

2021 STEERING

Steering Wheel and Steering Column - Canyon, Colorado

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Intermediate Steering Shaft Lower Bolt	45 N.m (33 lb ft)
Intermediate Steering Shaft Upper Bolt	45 N.m (33 lb ft)
Lower Steering Shaft Assembly Lower Bolt	50 N.m (37 lb ft)
Steering Column Lower Trim Cover Bolt	1.5 N.m (13 lb in)
Steering Column Nut	22 N.m (16 lb ft)
Steering Wheel Bolt	45 N.m (33 lb ft)
Steering Wheel Spoke Cover Fastener	1.5 N.m (13 lb in)
Turn Signal Switch Bracket Bolt	15 N.m (11 lb ft)

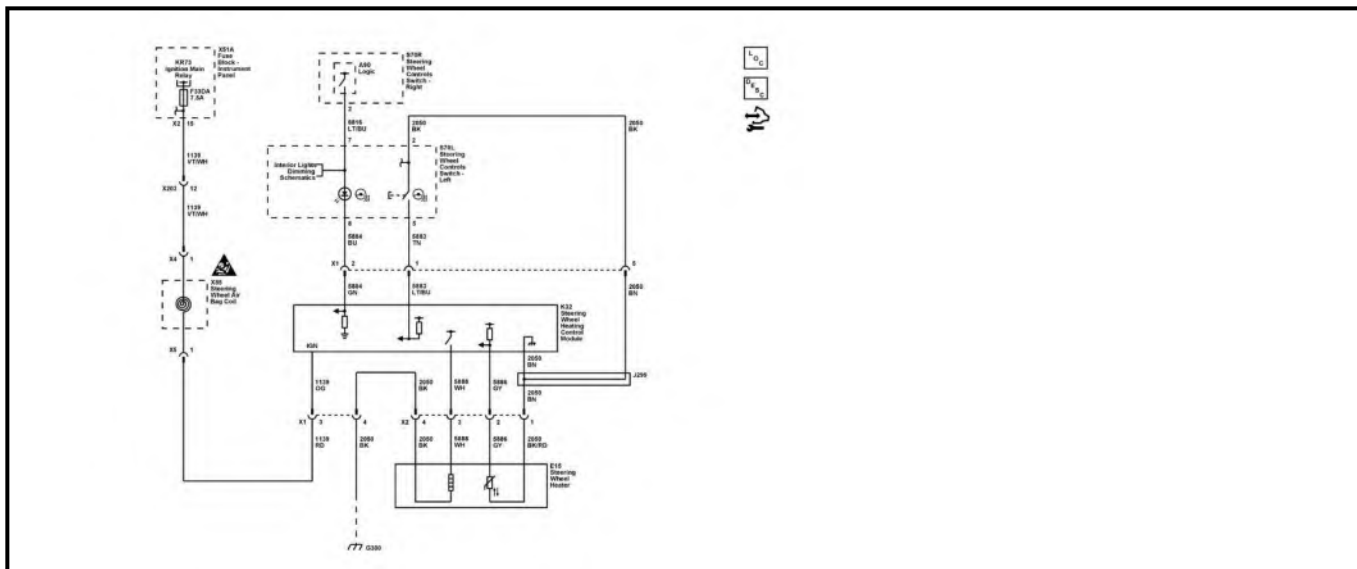
ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Intermediate Steering Shaft Lower Bolt	Thread Locking Adhesive	12345382	10953489
Intermediate Steering Shaft Upper Bolt	Thread Locking Adhesive	12345382	10953489
Lower Steering Shaft Assembly Lower Bolt	Thread Locking Adhesive	12345382	10953489
Steering Wheel Bolt	Thread Locking Adhesive	12345382	10953489

SCHEMATIC WIRING DIAGRAMS

STEERING WHEEL WIRING SCHEMATICS

Heated Steering Wheel (UVD)



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.
- 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](#)
- [Noise in Steering Column](#)
- [Looseness in Steering Column](#)

HEATED STEERING WHEEL INDICATOR MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	1	-	-
Switch Signal	2	1	-	-
LED Control	3	3	4	-
Switch and LED Ground	-	1	-	-
Module Ground	-	1	-	-
1. Heated Steering Wheel System Inoperative 2. Heated Steering Wheel Always ON				

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
3. LED Inoperative 4. LED Always ON				

Circuit/System Description

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

Reference Information

Schematic Reference

- [Steering Wheel Wiring Schematics](#)
- [Interior Lights Dimming Wiring Schematics](#)

Connector End View Reference

[Master Electrical Component List](#) , or [Inline Harness Connector End Views - Index](#) or [Component Connector End Views - Index](#)

Description and Operation

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

Electrical Information Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the S70L Steering Wheel Controls Switch - Left is OFF. The steering wheel heater indicator should not be illuminated and the left and right sides of the steering wheel should not be warm.

- **The steering wheel is always warm**

Refer to [Heated Steering Wheel Malfunction](#)

- **The steering wheel does not become warm and the heater indicator is illuminated**

Refer to Circuit/System Testing

- **Go to next step: The steering wheel does not become warm and the heater indicator is not illuminated**

3. Press and release the S70L Steering Wheel Controls Switch - Left. The steering wheel heater indicator should illuminate and the left and right sides of the steering wheel should become warm.

- **The steering wheel does not become warm**

Refer to [Heated Steering Wheel Malfunction](#)

- **The steering wheel becomes warm and the heater indicator does not illuminate**

Refer to Circuit/System Testing

- **Go to next step: The steering wheel becomes warm and the heater indicator illuminates**

4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the K32 Steering Wheel Heating Control Module.

2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition voltage circuit terminal 3 and ground.

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

1. Ignition OFF, remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch](#).
- Go to next step: If 2 Ω or greater

3. Verify the fuse is OK and there is voltage at the fuse.

- If the fuse is blown, replace the K32 Steering Wheel Heating Control Module.
- If the fuse is OK, repair the open/high resistance in the circuit.

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

1. Ignition OFF.

2. Test for infinite resistance between the ignition voltage circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K32 Steering Wheel Heating Control Module.

- **Go to next step: If the test lamp illuminates**

5. Ignition OFF, connect the X1 harness connector at the K32 Steering Wheel Heating Control Module.

Disconnect the harness connector at the S70L Steering Wheel Control Switch - Left. Ignition ON.

6. Test for B+ between the signal voltage circuit terminal 7 and ground.

- **If less than B+**

1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Control Switch - Right.

2. Test for infinite resistance between the signal circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- Go to next step: If infinite resistance

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the S70R Steering Wheel Control Switch - Right.

- **Go to next step: If B+**

NOTE: Once the jumper is installed the module will only ground the circuit for approximately 3 s.

7. Ignition OFF, install a 3 A fused jumper wire between the signal circuit terminal 5 and ground circuit terminal 2 at the S70L Steering Wheel Controls Switch - Left. Ignition ON.
8. Test for less than 300 Ω between the control circuit terminal 8 and ground.

- **If 300 Ω or greater**

Replace the K32 Steering Wheel Heating Control Module.

- **Go to next step: If less than 300 Ω**

9. Replace the S70L Steering Wheel Controls Switch - Left.

Repair Instructions

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

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

HEATED STEERING WHEEL MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

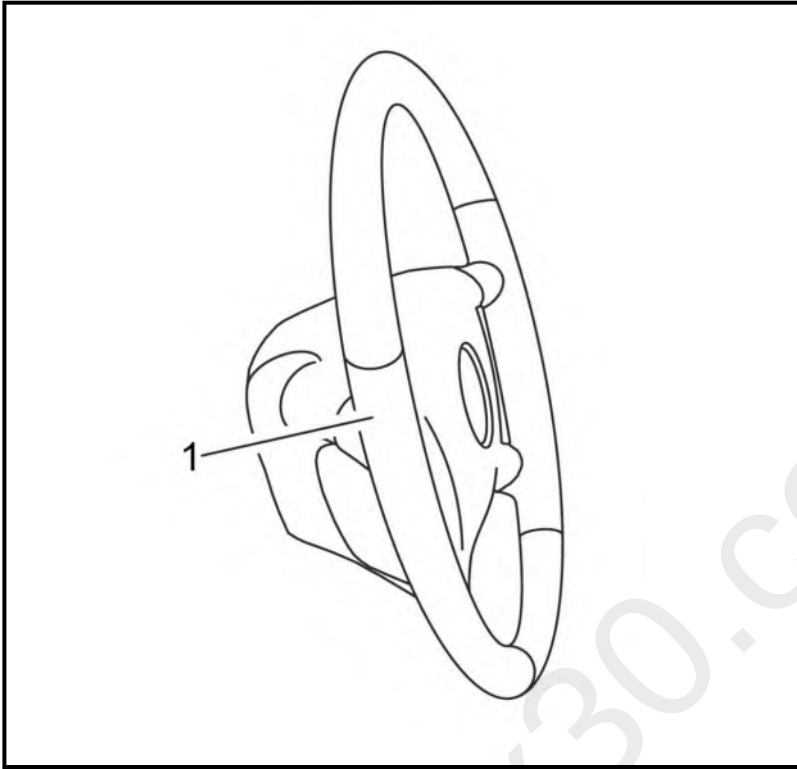
Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	1	-	-
Switch Signal	2	1	-	-
Switch and LED Ground	-	1	-	-
Temperature Sensor Signal	3	3	3	-
Temperature Sensor Ground	-	3	-	-
Heater Element Control	3	3	2	-
Heater Element Ground	-	3	-	-
Module Ground	-	1	-	-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

Circuit/System Description

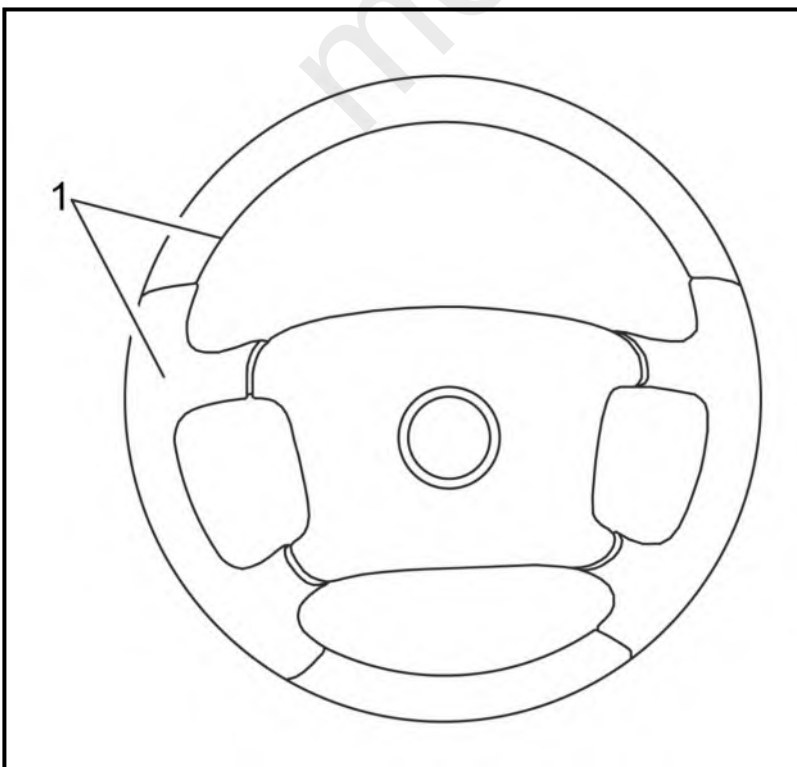
The heated steering wheel control module controls the heated steering wheel and the heated steering wheel ON indicator based on an input from the heated steering wheel switch. When the heated steering wheel switch is pressed, the switch signal circuit is pulled to ground. This indicates to the heating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

Diagnostic Aids

- Before replacing the steering wheel for complaints of not getting hot enough, a reliable infrared temperature gun should be used to measure the temperature at various points around the rim. The steering wheel's normal operating temperature is 32B°C (89.6B°F) and takes approximately 10 min to reach that temperature. It may take up to 20 min for the normal operating temperature to stabilize within the steering wheel rim. There may be spike in temperature during the first 3 - 4 min before it stabilizes at normal operating temperature. The steering wheel will take longer to heat up if the vehicle temperature is below -21B°C (-5.8B°F). The steering wheel heater will not operate when the steering wheel temperature is above 32B°C (89.6B°F).
- The infrared measurements are made at the rim (1) at the 3 and 9 o'clock positions of the steering wheel.



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



Reference Information

Schematic Reference

Steering Wheel Wiring Schematics

Connector End View Reference

Master Electrical Component List , or Inline Harness Connector End Views - Index or Component Connector End Views - Index

Description and Operation

Steering Wheel and Column Description and Operation

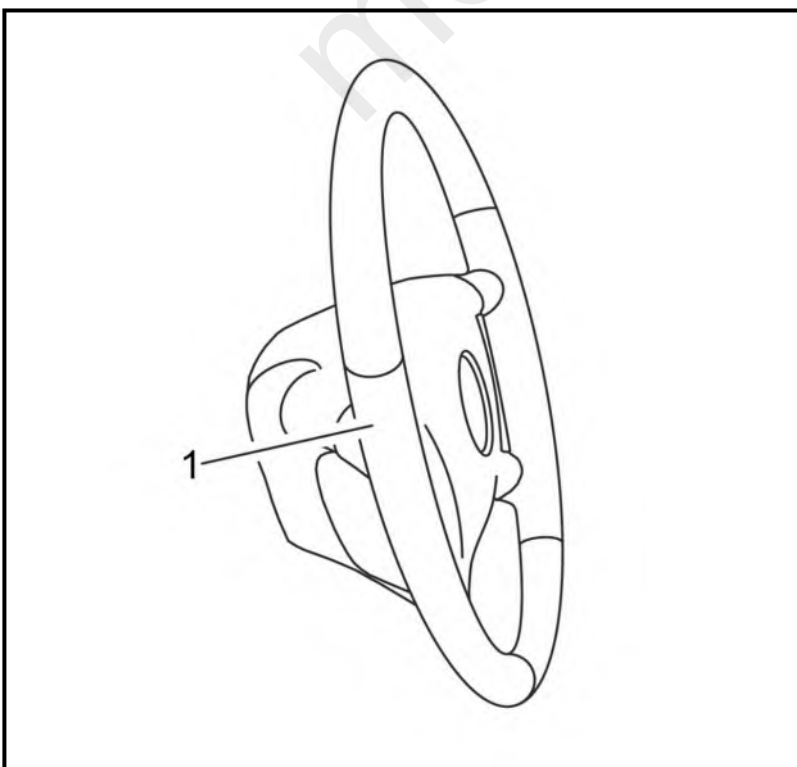
Electrical Information Reference

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

Circuit/System Verification

Using an Infrared Temperature Gun

1. Engine running, all accessories OFF.
2. Verify the steering wheel heater switch is OFF and the steering wheel heater indicator should not be illuminated.
 - **If the heater indicator is illuminated**
Refer to Heated Steering Wheel Indicator Malfunction
 - **Go to next step: If the heater indicator is not illuminated**
3. Measure the temperature readings at the 3 and 9 o'clock positions on the steering wheel rim (1).



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

4. Verify that the steering wheel temperature is 25B°C (77B°F) or below.

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

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

- **Go to next step: If the steering wheel temperature is 25B°C (77B°F) or below**

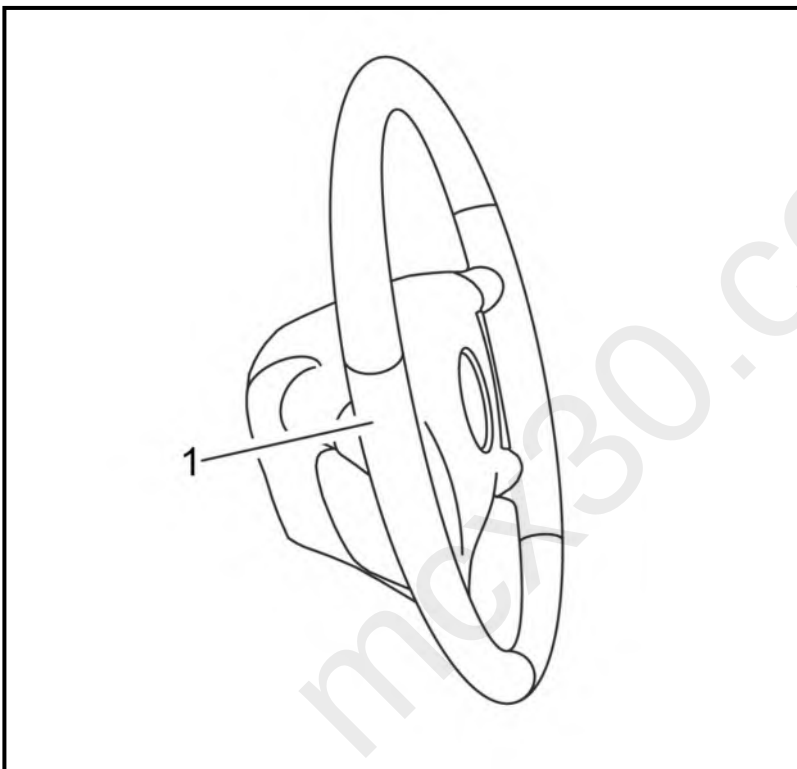
5. Press and release the steering wheel heater switch. The steering wheel heater indicator should illuminate. Allow the steering wheel to heat for a minimum of 10 min so that the temperature stabilizes.

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

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

- **Go to next step: If the heater indicator illuminates**

6. Measure the temperature readings at the 3 and 9 o'clock positions on the steering wheel rim (1).



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

7. Verify that the steering wheel temperature is greater than 28B°C (82.4B°F) within 20 min.

- **If after 20 minutes the measured temperature is less than 28B°C (82.4B°F)**

Refer to Circuit System Testing.

- **Go to next step: If after 20 minutes the measured temperature is 28B°C (82.4B°F) or greater**

8. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the in-line harness connector at the K32 Steering Wheel Heating Control Module.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition voltage circuit terminal 3 and ground.

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

1. Ignition OFF, remove the test lamp.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch](#).
- Go to next step: If 2 Ω or greater

3. Verify the fuse is OK and there is voltage at the fuse.

- If the fuse is blown, replace the K32 Steering Wheel Heating Control Module.
- If the fuse is OK, repair the open/high resistance in the circuit.

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

1. Ignition OFF.

2. Test for infinite resistance between the ignition voltage circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K32 Steering Wheel Heating Control Module.

- **Go to next step: If the test lamp illuminates**

5. Ignition OFF, reconnect the in-line harness connector. Disconnect the X1 harness connector at the S70L Steering Wheel Controls Switch - Left.

6. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

7. Ignition ON.

8. Test for B+ between the signal circuit terminal 5 and ground.

- **If less than B+**

Replace the K32 Steering Wheel Heating Control Module.

- **Go to next step: If B+**

9. Place the S70L Steering Wheel Controls Switch - Left in the OFF position.

10. Test for infinite resistance between terminal 5 and terminal 2 at the S70L Steering Wheel Controls Switch - Left.

- **If less than infinite resistance**

Replace the S70L Steering Wheel Controls Switch - Left.

- **Go to next step: If infinite resistance**

11. Place the S70L Steering Wheel Controls Switch - Left in the ON position.

12. Test for less than 40 Ω between terminal 5 and terminal 2.

- **If 40 Ω or greater**

Replace the S70L Steering Wheel Controls Switch - Left

- **Go to next step: If less than 40 Ω**

13. Ignition OFF, disconnect the in-line harness connector at the E15 Steering Wheel Heater.

14. Test for less than 10 Ω between the ground circuit terminal 4 at the E15 Steering Wheel Heater and ground.

- **If 10 Ω or greater**

Repair the open/high resistance in the circuit.

- **Go to next step: If less than 10 Ω**

15. Test for 1.5 - 3.0 Ω between the signal terminal 4 and the ground terminal 1 at the E15 Steering Wheel Heater.

- **If not within the specified range**

Replace the E15 Steering Wheel Heater.

- **Go to next step: If within the specified range**

16. Test for 9 - 11k Ω between the control circuit terminal 2 and the ground terminal 3 at the E15 Steering Wheel Heater.

- **If not within the specified range**

Replace the E15 Steering Wheel Heater.

- **Go to next step: If within the specified range**

17. Replace the K32 Steering Wheel Heating Control Module.

Repair Instructions

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

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

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 Symptoms - Steering Wheel and Column
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	If equipped, verify that the following components are not seized or corroded: • Tilt pivot pins • Tilt head lock shoes	Go to Step 7	Go to Step 4

Step	Action	Yes	No
	Are the components seized or corroded?		
4	Inspect the tilt pivot pins for binding. Are the tilt pivot pins binding?	Go to Step 8	Go to Step 5
5	Inspect for a weak or broken steering column tilt spring. Is the steering column tilt spring weak or broken?	Go to Step 9	Go to Step 6
6	Inspect the steering column wiring harness routing for tightness. Was the steering column wiring harness routed correctly?	Go to Step 11	Go to Step 10
7	Replace the steering column. Refer to Steering Column Replacement . Did you complete the repair?	Go to Step 11	-
8	If serviceable, replace the pivot pins. If not serviceable replace the steering column. Refer to Steering Column Replacement . Did you complete the repair?	Go to Step 11	-
9	If serviceable, replace the tilt spring. Did you complete the repair?	Go to Step 11	-
10	Route the steering column wiring harness to the correct location. Did you correctly route the wiring harness?	Go to Step 11	-
11	Operate the steering column tilt function in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

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 Symptoms - Steering Wheel and Column
2	Verify that noise is present in the steering column during operation. Is noise present in the steering column during operation?	Go to Step 3	System OK
3	Inspect the steering column mounting features for the following conditions: - The steering column mounting fasteners are loose. - The steering column mounting features are sheared. Are the steering column mounting features loose or sheared?	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	If equipped, inspect the lock plate retaining ring for correct installation. Is the lock plate retaining ring installed incorrectly?	Go to Step 12	Go to Step 6

Step	Action	Yes	No
6	Inspect the steering column upper and lower bearings for the following conditions: • Damage • Lubrication • Wear • Proper seating Are the bearings in need of repair or replacement?	Go to Step 13	Go to Step 7
7	Does the steering column tilt joint need to be lubricated?	Go to Step 14	Go to Step 8
8	NOTE: Inspect the intermediate steering shaft for noise while driving the vehicle, turning the steering wheel, and applying the brakes. Inspect the intermediate steering shaft for noise. Is the intermediate steering shaft noisy?	Go to Step 15	Go to Step 9
9	NOTE: For vehicles equipped with a telescoping steering column, perform this step. If not equipped, go to next step. Inspect the steering column for noise while telescoping the column. Is the steering column noisy while telescoping?	Go to Step 16	Go to Step 17
10	NOTE: If the steering column mounting features are damaged or sheared, replace the steering column.	Go to Step 17	-

Step	Action	Yes	No
	<u>Steering Column Replacement</u> Tighten the steering column mounting fasteners to specification. <u>Fastener Specifications</u> Did you complete the repair?		
11	Replace the SIR/SRS coil. <u>Steering Wheel Airbag Coil Replacement</u> Did you complete the repair?	Go to Step 17	-
12	Install the lock plate retaining ring correctly. Did you complete the repair?	Go to Step 17	-
13	NOTE: If the steering column upper and/or lower bearings are not serviceable, replace the steering column. <u>Steering Column Replacement</u> Replace the steering column upper and/or lower bearings, if serviceable. Did you complete the replacement?	Go to Step 17	-
14	Lubricate the steering column tilt joint. Did you complete the repair?	Go to Step 17	-
15	Replace the appropriate intermediate steering shaft component. Did you complete the repair?	Go to Step 17	-
16	Redistribute or add lubricant to the steering column lower jacket with the column telescoped to its end of outward travel. 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

LOOSENESS IN STEERING COLUMN

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Steering Wheel and Column</u>
2	Verify that the steering column is loose. Is the steering column loose?	Go to Step 3	System OK
3	Inspect the steering column mounting features for the following conditions.	Go to Step 5	Go to Step 4

Step	Action	Yes	No
	- The steering column mounting fasteners are loose. - The steering column mounting features are sheared. Are the steering column mounting features loose or sheared?		
4	Inspect the upper and/or lower bearings for looseness. Are any of the bearings worn or loose?	Go to Step 6	Go to Step 7
5	NOTE: If the steering column mounting features are damaged or sheared, replace the steering column. <u>Steering Column Replacement</u> Tighten the steering column mounting fasteners to specification. <u>Fastener Specifications</u> Did you complete the repair?	Go to Step 7	-
6	NOTE: If the steering column upper and/or lower bearings are not serviceable, replace the steering column. <u>Steering Column Replacement</u> Replace the upper and/or lower bearings, if serviceable. Did you complete the repair?	Go to Step 7	-
7	Operate the steering column in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

LOWER STEERING SHAFT ASSEMBLY REPLACEMENT

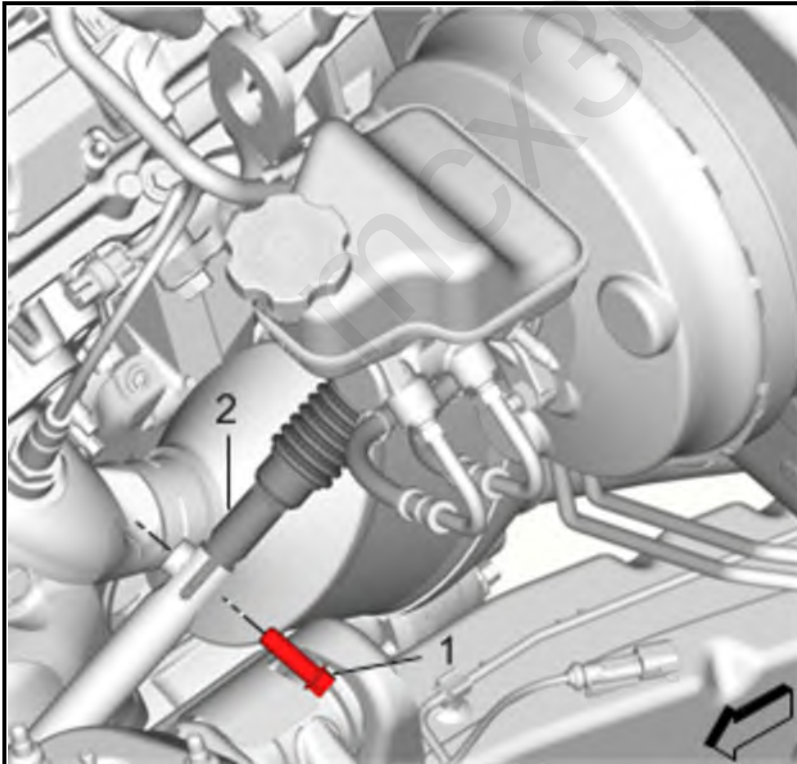
CAUTION:

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

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

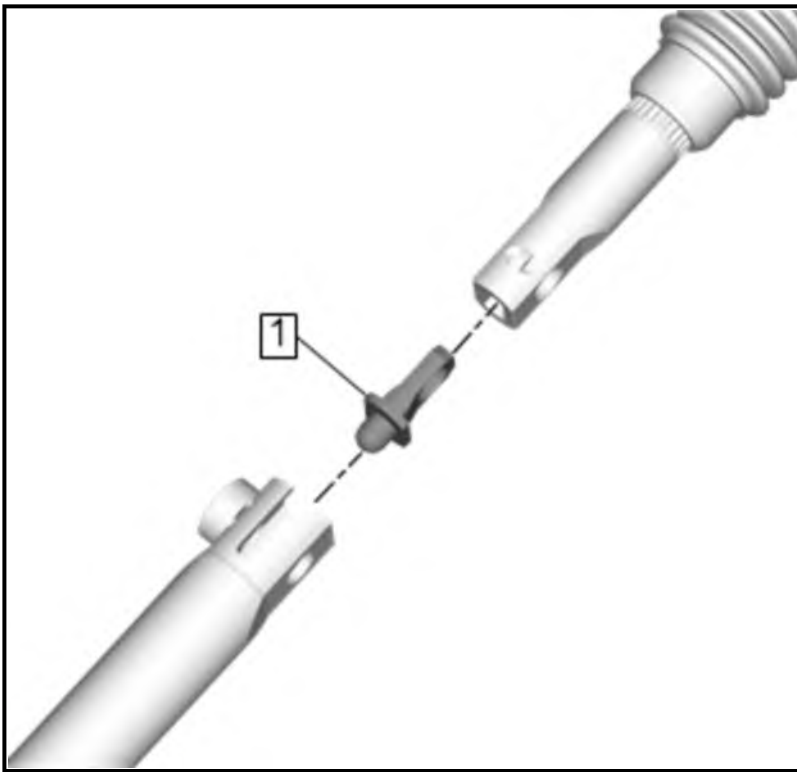
After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has become un-centered, refer to your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

1. With the steering wheel in the straight ahead position, LOCK the steering column.
2. Front Wheelhouse Liner- Left Side - Remove - [Front Wheelhouse Liner Replacement \(Without ZR2\)](#), or [Front Wheelhouse Liner Replacement \(With ZR2\)](#), or [Front Wheelhouse Liner Replacement \(Bison\)](#)
3. Underbody Splash Shield - Remove - [Underbody Splash Shield Replacement \(without ZR2\)](#), or [Underbody Splash Shield Replacement \(with ZR2\)](#), or [Underbody Splash Shield Replacement \(Bison\)](#)
4. Intermediate Steering Shaft Lower Bolt (1) - Remove

**NOTE:**

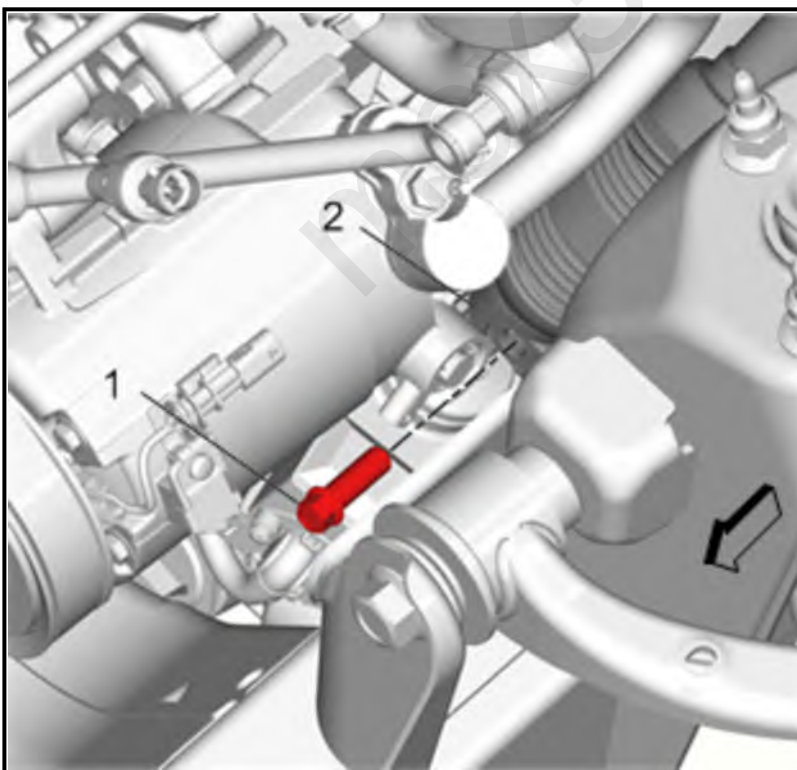
View shown from above for graphic clarity.

5. Intermediate Steering Shaft (2) @ Lower Steering Shaft Assembly - Separate
6. Remove the plastic insert (1) located at bottom of the intermediate steering shaft and DISCARD.



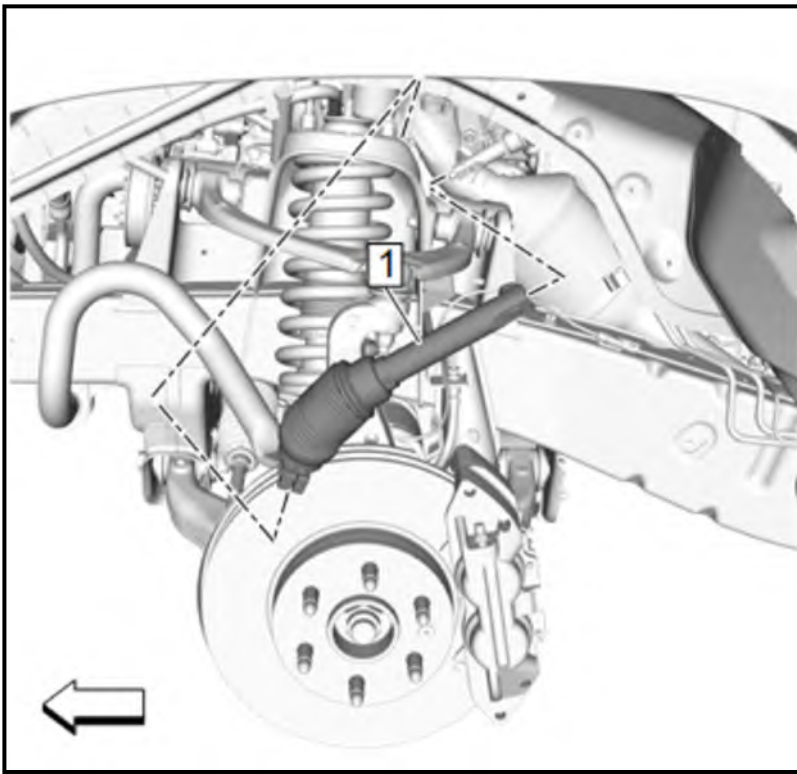
WARNING: Prior to intermediate steering shaft reassembly, remove the plastic insert located at the bottom of the intermediate steering shaft. Failure to remove this insert may result in binding in the steering system or possible bodily injury.

7. If the plastic insert (1) is missing, it may have fallen into the lower steering shaft assembly. The insert **MUST** be removed prior to intermediate steering shaft reassembly.
8. Lower Steering Shaft Assembly Lower Bolt (1) - Remove



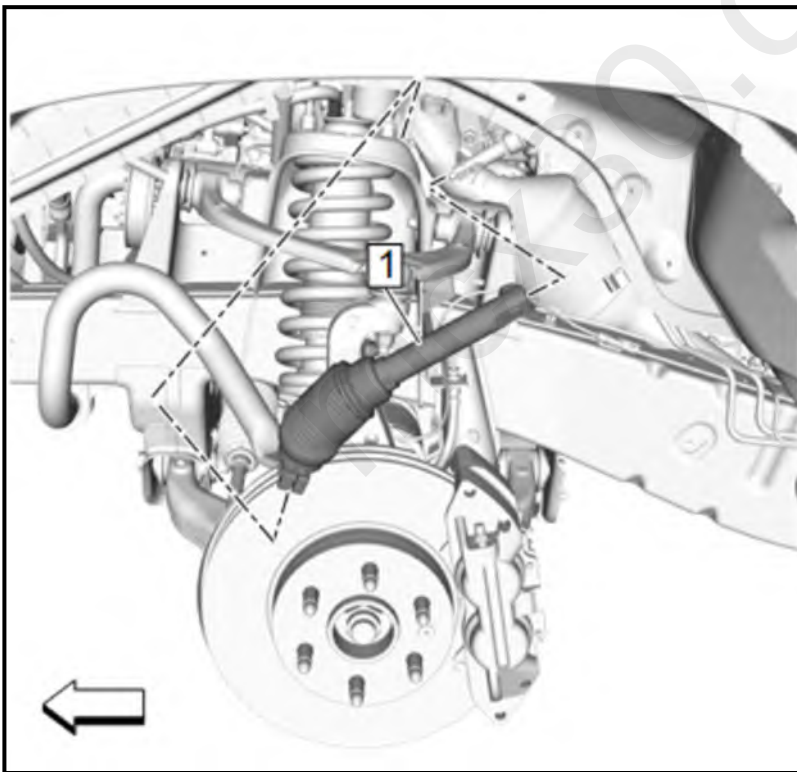
NOTE: View shown from above for graphic clarity.

9. Lower Steering Shaft Assembly (2) @ Steering Gear - Separate
10. Lower Steering Shaft Assembly (1) - Remove

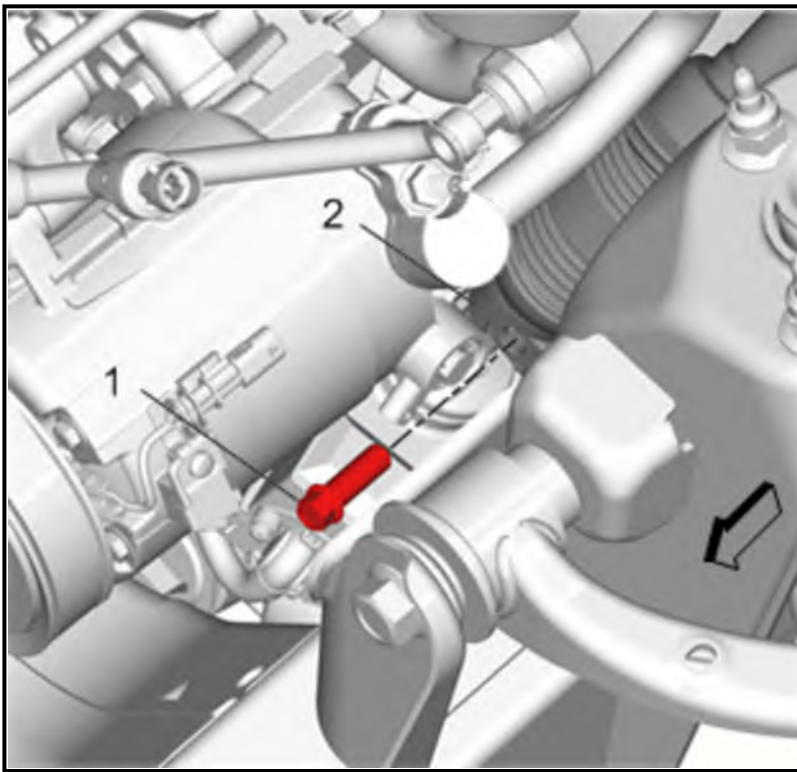


Installation Procedure

1. Lower Steering Shaft Assembly (1) - Install



2. Lower Steering Shaft Assembly (2) @ Steering Gear - Install

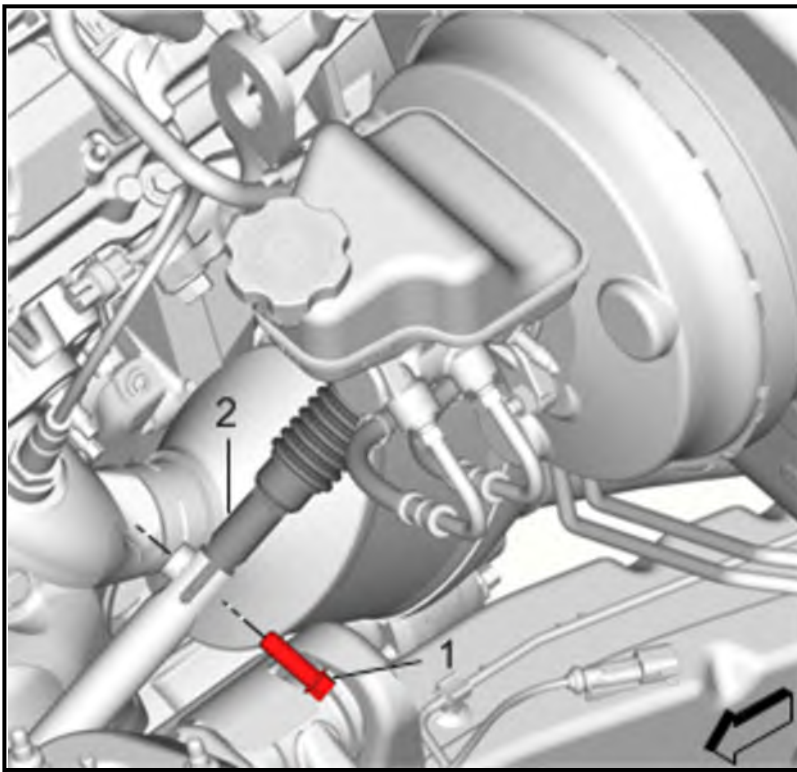


NOTE: View shown from above for graphic clarity.

3. Prepare the lower steering shaft assembly lower bolt (1) as follows:
 1. Remove all traces of the adhesive patches from the lower steering shaft assembly lower bolt (1).
 2. Clean the threads of the bolt with denatured alcohol.
 3. Apply thread locking adhesive to the lower steering shaft assembly lower bolt (1). Adhesives, Fluids, Lubricants, and Sealers
 4. Ensure there are no gaps in the thread locking adhesive along the length of the filled area of the threads on the bolt shaft.

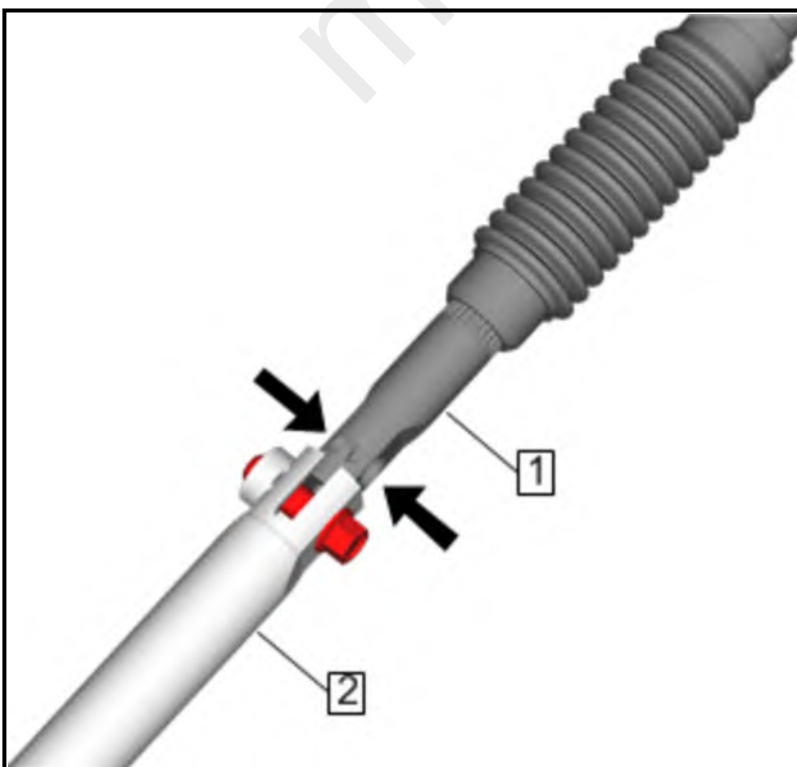
CAUTION: Refer to Fastener Caution .

4. Lower Steering Shaft Assembly Lower Bolt (1) - Install and tighten 50 N.m (37 lb ft)
5. Intermediate Steering Shaft (2) @ Lower Steering Shaft Assembly - Install



NOTE: View shown from above for graphic clarity.

6. Prepare the intermediate steering shaft lower bolt (1) as follows:
 1. Remove all traces of the adhesive patches from the intermediate steering shaft lower bolt (1).
 2. Clean the threads of the bolt with denatured alcohol.
 3. Apply thread locking adhesive to the intermediate steering shaft lower bolt (1). [Adhesives, Fluids, Lubricants, and Sealers](#)
 4. Ensure there are no gaps in the thread locking adhesive along the length of the filled area of the threads on the bolt shaft.
7. Intermediate Steering Shaft Lower Bolt (1) - Install, but do NOT tighten
8. To ensure the intermediate steering shaft (1) is installed in the lower steering shaft assembly (2) correctly, pull each shaft in opposite directions to try and separate the shafts.

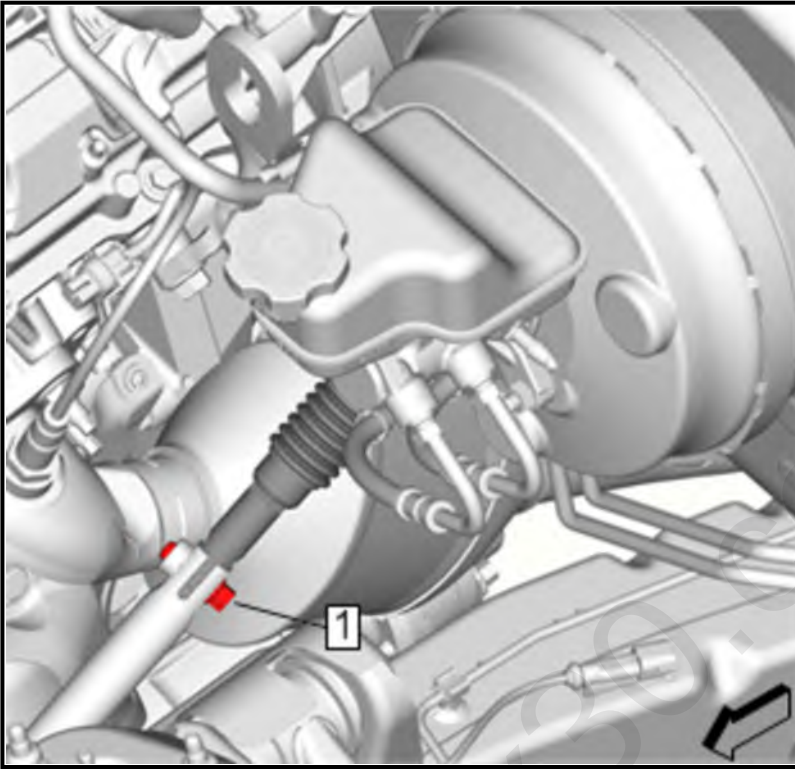


WARNING:

The intermediate steering shaft must be FULLY INSERTED into the lower steering shaft assembly prior to tightening the intermediate steering shaft lower bolt. Failure to properly assemble the intermediate steering shaft to the lower steering shaft assembly may result in loss of steering or possible bodily injury.

If the shafts separate, as shown in the graphic, then remove the bolt and connect the shafts correctly. The bolt MUST go through BOTH of the shafts for correct installation.

9. Intermediate Steering Shaft Lower Bolt (1) - Tighten 45 N.m (33 lb ft)

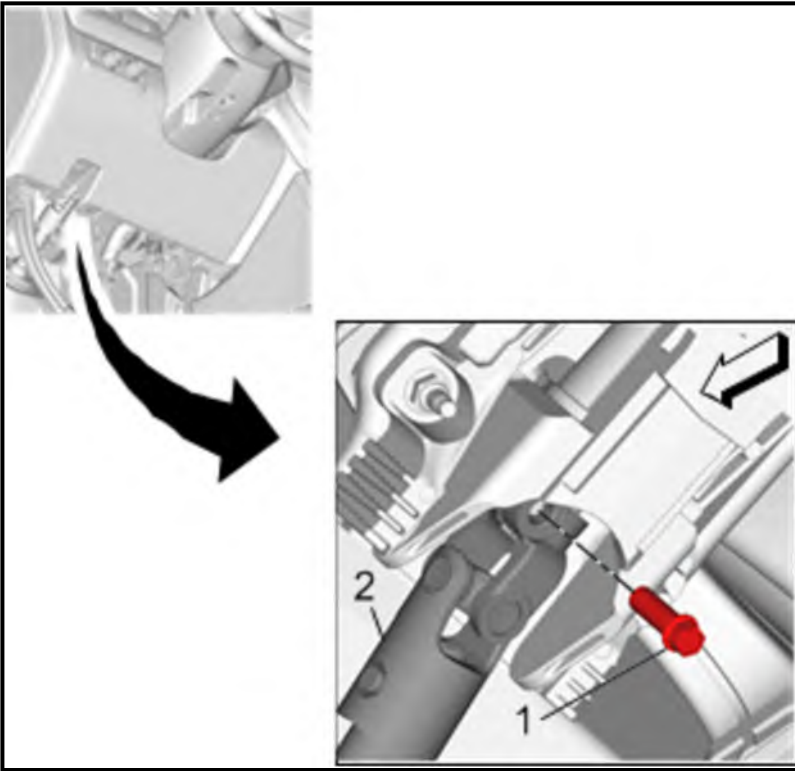
**NOTE:**

View shown from above for graphic clarity.

10. Underbody Splash Shield - Install - [Underbody Splash Shield Replacement \(without ZR2\)](#) , or [Underbody Splash Shield Replacement \(with ZR2\)](#) , or [Underbody Splash Shield Replacement \(Bison\)](#)
11. Front Wheelhouse Liner- Left Side - Install - [Front Wheelhouse Liner Replacement \(Without ZR2\)](#) , or [Front Wheelhouse Liner Replacement \(With ZR2\)](#) , or [Front Wheelhouse Liner Replacement \(Bison\)](#)

INTERMEDIATE STEERING SHAFT REPLACEMENT**Removal Procedure**

1. Rotate the intermediate steering shaft (2) until the head of the intermediate steering shaft upper bolt (1) is exposed.



2. Intermediate Steering Shaft Upper Bolt (1) - Remove
3. Do NOT disconnect the intermediate steering shaft (2) from the steering column.

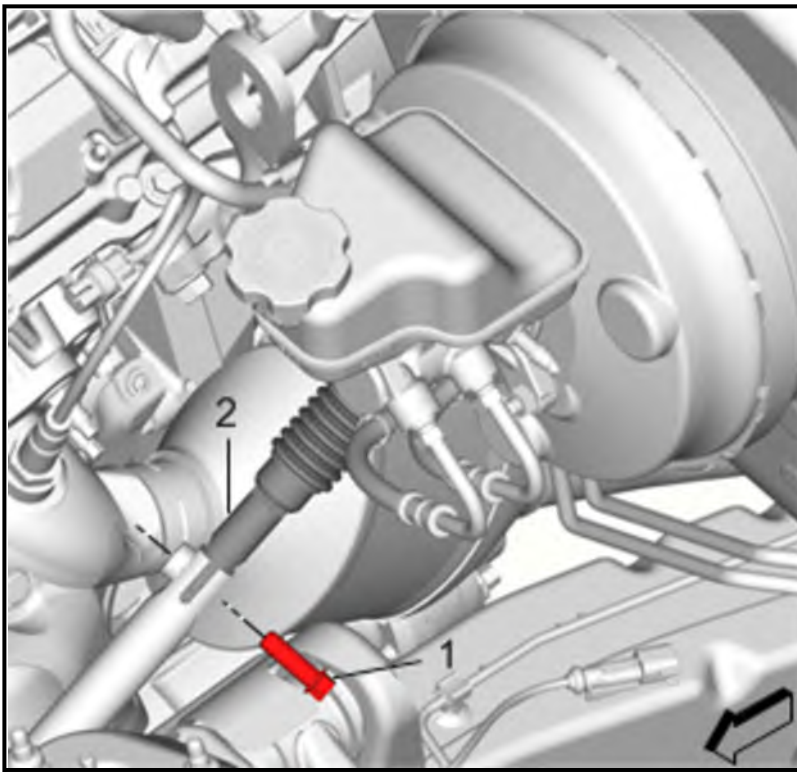
CAUTION:

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

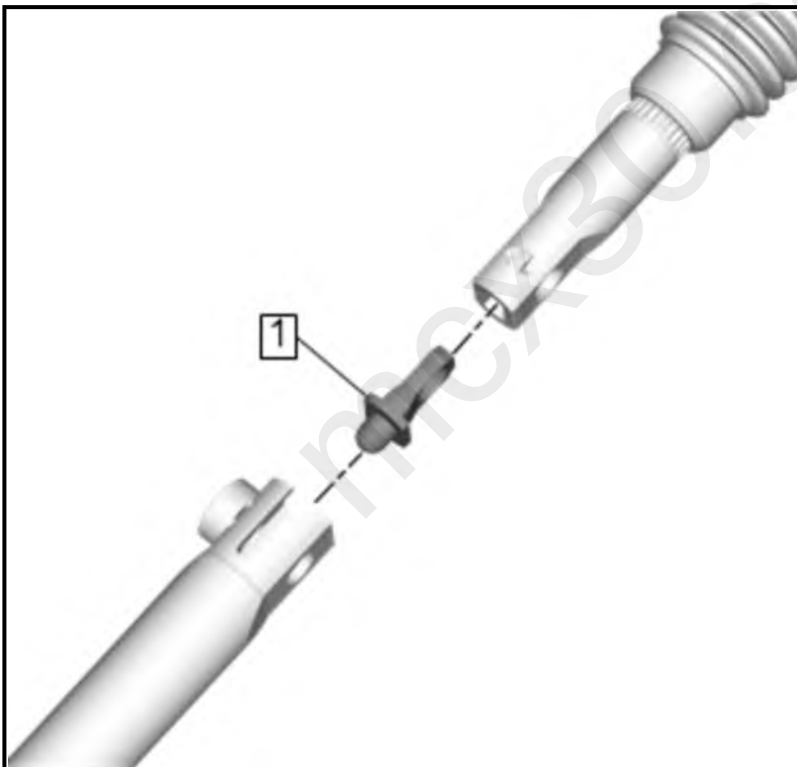
- The steering column
- The intermediate shaft(s)
- The steering gear

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

4. Return the steering wheel to the straight ahead position and LOCK the steering column.
5. Intermediate Steering Shaft (2) @ Steering Column - Separate
6. Intermediate Steering Shaft Lower Bolt (1) - Remove



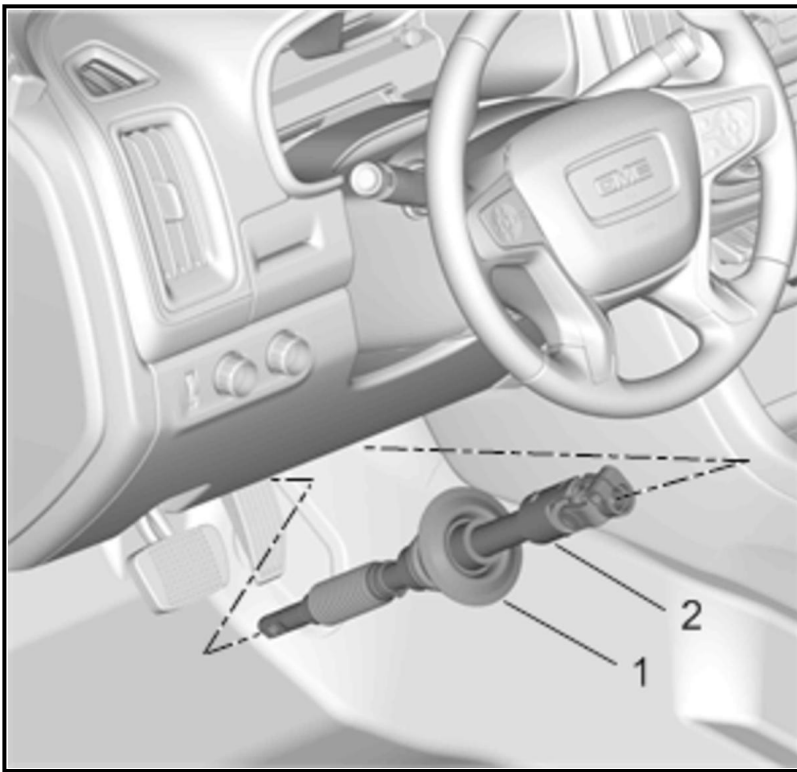
7. Intermediate Steering Shaft (2) @ Lower Steering Shaft Assembly - Separate
8. Remove the plastic insert (1) located at bottom of the intermediate steering shaft.



WARNING: Prior to intermediate steering shaft reassembly, remove the plastic insert located at the bottom of the intermediate steering shaft. Failure to remove this insert may result in binding in the steering system or possible bodily injury.

DISCARD the insert.

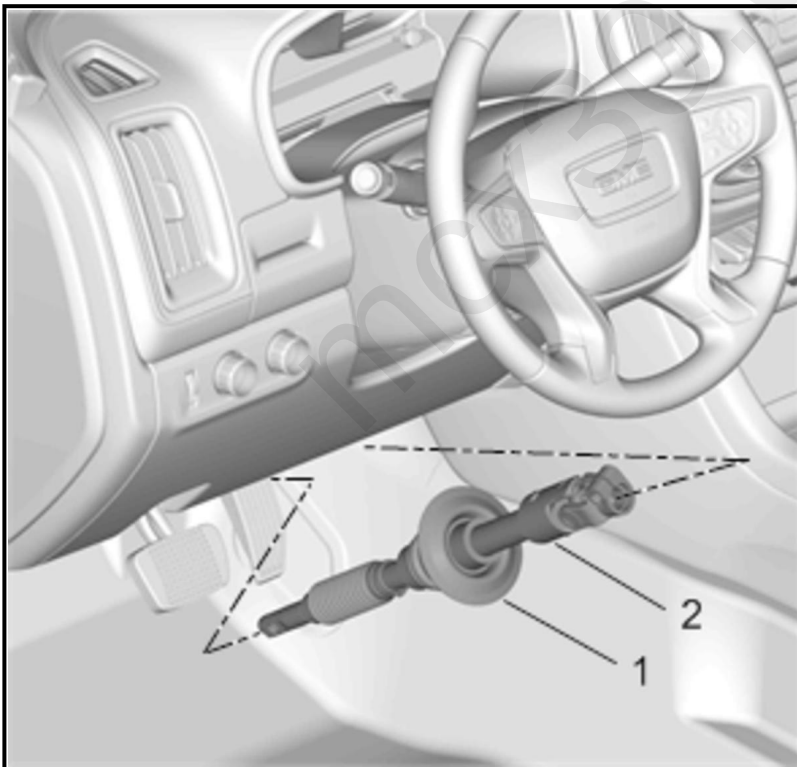
9. If the plastic insert (1) is missing, it may have fallen into the lower steering shaft assembly. The insert **MUST** be removed prior to intermediate steering shaft reassembly.
10. Separate the intermediate steering shaft seal from the dash panel. (1)



11. Intermediate Steering Shaft (2) - Remove

Installation Procedure

1. Position the intermediate steering shaft in the vehicle using the following steps:

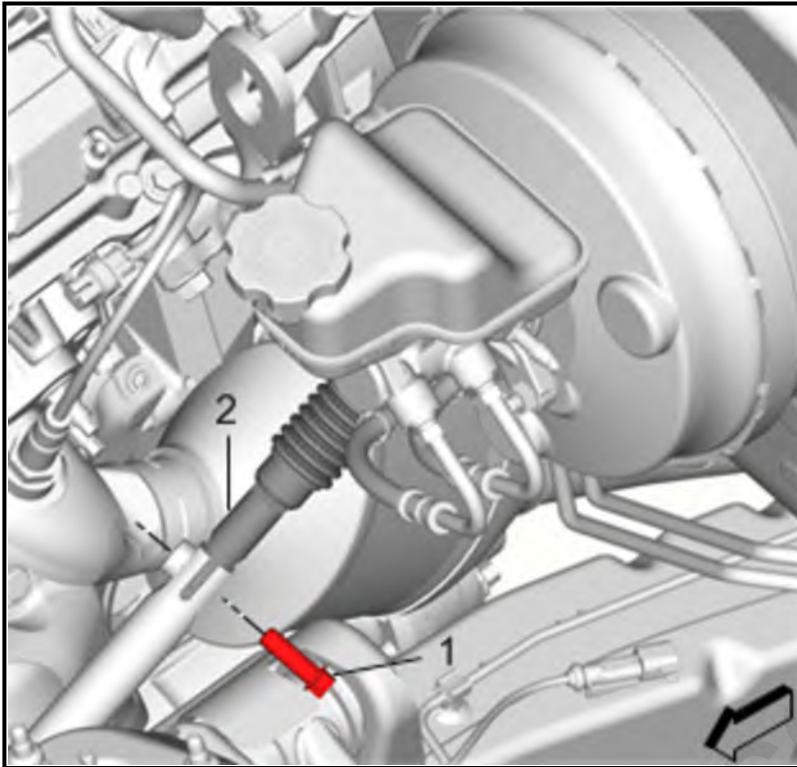


NOTE: There is a yellow stripe on the intermediate steering shaft seal. Once the yellow stripe is visible from the engine compartment side of the dash panel, then the seal is fully seated.

1. Push the intermediate steering shaft (2) and boot through the dash panel from inside the passenger compartment.
2. Pull the intermediate steering shaft and boot from the engine compartment side until the intermediate steering shaft seal (1) is fully seated.

3. Ensure the yellow stripe on the intermediate steering shaft seal (1) is showing on the engine compartment side of the dash panel.

2. Intermediate Steering Shaft (2) @ Lower Steering Shaft Assembly - Install

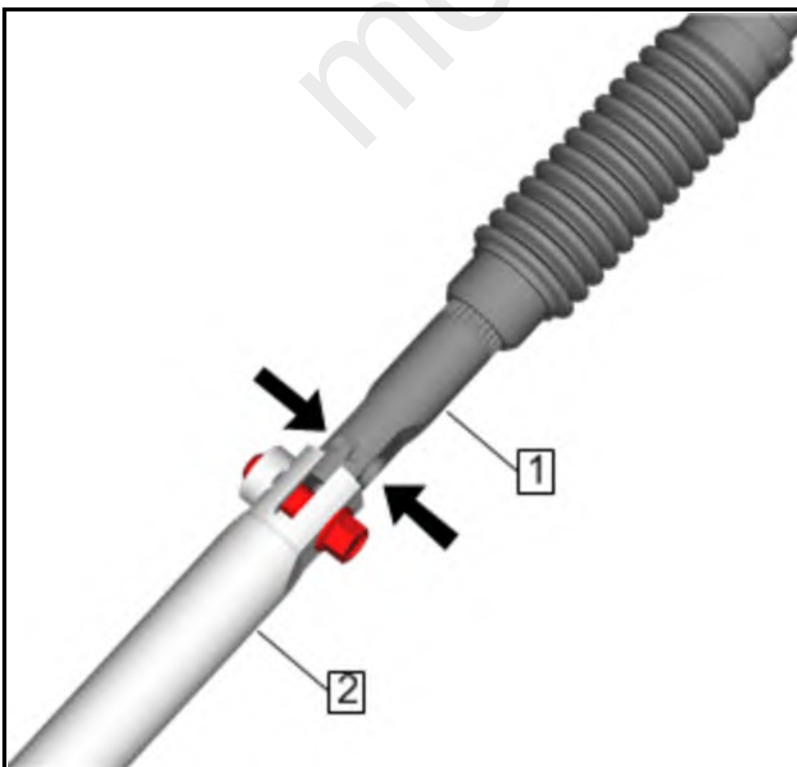


3. Intermediate Steering Shaft Lower Bolt (1) - Install, but do NOT tighten

1. Thread the cleaned component into the internal mating threads and remove to loosen trapped cured adhesive.

2. Apply thread locking adhesive to the external threads of the component. [Adhesives, Fluids, Lubricants, and Sealers](#)

4. To ensure the intermediate steering shaft (1) is installed in the lower steering shaft assembly (2) correctly, pull each shaft in opposite directions to try and separate the shafts.

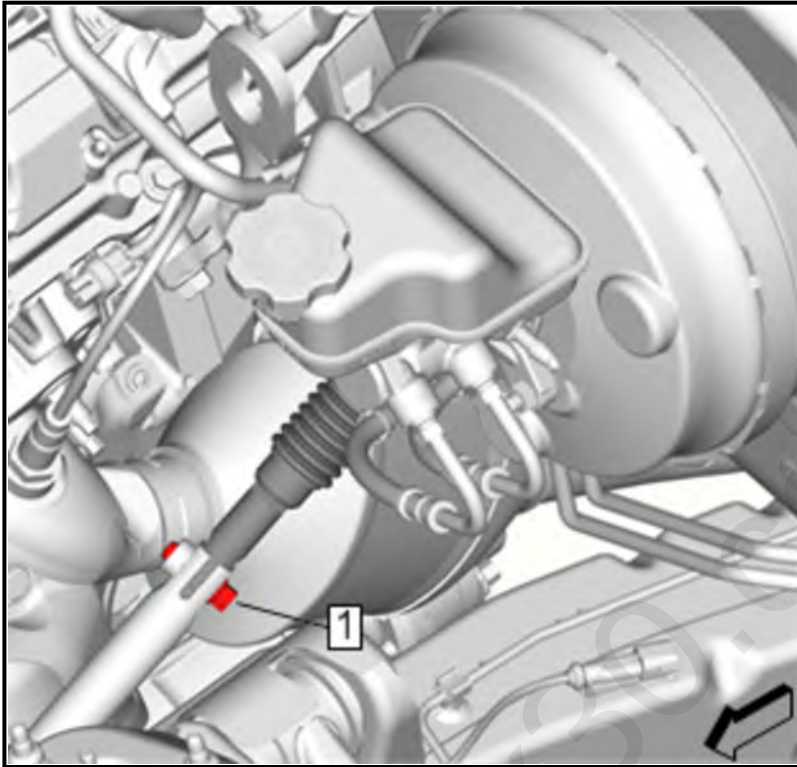


WARNING:

The intermediate steering shaft must be **FULLY INSERTED** into the lower steering shaft assembly prior to tightening the intermediate steering shaft lower bolt. Failure to properly assemble the intermediate steering shaft to the lower steering shaft assembly may result in loss of steering or possible bodily injury.

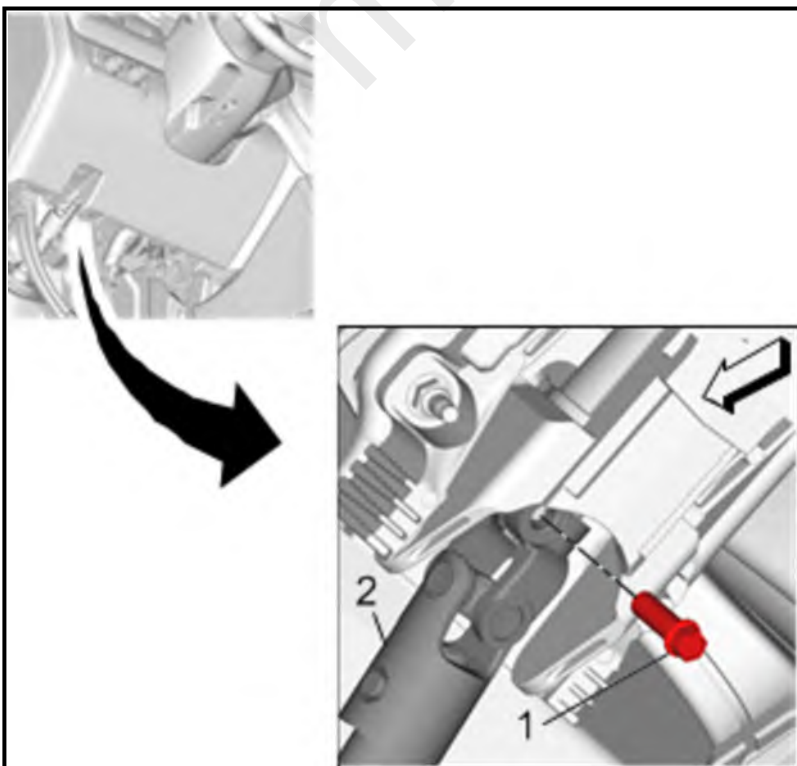
If the shafts separate, as shown in the graphic, then remove the bolt and connect the shafts correctly. The bolt **MUST** go through **BOTH** of the shafts for correct installation.

5. Intermediate Steering Shaft Lower Bolt (1) - Tighten 45 N.m (33 lb ft)

**CAUTION:**

Refer to [Fastener Caution](#) .

6. Intermediate Steering Shaft (2) @ Steering Column - Install



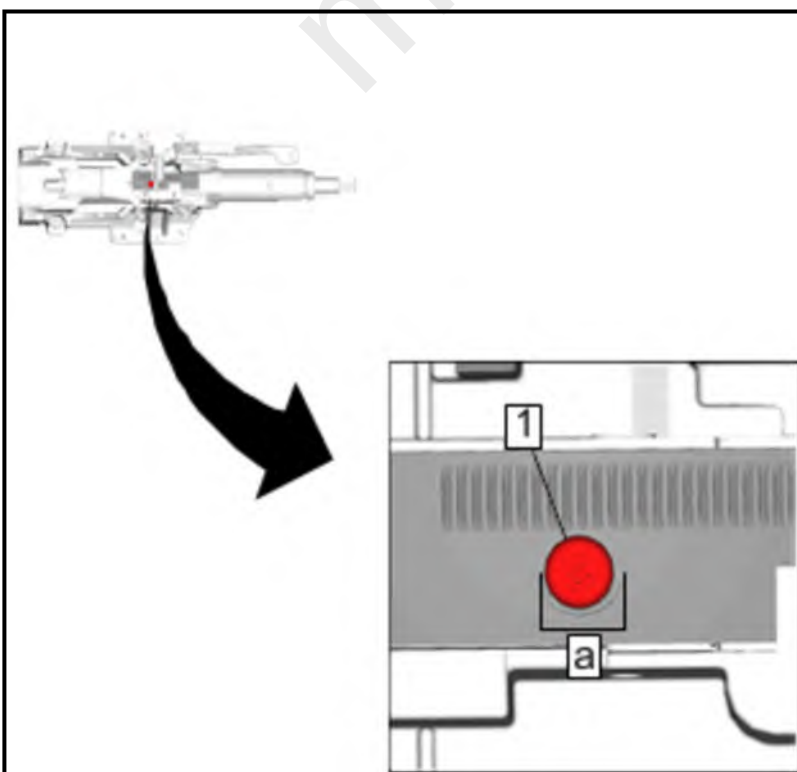
7. UNLOCK the steering column and turn the steering wheel until the intermediate steering shaft upper bolt (1) can be installed.
8. Intermediate Steering Shaft Upper Bolt (1) - Install
 1. Thread the cleaned component into the internal mating threads and remove to loosen trapped cured adhesive.
 2. Apply thread locking adhesive to the external threads of the component. [Adhesives, Fluids, Lubricants, and Sealers](#)
9. Intermediate Steering Shaft Upper Bolt (1) - Tighten 45 N.m (33 lb ft)

STEERING COLUMN ACCIDENT DAMAGE INSPECTION

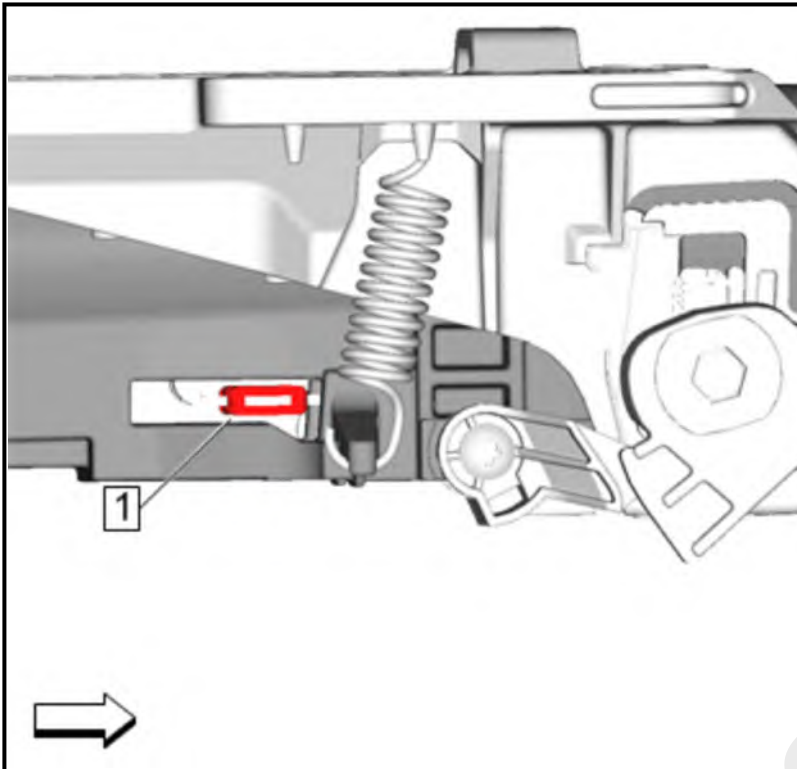
CAUTION: Vehicles involved in collisions may also have a damaged or misaligned steering column that is not obvious based on initial in-vehicle review. This inspection procedure is provided to ensure full steering column functionality after a collision before considering reuse. This procedure is not intended for use in collisions where replacement of the steering column is directed- such as those with frontal air bag deployment and side seat air bag deployment.

Inspection Procedure

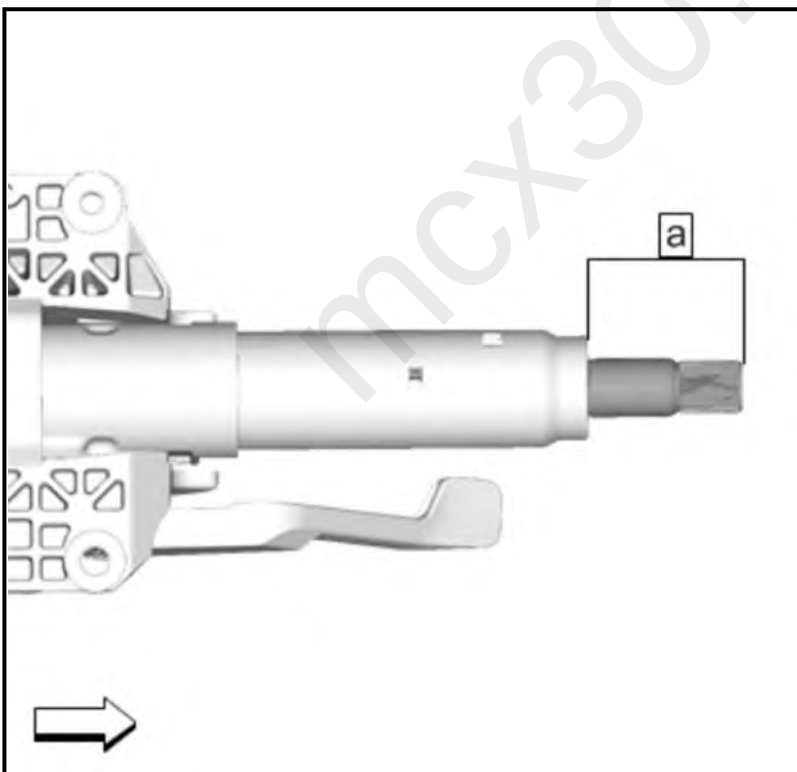
1. If the steering wheel airbag was deployed, replace the steering column. [Steering Column Replacement](#)
2. Turn Signal Switch Bracket - Remove - [Turn Signal Switch Bracket Replacement](#)
3. Unlock the steering column adjustment lever before removing the steering column from the vehicle:
 - Replace the steering column if the adjustment lever cannot be fully unlocked.
 - In the vehicle, with the adjustment lever unlocked, press forward on the steering wheel with a force of 50 - 100 N.m (11 - 22 lb ft) while adjusting the steering column up and down. If there is evidence of ratcheting teeth or the steering column will not adjust up and down, replace the steering column. [Steering Column Replacement](#)
4. Steering Column - Remove - [Steering Column Replacement](#)
5. Rotate the steering column shaft and verify the shaft turns freely and without interference.
6. Verify there is no visual damage to the Energy Absorbing (E/A) strap and that the E/A strap is not deformed. On Rake and Telescope steering columns, verify the E/A strap retaining screw (1) is centered within the boundary of the screw access hole (a) in the E/A strap.



7. Verify that the telescope bumper (1) on the E/A strap does not contact the upper or lower surfaces of the lower steering column jacket opening during telescoping of the steering column.



8. Measure the length of the upper steering shaft from the end of the shaft to the steering column upper jacket:



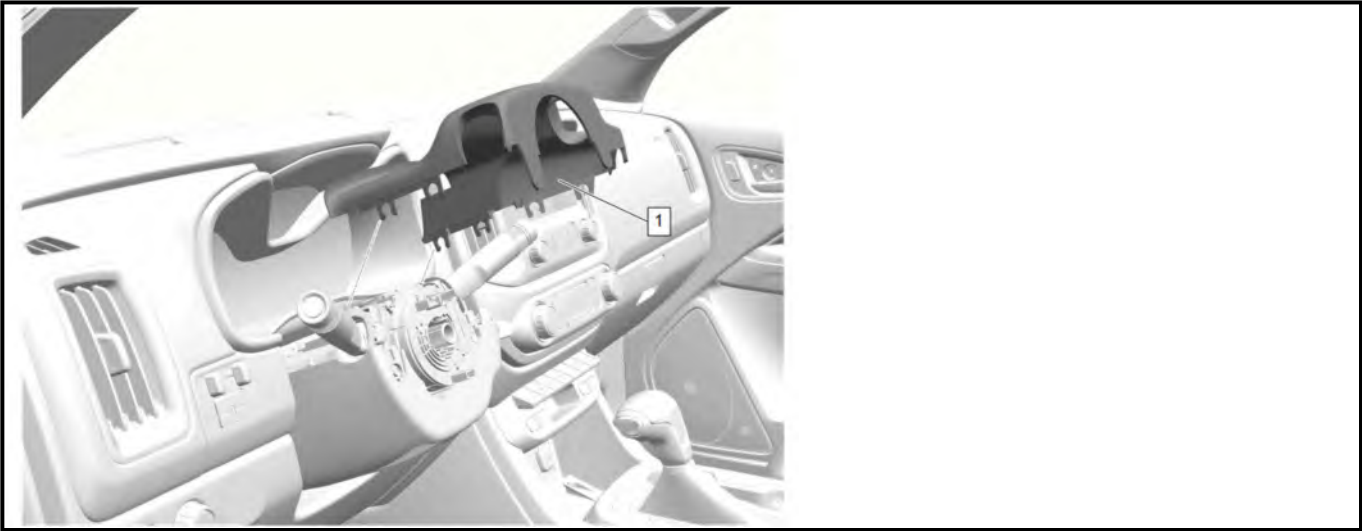
- Rake Only: The measured length (a) must be greater than 63 mm (2.48 in).
- Rake and Telescope: The measured length (a) must be greater than 63 mm (2.48 in).

9. If the steering column fails ANY of the measurement specifications, replace the steering column.

Steering Column Replacement

10. If the steering column passes ALL of the measurement specifications, install the OLD steering column and reassemble all components. **Steering Column Replacement**

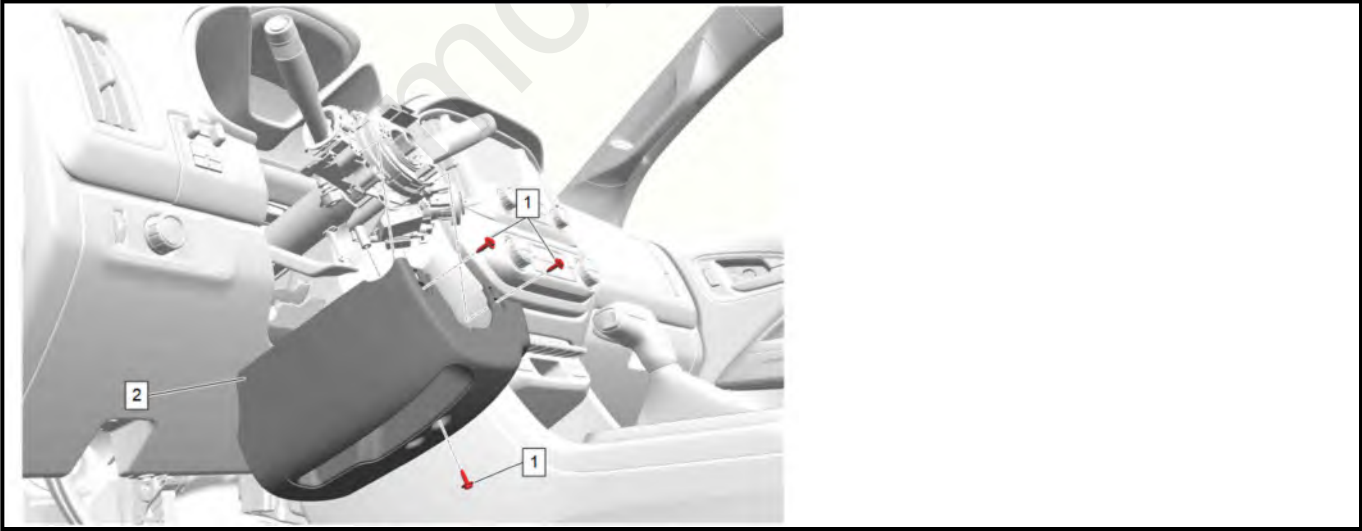
STEERING COLUMN UPPER TRIM COVER REPLACEMENT



NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedures 1. Remove the instrument panel cluster trim plate. Instrument Panel Cluster Trim Plate Replacement 2. Remove the steering wheel. Steering Wheel Replacement	
1	Steering Column Upper Trim Cover Procedure Use a flat bladed plastic trim tool in order to release the tabs securing the upper trim cover to the lower trim cover.

STEERING COLUMN LOWER TRIM COVER REPLACEMENT

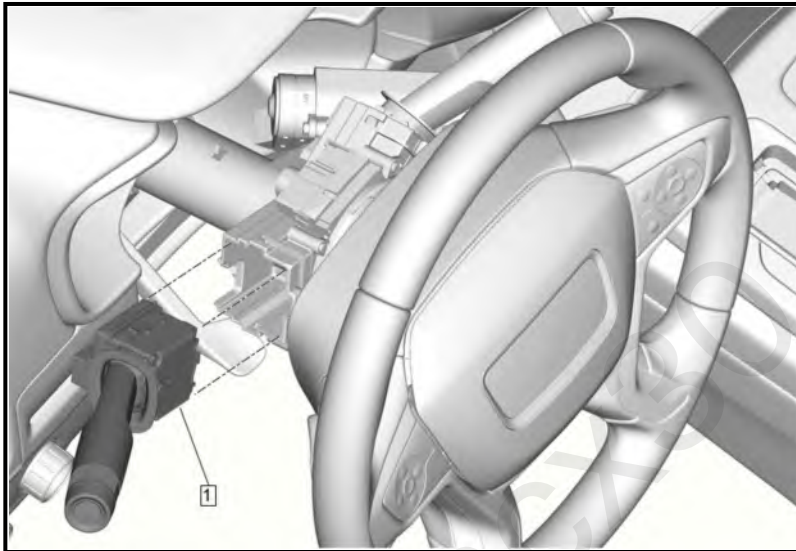


NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedure Remove the steering column upper trim cover. Refer to Steering Column Upper Trim Cover Replacement .	
1	Steering Column Lower Trim Cover Bolt (Qty: 3)

Callout	Component Name
	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Steering Column Lower Trim Cover Procedure 1. Extended the steering column to its furthest point to clear the instrument panel knee bolster.

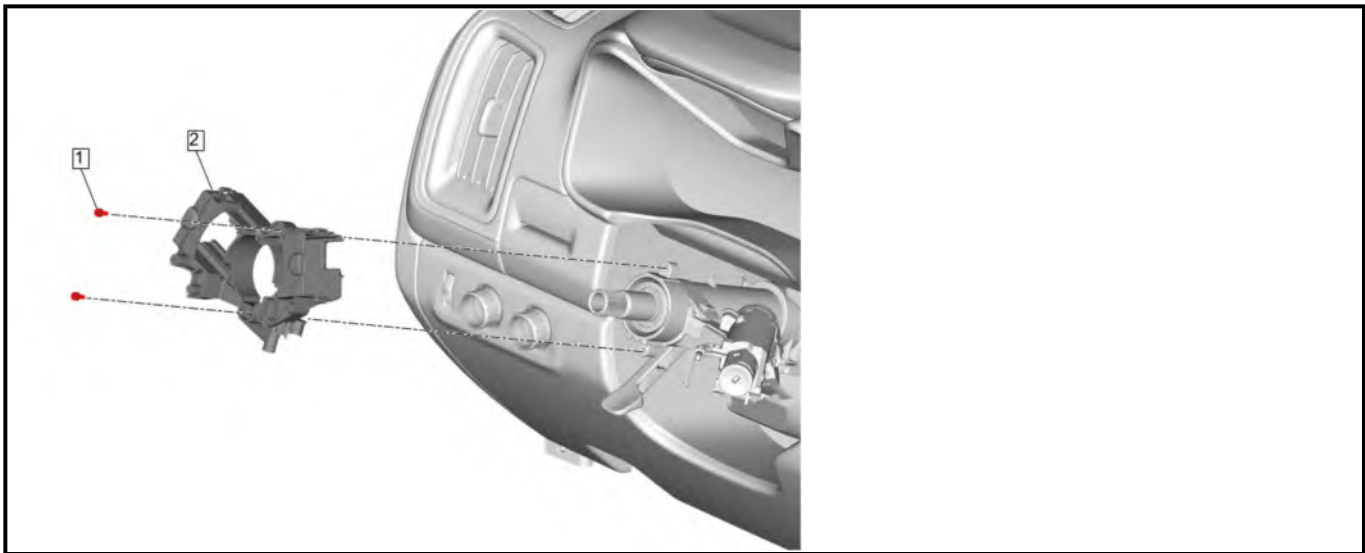
TURN SIGNAL SWITCH REPLACEMENT



NOTE: Callouts in the following chart represent components shown in graphic above.

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

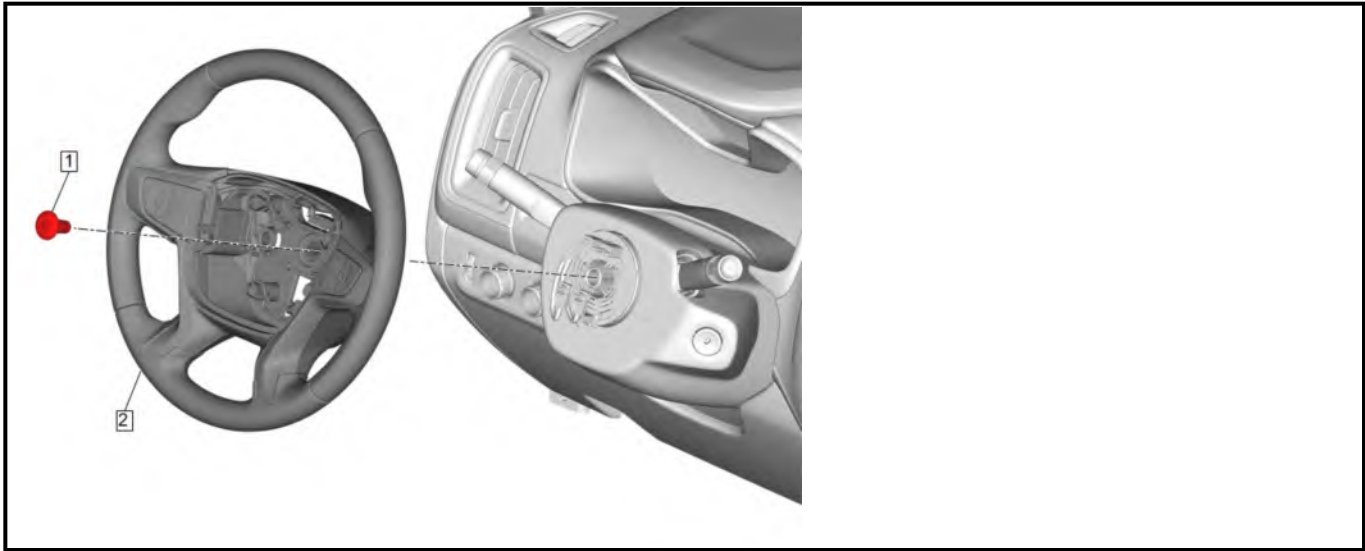
TURN SIGNAL SWITCH BRACKET REPLACEMENT



NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedures Steering Wheel Airbag Coil Replacement Turn Signal Switch Replacement Windshield Wiper and Windshield Washer Switch Replacement Theft Deterrent Module Replacement	
1	Turn Signal Switch Bracket Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 15 N.m (11 lb ft)
2	Turn Signal Switch Bracket

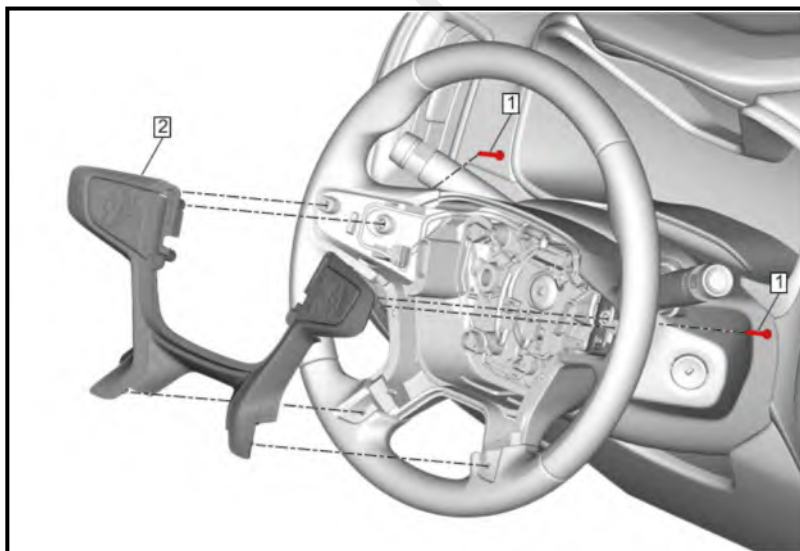
STEERING WHEEL REPLACEMENT



NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedure <u>Steering Wheel Airbag Replacement</u>	
1	Steering Wheel Bolt CAUTION: Refer to <u>Fastener</u> <u>Caution</u> . Procedure 1. Thread the cleaned component into the internal mating threads and remove to loosen trapped cured adhesive. 2. Apply thread locking adhesive to the external threads of the component. <u>Adhesives, Fluids, Lubricants, and Sealers</u> Tighten 45 N.m (33 lb ft)
2	Steering Wheel Procedure 1. Disconnect the electrical connectors. 2. Install the steering wheel bolt until 2 to 3 threads are engaged. 3. Wiggle the steering wheel until the wheel disengages completely. 4. Steering Wheel Bolt - Remove 5. Steering Wheel - Remove 6. Transfer components as necessary.

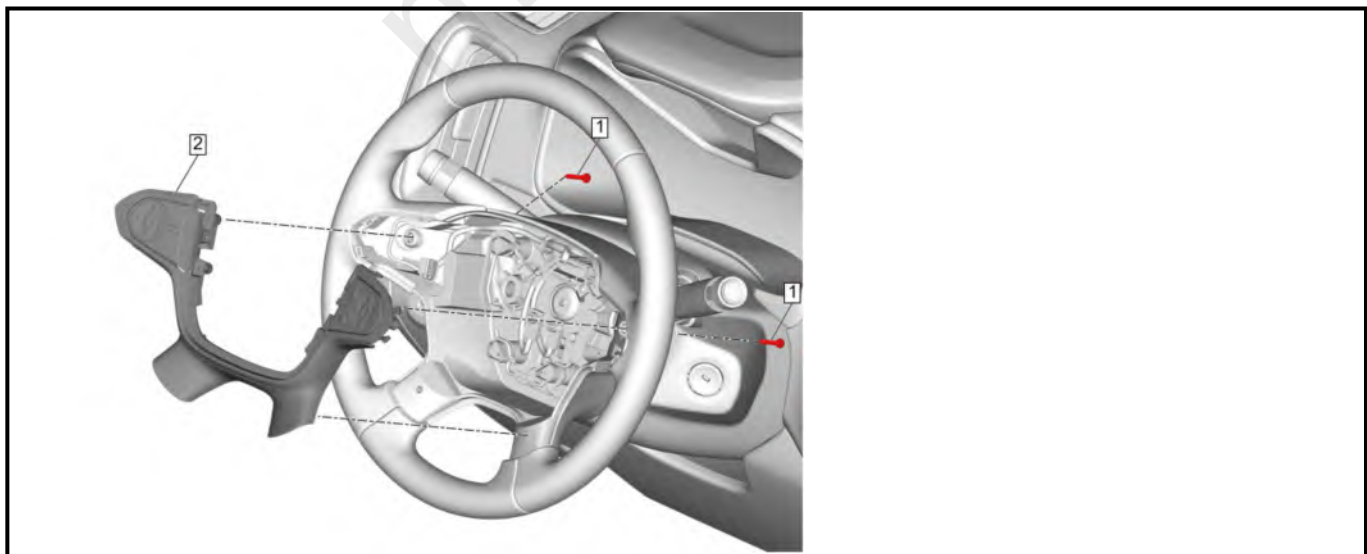
STEERING WHEEL SPOKE COVER REPLACEMENT (GMC, WITH RADIO CONTROLS)



NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedures <u>Steering Wheel Airbag Replacement</u> <u>Radio Control Switch Replacement - Rear</u> [2x]	
1	Steering Wheel Spoke Cover Fastener [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Steering Wheel Spoke Cover Procedure - Use the appropriate tool to gently release the retaining tabs on the cover. - Disconnect the electrical connectors. - Transfer components as necessary. NOTE: Gently release the tabs one by one, using care to avoid snapping any tabs off.

STEERING WHEEL SPOKE COVER REPLACEMENT (CHEVROLET, WITH RADIO CONTROLS)

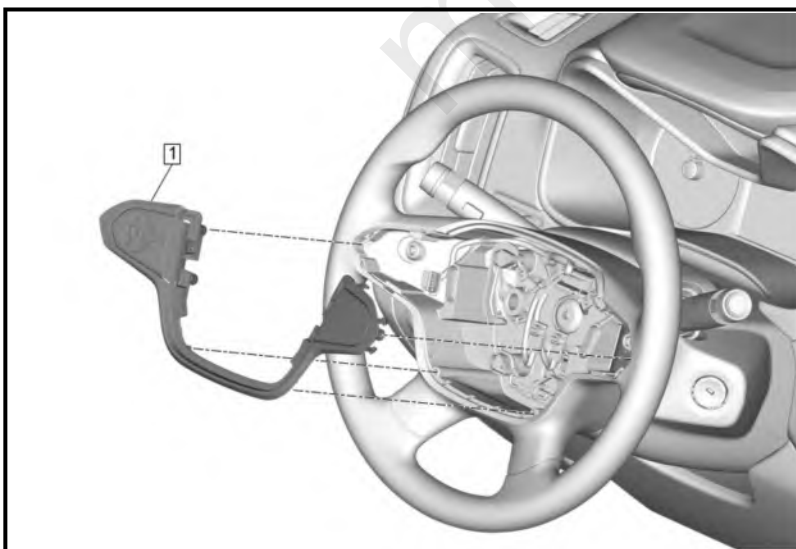


NOTE: Callouts in the following chart represent components shown in graphic above.

Callout	Component Name
Preliminary Procedures	

Callout	Component Name
1. <u>Steering Wheel Airbag Replacement</u> 2. <u>Radio Control Switch Replacement - Rear</u> [2x]	
1	Steering Wheel Spoke Cover Fastener [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1.5 N.m (13 lb in)
2	Steering Wheel Spoke Cover Procedure 1. Use the appropriate tool to gently release the retaining tabs on the cover. 2. Disconnect the electrical connectors. 3. Transfer components as necessary. NOTE: Gently release the tabs one by one, using care to avoid snapping any tabs off.

STEERING WHEEL SPOKE COVER REPLACEMENT (CHEVROLET OR GMC, WITHOUT RADIO CONTROLS)



NOTE: Callouts in the following chart represent components shown in graphic above.

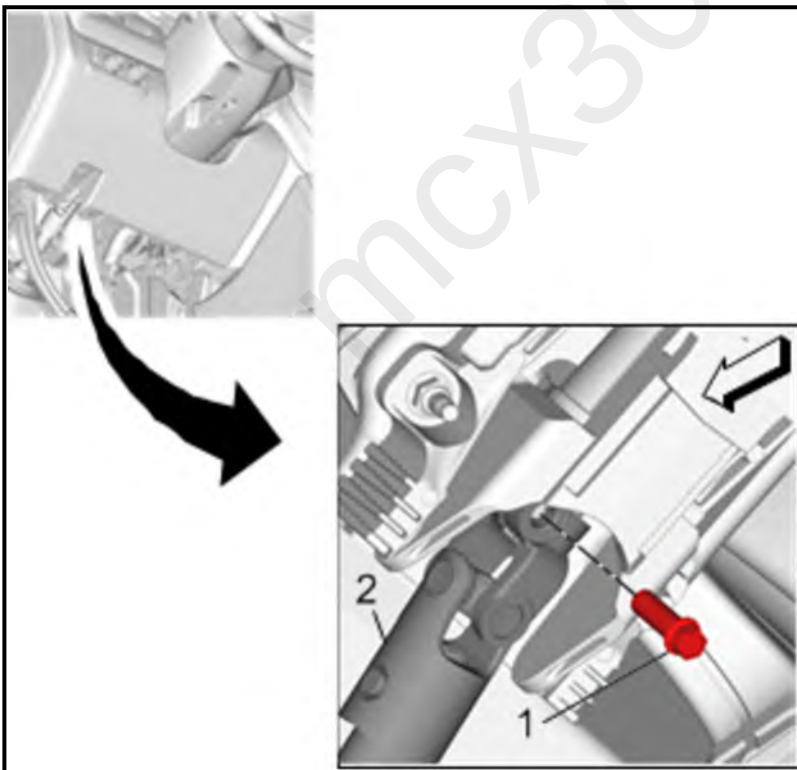
Callout	Component Name
Preliminary Procedure <u>Steering Wheel Airbag Replacement</u>	

Callout	Component Name
1	Steering Wheel Spoke Cover Procedure 1. Use the appropriate tool to gently release the retaining tabs on the cover. 2. Disconnect the electrical connector. 3. Transfer components as necessary. NOTE: Gently release the tabs one by one, using care to avoid snapping any tabs off.

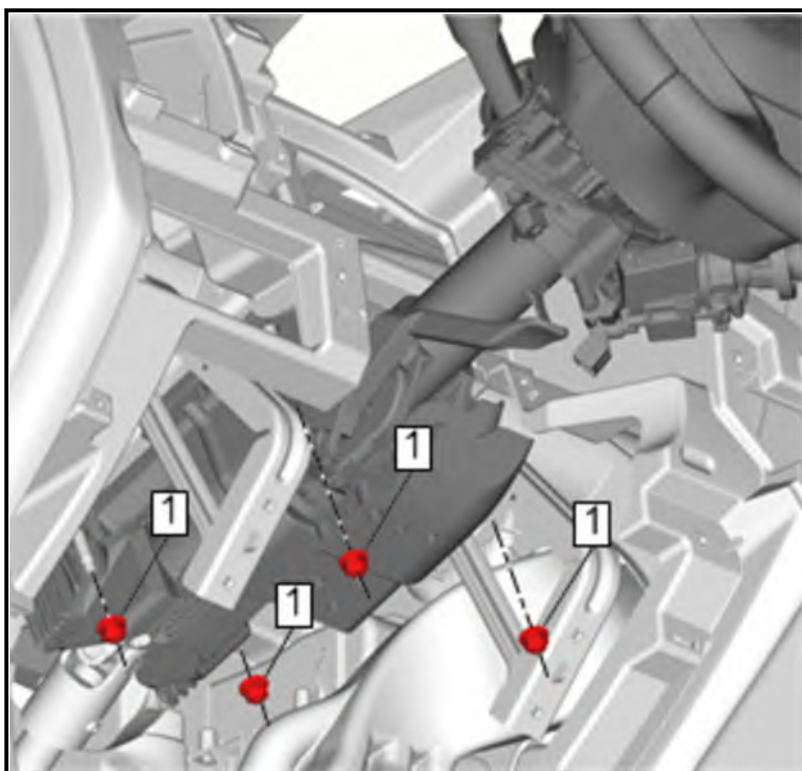
STEERING COLUMN REPLACEMENT

Removal Procedure

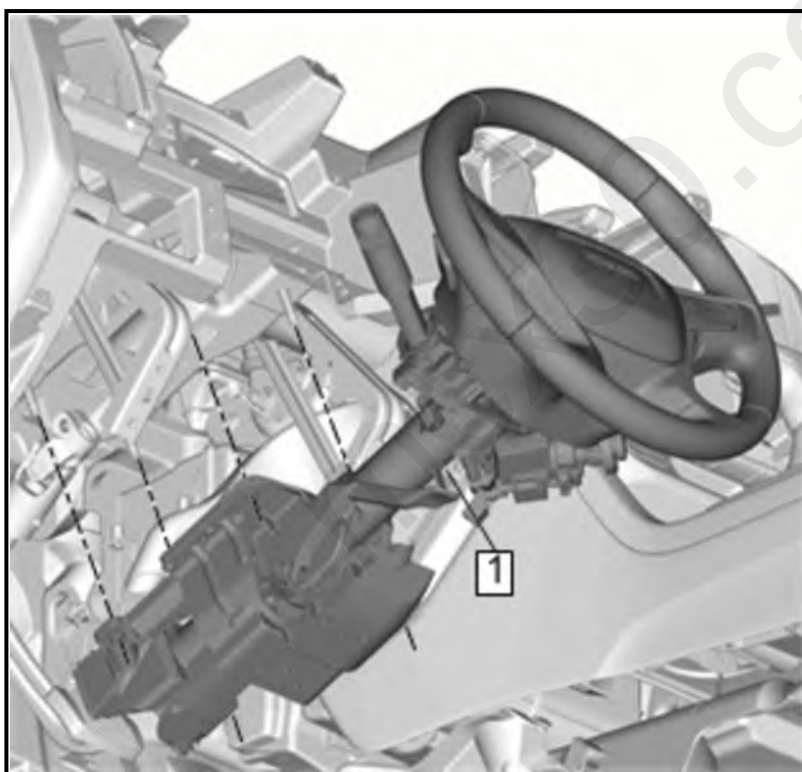
1. Instrument Panel Assembly - Remove - [Instrument Panel Assembly Replacement](#)
2. Instrument Panel Steering Column Opening Closeout - Remove - [Instrument Panel Steering Column Opening Closeout Replacement](#)
3. Intermediate Steering Shaft (2) @ Steering Column - Separate - [Intermediate Steering Shaft Replacement](#)



4. Steering Column Lower Trim Cover - Remove - [Steering Column Lower Trim Cover Replacement](#)
5. Disconnect the steering column electrical connectors as necessary.
6. Steering Column Nut (1) - Remove [4x]



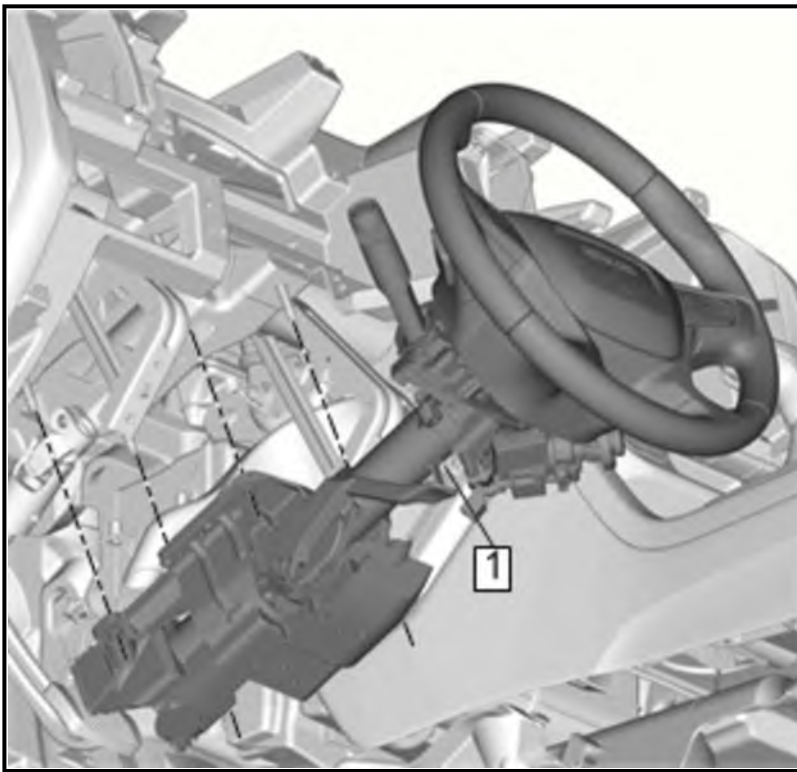
7. Remove the steering column (1) from the vehicle.



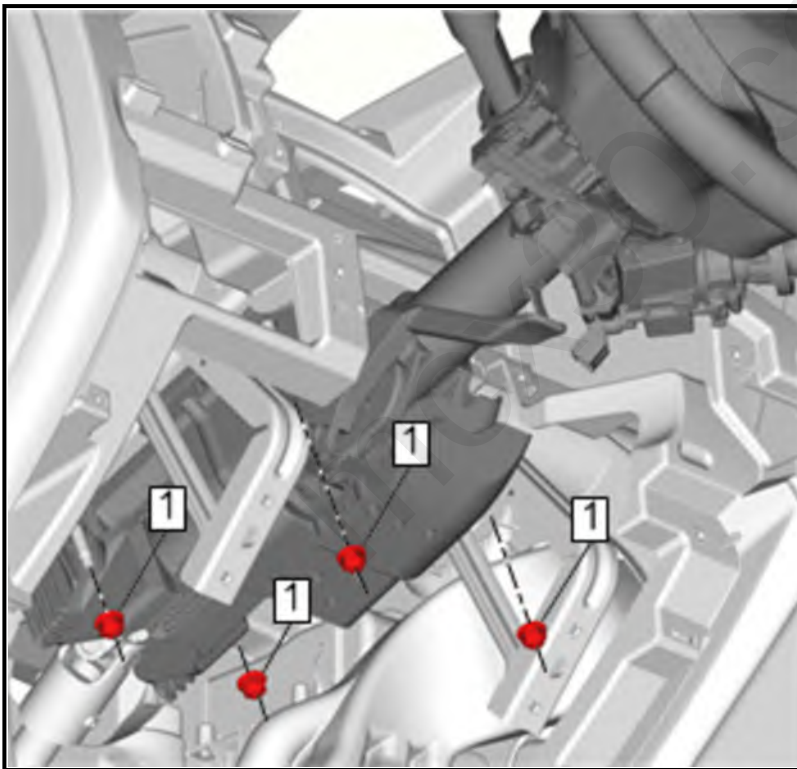
8. Transfer components as necessary.

Installation Procedure

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

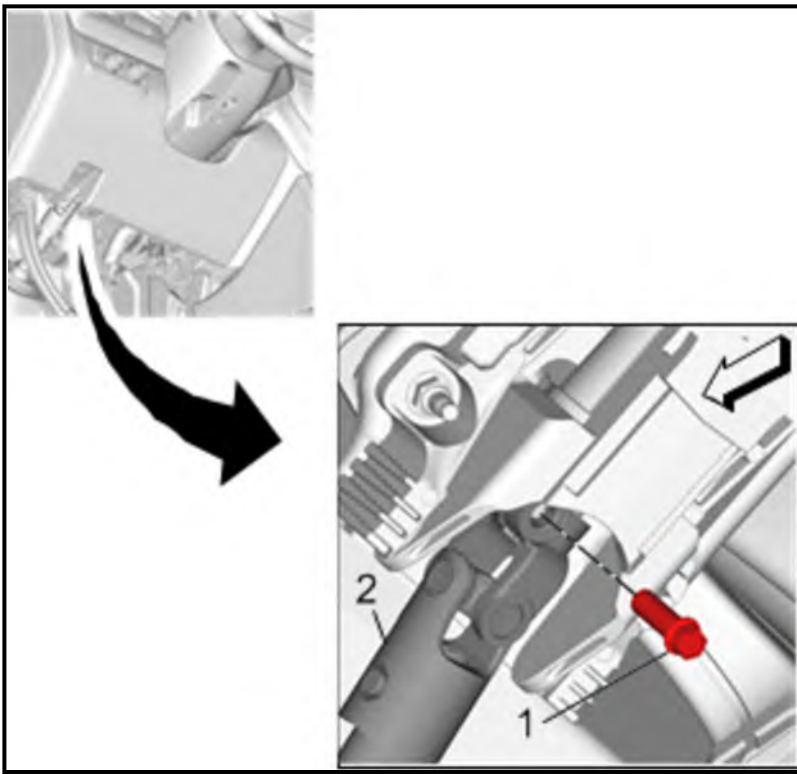


2. Steering Column Nut (1) - Install and tighten [4x] 22 N.m (16 lb ft)



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

3. Connect the steering column electrical connectors.
4. Steering Column Lower Trim Cover - Install - [Steering Column Lower Trim Cover Replacement](#)
5. Intermediate Steering Shaft (2) @ Steering Column - Install - [Intermediate Steering Shaft Replacement](#)



6. Instrument Panel Steering Column Opening Closeout - Install - [Instrument Panel Steering Column Opening Closeout Replacement](#)

7. Instrument Panel Assembly - Install - [Instrument Panel Assembly Replacement](#)

DESCRIPTION AND OPERATION

STEERING WHEEL AND COLUMN DESCRIPTION AND OPERATION

The steering wheel and column has 4 primary functions:

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

Vehicle Steering

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

The steering column can be adjusted vertically and longitudinally

Vehicle Security

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

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

Driver Convenience

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

- The turn signal switch
- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad
- The redundant radio/entertainment system controls
- The tilt functions
- The telephone system controls
- The DIC controls
- The cruise control functions
- The automatic transmission manual setting function

Heated Steering Wheel

The heated steering wheel system consists of a heated steering wheel, a heated steering wheel switch, and a steering wheel heat module. The heated steering wheel includes a non-serviceable heating element and temperature sensor, which both are located in the rim of the steering wheel. The heated steering wheel on/off switch is located in the instrumentation panel. The steering wheel heat module is located on the front-side of the steering wheel center hub.

When the on/off switch is depressed, a signal is sent to the heat module to command the heated steering wheel to heat up until either the normal operating temperature reaches the limit of 32B°C +/- 2.5B°C (90B°F +/- 4B°F) or the customer turns it off via the heated steering wheel switch. The built-in temperature sensor provides input to the controller to limit the temperature of the heated wheel to the normal operating temperature. The heated steering wheel system will also cease to operate if the vehicle temperature is at or above 32B°C (89.6B°F). The heated steering wheel takes approximately 3 to 4 minutes to reach the normal operating temperature and will take longer to heat up if the vehicle temperature is below -20B°C (-4B°F).

Driver Safety

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

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

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

Electronic Park Lock (EPL)/Ignition Lock Cylinder Control Actuator: If the vehicle is equipped with automatic transmission and a floor mounted console gear shift, it has an ignition lock cylinder control actuator system in the steering column. The ignition lock cylinder control actuator purpose is to prevent the ignition key from being turned to the OFF position when the transmission is in any position other than PARK and the vehicle may still be moving. The column ignition lock system consists of an ignition lock cylinder control actuator, and a park position switch that is located in the automatic transmission shift lock control switch. The ignition lock cylinder control actuator contains a pin that is spring loaded to mechanically prevent the ignition key cylinder from being turned to the lock position when the vehicle transmission is not in the PARK position. If vehicle power is lost, and/or the transmission is not in the PARK position the operator will not be able to turn the ignition key to the lock position and will not be able to remove the ignition key from the column.

Depending on the implementation, logic might be inverted: Key can be removed by power off.

Steering Wheel Angle Sensor: The steering wheel angle sensor is located somewhere along the steering shaft assembly. The sensor measures the position of the steering wheel and the speed at which it is rotated. A signal

representing this measurement is provided to the vehicle stability enhancement system (VSES) in the ABS module and to the variable effort steering (VES) system.

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

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