

TRANSMISSION

Clutch - Canyon, Colorado

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Clutch Actuator Cylinder Bolt	10 N.m (89 lb in)
Clutch Master Cylinder	23 N.m (17 lb ft)
Clutch Pedal Assembly Nut	23 N.m (17 lb ft)
Clutch Pressure Plate Bolt	40 N.m (30 lb ft)

SEALERS AND LUBRICANTS

Application	Type of Material	GM Part Number	
		United States	Canada
Hydraulic Brake System	DOT 3 Motor Vehicle Brake Fluid	19299818	19299819

DIAGNOSTIC INFORMATION AND PROCEDURES

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 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.

Intermittent

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

Symptom List

ptom 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. Review the <u>Symptoms - Clutch</u> and perform the necessary inspections.	
Pedal blocked from full travel	1. Inspect for obstacles that prevent the pedal from going to the floor. 2. Clear any obstacles from under the pedal area, such as floor mats or interior panels.
Excessive travel between pedal and clutch master cylinder	1. Inspect the pedal for worn bushings. 2. Replace the pedal if the bushings are worn. Refer to <u>Clutch Pedal Replacement</u>.
Clutch pedal mounting loose	1. Inspect the clutch pedal mounting bracket for loose or missing fasteners. 2. Replace or repair the fasteners. Refer to <u>Clutch Pedal Replacement</u>.
Linkage at pedal worn or damaged	1. Inspect the linkage at the pedal for excessive wear. 2. Repair or replace the linkage, as required. Refer to <u>Clutch Master Cylinder Replacement</u>.
Clutch master cylinder seized or binding	1. Inspect the master cylinder for the piston being able to move freely and full range of travel. 2. Repair or replace the clutch master cylinder, as required. Refer to <u>Clutch Master Cylinder Replacement</u>.
Air in the clutch hydraulic system	Bleed the clutch hydraulic system. Refer to <u>Hydraulic Clutch System Bleeding</u> .

Cause	Action
Clutch actuator cylinder seized or binding	1. Inspect the clutch actuator piston for moving freely. 2. Replace the clutch actuator cylinder if the piston is binding. Refer to Clutch Actuator Cylinder Replacement.
Clutch master cylinder leaking internally	1. Inspect for proper pedal reserve. Refer to Clutch System Description and Operation. 2. Replace the clutch master cylinder if it will not hold pedal reserve. Refer to Clutch Master Cylinder Replacement.
Damaged clutch assembly components	1. Remove the clutch assembly. 2. Inspect the following clutch assembly components for damage: • Damaged clutch disc hub splines • Bent clutch disc • Bent drive straps • Broken or warped pressure plate 3. Replace the clutch assembly if any of the above damage is found. Refer to Clutch Assembly Replacement.
Excessive side loading on the release bearing	1. Inspect the following clutch system components: • Worn or damaged pilot bearing • Excessive flywheel runout • Excessive engine to transmission misalignment 2. Repair or replace any faulty components.
Faulty pilot bearing	Replace the pilot bearing. Refer to Clutch Pilot Bearing Replacement .
Transmission input shaft splines worn or damaged	Replace the transmission input shaft. Refer to Transmission Disassemble .
Tight or contaminated clutch disc splines	1. Clean the clutch disc and input shaft splines. 2. If the clutch disc will not clean, replace the clutch assembly. Refer to Clutch Assembly Replacement.

Cause	Action
Flywheel housing, engine block to clutch housing, or transmission front case excessively misaligned	1. Inspect the transmission front case for being faulty. 2. Replace the transmission clutch housing. Refer to Transmission Disassemble.
Grease or oil contamination on the clutch discs facing	1. Repair the oil leak. 2. Repair the grease leak. 3. Clean the clutch disc facing and the other clutch assembly components. 4. Replace the clutch assembly if it will not clean. Refer to Clutch Assembly Replacement.

CLUTCH SLIPPING

Cause	Action
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. Review the Symptoms - Clutch and perform the necessary inspections.	
Incorrect clutch pedal height, not allowing the clutch master cylinder to return	Adjust the clutch release switch. Refer to Clutch Pedal Cruise Control Release Switch Replacement.
Clutch pedal binding or sticking	1. Clear away any items that may be contacting the pedal. 2. Inspect the pedal bushings for ease of movement. 3. Replace the clutch pedal if it is faulty. Refer to Clutch Pedal Replacement.
Clutch master cylinder binding or seized	Replace the clutch master cylinder. Refer to Clutch Master Cylinder Replacement .
Clutch actuator cylinder binding or seized	Replace the clutch actuator cylinder. Refer to Clutch Actuator Cylinder Replacement .

Cause	Action
Kinked or damaged clutch hydraulic hose	1. Inspect for the correct routing of the clutch hydraulic hose. 2. Route the hose properly. 3. Inspect for loose or faulty engine mounts that may allow the hydraulic hose to be kinked or pinched. 4. Repair or replace faulty engine mounts. Refer to Engine Mount Replacement - Left Side , and Engine Mount Replacement - Right Side , for the 2.5L diesel engine or, Engine Mount Replacement - Left Side , and Engine Mount Replacement - Right Side for the 3.6L engine. 5. Repair or replace the clutch hydraulic hose if it is damaged. Refer to Clutch Master Cylinder Replacement.
Grease or oil contamination of the clutch disc	1. Repair the source of the oil leak. 2. Repair the source of the grease leak. 3. Clean the contamination from the clutch components. 4. If contaminants cannot be removed, replace the clutch assembly. Refer to Clutch Assembly Replacement.
Worn or damaged flywheel	Replace the engine flywheel. Refer to Engine Flywheel Replacement for the 2.5L diesel engine.
Worn clutch disc facing	Replace the clutch assembly. Refer to Clutch Assembly Replacement .
Burnt or glazed clutch discs	Replace the clutch assembly. Refer to Clutch Assembly Replacement .
Input shaft splines worn	Replace the input shaft. Refer to Transmission Disassemble .
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 Engine Flywheel Replacement for the 2.5L diesel engine.

CLUTCH GRABBING

Cause	Action
DEFINITION: The clutch grabs, or chatters, or the clutch is unable to release without the vehicle jerking. An abrupt engagement of the clutch. Review the Symptoms - Clutch and perform the necessary inspections.	

Cause	Action
Grease or oil contamination on the clutch facings	1. Repair the cause of the oil leak or grease contamination. 2. Clean the clutch facings. 3. Replace the clutch components if they will not clean. Refer to Clutch Assembly Replacement.
Loose or faulty engine mounts	1. Inspect the engine mounts for being loose or faulty. Refer to Engine Mount Inspection , for the 2.5L engine or, Engine Mount Inspection for the 3.6L engine. 2. Repair or replace the engine mounts as required. Refer to Engine Mount Replacement - Left Side , and Engine Mount Replacement - Right Side , for the 2.5L engine or, Engine Mount Replacement - Left Side , and Engine Mount Replacement - Right Side for the 3.6L engine.
Clutch pedal sticking	1. Inspect the clutch pedal for correct operation. 2. Replace the clutch pedal if it is faulty. Refer to Clutch Pedal Replacement.
Clutch actuator cylinder binding	1. Inspect the clutch actuator cylinder for the piston seals binding or sticking on the hub. 2. Replace the clutch actuator cylinder if it is binding. Refer to Clutch Actuator Cylinder Replacement.
Clutch master cylinder binding	1. Inspect the clutch master cylinder for the piston binding or sticking in the cylinder. 2. Replace the master cylinder if it is faulty. Refer to Clutch Master Cylinder Replacement.
Improper clutch installation	1. Inspect for the following conditions: • The pressure plate for distortion caused by improperly tightening the pressure plate bolts • The clutch disc for a bent hub caused by forcing the installation of the transmission • The correct clutch disc • The clutch disc for being installed backwards 2. Replace the clutch assembly if it is damaged, or if the wrong components were installed. Refer to Clutch Assembly Replacement.

Cause	Action
Clutch disc binding on the input shaft	1. Inspect for the following conditions: • The input shaft for rust dirt or debris • The clutch disc for a bent hub • The input shaft for excessive wear on the splines, causing the clutch disc to bind 2. Repair or replace the following components if found faulty. • Clean and lubricate the input shaft. • Replace the clutch assembly if the clutch disc is faulty. Refer to Clutch Assembly Replacement. • Replace the transmission input shaft if it is worn. Refer to Transmission Disassemble.
Clutch pressure plate damaged	1. Inspect the pressure plate for bent drive straps caused by improper vehicle use. 2. Replace the clutch assembly if the clutch pressure plate is damaged. Inform the customer. Refer to Clutch Assembly Replacement.
Flywheel improperly machined	1. Inspect the flywheel for being machined, and causing interference with the clutch disc. 2. Replace the flywheel if it is faulty. Refer to Engine Flywheel Replacement for the 2.5L engine.
Flywheel uneven	1. Inspect the flywheel surface for being warped or uneven. 2. Replace the flywheel if it is faulty. Refer to Engine Flywheel Replacement for the 2.5L engine.

CLUTCH RATTLE

Cause	Action
DEFINITION: A rattle noise coming from the clutch components with the clutch disengaged or engaged. Review the Symptoms - Clutch and perform the necessary inspections.	
Idle rattle clutch engaged	Replace the clutch disc, due to faulty damper springs. Refer to Clutch Assembly Replacement .
Clutch is improperly installed	Remove the clutch and install it correctly. Refer to Clutch Assembly Replacement .

Cause	Action
Clutch disc damper worn or damaged	1. Inspect the clutch disc for a broken or worn damper. 2. Replace the clutch assembly. Refer to Clutch Assembly Replacement.
Clutch disc splines and input shaft splines worn	1. Inspect the clutch disc hub to input shaft splines for excessive clearance. 2. Replace the clutch assembly if the clutch splines are worn. Refer to Clutch Assembly Replacement. 3. Replace the input shaft. Refer to Transmission Disassemble.

CLUTCH NOISY

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

CLUTCH PEDAL SPONGY LOW PEDAL EFFORT

Cause	Action
DEFINITION: The clutch pedal may feel spongy, or it requires very little effort to operate. Review Symptoms - Clutch and perform the necessary inspections.	
Air in the hydraulic system	Bleed the clutch hydraulic system. Refer to Hydraulic Clutch System Bleeding .
Master cylinder fluid level low	1. Inspect for leakage in the clutch master cylinder, hose connections, and the clutch actuator. 2. Repair or replace any faulty components.
Incomplete pedal return	1. Inspect the pedal for full return. 2. Clear any obstacles that may interfere with the pedal operation. 3. Adjust the clutch release switch. Refer to Clutch Pedal Cruise Control Release Switch Adjustment.
Clutch incorrectly installed	Remove the clutch and install it correctly. Refer to Clutch Assembly Replacement .

Cause	Action
Clutch mounting bolts loose or broken	1. Remove the broken bolts. 2. Replace the broken or loose bolts, and tighten. Refer to Clutch Assembly Replacement.
Release bearing worn or damaged	Replace the release bearing. Refer to Clutch Actuator Cylinder Replacement .
Contaminated hydraulic fluid	1. Inspect for the following conditions: • The clutch hydraulic fluid for contamination of water • The reservoir cap for being faulty if water is present • The clutch hydraulic fluid for dirt or debris 2. Flush and bleed the clutch hydraulic system if the above conditions are found. Refer to Hydraulic Clutch System Bleeding.

CLUTCH PEDAL HARD TO PUSH

Cause	Action
DEFINITION: The clutch pedal requires high effort to operate. Review the Symptoms - Clutch and perform the necessary inspections.	
Incorrect hydraulic fluid	1. Inspect for the correct fluid in the master cylinder. Refer to Hydraulic Clutch System Bleeding. 2. Flush the hydraulic system and fill with the correct fluid.
Contaminated hydraulic fluid	1. Inspect the hydraulic fluid for water. 2. Inspect the hydraulic fluid for dirt or debris. 3. Flush the hydraulic system and fill with the correct fluid. Refer to Hydraulic Clutch System Bleeding.
Clutch pedal binding	1. Inspect the pedal for binding. 2. Repair or replace the pedal. Refer to Clutch Pedal Replacement.
Kinked or damaged clutch hydraulic pipe	1. Inspect for a kinked or damaged hydraulic hose. 2. Repair or replace the clutch hydraulic hose. Refer to Clutch Master Cylinder Replacement.
Clutch disc worn too thin	Replace the clutch assembly. Refer to Clutch Assembly Replacement .

BRATION Cause

Action

Cause	Action
DEFINITION: Vibration from the clutch components during disengagement or engagement. Review the Symptoms - Clutch and perform the necessary inspections.	
Excessive driveline torsional activity	Review the Vibration Analysis - Driveline .
Clutch incorrectly installed	Remove the clutch and install it correctly. Refer to Clutch Assembly Replacement .
Pilot bearing worn or damaged	1. Replace the pilot bearing. Refer to Clutch Pilot Bearing Replacement. 2. Inspect the input shaft pilot bearing journal for wear or damage. 3. Replace the input shaft if damaged or worn. Refer to Transmission Disassemble .
Transmission input splines worn or damaged	1. Inspect the clutch disc to input splines for wear or damage. 2. Replace the input shaft if the splines are excessively worn. Refer to Transmission Disassemble .
Clutch disc facings damaged	Replace the clutch assembly. Refer to Clutch Assembly Replacement .
Flywheel housing to clutch housing excessively misaligned	Replace the faulty transmission front case. Refer to Transmission Disassemble .
Clutch out of balance	Replace the clutch assembly. Refer to Clutch Assembly Replacement .

REPAIR INSTRUCTIONS

CLUTCH PEDAL REPLACEMENT

Removal Procedure

1. [Instrument Panel Tie Bar Replacement](#) »Remove

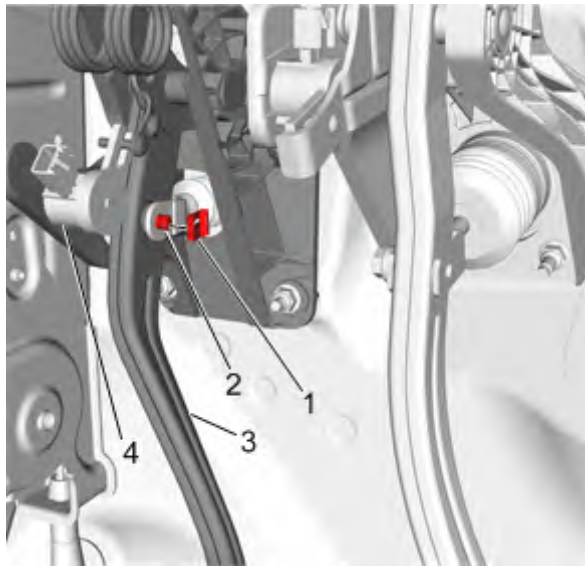


Fig. 1: Retainer And Clutch Pedal Pin

Courtesy of GENERAL MOTORS COMPANY

NOTE: A new retainer (1) is required after removal.

2. Remove the retainer (1) from the clutch pedal pin (2).
3. Remove the push rod to clutch pedal pin (2).
4. Disconnect the electrical connector from the clutch pedal position sensor (4).

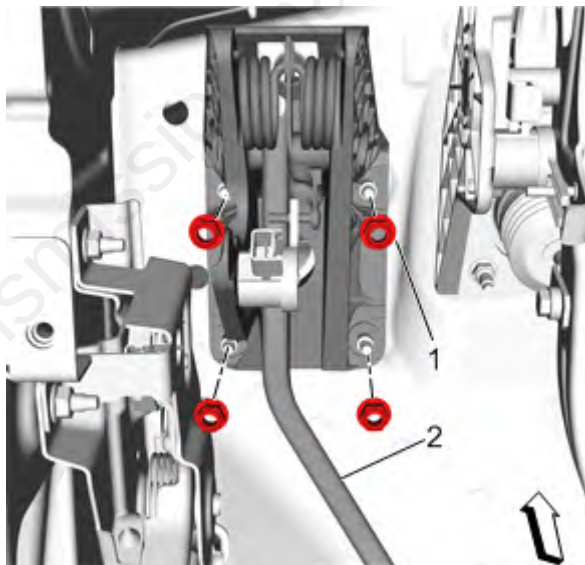


Fig. 2: Clutch Pedal Assembly And Nuts

Courtesy of GENERAL MOTORS COMPANY

5. Remove the 4 nuts (1) securing the clutch pedal assembly to the cowl.
6. Remove the clutch pedal assembly (2) from the vehicle.

Installation Procedure

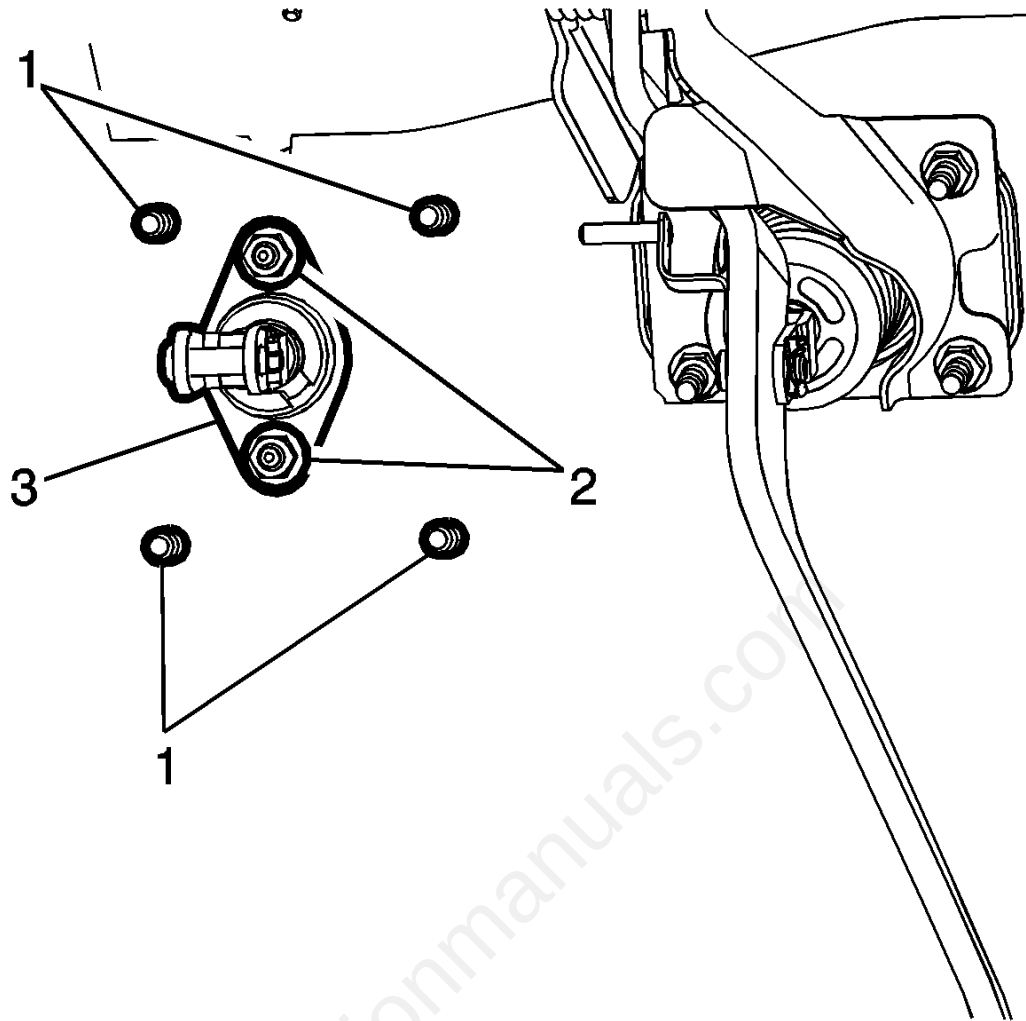


Fig. 3: Clutch Pedal Assembly Over Studs

Courtesy of GENERAL MOTORS COMPANY

1. Position the clutch pedal assembly over the studs (1).

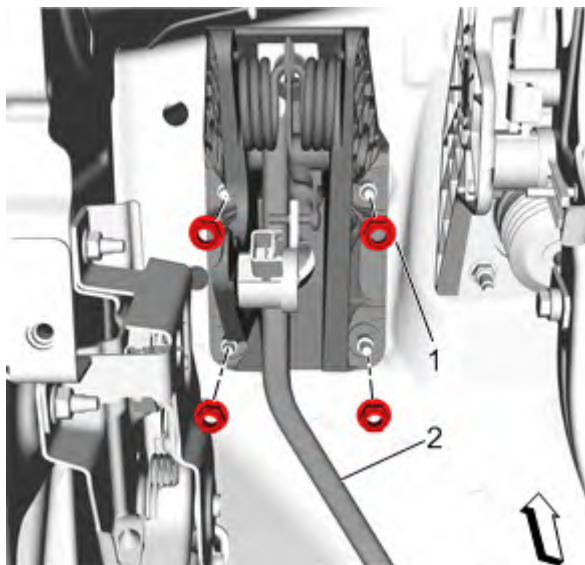


Fig. 4: Clutch Pedal Assembly And Nuts

Courtesy of GENERAL MOTORS COMPANY

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

2. Install the clutch pedal assembly nuts (1) and tighten to 23 N.m (17 lb ft).

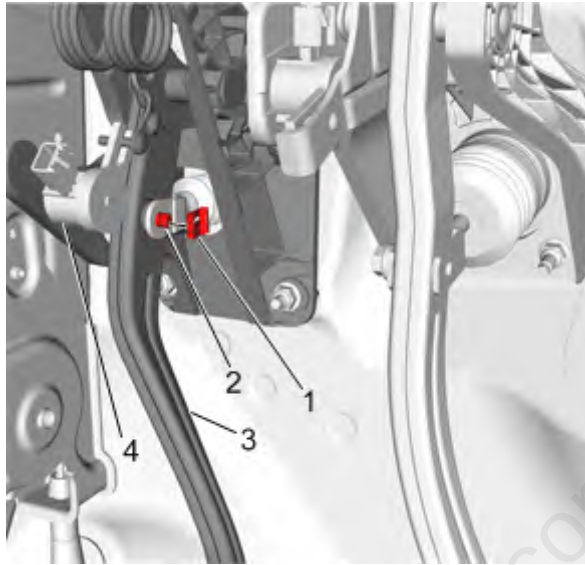


Fig. 5: Retainer And Clutch Pedal Pin

Courtesy of GENERAL MOTORS COMPANY

3. Install the push rod to clutch pedal pin (2).
4. Insert a NEW retainer (1) on the clutch pedal pin.
5. Connect the electrical connector to the clutch pedal position sensor (4).
6. [Instrument Panel Tie Bar Replacement](#) »Install
7. Check for proper clutch pedal movement and operation.

CLUTCH MASTER CYLINDER REPLACEMENT

Removal Procedure

1. Remove the clutch pedal from the vehicle. [Clutch Pedal Replacement](#)

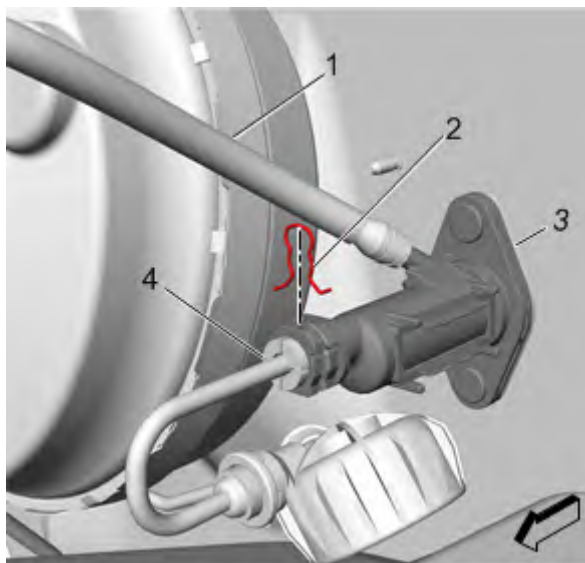


Fig. 6: Fluid Reservoir Hose

Courtesy of GENERAL MOTORS COMPANY

Plug the fluid reservoir hose to prevent loss of fluid.

2. Disconnect the fluid reservoir hose (1) from the clutch master cylinder (3).
3. Remove the clutch actuator hose clip (2).
4. Disconnect the clutch actuator pipe (4) from the clutch master cylinder.

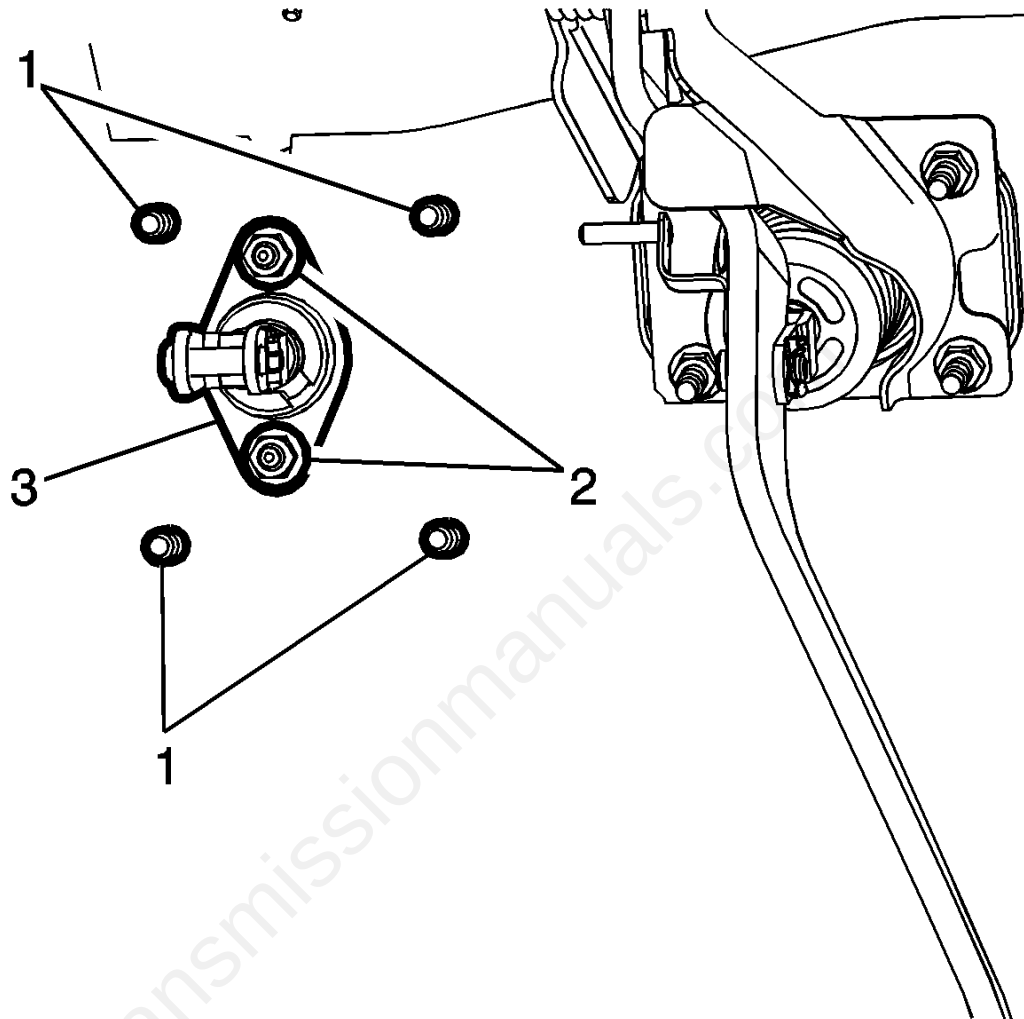


Fig. 7: Clutch Pedal Assembly Over Studs

Courtesy of GENERAL MOTORS COMPANY

5. Remove the clutch master cylinder retaining nuts (2).
6. Remove the clutch master cylinder (3) from the vehicle.

Installation Procedure

1. Install the clutch master cylinder in the vehicle.

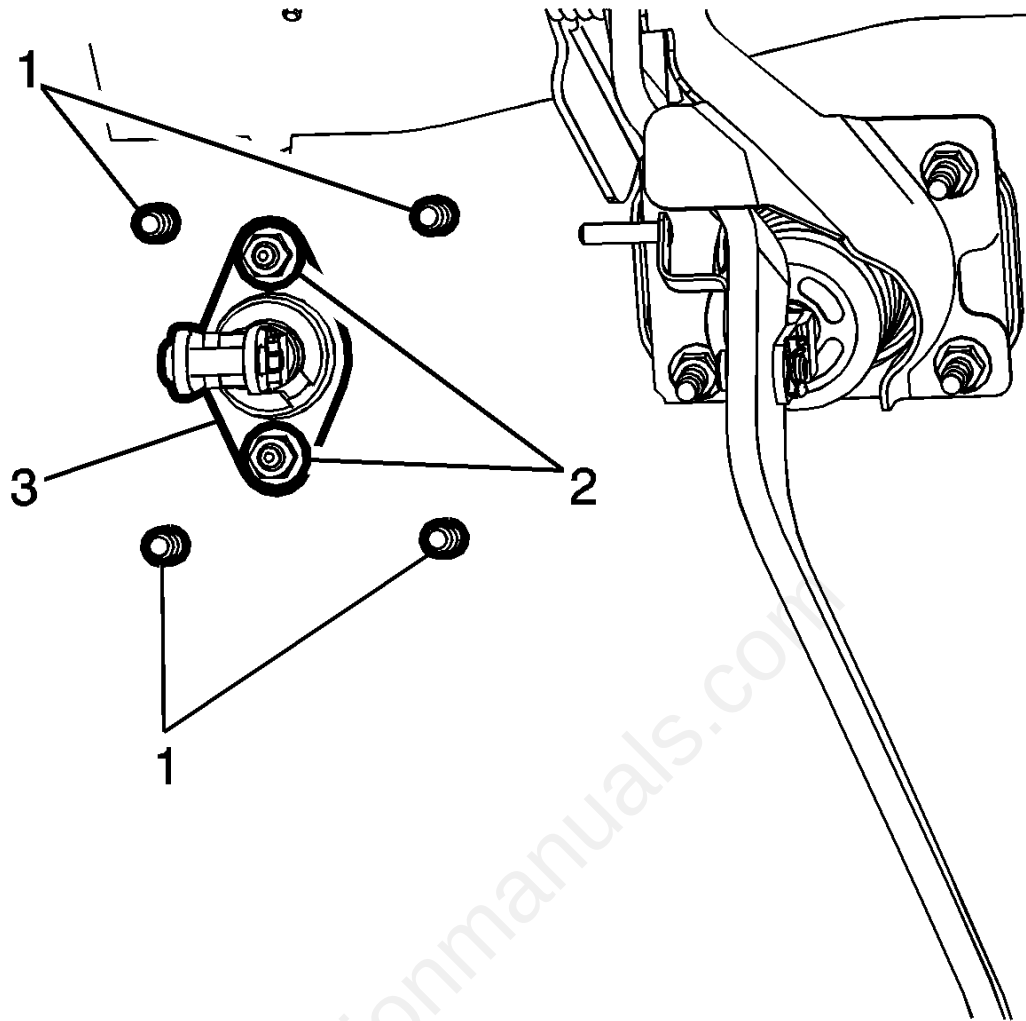
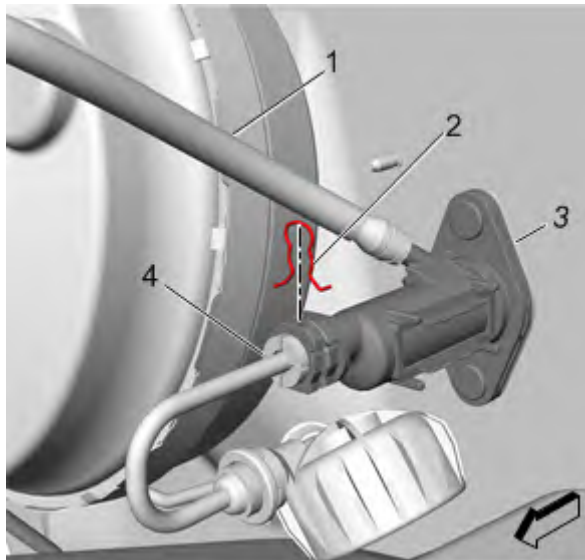


Fig. 8: Clutch Pedal Assembly Over Studs

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install the clutch master cylinder nuts (2) and tighten to 23 N.m (17 lb ft).



Fluid Reservoir Hose

Courtesy of GENERAL MOTORS COMPANY

3. Install the clutch fluid reservoir hose (1) to the clutch master cylinder (3).
4. Connect the clutch actuator pipe (4) to the clutch master cylinder.
5. Install the clutch actuator pipe clip (2) to the clutch master cylinder.
6. Install the clutch pedal. [Clutch Pedal Replacement](#)
7. Check for proper clutch pedal movement and operation.
8. Bleed the clutch hydraulic system. [Hydraulic Clutch System Bleeding](#)

CLUTCH ACTUATOR CYLINDER PIPE REPLACEMENT

Removal Procedure

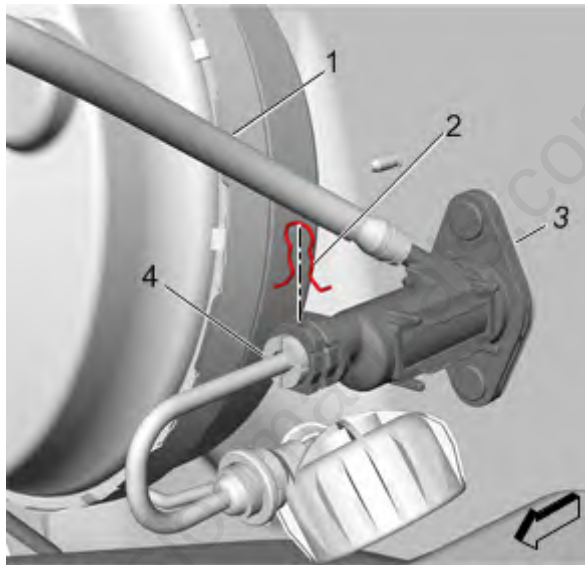


Fig. 10: Fluid Reservoir Hose

Courtesy of GENERAL MOTORS COMPANY

NOTE: Plug the fluid reservoir hose to prevent loss of fluid.

1. Disconnect the fluid reservoir hose (1) from the clutch master cylinder (3).
2. Remove the clutch actuator hose clip (2).
3. Disconnect the clutch actuator hose (4) from the clutch master cylinder.

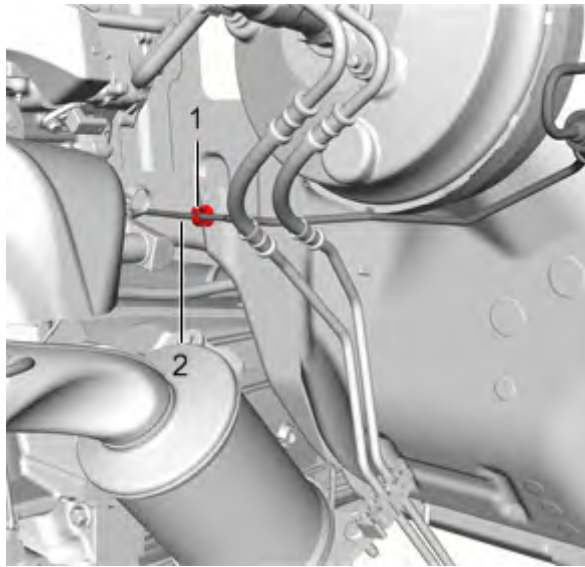


Fig. 11: Clutch Actuator Pipe And Retaining Clip
Courtesy of GENERAL MOTORS COMPANY

4. Unclip the clutch actuator pipe (2) from the retaining clip (1).
5. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .



Fig. 12: Retaining Clip And Clutch Actuator
Courtesy of GENERAL MOTORS COMPANY

6. Remove the retaining clip (2) from the clutch actuator cylinder (1).
7. Disconnect the rear actuator pipe (3) from the front clutch actuator cylinder (1).
8. Carefully remove the clutch actuator pipe from the vehicle.

Installation Procedure

1. Carefully position the clutch actuator pipe into the vehicle.



Fig. 13: Retaining Clip And Cluth Actuator

Courtesy of GENERAL MOTORS COMPANY

2. Connect the rear actuator pipe (3) to the front clutch actuator cylinder (1).
3. Install the retaining clip (2) to the clutch actuator cylinder (2).
4. Lower the vehicle.

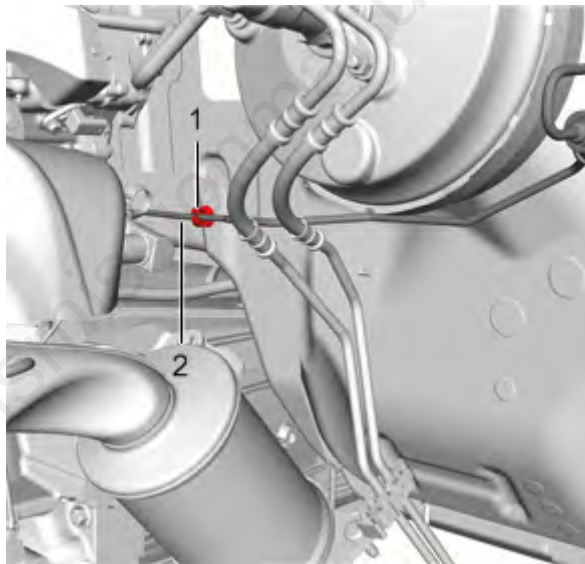


Fig. 14: Clutch Actuator Pipe And Retaining Clip

Courtesy of GENERAL MOTORS COMPANY

5. Clip the clutch actuator pipe (2) to the retaining clip (1).

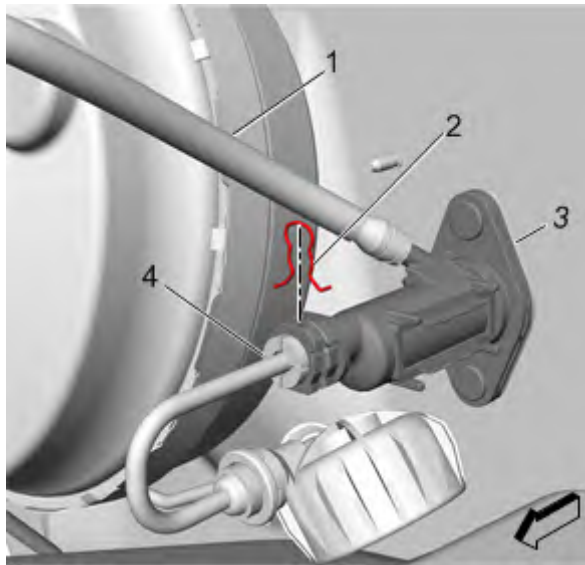


Fig. 15: Fluid Reservoir Hose

Courtesy of GENERAL MOTORS COMPANY

6. Connect the clutch actuator pipe (4) to the clutch master cylinder (1).
7. Install the clutch actuator pipe clip (2) to the clutch master cylinder.
8. Install the clutch fluid reservoir hose (1) to the clutch master cylinder.
9. Bleed the clutch hydraulic system. Refer to [Hydraulic Clutch System Bleeding](#).

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.

Perform the hydraulic clutch bleeding procedure with the aid of an assistant.

1. Ensure the reservoir is filled to the fill line with new fluid. Add fluid if required from a clean sealed container. Refer to [Sealers and Lubricants](#) for the correct fluid type.
2. Stroke the clutch pedal from the up stop to the down stop position at least 15 times.



Protective Cap And Bleeder Valve

Courtesy of GENERAL MOTORS COMPANY

NOTE: Temporally install a hose to the bleeder valve to drain the brake fluid into a suitable container. This will avoid fluid splash onto the transmission or other components. Brake fluid can harm some finishes or components.

3. Remove the protective cap (4) from the bleeder valve (3).
4. Pump the clutch pedal 5-7 times, then press and hold clutch pedal.

NOTE: The clutch pedal may need to be stroked by hand due to over center spring not returning the pedal to the up position.

5. With the pedal in the down stop position. Using an open end wrench, twist open the bleeder valve (3) to release the trapped air through the hose into the container.
6. Close the bleeder valve (3) and slowly return the clutch pedal to the up stop position.
7. Open the bleeder valve (3) and slowly depress the clutch pedal from the up stop to the down stop position until fluid escapes through the bleeder.
8. Close the bleeder valve (3).
9. Return the clutch pedal to the up stop position.
10. Depress the clutch pedal from the up stop to the down stop position.
11. Open the bleeder valve (3) in order to purge the air from the system.
12. Close the bleeder valve (3).

NOTE: Always make sure that the brake fluid reservoir remains filled with new clean fluid.

13. Repeat this bleeding process until a steady flow of fluid comes out each time, the repeat 3 more times.

CLUTCH PEDAL POSITION SENSOR REPLACEMENT

Removal Procedure

1. Remove the body control module bracket. Refer to [Body Control Module Bracket Replacement](#) .
2. Without removing the instrument panel tie bar, reposition the clutch pedal enough to access the clutch pedal sensor bolt. Refer to [Clutch Pedal Replacement](#).

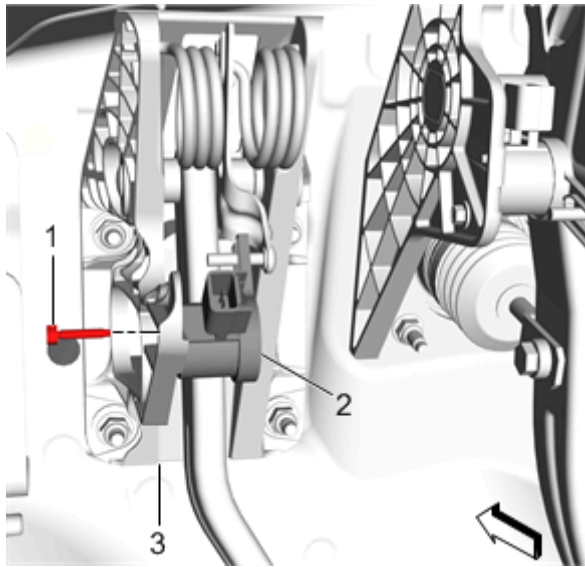


Fig. 17: Clutch Pedal Position Sensor Bolt
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

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

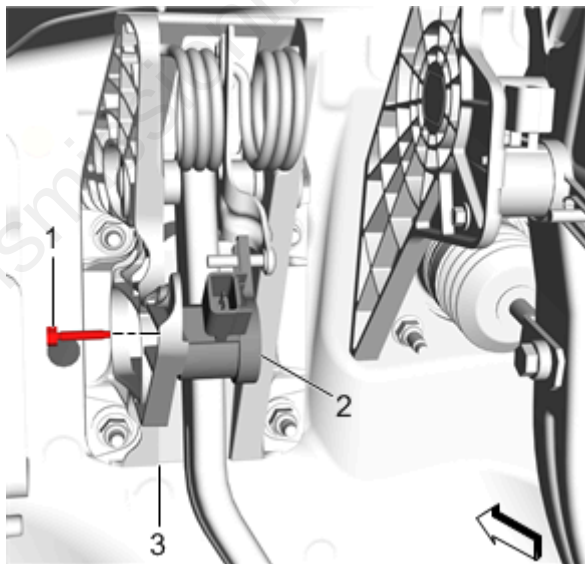


Fig. 18: Clutch Pedal Position Sensor Bolt
Courtesy of GENERAL MOTORS COMPANY

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).
4. Install the body control module bracket. Refer to **Body Control Module Bracket Replacement** .

the clutch pedal position sensor learn procedure. Refer to [Clutch Pedal Position Sensor Learn](#).

CLUTCH PILOT BEARING REPLACEMENT

Special Tools

- CH-9404180 Bearing Puller
- DT-30706024 Handle
- EN-840911-A Bearing Installer
- J-23907-1 Slide Hammer

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

Removal Procedure

1. Remove the clutch assembly from the engine wheel. Refer to [Clutch Assembly Replacement](#).

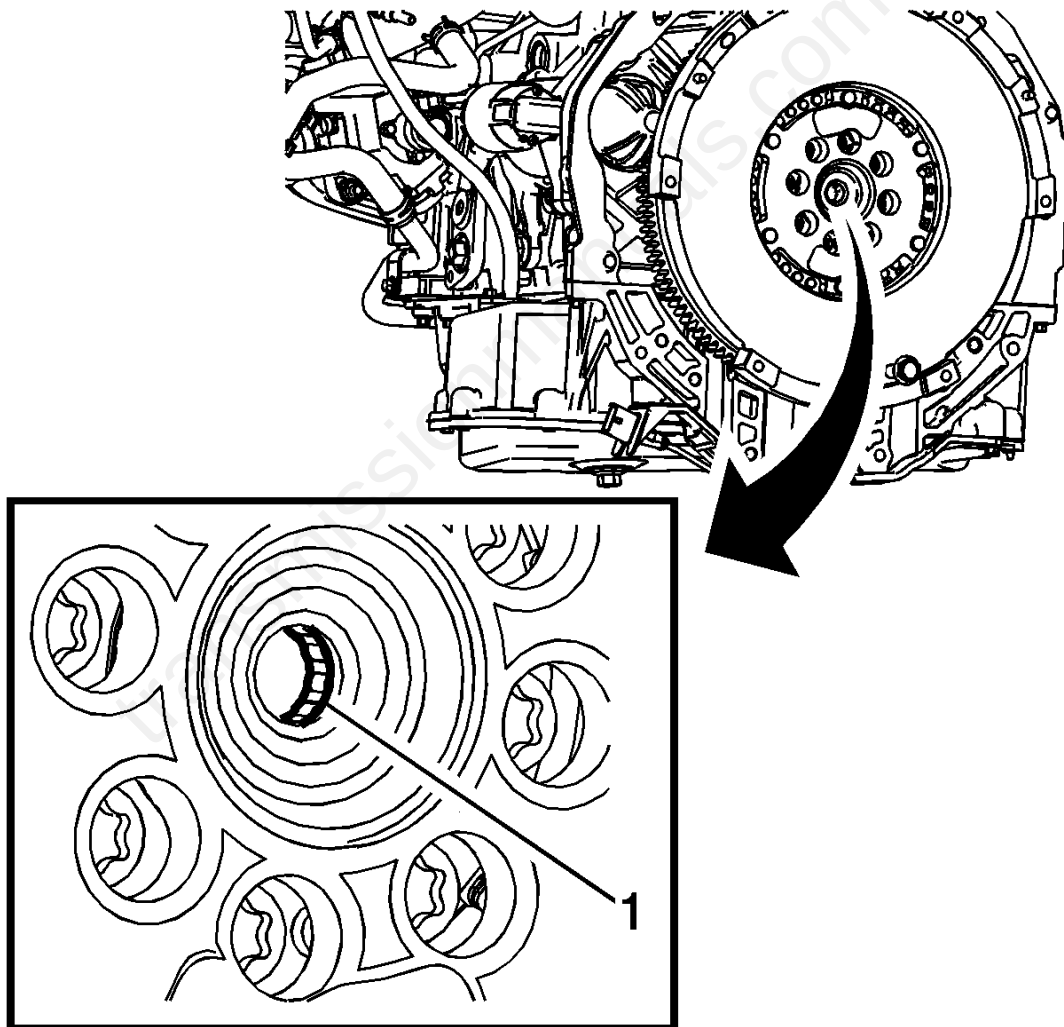


Fig. 19: Clutch Pilot Bearing

Courtesy of GENERAL MOTORS COMPANY

2. Using the CH-9404180 puller and J-23907-1 hammer, remove the clutch pilot bearing (1).
3. Discard the bearing.

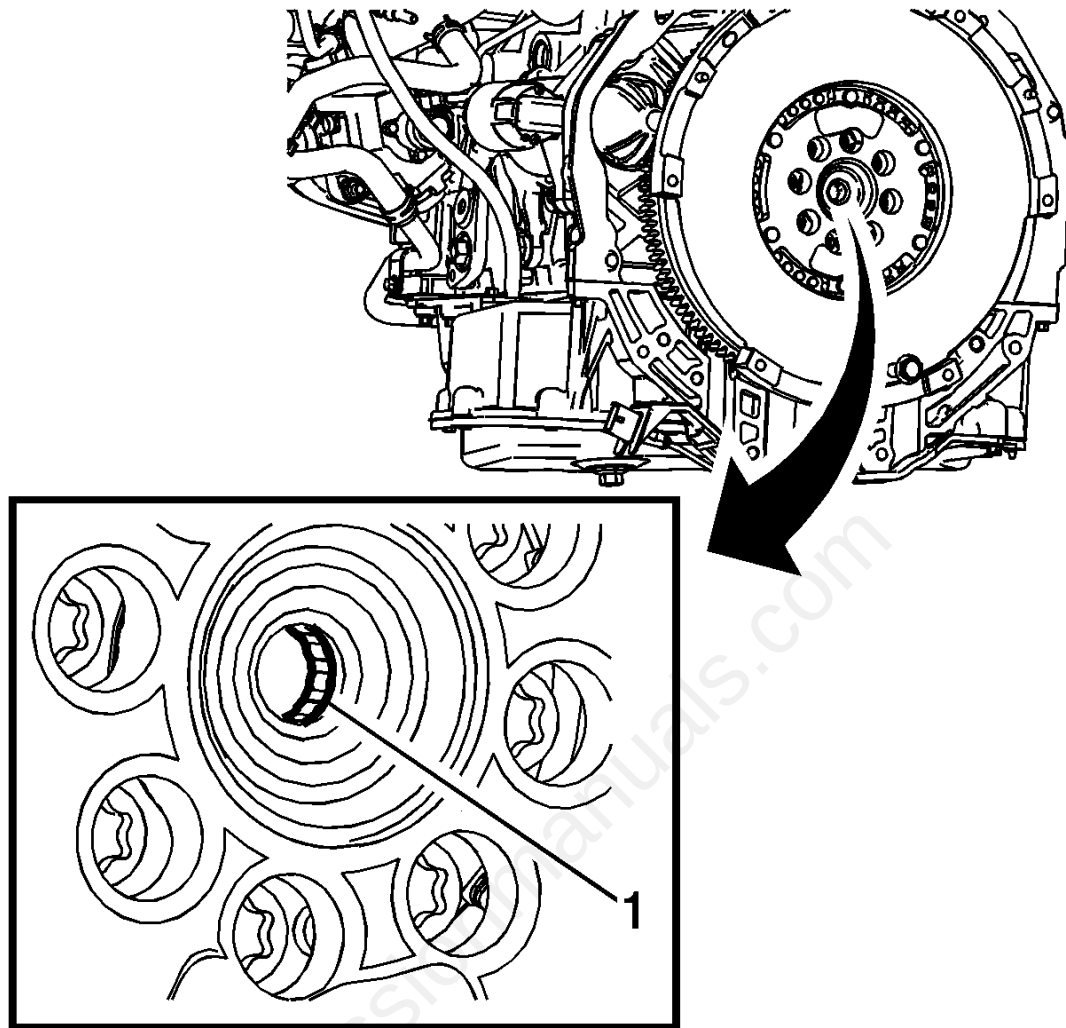


Fig. 20: Clutch Pilot Bearing

Courtesy of GENERAL MOTORS COMPANY

1. Using the **DT-30706024** handle and **EN-840911-A** installer, install the clutch pilot bearing (1).
2. Inspect the clutch pilot bearing for proper installation.
3. Install the clutch assembly on the engine flywheel. Refer to [Clutch Assembly Replacement](#).

CLUTCH ASSEMBLY REPLACEMENT

Special Tools

J-5824-A Clutch Alignment Tool

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

Removal Procedure

1. Remove the transmission. Refer to [Transmission Replacement](#).

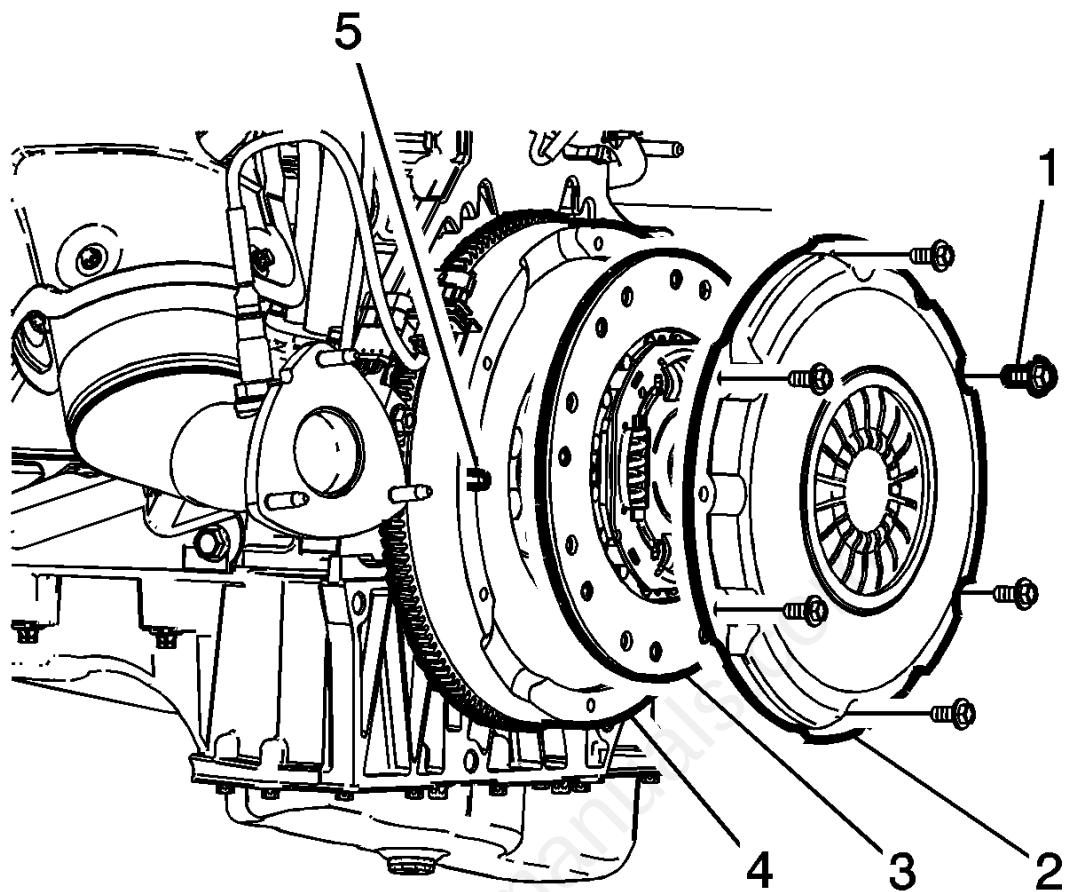


Fig. 21: Clutch Pressure Plate Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Remove the clutch pressure plate bolts (1).

Discard the bolts.

3. Remove the clutch pressure plate (2) and driven disc (3) from the dowel pins (4) on the flywheel (5).

Installation Procedure

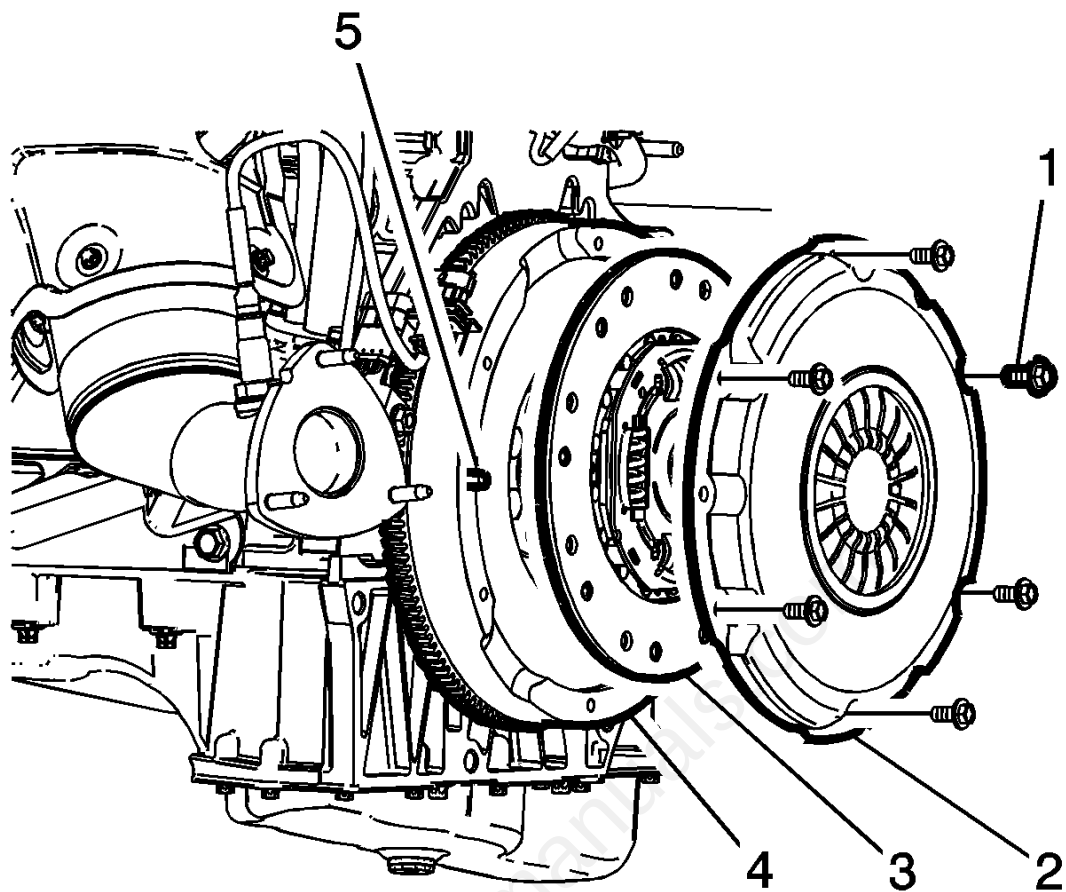


Fig. 22: Clutch Pressure Plate Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Install the clutch pressure plate (2) and driven plate (3) to the dowel pins (4) on the flywheel (5).
2. Install the clutch pressure plate bolts (1) finger tight.
3. Using **J-5824-A** tool, align the clutch driven plate (3) to the clutch pilot bearing.

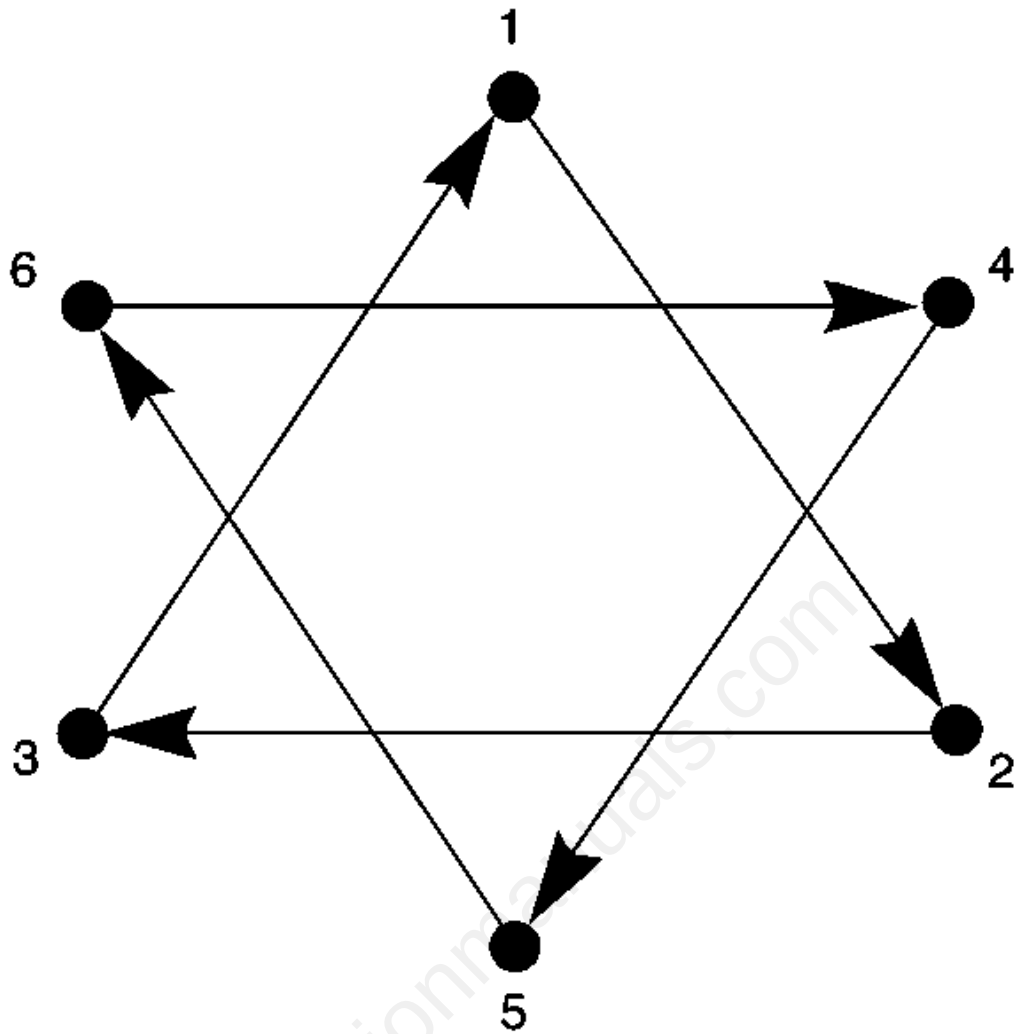


Fig. 23: Clutch Pressure Plate Bolts Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

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

4. Tighten the NEW clutch pressure plate bolts in the sequence shown to 40 N.m (30 lb ft).
5. Install the transmission. Refer to [Transmission Replacement](#) .

CLUTCH ACTUATOR CYLINDER REPLACEMENT

Removal Procedure

1. Remove the transmission. Refer to [Transmission Replacement](#) .

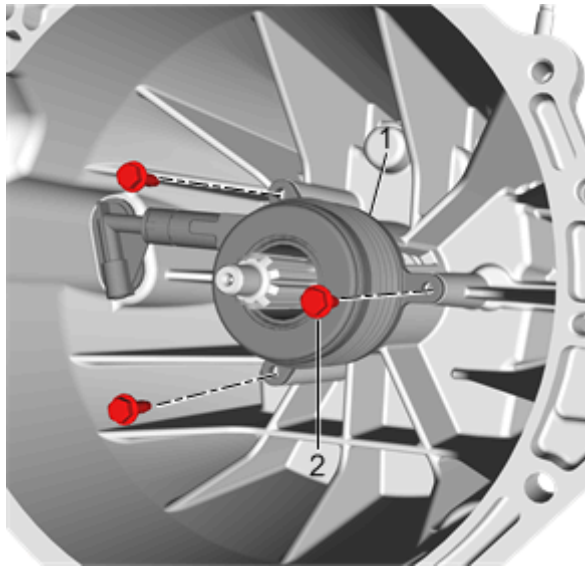


Fig. 24: Clutch Actuator Cylinder Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Remove the 3 clutch actuator cylinder bolts (2).
3. Remove the clutch actuator cylinder (1) from the transmission.

Installation Procedure

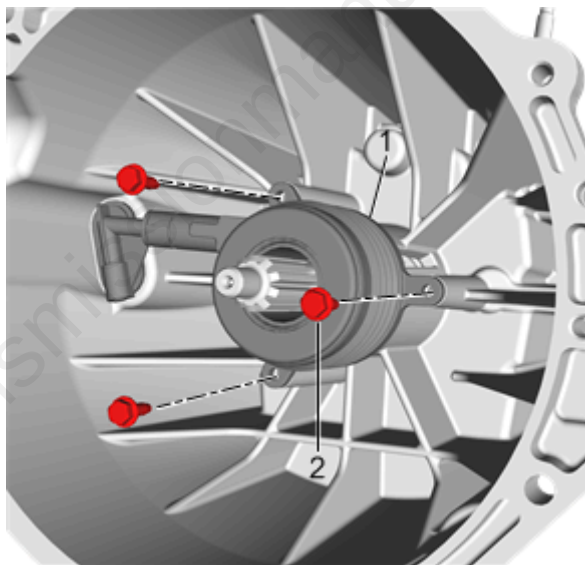


Fig. 25: Clutch Actuator Cylinder Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Position the clutch actuator cylinder (1) to the transmission.

CAUTION: Refer to **Fastener Caution** .

2. Install the 3 clutch actuator cylinder bolts (2) and tighten to 10 N.m (89 lb in).
3. Install the transmission. Refer to **Transmission Replacement** .

DESCRIPTION AND OPERATION

CLUTCH SYSTEM DESCRIPTION AND OPERATION

Components

Clutch Pedal

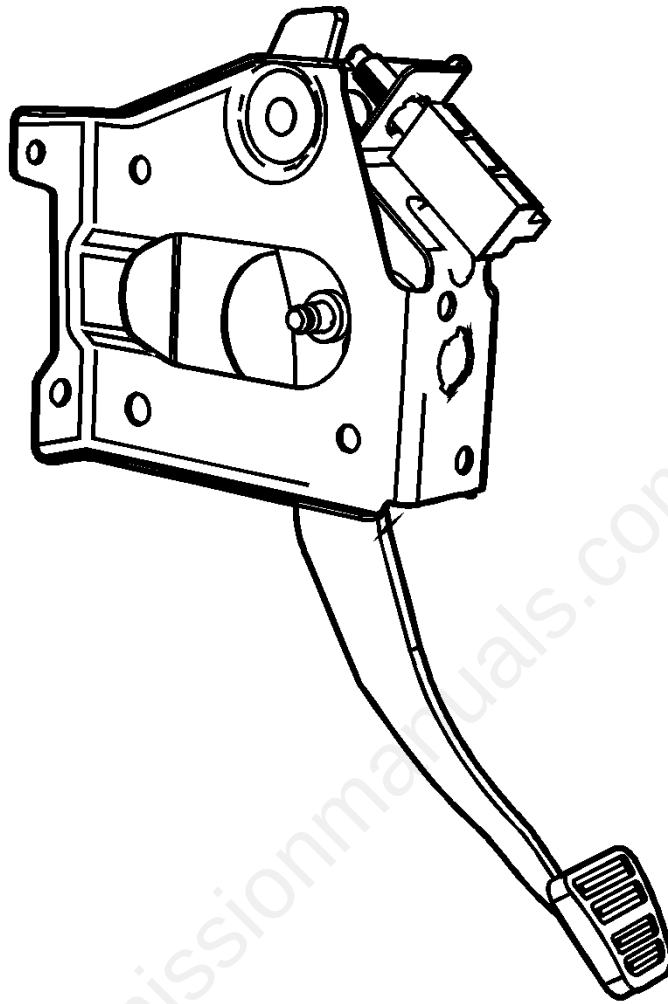


Fig. 26: Clutch Pedal

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. The clutch master cylinder pushrod connects to a pin on the pedal. A spring, located inside of the clutch master cylinder, returns the pedal to the correct position after depressing.

Clutch Master Cylinder

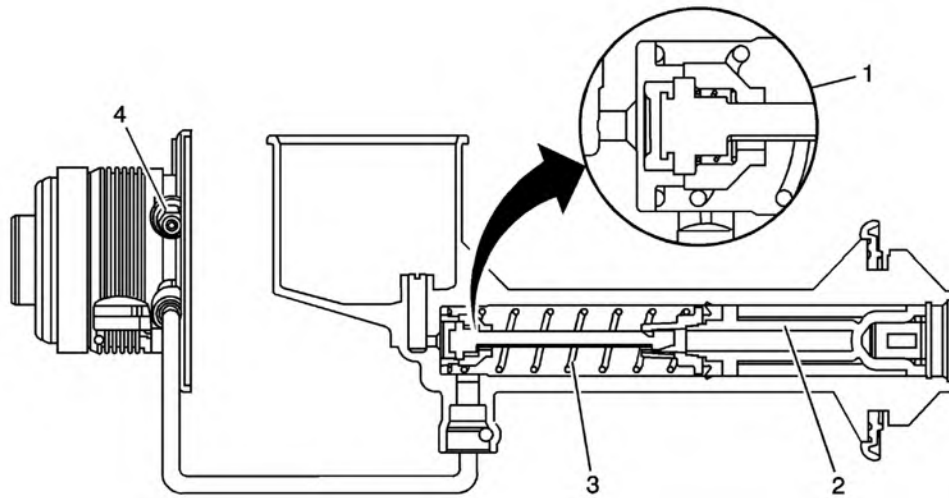


Fig. 27: 5 Speed Transmission Hydraulic Clutch System
Courtesy of GENERAL MOTORS COMPANY

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 port allows 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. When the clutch pedal is depressed, the piston moves forward in the cylinder, compressing the fluid. The compressed fluid travels through a hose to the clutch actuator cylinder. A bleeder screw (4) is located at the clutch actuator cylinder for bleeding the hydraulic system.

Clutch Actuator Cylinder and Release Bearing

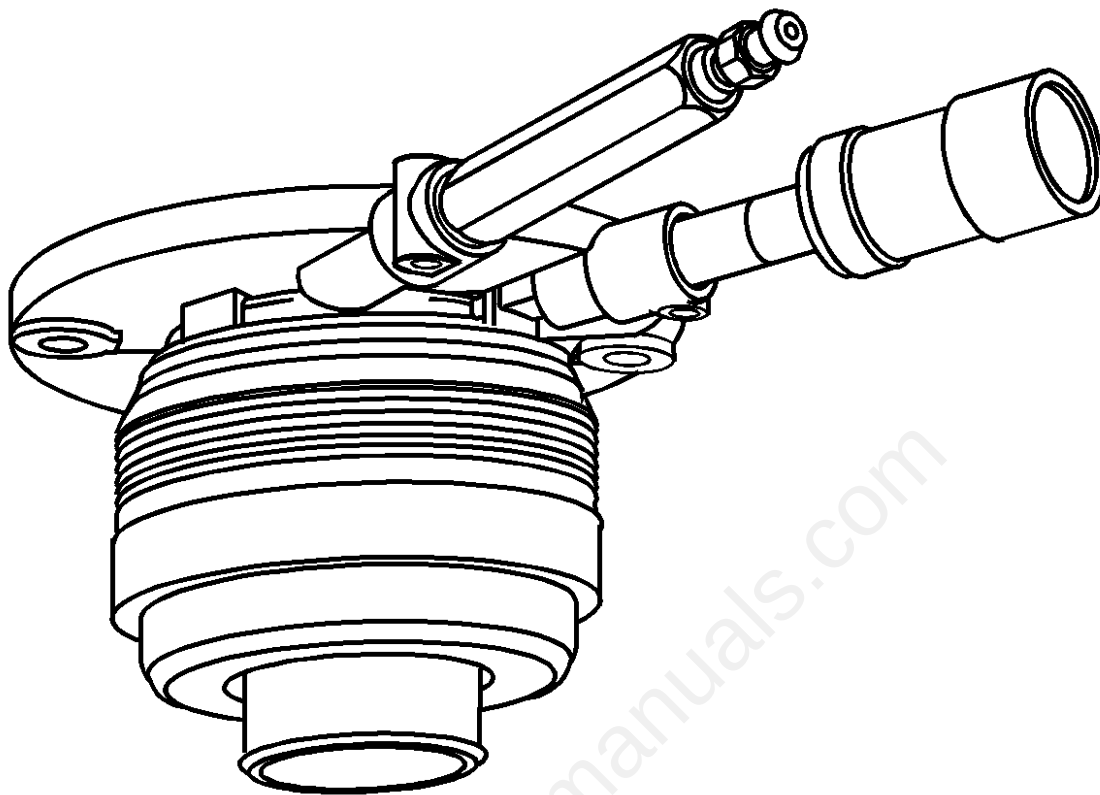


Fig. 28: Clutch Actuator Cylinder and Release Bearing
Courtesy of GENERAL MOTORS COMPANY

The clutch control actuator cylinder disengages the clutch, using the pressurized fluid from the clutch master cylinder. The clutch control actuator cylinder is fastened to the front of the transmission. The clutch release bearing is attached to the control actuator cylinder. The control actuator cylinder has a piston, which has seals that slide on the housing assembly. There is a spring between the piston and the housing to keep the piston at the extended position, allowing the release bearing to be in constant contact with the pressure plate fingers. The movement of the piston, by the pressurized fluid, pushes the release bearing against the tips of the clutch pressure plate fingers, to disengage the clutch.

As the clutch wears, the piston, or release bearing, moves towards the transmission. The piston is at the furthest position from the transmission with a new clutch.

The clutch control actuator cylinder has a bleeder, for bleeding the air out of the hydraulic system.

Ball bearings enable the release bearing to turn, while applying pressure to the pressure plate fingers. Using an angular contact style bearing allows the release bearing to be in constant contact with the pressure plate fingers.

Pressure Plate Assembly

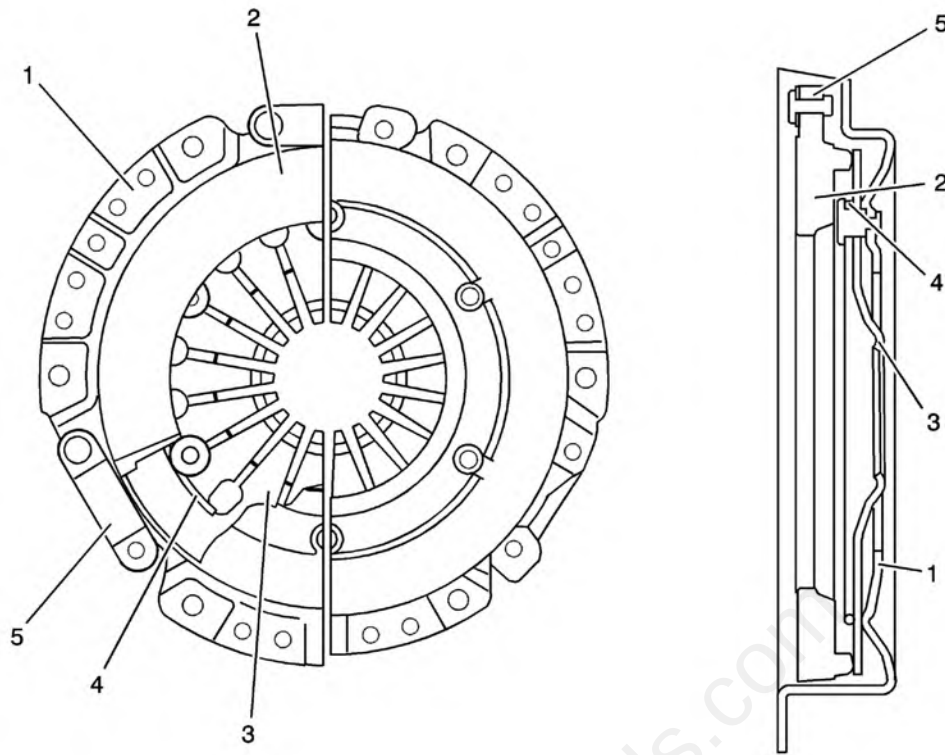


Fig. 29: Non-Self-Adjusting Pressure Plate Assembly

Courtesy of GENERAL MOTORS COMPANY

The 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 dual mass flywheel. The outside diameter of the diaphragm spring pivots on a pivot ring inside the cover. This action lifts the pressure plate off the dual mass flywheel through the drive straps, which connect the cover to the pressure plate. As the clutch wears, there is an increase in pedal effort.

Clutch Disc

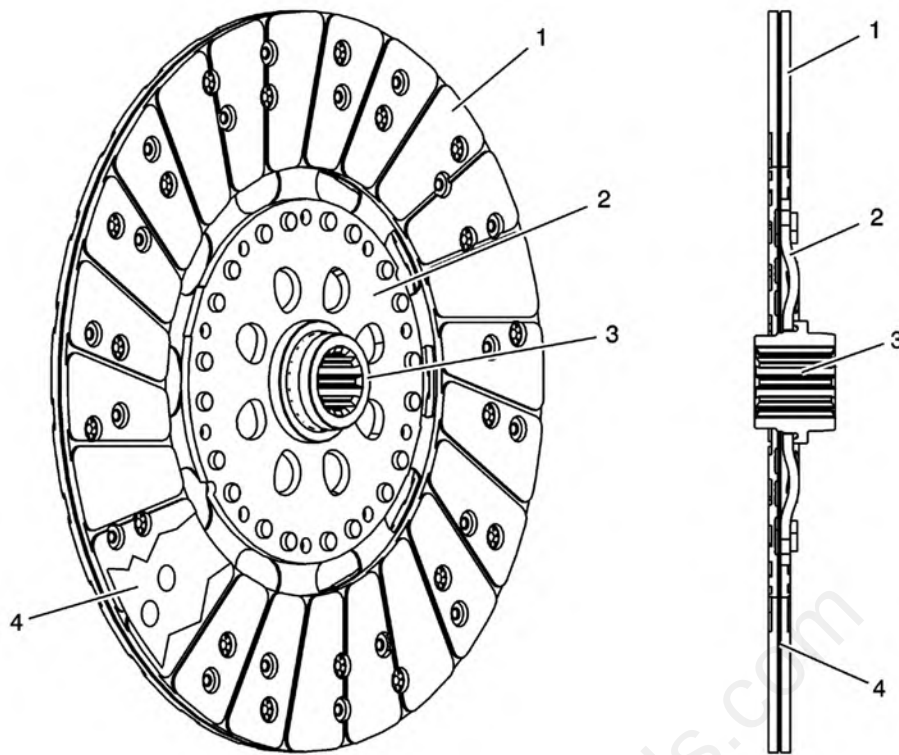


Fig. 30: Clutch Disc

Courtesy of GENERAL MOTORS COMPANY

The clutch disc, or driven member, is a critical component in the service life of the clutch system. The disc provides smooth engagement and dampens engine vibrations. Mounted to the transmission input shaft, between the dual mass flywheel and the clutch pressure plate, the disc slides on the input shaft forward and backward. The disc is splined to the input shaft and cannot rotate without rotating the input shaft. The critical component of the clutch disc is the hub flange (3). The hub flange (3) is press fit into a retainer plate (2) and splined to fit the input shaft. Friction material (1) is riveted to numerous components, called marcel, or cushion segments (4). Waves in marcel soften engagement.

Dual Mass Flywheel

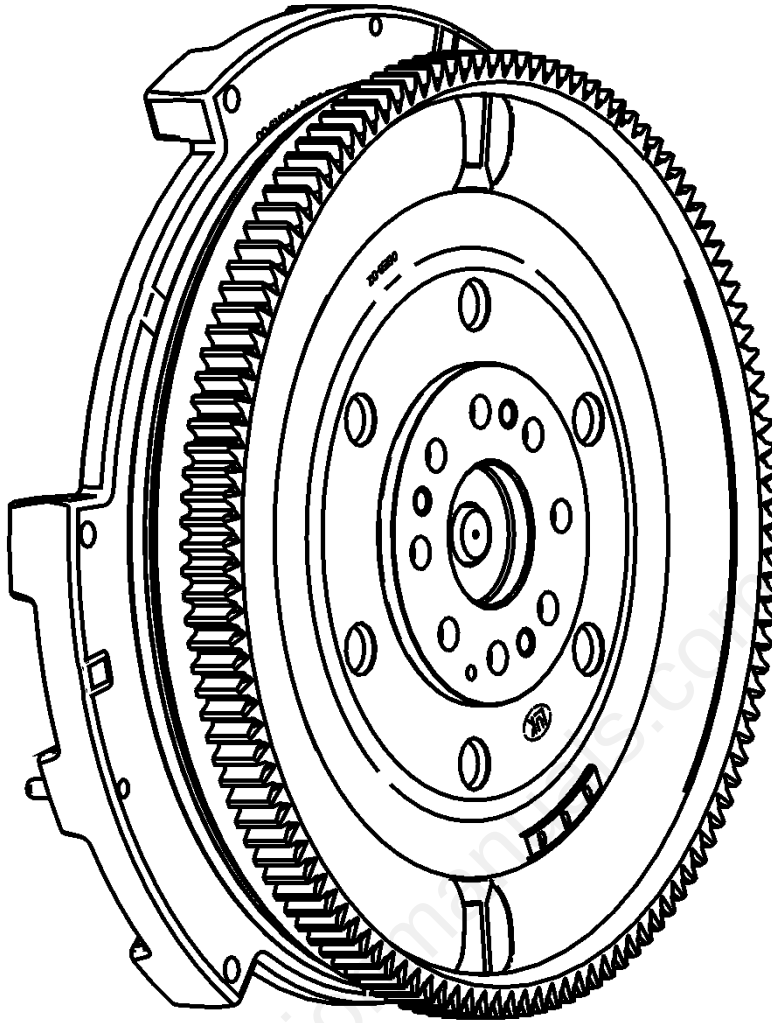


Fig. 31: Dual Mass Flywheel

Courtesy of GENERAL MOTORS COMPANY

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

Pilot Bearing/Bushing

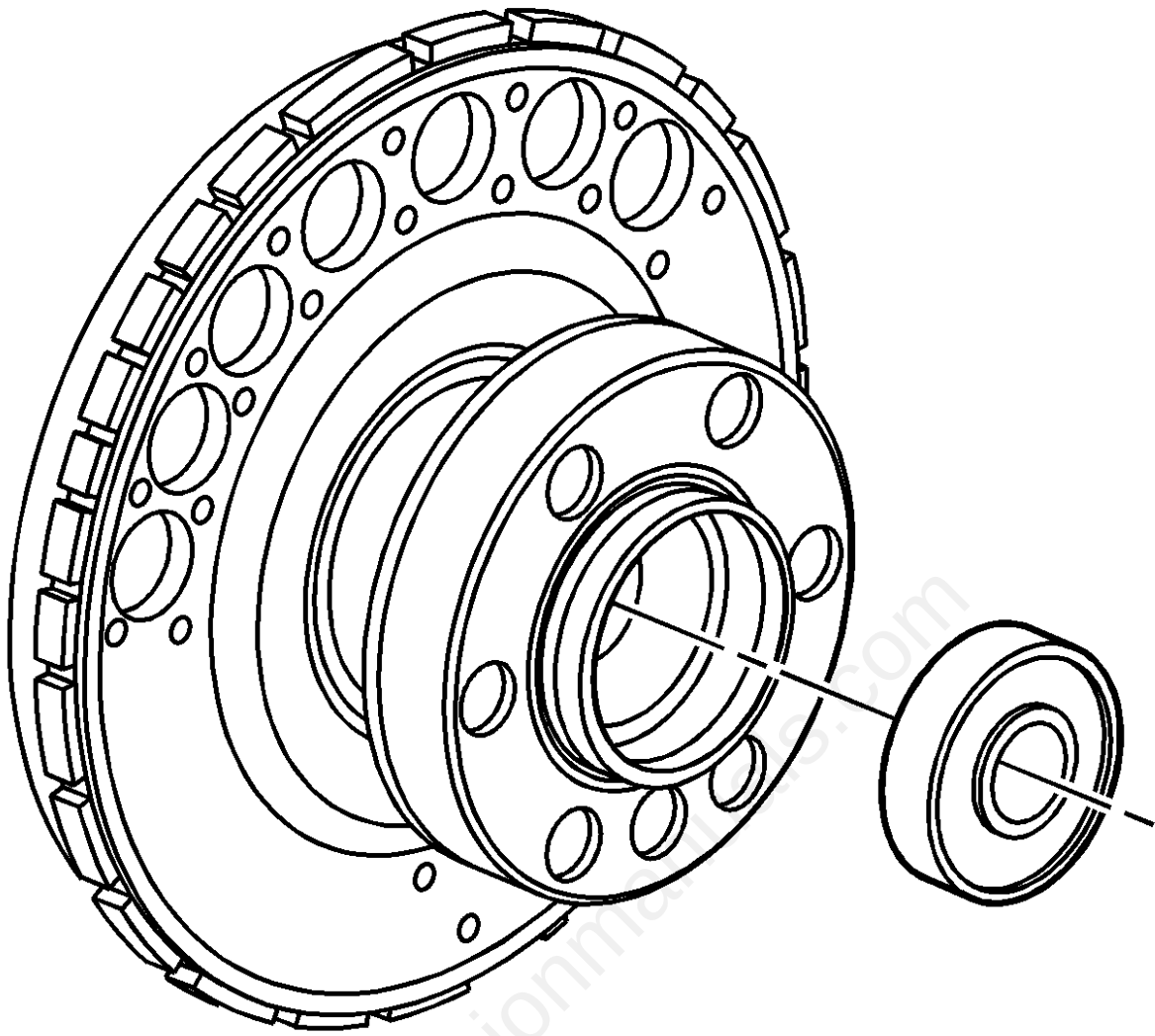


Fig. 32: Pilot Bearing/Bushing

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 dual mass flywheel. The pilot bearing is a sintered bronze bushing. 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 Pedal Reserve

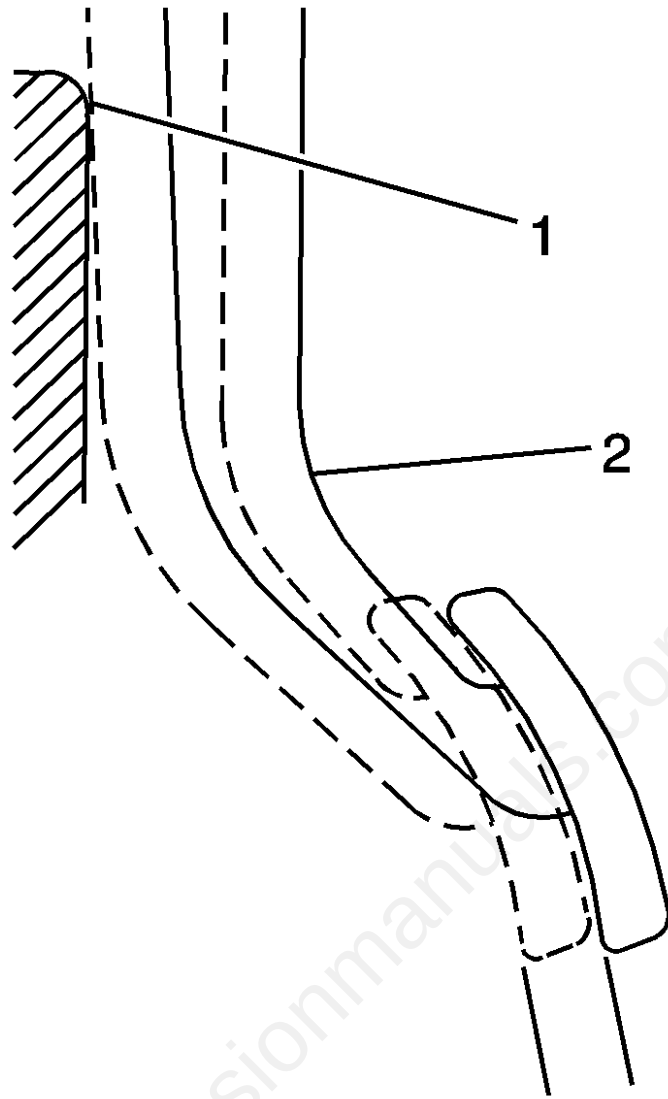


Fig. 33: Clutch Pedal Reserve

Courtesy of GENERAL MOTORS COMPANY

In order for the clutch to be completely disengaged and allow proper shifting of the transmission, clutch pedal reserve is required. Clutch pedal reserve is the movement of the pedal from the down stop, or the floor (1), to where the clutch begins transmitting torque (2); it should be a minimum of 25 mm (1 in). Inspect for clutch pedal reserve by depressing the clutch pedal. Allow the clutch disc to quit spinning, and let up on the clutch pedal while listening for the clutch disc to start spinning. The distance the pedal moved from the floor, before the clutch disc started to spin, is the pedal reserve.

In order 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.

edal 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.

Illustration	Tool Number/ Description
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SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

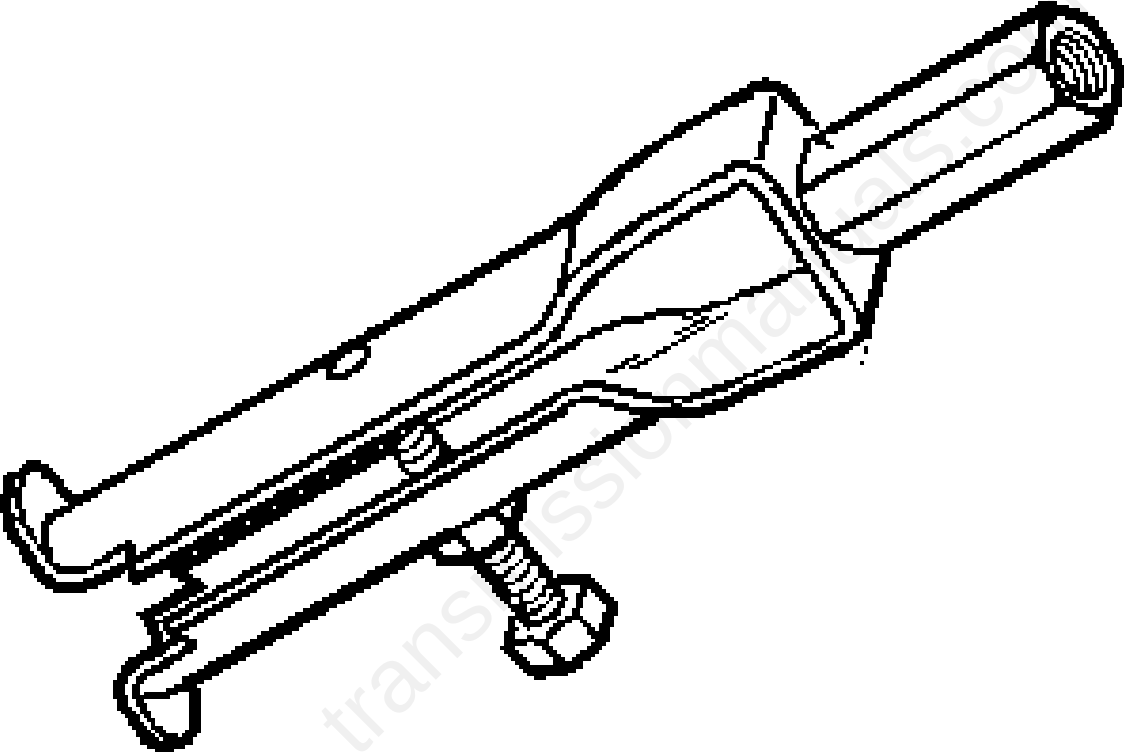
Illustration	Tool Number/ Description
	CH-9404180 Bearing Puller

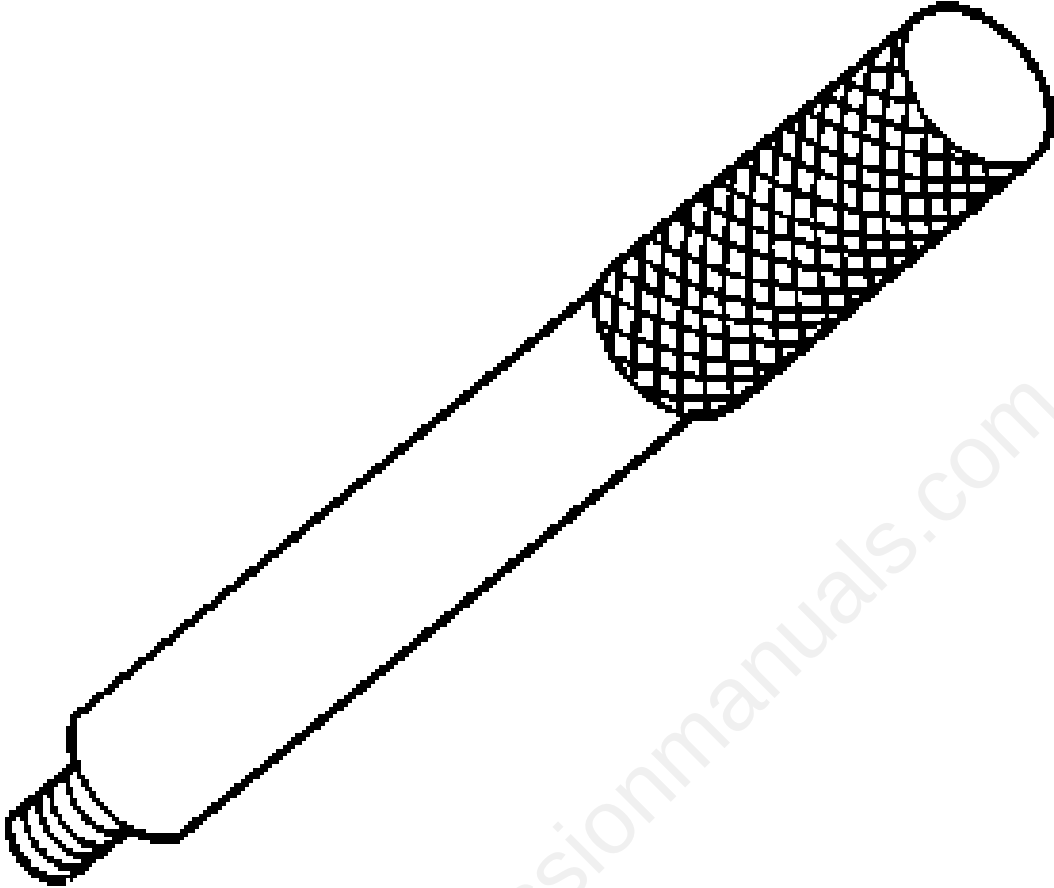
Illustration	Tool Number/ Description
 A technical line drawing of a long, tapered shaft. The shaft is oriented diagonally from the bottom-left to the top-right. The left end features a threaded section with approximately six visible threads. The main body of the shaft is smooth and tapers slightly towards the right. About one-third of the way from the right end, there is a section of the shaft that is wider and covered in a cross-hatched or knurled pattern, indicating a grip or a specific functional area. The right end of the shaft is a simple circular flange. A faint, diagonal watermark reading 'transmissionmanuals.com' is visible across the lower half of the illustration.	DT-30706024 Handle

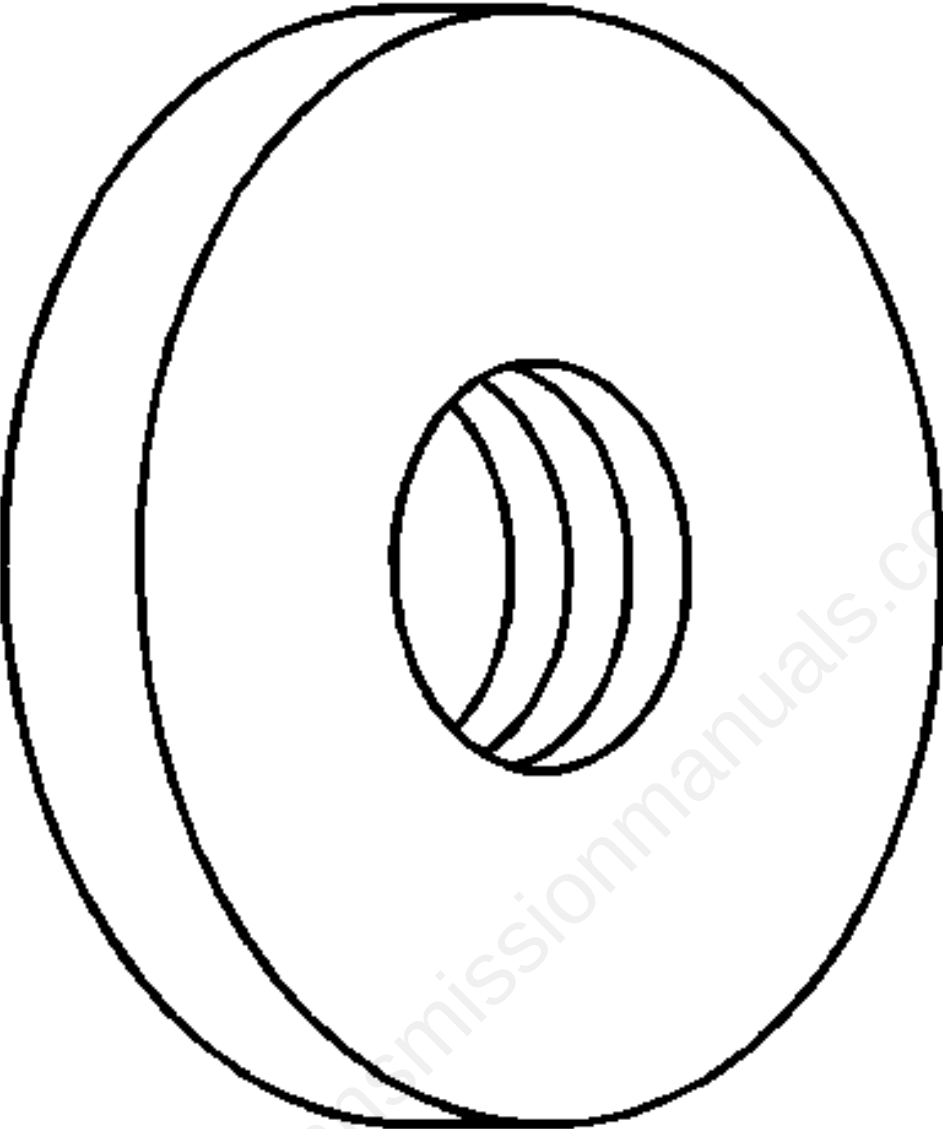
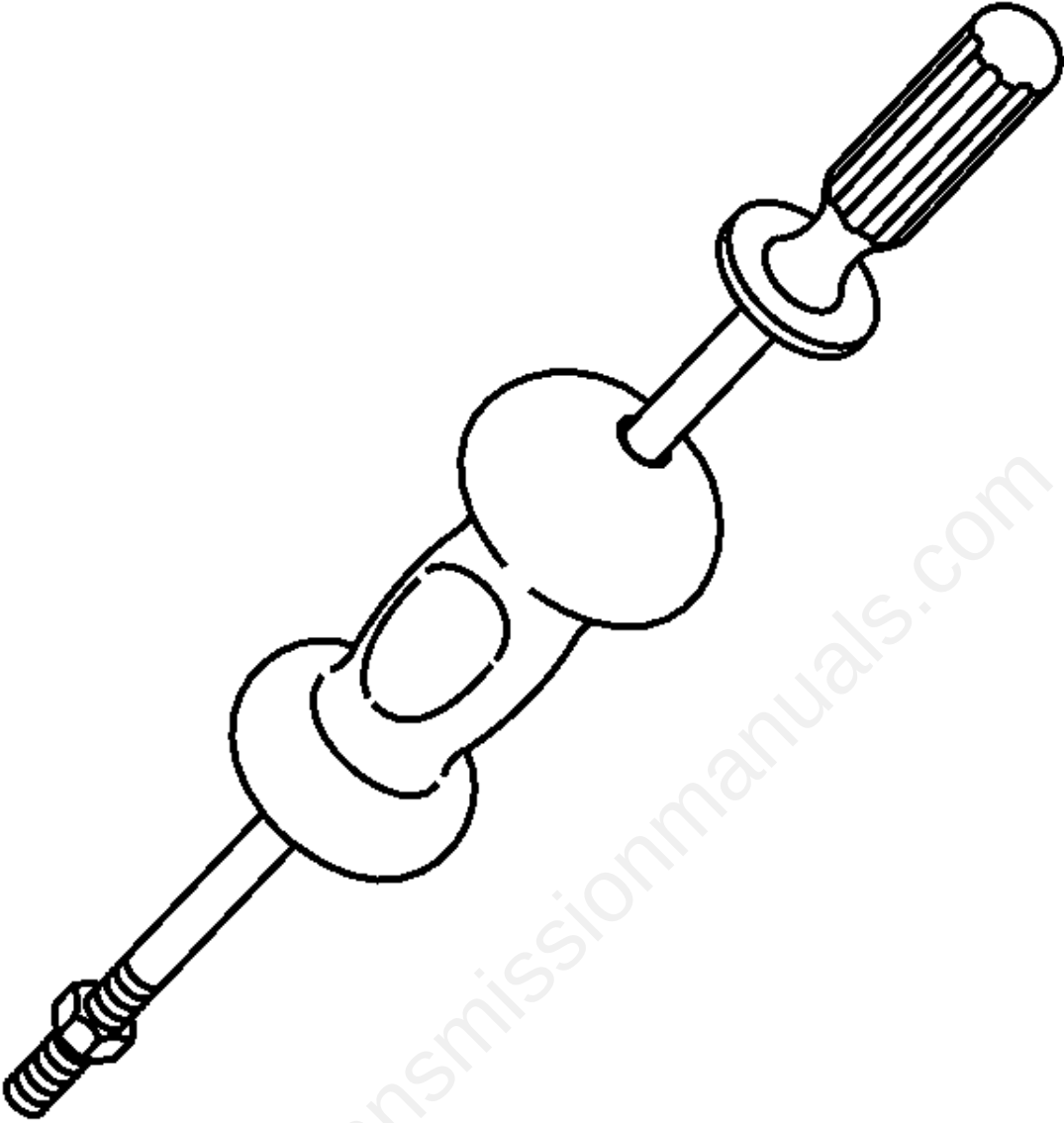
Illustration	Tool Number/ Description
	EN-840911-A Bearing Installer

Illustration	Tool Number/ Description
	J-5824-A DT-50538-30 3-9506260 (Brazil) Clutch Alignment Tool

Illustration	Tool Number/ Description
	J-23907-1 Slide Hammer