

**2017 Transmission**  
**Clutch - Sierra, Silverado**

## **SPECIFICATIONS**

### **FASTENER SPECIFICATIONS**

#### **Reusable Threaded Fastener Tightening Specifications**

**NOTE:**

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

| Application                               | Specification     |
|-------------------------------------------|-------------------|
|                                           | Metric (English)  |
| Clutch Actuator Cylinder Bolt             | 8 N.m (71 lb in)  |
| Clutch Pedal to Brake Module Bolt         | 50 N.m (37 lb ft) |
| Clutch Pedal to Clutch Pedal Bracket Bolt | 36 N.m (27 lb ft) |
| Clutch Pressure Plate Bolt                | 70 N.m (52 lb ft) |

### **ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS**

| Application             | Type of Material       | GM Part Number |          |
|-------------------------|------------------------|----------------|----------|
|                         |                        | United States  | Canada   |
| Hydraulic Clutch System | Hydraulic Clutch Fluid | 12345347       | 10953517 |

## **DIAGNOSTIC INFORMATION AND PROCEDURES**

### **SYMPTOMS - CLUTCH**

#### **Strategy Based Diagnostics**

Review the clutch system operations in order to familiarize yourself with the system functions. Refer to [Clutch System Description and Operation](#).

#### **Visual/Physical Inspection**

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the clutch master cylinder for the correct fluid level.
- Inspect the hydraulic clutch lines for dents, kinks, or other obvious damage that may affect the clutch system operations.
- Inspect the clutch system for contamination of dirt, oil, or other substances that may affect the clutch system operations.
- Inspect for aftermarket components and power take-off (PTO) set-ups.

## Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

## Symptom List

**IMPORTANT:** Due to the variety of clutch options there may be components in the mechanical diagnostic tables that are not on a particular vehicle.

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

- [Clutch Drag Hard Shifting](#)
- [Clutch Slipping](#)
- [Clutch Grabbing](#)
- [Clutch Rattle](#)
- [Clutch Noisy](#)
- [Clutch Pedal Spongy Low Pedal Effort](#)
- [Clutch Pedal Hard to Push](#)
- [Clutch Vibration](#)

## CLUTCH DRAG HARD SHIFTING

| Cause                                                                                                                                                                                                                                                                                                                                                  | Action                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DEFINITION: The clutch does not disengage completely to allow smooth shift operations. It may cause gear clashing while the vehicle is not moving, at idle, and shifting out of neutral, or hard shifting in and out of gears while driving the vehicle.<br>Review the <a href="#"><u>Symptoms - Clutch</u></a> and perform the necessary inspections. |                                                                                                                                                                                                                                           |
| Pedal blocked from full travel                                                                                                                                                                                                                                                                                                                         | <ol style="list-style-type: none"><li>1. Inspect for obstacles that prevent the pedal from going to the floor.</li><li>2. Clear any obstacles from under the pedal area, such as floor mats, damaged floor, or interior panels.</li></ol> |
| Too much travel between pedal and clutch master cylinder                                                                                                                                                                                                                                                                                               | <ol style="list-style-type: none"><li>1. Inspect the pedal for worn bushings.</li><li>2. Replace the pedal bushings if worn. Refer to <a href="#"><u>Clutch Pedal Replacement</u></a>.</li></ol>                                          |
| Clutch pedal mounting loose                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"><li>1. Inspect the clutch pedal mounting bracket for loose or missing fasteners.</li><li>2. Replace or repair the fasteners. Refer to <a href="#"><u>Clutch Pedal Replacement</u></a>.</li></ol>        |
| Linkage at pedal worn or damaged                                                                                                                                                                                                                                                                                                                       | <ol style="list-style-type: none"><li>1. Inspect the linkage at the pedal for excessive wear.</li><li>2. Repair or replace the linkage as required. Refer to <a href="#"><u>Clutch Pedal Replacement</u></a>.</li></ol>                   |

## CLUTCH SLIPPING

| Cause                                                                                                                                                                                                                                                                                                                                                                                             | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>DEFINITION: The clutch does not engage completely after the pedal is released, after shifting gears, or the clutch slips during maximum engine loads, such as climbing hills or high vehicle speeds. Clutch slipping is identified by increase in engine RPM without increase in vehicle speed.</p> <p>Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Incorrect clutch pedal height, not allowing the clutch master cylinder to return                                                                                                                                                                                                                                                                                                                  | Faulty clutch pedal position sensor. Refer to <a href="#">Clutch Pedal Position Sensor Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| The clutch pedal return spring is broken or missing                                                                                                                                                                                                                                                                                                                                               | Replace the clutch pedal return spring, if equipped. Refer to <a href="#">Clutch Pedal Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| The clutch pedal is binding or sticking                                                                                                                                                                                                                                                                                                                                                           | <ol style="list-style-type: none"> <li>1. Clear away any items that may be contacting the pedal.</li> <li>2. Inspect the pedal bushings for ease of movement.</li> <li>3. Replace the clutch pedal if it is faulty. Refer to <a href="#">Clutch Pedal Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Clutch master cylinder binding or seized                                                                                                                                                                                                                                                                                                                                                          | Replace the clutch master cylinder. Refer to <a href="#">Clutch Master Cylinder Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Clutch actuator cylinder binding or seized                                                                                                                                                                                                                                                                                                                                                        | Replace the clutch actuator cylinder. Refer to <a href="#">Clutch Actuator Cylinder Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Kinked or damaged clutch hydraulic hose                                                                                                                                                                                                                                                                                                                                                           | <ol style="list-style-type: none"> <li>1. Inspect for the correct routing of the clutch hydraulic hose.</li> <li>2. Route the hose properly.</li> <li>3. Inspect for loose or faulty engine mounts that may allow the hydraulic hose to be kinked or pinched.</li> <li>4. Repair or replace faulty engine mounts. Refer to <a href="#">Engine Mount Replacement - Left Side</a>, and <a href="#">Engine Mount Replacement - Right Side</a>, for the 4.3L engine, or <a href="#">Engine Mount Replacement - Left Side</a>, and <a href="#">Engine Mount Replacement - Right Side</a> for the 5.3L or 6.2L engine.</li> <li>5. Repair or replace the clutch hydraulic hose if it is damaged. Refer to <a href="#">Clutch Master Cylinder Replacement</a>.</li> </ol> |
| Grease or oil contamination of the clutch disc                                                                                                                                                                                                                                                                                                                                                    | <ol style="list-style-type: none"> <li>1. Repair the source of the oil leak.</li> <li>2. Repair the source of the grease leak.</li> <li>3. Clean the contamination from the clutch components.</li> <li>4. If contaminants cannot be removed, replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Cause                                                | Action                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Worn or damaged flywheel                             | Replace the engine flywheel. Refer to <a href="#">Engine Flywheel Replacement</a> , for the 4.3L engine or <a href="#">Automatic Transmission Flex Plate Replacement</a> for the 5.3L or 6.2L engine.                                                                                                                            |
| Worn clutch disc facing                              | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                              |
| Clutch discs splines worn                            | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                              |
| Low pedal from self-adjusted clutch adjusted forward | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                              |
| Burnt or glazed clutch discs                         | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                              |
| Input shaft splines worn                             | Replace the input shaft. Refer to <a href="#">Transmission Disassemble</a> .                                                                                                                                                                                                                                                     |
| Improper resurfacing of the flywheel                 | Replace the flywheel if it has been improperly resurfaced, allowing contact of the clutch disc hub or insufficient clamping load of the pressure plate. Refer to <a href="#">Engine Flywheel Replacement</a> , for the 4.3L engine or <a href="#">Automatic Transmission Flex Plate Replacement</a> for the 5.3L or 6.2L engine. |

## CLUTCH GRABBING

| Cause                                                                                                                                                                                                                                            | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>DEFINITION: The clutch grabs, or chatters, or the clutch is unable to release without the vehicle jerking. An abrupt engagement of the clutch.</p> <p>Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Grease or oil contamination on the clutch facings                                                                                                                                                                                                | <ol style="list-style-type: none"> <li>1. Repair the cause of the oil leak or grease contamination.</li> <li>2. Clean the clutch facings.</li> <li>3. Replace the clutch components if they will not clean. Refer to <a href="#">Clutch Assembly Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                |
| Loose or faulty engine mounts                                                                                                                                                                                                                    | <ol style="list-style-type: none"> <li>1. Inspect the engine mounts for being loose or faulty. Refer to <a href="#">Engine Mount Inspection</a> .</li> <li>2. Repair or replace the engine mounts as required. Refer to <a href="#">Engine Mount Replacement - Left Side</a> , and <a href="#">Engine Mount Replacement - Right Side</a> , for the 4.3L engine, or <a href="#">Engine Mount Replacement - Left Side</a> , and <a href="#">Engine Mount Replacement - Right Side</a> for the 5.3L or 6.2L engine.</li> </ol> |
| Clutch pedal sticking                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Inspect the clutch pedal for correct operation.</li> <li>2. Replace the clutch pedal if it is faulty. Refer to</li> </ol>                                                                                                                                                                                                                                                                                                                                                         |

| Cause                                  | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | <b><u>Clutch Pedal Replacement.</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Clutch actuator binding                | <ol style="list-style-type: none"> <li>1. Inspect the clutch actuator for the piston seals binding or sticking in the seal bore.</li> <li>2. Replace the clutch actuator if it is binding. Refer to <b><u>Clutch Actuator Cylinder Replacement.</u></b></li> </ol>                                                                                                                                                                                                                                                                               |
| Clutch master cylinder binding         | <ol style="list-style-type: none"> <li>1. Inspect the clutch master cylinder for the piston binding or sticking in the cylinder.</li> <li>2. Replace the master cylinder if it is faulty. Refer to <b><u>Clutch Master Cylinder Replacement.</u></b></li> </ol>                                                                                                                                                                                                                                                                                  |
| Improper clutch installation           | <ol style="list-style-type: none"> <li>1. Inspect the pressure plate for distortion caused by improperly tightening the pressure plate bolts.</li> <li>2. Inspect the clutch disc for a bent hub caused by forcing the installation of the transmission.</li> <li>3. Inspect for the correct clutch disc.</li> <li>4. Inspect the clutch disc for being installed backwards.</li> <li>5. Replace the clutch assembly if it is damaged or the wrong components were installed. Refer to <b><u>Clutch Assembly Replacement.</u></b></li> </ol>     |
| Clutch disc binding on the input shaft | <ol style="list-style-type: none"> <li>1. Inspect the input shaft for rust dirt or debris.</li> <li>2. Clean the input shaft.</li> <li>3. Inspect the clutch disc for a bent hub.</li> <li>4. Replace the clutch assembly if the clutch disc is faulty. Refer to <b><u>Clutch Assembly Replacement.</u></b></li> <li>5. Inspect the input shaft for excessive wear on the splines, causing the clutch disc to bind.</li> <li>6. Replace the transmission input shaft if it is worn. Refer to <b><u>Transmission Disassemble .</u></b></li> </ol> |
| Clutch pressure plate damaged          | <ol style="list-style-type: none"> <li>1. Inspect the pressure plate for bent drive straps caused by improper vehicle use.</li> <li>2. Replace the clutch assembly if the clutch pressure plate is damaged. Inform the customer. Refer to <b><u>Clutch Assembly Replacement.</u></b></li> </ol>                                                                                                                                                                                                                                                  |
| Flywheel improperly machined           | <ol style="list-style-type: none"> <li>1. Inspect the flywheel for being machined, and causing interference with the clutch disc.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                     |

| Cause           | Action                                                                                                                                                                                                                                                                                                                                   |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 2. Replace the flywheel if it has been machined. Refer to <a href="#">Engine Flywheel Replacement</a> , for the 4.3L engine or <a href="#">Automatic Transmission Flex Plate Replacement</a> for the 5.3L or 6.2L engine.                                                                                                                |
| Flywheel uneven | <ol style="list-style-type: none"> <li>1. Inspect the flywheel surface for being warped or uneven.</li> <li>2. Replace the flywheel if it is faulty. Refer to <a href="#">Engine Flywheel Replacement</a> , for the 4.3L engine or <a href="#">Automatic Transmission Flex Plate Replacement</a> for the 5.3L or 6.2L engine.</li> </ol> |

## CLUTCH RATTLE

| Cause                                                                                                                                                                                   | Action                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DEFINITION: A rattle noise coming from the clutch components with the clutch disengaged or engaged. Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections. |                                                                                                                                                                                                                                                                                                                                                         |
| Idle rattle clutch engaged                                                                                                                                                              | Replace the clutch disc, due to faulty dampener springs. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                         |
| Clutch is improperly installed                                                                                                                                                          | Remove the clutch and install it correctly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                                      |
| Clutch disc dampener worn or damaged                                                                                                                                                    | <ol style="list-style-type: none"> <li>1. Inspect the clutch disc for a broken or worn dampener.</li> <li>2. Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a>.</li> </ol>                                                                                                                                              |
| Clutch disc splines and input shaft splines worn                                                                                                                                        | <ol style="list-style-type: none"> <li>1. Inspect the clutch disc hub to input shaft splines for excessive clearance.</li> <li>2. Replace the clutch assembly if the clutch splines are worn. Refer to <a href="#">Clutch Assembly Replacement</a>.</li> <li>3. Replace the input shaft. Refer to <a href="#">Transmission Disassemble</a> .</li> </ol> |

## CLUTCH NOISY

| Cause                                                                                                                                                                        | Action                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| DEFINITION: A growl or whine noise is coming from the clutch when engaged or disengaged. Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections. |                                                                                              |
| Pilot bearing is worn or damaged                                                                                                                                             | Replace the pilot bearing. Refer to <a href="#">Clutch Pilot Bearing Replacement</a> .       |
| Release bearing damaged or worn                                                                                                                                              | Replace the release bearing. Refer to <a href="#">Clutch Actuator Cylinder Replacement</a> . |

## CLUTCH PEDAL SPONGY LOW PEDAL EFFORT

| Cause                                                                                                                                                                       | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DEFINITION: The clutch pedal may feel spongy, or it requires very little effort to operate. Review <a href="#">Symptoms - Clutch</a> and perform the necessary inspections. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Air in the hydraulic system                                                                                                                                                 | Bleed the clutch hydraulic system. Refer to <a href="#">Hydraulic Clutch System Bleeding</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Master cylinder fluid level low                                                                                                                                             | <ol style="list-style-type: none"> <li>1. Inspect for leakage in the clutch master cylinder, hose connections, and the clutch actuator.</li> <li>2. Repair or replace any faulty components.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Incomplete pedal return                                                                                                                                                     | <ol style="list-style-type: none"> <li>1. Inspect the pedal for full return.</li> <li>2. Clear any obstacles that may interfere with the pedal operation.</li> <li>3. Replace the clutch pedal return spring, if equipped. Refer to <a href="#">Clutch Pedal Replacement</a>.</li> <li>4. Faulty clutch pedal position sensor. Refer to <a href="#">Clutch Pedal Position Sensor Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                 |
| Clutch incorrectly installed                                                                                                                                                | Remove the clutch and install it correctly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Clutch mounting bolts loose or broken                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Remove the broken bolts.</li> <li>2. Replace the broken or loose bolts and tighten. Refer to <a href="#">Clutch Assembly Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Release bearing worn or damaged                                                                                                                                             | Replace the release bearing. Refer to <a href="#">Clutch Actuator Cylinder Replacement</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Contaminated hydraulic fluid                                                                                                                                                | <ol style="list-style-type: none"> <li>1. Inspect the clutch hydraulic fluid for contamination of water. If available, use a brake fluid boiling point tester. Boiling point should be above 177°C (350°F).</li> <li>2. Inspect the reservoir cap for being faulty if water is present.</li> <li>3. Inspect the clutch hydraulic fluid for dirt or debris.</li> <li>4. Flush and bleed the clutch hydraulic system if the above conditions are found. Refer to <a href="#">Hydraulic Clutch System Bleeding</a>.</li> <li>5. If mineral oil was added, replace the clutch master cylinder and clutch actuator cylinder due to seal damage. Refer to <a href="#">Clutch Master Cylinder Replacement</a>, and <a href="#">Clutch Actuator Cylinder Replacement</a>.</li> </ol> |

## CLUTCH PEDAL HARD TO PUSH

| Cause                                                                                                                                                           | Action                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>DEFINITION: The clutch pedal requires high effort to operate.</p> <p>Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Incorrect hydraulic fluid                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Inspect for the correct fluid in the master cylinder. Refer to <a href="#">Hydraulic Clutch System Bleeding</a>.</li> <li>2. Replace the clutch master cylinder and clutch actuator cylinder. Refer to <a href="#">Clutch Master Cylinder Replacement</a>, and <a href="#">Clutch Actuator Cylinder Replacement</a>.</li> <li>3. Flush the hydraulic system and fill with the correct fluid.</li> </ol> |
| Contaminated hydraulic fluid                                                                                                                                    | <ol style="list-style-type: none"> <li>1. Inspect the hydraulic fluid for water.</li> <li>2. Inspect the hydraulic fluid for dirt or debris.</li> <li>3. Flush the hydraulic system and fill with the correct fluid. Refer to <a href="#">Hydraulic Clutch System Bleeding</a>.</li> </ol>                                                                                                                                                        |
| Clutch pedal binding                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Inspect the pedal for binding.</li> <li>2. Repair or replace the pedal. Refer to <a href="#">Clutch Pedal Replacement</a>.</li> </ol>                                                                                                                                                                                                                                                                   |
| Kinked or damaged clutch hydraulic pipe                                                                                                                         | <ol style="list-style-type: none"> <li>1. Inspect for a kinked or damaged hydraulic hose.</li> <li>2. Repair or replace the clutch hydraulic hose. Refer to <a href="#">Clutch Master Cylinder Replacement</a>.</li> </ol>                                                                                                                                                                                                                        |
| Clutch disc worn too thin                                                                                                                                       | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                                                                                                                                               |

## CLUTCH VIBRATION

| Cause                                                                                                                                                                                  | Action                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>DEFINITION: Vibration from the clutch components during disengagement or engagement.</p> <p>Review the <a href="#">Symptoms - Clutch</a> and perform the necessary inspections.</p> |                                                                                                                                                                                                                                                                                                                                           |
| Excessive driveline torsional activity                                                                                                                                                 | Review the <a href="#">Vibration Analysis - Driveline</a> .                                                                                                                                                                                                                                                                               |
| Clutch incorrectly installed                                                                                                                                                           | Remove the clutch and install it correctly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                                                                                                        |
| Pilot bearing worn or damaged                                                                                                                                                          | <ol style="list-style-type: none"> <li>1. Replace the pilot bearing. Refer to <a href="#">Clutch Pilot Bearing Replacement</a>.</li> <li>2. Inspect the input shaft pilot bearing journal for wear or damage.</li> <li>3. Replace the input shaft if it is damaged or worn. Refer to <a href="#">Transmission Disassemble</a>.</li> </ol> |

| Cause                                                     | Action                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmission input shaft splines worn or damaged          | <ol style="list-style-type: none"> <li>1. Inspect the clutch disc to input splines for wear or damage.</li> <li>2. Replace the input shaft if the splines are excessively worn. Refer to <a href="#">Transmission Disassemble</a> .</li> </ol> |
| Clutch disc facings damaged                               | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                            |
| Flywheel housing to clutch housing excessively misaligned | Replace the faulty clutch housing or transmission front case. Refer to <a href="#">Transmission Disassemble</a> .                                                                                                                              |
| Clutch out of balance                                     | Replace the clutch assembly. Refer to <a href="#">Clutch Assembly Replacement</a> .                                                                                                                                                            |

## REPAIR INSTRUCTIONS

### CLUTCH PEDAL REPLACEMENT

#### Removal Procedure

1. Move the instrument panel to the service position. Refer to [Instrument Panel Assembly Replacement](#) .

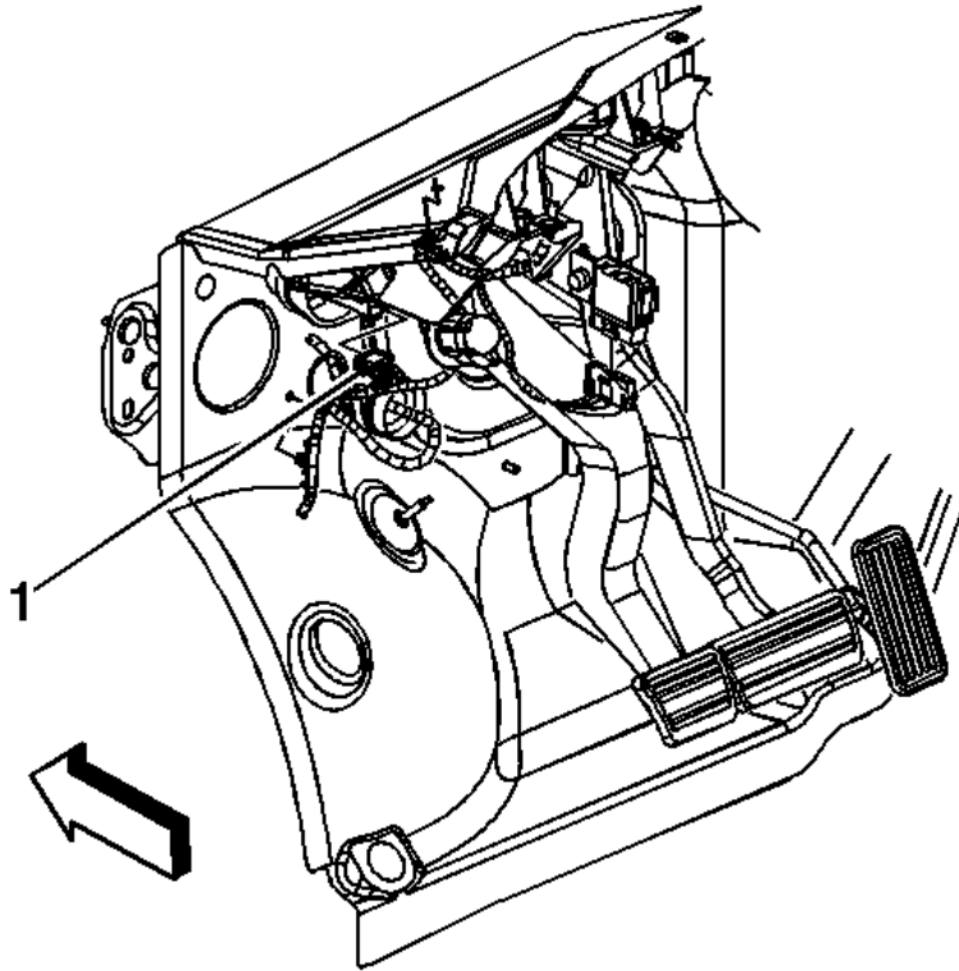


**Fig. 1: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the clutch pedal engine start switch electrical connector (1).
3. Remove the clutch master cylinder. Refer to [\*\*Clutch Master Cylinder Replacement\*\*](#).

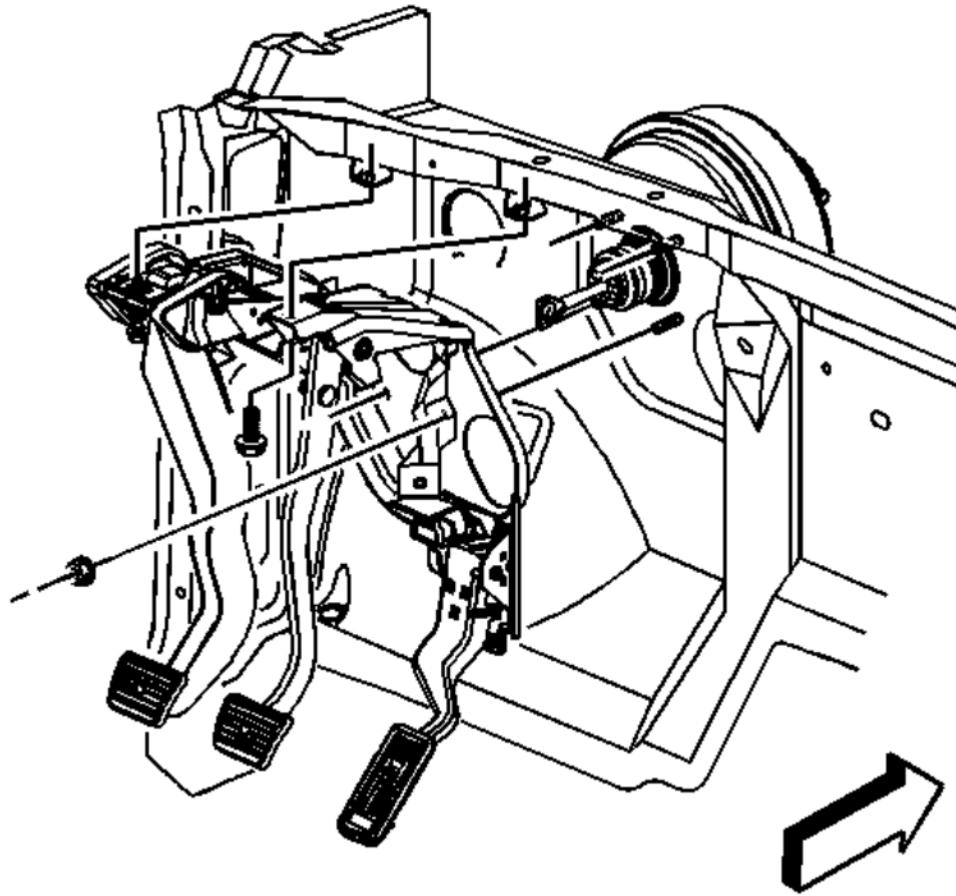


**Fig. 2: Clutch Pedal Bracket Assembly**

Courtesy of GENERAL MOTORS COMPANY

4. Remove the clutch pedal to clutch pedal bracket bolt .

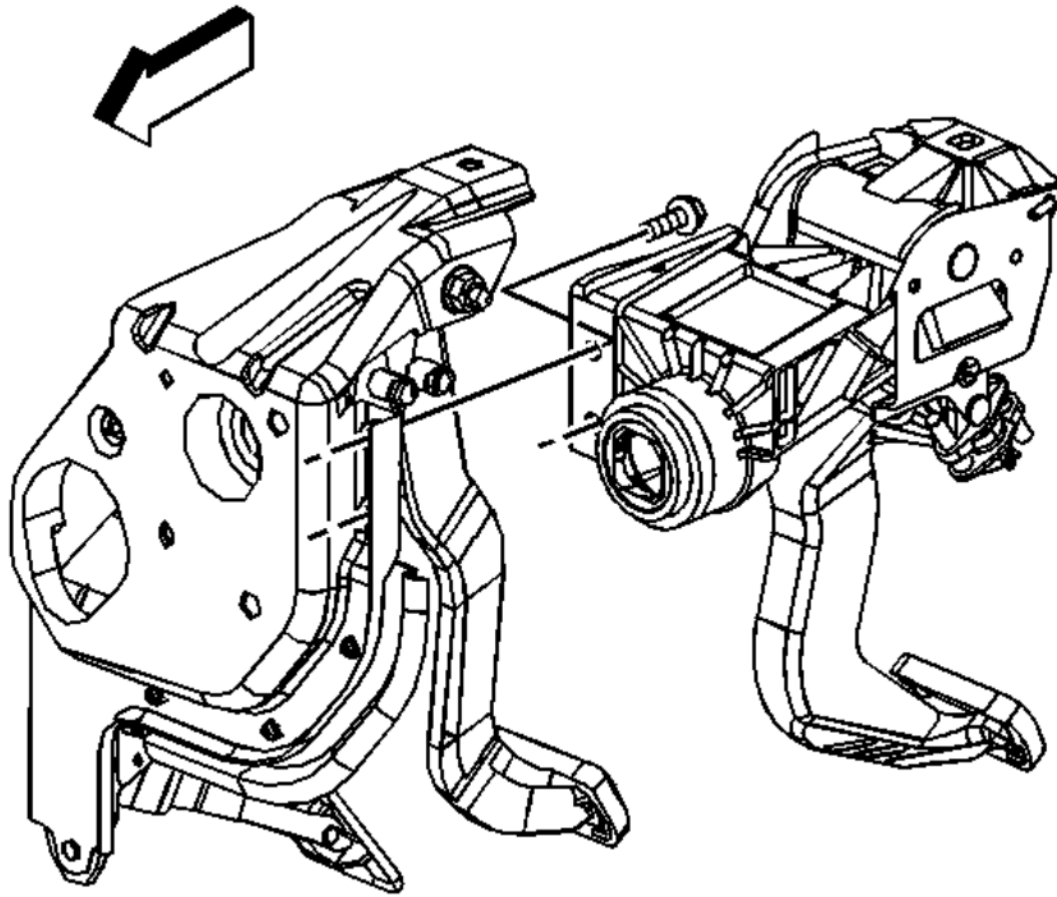


**Fig. 3: Clutch Pedal And Brake Module Assembly**  
Courtesy of GENERAL MOTORS COMPANY

5. Remove the clutch pedal to brake module bolts.
6. Remove the clutch pedal sub-assembly.

#### **Installation Procedure**

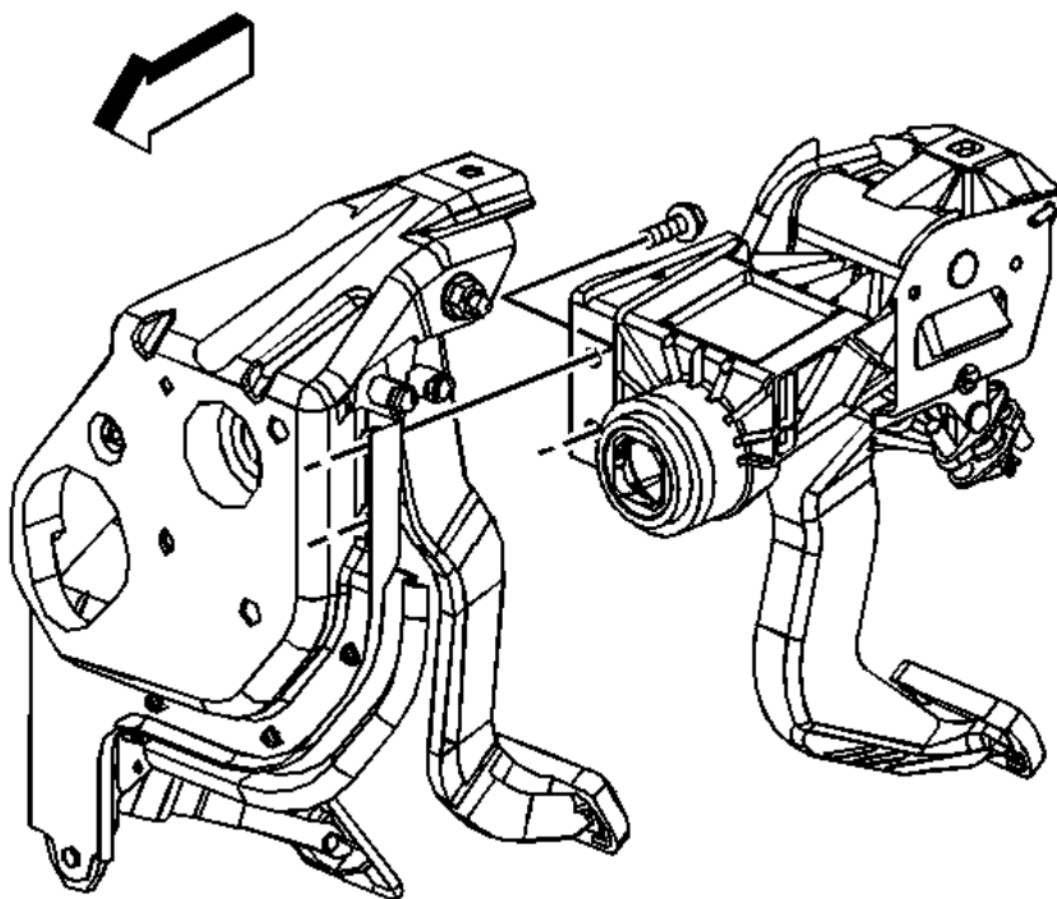


**Fig. 4: Clutch Pedal And Brake Module Assembly**

Courtesy of GENERAL MOTORS COMPANY

1. Install the clutch pedal sub-assembly.

**CAUTION:** Refer to **Fastener Caution** .

2. Install the clutch pedal to brake module bolts and tighten to 50 (37 lb ft).

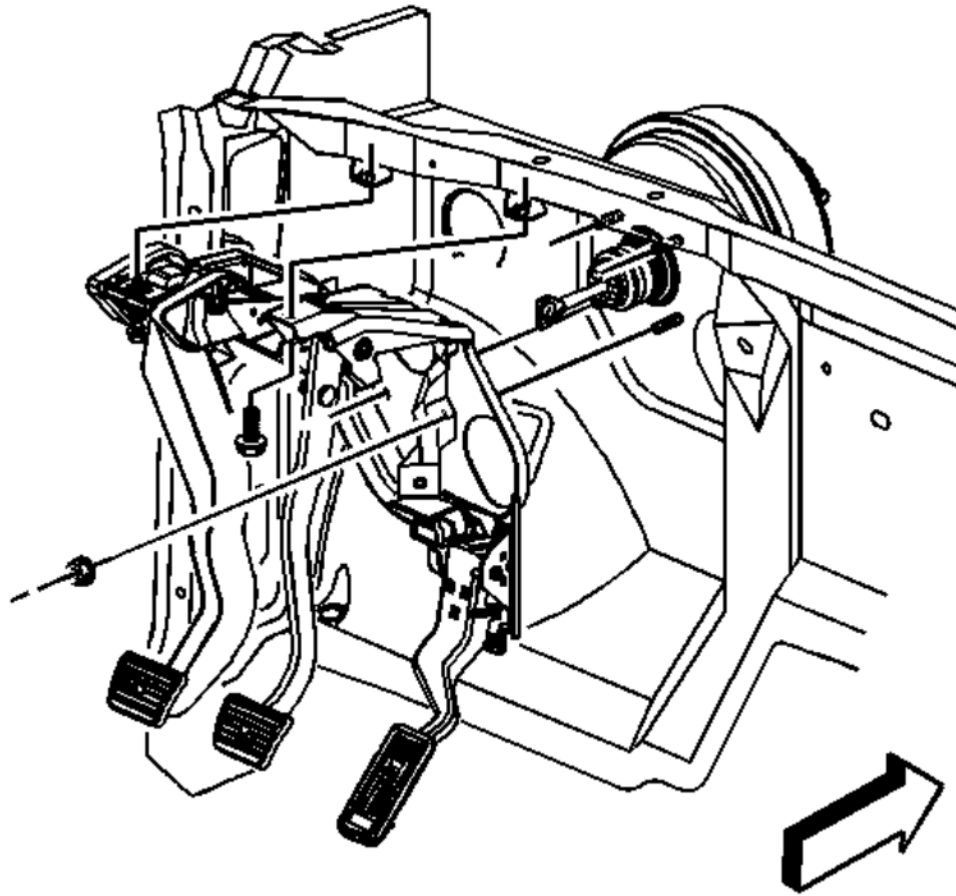


**Fig. 5: Clutch Pedal Bracket Assembly**

Courtesy of GENERAL MOTORS COMPANY

3. Install the clutch pedal to clutch pedal bracket bolt and tighten to 36 (27 lb ft).
4. Remove the clutch master cylinder. Refer to [Clutch Master Cylinder Replacement](#).

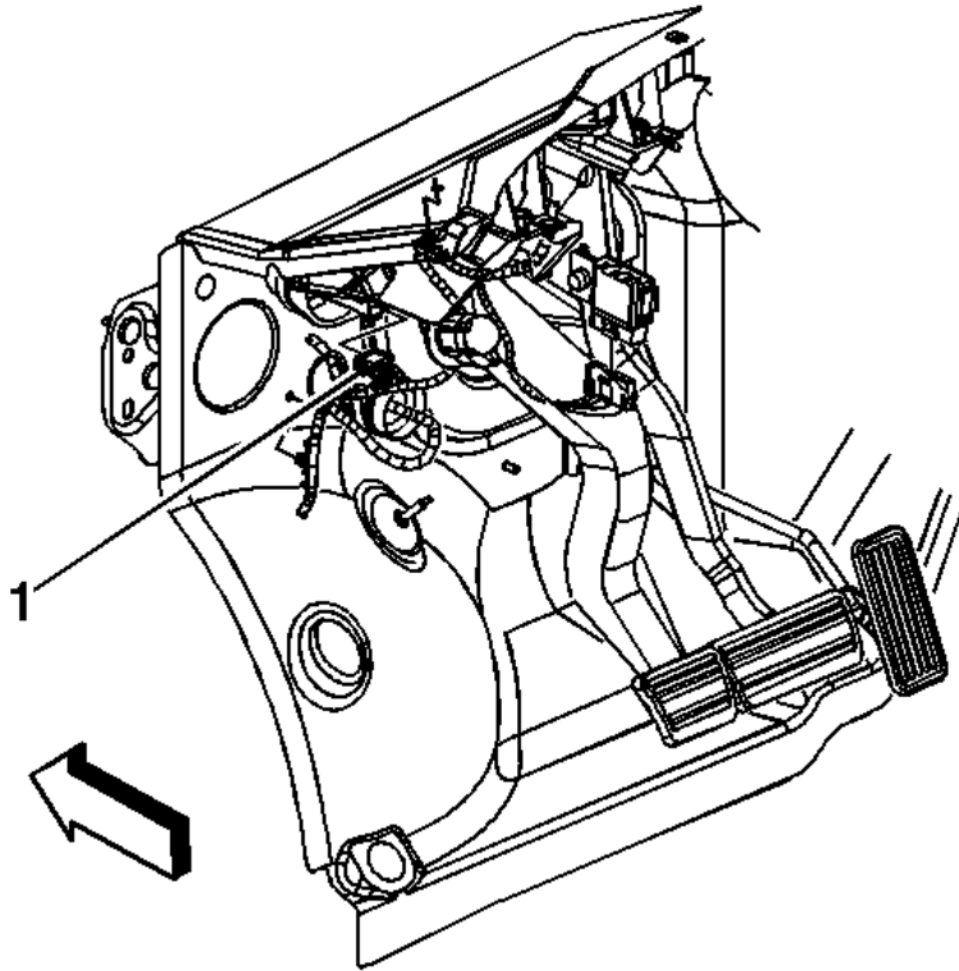


**Fig. 6: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

5. Connect the clutch pedal engine start switch electrical connector (1).
6. Install the instrument panel. Refer to [\*\*Instrument Panel Assembly Replacement\*\*](#) .

## **CLUTCH MASTER CYLINDER REPLACEMENT**

### **Removal Procedure**

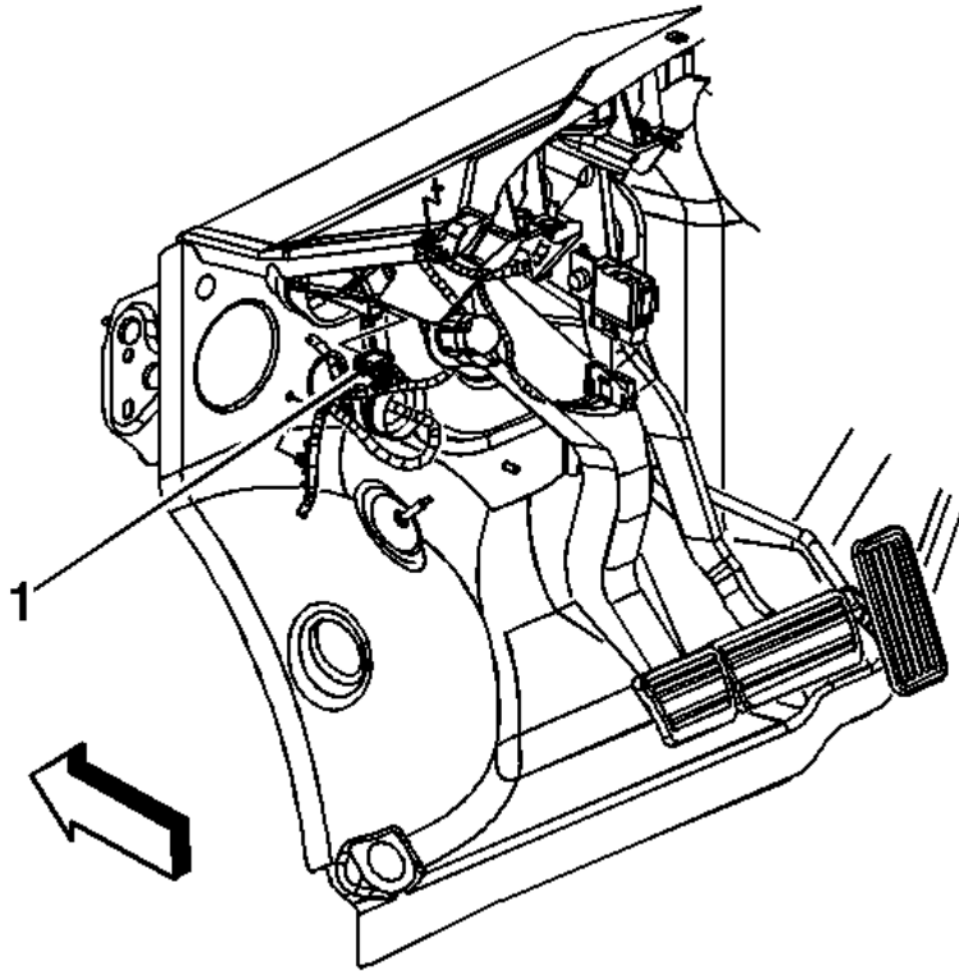


**Fig. 7: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

1. Disconnect the clutch pedal position switch electrical connector (1).
2. Push the clutch pedal in and squeeze the pushrod bushing tabs in, in order to release the pushrod bushing from the clutch pedal.

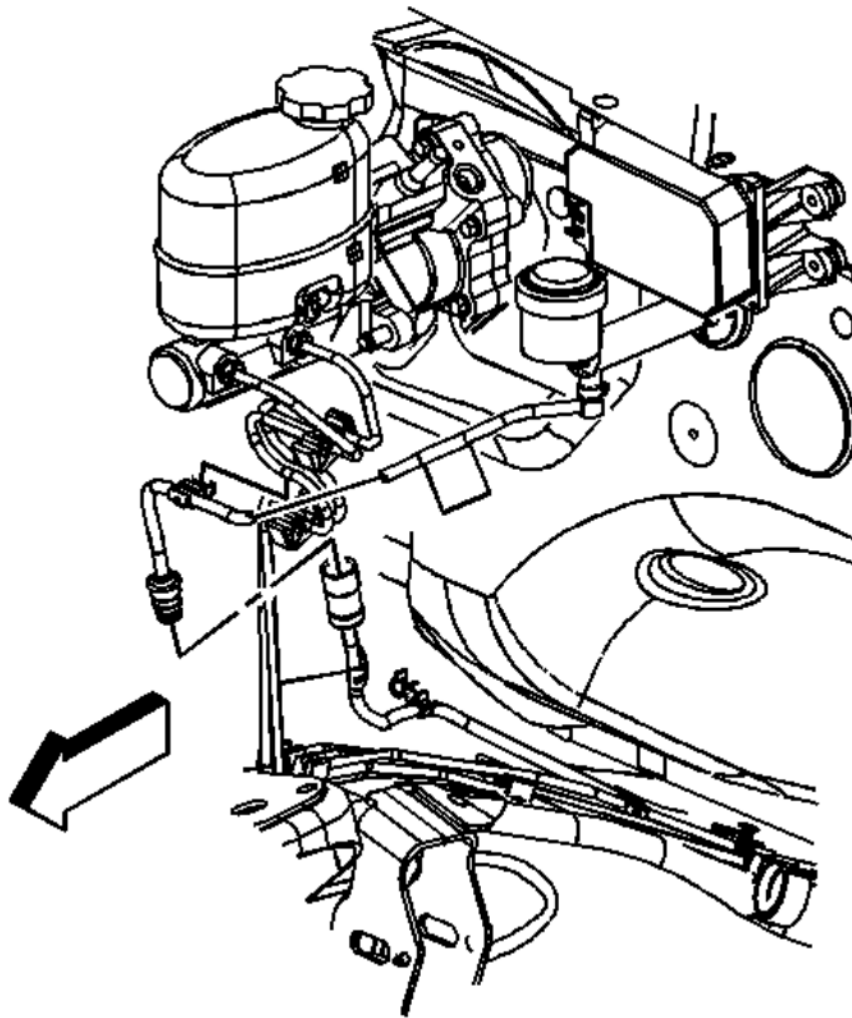


**Fig. 8: Clutch Master Cylinder To Clutch Actuator Cylinder Quick Connect Fitting (NV 3500 or NV 4500 Transmission)**

**Courtesy of GENERAL MOTORS COMPANY**

3. Disconnect the clutch actuator cylinder to clutch master cylinder quick connect fitting.
4. Remove the clutch master cylinder clip from the brake pressure module valve pipe.

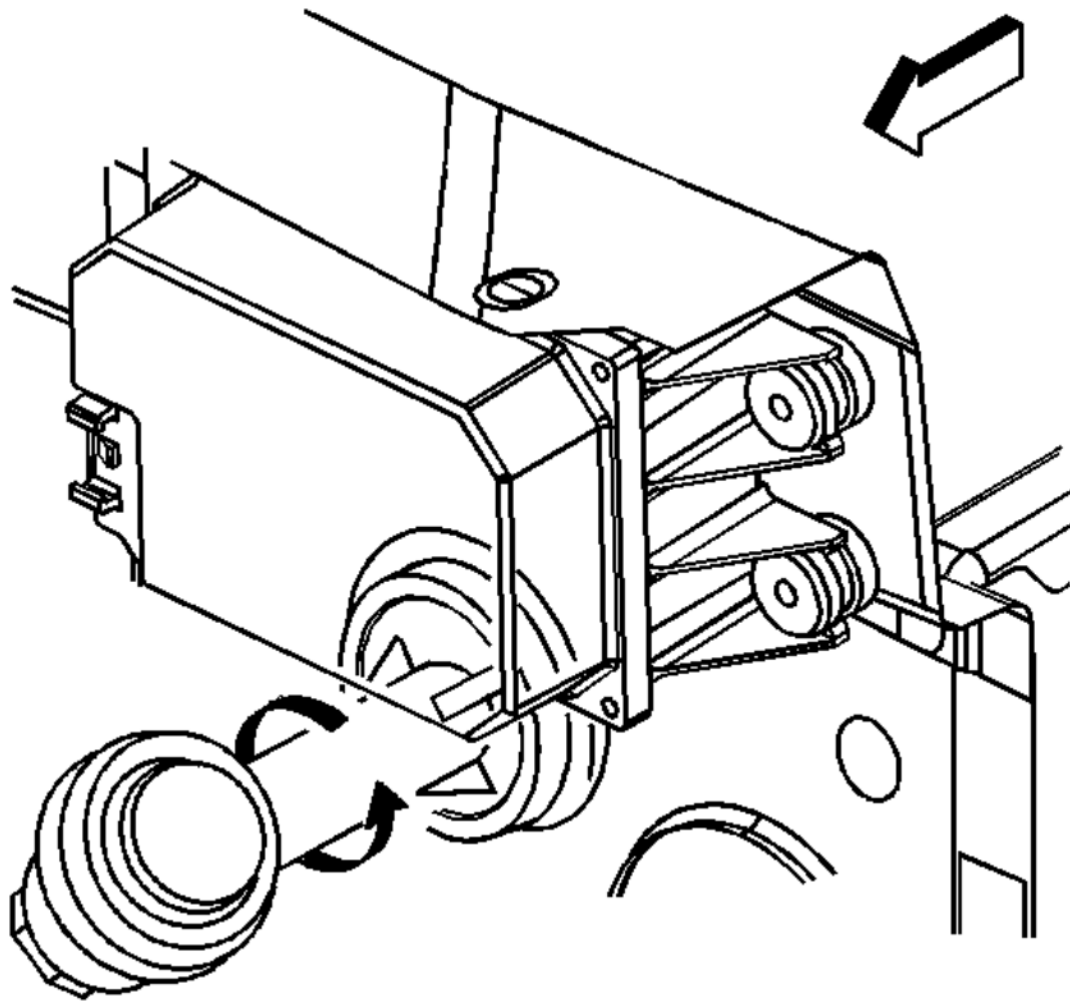


**Fig. 9: Rotating The Clutch Master Cylinder 45 Degrees**

Courtesy of GENERAL MOTORS COMPANY

5. Rotate the clutch master cylinder 45 degrees clockwise to the unlocked position.

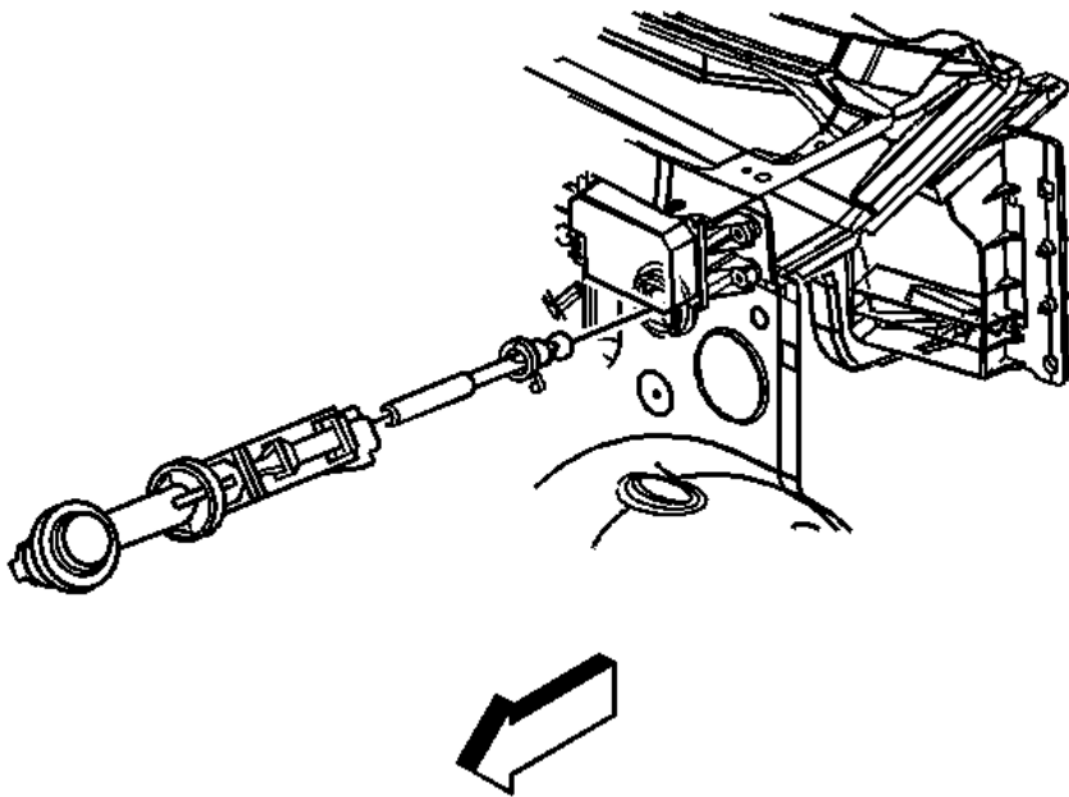


**Fig. 10: Clutch Master Cylinder (NV 3500 or NV 4500 Transmission)**  
Courtesy of GENERAL MOTORS COMPANY

6. Remove the clutch master cylinder.

#### **Installation Procedure**

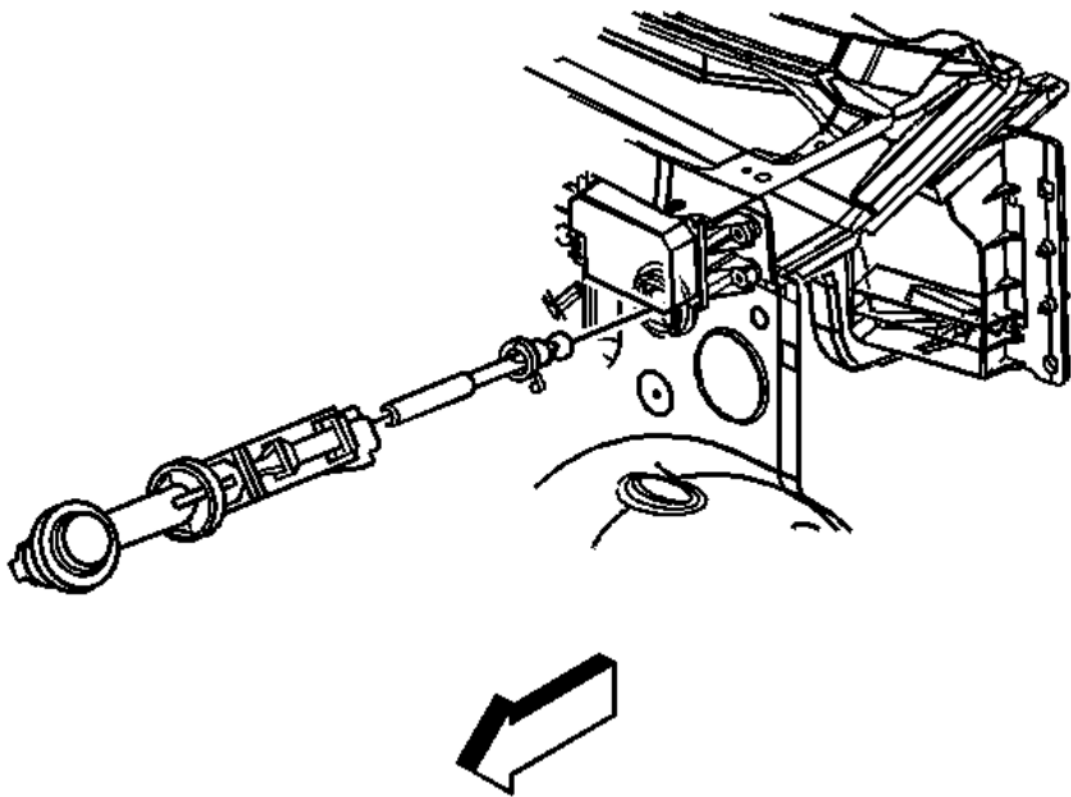


**Fig. 11: Clutch Master Cylinder (NV 3500 or NV 4500 Transmission)**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the clutch master cylinder.

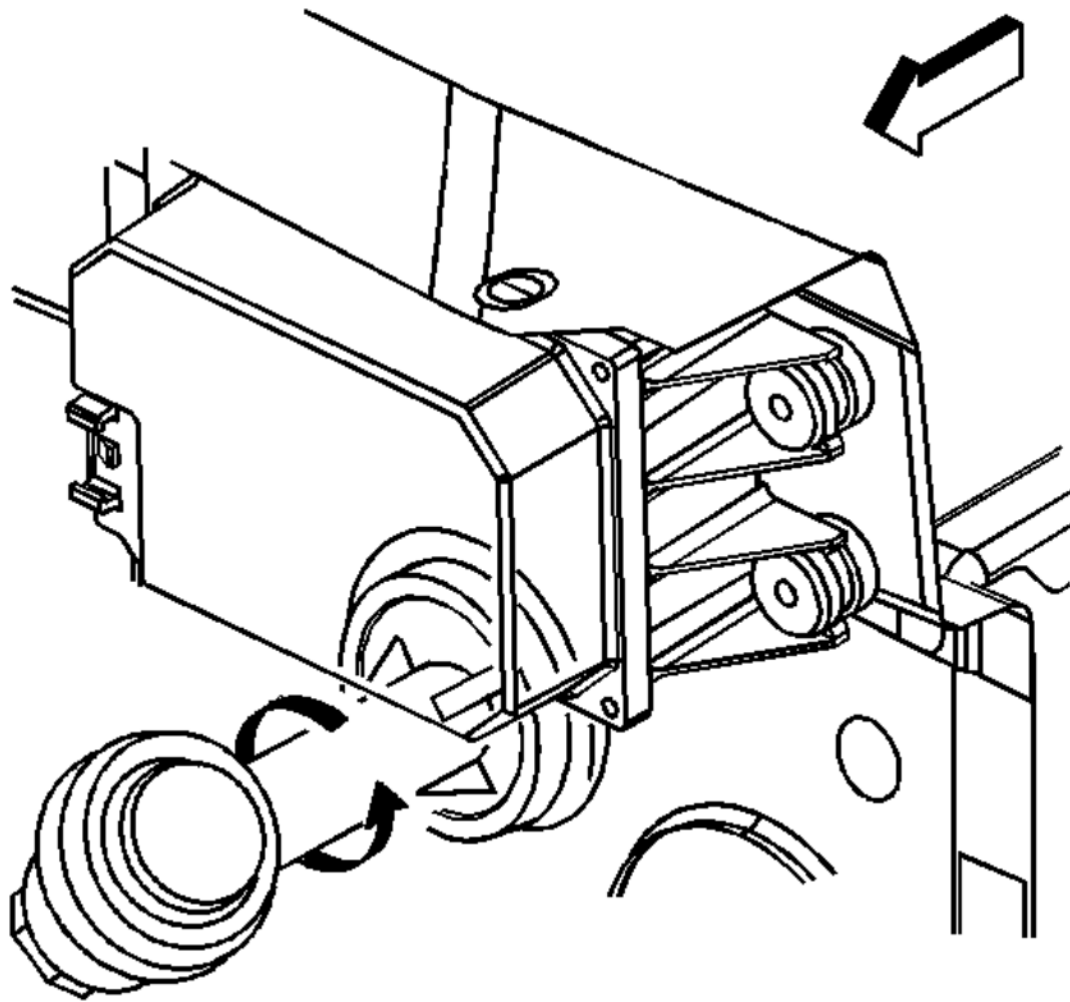


**Fig. 12: Rotating The Clutch Master Cylinder 45 Degrees**

Courtesy of GENERAL MOTORS COMPANY

2. Push in and rotate the clutch master cylinder 45 degrees counterclockwise to the locked position.

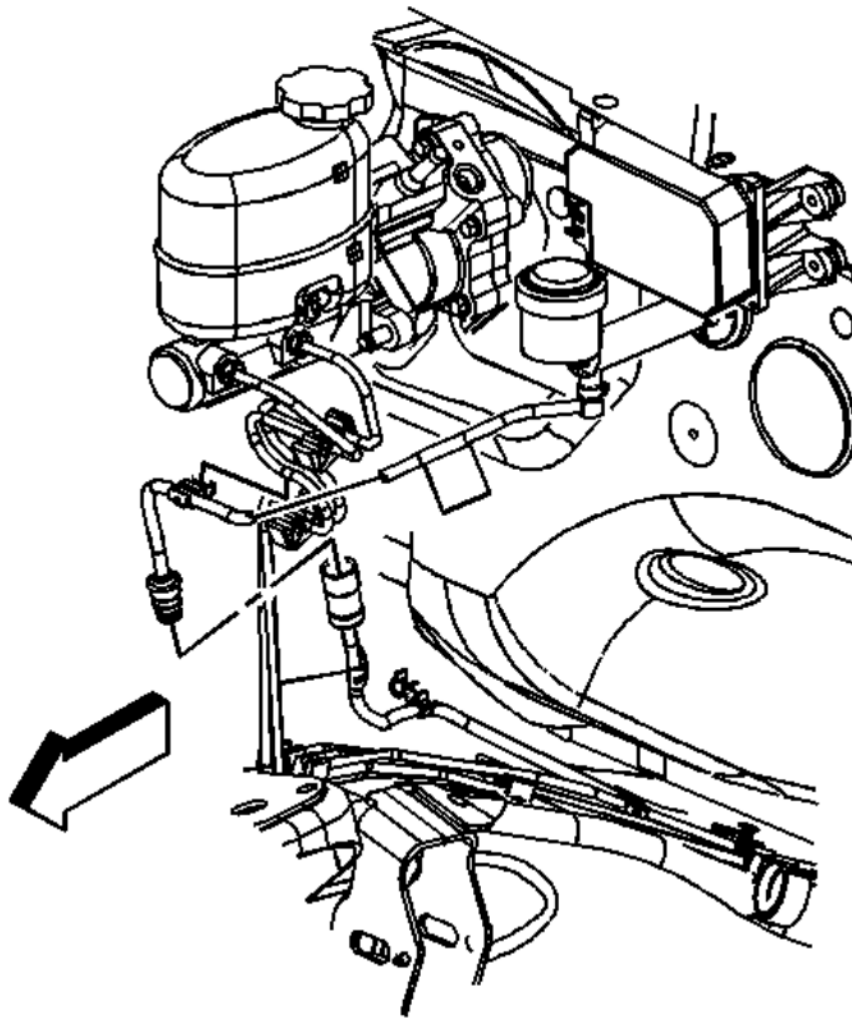


**Fig. 13: Clutch Master Cylinder To Clutch Actuator Cylinder Quick Connect Fitting (NV 3500 or NV 4500 Transmission)**

**Courtesy of GENERAL MOTORS COMPANY**

3. Disconnect the clutch actuator cylinder to clutch master cylinder quick connect fitting.
4. Install the clutch master cylinder clip to the brake pressure module valve pipe.

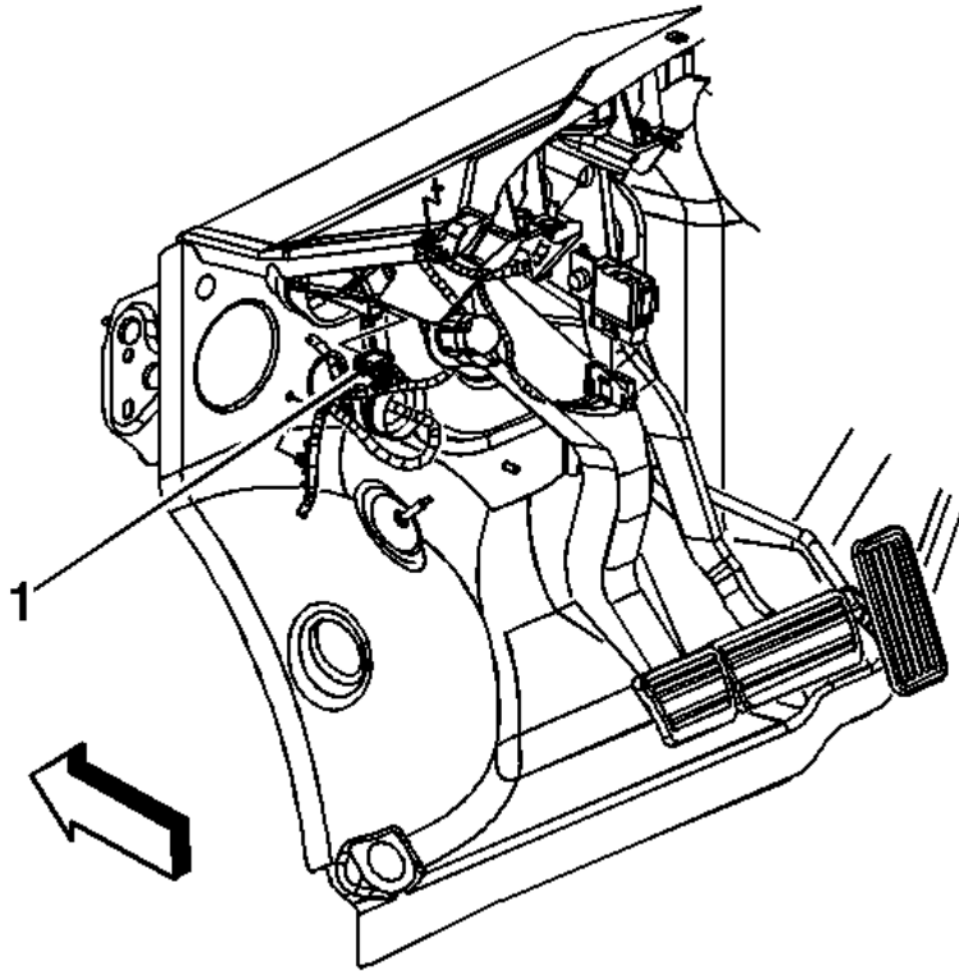


**Fig. 14: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

5. Apply light pressure to the clutch pedal to couple the pushrod socket to the clutch pedal.
6. Connect the clutch pedal position switch electrical connector (1).
7. Pump the clutch pedal 3 time prior to starting the vehicle to ensure connection is complete.

## **HYDRAULIC CLUTCH HOSE/PIPE REPLACEMENT**

### **Removal Procedure**

1. Remove or reposition the junction block bracket out of the way. Refer to **Underhood Electrical Center or Junction Block Bracket Replacement** .

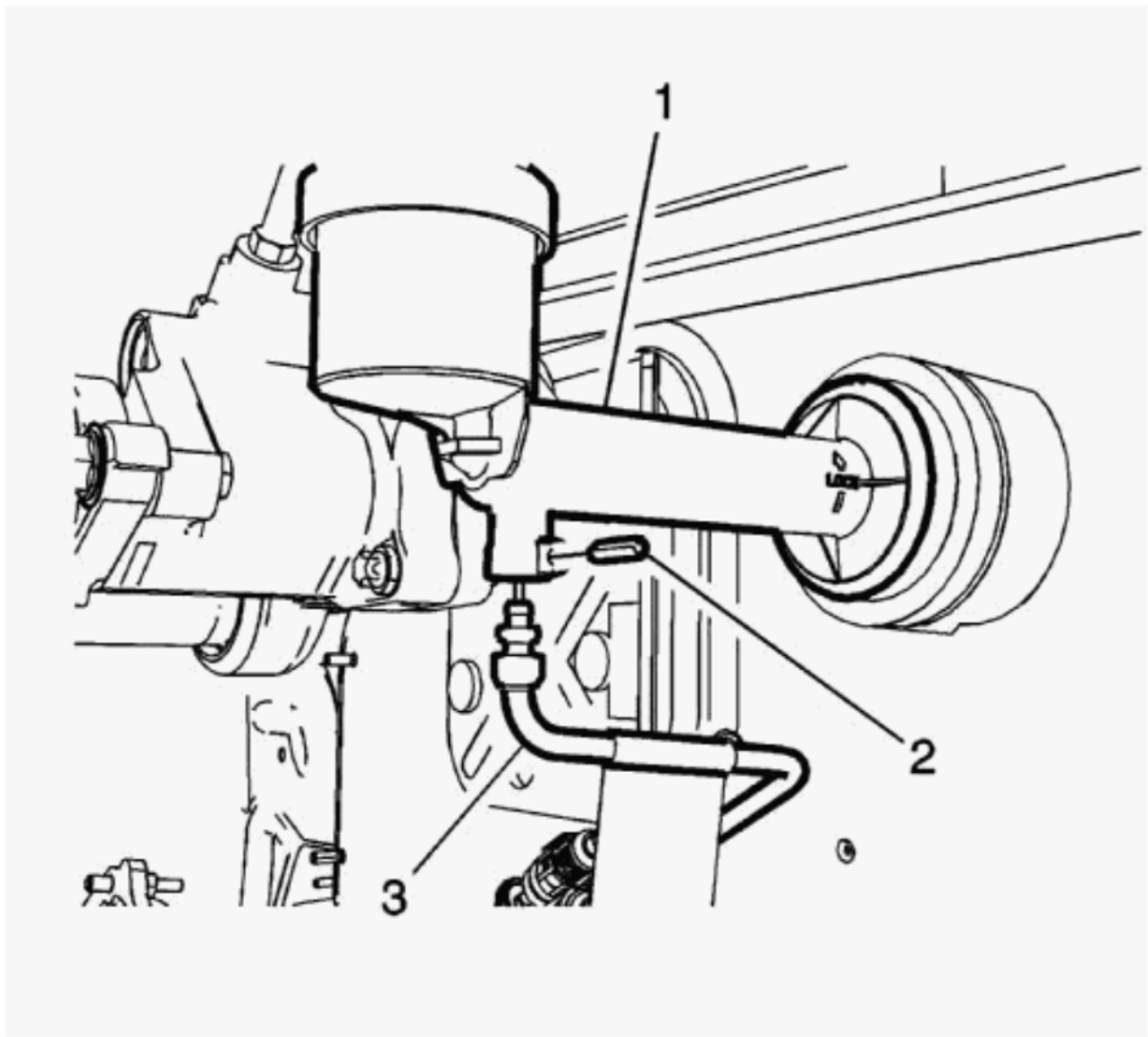


**Fig. 15: Clutch Hydraulic Fluid And Clutch Master Cylinder**

**Courtesy of GENERAL MOTORS COMPANY**

2. Remove the clutch hydraulic fluid from the clutch master cylinder (1).
3. Remove and Discard the roll pin (2) retaining the hydraulic clutch hose/pipe to the clutch master cylinder.
4. Disconnect the hydraulic clutch hose/pipe (3) from the clutch master cylinder.

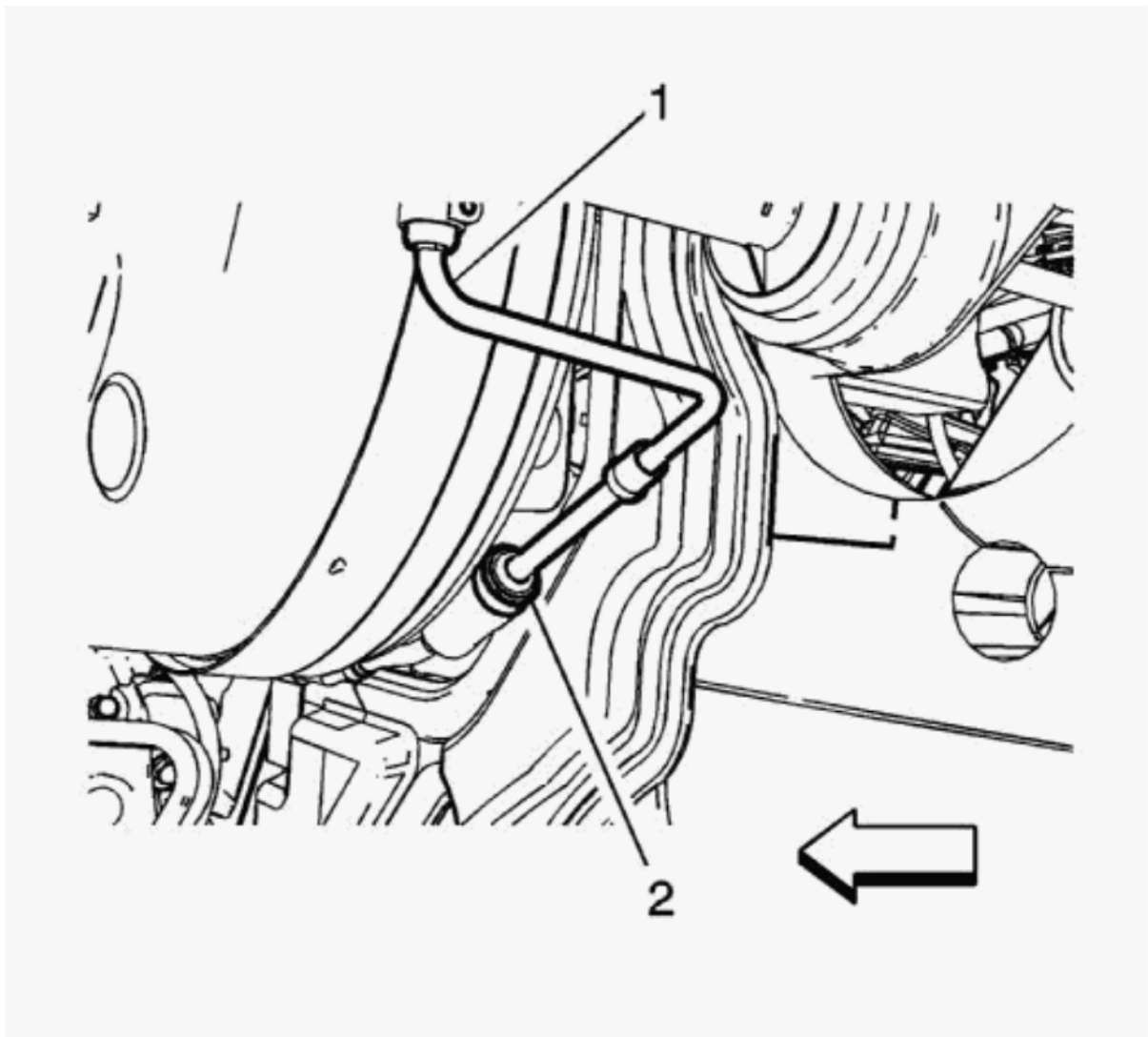


**Fig. 16: Upper Hydraulic Clutch Hose/Pipe**

**Courtesy of GENERAL MOTORS COMPANY**

5. Disconnect the upper hydraulic clutch hose/pipe (1) from the lower hydraulic clutch hose/pipe by pushing the retaining collar (2) inward to release the fitting.
6. Remove the upper hydraulic clutch hose/pipe from the vehicle.
7. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

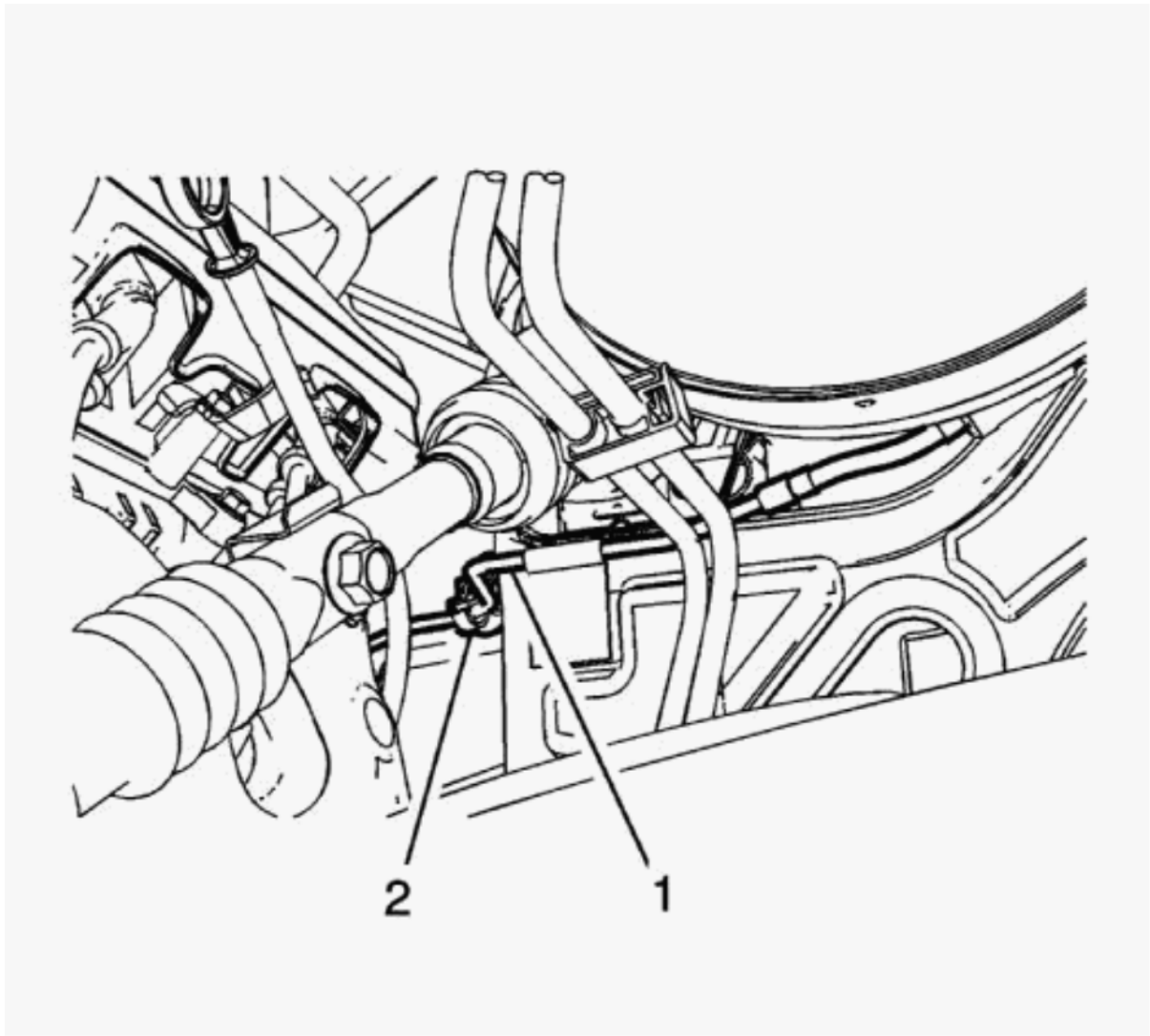


**Fig. 17: Lower Hydraulic Clutch Hose/Pipe And Upper Retaining Clip**  
Courtesy of GENERAL MOTORS COMPANY

8. Unclip the lower hydraulic clutch hose/pipe (1) from the upper retaining clip (2).

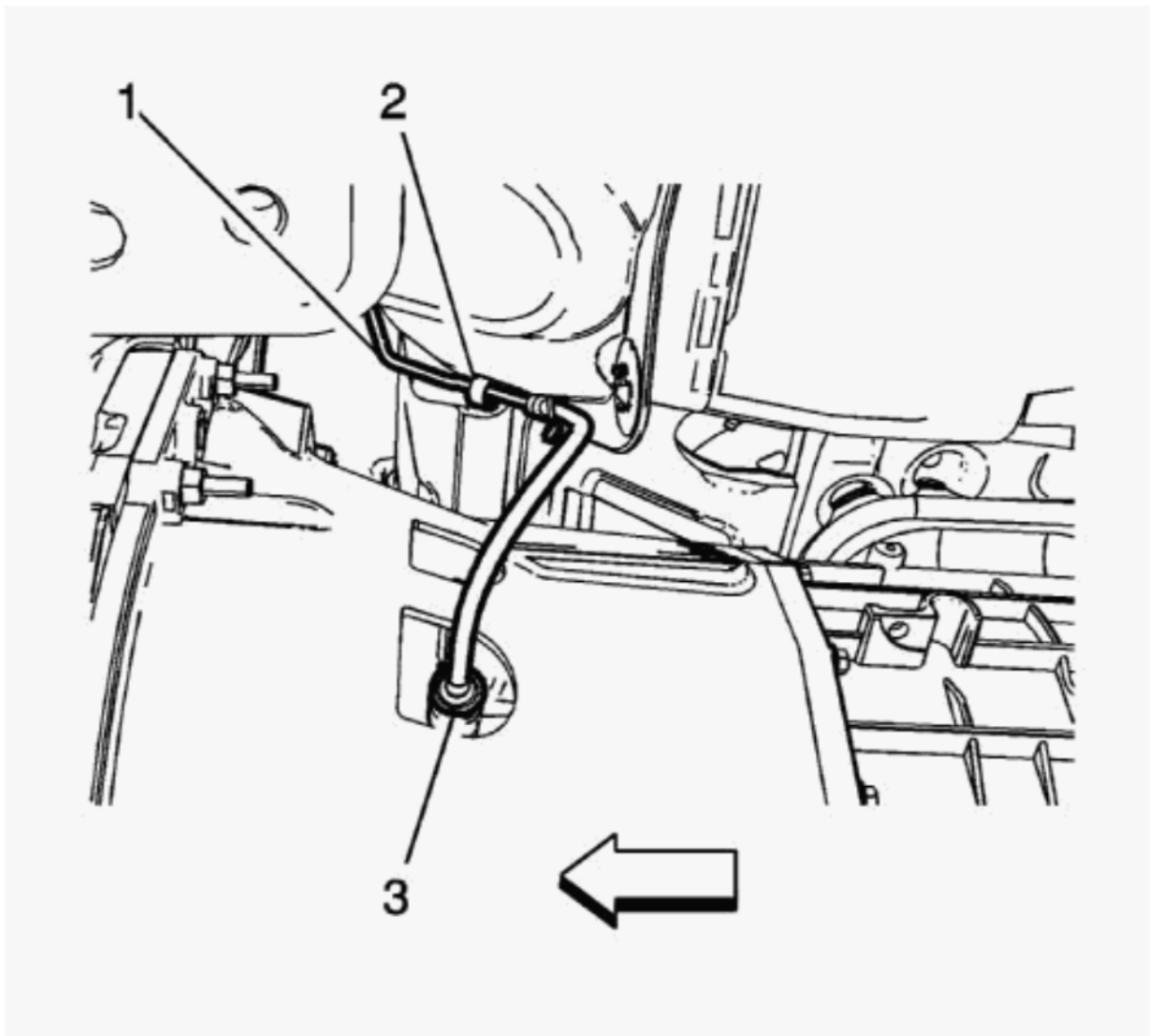


**Fig. 18: Lower Hydraulic Clutch Hose/Pipe And Lower Retaining Clip**

**Courtesy of GENERAL MOTORS COMPANY**

9. Unclip the lower hydraulic clutch hose/pipe (1) from the lower retaining clip (2).
10. Disconnect the lower hydraulic clutch hose/pipe (1) from the clutch actuator assembly by pushing the retaining collar (3) inward to release the fitting.
11. Remove the lower hydraulic clutch hose/pipe from the vehicle.

#### **Installation Procedure**

1. Position the lower hydraulic clutch hose/pipe to the vehicle.

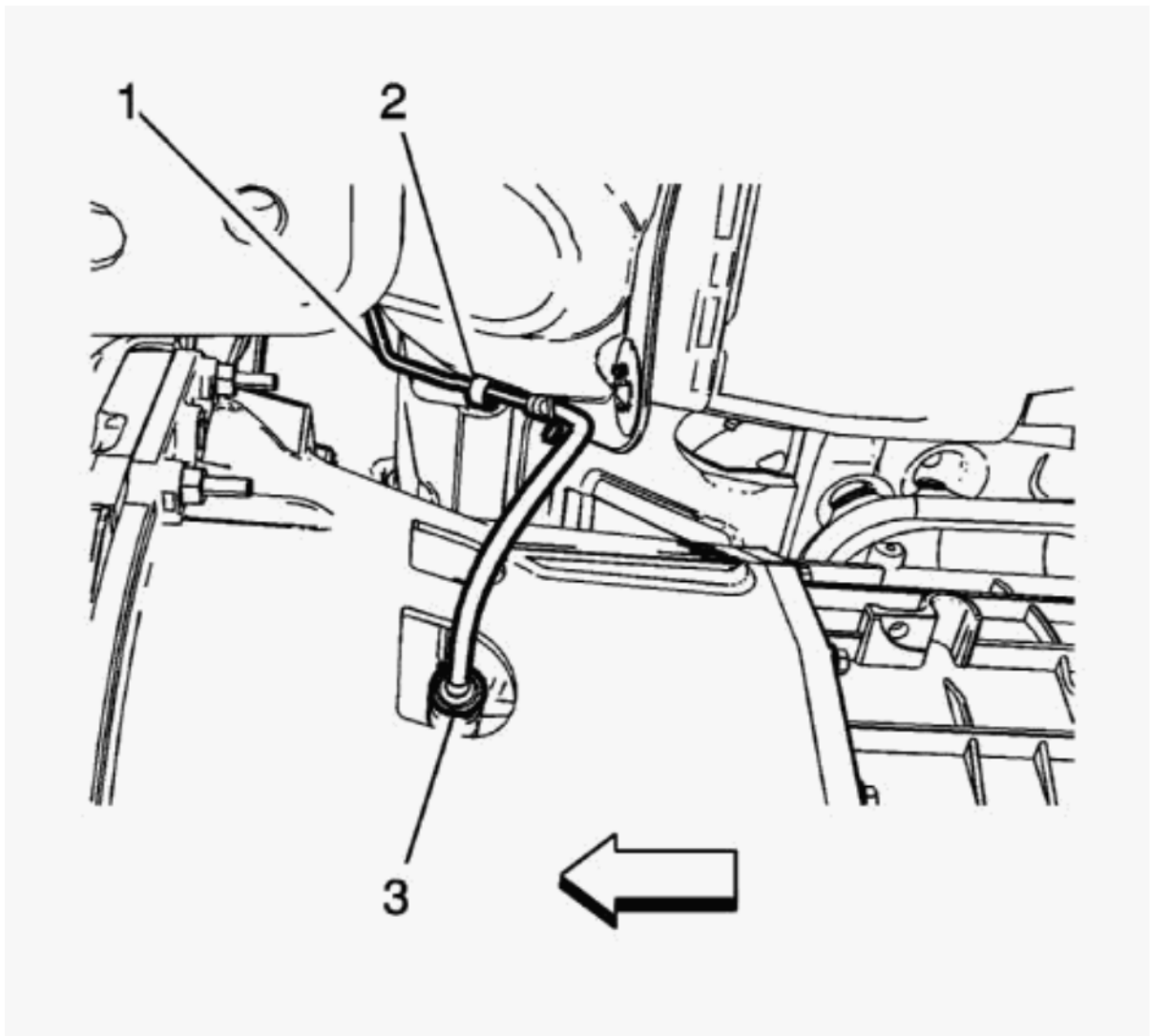


**Fig. 19: Lower Hydraulic Clutch Hose/Pipe And Lower Retaining Clip**

Courtesy of GENERAL MOTORS COMPANY

2. Clip the lower hydraulic clutch hose/pipe (1) to the lower retaining clip (2).

**NOTE:** Gently pull on the lower hydraulic clutch hose/pipe after installation to ensure a correct connection.

3. Connect the lower hydraulic clutch hose/pipe (1) to the clutch actuator assembly, then pull the retaining collar (3) outward to the lock the fitting.
4. Lower the vehicle.

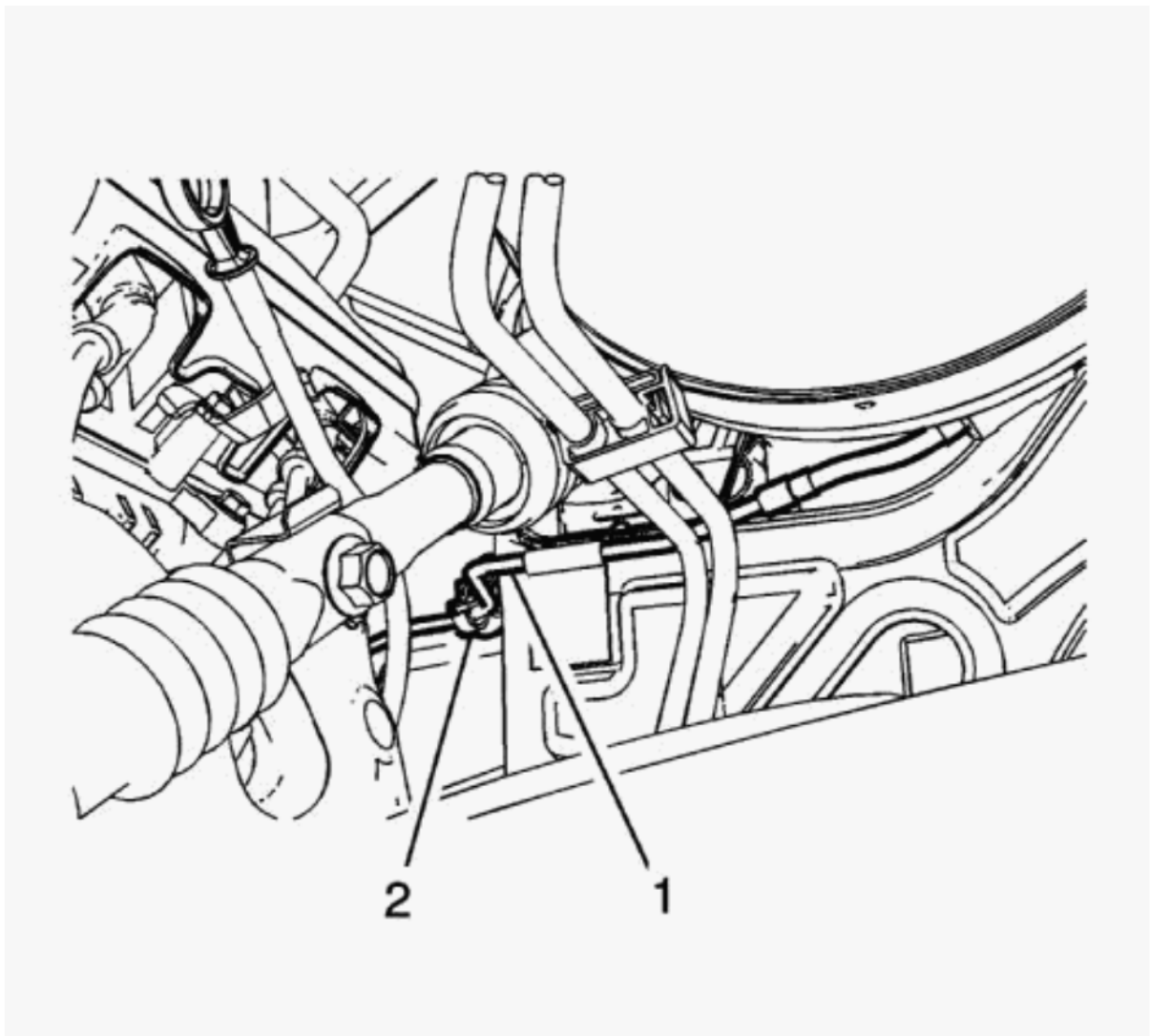


**Fig. 20: Lower Hydraulic Clutch Hose/Pipe And Upper Retaining Clip**

**Courtesy of GENERAL MOTORS COMPANY**

5. Clip the lower hydraulic clutch hose/pipe (1) to the upper retaining clip (2).
6. Position the upper hydraulic clutch hose/pipe to the lower hydraulic clutch hose/pipe.

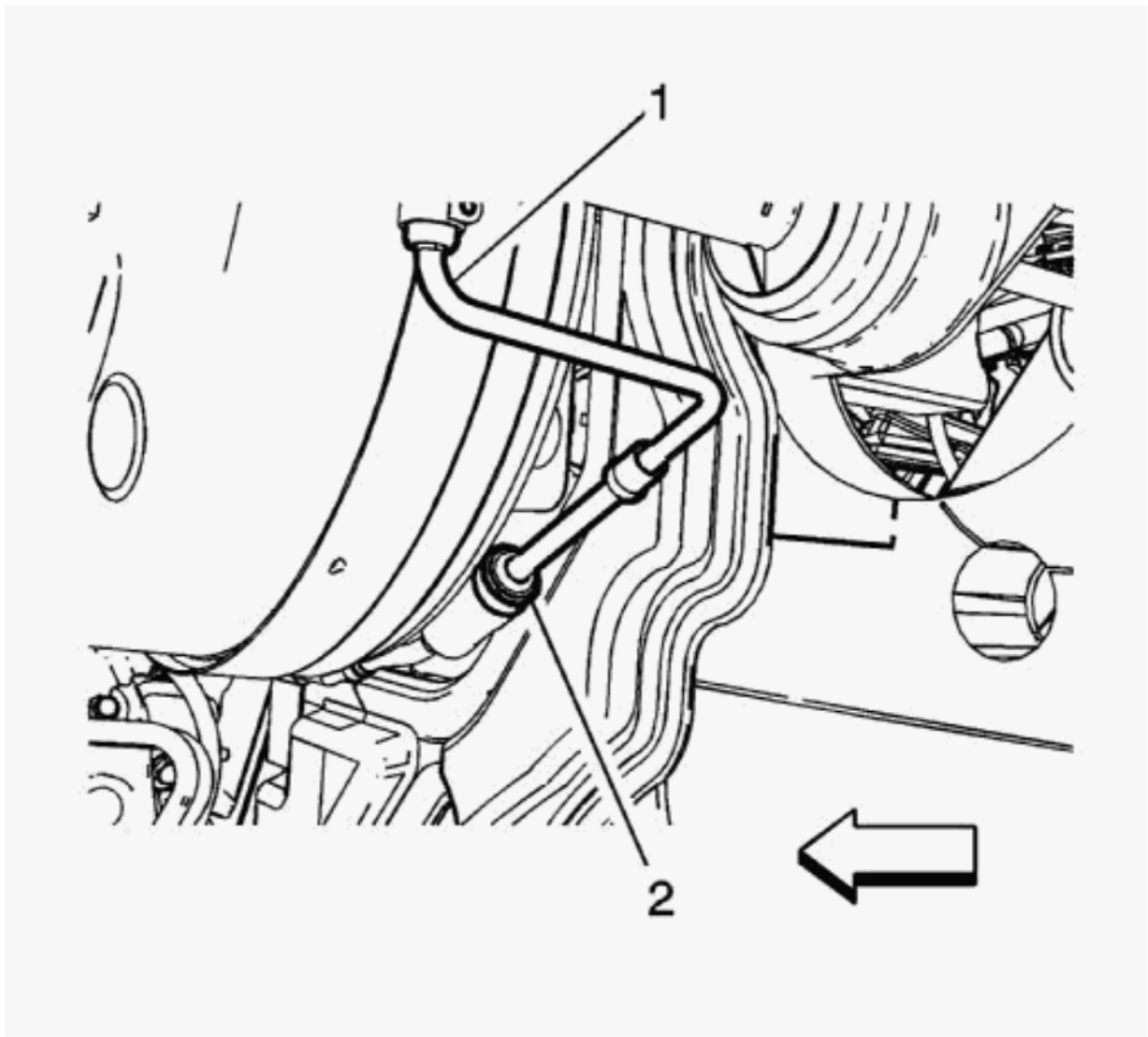


**Fig. 21: Upper Hydraulic Clutch Hose/Pipe**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Gently pull on the lower hydraulic clutch hose/pipe after installation to ensure a correct connection.

7. Connect the upper hydraulic clutch hose/pipe (1) to the lower hydraulic clutch hose/pipe by pulling the retaining collar (2) outward to lock the fitting.

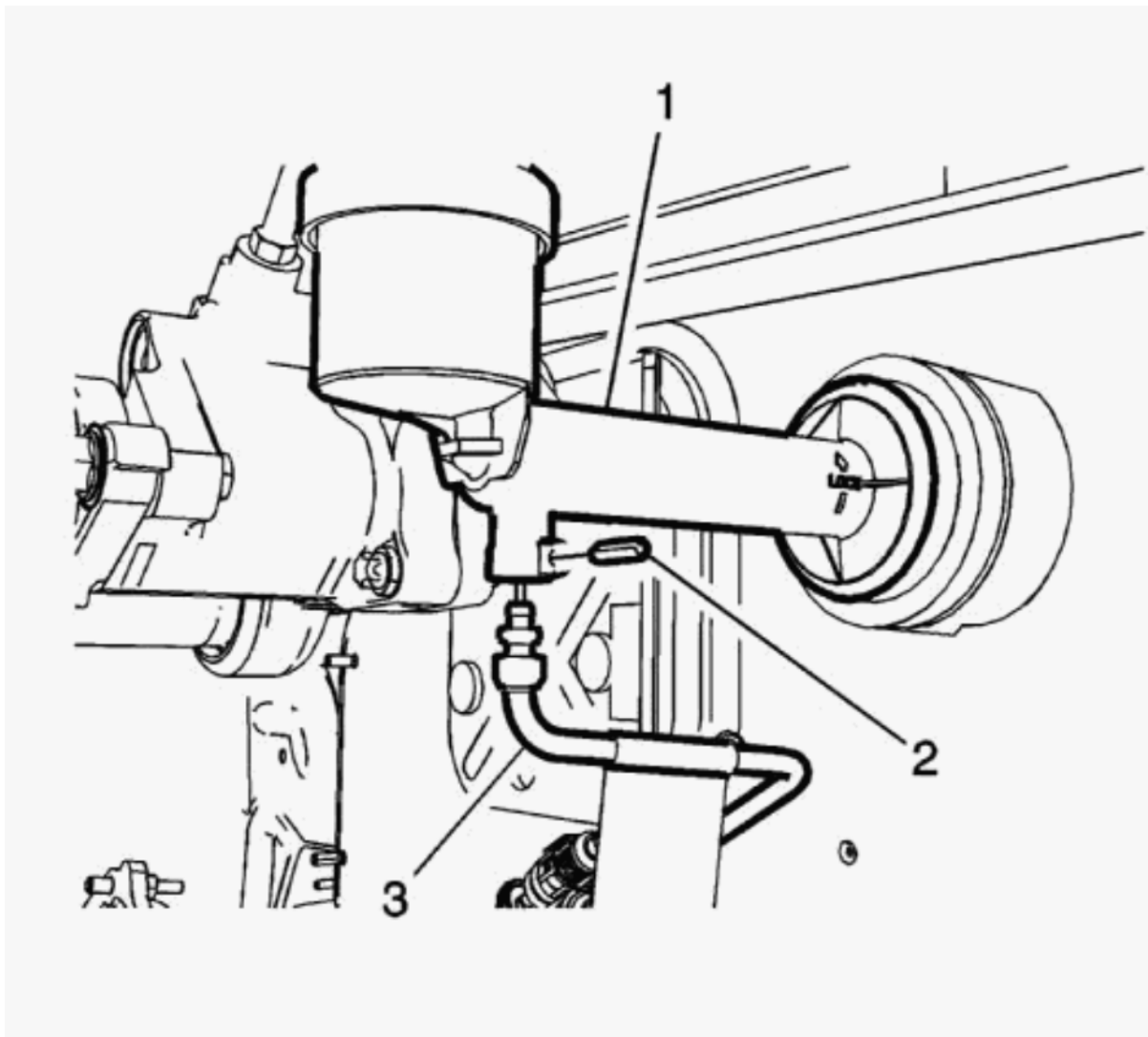


**Fig. 22: Clutch Hydraulic Fluid And Clutch Master Cylinder**

Courtesy of GENERAL MOTORS COMPANY

8. Connect the hydraulic clutch hose/pipe (3) to the clutch master cylinder.
9. Install a NEW roll pin (2) to retain the hydraulic clutch hose/pipe to the clutch master cylinder.
10. Fill the clutch master cylinder with fluid. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
11. Bleed the hydraulic clutch system. Refer to [Hydraulic Clutch System Bleeding](#).
12. Install the junction block bracket. Refer to [Underhood Electrical Center or Junction Block Bracket Replacement](#).

## **HYDRAULIC CLUTCH SYSTEM BLEEDING**

**CAUTION:** DO NOT use fluid which has been bled from a hydraulic clutch system, in order to fill the clutch master cylinder reservoir, due to the possibility that the fluid may be aerated, have too much moisture content, or be contaminated and may cause system or vehicle damage.

1. Ensure the reservoir is filled to the fill line with new hydraulic clutch fluid. Add fluid if required. Use hydraulic clutch fluid. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
2. Press the clutch pedal in completely to the floor panel.

3. Open the bleeder screw in order to purge the air from the system.
4. Close the bleeder and release the clutch pedal.

**NOTE:**      **Ensure no air is drawn into the clutch system.**

5. Repeat steps 2, 3, and 4 until all the air is out of the clutch system.
  1. Check and refill the reservoir as needed while bleeding.
  2. After bleeding, pump the clutch pedal several times. If clutch engagement is not satisfactory, repeat the bleed procedure.
6. If the previous procedures are unsuccessful, perform the following steps.
  1. Pump the clutch pedal very fast with full strokes for 30 seconds.
  2. Stop pumping and let the air escape into the reservoir while moving the rubber pad up and down 12 mm (0.5 in) for 30 seconds.
  3. Repeat this procedure, as necessary.

## **CLUTCH PEDAL ENGINE START SWITCH REPLACEMENT**

### **Removal Procedure**

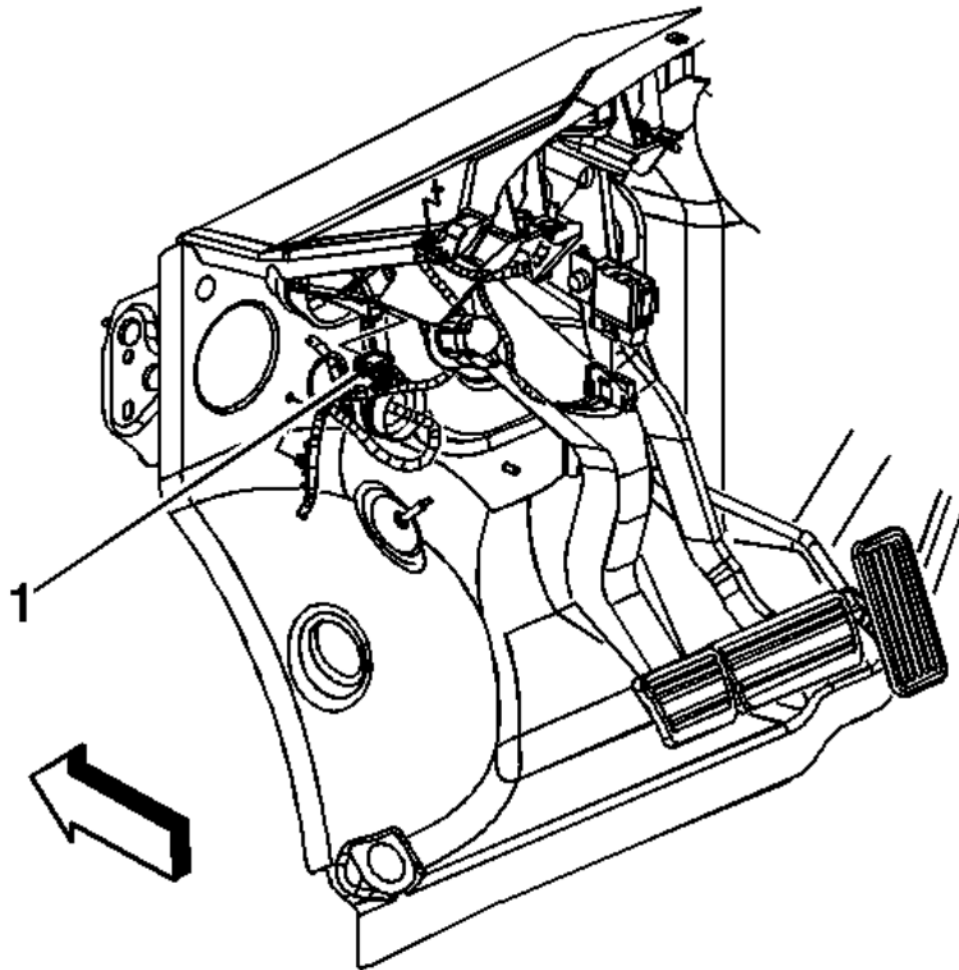


**Fig. 23: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

1. Disconnect the clutch pedal position switch electrical connector (1).

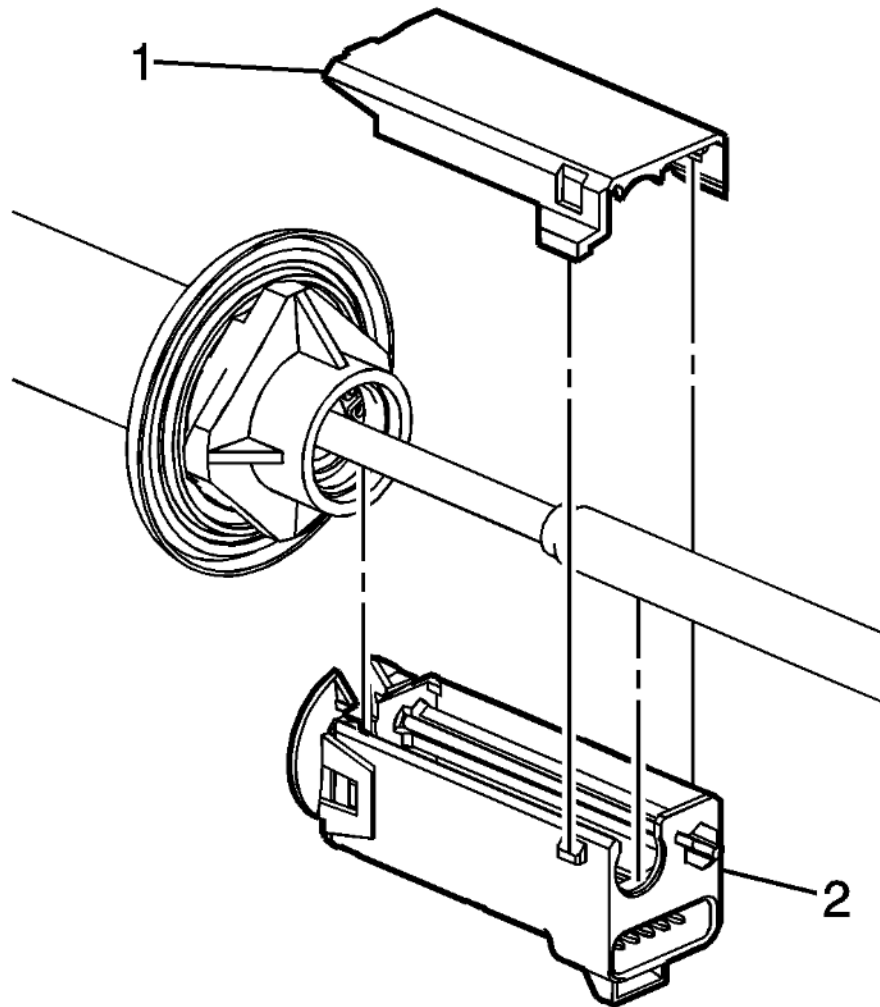


**Fig. 24: Clutch Pedal Engine Start Switch**

Courtesy of GENERAL MOTORS COMPANY

2. Remove the plastic retainer (1) tabs from the clutch pedal position switch (2).
3. Remove the clutch pedal position switch (2) from the pushrod.

### Installation Procedure

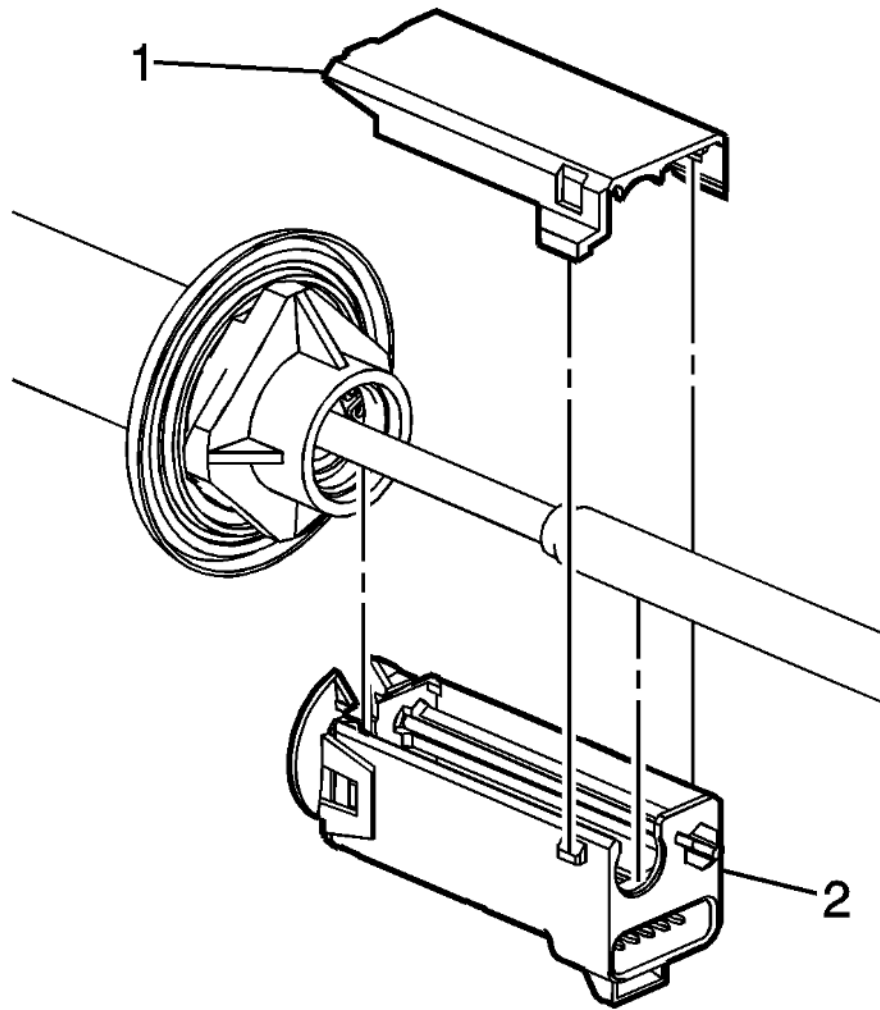


**Fig. 25: Clutch Pedal Engine Start Switch**

Courtesy of GENERAL MOTORS COMPANY

1. Install the clutch pedal position switch (2) to the pushrod.
2. Install the plastic retainer (1) tabs to the clutch pedal position switch (2).

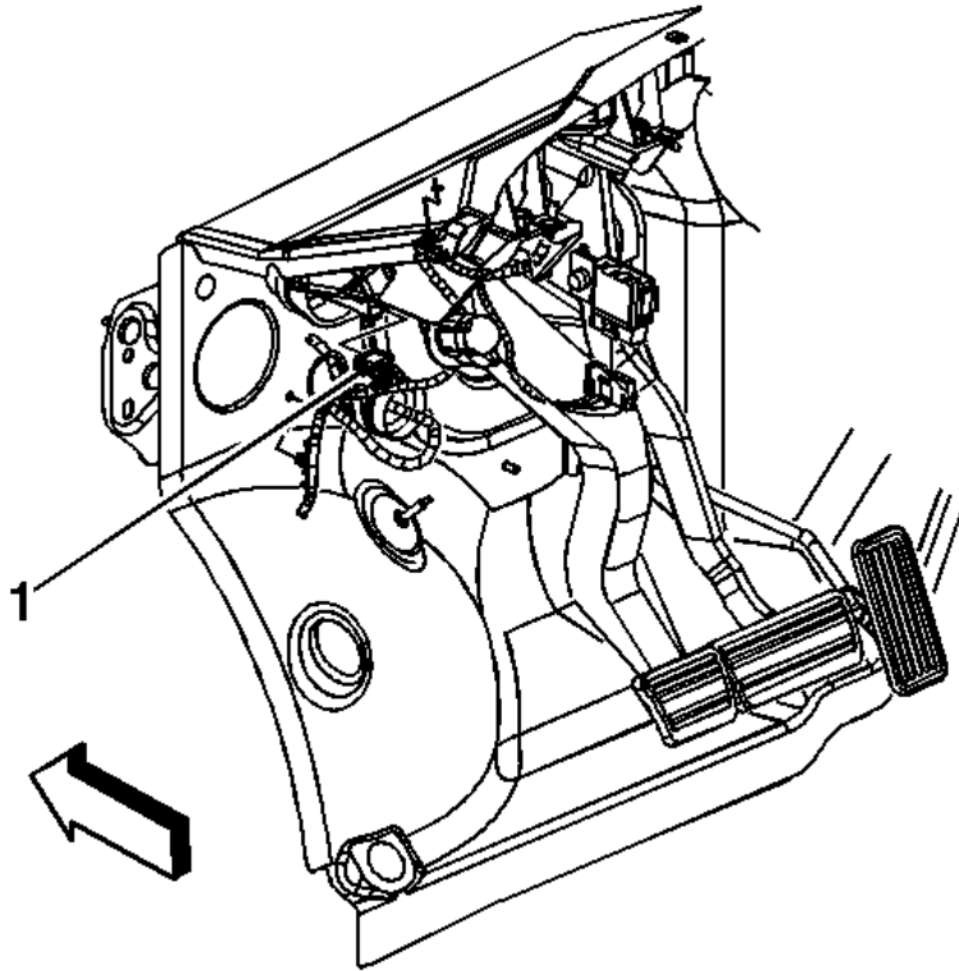


**Fig. 26: Clutch Pedal Position Switch Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

3. Connect the clutch pedal position switch electrical connector (1).

## **CLUTCH PEDAL POSITION SENSOR REPLACEMENT**

### **Removal Procedure**

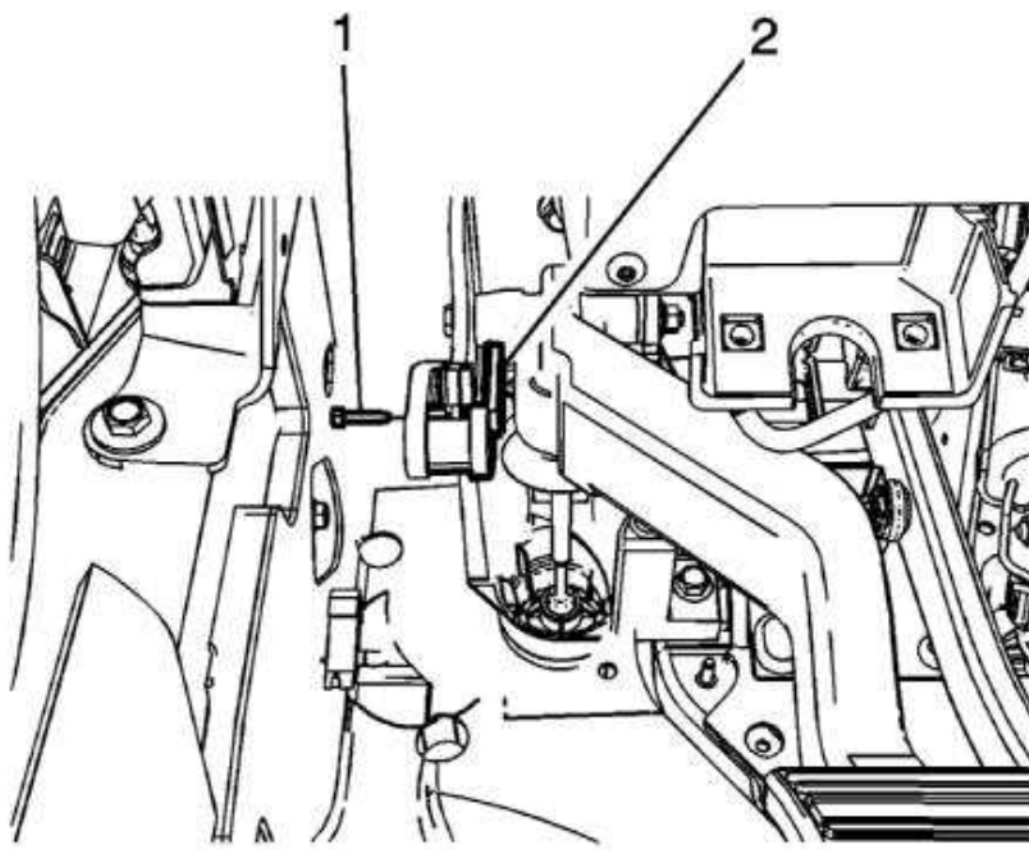


**Fig. 27: Clutch Pedal Position Sensor Bolt**

Courtesy of GENERAL MOTORS COMPANY

1. Remove the clutch pedal position sensor bolt (1).
2. Remove the clutch pedal position sensor (2).
3. Disconnect the clutch pedal position sensor wiring harness connector.

#### **Installation Procedure**

1. Connect the clutch pedal position sensor wiring harness connector.

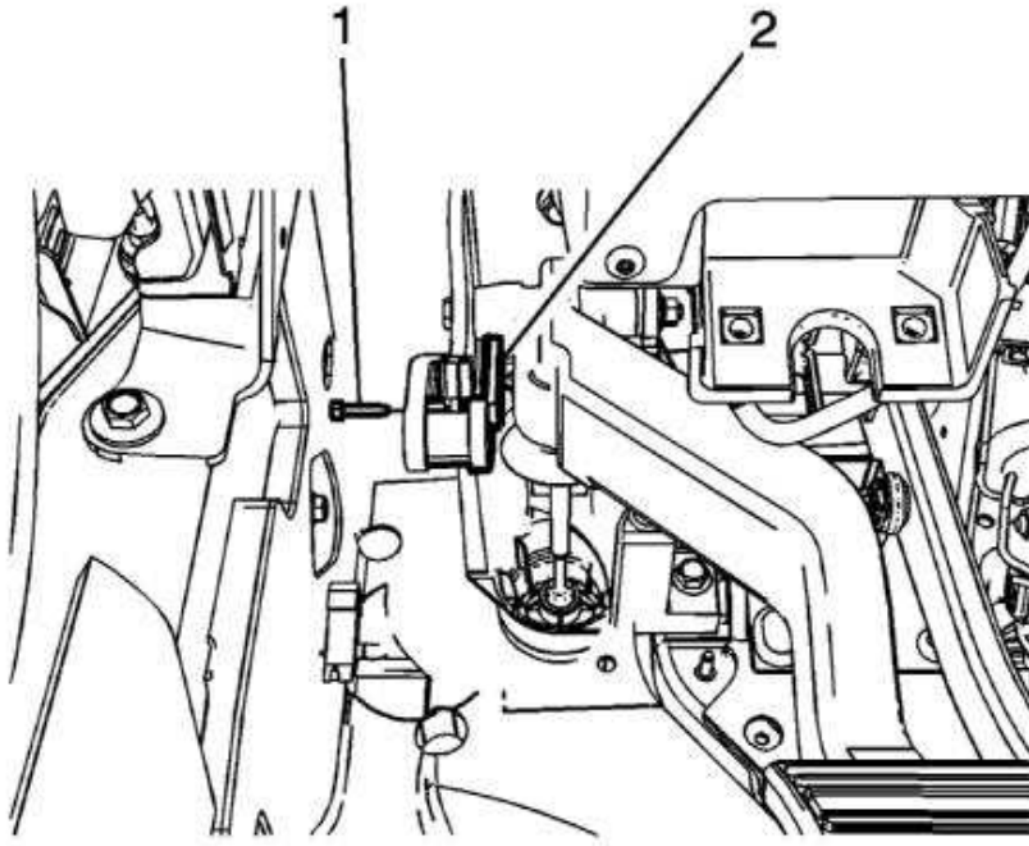


**Fig. 28: Clutch Pedal Position Sensor Bolt**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the clutch pedal position sensor (2).

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

3. Install the clutch pedal position sensor bolt (1) and tighten to 3 N.m (27 lb in).

## **CLUTCH PILOT BEARING REPLACEMENT**

### **Special Tools**

- **J-38836** Bushing Installer/Clutch Arbor
- **J-43276** Clutch Pilot Bearing Remover

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

### **Removal Procedure**

**CAUTION:** When using the J 43276 Clutch Pilot Bearing Remover, always secure the J 43276-1 Clutch Pilot Bearing Remover tool body using a wrench. Do not allow

the J 43276-1 tool body to rotate. Failing to do so causes damage to the J 43276-1 tool body.

**NOTE:** The flywheel spacer (if applicable) must be removed prior to clutch pilot bearing removal.

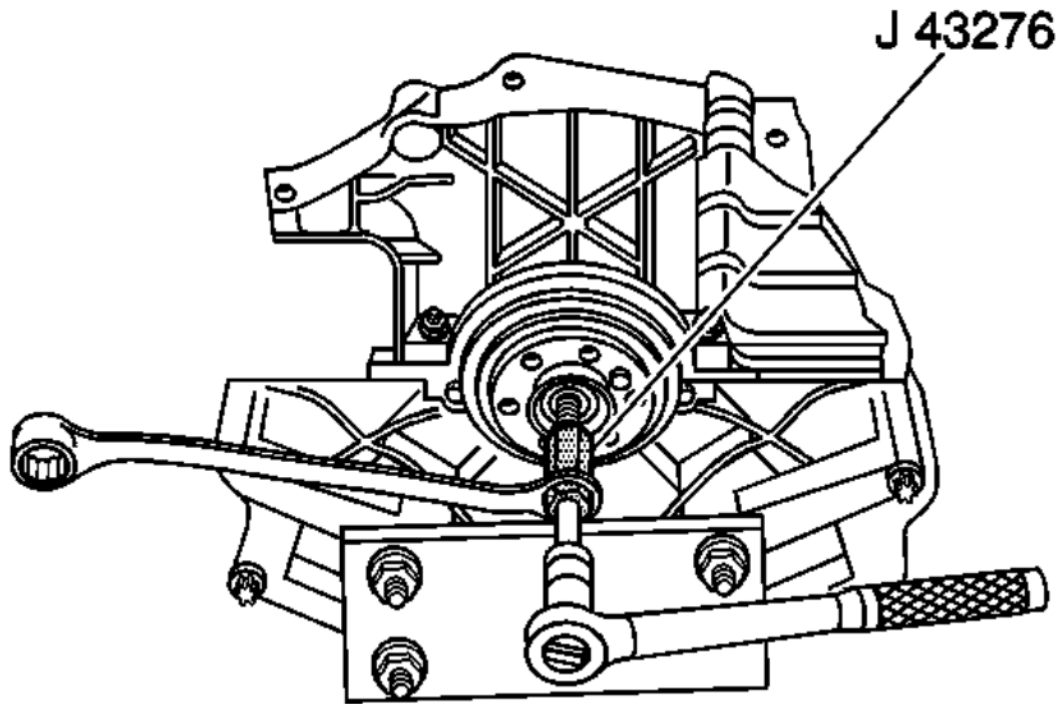


**Fig. 29: Removing Clutch Pilot Bearing**

Courtesy of GENERAL MOTORS COMPANY

1. Remove the clutch assembly. Refer to [Clutch Assembly Replacement](#).
2. Using **J-43276** clutch pilot bearing remover perform the following in order to remove the clutch pilot bearing:
  1. Install the J-43276-1 into the clutch pilot bearing.
  2. Using a wrench, secure the J-43276-1.
  3. Insert the J-43276-2 into the J-43276-1.
  4. Rotate the J-43276-2 clockwise into the J-43276-1 until the clutch pilot bearing is completely removed from the crankshaft.
  5. Rotate the J-43276-2 counterclockwise to remove the J-43276-2 from the J-43276-1.

6. Remove the J-43276-1 from the tool body.

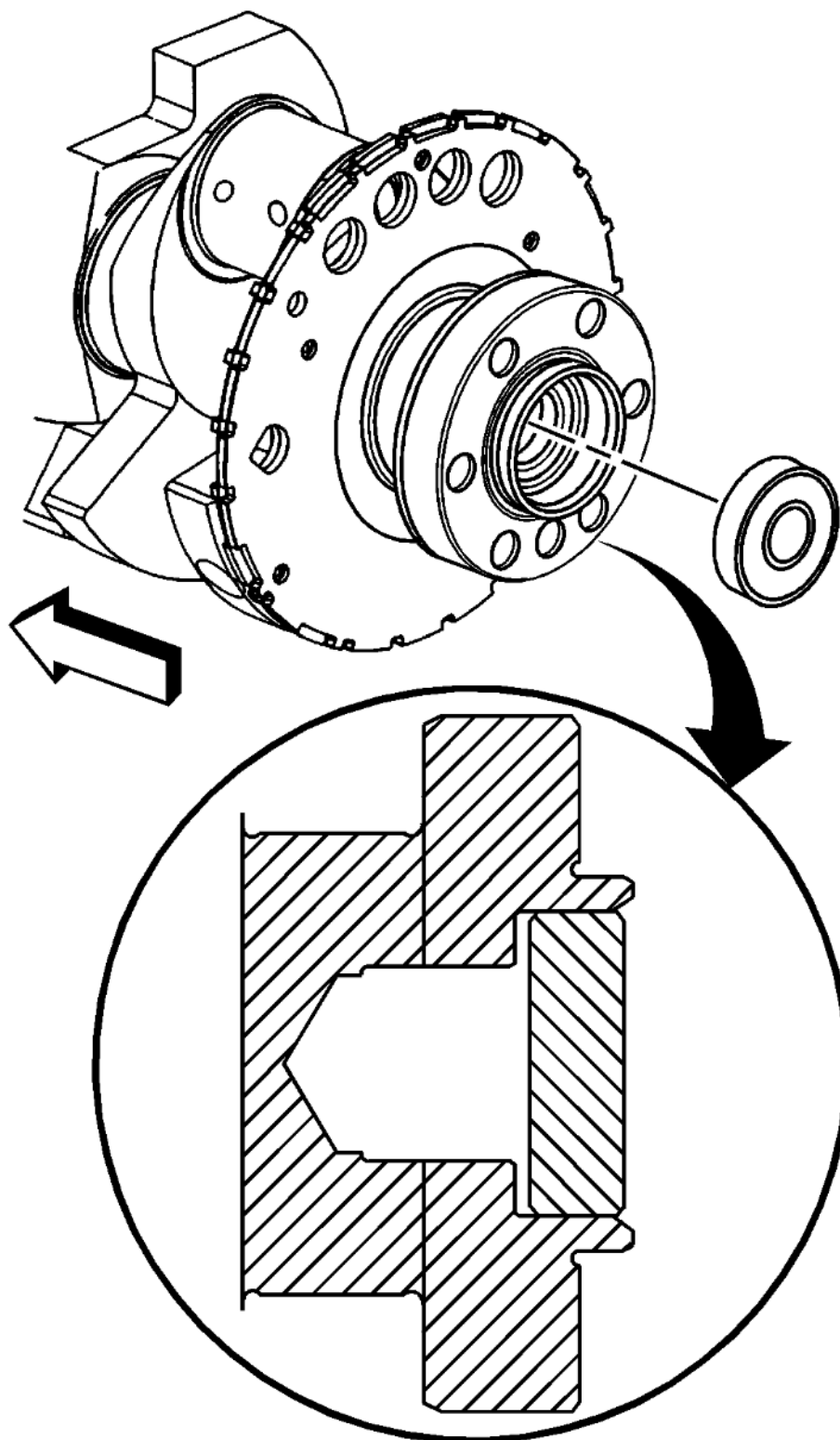


**Fig. 30: View Of Pilot Bearing (without RPO HP2)**

Courtesy of GENERAL MOTORS COMPANY

3. Discard the old clutch pilot bearing.

### Installation Procedure

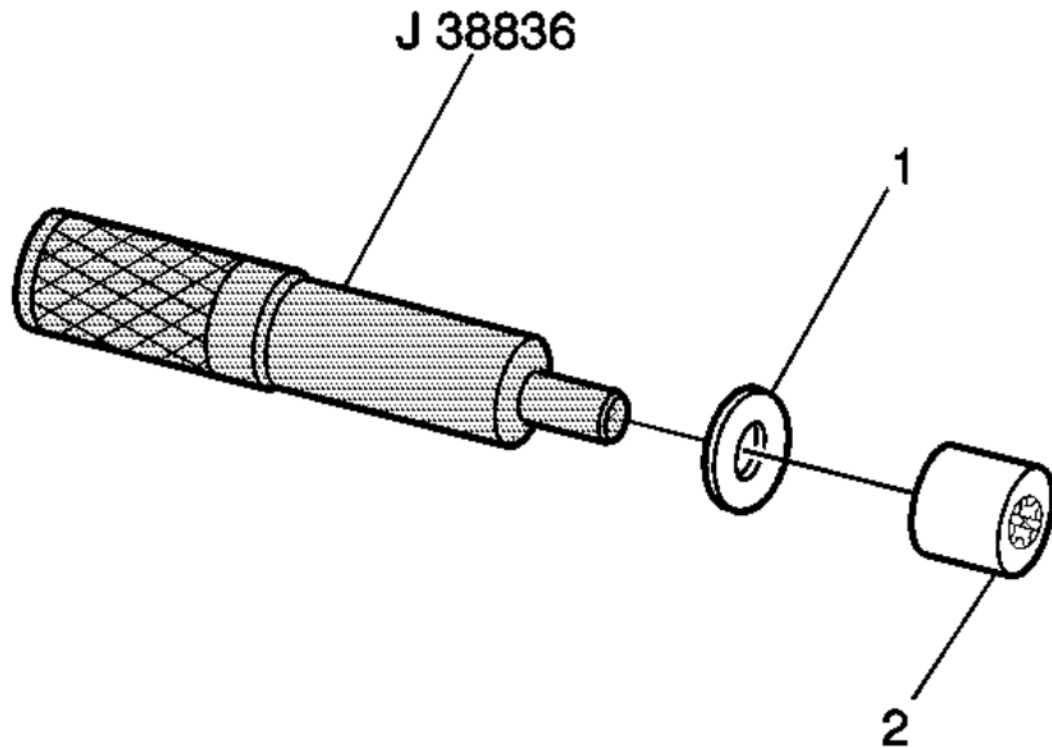


**Fig. 31: View Of J 38836, Washer & Pilot Bearing (without RPO HP2)**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The flywheel spacer (if applicable) must be removed prior to pilot bearing installation.

1. Install a 5/8 inch washer (1) onto the **J-38836** bushing installer/clutch arbor or equivalent.
2. Install a NEW clutch pilot bearing (2) onto the tool.

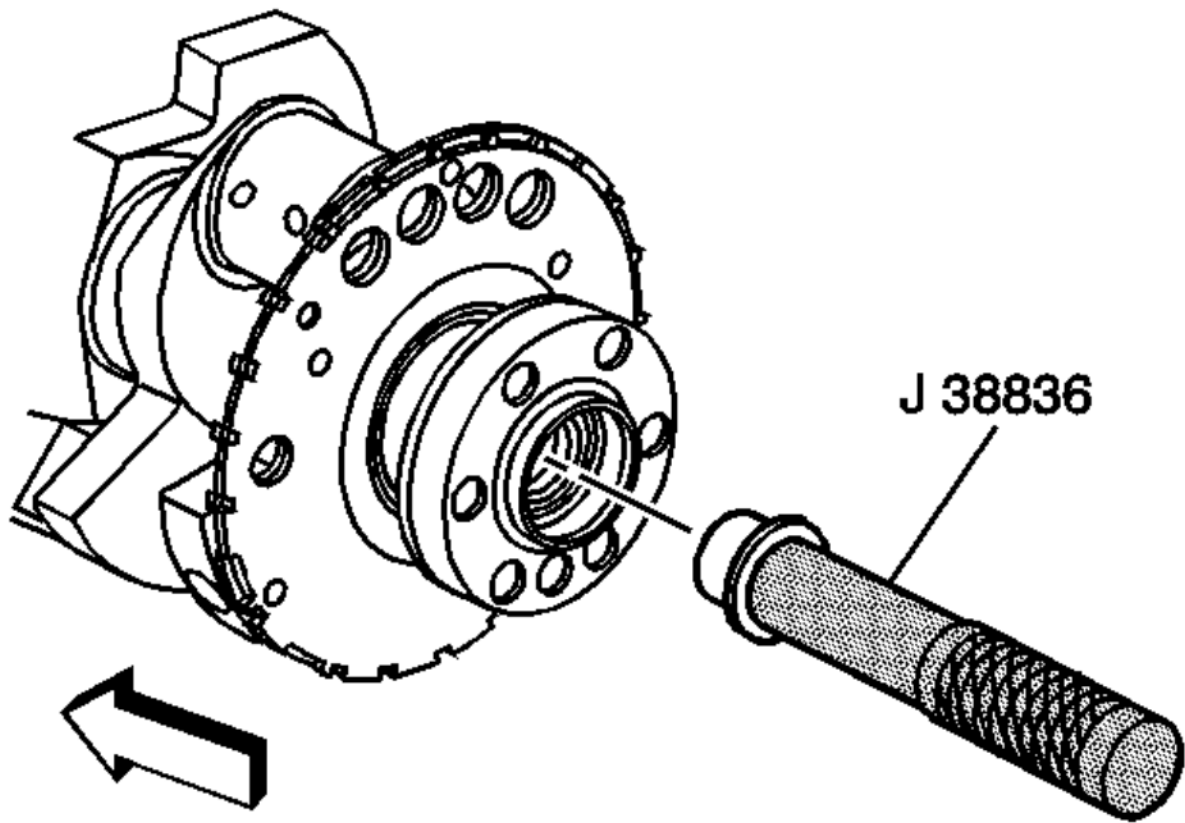


**Fig. 32: Installing Pilot Bearing (without RPO HP2)**

Courtesy of GENERAL MOTORS COMPANY

3. Install the NEW clutch pilot bearing into the crankshaft using **J-38836** bushing installer/clutch arbor.

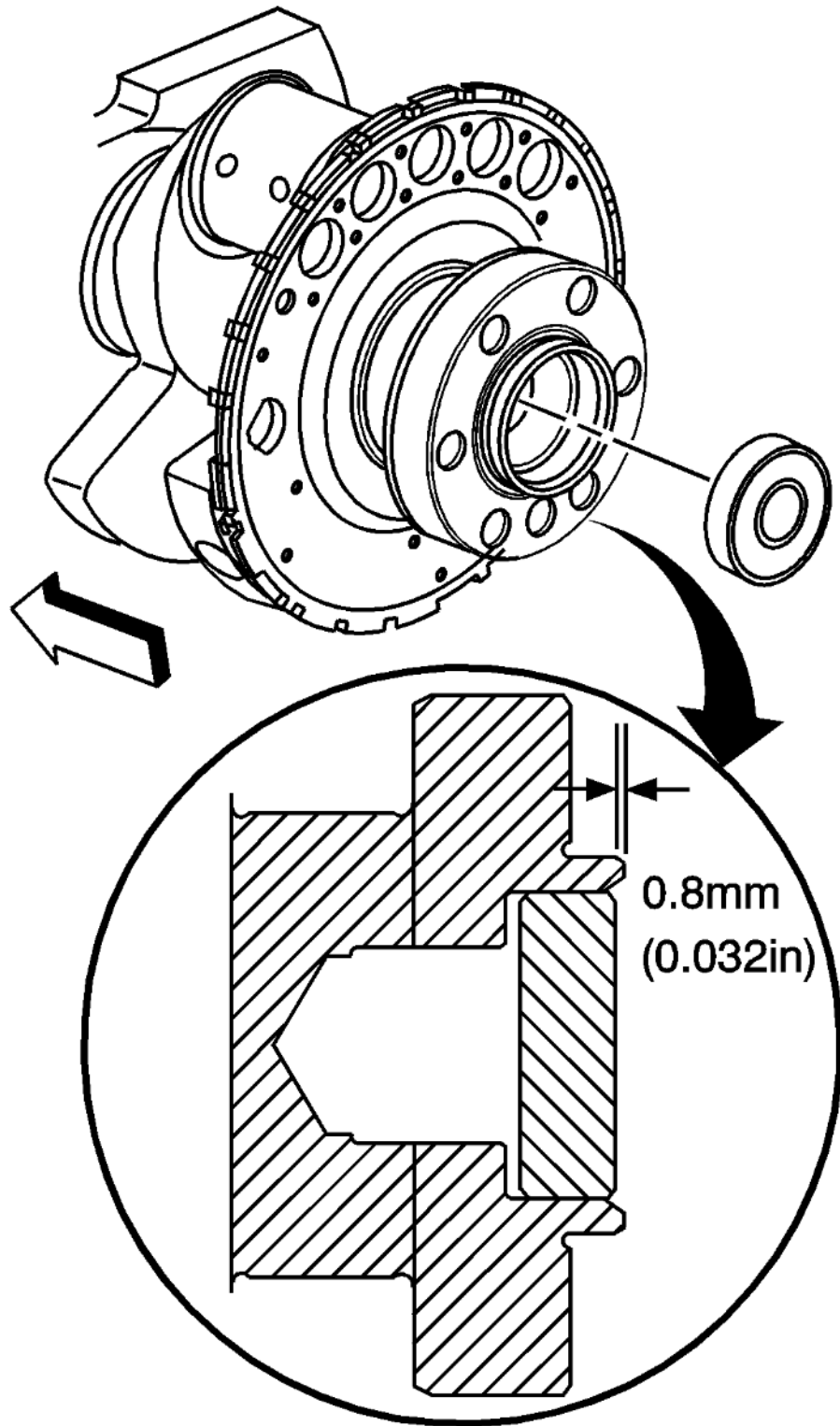


**Fig. 33: View Of Clutch Pilot Bearing Proper Installation Position (without RPO HP2)**  
Courtesy of GENERAL MOTORS COMPANY

4. Inspect the clutch pilot bearing for proper installation.
5. Install the clutch assembly. Refer to [Clutch Assembly Replacement](#).

## **CLUTCH ASSEMBLY REPLACEMENT**

## Special Tools

- GE-2619-01 Slide Hammer
- GE-23907 Slide Hammer with Bearing Adapter
- GE-23907-1 Slide Hammer
- GE-8433 Two Jaw Puller
- EN-45949 Pilot Bearing and Flywheel Locator Installer

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

## Removal Procedure

**NOTE:** GE-23907-1 slide hammer was part of the GE-23907 slide hammer with bearing adapter set. The adapter is still available as GE-23907 adapter.

1. Remove the clutch assembly. [Clutch Assembly Replacement](#)

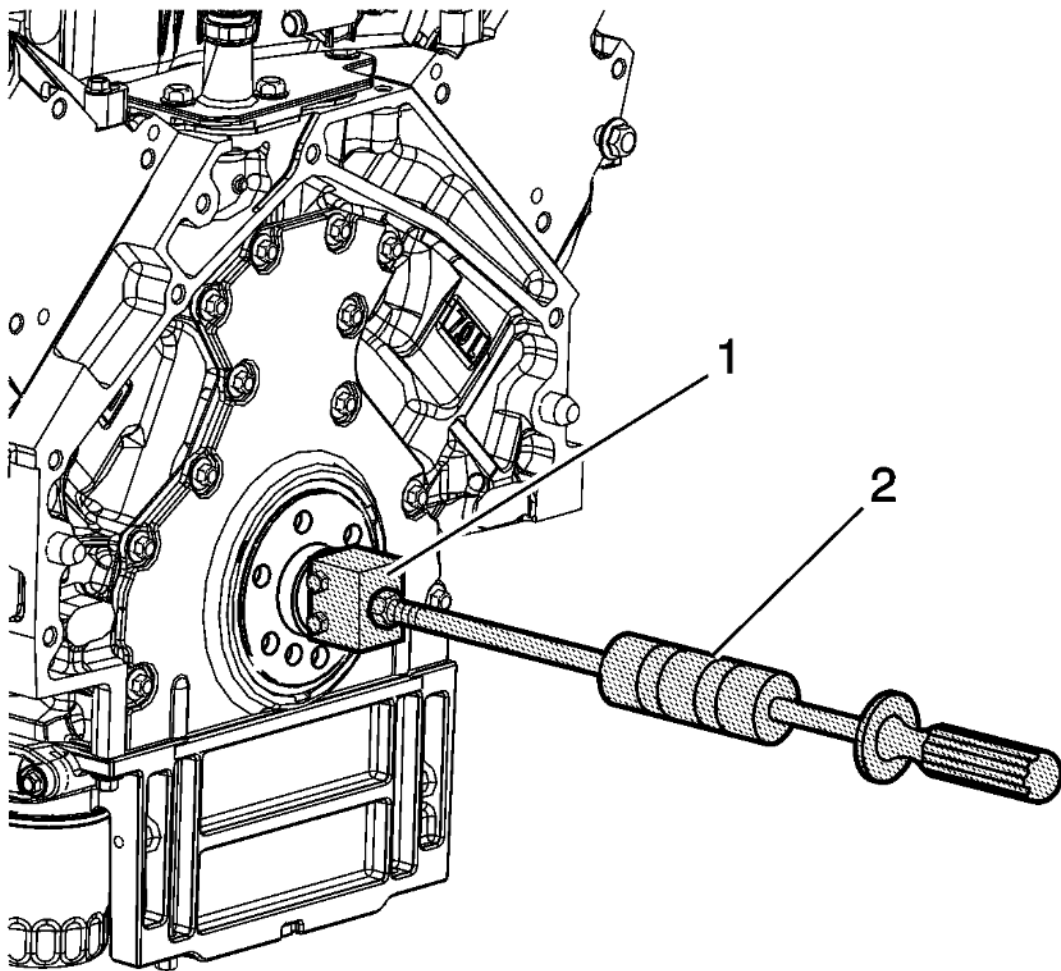


**Fig. 34: Clutch Pilot Bearing Slide Hammer & Adapter**  
Courtesy of GENERAL MOTORS COMPANY

2. Remove the clutch pilot bearing using the GE-23907 Adapter (1) and GE-23907-1 slide hammer (2).

3. Install the legs of the GE-23907 adapter (1) into the clutch pilot bearing.
4. Rotate the shaft of the tool until the legs of the tool are snug and contacting the inside diameter surface of the bearing.
5. Install the GE-23907 slide hammer (2) to the GE-23907 adapter (1).
6. Remove the bearing from the rear of the crankshaft.
7. Remove the special tools from the bearing.

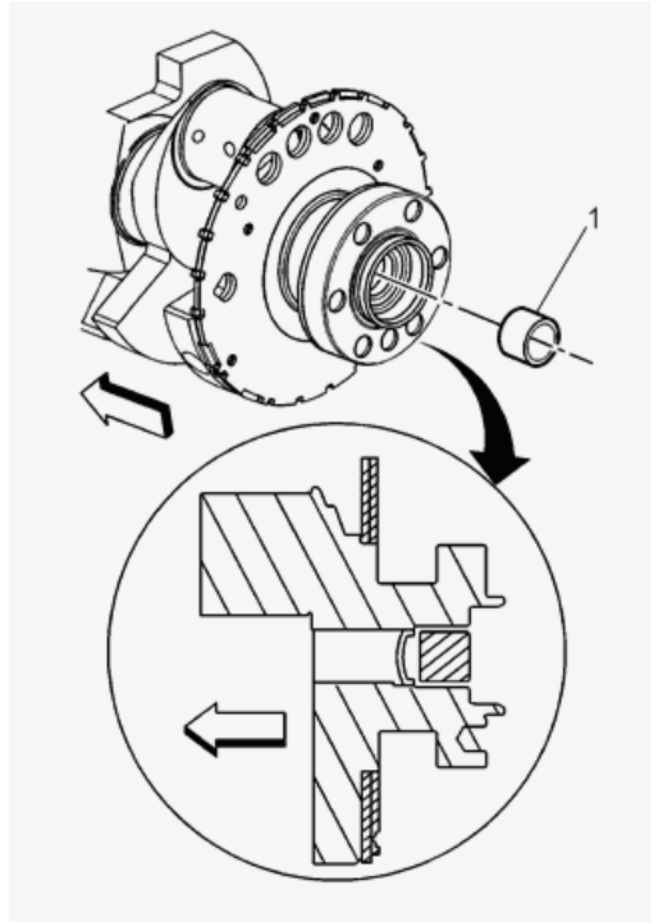


**Fig. 35: Clutch Pilot Bearing**

Courtesy of GENERAL MOTORS COMPANY

8. DISCARD the clutch pilot bearing (1).

#### **Installation Procedure**

1. Position the NEW bearing to the rear of the crankshaft.

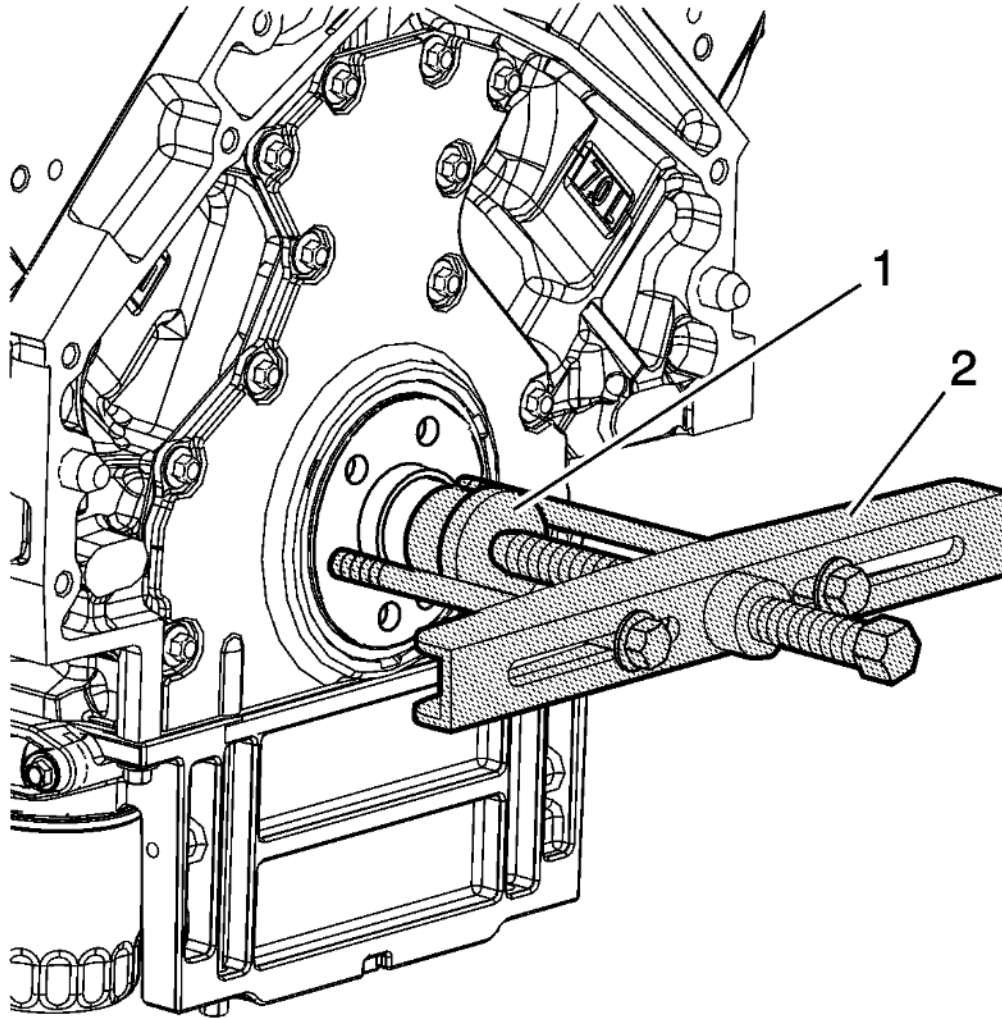


**Fig. 36: Identifying Special Tools**

**Courtesy of GENERAL MOTORS COMPANY**

2. Assemble the GE-8433 two jaw puller (2) to the EN-45949 pilot bearing and flywheel locator installer (1) and the bolts to the rear of the crankshaft.
3. Tighten the bolts until snug.
4. Rotate the bolt of the GE-8433 two jaw puller (2) until the bearing is seated in the bore of the crankshaft.
5. Remove the tools from the crankshaft.

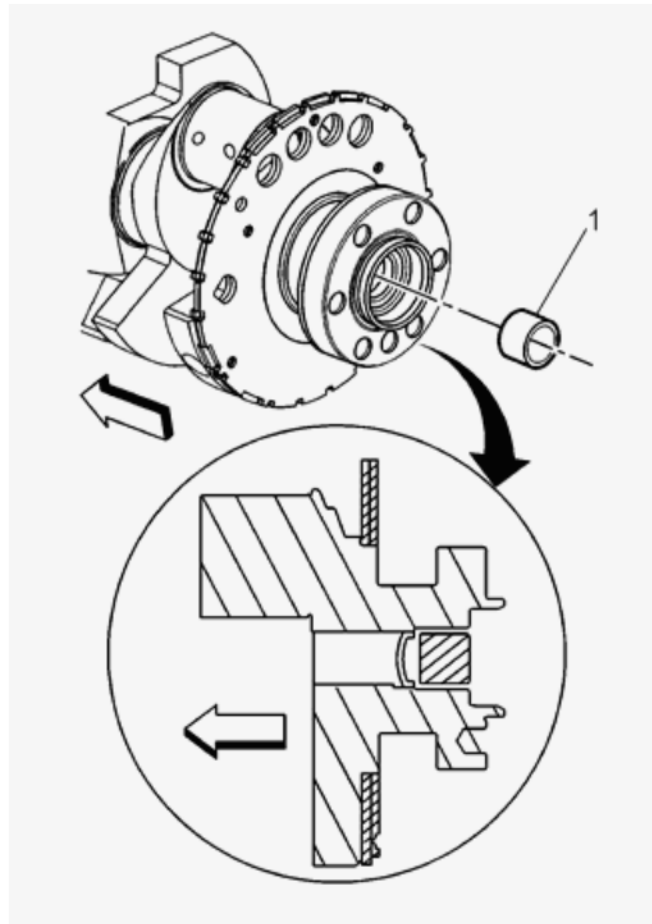


**Fig. 37: Clutch Pilot Bearing**

Courtesy of GENERAL MOTORS COMPANY

6. Inspect the clutch pilot bearing (1) for proper installation.
7. Install the clutch assembly. **Clutch Assembly Replacement**

## **RELEASE BEARING REPLACEMENT**

### **Removal Procedure**

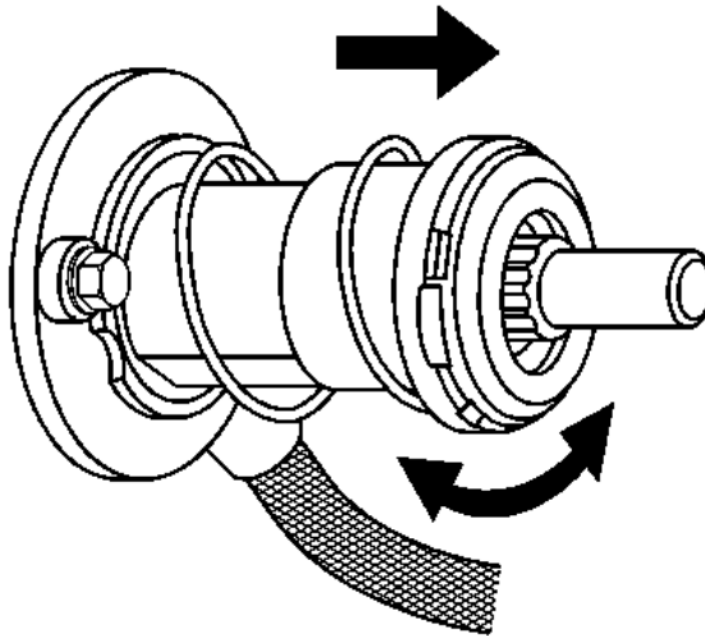


**Fig. 38: Clutch Release Bearing**

Courtesy of GENERAL MOTORS COMPANY

1. Remove the transmission. Refer to **TRANSMISSION REPLACEMENT**.
2. Remove the clutch release bearing.
  - Rotate the bearing in either direction.
  - The compression spring load will push the release bearing off the end of the clutch actuator bearing.

#### **Installation Procedure**

**NOTE:** DO NOT use cleaners or chemicals to clean the quill and DO NOT grease the quill.

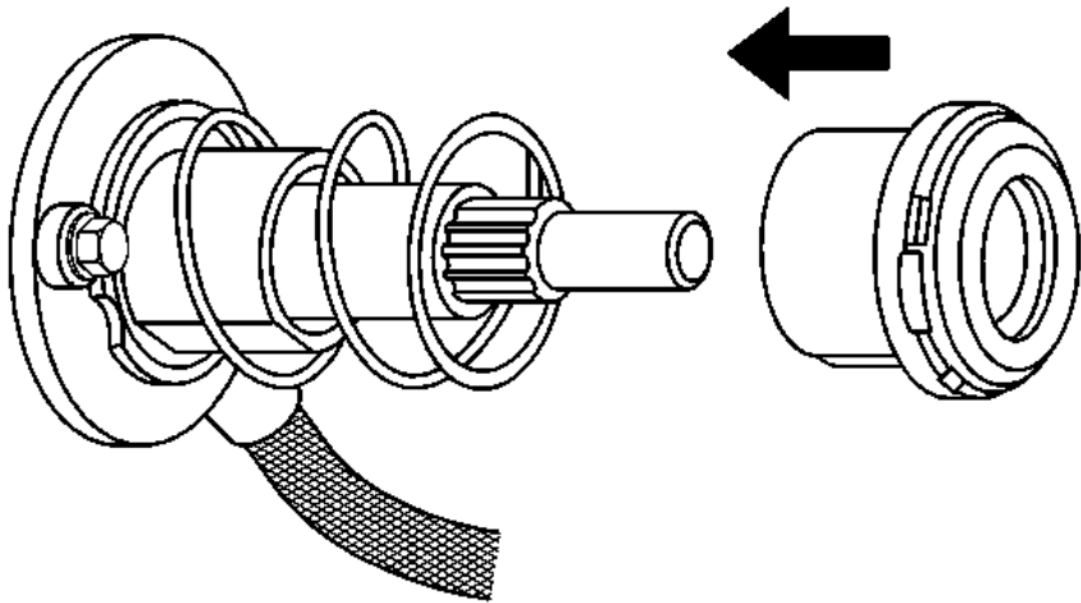


**Fig. 39: Clutch Release Bearing**

Courtesy of GENERAL MOTORS COMPANY

1. Using a clean dry cloth, clean the exposed area of the actuator cylinder quill.
2. Install the NEW clutch release bearing to the clutch actuator cylinder.
  - Firmly push the clutch release bearing into place.
  - The release bearing will snap over the retainer tab and will be self-retained to the actuator cylinder.
3. Install the transmission. Refer to [Transmission Replacement](#) .

## **CLUTCH ACTUATOR CYLINDER REPLACEMENT**

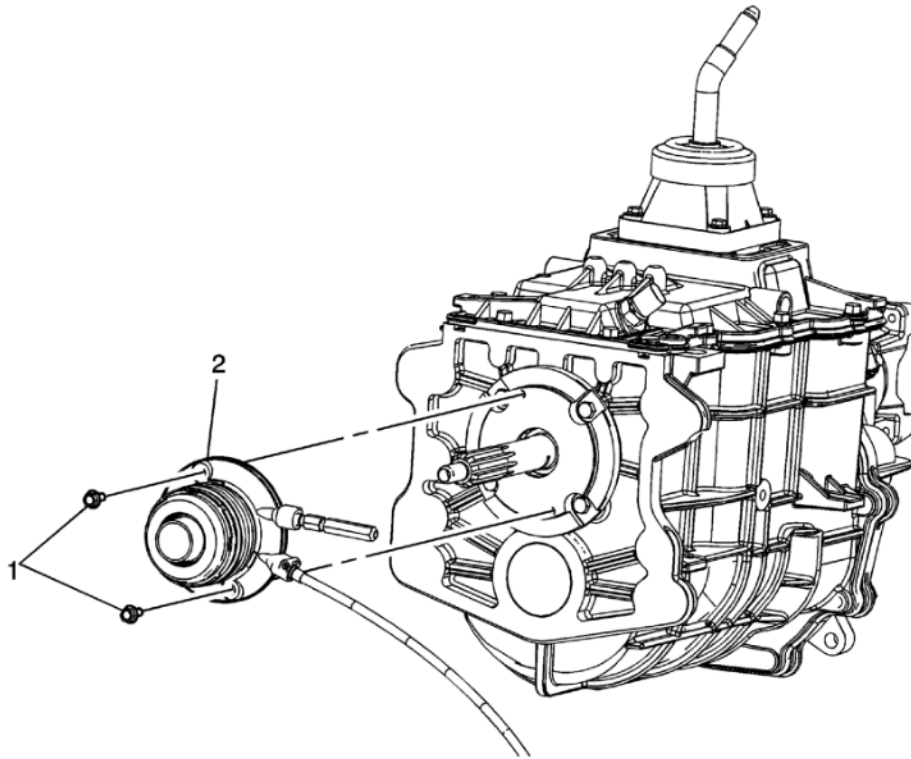


**Fig. 40: Clutch Actuator Cylinder (M96)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                      | Component Name                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b><br>Remove the transmission. Refer to <a href="#">Transmission Replacement</a> . |                                                                                                                                                                                  |
| 1                                                                                                            | Clutch Actuator Cylinder Bolt (Qty: 2)<br><br><b>CAUTION:</b><br><b>Refer to</b><br><a href="#">Fastener</a><br><a href="#">Caution</a> .<br><br><b>Tighten:</b><br>8 (71 lb in) |
| 2                                                                                                            | Clutch Actuator Cylinder                                                                                                                                                         |

## DESCRIPTION AND OPERATION

### CLUTCH SYSTEM DESCRIPTION AND OPERATION

This vehicle uses 2 different clutch hydraulic systems and 2 different clutch variations. The vehicles with the 5 speed transmission RPO TZO uses a different clutch hydraulic system than the vehicles with the 5 speed transmission RPO M96. For the proper diagnosis, because of the clutch variations, it is important to understand which clutch system is used.

#### 4.3L Clutch

The 4.3L clutch system is described as the following:

- Size - 280 mm (11 in)
- Clutch pressure plate - Diaphragm spring plate, non-self adjusting
- Clutch disc - Damper spring style
- Hydraulic system - 5 speed

## 6.0L Clutch

The 6.0L clutch system is described as the following:

- Size - 297 mm (11.70 in)
- Clutch pressure plate - Diaphragm spring plate, self adjusting
- Clutch disc - Damper spring style
- Hydraulic system - 5 speed

## 5 Speed Transmission Hydraulic Clutch System

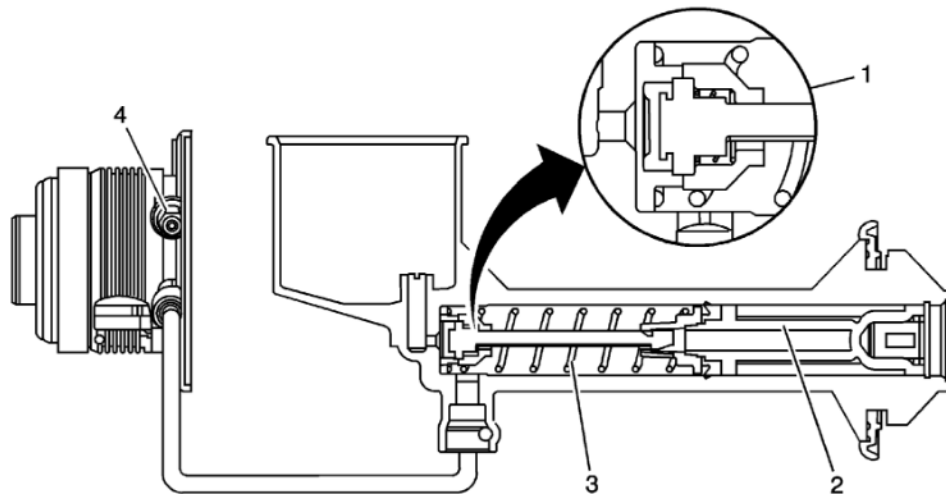


**Fig. 41: 5 Speed Transmission Hydraulic Clutch System**

Courtesy of GENERAL MOTORS COMPANY

The reservoir, which is part of the master cylinder, supplies the fluid at the front of the master cylinder through the center feed port (1). The center feed ports allow the flow of fluid from the reservoir to the cylinder when the pedal is in the complete returned position. The master cylinder uses a spring (3) to return the piston (2) to the clutch engagement position. A bleeder screw (4) is located at the clutch actuator cylinder for bleeding the hydraulic system.

## Clutch Pedal Reserve

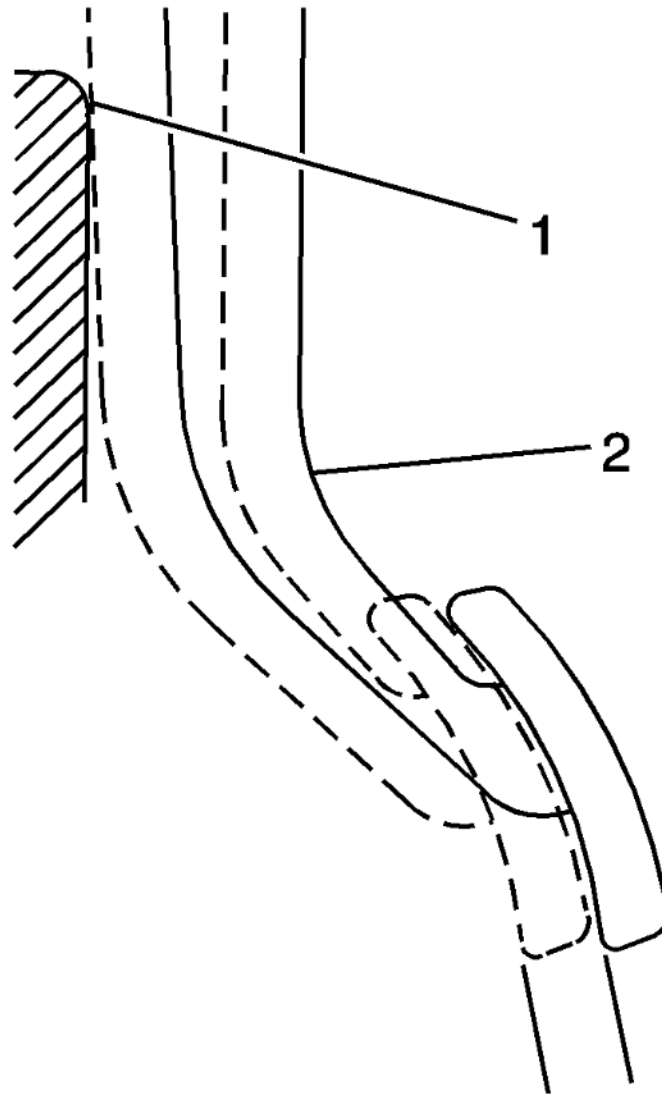


**Fig. 42: Clutch Pedal Reserve**

Courtesy of GENERAL MOTORS COMPANY

Clutch pedal reserve is necessary in order for the clutch to be completely disengaged and allow proper transmission shifting. Clutch pedal reserve is the movement of the pedal after the clutch has fully released. The distance from clutch full release (2) to pedal fully down (1) is the clutch reserve dimension, typically 25-38 mm (1.0-1.5 in).

In order to test to determine if the clutch is properly releasing, and the hydraulic system is functioning properly:

1. Depress the clutch pedal fully to disengage the clutch.
2. Shift into a low gear, either 1st or REVERSE.
3. Slowly shift out of the gear, only to disengage the synchronizer sleeve from the speed gear engagement teeth.
4. Let up on the pedal, to engage the clutch.
5. Depress the clutch pedal and shift back into gear.

If the clutch is releasing properly, you should be able to engage the gear without grinding after 4-5 seconds, which is the time for the clutch disc to quit spinning.

## Clutch System Components

### Non-Self-Adjusting Pressure Plate Assembly

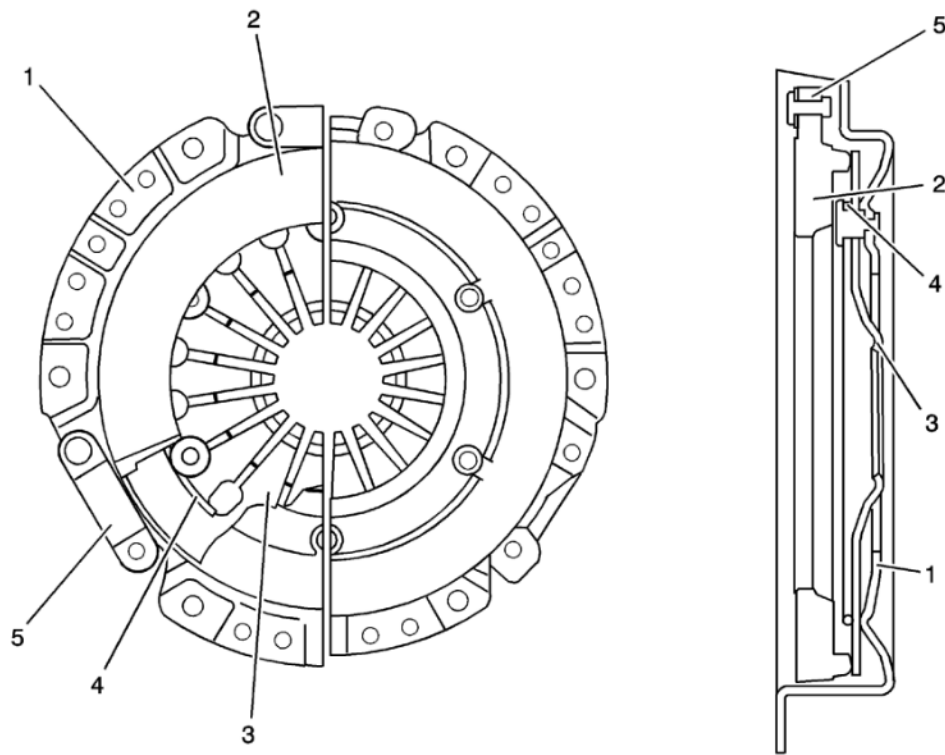


**Fig. 43: Non-Self-Adjusting Pressure Plate Assembly**

Courtesy of GENERAL MOTORS COMPANY

The non-self adjusting diaphragm spring clutch consists of a pressure plate (2), a diaphragm spring (3), a pivot ring (4), drive straps (5), and a cover (1). When the release bearing contacts the tips of the diaphragm spring fingers, it moves them toward the flywheel. The outside diameter of the diaphragm spring pivots on a pivot ring inside the cover. This action lifts the pressure plate off the flywheel through the drive straps, which connect the cover to the pressure plate. Non-self adjusting pressure plates have different symptoms. On non-self adjusting clutches, as the clutch wears, there is an increase in pedal effort. The piston or release bearing in the clutch actuator cylinder moves towards the transmission as the clutch wears. The piston is at the furthest position from the transmission with a new clutch.

### Self-Adjusting Pressure Plate Assembly

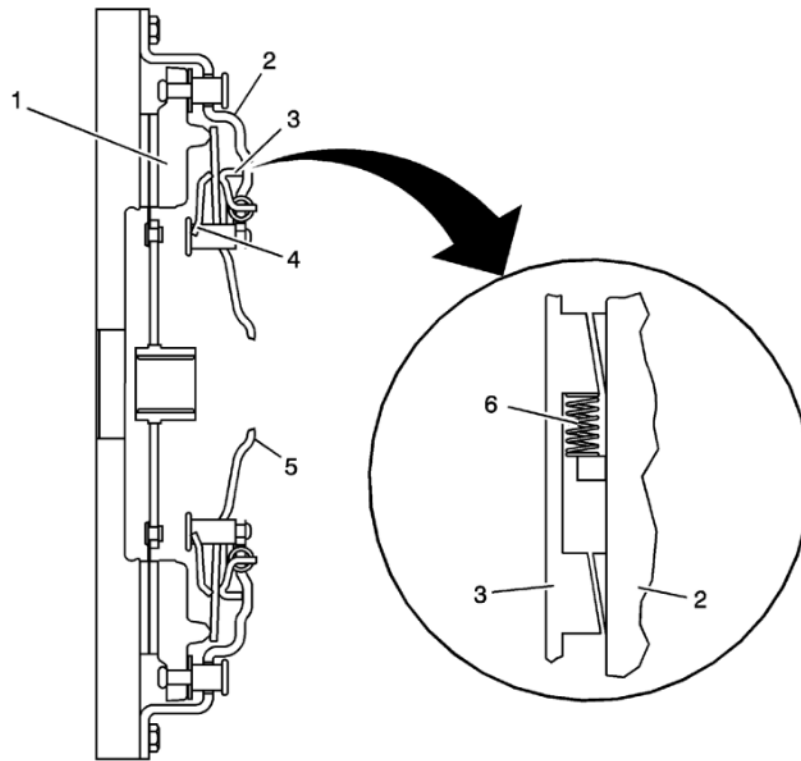


**Fig. 44: Self-Adjusting Pressure Plate Assembly**  
**Courtesy of GENERAL MOTORS COMPANY**

The self-adjusting diaphragm spring clutch consists of a pressure plate (1), a diaphragm spring (5), a ramp ring (3), sensor (4), coil spring (6), and a cover (2). In conventional clutch designs, pedal effort increases as the disc wears. The self-adjusting clutch was designed to keep pedal effort low and constant over the life of the clutch. As the disc friction material wears, the ramp ring (3) in the clutch adjusts for the wear. The main diaphragm spring (5) is not permanently riveted to the clutch cover, as with non-self-adjusting clutch assemblies, but is only retained axially against the cover by a defined or sensor (4) force. The clutch adjusts when the sensor (4) force cannot hold the diaphragm spring (5) against the cover (2) because of wear to the clutch disc. With the diaphragm spring (5) away from the cover, the spring loaded ramp ring (3) compensates for the gap. The adjustment lasts until the sensor (4) force can position the diaphragm spring to the original angle. When new, the clutch actuator piston or release bearing is closer to the transmission, on self-adjusting clutches. As the clutch wears, the clutch pressure plate levers move towards the engine. The clutch actuator piston moves further from the transmission. If a self-adjusting clutch does not self adjust, there will be low pedal effort and low clutch pedal reserve. If the clutch has backward adjusted after an incident of severe use, the pedal may seem hard. After a couple of applications, the clutch should adjust to the proper adjustment.

#### **Clutch Disc**

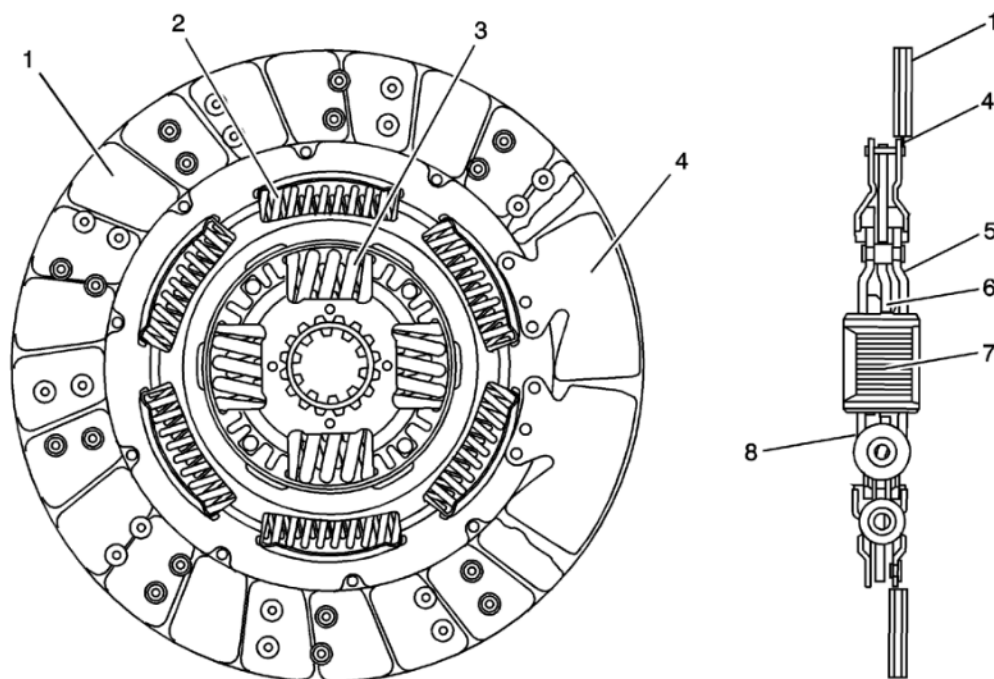


**Fig. 45: Clutch Disc**

Courtesy of **GENERAL MOTORS COMPANY**

The disc is a critical component in service life of the clutch system. It provides smooth engagement and dampens engine vibrations. Mounted to the input shaft between the flywheel and the clutch, it can slide forward and backward on the input shaft, but cannot rotate without rotating the input shaft. Critical component parts include the hub-flange (6) and the torsion springs (2 and 3). The hub-flange (6) is located between a cover plate (5) and a retainer plate (8); it is splined (7) to fit the input shaft. Torsion springs (2 and 3) reduce vibrations passed to the transmission through the input shaft and eliminate gear rattle. Friction material (1) is riveted to numerous metal components called marcells, or cushion segments (4). Waves in marcells soften engagement.

#### Clutch Pedal

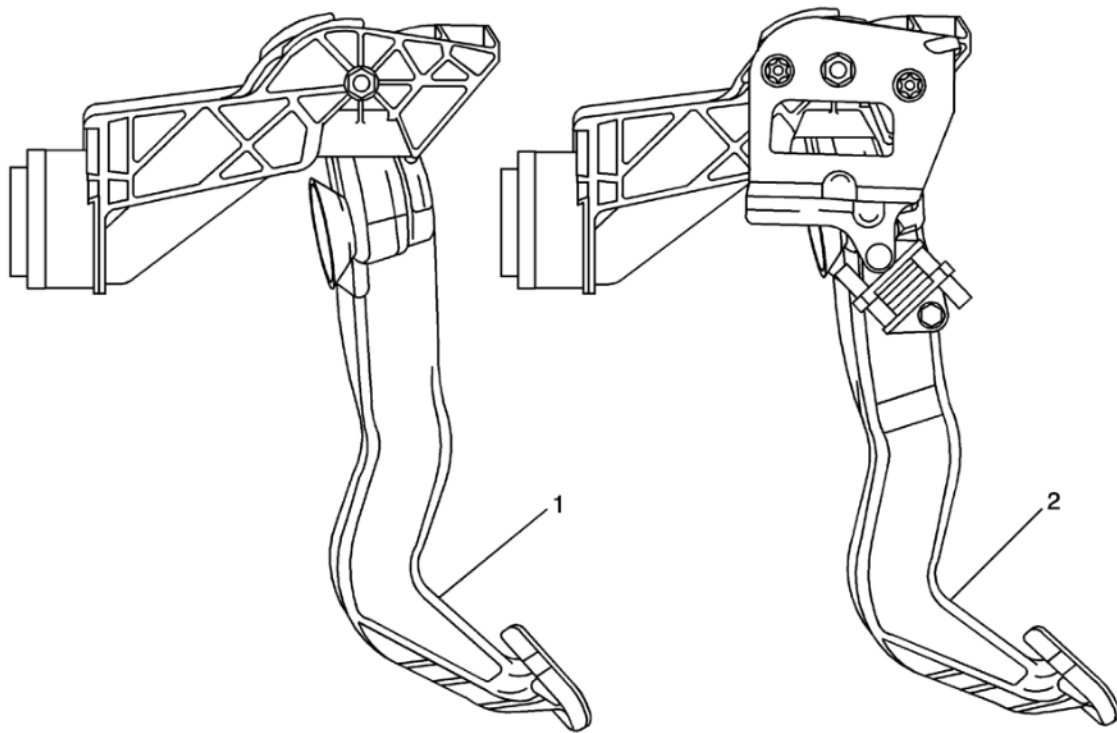


**Fig. 46: Clutch Pedal**

**Courtesy of GENERAL MOTORS COMPANY**

The clutch pedal, mounted on the engine cowl, is designed to compress the clutch hydraulic fluid with little driver effort. The pedal swivels on bushings. There are 2 different clutch pedal configurations. With the 5 speed transmission clutch pedal (1), the clutch master cylinder pushrod latches into a socket on the pedal. A spring, located inside of the clutch master cylinder, keeps the pushrod in the pedal socket and returns the pedal to the correct position after depressing.

**Flywheel**

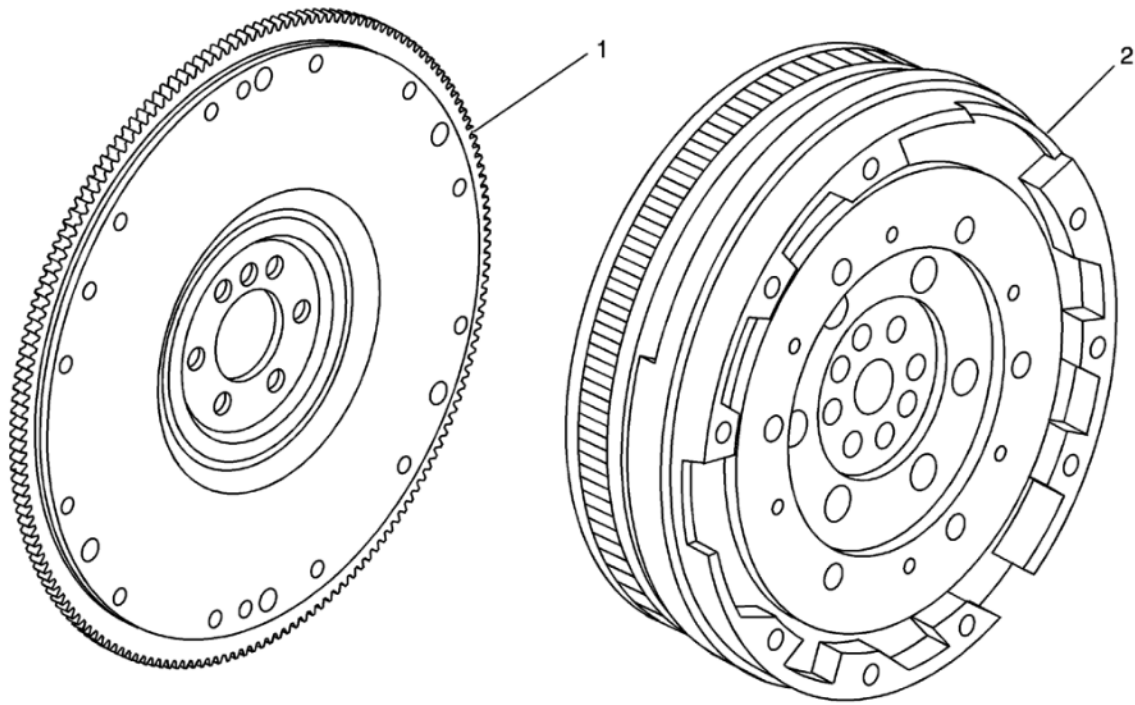


**Fig. 47: Flywheel**

Courtesy of **GENERAL MOTORS COMPANY**

Bolted to the end of the crankshaft, the flywheel (1) provides the mounting surface for the clutch. During engagement, the disc is clamped against the flywheel by the pressure plate. The flywheel acts as a heat sink, dissipating heat and moving it away from the clutch pressure plate and disc friction material. The flywheel must provide a smooth, flat surface in order for the clutch to operate properly.

#### **Pilot Bearing/Bushing**

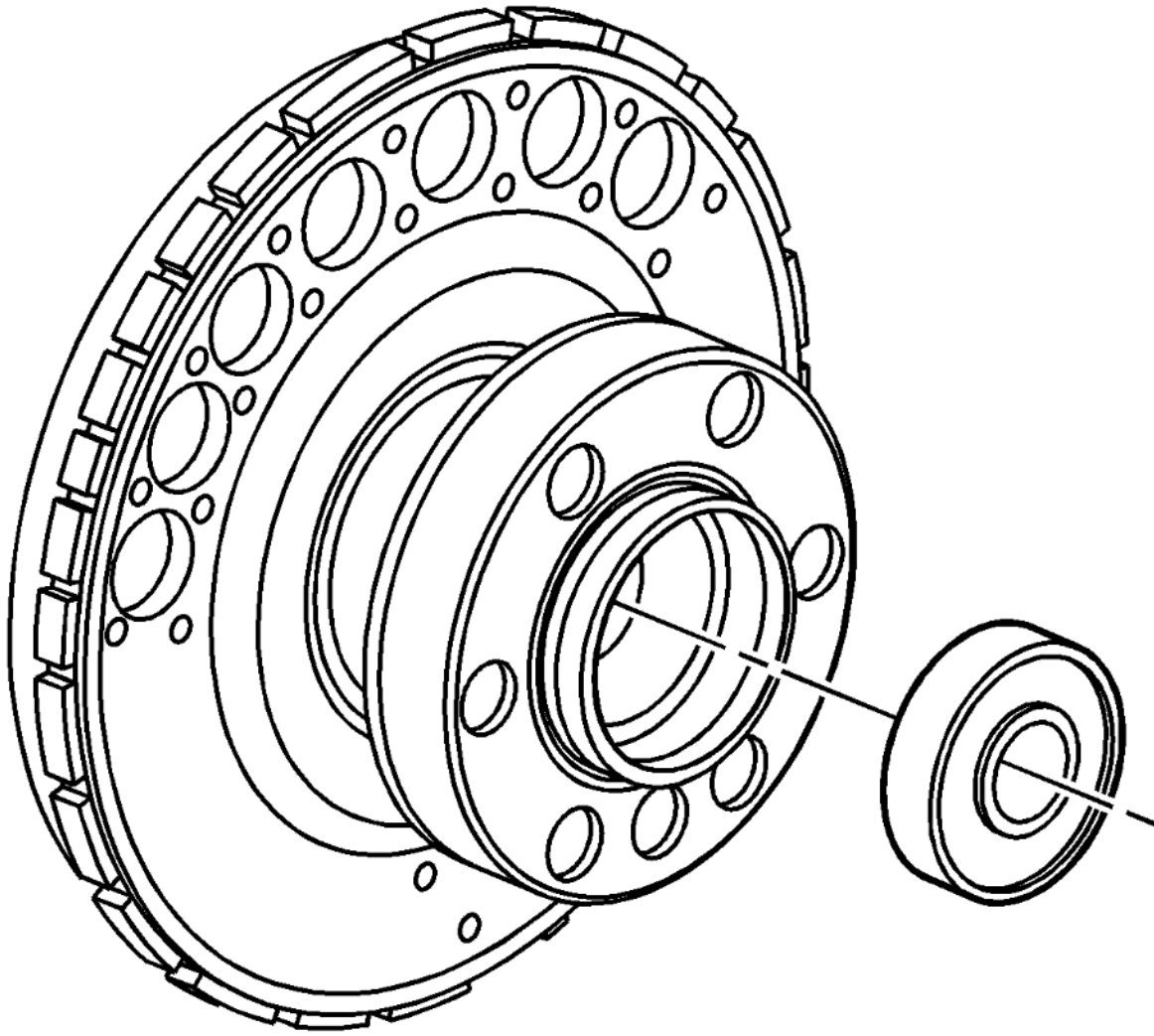


**Fig. 48: Pilot Bearing/Bushing**

Courtesy of GENERAL MOTORS COMPANY

A pilot bearing or bushing is located in the end of the crankshaft. The pilot bearing supports the end of the input shaft and centers the disc on the flywheel. A small and relatively inexpensive component, the pilot bearing or bushing should always be replaced during clutch installation. The variety of conditions caused by a worn or defective bearing or bushing is not worth the risk of having to remove the bell housing and transmission to replace this small part.

**Clutch Actuator Cylinder**

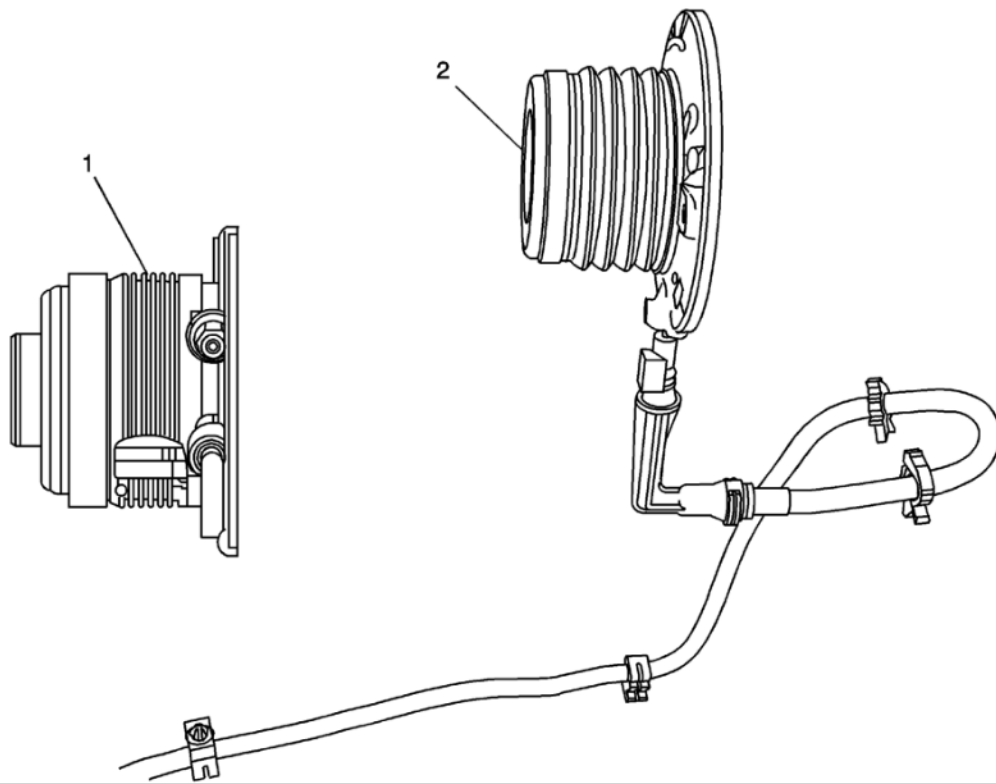


**Fig. 49: Clutch Actuator Cylinder**

Courtesy of GENERAL MOTORS COMPANY

The clutch actuator cylinder is fastened to the front of the transmission. The actuator cylinder moves the clutch release bearing from the pressurized hydraulic fluid. The actuator cylinder has a piston, which has seals that slide in the housing assembly. There is a spring between the piston and housing to keep the piston at the extended position, so that release bearing is in constant contact with the pressure plate fingers. With the 5 speed system (1), the clutch actuator has a bleeder for bleeding air out of the hydraulic system. The release bearing is replaceable on the 5 speed system.

### Release Bearing

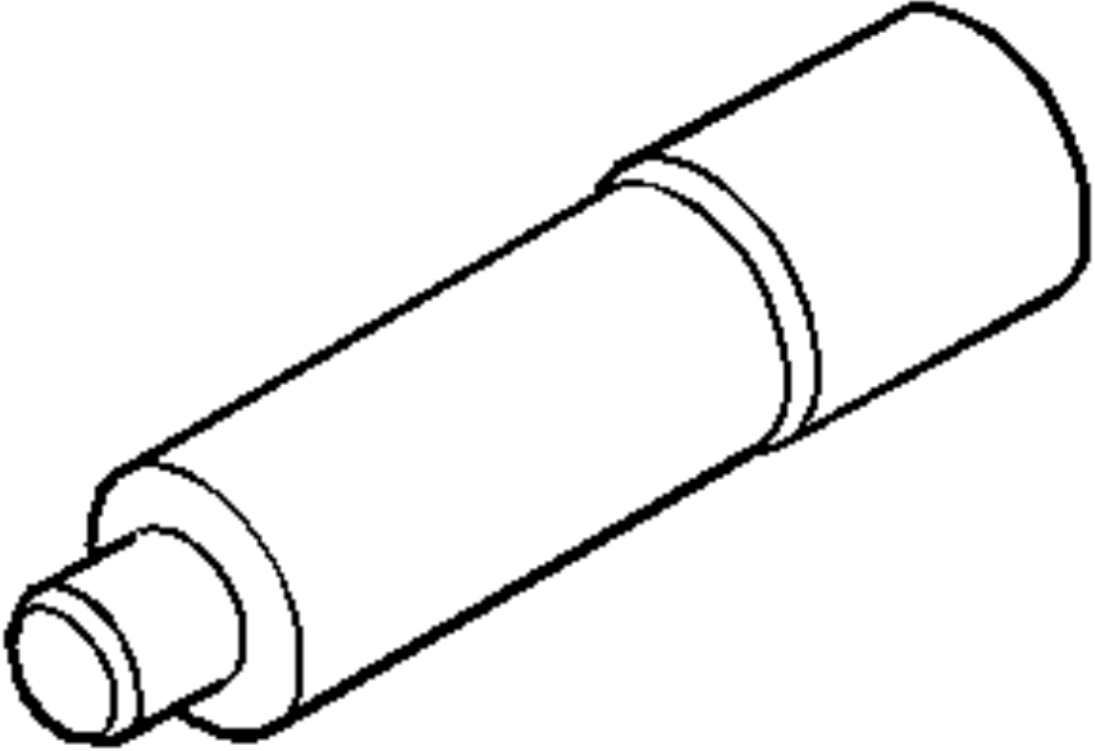
The release bearing is attached to the clutch actuator cylinder, which is attached to the front of the transmission. Movement of the clutch actuator cylinder piston moves the release bearing, to press against the tips of the diaphragm spring fingers. Ball bearings, in the release bearing, enable it to turn while applying pressure to the fingers. The release bearing is held in constant contact with the diaphragm spring fingers to prevent slippage and wear. This load is supplied by the clutch actuator spring.

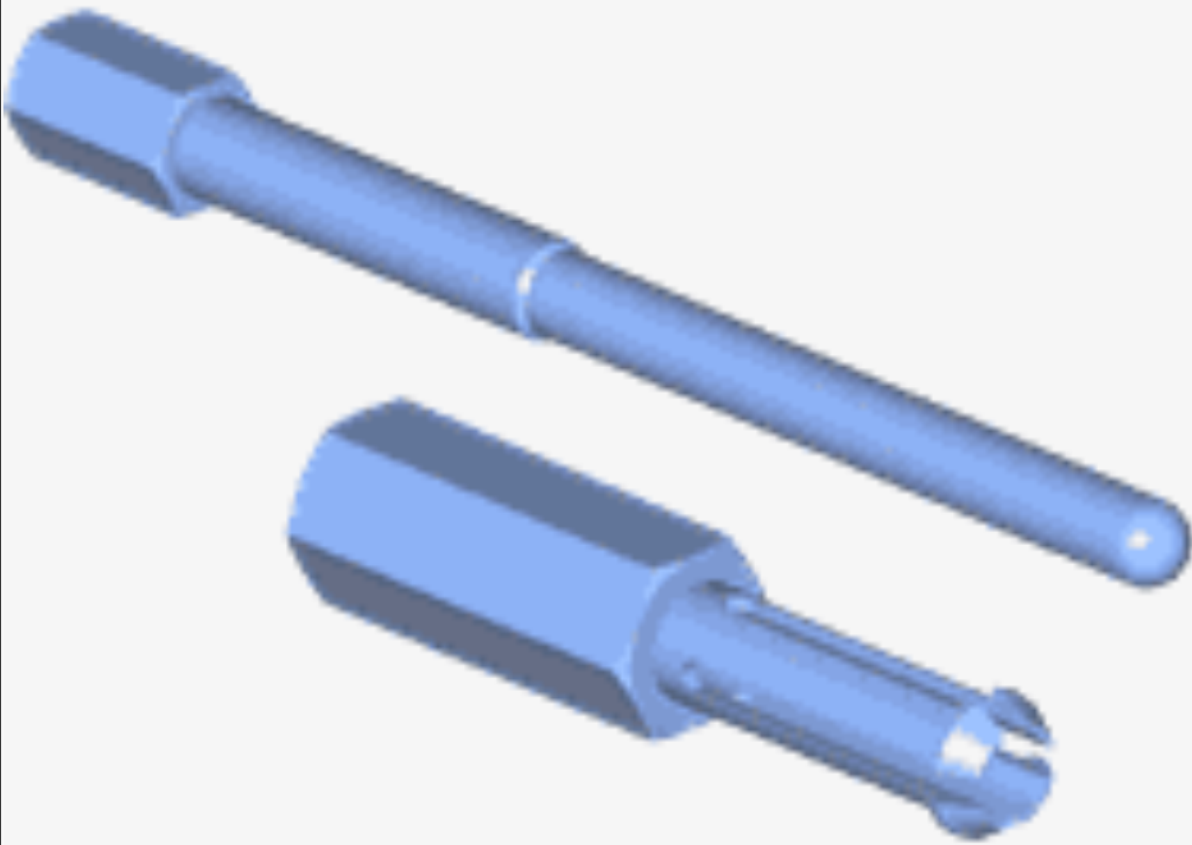
## SPECIAL TOOLS AND EQUIPMENT

### SPECIAL TOOLS

| Illustration | Tool Number/<br>Description |
|--------------|-----------------------------|
|--------------|-----------------------------|

| Illustration                                                                       | Tool<br>Number/<br>Description          |
|------------------------------------------------------------------------------------|-----------------------------------------|
|  | J-5824-A<br>Clutch<br>Alignment<br>Tool |

| Illustration                                                                        | Tool<br>Number/<br>Description                                     |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|  | <p>J-38836<br/>Bushings<br/>Installer<br/>and Clutch<br/>Arbor</p> |

| Illustration                                                                       | Tool Number/<br>Description                   |
|------------------------------------------------------------------------------------|-----------------------------------------------|
|  | J-43276<br>Clutch Pilot<br>Bearing<br>Remover |

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