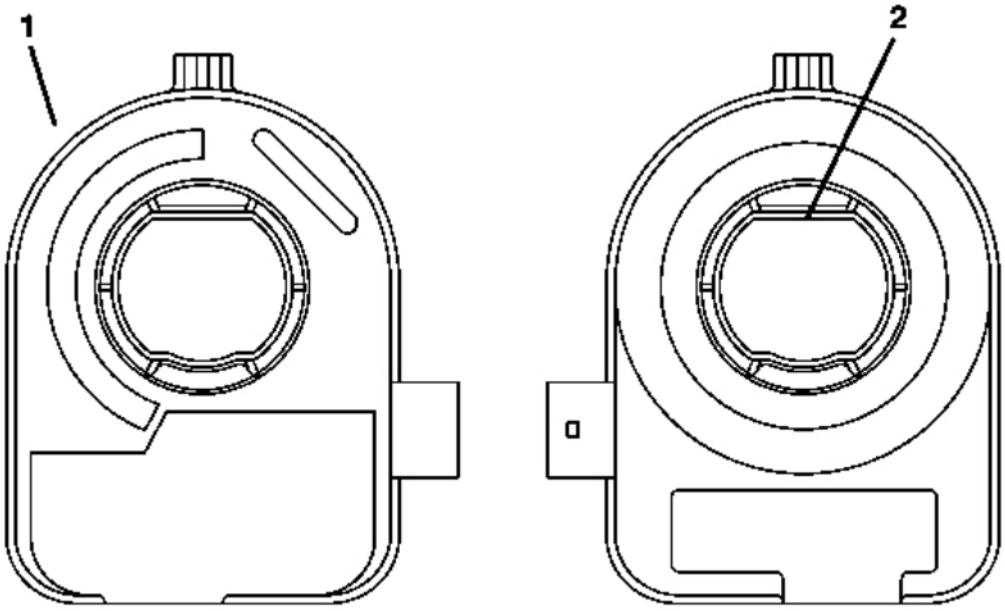


Fig. 167: Front And Back Views Of Steering Wheel Position Sensor
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If reusing the existing sensor, no centering of the sensor is required.

1. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated.
2. From the technicians point of view, the FRONT of the sensor (1) connector will be on your right.

   From the technicians point of view, the BACK of the sensor (2) connector will be on your left.

3. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
4. Install the connector to the sensor.

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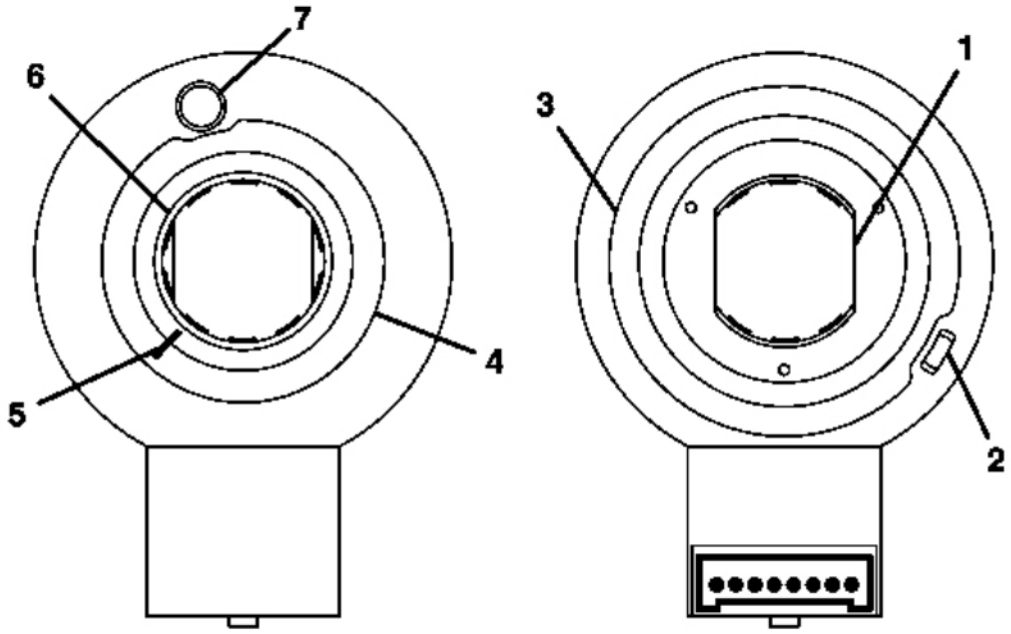


Fig. 168: Steering Wheel Position Sensor Identification Points
Courtesy of GENERAL MOTORS CORP.

5. From the technicians point of view, the FRONT of the sensor will have:
   - A foam ring (4)
   - A pin hole (7) for the centering pin- Note the location of the pin hole.
   - A flushed rotor flange cuff (6)
   - An alignment mark (5) for installation
6. From the technicians point of view, the BACK of the sensor will have:
   - Double D flats (1)
   - A foam ring (3)
   - An alignment tab (2) for installing into the adapter and bearing assembly
   - A view of the inside of the connector

IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.
If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not

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come with a pin installed, you must reorder a new sensor.

7. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
8. Install the connector to the sensor.

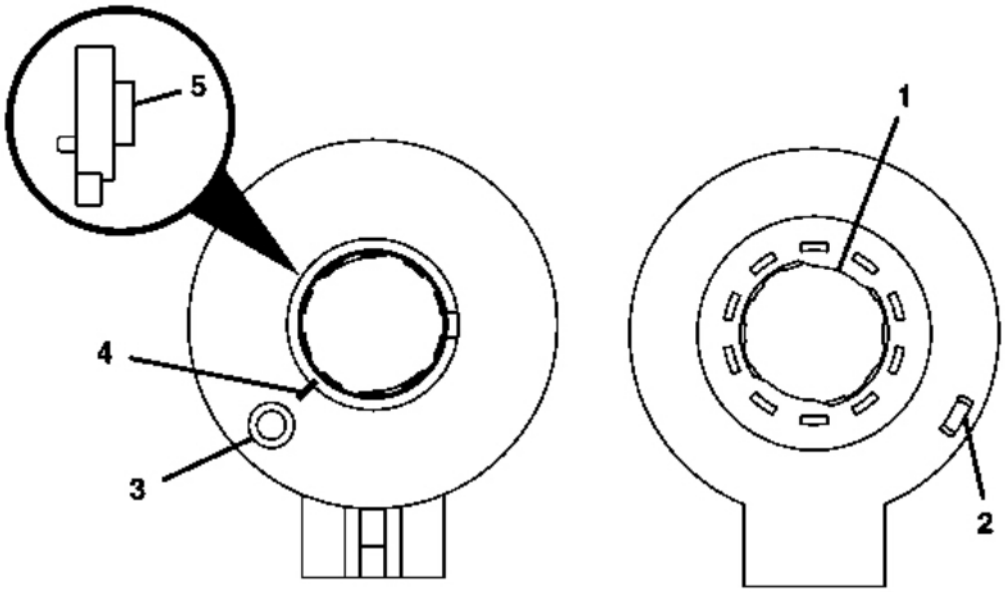


Fig. 169: Steering Wheel Position Sensor Front View
Courtesy of GENERAL MOTORS CORP.

9. From the technicians point of view, the FRONT of the sensor will have:
   - A pin hole (3) for the centering pin- Note location of the pin hole.
   - A raised rotor flange cuff (5)
   - An alignment mark (4) for installation
10. From the technicians point of view, the BACK of the sensor will have:
   - Double D flats (1)
   - An alignment tab (2) for installing into the adapter and bearing assembly

IMPORTANT: If reusing the existing sensor, you must align the marks on the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.
If installing a new sensor, it will come with a pin installed in the sensor.

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Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

11. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
12. Install the connector to the sensor.

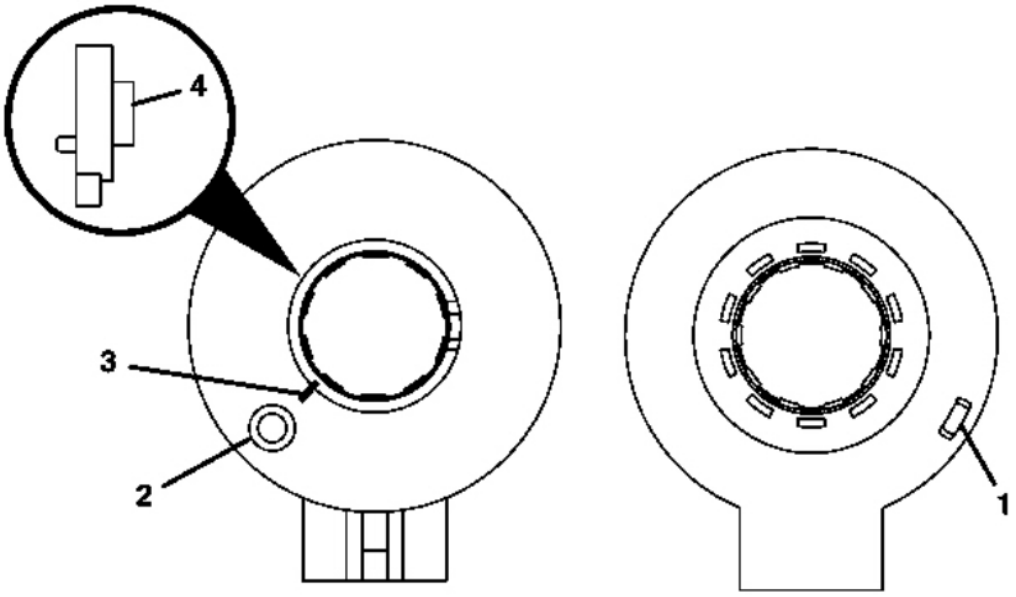


Fig. 170: Steering Wheel Position Sensor Centering Pin Hole, Rotor Flange Cuff And Alignment Mark
Courtesy of GENERAL MOTORS CORP.

13. From the technicians point of view, the FRONT of the sensor will have:
    - A pin hole (2) for the centering pin- Note the location of the pin hole.
    - A raised rotor flange cuff (4)
    - An alignment mark (3) for installation
14. From the technicians point of view, the BACK of the sensor will have an alignment tab (1) for installation. This sensor does not have double D flats.

IMPORTANT: If reusing the existing sensor, you must align the marks on the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

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If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

15. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
16. Install the connector to the sensor.

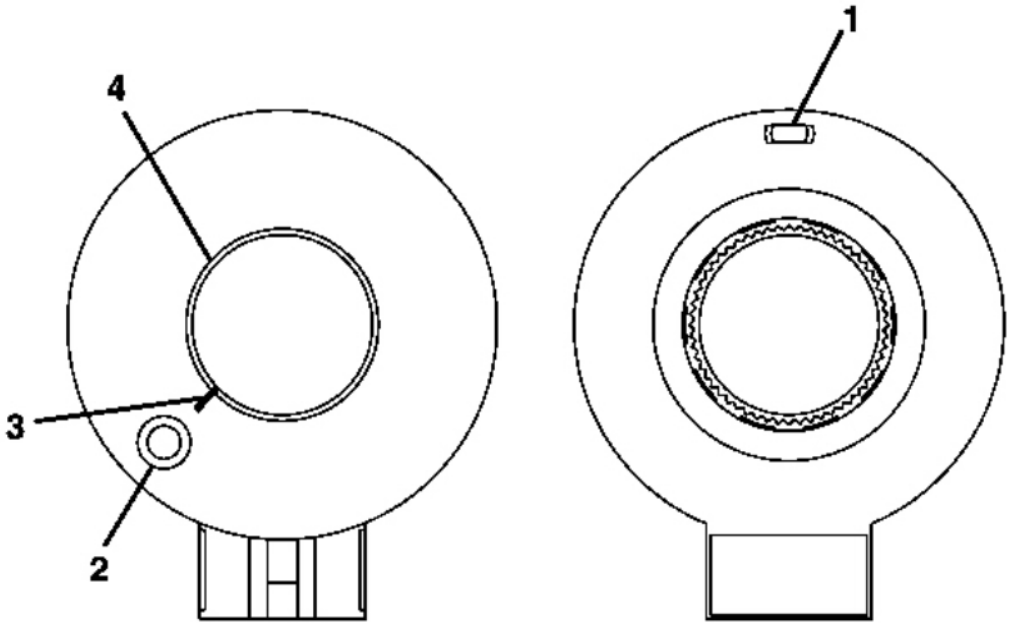


Fig. 171: Steering Wheel Position Sensor Center Pin, Rotor Flange Cuff And Installation Alignment Mark
Courtesy of GENERAL MOTORS CORP.

17. From the technicians point of view, the FRONT of the sensor will have:
    - A pin hole (2) for the centering pin- Note the location of the pin hole.
    - A flush rotor flange cuff (4)
    - An alignment mark (3) for installation
18. From the technicians point of view, the BACK of the sensor will have an alignment tab (1) for installation. This sensor does not have double D flats.

IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor

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flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.
If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

19. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
20. Install the connector to the sensor.

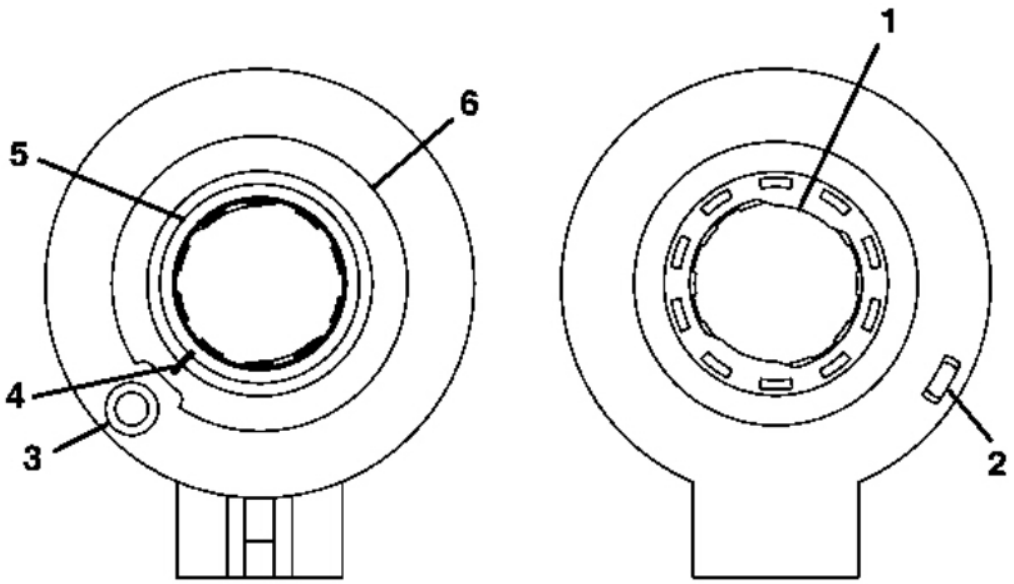


Fig. 172: Steering Wheel Position Sensor Double D Flats
Courtesy of GENERAL MOTORS CORP.

21. From the technicians point of view, the FRONT of the sensor will have:
    - A pin hole (3) for the centering pin- Note location of the pin hole.
    - A flush rotor flange cuff (5)
    - An alignment mark (4) for installation
    - A foam ring (6)
22. From the technicians point of view, the BACK of the sensor will have:
    - Double D flats (1)
    - An alignment tab (2) for installing into the adapter and bearing assembly

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IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.
If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

23. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
24. Install the connector to the sensor.

INFLATABLE RESTRAINT STEERING WHEEL MODULE COIL CENTERING

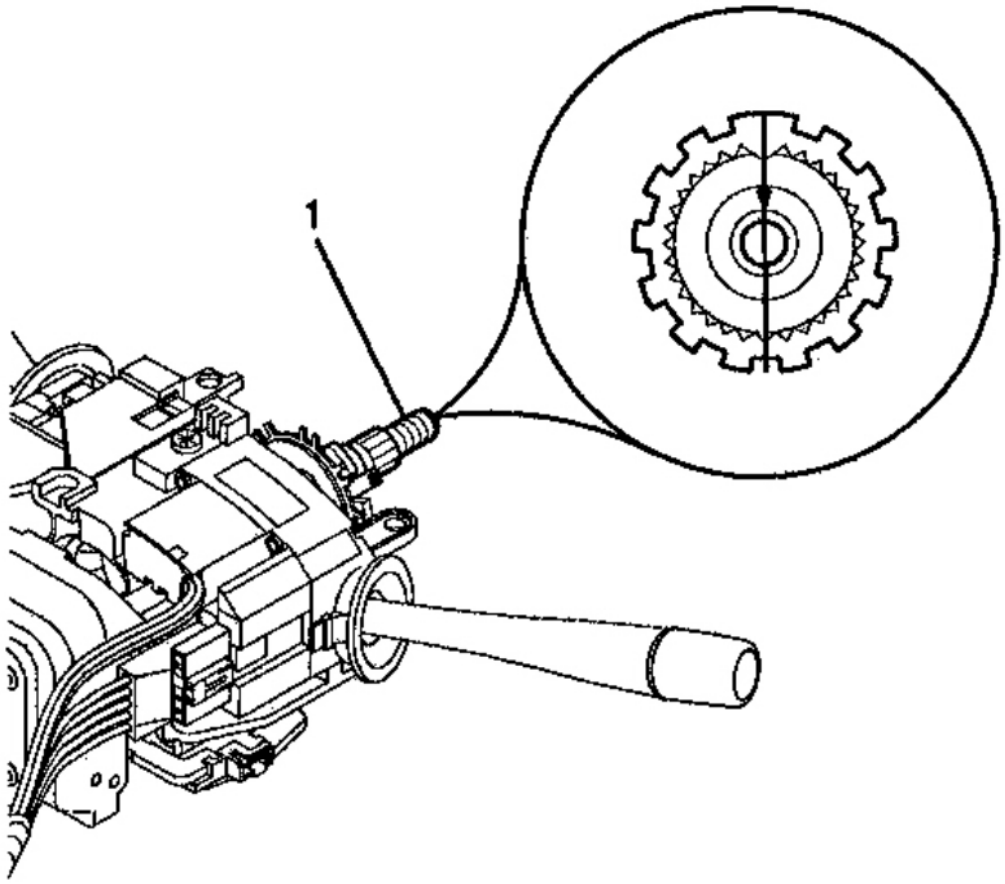


Fig. 173: View Of Block Tooth Of Steering Shaft Assembly In 12 O'clock Position

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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.**

IMPORTANT: **If double wire harness strap is installed onto the wire harness assembly and column, you must reuse the holder for the wire straps during installation.**
Remove the wire harness strap(s) where necessary.

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 is in the LOCK position.

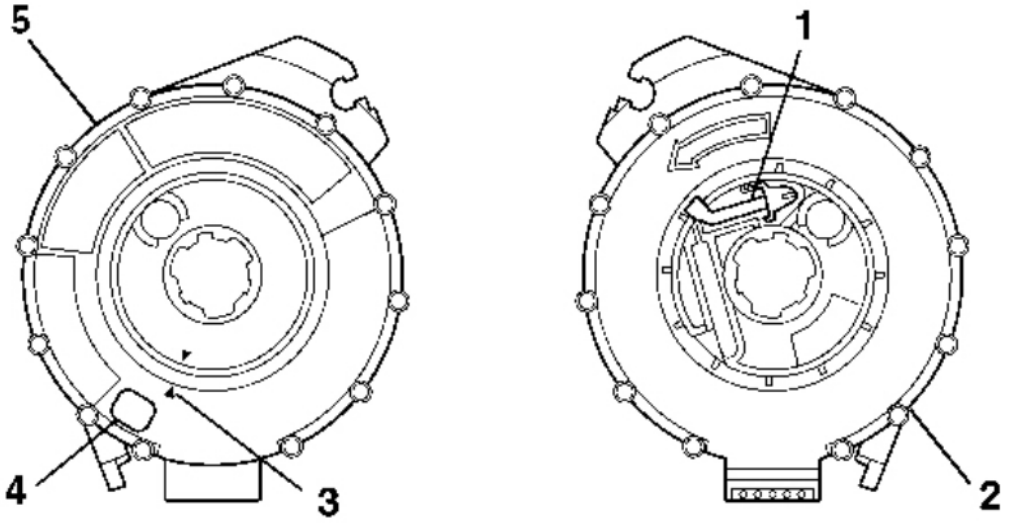


Fig. 174: Centering SIR Coil (With Centering Window & Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

2. If the front (5) of the SIR coil has a centering window (4), and the back side (2) includes a spring service lock (1), perform the following steps:
   1. Hold the SIR coil with the face up.
   2. While depressing the spring service lock, rotate the coil hub clockwise until the coil ribbon stops.

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3. Rotate the coil hub slowly, counterclockwise, until the centering window appears yellow and both arrows (3) line up.
4. Release 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.

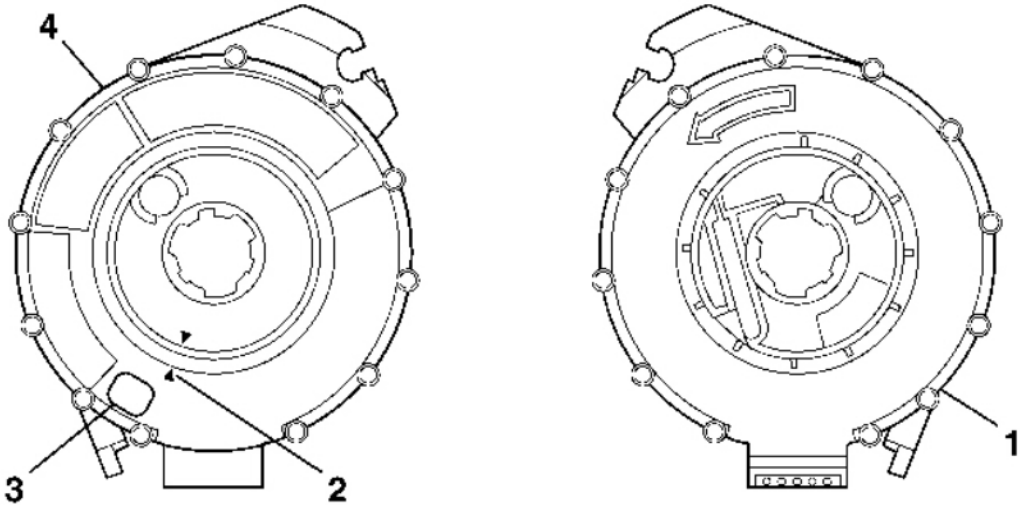


Fig. 175: Centering SIR Coil (With Centering Window, Without Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

3. If the front (4) of the SIR coil has a centering window (3), and the back side (1) includes NO spring service lock, perform the following steps:
    1. Hold the SIR 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 SIR coil with the horn tower and slide onto the steering shaft assembly.

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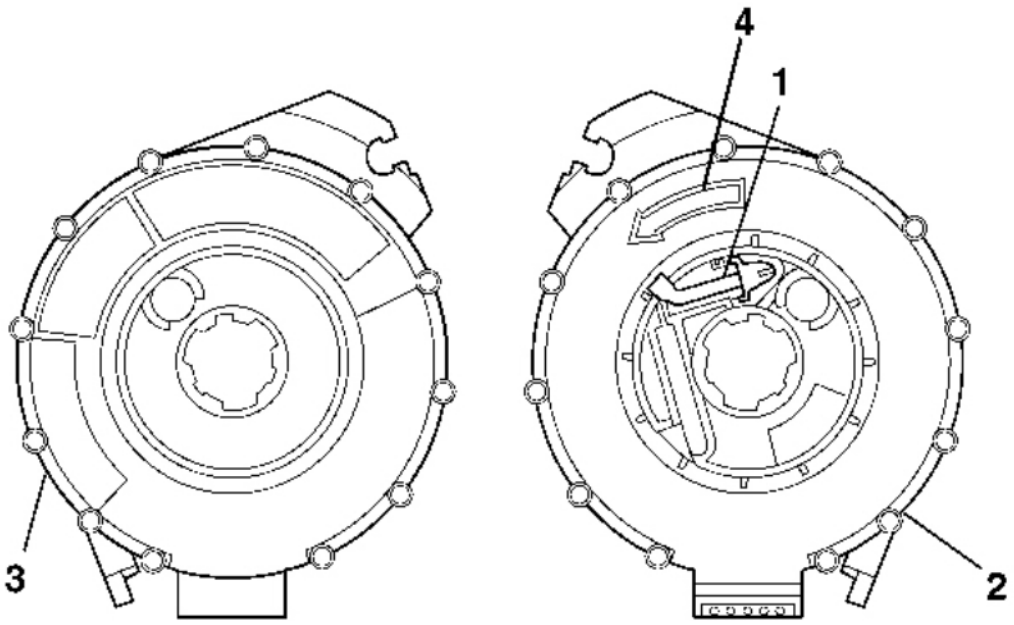


Fig. 176: Centering SIR Coil (No Centering Window, But Back Side Includes A Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

4. If the front side (3) of the SIR coil has NO centering window, but the back side (2) includes a spring service lock (1), perform the following steps:
    1. Hold the SIR 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 locking tabs. The SIR coil is now centered.
    5. Align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.

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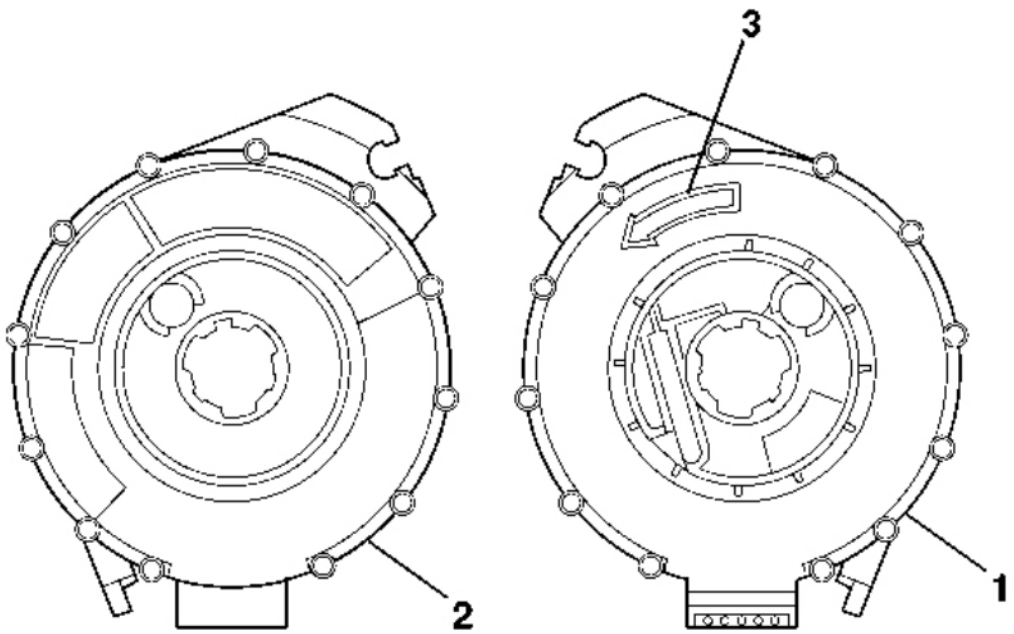


Fig. 177: Centering SIR Coil (Without Centering Window, Without Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

5. If the front side (2) of the SIR coil has NO centering window, and the back side (1) includes NO spring service lock, perform the following steps:
    1. Hold the SIR 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 21/2 revolutions. This is the CENTER position.
    4. While maintaining the coil hub in the CENTER position, align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.
6. If double wire harness strap is installed onto the wire harness assembly and column, you must route the wires up against the steering column. One wire harness strap will surround one lead from the coil to the steering column. The other wire harness strap will surround all leads to the steering column.

DESCRIPTION AND OPERATION

STEERING WHEEL AND COLUMN DESCRIPTION AND OPERATION

The steering wheel and column has 4 primary functions:

- Vehicle steering

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- 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 on 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 manual transmission 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
- 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

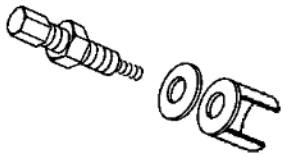
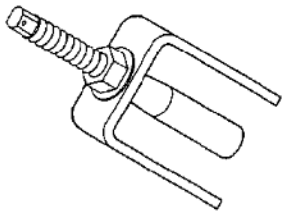
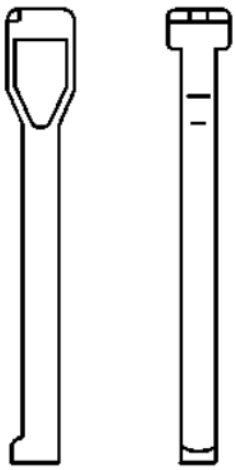
The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The mounting capsules break away from the mounting bracket in the event of an accident.

SPECIAL TOOLS AND EQUIPMENT

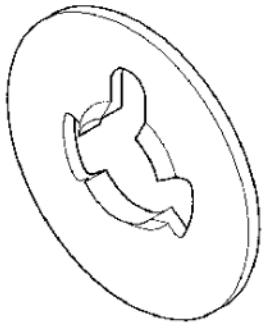
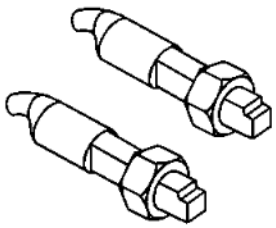
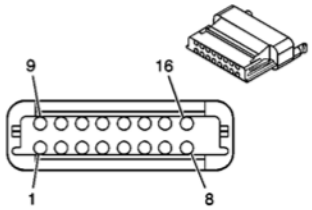
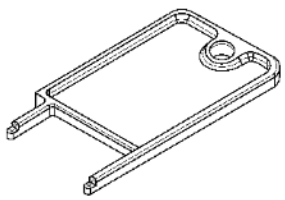
SPECIAL TOOLS

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Special Tools

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

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