

# 2004 TRANSMISSION

## Clutch - Vue

### SPECIFICATIONS

#### FASTENER TIGHTENING SPECIFICATIONS

##### Fastener Tightening Specifications

Application	Specification	
	Metric	English
Battery Cooling Box Cover Screws	2 N.m	18 lb in
Battery Hold Down Screw	15 N.m	11 lb ft
Battery Terminal Bolts	17 N.m	13 lb ft
Battery Tray Bracket Screws	16 N.m	12 lb ft
Bleed Screw	7 N.m	62 lb in
Clutch Actuator Cylinder Bolts	10 N.m	89 lb in
Clutch Pedal Assembly Bolt	10 N.m	89 lb in
Clutch Pedal Assembly Nuts	23 N.m	17 lb ft
Electronic Brake Traction Control Module (EBTCM) Bracket-to-Frame Rail	15 N.m	11 lb ft
Flywheel-to-Crankshaft Bolts	53 N.m + 25°	39 lb ft + 25°
Pressure Plate-to-Flywheel Bolts	24 N.m	17 lb ft
Transaxle Mount-to-Frame Rail Bolt	37 N.m	27 lb ft

### DIAGNOSTIC INFORMATION AND PROCEDURES

#### DIAGNOSTIC STARTING POINT - CLUTCH

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

#### SYMPTOMS - CLUTCH

##### Strategy Based Diagnostics

Review the 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 reservoir 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 parts 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

### 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. Review the <b>Symptoms - Clutch</b> and perform the necessary inspections.	
Pedal blocked from full travel	<ol style="list-style-type: none"> <li>1. Inspect for obstacles that will prevent the pedal from going to the floor.</li> <li>2. Clear any obstacles from under the pedal area, such as floor mats 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 <b>Clutch</b></li> </ol>

	<b><u>Pedal Replacement .</u></b>
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 <b><u>Clutch Pedal Replacement .</u></b></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 <b><u>Clutch Pedal Replacement .</u></b></li> </ol>
Clutch master cylinder seized or binding	<ol style="list-style-type: none"> <li>1. Inspect the master cylinder for the piston being able to move freely and full range of travel.</li> <li>2. Repair or replace the clutch master cylinder as required. Refer to <b><u>Clutch Master Cylinder Replacement .</u></b></li> </ol>
Air in the clutch hydraulic system	Bleed the clutch hydraulic system. Refer to <b><u>Hydraulic Clutch Bleeding .</u></b>
Clutch actuator cylinder seized or binding	<ol style="list-style-type: none"> <li>1. Inspect the clutch actuator piston for moving freely.</li> <li>2. Replace the clutch actuator cylinder if the piston is binding. Refer to <b><u>Clutch Actuator Cylinder Replacement .</u></b></li> </ol>
Clutch master cylinder leaking internally	<ol style="list-style-type: none"> <li>1. Inspect for proper pedal reserve. <ol style="list-style-type: none"> <li>1. Let up halfway on pedal.</li> <li>2. Apply the pedal a few times.</li> <li>3. Inspect to ensure there is still the proper pedal reserve.</li> </ol> </li> <li>2. Replace the clutch master cylinder if it will not hold pedal reserve. Refer to <b><u>Clutch Master Cylinder Replacement .</u></b></li> </ol>
Damaged clutch assembly components	<ol style="list-style-type: none"> <li>1. Remove the clutch assembly.</li> <li>2. Inspect the following clutch assembly components for damage: <ul style="list-style-type: none"> <li>• Damaged clutch disc hub splines</li> <li>• Bent clutch disc</li> <li>• Bent drive straps</li> <li>• Broken or warped pressure plate</li> </ul> </li> <li>3. Replace the clutch assembly if any of the above damage is found. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate .</u></b></li> </ol>
Excessive side loading on the clutch actuator cylinder	<ol style="list-style-type: none"> <li>1. Inspect the following clutch system components: <ul style="list-style-type: none"> <li>• Excessive flywheel runout</li> <li>• Excessive engine to transmission misalignment</li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>• Clutch actuator cylinder to transaxle misalignment</li> </ul> <ol style="list-style-type: none"> <li>2. Repair or replace any faulty components.</li> </ol>
Transaxle input shaft splines worn or damaged	Replace the transmission input shaft. Refer to Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.
Tight or contaminated clutch disc splines	<ol style="list-style-type: none"> <li>1. Clean the clutch disc and input shaft splines.</li> <li>2. If the clutch disc will not clean, replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</li> </ol>
Flywheel housing, engine block to clutch housing, or transaxle front case excessively misaligned	<ol style="list-style-type: none"> <li>1. Inspect the clutch housing or the transmission front case for being faulty.</li> <li>2. Replace the clutch housing if it is faulty. Refer to <b><u>Transmission Replacement</u></b> in Manual Transmission - Getrag 5 Speed.</li> <li>3. Replace the transmission front case half. Refer to Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.</li> </ol>
Grease or oil contamination on the clutch discs facing	<ol style="list-style-type: none"> <li>1. Repair the oil leak.</li> <li>2. Repair the grease leak.</li> <li>3. Clean the clutch disc facing and the other clutch assembly components.</li> <li>4. Replace the clutch assembly if it will not clean. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</li> </ol>

## CLUTCH SLIPPING

### 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 <b><u>Symptoms - Clutch</u></b> and perform the necessary inspections.</p>	
Incorrect clutch pedal height, not allowing the clutch master cylinder to return	Adjust the clutch start switch. Refer to <b><u>Clutch Pedal Position Switch Replacement</u></b> .
The clutch pedal return spring is broken or missing	Replace the clutch pedal return spring, if equipped. Refer to <b><u>Clutch Pedal Replacement</u></b> .
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 <b><u>Clutch Pedal Replacement</u></b> .</li> </ol>

Clutch master cylinder binding or seized	Replace the clutch master cylinder. Refer to <b><u>Clutch Master Cylinder Replacement</u></b> .
Clutch actuator cylinder binding or seized	Replace the clutch actuator cylinder. Refer to <b><u>Clutch Actuator Cylinder Replacement</u></b> .
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 <b><u>Engine Mount Replacement</u></b> in Engine Mechanical - 2.2L.</li> <li>5. Repair or replace the clutch hydraulic hose if it is damaged. Refer to <b><u>Hydraulic Clutch Hose/Pipe Replacement</u></b> .</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 contaminates cannot be removed, replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</li> </ol>
Worn or damaged flywheel	Replace the engine flywheel. Refer to <b><u>Engine Flywheel Replacement</u></b> in Engine Mechanical - 2.2L.
Worn clutch disc facing	Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
Burnt or glazed clutch discs	Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
Input shaft splines worn	Replace the input shaft. Refer to Refer to Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.
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 <b><u>Engine Flywheel Replacement</u></b> in Engine Mechanical - 2.2L.

## CLUTCH GRABBING

### 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 <b><u>Symptoms - Clutch</u></b> 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 <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</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 <b><u>Engine Mount Inspection</u></b> in Engine Mechanical - 2.2L.</li> <li>2. Repair or replace the engine mounts as required. Refer to <b><u>Engine Mount Replacement</u></b> in Engine Mechanical - 2.2L.</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 <b><u>Clutch Pedal Replacement</u></b> .</li> </ol>
Clutch actuator binding	<ol style="list-style-type: none"> <li>1. Inspect the clutch actuator for the piston seals binding or sticking on the hub.</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>
Warped Clutch Cover	<ol style="list-style-type: none"> <li>1. Inspect the clutch cover for distortion caused by improperly tightening the clutch cover bolts.</li> <li>2. Replace the clutch cover if it is distorted. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</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 Drive Plate and Clutch Driven Plate</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 and lubricate 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 Drive Plate and Clutch Driven Plate</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 Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.</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.</li> </ol>

	Inform the customer. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
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> <li>2. Replace the flywheel if it has been machined. Refer to <b><u>Engine Flywheel Replacement</u></b> in Engine Mechanical - 2.2L.</li> </ol>
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 <b><u>Engine Flywheel Replacement</u></b> in Engine Mechanical - 2.2L.</li> </ol>

## CLUTCH RATTLE

### Clutch Rattle

Cause	Action
DEFINITION: A rattle noise coming from the clutch components with the clutch disengaged or engaged. Review the <b><u>Symptoms - Clutch</u></b> and perform the necessary inspections.	
Idle rattle clutch engaged	Replace the clutch disc, due to faulty damper springs. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
Clutch is improperly installed	Remove the clutch and install it correctly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
Clutch disc damper worn or damaged	<ol style="list-style-type: none"> <li>1. Inspect the clutch disc for a broken or worn damper.</li> <li>2. Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</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 <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .</li> <li>3. Replace the input shaft. Refer to Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.</li> </ol>

## CLUTCH NOISY

### Clutch Noisy

Cause	Action
DEFINITION: A growl or whine noise is coming from the clutch when engaged or disengaged. Review the <b><u>Symptoms - Clutch</u></b> and perform the necessary inspections.	
Clutch actuator cylinder damaged or worn	Replace the release bearing. Refer to <b><u>Clutch Actuator Cylinder Replacement</u></b> .

## CLUTCH PEDAL SPONGY LOW PEDAL EFFORT

### Clutch Pedal Spongy Low Pedal Effort

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Cause	Action
<p>DEFINITION: The clutch pedal may feel spongy, or it requires very little effort to operate. Review <b>Symptoms - Clutch</b> and perform the necessary inspections.</p>	
Air in the hydraulic system	Bleed the clutch hydraulic system. Refer to <b>Hydraulic Clutch Bleeding</b> .
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 <b>Clutch Pedal Replacement</b> .</li> <li>4. Adjust the clutch start switch. Refer to <b>Clutch Pedal Position Switch Replacement</b> .</li> </ol>
Clutch incorrectly installed	Remove the clutch and install it correctly. Refer to <b>Clutch Drive Plate and Clutch Driven Plate</b> .
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 <b>Clutch Drive Plate and Clutch Driven Plate</b> .</li> </ol>
Clutch actuator cylinder worn or damaged	Replace the release bearing. Refer to <b>Clutch Actuator Cylinder Replacement</b> .
Contaminated hydraulic fluid	<ol style="list-style-type: none"> <li>1. Inspect the clutch hydraulic fluid for contamination of water.</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. Inspect the clutch hydraulic fluid for contamination of mineral oil. If contaminated, replace the clutch master cylinder and the clutch actuator cylinder. Refer to <b>Clutch Master Cylinder Replacement</b> and <b>Clutch Actuator Cylinder Replacement</b></li> <li>5. Flush and bleed the clutch hydraulic system if the above conditions are found. Refer to <b>Hydraulic Clutch Bleeding</b> .</li> </ol>

## CLUTCH PEDAL HARD TO PUSH

### Clutch Pedal Hard to Push

Cause	Action
<p>DEFINITION: The clutch pedal requires high effort to operate. Review the <b>Symptoms - Clutch</b> 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 <b>Hydraulic Clutch Bleeding</b> .</li> <li>2. If mineral oil is found, replace the clutch master cylinder, the clutch actuator</li> </ol>



	cylinder, and flush the hydraulic system and fill with the correct fluid. Refer to <b><u>Clutch Master Cylinder Replacement</u></b> , <b><u>Clutch Actuator Cylinder Replacement</u></b> , and <b><u>Hydraulic Clutch Bleeding</u></b> .
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. Inspect the clutch hydraulic fluid for contamination of mineral oil. If contaminated, replace the clutch master cylinder and the clutch actuator cylinder. Refer to <b><u>Clutch Master Cylinder Replacement</u></b> and <b><u>Clutch Actuator Cylinder Replacement</u></b></li> <li>4. Flush the hydraulic system and fill with the correct fluid. Refer to <b><u>Hydraulic Clutch Bleeding</u></b> .</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 <b><u>Clutch Pedal Replacement</u></b> .</li> </ol>
Clutch pedal spring worn	<ol style="list-style-type: none"> <li>1. Inspect the clutch pedal spring for wear.</li> <li>2. Replace the clutch pedal spring. Refer to <b><u>Clutch Pedal Replacement</u></b> .</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 <b><u>Hydraulic Clutch Hose/Pipe Replacement</u></b> .</li> </ol>
Clutch disc worn too thin	Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .

## CLUTCH FREQUENT ADJUSTMENTS

### Clutch Frequent Adjustments

Cause	Action
DEFINITION: The self-adjusting clutch is constantly adjusting. Review the <b><u>Symptoms - Clutch</u></b> and perform the necessary inspections.	
Excessive clutch slippage	Refer to <b><u>Clutch Slipping</u></b> .
Clutch wearing excessively	<ul style="list-style-type: none"> <li>• Review the vehicle application.</li> <li>• Review the driver practices.</li> </ul>

## CLUTCH VIBRATION

### Clutch Vibration

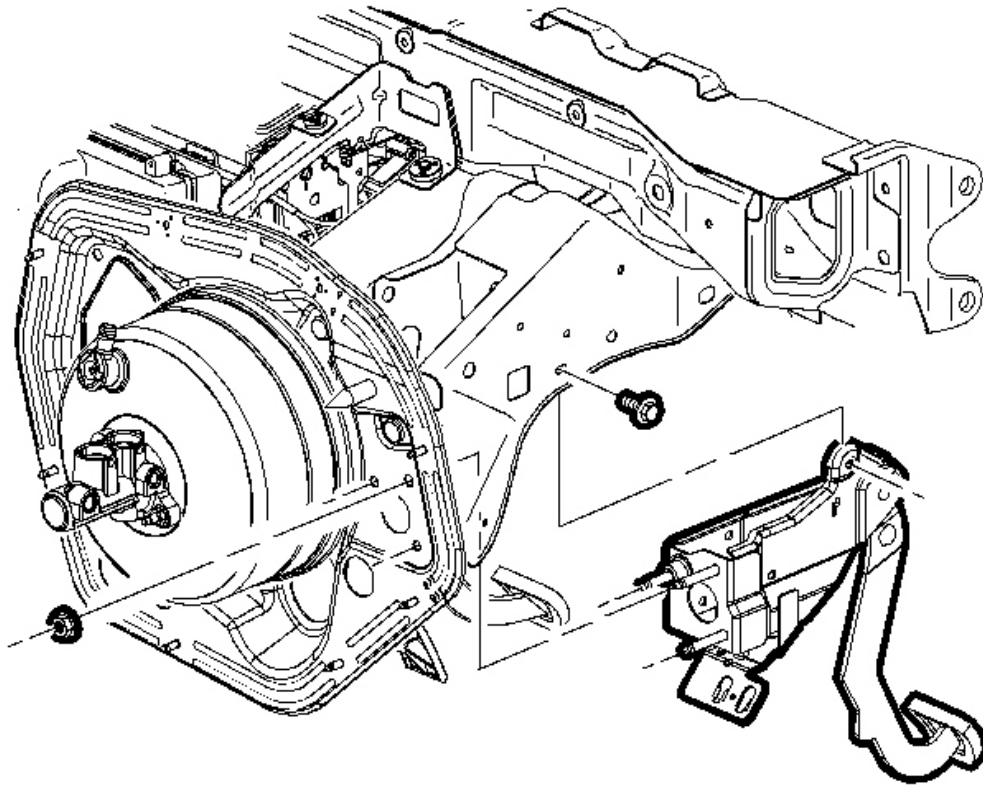
Cause	Action
DEFINITION: Vibration from the clutch components during disengagement or engagement. Review the <b><u>Symptoms - Clutch</u></b> and perform the necessary inspections.	
Excessive driveline torsional activity	Review the <b><u>Diagnostic Starting Point - Wheel Drive Shafts</u></b> in Wheel Drive Shafts.
Clutch incorrectly installed	Remove the clutch and install it correctly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .

Transmission input 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 Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.</li> </ol>
Clutch disc facings damaged	Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .
Flywheel housing to clutch housing excessively misaligned	Replace the faulty clutch housing or transmission front case. Refer to Transaxle Case Disassemble in Manual Transmission - Getrag 5 Speed.
Clutch out of balance	Replace the clutch assembly. Refer to <b><u>Clutch Drive Plate and Clutch Driven Plate</u></b> .

## REPAIR INSTRUCTIONS

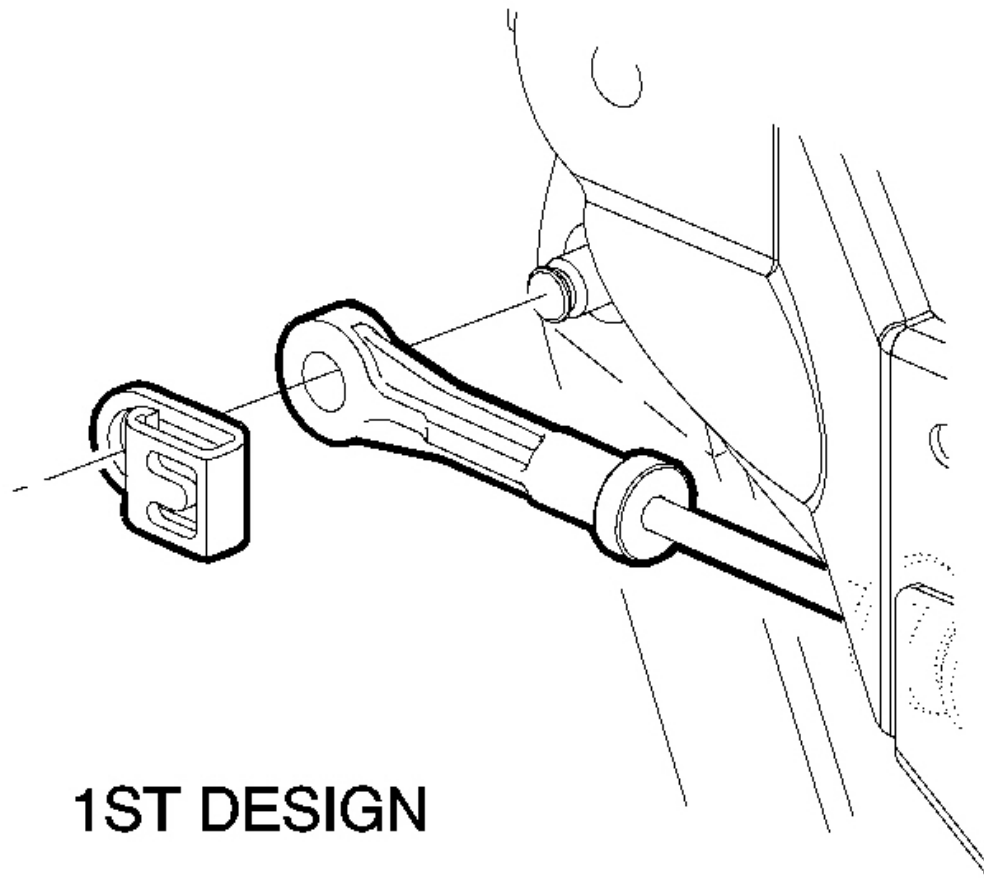
### CLUTCH PEDAL REPLACEMENT

#### Removal Procedure



**Fig. 1: Clutch Pedal Assembly, Studs & Nuts**  
**Courtesy of GENERAL MOTORS CORP.**

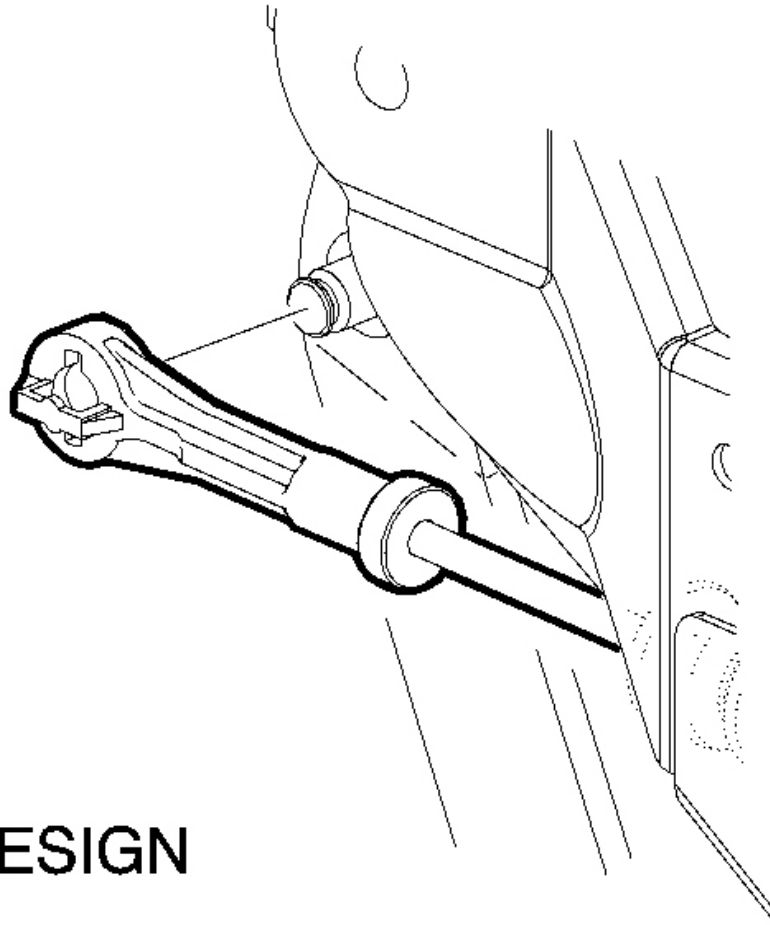
1. Remove the nuts from the clutch pedal assembly studs.



**1ST DESIGN**

**Fig. 2: Pushrod & Clutch Pedal**  
**Courtesy of GENERAL MOTORS CORP.**

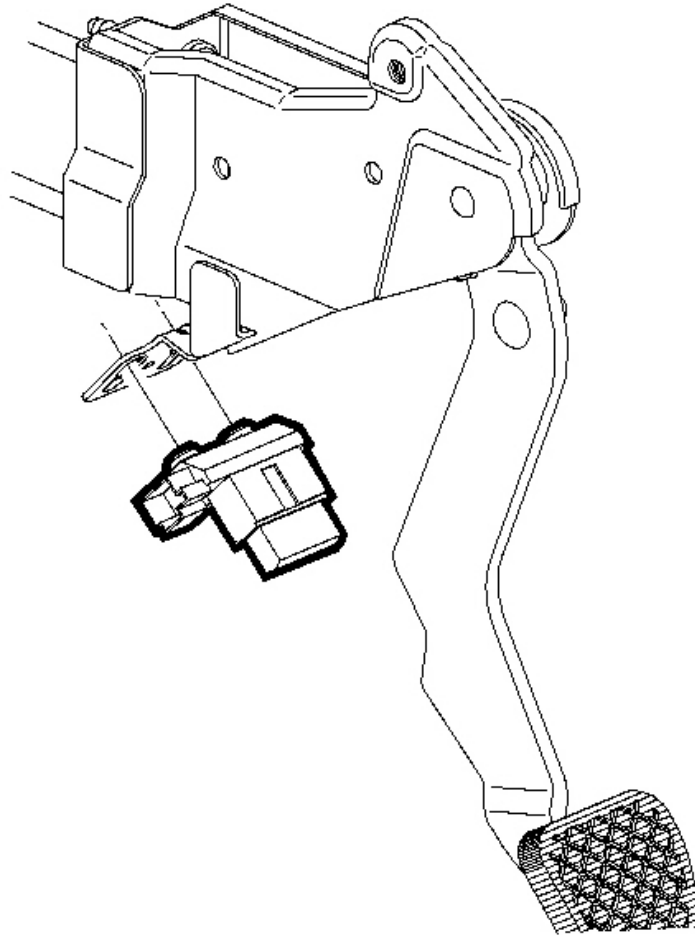
2. Disconnect the clutch master cylinder pushrod from the clutch pedal.



## 2ND DESIGN

**Fig. 3: Clutch Position Switch & Clutch Pedal**  
Courtesy of GENERAL MOTORS CORP.

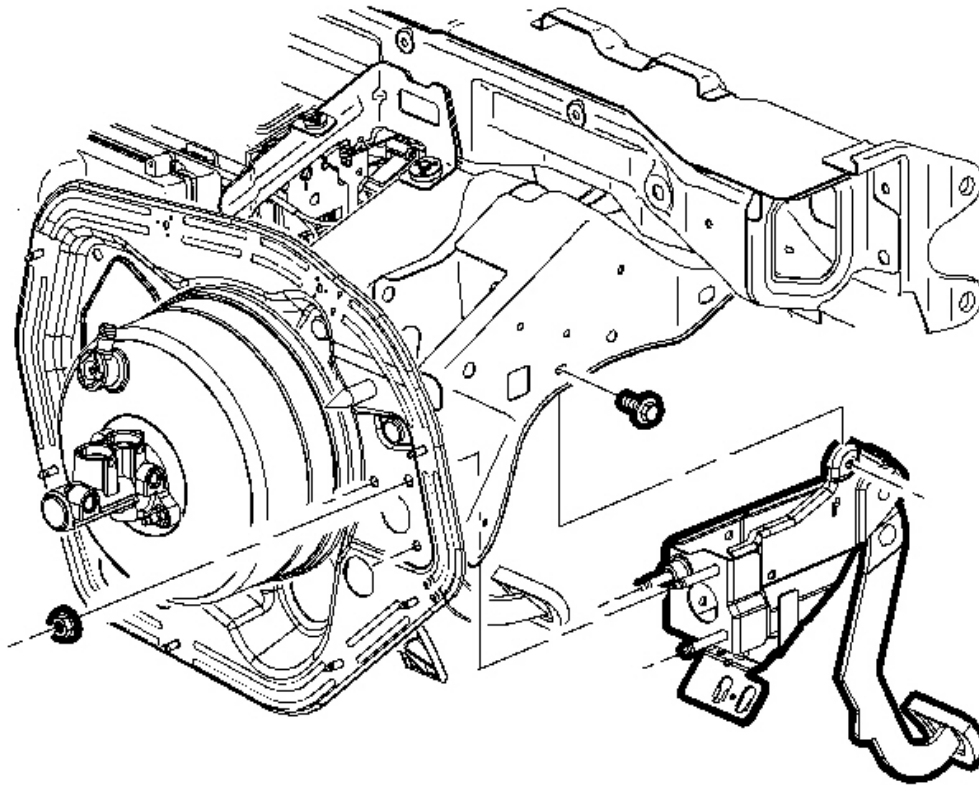
3. Remove the clutch position switch from the clutch pedal assembly by sliding upward.



**Fig. 4: Clutch Pedal Assembly & Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

4. Remove the bolt from the clutch pedal assembly.

**Installation Procedure**

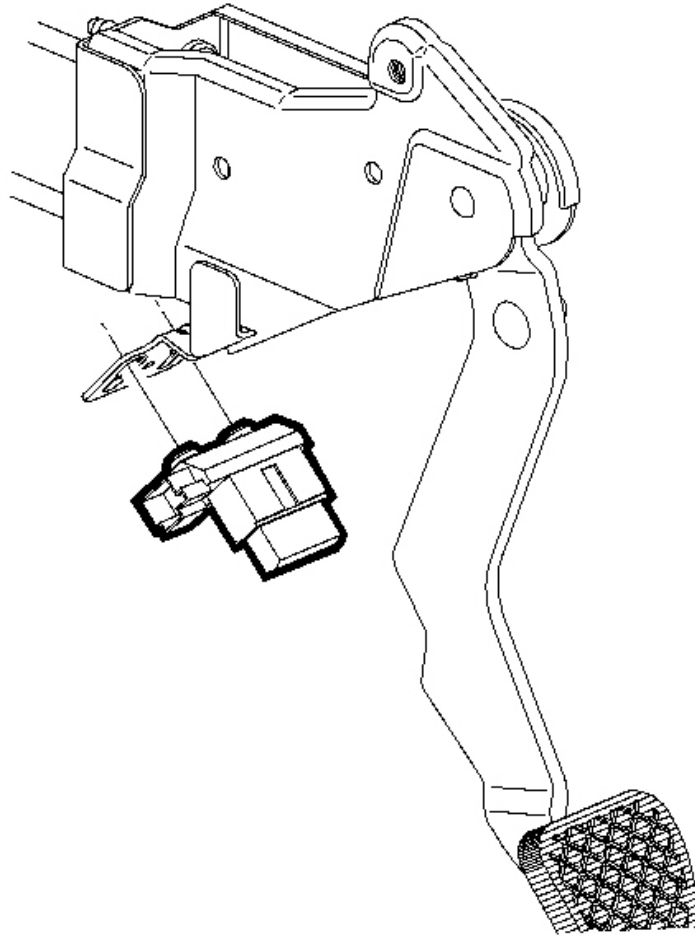


**Fig. 5: Clutch Pedal Assembly, Studs & Nuts**  
Courtesy of GENERAL MOTORS CORP.

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

1. Install the bolt to the clutch pedal assembly.

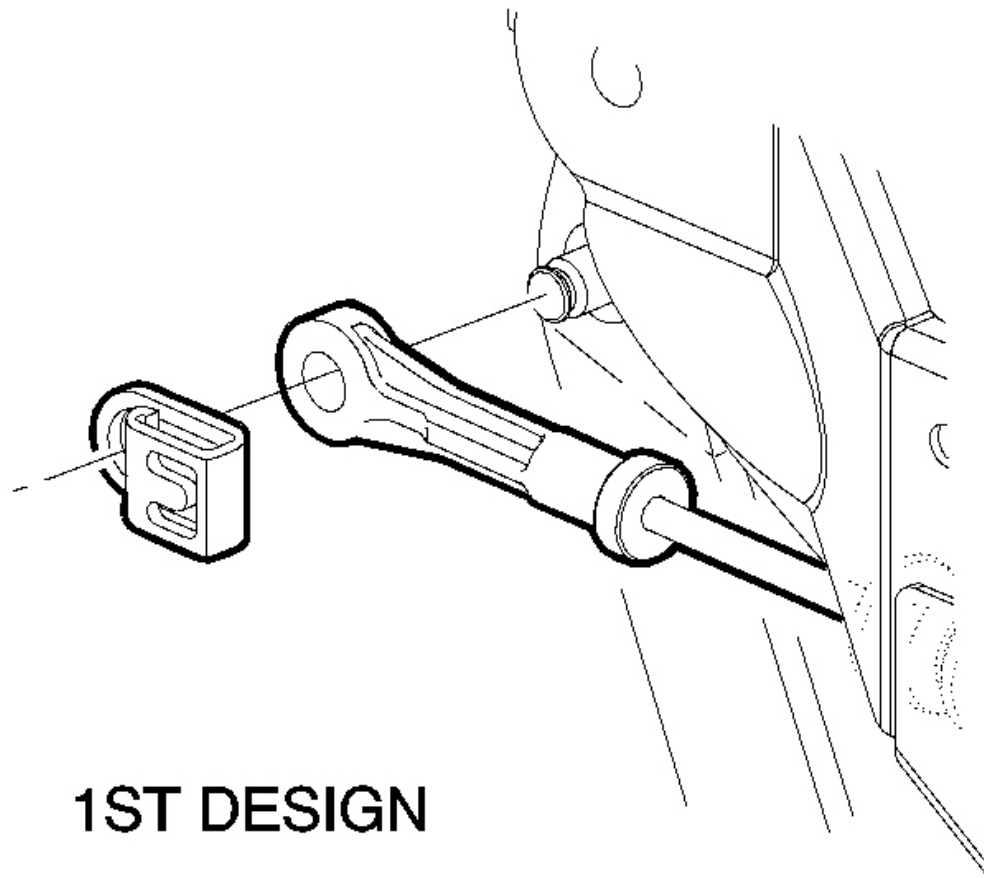
**Tighten:** Tighten the clutch pedal assembly bolt to 10 N.m (89 lb in).



**Fig. 6: Clutch Pedal Assembly & Bolt**  
**Courtesy of GENERAL MOTORS CORP.**

2. Install the clutch position switch by sliding downward.

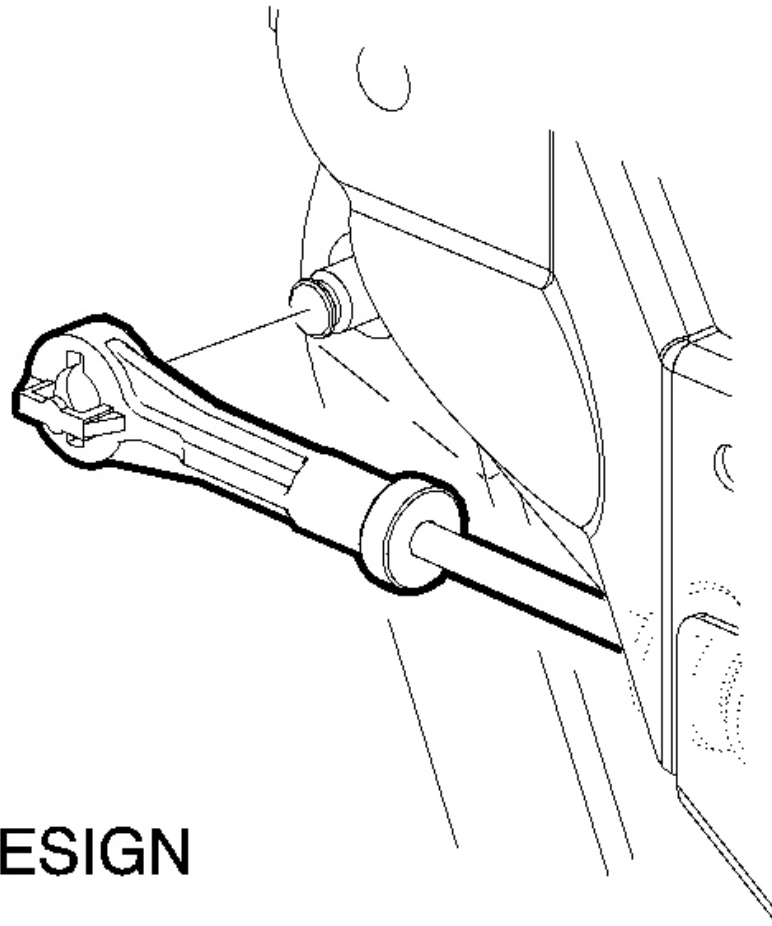




## 1ST DESIGN

**Fig. 7: Pushrod & Clutch Pedal**  
**Courtesy of GENERAL MOTORS CORP.**

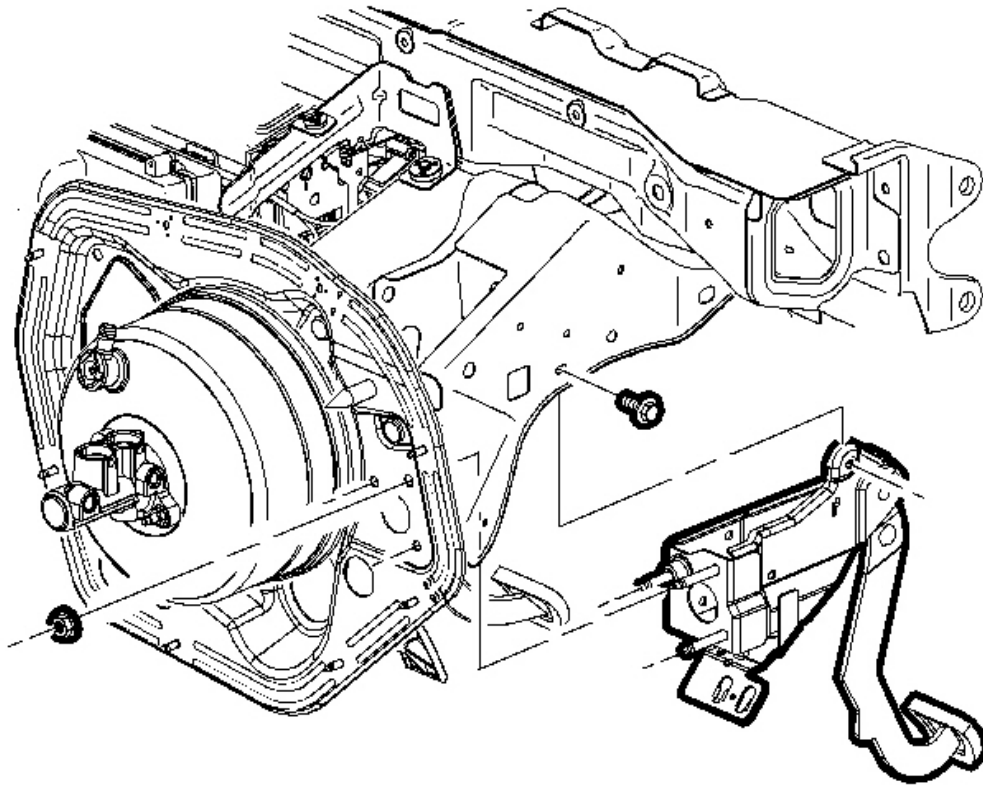
3. Connect the clutch master cylinder pushrod to the clutch pedal assembly.



## 2ND DESIGN

**Fig. 8: Clutch Position Switch & Clutch Pedal**  
Courtesy of GENERAL MOTORS CORP.

4. Install the clutch position switch to the clutch pedal assembly.



**Fig. 9: Clutch Pedal Assembly, Studs & Nuts**  
Courtesy of GENERAL MOTORS CORP.

5. Install the nuts to the clutch pedal assembly studs.

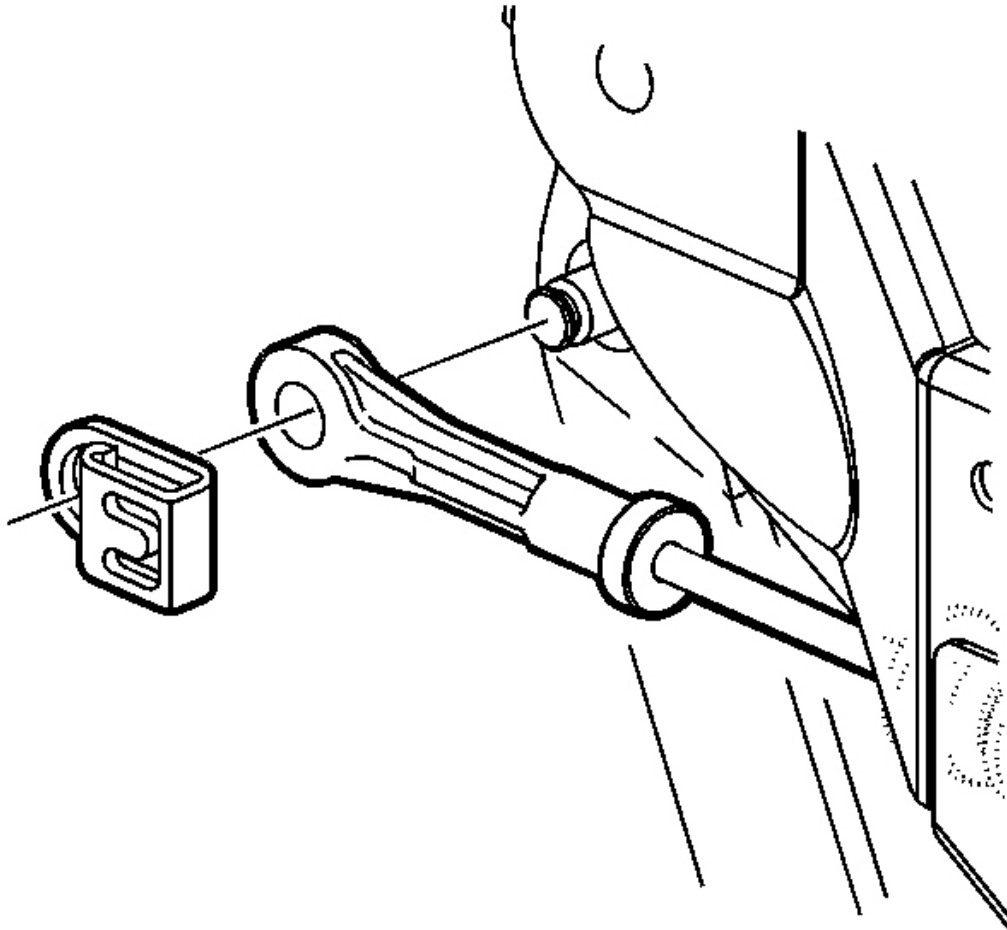
**Tighten:** Tighten the clutch pedal assembly nuts to 23 N.m (17 lb ft).

## CLUTCH MASTER CYLINDER REPLACEMENT

### Removal Procedure

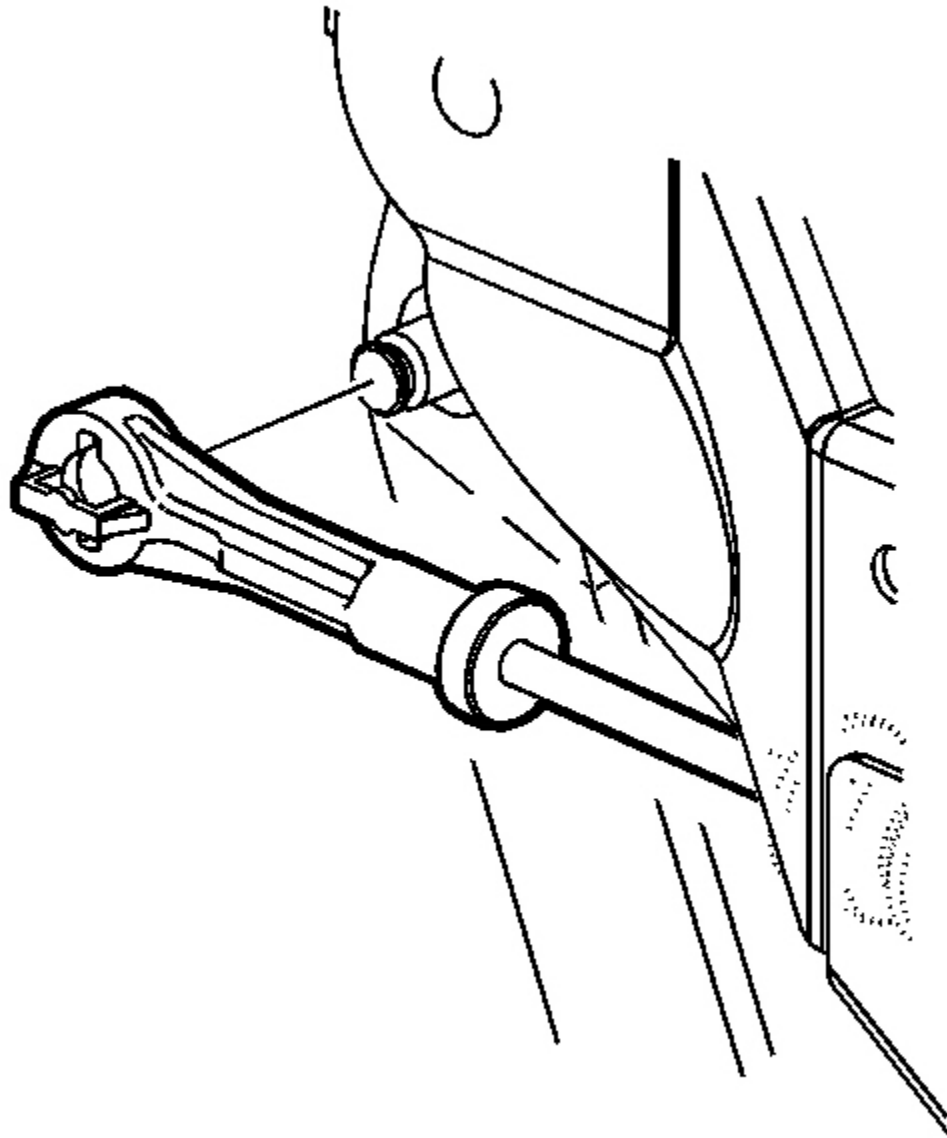
1. Clean the clutch fluid reservoir cap and area around the cap.
2. Remove the clutch fluid reservoir cap and remove enough brake fluid to clear a passage to the clutch

master cylinder.



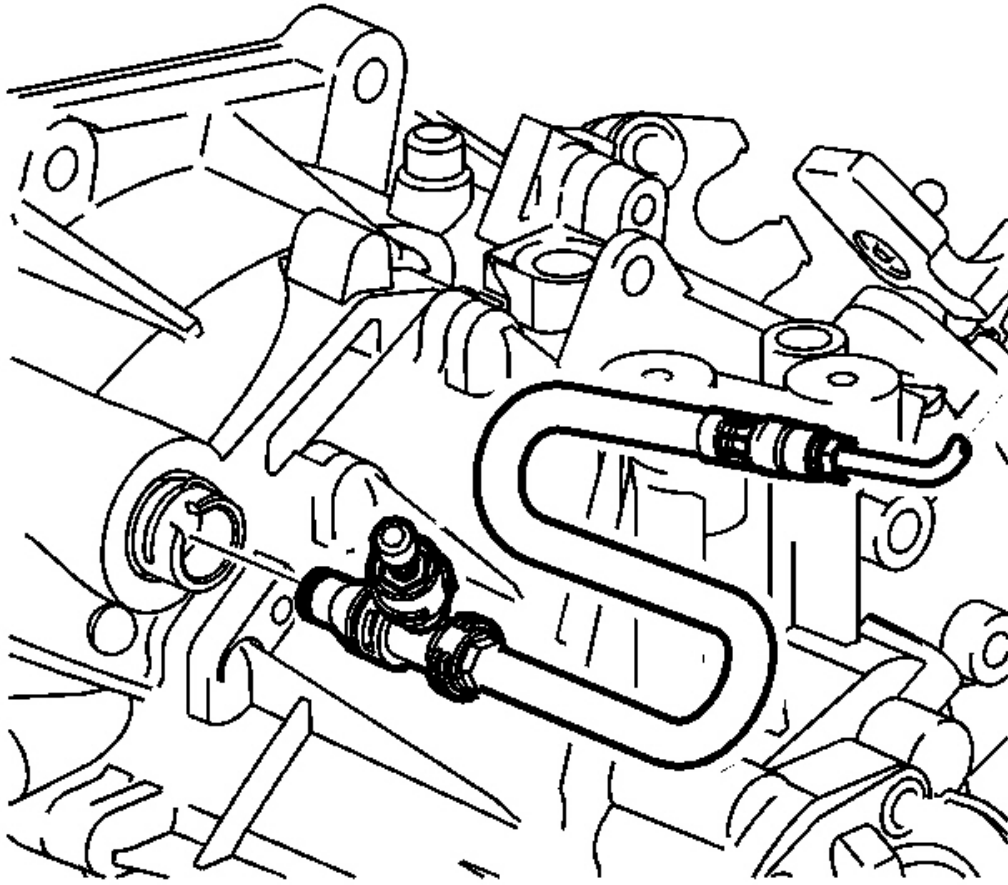
**Fig. 10: Clutch Pedal Retainer**  
Courtesy of GENERAL MOTORS CORP.

3. Remove the clutch pedal retainer.
4. Remove the clutch master cylinder pushrod from the clutch pedal assembly, 1st design.



**Fig. 11: Clutch Master Cylinder & Clutch Pedal Assembly**  
Courtesy of GENERAL MOTORS CORP.

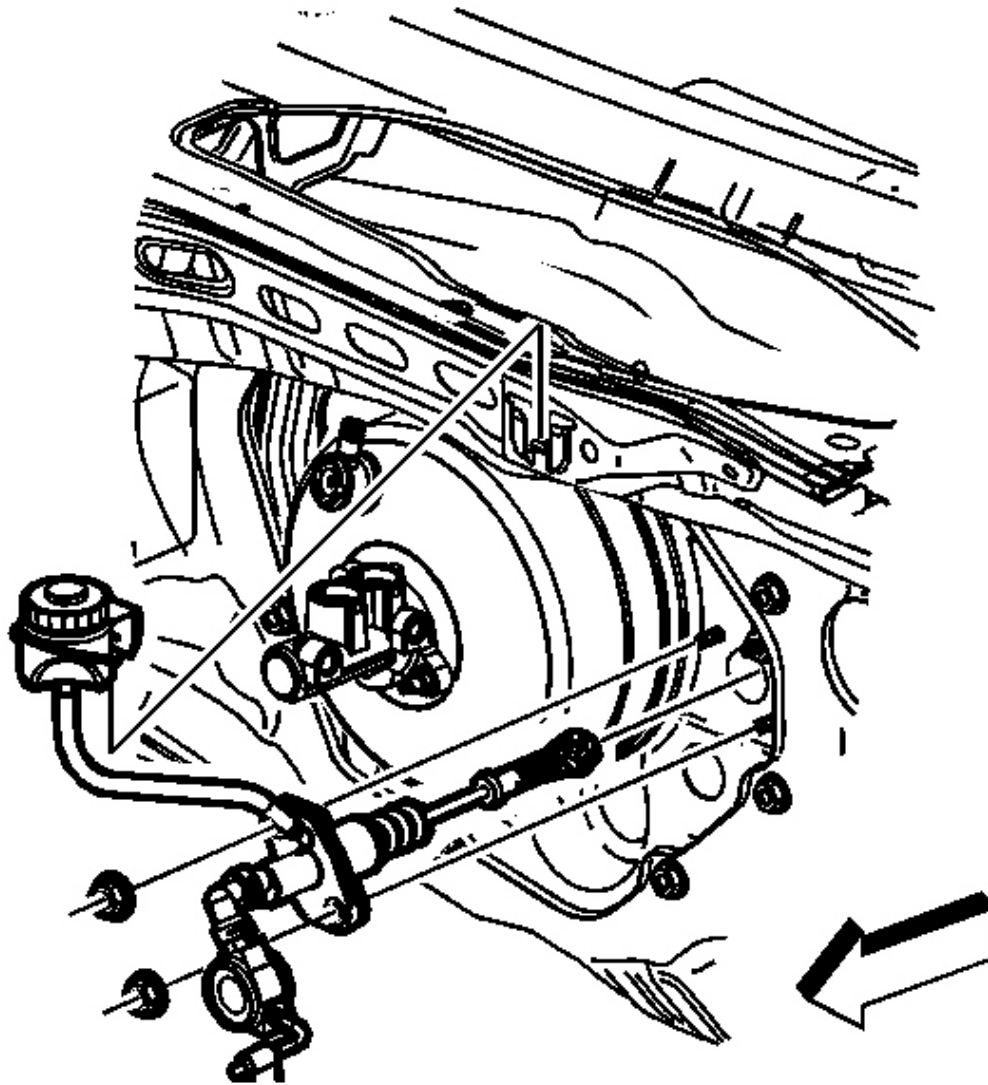
5. Remove the clutch master cylinder pushrod from the clutch pedal assembly, 2nd design.



**Fig. 12: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to Brake Fluid Effects on Paint and Electrical Components Notice in Cautions and Notices.

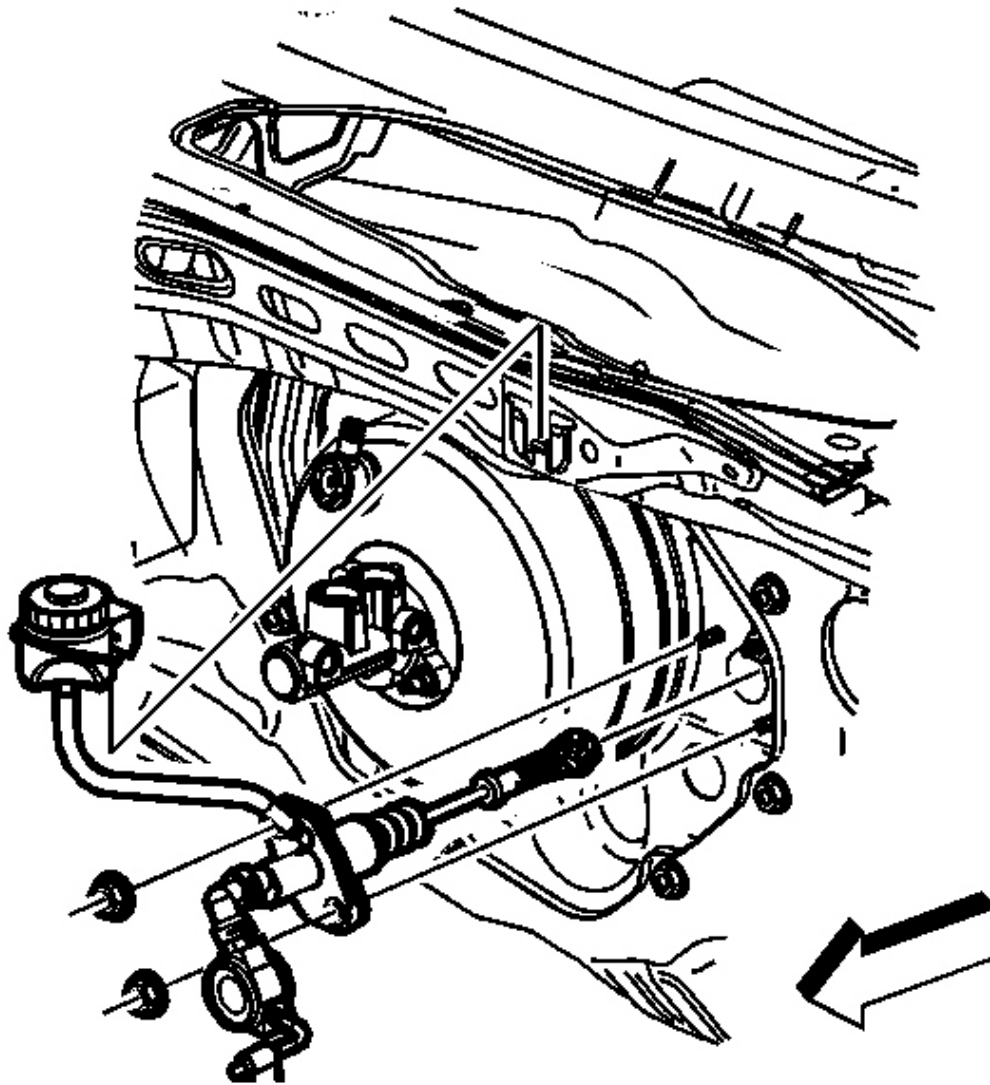
6. Place a shop towel under the clutch master cylinder in order to catch any fluid loss.
7. Using a pick tool on the strut tower side, disconnect the clutch line from clutch master cylinder.
8. Cap the reservoir and hydraulic lines in order to prevent fluid loss and contamination.



**Fig. 13: Clutch Master Cylinder Mounting Nuts & Clutch Fluid Reservoir**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT: Do not damage the pushrod boot when sliding it through the front of the dash.**

9. Remove the clutch master cylinder mounting nuts and slide the clutch fluid reservoir up and out.



**Fig. 14: Clutch Master Cylinder Mounting Nuts & Clutch Fluid Reservoir**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT: Do not damage the pushrod boot when sliding it through the front of the dash.**

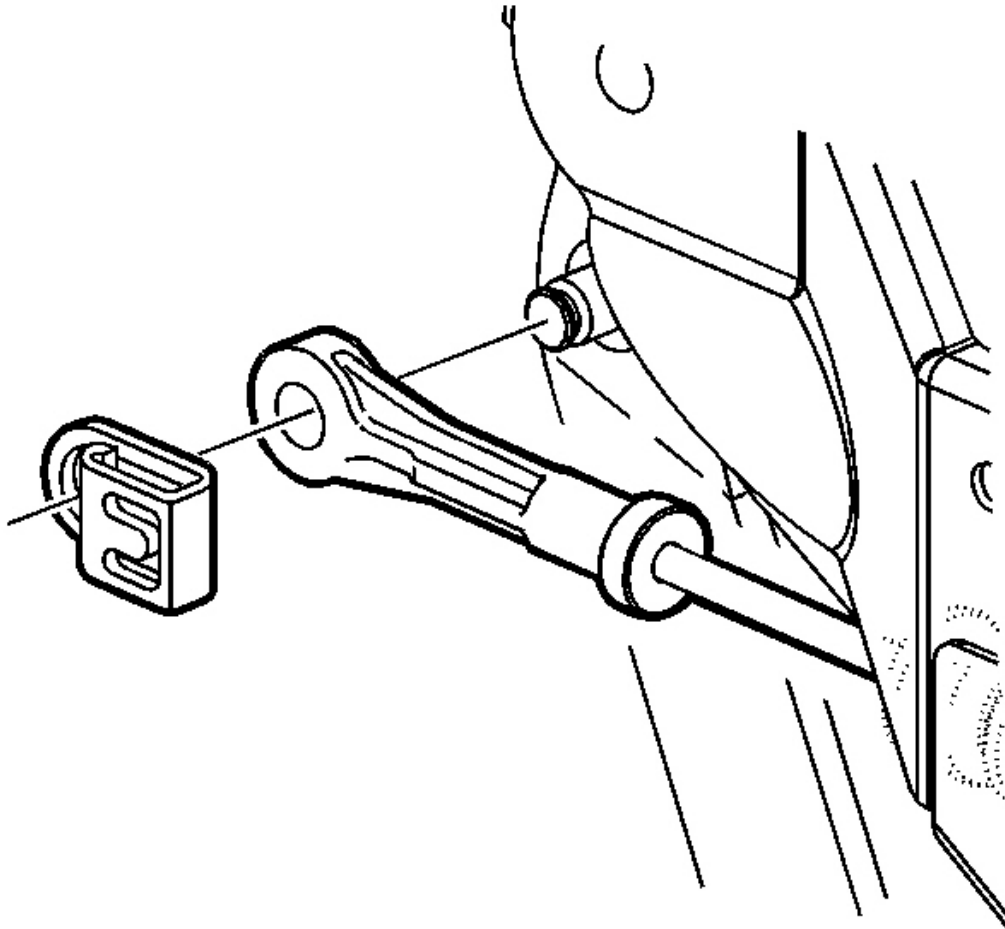
1. Uncap the fluid reservoir and hydraulic lines.



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

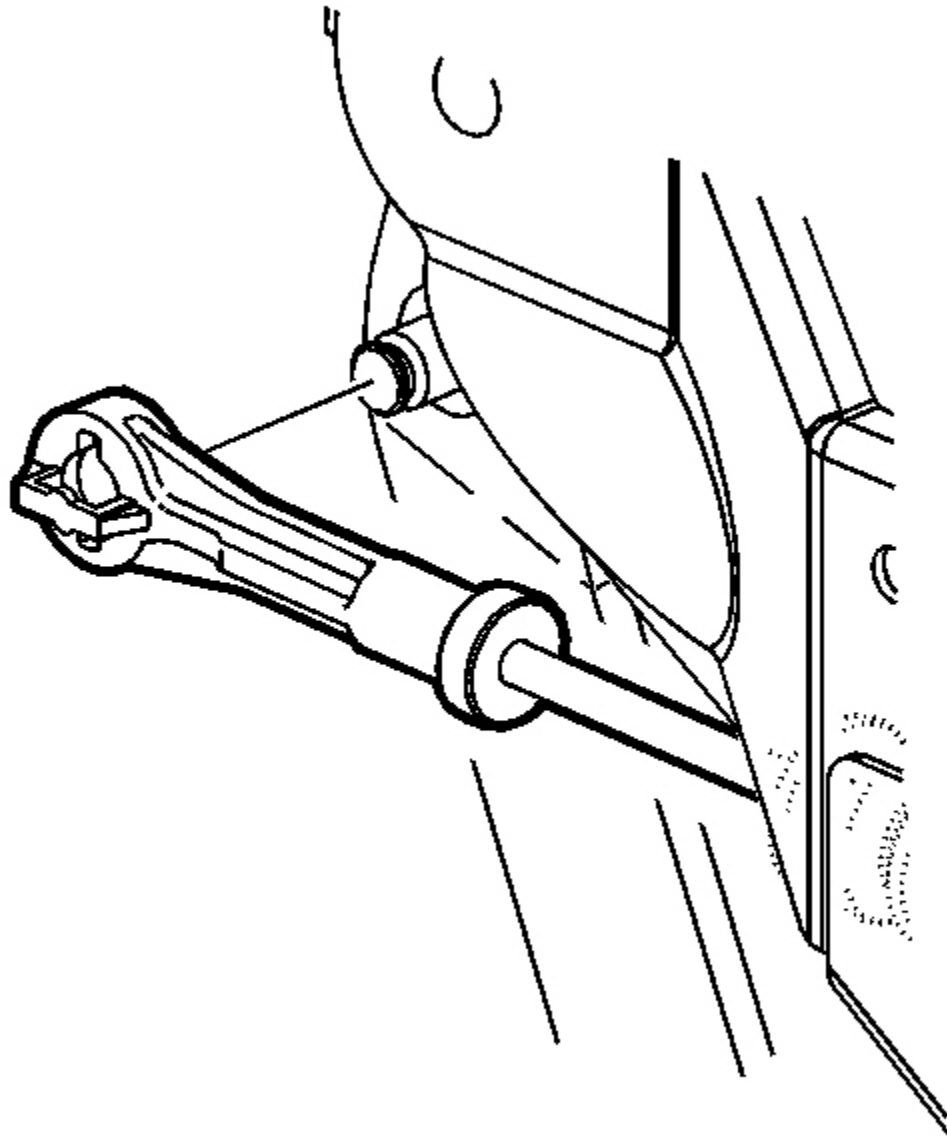
- Slide the clutch fluid reservoir into the mounting slot and install the clutch master cylinder mounting nuts.

**Tighten:** Tighten the nuts to 23 N.m (17 lb ft).



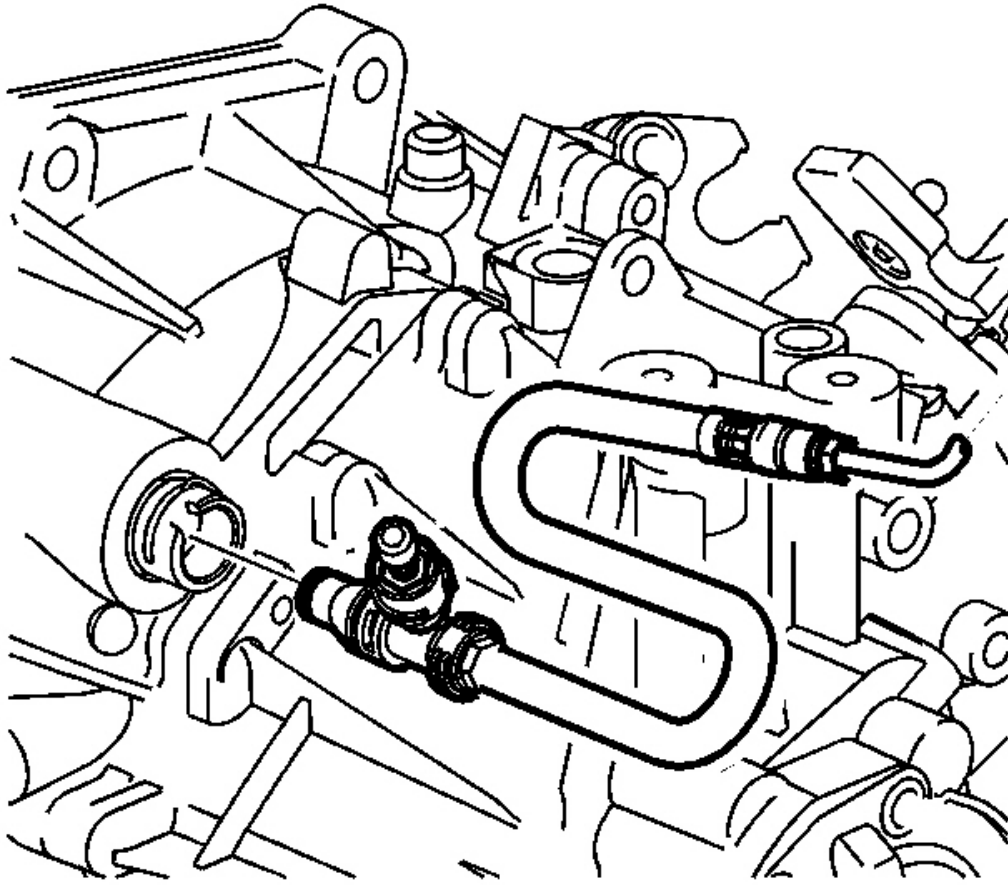
**Fig. 15: Clutch Pedal Retainer**  
Courtesy of GENERAL MOTORS CORP.

- Install the clutch master cylinder pushrod to the clutch pedal assembly, 1st design.
- Install the clutch pedal retainer.



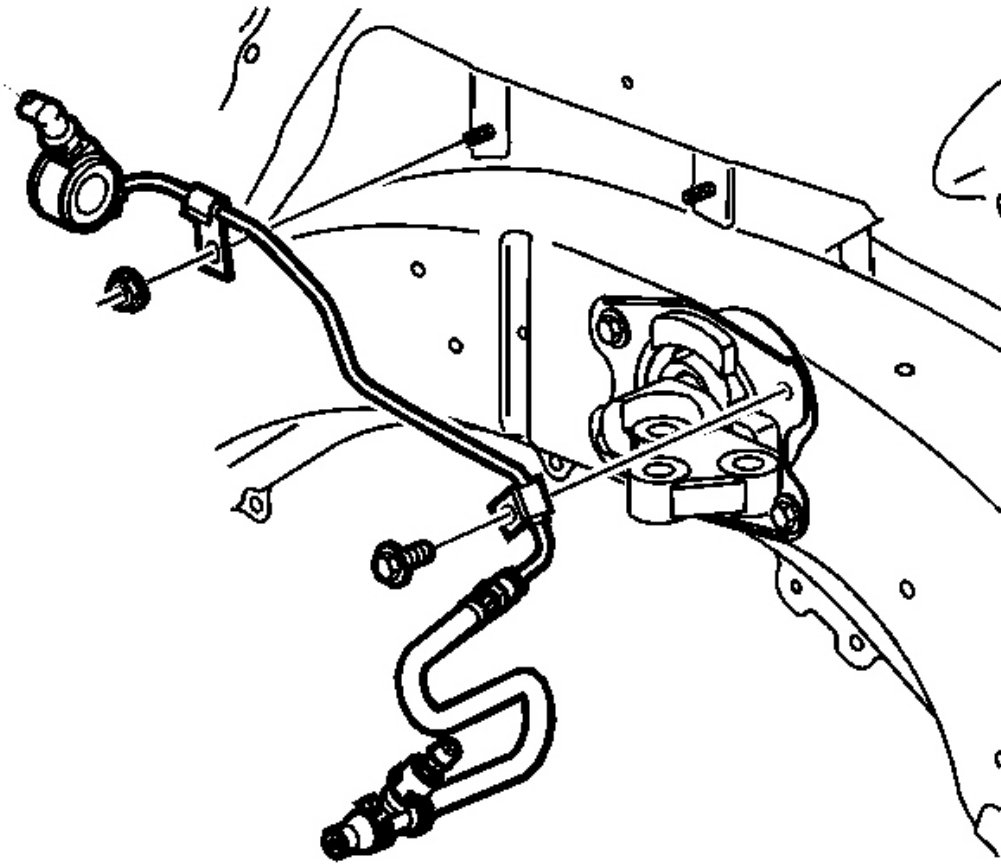
**Fig. 16: Clutch Master Cylinder & Clutch Pedal Assembly**  
Courtesy of GENERAL MOTORS CORP.

5. Install the clutch master cylinder pushrod to the clutch pedal assembly, 2nd design.



**Fig. 17: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

6. Remove the shop towel and discard into a suitable container.
7. Connect the clutch line to the clutch master cylinder.



**Fig. 18: Clutch Pedal Retainer, Nuts & Bolts**  
Courtesy of GENERAL MOTORS CORP.

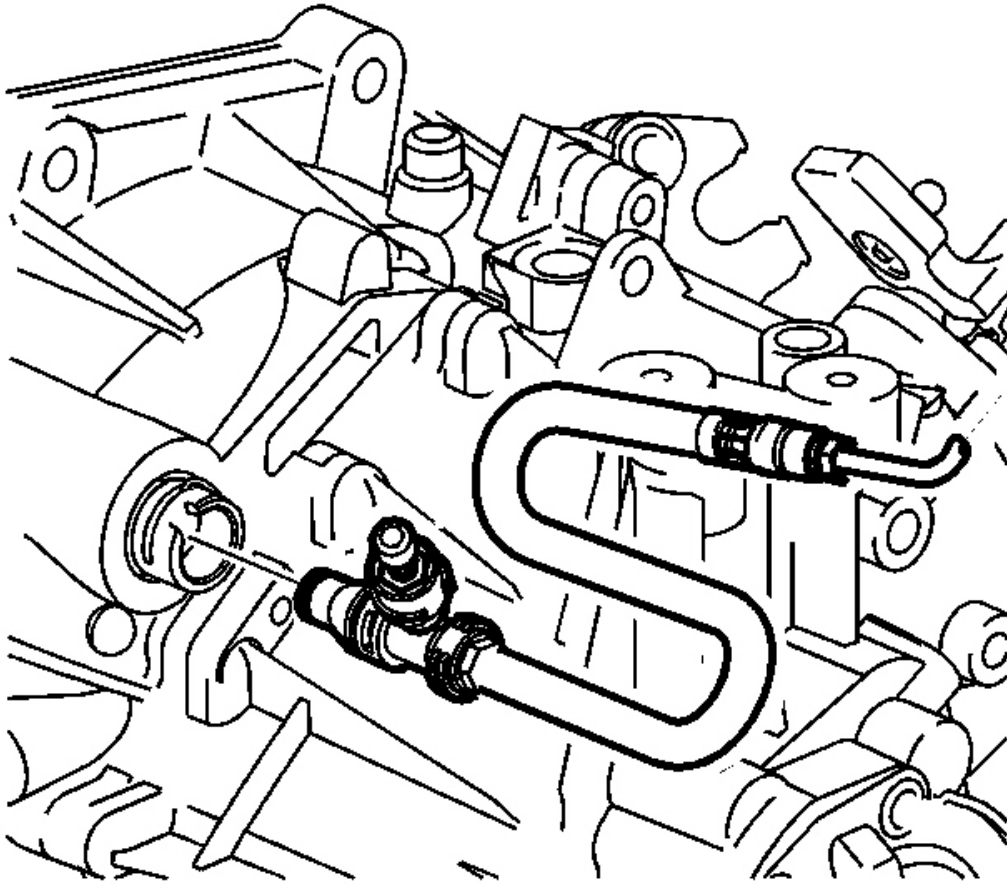
8. Connect the clutch master cylinder pushrod to the clutch pedal.
9. Install the clutch pedal retainer, nuts and bolts.
10. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .

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

### **Removal Procedure**

1. Turn the ignition off.
2. Remove the battery cover.
3. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

4. Remove the battery. Refer to **Battery Replacement** in Engine Electrical.
5. Loosen the battery tray bracket screw and remove the bracket.
6. On anti-lock brake system (ABS) models, remove the electronic brake traction control module (EBTCM) bracket fasteners.

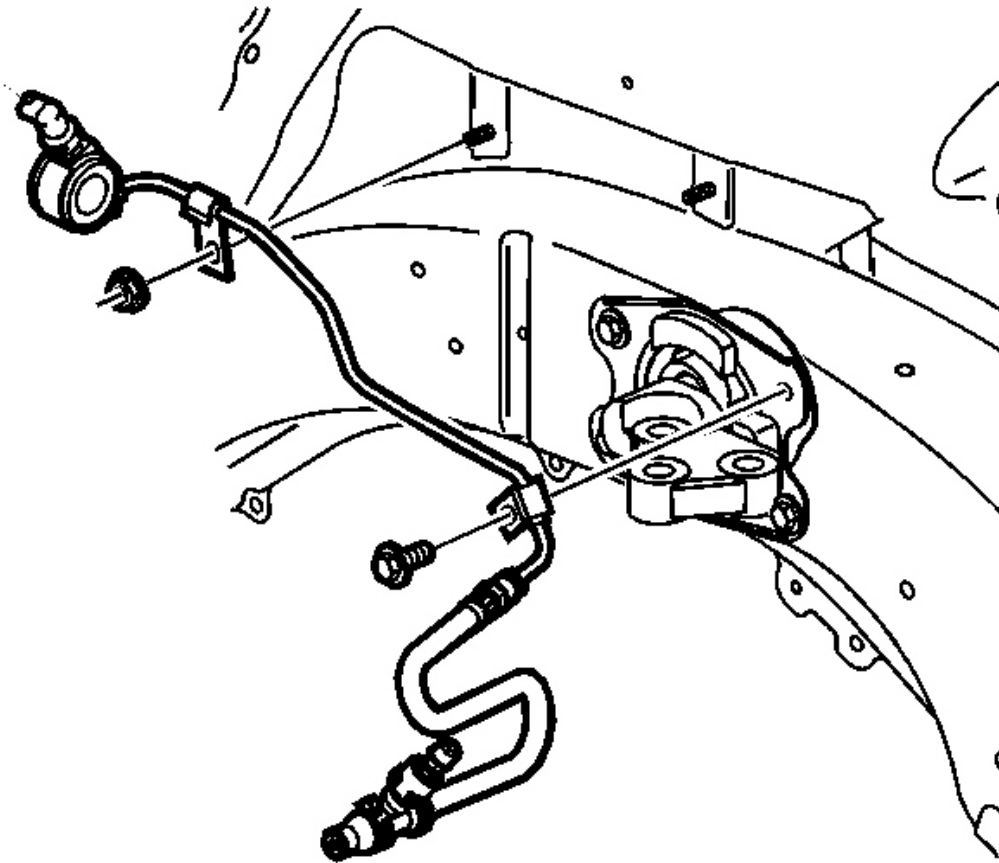


**Fig. 19: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

**NOTE:** Refer to **Brake Fluid Effects on Paint and Electrical Components Notice in Cautions and Notices.**

7. Place a shop towel under the clutch master cylinder in order to catch any fluid loss.
8. Disconnect the clutch master cylinder line from the transaxle by removing the C-clip.
9. Drain the clutch fluid into a suitable container.

10. Remove the top transaxle mount retaining bolt.
11. Disconnect the clutch line from the clutch master cylinder.

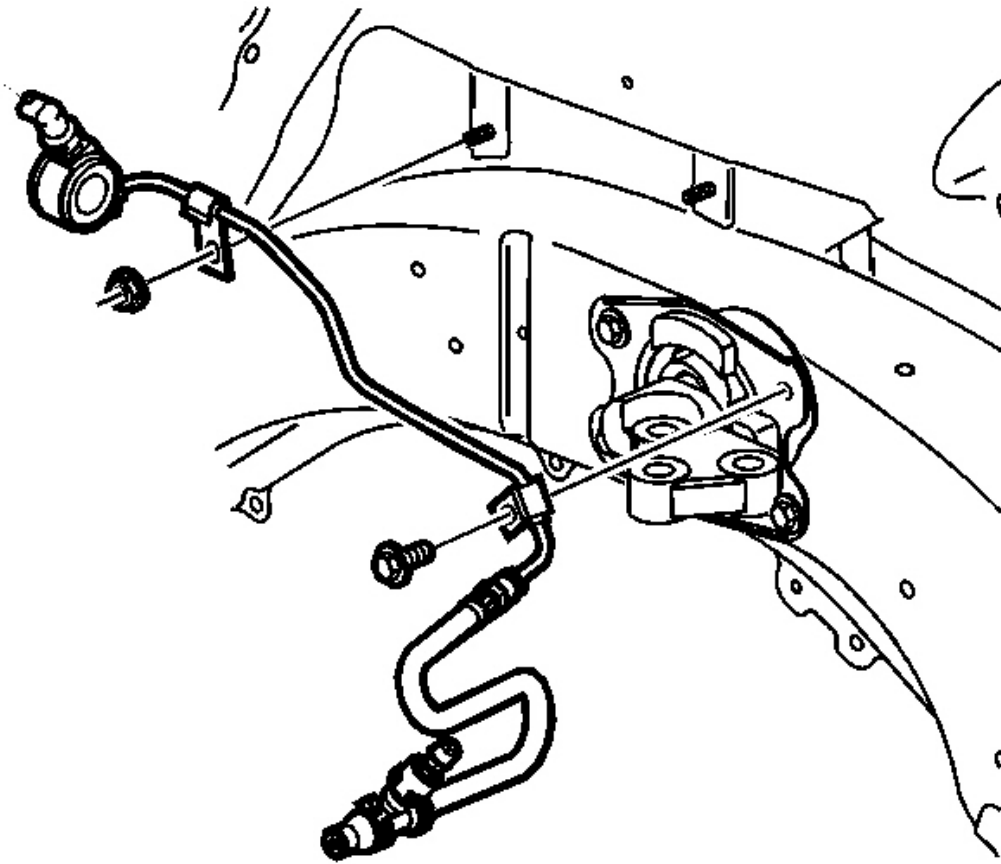


**Fig. 20: Clutch Pedal Retainer, Nuts & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT: Do not damage the brake lines.**

12. Remove the clutch hydraulic line.

#### **Installation Procedure**



**Fig. 21: Clutch Pedal Retainer, Nuts & Bolts**  
Courtesy of GENERAL MOTORS CORP.

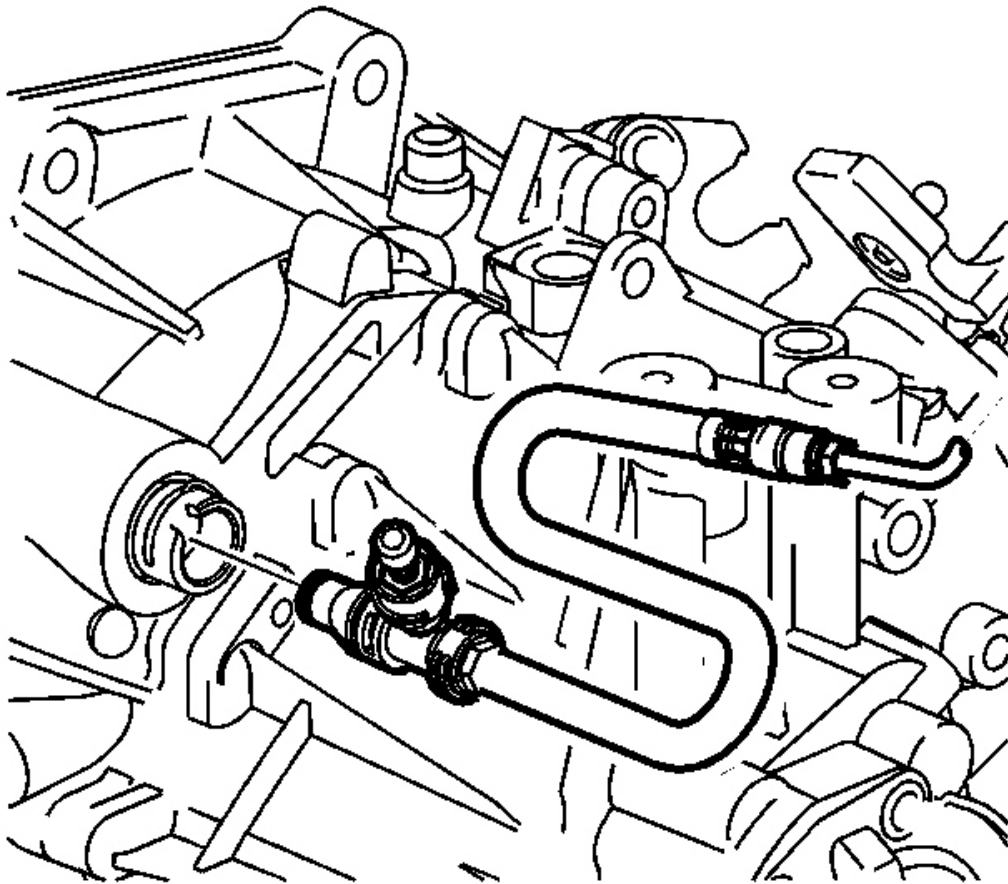
- IMPORTANT:**
- Do not damage the brake lines.
  - Ensure that the clutch line locks securely in place.

1. Install the clutch hydraulic line.
2. Connect the clutch line to the clutch master cylinder.
3. Remove the shop towel and discard into a suitable container.

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

4. Install the top transaxle mount retaining bolt.

**Tighten:** Tighten the bolt to 37 N.m (27 lb ft).



**Fig. 22: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

5. Connect the clutch hydraulic line to the transaxle by pushing it until it seats.
6. Fill the brake/clutch reservoir with DOT 3 hydraulic fluid to the proper level.
7. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .
8. On ABS models, install the EBTCM bracket fasteners.

**Tighten:** Tighten the fasteners to 15 N.m (11 lb ft).

9. Install the battery tray bracket. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.



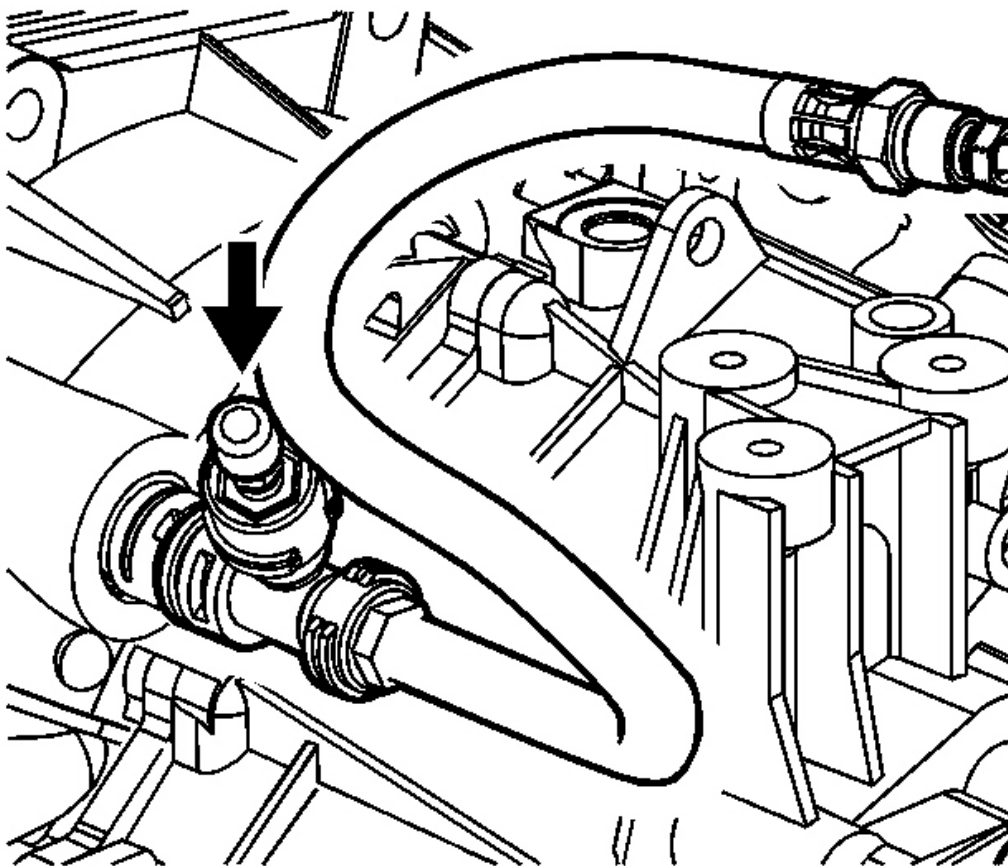
10. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.
11. Install the battery. Refer to **Battery Replacement** in Engine Electrical.

## HYDRAULIC CLUTCH BLEEDING

### Tools Required

- J 23738-A Vacuum Pump
- J45727 Rubber Stopper. See **Special Tools and Equipment** .

### Manual Bleeding



**Fig. 23: Bleed Line & Bleed Screw**  
Courtesy of GENERAL MOTORS CORP.

1. Attach a clear line to the bleed screw with the loose end submerged in a small container of clutch fluid.
2. Actuate the clutch pedal 5 times at a normal speed by stroking it all the way to the pedal stop in both directions.
3. Actuate the clutch pedal quickly 10-15 times without bringing the pedal all the way up, 30-40 mm (1.18-1.51 in) short of stop at pedal.
4. Repeat steps 2-3 5 times.
5. Hold the pedal at up stop and open the bleed screw.
6. Stroke the pedal to the floor normally and close the bleed screw.
7. Lift the pedal to up stop position.
8. Repeat steps 5-7 3 times.

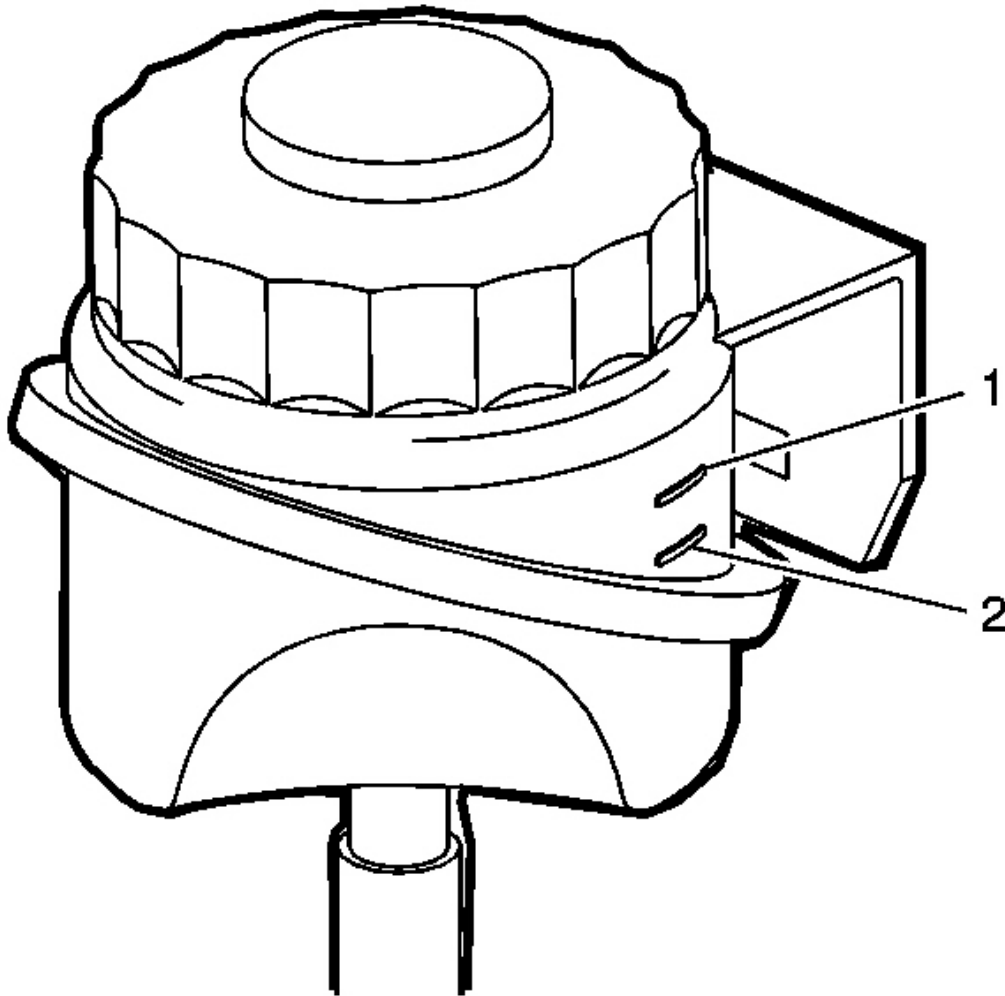
**NOTE:** Refer to Fastener Notice in **Cautions and Notices**.

9. Tighten the bleed screw.

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

10. Remove the bleed line from the bleed screw.

#### **Vacuum Bleeding**



**Fig. 24: Reservoir To Max Level**  
Courtesy of GENERAL MOTORS CORP.

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

1. Tighten the bleed screw.

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

2. Ensure the pedal is in the released position.
3. Fill the reservoir with DOT 3 hydraulic fluid to the MAX level (1).

**IMPORTANT: Brake fluid will deteriorate the rubber on the J45727 . See Special Tools and Equipment . Use a clean shop towel to wipe away all fluid after each use.**

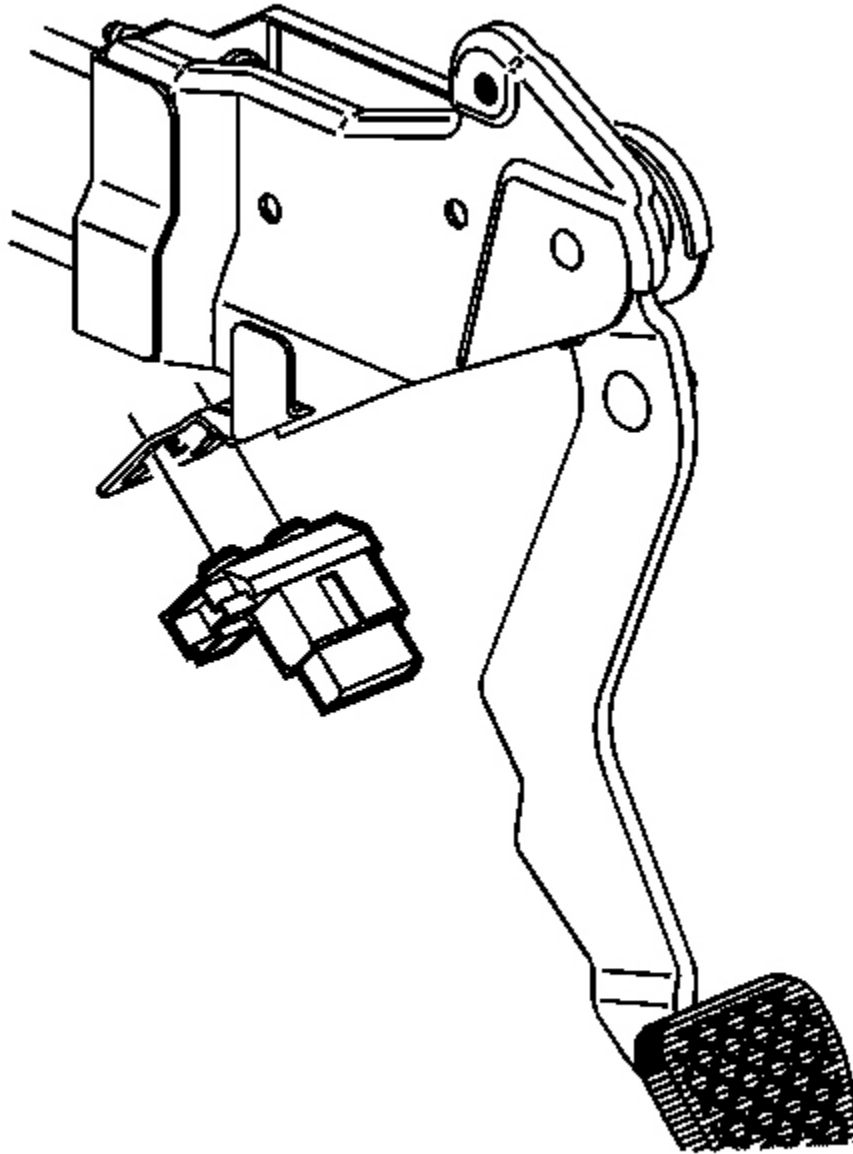
4. Install the **J45727** and attach to the **J 23738-A** or equivalent with a length of hose.
5. Place and hold the **J45727** over the top of the reservoir to ensure a tight fit. See Special Tools and Equipment .
6. Operate the **J 23738-A** to achieve 51-68 kPa (15-20 hg) on the gage.
7. Hold vacuum for approximately 1 minute.
8. Slowly relieve vacuum and remove the **J45727** from the reservoir. See Special Tools and Equipment .
9. Replenish fluid to the proper level.
10. Repeat steps 5-9 until all air is removed from the clutch system.
11. Replace the reservoir cap.

**IMPORTANT: The clutch pedal will go to the floor on the first actuation, but should improve on the following actuations.**

12. Actuate the clutch pedal 10-12 times to ensure proper operation.
13. Road test the vehicle to ensure proper clutch operation and shifting.

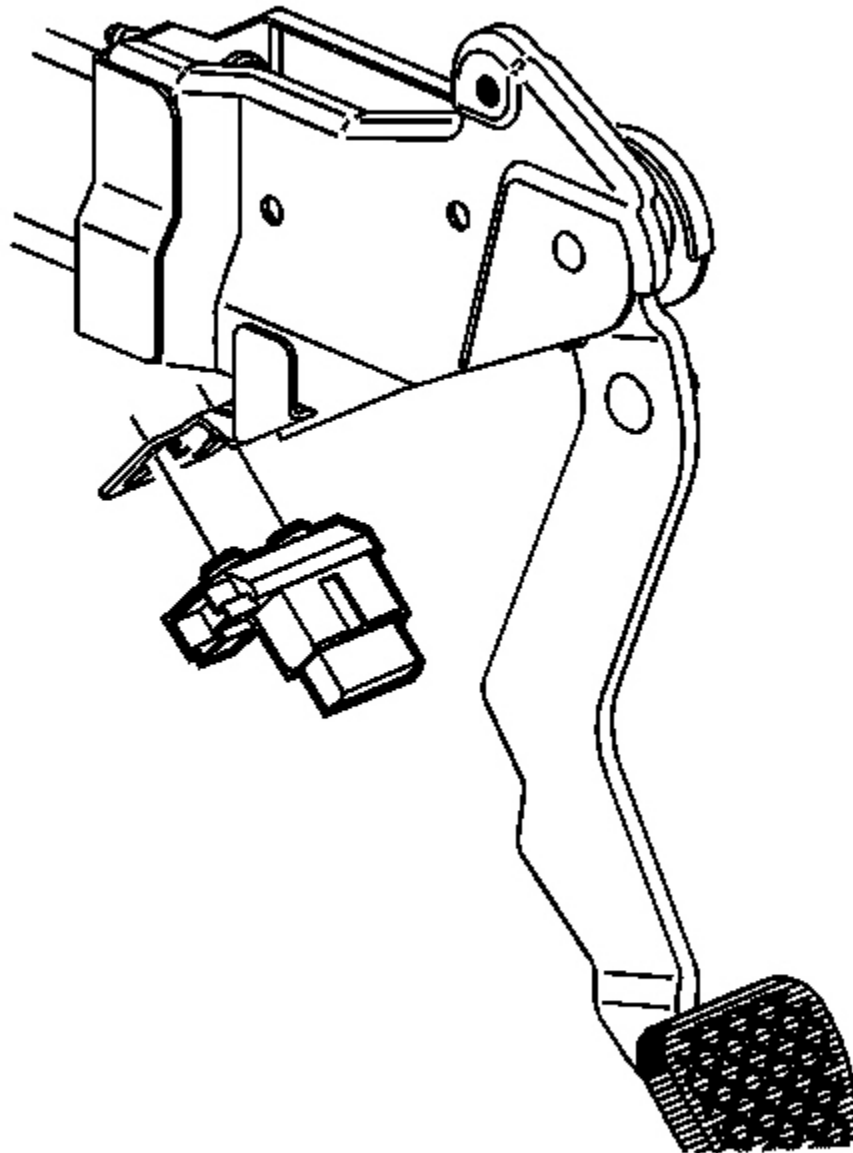
## **CLUTCH PEDAL POSITION SWITCH REPLACEMENT**

### **Removal Procedure**



**Fig. 25: Clutch Pedal Position Switch & Clutch Pedal**  
**Courtesy of GENERAL MOTORS CORP.**

1. Remove the clutch pedal position switch from the clutch pedal.
2. Remove the electrical connector from the clutch pedal position switch.



**Fig. 26: Clutch Pedal Position Switch & Clutch Pedal**  
Courtesy of GENERAL MOTORS CORP.

1. Install the electrical connector to the clutch pedal position switch.

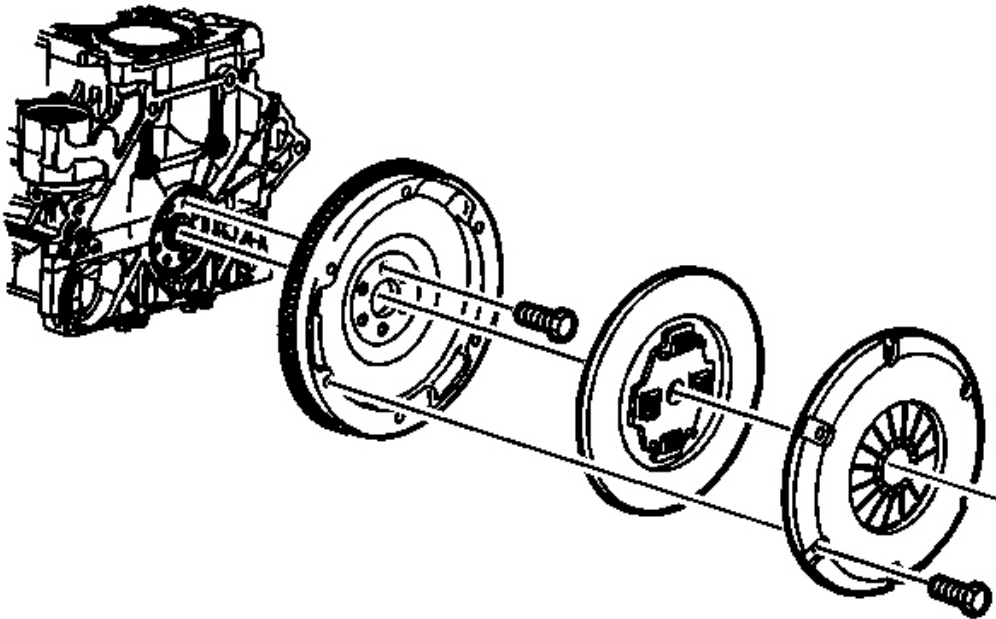
2. Install the clutch pedal position switch to the clutch pedal.

## CLUTCH DRIVE PLATE AND CLUTCH DRIVEN PLATE

### Tools Required

**J 43482** Clutch Alignment Arbor. See Special Tools and Equipment .

### Removal Procedure

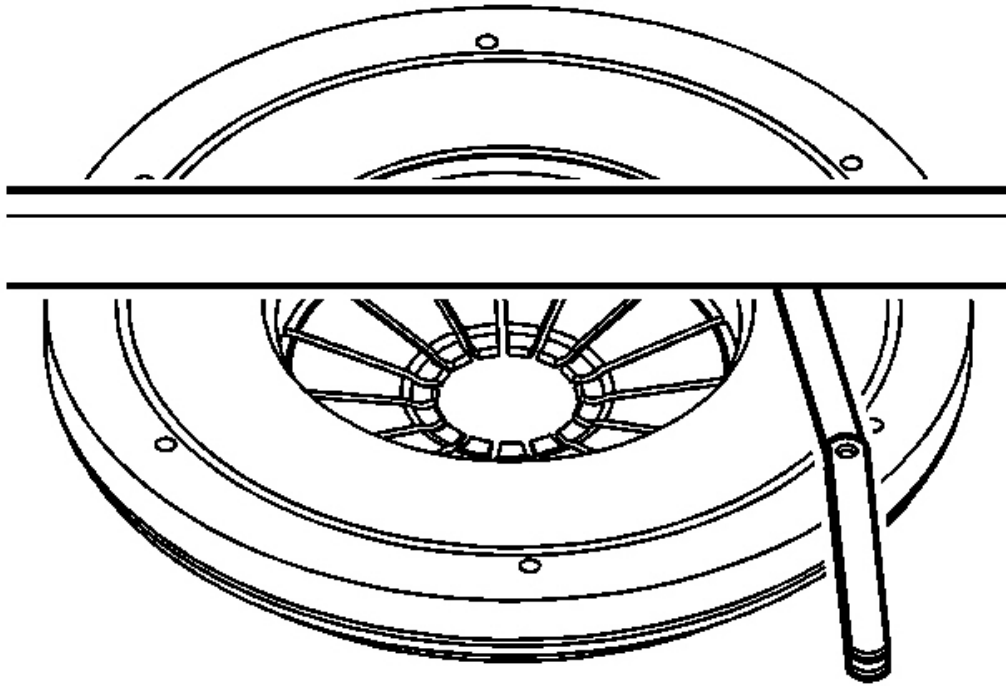


**Fig. 27: Transaxle & Actuator Release Bearing**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the transaxle. Refer to Transmission Replacement in Manual Transmission - Getrag-5 Speed.
2. Inspect the actuator release bearing minimal bearing drag.
3. Replace the actuator assembly if no or little drag is found. Refer to Clutch Actuator Cylinder Replacement .

**IMPORTANT:** Remove the bolts in a progressive crisscross pattern to prevent warping of the cover stamping.

4. Remove the pressure plate assembly to flywheel bolts.
5. Remove the pressure plate assembly and clutch disc.



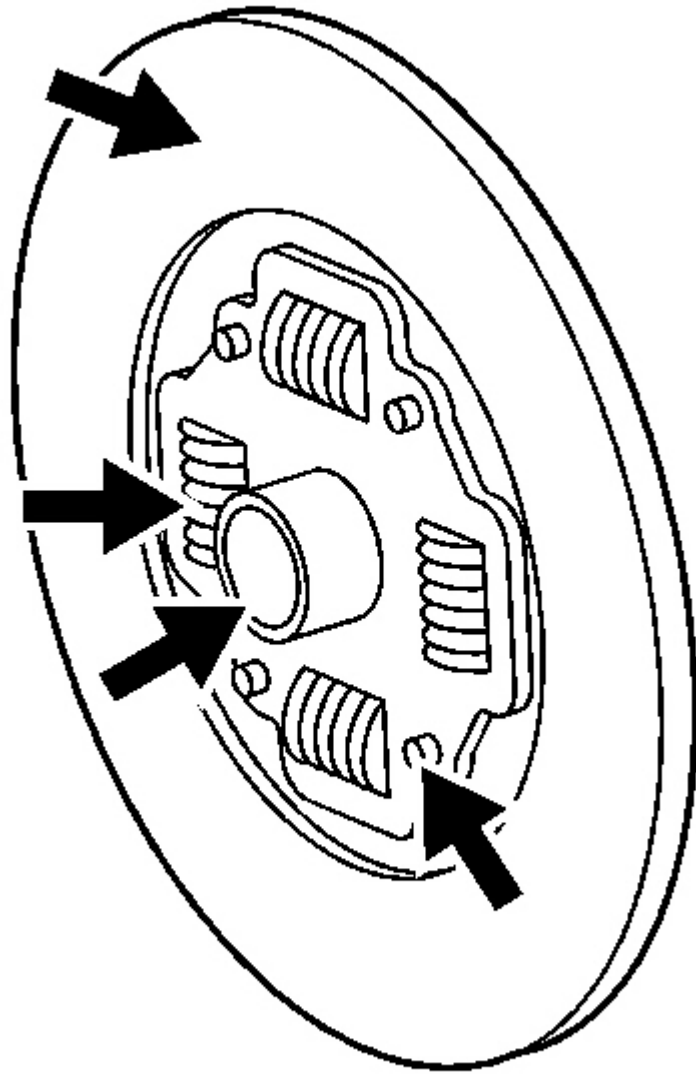
**Fig. 28: Inspecting The Clutch Pressure Plate Assembly Surface For Damage**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT: Random black spotting on the friction surface of the clutch pressure plate assembly is normal.**

6. Inspect the clutch pressure plate assembly surface for the following conditions:
  - Excessive wear
  - Chatter marks
  - Cracks
  - Overheating - indicated by blue discoloration
7. Replace the clutch pressure plate assembly if damaged.
8. Using a straight edge and a feeler gage, inspect the clutch pressure plate assembly for warpage.

**Specification:** Maximum warpage: 0.15 mm (0.006 in)



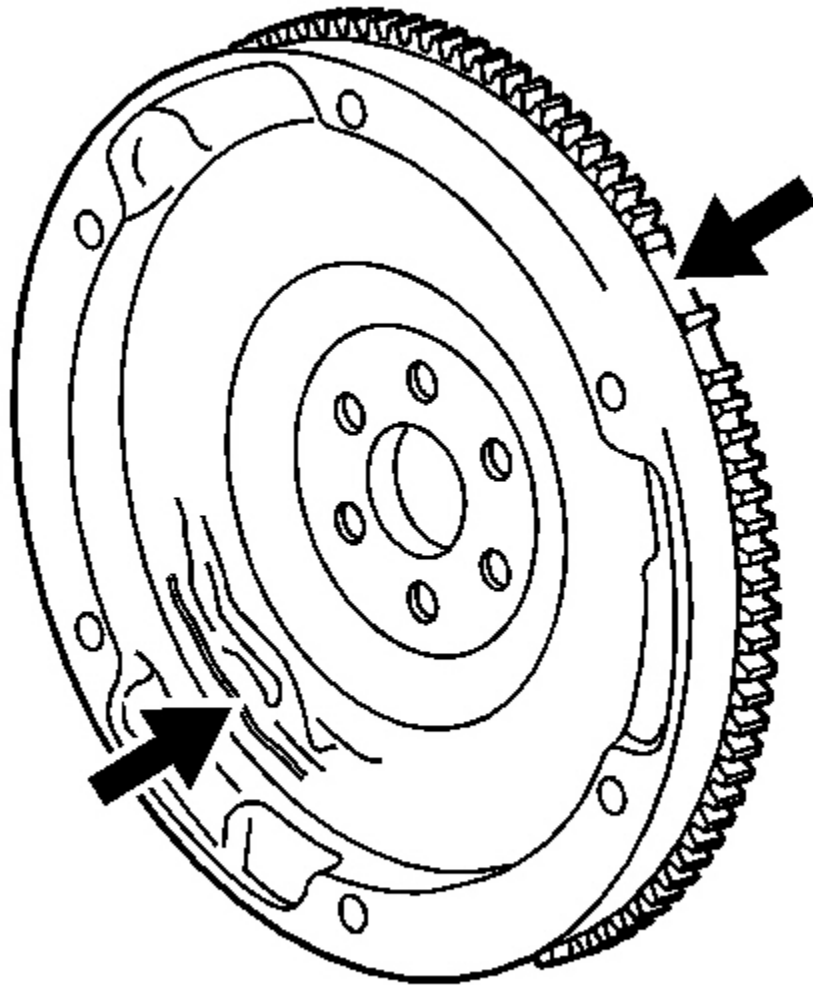


**Fig. 29: Inspecting The Clutch Disc For Damage**  
Courtesy of GENERAL MOTORS CORP.

9. Inspect the clutch disc facings for oil or burnt spots.
10. Replace the clutch disc if necessary.
11. Inspect the clutch disc for the following conditions:
  - Loose damper springs
  - Hub

- Rivets

12. Replace the clutch disc if any components are broken or excessively loose.



**Fig. 30: Inspecting The Flywheel Ring Gear For Damage**  
Courtesy of GENERAL MOTORS CORP.

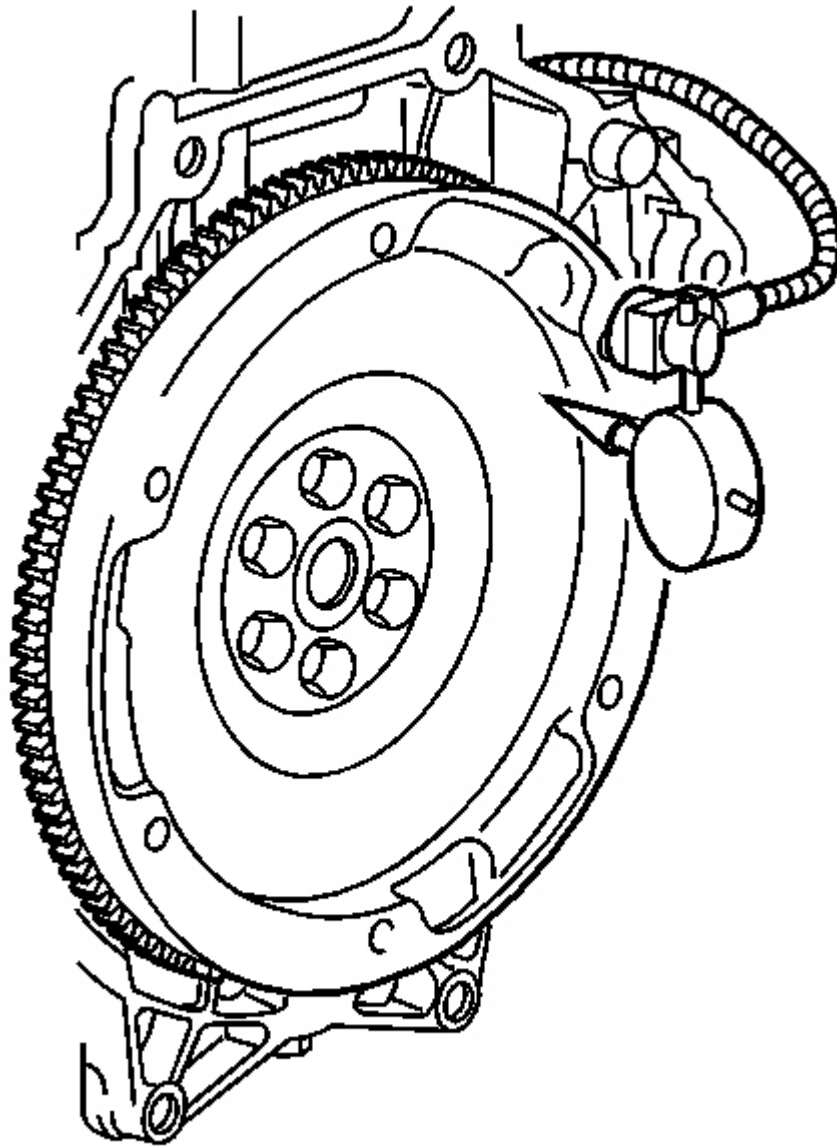
13. Inspect the flywheel ring gear for wear or damage.  
14. Replace the flywheel if damaged.

**IMPORTANT:** Random black spotting on the friction surface of the flywheel is normal.

15. Inspect the flywheel to clutch disc contact surface for the following conditions:

- Wear
- Cracks
- Chatter marks
- Overheating - indicated by blue discoloration

16. Repair or replace the flywheel if necessary.

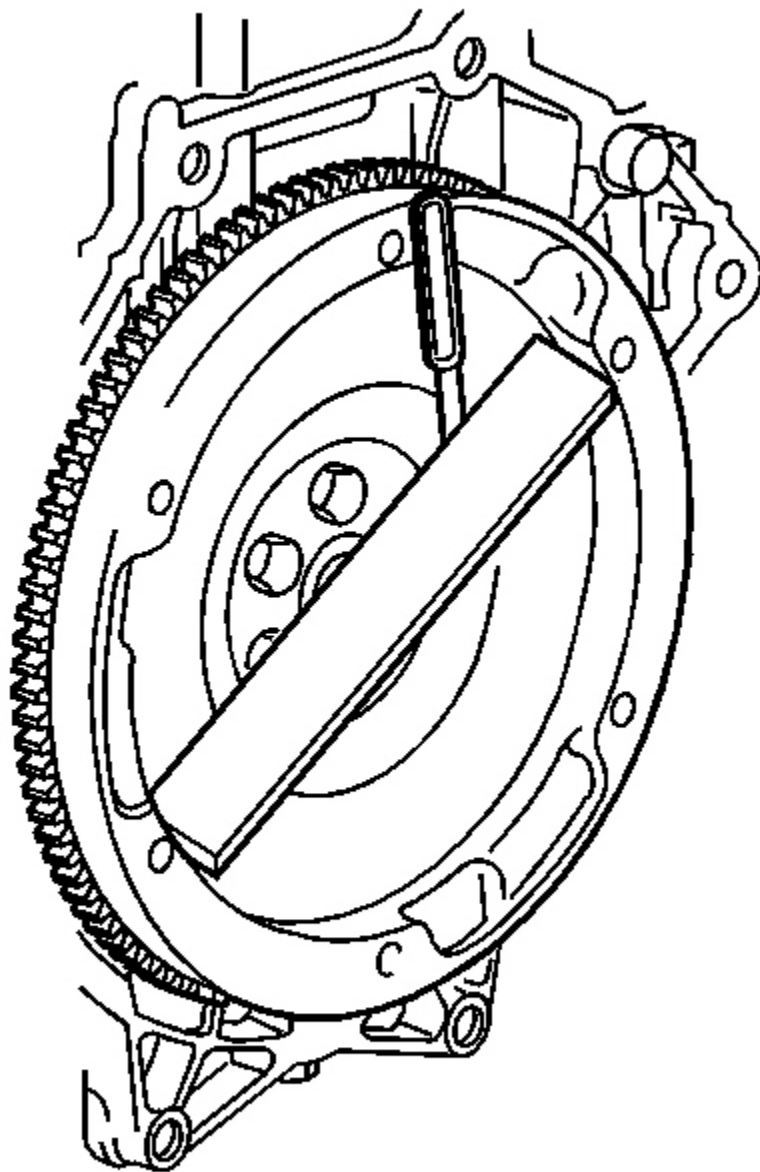


**Fig. 31: Measuring Flywheel Runout**  
Courtesy of GENERAL MOTORS CORP.

17. Using a dial indicator, for at least two revolutions, measure flywheel runout.

**Specification:** Maximum runout: 0.15 mm (0.006 in)

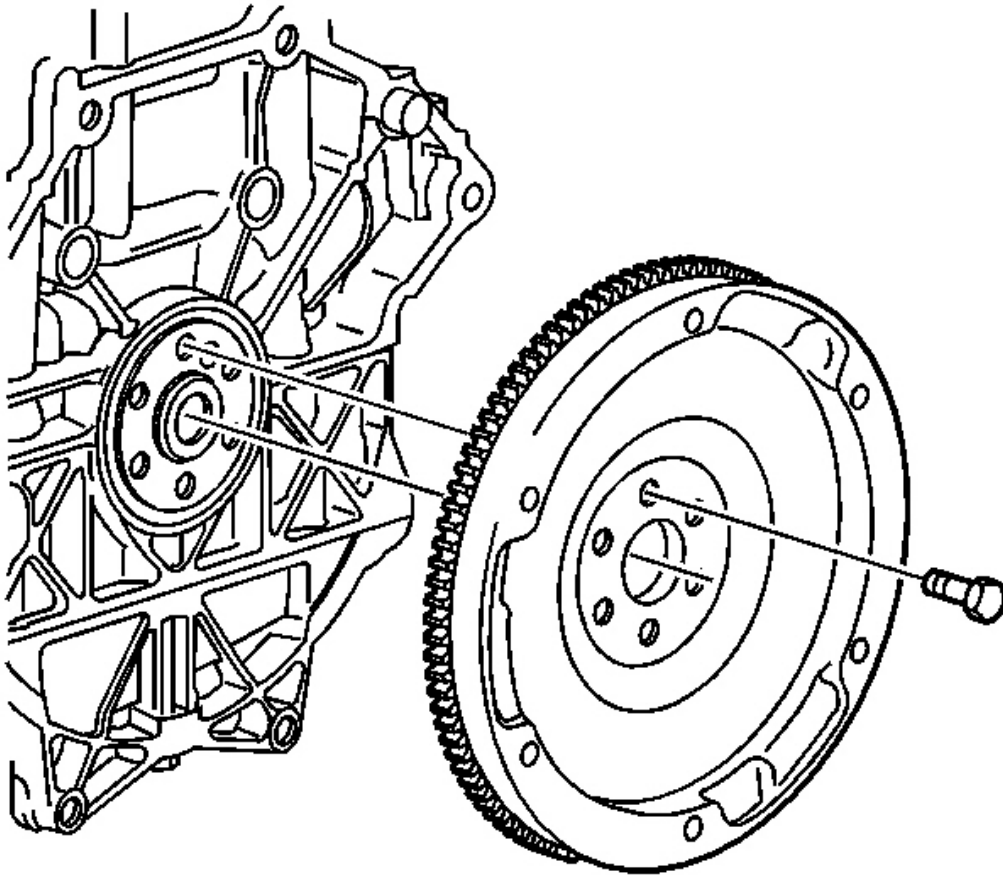
18. Repair or replace the flywheel if not within specification.



**Fig. 32: Inspecting The Flywheel For Warpage Using A Straight Edge & Feeler Gage**  
Courtesy of GENERAL MOTORS CORP.

19. Using a straight edge and a feeler gage, inspect the flywheel for warpage.

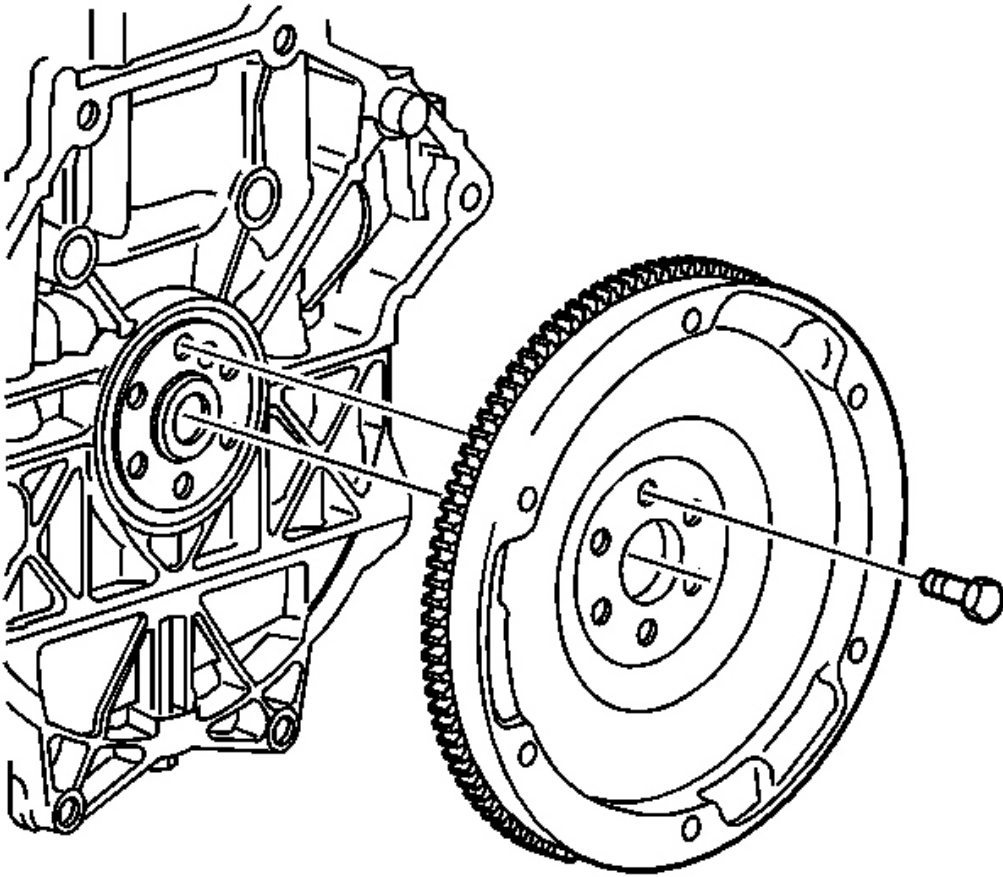
**Specification:** Maximum warpage: 0.15 mm (0.006 in)



**Fig. 33: Flywheel-To-Crankshaft Bolts**  
Courtesy of GENERAL MOTORS CORP.

20. If the flywheel is being replaced, remove and discard the flywheel-to-crankshaft bolts and remove the flywheel.

#### **Installation Procedure**

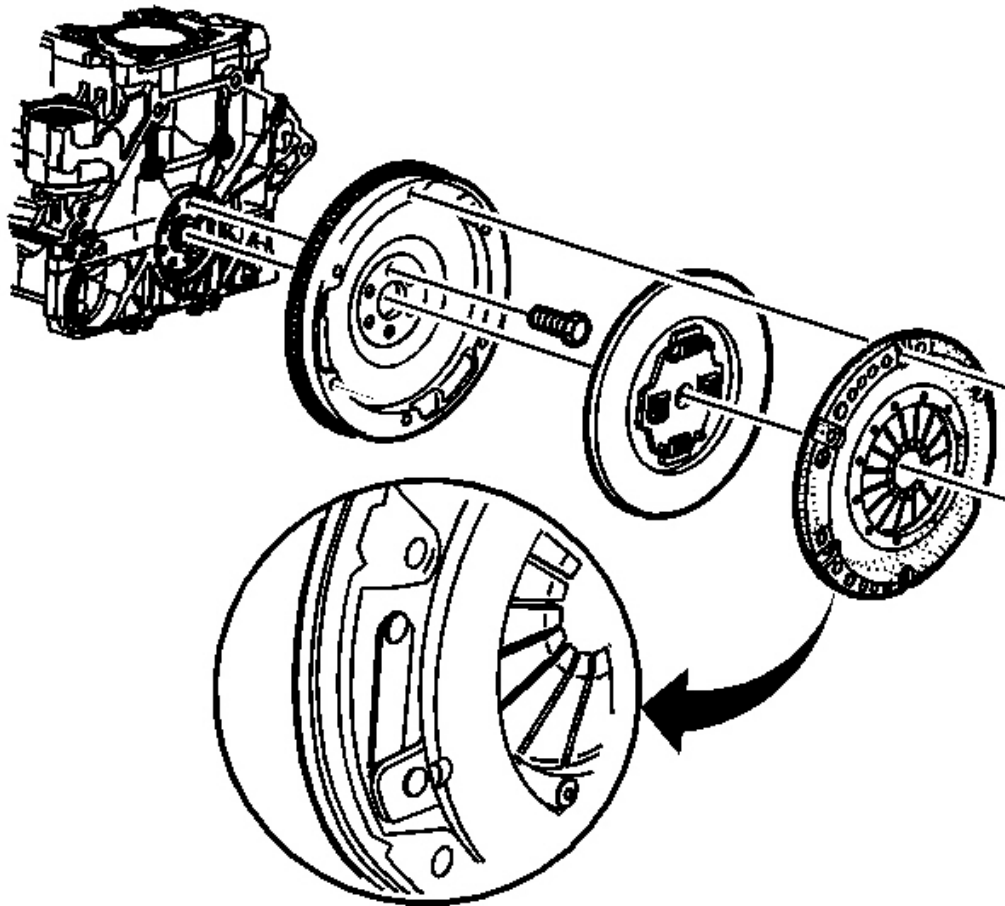


**Fig. 34: Flywheel-To-Crankshaft Bolts**  
Courtesy of GENERAL MOTORS CORP.

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

1. Install the flywheel and the new flywheel-to-crankshaft bolts. Hand start the bolts.
2. Tighten the flywheel-to-crankshaft bolts in a crisscross pattern.

**Tighten:** Tighten the bolts to 53 N.m plus 25 degrees (39 lb ft) plus 25 degrees.

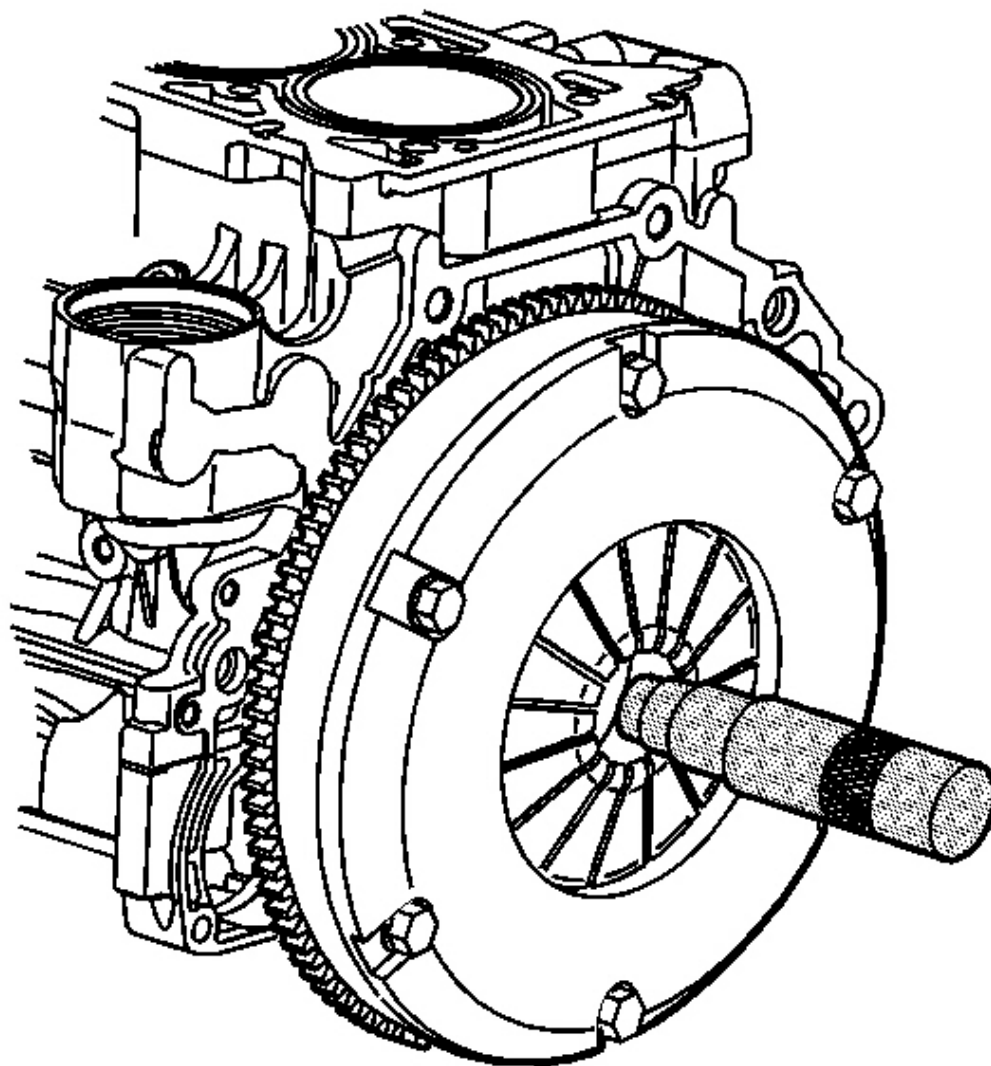


**Fig. 35: Clutch Pressure Plate & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Ensure that the straps on the clutch pressure plate fit into the slots on the flywheel, flexplate.

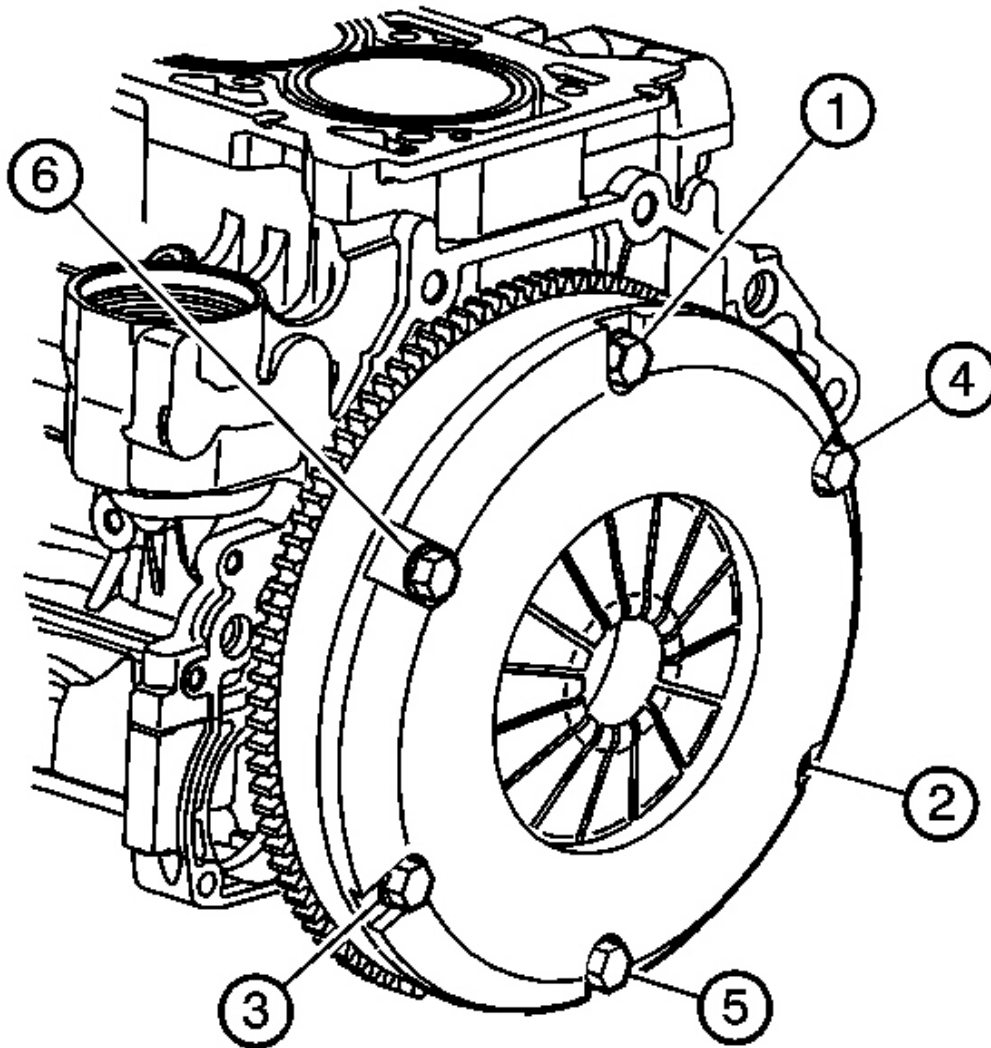
3. Install the clutch disc and the clutch pressure plate assembly to the flywheel.
4. Loosely install the clutch pressure plate bolts.





**Fig. 36: J 43482 & Clutch Disc**  
Courtesy of GENERAL MOTORS CORP.

5. Install the **J 43482** in the clutch disc and push in until it bottoms out in the crankshaft. See **Special Tools and Equipment** .



**Fig. 37: Pressure Plate Assembly & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Do not tighten the pressure plate assembly bolts more than half a turn at a time or the pressure plate assembly may warp.

6. Tighten the pressure plate assembly bolts using a progressive crisscross pattern to prevent warping of the pressure plate assembly.

**Tighten:** Tighten the bolts to 24 N.m (18 lb ft).

**IMPORTANT: Excessive amounts of lubricant on the input shaft splines can contaminate the clutch disc and cause clutch shudder.**

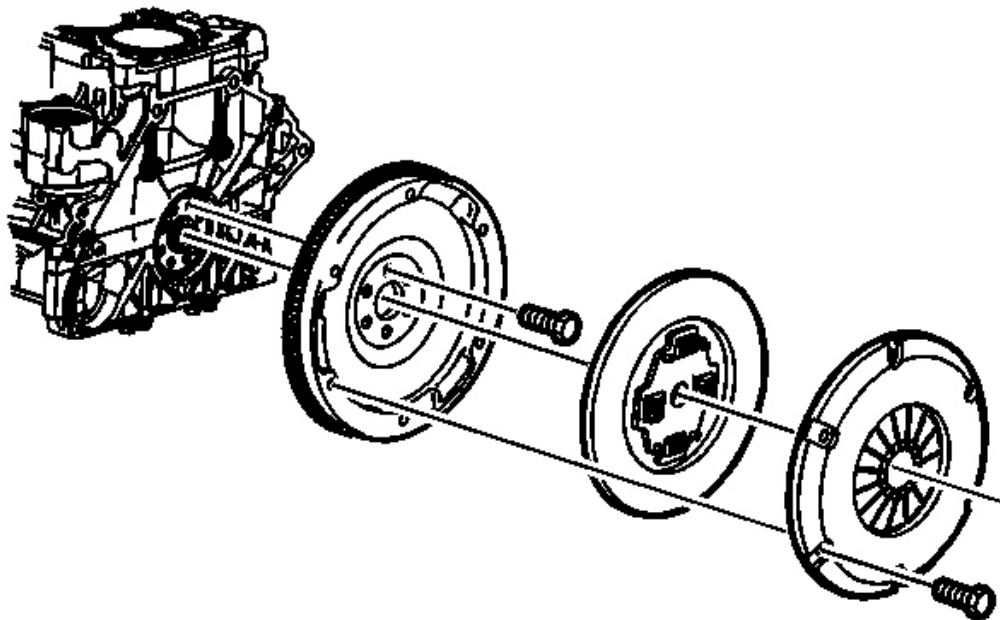
7. Lightly lubricate the input shaft splines with clutch spline lubricant P/N 21005995 or equivalent.
8. Install the transaxle. Refer to **Transmission Replacement** in Manual Transmission - Getrag-5 Speed.
9. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .

## **CLUTCH ASSEMBLY REPLACEMENT**

### **Tools Required**

**J 43482** Clutch Alignment Arbor. See **Special Tools and Equipment** .

### **Removal Procedure**



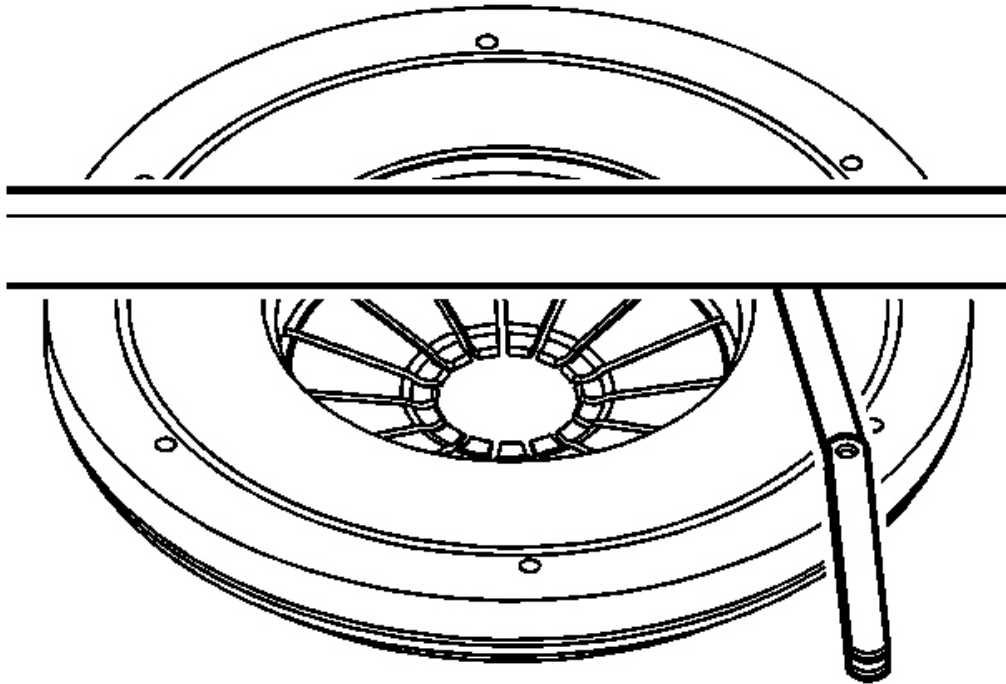
**Fig. 38: Transaxle & Actuator Release Bearing**  
Courtesy of GENERAL MOTORS CORP.

1. Remove the transaxle. Refer to **Transmission Replacement** in Manual Transmission - Getrag-5 Speed.
2. Inspect the actuator release bearing minimal bearing drag.
3. Replace the actuator assembly if no or little drag is found. Refer to **Clutch Actuator Cylinder**

## Replacement

**IMPORTANT:** Remove the bolts in a progressive crisscross pattern to prevent warping of the cover stamping.

4. Remove the pressure plate assembly to flywheel bolts.
5. Remove the pressure plate assembly and clutch disc.



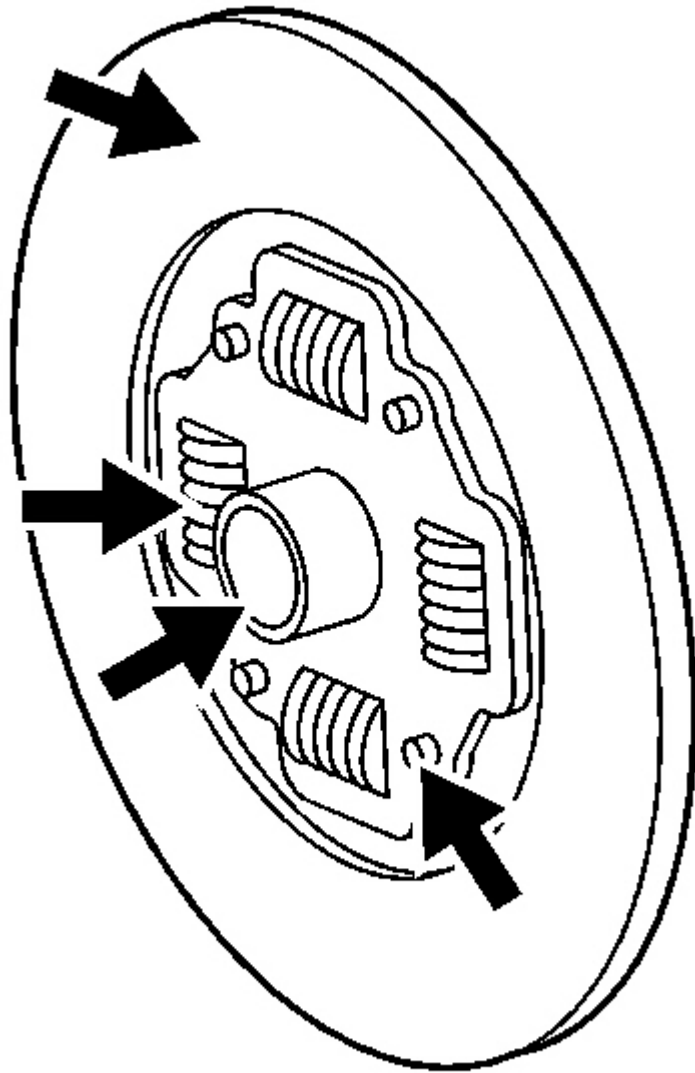
**Fig. 39: Inspecting The Clutch Pressure Plate Assembly Surface For Damage**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Random black spotting on the friction surface of the clutch pressure plate assembly is normal.

6. Inspect the clutch pressure plate assembly surface for the following conditions:
  - Excessive wear
  - Chatter marks
  - Cracks
  - Overheating - indicated by blue discoloration

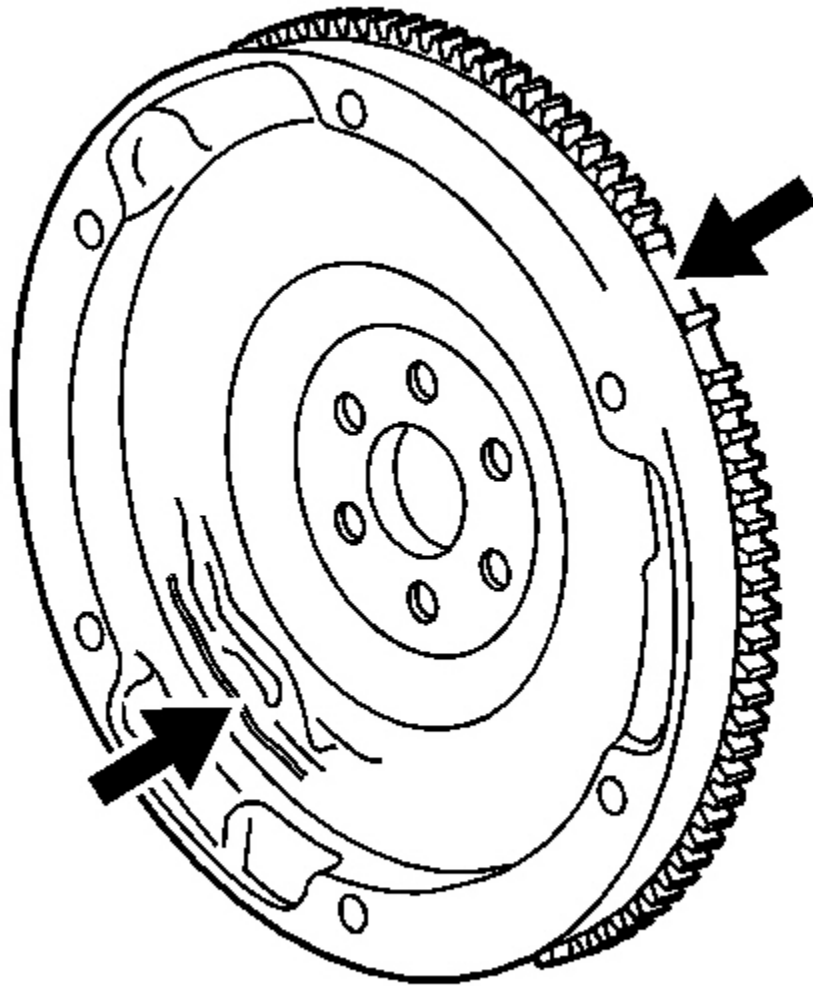
7. Replace the clutch pressure plate assembly if damaged.
8. Using a straight edge and a feeler gage, inspect the clutch pressure plate assembly for warpage.

**Specification:** Maximum warpage: 0.15 mm (0.006 in)



**Fig. 40: Inspecting The Clutch Disc For Damage**  
Courtesy of GENERAL MOTORS CORP.

9. Inspect the clutch disc facings for oil or burnt spots.
10. Replace the clutch disc if necessary.
11. Inspect the clutch disc for the following conditions:
  - Loose damper springs
  - Hub
  - Rivets
12. Replace the clutch disc if any components are broken or excessively loose.



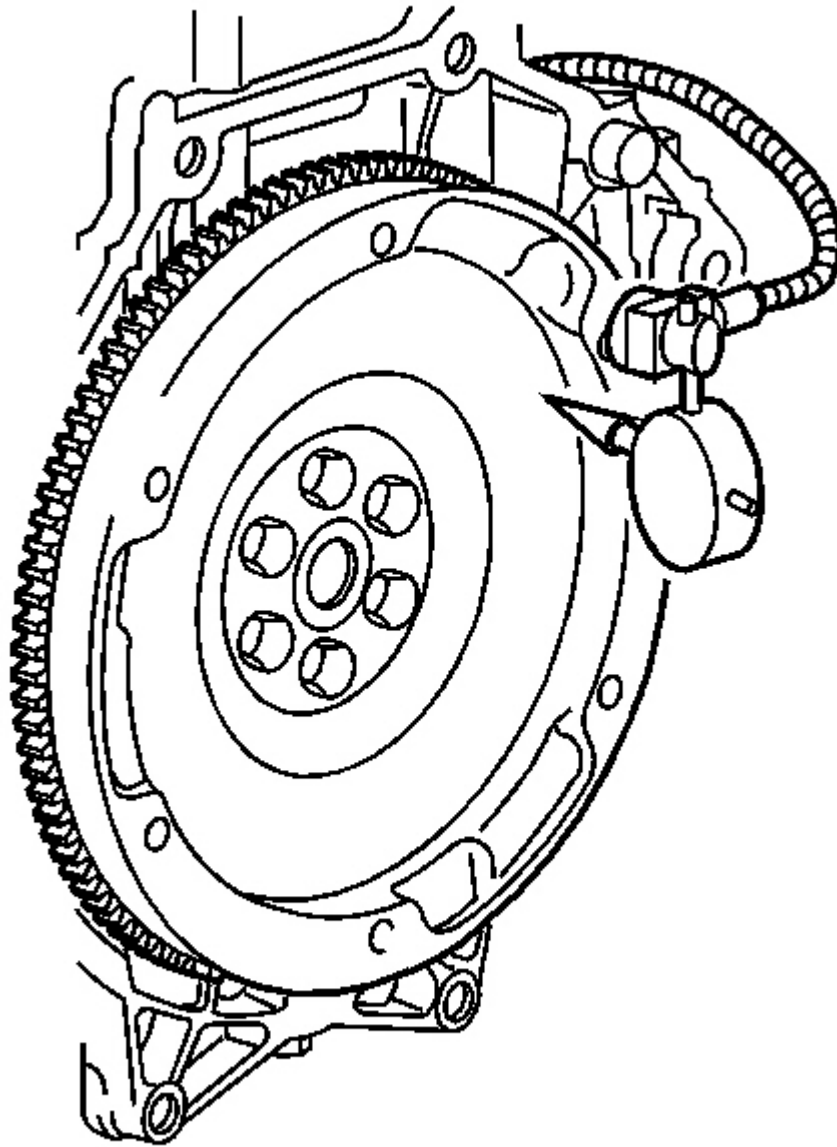
**Fig. 41: Inspecting The Flywheel Ring Gear For Damage**

**Courtesy of GENERAL MOTORS CORP.**

13. Inspect the flywheel ring gear for wear or damage.
14. Replace the flywheel if damaged.

**IMPORTANT: Random black spotting on the friction surface of the flywheel is normal.**

15. Inspect the flywheel to clutch disc contact surface for the following conditions:
  - Wear
  - Cracks
  - Chatter marks
  - Overheating - indicated by blue discoloration
16. Repair or replace the flywheel if necessary.



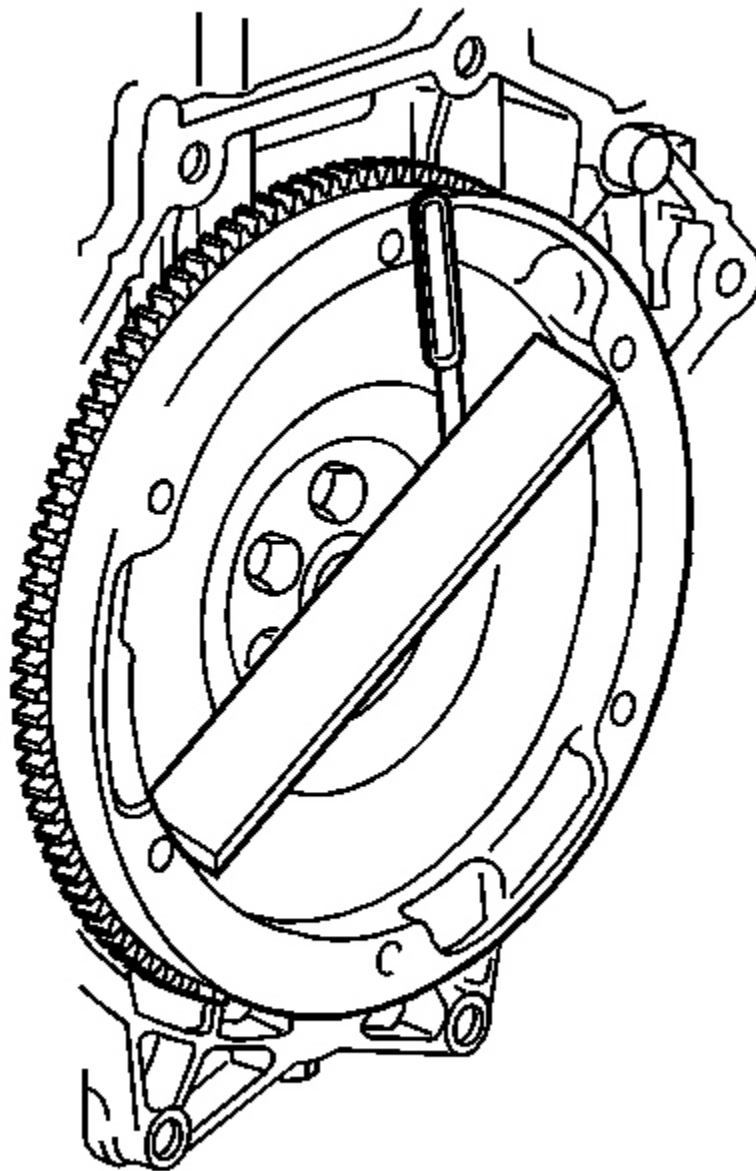
**Fig. 42: Measuring Flywheel Runout**  
Courtesy of GENERAL MOTORS CORP.

17. Using a dial indicator, for at least two revolutions, measure flywheel runout.

**Specification:** Maximum runout: 0.15 mm (0.006 in)



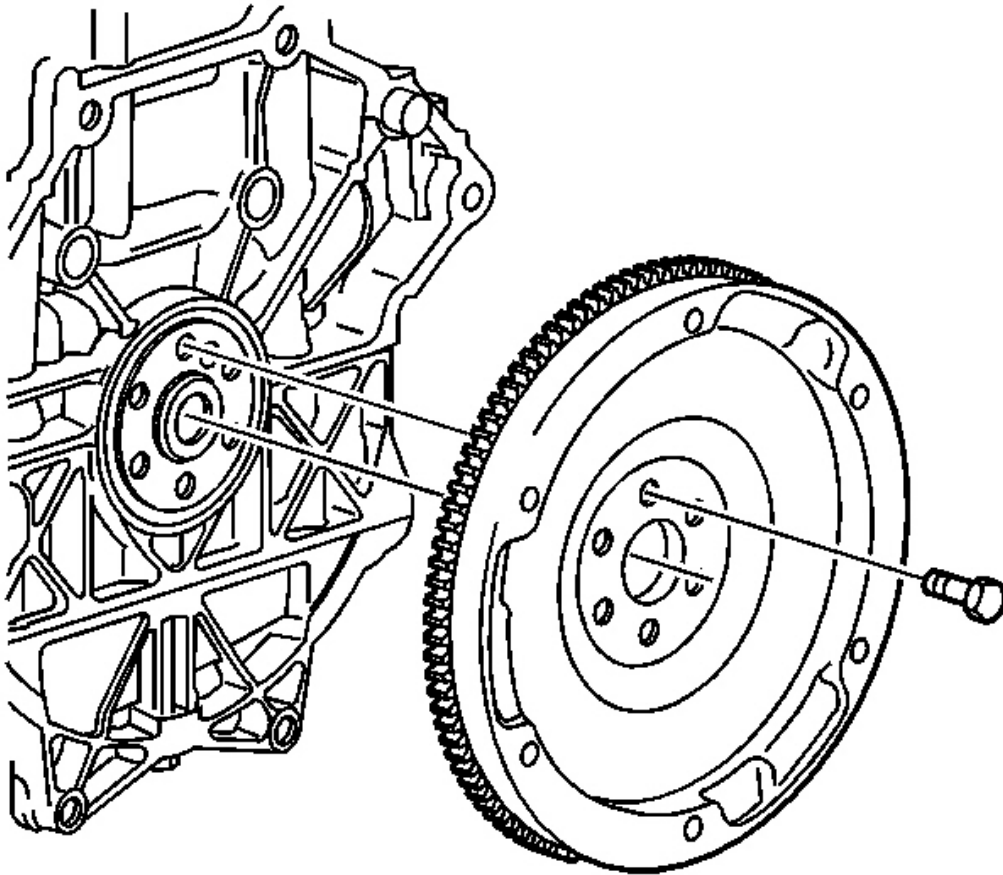
18. Repair or replace the flywheel if not within specification.



**Fig. 43: Inspecting The Flywheel For Warpage Using A Straight Edge & Feeler Gage**  
Courtesy of GENERAL MOTORS CORP.

19. Using a straight edge and a feeler gage, inspect the flywheel for warpage.

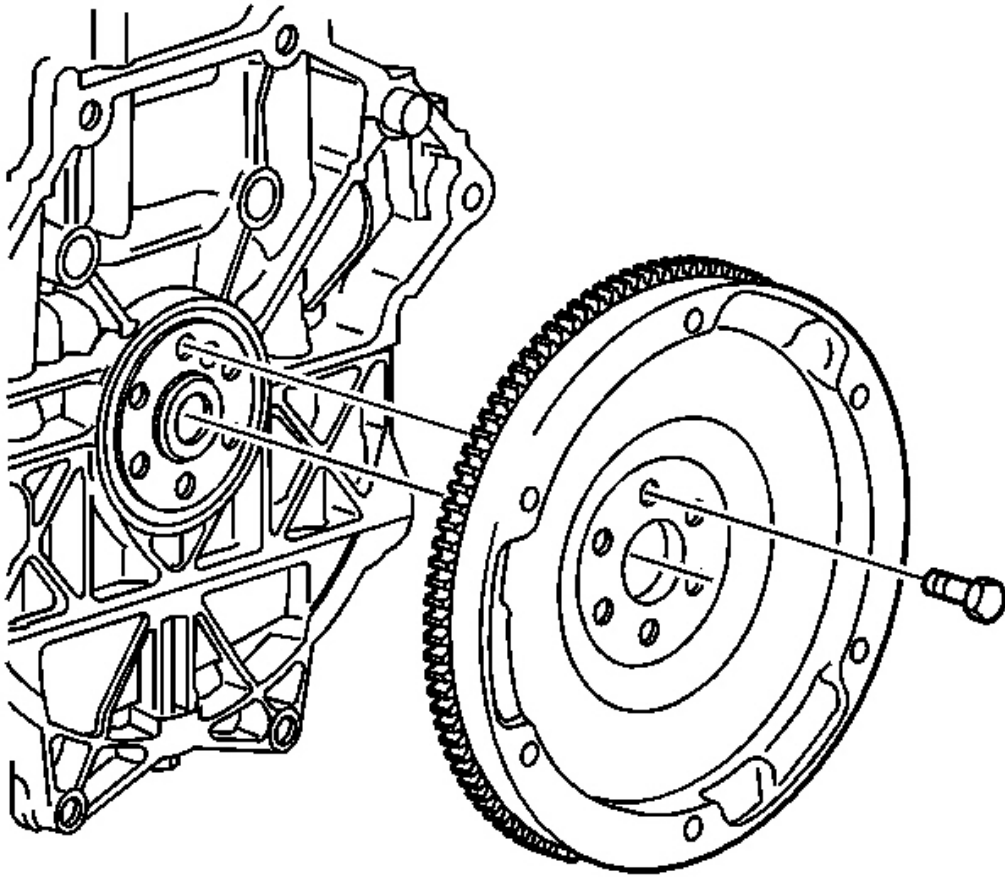
**Specification:** Maximum warpage: 0.15 mm (0.006 in)



**Fig. 44: Flywheel-To-Crankshaft Bolts**  
Courtesy of GENERAL MOTORS CORP.

20. If the flywheel is being replaced, remove and discard the flywheel-to-crankshaft bolts and remove the flywheel.

#### **Installation Procedure**

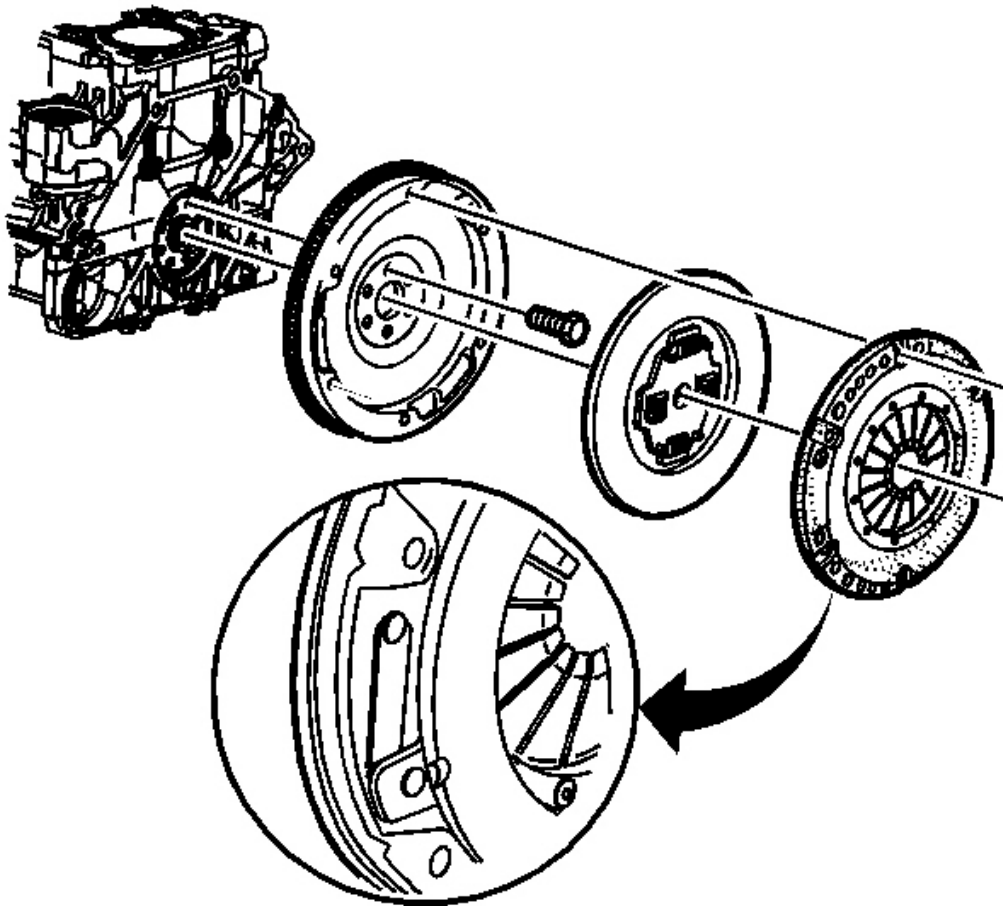


**Fig. 45: Flywheel-To-Crankshaft Bolts**  
Courtesy of GENERAL MOTORS CORP.

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

1. Install the flywheel and the new flywheel-to-crankshaft bolts. Hand start the bolts.
2. Tighten the flywheel-to-crankshaft bolts in a crisscross pattern.

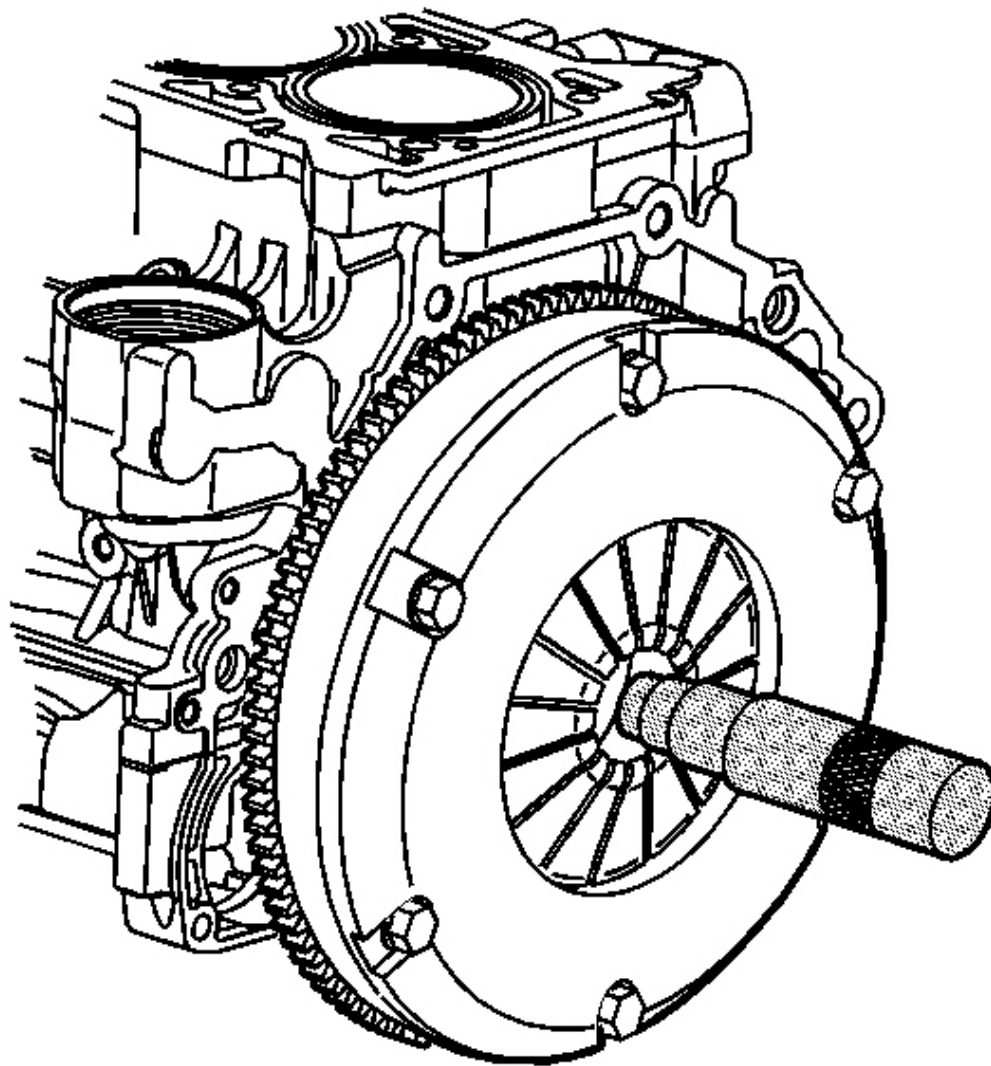
**Tighten:** Tighten the bolts to 53 N.m plus 25 degrees (39 lb ft) plus 25 degrees.



**Fig. 46: Clutch Pressure Plate & Bolts**  
Courtesy of GENERAL MOTORS CORP.

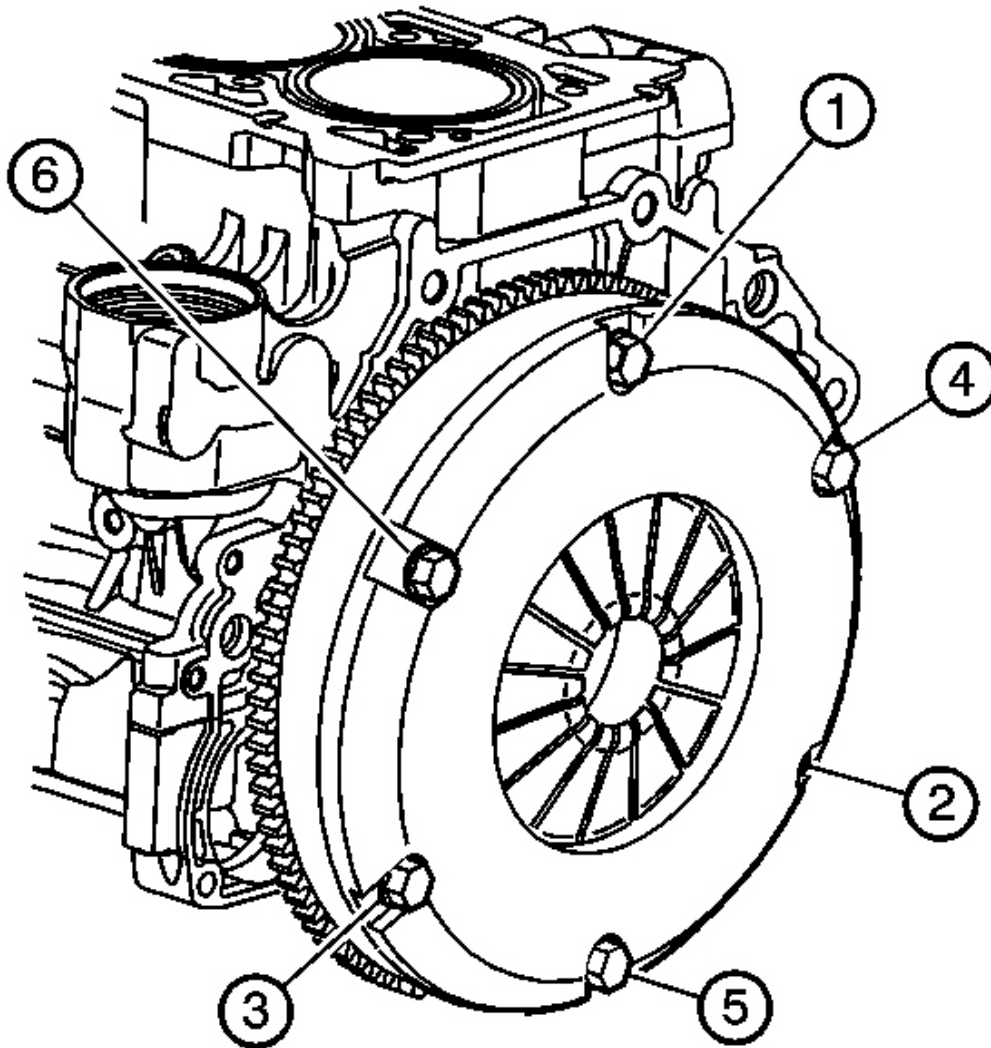
**IMPORTANT:** Ensure that the straps on the clutch pressure plate fit into the slots on the flywheel, flexplate.

3. Install the clutch disc and the clutch pressure plate assembly to the flywheel.
4. Loosely install the clutch pressure plate bolts.



**Fig. 47: J 43482 & Clutch Disc**  
Courtesy of GENERAL MOTORS CORP.

5. Install the **J 43482** in the clutch disc and push in until it bottoms out in the crankshaft. See **Special Tools and Equipment** .



**Fig. 48: Pressure Plate Assembly & Bolts**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Do not tighten the pressure plate assembly bolts more than half a turn at a time or the pressure plate assembly may warp.

6. Tighten the pressure plate assembly bolts using a progressive crisscross pattern to prevent warping of the pressure plate assembly.

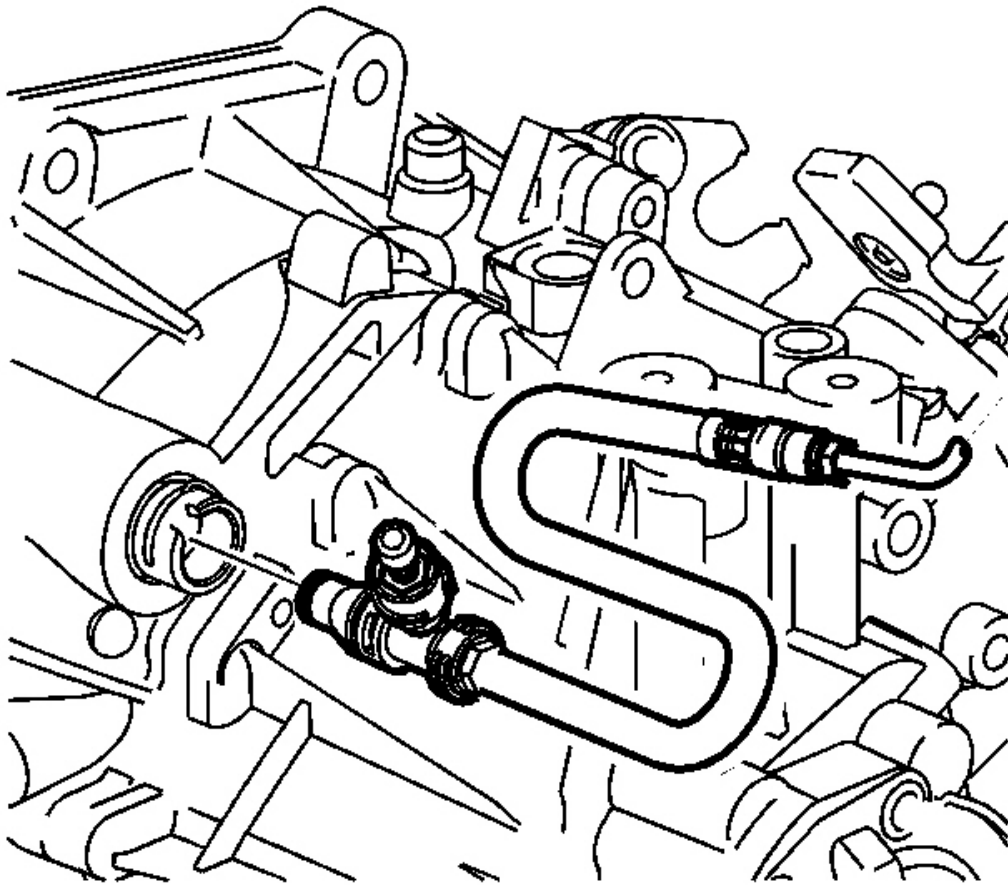
**Tighten:** Tighten the bolts to 24 N.m (17 lb ft).

**IMPORTANT: Excessive amounts of lubricant on the input shaft splines can contaminate the clutch disc and cause clutch shudder.**

7. Lightly lubricate the input shaft splines with clutch spline lubricant P/N 21005995 or equivalent.
8. Install the transaxle. Refer to **Transmission Replacement** in Manual Transmission - Getrag-5 Speed.
9. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .

## **CLUTCH ACTUATOR CYLINDER REPLACEMENT**

### **Removal Procedure**

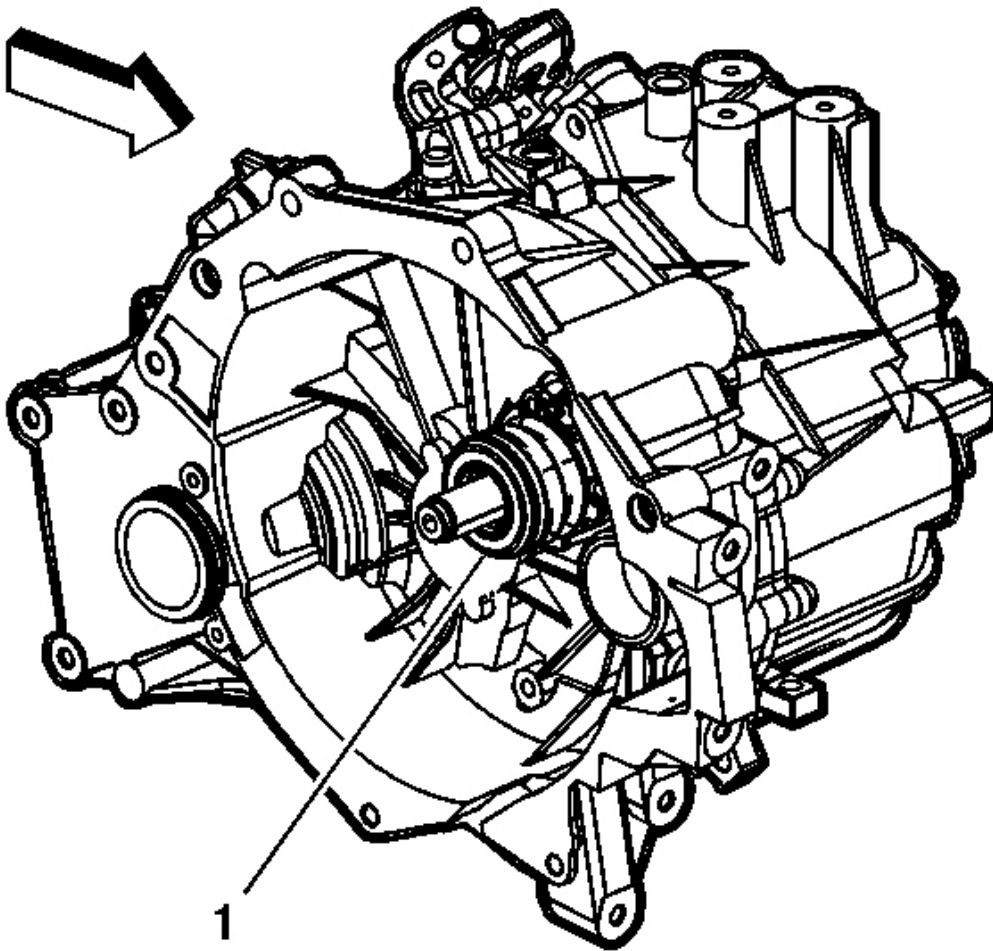


**Fig. 49: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the clutch master cylinder line from the transaxle by removing the C-clip.

2. Remove the transaxle. Refer to **Transmission Replacement** in Manual Transmission - Getrag-5 Speed.
3. Remove the clutch actuator cylinder bolts from the transaxle.
4. Remove the clutch actuator cylinder.

#### Installation Procedure



**Fig. 50: Clutch Actuator Cylinder & Transaxle**  
Courtesy of GENERAL MOTORS CORP.

**IMPORTANT:** Excessive amounts of lubricant on the input shaft splines can contaminate the clutch disc and cause clutch shudder.



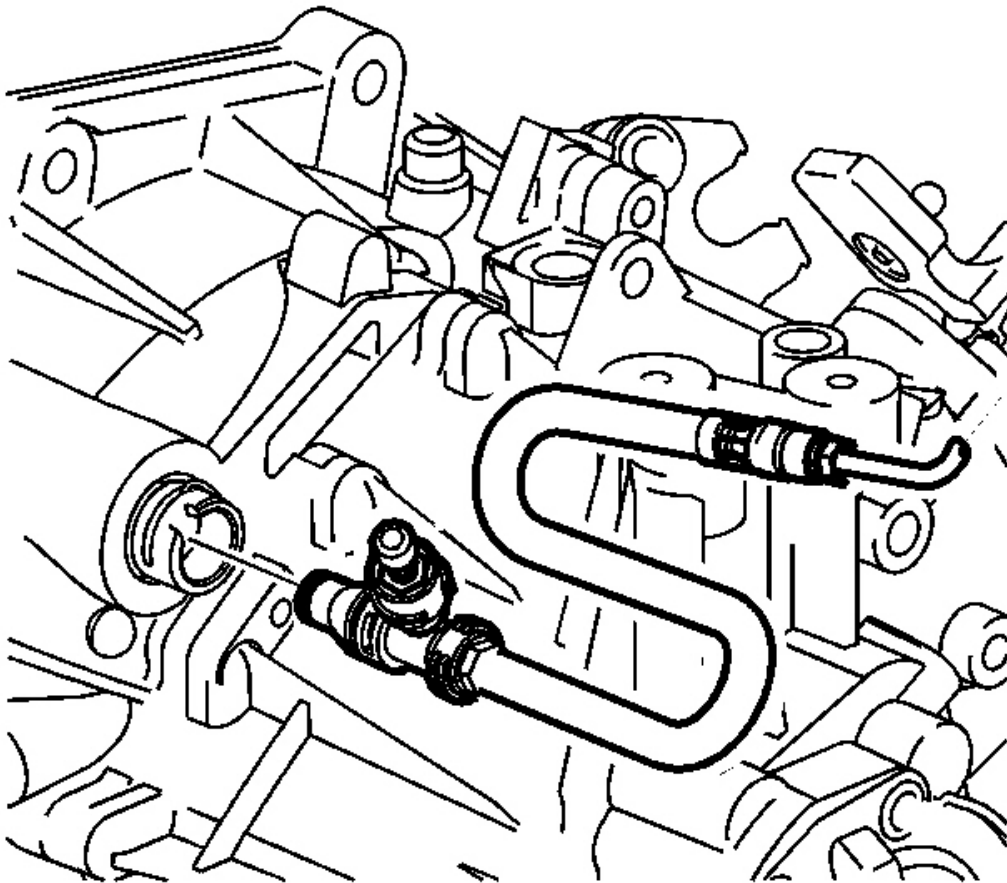
1. Lightly lubricate the inside diameter of the bearing with input shaft lubricant P/N 21005995 or equivalent.
2. Install the clutch actuator cylinder (1) to the transaxle.

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

3. Install the clutch actuator cylinder bolts.

**Tighten:** Tighten the bolts to 10 N.m (89 lb in).

4. Install the transaxle. Refer to **Transmission Replacement** in **Manual Transmission - Getrag-5 Speed**.



**Fig. 51: Clutch Line & Clutch Master Cylinder**  
Courtesy of GENERAL MOTORS CORP.

5. Connect the clutch master cylinder line to the transaxle by pushing it in until it seats.
6. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .

## **DESCRIPTION AND OPERATION**

### **CLUTCH SYSTEM DESCRIPTION AND OPERATION**

#### **Clutch Spin Down Time**

Check the clutch spin down time as follows:

1. Apply the parking brake. Block the vehicle wheels.
2. Shift the manual transmission into neutral.
3. Start the engine. Run the engine at idle speed.
4. Engage the clutch.
5. Disengage the clutch. Wait 9 seconds.
6. Shift the transmission into reverse.

#### **Clutch Driving Members**

The clutch driving members are 2 flat surfaces machined to a smooth finish. They are:

- The rear face of the engine flywheel
- The front face of the clutch pressure plate

#### **Clutch Driven Members**

The driven member is the clutch driven plate. The clutch driven plate has a splined hub. The splined hub slides lengthwise along the splines of the input shaft. The splined hub drives the input shaft through these same splines. The driving and driven members are held together with a spring pressure. This pressure is exerted by a diaphragm spring in the clutch pressure plate.

#### **Hydraulic Clutch Fluid**

**NOTE: Do not use mineral or paraffin-base oil in the clutch hydraulic system. These fluids may damage the rubber parts in the cylinders.**

#### **Hydraulic Clutch Operating Members**

The clutch system consists of the following components:

- A master cylinder with a reservoir
- A switch
- An actuator cylinder connected to hydraulic tubing

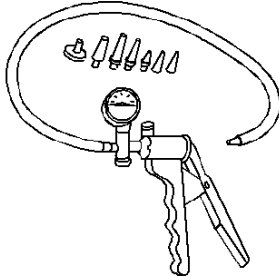
- The pressure plate
- The clutch cover
- The diaphragm springs
- The clutch disc
- The torsional springs

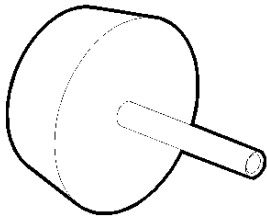
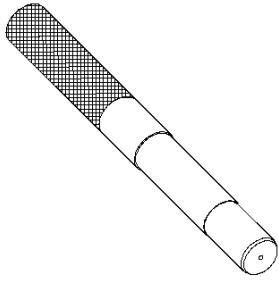
With the depression of the clutch pedal, the clutch master cylinder becomes pressurized from the force of the push rod into the master cylinder. This forces hydraulic fluid into the tubing from the master cylinder to the actuator cylinder. The actuator cylinder then pushes the release bearing into the diaphragm spring to disengage the clutch. A hole in the cowl panel accommodates the master cylinder. A quick connect coupling helps route the hydraulic tubing. The actuator cylinder is inside the transmission and on the input bearing retainer. The hydraulic control system can be replaced without having to gain access to the clutch system internal components, simply engage the quick connect coupling mounted through the transmission housing. No adjustments to the clutch system are necessary. As the clutch wears, the fluid level in the master cylinder reservoir changes to compensate for clear wear. A new system will have fluid in the reservoir. An electrical switch on the push rod has two functions. One function is a clutch interlock, ensuring the engine does not start unless the clutch pedal is engaged, positioned to the floor. The second function is to cut off the cruise-control system, if equipped, when the clutch pedal is engaged. Some systems may have a clutch pedal hold down assist spring. Its purpose is to keep the clutch pedal depressed. This reduces driver fatigue during stop and go traffic.

## SPECIAL TOOLS AND EQUIPMENT

### SPECIAL TOOLS

#### Special Tools

Illustration	Tool Number/Description
	<p>J 23738-A Mityvac</p>
	<p>J 43482 Clutch Alignment Arbor</p>



J 45727  
Power Steering Stopper