Automatic Transmission, 5AT (Repair Instructions) - Vue

REPAIR INSTRUCTIONS

TRANSMISSION FLUID REPLACEMENT

1. Start the engine until the transmission fluid temperature reaches 60-70°C (140-158°F).
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

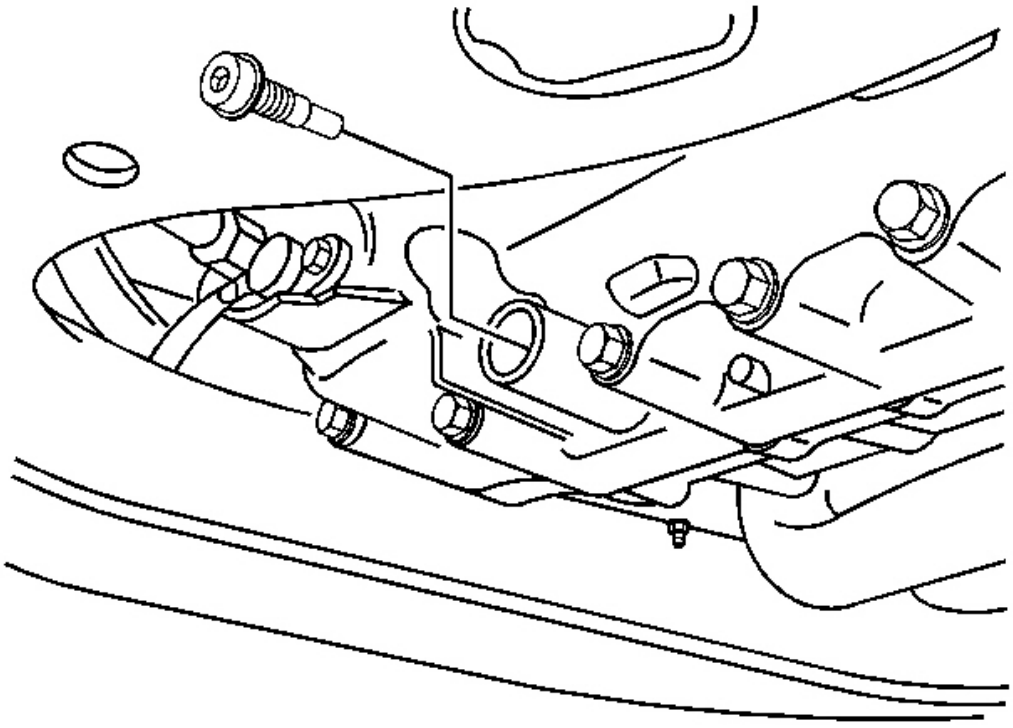

Fig. 1: Transmission Fluid Gasket & Drain Plug
Courtesy of GENERAL MOTORS CORP.

3. Remove the drain plug from the transmission. Allow the fluid to completely drain.
4. Remove the gasket from the drain plug and discard.
5. Install the new gasket on the drain plug.

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

6. Install the drain plug into the transmission.

   Tighten: Tighten the drain plug to 49 N.m (36 lb ft).

7. Lower the vehicle.
8. Remove the outlet resonator/duct assembly. Refer to **Air Cleaner Resonator Outlet Duct Replacement** in Engine Controls - 3.5L.

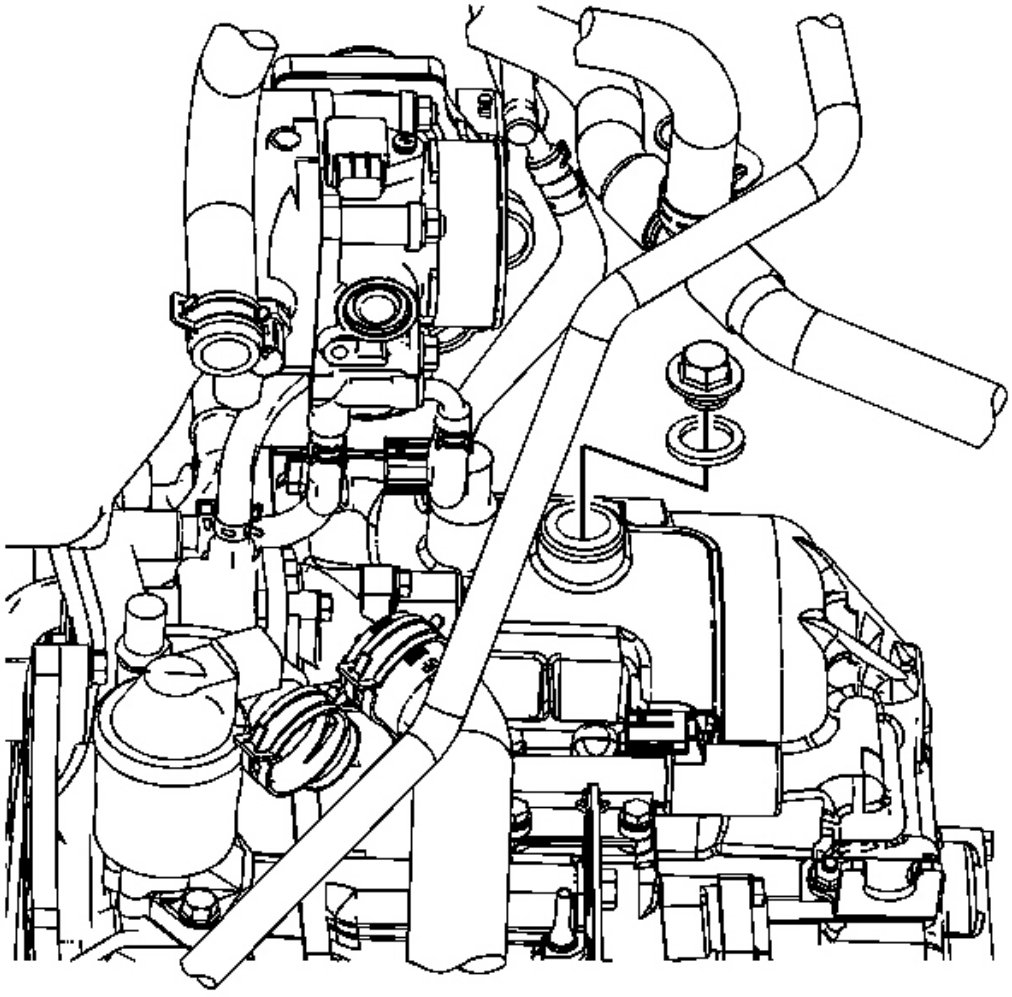

Fig. 2: ATF Fill Plug
Courtesy of GENERAL MOTORS CORP.

9. Remove the transmission fill plug.

IMPORTANT: Do not use ATF (P/N 21005966 or P/N 21019223). These fluids are not compatible with this transmission.

10. For AWD vehicles, add approximately 4.1 Liters (4.3 Qt) of Saturn ATF-Z 1 fluid (P/N 22717466) through the transmission fill plug.

    For FWD vehicles, add approximately 4.5 Liters (4.8 Qt) of Saturn ATF-Z 1 fluid (P/N 22717466) through the transmission fill plug.

11. With the vehicle on a flat level surface, start the engine and operate until the transmission fluid temperature reaches 60-70°C (140-158°F).
12. Apply the parking brake.
13. Depress the brake pedal and move the shift lever slowly through all gear ranges, pausing approximately 3 seconds in each range.
14. Return the shift lever to the park position.
15. Turn the engine OFF.
16. Pull the transmission level indicator from the transmission in order to check the proper fluid level on the gage.
17. If the fluid is not within the proper range, adjust as necessary.

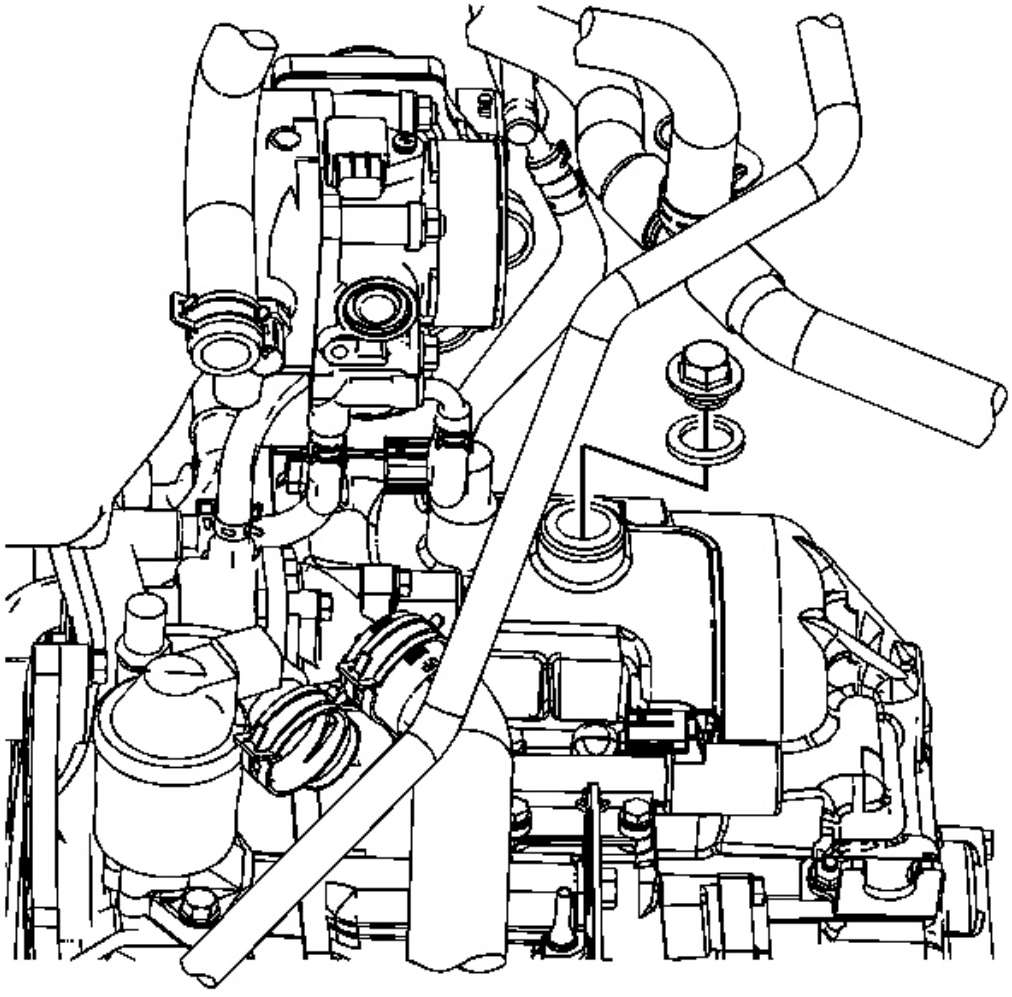

Fig. 3: ATF Fill Plug
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Make sure the ATF fill plug is clean and free of debris.

NOTE: Refer to Fastener Notice in Cautions and Notices.

18. Install the ATF fill plug into the transmission with a new sealing washer.

    Tighten: Tighten the ATF fill plug to 44 N.m (33 lb ft).

19. Install the outlet resonator/duct assembly. Refer to **Air Cleaner Resonator Outlet Duct Replacement** in Engine Controls - 3.5L.

TORQUE CONVERTER CLUTCH (TCC) SOLENOID REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

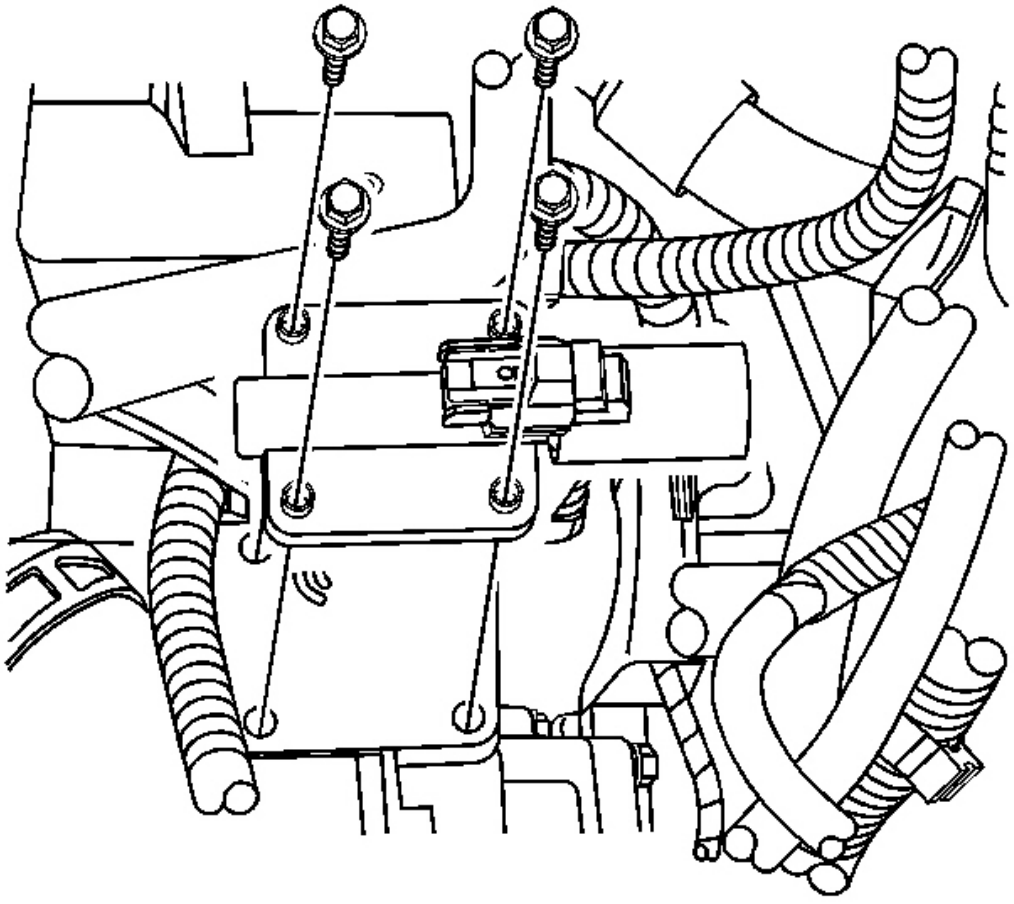

Fig. 4: TCC Solenoid & Bolts
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the wiring harness from the torque converter clutch (TCC) solenoid.

3. Remove the TCC solenoid bolts.
4. Remove the TCC solenoid assembly.

Installation Procedure

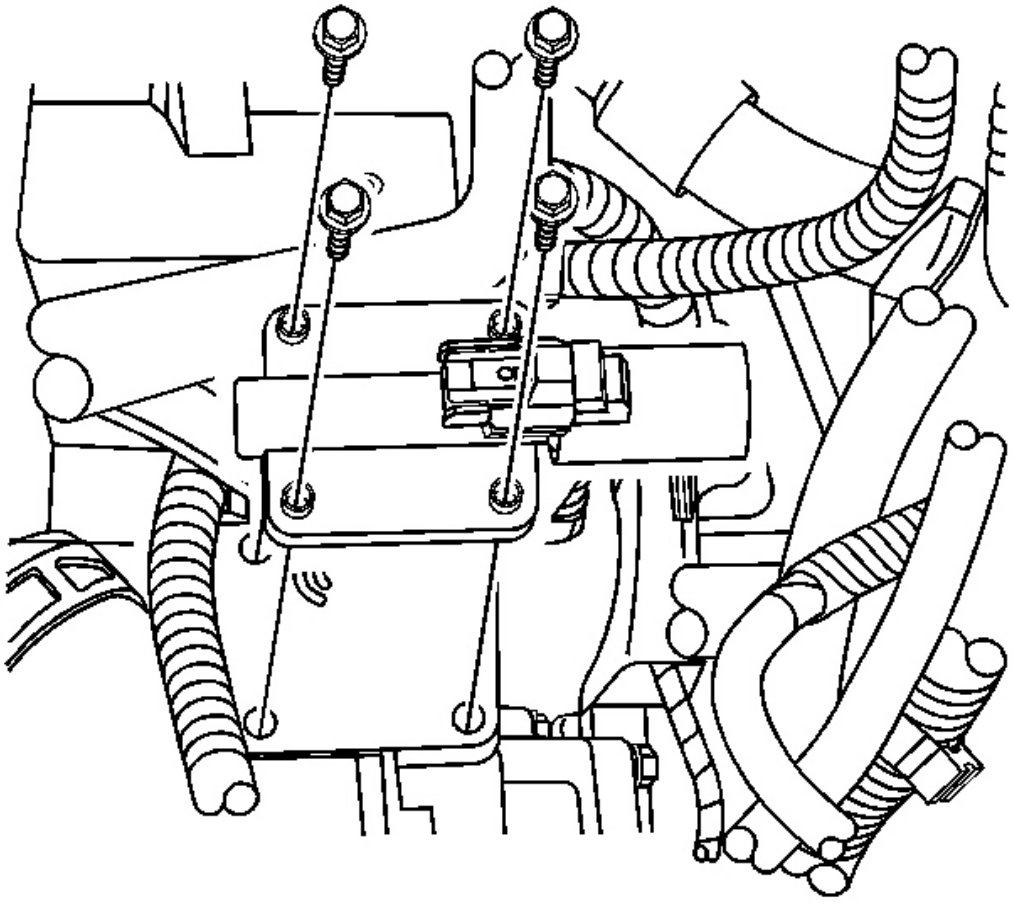

Fig. 5: TCC Solenoid & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the TCC solenoid assembly to the transmission case assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the TCC solenoid bolts.

Tighten: Tighten the TCC solenoid bolts 12 N.m (106 lb in).

3. Connect the wiring harness to the TCC solenoid.
4. Install the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

4TH CLUTCH PRESSURE SWITCH REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

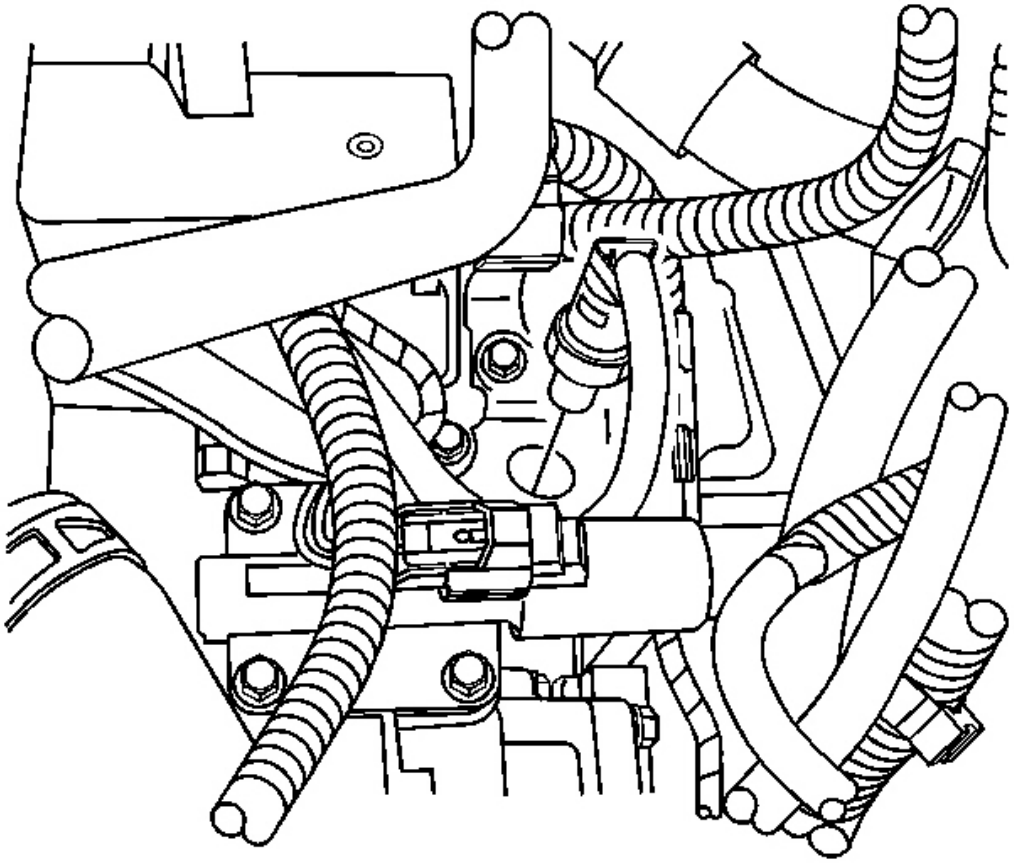

Fig. 6: 4th Clutch Pressure Switch
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the wiring harness from the 4th clutch pressure switch.
3. Remove the 4th clutch pressure switch and washer.

Installation Procedure

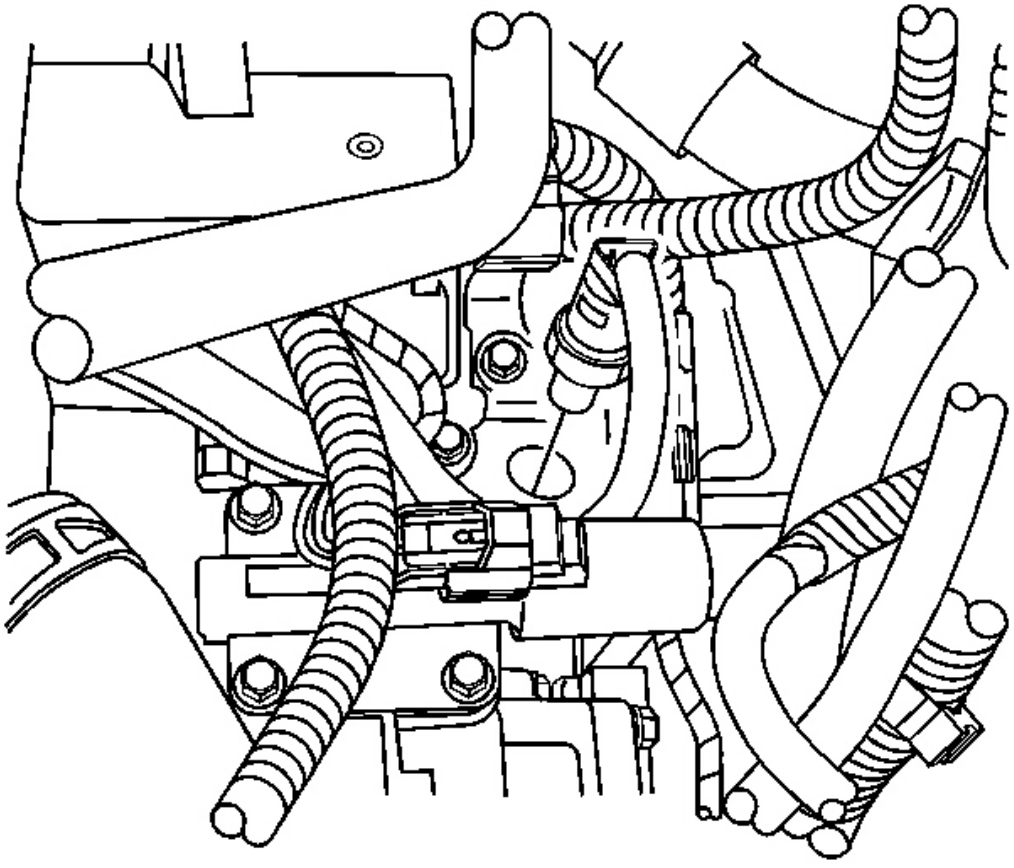

Fig. 7: 4th Clutch Pressure Switch
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the 4th clutch pressure switch and washer.

   Tighten: Tighten the input speed sensor bolt 20 N.m (14 lb ft).

2. Connect the wiring harness to the 4th clutch pressure switch.

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

3RD CLUTCH PRESSURE SWITCH REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Drain the transmission fluid. Refer to **Transmission Fluid Replacement** .

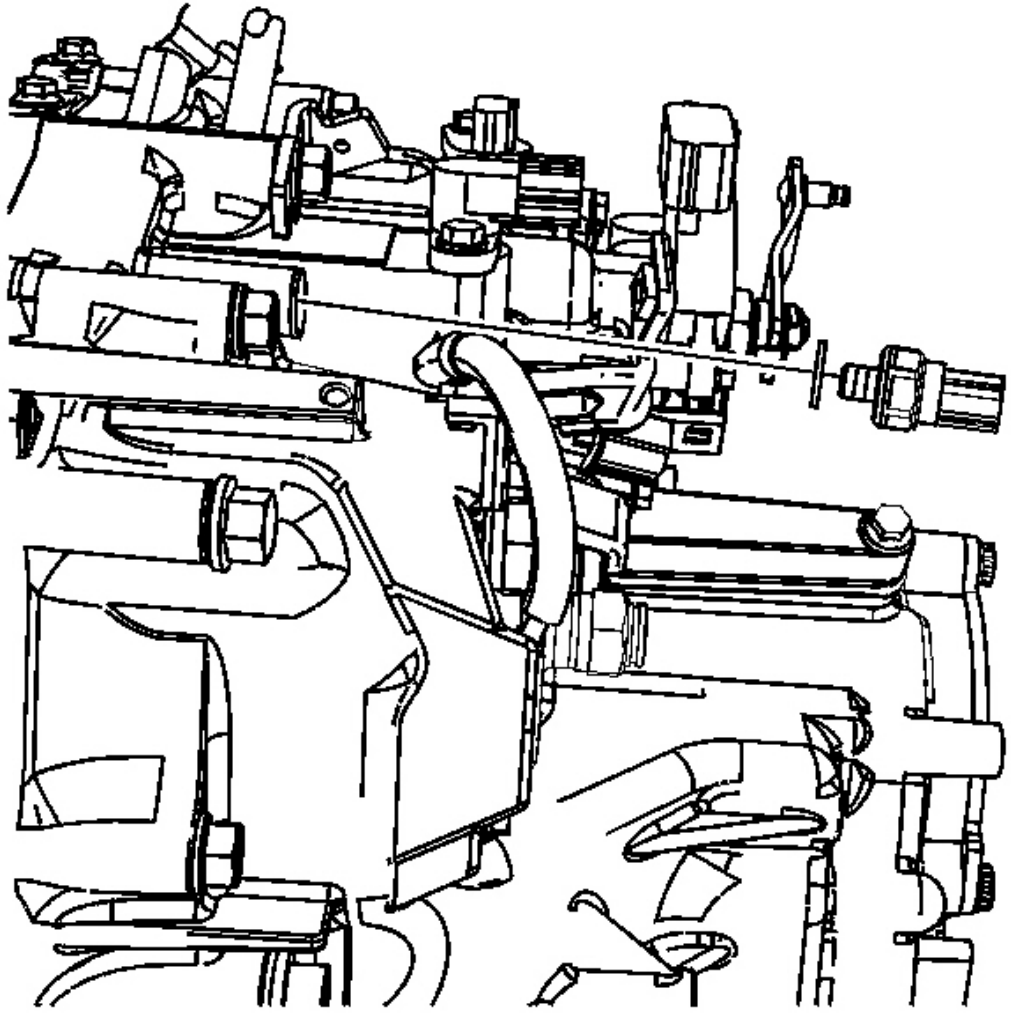

Fig. 8: 3rd Clutch Pressure Switch

Courtesy of GENERAL MOTORS CORP.

3. Disconnect the wiring harness from the 3rd clutch pressure switch.
4. Remove the 3rd clutch pressure switch and washer.

Installation Procedure

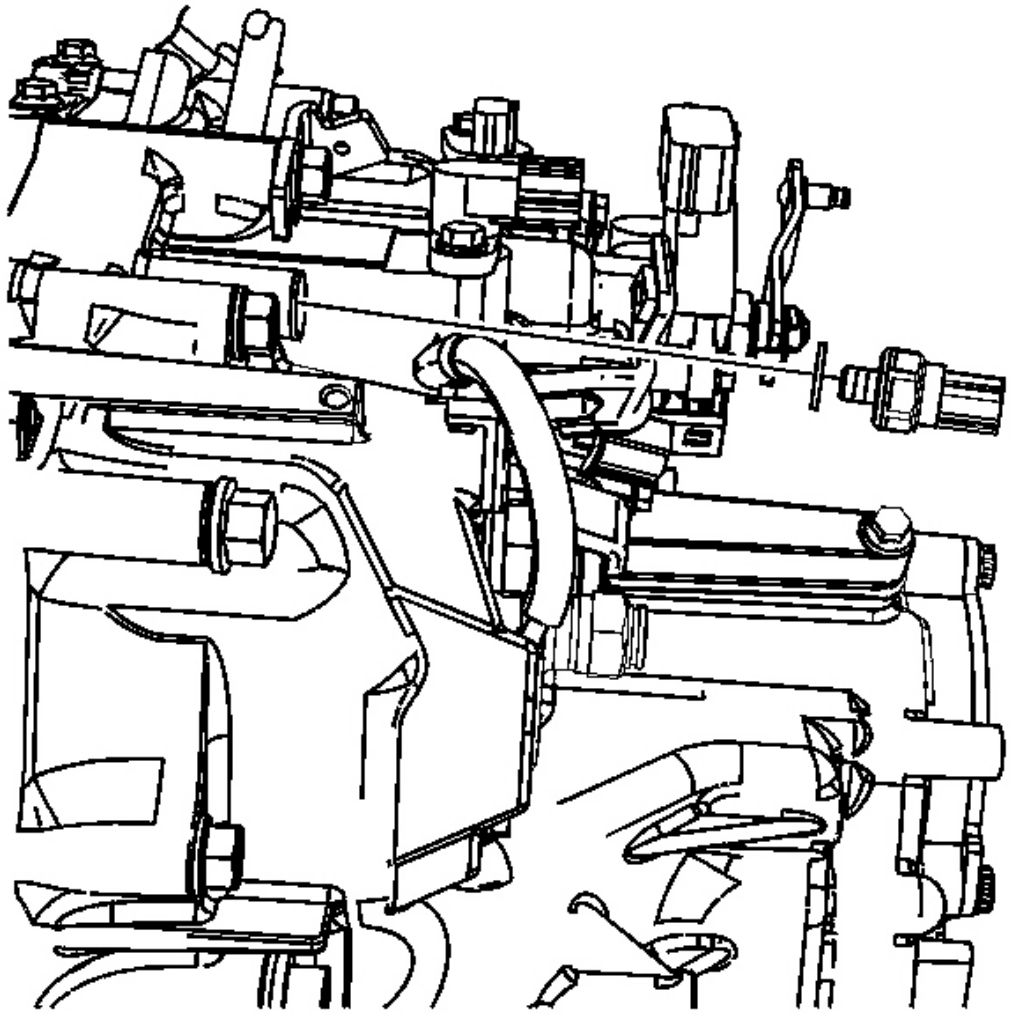

Fig. 9: 3rd Clutch Pressure Switch
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the 3rd clutch pressure switch and washer.

   Tighten: Tighten the input speed sensor bolt 20 N.m (14 lb ft).

2. Connect the wiring harness to the 3rd clutch pressure switch.
3. Fill the transmission with transmission fluid. Refer to **Transmission Fluid Replacement** .
4. Lower the vehicle.

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the wiring harness from the transmission fluid temperature (TFT) sensor.

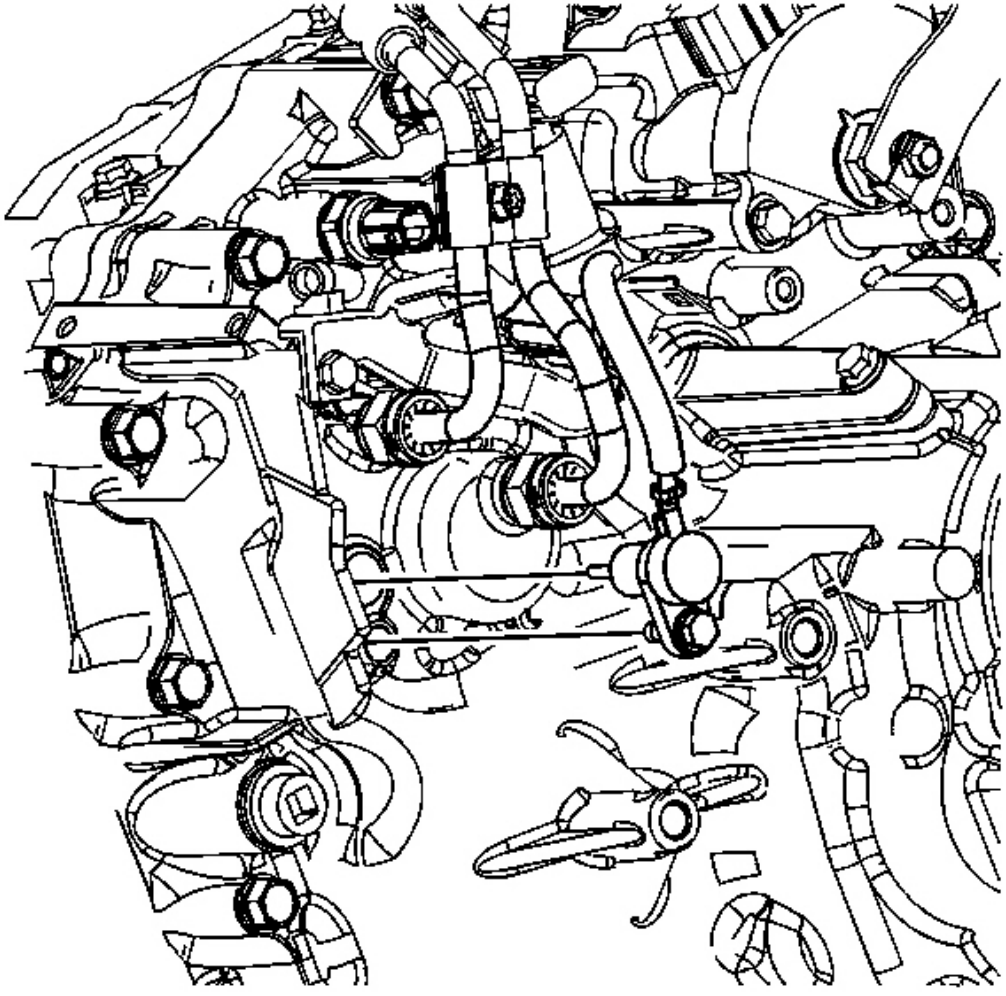

Fig. 10: TFT Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the TFT sensor or transaxle case.

3. Remove the TFT sensor bolt/screw.
4. Remove the TFT sensor and the O-ring.

Installation Procedure

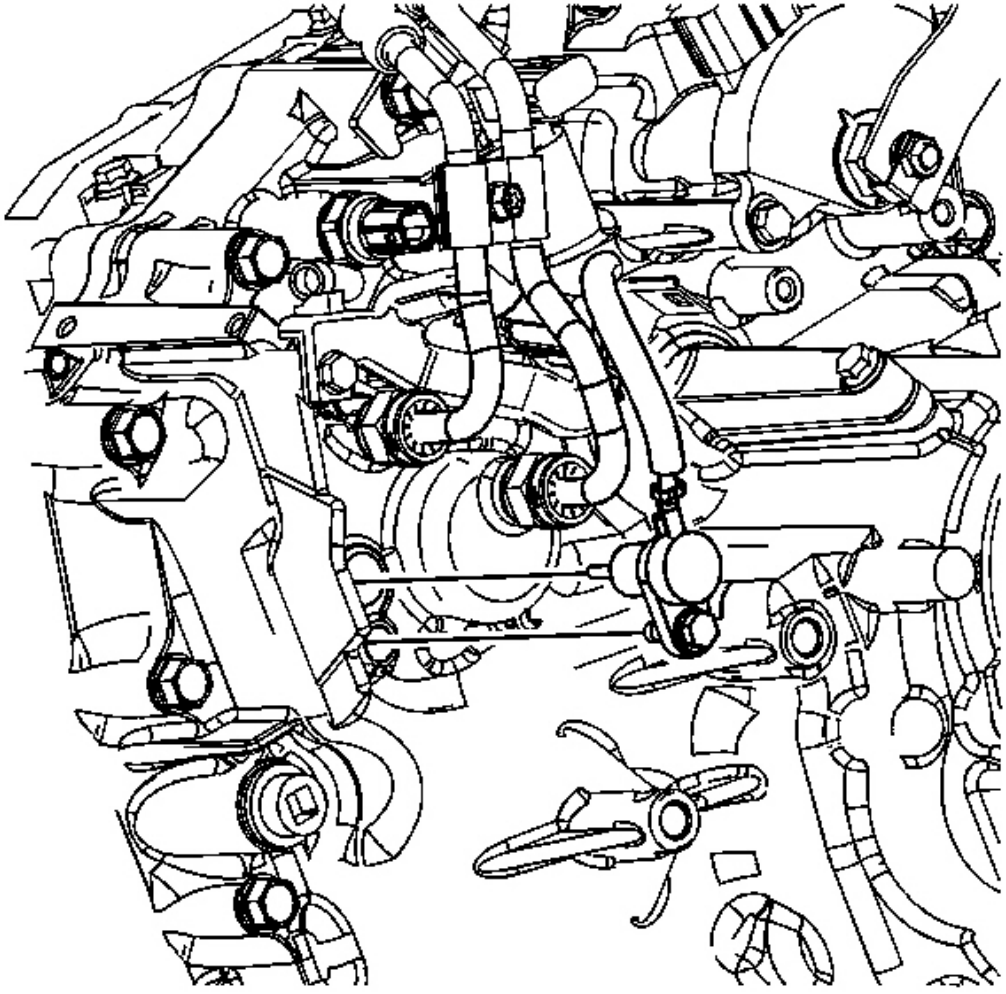

Fig. 11: TFT Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

1. Apply automatic transmission fluid to the new TFT sensor O-ring seal.
2. Install the new TFT sensor O-ring seal onto the TFT sensor.
3. Install the TFT sensor into the transmission case assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the TFT sensor bolt.

Tighten: Tighten the bolt to 12 N.m (106 lb in).

5. Connect the wiring harness to the TFT sensor.
6. Lower the vehicle.

INPUT SPEED SENSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

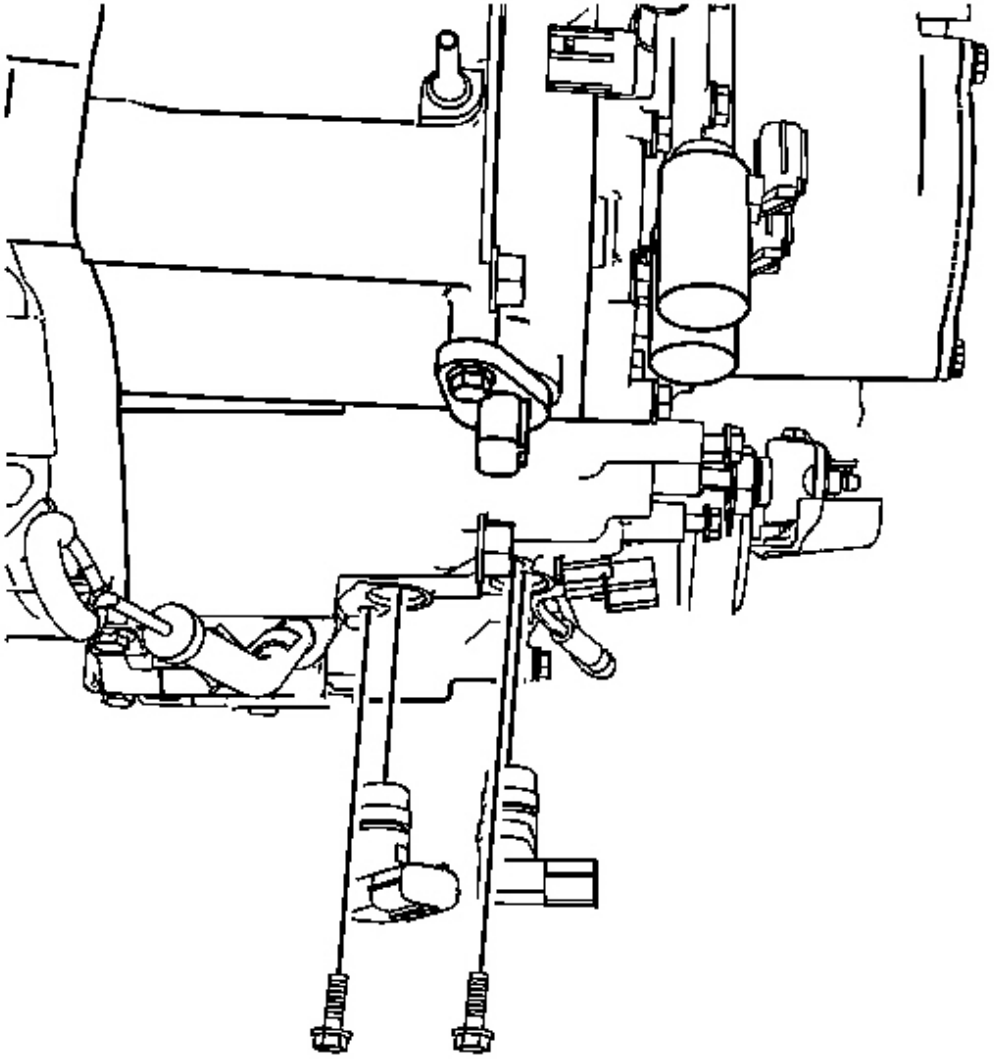

Fig. 12: Input/Output Speed Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the wiring harness from the input speed sensor.

IMPORTANT: Do not damage the input speed sensor or transaxle case.

3. Remove the input speed sensor bolt/screw.
4. Remove the input speed sensor, and the input speed sensor O-ring.

Installation Procedure

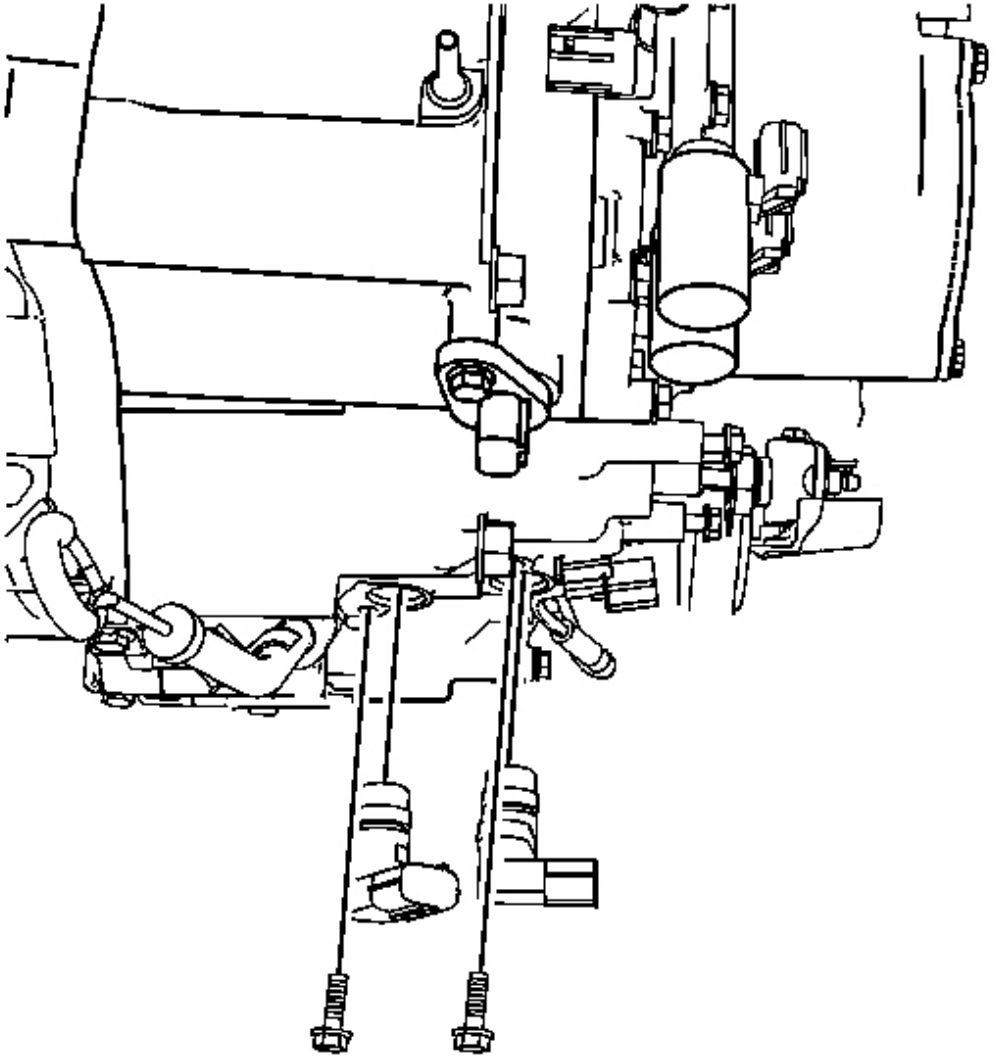

Fig. 13: Input/Output Speed Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

1. Apply automatic transmission fluid to the new input speed sensor O-ring seal.
2. Install the new input speed sensor O-ring seal onto the input speed sensor.
3. Install the input speed sensor into the transmission case assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the input speed sensor bolt.

   Tighten: Tighten the bolt 12 N.m (106 lb in).

5. Connect the wiring harness to the input speed sensor.
6. Lower the vehicle.

OUTPUT SPEED SENSOR REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the wiring harness from the output speed sensor.

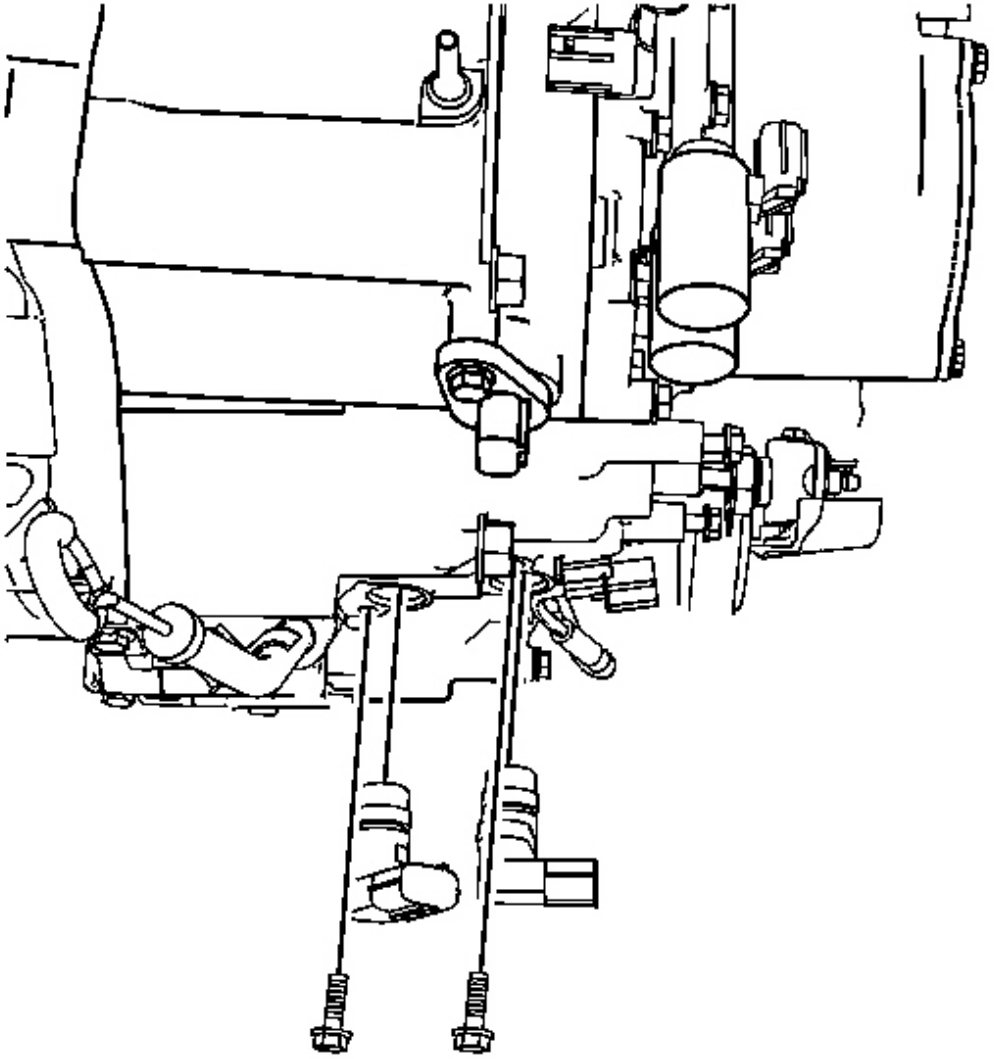

Fig. 14: Input/Output Speed Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the output speed sensor or transaxle case.

3. Remove the output speed sensor bolt/screw.
4. Remove the output shaft speed sensor and the O-ring.

Installation Procedure

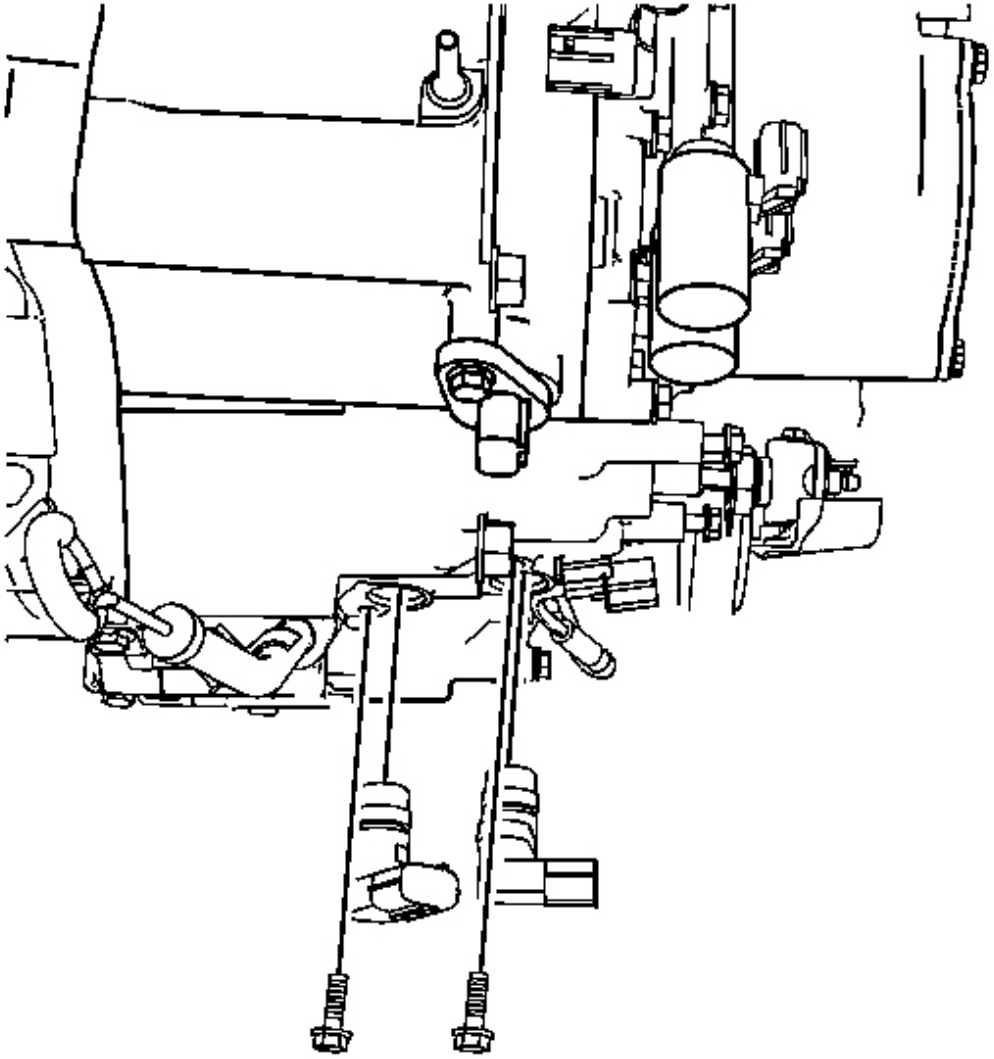

Fig. 15: Input/Output Speed Sensor, Bolt & Screw
Courtesy of GENERAL MOTORS CORP.

1. Apply automatic transmission fluid to the new output speed sensor O-ring seal.
2. Install the new output speed sensor O-ring seal onto the output speed sensor.
3. Install the output speed sensor into the transmission case assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the output speed sensor bolt.

   Tighten: Tighten the bolt to 12 N.m (106 lb in).

5. Connect the wiring harness to the output speed sensor.
6. Lower the vehicle.

AUTOMATIC TRANSMISSION RANGE SELECTOR CABLE LEVER REPLACEMENT

Tools Required

J 36346 Fascia Retainer Remover

Removal Procedure

NOTE: The control cable must be disconnected from the transaxle range switch lever prior to disconnecting it from the control cable bracket. Otherwise damage to the manual shift shaft may result, requiring transaxle disassembly.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the left splash shield. Refer to **Splash Shield Replacement - Engine** in Body Front End.
4. Remove the range selective lever bolt and cover.
5. Using the **J 36346** , disconnect the control cable from the transaxle range switch lever.

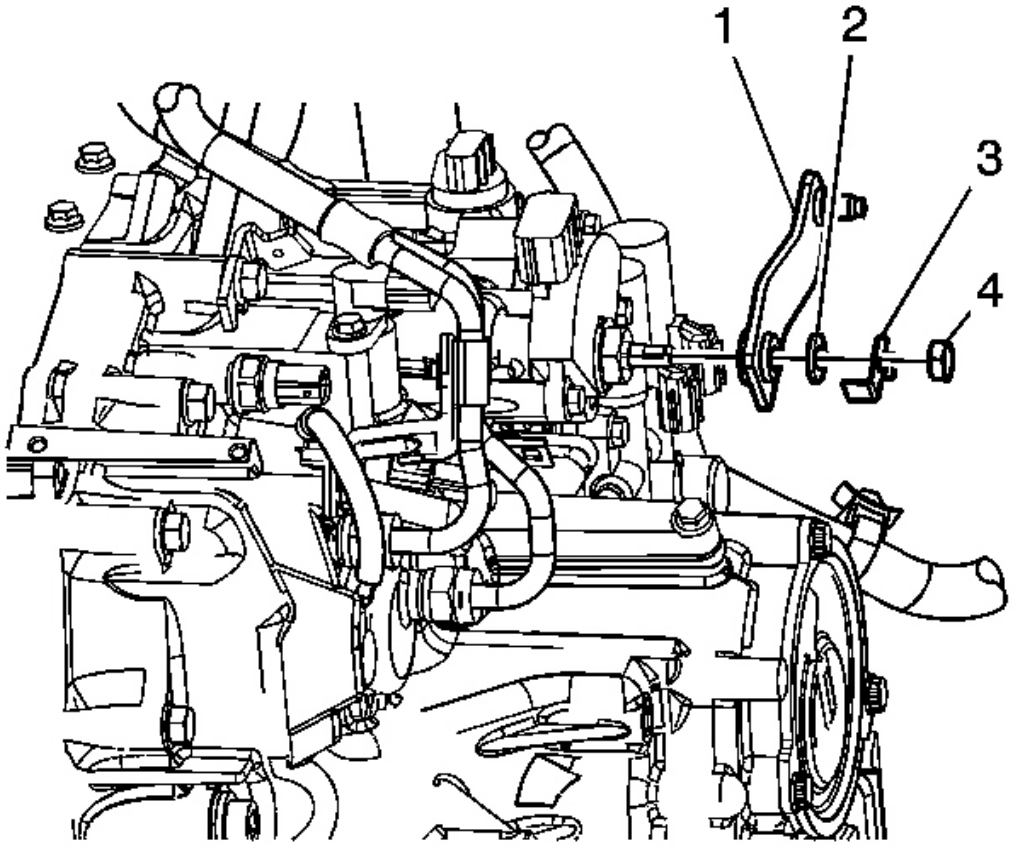

Fig. 16: Transaxle Range Switch Lever Nut, Lock Nut, Washer & Lever
Courtesy of GENERAL MOTORS CORP.

6. Remove the transaxle range switch lever nut (4), lock nut (3), washer (2), and lever (1).

Installation Procedure

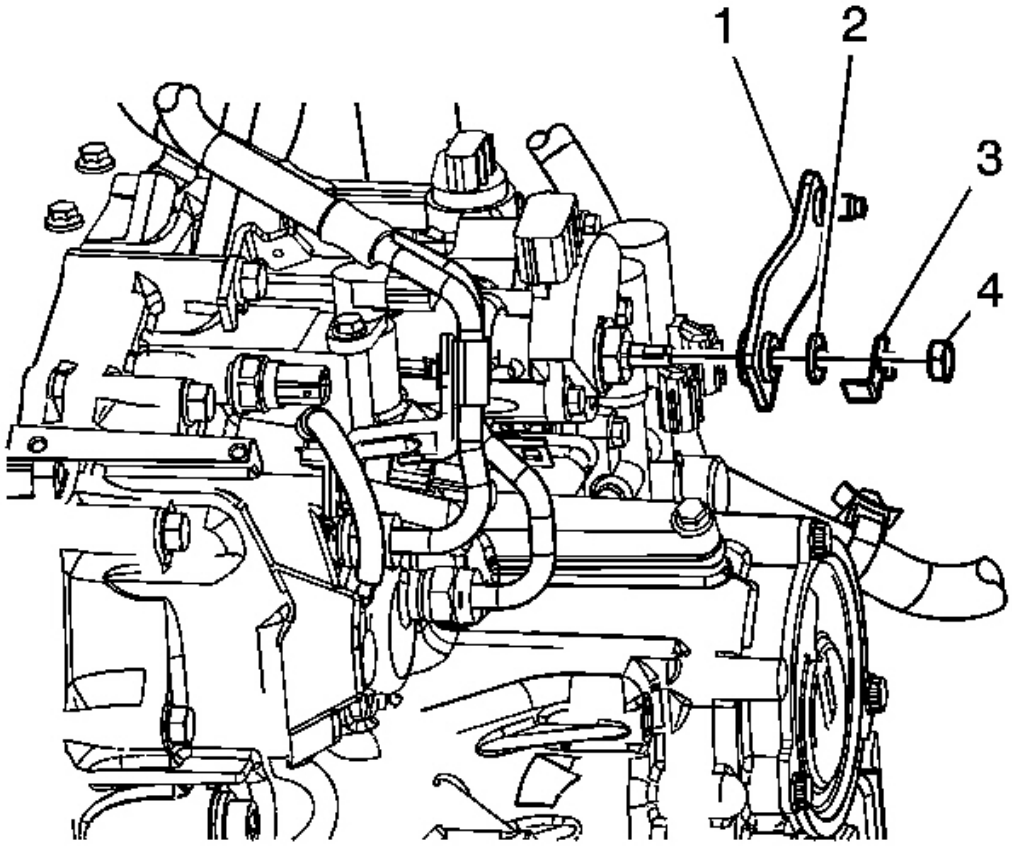

Fig. 17: Transaxle Range Switch Lever Nut, Lock Nut, Washer & Lever
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the transaxle range switch lever (1), washer (2) lock washer (3), and lever nut (4).

   Tighten: Tighten the transaxle range switch lever nut to 16 N.m (12 lb ft).

2. Snap the cable end fitting onto the ball stud of the transaxle range switch lever. An audible snap will be heard when properly installed.
3. Install the battery tray and bracket. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.
4. Install the battery. Refer to **Battery Replacement** in Engine Electrical.
5. Install the range selective lever bolt and cover.

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

6. Install the left splash shield. Refer to **Splash Shield Replacement - Engine** in Body Front End.
7. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION OIL LEVEL INDICATOR TUBE REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

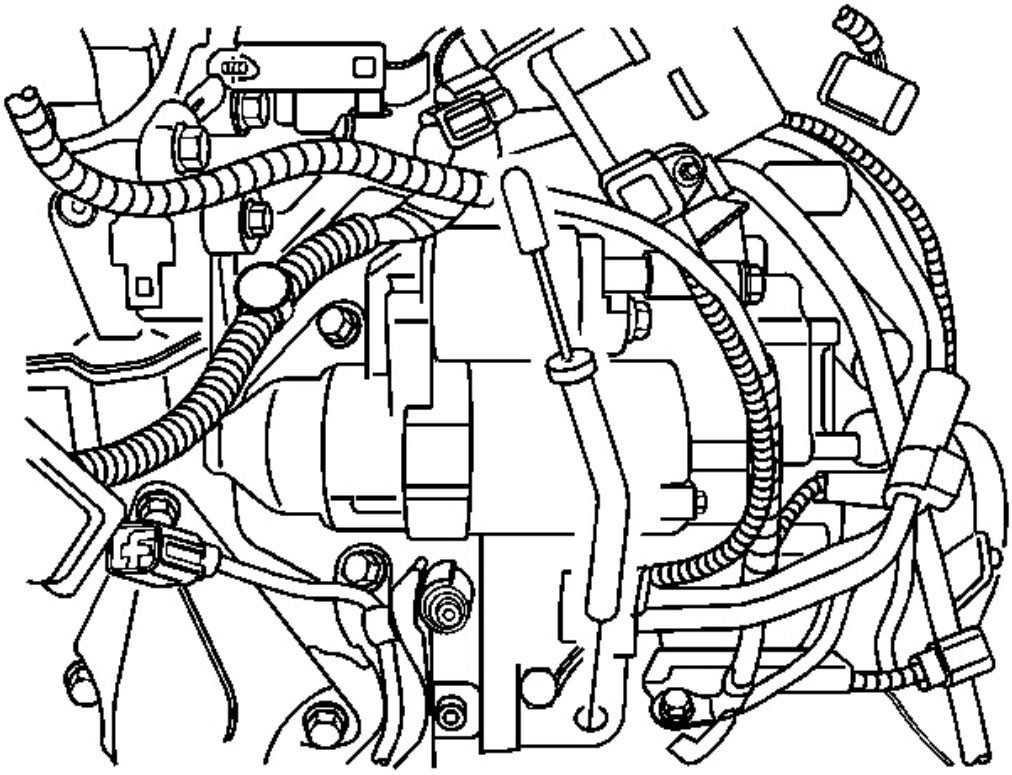

Fig. 18: Oil Indicator Tube & Bolt
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil indicator tube bolt.
3. Remove the oil indicator and tube.

Installation Procedure

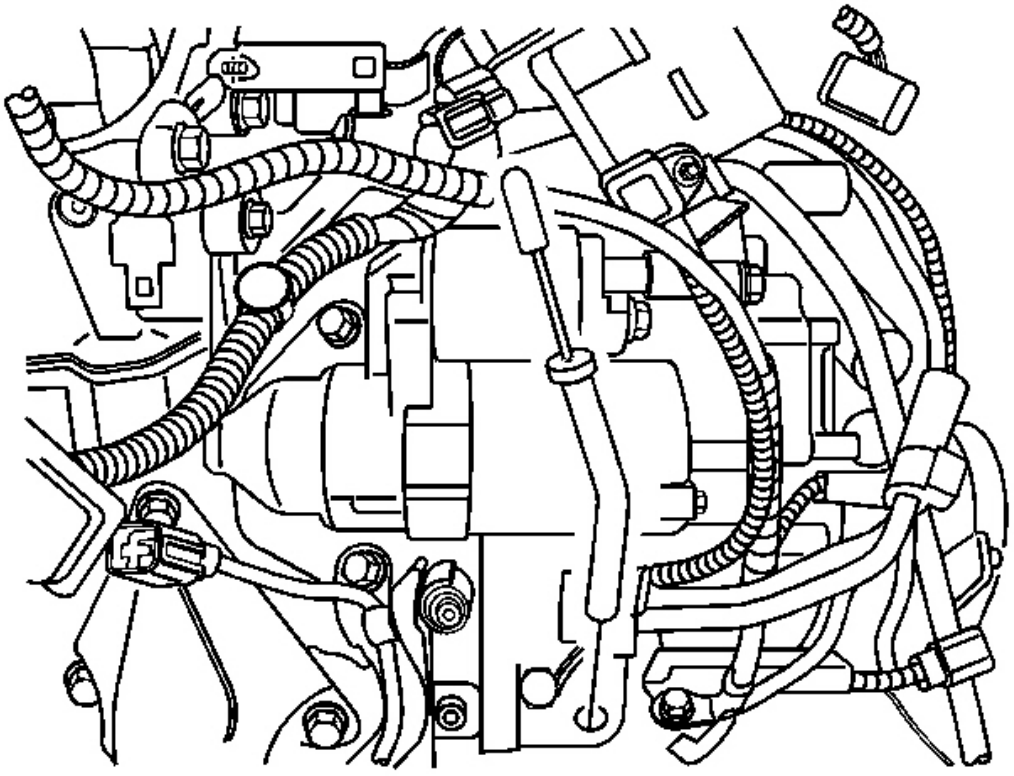

Fig. 19: Oil Indicator Tube & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install the oil indicator and tube into the transmission case assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the oil indicator tube bolt.

Tighten: Tighten the bolt to 12 N.m (106 lb in).

PARK/NEUTRAL POSITION SWITCH REPLACEMENT

Tools Required

J 36346 Fascia Retainer Remover

Removal Procedure

1. Apply the parking brake.
2. Place the transmission shift lever in the neutral position.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
5. Remove the left splash shield. Refer to **Splash Shield Replacement - Engine** in Body - Front End.

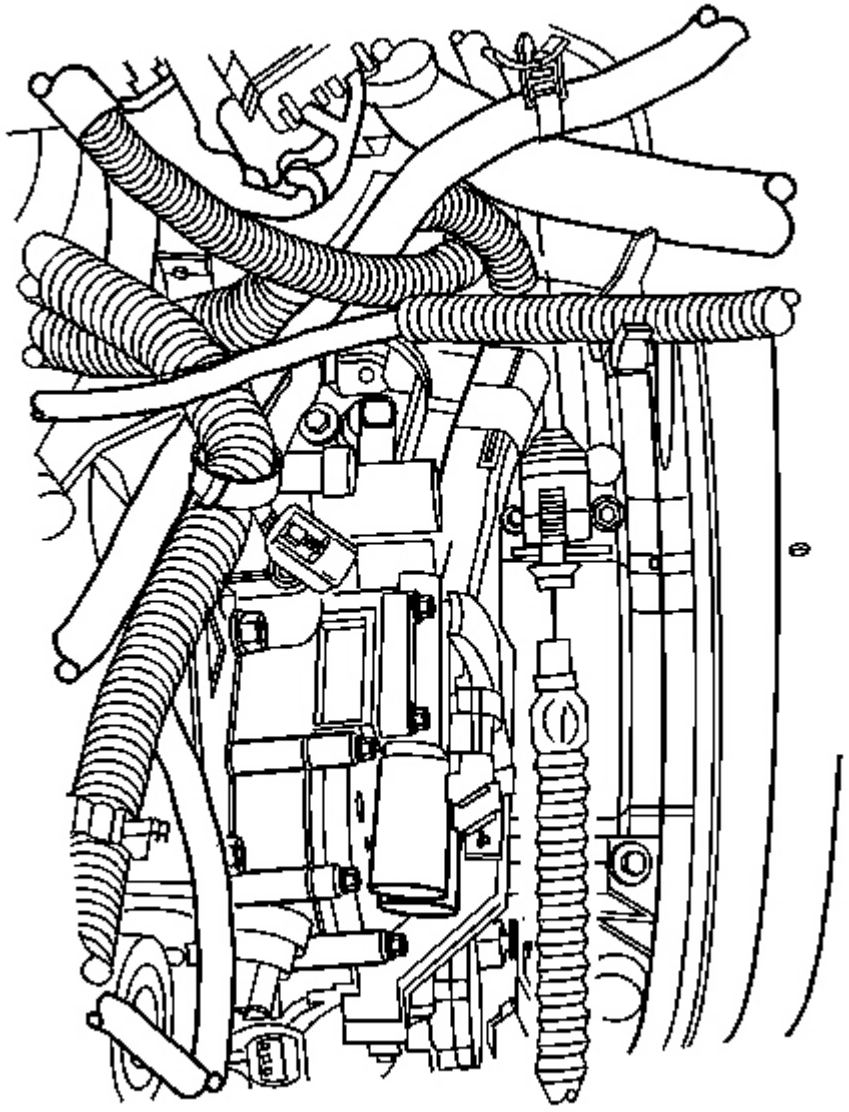

Fig. 20: Park/Neutral Position Switch Harness Connector
Courtesy of GENERAL MOTORS CORP.

6. Remove the range selective lever bolt and cover.
7. Using the **J 36346** , disconnect the control cable from the transaxle range switch lever.
8. Disconnect the Park/neutral position switch harness connector.

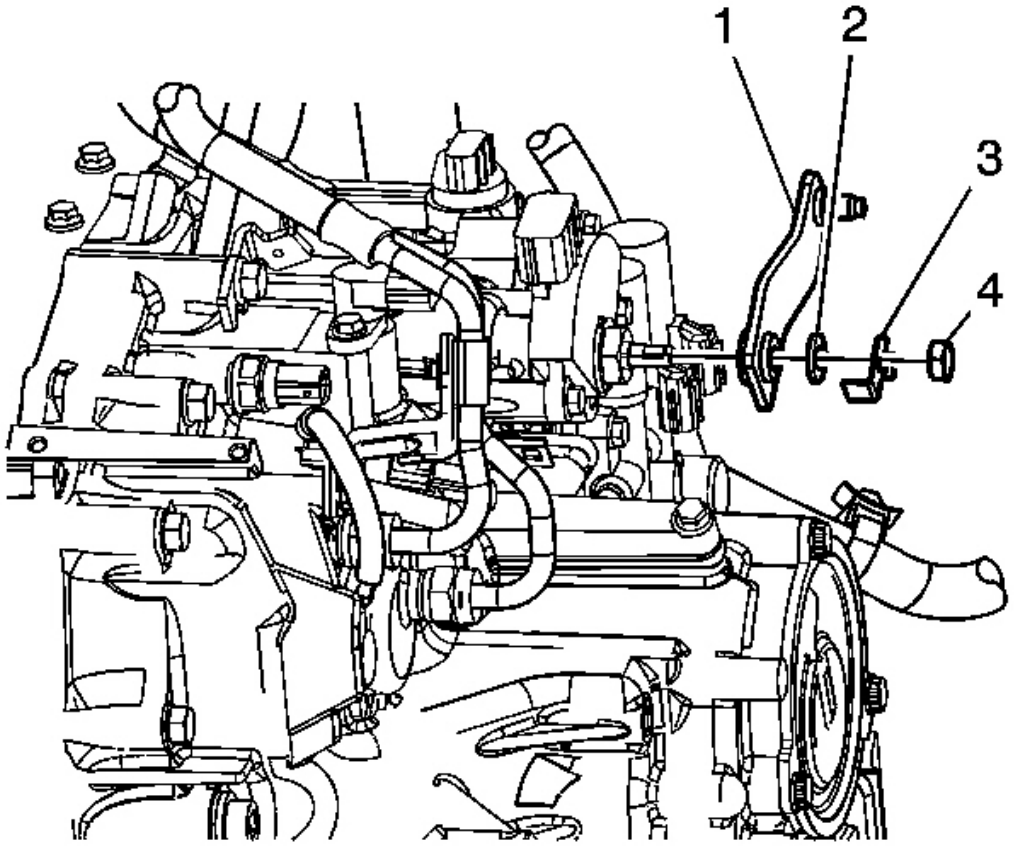

Fig. 21: Transaxle Range Switch Lever Nut, Lock Nut, Washer & Lever
Courtesy of GENERAL MOTORS CORP.

9. Remove the transmission control nut (4) and lever (1).
10. Using a small screwdriver, bend the lock washer tabs down on the manual shaft nut.

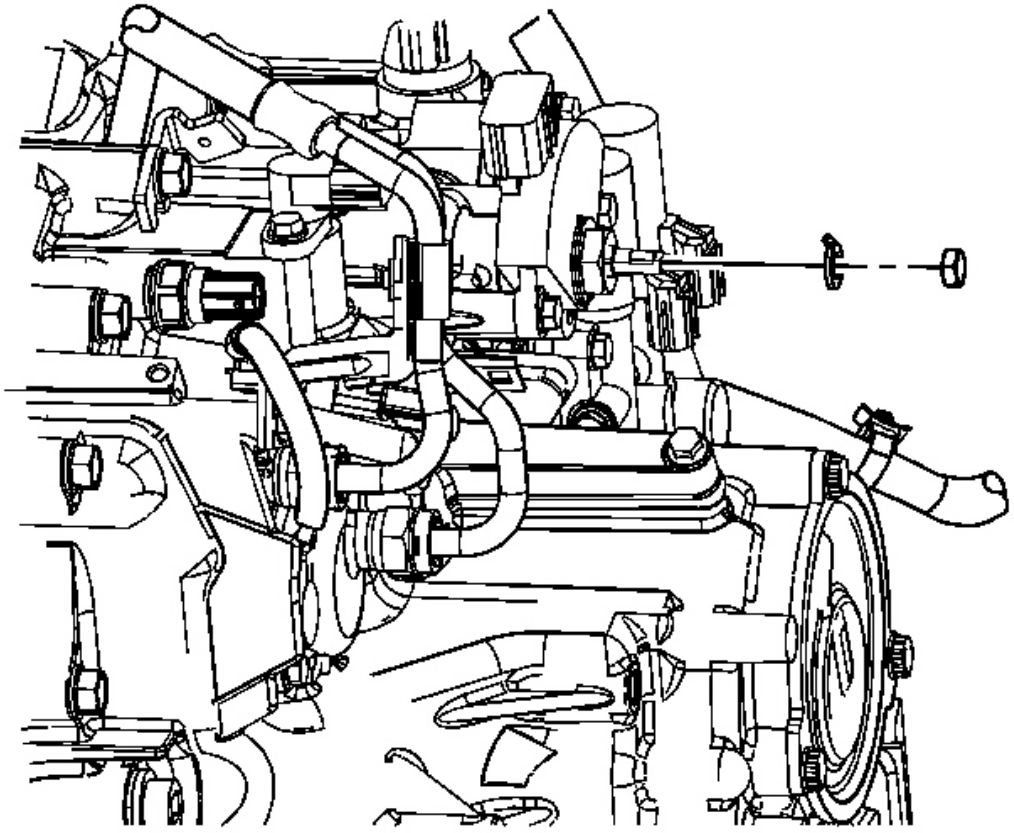

Fig. 22: Manual Shaft Nut & Lock Washer
Courtesy of GENERAL MOTORS CORP.

11. Remove the manual shaft nut and lock washer.

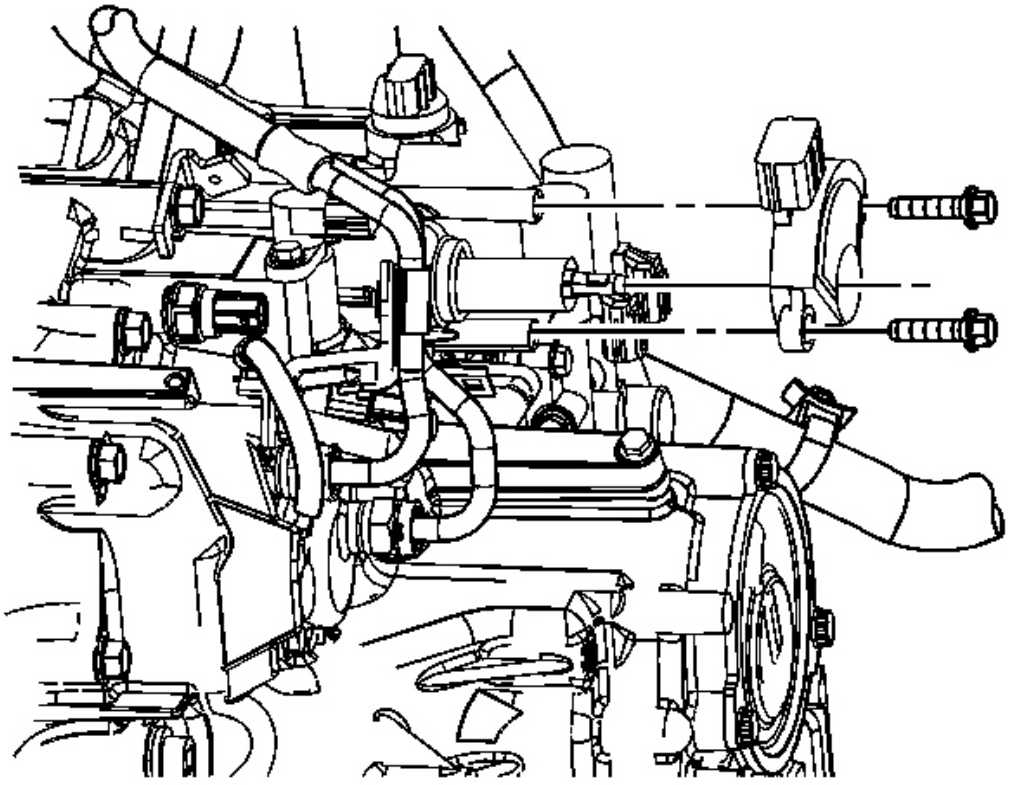

Fig. 23: Park/Neutral Position Switch & Bolts
Courtesy of GENERAL MOTORS CORP.

12. Remove the park/neutral position switch bolts.
13. Remove the park/neutral position switch from the transmission.

Installation Procedure

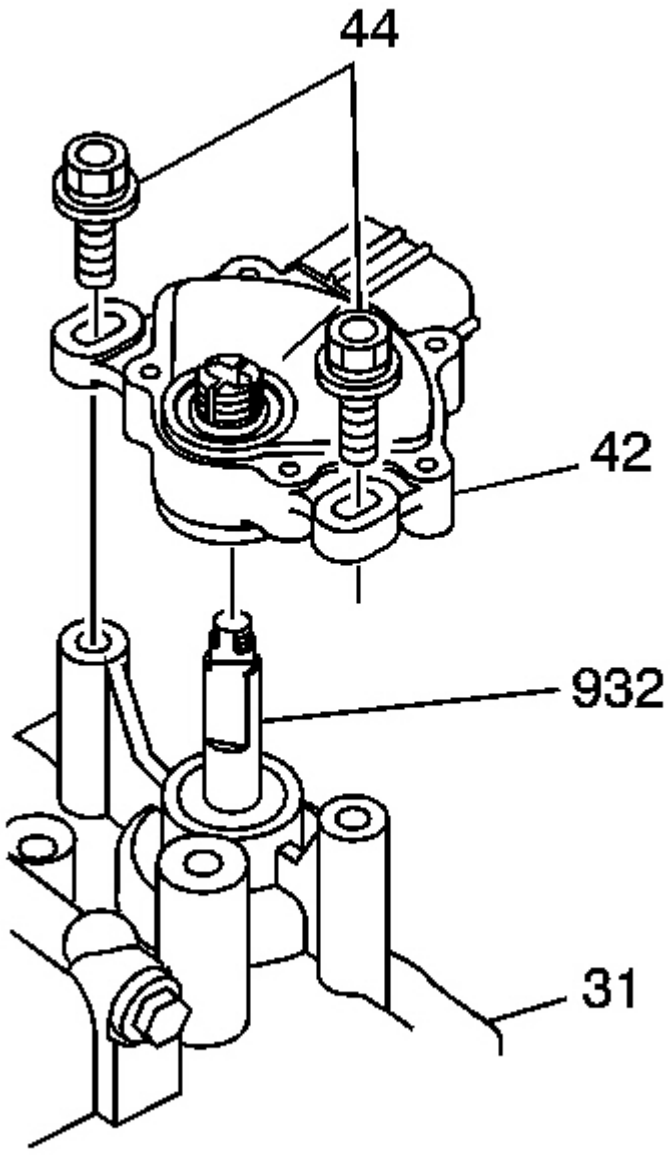

Fig. 24: Park/Neutral Position Switch & Control Shaft Hole
Courtesy of GENERAL MOTORS CORP.

1. Position the park/neutral position switch (42) to the neutral (N) position. The park/neutral position switch will click in the neutral position, and the control shaft hole aligns with the positioning line.

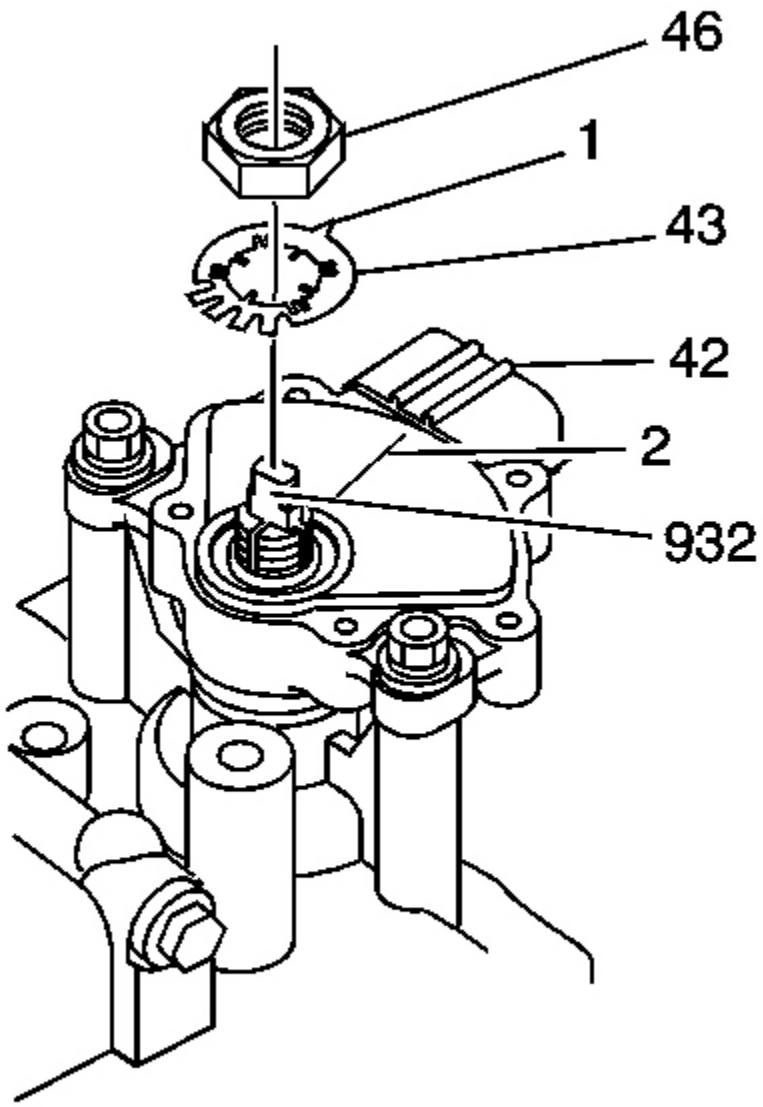

Fig. 25: Park/Neutral Position Switch, Manual Shift Shaft & Lock Washer
Courtesy of GENERAL MOTORS CORP.

2. Install the park/neutral position switch (42) gently over the manual shift shaft (932), and install the M 6 x 1.0 x 16 mm flanged bolt/screws loosely into the transmission case housing.
3. Install a new lock washer over the manual shift shaft while aligning the projection/indicator point of the lock washer with the positioning line on the park/neutral position switch, and install the 16 mm locknut.

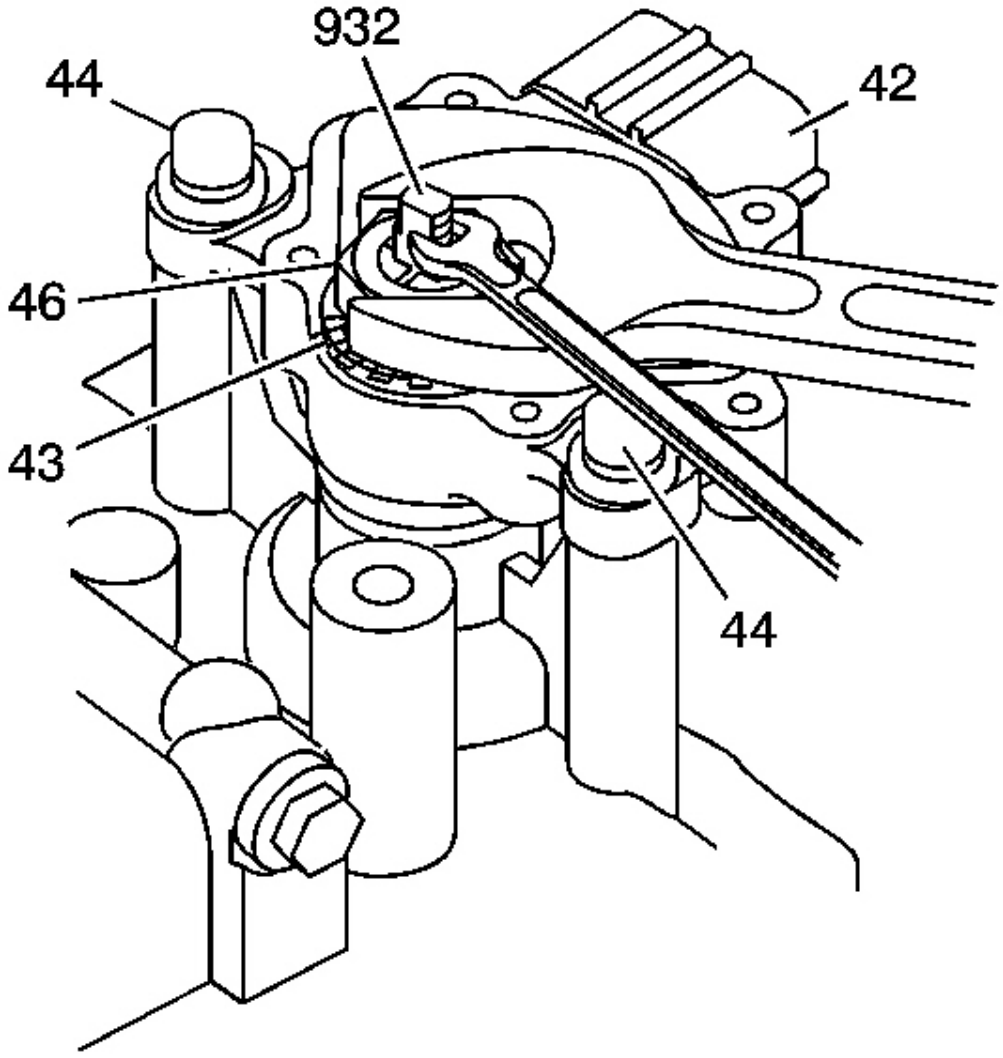

Fig. 26: Tightening The Locknut & Flanged Bolt/Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Push the 16 mm locknut against the transmission housing to seat the park/neutral position switch into the manual shift shaft, and tighten the 16 mm locknut while holding the manual shift shaft (932) with an adjustable wrench, and then bend the lock tabs of the lock washer (46) against the 16 mm lock nut.

Tighten: Tighten the 16 mm locknut to 12 N.m (8.7 lb ft).

5. Tighten the park/neutral position switch flanged bolt/screws to secure the park/neutral position switch to the transmission case housing.

   Tighten: Tighten the 2 M 6 x 1.0 x 16 mm flanged bolt/screws to 12 N.m (8.7 lb ft).

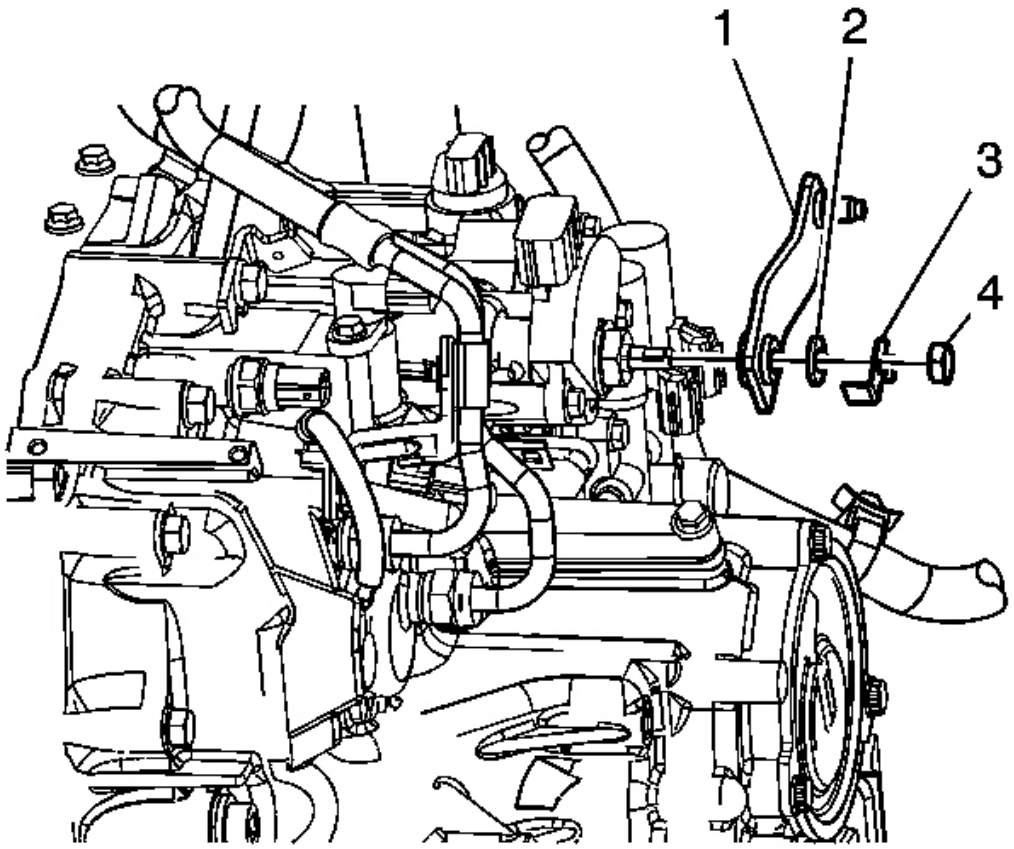

Fig. 27: Transaxle Range Switch Lever Nut, Lock Nut, Washer & Lever
Courtesy of GENERAL MOTORS CORP.

6. Install the range selector lever (1), 8 mm spring washer (2), 8 mm lock washer (3), and 8 mm locknut (4) on the manual shift shaft.

   Tighten: Tighten the 8 mm locknut to 12 N.m (8.7 lb ft).

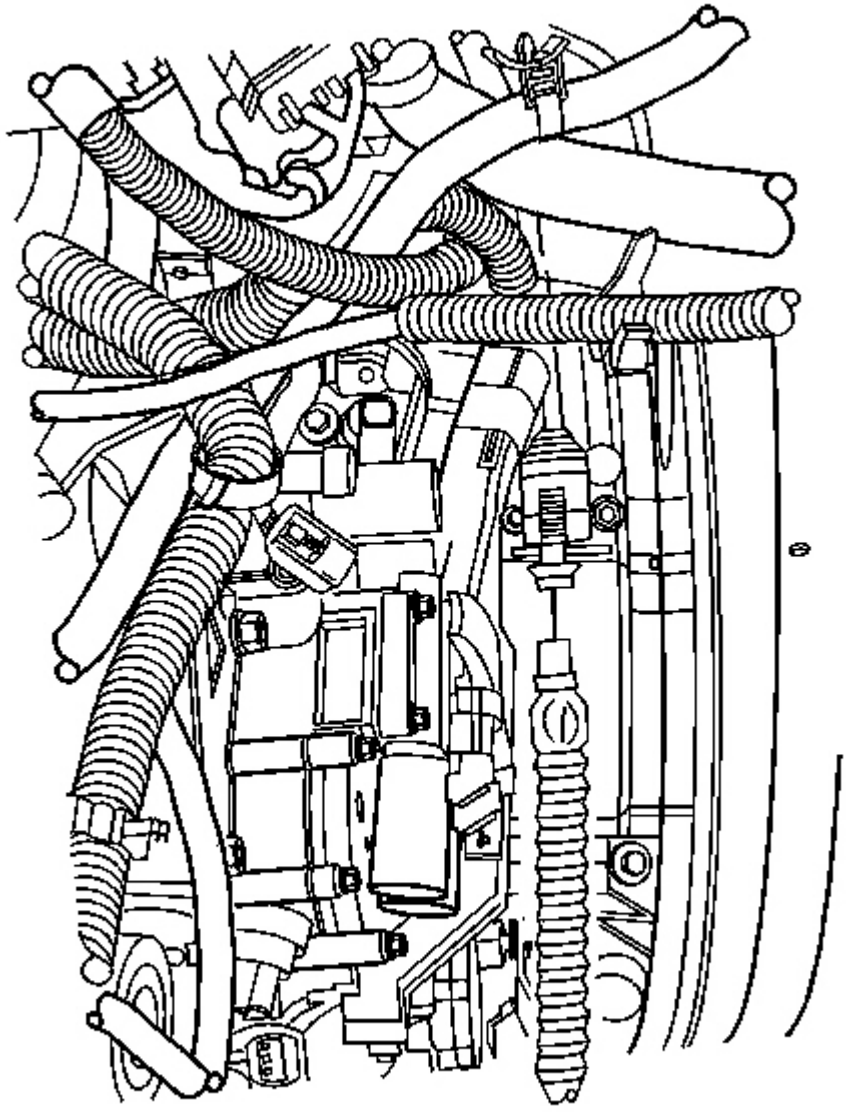

Fig. 28: Park/Neutral Position Switch Harness Connector
Courtesy of GENERAL MOTORS CORP.

7. Connect the shift cable to the transmission control lever and cable bracket.
8. Connect the park/neutral position switch harness connectors.
9. Install the range selective lever bolt and cover.

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

10. Install the left splash shield. Refer to **Splash Shield Replacement - Engine** in Body - Front End.
11. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
12. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
13. Verify the park/neutral position switch adjustment by starting the vehicle in all ranges. If the transmission starts in any ranger other than park or neutral, readjust the park/neutral position switch.

TRANSMISSION OUTPUT SHAFT SEAL REPLACEMENT

Tools Required

- **J 43068** Axle Seal Installer
- **J 45000** Seal Remover

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the drive axle assembly. Refer to **Wheel Drive Shaft Replacement - Front** in Wheel Drive Shafts.
3. For right side seal, remove exhaust front pipe. Refer to **Exhaust Manifold Pipe Replacement (L66)** or **Exhaust Manifold Pipe Replacement (L61)** in Engine Exhaust.

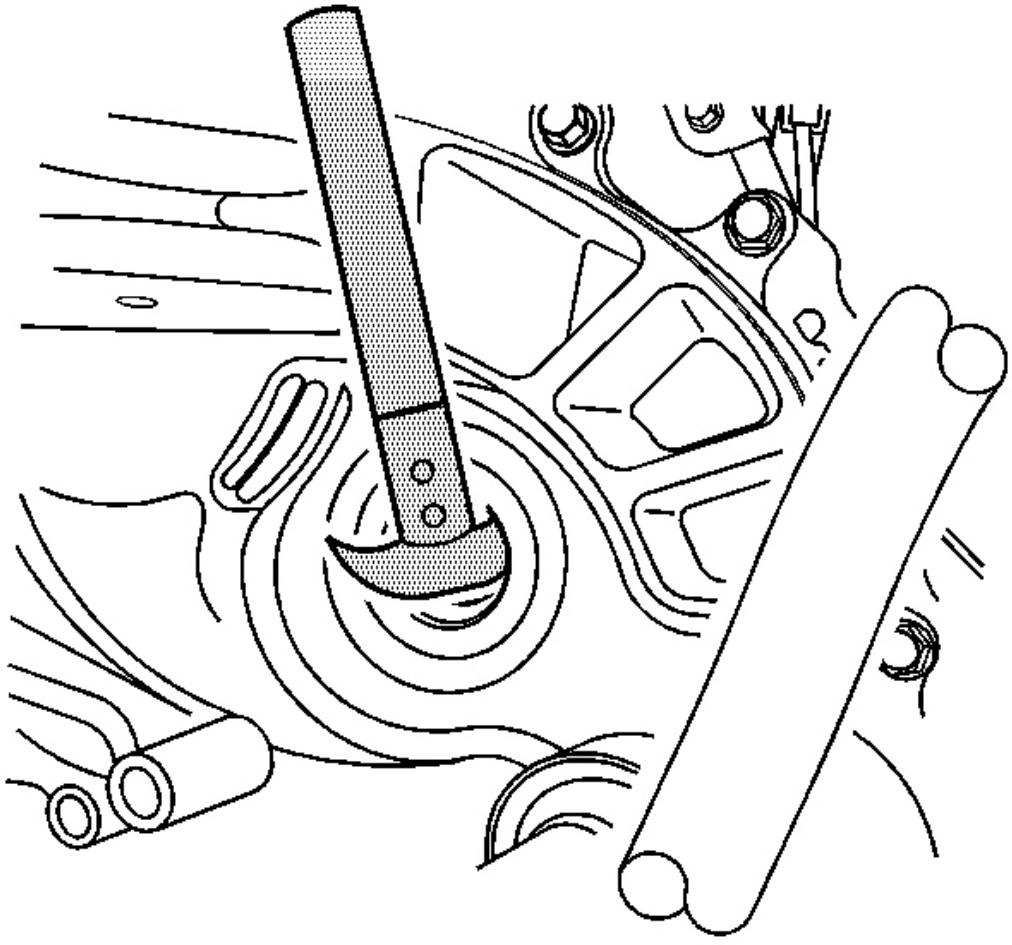

Fig. 29: Removing Wheel Drive Shaft Oil Seal From Transmission Case Using J 45000
Courtesy of GENERAL MOTORS CORP.

4. Using **J 45000** , remove the wheel drive shaft oil seal from the transmission case.

Installation Procedure

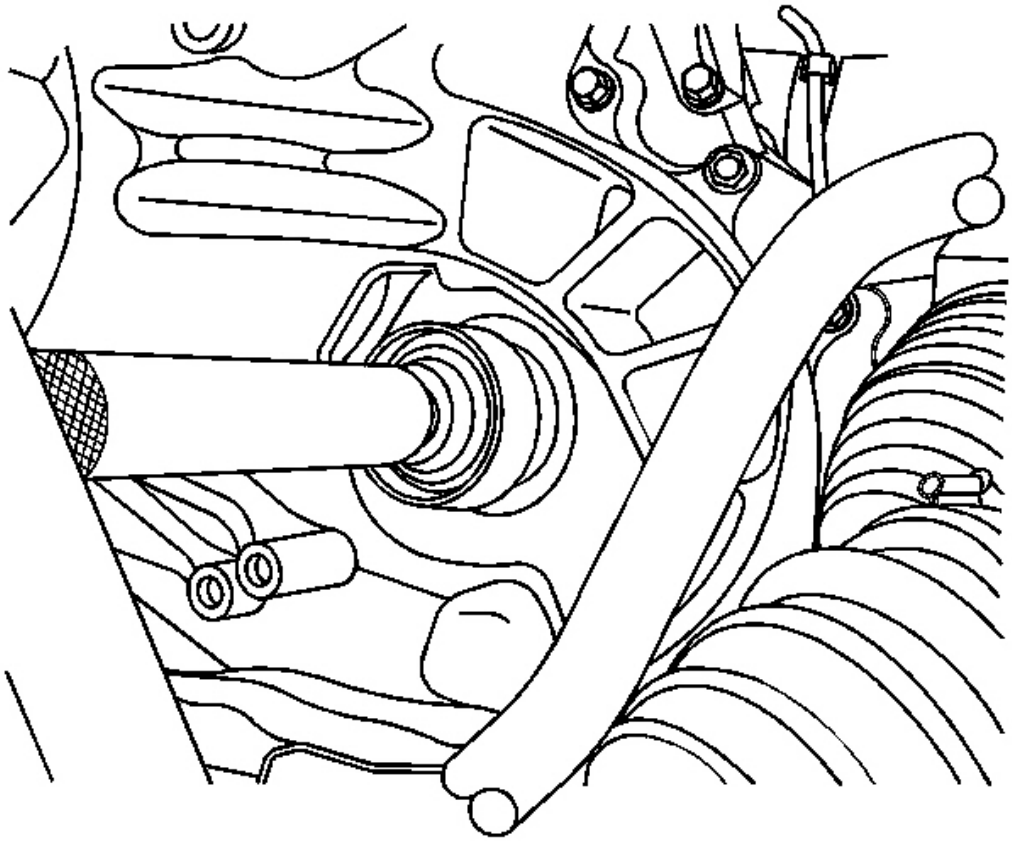

Fig. 30: Transmission Output Shaft Oil Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The seal must install flush with the case flange.

1. Using the **J 43068** , install the transmission output shaft oil seal into the transmission case.
2. Install the drive axle assembly. Refer to **Wheel Drive Shaft Replacement - Front** in Wheel Drive Shafts.
3. Lower the vehicle.
4. Check the transaxle fluid level. Refer to **Transmission Fluid Checking Procedure** .

OIL COOLER LINE REPLACEMENT

Removal Procedure

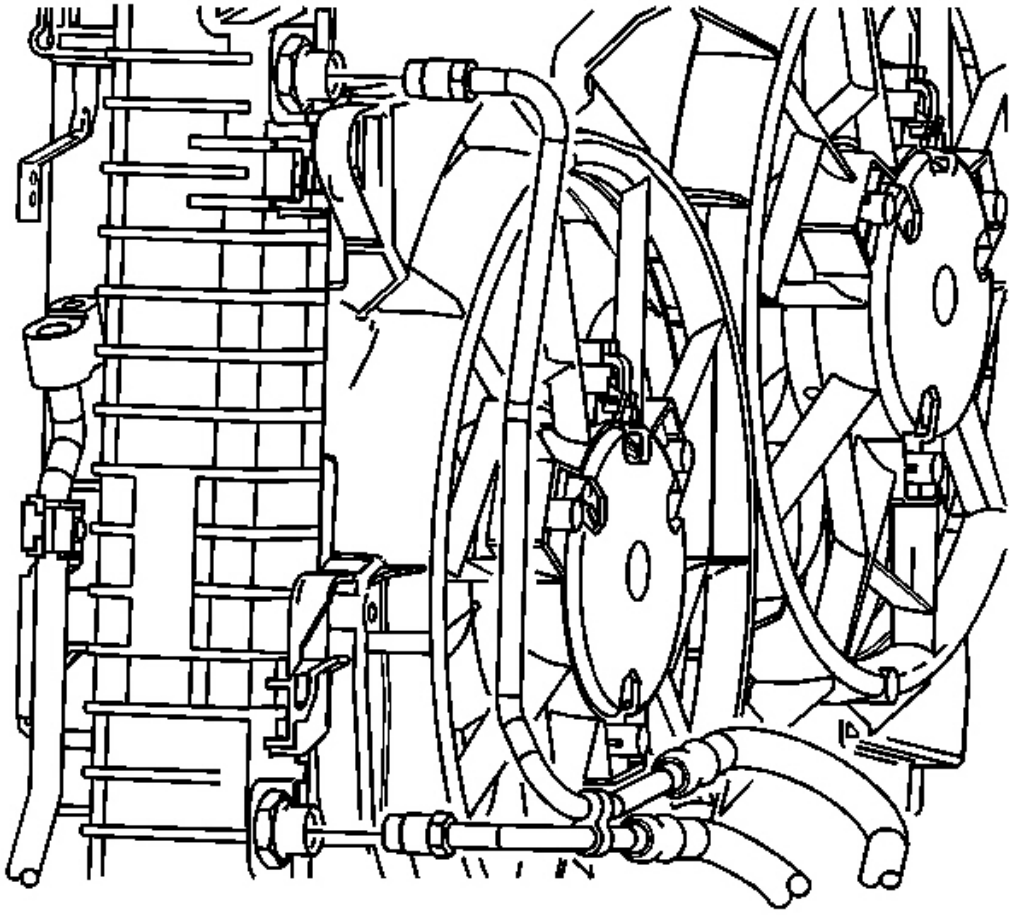

Fig. 31: TOC Line From Radiator
Courtesy of GENERAL MOTORS CORP.

1. Place a drain pan or suitable container under the vehicle.
2. Clean the cooler line connection points at the radiator and transmission.
3. Disconnect the upper transmission oil cooler (TOC) line from the radiator.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
5. Disconnect the lower TOC line from the radiator.
6. Disconnect the upper TOC line from the clip on the fan shroud.

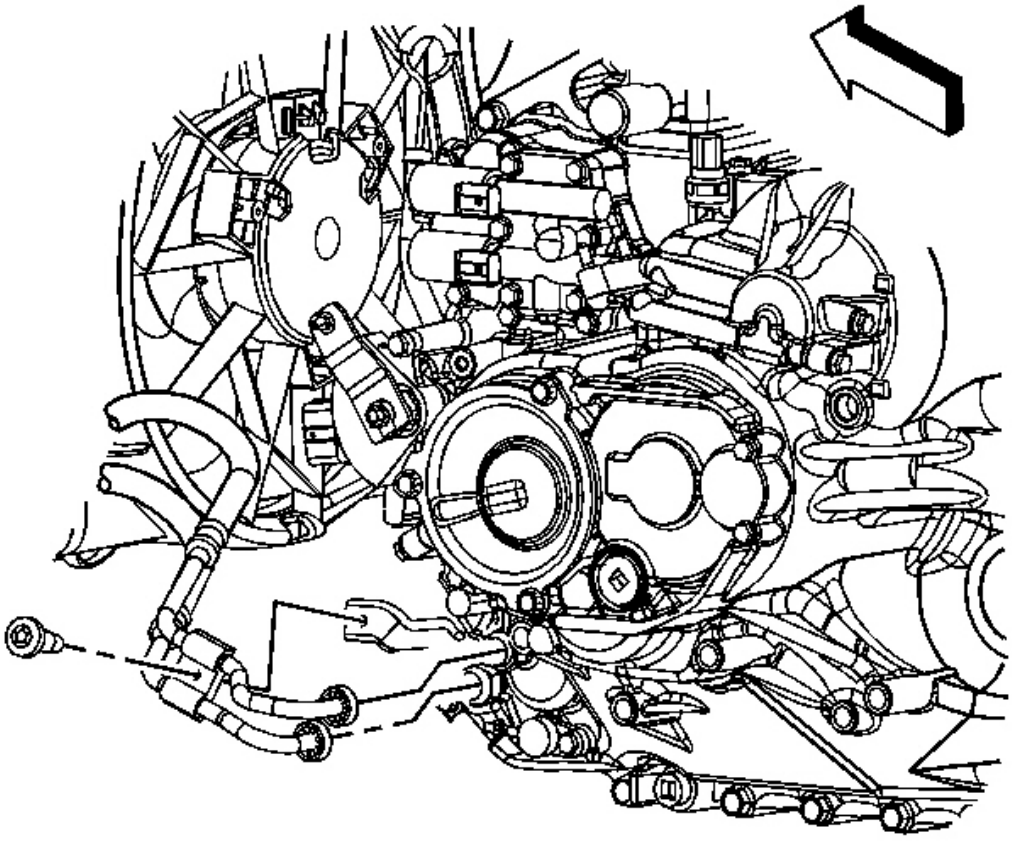

Fig. 32: TOC Line Bracket Bolt From Transmission Bracket
Courtesy of GENERAL MOTORS CORP.

7. Remove the TOC line bracket bolt from the transmission bracket.
8. Slide the TOC line dust covers away from the quick connect fittings.
9. Using a small flat-bladed tool, carefully remove the "E" clip retainers from the quick connect fittings.
10. Remove the TOC lines from the transmission.
11. Remove the TOC lines from the vehicle.
12. Remove the TOC line dust covers from the TOC lines.
13. Remove the TOC line seal from the transmission. Refer to **Oil Cooler Pipe Seals Replacement** .

Installation Procedure

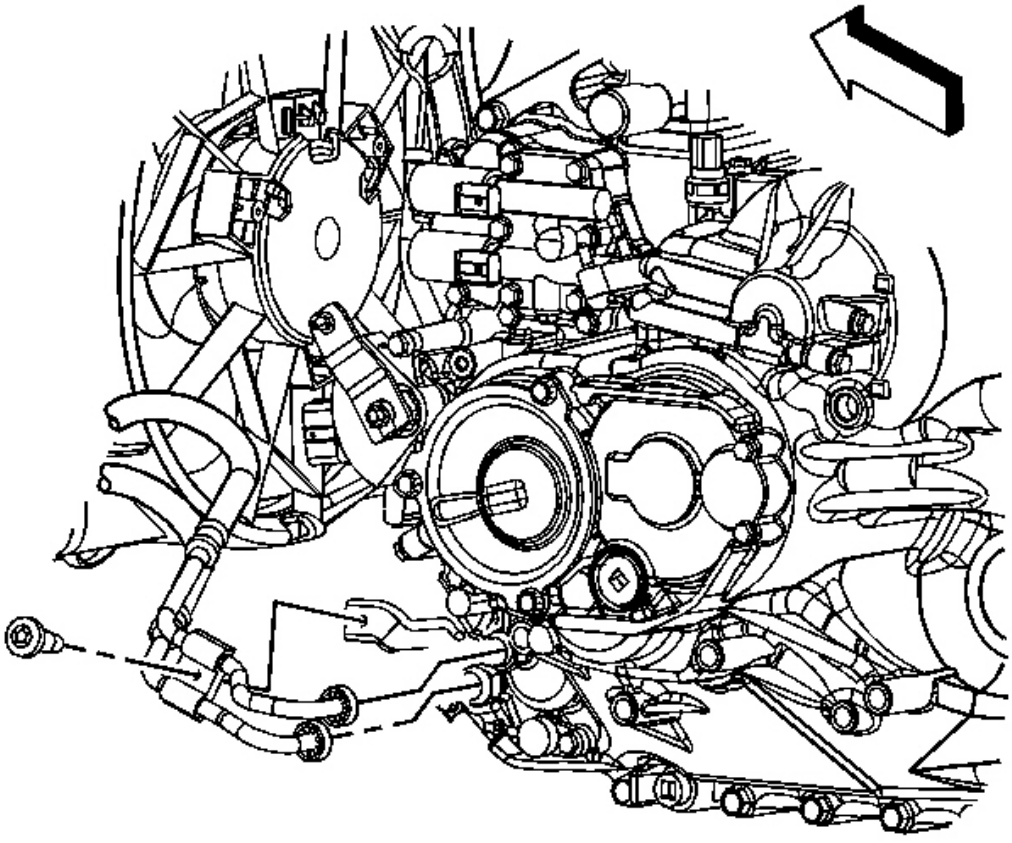

Fig. 33: TOC Line Bracket Bolt From Transmission Bracket
Courtesy of GENERAL MOTORS CORP.

1. Install the "E" clip retainers to the quick connect fittings.
2. Install the dust covers to the quick connect fittings.
3. Install the TOC lines to the transmission. Gently tug on the TOC lines to ensure proper engagement of the quick connect fitting.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the TOC line bracket bolt to the transmission.

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

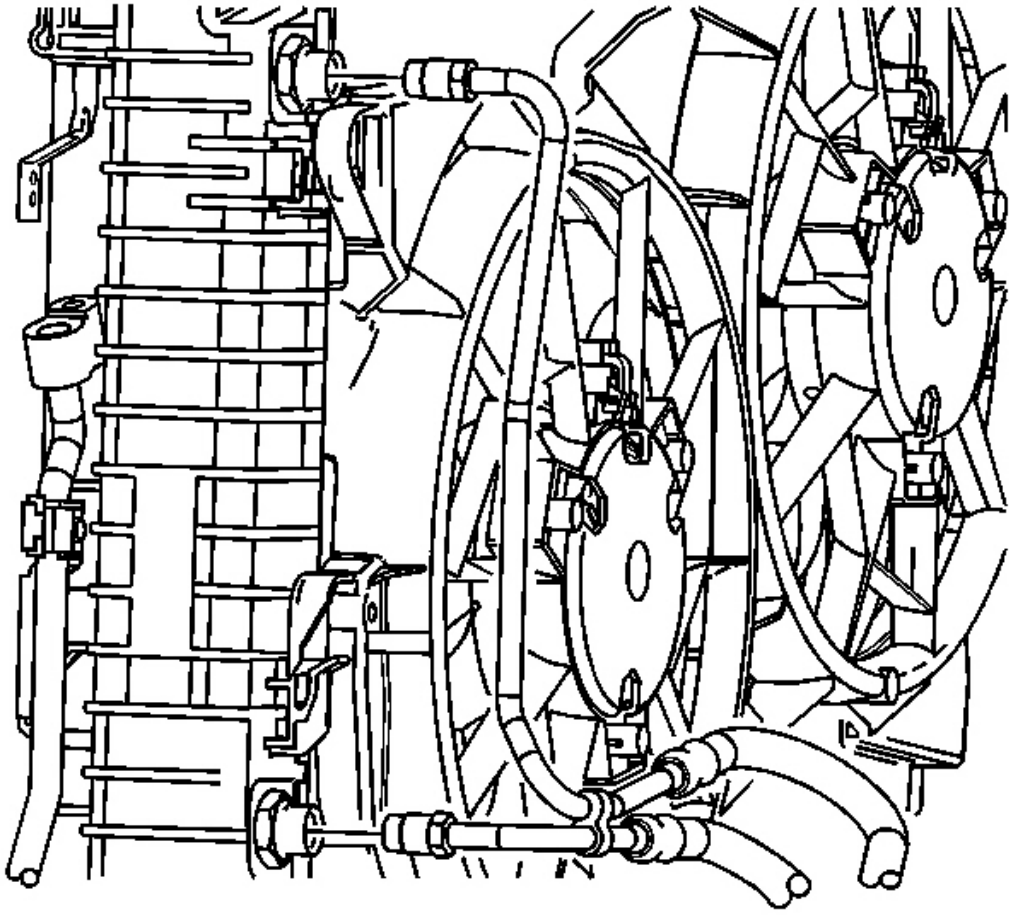

Fig. 34: TOC Line From Radiator
Courtesy of GENERAL MOTORS CORP.

5. Install the lower TOC line to the radiator.

   Tighten: Tighten fitting to 16 N.m (12 lb ft).

6. Connect the upper TOC line to the clip on the fan shroud.
7. Lower the vehicle.
8. Install the upper TOC line to the radiator.

   Tighten: Tighten fitting to 16 N.m (12 lb ft).

9. Add fluid to the transmission as necessary. Refer to **Transmission Fluid Replacement** .

10. Start the engine and inspect for leaks.

OIL COOLER PIPE SEALS REPLACEMENT

Removal Procedure

1. Disconnect the oil cooler lines from the transmission. Refer to **Oil Cooler Line Replacement** .

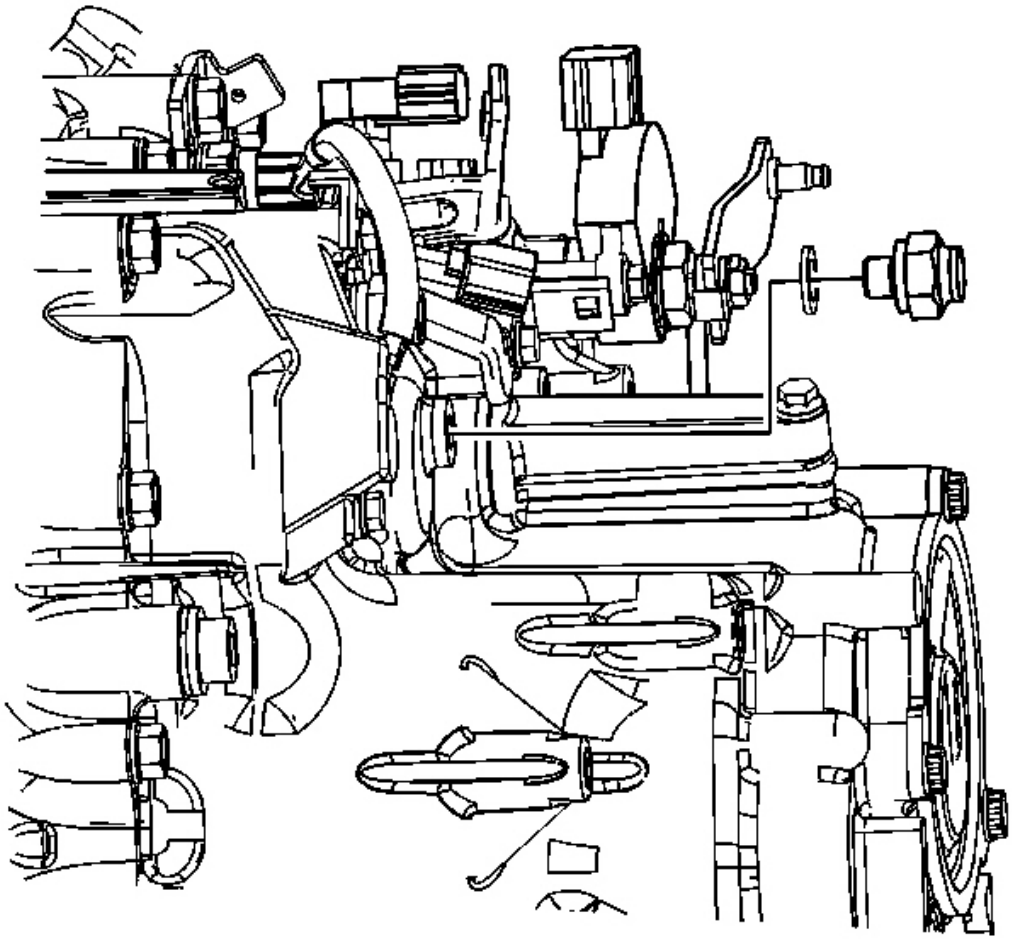

Fig. 35: Removing Oil Cooler Pipe Fitting & Seal
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil cooler pipe fitting and seal.
3. Discard the seal.

Installation Procedure

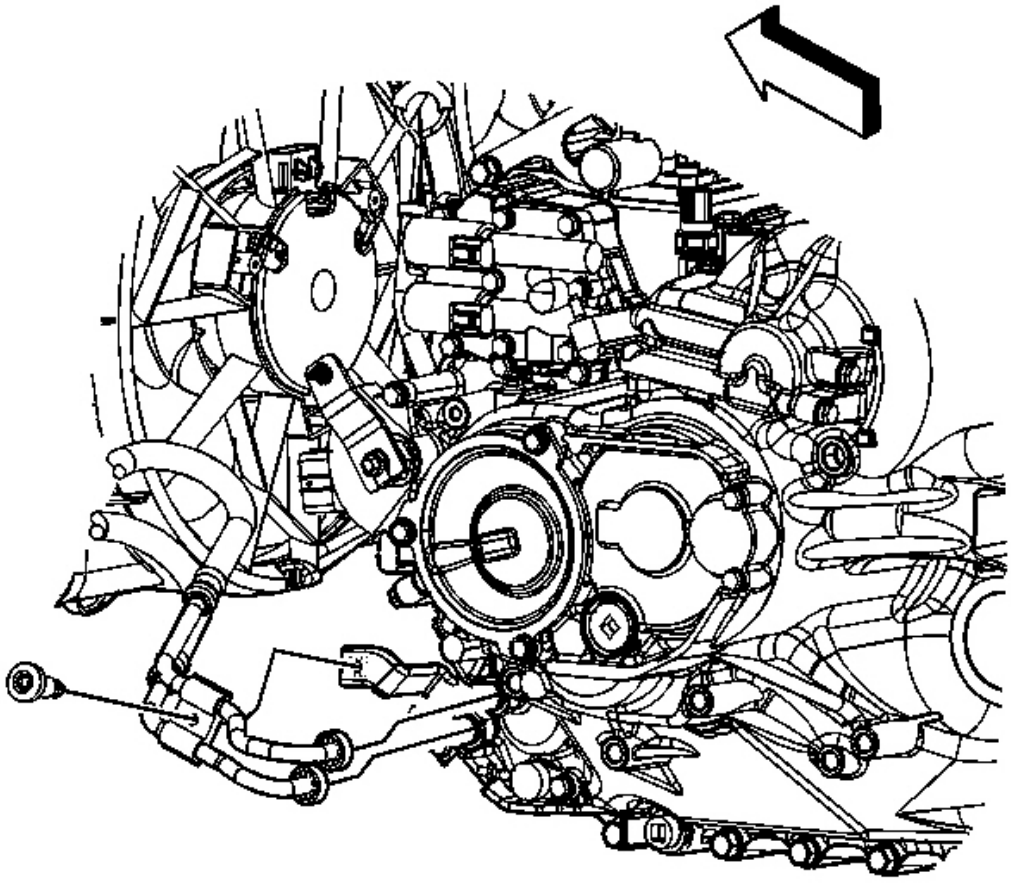

Fig. 36: Installing Oil Cooler Pipe Fitting & Seal
Courtesy of GENERAL MOTORS CORP.

1. Insert a new oil cooler pipe seal to the cooler pipe fitting.

   NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the cooler pipe fitting to the transmission.

   Tighten: Tighten the cooler pipe fitting to 20 N.m (14 lb in).

3. Connect the oil cooler lines to the transmission. Refer to **Oil Cooler Line Replacement** .

A/B CLUTCH PRESSURE CONTROL SOLENOID ASSEMBLY COVER REPLACEMENT

Removal Procedure

1. Remove the A/B pressure control assembly. Refer to **A/B Clutch Pressure Control Solenoid Assembly Replacement** .
2. Remove the feed pipes, noting proper locations and orientation.

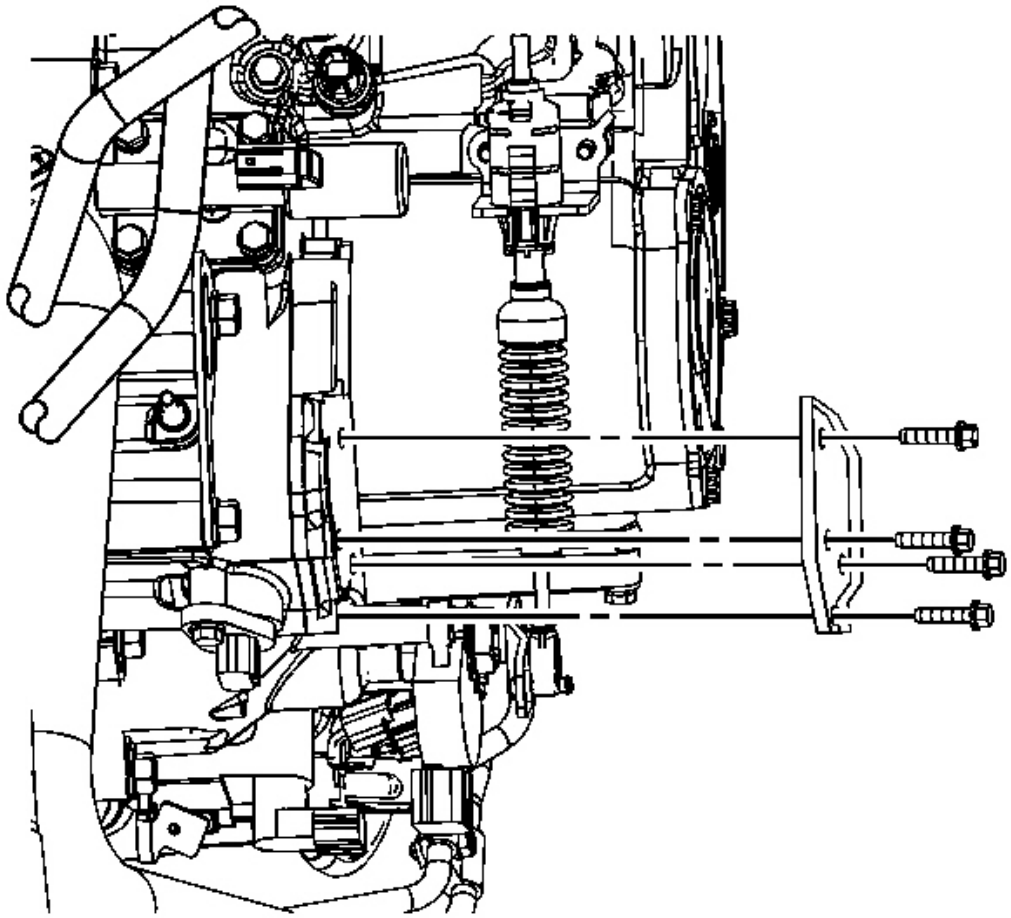

Fig. 37: Solenoid Assembly Cover, Gasket & Bolts Removed
Courtesy of GENERAL MOTORS CORP.

3. Remove the solenoid assembly cover bolts.
4. Remove the solenoid assembly cover and gasket.

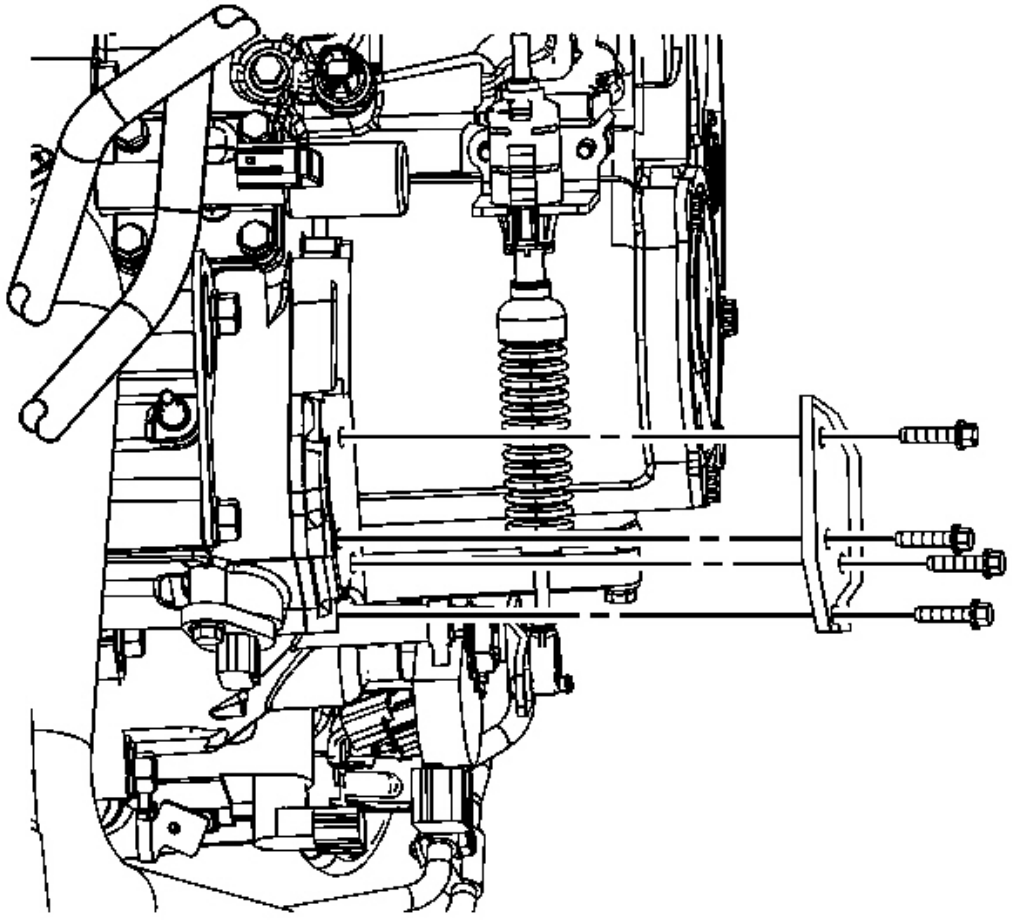

Fig. 38: Solenoid Assembly Cover, Gasket & Bolts Removed
Courtesy of GENERAL MOTORS CORP.

1. Install a new solenoid assembly cover gasket.
2. Install the solenoid assembly cover.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the solenoid assembly cover bolts.

Tighten: Tighten the solenoid assembly cover bolts to 12 N.m (106 lb in).

4. Install the feed pipes to the original locations and orientation.
5. Install the A/B clutch pressure control solenoid assembly. Refer to **A/B Clutch Pressure Control Solenoid Assembly Replacement** .

A/B CLUTCH PRESSURE CONTROL SOLENOID ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** .
2. Disconnect the transmission shift cable from the select lever and cable bracket.
3. Remove the wiring harness bolt and nut from the transmission.

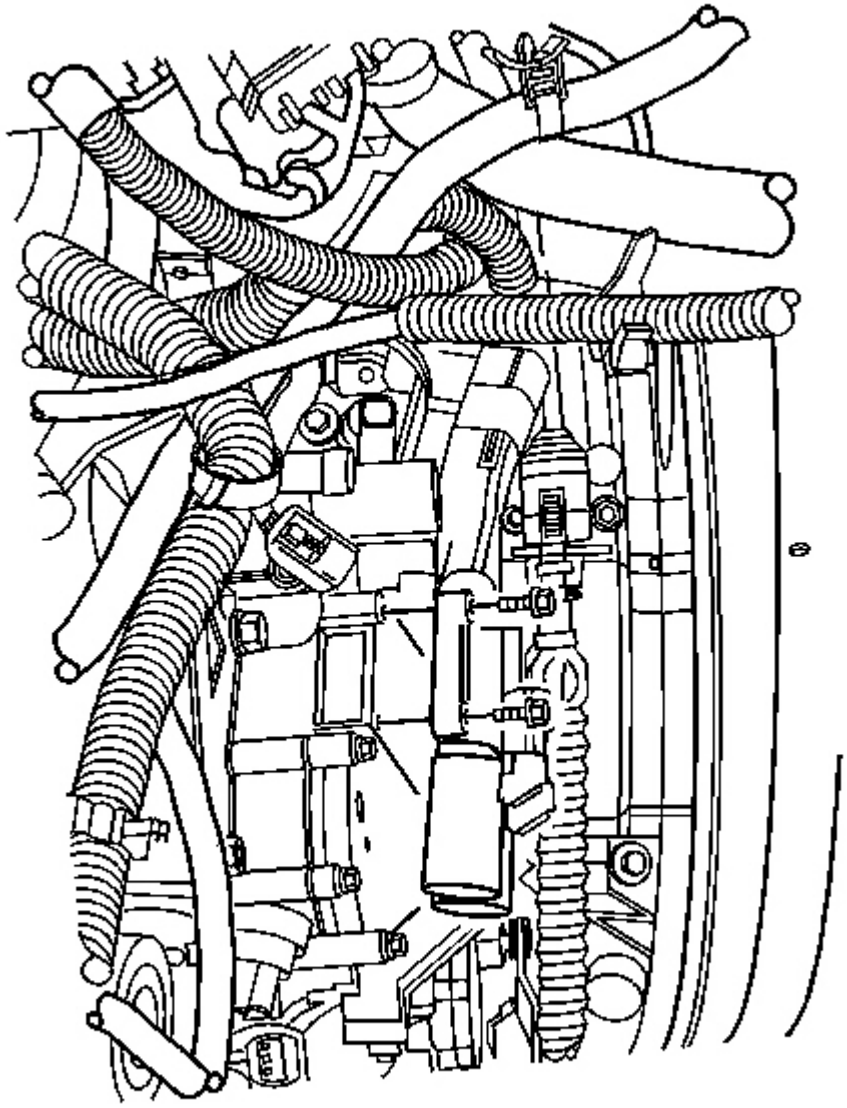

Fig. 39: Solenoid Assembly Electrical Connectors, Gasket & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the solenoid assembly electrical connectors.
5. Remove the solenoid assembly bolts.
6. Remove the solenoid assembly and gasket.
7. Discard the gasket.

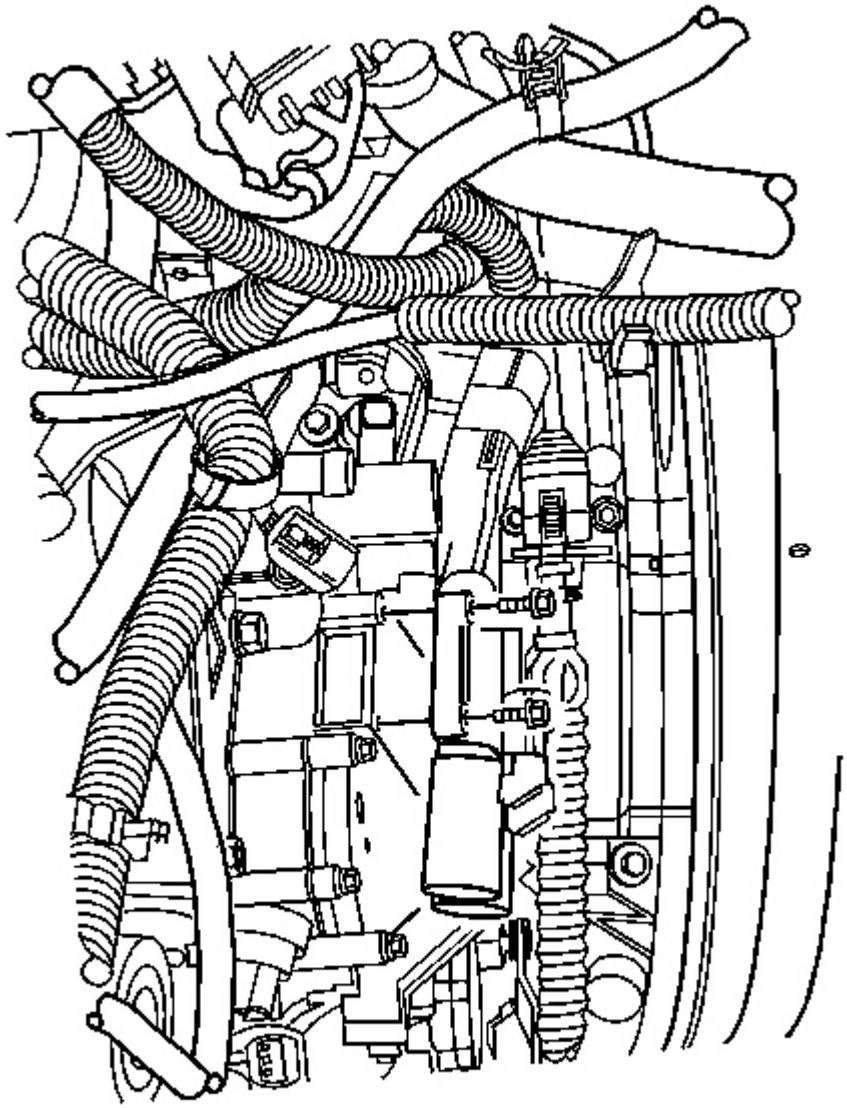

Fig. 40: Solenoid Assembly Electrical Connectors, Gasket & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install a new solenoid assembly gasket.
2. Install the solenoid assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the solenoid assembly bolts.

   Tighten: Tighten the solenoid assembly bolts to 12 N.m (106 lb in).

4. Connect the solenoid assembly electrical connectors.
5. Install the feed pipes to the original locations and orientation.
6. Install the wiring harness fasteners to the transmission.
7. Connect the transmission shift cable to the select lever and cable bracket.
8. Install the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** .

MAINSHAFT END COVER REPLACEMENT

Removal Procedure

1. Remove the left front wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
2. Remove the left front wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** .
3. Remove the mainshaft end cover bolts (5).

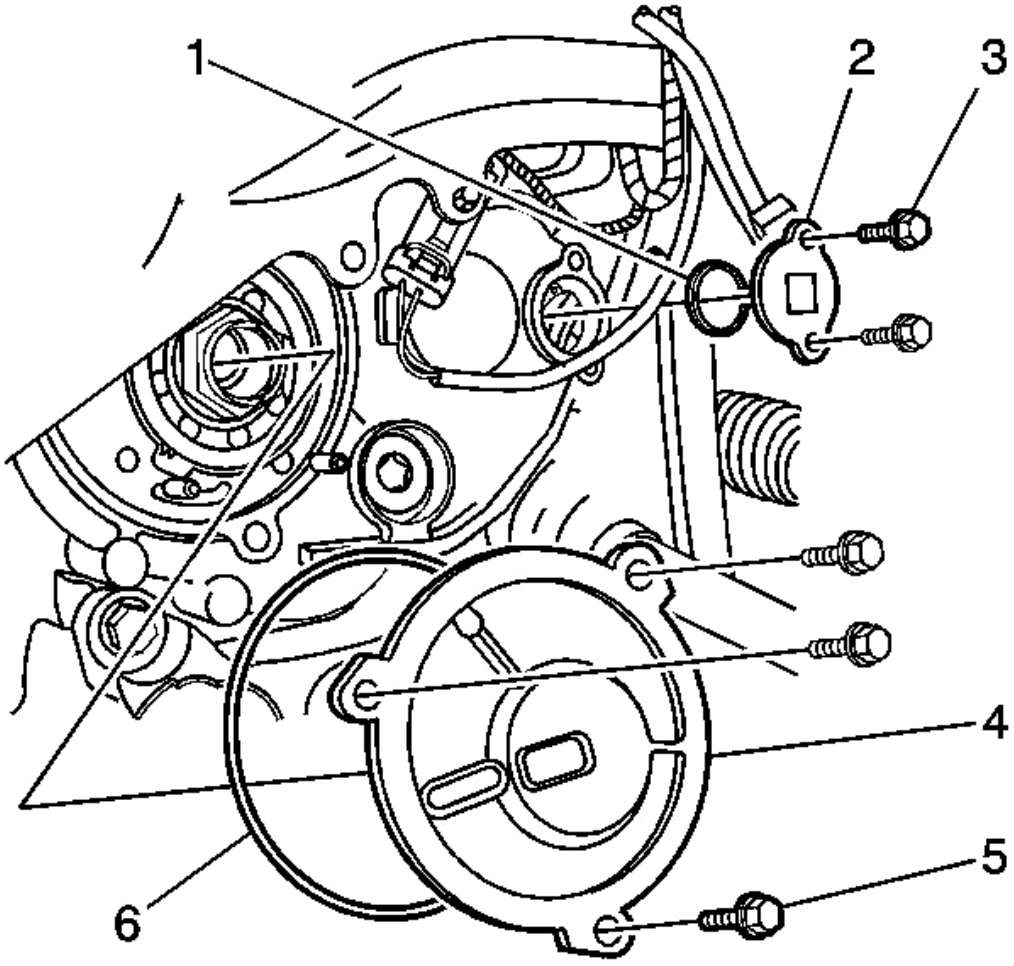

Fig. 41: End Cover Seal & Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the mainshaft end cover (4) from the transmission.
5. Remove the mainshaft end cover seal (6) from the transmission and discard.

Installation Procedure

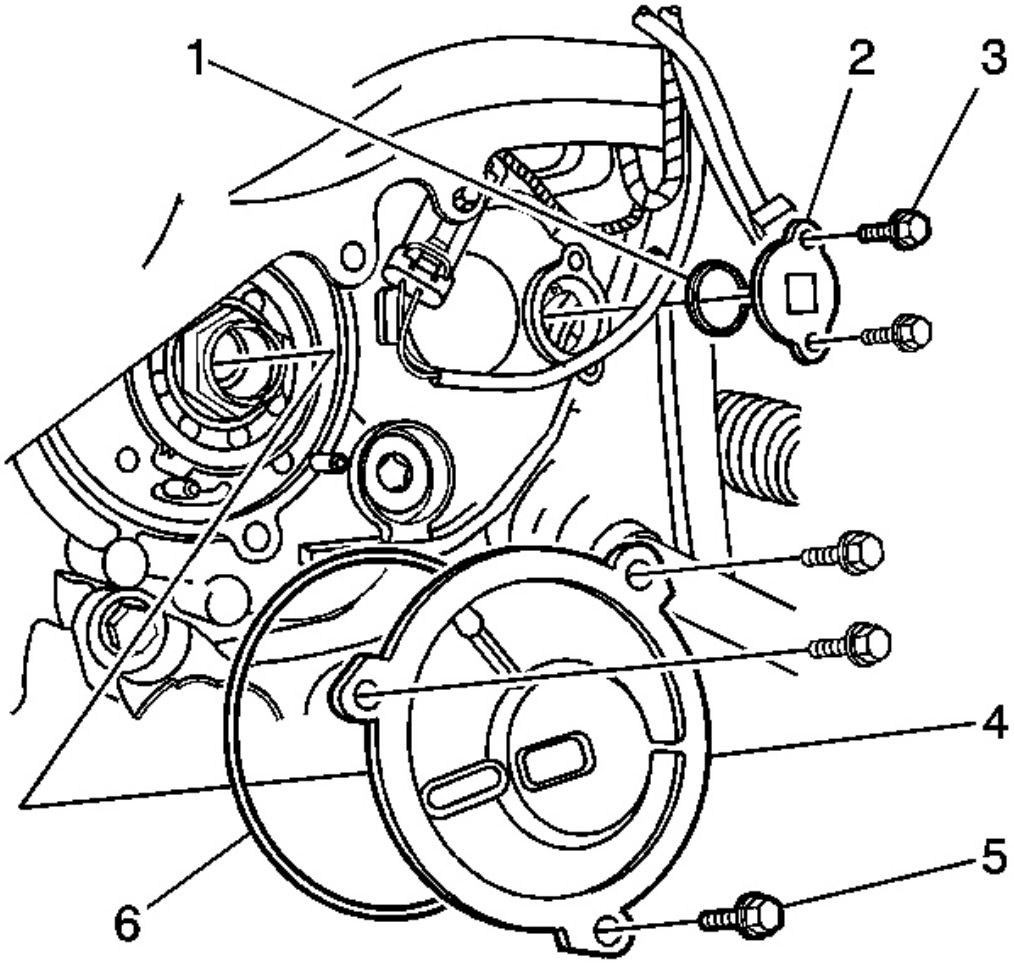

Fig. 42: End Cover Seal & Components
Courtesy of GENERAL MOTORS CORP.

1. Install a new mainshaft end cover seal (6).

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

2. Install the mainshaft end cover (4) to the transmission.

Tighten: Tighten the mainshaft end cover bolts to 19 N.m (14 lb ft).

3. Install the left front wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** .

4. Install the left front wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

OUTPUT SHAFT END COVER REPLACEMENT

Removal Procedure

1. Remove the left front wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
2. Remove the left front wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** in Body - Front End.
3. Remove the output shaft end cover bolts (3).

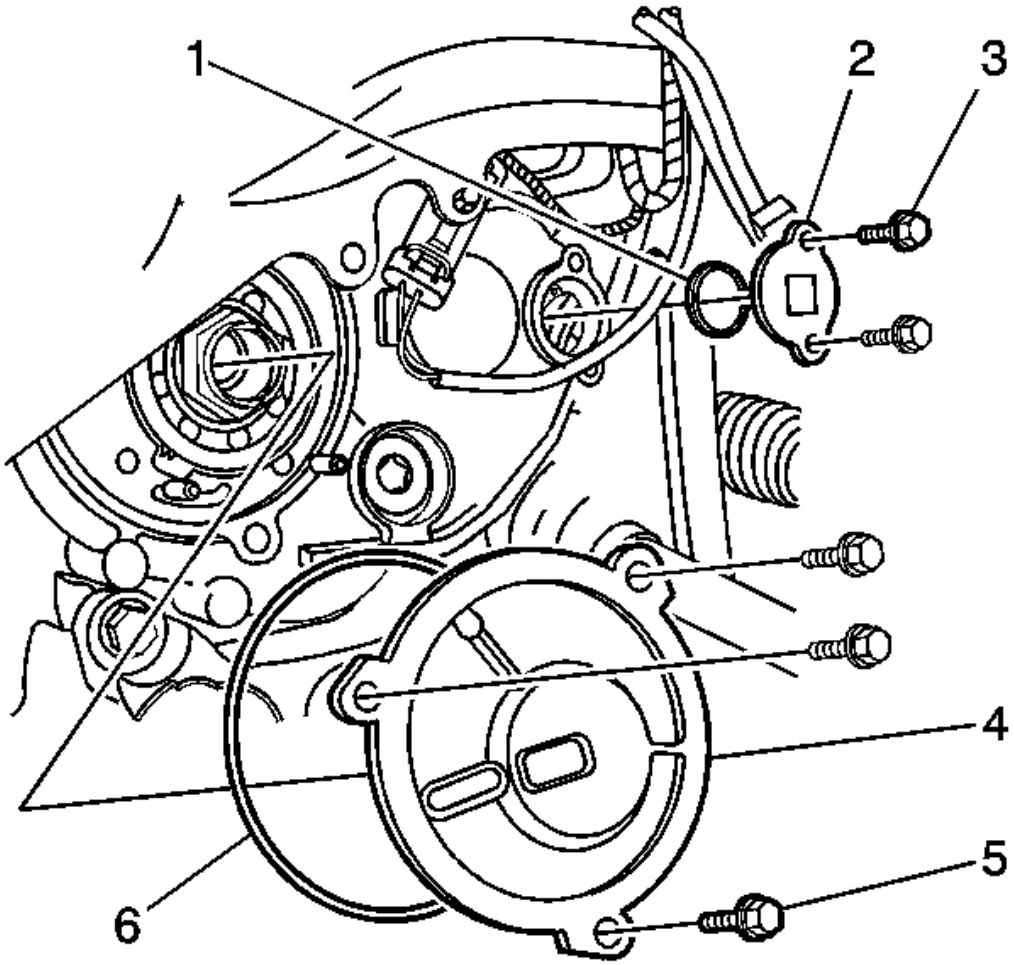

Fig. 43: End Cover Seal & Components

Courtesy of GENERAL MOTORS CORP.

4. Remove the output shaft end cover (2) from the transmission.
5. Remove the output shaft end cover seal (1) from the transmission and discard.

Installation Procedure

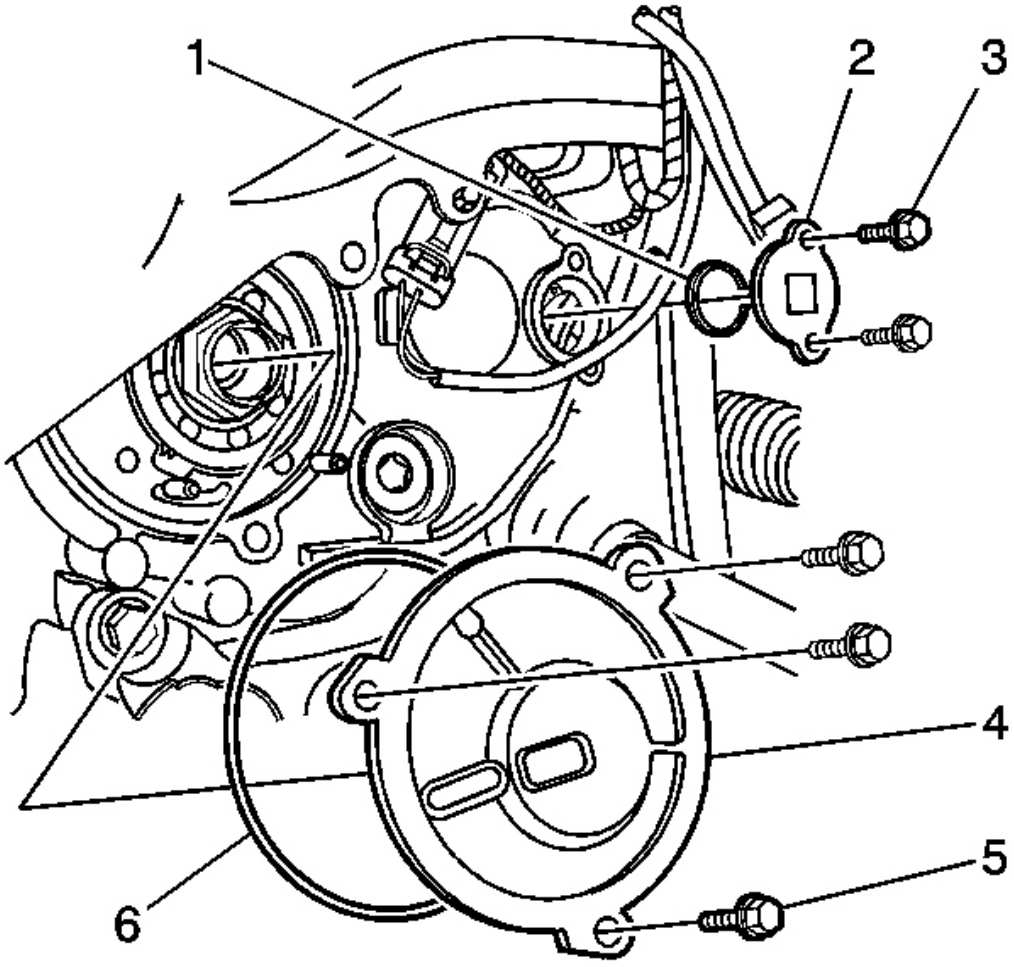

Fig. 44: End Cover Seal & Components
Courtesy of GENERAL MOTORS CORP.

1. Install a new output shaft end cover seal (1).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the output shaft end cover (2) to the transmission.

   Tighten: Tighten the output shaft end cover bolts to 12 N.m (106 lb in).

3. Install the left front wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** in Body - Front End.
4. Install the left front wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

TRANSMISSION WIRING HARNESS EXTENSION REPLACEMENT

Removal Procedure

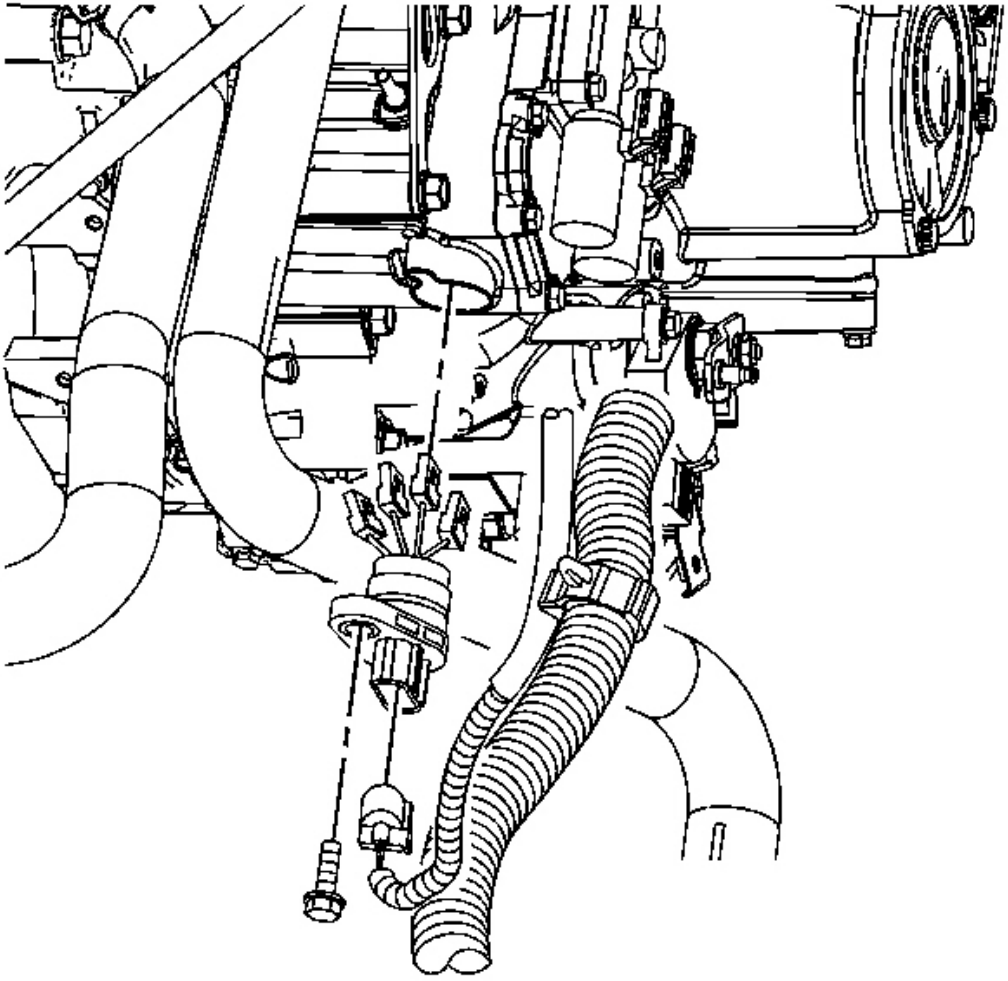

Fig. 45: Shift Control Solenoid Valve Electrical Connectors, Transmission Wiring Harness & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the clutch pressure control solenoid cover. Refer to **A/B Clutch Pressure Control Solenoid Assembly Cover Replacement** .
2. Disconnect the shift control solenoid valve electrical connectors, noting proper location.
3. Remove the transmission wiring harness bolt and harness assembly.

Installation Procedure

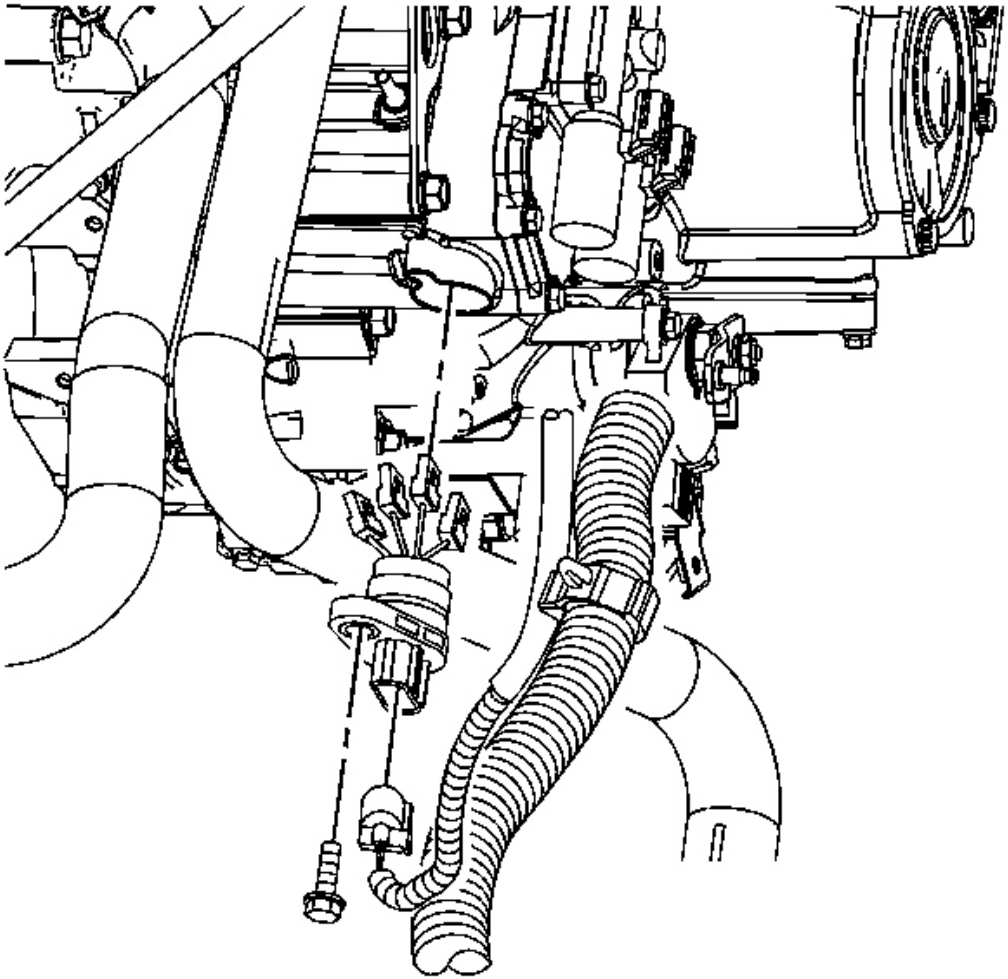

Fig. 46: Shift Control Solenoid Valve Electrical Connectors, Transmission Wiring Harness & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Apply automatic transmission fluid to a new transmission wiring connector O-ring seal.
2. Install the new transmission wiring connector O-ring seal onto the transmission wiring harness assembly.
3. Install the transmission wiring harness assembly into the transmission case assembly through the wiring harness bore.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the transmission wiring harness assembly bolt.

   Tighten: Tighten the bolt to 12 N.m (106 lb in).

5. Install the clutch pressure control solenoid cover. Refer to **A/B Clutch Pressure Control Solenoid Assembly Cover Replacement** .

TRANSMISSION MOUNT INSPECTION

Inspection Procedure

NOTE: In order to avoid oil pan damage and possible engine failure, insert a block of wood that spans the width of the oil pan bottom between the oil pan and the jack support.

IMPORTANT: Before replacing any transmission mount due to a suspected fluid loss, verify that the source of the fluid is the mount.

1. Raise the transmission/transaxle in order to relieve tension in the mount.
2. Observe the mount while raising the transmission/transaxle. Raising the transmission/transaxle removes the weight from the mount.
3. Replace the mount if it exhibits any of the following conditions:
   - The hard rubber surface is covered with heat check cracks.
   - The rubber is separated from the outer metal sleeve of the mount.
   - The rubber is split through the center of the transmission mount.
   - The mount is leaking fluid.
4. When replacing the transmission mounts or brackets, refer to the following procedures:
   - **Automatic Transmission Mount Replacement - Rear**
   - **Transmission Mount Bracket Replacement - Rear**

TRANSMISSION MOUNT REPLACEMENT - FRONT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

2. Disconnect the oxygen sensor connector.
3. Remove the transmission oil level indicator tube. Refer to **Transmission Oil Level Indicator Tube Replacement** in Automatic Transmission.
4. Remove the starter motor. Refer to **Starter Motor Replacement (L61)** or **Starter Motor Replacement (L66)** in Engine Electrical.

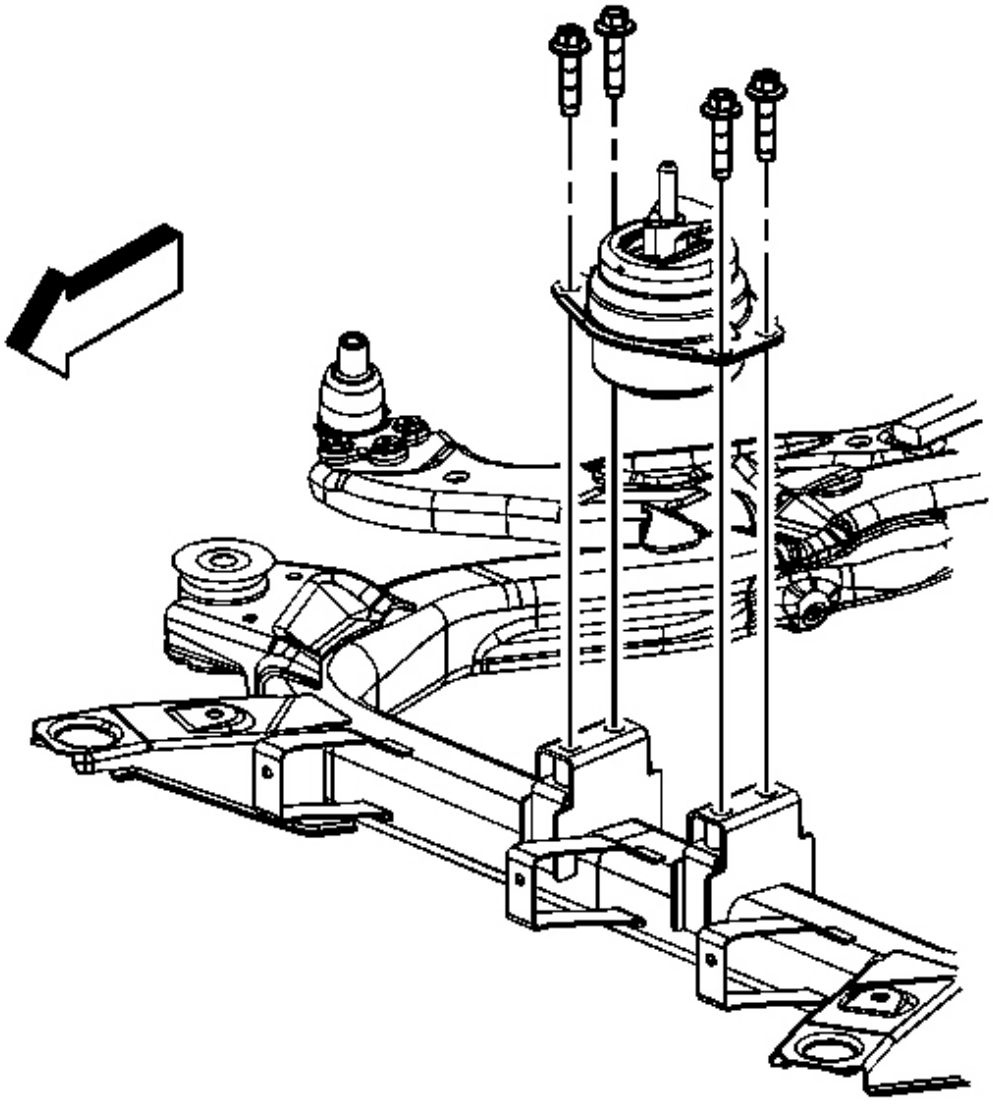

Fig. 47: Front Transmission Mount-To-Frame Bolts

Courtesy of GENERAL MOTORS CORP.

5. Remove the transmission mount-to-frame bolts.

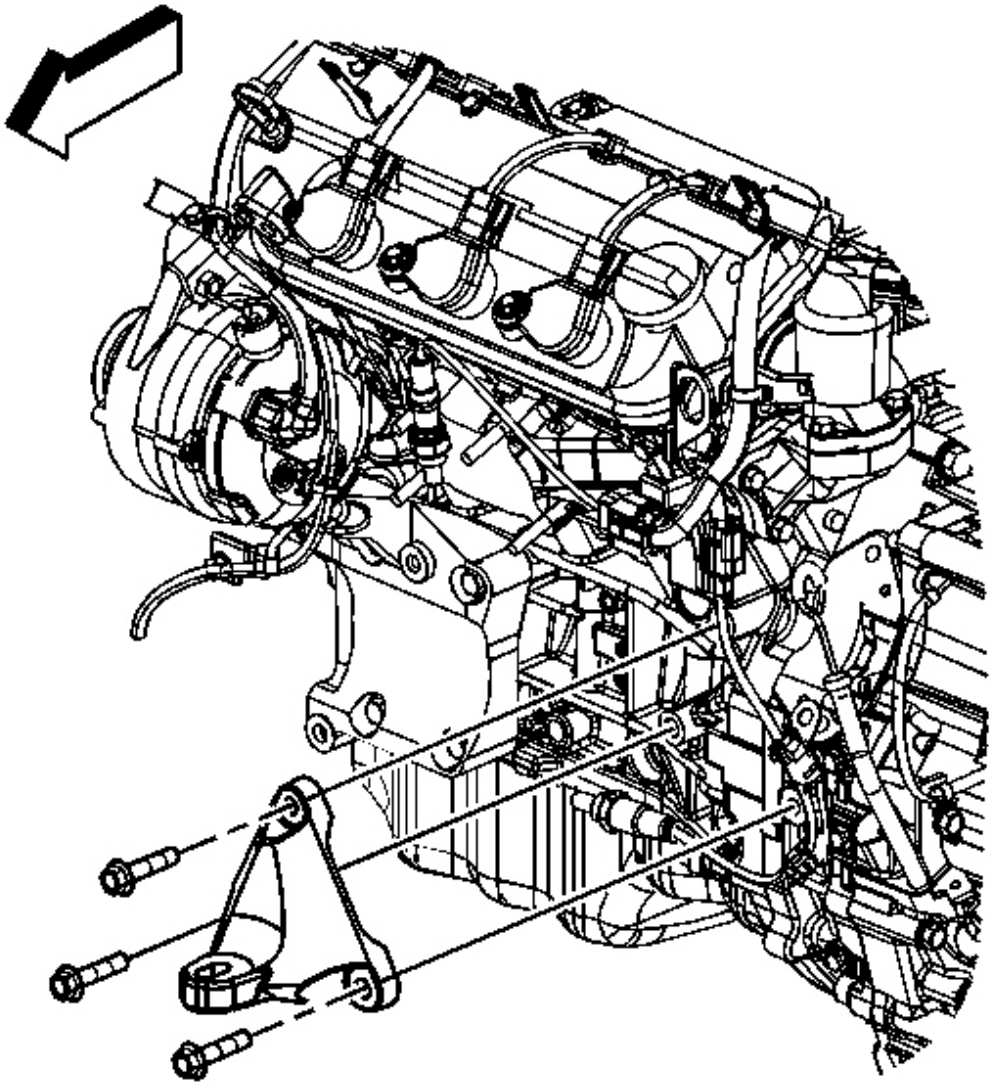

Fig. 48: Front Transmission Mount Bracket-To-Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission mount bracket-to-transmission bolts.

7. Remove the transmission mount/bracket assembly from the vehicle.

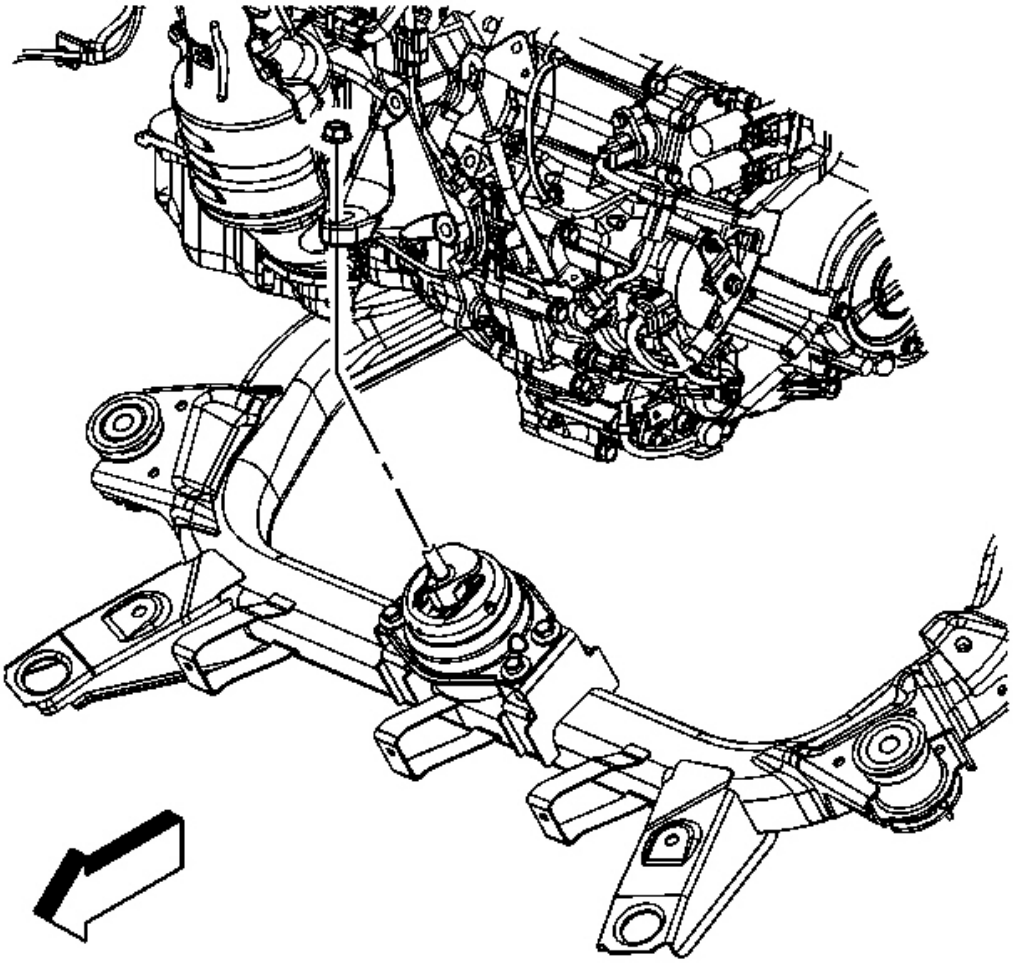

Fig. 49: Front Transmission Mount Bracket Top & Nut
Courtesy of GENERAL MOTORS CORP.

8. Remove the transmission mount bracket top nut.

Installation Procedure

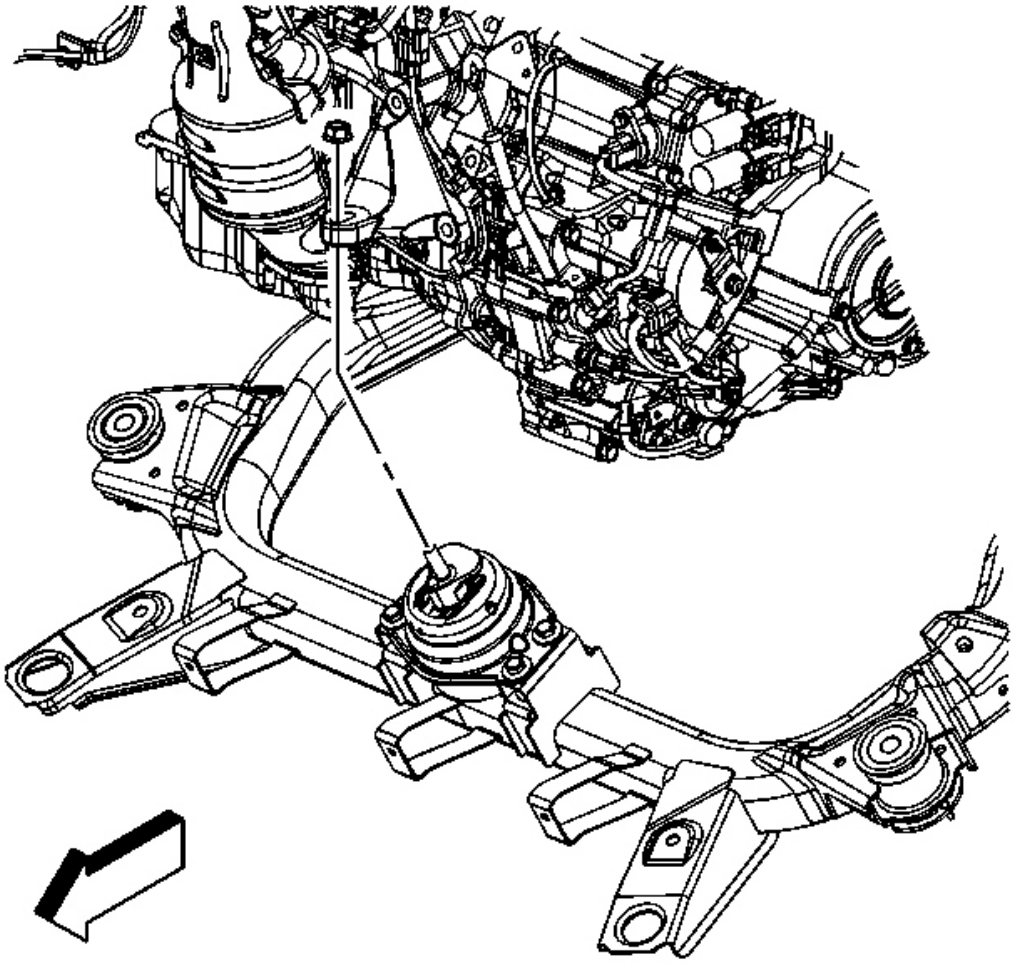

Fig. 50: Front Transmission Mount Bracket Top & Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the front transmission mount bracket top nut.

   Tighten: Tighten the nut to 90 N.m (64 lb ft).

2. Install the transmission mount/mount bracket.

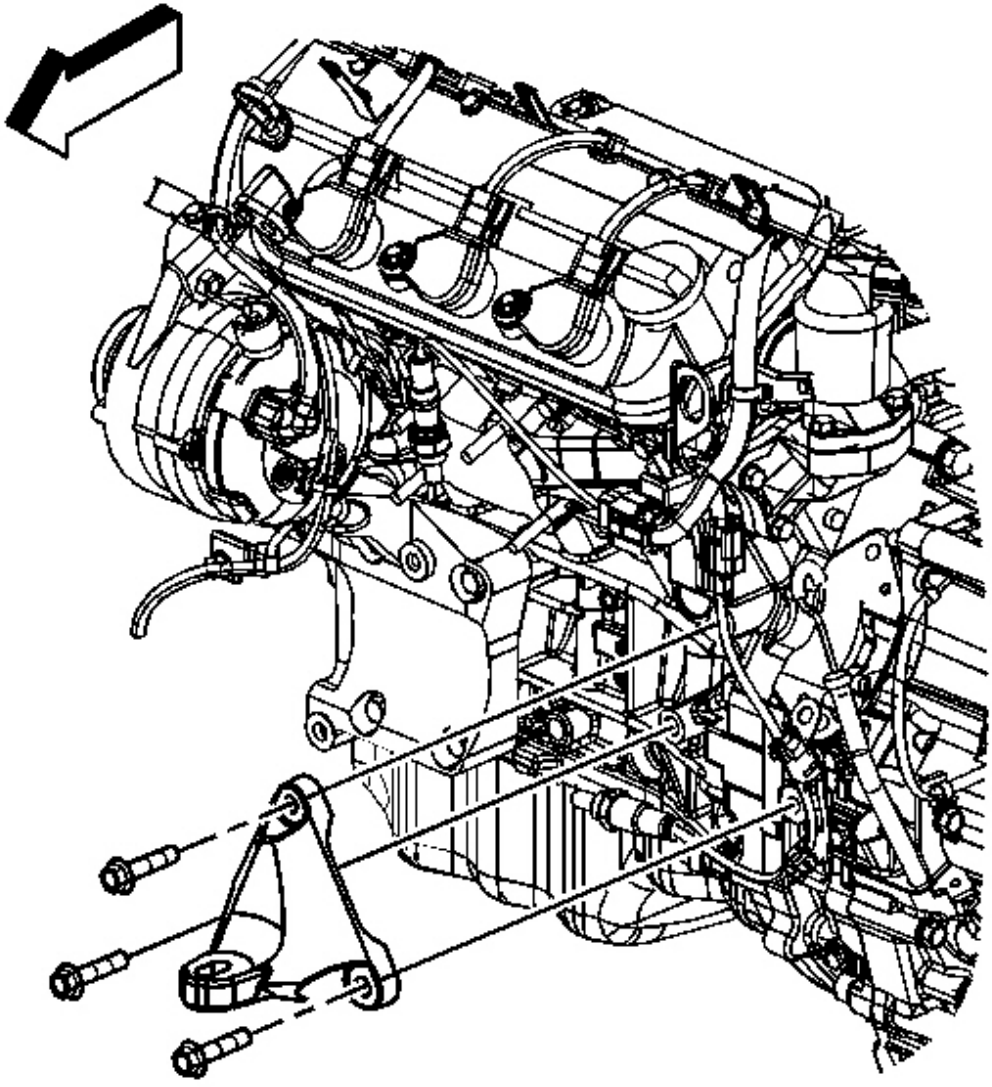

Fig. 51: Front Transmission Mount Bracket-To-Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission mount bracket-to-transmission bolts.

   Tighten: Tighten the bolts to 50 N.m (37 lb ft).

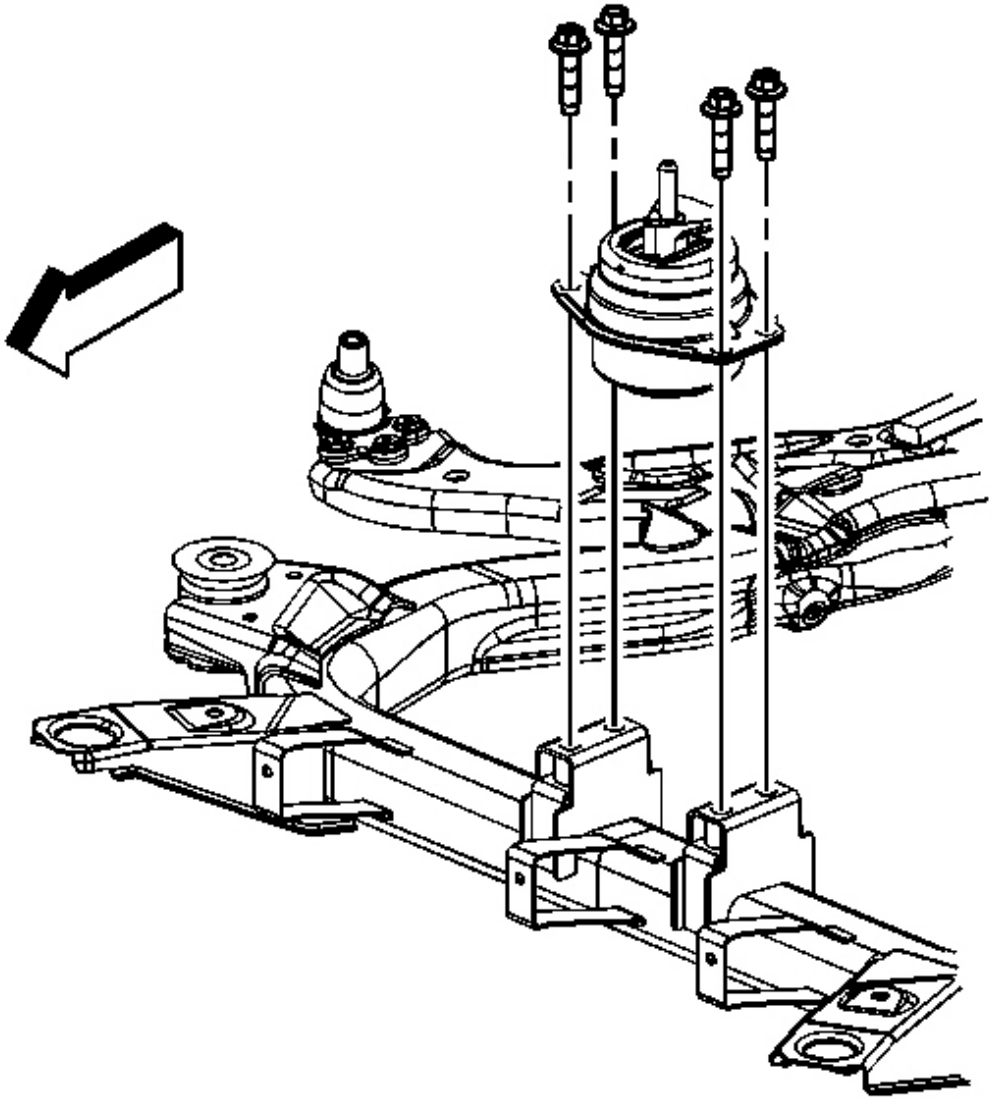

Fig. 52: Front Transmission Mount-To-Frame Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the transmission mount-to-frame bolts.

   Tighten: Tighten the bolts to 50 N.m (37 lb ft).

5. Install the starter motor. Refer to **Starter Motor Replacement (L61)** or **Starter Motor Replacement**

(L66) in Engine Electrical.

6. Install the transmission oil level indicator tube. Refer to **Transmission Oil Level Indicator Tube Replacement** in Automatic Transmission.
7. Reconnect the oxygen sensor connector.
8. Install the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

TRANSMISSION MOUNT BRACKET REPLACEMENT - FRONT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

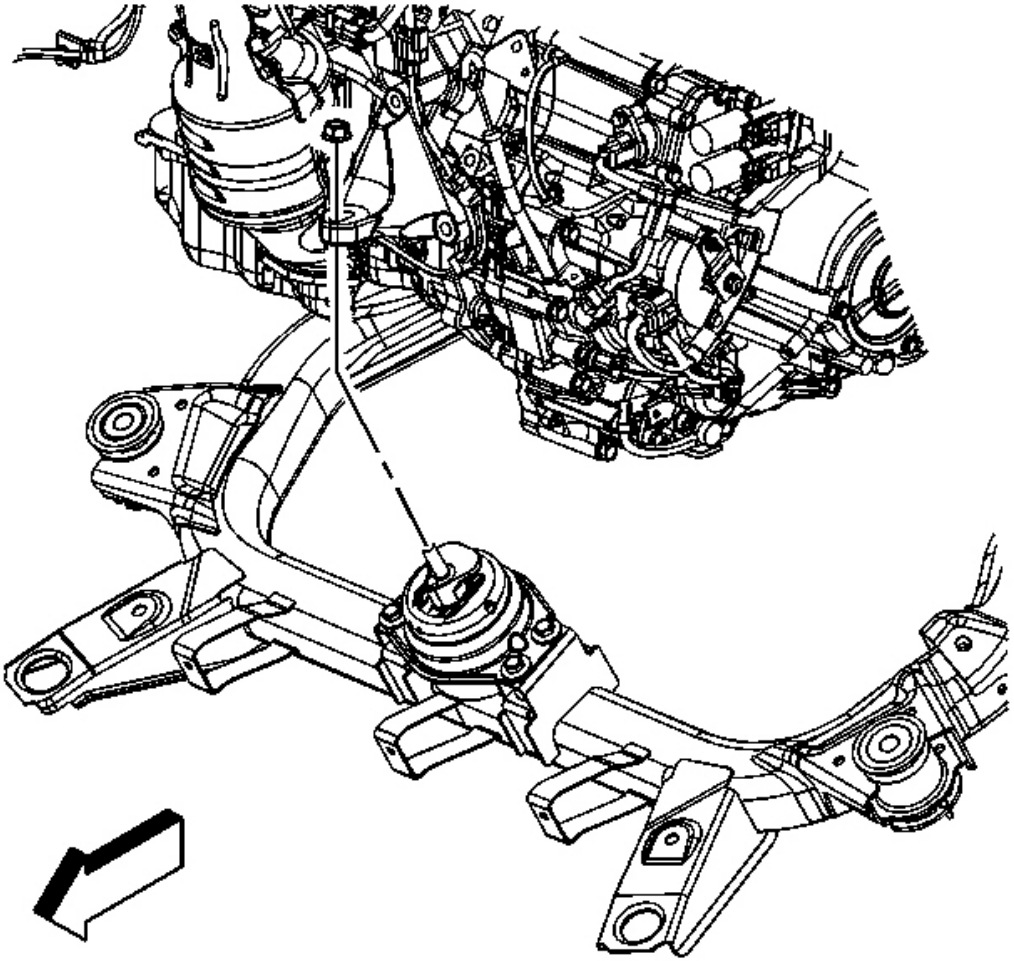

Fig. 53: Front Transmission Mount Bracket Top & Nut
Courtesy of GENERAL MOTORS CORP.

2. Remove the front transmission mount bracket top nut.

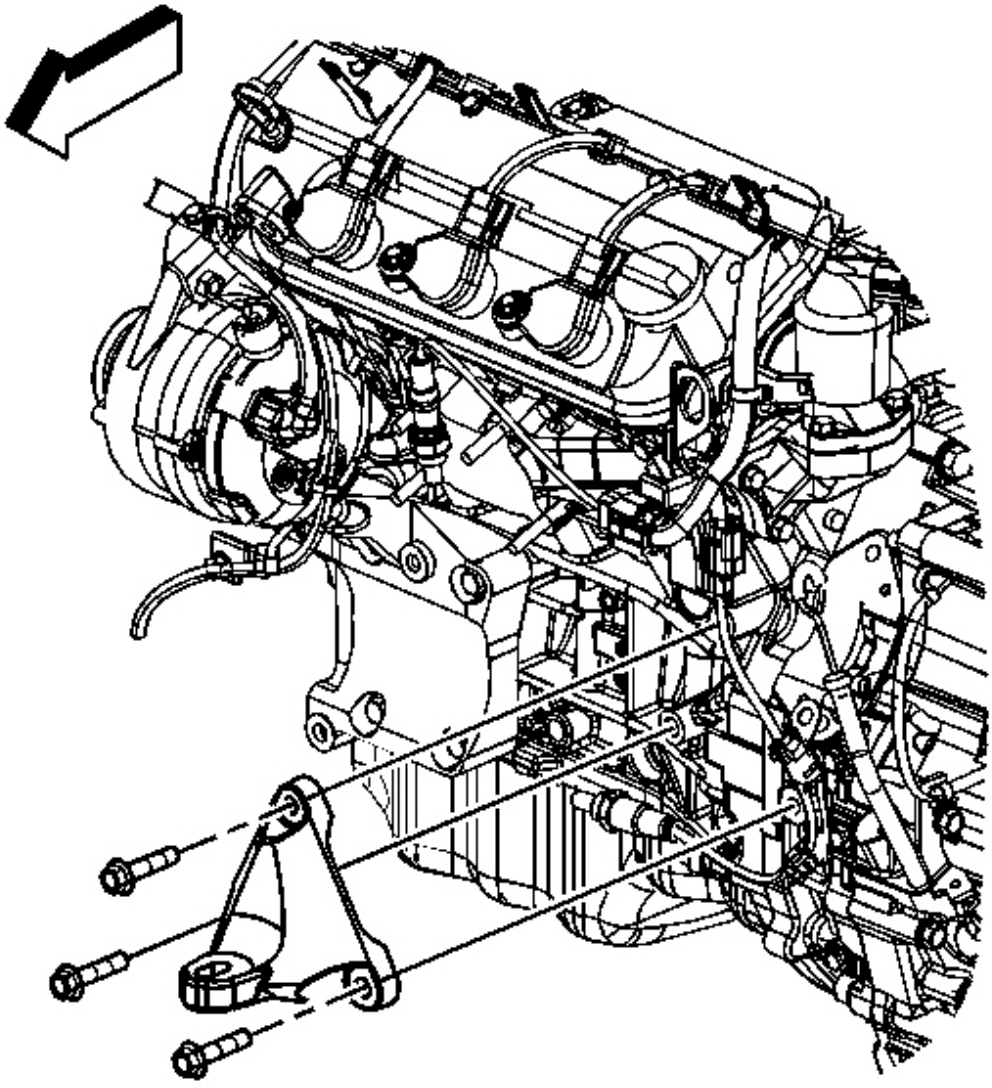

Fig. 54: Front Transmission Mount Bracket-To-Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the transmission mount bracket to engine bolts.

4. Remove the transmission mount bracket from the vehicle.

Installation Procedure

1. Position the transmission mount bracket to the engine.

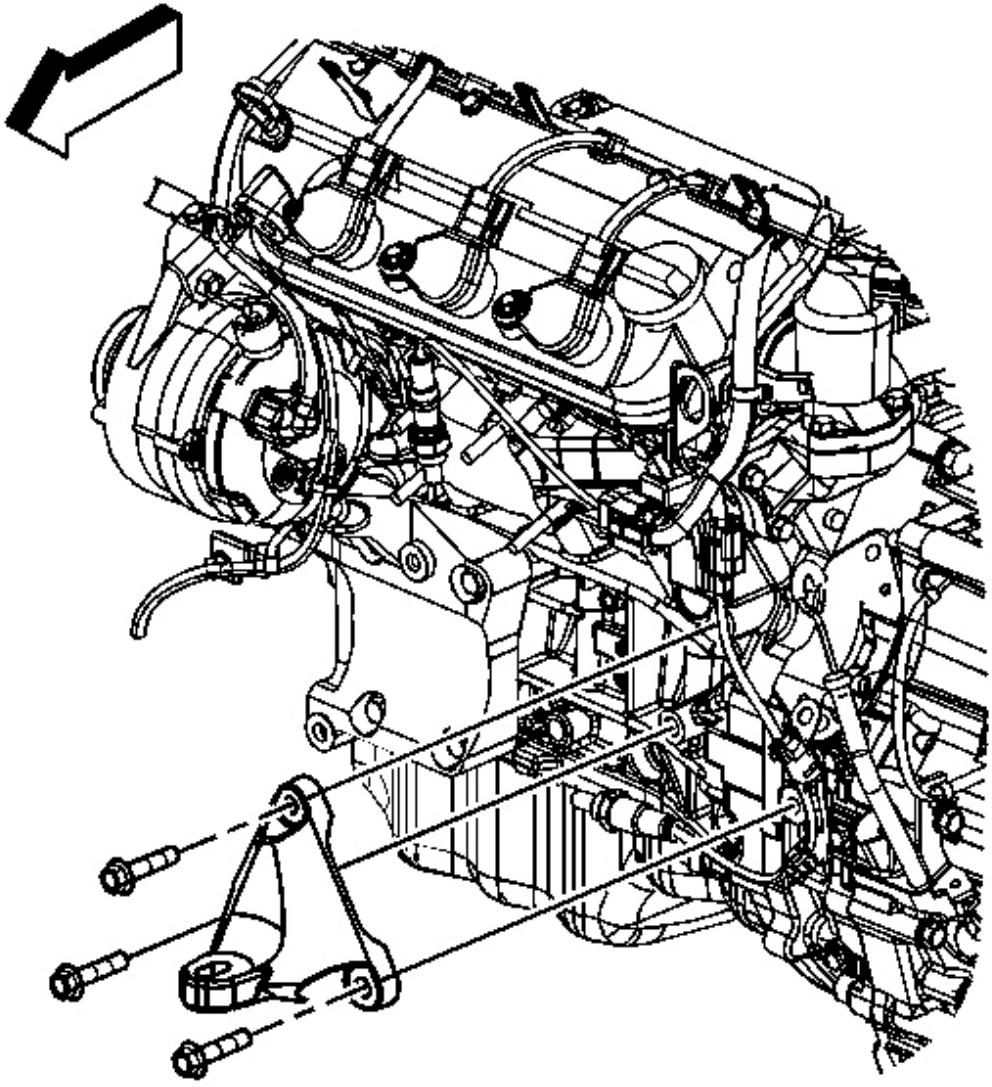

Fig. 55: Front Transmission Mount Bracket-To-Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the transmission mount bracket to engine bolts.

   Tighten: Tighten the bolts to 50 N.m (37 lb ft).

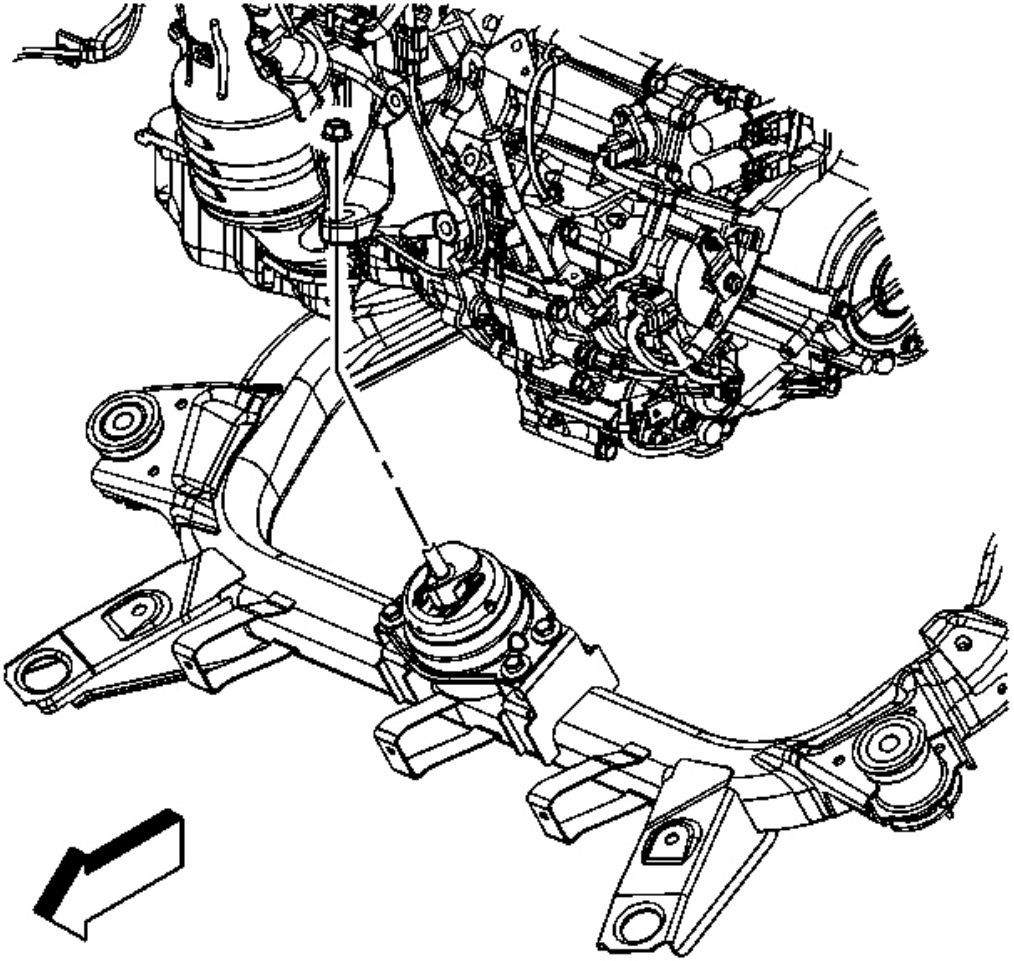

Fig. 56: Front Transmission Mount Bracket Top & Nut
Courtesy of GENERAL MOTORS CORP.

3. Install the front transmission mount bracket top nut.

   Tighten: Tighten the nut to 90 N.m (64 lb ft).

4. Lower the vehicle.

AUTOMATIC TRANSMISSION MOUNT REPLACEMENT - REAR

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove both front tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

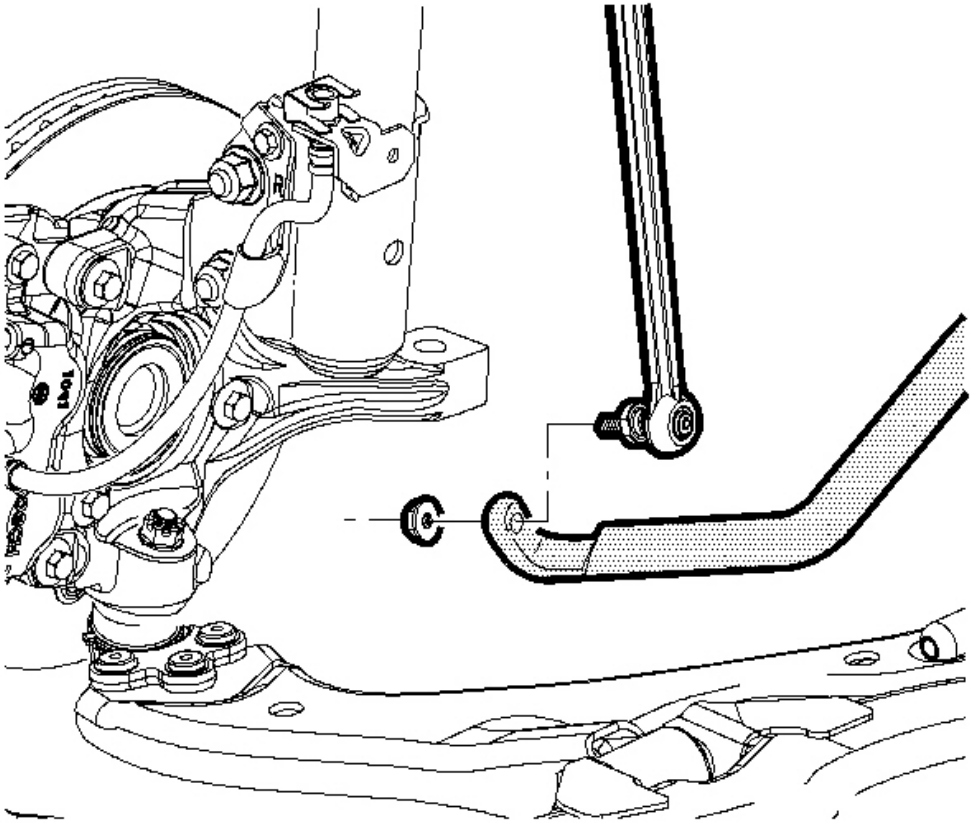

Fig. 57: Locating Rod & Bar
Courtesy of GENERAL MOTORS CORP.

3. If equipped with AWD, disconnect the stabilizer links from the stabilizer shaft.
4. If equipped with AWD, swing the stabilizer shaft upwards in order to gain additional clearance.

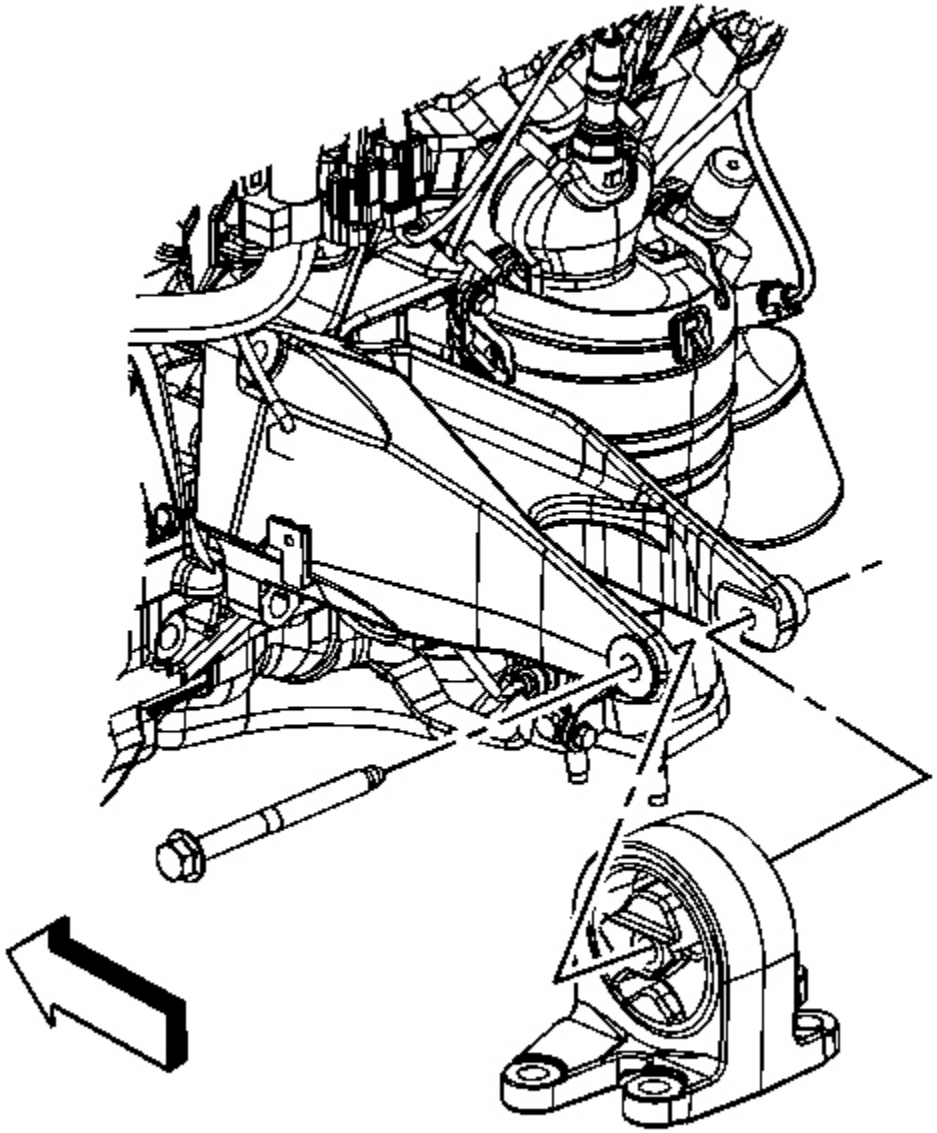

Fig. 58: Rear Transmission Mount-To-Bracket Through Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the transmission mount-to-bracket through bolt.

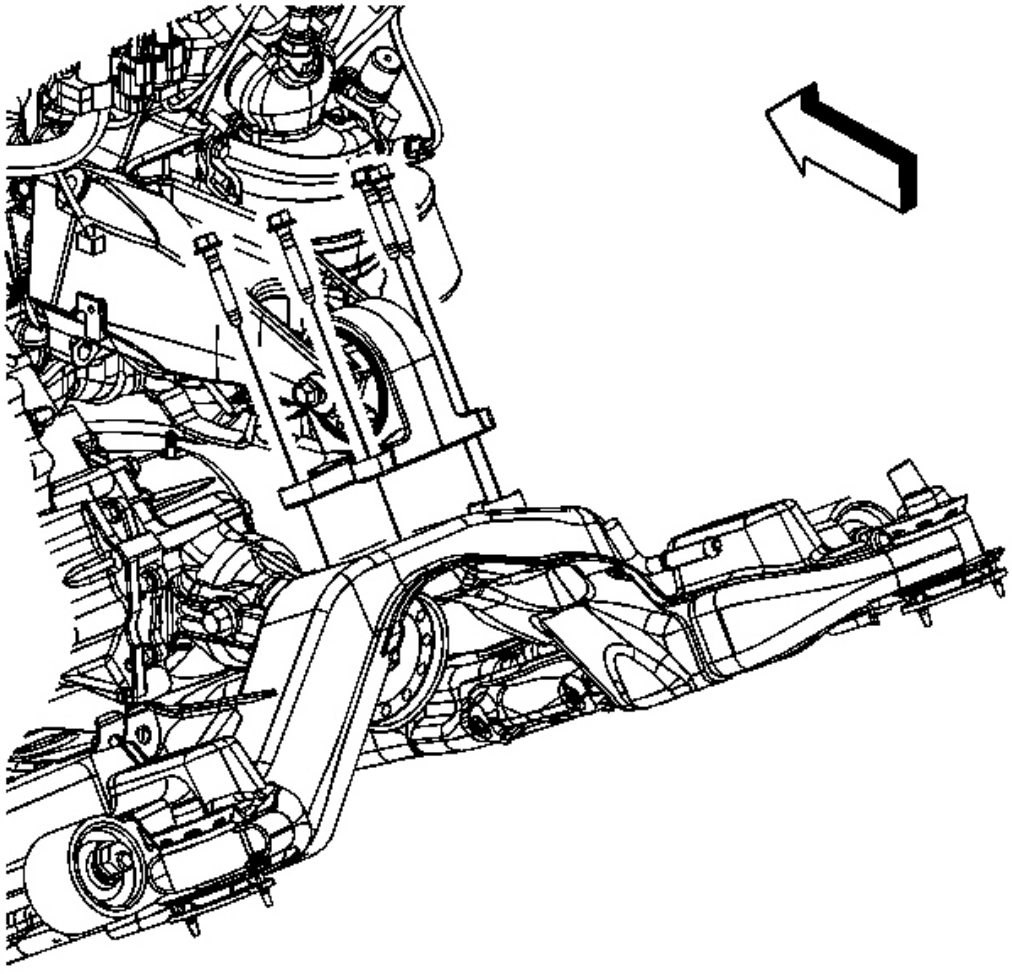

Fig. 59: Rear Transmission Mount-To-Frame Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission mount-to-frame bolts.
7. Remove the transmission mount from the vehicle.

Installation Procedure

1. Position the transmission mount to the frame.

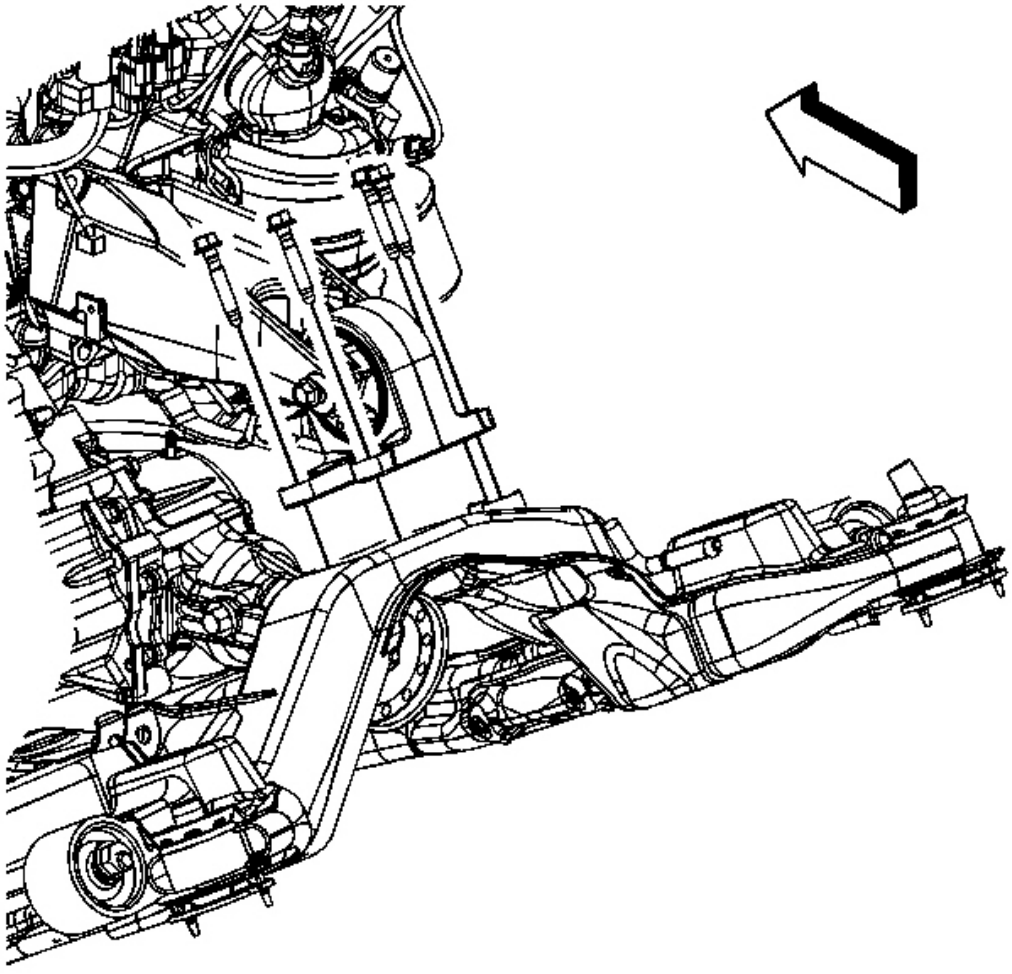

Fig. 60: Rear Transmission Mount-To-Frame Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the transmission mount-to-frame bolts.

   Tighten: Tighten the bolt to 50 N.m (37 lb ft).

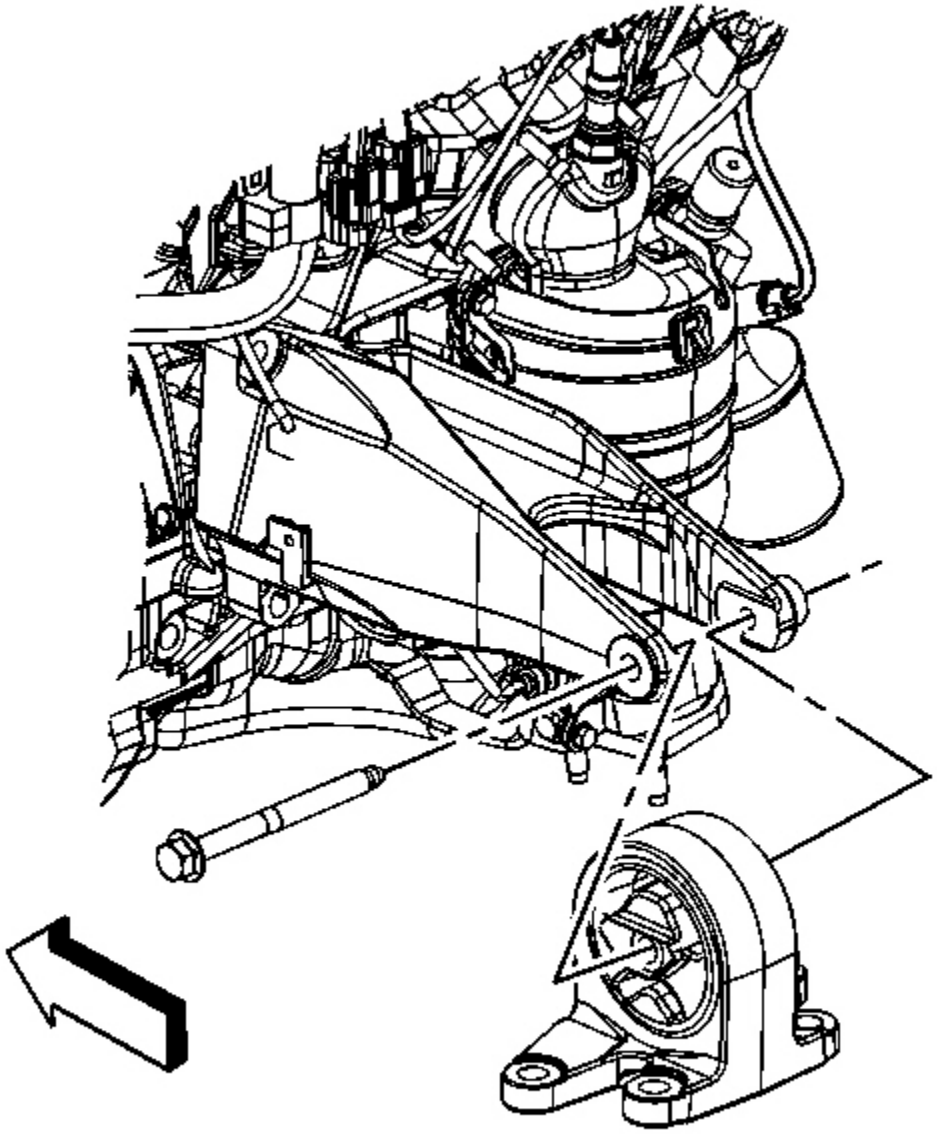

Fig. 61: Rear Transmission Mount-To-Bracket Through Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission mount-to-bracket through bolt, while aligning the transmission mount to the bracket.

   Tighten: Tighten the bolt to 110 N.m (81 lb ft).

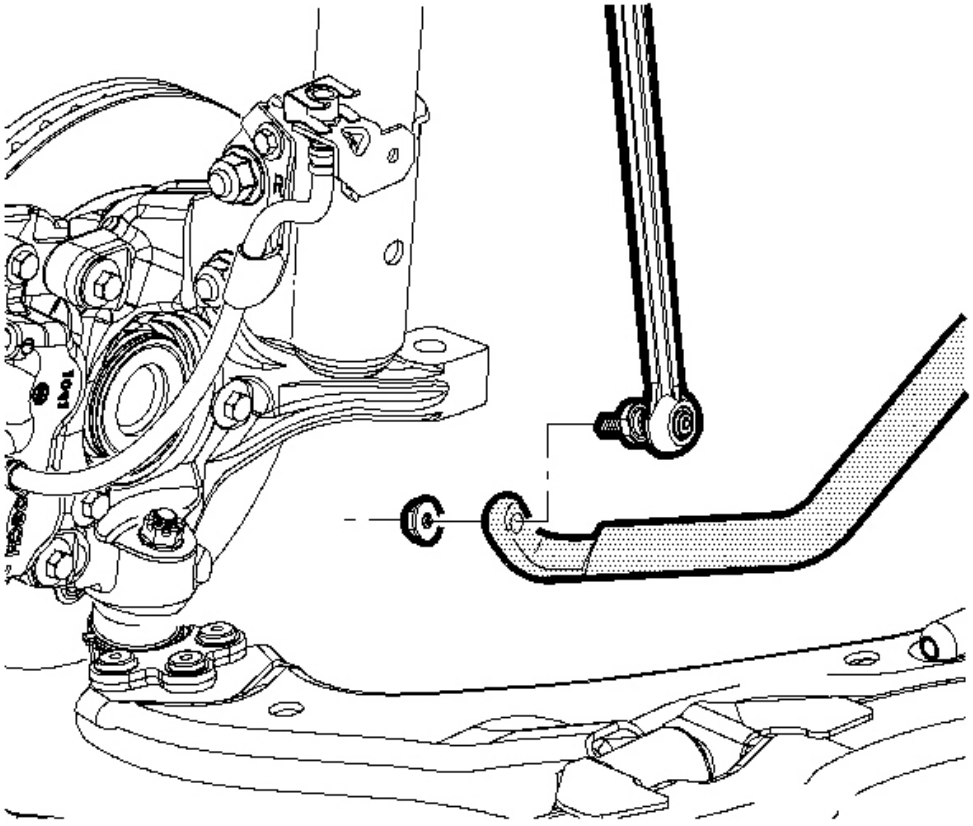

Fig. 62: Locating Rod & Bar
Courtesy of GENERAL MOTORS CORP.

4. If equipped with AWD, lower the stabilizer shaft and connect the stabilizer links.

   Tighten: Tighten the stabilizer link nuts to 65 N.m (48 lb ft).

5. Install both front tires and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
6. Lower the vehicle.

TRANSMISSION MOUNT BRACKET REPLACEMENT - REAR

Removal Procedure

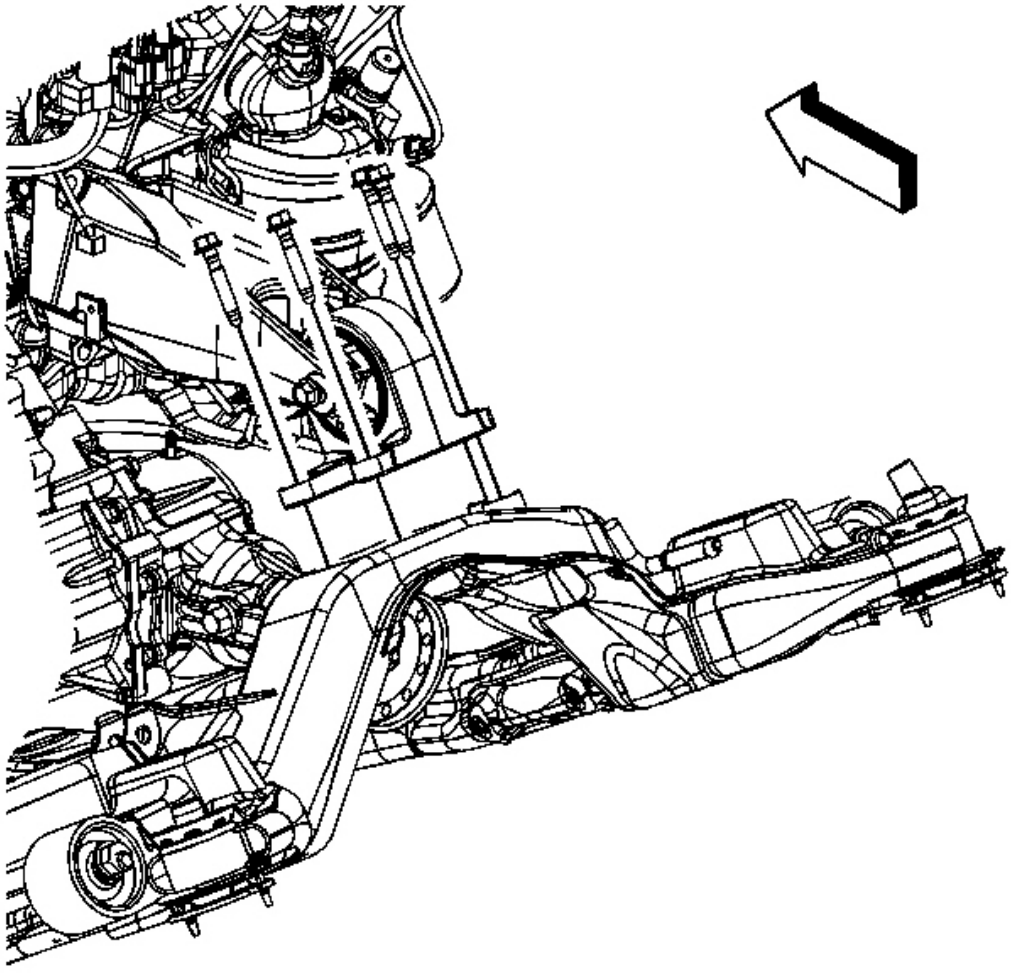

Fig. 63: Rear Transmission Mount-To-Frame Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the rear transmission mount. Refer to **Automatic Transmission Mount Replacement - Rear** .

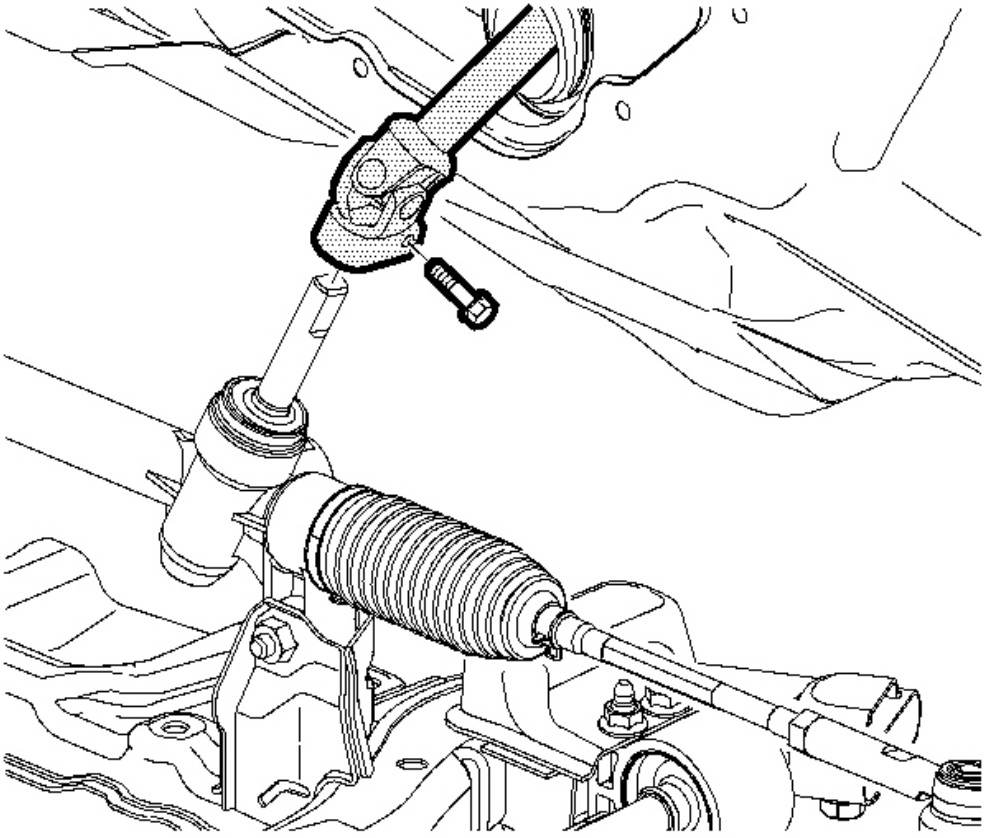

Fig. 64: Intermediate Steering Shaft & Steering Gear
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the intermediate steering shaft from the steering gear.

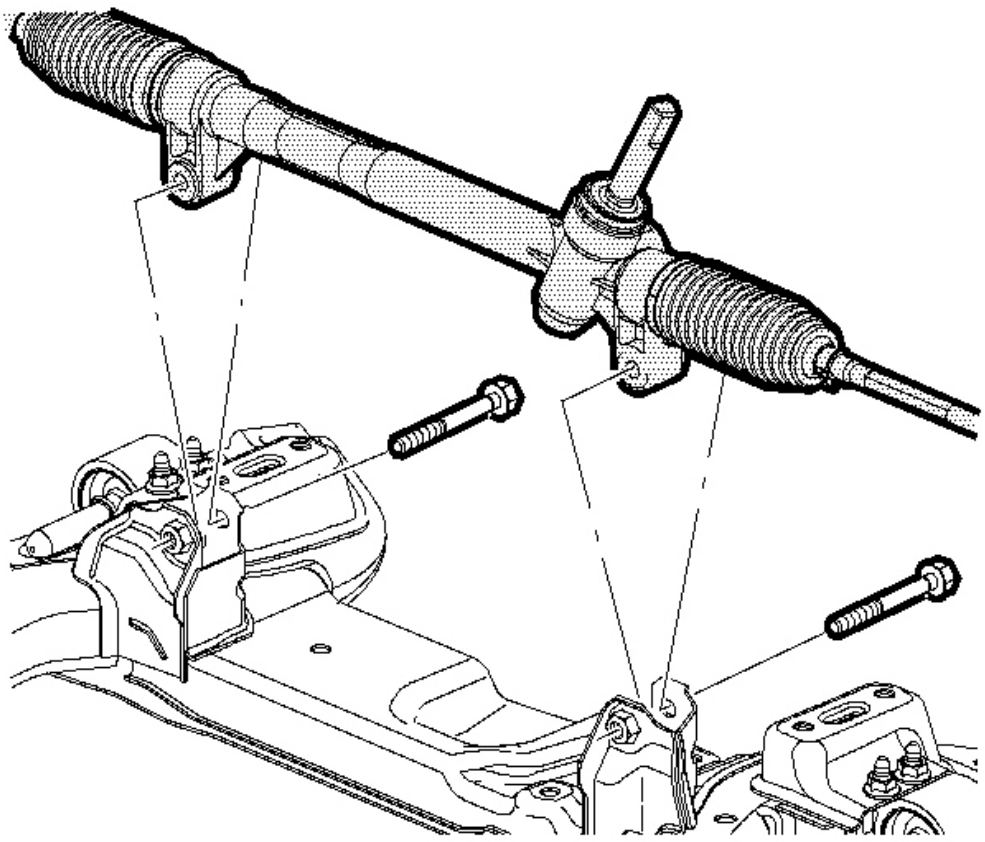

Fig. 65: Steering Gear & Frame Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the steering gear to frame bolts.
4. Secure the steering gear upward in order to gain additional clearance.
5. Remove the HO2S sensor. Refer to **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2** in Engine Controls 3.5L (L66).

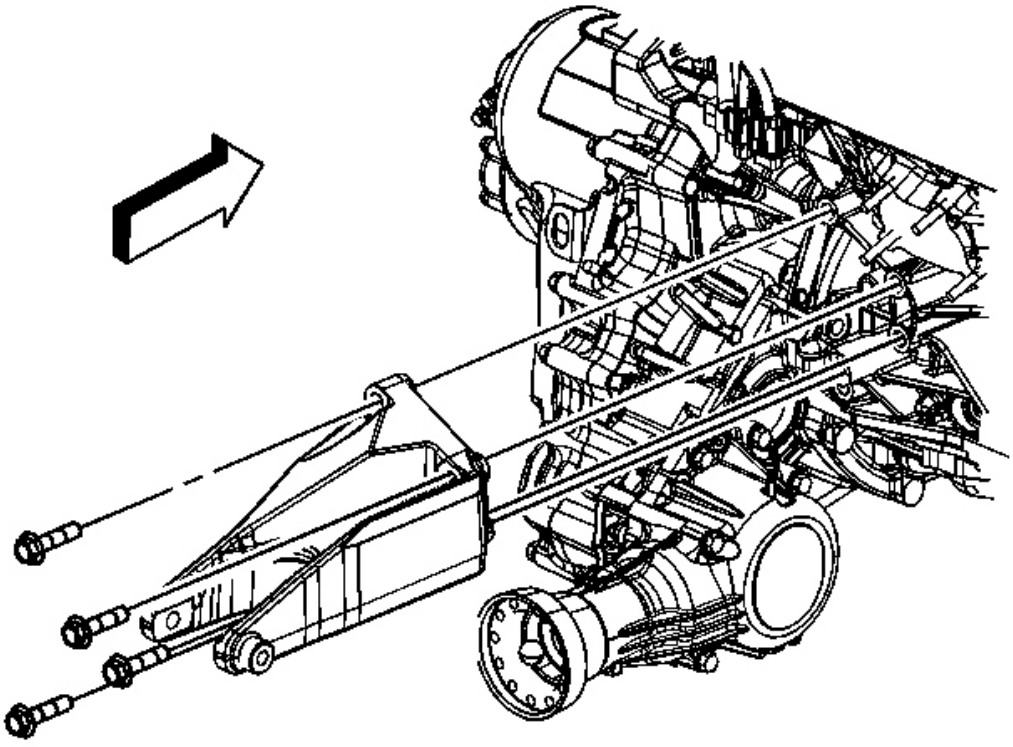

Fig. 66: Rear Transmission Mount Bracket To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission mount bracket to transmission bolts.
7. Remove the transmission mount bracket from the vehicle.

Installation Procedure

1. Position the transmission mount bracket to the transmission.

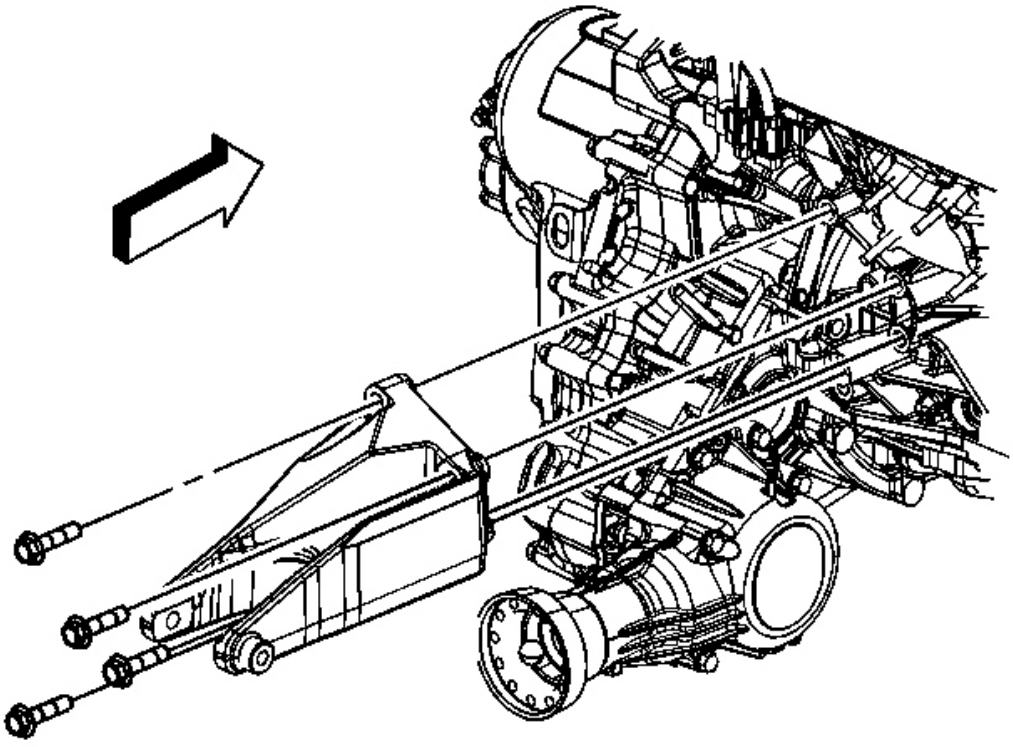

Fig. 67: Rear Transmission Mount Bracket To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the transmission mount bracket to transmission bolts.

   Tighten: Tighten the bolts to 110 N.m (81 lb ft).

3. Install the HO2S sensor. Refer to **Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2** in Engine Controls 3.5L (L66).

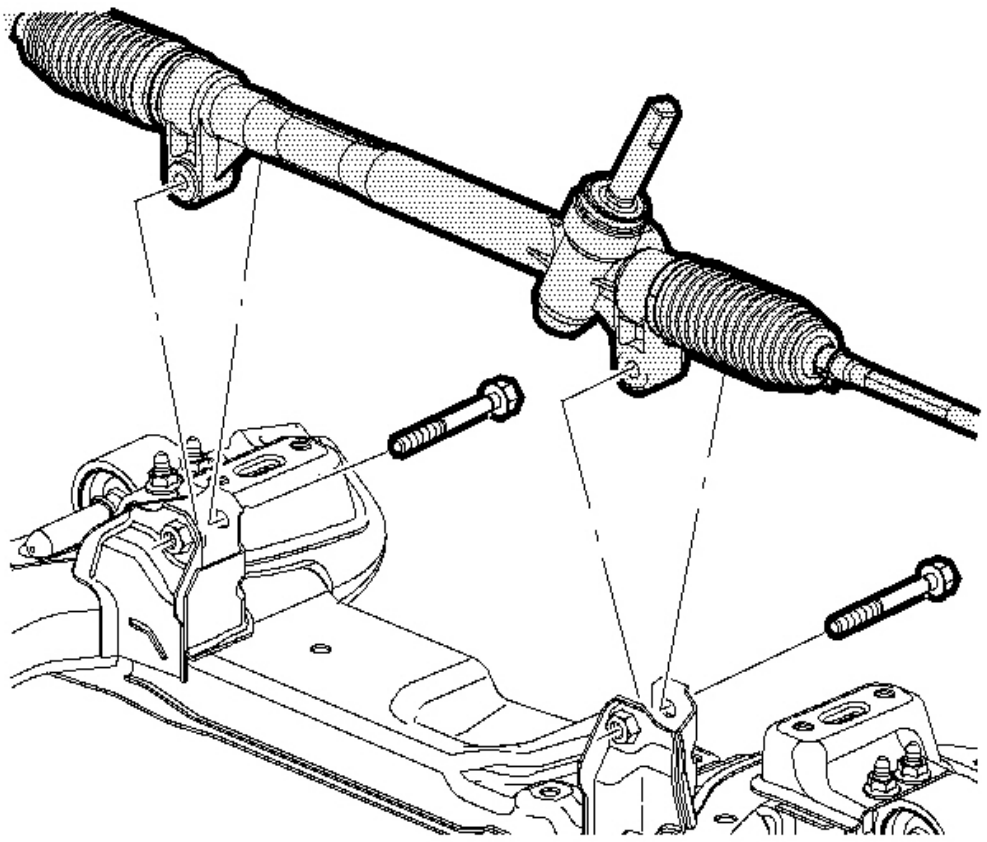

Fig. 68: Steering Gear & Frame Bolts
Courtesy of GENERAL MOTORS CORP.

4. Lower the steering gear to the frame.
5. Install the steering gear to frame bolts.

Tighten: Tighten the bolts to 110 N.m (81 lb ft).

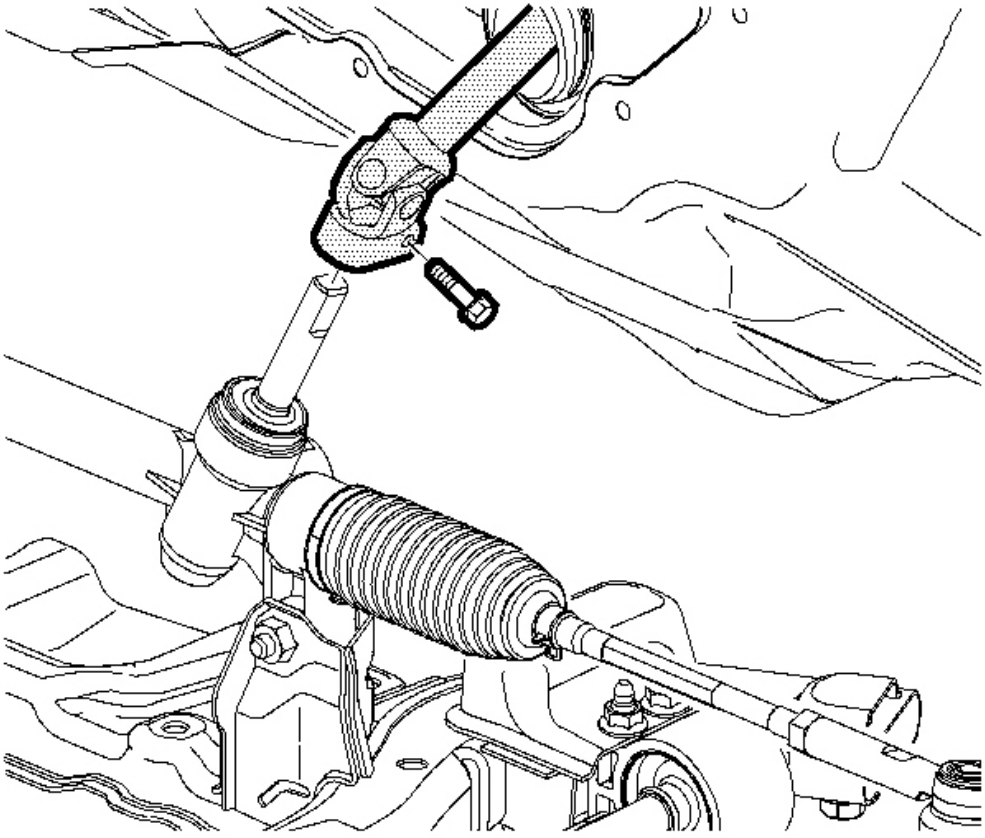

Fig. 69: Intermediate Steering Shaft & Steering Gear
Courtesy of GENERAL MOTORS CORP.

6. Install the intermediate steering shaft to the steering gear.
7. Install the intermediate steering shaft to gear pinch bolt.

Tighten: Tighten the bolts to 34 N.m (25 lb ft).

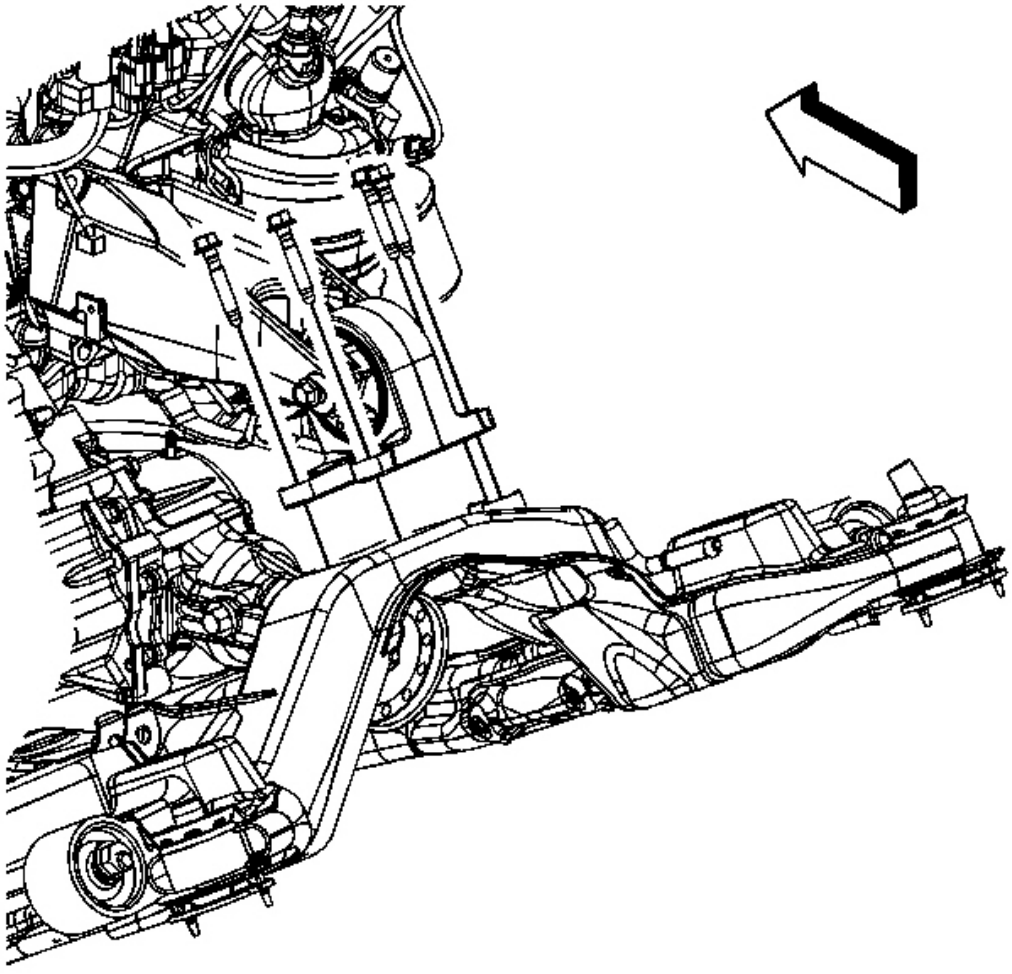

Fig. 70: Rear Transmission Mount-To-Frame Bolts
Courtesy of GENERAL MOTORS CORP.

8. Install the rear transmission mount. Refer to **Automatic Transmission Mount Replacement - Rear** .

TRANSMISSION REPLACEMENT

Removal Procedure

1. With the tires in the straight forward position, remove the key from the ignition.
2. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

3. Remove the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 3.5L (L66).

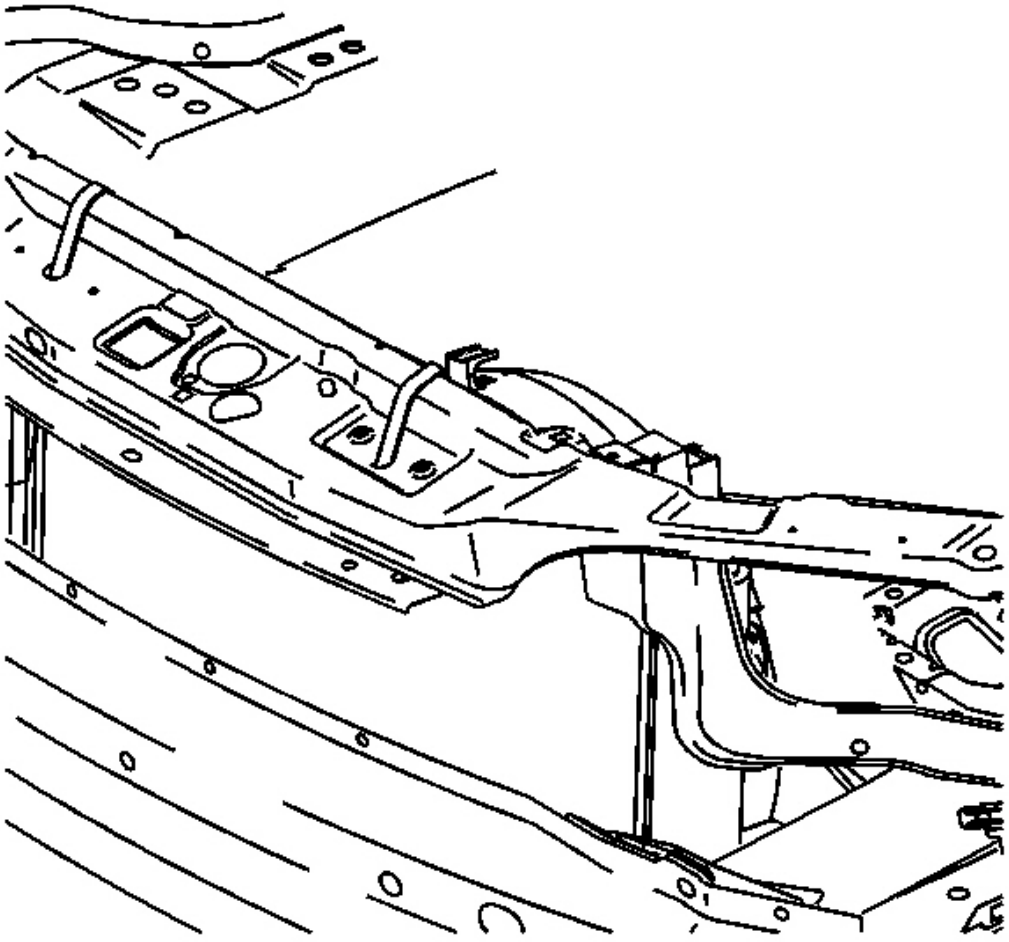

Fig. 71: Cooling Module & Upper Body Structure
Courtesy of GENERAL MOTORS CORP.

4. Secure the cooling module to the upper body structure.
5. Remove the battery and battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.
6. Disconnect the transmission shiftier cable.
7. Disconnect the wiring harness from the underhood junction block. Refer to **Underhood Electrical Center or Junction Block Replacement** in Wiring Systems.

8. Evacuate the A/C system. Refer to **Refrigerant Recovery and Recharging** in Heating, Ventilation and Air Conditioning.
9. Drain the cooling system. Refer to **Draining and Filling Cooling System** in Engine Cooling.
10. Remove the powertrain control module (PCM). Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5L (L66).
11. Remove the A/C low pressure tube at the front lift bracket.
12. Disconnect the generator positive cable.
13. Disconnect the A/C high pressure switch harness.
14. Remove the A/C tube from the A/C compressor. Refer to **Compressor Hose Assembly Replacement (L66)** or **Compressor Hose Assembly Replacement (L61)** in Heating, Ventilation, and Air Conditioning.
15. Disconnect the A/C line from the condenser to the compressor.
16. Disconnect the coolant reservoir hose from the engine to reservoir.

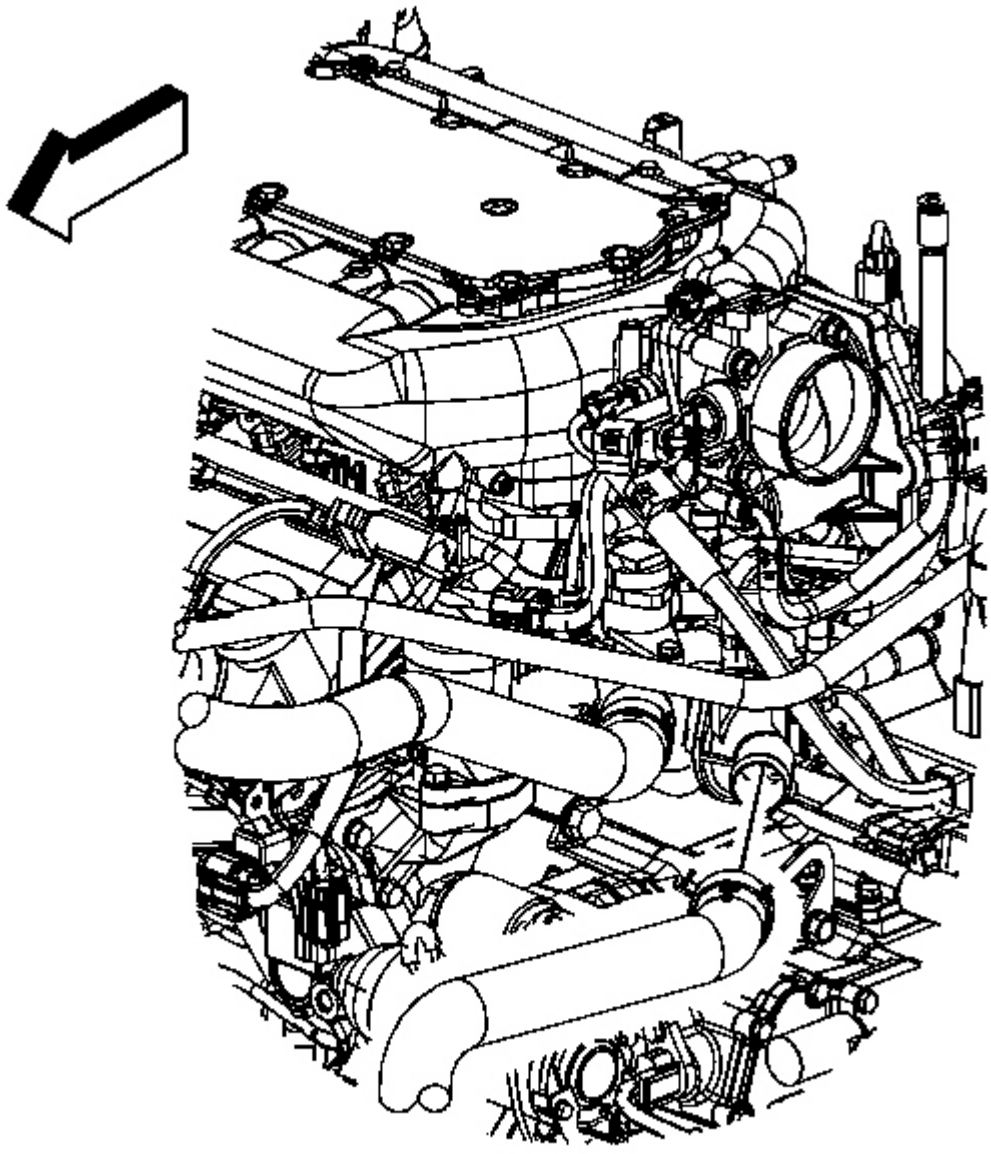

Fig. 72: Radiator Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

17. Disconnect the radiator inlet and outlet hoses from the engine.

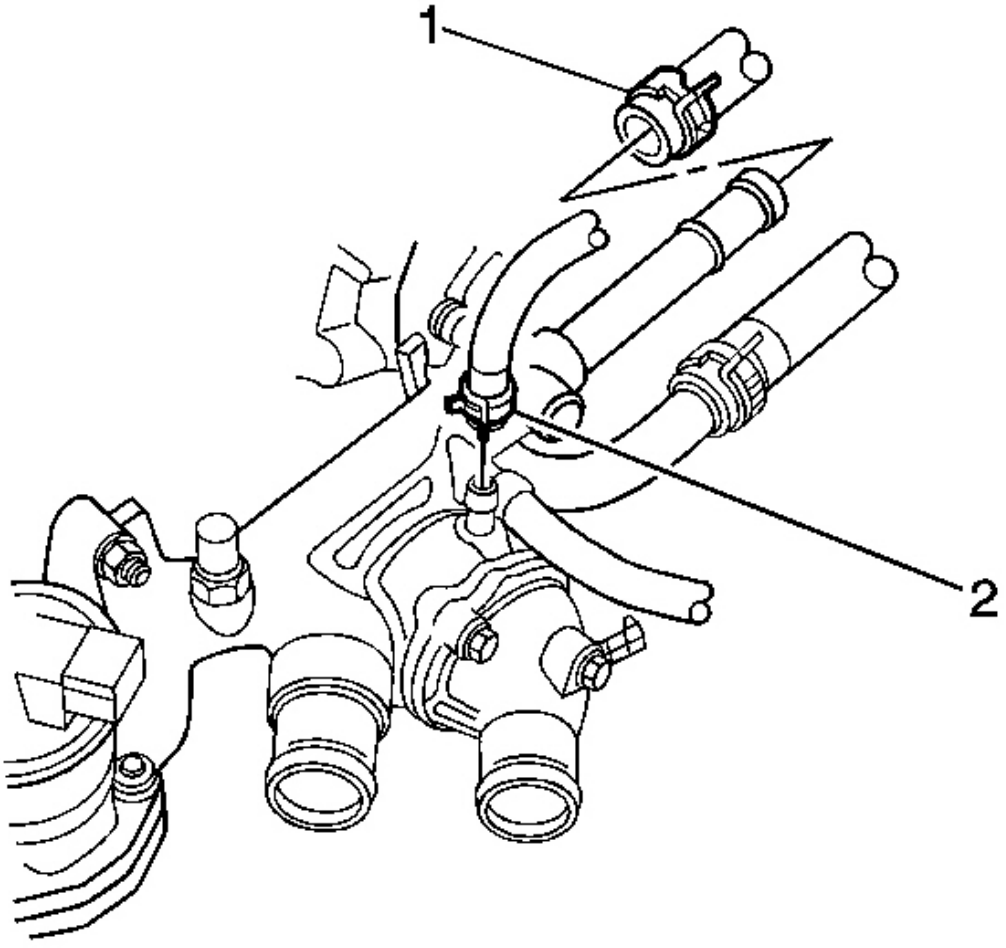

Fig. 73: Inlet & Outlet Heater Hoses
Courtesy of GENERAL MOTORS CORP.

18. Remove the inlet and outlet heater hoses (1, 2).
19. Remove the starter positive cable.
20. Relieve the fuel pressure. Refer to **Fuel Pressure Relief Procedure** in Engine Controls - 3.5L (L66).
21. Disconnect the fuel feed line.
22. Disconnect the fuel EVAP line.
23. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
24. Remove the lower transaxle-to-engine bolts.
25. Remove the PTU. Refer to **Transfer Case Replacement** in Transfer Case - MJ8.

26. Remove the torque convertor inspection cover.
27. Remove the torque convertor-to-flywheel bolts.
28. Remove the front wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
29. Remove the left wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** in Body Front End.
30. Disconnect the transmission cooler lines from the transmission and bracket. Refer to **Oil Cooler Line Replacement** .
31. Remove the left and right tie rod ends from the steering knuckles. Refer to **Rack and Pinion Outer Tie Rod End Replacement** in Power Steering System.
32. Remove the left and right stabilizer bar links. Refer to **Stabilizer Shaft Link Replacement** in Front Suspension.
33. Disconnect the left and right lower ball joints. Refer to **Lower Ball Joint Replacement** in Front Suspension.
34. Remove the left and right axle shaft nuts. Refer to **Wheel Drive Shaft Replacement - Front** in Wheel Drive Shafts.

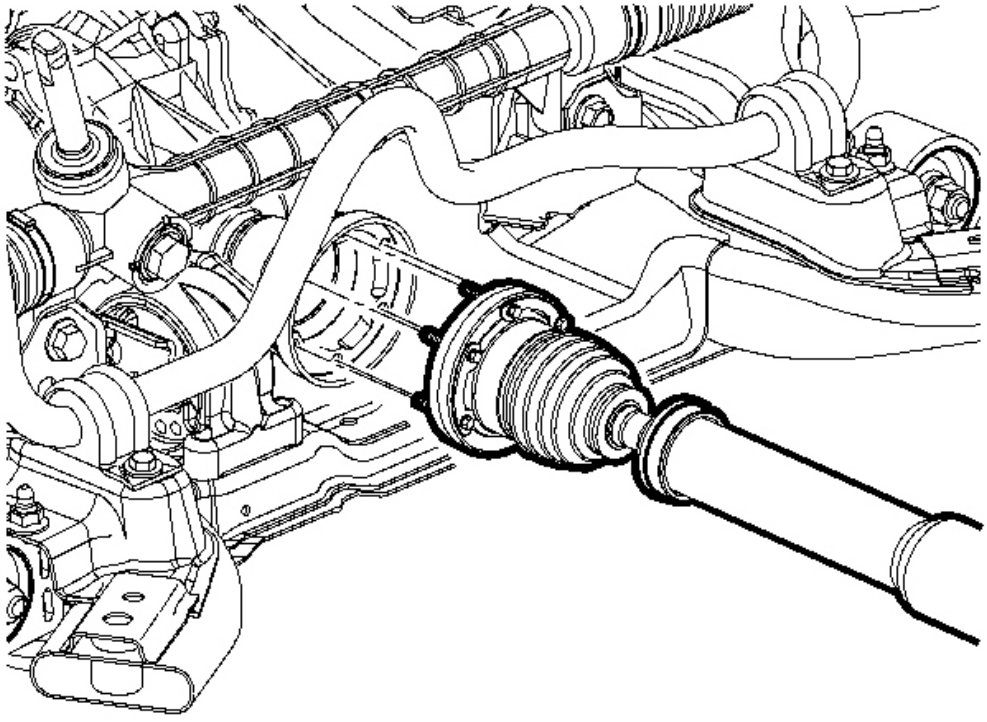

Fig. 74: Propeller Shaft
Courtesy of GENERAL MOTORS CORP.

35. Remove the propeller shaft. Refer to **Propeller Shaft Replacement** in Propeller Shaft.

IMPORTANT: In order to prevent possible SIR system deployment, do not attempt to rotate the steering shaft.

36. Disconnect the intermediate shaft from the steering gear. Refer to **Intermediate Steering Shaft Replacement** in Steering Wheel and Column.
37. Remove the front exhaust pipe. Refer to **Exhaust Manifold Pipe Replacement (L66)** or **Exhaust Manifold Pipe Replacement (L61)** in Engine Exhaust.

38. Remove the 3 front fender pushpins to allow the front fender to flex.
39. Use a paint pen or magic marker to mark the frame to the body position.
40. Support the engine in the cradle with wood blocks.
41. Disconnect the front engine mount from the body. Refer to **Automatic Transmission Mount Replacement - Rear** in Engine Mechanical - 3.5L (L66).

IMPORTANT: During the powertrain removal, support the vehicle body by placing a jack at the rear of the vehicle.

42. Position the engine support table under the powertrain assembly.
43. With the table positioned, fully raise the table to contact with the powertrain assembly.
44. Remove the cradle bolts.
45. Slowly lower the table to the floor.

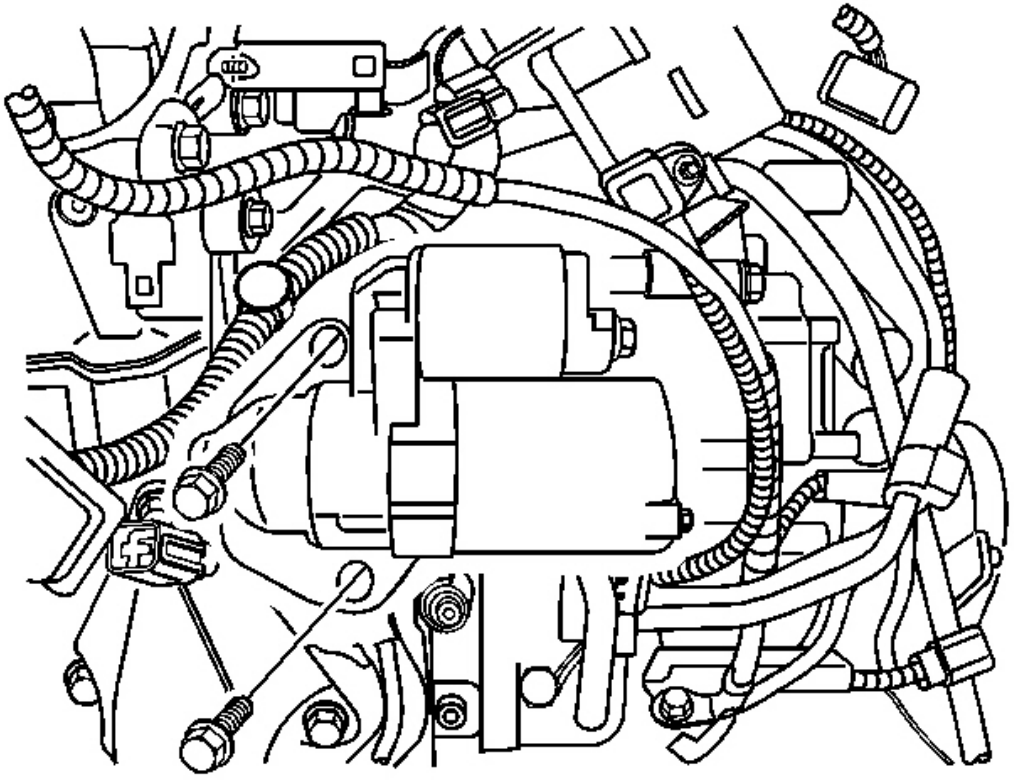

Fig. 75: Starter
Courtesy of GENERAL MOTORS CORP.

46. Remove the starter.
47. Remove the following components:
    1. Remove the transmission shift cable bracket.
    2. Remove the Park/Neutral position switch. Refer to **Park/Neutral Position Switch Replacement** .
    3. Remove the transmission vent hose.
48. Remove the transmission mount from the transmission. Refer to **Transmission Mount Bracket Replacement - Rear** .
49. Remove the rear transmission mount bracket. Refer to **Transmission Mount Bracket Replacement - Rear** .
50. Separate the transmission from the engine.
51. Remove the transfer case, if equipped. Refer to **Transfer Case Replacement** .

Installation Procedure

1. Align the transmission to the engine.

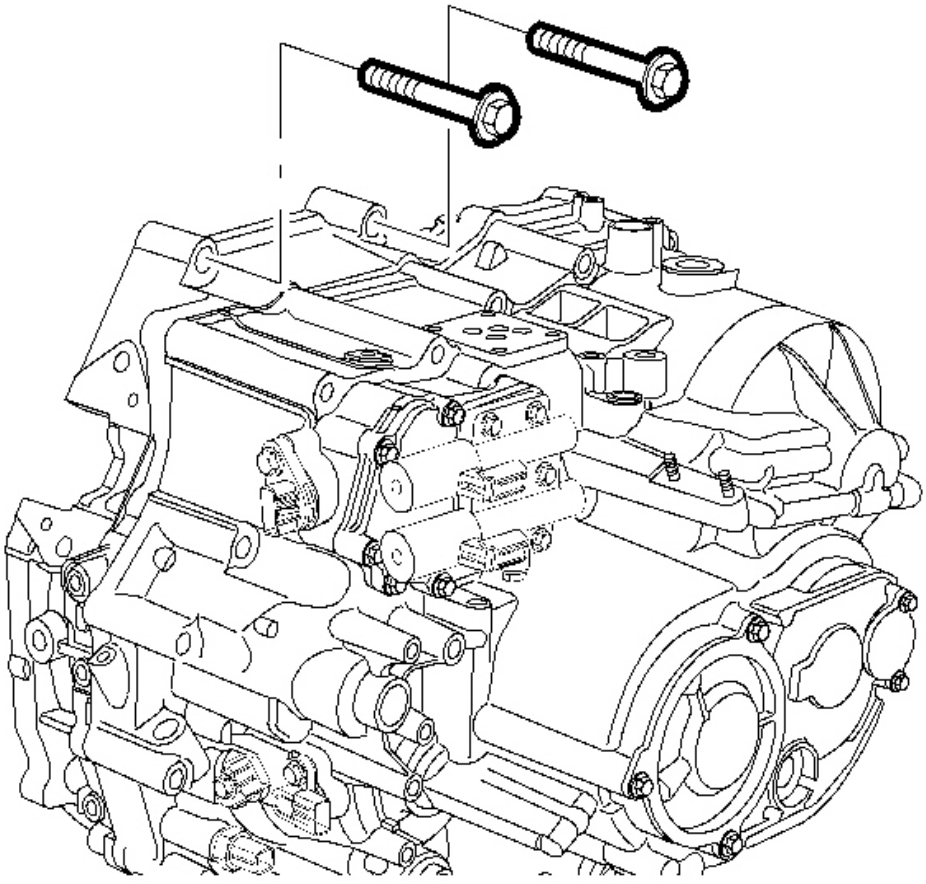

Fig. 76: Two Upper Transmission-To-Engine Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Apply sealant Saturn P/N 21485277 (GM P/N 12345382) or equivalent, to the two upper transmission-to-engine bolts only, and install the transmission-to-engine mounting bolts.

   Tighten: Tighten the bolts to 64 N.m (47 lb ft).

3. Install the rear. Refer to **Engine Mount Replacement - Right** in Engine Mechanical - 3.5L (L66).
4. Install the front engine mount to the engine. Refer to **Automatic Transmission Mount Replacement -**

Rear in Engine Mechanical - 3.5L (L66).

5. Install the following components:
    1. Install the transmission vent hose.
    2. Install the Park/Neutral position switch. Refer to **Park/Neutral Position Switch Replacement** .
    3. Install the transmission shift cable bracket and bolts.

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

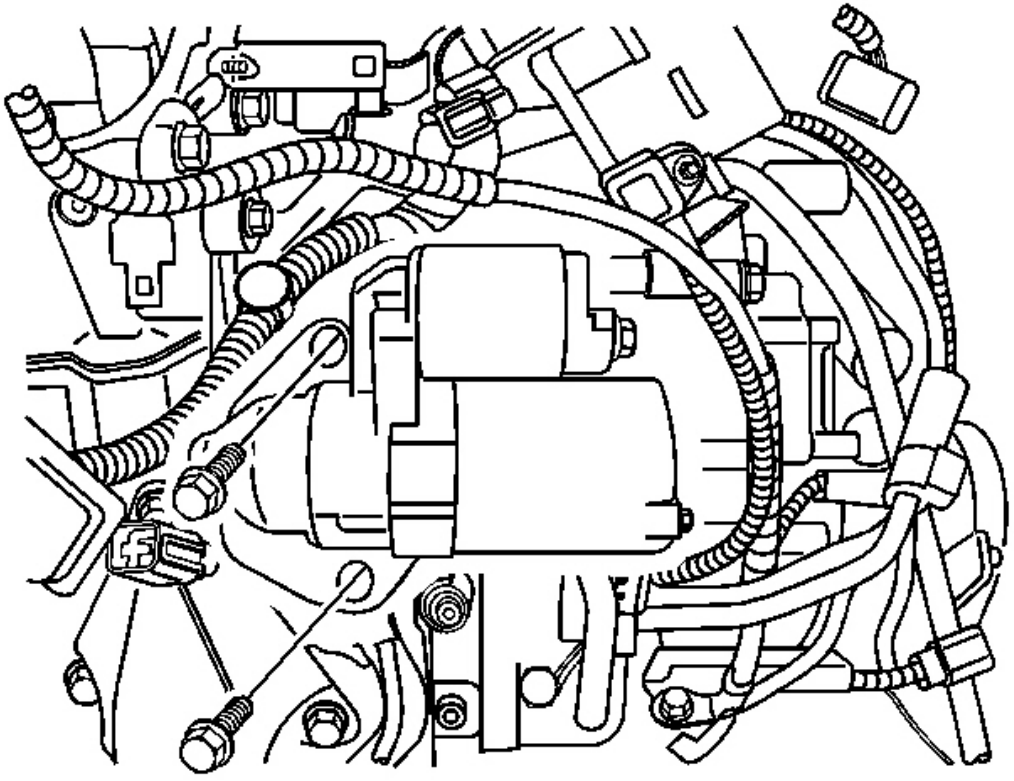

Fig. 77: Starter
Courtesy of GENERAL MOTORS CORP.

6. Install the starter. Refer to **Starter Motor Replacement (L61)** or **Starter Motor Replacement (L66)** in Engine Electrical.
7. Install the powertrain assembly to the vehicle.
8. Install the cradle bolts. Refer to **Frame Replacement (L61)** or **Frame Replacement (L66)** in Frame and Underbody.

9. Remove the engine support table.
10. Install the front engine mount bolts to the body. Refer to **Automatic Transmission Mount Replacement - Rear** in Engine Mechanical - 3.5L (L66).
11. Remove the wood blocks from the cradle.
12. Install the lower transaxle-to-engine bolts.

    Tighten: Tighten the bolts to 64 N.m (47 lb ft).

13. Install the PTU. Refer to **Transfer Case Replacement** in Transfer Case - MJ8.
14. Install the torque convertor-to-flywheel bolts.

    Tighten: Tighten the bolts to 12 N.m (9 lb ft).

15. Install the torque convertor inspection cover.

    Tighten: Tighten the bolts to 12 N.m (9 lb ft).

16. Install the 3 front fender pushpins
17. Install the front exhaust pipe. Refer to **Exhaust Manifold Pipe Replacement (L66)** or **Exhaust Manifold Pipe Replacement (L61)** in Engine Exhaust.
18. Connect the intermediate shaft from the steering gear. Refer to **Intermediate Steering Shaft Replacement** in Steering Wheel and Column.
19. Install the propeller shaft. Refer to **Propeller Shaft Replacement** in Propeller Shaft.
20. Install the left and right axle shaft nuts. Refer to **Wheel Drive Shaft Replacement - Front** in Wheel Drive Shafts.
21. Connect the left and right lower ball joints. Refer to **Lower Ball Joint Replacement** in Front Suspension.
22. Install the left and right stabilizer bar links. Refer to **Stabilizer Shaft Link Replacement** in Front Suspension.
23. Install the left and right tie rod ends to the steering knuckles. Refer to **Rack and Pinion Outer Tie Rod End Replacement** in Power Steering System.
24. Connect the transmission cooler lines to the transmission and bracket. Refer to **Oil Cooler Line Replacement** .
25. Install the left wheelhouse liner. Refer to **Wheelhouse Liner Replacement - Front** in Body Front End.
26. Install the front tires. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
27. Lower the vehicle.

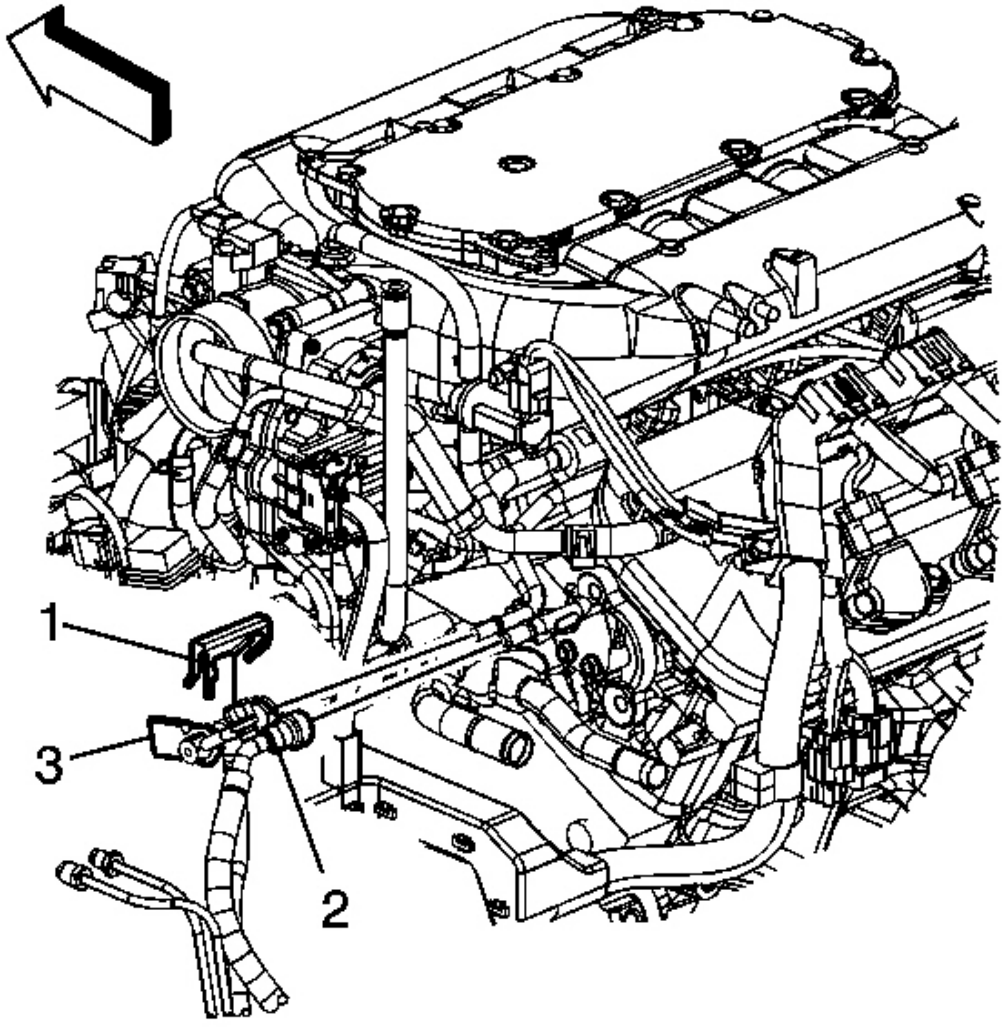

Fig. 78: A/C High Pressure Switch Harness & Fuel EVAP Line
Courtesy of GENERAL MOTORS CORP.

28. Install the fuel EVAP line.
29. Connect the fuel feed line. Refer to **Fuel Hose/Pipes Replacement - Chassis** in Engine Mechanical - 3.5L (L66).
30. Install the starter positive cable.

Tighten: Tighten the starter cable to 12 N.m (106 lb in).

31. Install the inlet and outlet heater hoses.
32. Connect the inlet and outlet radiator hoses to the engine.
33. Install the A/C tube to the A/C compressor. Refer to **Compressor Hose Assembly Replacement (L66)** or **Compressor Hose Assembly Replacement (L61)** in Heating, Ventilation, and Air Conditioning.
34. Connect the coolant reservoir hose from engine to reservoir.
35. Connect the A/C line from the condenser to the compressor.
36. Connect the A/C high pressure switch harness.
37. Connect the generator positive cable and nut.

    Tighten: Tighten the nut to 12 N.m (106 lb in).

38. Install the A/C lower pressure tube at the front lift bracket. Refer to **Liquid Line Replacement (L61)** or **Liquid Line Replacement (L66)** in Heating, Ventilation, and Air Conditioning.
39. Install the PCM. Refer to **Powertrain Control Module (PCM) Replacement** in Engine Controls - 3.5L (L66).

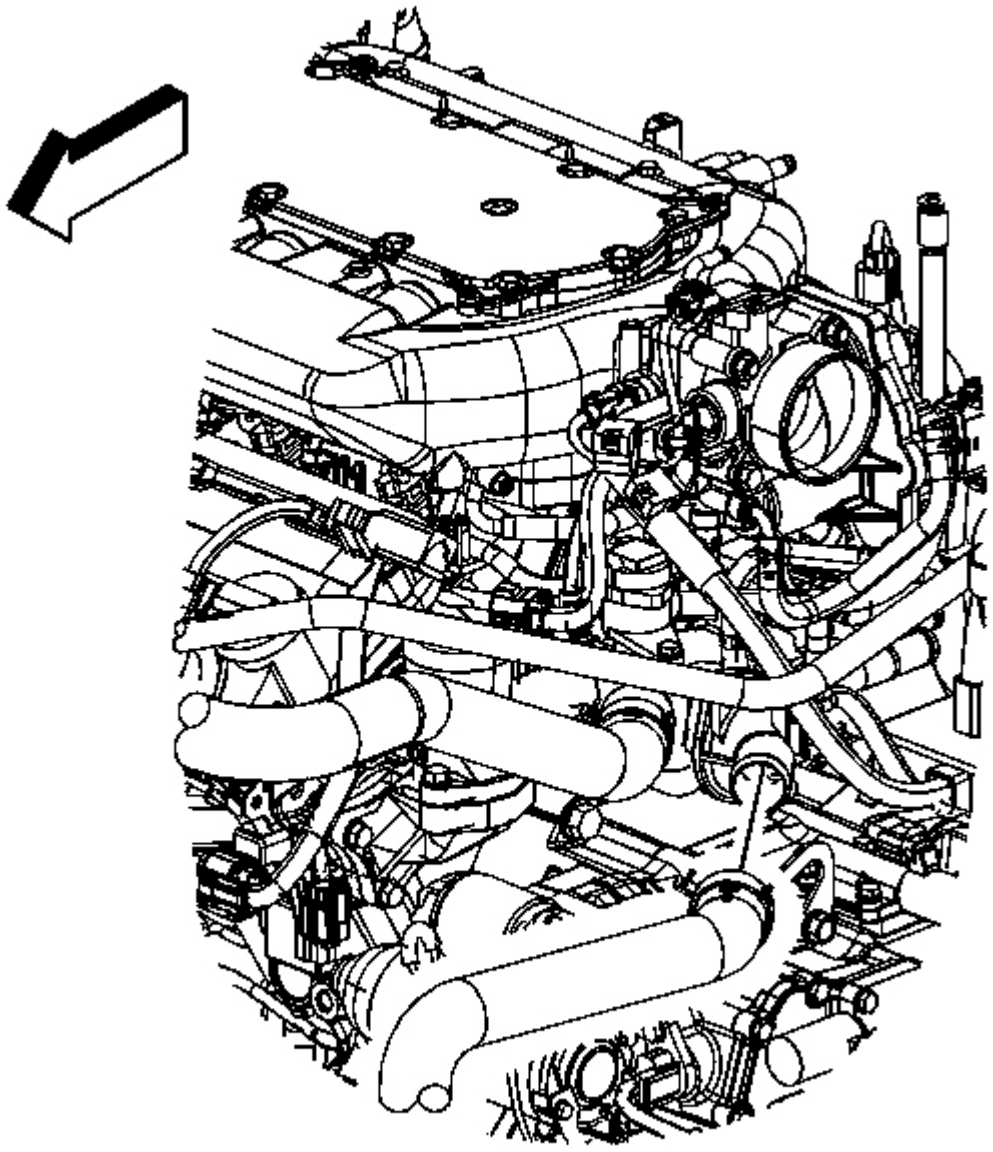

Fig. 79: Radiator Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

40. Connect the radiator inlet and outlet hoses to the engine.
41. Fill the vehicle with coolant. Refer to **Draining and Filling Cooling System** in Engine Cooling.
42. Connect the wiring harness to the underhood junction block. Refer to **Underhood Electrical Center or**

Junction Block Replacement in Wiring Systems.

43. Connect the transmission shiftier cable.

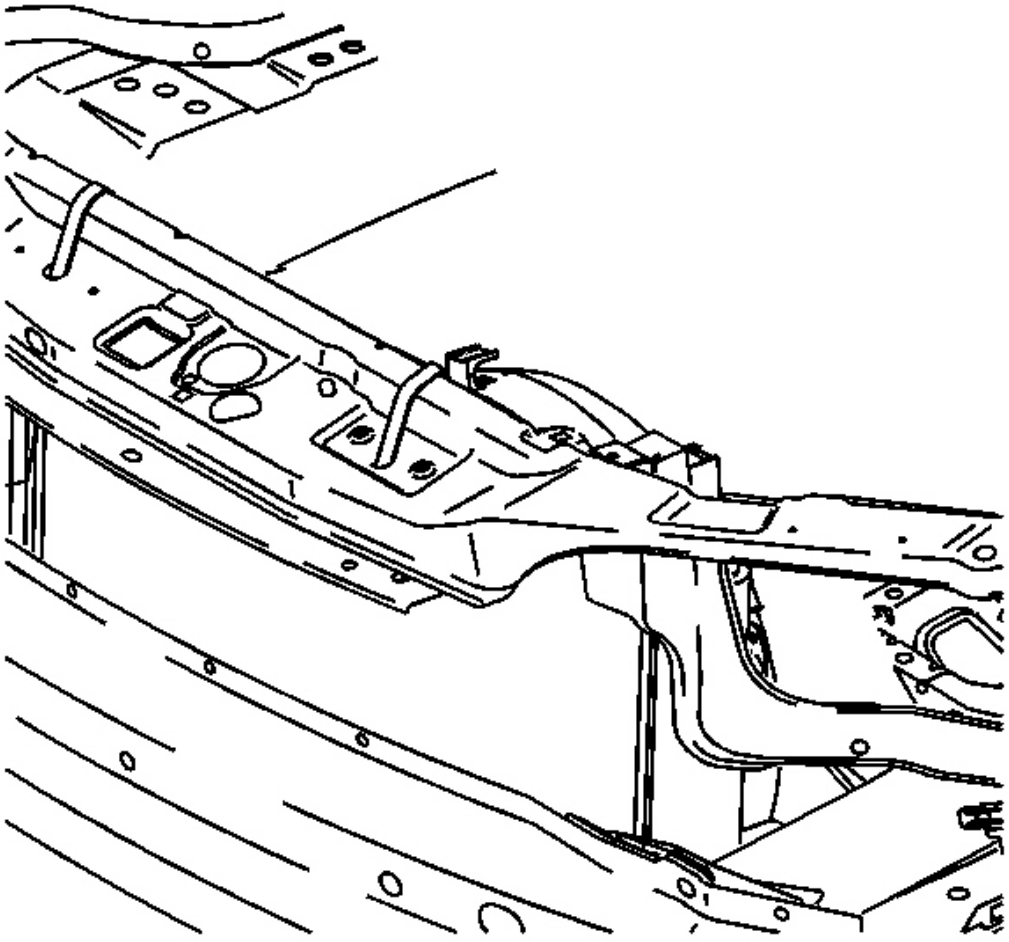

Fig. 80: Cooling Module & Upper Body Structure
Courtesy of GENERAL MOTORS CORP.

44. Remove the cooling module support.
45. Install the battery tray and battery. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.
46. Install the air cleaner assembly. Refer to **Air Cleaner Assembly Replacement** in Engine Controls - 3.5L (L66).
47. Install the air outlet duct assembly. Refer to **Air Cleaner Resonator Outlet Duct Replacement** in Engine Mechanical - 3.5L (L66).

48. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnect/Connect Procedure** in Engine Electrical.

SHIFT CONTROL REPLACEMENT

Tools Required

J 36346 Fascia Retainer Remover

Removal Procedure

IMPORTANT: All shifter cable and park lock cable clips are one time usage only. Any service repair requiring cables to be disconnected from the transaxle control cable bracket or shiftier assembly will require a cable clip replacement.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling Zone 8** in SIR.
2. Remove the console. Refer to **Console Replacement** in Instrument Panel, Gages, and Console.

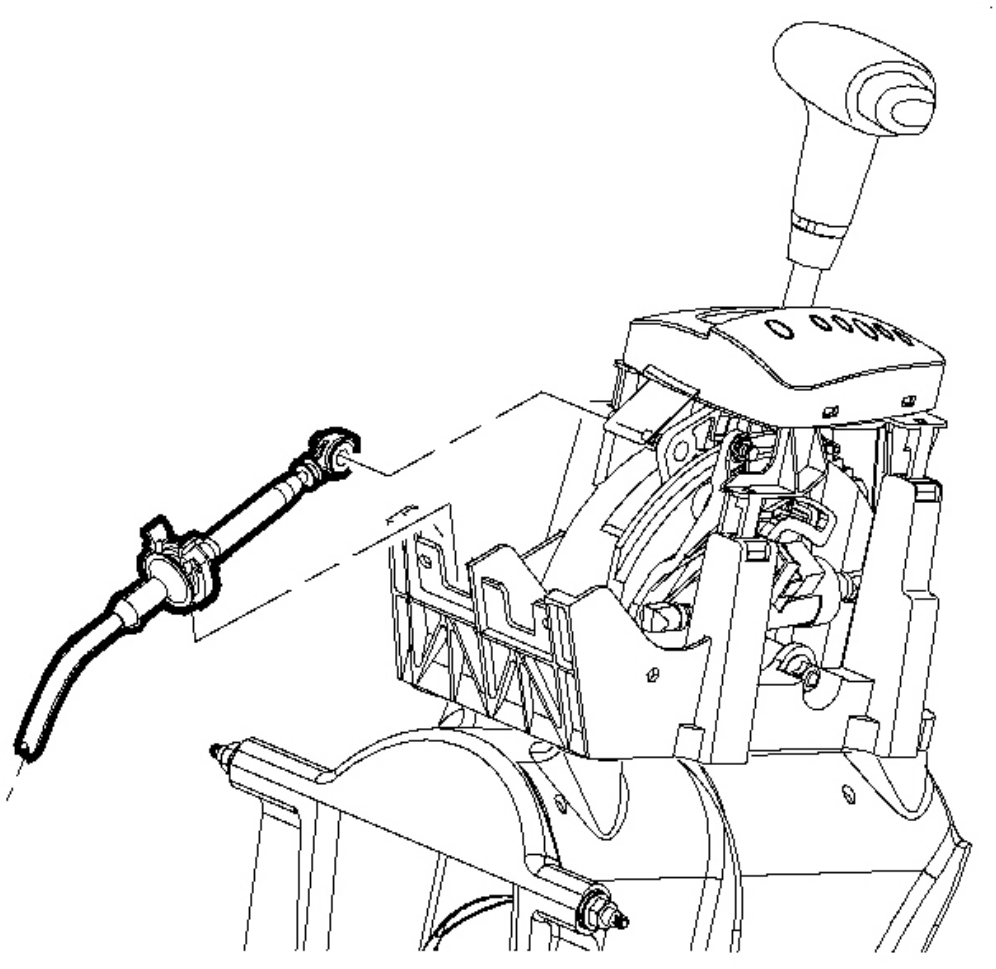

Fig. 81: Shifter Cable & Control Assembly Pin
Courtesy of GENERAL MOTORS CORP.

3. Using the **J 36346** , disconnect the shifter cable from the control assembly pin.
4. Remove the shifter cable retainer clip and remove the cable from the control assembly. Discard the clip.

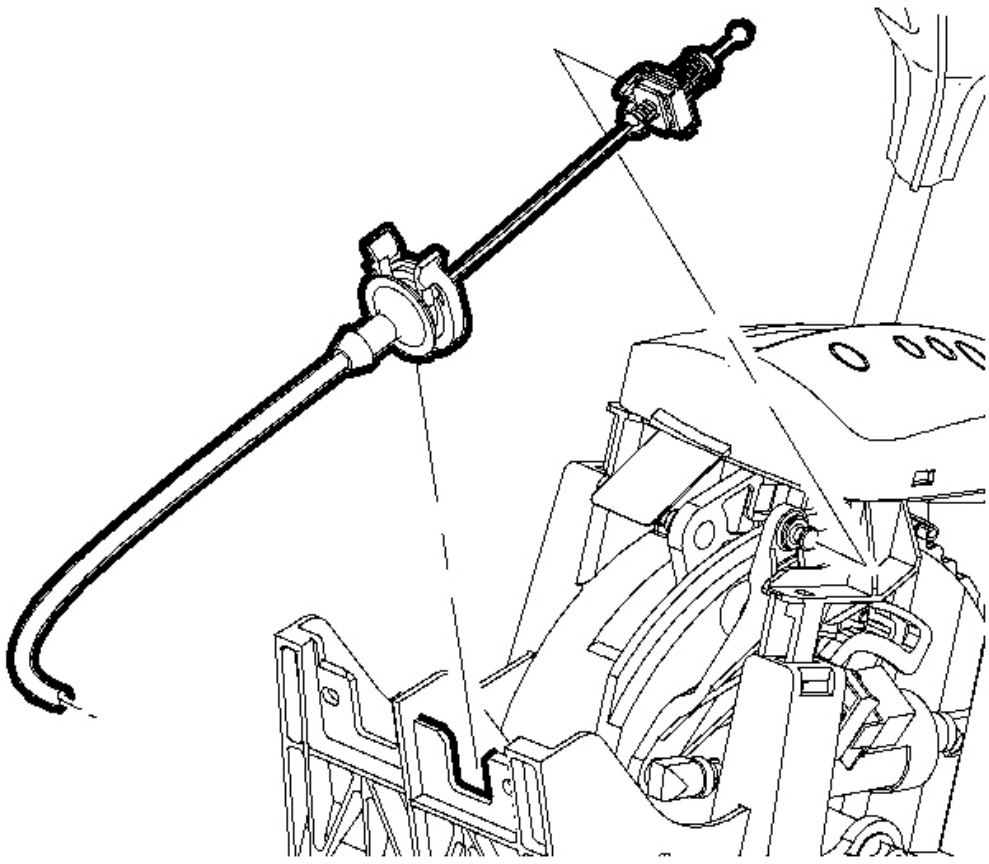

Fig. 82: Park Lock Cable Assembly & Pin On Control Assembly
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the park lock cable assembly from the pin on the control assembly.
6. Depress the tab on the park lock cable and remove the cable from the control assembly. Discard the park lock cable clip.

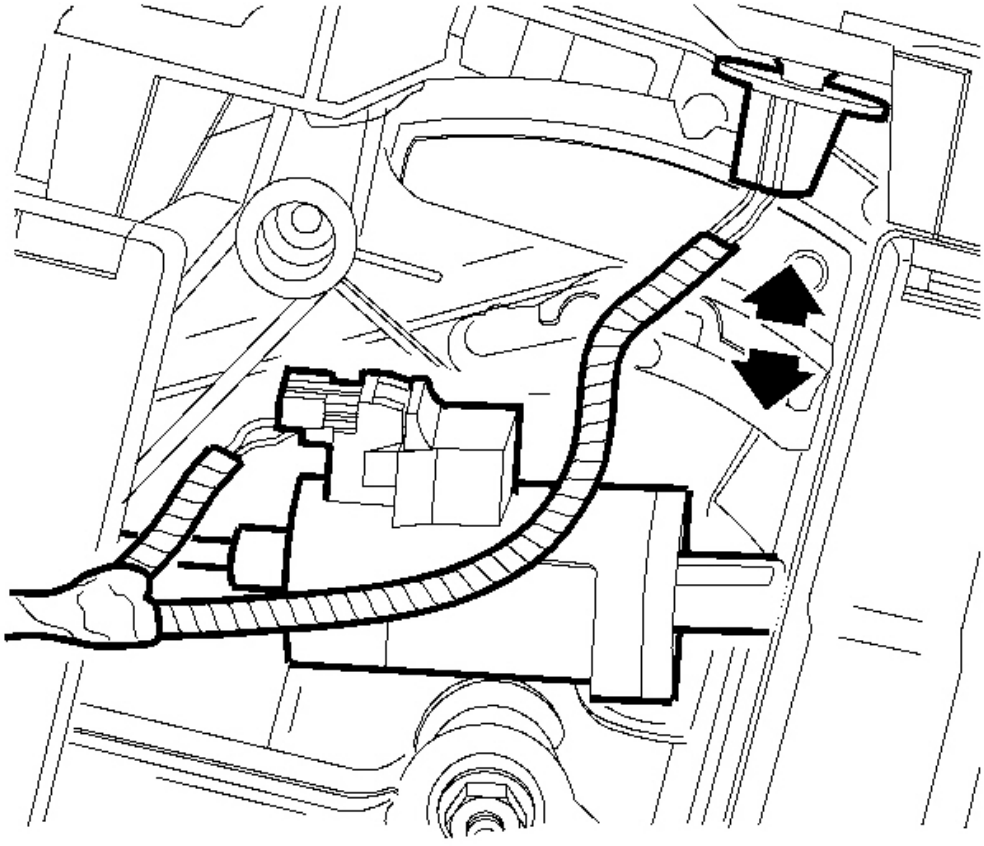

Fig. 83: Indicator Bulb
Courtesy of GENERAL MOTORS CORP.

7. Remove the indicator bulb by rotating the bulb a 1/4 turn and pulling out.

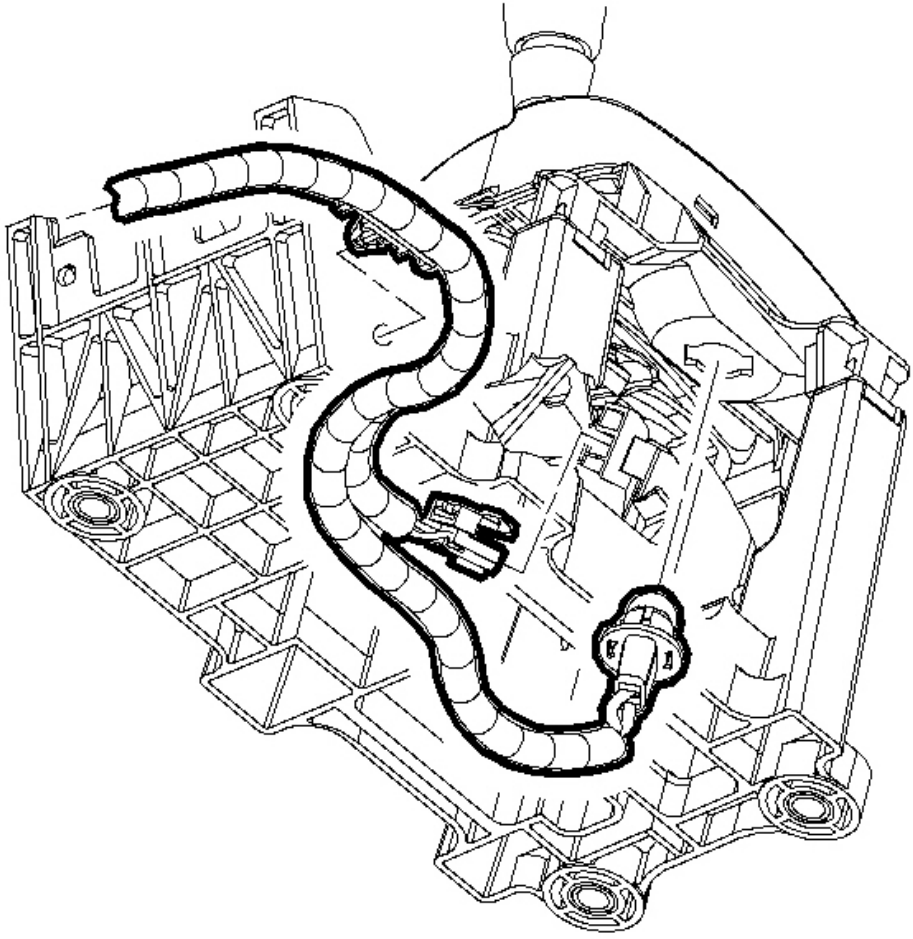

Fig. 84: Control Assembly Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the control assembly electrical connectors.

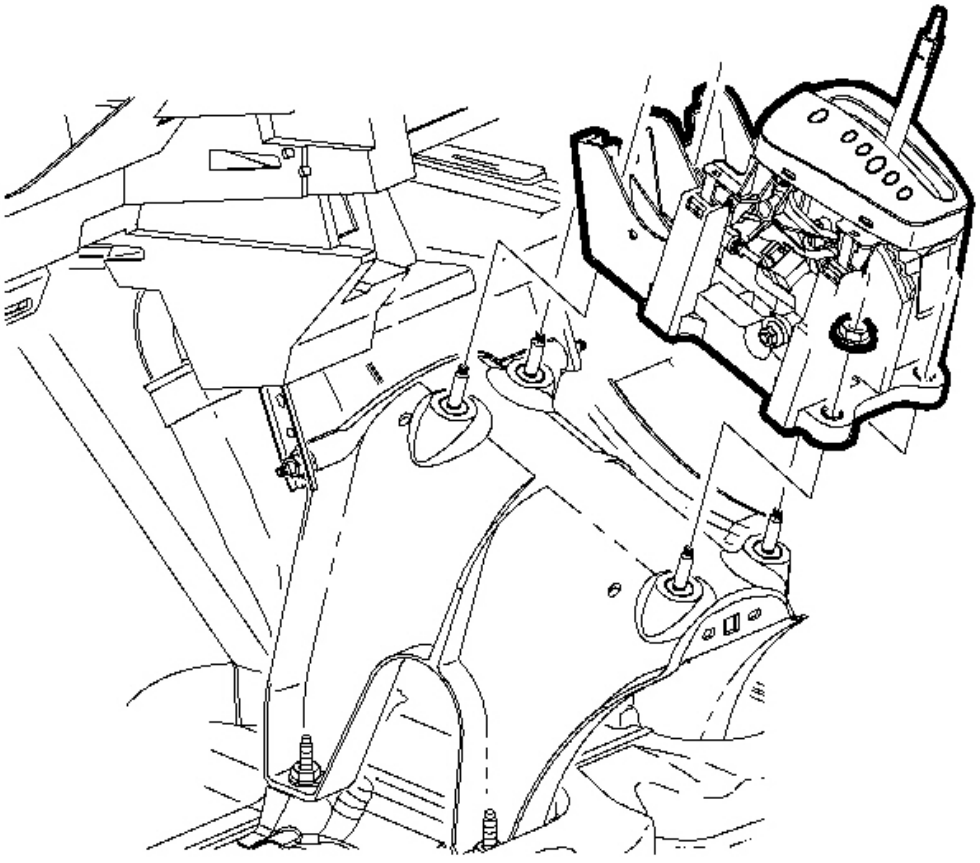

Fig. 85: Control Assembly & Nuts
Courtesy of GENERAL MOTORS CORP.

9. Remove the nuts from the control assembly.
10. Remove the control assembly and replace if necessary.

Installation Procedure

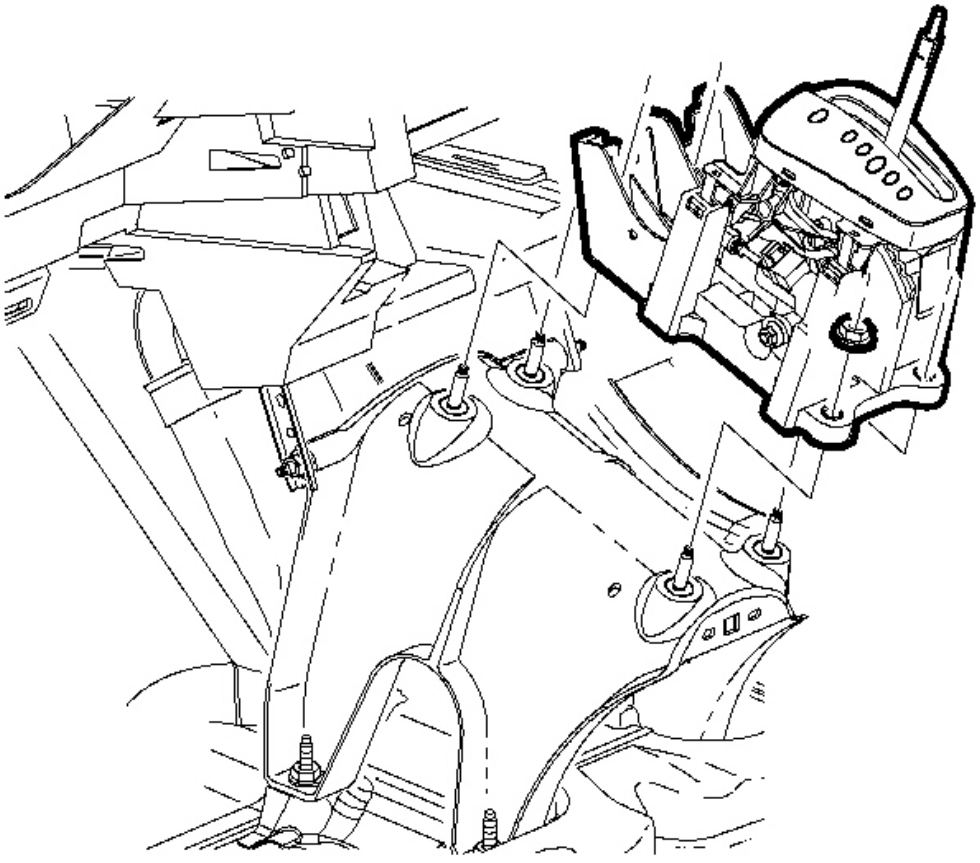

Fig. 86: Control Assembly & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the control assembly.

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

2. Install the control assembly bolts.

Tighten: Tighten the control assembly to bracket bolts to 25 N.m (18 lb ft).

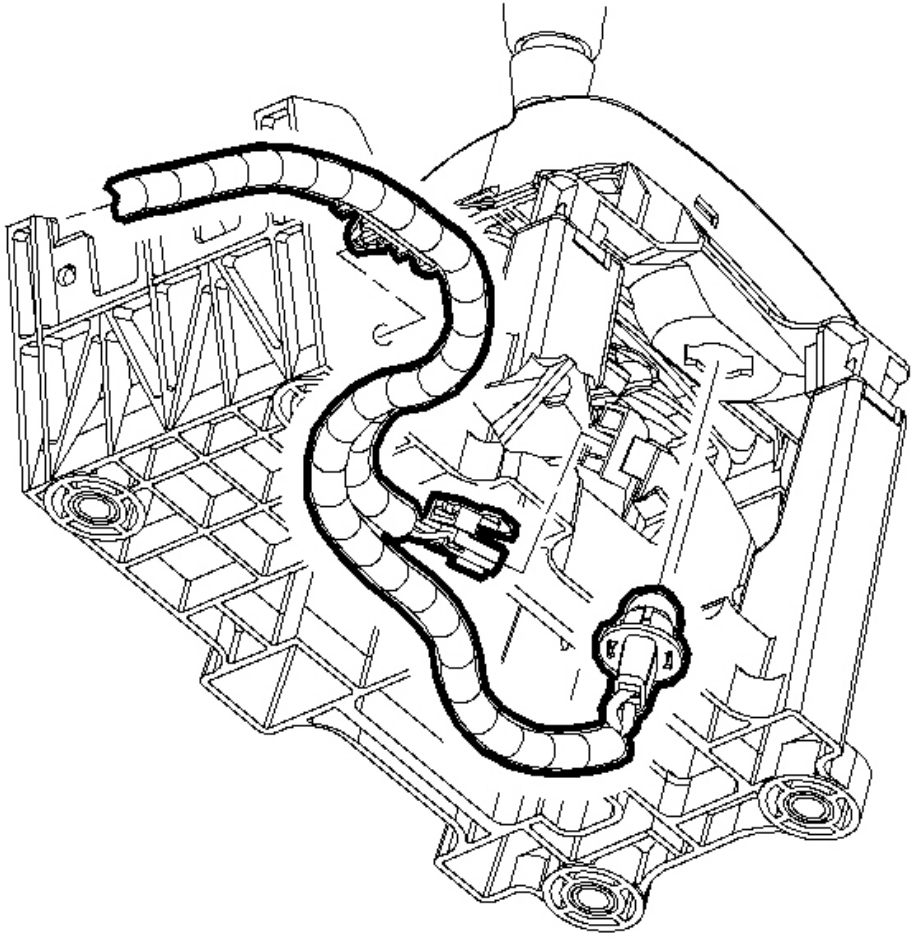

Fig. 87: Control Assembly Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

3. Connect the control assembly electrical connectors.

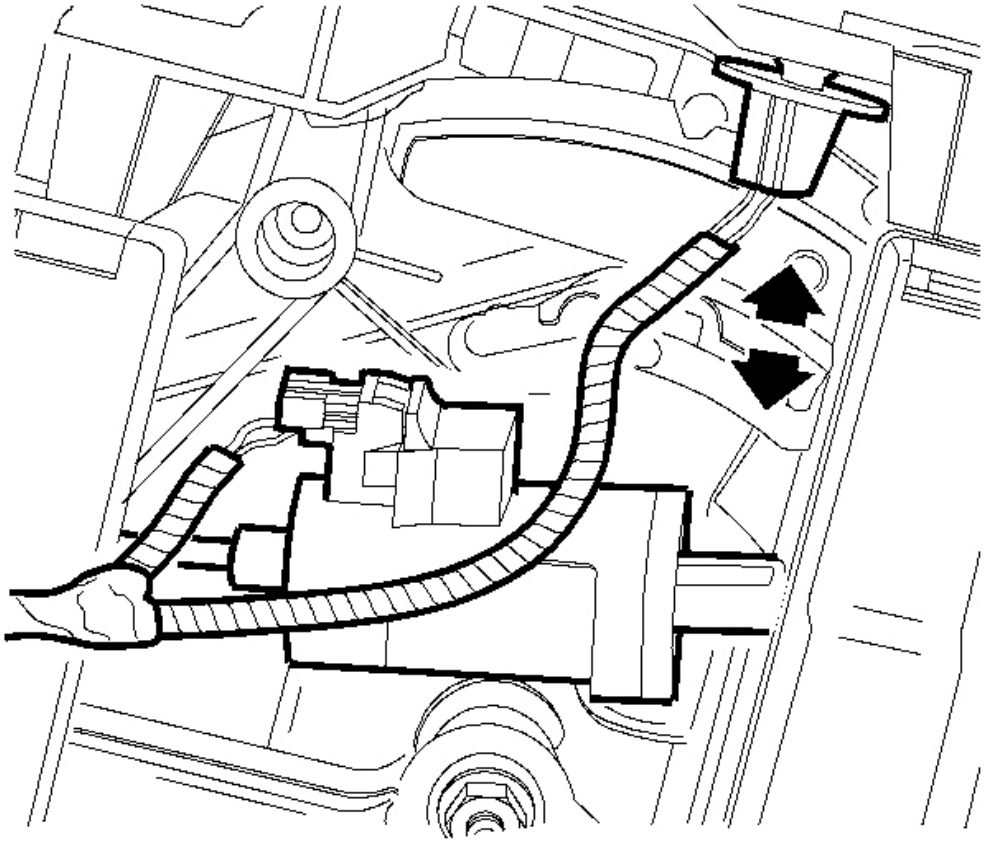

Fig. 88: Indicator Bulb
Courtesy of GENERAL MOTORS CORP.

4. Install the indicator bulb by inserting and rotating one-quarter turn.

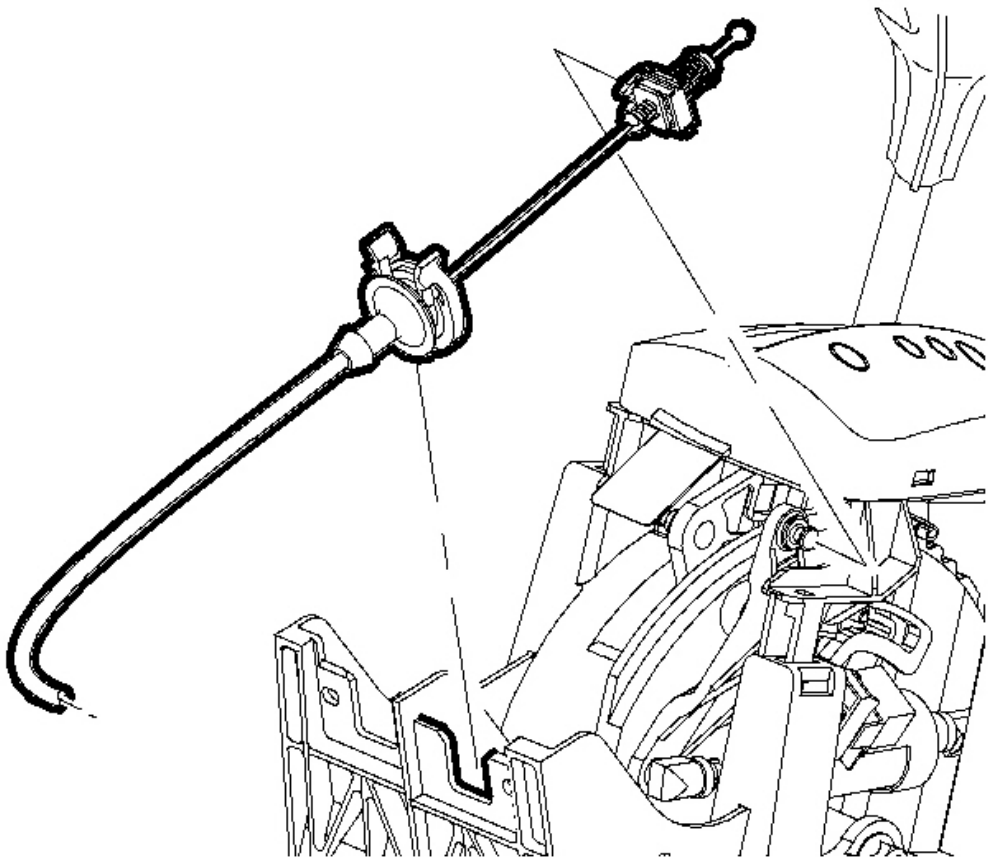

Fig. 89: Park Lock Cable Assembly & Pin On Control Assembly
Courtesy of GENERAL MOTORS CORP.

5. Install the park lock cable onto the control assembly using a new clip.
6. Connect the park lock cable onto the control assembly pin.

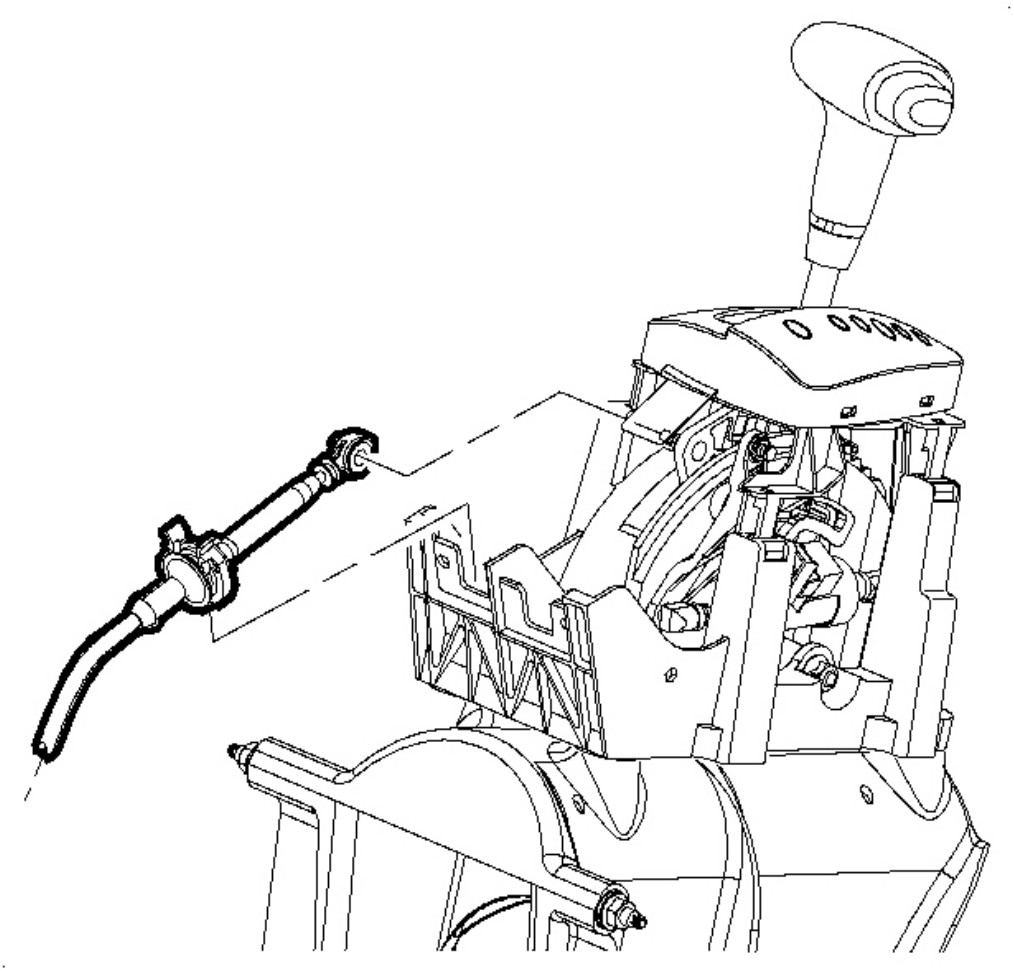

Fig. 90: Shifter Cable & Control Assembly Pin
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The secondary clip is not required for service. Make sure the shifter cable is fully engaged into the shiftier control.

7. Install the shifter cable onto the control assembly. Secure with a new shiftier cable retainer clip.
8. Connect the shifter cable onto the control assembly pin.
9. Install the console. Refer to **Console Replacement** in Instrument Panel, Gages, and Console.
10. Enable SIR system. Refer to **SIR Disabling and Enabling Zone 8** in SIR.

SHIFT SELECT CABLE REPLACEMENT

Tools Required

J 36346 Fascia Retainer Remover

Removal Procedure

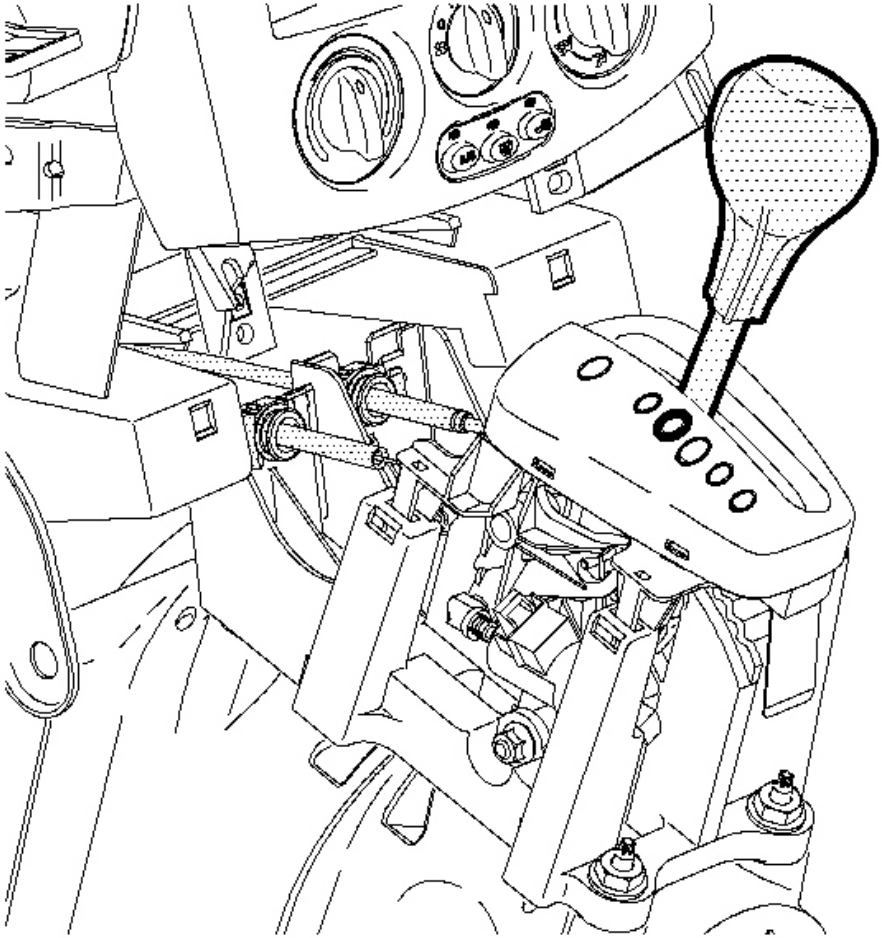

Fig. 91: Control Assembly Into Neutral Position
Courtesy of GENERAL MOTORS CORP.

CAUTION: Ensure that the vehicle is properly supported and squarely positioned. To help avoid personal injury when a vehicle is on a hoist, provide additional support for the vehicle on the opposite end from which the components are being removed.

IMPORTANT: All shiftier cable and park lock cable clips are one time usage only. Any service repair requiring cables to be disconnected from the transaxle control cable bracket or shiftier assembly will require a cable clip replacement.

1. Move the control assembly into the N - Neutral position.

IMPORTANT: Record all pre-set radio stations.

2. Remove the battery. Refer to **Battery Replacement** in Engine Electrical.
3. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.
4. Remove the console. Refer to **Console Replacement** in Instrument Panel, Gages, and Console.

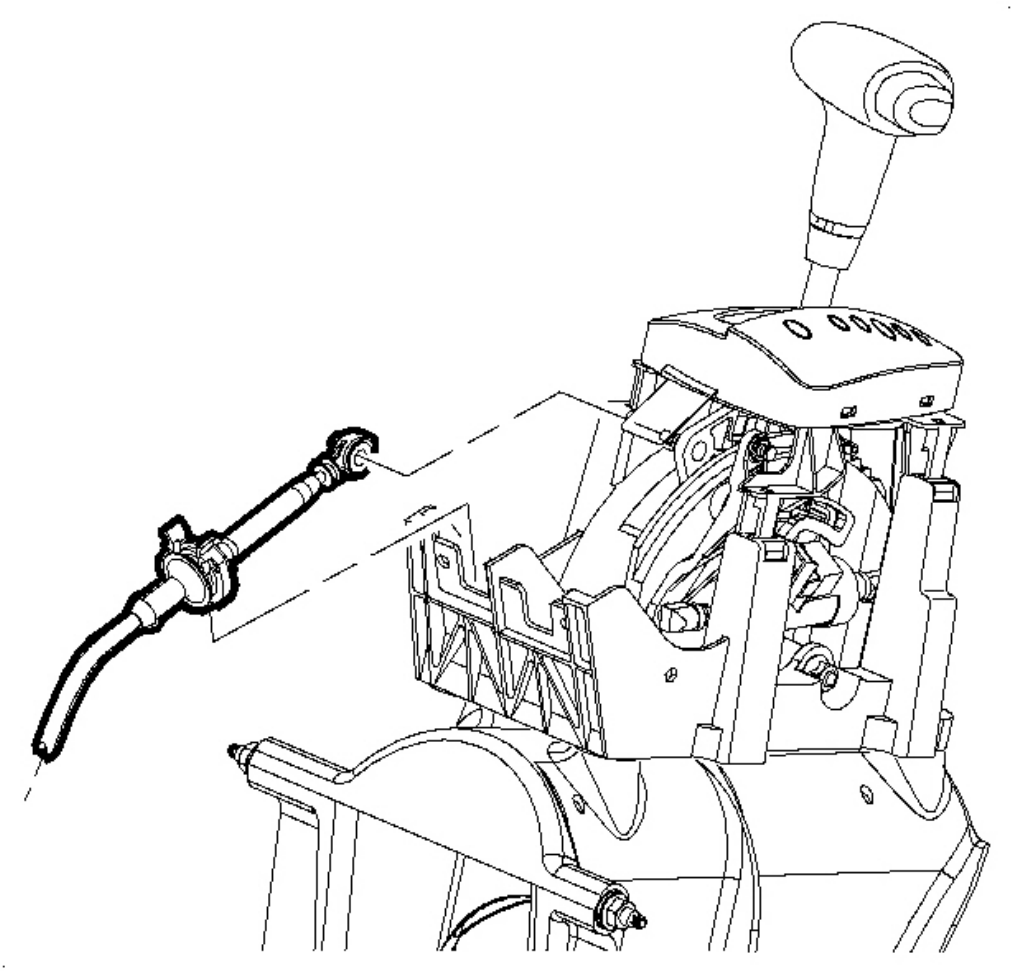

Fig. 92: Shifter Cable & Control Assembly Pin
Courtesy of GENERAL MOTORS CORP.

5. Using the **J 36346** or equivalent, disconnect the control cable from the control assembly lever.
6. Depress the control cable retainer clip tabs and remove the cable from the control assembly. Discard the clip.

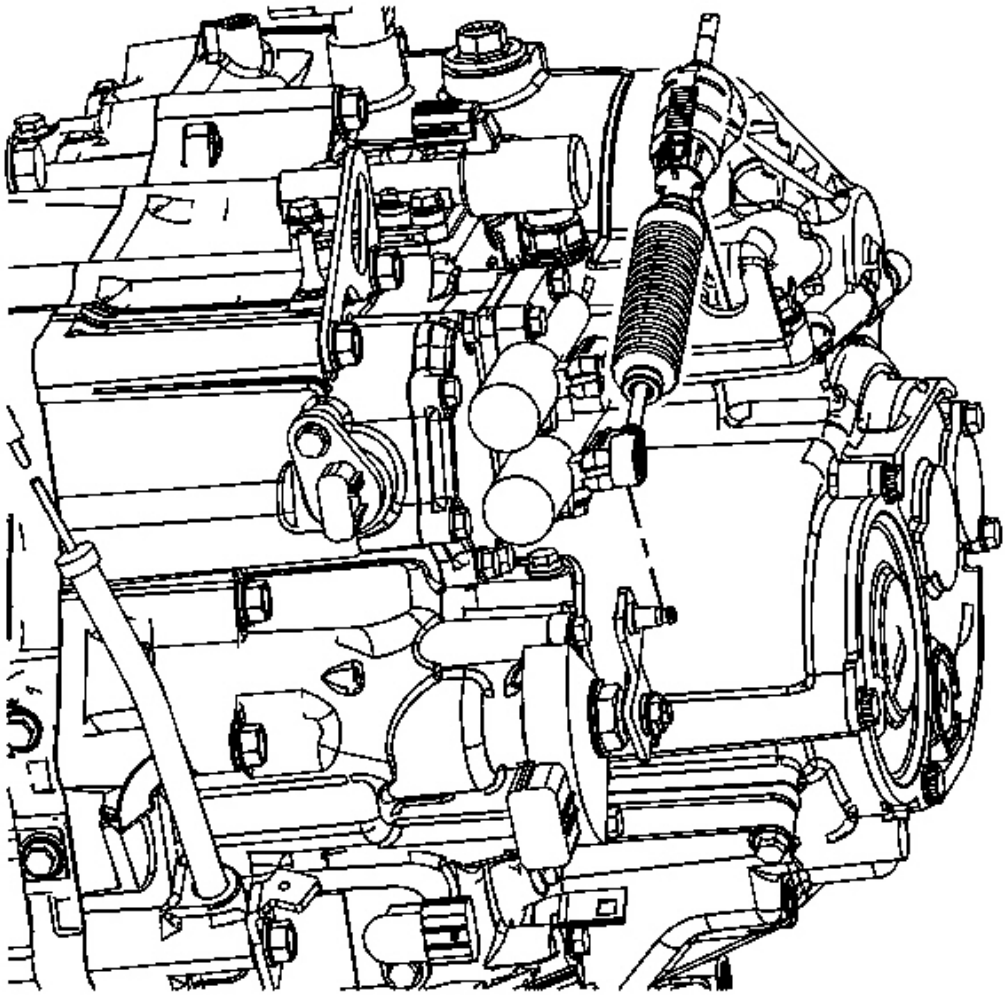

Fig. 93: Control Cable & Transaxle Range Switch Lever
Courtesy of GENERAL MOTORS CORP.

NOTE: The control cable must be disconnected from the transaxle range switch lever prior to disconnecting it from the control cable bracket. Otherwise damage to the manual shift shaft may result, requiring transaxle disassembly.

7. Using the **J 36346** or equivalent, disconnect the control cable from the transaxle range switch lever.

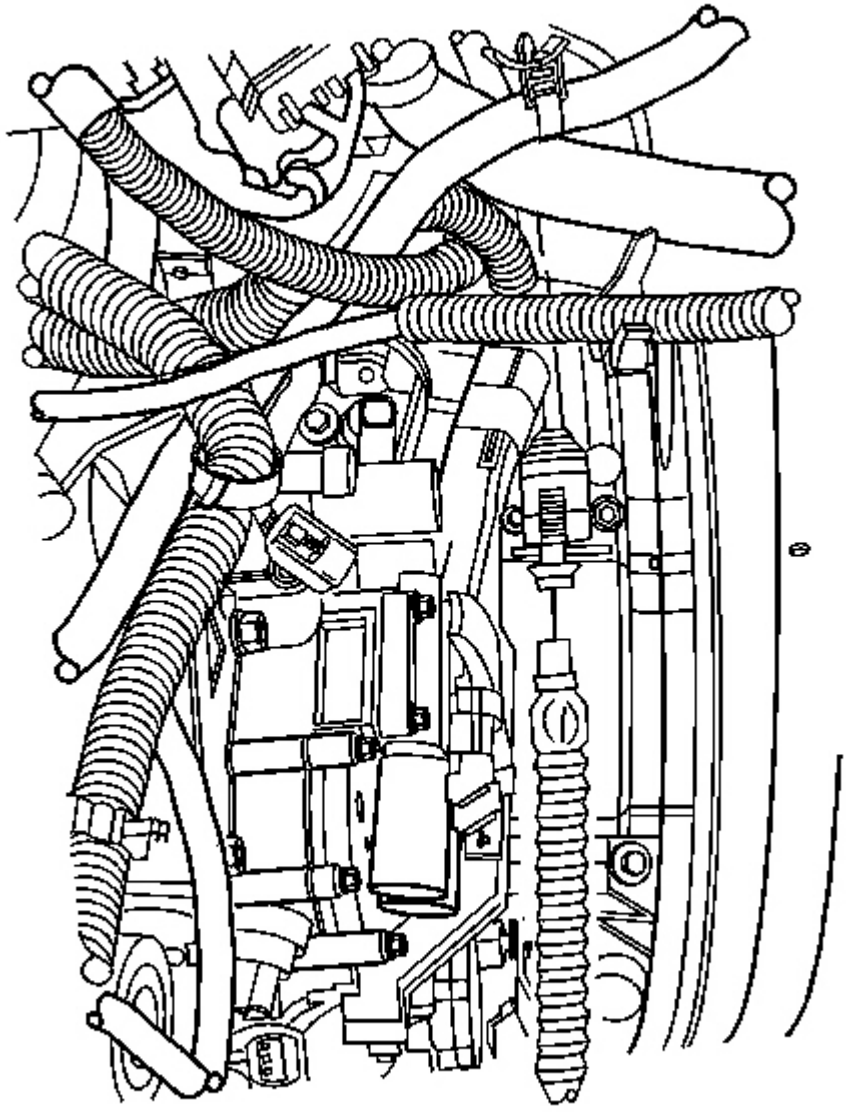

Fig. 94: Park/Neutral Position Switch Harness Connector
Courtesy of GENERAL MOTORS CORP.

8. Depress the control cable retainer clip tabs and remove the cable from the control cable bracket. Discard the clip.

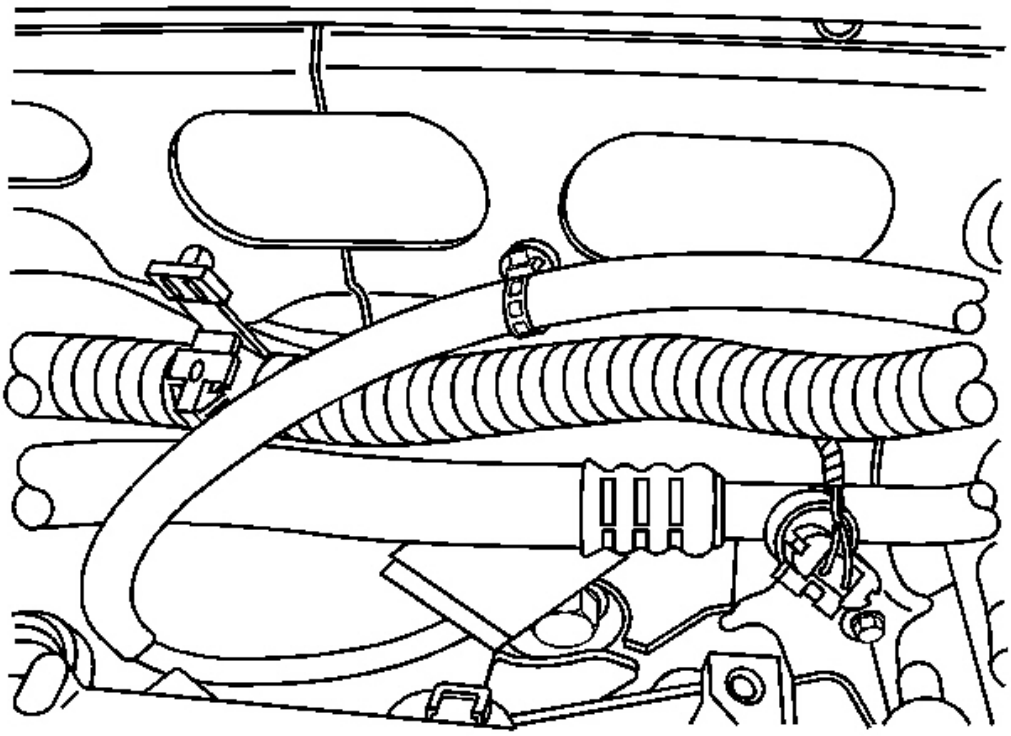

Fig. 95: Control Cable & Front Of Dash
Courtesy of GENERAL MOTORS CORP.

9. Remove the control cable from the front of dash.

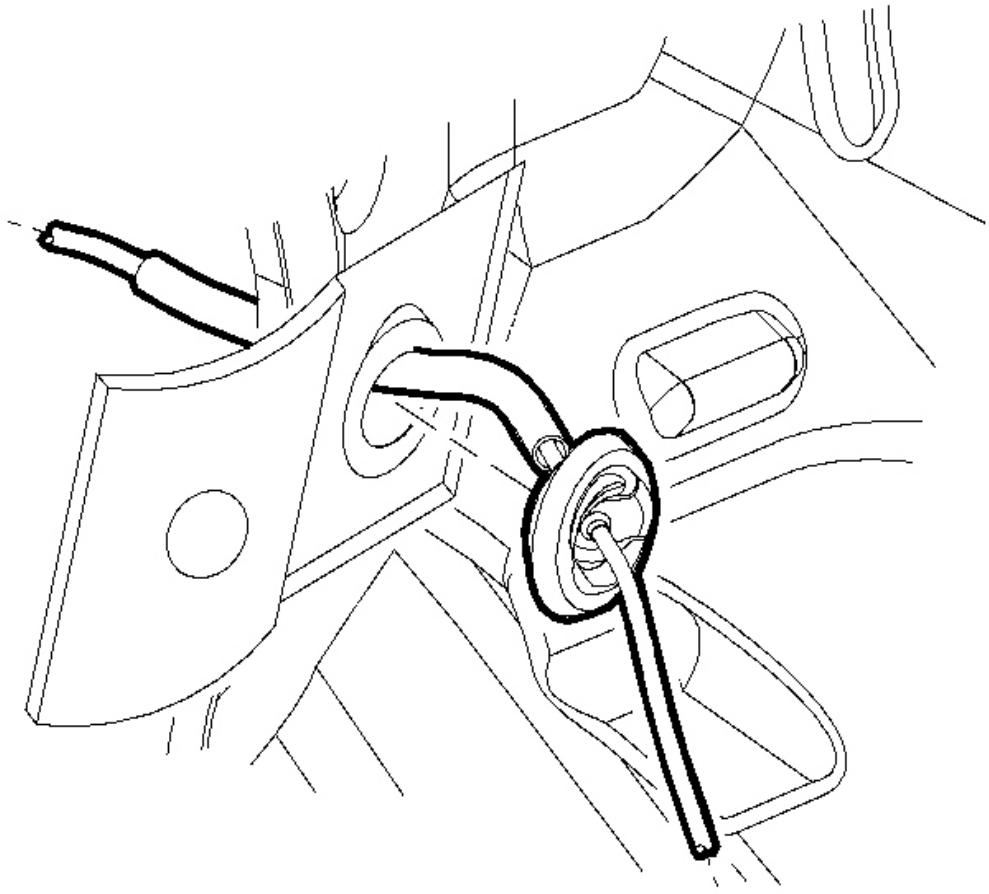

Fig. 96: Control Cable Grommet & Dash Panel
Courtesy of GENERAL MOTORS CORP.

10. Remove the control cable grommet from the dash panel.
11. Remove the control cable from the vehicle.

Installation Procedure

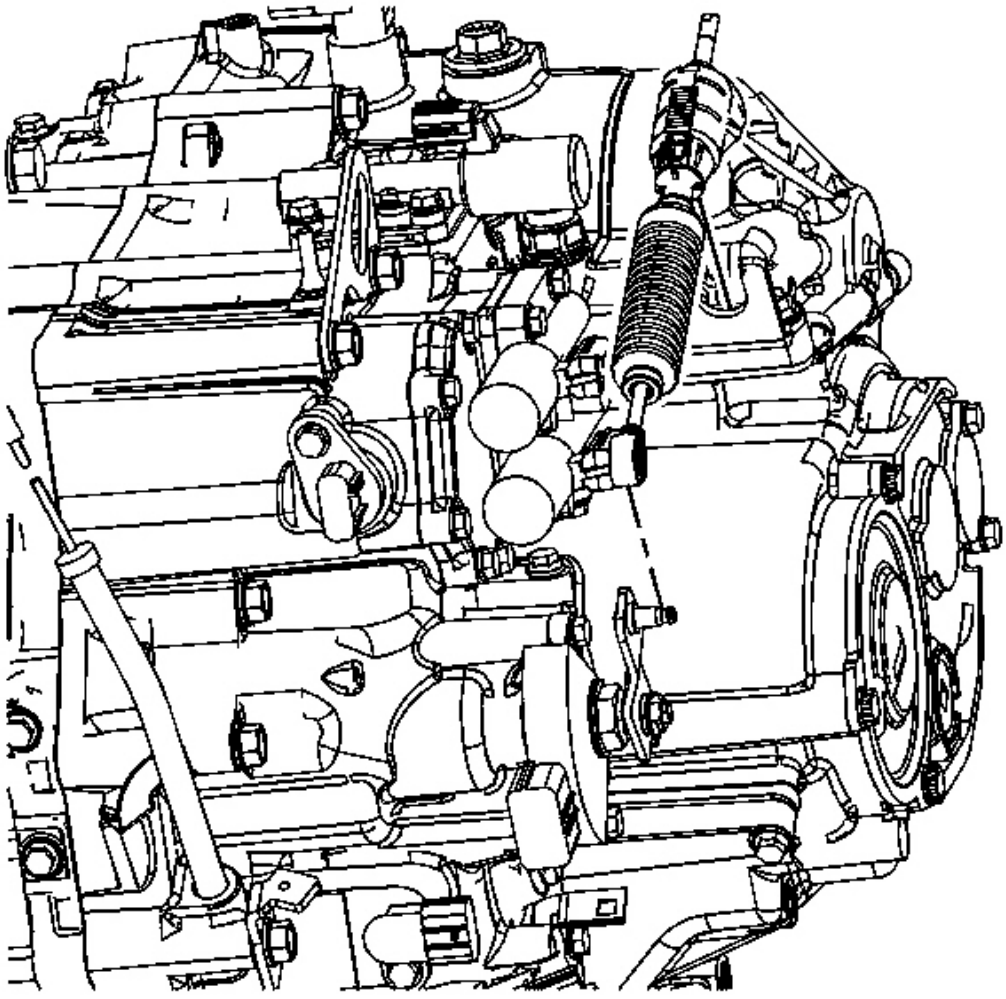

Fig. 97: Control Cable & Transaxle Range Switch Lever
Courtesy of GENERAL MOTORS CORP.

1. Route the control cable through the cable bracket.

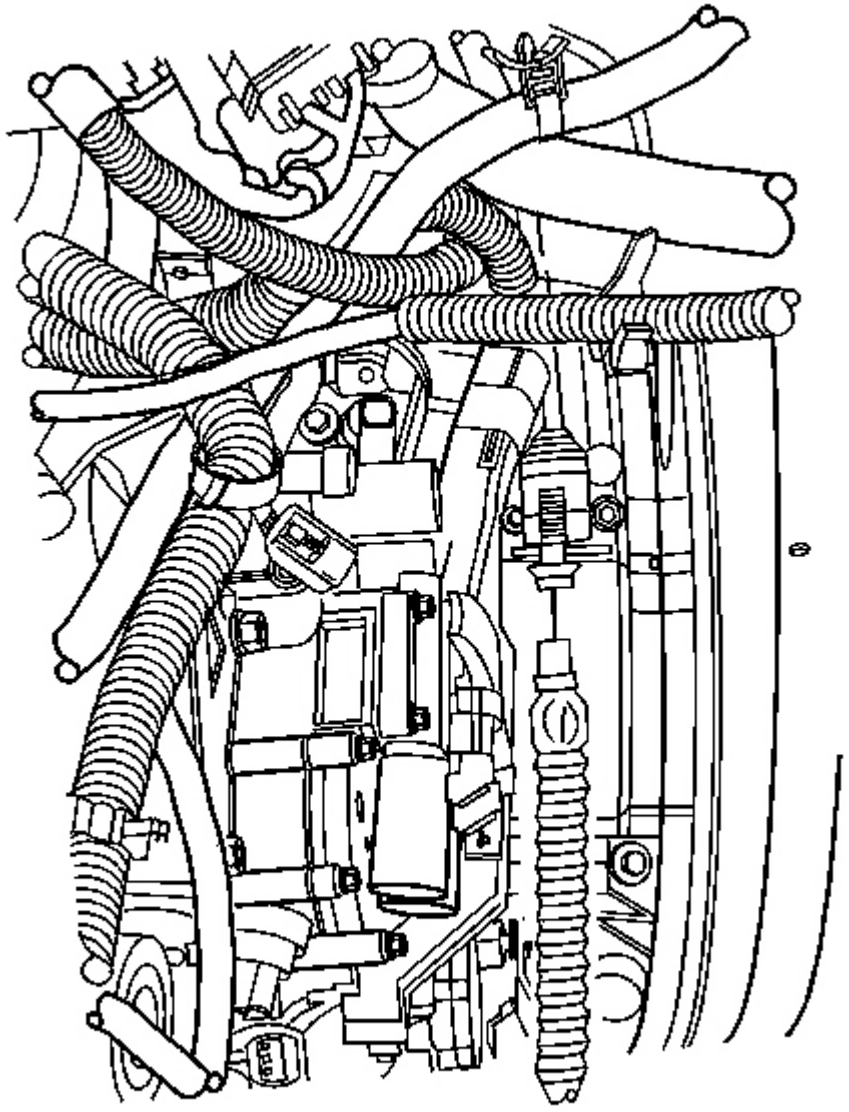

Fig. 98: Park/Neutral Position Switch Harness Connector
Courtesy of GENERAL MOTORS CORP.

2. Secure the cable to the bracket with a new control cable retainer clip. An audible snap will be heard when properly installed.
3. With the transaxle range switch lever located in N - Neutral, snap the cable end fitting onto the ball stud of the lever. An audible snap will be heard when properly installed.

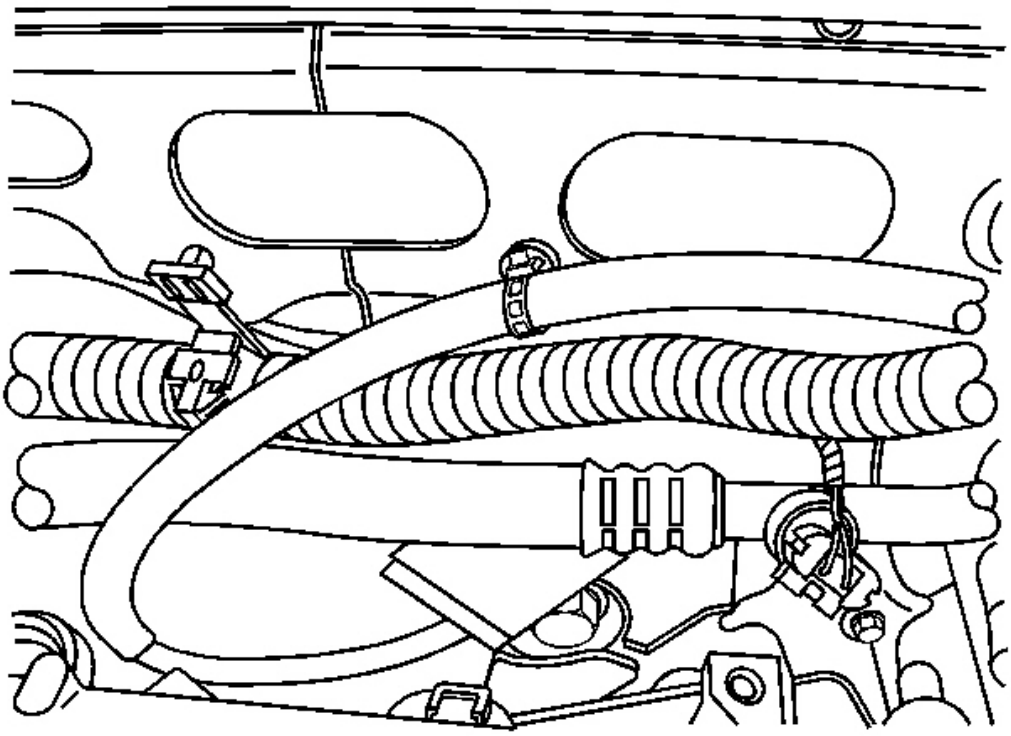

Fig. 99: Control Cable & Front Of Dash
Courtesy of GENERAL MOTORS CORP.

4. Route the cable and install to front of dash.

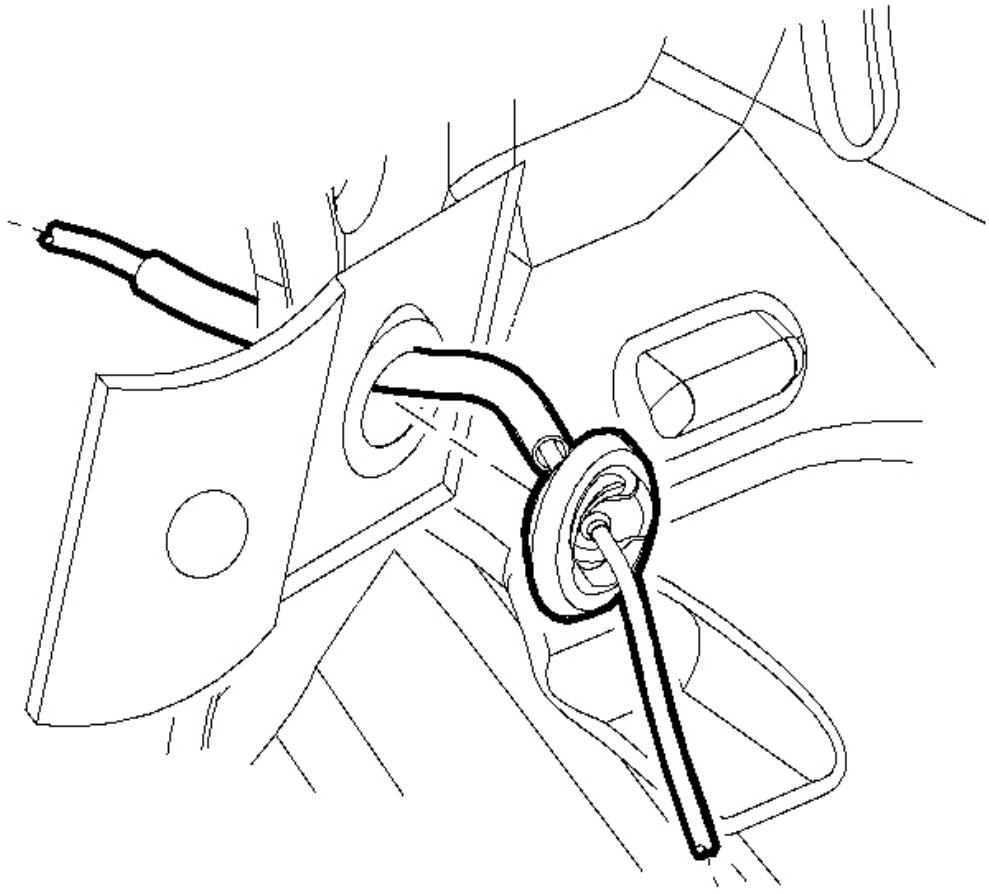

Fig. 100: Control Cable Grommet & Dash Panel
Courtesy of GENERAL MOTORS CORP.

5. Secure the control cable grommet by pressing the cable into the pass-thru hole in the dash panel.

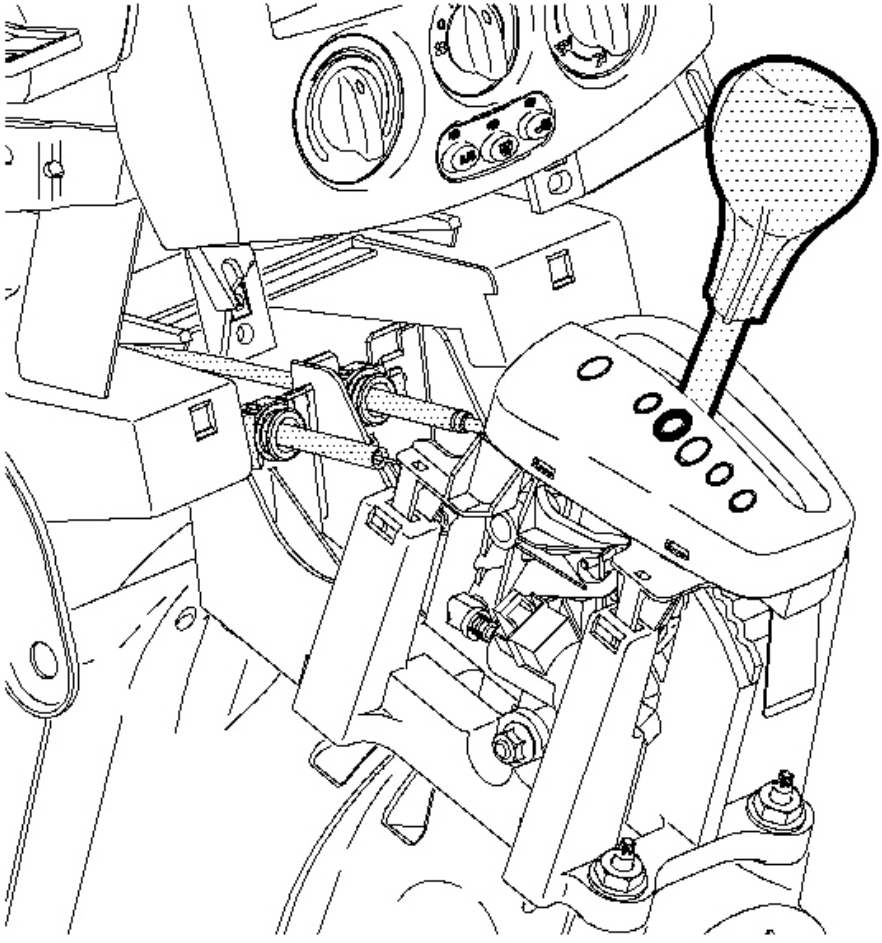

Fig. 101: Control Assembly Into Neutral Position
Courtesy of GENERAL MOTORS CORP.

6. Make sure the control assembly is in the N - Neutral position.

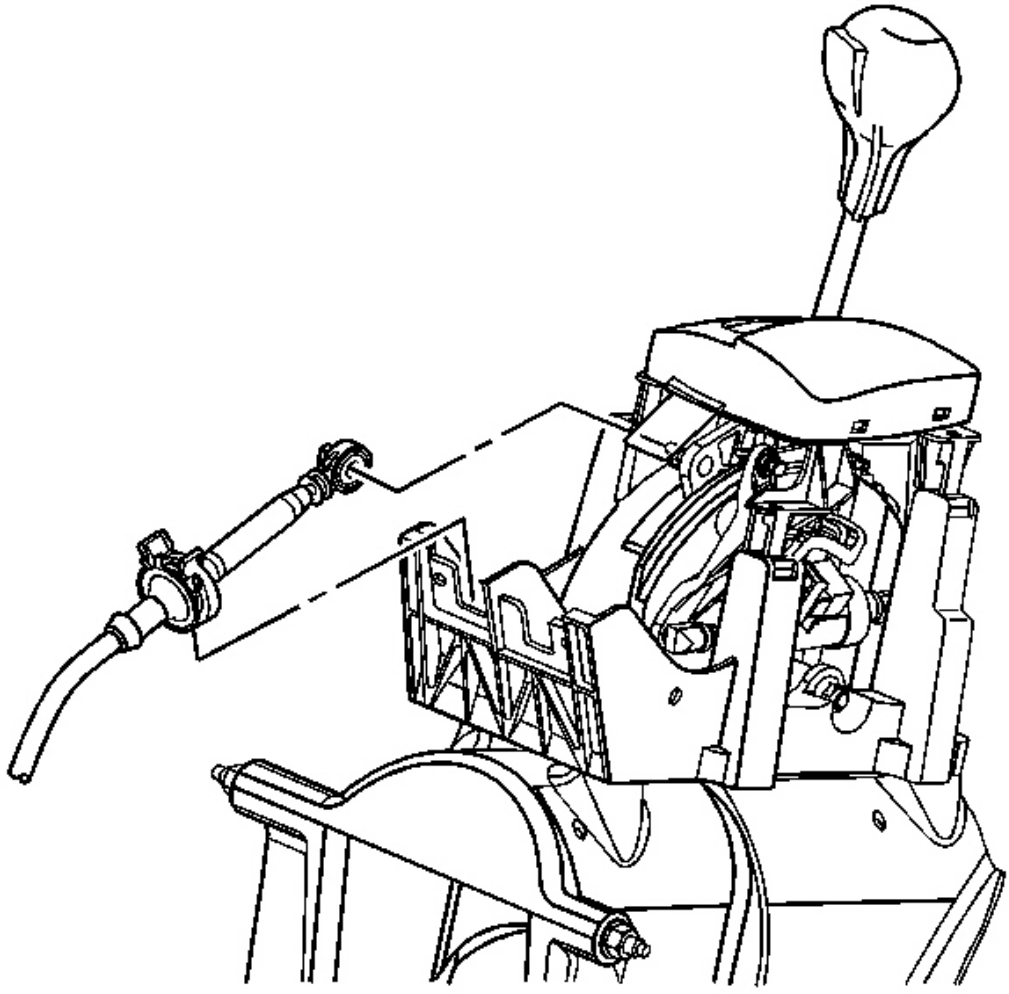

Fig. 102: Control Cable & Control Assembly Lever
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The secondary clip is not required for service. Make sure the shiftier cable is fully engaged into the shiftier control.

7. Connect the control cable to the control assembly. Secure with a new control cable retainer clip.
8. Install the control cable onto the control assembly lever.
9. Adjust the control cable assembly.
10. Install the console. Refer to **Console Replacement** in Instrument Panel, Gages, and Console.
11. Install the battery tray bracket. Refer to **Battery Tray Replacement (L61)** or **Battery Tray**

Replacement (L66) in Engine Electrical.

12. Install the battery. Refer to **Battery Replacement** in Engine Electrical.

TORQUE CONVERTER ASSEMBLY REMOVAL

Tools Required

DT 46411 6 mm T-Handles

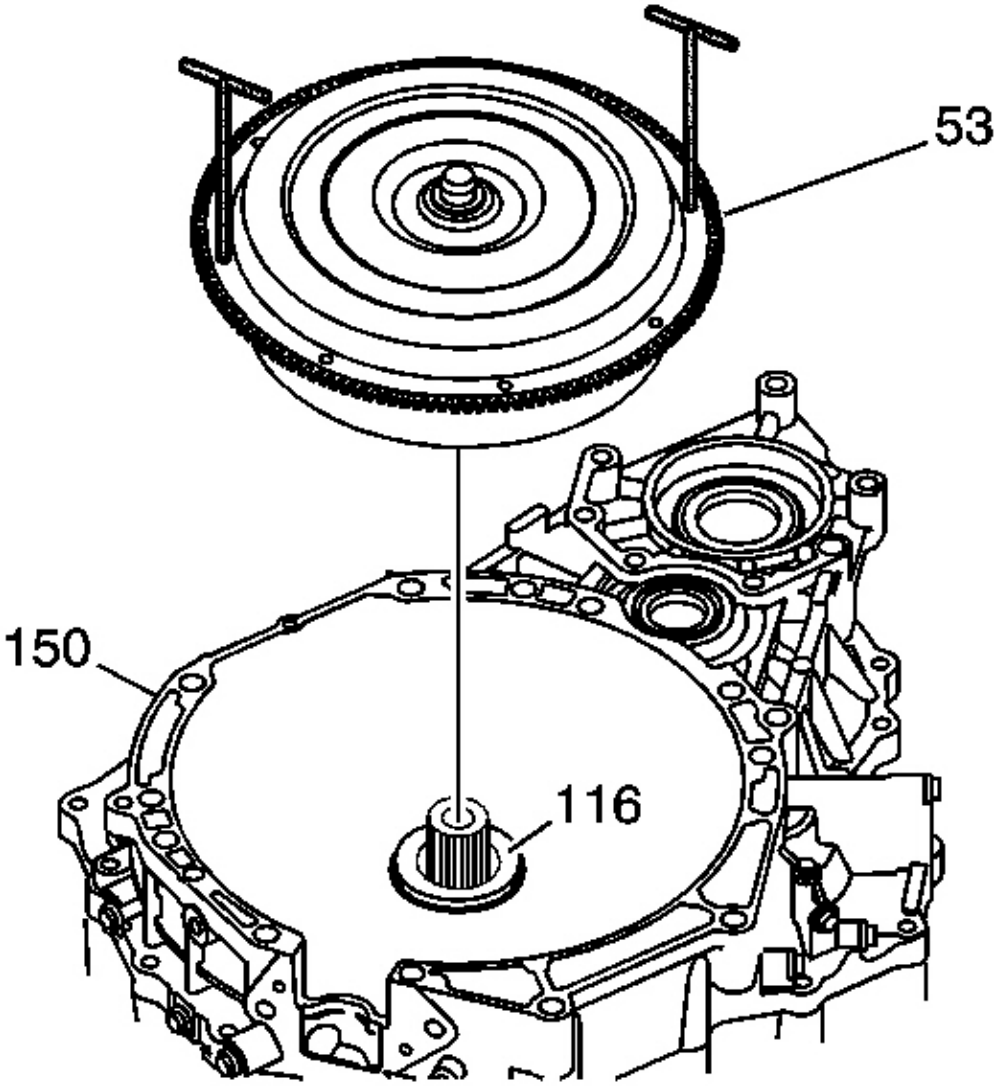

Fig. 103: Torque Converter Assembly Removed
Courtesy of GENERAL MOTORS CORP.

1. Using **DT 46411** , remove the torque converter assembly (53).
2. Inspect the following:
    - External damage
    - Metal particles found after flushing the oil cooler and lines
    - External leaks in the hub wells area
    - The torque converter pilot is damaged or fits poorly into the crankshaft
    - Internal failure of the stator roller clutch
    - Contamination from engine coolant
    - Excessive end play

HOLDING FIXTURE INSTALLATION

Tools Required

DT 46238 Transaxle Holding Fixture

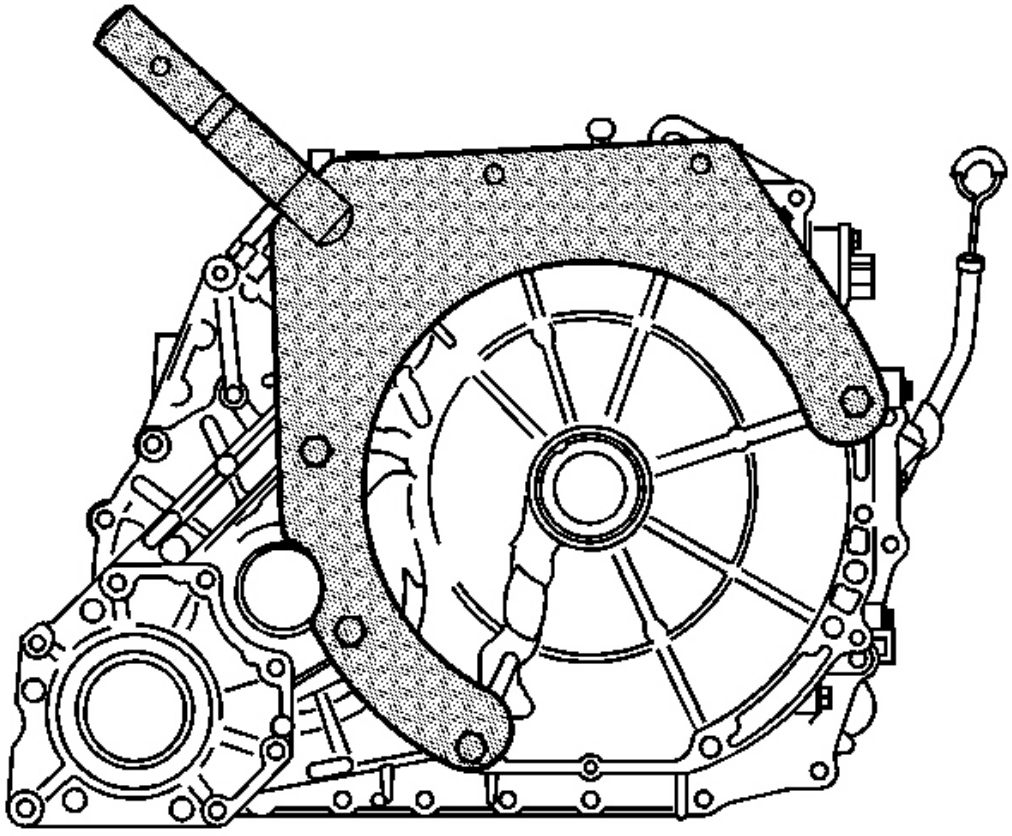

Fig. 104: Attaching DT 46238 To Transaxle Assembly
Courtesy of GENERAL MOTORS CORP.

1. Attach the **DT 46238** to the transaxle assembly with the 6 mounting bolts.
2. Mount securely in a suitable transaxle repair holding stand.

DRAINING TRANSMISSION FLUID

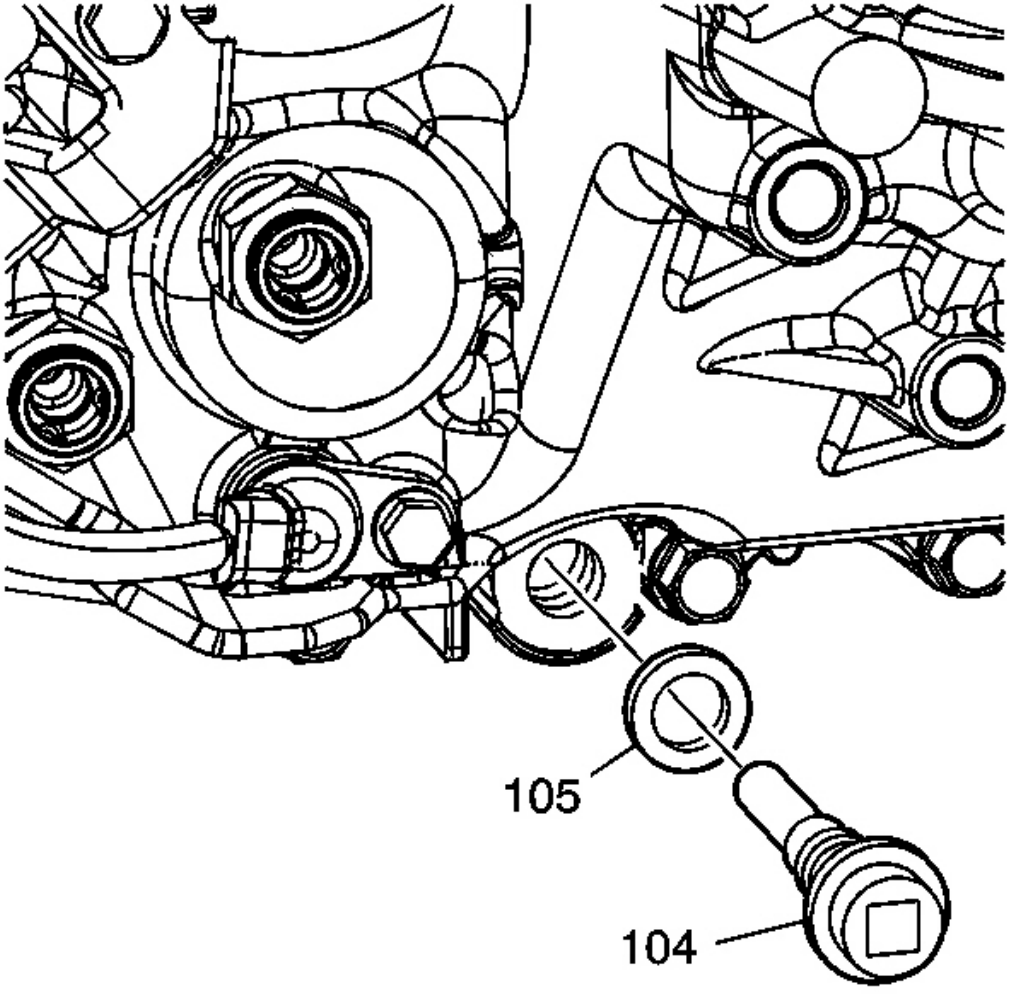

Fig. 105: Fluid Drain Plug & Sealing Washer
Courtesy of GENERAL MOTORS CORP.

1. Remove the fluid drain plug (104).
2. Remove the sealing washer from the fluid drain plug (105).

FLUID LEVEL INDICATOR REMOVAL

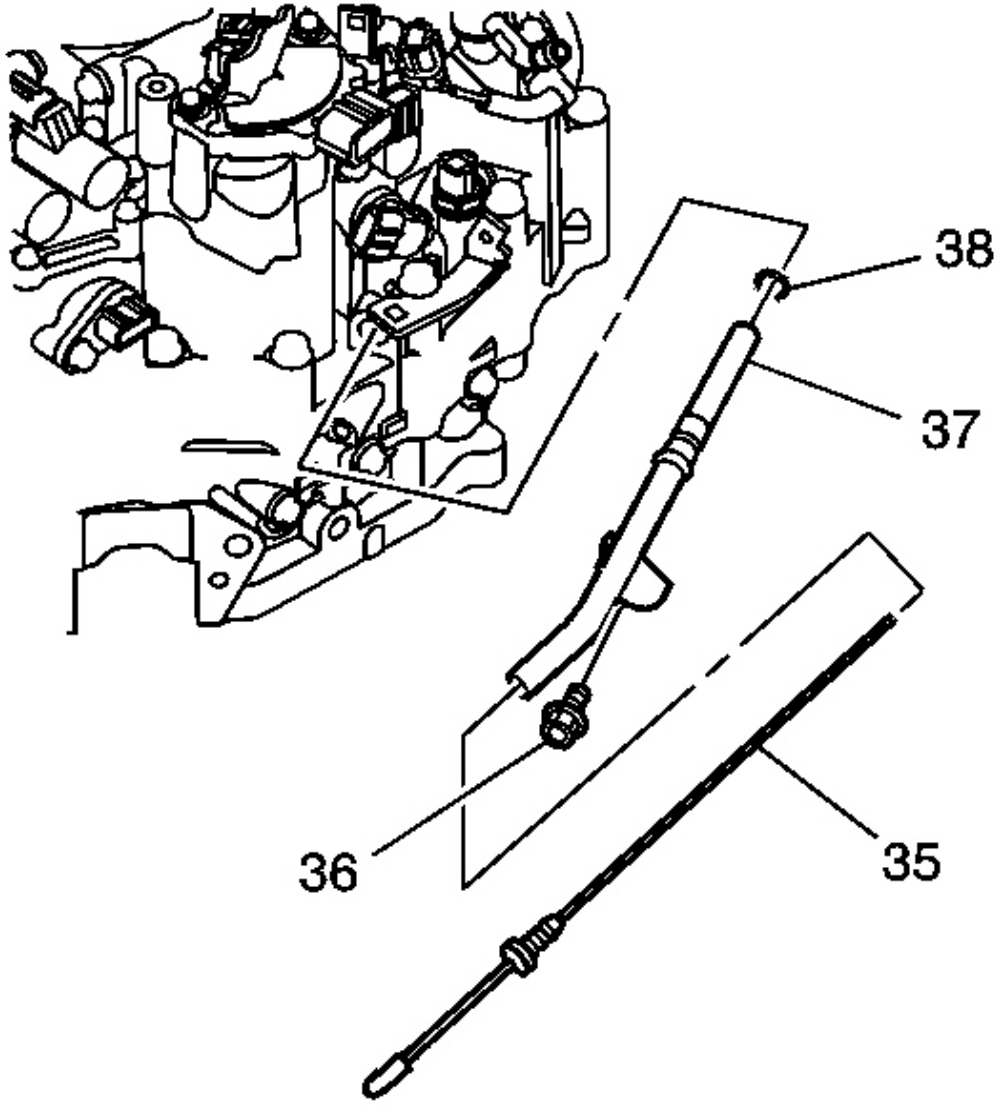

Fig. 106: Fluid Level Indicator, Tube, O-Ring, Transmission Fluid Fill Tube & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the fluid level indicator (35).
2. Remove the transmission fluid fill tube bolt (36).
3. Remove the fluid fill tube assembly (37).
4. Remove the fluid fill tube O-ring (38).

CLUTCH PRESSURE CONTROL SOLENOID VALVE REMOVAL

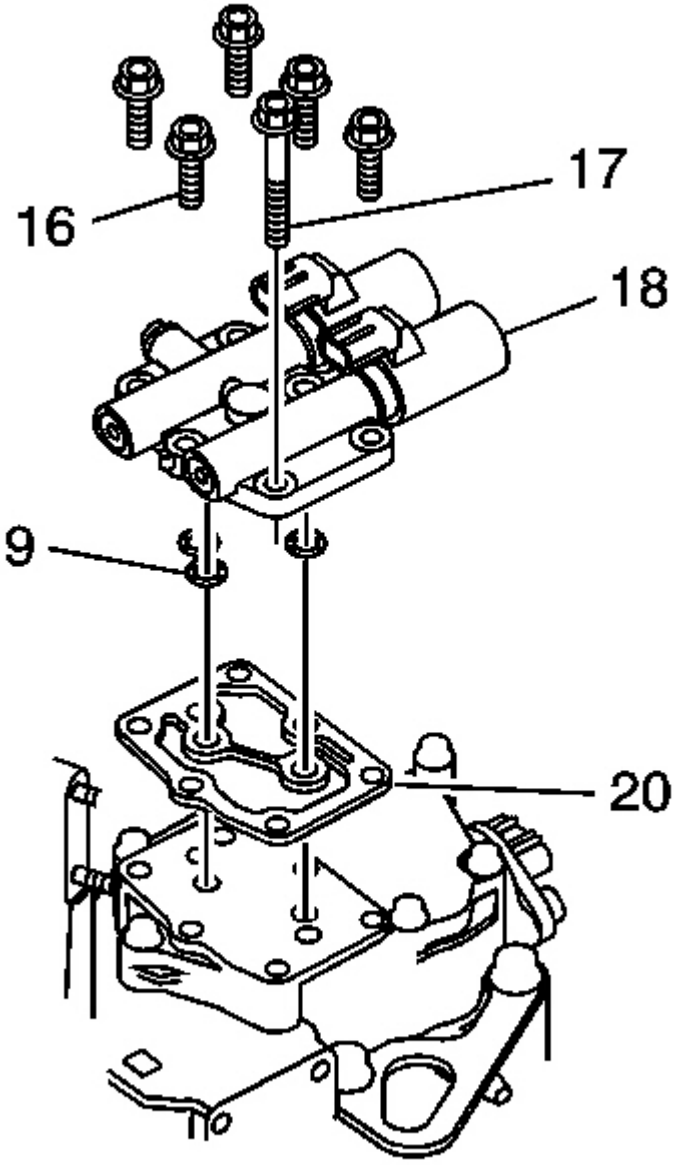

Fig. 107: Clutch Pressure Control Solenoid, Bolts, Valve, Gasket & Fluid Feed Pipe O-Rings
Courtesy of GENERAL MOTORS CORP.

1. Remove the 6 clutch pressure control solenoid bolts (16 and 17).

2. Remove the clutch pressure control solenoid valve (18).
3. Remove the fluid feed pipe O-rings (9).
4. Remove the clutch pressure control solenoid valve gasket (20).

CLUTCH PRESSURE CONTROL SOLENOID MANIFOLD REMOVAL

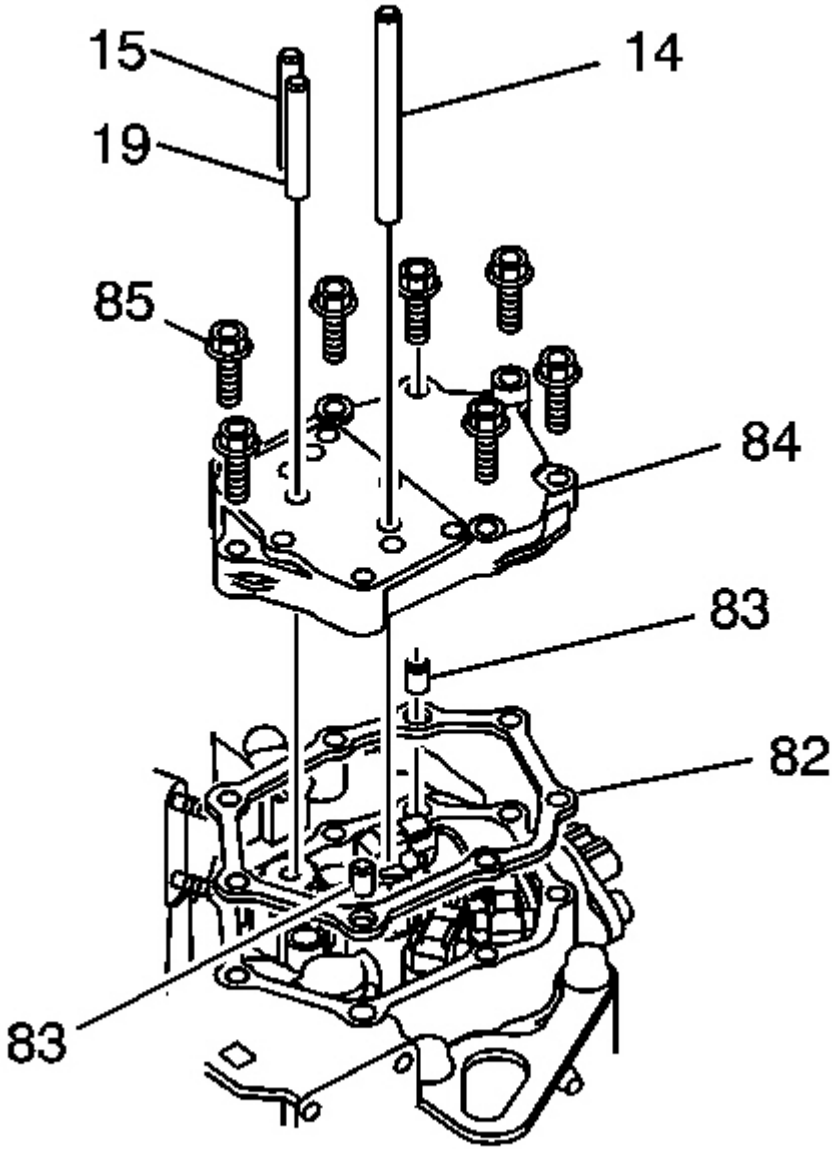

Fig. 108: Clutch Pressure Control Fluid Pipes, Bolts, Manifold Gasket & Pins
Courtesy of GENERAL MOTORS CORP.

1. Remove the clutch pressure control fluid pipes (14 and 15), and the fluid feed pipe (19).
2. Remove the 7 clutch pressure control solenoid manifold bolts (85).
3. Remove the clutch pressure control solenoid manifold (84).
4. Remove the clutch pressure control solenoid manifold gasket (82).
5. Remove the 2 clutch pressure control solenoid manifold locating pins (83).

WIRING HARNESS REMOVAL

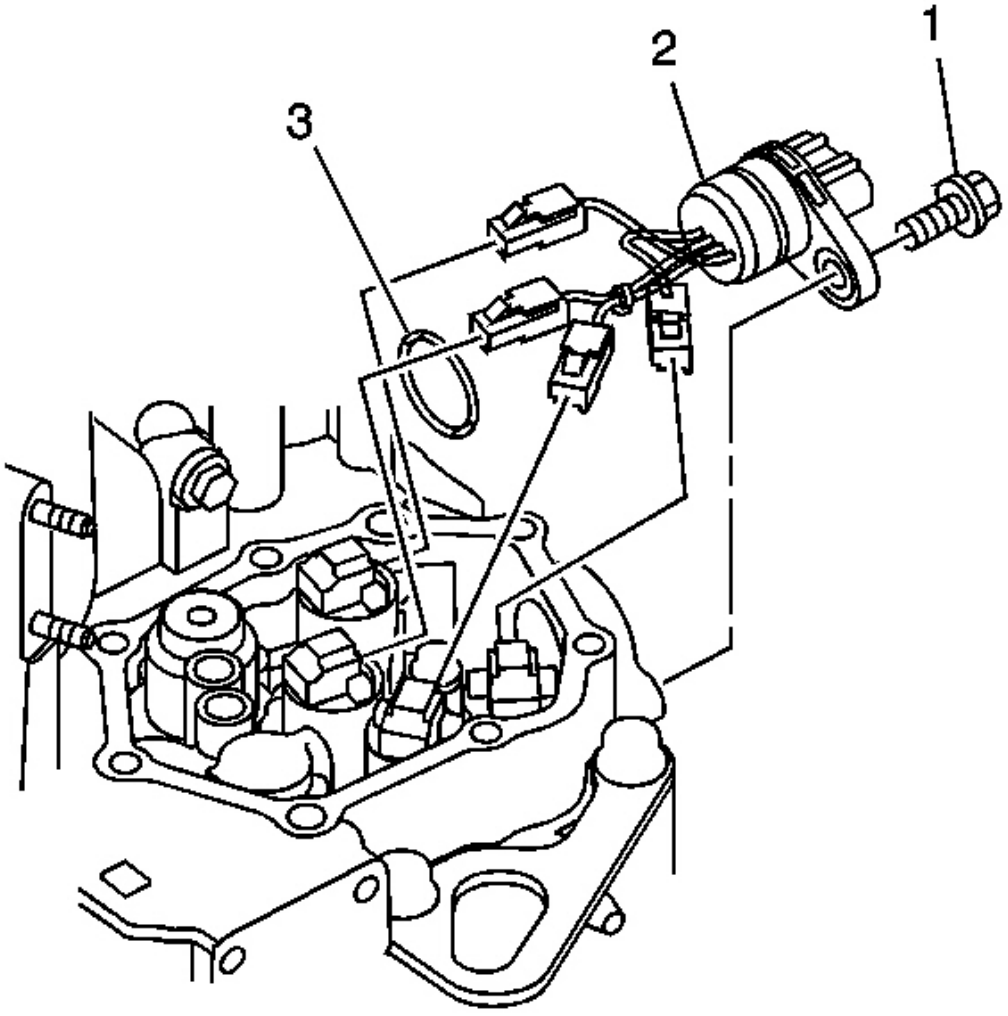

Fig. 109: Automatic Transmission Wiring Harness, Bolt & O-Ring
Courtesy of GENERAL MOTORS CORP.

1. Remove the wiring harness bolt (1).
2. Disconnect the 4 automatic transmission wiring harness (2) electrical connectors from the shift solenoids.
3. Remove the wiring harness with O-ring (3) from the transmission case assembly.

TORQUE CONVERTER CLUTCH (TCC) PRESSURE CONTROL SOLENOID REMOVAL

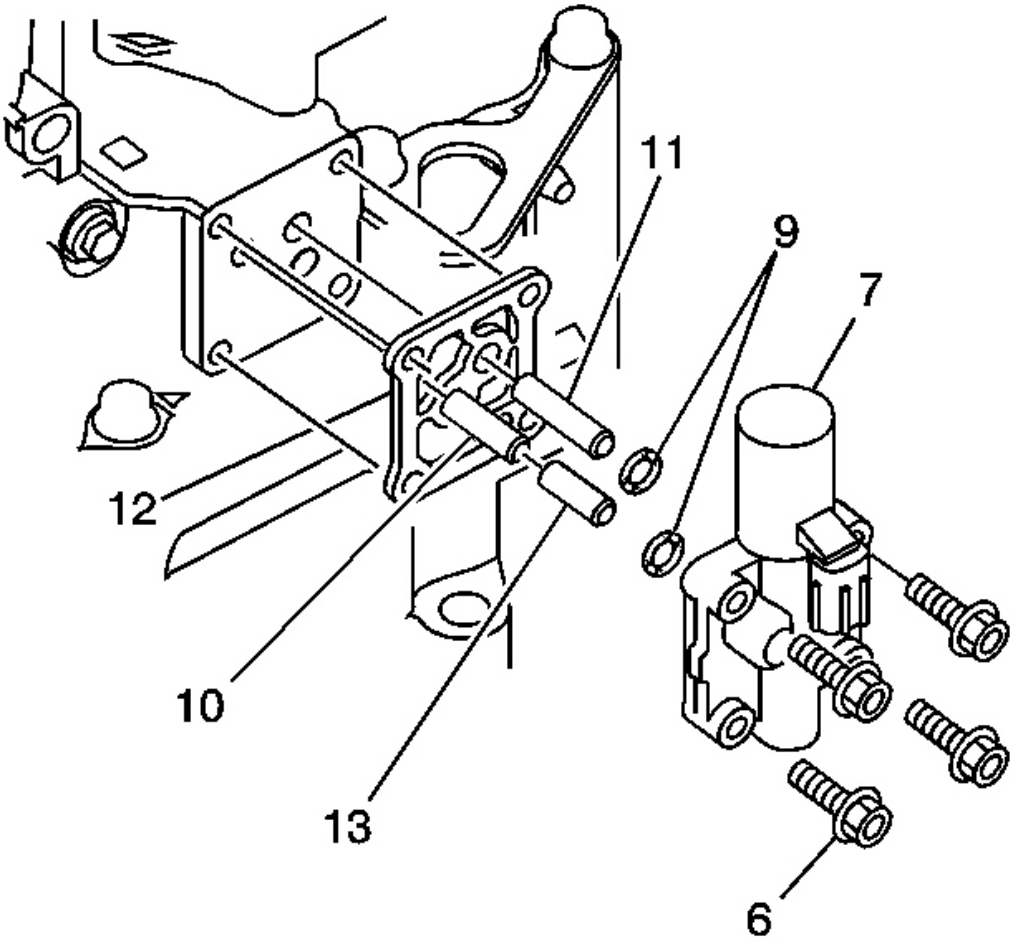

Fig. 110: TCC Pressure Control Solenoid Valve, Bolts, O-Ring, Gasket & Fluid Feed Pipes
Courtesy of GENERAL MOTORS CORP.

1. Remove the 4 TCC pressure control solenoid valve bolts (6).
2. Remove the TCC pressure control solenoid (7).
3. Remove the 3 fluid feed pipes (10, 11, 13) and the 2 O-rings (9).
4. Remove the TCC pressure control solenoid valve gasket (12).

PARK/NEUTRAL POSITION (PNP) SWITCH REMOVAL

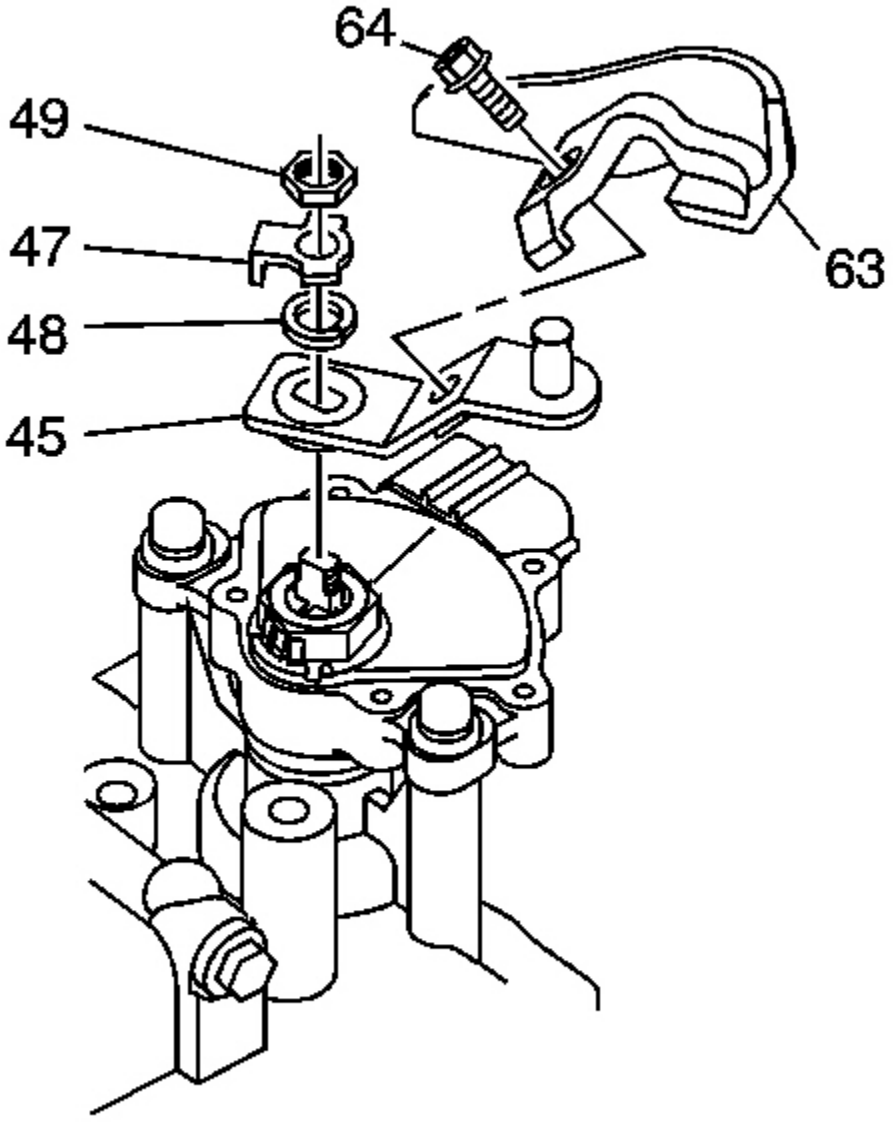

Fig. 111: Range Selector Lever, Bolt, Spring Washer, Lock Washer, Nut & Link Cover
Courtesy of GENERAL MOTORS CORP.

1. Remove the range selector lever position switch shield bolt (64) and the range selector lever link cover (63).
2. Bend the locking tab on the range selector lever washer (47) from the range selector lever nut (49).
3. Remove the range selector lever nut (49).

4. Remove the lock washer (47) and the spring washer (48).
5. Remove the range selector lever (45).

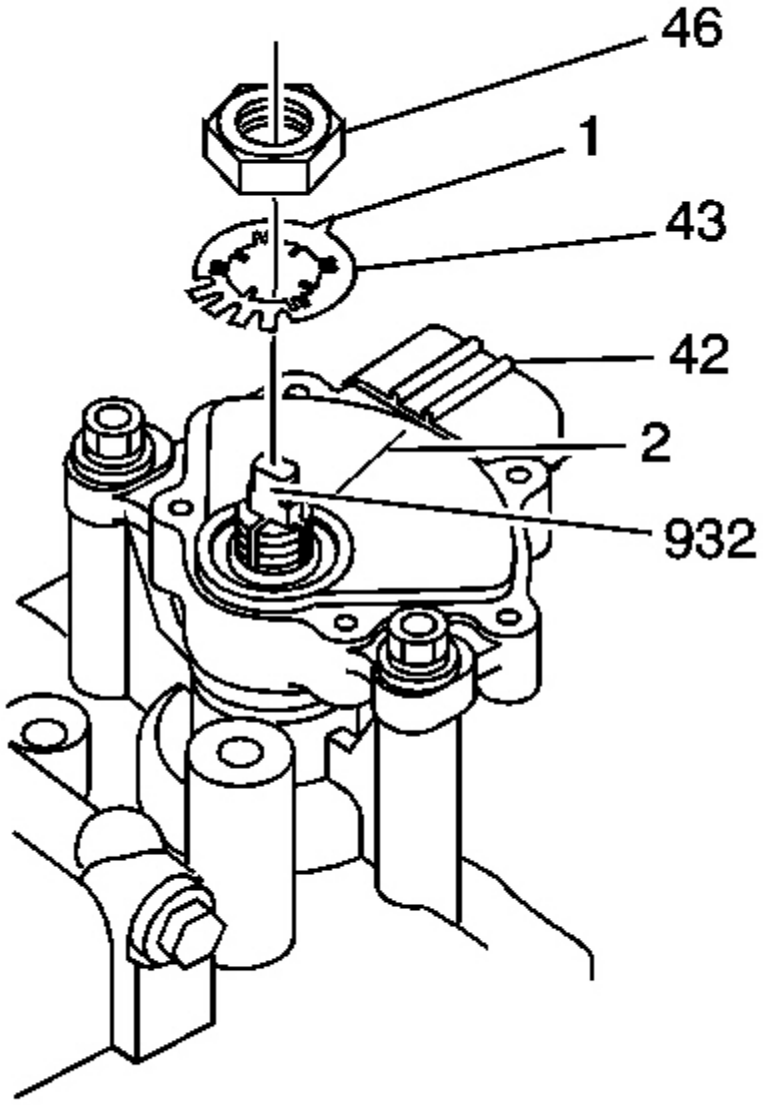

Fig. 112: Park/Neutral Position Switch, Manual Shift Shaft & Lock Washer
Courtesy of GENERAL MOTORS CORP.

6. Bend the lock tabs of the park/neutral position switch washer (43).

7. Using an adjustable wrench, hold the manual shift shaft (932) and remove the park/neutral position (PNP) switch nut (46).
8. Remove the washer (43).

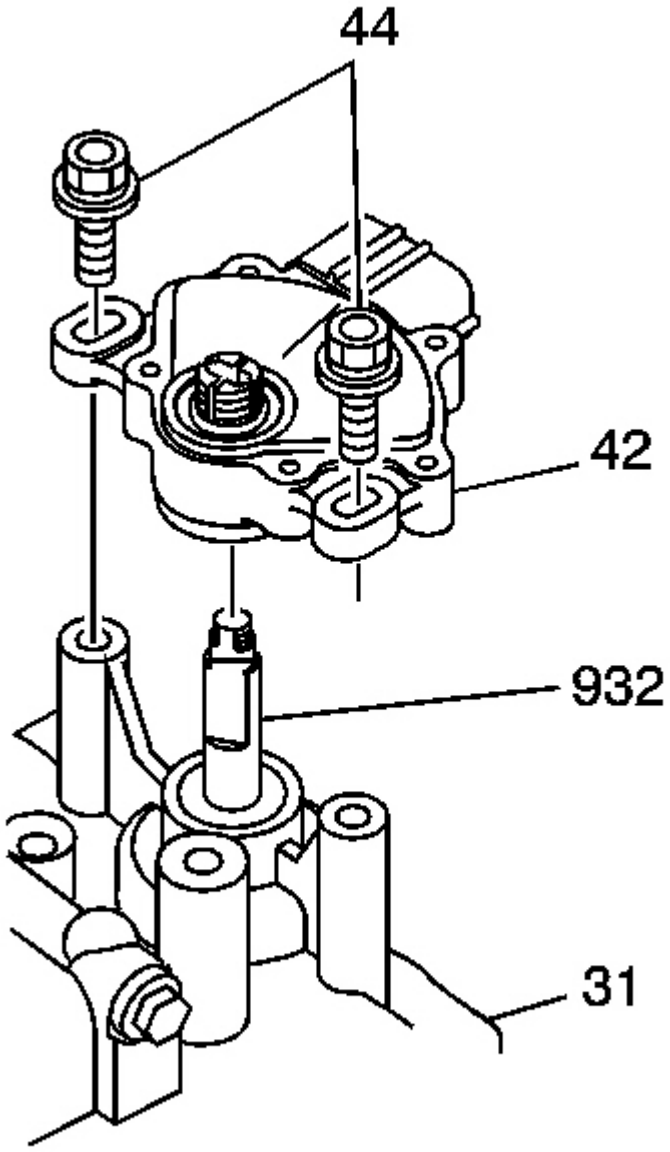

Fig. 113: Park/Neutral Position Switch & Control Shaft Hole
Courtesy of GENERAL MOTORS CORP.

9. Remove the 2 PNP switch bolts (44).
10. Remove the PNP switch assembly (42) from the transmission case (31).

INPUT AND OUTPUT SPEED SENSORS REMOVAL

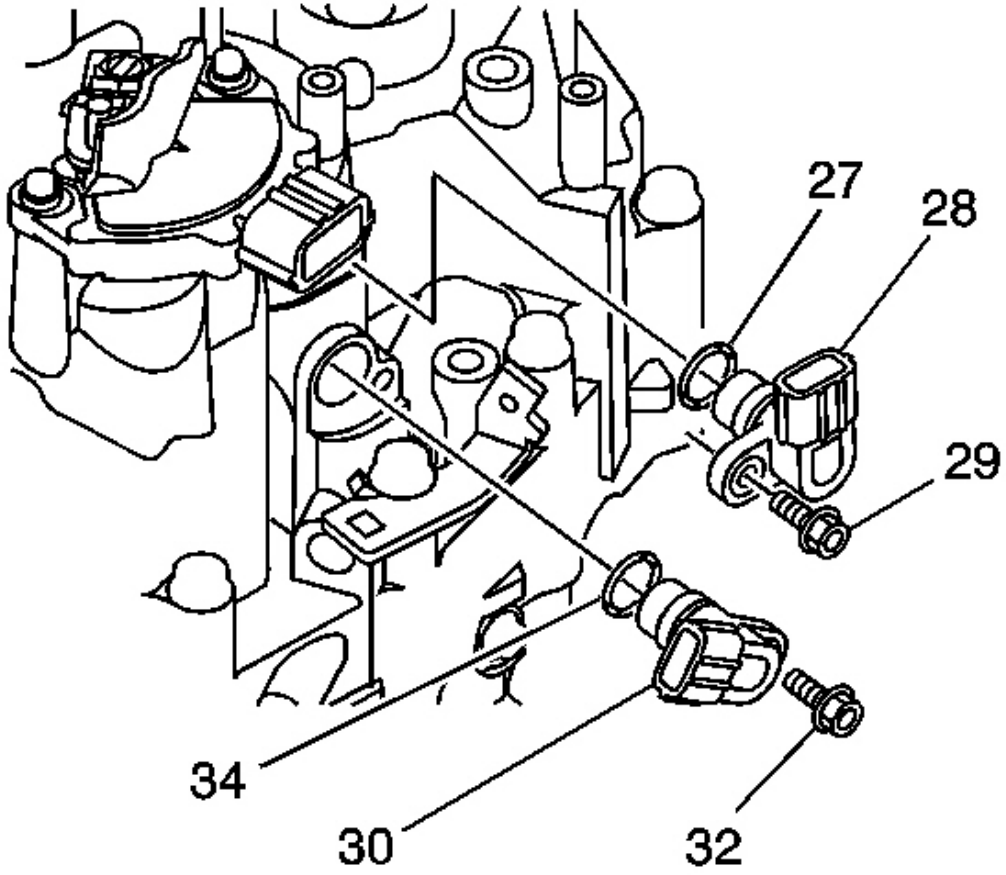

Fig. 114: Input And Output Speed Sensor, Bolts & O-Ring
Courtesy of GENERAL MOTORS CORP.

1. Remove the input and output speed sensor bolts (29) and (32).
2. Using a slight twisting motion, remove the input (28) and output (30) speed sensor.
3. Remove the O-ring seals (27) and (34).

AUTOMATIC TRANSMISSION FLUID TEMPERATURE SENSOR REMOVAL

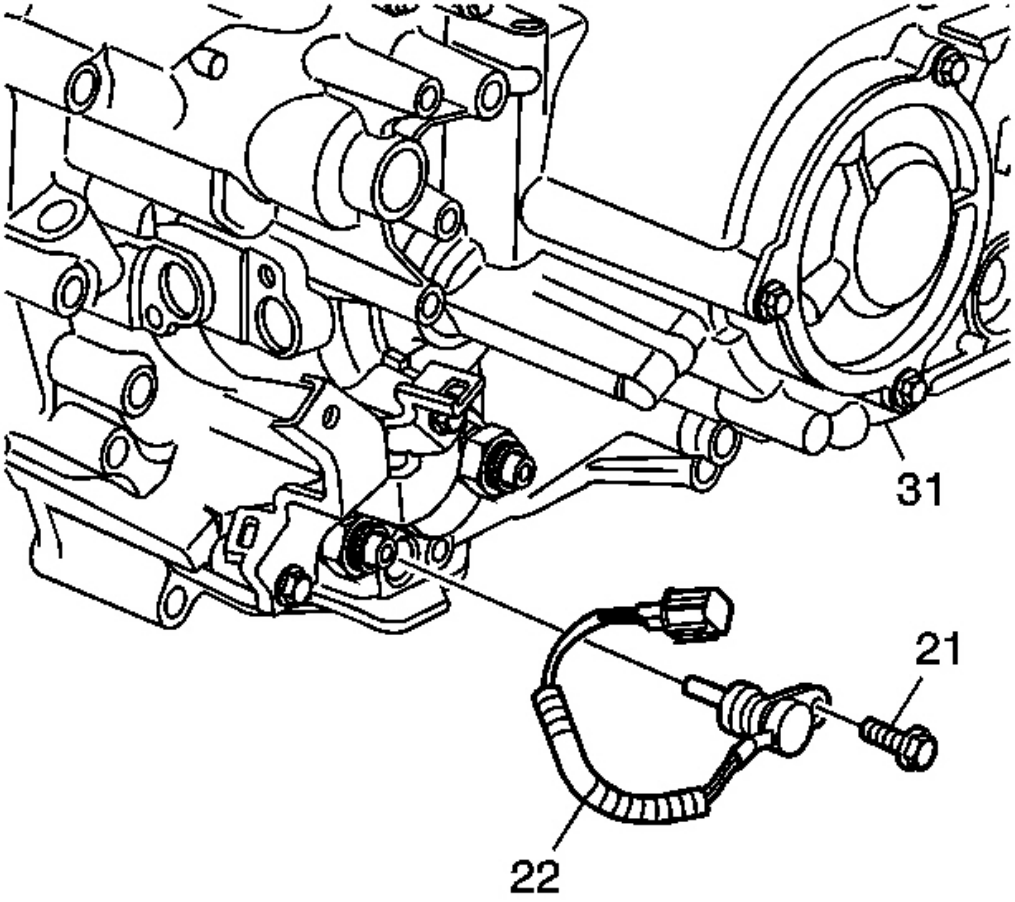

Fig. 115: Automatic Transmission Fluid Temperature Sensor, Bolt, O-Ring Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Remove the automatic transmission fluid temperature sensor bolt (21).
2. With a slight twisting motion, remove the automatic transmission fluid temperature sensor (22) with the O-ring seal (23) from the transmission case (31).

TRANSMISSION CASE COVER REMOVAL

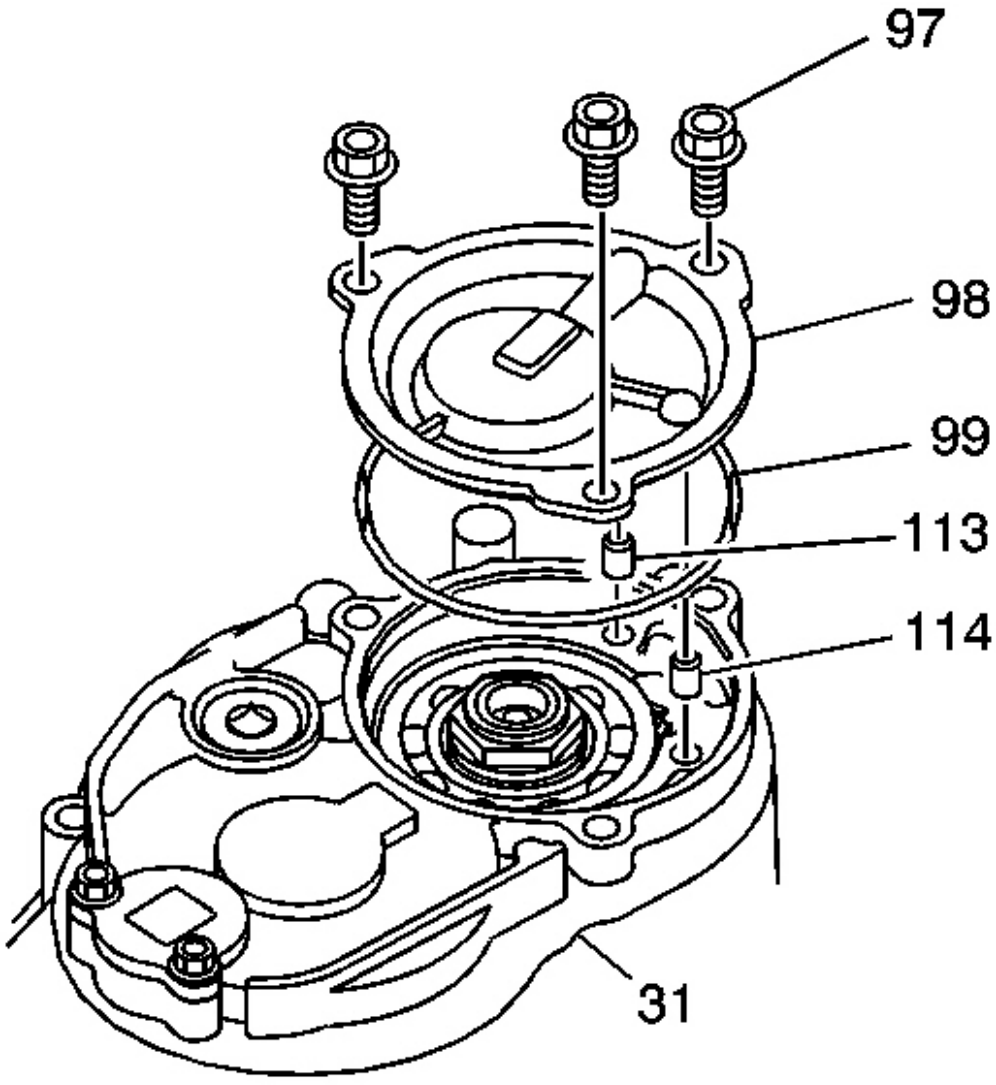

Fig. 116: Mainshaft Rear Case Cover, Bolts, O-Ring Seal, Pin & Transfer Tube
Courtesy of GENERAL MOTORS CORP.

1. Remove the 3 mainshaft rear case cover bolts (97).
2. Remove the mainshaft rear case cover (98).
3. Remove the mainshaft lube transfer tube (113).
4. Remove the mainshaft rear case cover locating pin (114).
5. Remove the mainshaft rear case cover O-ring seal (99).

Output Shaft Rear Access Cover Removal

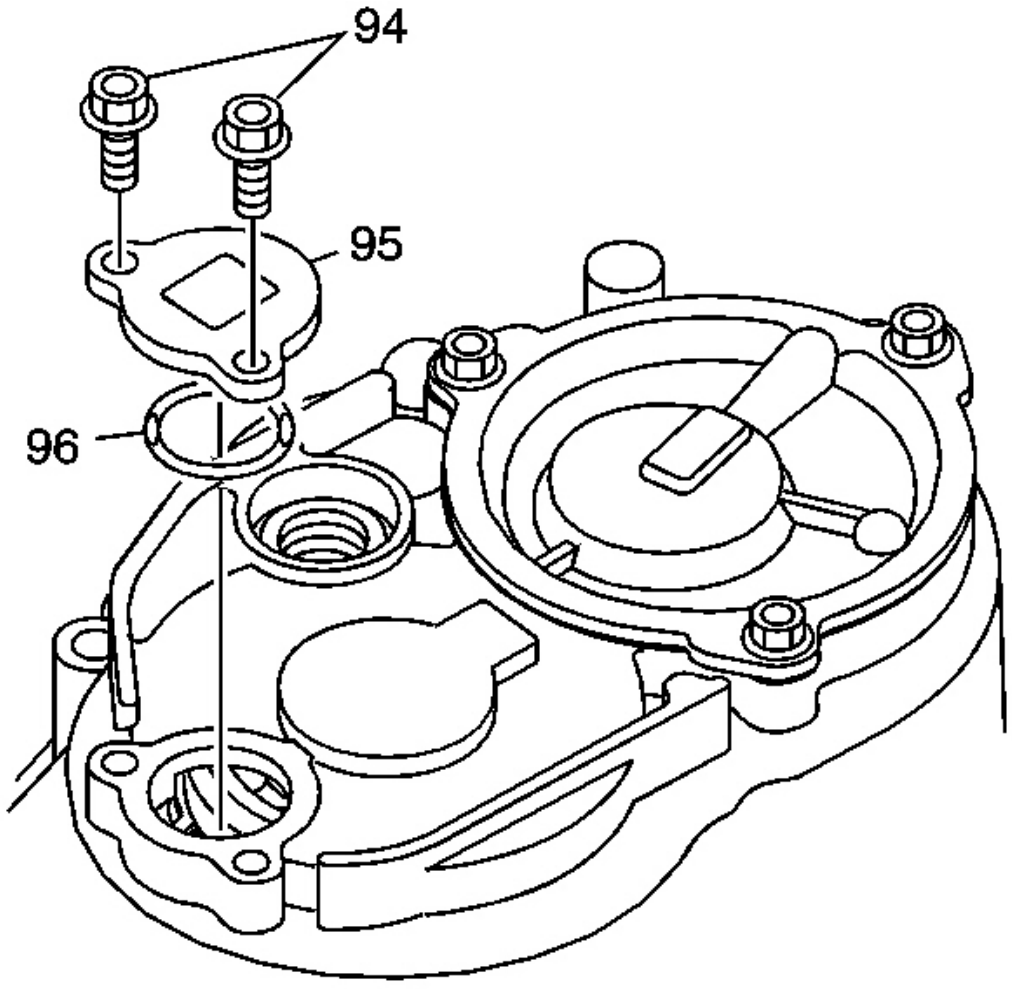

Fig. 117: Output Shaft Rear Access Cover, Bolts, O-Ring Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Remove the 2 output shaft rear access cover bolts (94) from the transmission case (31).
2. Remove the output shaft rear access cover (95) and the O-ring seal (96) from the transmission case (31).

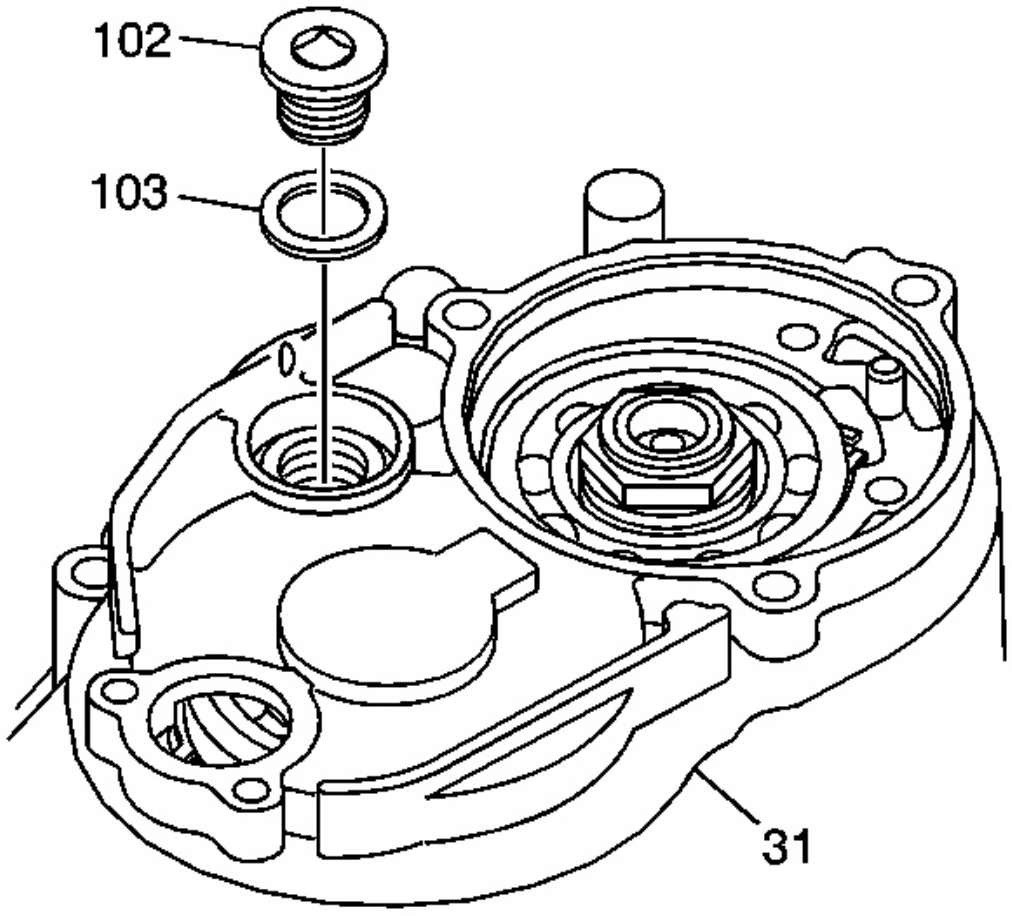

Fig. 118: Reverse Idler Gear Access Hole Plug, Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

3. Remove the reverse idler gear access hole plug (102) and the seal (103) from the transmission case (31).

MAINSHAFT RETAINER NUT REMOVAL

Tools Required

- **DT 46434** Mainshaft Socket
- **DT 46435** Mainshaft Socket Handle
- **DT 46238** Holding Fixture

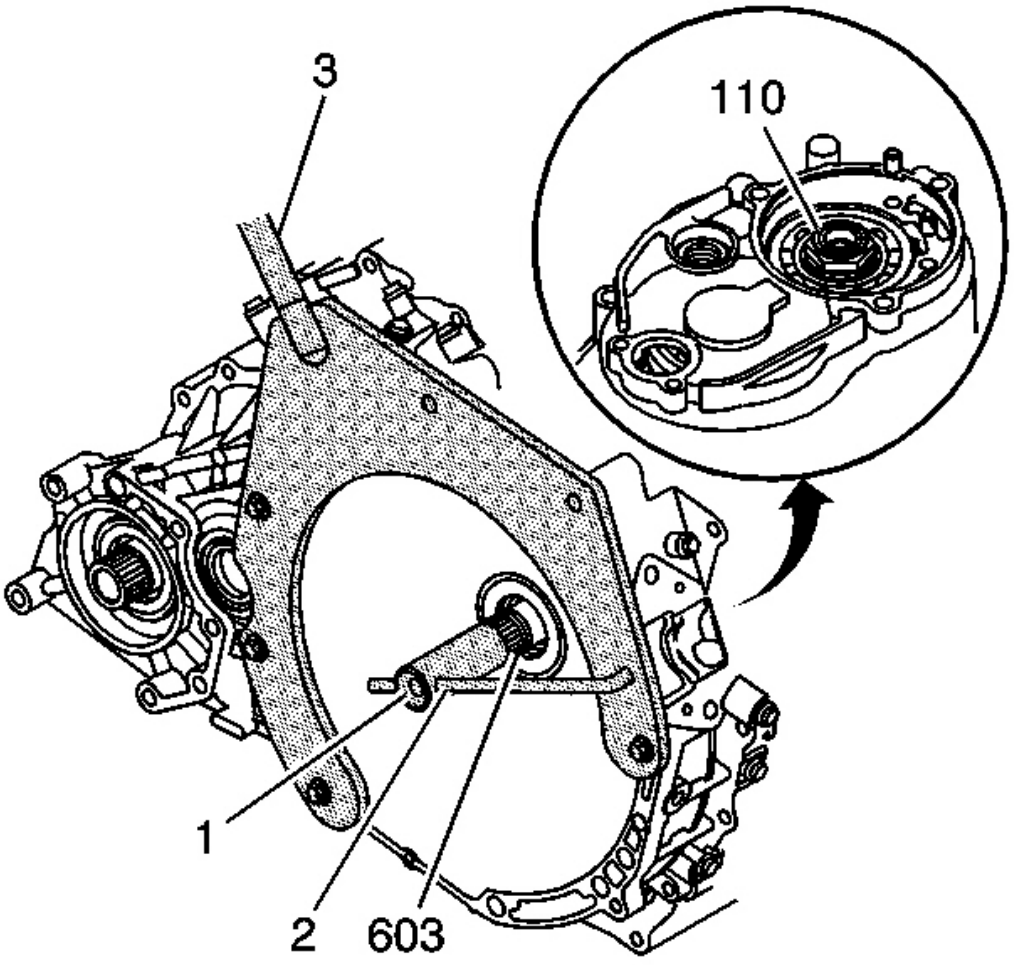

Fig. 119: DT 46435, DT 46434, Mainshaft Splines & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install **DT 46435** (2) through the hole in **DT 46434** (1).
2. Install **DT 46434** (1) onto the mainshaft splines and **DT 46435** (2) into the lock hole in **DT 46238** (3).
3. Apply a slight torque on the mainshaft nut (110) in order to secure the tools in place on the mainshaft (603).

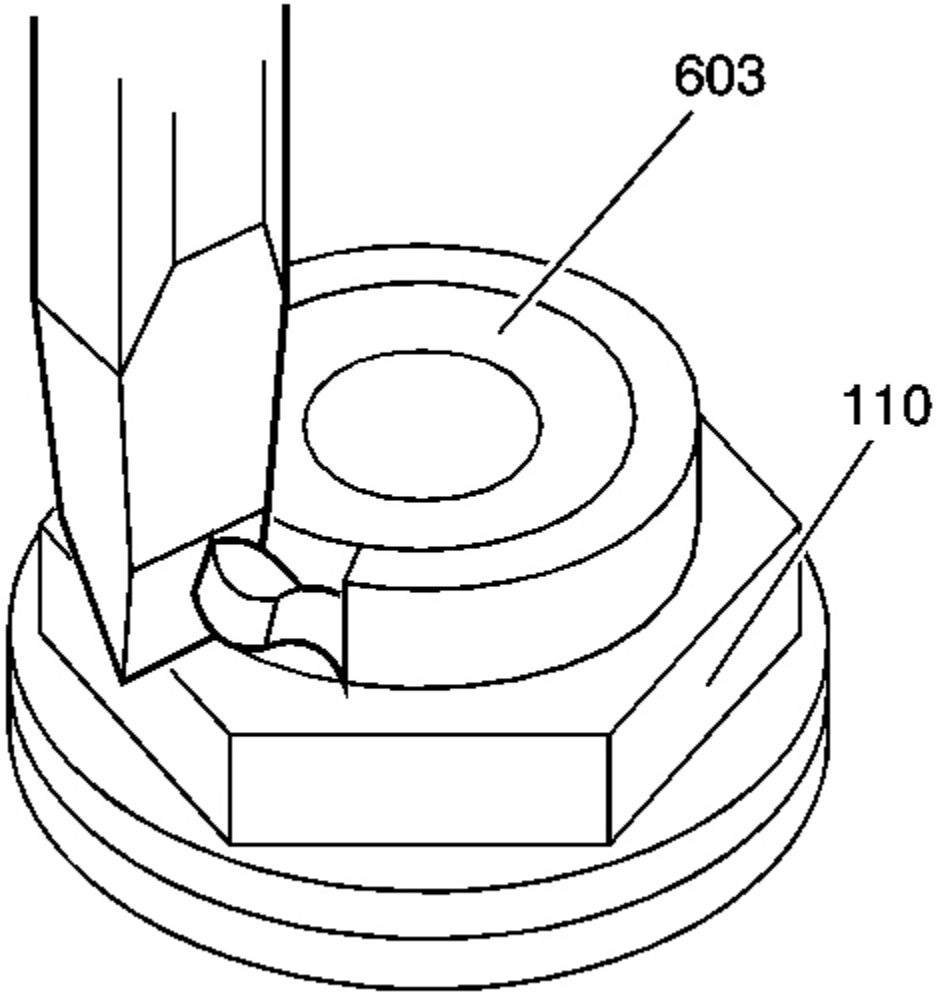

Fig. 120: Locktab & Mainshaft Retainer Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Ensure that all the metal particles are collected in order to prevent internal damage to the transaxle or bearings.

IMPORTANT: Do not damage the threads or the mainshaft.

4. Using a chisel remove the locktab from the mainshaft retainer nut (110).

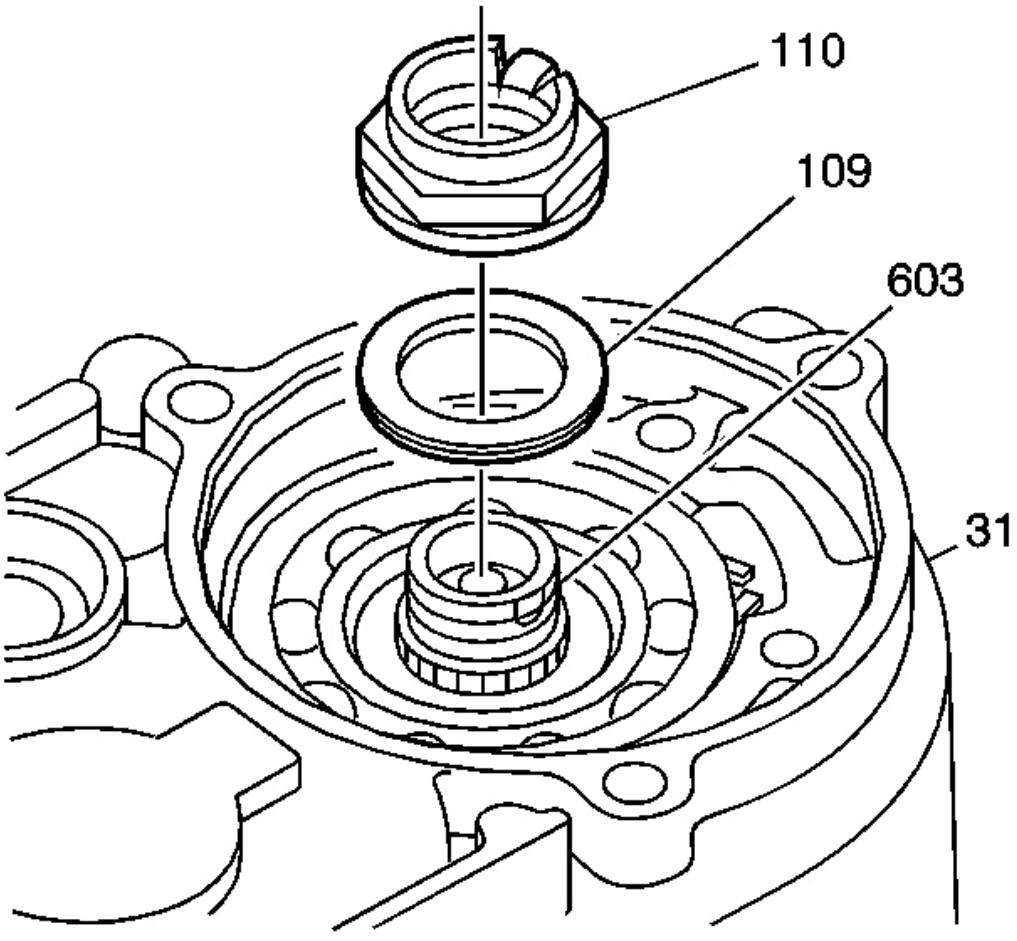

Fig. 121: Mainshaft Nut & Washer
Courtesy of GENERAL MOTORS CORP.

5. Remove the mainshaft nut (110).
6. Remove the mainshaft washer (109). Do not discard the nut or the washer.
7. Remove **DT 46434** and **DT 46435** .

TRANSMISSION CASE REMOVAL

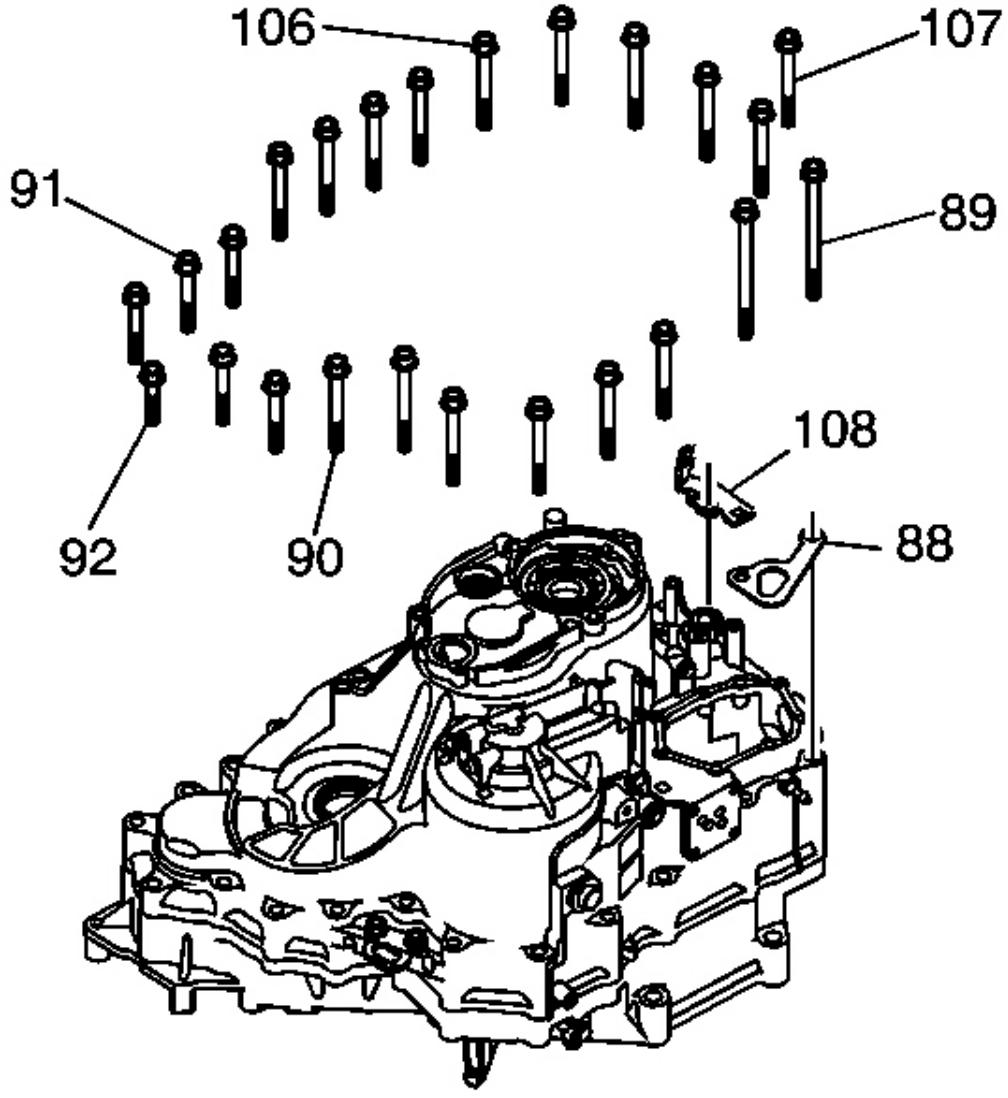

Fig. 122: Torque Converter Housing Bolts, Transmission Lift Bracket & Wiring Harness Bracket
Courtesy of GENERAL MOTORS CORP.

1. Position the transaxle with the rear of the transmission case facing upward.
2. Remove the 24 torque converter housing bolts (89, 90, 91, 92, 106, and 107).
3. Remove the transmission lift bracket (88) and the wiring harness bracket (108).

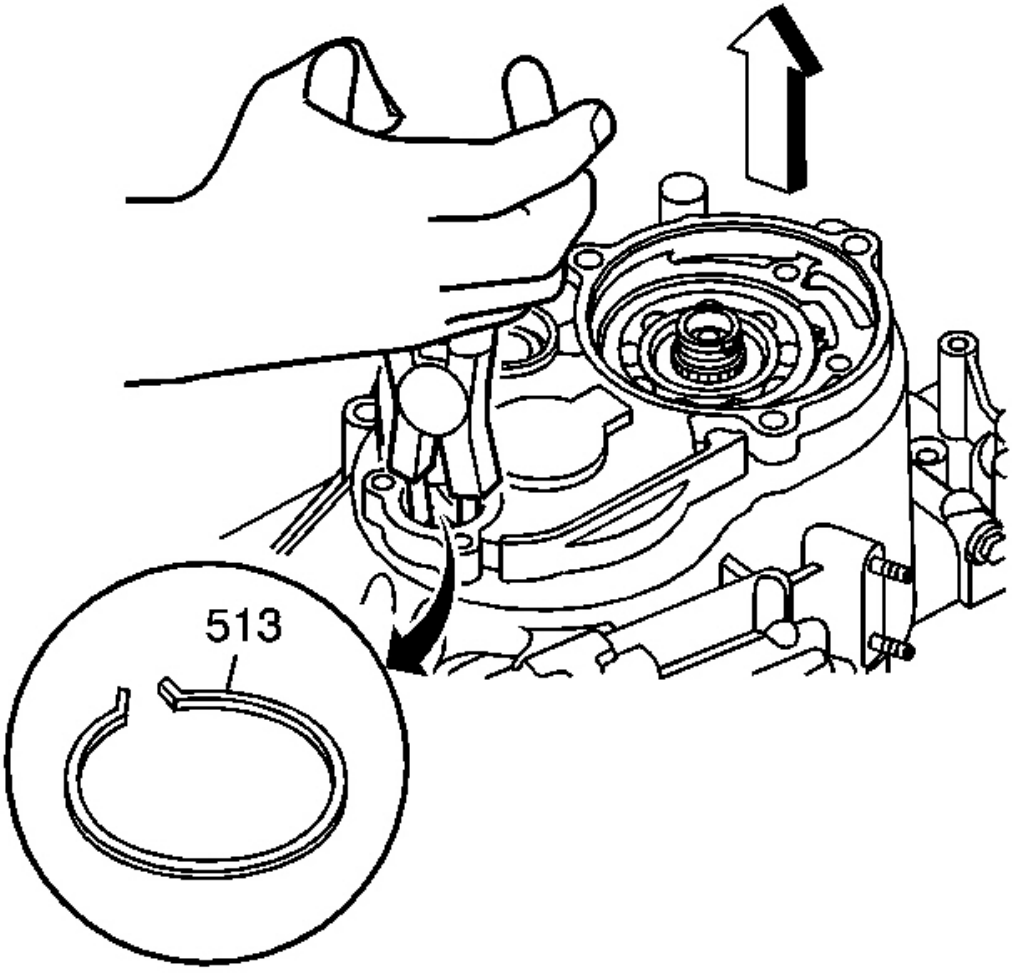

Fig. 123: Expanding The Output Shaft Retaining Ring Using A Snap Ring Pliers
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not nick, scratch or damage the sealing surface. The sealing surface is a machined surface. Damage to the machined surface can cause leakage.

4. Using the snap ring pliers, expand the output shaft retaining ring (513).
5. Lift the transmission case (31) off of the torque converter housing (150).

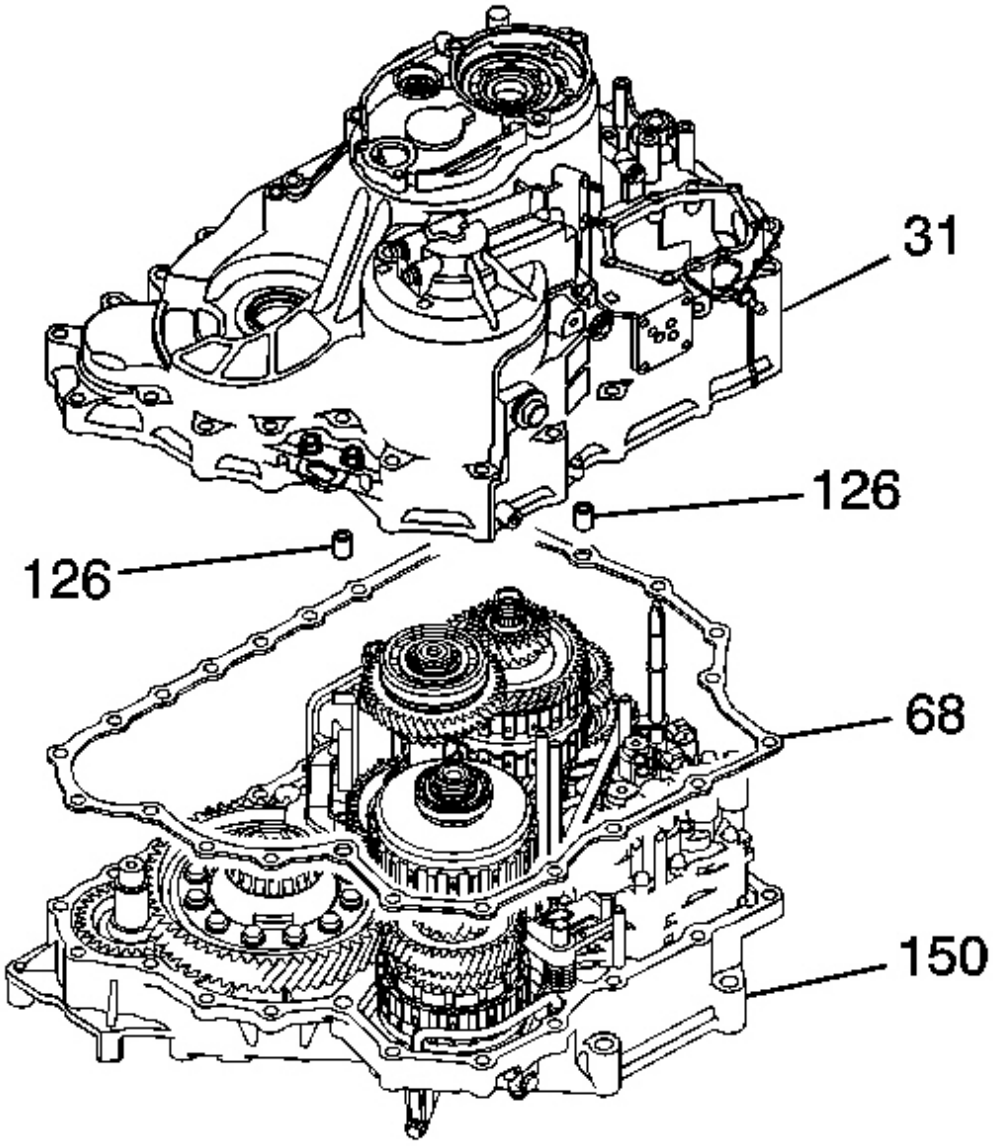

Fig. 124: Transmission Case, Torque Converter Housing Gasket & Pins
Courtesy of GENERAL MOTORS CORP.

6. Release the snap ring pliers and continue to remove the transmission case (31).
7. Remove the torque converter housing gasket (68).
8. Remove the 2 transmission case locating pins (126).

FLUID FEED PIPE REMOVAL

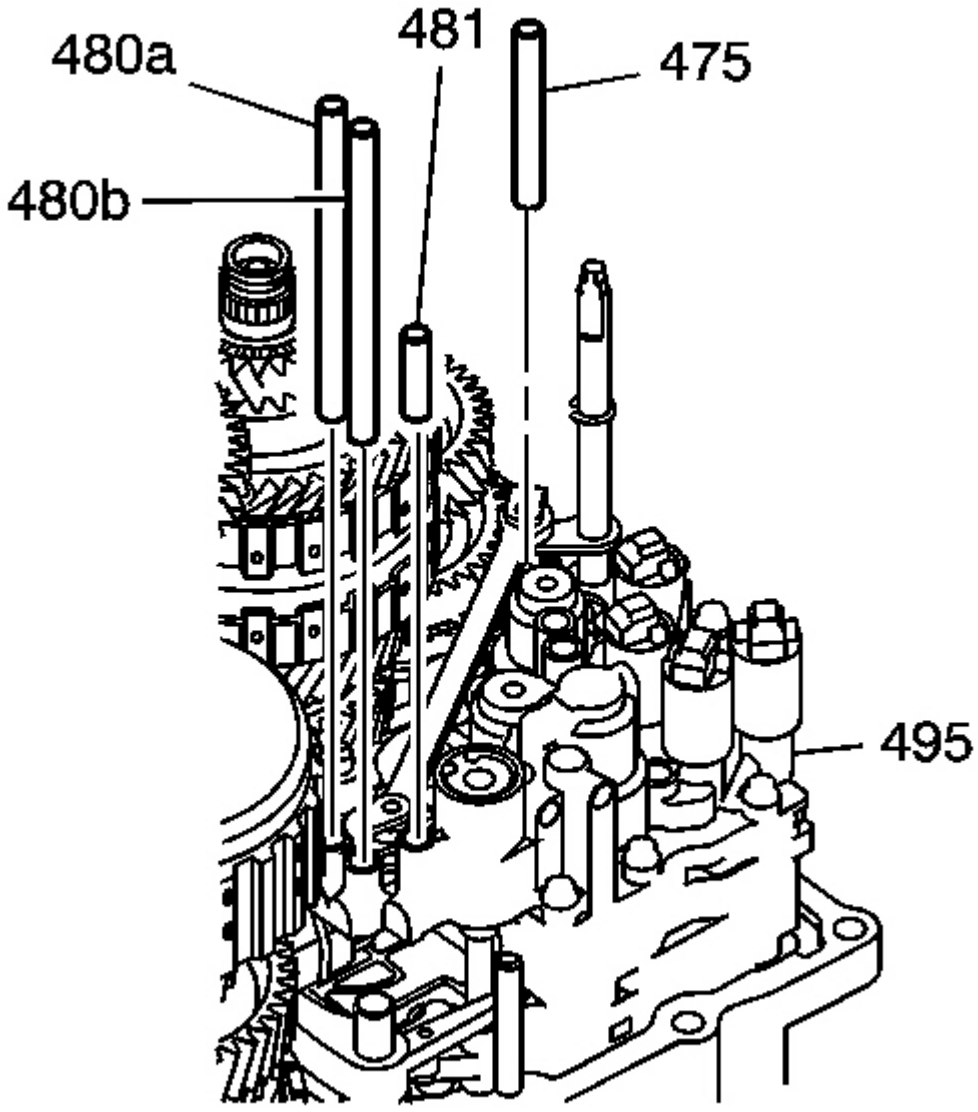

Fig. 125: Clutch Control Fluid Pipe & Accumulator Valve Body
Courtesy of GENERAL MOTORS CORP.

1. Remove the mainshaft lube fluid pipe (475) from the accumulator valve body (495).
2. Remove the 1st clutch control fluid pipe (480a) from the accumulator valve body (495).

3. Remove the coast clutch control fluid pipe (480b) from the accumulator valve body (495).
4. Remove the 4th clutch control fluid pipe (481) from the accumulator valve body (495).

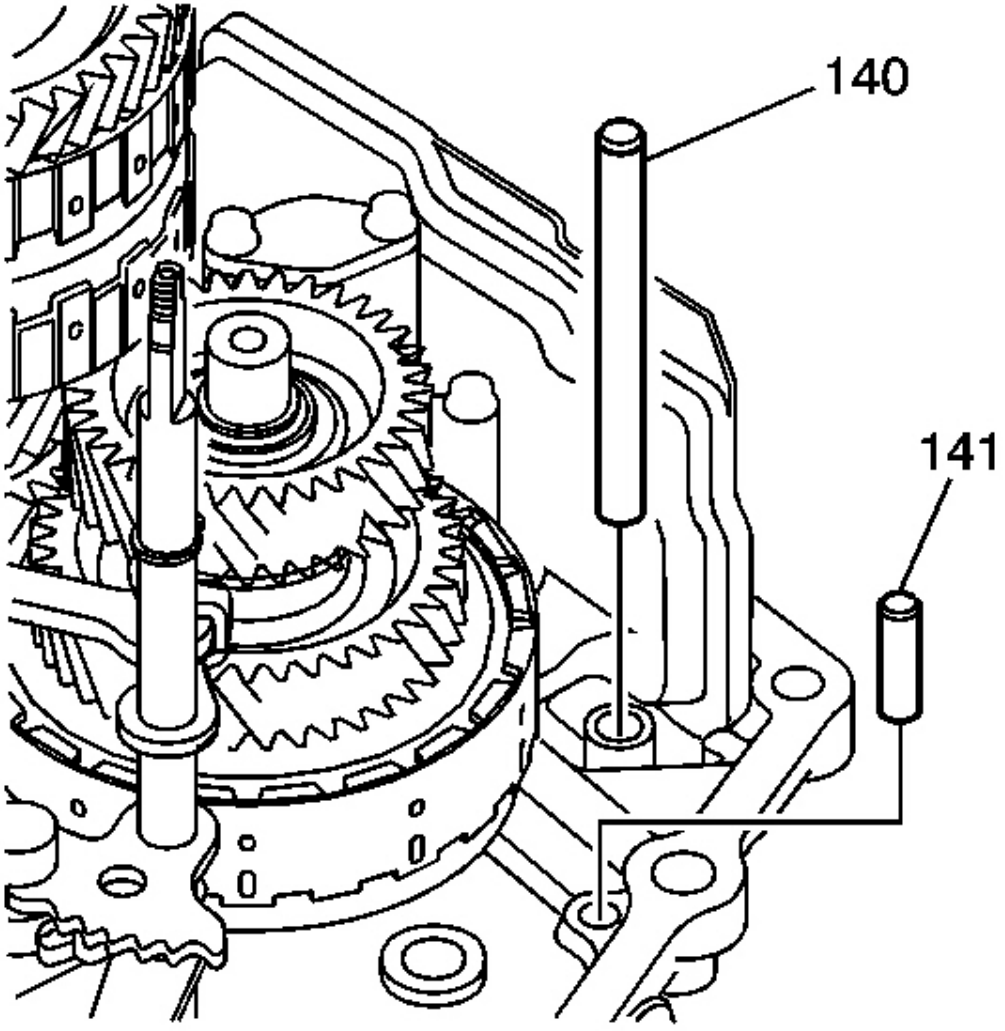

Fig. 126: Clutch Apply Fluid Pipe & Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS CORP.

5. Remove the 3rd clutch apply fluid pipe (140) from the torque converter housing (150).
6. Remove the transmission fluid cooler pipe (141) from the torque converter housing (150).

PARK PAWL ASSEMBLY REMOVAL

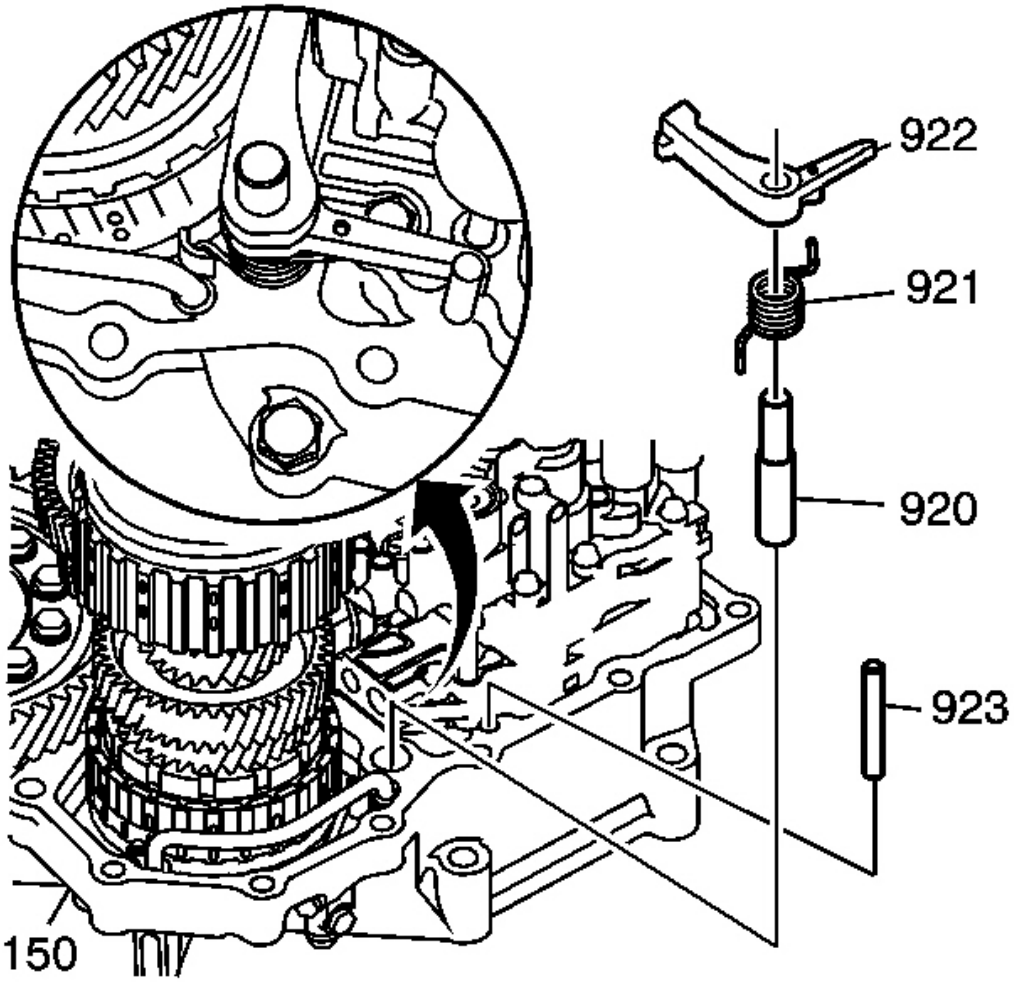

Fig. 127: Park Pawl, Spring, Shaft & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

1. Remove the park pawl stop lever pin (923) from the torque converter housing (150).
2. Remove the park pawl (922), the park pawl spring (921) and the park pawl shaft (920) from the torque converter housing (150).

1ST/2ND CLUTCH SHAFT LUBE FEED PIPE REMOVAL

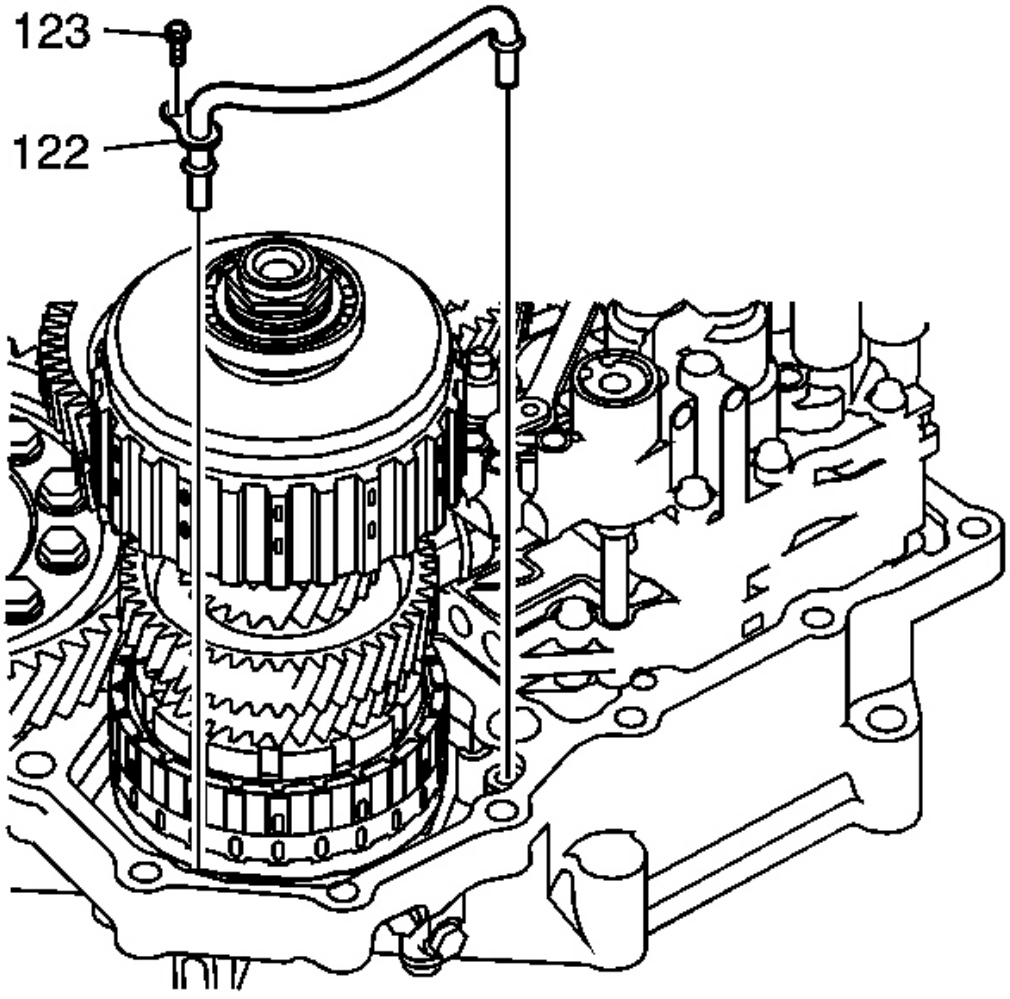

Fig. 128: Clutch Shaft Fluid Pipe Retainer Bolt & Clutch Shaft Lube Feed Pipe
Courtesy of GENERAL MOTORS CORP.

1. Remove the 1st/2nd clutch shaft fluid pipe retainer bolt (123).
2. Remove the 1st/2nd clutch shaft lube feed pipe (122).

SHAFT AND CLUTCHES REMOVAL

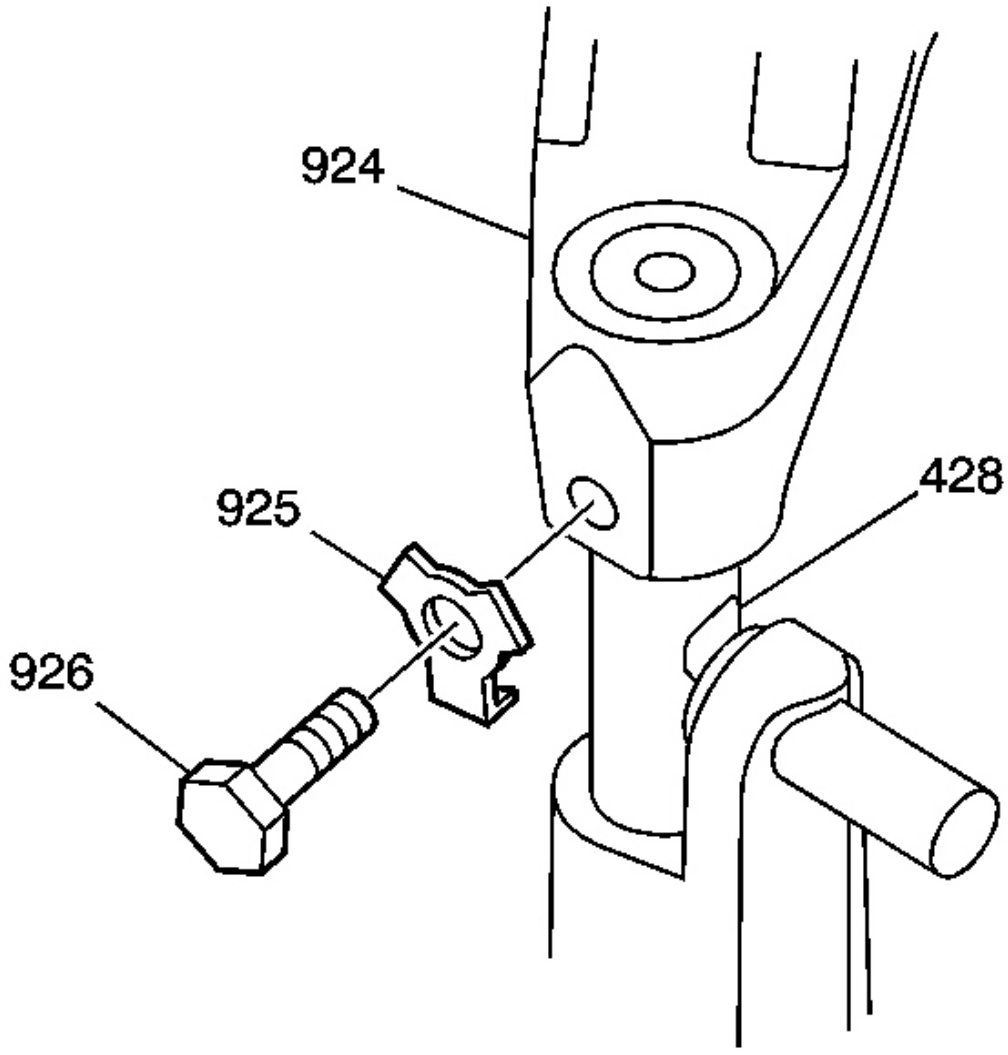

Fig. 129: Reverse Shift Fork, Washer & Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: This procedure requires 3 technicians. Each technician needs to remove or install a complete shaft assembly in order to prevent personal injury.

1. Bend the lock tab of the reverse shift fork washer (925) on the reverse shift fork (924).
2. Remove the reverse shift fork retainer bolt (926) and washer (925) from the reverse shift fork (924).

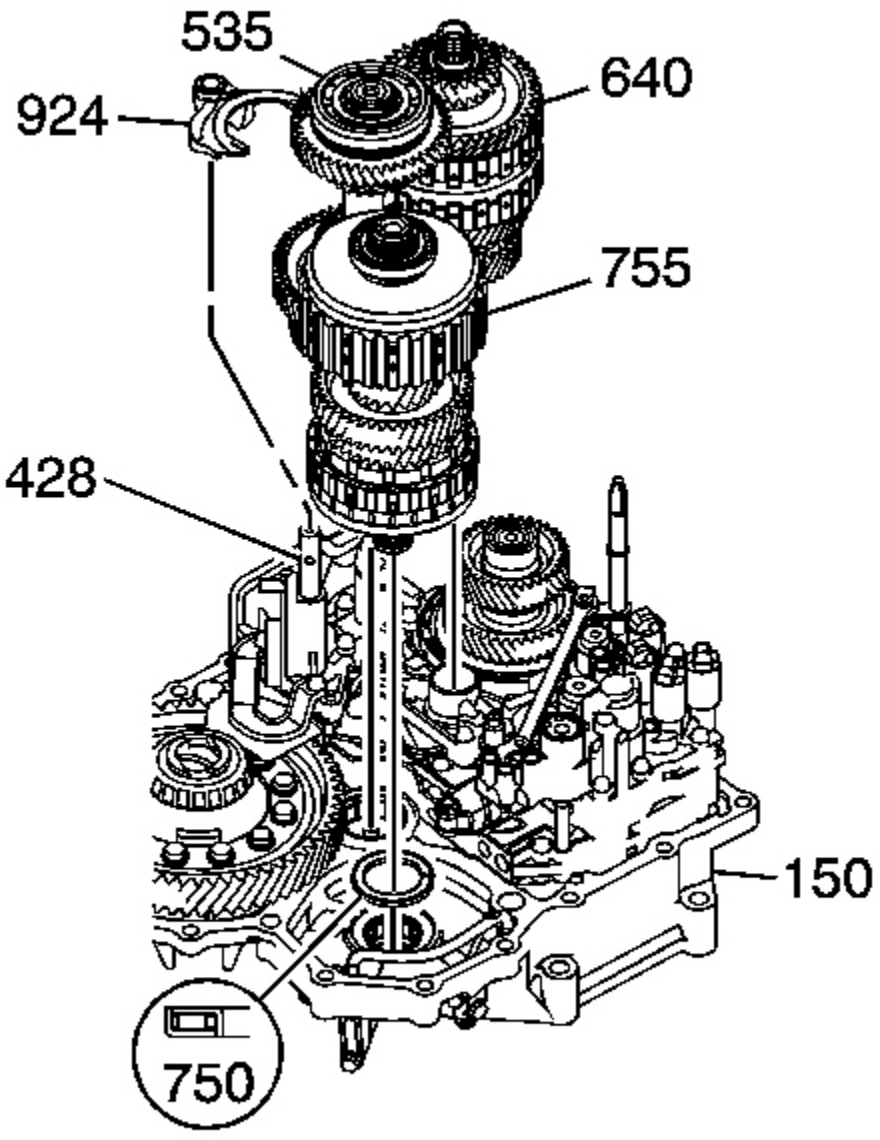

Fig. 130: Mainshaft Complete Assembly, Output Shaft, Clutch Shaft & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

NOTE: **Do not allow the reverse shift fork to fall on the floor during the removal of the 3 shaft assemblies. The reverse shift fork will fall free from the output shaft assembly, possibly damaging the fork end of the shaft.**

3. As a complete assembly, lift straight up the mainshaft complete assembly (640), the output shaft assembly (535) and 1st/2nd clutch shaft assembly (755) until they are clear of from the torque converter housing assembly (150) as shown.
4. Remove the 2nd clutch housing thrust bearing (750) from the torque converter housing (150).

MANUAL SHAFT DETENT LEVER AND PARK PAWL ACTUATOR WITH LINKAGE ASSEMBLY REMOVAL

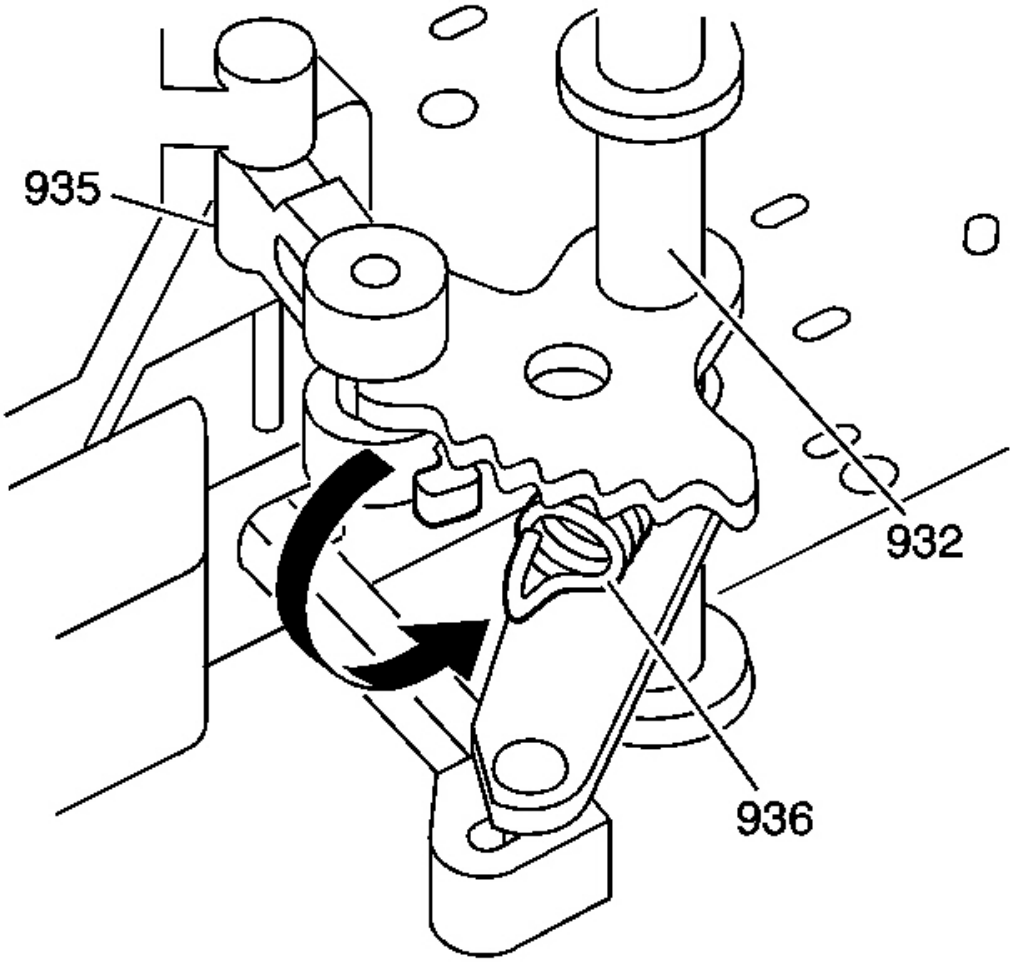

Fig. 131: Manual Shift Shaft & Detent Roller Spring
Courtesy of GENERAL MOTORS CORP.

1. Remove the manual shift shaft detent roller spring (936) from the manual shift shaft assembly (932) and the manual shift shaft detent roller assembly (935).

2. Remove the manual shift shaft assembly (932).
3. Inspect the park pawl actuator shaft front bearing for being faulty.

FRONT DIFFERENTIAL ASSEMBLY AND TRANSFER CASE INPUT GEAR REMOVAL

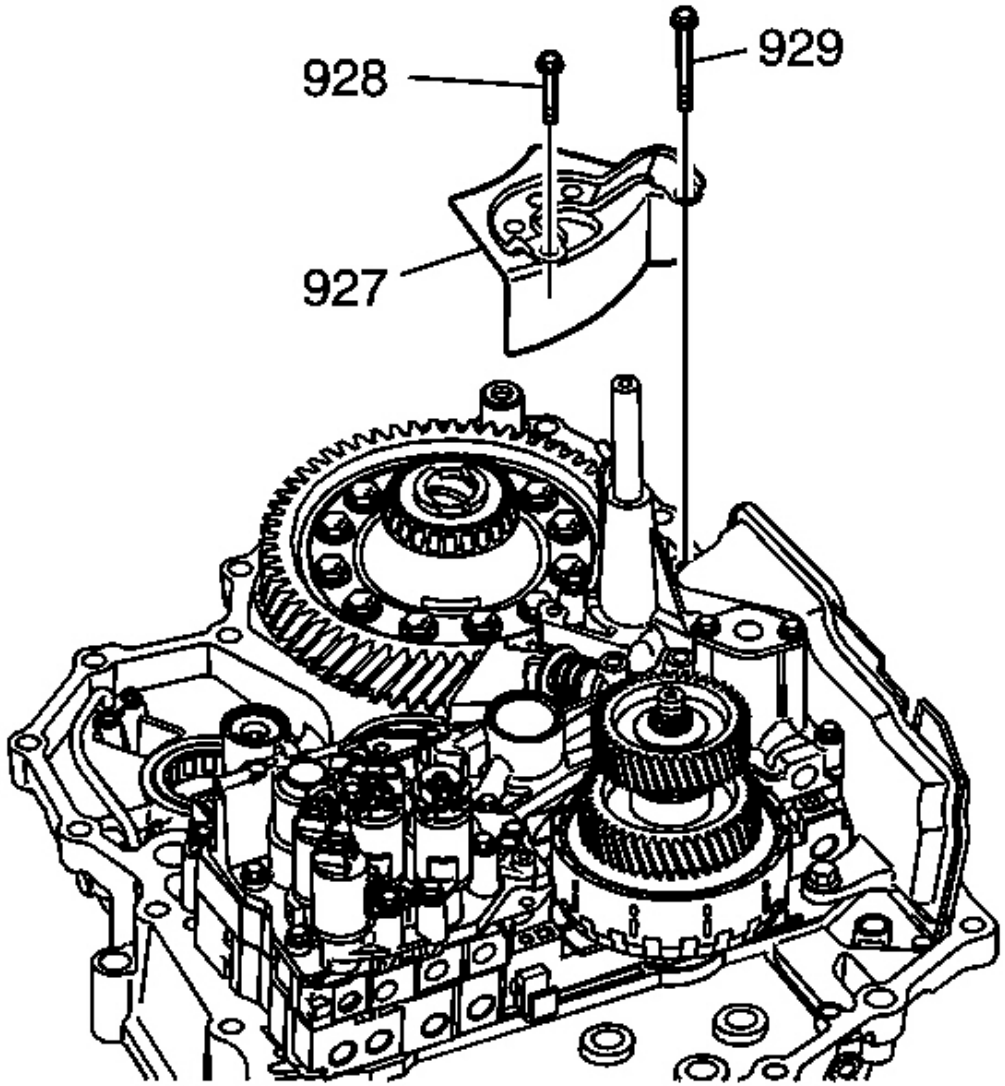

Fig. 132: Fluid Baffle & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the fluid baffle bolts (928, 929) from the torque converter housing.

2. Remove the fluid baffle (927).

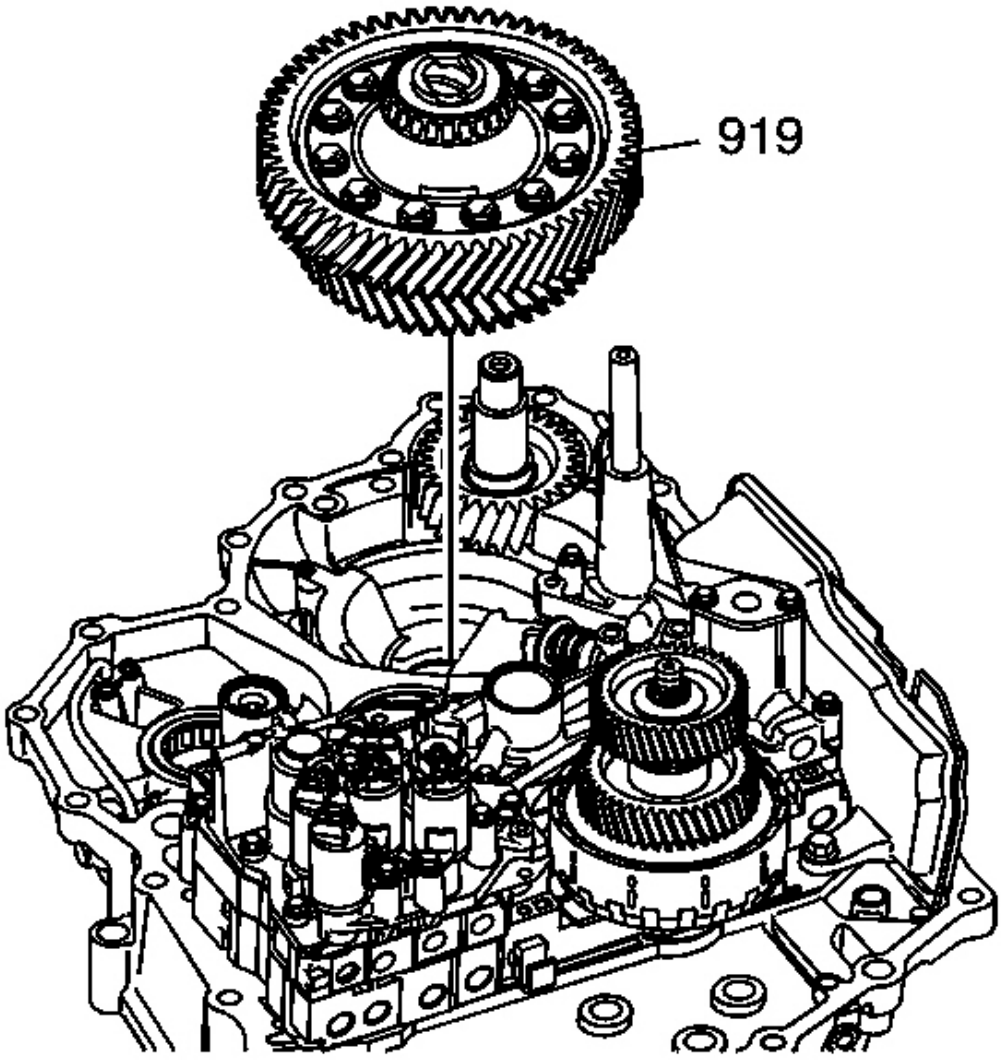

Fig. 133: Complete Front Differential Assembly
Courtesy of GENERAL MOTORS CORP.

3. Remove the complete front differential assembly (919).

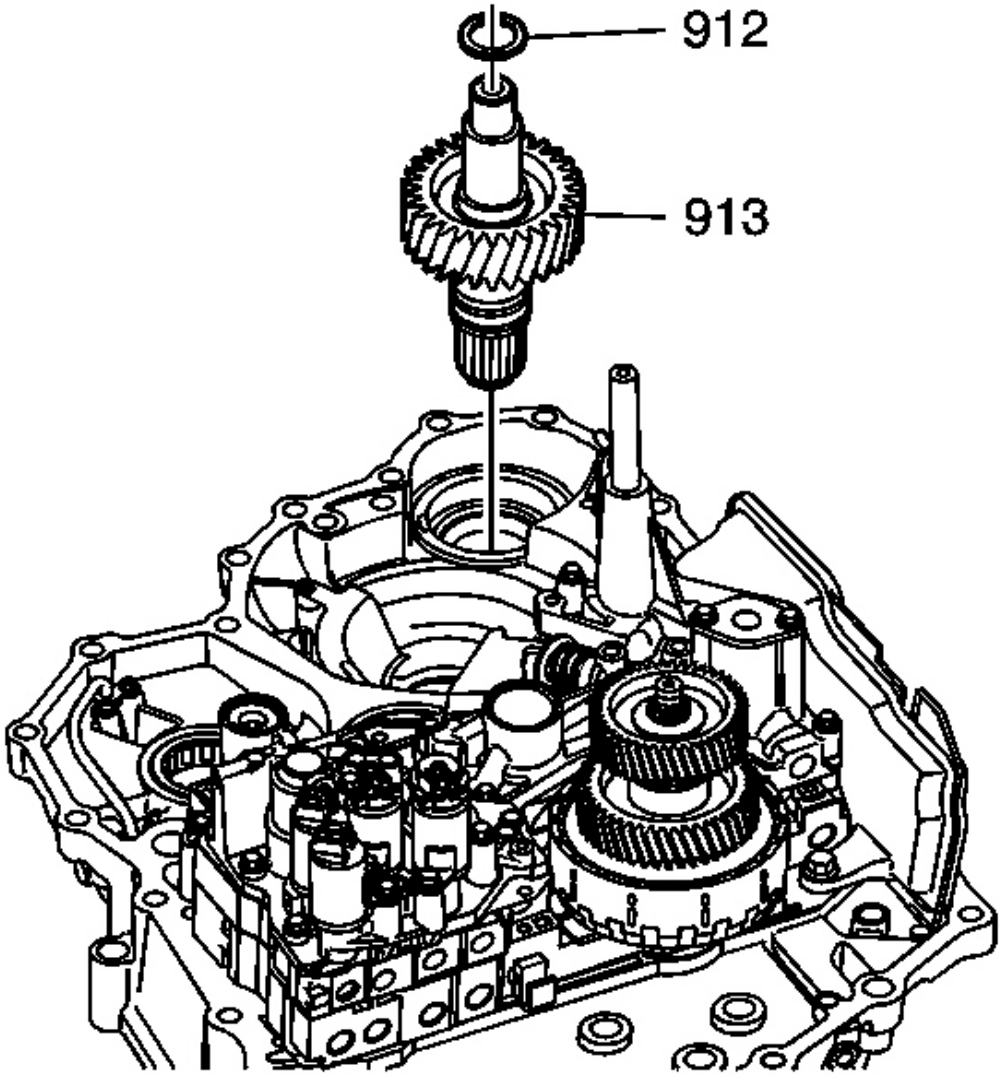

Fig. 134: Transfer Case Selective Shim, Input Gear & Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

4. Remove the transfer case selective shim (912).
5. Remove the transfer case input gear and shaft assembly (913).

3RD CLUTCH SHAFT ASSEMBLY REMOVAL

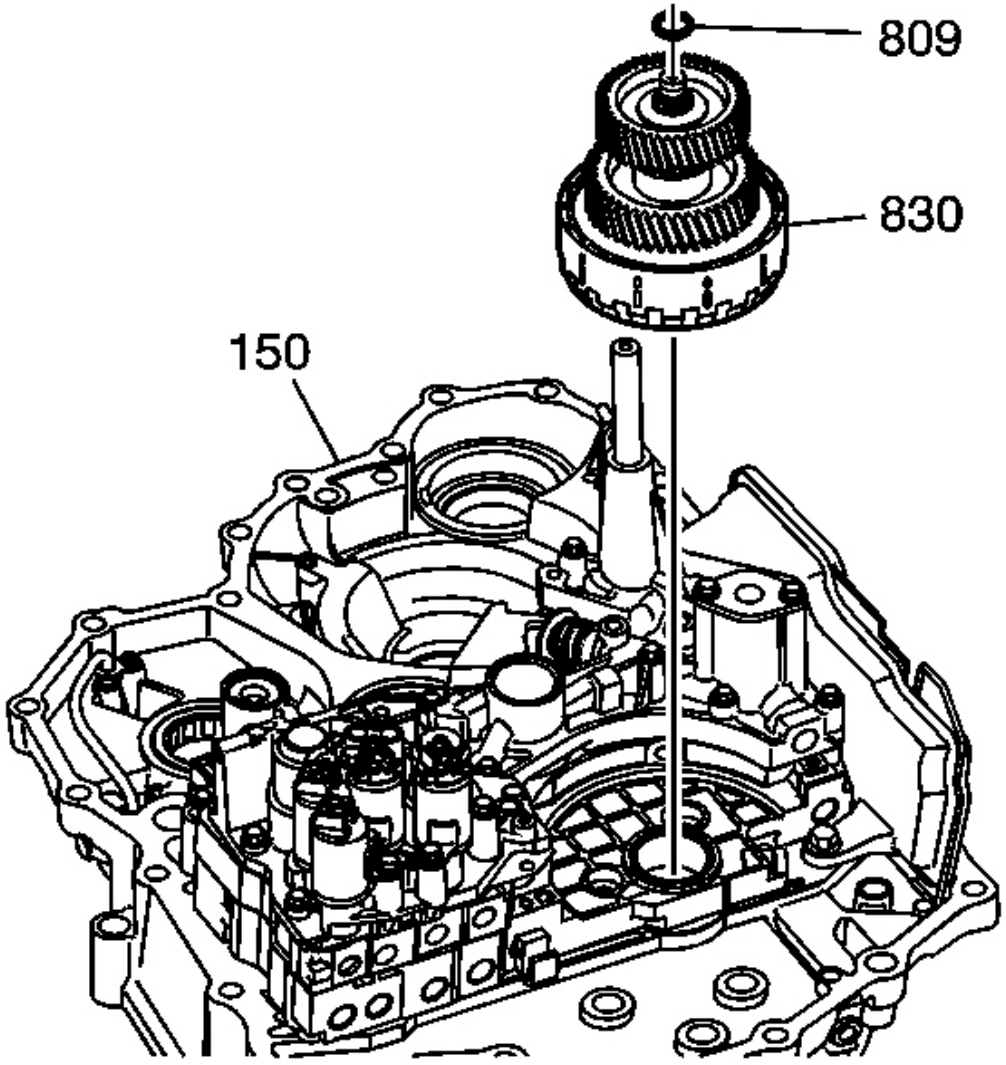

Fig. 135: Selective Washer, 3rd Clutch Assembly & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

1. Remove the selective washer (809).
2. Remove the complete 3rd Clutch assembly (830) from the torque converter housing (150).

FLUID FILTER REMOVAL

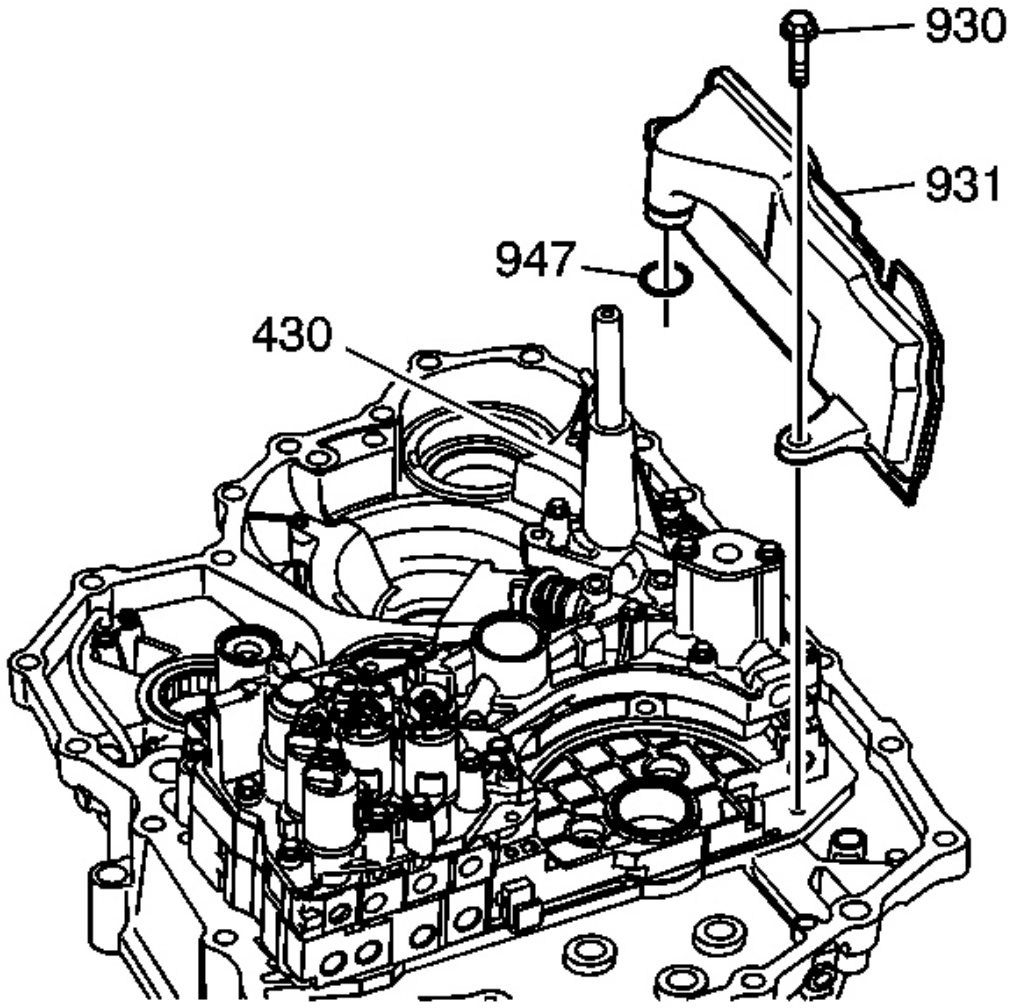

Fig. 136: Regulator Valve Body, Transmission Fluid Filter & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the transmission fluid filter bolt (930) from the torque converter housing.
2. Remove the transmission fluid filter (931) from the regulator valve body (430).
3. Remove the transmission fluid filter O-ring seal (947) from the transmission fluid filter. Replace the O-ring seal when assembling the transmission.

ACCUMULATOR VALVE BODY REMOVAL

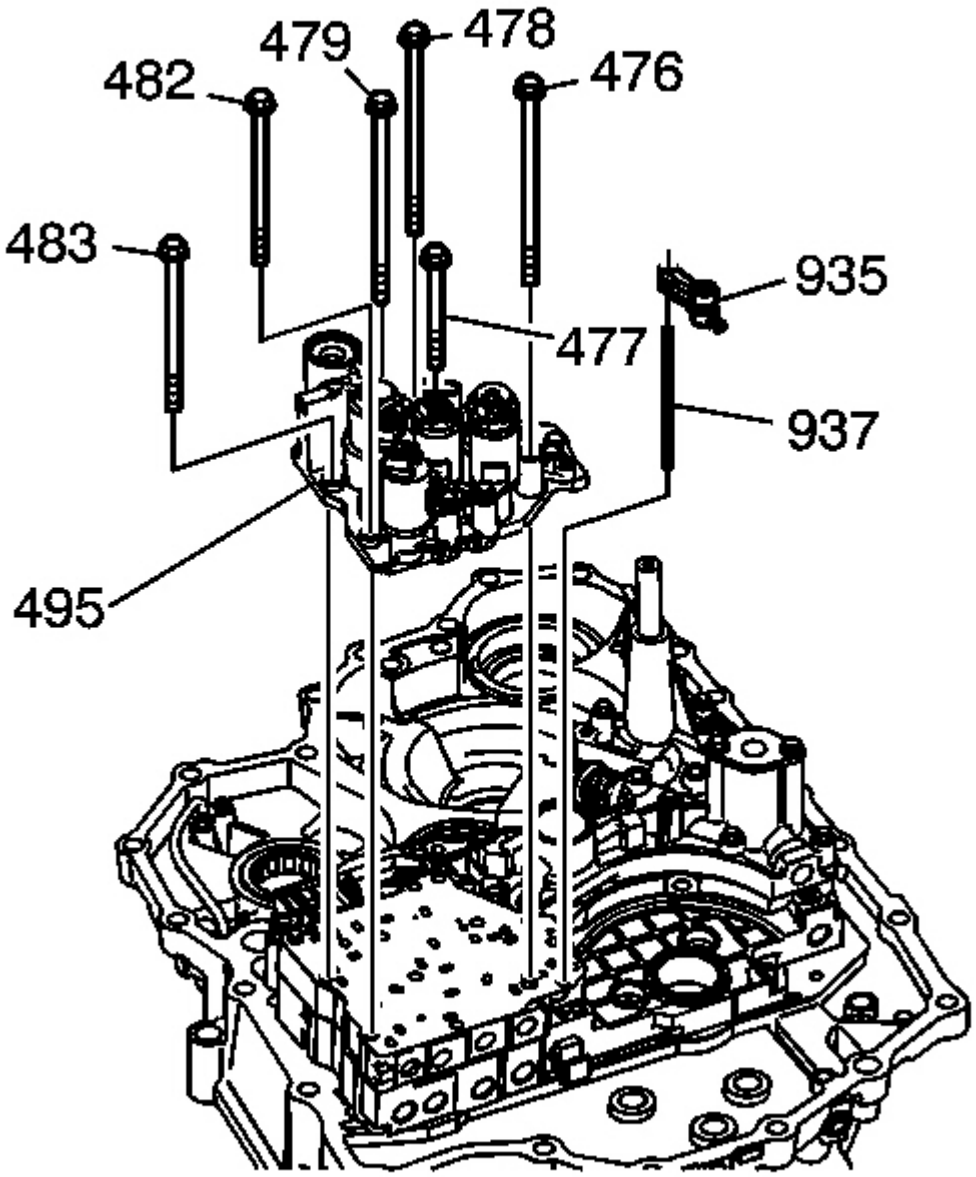

Fig. 137: Manual Shift Shaft Detent Roller, Pin & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the 11 accumulator valve body bolts (476), (477), (478), (479), (482) and (483).
2. Remove the manual shift shaft detent roller assembly (935).
3. Remove the manual shift shaft detent roller pin (937).

4. Remove the accumulator valve body (495).

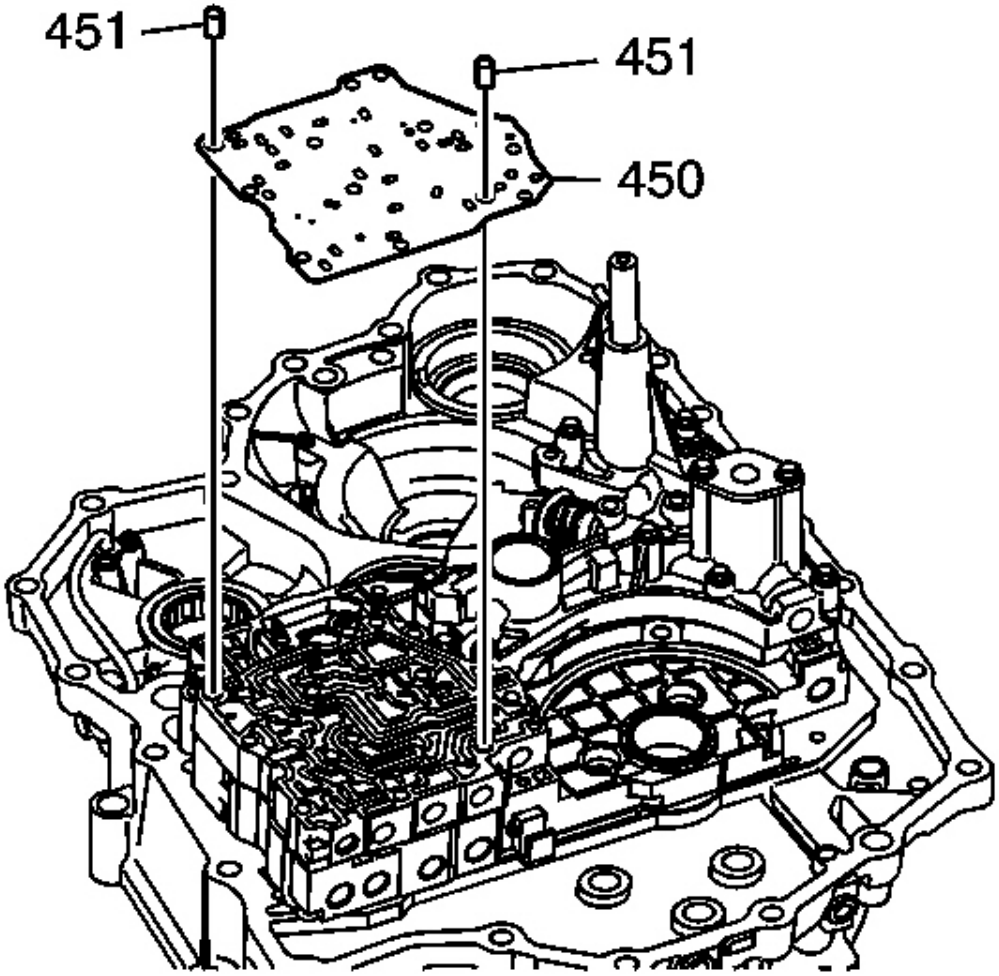

Fig. 138: Accumulator Valve Body Spacer Plate & Locating Pins
Courtesy of GENERAL MOTORS CORP.

5. Remove the accumulator valve body spacer plate (450).
6. Remove the 2 spacer plate locating pins (451).

SERVO VALVE BODY REMOVAL

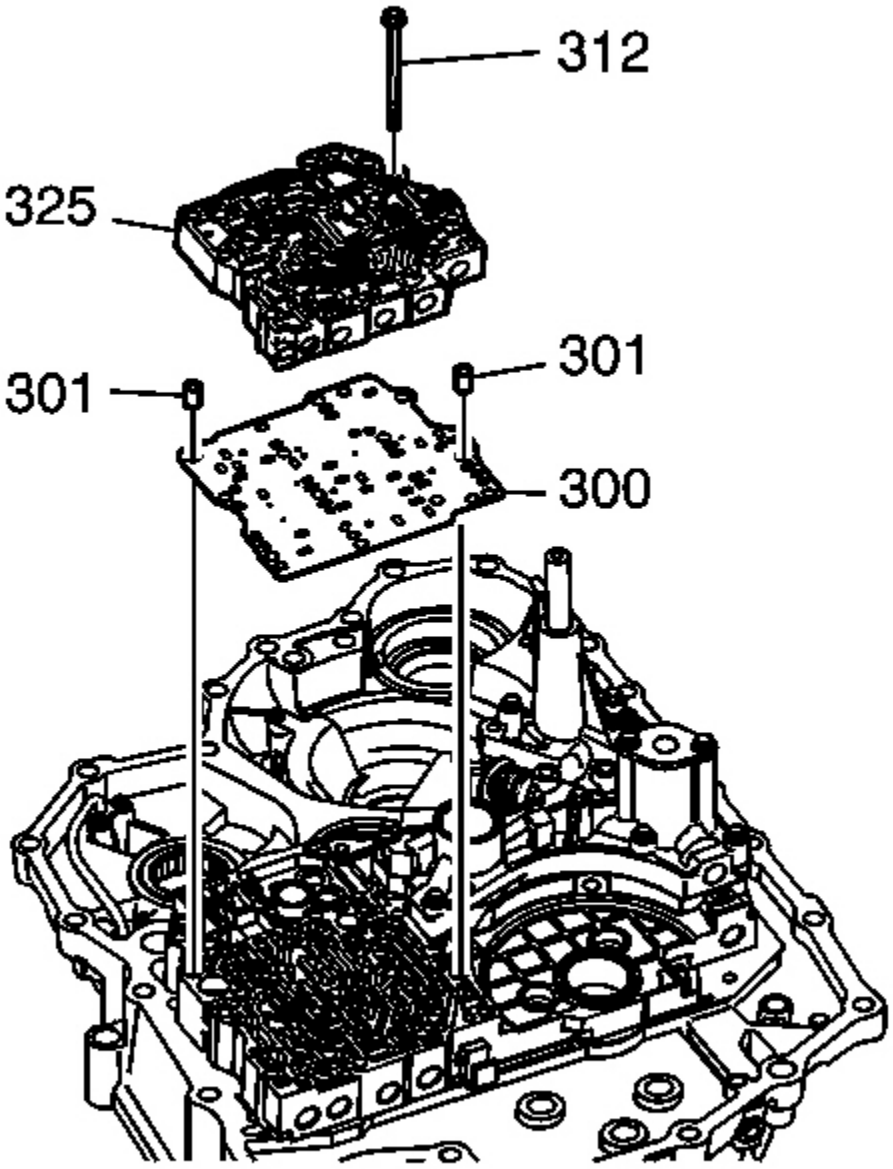

Fig. 139: Servo Valve Body, Spacer Plate & Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not allow the 3 servo valve body check balls and the 1st accumulator choke to fall out of the servo valve body.

1. Remove the servo valve body bolt (312).
2. Remove the servo valve body (325).
3. Remove the servo valve body spacer plate (300).
4. Remove the 2 spacer plate locating pins (301).

REGULATOR VALVE BODY REMOVAL

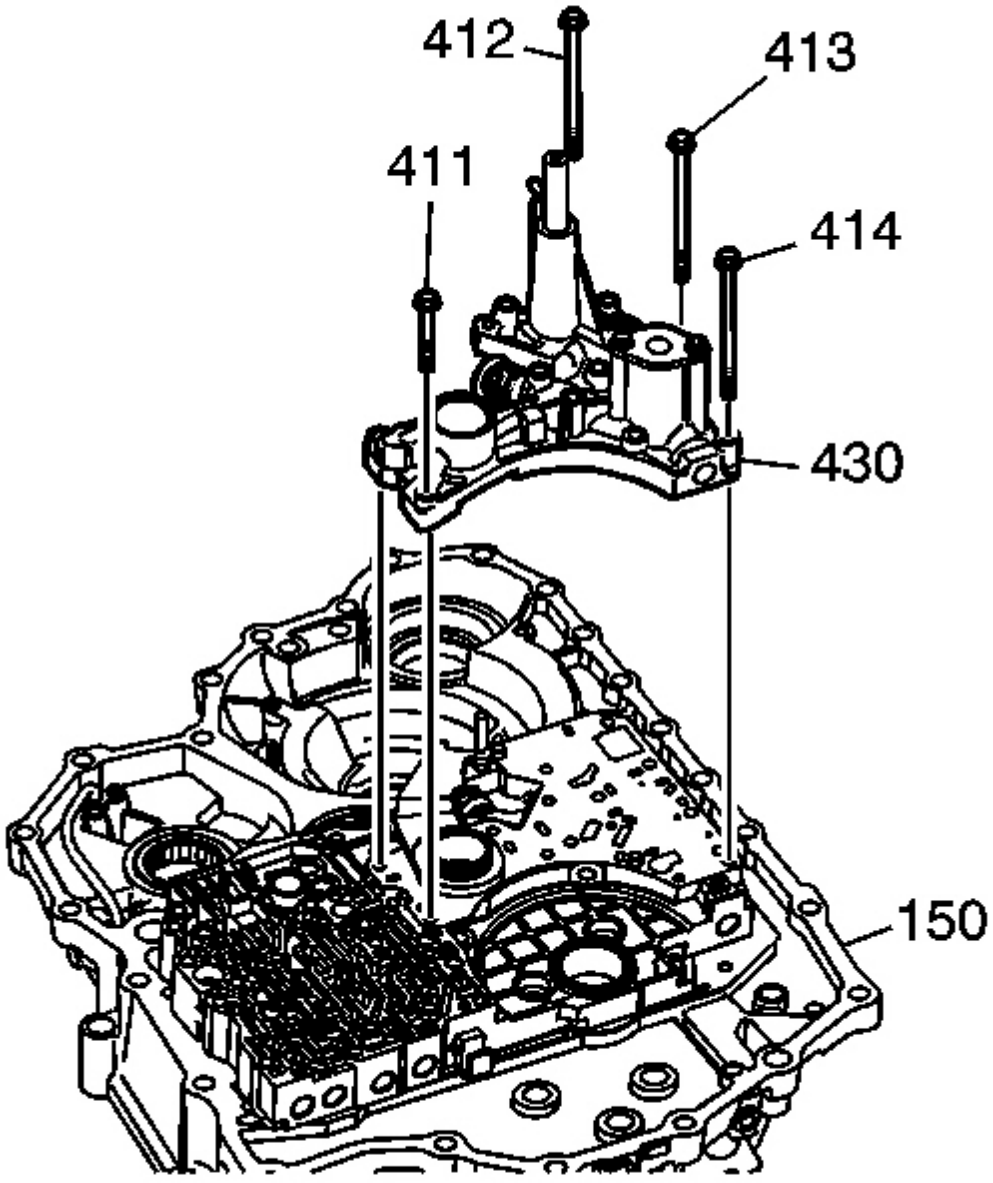

Fig. 140: Regulator Valve Body Assembly & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the regulator valve body assembly (430) bolts (411), (412), (413) and (414).

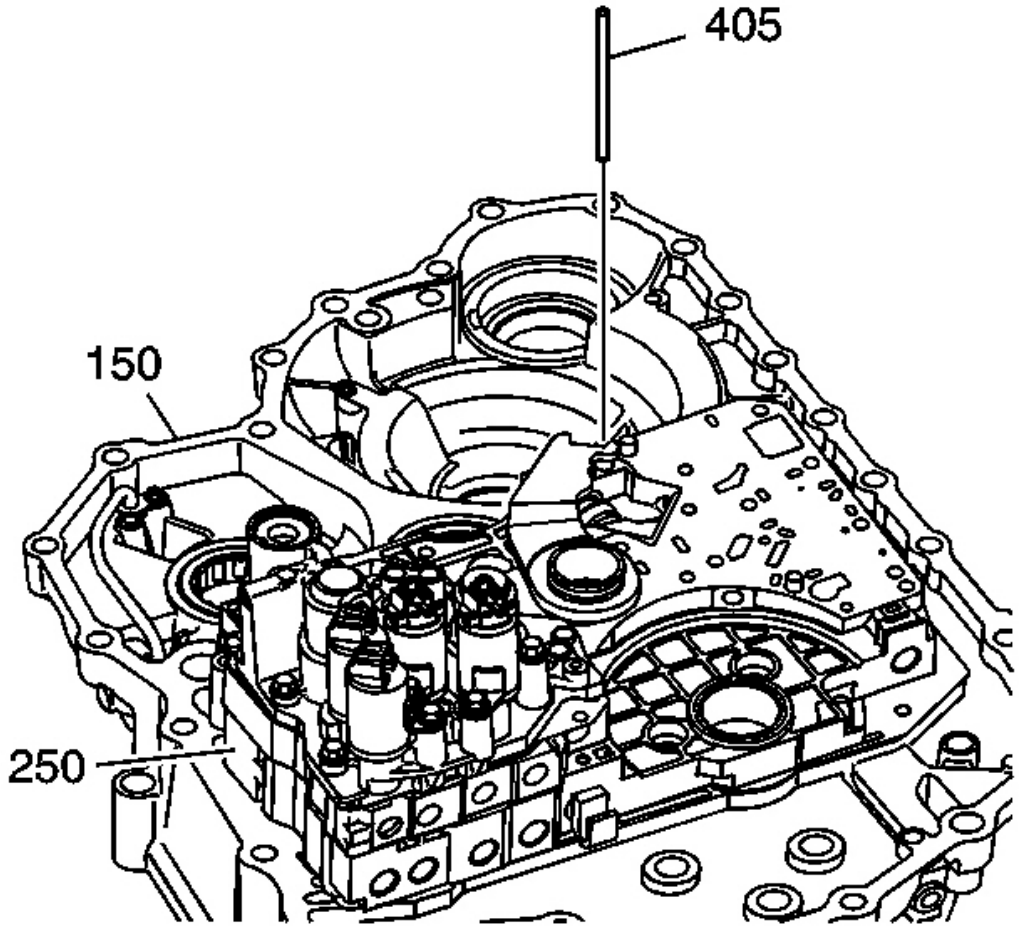

Fig. 141: Stator Shaft Stop Pin
Courtesy of GENERAL MOTORS CORP.

2. Remove the stator shaft stop pin (405).

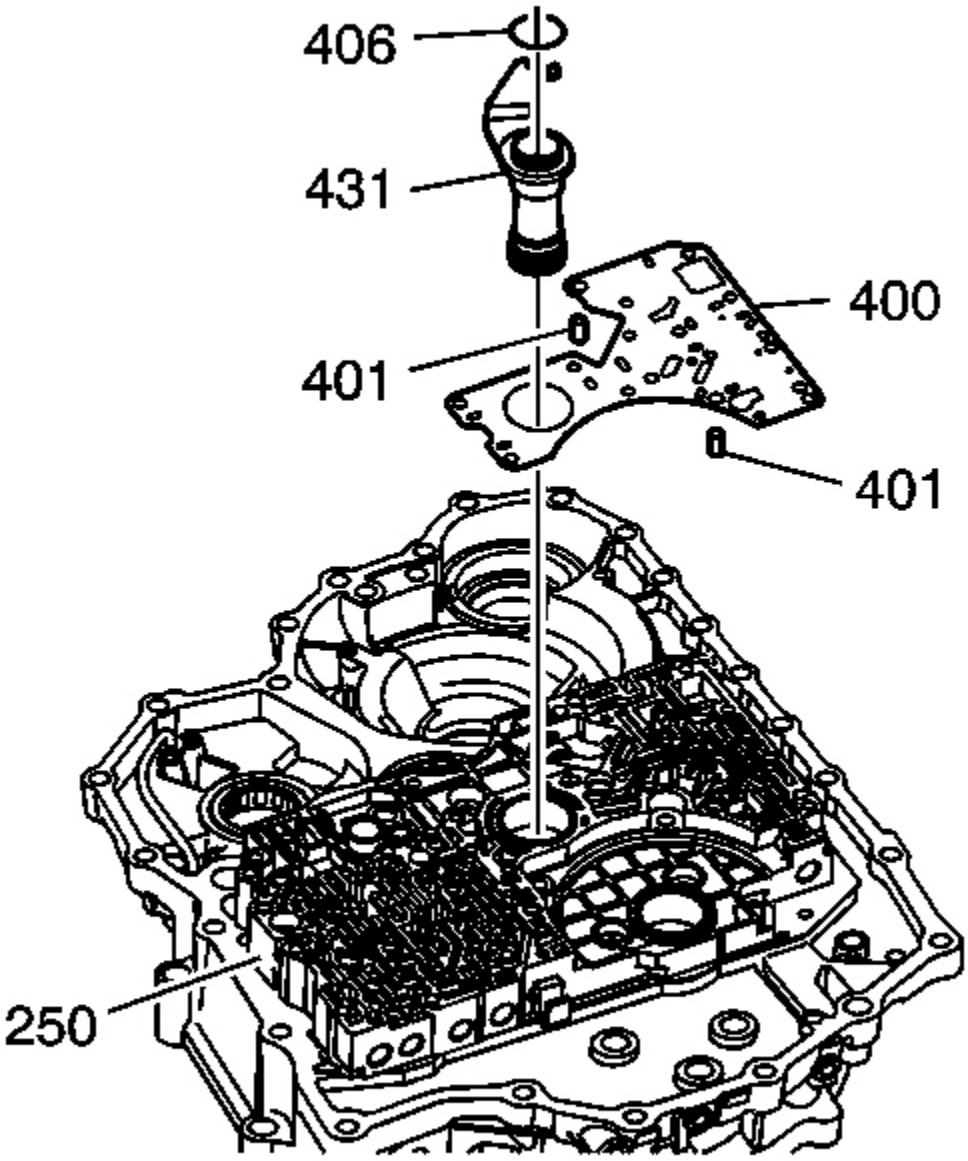

Fig. 142: Regulator Spacer Plate, Locating Pins, Stator Shaft & Torque Arm Assembly
Courtesy of GENERAL MOTORS CORP.

3. Remove the 2 regulator spacer plate locating pins (401).
4. Remove the stator shaft and torque arm assembly (431).

IMPORTANT: When the spacer plate (400) is removed the oil cooler check ball return spring (227) and the oil cooler check ball (228) will fall out of the control valve body assembly.

5. Remove the spacer plate (400).
6. Remove the stator shaft O-ring seal (406) from the stator shaft (404). Replace the stator shaft O-ring seal when assembling the transmission.

MAIN CONTROL VALVE BODY ASSEMBLY REMOVAL

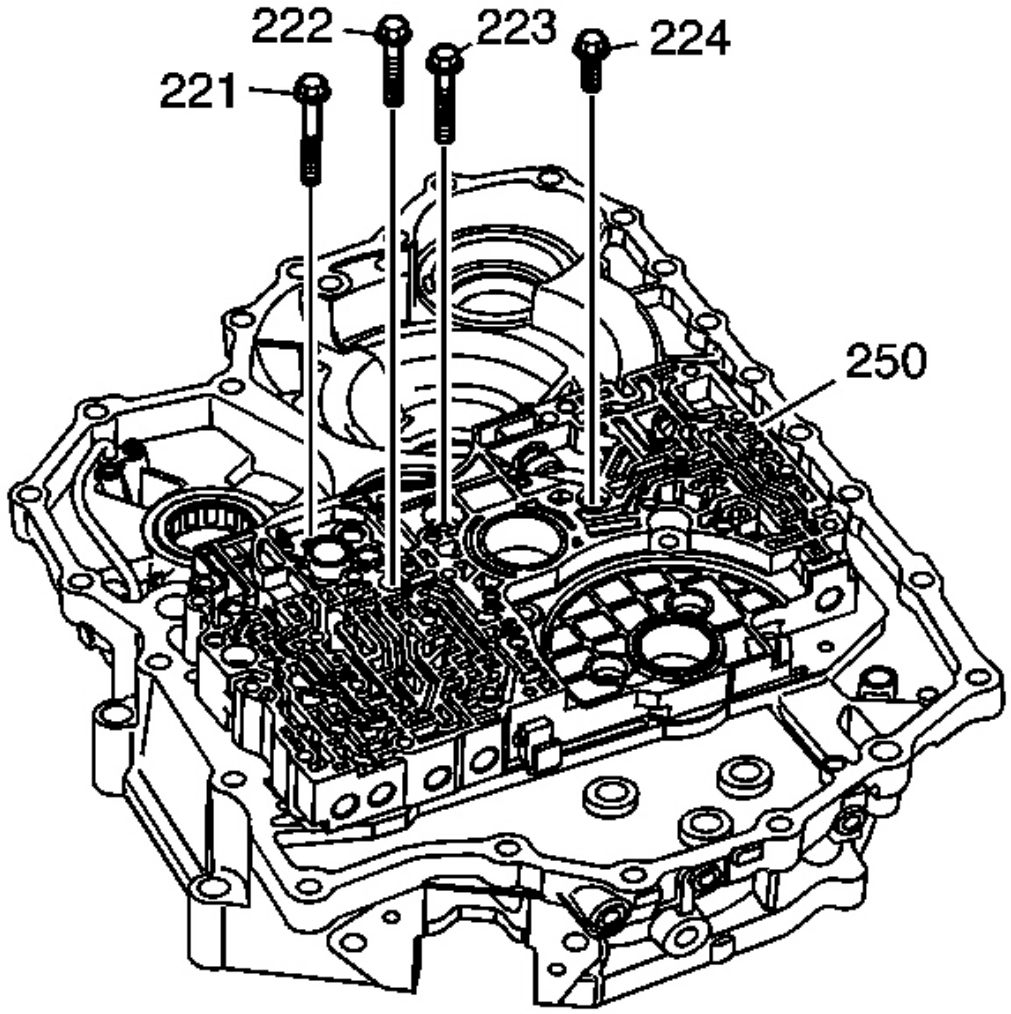

Fig. 143: Control Valve Body & Bolts

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not misplace the following components when removing the control valve body assembly (250):

- **Oil cooler check ball (228)**
- **Oil cooler return spring (227)**
- **Torque converter check valve (225)**
- **Torque converter check valve return spring (226)**
- **Lubrication control valve (245)**

1. Remove the 10 control valve body bolts.
   - 2 control valve body bolts (221)
   - 2 control valve body bolts (222)
   - 3 control valve body bolts (223)
   - 3 control valve body bolts (224)

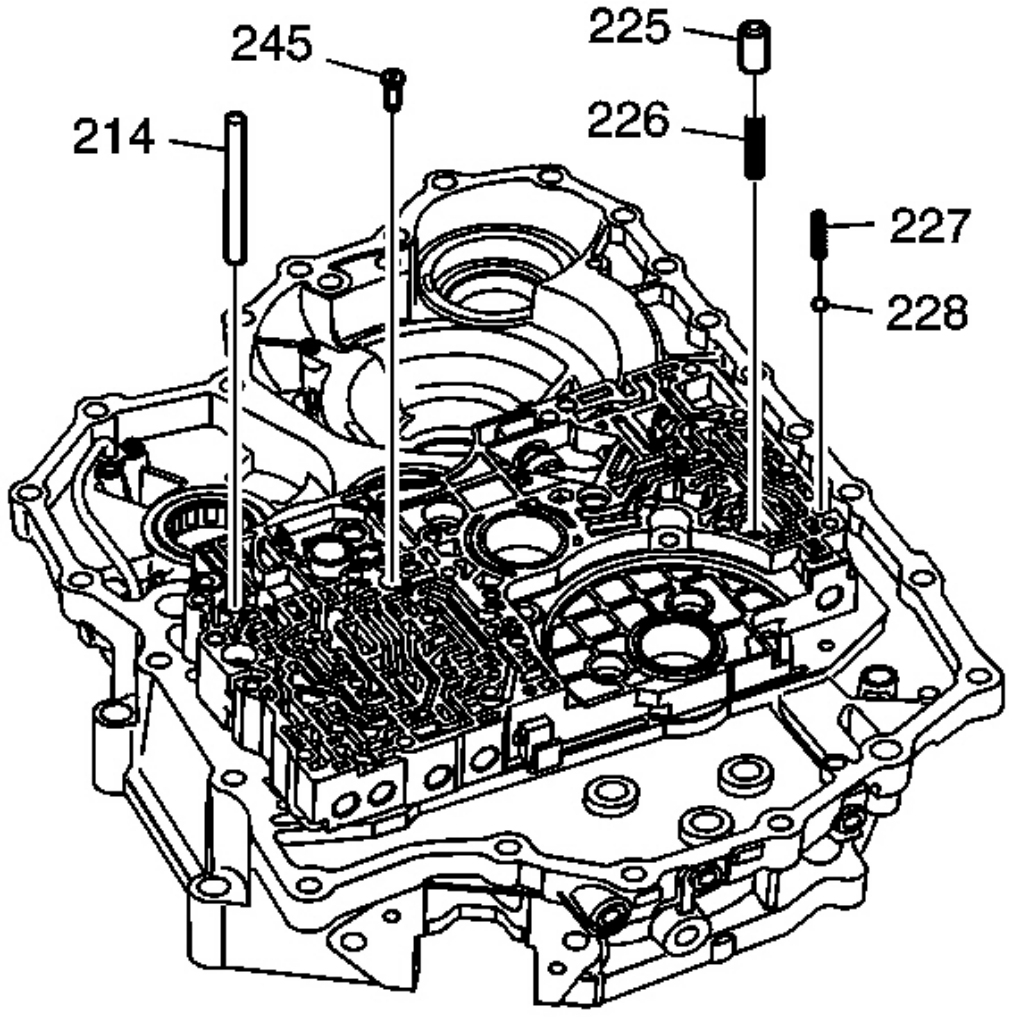

Fig. 144: Torque Converter Check Valve & Components
Courtesy of GENERAL MOTORS CORP.

2. Remove the torque converter check valve (225).
3. Remove the torque converter check valve spring (226).
4. Remove the oil cooler check ball return spring (227).
5. Remove the oil cooler check ball (228)
6. Remove the 4th clutch apply fluid pipe (214).
7. Remove the lubrication control valve (245)

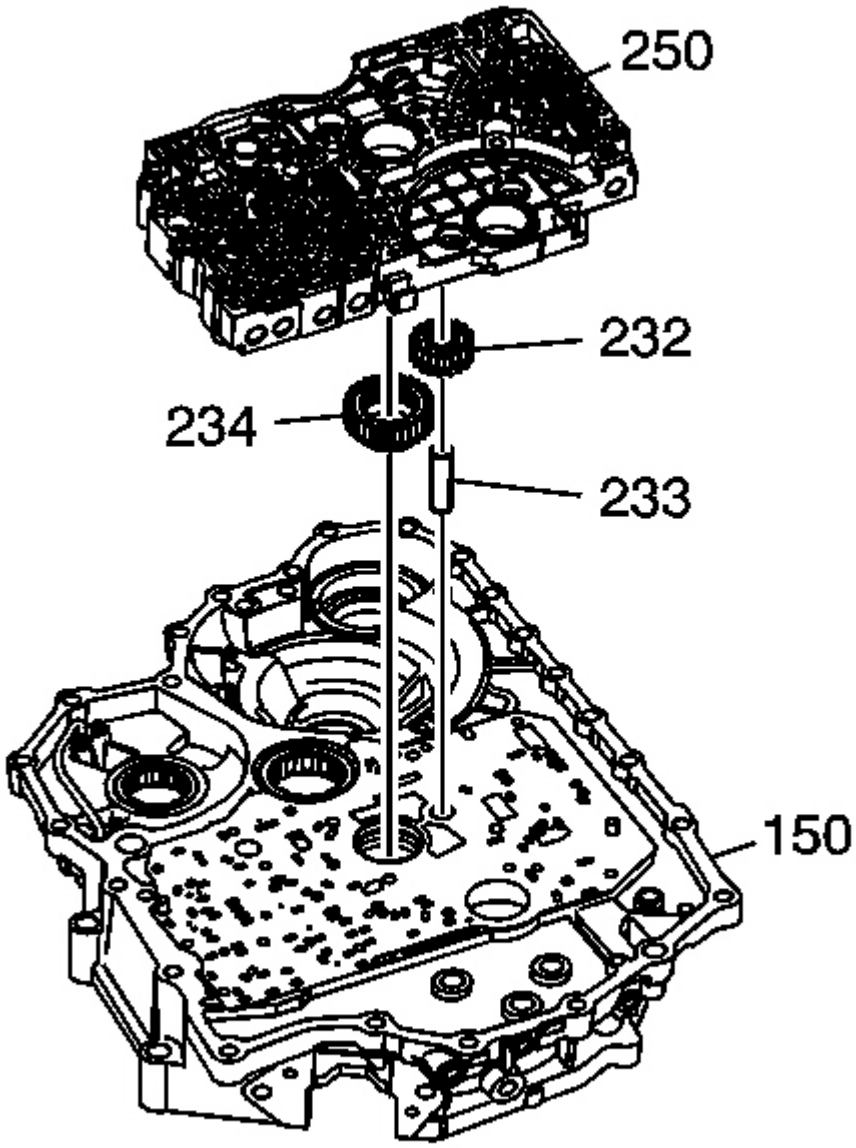

Fig. 145: Control Valve Body, Fluid Pump Driven Gear & Pin
Courtesy of GENERAL MOTORS CORP.

8. Lift straight up on the control valve body assembly (250) from the torque converter housing assembly (150).
9. Remove the fluid pump driven gear pin (233).

10. Remove the fluid pump driven gear (232).
11. Remove the fluid pump drive gear (234).

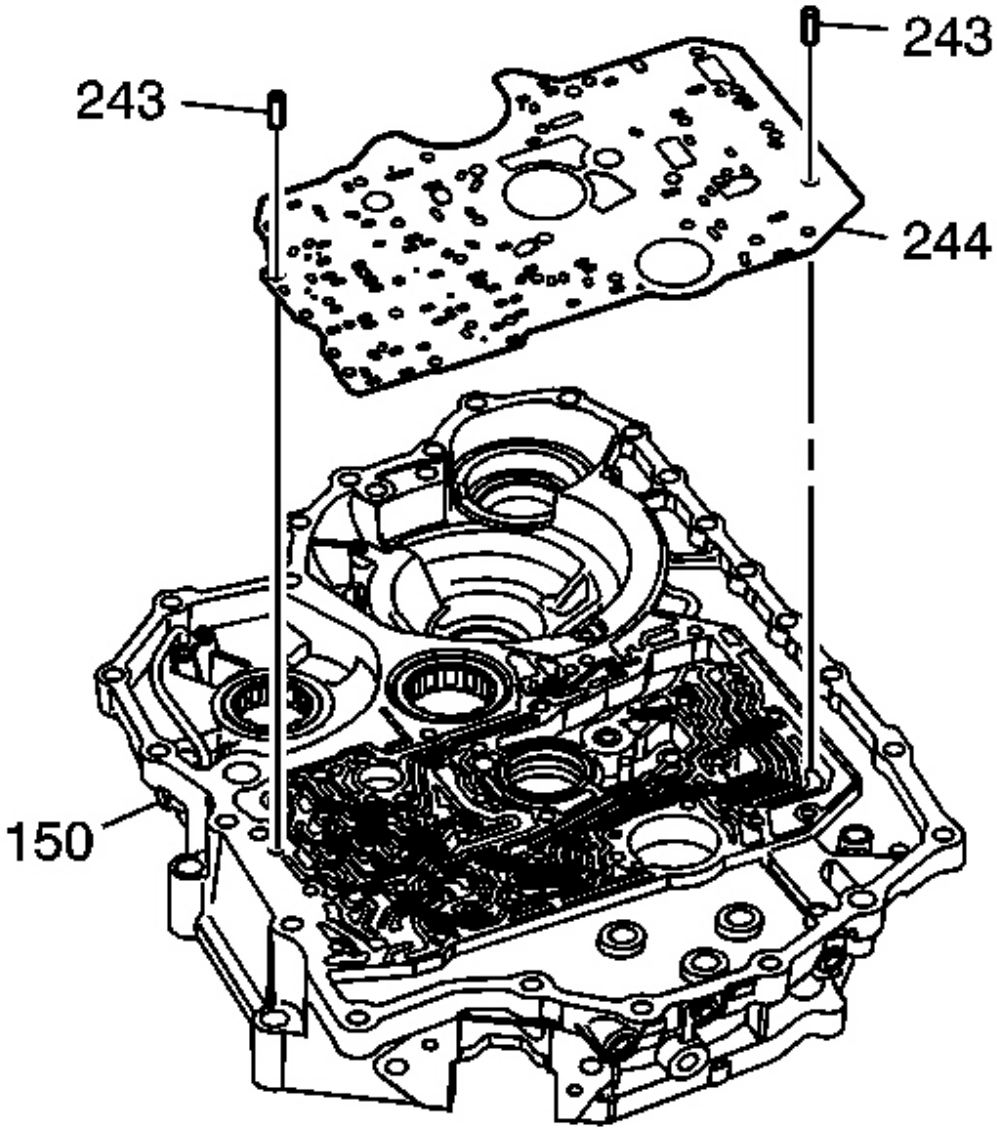

Fig. 146: Control Valve Body Spacer Plate & Locating Pins
Courtesy of GENERAL MOTORS CORP.

12. Remove the 2 control valve body spacer plate locating pins (243).

13. Remove the control valve body spacer plate (244).

TORQUE CONVERTER HOUSING DISASSEMBLE

Tools Required

- **J 26941** Bushing and Bearing Remover
- **J 29369-2** Bushing and Bearing Remover - 2-3 in
- **J 29369-1** Bushing and Bearing Remover
- **DT 46424** Bearing Puller
- **SA9133T** Axle Seal Puller
- **SA9133T-1** Axle Seal Puller Adapter

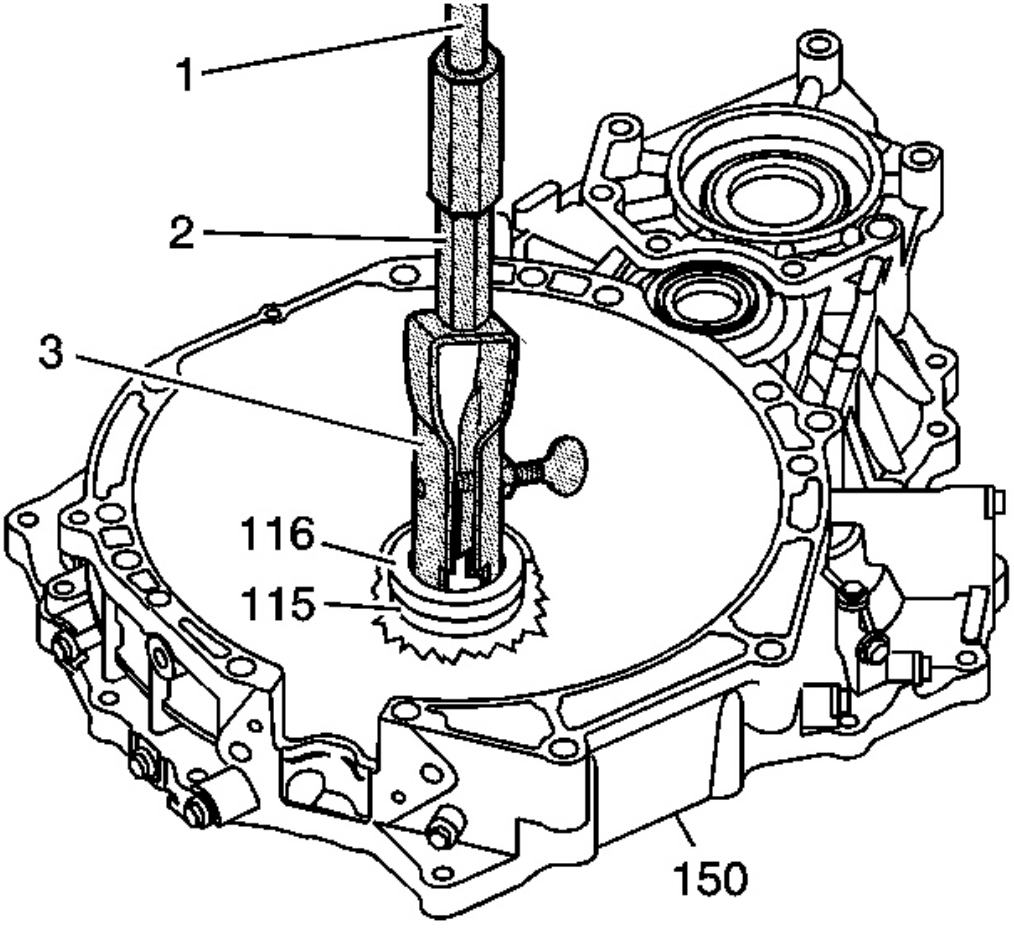

Fig. 147: J 26941, SA9133T, SA9133T-1 & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

1. Using the **J 26941** (3), **SA9133T** (1) and **SA9133T-1** (2), remove the torque converter seal (116) from the torque converter housing (150).

IMPORTANT: Ensure the jaws of the J 26941 do not catch on the other side of the bearing bore.

2. Using the **J 26941** (3),**SA9133T** (1) and **SA9133T-1** (2), remove the torque converter bearing (115) from the torque converter housing (150).

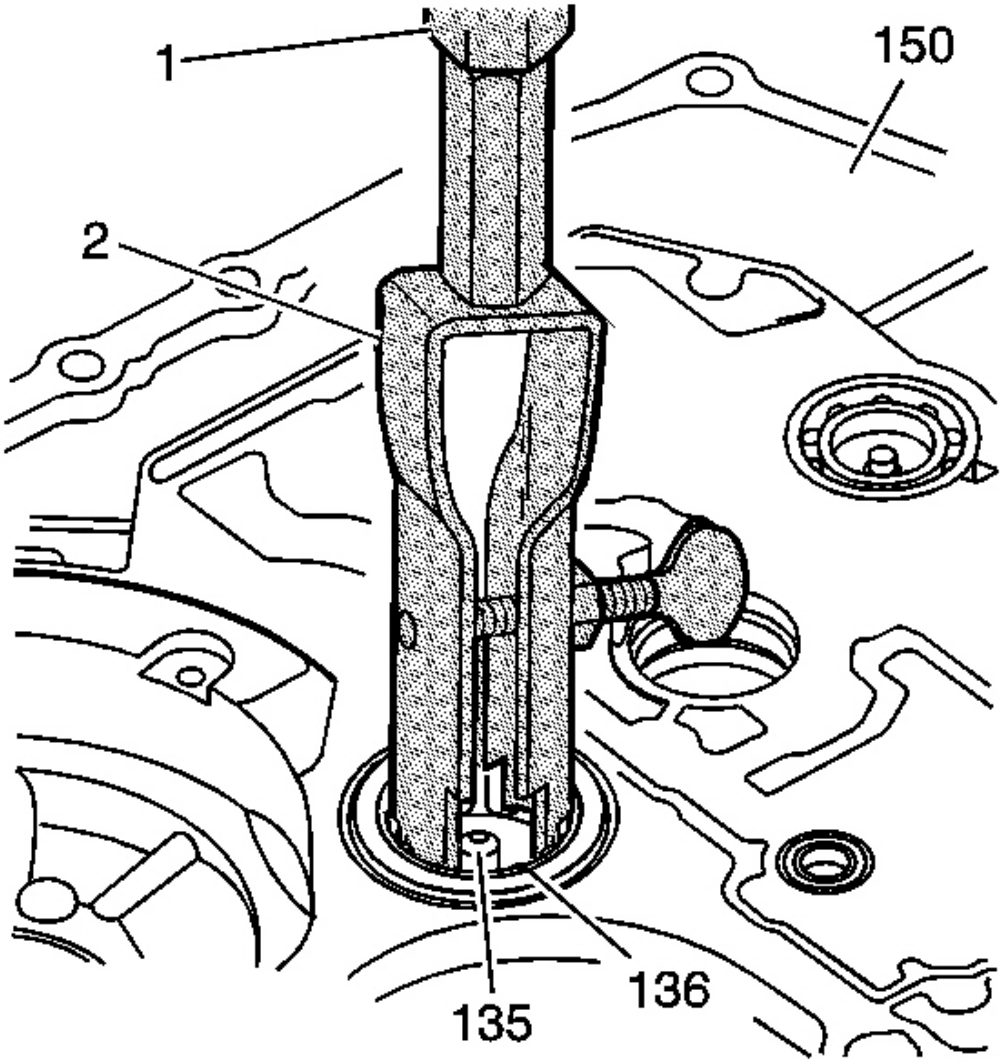

Fig. 148: J 26941, SA9133T, SA9133T-1, Output Shaft Front Bearing & Lube Feed Plate
Courtesy of GENERAL MOTORS CORP.

3. Inspect the output shaft front bearing (136) for wear or damage. Do not reuse the bearing after the bearing is removed. Replace the bearing if necessary.
4. Using the **J 26941** (2),**SA9133T** (1) and **SA9133T-1** , remove the output shaft front bearing (136) from the torque converter housing (150).
5. By hand, remove the output shaft lube feed plate (135) from the torque converter housing (150).

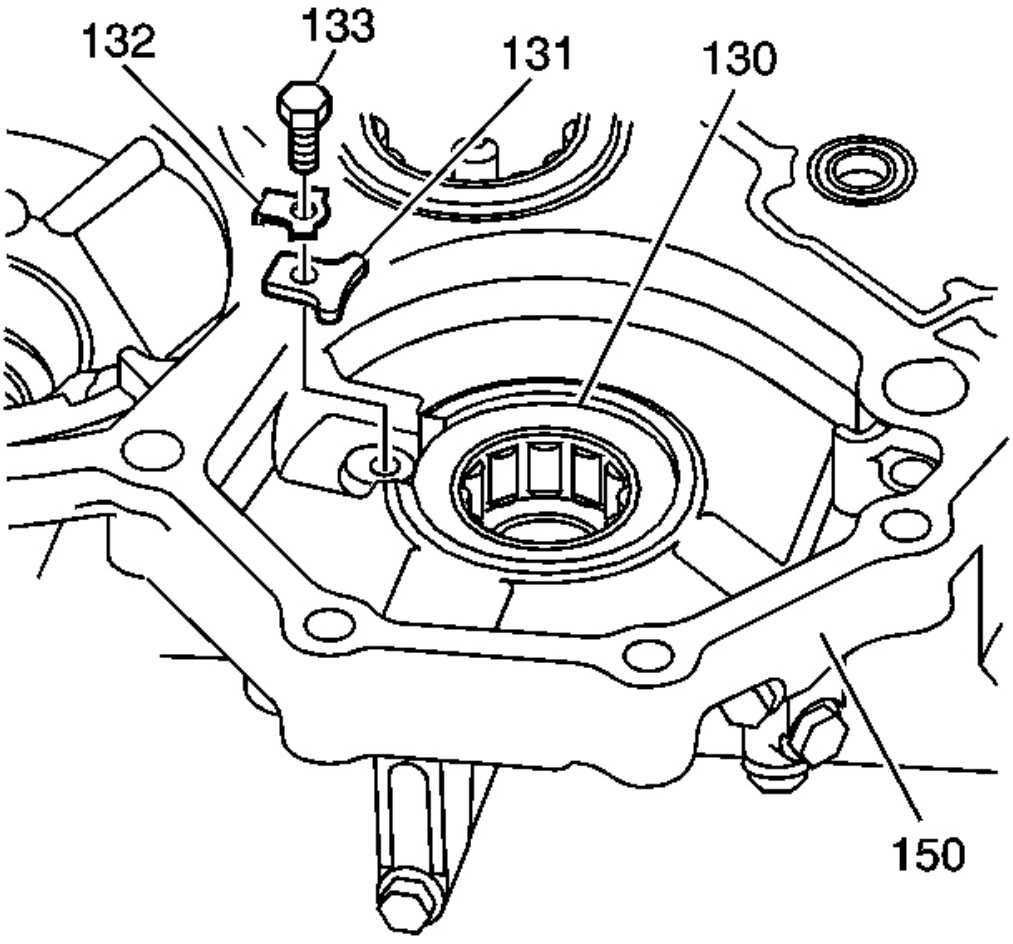

Fig. 149: 1st/2nd Clutch Shaft Intermediate Bearing Retainer Bolt & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

6. Remove the 1st/2nd clutch shaft intermediate bearing retainer bolt (133) from the torque converter housing (150).
7. Remove the intermediate bearing retainer (132) and the front bearing retainer washer (131).

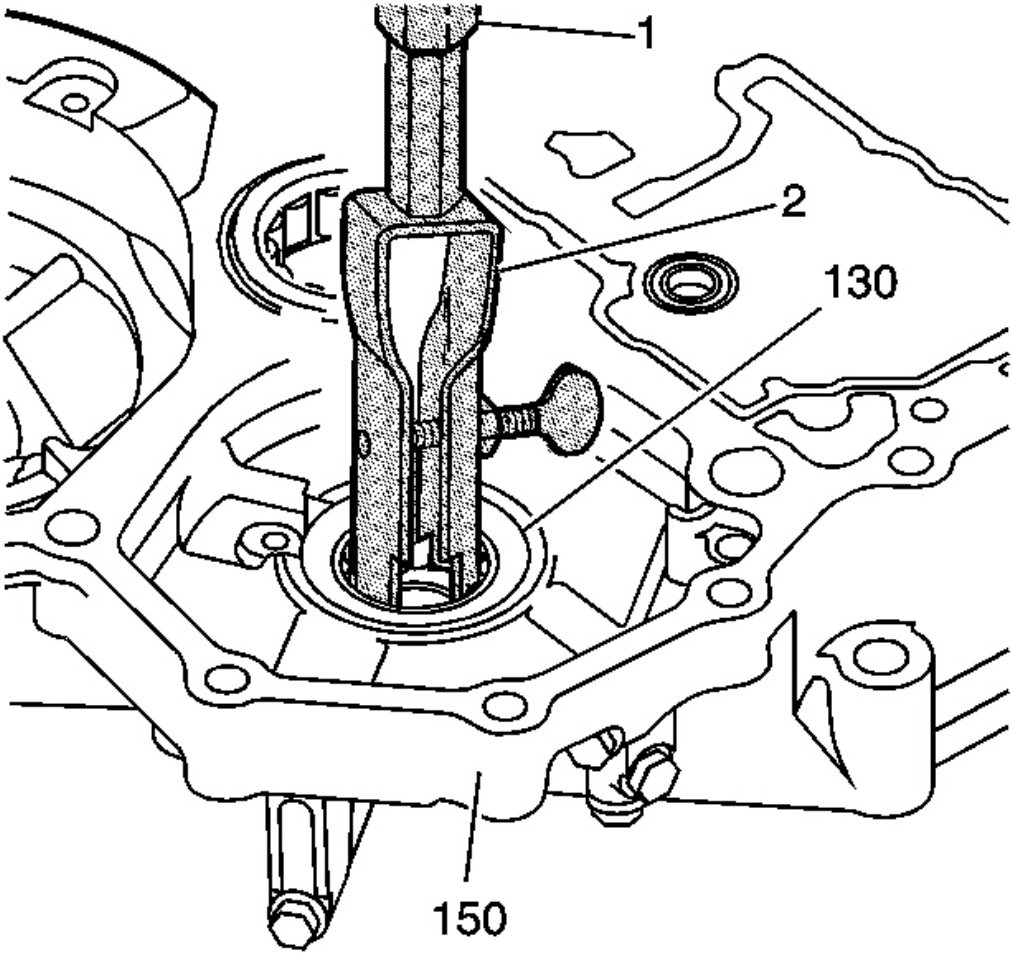

Fig. 150: Clutch Shaft Intermediate Bearing & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

8. Using the **J 29369-2** (2), **SA9133T** and **SA9133T-1** (1), remove the 1st/2nd clutch shaft intermediate bearing (130) from the torque converter housing (150).

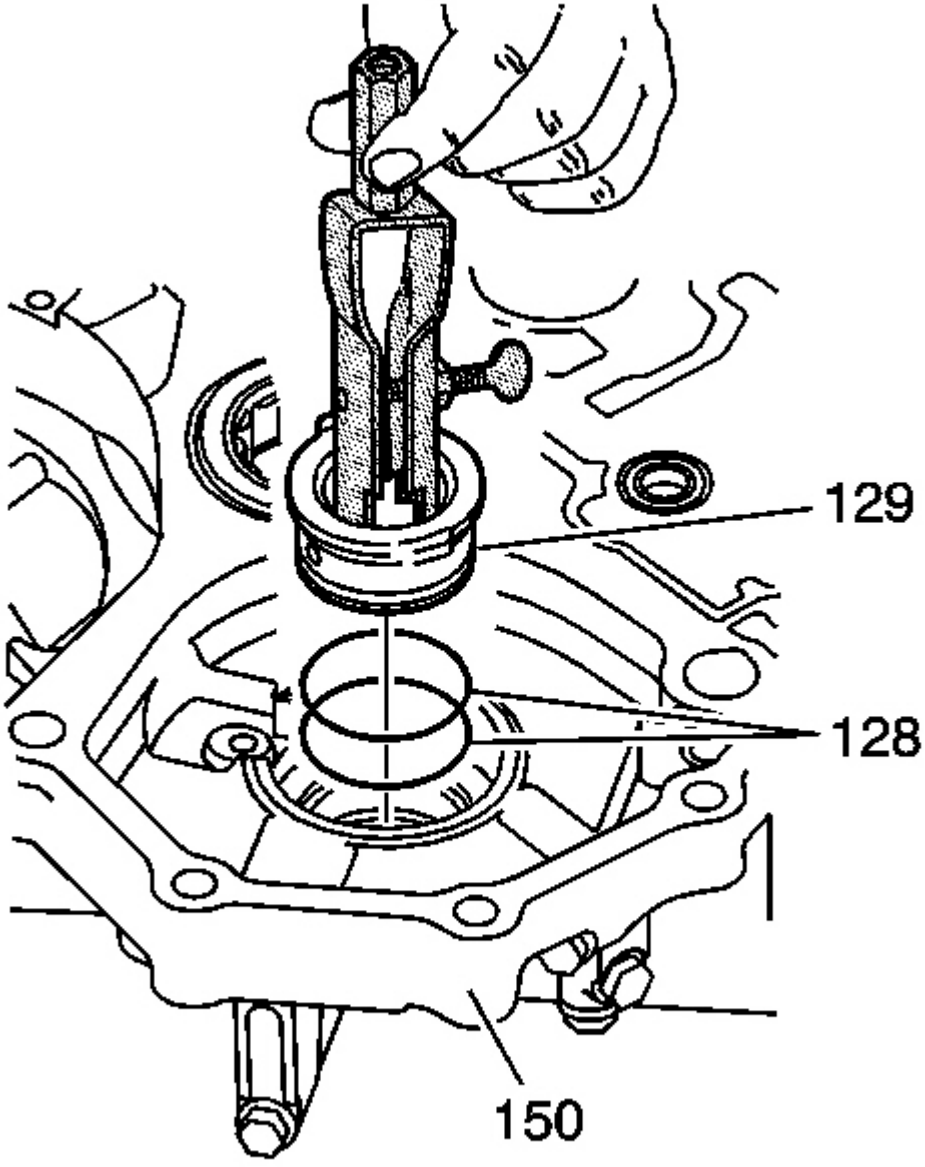

Fig. 151: Removing 1St/2Nd Clutch Shaft Lube Feed Collar From Torque Converter Housing Using J 29369-1
Courtesy of GENERAL MOTORS CORP.

9. Using the **J 29369-1** by hand, remove the 1st/2nd clutch shaft lube feed collar (129) from the torque converter housing (150).

10. Remove the 1st/2nd clutch shaft lube feed collar seals (128).

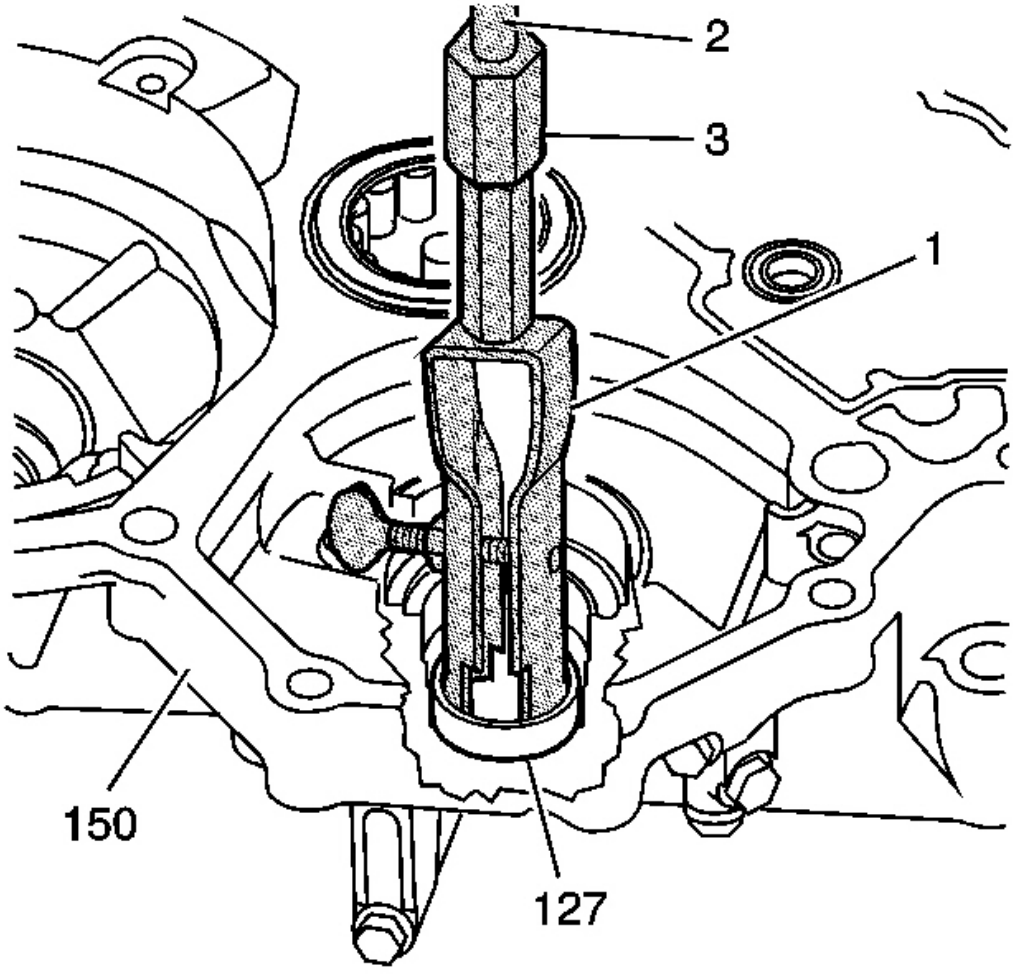

Fig. 152: J 26941, SA9133T, SA9133T-1 & 1st/2nd Clutch Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

11. Using the **J 29369-1** (1), **SA9133T** (2) and **SA9133T-1** (3), remove the 1st/2nd clutch shaft front bearing (127) from the torque converter housing (150).
12. Inspect the bearing for wear or damage. Replace the bearing if necessary.

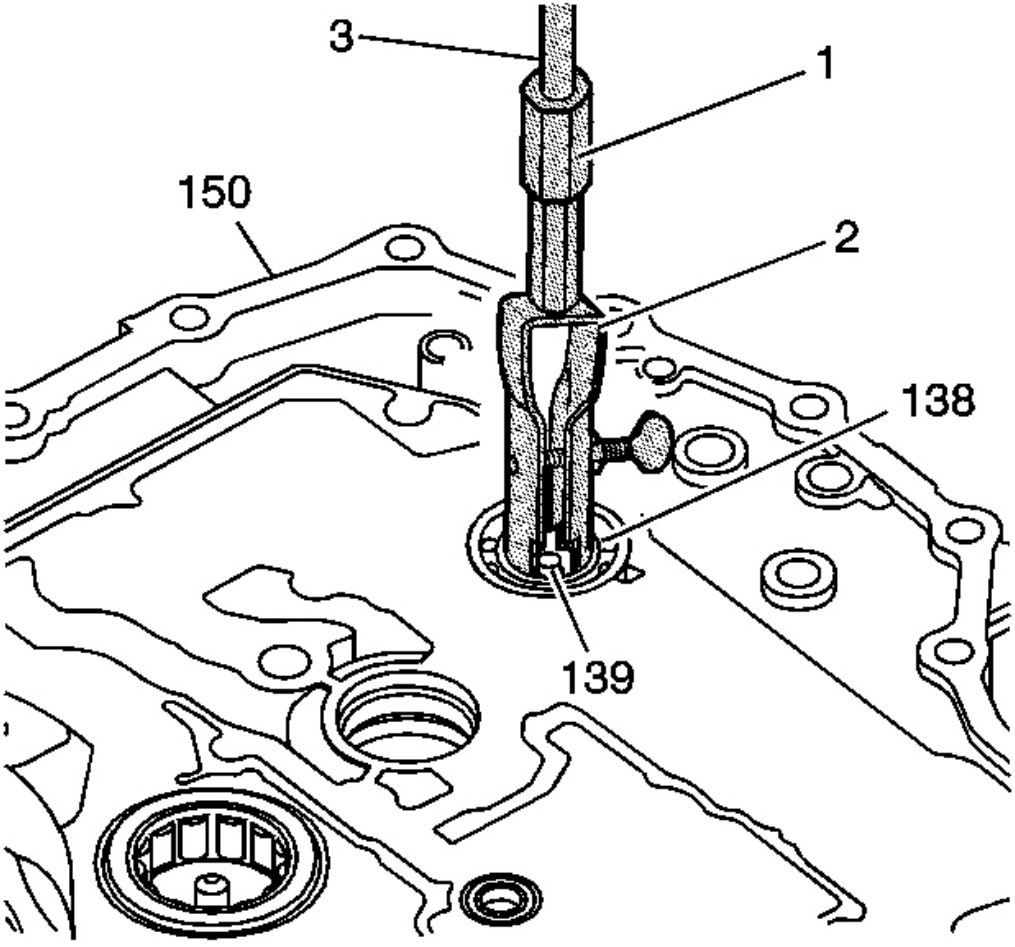

Fig. 153: J 26941, SA9133T, SA9133T-1 & 3rd Clutch Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

13. Using the **J 29369-1** (2), **SA9133T** (3) and **SA9133T-1** (1), remove the 3rd clutch shaft front bearing (138).
14. Remove the 3rd clutch shaft lube feed plate (139).
15. Inspect the bearing for wear or damage. Replace the bearing if necessary.

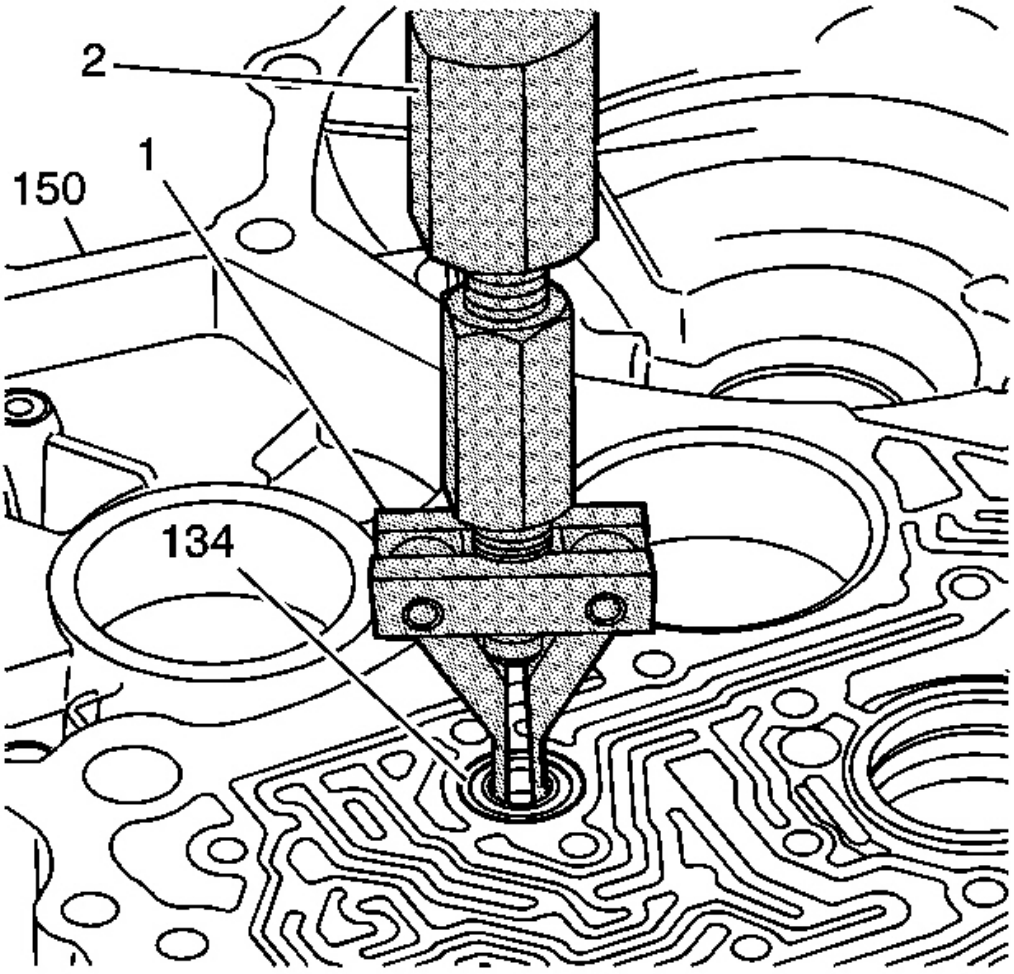

Fig. 154: DT 46424, SA9133T-1 & Park Pawl Actuator Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

16. Using the **DT 46424** (1) and **SA9133T-1** (2), remove the park pawl actuator shaft front bearing (134) from the transmission torque converter housing (150).
17. Inspect the bearing for wear or damage. Replace the bearing if necessary.

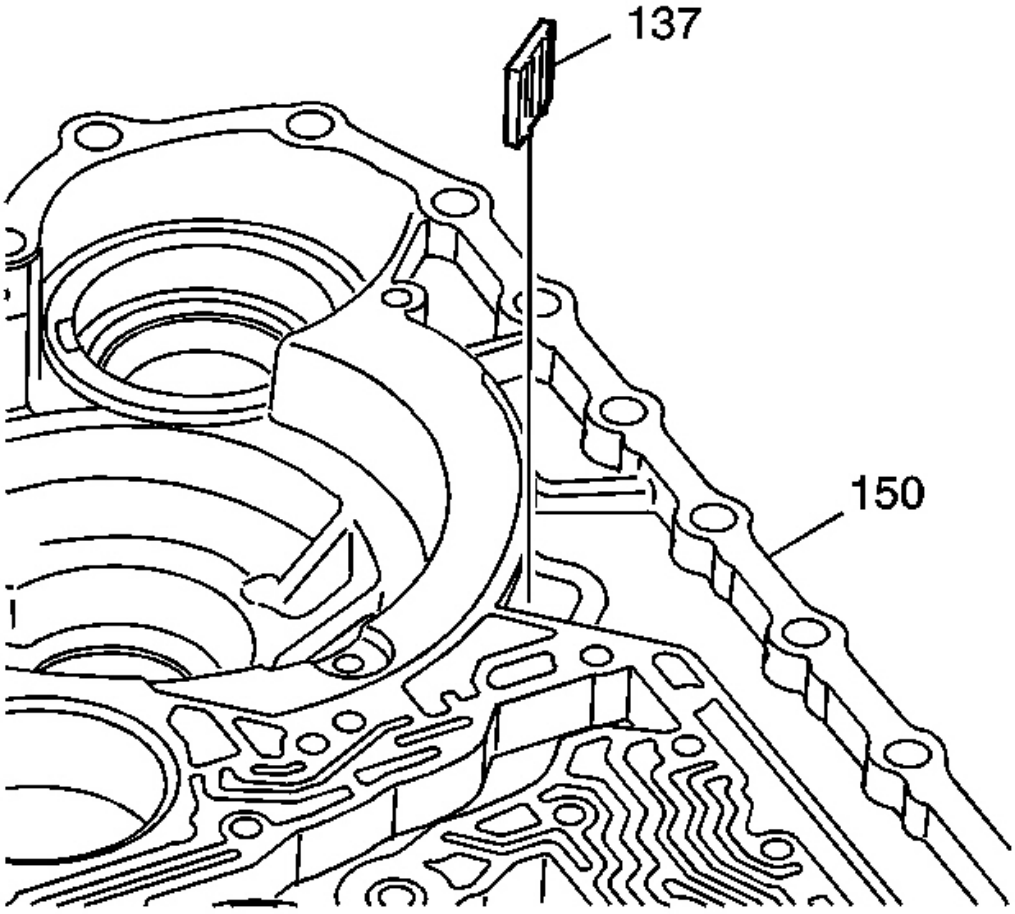

Fig. 155: Magnetic Chip Collector
Courtesy of GENERAL MOTORS CORP.

18. Remove the magnetic chip collector (137) from the torque converter housing (150).
19. Clean and inspect the magnet.

    If there is heavy build up on the magnet, determine the cause of this build-up and correct as needed.

20. If the chip collector is damaged, replace the complete assembly.

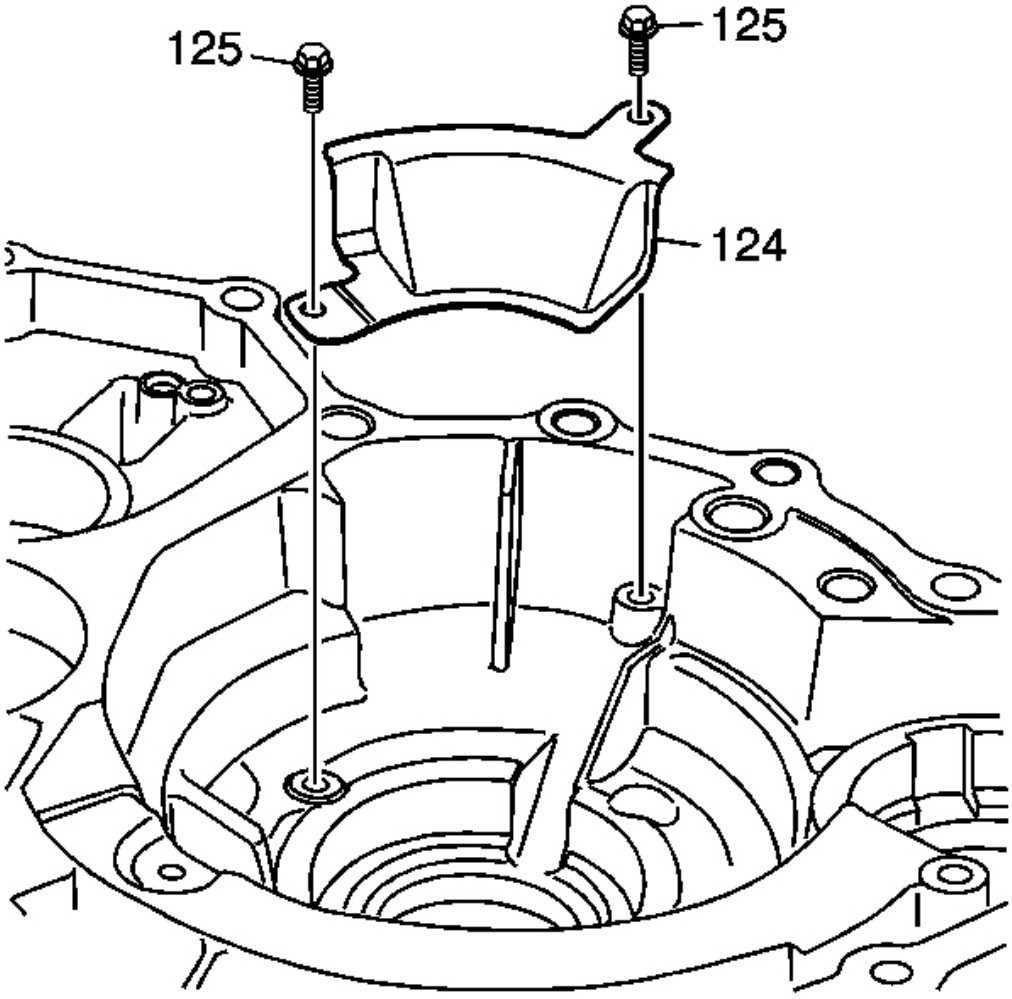

Fig. 156: Fluid Baffle & Bolts
Courtesy of GENERAL MOTORS CORP.

21. Remove the fluid baffle bolts (125).
22. Remove the fluid baffle (124).

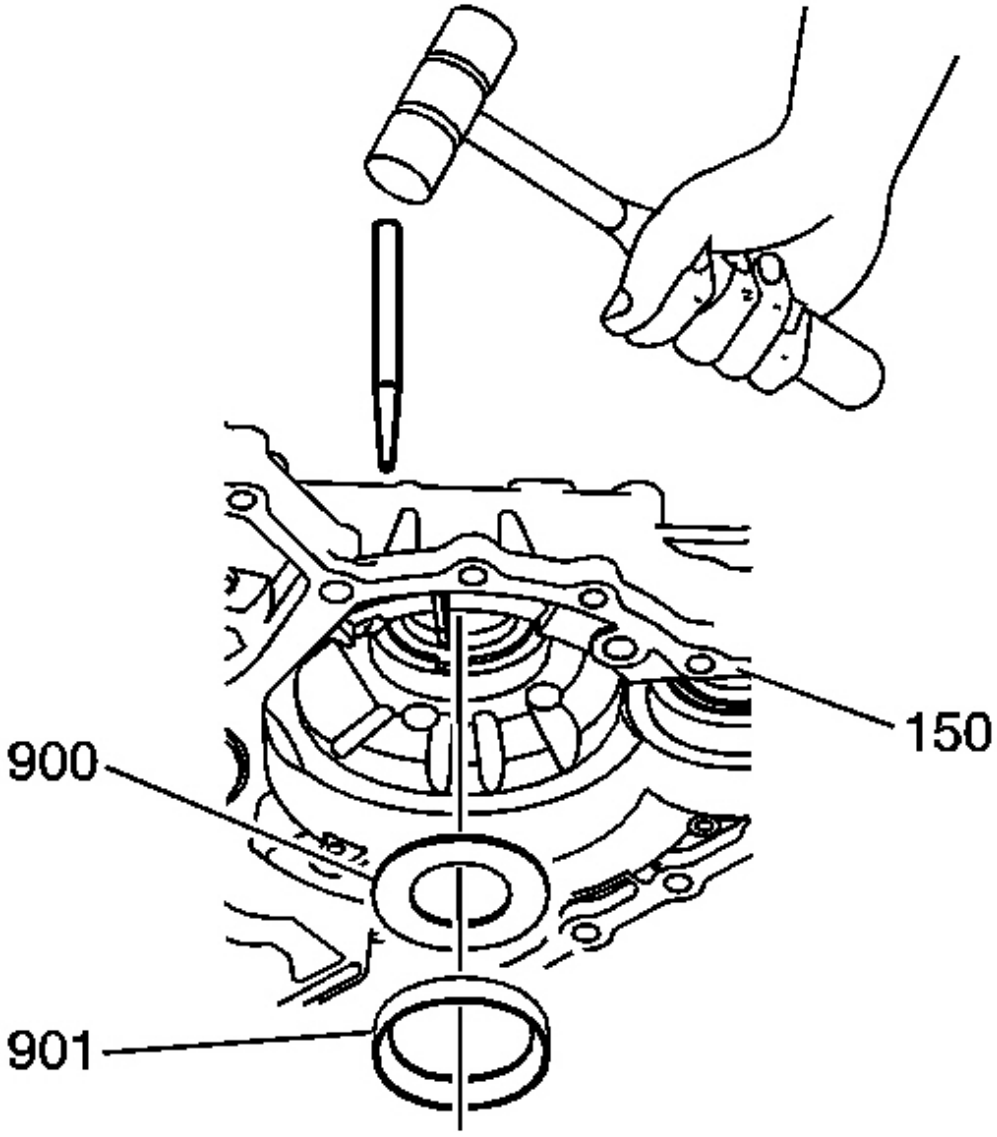

Fig. 157: Removing Front Differential Tapered Front Roller Bearing Race From Torque Converter Housing Using A Hammer & Punch
Courtesy of GENERAL MOTORS CORP.

23. Inspect the front differential bearing race (901) for damage or excessive wear.
24. Using a hammer and punch, remove the front differential tapered front roller bearing race (901) and (900) from the torque converter housing (150)

Tap lightly and evenly around the race, the race will slide out if kept even to the bore.

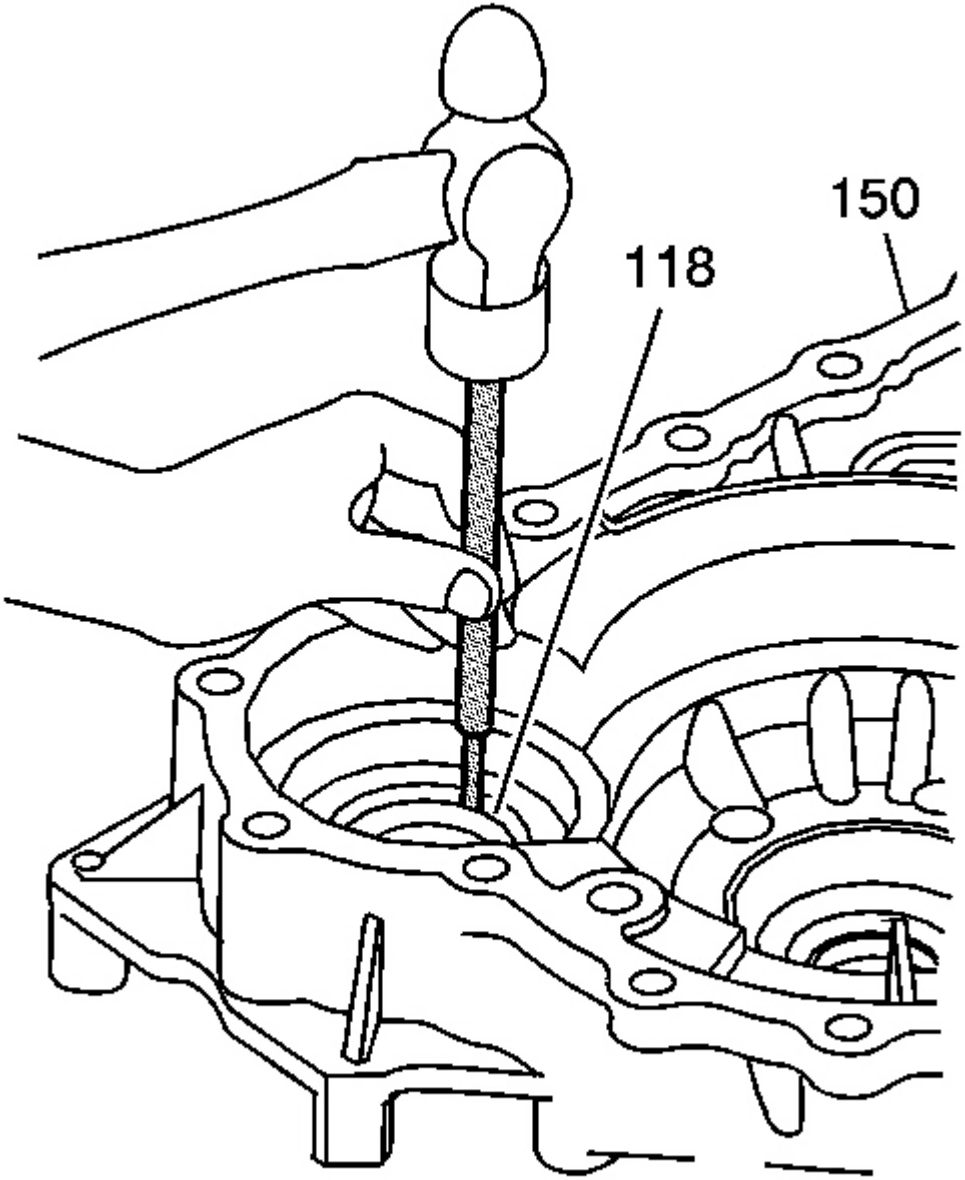

Fig. 158: Removing Transfer Case Input Shaft Seal From Torque Converter Housing Using A Hammer & Punch
Courtesy of GENERAL MOTORS CORP.

25. Using a hammer and punch, remove the transfer case input shaft seal (118) from the torque converter housing (150).

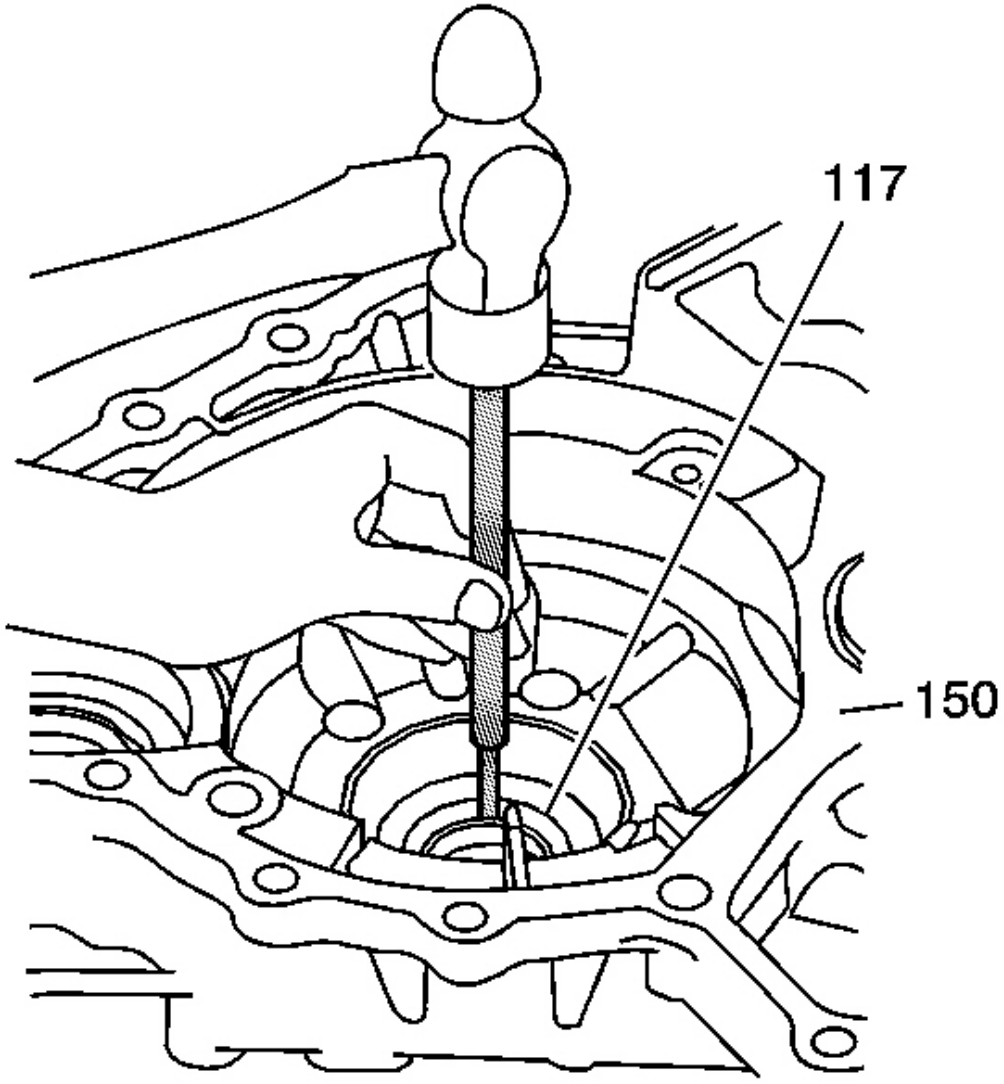

Fig. 159: Removing Front Wheel Drive Shaft Fluid Seal From Torque Converter Housing Using A Hammer & Punch
Courtesy of GENERAL MOTORS CORP.

26. Using a hammer and punch, remove the front wheel drive shaft fluid seal (117) from the torque converter housing (150).

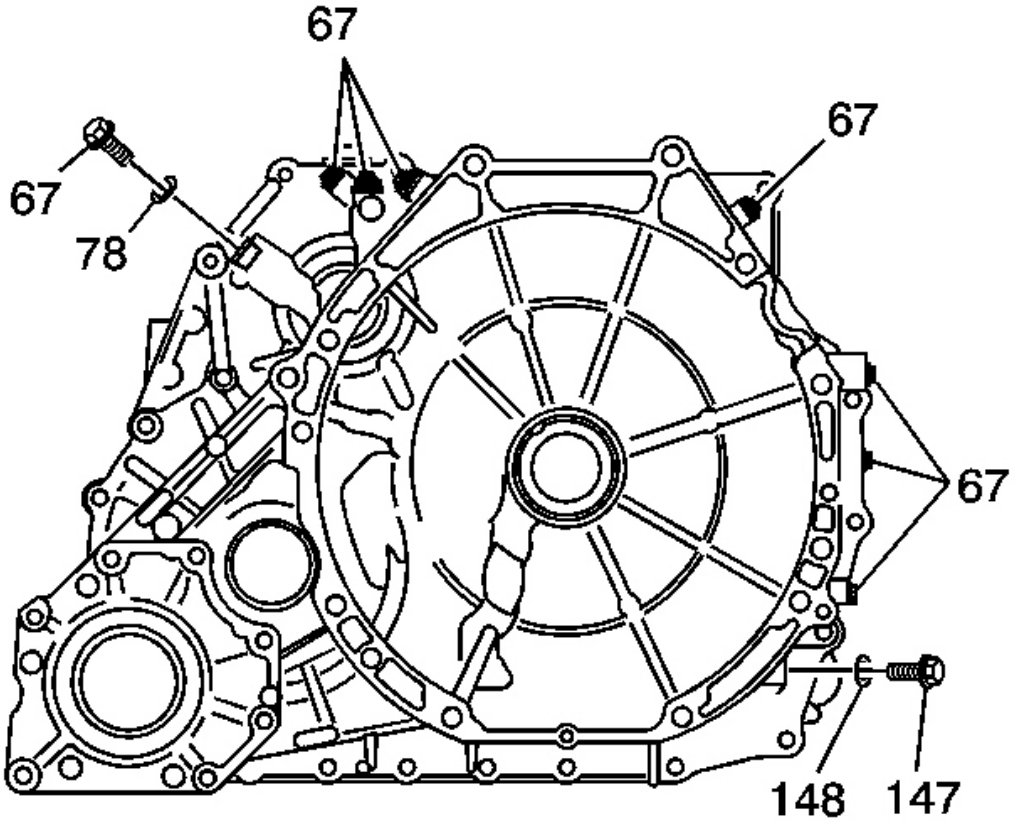

Fig. 160: Case Plug, Sealing Washer & Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS CORP.

27. Remove the case plug (147) with the sealing washer (148).
28. Remove the 8 fluid pressure test hole plugs (67) with sealing washer (78).

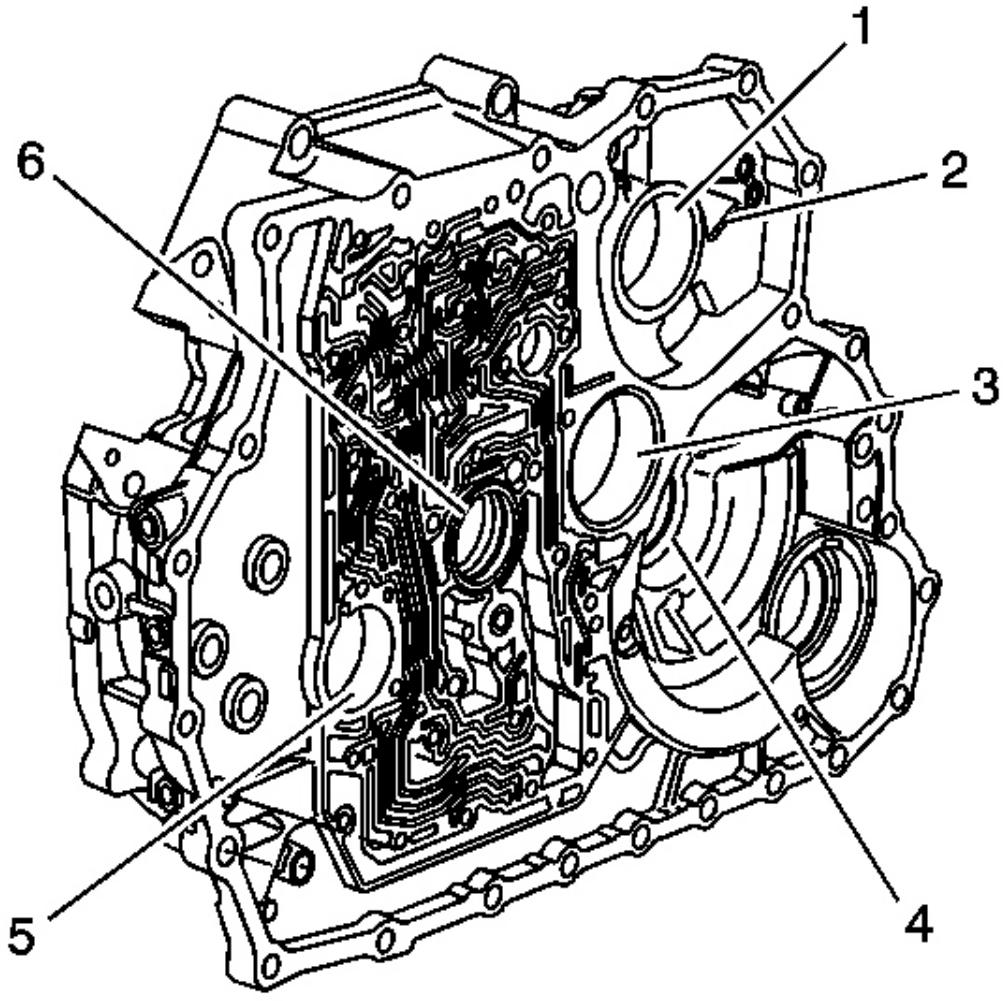

Fig. 161: Inspecting Bearing Bores For Damage
Courtesy of GENERAL MOTORS CORP.

29. Clean the torque converter housing in solvent and air dry. Ensure that all cleaning solvent is removed from the fluid passages.
30. Inspect the torque converter housing for being broken or cracked.
31. Inspect the control valve body mounting surface for damage.
32. Inspect the following bearing bores for cracks or a spun bearing:
    - 1st/2nd clutch shaft front bearing (1)
    - 1st/2nd clutch shaft intermediate bearing (2)

- Output shaft front bearing (3)
- Front differential bearing race (4)
- 3rd clutch shaft front bearing (5)
- Torque converter bearing (6)

33. Replace the torque converter housing if any of the above conditions are found.
34. Inspect the sealing surfaces for damage.
35. Repair small scratches or nicks with a soft stone.
36. Inspect the transmission to torque converter housing mounting surface for damage.
37. Inspect the case threaded bolt holes for damage.
38. Repair any damaged threads.

TORQUE CONVERTER HOUSING ASSEMBLE

Tools Required

- **DT 46412** Driver
- **DT 46413** Driver
- **DT 46414** Driver
- **DT 46415** Driver
- **DT 46516** Driver
- **DT 46417** Driver
- **DT 46428** Driver
- **DT 46429** Oil Seal Driver
- **EN 46342** Driver Handle

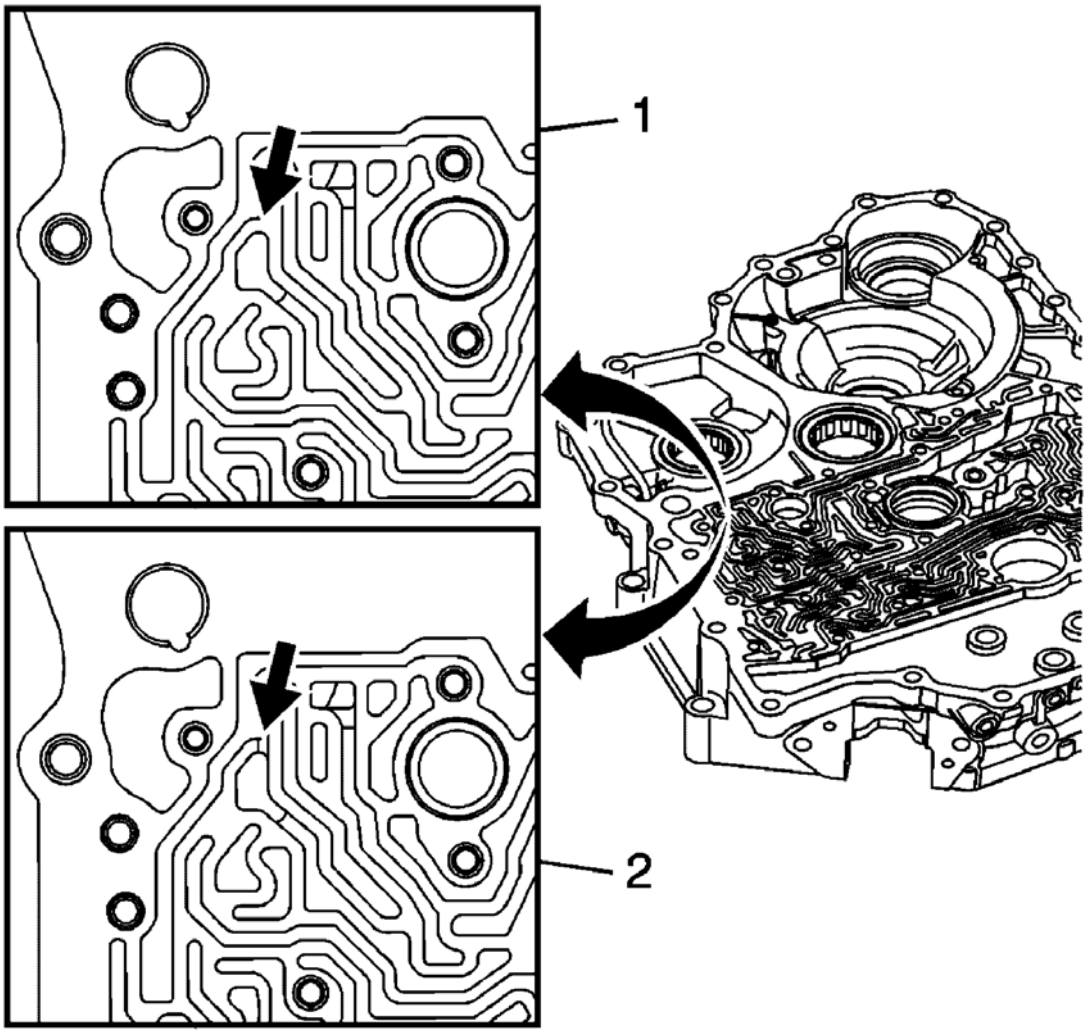

Fig. 162: Inspecting The Torque Converter Housing For Correct Lubrication Passage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the transaxle has a failure of the coast clutch sprag assembly or any of the below listed parts, a service kit is available. Replace all of the parts of the kit to prevent loss of adequate lubrication. The kit includes the following parts:

- **Torque converter housing**
- **1st/2nd clutch shaft**
- **3rd clutch shaft**
- **1st drive gear**
- **Coast clutch sprag assembly**

1. Inspect the torque converter housing for the correct lubrication passage. The 1st design (1) will not have the small lubrication passage and the 2nd design (2) will have the passage.

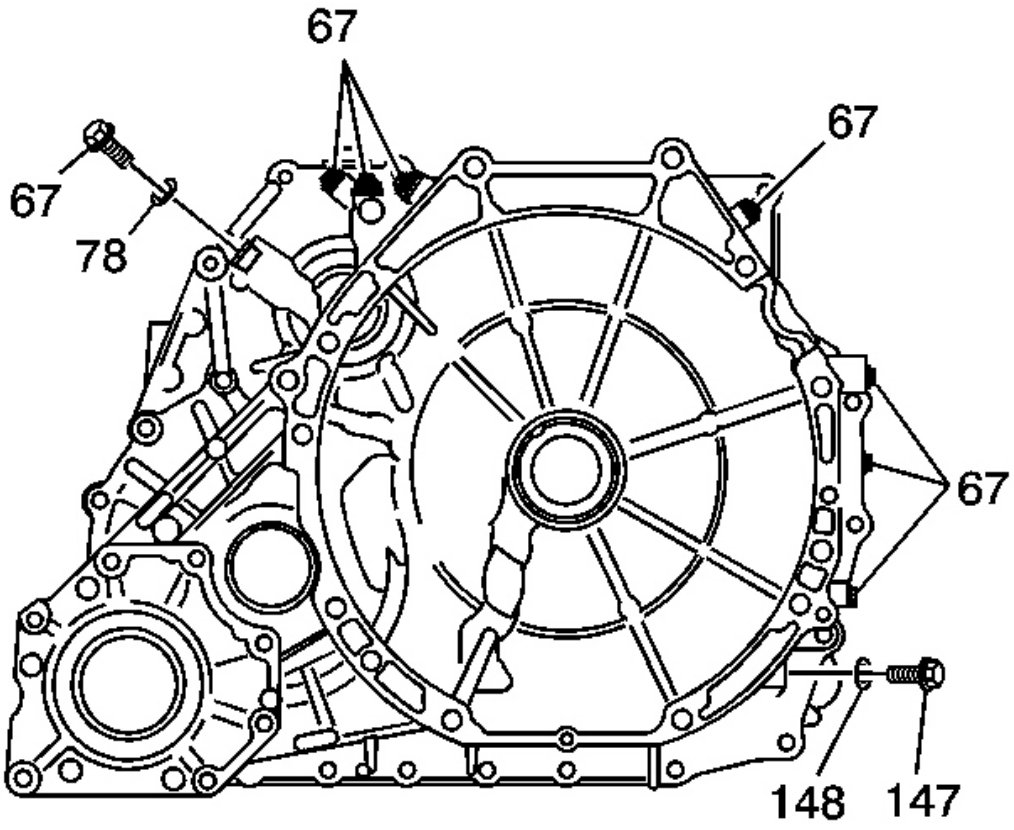

Fig. 163: Case Plug, Sealing Washer & Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the 8.8 mm fluid pressure test hole plugs (67) with new sealing washers (78).

   Tighten: Tighten the test hole plugs to 18 N.m (13 lb ft).

3. Install the 10 mm case plug (147) with the sealing washer (148).

   Tighten: Tighten the plug to 26 N.m (20 lb ft).

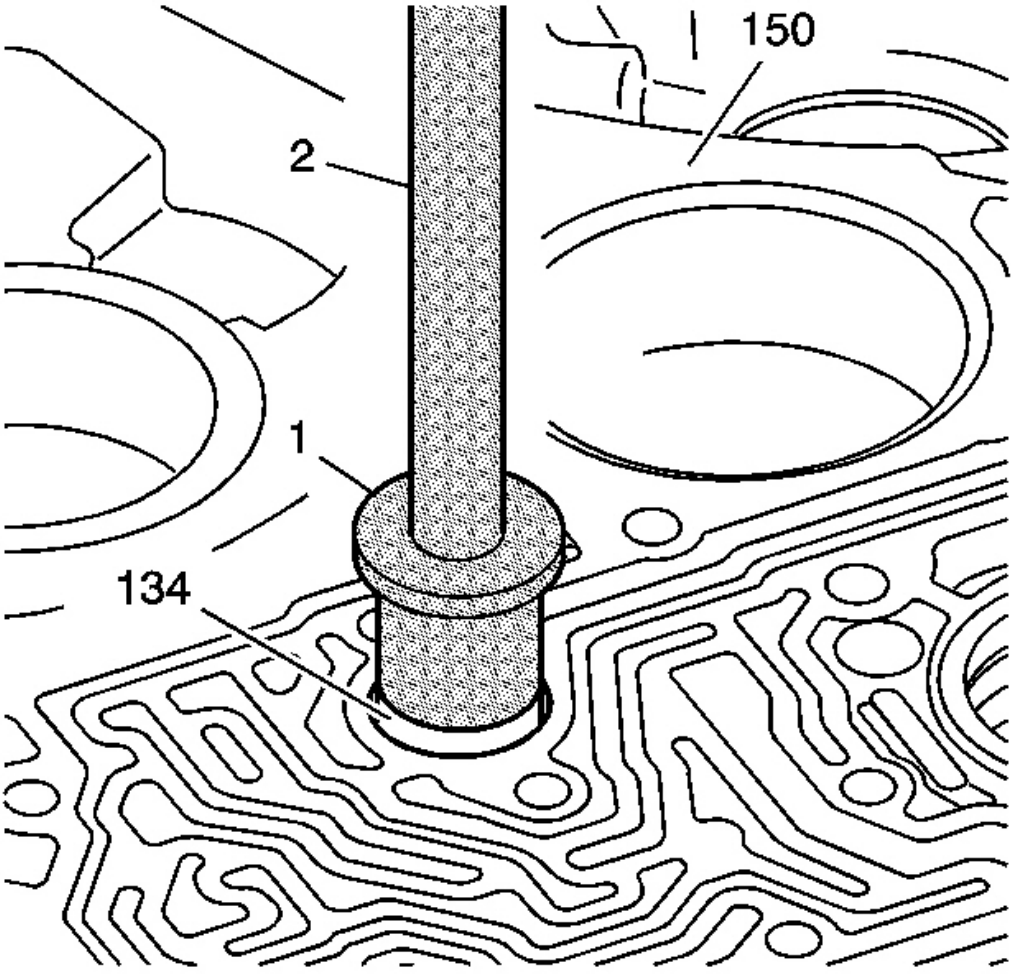

Fig. 164: DT 46516, EN 46342 & Park Pawl Actuator Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

4. Using the 25 mm side of the **DT 46516** (1) and **EN 46342** (2), install the 12 mm x 24 mm x 6 mm park pawl actuator shaft front bearing (134) until flush in the transmission torque converter housing (150).

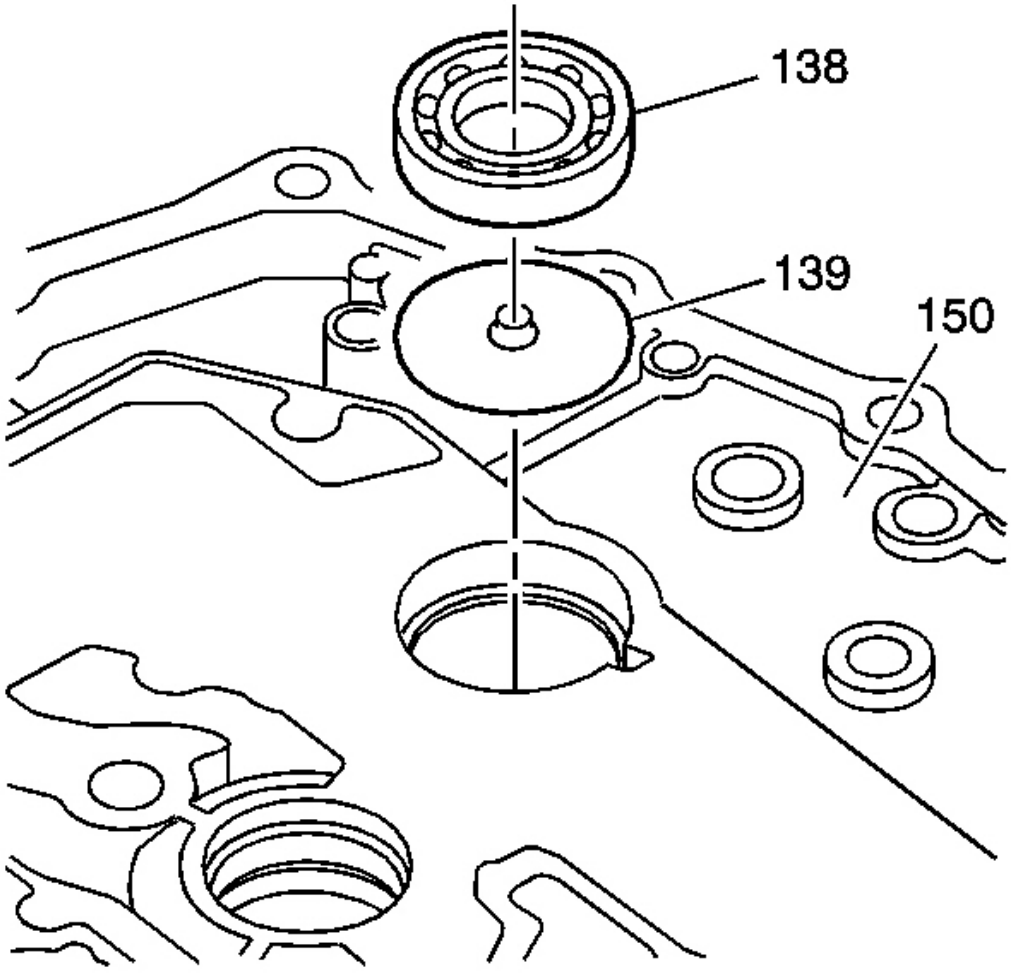

Fig. 165: 3rd Clutch Shaft Lube Feed Plate & 3rd Clutch Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

5. Install the 3rd clutch shaft lube feed plate (139) into the torque converter housing (150).
6. Install the 28 mm x 52 mm x 12.8 mm 3rd clutch shaft front bearing (138) into the torque converter housing (150).

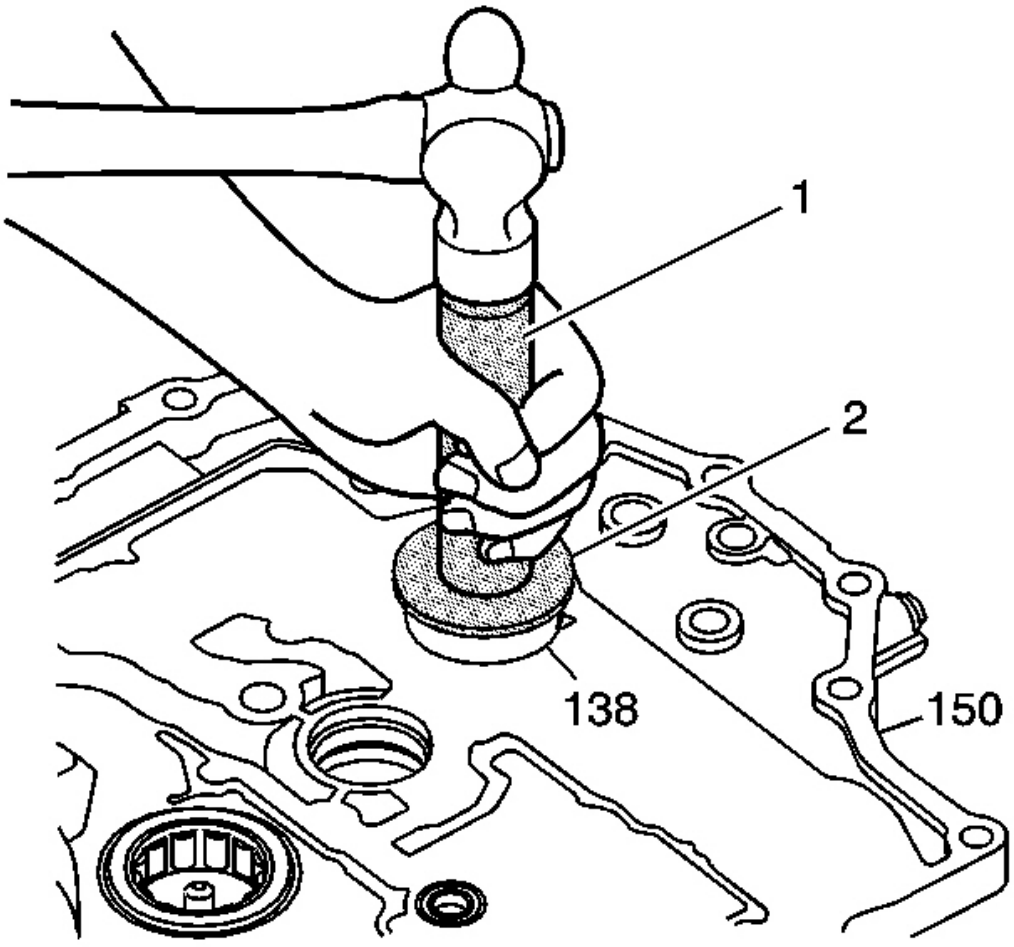

Fig. 166: Installing The 3rd Clutch Shaft Front Bearing Using DT 46412 & EN 46342
Courtesy of GENERAL MOTORS CORP.

7. Using the 52 mm side of **DT 46412** (2) and **EN 46342** (1), install the 3rd clutch shaft front bearing (138) until it bottoms in the torque converter housing (150).

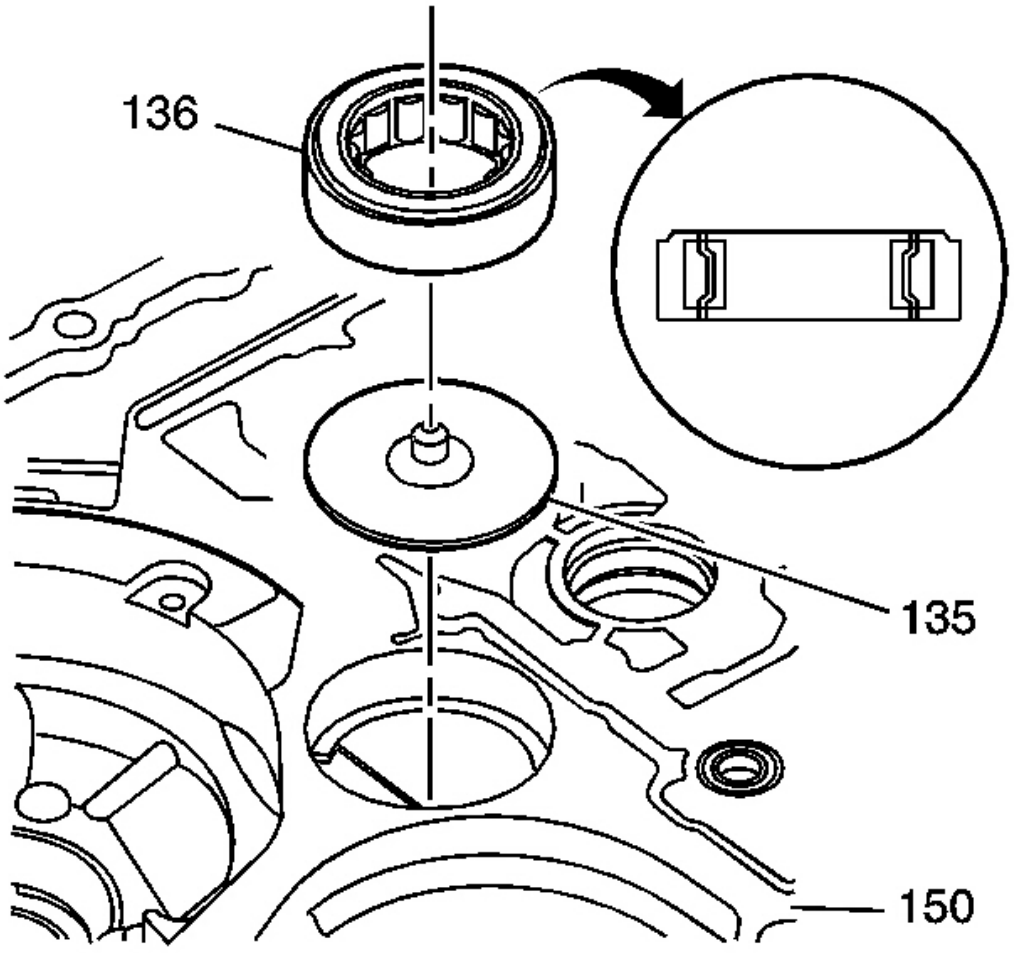

Fig. 167: Output Shaft Lube Feed Plate & Output Shaft Front Bearing
Courtesy of GENERAL MOTORS CORP.

8. Install the output shaft lube feed plate (135) into the torque converter housing (150).
9. Install the 40.5 mm x 74 mm x 21 mm output shaft front bearing (136) in the direction as shown in the insert.

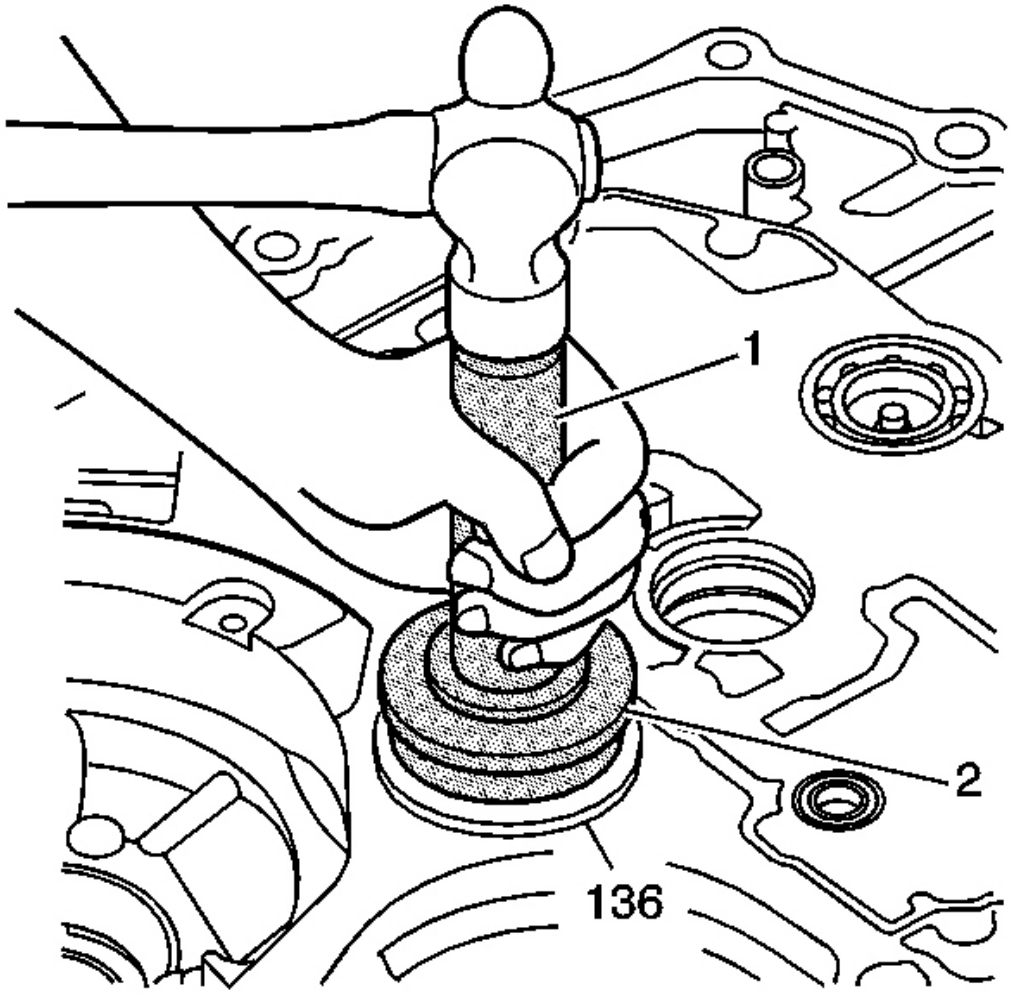

Fig. 168: Installing The Output Shaft Front Bearing Using DT 46412 & EN 46342
Courtesy of GENERAL MOTORS CORP.

10. Using the 72 mm side of **DT 46415** (2) and **EN 46342** (1), install the output shaft front bearing (136) until it bottoms out in the torque converter housing.

    When the bearing is fully seated the bearing will be slightly above the housing surface due to the design of the bearing.

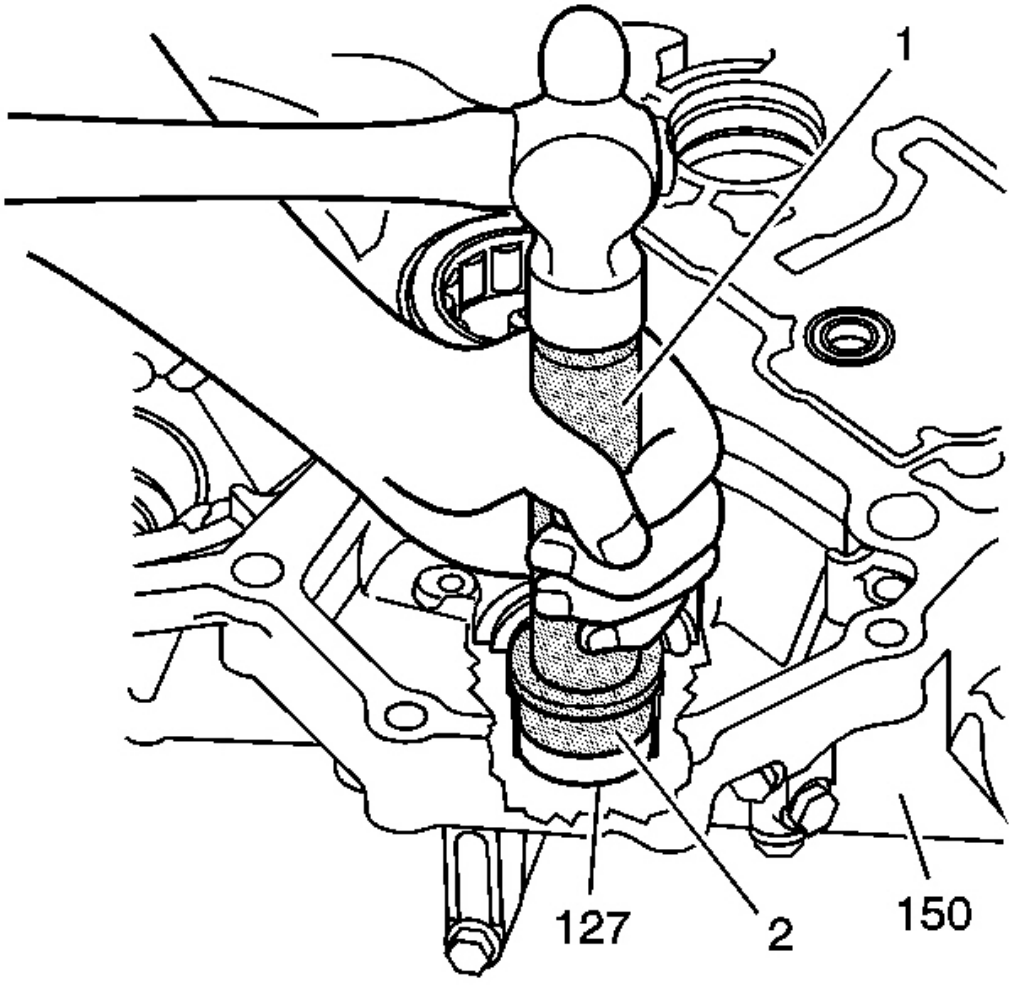

Fig. 169: Installing The 1st/2nd Clutch Shaft Front Bearing Using DT 46412 & EN 46342
Courtesy of GENERAL MOTORS CORP.

11. Using the 37 mm side of the **DT 46413** (2) and **EN 46342** (1), install the 29 mm x 39 mm x 9.5 mm 1st/2nd clutch shaft front bearing (127) until it bottoms out into the torque converter housing (150).

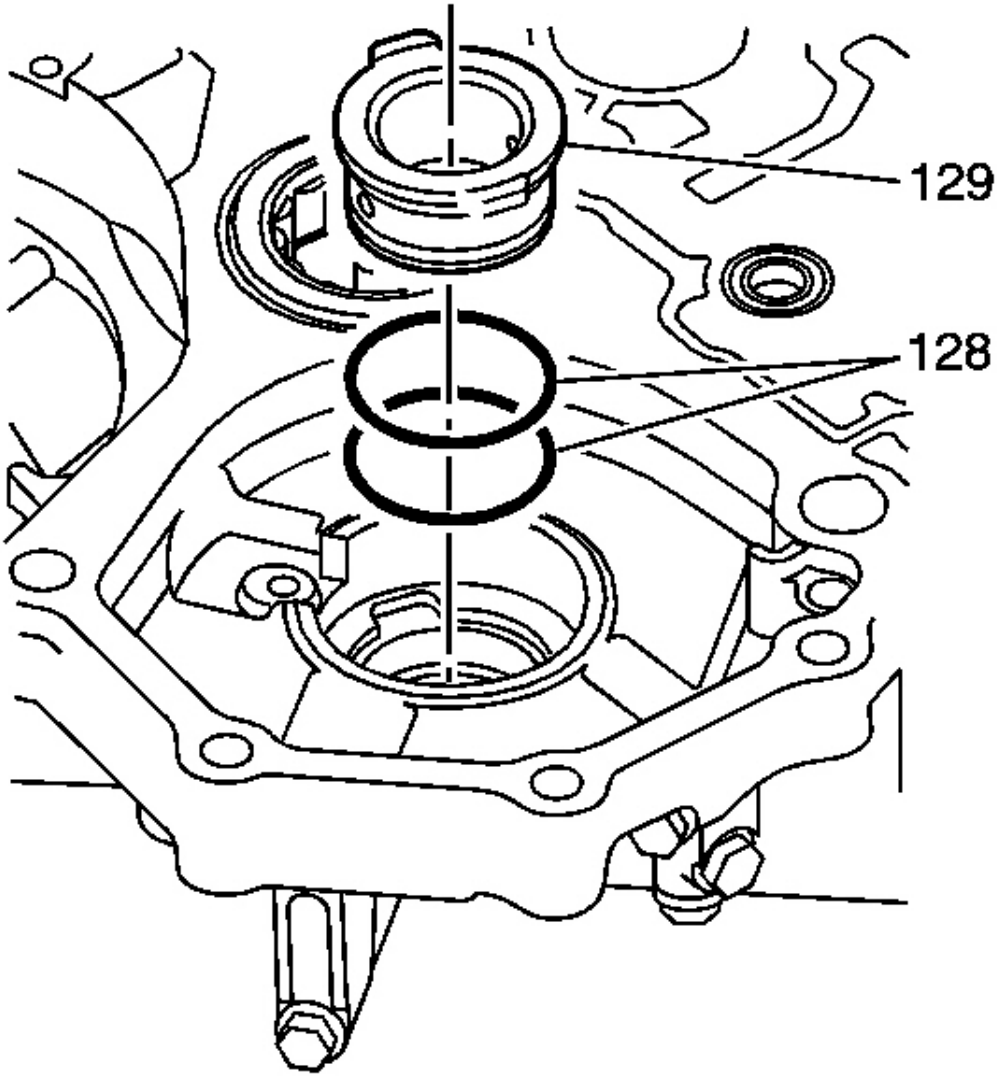

Fig. 170: 1st/2nd Clutch Shaft Lube Feed Collar & O-Ring Seals
Courtesy of GENERAL MOTORS CORP.

12. Install both 1st/2nd clutch shaft lube feed collar O-ring seals (128) on the 1st/2nd clutch shaft lube feed collar (129). Lubricate the O-ring seals with transmission fluid.

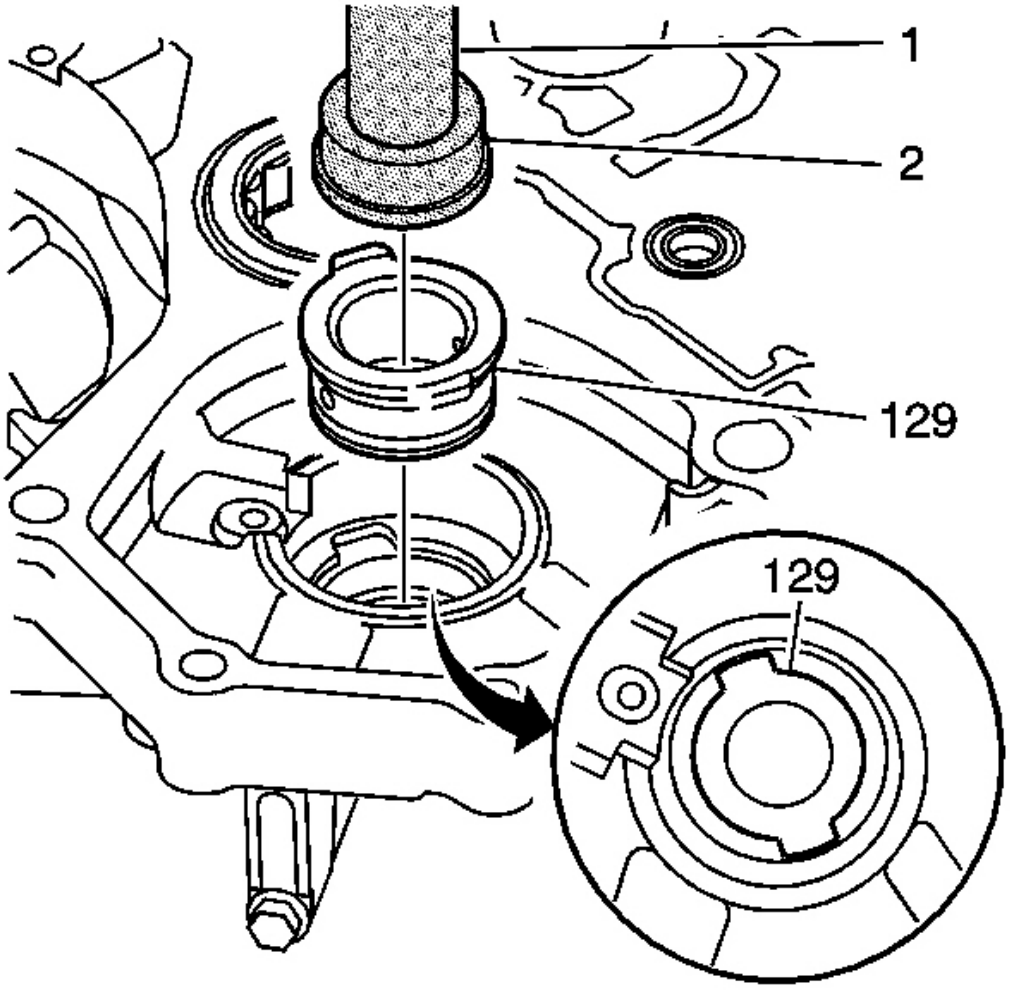

Fig. 171: Lube Feed Collar, DT 46412 & EN 46342
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure the lube feed collar is fully seated into the torque converter housing. Ensure there is no damage to the O-ring seals during installation.

13. Install the lube feed collar (129) into the torque converter housing bore with the aid of the 40 mm side of **DT 46413** (2) and **EN 46342** (1) as shown.

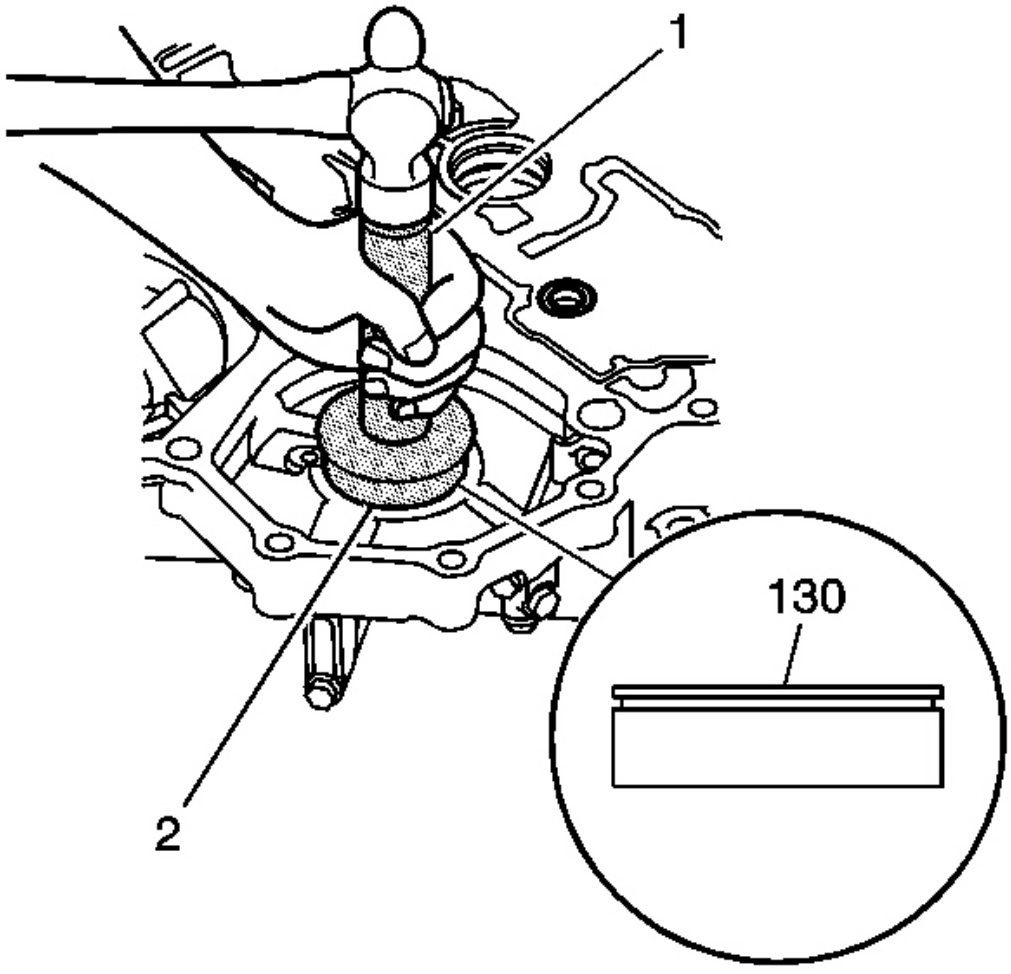

Fig. 172: Installing The 1st/2nd Clutch Shaft Intermediate Bearing Using DT 46412 & EN 46342
Courtesy of GENERAL MOTORS CORP.

14. Using the 62 mm side of **DT 46414** (2) and **EN 46342** (1), install the 32 mm x 63 mm x 19 mm 1st/2nd clutch shaft intermediate bearing (130) with the groove for the lock tab facing up.

    The 1st/2nd clutch shaft intermediate bearing is properly installed into the torque converter housing when the following conditions are met:

    - Install the bearing until the lock tab groove is aligned to the lock tab surface.
    - When the lock tab is flush to the mounting surface, the lock tab will slide into the bearing groove.

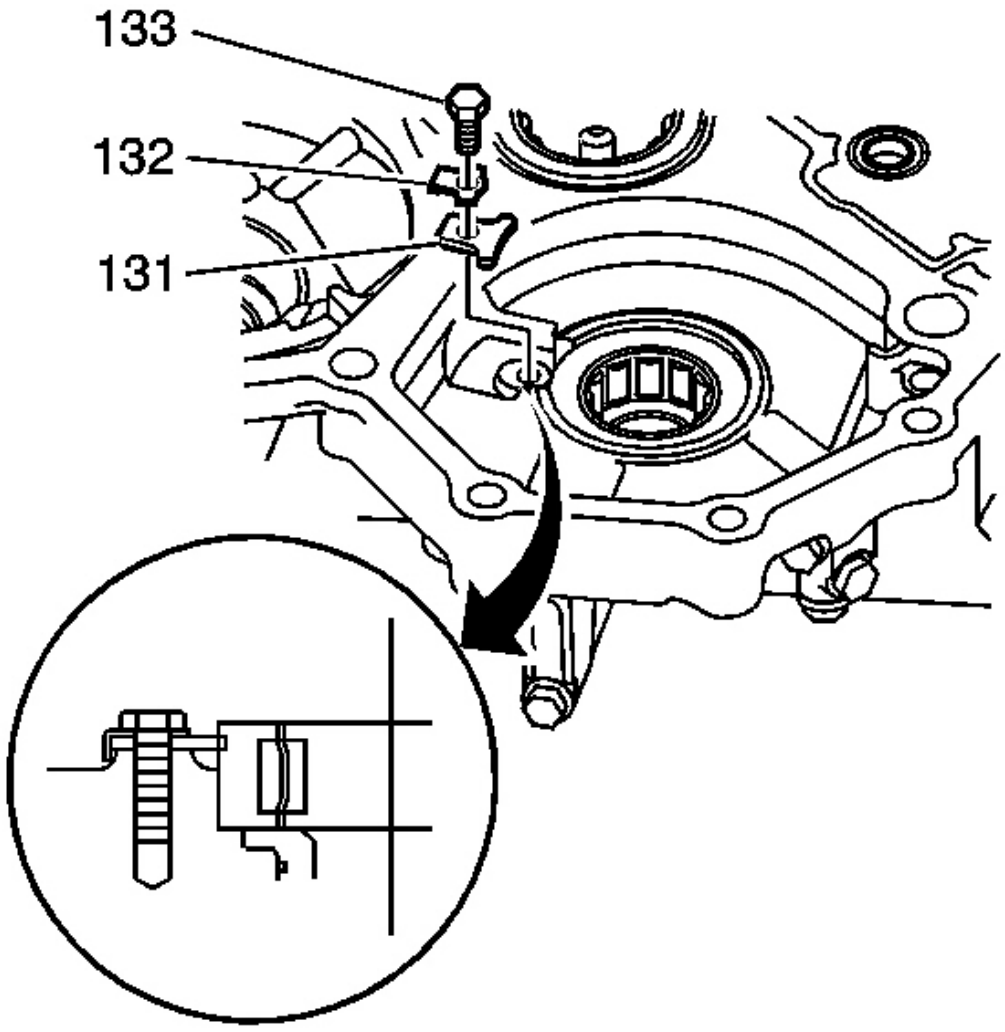

Fig. 173: 1st/2nd Clutch Shaft Intermediate Bearing Retainer & Bolt
Courtesy of GENERAL MOTORS CORP.

15. Install the 1st/2nd clutch shaft intermediate bearing retainer lock tab retainer (132).
16. Install the 1st/2nd clutch shaft intermediate bearing retainer M6 x 1.0 mm x 20 mm bolt (133).

    Tighten: Tighten the bolt to 12 N.m (106 lb in)

17. Secure the bolt by bending the lock tab against the bolt head.

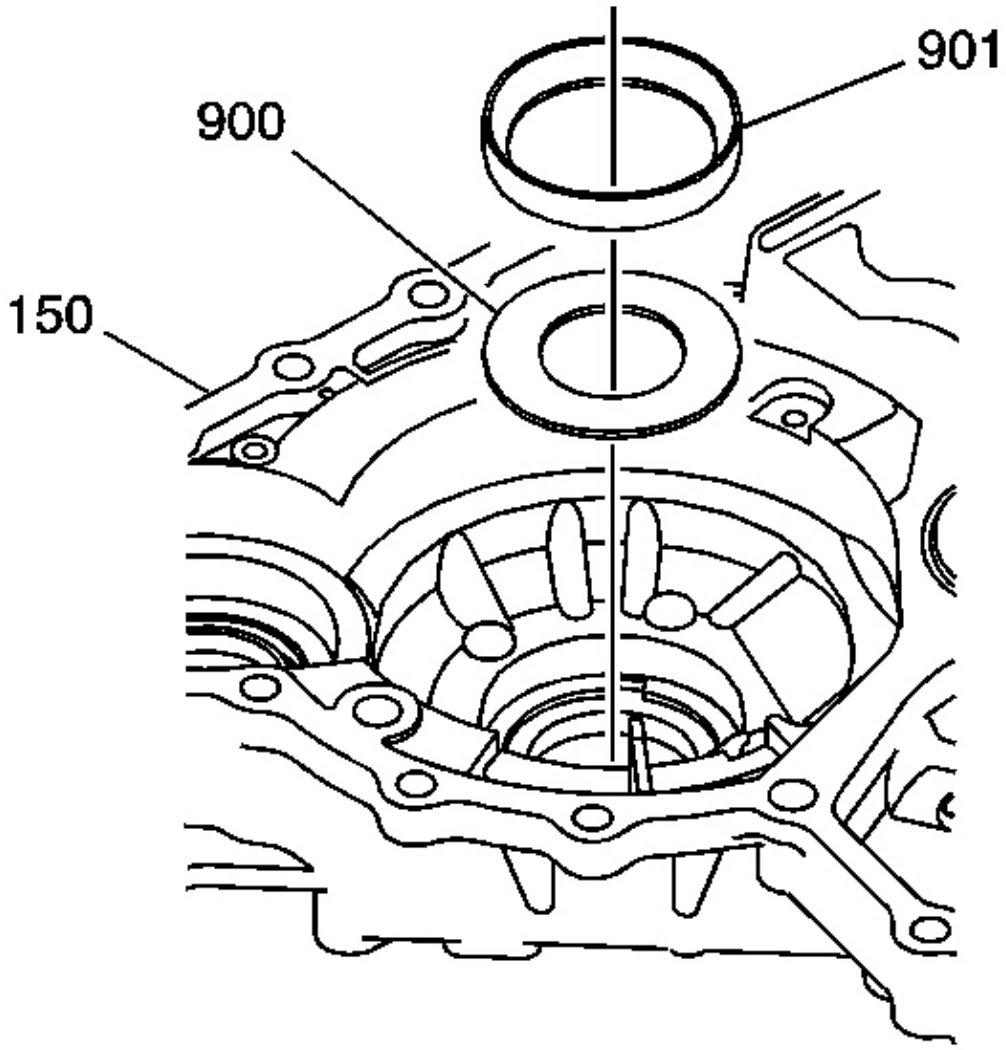

Fig. 174: Front Bearing Race Spacer & Front Roller Bearing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- **Lubricate all parts with automatic transmission fluid during installation.**
- **Replace the tapered roller bearing with a NEW one whenever the race is replaced.**
- **Do not use the selective shim or shims on the torque converter housing side.**

- **Adjust the preload after replacing the tapered roller bearing and race.**

18. Install the front differential front bearing race spacer (900) into the torque converter housing (150).
19. Install the front differential tapered front roller bearing 80 mm race (901) into the torque converter housing (150).

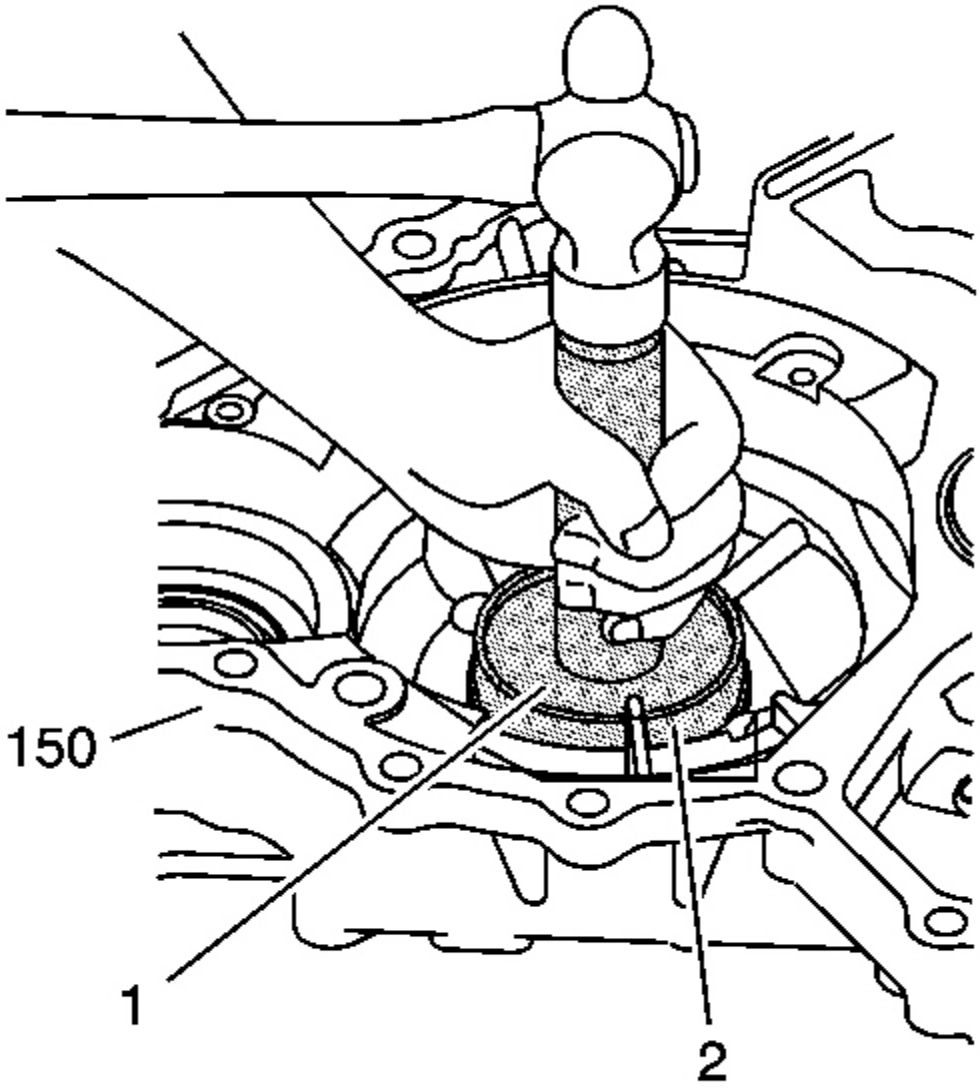

Fig. 175: Installing The 80 mm Front Differential Tapered Front Roller Bearing Race Using DT

46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

20. Using the 78 mm side of **DT 46428** (2) and **EN 46342** (1), install the 80 mm front differential tapered front roller bearing race (901) until fully seated.

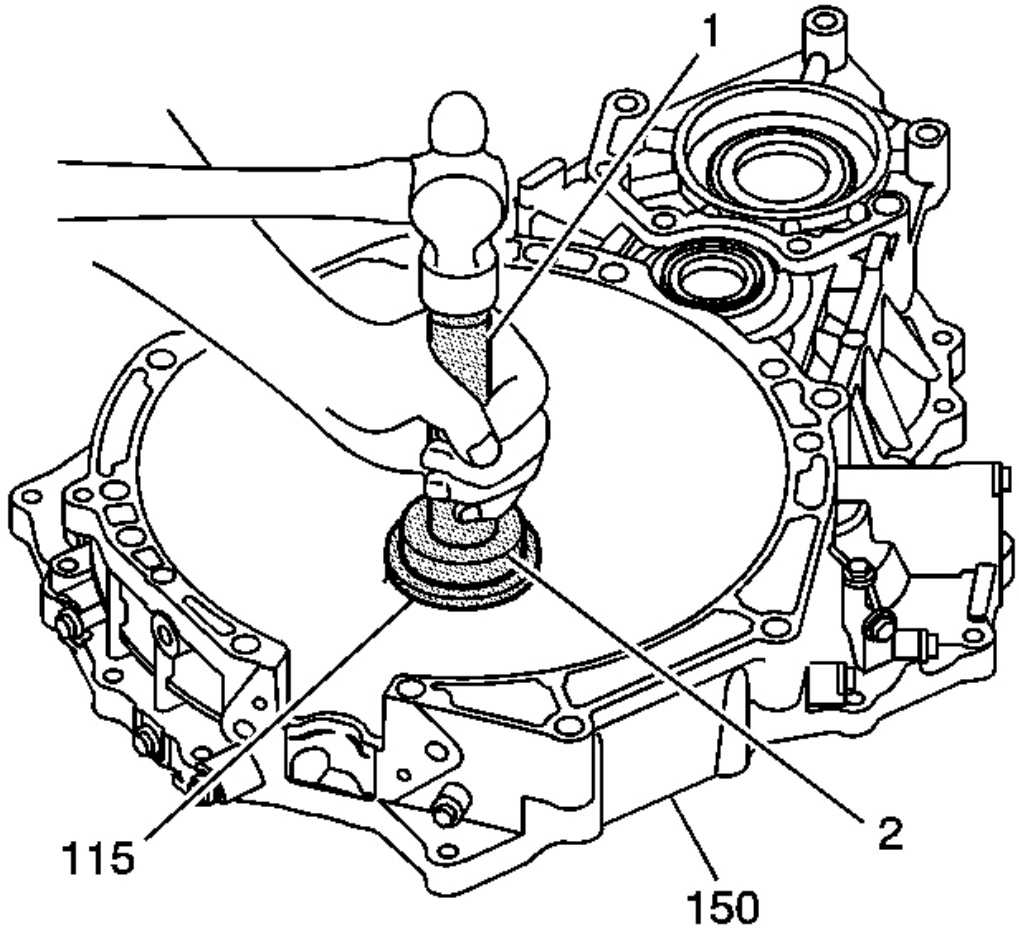

Fig. 176: Installing The Torque Converter Bearing Using DT 46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

21. Using the **DT 46414** (2) and **EN 46342** (1), install the torque converter bearing (115) until it bottoms out flush in the torque converter housing (150) using the 68 mm side of the driver.

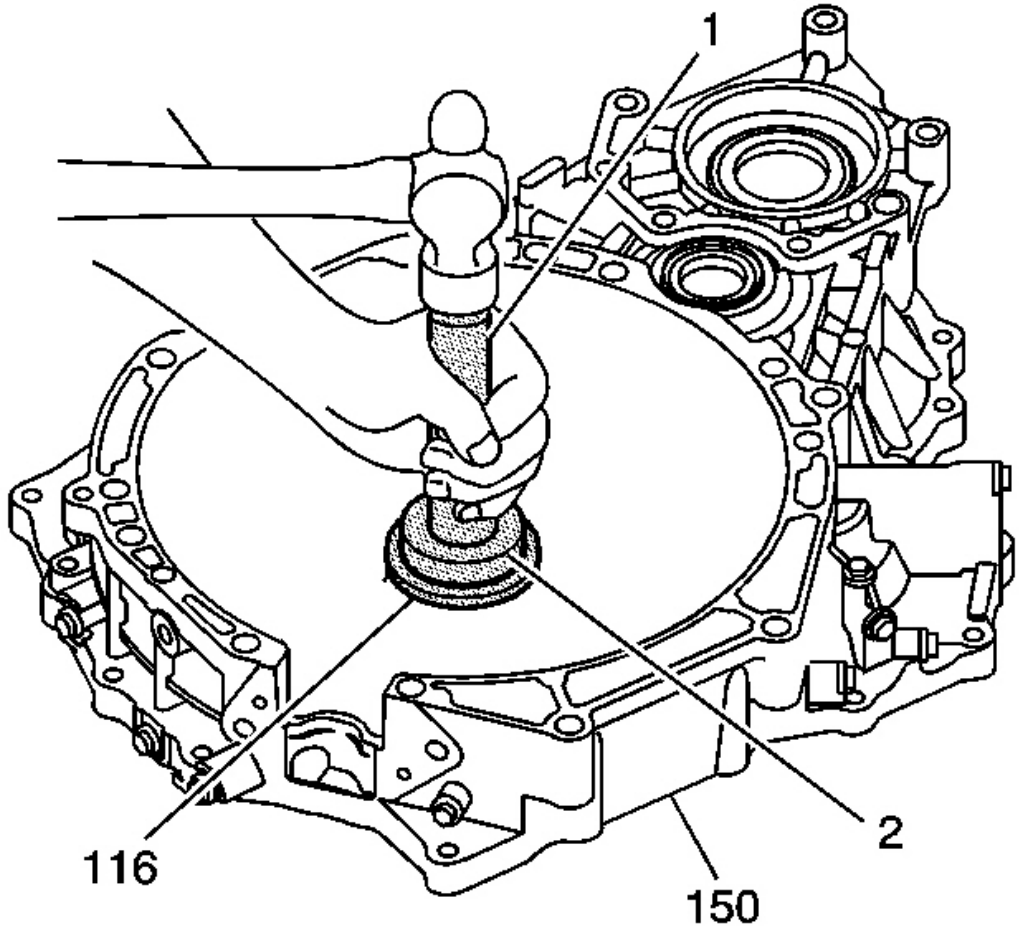

Fig. 177: Installing The Torque Converter Fluid Seal Using DT 46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not install the torque converter fluid seal (116) below the flanged section of the torque converter housing or premature failure of the mainshaft front bearing could occur.

22. Using the **DT 46417** and **EN 46342** , install the torque converter fluid seal (116) until it is flush with the flanged section of the torque converter housing (150) using the 45 mm side of the driver.

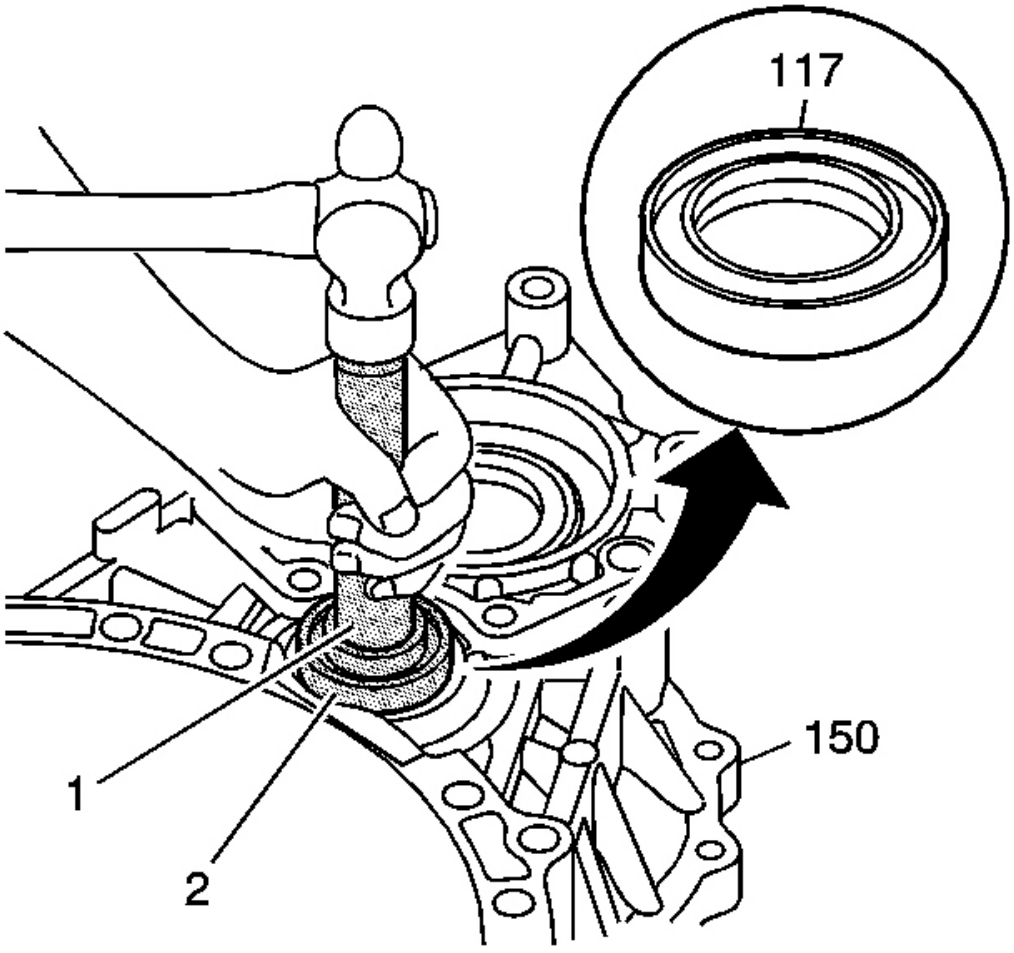

Fig. 178: Installing The Front Wheel Drive Shaft Fluid Seal Using DT 46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

23. Using **EN 46342** (1) and **DT 46429** (2), install the 35 mm x 54 mm x 8 mm front wheel drive shaft fluid seal (117) into the torque converter housing (150) until the seal is flush with the housing surface.

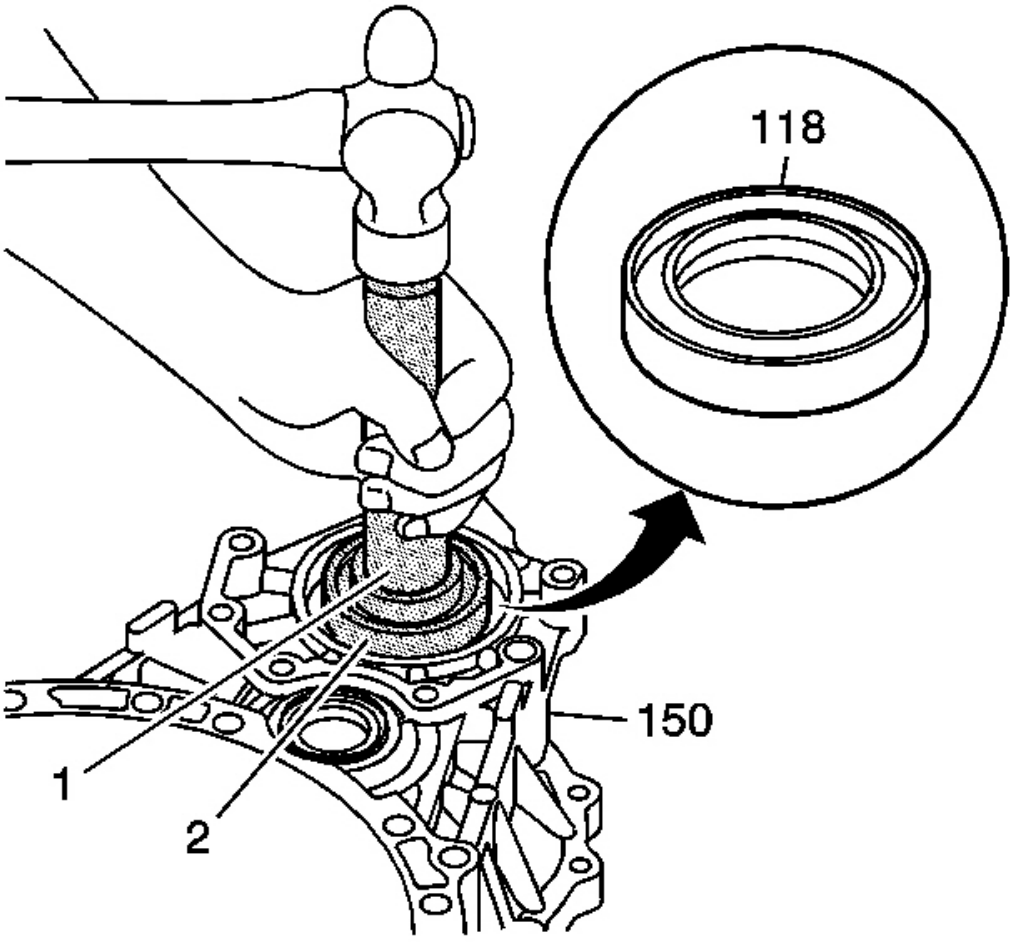

Fig. 179: Installing The Transfer Case Input Shaft Seal Using DT 46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

24. Using the 65 mm side of **DT 46417** (2) and **EN 46342** (1) install a NEW 48 mm x 65 mm x 7.5 mm transfer case input shaft seal (118) into the torque converter housing (150) until the seal is flush with the housing surface.

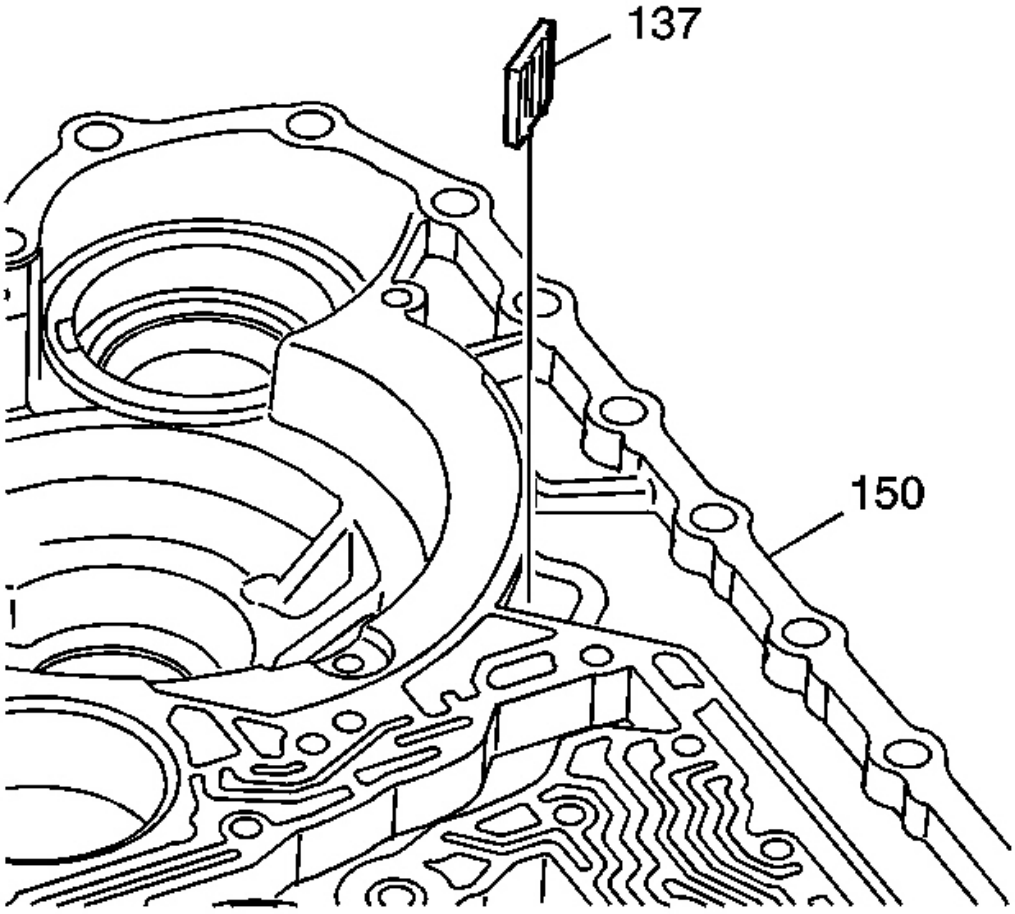

Fig. 180: Magnetic Chip Collector
Courtesy of GENERAL MOTORS CORP.

25. Install the magnetic chip collector (137) back into the torque converter housing assembly (150).

REVERSE IDLER GEAR REPLACEMENT

Removal

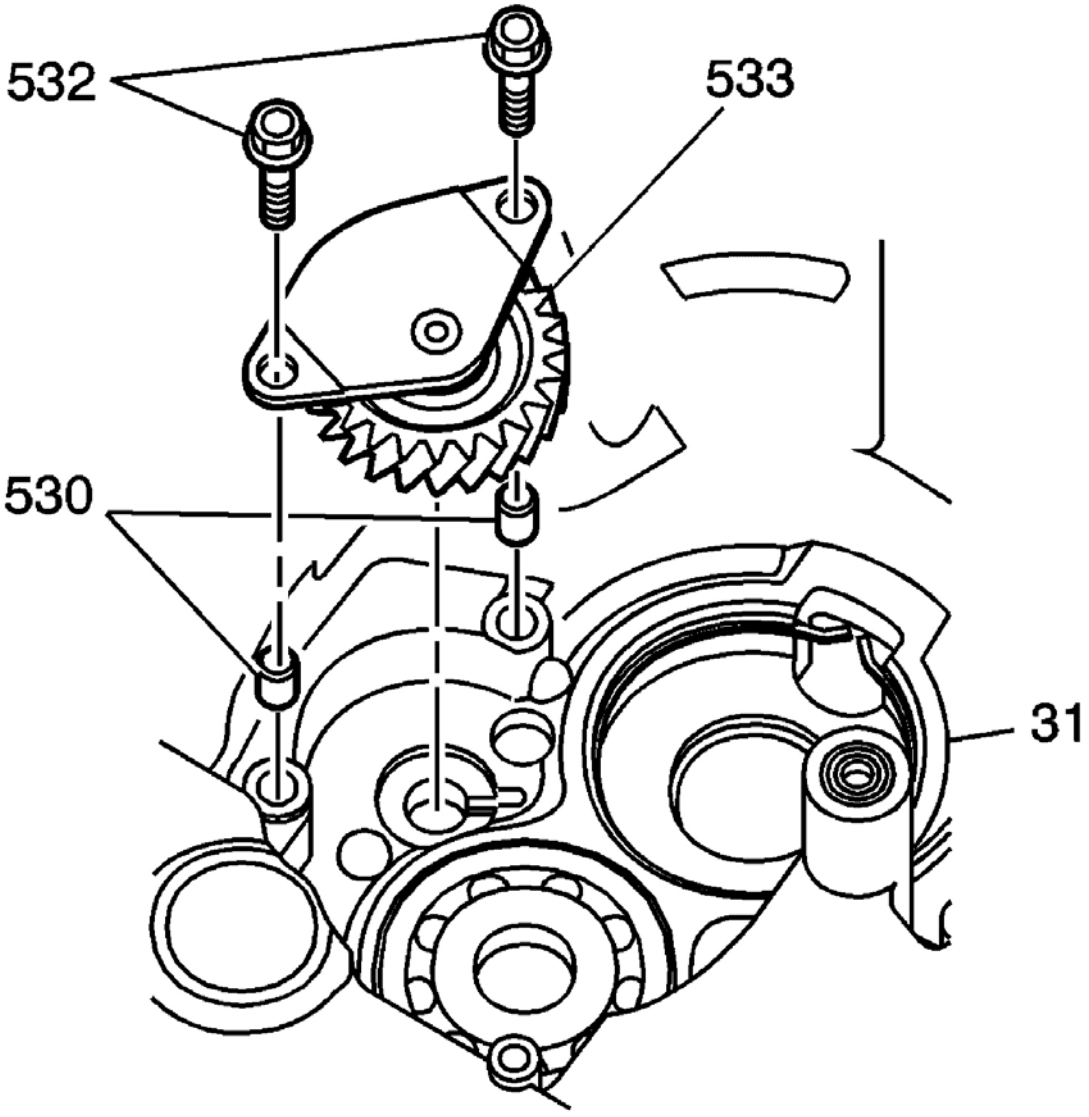

Fig. 181: Reverse Idler Gear Assembly, Bolts & Pins
Courtesy of GENERAL MOTORS CORP.

1. Remove the 2 reverse idler gear retaining plate bolts (532) from the transmission case (31).
2. Remove the reverse idler gear assembly (533) from the transmission case (31).
3. Remove the 2 reverse idler gear locating pins (530) from the transmission case (31).

Disassembly

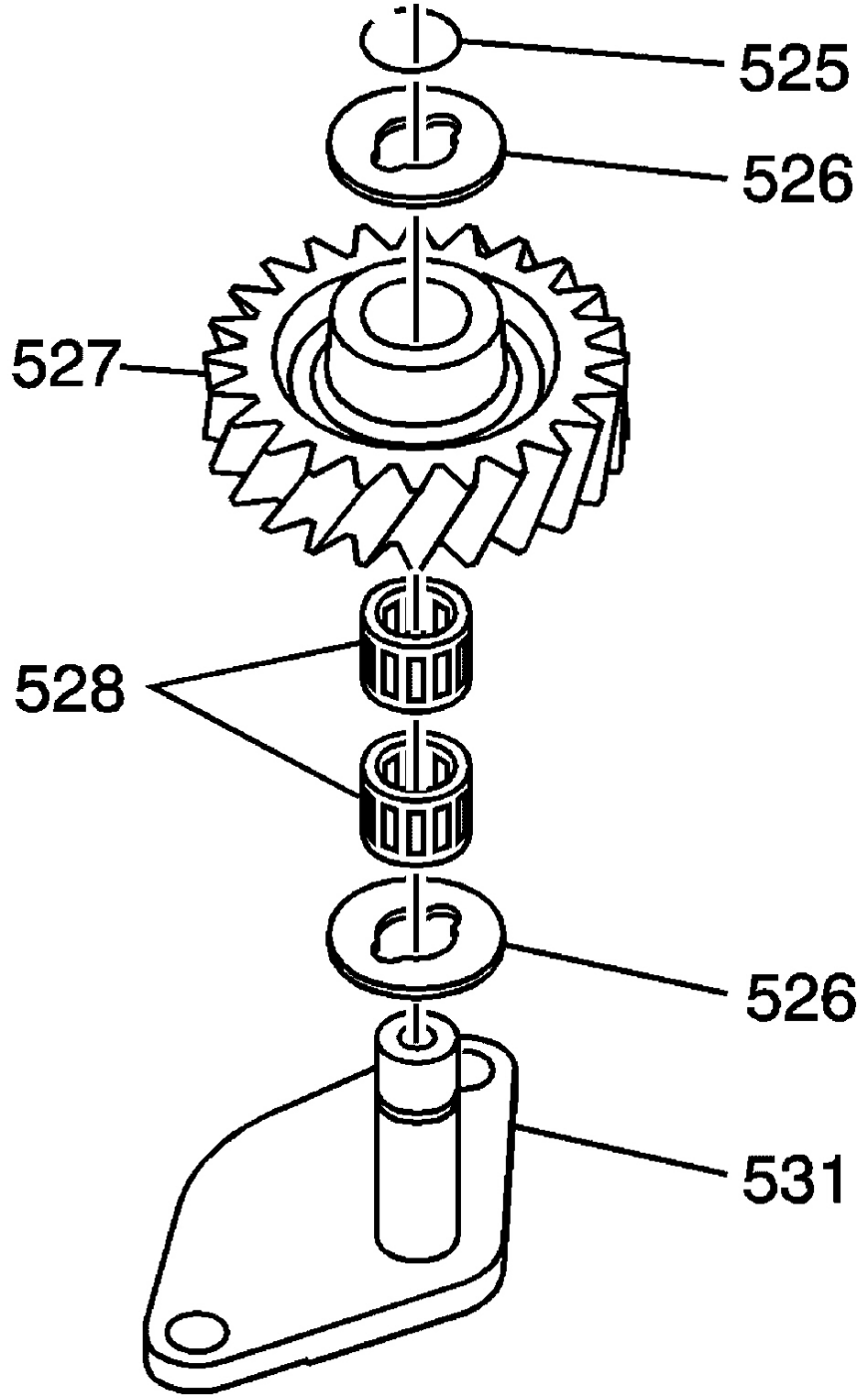

Fig. 182: Removing Reverse Idler Gear Returning Plate Assembly
Courtesy of GENERAL MOTORS CORP.

1. Remove the reverse idler gear retaining ring (525).

2. Remove the following components from the reverse idler gear returning plate assembly (531):
    - The reverse idler gear thrust washer (526).
    - The reverse idler gear (527).
    - Both reverse idler gear inner bearings (528).
    - The lower reverse idler gear thrust washer (526).

Inspection

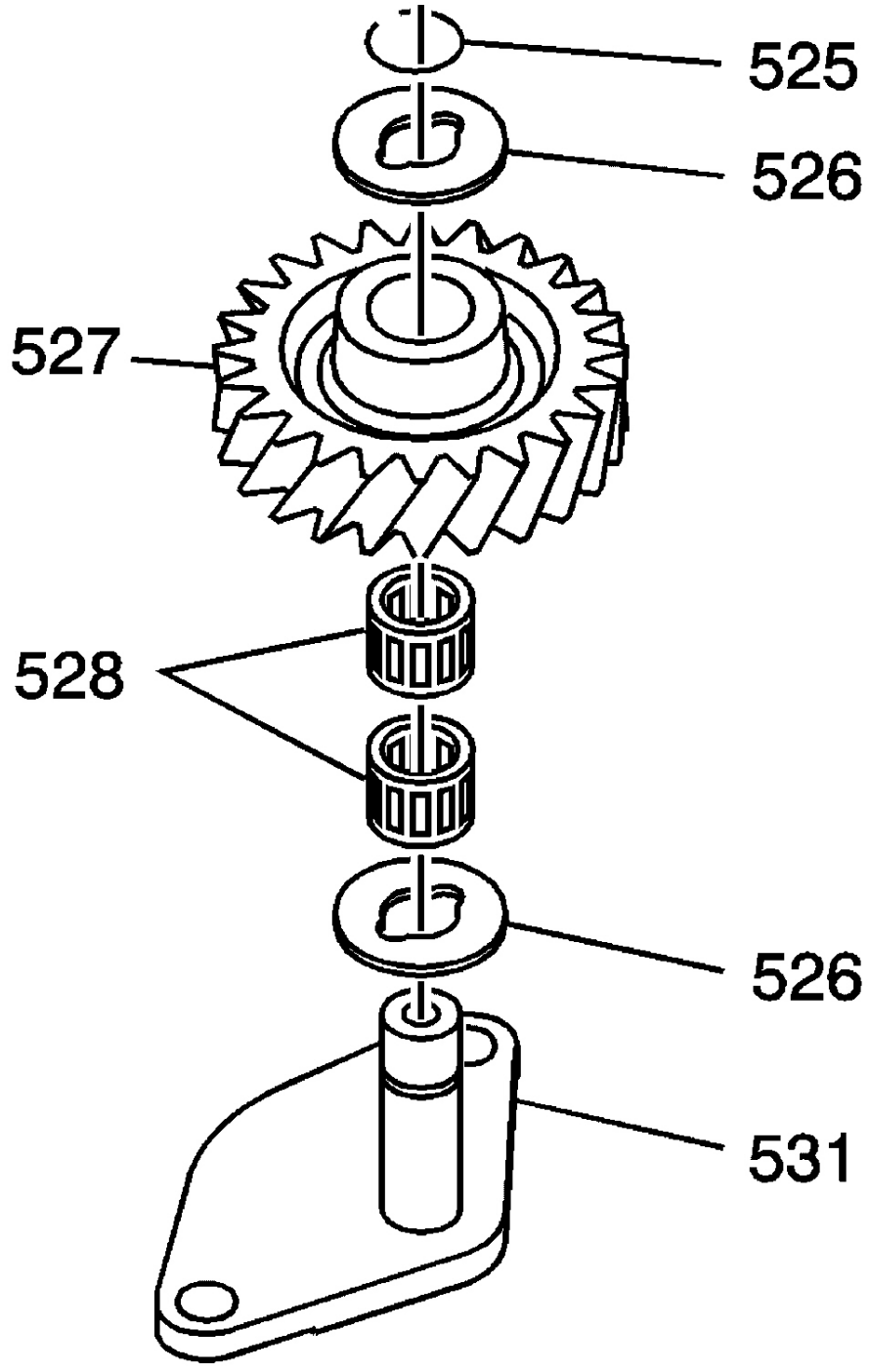

Fig. 183: Inspecting All Components For Damage
Courtesy of GENERAL MOTORS CORP.

1. Inspect all components for excessive wear or damage. Replace as needed.

2. Inspect the bearings for wear or damage. Replace as needed.

Assembly

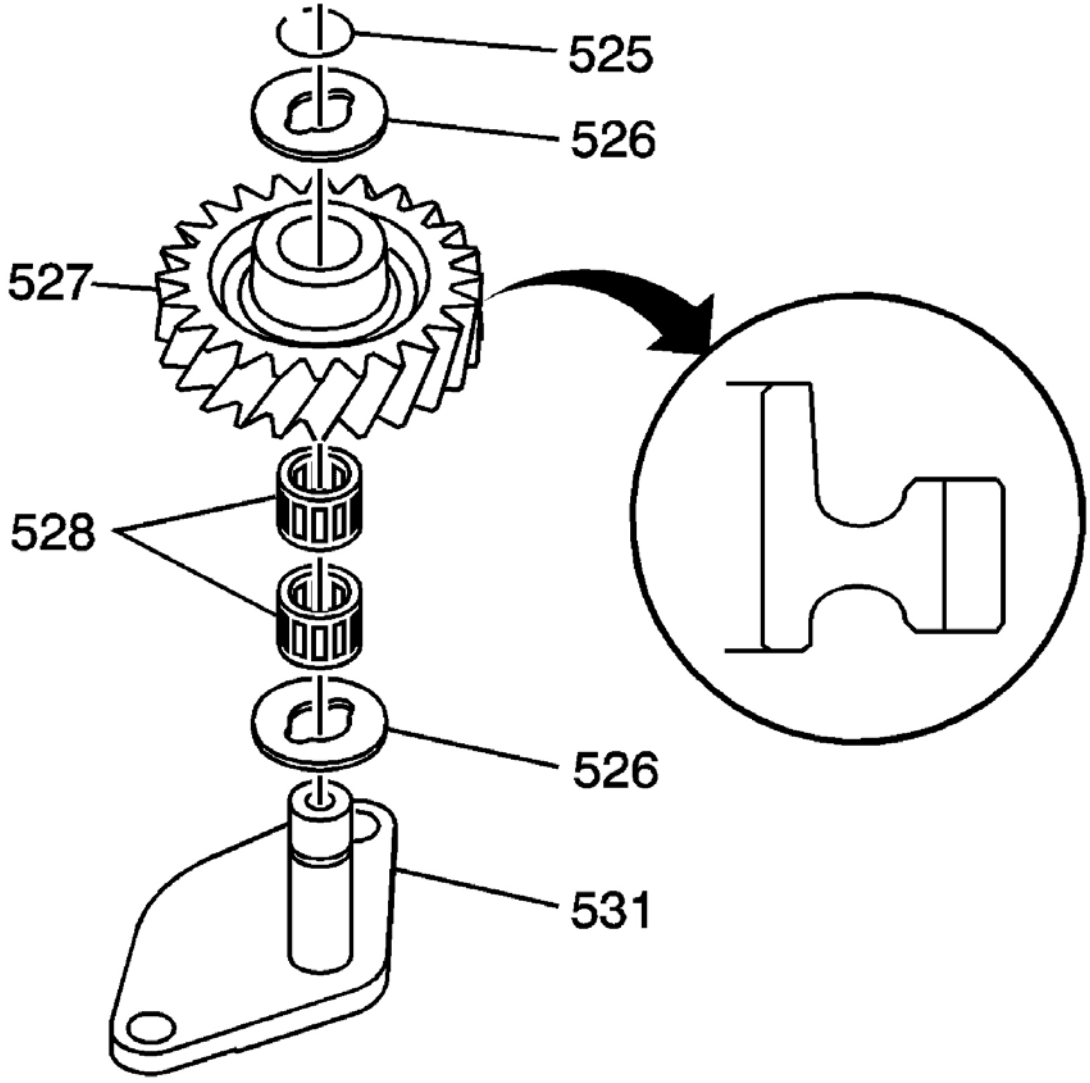

Fig. 184: Installing Reverse Idler Gear Returning Plate Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the lower reverse idler gear thrust washer (526) on the reverse idler gear retaining plate assembly (531).
2. Install the 2 reverse idler gear inner bearings (528) on the reverse idler gear retaining plate assembly (531).

IMPORTANT: The shorter hub side of the reverse idler gear installs to the plate as

shown.

3. Install the reverse idler gear (527) on the reverse idler gear retaining plate assembly (531).
4. Install the upper reverse idler gear thrust washer (526) on the reverse idler gear retaining plate assembly (531).
5. Install the reverse idler gear retaining ring (525) on the reverse idler gear retaining plate assembly (531).

Installation

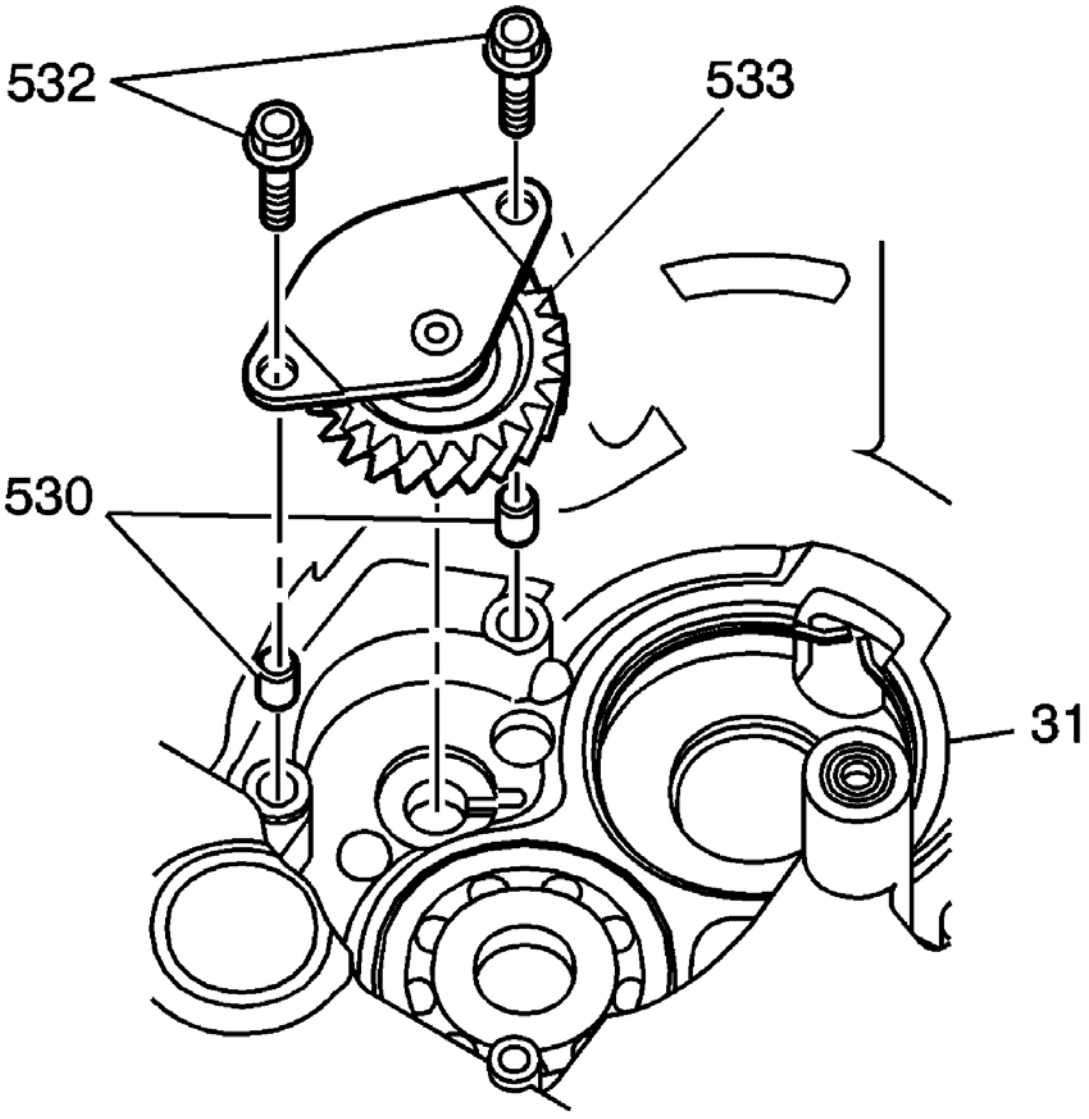

Fig. 185: Reverse Idler Gear Assembly, Bolts & Pins
Courtesy of GENERAL MOTORS CORP.

1. Install both 10 mm x 16 mm reverse idler gear locating pins (530) into the transmission case (31).

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the reverse idler gear assembly (533) into the transmission case (31).

IMPORTANT: Overtightening of the idler gear retaining plate bolts will cause the reverse idler gear to bind.

3. Install both M8 x 1.0 x 35 mm reverse idler gear retaining plate bolts (532).

Tighten: Tighten the bolts to 26 N.m (20 lb ft)

LUBE FLUID FILTER REPLACEMENT

Removal

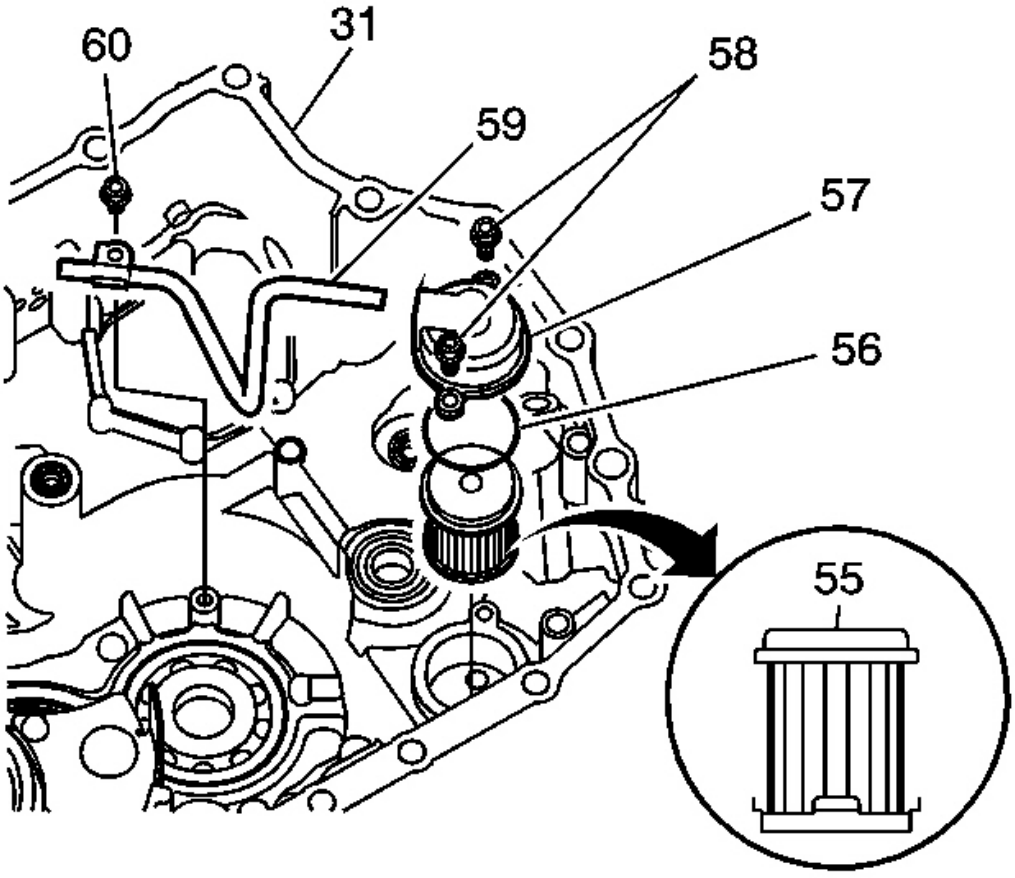

Fig. 186: Lube Fluid Pipe, Bolt, O-Ring Seal & Fluid Filter Cover
Courtesy of GENERAL MOTORS CORP.

1. Remove the 2 lube fluid filter cover bolts (58) from the transmission case cover.
2. Remove the fluid pipe bolt (60) from the transmission case cover.
3. Remove the fluid filter cover (57) and the lube fluid pipe with retainer (59) from the transmission case cover.
4. Remove the lube fluid pipe (59) from the fluid filter cover (57).
5. Remove the fluid filter (55) and the O-ring seal (56) from the fluid filter cover (57).

Inspection

1. Inspect the inside of the lube fluid filter (55) for contaminated fluid or faulty transmission components.
2. Discard the fluid filter (55) and O-ring seal (56).

Installation

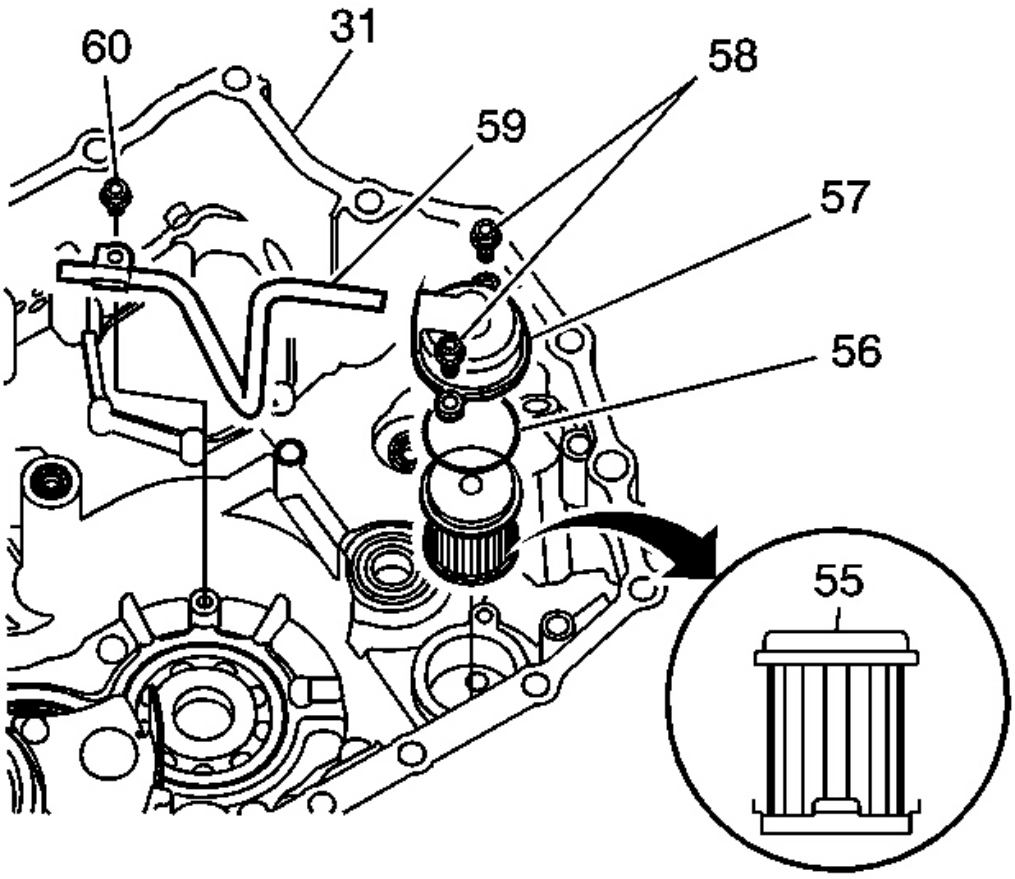

Fig. 187: Lube Fluid Pipe, Bolt, O-Ring Seal & Fluid Filter Cover
Courtesy of GENERAL MOTORS CORP.

1. Install the fluid filter (55) into the transmission case cover (31) in the direction as shown in the insert.
2. Install a new fluid filter cover O-ring seal (56) on the filter cover (57).
3. Install the lube fluid pipe with retainer (59) into the filter cover (57).
4. Install the filter cover and pipe assembly into the transmission case cover.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install 2 M6 x 1.0 mm x 20 mm fluid cover bolts (58).

Tighten: Tighten both bolts to 12 N.m (106 lb in)

6. Install a M6 x 1.0 mm x 12 mm lube fluid pipe bolt (60) in the lube fluid pipe retainer (59).

   Tighten: Tighten the bolt to 12 N.m (106 lb in)

1ST/COAST CLUTCH APPLY FLUID COLLAR REPLACEMENT

Removal Procedure

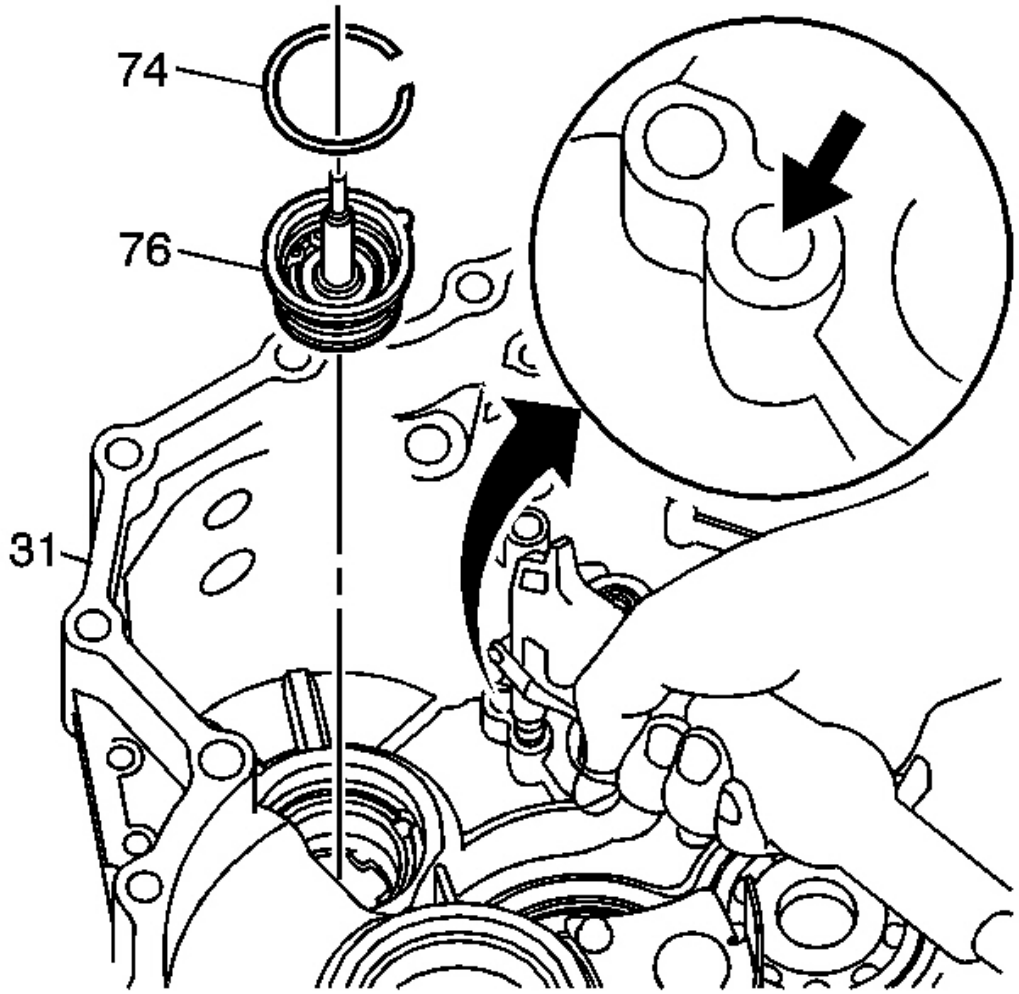

Fig. 188: Applying Compressed Air Into 1st Clutch Fluid Feed Pipe
Courtesy of GENERAL MOTORS CORP.

1. Remove the 1st/2nd clutch shaft shim (74) from the transmission case.

2. Cover the feed pipe opening of the 1st clutch apply fluid collar (76) with a shop rag to prevent oil from squirting out the feed pipe when compressed air is applied in the fluid port.

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

3. Apply compressed air into the 1st clutch fluid feed pipe port located in the transmission case as shown.
4. Remove the 1st and coast clutch apply fluid collar assembly (76) from the transmission case (31).

Disassembly Procedure

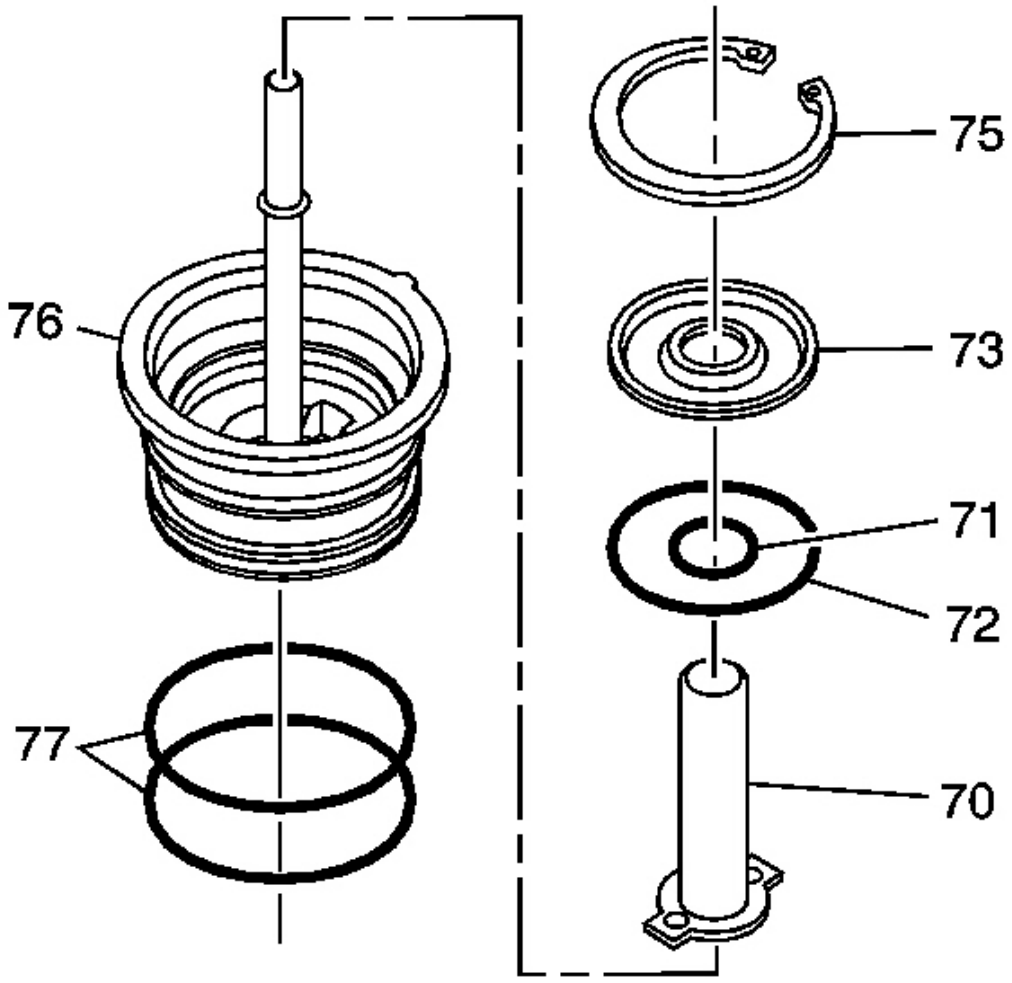

Fig. 189: Coast Clutch Apply Fluid Pipe Guide Plate & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Remove the coast clutch apply fluid pipe guide plate retaining ring (75).
2. Remove the coast clutch apply fluid pipe guide plate (73).
3. Remove the coast clutch apply fluid pipe guide plate outer O-ring seal (72).
4. Remove the coast clutch apply fluid pipe guide plate inner O-ring seal (71).
5. Remove the coast clutch apply fluid pipe (70).
6. Remove the 1st and coast clutch apply fluid collar O-ring seals (77).
7. Inspect, clean, and replace the components as needed.

The coast clutch apply fluid pipe (70) and the fluid feed pipe guide plate (73) are not serviced separately.

Assembly Procedure

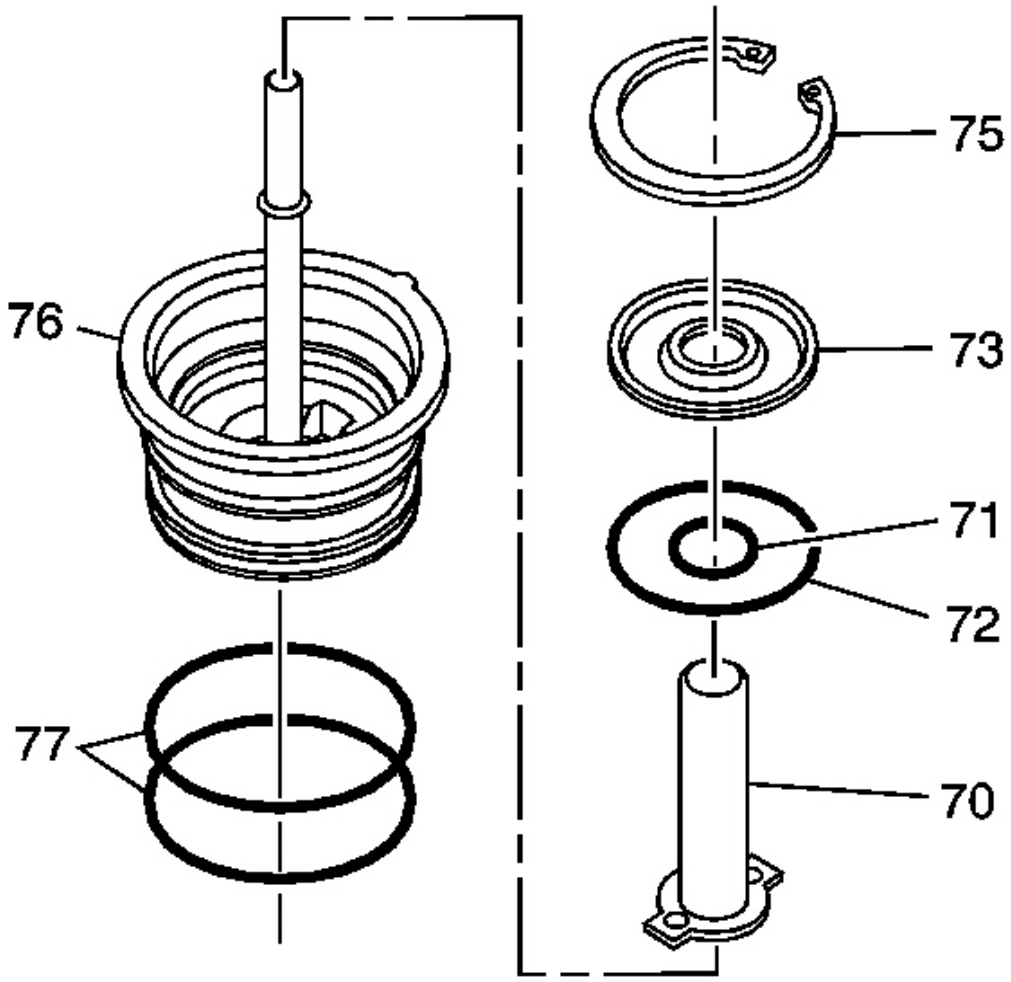

Fig. 190: Coast Clutch Apply Fluid Pipe Guide Plate & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Install 2 NEW 43.5 x 2.2 mm O-ring seals (77) on the 1st clutch apply fluid collar assembly (76).
2. Align the apply fluid pipe tabs with the tab slots in the collar and install the coast clutch apply fluid pipe (70).
3. Install the coast clutch apply fluid pipe guide plate inner O-ring seal (71) and the coast clutch apply fluid pipe guide plate outer O-ring seal (72) to the coast clutch apply fluid pipe guide plate (73).

4. Install the coast clutch apply fluid pipe guide plate (73).
5. Install the coast clutch apply fluid pipe guide plate retaining ring (75).

Installation Procedure

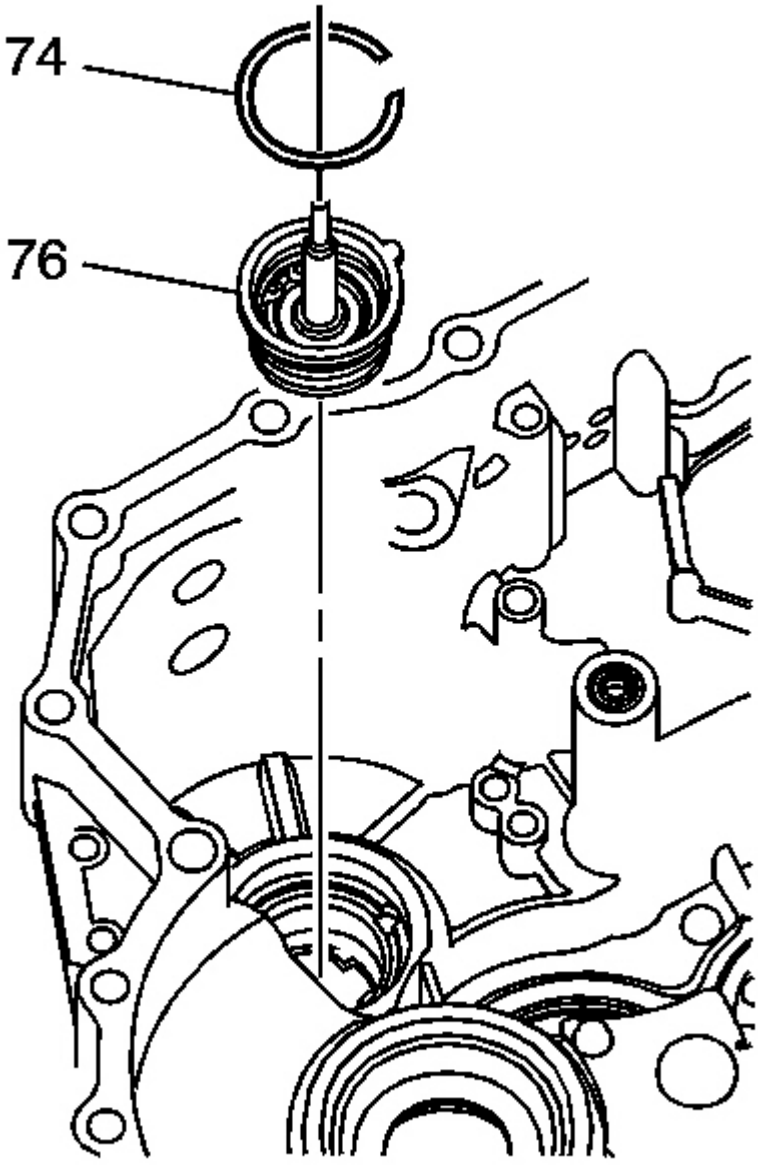

Fig. 191: 1st/Coast Clutch Apply Fluid Collar & 1st/2nd Clutch Shaft Shim

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the O-ring seals during installation.

1. Lube the O-ring seals and the transmission case bore.
2. Install the 1st/coast clutch apply fluid collar assembly (76) into the transmission case bore (31), aligning the fluid collar tab to the transmission case.
3. Install the 1st/2nd clutch shaft shim (74) into the transmission case.

MAINSHAFT REAR BEARING REPLACEMENT

Tools Required

- **DT 46427** Driver
- EN 46342 Driver Handle

Removal Procedure

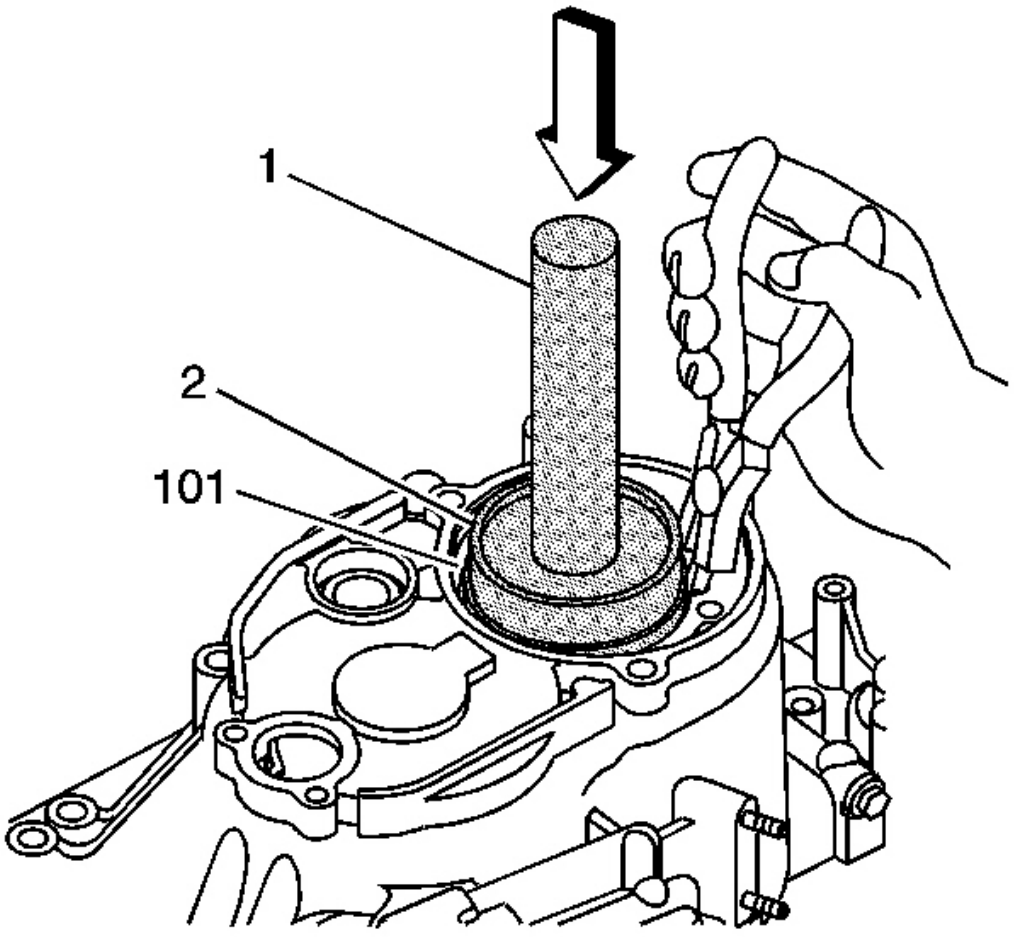

Fig. 192: Expanding The Mainshaft Rear Bearing Retaining Ring Using Pliers
Courtesy of GENERAL MOTORS CORP.

1. Using snap ring pliers, expand the mainshaft rear bearing retaining ring (101) as far as possible to allow the mainshaft rear bearing to pass through the retaining ring.
2. Using the 78 mm side of the **DT 46427** (2), push the mainshaft rear bearing out of the mainshaft rear bearing retaining ring (101).

   It is not necessary to remove the mainshaft rear bearing retaining ring (101) unless the groove in the transmission case needs cleaning or the retaining ring is damaged.

3. Inspect the bearing for excessive wear or damage. Replace as needed.

Installation Procedure

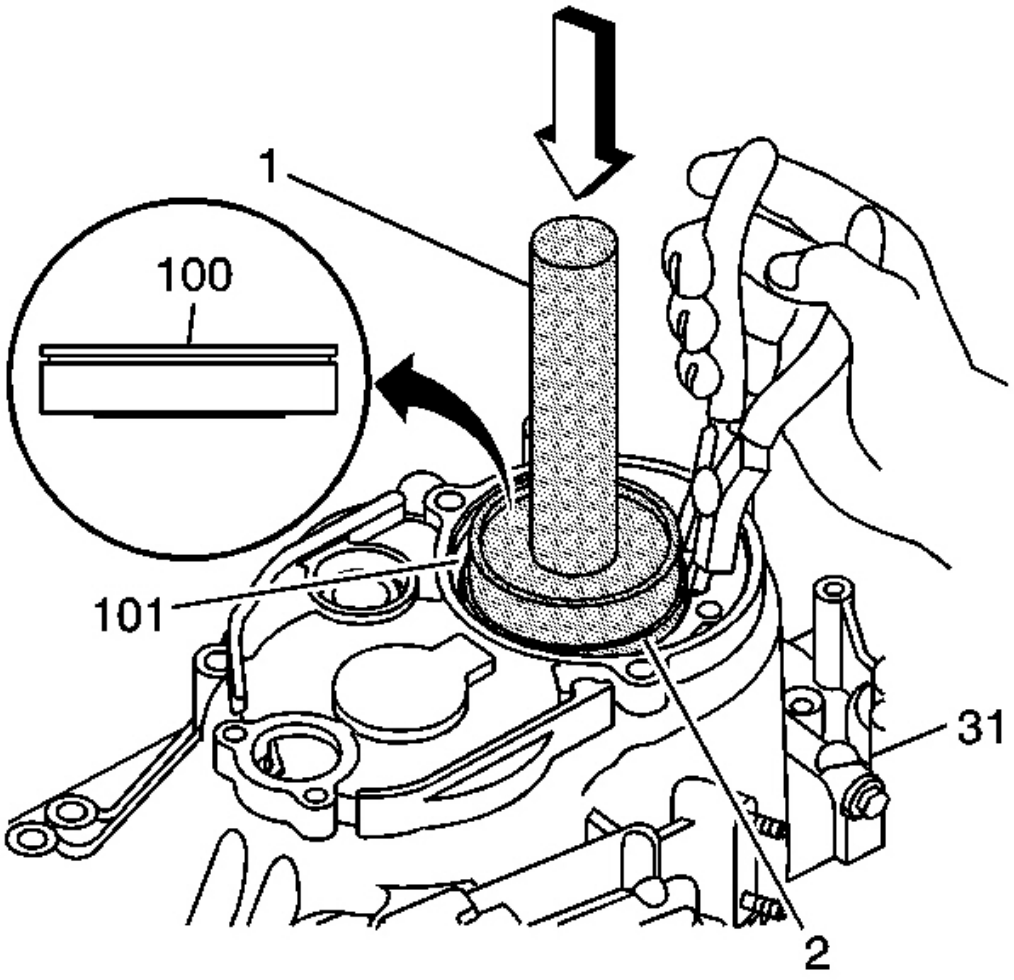

Fig. 193: Expanding The Mainshaft Rear Bearing Using Pliers
Courtesy of GENERAL MOTORS CORP.

1. If removed, install the mainshaft rear bearing retaining ring.
2. Set the 29 x 82 x 17x15.5 mm mainshaft rear bearing (100) on the transmission case with the groove in the up position.
3. Using the snap ring pliers, expand the mainshaft rear bearing retaining ring (101) and by hand insert the bearing partially into the transmission case.
4. Release the snap ring pliers, and then using EN 46342 (1) and the 78 mm side of the **DT 46427** (2), push the bearing down into the transmission case until the mainshaft rear bearing retaining ring (101) seats in the groove of the mainshaft rear bearing (100).

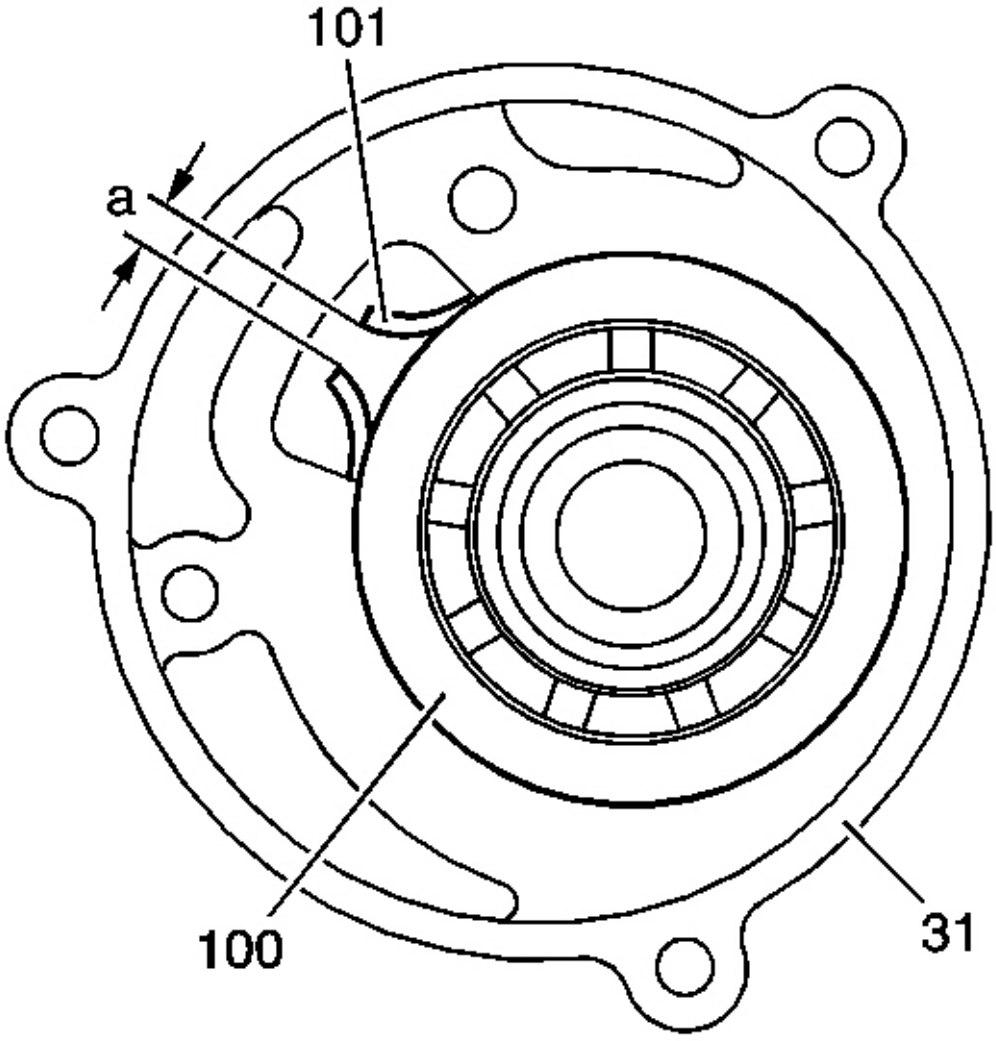

Fig. 194: Measuring The Retaining Ring End Gap
Courtesy of GENERAL MOTORS CORP.

5. Measure the retaining ring end gap (a) to verify the retaining ring (101) is properly installed in the bearing and transmission case (31).

   Specification: The retaining ring end gap is between 0-7 mm (0.00-0.28 in)

3RD CLUTCH SHAFT REAR BEARING REPLACEMENT

Tools Required

- **DT 46424** Adjustable Bearing Remover
- **EN 46342** Driver Handle
- **DT 46516** Driver
- **SA9133T** Axle Seal Puller
- **SA9133T-1** Axle Seal Puller Adapter

Removal Procedure

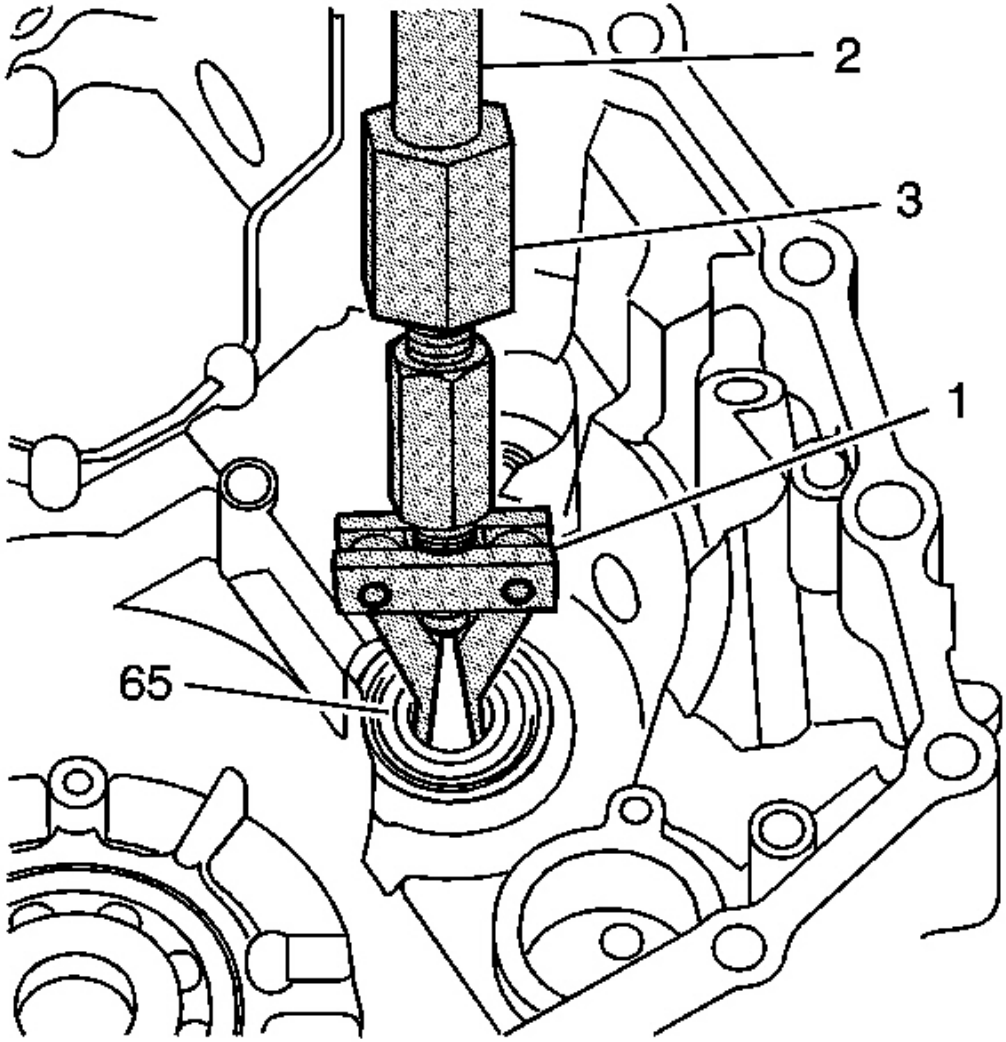

Fig. 195: Removing 3rd Clutch Shaft Rear Bearing Using DT 46424, SA9133T & SA9133T-1
Courtesy of GENERAL MOTORS CORP.

1. Using the **DT 46424** (1), **SA9133T** (2) and **SA9133T-1** (3), remove the 3rd clutch shaft rear bearing (65) from the transmission case.
2. Inspect the bearing for wear or damage. Replace as needed.

Installation Procedure

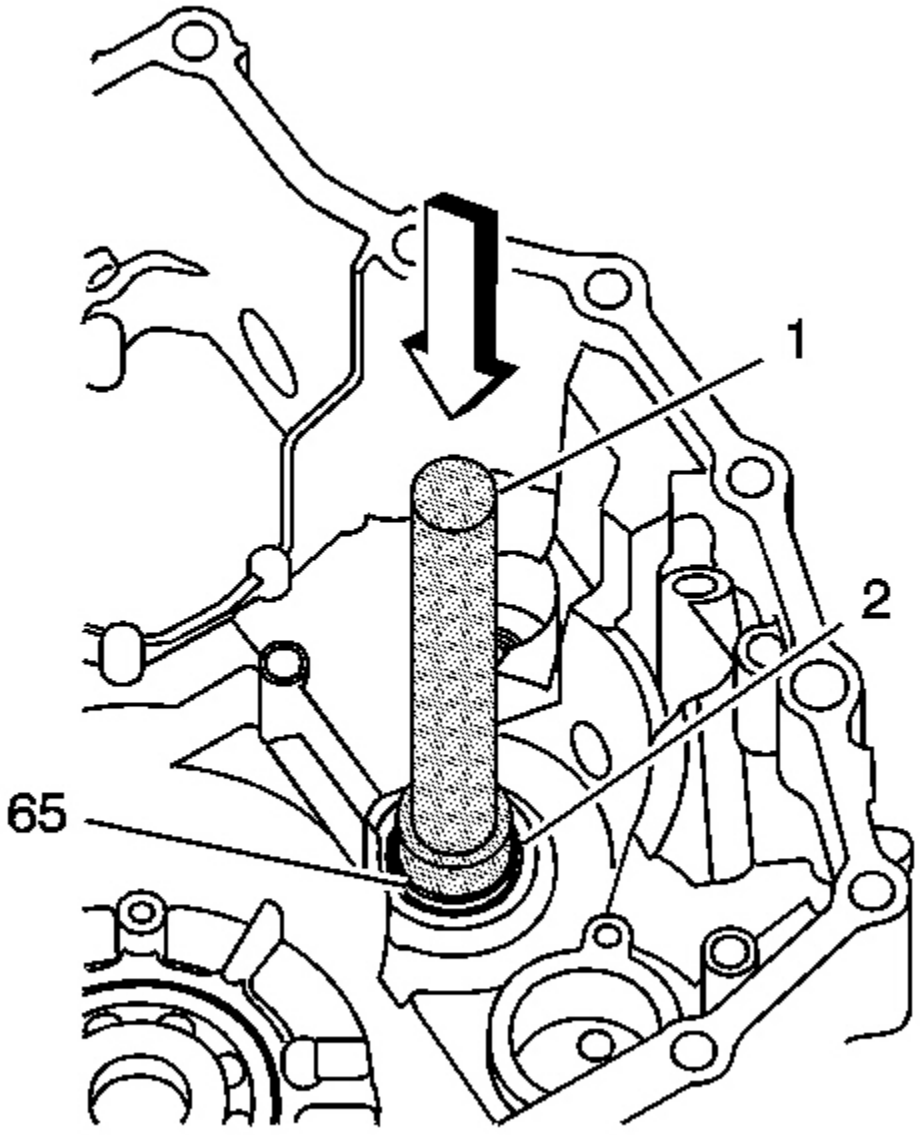

Fig. 196: DT 46516, EN 46342 & 3rd Clutch Shaft Rear Bearing
Courtesy of GENERAL MOTORS CORP.

Using the 42 mm side of **DT 46516** (2) and **EN 46342** (1), install the 20 x 41 x 17/16 mm 3rd clutch shaft rear bearing (65) until it bottoms in the transmission case.

PARK PAWL ACTUATOR BEARING REPLACEMENT

Tools Required

- **DT 46424** Adjustable Bearing Remover
- **DT 46516** Driver
- **EN 46342** Driver Handle
- **SA9133T** Axle Seal Puller
- **SA9133T-1** Axle Seal Puller Adapter

Removal Procedure

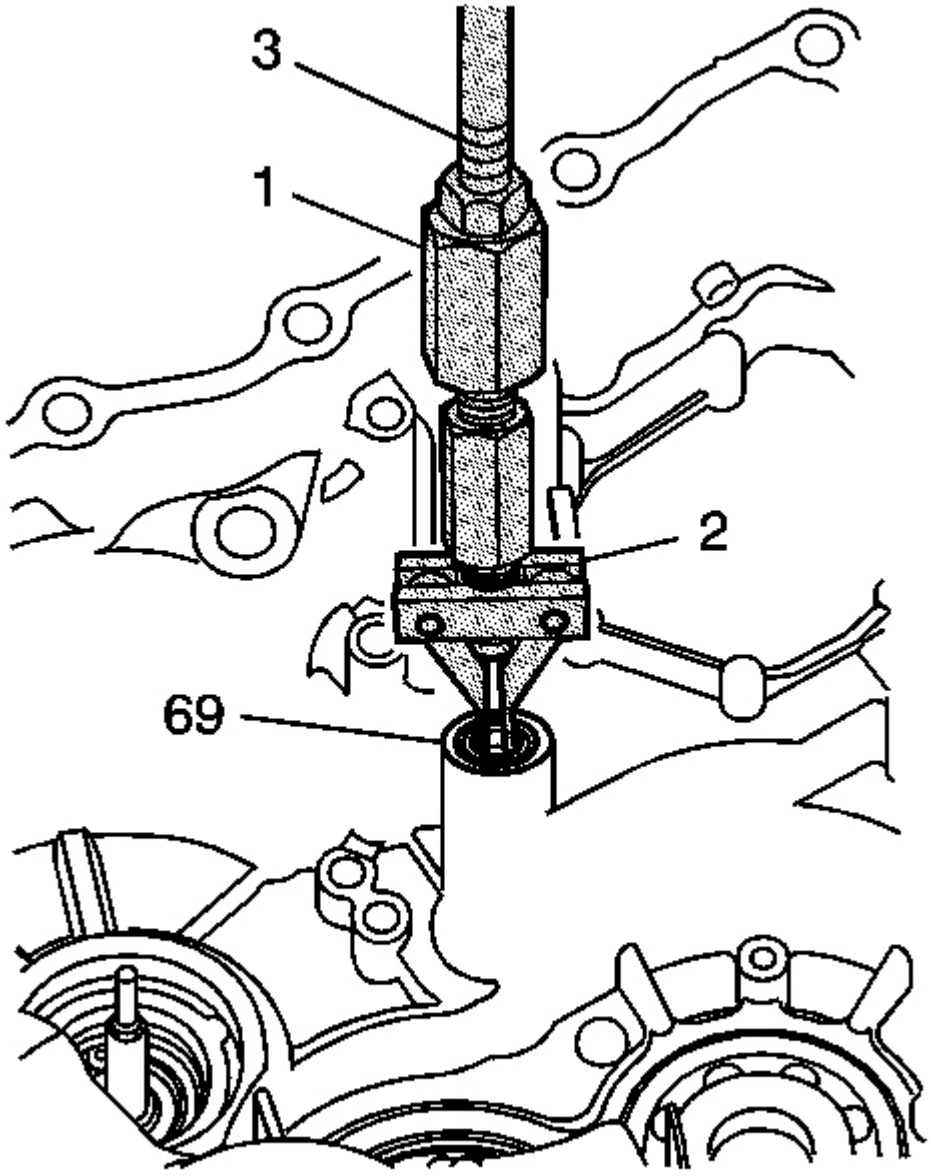

Fig. 197: Remove The Park Pawl Actuator Bearing Using DT 46424, SA9133T & SA9133T-1
Courtesy of GENERAL MOTORS CORP.

1. Using the **DT 46424** (2), **SA9133T-1** (1), and **SA9133T** (3) remove the park pawl actuator bearing (69) from the transmission case.
2. Inspect the bearing for wear or damage. Replace as needed.

Installation Procedure

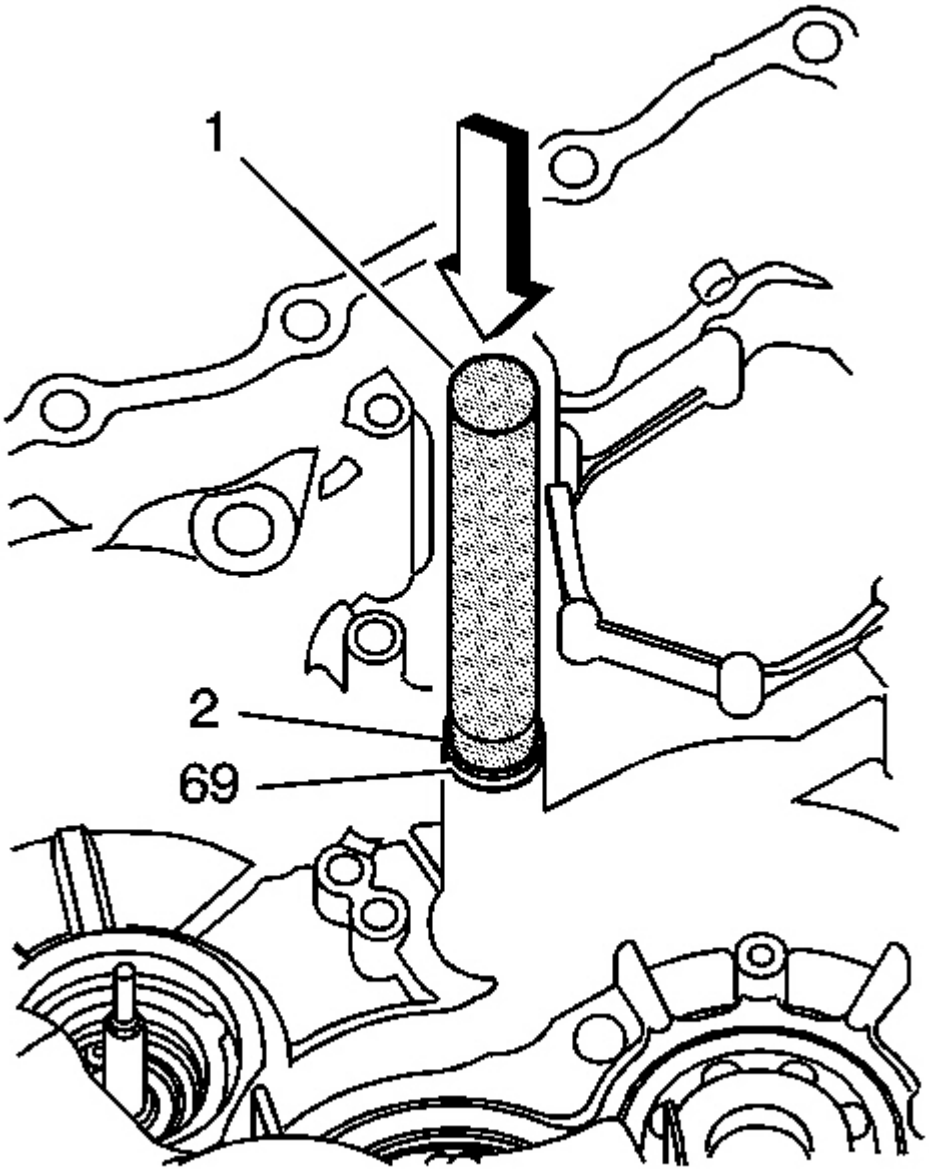

Fig. 198: DT 46516, EN 46342 & Park Pawl Actuator Bearing
Courtesy of GENERAL MOTORS CORP.

Using the 26 mm side of **DT 46516** (2) and **EN 46342** (1), install the 9 x 20 x 6 mm park pawl actuator bearing

(69) until it bottoms out flush in the transmission case.

MANUAL SHIFT SHAFT BEARING REPLACEMENT

Tools Required

- **DT 46424** Adjustable Bearing Remover
- **DT 46516** Driver
- **EN 46342** Driver Handle
- **SA9133T** Axle Seal Puller
- **SA9133T-1** Axle Seal Puller Adapter

Removal Procedure

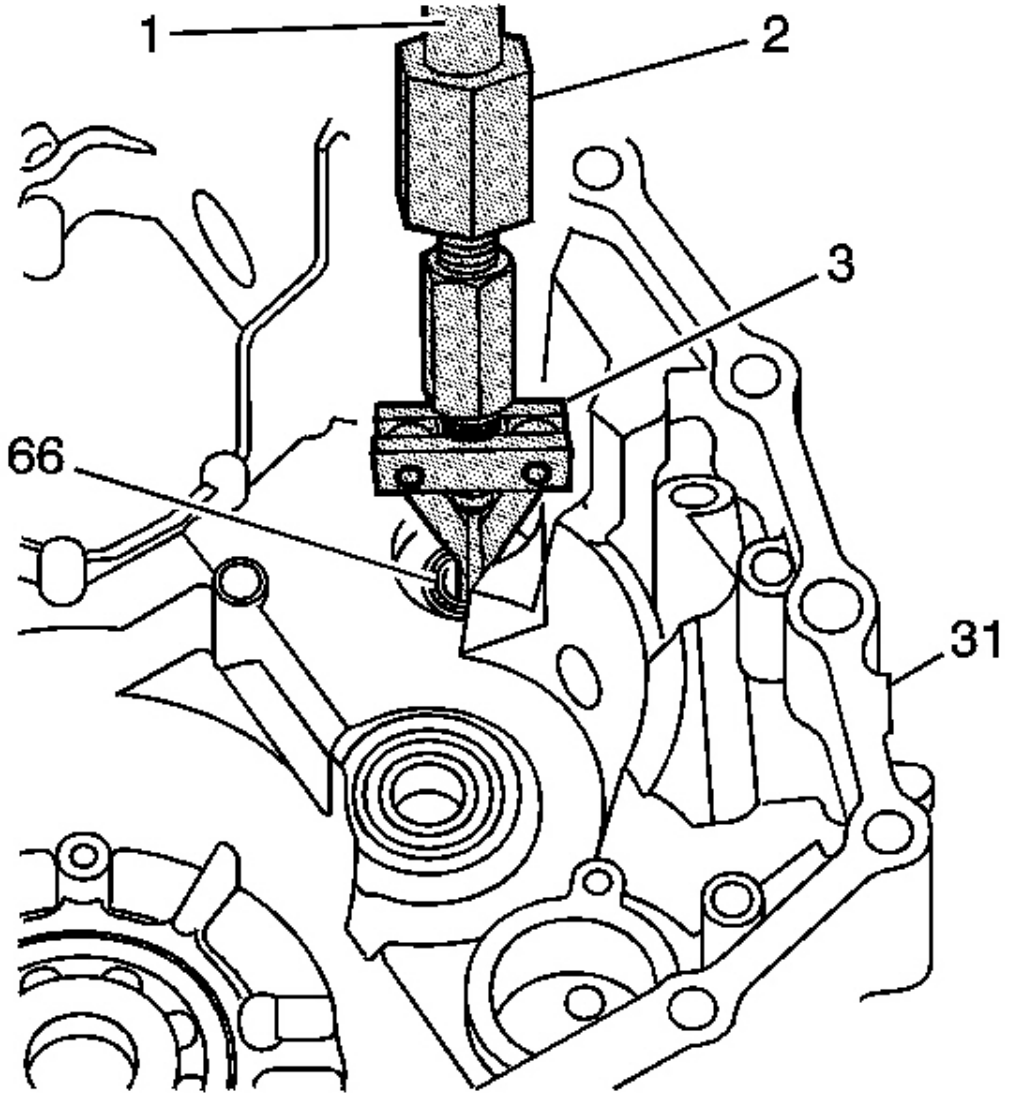

Fig. 199: Remove Manual Shift Shaft Bearing Using DT 46424, SA9133T & SA9133T-1
Courtesy of GENERAL MOTORS CORP.

1. Using the **DT 46424** (3), **SA9133T** (1) and **SA9133T-1** (2), remove the manual shift shaft bearing (66) from the transmission case (31).
2. Inspect the bearing for wear or damage. Replace as needed.

Installation Procedure

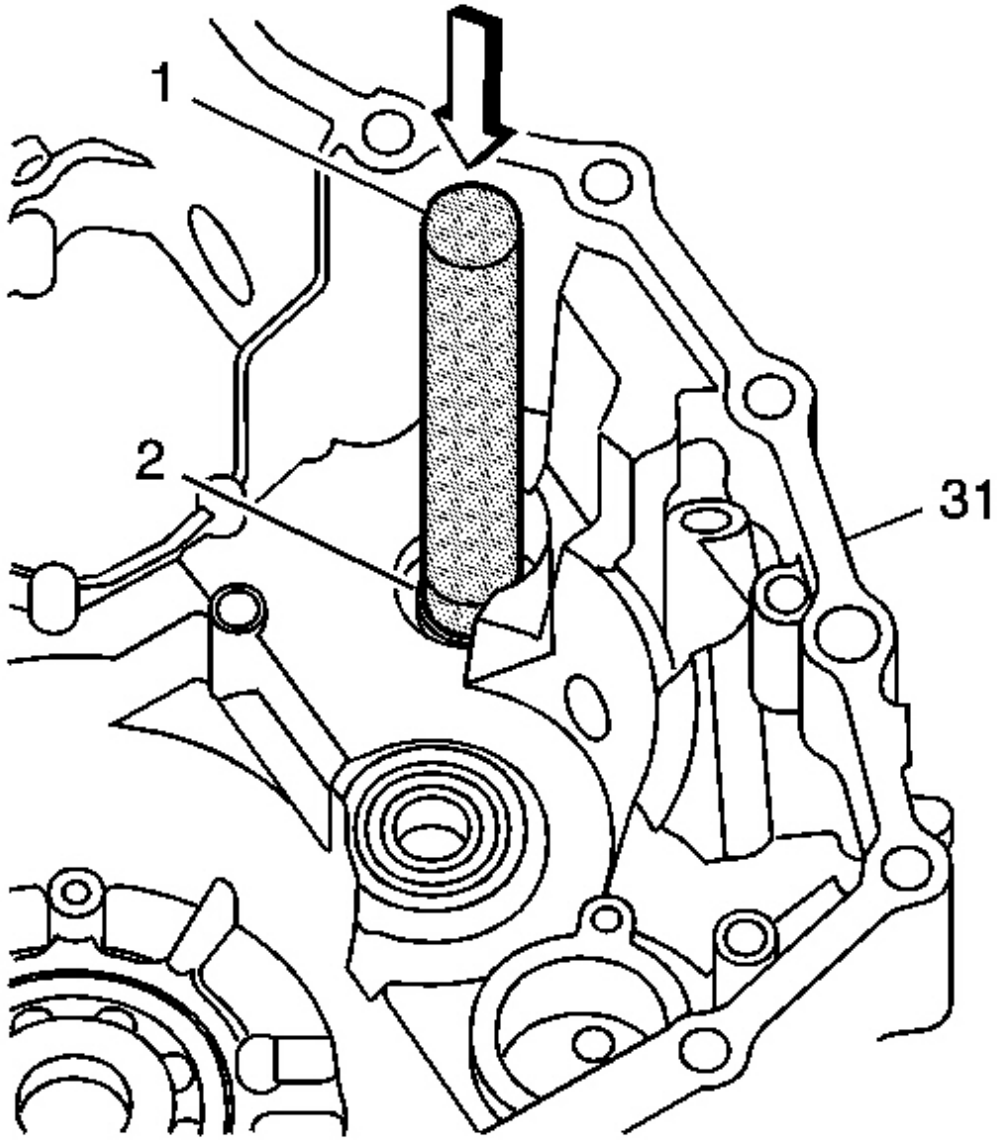

Fig. 200: DT 46516, EN 46342 & Manual Shift Shaft Bearing
Courtesy of GENERAL MOTORS CORP.

Using the 26 mm side of **DT 46516** (2) and **EN 46342** (1), install the manual shift shaft bearing (66) until it bottoms out flush in the transmission case (31).

MANUAL SHIFT SHAFT OIL SEAL REPLACEMENT

Tools Required

- **DT 46516** Driver
- **EN 46342** Driver Handle

Removal

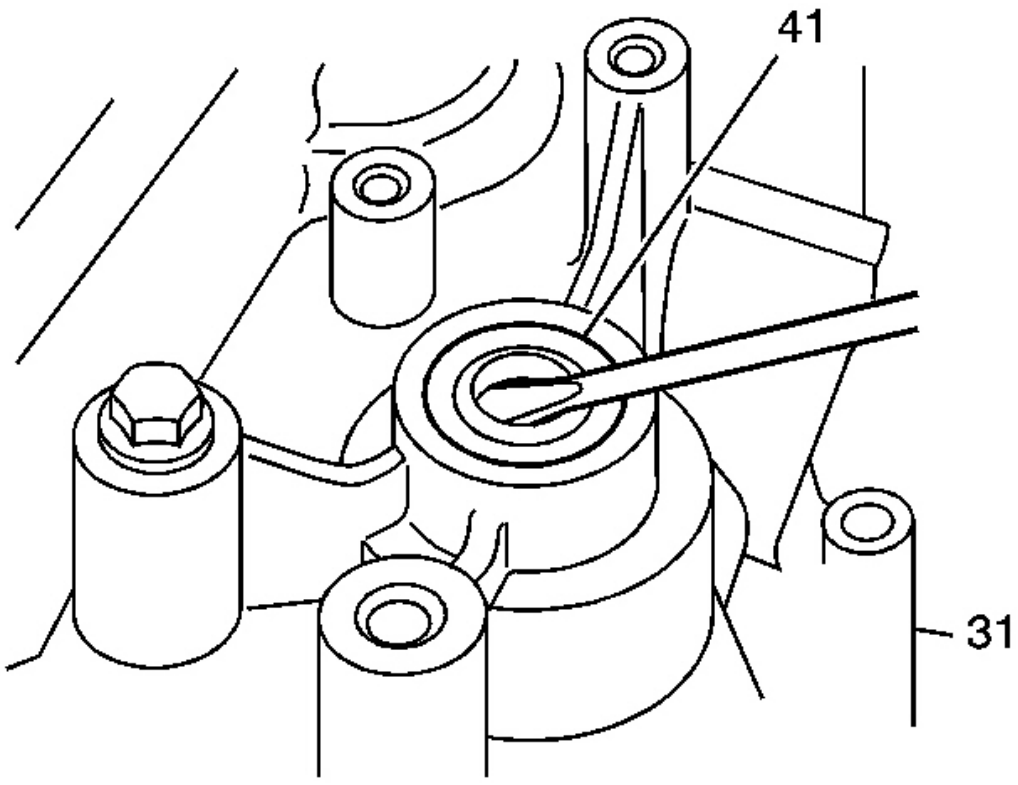

Fig. 201: Removing Manual Shift Shaft Seal Using A Small Prybar
Courtesy of GENERAL MOTORS CORP.

Using a small prybar, remove the manual shift shaft seal (41) from the transmission case (31). Do not scratch the seal bore.

Installation

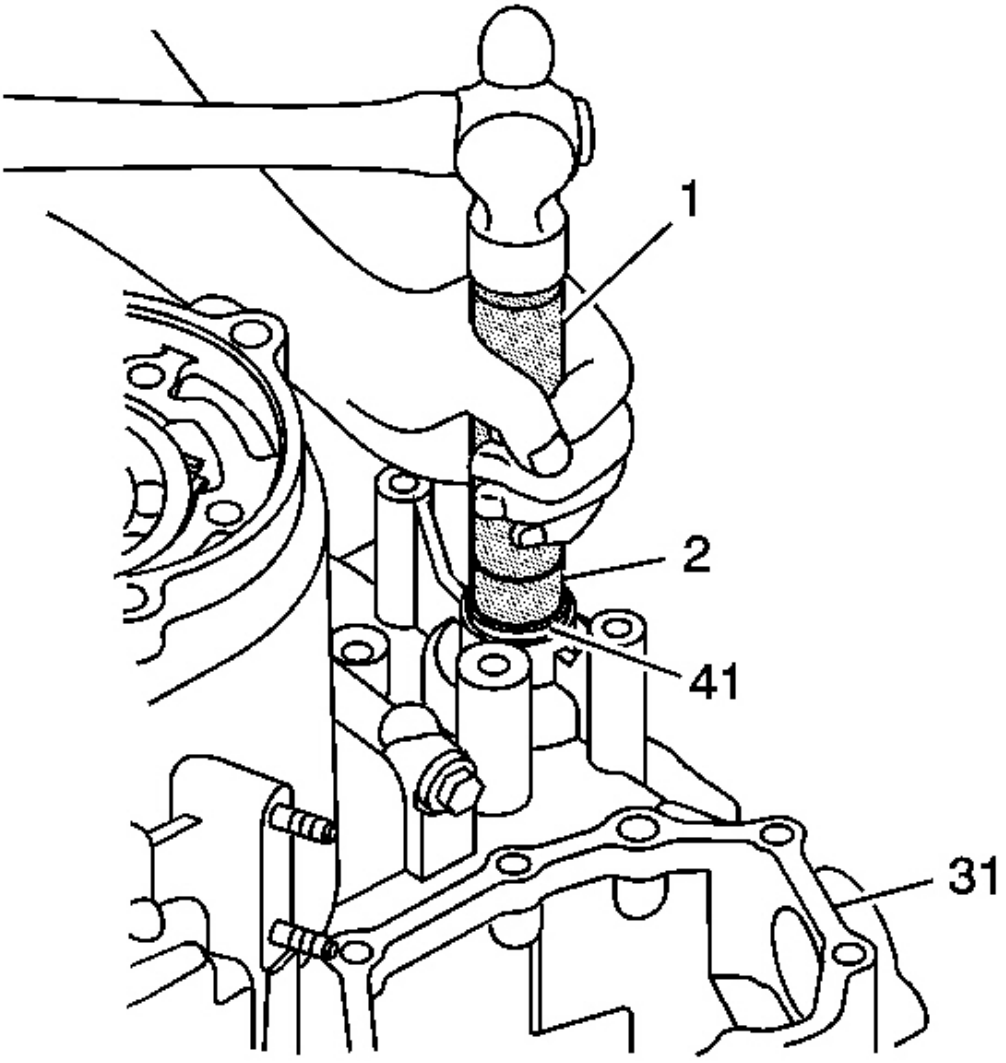

Fig. 202: Installing Manual Shift Shaft Seal Using DT 46516 & EN 46342
Courtesy of GENERAL MOTORS CORP.

Using the 24 mm side of **DT 46516** (2) and **EN 46342** (1), install a new manual shift shaft seal (41) until it bottoms out flush in the transmission case (31).

3RD AND 4TH CLUTCH FLUID PRESSURE SWITCH REPLACEMENT

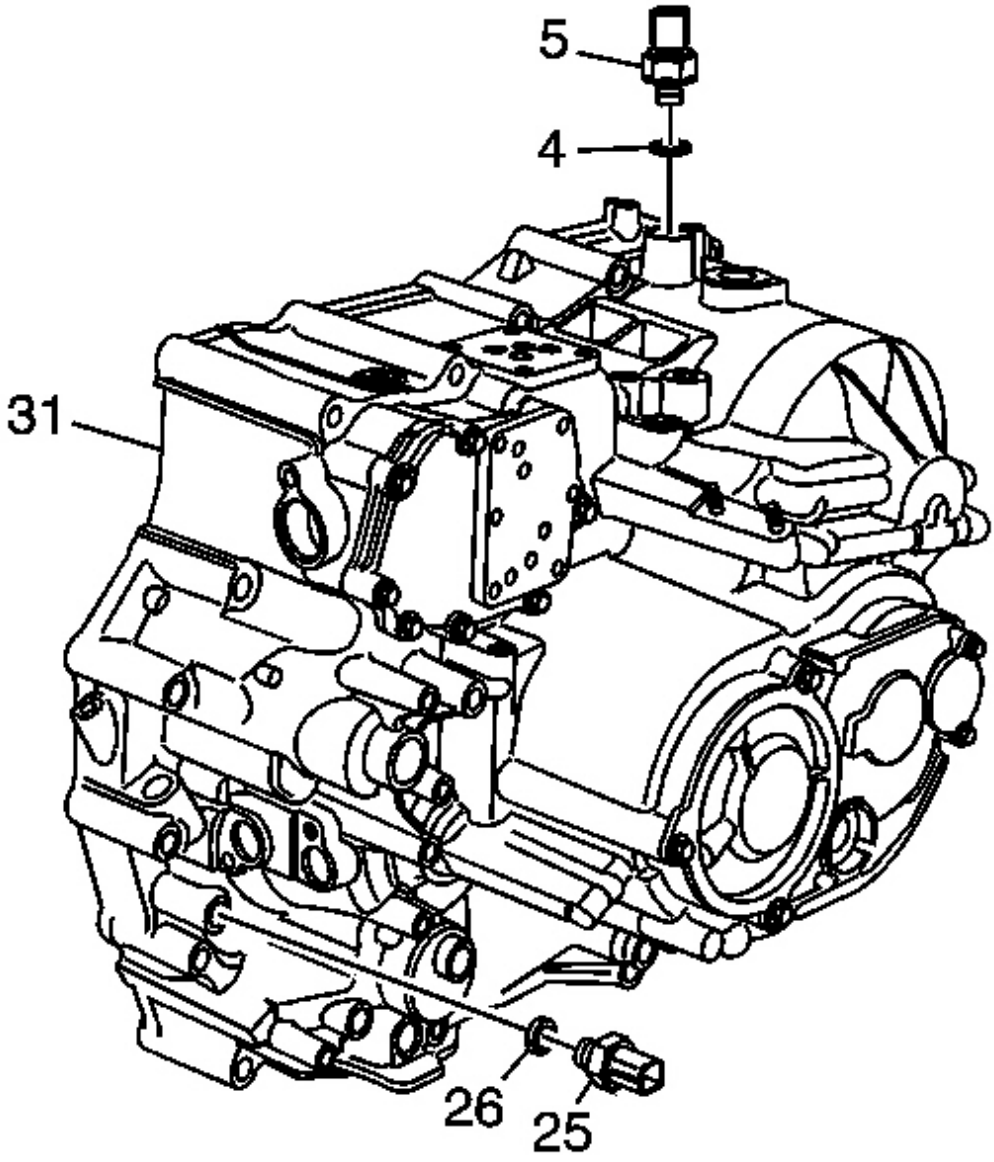

Fig. 203: 4th Clutch Pressure Switch/Seal & 3rd Clutch Pressure Switch/Seal
Courtesy of GENERAL MOTORS CORP.

1. Remove the 4th clutch pressure switch (5) and the 4th clutch pressure switch seal (4) from the top of the transmission case (31).
2. Remove the 3rd clutch pressure switch (25) and the 3rd clutch pressure switch seal (26) from the side of

the transmission case (31).

3. Inspect the fluid pressure switches for damage. Replace the switches if faulty.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the 3rd clutch pressure switch (25) with a new 3rd clutch pressure switch seal (26) into the transmission case (31).

   Tighten: Tighten the pressure switches to 20 N.m (14 lb ft)

5. Install the 4th clutch pressure switch (5) with a new 4th clutch pressure switch seal (4) into the transmission case (31).

   Tighten: Tighten the pressure switches to 20 N.m (14 lb ft)

TRANSMISSION FLUID COOLER PIPE FITTING REPLACEMENT

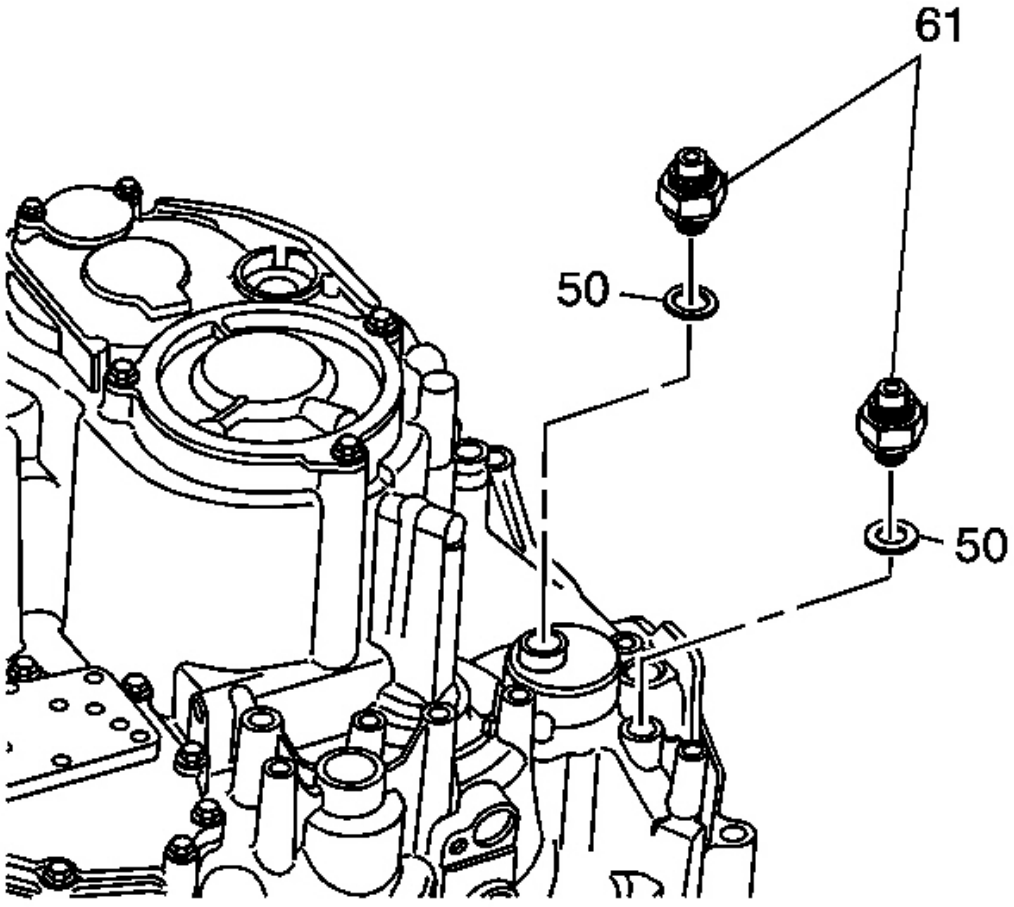

Fig. 204: Transmission Fluid Cooler Pipe Fittings & Sealing Washers
Courtesy of GENERAL MOTORS CORP.

1. Remove both transmission fluid cooler pipe fittings (61) and sealing washers (50) from the transmission case.
2. Inspect the fluid cooler pipe fittings for damage and replace as needed.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Using new sealing washers (50), install both transmission fluid cooler pipe fittings (61).

Tighten: Tighten the fittings to 20 N.m (14 lb in)

MAINSHAFT DISASSEMBLE

Tools Required

J 22912-01 Split-Plate Bearing Puller

Disassembly Procedure

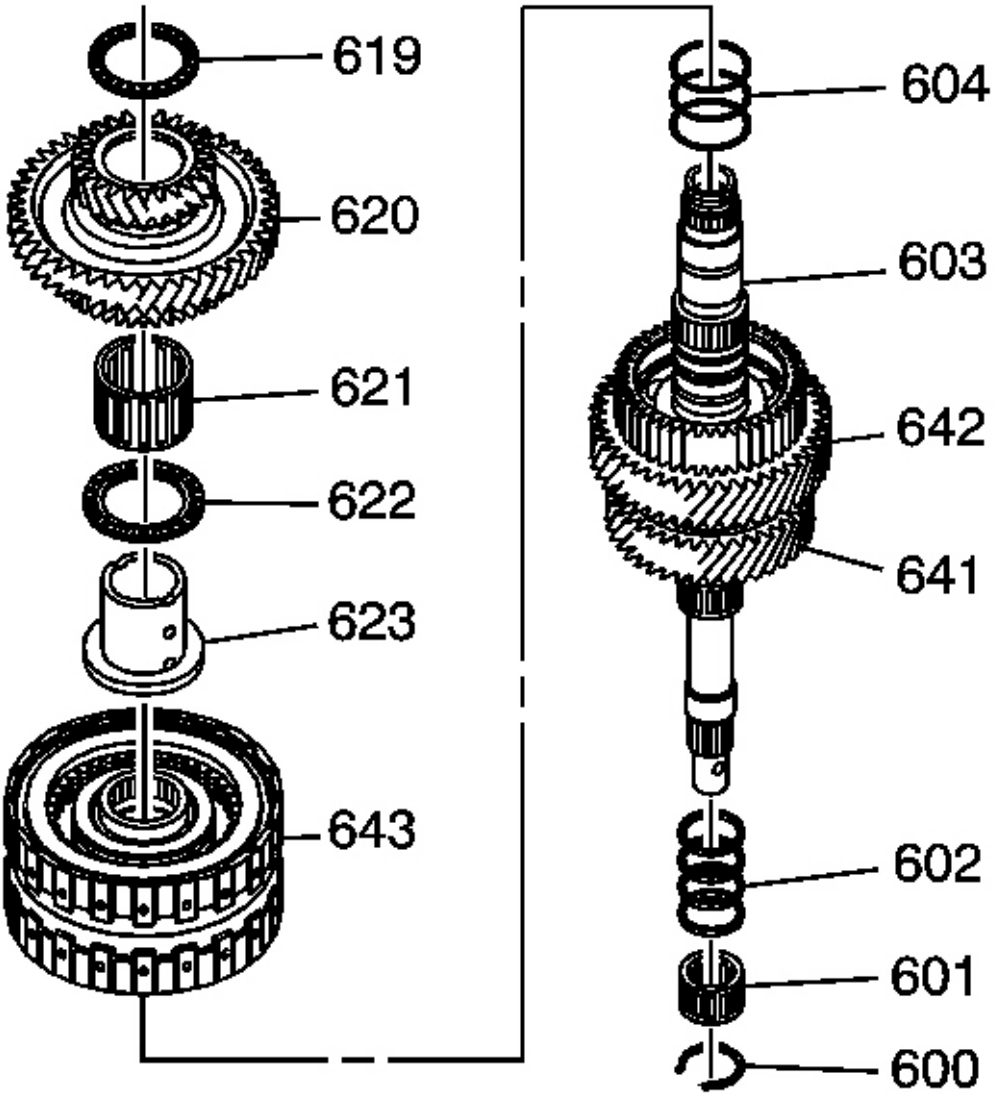

Fig. 205: Rear Of Mainshaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Remove the following components from the rear of the mainshaft (603):
    - 5th/reverse drive gear and clutch hub thrust bearing (619)
    - 5th/reverse drive gear (620)
    - 5th/reverse drive gear and clutch hub inner bearing (621)
    - 5th/reverse drive gear and clutch hub thrust bearing (622)
    - 5th/reverse drive gear and clutch hub bearing race (623)
    - 4th/5th clutch assembly (643)
    - 4th/5th/reverse clutch housing fluid passage O-ring seals (604)
2. Remove the following from the front of the mainshaft (603):
    - Mainshaft front bearing retaining ring (600)
    - Mainshaft front bearing (601)
    - Mainshaft fluid passage seal (602)

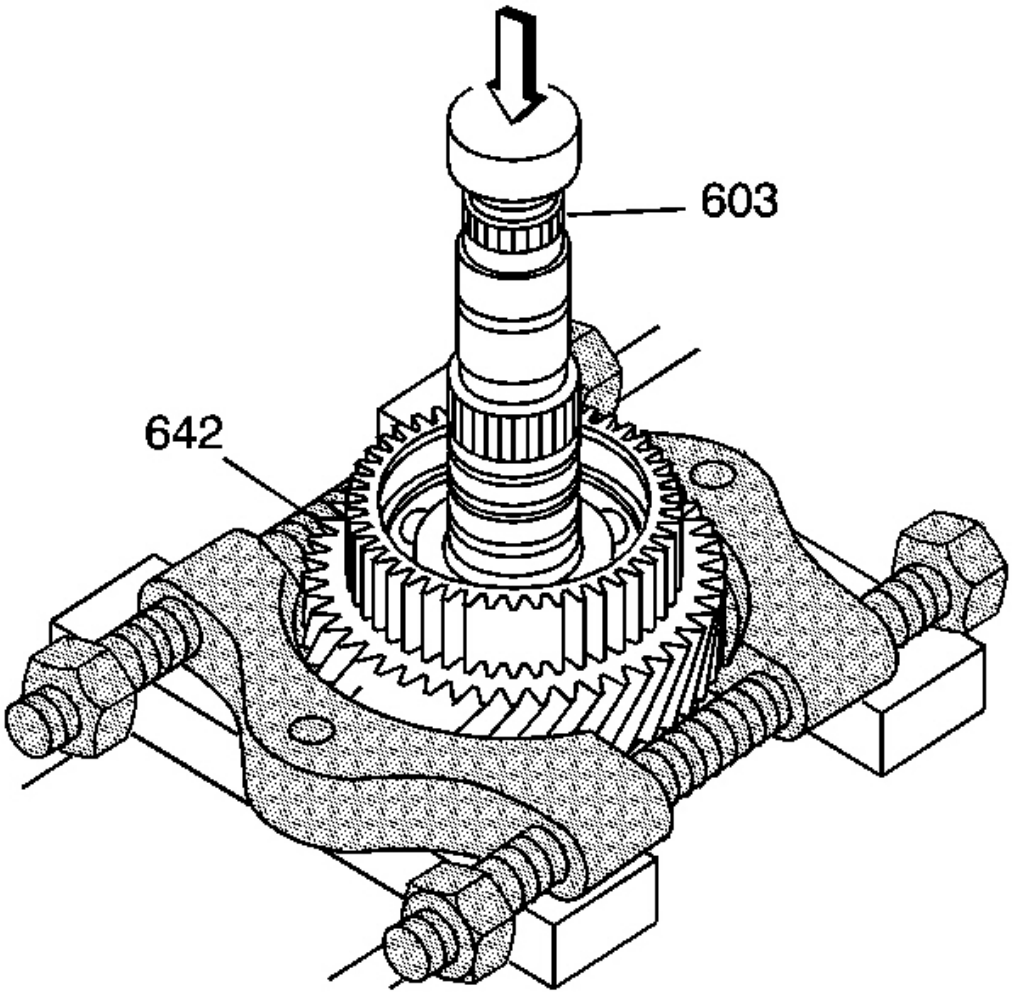

Fig. 206: 4th Drive Gear With Clutch Hub Assembly & Mainshaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The 1st/2nd/3rd drive gear (641) does not remove from the mainshaft (603).

3. Using a hydraulic press and **J 22912-01** , remove the 4th drive gear with clutch hub assembly (642) from the mainshaft (603).
    - Protect the end of the mainshaft to avoid damage to the threads.
    - Ensure the **J 22912-01** is under the bearing race. Do not catch on or under the flange on the shaft.

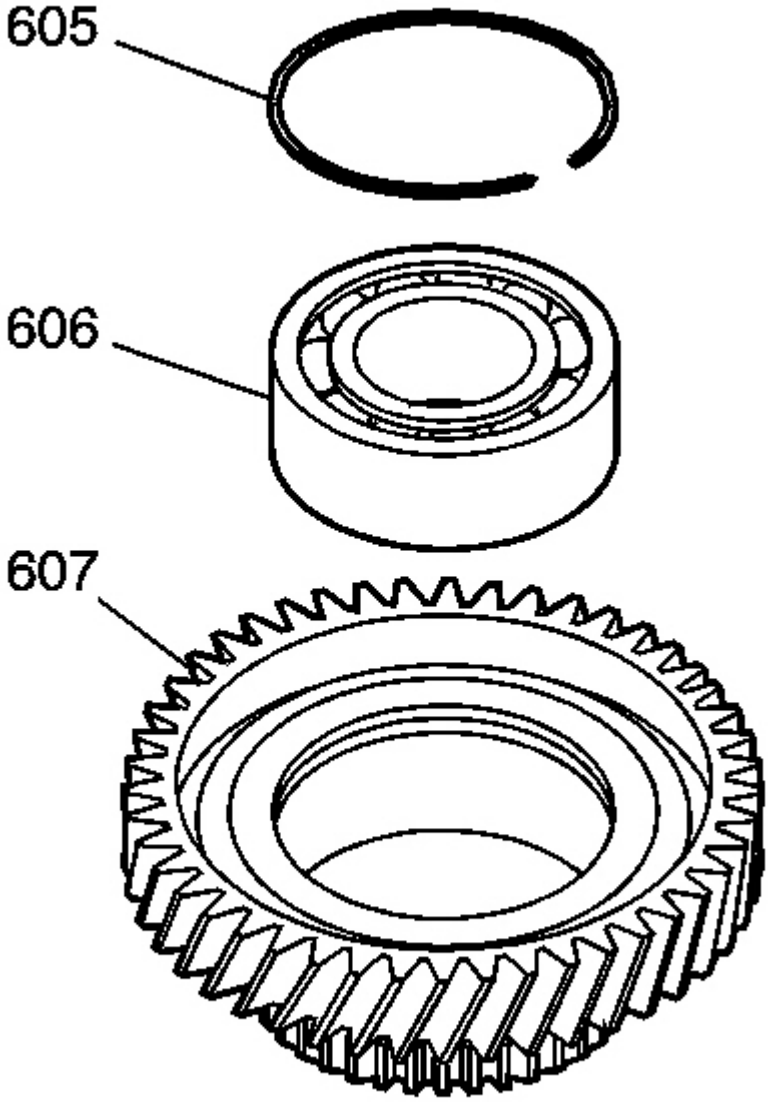

Fig. 207: 4th Drive Gear And Clutch Hub Bearing, Retaining Ring & Drive Gear
Courtesy of GENERAL MOTORS CORP.

4. Remove the 4th drive gear and clutch hub bearing retaining ring (605).
5. Using a brass drift and hammer, remove the 4th drive gear and clutch hub bearing (606) from the 4th drive gear (607).

Inspection Procedure

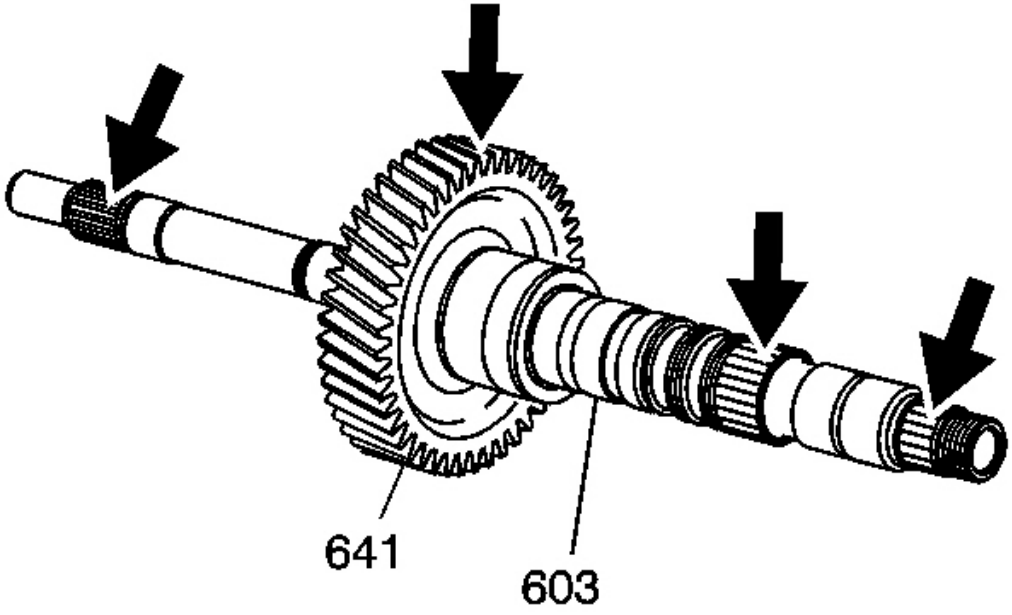

Fig. 208: Inspecting The Mainshaft For Damage
Courtesy of GENERAL MOTORS CORP.

1. Inspect the mainshaft (603) for the following conditions:
    - Worn or damaged splines
    - Bearing journals for excessive wear or damage
    - Damaged threads
    - Oil passage seal grooves for nicks, scratches, or other damage
2. Inspect the 1st/2nd/3rd drive gear (641) for the following conditions:
    - Excessive wear to the teeth
    - Chipped teeth
    - Cracked teeth
    - Looseness on the mainshaft
3. Replace the mainshaft (603) if any of the above conditions are found.

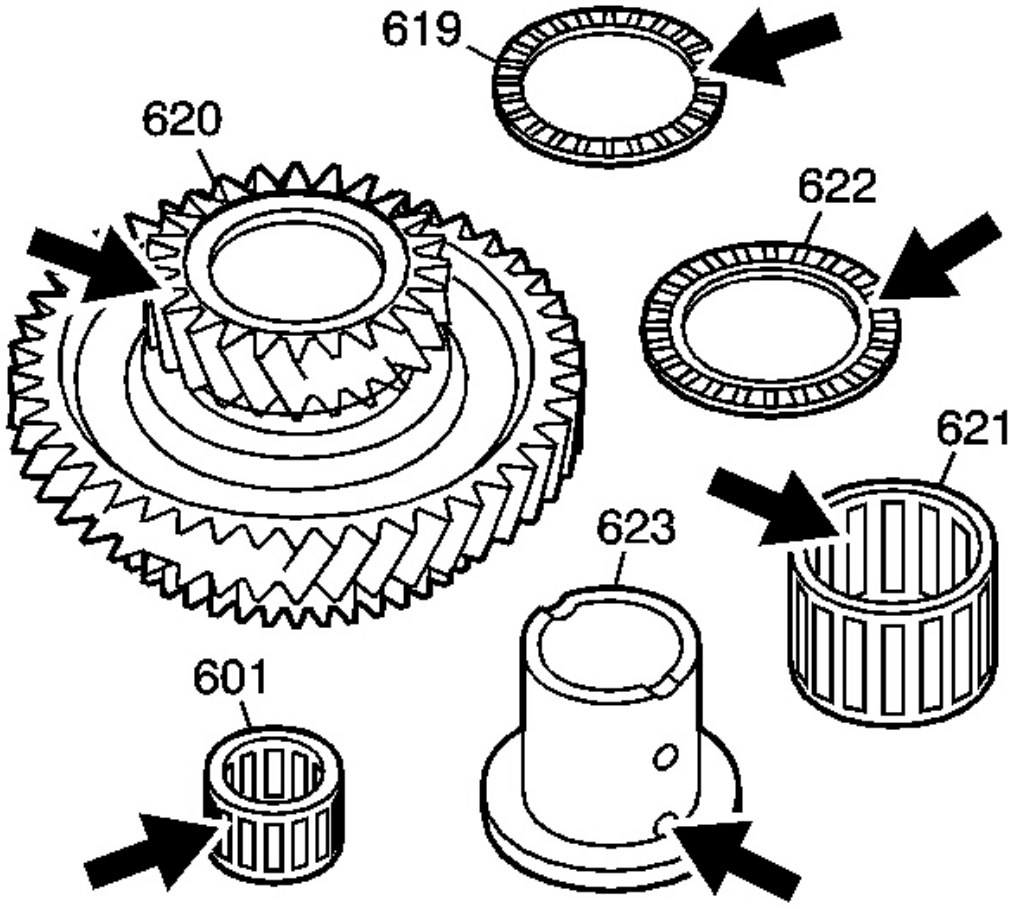

Fig. 209: Inspecting 5th/Reverse Drive Gear & Components For Damage
Courtesy of GENERAL MOTORS CORP.

4. Inspect the following components for wear or damage:
    - 5th/reverse drive gear and clutch hub thrust bearing (619)
    - 5th/reverse drive gear (620)
    - 5th/reverse drive gear and clutch hub inner bearing (621)
    - 5th/reverse drive gear and clutch hub thrust bearing (622)
    - 5th/reverse drive gear and clutch hub bearing race (623)
    - Mainshaft front bearing (601)
5. Replace any faulty parts.

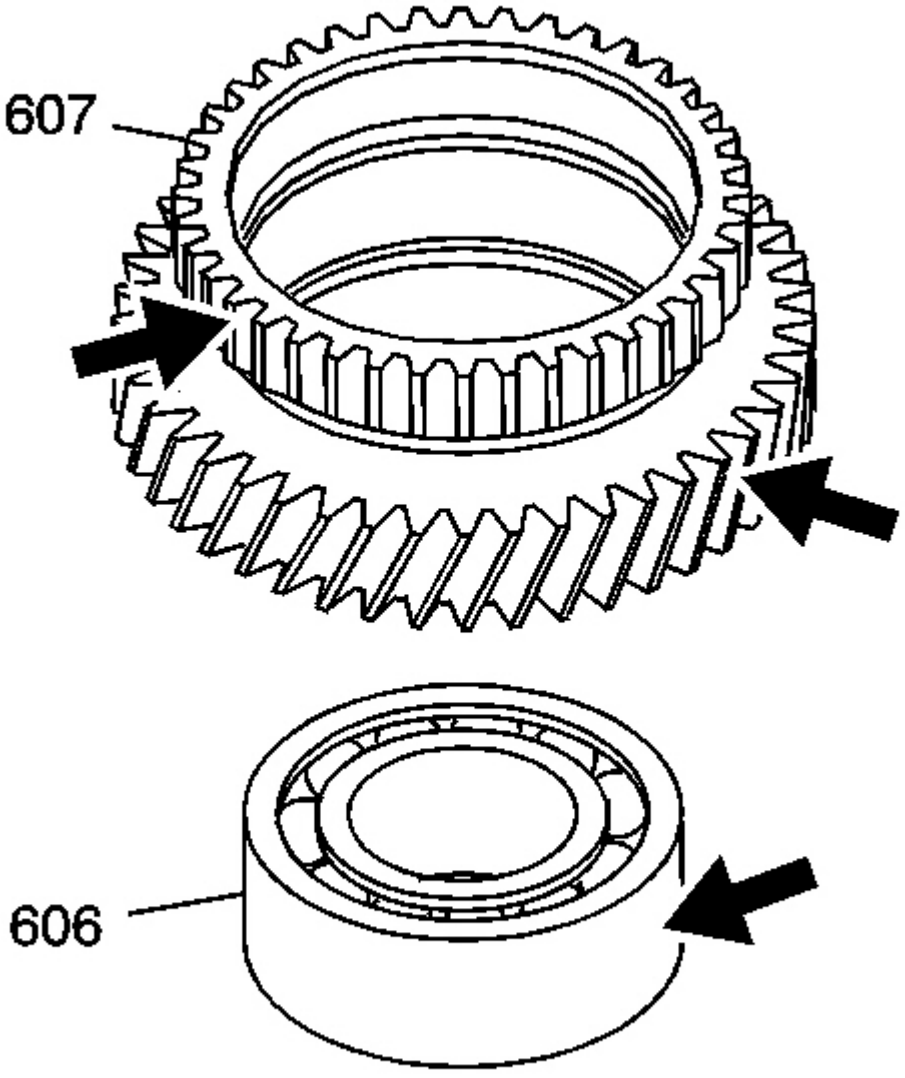

Fig. 210: Inspecting 4th Drive Gear For Damage
Courtesy of GENERAL MOTORS CORP.

6. Inspect the 4th drive gear (607) for the following conditions:
    - Excessive wear to the teeth
    - Chipped teeth
    - Cracked teeth
7. Inspect the 4th drive gear and clutch hub bearing (606) for wear or damage.

8. Replace any faulty parts.

4TH DRIVE GEAR AND CLUTCH HUB REPLACEMENT

Tools Required

DT 46509 Tube Style Driver, 40 mm I.D.

Disassembly

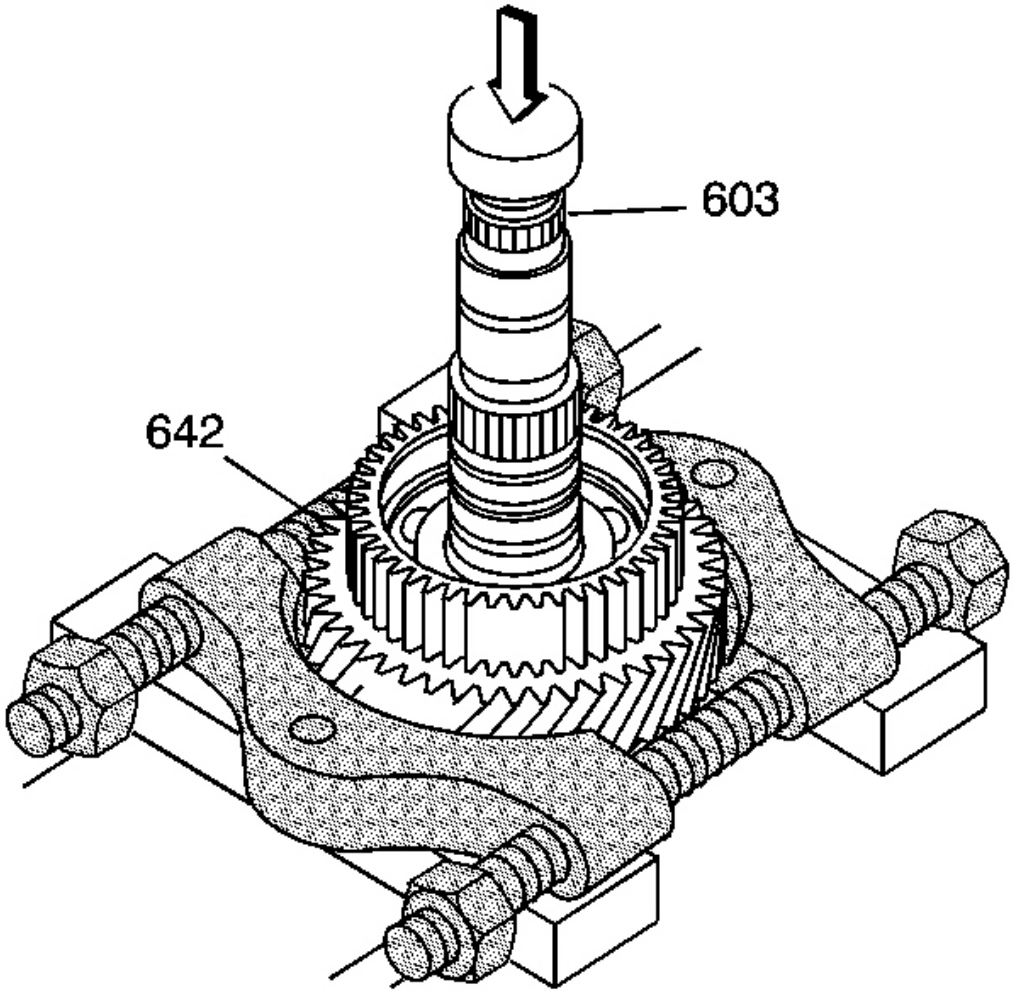

Fig. 211: 4th Drive Gear With Clutch Hub Assembly & Mainshaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Place a shaft protector (1) between the press and mainshaft (641) in order to prevent damage to the mainshaft during 4th drive gear and clutch removal.

Using a hydraulic press, remove the 4th drive gear and clutch hub assembly (607).

Inspection

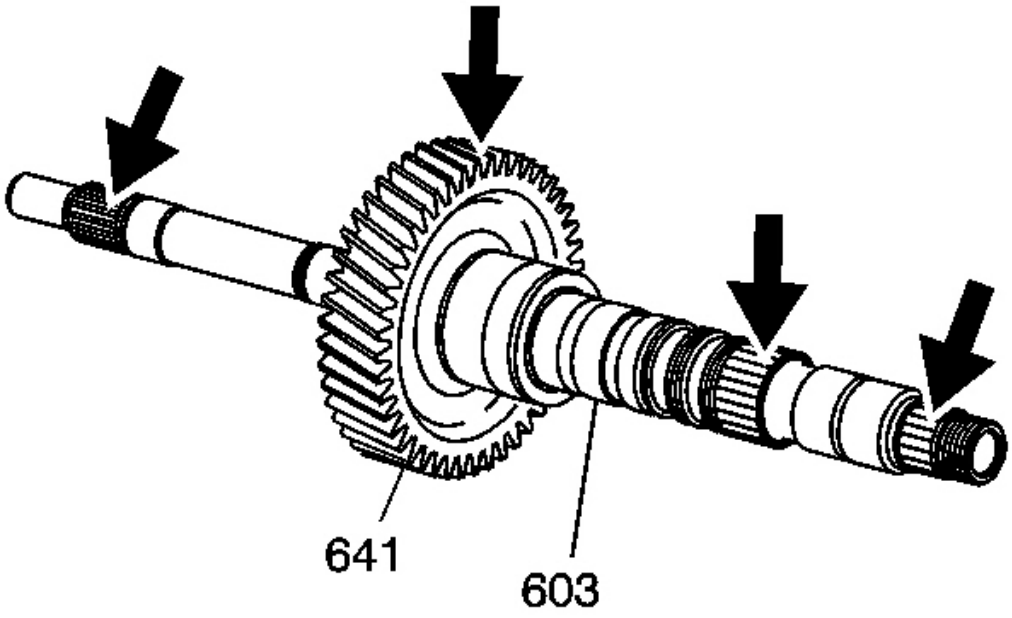

Fig. 212: Inspecting The Mainshaft For Damage
Courtesy of GENERAL MOTORS CORP.

1. Inspect the splines on the mainshaft (641) for excessive wear or damage. Replace mainshaft assembly if needed.
2. Check the mainshaft (641) bearing surfaces for scoring or excessive wear. Replace main shaft if necessary.

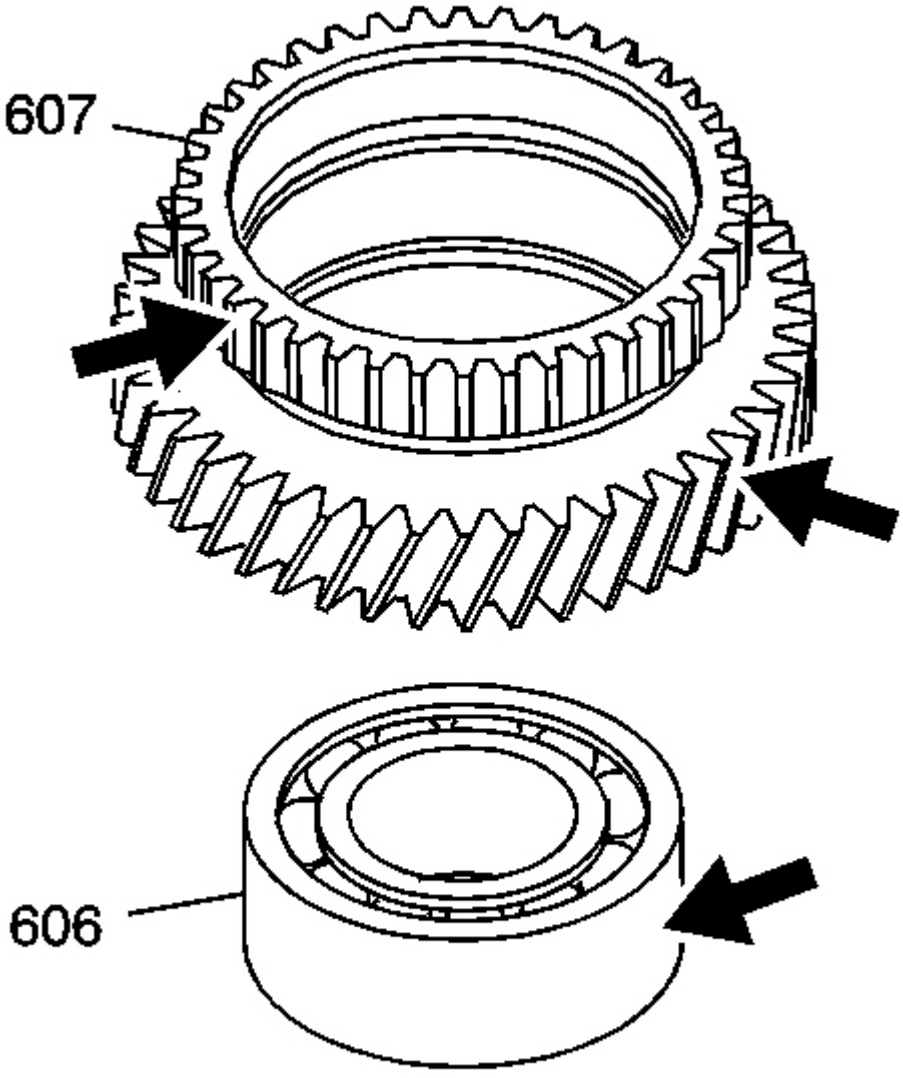

Fig. 213: Inspecting 4th Drive Gear For Damage
Courtesy of GENERAL MOTORS CORP.

3. Inspect the 4th drive gear and clutch hub assembly (607) and the 4th drive gear and clutch hub bearing (606) for wear or damage.
4. Replace the 4th drive gear and clutch hub assembly (607) and the 4th drive gear and clutch hub bearing (606) if the gear is worn or damaged.

Assembly

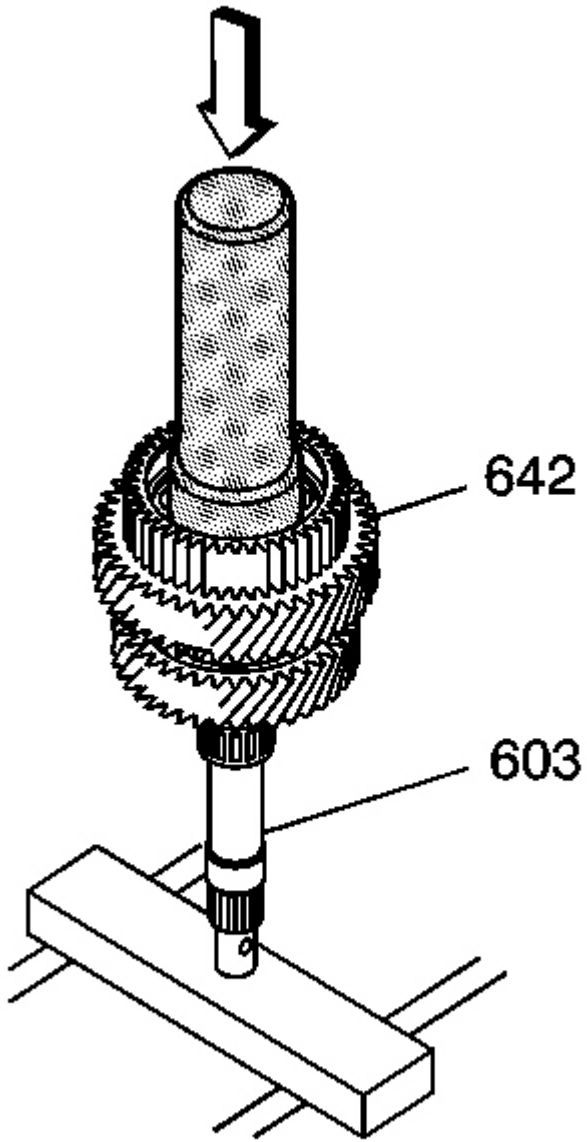

Fig. 214: Installing The 4th Drive Gear & Clutch Hub Assembly Using DT 46509
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Lubricate all parts with automatic transmission fluid during assembly.

Place a shaft protector between the press and the mainshaft (641) in order to prevent damage to the mainshaft.

Using the **DT 46509** and a hydraulic press, install and properly seat the 4th drive gear and clutch hub assembly (607) onto the mainshaft (641).

4TH AND 5TH/REVERSE CLUTCH ASSEMBLY DISASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 45124** Adjustable Bridge

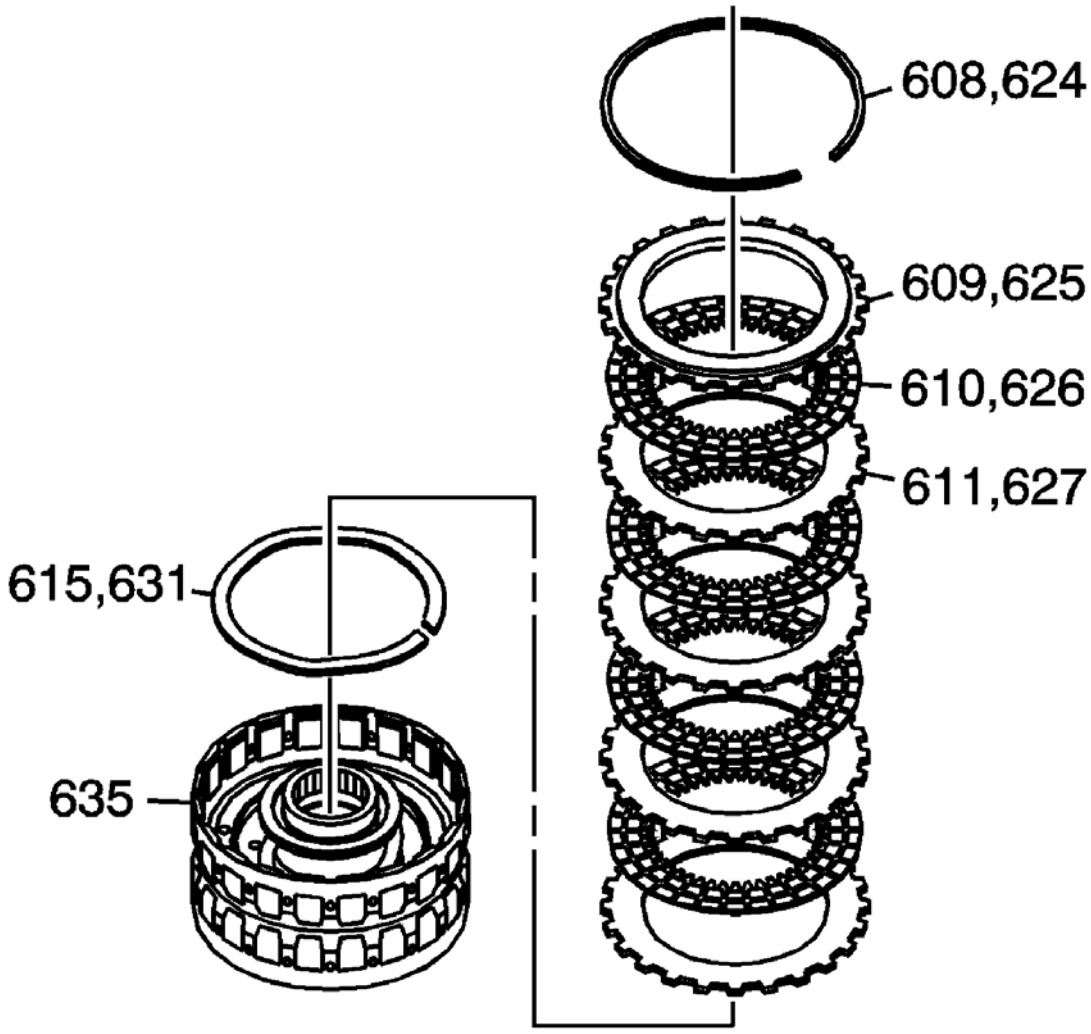

Fig. 215: Clutch Backing Plate Retaining Ring & Components Removed
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The disassemble for either the 4th clutch assembly or the 5th/reverse clutch assembly is the same.

1. Using a screw driver, remove the clutch backing plate retaining ring (608) or (624).
2. Remove the clutch selective backing plate (609) or (625).
3. Remove the clutch steel and fiber plates (610) and (611), or (626) and (627).
4. Remove the clutch waved plate (615) or (631).

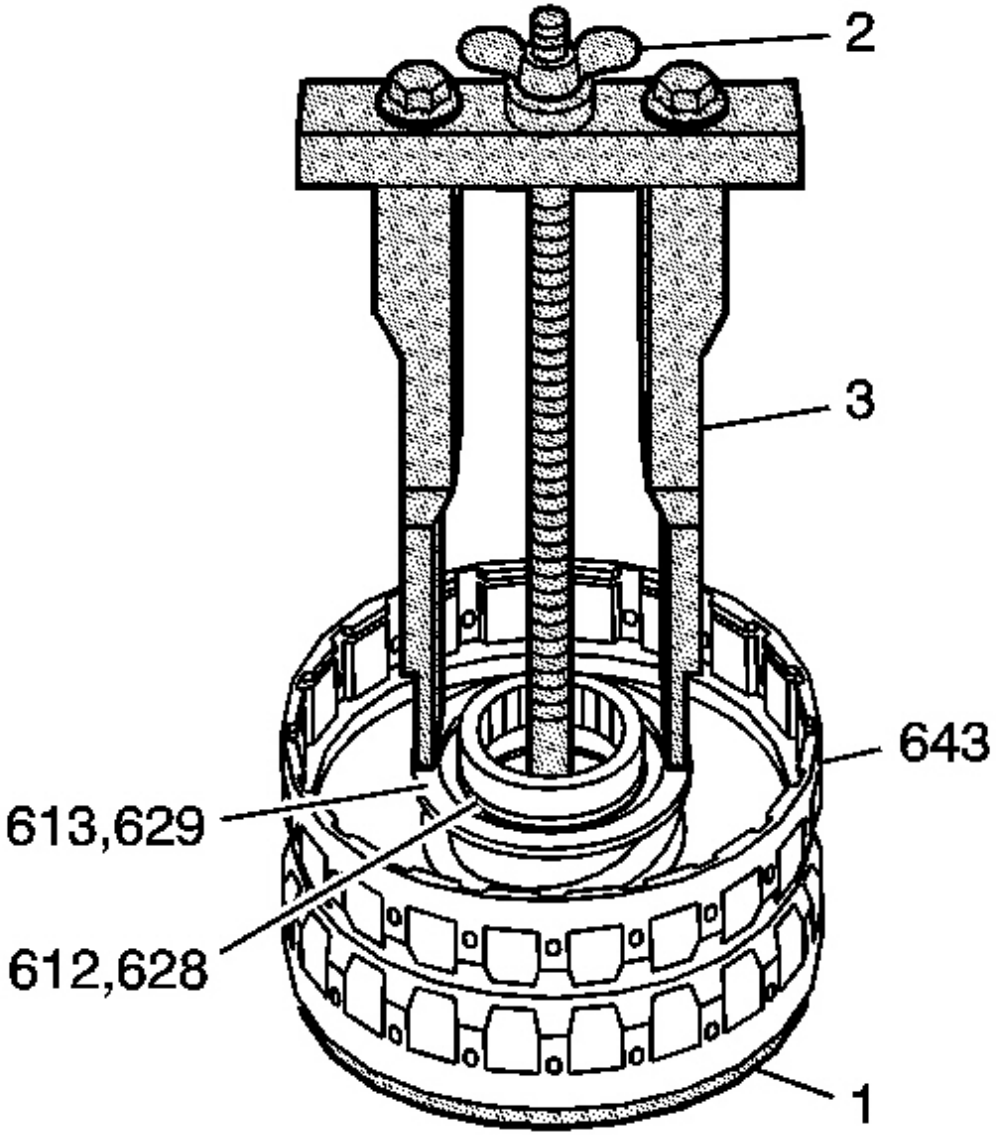

Fig. 216: J 45124, J 23327, Clutch Piston Return Spring, Retaining Ring & Return Spring Retainer

Cap
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

5. Using the bridge and legs of the **J 45124** (3) with the forcing screw of the **J 23327** (2) and J 21420-2 (1) plate of the **J 23327** , compress the clutch piston return spring (614) or (630) until the clutch spring retainer cap retaining ring (612) or (628) is accessible.
   - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap (613) or (629).
   - Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

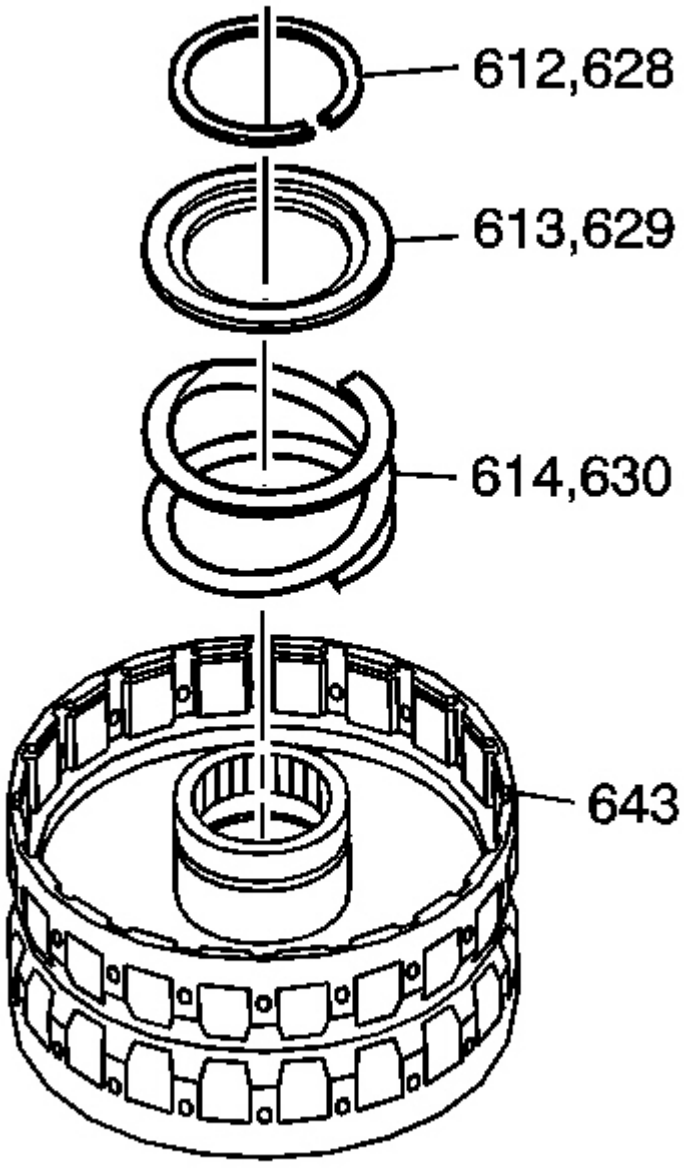

Fig. 217: Clutch Piston Return Spring & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Remove the clutch piston return spring retaining ring (612) or (628). Remove the tools.
7. Remove the clutch piston return spring cap (613) or (629), and remove the clutch piston return spring (614) or (630).

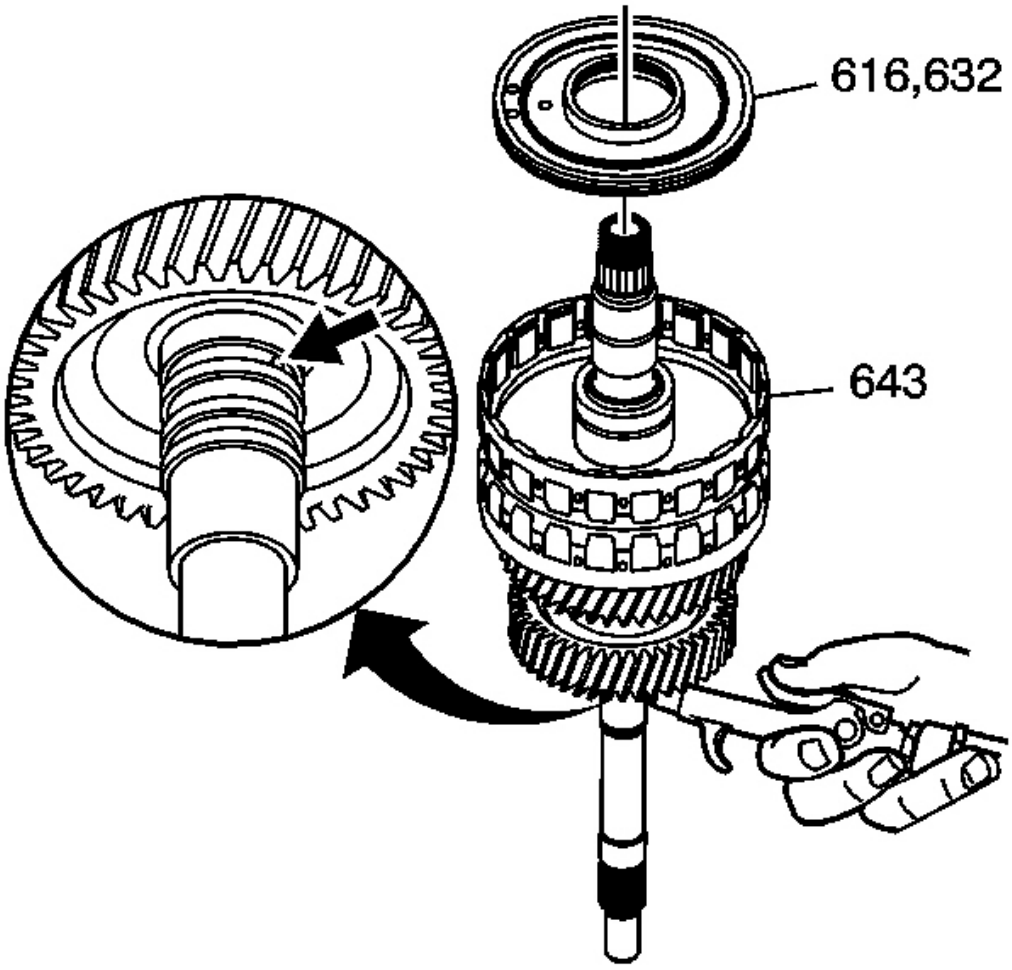

Fig. 218: Applying Compressed Air Into Appropriate Fluid Passage Hole
Courtesy of GENERAL MOTORS CORP.

8. If the 4th and 5th/reverse clutch fluid passage O-ring seals (604) were removed, install the old seals.
9. Install the clutch housing assembly (643) back onto the mainshaft assembly. Apply compressed air into the appropriate fluid passage hole of the mainshaft assembly in order to remove either clutch piston assembly (616) or (632).
10. Remove the inner and outer O-ring seals from the clutch pistons.

4TH AND 5TH/REVERSE CLUTCH INSPECTION

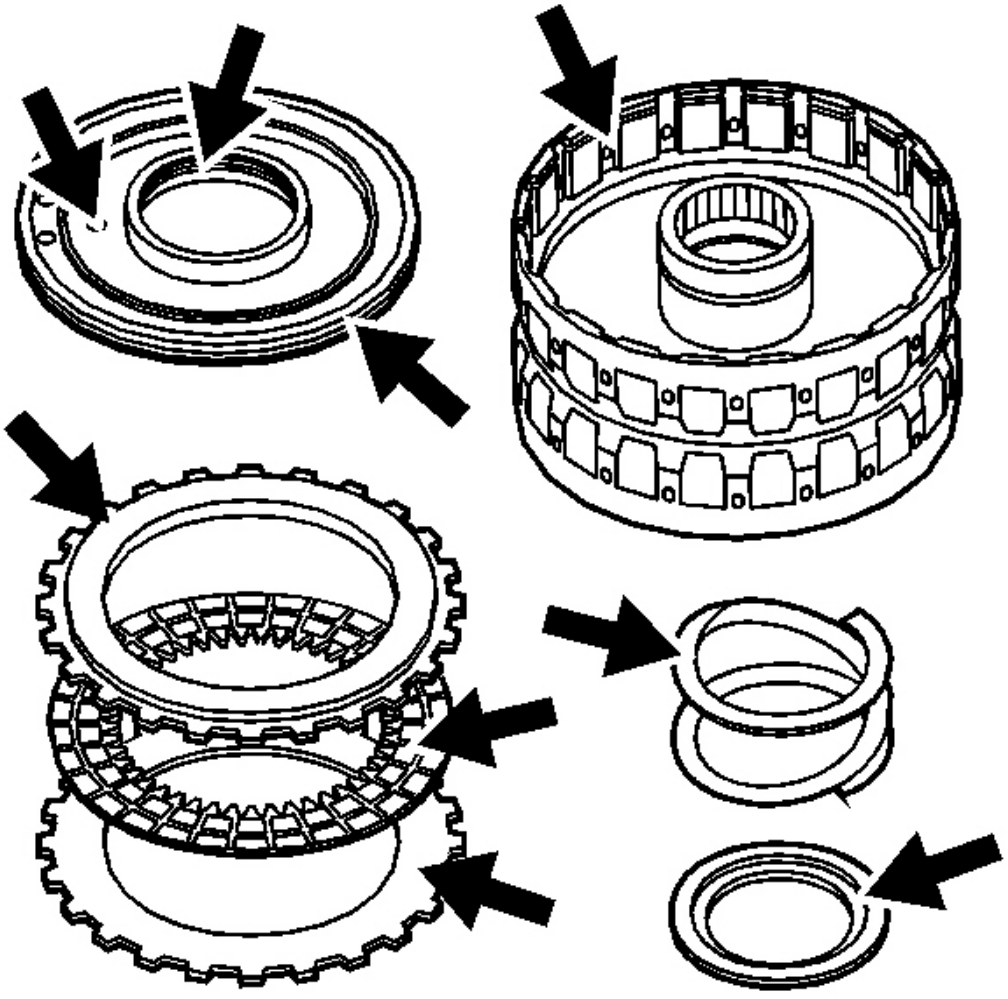

Fig. 219: Inspecting 4th & 5th Clutch & Components
Courtesy of GENERAL MOTORS CORP.

1. Clean the clutch components, except the clutch fiber plates in solvent and air dry.
2. Inspect the clutch piston check valve in the clutch pistons for looseness or damage.
3. Inspect the O-ring seal groove in the clutch pistons for nicks, scratches, or burrs.
4. Inspect for excessively worn or bent piston retainer caps.
5. Inspect the clutch piston return springs for the correct free length. Refer to **Transmission Clearance Specifications** , Clutch Return Spring Free Length.
6. Inspect the 4th and 5th/reverse clutch hub for worn grooves in the clutch plate notches that will prevent the clutch plates from sliding.

7. Inspect the clutch steel plates for heat damage, excessive wear, or warping.
8. Inspect the clutch fiber plates for heat damage, wear, and discoloration.
9. Inspect the clutch backing plate for heat damage and excessive wear.
10. Replace all faulty clutch components. Replace the clutch plates as a set.

4TH AND 5TH/REVERSE CLUTCH ASSEMBLY ASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Adjustable Bridge

Note these items during assembly:

- Apply automatic transmission fluid to all O-ring seals before assembly.
- Soak all clutch fiber plates in automatic transmission fluid for a minimum of 30 minutes.

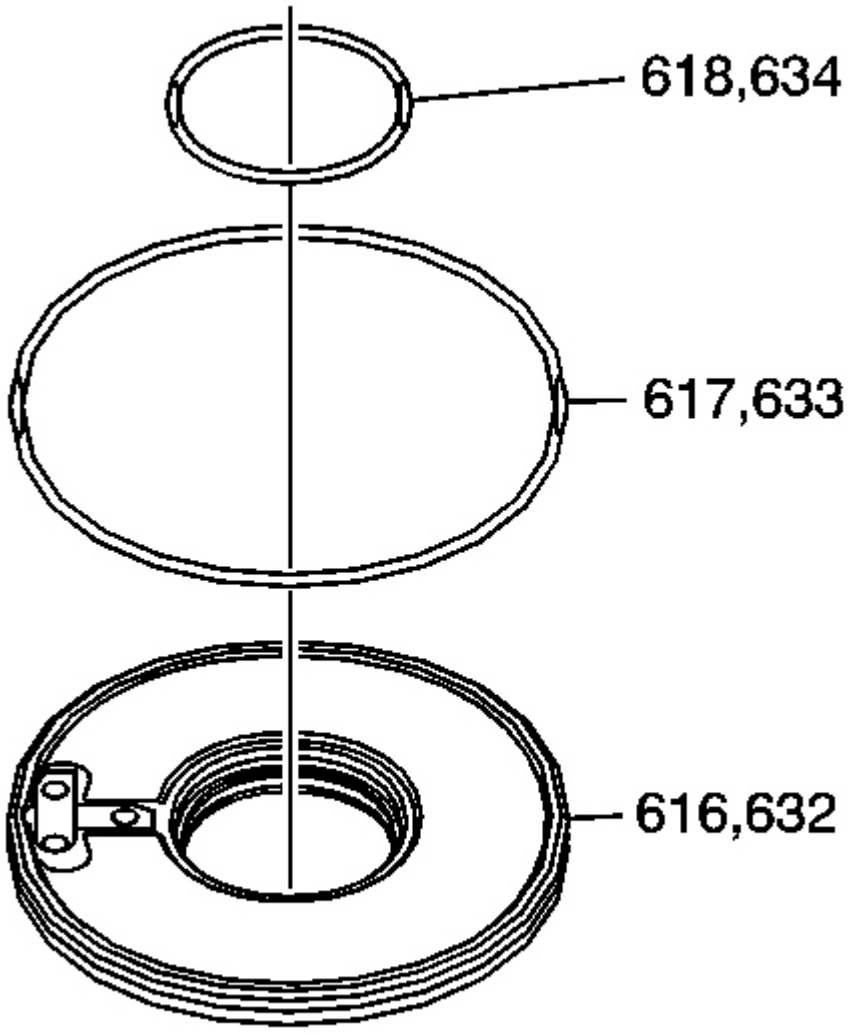

Fig. 220: Inner, Outer O-Ring Seals & Clutch Piston
Courtesy of GENERAL MOTORS CORP.

1. Install new inner (618) or (634) and outer O-ring seals (617) or (633) on the clutch piston (616) or (632).

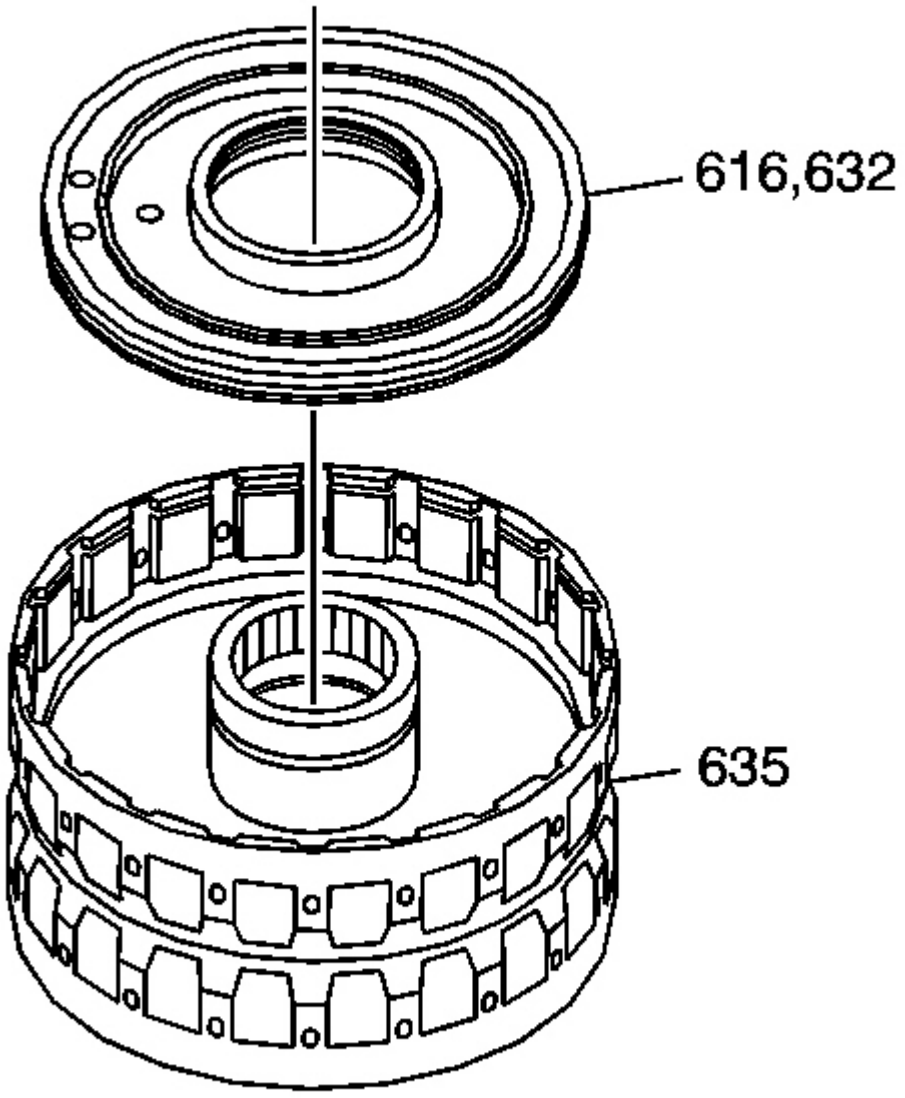

Fig. 221: Clutch Piston Assembly & Clutch Housing
Courtesy of GENERAL MOTORS CORP.

2. Install the clutch piston assembly (616) or (632) into the clutch housing (635).
    - Apply even hand pressure and rotate the clutch piston assembly.
    - Ensure proper seating.
    - Do not pinch the O-ring seal by installing the piston with excessive force.

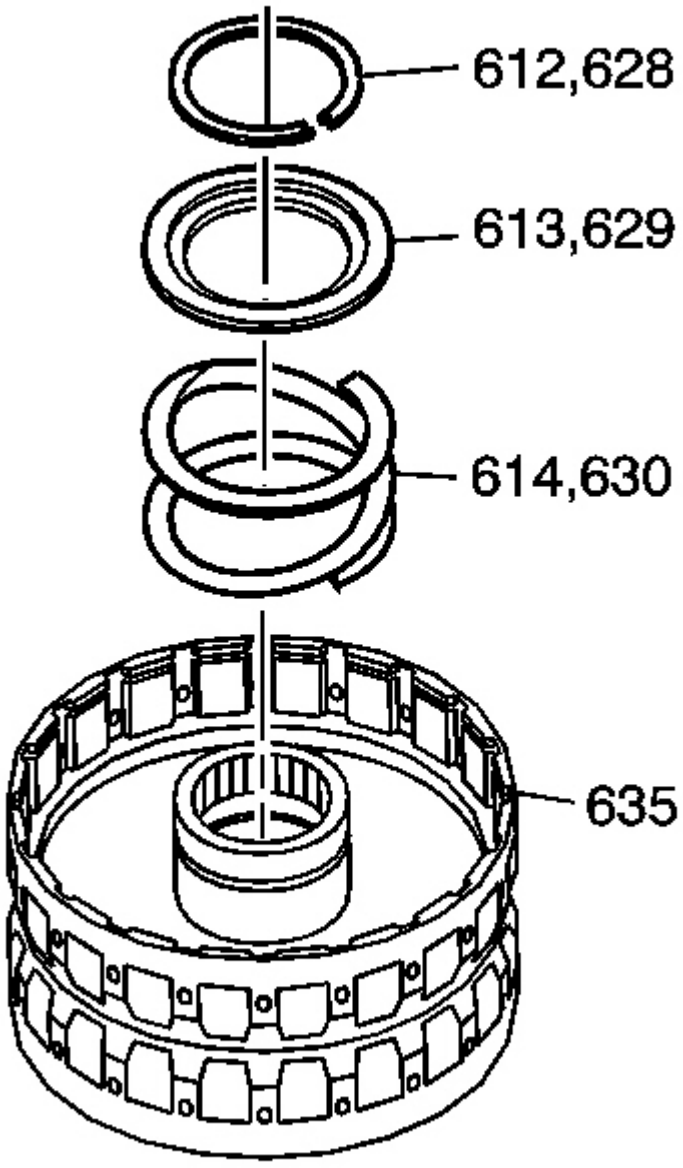

Fig. 222: Installing Clutch Return Spring & Components
Courtesy of GENERAL MOTORS CORP.

3. Install the clutch return spring (614) or (630).
4. Install the clutch return spring retainer cap (613) or (629).
5. Install the clutch piston return spring retaining ring (612) or (628) on the clutch piston return spring

retainer cap (613) or (629).

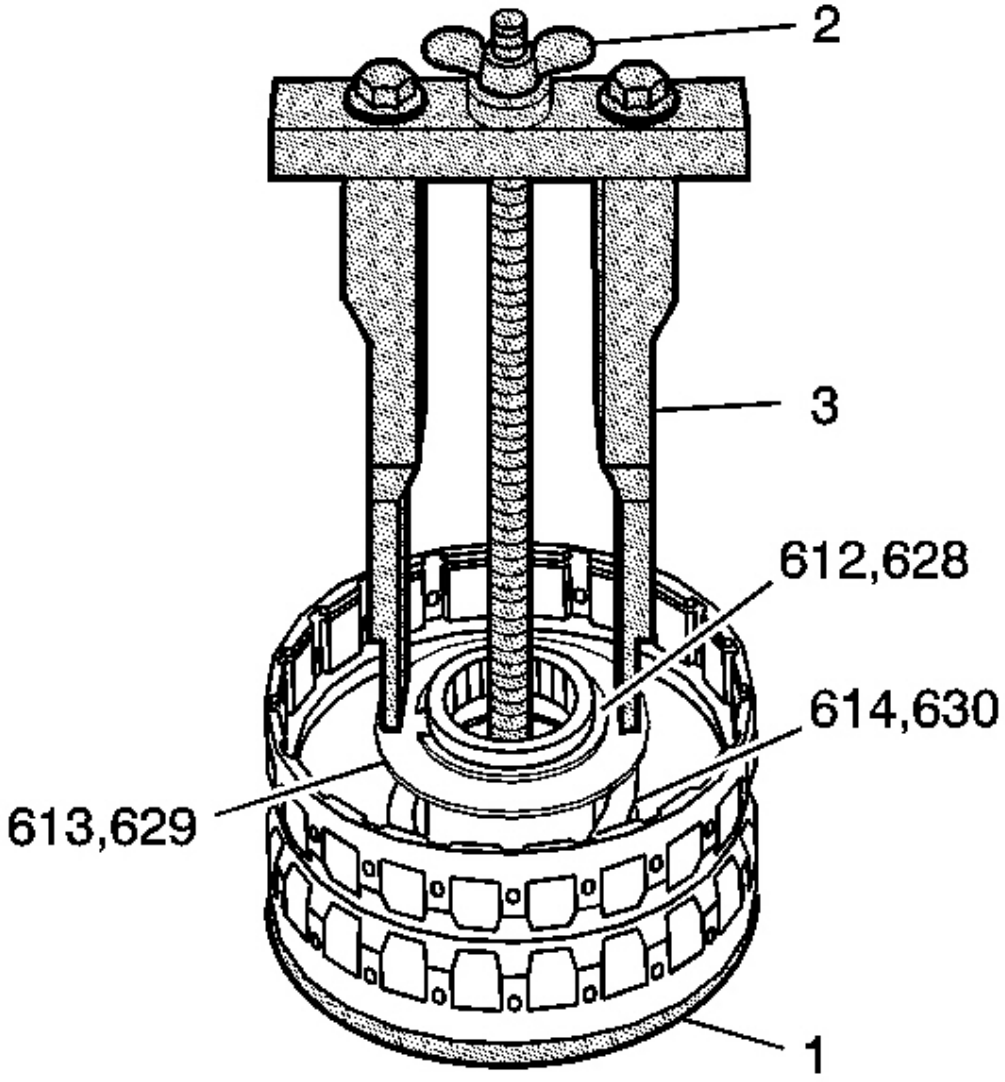

Fig. 223: J 45124, J 23327, Clutch Piston Return Spring, Retaining Ring & Clutch Spring Retainer Cap
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

6. Using the bridge and legs of the **J 45124** (3) with the forcing screw of **J 23327** (2) and J 21420-2 (1) plate of **J 23327** , compress the clutch piston return spring (614) or (628) until the groove for the clutch spring retainer cap retaining ring (612) or (628) is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap (613) or (629).
    - Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

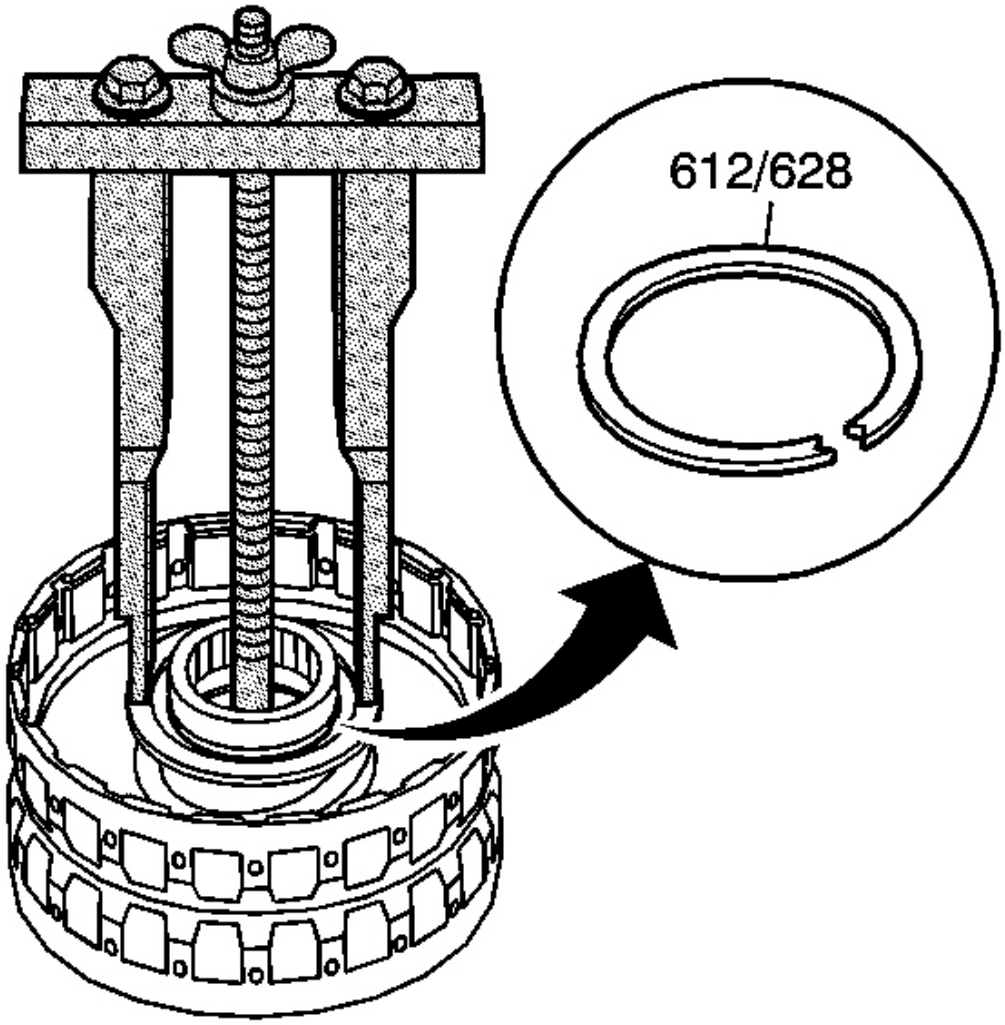

Fig. 224: Clutch Piston Return Spring Retaining Cap
Courtesy of GENERAL MOTORS CORP.

7. Install the clutch piston return spring retaining cap retaining ring (612) or (628).
8. Remove the tools.

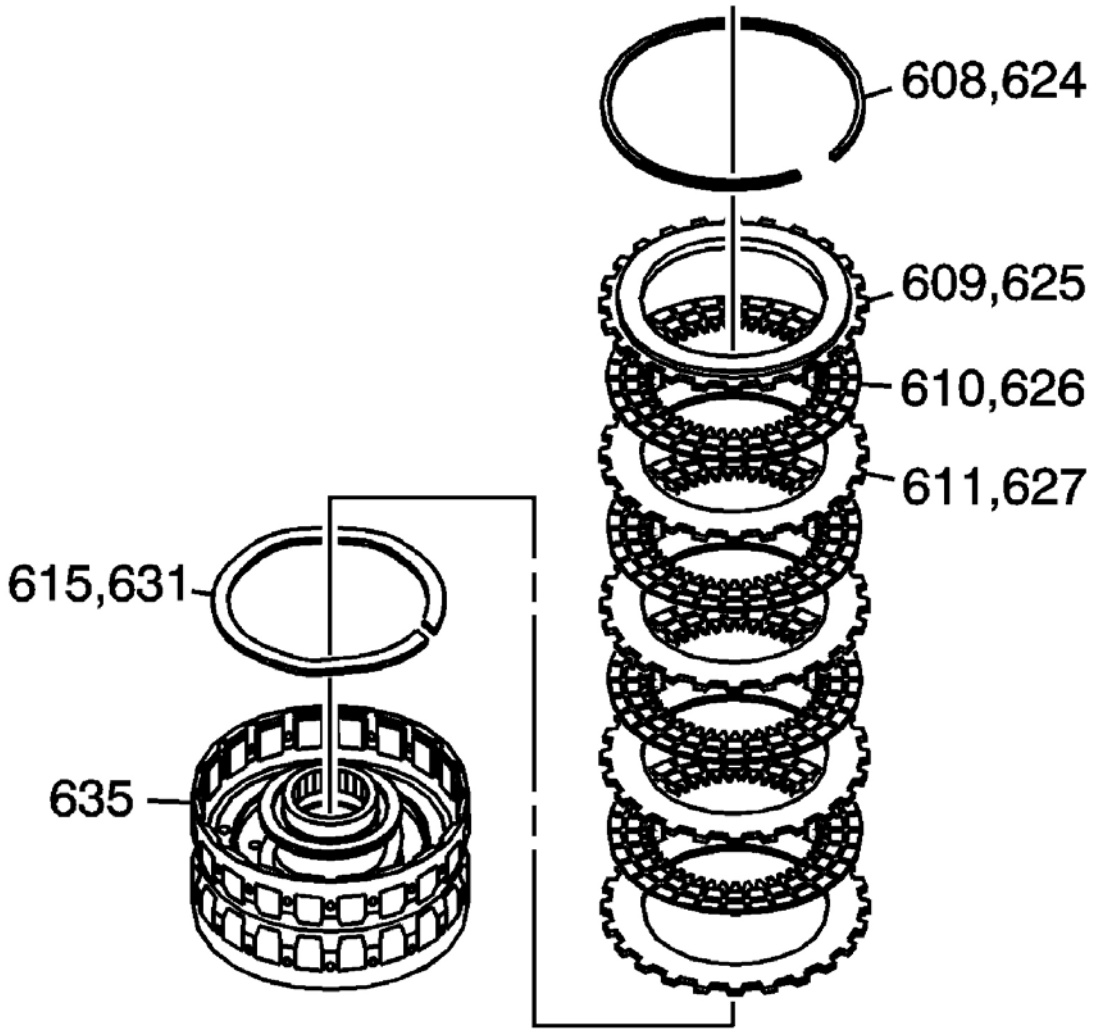

Fig. 225: Installing Clutch Piston Assembly & Components
Courtesy of GENERAL MOTORS CORP.

9. Install the wave plate (615) or (631) into the groove of the clutch piston assembly (616) or (632).
10. Install a clutch steel plate (611) or (627).
11. Install a clutch fiber plate (610, 626).
12. Alternately install the steel plates and the fiber plates until 4 steel and 4 fiber plates are installed.
13. Install the clutch selective backing plate (609) or (625).
14. Install the backing plate retaining ring (608) or (624).
15. Measure the clutch backing plate clearance. Refer to **Clutch Backing Plate Clearance Measurement** .

CLUTCH BACKING PLATE CLEARANCE MEASUREMENT

Tools Required

- **DT 46666** Compressor
- **SA9178NE-A** Dial Indicator

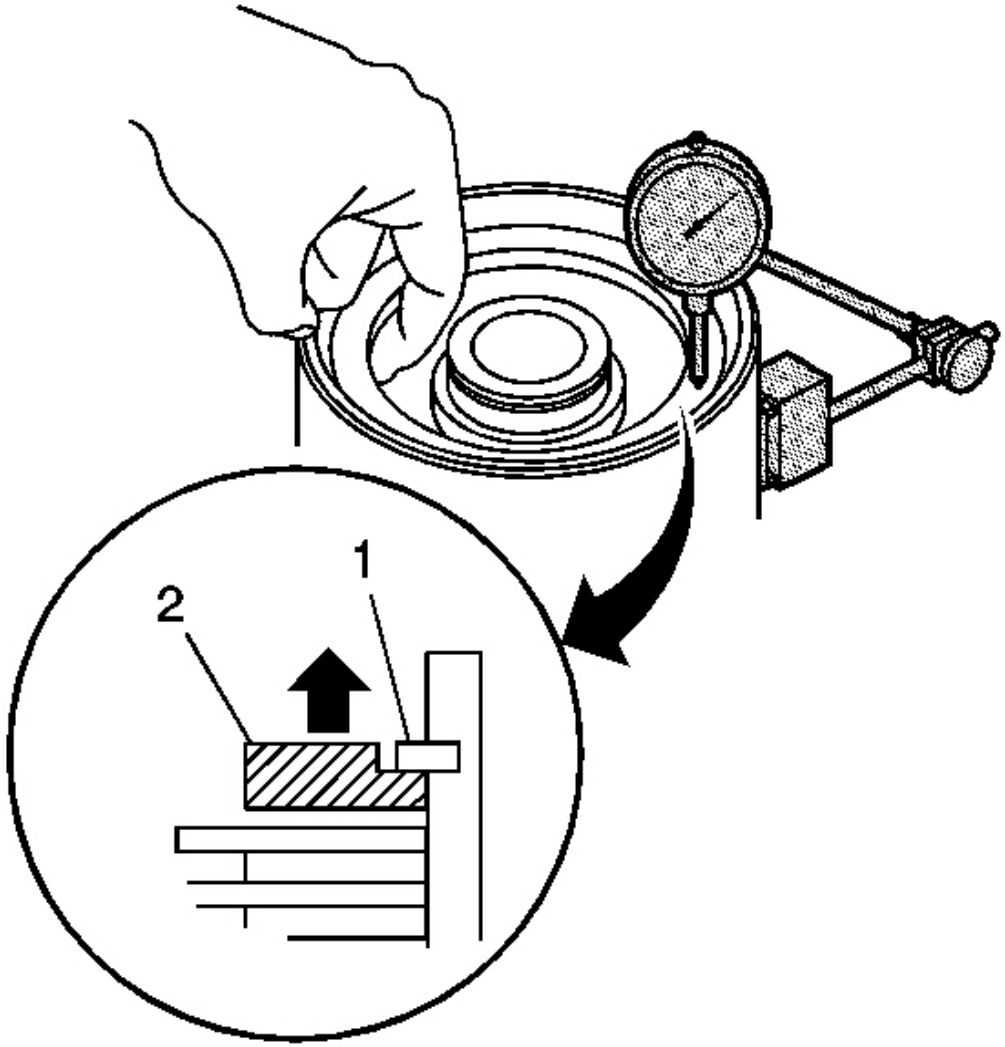

Fig. 226: Measuring The Clutch Assemblies Clutch Backing Plate Clearance
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- **Use this procedure to measure the following clutch assemblies clutch backing plate clearance:**
  - **1st Clutch**
  - **2nd Clutch**
  - **3rd Clutch**
  - **4th Clutch**
  - **5th Clutch**
- **A hydraulic press is used during this procedure and it may be beneficial to place the clutch hub on the press plates before starting the measurements.**

1. Install the **SA9178NE-A** on the clutch hub.
2. Position the dial indicator pointer on the clutch backing plate (2).
3. Lift the clutch backing plate (2) to the clutch backing plate retaining ring (1).
4. Zero the gauge of the **SA9178NE-A** while the backing plate is against the retaining ring.

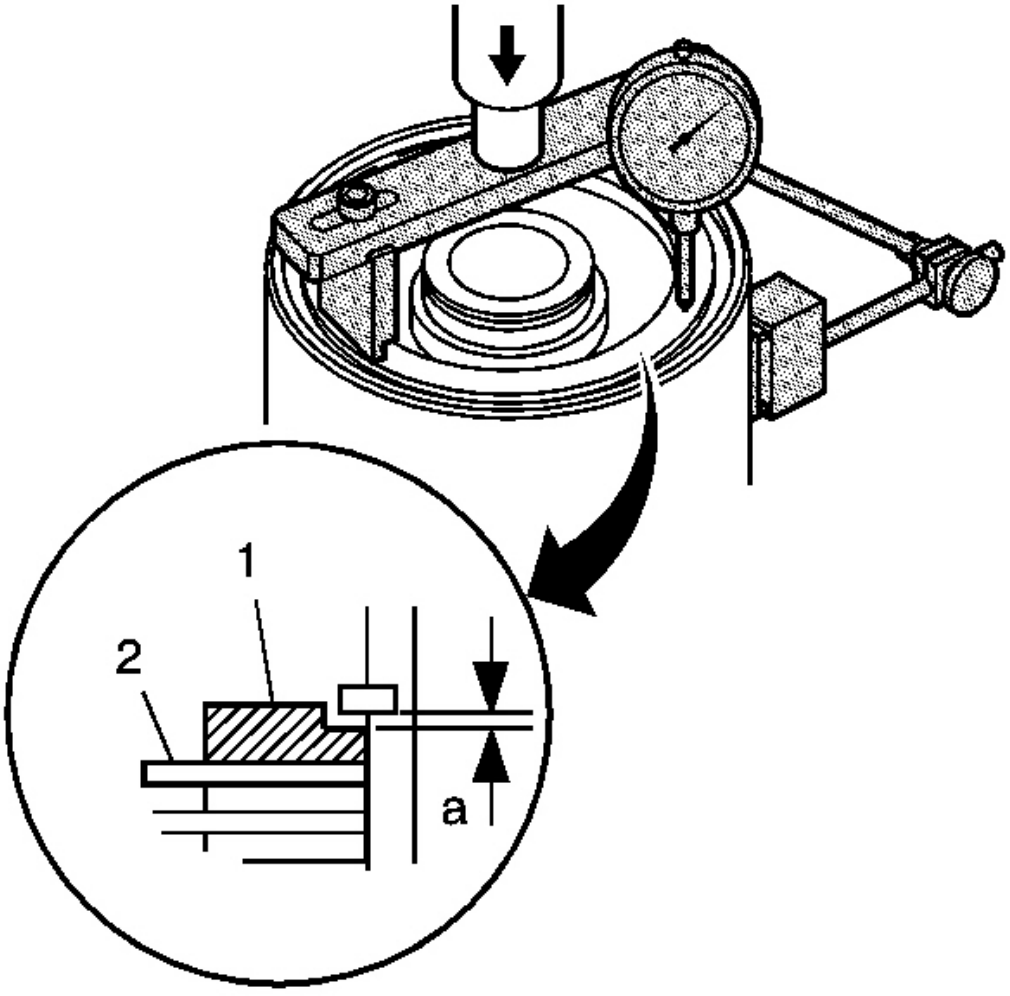

Fig. 227: Clutch Backing Plate & DT 46666
Courtesy of GENERAL MOTORS CORP.

5. Release the clutch backing plate and place **DT 46666** on the backing plate.
6. Using a hydraulic press apply only 39 N.m (9 lb ft) on the **DT 46666** . If a press gauge is not available apply only enough pressure until the dial indicator pointer quits moving.
7. Read the dial indicator. This reading is the clearance (a) for the clutch backing plate to the top fiber plate.
8. Measure at least 3 places and average the 3 measurements. Use the average measurement as the actual clearance.

Specifications:

- 1st clutch: 1.1-1.3 mm (0.043-0.051 in)
- 2nd clutch: 1.0-1.2 mm (0.039-0.047 in)
- 3rd clutch: 0.7-0.9 mm (0.028-0.035 in)
- 4th clutch: 0.55-0.75 mm (0.022-0.030 in)
- 5th clutch: 0.55-0.75 mm (0.022-0.030 in)

9. If the clearance is not within specifications, replace the clutch steel and fiber plates, if not new.
10. If the clearance is still not within specifications, select a thinner backing plate to increase the measurement or a thicker backing plate to reduce the clearance listed in the specification table. Refer to **Shim Size Specifications** .
11. After installing a new backing plate, measure the clearance again to ensure the clearance is within specifications.

MAINSHAFT ASSEMBLE

Tools Required

DT 46509 Tube Style Driver

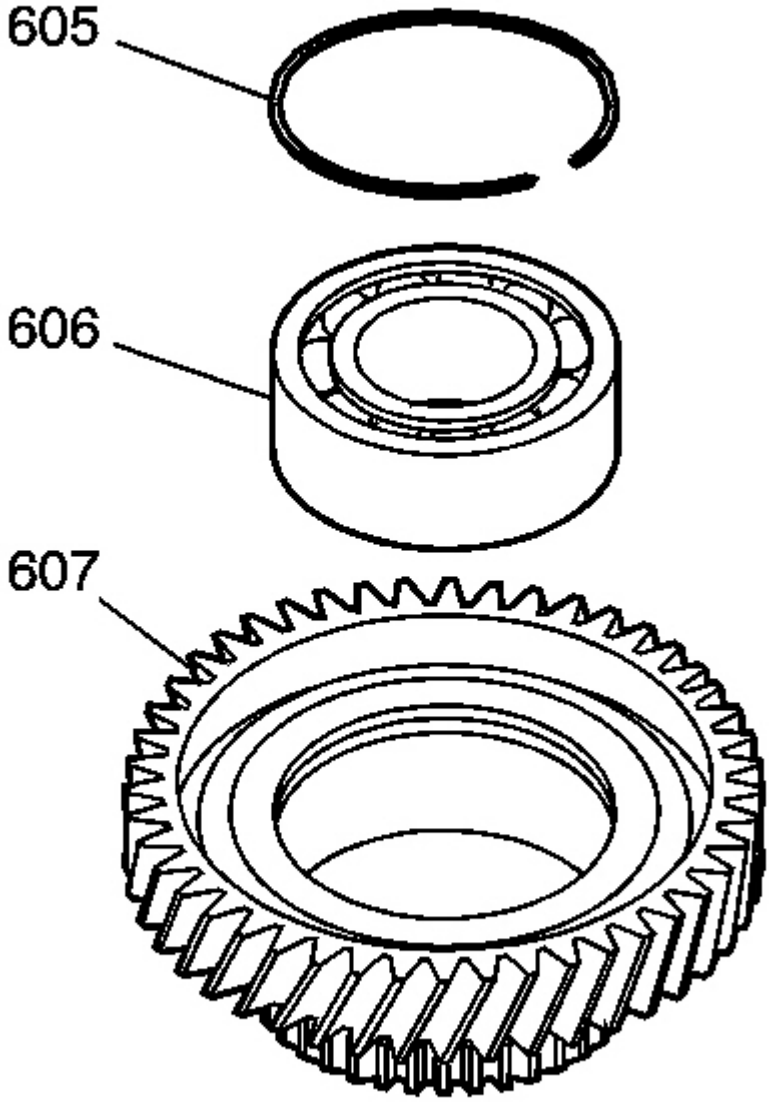

Fig. 228: 4th Drive Gear And Clutch Hub Bearing, Retaining Ring & Drive Gear
Courtesy of GENERAL MOTORS CORP.

1. Lubricate all parts during assembly with automatic transmission fluid.
2. Using a brass drift and hammer, install the 4th drive gear and clutch hub bearing (606) in the 4th drive gear (607).
3. Install the 4th drive gear and clutch hub bearing retaining ring (605).

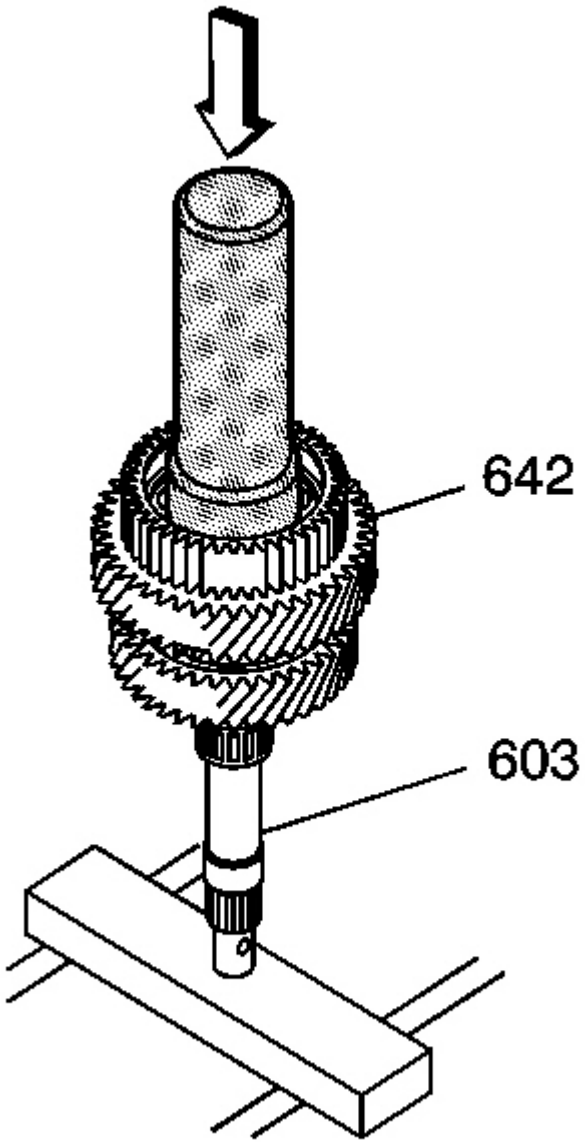

Fig. 229: Installing The 4th Drive Gear & Clutch Hub Assembly Using DT 46509
Courtesy of GENERAL MOTORS CORP.

4. Using the **DT 46509** and a hydraulic press, install the 4th drive gear with clutch hub assembly (642) on the mainshaft (603). Do not damage the threads on the mainshaft.

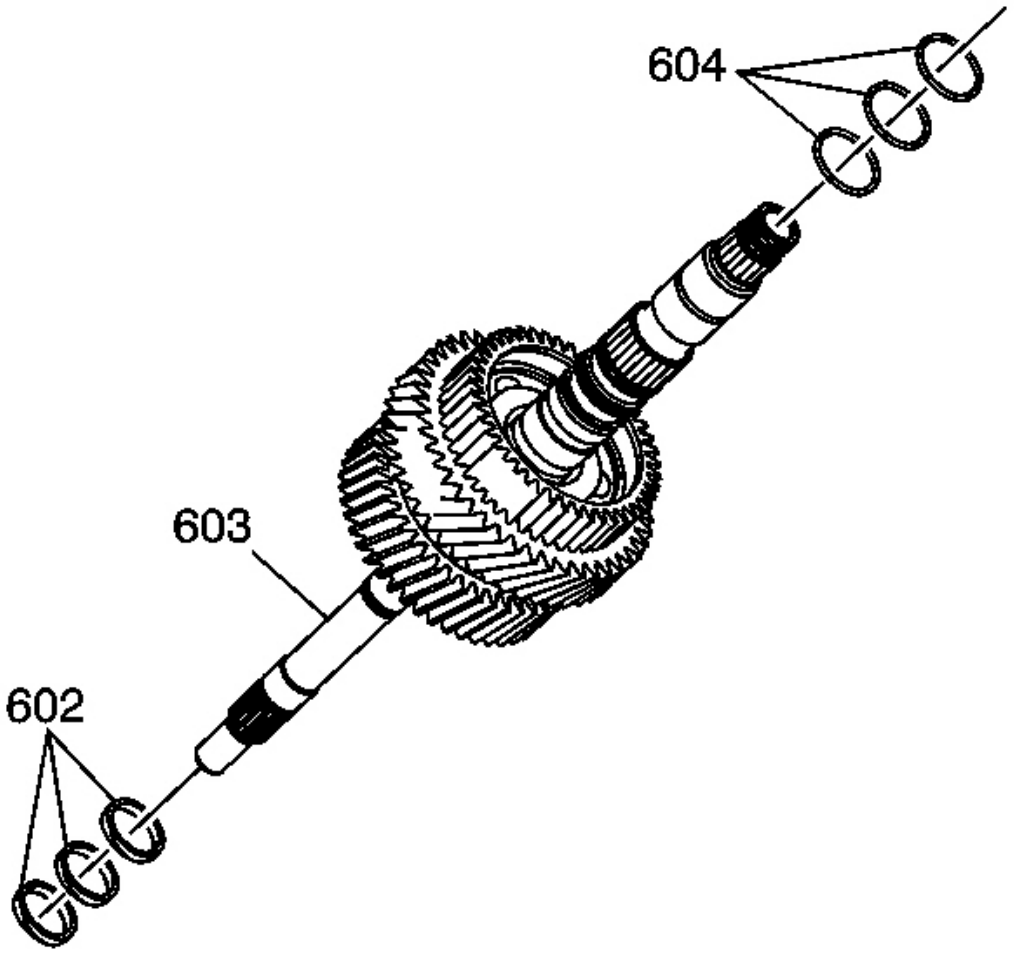

Fig. 230: Installing Square Cut Mainshaft Fluid Passage Seals & 4th/5th/Reverse Clutch Housing Fluid Passage O-Ring Seals
Courtesy of GENERAL MOTORS CORP.

5. Wrap the splines on each end of the mainshaft (603) with tape to prevent damage to the O-ring seals when installing.
6. Install 3 new square cut mainshaft fluid passage seals (602) on the mainshaft.
7. Install 3 4th/5th/reverse clutch housing fluid passage O-ring seals (604) on the mainshaft.
8. Remove the tape from the mainshaft.

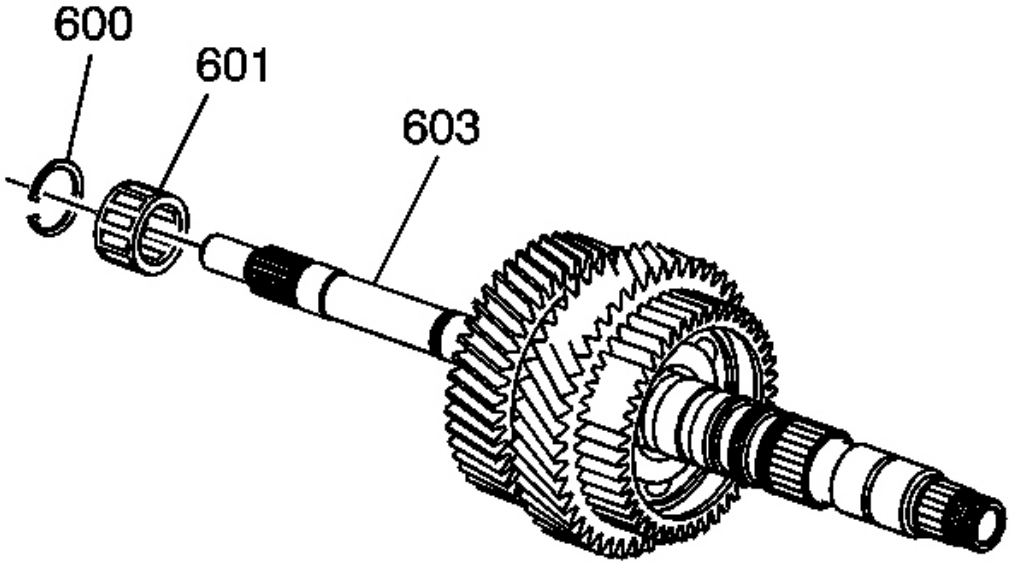

Fig. 231: Installing Mainshaft Front Bearing & Retaining Ring
Courtesy of GENERAL MOTORS CORP.

9. Install the 23 x 31 x 21.8 mm mainshaft front bearing (601).
10. Install the mainshaft front retaining ring (600) on the mainshaft (603).

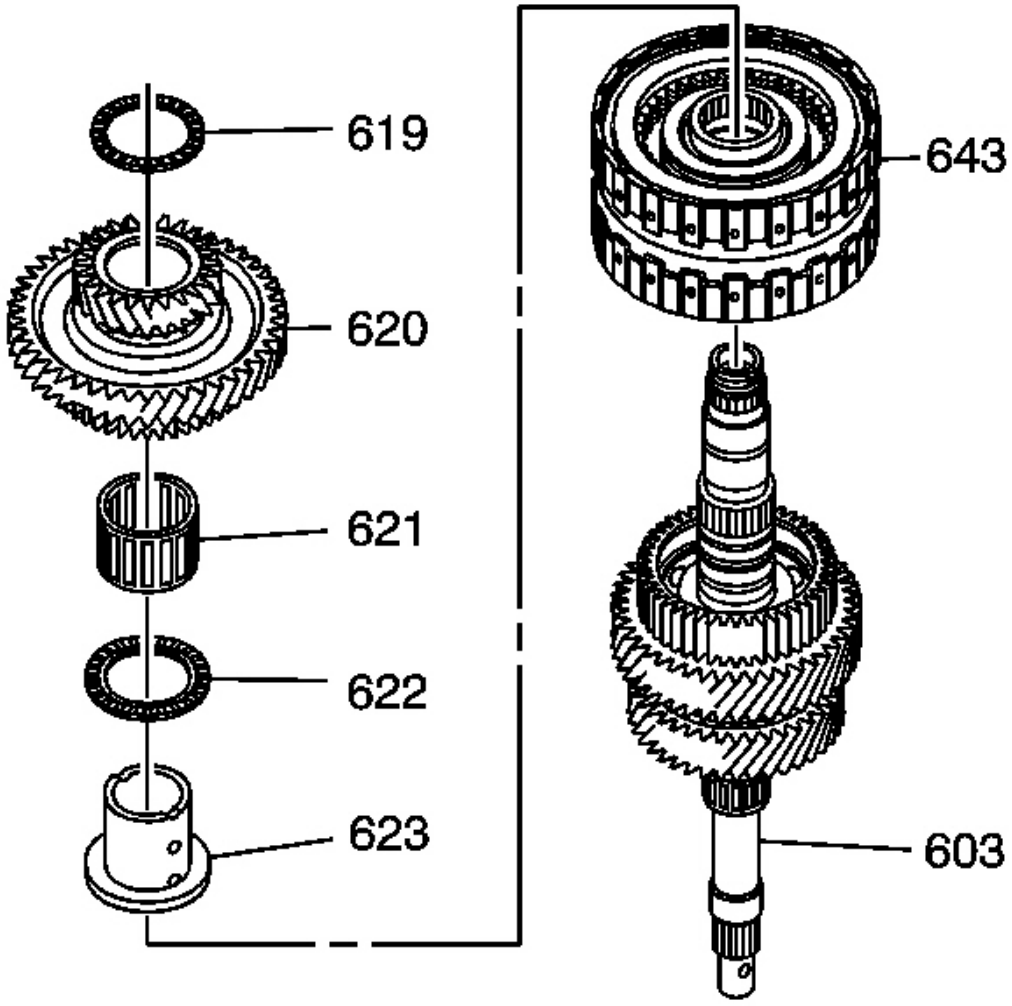

Fig. 232: Installing 4th & 5th/Reverse Clutch Housing Assembly & Components
Courtesy of GENERAL MOTORS CORP.

11. Install the 4th and 5th/reverse clutch housing assembly (643).

    Turn to index the clutch discs to the hub.

12. Install the 33 x 40 x 48.7 mm 5th/reverse drive gear and clutch hub thrust bearing race (623).
13. Install the 40 x 59 x 3 mm 5th/reverse drive gear and clutch hub thrust bearing (622).
14. Install the 40 x 46 x 34 mm 5th/reverse drive gear and clutch hub inner bearing (621).
15. Install the 5th/reverse drive gear and clutch hub assembly (620).

16. Install the 40 x 53 x 2.5 mm 5th/reverse drive gear and clutch hub end bearing (619).

OUTPUT SHAFT DISASSEMBLE

Tools Required

SA9179NE Dial Indicator

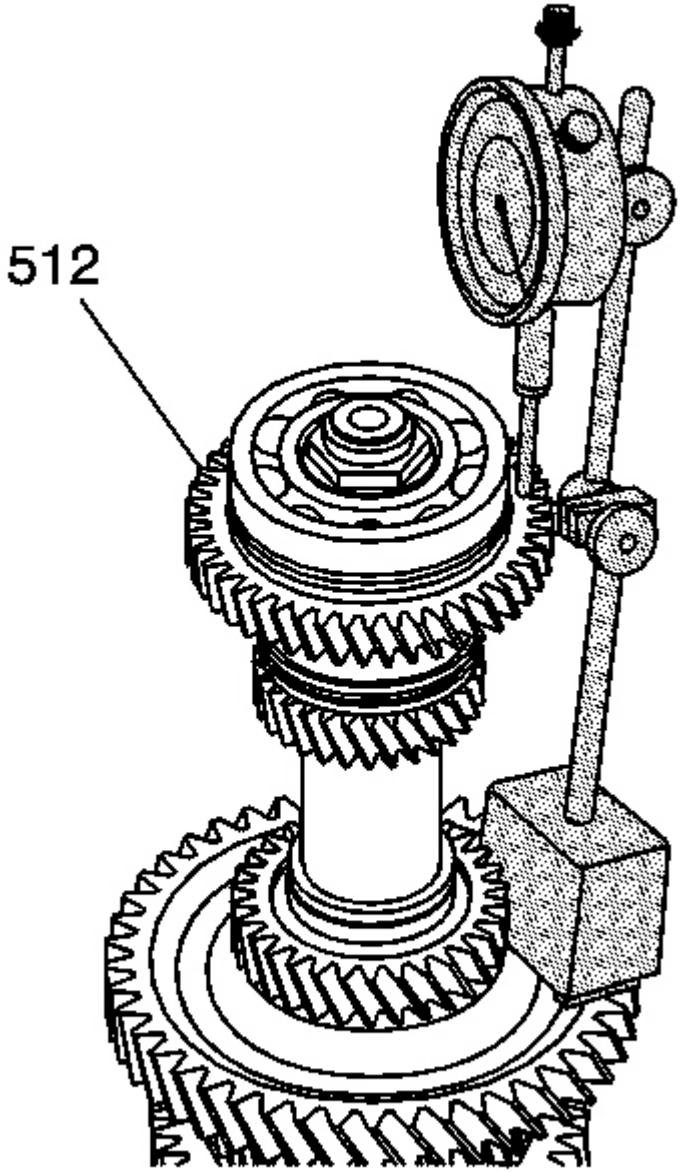

Fig. 233: Measuring The Axial Clearance For Reverse Driven Gear
Courtesy of GENERAL MOTORS CORP.

1. Measure the axial clearance for the reverse driven gear (512).
    1. Install the **SA9179NE** on the reverse driven gear.
    2. Zero the gage.

3. Lift up on the reverse driven gear and record the measurement.

   Specifications: Reversed driven gear axial clearance 0.10-0.25 mm (0.0039-0.0098 in)

4. If the clearance is out of specifications inspect for excessive wear on the thrust surface of the reverse driven gear (512) or the 5th/reverse synchronizer hub (509).

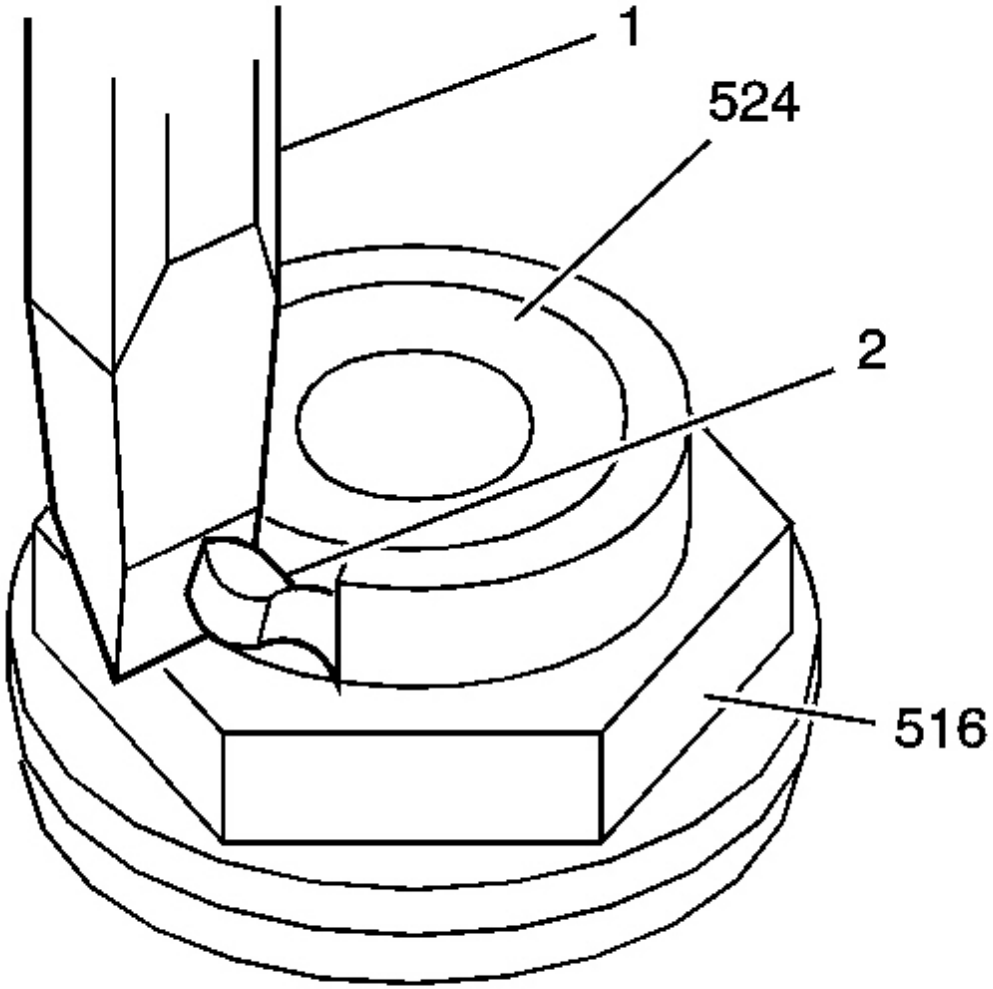

Fig. 234: Using A Chisel Cut The Locktab On Output Shaft Retaining Nut
Courtesy of GENERAL MOTORS CORP.

2. Using a chisel (1) cut the locktab (2) on the output shaft retaining nut (516). Do not damage the threads

on the output shaft (524).

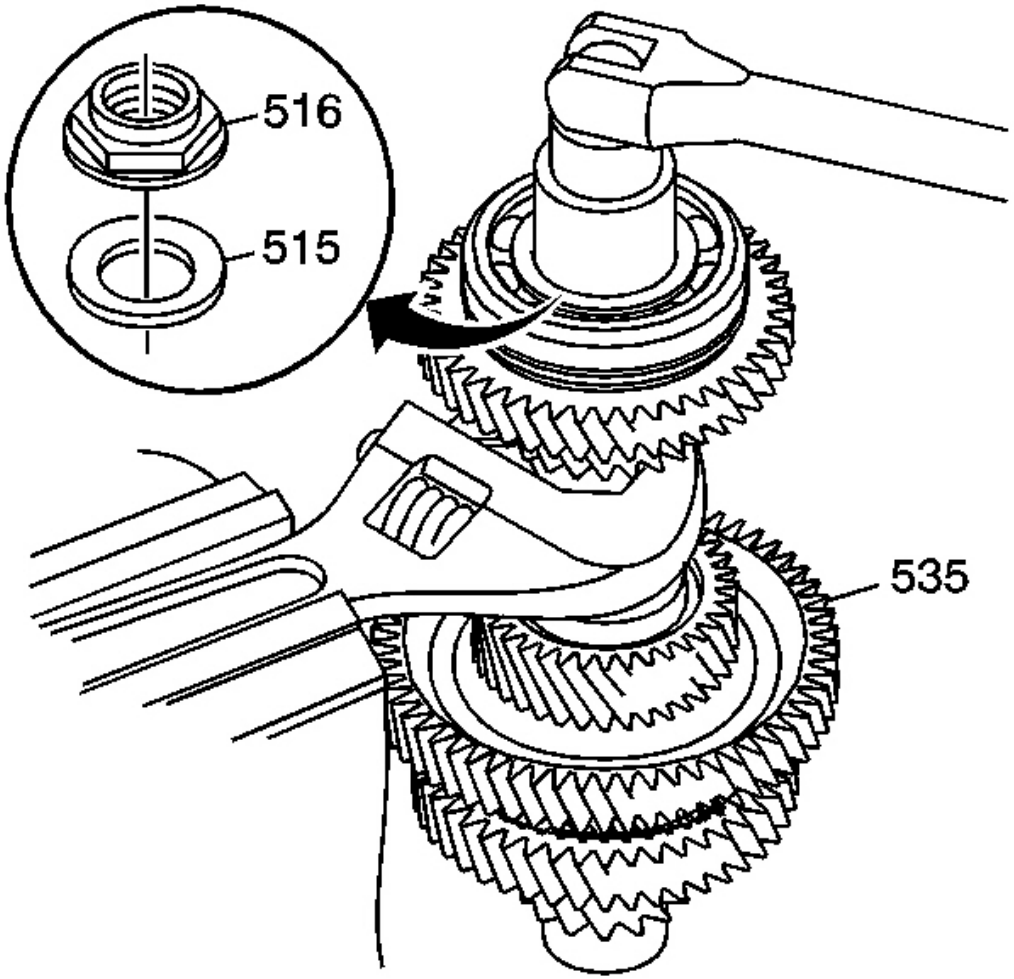

Fig. 235: Removing The Output Shaft Retaining Nut
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The output shaft retaining nut (516) is left handed thread.

3. Remove the output shaft retaining nut (516).
    - Use an adjustable wrench held in a vise.
    - Securely hold the output shaft.
4. Remove the output shaft washer (515).

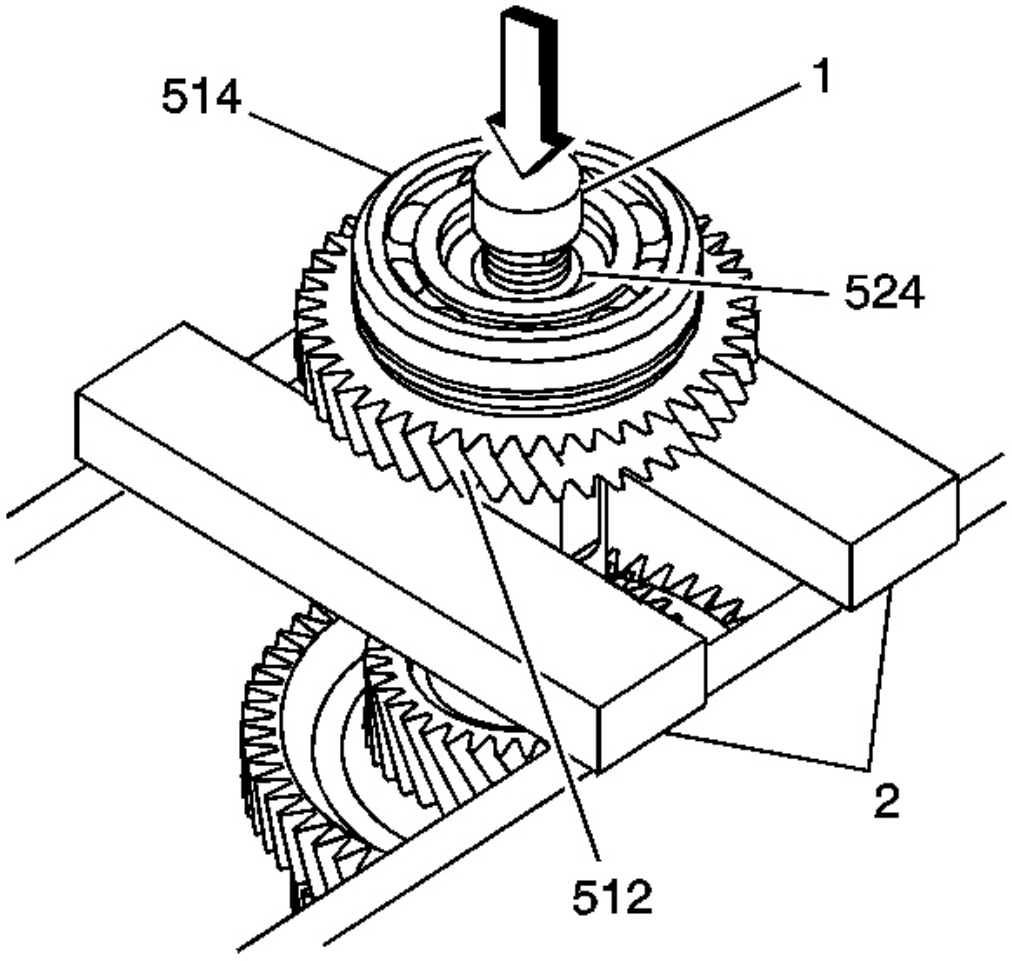

Fig. 236: Removing The Output Shaft Rear Bearing Using A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

5. Using a hydraulic press remove the output shaft rear bearing (514).
    - Use press plates (2) under the reverse drive gear (512).
    - Use a shaft protector (1) to prevent damage tot he output shaft threads.
    - Support the output shaft (524) to prevent the shaft from dropping.

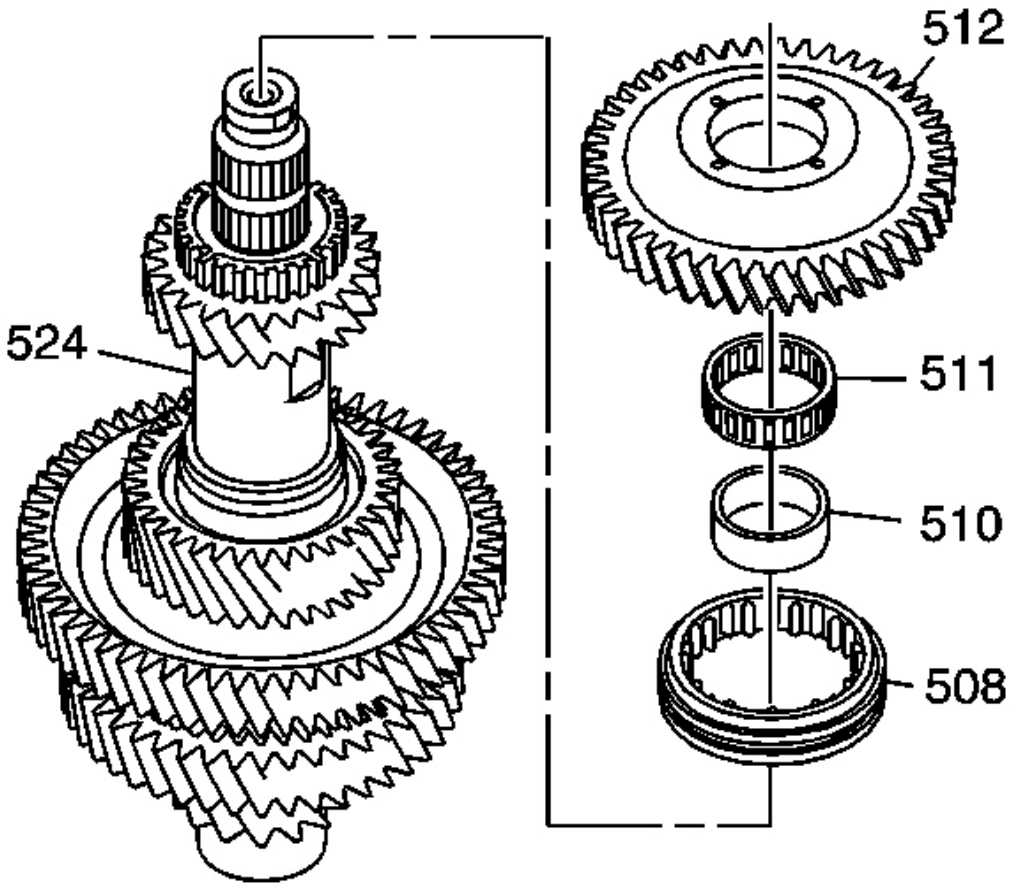

Fig. 237: Reverse Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Remove the following components from the output shaft (524):
    - The reverse driven gear (512)
    - The reverse driven gear inner bearing (511)
    - The reverse driven gear inner bearing race (510)
    - The reverse synchronizer sleeve (508)

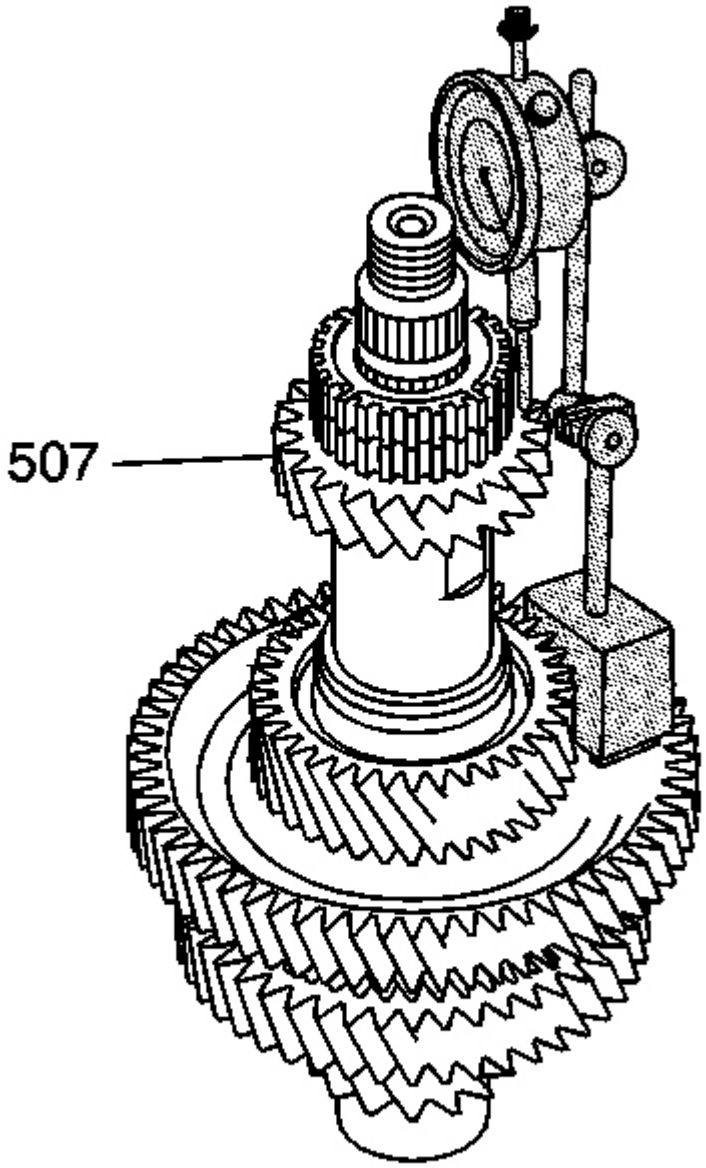

Fig. 238: Measuring The 5th Driven Gear Axial Clearance
Courtesy of GENERAL MOTORS CORP.

7. Measure the 5th driven gear (507) axial clearance.
    1. Install the **SA9179NE** on the 5th driven gear.
    2. Zero the gage.

3. Lift up on the 5th driven gear and record the measurement.

   Specifications: 5th driven gear axial clearance 0.12-0.27 mm (0.0047-0.0106 in)

4. If the clearance is out of specifications inspect for excessive wear on the thrust surface of the 5th driven gear (507), the 5th/reverse synchronizer hub (509), and the shoulder of the output shaft (524).

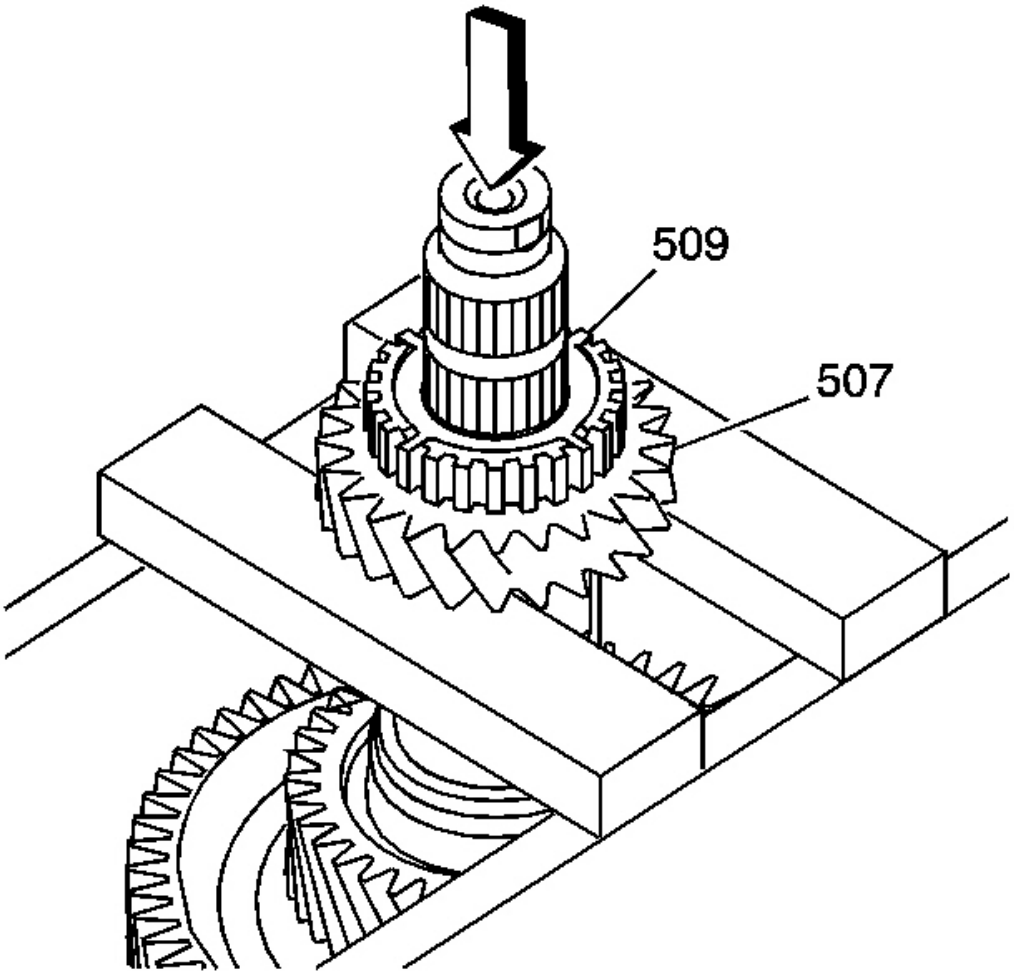

Fig. 239: Removing The 5th/Reverse Synchronizer Hub & 5th Driven Gear Using A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

8. Using a hydraulic press remove the 5th/reverse synchronizer hub (509) and the 5th driven gear (507).

9. Remove the 5th driven gear inner bearing (506).
10. Remove the 5th driven gear spacer (505).

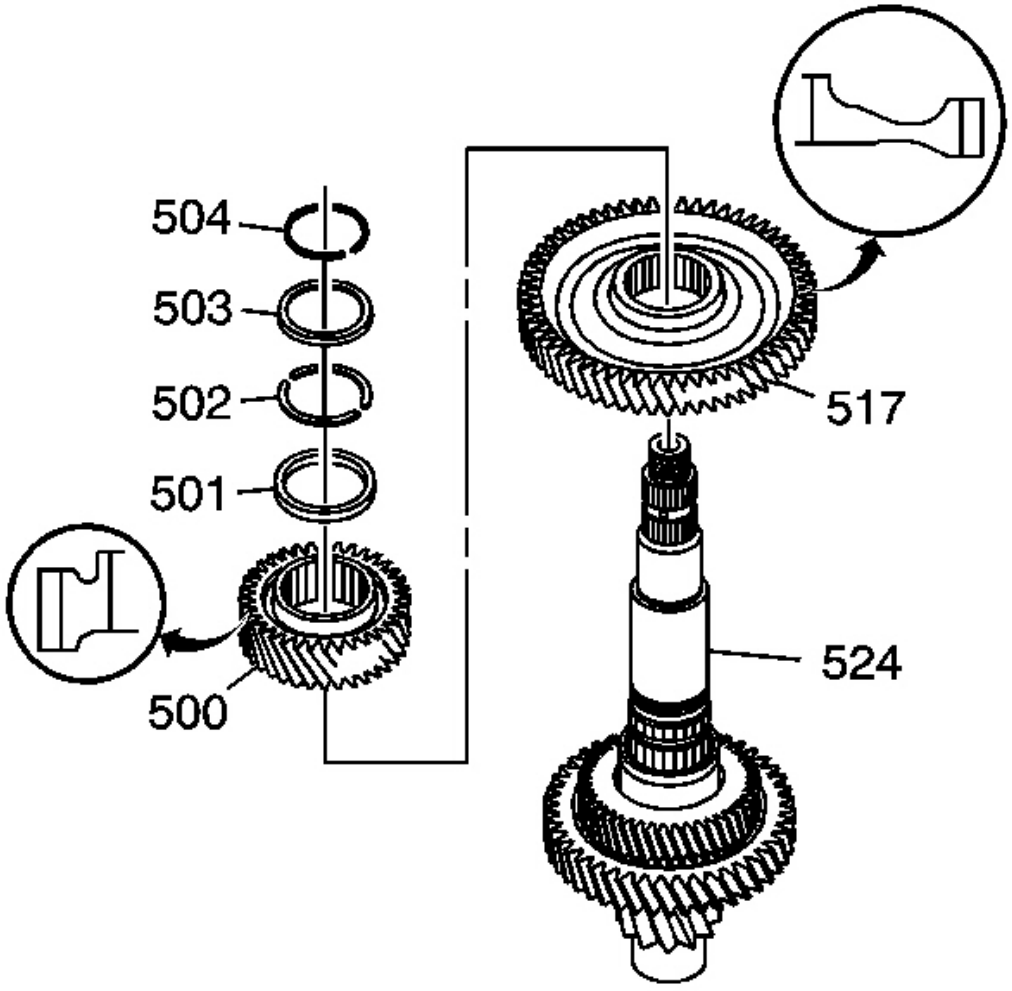

Fig. 240: 3rd/4th Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

11. Remove the following components from the output shaft:
    - The 3rd/4th driven gear retaining ring cap retainer (504)
    - The 3rd/4th driven gear retaining ring cap (503)
    - The 3rd/4th driven gear retaining rings (502)
    - The 3rd/4th driven gear selective spacer (501)

- The 3rd/4th driven gear (500)
- The 1st driven gear (517)

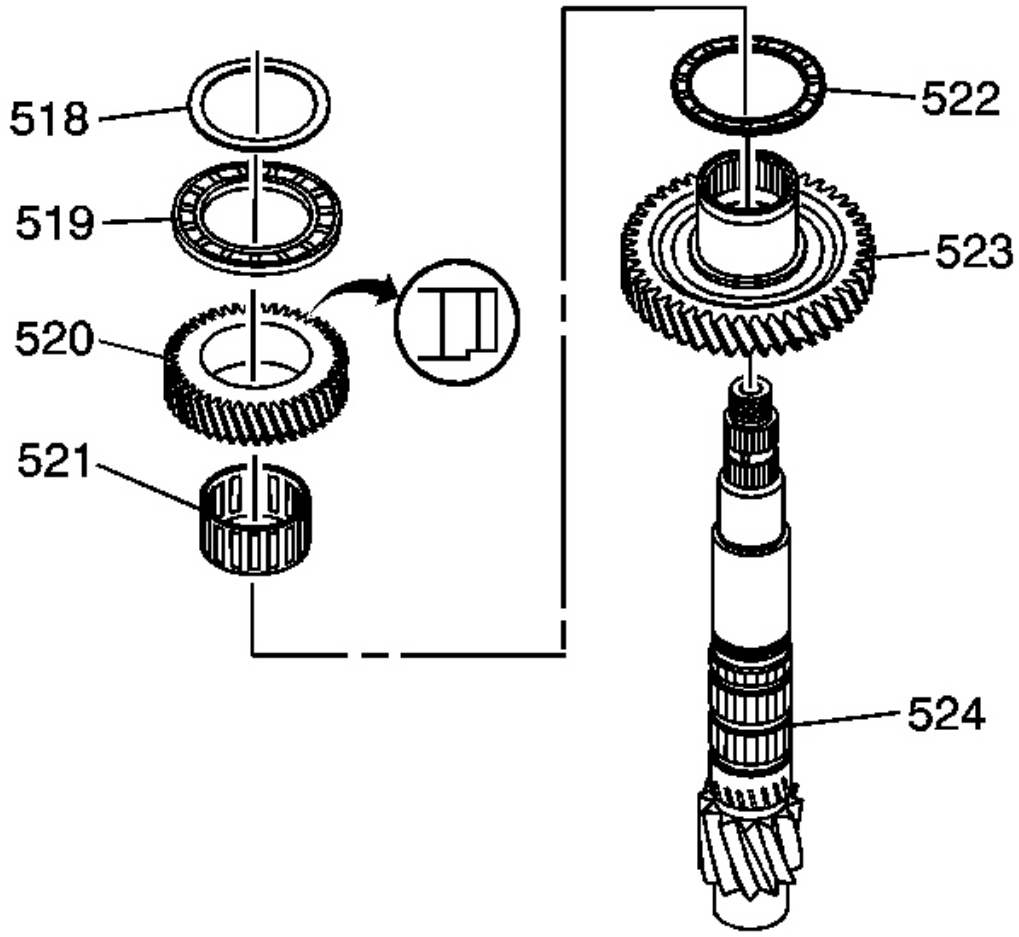

Fig. 241: 1st/2nd Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

12. Remove the following components from the output shaft (524):
    - The 1st driven gear selective spacer (518)
    - The 1st/2nd idler gear thrust bearing (519)
    - The 1st/2nd idler gear (520)
    - The 1st/2nd idler gear inner bearing (521)
    - The 1st/2nd driven gear thrust bearing (522)

- The 1st/2nd driven gear (523)

13. Inspect all bearings for wear or damage.
14. Inspect the output shaft (524) bearing surfaces and shaft splines for scoring, excessive wear, or damage. Replace the output shaft if faulty.
15. Inspect the gear bearing surfaces for excessive wear or damage. Refer to Output Shaft in **Transmission Clearance Specifications** .

OUTPUT SHAFT ASSEMBLE

Tools Required

- **DT 46509** Tube Style Driver
- **SA9179NE** Dial Indicator

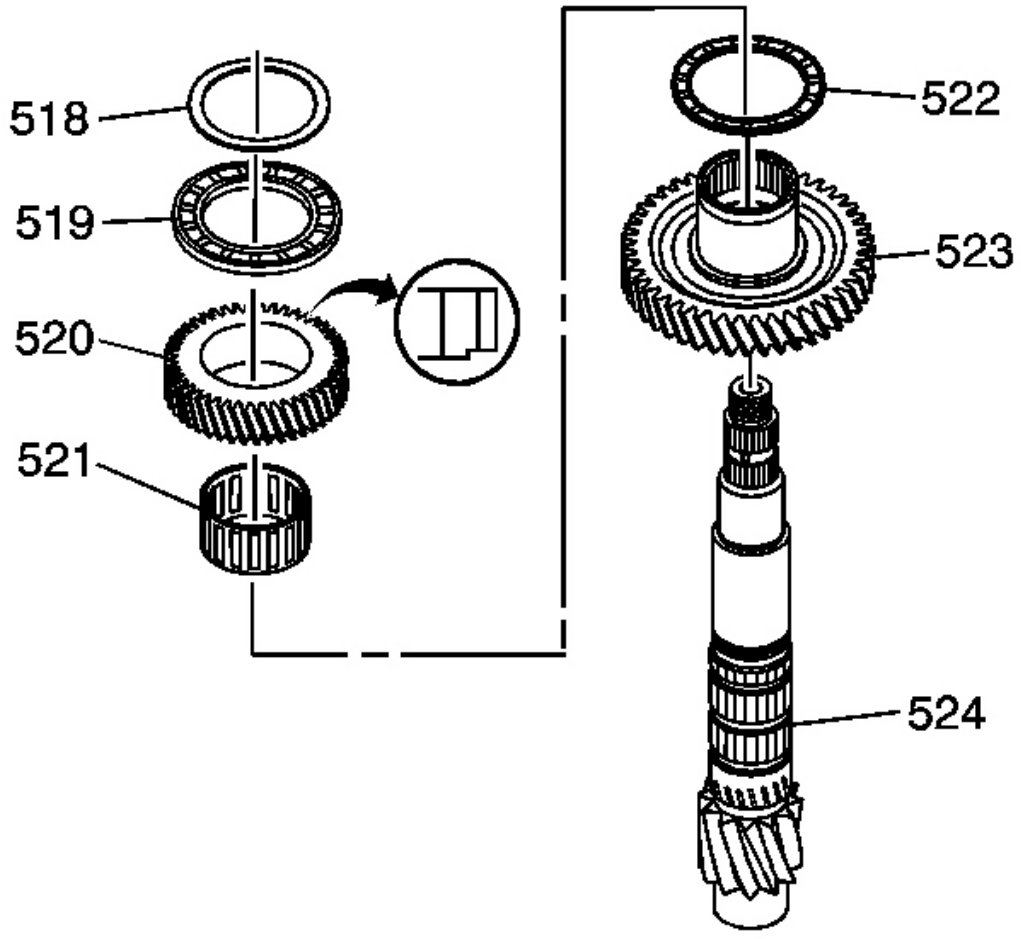

Fig. 242: 1st/2nd Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Install the following components on the output shaft:
   - The 1st/2nd driven gear (523)
   - The 1st/2nd driven gear 65 x 83 x 4.5 mm thrust bearing (522)
   - The 1st/2nd idler gear 57 x 65 x 28.7 mm inner bearing (521)
   - The 1st/2nd idler gear (520) with shoulder side down
   - The 1st/2nd idler gear 56 x 878.5 x 5.5 mm thrust bearing (519)
   - The 1st driven gear 56 mm selective spacer (518)

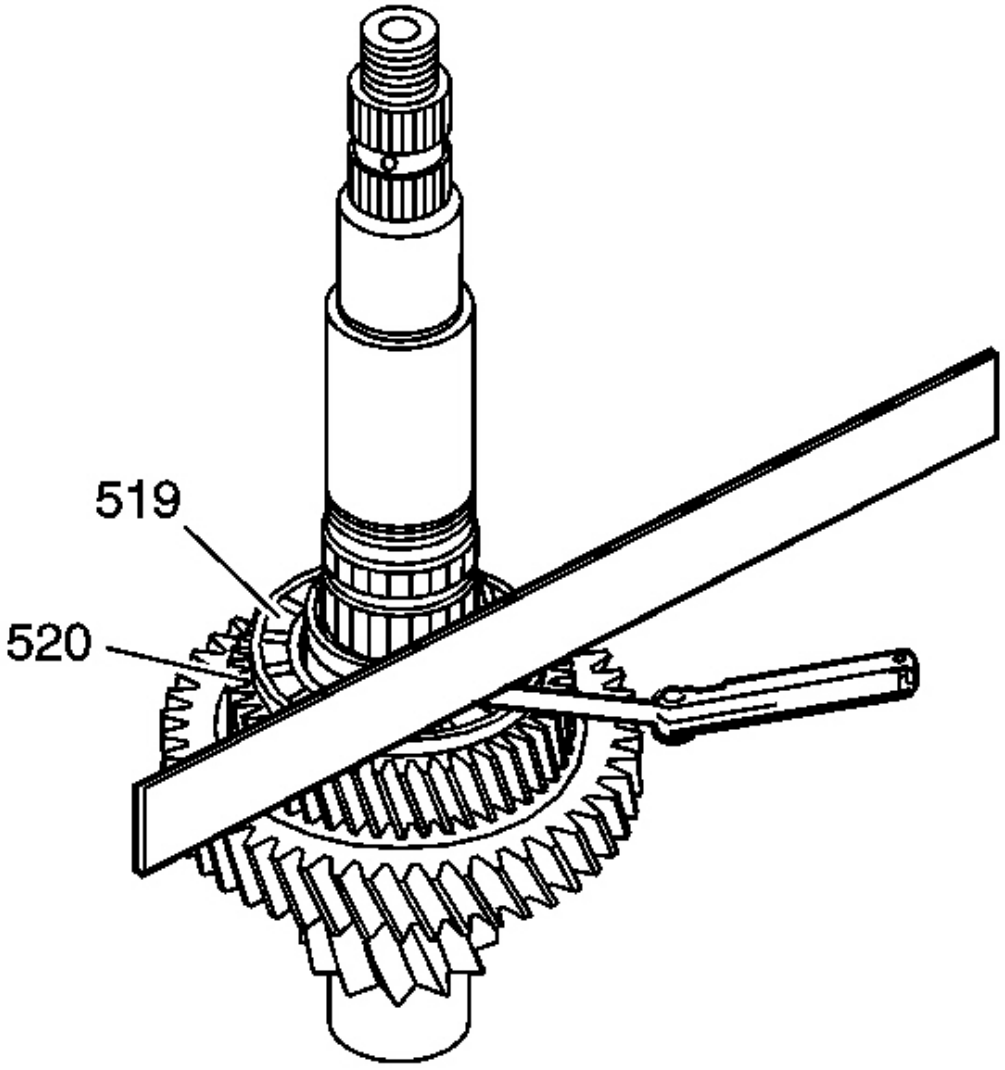

Fig. 243: Measuring Between The Straight Edge & Roller Bearings Using A Feeler Gage
Courtesy of GENERAL MOTORS CORP.

2. Put a straight edge across the top of the 1st/2nd idler gear thrust bearing (519).
3. Using a feeler gage measure between the straight edge and the roller bearings on the 1st/2nd idler gear thrust bearing (519) in 3 places. Use the average of the 3 measurements as the actual clearance.
4. Measure the 1st/2nd idler gear (520) axial clearance in at least 3 places on the gear. Use the average of the 3 measurements as the actual clearance.

Specification: 1st/2nd idler gear clearance 0.005-0.040 mm (0.0002-0.0016 in)

5. If the measurement exceeds the specifications, remove and measure the thickness of the 1st driven gear 56 mm selective spacer (518).
6. Select and install a new 1st driven gear 56 mm selective spacer (518) in order to obtain the specified clearance. Measure the clearance again to ensure that the 1st/2nd idler gear is within specifications.

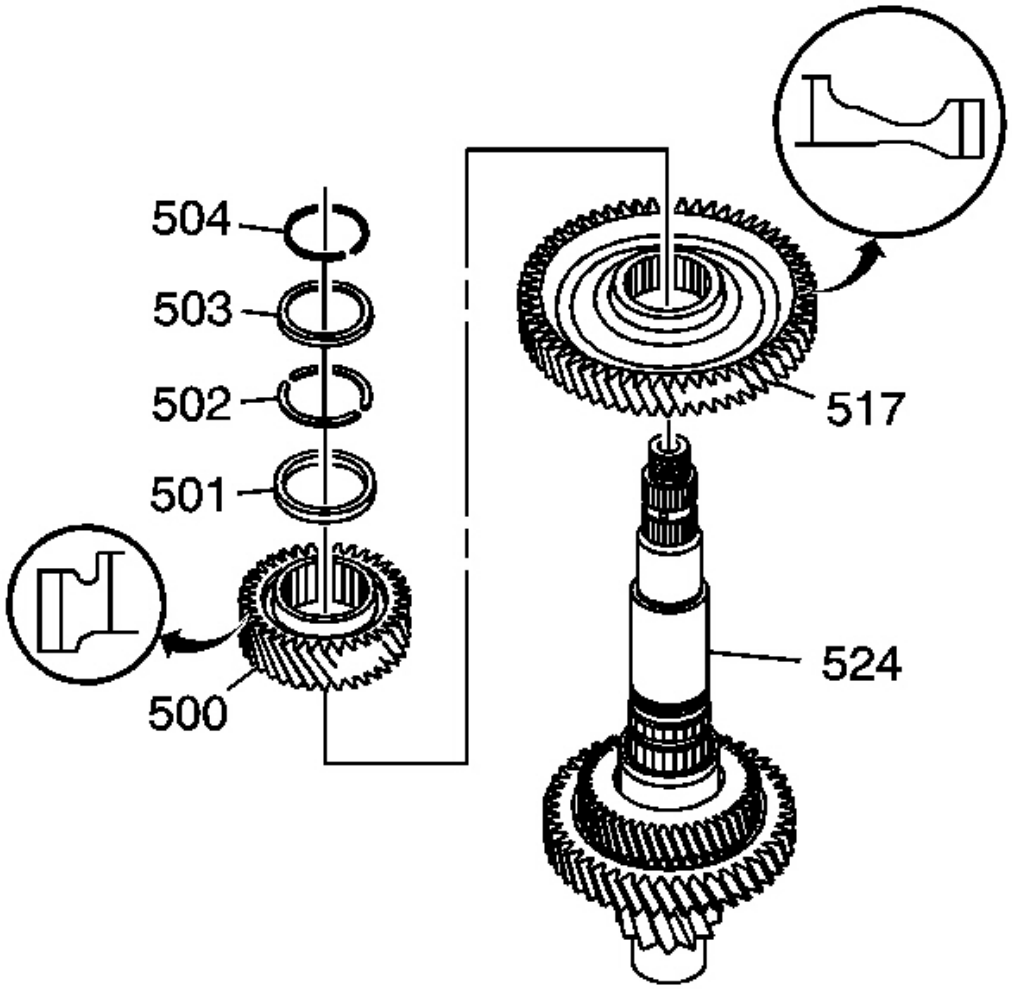

Fig. 244: 3rd/4th Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

7. Install the following components on the output shaft:
   - The 1st driven gear (517) with the gear protrusion facing up

- The 3rd/4th driven gear (500) with the gear protrusion facing up
- The 3rd/4th driven gear 50.2 mm selective spacer (501)
- The 3rd/4th driven gear 39 mm split retaining rings (502)
- The 3rd/4th driven gear 39 mm retaining ring cap (503)
- The 3rd/4th driven gear 39 mm retaining ring cap retainer (504)

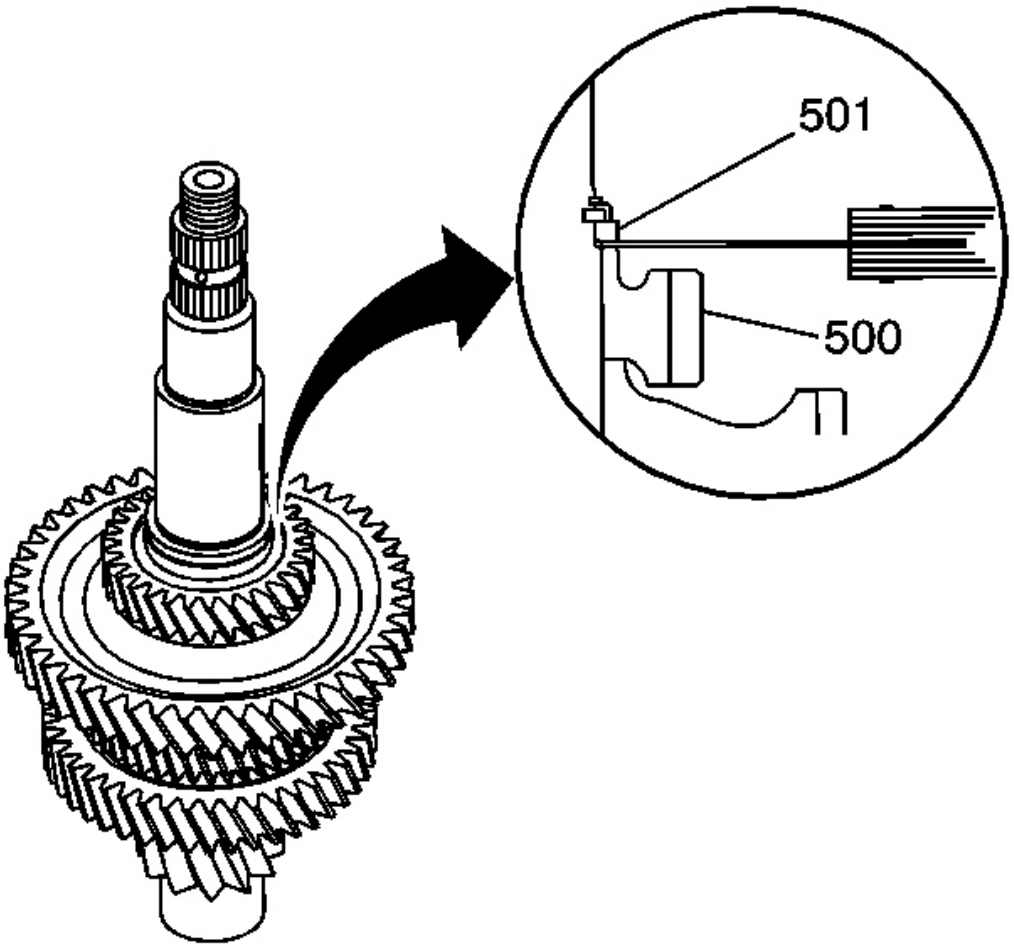

Fig. 245: Measuring The Clearance Between The 3rd/4th Driven Gear & 3rd/4th Driven Gear Using A Feeler Gage
Courtesy of GENERAL MOTORS CORP.

8. Measure the clearance between the 3rd/4th driven gear (500) and the 3rd/4th driven gear 50.2 mm selective spacer (501) with a feeler gage (1) in at least 3 places. Use the average of the 3 measurements as

the actual clearance.

Specification: The clearance between the 3rd/4th driven gear and the 3rd/4th driven gear selective spacer 0.005-0.040 mm (0.0002-0.0016 in).

9. If the measurement exceeds 0.040 mm (0.016 in), remove and measure the thickness of the 3rd/4th driven gear 52 mm selective spacer (501).
10. Select and install a new 3rd/4th driven gear 52 mm selective spacer (501) in order to obtain the specified clearance, then check for the proper clearance again.

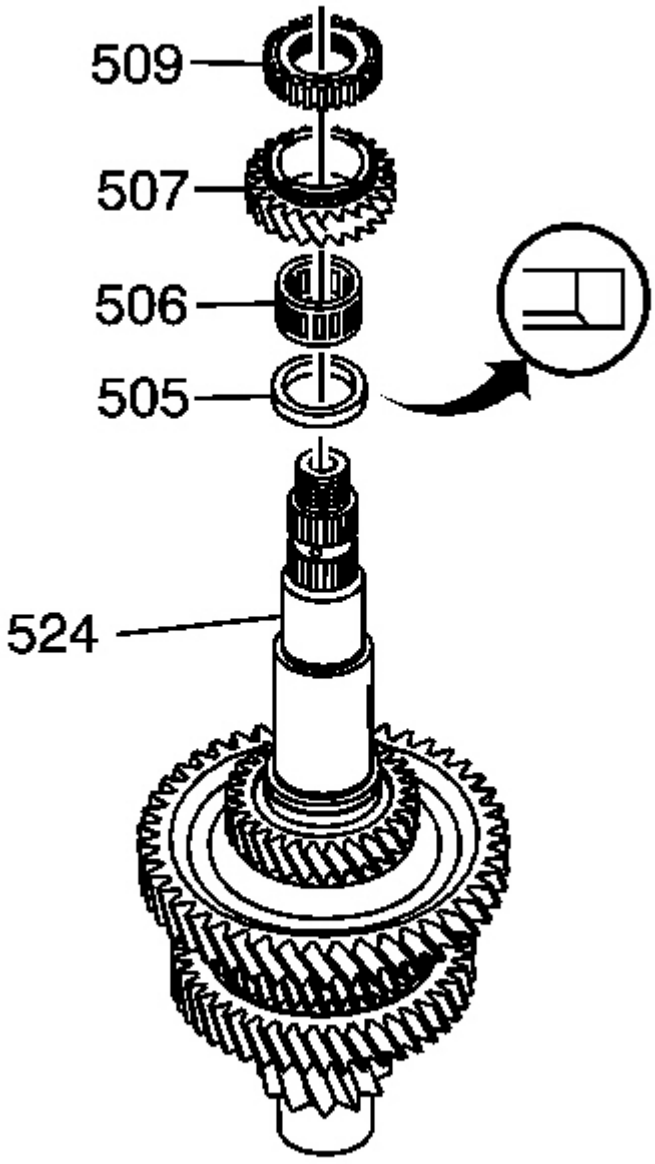

Fig. 246: 5th Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

11. Install the following components on the output shaft:
    - The 5th driven gear spacer (505)
    - The 5th driven gear inner bearing (506)

- The 5th driven gear (507)
- The 5th/reverse synchronizer hub (509)

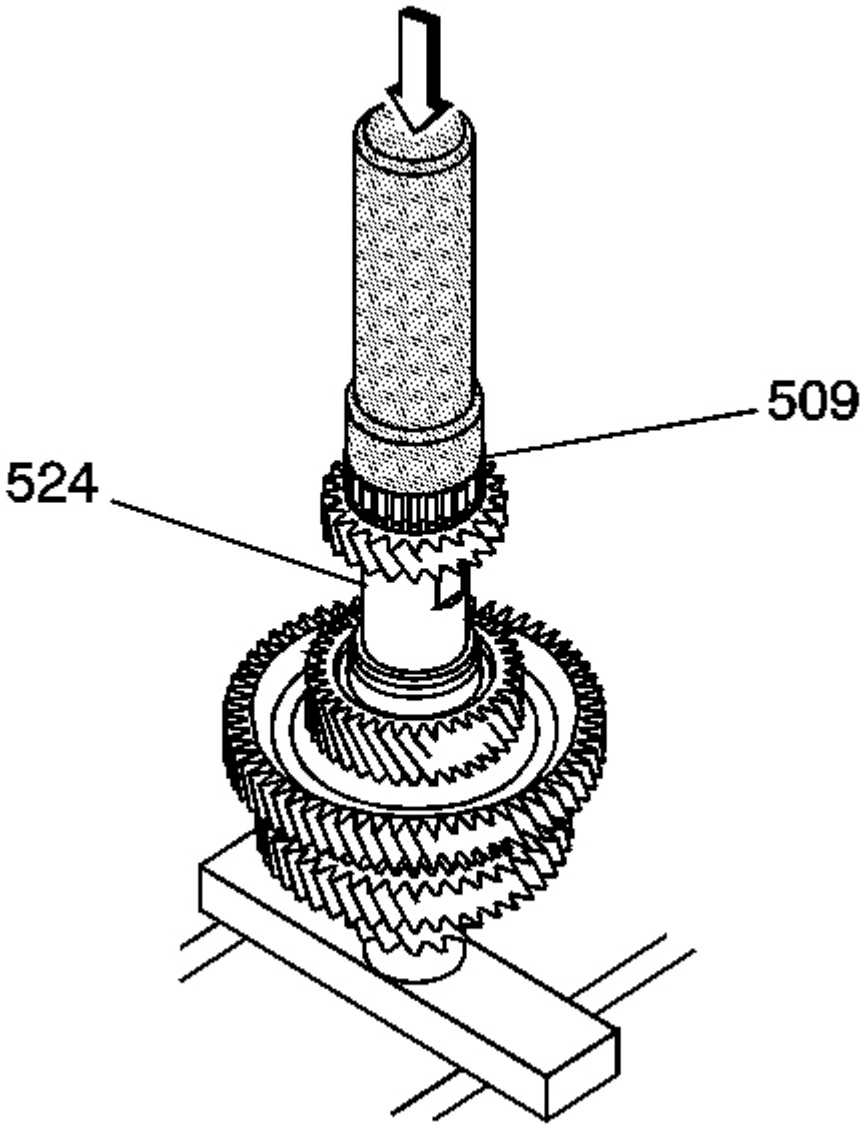

Fig. 247: DT 46509 & 5th/Reverse Synchronizer Hub
Courtesy of GENERAL MOTORS CORP.

12. Using a hydraulic press and **DT 46509** complete the installation of the 5th/reverse synchronizer hub

(509).

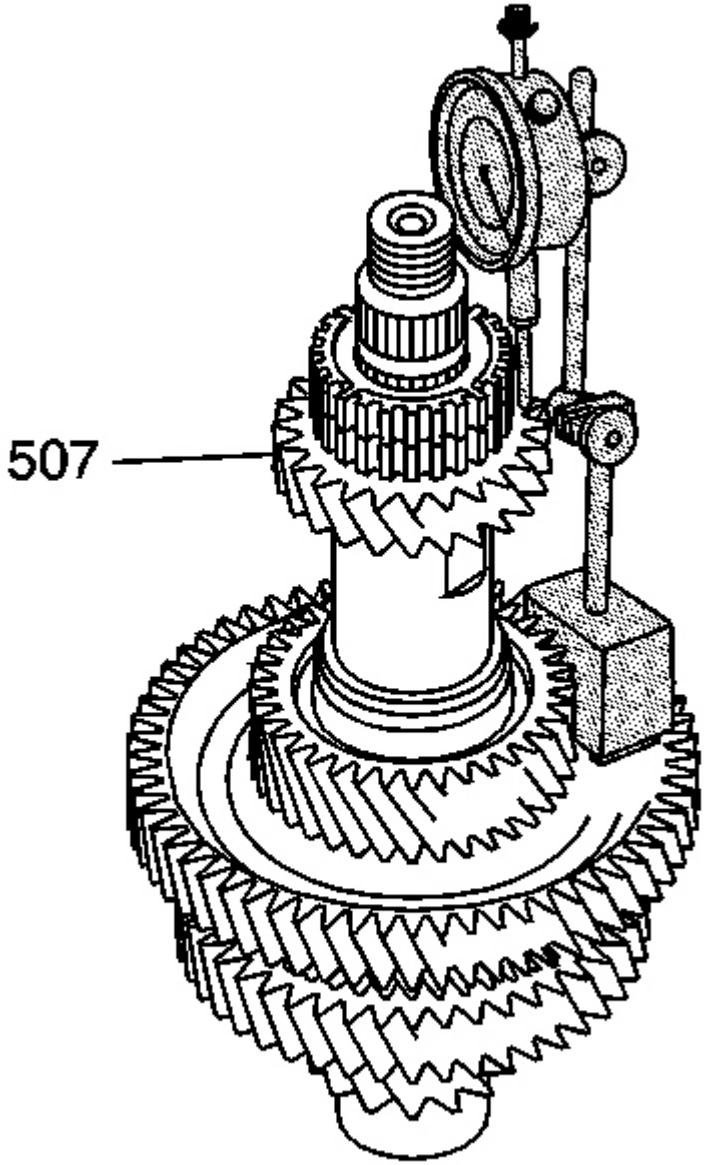

Fig. 248: Measuring The 5th Driven Gear Axial Clearance
Courtesy of GENERAL MOTORS CORP.

13. Measure the 5th driven gear (507) axial clearance.

1. Install **SA9179NE** on the 5th driven gear.
2. Zero the gage.
3. Lift up on the 5th driven gear and record the measurement.

   Specification: 5th driven gear axial clearance 0.12-0.27 mm (0.0047-0.0106 in)

4. If the clearance exceeds specifications inspect for excessive wear on the thrust surface of the 5th driven gear (507), the 5th/reverse synchronizer hub (509), and the shoulder of the output shaft (524).
5. If there is not any clearance, ensure the 5th/reverse synchronizer hub (509) is completely installed and there are no burrs or debris between the gears.

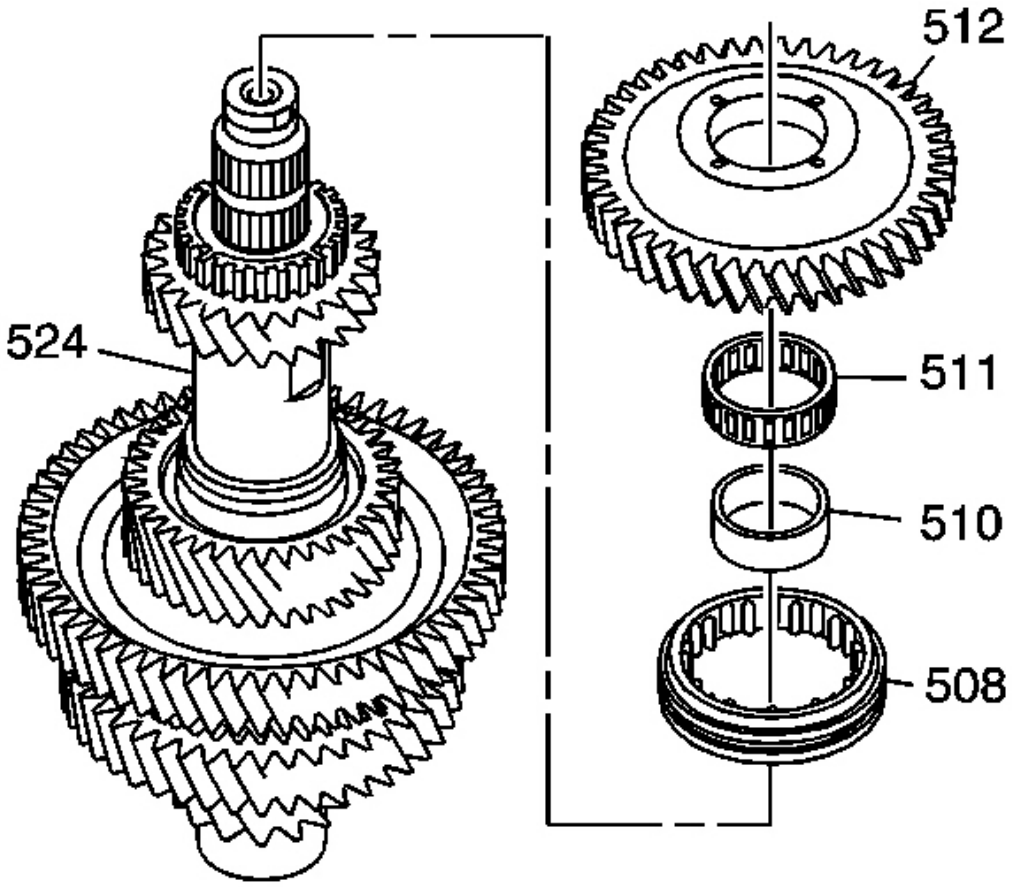

Fig. 249: Reverse Driven Gear Output Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

14. Install the following components on the output shaft (524):
    - The 5th/reverse synchronizer sleeve (508)
    - The reverse driven gear 31 x 40 x 14.5 mm inner bearing race (510)
    - The reverse driven gear 40 x 46 x 14.5 mm inner bearing (511)
    - The reverse driven gear (512)

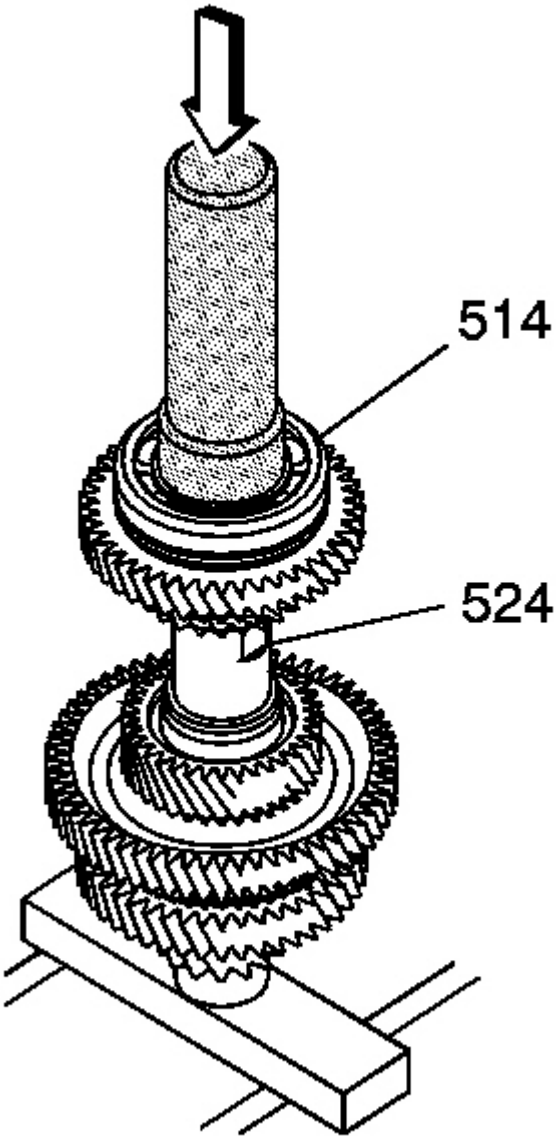

Fig. 250: Installing Rear Bearing & Output Shaft Using DT 46509 & Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

15. Using the **DT 46509** and a hydraulic press, install the output shaft 31 x 93 x 19 mm rear bearing (514) on the output shaft (524).

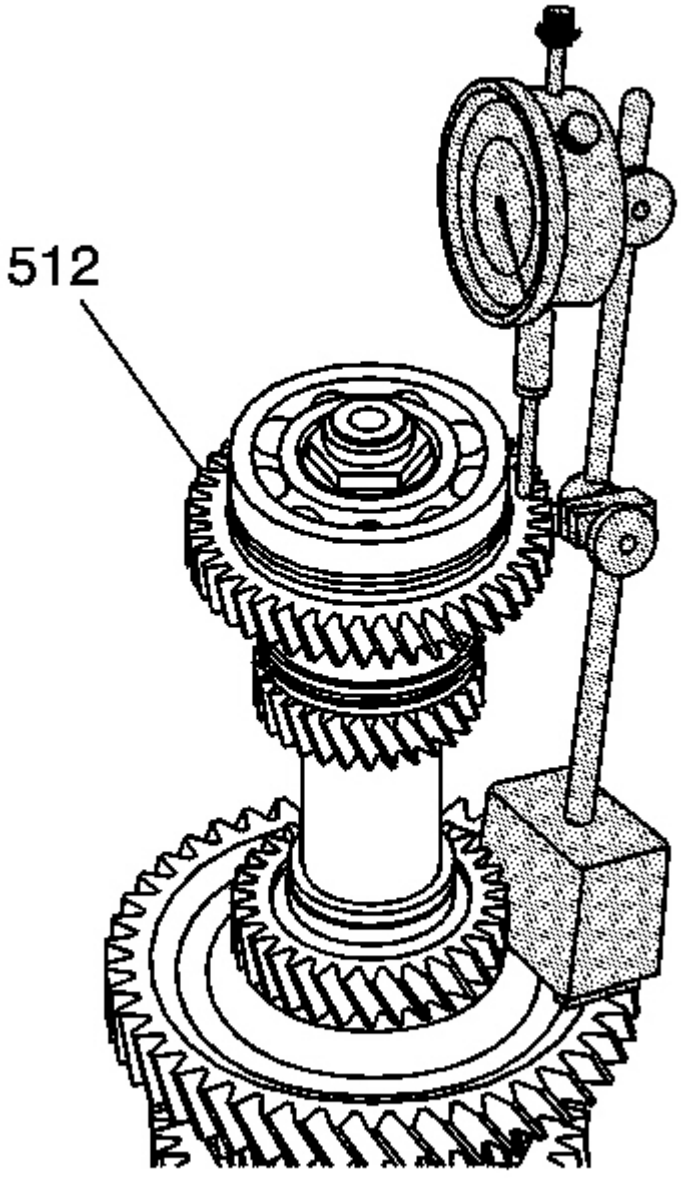

Fig. 251: Measuring The Axial Clearance For Reverse Driven Gear
Courtesy of GENERAL MOTORS CORP.

16. Measure the reverse driven gear (512) axial clearance.
    1. Install **SA9179NE** on the reverse driven gear.
    2. Zero the gage.
    3. Lift up on the reverse driven gear and record the measurement.

       Specification: Reverse driven gear axial clearance 0.10-0.25 mm (0.0039-0.0098 in)

    4. If the clearance exceeds specifications inspect for excessive wear on the thrust surface of the reverse driven gear (512) or the 5th/reverse synchronizer hub (509).
    5. If there is not any clearance, ensure the output shaft rear bearing (514) is completely installed and there are no burrs or debris between the gears.

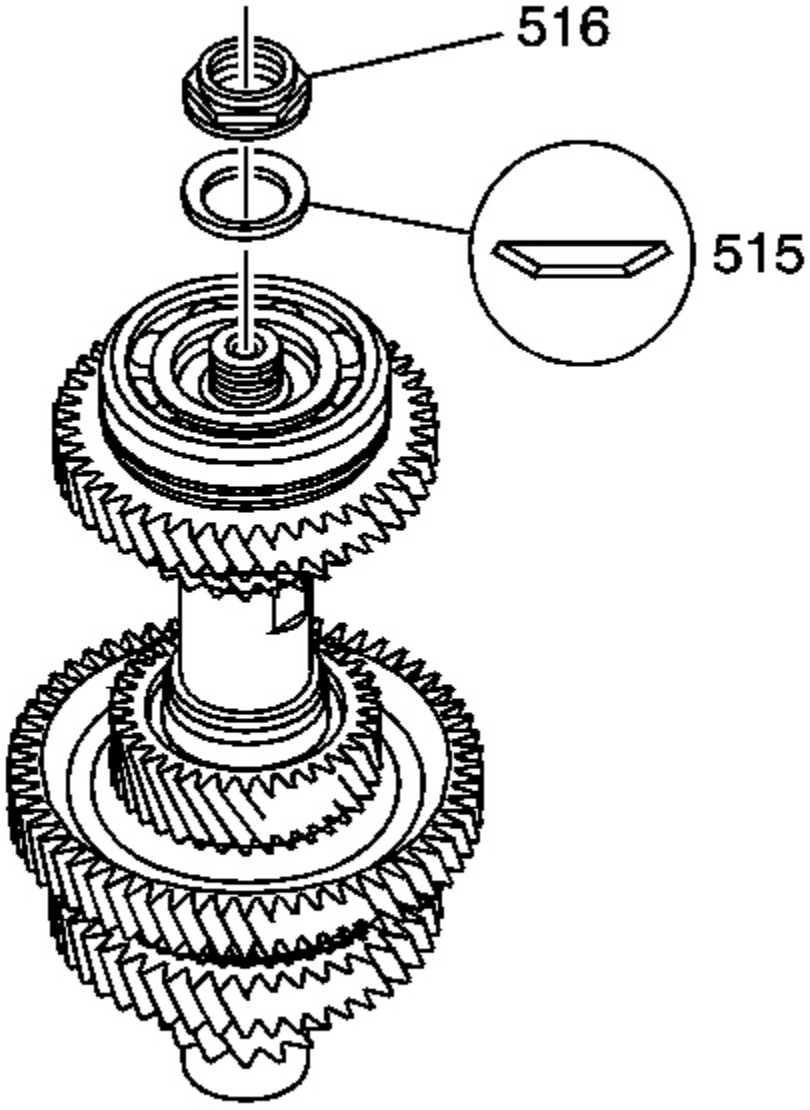

Fig. 252: Installing Output Shaft Washer & Retaining Nut
Courtesy of GENERAL MOTORS CORP.

17. Install an output shaft washer (515) in the direction as shown.
18. Loosely install an output shaft retaining nut (516).

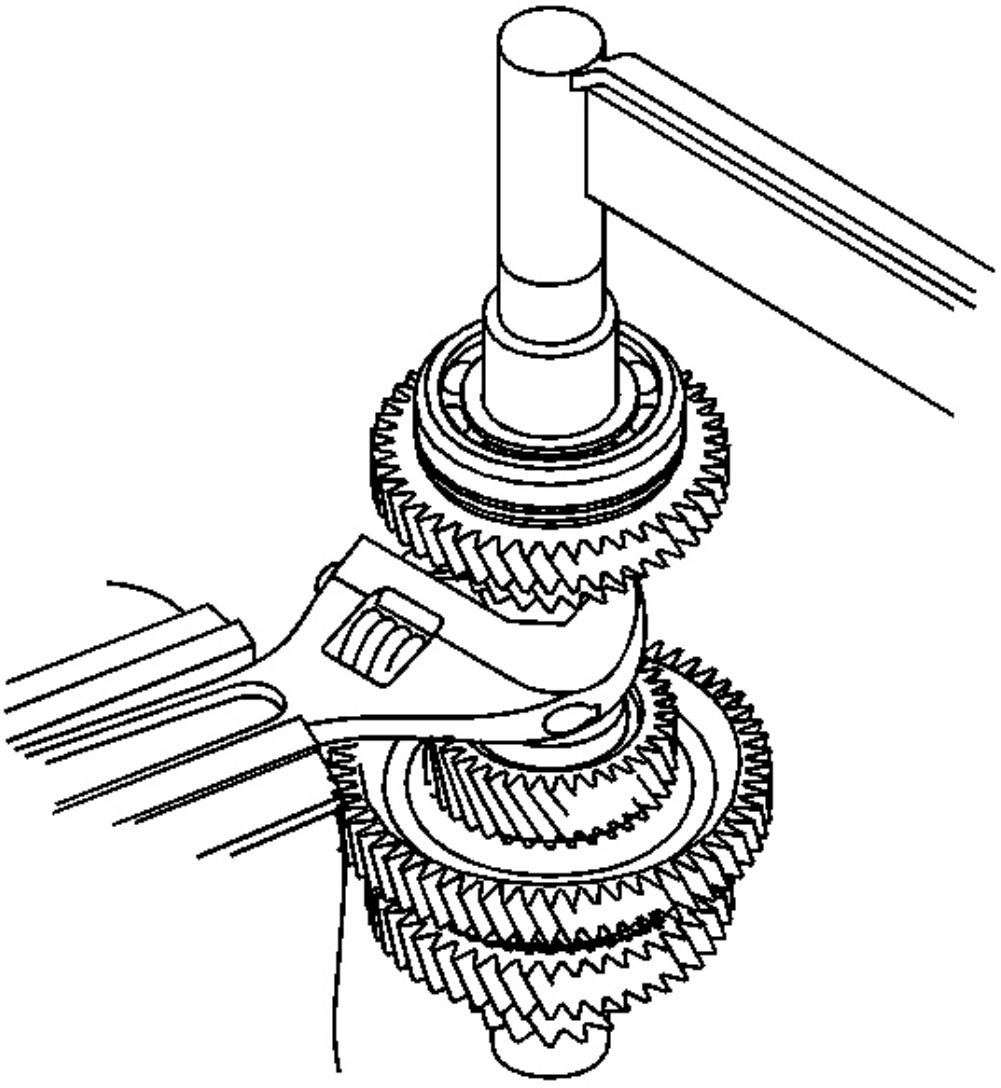

Fig. 253: Tightening The Retaining Nut Using A Wrench Mounted In A Vise
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- **Do not use an impact wrench to tighten the nut.**
- **The nut is left handed thread.**

19. To tighten the retaining nut (516), use an adjustable wrench mounted in a vise. Securely hold the output shaft in the adjustable wrench while tightening.

Tighten: Tighten the nut to 167 N.m (123 lb ft).

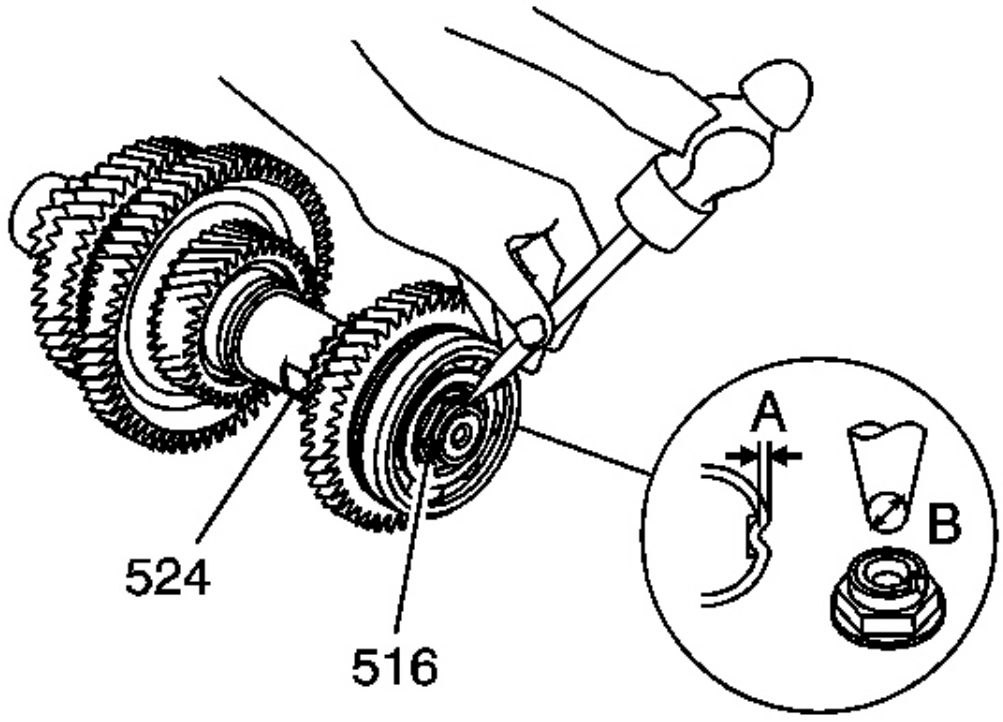

Fig. 254: Staking The Output Shaft Nut In Place On Output Shaft Using A Punch
Courtesy of GENERAL MOTORS CORP.

20. Using a 3.5 mm (9/64 in) punch (b), stake the output shaft nut (516) in place on the output shaft (524) to the specified depth (a).

    Specification: Stake the nut to 0.7-1.3 mm (0.03-0.05 in.)

1ST/2ND CLUTCH SHAFT DISASSEMBLE

Tools Required

- **DT 46427** Driver
- **DT 46516** Driver
- **DT 46540** Wrench
- **EN 46342** Driver Handle

- **SA9179NE** Dial Indicator

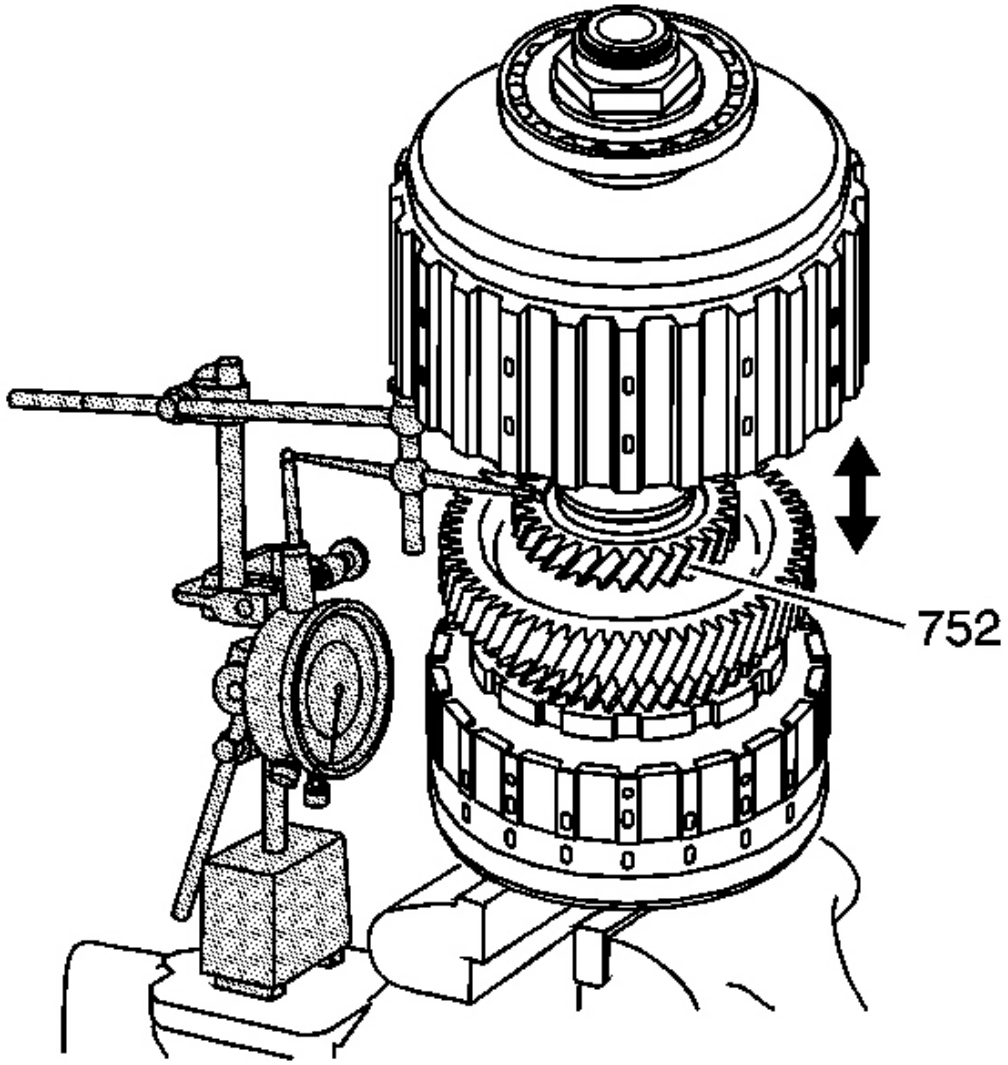

Fig. 255: Measuring The Axial Clearance For The 1st Drive Gear
Courtesy of GENERAL MOTORS CORP.

1. Measure the axial clearance for the 1st drive gear (726). Measuring the axial clearance before disassembly of the 1st/2nd clutch shaft will help determine the wear on the components and what selective washer to use during assembly.
    1. Position the 1st/2nd clutch shaft assembly in a soft-jaw vise with the nut end up.

2. Install the **SA9179NE** and a hole attachment tool on the 1st/coast hub (752).
3. Set the dial indicator to zero.
4. Lift up on the 1st/coast hub (752) and record the axial clearance reading.
5. Measure the axial clearance in 2 more locations.
6. Average the readings to get the axial clearance.

   Specification: 1st gear axial clearance 0.085-0.130 mm (0.003-0.050 in)

   - If the axial clearance is higher than the specification, during inspection look for excessive wear on the thrust bearing surfaces of the gears.
   - If there is not excessive wear, replace the 1st/coast hub washer (722) with a thicker washer to be within the axial clearance specifications.
   - If the axial clearance is lower than the specification, during inspection look for burrs or contamination on the thrust bearing surfaces of the gears.
7. Record the measurement for reference during assembly.

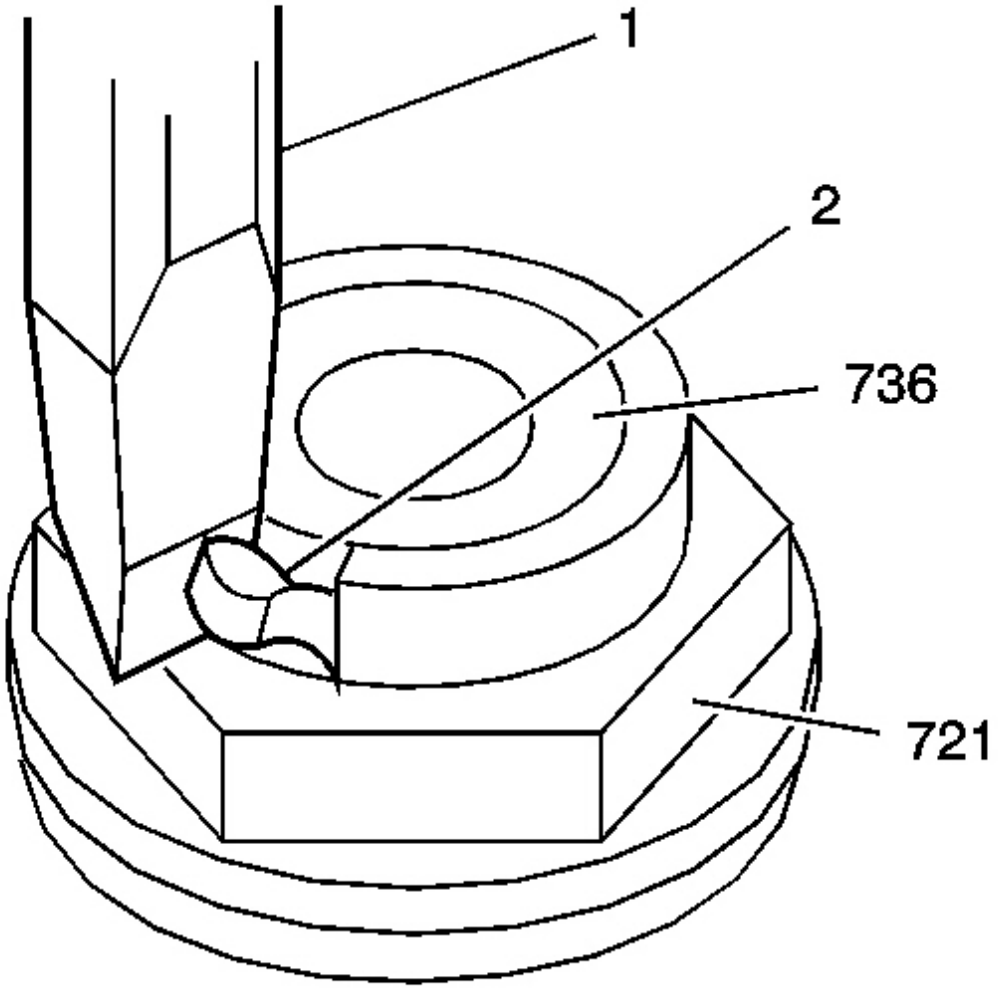

Fig. 256: Removing The Stake Area From The 1st/2nd Clutch Shaft Retaining Nut Using A Chisel
Courtesy of GENERAL MOTORS CORP.

NOTE: Ensure that all the metal particles are collected in order to prevent internal damage to the transaxle or bearings.

2. Using a chisel (1) remove the stake area from the 1st/2nd clutch shaft retaining nut (721). Do not damage the threads on the clutch shaft.

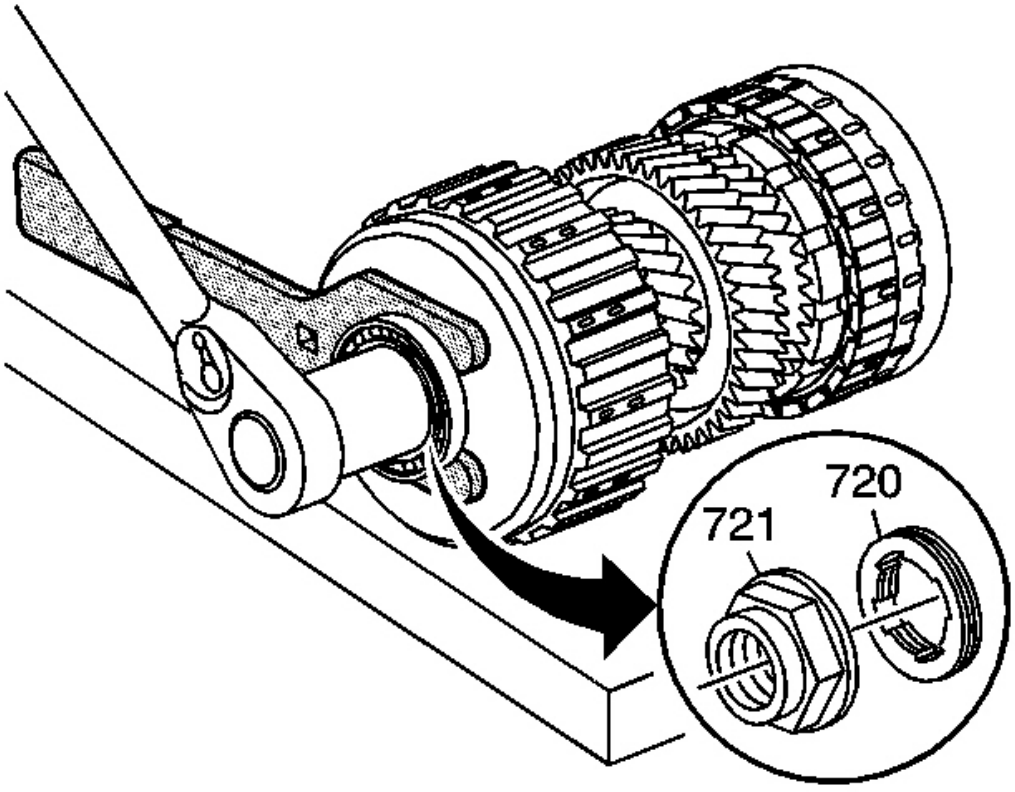

Fig. 257: Removing The 1st/2nd Clutch Shaft Retainer Nut
Courtesy of GENERAL MOTORS CORP.

3. Remove the 1st/2nd clutch shaft retainer nut (721).
    1. Lay the 1st/2nd clutch shaft assembly on a bench.
    2. Insert **DT 46540** between the 1st/coast housing (718) and the 1st/2nd clutch shaft rear bearing (719).
    3. Using a breaker bar and a 38 mm six-point socket loosen the 1st/2nd clutch shaft retainer nut (721).
    4. Hold the **DT 46540** against the bench top.
    5. Remove the 1st/2nd clutch shaft retainer nut (721).
    6. Remove any burrs or metal shavings from the clutch shaft threads.

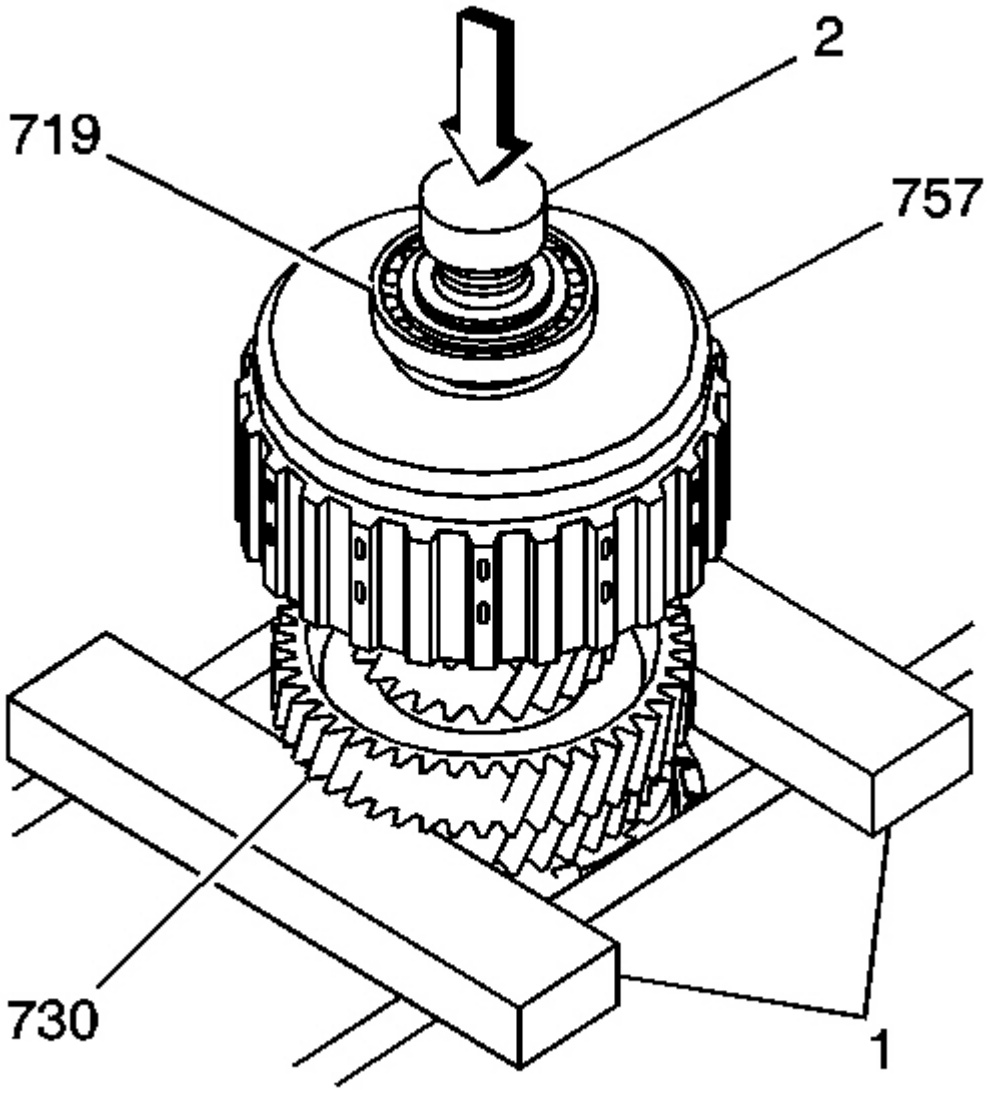

Fig. 258: Removing The 1st/2nd Clutch Shaft Rear Bearing & the 1st/2nd Clutch Drive Gear Using A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

NOTE: Support the component while using the press. Failure to support the component may allow the component to drop, causing damage.

4. Using a hydraulic press remove the 1st/2nd clutch shaft rear bearing (719) and the 1st/2nd clutch drive

gear (730).

- Use press plates (1) under the 1st/2nd clutch shaft drive gear (730).
- Protect the threads of the clutch shaft using a shaft protector (2).
- Hold onto the 1st/2nd clutch shaft assembly to prevent the assembly from dropping.

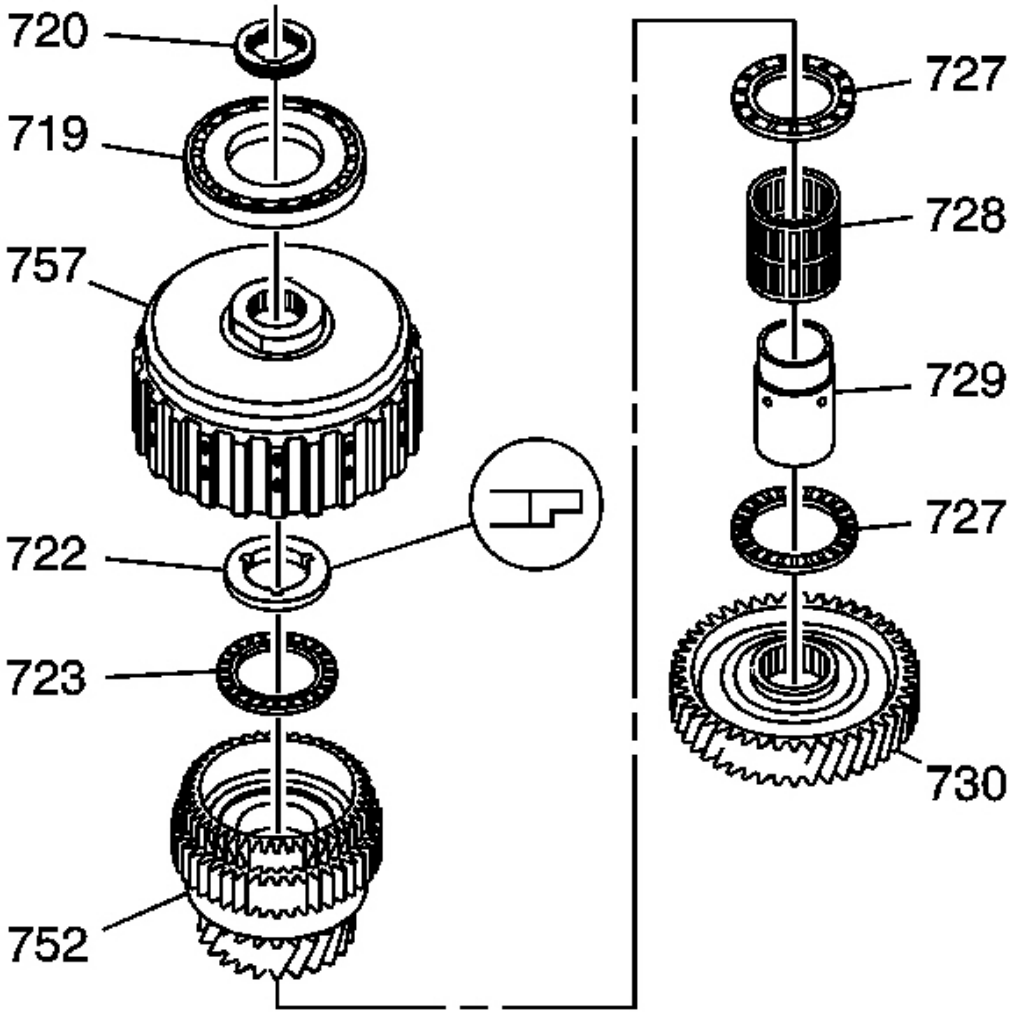

Fig. 259: Rear Bearing, Drive Gear & Components Removed
Courtesy of GENERAL MOTORS CORP.

5. Separate the following components, which were removed when pressing off the rear bearing and drive gear.

- 1st/2nd clutch shaft retaining nut washer (720)
- 1st/2nd clutch shaft rear bearing (719)
- 1st/coast clutch assembly (757)
- 1st/coast clutch hub thrust bearing race (722)
- 1st/coast clutch hub thrust bearing (723)
- 1st/coast clutch hub and coast sprag assembly (752)
- 1st drive gear thrust bearing (727)
- 1st drive gear inner bearing (728)
- 1st drive gear inner bearing race (729)
- 1st drive gear thrust bearing (727)
- 1st/2nd clutch shaft drive gear (730)

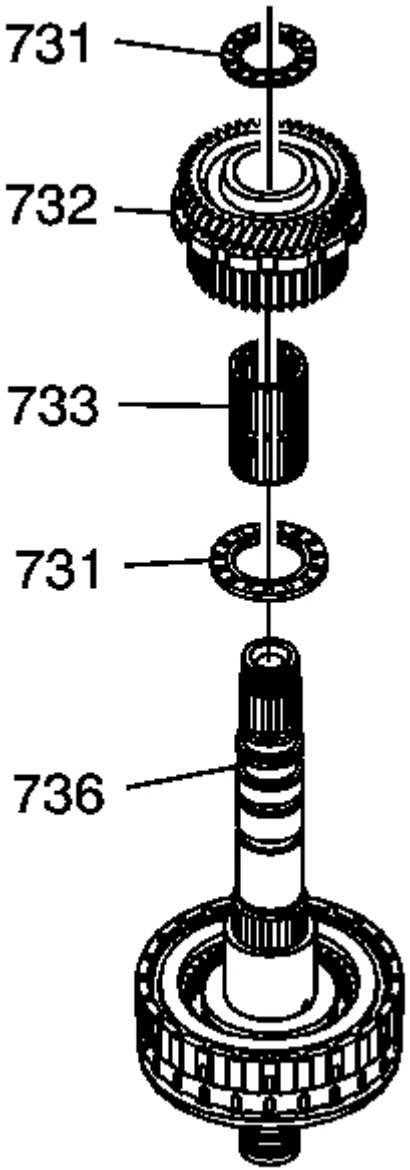

Fig. 260: 1st/2nd Clutch Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Remove the following from the 1st/2nd clutch shaft (736):
    - 2nd drive gear thrust bearing (731)
    - 2nd drive with clutch hub and park gear (732)

- 2nd drive gear inner bearing (733)
- 2nd drive gear thrust bearing (731)

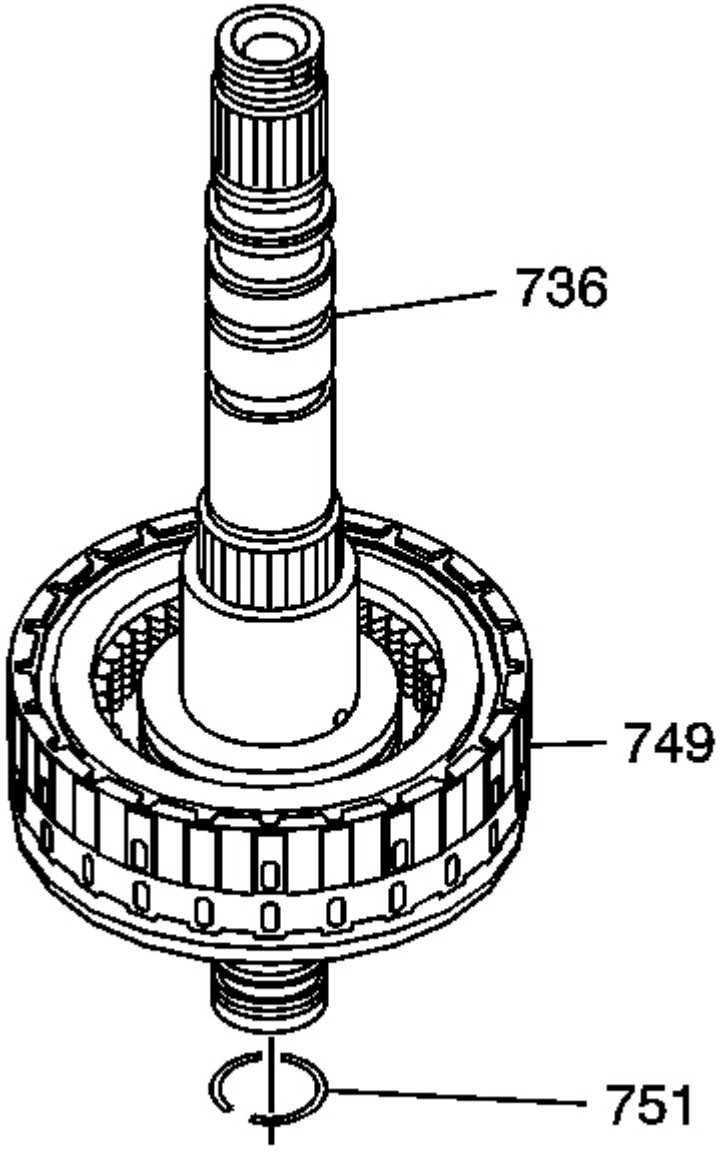

Fig. 261: 2nd Clutch Housing Assembly, Retaining Ring & 1st/2nd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

7. Remove the 2nd clutch housing retaining ring (751) from the 1st/2nd clutch shaft 736).
8. Remove the 2nd clutch housing assembly (749) from the 1st/2nd clutch shaft (736).

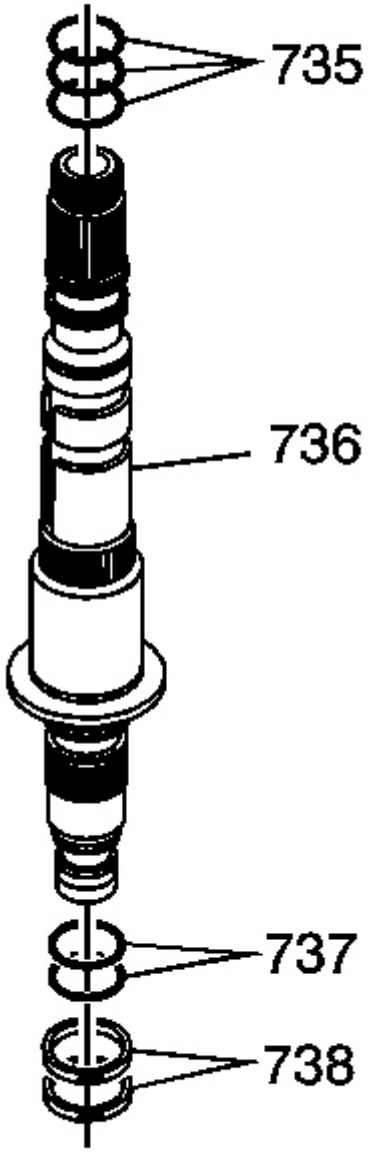

Fig. 262: 1st/2nd Clutch Shaft Fluid Passage Seals Removed
Courtesy of GENERAL MOTORS CORP.

9. Remove the 1st/coast clutch housing fluid passage seals (735).
10. Remove the 1st/2nd clutch shaft fluid passage seals (738).
11. Remove the 2nd clutch housing fluid passage seals (737).

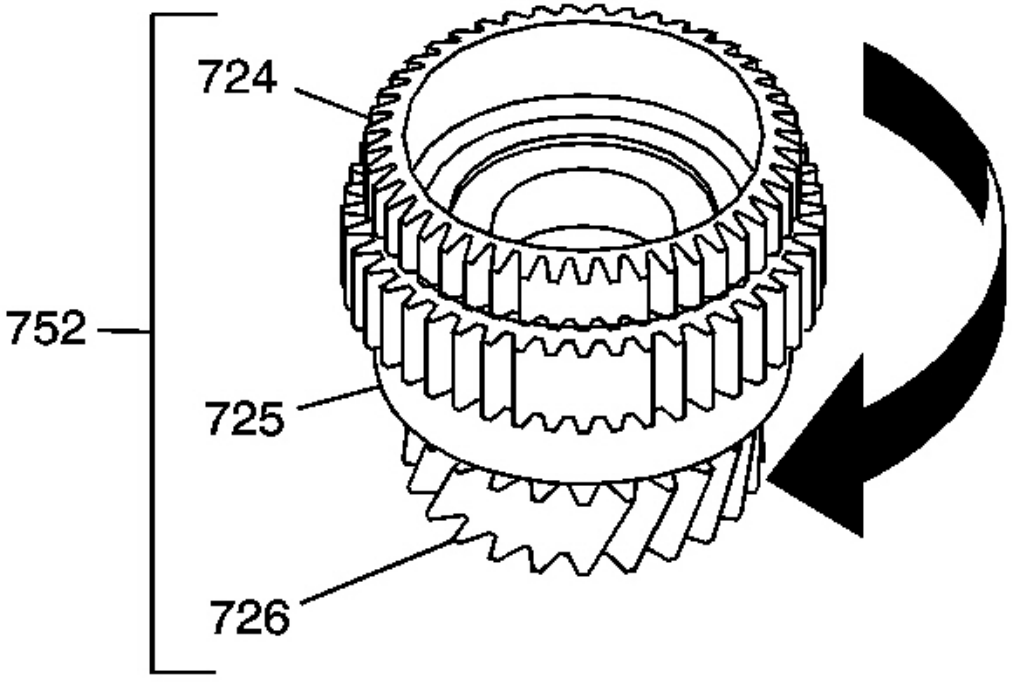

Fig. 263: Inspecting The Operation Of 1st/Coast Hub & Coast Sprag Assembly
Courtesy of GENERAL MOTORS CORP.

12. Inspect the operation of the 1st/coast hub and coast sprag assembly (752).
    - Hold the coast clutch hub (724) and turn clockwise the 1st drive gear (726). The assembly should turn freely clockwise.
    - Turn the 1st drive gear (726) the opposite direction, counterclockwise. The assembly should lock.
13. Inspect the gears on the 1st/coast hub and coast sprag assembly (752) for damage or excessive wear.
14. Replace the 1st/coast hub and coast sprag assembly (752) if faulty. The one-way clutch and the hub are serviced as an assembly.

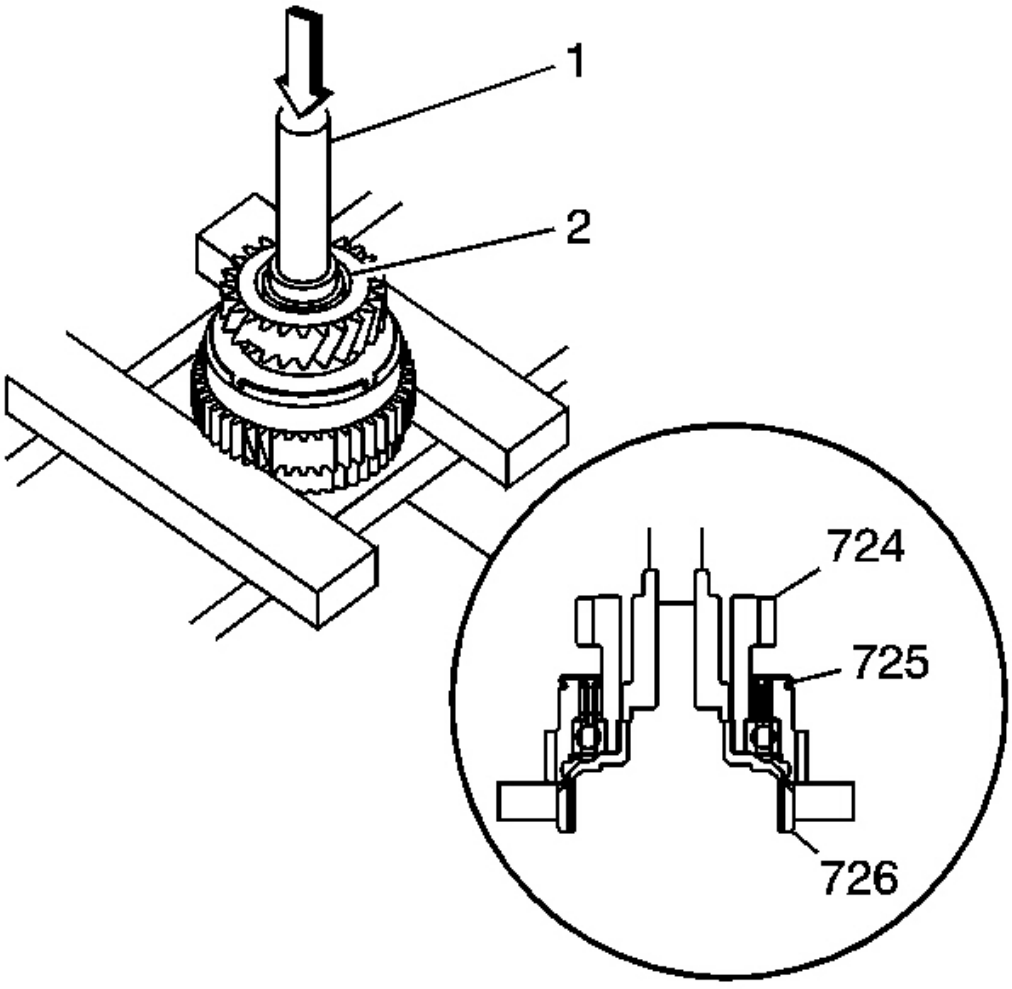

Fig. 264: Coast Sprag Assembly, Coast Clutch Hub & 1st Drive Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If necessary the 1st/coast hub and coast sprag assembly (752) can be disassembled for cleaning.

15. Using **EN 46342** (1) and **DT 46516** (2) with a hydraulic press, remove the coast clutch hub (724) form the 1st drive gear (726).
16. Clean the components in solvent and air dry.

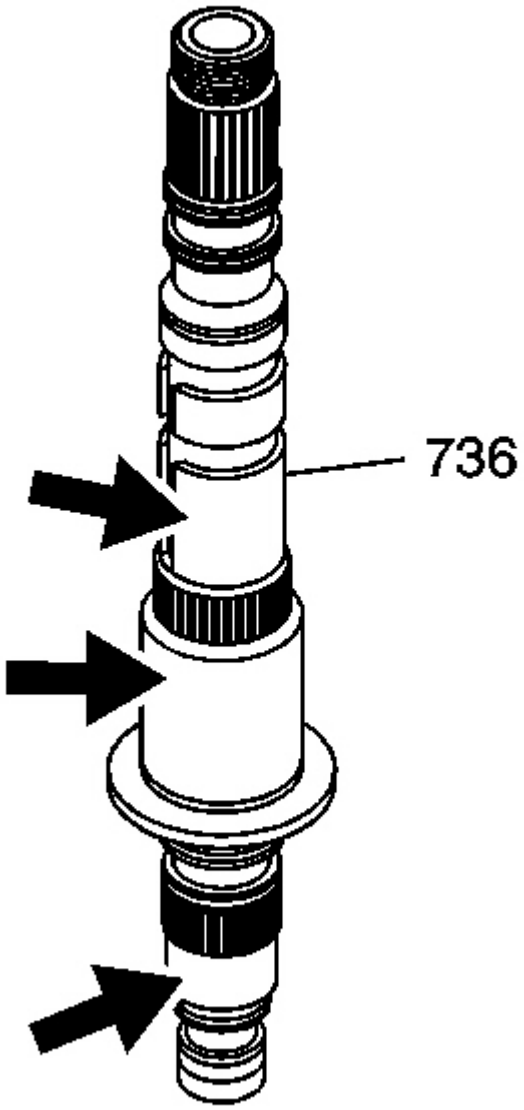

Fig. 265: Inspecting The 1st/2nd Clutch Shaft For Damage
Courtesy of GENERAL MOTORS CORP.

17. Clean the 1st/2nd clutch shaft (736) in solvent, air dry and blow out the oil passages.
18. Inspect the 1st/2nd clutch shaft (736) for the following conditions:

    Refer to 1st/2nd Clutch Shaft in **Transmission Clearance Specifications** .

- Shaft splines for excessive wear, witness marks from the gears is normal
- Bearing journal surfaces for wear, scoring, or brinelling
- Fluid passage seal grooves for damage
- Thrust bearing surface on shaft flange for excessive wear, roughness, or scoring

19. Replace the 1st/2nd clutch shaft (736) if faulty.
20. Clean the gears and bearing for the 1st/2nd clutch shaft insolvent and air dry.
21. Inspect the gears for damaged teeth.
22. Inspect the thrust surface on the gears for excessive wear and scoring.
23. Inspect the bearings for roughness, brinneling, or bent cages.
24. Replace any faulty components.

1ST CLUTCH HUB REPLACEMENT

Tools Required

- **DT 46427** Driver
- **DT 46516** Driver
- **EN 46342** Driver Handle

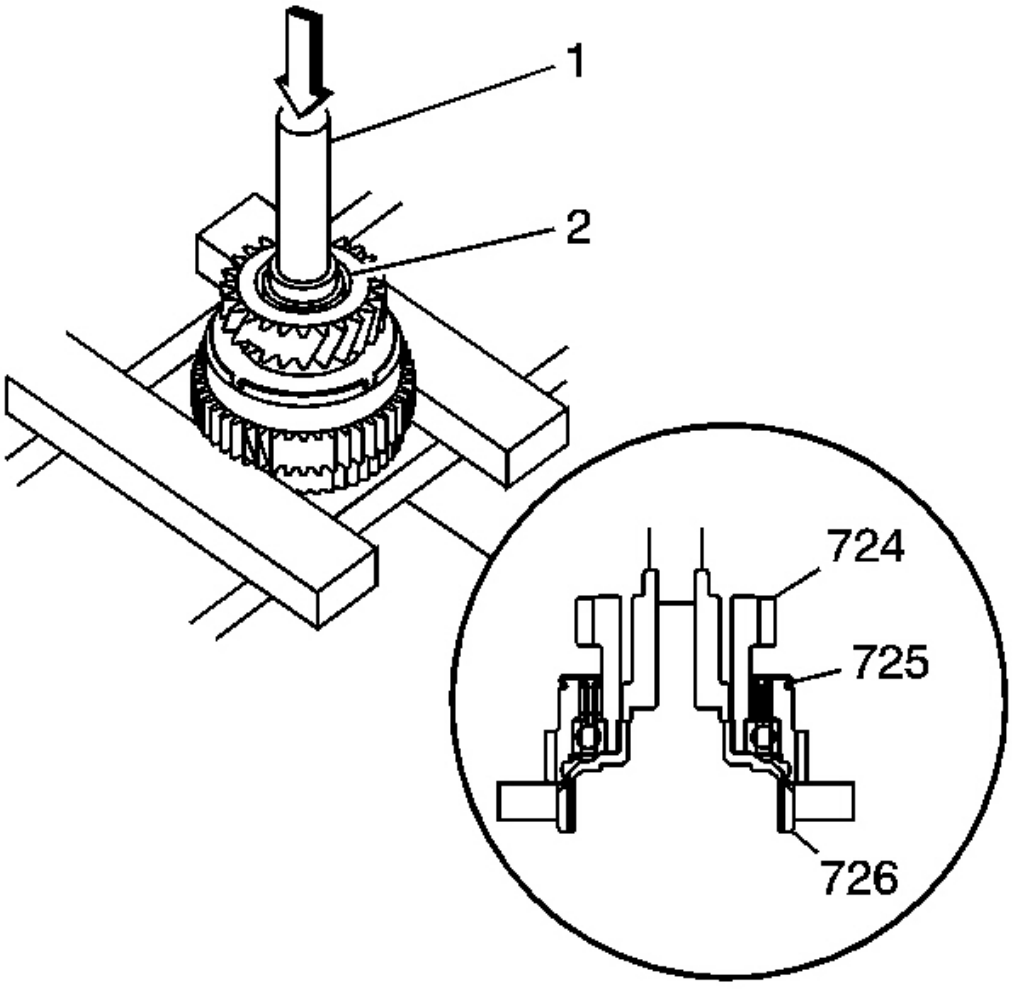

Fig. 266: Coast Sprag Assembly, Coast Clutch Hub & 1st Drive Gear
Courtesy of GENERAL MOTORS CORP.

1. Using **EN 46342** (1) and **DT 46516** (2) and a hydraulic press, remove the coast clutch hub (724) from the 1st drive gear (726).
2. Remove the 1st clutch hub and coast sprag assembly (725) from the 1st drive gear (726).
3. Install the new 1st clutch hub and coast sprag assembly (725) in the 1st gear.

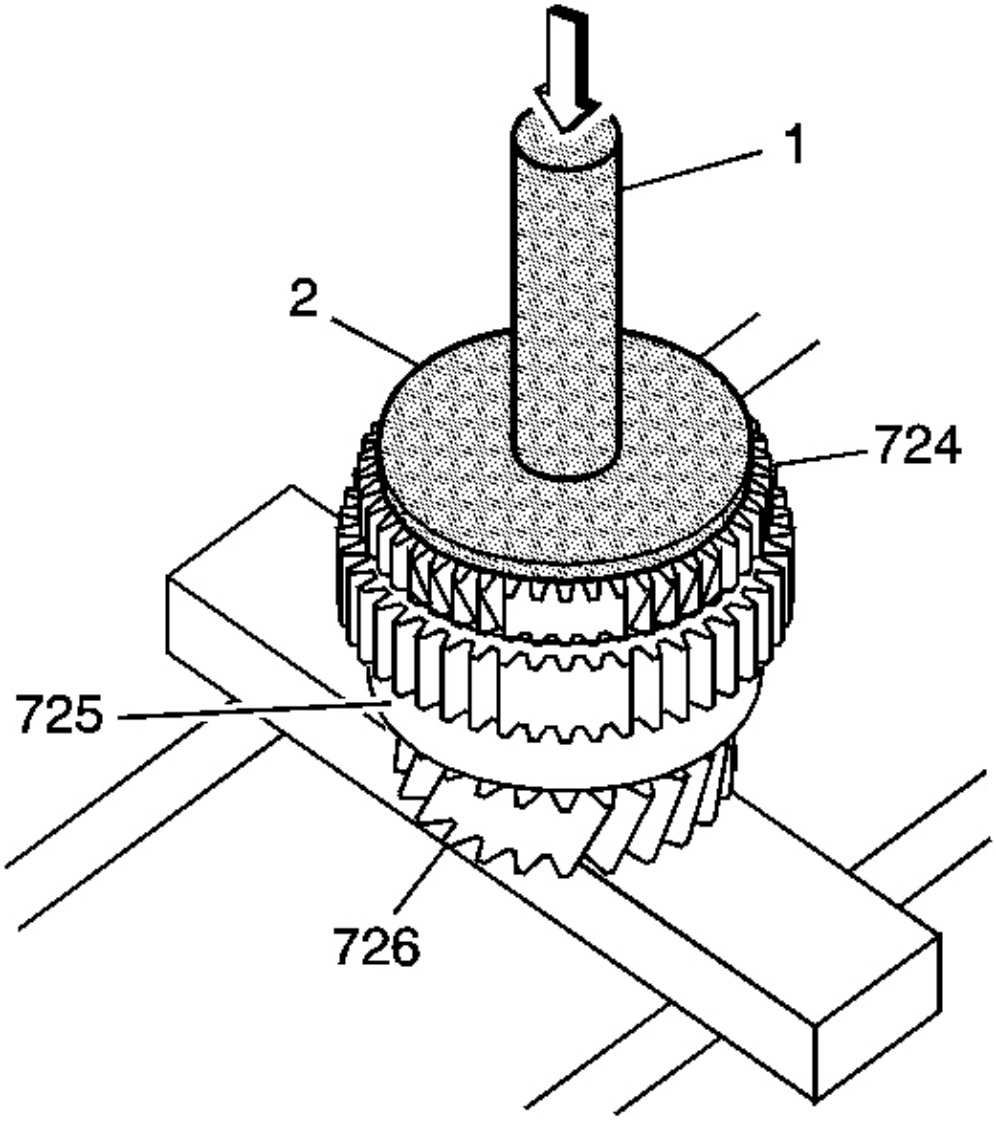

Fig. 267: Installing The 1st Coast Clutch Hub & 1st Drive Gear Using EN 46342, DT 46516 & A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

4. Using **EN 46342** (1) and **DT 46516** (2) and a hydraulic press, install the 1st and coast clutch hub (724) and the 1st drive gear (726).

1ST/COAST CLUTCH DISASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Removal Bridge

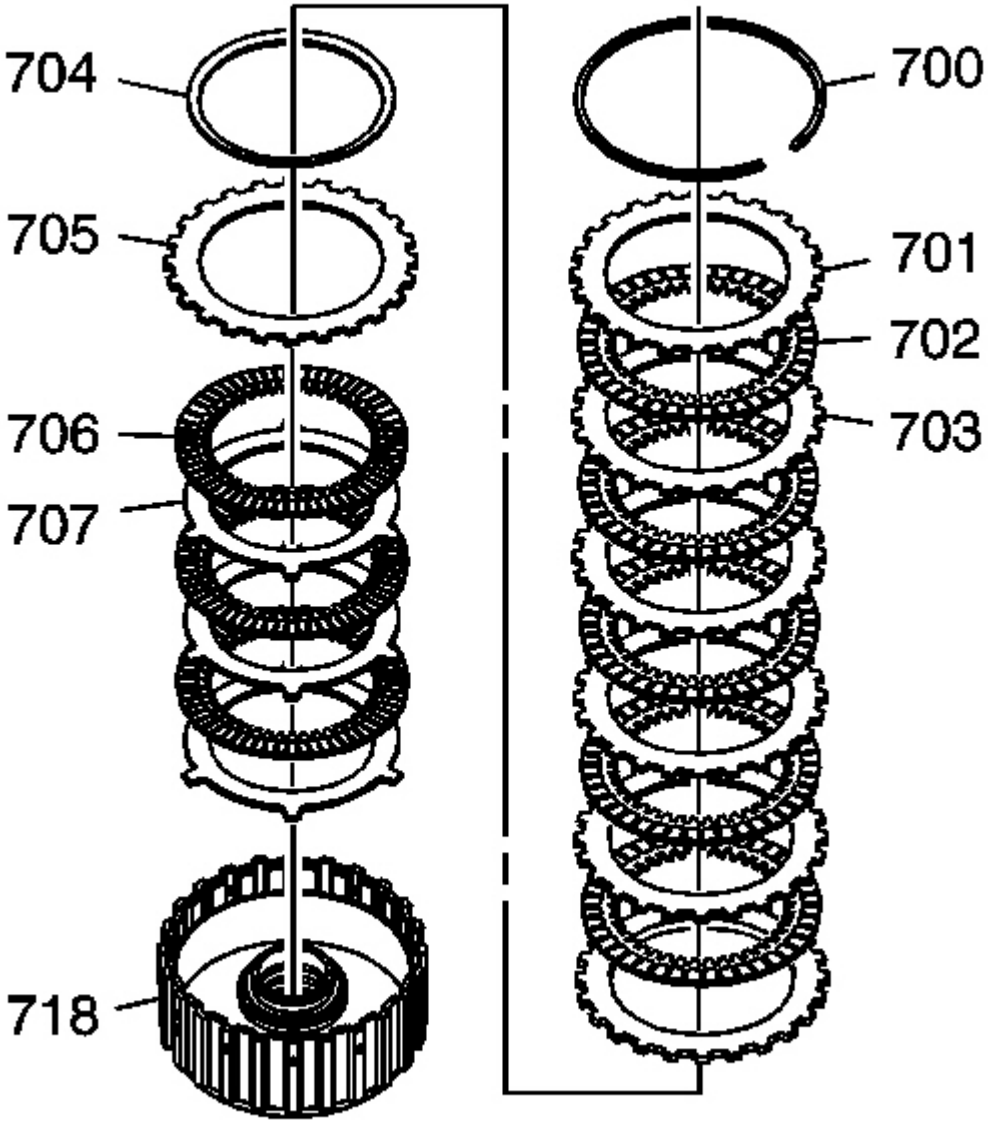

Fig. 268: 1st Clutch Backing Plate Retaining Ring & Components Removed

Courtesy of GENERAL MOTORS CORP.

1. Using **J 28585** , remove the 1st clutch backing plate retaining ring (700).
2. Remove the selective 1st clutch backing plate (701).
3. Remove the 1st clutch steel (703) and fiber plates (702).

IMPORTANT: The coast clutch piston spring washer (711) is not detachable from the coast clutch piston (712) and is not shown.

4. Remove the 1st clutch spring plate (704).
5. Remove the coast clutch backing plate (705).
6. Remove the coast clutch steel (707) and fiber plates (706).

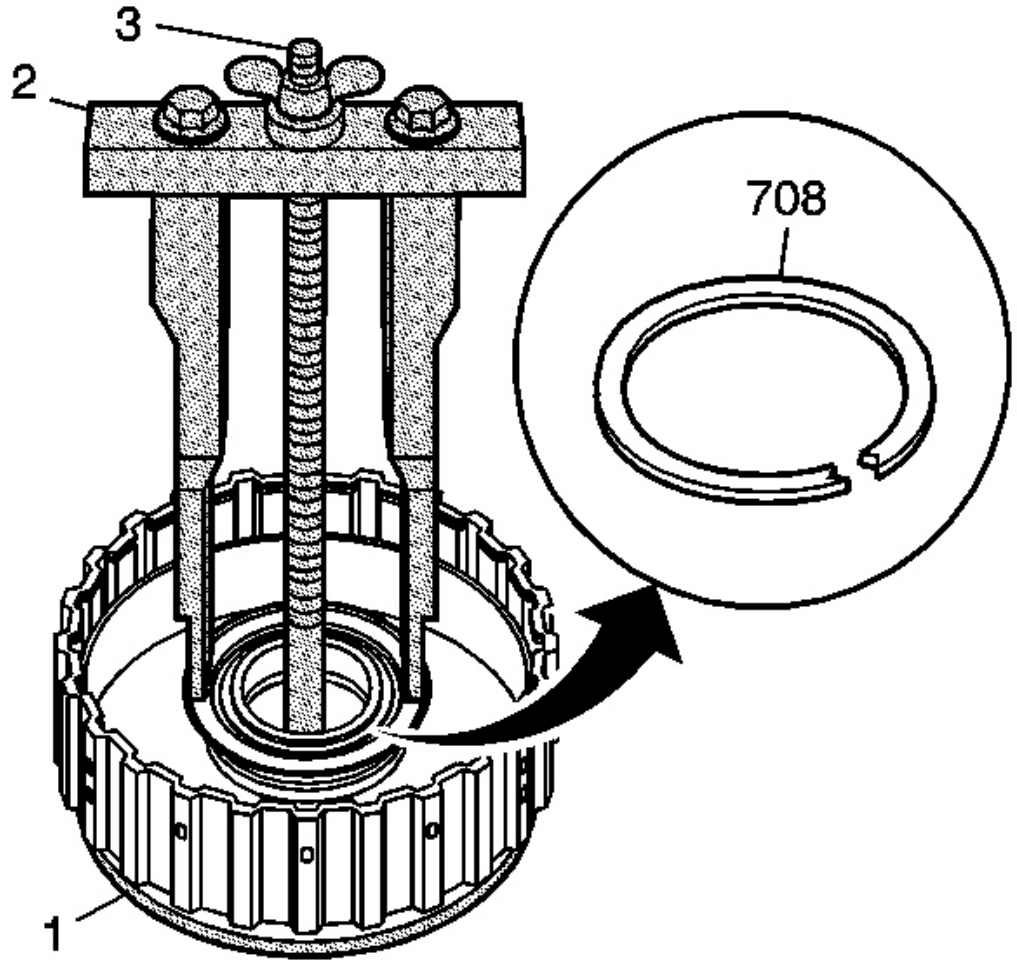

Fig. 269: 1st/Coast Clutch Disassemble, J 45124, J 23327 & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

7. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (3) and J 21420-2 (1) plate of the **J 23327** compress the clutch piston return spring (710) until the groove for the clutch spring retainer cap retaining ring (708) is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap (709).

- Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

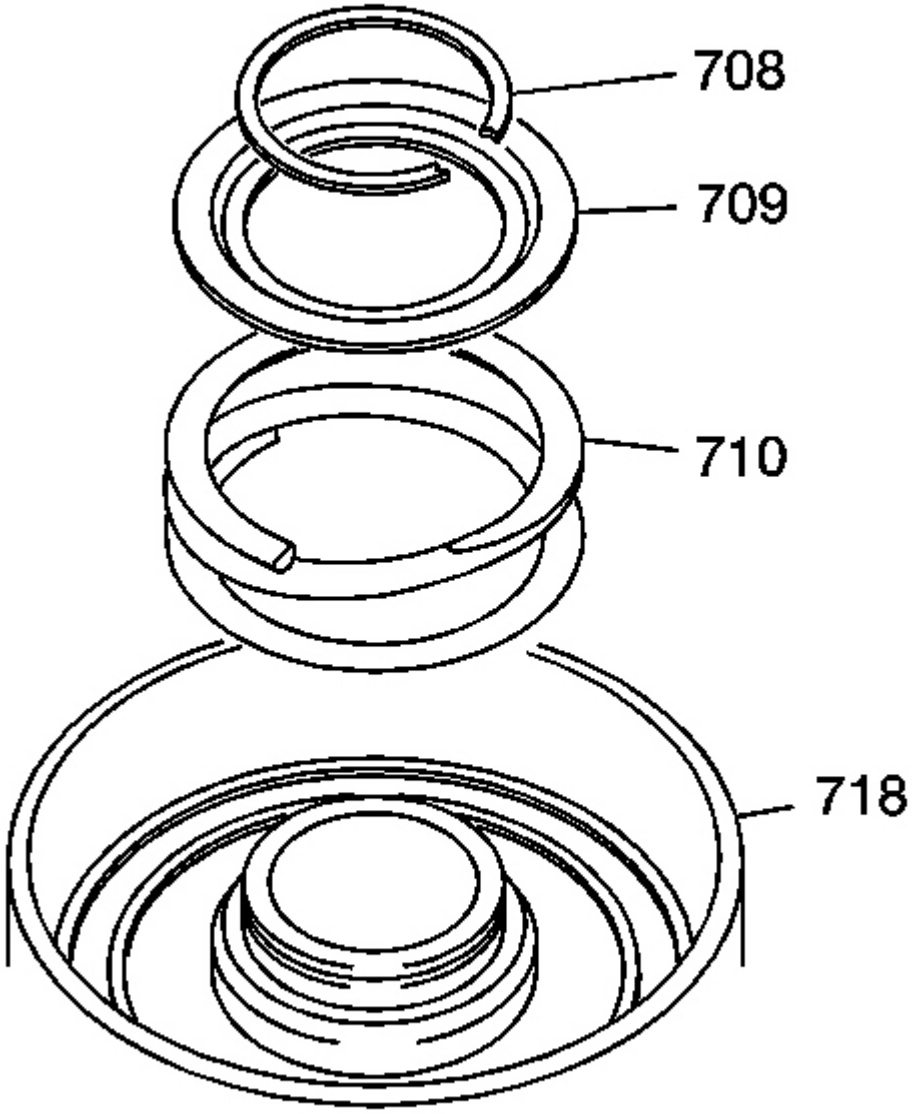

Fig. 270: Retaining Ring, Return Spring Cap & Clutch Return Spring Removed
Courtesy of GENERAL MOTORS CORP.

8. Remove the retaining ring (708), return spring cap (709), and the clutch return spring (710).
9. Remove the tools.

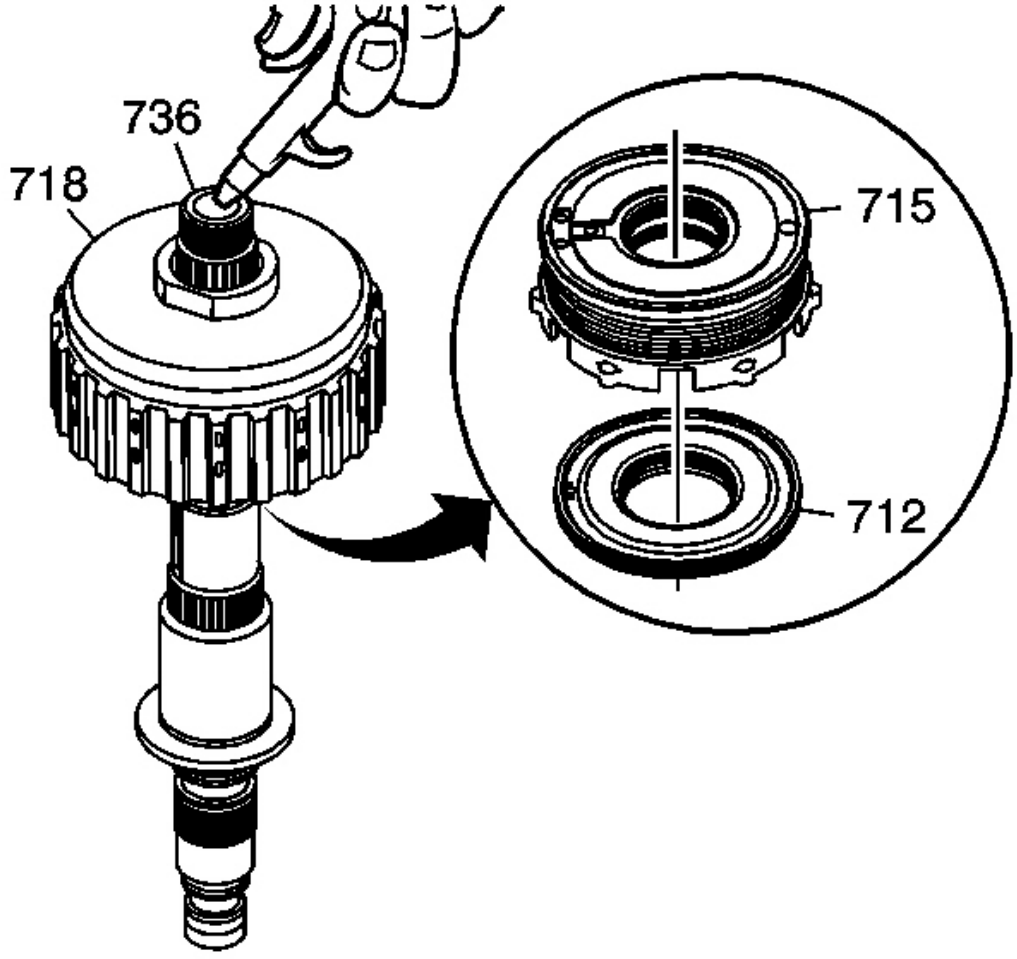

Fig. 271: Applying Compressed Air Into Center Fluid Passage Hole Of 1st & 2nd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

10. Install the 1st/coast clutch housing assembly (718) back onto the 1st/2nd clutch shaft (736).

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

11. Apply compressed air into the center fluid passage hole of the 1st, 2nd clutch shaft (736) to remove the 1st clutch piston (715) and the coast clutch piston (712) from the 1st and coast clutch housing (718).

The 1st/coast clutch housing fluid passage seals (735) may have to be installed to prevent air leakage.

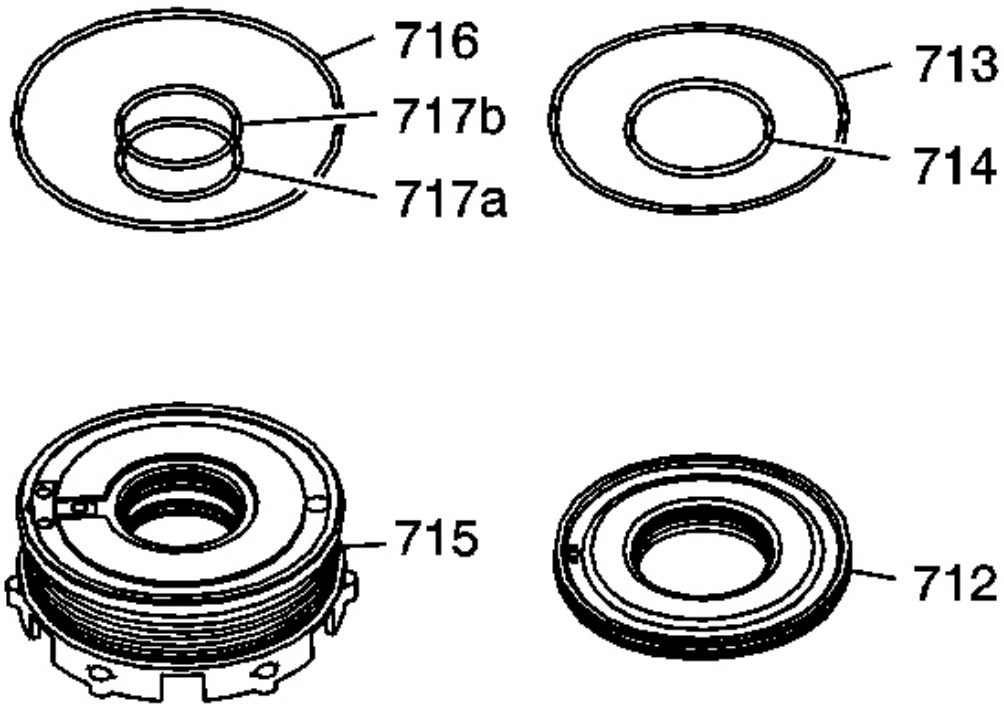

Fig. 272: Inner, Outer O-Ring Seals & Piston Assemblies
Courtesy of GENERAL MOTORS CORP.

12. Remove the inner (714), (717a) and (717b) and outer O-ring seals (713) and (716) from the piston assemblies (712, 715).

1ST/COAST CLUTCH INSPECTION

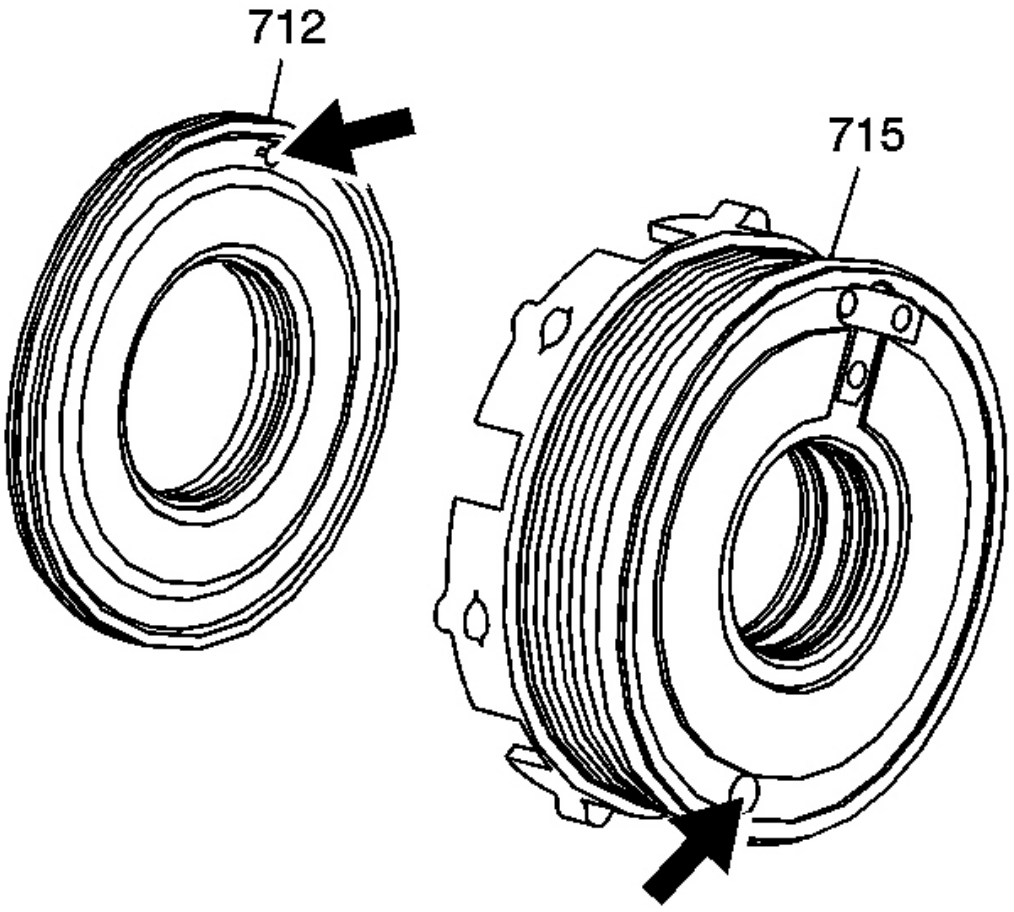

Fig. 273: Inspecting The 1st Clutch & Coast Clutch
Courtesy of GENERAL MOTORS CORP.

1. Inspect the 1st clutch (715) and the coast clutch (712) pistons to include each piston's check valve. If the clutch piston's check valve is stuck, falls out of the piston or otherwise damaged, replace the clutch piston.

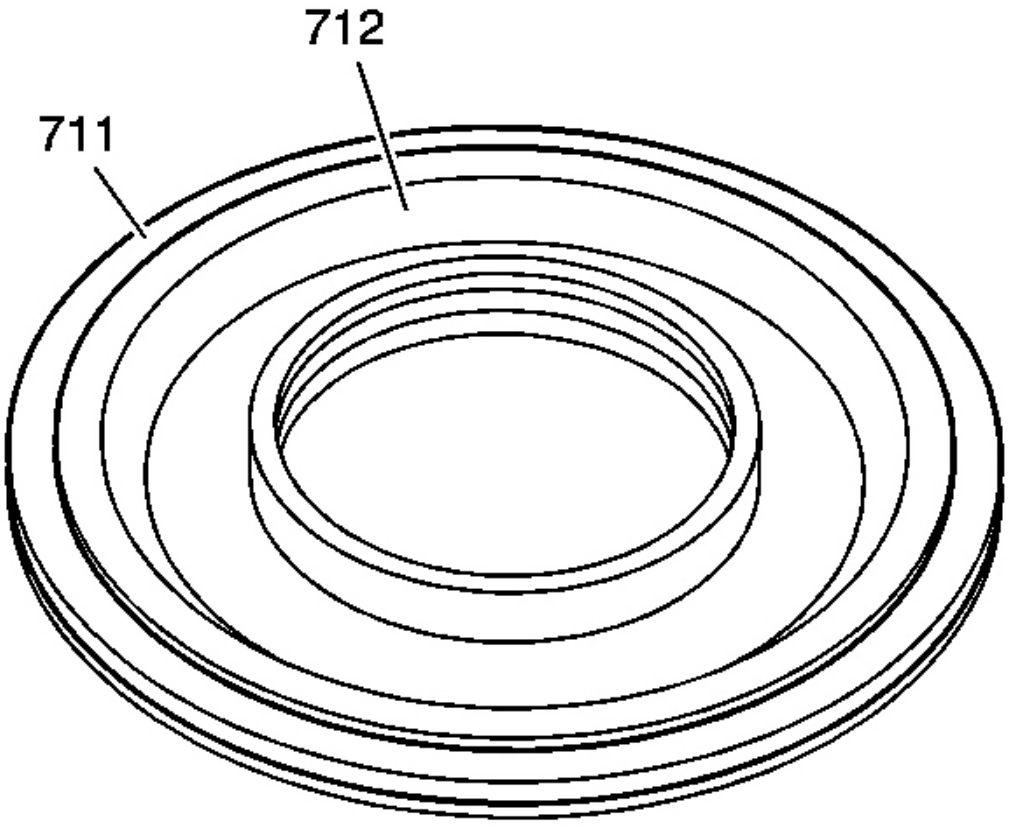

Fig. 274: Coast Clutch Piston Spring & Washer Plate
Courtesy of GENERAL MOTORS CORP.

2. Verify that the coast clutch piston spring washer plate (711) is staked to the coast clutch piston (712). If not, replace the coast clutch piston assembly.

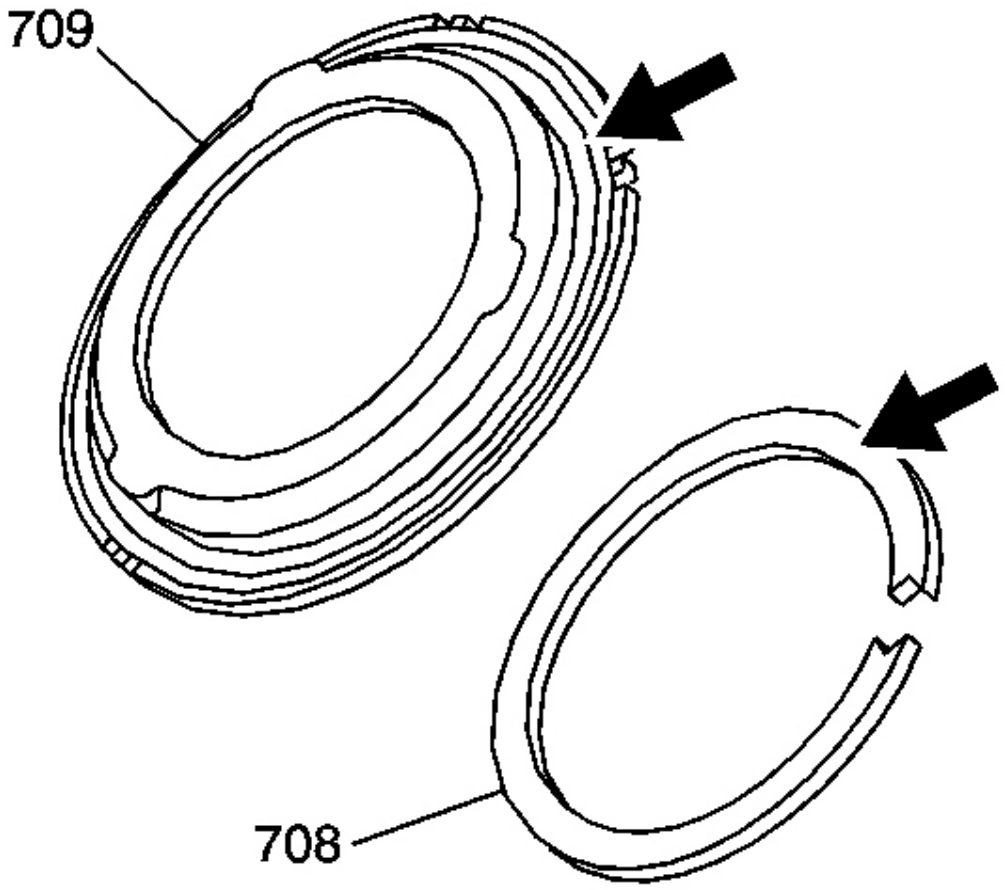

Fig. 275: Inspecting Clutch Piston Spring Retainer Cap & Retaining Ring For Damage
Courtesy of GENERAL MOTORS CORP.

3. Check the clutch piston spring retainer cap (709) and retaining ring (708) for wear or damage.

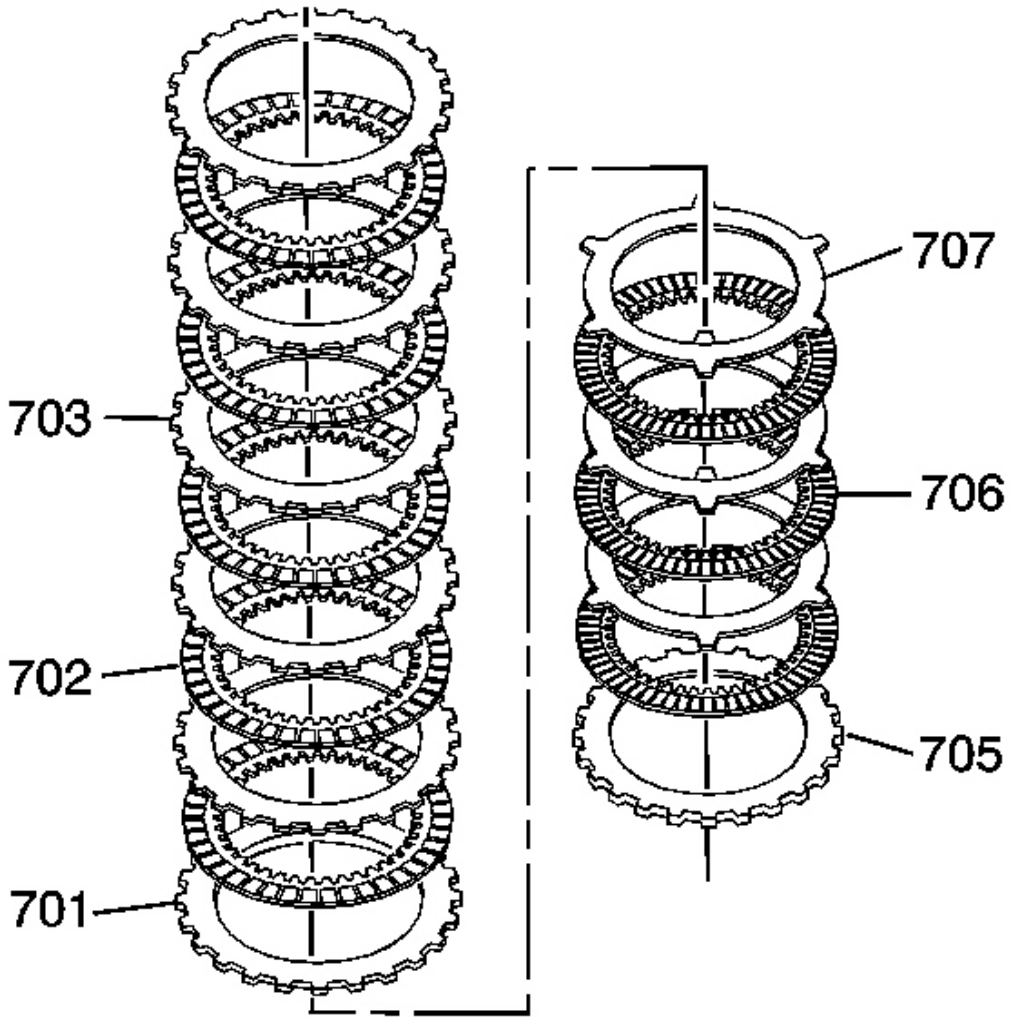

Fig. 276: Inspecting Steel Clutch Plates, Clutch Fiber Plates & Clutch Backing Plates For Damage
Courtesy of GENERAL MOTORS CORP.

4. Inspect all of the steel clutch plates (703) and (707), clutch fiber plates (702) and (706), and clutch backing plates (701) and (705) for the following:
    - If the clutch steel plates are worn, damaged or severely discolored, replace the plates as a complete set.
    - If the clutch fiber plates are worn, damaged, or discolored, replace the plates as a complete set.
    - If the 1st clutch (701) or the coast clutch backing plate (705) is worn, damaged, or severely discolored, inspect the clutch backing plate-to-top-disc clearance, then replace the clutch-backing-

plate making sure to use the correct selective size backing plate.

1ST/COAST CLUTCH ASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Removable Bridge

Note these items during assembly:

- Apply automatic transmission fluid to all O-ring seals before assembly.
- Soak all clutch fiber plates thoroughly in automatic transmission fluid for a minimum of 30 minutes.

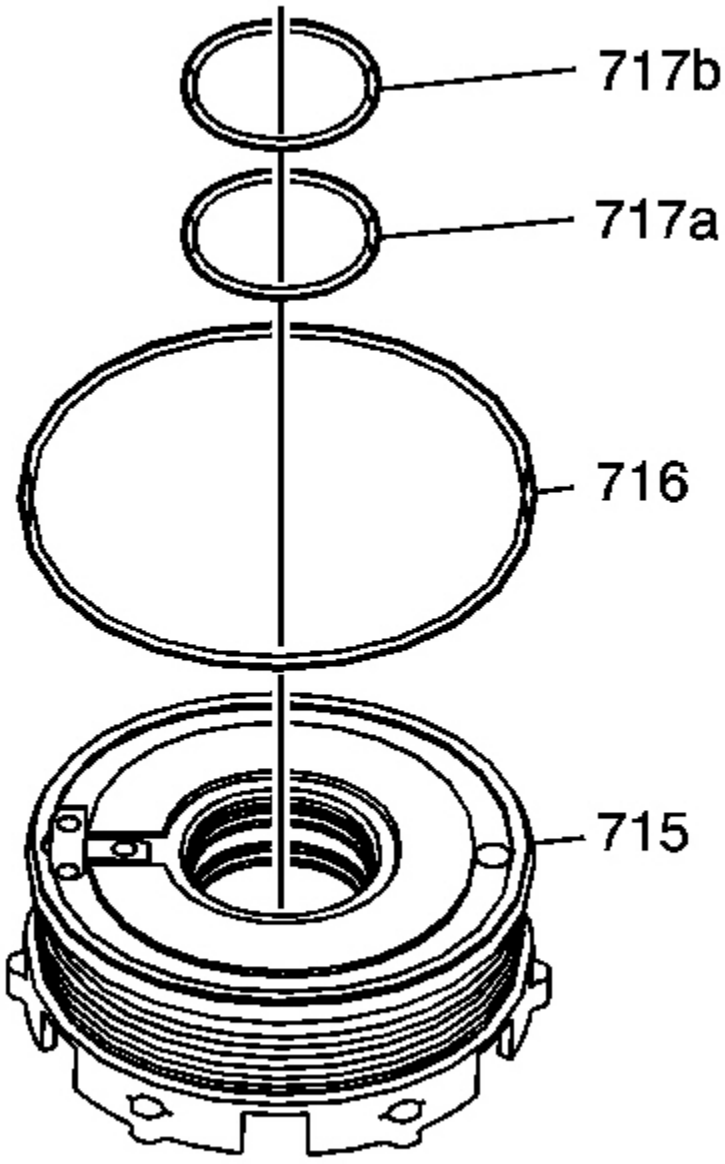

Fig. 277: Installing Inner O-Ring Seals In 1st Clutch Piston
Courtesy of GENERAL MOTORS CORP.

1. Install inner O-ring seals in the 1st clutch piston (715) as follows:
    - Upper, forward inner groove, O-ring seal (717a)
    - Lower, rear inner groove, O-ring seal (717b)

2. Install an outer O-ring seal (716) in the outer groove of the 1st clutch piston (715).

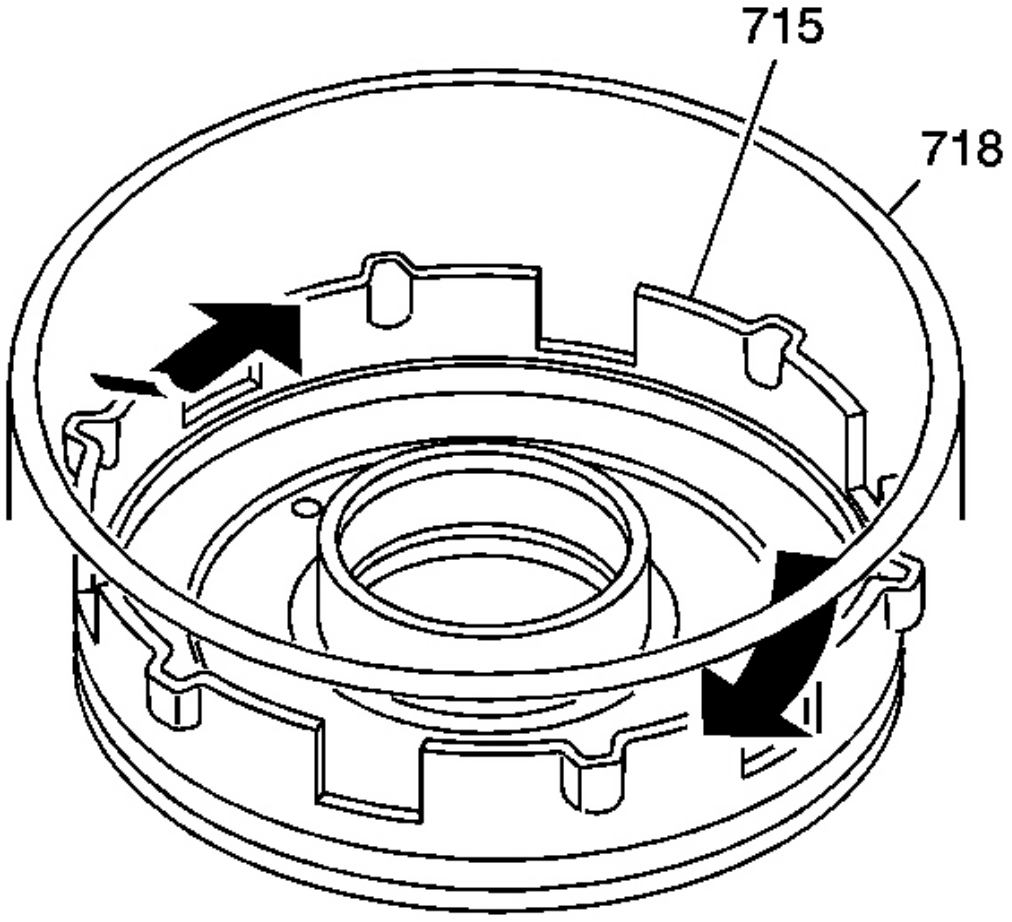

Fig. 278: Installing The 1st Clutch Piston Into The 1st & Coast Clutch Housing
Courtesy of GENERAL MOTORS CORP.

3. Install the 1st clutch piston (715) into the 1st and coast clutch housing (718) by applying hand pressure and rotating the 1st clutch piston assembly.
    - Ensure proper O-ring seating.
    - Do not pinch the O-ring seal by installing the piston with excessive force.

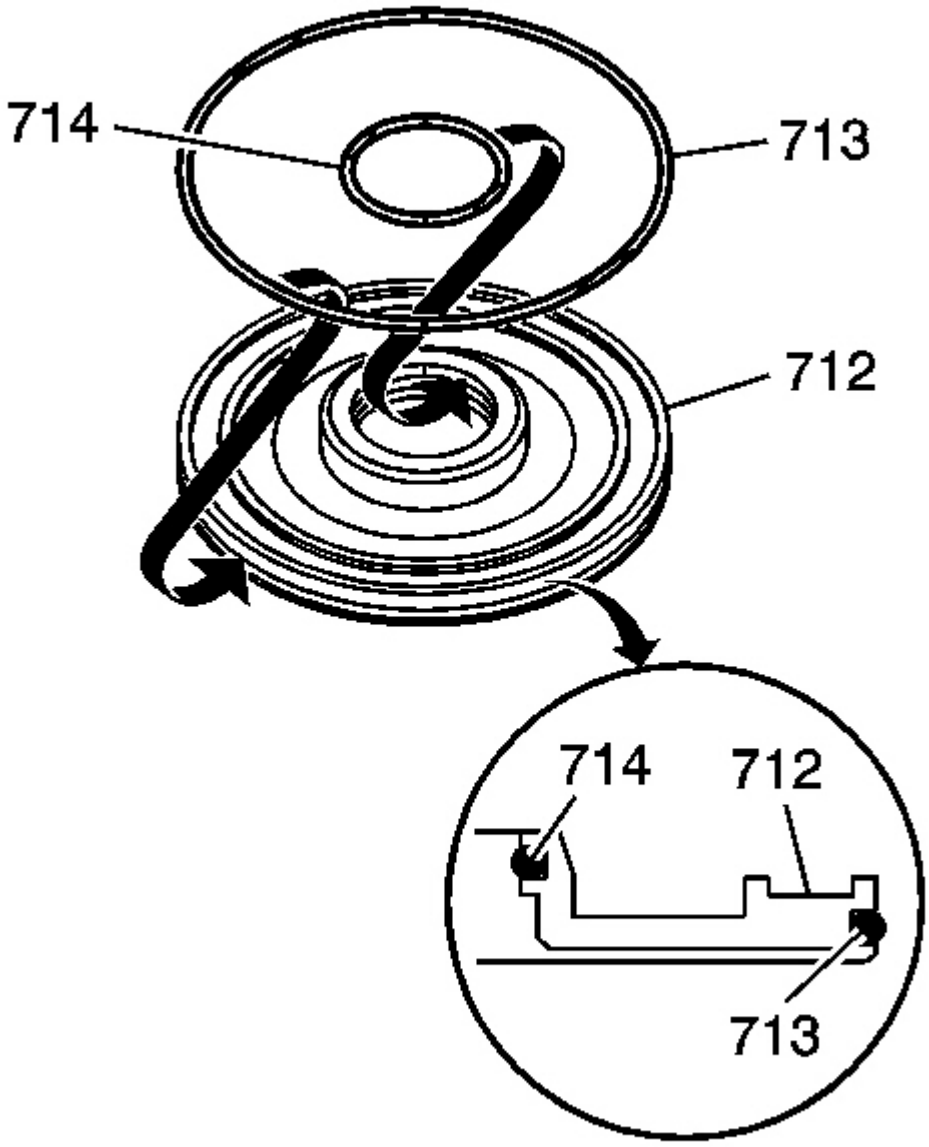

Fig. 279: Installing O-Ring Seals In The Coast Clutch Piston
Courtesy of GENERAL MOTORS CORP.

4. Install O-ring seals in the coast clutch piston (712) as follows:
    - Inner groove, inner coast clutch O-ring seal (714)
    - Outer groove, outer coast clutch O-ring seal (713)

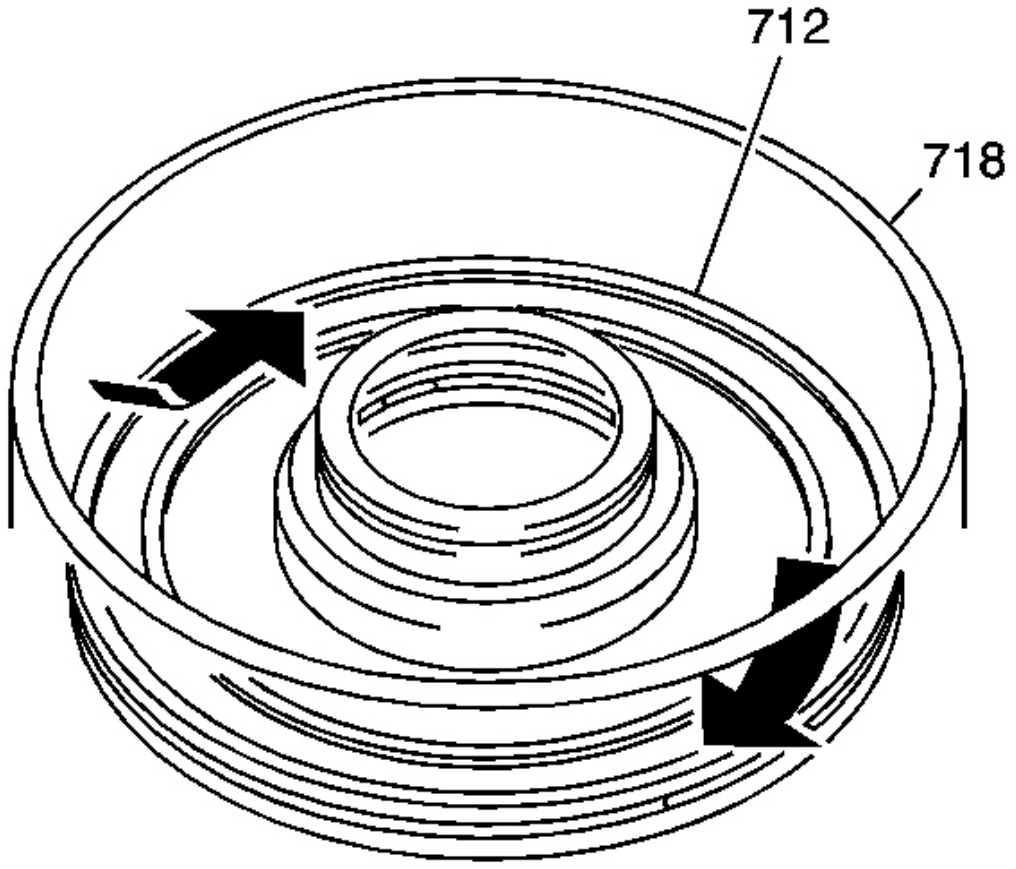

Fig. 280: Installing The Coast Clutch Piston Into The 1st & Coast Clutch Housing
Courtesy of GENERAL MOTORS CORP.

5. Install the coast clutch piston (712) into the 1st and coast clutch housing (718) by applying hand pressure and rotating the coast clutch piston assembly.
    - Ensure proper O-ring seating.
    - Do not pinch the O-ring seal by installing the piston with excessive force.

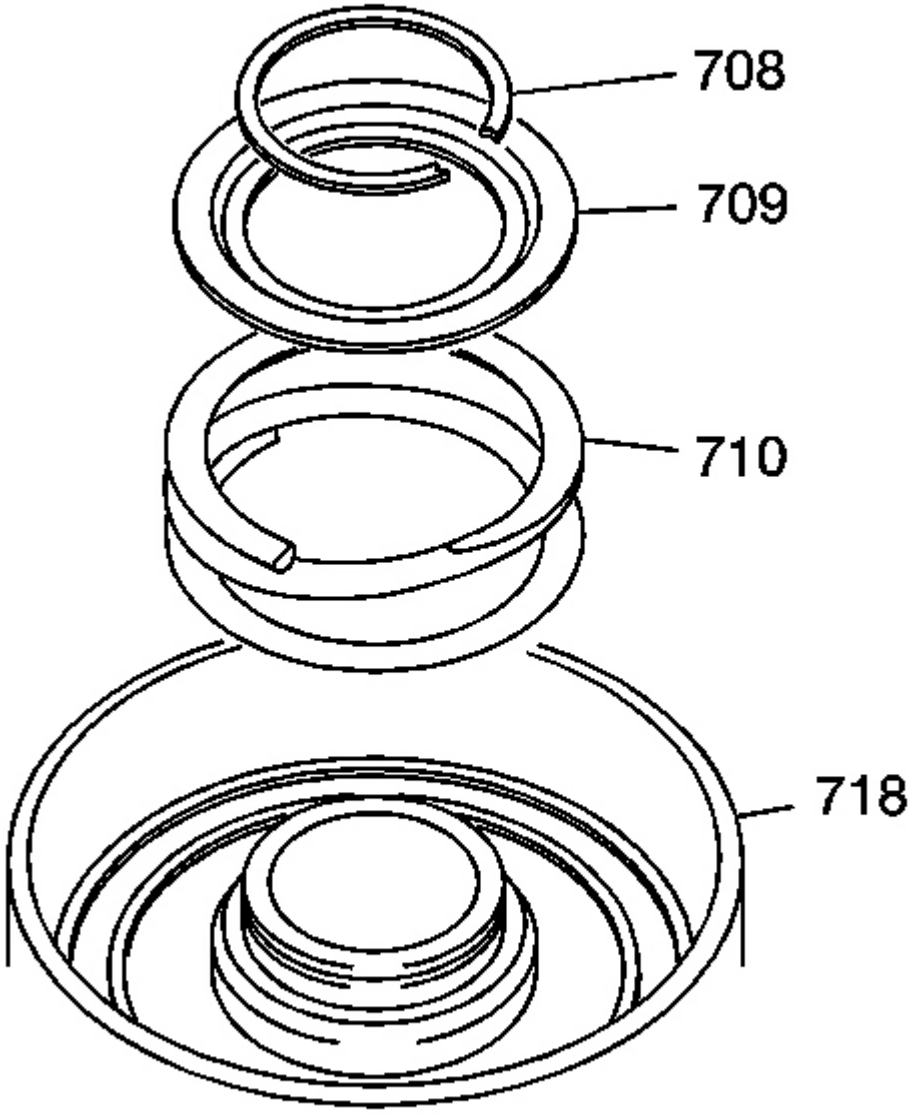

Fig. 281: Retaining Ring, Return Spring Cap & Clutch Return Spring Removed
Courtesy of GENERAL MOTORS CORP.

6. Install the following components into the 1st and coast clutch housing (718):
    - 1st and coast clutch piston return spring (710)
    - 1st and coast clutch piston return spring retainer cap (709)
    - 1st and coast clutch piston return spring retainer cap 44 mm retaining ring (708) on the retainer cap

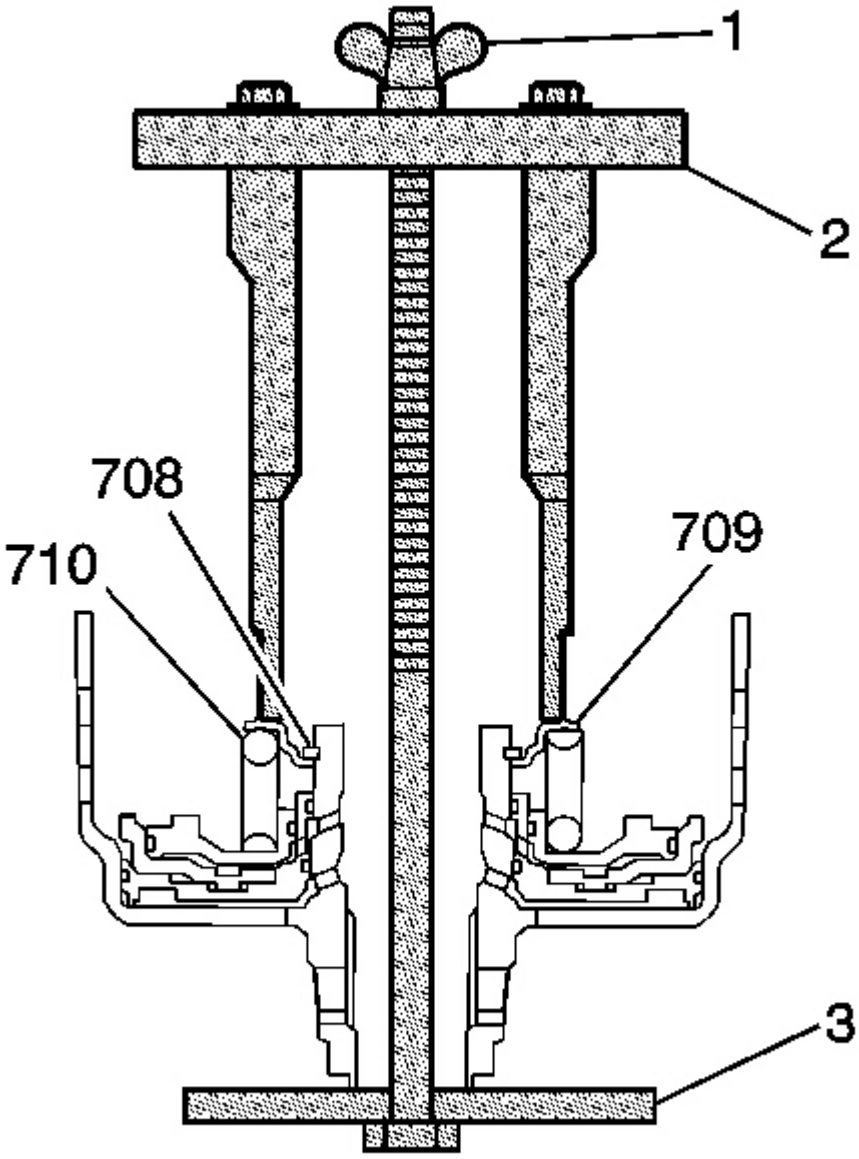

Fig. 282: 1st/Coast Clutch Assemble, J 45124, J 23327, Clutch Piston Return Spring & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

7. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (1) and J 21420-2 (3) plate of the **J 23327** , compress the clutch piston return spring (710) until the groove for the clutch spring retainer cap retaining ring (708) is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap (709).
    - Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

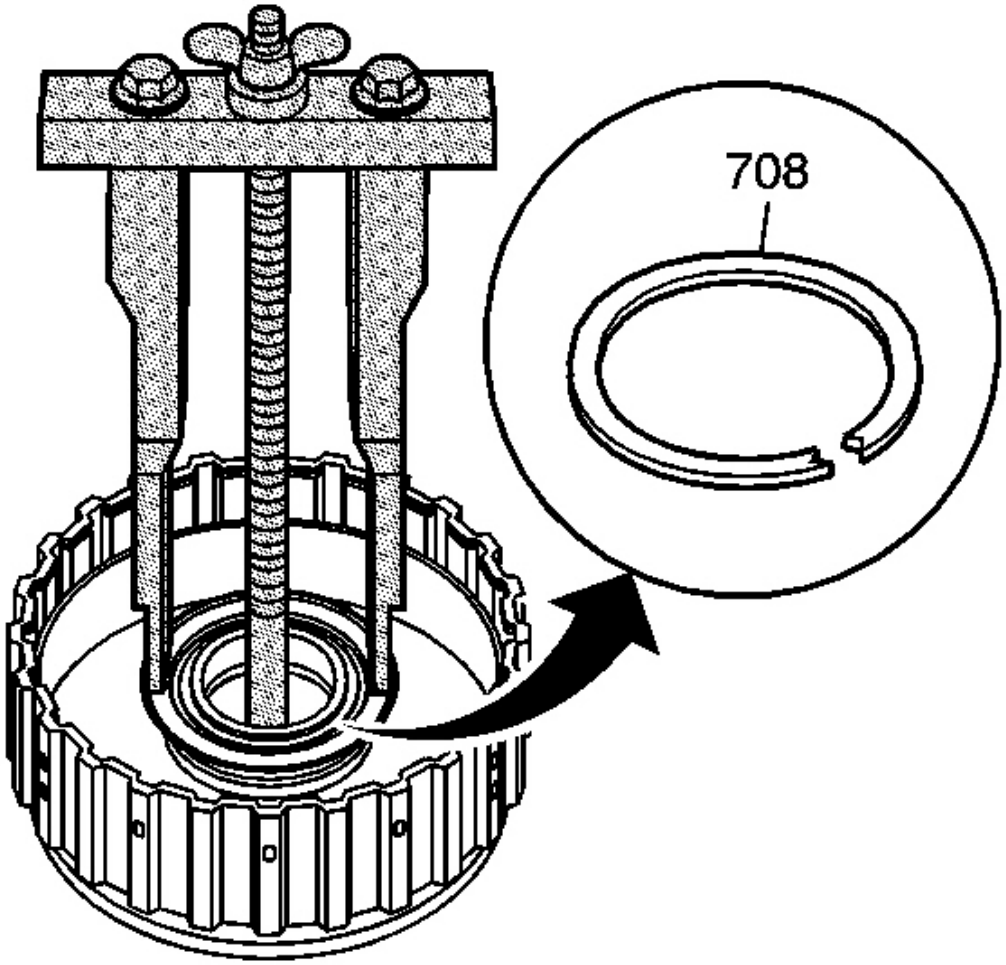

Fig. 283: 44 mm 1st & Coast Clutch Return Spring Retaining Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

8. Install the 44 mm 1st and coast clutch return spring retaining cap retaining ring (708).
9. Remove the tools.

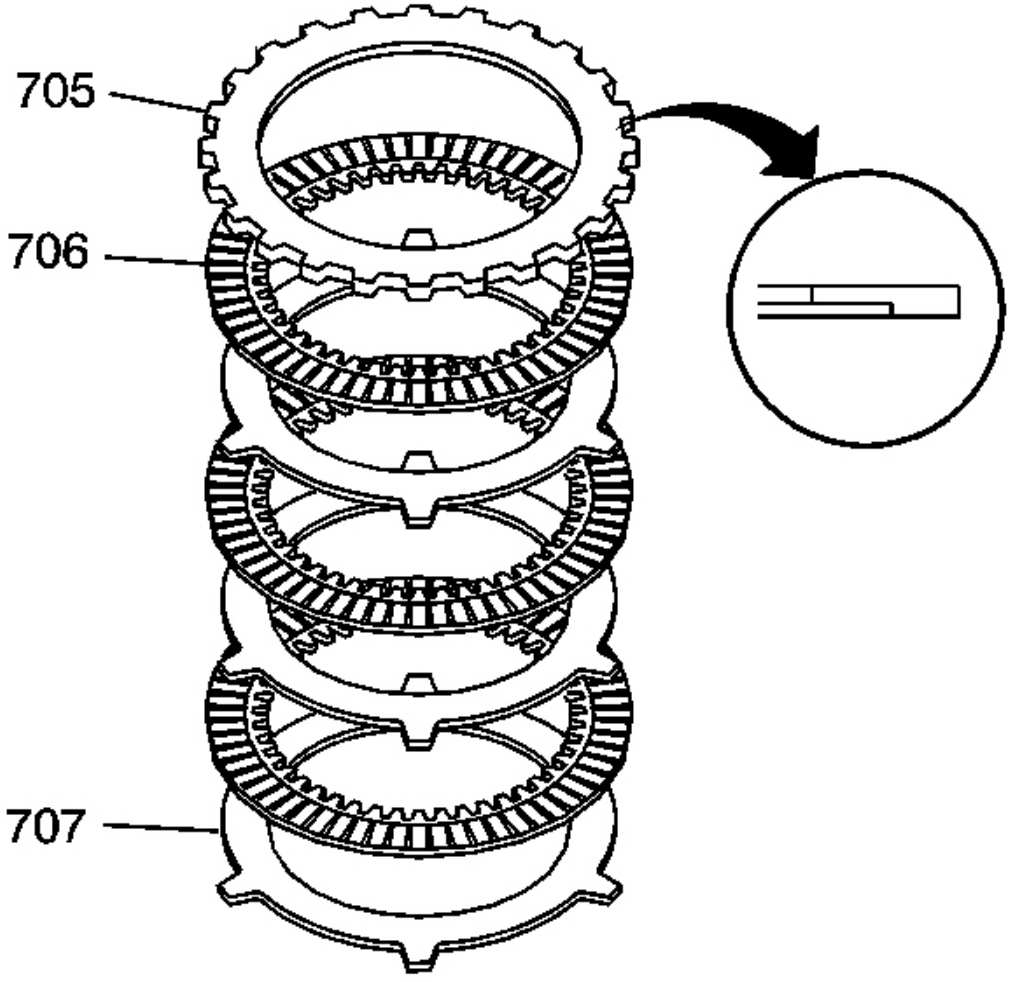

Fig. 284: Installing The 1st & Coast Clutch Housing & Components
Courtesy of GENERAL MOTORS CORP.

10. Install into the 1st and coast clutch housing (718) the following components:
    - Coast clutch steel plate (707)
    - Coast clutch fiber plate (706)
    - Continue to alternately install the above components until a total of 3 each have been installed.
    - Selective coast clutch backing plate (705) in the direction shown

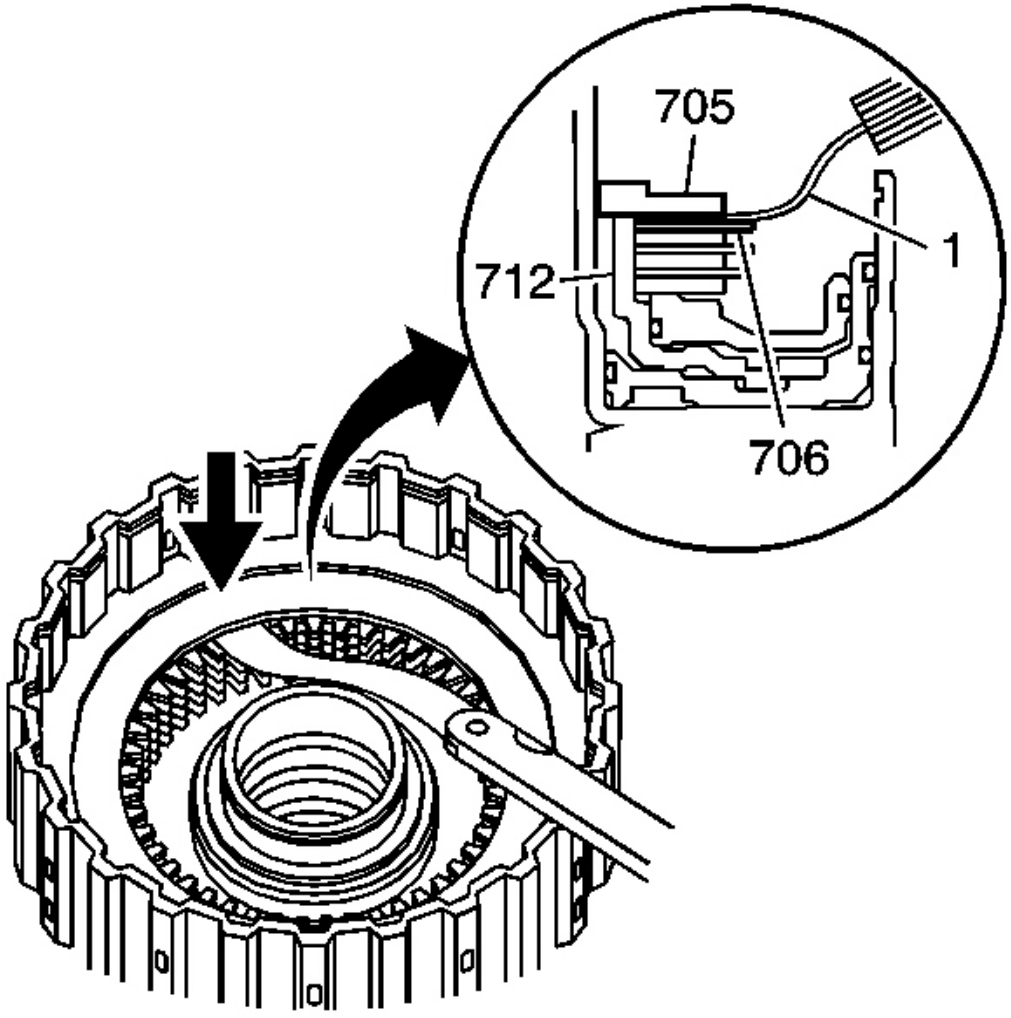

Fig. 285: Measuring The Coast Clutch Clearance Between The Coast Clutch Backing Plate & The Top Coast Clutch Fiber Plate Using A Feeler Gage
Courtesy of GENERAL MOTORS CORP.

11. By hand, press down on the coast clutch backing plate (705) in order to seat the backing plate to the coast clutch piston (712).
12. Measure the coast clutch clearance between the coast clutch backing plate (705) and the top coast clutch fiber plate (706) with a feeler gage (1).
    - Measure in at least 3 places.
    - Use the average of the 3 measurements as the actual clearance.

Specification: 0.6-1.0 mm (0.024-0.039 in)

13. If the coast clutch backing plate clearance is out of specification, replace the coast clutch steel (707) and fiber plates (706) as a set, and recheck for proper clearance.

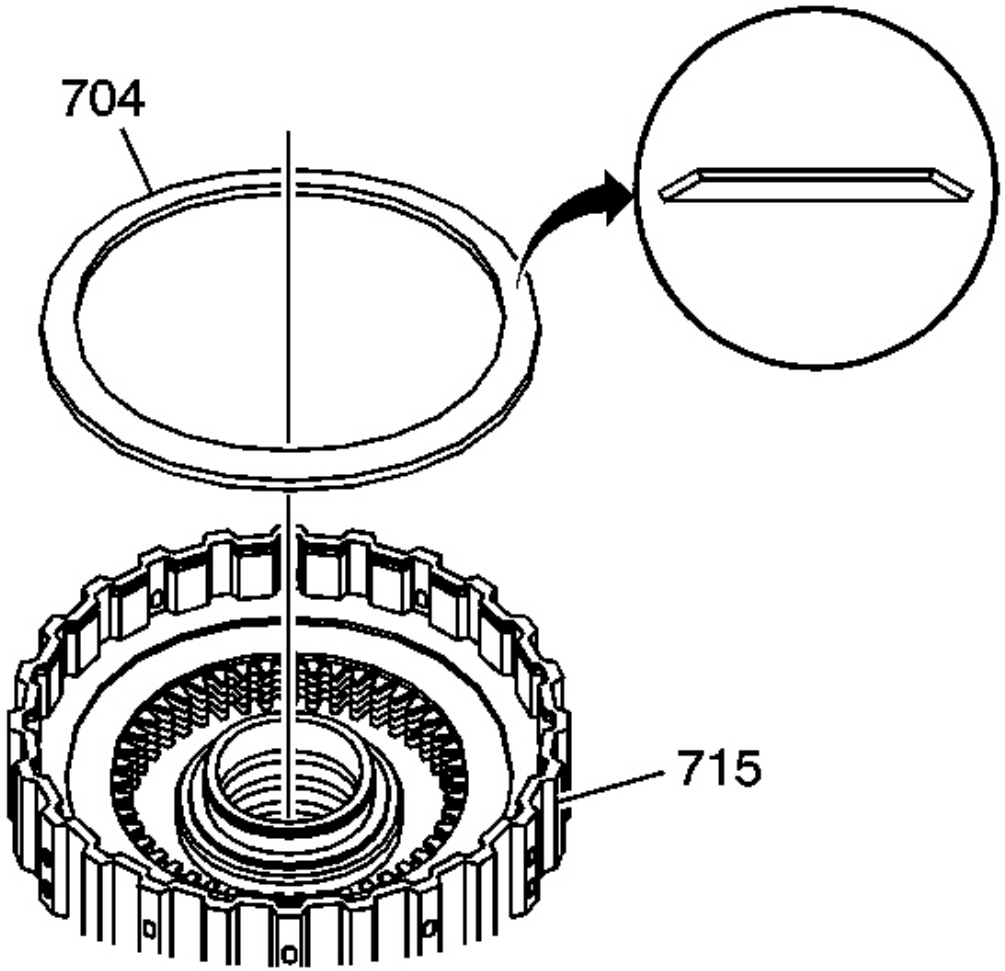

Fig. 286: 1st Clutch Spring Plate & 1st Clutch Piston
Courtesy of GENERAL MOTORS CORP.

14. Install the 1st clutch spring plate (704) in the groove located in the 1st clutch piston (715) with the cone side facing up.

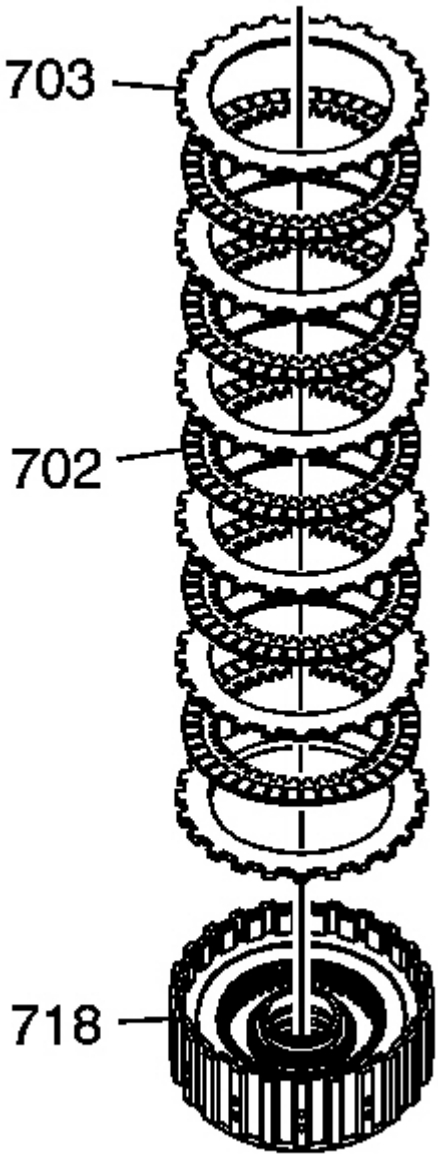

Fig. 287: 1st Clutch Steel Plate, 1st Clutch Fiber Plates & 1st Clutch Housing
Courtesy of GENERAL MOTORS CORP.

15. Install a 1st clutch steel plate (703).
16. Instal a 1st clutch fiber plates (702).
17. Alternately install the plates until a total of 5 plates each are installed into the 1st clutch housing (718).

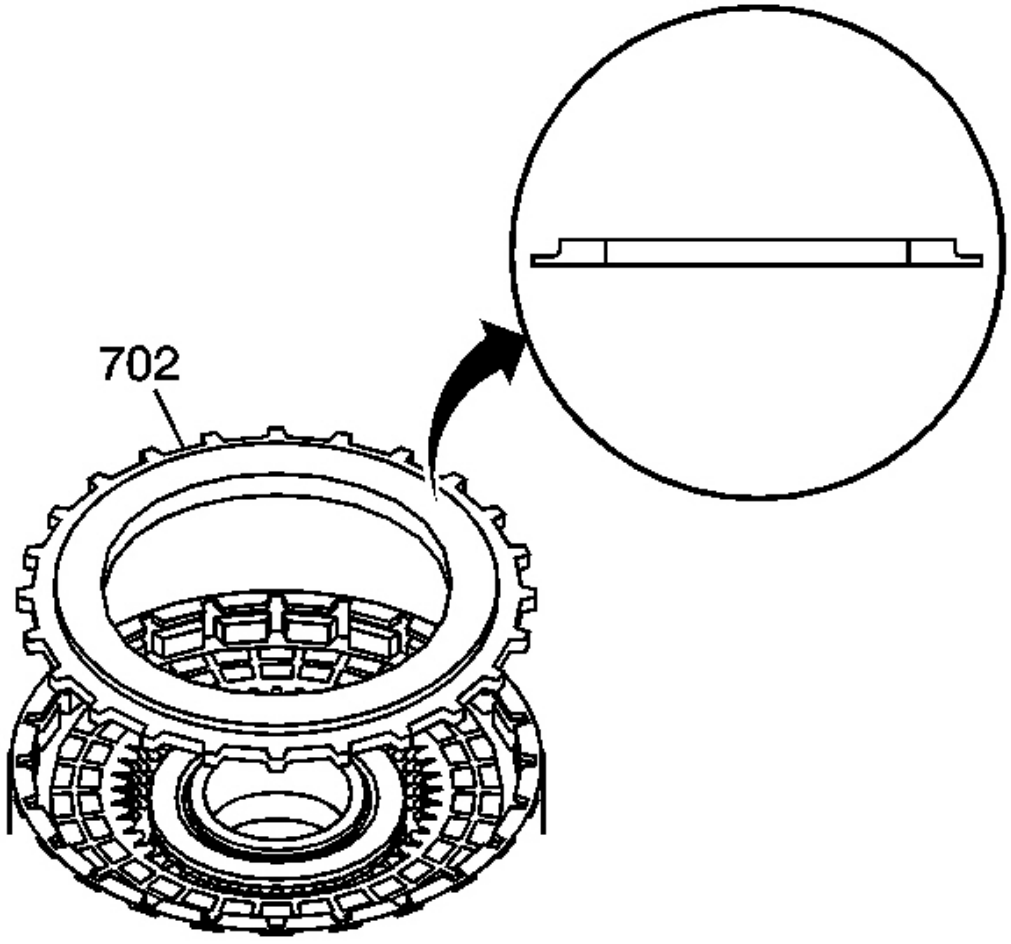

Fig. 288: 1st Clutch Backing Plate & 1st Clutch Fiber Plate
Courtesy of GENERAL MOTORS CORP.

18. Install the selective 1st clutch backing plate (701) with the flat side facing the last 1st clutch fiber plate (702) as shown in the insert.

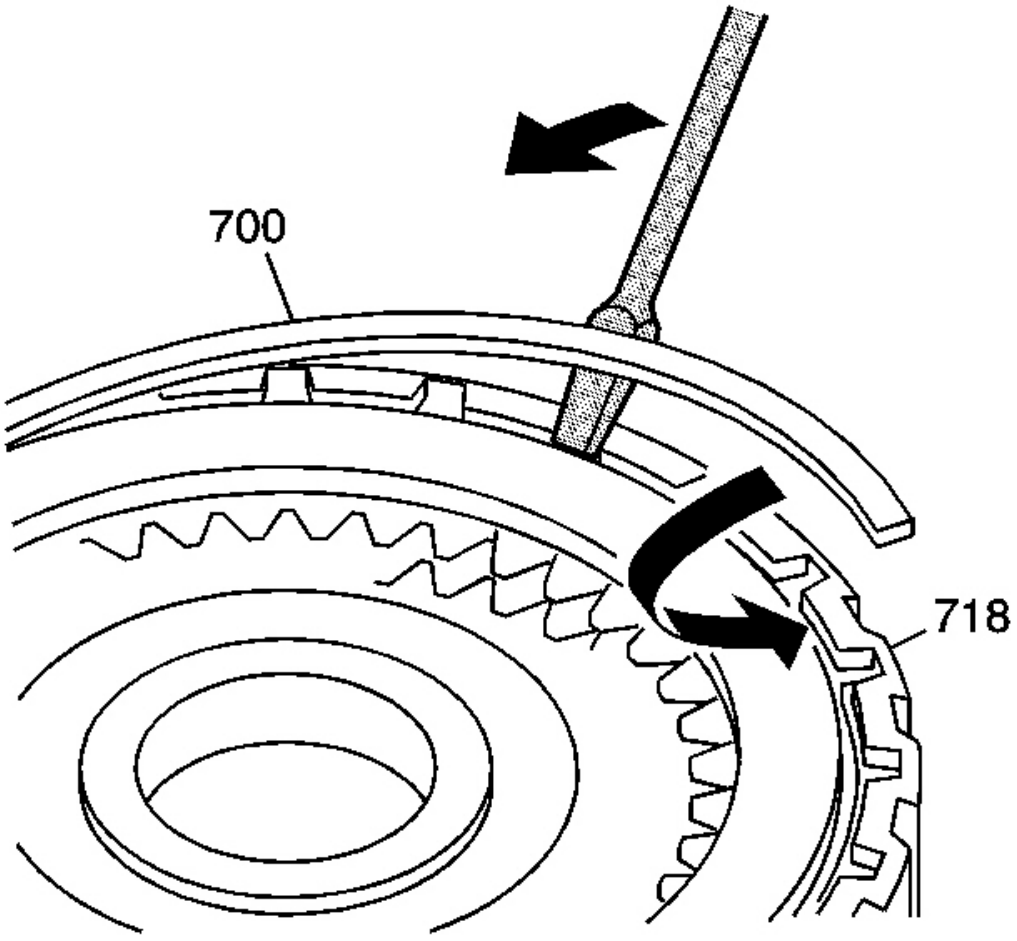

Fig. 289: Installing The 141 mm 1st Clutch Backing Plate Retaining Ring Using J 28585
Courtesy of GENERAL MOTORS CORP.

19. Using **J 28585** , install the 141 mm 1st clutch backing plate retaining ring (700).

    Ensure that the retaining ring is fully seated in the groove of the 1st and coast clutch housing (718).

20. Measure the clutch backing plate clearance. Refer to **Clutch Backing Plate Clearance Measurement** .

2ND CLUTCH DISASSEMBLE

Tools Required

- **J 23327** Spring Compressor

- **J 28585** Snap Ring Remover
- **J 45124** Adjustable Bridge

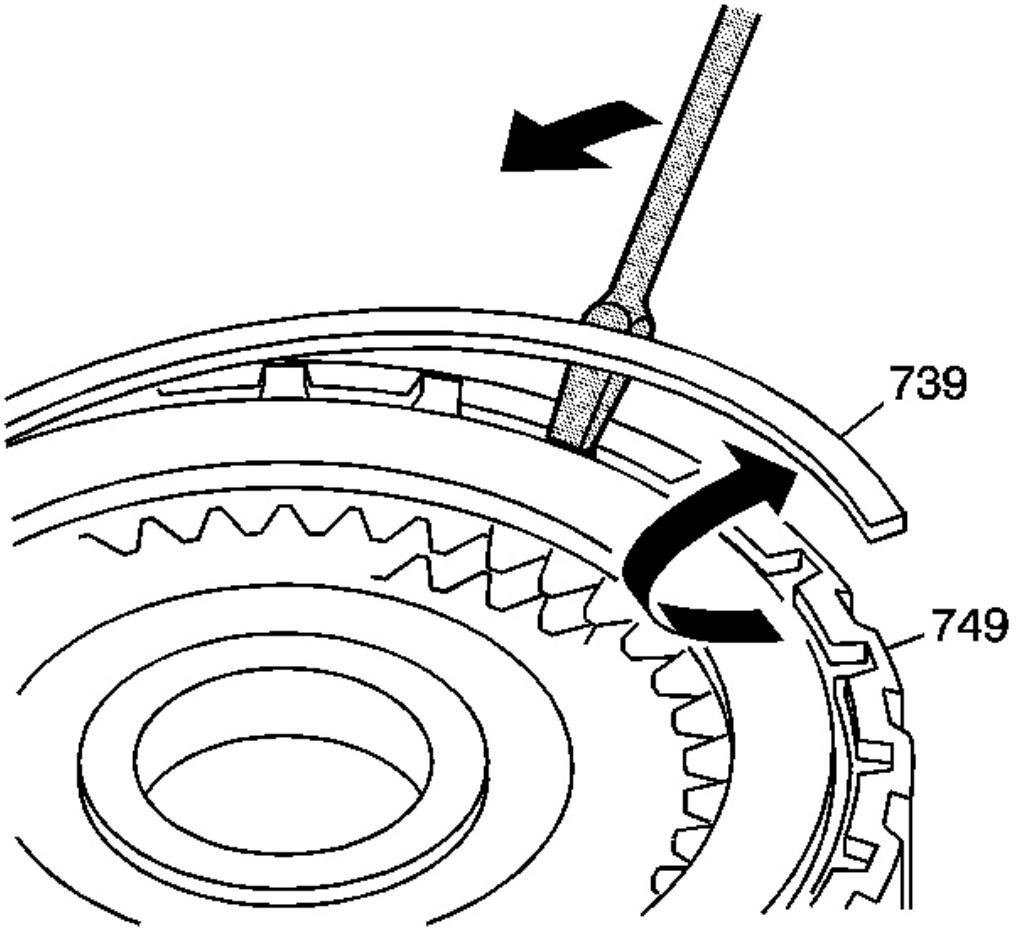

Fig. 290: Removing The 2nd Clutch Backing Plate Retaining Ring Using J 28585
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The clutch piston spring washer is crimped to the 2nd clutch piston. Do not detach from the piston.

1. Using **J 28585** remove the 2nd clutch backing plate retaining ring (739) from the 2nd clutch hub (749).

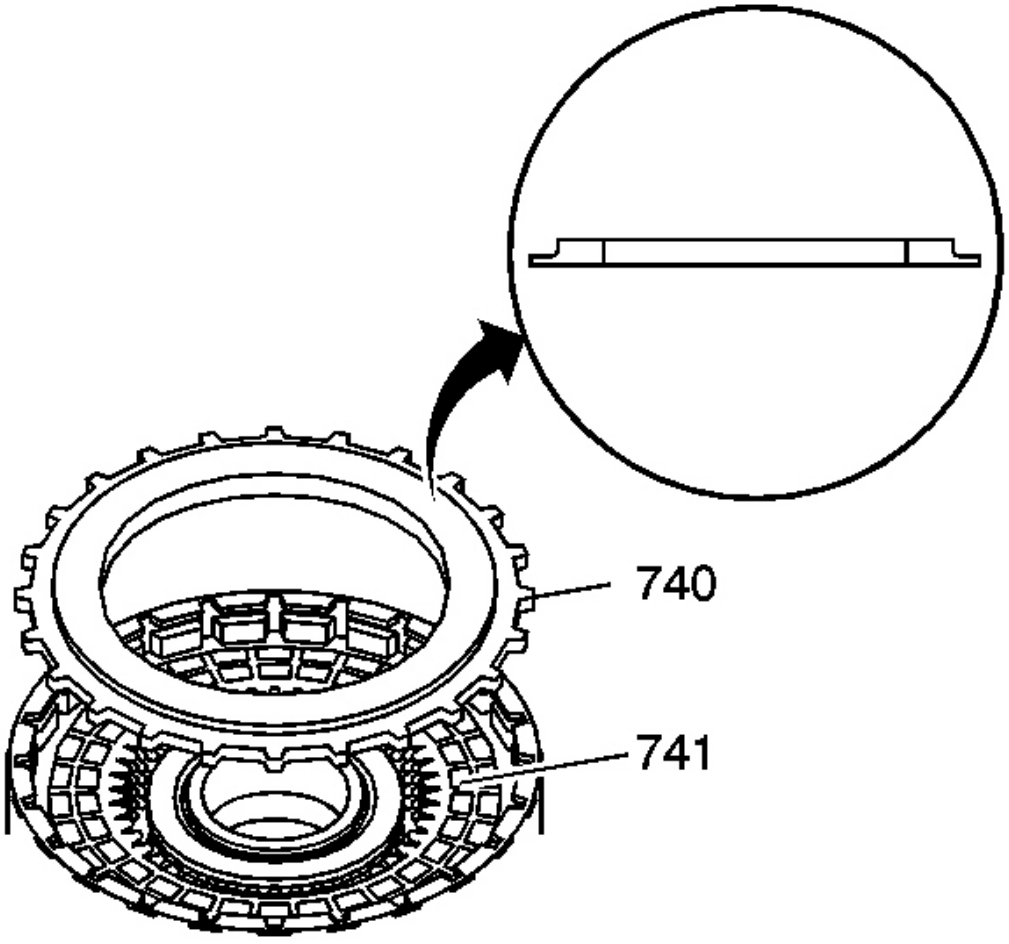

Fig. 291: Selective Clutch Backing Plate Removed
Courtesy of GENERAL MOTORS CORP.

2. Remove the selective clutch backing plate (740) from the 2nd clutch hub (749).

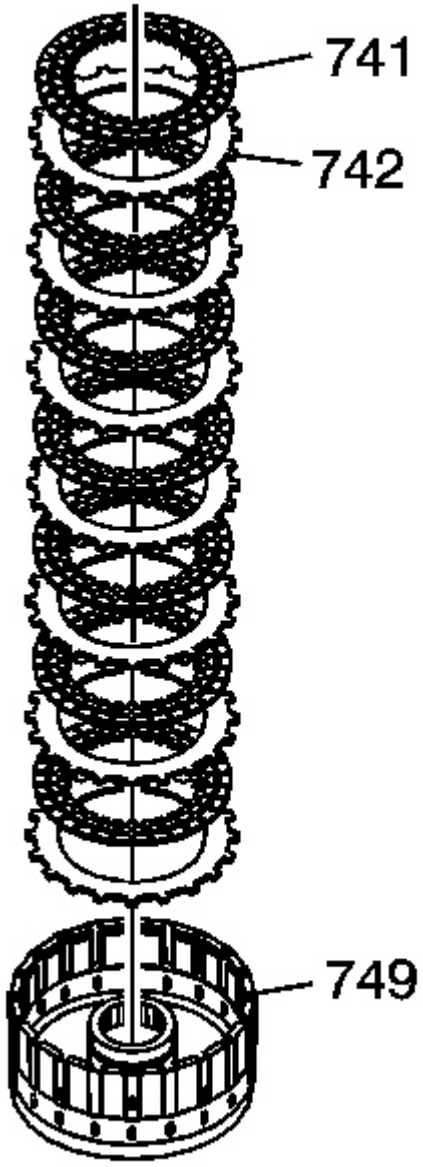

Fig. 292: Steel Plates, Fiber Plates & 2nd Clutch Hub Removed
Courtesy of GENERAL MOTORS CORP.

3. Remove the steel plates (741) and the fiber plates (742) from the 2nd clutch hub (749).

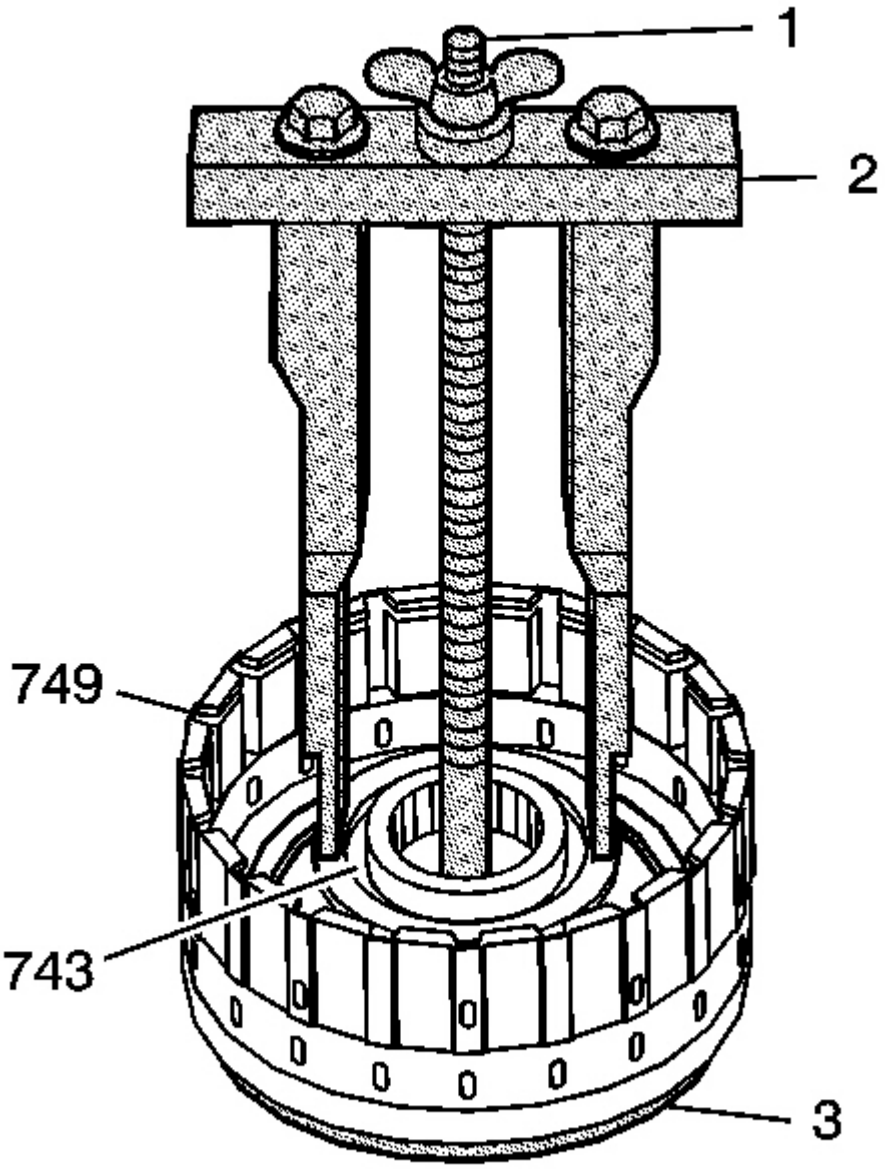

Fig. 293: 2nd Clutch Disassemble, J 45124, J 23327 J 21420-2 & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

4. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (1) and J 21420-2 (3) plate of the **J 23327** , compress the clutch piston return spring until the groove for the clutch spring retainer cap retaining ring (743) is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap.
    - Do not place the legs on the spring retainer cap that is not supported by the spring.
    - Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

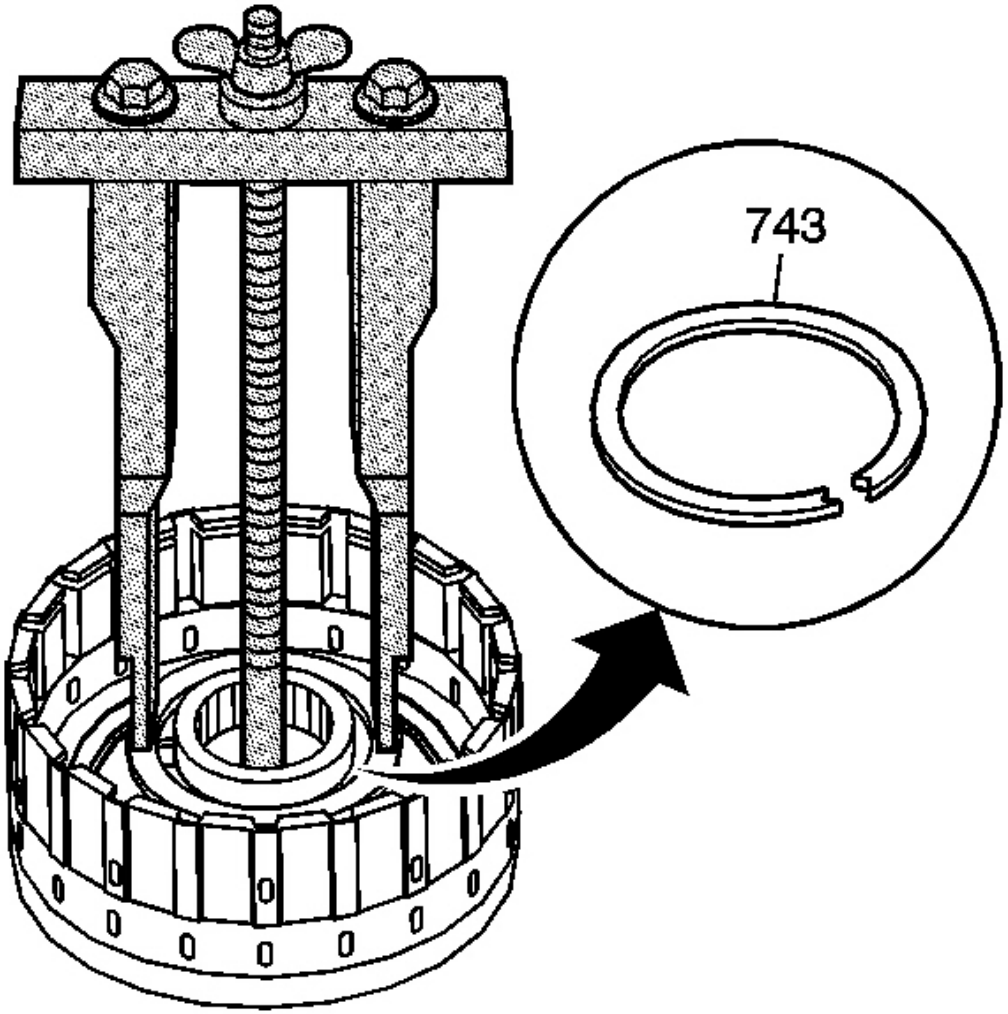

Fig. 294: 2nd Clutch Piston Return Spring Cap Removed
Courtesy of GENERAL MOTORS CORP.

5. Remove the 2nd clutch piston return spring cap, retaining ring (743) and remove the tools.

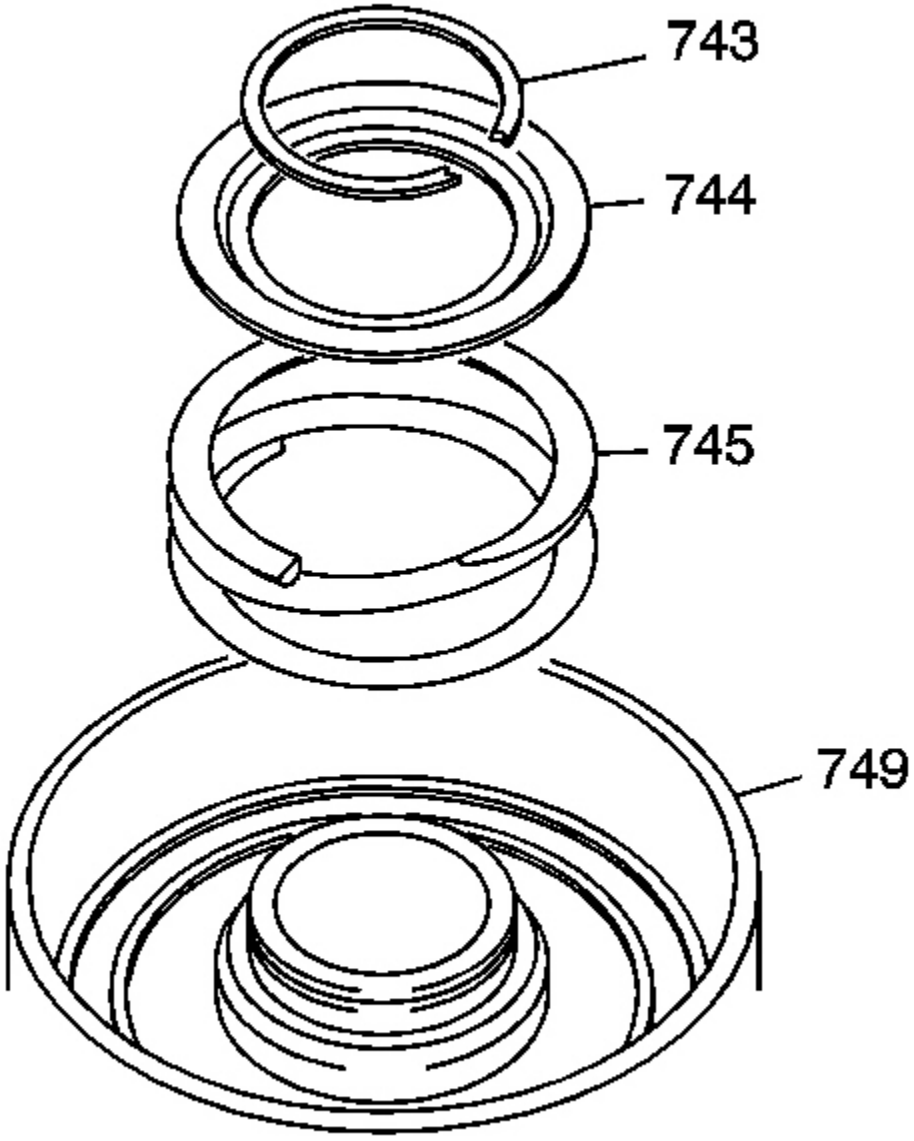

Fig. 295: 2nd Clutch Housing & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Remove the following components from the 2nd clutch housing (749):

- 2nd clutch piston retaining ring (743).
- 2nd clutch retaining cap (744).
- 2nd clutch piston return spring (745).

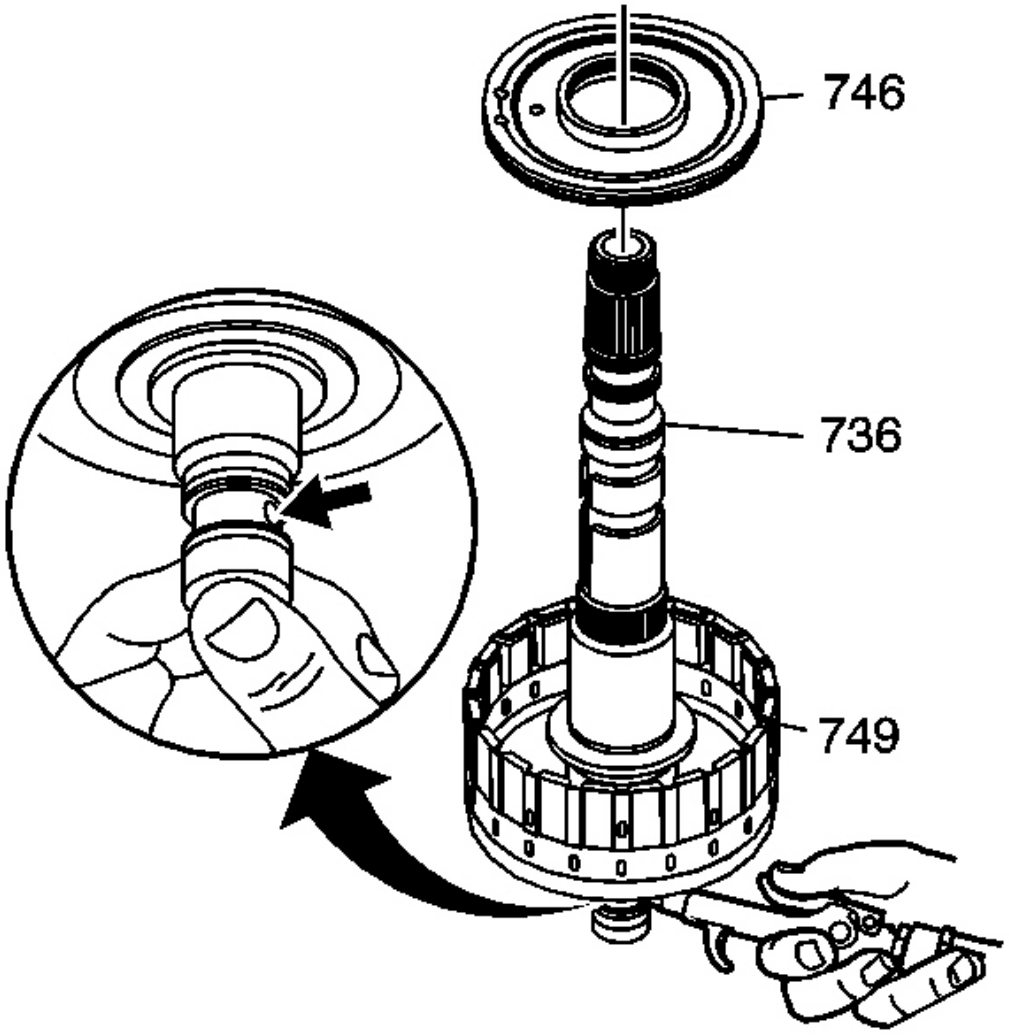

Fig. 296: Applying Compressed Air To 2nd Clutch Apply Port
Courtesy of GENERAL MOTORS CORP.

7. Install the 2nd clutch housing (749) onto the 1st/2nd clutch shaft (736).

CAUTION: When you use compressed air in order to clear fluid passages and to

dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

8. Apply compressed air to the 2nd clutch apply port located in the 1st/2nd clutch shaft.

   If there is too much air leakage to remove the piston, install the old 1st/2nd clutch shaft fluid passage seals (738).

9. Remove the 2nd clutch piston (746).

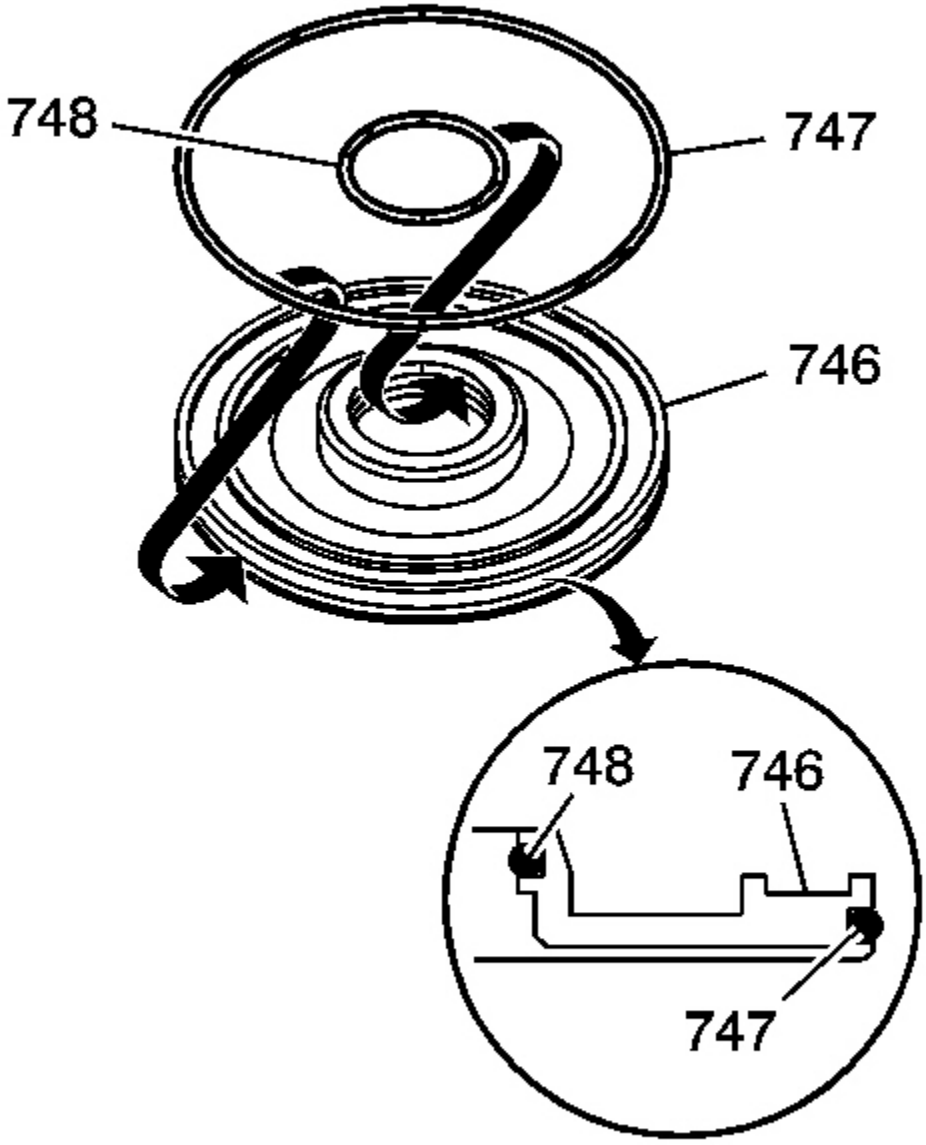

Fig. 297: 2nd Clutch Piston Inner & Outer Seal
Courtesy of GENERAL MOTORS CORP.

10. Remove the 2nd clutch piston inner seal (748).
11. Remove the 2nd clutch piston outer seal (747).

2ND CLUTCH INSPECTION

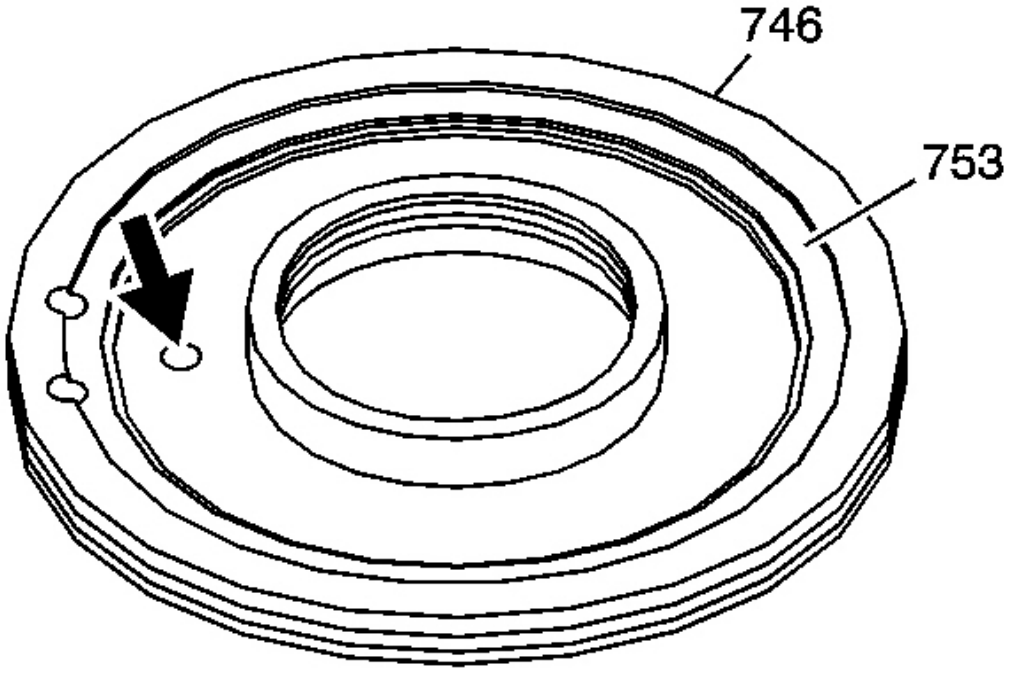

Fig. 298: 2nd Clutch Piston & Spring Washer
Courtesy of GENERAL MOTORS CORP.

1. Inspect the 2nd clutch piston (746) and the clutch piston check valve.

   If the 2nd clutch check valve is missing, stuck or damaged, replace the complete 2nd clutch piston assembly.

   If the 2nd clutch piston spring washer (753) is not staked to the piston, replace the complete 2nd clutch piston assembly.

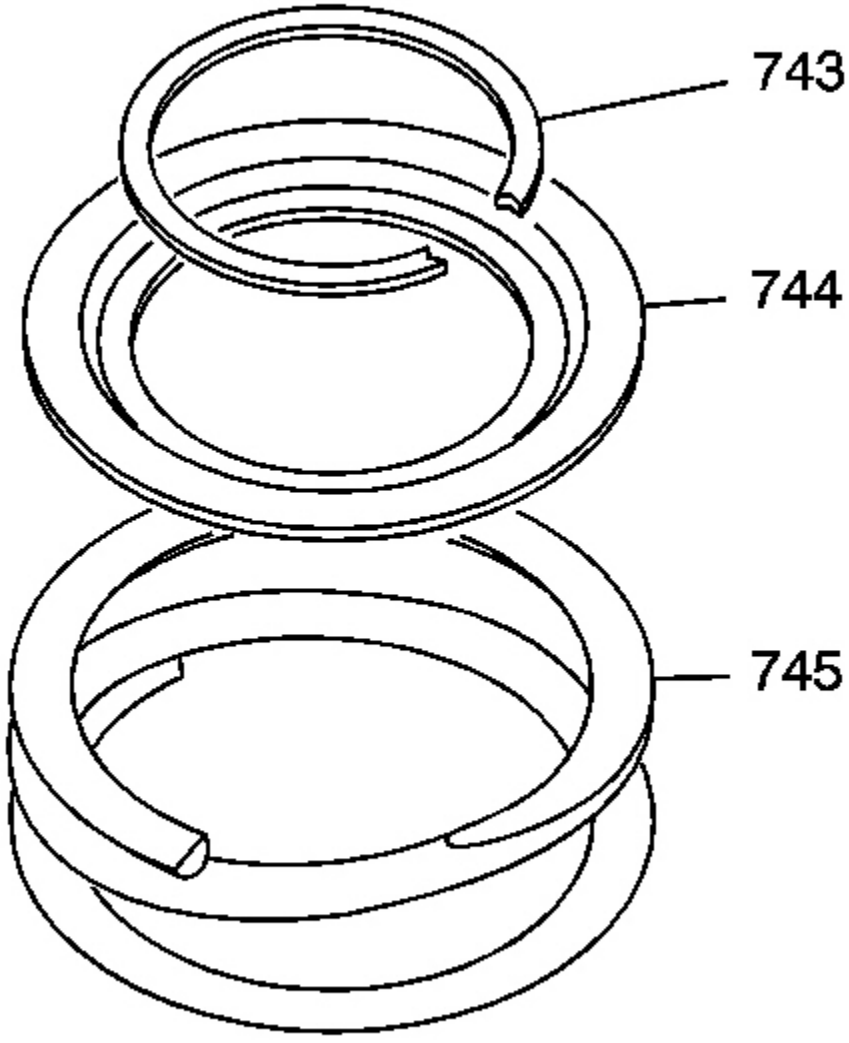

Fig. 299: Inspecting 2nd Clutch Piston & Components
Courtesy of GENERAL MOTORS CORP.

2. Inspect the following components:
    - 2nd clutch piston retaining ring (743)
    - 2nd clutch piston retainer cap (744)
    - 2nd clutch piston spring (745)

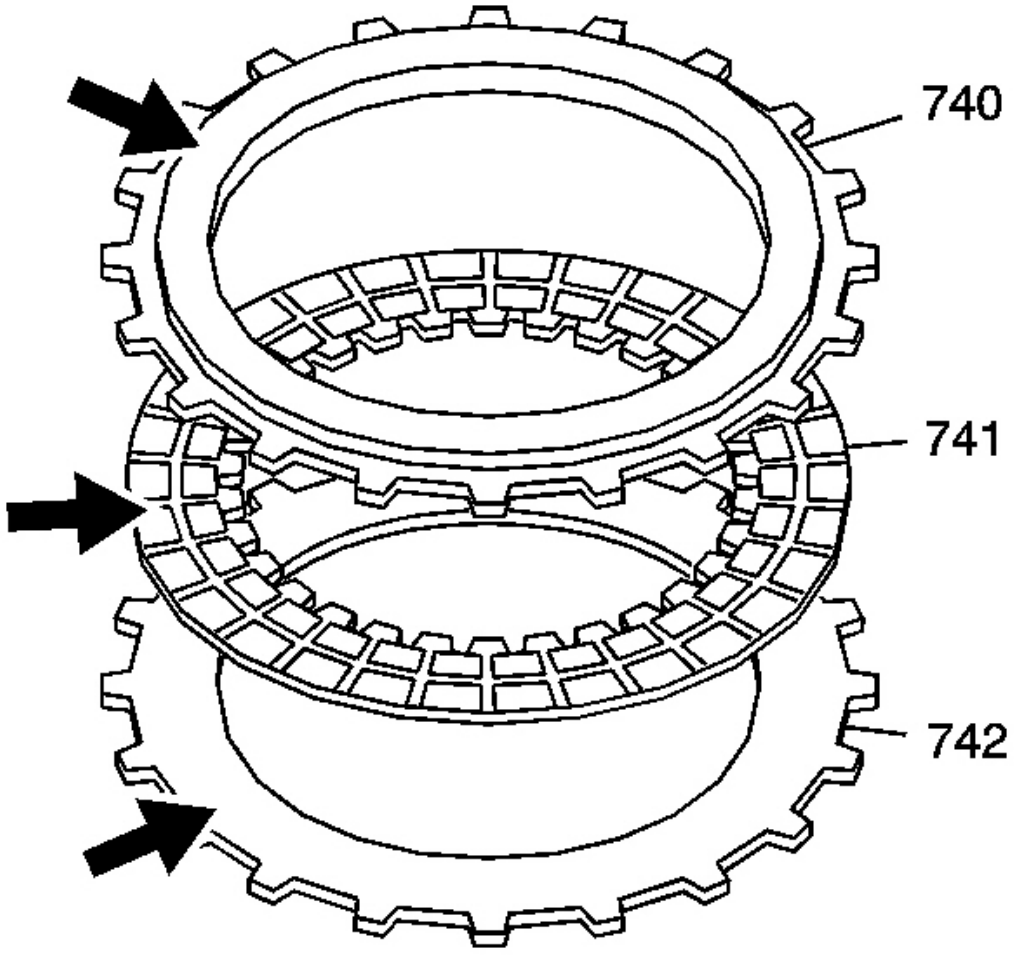

Fig. 300: Inspecting 2nd Clutch Steel Plates, Fiber Plates & Selective Backing Plate For Damage
Courtesy of GENERAL MOTORS CORP.

3. Inspect the following components for wear, damage, or discoloration:
    - 2nd clutch steel plates (742)
    - 2nd clutch fiber plates (741)
    - 2nd clutch selective backing plate (740)
4. If the 2nd clutch fiber plates (741) are worn or damaged, replace as a set.
5. If the 2nd clutch steel plates (742) are worn, damaged, or severely discolored, replace the plates as a set.
6. If the 2nd clutch selective backing plate (740) is worn, damaged, or severely discolored, inspect the 2nd clutch selective backing plate-to-top disc clearance, then replace the selective clutch backing plate as needed.

2ND CLUTCH ASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Removable Bridge

Note these items during assembly:

- Clean all parts thoroughly and dry them.

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

- Use compressed air to clear all passages.
- Apply automatic transmission fluid to all O-ring seals before assembly.
- Soak all clutch fiber plates thoroughly in automatic transmission fluid for a minimum of 30 minutes.

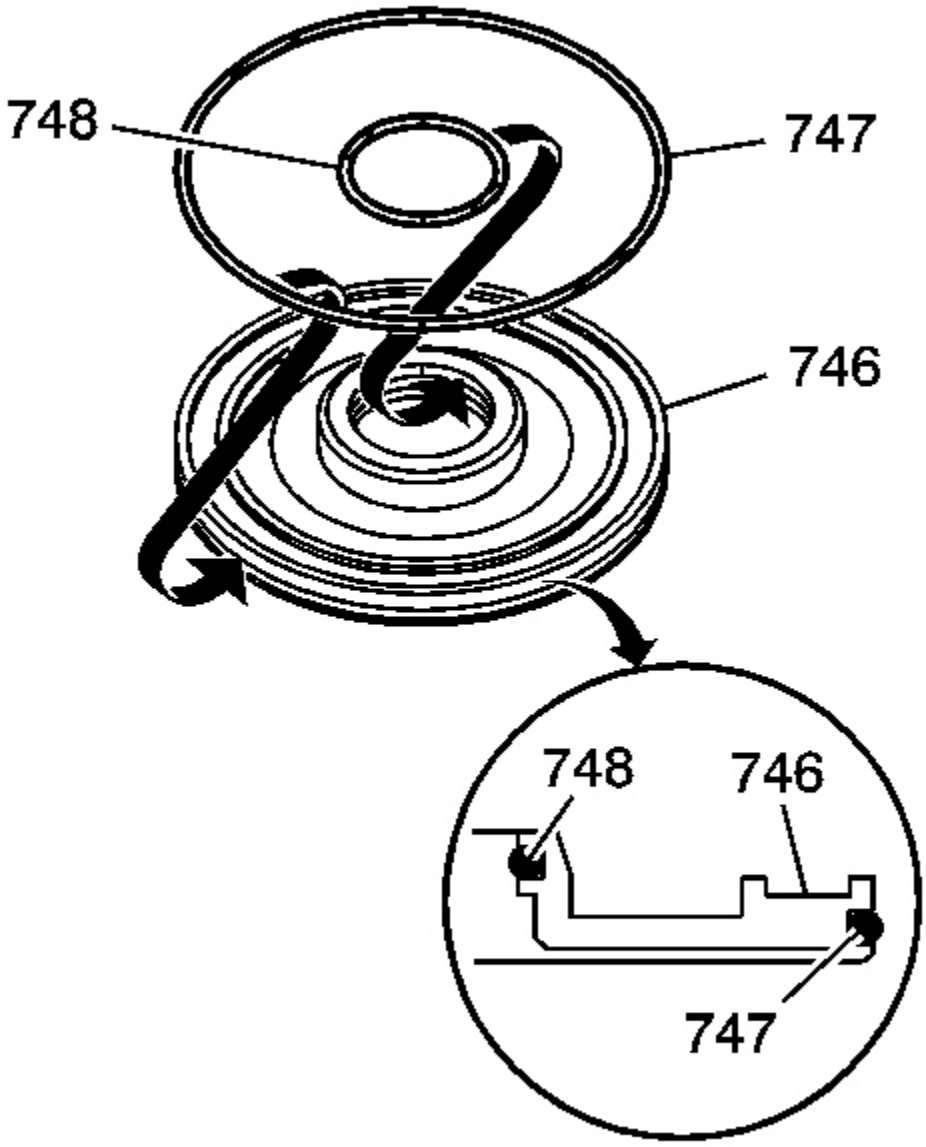

Fig. 301: 2nd Clutch Piston Inner & Outer Seal
Courtesy of GENERAL MOTORS CORP.

1. Install new O-ring seals in the 2nd clutch piston (746) as follows:
    1. Install the 2nd clutch inner O-ring seal (748).
    2. Install the 2nd clutch outer O-ring seal (747).

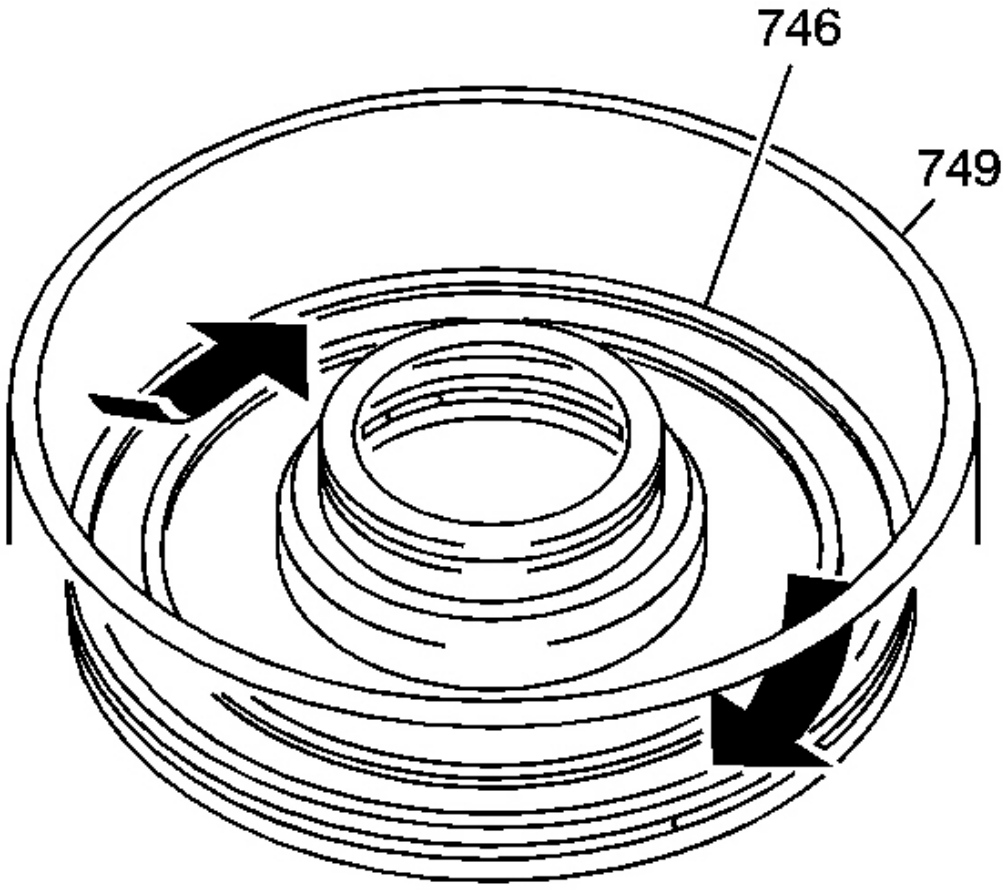

Fig. 302: Installing The 2nd Clutch Piston Into 2nd Clutch Housing
Courtesy of GENERAL MOTORS CORP.

2. Install the 2nd clutch piston (746) into the 2nd clutch housing (749) by applying hand pressure and rotating the 2nd clutch piston assembly.
    - Ensure proper seating.
    - Do not pinch the O-ring seal by installing the piston with excessive force.

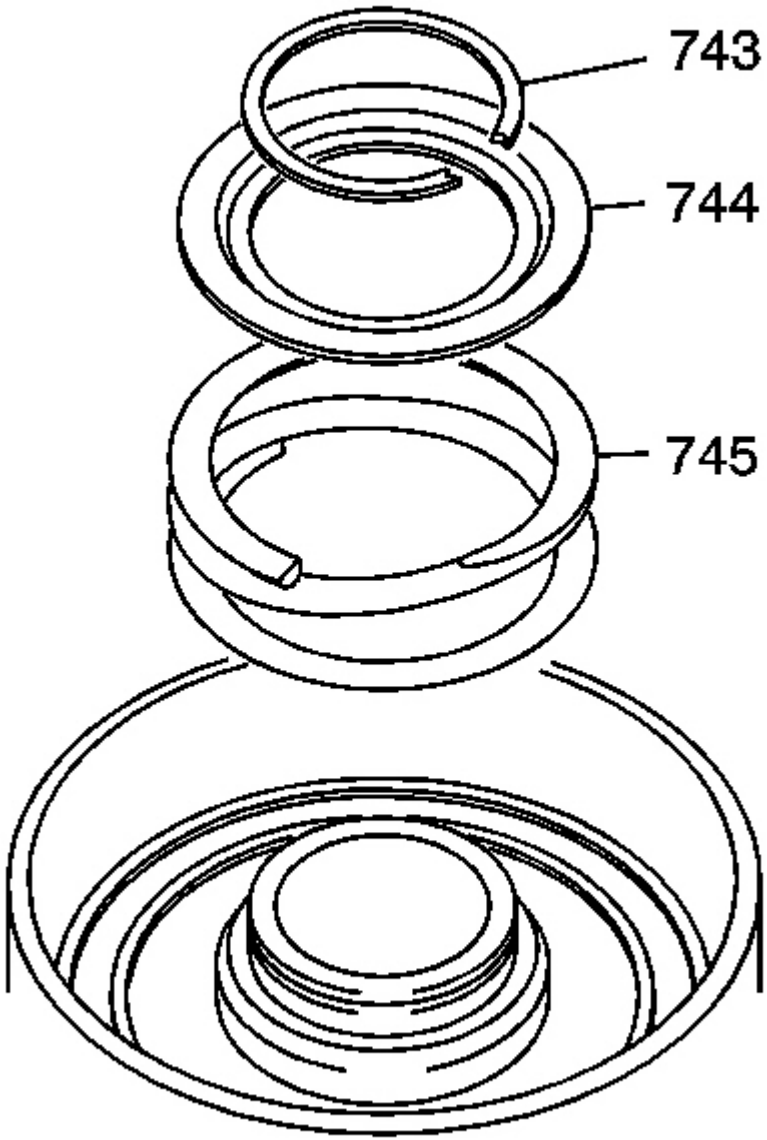

Fig. 303: 2nd Clutch Piston & Components Removed
Courtesy of GENERAL MOTORS CORP.

3. Install the 2nd clutch piston return spring (745).
4. Install the 2nd clutch piston retainer cap (744).
5. Install the 2nd clutch piston 42 mm retaining ring (743) on top of the retainer cap (744).

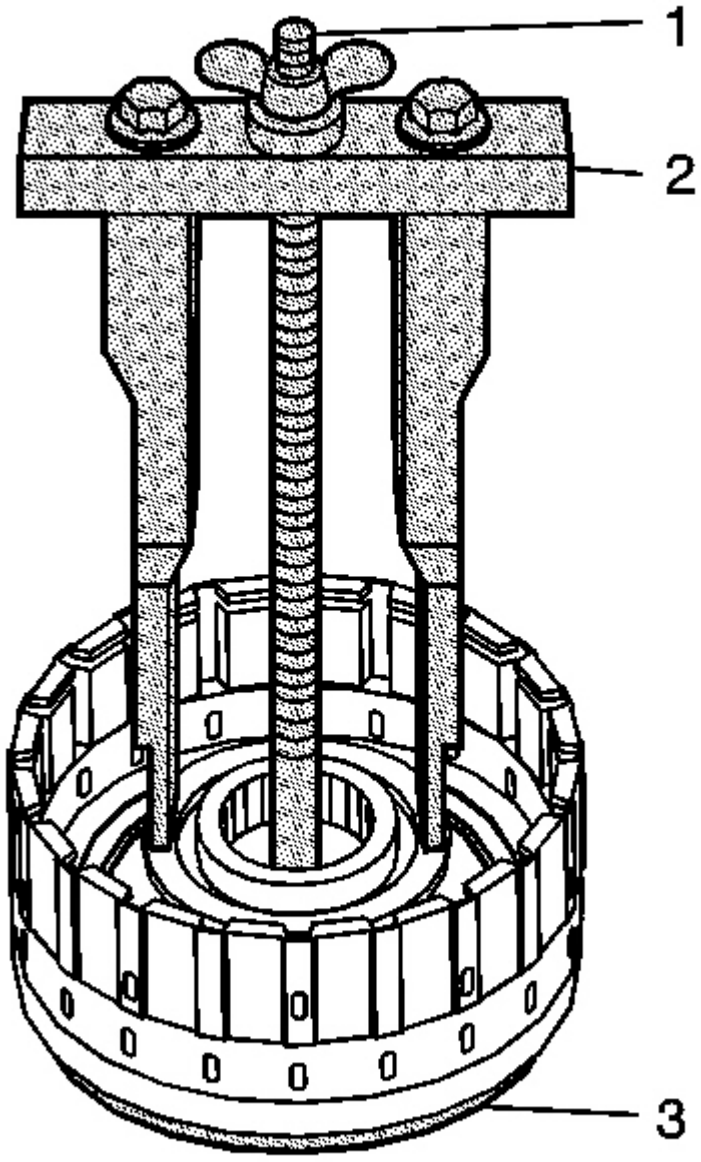

Fig. 304: 2nd Clutch Assemble, J 45124, J 23327, J 21420-2, Clutch Piston Return Spring & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

6. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (1) and J 21420-2 (3) plate of the **J 23327** , compress the clutch piston return spring until the groove for the clutch spring retainer cap retaining ring (743) is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap.
    - Do not place the legs on the spring retainer cap that is not supported by the spring.
    - Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

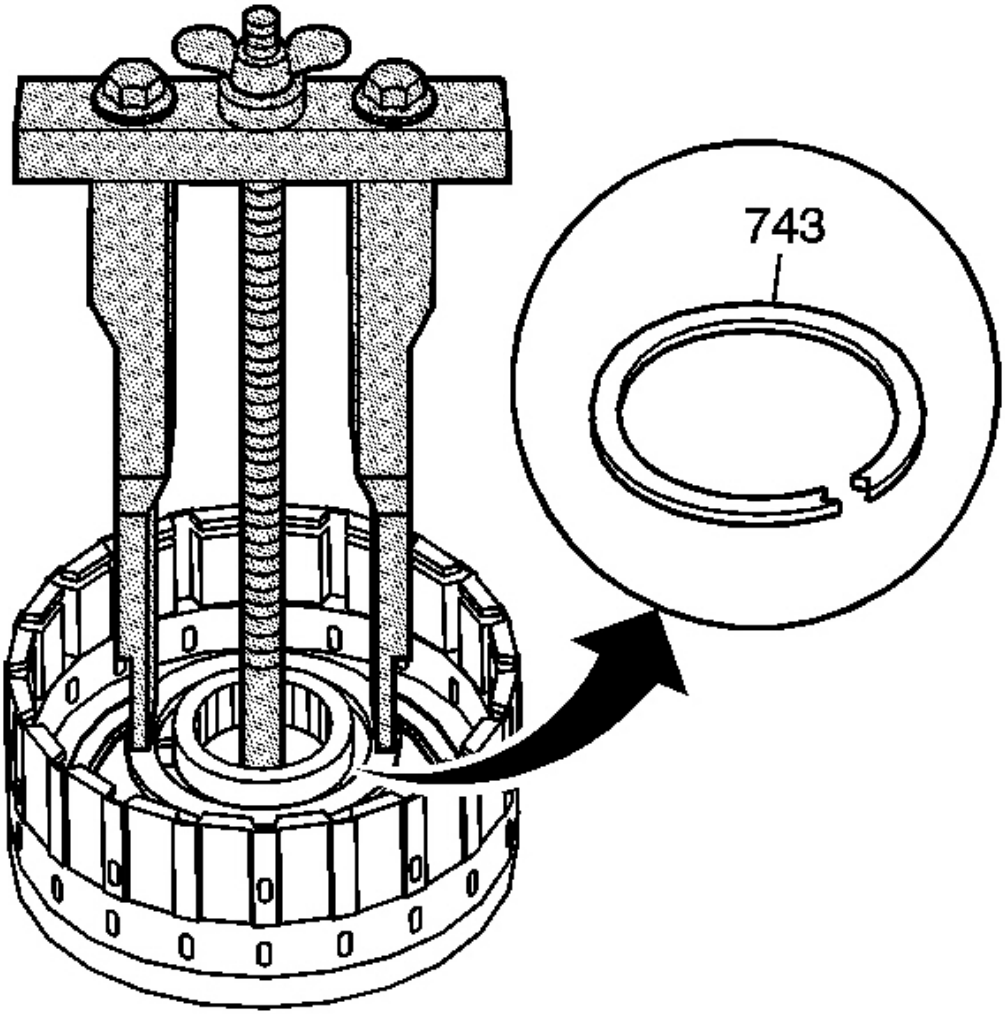

Fig. 305: 2nd Clutch Piston Retaining Ring
Courtesy of GENERAL MOTORS CORP.

7. Install the 42 mm, 2nd clutch piston retaining ring (743).
8. Remove the tools.

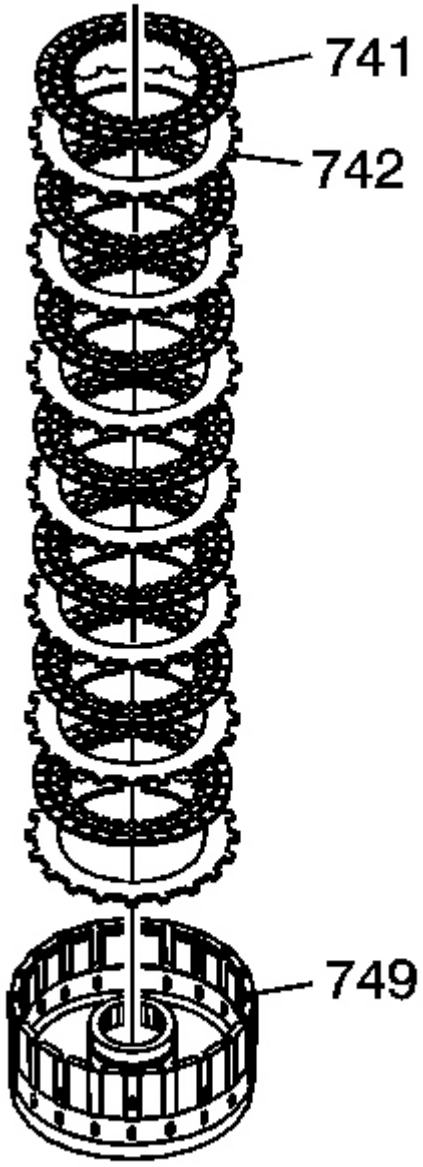

Fig. 306: Steel Plates, Fiber Plates & 2nd Clutch Hub Removed
Courtesy of GENERAL MOTORS CORP.

9. Install into the 2nd clutch housing (749) the following components:
    - 2nd clutch steel plate (742).
    - 2nd clutch fiber plate (741).
    - Continue to alternately install the above components until a total of 7 each have been installed.

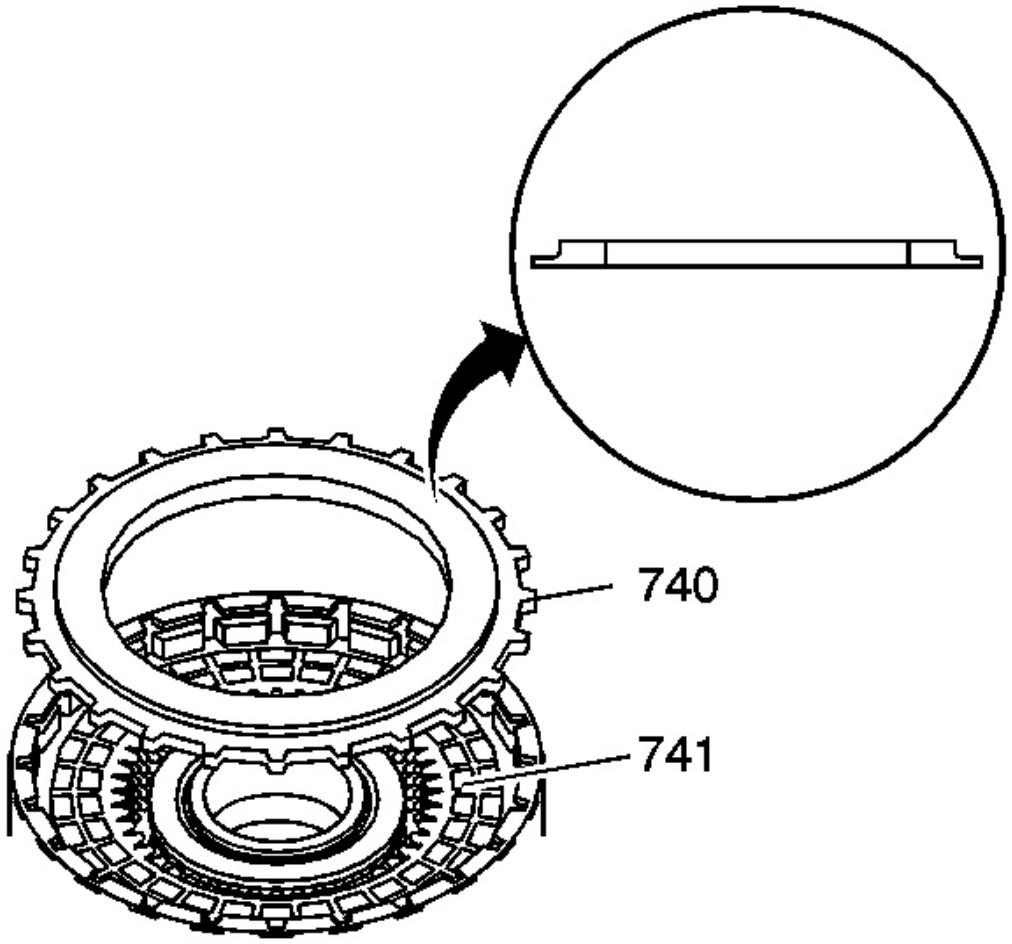

Fig. 307: Selective Clutch Backing Plate Removed
Courtesy of GENERAL MOTORS CORP.

10. Install the selective 2nd clutch backing plate (740) with the flat side facing the last 2nd clutch fiber plate (741) as shown in the insert.

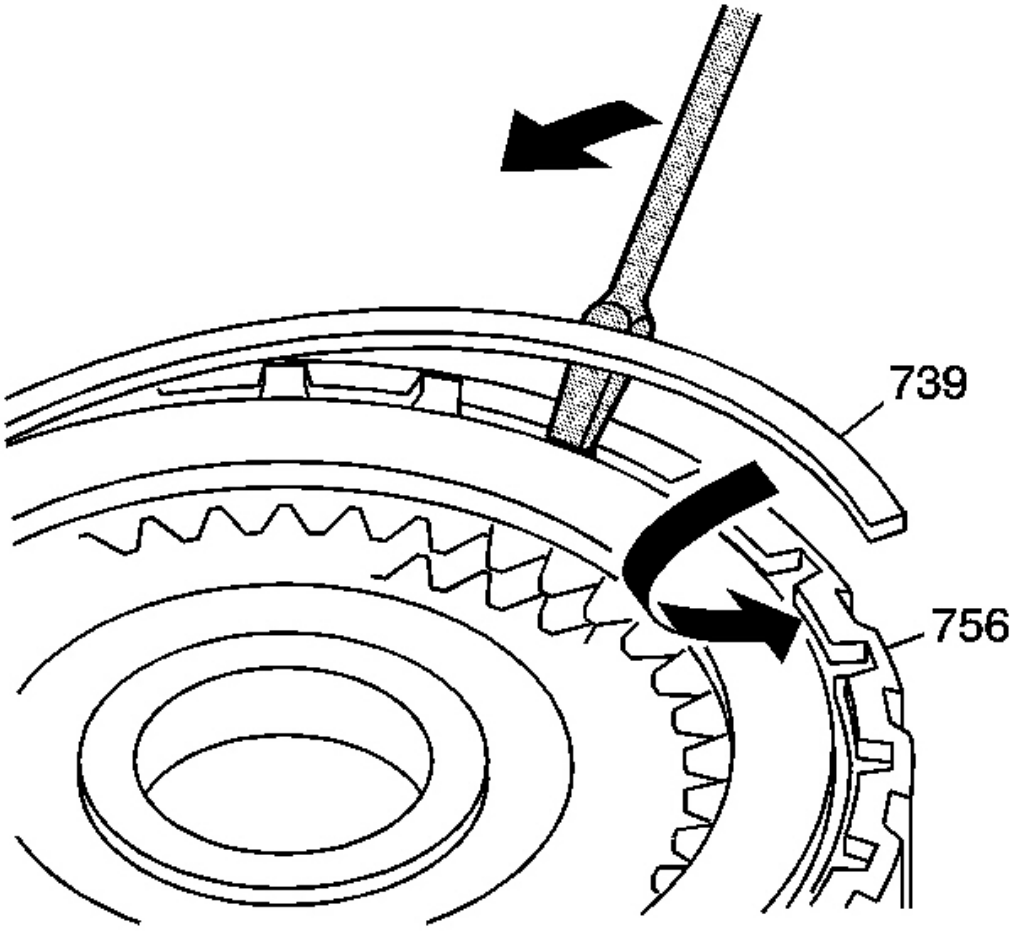

Fig. 308: Installing The 129 mm 2nd Clutch Backing Plate Retaining Ring Into The Groove In 2nd Clutch Housing Using J 28585
Courtesy of GENERAL MOTORS CORP.

11. Using **J 28585** , install the 129 mm 2nd clutch backing plate retaining ring (739) into the groove in the 2nd clutch housing (756).

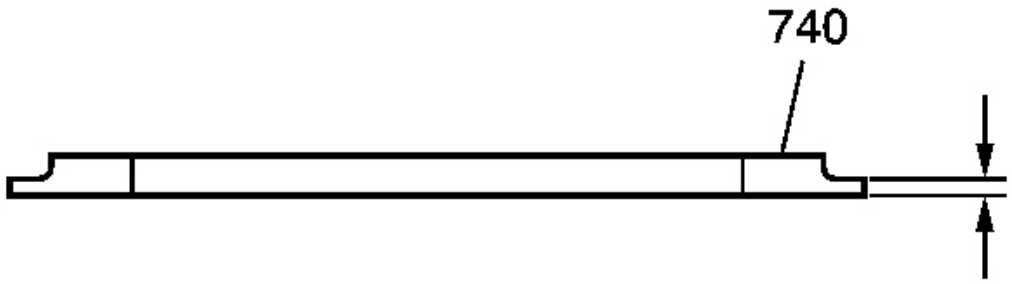

Fig. 309: Measuring The Clutch Backing Plate Clearance
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The thickness of the backing plate (740) is measured at the outer thickness.

12. Measure the clutch backing plate clearance. Refer to **Clutch Backing Plate Clearance Measurement** .

1ST/2ND CLUTCH SHAFT ASSEMBLE

Tools Required

- **DT 46418** Driver
- **DT 46427** Driver
- **DT 46509** Tube Style Driver
- **DT 46516** Driver
- **DT 46540** Wrench
- **EN 46342** Driver Handle
- **SA9179NE** Dial Indicator

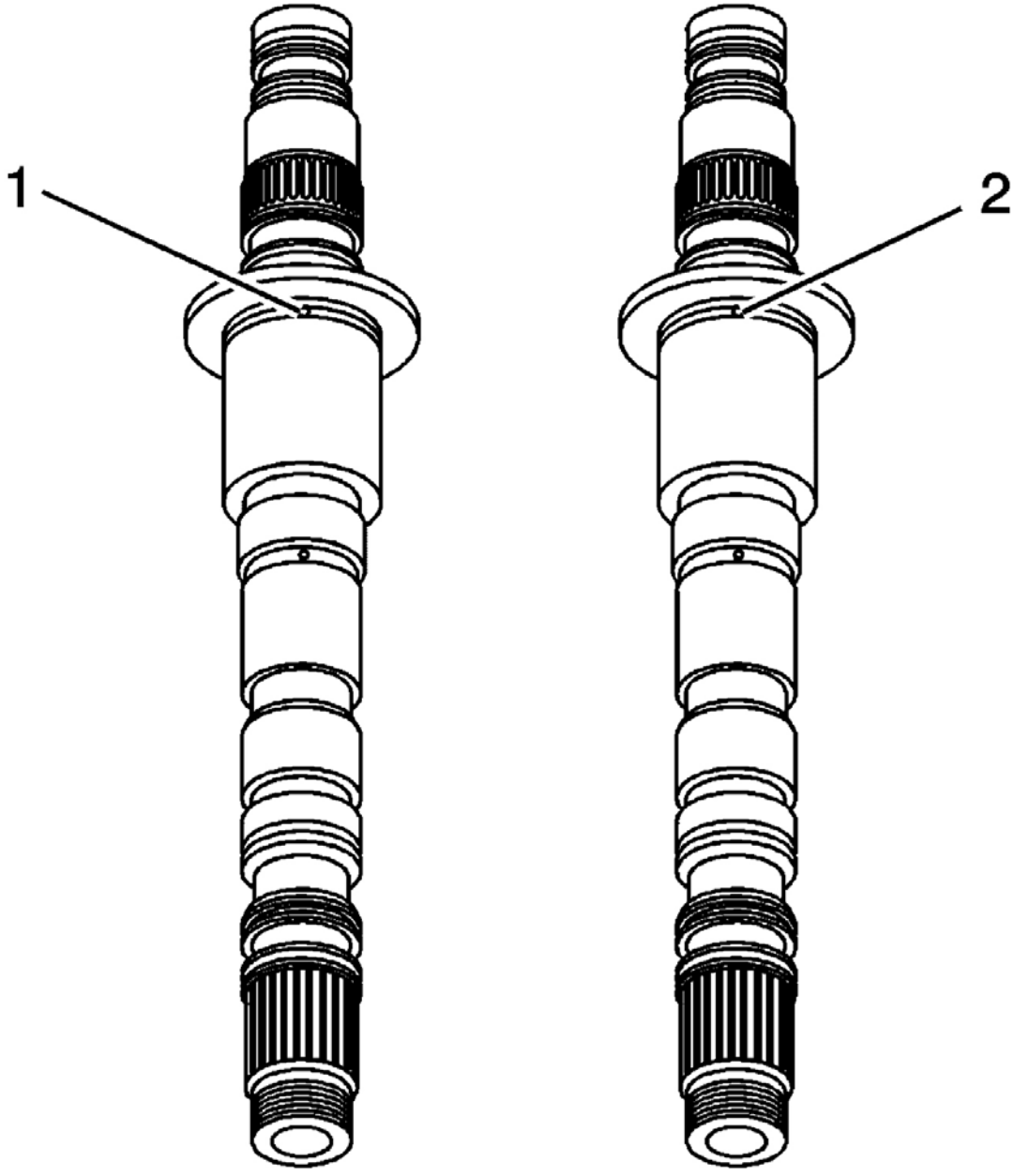

Fig. 310: Inspecting The 1st/2nd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the transaxle has a failure of the coast clutch sprag assemble or any of the below parts, a service kit is available. Replace all of the parts of the kit to prevent loss of adequate lubrication. The kit includes the following parts:

- **Torque converter housing**
- **1st/2nd clutch shaft**
- **3rd clutch shaft**
- **1st drive gear**
- **Coast clutch sprag assembly**

1. Inspect the 1st/2nd clutch shaft to determine if the fluid passage hole matches the 1st design or the 2nd design. In the 1st design (1) the fluid passage hole diameter is 3.2 mm. In the 2nd design (2) the fluid passage hole diameter is 3.0 mm.

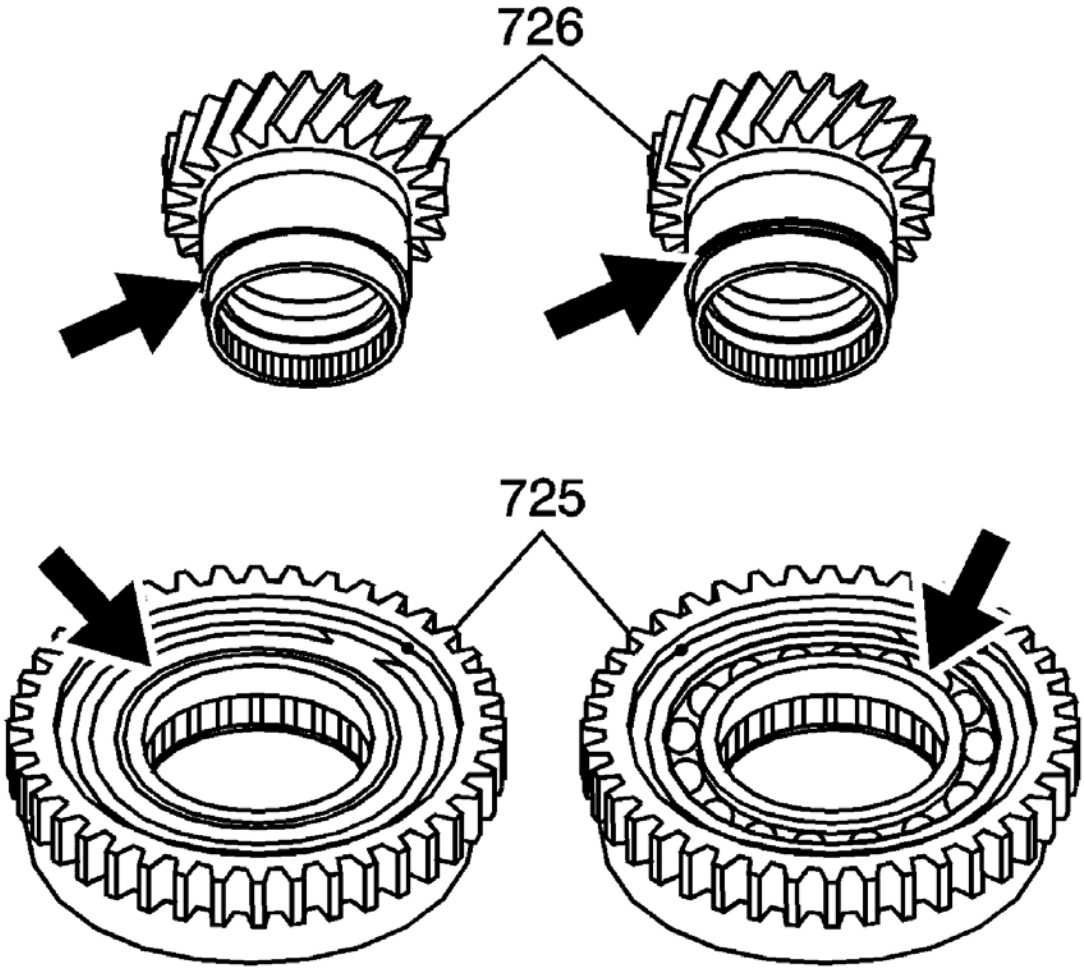

Fig. 311: Inspecting The Coast Sprag Assembly
Courtesy of GENERAL MOTORS CORP.

2. Inspect the coast sprag assembly (725) to determine if the angle step matches the 1st design or the 2nd design. The 1st design (1) has a single angle step by the bearing journal shoulder. The 2nd design (2) has

a double angle step by the bearing journal shoulder.

3. Inspect the 1st drive gear (726) to determine if there are end plates covering the bearing. In the 1st design (3) there are end plates covering the bearing. The 2nd design (4) does not use end plates and the bearing is exposed.

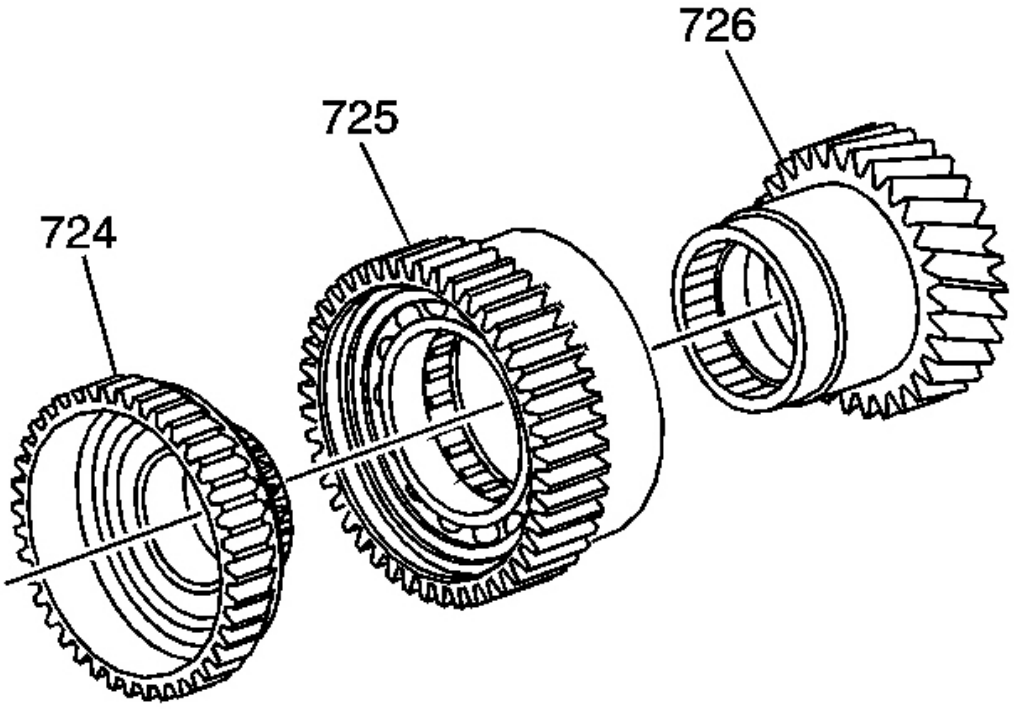

Fig. 312: Coast Clutch Hub, Coast Sprag Assembly & 1st Drive Gear
Courtesy of GENERAL MOTORS CORP.

4. If disassembled or installing the 2nd design coast sprag assembly (725) and the 1st drive gear (726), install the 1st drive gear in the coast sprag assembly.
    - Push in on the sprag rollers
    - Keep the 1st drive gear square to the sprag assembly
    - The components will slide together without being forced
5. Partially install the coast clutch hub (724) in the coast sprag assembly (725).

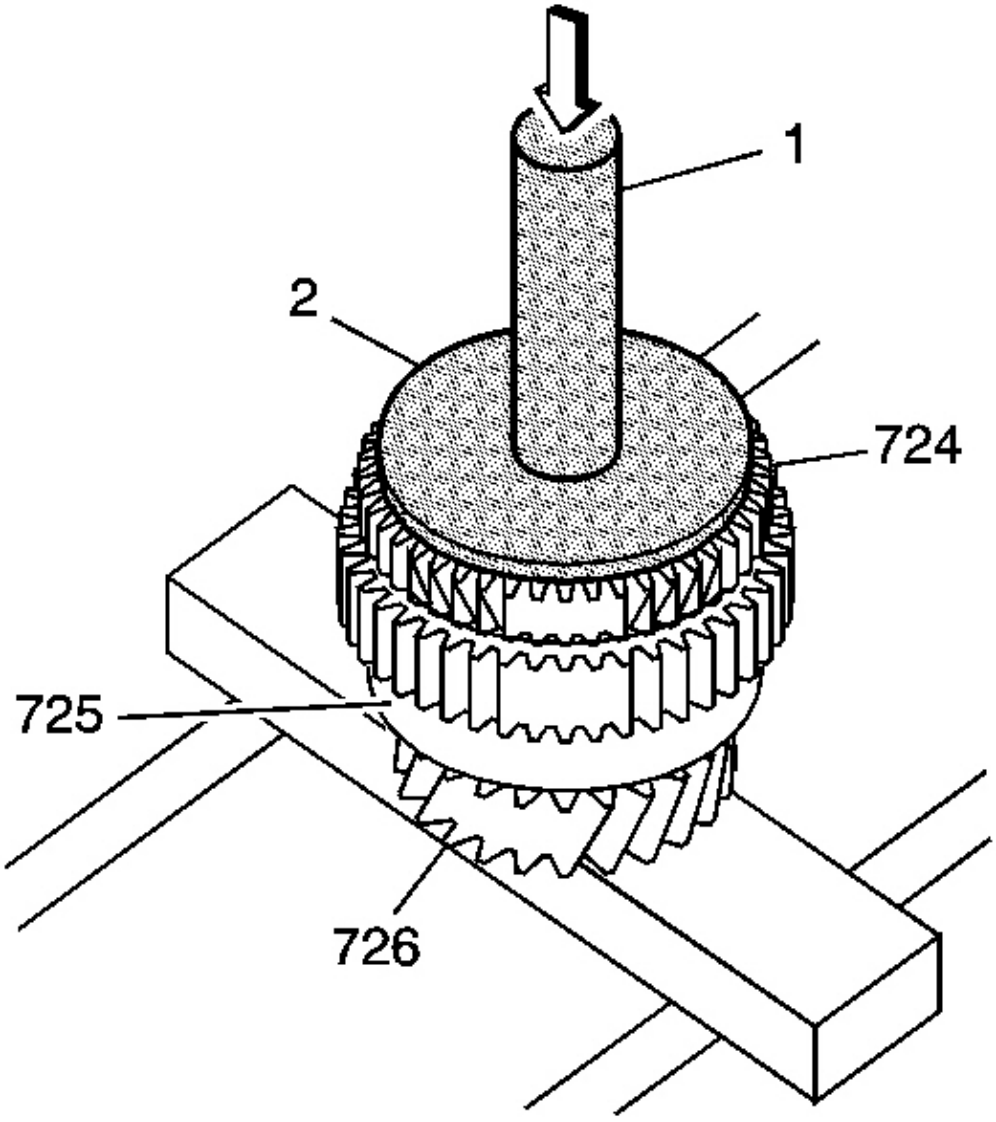

Fig. 313: Installing The 1st Coast Clutch Hub & 1st Drive Gear Using EN 46342, DT 46516 & A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

6. Using the **EN 46342** (1) and the **DT 46427** (2) with a hydraulic press, complete the installation of the coast clutch hub (724) in the coast sprag assembly (725).

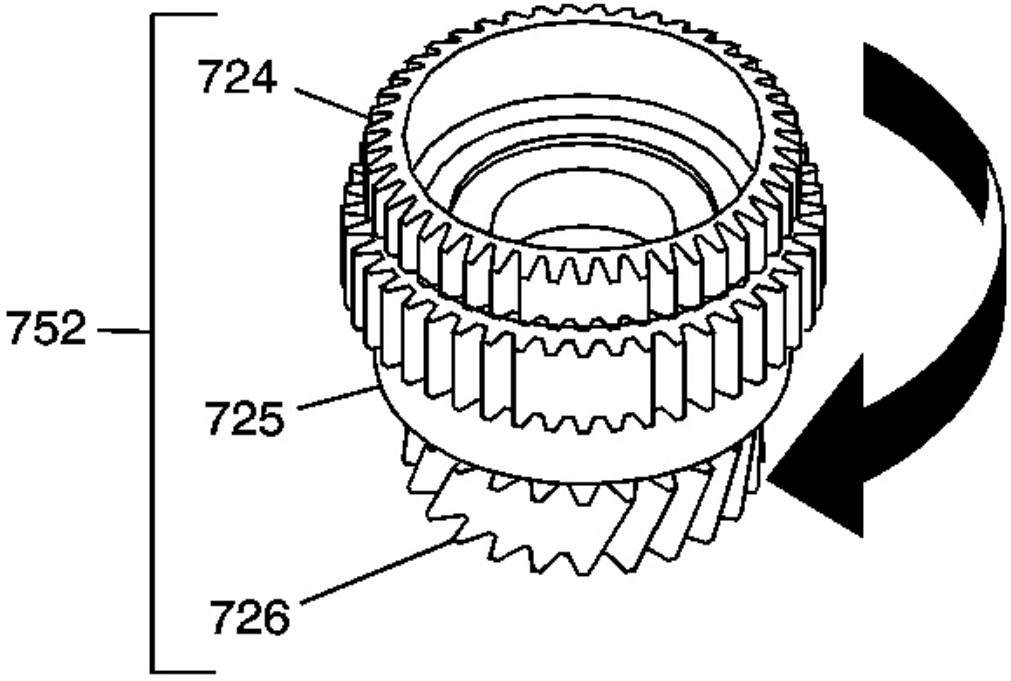

Fig. 314: Inspecting The Operation Of 1st/Coast Hub & Coast Sprag Assembly
Courtesy of GENERAL MOTORS CORP.

7. Inspect the operation of the 1st/coast hub and coast sprag assembly (752).
    - Hold the coast clutch (724) and turn clockwise the 1st drive gear (726). The assembly should turn freely clockwise.
    - Turn the 1st drive gear (726) the opposite direction, counter clockwise. The assembly should lock.

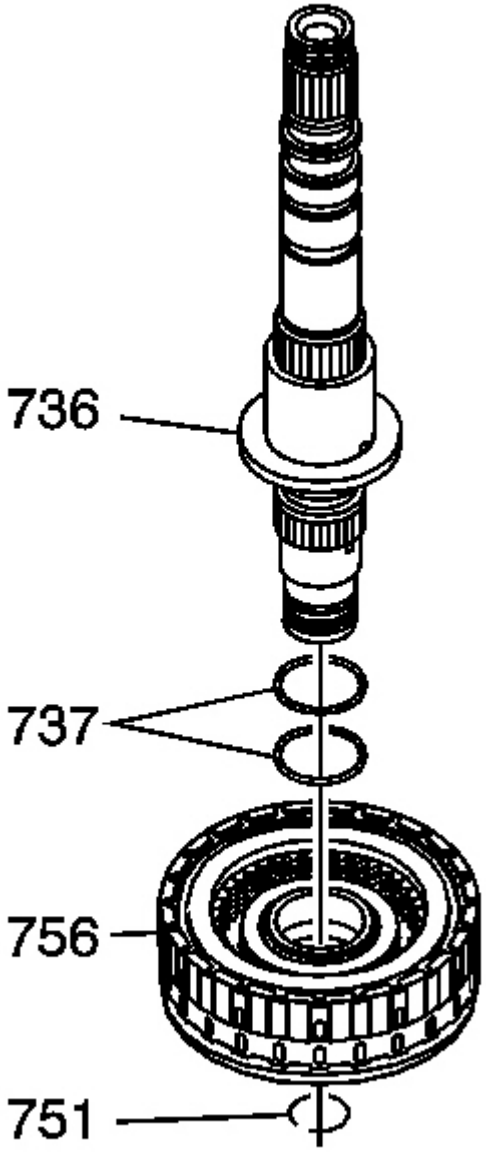

Fig. 315: Installing 2nd Clutch Assembly & 32 mm 2nd Clutch Housing Retaining Ring
Courtesy of GENERAL MOTORS CORP.

8. Lubricate all of the components with automatic transmission fluid during assembly.
9. Wrap the splines on the shaft end of the 1st/2nd clutch shaft with tape. This is to prevent damage to the seals during installation.

10. Install the two new 31.2 mm x 1.9 mm 2nd clutch housing fluid passage seals (737).
11. Remove the tape.
12. Install the 2nd clutch assembly (756) in the clutch shaft.
13. Install the 32 mm 2nd clutch housing retaining ring (751).

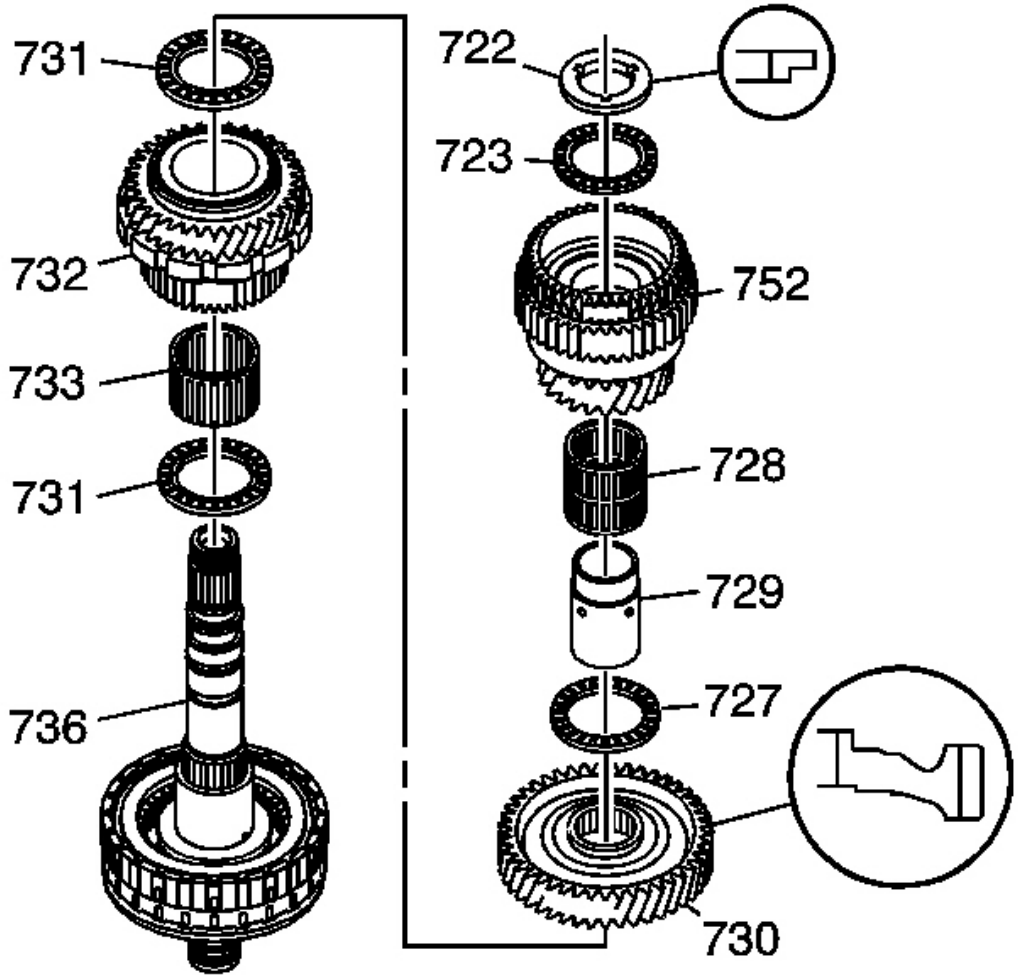

Fig. 316: 1st/2nd Clutch Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

14. Install the following components on the 1st/2nd clutch shaft (736):
    - 2nd drive gear thrust bearing (731)
    - 2nd drive gear inner bearing (733)

- 2nd drive gear and clutch hub and park gear assembly (732)
- 2nd drive gear thrust bearing (731)
- 1st/2nd clutch shaft drive gear (730) in the direction shown
- 1st drive gear thrust bearing (727)
- 1st drive gear bearing race (729)

  Install with the lube holes in the up position. Align the race with the lube groove of the 1st and 2nd clutch shaft (736).

- 1st drive gear inner bearing (728)
- 1st/coast hub and coast sprag assembly (752)
- 1st/coast clutch thrust bearing (723)
- 1st/coast clutch hub selective thrust bearing washer (722) in the direction shown

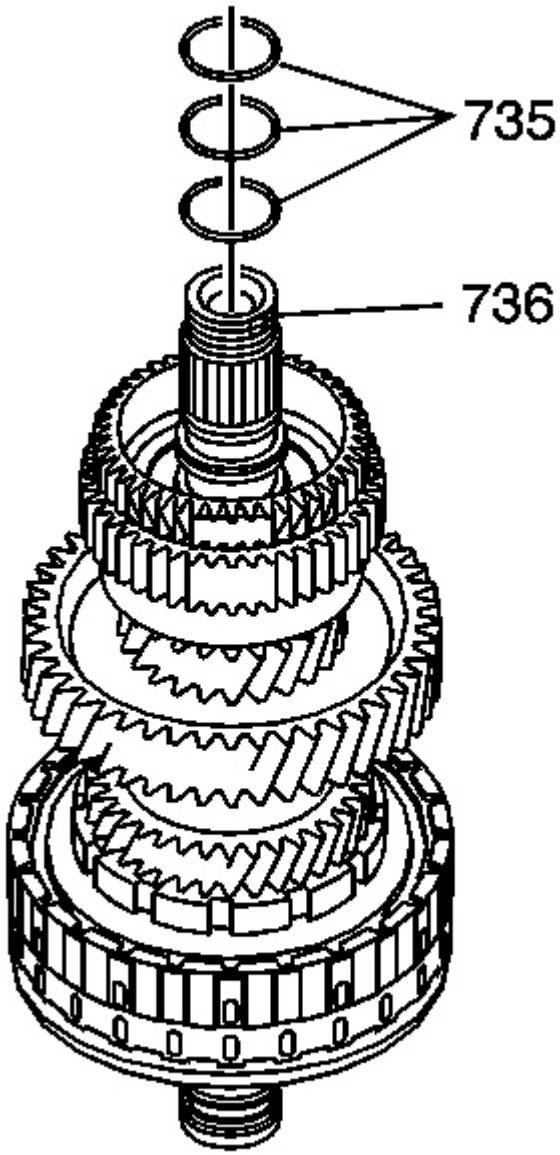

Fig. 317: 1st And Coast Clutch Housing & 1st And 2nd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

15. Wrap the splines on the 1st and 2nd clutch shaft (736) with tape.
16. Install 3 new 1st and coast clutch housing 26.7 mm x 1.9 mm O-ring seals (735) in the 1st coast clutch O-ring grooves of the 1st and 2nd clutch shaft (736).

17. Remove the tape from the clutch shaft.

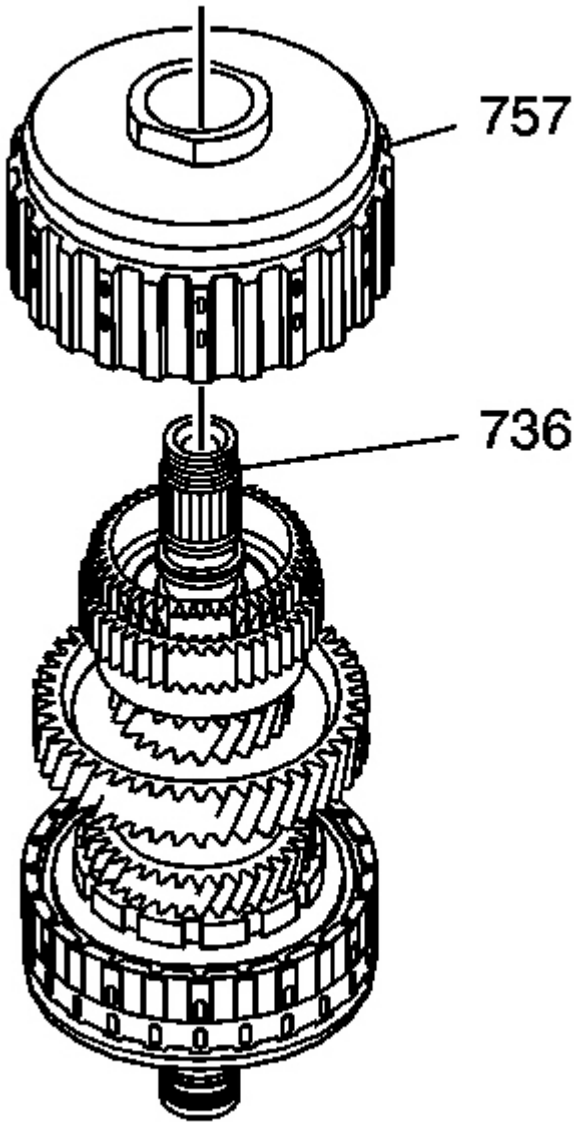

Fig. 318: 1st Coast Clutch Assembly & 1st And 2nd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

18. Install the 1st coast clutch assembly (757) onto the 1st and 2nd clutch shaft (736). Turn the clutch hub to align to the clutch discs. Ensure the hub is installed completely in the clutch discs.

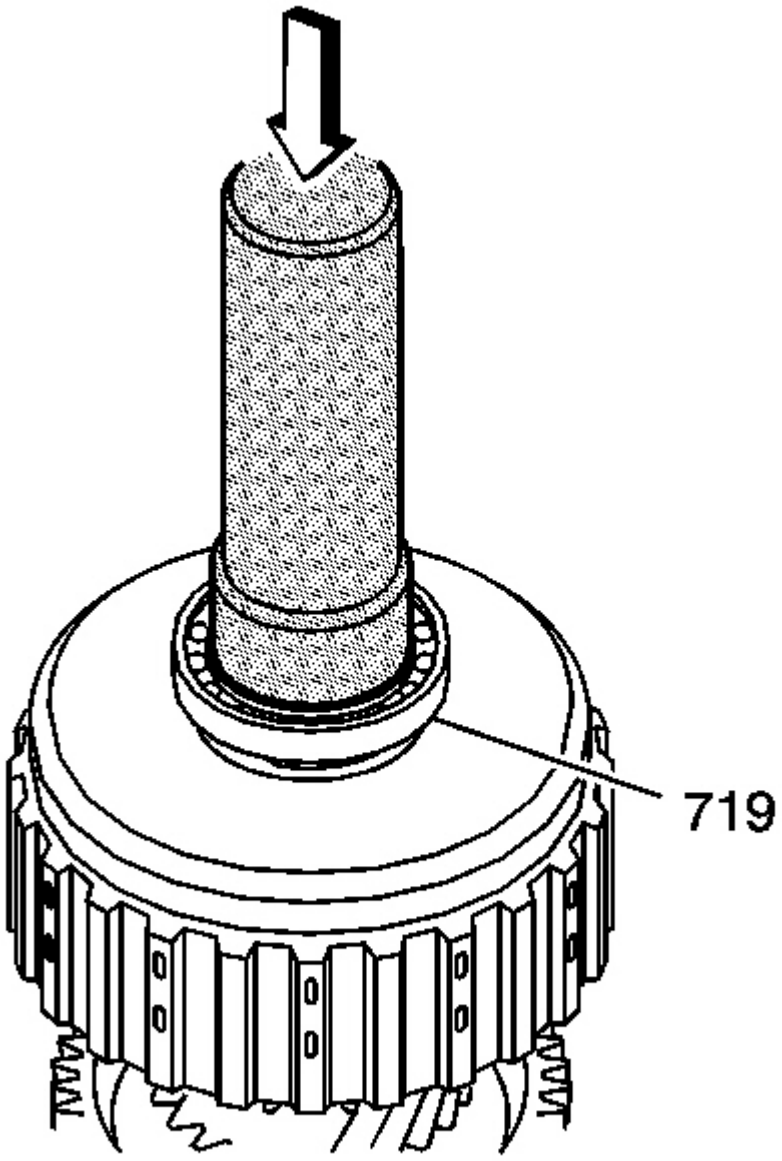

Fig. 319: 1st And 2nd Clutch Shaft Rear Bearing
Courtesy of GENERAL MOTORS CORP.

19. Install the 1st and 2nd clutch shaft rear bearing (719) on the 1st/2nd clutch shaft (736) using **DT 46509** and a hydraulic press.

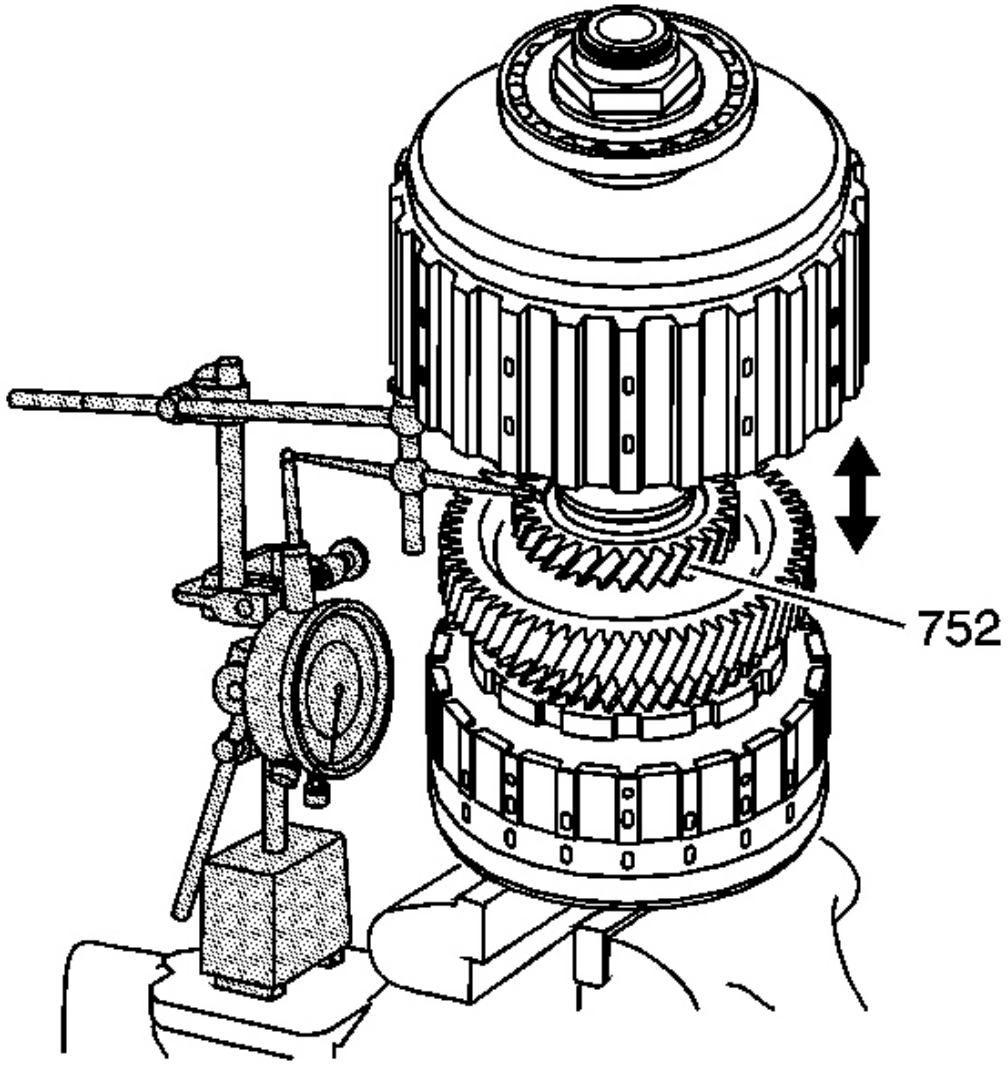

Fig. 320: Measuring The Axial Clearance For The 1st Drive Gear
Courtesy of GENERAL MOTORS CORP.

20. Measure the axial clearance for the 1st drive gear (726).
    1. Position the 1st/2nd clutch shaft assembly in a soft-jaw vise.
    2. Install the **SA9179NE** and a hole attachment tool on the 1st/coast hub (752).
    3. Set the dial indicator to zero.
    4. Lift up on the 1st/coast hub (752) and record the axial clearance reading.
    5. Measure the axial clearance in two more locations.

6. Average the readings to get the axial clearance.

   Specifications: 1st gear axial clearance 0.085-0.130 mm (0.003-0.05 in)

- Replace the 1st/coast hub washer (722) with a thicker washer to be within the axial clearance specifications.
- if the axial clearance is still higher than the specification, disassembly the 1st/2nd clutch shaft and inspect for excessive wear on the thrust bearing surfaces of the gears. Refer to 1st/2nd Clutch Shaft in **Transmission Clearance Specifications** .
- If the axial clearance is lower than the specification, inspect for burrs or contamination on the thrust bearing surfaces or the gears.

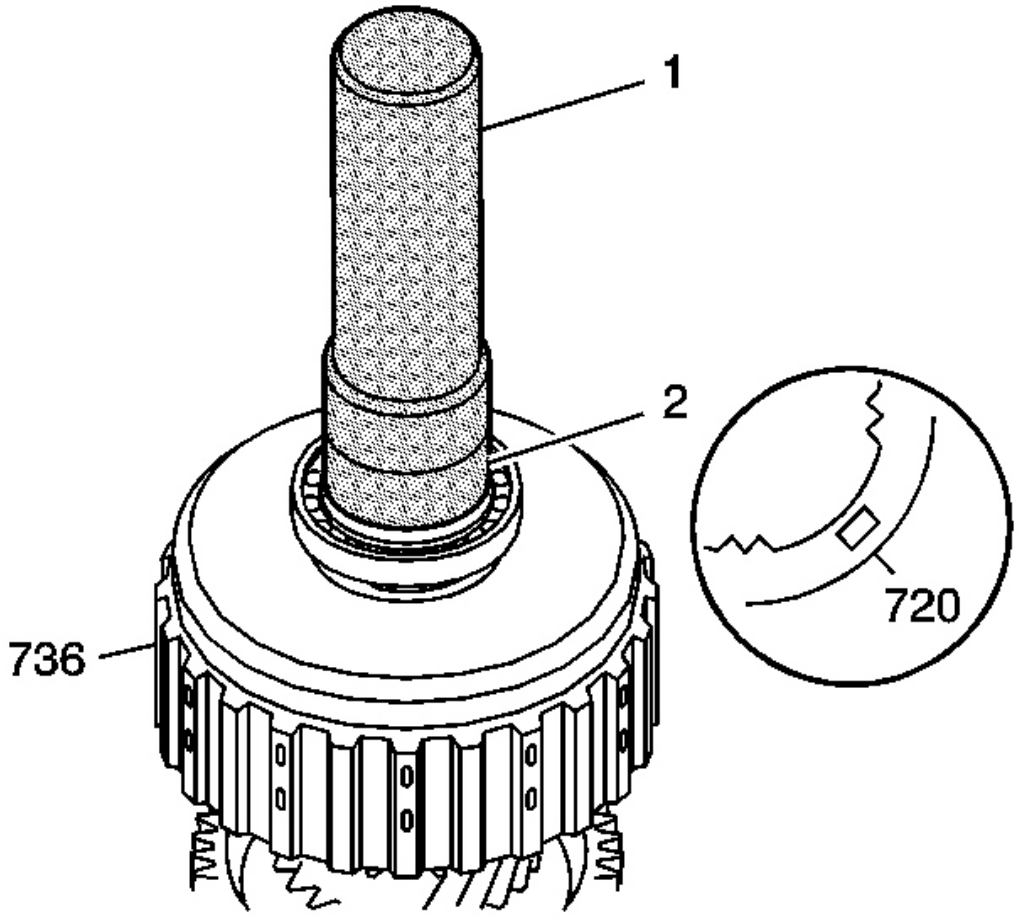

Fig. 321: Installing 1st/2nd Clutch Shaft Retaining Nut Washer Using DT 46509 & DT 46418
Courtesy of GENERAL MOTORS CORP.

21. Using **DT 46509** (1) and **DT 46418** (2), install the new 1st/2nd clutch shaft retaining nut washer (720). The marked side of the washer aligns up.

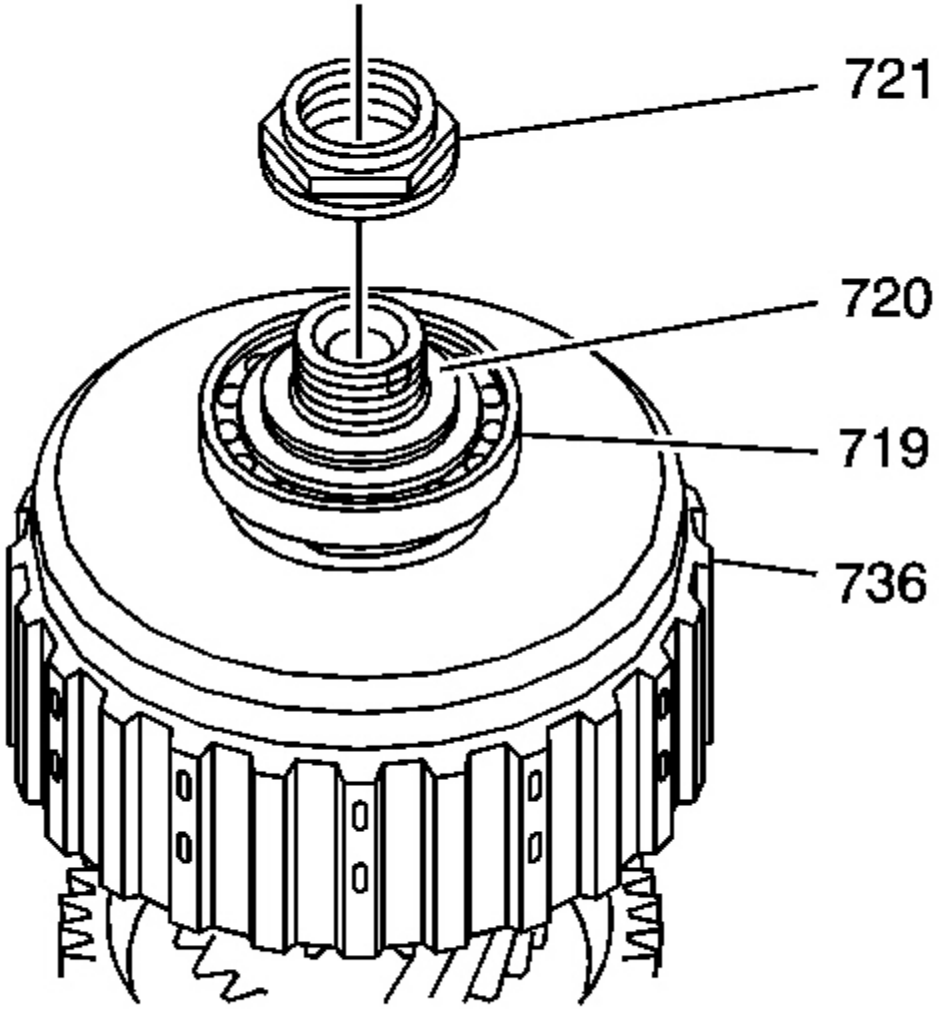

Fig. 322: 1st And 2nd Clutch Shaft Retaining Nut & 26 mm
Courtesy of GENERAL MOTORS CORP.

22. Install a new 26 mm, 1st and 2nd clutch shaft retaining nut (721).
23. Hand tighten the nut to seat against the washer.

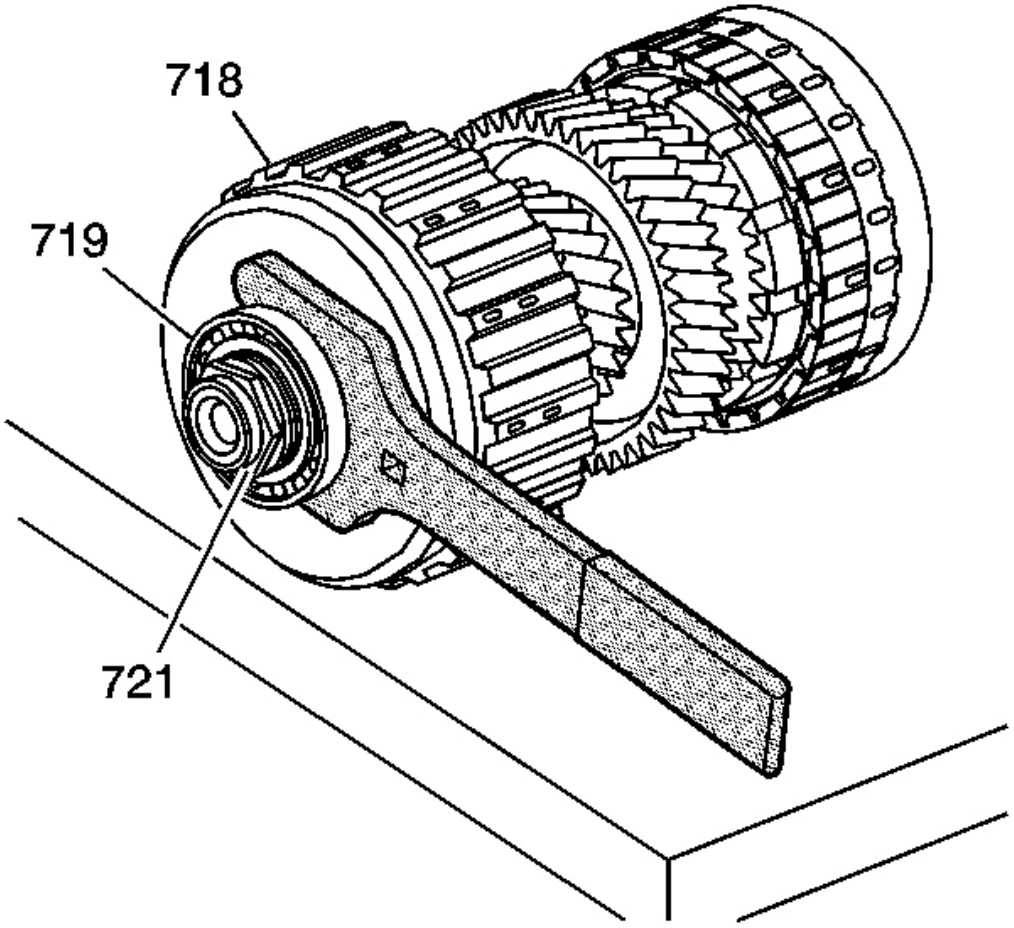

Fig. 323: Tightening The 1st/2nd Clutch Shaft Retainer Nut Using A Torque Wrench
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

24. Use the following to tighten the 1st/2nd clutch shaft retaining nut (721):
    1. Lay the 1st/2nd clutch shaft assembly on a bench.
    2. Insert **DT 46540** between the 1st/coast clutch housing (718) and the 1st/2nd clutch shaft rear bearing (719).
    3. Using a torque wrench and 38 mm six point socket tighten the 1st/2nd clutch shaft retainer nut (721).
        - Do not use an impact wrench.
        - Hold the **DT 46540** against the bench top.

Tighten: Tighten the retaining nut to 178 N.m (132 lb ft)

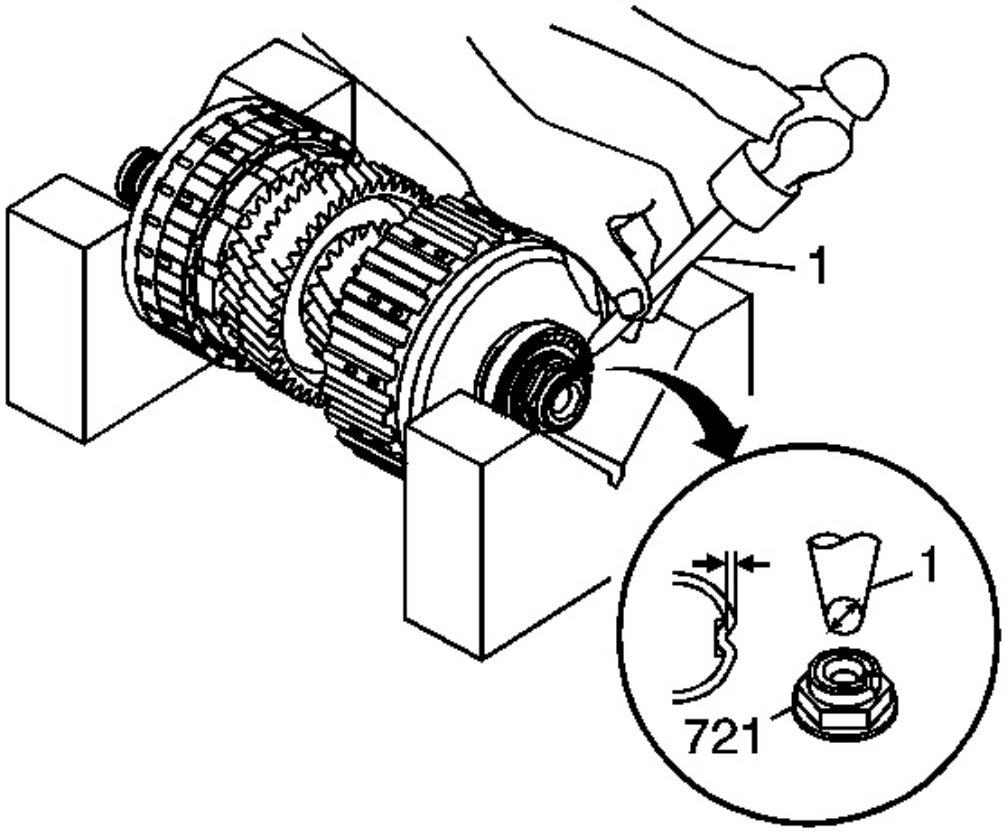

Fig. 324: Staking The 1st And 2nd Clutch Shaft Retaining Nut Using A 3.5 mm Punch
Courtesy of GENERAL MOTORS CORP.

25. Using a 3.5 mm (9/64 in) punch (1), stake the 1st and 2nd clutch shaft retaining nut (721)

    Specification: Stake the 1st and 2nd clutch shaft retaining nut to 0.7-1.3 mm (0.03-0.05 in)

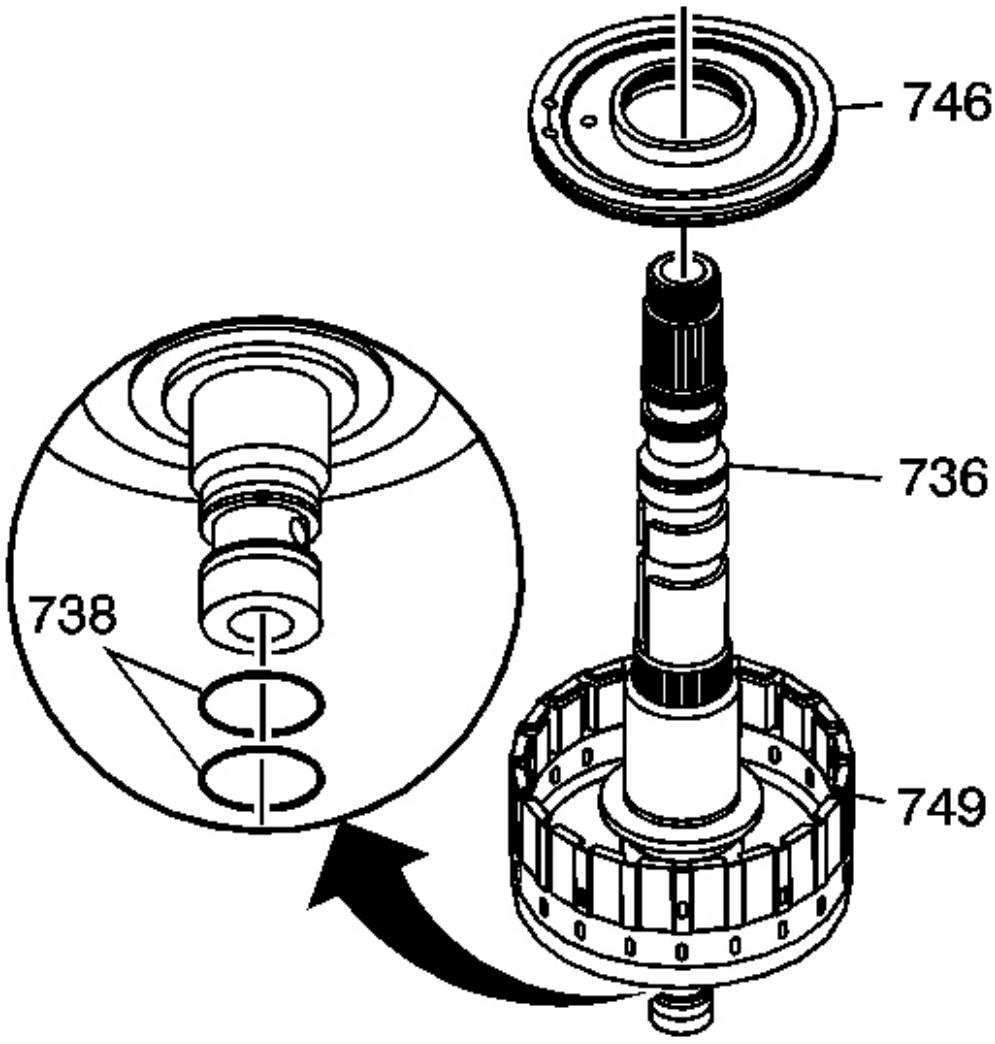

Fig. 325: 1st/2nd Clutch Shaft & Fluid Passage Seals
Courtesy of GENERAL MOTORS CORP.

26. Install new 1st/2nd clutch shaft fluid passage seals (738) on the 1st/2nd clutch shaft.

3RD CLUTCH SHAFT DISASSEMBLE

Tools Required

- **J 22912-01** Split-Plate Bearing Puller

- **SA9179NE** Dial Indicator

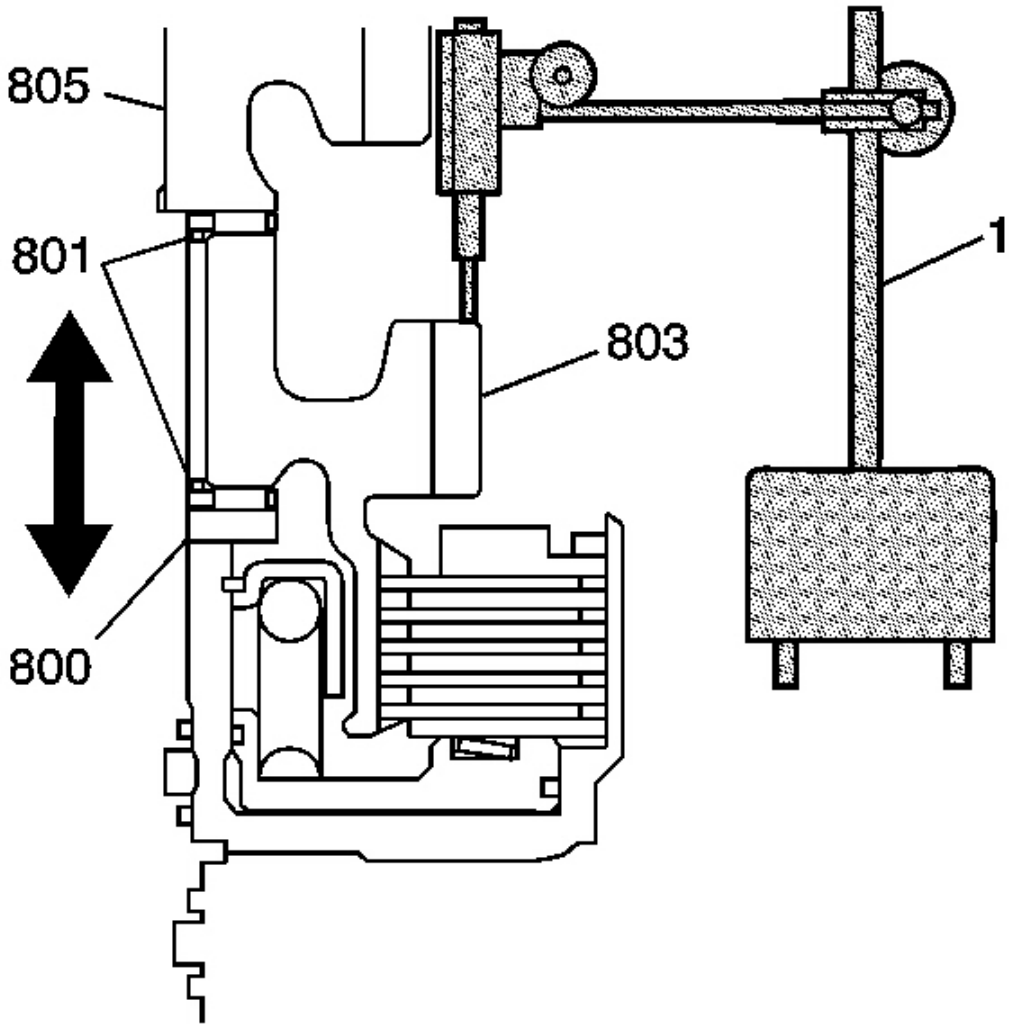

Fig. 326: Measuring The 3rd Drive Gear Axial Clearance Using SA91979NE
Courtesy of GENERAL MOTORS CORP.

1. Position the 3rd clutch shaft assembly in a soft-jaw vise with the 3rd driven gear on top.
2. Using **SA9179NE** measure the 3rd drive gear (803) axial clearance.
    1. Position **SA9179NE** gage pointer on the top of the gear teeth.
    2. Zero the gage.
    3. Lift up on the gear to measure the clearance.

4. Measure the axial clearance in 3 different locations by rotating the 3rd drive gear.
5. Average the 3 measurements for the axial clearance.
6. Record the clearance to help determine the correct replacement 3rd drive gear thrust bearing race (800).

   Specification: The 3rd gear axial clearance is 0.005-0.045 mm (0.0002-0.0012 in)

3. If the clearance exceeds the maximum, during disassembly, inspect the following bearings for wear on the bearing thrust surfaces:
   - 3rd drive gear (803)
   - 3rd drive gear thrust bearing race (800)
   - 3rd drive gear thrust bearing (801)
   - 3rd driven gear (805)
4. If the clearance is lower than the specifications inspect for burrs or contamination of debris between the bearing thrust surfaces.

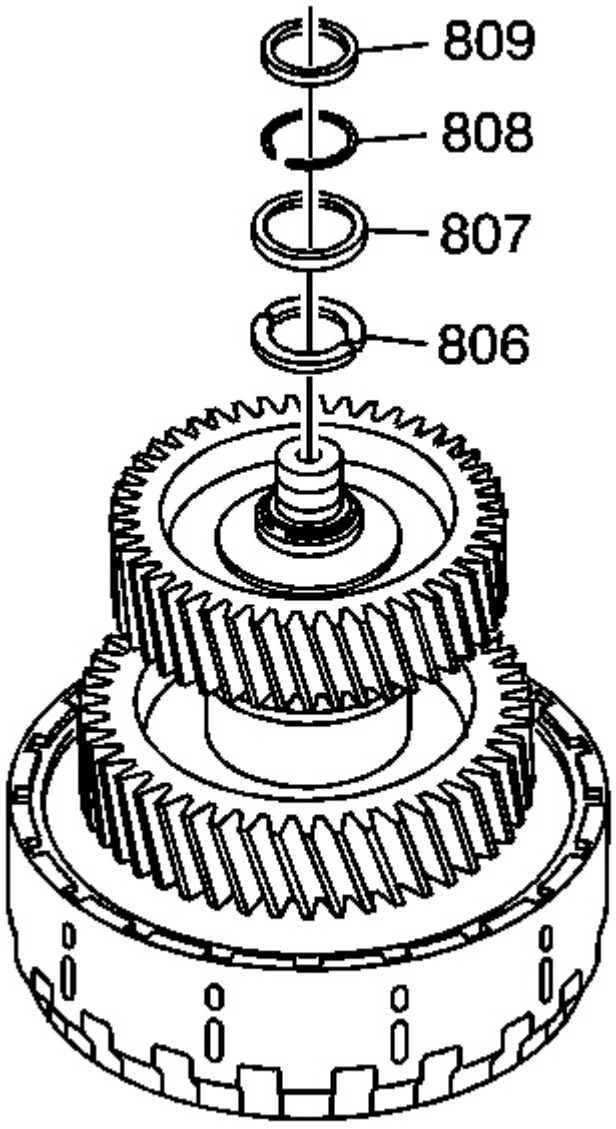

Fig. 327: 3rd Clutch Shaft Assembly & Components Removed
Courtesy of GENERAL MOTORS CORP.

5. Remove the following components from the 3rd clutch shaft assembly:
    - 3rd clutch shaft assembly washer (809)
    - 3rd drive gear retaining ring cap retainer (808)
    - 3rd driven gear retaining ring cap (807)

- 3rd driven gear split retaining ring (806)

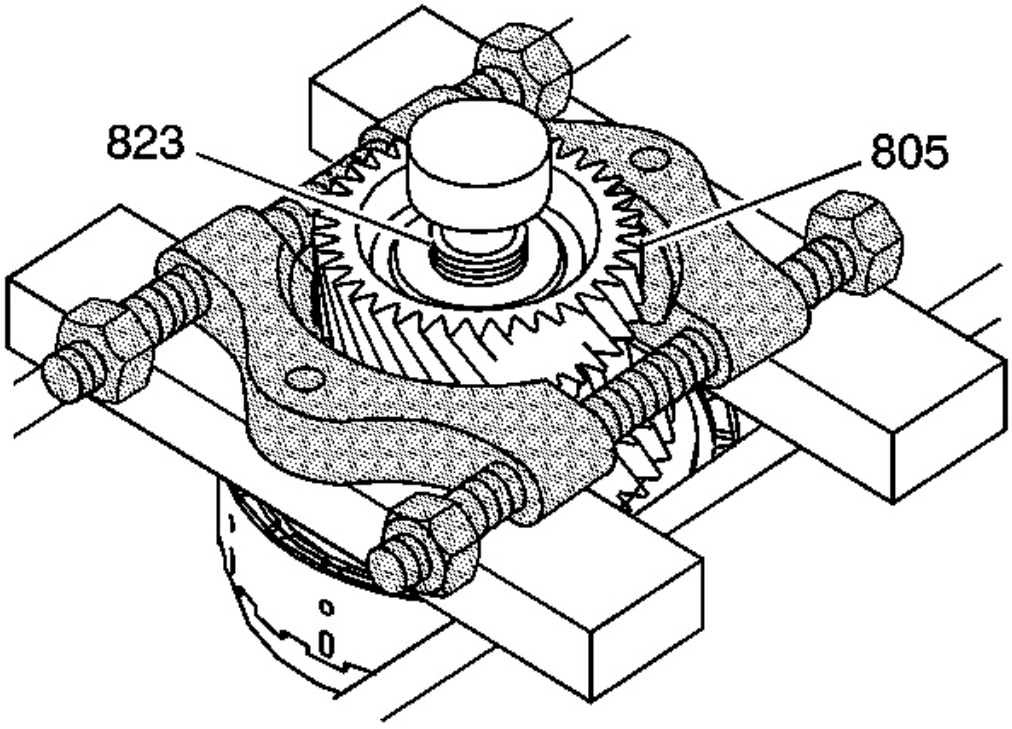

Fig. 328: Removing 3rd Driven Gear Using A Hydraulic Press & J 22912-01
Courtesy of GENERAL MOTORS CORP.

NOTE: Support the component while using the press. Failure to support the component may allow the component to drop, causing damage.

6. Using a hydraulic press and **J 22912-01** , remove the 3rd driven gear (805).
   - Protect the threads of the 3rd clutch shaft (823) using a shaft protector.
   - Hold onto the 3rd clutch shaft (823) assembly to prevent the shaft from dropping to the floor.

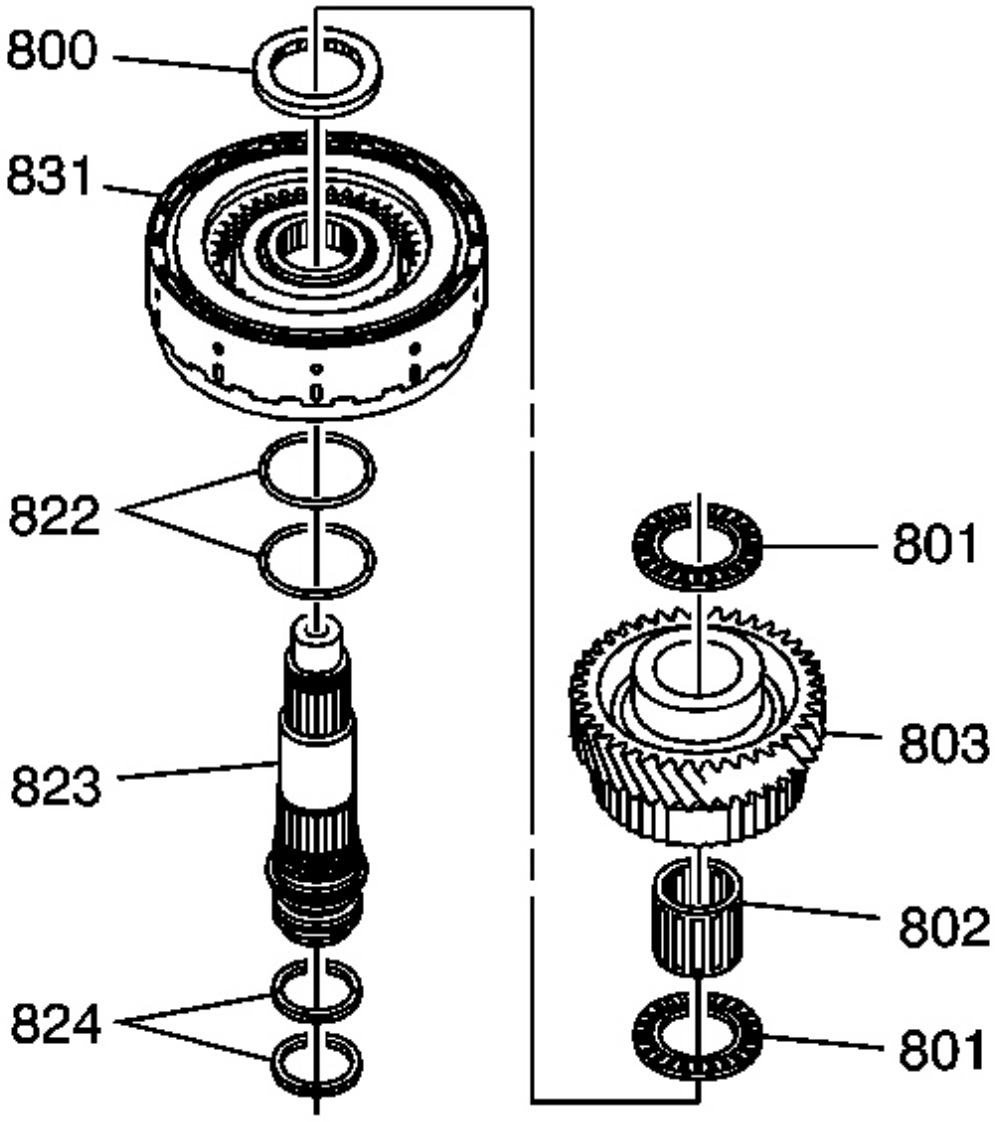

Fig. 329: 3rd Gear Shaft & Components Removed
Courtesy of GENERAL MOTORS CORP.

7. Remove the following components from the 3rd gear shaft (823):
    - 3rd driven gear thrust bearing (801)
    - 3rd drive gear (803)
    - 3rd drive gear inner bearing (802)

- 3rd drive gear thrust bearing (801)
- 3rd drive gear bearing race (800)
- 3rd clutch housing assembly (831)
- 3rd clutch housing fluid passage O-ring seals (822)
- 3rd clutch shaft fluid passage seals (824)

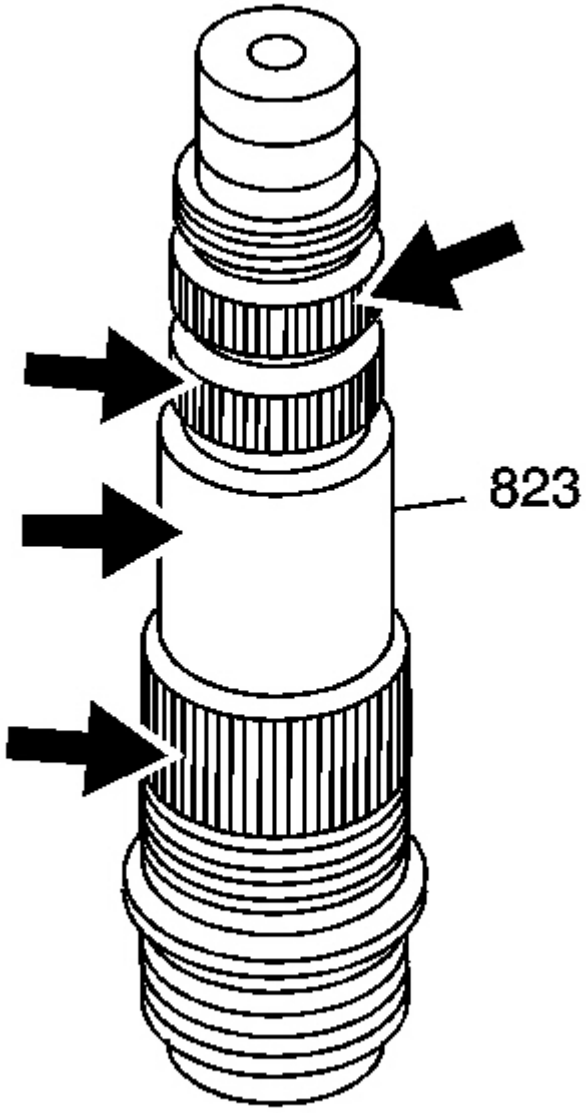

Fig. 330: Inspecting The Gears & Bearings For Damage
Courtesy of GENERAL MOTORS CORP.

8. Clean the 3rd clutch shaft, gears, and bearings in clean cleaning solvent and dry with compressed air.
9. Use compressed air to clean the oil passages in the 3rd clutch shaft (823).
10. Inspect the gears and bearing s for excessive wear or damage.
11. Replace any gears or bearings that are faulty.

3RD CLUTCH DISASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Removable Bridge

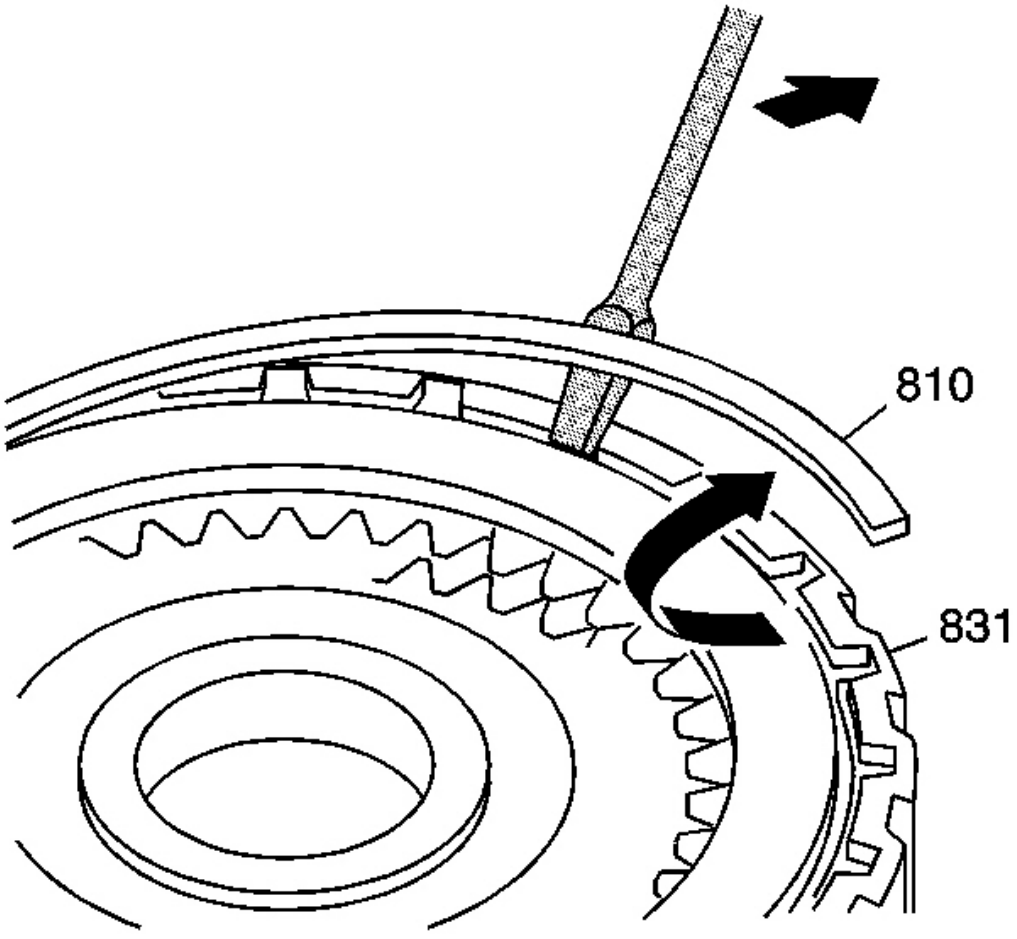

Fig. 331: Removing 3rd Clutch Backing Plate Retaining Ring Using J 28585
Courtesy of GENERAL MOTORS CORP.

1. Using **J 28585** , remove the 3rd clutch, backing plate retaining ring (810) from the 3rd clutch assembly (831).

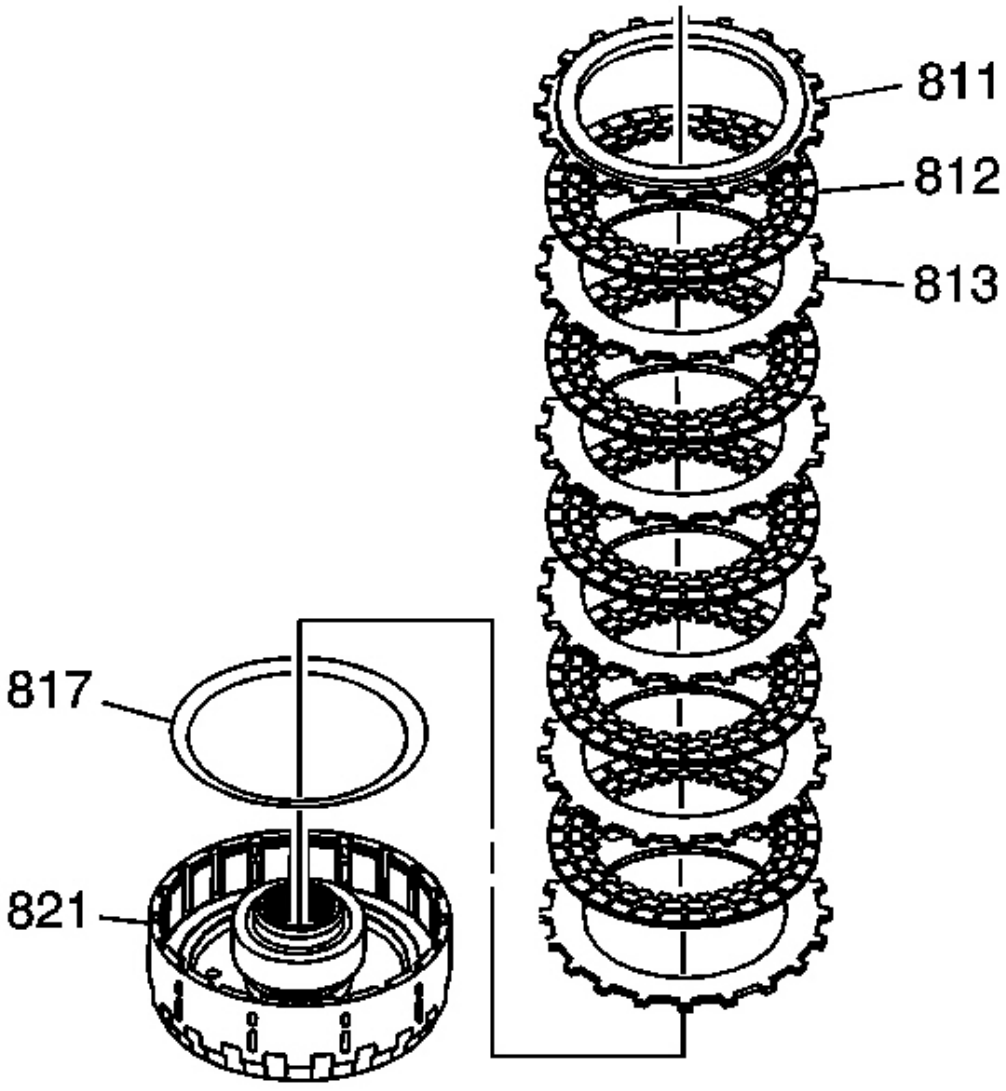

Fig. 332: 3rd Clutch Housing & Components Removed
Courtesy of GENERAL MOTORS CORP.

2. Remove the following components from the 3rd clutch housing (821):
    - 3rd clutch selective backing plate (811)
    - 3rd clutch fiber plates (812)
    - 3rd clutch steel plates (813)
    - 3rd clutch spring plate (817)

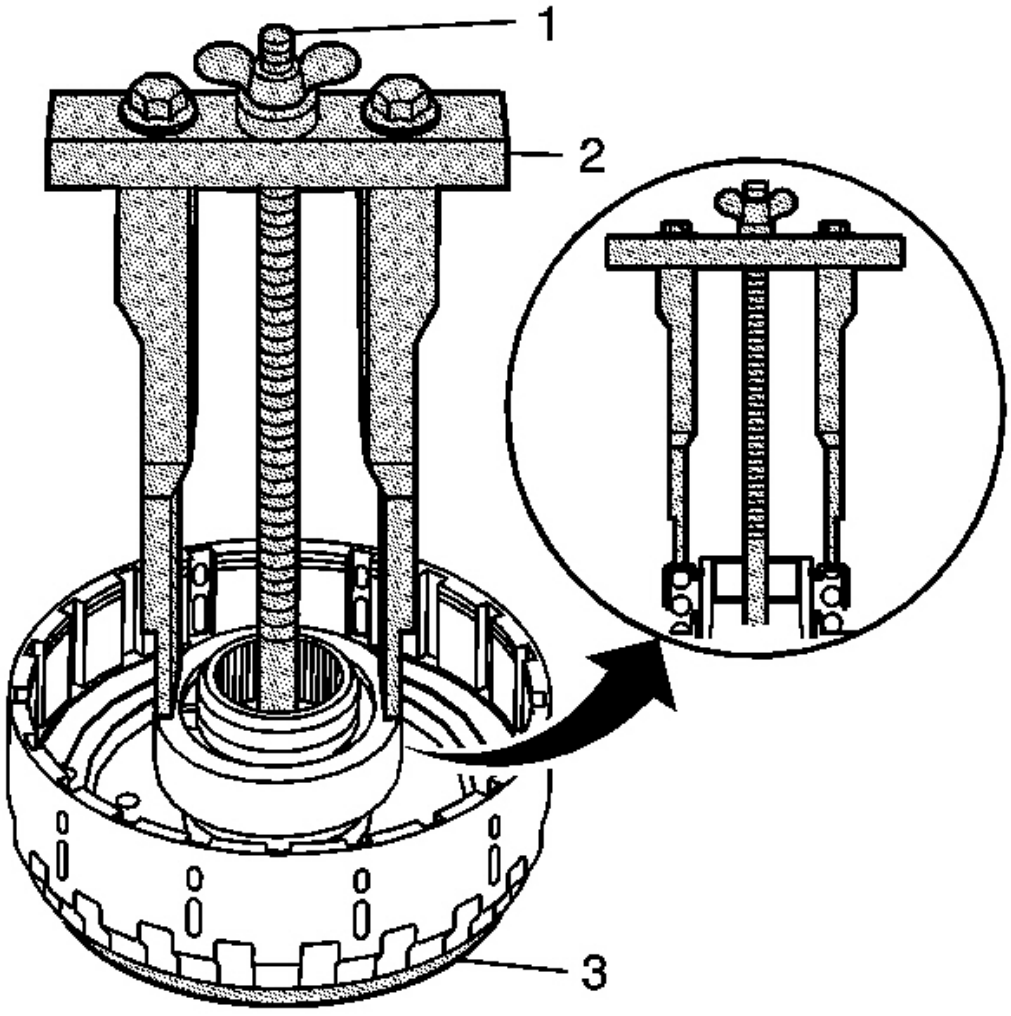

Fig. 333: 3rd Clutch Disassemble, J 45124, J 23327, J 21420-2, Clutch Piston Return Spring & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

3. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (1) and J 21420-2 (3) plate of the **J 23327** compress the clutch piston return spring until the groove for the clutch spring retainer cap retaining ring is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap.

- Do not place the legs on the spring retainer cap that is not supported by the spring.
- Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

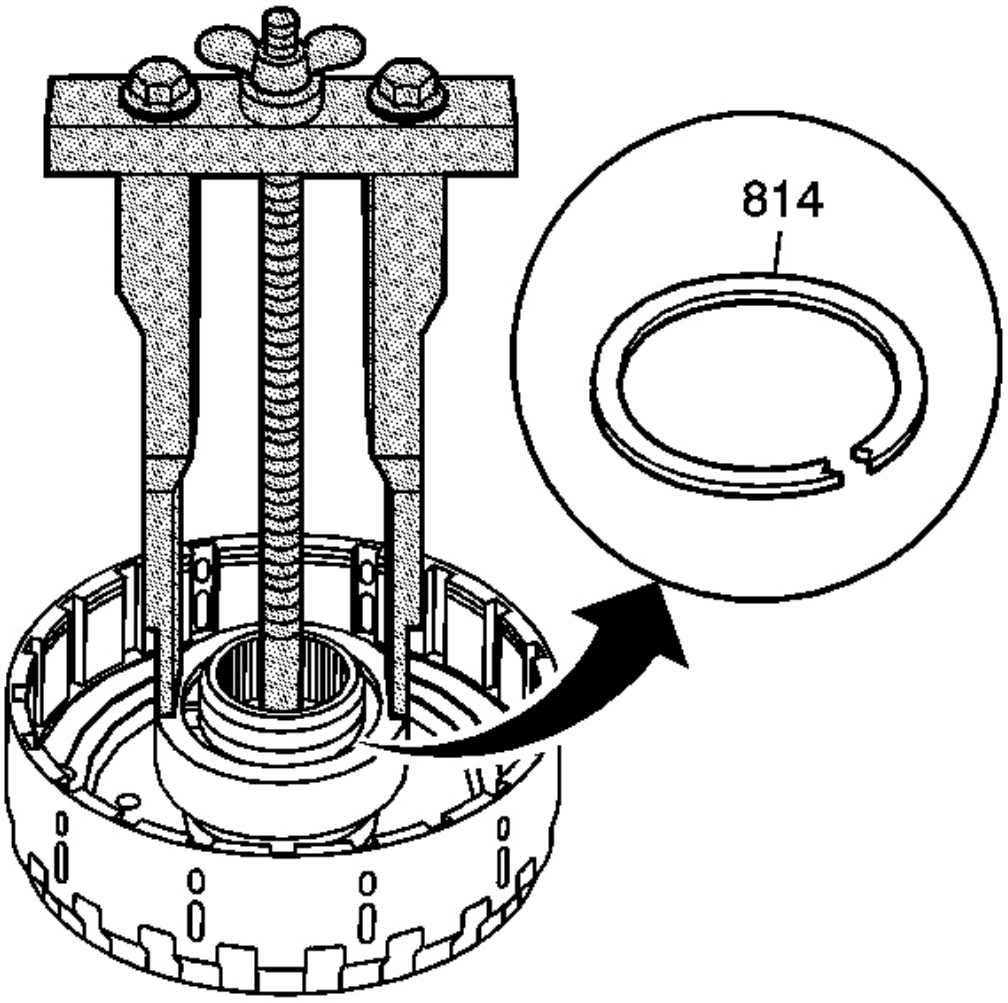

Fig. 334: Removing 3rd Clutch Piston Retaining Ring Using Pliers
Courtesy of GENERAL MOTORS CORP.

4. Using snap ring pliers, remove the 3rd clutch piston retaining ring (814).

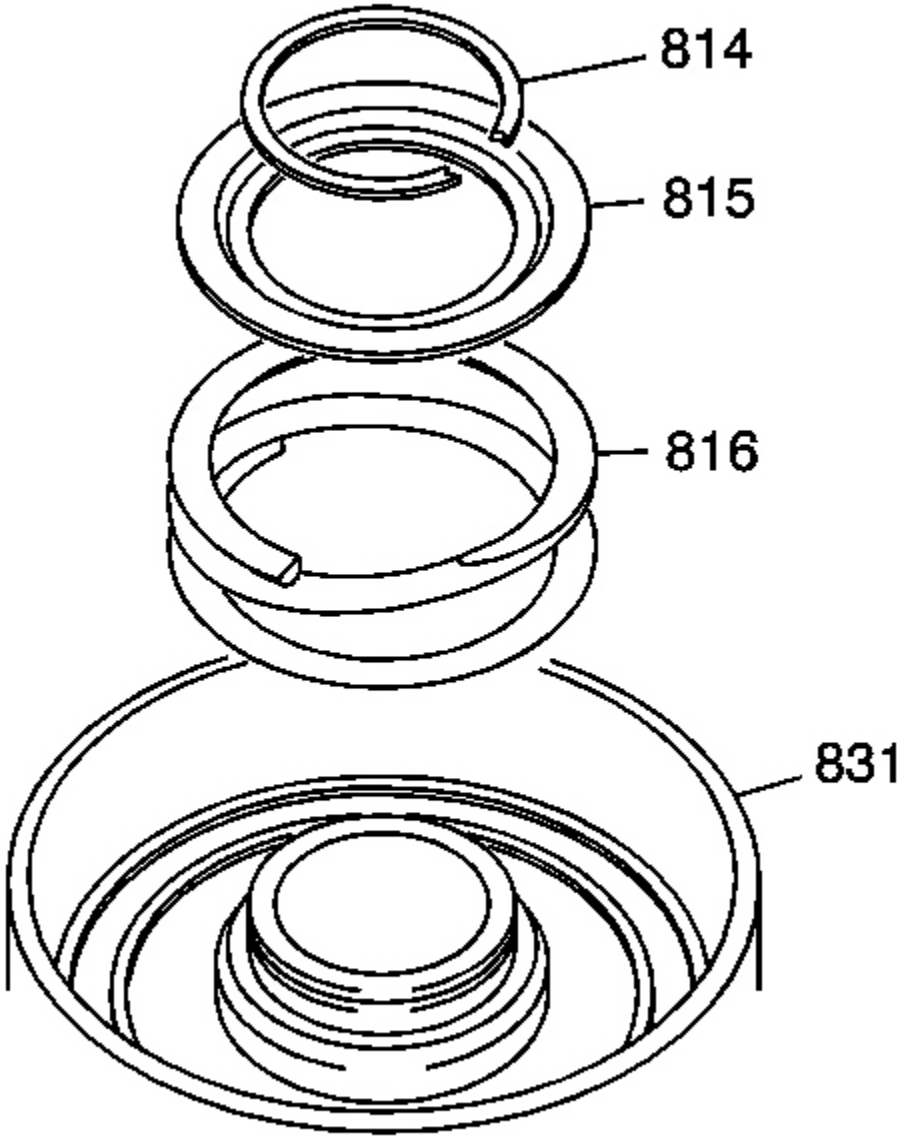

Fig. 335: 3rd Clutch Piston & Components Removed
Courtesy of GENERAL MOTORS CORP.

5. Remove the tools.
6. Remove the 3rd clutch piston retaining ring (814).
7. Remove the 3rd clutch piston spring cap (815).

8. Remove the 3rd clutch piston return spring (816).

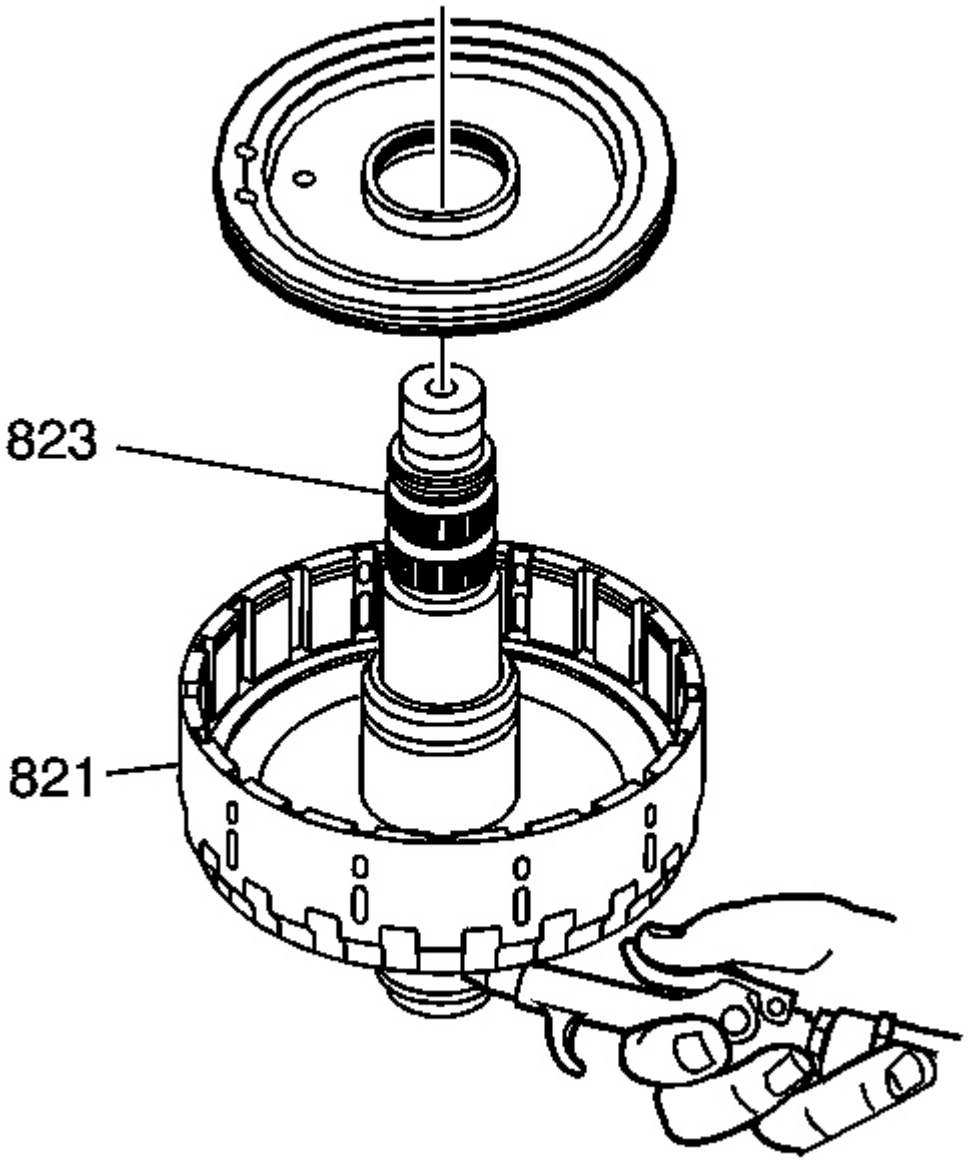

Fig. 336: Applying Compressed Air To 3rd Clutch Piston Fluid Apply Port
Courtesy of GENERAL MOTORS CORP.

9. Install the 3rd clutch housing (821) onto the 3rd clutch shaft (823).

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

10. Apply compressed air to the 3rd clutch piston fluid apply port located in the 3rd clutch shaft in order to remove the piston.

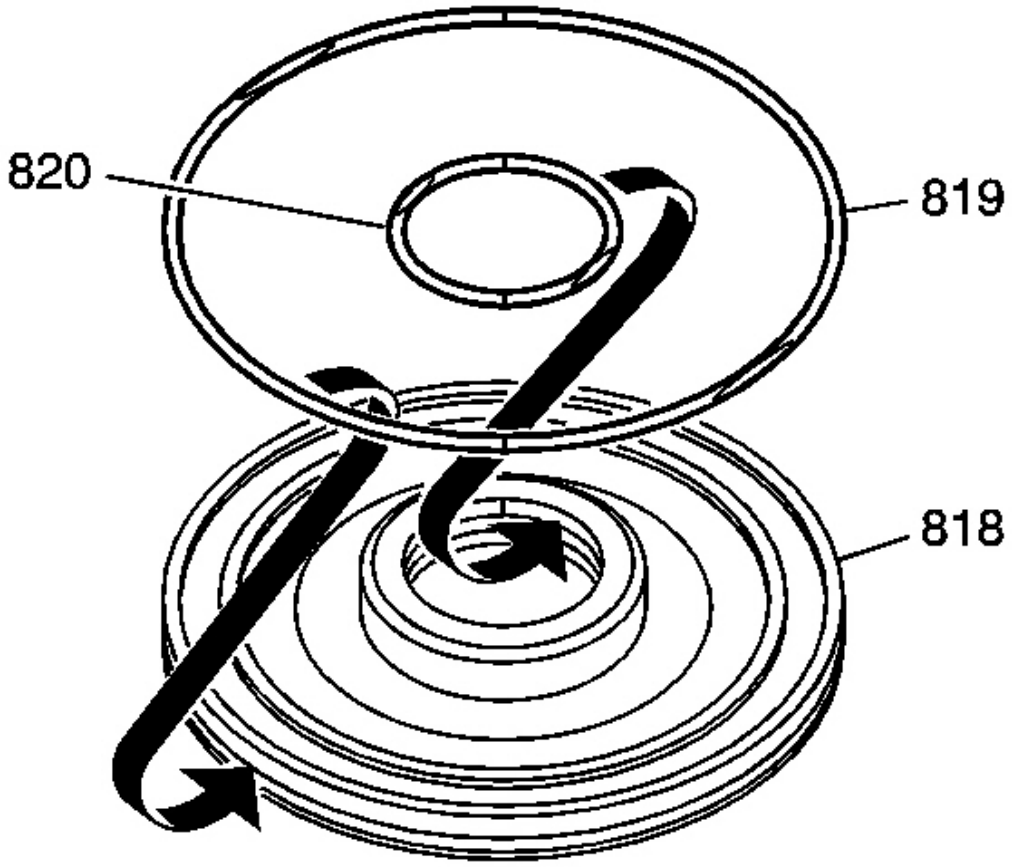

Fig. 337: 3rd Clutch Piston & Outer/Inner O-Ring Seal Removed
Courtesy of GENERAL MOTORS CORP.

11. Remove the following components from the 3rd clutch piston (818):
    - 3rd clutch piston, outer O-ring seal (819)
    - 3rd clutch piston, inner O-ring seal (820)

3RD CLUTCH INSPECTION

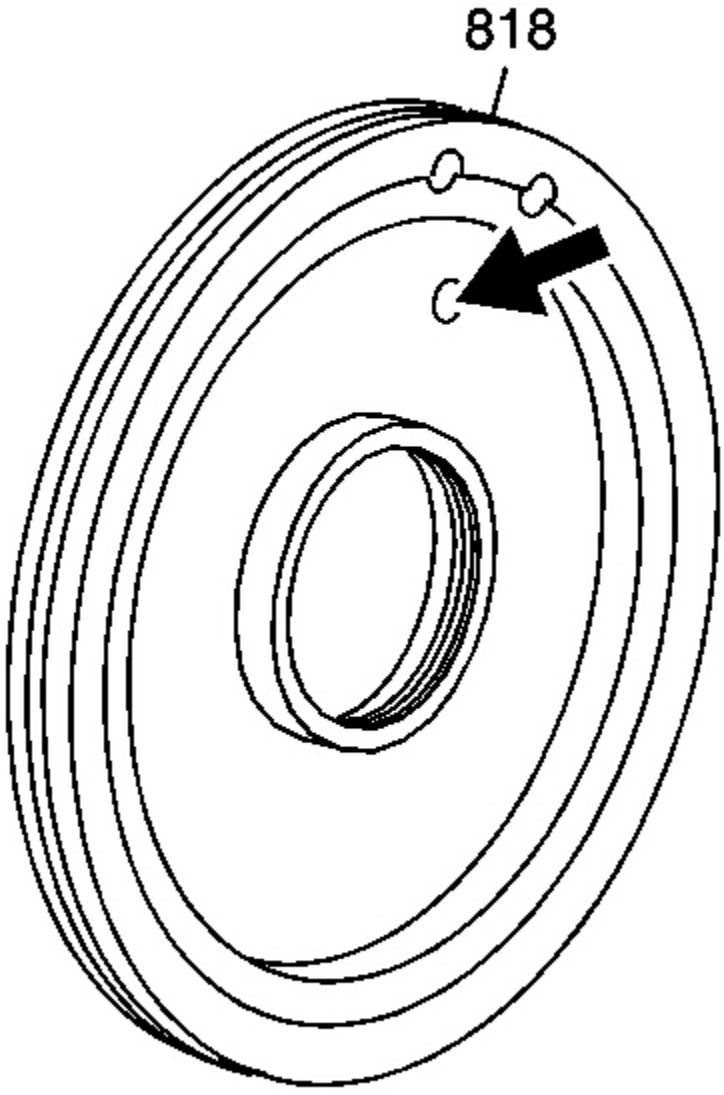

Fig. 338: Inspecting The 3rd Clutch Piston & Clutch Piston Check Valve
Courtesy of GENERAL MOTORS CORP.

1. Inspect the 3rd clutch piston (818) and the clutch piston check valve.
2. Replace the 3rd clutch piston if the check valve is missing, stuck, or damaged.

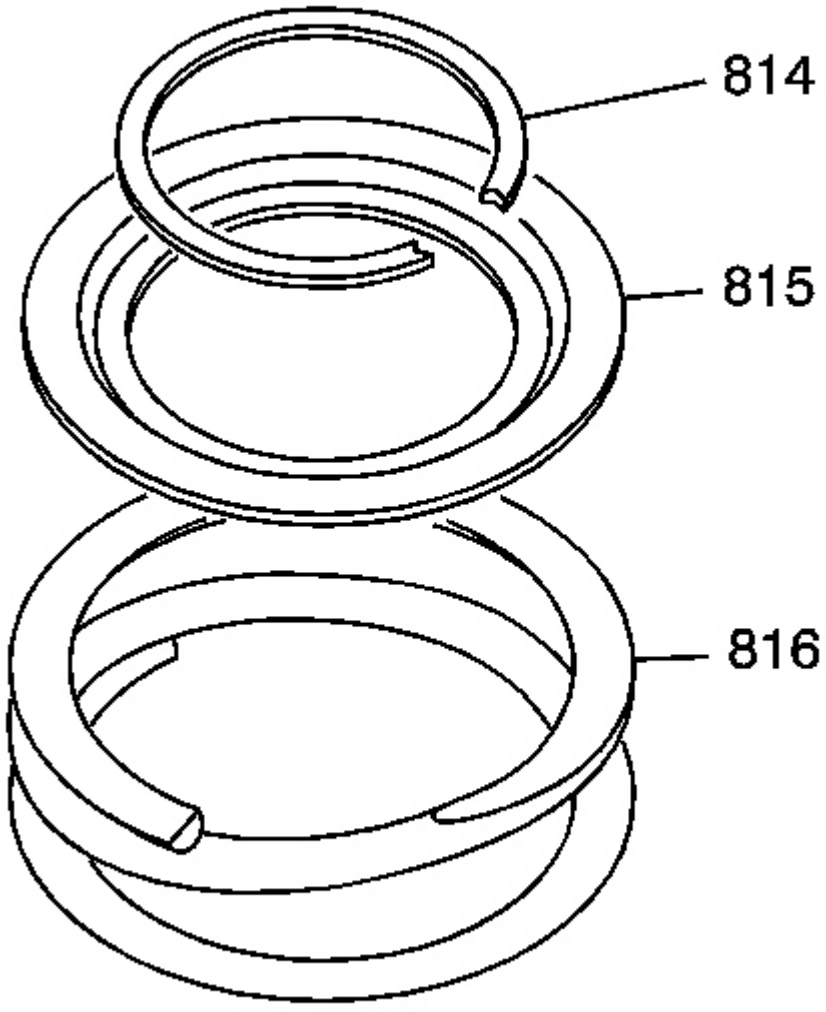

Fig. 339: Inspecting 3rd Clutch Piston For Damage
Courtesy of GENERAL MOTORS CORP.

3. Inspect the following components for wear or damage:
    - 3rd clutch piston spring cap (815)
    - 3rd clutch piston retaining ring (814)
    - 3rd clutch piston return spring (816)
4. Replace the components if faulty.

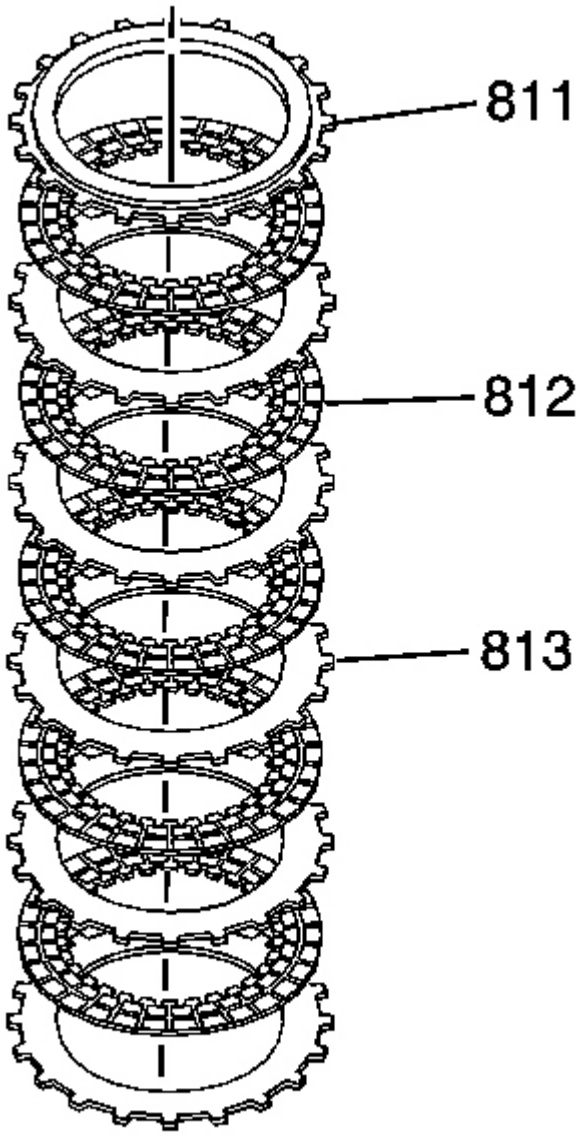

Fig. 340: Inspecting 3rd Clutch Components For Damage
Courtesy of GENERAL MOTORS CORP.

5. Inspect the following 3rd clutch components for wear, damage, or severe discoloration:
    - 3rd clutch steel plates (813)
    - 3rd clutch fiber plates (812)

- 3rd clutch selective backing plate (811)

6. If the clutch steel plates are worn or damaged or severely discolored, replace the plates as a complete set.
7. If the clutch fiber plates are worn, damaged, or discolored, replace the plates as a complete set.
8. If the 3rd clutch selective backing plate (811) is worn, damaged, or severely discolored, inspect the clutch backing plate-to-top disc clearance, then replace the clutch backing plate making sure to use the correct selective size backing plate.

3RD CLUTCH ASSEMBLE

Tools Required

- **J 23327** Spring Compressor
- **J 28585** Snap Ring Remover
- **J 45124** Removable Bridge

Note these items during reassembly:

- Clean all parts thoroughly and dry them with compressed air.

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

- Use compressed air to clear all passages.
- Apply automatic transmission fluid to all O-ring seals before assembly.
- Soak all clutch fiber plates thoroughly in automatic transmission fluid for a minimum of 30 minutes.

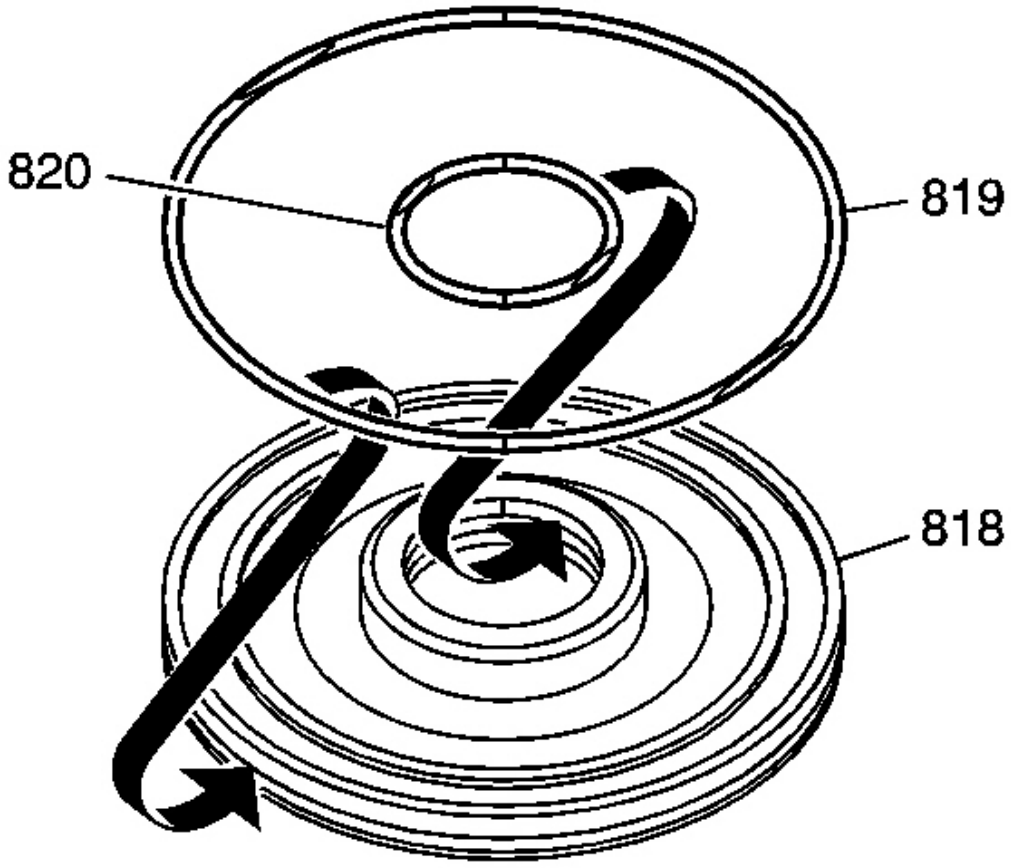

Fig. 341: 3rd Clutch Piston & Outer/Inner O-Ring Seal Removed
Courtesy of GENERAL MOTORS CORP.

1. Install a 41.8 x 2.2 mm 3rd clutch piston inner O-ring seal (820).
2. Install a 116.7 x 2.2 mm 3rd clutch piston outer O-ring seal (819).

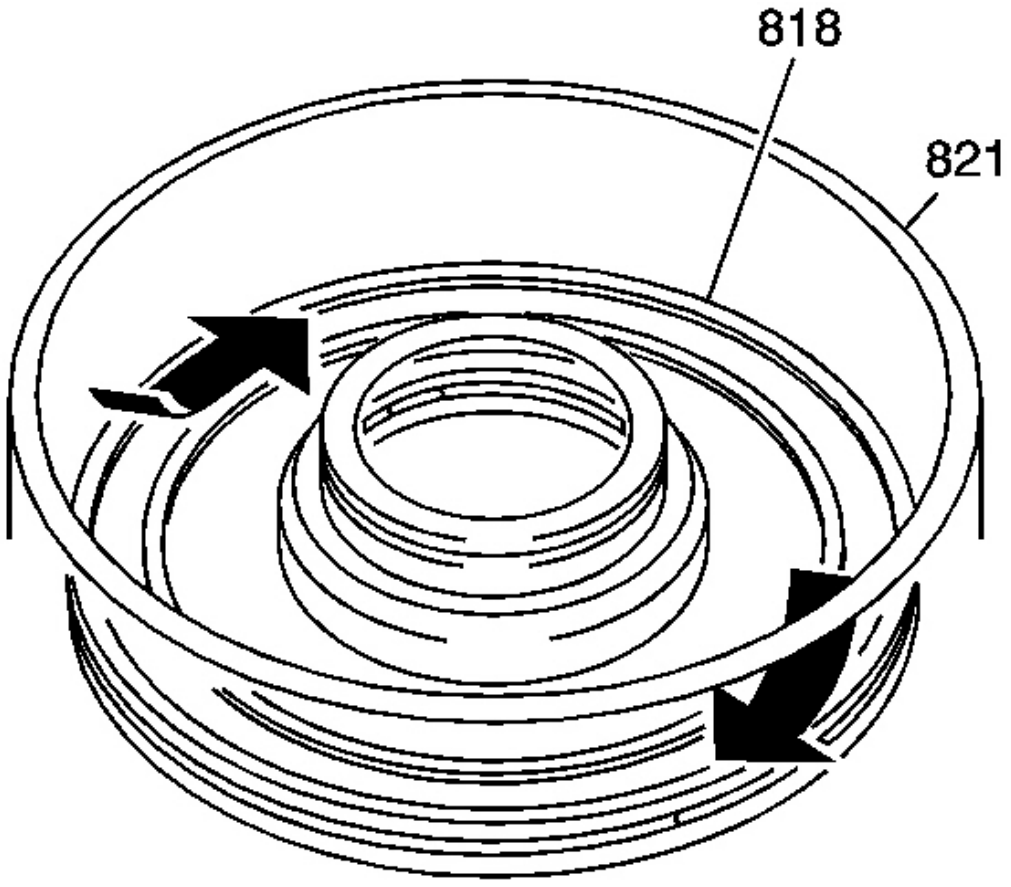

Fig. 342: Installing 3rd Clutch Piston Assembly Into 3rd Clutch Housing
Courtesy of GENERAL MOTORS CORP.

3. Install the 3rd clutch piston assembly (818) into the 3rd clutch housing (821).
    - Apply hand pressure and rotate the 3rd clutch piston assembly.
    - Ensure proper seating.
    - Do not pinch the O-ring seal by installing the piston with excessive force.

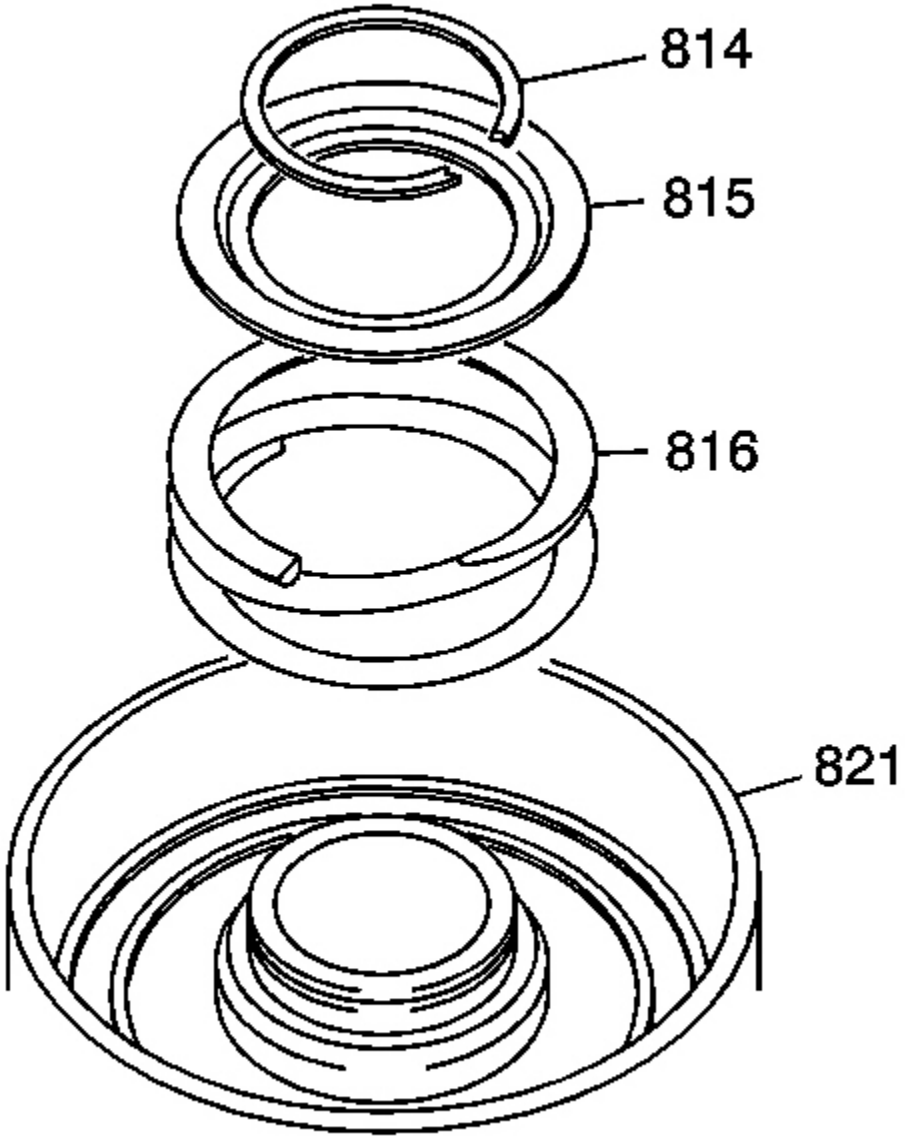

Fig. 343: 3rd Clutch Piston Spring Cap, Return Spring & Retaining Ring
Courtesy of GENERAL MOTORS CORP.

4. Install the 3rd clutch piston return spring (816).
5. Install the 3rd clutch piston spring cap (815).
6. Place the 3rd clutch piston 42 mm retaining ring (814) on the retainer cap.

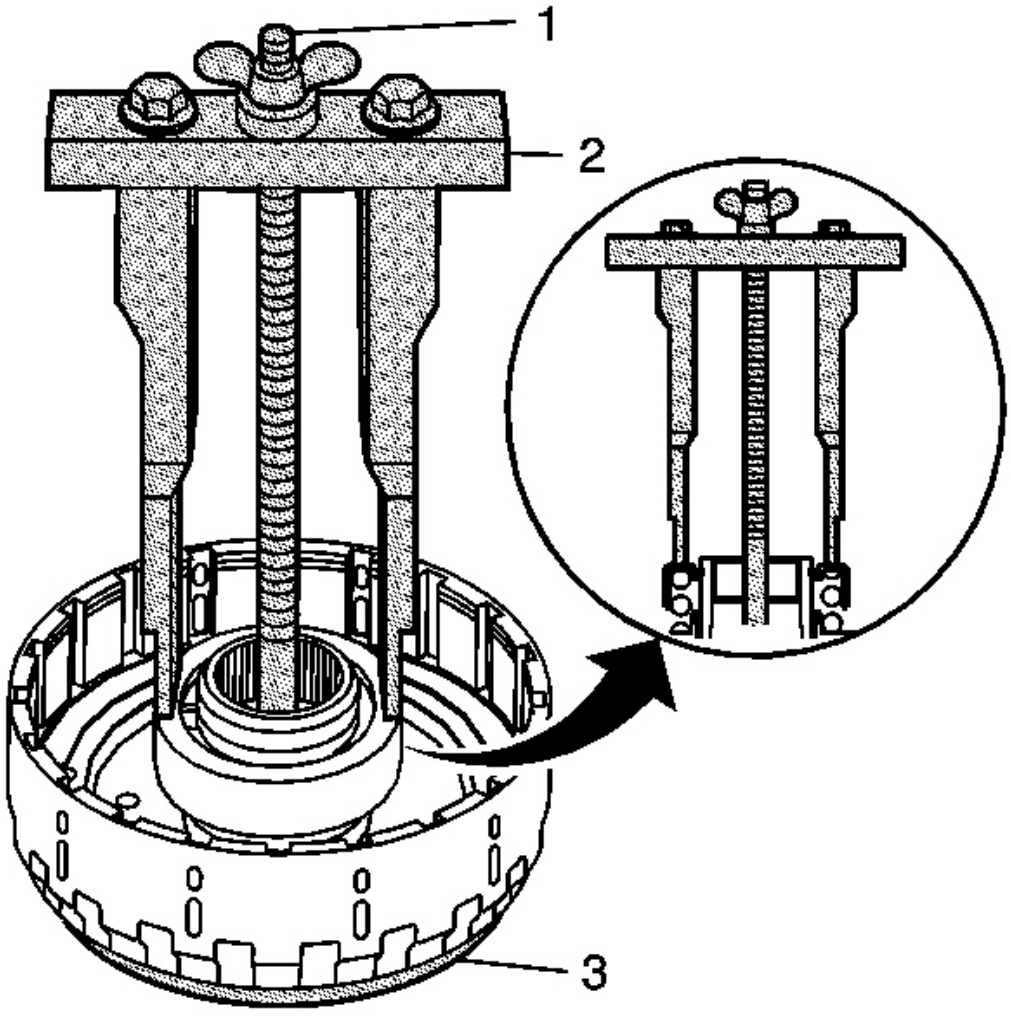

Fig. 344: 3rd Clutch Disassemble, J 45124, J 23327, J 21420-2, Clutch Piston Return Spring & Clutch Spring Retainer Cap Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the legs of the J 45124 on the spring retainer cap only where the spring is in contact with the cap.

7. Using the bridge and legs of the **J 45124** (2) with the forcing screw of the **J 23327** (1) and J 21420-2 (3) plate of the **J 23327** , compress the clutch piston return spring until the groove for the clutch spring retainer cap retaining ring is accessible.
    - Adjust the legs of the **J 45124** to have full contact with the clutch piston return spring retainer cap.

- Do not place the legs on the spring retainer cap that is not supported by the spring.
- Ensure the legs remain in position where the spring retainer cap is in contact with the spring.

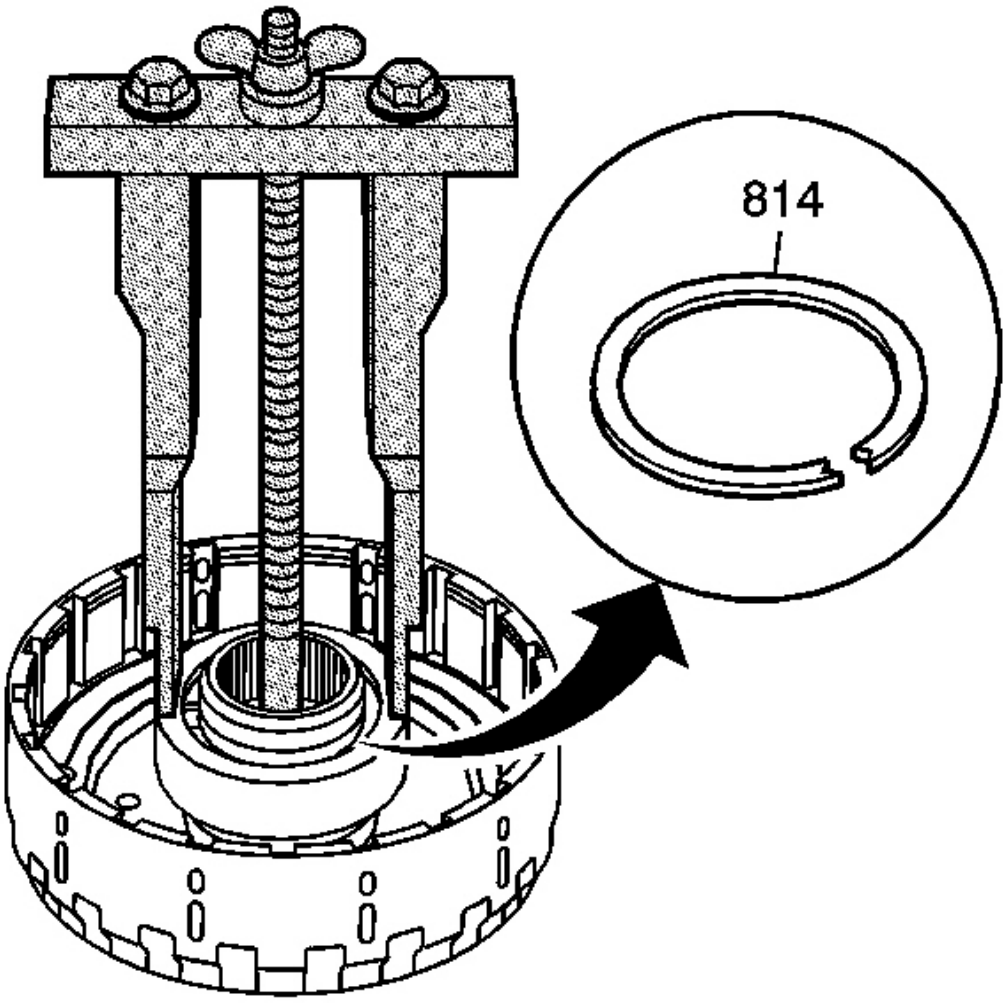

Fig. 345: Removing 3rd Clutch Piston Retaining Ring Using Pliers
Courtesy of GENERAL MOTORS CORP.

8. Install the 3rd clutch piston 42 mm retaining ring (814).
9. Remove the tools.

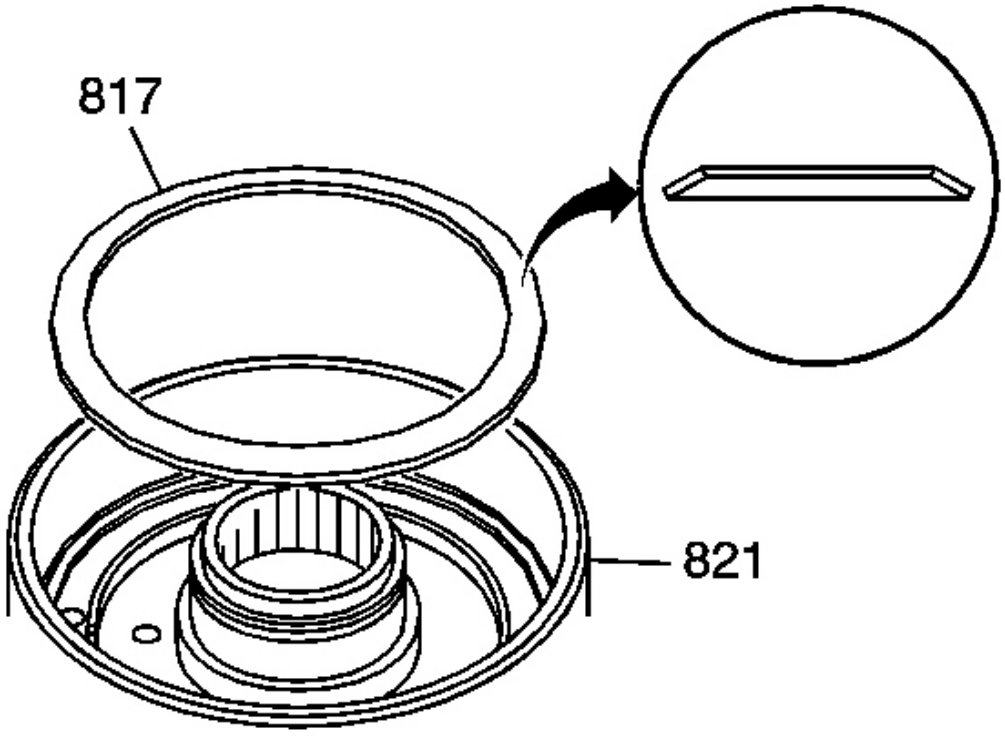

Fig. 346: 3rd Clutch Housing & 3rd Clutch Piston Spring Plate
Courtesy of GENERAL MOTORS CORP.

10. Install into the 3rd clutch housing (821) the 3rd clutch piston, spring plate (817) with the cone facing up as shown.

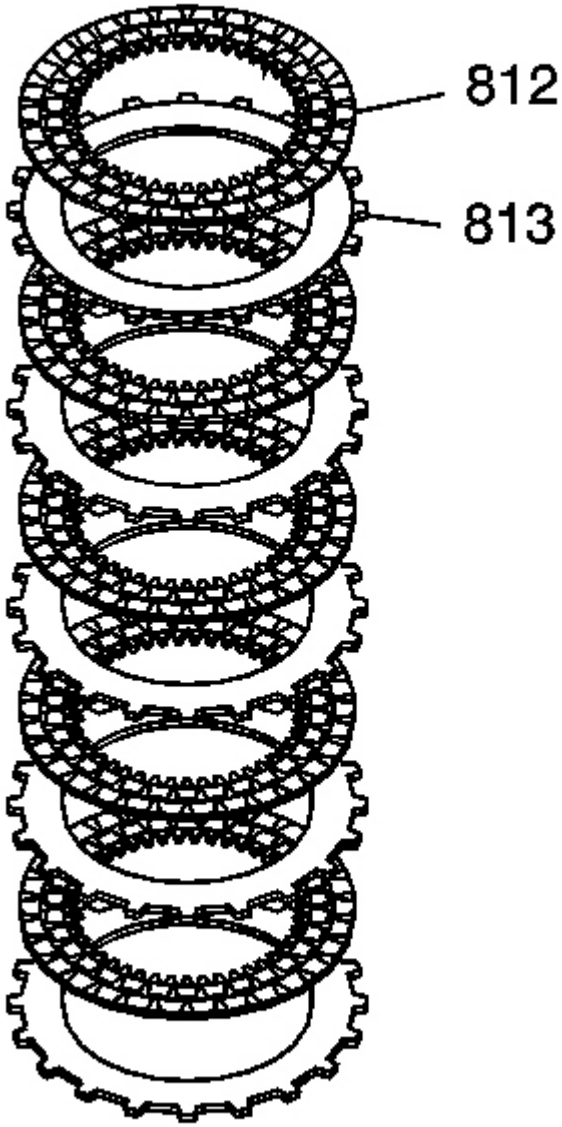

Fig. 347: 3rd Clutch Housing & Components Removed
Courtesy of GENERAL MOTORS CORP.

11. Install into the 3rd clutch housing (821) the following components:
    - 3rd clutch steel plate (813)
    - 3rd clutch fiber plate (812)
12. Alternately install the above components until a total of 5 each have been installed.

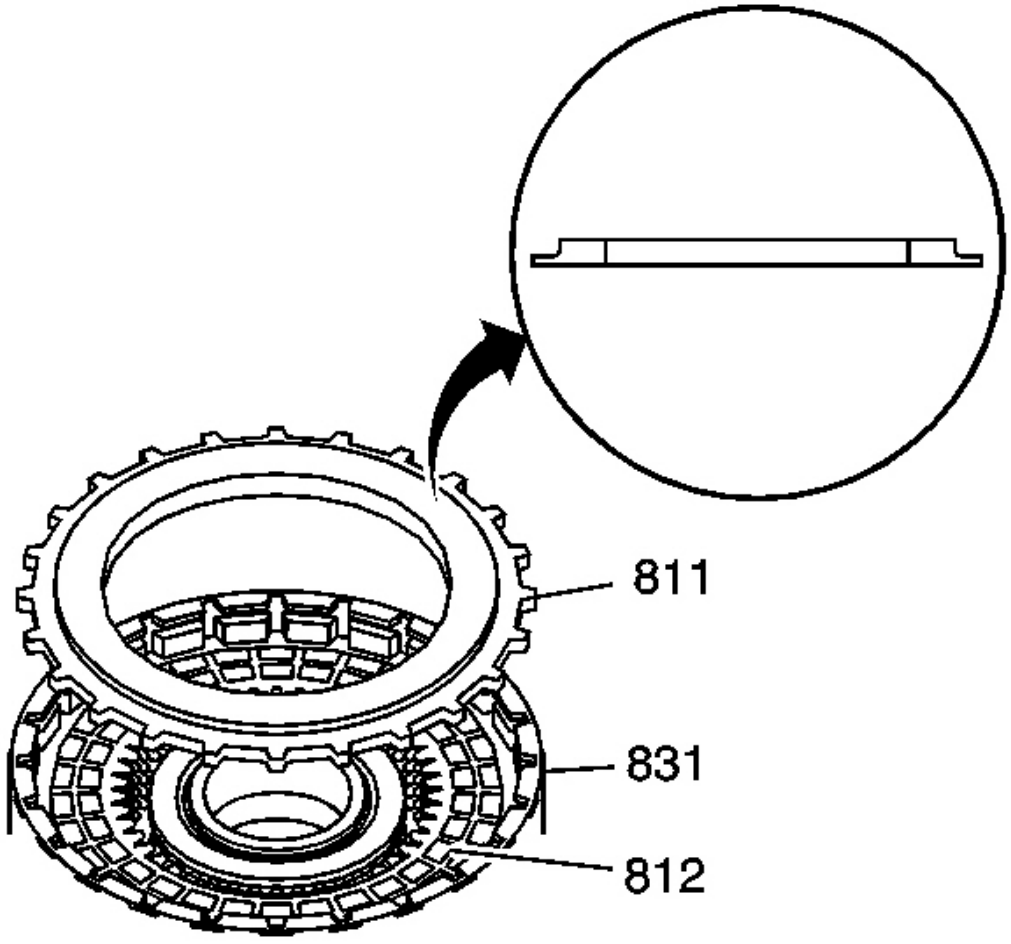

Fig. 348: 3rd Clutch Selective Backing Plate & 3rd Clutch Fiber Plate
Courtesy of GENERAL MOTORS CORP.

13. Install the 3rd clutch selective backing plate (811) with the flat side facing the last 3rd clutch fiber plate (812) as shown in the insert.

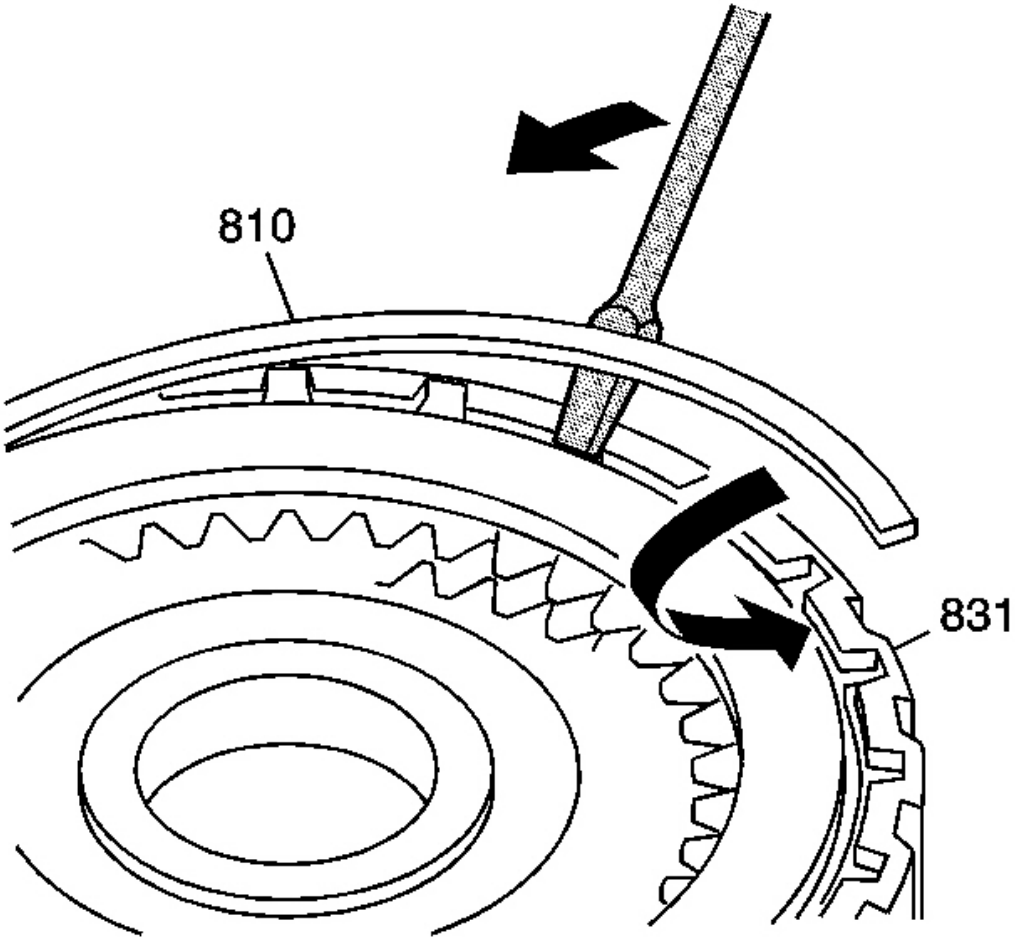

Fig. 349: Installing 3rd Clutch Backing Plate Retaining Ring Into Groove Of 3rd Clutch Housing Using J 28585
Courtesy of GENERAL MOTORS CORP.

14. Using **J 28585** , install the 3rd clutch backing plate 137 mm retaining ring (810) into the groove of the 3rd clutch housing (831).
15. Measure the clutch backing plate clearance. Refer to **Clutch Backing Plate Clearance Measurement** .

3RD CLUTCH SHAFT ASSEMBLE

Tools Required

- **DT 46509** Tube Style Driver

- **SA9179NE** Dial Indicator

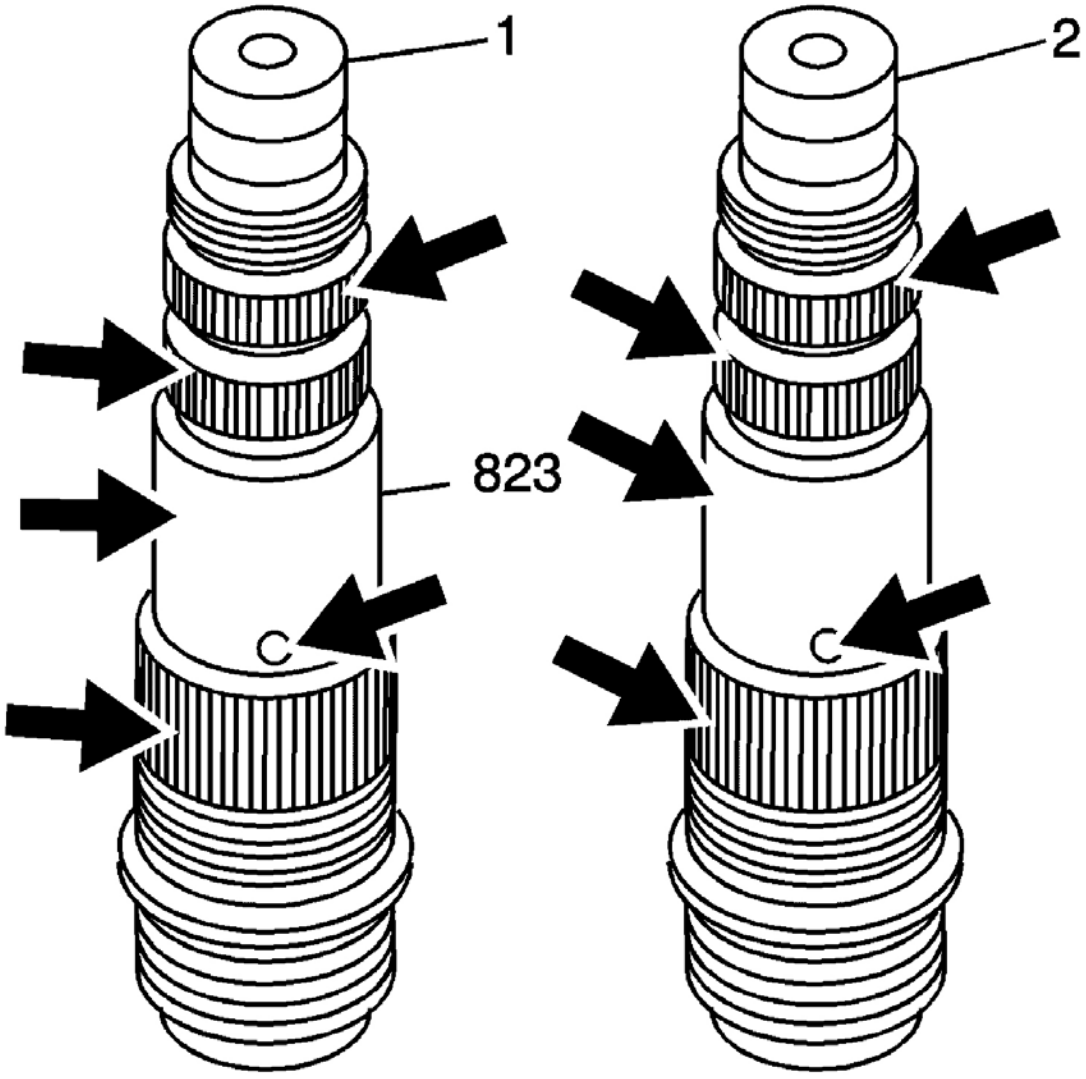

Fig. 350: Inspecting The 3rd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the transaxle has a failure of the coast clutch sprag assembly or any of the below parts, a service kit is available.
Replace all of the parts of the kit to prevent loss of adequate lubrication.
The kit includes the following parts:

- **Torque converter housing**
- **1st/2nd clutch shaft**
- **3rd clutch shaft**

- **1st drive gear**
- **Coast clutch sprag assembly**

1. Inspect the 3rd clutch shaft to determine if the fluid passage hole matches the 1st design or 2nd design. In the 1st design (1) the fluid passage hole diameter is 4.0 mm. In the 2nd design (2) the fluid passage hole diameter is 3.7 mm.

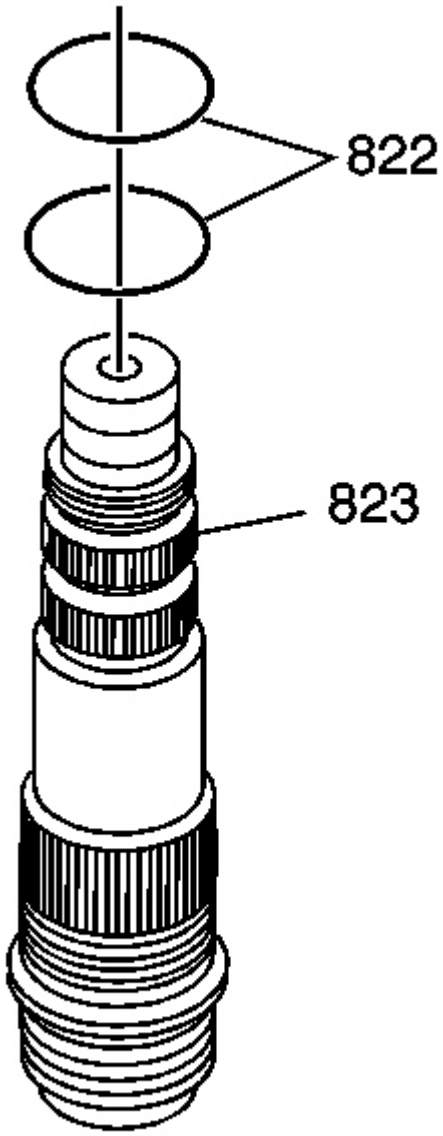

Fig. 351: 3rd Clutch Housing Fluid Passage O-Ring Seals & 3rd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The 3rd clutch shaft fluid passage seals (824) are installed after the installed height measurement.

2. Wrap the 3rd clutch shaft (823) splines with tape.

3. Install 2 new 26.7 mm x 1.9 mm 3rd clutch housing fluid passage O-ring seals (822) in the 3rd clutch O-ring grooves.
4. Remove the tape from the 3rd clutch shaft (823).

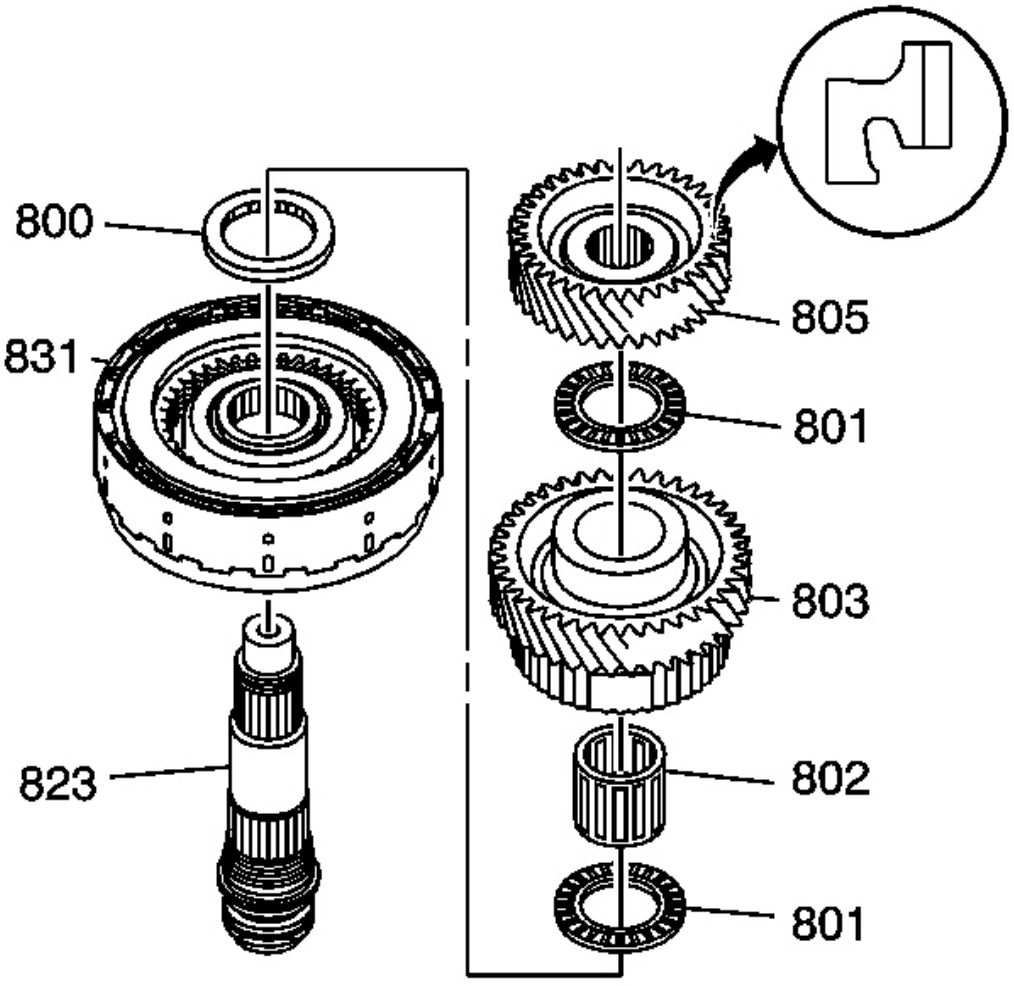

Fig. 352: 3rd Clutch Assembly & Components Removed
Courtesy of GENERAL MOTORS CORP.

5. Install the 3rd clutch assembly (831) on the 3rd clutch shaft (823).
6. Install the 53 mm 3rd drive gear and clutch hub bearing race (800).
7. Install the 3rd drive gear and clutch hub 30 mm x 52 mm x 3 mm thrust bearing (801).
8. Install the 3rd drive gear and clutch hub 30 mm x 36 mm x 3 mm inner bearing (802).

9. Install the 3rd drive gear and clutch hub (803).
10. Install the 3rd driven gear and clutch hub 30 mm x 52 mm x 3 mm thrust bearing (801).
11. Place the 3rd driven gear (805) on the 3rd clutch shaft (823) with the hub protrusion facing down as shown and align the splines.

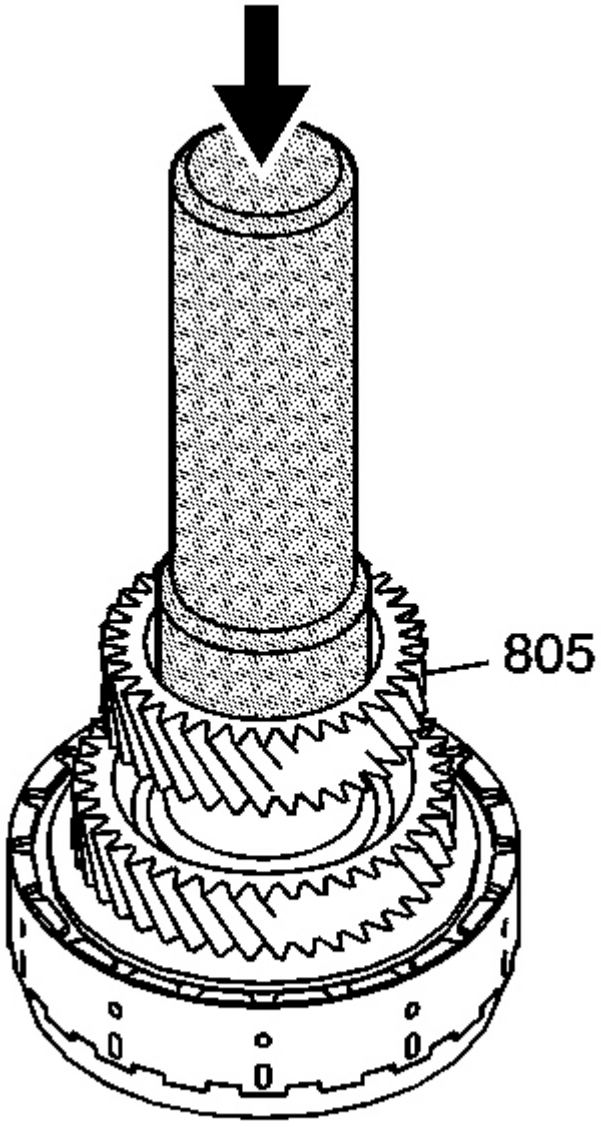

Fig. 353: Installing 3rd Driven Gear Using DT 46509 And A Hydraulic Press
Courtesy of GENERAL MOTORS CORP.

12. Using **DT 46509** and a hydraulic press, Install the 3rd driven gear (805) until the gear seats on the shoulder of the 3rd clutch shaft.

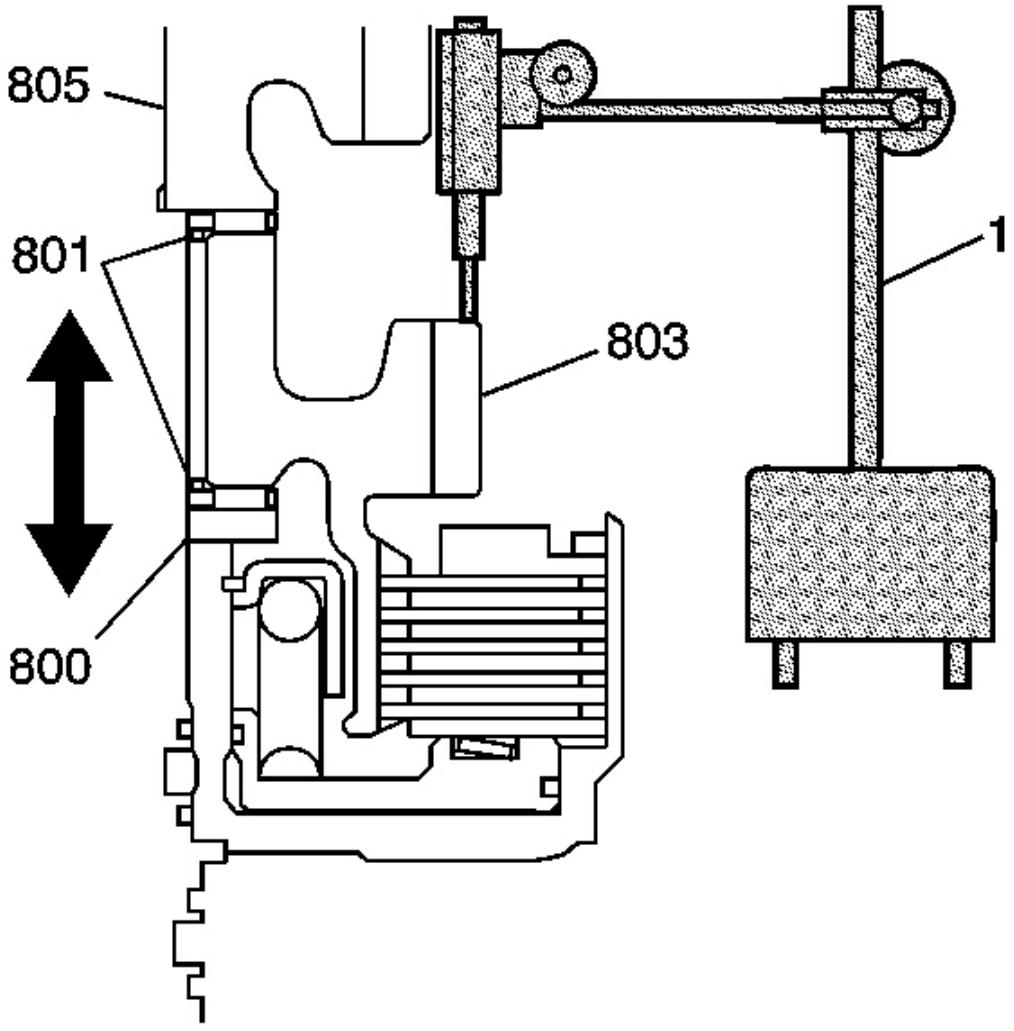

Fig. 354: Measuring The 3rd Drive Gear Axial Clearance Using SA91979NE
Courtesy of GENERAL MOTORS CORP.

13. Using **SA9179NE** (1) measure the 3rd drive gear (803) axial clearance.
    1. Position **SA9179NE** gage pointer on the top of the gear teeth.
    2. Zero the gage.
    3. Lift up on the 3rd drive gear (803) to measure the clearance.

4. Measure the axial clearance in 3 different locations by rotating the 3rd drive gear.
5. Average the 3 measurements for the axial clearance.

   Specification: The 3rd gear axial clearance is 0.005-0.045 mm (0.0002-0.0018 in)

14. If the clearance exceeds the specification, replace the 3rd drive gear thrust bearing race (800) with the correct thickness.
15. If the clearance exceeds the maximum with the thickest bearing race (800), inspect the following:
    - 3rd driven gear (805) not installed completely
    - 3rd drive gear (803) worn thrust surface
    - 3rd drive gear thrust bearing (801) worn or damaged
    - 3rd driven gear (805) worn thrust surface
16. If the clearance is lower than the specifications with the thinnest bearing race (800), inspect for burrs or contamination of debris between the bearing thrust surfaces.

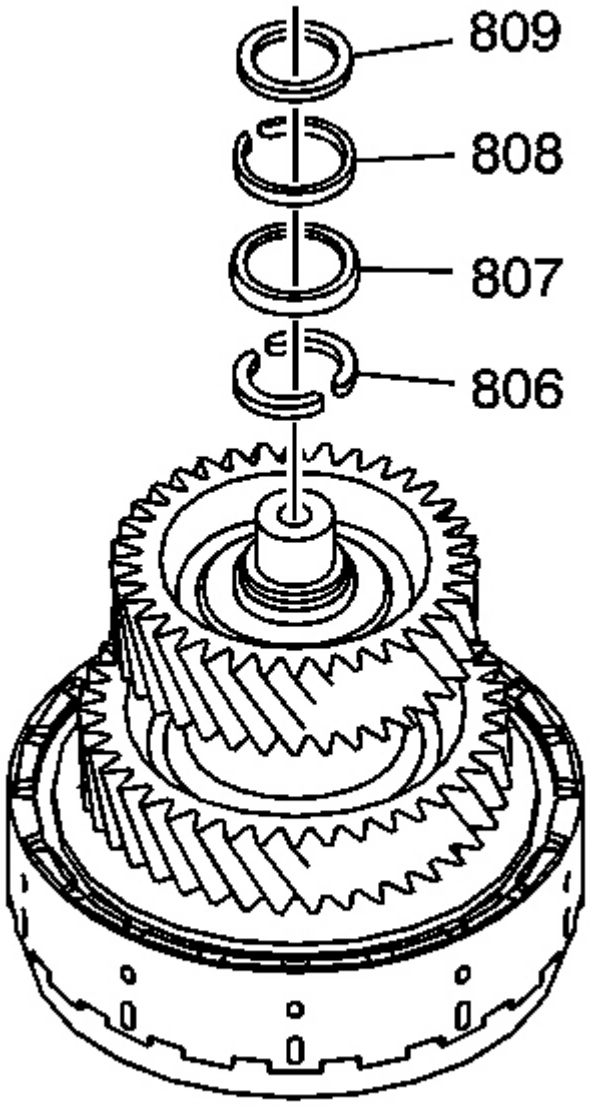

Fig. 355: 3rd Driven Gear Retaining Ring & Cap Removed
Courtesy of GENERAL MOTORS CORP.

17. Install the 3rd driven gear retaining ring (806) on the 3rd clutch shaft (823).
18. Install the 3rd driven gear retaining ring cap (807).
19. Install the 3rd driven gear retaining ring cap 24 mm retaining ring (808).
20. Install the 3rd clutch shaft 26.5 mm washer (809). The correct thickness of the washer will be determined

during the installed height measurement procedure. Refer to **3rd Clutch Shaft Installed Height Measurement** .

GENERAL VALVE BODY SERVICE INSTRUCTIONS

Valve Body Repair

Valve body repair is only necessary if 1 or more of the valves in a valve body do not slide smoothly in their bores. Use this procedure to free any questionable or binding valves.

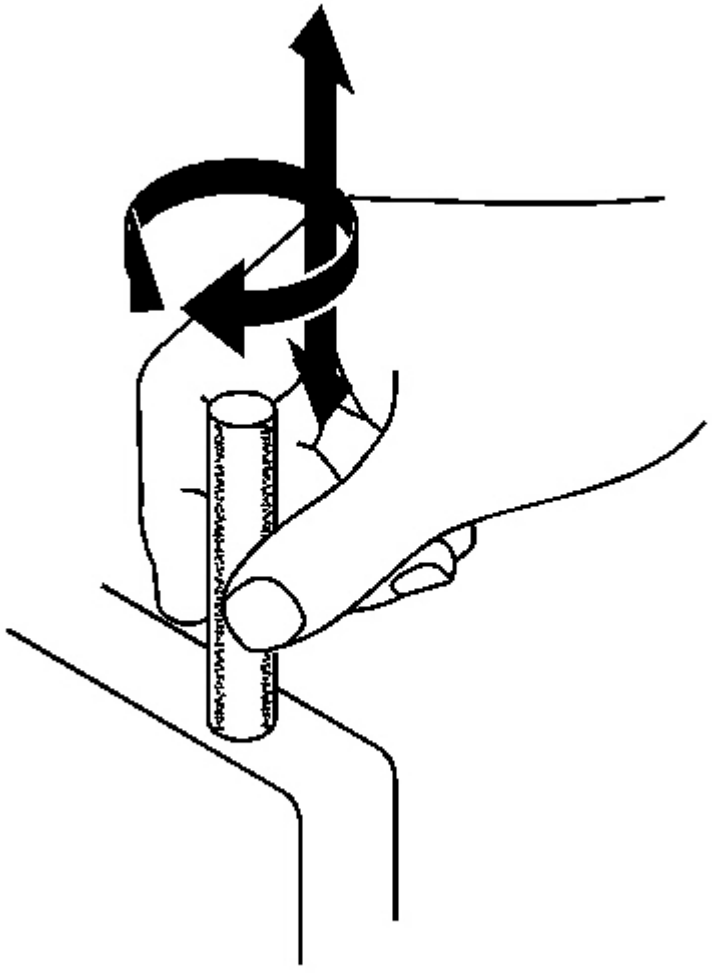

Fig. 356: Sticking Valve Drops Out Of The Bore
Courtesy of GENERAL MOTORS CORP.

1. Soak a sheet of 600 abrasive paper in automatic transmission fluid for about 30 minutes.
2. Carefully tap the valve body so the sticking valve drops out of its bore. It may be necessary to use a small pocket style screwdriver to pry the valve free. Be careful not to scratch the bore with the screwdriver.

IMPORTANT: The valve body is aluminum and doesn't require much polishing to remove any burrs.

3. Inspect the valve for any scuff-marks. Use the automatic transmission fluid-soaked 600 paper to polish off any burrs that are on the valve, then wash the valve in solvent and dry it with compressed air.
4. Roll up half of automatic transmission fluid-soaked 600 paper and insert it in the valve bore of the sticking valve. Twist the paper slightly, so that it unrolls and fits the bore tightly, and then polish the bore by twisting the paper as you push it in and out.
5. Remove the 600 paper. Thoroughly wash the entire valve body in solvent.

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

6. Using compressed air, dry the valve body.

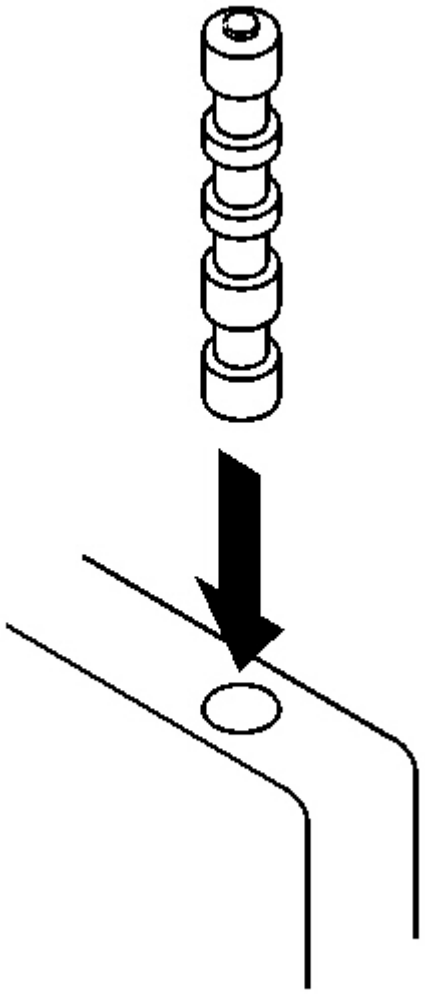

Fig. 357: Inserting Valve Into The Bore
Courtesy of GENERAL MOTORS CORP.

7. Coat the valve with automatic transmission fluid and then drop it into its bore. It should drop to the bottom of the bore under its own weight. If not, repeat the previous steps then retest. If the valve still sticks, replace the valve body.
8. Remove the valve, and thoroughly clean it and the valve body with solvent.
9. Using compressed air, dry all parts.
10. Assemble using automatic transmission fluid as a lubricant.

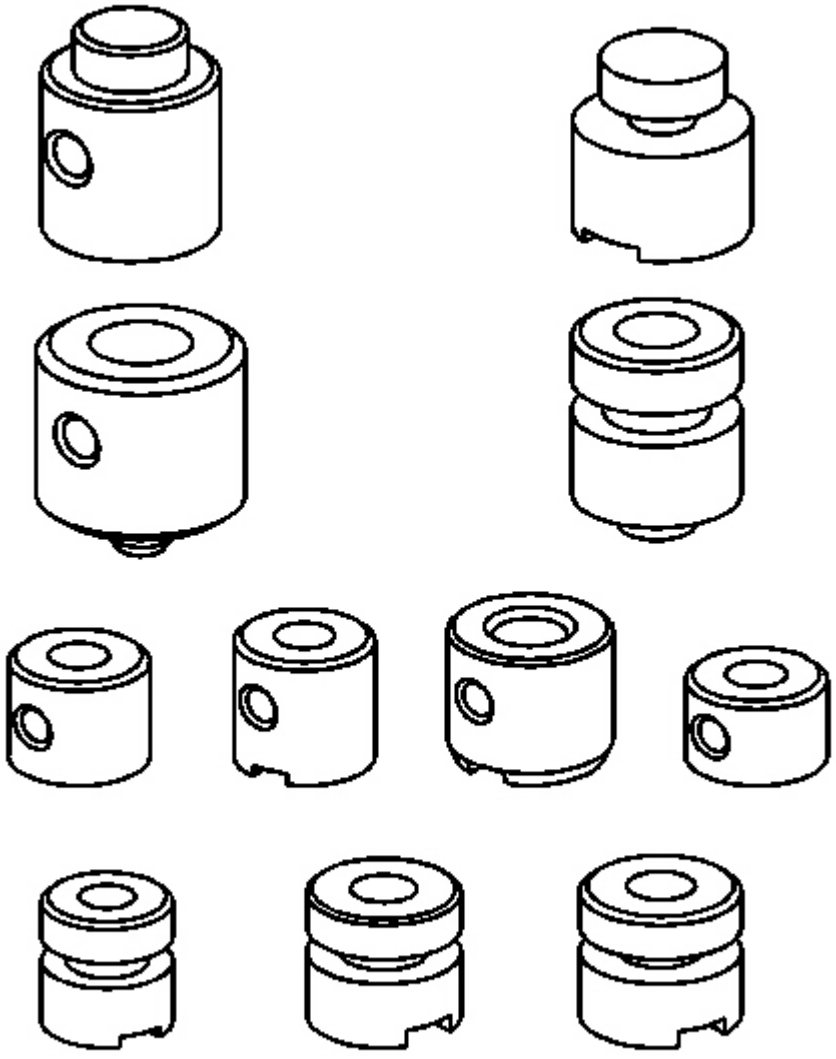

Fig. 358: Installing Valves & Springs In Sequence
Courtesy of GENERAL MOTORS CORP.

1. Coat all parts with automatic transmission fluid before assembly.
2. Install the valve(s) and spring(s) in the sequence shown for the main control valve body, servo valve body, regulator valve body, and accumulator body.
3. Secure the bore plug with the correct bore plug retainer.

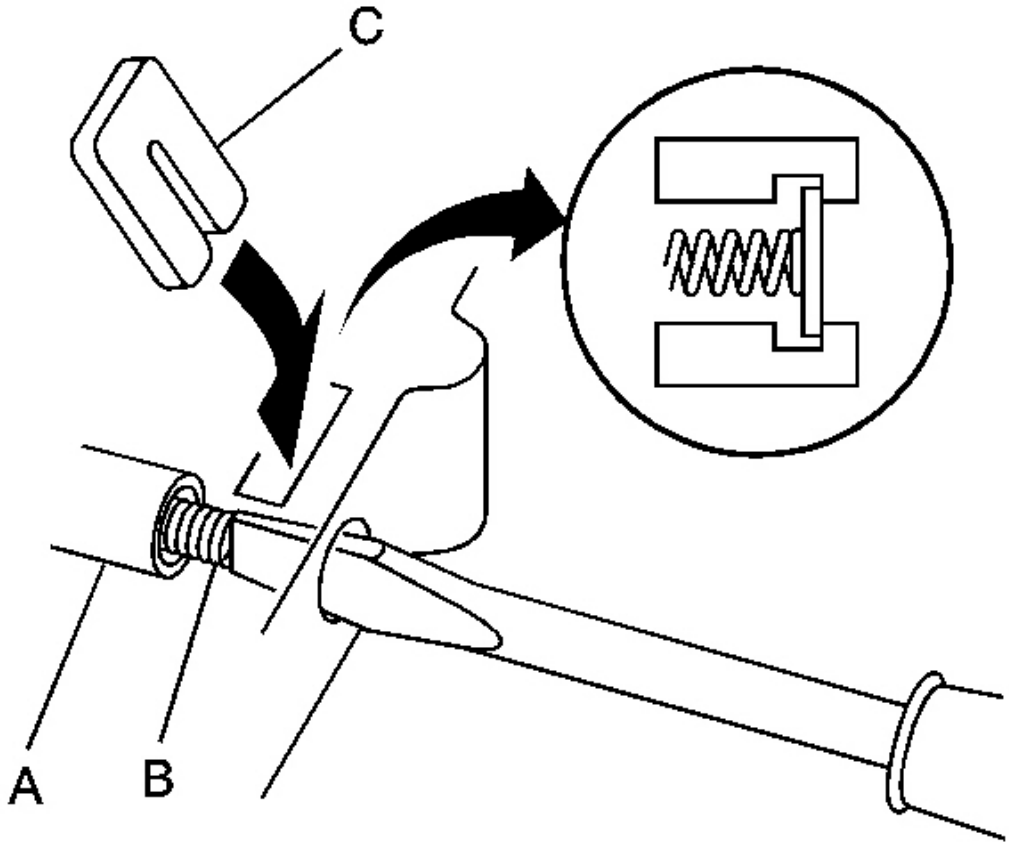

Fig. 359: Valves, Valve Springs & Spring Retainer
Courtesy of GENERAL MOTORS CORP.

4. Install the correct valve(s) (A) and valve spring(s) (B) in the correct valve body bore. Push the valve spring in with a screwdriver, and then install the correct spring retainer (C).

REGULATOR VALVE BODY ASSEMBLY OVERHAUL

Disassembly Procedure

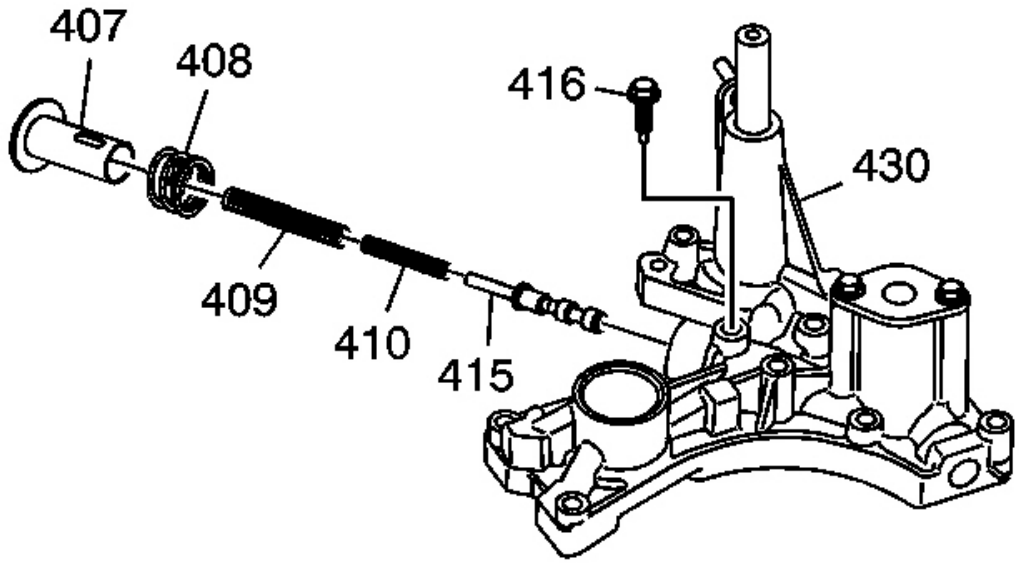

Fig. 360: Pressure Regulator Valve Spring Cap Guide & Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Some valves are under pressure. Cover the bores while removing the retainers and plugs or personal injury could result.

1. Hold the regulator spring cap (407) in place and remove the pressure regulator valve spring cap guide bolt (416).
2. Release the spring cap (407) slowly and remove.
3. Remove the following components:
    - Stator reaction spring (408)
    - Regulator valve outer spring (409)
    - Regulator valve inner spring (410)
    - Regulator pressure valve (415)

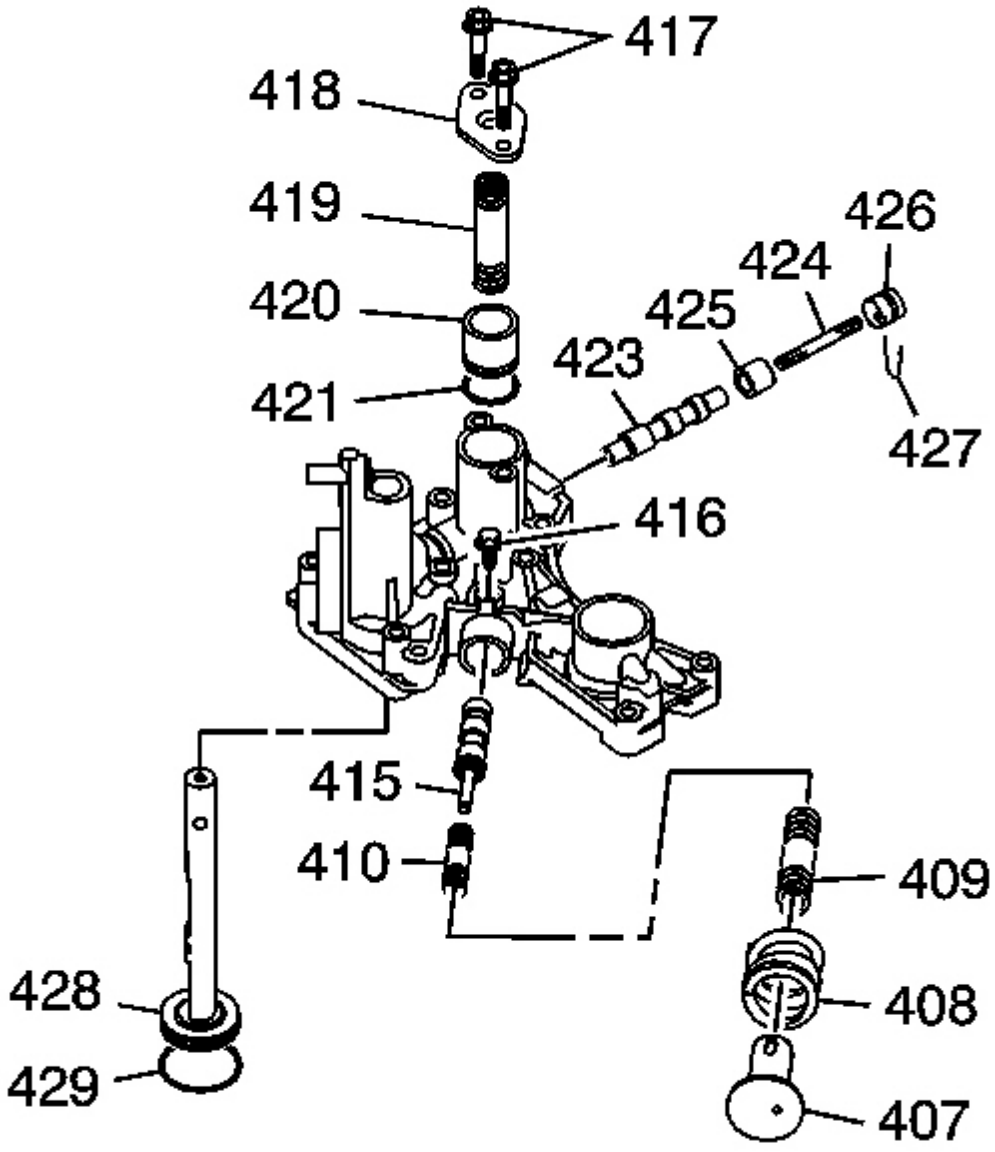

Fig. 361: 3rd Accumulator Piston Bore Cover Bolts & Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the 3rd accumulator piston bore cover bolts (417), then remove the following components:
   - 3rd accumulator piston bore cover (418)
   - 3rd clutch accumulator piston return spring (419)

- 3rd clutch accumulator piston (420)
- 3rd clutch accumulator piston O-ring (421)

5. Remove the valve bore plug retainer clip (427), then remove the following components:
    - Valve bore plug (426)
    - TCC lockup control valve return spring (424)
    - TCC lockup control valve spacer (425)
    - TCC lockup control valve (423)
6. Remove the reverse shift fork shaft (428)
7. Remove the reverse shift fork shaft seal (429)
8. Clean all parts thoroughly and then dry the components.

Inspection Procedure

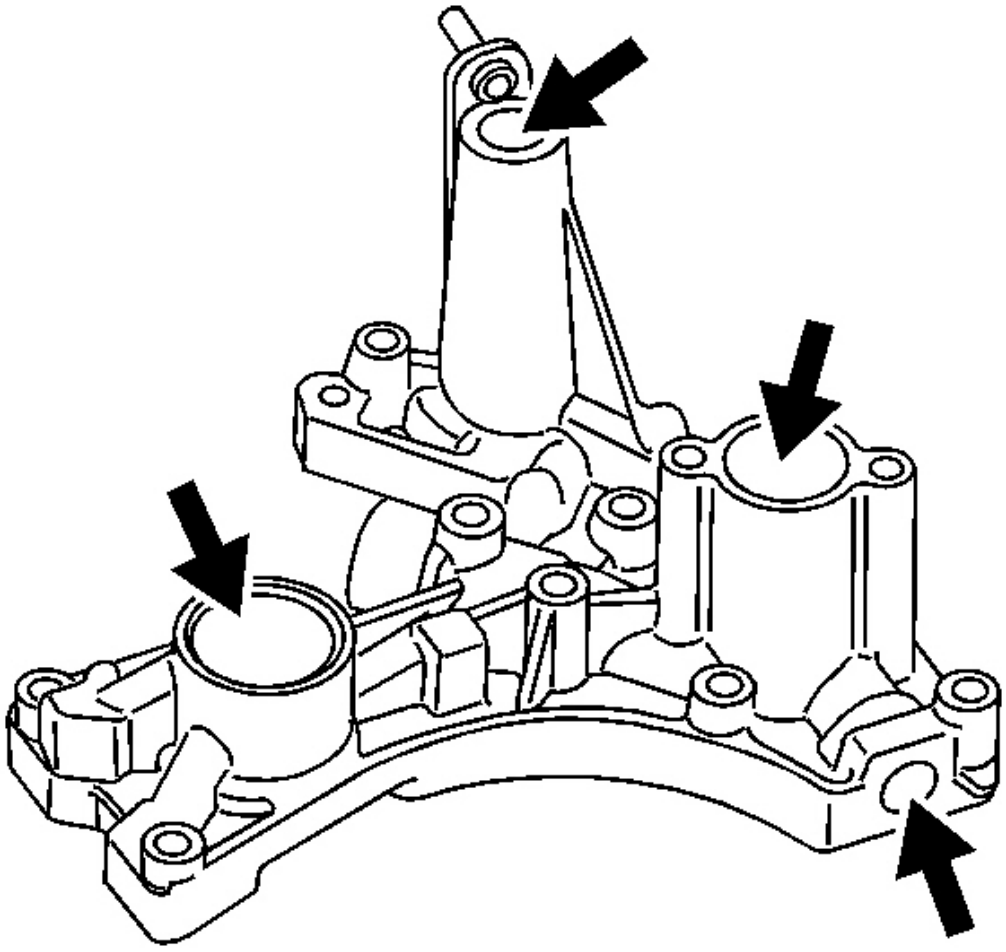

Fig. 362: Inspecting All Valves For Free Movement
Courtesy of GENERAL MOTORS CORP.

1. Inspect all valves for free movement. If any fail to slide freely, refer to **General Valve Body Service Instructions** .
2. Clean all of the regulator valve body bore passages.
3. Lubricate the regulator valve body bores with automatic transmission fluid.

Assembly Procedure

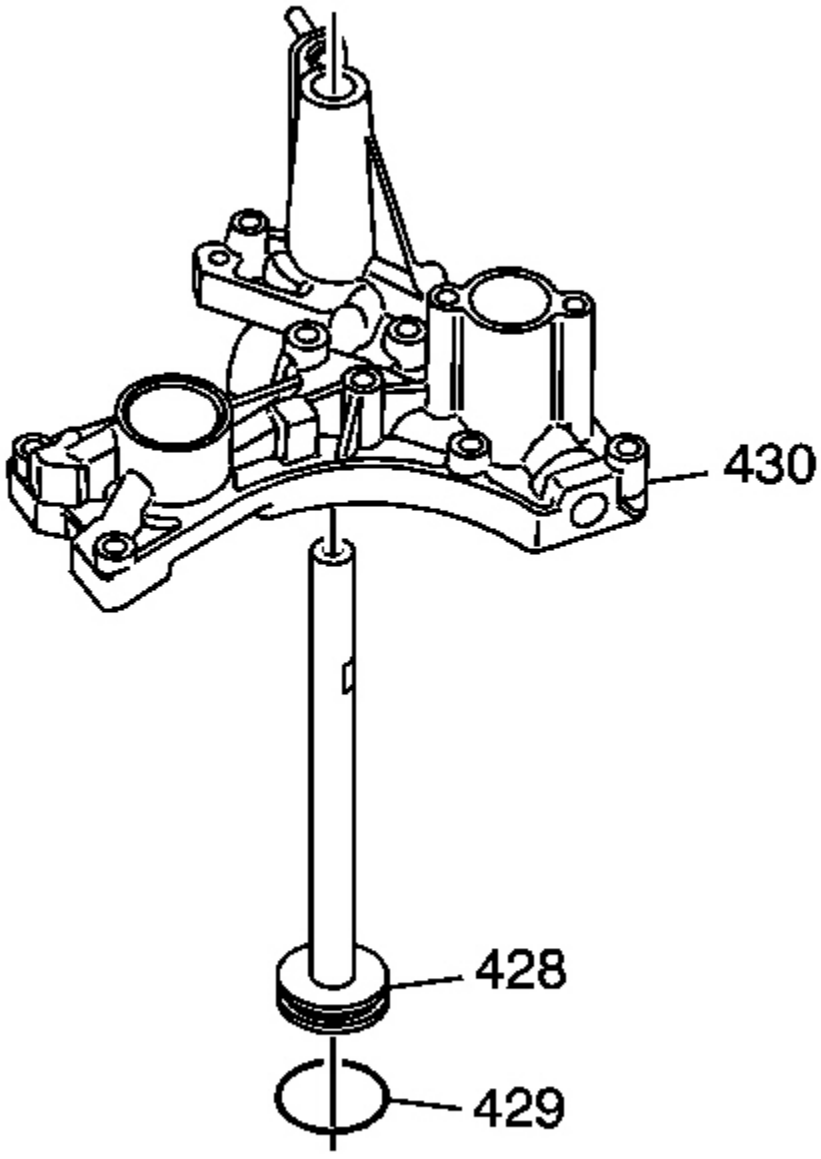

Fig. 363: Reverse Shift Fork, O-Ring Seal & Regulator Valve Body
Courtesy of GENERAL MOTORS CORP.

1. Lubricate all parts with automatic transmission fluid during assembly.
2. Install a NEW 31 x 2.7 mm reverse shift fork O-ring seal (429) in the groove of the reverse shift fork (428).

3. Install the reverse shift fork (428) into the regulator valve body (430) until it locks into the spring-loaded retainer ball.

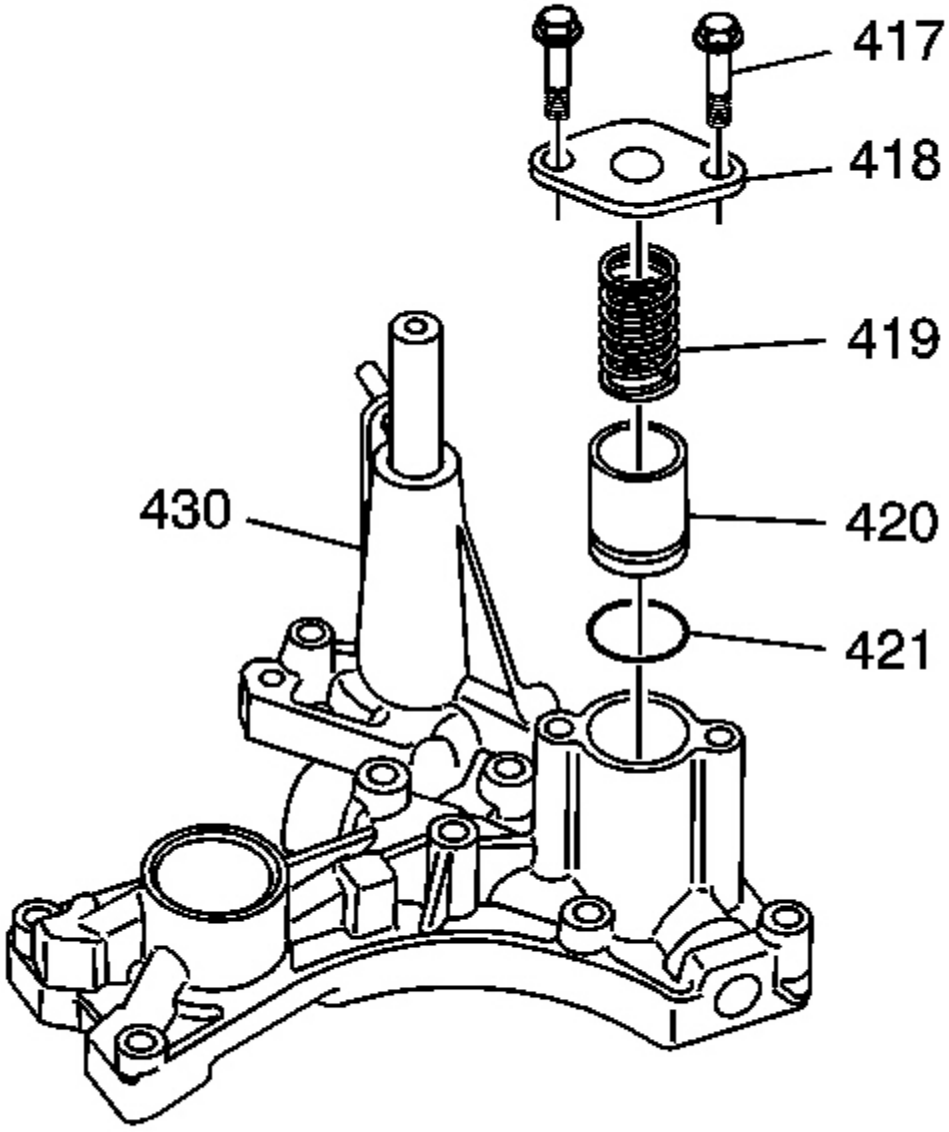

Fig. 364: 3rd Clutch Accumulator Piston & Components
Courtesy of GENERAL MOTORS CORP.

4. Install a new 21.2 x 2.4 mm 3rd clutch accumulator piston O-ring seal (421) on the 3rd clutch

accumulator piston (420).

5. Install the 3rd clutch accumulator piston (420).
6. Install the 3rd clutch accumulator piston return spring (419).
7. Install the 3rd clutch accumulator piston bore cover (418).

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Install the M6 x 1.0 x 30 mm 3rd clutch accumulator piston bore cover bolt (417).

Tighten: Tighten the piston bore cover bolt to 12 N.m (106 lb in)

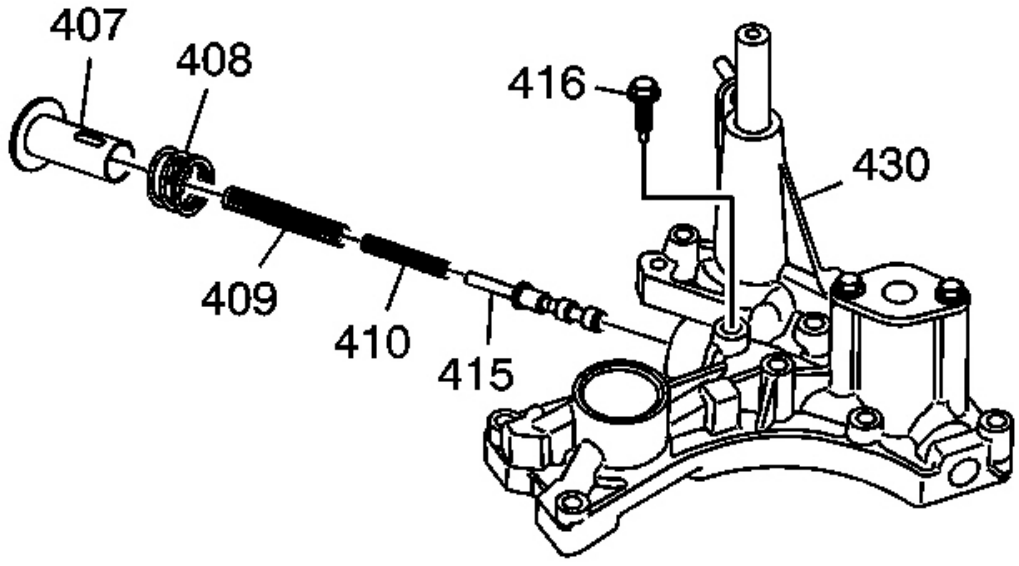

Fig. 365: Pressure Regulator Valve Spring Cap Guide & Bolt
Courtesy of GENERAL MOTORS CORP.

9. Install the pressure regulator valve (415) into the regulator valve body (430).
10. Install the pressure regulator valve inner spring (410).
11. Install the pressure regulator valve outer spring (409).
12. Install the stator action spring (408).
13. Align the slot in the pressure regulator valve spring cap (407) with the hole for the cap bolt.
14. Press the spring cap into the regulator valve body.
15. Install the pressure regulator valve spring cap guide M6 x 1.0 x 30 mm bolt (416).

Tighten: Tighten the regulator spring cap guide bolt to 12 N.m (106 lb in)

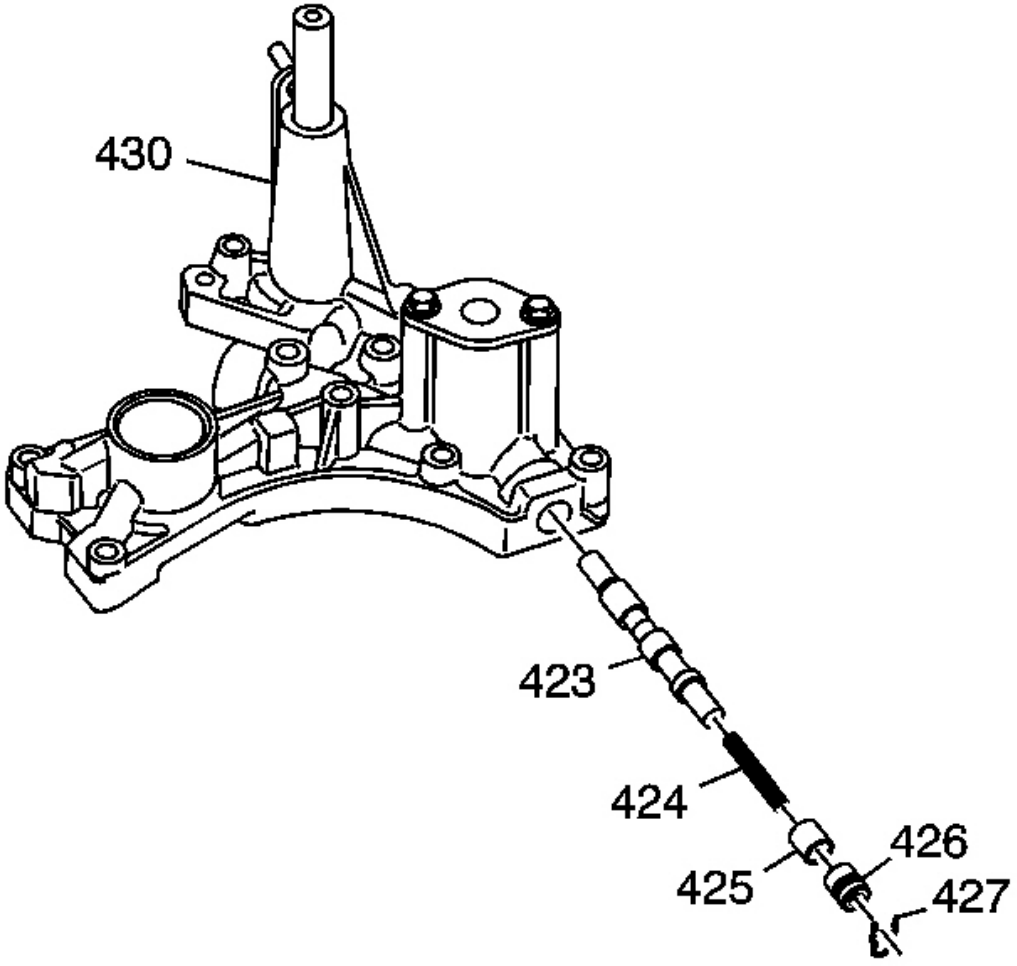

Fig. 366: TCC Lock-Up Control Valve & Components
Courtesy of GENERAL MOTORS CORP.

16. Install the TCC lock-up control valve (423) into the regulator valve body (430).
17. Install the TCC lock-up control valve 49.2 mm return spring (424).
18. Install the TCC lock-up control valve 15 mm spacer (425).
19. Install the 15 mm valve bore plug (426).
20. Install the valve bore plug retainer clip (427).

ACCUMULATOR VALVE BODY ASSEMBLY OVERHAUL

Removal Procedure

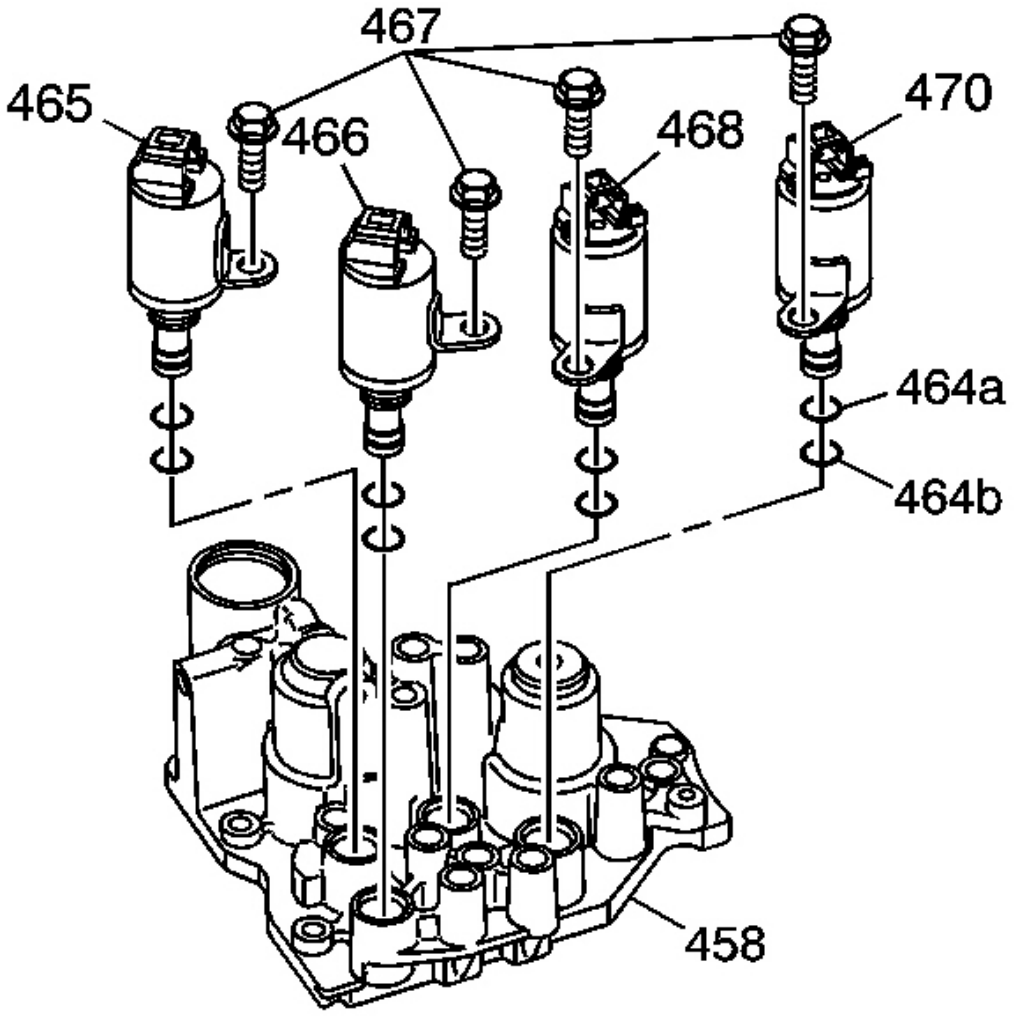

Fig. 367: Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not hold the solenoid valve connector in order to remove or install a solenoid valve. Hold the solenoid valve body. Damage to the solenoid valve may result if the solenoid valve is removed by the connector.

1. Remove the following components from the accumulator valve body (458):
   - 4 solenoid valve bolts (467)

- B shift solenoid valve (470)
- TCC solenoid valve (468)
- A Shift solenoid valve (466)
- C Shift solenoid valve (465)

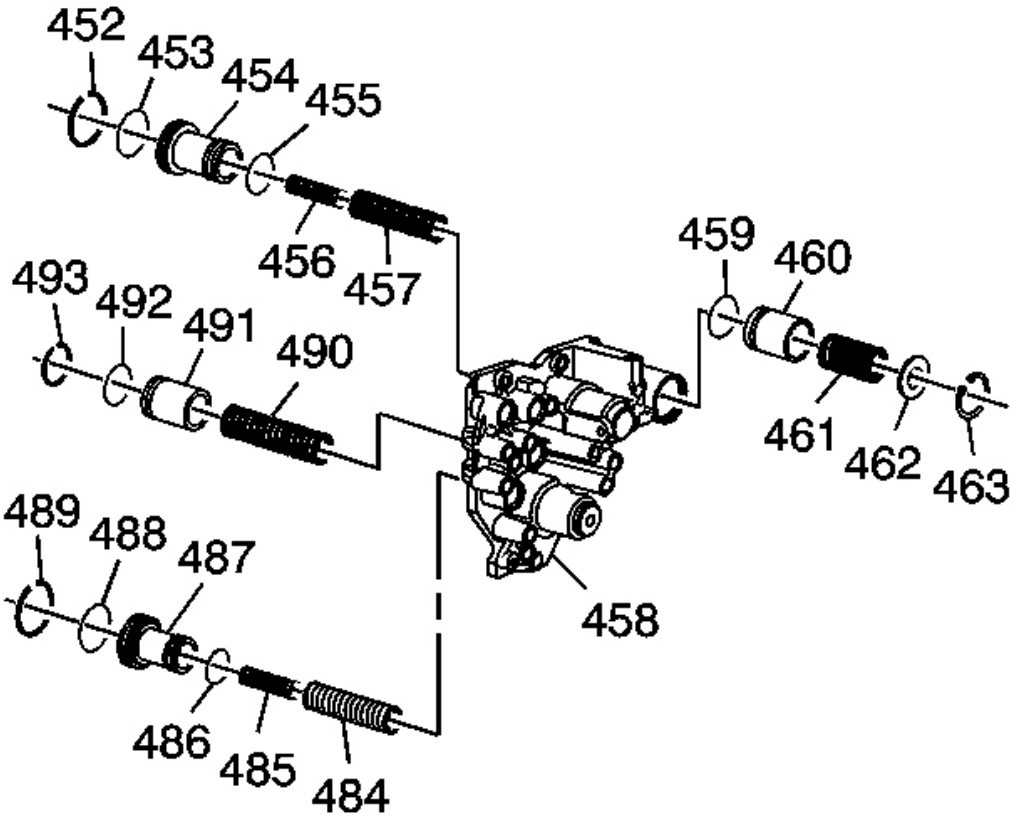

Fig. 368: 4th Clutch Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

2. Remove the following components from the accumulator valve body (458):
   - 4th clutch accumulator spring cover retaining ring (463)

- 4th clutch accumulator spring cover (462)
- 4th clutch accumulator piston spring (461)
- 4th clutch accumulator piston (460)
- 4th clutch accumulator piston outer O-ring seal (459)

3. Remove the following components from the accumulator valve body (458):
    - 5th clutch accumulator piston retaining ring (452)
    - 5th clutch accumulator piston (454) with outer and inner O-ring seals (453, 455)
    - 5th clutch accumulator piston inner spring (456)
    - 5th clutch accumulator piston outer spring (457)
4. Remove the following components from the accumulator valve body (458):
    - 2nd clutch accumulator piston retaining ring (493)
    - 2nd clutch accumulator piston (491) with O-ring seal (492)
    - 2nd clutch accumulator piston spring (490)
5. Remove the following components from the accumulator valve body (458):
    - 1st clutch accumulator piston retaining ring (489)
    - 1st clutch accumulator piston (487) with outer and inner O-ring seals (488, 486)
    - 1st clutch accumulator piston inner spring (485)
    - 1st clutch accumulator piston return spring (484)

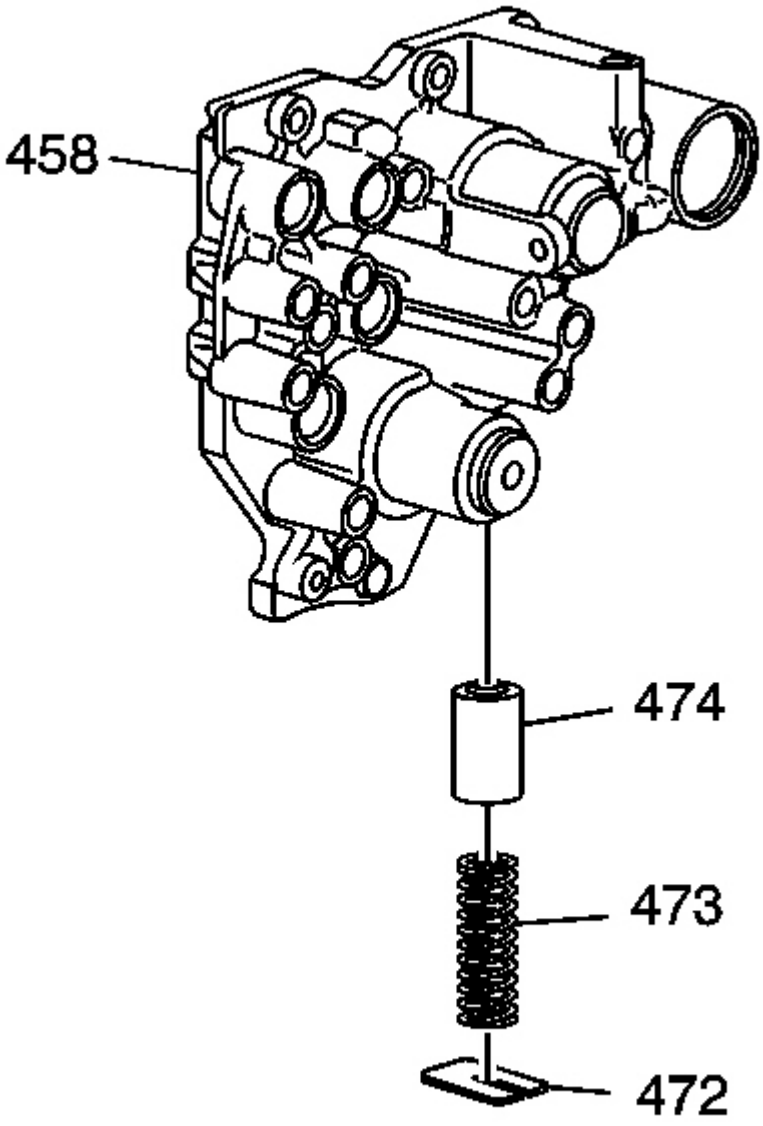

Fig. 369: Coast Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Remove the following components from the accumulator valve body (458):
    - Coast clutch accumulator valve spring retainer (472)
    - Coast clutch accumulator valve spring (473)
    - Coast clutch accumulator valve (474)

7. Clean all parts thoroughly and dry them with compressed air. Blow out all passages.
8. Inspect the accumulator valve body for scoring and damage.

Assembly Procedure

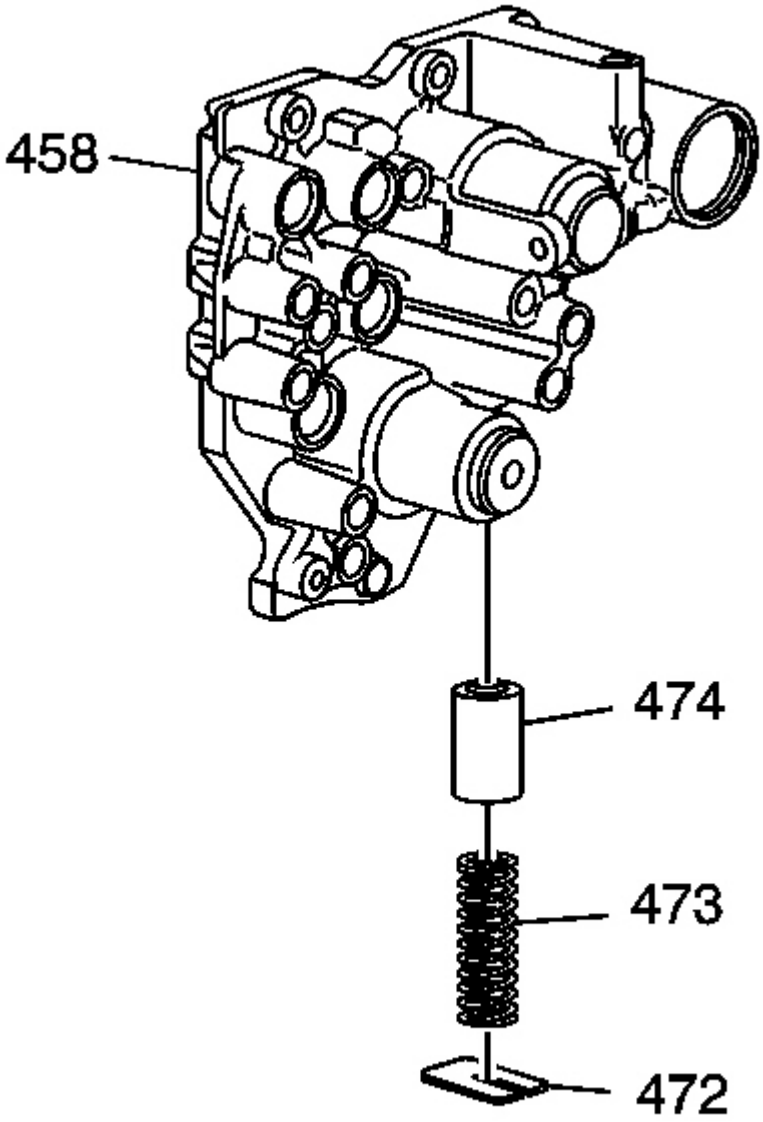

Fig. 370: Coast Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Lubricate all parts with automatic transmission fluid during assembly.
2. Install the following components into the accumulator valve body (458):
    - Coast clutch accumulator valve (474)
    - Coast clutch accumulator valve spring (473)
    - Coast clutch accumulator valve spring retainer (472)

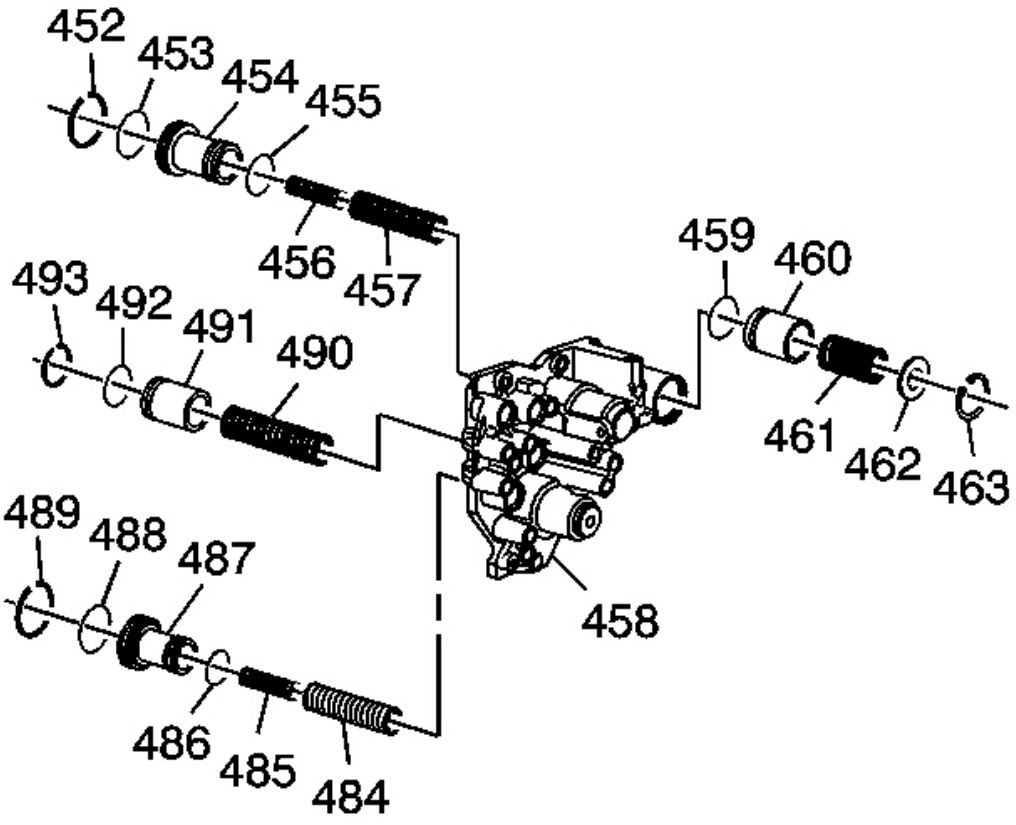

Fig. 371: 4th Clutch Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

3. Install the new O-ring seals on the 1st clutch accumulator piston (487):
    - 1st clutch accumulator piston rear O-ring seal (486)
    - 1st clutch accumulator piston front O-ring seal (488)
4. Install the following components into the accumulator valve body (458):
    - 1st clutch accumulator piston outer return spring (484)
    - 1st clutch accumulator piston inner return spring (485)

- 1st clutch accumulator piston (487)
- 1st clutch accumulator piston retainer ring (489)

5. Install the 2nd clutch accumulator piston O-ring seal (492) on the 2nd clutch accumulator piston (491).
6. Install the following components into the accumulator valve body (458):
   - 2nd clutch accumulator piston spring (490)
   - 2nd clutch accumulator piston (491)
   - 2nd clutch accumulator piston retainer ring (493)
7. Install the new O-ring seals onto the 5th clutch accumulator piston (454):
   - 5th clutch accumulator piston outer O-ring seal (453)
   - 5th clutch accumulator piston inner O-ring seal (455)
8. Install the following components into the accumulator valve body (458):
   - 5th clutch accumulator piston outer spring (457)
   - 5th clutch accumulator piston inner spring (456)
   - 5th clutch accumulator piston (454)
   - 5th clutch accumulator piston retainer ring (452)
9. Install the 4th clutch accumulator piston O-ring seal (459) on the 4th clutch accumulator piston (460).
10. Install the following components into the accumulator valve body (458):
    - 4th clutch accumulator piston (460)
    - 4th clutch accumulator piston spring (461)
    - 4th clutch accumulator piston spring cover (462)
    - 4th clutch accumulator piston spring cover retaining ring (463)

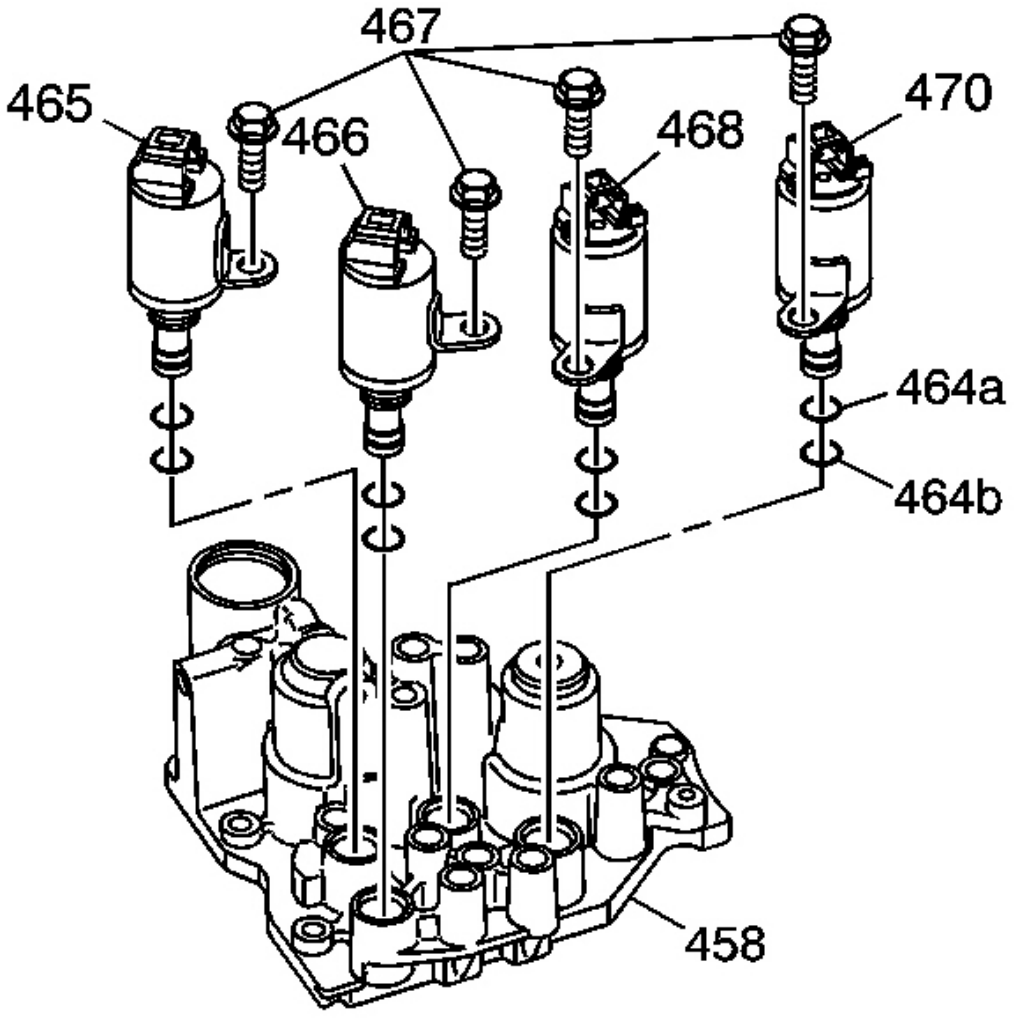

Fig. 372: Accumulator Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not hold the solenoid valve connector in order to remove or install a solenoid valve. Hold the solenoid valve body. Damage to the solenoid valve may result if the solenoid valve is removed by the connector.

IMPORTANT: A new solenoid valve has the O-ring seals. Do not remove the seals.

1. Install a new O-ring seal (464a) and (464b) on each solenoid valve, if necessary.
2. Install the A shift solenoid valve (466).

NOTE: Do not install the shift solenoid valve before installing the torque converter clutch solenoid valve. Failure to follow this instruction may result in damage to the hydraulic control system.

3. Install the torque converter clutch solenoid valve (468).
4. Install the B shift solenoid valve (470).
5. Install the C shift solenoid valve (465).

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Install the 4 solenoid valve bolts (467).

Tighten: Tighten the M6 x 1.0 x 16 mm bolts to 12 N.m (106 lb in).

SERVO VALVE BODY OVERHAUL

Removal Procedure

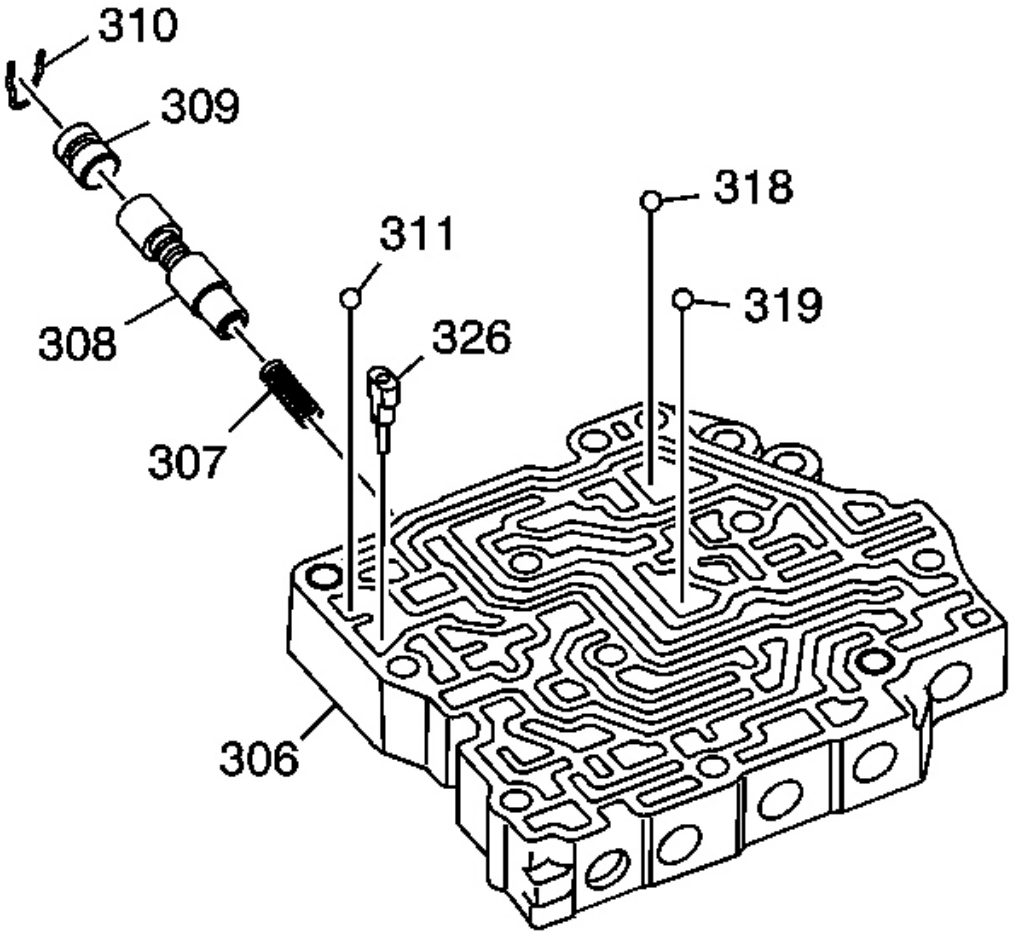

Fig. 373: Servo Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

CAUTION: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

NOTE: Do not use a magnet in order to remove the control valve body ball check valves. This may magnetize the control valve body ball check valves, causing metal particles to stick to them.

1. Remove the following steel check balls from the servo valve body (306):
   - 1st clutch accumulator check valve (311)

- 1st clutch check valve (318)
- 2nd clutch check valve (319)

2. Remove the 1st accumulator choke (326).
3. Remove the valve bore plug retainer clip (310) from the servo valve body, then remove the following components:
   - The valve bore plug (308)
   - The clutch pressure control (CPC) valve (308)
   - The CPC valve return spring (307)

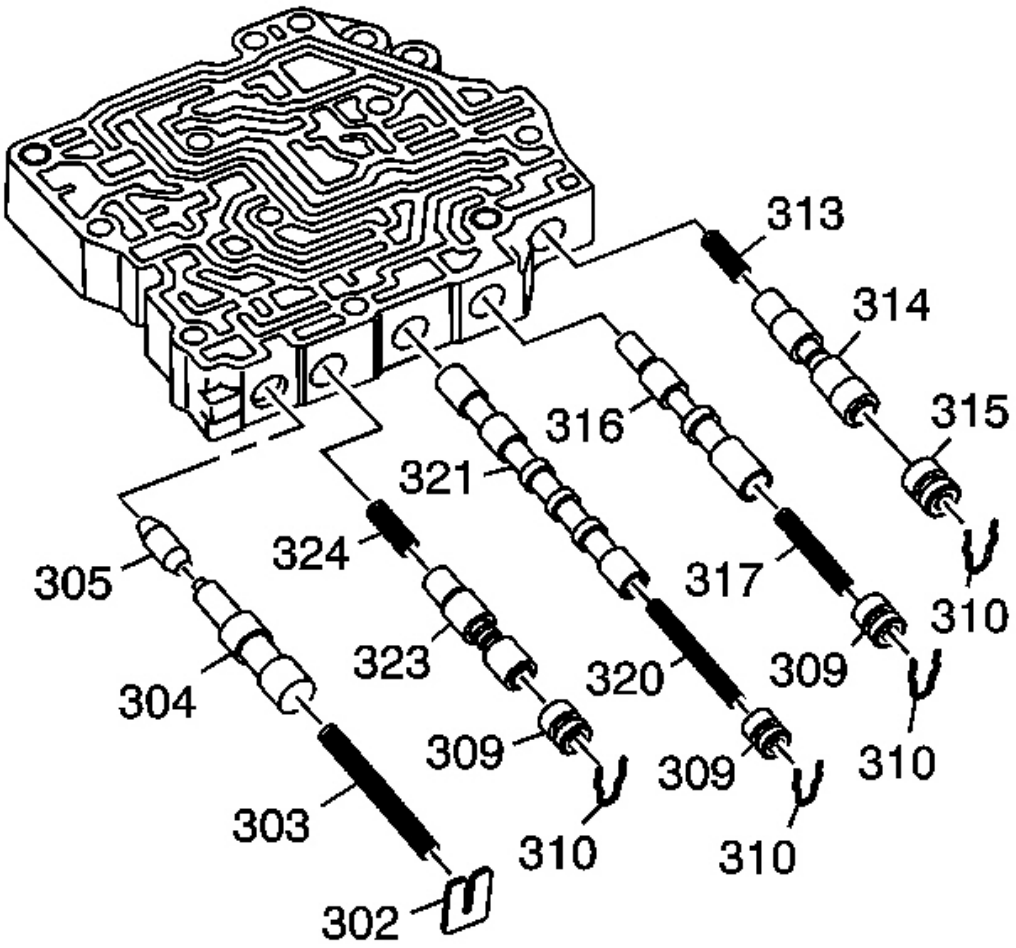

Fig. 374: Servo Valve Bore & Components Removed
Courtesy of GENERAL MOTORS CORP.

CAUTION: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.

4. Remove the following:
   - Valve bore plug retainer clip (310), bore plug (315), reverse CPC valve (314), and Reverse CPC valve return spring (313).
   - Valve bore plug retainer clip (310), bore plug (309), return spring (317), and servo control valve (316).
   - Valve bore plug retainer clip (310), bore plug (309), return spring (320), and shift valve C (321).
   - Valve bore plug retainer clip (310), bore plug (309), CPC valve A (323), and return spring (324).
   - Valve bore retainer (302), return spring (303), kick-down valve (304), and kick-down short valve (305).

Inspection Procedure

CAUTION: When you use compressed air in order to clear fluid passages and to dry parts, always aim the air pressure away from face and eyes. Always wear adequate eye protection in order to avoid injury from dirt and debris that may adhere to parts.

1. Clean all parts thoroughly and dry them with compressed air. Blow out all passages.
2. Inspect the servo valve body for scoring and damage.
3. Inspect all valves for wear or damage. If a valve does not operate, refer to **General Valve Body Service Instructions** .
4. Lubricate all parts with automatic transmission fluid during assembly.

Installation Procedure

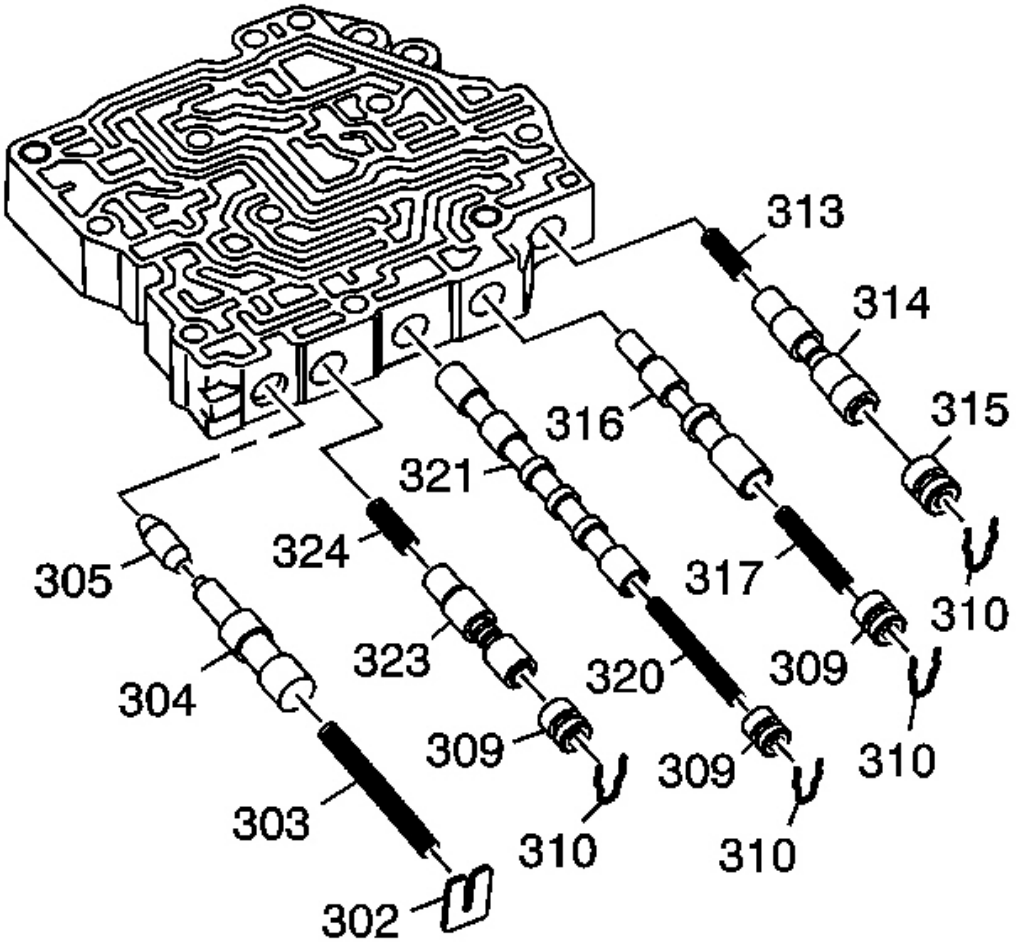

Fig. 375: Servo Valve Bore & Components Removed
Courtesy of GENERAL MOTORS CORP.

1. Install the reverse CPC valve (314), return spring (313), bore plug (315), and valve bore plug retainer clip (310).
2. Install the servo control valve (316), return spring (317), bore plug (309), and valve bore plug retainer clip (310).
3. Install the shift valve C (321), return spring (320), bore plug (309), and valve bore plug retainer clip (310).
4. Install the CPC valve A, return spring (324), control valve A (323), bore plug (309), and valve bore plug retainer clip (310).
5. Install the kick-down short valve (305), kick-down valve (304), return spring (303), and valve bore retainer plate (302).

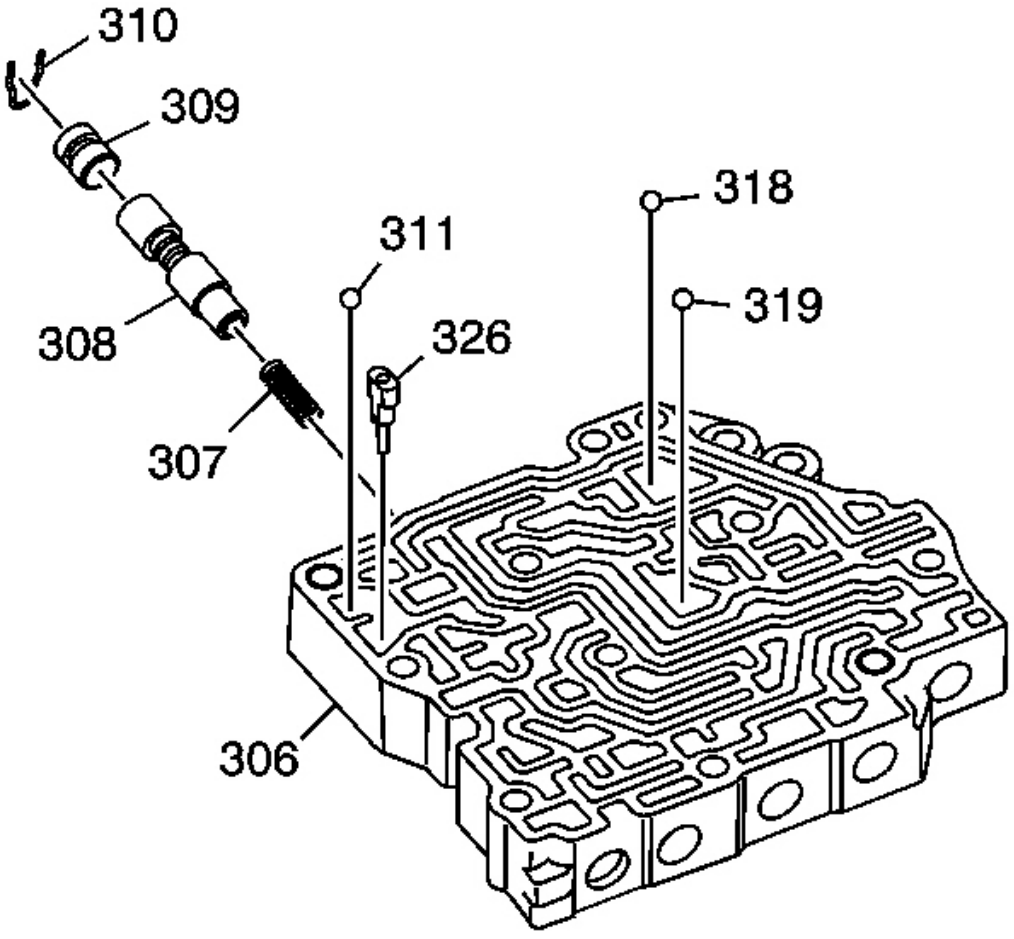

Fig. 376: Servo Valve Body & Components Removed
Courtesy of GENERAL MOTORS CORP.

6. Install the clutch pressure control valve B return spring (307), control valve B (308), bore plug (309), and retainer clip (310).
7. Install the following steel check balls in their correct passages:
   - 1st clutch accumulator check valve (311)
   - 1st clutch check valve (318)
   - 2nd clutch check valve (319)
8. Install the 1st accumulator choke (326).

MAIN CONTROL VALVE BODY ASSEMBLY OVERHAUL

Disassembly Procedure

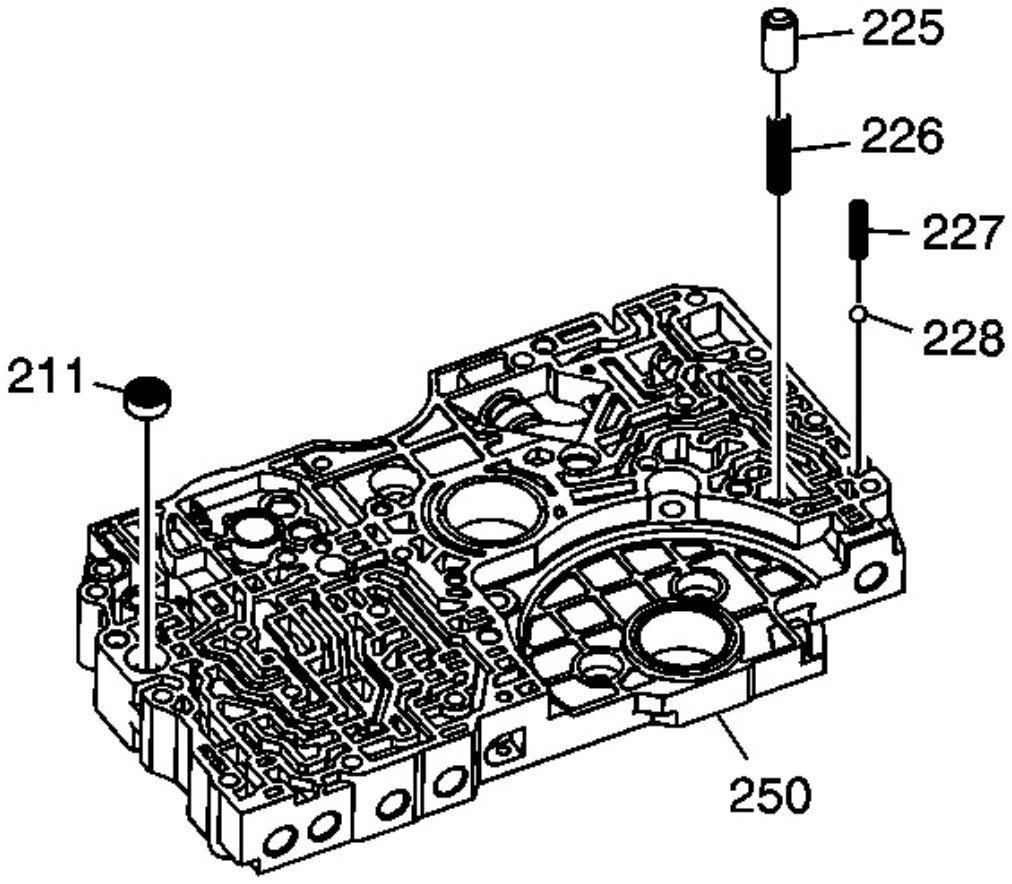

Fig. 377: Main Control Valve Body & Bolts Removed
Courtesy of GENERAL MOTORS CORP.

1. If not removed during the control valve body removal, remove the following components:
    - The transmission fluid cooler check ball (228) and spring (227)
    - The torque converter check valve (225) and return spring (226)
2. Remove the transmission fluid servo valve body filter (211)

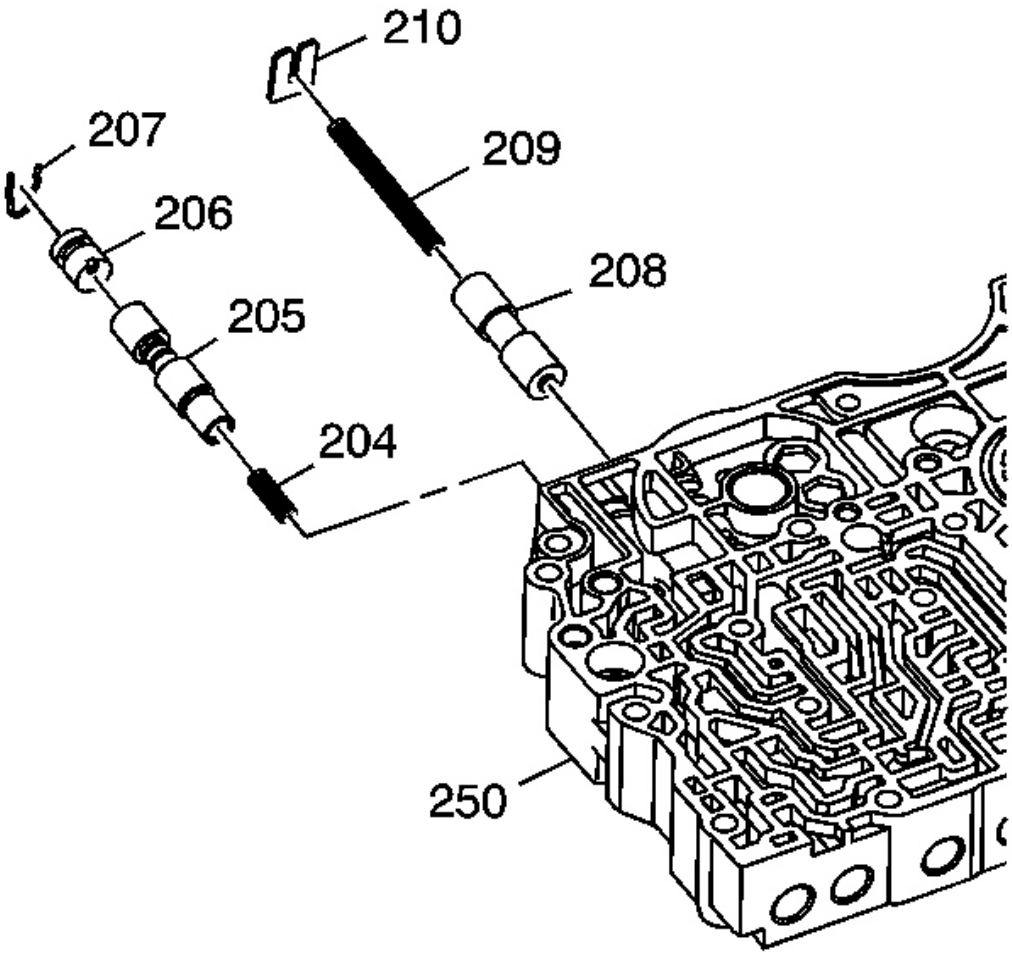

Fig. 378: Main Control Valve Body Assembly, Plugs & Clips Removed
Courtesy of GENERAL MOTORS CORP.

3. Remove the following components from the control valve body assembly (250):
    - The bore plug retainer clip (207)
    - The bore plug (206)
    - The CPC valve (205)
    - The CPC valve return spring (204)
    - The valve spring retainer (210)
    - The shift valve E return spring (209)
    - The shift valve E (208)

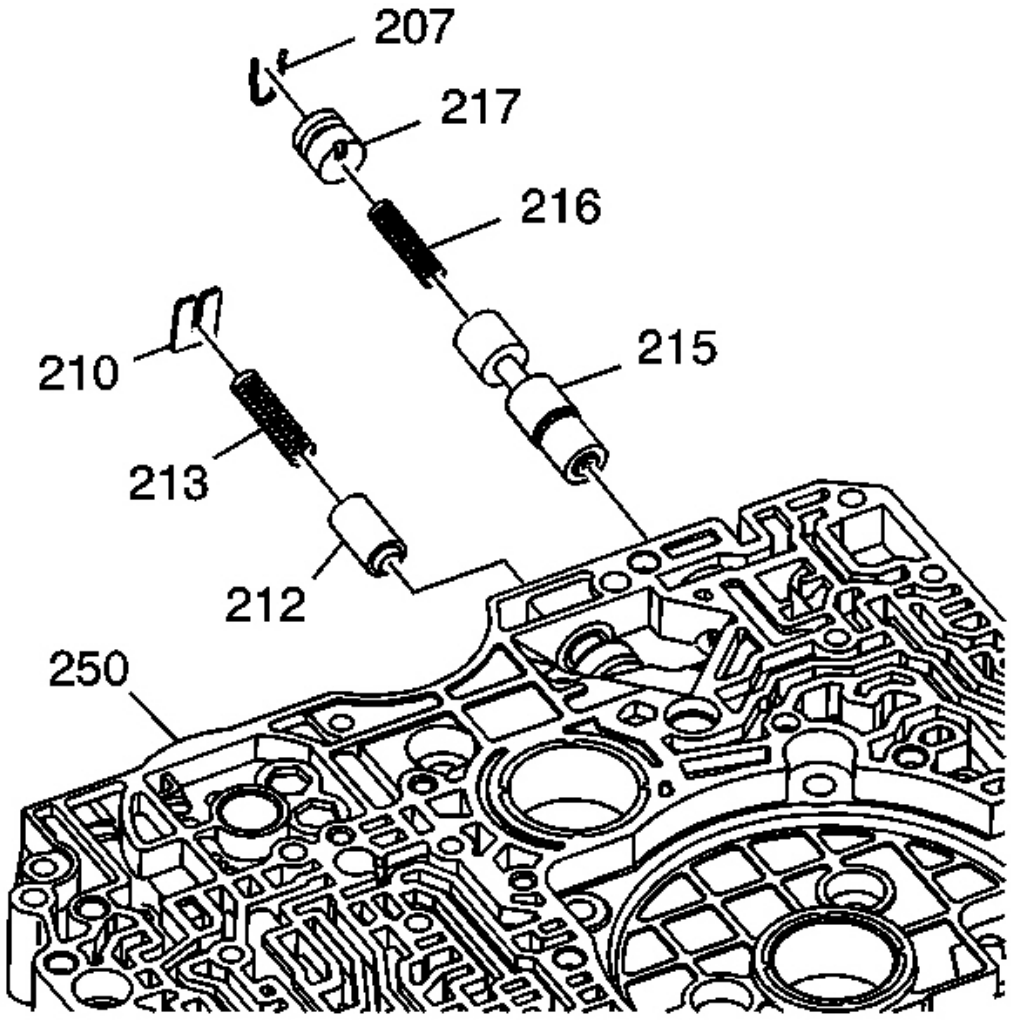

Fig. 379: Main Control Valve Body Assembly & Components Removed
Courtesy of GENERAL MOTORS CORP.

4. Remove the following components from the control valve body assembly (250):
    - The valve spring retainer plate (210)
    - The relief valve return spring (213)
    - The relief valve (212)
    - The bore plug retainer clip (207)
    - The bore plug (217)
    - The lubrication control valve return spring (216)

- The lubrication control valve (215)

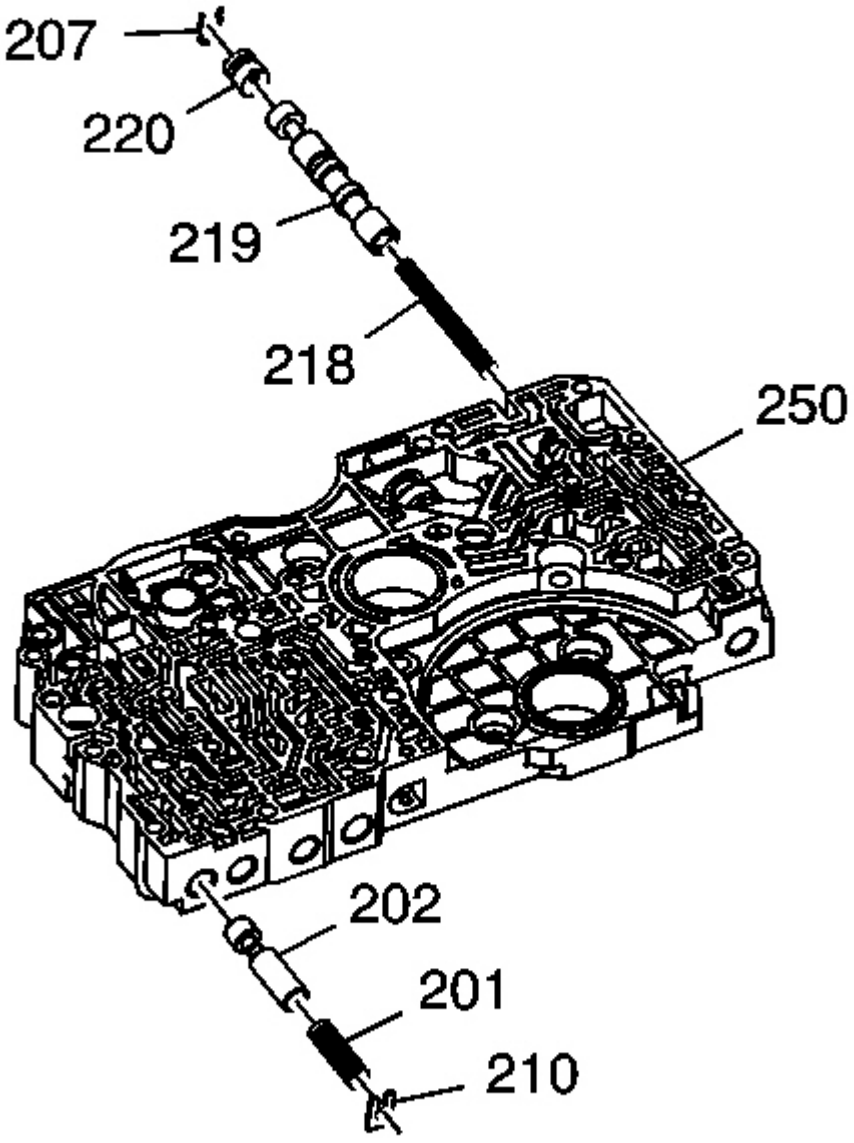

Fig. 380: Main Control Valve Body, Bore Plug, Retainer Clip, Lock-Up Shift Valve & Return Spring
Courtesy of GENERAL MOTORS CORP.

5. Remove the following components from the control valve body assembly (250):

- The bore plug retainer clip (207)
- The bore plug (220)
- The lock-up shift valve (219)
- The lock-up shift valve return spring (218)
- The valve spring retainer (210)
- The modulator valve return spring (201)
- The modulator valve (202)

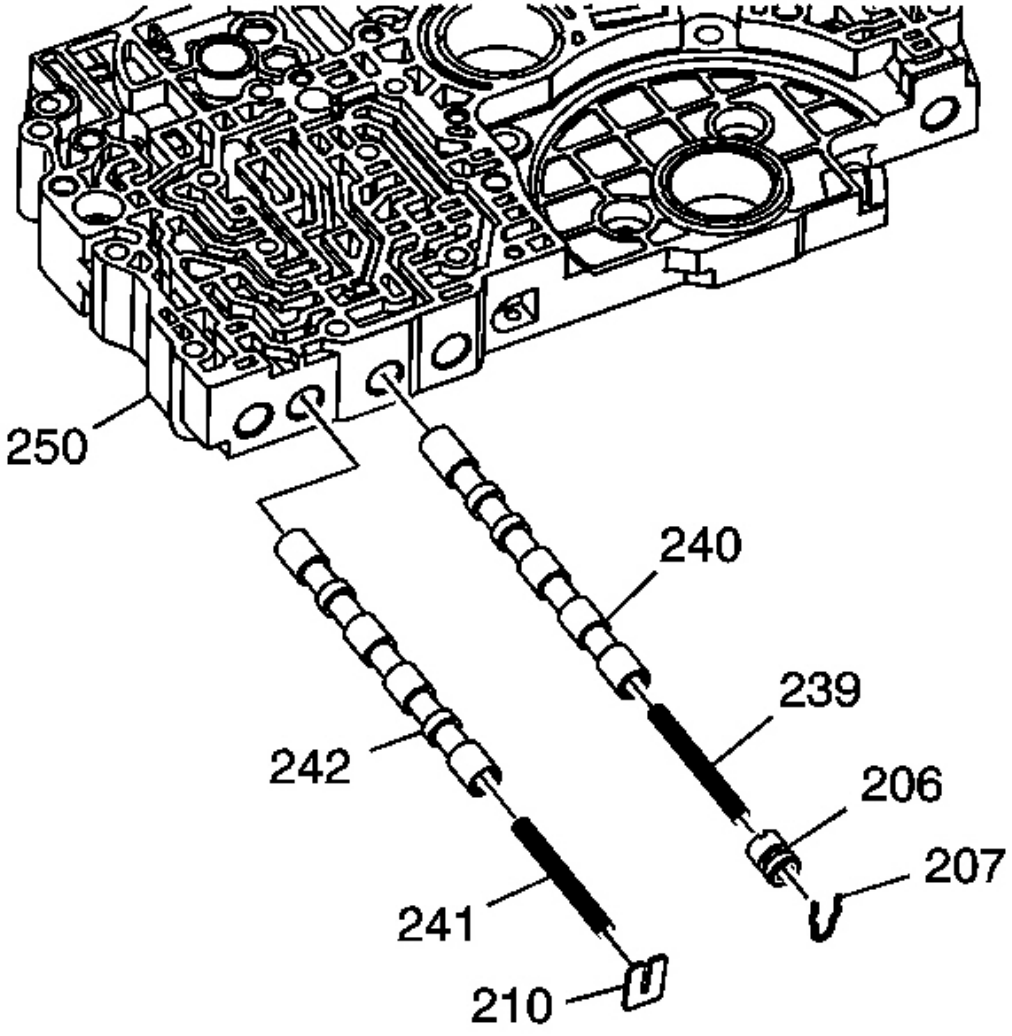

Fig. 381: Main Control Valve Body, Spring Retainer, Shift Valve A, Bore Plug & Retainer Clip

Courtesy of GENERAL MOTORS CORP.

6. Remove the following components from the main control valve body assembly (250):
    - The valve body spring retainer (210)
    - The shift valve A return spring (241)
    - The shift valve A (242)
    - The bore plug retainer clip (207)
    - The bore plug (206)
    - The shift valve B return spring (239)
    - The shift valve B (240)

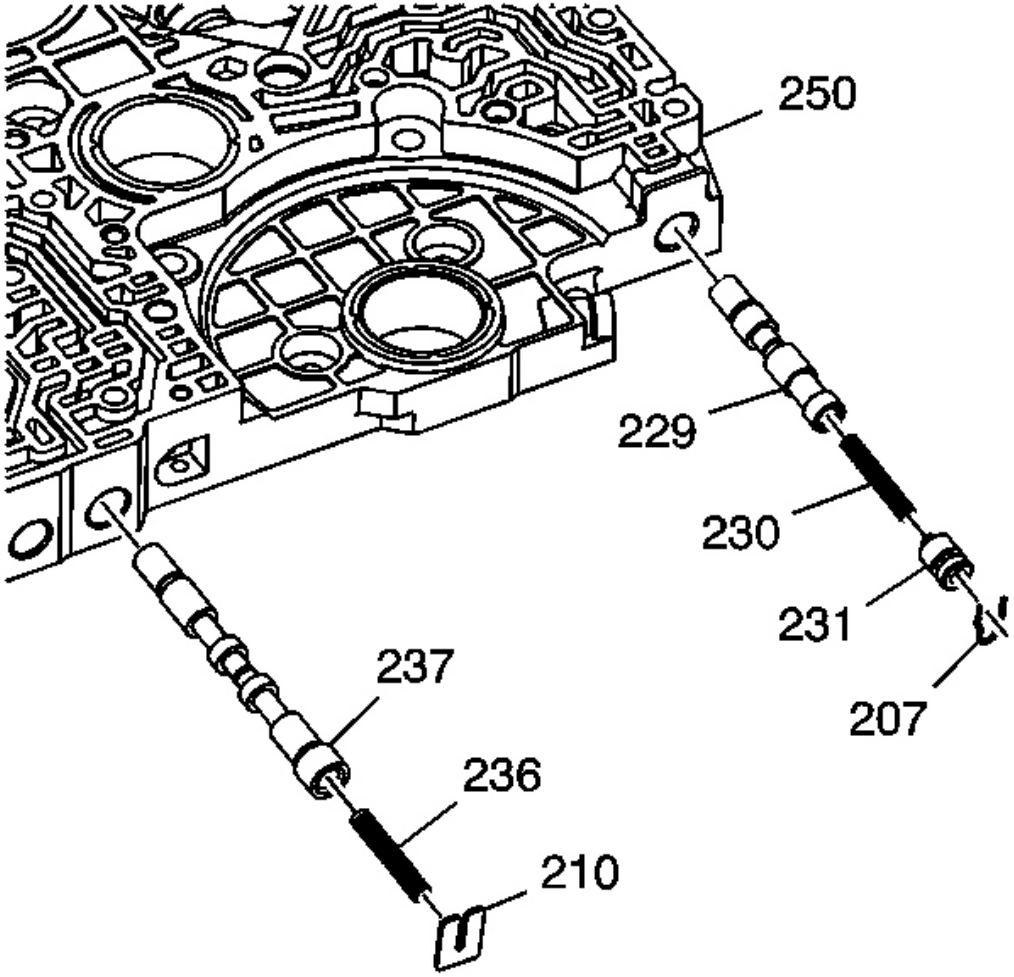

Fig. 382: Main Control Valve Body, Spring Retainer, Shift Valve D, Retainer Clip & Bore Plug
Courtesy of GENERAL MOTORS CORP.

7. Remove the following components from the control valve body assembly (250):
    - The valve body spring retainer (210)
    - The shift valve D return spring (236)
    - The shift valve D (237)
    - The bore plug retainer clip (207)
    - The bore plug (231)
    - The lock-up timing valve return spring (230)
    - The lock-up timing valve (229)

Inspection Procedure

1. Inspect the main control valve body for scoring or damage.
2. Clean the bores and passages.
3. Inspect all valves for wear or damage. If a valve does not operate, refer to **General Valve Body Service Instructions** .

Assembly Procedure

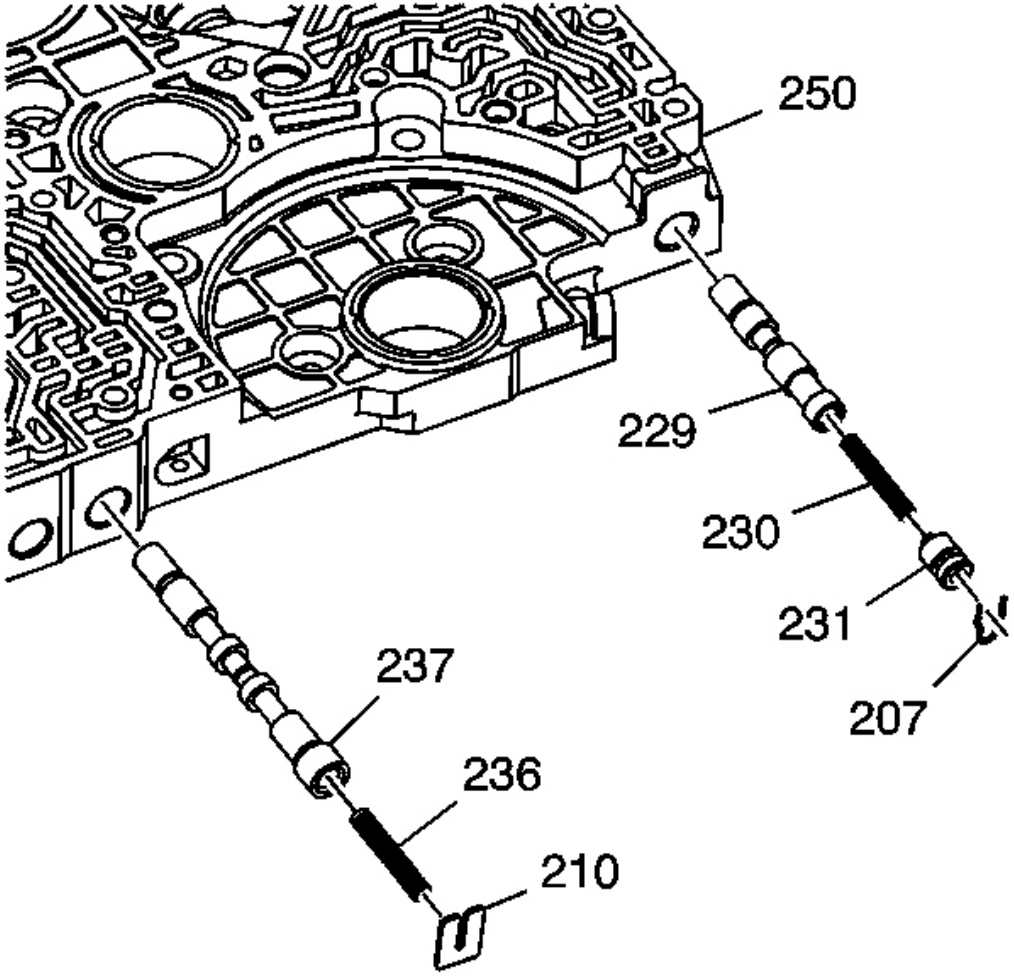

Fig. 383: Main Control Valve Body, Spring Retainer, Shift Valve D, Retainer Clip & Bore Plug
Courtesy of GENERAL MOTORS CORP.

1. Lubricate all the parts with automatic transmission fluid during assembly.
2. Install the following components into the control valve body assembly (250):
   - The shift valve D (237)
   - The shift valve D return spring (236)
   - The valve bore plug retainer (210)
   - The lock-up timing valve (229)
   - The lock-up timing valve return spring (230)
   - The bore plug (231)

- The bore plug retainer clip (207)

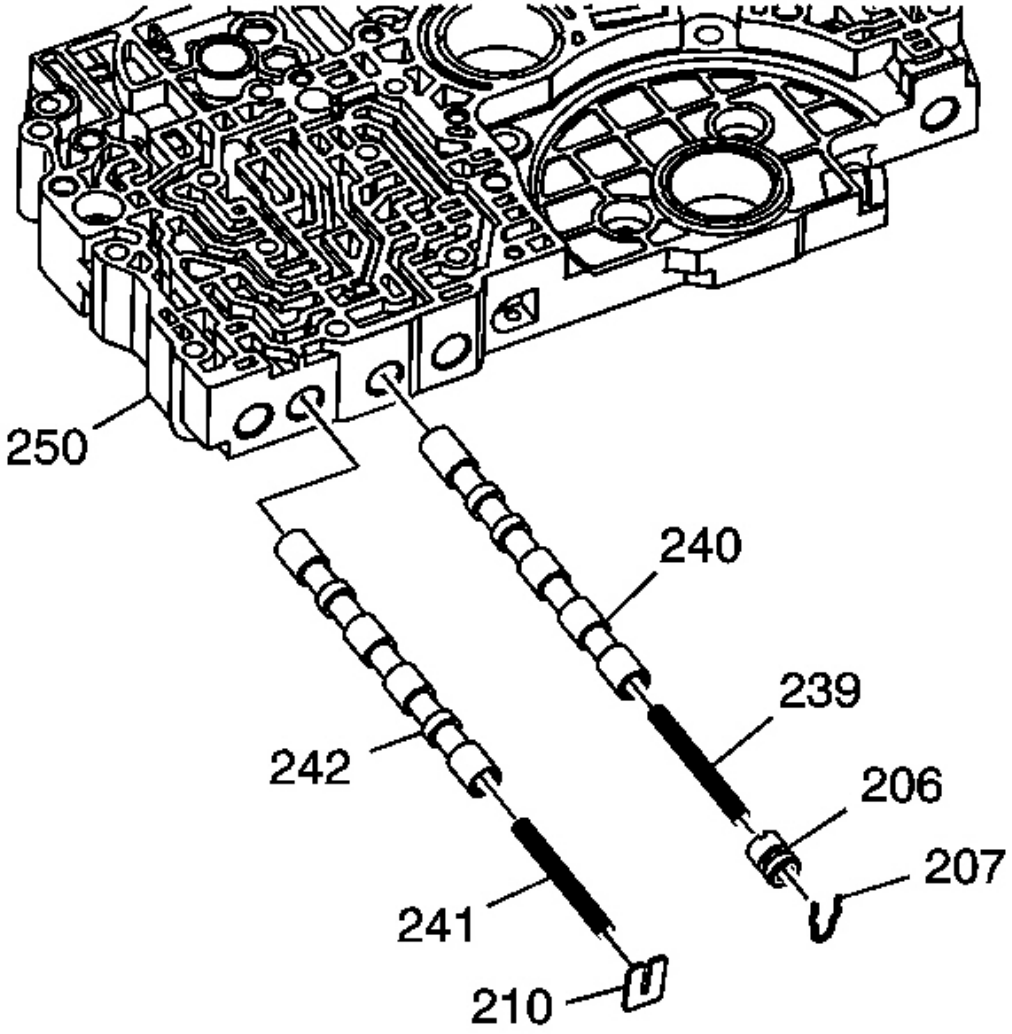

Fig. 384: Main Control Valve Body, Spring Retainer, Shift Valve A, Bore Plug & Retainer Clip
Courtesy of GENERAL MOTORS CORP.

3. Install the following components into the control valve body assembly (250):
   - The shift valve A (242)
   - The shift valve A return spring (241)
   - The valve bore plug retainer (210)
   - The shift valve B (240)

- The shift valve B return spring (239)
- The bore plug (206)
- The bore plug retainer clip (207)

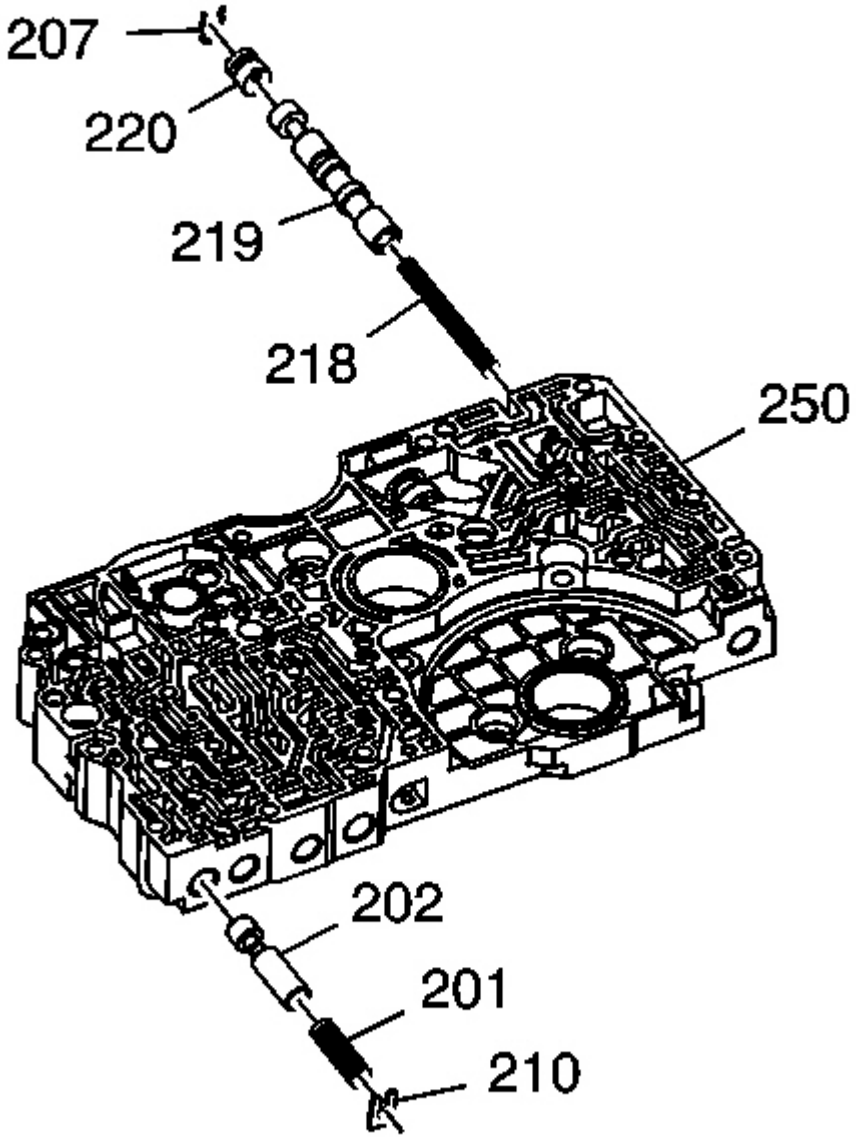

Fig. 385: Main Control Valve Body, Bore Plug, Retainer Clip, Lock-Up Shift Valve & Return Spring

Courtesy of GENERAL MOTORS CORP.

4. Install the following components into the control valve body assembly (250):
    - The lock-up shift valve return spring (218)
    - The lock-up shift valve (219)
    - The bore plug (220)
    - The bore plug retainer clip (207)
    - The modulator valve (202)
    - The modulator valve return spring (201)
    - Install the bore retainer plate (210)

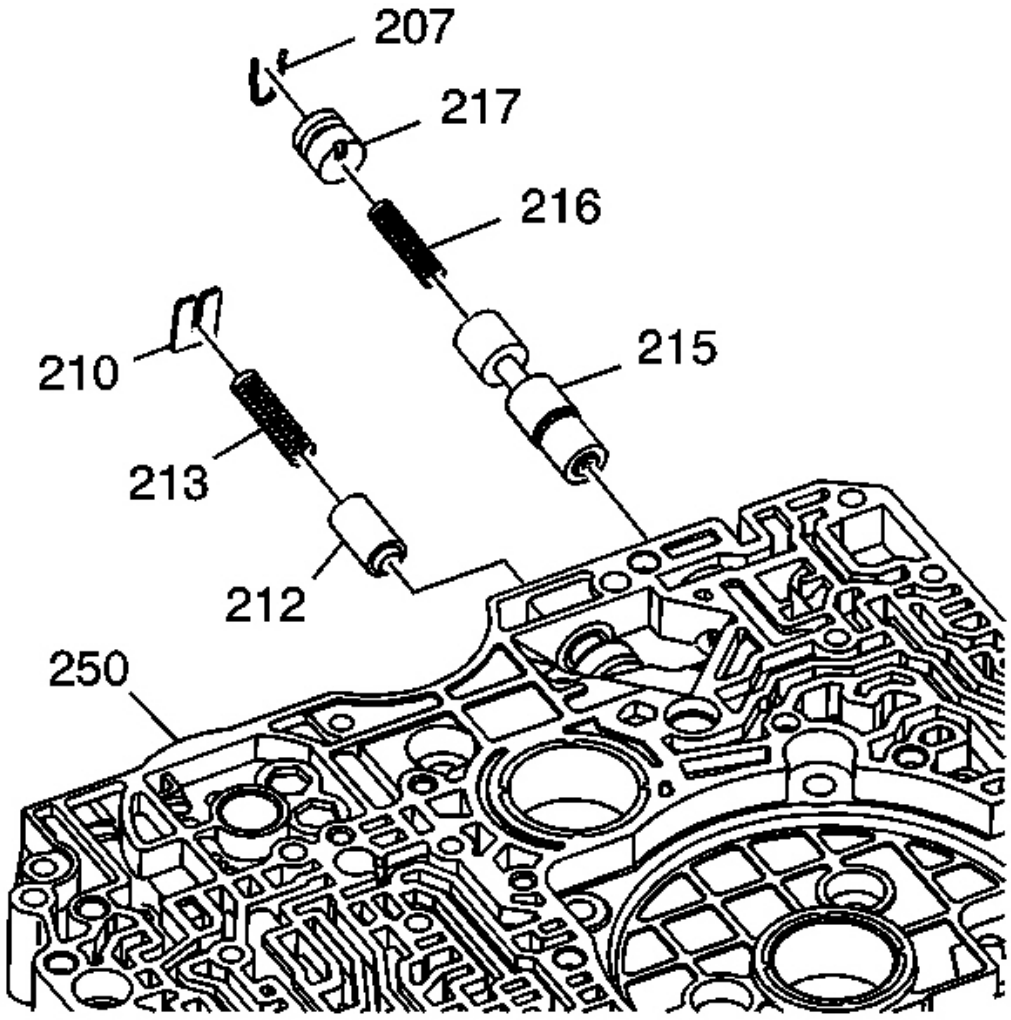

Fig. 386: Main Control Valve Body Assembly & Components Removed
Courtesy of GENERAL MOTORS CORP.

5. Install the following components into the control valve body assembly (250):
    - The relief valve (212)
    - The relief valve return spring (213)
    - The bore retainer plate (210)
    - The lubrication control valve (215)
    - The lubrication control valve return spring (216)
    - The bore plug (217)

- The valve bore plug retainer (207)

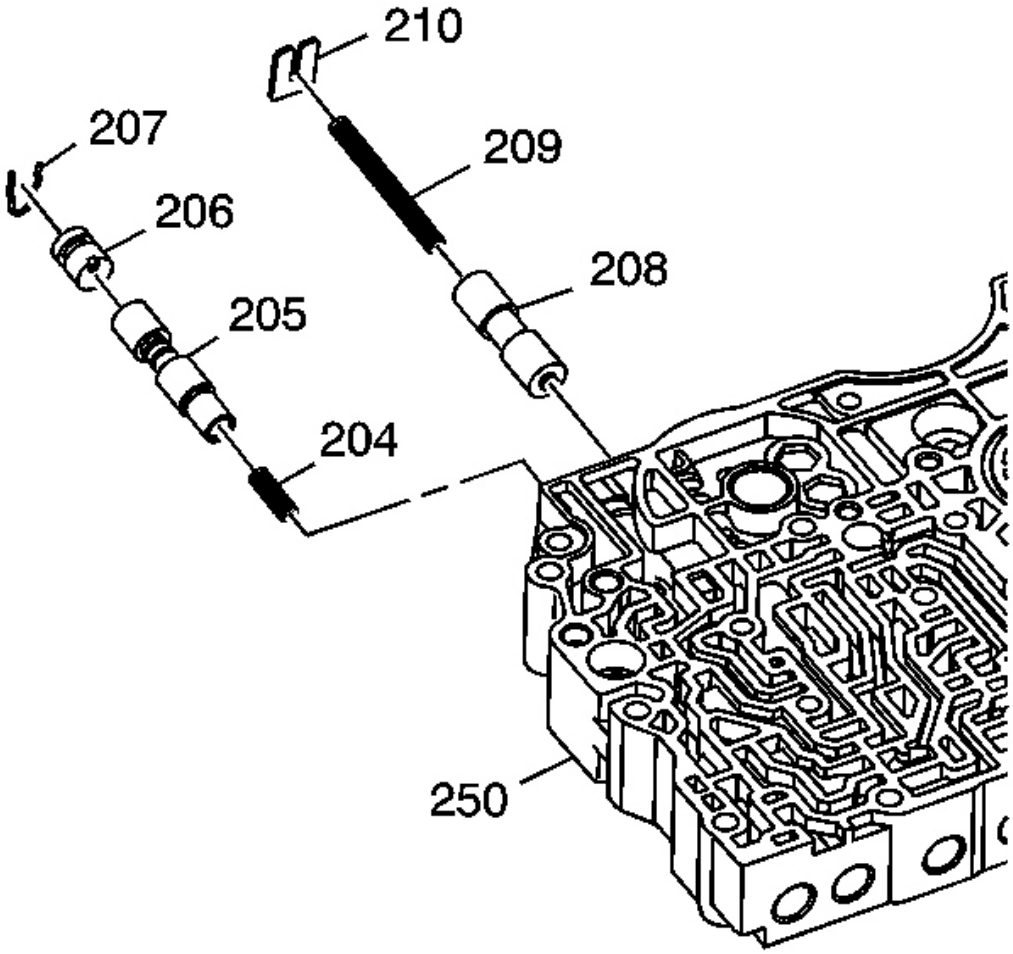

Fig. 387: Main Control Valve Body Assembly, Plugs & Clips Removed
Courtesy of GENERAL MOTORS CORP.

6. Install the following components into the control valve body assembly (250):
   - The CPC valve return spring (204)
   - The CPC valve (205)
   - The bore plug (206)
   - The bore plug retainer clip (207)
   - The shift valve E (208)
   - The shift valve E return spring (209)

- The valve bore plug retainer (210)

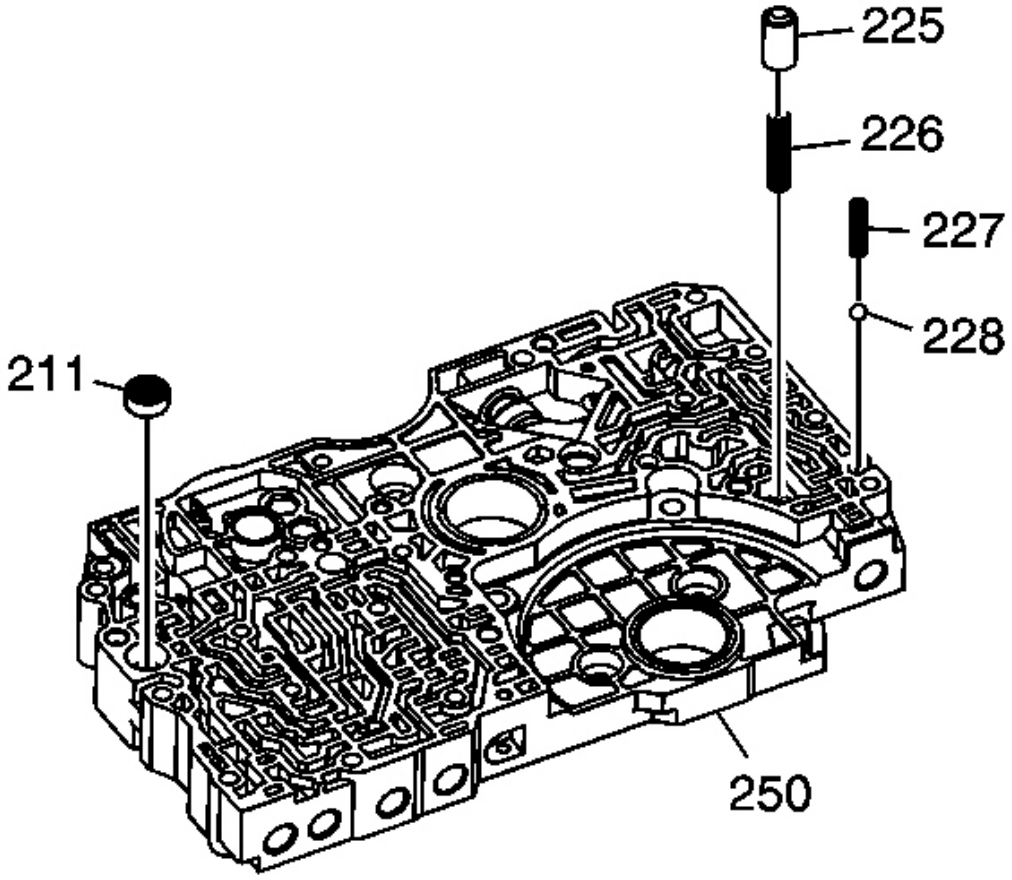

Fig. 388: Main Control Valve Body & Bolts Removed
Courtesy of GENERAL MOTORS CORP.

7. Install the following into the main control valve body assembly (250):
   - The transmission fluid cooler check ball (228) and spring (227)
   - The transmission fluid filter (211)
   - Torque converter check valve return spring (226) and check valve (225)

FRONT DIFFERENTIAL ASSEMBLY OVERHAUL

Tools Required

- **DT 46432** Driver
- **J 22912-01** Split Plate Bearing Puller
- **SA9179NE** Dial Indicator
- **SA9211T-2** Fifth Gear Remover

Disassembly Procedure

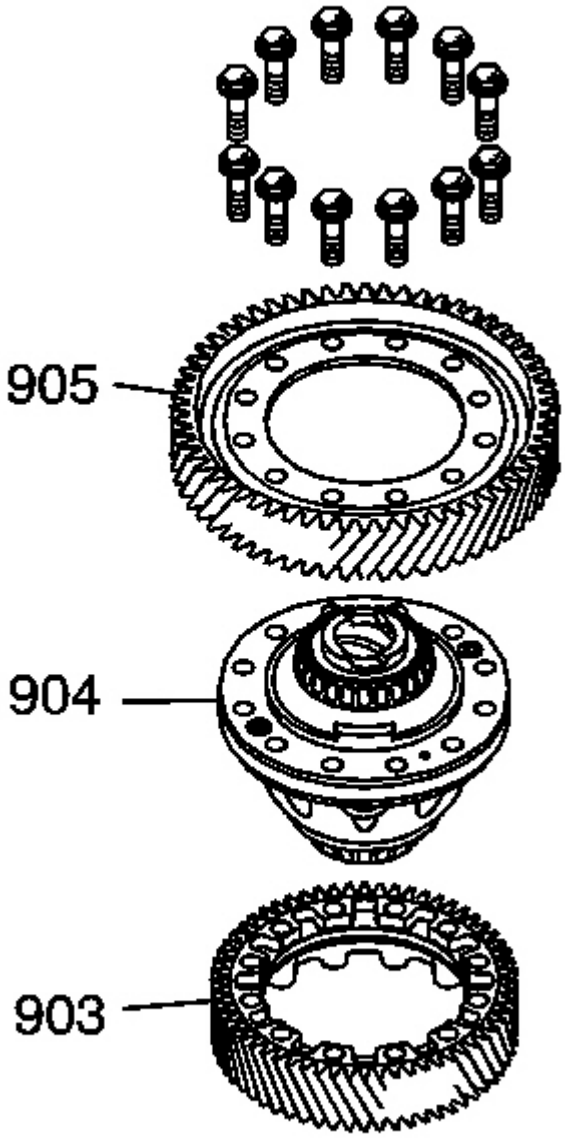

Fig. 389: Front Differential, Carrier Bolts & Ring Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ring gear mounting bolts are left-handed thread.

1. Mark the location of the gears to the differential assembly.

2. Remove the 12 front differential carrier bolts (906) from the front differential assembly (904).
3. Remove the transfer case drive ring gear (903), AWD only, from the front differential assembly (904).
4. Remove the driven ring gear (905) from the front differential assembly (904).

Backlash Inspection Procedure

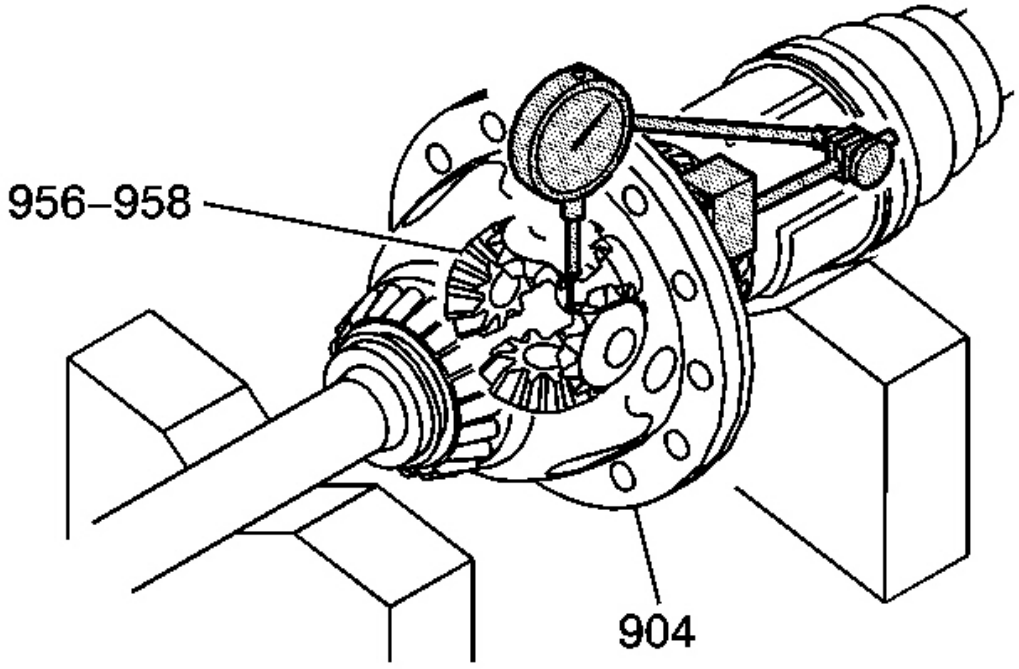

Fig. 390: Measuring The Backlash Of Pinion Gears Using SA9179NE
Courtesy of GENERAL MOTORS CORP.

1. Install both axles, and place the front differential assembly (904) on V-blocks as shown.
2. Using **SA9179NE** , measure the backlash of the pinion gears (956) and (958).

   Specification: The backlash of the pinion gears are 0.05-0.15 mm (0.002-0.006 in)

3. If the backlash is out of specification, replace the front differential assembly (904).

Assembly Procedure

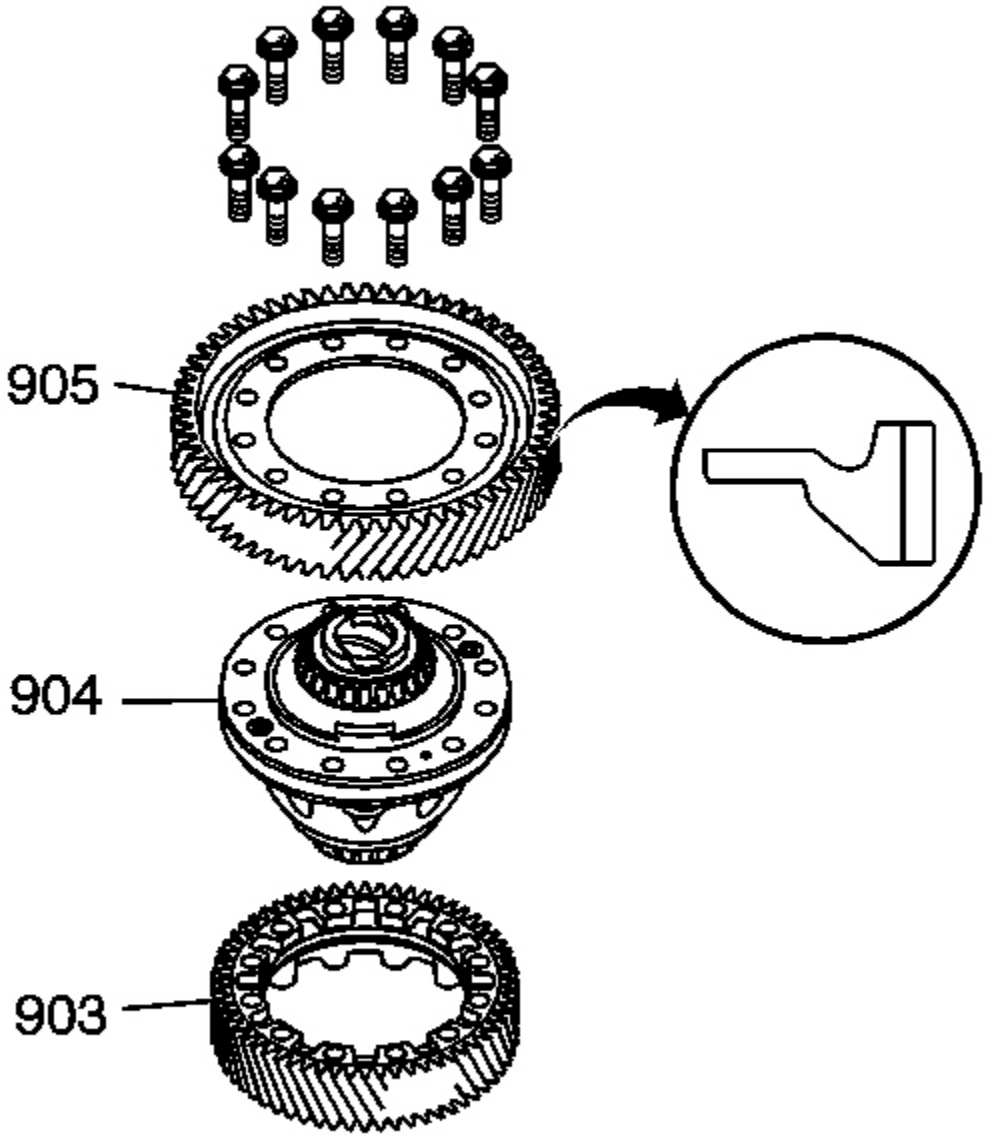

Fig. 391: Inspecting The Gears For Damage
Courtesy of GENERAL MOTORS CORP.

1. Inspect the gears for signs of tooth damage or wear.
2. Inspect all mating surfaces for burrs or damage:
    - If using the gears again, align to the marks during removal.

- Ensure the flat, machined side of the driven ring gear is facing the flat, machined side of the front differential assembly. See the illustration insert.

3. Install the driven ring gear (905) on the front differential assembly (904).
4. Install the drive ring gear (903) on the front differential carrier assembly (904).

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the front differential carrier M10 x 1.0 x 35 mm bolts (906).

Tighten: Tighten the bolts to 101 N.m (74.5 lb ft).

Bearing Removal Procedure

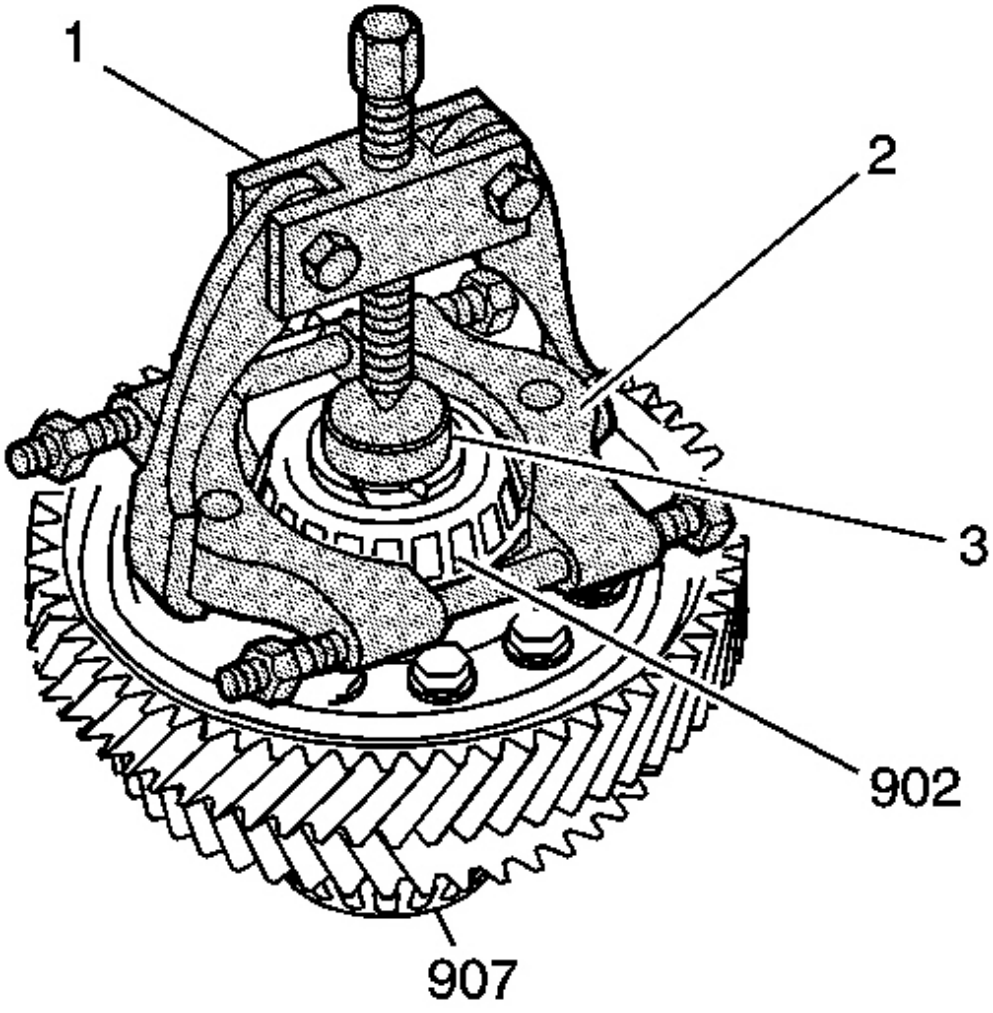

Fig. 392: Removing Front Differential Tapered Front/Rear Roller Bearing Using SA9211T-2 & J 22912-01
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Tapered roller bearing(s) and outer race(s) should be replaced as a set. Refer to Transmission Case Front Differential Bearing Race Replacement .

1. Using **SA9211T-2** (1), **J 22912-01** (2), and a shaft protector (3), remove the front differential tapered front roller bearing (902).
2. Using **SA9211T-2** (1),**J 22912-01** (2), and a shaft protector (3), remove the front differential tapered rear

roller bearing (907).

Bearing Installation Procedure

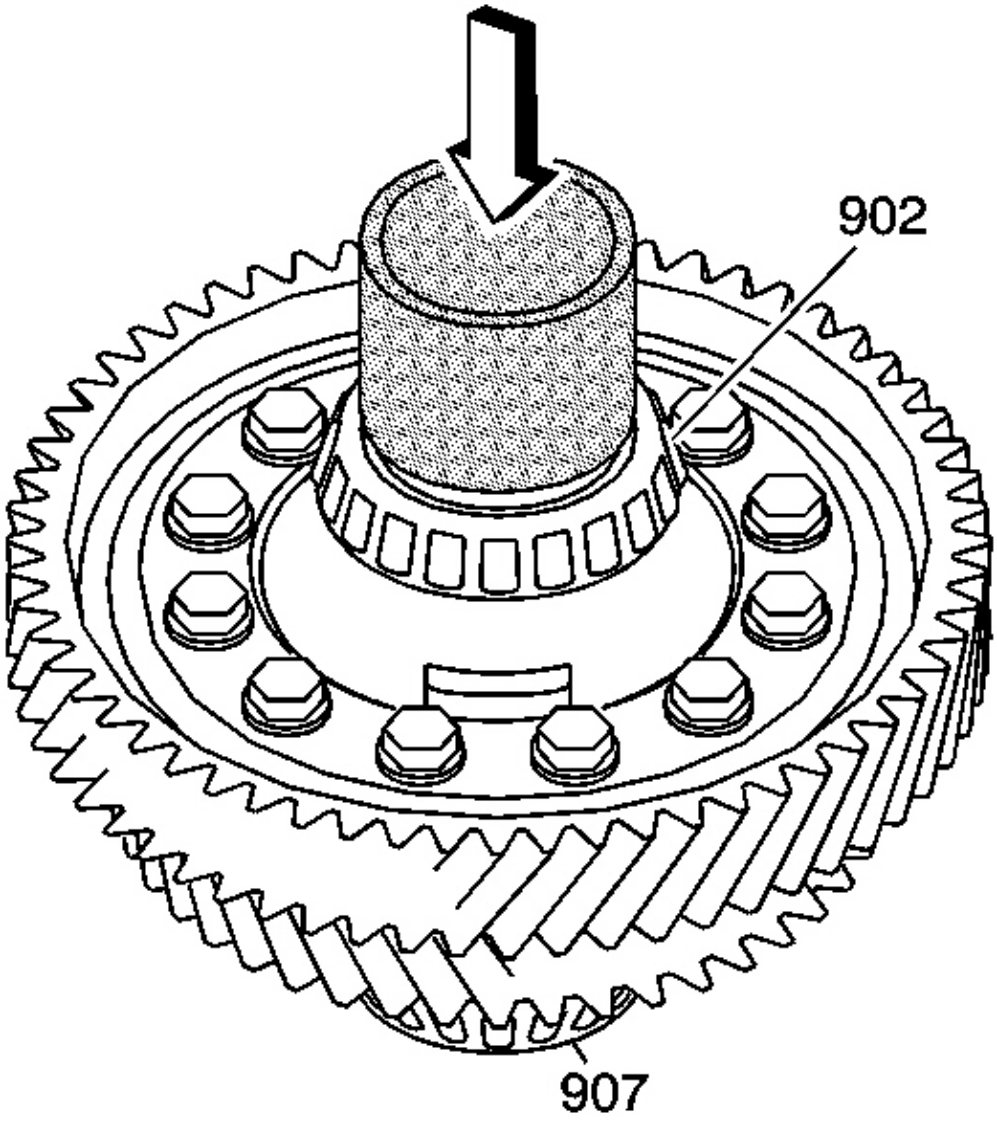

Fig. 393: Installing Front Differential Tapered Front/Rear Roller Bearing Using DT 46432
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure that the bearings are pressed on completely. There should be no

clearance between the bearing and the front differential assembly.

1. Using the 45 mm end of **DT 46432** and a hydraulic press, install the front differential tapered front roller bearing (902) on the front differential assembly.
2. Using the 45 mm end of **DT 46432** and a hydraulic press, install the front differential tapered rear roller bearing (907) on the front differential assembly.

TRANSMISSION CASE FRONT DIFFERENTIAL BEARING RACE REPLACEMENT

Tools Required

- **EN 46342** Driver Handle
- **DT 46428** Driver
- **J 25070** Heat Gun

Removal Procedure

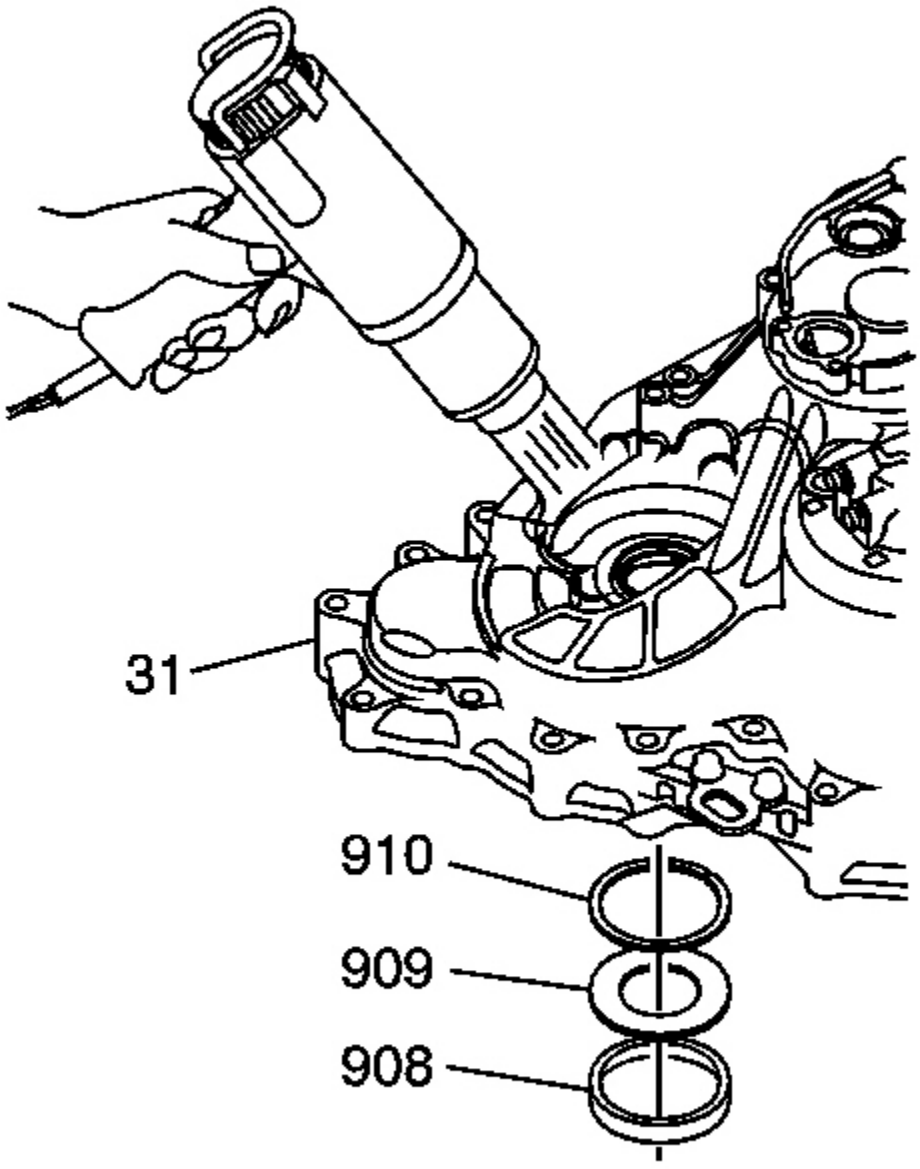

Fig. 394: Heating The Transmission Case Using J 25070
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Always replace the tapered roller bearing and the race as a set.

NOTE: Do not heat the component over the specified value or damage could

occur.

1. Using **J 25070** heat the transmission case (31).

   Do not heat the housing greater than 100°C (212°F).

2. Remove the following components:
   - Front differential tapered rear roller bearing race (908)
   - Front differential rear bearing race spacer (909)
   - Front differential bearing race selective shim (910)
3. Refer to **Front Differential Rotational Torque Measurement** in order to determine the correct size of the front differential bearing race selective shim (910).

Installation Procedure

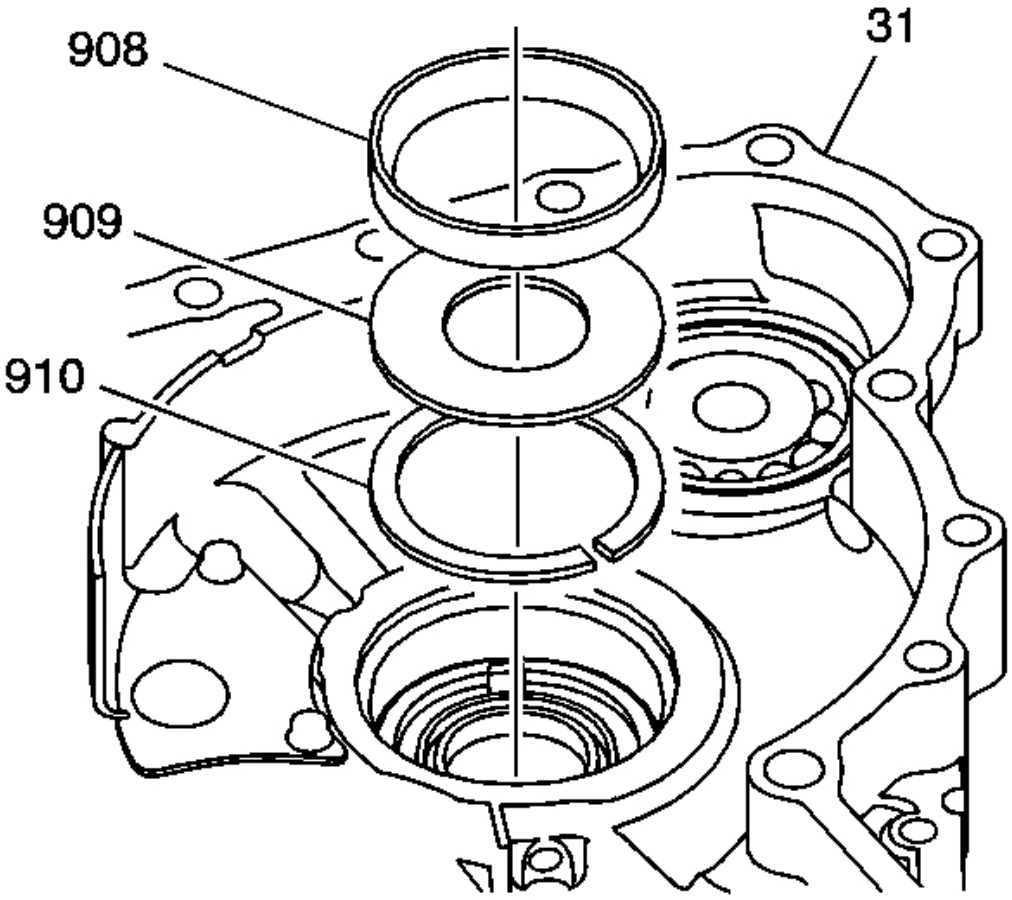

Fig. 395: Bearing Race Selective Shim, Spacer & Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Lubricate all parts with automatic transmission fluid during installation.
2. Install the bearing race selective shim (910) and the bearing race spacer (909) into the transmission case (31).
3. Install the tapered rear roller bearing race (908) into the transmission case (31).

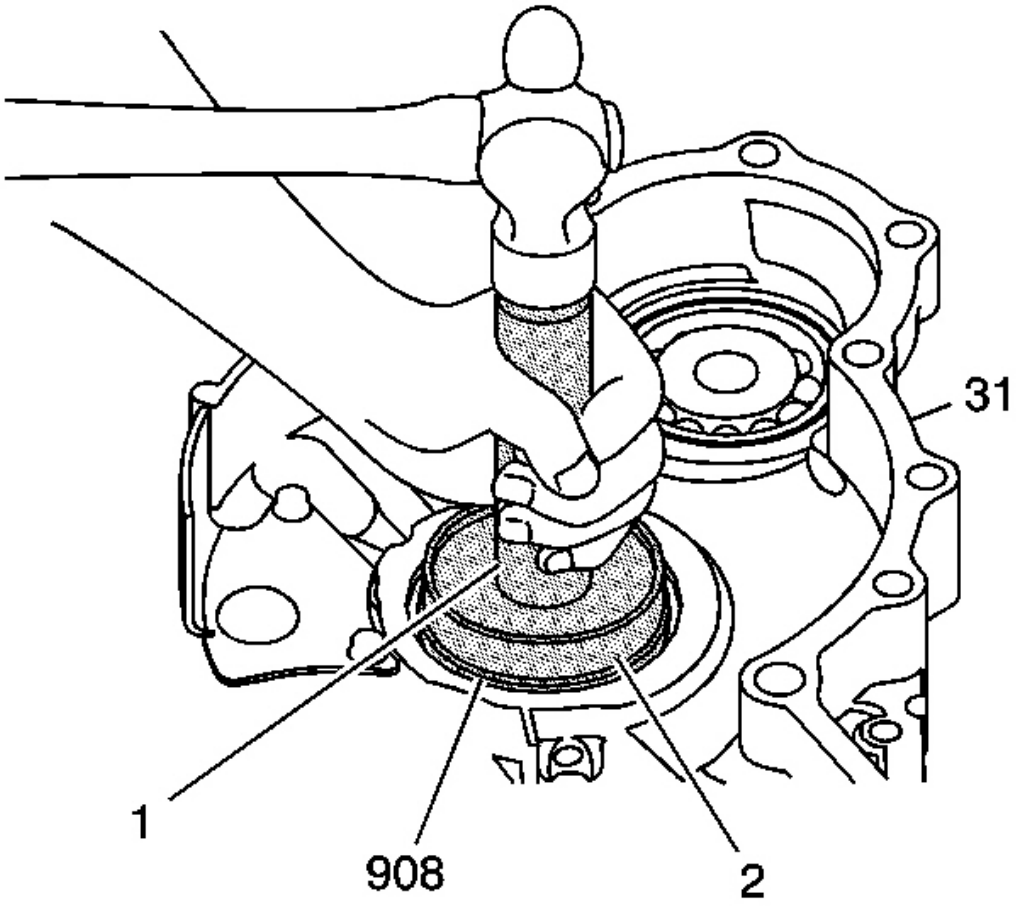

Fig. 396: Installing The Front Differential Tapered Rear Roller Bearing Race Using DT 46428 & EN 46342
Courtesy of GENERAL MOTORS CORP.

4. Using the 83 mm side of **DT 46428** (1) and **EN 46342** (2), install the front differential tapered rear roller bearing race (908) until it bottoms in the transmission case (31).

TRANSMISSION CASE AXLE SHAFT SEAL REPLACEMENT

Tools Required

- **DT 46429** Oil Seal Driver
- **EN 46342** Driver Handle

Removal Procedure

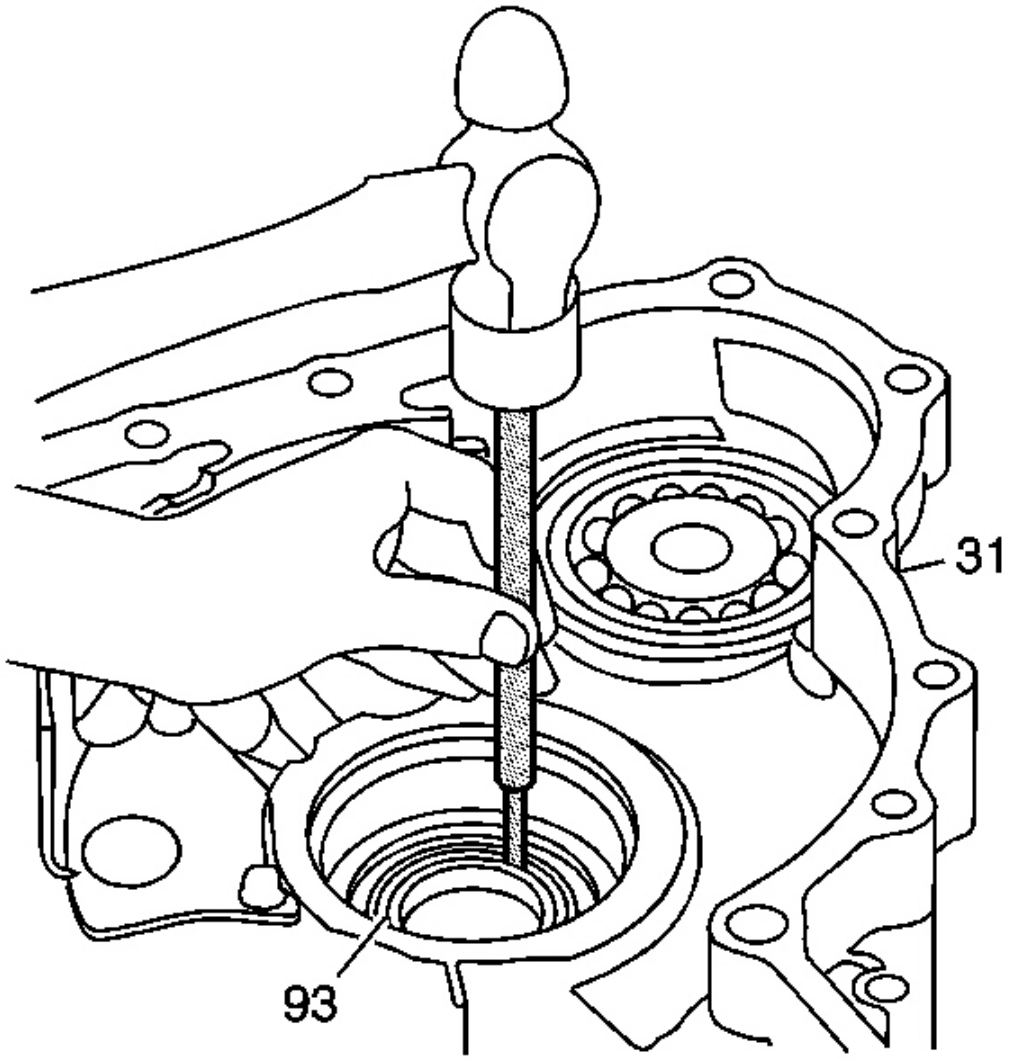

Fig. 397: Removing Front Wheel Drive Shaft Fluid Seal Using A Hammer & Punch
Courtesy of GENERAL MOTORS CORP.

Using a hammer and punch, remove the front wheel drive shaft fluid seal (93) from the transmission case (31).

Installation Procedure

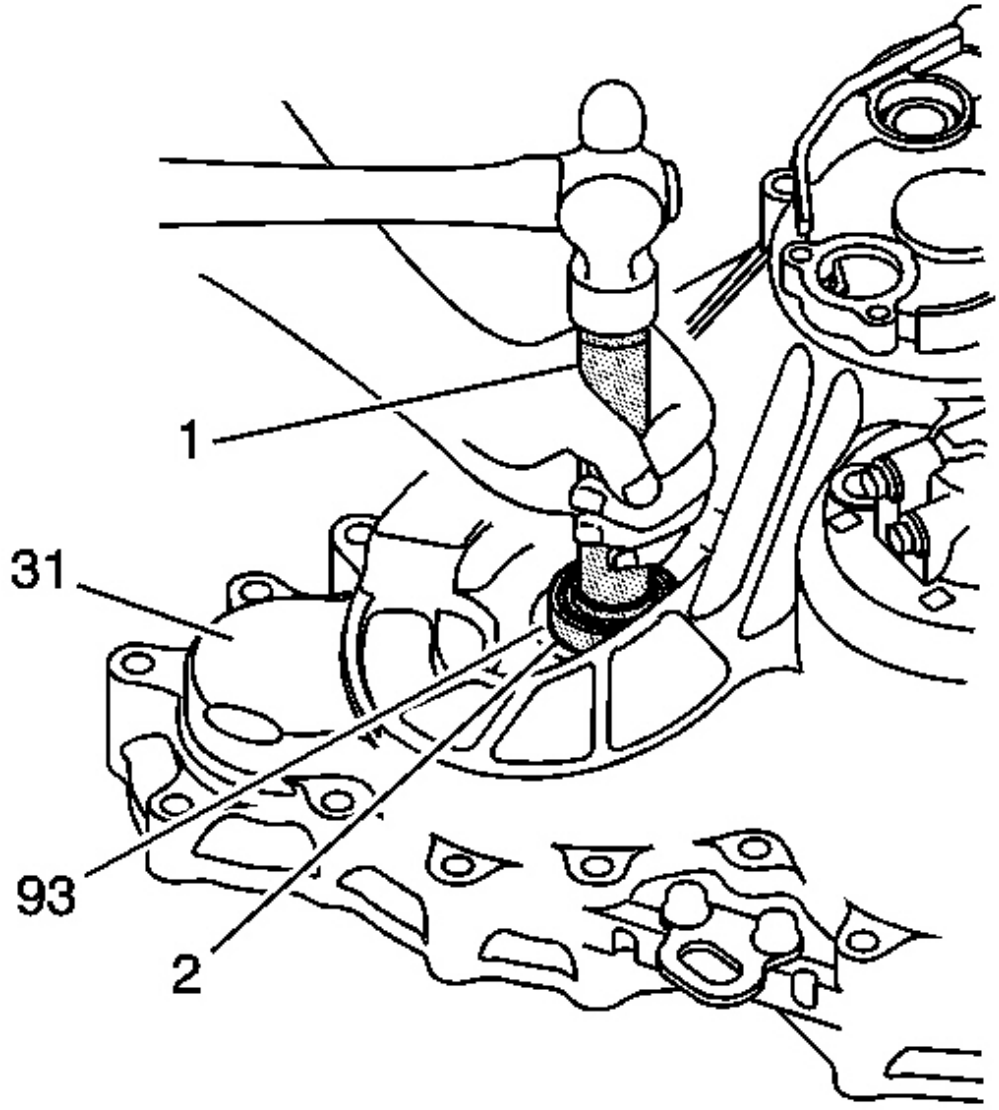

Fig. 398: Installing Front Wheel Drive Shaft Fluid Seal Into Transmission Case Using DT 46429 & EN 46342
Courtesy of GENERAL MOTORS CORP.

Using **EN 46342** (1) and **DT 46429** (2), install the 40 x 56 x 9 mm front wheel drive shaft fluid seal (93) into the transmission case (31) until flush with the housing surface.

TRANSFER CASE INPUT GEAR ASSEMBLY OVERHAUL

Tools Required

- **DT 46509** Tube Style Driver
- **J 22912-01** Split Plate Bearing Remover
- **SA9211T-2** Bearing Puller
- **DT 46424** Bearing Puller

Removal Procedure

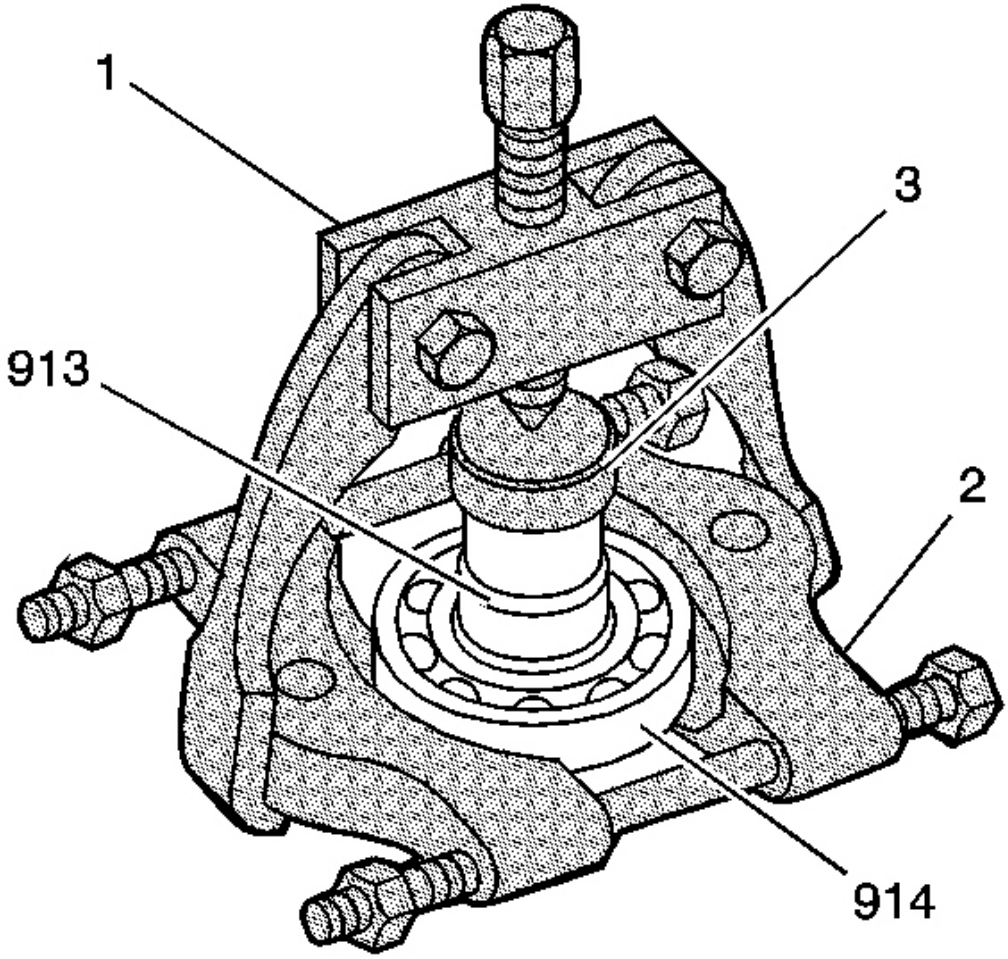

Fig. 399: Removing The Transfer Case Input Gear With Shaft Front Bearing From Transfer Case Input Gear Assembly Using DT 46424 & J 22912-01
Courtesy of GENERAL MOTORS CORP.

1. Inspect the bearing for wear and rough rotation. If the bearing is OK, removal is not necessary.
2. Place a shaft protector (3) between transfer output shaft (913) and **DT 46424** (1) in order to prevent damaging the shaft.
3. Using **DT 46424** (1),**J 22912-01** (2), and the shaft protector (3), remove the transfer case input gear with shaft front bearing (914) from the transfer case input gear assembly (913).

Installation Procedure

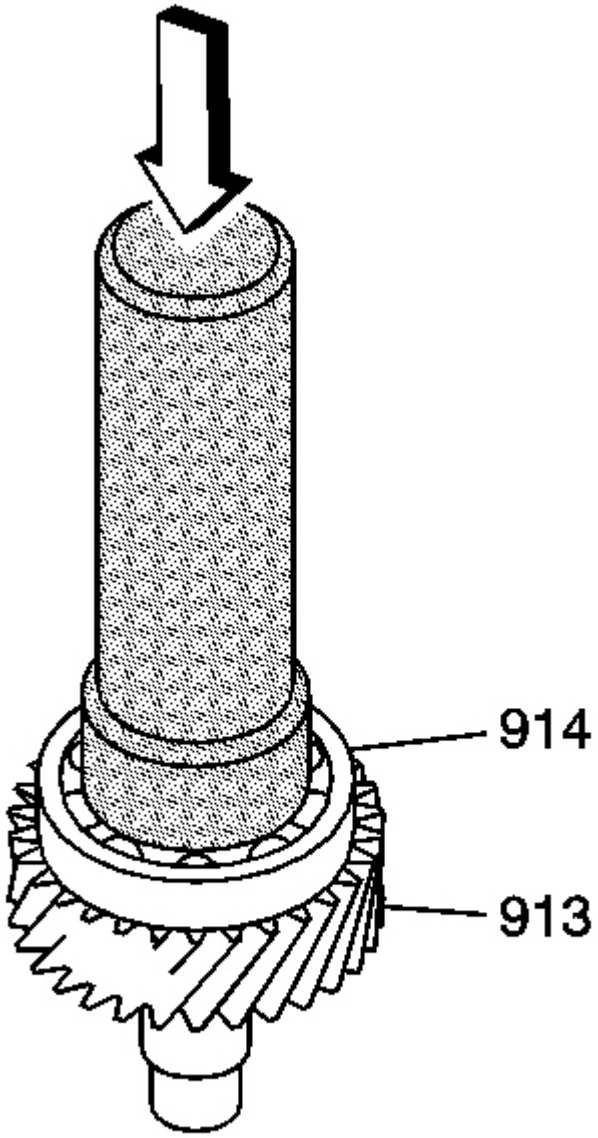

Fig. 400: Installing The Transfer Case Input Gear With Shaft Front Bearing Onto Transfer Case Input Gear Using DT 46509
Courtesy of GENERAL MOTORS CORP.

1. Using **DT 46509** and a hydraulic press, install the transfer case input gear with shaft 22 x 76 x 19 mm front bearing (914) onto the transfer case input gear with shaft (913). Ensure the bearing is properly seated on the shaft.

2. Inspect and adjust the transfer case input gear with shaft installed height as necessary. Refer to **Transfer Case Input Gear Installed Height Measurement** .

TRANSFER CASE INPUT GEAR BEARING REPLACEMENT

Tools Required

- **DT 46415** Driver
- **EN 46342** Driver Handle
- **J 25070** Heat Gun
- **J 26941** Bushing and Bearing Remover
- **SA9133T** Axle Seal Puller
- **SA9133T-1** Axle Seal Puller Adapter

Removal Procedure

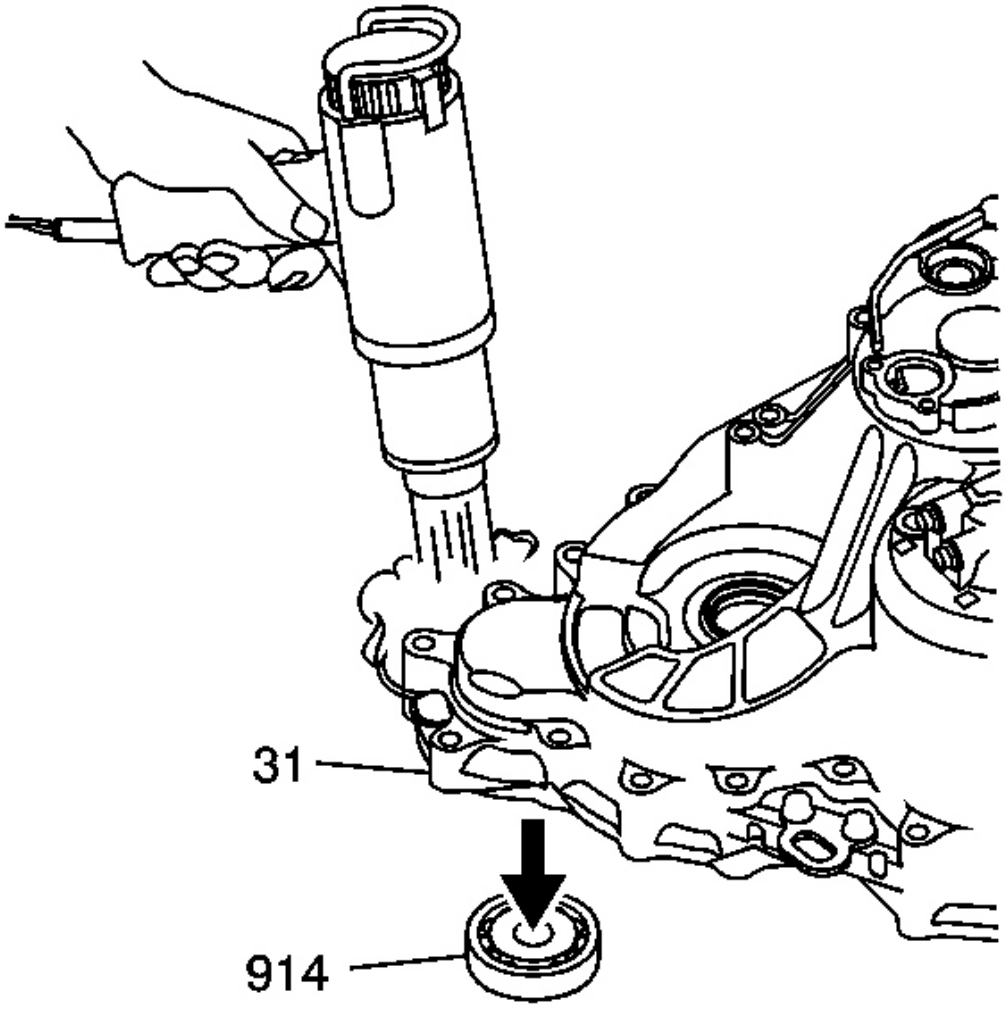

Fig. 401: Heating The Transmission Case Using J 25070
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not heat the component over the specified value or damage could occur.

IMPORTANT: If a slide hammer and puller are being used without heating the case, the bearing will come apart.

1. Using **J 25070** , heat the transmission case (31) in order to remove the transfer case input gear bearing (914).

Do not heat the transmission case greater than 100°C (212°F).

2. Using the **J 26941** ,**SA9133T-1** , and the **SA9133T** remove the bearing after the case is warm.

Installation Procedure

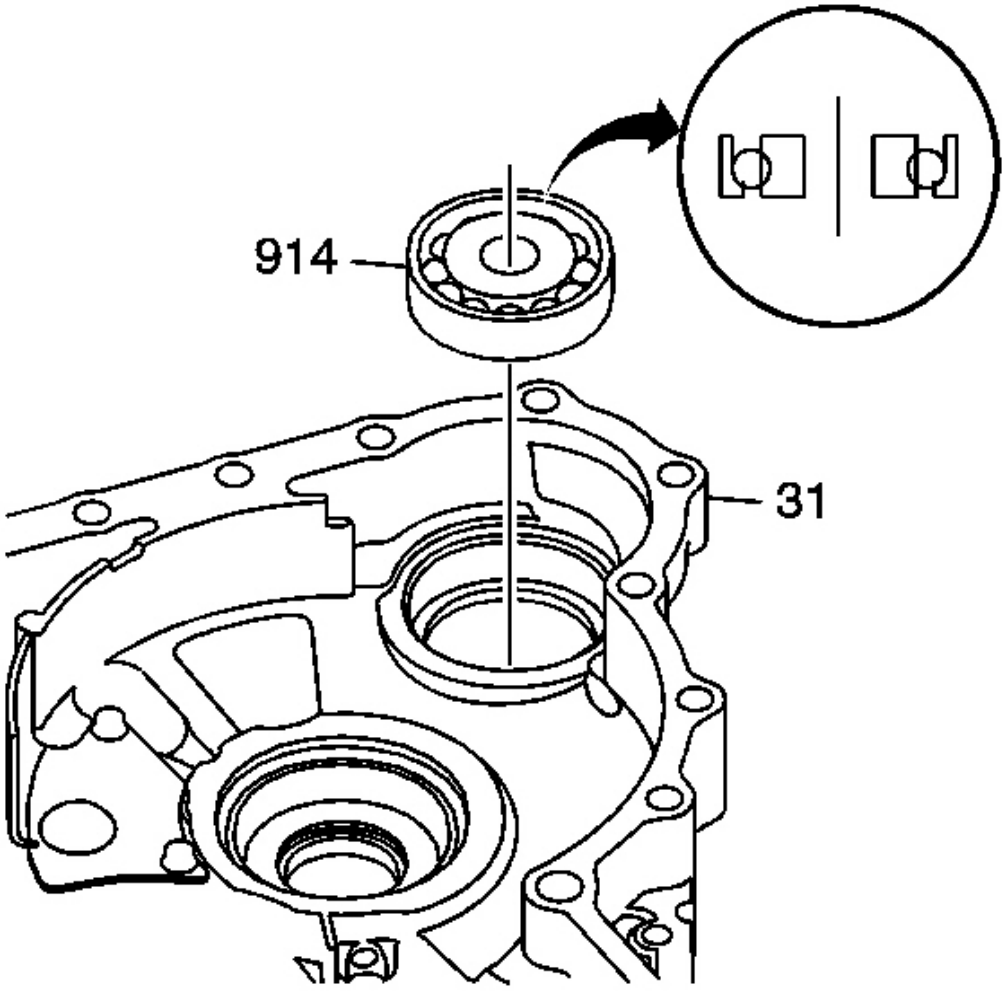

Fig. 402: Transfer Case Input Gear Bearing & Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Install the transfer case input gear 40 x 80 x 16.5 mm bearing (914) into the transmission case (31) in the direction shown in the insert.

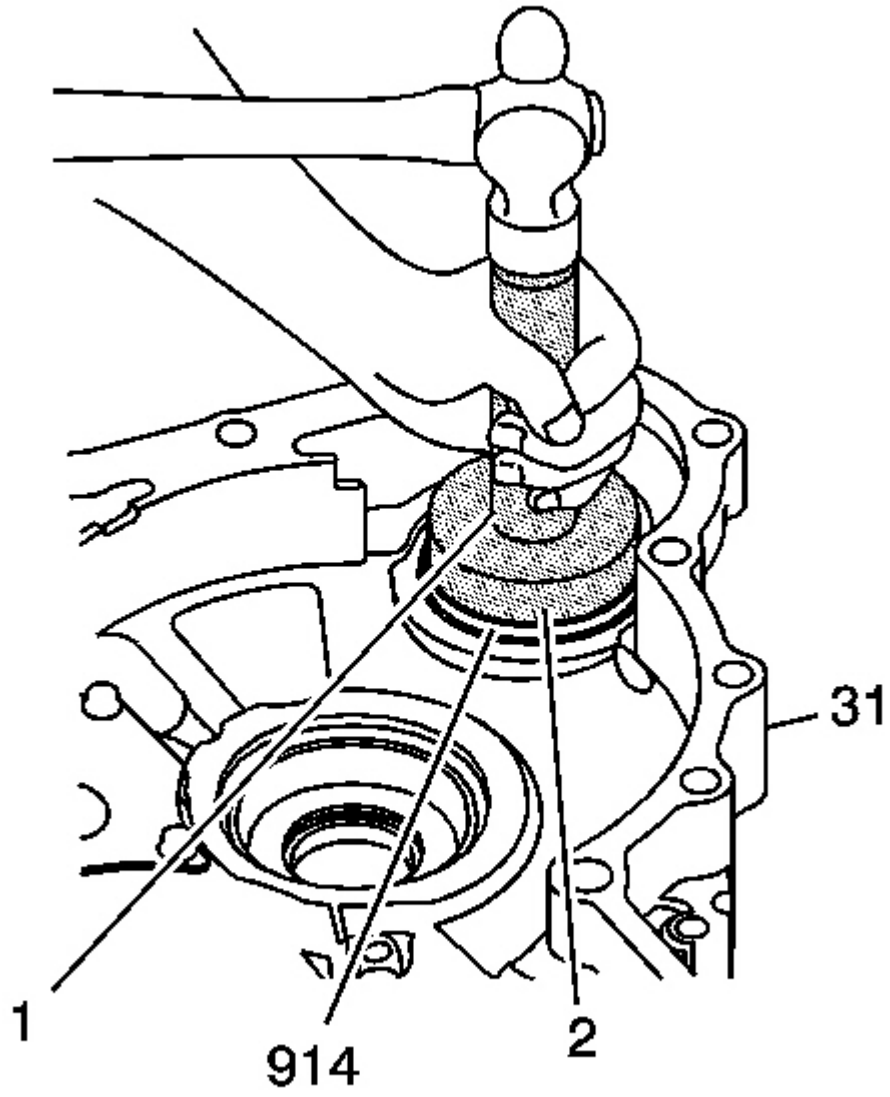

Fig. 403: Installing The Transfer Case Input Gear Bearing Using DT 46415 & EN 46342
Courtesy of GENERAL MOTORS CORP.

2. Using **DT 46415** (2) and **EN 46342** (1), install the transfer case input gear bearing (914) until it bottoms out in the transmission case (31).

TRANSFER CASE INPUT GEAR INSTALLED HEIGHT MEASUREMENT

If any of the following components have been serviced or replaced, inspect the installed height measurement to prevent internal damaged to the transaxle assembly.

- The transfer case input gear assembly (918)
- The transfer case input gear bearing (911)
- The transfer case input gear bearing (914)
- The transmission case (31)
- The torque converter housing (150)

The transfer case input gear installed height measurement (a) can be changed by replacing the transfer case driven gear with shaft, 28.5 mm selective shim (912) as needed.

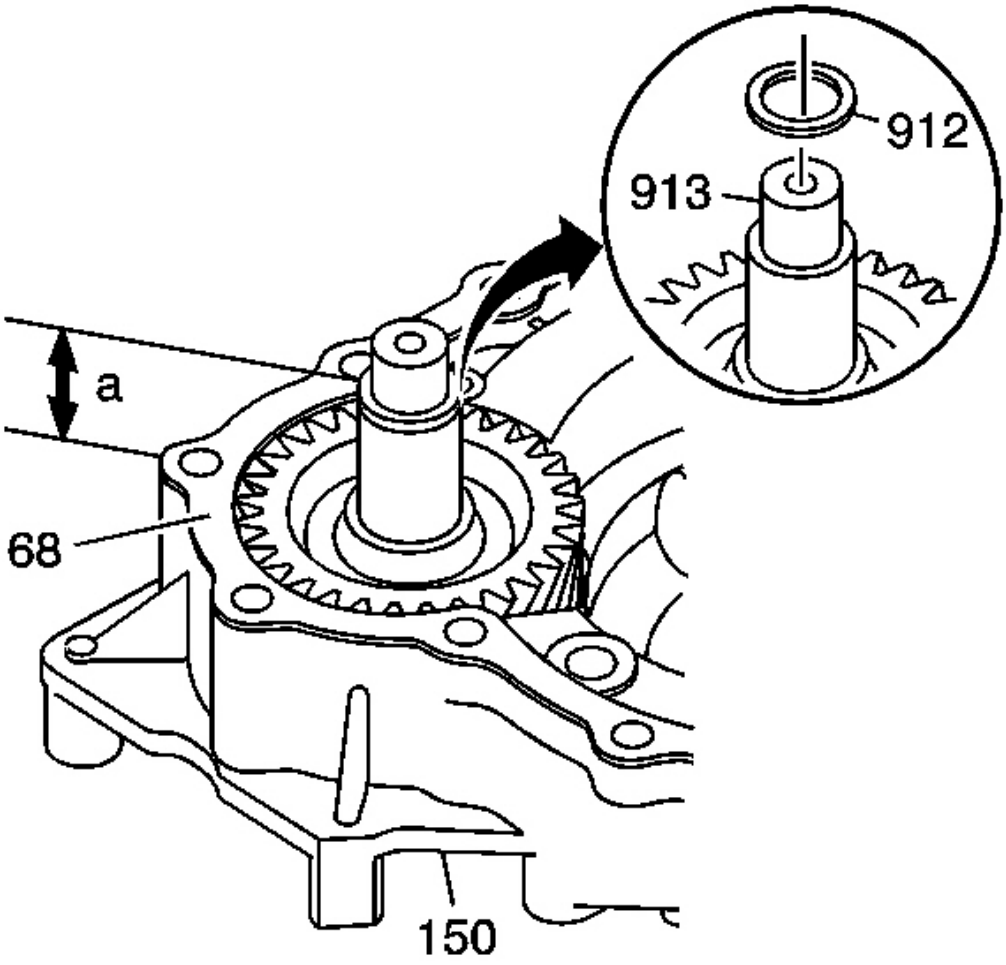

Fig. 404: Transfer Case Input Gear Assembly & Selective Shim
Courtesy of GENERAL MOTORS CORP.

1. Install the transfer case input gear assembly (913) into the torque converter housing (150).
2. Install a transfer case input gear 28.5 mm selective shim (912) on top of the shaft (913).
3. Install a new torque converter housing gasket (68) on top of the torque converter housing (150) ensuring to align the gasket with the two transmission case locating pins.

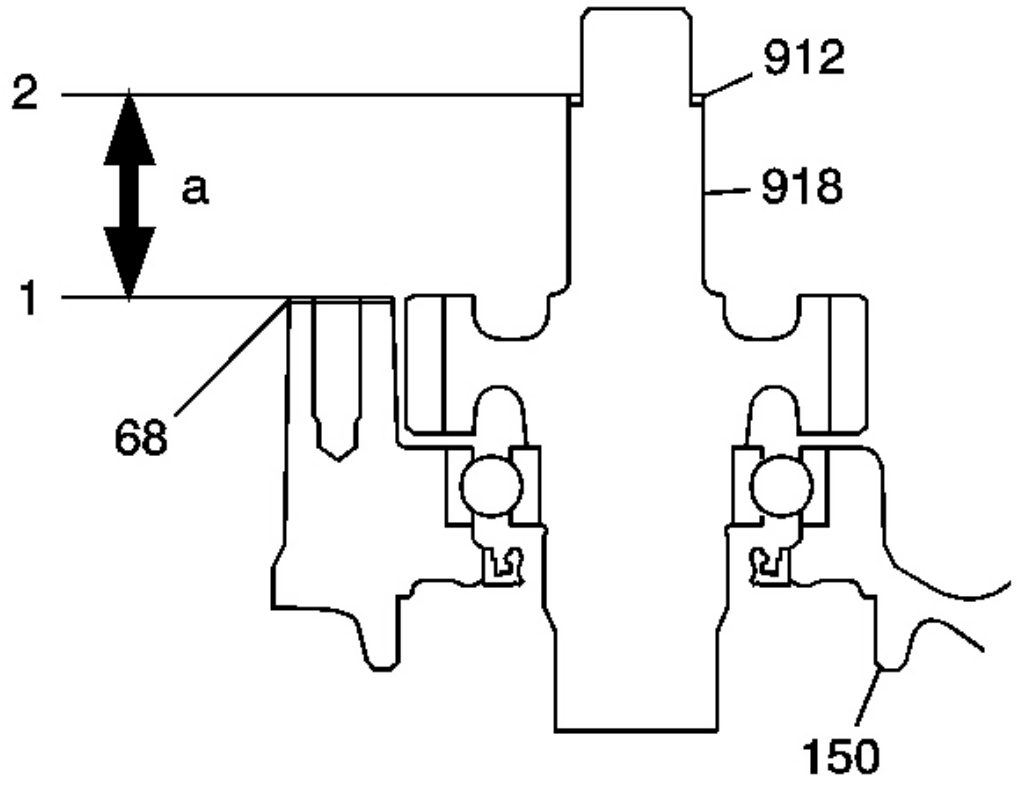

Fig. 405: Measuring The Height From Torque Converter Housing Gasket & Top Of Transfer Case Input Gear Selective Shim
Courtesy of GENERAL MOTORS CORP.

4. Measure the height (a) from the torque converter housing gasket (1) and the top (2) of the transfer case input gear 28.5 mm selective shim (912) in at least 3 places. Use the average of the 3 measurements as the actual height.

Specification: The height (a) is between 42.81-42.85 mm (1.685-1.687 in)

5. If the measurement is out of specification, remove the transfer case input gear 28.5 mm selective shim (912) and measure its thickness.
6. Select and install the correct transfer case input gear 28.5 mm selective shim (912), and then measure the installation height again.

FRONT DIFFERENTIAL ROTATIONAL TORQUE MEASUREMENT

Tools Required

- **DT 46410** Differential Rotational Torque Adapter
- **EN 46342** Driver Handle

If any of the following components have been serviced or replaced, inspect the rotational torque to prevent internal damaged to the transaxle assembly.

- The transmission case (31)
- The torque converter housing (150)
- The front differential assembly (919)
- The front differential front bearing (902)
- The front differential rear bearing (907)

The rotational torque can be changed by replacing the front differential bearing race 85 mm selective shim (910) as needed.

Measure the starting rotational torque at normal room temperature in both directions.

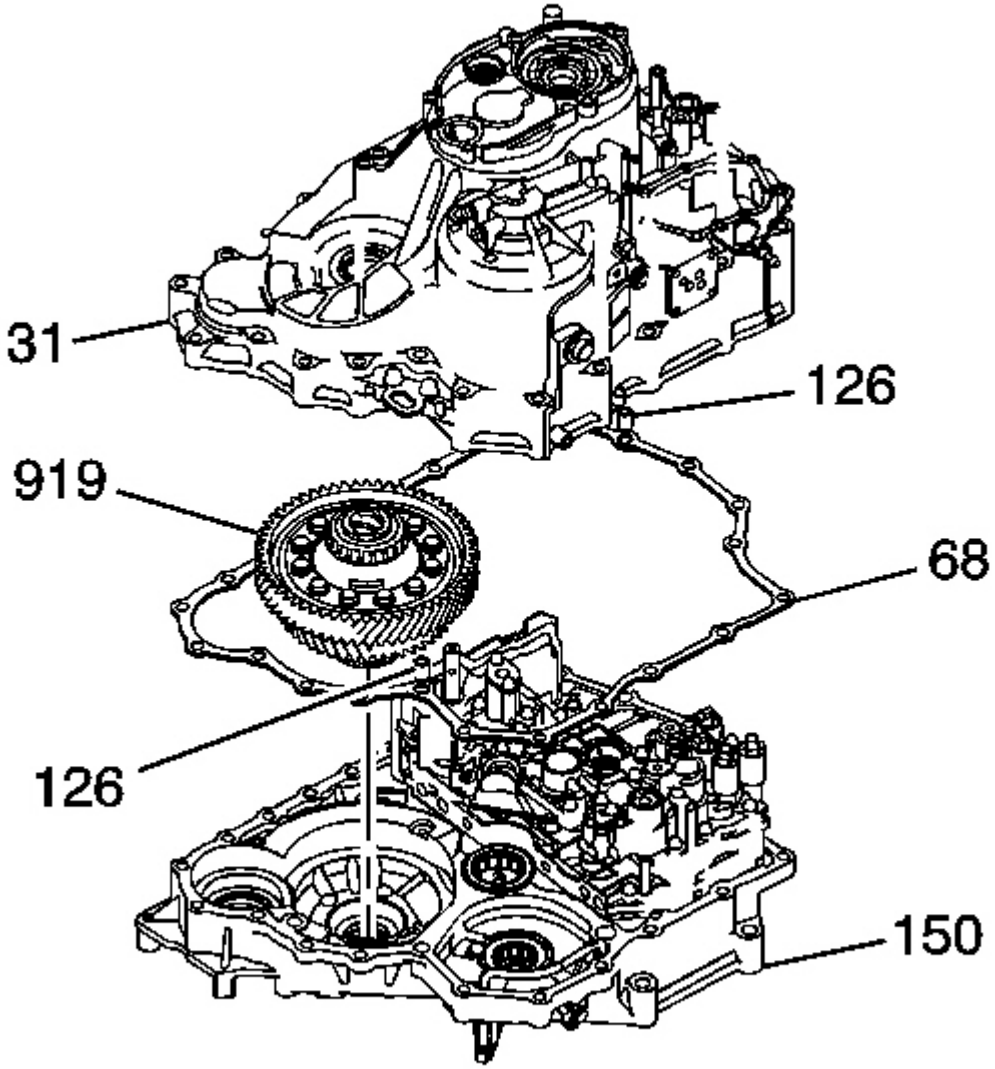

Fig. 406: Front Differential Assembly, Torque Converter Housing, Gasket & Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Install the front differential assembly (919) into the torque converter housing (150).
2. Install both 14 x 25 mm torque converter housing locating pins (126) into the torque converter housing (150).
3. Install the torque converter housing gasket (68) into the torque converter housing (150).
4. Install the transmission case (31) onto the torque converter housing (150).

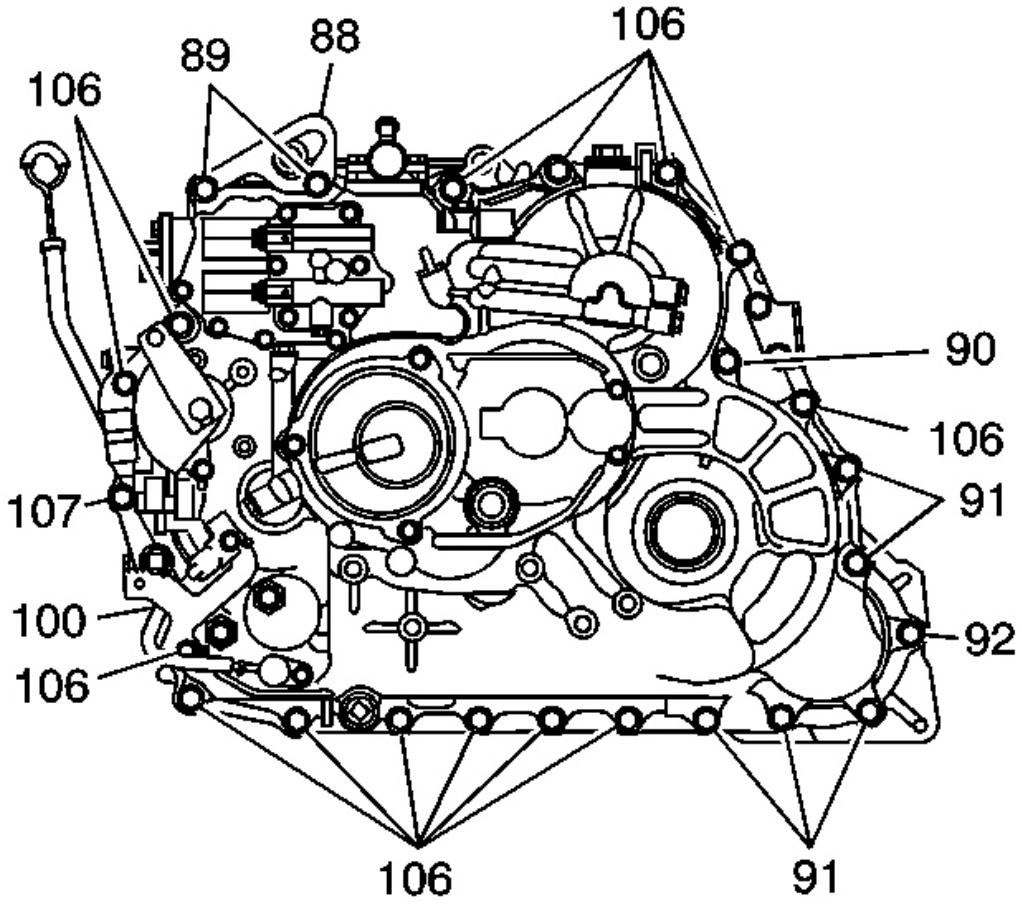

Fig. 407: Torque Converter Housing & Bolts
Courtesy of GENERAL MOTORS CORP.

5. Install a M10 x 1.25 x 50 mm transmission case bolt (92) in the correct location.
6. Install 5 M10 x 1.25 x 70 mm torque converter housing bolts (91) in the correct location.
7. Install a M10 x 1.25 x 80 mm torque converter housing bolt (107) in the correct location.
8. Install 14 M10 x 1.25 x 90 mm torque converter housing bolts (106) in the correct location.
9. Install a M10 x 1.25 x 100 mm torque converter housing bolt (90) in the correct location.
10. Install both M10 x 1.25 x 140 mm torque converter housing bolts (89) in the correct location, include the one transmission lift bracket (88).

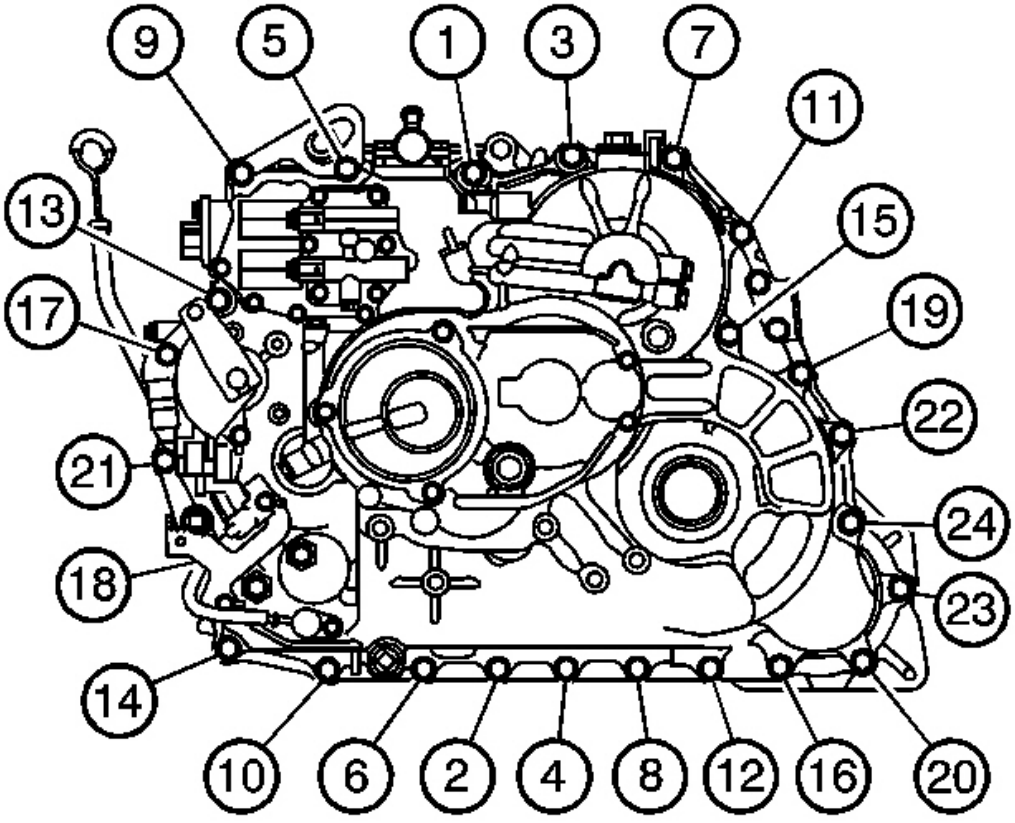

Fig. 408: Tightening The Front Differential Rotational Torque Bolts In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

11. Tighten the bolts in the sequence shown.

    Tighten: Tighten the bolts to 44 N.m (33 lb ft)

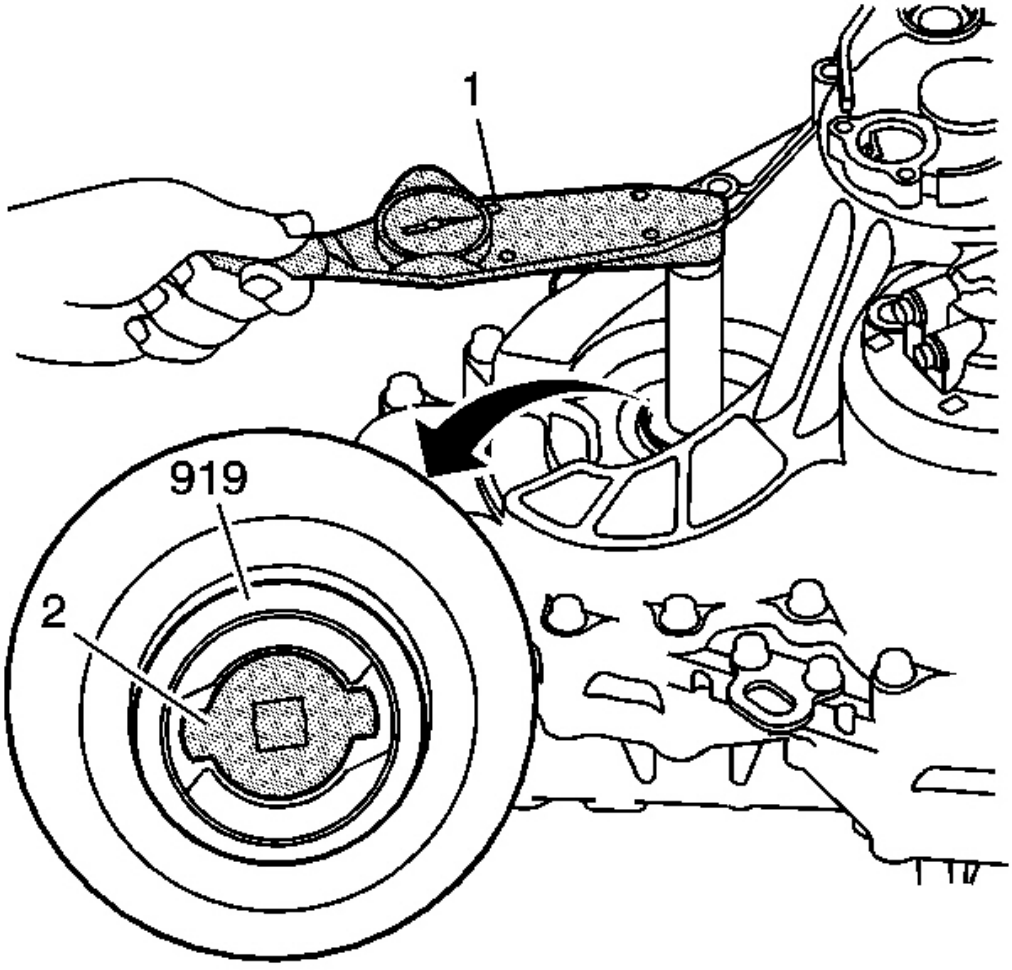

Fig. 409: Rotating The Differential Assembly In Both Directions In Order To Seat The Bearings Using DT 46410
Courtesy of GENERAL MOTORS CORP.

12. Using **DT 46410** (2), rotate the differential assembly (919) in both directions in order to seat the bearings.
13. Using **DT 46410** (2), and a torque wrench that can measure the specifications (1), measure the starting rotational torque of the front differential assembly (919).

Specification:

- New bearings: 3.9-5.1 N.m (35-45 lb in)
- Reused bearings: 3.6-4.8 N.m (32-43 lb in)

14. If the observed measurement is out of specification, remove the front differential bearing race selective shim (910) from the transmission case housing (31) and measure its thickness. Refer to **Transmission Case Front Differential Bearing Race Replacement** .
15. Select a new front differential bearing race selective shim (910) from the front differential bearing race selective shim table.
    - To increase the starting rotational torque, increase the thickness of the front differential bearing race selective shim (910).
    - To decrease the starting torque, decrease the thickness of the front differential bearing race selective shim (910).
    - Changing the shim to next size will increase or decrease the starting rotational torque approximately 0.5-0.6 N.m (5.5 lb in).
16. Install the new front differential bearing race selective shim (910), and then recheck the starting torque.

3RD CLUTCH SHAFT INSTALLED HEIGHT MEASUREMENT

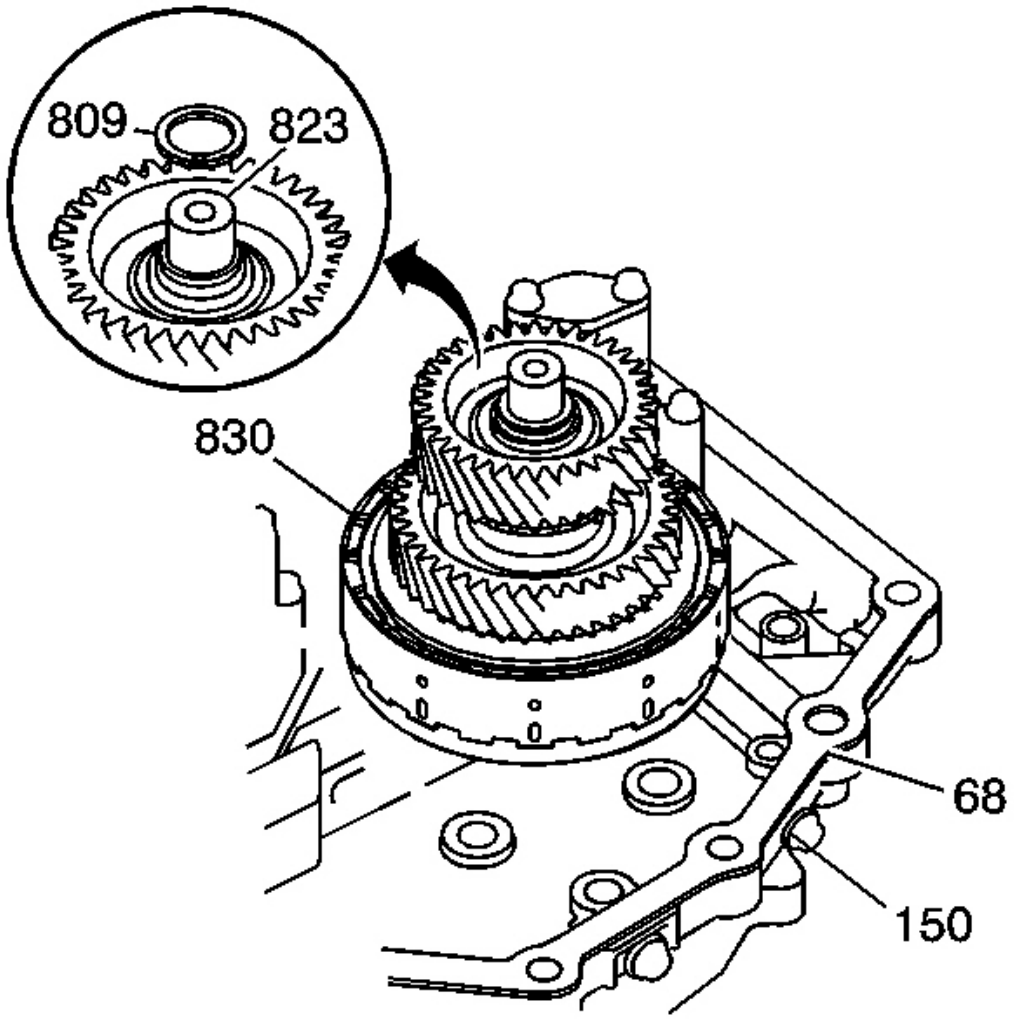

Fig. 410: 3rd Clutch Shaft & Washer
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not have the 3rd clutch shaft fluid passage seals (824) installed at this time on the clutch shaft.

1. Install the 3rd clutch shaft assembly (830) into the torque converter housing (150).
2. Install a selective 26.5 mm 3rd clutch shaft washer (809) on the machined end of the 3rd clutch shaft (823).
3. Install both torque converter housing locating pins into the torque converter housing (150).

4. Install the torque converter housing gasket (68) into the torque converter housing (150).

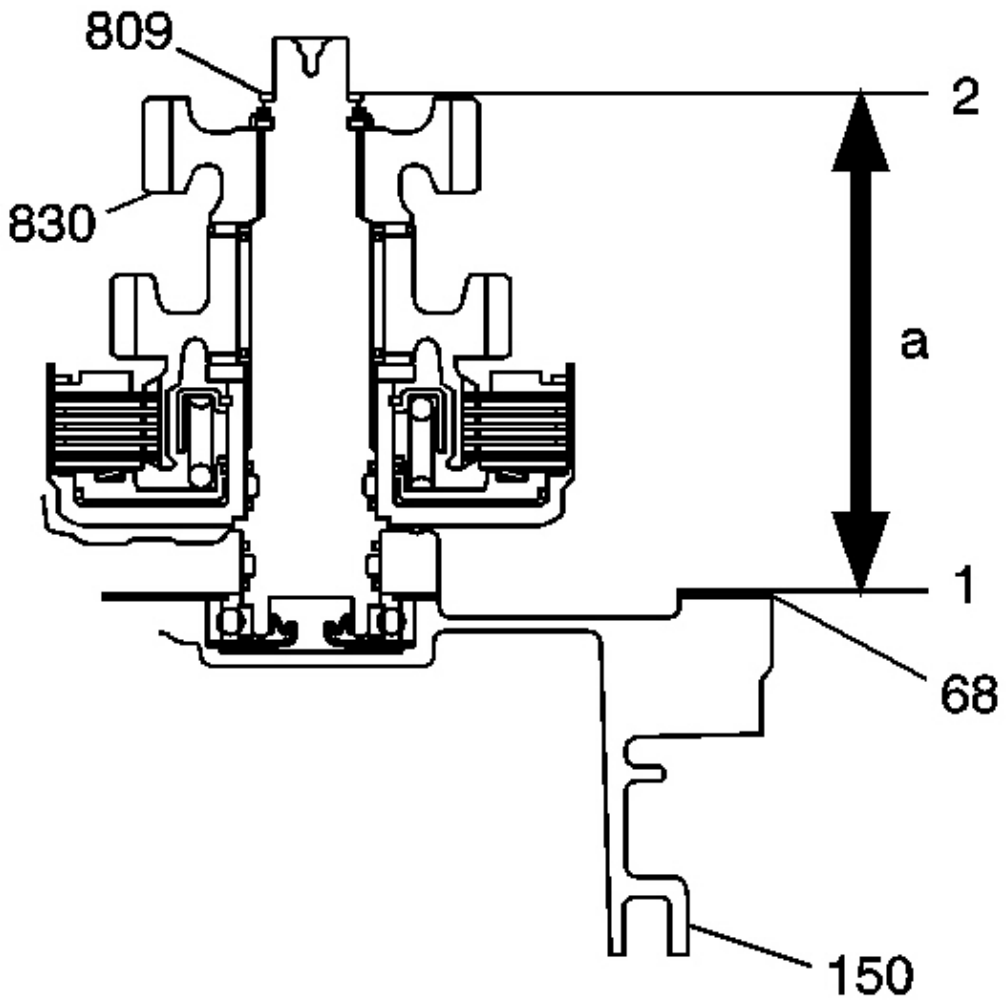

Fig. 411: Measuring The Height Of The 3rd Clutch Shaft Assembly From Top Of Torque Converter Housing Gasket To Top Surface Of 3rd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

5. Measure the installed height (a) of the 3rd clutch shaft assembly from the top of the torque converter housing gasket (1) to the top surface (2) of the 3rd clutch shaft installed height washer (809).

   Specification: The 3rd clutch shaft installation height is between 133.785-133.885 mm (5.2671-5.2711 in)

6. If the measurement is out of specification, remove the 3rd clutch shaft washer (809) and measure its thickness.
7. Select and install the correct 3rd clutch shaft washer (809), then measure the installed height again.

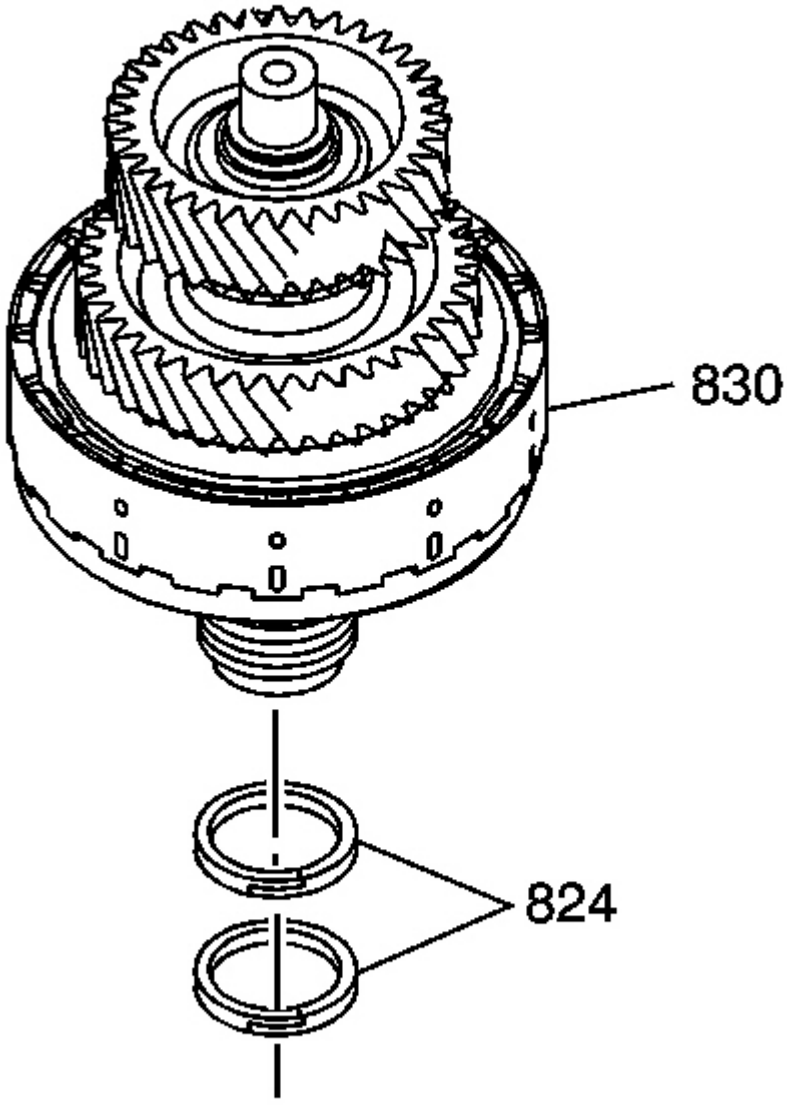

Fig. 412: 3rd Clutch Shaft Fluid Passage Seals & 3rd Clutch Shaft
Courtesy of GENERAL MOTORS CORP.

8. Install 2 new 35 mm 3rd clutch shaft fluid passage seals (824) on the 3rd clutch shaft.

1ST/2ND CLUTCH SHAFT INSTALLED HEIGHT MEASUREMENT

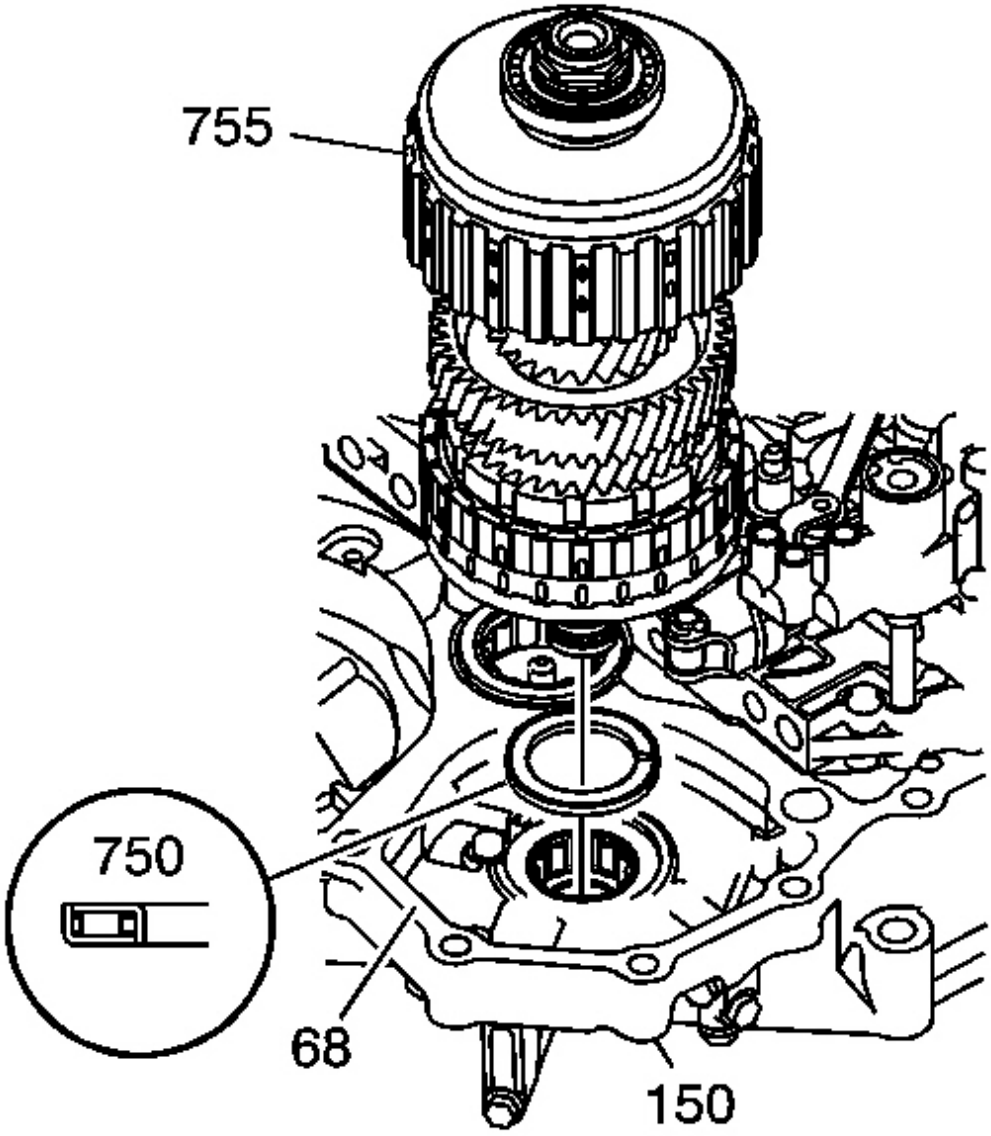

Fig. 413: 1st/2nd Clutch Shaft & Clutch Housing Thrust Bearing
Courtesy of GENERAL MOTORS CORP.

1. Install the following components into the torque converter housing (150):
    - The 1st/2nd clutch housing thrust bearing (750) with the rounded shoulder down
    - The 1st, 2nd clutch shaft assembly (755)
    - Both torque converter housing locating pins
    - The torque converter housing gasket (68)

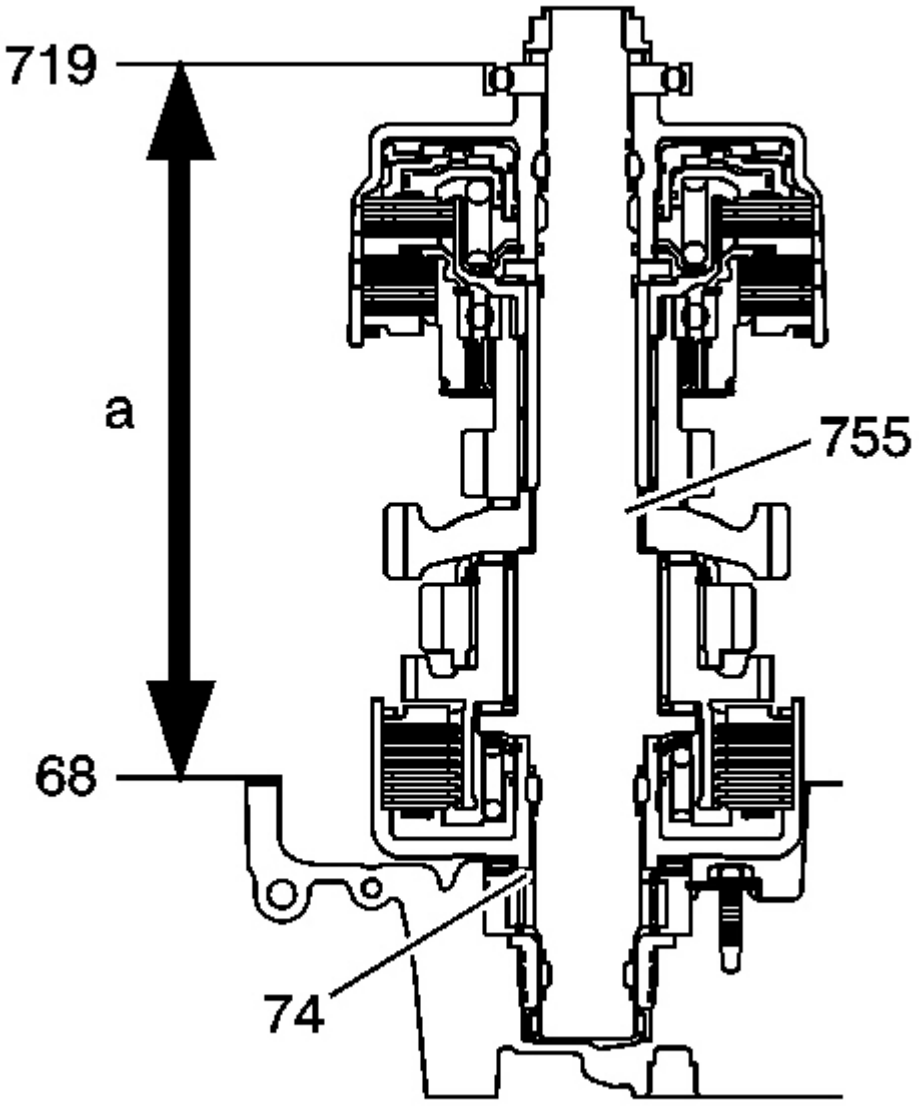

Fig. 414: Measuring The Height Of 1st/2nd Clutch Shaft Assembly From Top Of Torque Converter

Housing Gasket To Top Of 1st/2nd Clutch Shaft Bearing
Courtesy of GENERAL MOTORS CORP.

2. Measure the height (a) of the 1st/2nd clutch shaft assembly (755) from the top of the torque converter housing gasket (68) to the top of the 1st/2nd clutch shaft bearing (719).
3. Record the measurement. The measurement is the recorded 1st/2nd clutch shaft installed height.
4. Use the following formula for selection of the correct thickness of the 1st/2nd clutch shaft shim (74):

   Formula: The recorded 1st/2nd clutch shaft installed height measurement minus the 1st/2nd clutch shaft installed height specification equals the required shim thickness adjustment.

   Specifications: 1st/2nd clutch shaft installed height 222.54-222.63 mm (8.761-8.765 in)

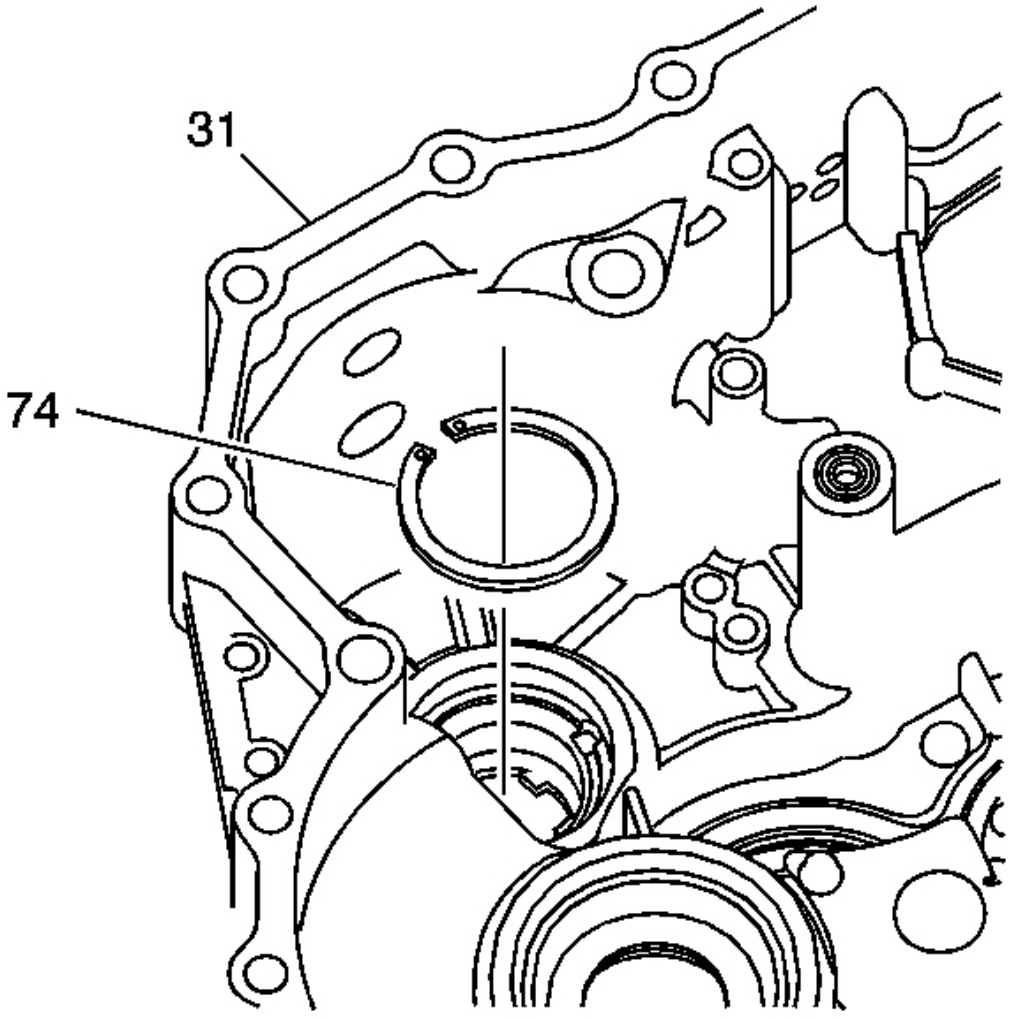

Fig. 415: 1st/2nd Clutch Shaft Shim & Transmission Case
Courtesy of GENERAL MOTORS CORP.

5. Remove the 1st/2nd clutch shaft shim (74) from the transmission case (31).
6. Measure the thickness of the shim.
    - In the above formula if the recorded height was less than the specification height, add the difference to the removed shim (74).
    - In the above formula if the recorded height was more than the specification height, subtract the difference from the removed shim (74).
7. If the thickness of the shim is not the required thickness from the above formula, select from the table the

correct thickness of shim. Refer to **Shim Size Specifications** .

8. Install the correct 1st/2nd clutch shaft 65 mm selective shim (74) into the transmission case (31).

CONTROL VALVE BODY ASSEMBLY INSTALLATION

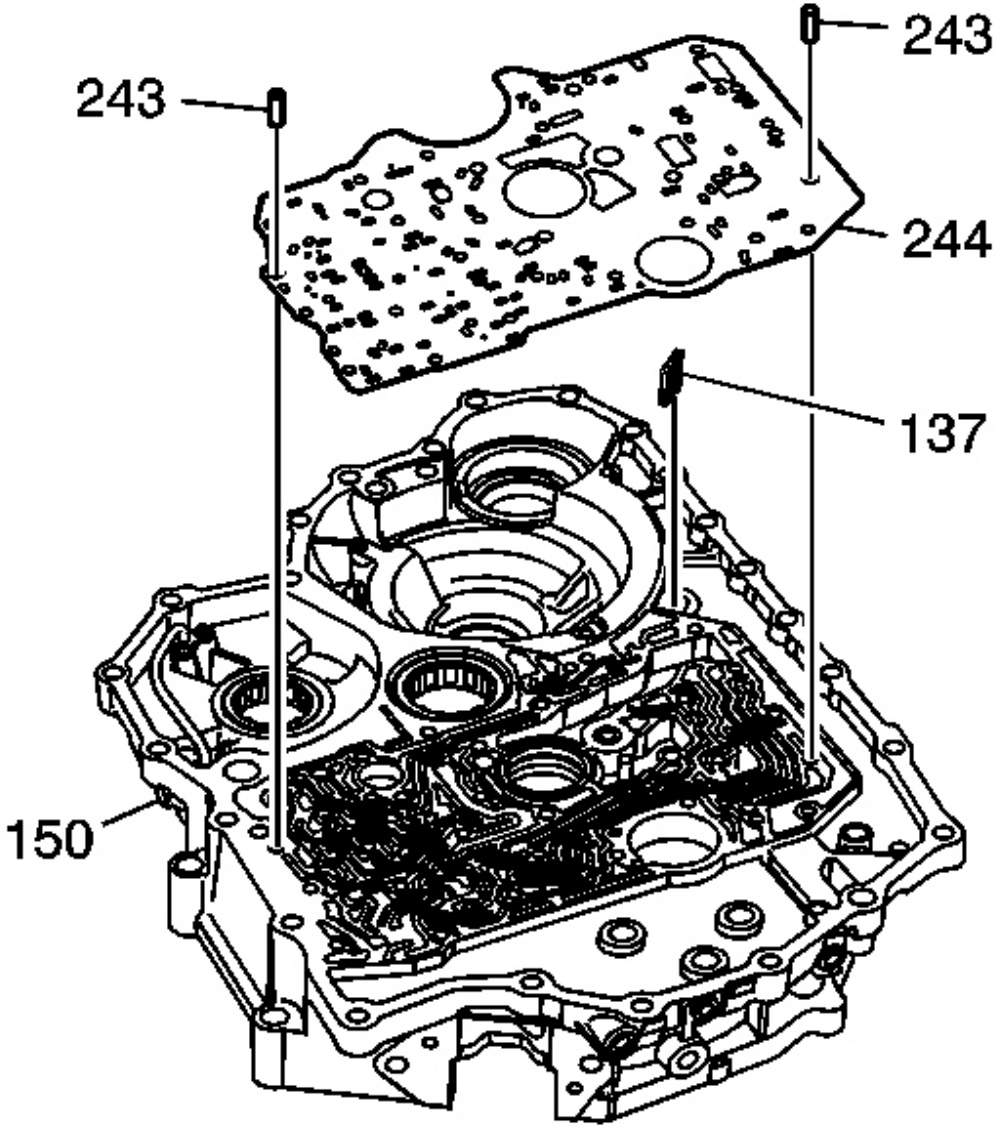

Fig. 416: Control Valve Body Spacer Plate, Locating Pins & Transmission Magnet Chip Collector
Courtesy of GENERAL MOTORS CORP.

1. If necessary, clean and install the transmission magnet chip collector (137) in the torque converter housing (150).
2. Install the spacer plate locating pins (243).
3. Install the control valve body spacer plate (244).

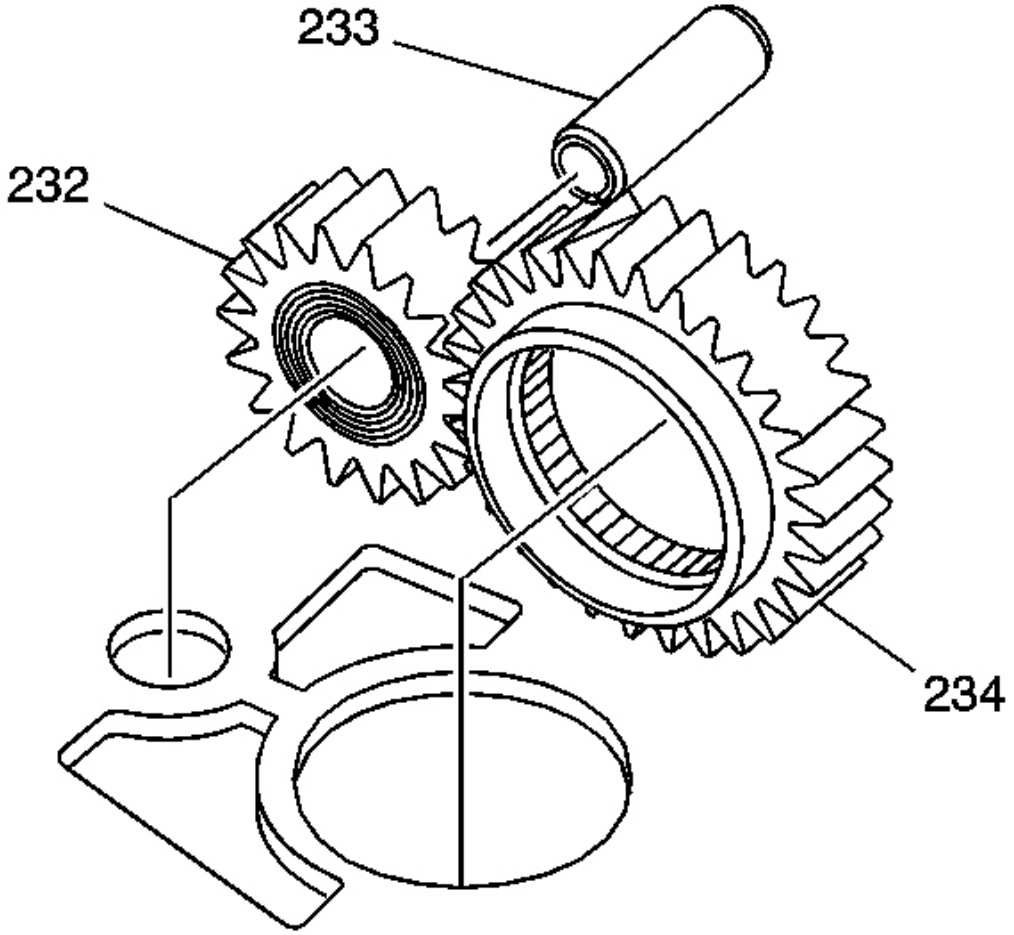

Fig. 417: Automatic Transmission Fluid Pump Driven Gear, Drive Gear & Gear Pin
Courtesy of GENERAL MOTORS CORP.

4. Install the automatic transmission fluid pump drive gear (234) into the transmission torque converter housing.
5. Install the automatic transmission fluid pump driven gear (232) into the transmission torque converter housing with its grooved and chamfered side facing down as shown.

6. Install the automatic transmission fluid pump driven gear pin (233) into the transmission torque converter housing.

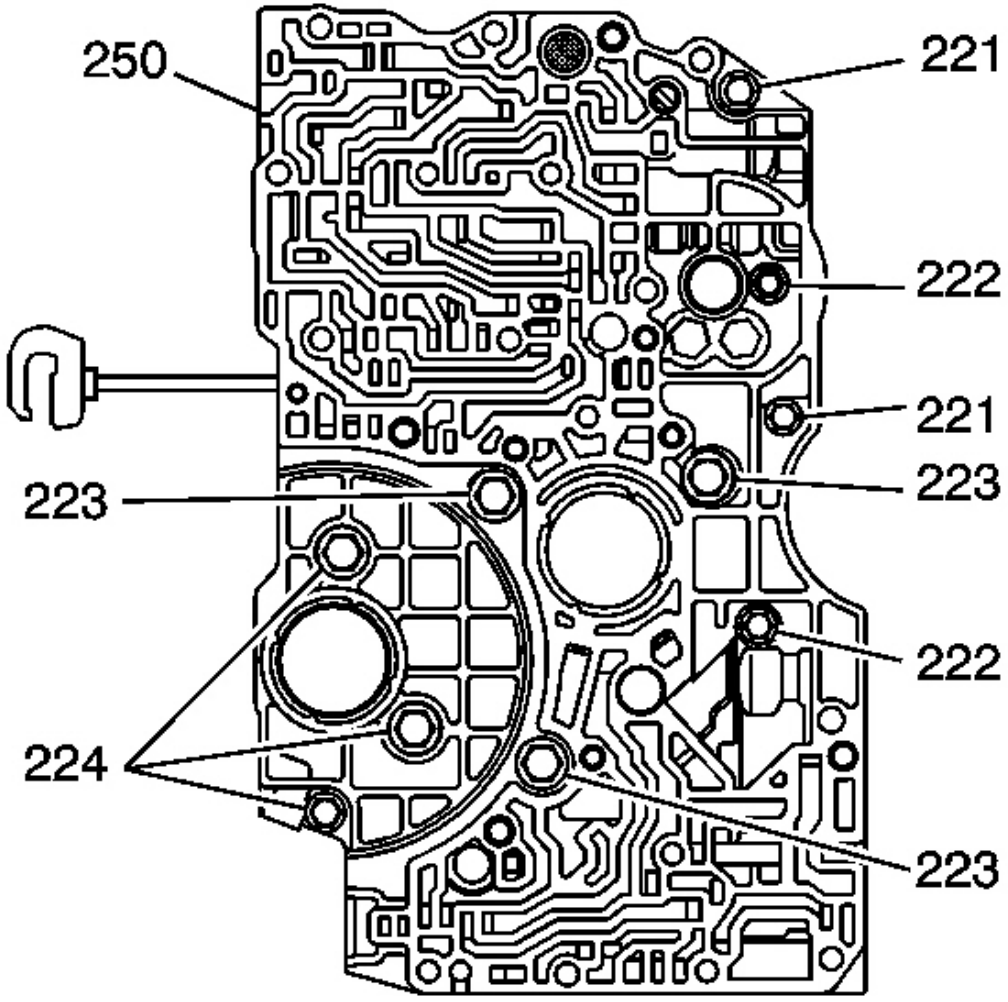

Fig. 418: Main Control Valve Body Assembly & Bolt/Screws
Courtesy of GENERAL MOTORS CORP.

7. Install the main control valve body assembly (250) to the torque converter housing assembly using the following flanged bolt/screws:
   - 2 M6 x 1.0 x 40 mm (221)
   - 2 M6 x 1.0 x 30 mm (222)

- 3 M8 x 1.0 x 32 mm (223)
- 3 M6 x 1.0 x 20 mm (224)

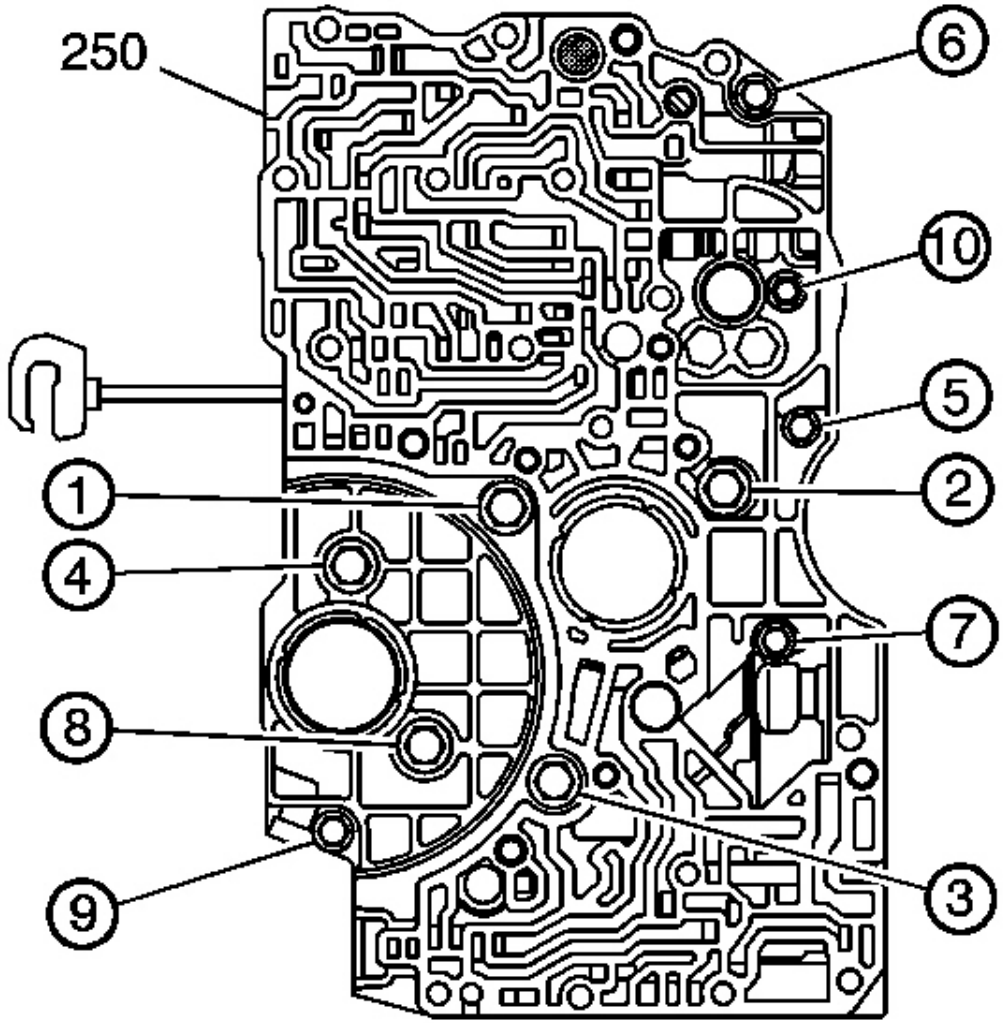

Fig. 419: Tightening The Control Valve Body Assembly Bolts In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Tighten the bolts in the sequence shown.

Tighten:

- Tighten all M6 bolts to 12 N.m (106 lb in)
- Tighten all M8 bolts to 18 N.m (13 lb ft)

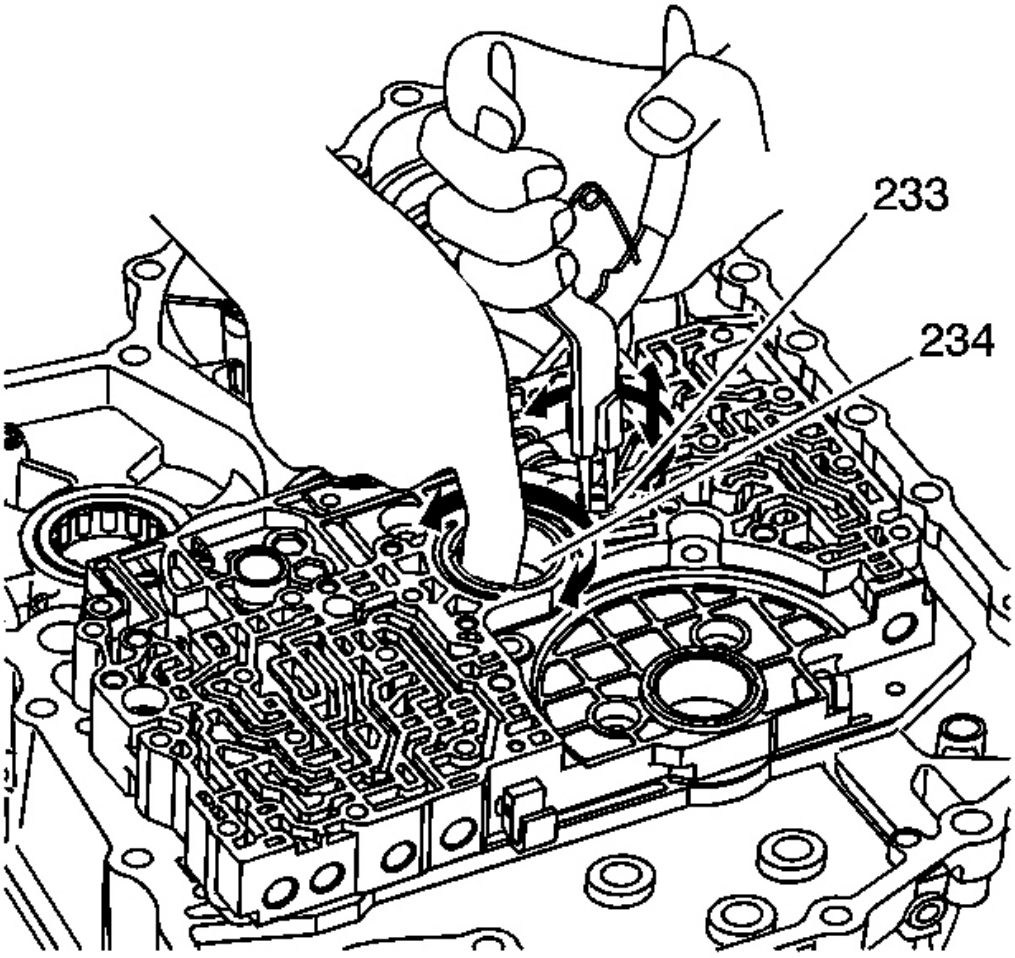

Fig. 420: Inspecting The Automatic Transmission Fluid Pump Drive Gear Pin & Automatic Transmission Fluid Pump Driven Gear Pin For Smooth Rotation
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Properly align the fluid pump driven gear pin in order to prevent a seized fluid pump.

9. Inspect the automatic transmission fluid pump drive gear pin (234) and the automatic transmission fluid pump driven gear pin (233) for smooth rotation.

10. If the gears do not rotate smoothly perform the following:
    - Loosen all of the control valve body bolts
    - Align the fluid pump driven gear pin again
    - Torque the bolts to specifications again
    - Verify the gears rotate smoothly

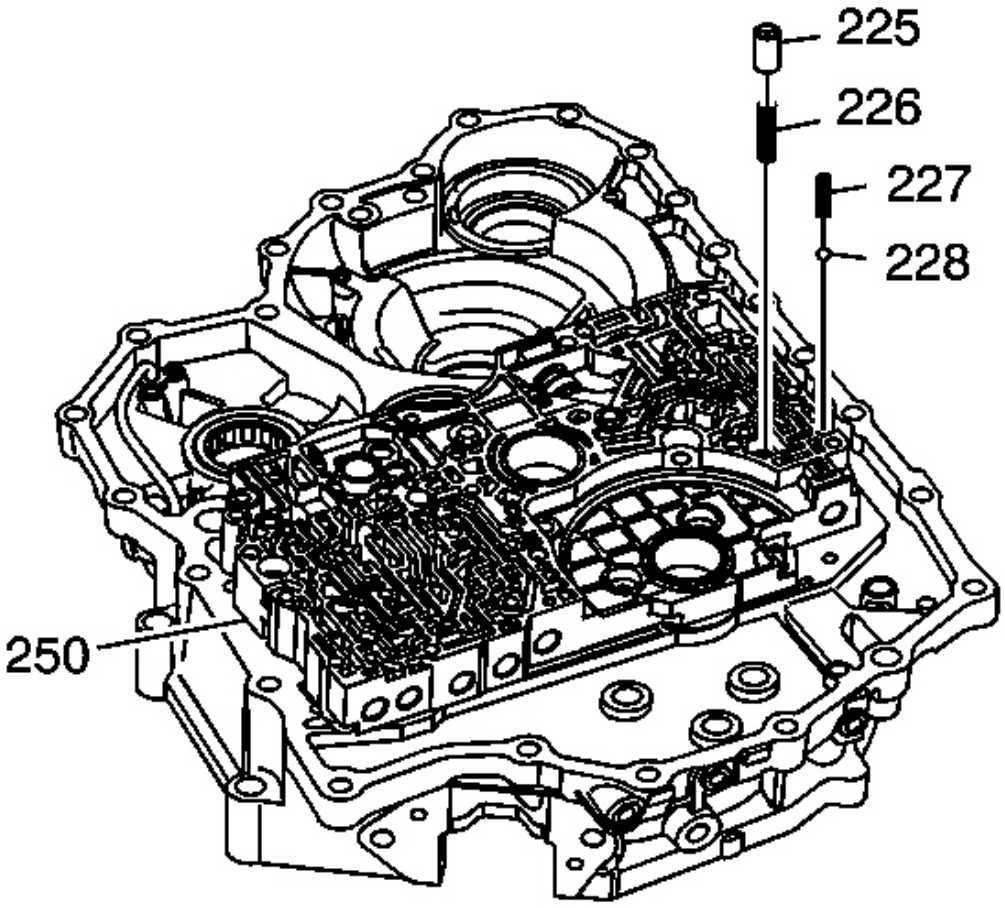

Fig. 421: Torque Converter Check Valve, Return Spring, Transmission Fluid Cooler Check Valve & Oil Cooler Check Return Spring
Courtesy of GENERAL MOTORS CORP.

11. Install the torque converter check valve 35.1 mm return spring (226) into the control valve body (250).
12. Install the torque converter check valve (225) into the control valve body (250).

13. Install the transmission fluid cooler check valve (228) into the control valve body (250).
14. Install the oil cooler check ball 14.5 mm return spring (227) into the control valve body (250).

SERVO VALVE BODY ASSEMBLY INSTALLATION

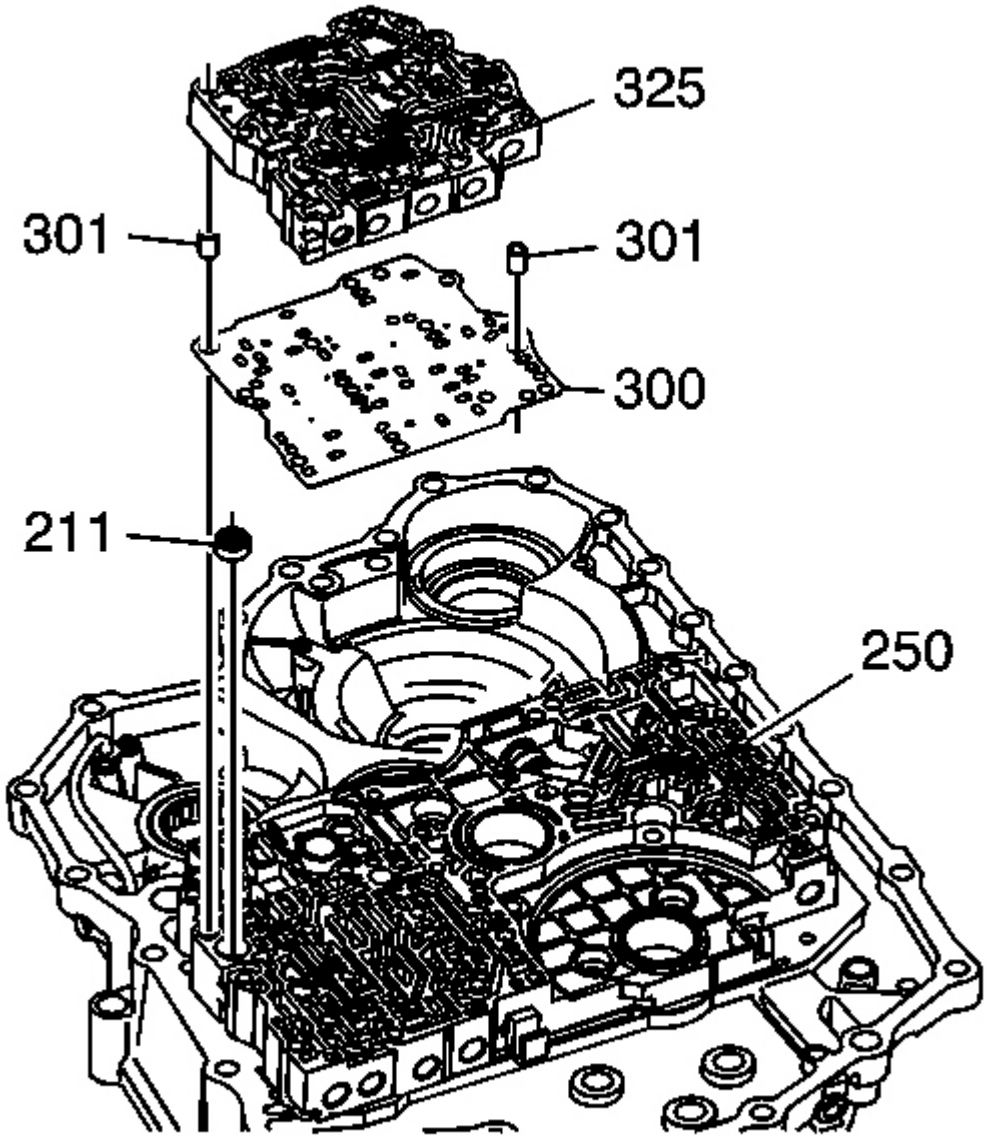

Fig. 422: Servo Valve Body Spacer Plate, Locating Pins & Transmission Fluid Filter

Courtesy of GENERAL MOTORS CORP.

1. Install the transmission fluid filter (211) into the control valve body assembly (250).
2. Install both 8 x 14 mm spacer plate locating pins (301) into the control valve body assembly (250).
3. Install the servo valve body spacer plate (300) on top of the control valve body assembly (250).
4. Install the servo valve body assembly (325) on top of the control valve body assembly (250).

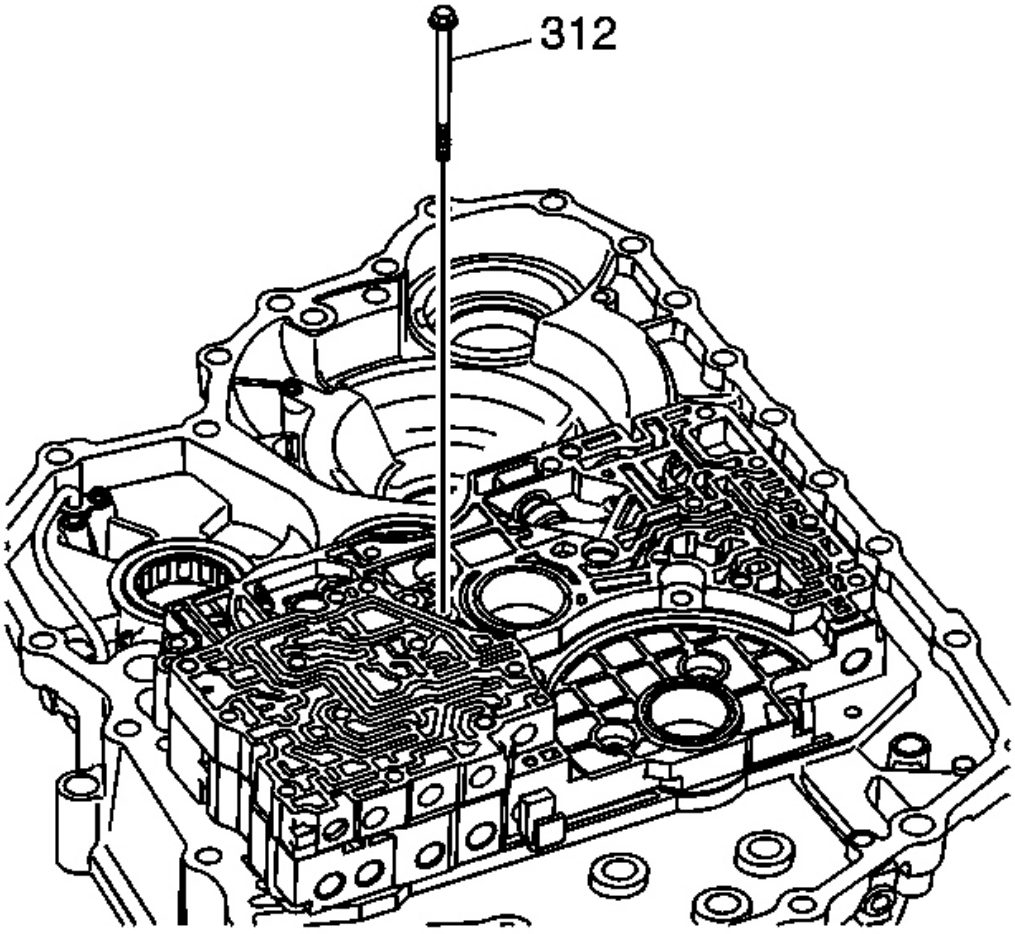

Fig. 423: Installing Servo Valve Body Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the servo valve body M6 x 1.0 x 60 mm bolt (312).

Tighten: Tighten the bolt to 12 N.m (106 lb in)

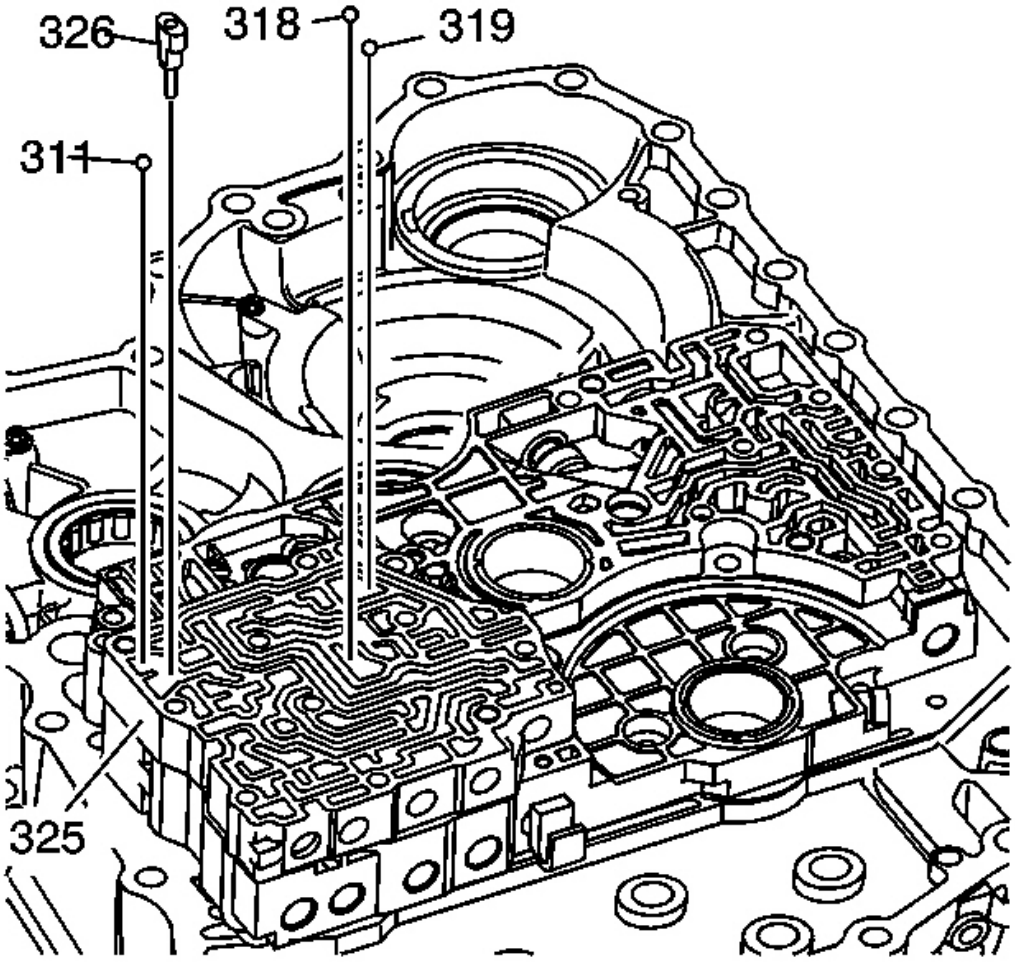

Fig. 424: 1st/2nd Clutch 7/32 In Check Valve & 1st Accumulator Choke
Courtesy of GENERAL MOTORS CORP.

6. Install the 1st clutch accumulator 7/32 in check valve (311) into the servo valve body assembly (325).
7. Install the 1st clutch 7/32 in check valve (318).
8. Install the 2nd clutch 7/32 in check valve (319).
9. Install the 1st accumulator choke (326).

ACCUMULATOR VALVE BODY ASSEMBLY INSTALLATION

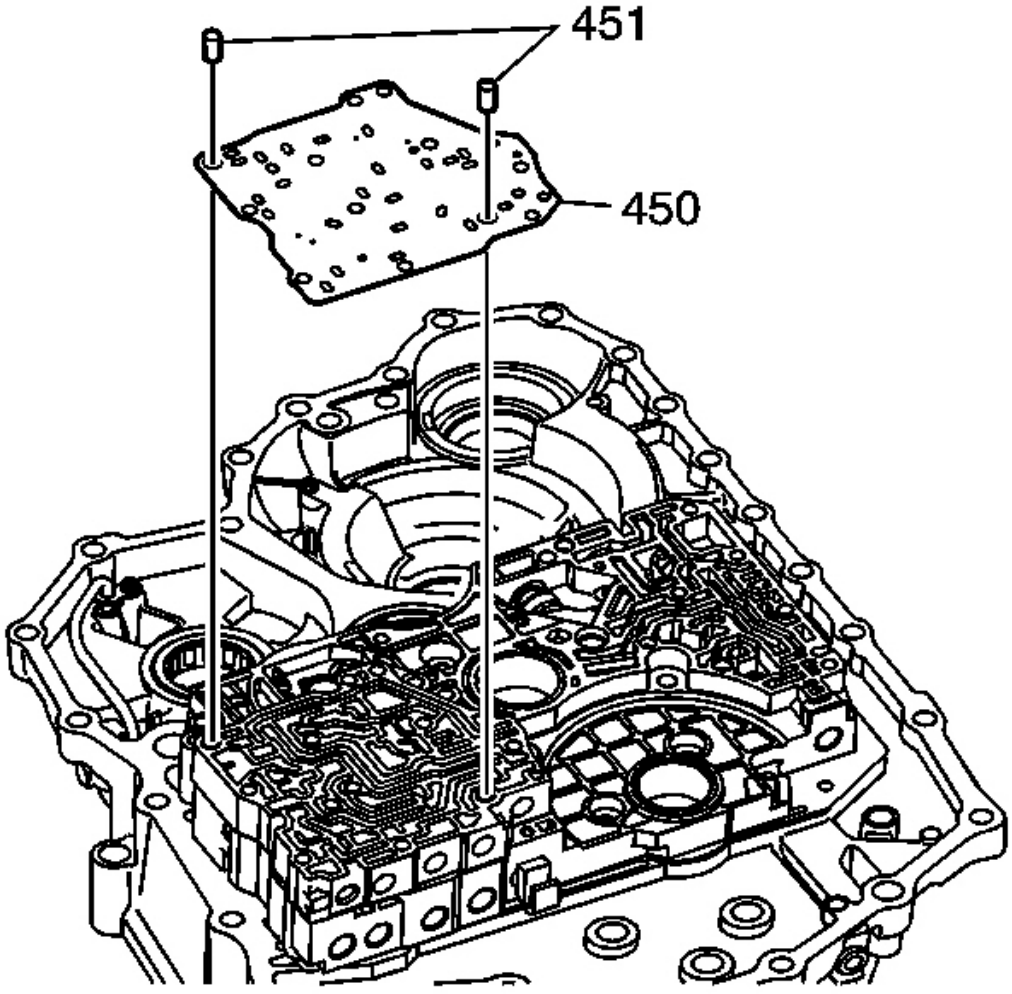

Fig. 425: Accumulator Valve Body Spacer Plate & Location Pin
Courtesy of GENERAL MOTORS CORP.

1. Install 2 8 x 14 mm spacer plate locating pins (451) into the servo valve body assembly.
2. Install the accumulator valve body spacer plate (450) on top of the servo valve body assembly.

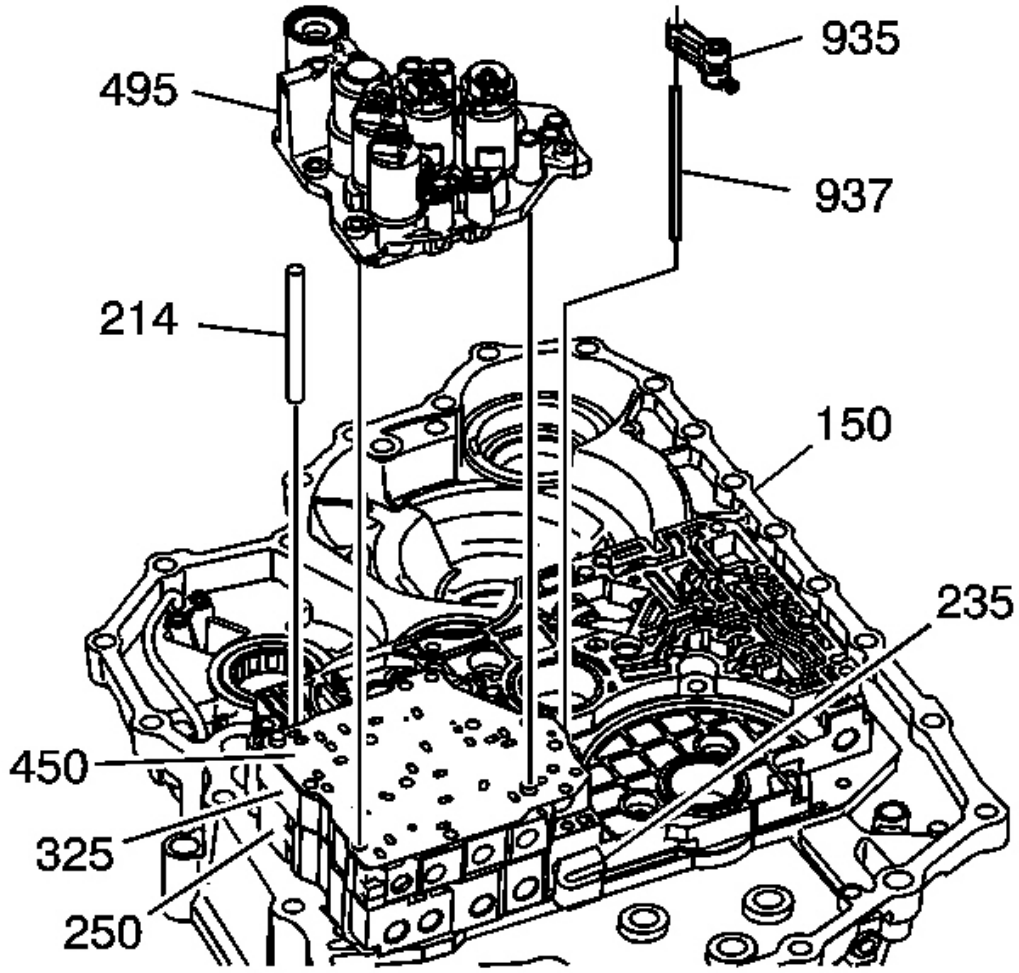

Fig. 426: Manual Shift Detent Roller Pin & Components
Courtesy of GENERAL MOTORS CORP.

3. Place the manual shift detent roller (935) between the accumulator valve body spacer plate (450) and the accumulator valve body assembly (495).

IMPORTANT: The manual valve (235) must be turned in the correct position for the roller pin (937) to clear.

4. Insert the manual shift detent roller pin (937) through the following components:
   - Accumulator valve body spacer plate (450)
   - Servo valve body assembly (325)

- Control valve body assembly (250)

5. Seat the end of the manual shift detent roller pin (937) into the locating hole in the torque converter housing (150).
6. Install the 8 x 62 mm 4th clutch apply fluid passage pipe (214) into the correct oil passage located in the top side of the control valve body assembly (250).
7. Install the accumulator valve body (495) on top of the accumulator valve body spacer plate (450).

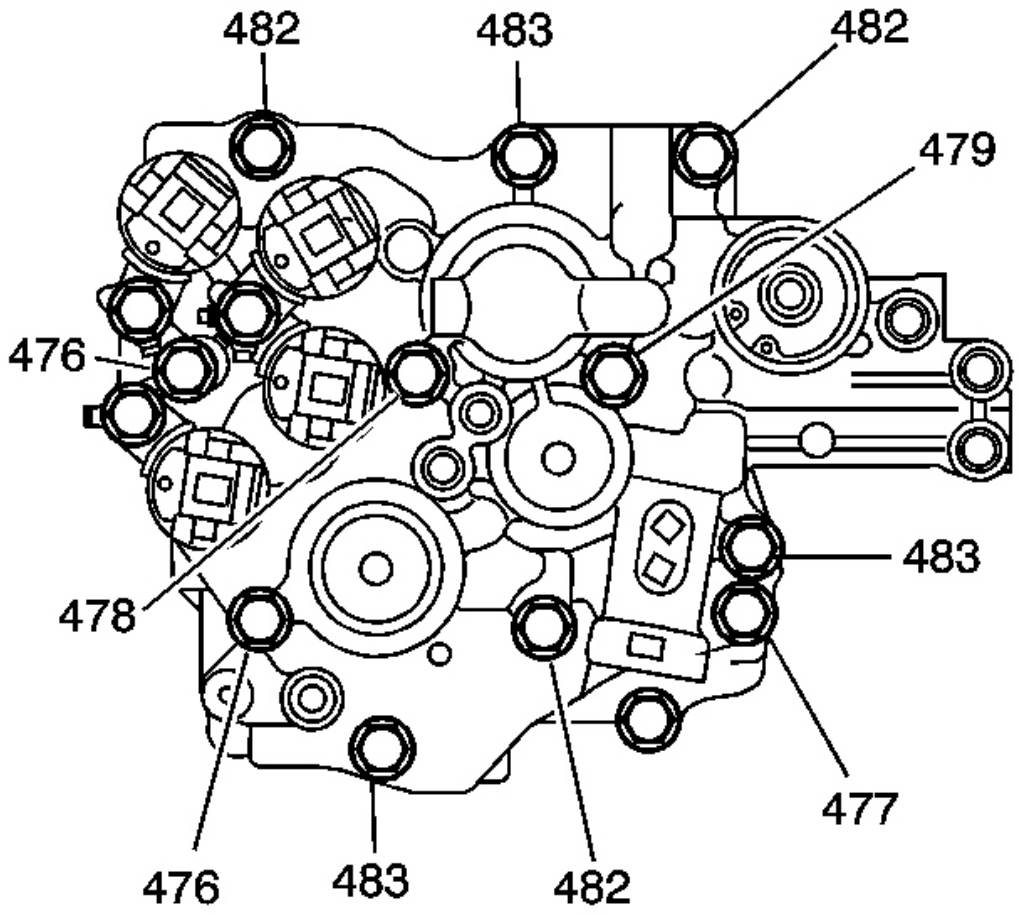

Fig. 427: Accumulator Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

8. Install the following accumulator valve body bolts:
   - A M6 x 1.0 x 60 mm bolt (477)
   - 3 M6 x 1.0 x 85 mm bolts (483)

- 4 M6 x 1.0 x 95 mm bolts (482)
- 2 M6 x 1.0 x 110 mm bolts (476)
- A M6 x 1.0 x 125 mm bolt (479)
- A M6 x 1.0 x 140 mm bolt (478)

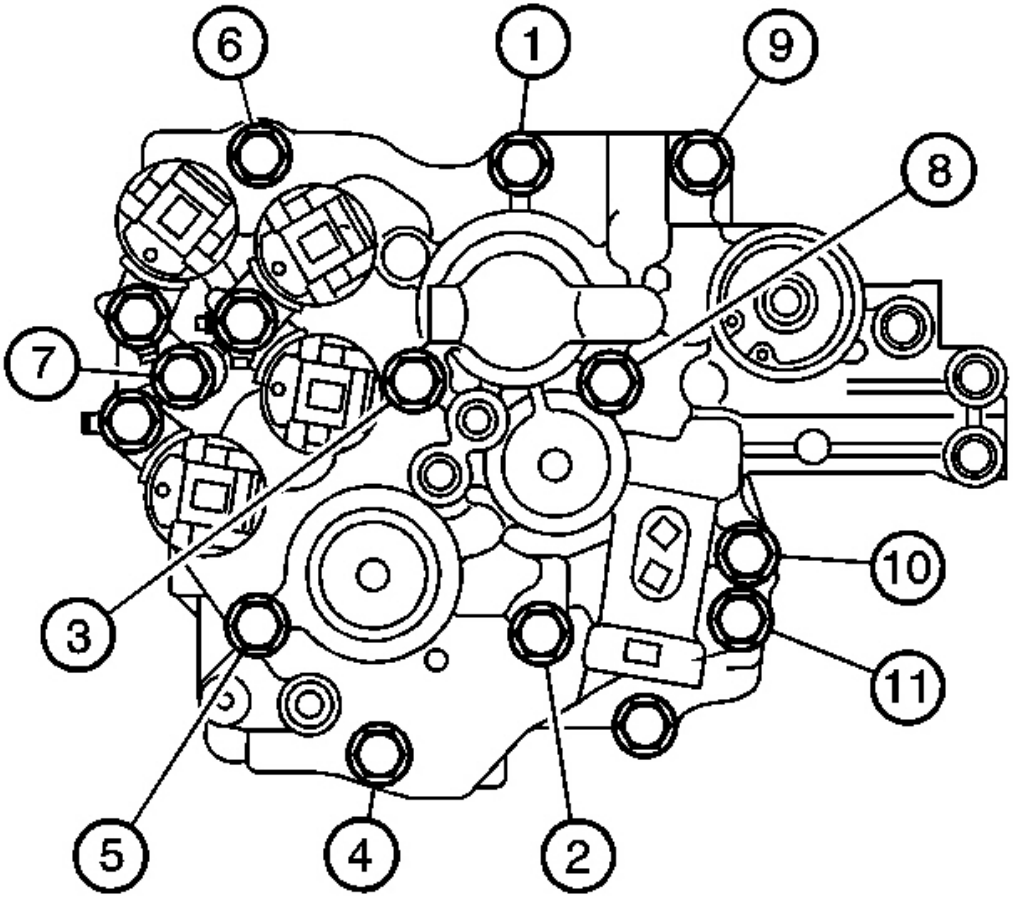

Fig. 428: Tightening The Accumulator Valve Body Bolts In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

9. Tighten the bolts in the sequence shown.

   Tighten: Tighten all bolts to 12 N.m (106 lb in).

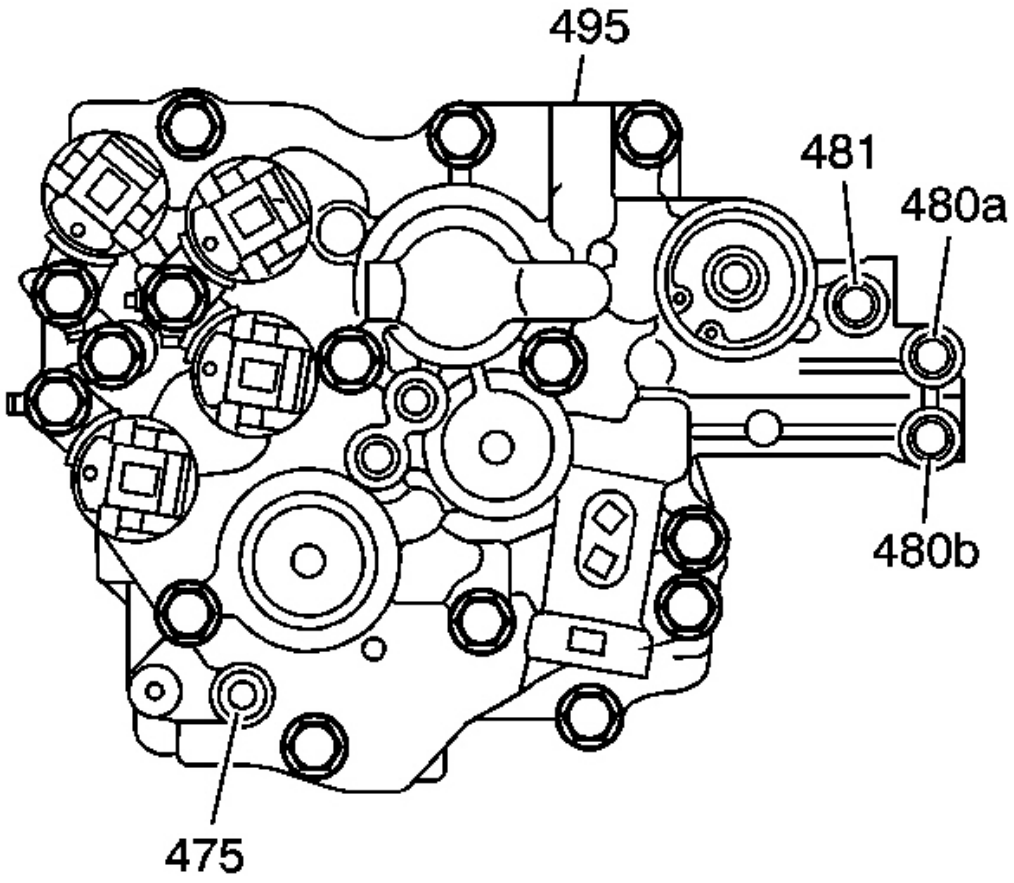

Fig. 429: Installing Pipes Into Accumulator Valve Body
Courtesy of GENERAL MOTORS CORP.

10. Install the following passage pipes into the accumulator valve body (495).
    - Mainshaft lube fluid pipe (475) 8 x 85 mm
    - 1st clutch control fluid pipe (480a) 8 x 151.5 mm
    - Coast clutch fluid pipe (480b) 8 x 151.5 mm
    - 4th clutch control fluid pipe (481) 8 x 40 mm

REGULATOR VALVE BODY ASSEMBLY INSTALLATION

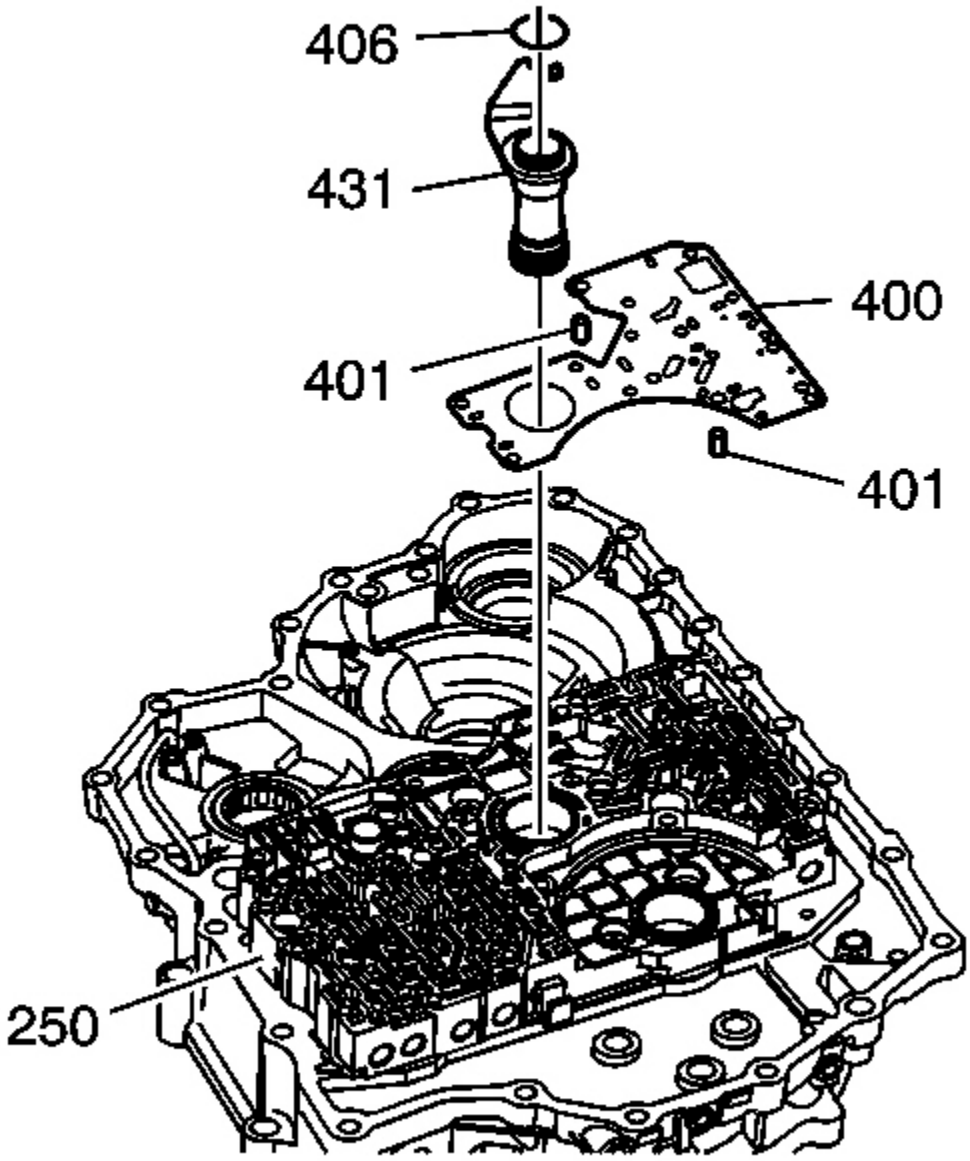

Fig. 430: Regulator Spacer Plate, Locating Pins, Stator Shaft & Torque Arm Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the spacer plate locating pins (401) into the control valve body assembly (250).
2. Install the regulator body spacer plate (400).
3. Lubricate and install a new stator shaft O-ring seal (406) on the stator shaft and torque arm assembly

(431).

4. Install the stator shaft and torque arm assembly (431) through the hole located in the control valve body assembly (250). Ensure that the assembly is fully seated and moves freely.

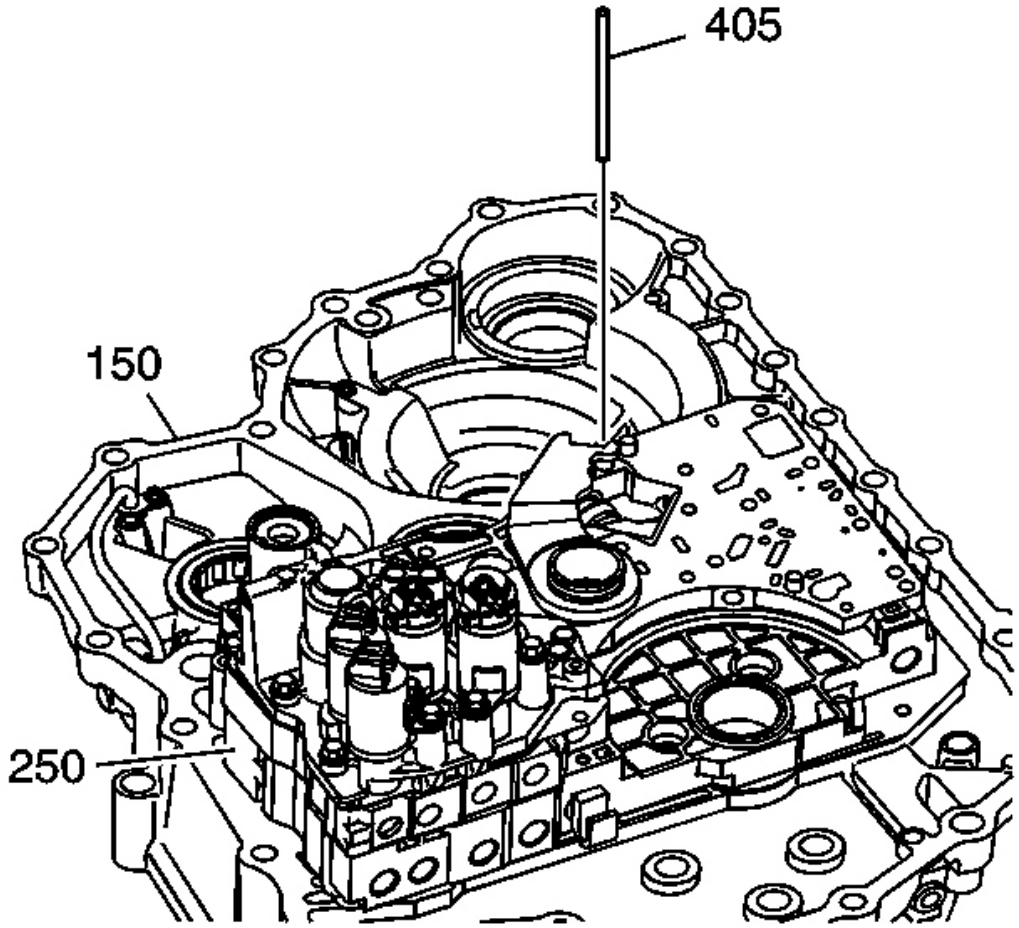

Fig. 431: Stator Shaft Stop Pin
Courtesy of GENERAL MOTORS CORP.

5. Insert the 7 x 71 mm stator shaft stop pin (405) into the hole located in the control valve body assembly (250).
    - Ensure that the pin bottoms out in the hole located in the torque converter housing assembly (150).
    - Position the torque arm assembly to allow the pin to be positioned between the stops.

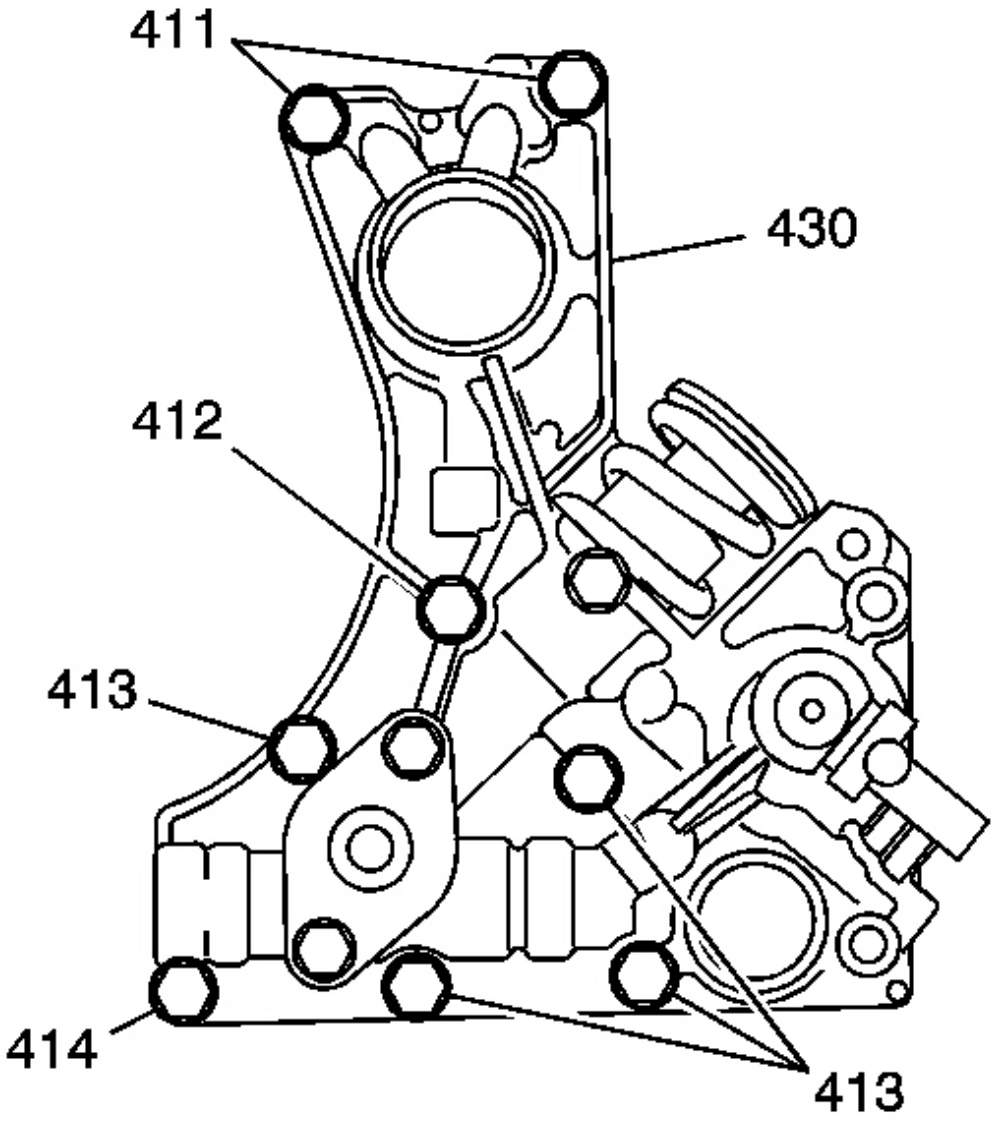

Fig. 432: Installing Regulator Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the regulator valve body assembly (430) onto the control valve body assembly.
7. Install the following regulator valve body bolts:
    - 2 M6 x 1.0 x 35 mm bolts (411)
    - A M6 x 1.0 x 55 mm bolt (412)

- 4 M6 x 1.0 x 70 mm bolts (413)
- A M6 x 1.0 x 80 mm bolt (414)

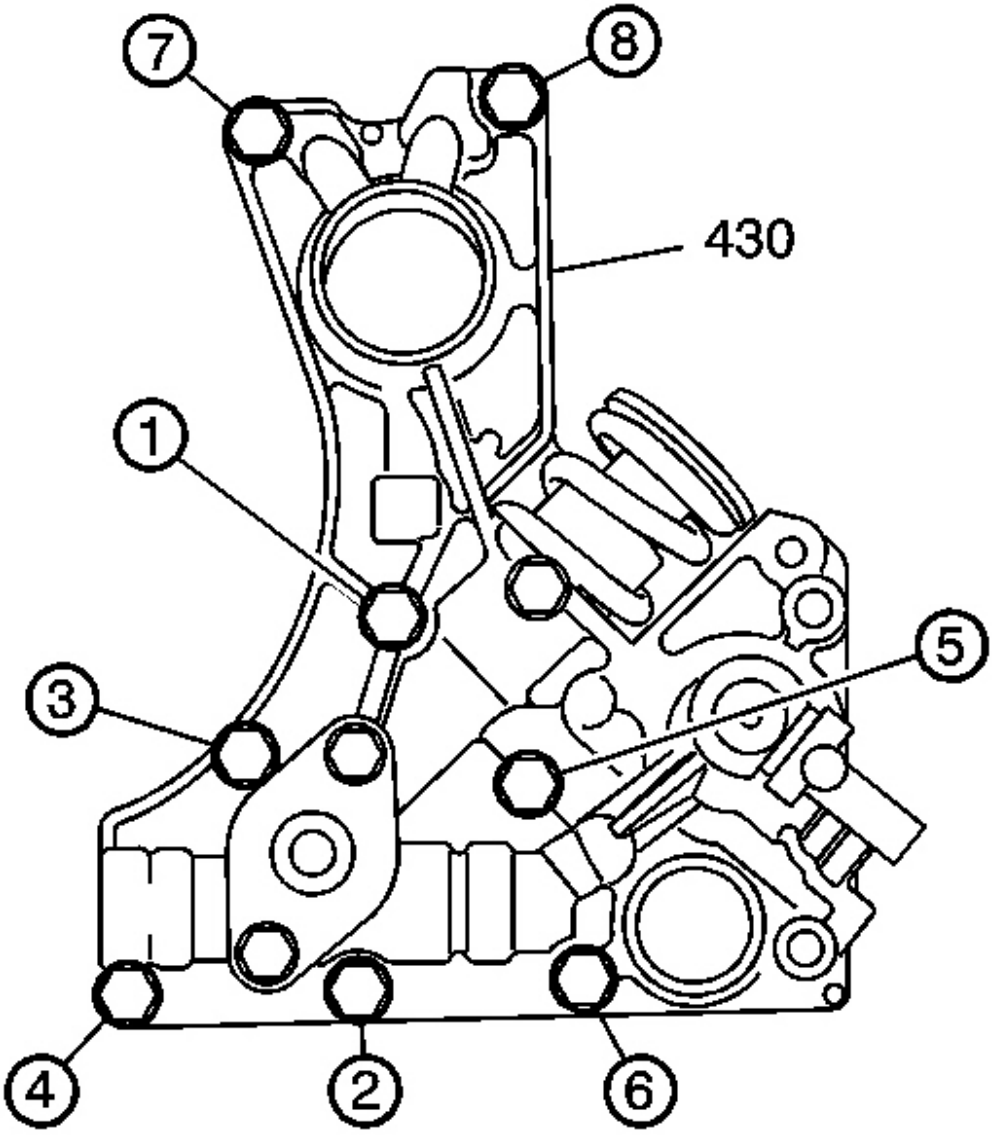

Fig. 433: Tightening The Regulator Valve Body Assembly In Sequence
Courtesy of GENERAL MOTORS CORP.

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

8. Tighten the bolts in the sequence shown.

   Tighten: Tighten all bolts to 12 N.m (106 lb in).

FLUID FILTER INSTALLATION

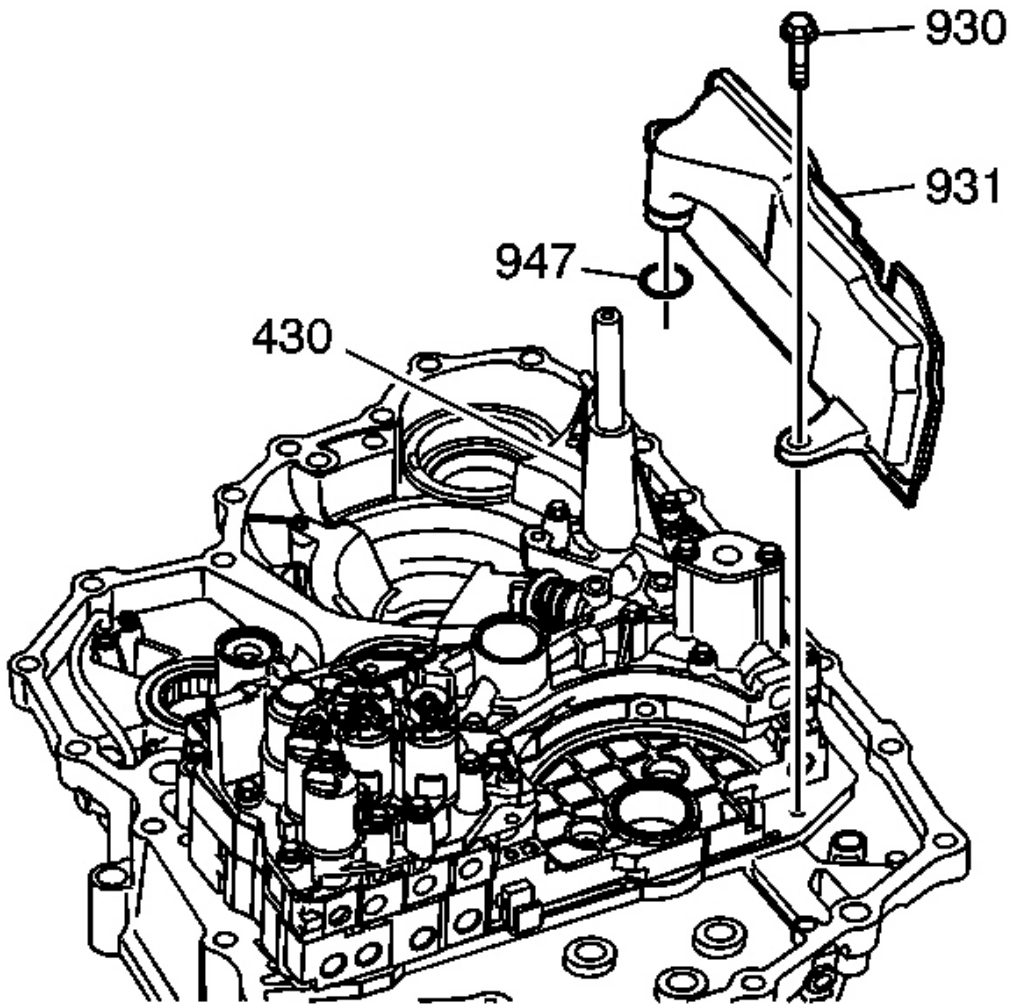

Fig. 434: Regulator Valve Body, Transmission Fluid Filter & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install a new fluid filter 21.8 mm x 1.9 mm O-ring seal (947) on the fluid filter (931).
2. Install the fluid filter (931).

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the fluid filter bolt (930).

Tighten: Tighten the bolt/screw to 12 N.m (106 lb in).

3RD CLUTCH SHAFT ASSEMBLY INSTALLATION

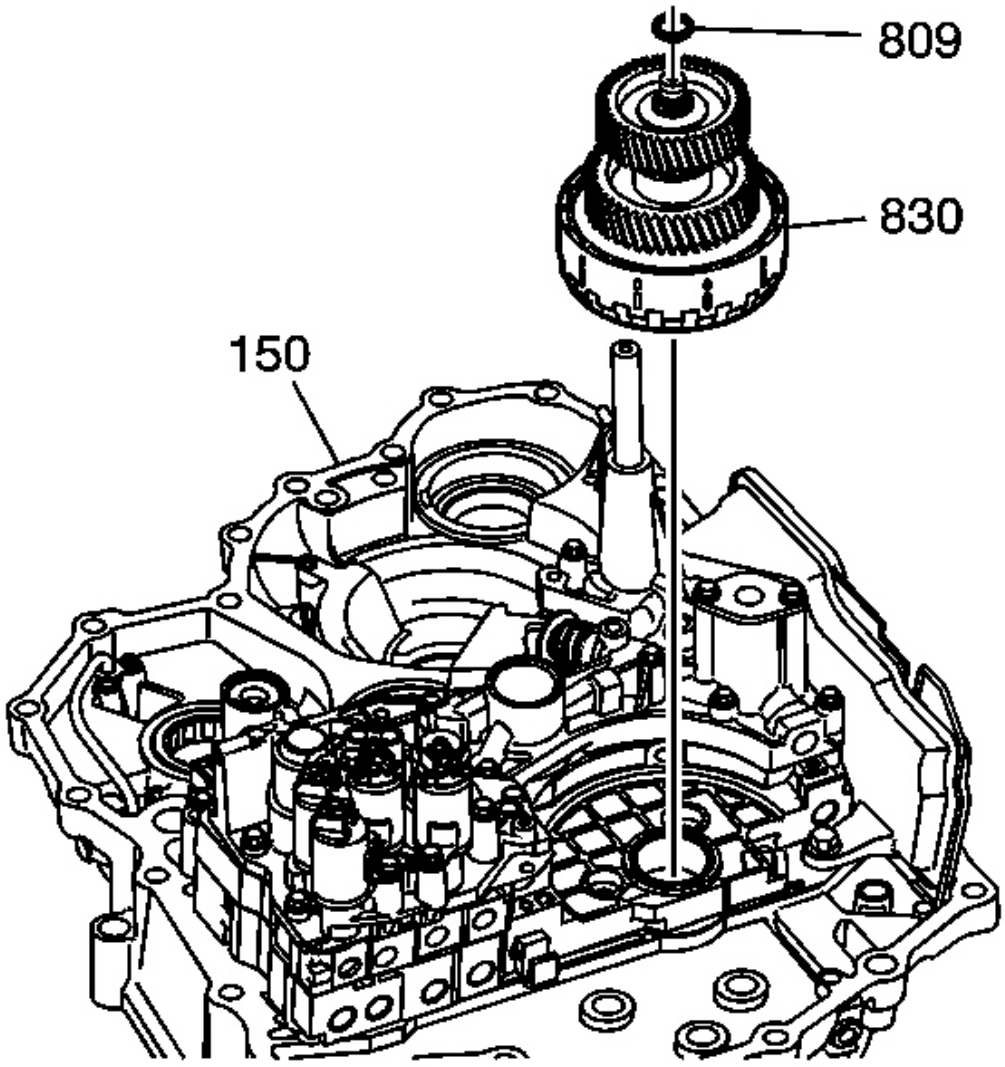

Fig. 435: Selective Washer & 3rd Clutch Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the 3rd clutch shaft assembly (830) into the torque converter housing assembly (150).
2. Install the correct predetermined 3rd clutch shaft, installed height, selective 26.5 mm washer (809) on the machined end of the 3rd clutch shaft assembly (830).

TRANSFER CASE INPUT GEAR ASSEMBLY INSTALLATION

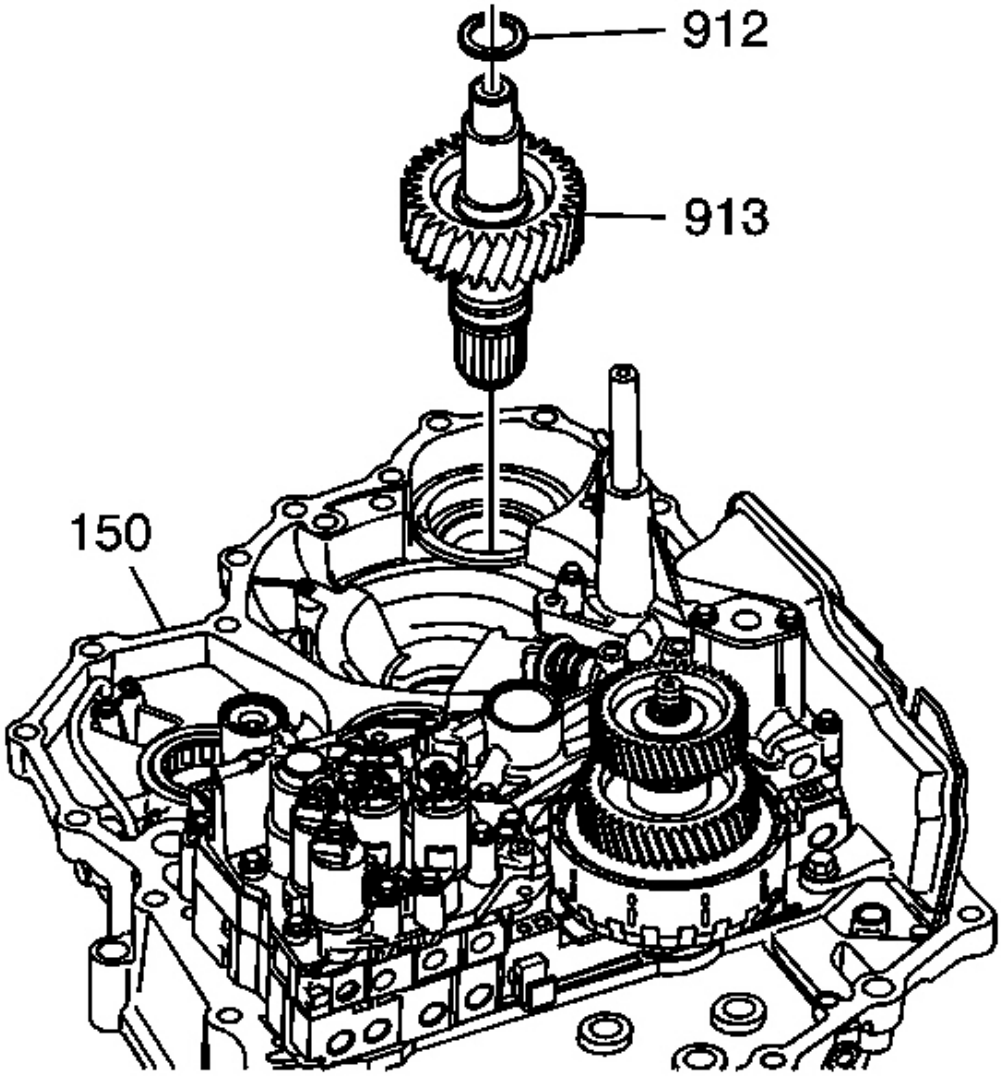

Fig. 436: Transfer Case Input Gear & Selective Shim
Courtesy of GENERAL MOTORS CORP.

1. Install the transfer case input gear (913) into the torque converter housing (150).
2. Install the correct predetermined transfer case input gear selective 28.5 mm thrust shim (912) on the machined surface of the transfer case input gear (913).

FRONT DIFFERENTIAL ASSEMBLY INSTALLATION

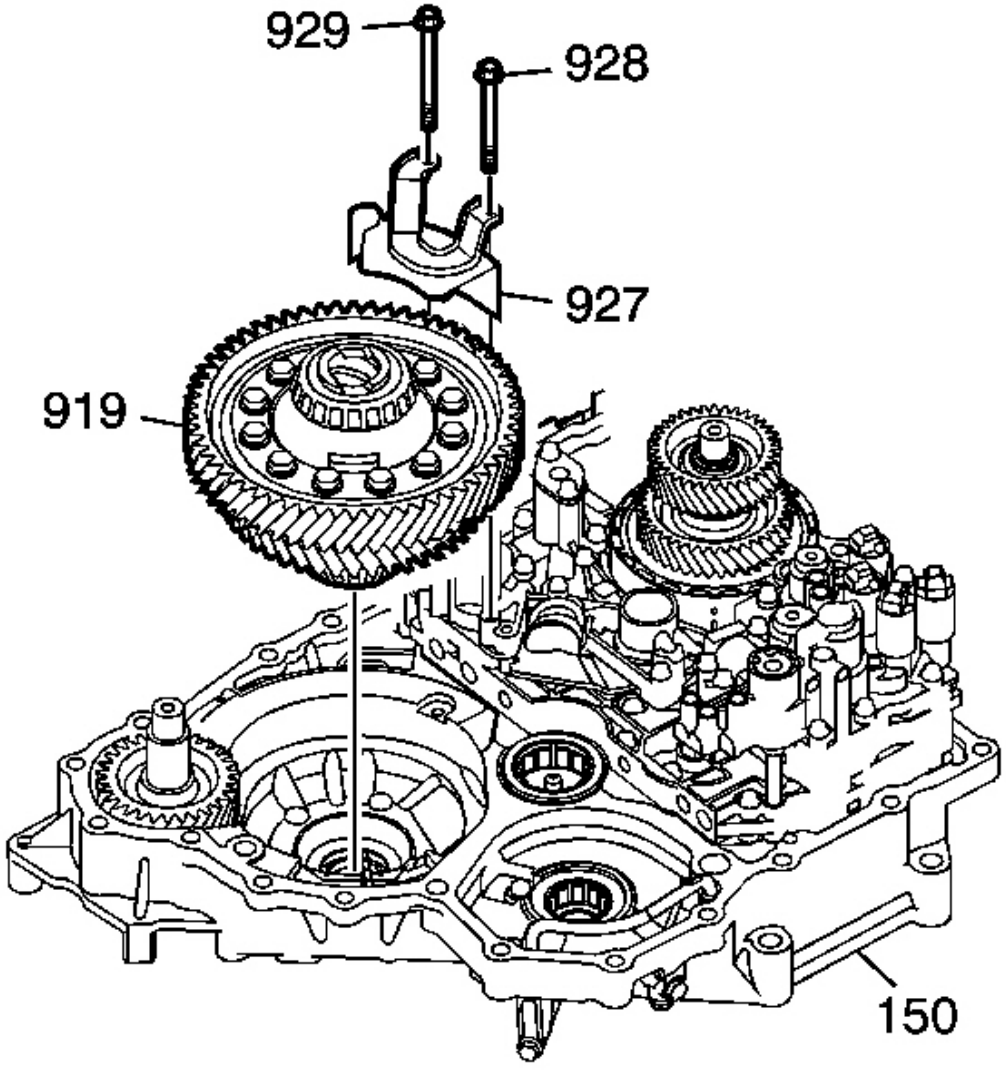

Fig. 437: Front Differential Assembly, Automatic Transmission Fluid Baffle & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the front differential assembly (919) into the torque converter housing assembly (150).
2. Install the automatic transmission fluid baffle (927), ensuring that the differential is clear of the baffle.
3. Install the fluid baffle M6x1.0x80 mm bolt (928) and the M6x1.0x95 mm bolt (929).

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Tighten the fluid baffle bolts.

   Tighten: Tighten the bolts to 12 N.m (106 lb in).

MANUAL SHAFT DETENT LEVER AND PARK PAWL ACTUATOR WITH LINKAGE ASSEMBLY INSTALLATION

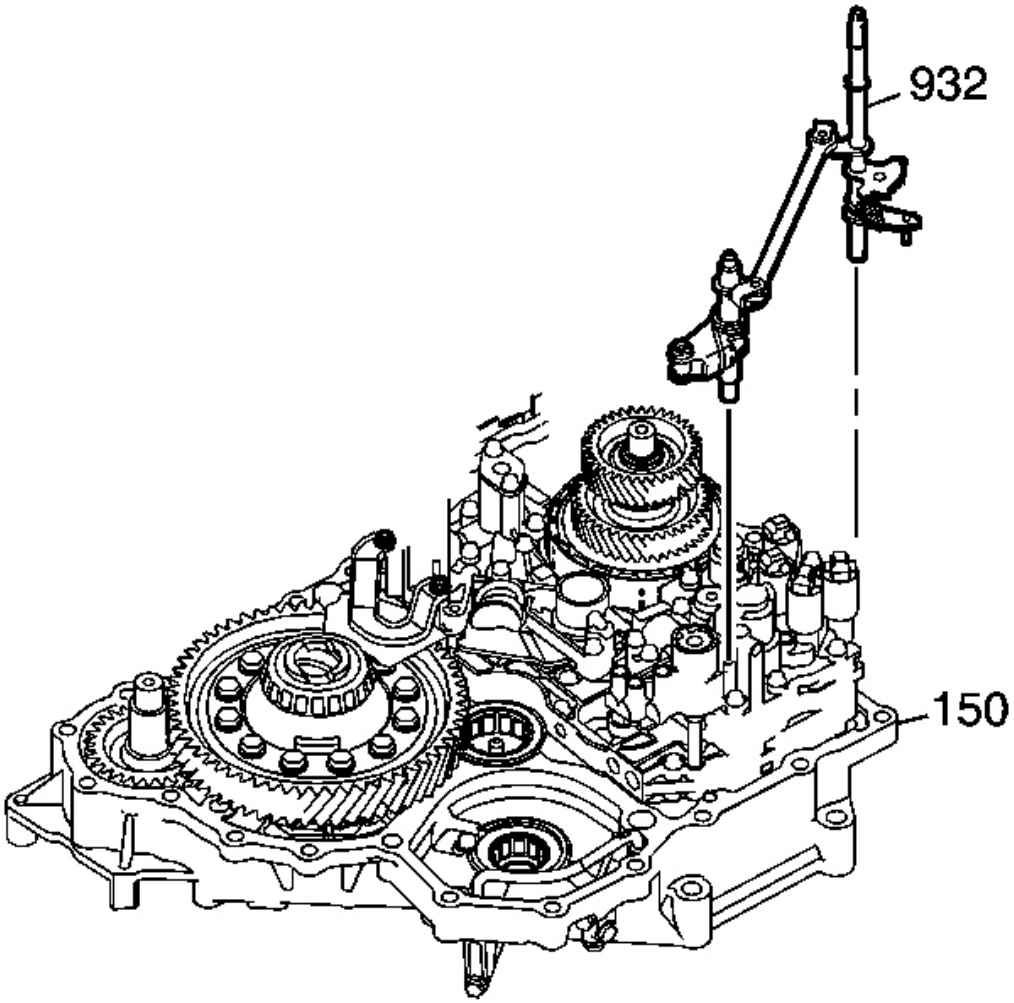

Fig. 438: Park Pawl Actuator Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

1. Insert the smaller end of the park pawl actuator shaft assembly (932) into the correct hole location in the torque converter housing assembly (150).

2. Insert the park pawl shaft end of the assembly into the park pawl actuator shaft front bearing (134) located in the upper center section of the torque converter housing (150).

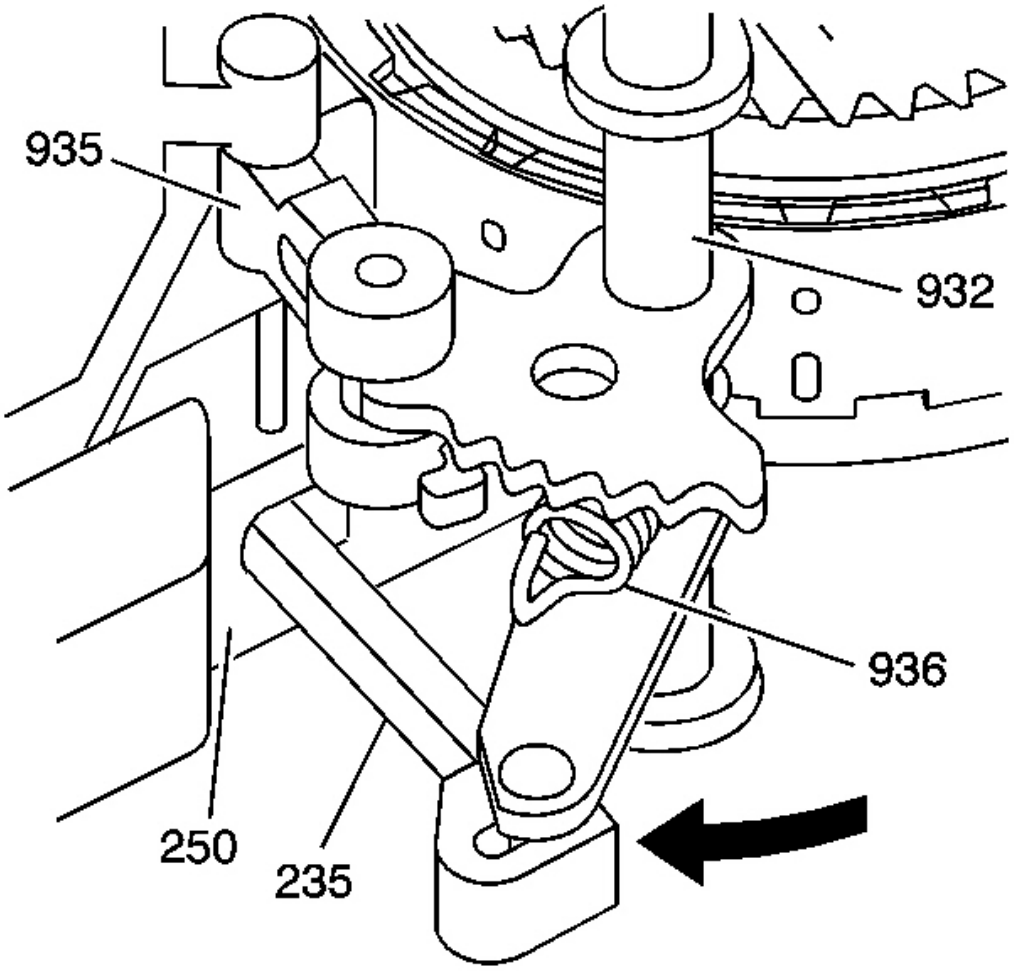

Fig. 439: Manual Shift Shaft, Detent Roller Spring & Manual Valve
Courtesy of GENERAL MOTORS CORP.

3. Align the park pawl actuator shaft control lever pin with the manual valve (235) located in the main control valve body assembly (250).
4. Install the manual shift shaft detent roller spring (936) to the manual shift shaft (932) and the smaller end of the spring to the manual shift shaft detent roller (935).

SHAFTS AND CLUTCH ASSEMBLIES INSTALLATION

CAUTION: This procedure requires 3 technicians. Each technician needs to remove or install a complete shaft assembly in order to prevent personal injury.

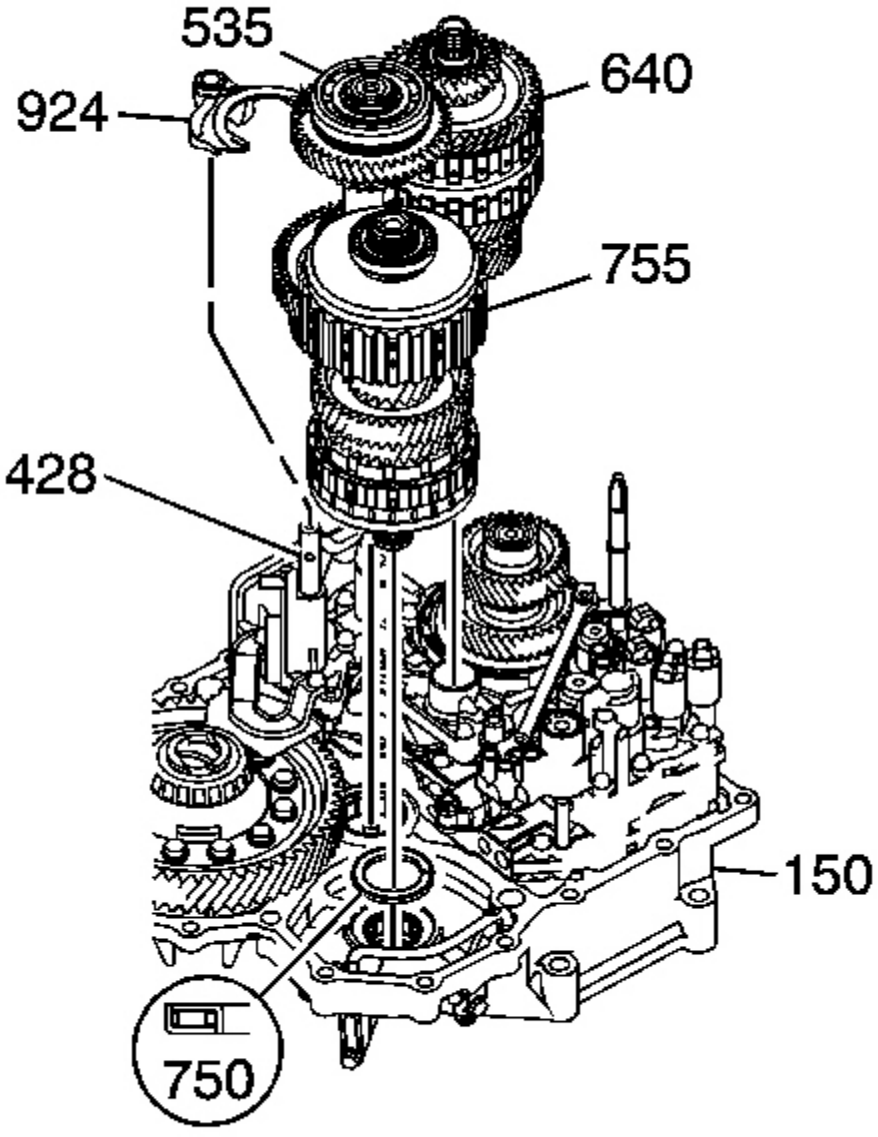

Fig. 440: Mainshaft Complete Assembly, Output Shaft, Clutch Shaft & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

1. Install the 2nd clutch housing 46 x 62.95 x 4.62 mm thrust bearing (750) into the torque converter

housing (150) with the rounded shoulder down.

2. Place the reverse shift fork shaft (428) so the large chamfered hole is facing the reverse shift fork bolt hole of the reverse shift fork (924) when installed in the torque converter housing (150).
3. Engage the reverse shift fork (924) with the 5th/reverse synchronizer ring (508) on the output shaft assembly (535).
4. Using 3 technicians, join the mainshaft assembly (640), output shaft assembly (535), and the 1st/2nd clutch shaft assembly (755) together.

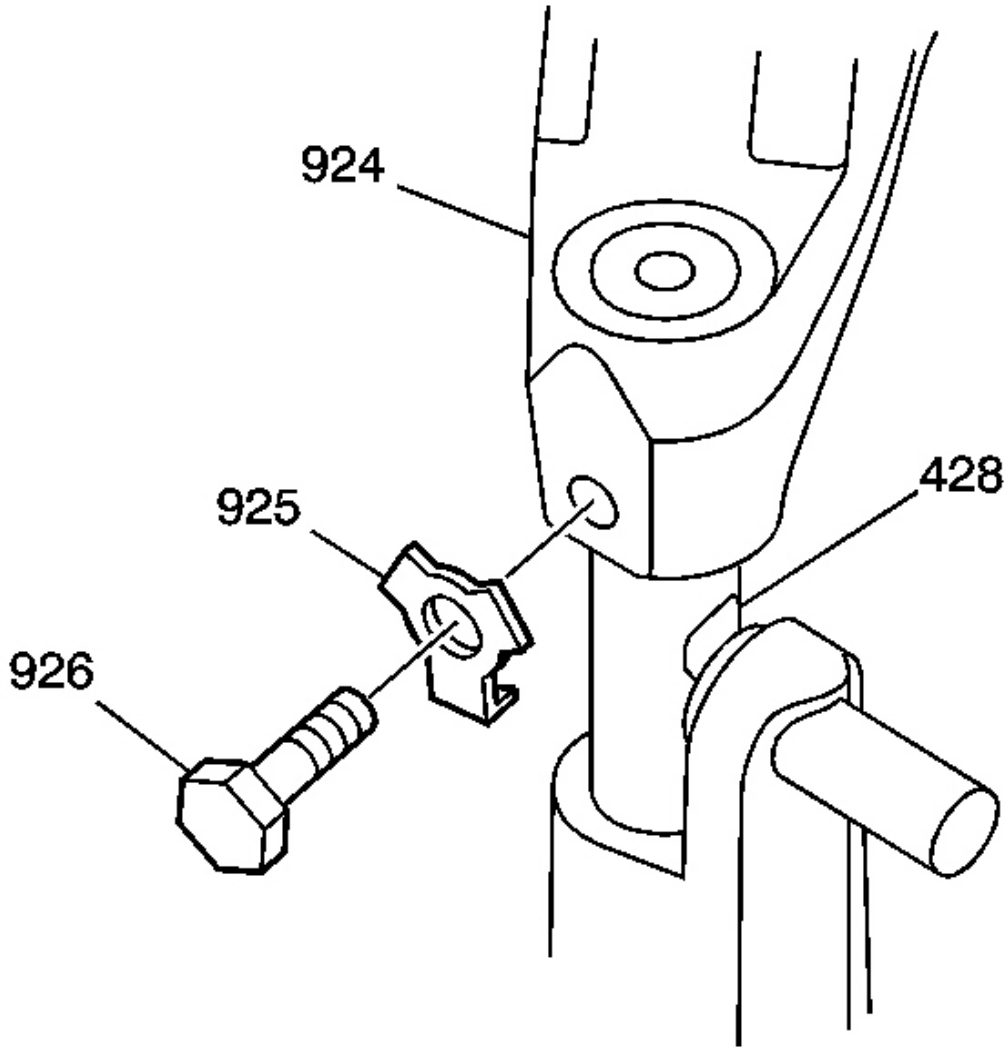

Fig. 441: Reverse Shift Fork, Washer & Bolt

Courtesy of GENERAL MOTORS CORP.

5. With all 3-clutch shaft assemblies installed together, position the 3 clutch shaft assemblies above the torque converter housing, lower the clutch assemblies into the torque converter housing, and at the same time position the reverse shift fork (924) onto the reverse shift fork shaft (428).
6. Position the 3 clutch shaft assemblies until all 3-clutch shaft assemblies are properly seated in the torque converter housing assembly (150).

NOTE: Refer to Fastener Notice in Cautions and Notices.

7. Install the reverse shift fork bolt (926) and a new reverse shift fork washer (925).

   Tighten: Tighten the bolt to 14 N.m (10 lb ft).

8. Bend the tab of the washer over the bolt head.

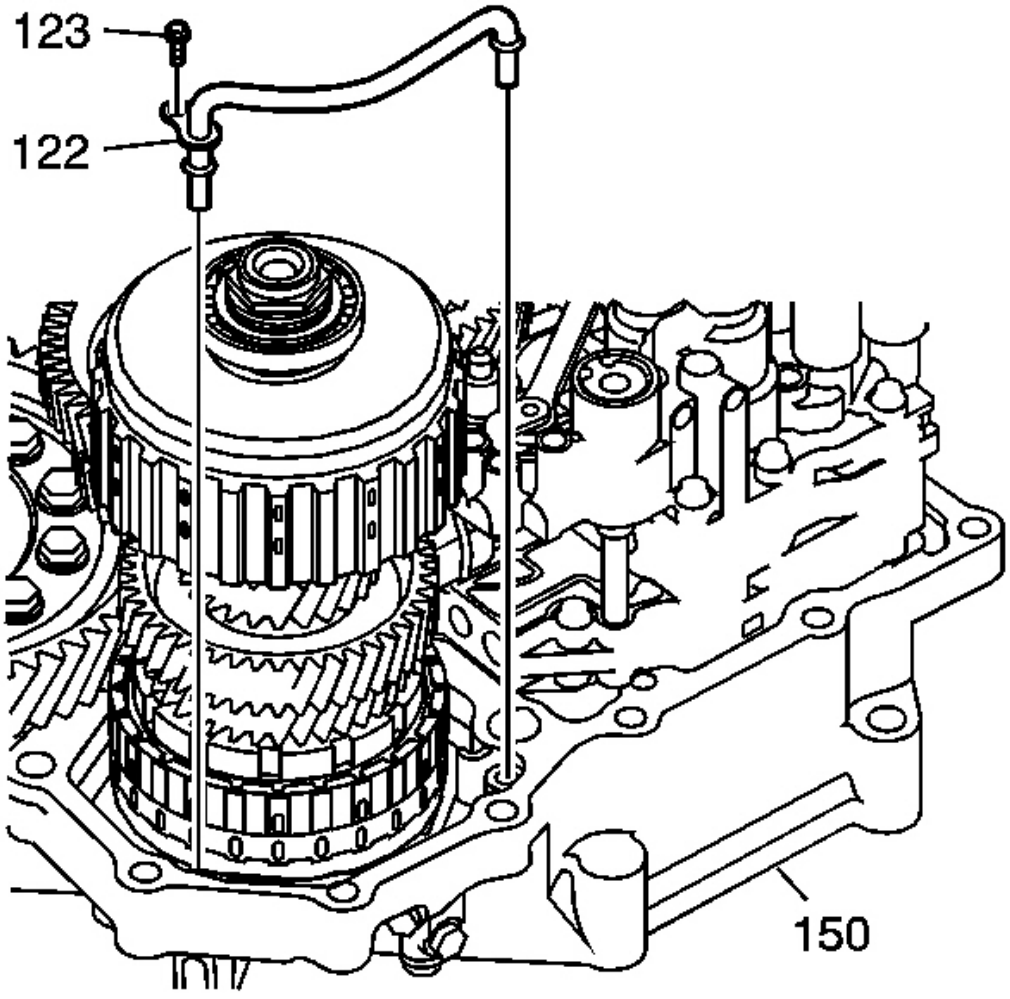

Fig. 442: 1st/2nd Clutch Shaft Lube Fluid Pipe & Retainer Bolt
Courtesy of GENERAL MOTORS CORP.

9. Install the 1st/2nd clutch shaft feed pipe (122) into the torque converter housing (150).
10. Install the 1st/2nd clutch shaft lube fluid pipe M6 x 1.0 x 12 mm retainer bolt (123).

Tighten: Tighten the bolt to 12 N.m (106 lb in)

PARKING PAWL ASSEMBLY INSTALLATION

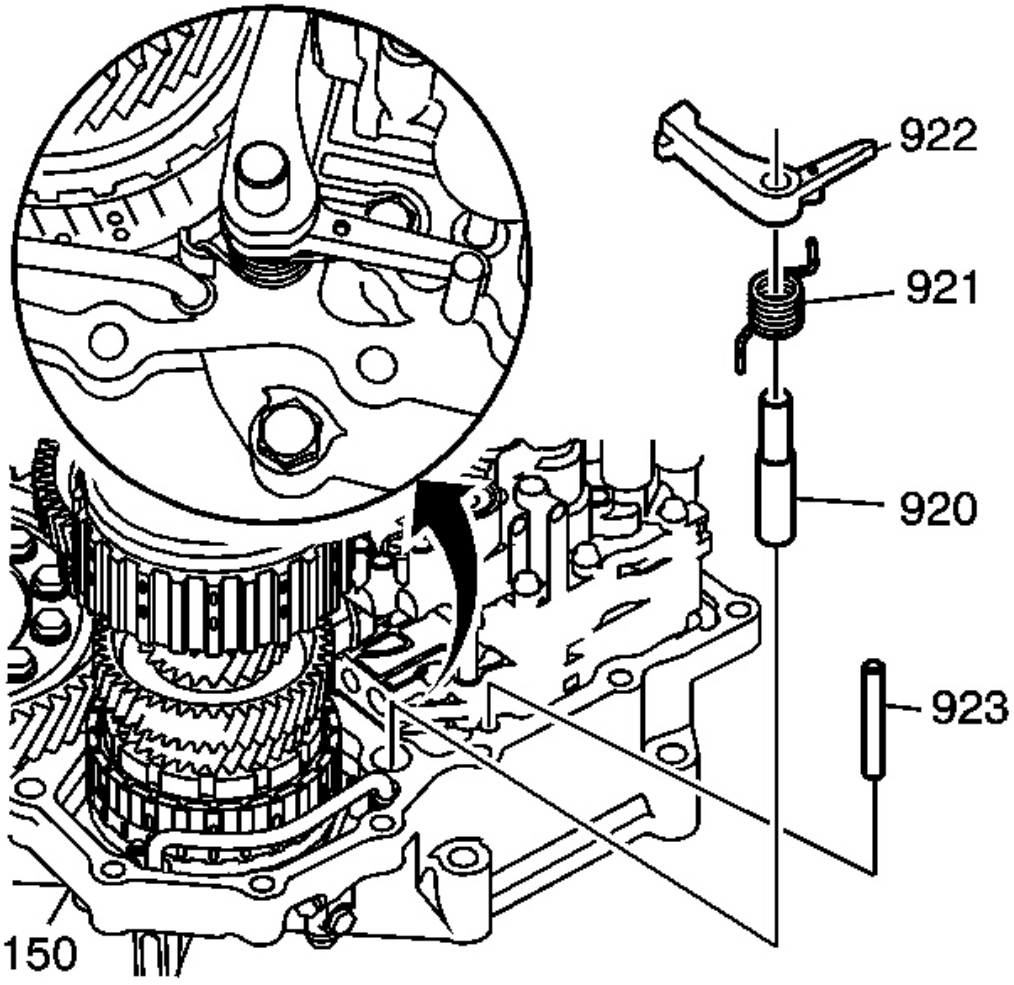

Fig. 443: Park Pawl, Spring, Shaft & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

1. Install the park pawl shaft (920), park pawl spring (921), park pawl (922), and the 8 mm x 73 mm park pawl stop lever pin (923) into the correct hole locations in the transmission torque converter housing (150).
2. With one end of the spring (921) in the park pawl (922) hook the other end on the case.

FLUID FEED PIPES INSTALLATION

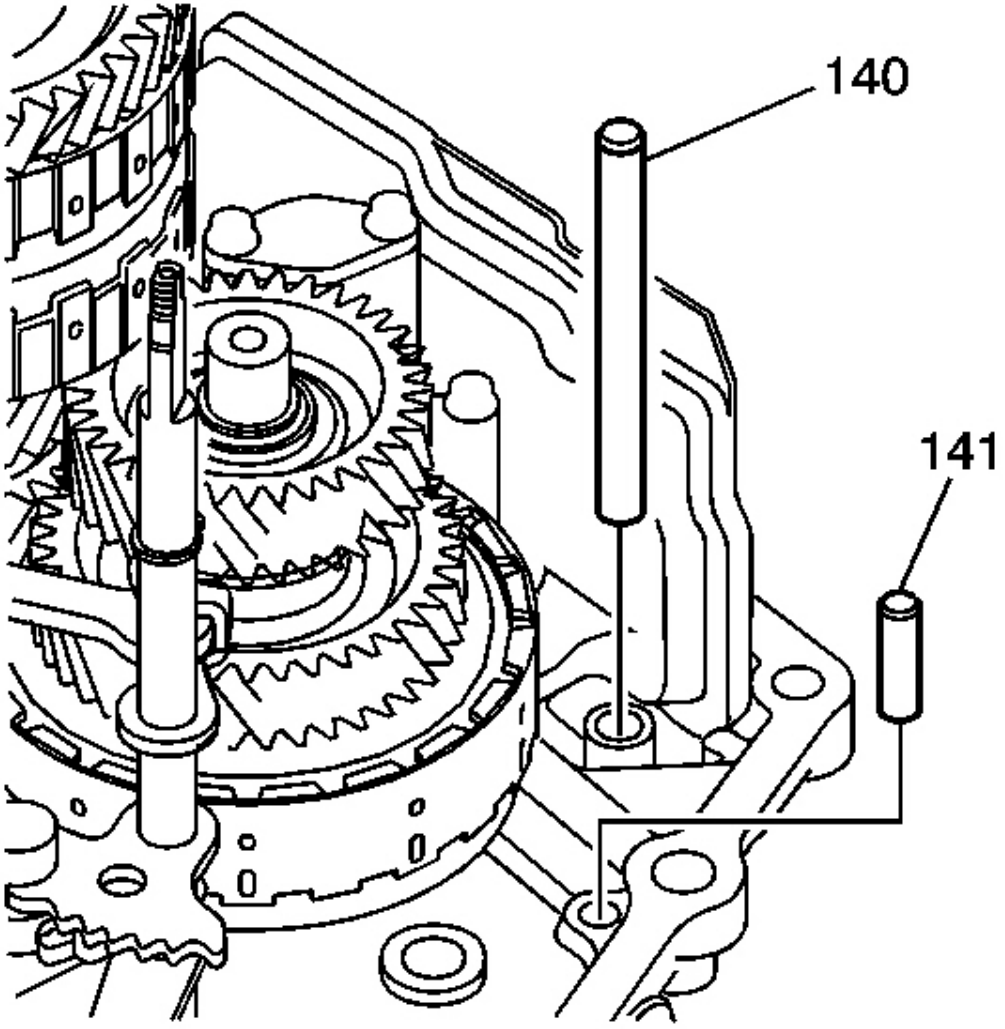

Fig. 444: Clutch Apply Fluid Pipe & Transmission Fluid Cooler Pipe
Courtesy of GENERAL MOTORS CORP.

1. Install a 8 mm x 57.5 mm 3rd clutch apply fluid pipe (140) into the torque converter housing (150).
2. Install a 10 mm x 153 mm transmission fluid cooler pipe (141) into the torque converter housing (150).

TRANSMISSION CASE ASSEMBLY INSTALLATION

Tools Required

- **DT 46238** Holding Fixture
- **DT 46434** Mainshaft Socket
- **DT 46435** Mainshaft Socket Handle

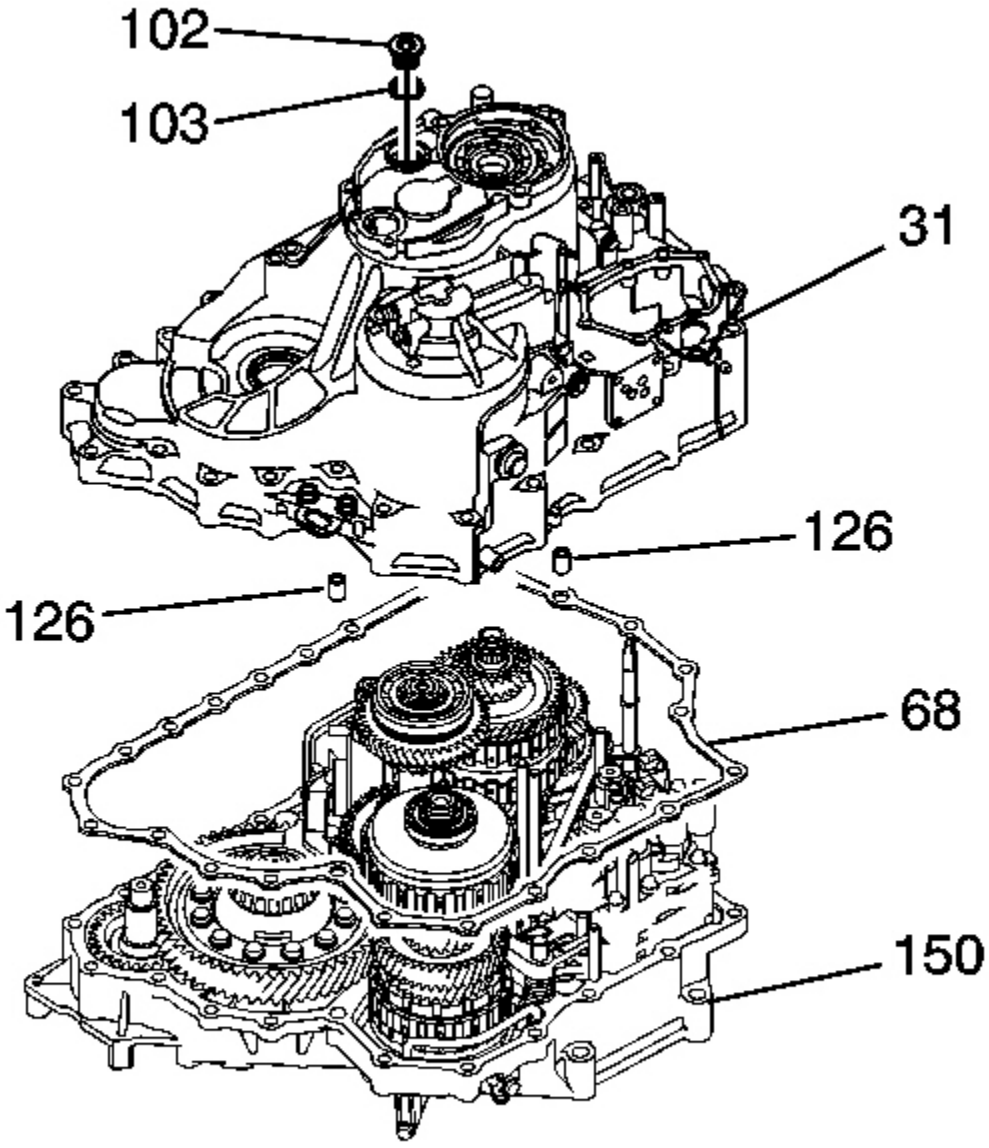

Fig. 445: Transmission Case Housing, Housing Gasket & Locating Pin
Courtesy of GENERAL MOTORS CORP.

1. Install two 14 x 25 mm transmission case locating pins (126) into the torque converter housing (150).
2. Install a new torque converter housing gasket (68) into the torque converter housing (150).
3. If necessary, remove the reverse idler gear access hole plug (102) and sealing washer (103) from the rear of the transmission case assembly (31).
4. Lower the transmission case housing assembly (31) onto the torque converter housing (150).

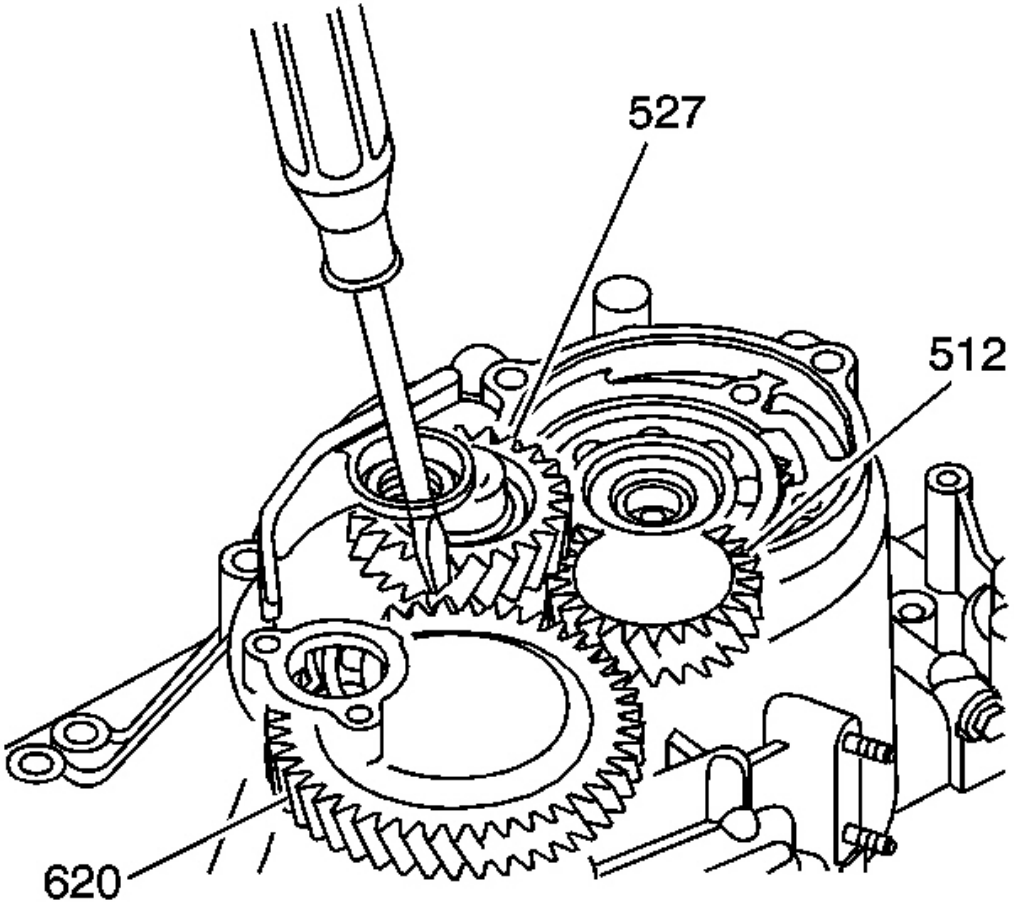

Fig. 446: Rotating The Reverse Idler Gear To Engage The Reverse Gear With Reverse Driven Gear & 5th/Reverse Drive Gear Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

5. Wrap a screwdriver tip with tape to prevent damage to the reverse idler gear teeth.
6. Using the screwdriver, rotate the reverse idler gear (527) to engage the reverse gear with the reverse driven gear (512) and the 5th/reverse drive gear.

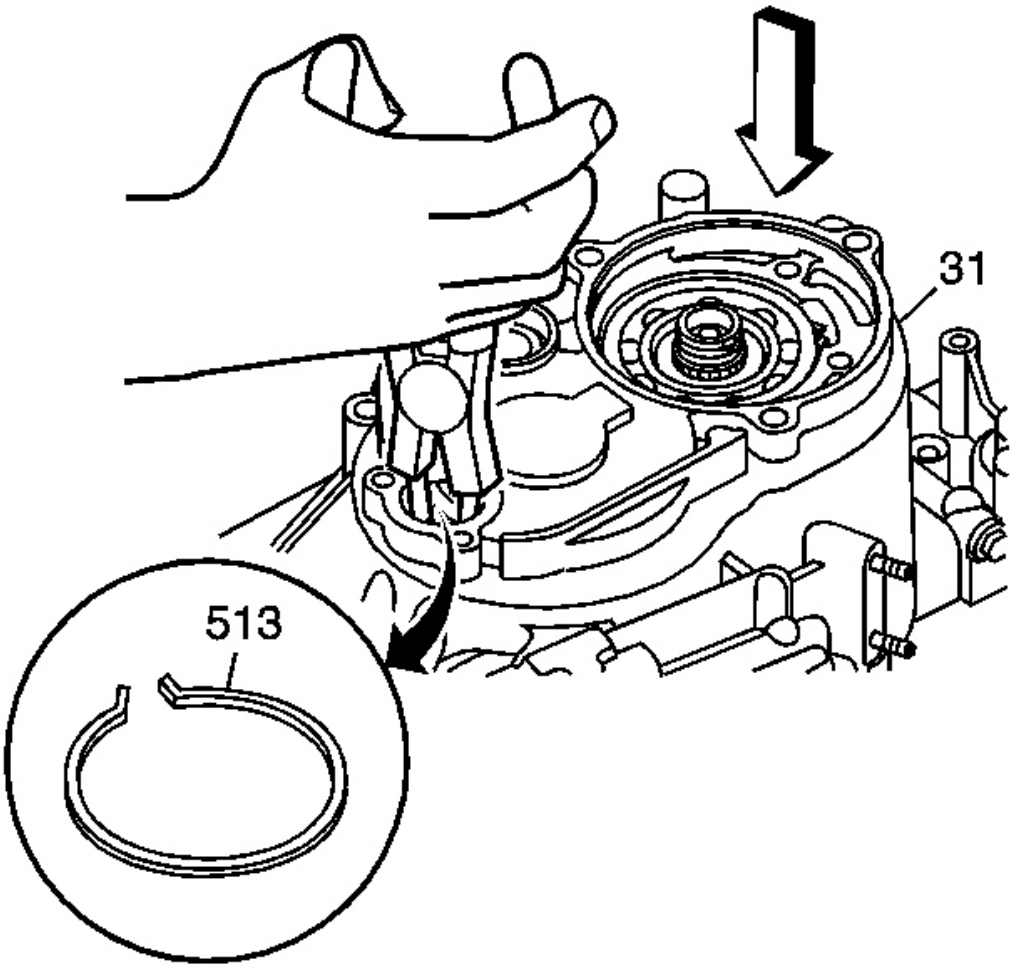

Fig. 447: Expanding The Output Shaft Retaining Ring & Transmission Case Housing Using Pliers
Courtesy of GENERAL MOTORS CORP.

7. Using snap ring pliers, expand the output shaft retaining ring (513) and continue to install the transmission case housing (31) partially onto the output shaft rear bearing (514).
8. Release the snap ring pliers, and carefully push down on the transmission case (31) until it bottoms out on the torque converter housing.
9. Visually inspect that the output shaft retaining ring (513) has snapped into place in the retaining ring groove in the output shaft rear bearing (514).

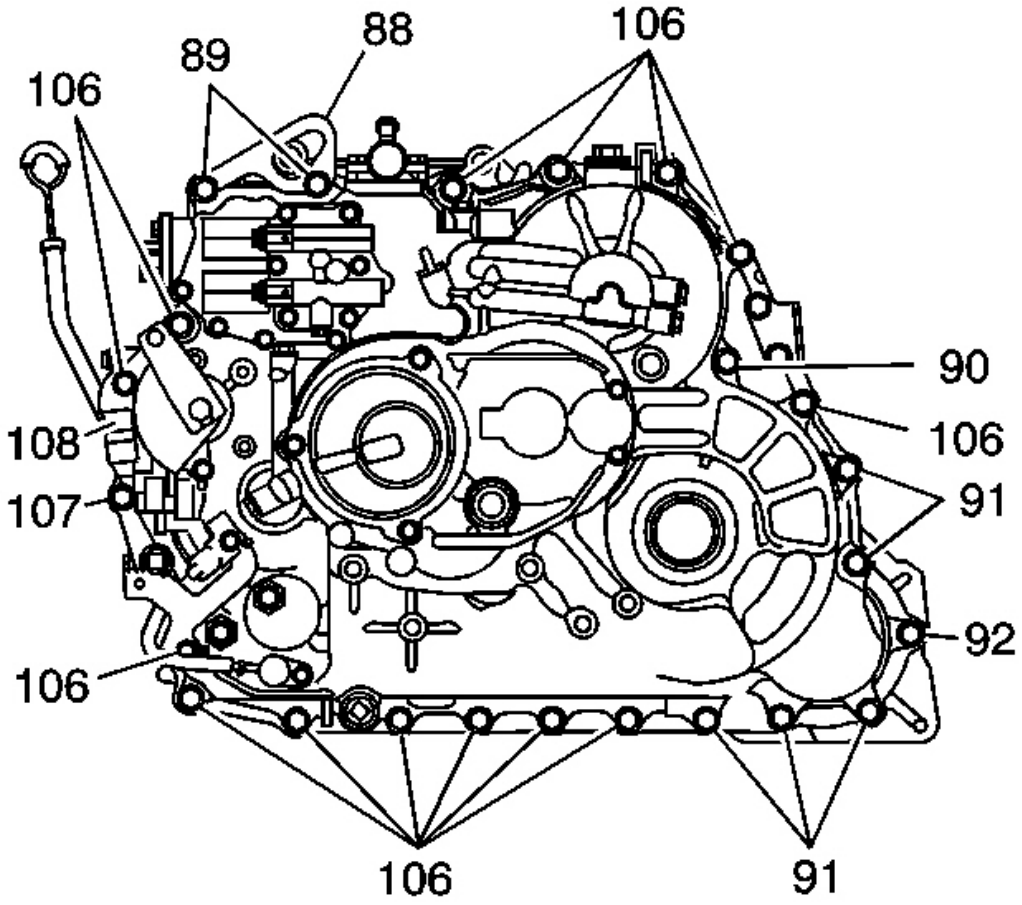

Fig. 448: Installing Torque Converter Housing Bolts
Courtesy of GENERAL MOTORS CORP.

10. Clean all case mounting bolts of any grease or oil.
11. Install a M10 x 1.25 x 50 mm torque converter housing bolt (92) in the correct location.
12. Install 5 M10 x 1.25 x 70 mm torque converter housing bolts (91) in the correct location.
13. Install a M10 x 1.25 x 80 mm torque converter housing bolt (107) in the correct location.
14. Install 14 M10 x 1.25 x 90 mm torque converter housing bolts (106) in the correct location, include the transmission wire harness bracket (108).
15. Install a M10 x 1.25 x 100 mm torque converter housing bolt (90) in the correct location.
16. Install 2 M10 x 1.25 x 140 mm torque converter housing bolts (89) in the correct location, include the transmission lift bracket (88).

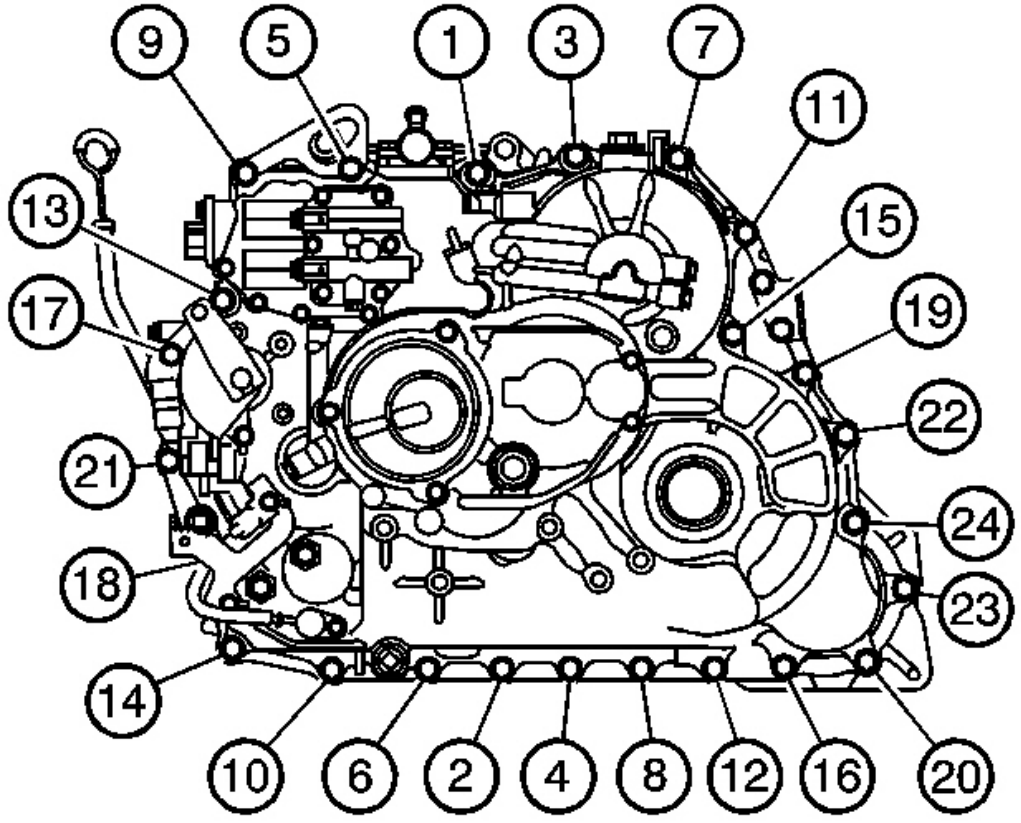

Fig. 449: Tightening The Transmission Case Assembly In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

17. Tighten the case bolts in the sequence shown.

    Tighten:

    - Tighten the upper case bolts (1 and 3) to 39 N.m (29 lb ft).
    - Tighten 22 case bolts (2 and 7-24) to 44 N.m (33 lb ft).

18. Rotate the transaxle assembly to the installed or upright position.

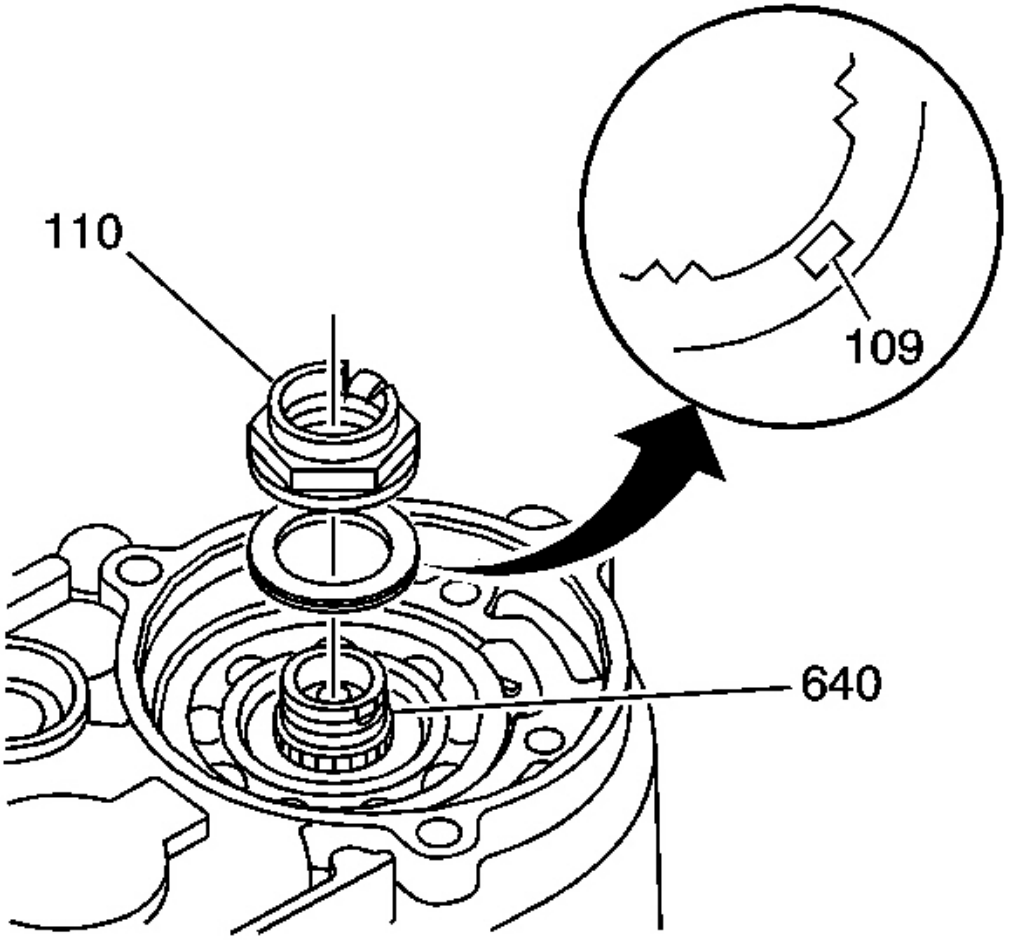

Fig. 450: Mainshaft, Washer & Retaining Nut
Courtesy of GENERAL MOTORS CORP.

19. Lubricate both sides of a 29 x 40 x 3.9 mm mainshaft washer (109) with automatic transmission fluid.
20. Install the NEW mainshaft washer (109) on the mainshaft (640) with the marked side up as shown.
21. Install the original mainshaft retaining nut (110) on the mainshaft (640) and hand tighten.

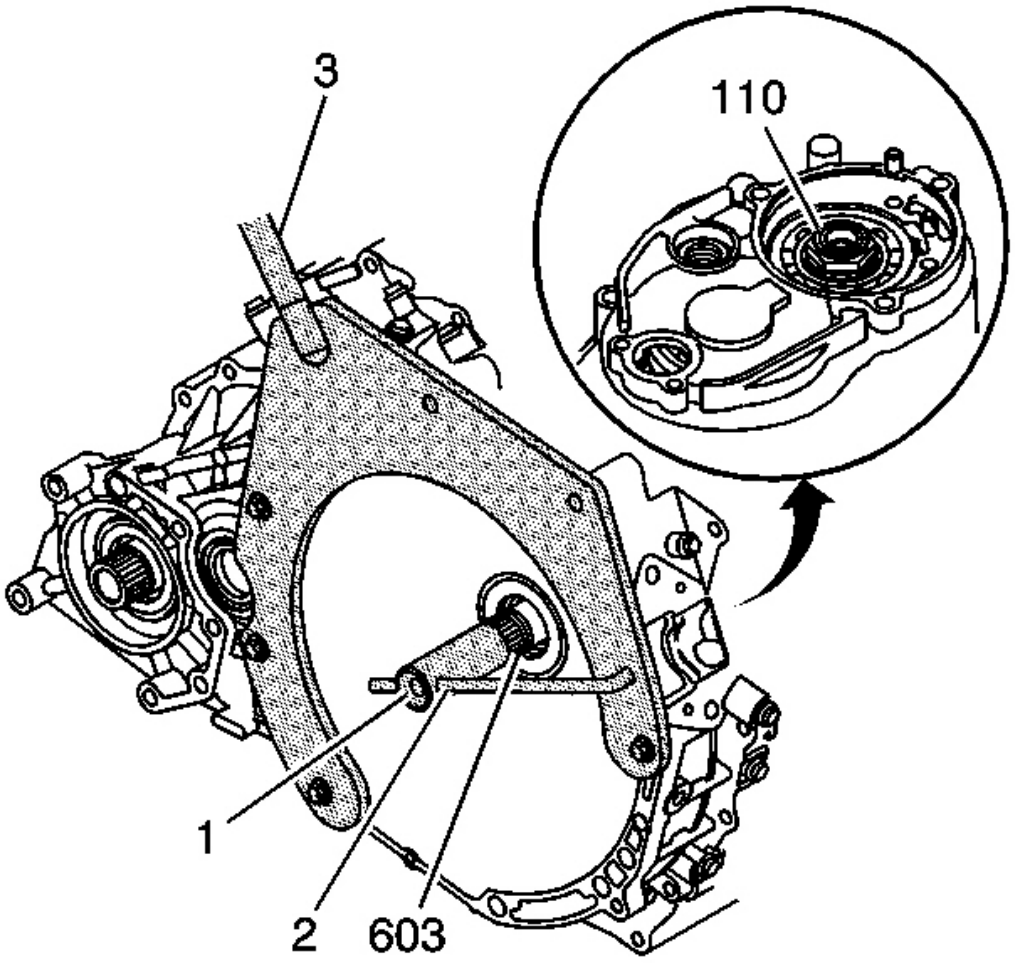

Fig. 451: DT 46435, DT 46434, Mainshaft Splines & Nuts
Courtesy of GENERAL MOTORS CORP.

22. Install **DT 46435** (2) through the hole in **DT 46434** (1).
23. Install **DT 46434** onto the mainshaft splines and at the same time secure **DT 46435** (2) into the lock hole in **DT 46238** (3) as shown.
24. Tighten the original mainshaft nut (110) in order to seat the new mainshaft washer (109).

    Tighten: Tighten the nut to 178 N.m (132 lb ft).

25. Remove the original mainshaft nut (110).
26. Install a new mainshaft nut (110).

Tighten: Tighten the nut to 178 N.m (132 lb ft).

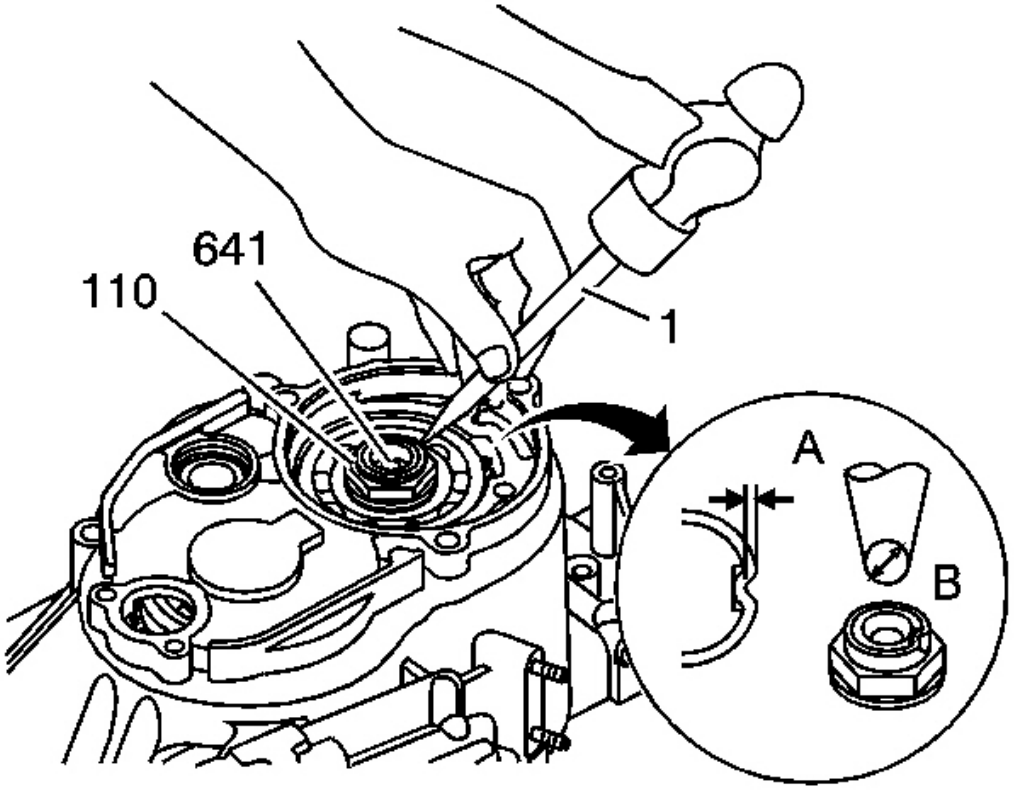

Fig. 452: Staking The Mainshaft Nut Into Mainshaft Using A Punch
Courtesy of GENERAL MOTORS CORP.

27. Using a 3.5 mm (9/64 in) punch (1), stake the new mainshaft nut (110) into the mainshaft (641).

    Specification: Stake the nut to a depth of 0.7-1.3 mm (0.03-0.05 in).

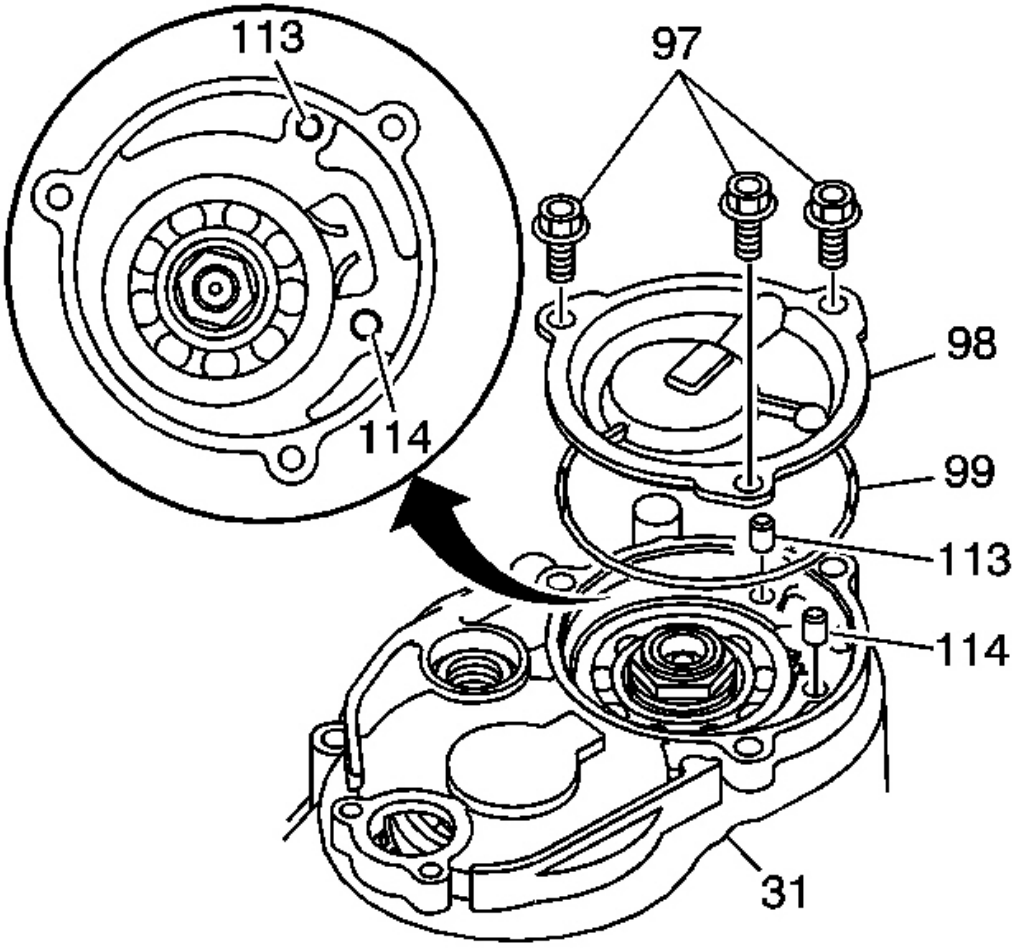

Fig. 453: Mainshaft Rear Case Cover Locating Pin, O-Ring Seal & Transfer Tube
Courtesy of GENERAL MOTORS CORP.

28. Install a mainshaft rear case cover locating pin (114) on the transmission case (31).
29. Install a mainshaft lube transfer tube (113) on the transmission case (31).
30. Install a mainshaft case rear cover O-ring seal (99) on the mainshaft case rear cover (98).
31. Install the mainshaft case rear cover (98) onto the transmission case (31).
32. Install 3 M8 x 1.25 x 21 mm mainshaft case rear cover bolts (97) on the transmission case (31) and tighten.

Tighten: Tighten the bolts to 19 N.m (14 lb ft).

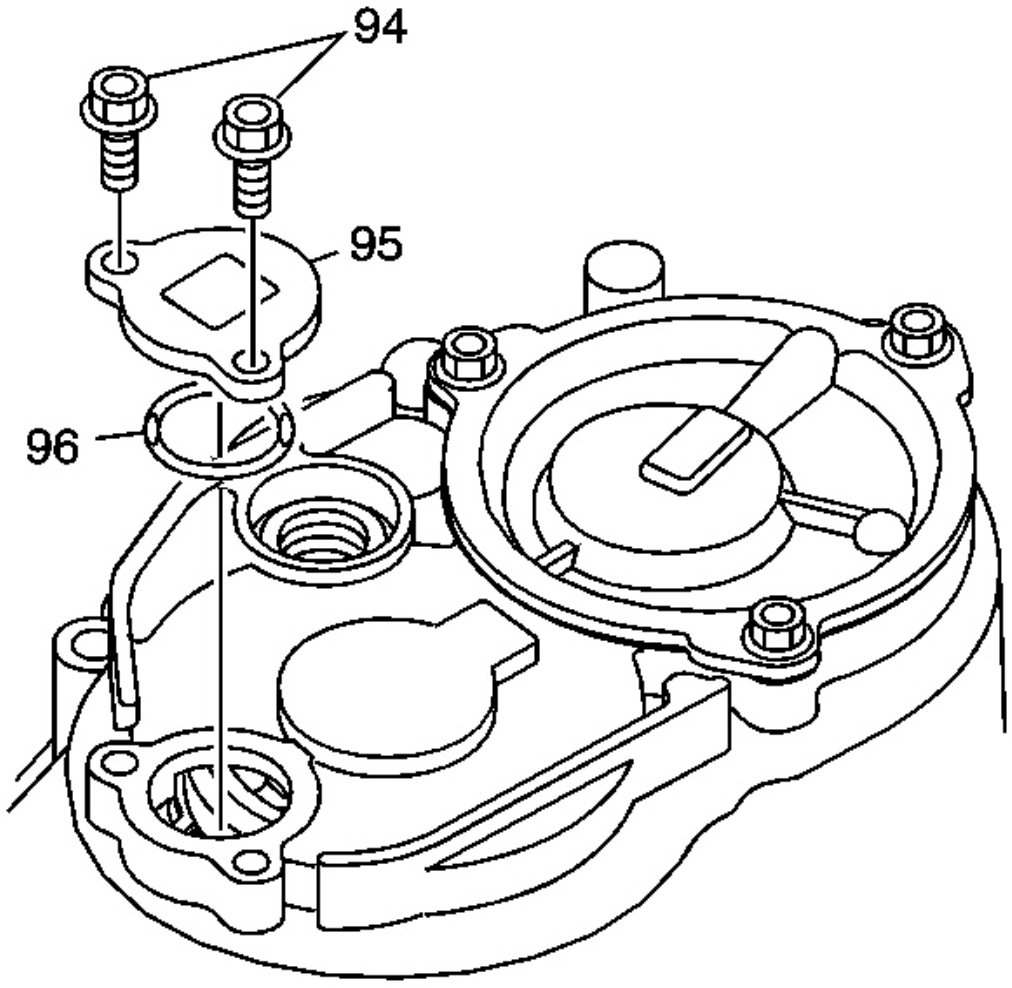

Fig. 454: Output Shaft Rear Access Cover, Bolts, O-Ring Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

33. Install a 28 x 2.2 mm O-ring seal (96) and the output shaft rear access cover (95).
34. Install the output shaft rear access cover (95).
35. Install the M6 x 1.25 x 20 mm output shaft rear access cover bolts (94).

Tighten: Tighten the bolts to 12 N.m (106 lb in).

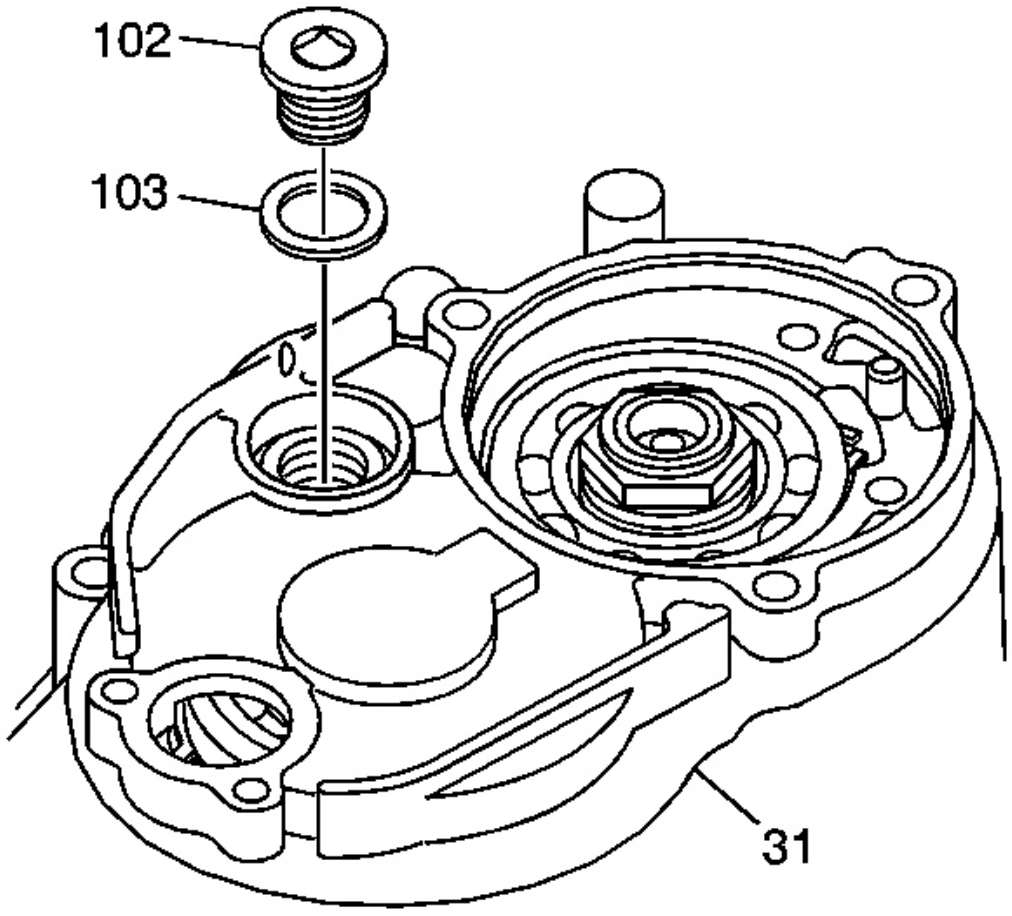

Fig. 455: Reverse Idler Gear Access Hole Plug, Seal & Transmission Case
Courtesy of GENERAL MOTORS CORP.

36. Apply threadlock GM P/N 12345382 (Canada P/N 10953489) to the threads of the 20 mm reverse idler gear access hole plug (102).
37. Install a reverse idler gear access hole plug 20 mm sealing washer (103) on the reverse idler gear access hole plug (102).
38. Install the reverse idler gear access hole cover plug (102).

Tighten: Tighten the cover plug to 49 N.m (36 lb ft).

TRANSAXLE FLUID COOLER PIPE FITTING INSTALLATION

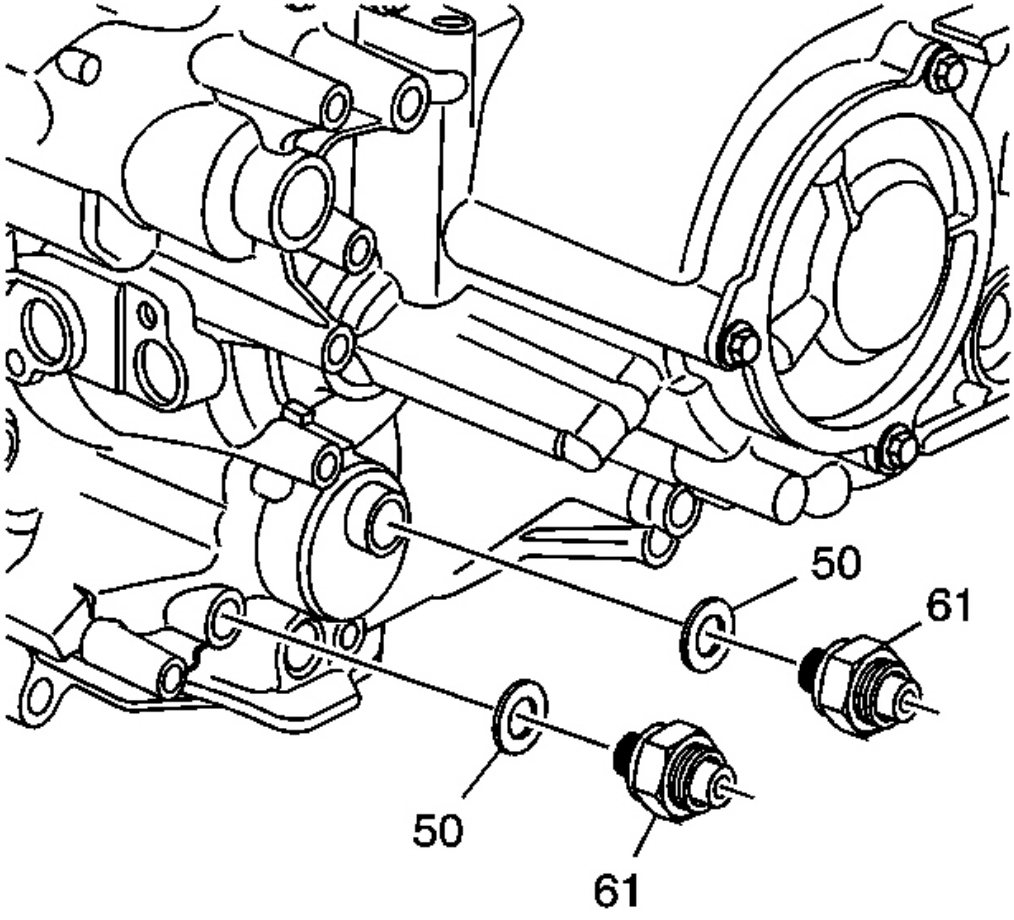

Fig. 456: Transaxle Fluid Cooler Pipe Fitting & Sealing Washers
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

Using new transaxle fluid cooler pipe fitting and sealing washers (50), install the transaxle fluid cooler pipe fittings (61).

Tighten: Tighten the fittings to 20 N.m (14 lb ft).

TRANSAXLE FLUID LEVEL INDICATOR INSTALLATION

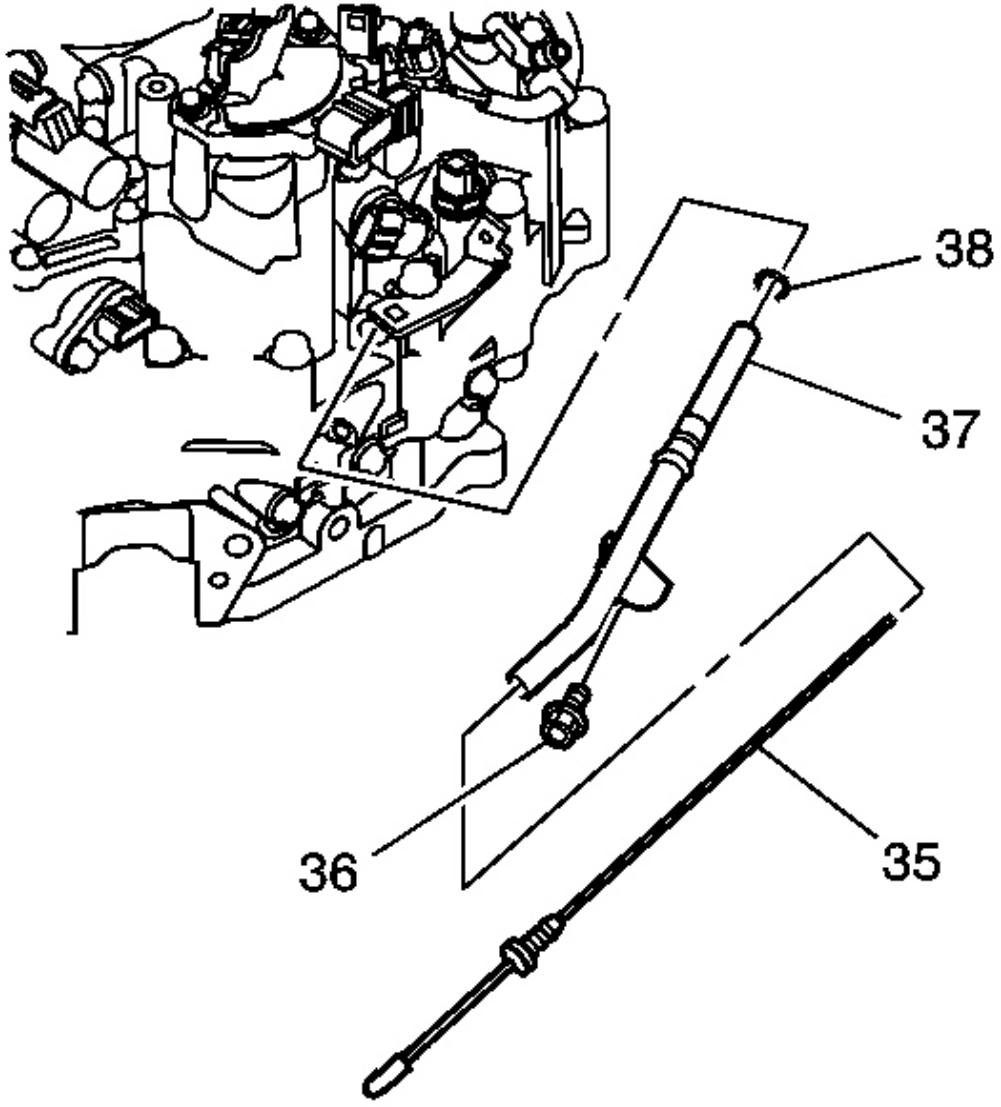

Fig. 457: Fluid Level Indicator, Tube, O-Ring, Transmission Fluid Fill Tube & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install a fluid fill tube O-ring seal (38) onto the transmission fluid fill tube (37).
2. Install the transmission fluid fill tube (37) into the transmission case.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the M6 x 1.0 x 14 mm transmission fluid fill tube bolt (36).

   Tighten: Tighten the bolt to 12 N.m (106 lb in)

4. Install the fluid level indicator (35) into the fluid level indicator tube (37).

WIRING HARNESS INSTALLATION

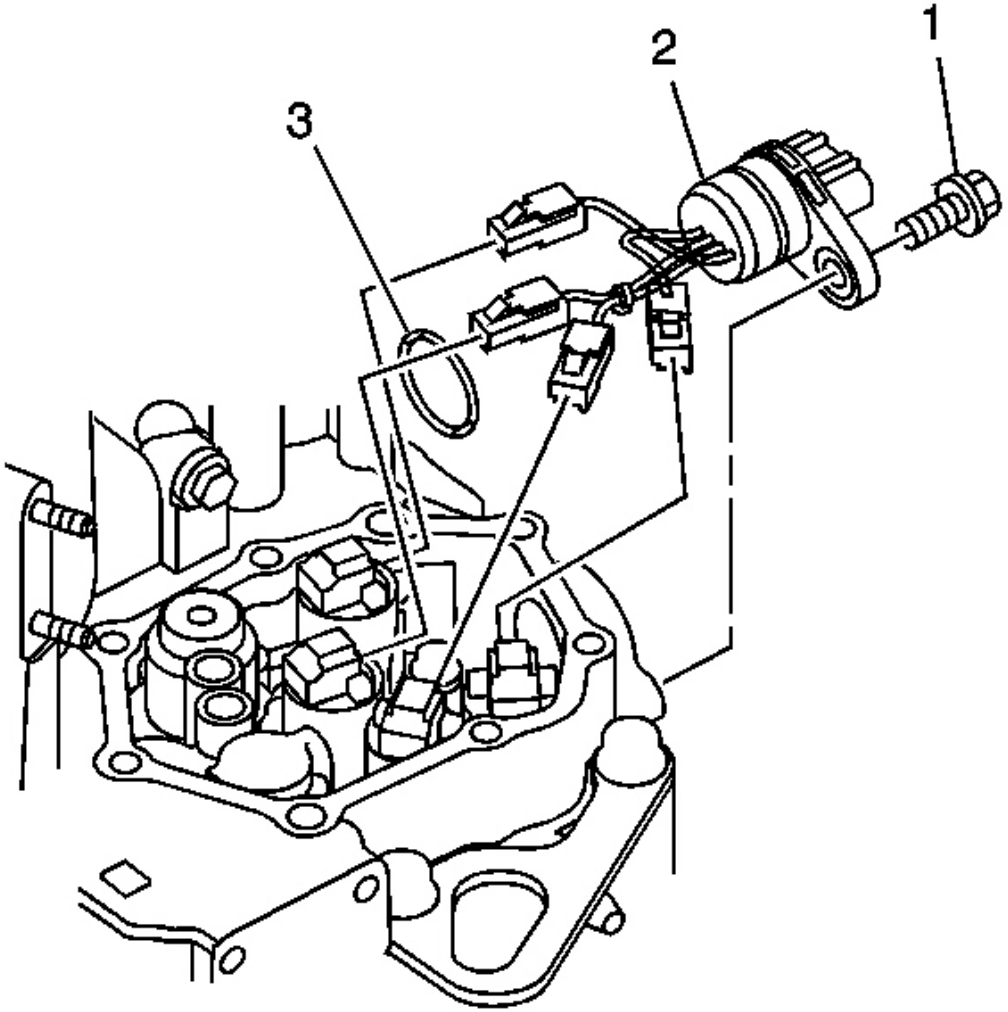

Fig. 458: Automatic Transmission Wiring Harness, Bolt & O-Ring
Courtesy of GENERAL MOTORS CORP.

1. Install an automatic transmission wiring harness O-ring seal (3) on the automatic transmission wiring harness (2) and route the wiring harness through the transmission case housing bore.

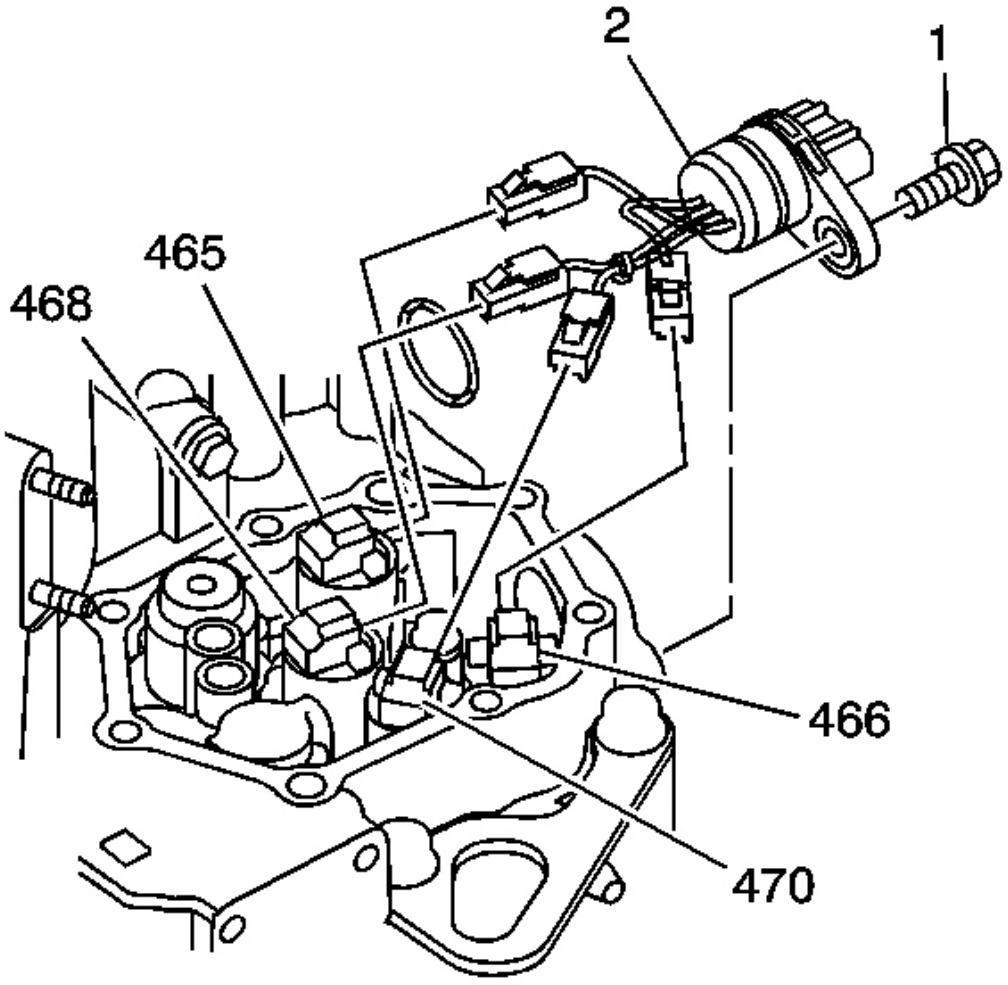

Fig. 459: Green, Yellow, Red & Orange Wire Harness Connectors
Courtesy of GENERAL MOTORS CORP.

2. Connect the green wire harness connector to the B shift solenoid valve (470).
3. Connect the yellow wire harness connector to the TCC solenoid valve (468).
4. Connect the red wire harness connector to the A shift solenoid valve (466).
5. Connect the orange wire harness connector to the C shift solenoid valve (465).

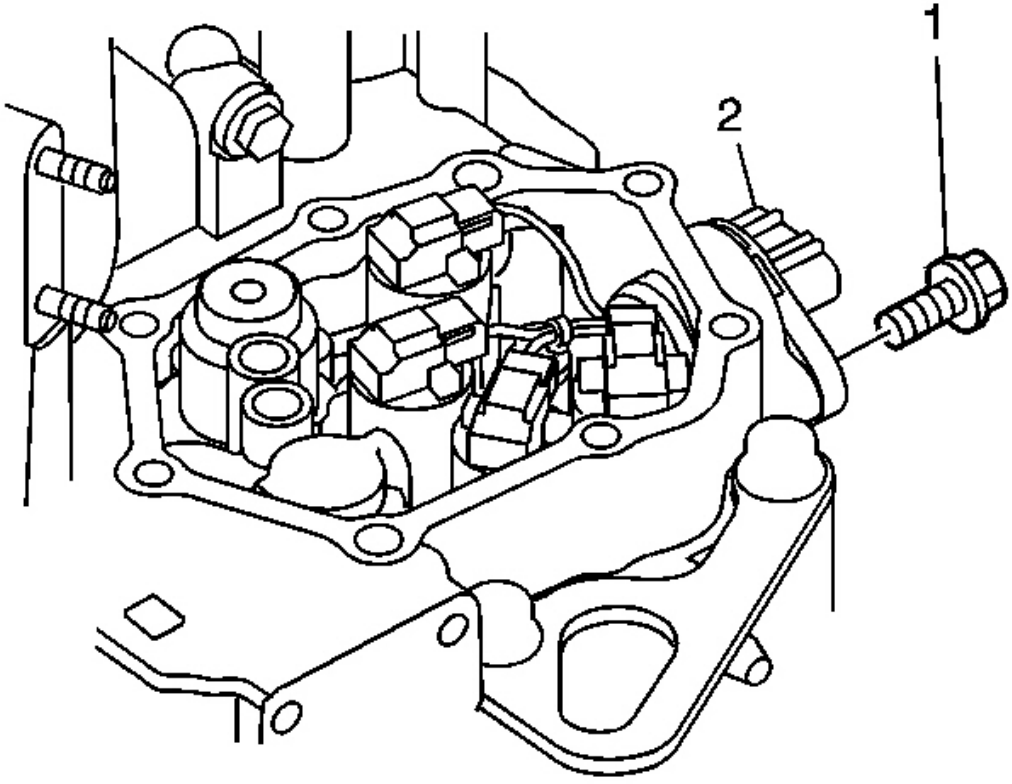

Fig. 460: Transmission Wiring Harness & Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Install the transmission wiring harness assembly (2).
7. Install the transmission wiring harness M6 x 1.0 x 20 mm bolt (1).

Tighten: Tighten the bolt to 12 N.m (106 lb in).

CLUTCH PRESSURE CONTROL SOLENOID MANIFOLD INSTALLATION

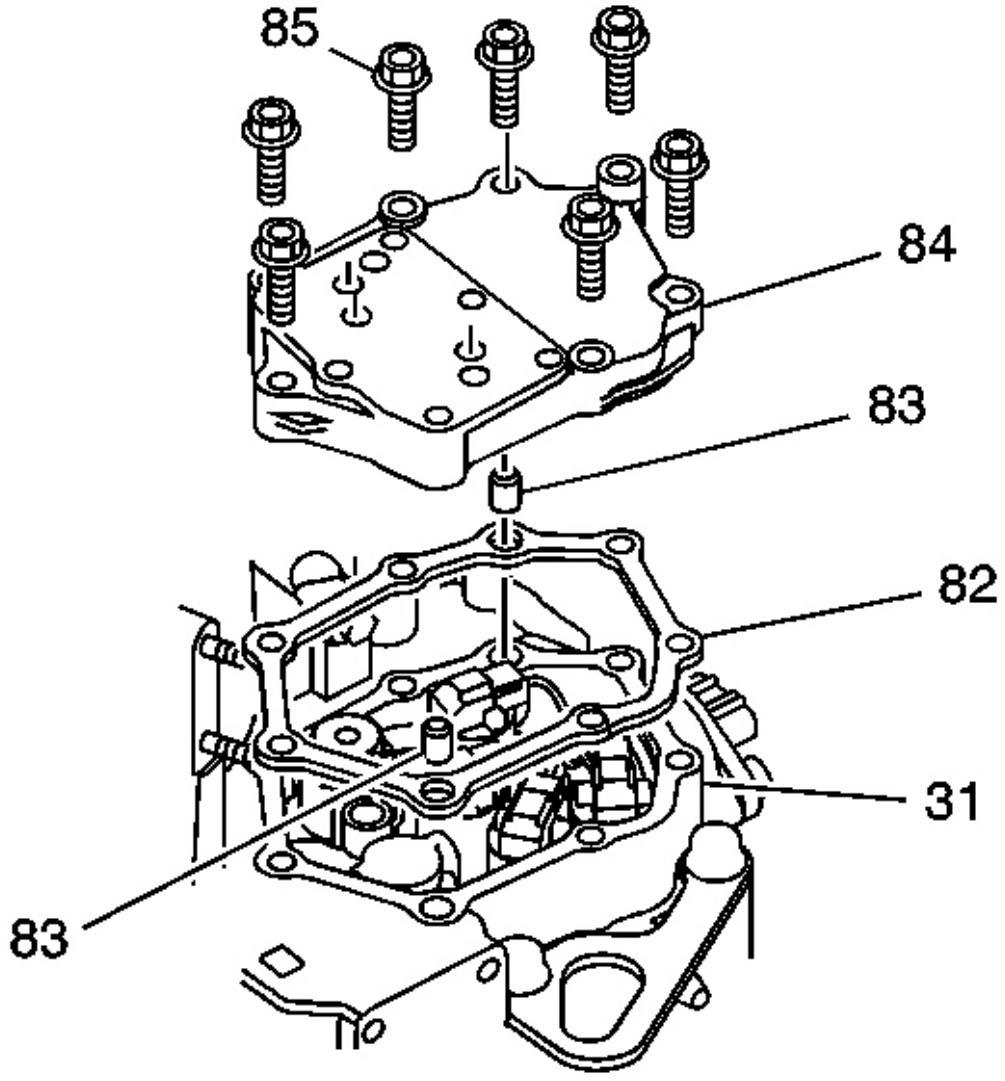

Fig. 461: CPC Solenoid Manifold Locating Pins & Gasket
Courtesy of GENERAL MOTORS CORP.

1. Install two 8 x 14 mm clutch pressure control (CPC) solenoid manifold locating pins (83) into the transmission case (31).
2. Install the CPC solenoid manifold gasket (82).

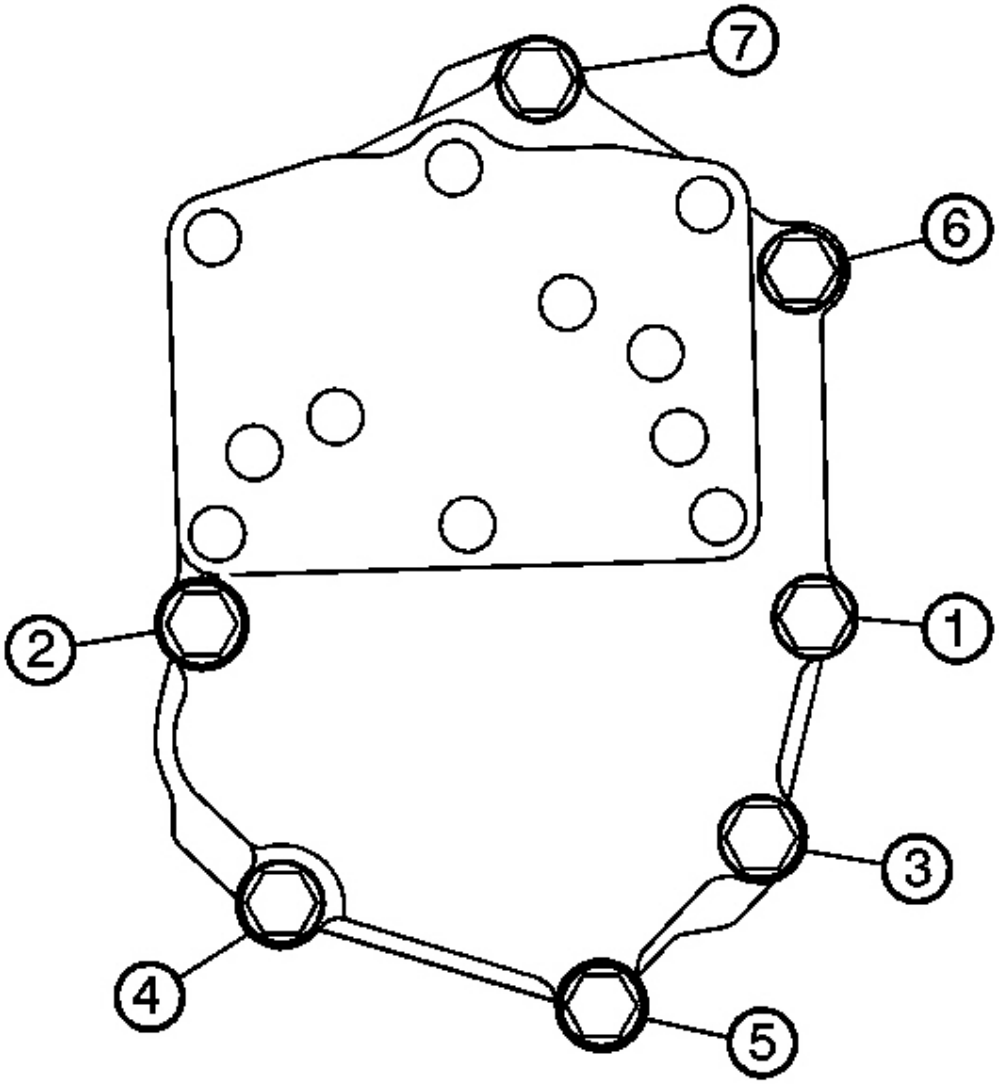

Fig. 462: Tightening The CPC Solenoid Manifold Bolts In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the CPC solenoid manifold (84).

   Install the seven M6 x 1.0 x 35 mm CPC solenoid manifold bolts (85).

Tighten: Tighten the bolts to 12 N.m (106 lb in) in the sequence shown.

CLUTCH PRESSURE CONTROL SOLENOID INSTALLATION

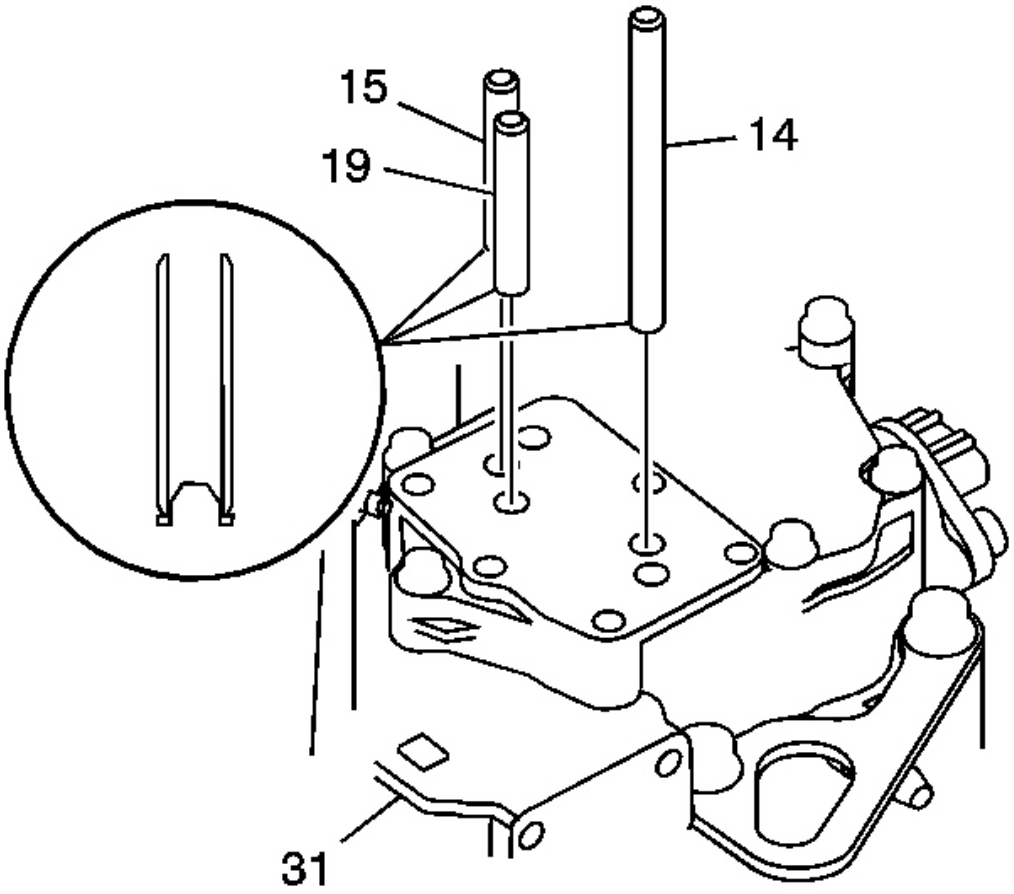

Fig. 463: CPC Solenoid Fluid Pipes & Transmission Case
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install the fluid feed pipes with the filter side of the pipe into the transmission case as shown in insert.

1. Install a 8 x 105.8 mm clutch pressure control (CPC) solenoid fluid pipe (14) into the transmission case (31).
2. Install 2 8 x 58.3 mm CPC solenoid fluid pipes (15), (19) into the transmission case (31).

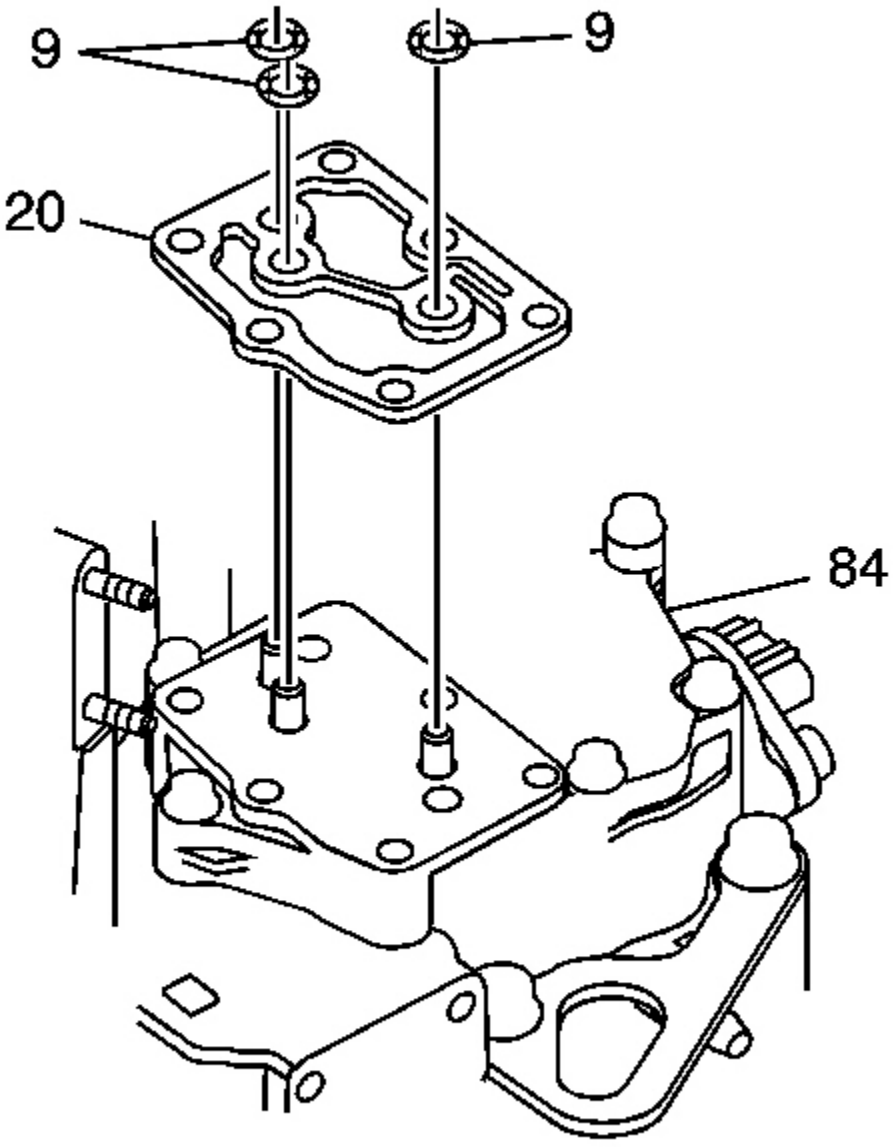

Fig. 464: CPC Solenoid Gasket & O-Ring Seals
Courtesy of GENERAL MOTORS CORP.

3. Install the new CPC solenoid gasket (20) to the clutch pressure control solenoid manifold (84).

IMPORTANT: Do not damage the O-ring seals (9) during installation.

4. Install a 7.7 x 2.3 mm fluid pipe O-ring seal (9) over each of the 3 fluid passage pipes.

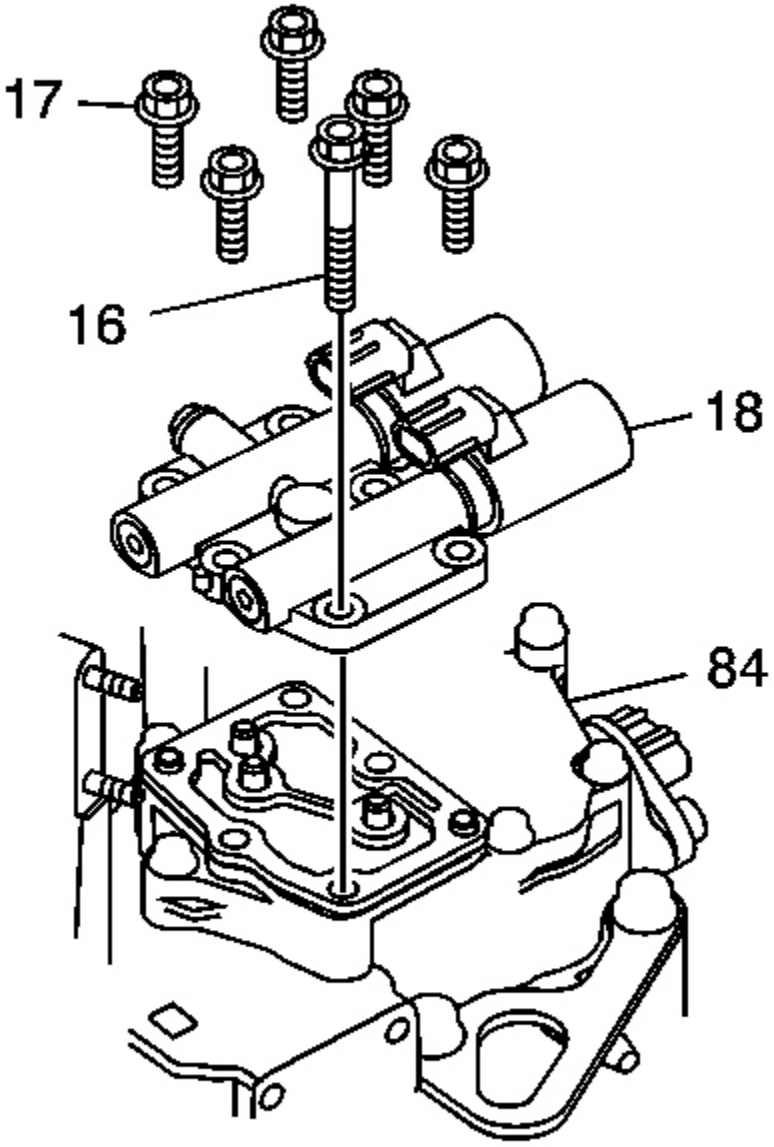

Fig. 465: CPC Solenoid Valve & Bolts
Courtesy of GENERAL MOTORS CORP.

5. Install the CPC solenoid valve assembly (18) onto the solenoid cover (84).

6. Install the following CPC solenoid valve bolts:
    - 5 M6 x 1.0 x 25 mm bolts (17)
    - A M6 x 1.0 x 55 mm bolt (16)

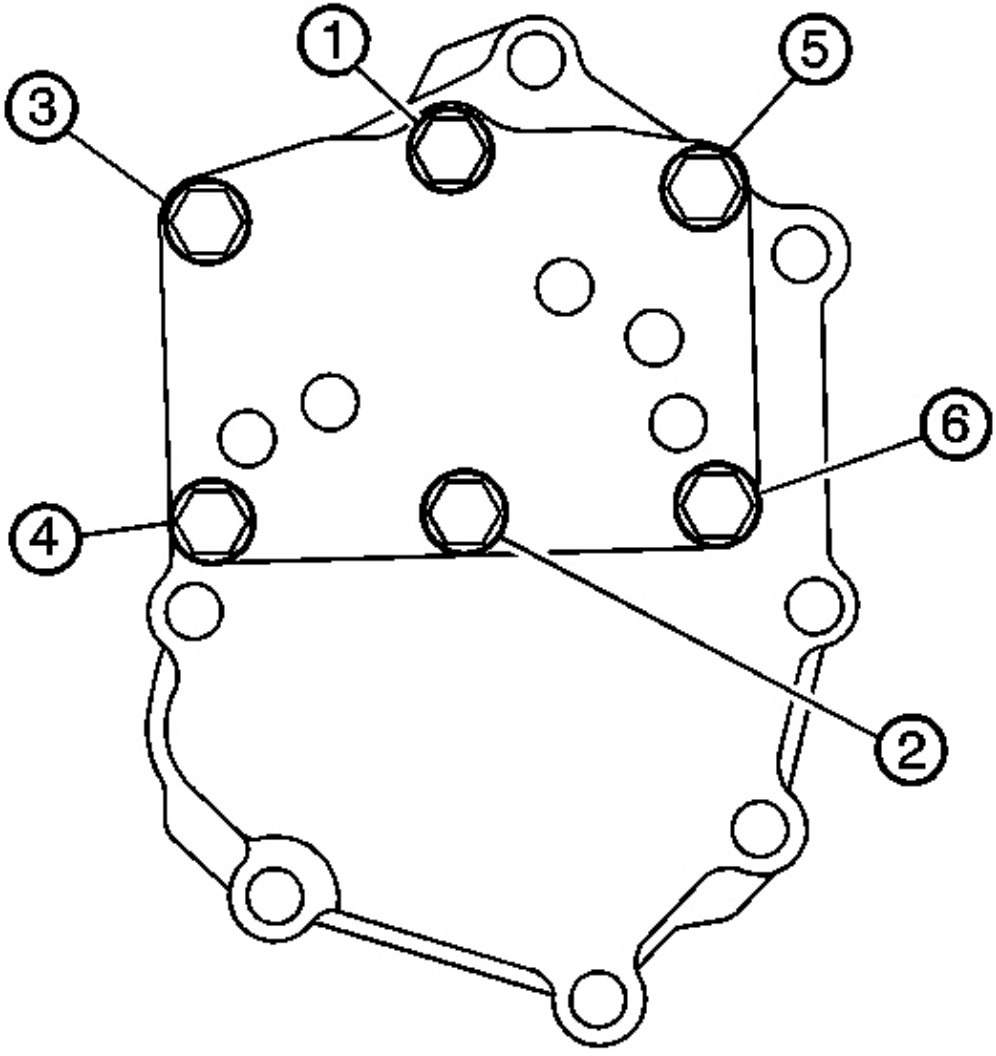

Fig. 466: Tightening The Clutch Pressure Control Solenoid Bolts In Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

7. Tighten the bolts in the sequence shown.

   Tighten: Tighten the bolts to 12 N.m (106 lb in).

TORQUE CONVERTER CLUTCH (TCC) LOCK UP PRESSURE CONTROL SOLENOID INSTALLATION

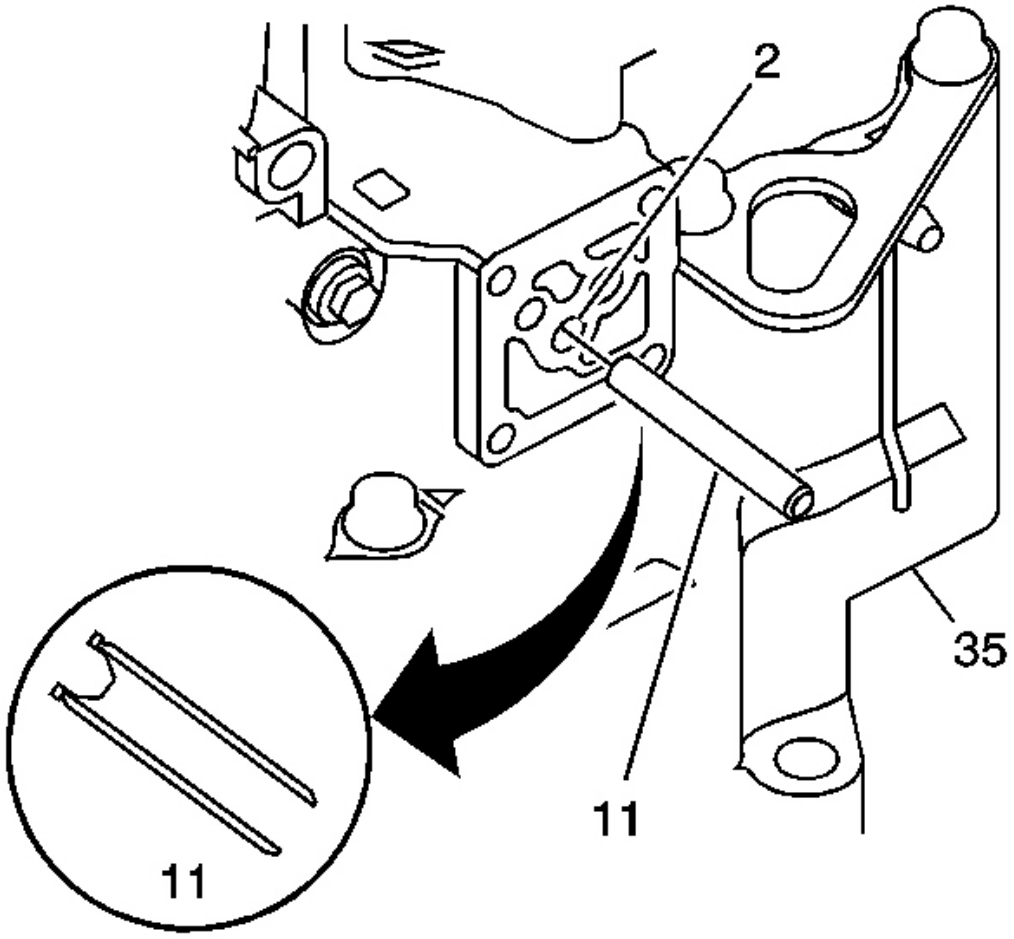

Fig. 467: Pressure Control Solenoid Fluid Feed Passage Tube & Transmission Case Hole
Courtesy of GENERAL MOTORS CORP.

1. Install a 8 x 53 mm TCC apply pressure control solenoid fluid feed passage tube (11) with the filter end facing the transmission case hole (2).

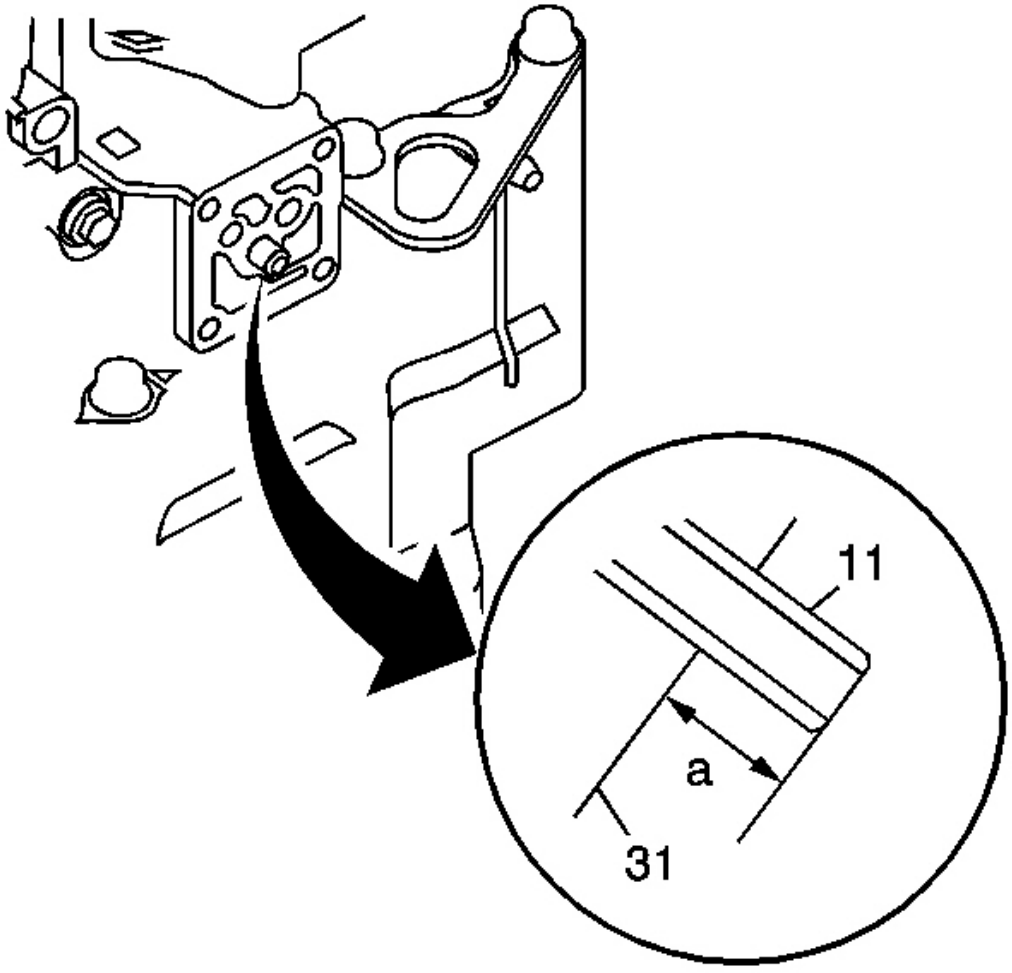

Fig. 468: Measuring The Top Of Fluid Passage Tube To Machined Surface Of Transmission Case
Courtesy of GENERAL MOTORS CORP.

2. Measure from the top of the 8 x 53 mm fluid passage tube (11) to the machined surface of the transmission case (31). This is the installed height (a) of the fluid passage tube (11).
3. If the measurement between the top of the tube and the case machined surface is approximately 7 mm (0.3 in), the tube is correctly installed in the accumulator fluid passage port.
4. If the measurement is greater than 7 mm (0.3 in), install the fluid passage tube again until it is correctly seated in the accumulator body.

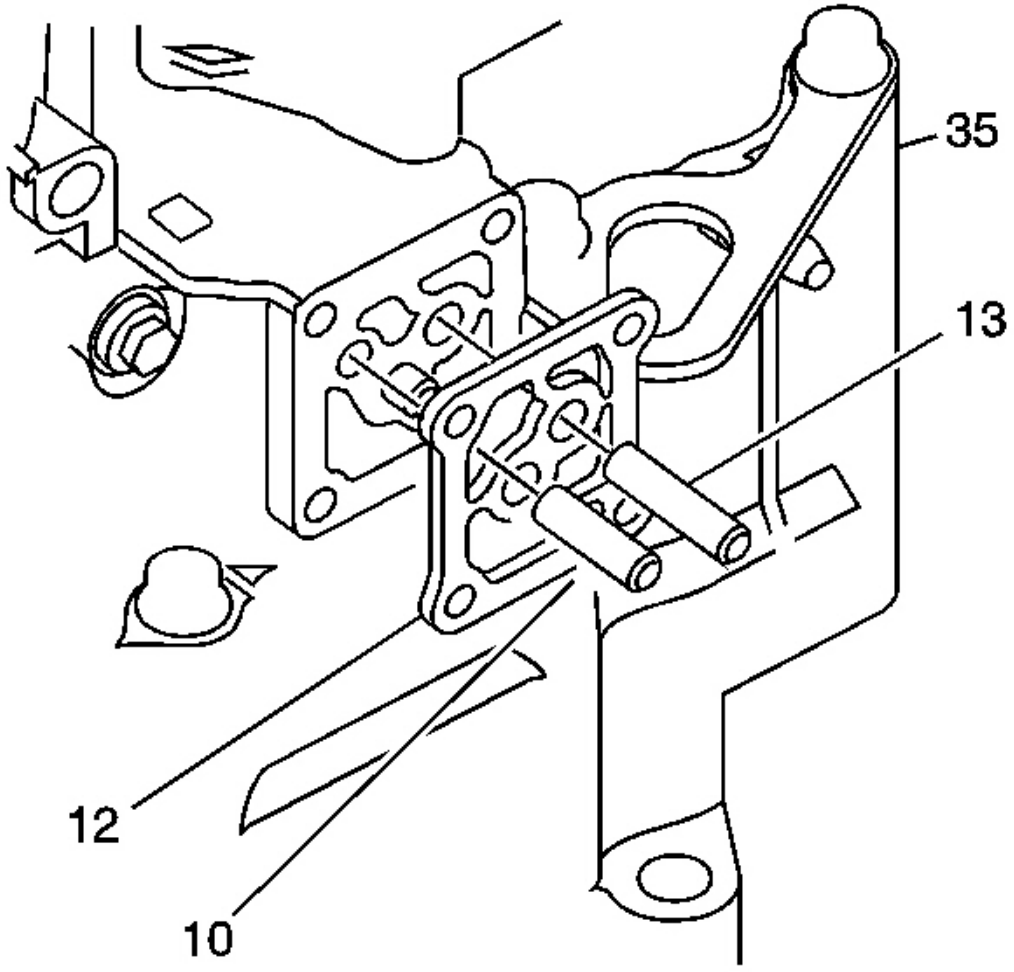

Fig. 469: TCC Lock-Up Pressure Control Solenoid Fluid Apply Passage Pipe & Solenoid Gasket
Courtesy of GENERAL MOTORS CORP.

5. Install a 8 x 36 mm TCC lock-up pressure control solenoid fluid apply passage pipe (10) with the filter end facing the transmission case.
6. Install the following components into the transmission case:
    - A 8 x 25.2 mm TCC lock-up pressure control solenoid fluid apply passage pipe (13)
    - A new TCC apply pressure control solenoid gasket (12)

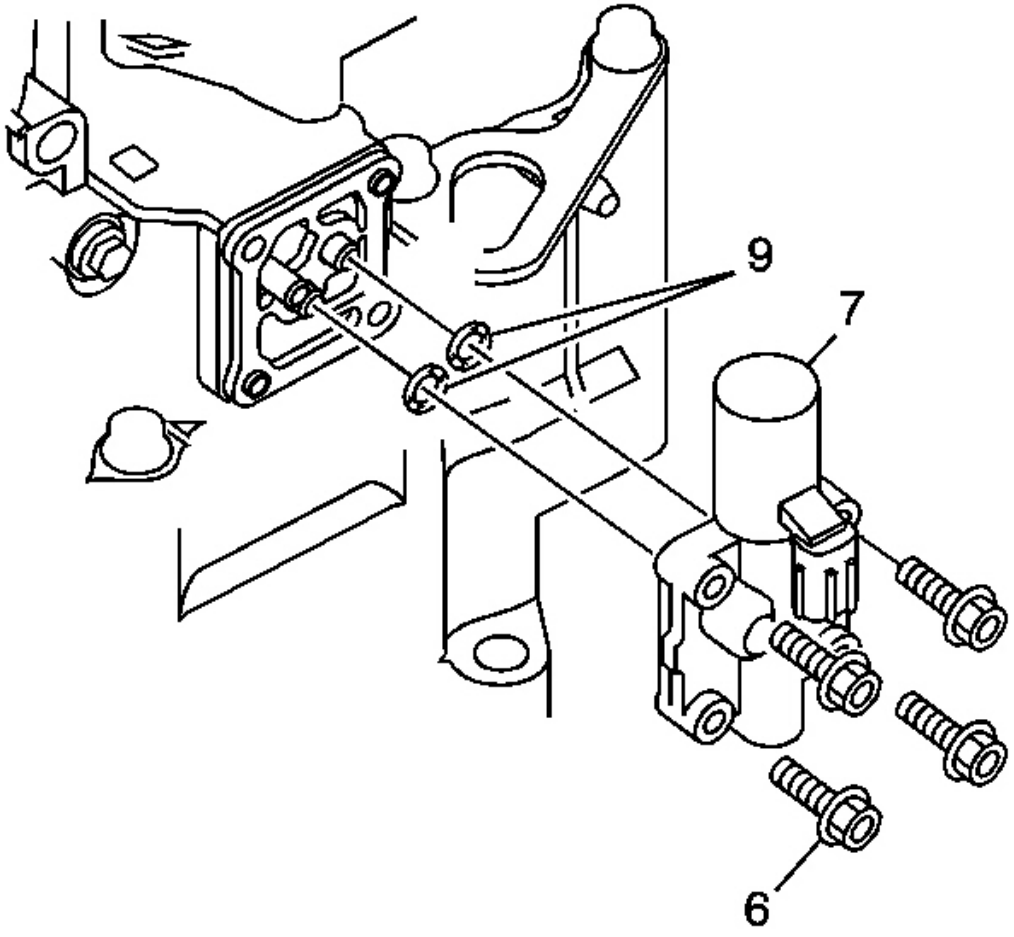

Fig. 470: TCC Apply Pressure Control Solenoid Assembly & Valve Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install both 7.7 x 2.3 mm clutch pressure control fluid passage pipe O-ring seals (9) over the fluid feed passage tubes.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Do not damage any of the TCC lock-up pressure control fluid passage pipe O-ring seals (9) during installation.

8. Install the TCC apply pressure control solenoid assembly (7).
9. Install the 4 TCC pressure control solenoid valve M6 x 1.0 x 30 mm bolts (6).

Tighten: Tighten the bolts to 12 N.m (106 lb in).

INPUT AND OUTPUT SPEED SENSORS INSTALLATION

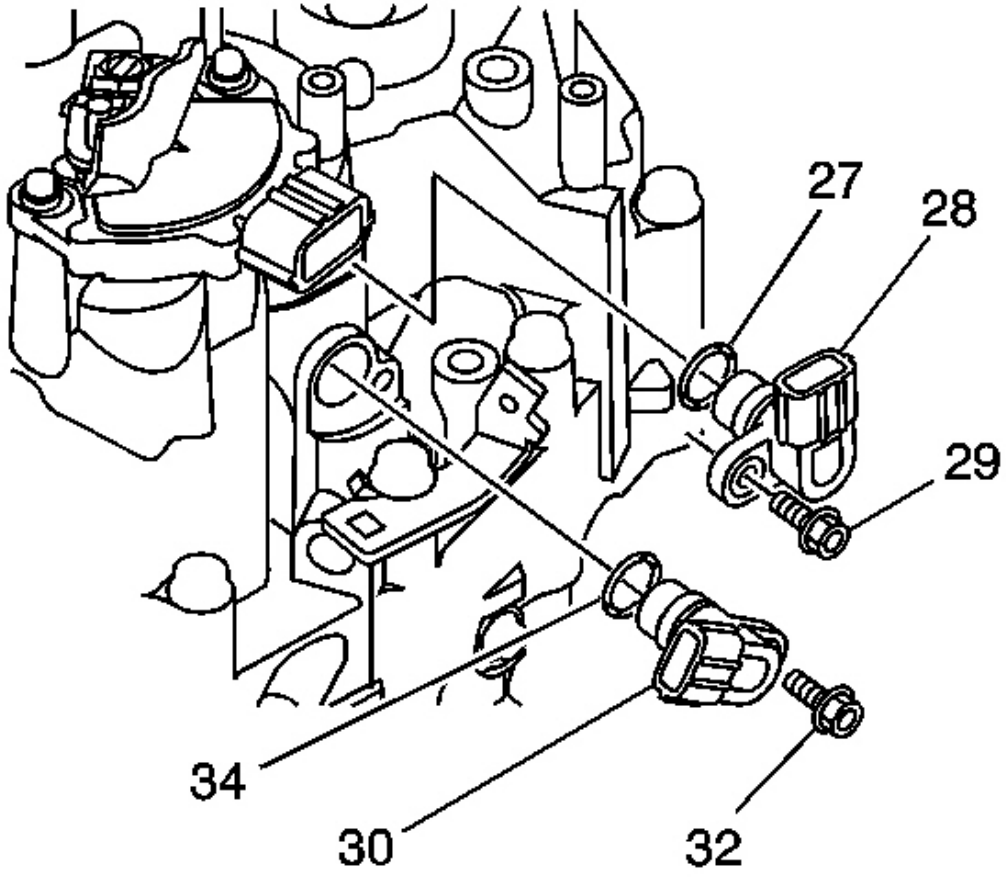

Fig. 471: Input And Output Speed Sensor, Bolts & O-Ring
Courtesy of GENERAL MOTORS CORP.

1. Install a speed sensor O-ring seal (27) on the input speed sensor (28) and an O-ring seal (27) on the output speed sensor (30).
2. Install each speed sensor into the correct transmission case borehole.
3. Install the speed sensor M6 x 1.0 x 18 mm bolt (29) and (32).

Tighten: Tighten the bolts to 12 N.m (8.7 lb ft).

3RD AND 4TH CLUTCH FLUID PRESSURE SWITCH INSTALLATION

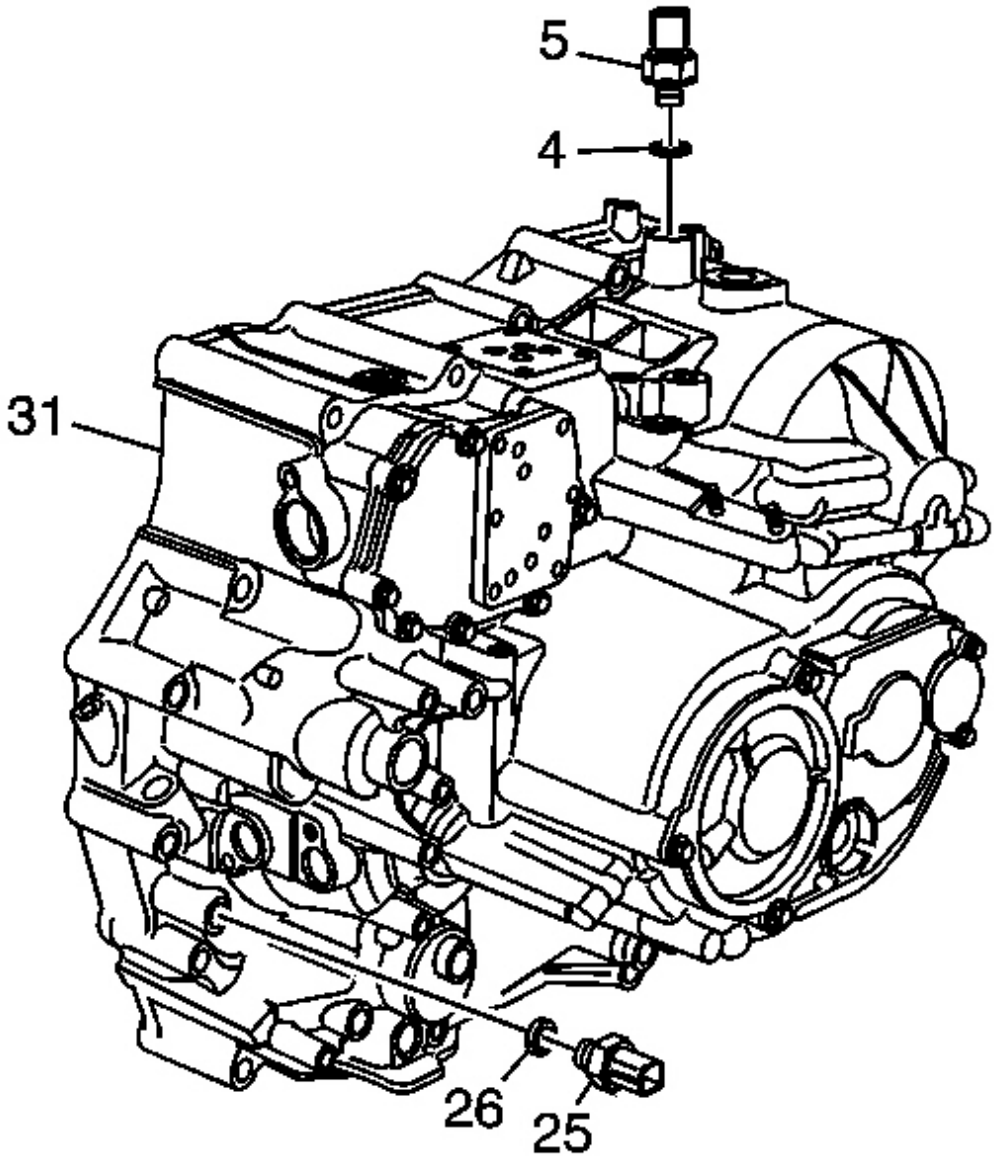

Fig. 472: 4th Clutch Pressure Switch/Seal & 3rd Clutch Pressure Switch/Seal
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Using a new clutch fluid pressure switch sealing washer (4), install the 3rd clutch fluid pressure switch (25).

   Tighten: Tighten the pressure switch to 20 N.m (14 lb ft).

2. Using a new clutch fluid pressure switch sealing washer (4), install the 4th clutch fluid pressure switch (5).

   Tighten: Tighten the pressure switch to 20 N.m (14 lb ft).

AUTOMATIC TRANSMISSION FLUID TEMPERATURE SENSOR INSTALLATION

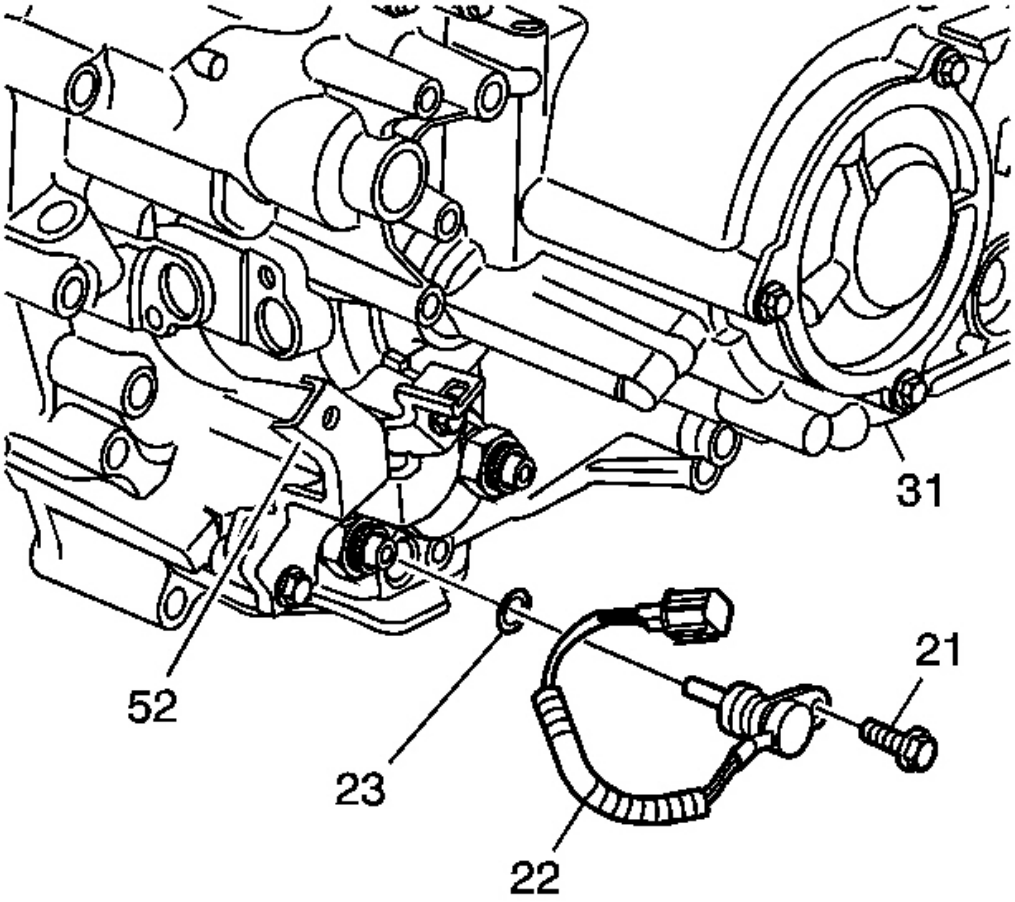

Fig. 473: Fluid Temperature Sensor, Harness Assembly, O-Ring Seal & Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install a new 12 mm x 2.4 mm fluid temperature O-ring seal (23) on the fluid temperature sensor (22).
2. Insert the fluid temperature sensor with harness assembly (22) into the correct transmission case (31) bore hole.
3. Install the fluid temperature sensor assembly (22).

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the fluid temperature sensor assembly M6 x 1.0 x 18 mm bolt (21).

   Tighten: Tighten the bolt to 12 N.m (106 lb in).

5. Install the connector on the temperature sensor connector bracket (52).

PARK/NEUTRAL POSITION (PNP) SWITCH INSTALLATION

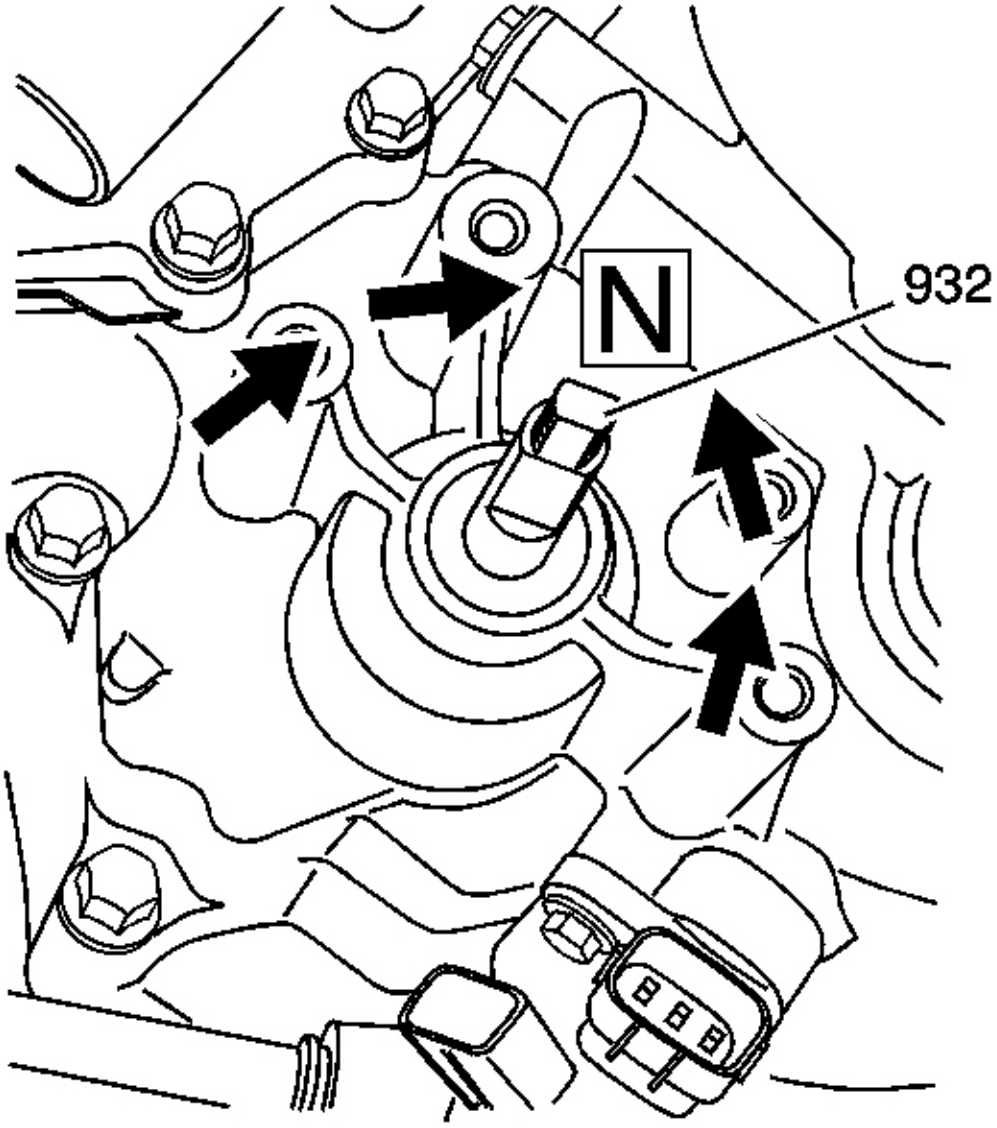

Fig. 474: Transaxle In Neutral Position
Courtesy of GENERAL MOTORS CORP.

1. Using an adjustable wrench, turn the manual shift shaft lever (932) counterclockwise until the transaxle is in the PARK position. Park can be felt by the stronger detent.
2. Once in the PARK position, rotate the manual shift shaft lever (932) clockwise 2 clicks. The transaxle should now be in the NEUTRAL position.

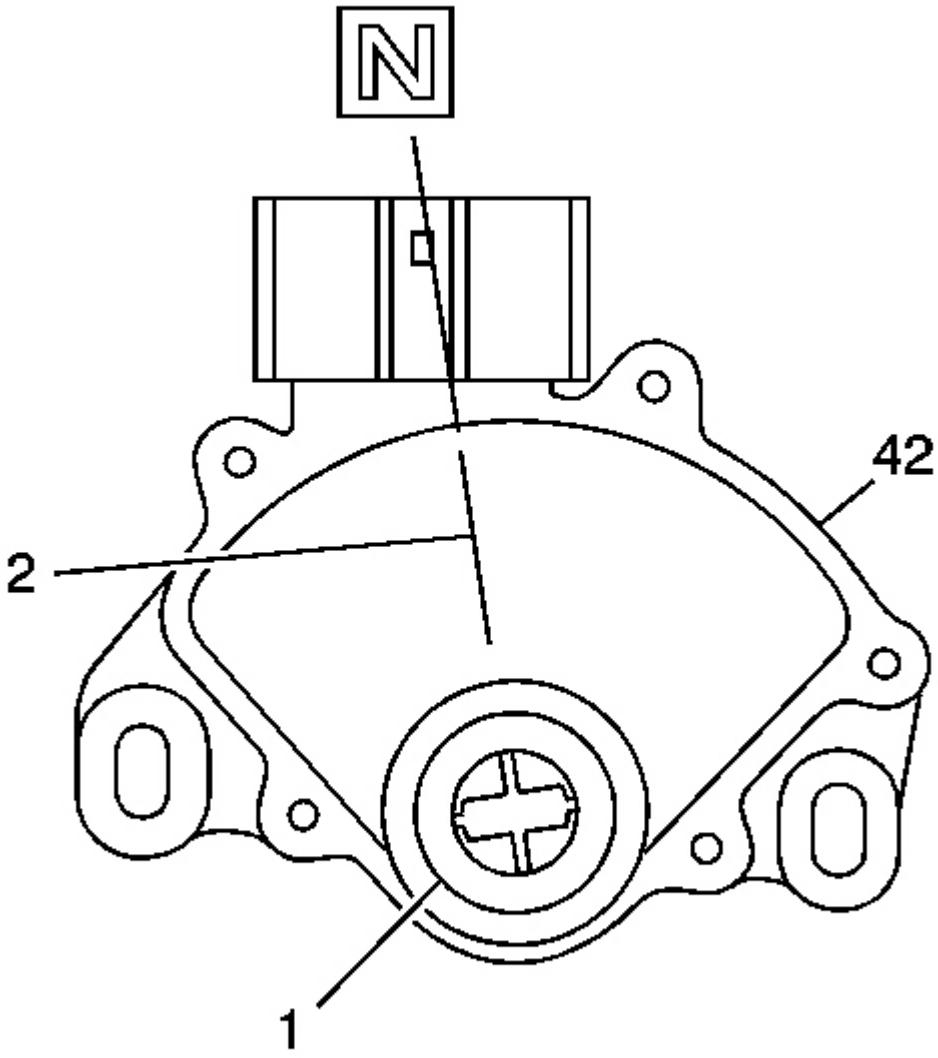

Fig. 475: Control Shaft Hole, Positioning Line & PNP Switch
Courtesy of GENERAL MOTORS CORP.

3. Place the internal part of the park/neutral position (PNP) switch (42) to the NEUTRAL position.

   The PNP switch will click in the NEUTRAL position, and the control shaft hole (1) will align with the positioning line (2) as shown in the insert.

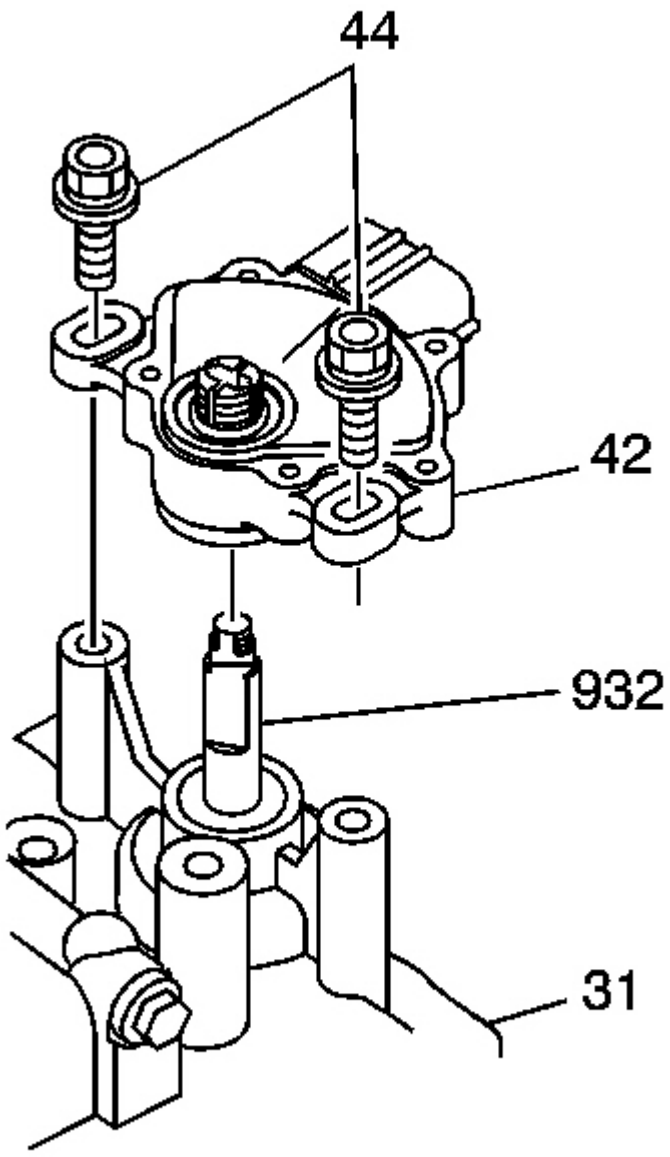

Fig. 476: Park/Neutral Position Switch & Control Shaft Hole
Courtesy of GENERAL MOTORS CORP.

4. Install the PNP switch (42) through the manual shift shaft (932).
5. Install 2 PNP M6 x 1.0 x 16 mm bolts (44) finger tight into the transmission case (31).

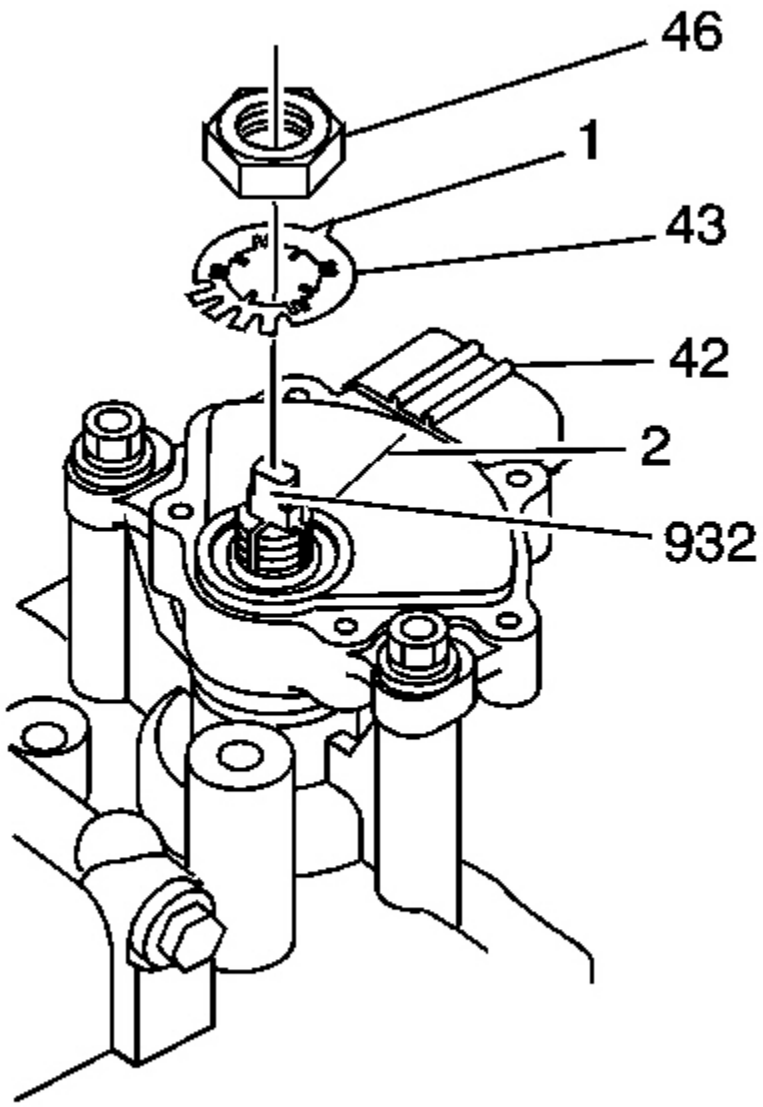

Fig. 477: Park/Neutral Position Switch, Manual Shift Shaft & Lock Washer
Courtesy of GENERAL MOTORS CORP.

6. Install a new PNP switch shaft washer (43) over the manual shift shaft (932).
7. Align the indicator/pointer (1) of the PNP switch shaft washer (43) with the positioning line (2) on the PNP switch (42).
8. Install the PNP switch shaft locknut (46) on the manual shift shaft (932) and hand tighten.

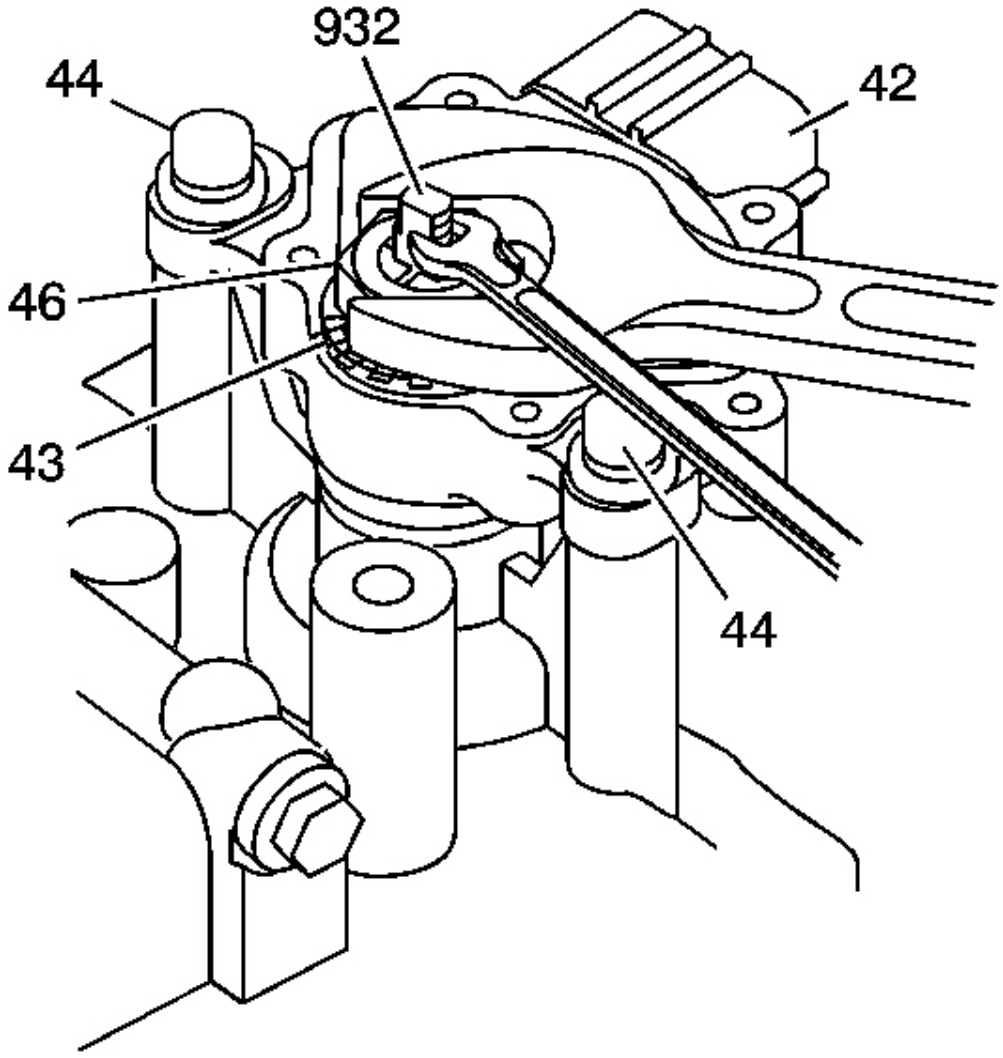

Fig. 478: Tightening The Locknut & Flanged Bolt/Screws
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

9. While holding the exposed section of the manual shift shaft (932) with an open end wrench, use another open end wrench to tighten the PNP switch shaft locknut (46).

   Tighten: Tighten the locknut to 12 N.m (106 lb in).

10. Bend a tab of the PNP switch shaft washer (43) up against the PNP switch shaft locknut (46).
11. Verify that the PNP switch (42) is still aligned with the indicator pointer (43). If not, reposition the PNP switch (42) and then tighten the 2 bolts (44).

    Tighten: Tighten the bolts to 12 N.m (106 lb in).

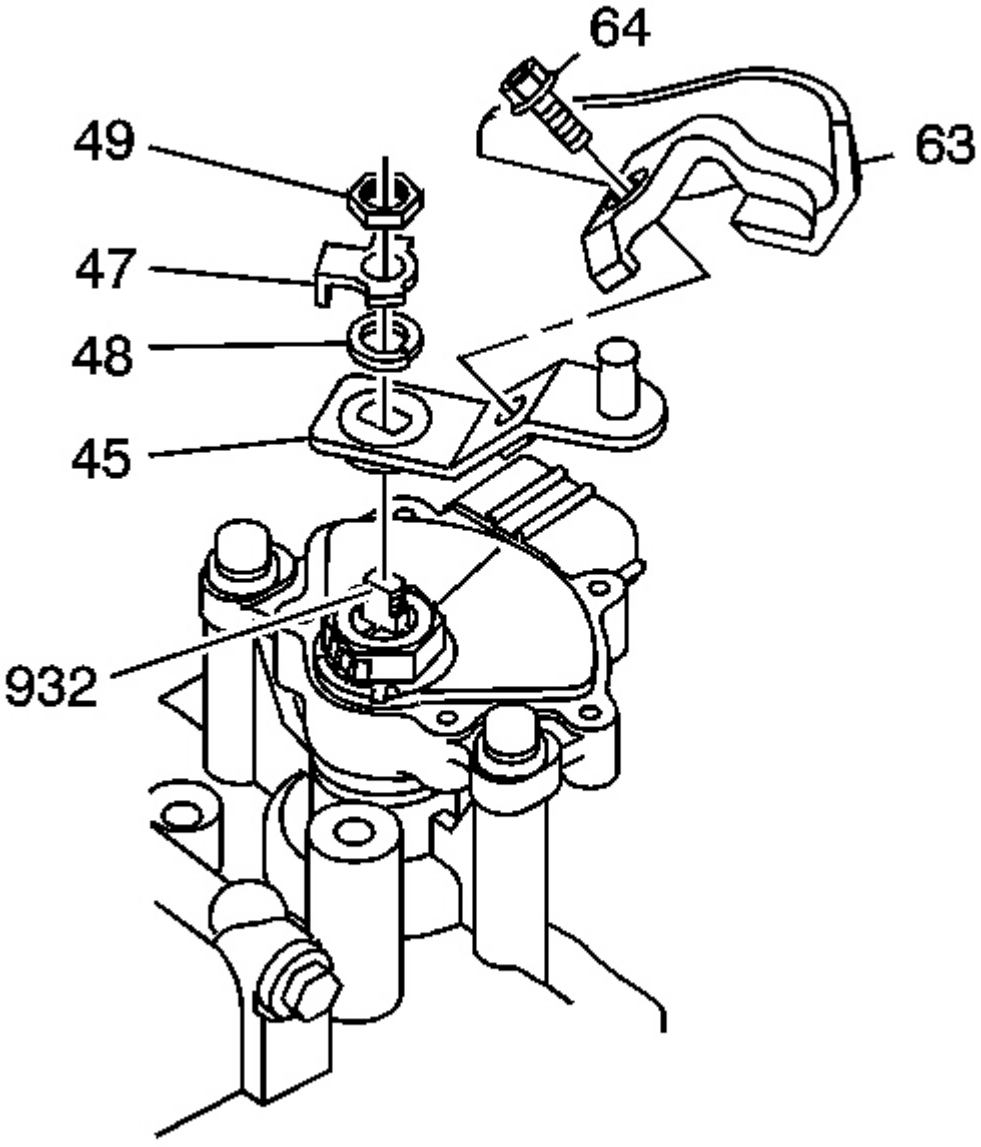

Fig. 479: PNP Switch Manual Shift Shaft & Components
Courtesy of GENERAL MOTORS CORP.

12. Install the following components to the manual shift shaft (932):
    - The automatic transmission range selector lever (45)
    - The automatic transmission range selector lever spring washer (48)
    - The automatic transmission range selector lever lock tab washer (47)
    - The automatic transmission range selector retainer nut (49)

    Tighten: Tighten the nut to 12 N.m (106 lb in).

13. Install the automatic transmission range selector lever cover (63).
14. Install the automatic transmission range selector lever cover M6 x 1.0 x 16 mm bolt (64).

    Tighten: Tighten the bolt to 12 N.m (106 lb in).

DRAIN PLUG INSTALLATION

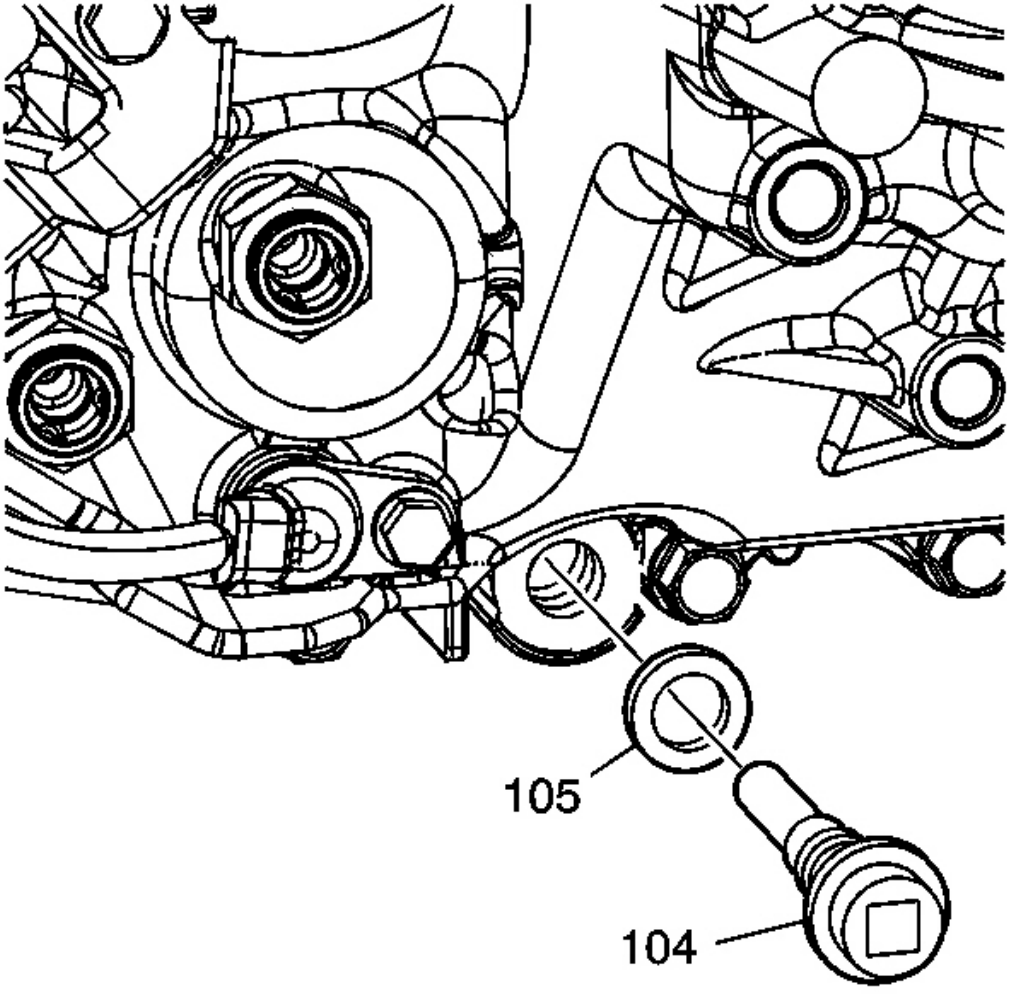

Fig. 480: Fluid Drain Plug & Sealing Washer
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

Using a new 18 mm transmission fluid drain plug sealing washer (105), install the 18 mm transmission fluid drain plug (104) into the transmission case.

Tighten: Tighten the drain plug to 49 N.m (36 lb ft)

HOLDING FIXTURE REMOVAL

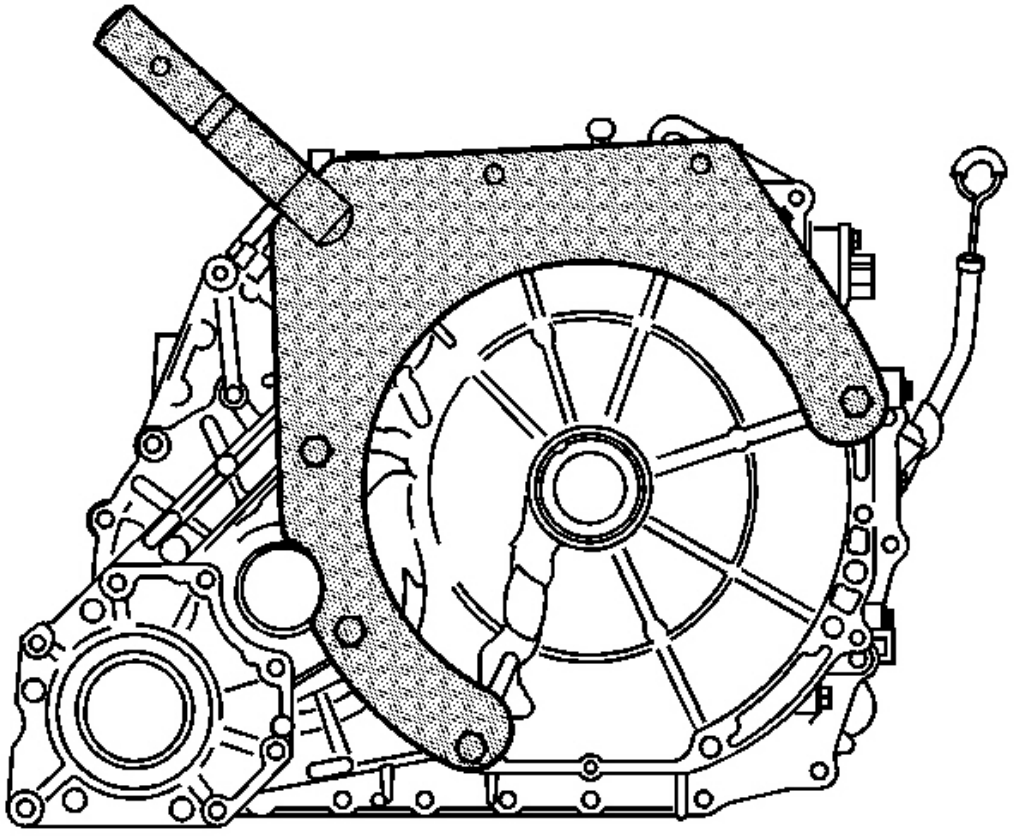

Fig. 481: Attaching DT 46238 To Transaxle Assembly
Courtesy of GENERAL MOTORS CORP.

1. Properly support and secure the transaxle assembly with the torque converter housing facing in the upright position.
2. Remove the transaxle assembly from the transaxle repair station / build stand.
3. Remove the 6 transaxle holding fixture mounting bolts.
4. Remove the transaxle holding fixture from the automatic transaxle assembly.

TORQUE CONVERTER INSTALLATION

Tools Required

DT 46411 6 mm T-handle

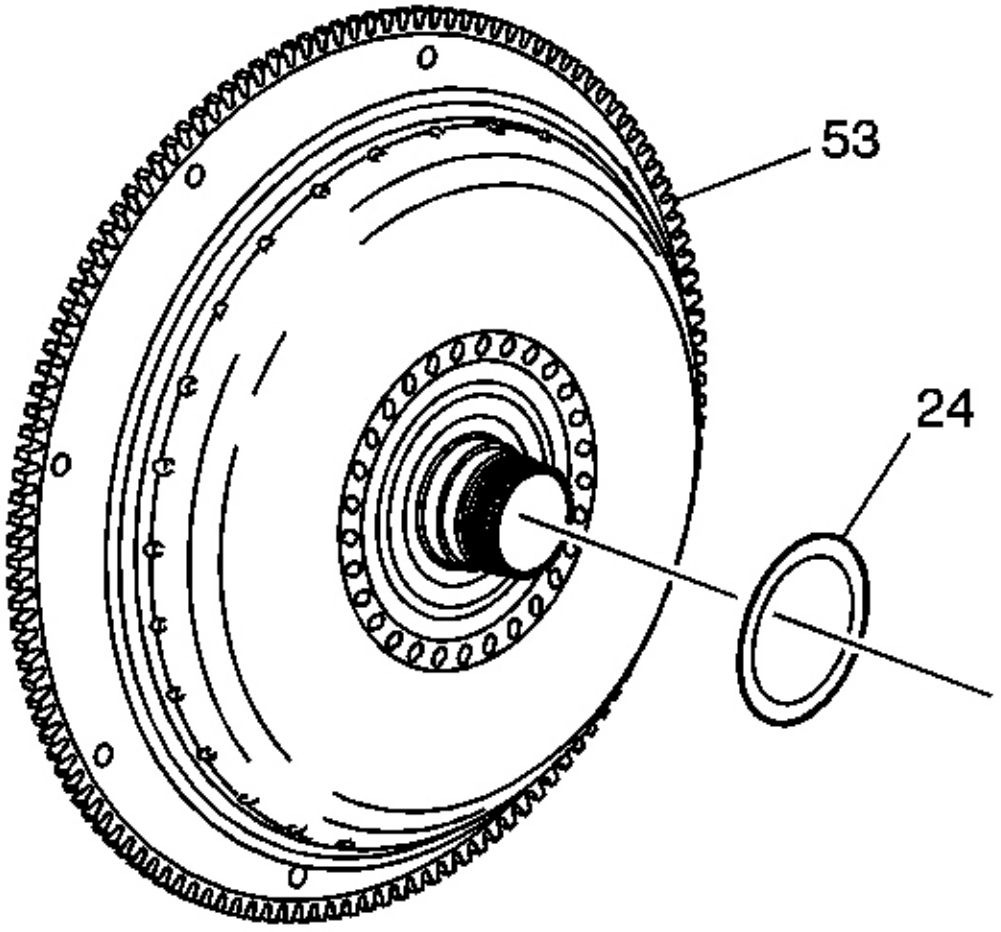

Fig. 482: Torque Converter O-Ring Seal & Hub Of Torque Converter Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install a new torque converter O-ring seal (24) on the hub of the torque converter assembly (53).

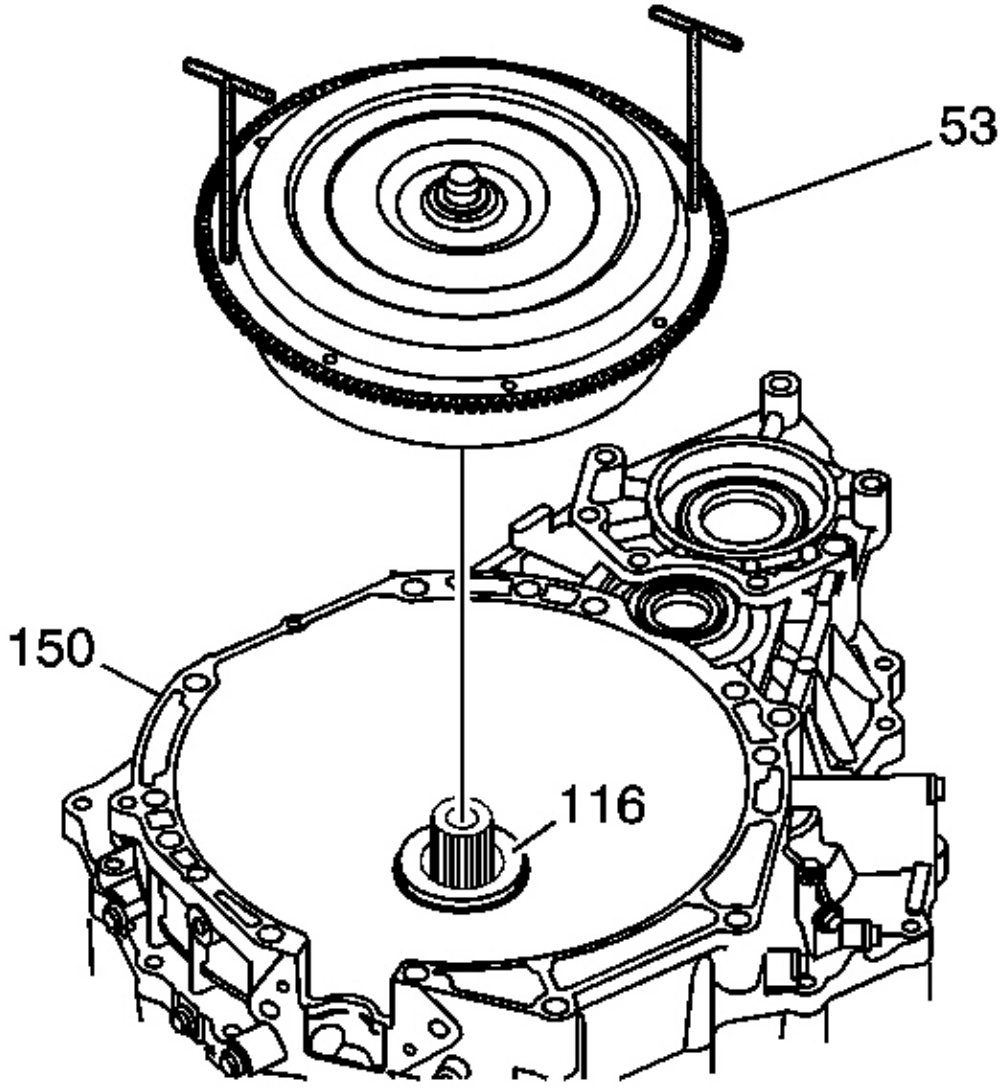

Fig. 483: Torque Converter Assembly Removed
Courtesy of GENERAL MOTORS CORP.

2. Install **DT 46411** in one of the 6 mm torque converter to flex-plate mount bolt holes.
3. Install the second **DT 46411** directly across from the first T-handle as shown.

NOTE: Do not install the torque converter fluid seal (116) below the flanged section of the torque converter housing or premature failure of the

mainshaft front bearing could occur.

4. Install the torque converter assembly (53) into the torque converter housing (150) making sure not to damage the torque converter seal (116).

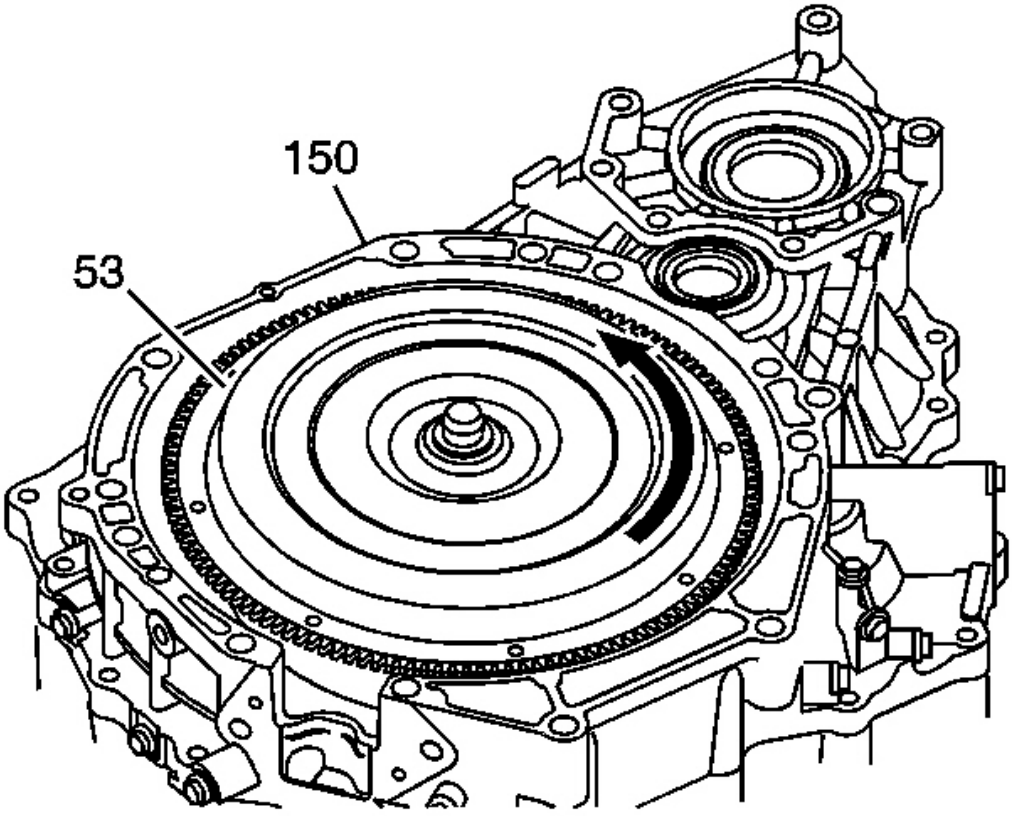

Fig. 484: Torque Converter Assembly & Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

5. Verify that the torque converter assembly (53) is fully seated into the torque converter housing (150) by performing the following inspection:
   - Rotate the torque converter and visually inspect that the starter motor ring gear is below the front surface of the torque converter housing (150).
   - The torque converter should spin free and make no rubbing noise(s).
6. Secure the torque converter (53) to the torque converter housing (150) using a torque converter housing shipping bracket until ready to install the transaxle assembly.

AUTOMATIC TRANSMISSION MOUNT REPLACEMENT - LEFT

Removal Procedure

1. Support the engine. Refer to **Engine Support Fixture** .
2. Remove the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.

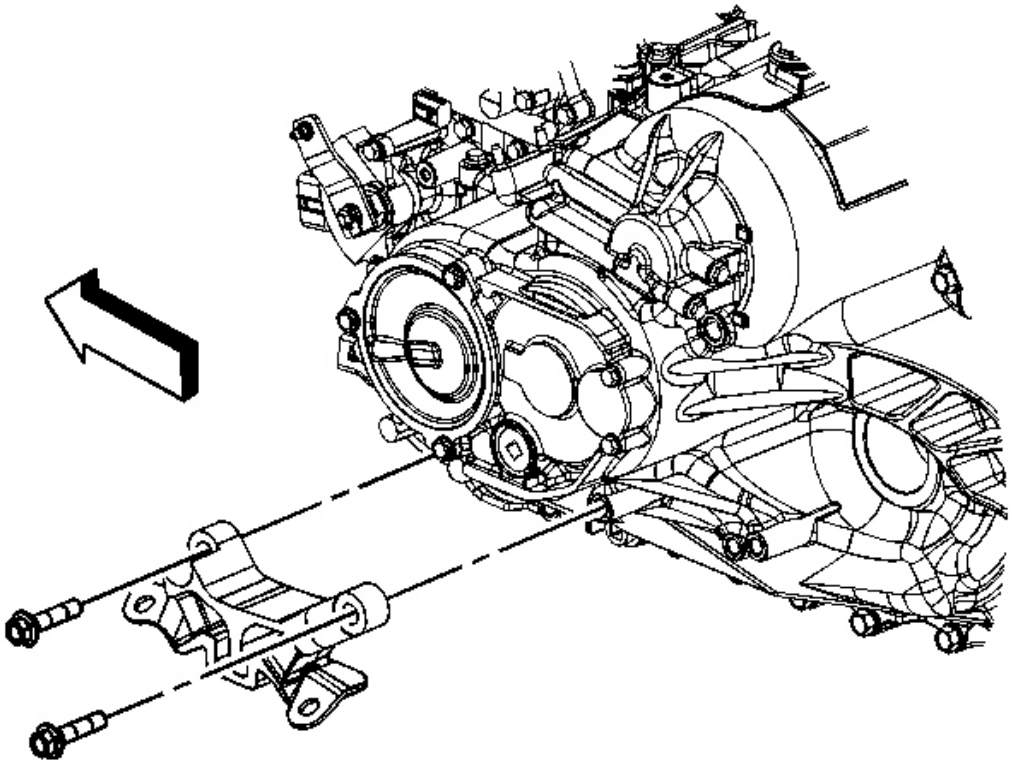

Fig. 485: Left Transmission Mount & Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the transmission mount to transmission bolts.

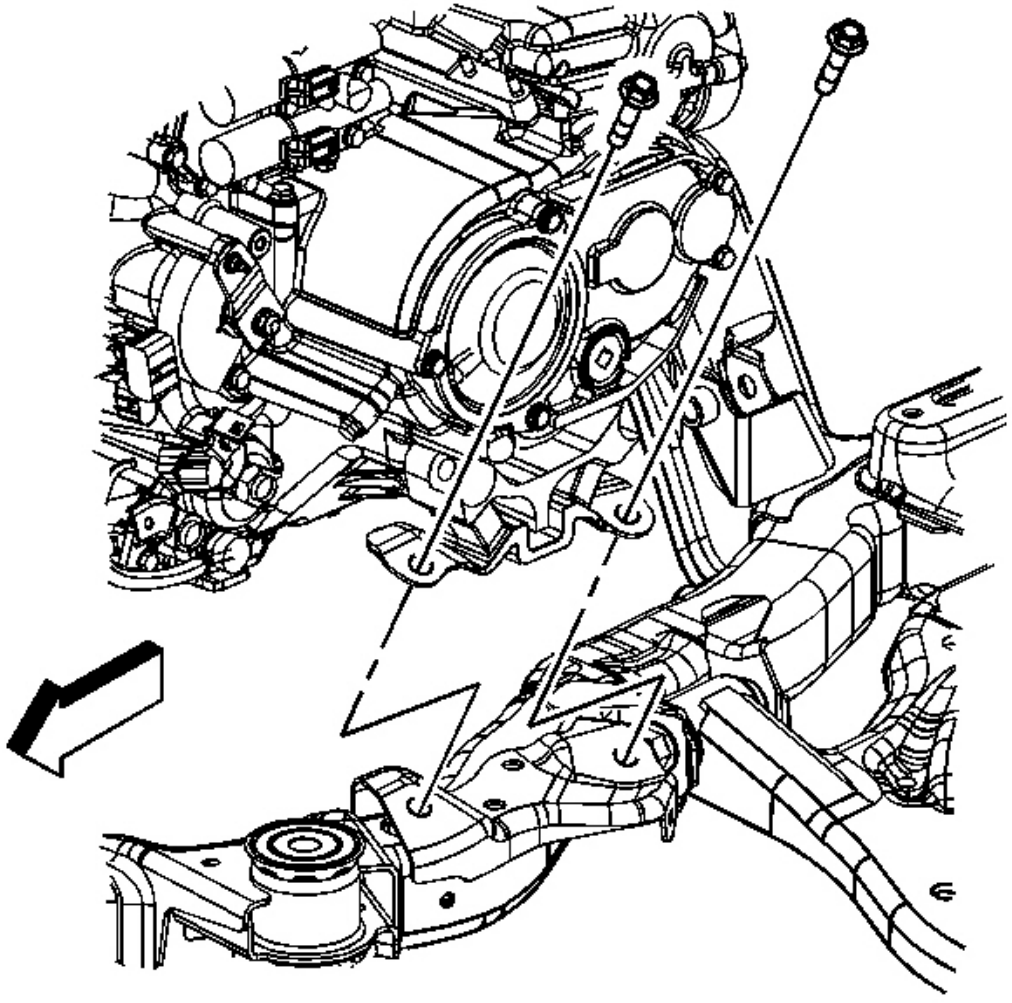

Fig. 486: Left Transmission Mount & Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the transmission mount to frame rail bolts.
5. Remove the mount from the engine.

Installation Procedure

1. Position the transmission mount on the frame rail.

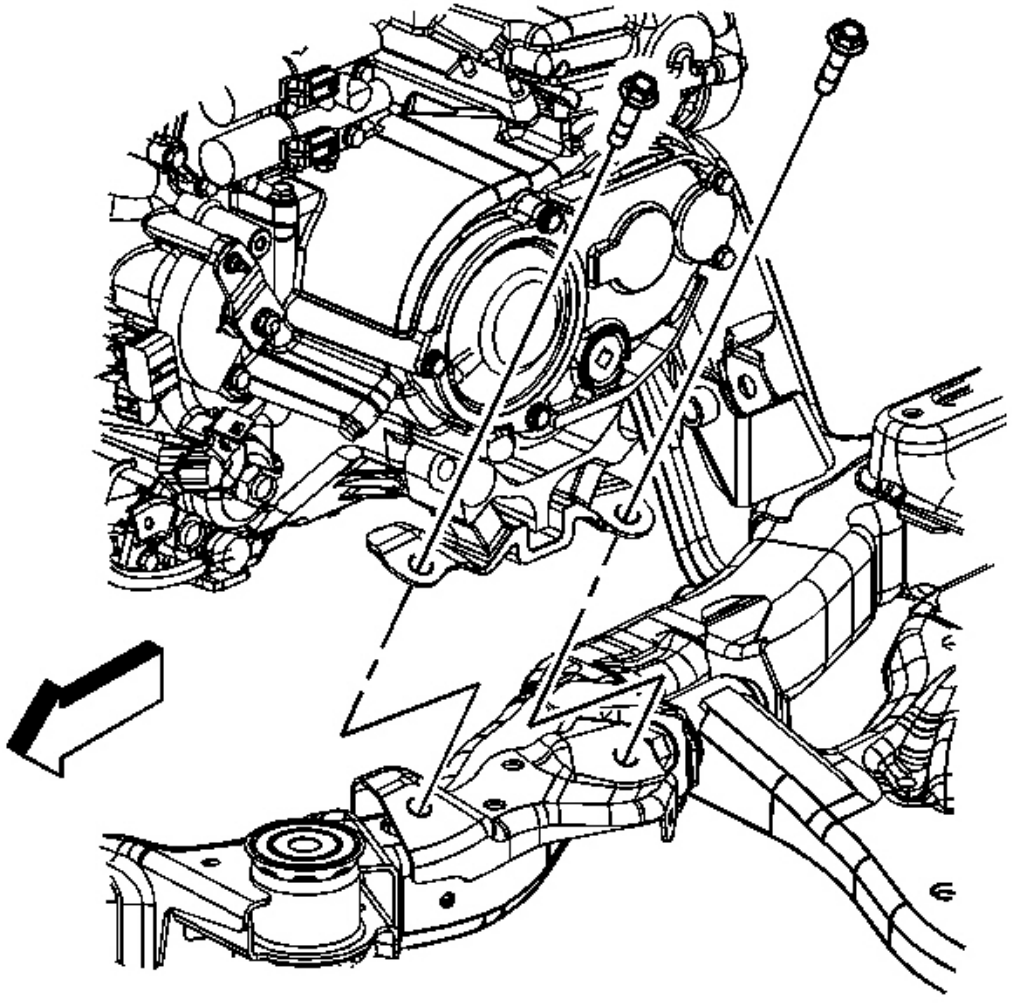

Fig. 487: Left Transmission Mount & Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the transmission mount to frame rail bolts.

   Tighten: Tighten the bolts to 50 N.m (37 lb ft).

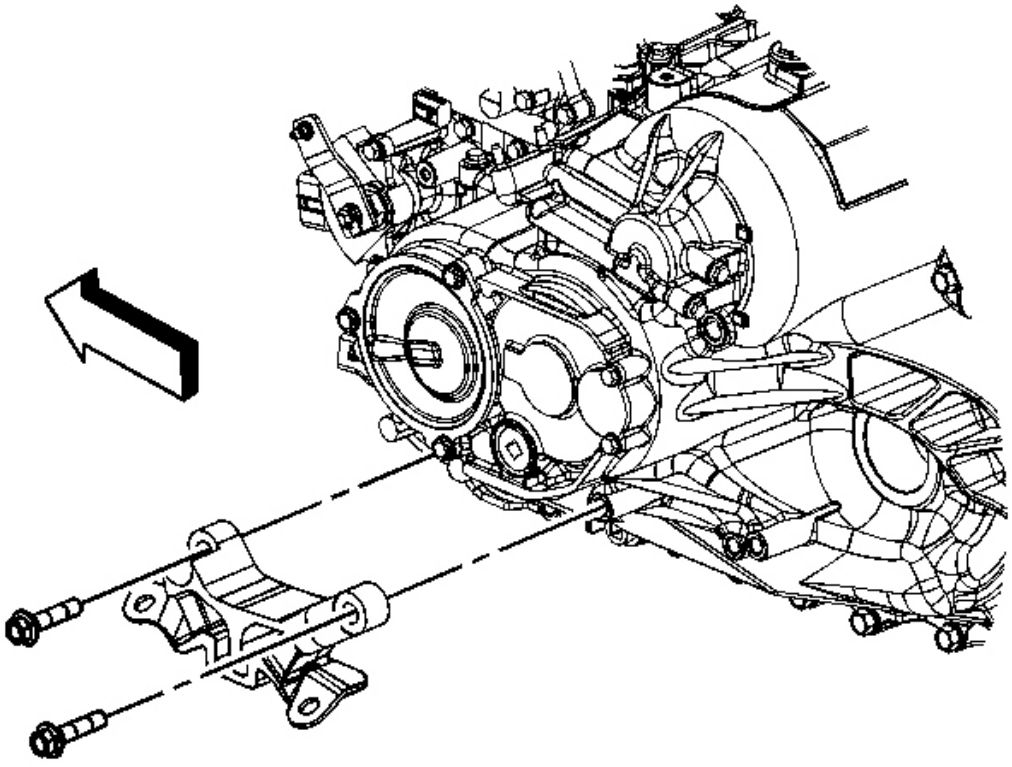

Fig. 488: Left Transmission Mount & Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission mount to transmission bolts.

   Tighten: Tighten the bolts to 50 N.m (37 lb ft).

4. Install the battery tray. Refer to **Battery Tray Replacement (L61)** or **Battery Tray Replacement (L66)** in Engine Electrical.
5. Remove the engine support. Refer to **Engine Support Fixture** .