

## Fastener Tightening Specifications

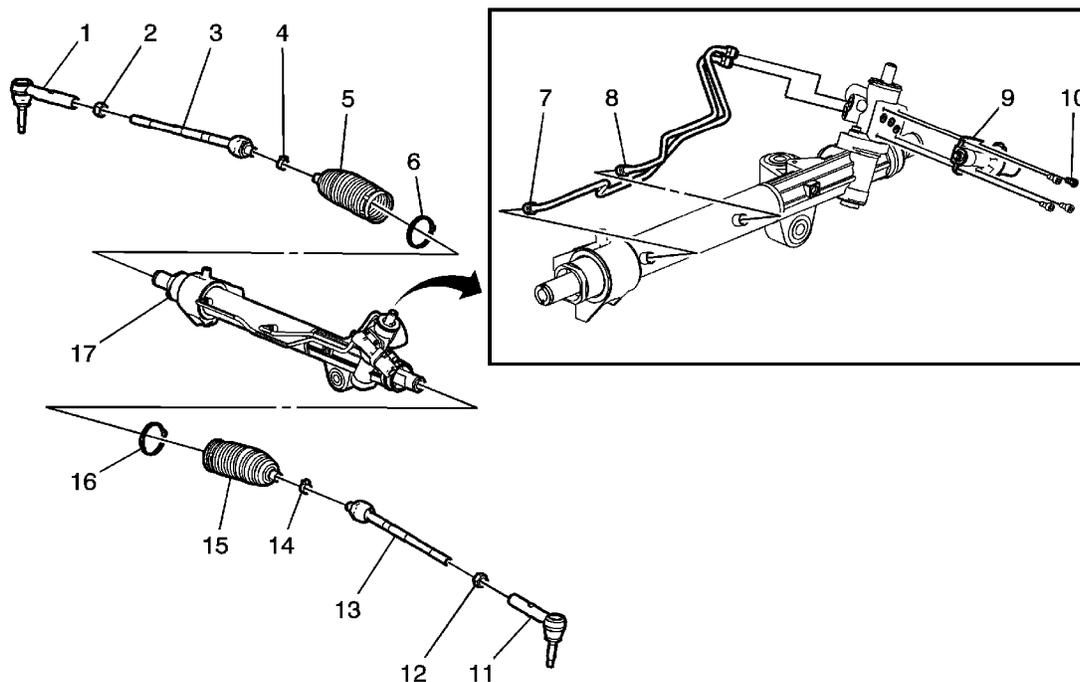
Application	Specification	
	Metric	English
Front Frame Mounting Bolt	100 N·m plus 90 degrees	74 lb ft plus 90 degrees
Front Frame Reinforcement Mounting Bolt	50 N·m	37 lb ft
Power Steering Fluid Cooler Nut	30 N·m	22 lb in
Power Steering Gear Inlet and Outlet Pipe Clip Bolt	9 N·m	80 lb in
Power Steering Gear Inlet Hose Bracket Nut	8 N·m	71 lb in
Power Steering Gear Inlet Hose Fitting	27 N·m	20 lb ft
Power Steering Gear Inlet Hose Retaining Plate Bolt	12 N·m	106 lb in
Power Steering Gear Outlet Hose Bracket Bolt	8 N·m	71 lb in
Power Steering Gear Outlet Hose Bracket Nut	8 N·m	71 lb in
Power Steering Pump Bolt	50 N·m	37 lb ft
Rear Front Frame Mounting Bolt	100 N·m	74 lb ft
Remote Power Steering Fluid Reservoir Bolt	9 N·m	80 lb in
Remote Power Steering Fluid Reservoir Bracket Bolt	9 N·m	80 lb in
Steering Gear Bolt (at the right side)	100 N·m	74 lb ft
Steering Gear Nut (at the left side)	75 N·m	55 lb ft
Steering Gear Heat Shield Bolt	7 N·m	62 lb in
Steering Gear Valve Solenoid Bolt	8 N·m	71 lb in
Steering Linkage Inner Tie Rod Housing	100 N·m	74 lb ft
Steering Linkage Inner Tie Rod Nut	75 N·m	55 lb ft
Steering Linkage Outer Tie Rod Nut		
First Pass	30 N·m	22 lb ft
Second Pass	Plus 120 degrees	Plus 120 degrees

## Power Steering Pump Specifications

Engine Code	Engine Size	High Flow		Pressure Relief	
		LPM	GPM	kPa	PSI
LLT	V6 - 3.6L	12.72	3.36	9308/10342	1350/1500

## Power Steering Gear Disassembled View

### Disassembled View



- (1) Steering Linkage Outer Tie Rod  
 (2) Steering Linkage Inner Tie Rod Nut  
 (3) Steering Linkage Inner Tie Rod  
 (4) Steering Gear Boot Clamp  
 (5) Steering Gear Boot  
 (6) Steering Gear Boot Clamp  
 (7) Steering Gear Pipe  
 (8) Steering Gear Pipe  
 (9) Steering Gear Valve Solenoid  
 (10) Steering Gear Valve Solenoid Bolt  
 (11) Steering Linkage Outer Tie Rod  
 (12) Steering Linkage Inner Tie Rod Nut  
 (13) Steering Linkage Inner Tie Rod  
 (14) Steering Gear Boot Clamp  
 (15) Steering Gear Boot  
 (16) Steering Gear Boot Clamp  
 (17) Steering Gear Assembly

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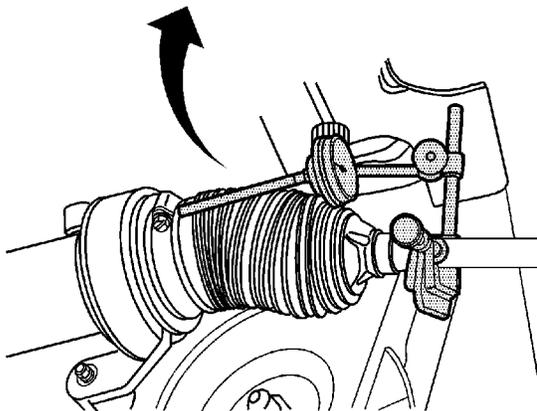
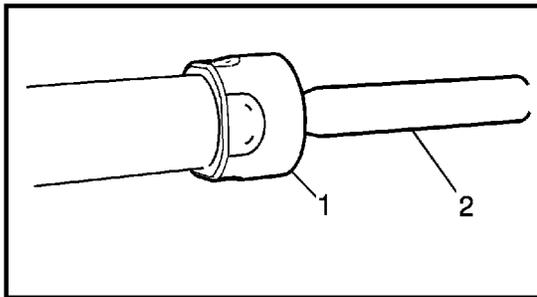
## Steering Linkage Inner Tie Rod Inspection

### Special Tools

[J 8001](#) Dial Indicator Set

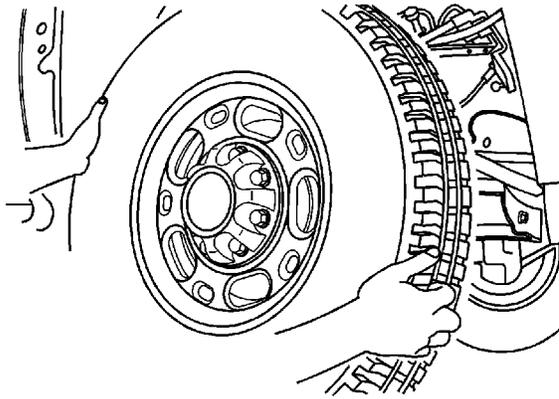
**Note:** This inspection procedure does not supersede local government required inspections that have more stringent requirements.

1. Turn the ignition key to the on position with the engine off.
2. With the aid of an assistant, turn the steering wheel to the full stop position and hold it in that position until the test is complete. The tie rod being tested should be inside the steering gear housing seated against the steering stop.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



4. If there is not a good location for the dial indicator pointer at the steering gear housing, install a large worm gear hose clamp to the steering gear housing over the larger steering gear boot clamp and align the clamp so that the screw can be a location for the dial indicator pointer.
5. Install a dial indicator between the inner tie rod (2) and the steering gear housing or the worm gear clamp in such a way as to measure the lash between the inner tie rod and the steering gear housing.

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**Note:** Only move the tire enough to feel any lash between the inner tie rod and the inner tie rod housing without moving the steering gear rack.

6. Grasping the tire at the 3 o'clock and 9 o'clock positions, gently push in on one side of the tire to remove any lash.
7. Zero the dial indicator.
8. On the same side of the tire previously pushed inwards, gently pull outwards and measure the lash.
9. Record the measurement seen on the dial indicator.
10. If the measured value exceeds 0.5 mm (0.02 in) then replace the inner tie rod. Refer to [Steering Linkage Inner Tie Rod Replacement](#).
11. Repeat the procedure for the other side.

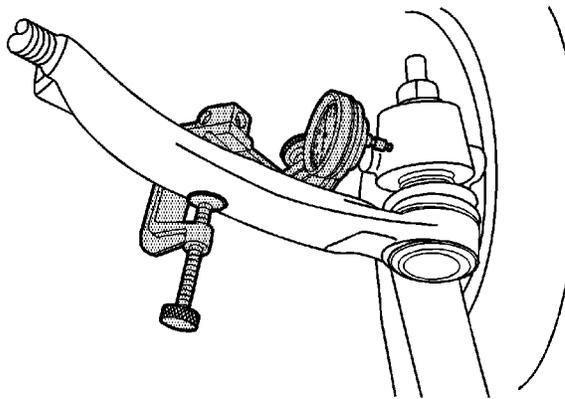
# Steering Linkage Outer Tie Rod Inspection

## Special Tools

[J 8001](#) Dial Indicator Set

**Note:** This inspection procedure does not supersede local government required inspections that have more stringent requirements.

1. Inspect the outer tie rod end seal. If the outer tie rod end seal is torn, replace the outer tie rod end. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
2. Raise the side of the vehicle being inspected with a floor jack while maintaining contact between the opposite wheel and the shop floor. Support the lower control arm with a floor jack stand as far outboard as possible and remove the floor jack. Refer to [Lifting and Jacking the Vehicle](#).



3. Install dial indicator [J 8001](#) or equivalent between the outer tie rod end and the steering knuckle as shown in the graphic. Note that the tire and wheel assembly is shown removed only for clarification of the dial indicator position.
4. Grasping the tire at the 3 o'clock and 9 o'clock positions, gently push in on one side of the tire to remove any lash.
5. Zero the dial indicator.
6. On the same side of the tire previously pushed inwards, gently pull outwards and measure the lash.
7. Record the measurement seen on the dial indicator.
8. Movement should not exceed 0.5 mm (0.02 in). If the movement exceeds 0.5 mm (0.02 in) then replace the outer tie rod. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
9. Repeat this procedure for the other side of the vehicle.

## Power Steering System Bleeding

**Note:**

- Use clean, new power steering fluid type only. Refer to [Fluid and Lubricant Recommendations](#).
  - Hoses touching the frame, body or engine may cause system noise. Verify that the hoses do not touch any other part of the vehicle.
  - Loose connections may not leak, but could allow air into the steering system. Verify that all hose connections are tight.
  - Maintain the power steering fluid level throughout the bleed procedure.
1. With the engine OFF, fill the pump reservoir to the MAX mark on capstick fluid level indicator.
  2. Raise the vehicle until the front wheels are off the ground. Refer to [Lifting and Jacking the Vehicle](#).
  3. Start the engine and turn the steering wheel from stop to stop 4 times.
  4. Verify power steering fluid level. Refer to [Checking and Adding Power Steering Fluid](#).
  5. Rotate steering wheel from left to right another 8 times. Check for signs of cavitation or fluid aeration (pump noise/whining).
  6. Verify the fluid level. Repeat the bleed procedure, if necessary.

## Checking and Adding Power Steering Fluid

**Caution:** When adding fluid or making a complete fluid change, always use the proper power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

1. Clean the area surrounding the reservoir cap.
2. Remove the reservoir cap.
3. Inspect the power steering pump fluid level at regular intervals. Use the appropriate procedure below.

Add fluid when required. Refer to [Fluid and Lubricant Recommendations](#).

### Fluid Is Hot

- 3.1. Run the engine until the fluid reaches about 80°C (170°F).
- 3.2. Turn the engine OFF.
- 3.3. Remove the reservoir cap.
- 3.4. Inspect the fluid level on the capstick.
- 3.5. Ensure that the fluid level is at the HOT/FULL/MAX mark on the capstick.
4. If the fluid level is low, add power steering fluid to the proper level.
5. Install the reservoir cap.
6. When checking the fluid level after servicing the steering system, bleed the air from the system. Refer to [Power Steering System Bleeding](#).

## Power Steering System Flushing

**Important:** Do not reuse any drained power steering fluid regardless of appearance or condition.

1. Turn OFF the engine.
2. Raise the front end of the vehicle off the ground until the tires and wheels turn freely. Refer to [Lifting and Jacking the Vehicle](#).
3. Place a large container under the fluid return hose in order to collect the draining fluid.
4. Remove the fluid return hose at the power steering pump reservoir inlet connection.
5. Plug the reservoir return hose inlet connection on the power steering pump.

**Important:** This step may require 4 L (4 qt) of power steering fluid until the draining fluid appears clear.

6. With the key on engine off, turn the steering wheel fully to the left and to the right while an assistant maintains the minimum fluid level in the reservoir using new approved power steering fluid. Continue until the fluid from the return hose runs clear.
7. Remove the plug from the pump reservoir inlet connection and install the fluid return hose to the pump reservoir.

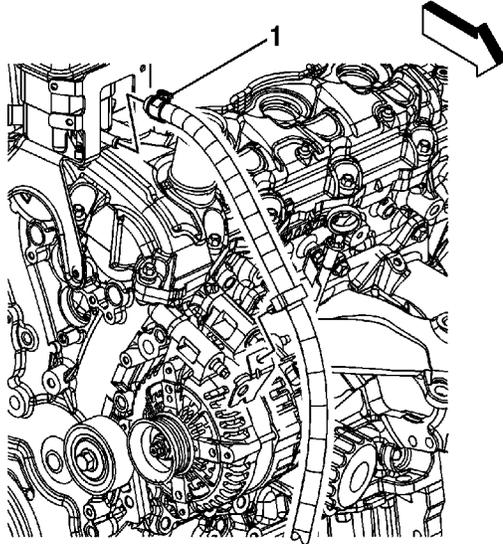
**Important:** Do NOT run the engine without the power steering fluid at a minimum system level.

8. Bleed the power steering system. Refer to [Power Steering System Bleeding](#).
9. Inspect the power steering fluid for the following indications of contamination:
  - Milky fluid - water
  - Brown fluid - burnt
  - Plastic debris or dirt chunks
10. If the fluid is contaminated, repeat steps 2-9.
11. Lower the vehicle and check the Power Steering system for leaks.

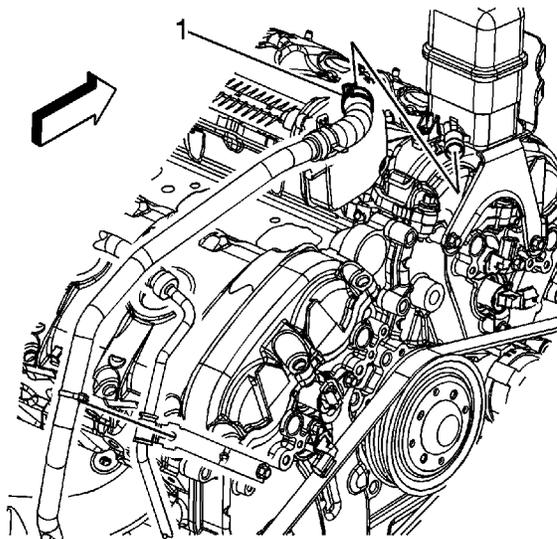
## Power Steering Fluid Reservoir Replacement

### Removal Procedure

1. Remove the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).
2. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
3. Place drain pans under the vehicle as needed.

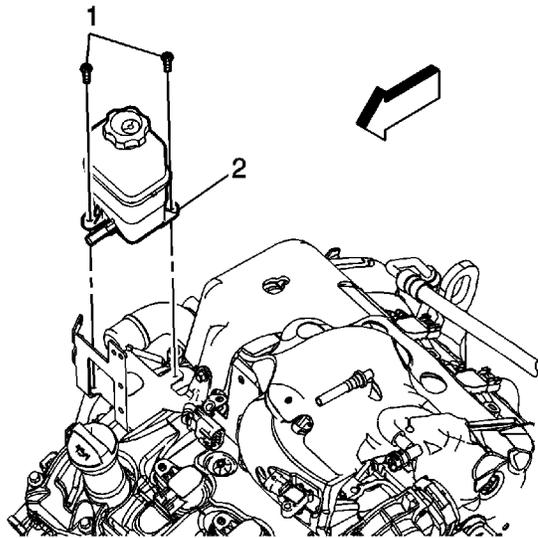


4. Compress the power steering reservoir inlet hose clamp (1) and disconnect the hose from the remote power steering fluid reservoir.



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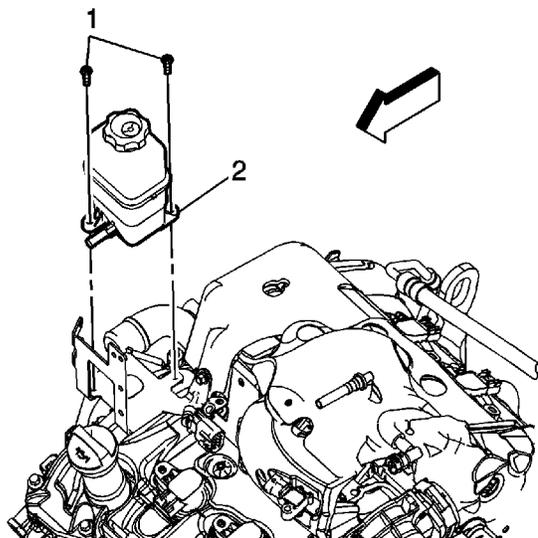
5. Compress the power steering fluid reservoir outlet hose clamp (1) and disconnect the hose from the remote power steering fluid reservoir.



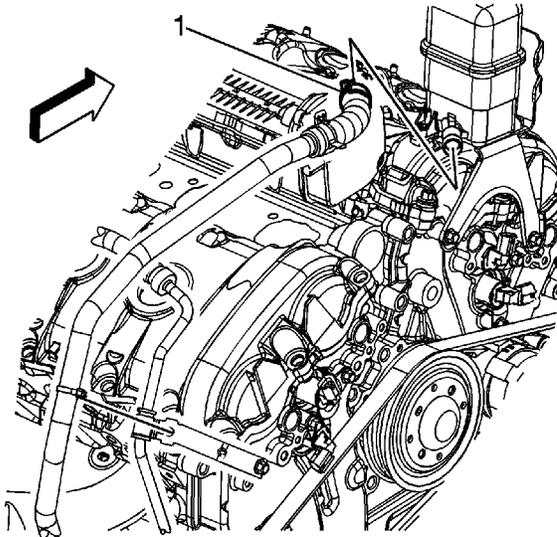
6. Remove the remote power steering fluid reservoir bolts (1).
7. Remove the remote power steering fluid reservoir (2).

## Installation Procedure

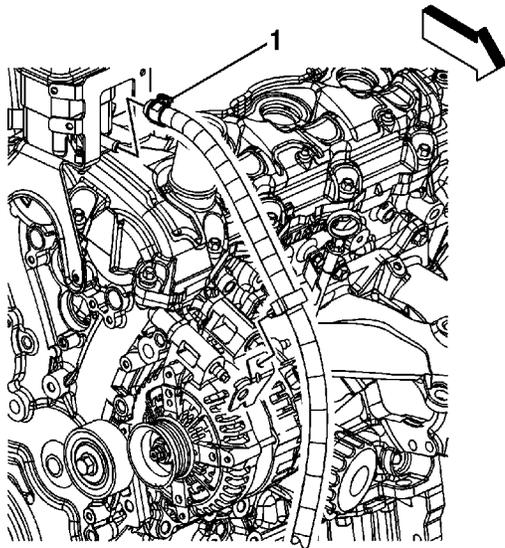
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the remote power steering fluid reservoir (2).
2. Install the remote power steering fluid reservoir bolts (1) and tighten to **9 N·m (80 lb in)**.



3. Connect the power steering fluid reservoir outlet hose and clamp (1).

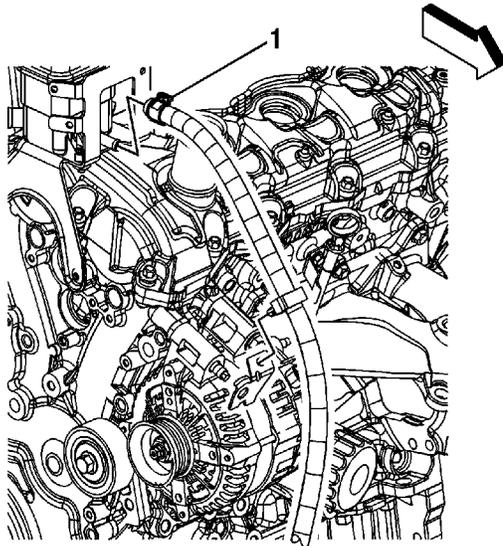


4. Connect the power steering reservoir inlet hose and clamp (1).
5. Clean all excess fluid from the vehicle and remove the drain pans.
6. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).
7. Install the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).

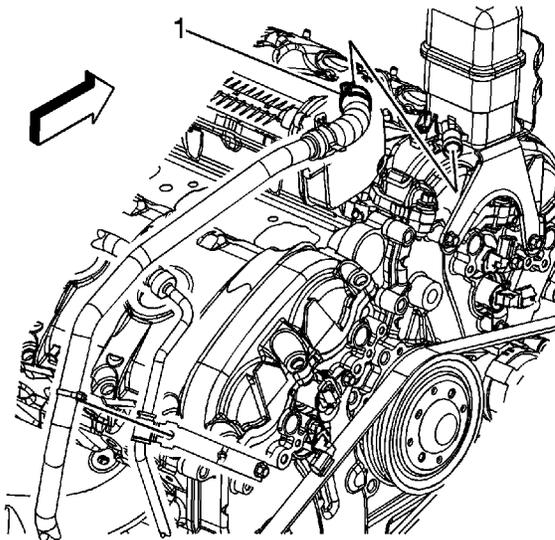
## Power Steering Fluid Reservoir Bracket Replacement

### Removal Procedure

1. Remove the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).
2. Remove the right side engine mount strut bracket. Refer to [Engine Mount Strut Bracket Replacement - Right Side](#)
3. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
4. Place drain pans under the vehicle as needed.

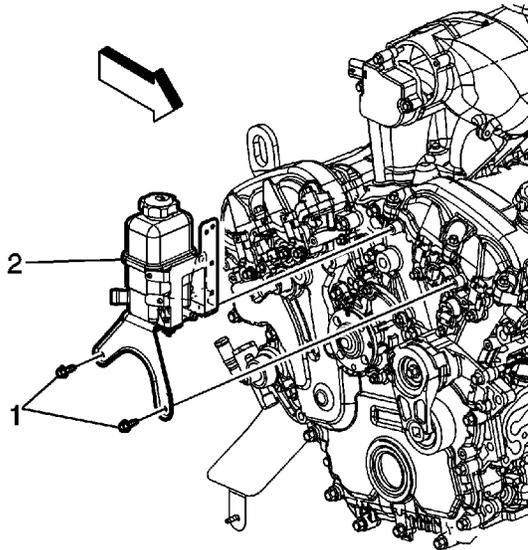


5. Disconnect the power steering reservoir inlet hose (1).





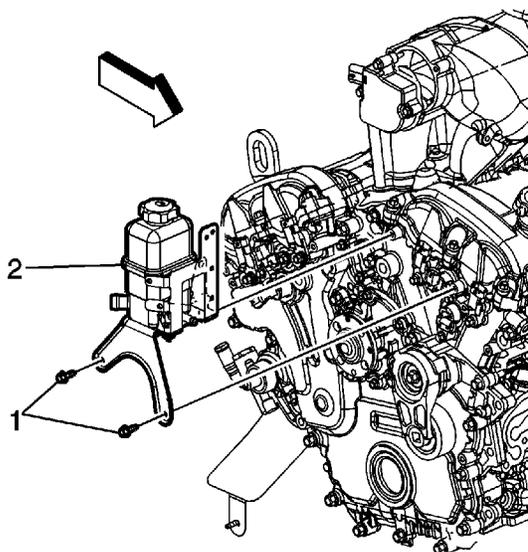
6. Disconnect the power steering fluid reservoir outlet hose (1).



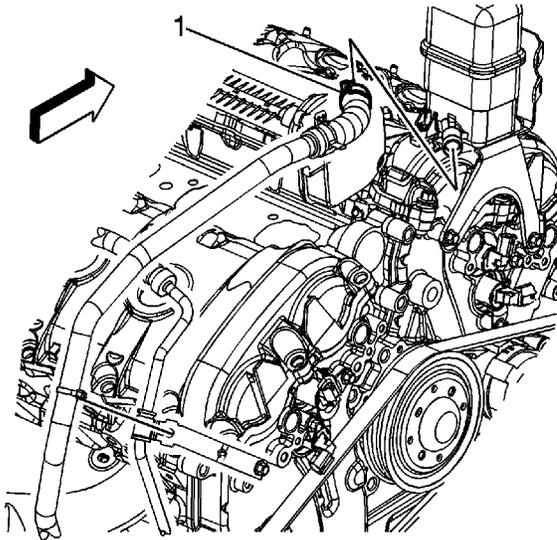
7. Remove the remote power steering fluid reservoir bracket bolts (1).
8. Remove the remote power steering fluid reservoir bracket (2).
9. Transfer any parts as needed.

## Installation Procedure

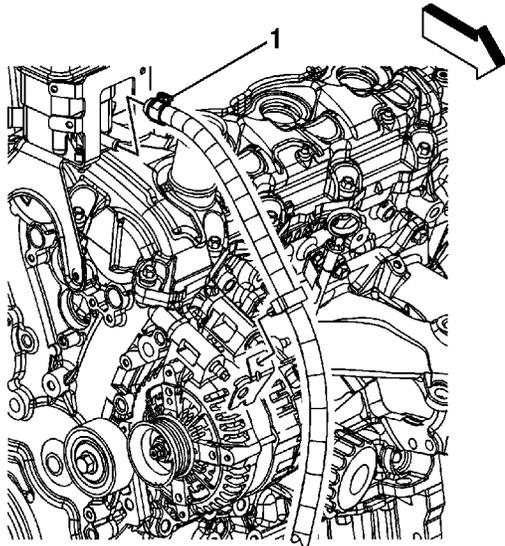
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



1. Install the remote power steering fluid reservoir bracket (2).
2. Install the remote power steering fluid reservoir bracket bolts (1) and tighten to **9 N·m (80 lb in)**.

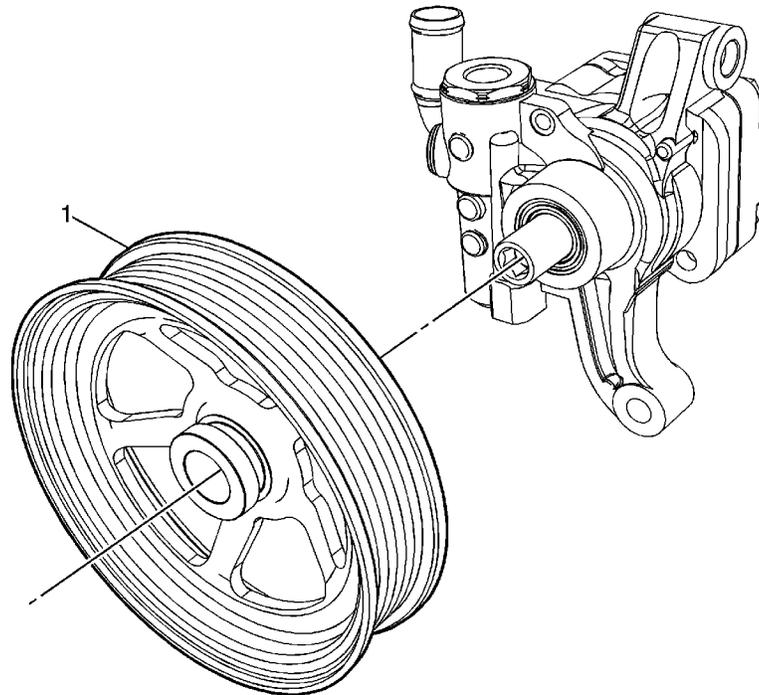


3. Connect the power steering fluid reservoir outlet hose (1).



4. Connect the power steering reservoir inlet hose (1).
5. Clean all excess fluid from the vehicle and remove the drain pans.
6. Install the right side engine mount strut bracket. Refer to [Engine Mount Strut Bracket Replacement - Right Side](#)
7. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).
8. Install the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).

# Power Steering Pump Pulley Replacement



Callout	Component Name
<p><b>Preliminary Procedure</b></p> <p>Remove the power steering pump. Refer to <a href="#">Power Steering Pump Replacement</a>.</p>	
<p>1</p>	<p>Power Steering Pump Pulley</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Use the <i>J 25034-C</i> remover for Buick, GMC, and Chevrolet or the <i>SA9162C</i> remover/installer for Saturn to remove the power steering pump pulley.</li> <li>2. Use the <i>J 25033-C</i> installer for Buick, GMC, and Chevrolet or the <i>SA9162C</i> remover/installer for Saturn to install the power steering pump pulley.</li> <li>3. Ensure the axial tolerance of the power steering pulley on the shaft is within 0.25 mm (0.010 in).</li> </ol> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <i>J 25033-C</i> Pulley Installer</li> <li>• <i>J 25034-C</i> Pulley Remover</li> </ul> <p>© 2010 General Motors Corporation. All rights reserved.</p>

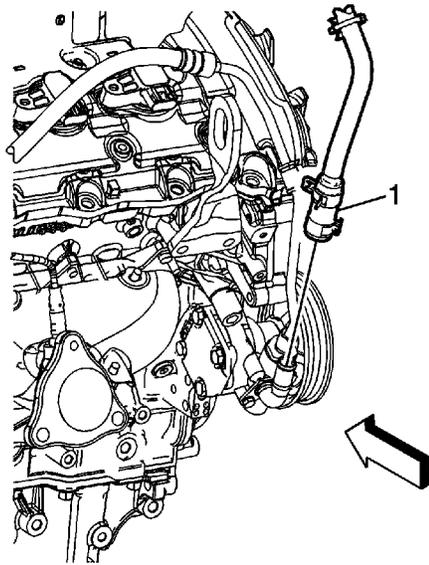
- *SA9162C* Power Steering Pump Pulley Remover/Installer

For equivalent regional tools, refer to [Special Tools](#).

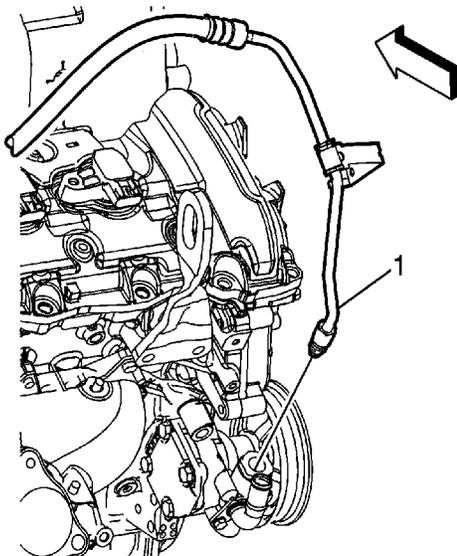
## Power Steering Pump Replacement

### Removal Procedure

1. Remove the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).
2. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
3. Place drain pans under the vehicle as needed.
4. Remove the drive belt. Refer to [Drive Belt Replacement](#).
5. Remove the steering gear heat shield. Refer to [Steering Gear Heat Shield Replacement](#).
6. Remove the right side catalytic convertor. Refer to [Catalytic Converter Replacement - Right Side](#).



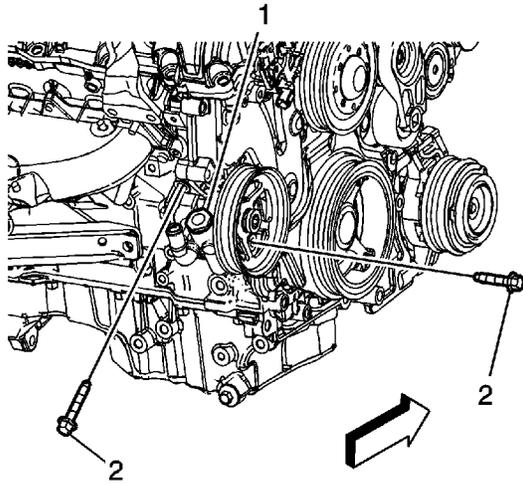
7. Disconnect the power steering fluid reservoir outlet hose (1) from the power steering pump.



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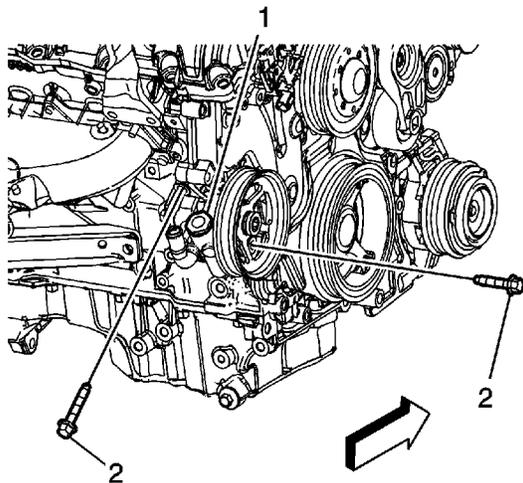


8. Disconnect the power steering gear inlet hose (1) from the power steering pump.



9. Remove the power steering pump bolts (2).
10. Remove the power steering pump (1) from the vehicle.
11. Transfer any parts as needed.

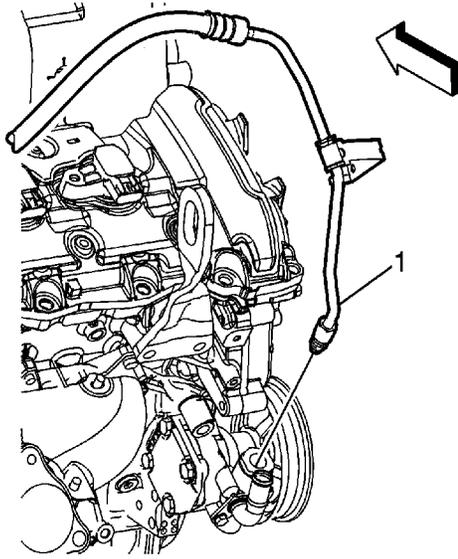
## Installation Procedure



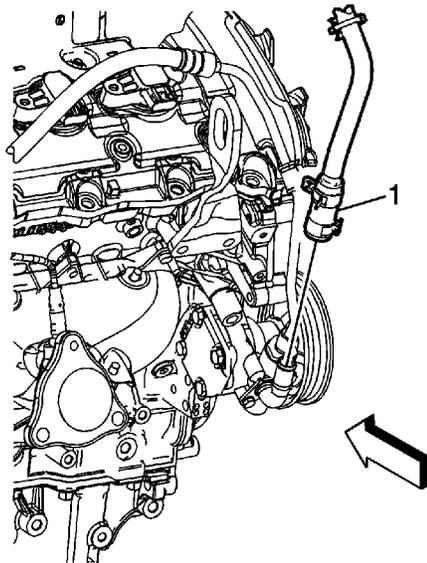
1. Install the power steering pump (1) to the vehicle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the power steering pump bolts (2) and tighten to **50 N·m (37 lb ft)**.



3. Connect the power steering gear inlet hose fitting (1) to the power steering pump and tighten to **27 N·m (20 lb ft)**.



4. Connect the power steering fluid reservoir outlet hose (1) to the power steering pump.
5. Clean any excess fluid from the vehicle and remove the drain pans.
6. Install the right side catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#).
7. Install the steering gear heat shield. Refer to [Steering Gear Heat Shield Replacement](#).
8. Install the drive belt. Refer to [Drive Belt Replacement](#).
9. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).
10. Install the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).

# Steering Linkage Outer Tie Rod Replacement

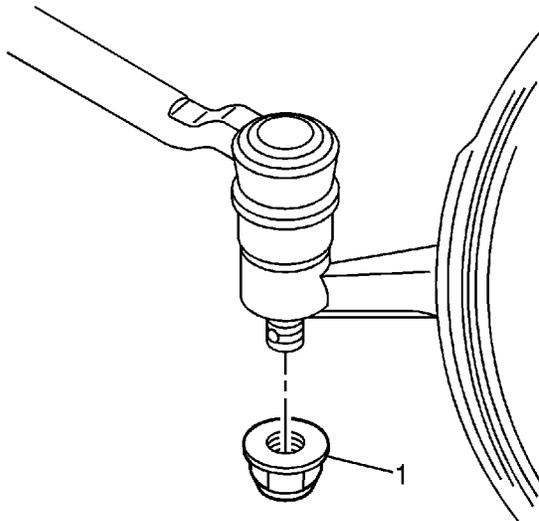
## Special Tools

- *J 24319-B* Steering Linkage and Tie Rod Puller
- *SA91100C* Tie Rod Separator

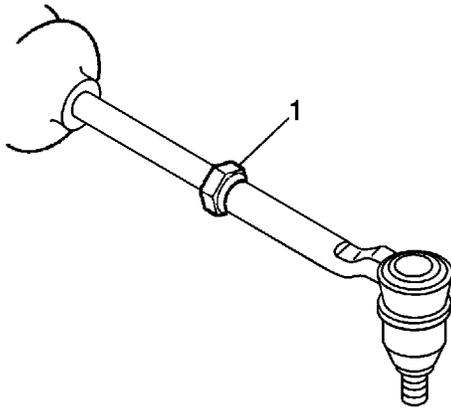
For equivalent regional tools, refer to [Special Tools](#).

## Removal Procedure

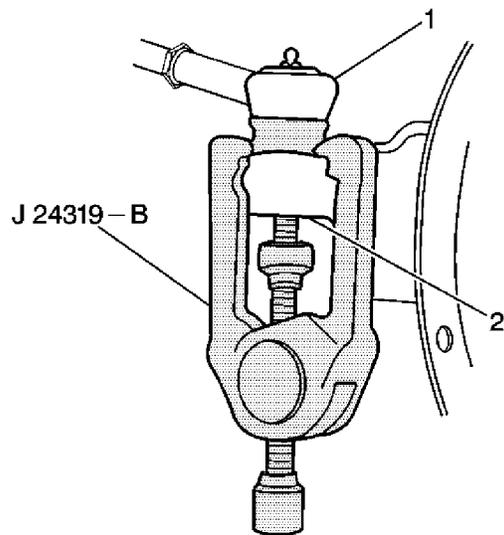
1. Remove the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).



2. Remove the steering linkage outer tie rod nut (1).

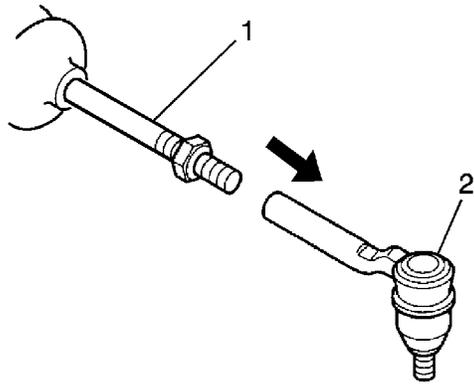


3. Loosen the steering linkage inner tie rod nut (1).



**Caution:** Do not attempt to free the ball stud by using a pickle fork or wedge type tool, because seal or bushing damage could result. Use the proper tool to separate all ball joints.

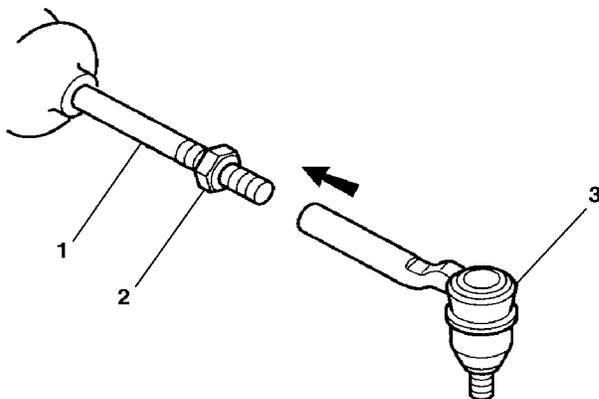
4. Use the *J 24319-B* puller for Buick, GMC, and Chevrolet and the *SA91100C* separator for Saturn to separate the steering linkage outer tie rod (1) from the steering knuckle (2).



**Note:** Count the total number of complete rotations needed to remove the steering linkage outer tie rod from the steering linkage inner tie rod.

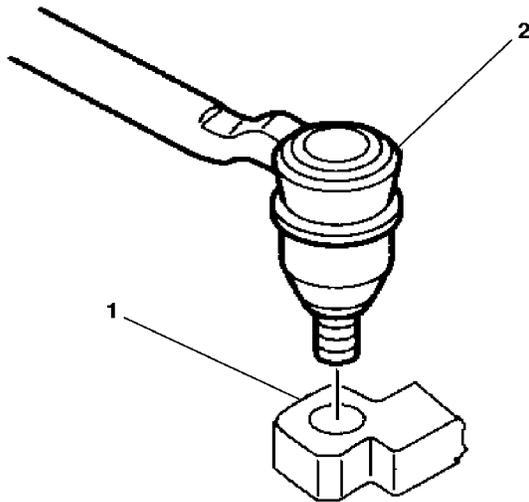
5. Remove the steering linkage outer tie rod (2) from the steering linkage inner tie rod (1).

## Installation Procedure



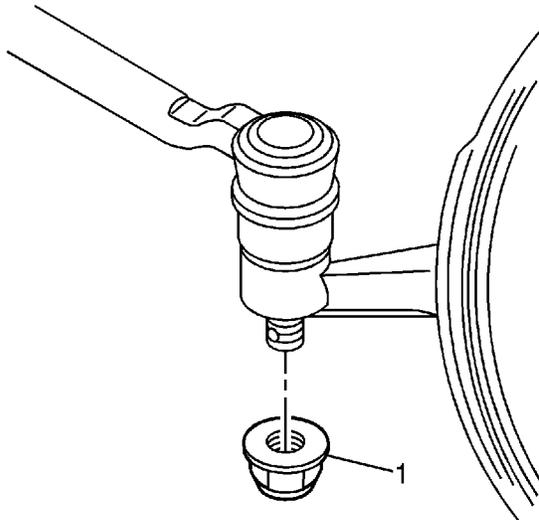
**Note:** Install the steering linkage outer tie rod the same number of complete rotations counted when removing it prior.

1. Install the steering linkage outer tie rod (3) to the steering linkage inner tie rod (1) but do not tighten the steering linkage inner tie rod nut (2).



2. Install the steering linkage outer tie rod (2) to the steering knuckle (1).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



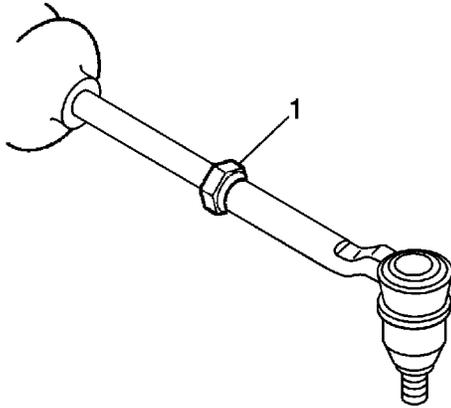
**Note:**

- The fastener and its counterpart are clean and free from rust.
- The fastener develops 2 N·m (18 lb in) of torque (drag) against its counterpart prior to the fastener seating.

If the fastener does not meet these criteria then REPLACE the fastener.

3. Install the steering linkage outer tie rod nut (1) and tighten to **30 N·m (22 lb ft) plus 120 degrees (2 flats)**.

**Note:** Ensure that 2.5-4.5 steering linkage outer tie rod end threads are visible beyond the steering linkage outer tie rod nut nylon.

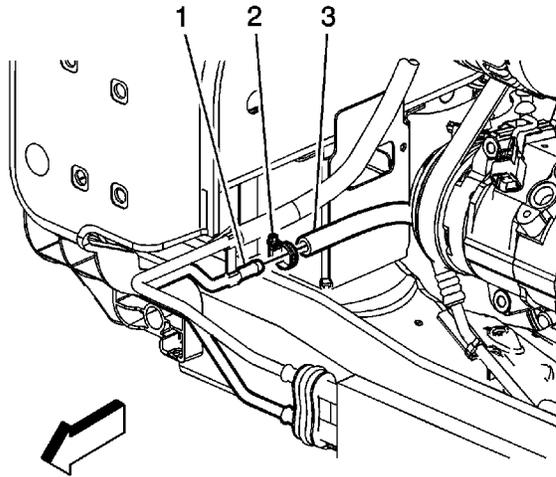


4. Tighten the steering linkage inner tie rod nut (1) and tighten to **75 N·m (55 lb ft)**.
5. Install the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).
6. Adjust the front toe. Refer to [Front Toe Adjustment](#).

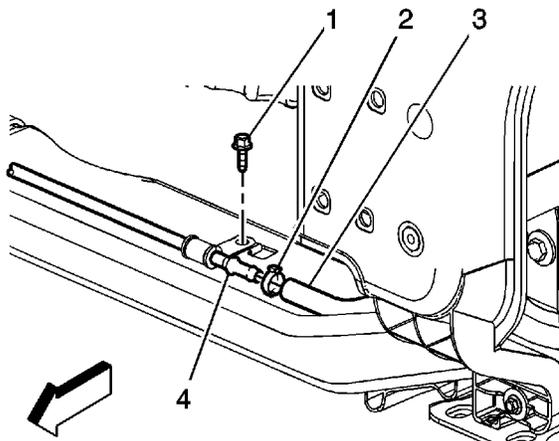
## Power Steering Cooler Pipe/Hose Replacement

### Removal Procedure

1. Remove the right front frontwards wheelhouse liner. Refer to [Front Wheelhouse Front Liner Replacement](#).
2. Place drain pans under the vehicle as needed.



3. Loosen the power steering cooler pipe clamp (2) and disconnect the power steering cooler pipe (3) from the power steering fluid cooler (1).



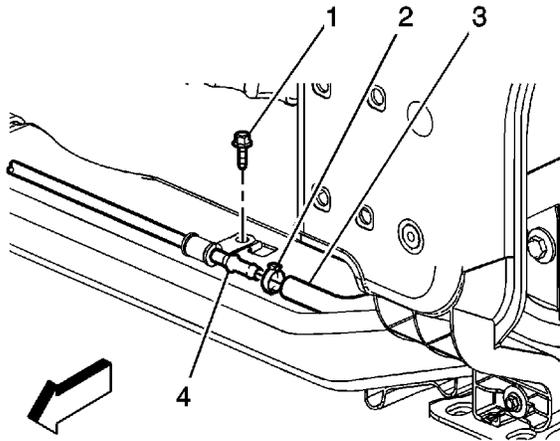
4. Remove the power steering gear outlet hose bracket bolt (1).

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5. Remove and discard the power steering gear outlet hose clamp (2).
6. Disconnect the power steering cooler pipe from the power steering gear outlet hose (4,3).
7. Remove any plastic retaining clips on the power steering cooler pipe and discard them.
8. Remove the power steering cooler pipe from the vehicle.

## Installation Procedure

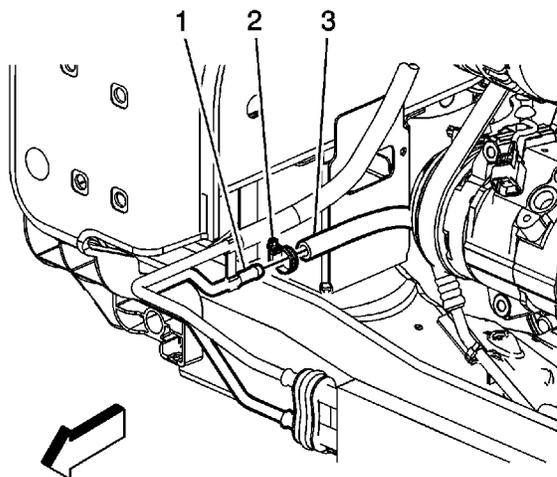
1. Install the power steering cooler pipe to the vehicle.



2. Install a new power steering cooler pipe clamp (2).
3. Connect the power steering cooler pipe to the power steering gear outlet hose (4,3).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

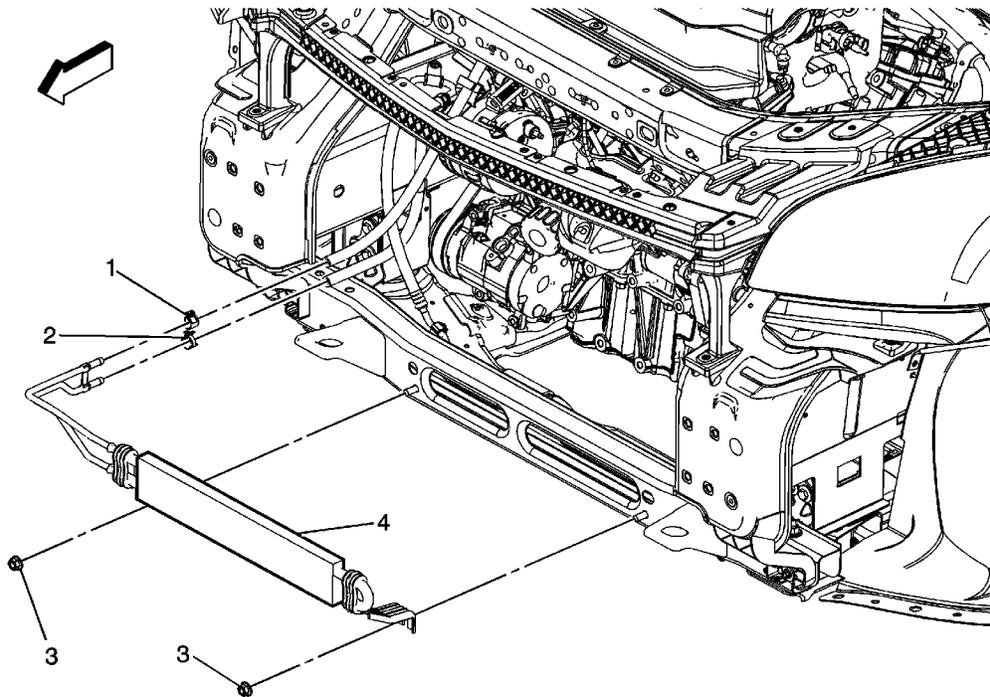
4. Install the power steering gear outlet hose bracket bolt (1) and tighten to **8 N·m (71 lb in)**.





5. Connect the power steering cooler pipe (3) to the power steering fluid cooler (1) and tighten the power steering cooler pipe clamp (2).
6. Clean any excess fluid from the vehicle and remove the drain pans.
7. Install the right front frontwards wheelhouse liner. Refer to [Front Wheelhouse Front Liner Replacement](#).
8. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).

# Power Steering Fluid Cooler Replacement

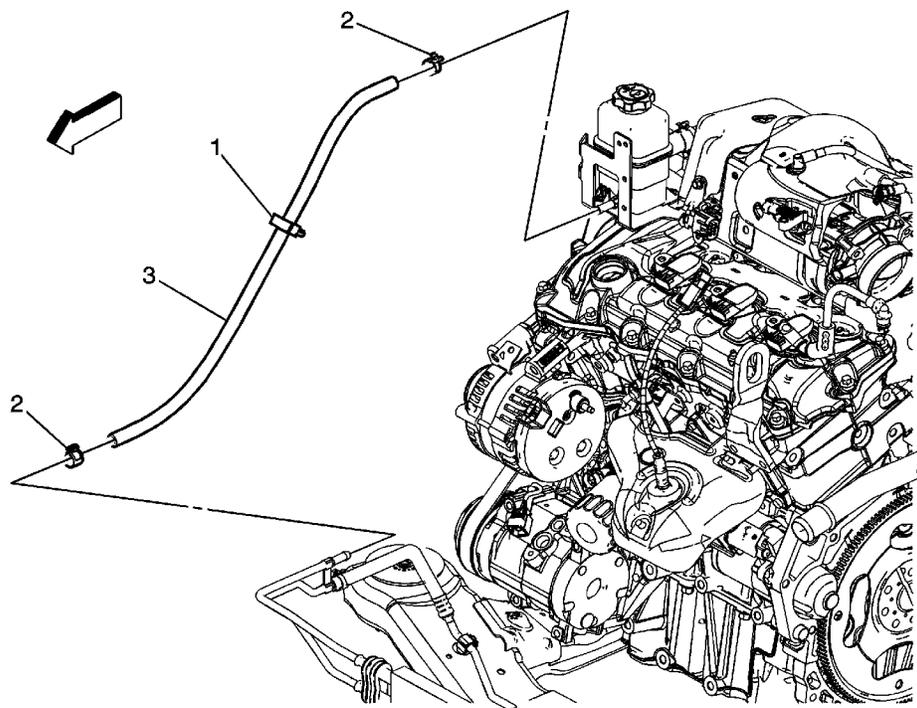


Callout	Component Name
<p><b>Preliminary Procedures</b></p> <ol style="list-style-type: none"> <li>1. For Saturn and GMC, remove the fascia. Refer to <a href="#">Front Bumper Fascia Brace Replacement</a>.</li> <li>2. For Buick, and Chevrolet, remove the front air deflector. Refer to <a href="#">Front Air Deflector Replacement</a>.</li> <li>3. Remove the lower retainers from the front bumper fascia. Refer to <a href="#">Front Bumper Fascia Replacement</a>.</li> </ol>	
1	<p>Power Steering Reservoir Inlet Hose Clamp</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.</li> <li>2. Place drain pans under the vehicle as needed.</li> </ol>
2	<p>Power Steering Cooler Hose Clamp</p>
3	<p>Power Steering Fluid Cooler Nuts (Qty: 2)</p> <p><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.</p>

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	<b>Tighten</b> 30 N·m (22 lb in)
4	Power Steering Fluid Cooler <b>Procedure</b> Fill and bleed the power steering system. Refer to <a href="#">Power Steering System Bleeding</a> .

## Power Steering Fluid Reservoir Inlet Hose Replacement

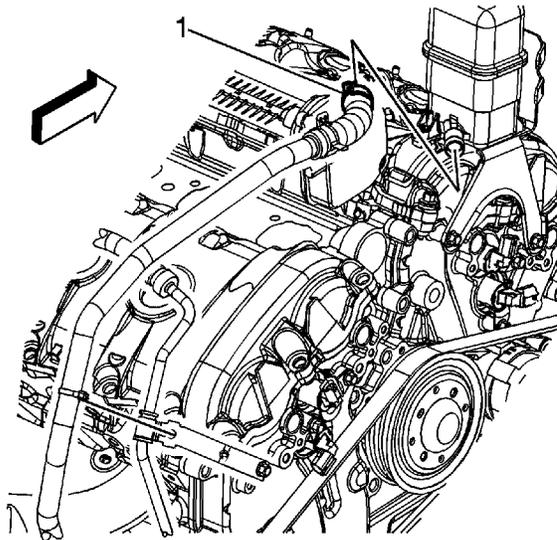


Callout	Component Name
<b>Preliminary Procedure</b>	
Remove the fuel injector sight shield. Refer to <a href="#">Fuel Injector Sight Shield Replacement</a> .	
1	Power Steering Reservoir Inlet Hose Clip
2	Power Steering Reservoir Inlet Hose Clamp (Qty: 2)  <b>Procedure</b>  1. Remove as much power steering fluid from the remote power steering fluid reservoir as possible. 2. Place drain pans under the vehicle as needed.
3	Power Steering Reservoir Inlet Hose  <b>Procedure</b>  1. Clean any excess fluid from the vehicle and remove the drain pans. 2. Fill and bleed the power steering system. Refer to <a href="#">Power Steering System Bleeding</a> .

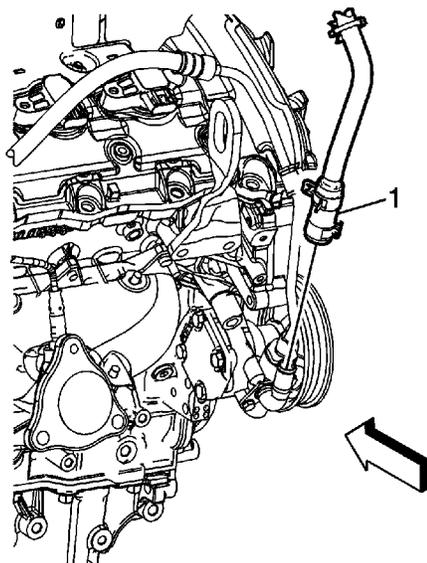
## Power Steering Fluid Reservoir Outlet Hose Replacement

### Removal Procedure

1. Remove the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).
2. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
3. Place drain pans under the vehicle as needed.



4. Disconnect the power steering fluid reservoir outlet hose (1) from the remote power steering fluid reservoir.





5. Disconnect the power steering fluid reservoir outlet hose (1) from the power steering pump.

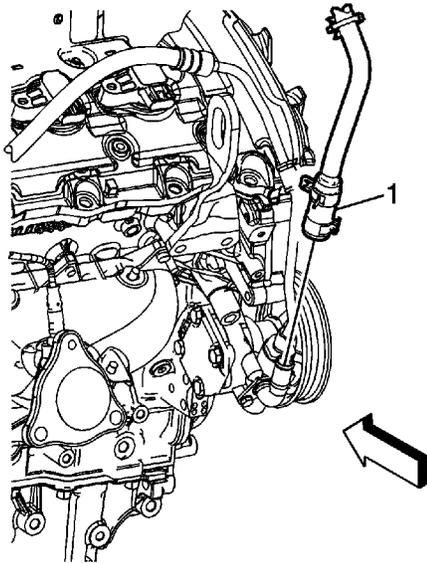
**Note:** Disconnect any clips as needed before attempting removal.

6. Remove the power steering fluid reservoir outlet hose from the vehicle.

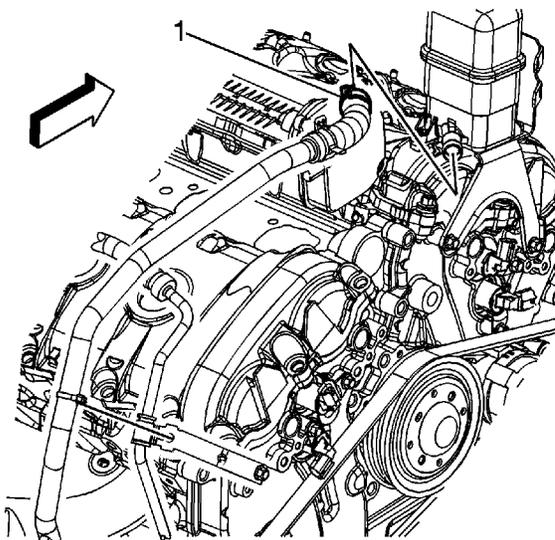
## Installation Procedure

**Note:** Clip the power steering fluid reservoir hose in place in its original routing.

1. Install the power steering fluid reservoir outlet hose to the vehicle.



2. Connect the power steering fluid reservoir outlet hose (1) to the power steering pump.



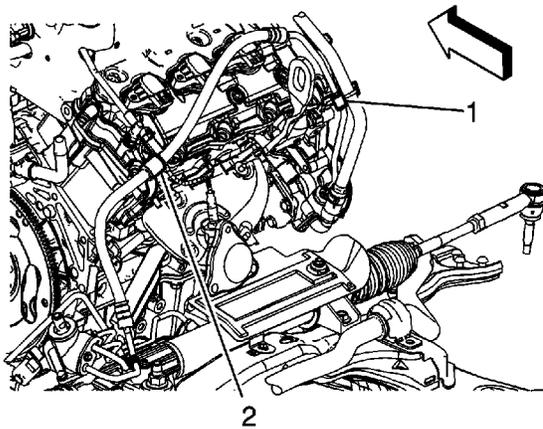


3. Connect the power steering fluid reservoir outlet hose (1) to the remote power steering fluid reservoir.
4. Clean all excess fluid from the vehicle and remove the drain pans.
5. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).
6. Install the fuel injector sight shield. Refer to [Fuel Injector Sight Shield Replacement](#).

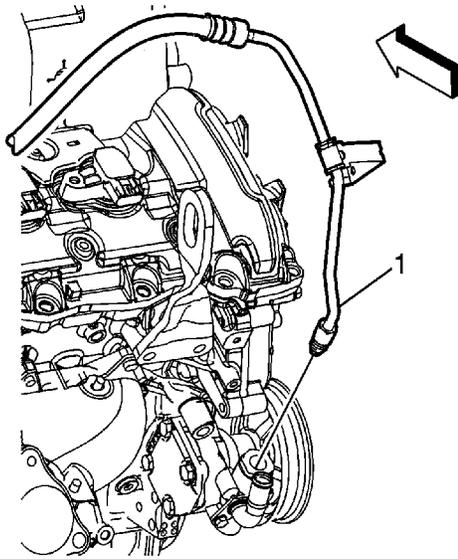
## Power Steering Gear Inlet Pipe/Hose Replacement

### Removal Procedure

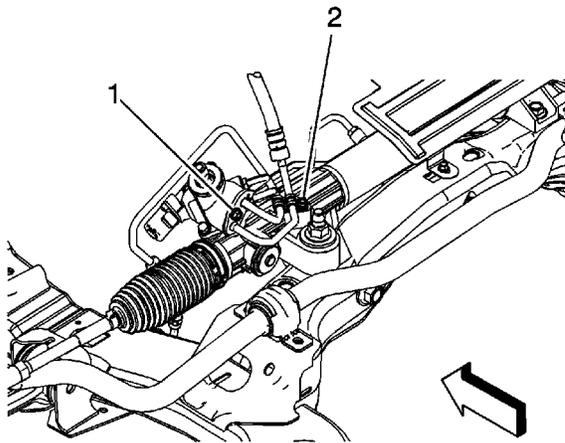
1. Remove the right side catalytic convertor. Refer to [Catalytic Converter Replacement - Right Side](#)
2. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
3. Place drain pans under the vehicle as needed.
4. Disconnect the power steering fluid reservoir outlet hose from the power steering pump. Refer to [Power Steering Fluid Reservoir Outlet Hose Replacement](#)



5. Unclip the power steering fluid reservoir outlet hose from the power steering gear inlet hose bracket.
6. Remove the power steering gear inlet hose bracket bolt (1).
7. Remove the power steering gear inlet hose bracket nut (2).



8. Disconnect the power steering gear inlet hose (1) from the power steering pump.



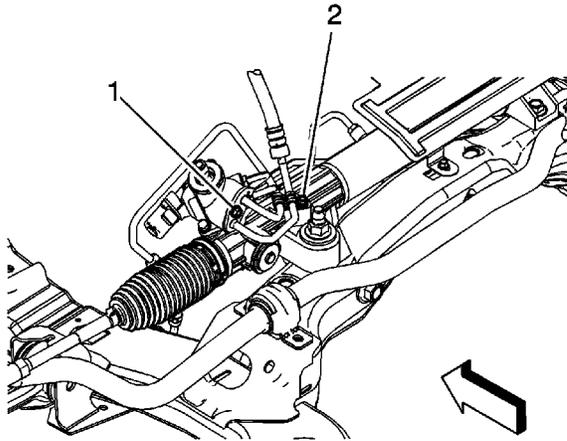
9. Remove the power steering gear inlet hose retaining plate bolt (1).
10. Remove the power steering gear inlet and outlet pipe clip bolt (2).
11. Remove the power steering gear inlet hose from underneath the vehicle.

## Installation Procedure

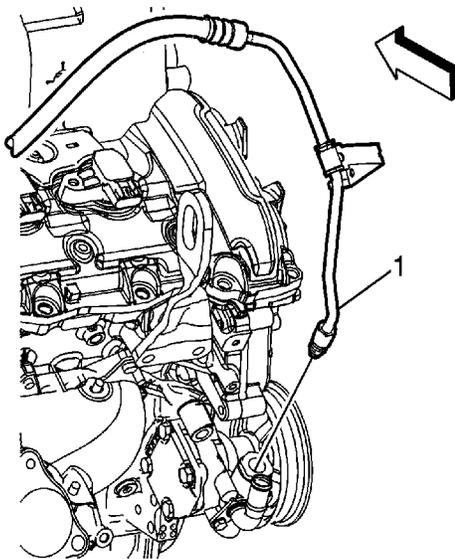
**Note:** Hand tighten the bolts and nut in the following steps until all parts are in place. Once all bolts, the nut, and the part are in place they can be torqued to the specifications.

1. Install the power steering gear inlet hose to the vehicle from underneath the vehicle and place the power steering gear inlet hose end into the steering gear.

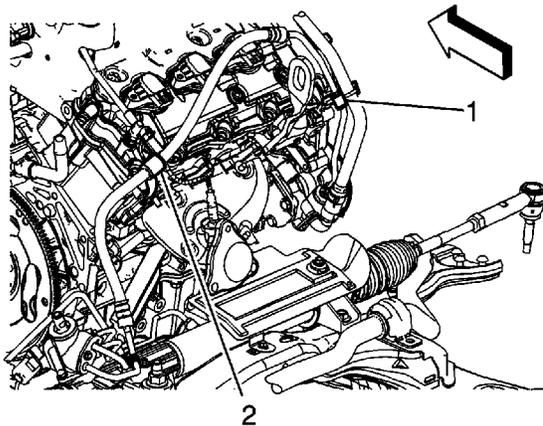
**Caution:** Refer to [Fastener Caution](#) in the Preface section.



2. Install the power steering gear inlet hose retaining plate bolt (1) and tighten to **12 N·m (106 lb in)**.
3. Install the power steering gear inlet and outlet pipe clip bolt (2) and tighten to **9 N·m (80 lb in)**.



4. Connect the power steering gear inlet hose (1) to the power steering pump.

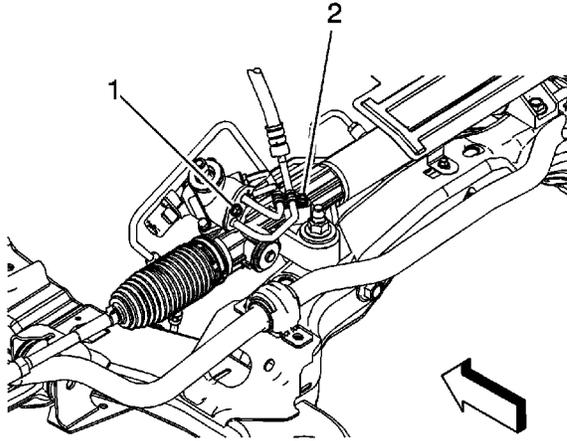


5. Install the power steering gear inlet hose bracket and bolt (1) and tighten to **8 N·m (71 lb in)**.
6. Install the power steering gear inlet hose bracket and nut (2) and tighten to **8 N·m (71 lb in)**.
7. Connect the power steering fluid reservoir outlet hose to the power steering pump. Refer to [Power Steering Fluid Reservoir Outlet Hose Replacement](#)
8. Clip the power steering fluid reservoir outlet hose to the power steering gear inlet hose bracket.
9. Clean any excess fluid from the vehicle and remove the drain pans.
10. Install the right side catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#)
11. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).

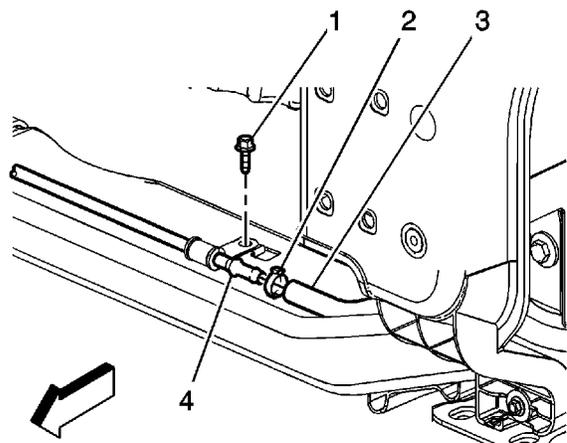
## Power Steering Gear Outlet Pipe/Hose Replacement

### Removal Procedure

1. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
2. Hoist and raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Place drain pans under the vehicle as needed.



4. Remove the power steering gear inlet hose retaining plate bolt (1) and the power steering gear inlet and outlet pipe clip bolt (2).
5. Pull the power steering gear outlet hose out of the steering gear.

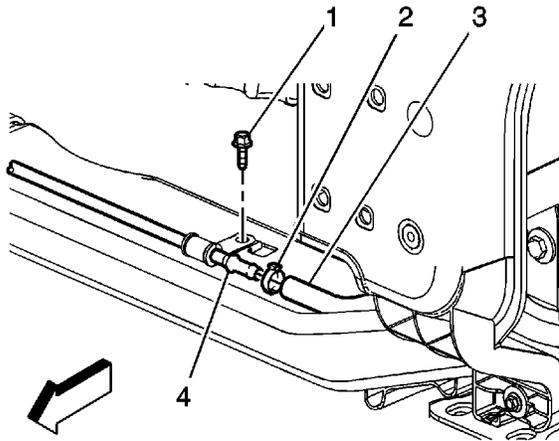




6. Remove the power steering gear outlet hose bracket bolt (1).
7. Remove and discard the power steering gear outlet hose crimp clamp (2).
8. Disconnect the rubber segment from the metal segment of the power steering gear outlet hose (3, 4).
9. Remove any plastic retaining clips on the power steering gear outlet hose and discard them.
10. Remove the power steering gear outlet hose from the vehicle.

## Installation Procedure

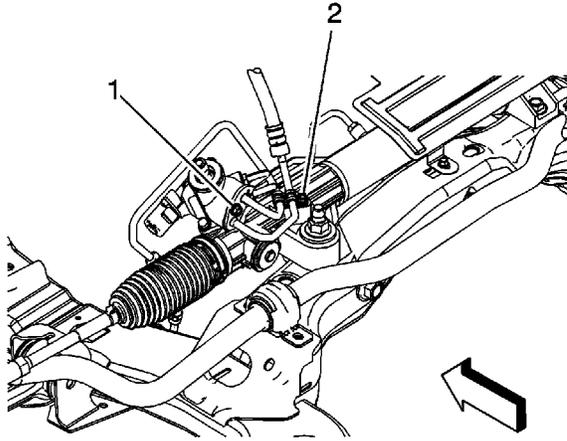
1. Position the power steering gear outlet hose to the vehicle.



2. Position a new power steering gear outlet hose clamp (2).
3. Connect the rubber segment to the metal segment of the power steering gear outlet hose (3, 4).
4. Crimp the new power steering gear outlet hose crimp clamp.

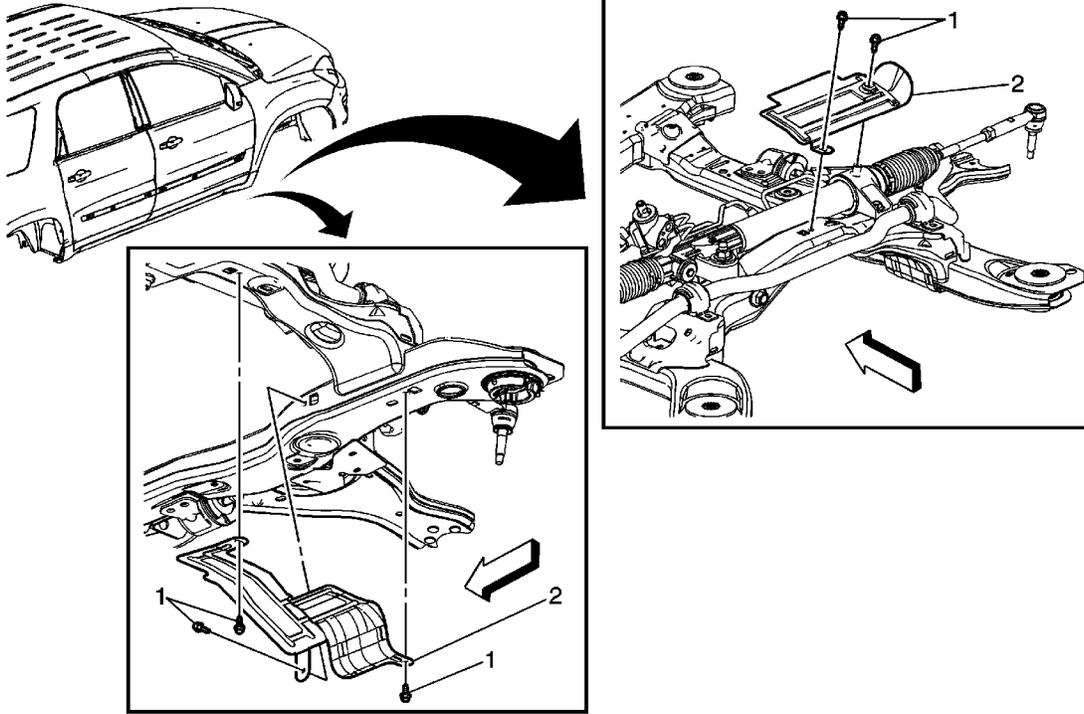
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Install the power steering gear outlet hose bracket bolt (1) and tighten to **8 N·m (71 lb in)**.



6. Insert the steering gear outlet hose in to the steering gear.
7. Install the power steering gear inlet hose retaining plate bolt (1) and tighten to **12 N·m (106 lb in)**.
8. Install the power steering gear inlet and outlet pipe clip bolt (2) and tighten to **9 N·m (80 lb in)**.
9. Clean any excess fluid from the vehicle and remove the drain pans.
10. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).

# Steering Gear Heat Shield Replacement



Callout	Component Name
<b>Preliminary Procedure</b>	
Raise the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a> .	
1	Steering Gear Heat Shield Bolt (Qty: 5) <b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section. <b>Tighten</b> 7 N·m (62 lb in)
2	Steering Gear Heat Shield (Qty: 2)

## Steering Gear Replacement

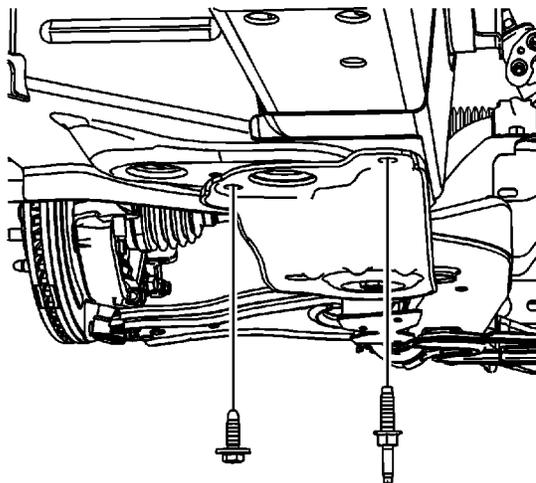
### Removal Procedure

**Caution:** Secure the steering wheel utilizing 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
- The steering gear

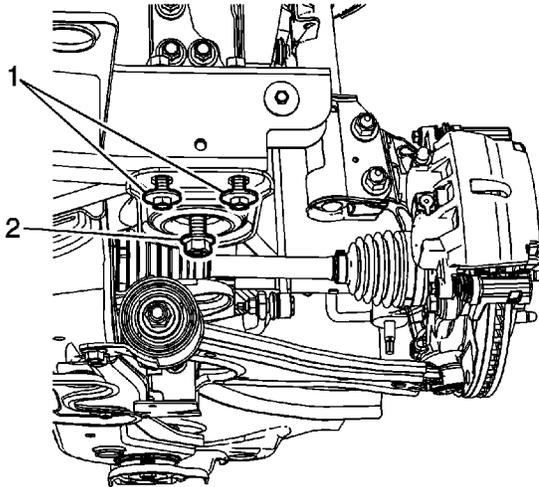
After disconnecting these components, do not move the front tires and wheels. Failure to follow these procedures may cause improper alignment of some components during installation and result in possible damage to the SIR coil.

1. Remove as much power steering fluid from the remote power steering fluid reservoir as possible.
2. Disconnect the steering linkage outer tie rods from the steering knuckles. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
3. Disconnect the stabilizer shaft links at the stabilizer shaft. Refer to [Stabilizer Shaft Link Replacement](#).
4. Disconnect the intermediate steering shaft from the steering gear. Refer to [Intermediate Steering Shaft Replacement](#).
5. Remove the rear propeller shaft, if equipped. Refer to [Propeller Shaft Replacement](#).
6. Remove the underbody rear side rails. Refer to [Underbody Rear Side Rail Replacement](#).
7. Remove the frame brace. Refer to [Frame Brace Replacement](#).
8. Remove the right side catalytic converter. Refer to [Catalytic Converter Replacement - Right Side](#).
9. Remove the steering gear heat shields. Refer to [Steering Gear Heat Shield Replacement](#).
10. Position adjustable jack stands underneath the left and right sides of the vehicle at the rear of the front frame.
11. Place drain pans under the vehicle as needed.

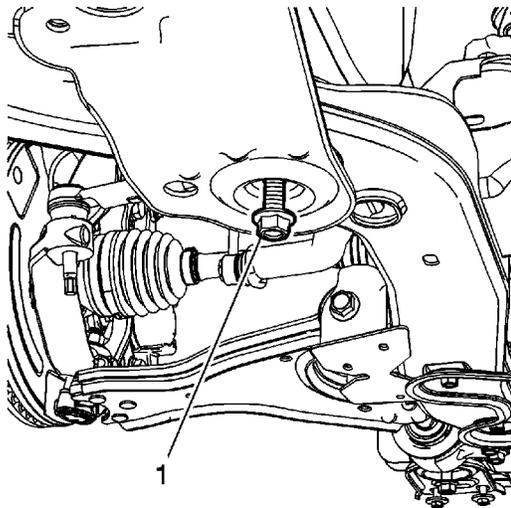




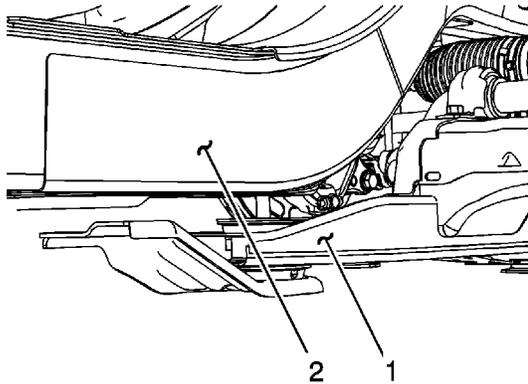
12. Remove the left and right front frame reinforcement mounting bolts. Left side shown, right side similar.



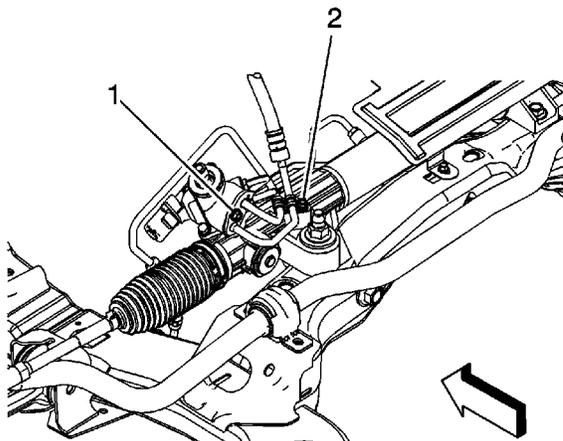
13. Loosen the front frame reinforcement mounting bolts (1). Left side shown, right side similar.
14. Loosen the front frame mounting bolts (2). Left side shown, right side similar.



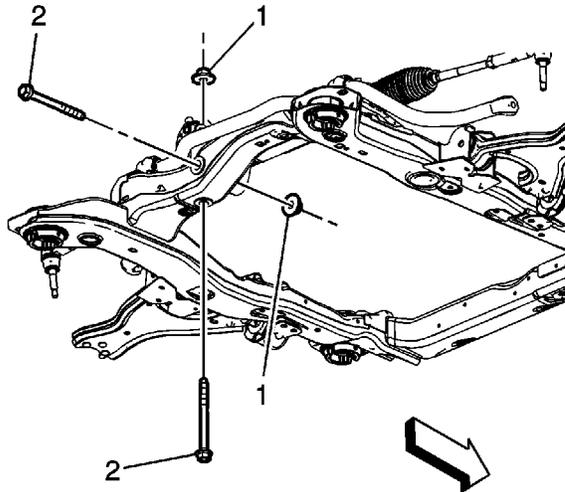
15. Loosen the rear front frame mounting bolts (1).



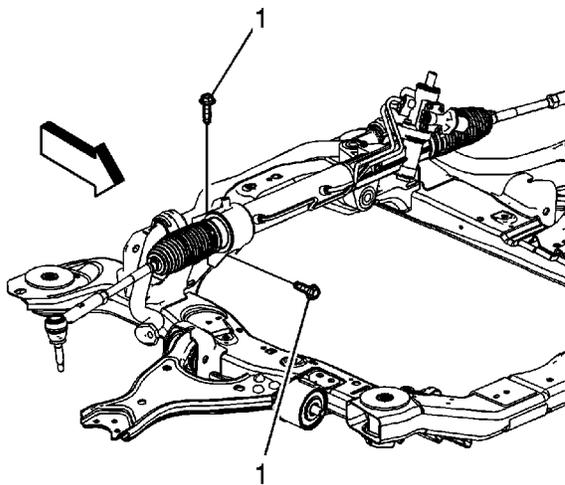
16. Lower the frame (1) from the frame rail (2) until enough clearance is gained to remove the steering gear.



17. Remove the power steering gear inlet hose retaining plate bolt (1) and the power steering gear inlet and outlet pipe clip bolt (2).
18. Pull the power steering gear inlet and outlet hoses out of the steering gear and power steering gear inlet and outlet pipe clip.



19. Remove the left side steering gear nuts (1) and bolts (2).



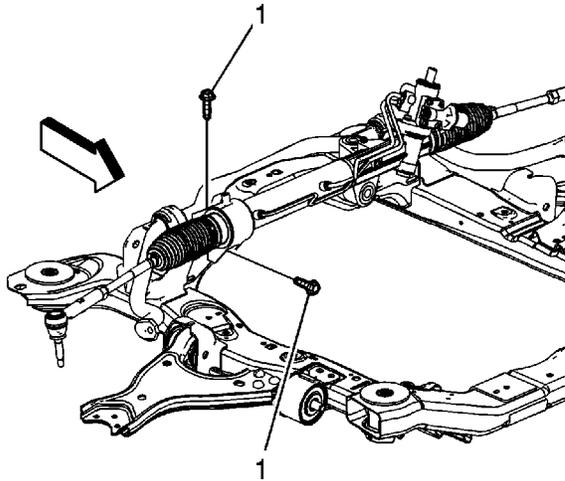
20. Remove the right side steering gear bolts (1).

21. Remove the steering gear from the vehicle through the driver side of the vehicle.

## **Installation Procedure**

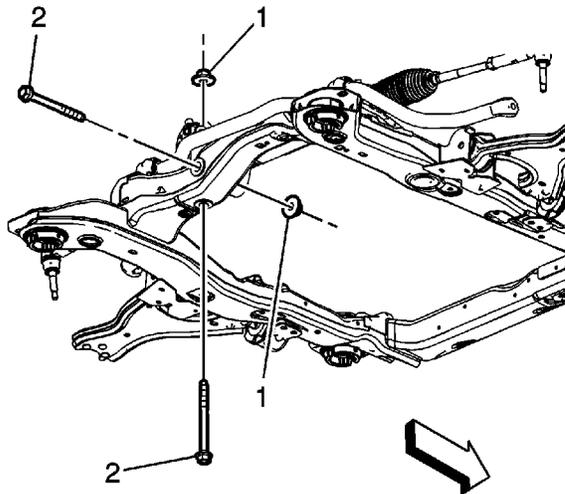
1. Install the steering gear to the vehicle through the driver's side.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

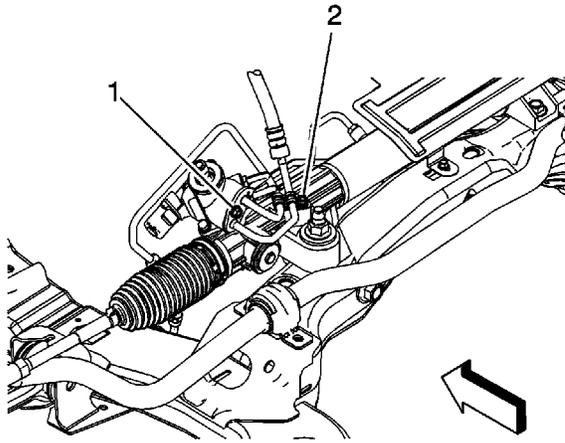


**Note:** Start all bolts by hand before finalizing any torques.

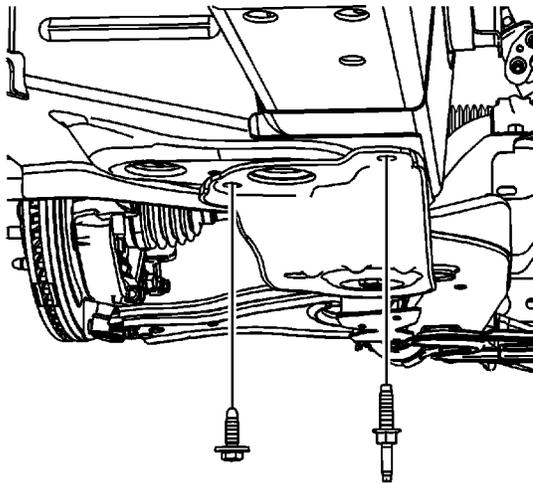
2. Install the right side steering gear bolts (1) and tighten to **100 N·m (74 lb ft)**.



3. Install the left side steering gear nuts (1) and bolts (2) and tighten to **75 N·m (55 lb ft)**.
4. Install the power steering gear inlet and outlet hoses to the steering gear.

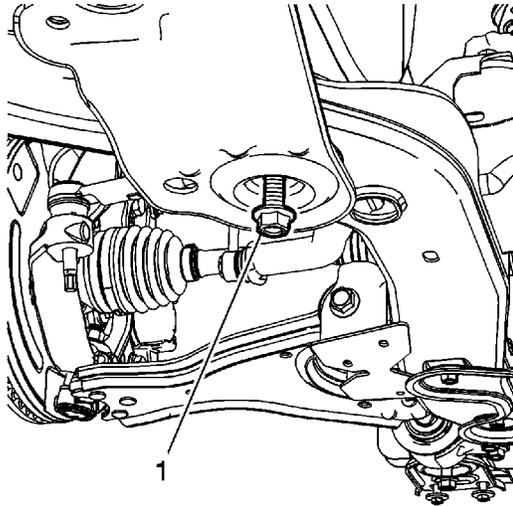


5. Install the power steering gear inlet hose retaining plate bolt (1) and tighten to **12 N·m (106 lb in)**.
6. Install the power steering gear inlet and outlet pipe clip bolt (2) and tighten to **9 N·m (80 lb in)**.
7. Raise the front frame to the vehicle body leaving approximately a half inch gap.

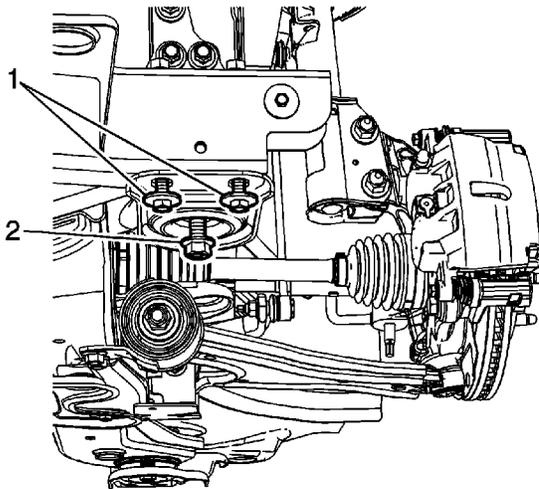


8. Install the left and right front frame reinforcement mounting bolts and tighten to **50 N·m (37 lb ft)**.

Left side is shown, right side is similar



9. Tighten the rear front frame mounting bolts (1) and tighten to **100 N·m (74 lb ft) plus 90 degrees**.



10. Tighten the front frame mounting bolts (2) and tighten to **100 N·m (74 lb ft) plus 90 degrees**.

Left side is shown, right side is similar

11. Tighten the front frame reinforcement mounting bolts (1) and tighten to **50 N·m (37 lb ft)**.

Left side is shown, right side is similar

12. Remove the adjustable jack stands from underneath the vehicle.  
13. Clean any excess fluid from the vehicle and remove the drain pans.

14. Install the underbody rear side rails. Refer to [Underbody Rear Side Rail Replacement](#).
15. Install the rear propeller shaft, if equipped. Refer to [Propeller Shaft Replacement](#).
16. Install the steering gear heat shields. Refer to [Steering Gear Heat Shield Replacement](#).
17. Install the right side catalytic convertor. Refer to [Catalytic Converter Replacement - Right Side](#).
18. Install the frame brace. Refer to [Frame Brace Replacement](#).
19. Connect the intermediate steering shaft to the steering gear. Refer to [Intermediate Steering Shaft Replacement](#).
20. Connect the stabilizer shaft links at the stabilizer shaft. Refer to [Stabilizer Shaft Link Replacement](#).
21. Connect the steering linkage outer tie rods to the steering knuckles. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
22. Fill and bleed the power steering system. Refer to [Power Steering System Bleeding](#).
23. Adjust the front toe. Refer to [Front Toe Adjustment](#).

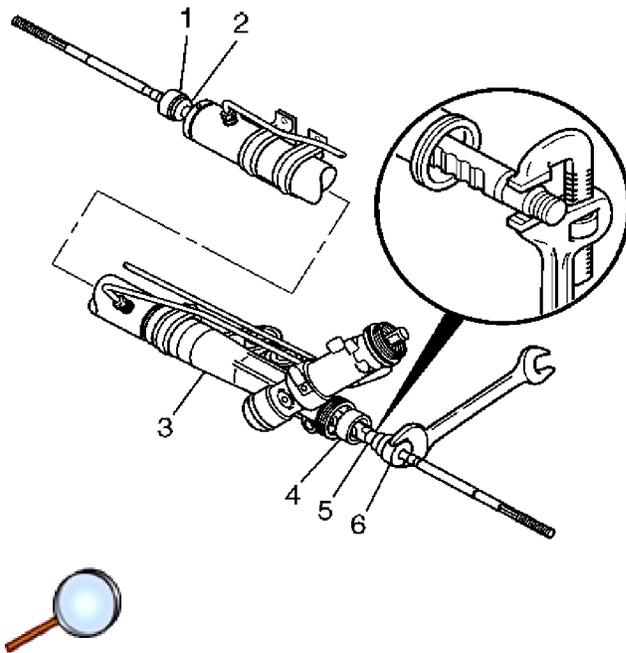
# Steering Linkage Inner Tie Rod Replacement

## Special Tools

*J 34028* Inner Tie Rod Wrench

## Disassembly Procedure

1. Remove the power steering gear from the vehicle. Refer to [Steering Gear Replacement](#).



**Note:** After removing the boot, inspect the inner tie rod for evidence of corrosion or contamination. If none is evident, continue with the repair. If corrosion or contamination is evident, replace the steering gear.

2. Remove the power steering gear boot.
3. Place the power steering gear in a vise.

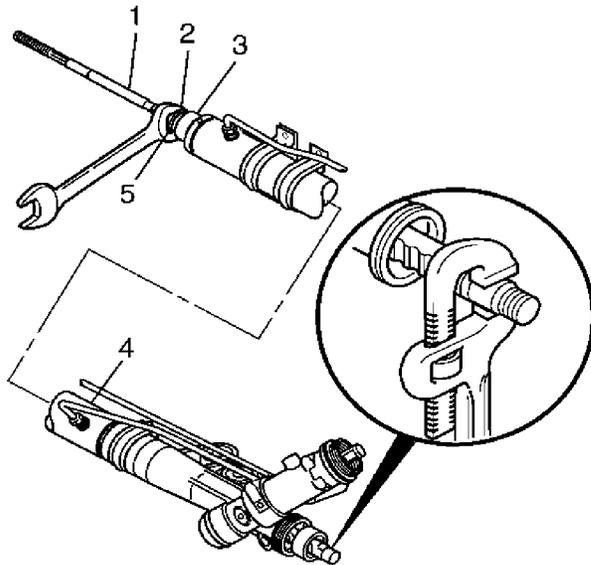
**Caution:** Do not change the steering gear preload adjustment before moving the inner tie rod from the steering gear. Changing the steering gear preload adjustment before moving the inner tie rod could result in damage to the pinion and the steering gear.

4. Remove the shock dampener (4) from the steering linkage inner tie rod (6).
5. Slide the shock dampener (4) back on the power steering gear (5).

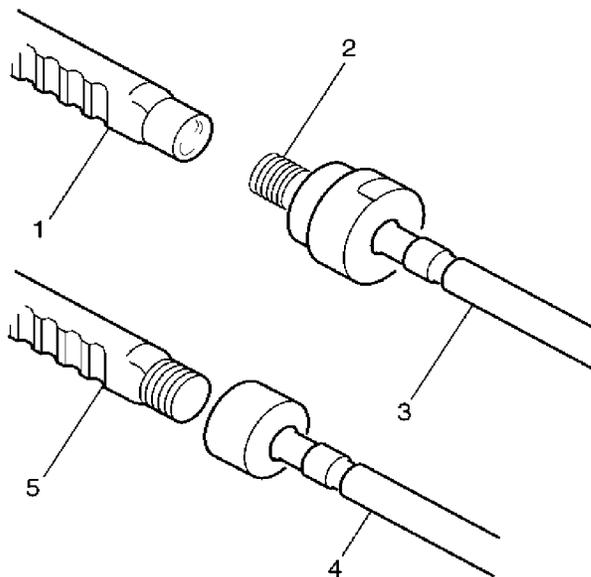
**Caution:** Refer to [Pipe Wrench Positioning Caution](#) in the Preface section.

6. Place a pipe wrench on the power steering gear rack (5) next to the power steering gear inner tie rod housing (6).
7. Place a wrench on the flats of the steering linkage inner tie rod housing (6).
8. Rotate the steering linkage inner tie rod housing (6) counter-clockwise, while holding the

power steering gear rack stationary, until the steering linkage inner tie rod separates from the power steering gear rack (5).



9. Remove the shock dampener (3) from the steering linkage inner tie rod housing (2).
10. Slide the shock dampener (3) back on the power steering gear rack (5).
11. Place a pipe wrench on the power steering gear rack.
12. Place a wrench on the flats of the steering linkage inner tie rod housing (2).
13. Rotate the steering linkage inner tie rod housing (2) counterclockwise, while holding the power steering gear rack stationary, until the steering linkage inner tie rod (1) separates from the power steering gear rack (5).

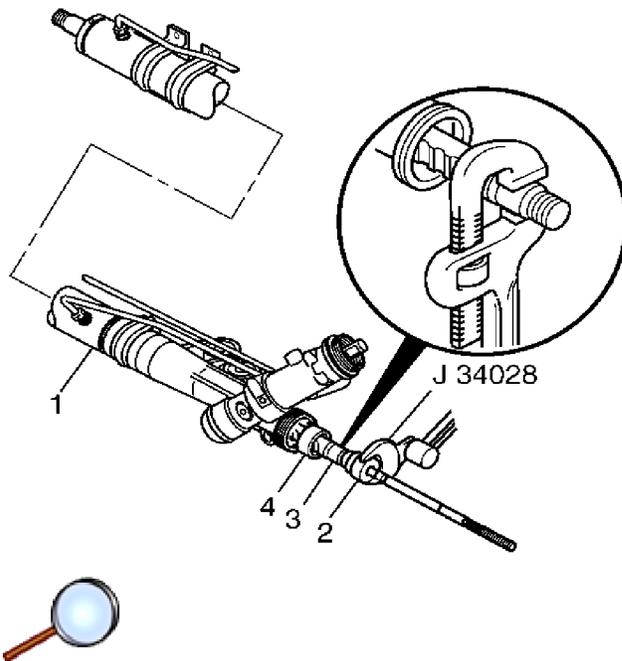


14. If a female power steering gear rack (1) and a male steering linkage inner tie rod (3) then remove the old LOCTITE® from the threads (2) of the steering linkage inner tie rod and the power steering gear rack.

If a male power steering gear rack (5) and a female steering linkage inner tie rod (4) then

LOCTITE® will not be present.

## Assembly Procedure



1. Slide the shock dampener (4) forward onto the power steering gear rack (3).

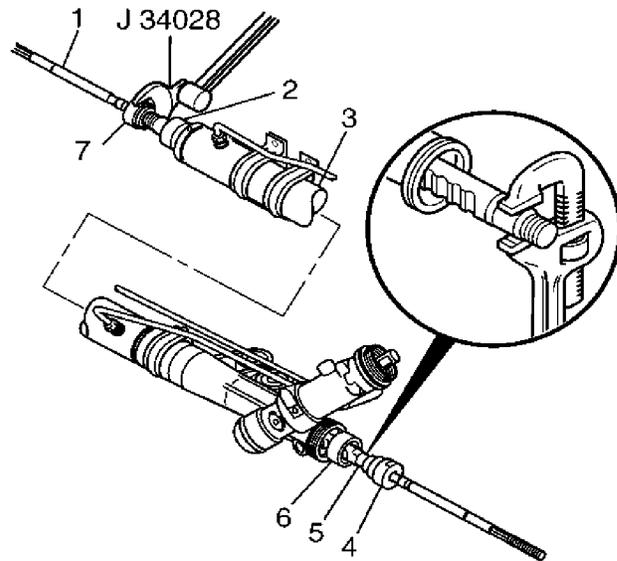
**Note:** Threads must be clean prior to the LOCTITE® application. Check the LOCTITE® or equivalent container for the expiration date. Use only enough LOCTITE® to evenly coat the threads.

If a male power steering gear rack (3) and a female steering linkage inner tie rod (2) then do not apply LOCTITE®.

2. If a female power steering gear rack (3) and a male steering linkage inner tie rod (2) then apply LOCTITE® 262 or equivalent to the steering linkage inner tie rod threads.
3. Attach the steering linkage inner tie rod onto the power steering gear rack (3).
4. Place a pipe wrench on the power steering gear rack (3) next to the steering linkage inner tie rod housing (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Place a torque wrench and the *J 34028* wrench on the flats of the steering linkage inner tie rod housing (2).
6. Tighten the steering linkage inner tie rod housing to **100 N·m (74 lb ft)**.

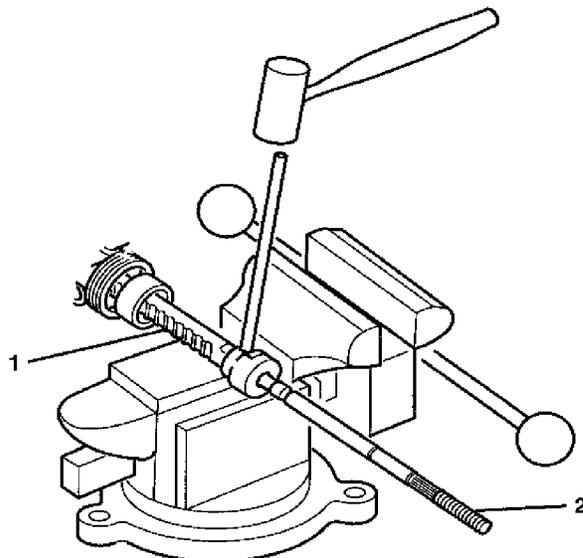


7. Slide the shock dampener (2) forward onto the power steering gear rack.

**Note:** Threads must be clean prior to LOCTITE® application. Check the LOCTITE® or equivalent container for the expiration date. Use only enough LOCTITE® to evenly coat the threads.

If a male power steering gear rack and a female steering linkage inner tie rod (1) then do not apply LOCTITE®.

8. If a female power steering gear rack and a male steering linkage inner tie rod (1) then apply LOCTITE® 262 or equivalent to the steering linkage inner tie rod threads.
9. Attach the steering linkage inner tie rod (1) onto the power steering gear rack.
10. Place a pipe wrench on the rack next to the steering linkage inner tie rod housing (4).
11. Place a torque wrench and [J 34028](#) on the flats of the steering linkage inner tie rod housing (7).
12. Tighten the steering linkage inner tie rod housing to **100 N·m (74 lb ft)**.

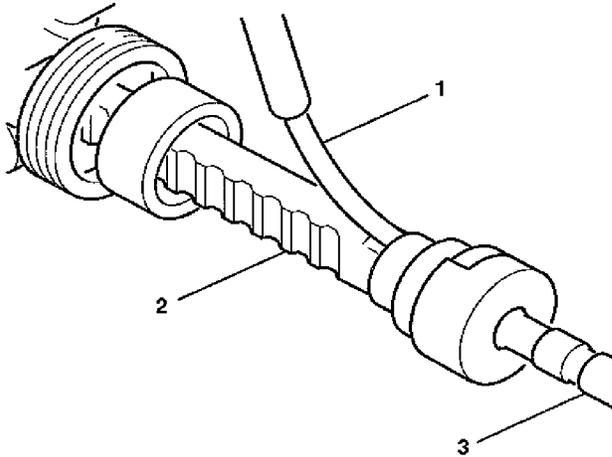




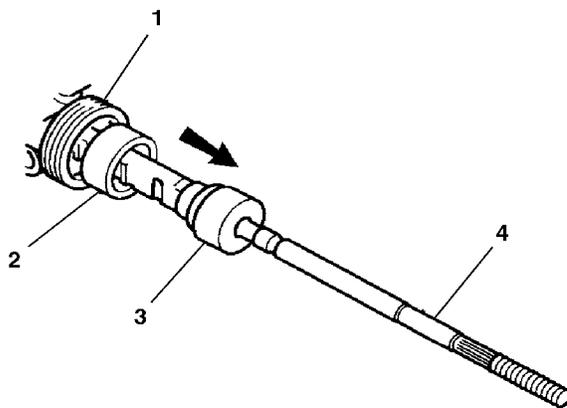
13. Place the steering linkage inner tie rod assembly (2) in a vise.

**Note:** If a female power steering gear rack (1) and a male steering linkage inner tie rod (2) then do not stake. If a male power steering gear rack (1) and a female steering linkage inner tie rod (2) then you must stake.

14. Stake both sides of the female steering linkage inner tie rod housing to the male power steering gear rack.

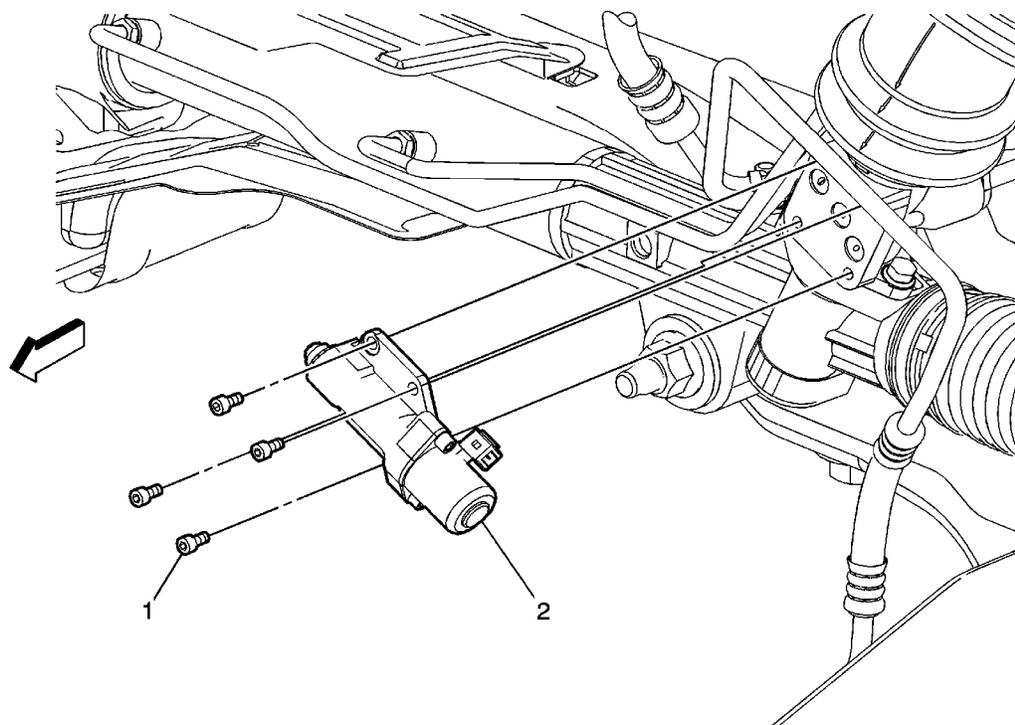


15. Insert a 0.25 mm gage (1) between the power steering gear rack (2) and the steering linkage inner tie rod housing in order to check both stakes. The feeler gage (1) must not pass between the power steering gear rack and the housing stake.



16. Slide the shock dampener (2) over the steering linkage inner tie rod housing (3) until the front lip of the shock dampener (2) bottoms against the steering linkage inner tie rod housing (3).
17. Install the power steering gear boot.
18. Install the power steering gear to the vehicle. Refer to [Steering Gear Replacement](#).

## Steering Gear Valve Solenoid Replacement



Callout	Component Name
<p><b>Preliminary Procedure</b></p> <p>Hoist the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a>.</p>	
<p>1</p>	<p>Steering Gear Valve Solenoid Bolt (Qty: 4)</p> <p><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.</p> <p><b>Tighten</b> 8 N·m (71 lb in)</p>
<p>2</p>	<p>Steering Gear Valve Solenoid</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Disconnect any electrical connectors as needed.</li> <li>2. Transfer or replace any O-ring seals as needed.</li> </ol>