

**2006 Chevrolet Impala LS**

2006 STEERING Power Steering System - Impala

**2006 STEERING****Power Steering System - Impala****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS****Fastener Tightening Specifications**

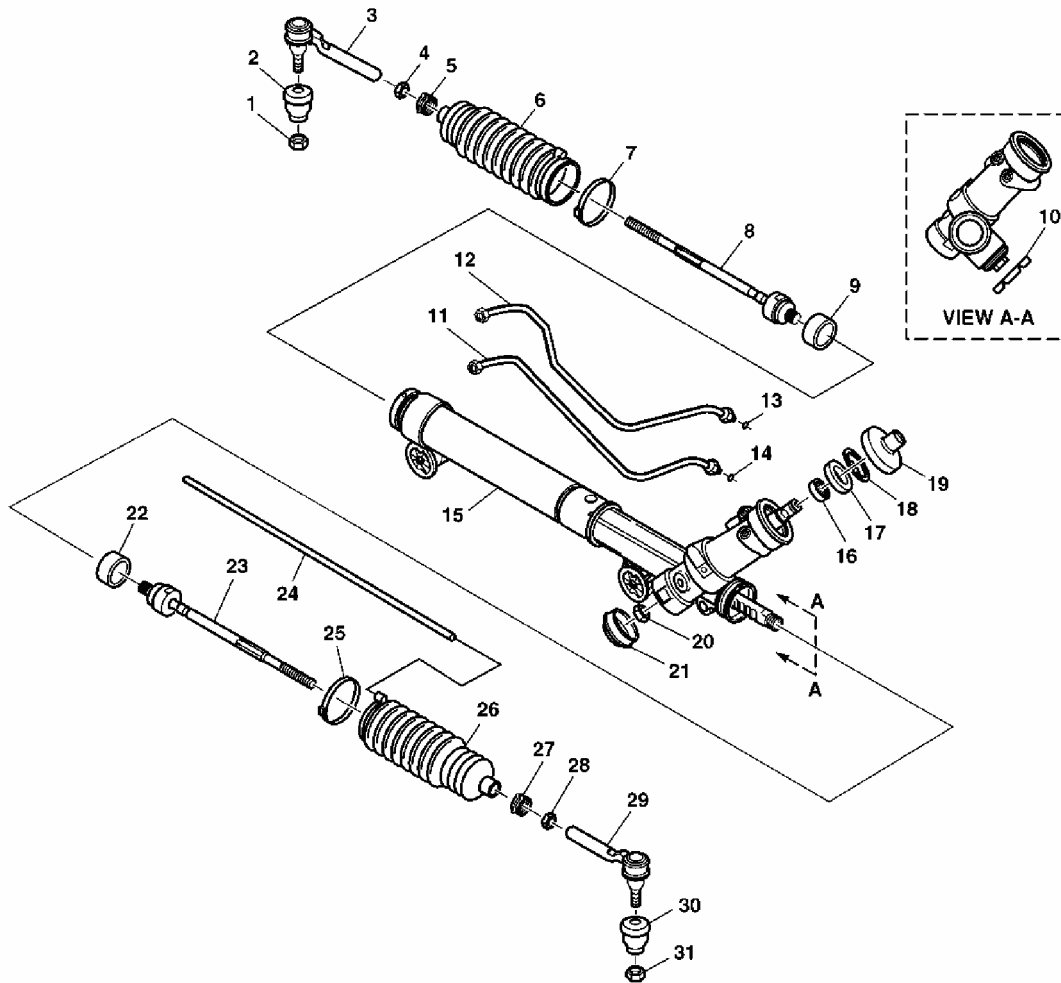
| Application                                                                              | Specification |                 |
|------------------------------------------------------------------------------------------|---------------|-----------------|
|                                                                                          | Metric        | English         |
| Inner Tie Rod                                                                            | 100 N.m       | 74 lb ft        |
| Outer Tie Rod End Jam Nut                                                                | 70 N.m        | 52 lb ft        |
| Outer Tie Rod End Nut *                                                                  | 30 N.m + 120° | 22 lb ft + 120° |
| Power Steering Cooler Retaining Nuts                                                     | 14 N.m        | 124 lb in       |
| Power Steering Gear Cylinder Line Fittings                                               | 17 N.m        | 13 lb ft        |
| Power Steering Gear Mounting Bolts                                                       | 88 N.m        | 65 lb ft        |
| Power Steering Pipe Fittings                                                             | 27 N.m        | 20 lb ft        |
| Power Steering Pressure Hose Bracket Bolt (V6)                                           | 23 N.m        | 17 lb ft        |
| Power Steering Pressure Hose Bracket Bolt (V8)                                           | 55 N.m        | 41 lb ft        |
| Power Steering Pressure Hose Clip Nut (V6)                                               | 9 N.m         | 80 lb in        |
| Power Steering Pump Flow Control Valve                                                   | 75 N.m        | 55 lb ft        |
| Power Steering Pump Mounting Bolts (V6)                                                  | 34 N.m        | 25 lb ft        |
| Power Steering Pump Mounting Bolts (V8)                                                  | 25 N.m        | 18 lb in        |
| Power Steering Remote Reservoir Bolt (V8)                                                | 25 N.m        | 18 lb in        |
| Rack Bearing Preload Lock Nut                                                            | 68 N.m        | 50 lb ft        |
| Reservoir Inlet Hose Clip Bolt (V6)                                                      | 58 N.m        | 43 lb ft        |
| Reservoir Inlet Pipe Bolt (V8)                                                           | 55 N.m        | 41 lb ft        |
| * Visually inspect to ensure that 21/2 - 41/2 threads are visible past the nylon washer. |               |                 |

**POWER STEERING PUMP SPECIFICATIONS****Power Steering Pump Specifications**

| Vehicle | Engine Code | Engine Size | High Flow |         | Pressure Relief |           |
|---------|-------------|-------------|-----------|---------|-----------------|-----------|
|         |             |             | LPM       | GPM     | kPa             | PSI       |
| W Chevy | LZ4/LZE     | 3.5L        | 9.1/10.6  | 2.4/2.8 | 9653/10342      | 1400/1500 |
|         | LZ9         | 3.9L        | 9.1/10.6  | 2.4/2.8 | 9653/10342      | 1400/1500 |
|         | LS4         | 5.3L        | 9.1/10.6  | 2.4/2.8 | 9846/10342      | 1428/1500 |

**COMPONENT LOCATOR**

**POWER STEERING GEAR DISASSEMBLED VIEW (RACK AND PINION)**



**Fig. 1: Rack and Pinion Power Steering Gear**  
**Courtesy of GENERAL MOTORS CORP.**

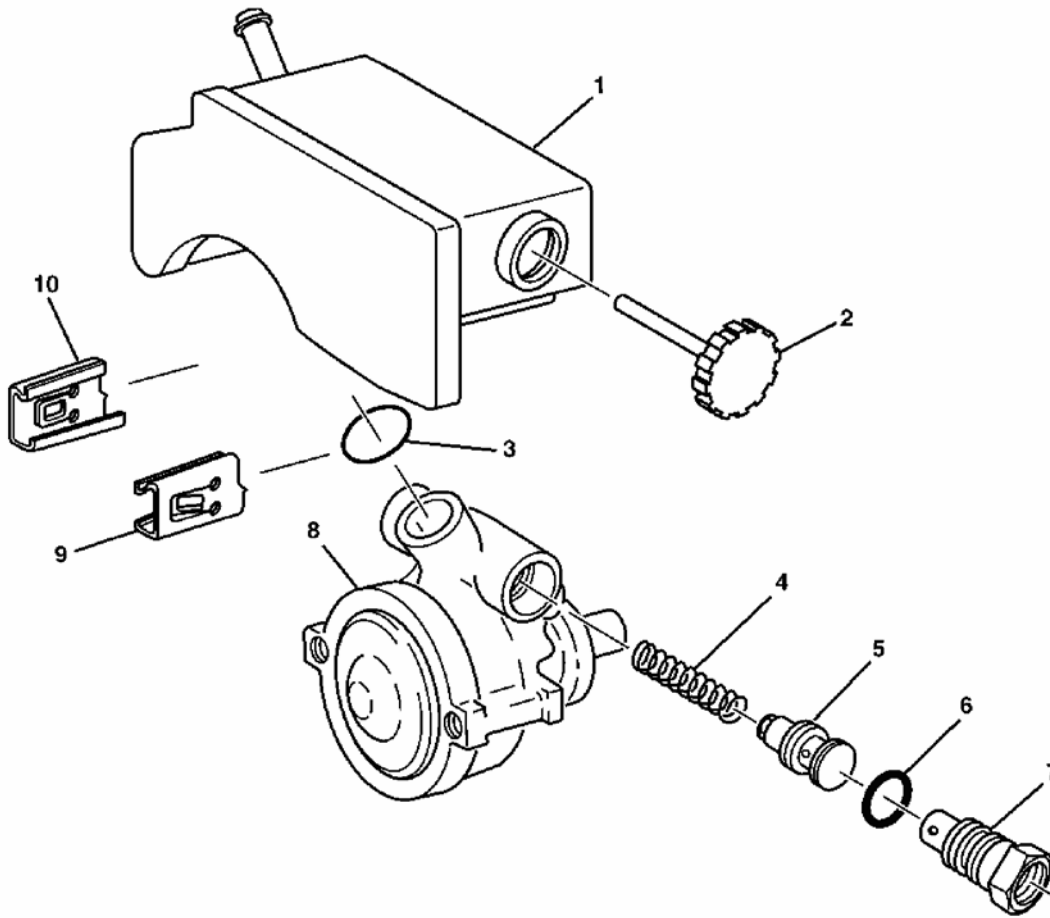
**Callouts For Fig. 1**

| Callout | Component Name                |
|---------|-------------------------------|
| 1       | Hexagon Torque Prevailing Nut |
| 2       | Tie Rod Seal                  |
| 3       | Outer Tie Road Assembly       |
| 4       | Hexagon Jam Nut               |
| 5       | Tie Rod End Clamp             |
| 6       | Rack and Pinion Boot          |
| 7       | Boot Clamp                    |
| 8       | Inner Tie Rod Assembly        |
| 9       | Shock Dampener Ring           |

**2006 Chevrolet Impala LS****2006 STEERING Power Steering System - Impala**

|    |                                         |
|----|-----------------------------------------|
| 10 | Adjuster Plug Lock Nut                  |
| 11 | Cylinder Line Assembly (RH)             |
| 12 | Cylinder Line Assembly (LH)             |
| 13 | O-Ring Seal                             |
| 14 | O-Ring Seal                             |
| 15 | Rack and Pinion Gear Assembly (Partial) |
| 16 | Needle Bearing Annulus Assembly         |
| 17 | Seal Adapter                            |
| 18 | Retaining Ring                          |
| 19 | Spool Shaft Seal                        |
| 20 | Hexagon Lock Nut                        |
| 21 | Dust Cover                              |
| 22 | Shock Dampener Ring                     |
| 23 | Inner Tie Rod Assembly                  |
| 24 | Breather Tube                           |
| 25 | Boot Clamp                              |
| 26 | Rack and Pinion Boot                    |
| 27 | Tie Rod End Clamp                       |
| 28 | Hexagon Jam Nut                         |
| 29 | Outer Tie Rod Assembly                  |
| 30 | Tie Rod Seal                            |
| 31 | Hexagon Torque Prevailing Nut           |

**POWER STEERING PUMP DISASSEMBLED VIEW (CB SERIES PUMP)**



**Fig. 2: Exploded View Of Power Steering Pump Components (CB Series)**  
**Courtesy of GENERAL MOTORS CORP.**

**Callouts For Fig. 2**

| Callout | Component Name                              |
|---------|---------------------------------------------|
| 1       | Hydraulic Pump Reservoir Assembly (Typical) |
| 2       | Reservoir Capstick Assembly                 |
| 3       | O-Ring Seal                                 |
| 4       | Flow Control Spring                         |
| 5       | Control Valve Assembly                      |
| 6       | O-Ring Seal                                 |
| 7       | O-Ring Union Fitting                        |
| 8       | Hydraulic Pump Housing Assembly             |
| 9       | Reservoir Retaining Clip (RH)               |
| 10      | Reservoir Retaining Clip (LH)               |

## DIAGNOSTIC INFORMATION AND PROCEDURES

### DIAGNOSTIC STARTING POINT - POWER STEERING SYSTEM (W/O ELECTRO-HYDRAULIC STEERING)

Begin the system diagnosis by reviewing the system Description and Operation. Refer to **Description and Operation**. Reviewing the Description and Operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the Description and Operation information will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Power Steering System** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

### SYMPTOMS - POWER STEERING SYSTEM

**IMPORTANT:** Review the system description and operation in order to familiarize yourself with the system functions. Refer to **Power Steering System Description and Operation (w/o Electro-Hydraulic Steering)**.

#### Visual/Physical Inspection

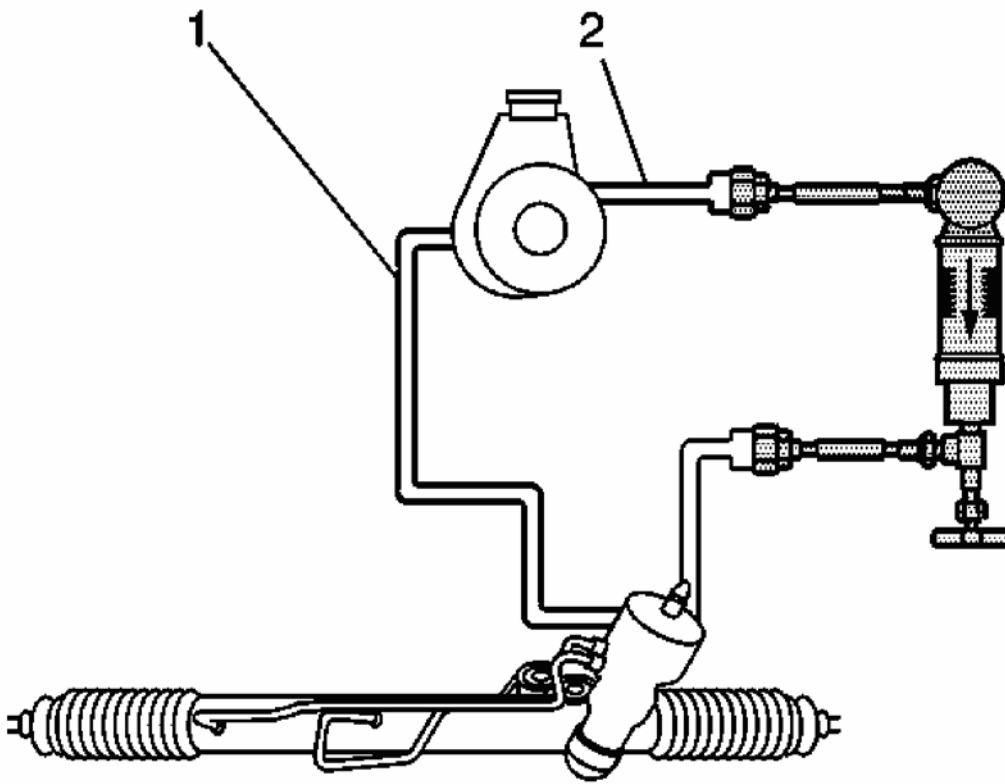
- Inspect for aftermarket devices which could affect the operation of the power steering system.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the power steering reservoir for the proper power steering fluid level and condition.

#### Symptoms List

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

- **Power Steering Fluid Leaks**
- **Rattle, Clunk, or Shudder Noise from the Power Steering System**
- **Whine or Growl Noise from the Power Steering System**
- **Steering Effort Hard or Too Easy in One or Both Directions**

### POWER STEERING SYSTEM TEST PROCEDURE



**Fig. 3: Testing Rack and Pinion System Pressures**  
 Courtesy of GENERAL MOTORS CORP.

**Callouts For Fig. 3**

| Callout | Component Name               |
|---------|------------------------------|
| 1       | Power Steering Return Hose   |
| 2       | Power Steering Pressure Hose |

**Test Description**

The numbers below refer to the step numbers on the diagnostic table.

**5:** This step tests the system for restrictions.

**7:** This step tests the following components for the following conditions:

- The pump for internal leaks
- The power steering pipes for kinks

**8:** This step tests the ability of the pump to regulate flow at maximum pressure.

**10:** This step tests the ability of the pump to regulate flow under normal operating

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

conditions.

**12:** This step tests the internal components of the pump and the gear.

#### Power Steering System Test Procedure

| Step                                                                                                                                                                                                                                                                                                                                               | Action                                                                                                                                                                                                                                                                                                                                                                                                                      | Value(s) | Yes                 | No                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|---------------------|
| <p>DEFINITION: The Power Steering System Test Procedure will perform the following functions:</p> <ul style="list-style-type: none"> <li>• Test the operation of the hydraulic power steering system.</li> <li>• Test the operation of the power steering pump and power steering gear.</li> <li>• Identify restrictions in the system.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                             |          |                     |                     |
| 1                                                                                                                                                                                                                                                                                                                                                  | <p>Inspect the power steering fluid for the following indications of contamination:</p> <ul style="list-style-type: none"> <li>• Milky fluid - water</li> <li>• Brown fluid - burnt</li> <li>• Debris in fluid - plastic or dirt</li> </ul> <p>Is the fluid free of contamination?</p>                                                                                                                                      | -        | Go to <b>Step 3</b> | Go to <b>Step 2</b> |
| 2                                                                                                                                                                                                                                                                                                                                                  | <p>Flush the power steering system. Refer to <b>Flushing the Power Steering System</b>.</p> <p>Did you complete the procedure?</p>                                                                                                                                                                                                                                                                                          | -        | Go to <b>Step 3</b> | -                   |
| 3                                                                                                                                                                                                                                                                                                                                                  | <p><b>IMPORTANT:</b><br/>In order to accurately diagnose the system, the malfunction must be present during the test procedure.</p> <p>Attempt to duplicate the condition. Is the condition present?</p>                                                                                                                                                                                                                    | -        | Go to <b>Step 4</b> | System OK           |
| 4                                                                                                                                                                                                                                                                                                                                                  | <ol style="list-style-type: none"> <li>1. Turn the ignition switch to the OFF position.</li> <li>2. Place a drain pan under the vehicle in order to catch any power steering fluid.</li> <li>3. Disconnect the power steering pressure pipe/hose from the power steering pump or the power steering gear as necessary.</li> <li>4. Install the <b>J 44721</b> Power Steering System Analyzer. See <b>Special</b></li> </ol> | -        |                     |                     |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |                     |                     |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------------|
|   | <p><b><u>Tools.</u></b></p> <p>5. Fill the power steering system.<br/>Refer to <b><u>Checking and Adding Power Steering Fluid.</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                     |                     |
|   | Did you complete the installation?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       | Go to <b>Step 5</b> | -                   |
| 5 | <p>1. Fully open the <b>J 44721</b> valve. See <b><u>Special Tools.</u></b></p> <p>2. Start the engine.</p> <p><b>NOTE:</b><br/><b>Refer to STEERING WHEEL IN THE FULL TURN POSITION NOTICE in Cautions and Notices.</b></p> <p>3. Turn the steering wheel and BRIEFLY hold the steering wheel against the steering stop in order to release any trapped air from the system.</p> <p>4. Inspect and ensure that all of the power steering pipe/hose connections are not leaking.</p> <p>5. Making sure the steering wheel is OFF the steering stop, observe the pressure reading.</p> <p>Is the pressure reading greater than the specified value?</p> | 1379 kPa<br>(200 psi) |                     |                     |
| 6 | <p><b>IMPORTANT:</b><br/><b>A restriction may be present in the power steering system. Turn off the engine IMMEDIATELY.</b></p> <p>Locate and repair the restriction.Did you complete the repair?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -                     | Go to <b>Step 6</b> | Go to <b>Step 7</b> |
| 7 | <p>1. Allow the engine to run until the engine reaches full operating temperature.</p> <p>2. Record the pressure reading and flow reading.</p> <p>3. Partially close the <b>J 44721</b> valve until the system pressure reaches</p>                                                                                                                                                                                                                                                                                                                                                                                                                    | 4827 kPa              |                     |                     |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |                      |                      |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------|----------------------|
|    | <p>the specified value, then record the FLOW reading. See <b>Special Tools</b>.</p> <p>4. Subtract second flow reading from the first flow reading.</p> <p>Is the flow DECREASE greater than 3.8 L (1 gal) per minute?</p>                                                                                                                                                                                                                | (700 psi) | Go to <b>Step 13</b> | Go to <b>Step 8</b>  |
| 8  | <p><b>NOTE:</b><br/>Do not leave the valve fully closed for more than 5 seconds, or the pump could be damaged internally.</p> <p>Fully close then open the <b>J 44721</b> valve 3 times. See <b>Special Tools</b>. Record all of the high pressure readings. Refer to <b>Power Steering Pump Specifications</b> for power steering system pressure relief specifications. Are the three high pressure readings within specifications?</p> | -         | Go to <b>Step 9</b>  | Go to <b>Step 15</b> |
| 9  | Are the three high pressure readings within 245 kPa (50 psi) of each other?                                                                                                                                                                                                                                                                                                                                                               | -         | Go to <b>Step 10</b> | Go to <b>Step 14</b> |
| 10 | <p>1. Increase the engine speed to approximately 1500 RPM.</p> <p>2. Record the flow reading. Refer to <b>Power Steering Pump Specifications</b> for power steering system pressure specifications.</p> <p>Is the actual flow reading within specifications?</p>                                                                                                                                                                          | -         | Go to <b>Step 11</b> | Go to <b>Step 13</b> |
| 11 | Is the difference between the actual flow reading and the maximum flow specification more than 3.8 L (1 gal) per minute?                                                                                                                                                                                                                                                                                                                  | -         | Go to <b>Step 16</b> | Go to <b>Step 12</b> |
| 12 | <p><b>NOTE:</b><br/>Refer to <b>STEERING WHEEL IN THE FULL TURN POSITION NOTICE</b> in <b>Cautions and Notices</b>.</p> <p>Turn the steering wheel from steering stop to steering stop and record the FLOW readings at each stop. Is the flow LOWER than 3.8 L (1 gal) per minute?</p>                                                                                                                                                    | -         | Go to <b>Step 18</b> | Go to <b>Step 17</b> |
|    | Replace the power steering pump. Refer                                                                                                                                                                                                                                                                                                                                                                                                    |           |                      |                      |

# 2006 Chevrolet Impala LS

## 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |               |   |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------|---|
| 13 | <p>to <b>Power Steering Pump Replacement (LS4) or Power Steering Pump Replacement (LZ4/LZE/LZ9)</b>.<br/>Did you complete the replacement?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | - | Go to Step 18 | - |
| 14 | <p>1. Remove the power steering pump flow control valve. Refer to <b>Power Steering Pump Flow Control Valve Replacement - Off Vehicle (CB Series)</b>.</p> <p>2. Inspect the flow control valve.</p> <p>If any burrs or scratches are noticed on the flow control valve, replace the flow control valve. Do NOT attempt to clean the flow control valve. Refer to <b>Power Steering Pump Flow Control Valve Replacement - Off Vehicle (CB Series)</b>.</p> <p>3. Inspect the flow control valve bore.</p> <p>If any burrs or scratches are present in the control valve bore, replace the power steering pump. Refer to <b>Power Steering Pump Replacement (LS4) or Power Steering Pump Replacement (LZ4/LZE/LZ9)</b>.</p> <p>Did you complete the repair?</p> | - | Go to Step 18 | - |
| 15 | <p>Replace the power steering pump flow control valve. Refer to <b>Power Steering Pump Flow Control Valve Replacement - Off Vehicle (CB Series)</b>.<br/>Did you complete the replacement?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | - | Go to Step 18 | - |
|    | <p>1. Remove the power steering pump flow control valve and inspect for any wear or damage. Do NOT disassemble the flow control valve.</p> <p>2. If the flow control valve is worn</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |               |   |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                                                                                     |   |                      |                      |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------|----------------------|
| 16 | damaged, replace the flow control valve. Refer to <b><u>Power Steering Pump Flow Control Valve Replacement - Off Vehicle (CB Series)</u></b> .<br>Did you complete the repair?                                                                                                                                      | - | Go to <b>Step 18</b> | -                    |
| 17 | The power steering gear is leaking across the piston or bypassing the valve circuit. Replace the power steering gear. Refer to <b><u>Power Steering Gear Replacement</u></b> .<br>Did you complete the replacement?                                                                                                 | - | Go to <b>Step 18</b> | -                    |
| 18 | Test the power steering system for the original condition.<br>Does the original condition still exist?                                                                                                                                                                                                              | - | Go to <b>Step 5</b>  | Go to <b>Step 19</b> |
| 19 | 1. Disconnect and remove the <b>J 44721</b> from the vehicle. See <b><u>Special Tools</u></b> .<br>2. Connect the vehicle power steering pipes/hoses.<br>3. Bleed the power steering system and add fluid as necessary. Refer to <b><u>Bleeding the Power Steering System</u></b> .<br>Did you complete the repair? | - | System OK            | -                    |

## POWER STEERING FLUID LEAKS

### Power Steering Fluid Leaks

| Step | Action                                                                                              | Yes                 | No                                                   |
|------|-----------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------|
| 1    | Did you review the Power Steering System General Description and perform the necessary inspections? | Go to <b>Step 2</b> | Go to <b><u>Symptoms - Power Steering System</u></b> |
| 2    | Verify that power steering fluid leaks are present.<br>Is the power steering system leaking?        | Go to <b>Step 3</b> | System OK                                            |
| 3    | Inspect the power steering system fittings.<br>Are the fittings leaking?                            | Go to <b>Step 8</b> | Go to <b>Step 4</b>                                  |
| 4    | Inspect the power steering hoses.                                                                   |                     |                                                      |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |                     |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------|
|    | Are the hoses leaking?                                                                                                                                                                                                                                                                                                                                                                                            | Go to <b>Step 9</b>  | Go to <b>Step 5</b> |
| 5  | Inspect the power steering sensors.<br>Are the sensors leaking?                                                                                                                                                                                                                                                                                                                                                   | Go to <b>Step 10</b> | Go to <b>Step 6</b> |
| 6  | Inspect the power steering pump and the reservoir for leaks.<br>Is the power steering pump or reservoir leaking?                                                                                                                                                                                                                                                                                                  | Go to <b>Step 11</b> | Go to <b>Step 7</b> |
| 7  | Inspect the power steering gear for leaks.<br>Is the power steering gear leaking?                                                                                                                                                                                                                                                                                                                                 | Go to <b>Step 12</b> | Go to <b>Step 8</b> |
| 8  | <b>NOTE:</b><br><b>Refer to FASTENER NOTICE in Cautions and Notices.</b><br><br>Tighten the fittings. Refer to <b>Fastener Tightening Specifications</b> . Did you complete the repair?                                                                                                                                                                                                                           | Go to <b>Step 13</b> | -                   |
| 9  | Replace the power steering hoses. Refer to the appropriate procedure(s):<br><br><ul style="list-style-type: none"> <li>• <b>Power Steering Pressure Pipe/Hose Replacement (LS4) or Power Steering Pressure Pipe/Hose Replacement (LZ4/LZE/LZ9)</b></li> <li>• <b>Power Steering Return Hose Replacement (LS4) or Power Steering Return Hose Replacement (LZ4/LZE/LZ9)</b></li> </ul> Did you complete the repair? | Go to <b>Step 13</b> | -                   |
| 10 | Replace the power steering sensors.<br>Did you complete the repair?                                                                                                                                                                                                                                                                                                                                               | Go to <b>Step 13</b> | -                   |
| 11 | Replace the power steering pump or reservoir. Refer to <b>Power Steering Pump Replacement (LS4) or Power Steering Pump Replacement (LZ4/LZE/LZ9) or Power Steering Reservoir Replacement - Off Vehicle (CB Series)</b> .<br>Did you complete the repair?                                                                                                                                                          | Go to <b>Step 13</b> | -                   |
| 12 | Replace the power steering gear. Refer to <b>Power Steering Gear Replacement</b> .<br>Did you complete the repair?                                                                                                                                                                                                                                                                                                | Go to <b>Step 13</b> | -                   |
|    | Operate the system in order to verify the                                                                                                                                                                                                                                                                                                                                                                         |                      |                     |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                           |           |                     |
|----|-------------------------------------------|-----------|---------------------|
| 13 | repair.<br>Did you correct the condition? | System OK | Go to <b>Step 3</b> |
|----|-------------------------------------------|-----------|---------------------|

### RATTLE, CLUNK, OR SHUDDER NOISE FROM THE POWER STEERING SYSTEM

#### Rattle, Clunk, or Shudder Noise from the Power Steering System

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                        | Yes                  | No                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------|
| 1    | Did you review the Power Steering System General Description and perform the necessary inspections?                                                                                                                                                                                                                                                                                                                           | Go to <b>Step 2</b>  | Go to <b>Symptoms - Power Steering System</b> |
| 2    | Verify that a rattle, clunk or shudder noise is present.<br>Is a rattle, clunk or shudder noise present?                                                                                                                                                                                                                                                                                                                      | Go to <b>Step 3</b>  | System OK                                     |
| 3    | Inspect the power steering hoses for proper routing and clearance.<br>Is the routing or clearance of the power steering hoses incorrect?                                                                                                                                                                                                                                                                                      | Go to <b>Step 11</b> | Go to <b>Step 4</b>                           |
| 4    | Inspect the engine drive belt for cracking or excessive wear. Refer to one of the following procedures: <ul style="list-style-type: none"> <li>• <b>Drive Belt Excessive Wear Diagnosis</b> for the 3.5L engine</li> <li>• <b>Drive Belt Excessive Wear Diagnosis</b> for the 3.9L engine</li> <li>• <b>Drive Belt Excessive Wear Diagnosis</b> for the 5.3L engine</li> </ul> Is the drive belt cracked or excessively worn? | Go to <b>Step 12</b> | Go to <b>Step 5</b>                           |
| 5    | Inspect the power steering pump pulley for damage.<br>Is the power steering pump pulley damaged?                                                                                                                                                                                                                                                                                                                              | Go to <b>Step 13</b> | Go to <b>Step 6</b>                           |
| 6    | Inspect the power steering pump for the proper installation. Refer to <b>Power Steering Pump Replacement (LS4)</b> or <b>Power Steering Pump Replacement (LZ4/LZE/LZ9)</b> .<br>Is the power steering pump installation incorrect?                                                                                                                                                                                            | Go to <b>Step 14</b> | Go to <b>Step 7</b>                           |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                      |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|
| 7  | <p>Inspect the power steering gear for the proper installation. Refer to <b><u>Power Steering Gear Replacement</u></b>.</p> <p>Is the power steering gear installation incorrect?</p>                                                                                                                                                                                                                                                                                                                  | Go to <b>Step 15</b> | Go to <b>Step 8</b>  |
| 8  | <p>Inspect the rack and pinion gear rack bearing preload adjustment. Refer to <b><u>Rack and Pinion Gear Rack Bearing Preload Adjustment - Off Vehicle (Rack and Pinion)</u></b>.</p> <p>Is the rack and pinion preload adjustment incorrect?</p>                                                                                                                                                                                                                                                      | Go to <b>Step 16</b> | Go to <b>Step 9</b>  |
| 9  | <p>Inspect the suspension.</p> <p>Is the suspension worn?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                          | Go to <b>Step 17</b> | Go to <b>Step 10</b> |
| 10 | <p>Inspect the intermediate steering shaft.</p> <p>Is the intermediate steering shaft worn?</p>                                                                                                                                                                                                                                                                                                                                                                                                        | Go to <b>Step 18</b> | Go to <b>Step 3</b>  |
| 11 | <p>Adjust or replace the hoses. Refer to the appropriate procedure(s):</p> <ul style="list-style-type: none"> <li>• <b><u>Power Steering Cooler Pipe/Hose Replacement</u></b></li> <li>• <b><u>Power Steering Pressure Pipe/Hose Replacement (LS4) or Power Steering Pressure Pipe/Hose Replacement (LZ4/LZE/LZ9)</u></b></li> <li>• <b><u>Power Steering Return Hose Replacement (LS4) or Power Steering Return Hose Replacement (LZ4/LZE/LZ9)</u></b></li> </ul> <p>Did you complete the repair?</p> | Go to <b>Step 19</b> | -                    |
| 12 | <p>Replace the engine drive belt. Refer to one of the following procedures:</p> <ul style="list-style-type: none"> <li>• <b><u>Drive Belt Replacement</u></b> for the 3.5L engine</li> <li>• <b><u>Drive Belt Replacement</u></b> for the 3.9L engine</li> <li>• <b><u>Drive Belt Replacement - Accessory</u></b> for the 5.3L engine</li> </ul>                                                                                                                                                       |                      |                      |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                               |                      |                     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------|
|    | Did you complete the repair?                                                                                                                                                                  | Go to <b>Step 19</b> | -                   |
| 13 | Replace the power steering pump pulley. Refer to <b>Power Steering Pulley Replacement (LS4)</b> or <b>Power Steering Pulley Replacement (LZ4/LZE/LZ9)</b> . Did you complete the replacement? | Go to <b>Step 19</b> | -                   |
| 14 | Install the power steering pump correctly. Refer to <b>Power Steering Pump Replacement (LS4)</b> or <b>Power Steering Pump Replacement (LZ4/LZE/LZ9)</b> . Did you complete the repair?       | Go to <b>Step 19</b> | -                   |
| 15 | Install the power steering gear correctly. Refer to <b>Power Steering Gear Replacement</b> . Did you complete the repair?                                                                     | Go to <b>Step 19</b> | -                   |
| 16 | Adjust the rack and pinion preload. Refer to <b>Rack and Pinion Gear Rack Bearing Preload Adjustment - Off Vehicle (Rack and Pinion)</b> . Did you complete the repair?                       | Go to <b>Step 19</b> | -                   |
| 17 | Replace the worn suspension components. Refer to <b>Diagnostic Starting Point - Suspension General Diagnosis</b> . Did you complete the replacement?                                          | Go to <b>Step 19</b> | -                   |
| 18 | Replace the intermediate shaft. Refer to <b>Intermediate Steering Shaft Replacement</b> . Did you complete the replacement?                                                                   | Go to <b>Step 19</b> | -                   |
| 19 | Operate the system in order to verify the repair. Did you correct the condition?                                                                                                              | System OK            | Go to <b>Step 3</b> |

### WHINE OR GROWL NOISE FROM THE POWER STEERING SYSTEM

#### Whine or Growl Noise from the Power Steering System

| Step | Action                                                                                      | Yes                 | No                                            |
|------|---------------------------------------------------------------------------------------------|---------------------|-----------------------------------------------|
| 1    | Did you review the Power Steering System Description and perform the necessary inspections? | Go to <b>Step 2</b> | Go to <b>Symptoms - Power Steering System</b> |
| 2    | Verify that a whine or growl noise is present.                                              |                     |                                               |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|    |                                                                                                                                                                                                                                                |                      |                     |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------|
|    | Is a whine or growl noise present?                                                                                                                                                                                                             | Go to <b>Step 3</b>  | System OK           |
| 3  | Perform the power steering test procedure in order to diagnose a hydraulic condition and repair or replace a component. Refer to <b>Power Steering System Test Procedure</b> .<br>Did you repair or replace a power steering system component? | Go to <b>Step 10</b> | Go to <b>Step 4</b> |
| 4  | Using the <b>J 39570</b> Chassis Ear, inspect the power steering gear for a whine or growl noise.<br>Is the noise present at the power steering gear?                                                                                          | Go to <b>Step 7</b>  | Go to <b>Step 5</b> |
| 5  | Using the <b>J 39570</b> , inspect the power steering pump for a whine or growl noise.<br>Is the noise present at the power steering pump?                                                                                                     | Go to <b>Step 8</b>  | Go to <b>Step 6</b> |
| 6  | Using the <b>J 39570</b> , inspect the power steering hoses for a whine or growl noise.<br>Is the noise present at the power steering hoses?                                                                                                   | Go to <b>Step 9</b>  | Go to <b>Step 2</b> |
| 7  | Replace the power steering gear. Refer to <b>Power Steering Gear Replacement</b> .<br>Did you complete the repair?                                                                                                                             | Go to <b>Step 10</b> | -                   |
| 8  | Replace the power steering pump. Refer to <b>Power Steering Pump Replacement (LS4)</b> or <b>Power Steering Pump Replacement (LZ4/LZE/LZ9)</b> .<br>Did you complete the repair?                                                               | Go to <b>Step 10</b> | -                   |
| 9  | Adjust the routing of the power steering hoses.<br>Did you complete the repair?                                                                                                                                                                | Go to <b>Step 10</b> | -                   |
| 10 | Operate the system in order to verify the repair.<br>Did you correct the condition?                                                                                                                                                            | System OK            | Go to <b>Step 3</b> |

### STEERING EFFORT HARD OR TOO EASY IN ONE OR BOTH DIRECTIONS

#### Steering Effort Hard or Too Easy in One or Both Directions

| Step | Action                                                                                              | Yes | No                                     |
|------|-----------------------------------------------------------------------------------------------------|-----|----------------------------------------|
| 1    | Did you review the Power Steering System General Description and perform the necessary inspections? |     | Go to <b>Symptoms - Power Steering</b> |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|   |                                                                                                                                         | Go to <b>Step 2</b> | <b>System</b>       |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|
| 2 | Verify that the steering effort is hard or too easy in one or both directions.<br>Does the system operate normally?                     | System OK           | Go to <b>Step 3</b> |
| 3 | Perform the power steering test procedure.<br>Refer to <b>Power Steering System Test Procedure</b> .<br>Did you complete the procedure? | Go to <b>Step 4</b> | -                   |
| 4 | Operate the system in order to verify the repair.<br>Did you correct the condition?                                                     | System OK           | Go to <b>Step 3</b> |

## REPAIR INSTRUCTIONS

### BLEEDING THE POWER STEERING SYSTEM

#### Tools Required

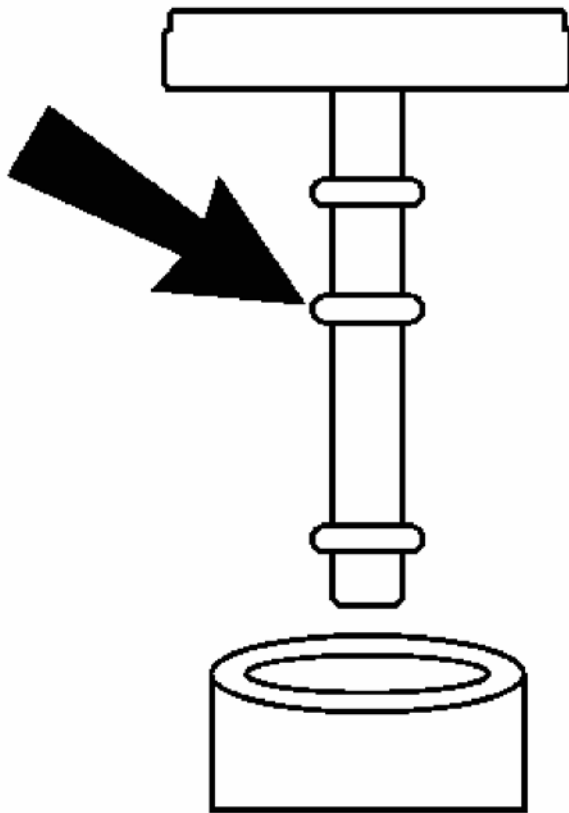
- **J 35555** Metal Mityvac. See **Special Tools**.
- **J 43485** Power Steering Bleeder Adapter. See **Special Tools**.

**IMPORTANT: Hoses touching the frame, body, or engine may cause system noise.**

1. Verify that the hoses do not touch any other part of the vehicle.

**IMPORTANT: Loose connections may not leak, but could allow air into the steering system.**

2. Verify that all hose connections are tight.



**Fig. 4: Identifying FULL COLD Level On Reservoir Cap**  
Courtesy of GENERAL MOTORS CORP.

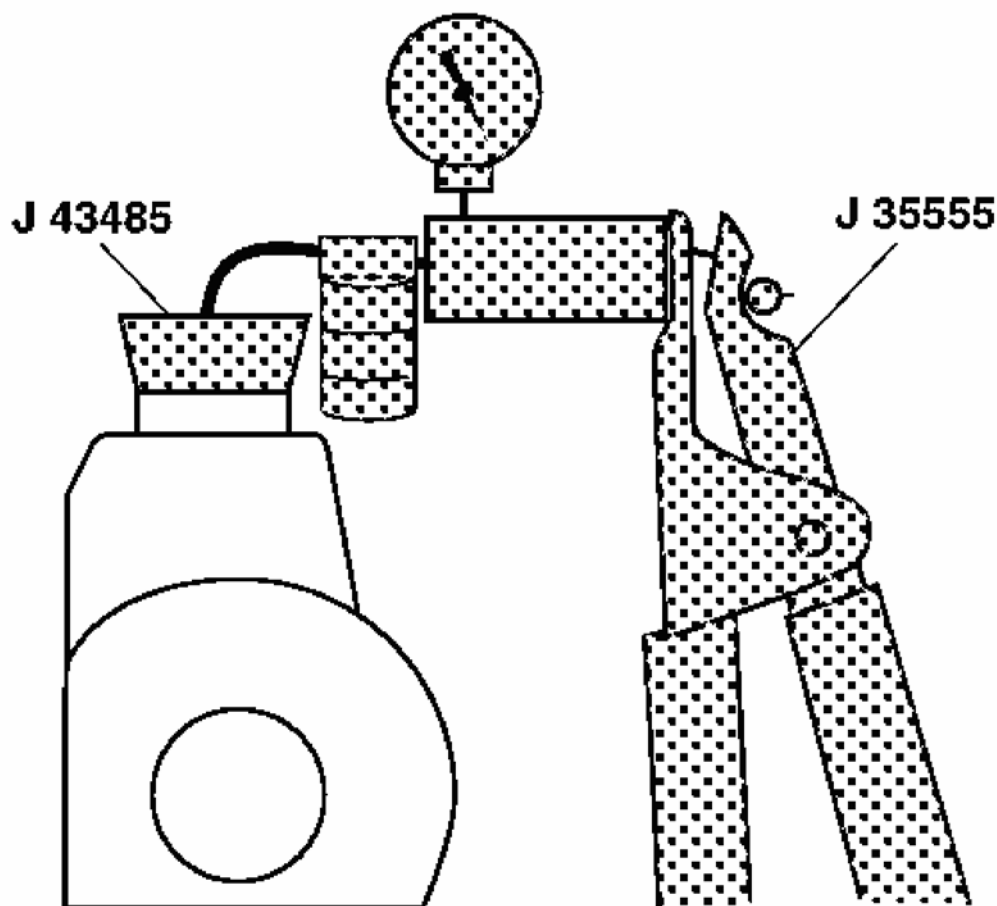
**NOTE:** If the power steering system has been serviced, an accurate fluid level reading cannot be obtained unless air is bled from the steering system. The air in the fluid may cause pump cavitation noise and may cause pump damage over a period of time.

**IMPORTANT:** Maintain the fluid level throughout the bleed procedure.

3. Remove the pump reservoir cap.

**IMPORTANT:** Use clean, new power steering fluid only.

4. Fill the pump reservoir with fluid to the FULL COLD level.



**Fig. 5: Bleeding Power Steering System Using J 43485 & J 35555**  
Courtesy of GENERAL MOTORS CORP.

5. Attach the J 43485 to the J 35555 or equivalent. See Special Tools.
6. Place the J 43485 on or in the pump reservoir filler neck. See Special Tools.
7. Apply a vacuum of 68 kPa (20 in Hg) maximum.
8. Wait 5 minutes.

Typical vacuum drop is 7-10 kPa (2-3 in Hg). If the vacuum does not remain steady, refer to Excessive Vacuum Drop Diagnosis at the end of this procedure.

9. Remove the J 43485 and the J 35555 . See Special Tools.

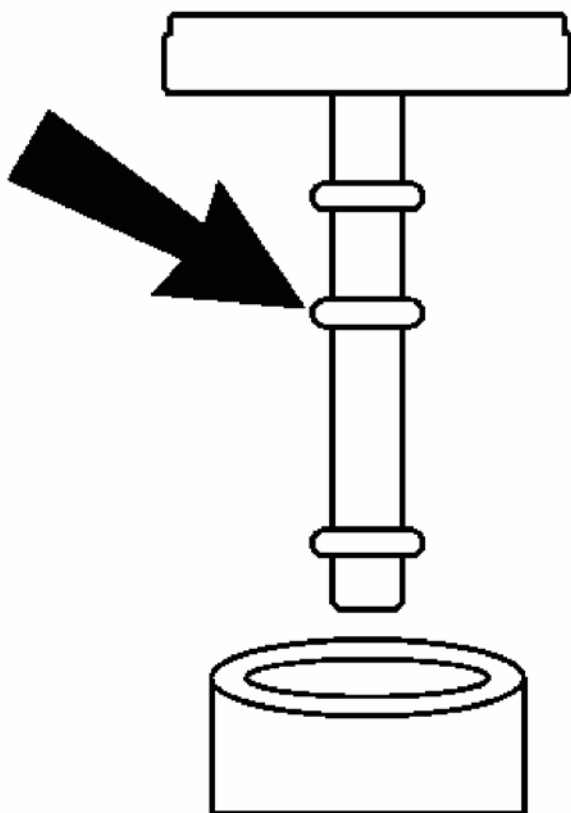
10. Reinstall the pump reservoir cap.
11. Start the engine. Allow the engine to idle.
12. Turn off the engine.
13. Verify the fluid level. Repeat steps 11-13 until the fluid stabilizes.

**IMPORTANT: Do not turn steering wheel to lock.**

14. Start the engine. Allow the engine to idle.
15. Turn the steering wheel 180-360 degrees in both directions 5 times.
16. Switch the ignition off.

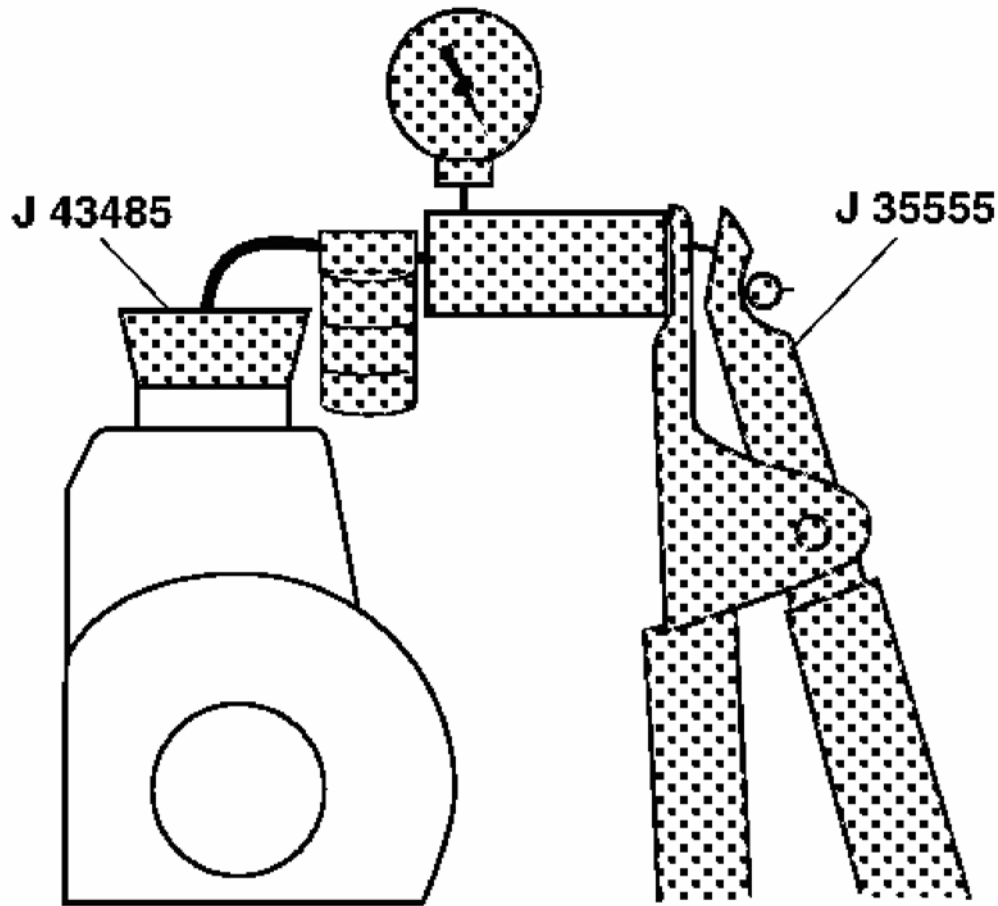
**NOTE: When adding fluid or making a complete fluid change, always use the proper power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.**

17. Verify the fluid level.



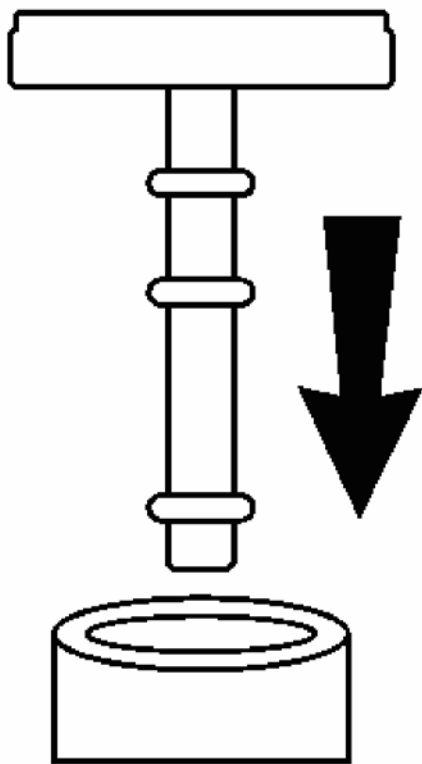
**Fig. 6: Identifying FULL COLD Level On Reservoir Cap**  
**Courtesy of GENERAL MOTORS CORP.**

18. Remove the pump reservoir cap.



**Fig. 7: Bleeding Power Steering System Using J 43485 & J 35555**  
Courtesy of GENERAL MOTORS CORP.

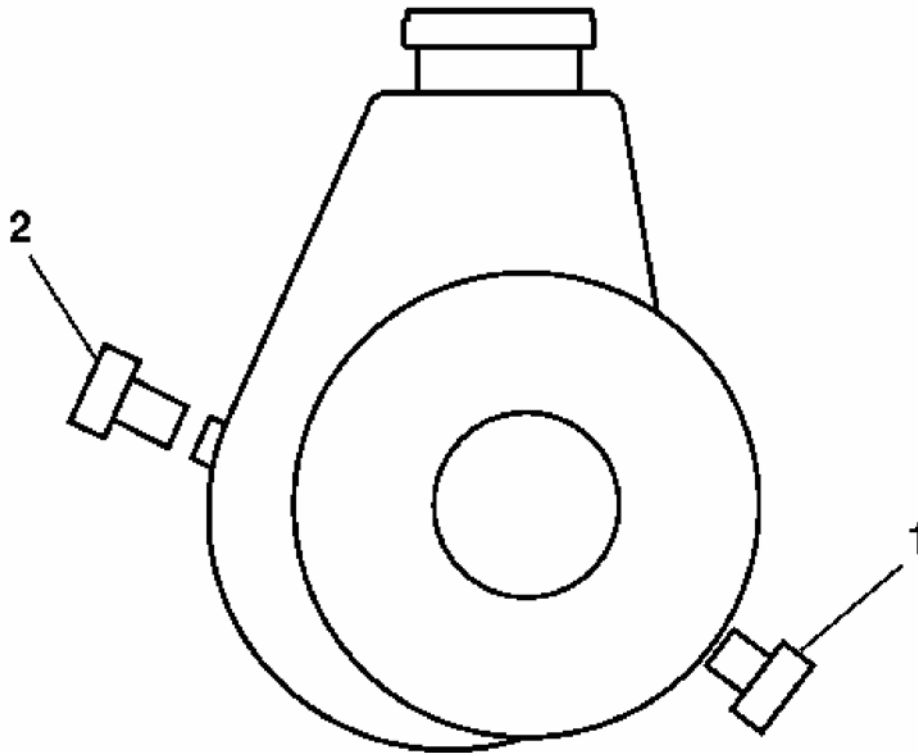
19. Attach the **J 43485** to the **J 35555** or equivalent. See Special Tools.
20. Place the **J 43485** on or in the pump reservoir filler neck. See Special Tools.
21. Apply a vacuum of 68 kPa (20 in Hg) maximum.
22. Wait 5 minutes.
23. Remove the **J 43485** and the **J 35555** . See Special Tools.
24. Verify the fluid level.



**Fig. 8: View Of Pump Reservoir Cap**  
**Courtesy of GENERAL MOTORS CORP.**

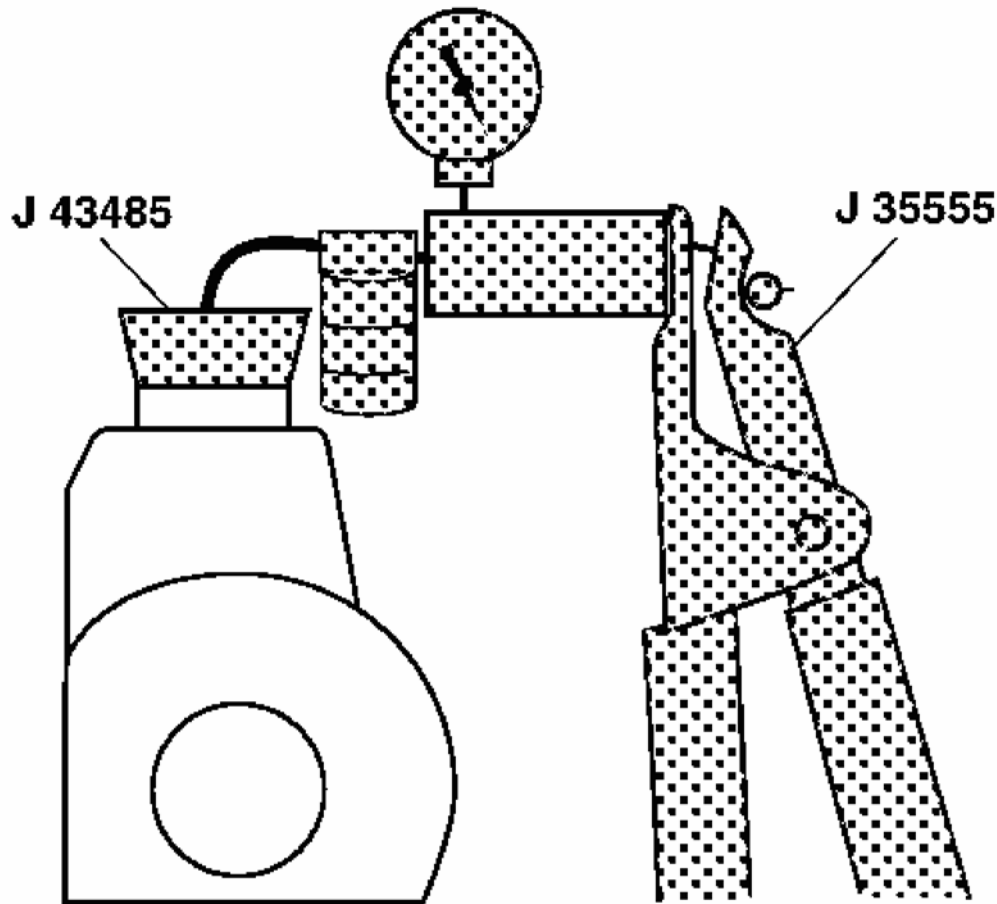
25. Reinstall the pump reservoir cap.

**Excessive Vacuum Drop Diagnosis**



**Fig. 9: Installing Plugs Into Power Steering Pump Pressure & Return Ports**  
**Courtesy of GENERAL MOTORS CORP.**

1. If the vacuum continues to drop, remove the pressure and return hose from the pump.
2. Install the plugs (1,2) supplied with the **J 43485** into the pressure and return port. See **Special Tools**.



**Fig. 10: Bleeding Power Steering System Using J 43485 & J 35555**  
Courtesy of GENERAL MOTORS CORP.

3. Attach the **J 43485** to the **J 35555** or equivalent. See Special Tools.
4. Place the **J 43485** on or in the pump reservoir filler neck. See Special Tools.
5. Apply a vacuum of 68 kPa (20 in Hg) maximum.
6. If the vacuum drops again, repair or replace the pump. If the vacuum holds steady, continue to check the other parts of the steering system.

**IMPORTANT:** Fluid must be free from bubbles and foam. Be aware of periodic bubbles that indicate a loose connection or leaking O-ring seal in the return hose or the pressure hose. Fluid must be free from discoloration.

7. Observe the fluid.
8. If condition persists, replace the following parts:
  - The return hose clamps
  - The return hose O-rings
  - The pressure hose O-rings
  - The gear cylinder line O-rings
  - The reservoir to pump O-ring
9. Repeat the bleed procedure from the beginning.
10. Drive the vehicle approximately 16 km (10 mi) in order to warm the system to operating temperature. Evaluate vehicle on a smooth flat surface.
11. Verify the following conditions:
  - There is smooth power assist.
  - The vehicle operates quietly.
  - The pump maintains the proper fluid level.
  - There is not any leaking in the steering system.
  - The fluid is free of foam or discoloration.

#### **CHECKING AND ADDING POWER STEERING FLUID**

**NOTE:** 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** in Maintenance and Lubrication.

#### **Fluid Is Hot**

1. Run the engine until the fluid reaches about 80°C (170°F).
2. Turn the engine OFF.
3. Remove the reservoir cap.
4. Inspect the fluid level on the capstick.
5. Ensure that the fluid level is at the HOT/FULL 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 **Bleeding the Power Steering System**.

#### **FLUSHING THE POWER STEERING SYSTEM**

**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** in General Information.
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.

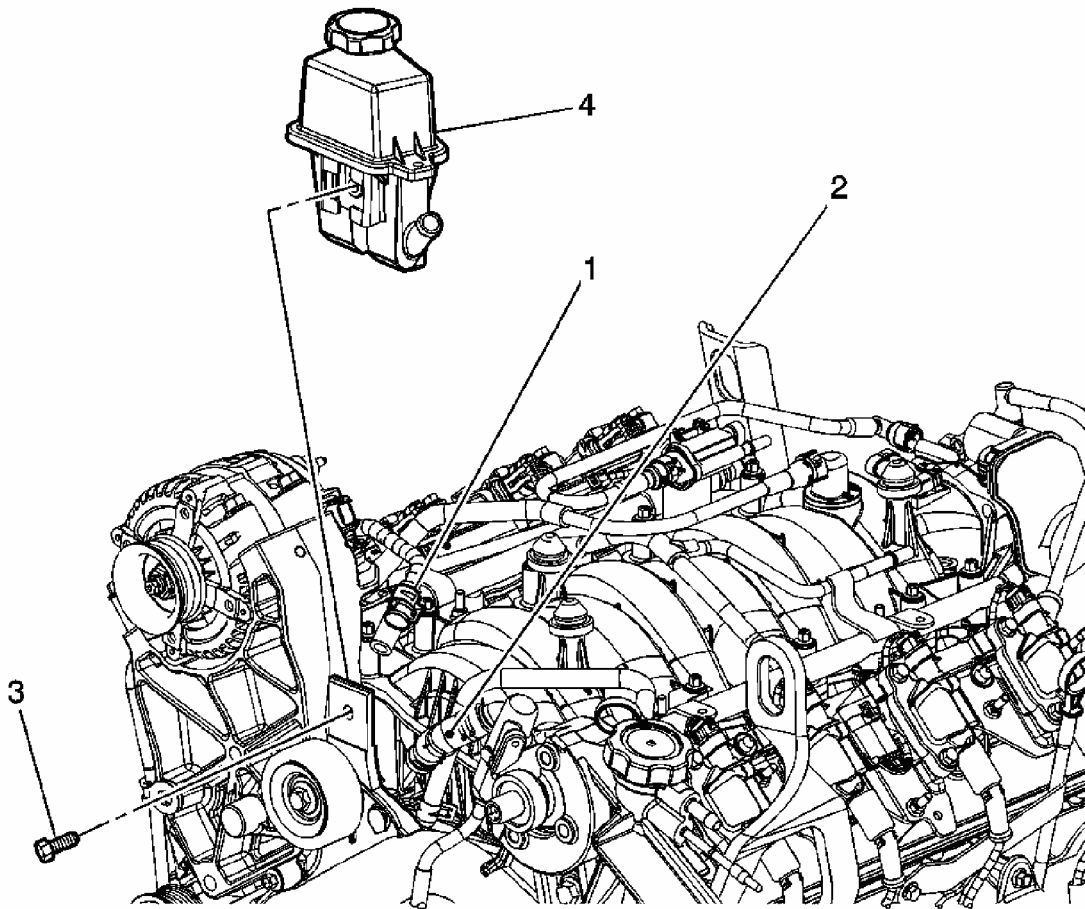
**IMPORTANT:**

- **This step may require 4 L (4 qt) of power steering fluid until the draining fluid appears clear.**
- **Do not run the engine without the power steering fluid level at FULL COLD.**

6. Run the engine at idle while an assistant maintains the fluid level at FULL COLD in the reservoir using new approved power steering fluid.
7. Turn off the engine.
8. Turn the steering wheel fully to the left and to the right.
9. Remove the plug from the pump reservoir inlet connection.
10. Install the fluid return hose to the pump reservoir.
11. Maintain the fluid level at FULL COLD.
12. Operate the engine at idle for approximately 15 minutes.
13. Repeat steps 3-5.
14. Inspect the power steering fluid for the following indications of contamination:
  - Milky fluid - water
  - Brown fluid - burnt
  - Plastic debris or dirt chunks
15. If the fluid is contaminated, repeat steps 6-12 in order to complete a third flush.
16. Remove the plug from the pump reservoir inlet connection.
17. Install the fluid return hose to the pump reservoir.
18. Clean any spilled fluid.

19. Bleed the power steering system. Refer to **Bleeding the Power Steering System**

### REMOTE POWER STEERING FLUID RESERVOIR REPLACEMENT



**Fig. 11: Replacing Remote Power Steering Fluid Reservoir**  
Courtesy of GENERAL MOTORS CORP.

### Remote Power Steering Fluid Reservoir Replacement

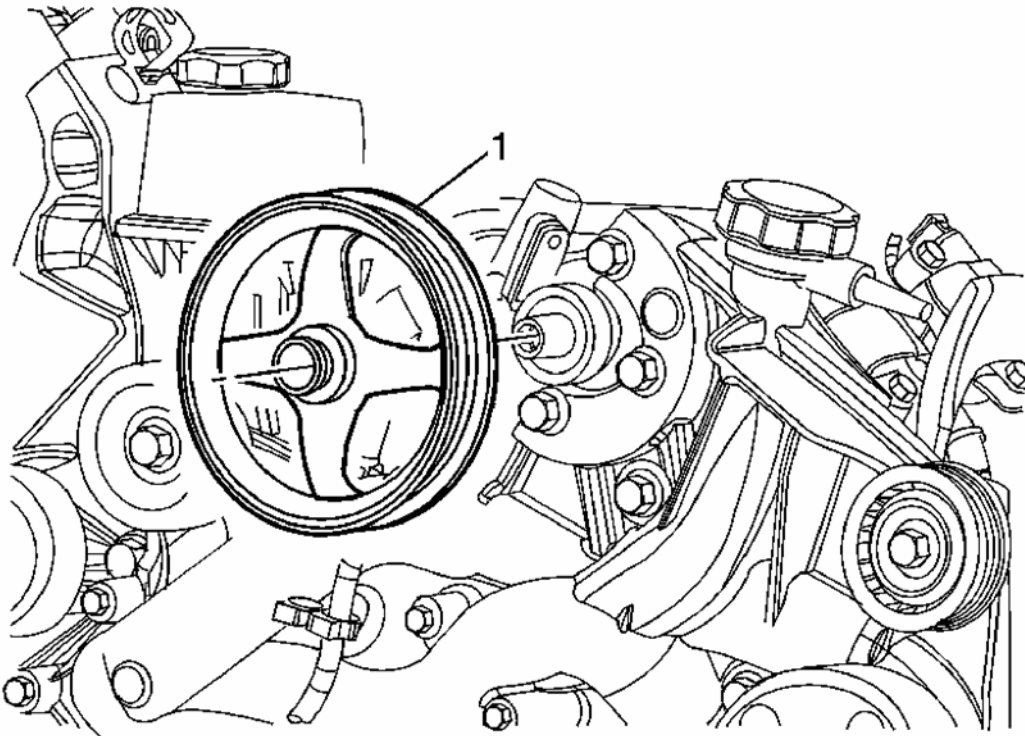
| Callout                                                                                                                             | Component Name                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE:</b><br>Refer to <b><u>Fastener Notice</u></b> .                                                                            |                                                                                                                                                                                                            |
| <b>Fastener Tightening Specifications:</b> Refer to <b><u>Fastener Tightening Specifications</u></b> . <b>Preliminary Procedure</b> |                                                                                                                                                                                                            |
| 1                                                                                                                                   | Clamp, Power Steering Return Hose<br><b>Tip:</b> Using the appropriate tool, remove the power steering fluid from the reservoir. Also, plug the open end of the hose to limit the amount of fluid leakage. |
|                                                                                                                                     | Clamp, Power Steering Pump Feed Hose                                                                                                                                                                       |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|   |                                                                                                                             |
|---|-----------------------------------------------------------------------------------------------------------------------------|
| 2 | <b>Tip:</b> Plug or cap the hose between the power steering pump and the reservoir so as to limit the amount of fluid loss. |
| 3 | Bolt, Remote Power Steering Reservoir (Qty: 1)<br><b>Tighten:</b> 18 N.m (13 lb ft)                                         |
| 4 | Reservoir, Power Steering Remote                                                                                            |

### POWER STEERING PULLEY REPLACEMENT (LS4)



**Fig. 12: Replacing Power Steering Pulley**  
Courtesy of GENERAL MOTORS CORP.

### Power Steering Pulley Replacement (LS4)

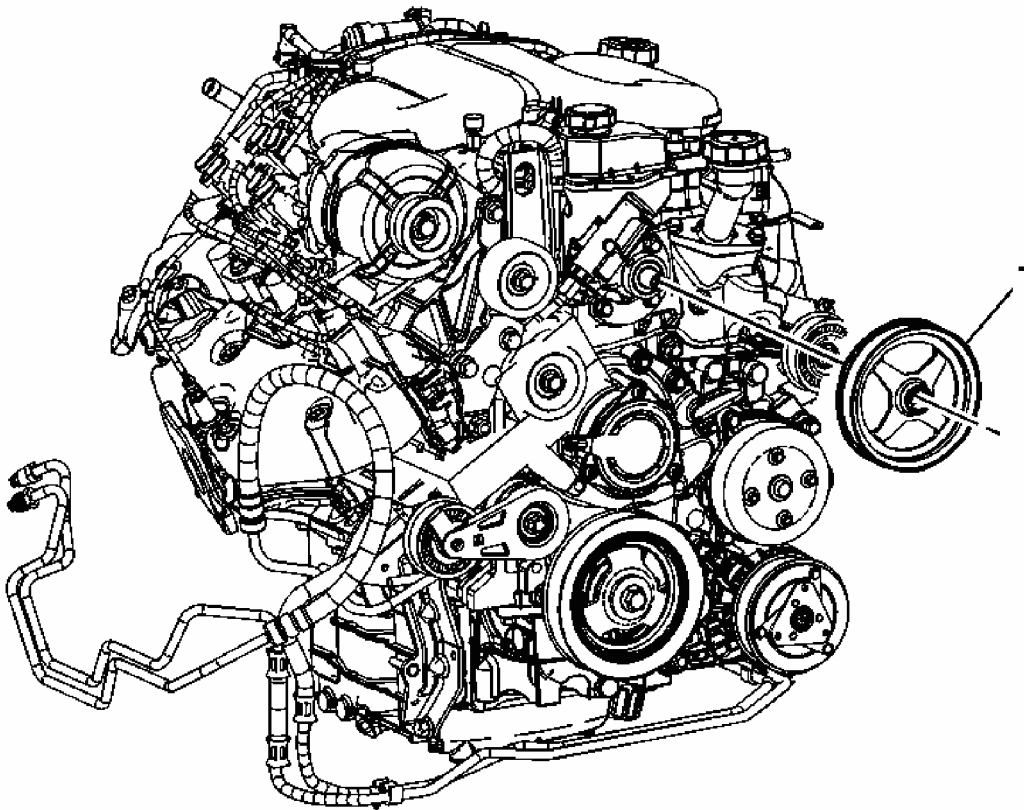
| Callout                                                                                                                                                                                   | Component Name |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Fastener Tightening Specifications:</b> Refer to <u>Fastener Tightening Specifications</u> .                                                                                           |                |
| <b>Tools Required</b>                                                                                                                                                                     |                |
| <ul style="list-style-type: none"><li>• J 25034-C Pulley Remover. See <u>Special Tools</u>.</li><li>• J 25033-C Power Steering Pump Pulley Installer. See <u>Special Tools</u>.</li></ul> |                |

**Preliminary Procedure:**

Remove the drive belt. Refer to **Drive Belt Replacement - Accessory** for the 5.3L engine.

|   |                                                                                                                                                                                                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Pulley, Power Steering Pump<br/><b>Tip:</b></p> <ol style="list-style-type: none"> <li>1. Use the <b>J 25034-C</b> pulley remover to remove the pulley from the pump. See <b>Special Tools</b>.</li> <li>2. Use the <b>J 25033-C</b> power steering pump pulley installer to install the pulley to the pump. See <b>Special Tools</b>.</li> </ol> |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**POWER STEERING PULLEY REPLACEMENT (LZ4/LZE/LZ9)**



**Fig. 13: Replacing Power Steering Pulley**  
Courtesy of GENERAL MOTORS CORP.

**Power Steering Pulley Replacement (LZ4/LZE/LZ9)**

| Callout | Component Name |
|---------|----------------|
|---------|----------------|

**Fastener Tightening Specifications:** Refer to Fastener Tightening Specifications .

### Tools Required

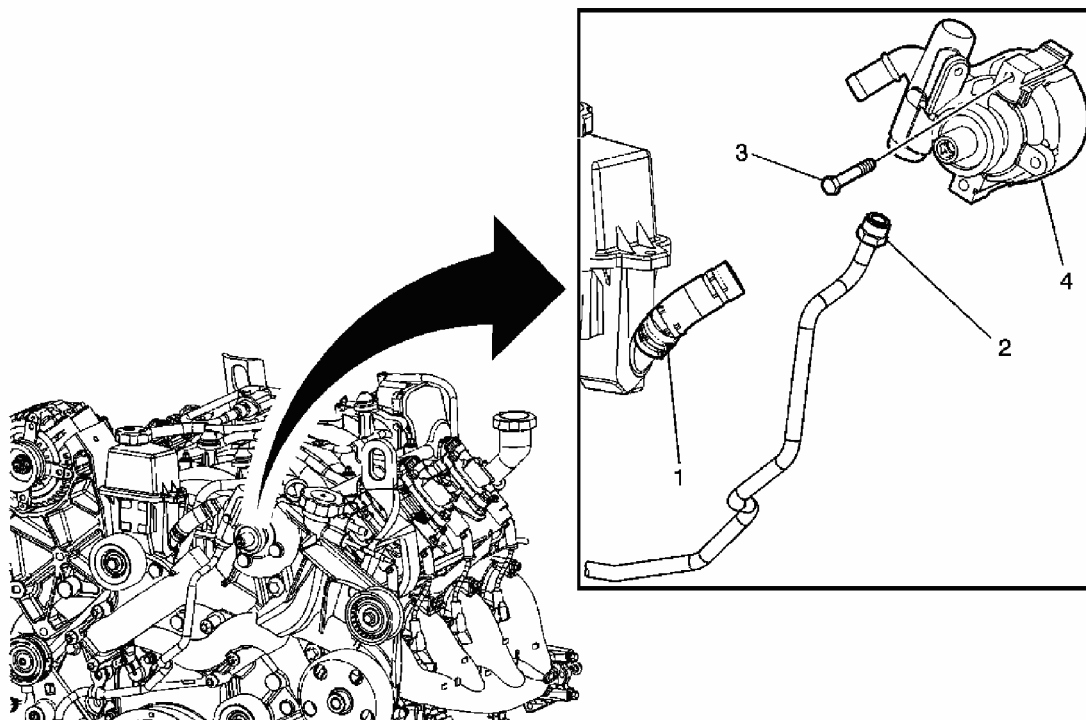
- **J 25034-C** Pulley Remover. See Special Tools.
- **J 25033-C** Power Steering Pump Pulley Installer. See Special Tools.

### Preliminary Procedure:

Remove the drive belt. Refer to Drive Belt Replacement for the 3.5L engine or Drive Belt Replacement for the 3.9L engine

|   |                                                                                                                                                                                                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Pulley, Power Steering Pump<br/><b>Tip:</b></p> <ol style="list-style-type: none"> <li>1. Use the <b>J 25034-C</b> pulley remover to remove the pulley from the pump. See <u>Special Tools</u>.</li> <li>2. Use the <b>J 25033-C</b> power steering pump pulley installer to install the pulley to the pump. See <u>Special Tools</u>.</li> </ol> |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### POWER STEERING PUMP REPLACEMENT (LS4)



**Fig. 14: Replacing Power Steering Pump**  
Courtesy of GENERAL MOTORS CORP.

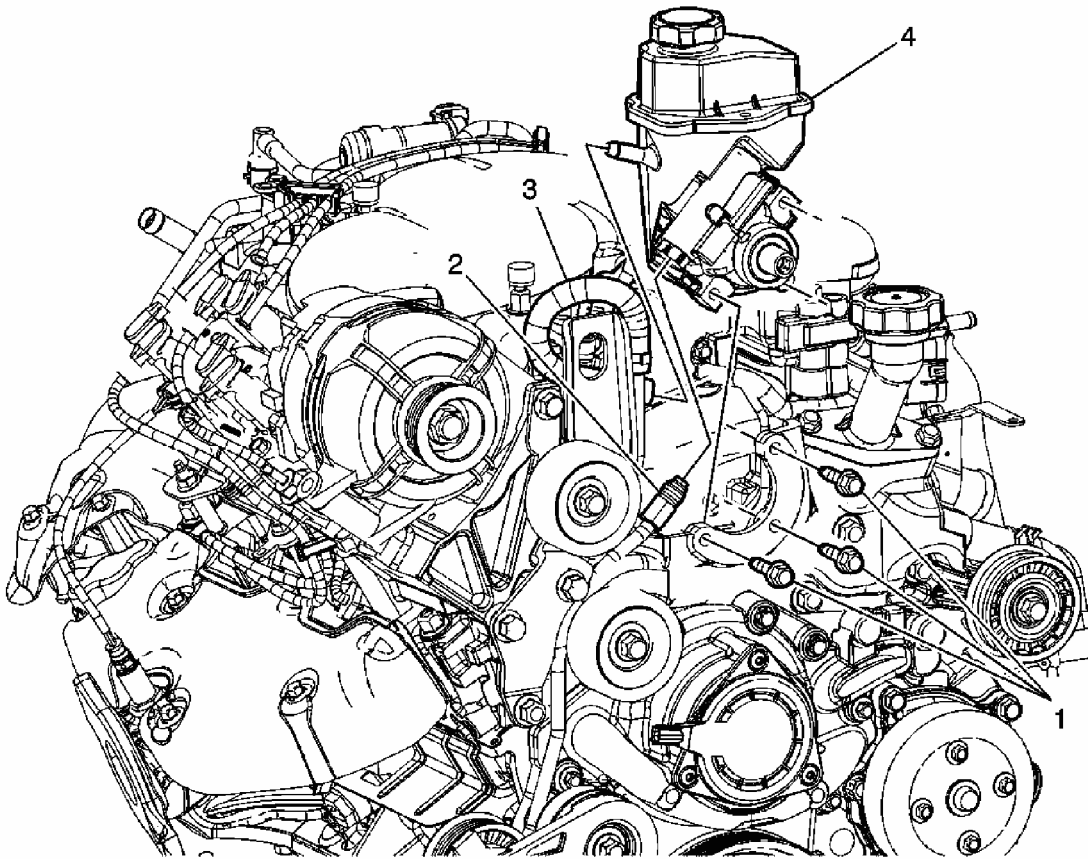
### Power Steering Pump Replacement (LS4)

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Component Name                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE:</b><br>Refer to <b>Fastener Notice</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                       |
| <b>Fastener Tightening Specifications:</b> Refer to <b>Fastener Tightening Specifications</b> .                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                       |
| <b>Preliminary Procedures</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                       |
| <ol style="list-style-type: none"><li>1. Place a drain pan under the vehicle.</li><li>2. Remove the drive belt. Refer to <b>Drive Belt Replacement - Accessory</b> for the 5.3L engine.</li><li>3. Remove the power steering pump pulley. Refer to <b>Power Steering Pulley Replacement (LS4)</b> or <b>Power Steering Pulley Replacement (LZ4/LZE/LZ9)</b>.</li><li>4. Fill and bleed the power steering system after the repair has been completed. Refer to <b>Bleeding the Power Steering System</b>.</li></ol> |                                                                                                                                                                                                                                                                                       |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Clamp, Power Steering Pump Hose<br><b>Tip:</b> Use an appropriate tool to remove the power steering fluid from the reservoir before relocating the clamp. Also plug the end of the hose between the reservoir and the power steering pump to limit the leakage of the steering fluid. |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Fitting, Power Steering High Pressure Hose<br><b>Tighten:</b> 27 N.m (20 lb ft)                                                                                                                                                                                                       |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Bolt, Power Steering Pump (Qty: 3)<br><b>Tighten:</b> 25 N.m (18 lb ft)                                                                                                                                                                                                               |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Pump, Power Steering                                                                                                                                                                                                                                                                  |

### POWER STEERING PUMP REPLACEMENT (LZ4/LZE/LZ9)



**Fig. 15: Replacing Power Steering Pump**  
 Courtesy of GENERAL MOTORS CORP.

### Power Steering Pump Replacement (LZ4/LZE/LZ9)

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Component Name                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <p><b>NOTE:</b><br/>           Refer to <b>Fastener Notice</b> .</p> <p><b>Fastener Tightening Specifications:</b> Refer to <b>Fastener Tightening Specifications</b>.</p> <p><b>Preliminary Procedures</b></p> <ol style="list-style-type: none"> <li>1. Remove the drive belt. Refer to <b>Drive Belt Replacement</b> for the 3.5L engine or <b>Drive Belt Replacement</b> for the 3.9L engine.</li> <li>2. Remove the power steering pump pulley. Refer to <b>Power Steering Pulley Replacement (LS4)</b> or <b>Power Steering Pulley Replacement (LZ4/LZE/LZ9)</b>.</li> <li>3. Remove the intake manifold Cover. Refer to <b>Intake Manifold Cover Replacement</b> for the 3.5L engine or <b>Intake Manifold Cover Replacement</b> for the 3.9L engine.</li> </ol> |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Bolt, Power Steering Pump (Qty: 3) |

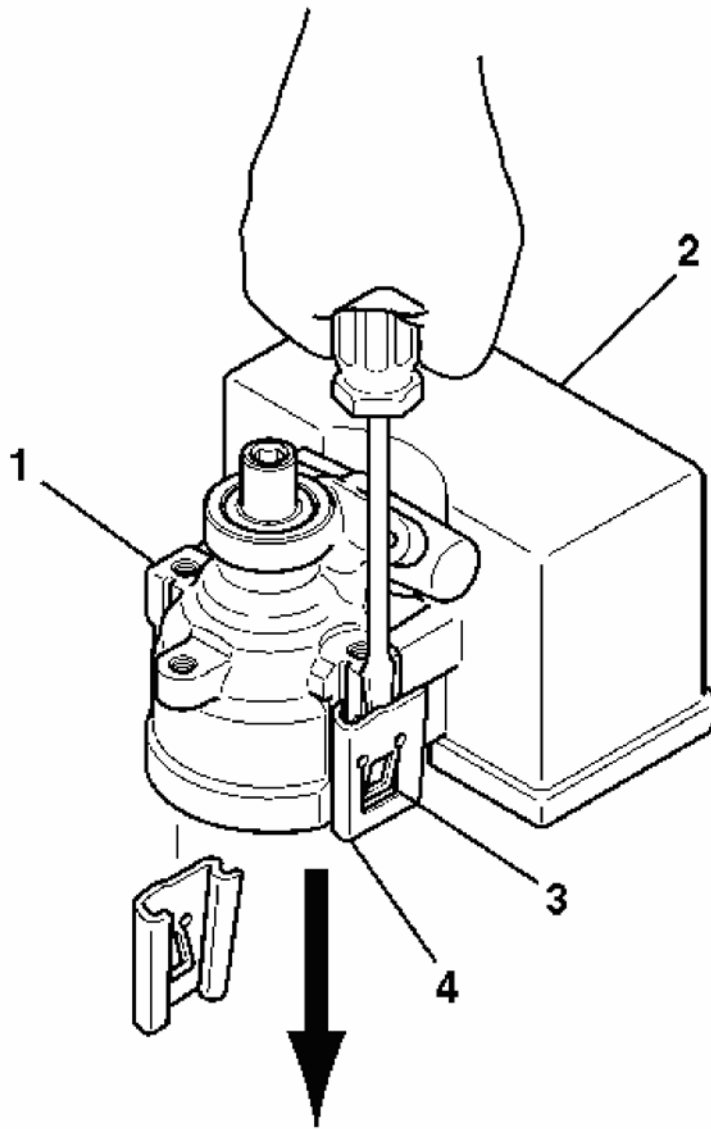
## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|   |                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Tip:</b> Use an appropriate tool to remove the power steering fluid from the reservoir before removing the hoses from the pump.<br><b>Tighten:</b> 25 N.m (18 lb ft) |
| 2 | Fitting, Power Steering High Pressure Hose<br><b>Tighten:</b> 27 N.m (20 lb ft)                                                                                         |
| 3 | Clamp, Power Steering Return Hose (at pump)<br><b>Tip:</b> Position the clamp rearward to remove the hose from the pump.                                                |
| 4 | Pump, Power Steering                                                                                                                                                    |

### POWER STEERING RESERVOIR REPLACEMENT - OFF VEHICLE (CB SERIES)

#### Disassembly Procedure

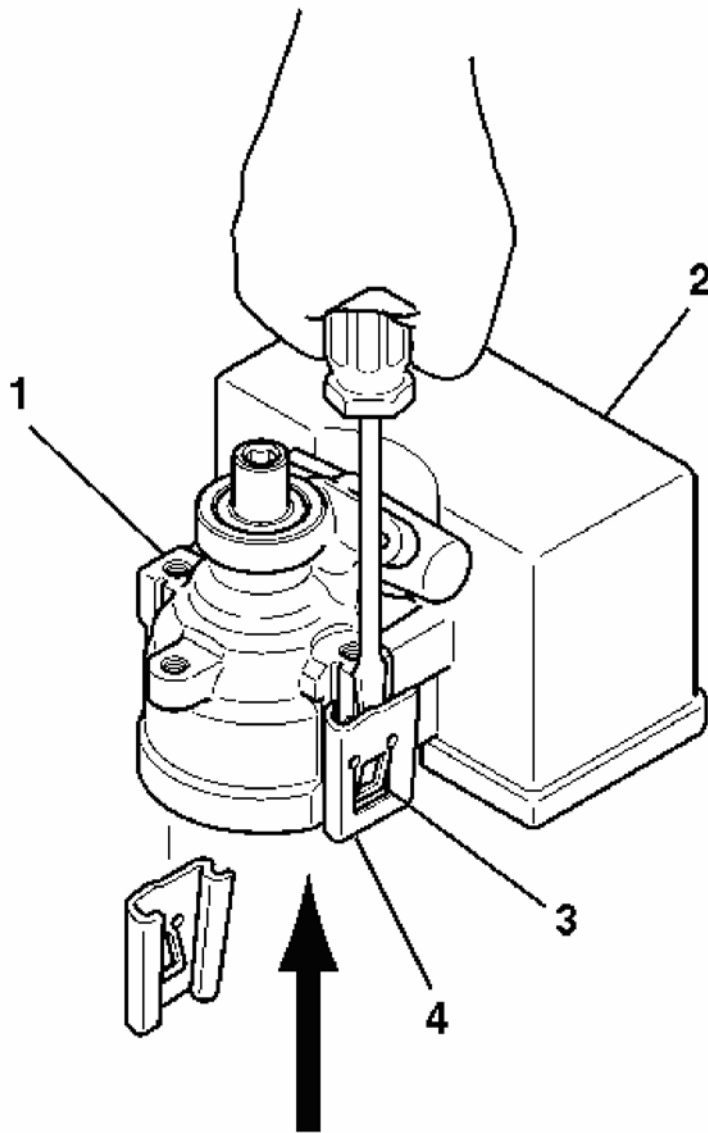


**Fig. 16: Removing Power Steering Reservoir (CB Series)**  
Courtesy of GENERAL MOTORS CORP.

1. Place the hydraulic pump (1) on a fixed, flat surface, with the shaft facing upward.
2. Insert a screwdriver into the retaining clip tab (3).
3. Using the screwdriver, force the retaining clip tab (3) outward.
4. Slide the reservoir clip (4) away from the hydraulic pump assembly (1).
5. Repeat the above steps to remove the second reservoir clip (4).

6. Remove the reservoir (2) from the hydraulic pump housing (1).
7. Remove the O-ring seal from the neck of the reservoir (2) or inside the hydraulic pump housing (1). Discard the O-ring seal.

**Assembly Procedure**



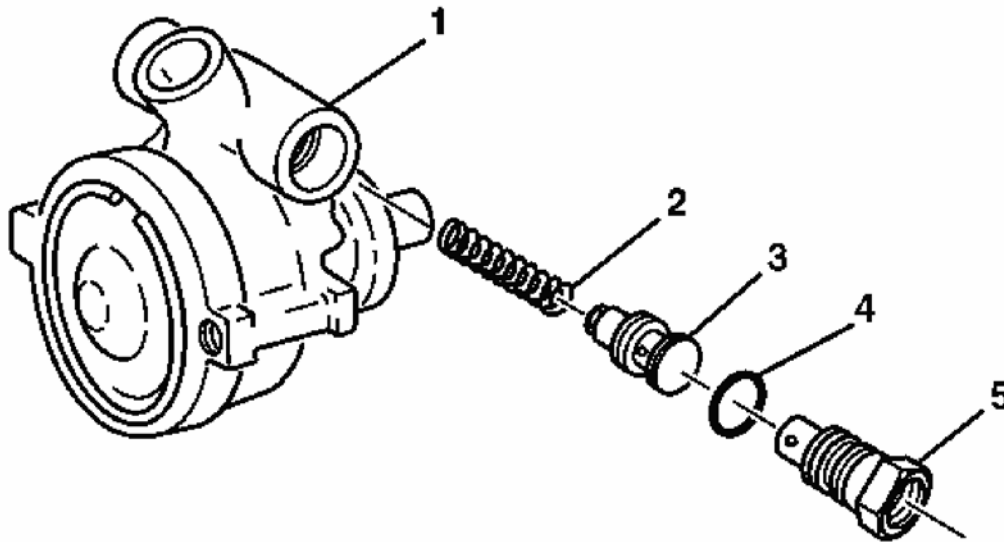
**Fig. 17: View Of Power Steering Pump And Reservoir (CB Series)**  
**Courtesy of GENERAL MOTORS CORP.**

1. Lubricate the new O-ring seal with power steering fluid

2. Install the new O-ring seal onto the neck of the reservoir (2).
3. Install the reservoir (2) onto the hydraulic pump assembly (1). Ensure the reservoir neck is completely engaged onto the hydraulic pump assembly (1).
4. Align the feet of the reservoir with the sides of the hydraulic pump housing.
5. Install the new reservoir retaining clips (4) (supplied with the pump). Ensure the retaining clip tabs (3) fully engage with the hydraulic pump housing (1).

### **POWER STEERING PUMP FLOW CONTROL VALVE REPLACEMENT - OFF VEHICLE (CB SERIES)**

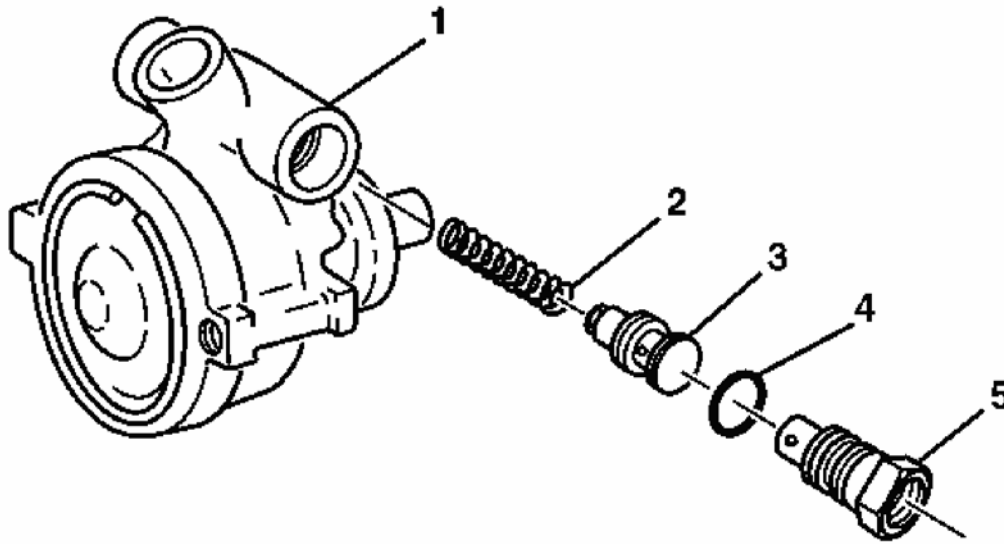
#### **Disassembly Procedure**



**Fig. 18: Exploded View Of Power Steering Pump Flow Control Valve (CB Series)**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the O-ring union fitting (5) from the hydraulic pump housing assembly (1).
2. Remove the O-ring seal (4) from the O-ring union fitting (5).
3. Remove the control valve assembly (3).
4. Remove the flow control spring (2).

#### **Assembly Procedure**



**Fig. 19: Exploded View Of Power Steering Pump Flow Control Valve (CB Series)**  
Courtesy of GENERAL MOTORS CORP.

1. Install the flow control spring (2) to the hydraulic pump housing assembly (1).
2. Install the control valve assembly (3).
3. Lubricate the O-ring seal (4) with power steering fluid.
4. Install the O-ring seal (4) onto the O-ring union fitting (5).

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

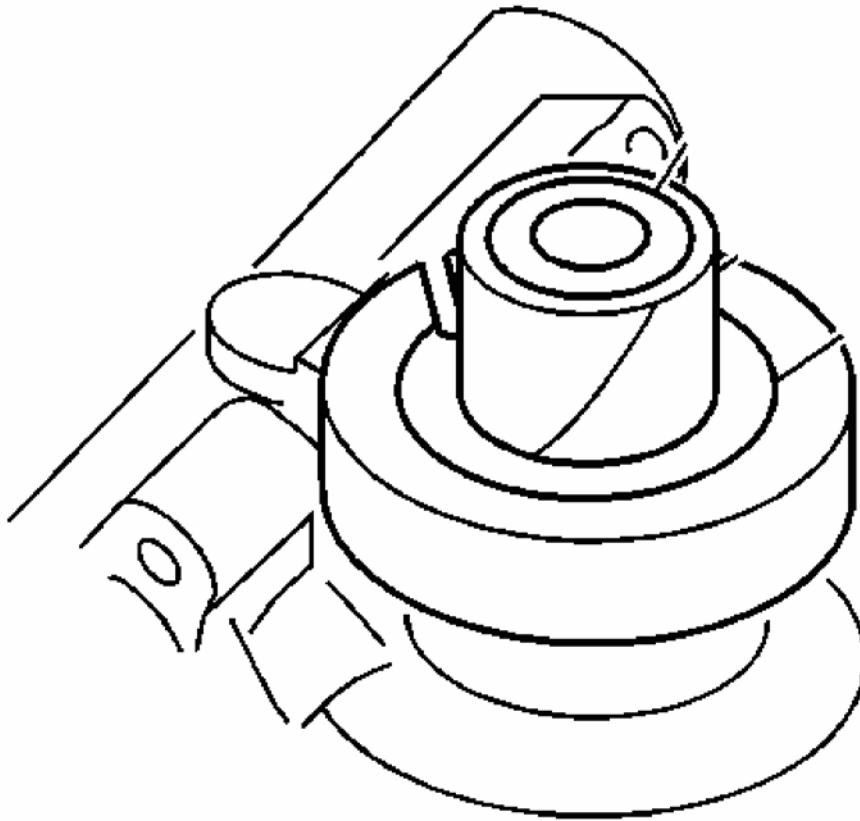
5. Install the O-ring union fitting (5) into the hydraulic pump housing assembly (1).

**Tighten:** Tighten the fitting (5) to 75 N.m (55 lb ft).

#### POWER STEERING PUMP DRIVE SHAFT SEAL REPLACEMENT (CB)

##### Removal Procedure

1. Remove the power steering pump from the vehicle, if necessary. Refer to Power Steering Pump Replacement (LS4) or Power Steering Pump Replacement (LZ4/LZE/LZ9).



**Fig. 20: Power Steering Pump Drive Shaft Seal**  
Courtesy of GENERAL MOTORS CORP.

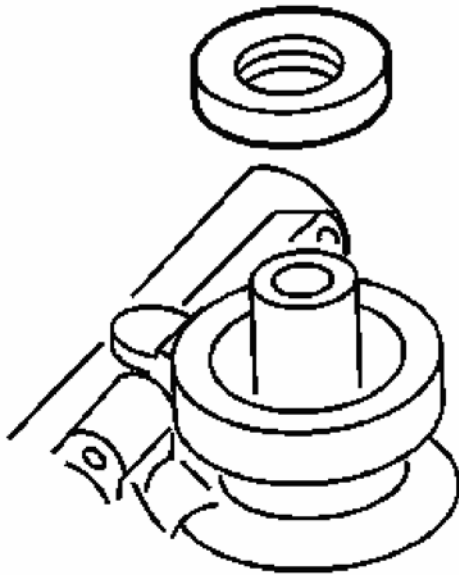
**IMPORTANT: Protect the drive shaft with the shim stock.**

2. Use a small chisel in order to remove the seal.

Discard the seal.

#### **Installation Procedure**

1. Lubricate the new drive shaft seal using power steering fluid.



**Fig. 21: Power Steering Pump Drive Shaft Seal**  
Courtesy of GENERAL MOTORS CORP.

2. Use a deep socket in order to install the new drive shaft seal.
3. Install the power steering pump, if removed. Refer to **Power Steering Pump Replacement (LS4)** or **Power Steering Pump Replacement (LZ4/LZE/LZ9)**.

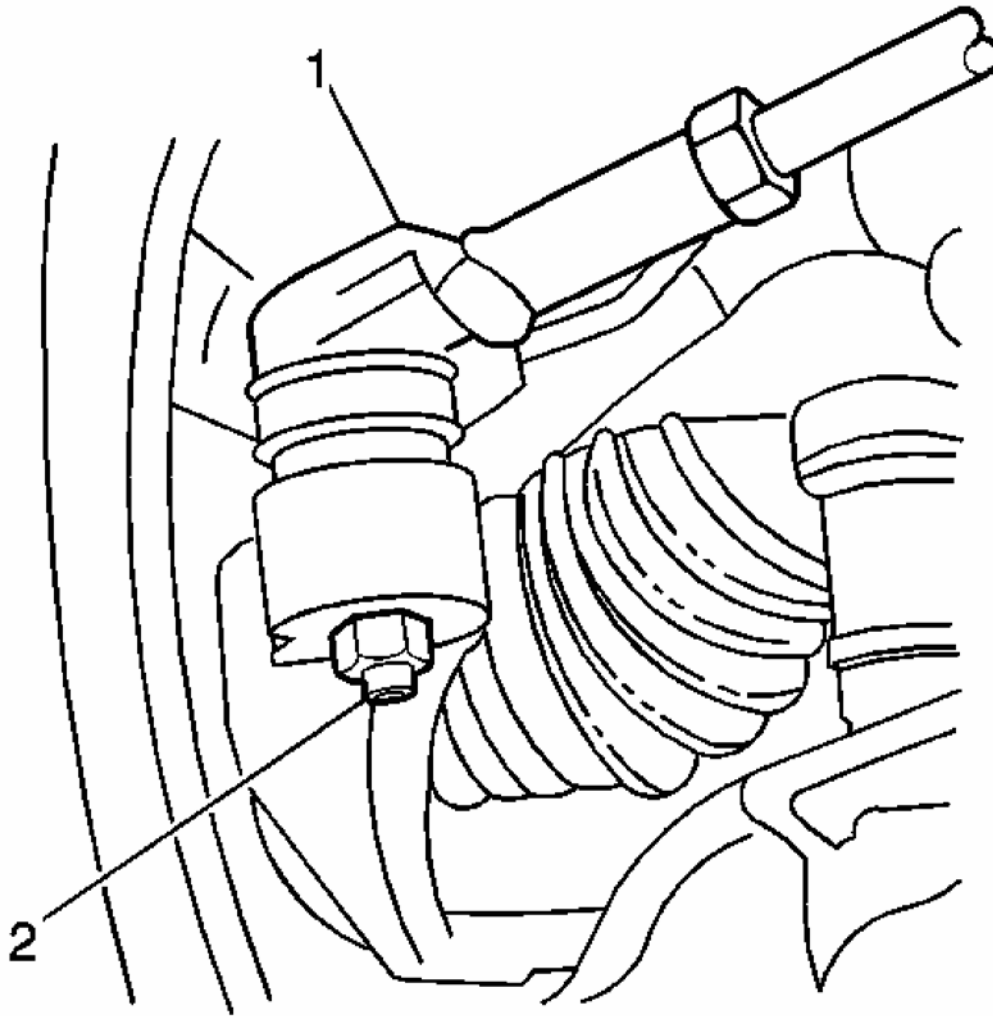
#### **RACK AND PINION OUTER TIE ROD END REPLACEMENT**

##### **Tools Required**

**J 24319-B** Universal Steering Linkage Puller. See **Special Tools**.

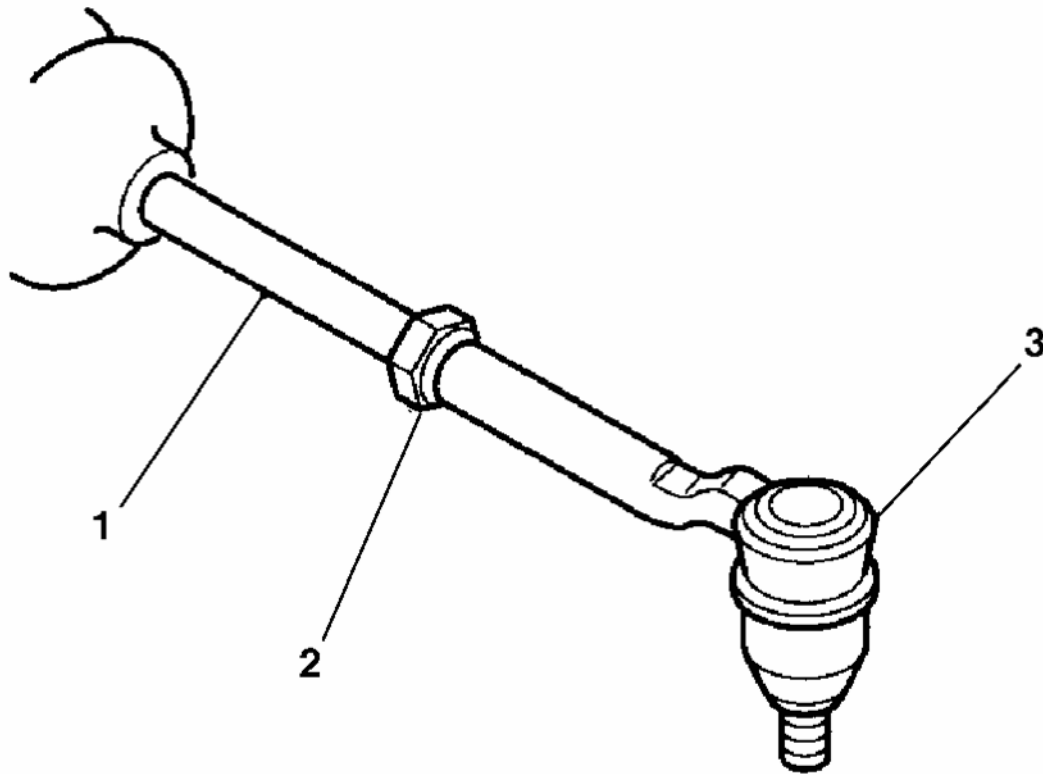
##### **Removal Procedure**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.



**Fig. 22: Identifying Outer Tie Rod & Retaining Nut**  
Courtesy of GENERAL MOTORS CORP.

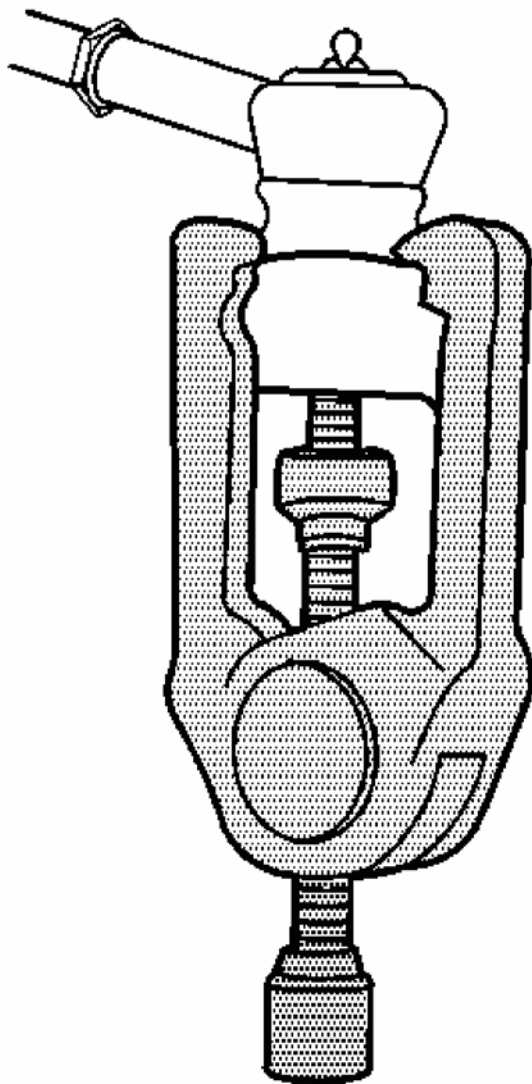
3. Remove the prevailing torque nut (2) from the outer tie rod assembly (1).



**Fig. 23: Identifying Tie Rod & Jam Nut**  
Courtesy of GENERAL MOTORS CORP.

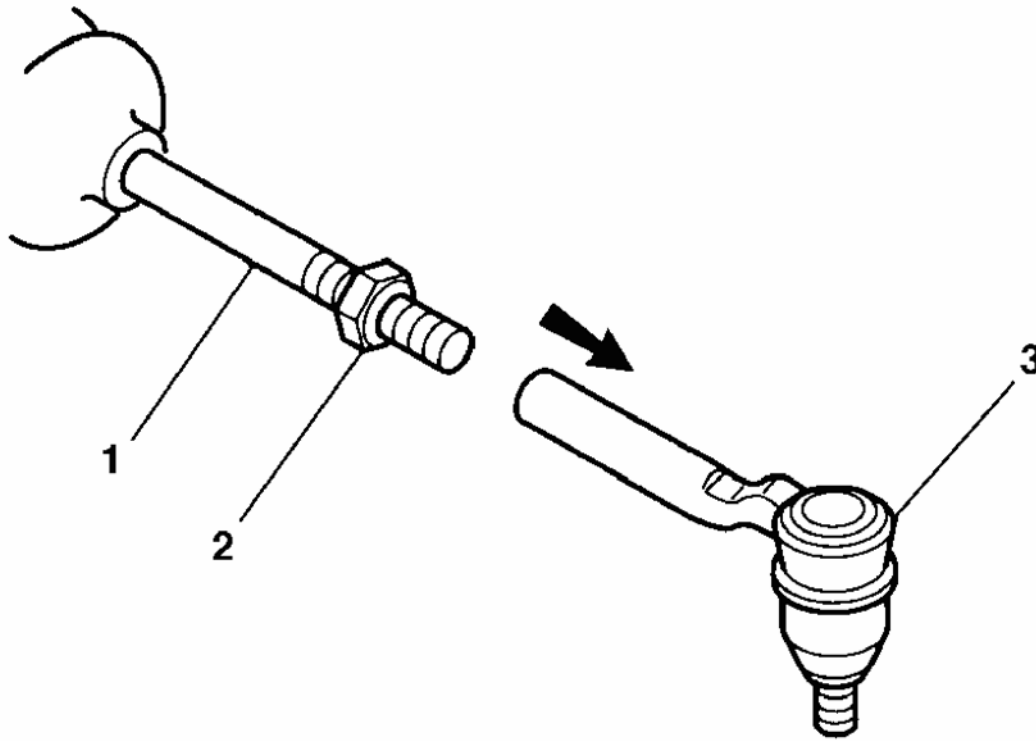
4. Loosen the jam nut (2) on the inner tie rod assembly (1).

**NOTE:** Do not attempt to disconnect a steering linkage joint by driving a wedge between the joint and the attached part. Seal damage may result which will cause premature failure of the joint.



**Fig. 24: Removing Outer Tie Rod Assembly From Steering Knuckle**  
Courtesy of GENERAL MOTORS CORP.

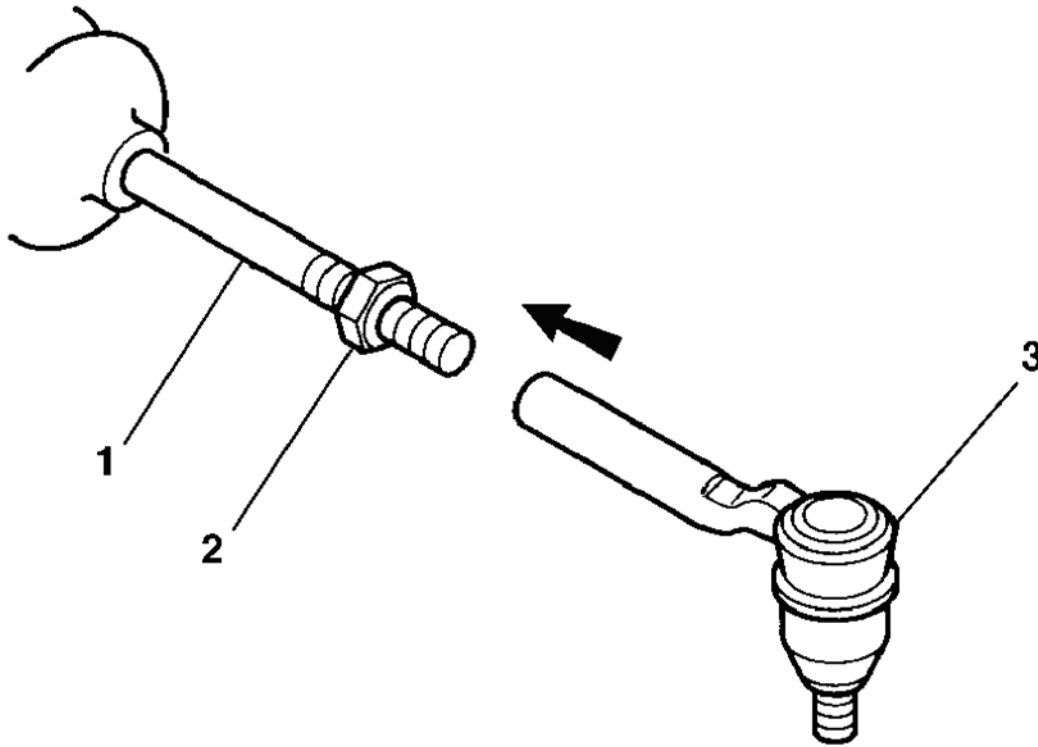
5. Remove the outer tie rod assembly from the steering knuckle using **J 24319-B** . See **Special Tools**.



**Fig. 25: View Of Outer Tie Rod & Inner Tie Rod**  
**Courtesy of GENERAL MOTORS CORP.**

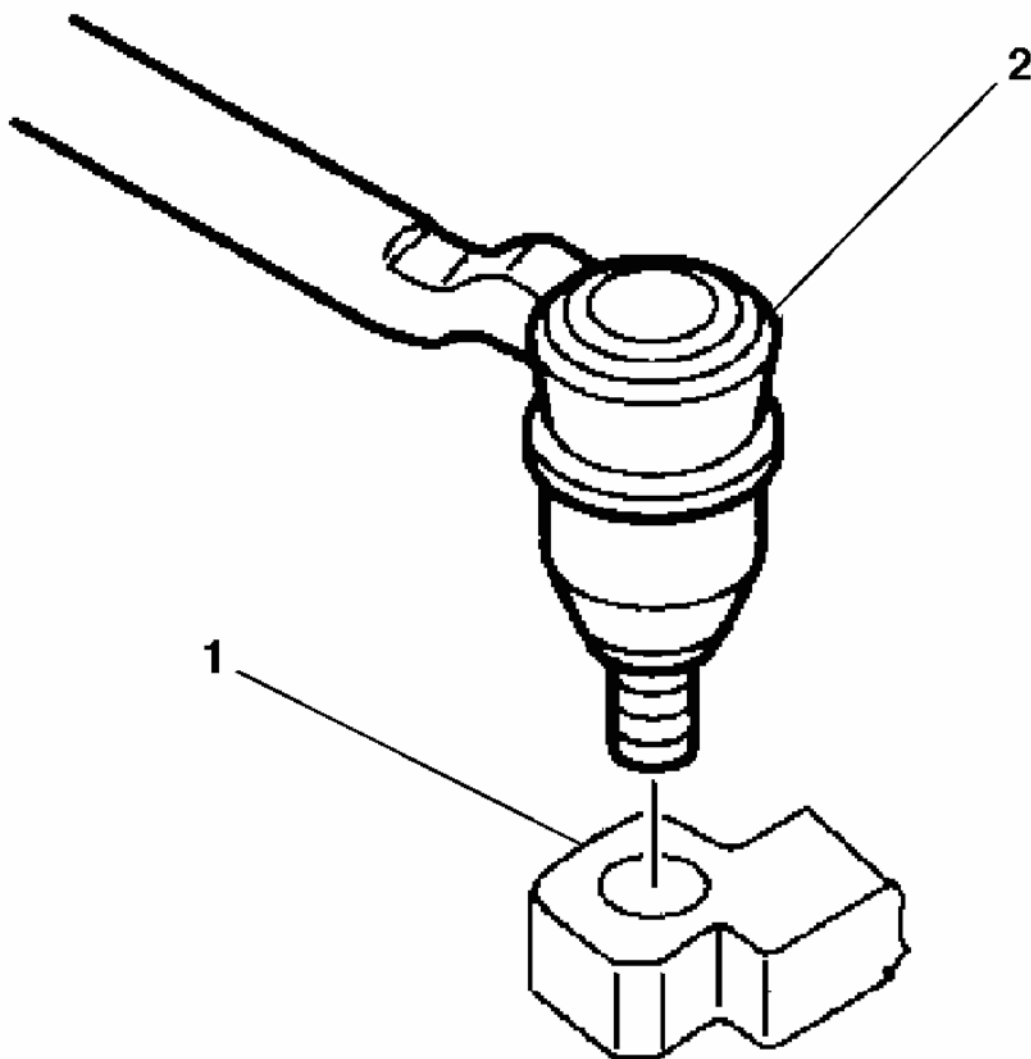
6. Remove the outer tie rod assembly (3) from the inner tie rod assembly (1).

**Installation Procedure**



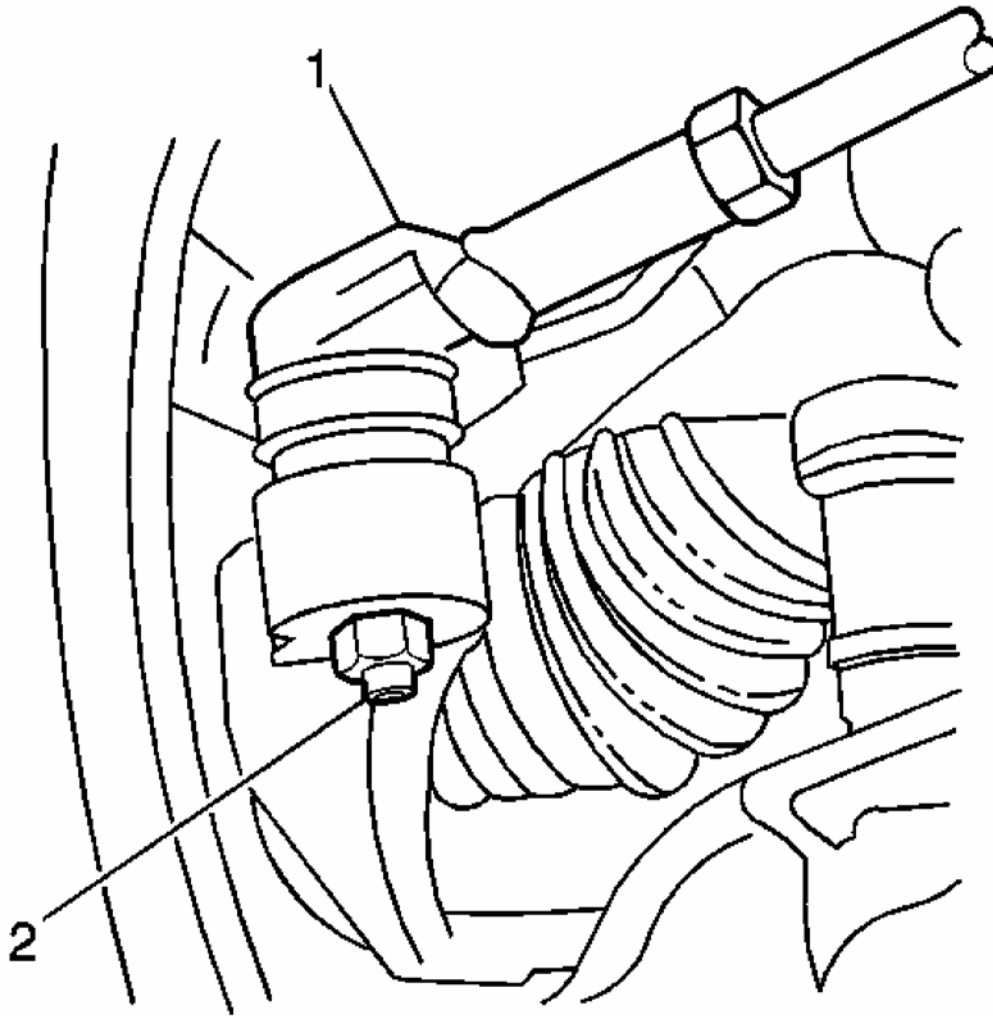
**Fig. 26: Installing Outer Tie Rod Assembly To Inner Tie Rod Assembly**  
Courtesy of GENERAL MOTORS CORP.

1. Install the outer tie rod assembly (3) to the inner tie rod assembly (1). Do NOT tighten the jam nut (2).



**Fig. 27: View Of Outer Tie Rod & Steering Knuckle**  
**Courtesy of GENERAL MOTORS CORP.**

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

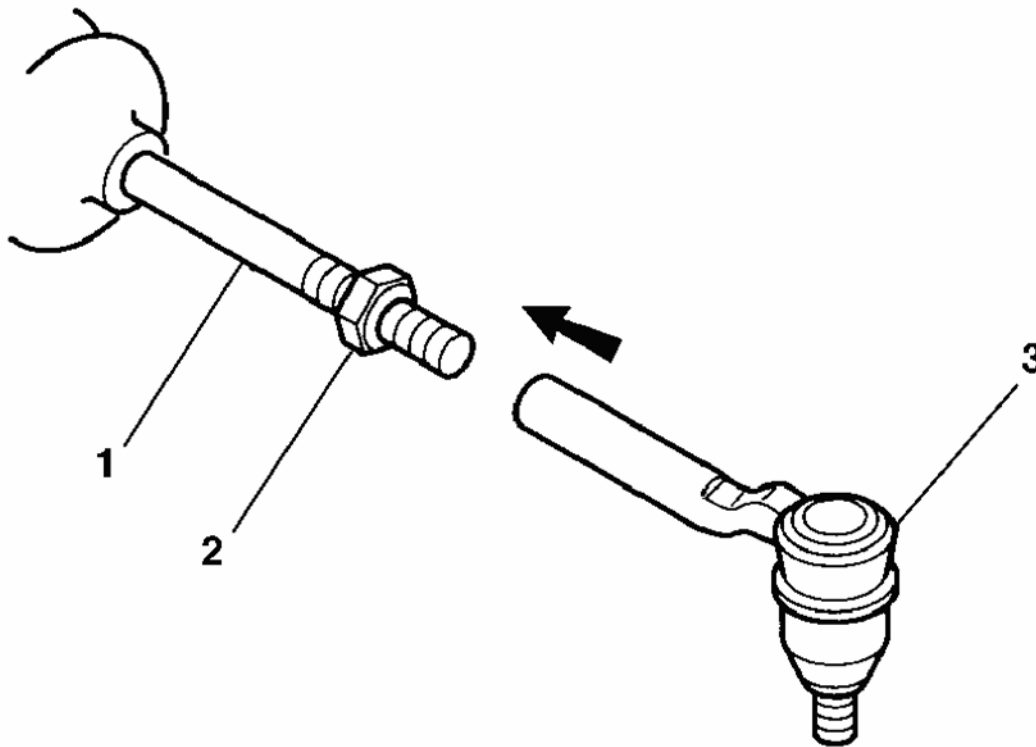


**Fig. 28: Identifying Outer Tie Rod & Retaining Nut**  
Courtesy of GENERAL MOTORS CORP.

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

3. Install the prevailing torque nut (2) to the outer tie rod assembly (1).

**Tighten:** Tighten the nut to 30 N.m (22 lb ft) plus 120 degrees. Visually inspect to ensure that 2 1/2 to 4 1/2 threads are visible past the nylon washer.



**Fig. 29: Installing Outer Tie Rod Assembly To Inner Tie Rod Assembly**  
Courtesy of GENERAL MOTORS CORP.

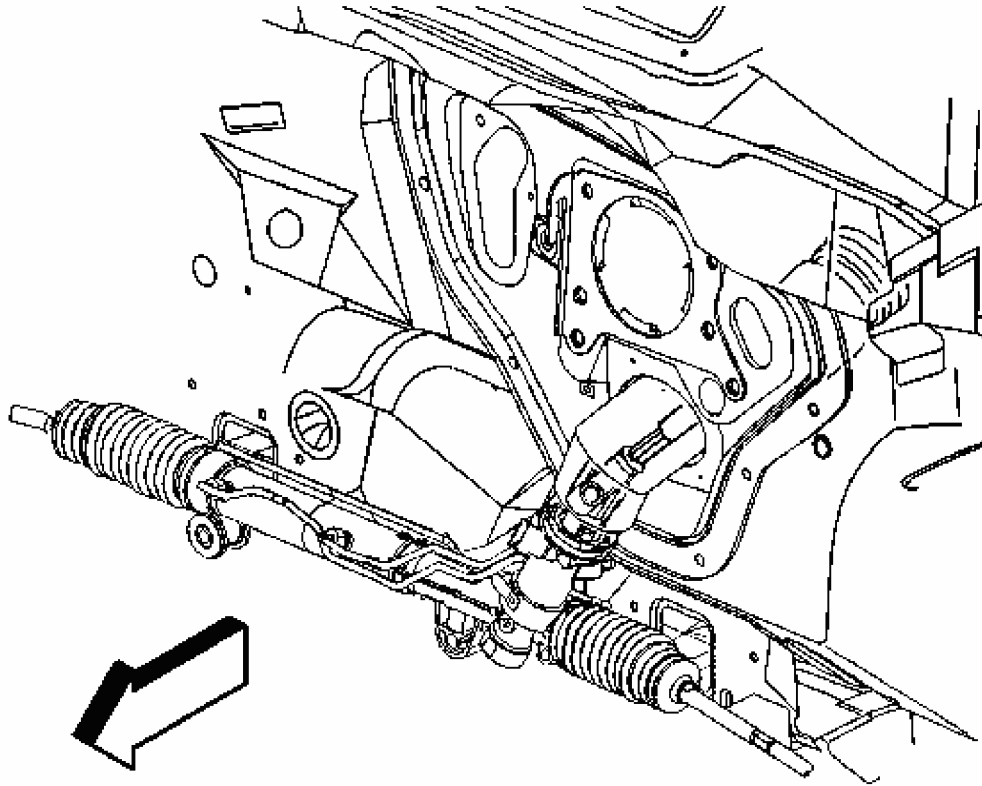
4. Install tire and wheel assembly. Refer to Tire and Wheel Removal and Installation in Tires and Wheels.
5. Lower the vehicle.
6. Perform a front end alignment. Refer to Measuring Wheel Alignment in Wheel Alignment.

#### **RACK AND PINION BOOT REPLACEMENT - ON VEHICLE**

##### **Tools Required**

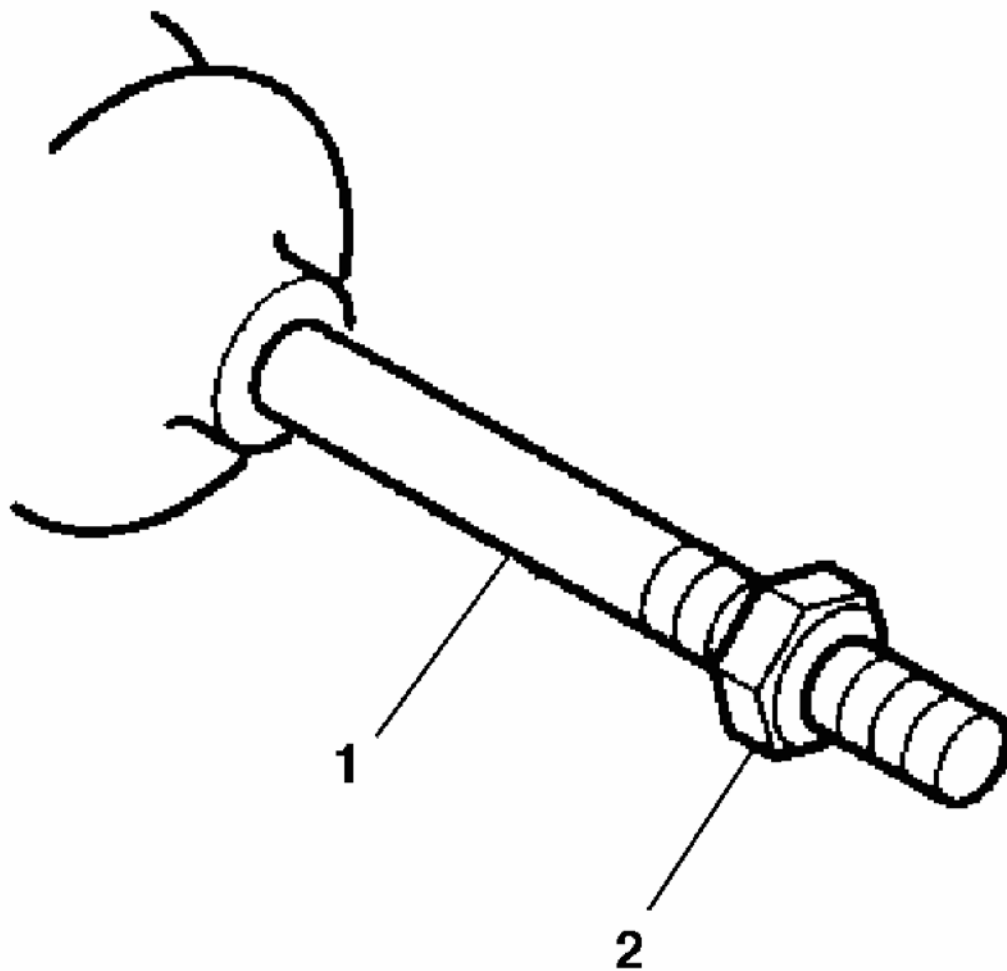
**J 22610** Keystone Clamp Pliers

##### **Removal Procedure**



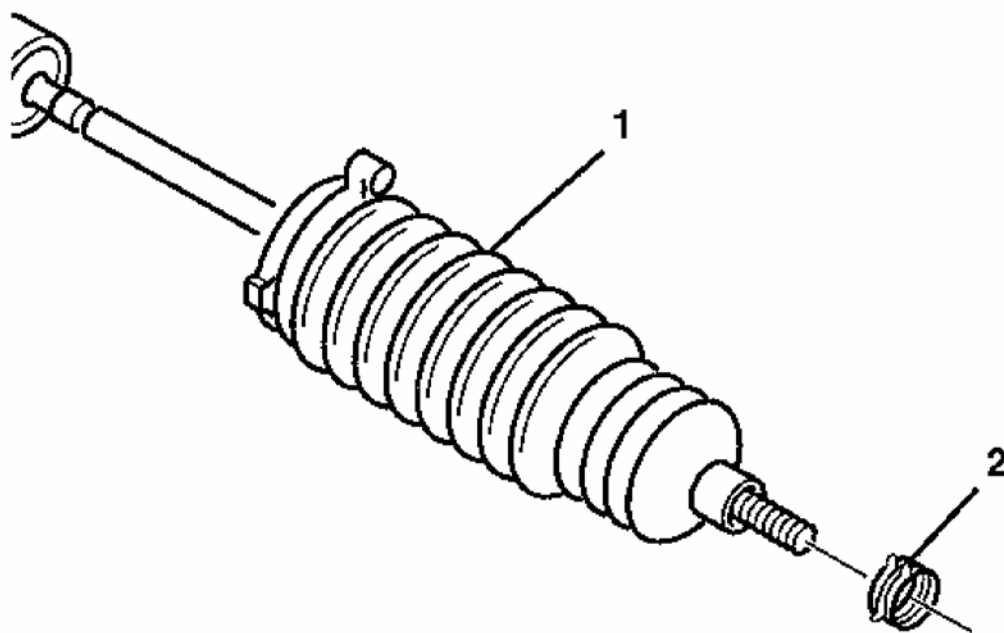
**Fig. 30: View Of Steering Rack Assembly**  
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the outer tie rod from the inner tie rod assembly. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.
4. Remove the intermediate steering shaft lower pinch bolt. Refer to **Intermediate Steering Shaft Replacement** in Steering Wheel and Column.
5. Remove the rear frame mounting bolts to allow for tool access. Refer to **Frame Replacement** in Frame and Underbody.



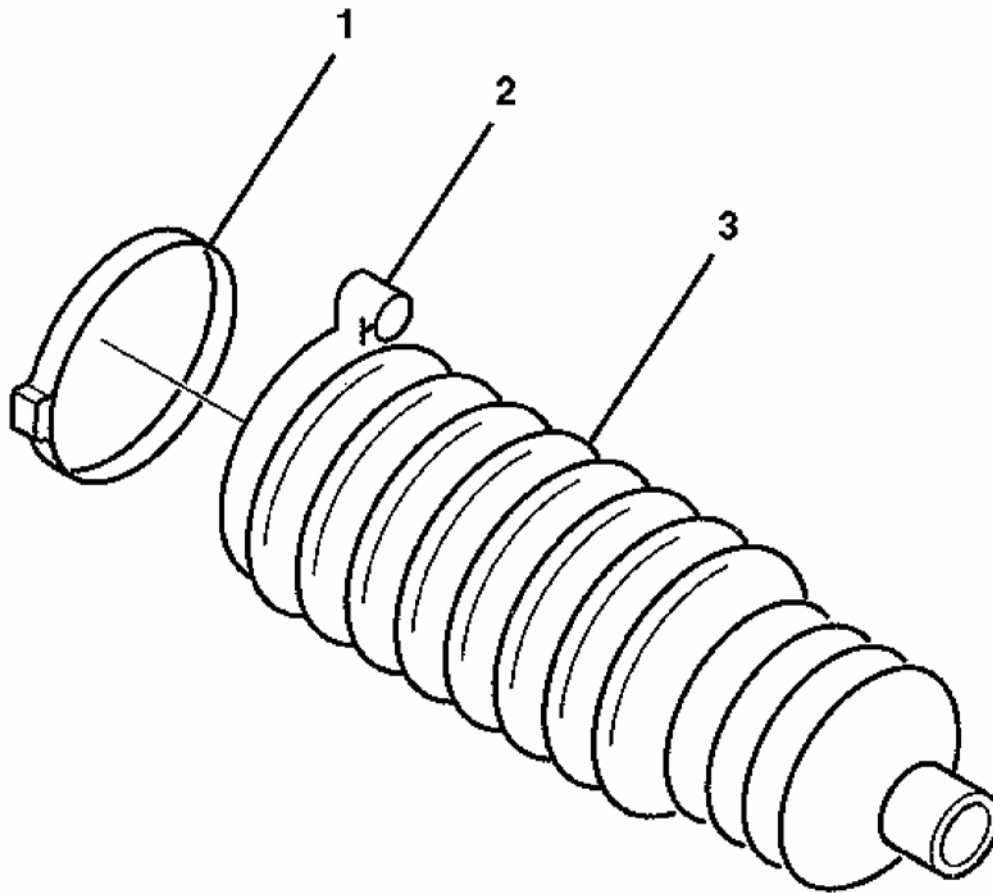
**Fig. 31: Identifying Inner Tie Rod Assembly Jam Nut**  
**Courtesy of GENERAL MOTORS CORP.**

6. Remove the inner tie rod jam nut (2) from the inner tie rod assembly (1).



**Fig. 32: View Of Tie Rod End Clamp, Rack & Pinion Boot**  
**Courtesy of GENERAL MOTORS CORP.**

7. Remove the clamp (2) from the end of the inner tie rod boot (1).

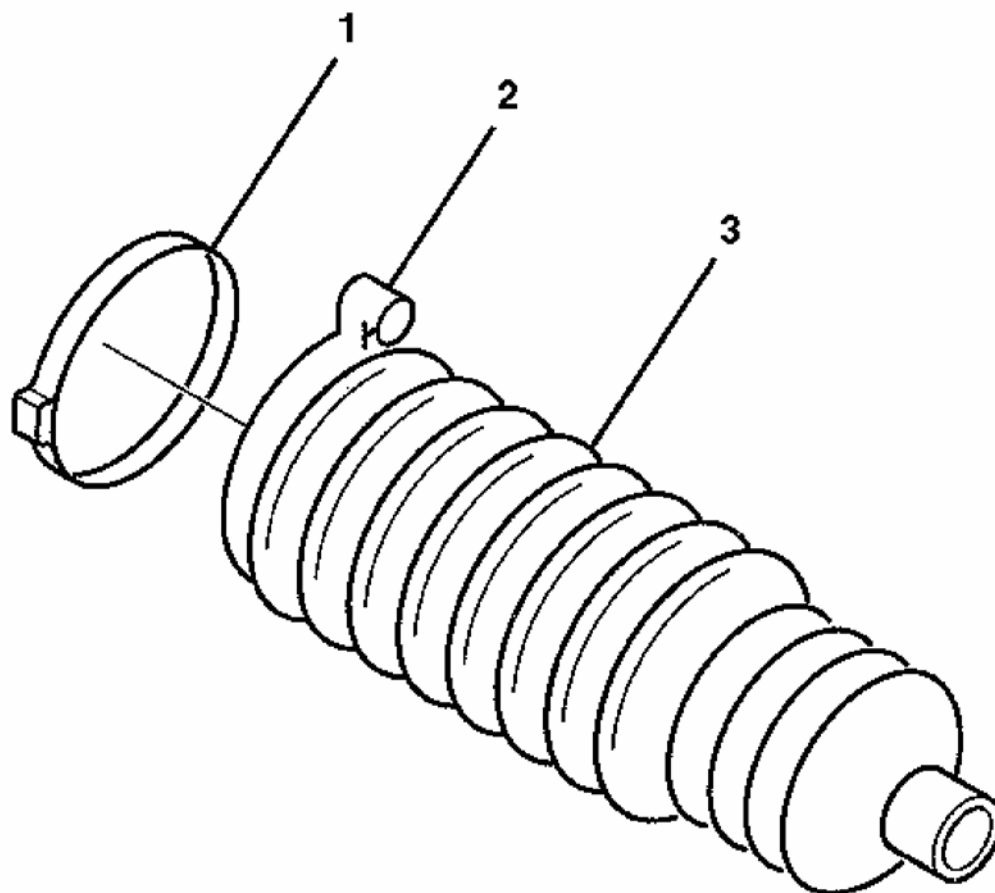


**Fig. 33: View Of Inner Tie Rod Boot Clamp**  
Courtesy of GENERAL MOTORS CORP.

8. Remove the inner tie rod boot clamp (1) from the inner tie rod boot (3) with side cutters.
9. Discard the inner tie rod boot clamp (1).

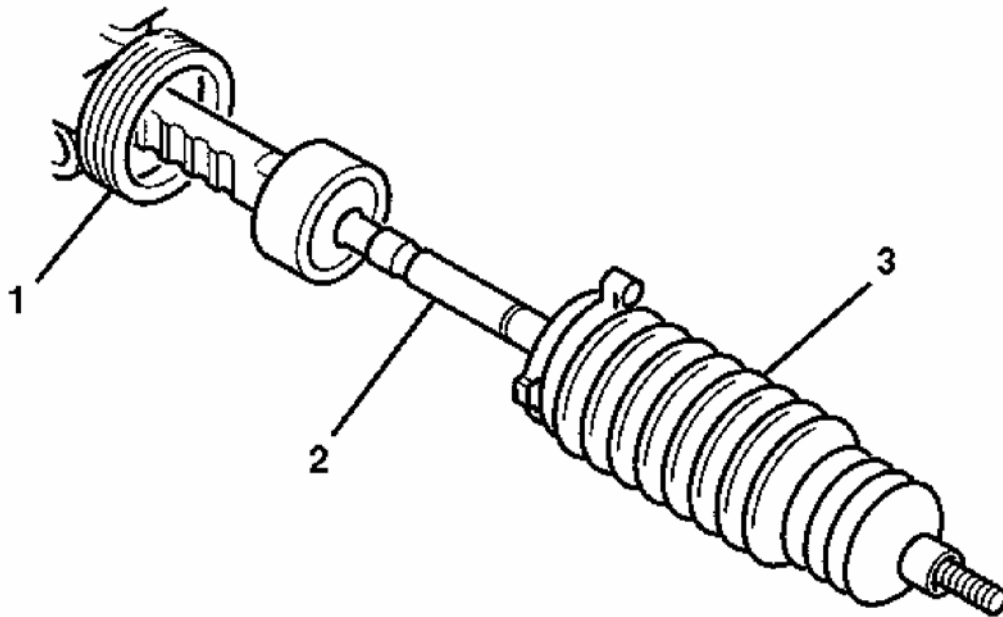
**IMPORTANT:** Prior to removing breather tube (2) or the inner tie rod boot (3), mark the location of the breather tube (2) on the power steering gear assembly.

10. Remove the inner tie rod boot (3) and the breather tube (2).



**Fig. 34: View Of Inner Tie Rod Boot Clamp**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the new inner tie rod boot clamp (1) onto the inner tie rod boot (3).

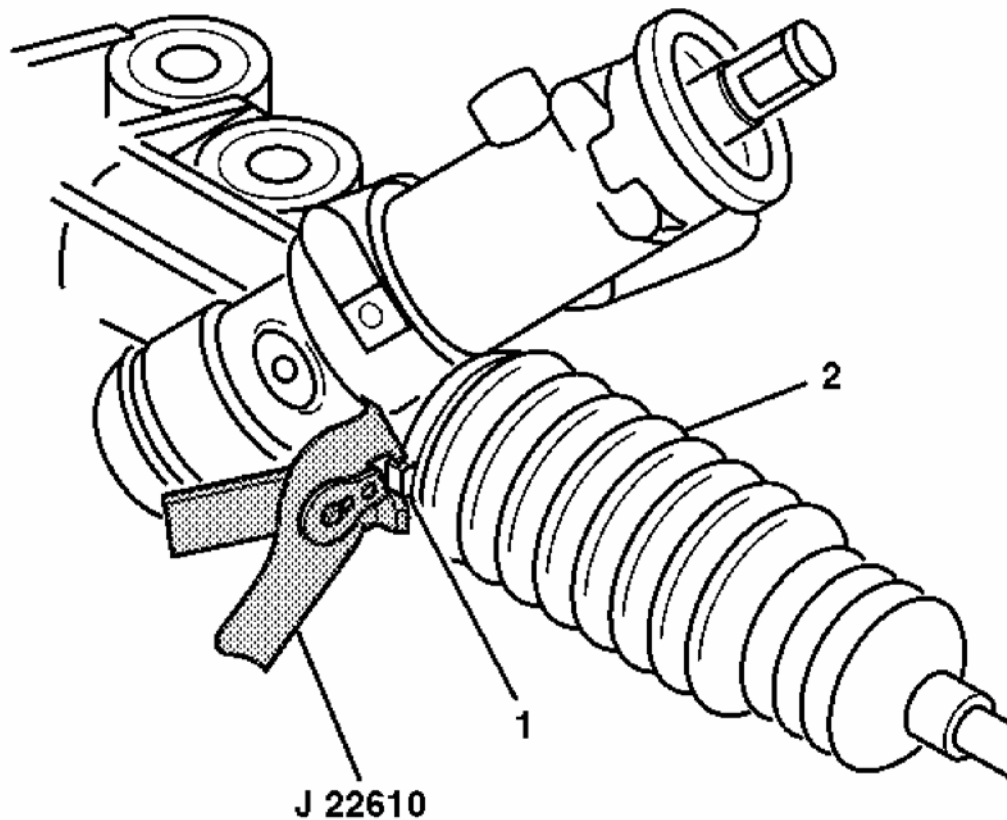


**Fig. 35: Inner Tie Rod, Rack And Pinion Gear & Rack And Pinion Boot**  
 Courtesy of GENERAL MOTORS CORP.

2. Prior to the inner tie rod boot (3) installation, apply grease to the inner tie rod assembly (2) and the power steering gear assembly (1).
3. Install the inner tie rod boot (3) onto the inner tie rod assembly (2).
4. Align the breather tube with the mark made during removal and the molded nipple of the inner tie rod boot.
5. Install the inner tie rod boot (3) onto the power steering gear assembly until the inner tie rod boot (3) is seated in the power steering gear assembly groove.

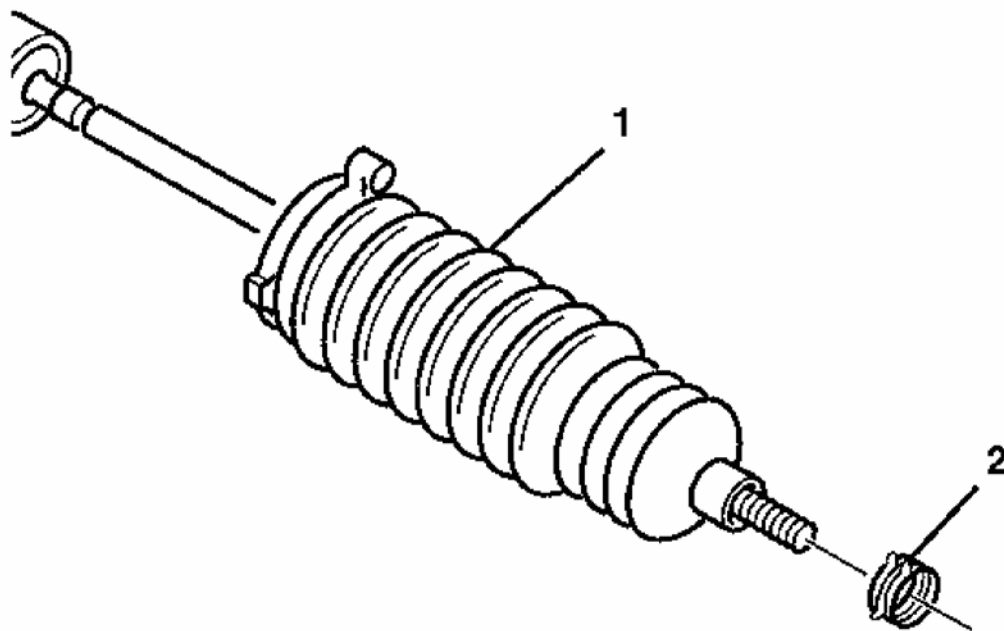
**IMPORTANT:** The inner tie rod boot (3) must not be twisted, puckered or out of shape in any way. If the inner tie rod boot (3) is not shaped properly, adjust the inner tie rod boot (3) by hand before installing the boot clamp.

6. Install the inner tie rod boot (3) onto the inner tie rod assembly (2).

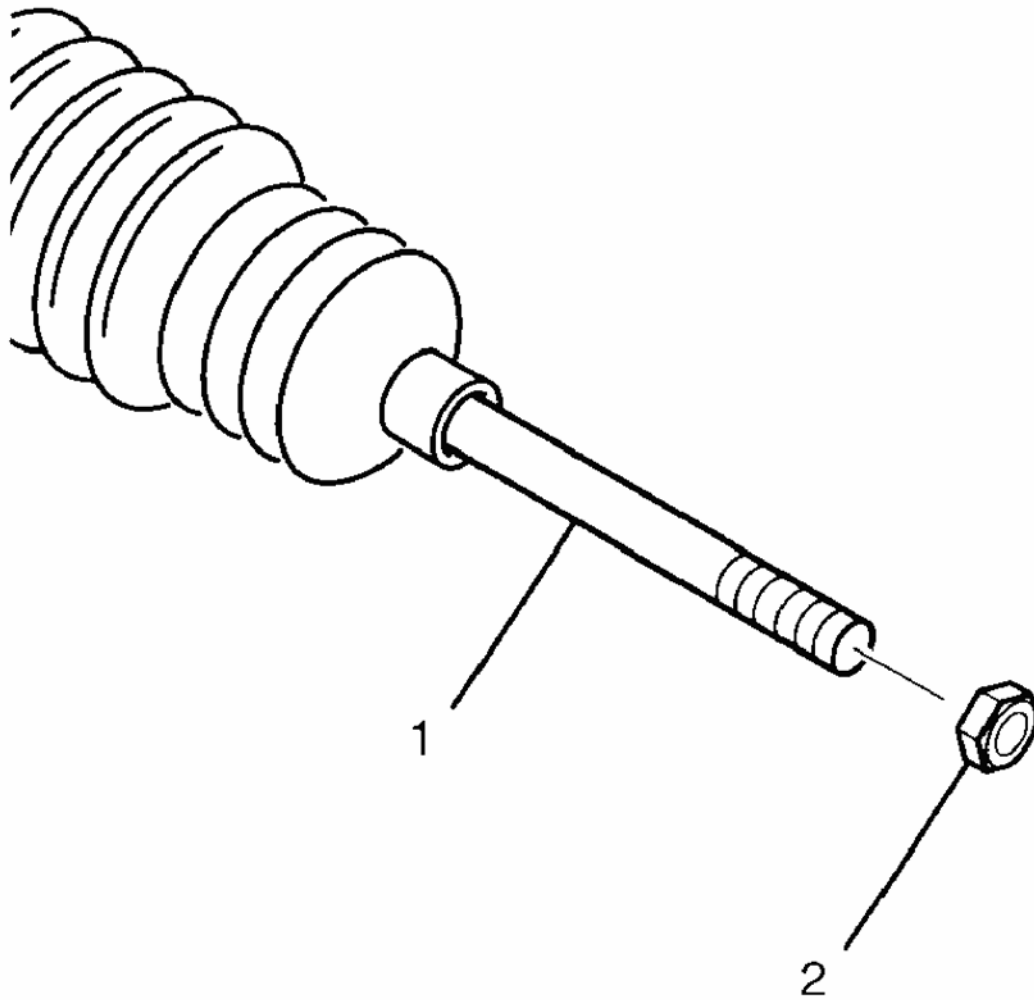


**Fig. 36: Installing Inner Tie Rod Boot Clamp**  
Courtesy of GENERAL MOTORS CORP.

7. Using the **J 22610** install the inner tie rod boot clamp (1) on the inner tie rod boot (2) by firmly crimping the inner tie rod boot clamp (1).
8. Install the inner tie rod small boot clamp (2).

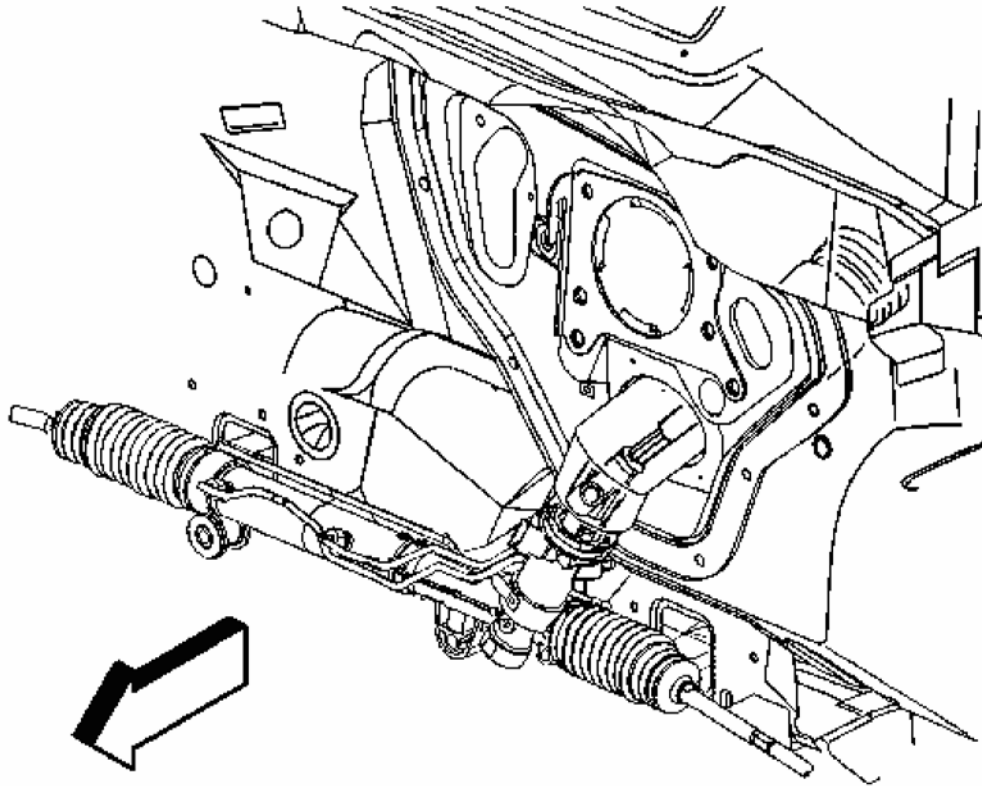


**Fig. 37: View Of Tie Rod End Clamp, Rack & Pinion Boot**  
**Courtesy of GENERAL MOTORS CORP.**



**Fig. 38: View Of Inner Tie Rod & Hex Jam Nut**  
Courtesy of GENERAL MOTORS CORP.

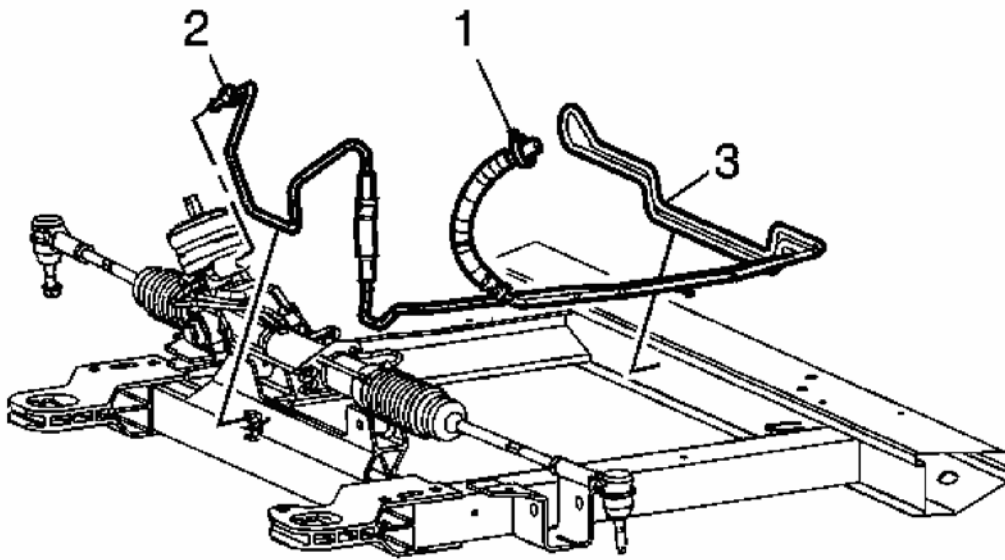
9. Install the inner tie rod jam nut (2) to the inner tie rod assembly (1).
10. Install the rear frame mounting bolts. Refer to **Frame Replacement** in Frame and Underbody.
11. Install the intermediate steering shaft lower pinch bolt. Refer to **Intermediate Steering Shaft Replacement** in Steering Wheel and Column.
12. Install the outer tie rod to the inner tie rod assembly. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.



**Fig. 39: View Of Steering Rack Assembly**  
Courtesy of GENERAL MOTORS CORP.

13. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
14. Lower the vehicle.
15. Perform a front end alignment. Refer to **Measuring Wheel Alignment** in Wheel Alignment.

#### **POWER STEERING COOLER PIPE/HOSE REPLACEMENT**



**Fig. 40: Replacing Power Steering Cooler Pipe/Hose**  
 Courtesy of GENERAL MOTORS CORP.

### Power Steering Cooler Pipe/Hose Replacement

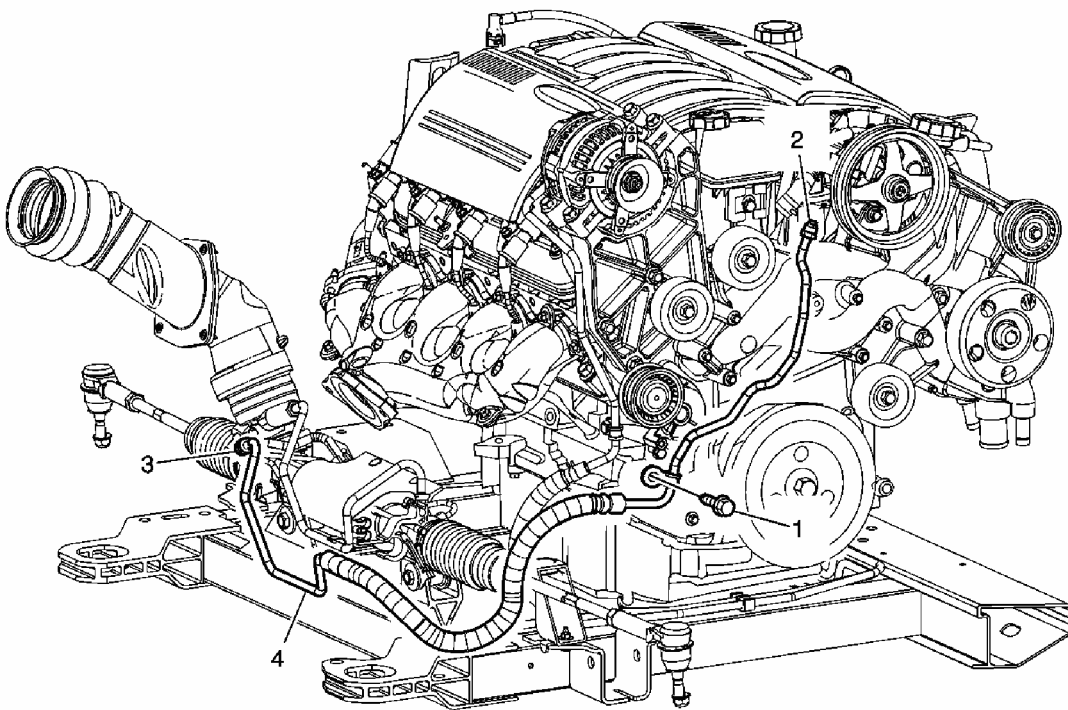
| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Component Name                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>NOTE:</b><br/>           Refer to <u>Fastener Notice</u> .</p> <p><b>Fastener Tightening Specifications:</b> Refer to <u>Fastener Tightening Specifications</u>.</p> <p><b>Preliminary Procedures</b></p> <ol style="list-style-type: none"> <li>1. Place a drain pan under the vehicle.</li> <li>2. Raise and lower the vehicle as necessary to access the power steering hose clamp (at pipe) and fitting (at the rack and pinion). Refer to <u>Lifting and Jacking the Vehicle</u> .</li> <li>3. Fill and bleed the power steering system after the repair has been completed. Refer to <u>Bleeding the Power Steering System</u>.</li> </ol> |                                                                                                                                                                                                                                                      |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Clamp, Power Steering Cooler Pipe/Hose to Return Pipe/Hose<br><b>Tip:</b> <ol style="list-style-type: none"> <li>1. Position the clamp off of the hose.</li> <li>2. Use a shop rag or suitable plug to minimize fluid loss from the hose.</li> </ol> |

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

|   |                                                                                                                              |
|---|------------------------------------------------------------------------------------------------------------------------------|
| 2 | Nut, Power Steering Cooler Pipe/Hose Fitting<br><b>Tighten:</b> 27 N.m (20 lb ft)                                            |
| 3 | Pipe/Hose, Power Steering Cooler<br><b>Tip:</b> Release the power steering cooler pipe/hose from the retainers on the frame. |

#### POWER STEERING PRESSURE PIPE/HOSE REPLACEMENT (LS4)



**Fig. 41: Replacing Power Steering Pressure Pipe/Hose**  
Courtesy of GENERAL MOTORS CORP.

#### Power Steering Pressure Pipe/Hose Replacement (LS4)

| Callout                                                                                           | Component Name |
|---------------------------------------------------------------------------------------------------|----------------|
| <b>NOTE:</b><br>Refer to <b>Fastener Notice</b> .                                                 |                |
| <b>Fastener Tightening Specifications:</b> Refer to <b>Fastener Tightening Specifications</b> .   |                |
| <b>Preliminary Procedures</b>                                                                     |                |
| 1. Remove the drive belt. Refer to <b>Drive Belt Replacement - Accessory</b> for the 5.3L engine. |                |

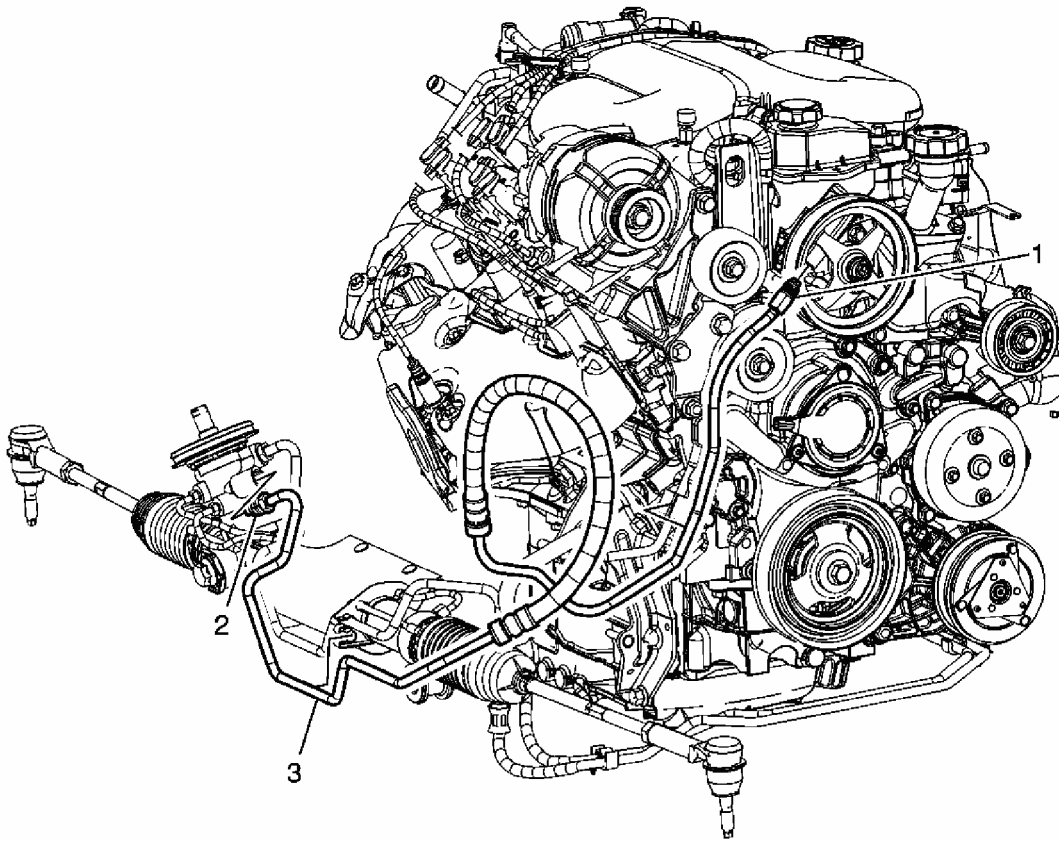
## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

2. Place a drain pan under the vehicle.
3. Raise and lower the vehicle as necessary to access the power steering hose fitting at the rack and pinion. Refer to **Lifting and Jacking the Vehicle** .
4. Fill and bleed the power steering system after the repair has been completed. Refer to **Bleeding the Power Steering System**.

|   |                                                                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Bolt, Drive Belt Tensioner<br><b>Tip:</b> Only remove the one tensioner bolt that retains the power steering pressure hose.<br><b>Tighten:</b> 50 N.m (37 lb ft) |
| 2 | Nut, Power Steering Pressure Hose Fitting (at pump)<br><b>Tighten:</b> 27 N.m (20 lb ft)                                                                         |
| 3 | Nut, Power Steering Pressure Hose Fitting (at rack and pinion)<br><b>Tighten:</b> 27 N.m (20 lb ft)                                                              |
| 4 | Hose, Power Steering Pressure<br><b>Tip:</b> Release the hose from the retainers to remove it from the vehicle.                                                  |

#### POWER STEERING PRESSURE PIPE/HOSE REPLACEMENT (LZ4/LZE/LZ9)



**Fig. 42: Replacing Power Steering Pressure Pipe/Hose**  
Courtesy of GENERAL MOTORS CORP.

#### Power Steering Pressure Pipe/Hose Replacement (LZ4/LZE/LZ9)

| Callout                                                                                                                                                                  | Component Name |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>NOTE:</b><br>Refer to <b>Fastener Notice</b> .                                                                                                                        |                |
| <b>Fastener Tightening Specifications:</b> Refer to <b>Fastener Tightening Specifications</b> .                                                                          |                |
| <b>Preliminary Procedures</b>                                                                                                                                            |                |
| 1. Place a drain pan under the vehicle.                                                                                                                                  |                |
| 2. Remove the drive belt. Refer to <b>Drive Belt Replacement</b> for the 3.5L engine or <b>Drive Belt Replacement</b> for the 3.9L engine.                               |                |
| 3. Remove the drive belt tensioner. Refer to <b>Drive Belt Tensioner Replacement</b> for the 3.5L engine or <b>Drive Belt Tensioner Replacement</b> for the 3.9L engine. |                |
| 4. Raise and lower the vehicle as necessary to access the pipe fitting at the rack and pinion. Refer to <b>Lifting and Jacking the Vehicle</b> .                         |                |

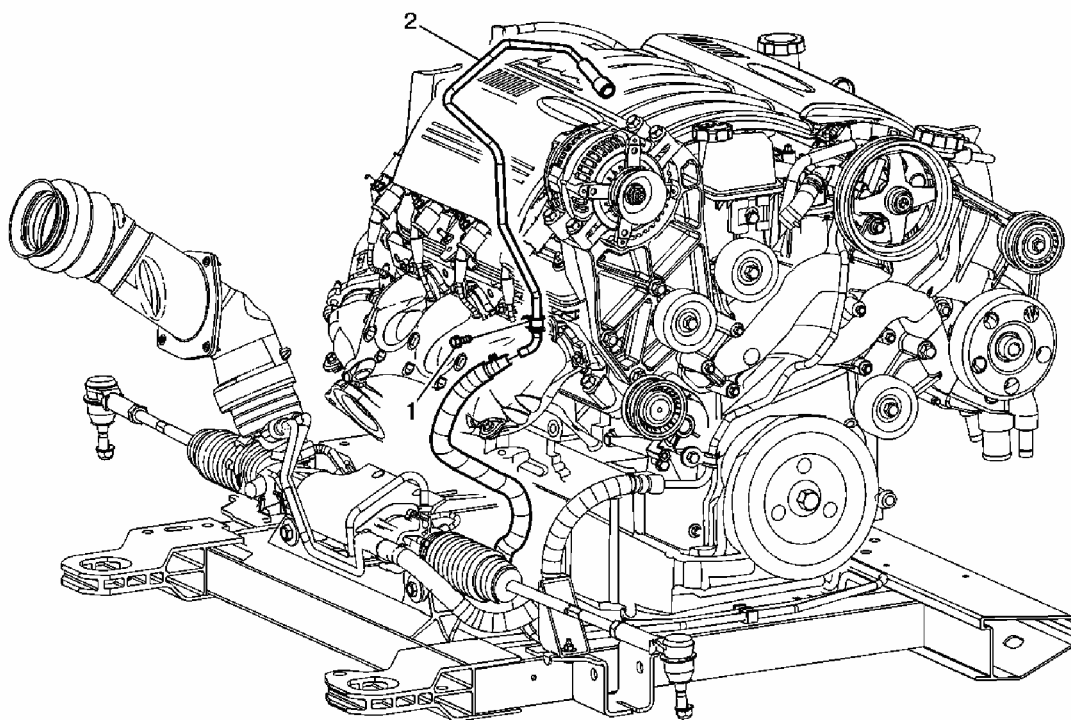
## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

5. Fill and bleed the power steering system after the repair has been completed.  
Refer to **Bleeding the Power Steering System**.

|   |                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------|
| 1 | Fitting, Power Steering High Pressure Hose (at pump)<br><b>Tighten:</b> 27 N.m (20 lb ft)                            |
| 2 | Fitting, Power Steering High Pressure Hose (at rack and pinion)<br><b>Tighten:</b> 27 N.m (20 lb ft)                 |
| 3 | Hose, Power Steering High Pressure<br><b>Tip:</b> Release the hose from the retainers to remove it from the vehicle. |

### POWER STEERING RETURN HOSE REPLACEMENT (LS4)



**Fig. 43: Replacing Power Steering Return Hose**  
Courtesy of GENERAL MOTORS CORP.

### Power Steering Return Hose Replacement (LS4)

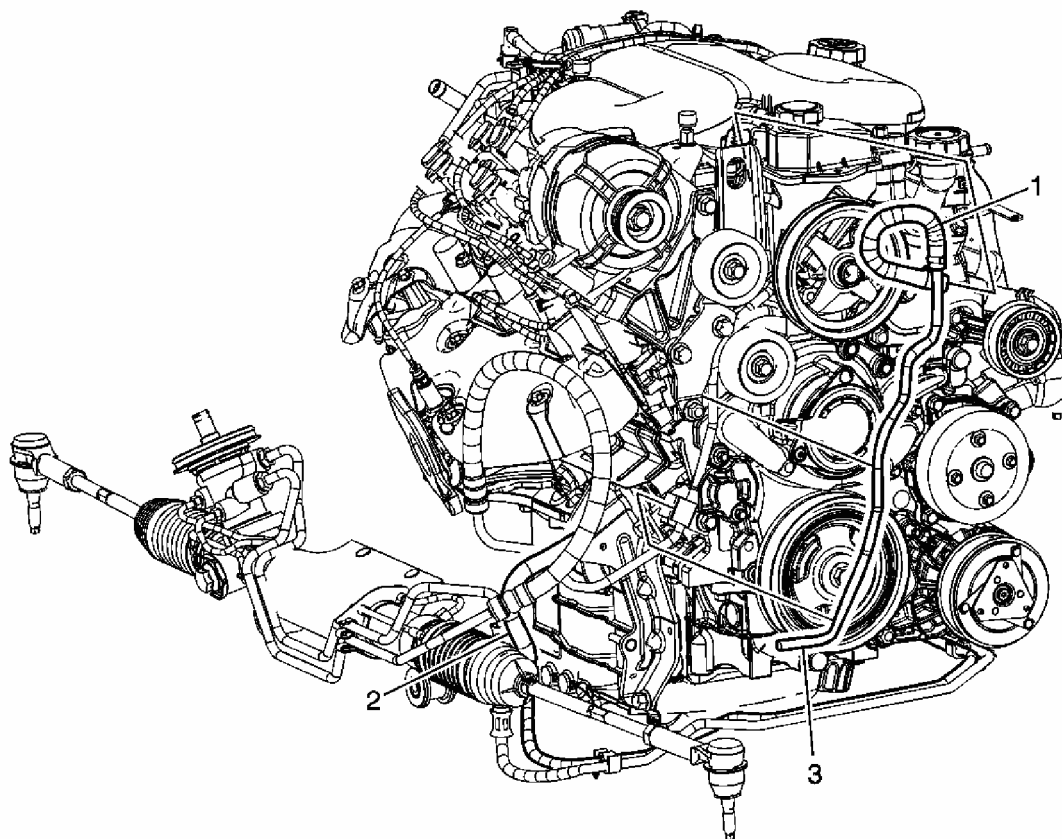
| Callout                                                                                         | Component Name |
|-------------------------------------------------------------------------------------------------|----------------|
| <b>NOTE:</b><br>Refer to <b>Fastener Notice</b> .                                               |                |
| <b>Fastener Tightening Specifications:</b> Refer to <b>Fastener Tightening Specifications</b> . |                |

## Preliminary Procedures

1. Remove the engine sight shield. Refer to **Engine Sight Shield Replacement** for the 5.3L engine.
2. Place a drain pan under the vehicle.
3. Raise and lower the vehicle as necessary to access the power steering return hose clamp at the cooler pipe/hose. Refer to **Lifting and Jacking the Vehicle**.
4. Fill and bleed the power steering system after the repair has been completed. Refer to **Bleeding the Power Steering System**.

|   |                                                                                                                                                                 |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Bolt, Power Steering Return Hose/Pipe<br><br><b>Tighten:</b> 55 N.m (41 lb ft)<br><br><b>Tip:</b> Remove the power steering return hose clamp (at cooler pipe). |
| 2 | Pipe/Hose, Power Steering Return<br><b>Tip:</b> Remove the power steering return pipe/hose clamp (at reservoir).                                                |

## POWER STEERING RETURN HOSE REPLACEMENT (LZ4/LZE/LZ9)



**Fig. 44: Replacing Power Steering Return Hose**  
 Courtesy of GENERAL MOTORS CORP.

### Power Steering Return Hose Replacement (LZ4/LZE/LZ9)

| Callout                                                                                                                                                                     | Component Name                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE:</b><br>Refer to <u>Fastener Notice</u> .                                                                                                                           |                                                                                                                                    |
| <b>Fastener Tightening Specifications:</b> Refer to <u>Fastener Tightening Specifications</u> .                                                                             |                                                                                                                                    |
| <b>Preliminary Procedures</b>                                                                                                                                               |                                                                                                                                    |
| 1. Remove the intake manifold cover. Refer to <u>Intake Manifold Cover Replacement</u> for the 3.5L engine or <u>Intake Manifold Cover Replacement</u> for the 3.9L engine. |                                                                                                                                    |
| 2. Place a drain pan under the vehicle.                                                                                                                                     |                                                                                                                                    |
| 3. Remove the belt tensioner. Refer to <u>Drive Belt Tensioner Replacement</u> for the 3.5L engine or <u>Drive Belt Tensioner Replacement</u> for the 3.9L engine.          |                                                                                                                                    |
| 4. Raise and lower the vehicle as necessary to access the power steering return hose clamp at the cooler pipe/hose. Refer to <u>Lifting and Jacking the Vehicle</u> .       |                                                                                                                                    |
| 5. Fill and bleed the power steering system after the repair has been completed. Refer to <u>Bleeding the Power Steering System</u> .                                       |                                                                                                                                    |
| 1                                                                                                                                                                           | Clamp, Power Steering Return Pipe/Hose (at reservoir)                                                                              |
| 2                                                                                                                                                                           | Clamp, Power Steering Return Pipe/Hose (at cooler pipe)                                                                            |
| 3                                                                                                                                                                           | Pipe/Hose, Power Steering Pump Return<br><b>Tip:</b> Release the return pipe/hose from the retainer to remove it from the vehicle. |

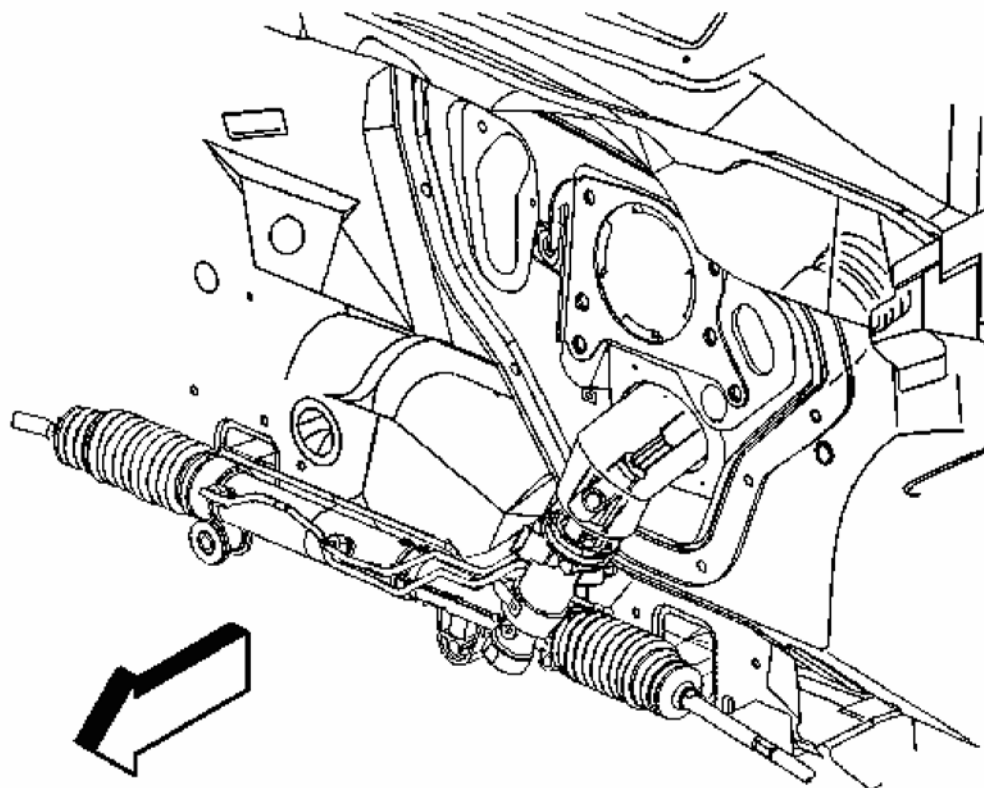
### POWER STEERING GEAR REPLACEMENT

#### Tools Required

**J 42640** Steering Column Lock Pin

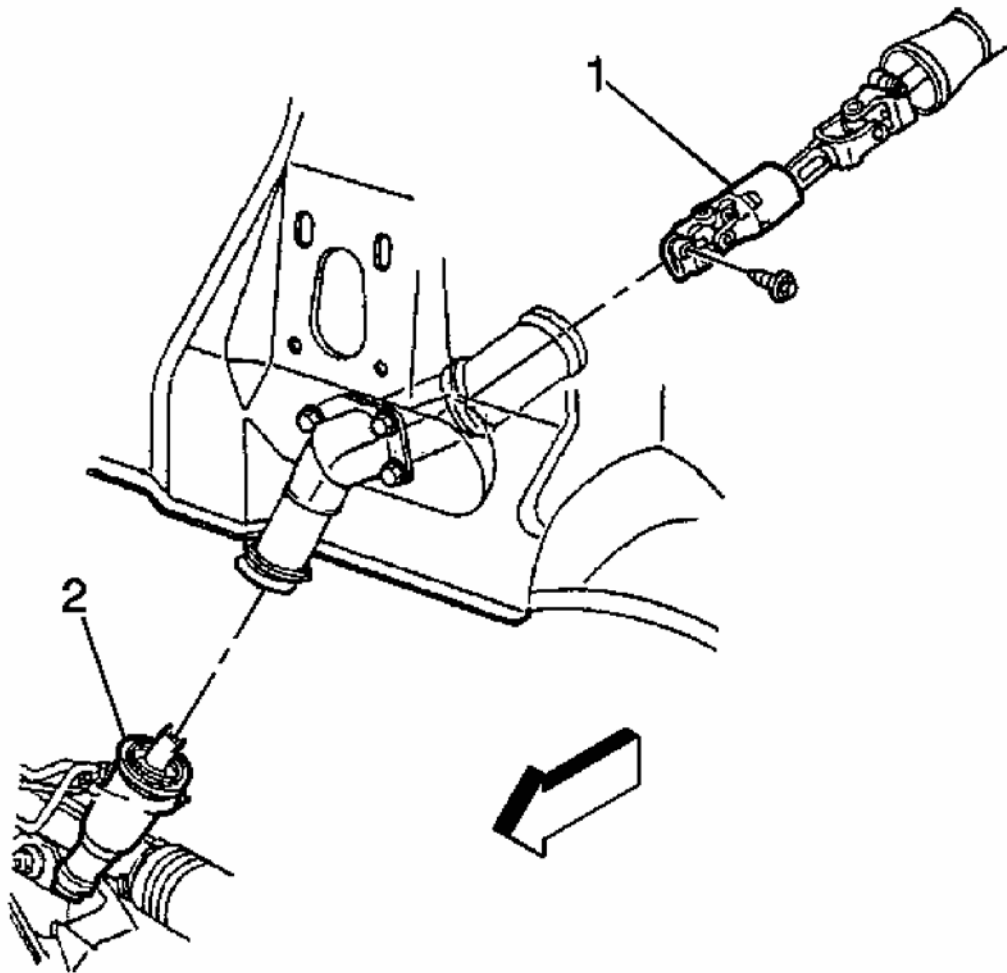
#### Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Place a drain pan under the vehicle.



**Fig. 45: View Of Steering Rack Assembly**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .



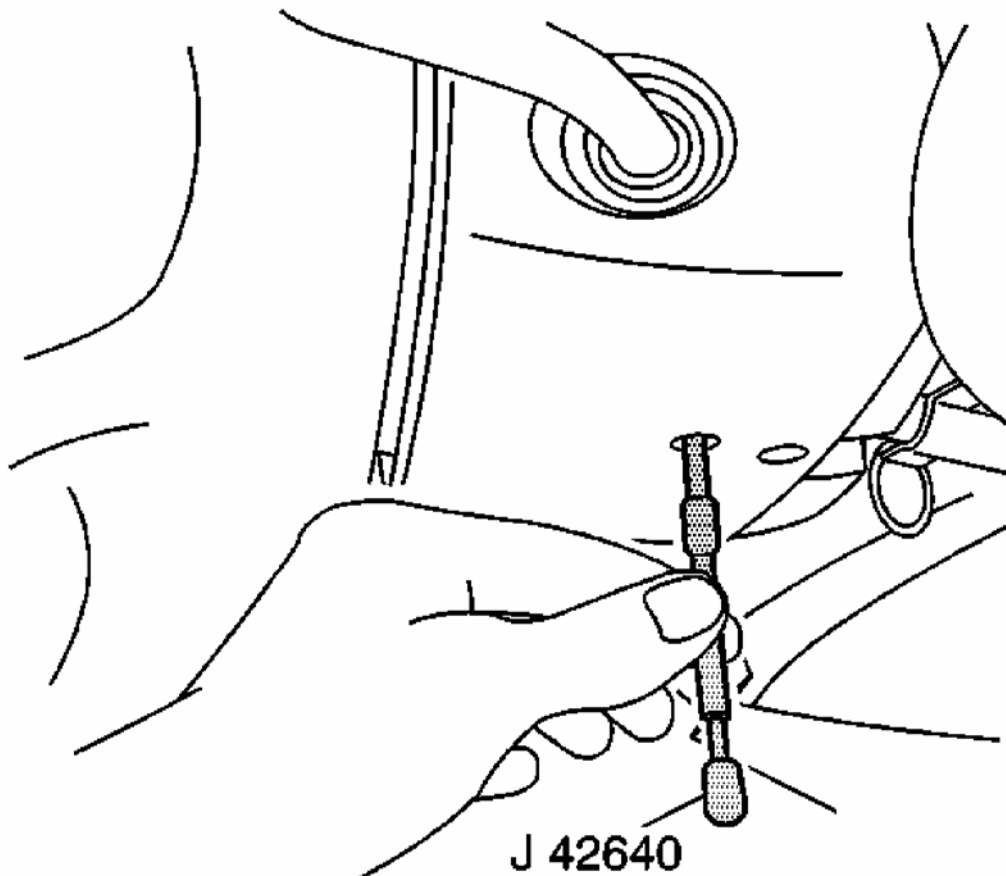
**Fig. 46: View Of Intermediate Steering Shaft To Power Steering Gear Stub Shaft**  
Courtesy of GENERAL MOTORS CORP.

**CAUTION:** Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal injury.

**NOTE:** Set steering shaft so the block tooth on the upper steering shaft is at the 12 o'clock position, the wheels on the vehicle are straight ahead and set the ignition switch to the LOCK position. Failure to follow these procedures could result in damage to the coil.

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

4. Remove the lower pinch bolt from the power steering gear stub shaft (2).



**Fig. 47: Identifying J 42640**  
Courtesy of GENERAL MOTORS CORP.

5. Insert **J 42640** into the steering column access hole in order to lock the steering column. This will maintain the correct orientation.
6. Remove the intermediate steering shaft (1) from the power steering gear stub shaft (2).
7. Remove both of the tie rod ends from the steering knuckles. Refer to **Rack and Pinion**

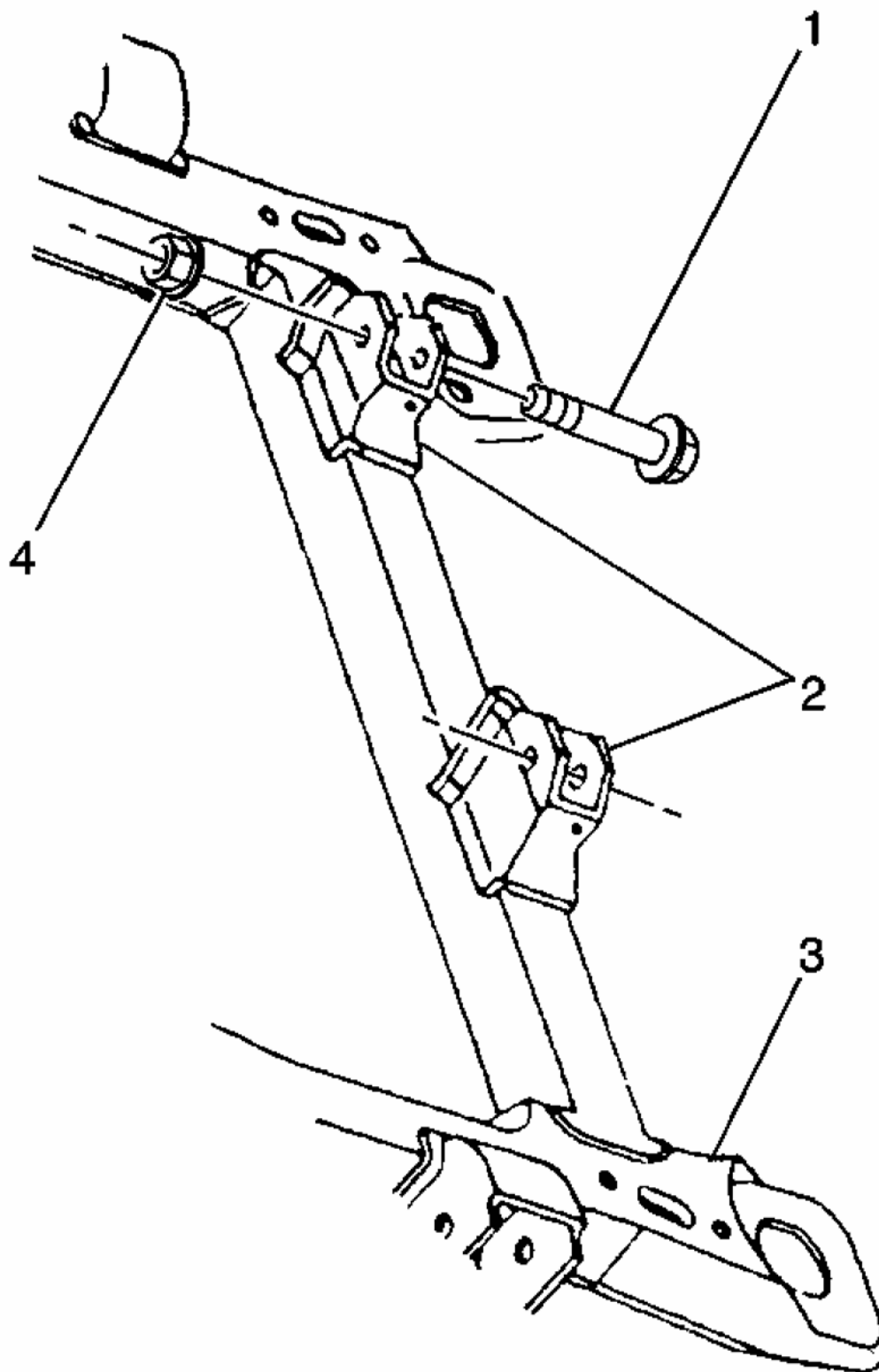
## 2006 Chevrolet Impala LS

2006 STEERING Power Steering System - Impala

### Outer Tie Rod End Replacement.

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala

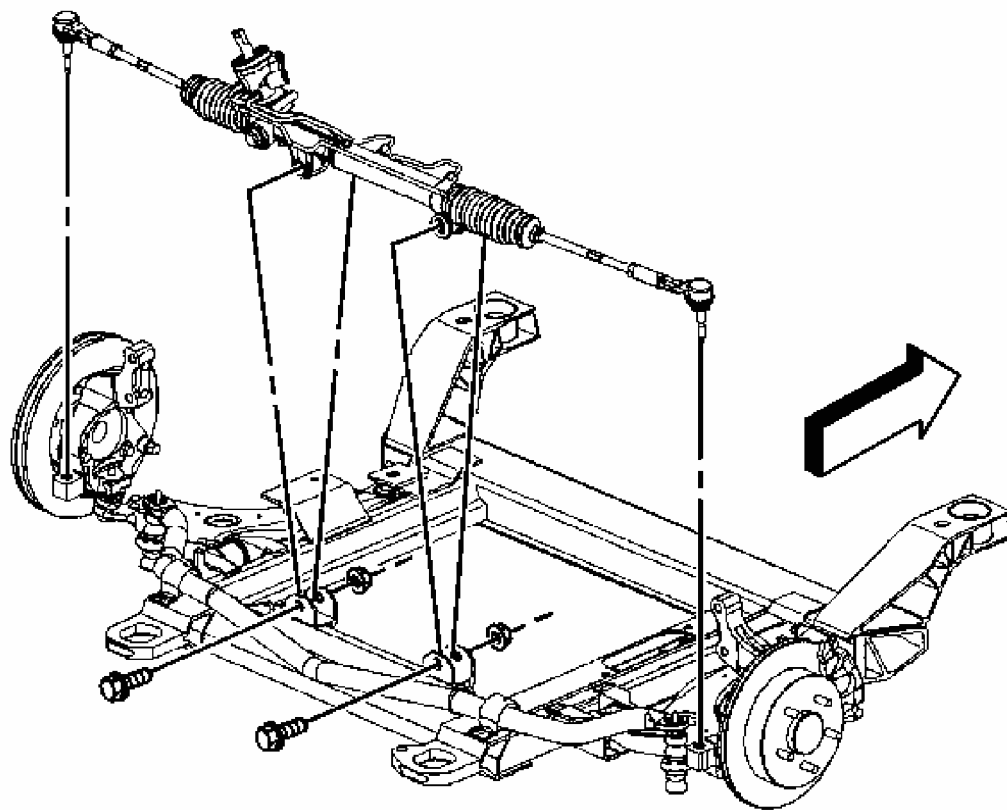


**Fig. 48: View Of Rear Of Frame**  
**Courtesy of GENERAL MOTORS CORP.**

8. Support the rear of the frame (3) using jackstands.
9. Remove the frame bolts from the rear of the frame. Refer to **Frame Replacement** .

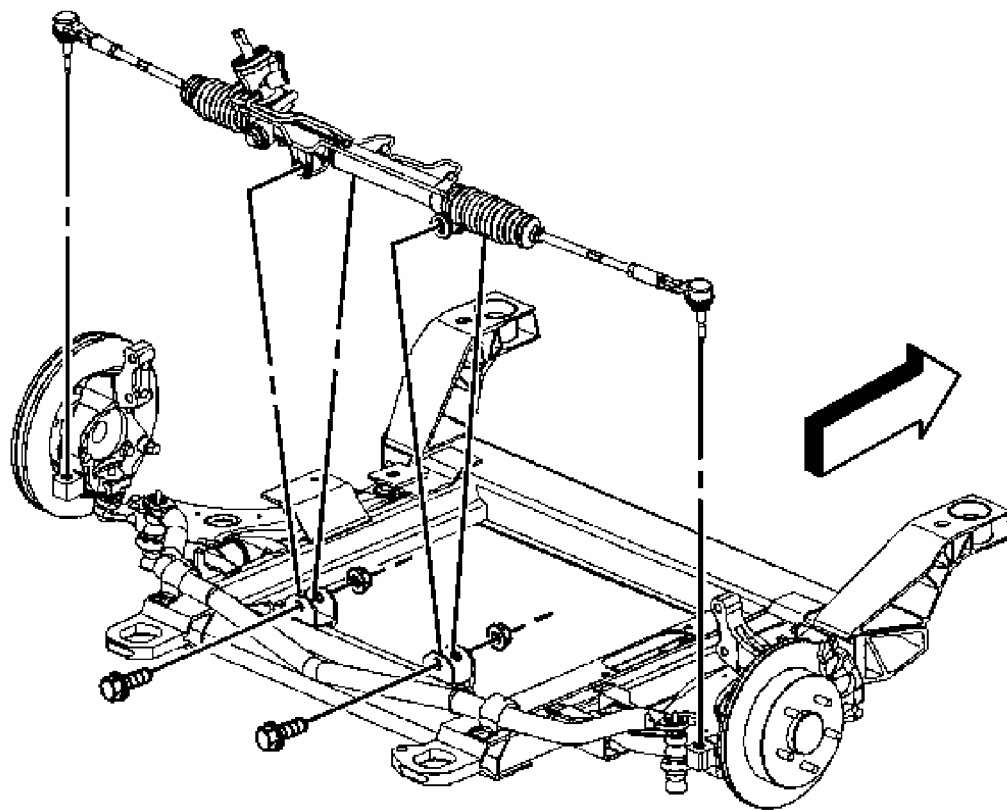
**NOTE:**      **Do not lower the rear of the frame too far as damage to the engine components nearest to the cowl may result.**

10. Lower the rear of the frame (3).
11. Remove the power steering pressure hose from the power steering gear. Refer to **Power Steering Pressure Pipe/Hose Replacement (LS4)** or **Power Steering Pressure Pipe/Hose Replacement (LZ4/LZE/LZ9)**.
12. Remove the power steering return hose from the power steering gear. Refer to **Power Steering Return Hose Replacement (LS4)** or **Power Steering Return Hose Replacement (LZ4/LZE/LZ9)**.
13. Remove the power steering gear mounting bolts and nuts (1, 4).
14. Remove the power steering gear through the left wheel opening.



**Fig. 49: View Of Power Steering Gear**  
**Courtesy of GENERAL MOTORS CORP.**

**Installation Procedure**

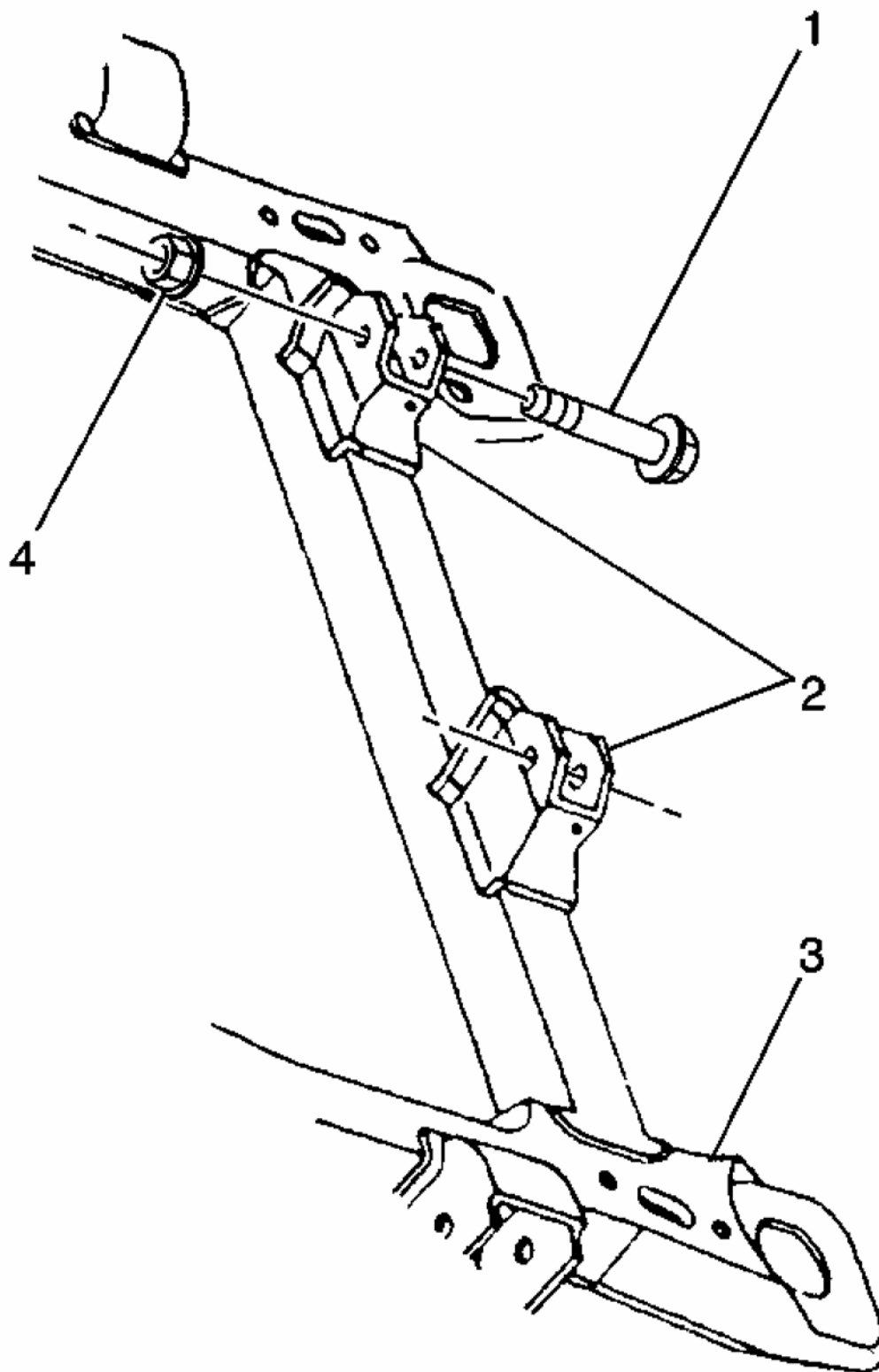


**Fig. 50: View Of Power Steering Gear**  
**Courtesy of GENERAL MOTORS CORP.**

1. Install the power steering gear through the left wheel opening.

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala



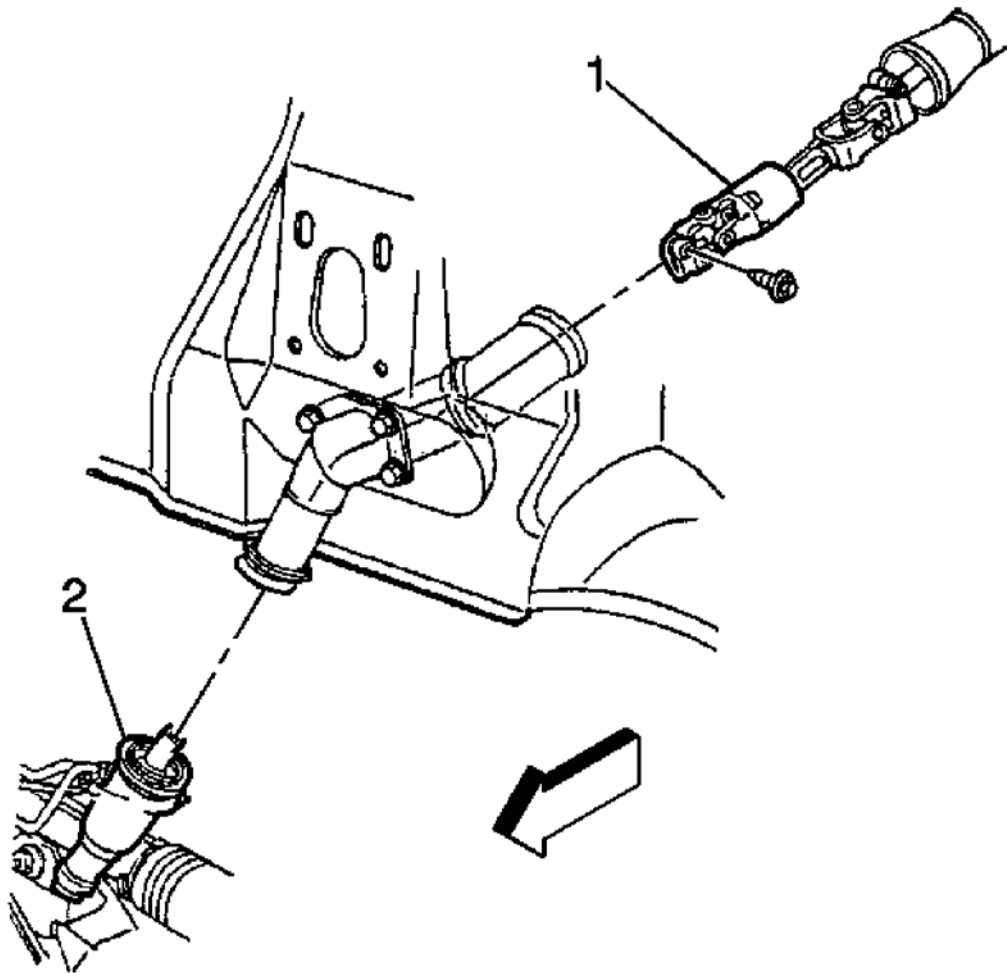
**Fig. 51: View Of Rear Of Frame**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Fastener Notice .

2. Install the power steering gear mounting bolts and nuts (1, 4).

**Tighten:** Tighten the power steering gear mounting bolts to 90 N.m (66 lb ft).

3. Inspect the threads on the power steering pressure hose and the power steering return hose.
4. Inspect the O-ring seals on the power steering hoses.
5. Replace the seals if damaged, lubricate the seals before installation.
6. Install the clamp that holds the power steering hoses to the power steering gear.
7. Install the power steering pressure hose to the power steering gear. Refer to **Power Steering Pressure Pipe/Hose Replacement (LS4)** or **Power Steering Pressure Pipe/Hose Replacement (LZ4/LZE/LZ9)**.
8. Install the power steering return hose to the power steering gear. Refer to **Power Steering Return Hose Replacement (LS4)** or **Power Steering Return Hose Replacement (LZ4/LZE/LZ9)**.
9. Raise the frame into position (3).
10. Install rear frame bolts. Refer to **Frame Replacement** .
11. Remove the jackstands.
12. Install the tie rod ends to the steering knuckles. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.



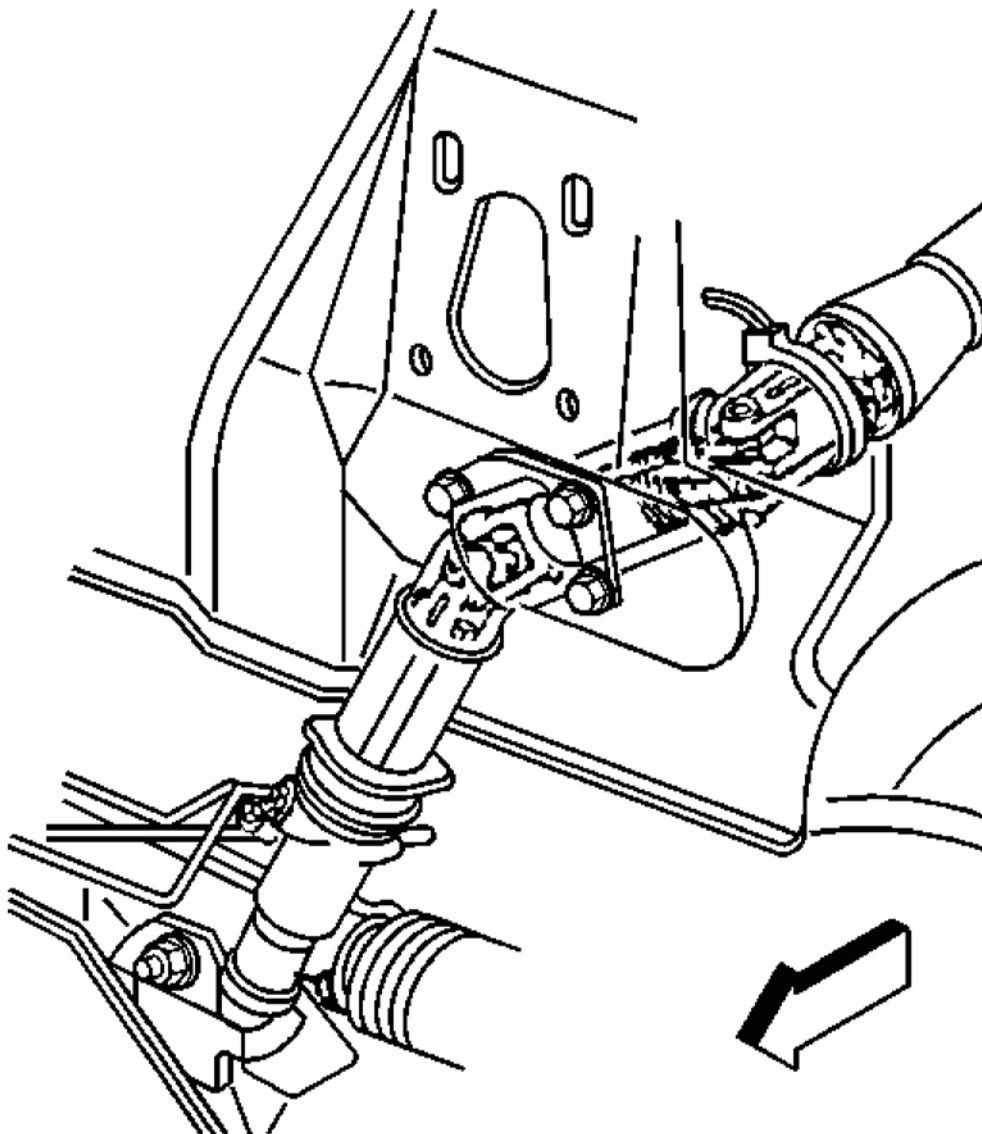
**Fig. 52: View Of Intermediate Steering Shaft To Power Steering Gear Stub Shaft**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Set steering shaft so the block tooth on the upper steering shaft is at the 12 o'clock position, the wheels on the vehicle are straight ahead and set the ignition switch to the LOCK position. Failure to follow these procedures could result in damage to the coil.

**IMPORTANT:** During the installation of the intermediate steering shaft, ensure the steering shaft is seated before you install the pinch bolt. The two mating shafts may disengage if the pinch bolt is inserted into the coupling before the steering shaft installation.

13. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
14. Install the intermediate steering shaft (1) to the power steering gear stub shaft (2).
15. Install the lower pinch bolt to the intermediate steering shaft at the power steering gear stub shaft.

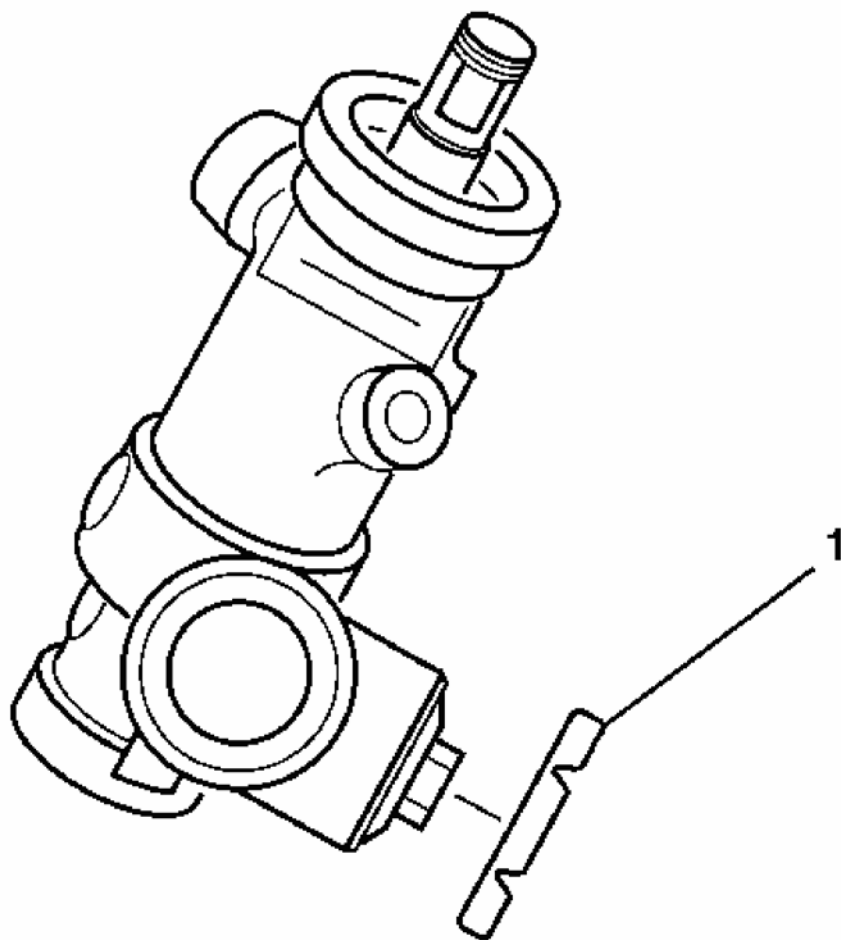
**Tighten:** Tighten the pinch bolt to 48 N.m (35 lb ft).



**Fig. 53: Providing Access To Intermediate Steering Shaft Lower Pinch Bolt**  
Courtesy of GENERAL MOTORS CORP.

16. Install the intermediate steering shaft seal onto the power steering gear.
17. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
18. Remove the drain pan from under the vehicle.
19. Lower the vehicle.
20. Remove the **J 42640** from the steering column.
21. Fill the power steering system with power steering fluid. Refer to **Checking and Adding Power Steering Fluid**.
22. Bleed the power steering system. Refer to **Bleeding the Power Steering System**.
23. Inspect the power steering system for leaks. Refer to **Power Steering Fluid Leaks**.
24. Perform a front end alignment. Refer to **Measuring Wheel Alignment** .

**RACK AND PINION GEAR RACK BEARING PRELOAD ADJUSTMENT - OFF VEHICLE  
(RACK AND PINION)**



**Fig. 54: View Of Adjuster Plug Lock Nut (Rack & Pinion)**  
Courtesy of GENERAL MOTORS CORP.

1. Loosen the adjuster plug lock nut (1).
2. Turn the adjuster plug clockwise until the adjuster plug bottoms in the gear assembly.
3. Turn the adjuster plug back 50 degrees to 70 degrees (approximately one flat).

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

4. Install the adjuster plug lock nut (1) to the adjuster plug.

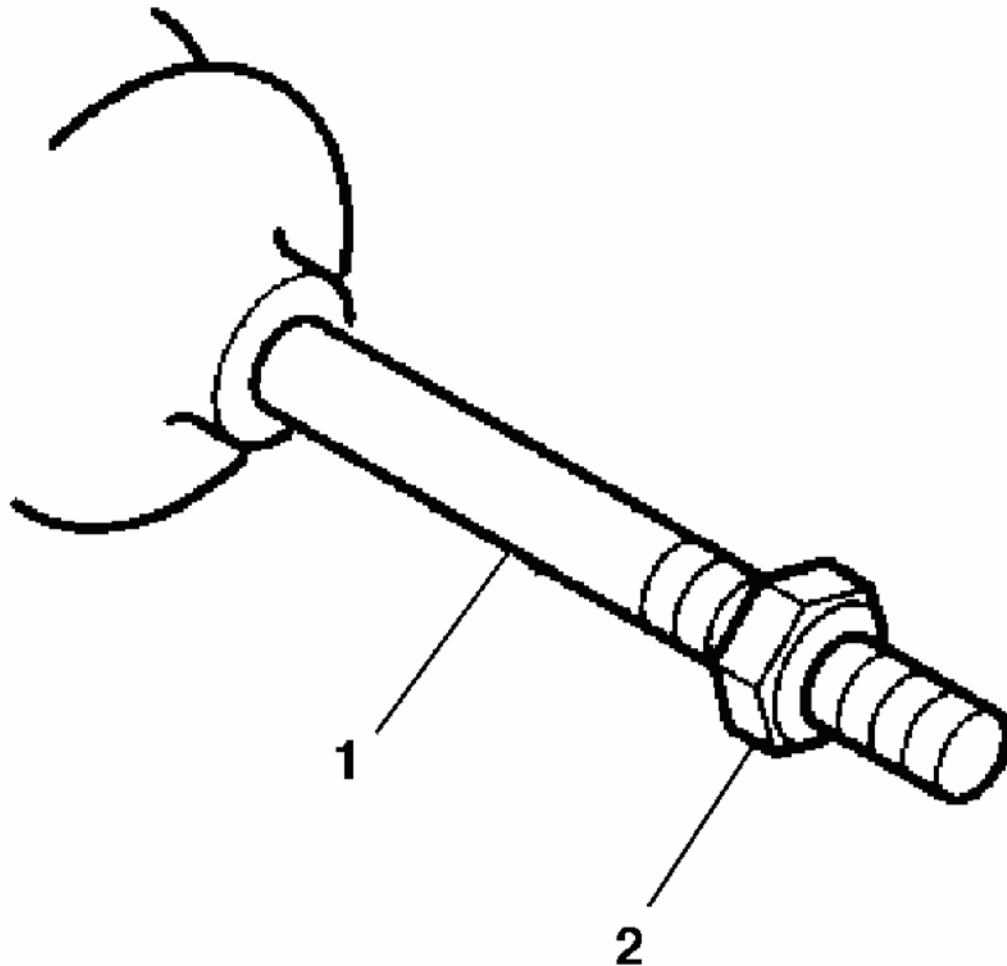
**Tighten:** Hold the adjuster plug stationary while tightening the adjuster plug lock nut (1) to 68 N.m (50 lb ft).

## RACK AND PINION BOOT AND BREATHER TUBE REPLACEMENT - OFF VEHICLE

### Tools Required

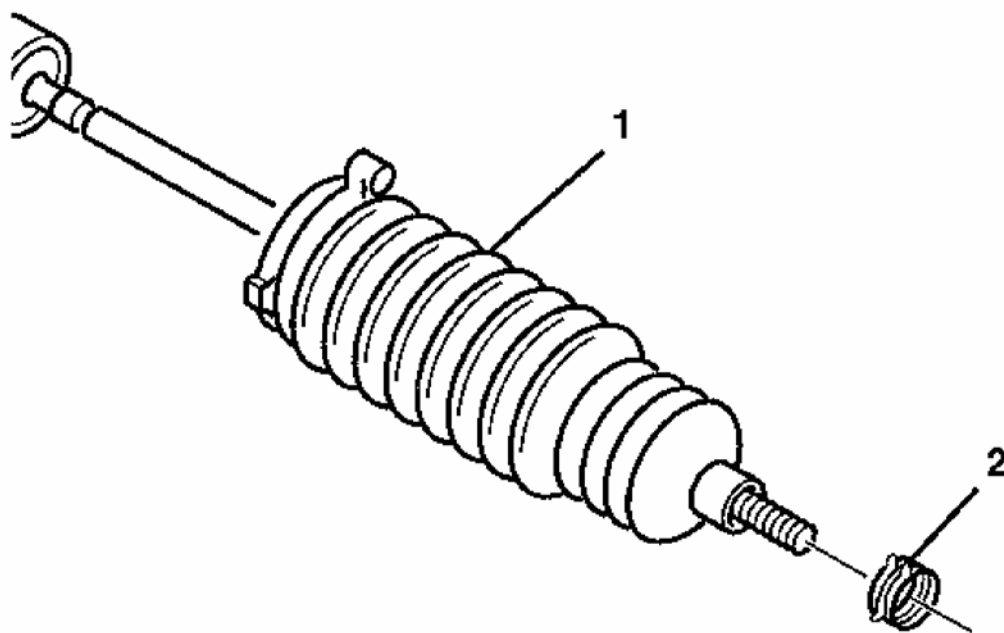
**J 22610** Keystone Clamp Pliers.

### Disassembly Procedure



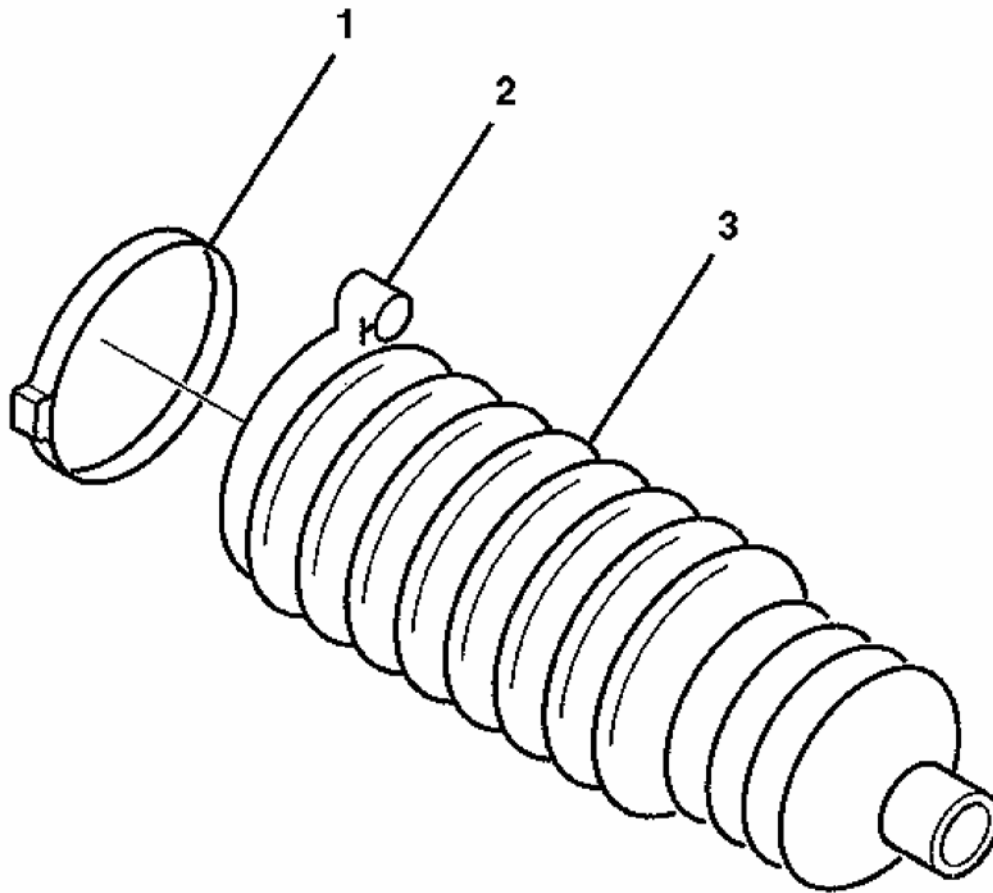
**Fig. 55: Identifying Inner Tie Rod Assembly Jam Nut**  
Courtesy of GENERAL MOTORS CORP.

1. To remove the outer tie rod. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.
2. Remove the hexagon jam nut (2) from the inner tie rod assembly (1).



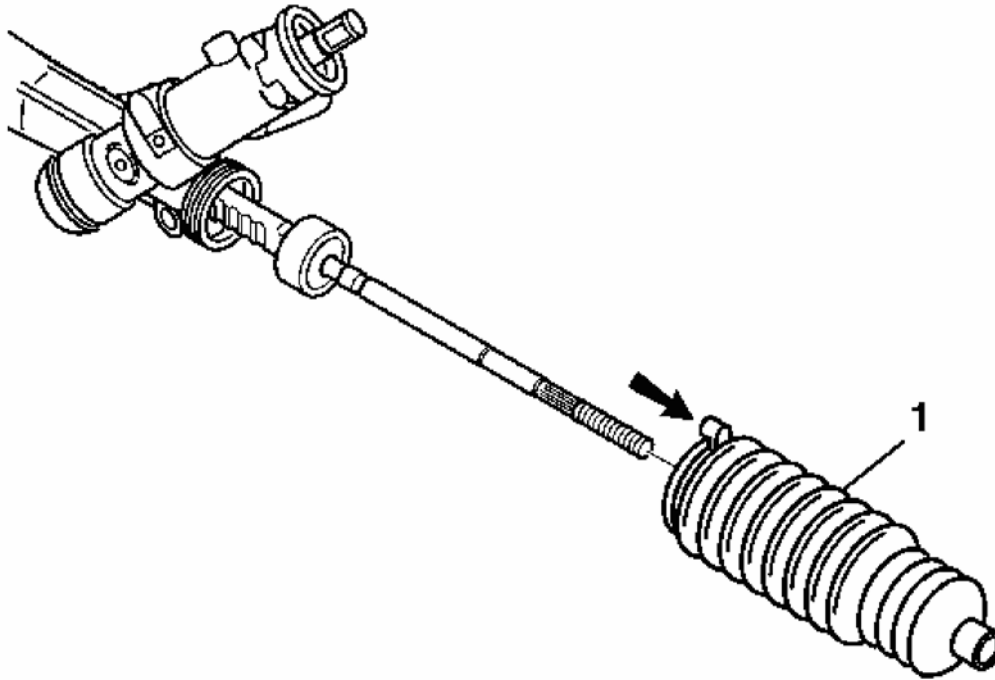
**Fig. 56: View Of Tie Rod End Clamp At Rack & Pinion Boot**  
**Courtesy of GENERAL MOTORS CORP.**

3. Remove the tie rod end clamp (2) from the rack and pinion boot (1).



**Fig. 57: View Of Boot Clamp And Rack & Pinion Boot**  
**Courtesy of GENERAL MOTORS CORP.**

4. Remove the boot clamp (1) from the rack and pinion boot with side cutters.
5. Discard the boot clamp (1).

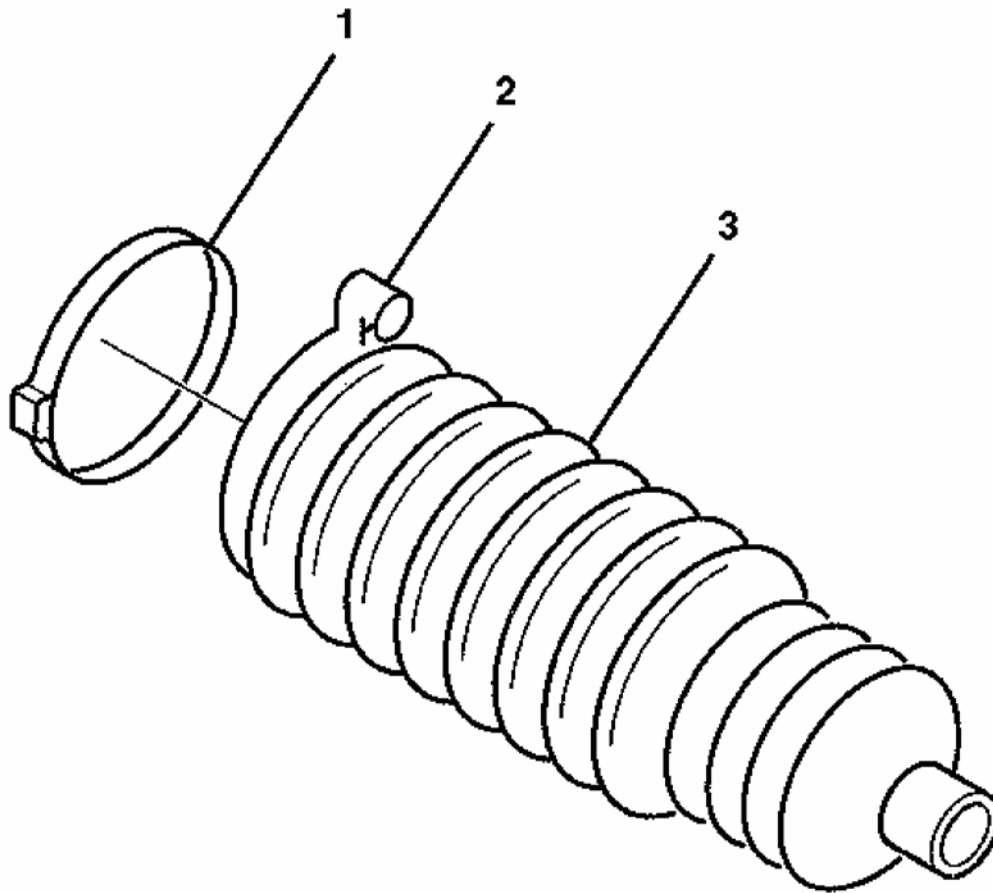


**Fig. 58: Identifying Rack & Pinion Boot & Breather Tube**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** If a breather tube is present, mark the location of the breather tube on the gear assembly before removal of the rack and pinion boot.

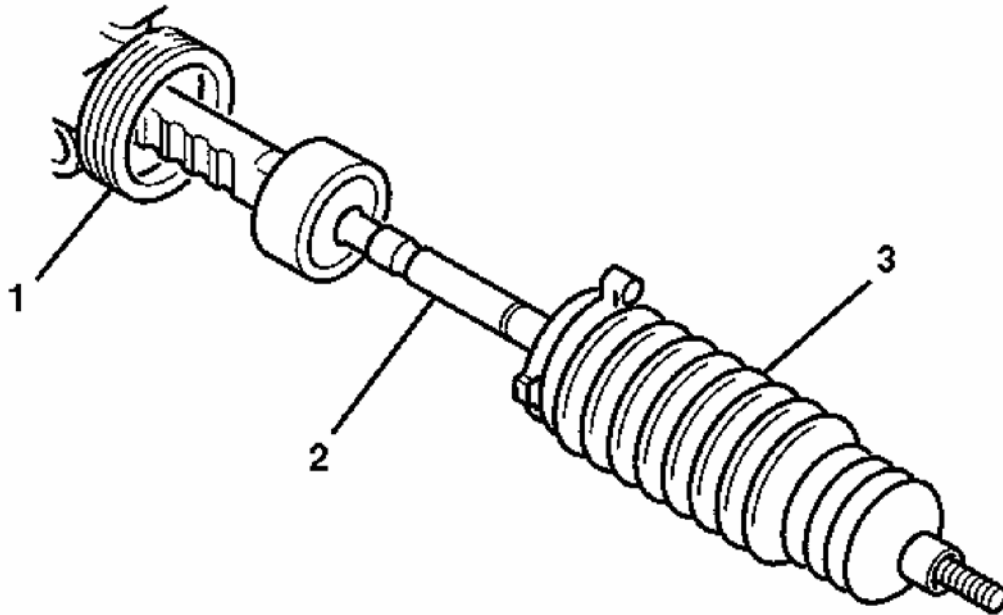
6. Remove the rack and pinion boot (1) and the breather tube, if present, from the rack and pinion gear assembly.

#### Assembly Procedure



**Fig. 59: View Of Boot Clamp And Rack & Pinion Boot**  
Courtesy of GENERAL MOTORS CORP.

1. Install the new boot clamp (1) onto the rack and pinion boot (3).

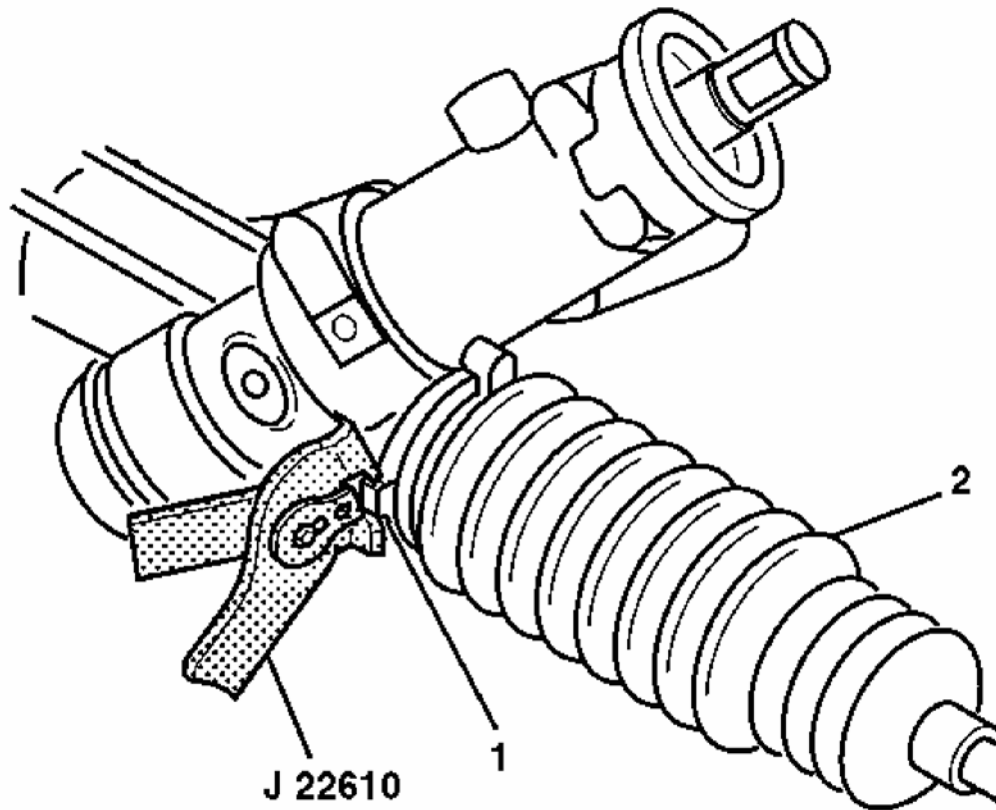


**Fig. 60: Rack & Pinion Gear Assembly, Boot & Inner Tie Rod Assembly**  
Courtesy of GENERAL MOTORS CORP.

2. Prior to rack and pinion boot installation, apply grease to the inner tie rod assembly (2) and the rack and pinion gear assembly (1).
3. Install the rack and pinion boot (3) onto the inner tie rod assembly (2).
4. If present, install the breather tube while aligning the breather tube with the mark made during removal and the molded nipple of the rack and pinion boot.

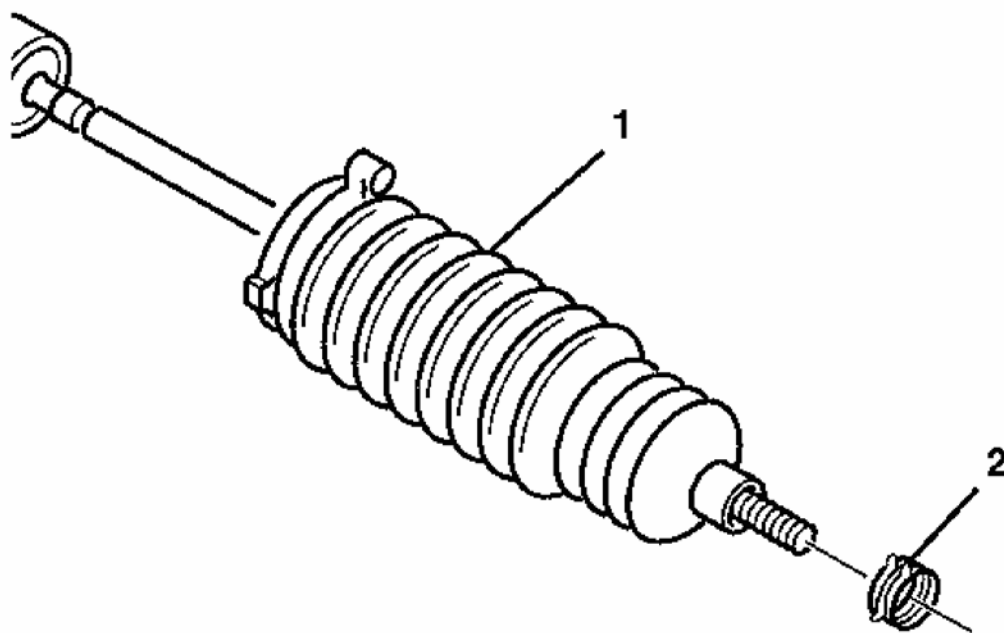
**IMPORTANT:** The rack and pinion boot (3) must not be twisted, puckered or out of shape in any way. If the rack and pinion boot (3) is not shaped properly, adjust the rack and pinion boot (3) by hand before installing the boot clamp.

5. Install the rack and pinion boot onto the gear assembly (1) until the rack and pinion boot (3) is seated in the gear assembly groove.



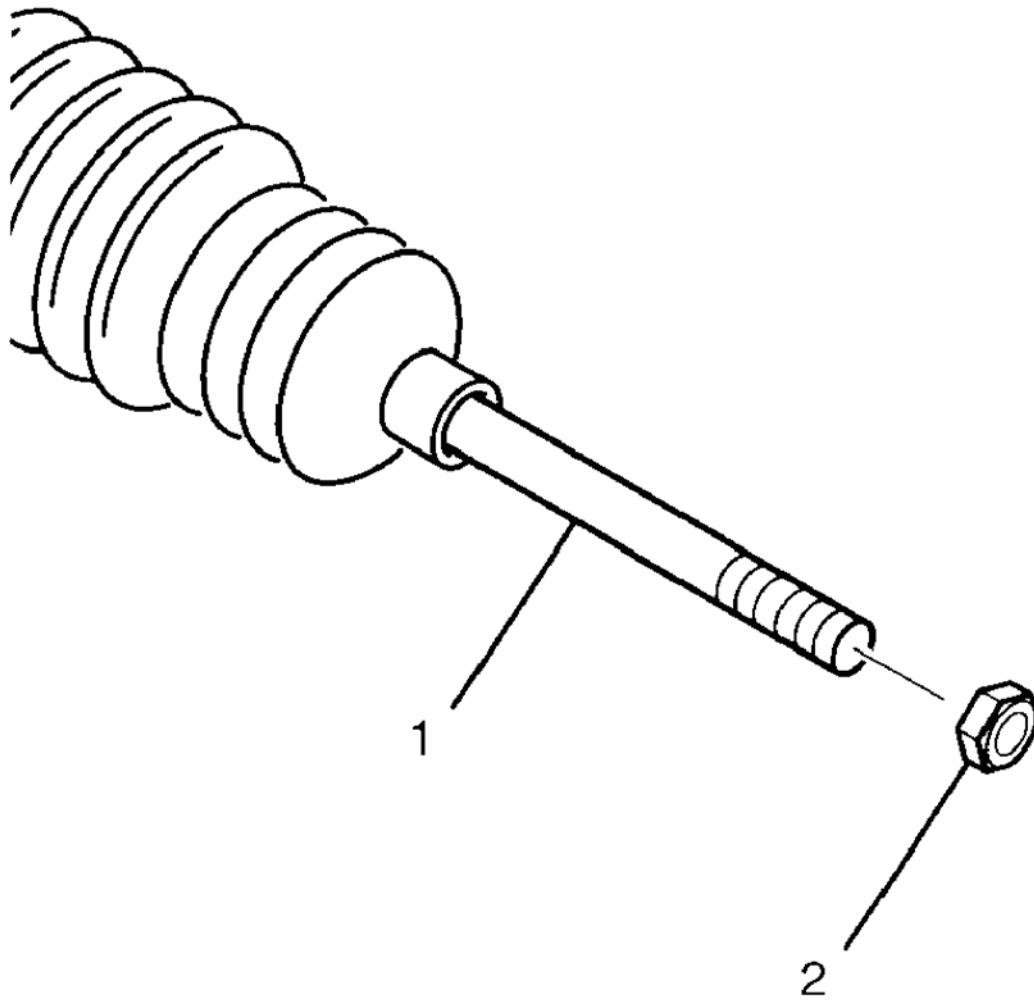
**Fig. 61: Using J 22610 To Install Boot Clamp**  
**Courtesy of GENERAL MOTORS CORP.**

6. Install the boot clamp (1) on the rack and pinion boot (2) with **J 22610** .
7. Crimp the boot clamp (1).
8. Pinch the pliers together on the rack and pinion boot (2) in order to install the tie rod end clamp.



**Fig. 62: View Of Tie Rod End Clamp At Rack & Pinion Boot**  
**Courtesy of GENERAL MOTORS CORP.**

9. Install the tie rod end clamp (2) onto the rack and pinion boot (1).

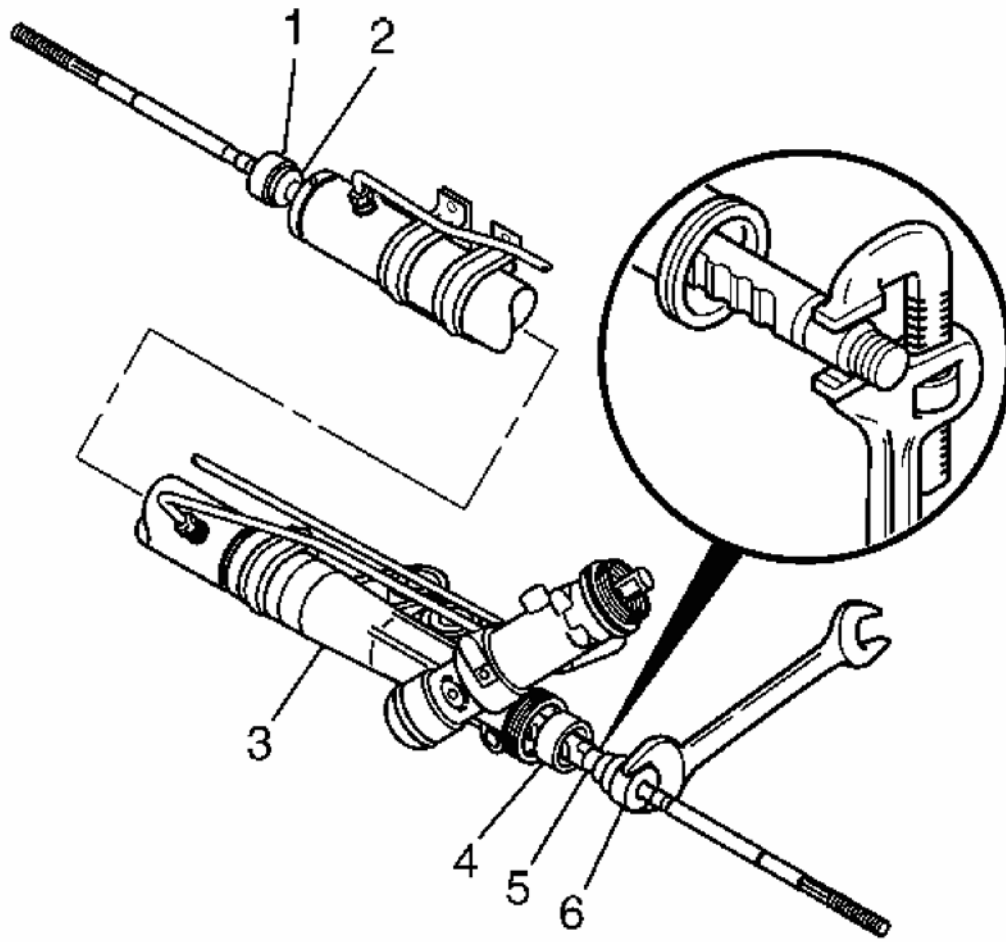


**Fig. 63: View Of Inner Tie Rod & Hex Jam Nut**  
Courtesy of GENERAL MOTORS CORP.

10. Install the hexagon jam nut (2) to the inner tie rod assembly (1).
11. To assemble the outer tie rod assembly. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.

#### **RACK AND PINION INNER TIE ROD REPLACEMENT - OFF VEHICLE (QUIET VALVE)**

##### **Disassembly Procedure**



**Fig. 64: Identifying Inner Tie Rod Components**  
Courtesy of GENERAL MOTORS CORP.

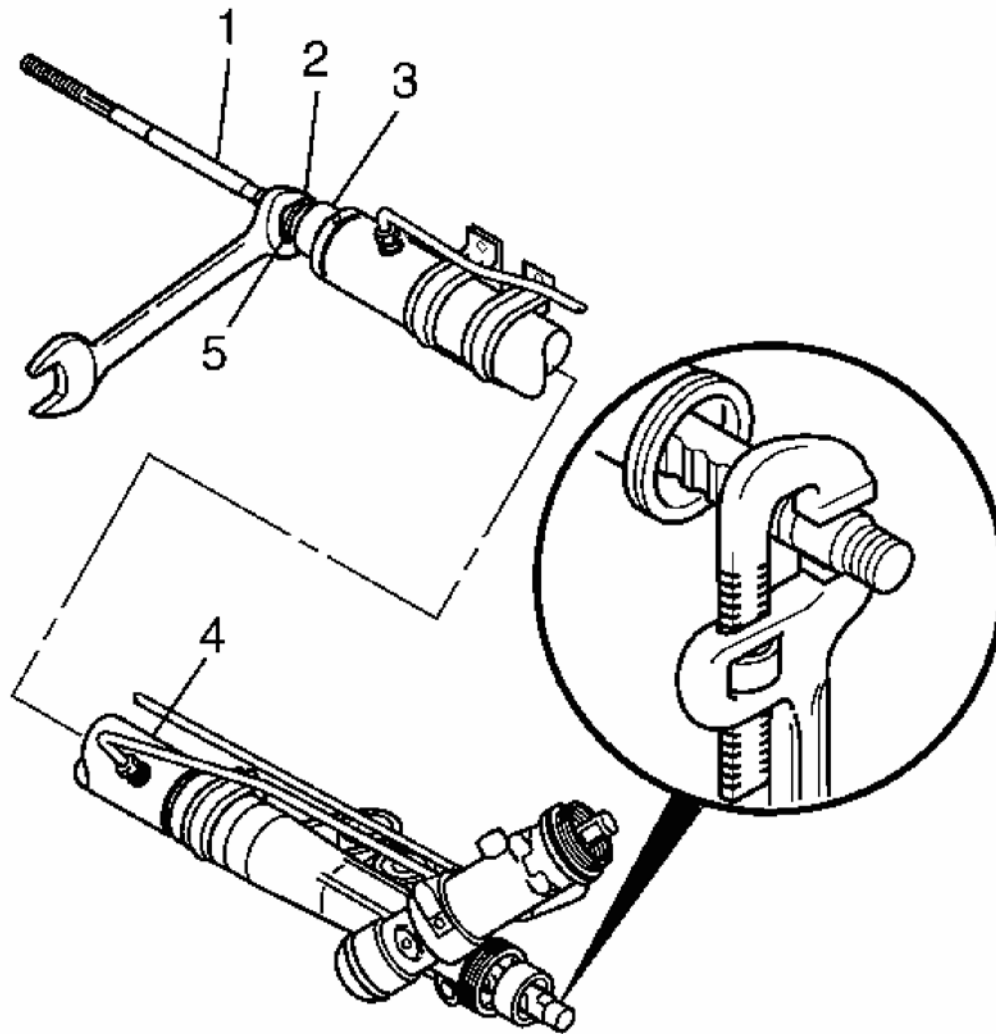
1. Remove the rack and pinion boot. Refer to **Rack and Pinion Boot and Breather Tube Replacement - Off Vehicle**.
2. Place the gear in a vise.

**NOTE:** 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.

3. Remove the shock dampener (4) from the inner tie rod assembly (6).
4. Slide the shock dampener (4) back on the rack (5).

**NOTE:** Refer to **PIPE WRENCH POSITIONING NOTICE** in Cautions and Notices.

5. Place a pipe wrench on the rack (5) next to the inner tie rod housing (6).
6. Place a wrench on the flats of the inner tie rod housing (6).
7. Rotate the inner tie rod housing (6) counterclockwise, while holding the rack stationary, until the inner tie rod separates from the rack (5).



**Fig. 65: Separating Inner Tie Rod From Rack**  
Courtesy of GENERAL MOTORS CORP.

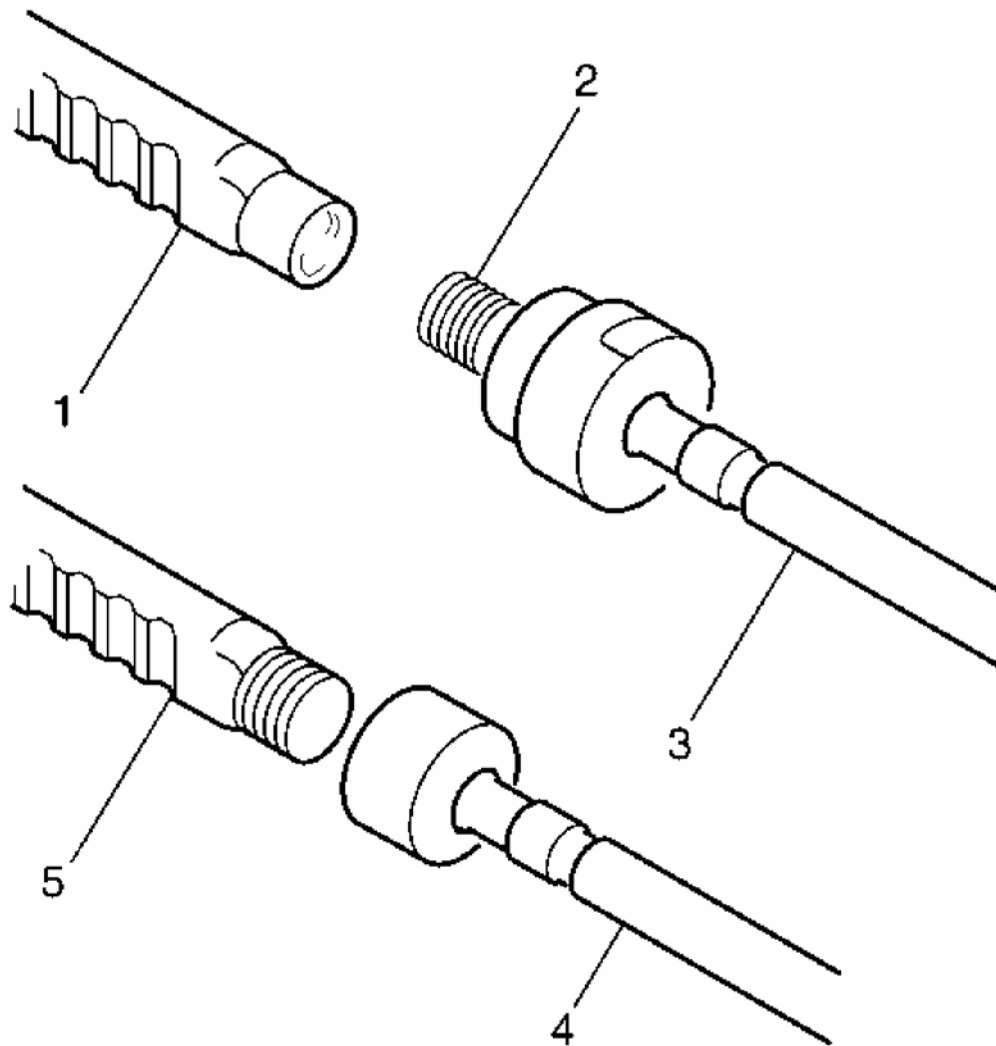
**NOTE:** Do not change the steering gear preload adjustment before

**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.**

8. Remove the shock dampener (3) from the inner tie rod housing (2).
9. Slide the shock dampener (3) back on the rack (5).

**NOTE: Refer to PIPE WRENCH POSITIONING NOTICE in Cautions and Notices.**

10. Place a pipe wrench on the rack.
11. Place a wrench on the flats of the inner tie rod housing (2).
12. Rotate the inner tie rod housing (2) counterclockwise, while holding the rack stationary, until the inner tie rod (1) separates from the rack (5).



**Fig. 66: Identifying Tie Rod Male & Female Ends**  
**Courtesy of GENERAL MOTORS CORP.**

13. If female rack (1) and male inner tie rod (3), remove the old LOCTITE® from the threads (2) of the inner tie rod and the rack.

If male rack (5) and female inner tie rod (4) LOCTITE® will not be present.

**Assembly Procedure**



**Fig. 67: Connecting Inner Tie Rod To Rack**  
**Courtesy of GENERAL MOTORS CORP.**

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

**IMPORTANT:** Threads must be clean prior to LOCTITE® application. Check LOCTITE® or equivalent container for expiration date. Use only enough LOCTITE® to evenly coat threads. If male rack (3) and female inner tie rod (2) do not apply LOCTITE®.

2. If female rack (3) and male inner tie rod (2), apply LOCTITE® 262 or equivalent to the inner tie rod threads.
3. Attach the inner tie rod onto the rack (3).

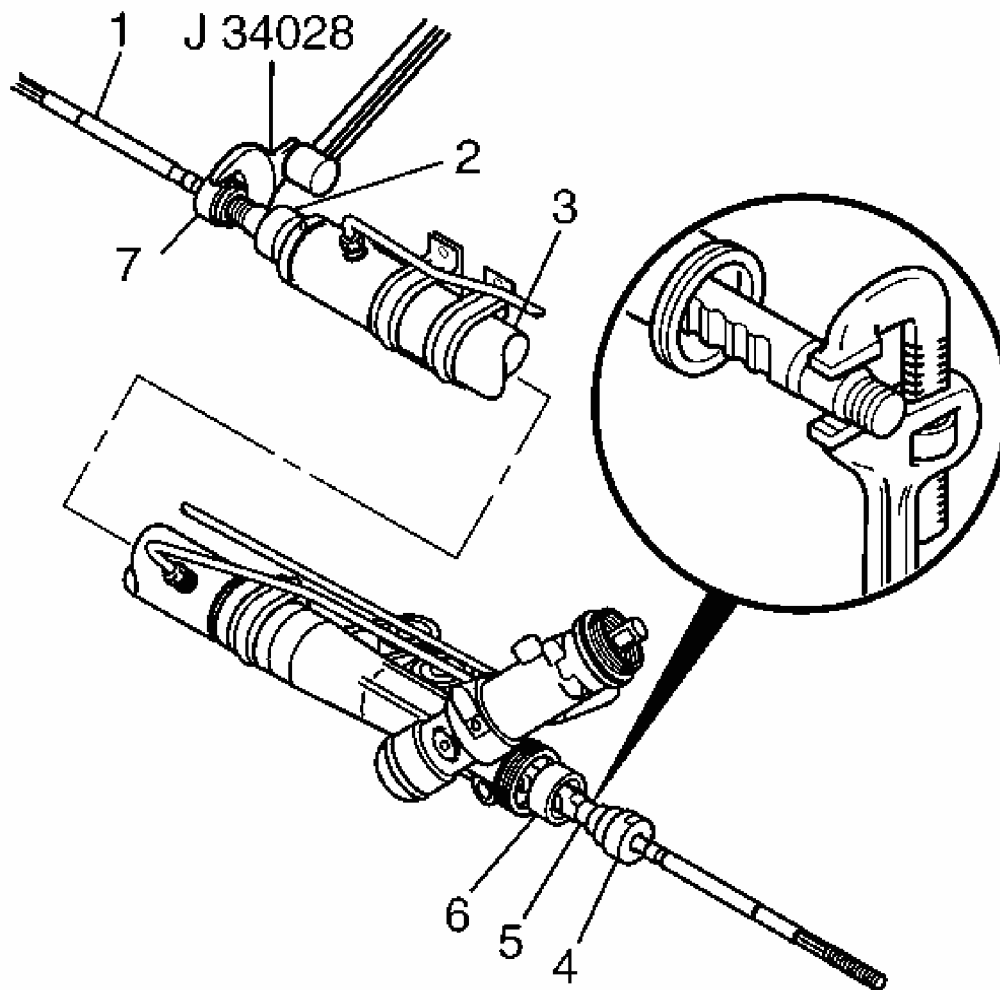
**NOTE:** Refer to PIPE WRENCH POSITIONING NOTICE in Cautions and Notices.

4. Place a pipe wrench on the rack (3) next to the inner tie rod housing (2).

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

5. Place a torque wrench and J 34028 on the flats of the inner tie rod housing (2). See Special Tools.

**Tighten:** Tighten the inner tie rod to 100 N.m (74 lb ft).



**Fig. 68: Tighten The Inner Tie Rod To Rack**  
Courtesy of GENERAL MOTORS CORP.

6. Slide the shock dampener (2) forward onto the rack.

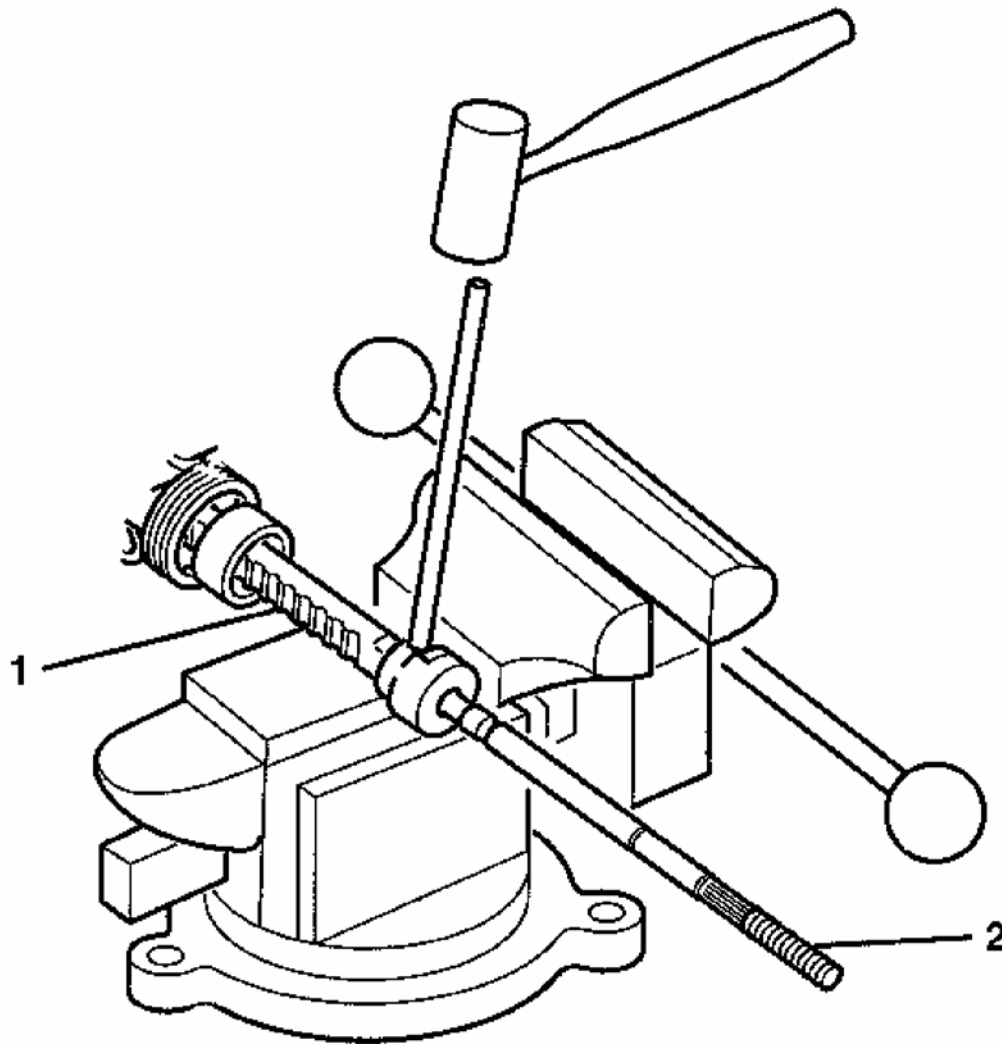
**IMPORTANT:** Threads must be clean prior to LOCTITE® application. Check LOCTITE® or equivalent container for expiration date. Use only enough LOCTITE® to evenly coat threads. If male rack and female inner tie rod (1) do not apply LOCTITE®.

7. If female rack and male inner tie rod (1), apply LOCTITE® 262 or equivalent to the inner tie rod threads.
8. Attach the inner tie rod (1) onto the rack.

**NOTE:** Refer to PIPE WRENCH POSITIONING NOTICE in Cautions and Notices.

9. Place a pipe wrench on the rack next to the inner tie rod housing (4).
10. Place a torque wrench and **J 34028** on the flats of the inner tie rod housing (7). See Special Tools.

**Tighten:** Tighten the inner tie rod to 100 N.m (74 lb ft).



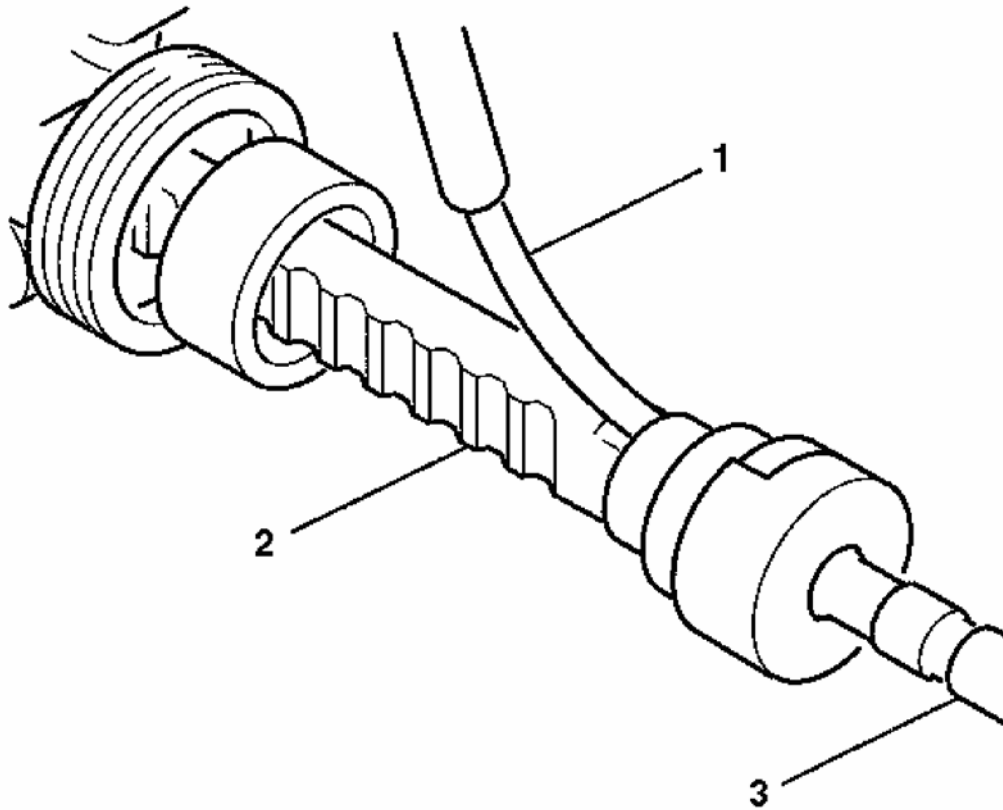
**Fig. 69: Staking Both Sides Of Female Inner Tie Rod Assembly Housing To The Male Rack**

**Courtesy of GENERAL MOTORS CORP.**

11. Place the inner tie rod assembly (2) in a vise.

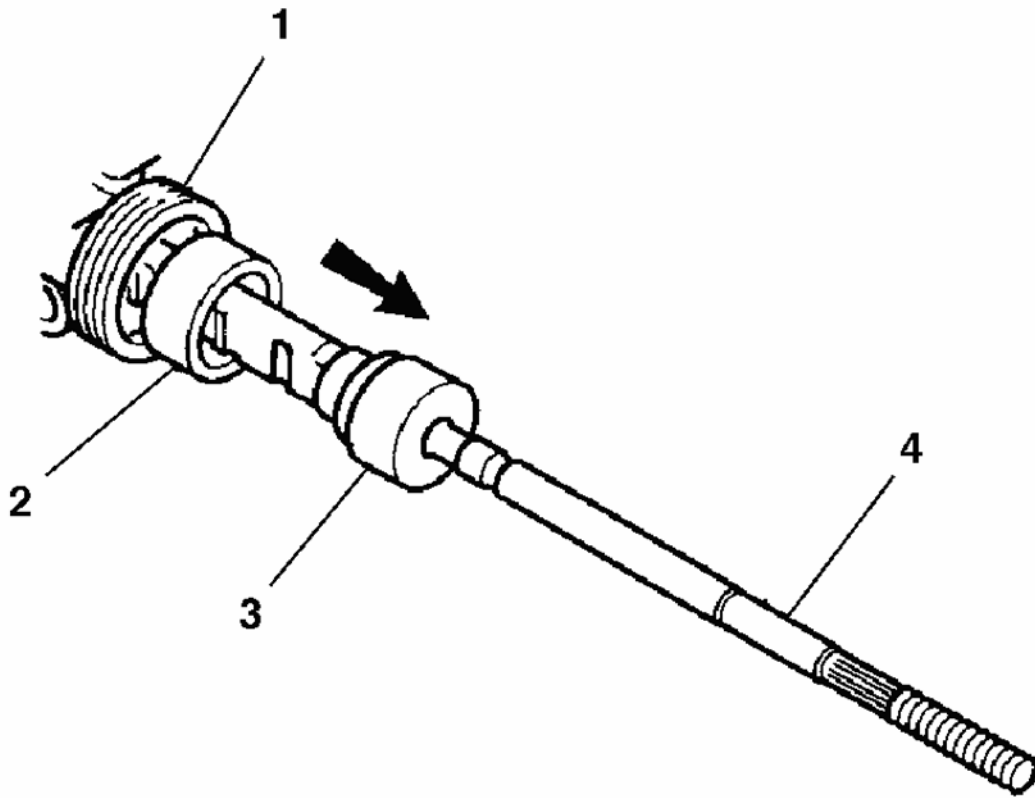
**IMPORTANT:** If female rack (1) and male inner tie rod (2) do not stake. If male rack (1) and female inner tie rod (2) you must stake.

12. Stake both sides of the female inner tie rod assembly housing to the male rack.



**Fig. 70: Inserting Gage Between Rack & Inner Tie Rod Housing**  
Courtesy of GENERAL MOTORS CORP.

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

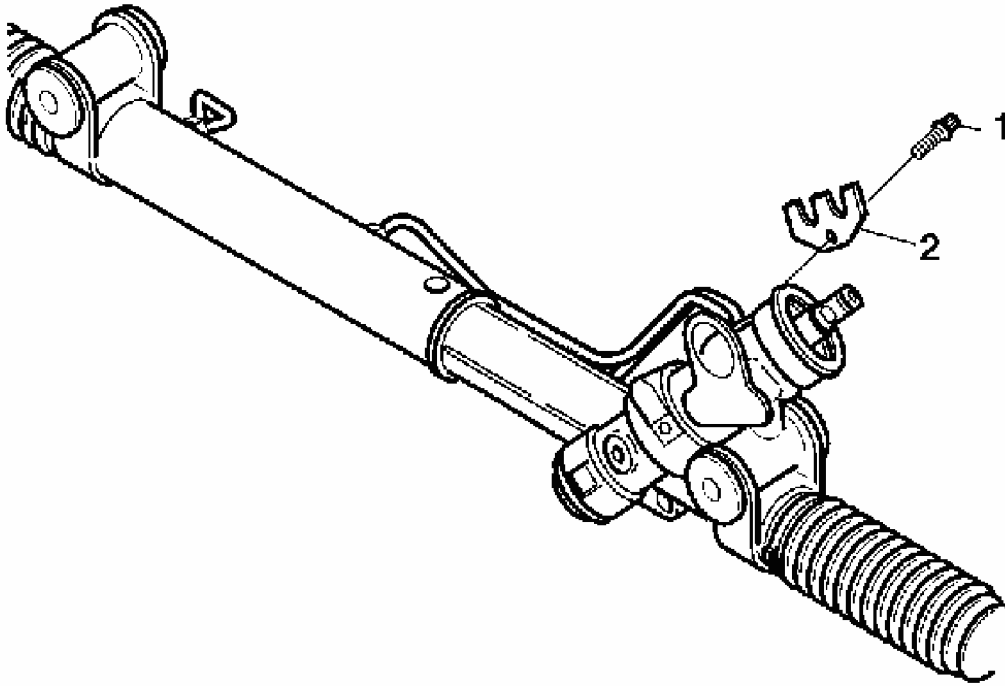


**Fig. 71: Identifying Shock Dampener & Inner Tie Rod Housing**  
Courtesy of GENERAL MOTORS CORP.

14. Slide the shock dampener (2) over the inner tie rod housing (3) until the front lip of the shock dampener (2) bottoms against the inner tie rod housing (3).
15. To assemble the rack and pinion boot. Refer to **Rack and Pinion Boot and Breather Tube Replacement - Off Vehicle**.

#### **STEERING GEAR CYLINDER PIPE ASSEMBLIES/O-RING SEALS REPLACEMENT - OFF VEHICLE**

##### **Removal Procedure**

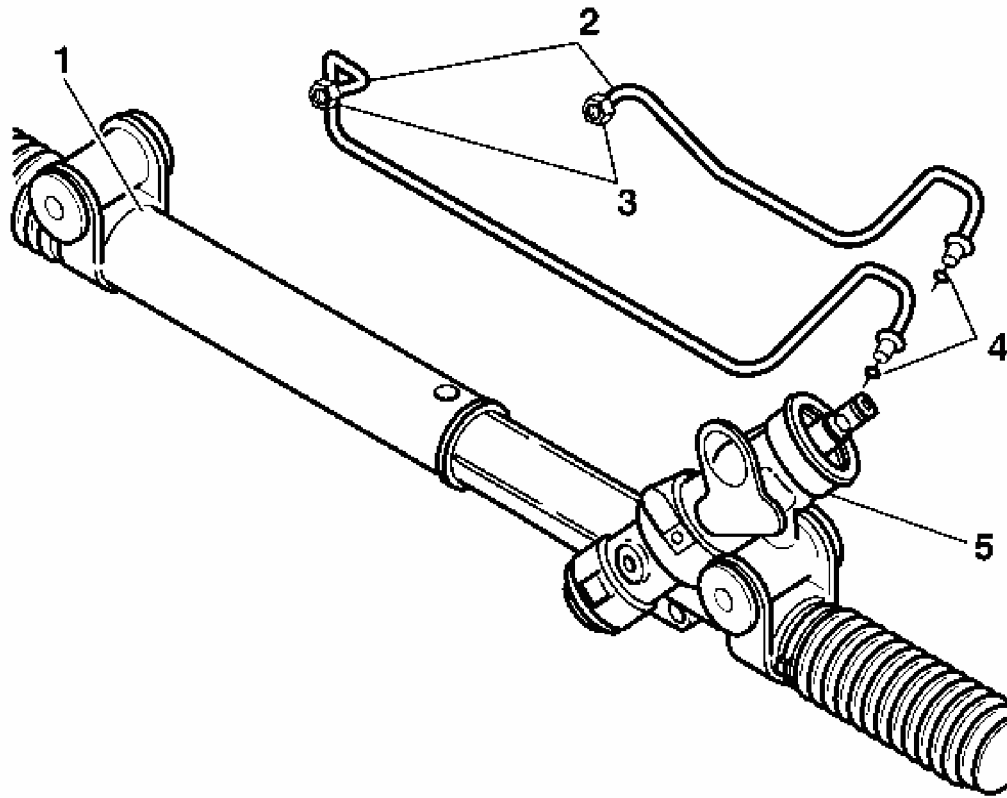


**Fig. 72: Removing Cylinder Line Retaining Plate**

Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Protect the boots from sharp tools and from the sharp edges of surrounding components.

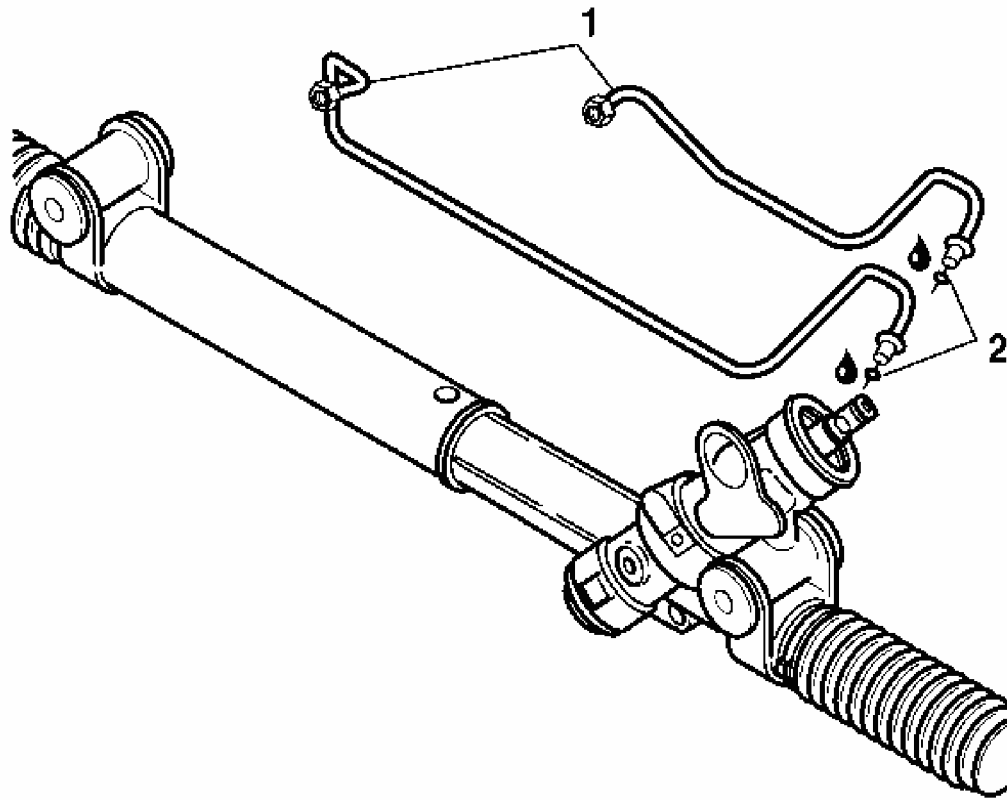
1. Remove the TORX® screw (1) from the cylinder line retaining plate (2) at the valve end.
2. Remove the cylinder line retaining plate (2).



**Fig. 73: Removing Both Cylinder Line Assemblies From Gear Assembly**  
**Courtesy of GENERAL MOTORS CORP.**

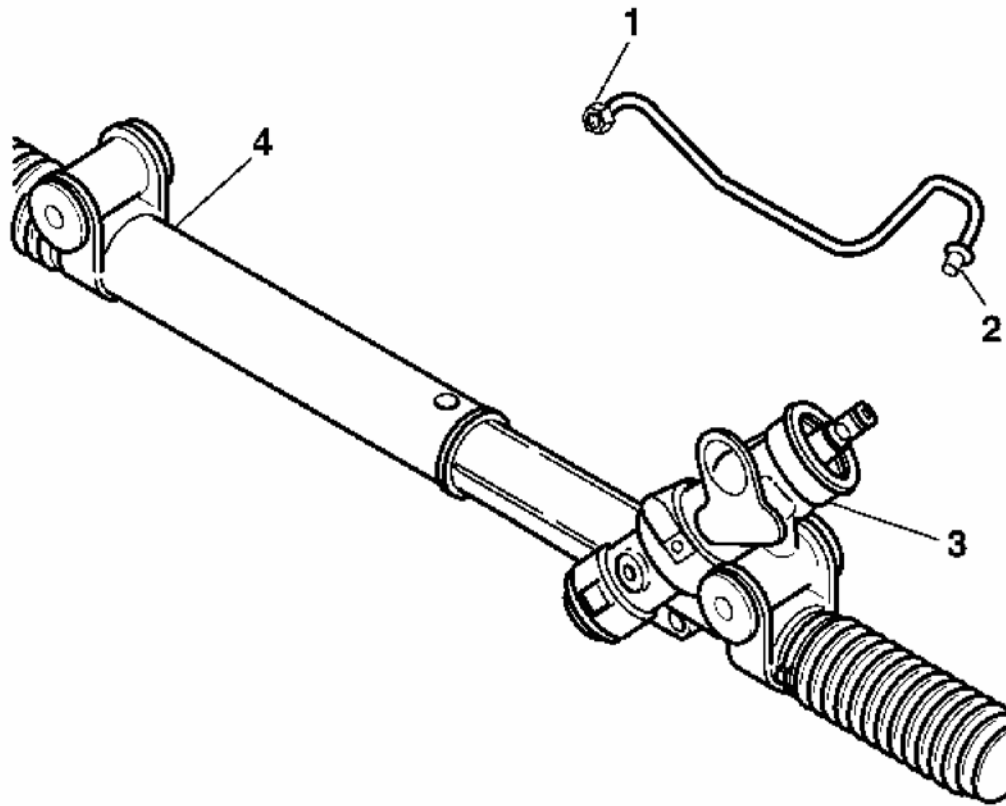
3. Loosen both cylinder line nuts (3) on cylinder end of the gear assembly (1).
4. Remove both cylinder line assemblies (2) from the rack and pinion gear assembly (1).
5. Remove and discard the O-rings seals (4) from the valve end (5).

**Installation Procedure**



**Fig. 74: Inspecting Cylinder Lines**  
Courtesy of GENERAL MOTORS CORP.

1. Inspect the cylinder lines (1) for the following items:
  - Cracks
  - Dents
  - Damage to the threads
2. Replace the parts as needed.
3. Lubricate and install the O-rings seals (2) onto the cylinder lines (1).



**Fig. 75: Installing Smaller Cylinder Line Into Valve Housing**  
Courtesy of GENERAL MOTORS CORP.

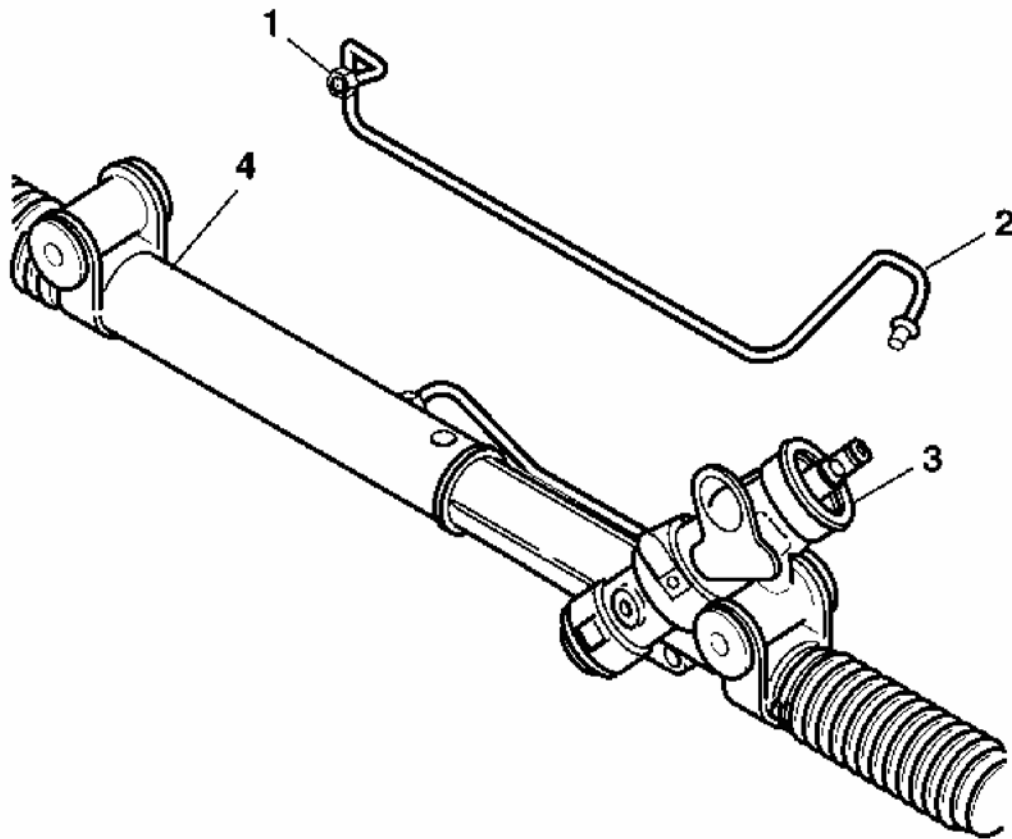
**IMPORTANT:** You must install the smaller cylinder line into the valve housing (3) first.

4. Place the smaller cylinder line (2) into the valve housing (3).

**IMPORTANT:** Hold the smaller cylinder line (2) in place. Do not torque the cylinder line nut (1).

5. Place the other end of the cylinder line at the gear tube end (4).

Finger tighten the cylinder line nut (1) on the smaller cylinder line.



**Fig. 76: Installing Larger Cylinder Line Into Valve Housing**  
Courtesy of GENERAL MOTORS CORP.

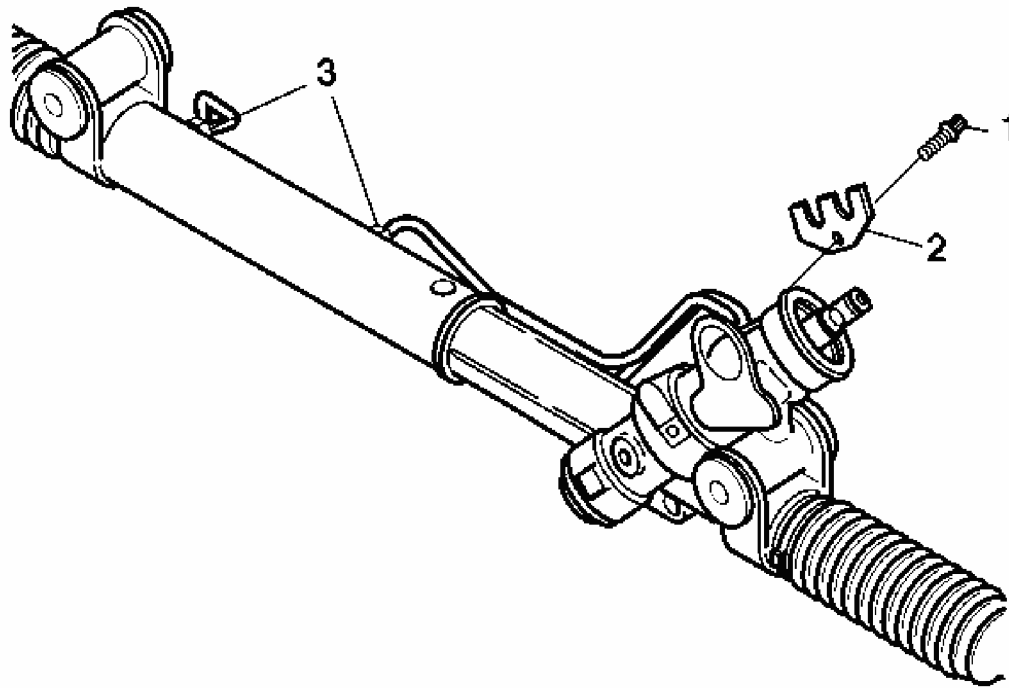
**IMPORTANT:** You must install the larger cylinder line into the valve housing (3) first.

6. Place the larger cylinder line (2) into the valve housing (3).

**IMPORTANT:** Hold the larger cylinder line (2) in place. Do not torque the cylinder line nut (1).

7. Place the other end of the cylinder line at the gear tube end (4).

Finger tighten the cylinder line nut (1) on the larger cylinder line.



**Fig. 77: Installing Cylinder Line Retaining Plate**  
Courtesy of GENERAL MOTORS CORP.

8. Place the cylinder line retaining plate (2) over the cylinder line beads at the valve end.

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

9. Install the TORX® screw (1) into the cylinder line retaining plate (2) and tighten using an E 8 socket.

**Tighten:** Tighten the screw to 15 N.m (12 lb ft).

10. Tighten both cylinder line nuts (3) at the cylinder end.

**Tighten:** Tighten the nuts to 31 N.m (23 lb ft).

## DESCRIPTION AND OPERATION

**POWER STEERING SYSTEM DESCRIPTION AND OPERATION (W/O ELECTRO-HYDRAULIC STEERING)**

The hydraulic power steering pump is a constant displacement vane-type pump that provides hydraulic pressure and flow for the power steering gear. The hydraulic power steering pumps are either belt-driven or direct-drive, cam-driven.

The power steering fluid reservoir holds the power steering fluid and may be integral with the power steering pump or remotely located. The following locations are typical locations for the remote reservoir:

- Mounted to the front of the dash panel
- Mounted to the inner fender
- Mounted to a bracket on the engine

The 2 basic types of power steering gears are listed below:

- A recirculating ball system
- A rack and pinion system

In the recirculating ball system, a worm gear converts steering wheel movement to movement of a sector shaft. A pitman arm attached to the bottom of the sector shaft actually moves one tie rod and an intermediate rod move the other tie rod.

In the rack and pinion system, the rack and the pinion are the 2 components that convert steering wheel rotation to lateral movement. The steering shaft is attached to the pinion in the steering gear. The pinion rotates with the steering wheel. Gear teeth on the pinion mesh with the gear teeth on the rack. The rotating pinion moves the rack from side to side. The lateral action of the rack pushes and pulls the tie rods in order to change the direction of the vehicle's front wheels.

The power steering pressure hose connects the power steering pump union fitting to the power steering gear and allows pressurized power steering fluid to flow from the pump to the gear.

The power steering return hose returns fluid from the power steering gear back to the power steering fluid reservoir. The power steering return line may contain an integral fin-type or line-type power steering fluid cooler.

In a typical power steering system, a pump generates hydraulic pressure, causing fluid to flow, via the pressure hose, to the steering gear valve assembly. The steering gear valve assembly regulates the incoming fluid to the right and left chambers in order to assist in right and left turns.

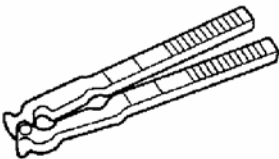
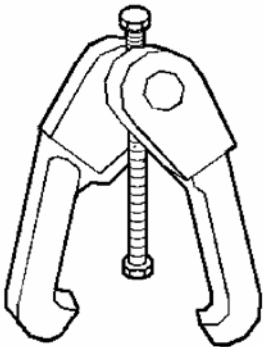
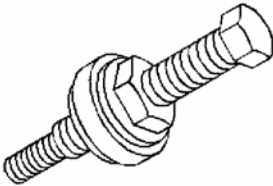
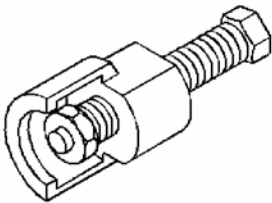
Turning the steering wheel activates the valve assembly, which applies greater fluid pressure and flow to 1 side of the steering gear piston, and lower pressure and flow to the other side of the piston. The pressure assists the movement of the gear piston. Tie rods transfer this

force to the front wheels, which turn the vehicle right or left.

## SPECIAL TOOLS AND EQUIPMENT

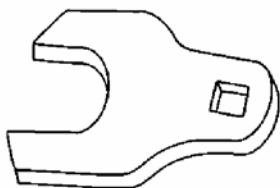
### SPECIAL TOOLS

#### Special Tools

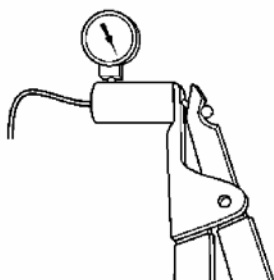
| Illustration                                                                        | Tool Number/ Description                         |
|-------------------------------------------------------------------------------------|--------------------------------------------------|
|    | J 22610<br>Keystone Clamp Pliers                 |
|   | J 24319-B<br>Steering Linkage and Tie Rod Puller |
|  | J 25033-C<br>Pulley Installer                    |
|  | J 25034-C<br>Pulley Remover                      |

## 2006 Chevrolet Impala LS

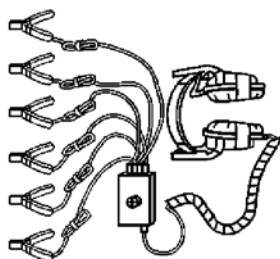
### 2006 STEERING Power Steering System - Impala



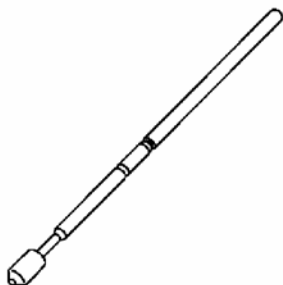
J 34028  
Inner Tie Rod Wrench



J 35555  
Metal Mity Vac



J 39570  
Chassis Ear

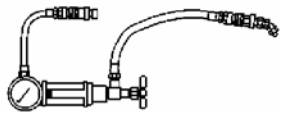


J 42640  
Steering Column Anti-rotation Pin

J 43485  
Power Steering Bleeder Adapter

## 2006 Chevrolet Impala LS

### 2006 STEERING Power Steering System - Impala



J 44721  
Power Steering Analyzer