

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

2003 TRANSMISSION

Manual Transmission - MM6/M12 (Unit Repair) - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Adapter Plate Plug	27 N-m	20 lb ft
Adapter Plate to Transmission Case Bolts	48 N-m	36 lb ft
Backup Lamp Switch	27 N-m	20 lb ft
Computer Aided Gear Select Solenoid	40 N-m	30 lb ft
Cover Plate Bolts	20 N-m	15 lb ft
Extension Housing Plug	27 N-m	20 lb ft
Extension Housing to Transmission Case Bolts	48 N-m	36 lb ft
Neutral Return Cam Spring Retaining Bolt	25 N-m	18 lb ft
Reverse Idler Shaft Bracket Bolts	25 N-m	18 lb ft
Reverse Lockout Assembly Bolt	18 N-m	13 lb ft
Reverse Lockout Solenoid	40 N-m	30 lb ft
Shift Detent Assembly	40 N-m	30 lb ft
Shift Guide Plate Bolts	22 N-m	16 lb ft
Shift Lever Guide Bolts	27 N-m	20 lb ft
Temperature Switch (M12 Only)	41 N-m	30 lb ft
Transmission Case Drain Plug	18 N-m	13 lb ft
Transmission Case Fill Plug (MM6 Only)	18 N-m	13 lb ft

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Fig. 1: Fastener Tightening Specifications
Courtesy of GENERAL MOTORS CORP.

SEALERS, ADHESIVES, & LUBRICANTS

Application	Type Of Material	GM Part Number	
		United States	Canada
Adapter Plate Plug	Sealant	12346004	10953480
Cover Plate	Sealant	12345739	10953472
Extension Housing Bolts	Sealant	12346004	10953480
Extension Housing to Transmission Case Mating Surface	Sealant	12345739	10953472
Reverse Idler Shaft Bracket Bolts	Threadlock	12345382	10953489
Reverse Lamp Switch	Sealant	12346004	10953480
Shift Lever Guide Bolts	Sealant	12346004	10953480
Temperature Switch - M12 Only	Sealant	12346004	10953480
Transmission Case Drain Plug	Sealant	12346004	10953480
Transmission Case Fill Plug - MM6 Only	Sealant	12346004	10953480
Transmission Case to Adapter Plate Mating Surface	Sealant	12345739	10953472
Transmission Fluid	Lubricant	DEXRON III®	DEXRON III®

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Fig. 2: Sealers, Adhesives, & Lubricants
Courtesy of GENERAL MOTORS CORP.

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LUBRICATION SPECIFICATIONS

Application	Specification	
	Metric	English
Dexron™ III, IIE	3.45 liters	3.65 quarts

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Fig. 3: Lubrication Specifications
Courtesy of GENERAL MOTORS CORP.

SHIM SIZE SPECIFICATIONS

Application	Specification	
	Metric	English
Countershaft Extension Shim Axial Play	0.05–0.13 mm	0.002–0.005 in
Countershaft Shim Preload	0.0–0.05 mm	0.0–0.002 in
Input Shaft/Mainshaft Shim Preload	0.0–0.05 mm	0.0–0.002 in

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Fig. 4: Shim Size Specifications
Courtesy of GENERAL MOTORS CORP.

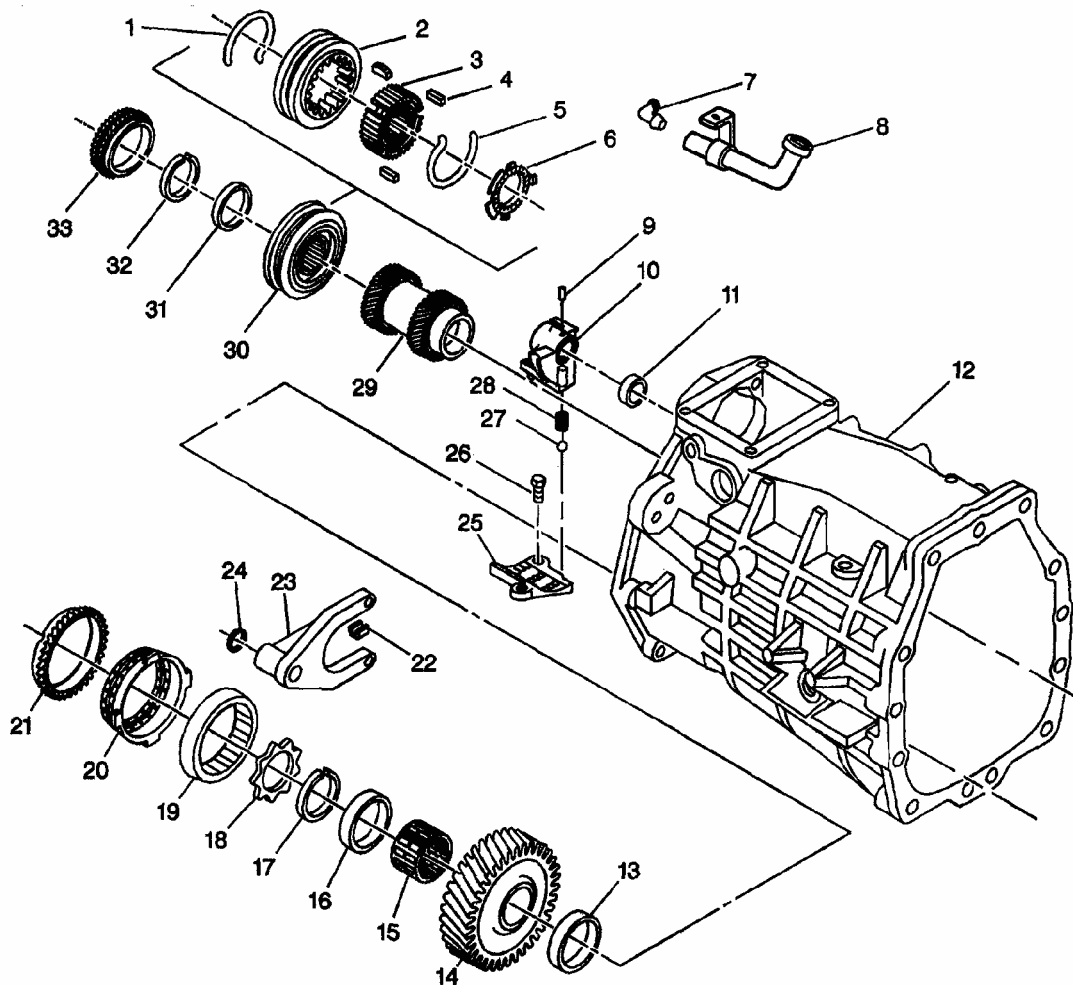
COMPONENT LOCATOR

TRANSMISSION COMPONENT LOCATION

Exploded View Of Transmission Case Components

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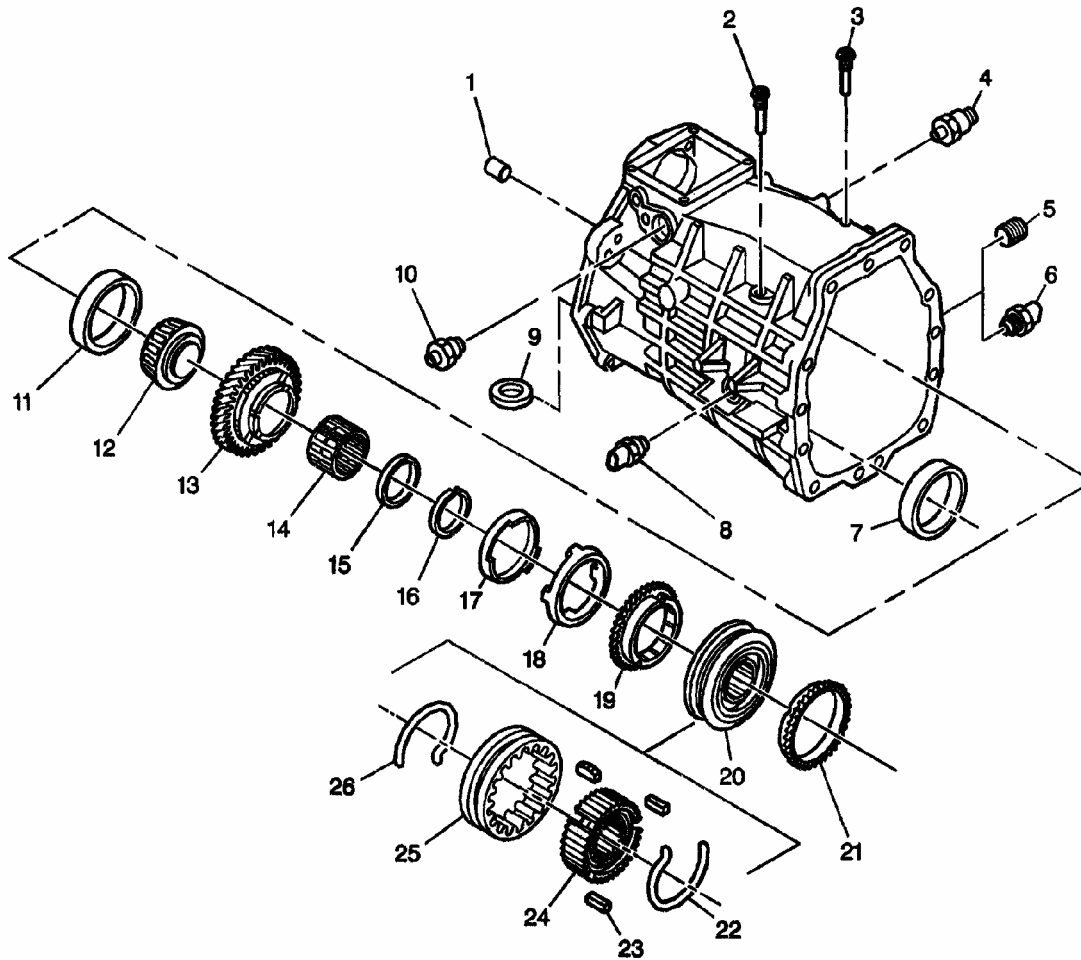
- | | |
|--|--|
| (1) Reverse Synchronizer Spring | (6) Reverse Synchronizer Key Retainer |
| (2) Reverse Synchronizer Sleeve | (7) Vent |
| (3) Reverse Synchronizer Hub | (8) Vent Pipe |
| (4) Reverse Synchronizer Key | (9) Offset Lever Roll Pin |
| (5) Reverse Synchronizer Spring | (10) Offset Shift Lever |
| (11) Top Shift Shaft Bushing | (22) Reverse Shift Fork Pad |
| (12) Transmission Case | (23) Reverse Shift Fork |
| (13) 6TH Speed Drive Gear Bearing Spacer | (24) Reverse Shift Fork Retainer Ring |
| (14) 6TH Speed Drive Gear | (25) Guide Plate |
| (15) 6TH Speed Drive Gear Needle Bearing | (26) Guide Plate Bolt |
| (16) 6TH Speed Drive Gear Bearing Spacer | (27) Shift Detent Ball |
| (17) Synchronizer Retainer Ring | (28) Shift Detent Ball Spring |
| (18) 6TH Speed Drive Gear Thrust Washer | (29) 5TH and 6TH Speed Driven Gear |
| (19) 6TH Speed Drive Gear Inner Cone | (30) Reverse Synchronizer Hub and Sleeve |
| (20) 6TH Speed Drive Gear Friction Cone | (31) Reverse Gear Thrust Washer |
| (21) 6TH Speed Drive Gear Synchronizer Blocking Ring | (32) Reverse Synchronizer Retainer Ring |
| | (33) Reverse Synchronizer Blocking Ring |

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Fig. 5: Exploded View Of Transmission Case Components (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

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- | | |
|--|--|
| (1) Case Rear Extension Pin | (3) Interlock Guide Bolt |
| (2) 5th /6th Lever Guide Bolt | (4) Computer Aided Gear Select Solenoid |
| (5) Oil Fill Plug (MM6 Only) | (16) Synchronizer Retainer Ring |
| (6) Temperature Switch (M12 Only) | (17) 1st Speed Drive Gear Inner Cone |
| (7) Countershaft Bearing Race | (18) 1st Speed Drive Gear Friction Cone |
| (8) Backup Lamp Switch | (19) 1st Gear Synchronizer Blocking Ring |
| (9) Magnet | (20) 1st /2nd Synchronizer Assembly |
| (10) Shift Detent Assembly | (21) 2nd Gear Synchronizer Blocking Ring |
| (11) Mainshaft Rear Bearing Race | (22) 1st /2nd Synchronizer Spring |
| (12) Mainshaft Rear Bearing | (23) 1st /2nd Synchronizer Key |
| (13) 1st Speed Drive Gear | (24) 1st /2nd Synchronizer Hub |
| (14) 1st Speed Drive Gear Needle Bearing | (25) 1st /2nd Synchronizer Sleeve |
| (15) 1st Speed Drive Gear Bearing Spacer | (26) 1st /2nd Synchronizer Spring |

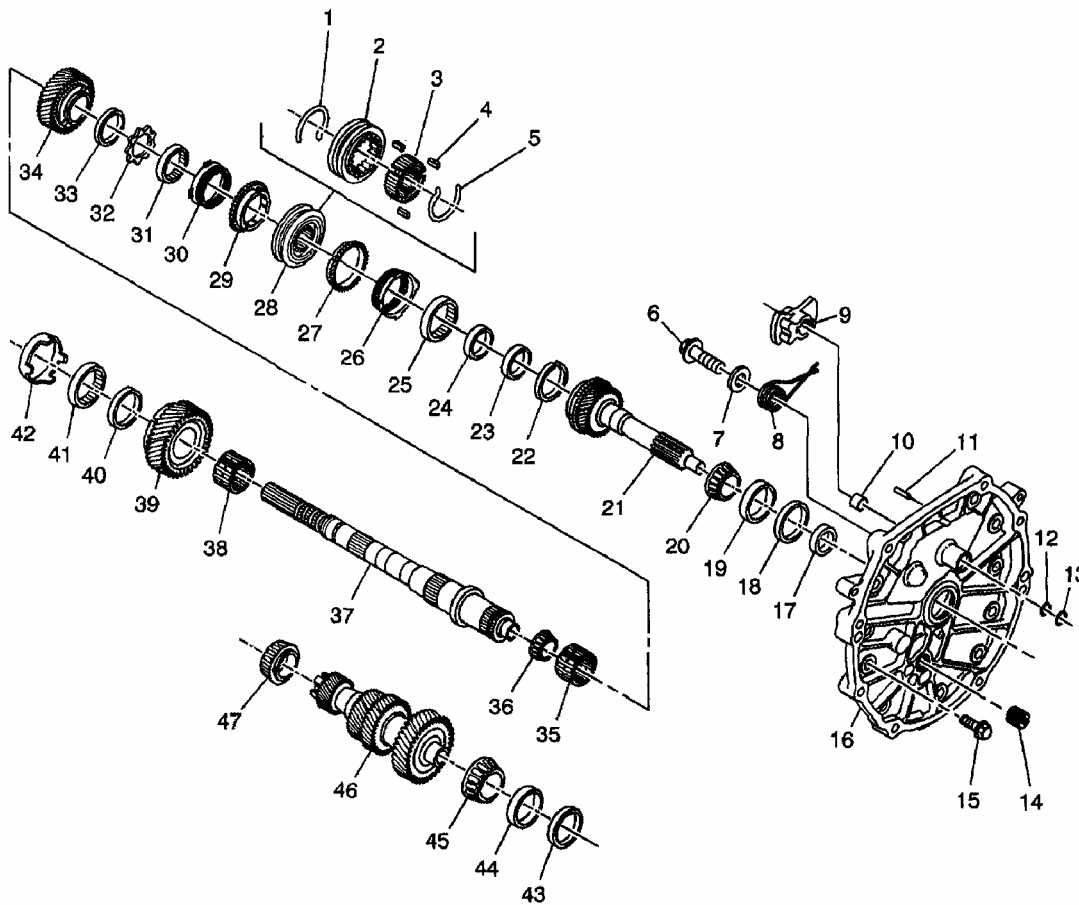
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Fig. 6: Exploded View Of Transmission Case Components (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

Exploded View Of Adapter Plate & Gears Components

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- | | |
|---|--|
| (1) 3rd /4th Synchronizer Spring | (4) 3rd /4th Synchronizer Key |
| (2) 3rd /4th Synchronizer Sleeve | (5) 3rd /4th Synchronizer Spring |
| (3) 3rd /4th Synchronizer Hub | (6) Neutral Return Cam Spring Bolt |
| (7) Neutral Return Cam Spring Washer | (28) 3rd /4th Synchronizer Assembly |
| (8) Neutral Return Cam Spring | (29) 3rd Speed Drive Gear Synchronizer Blocking Ring |
| (9) Neutral Return Cam | (30) 3rd Speed Drive Gear Friction Cone |
| (10) Top Shaft Rail Bushing | (31) 3rd Speed Drive Gear Inner Cone |
| (11) Dowel Pin | (32) 3rd Speed Drive Gear Thrust Washer |
| (12) Inner Shift Shaft Seal | (33) 3rd Speed Drive Gear Thrust Washer |
| (13) Outer Shift Shaft Seal | (34) 3rd Speed Drive Gear |
| (14) Adapter Plate Inspection Plug | (35) 3rd Speed Drive Gear Bearing |
| (15) Adapter to Transmission Case Bolt | (36) Mainshaft Small Tapered Bearing |
| (16) Front Adapter Plate | (37) Mainshaft |
| (17) Input Shaft Seal | (38) 2nd Speed Drive Gear Needle Bearing |
| (18) Input Shaft Bearing Shim | (39) 2nd Speed Drive Gear |
| (19) Input Shaft Bearing Race | (40) 2nd Speed Drive Gear Bearing Spacer |
| (20) Input Shaft Bearing | (41) 2nd Speed Drive Gear Inner Cone |
| (21) Input Shaft | (42) 2nd Speed Drive Gear Friction Cone |
| (22) Input Shaft Bearing Race | (43) Countershaft Bearing Adjust Shim |
| (23) 3rd /4th Synchronizer Retaining Ring | (44) Countershaft Bearing Race |
| (24) 4th Speed Drive Gear Thrust Washer | (45) Countershaft Front Bearing |
| (25) 4th Speed Drive Gear Inner Cone | (46) Countershaft |
| (26) 4th Speed Drive Gear Friction Cone | (47) Countershaft Rear Bearing |
| (27) 4th Speed Drive Gear Blocker Ring | |

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Fig. 7: Exploded View Of Adapter Plate & Gears Components

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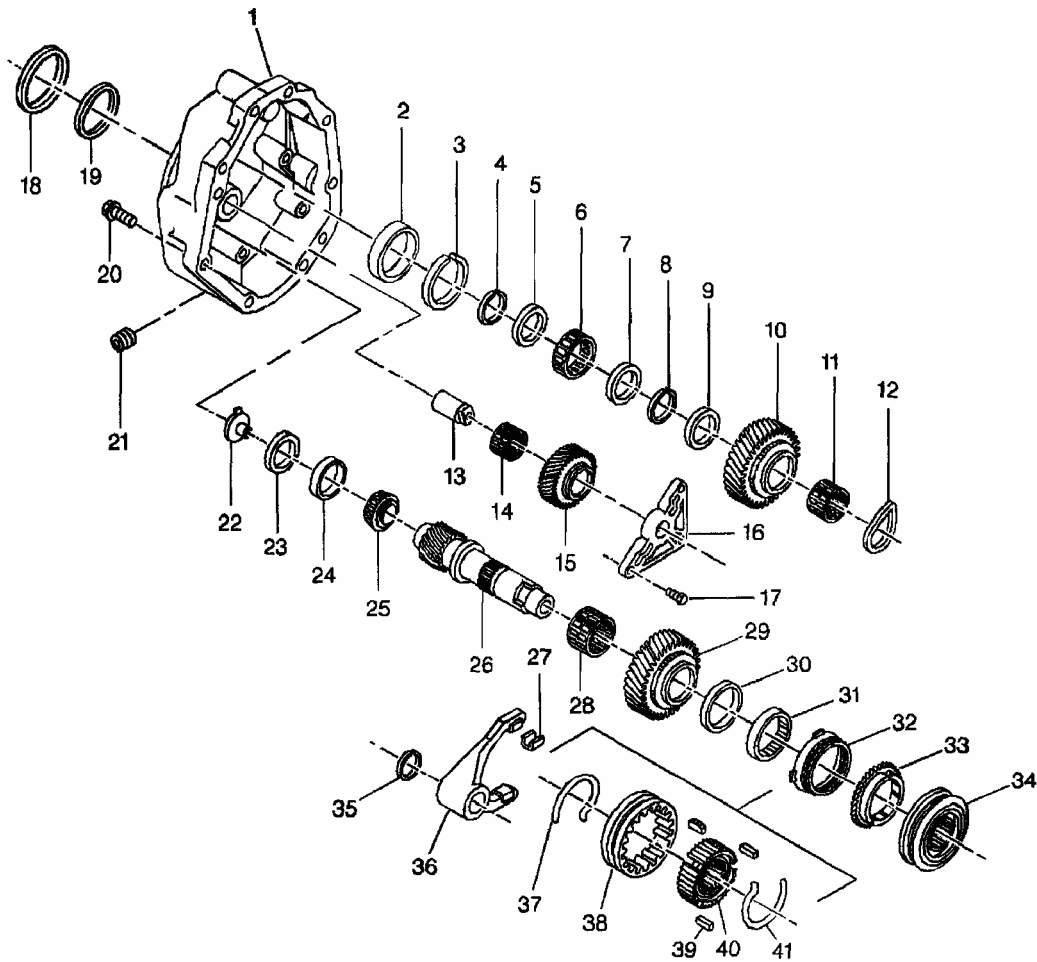
2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

Courtesy of GENERAL MOTORS CORP.

Exploded View Of Extension Housing Components

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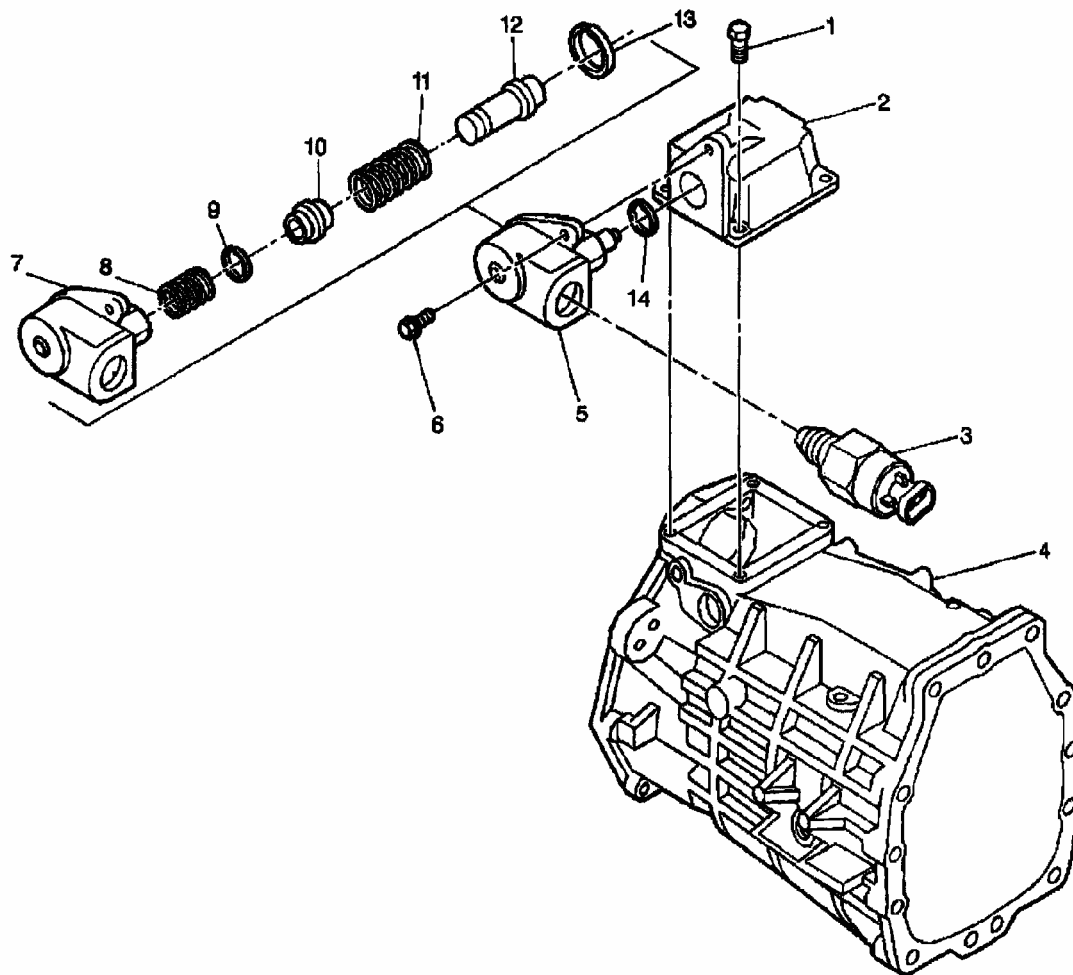


- | | |
|--|--|
| (1) Extension Housing | (16) Reverse Idler Bracket |
| (2) Mainshaft Bearing Race | (17) Reverse Idler Bracket Bolt |
| (3) Mainshaft Rear Bearing Retainer Ring | (18) Outer Output Shaft Seal |
| (4) Mainshaft Rear Bearing Retainer Ring | (19) Inner Output Shaft Seal |
| (5) Mainshaft Gear Bearing Spacer | (20) Extension Housing to Transmission Case Bolt |
| (6) Mainshaft Rear Bearing | (21) Oil Drain Plug |
| (7) Mainshaft Gear Bearing Spacer | (22) Lubrication Funnel |
| (8) Synchronizer Retainer Ring | (23) Front Countershaft Extension Bearing Shim |
| (9) Reverse Gear Thrust Washer | (24) Countershaft Extension Bearing Race |
| (10) Mainshaft Reverse Speed Gear | (25) Countershaft Extension Bearing |
| (11) Reverse Gear Bearing | (26) Countershaft Extension |
| (12) Reverse Gear Washer | (27) Shift Fork Pad |
| (13) Reverse Idler Gear Shaft | (28) 5th Speed Drive Gear Needle Bearing |
| (14) Reverse Idler Gear Needle Bearing | (29) 5th Speed Drive Gear |
| (15) Reverse Idler Gear | (30) 5th Speed Drive Gear Thrust Washer |
| (31) 5th Speed Gear Inner Cone | (37) 5th /6th Synchronizer Spring |
| (32) 5th Speed Gear Friction Cone | (38) 5th /6th Synchronizer Sleeve |
| (33) 5th Gear Synchronizer Blocking Ring | (39) 5th /6th and Reverse Synchronizer Key |
| (34) 5th /6th Synchronizer Assembly | (40) 5th /6th Synchronizer Hub |
| (35) 5th Gear Shift Fork Retainer Ring | (41) 5th /6th Synchronizer Spring |
| (36) 5th /6th Shift Fork | |

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Fig. 8: Exploded View Of Extension Housing Components
Courtesy of GENERAL MOTORS CORP.

Exploded View Of Reverse Lockout Components



- (1) Transmission Case Cover Bolt
- (2) Transmission Case Cover
- (3) Reverse Lockout Solenoid
- (4) Transmission Case
- (5) Reverse Lockout Assembly
- (6) Reverse Lockout Solenoid Mounting Bolt
- (7) Reverse Lockout Body

- (8) Reverse Lockout Inner Spring
- (9) Snap Ring
- (10) Reverse Lockout Collar
- (11) Reverse Lockout Outer Spring
- (12) Reverse Lockout Plunger
- (13) Snap Ring
- (14) O-Ring

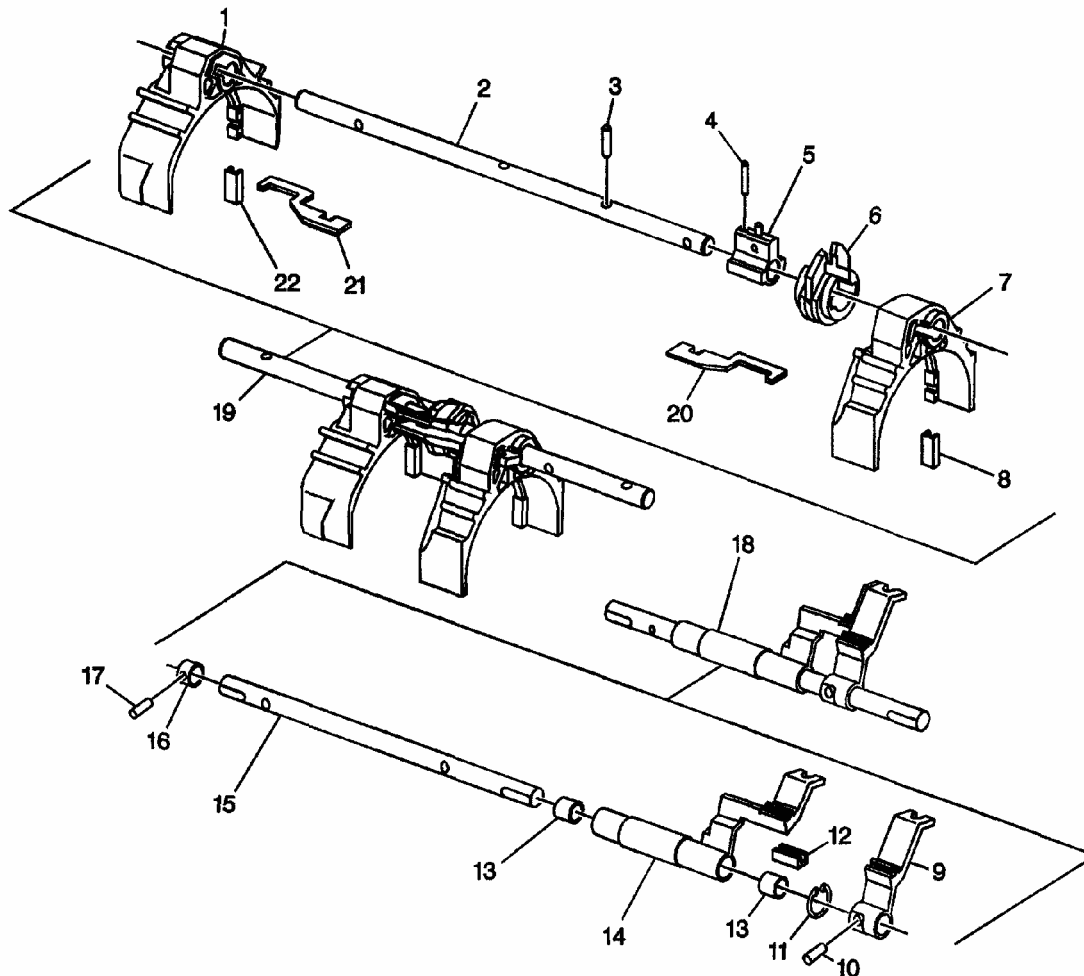
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Fig. 9: Exploded View Of Reverse Lockout Components
Courtesy of GENERAL MOTORS CORP.

Exploded View Of Shift Shafts Components

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- | | |
|---------------------------------|---|
| (1) 1st /2nd Shift Fork | (12) 5th /6th Shift Lever Pad |
| (2) Shift Shaft | (13) 5th /6th Shift Shaft Lever Bushing |
| (3) Neutral Return Cam Pin | (14) 5th /6th Shift Lever |
| (4) 1st /2nd Shift Fork Pin | (15) 5th /6th Reverse Shift Shaft |
| (5) Control Select Arm Pin | (16) Reverse Shift Collar |
| (6) Gear Select Interlock Plate | (17) Reverse Shift Collar Pin |
| (7) 3rd /4th Shift Fork | (18) 5th /6th Shift Lever Assembly |
| (8) 3rd /4th Shift Fork Pad | (19) 1st /2nd Shift Shaft Assembly |
| (9) Offset Shift Lever | (20) Shift Interlock Plate |
| (10) Reverse Shift Lever Pin | (21) Interlock Shift Plate |
| (11) Retaining Ring | (22) 1st /2nd Shift Fork Pad |

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Fig. 10: Exploded View Of Shift Shafts Components
Courtesy of GENERAL MOTORS CORP.

REPAIR INSTRUCTIONS

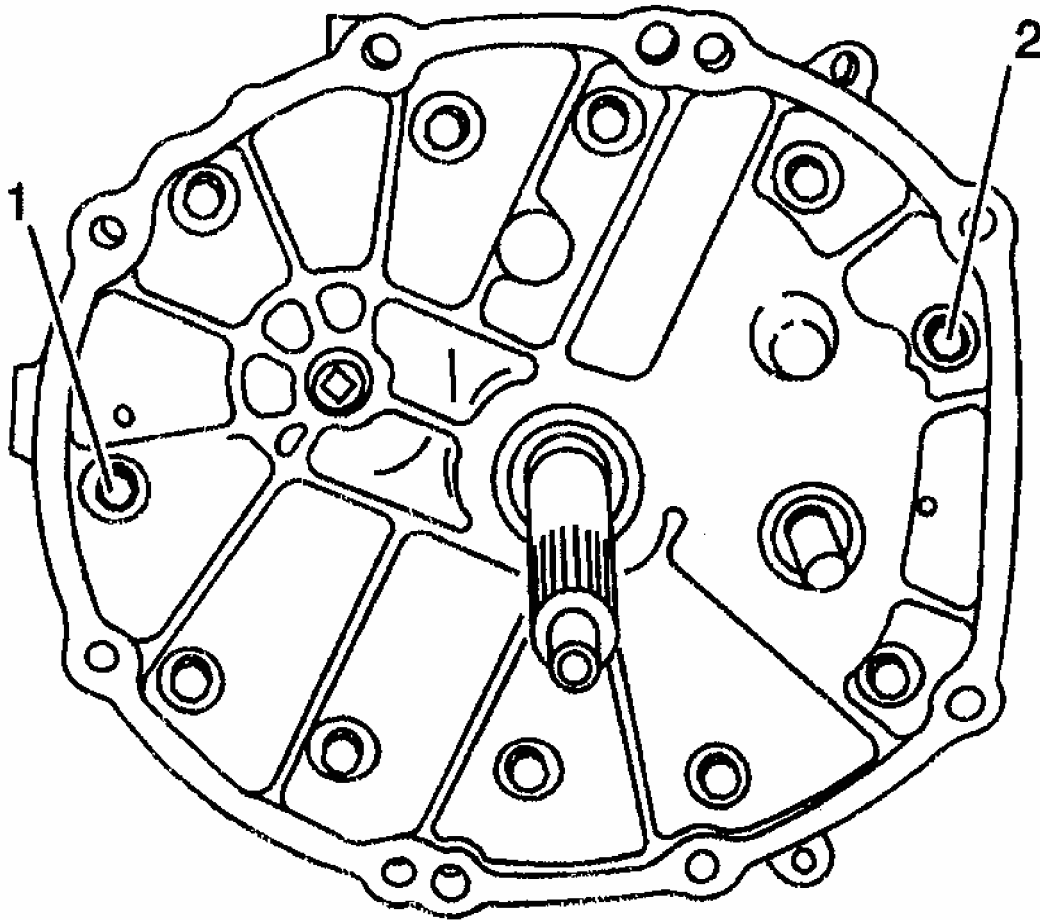
TRANSMISSION DISASSEMBLE

Extension Housing Removal

Tools Required

- J 3289-20 Holding Fixture. See **Special Tools and Equipment** .
- J 44395 Transmission Holding Fixture. See **Special Tools and Equipment** .

1. Remove the adapter plate bolts (1) and (2).



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Fig. 11: Removing Adapter Plate Bolts
Courtesy of GENERAL MOTORS CORP.

2. Install the J 44395.

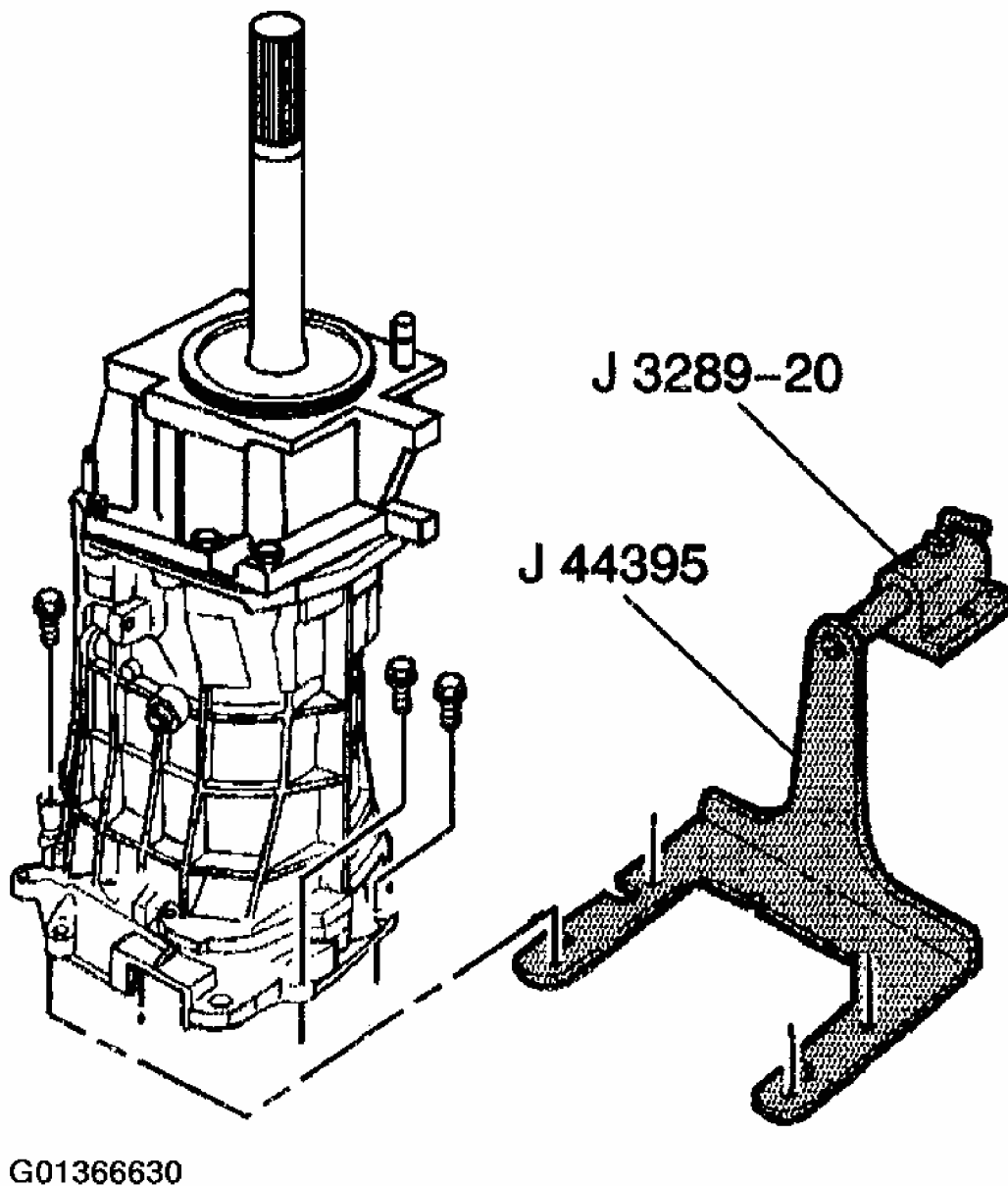
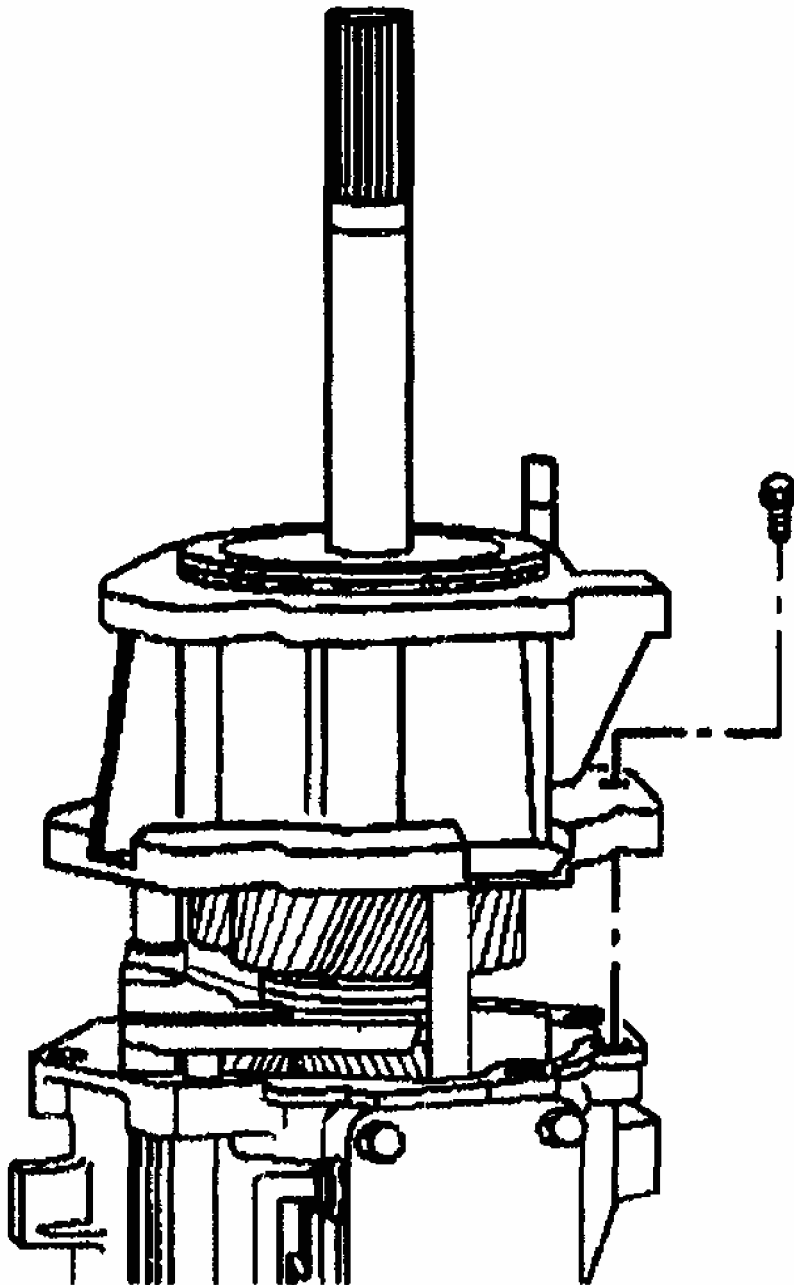


Fig. 12: Installing J 44395
Courtesy of GENERAL MOTORS CORP.

3. Mount the transmission on a workbench using the J 3289-20.
4. Rotate the transmission into a horizontal position.
5. Remove the transmission drain plug and drain the transmission fluid.
6. Shift the transmission into neutral (N).
7. Remove the rear extension housing bolts and the rear extension housing.

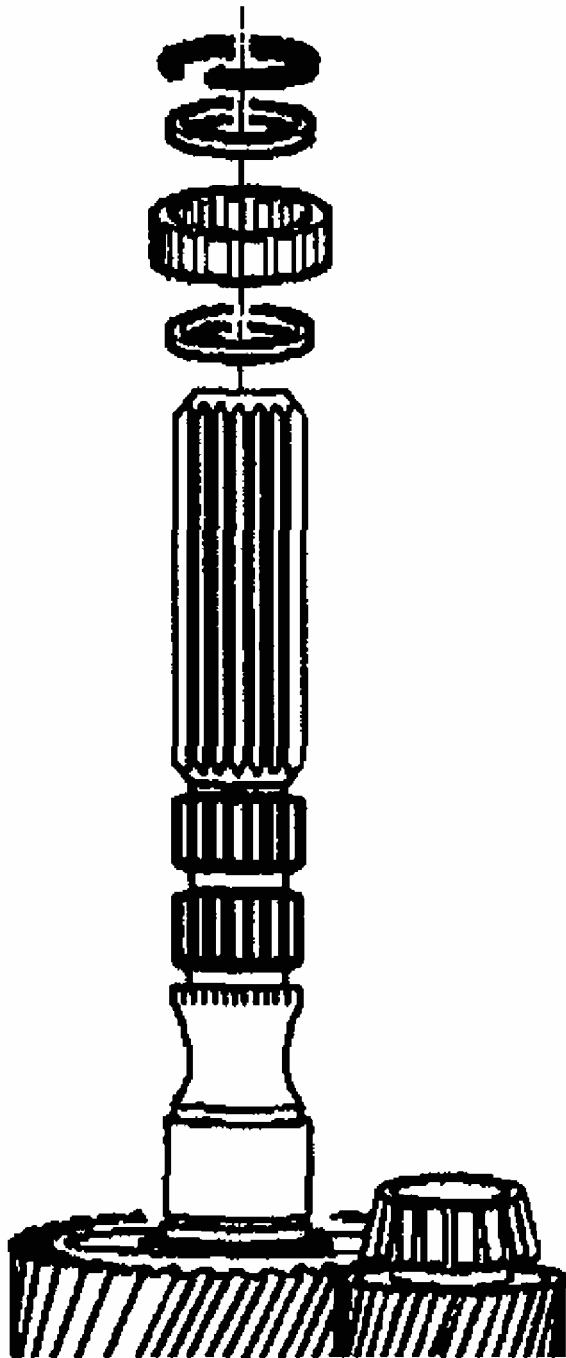


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Fig. 13: Removing Rear Extension Housing Bolts
Courtesy of GENERAL MOTORS CORP.

Reverse Speed Gear Removal

1. Remove the rear bearing retainer ring.

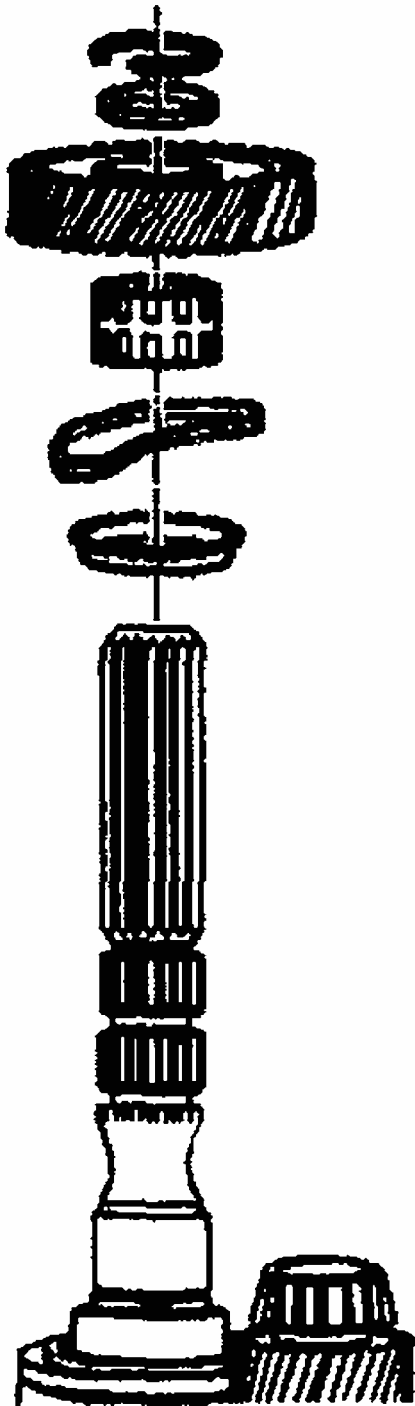


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Fig. 14: Removing Rear Bearing Retainer Ring, Spacer & Roller Bearing
Courtesy of GENERAL MOTORS CORP.

2. Remove the spacer.
3. Remove the mainshaft rear roller bearing.
4. Remove the spacer.

5. Remove the retainer ring.



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Fig. 15: Removing Reverse Gear & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

6. Remove the reverse gear thrust washer.

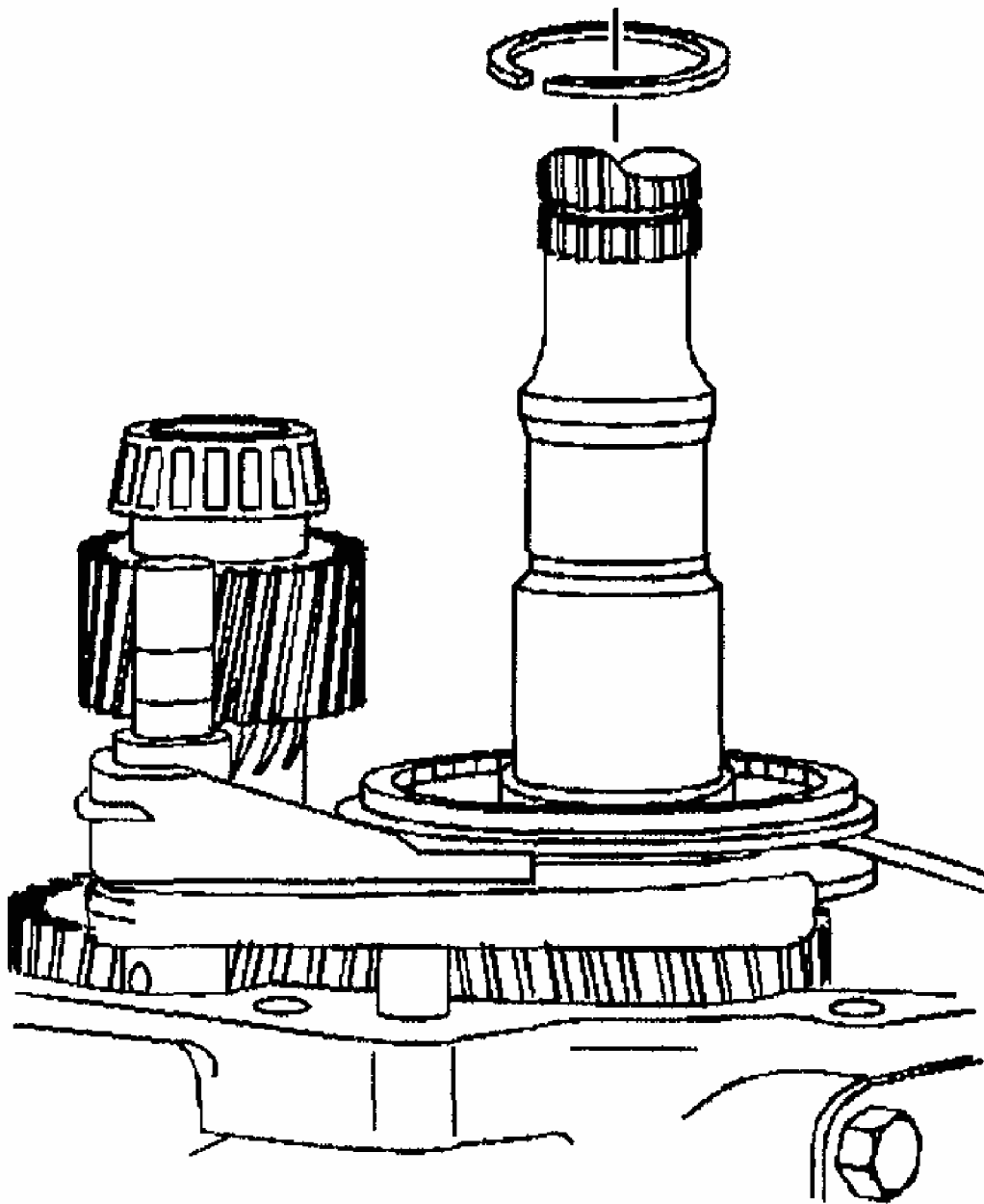
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7. Remove the reverse gear.
8. Remove the reverse gear caged needle bearing.
9. Remove the wave washer.
10. Remove the reverse gear synchronizer blocking ring.

Reverse Shift Fork Removal

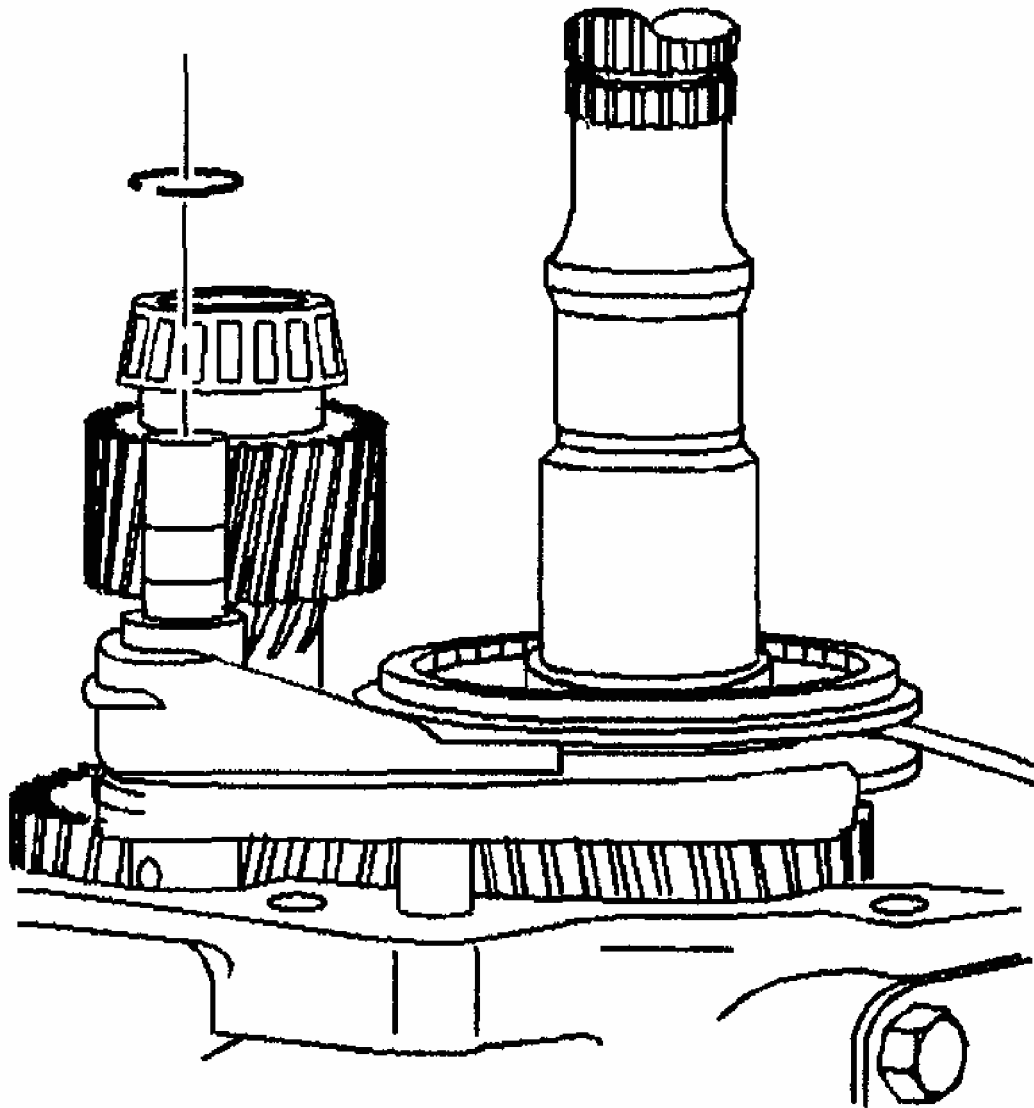
1. Remove the reverse synchronizer retainer ring.



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Fig. 16: Removing Reverse Synchronizer Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Remove and discard the reverse shift fork retainer ring.



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Fig. 17: Removing & Discard Reverse Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

3. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

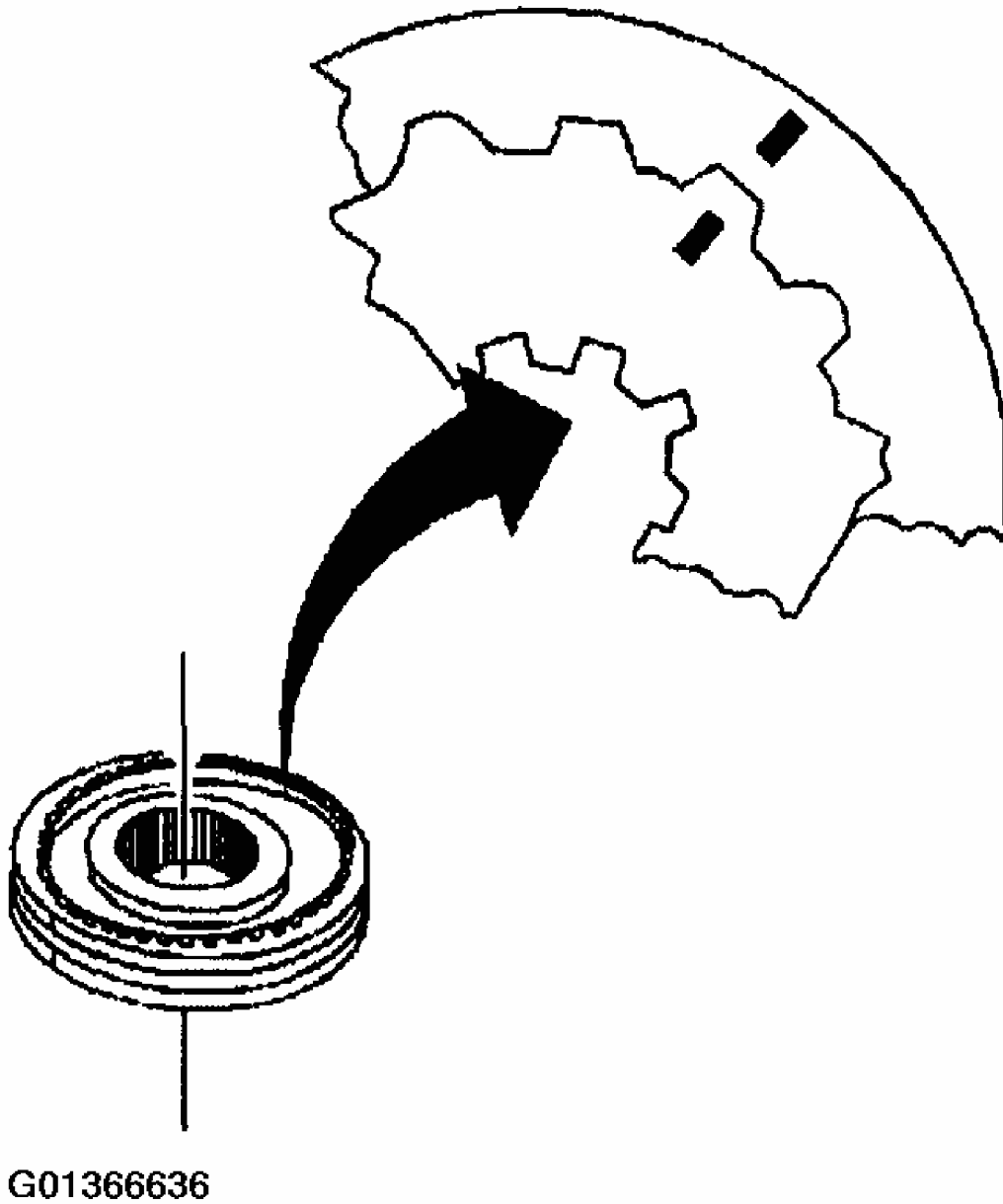
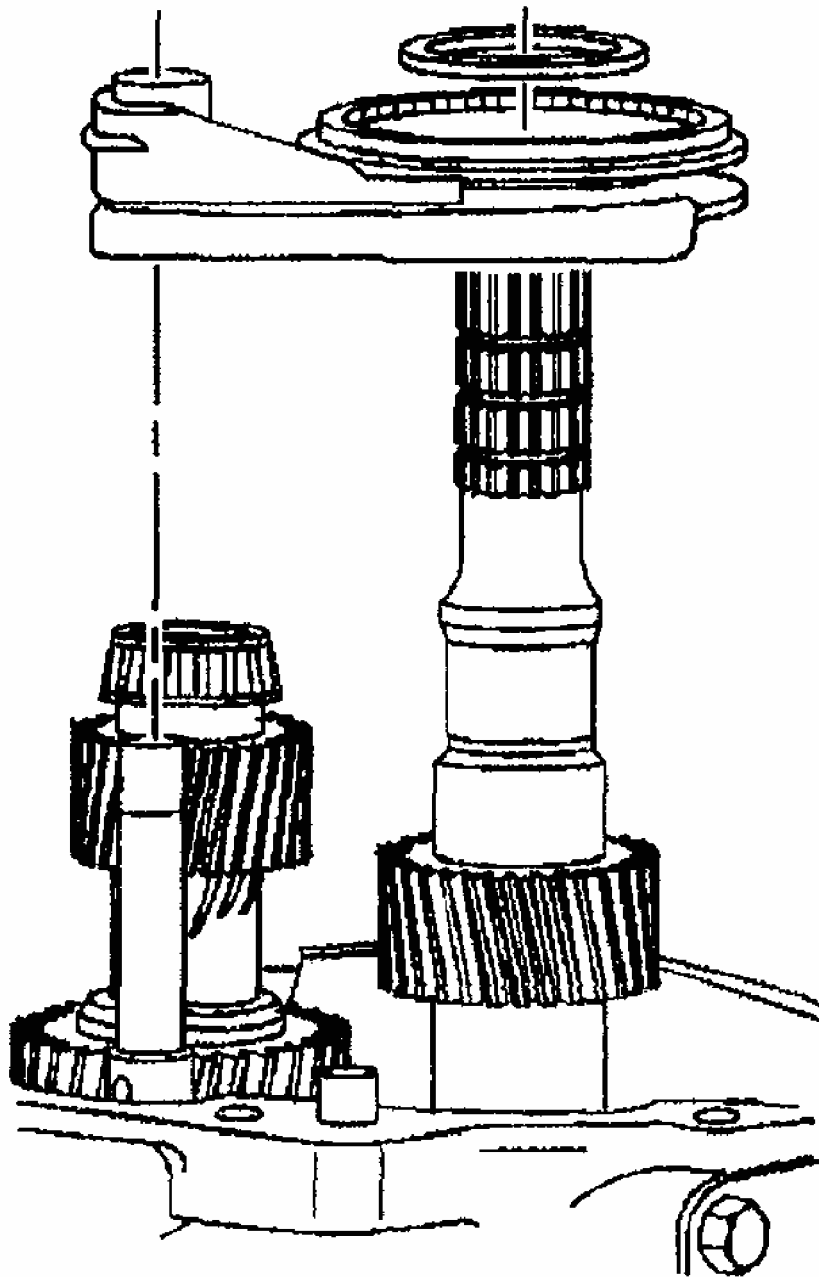


Fig. 18: Identifying Mark On Synchronizer Hub & Sleeve
Courtesy of GENERAL MOTORS CORP.

4. Remove the following parts in order:



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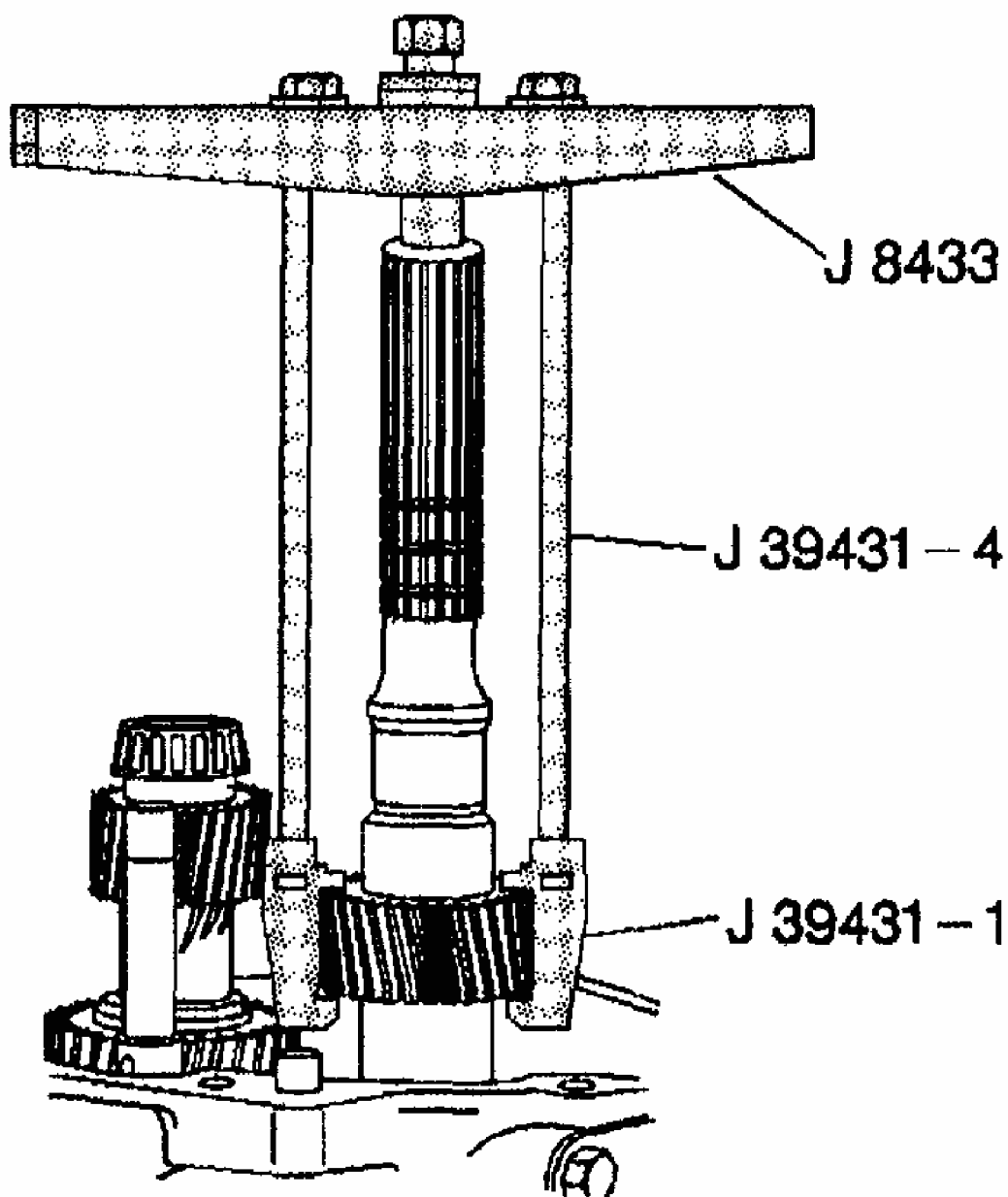
Fig. 19: Removing Reverse Synchronizer Assembly & Shift Fork
Courtesy of GENERAL MOTORS CORP.

1. The thrust washer
2. The reverse synchronizer assembly and the shift fork

Tools Required

- J 8433 Universal Bridge Puller. See Special Tools and Equipment .
- J 39431-1 Gear Remover and Bolts. See Special Tools and Equipment .

Remove the 5th/6th speed driven gear. Use the J 8433, the J 39431-1 and the J 39431-4.



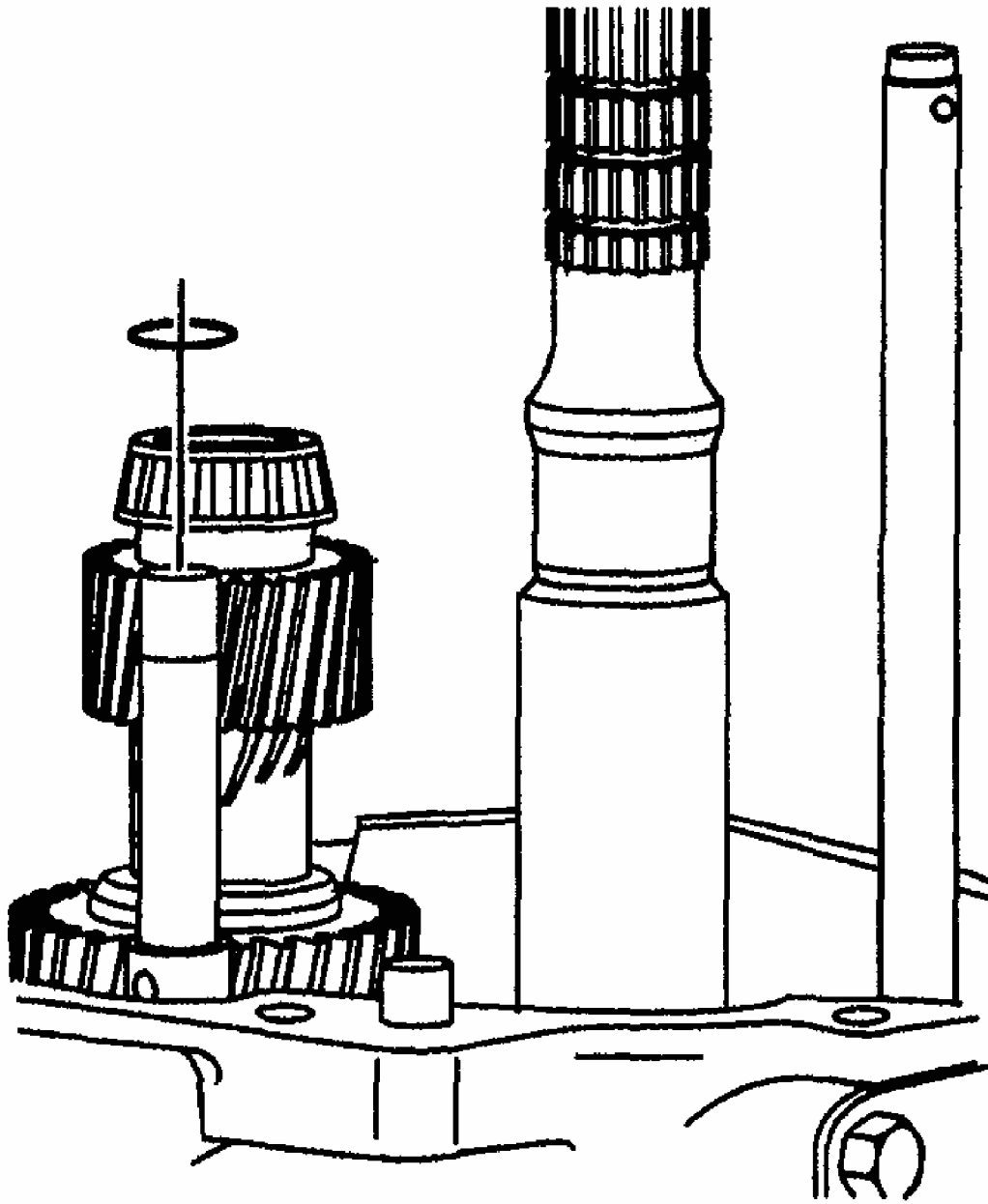
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Fig. 20: Removing 5th/6th Speed Driven Gear

Courtesy of GENERAL MOTORS CORP.

Countershaft Extension Removal

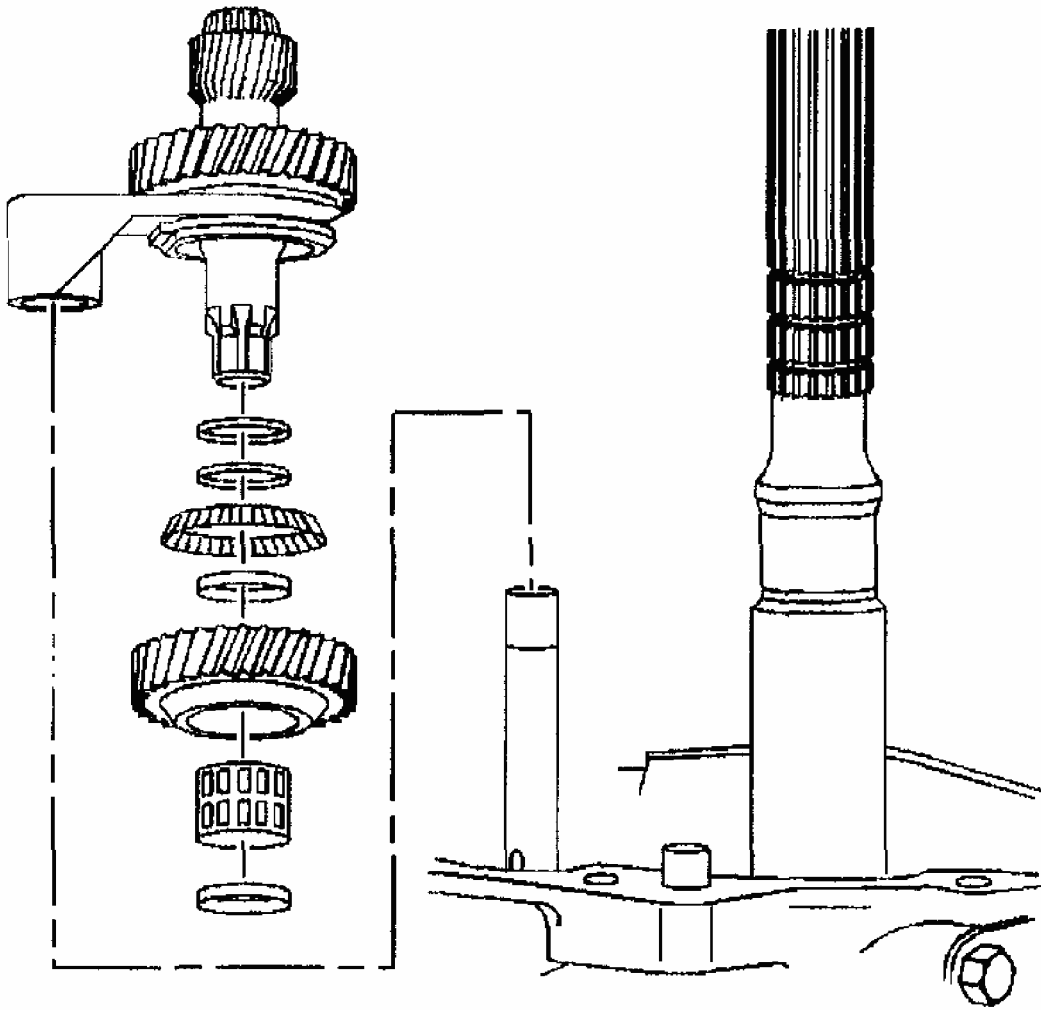
1. Remove the 5th/6th speed shift fork retainer ring.



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Fig. 21: Removing 5th/6th Speed Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Rotate the transmission in the horizontal position with the guide plate up.



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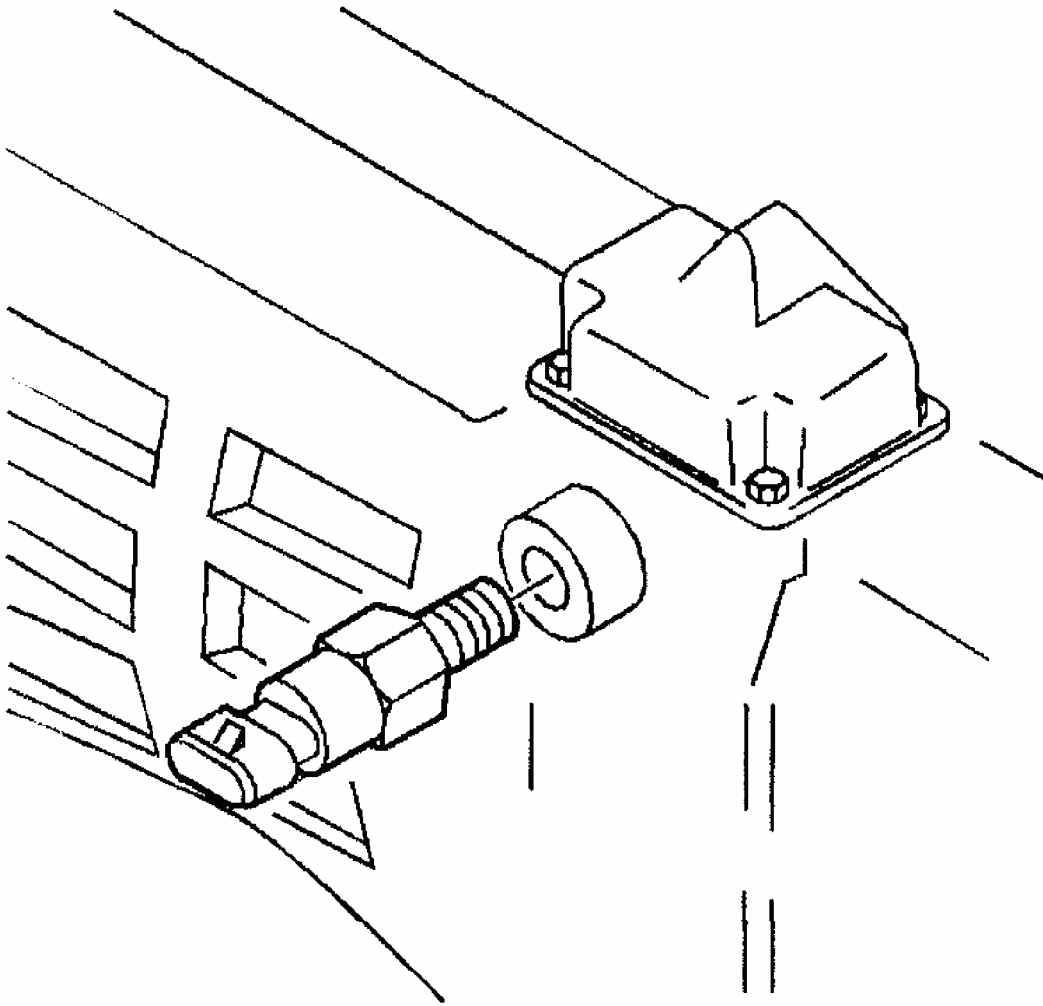
Fig. 22: Removing Countershaft Extension Assembly With 5th/6th Speed Shift Fork

Courtesy of GENERAL MOTORS CORP.

3. Remove the countershaft extension assembly with the 5th/6th speed shift fork, 6th speed gear bearing spacer, 6th speed drive gear, and caged needle bearing. The 6th speed gear bearing spacer will slide out during removal of the countershaft extension assembly.

Transmission Case Removal

Tools Required

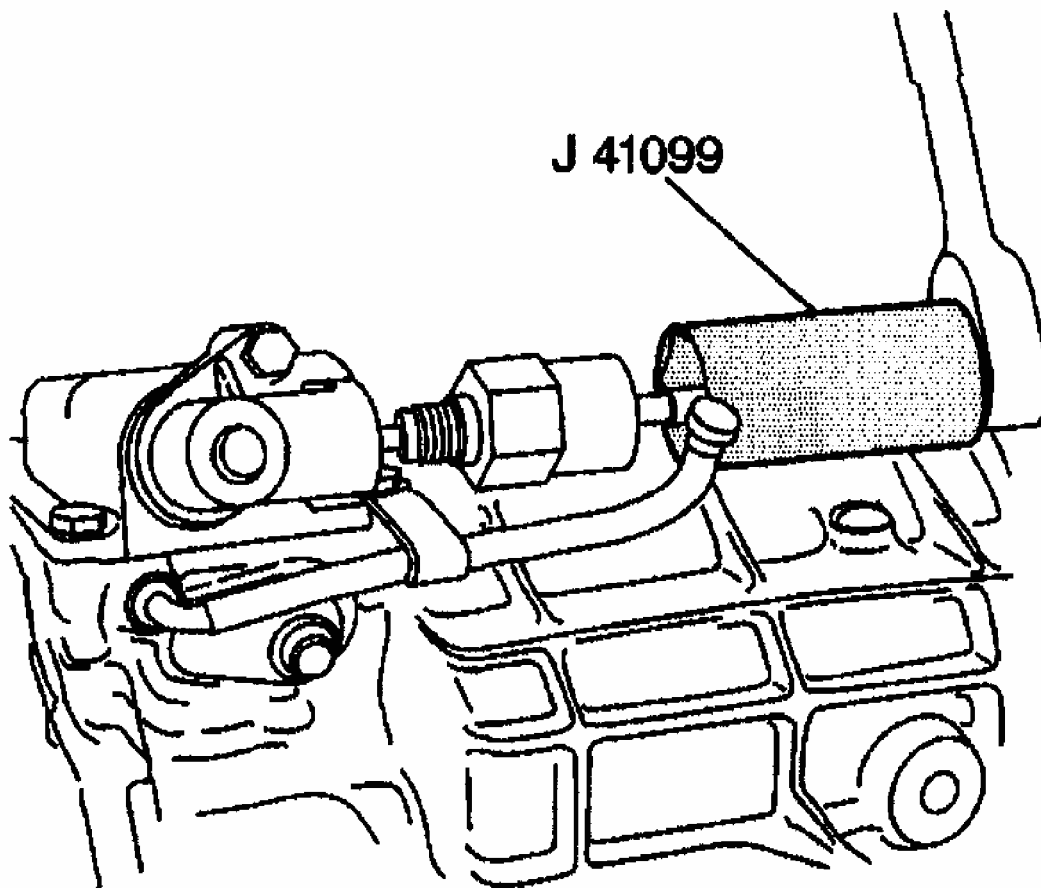


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Fig. 23: Removing Computer Aided Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

J 41099 Skip Shift Sensor Remover/Installer Installer. See **Special Tools and Equipment** .

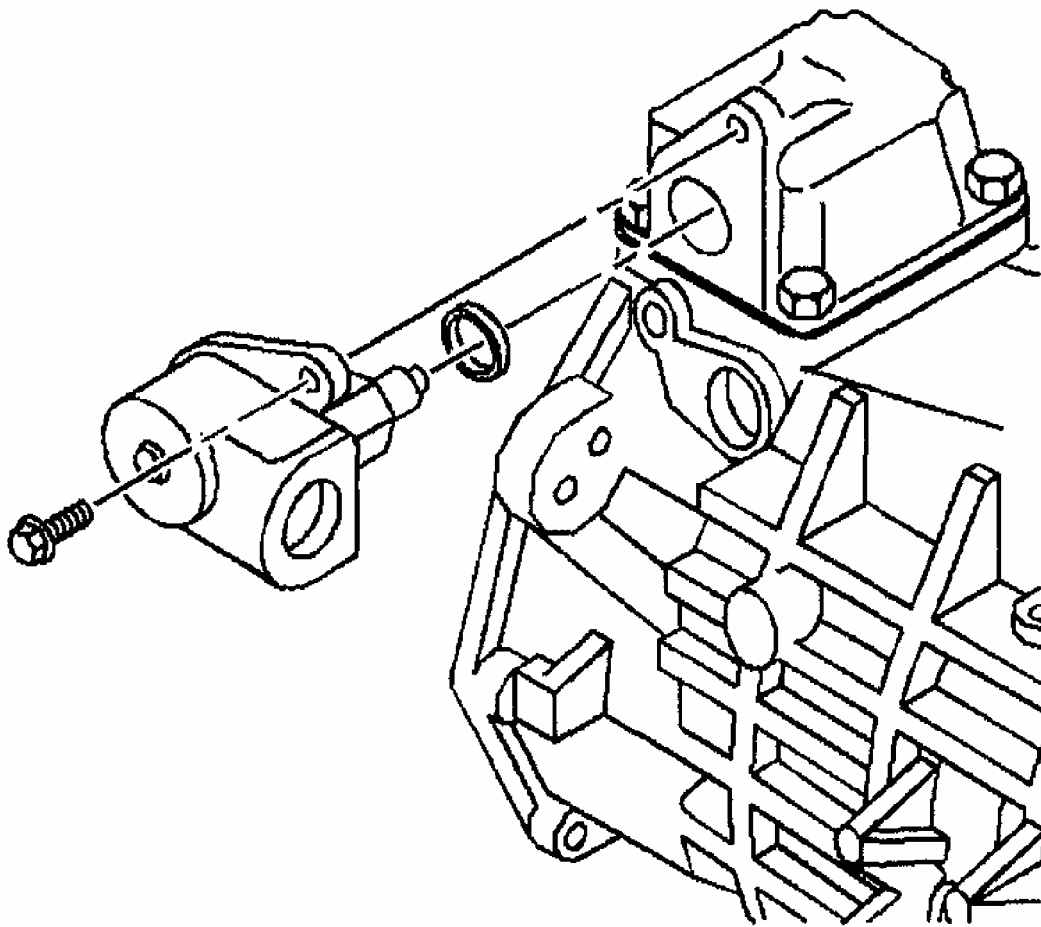
1. Remove the computer aided gear select solenoid.
2. Remove the reverse lockout solenoid from the reverse lockout body. Use the J 41099.



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Fig. 24: Removing Reverse Lockout Solenoid From Reverse Lockout Body
Courtesy of GENERAL MOTORS CORP.

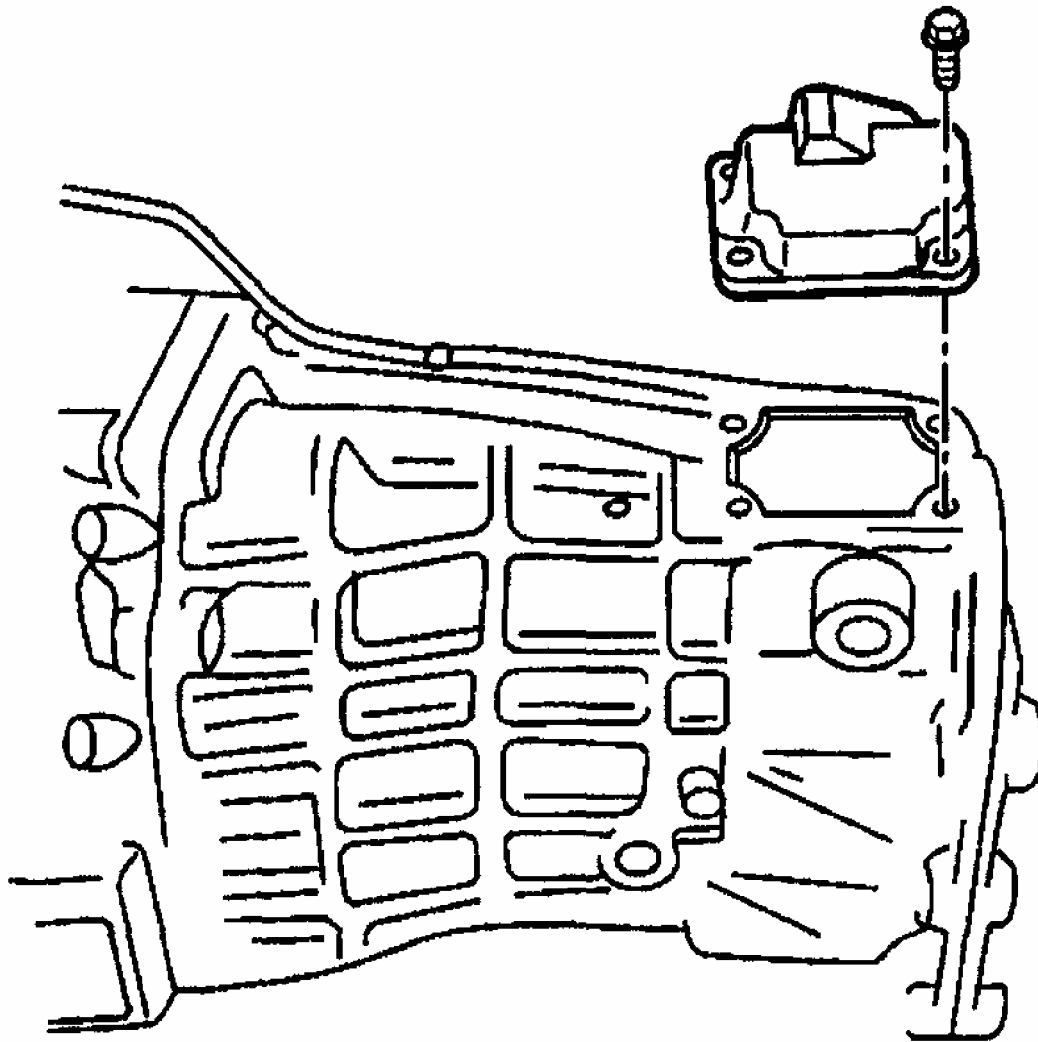
3. Remove the reverse lockout assembly bolt and the reverse lockout body.



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Fig. 25: Removing Reverse Lockout Assembly Bolt
Courtesy of GENERAL MOTORS CORP.

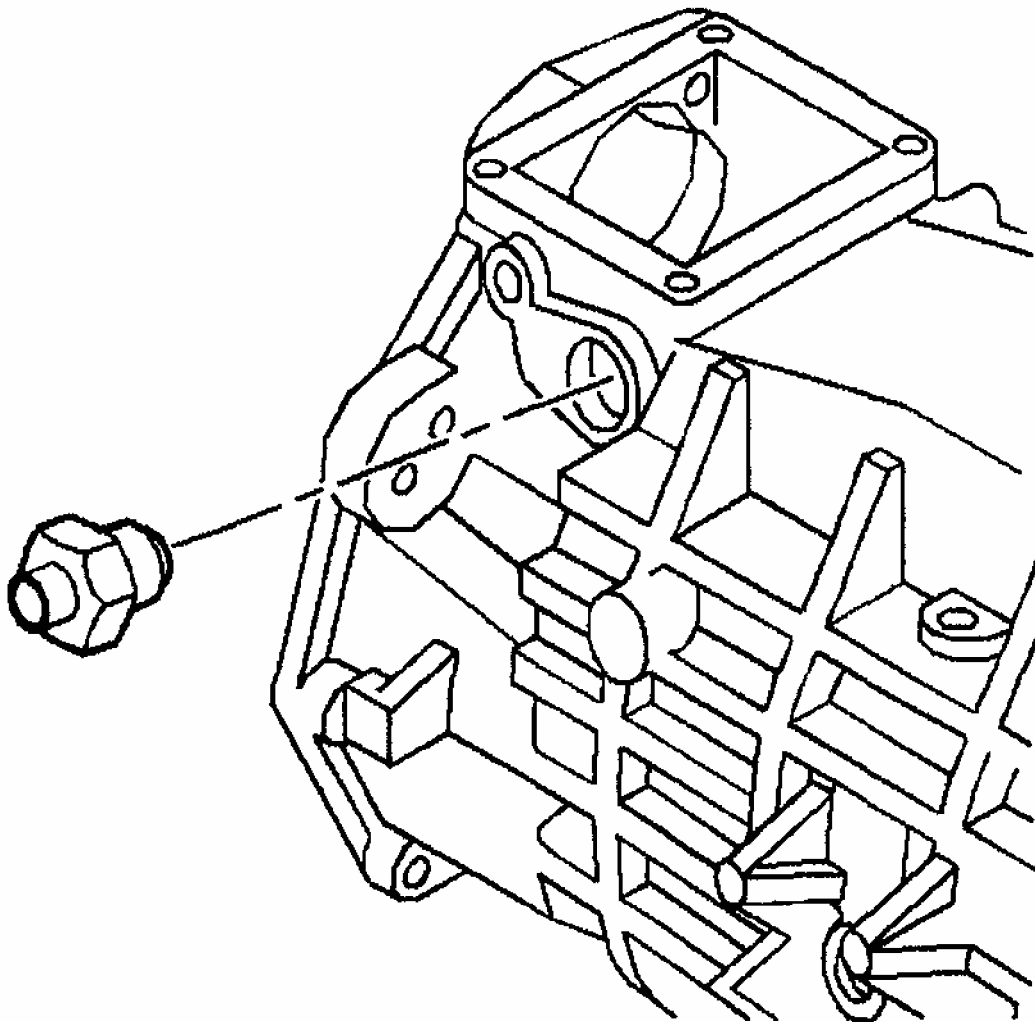
4. Remove the shifter cover plate retainer bolts.



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Fig. 26: Removing Shifter Cover Plate Retainer Bolts
Courtesy of GENERAL MOTORS CORP.

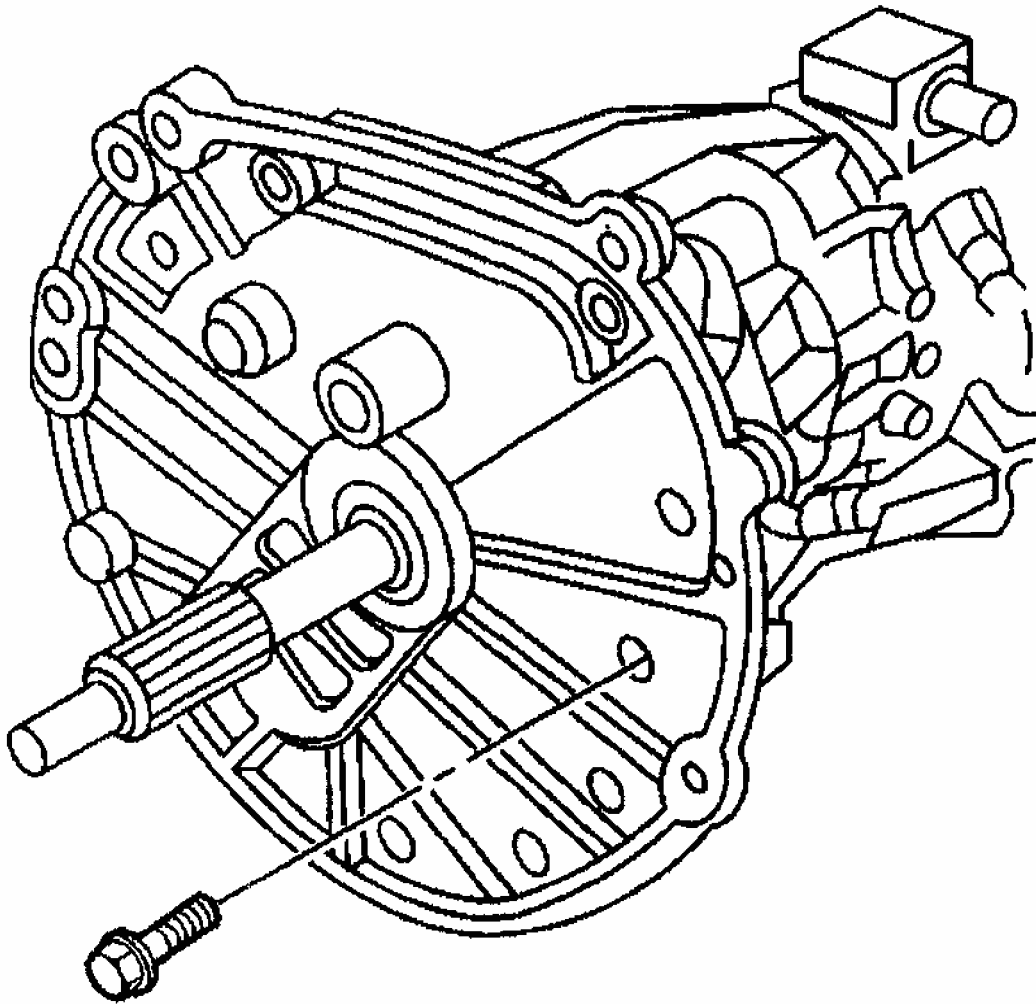
5. Remove the shifter cover plate.
6. Remove the shift detent assembly.



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Fig. 27: Removing Shift Detent Assembly
Courtesy of GENERAL MOTORS CORP.

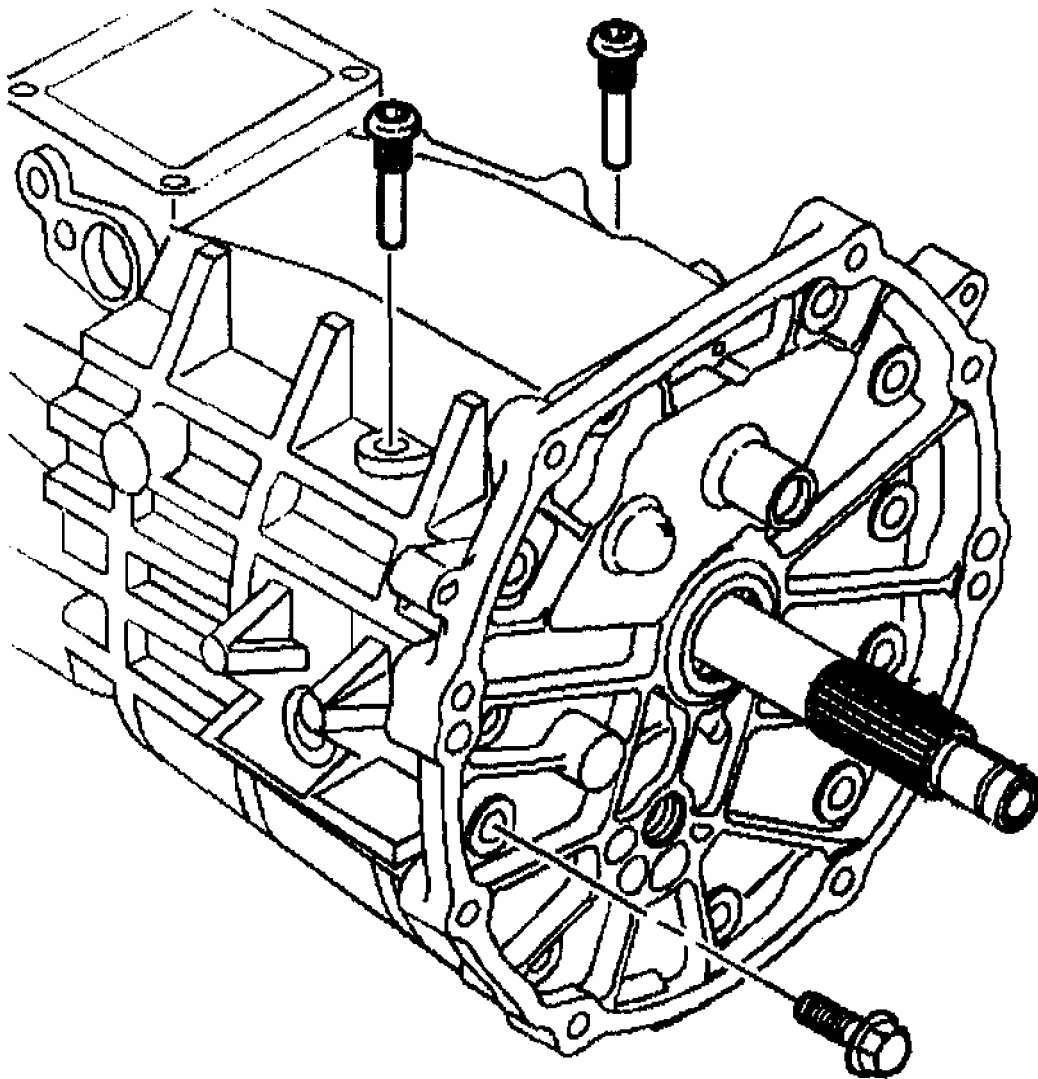
7. Remove 9 of the 11 adapter plate to transmission case bolts.



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Fig. 28: Removing Adapter Plate To Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

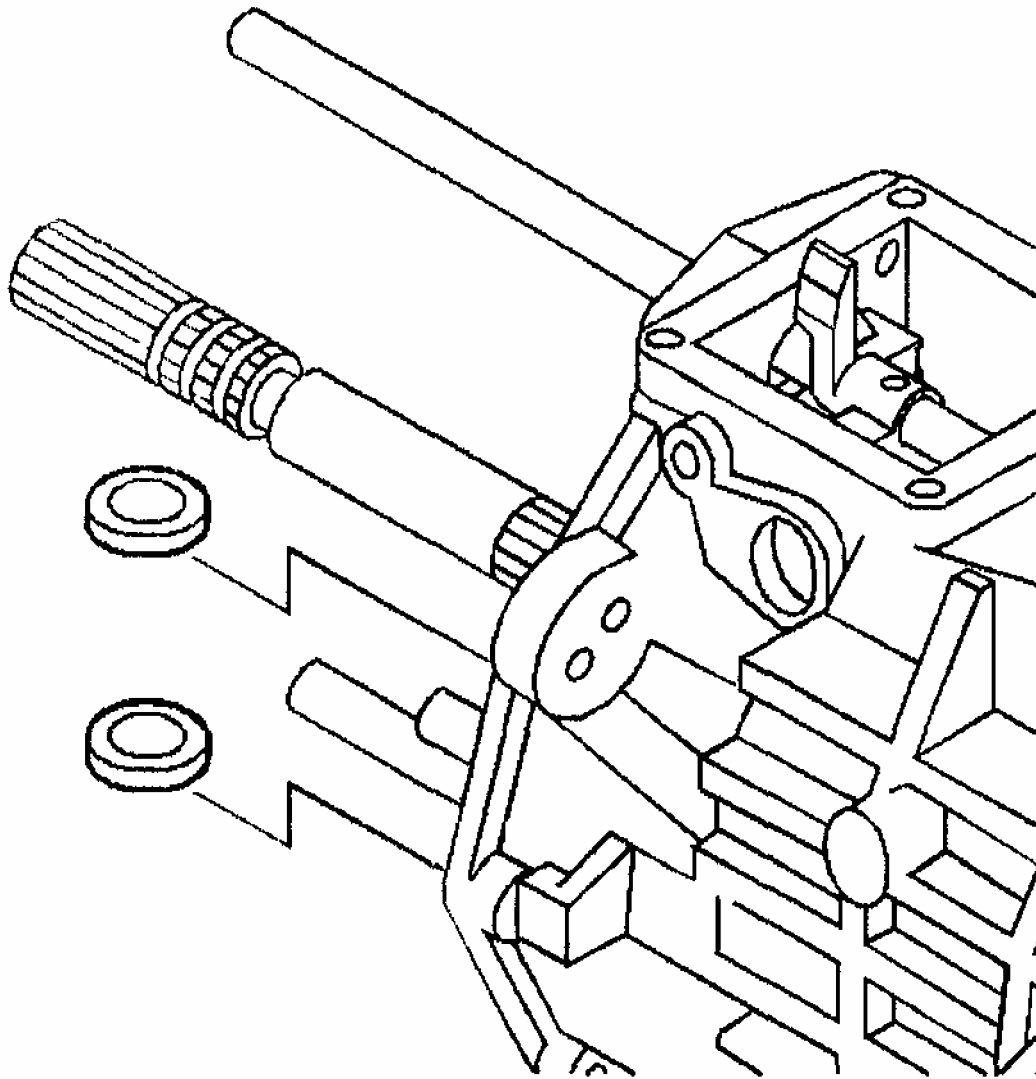
8. Rotate the transmission into the vertical position.
9. Remove the last 2 adapter plate to transmission case bolts.



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Fig. 29: Removing Remaining Adapter Plate To Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

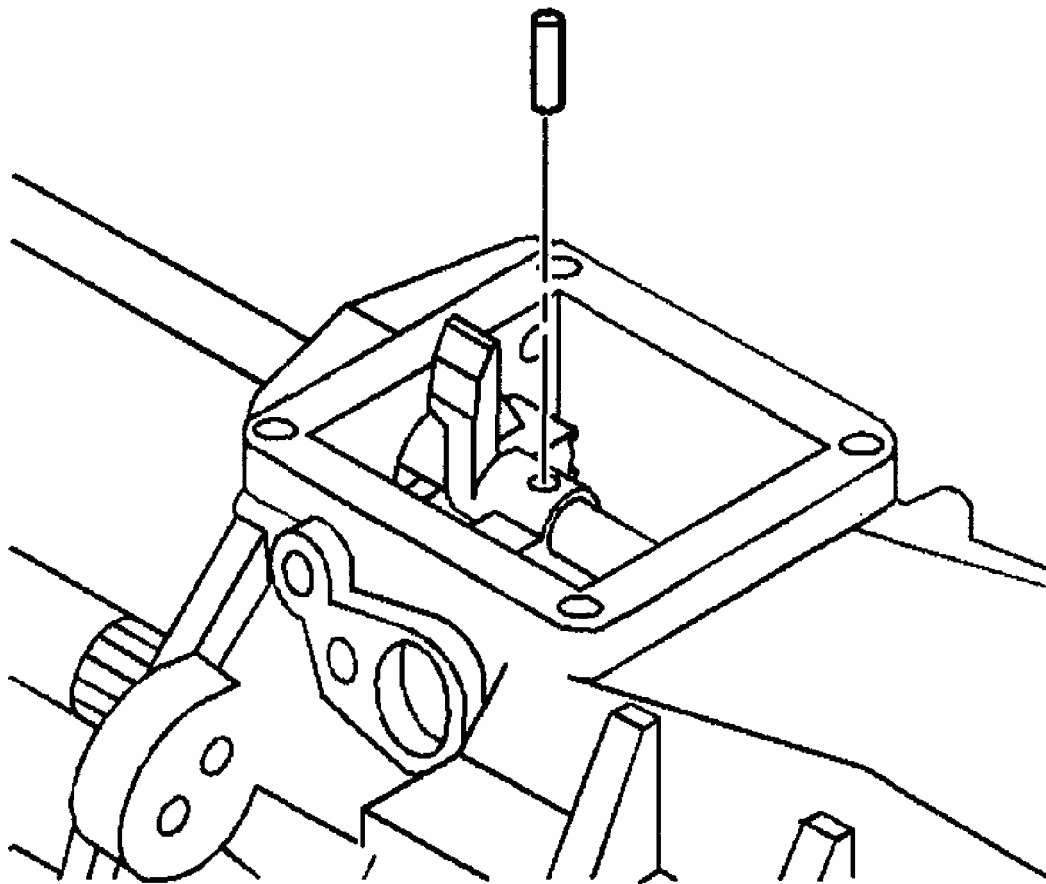
10. Remove the shift lever guide bolts.
11. Remove the magnets from the transmission case.



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Fig. 30: Removing Magnets From Transmission Case
Courtesy of GENERAL MOTORS CORP.

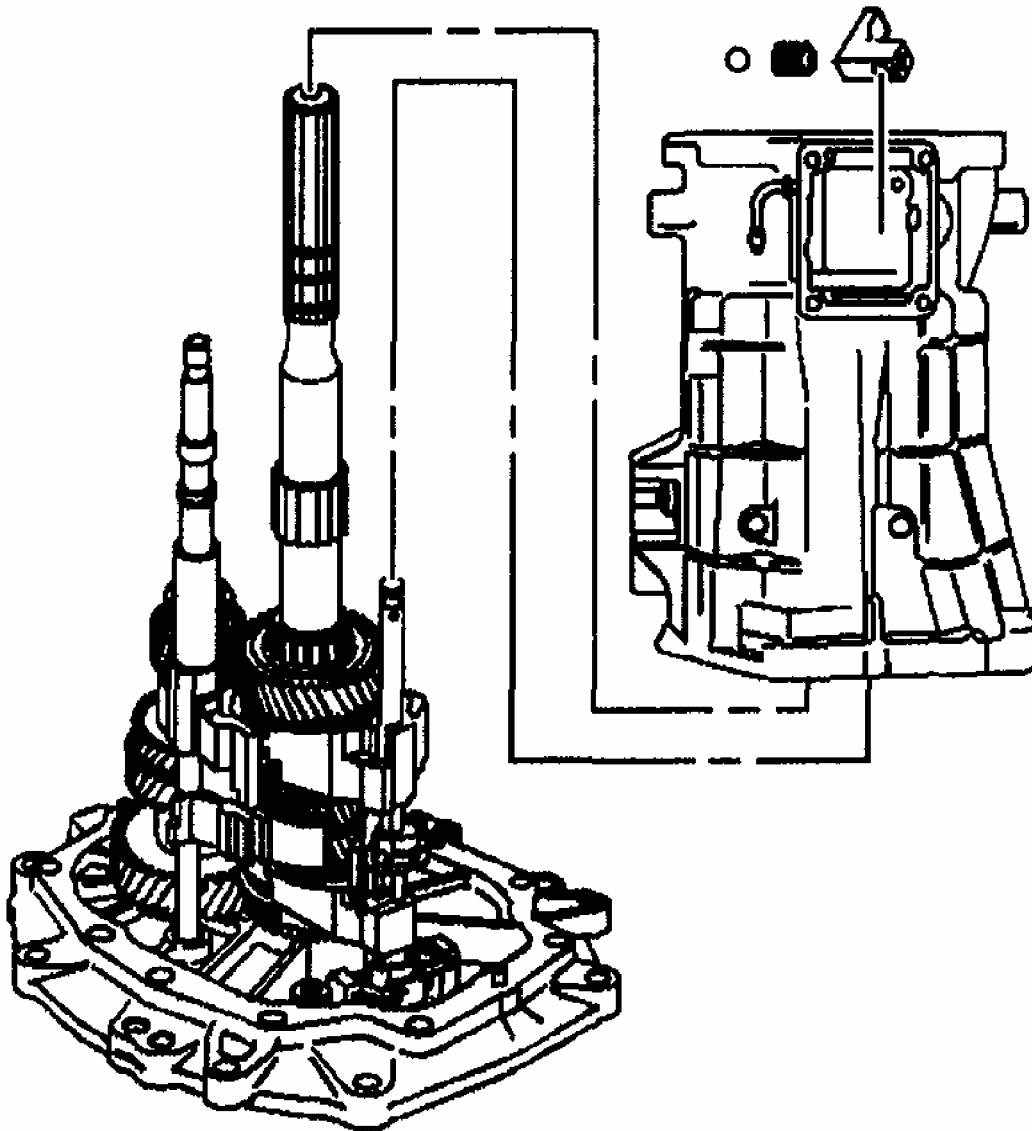
12. Remove the offset lever roll pin.



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Fig. 31: Removing Offset Lever Roll Pin
Courtesy of GENERAL MOTORS CORP.

13. Remove the transmission case and the offset lever together as follows:
 1. Slide the transmission case up and off of the gear clusters and the shift shaft components.
 2. Hold the offset lever against the guide plate in order to prevent the release of the detent ball and the spring.
 3. Remove the offset lever from the transmission case.

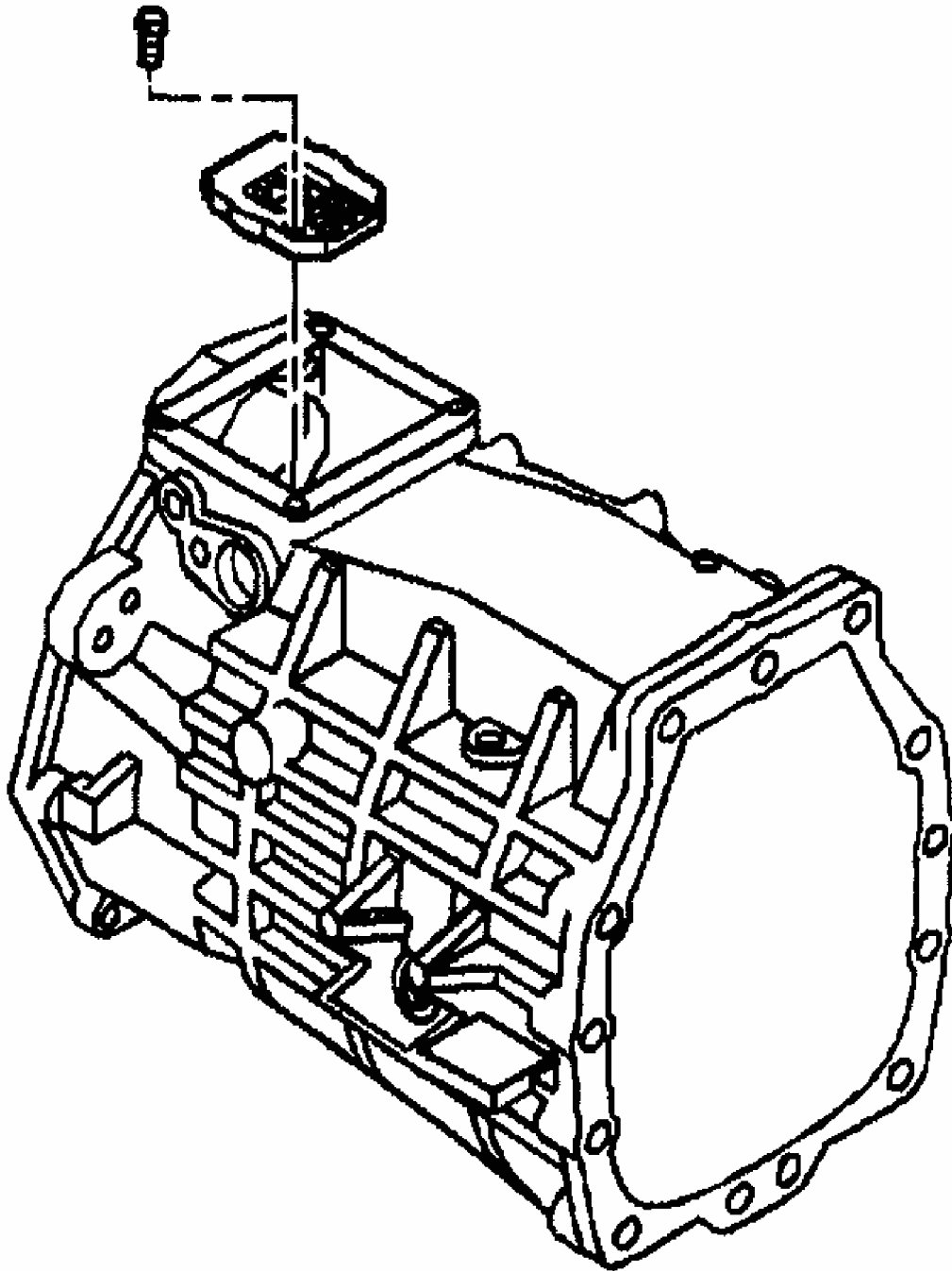


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Fig. 32: Removing Transmission Case & Offset Lever
Courtesy of GENERAL MOTORS CORP.

Guide Plate Removal

1. Remove the detent guide plate attaching bolts.



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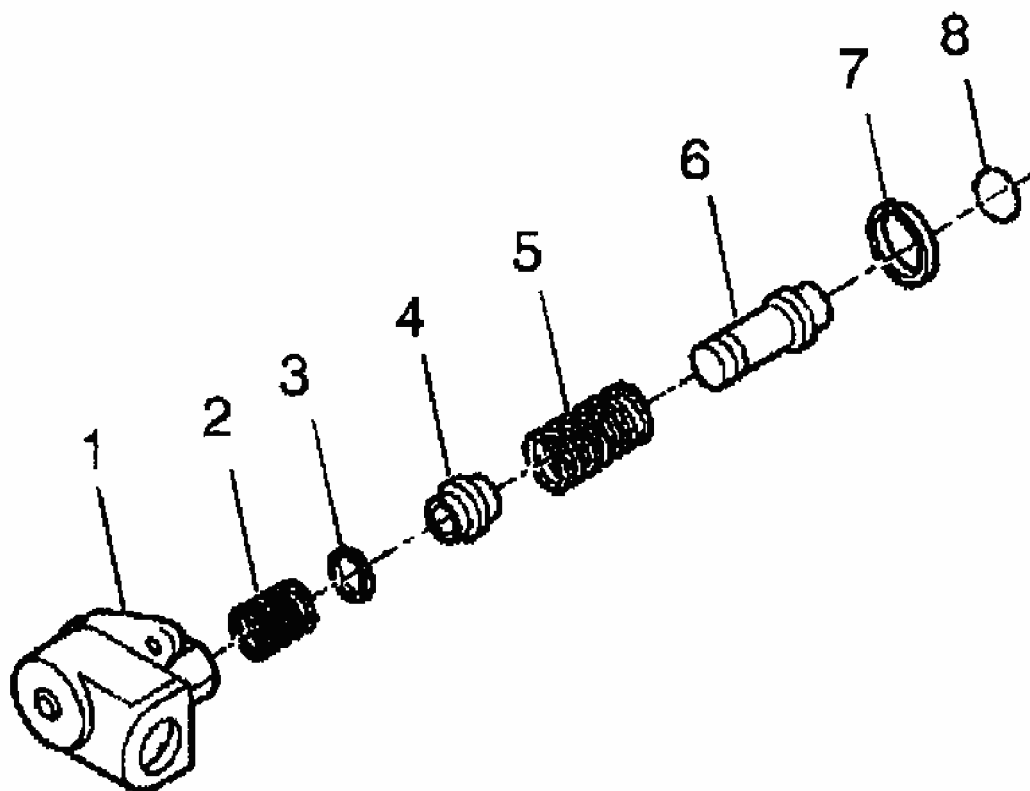
Fig. 33: Removing Detent Guide Plate Attaching Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the detent guide plate.

Reverse Lockout Assembly Disassemble

CAUTION: The reverse lockout assembly is under spring pressure. Exercise caution when removing the retainer ring, as bodily injury may result.

1. Remove the O-ring (8) from the body (1).



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Fig. 34: Removing O-Ring, Retainer Ring, Plunger & Outer Spring From Body
Courtesy of GENERAL MOTORS CORP.

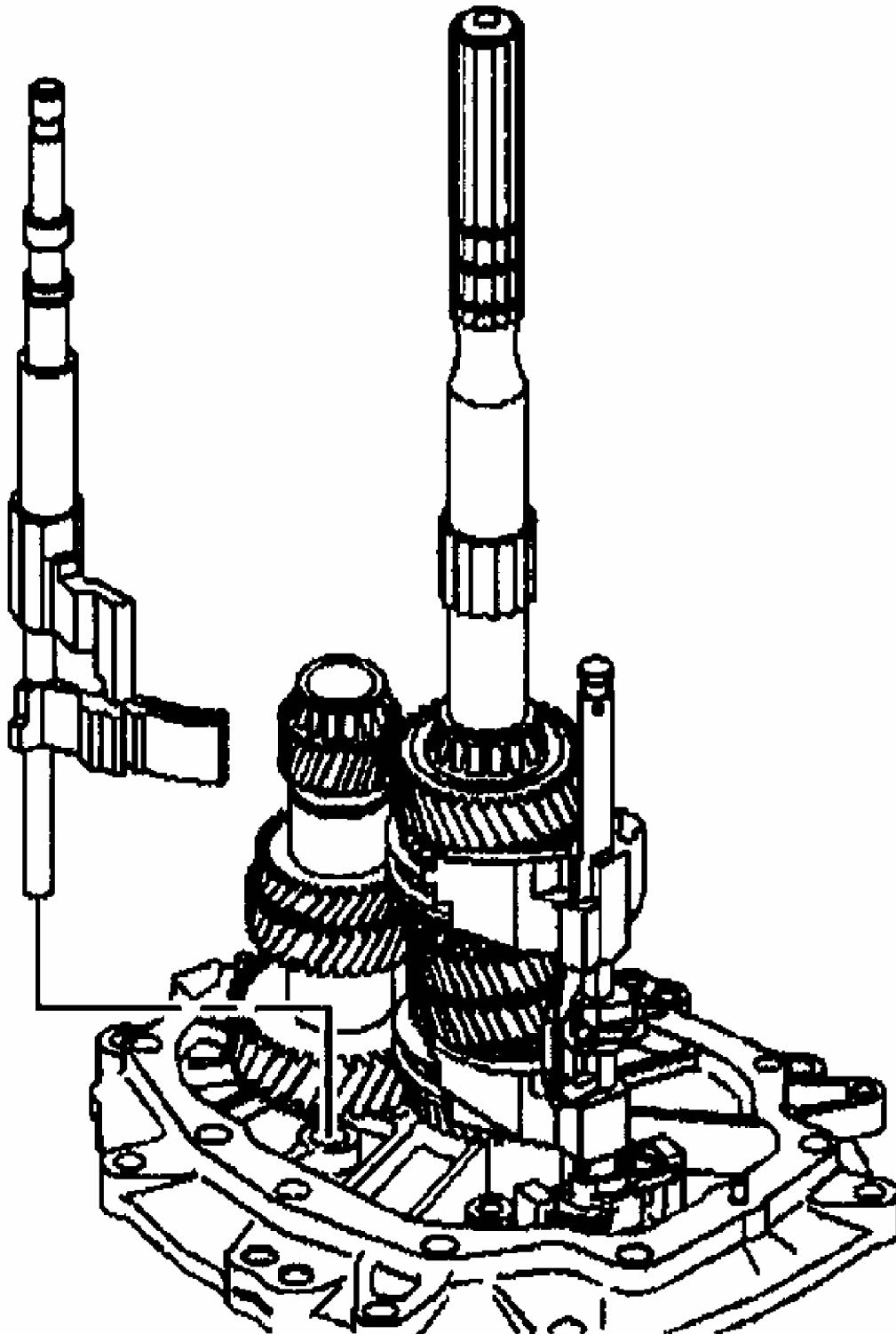
2. Remove the retainer ring (7) from the body (1).
3. Remove the reverse lockout inner spring (2).
4. Compress the reverse lockout plunger (6) and the collar (4) in a vise and remove the retainer ring (3).
5. Remove the reverse lockout plunger (6).
6. Remove the reverse lockout outer spring (5).
7. Remove the reverse lockout collar (4).

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

Shift Shaft Assemblies and Gear Cluster Removal

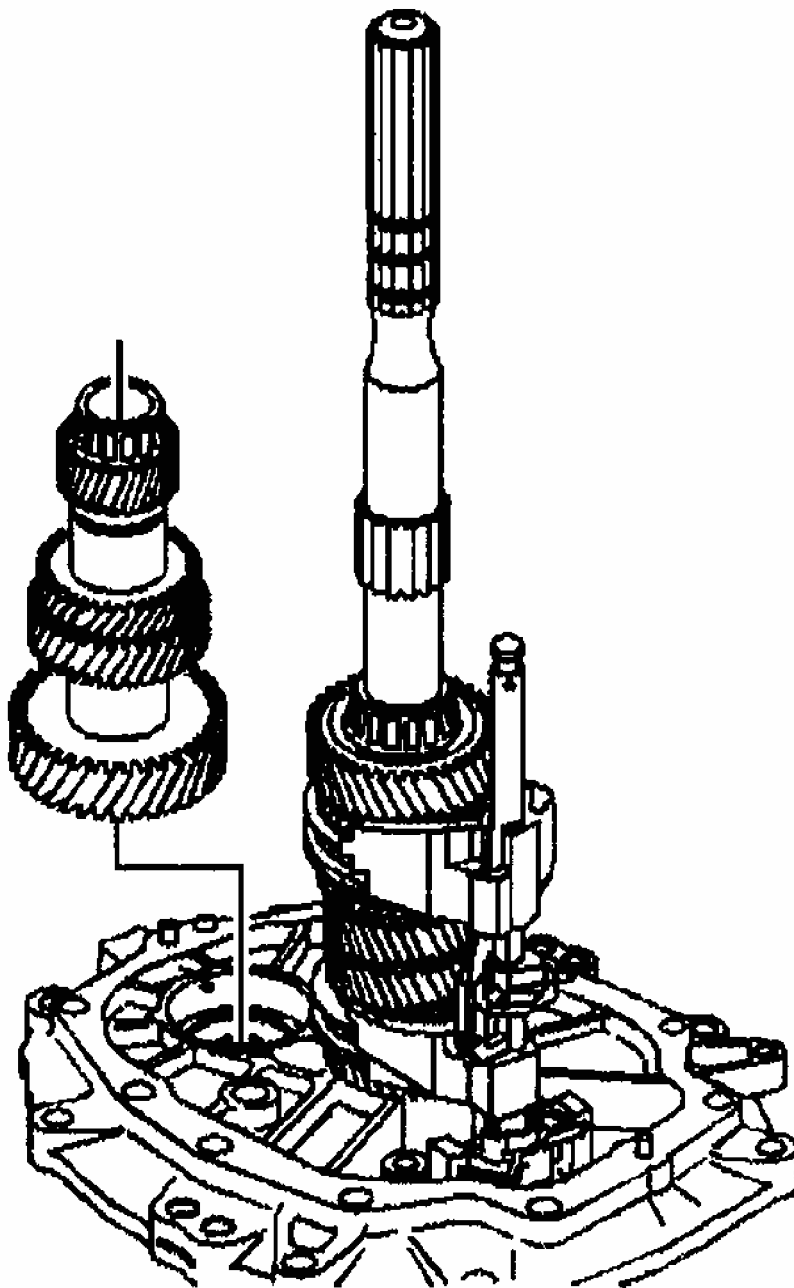
1. Rotate the 5th/6th and the reverse shift shaft levers off the shift interlock plate.



G01366653

Fig. 35: Removing 5th/6th & Reverse Shift Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

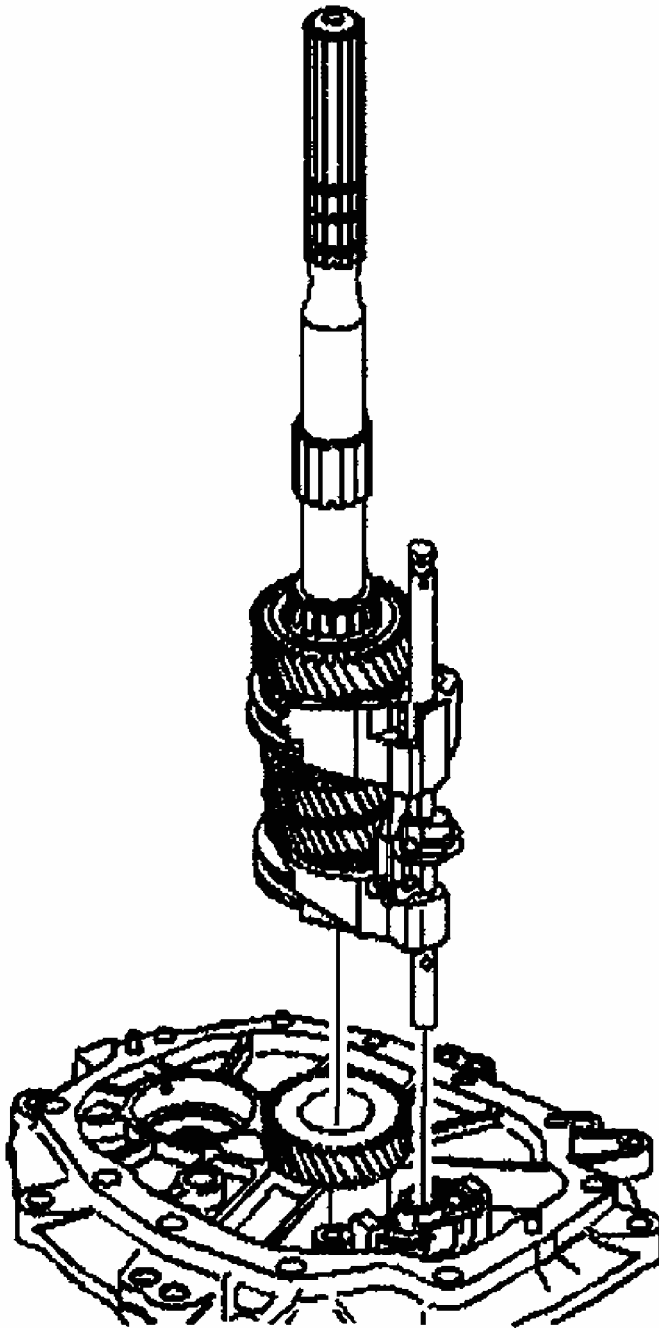
2. Remove the 5th/6th and the reverse shift shaft assembly.
3. Remove the countershaft. Lift up the mainshaft enough in order to remove the countershaft.



G01366654

Fig. 36: Removing Countershaft
Courtesy of GENERAL MOTORS CORP.

4. Remove the mainshaft and the shift shaft components as an assembly.

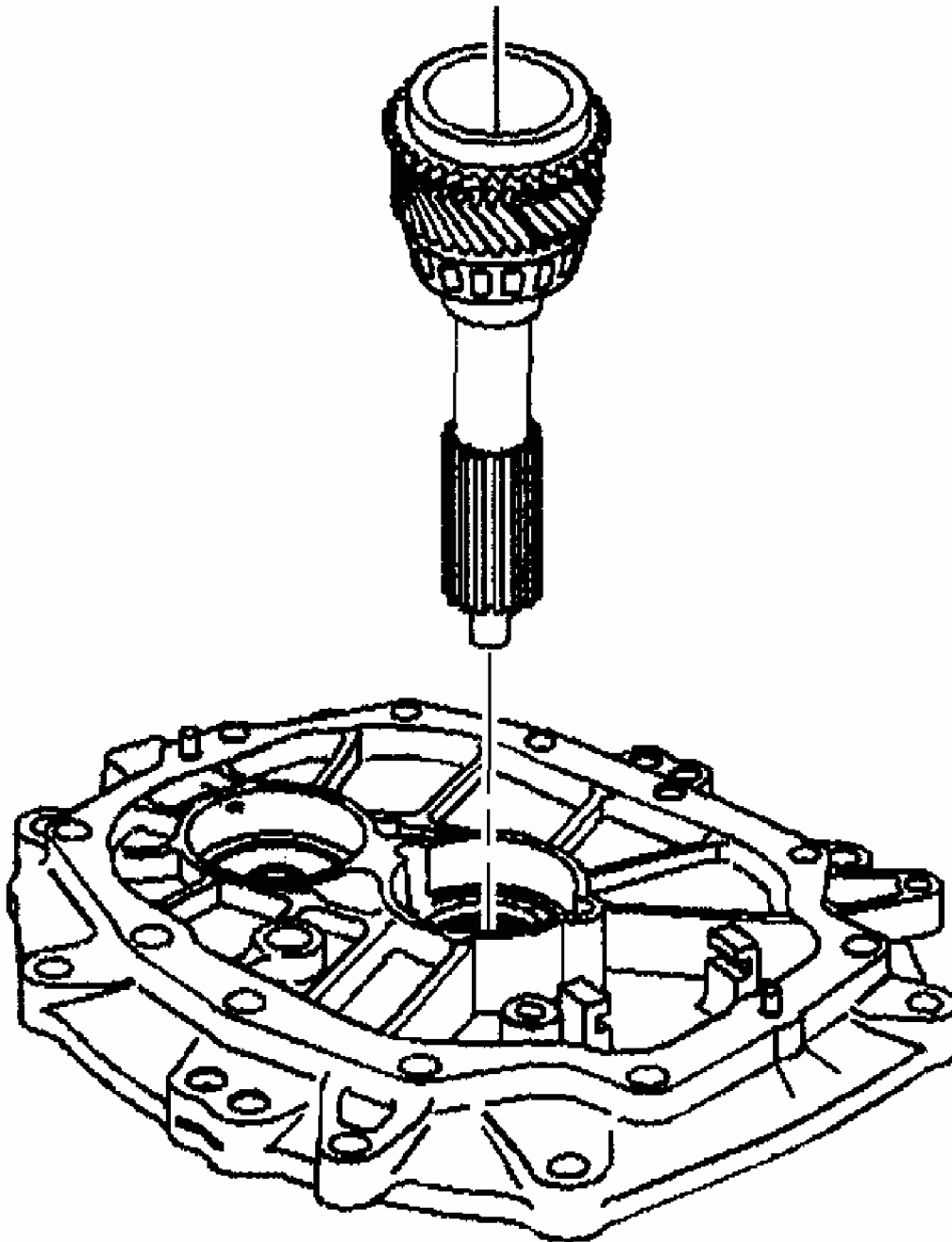


G01366655

Fig. 37: Removing Shift Shaft Assembly From Mainshaft
Courtesy of GENERAL MOTORS CORP.

Important: When removing the shift shaft be careful not to lose the dowel pin.

5. Remove the shift shaft assembly from the mainshaft.
6. Remove the input shaft.



G01366656

Fig. 38: Removing Input Shaft
Courtesy of GENERAL MOTORS CORP.

MAINSHAFT AND INPUT SHAFT DISASSEMBLE

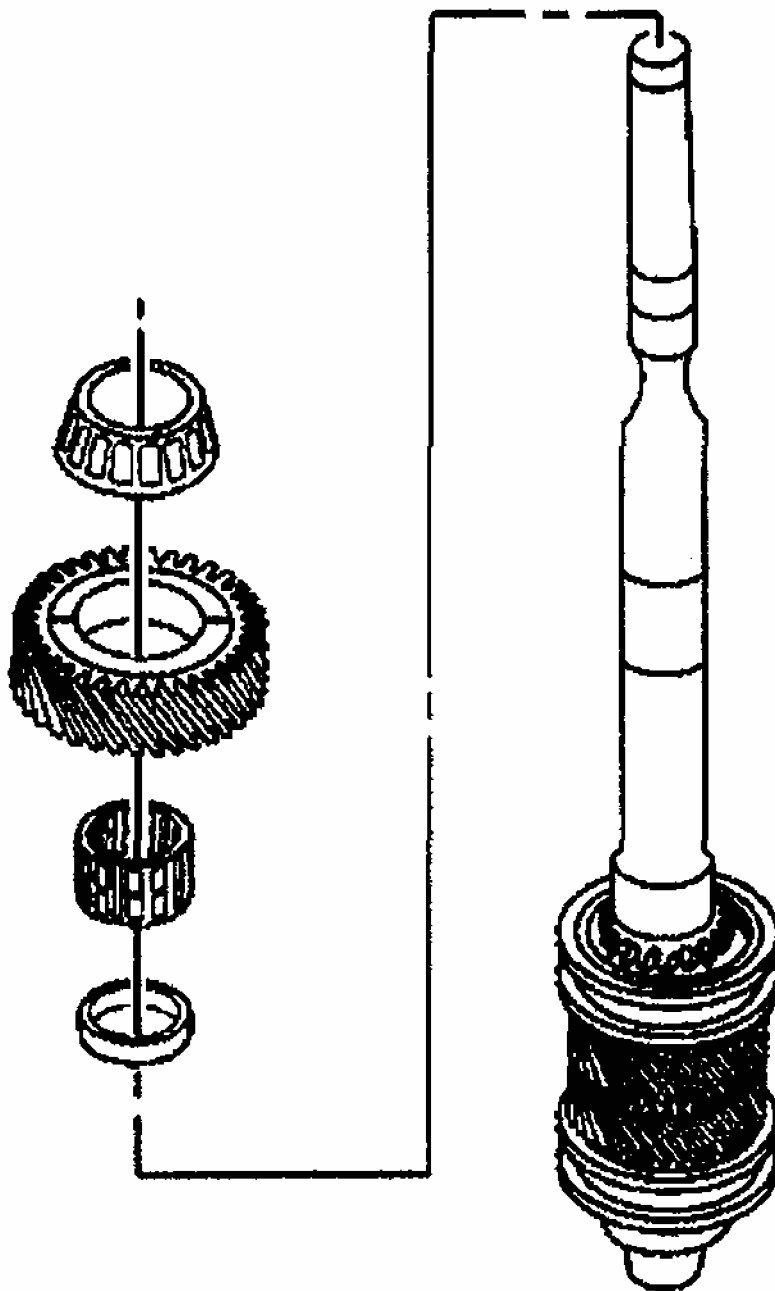
Mainshaft Disassembly

Tools Required

- J 36513 Split Plate. See **Special Tools and Equipment** .
- J 39442 Press Adapter. See **Special Tools and Equipment** .
- J 39443 Split Plate. See **Special Tools and Equipment** .
- J 39473 Mainshaft Bearing Installer. See **Special Tools and Equipment** .

Important: Measure the 4th speed gear synchronizer wear gap before disassembling the mainshaft.

1. Install the input shaft in the adapter plate.



G01366657

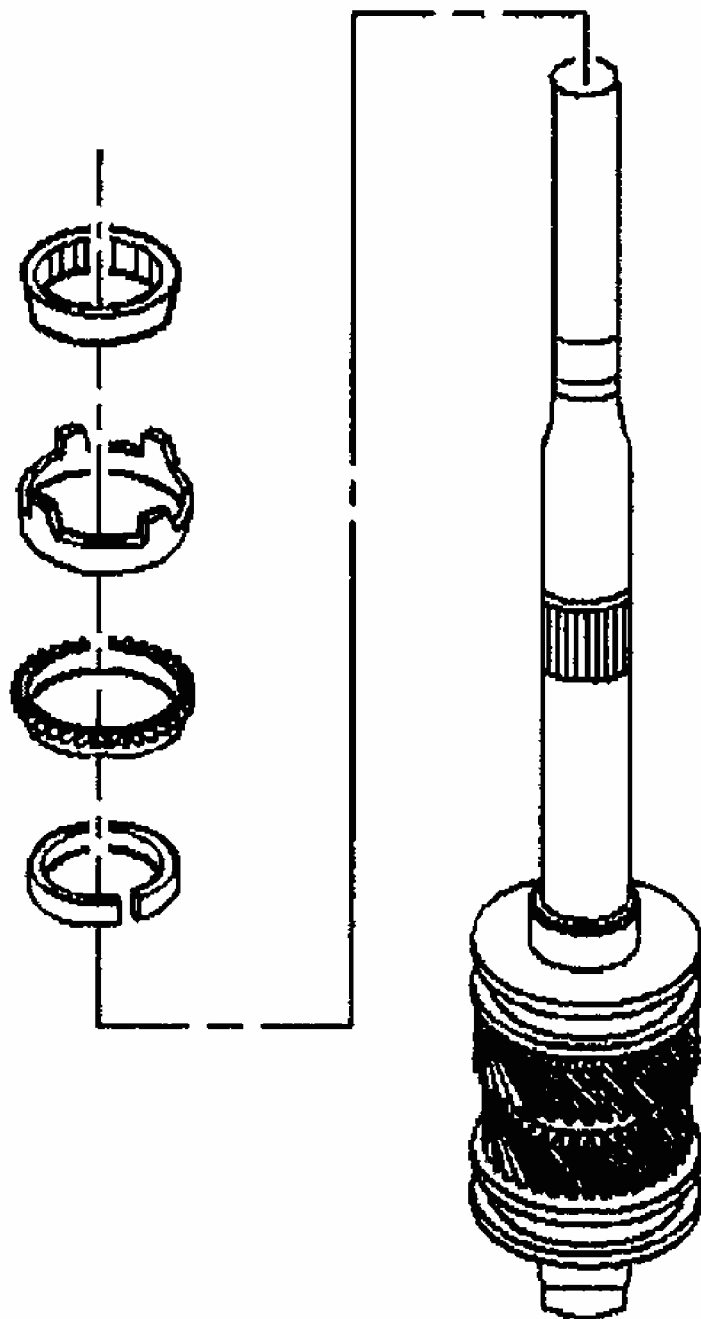
Fig. 39: Installing Mainshaft On Input Shaft
Courtesy of GENERAL MOTORS CORP.

2. Install the mainshaft on the input shaft.
3. Using a feeler gauge measure the gap between the 4th speed gear blocking ring and the 4th speed gear.

4. Replace the 4th speed gear friction cone and blocking ring when the gap is less than 1.27 mm (0.050 in).

NOTE: Do not overtighten the J 36513 split plate past the gear teeth or damage to gear may occur.

5. Using the J 36513, close the split plate only enough to support the gear teeth, and the J 39442, remove the following parts in order:
 1. If an O-ring is present on the mainshaft, remove and discard the O-ring. The O-ring was used for manufacturing purposes only.
 2. The mainshaft large tapered bearing
 3. The 1st speed gear
 4. The 1st speed gear caged needle bearing
 5. The 1st speed bearing spacer
6. Remove the following parts in order:
 1. The 1st speed gear inner cone
 2. The 1st speed gear friction cone
 3. The 1st speed gear blocking ring
 4. The retainer ring



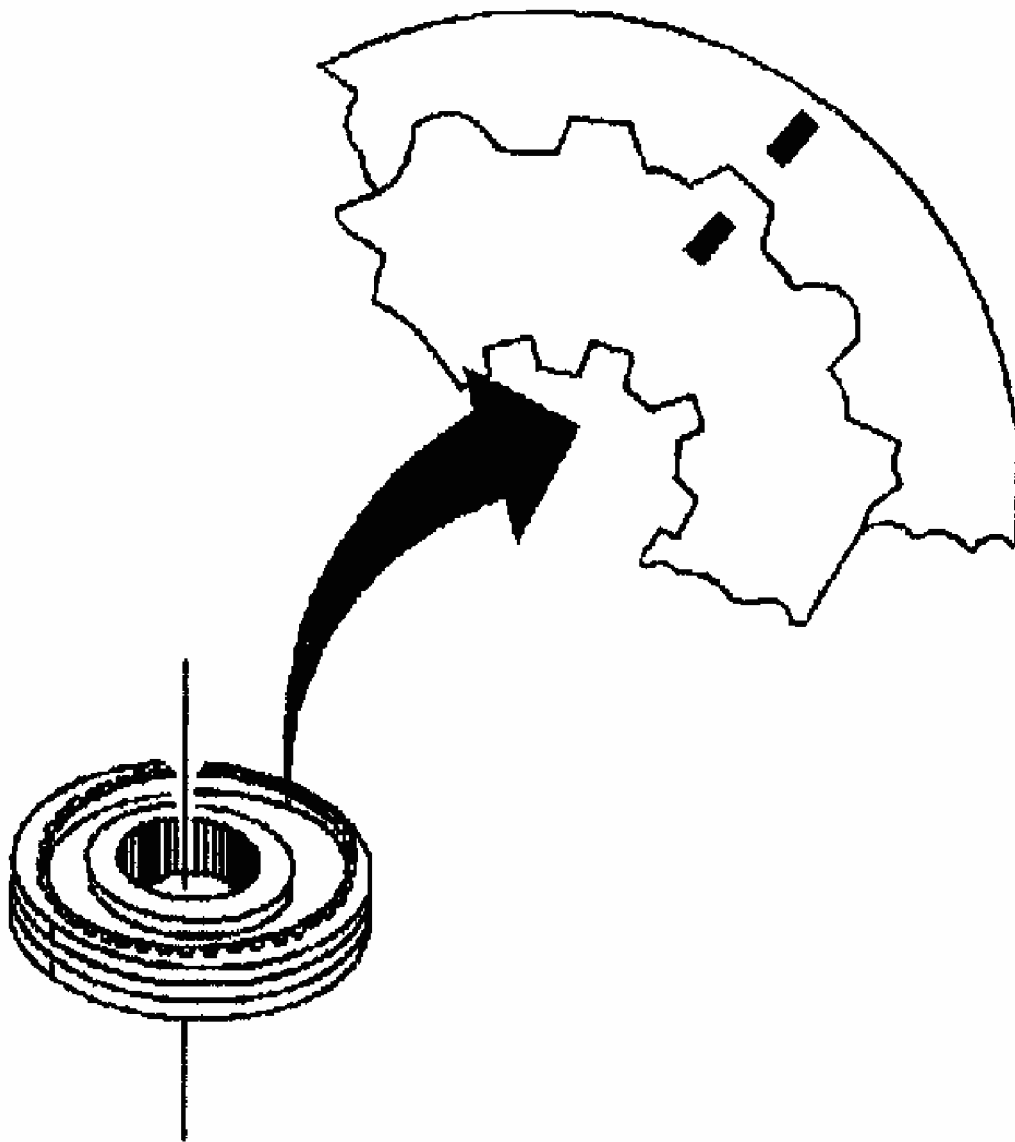
G01366658

Fig. 40: Mainshaft Components Removal Sequence
Courtesy of GENERAL MOTORS CORP.

Important: The synchronizer hubs and sliding sleeves are a selected assembly. Keep these parts together as originally assembled.

7. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall

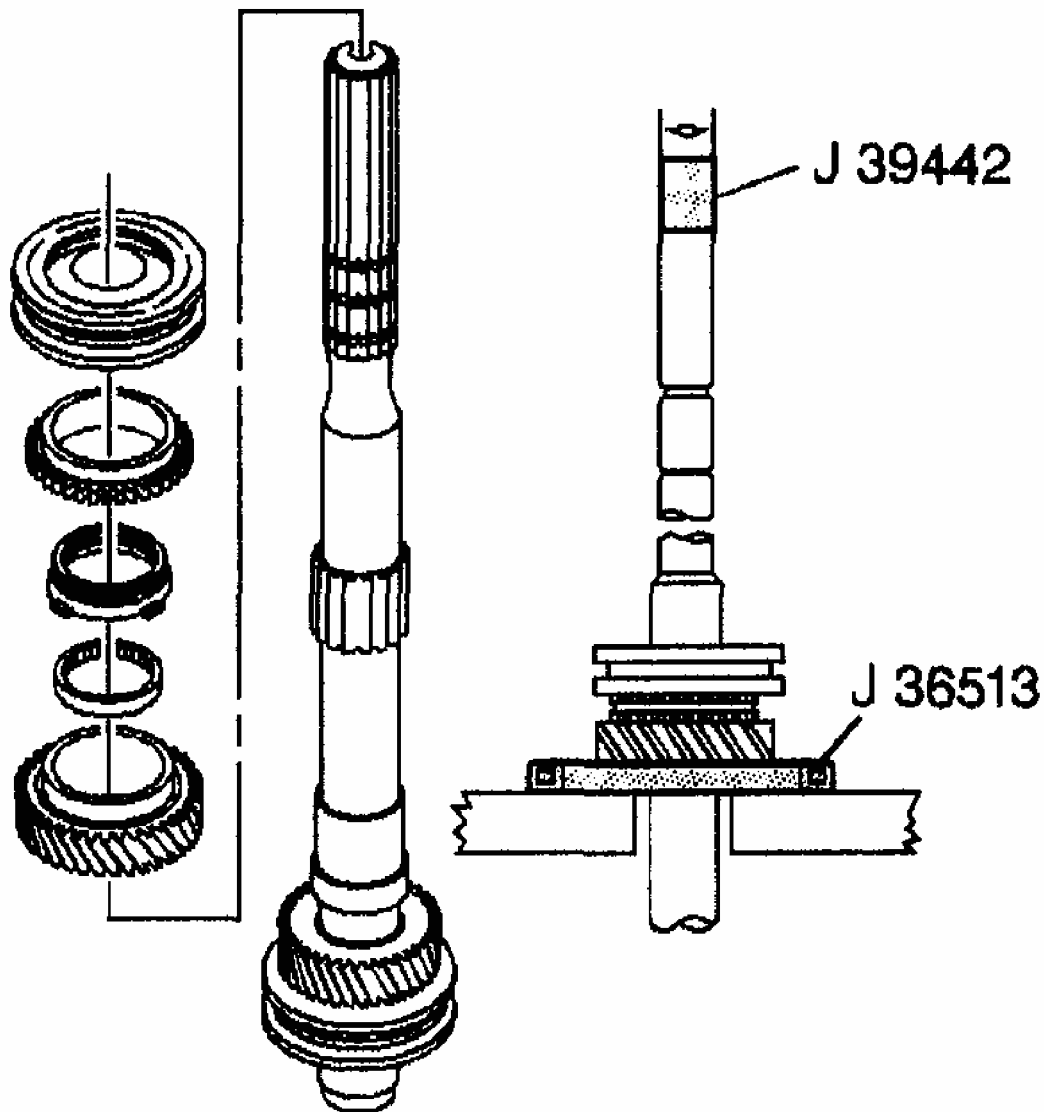
the parts in the same position.



G01366659

Fig. 41: Locating Marks On Synchronizer Hub And On Sleeve
Courtesy of GENERAL MOTORS CORP.

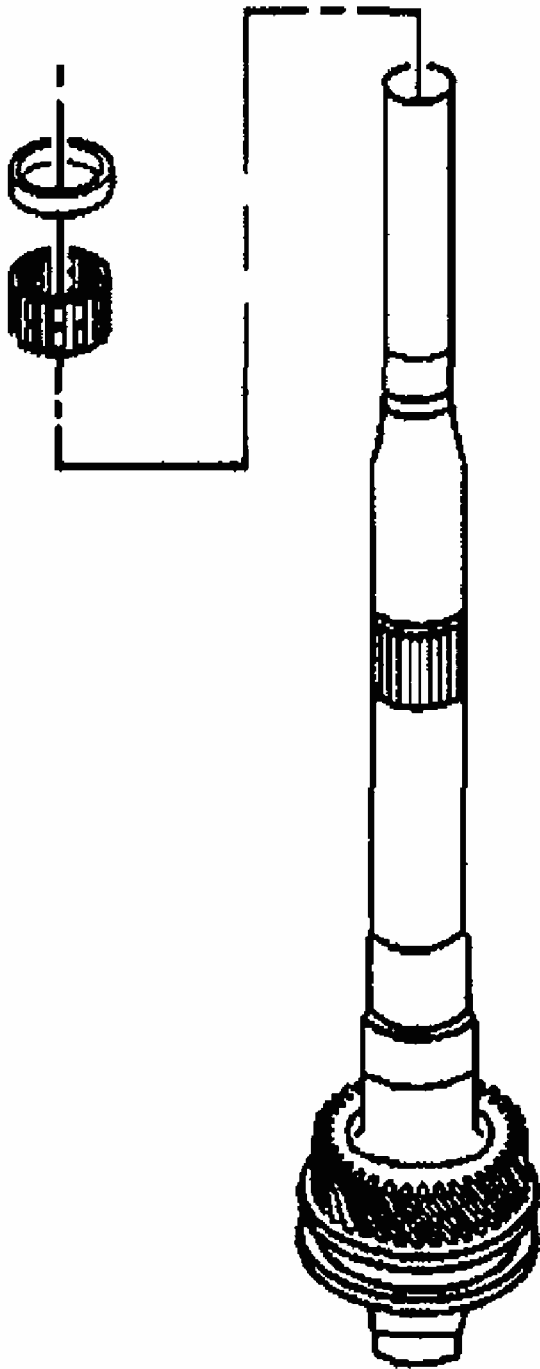
8. Remove the 2nd speed gear. The 1st/2nd speed synchronizer assembly, the 2nd speed gear blocking ring, the 2nd speed gear friction cone, and the 2nd speed gear inner cone will press off with the 2nd speed gear. Use the J 36513 in an inverted position, J 39442 and a hydraulic press.



G01366660

Fig. 42: Removing 2nd Speed Gear & Synchronizer Assembly
Courtesy of GENERAL MOTORS CORP.

9. Remove the 2nd speed gear spacer and caged needle bearing.



G01366661

Fig. 43: Removing 2nd Speed Gear Spacer & Caged Needle Bearing
Courtesy of GENERAL MOTORS CORP.

10. Remove the mainshaft small tapered bearing. Use the J 39442, the J 39443, and a hydraulic press.

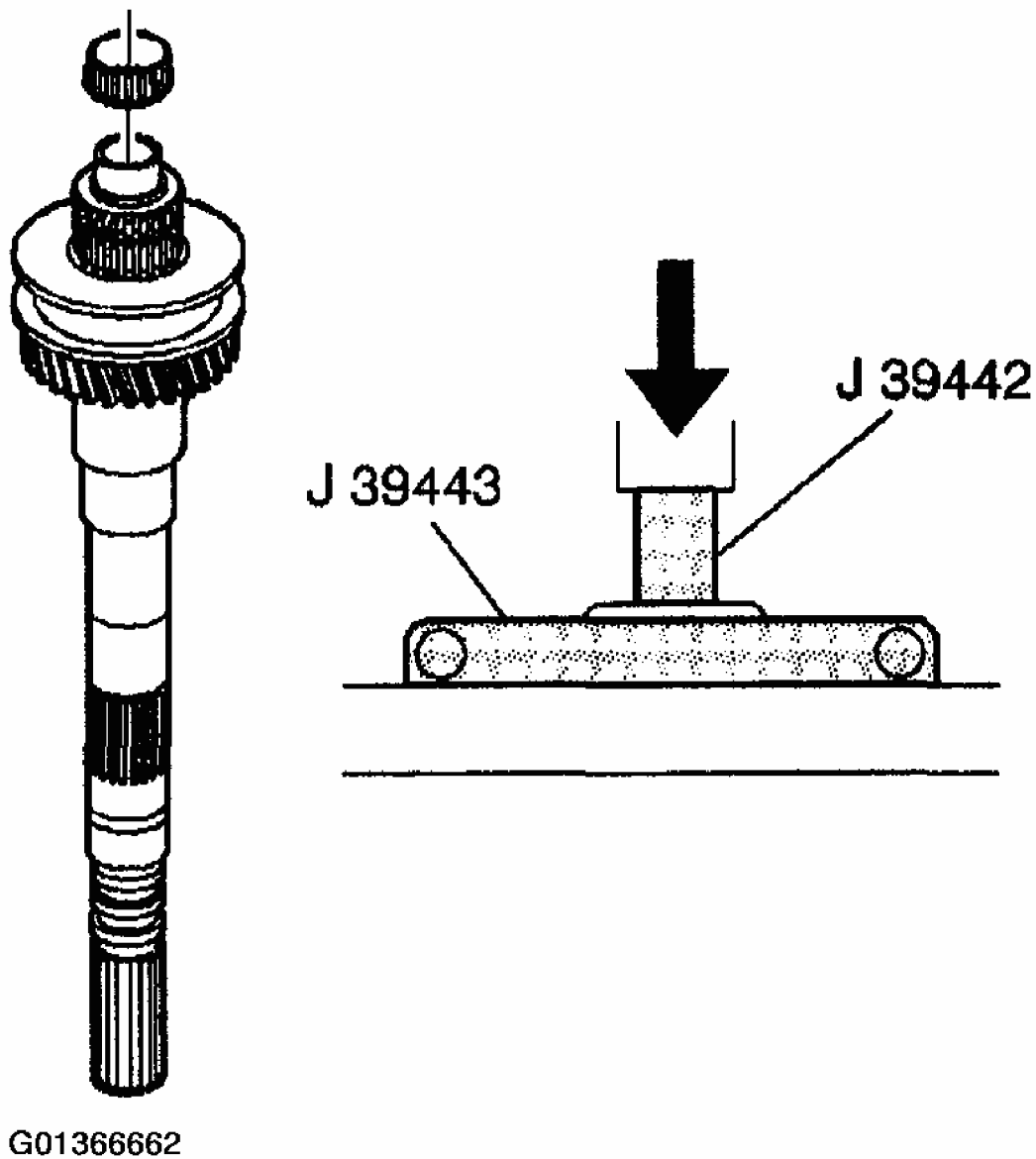
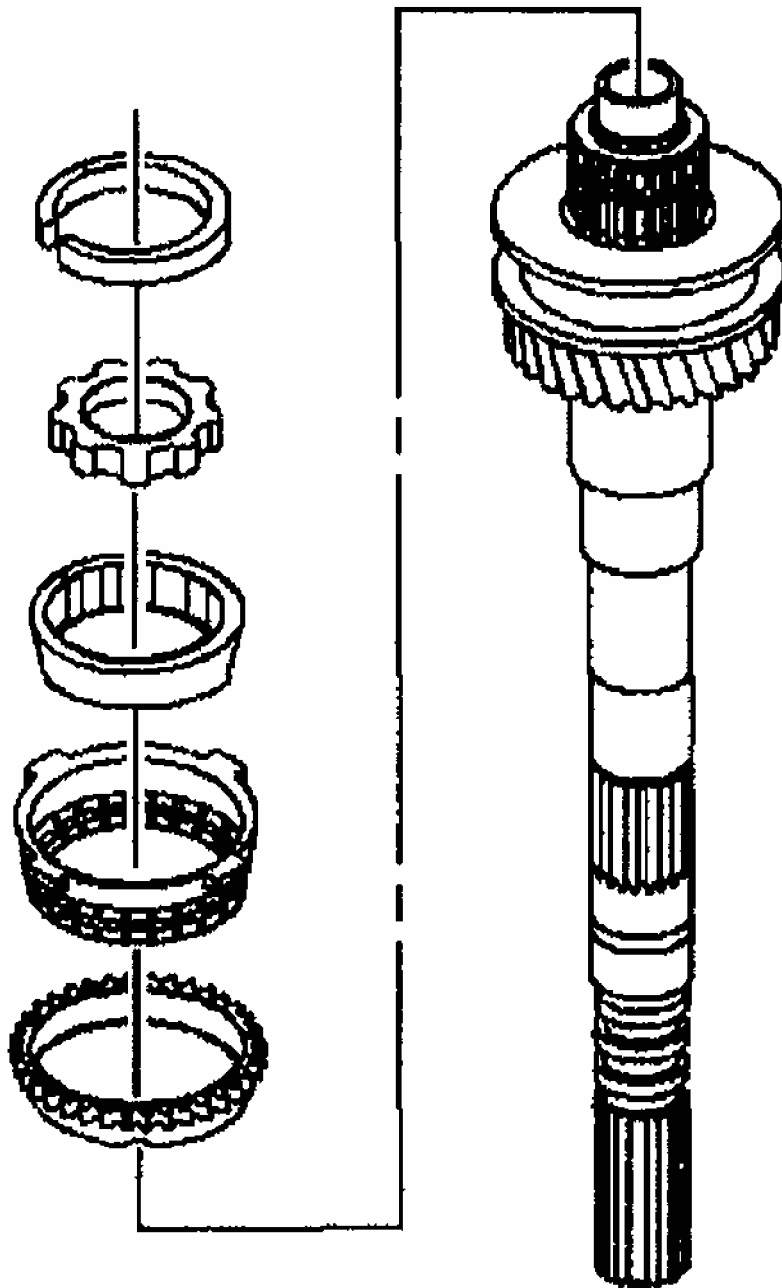


Fig. 44: Removing Mainshaft Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

11. Discard the small tapered bearing.
12. Remove the following parts in order:
 1. Retainer
 2. 4th gear thrust washer
 3. 4th gear inner cone
 4. 4th gear friction cone
 5. 4th gear blocking ring

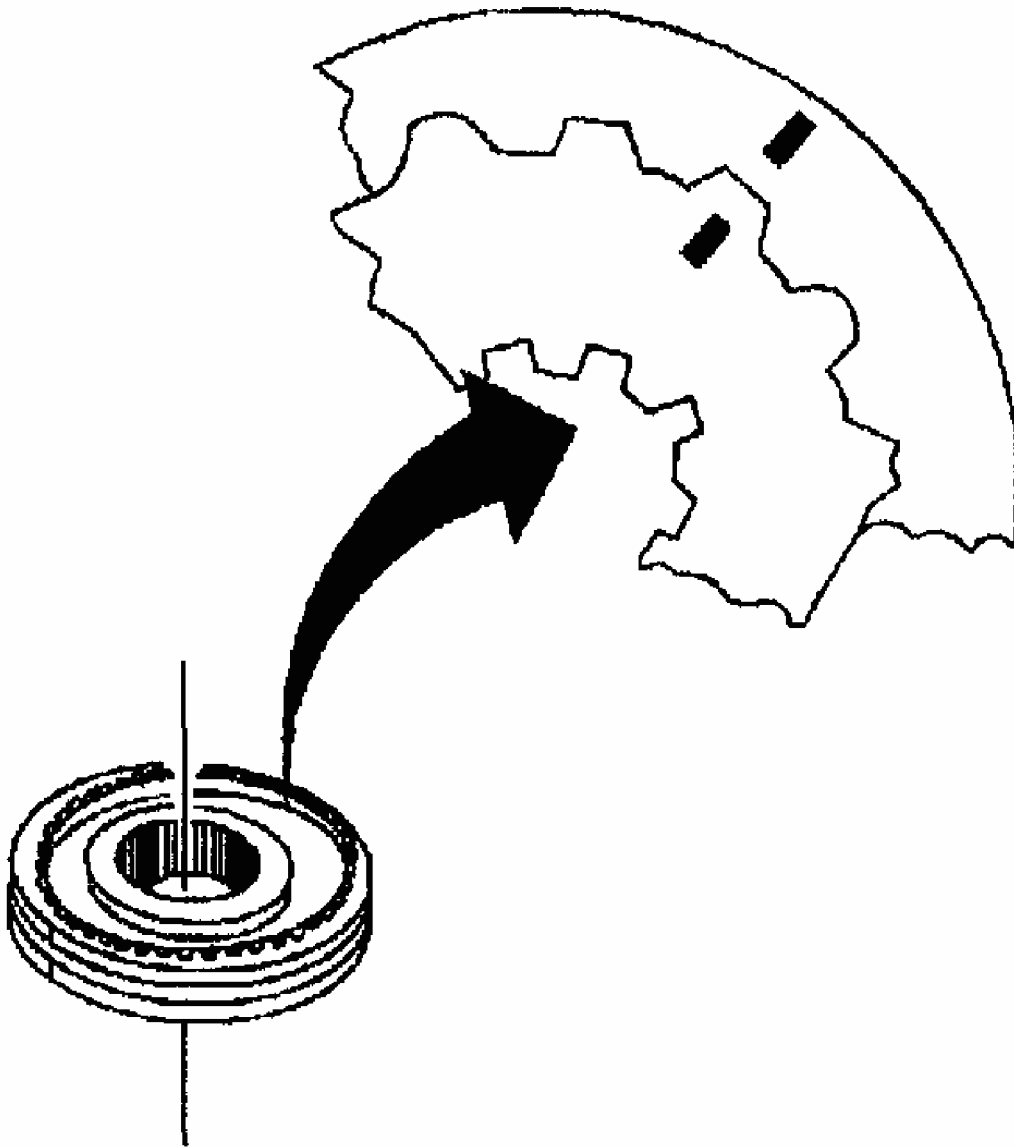
Important: The synchronizer hubs and sliding sleeves are a selected assembly. Keep these parts together as originally assembled.



G01366663

Fig. 45: Removing 4th Gear Thrust Washer, Inner Cone, Friction Cone & Blocking Ring
Courtesy of GENERAL MOTORS CORP.

13. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.



G01366664

Fig. 46: Identifying Mark On Synchronizer Hub & Sleeve
Courtesy of GENERAL MOTORS CORP.

14. Use the J 39473, V-blocks, and a hydraulic press to remove the 3rd speed gear. The 3rd/4th speed synchronizer assembly, the 3rd speed gear blocking ring, the 3rd speed gear friction cone, the 3rd speed gear inner cone, thrust washer, and spacer will press

off with the 3rd speed gear.

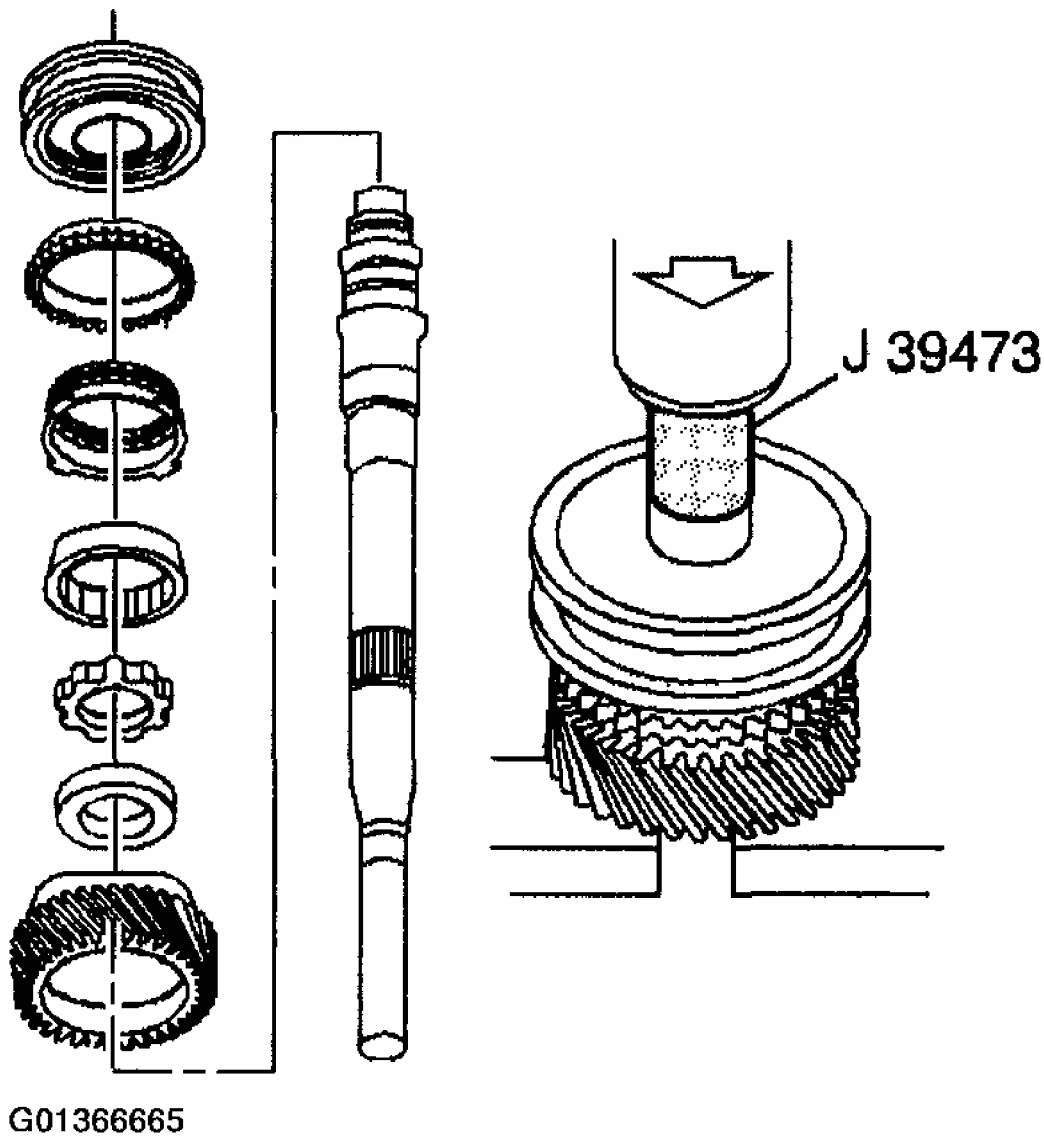
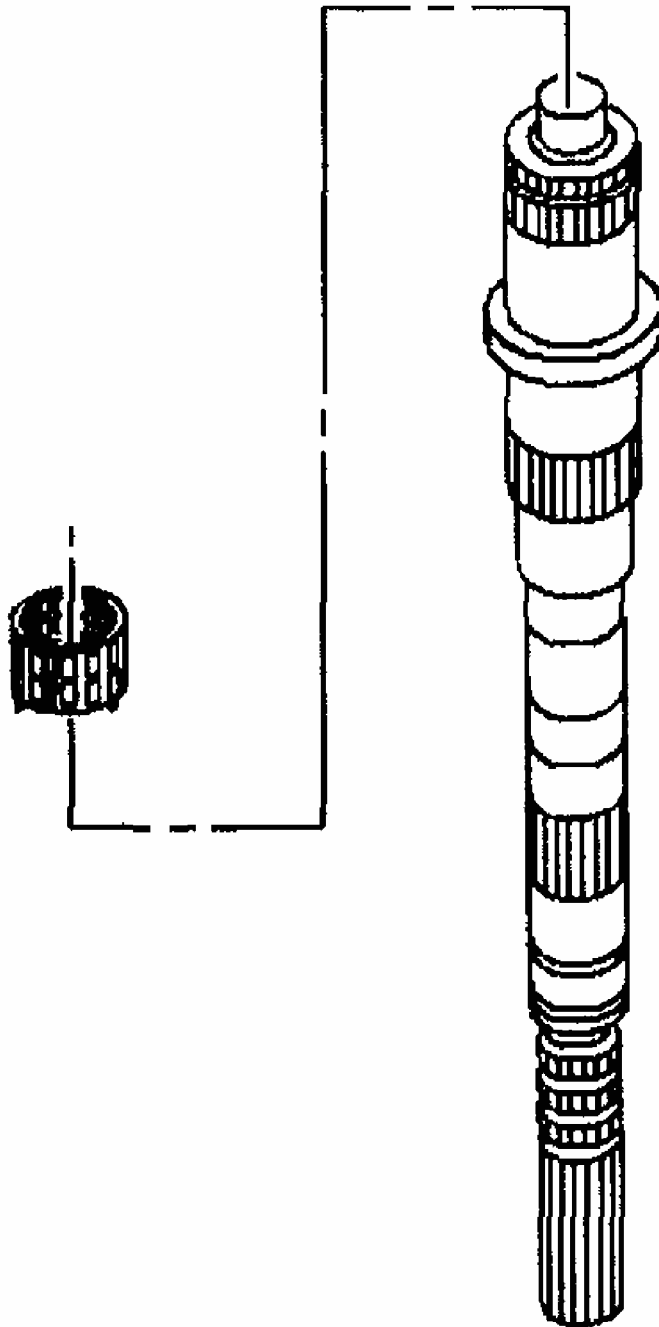


Fig. 47: Removing 3rd Speed Gear & Synchronizer Assembly
Courtesy of GENERAL MOTORS CORP.

15. Remove the 3rd speed gear caged needle bearing.



G01366666

Fig. 48: Removing 3rd Speed Gear Caged Needle Bearing
Courtesy of GENERAL MOTORS CORP.

INPUT SHAFT

Tools Required

- J 22912-01 Split Plate. See Special Tools and Equipment .
- J 23907 Slide Hammer. See Special Tools and Equipment .
- J 39594 Bearing Race Remover. See Special Tools and Equipment .

Important: Do not replace the tapered bearing or the bearing race unless inspection shows that the bearing or the race are damaged.

1. Remove the tapered bearing from the input shaft, using the J 22912-01 and a hydraulic press.

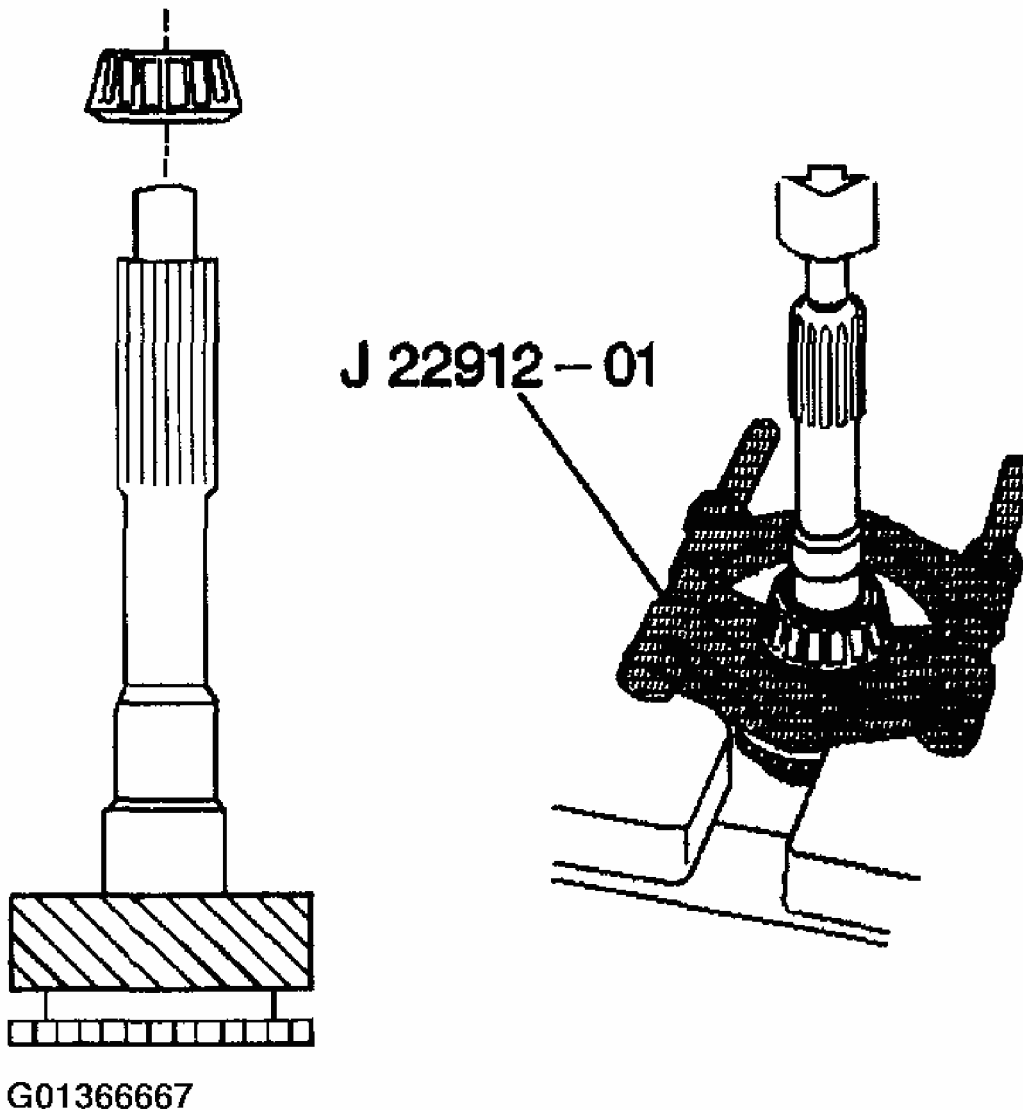


Fig. 49: Removing Tapered Bearing From Input Shaft
Courtesy of GENERAL MOTORS CORP.

2. Remove the bearing race from the input shaft, using the J 23907 and the J 39594.

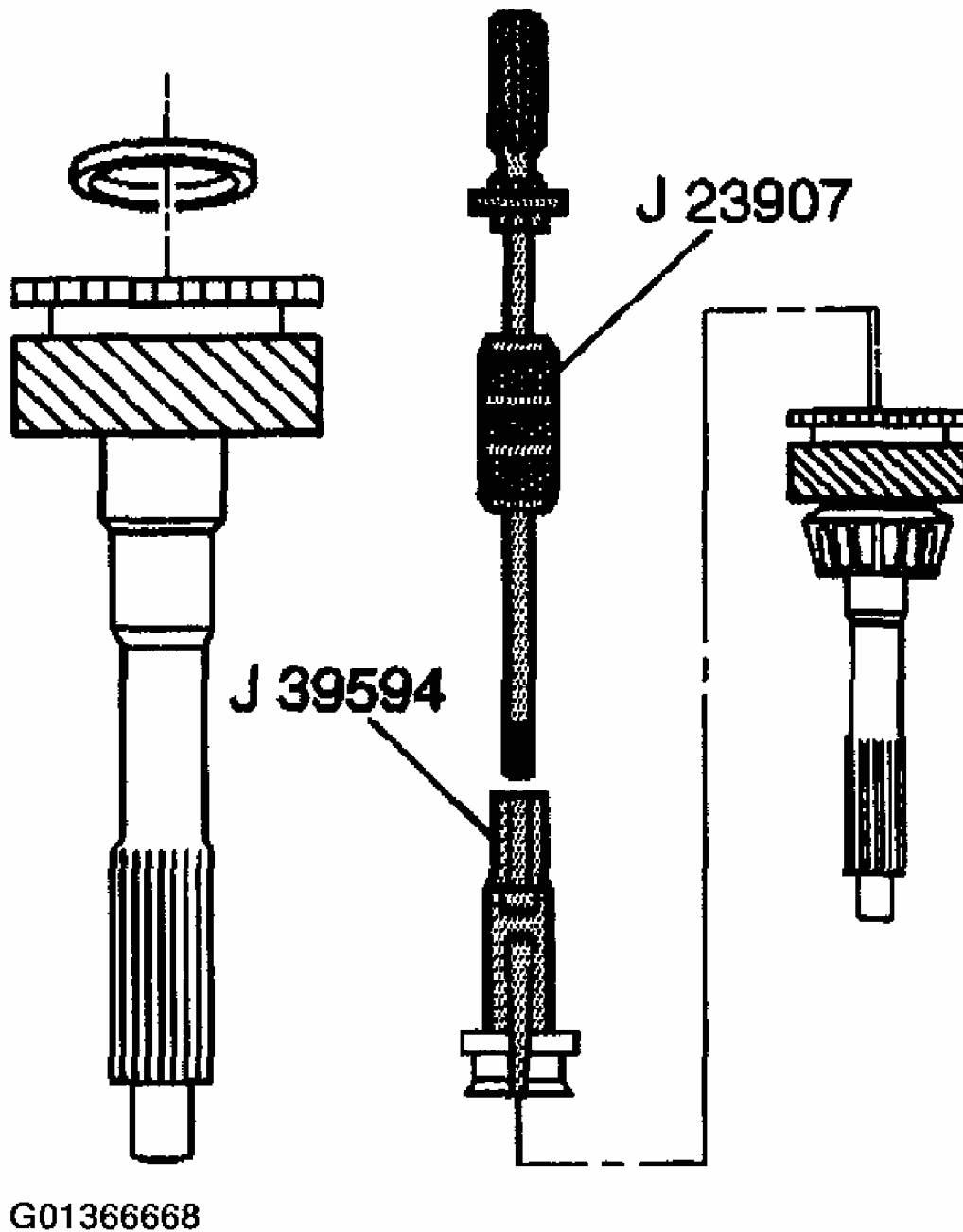


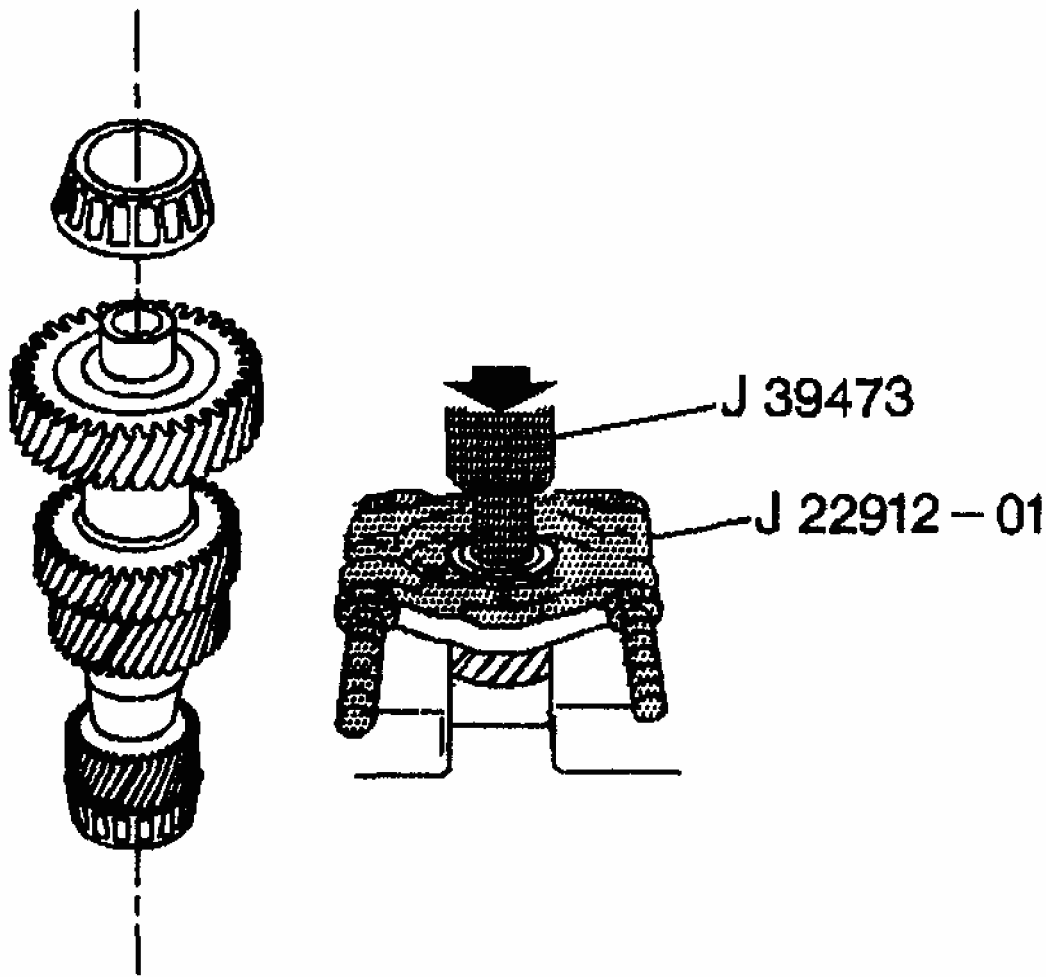
Fig. 50: Removing Bearing Race From Input Shaft
Courtesy of GENERAL MOTORS CORP.

Tools Required

- J 22912-01 Split Plate. See Special Tools and Equipment .
- J 39473 Mainshaft Bearing Installer. See Special Tools and Equipment .
- J 39511 Split Plate. See Special Tools and Equipment .
- J 39547 Press Adapter. See Special Tools and Equipment .

Important: Do not replace tapered bearings unless inspection shows bearing damage.

1. Remove the small tapered bearing, using the J 22912-01 with the J 39473 and a hydraulic press.



G01366669

Fig. 51: Removing Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

2. Discard the small tapered bearing.
3. Remove the large tapered bearing, using the J 39511, the J 39547, and a hydraulic press.

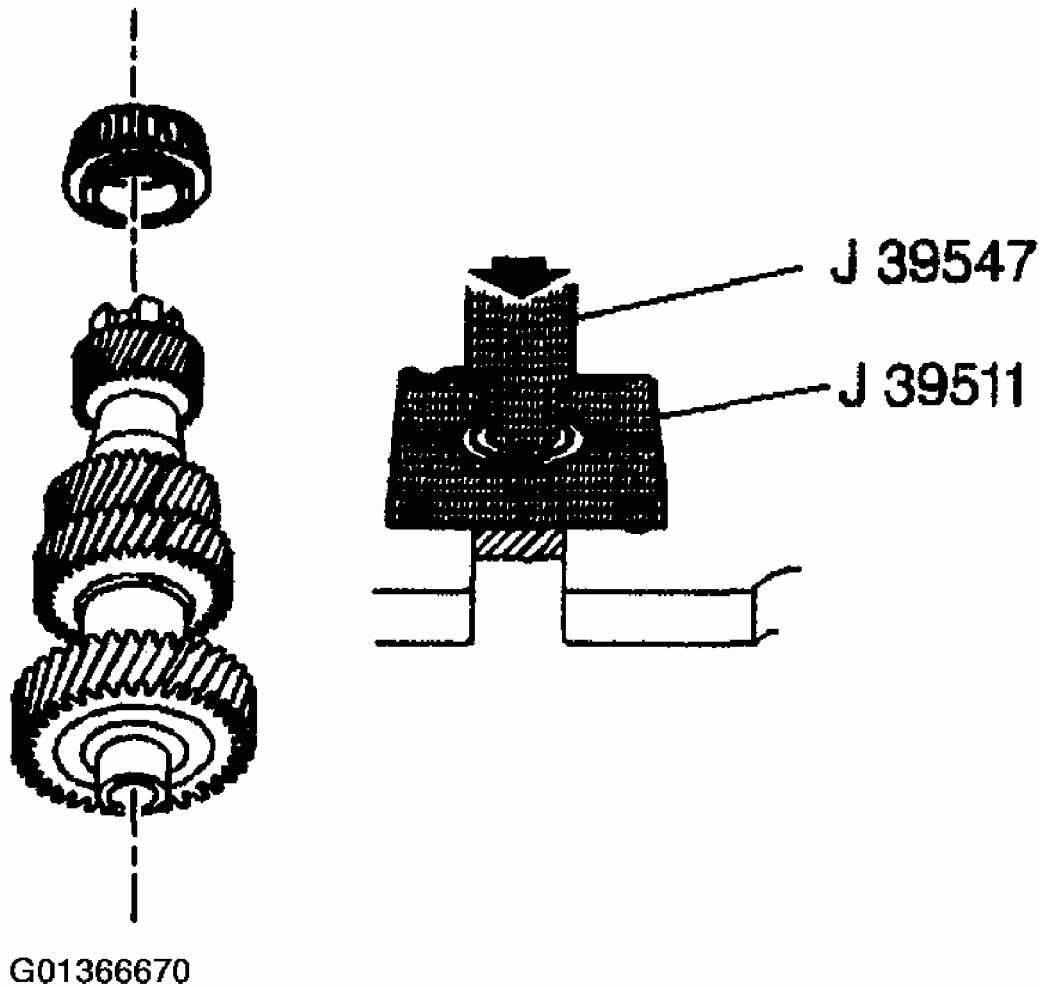


Fig. 52: Removing Large Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

4. Discard the large tapered bearing.

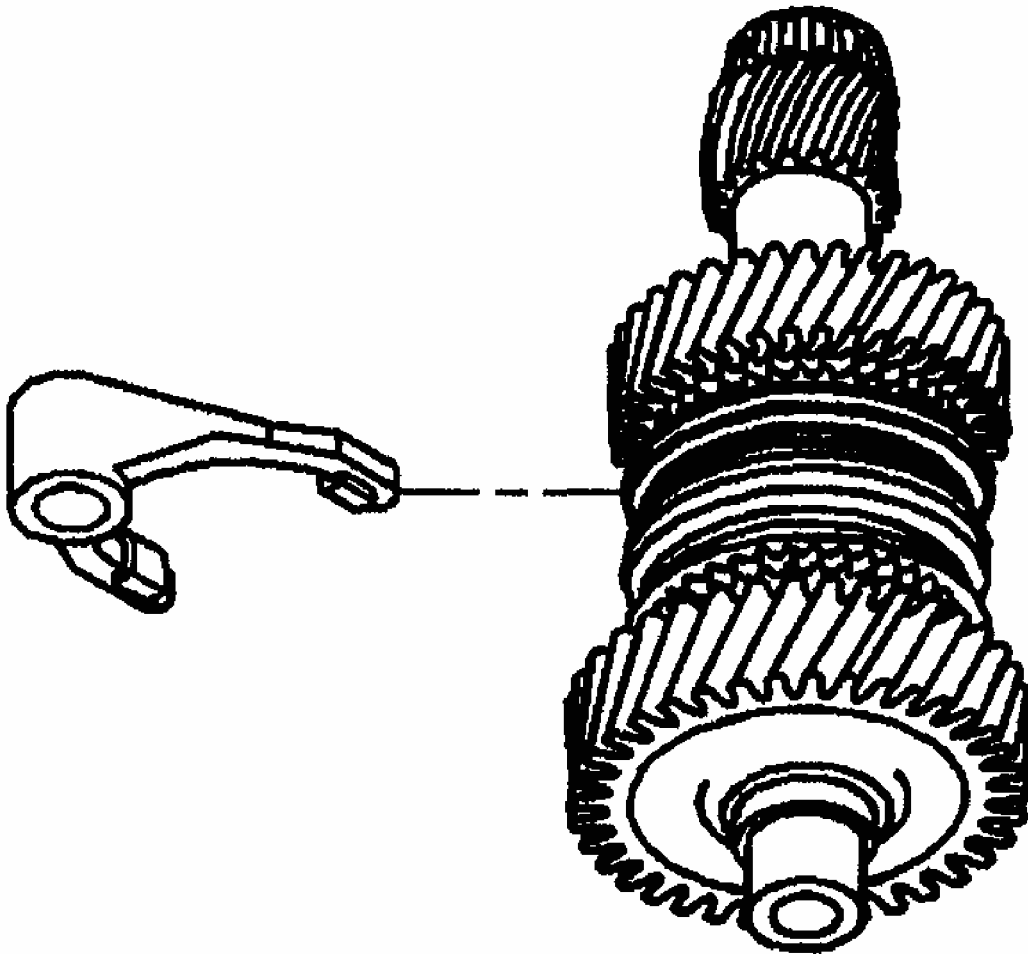
COUNTERSHAFT EXTENSION DISASSEMBLE

Tools Required

- J 22910-01 Split Plate. See Special Tools and Equipment .
- J 39442 Press Adapter. See Special Tools and Equipment .

- J 39443 Split Plate. See **Special Tools and Equipment** .

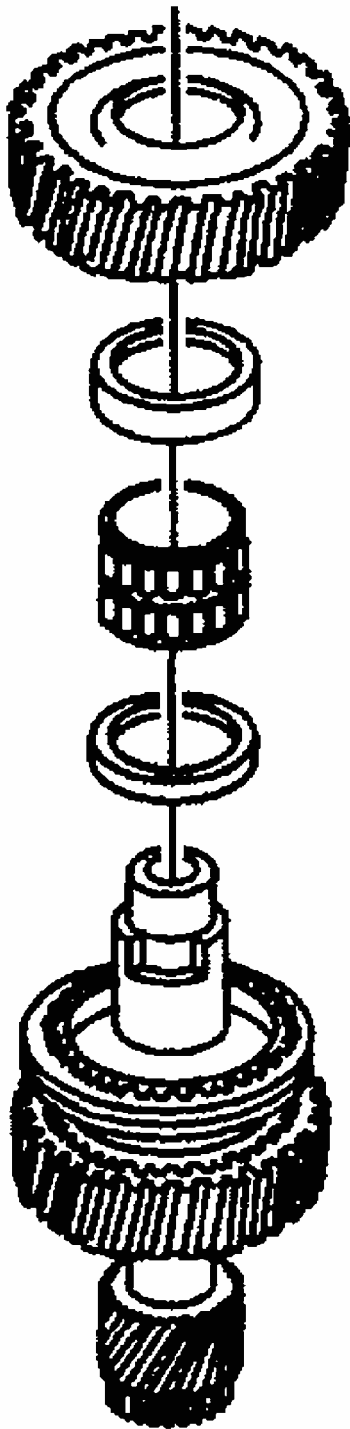
1. Remove the 5th/6th speed shift fork.



G01366671

Fig. 53: Removing 5th/6th Speed Shift Fork
Courtesy of GENERAL MOTORS CORP.

2. Remove the following parts in order:
 1. The 6th speed drive gear
 2. The 6th speed gear bearing spacer
 3. The caged needle bearing
 4. The 6th speed gear bearing spacer

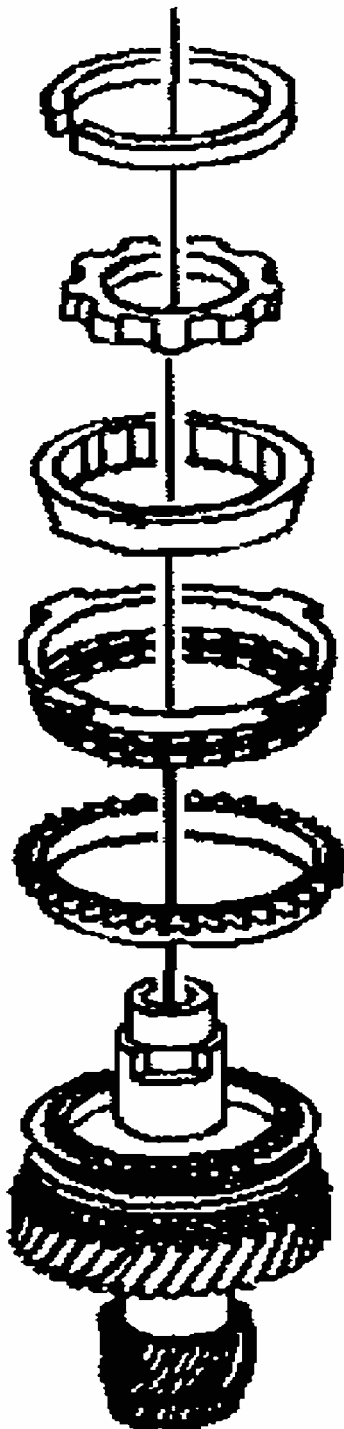


G01366672

Fig. 54: Removing 6th Speed Drive Gear, Bearing Spacer & Needle Bearing
Courtesy of GENERAL MOTORS CORP.

3. Remove the following parts in order:
 1. The 5th/6th speed synchronizer retainer ring
 2. The thrust washer

3. The 6th speed drive gear inner cone
4. The 6th speed drive gear friction cone
5. The 6th speed drive gear blocking ring



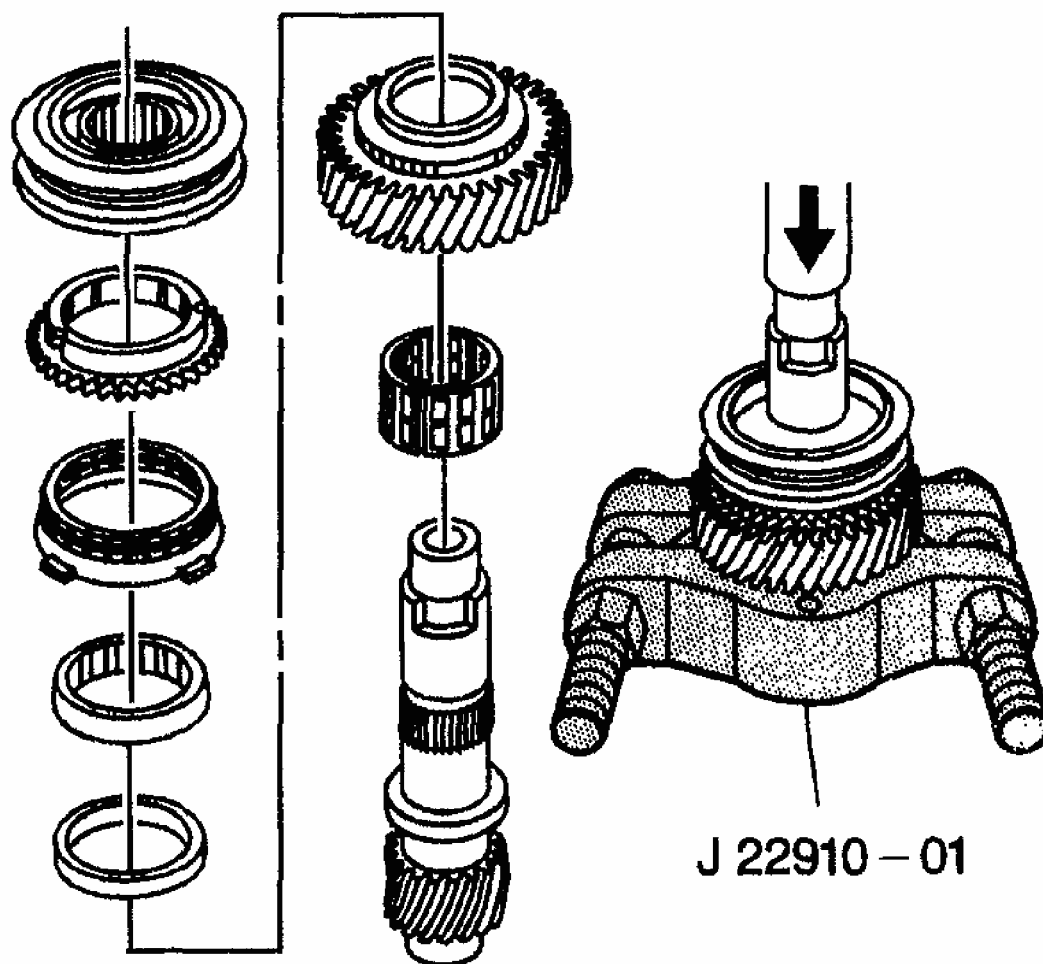
G01366673

Fig. 55: Removing 6th Speed Drive Gear Inner Cone, Friction Cone & Blocking Ring

Courtesy of GENERAL MOTORS CORP.

4. Discard the retainer ring.
5. Remove the 5th speed drive gear, using the J 22910-01 and a hydraulic press.

The 5th/6th speed synchronizer assembly, and the 5th speed drive gear blocking ring, friction cone, inner cone and thrust washer will press off with the 5th speed drive gear.



G01366674

Fig. 56: Removing 5th Speed Drive Gear Caged Needle Bearing
Courtesy of GENERAL MOTORS CORP.

6. Remove the 5th speed drive gear caged needle bearing.

Important: Do not replace the small tapered bearing unless inspection shows bearing damage.

7. Remove the small tapered bearing, using the J 39442, the J 39443, and a hydraulic press.

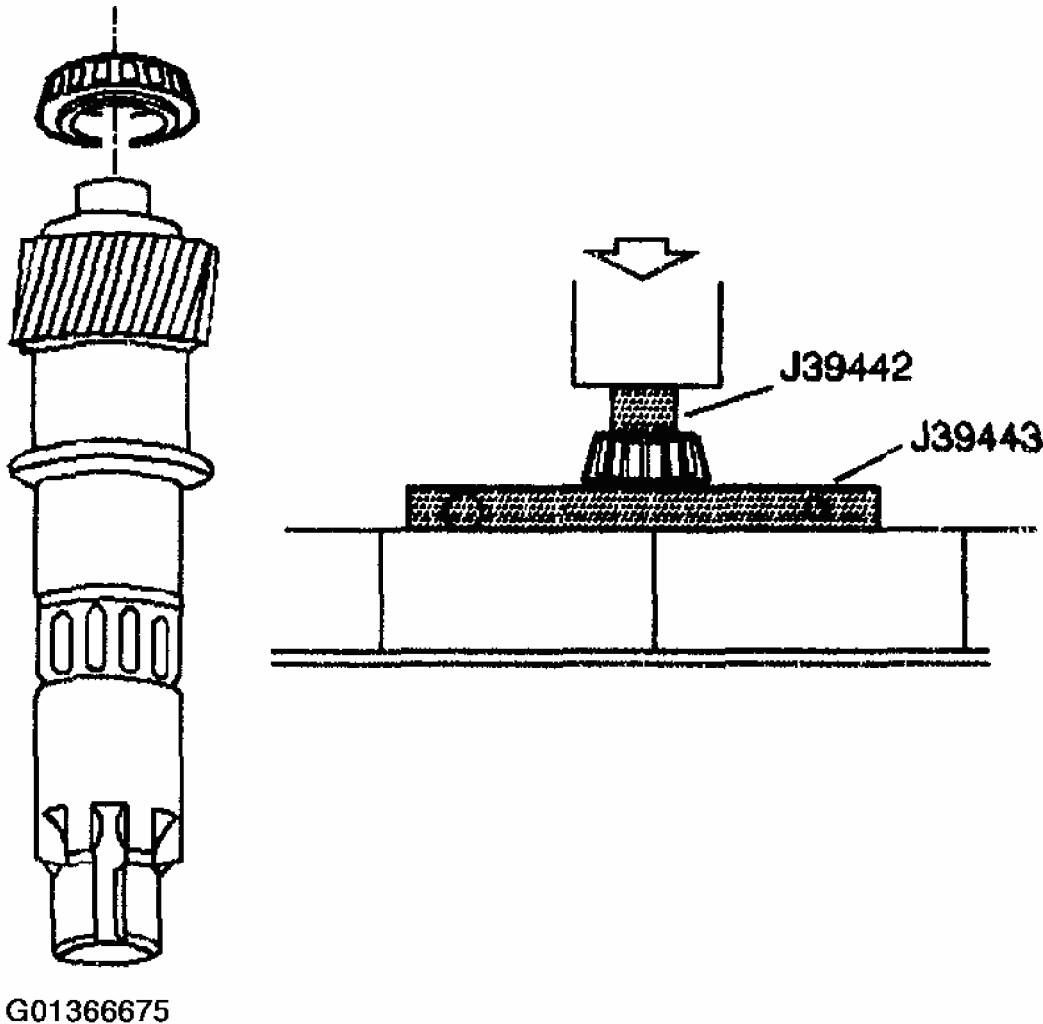


Fig. 57: Removing Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

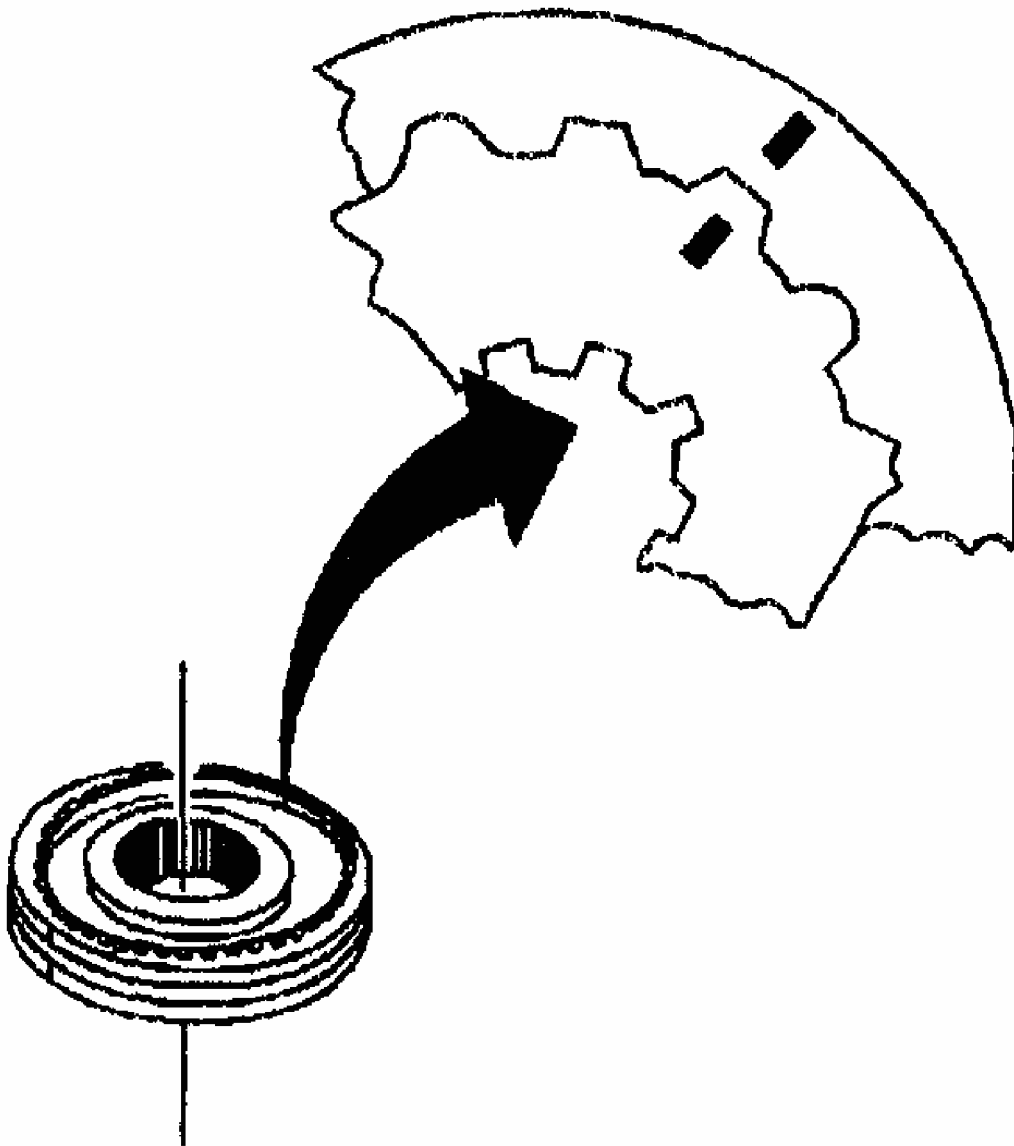
SYNCHRONIZERS DISASSEMBLE

1st/2nd, 3rd/4th, 5th/6th Synchronizers

Important: Synchronizer components are not interchangeable. Keep all the synchronizer components separate. The synchronizer hubs and the sliding sleeves are a selected assembly. Keep the hubs and the sliding sleeves together as originally assembled.

1. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall

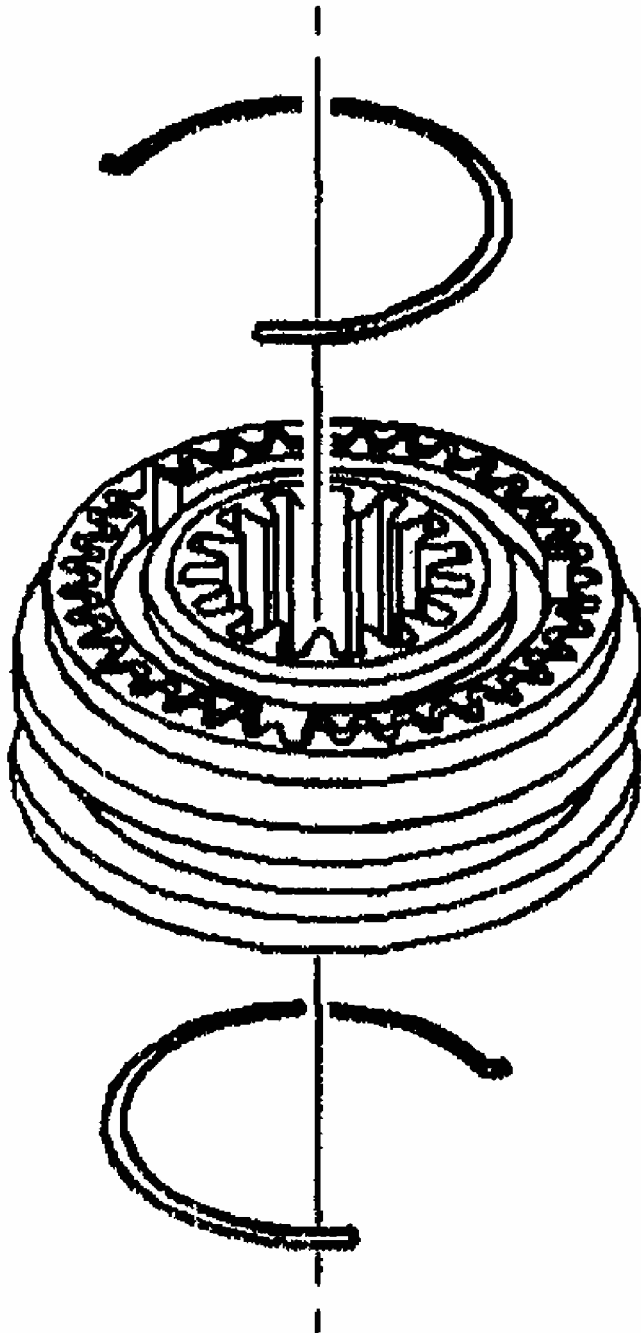
the parts in the same position.



G01366676

Fig. 58: Locating Mark On Synchronizer Hub & Sleeve
Courtesy of GENERAL MOTORS CORP.

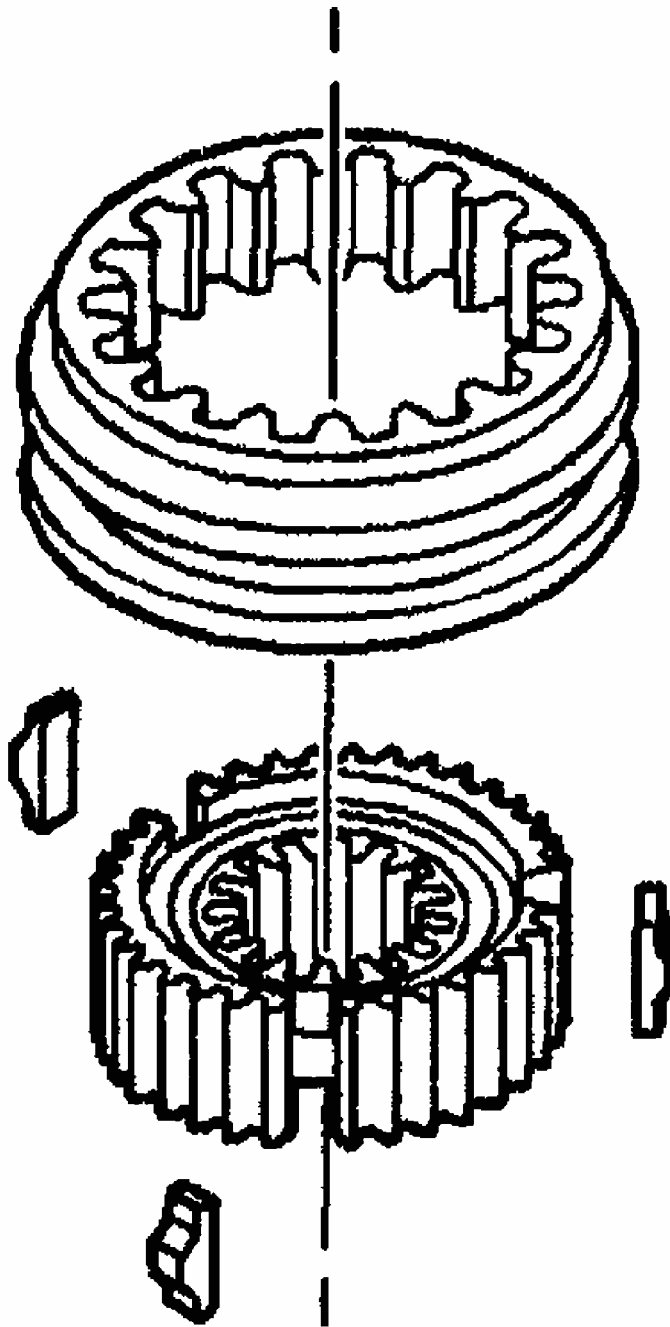
2. Remove the synchronizer springs. Use a small-bladed screwdriver.



G01366677

Fig. 59: Removing Synchronizer Springs
Courtesy of GENERAL MOTORS CORP.

3. Remove the synchronizer sleeve and the keys from the hub.



G01366678

Fig. 60: Removing Synchronizer Sleeve & Keys From Hub
Courtesy of GENERAL MOTORS CORP.

Reverse Synchronizer

1. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

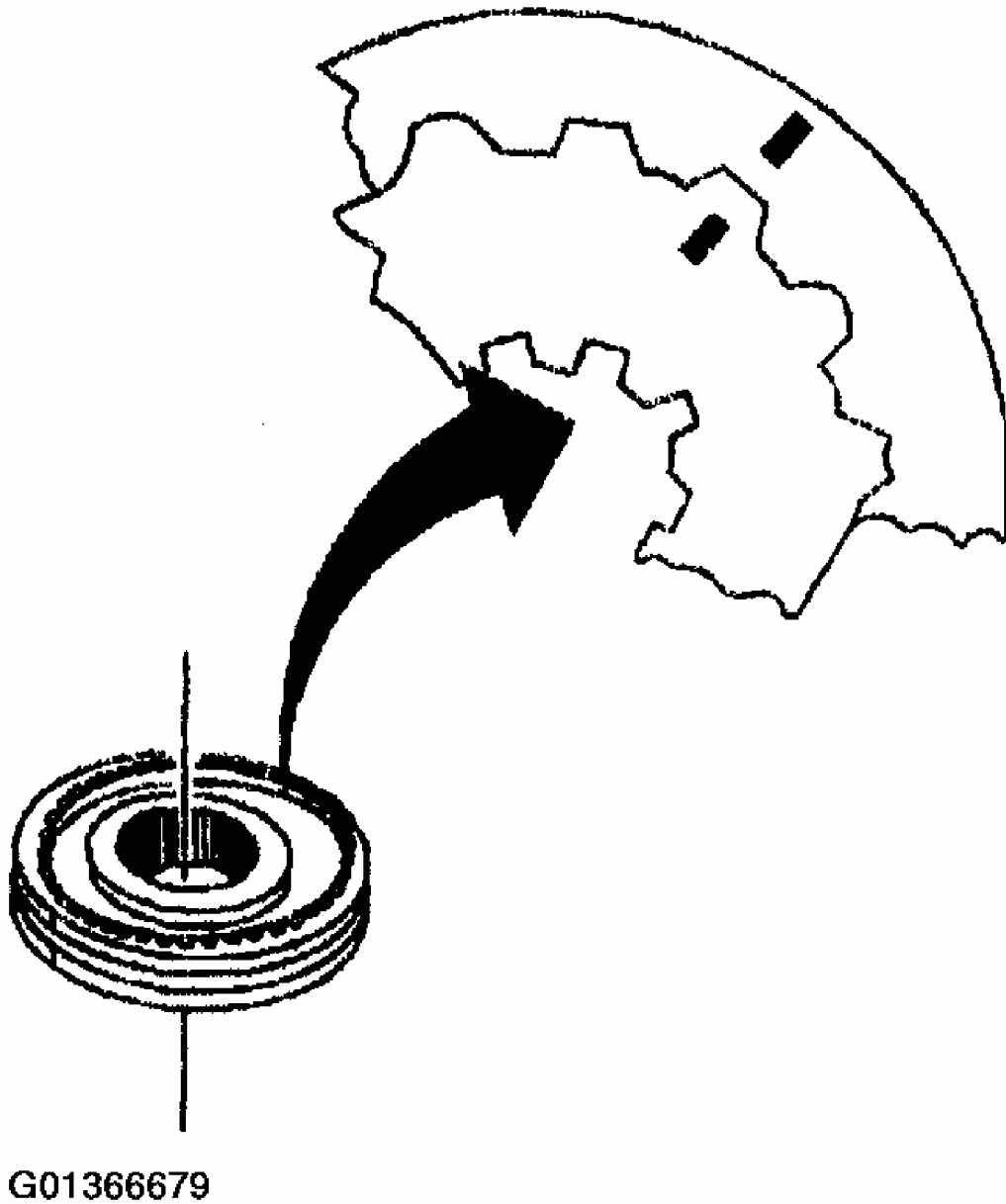
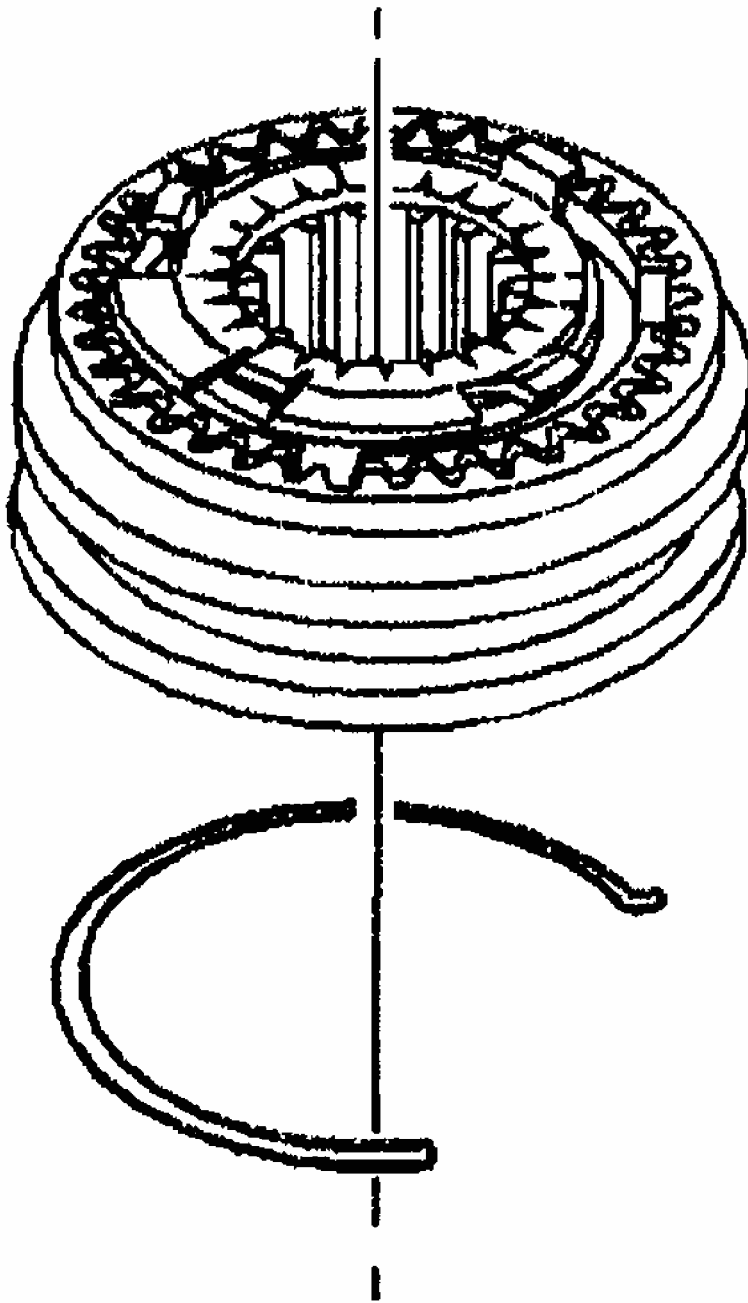


Fig. 61: Identifying Marks On Synchronizer Hub & Sleeve
Courtesy of GENERAL MOTORS CORP.

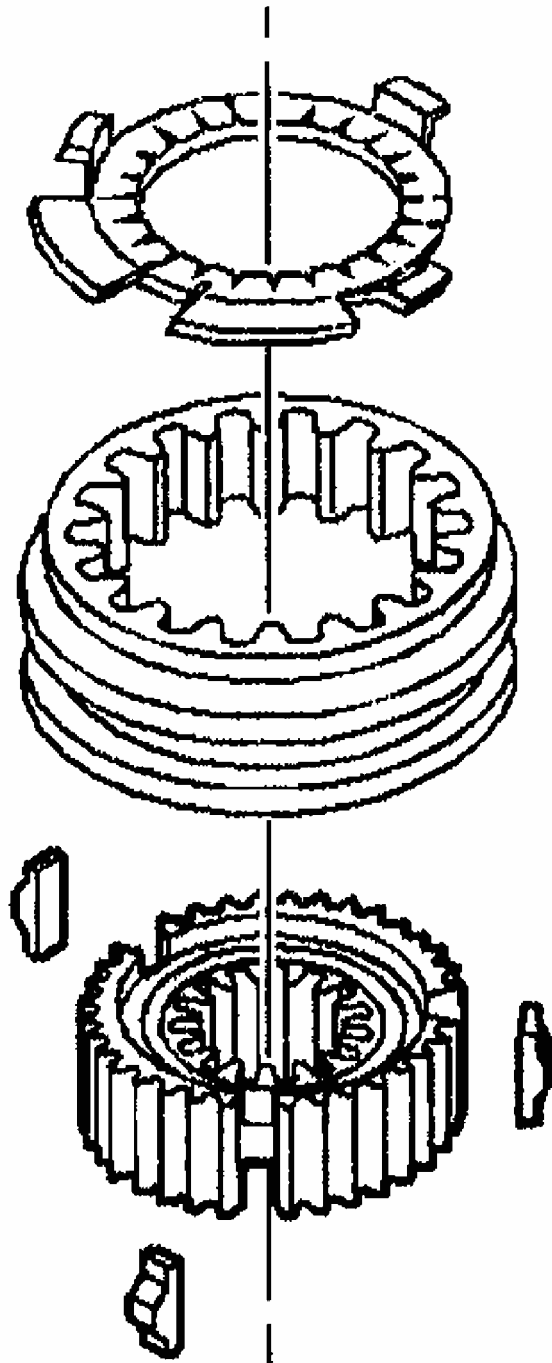
2. Remove the synchronizer spring. Use a small-bladed screwdriver.



G01366680

Fig. 62: Removing Synchronizer Spring
Courtesy of GENERAL MOTORS CORP.

3. Remove the synchronizer sleeve from the hub. Press against the inner hub.

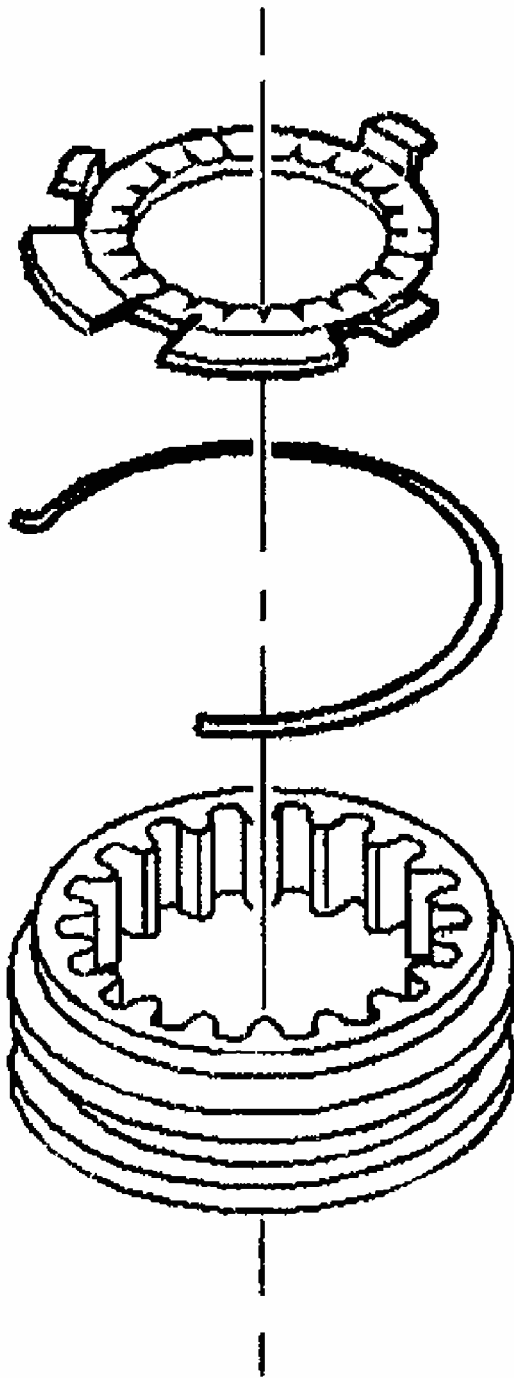


G01366681

Fig. 63: Removing Synchronizer Sleeve From Hub
Courtesy of GENERAL MOTORS CORP.

4. Turn the hub over. The keys will slide out from the hub.
5. Remove the following parts using a small-bladed screwdriver:
 1. The synchronizer key retainer

2. The synchronizer spring



G01366682

Fig. 64: Removing Synchronizer Key Retainer & Spring
Courtesy of GENERAL MOTORS CORP.

6. Discard the synchronizer key retainer.

SYNCHRONIZERS CLEANING AND INSPECTION

1. Clean all the synchronizer parts in a suitable solvent. Air dry all the synchronizer parts.
2. Inspect the synchronizer parts for the following conditions:
 - Burrs
 - Cracks
 - Chamfer for excessive wear
 - Free movement of the clutching sleeves on their hubs
 - Worn or damaged clutch teeth
 - Distorted springs
3. Replace synchronizer parts that are worn or damaged.

Replace a burred or nicked part that cannot be reconditioned by hand. Use a soft stone or a crocus cloth.

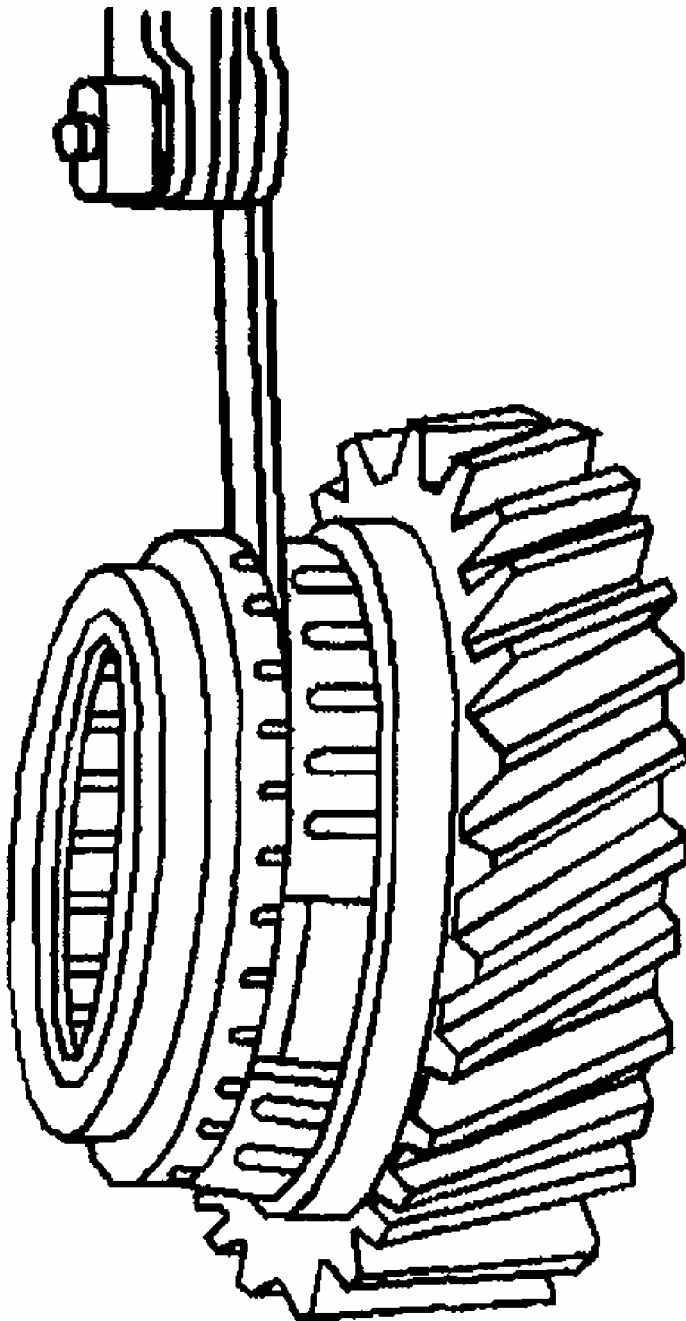
4. Measure the gap between the vertical faces of the blocking ring teeth and the speed gear as follows:
 1. Assemble the correct blocking ring with the correct speed gear.
 2. The blocking ring must be fully seated on the gear.
 3. Use a feeler gauge to measure the forward gear gap.
 4. Use a feeler gauge to measure the reverse gear gap.

Measure the gap without the wave washer in between the blocking ring and the reverse gear.

The nominal gap is 1.27-2.16 mm (0.050-0.085 in) for the 1st and 2nd gear.

The nominal gap is 1.27-2.03 mm (0.050-0.080 in) for the 3rd, 4th, 5th and 6th gear.

Replace the friction cones and blocker rings when the gap is significantly less than specified.



G01366683

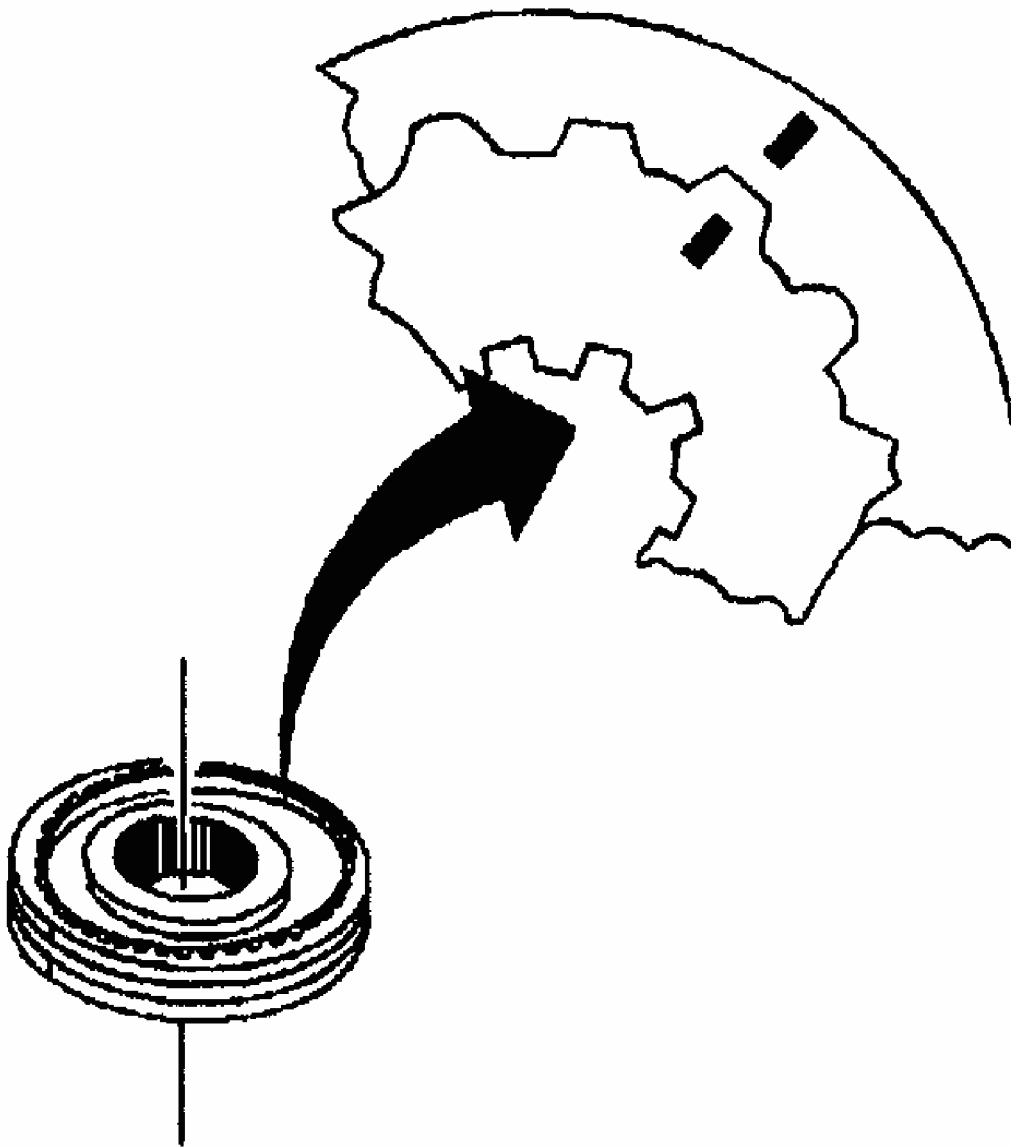
Fig. 65: Measuring Gap Between Vertical Faces Of Blocking Ring Teeth & Speed Gear

Courtesy of GENERAL MOTORS CORP.

SYNCHRONIZERS ASSEMBLE

1st/2nd Synchronizer

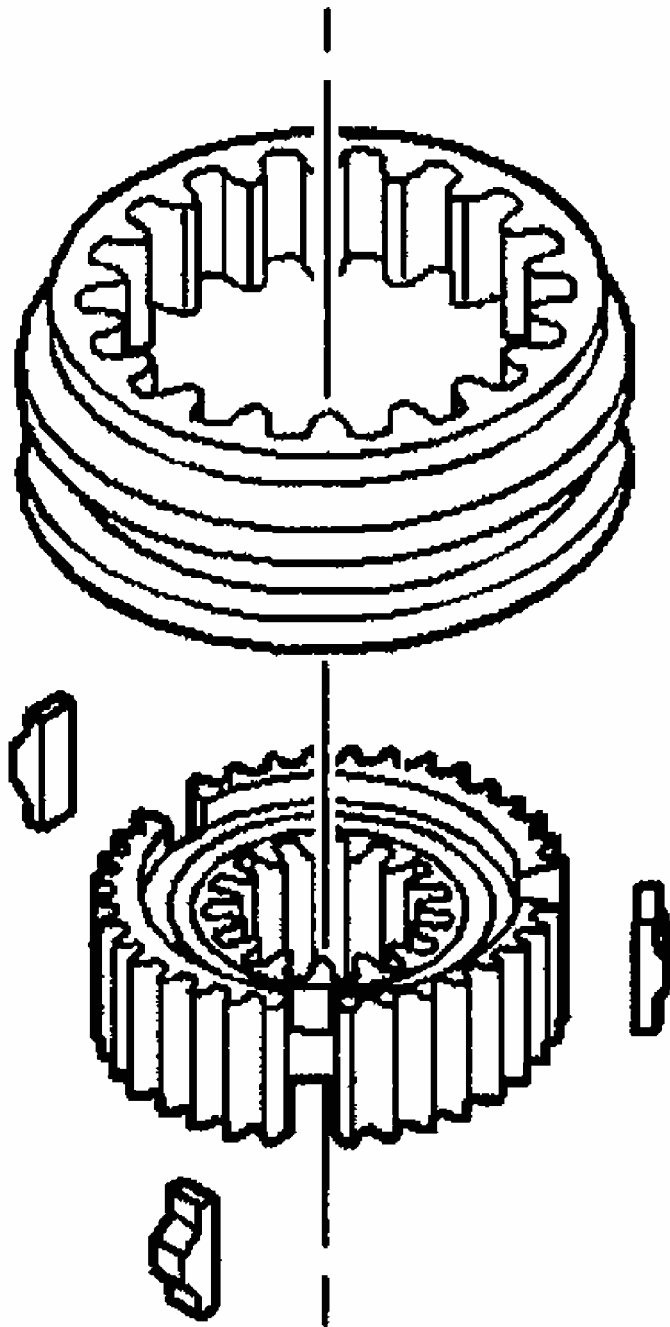
1. Check the synchronizer assembly scribe marks for correct positions.



G01366684

Fig. 66: Locating Marks On Synchronizer Hub & Sleeve
Courtesy of GENERAL MOTORS CORP.

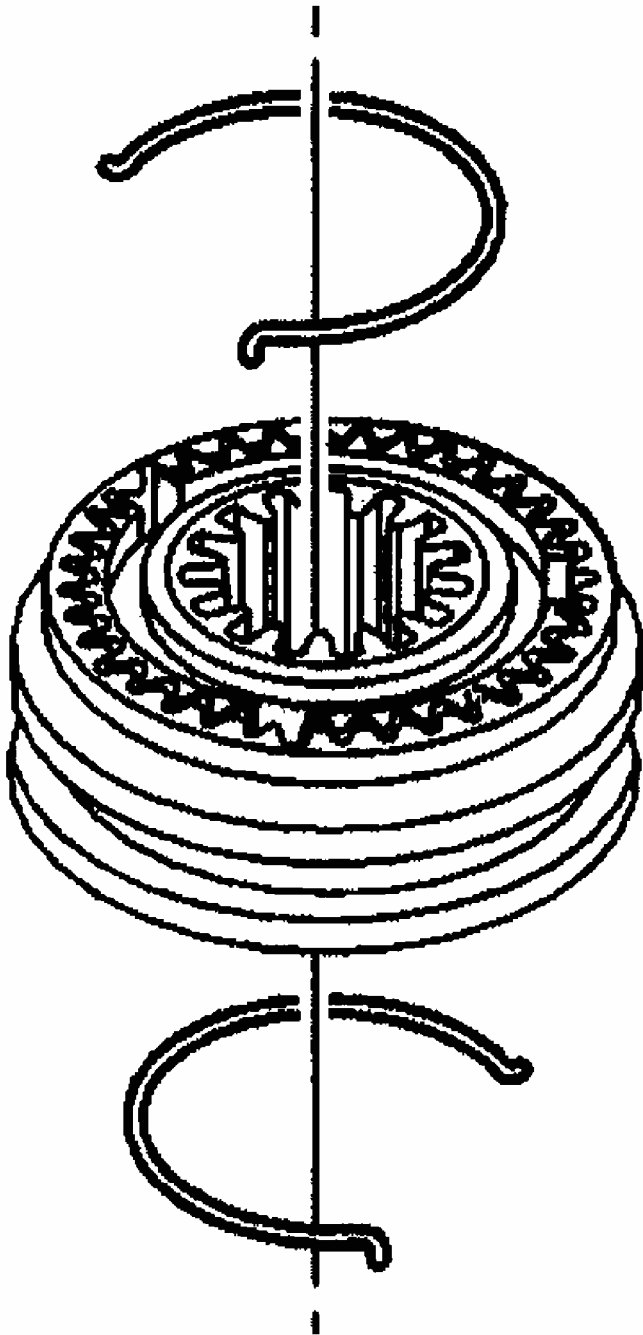
2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).
3. Install the keys with the slots facing the hub.



G01366685

Fig. 67: Installing Synchronizer Sleeve To Hub
Courtesy of GENERAL MOTORS CORP.

4. Assemble the first spring (assemble the spring tangs to the side of two keys).
5. Assemble the second spring (assemble the spring tangs to the side of two keys such that the gap is not between the same two keys as the first spring).



G01366686

Fig. 68: Assembling First Spring
Courtesy of GENERAL MOTORS CORP.

3rd/4th, 5th/6th Synchronizers

1. Check the synchronizer assembly scribe marks for correct positions.

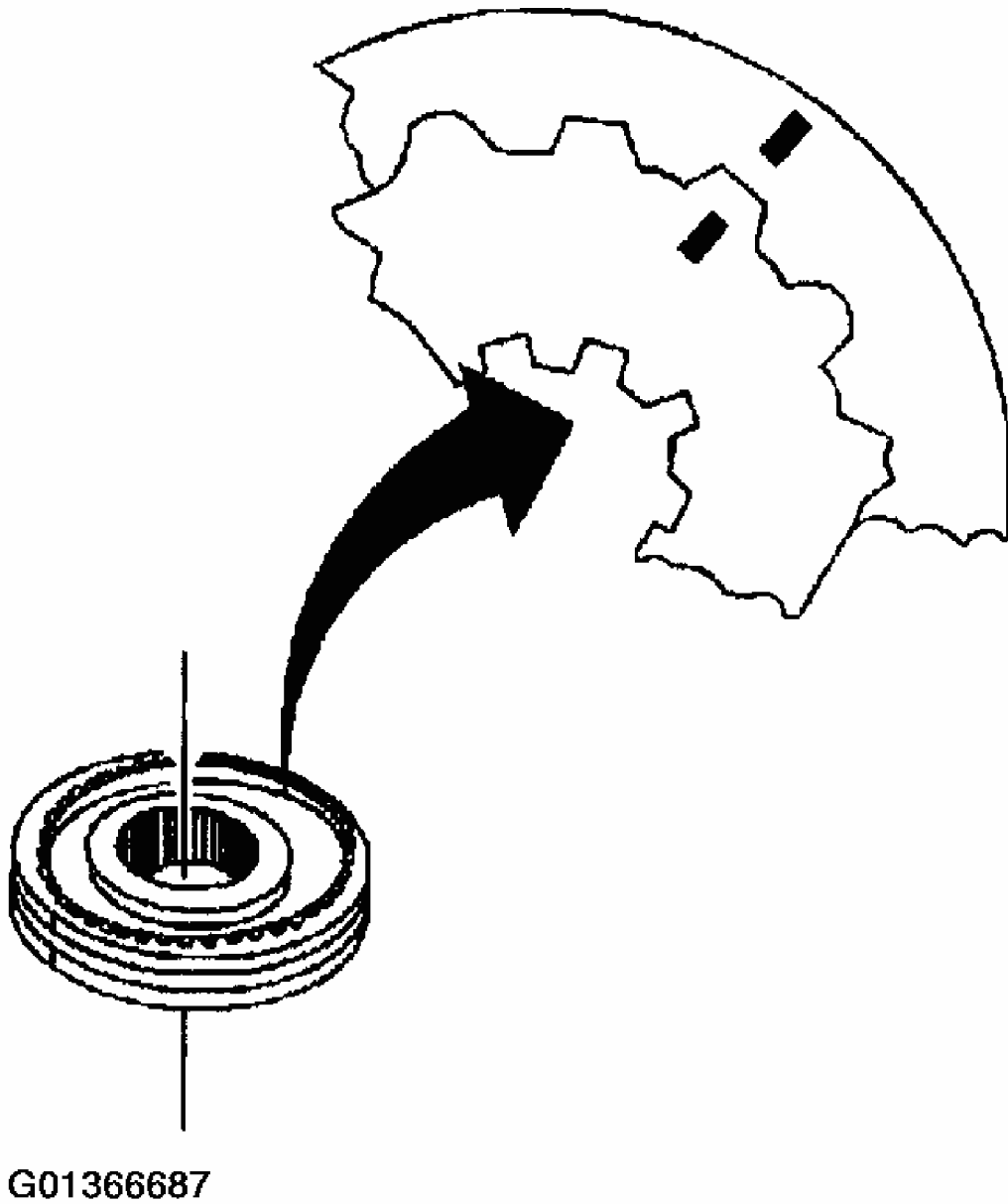
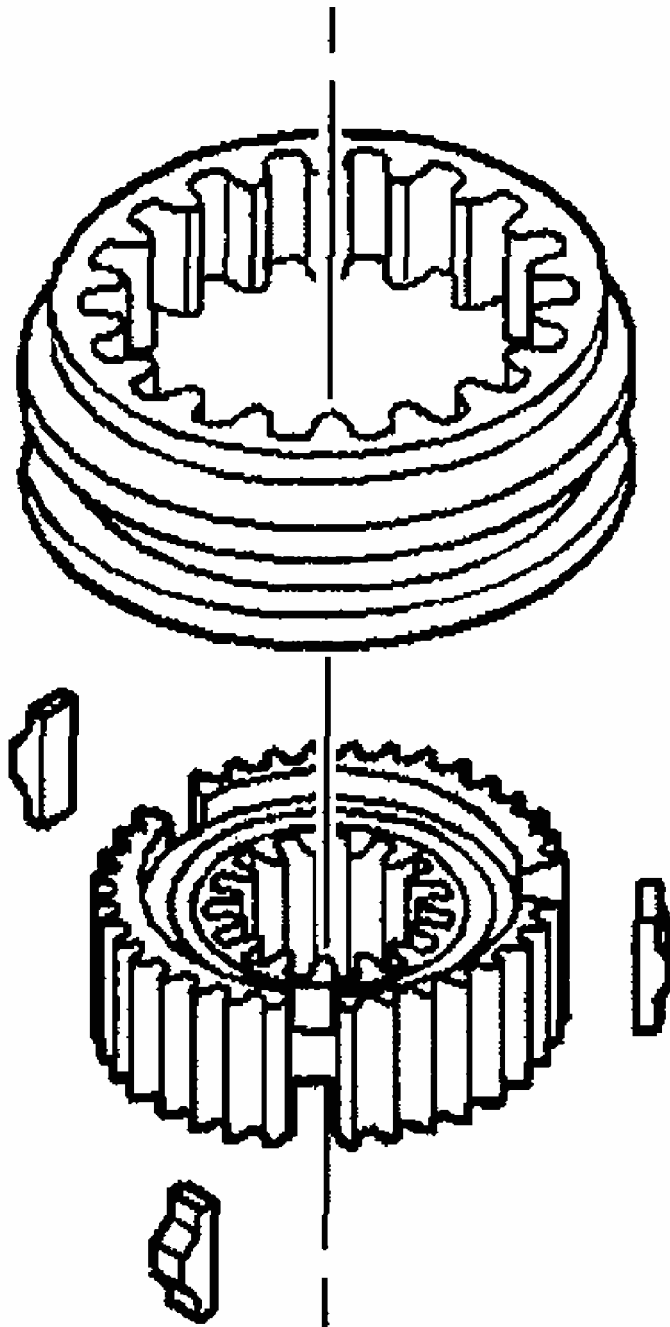


Fig. 69: Checking Synchronizer Assembly Scribe Marks
Courtesy of GENERAL MOTORS CORP.

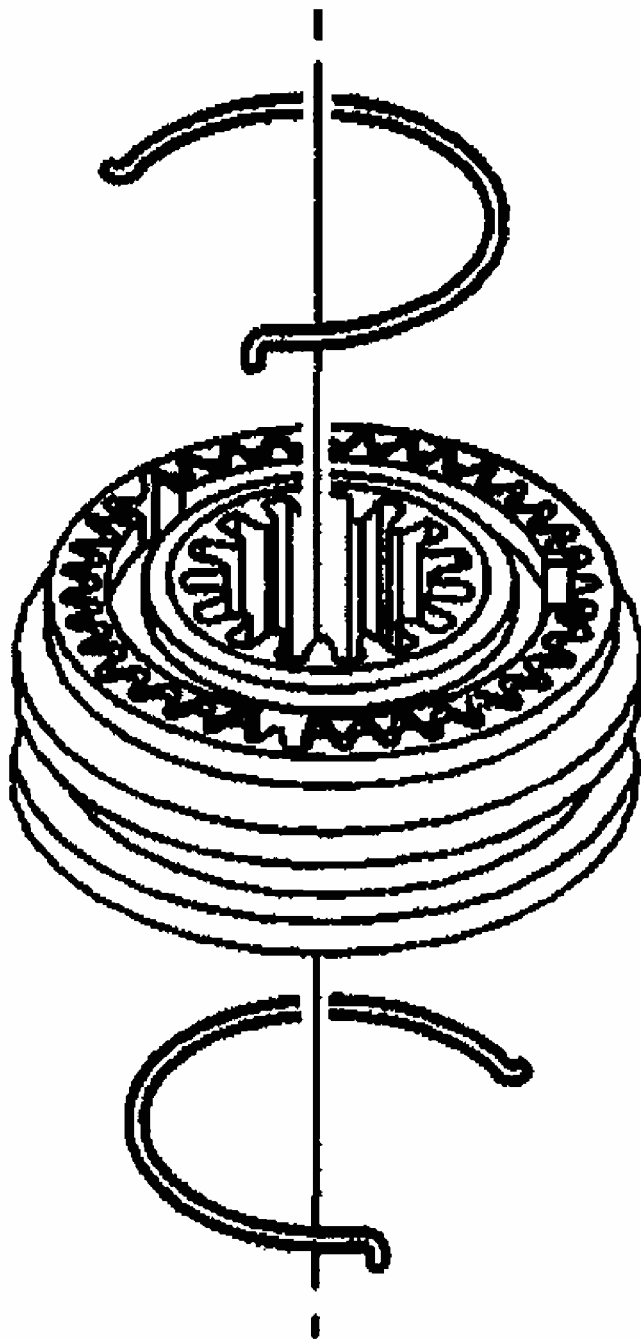
2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).



G01366688

Fig. 70: Installing Synchronizer Sleeve To Hub
Courtesy of GENERAL MOTORS CORP.

3. Install the keys with the slots facing the hub.
4. Assemble the first spring (assemble the spring tang to one of the key slots).



G01366689

Fig. 71: Assembling First Spring & Second Spring
Courtesy of GENERAL MOTORS CORP.

5. Assemble the second spring (assemble the spring tang on the same key but in the opposite direction).

1. Check the synchronizer assembly scribe marks for correct positions.

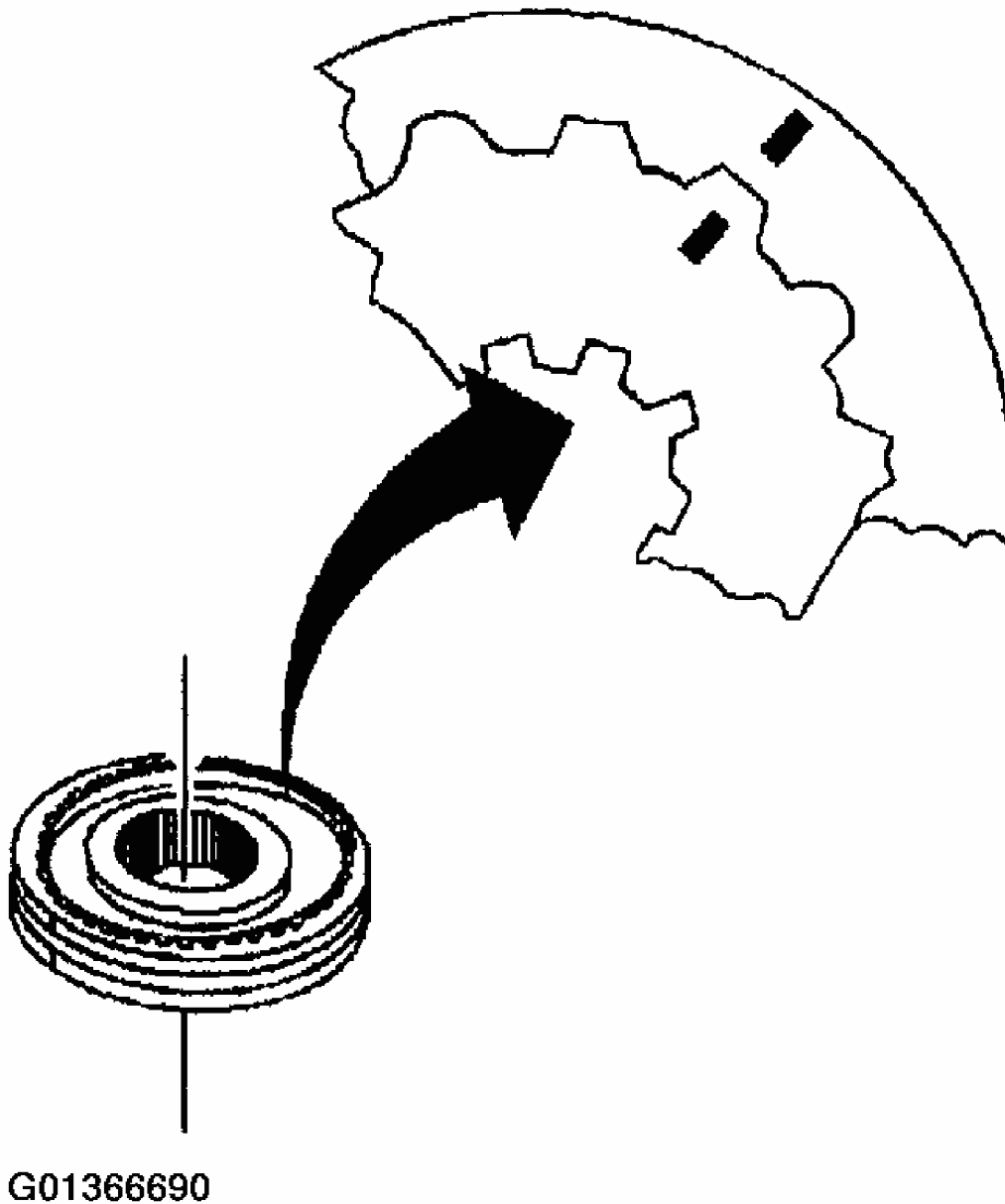
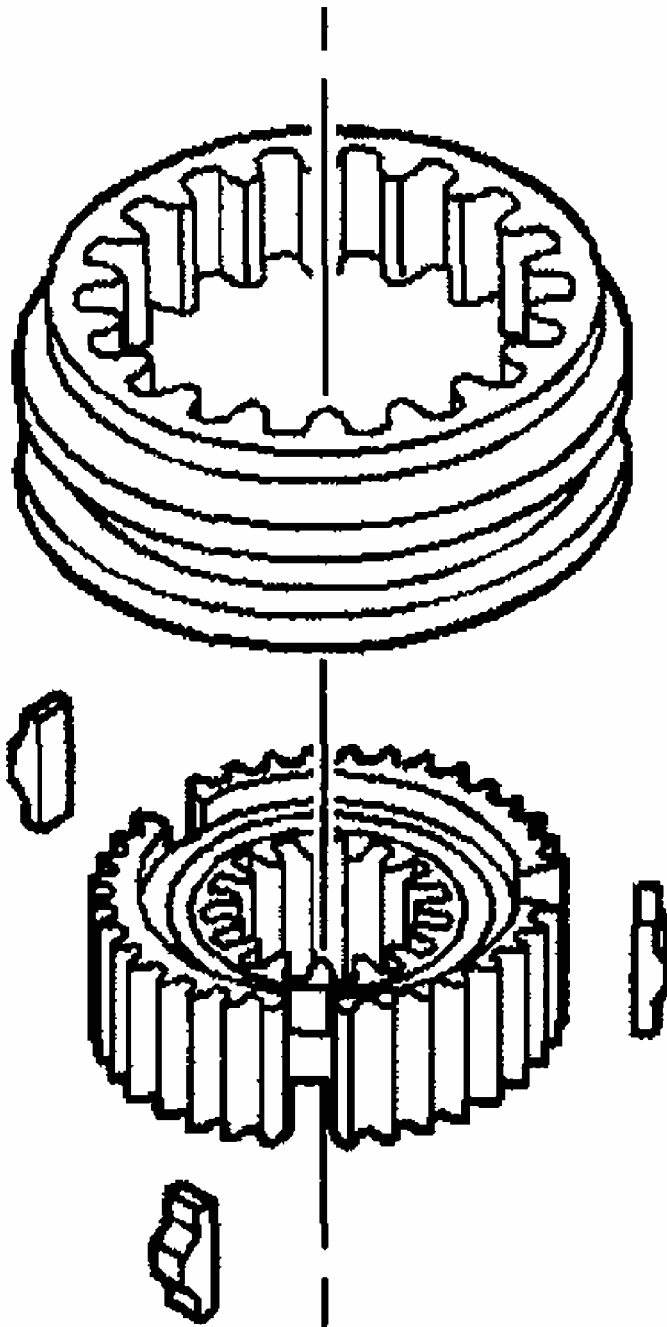


Fig. 72: Checking Synchronizer Assembly Scribe Marks For Correct Positions
Courtesy of GENERAL MOTORS CORP.

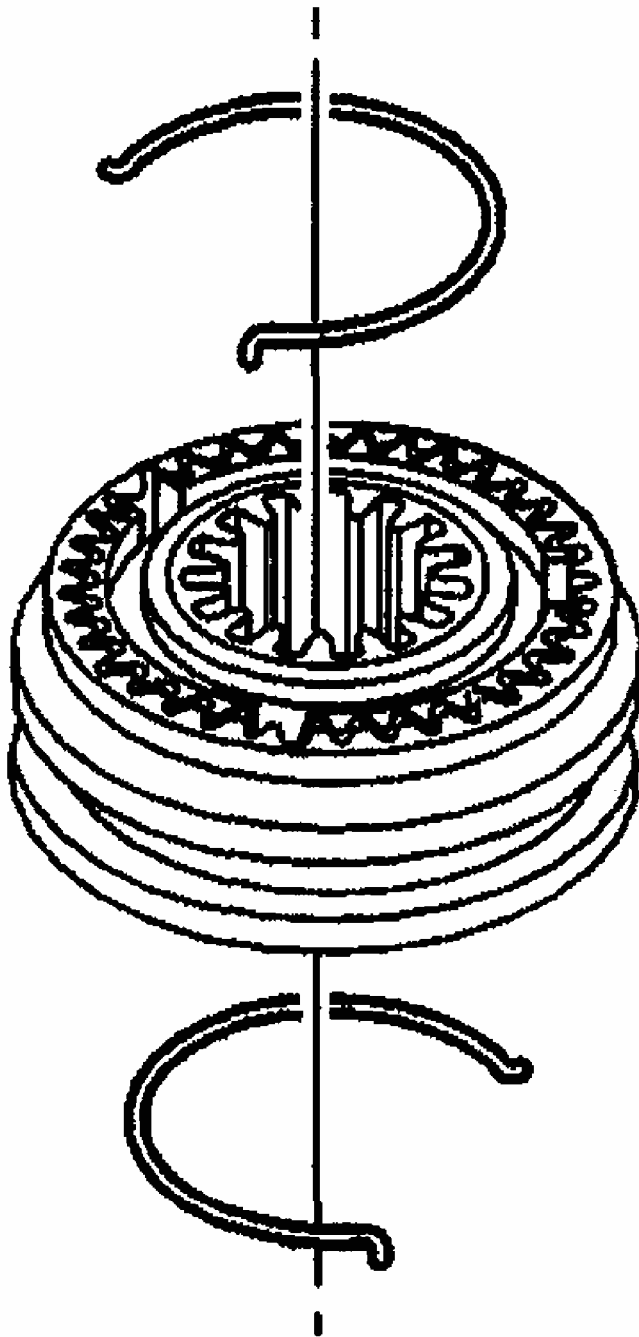
2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).



G01366691

Fig. 73: Installing Synchronizer Sleeve To Hub
Courtesy of GENERAL MOTORS CORP.

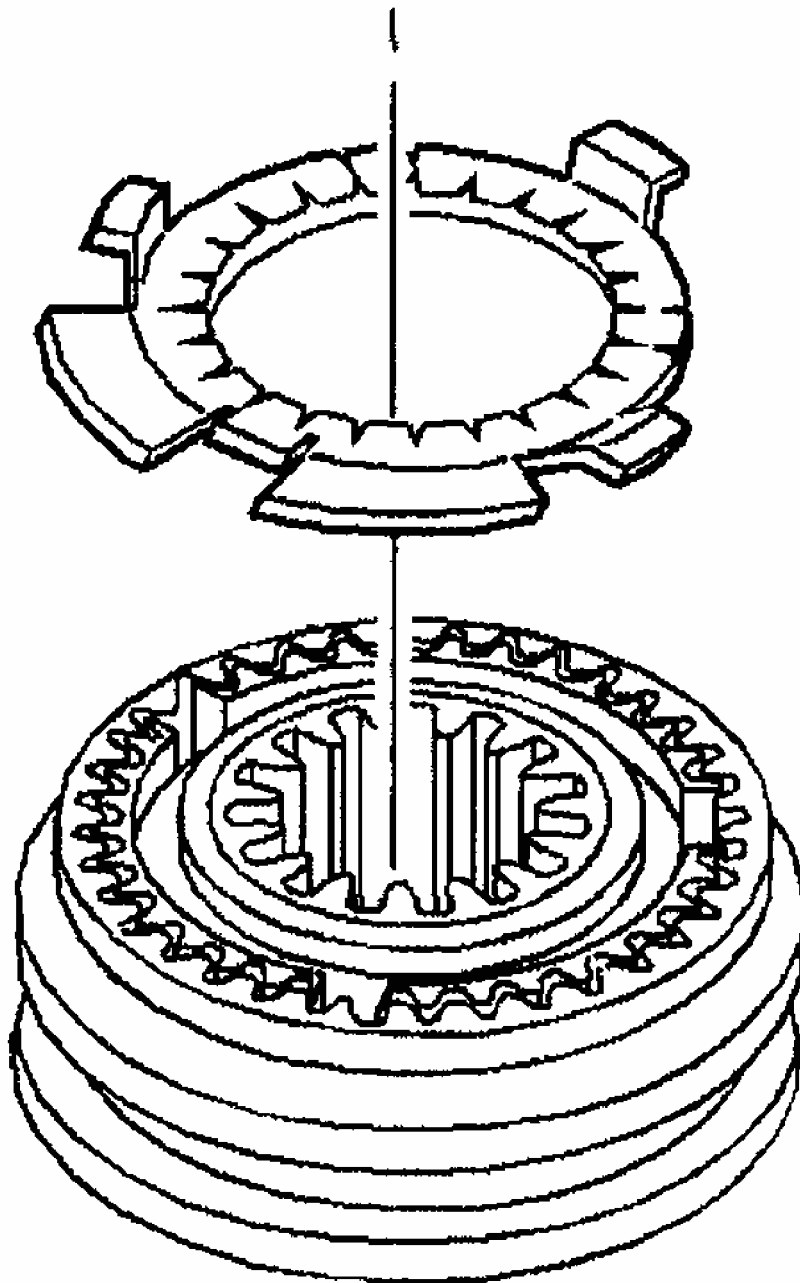
3. Install the keys with the slots facing the hub.
4. Assemble the first spring (assemble the spring tang to one of the key slots).



G01366692

Fig. 74: Assembling First Spring & Second Spring
Courtesy of GENERAL MOTORS CORP.

5. Assemble the second spring (assemble the spring tang on the same key but in the opposite direction).
6. Install a new synchronizer key retainer with the key retainer tangs over the synchronizer keys.



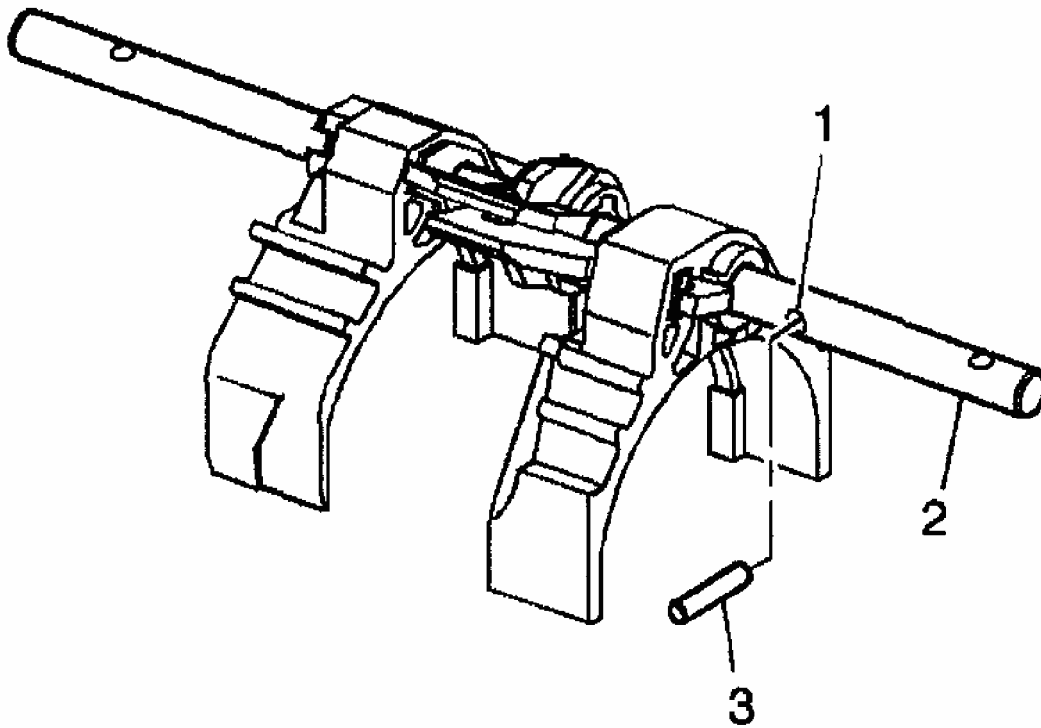
G01366693

Fig. 75: Installing Synchronizer Key Retainer With Key retainer
Courtesy of GENERAL MOTORS CORP.

SHIFT RAIL AND FORK ASSEMBLIES DISASSEMBLE

1st/2nd, 3rd/4th Shift Rail Assembly

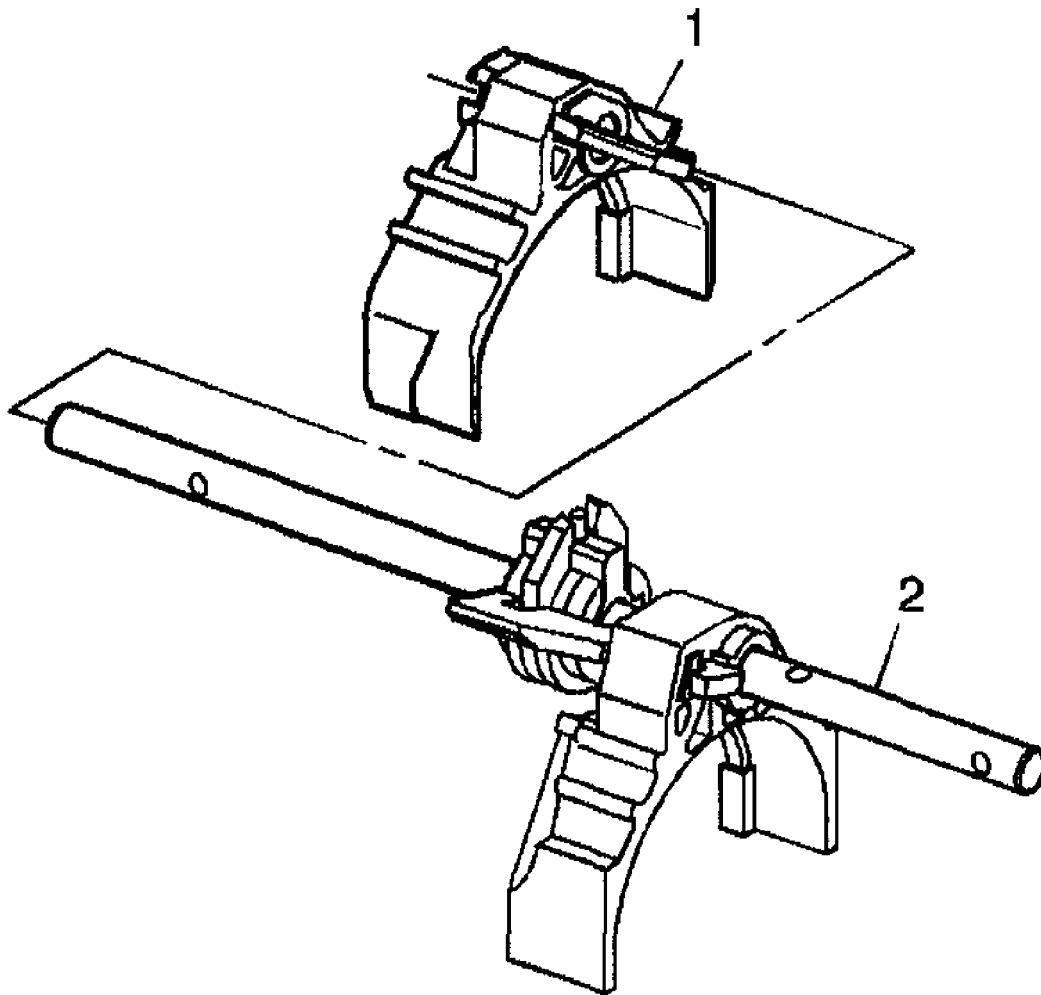
1. Remove the neutral return cam pin (3) from the shift shaft (2).



G01366694

Fig. 76: Removing Neutral Return Cam Pin From Shift Shaft
Courtesy of GENERAL MOTORS CORP.

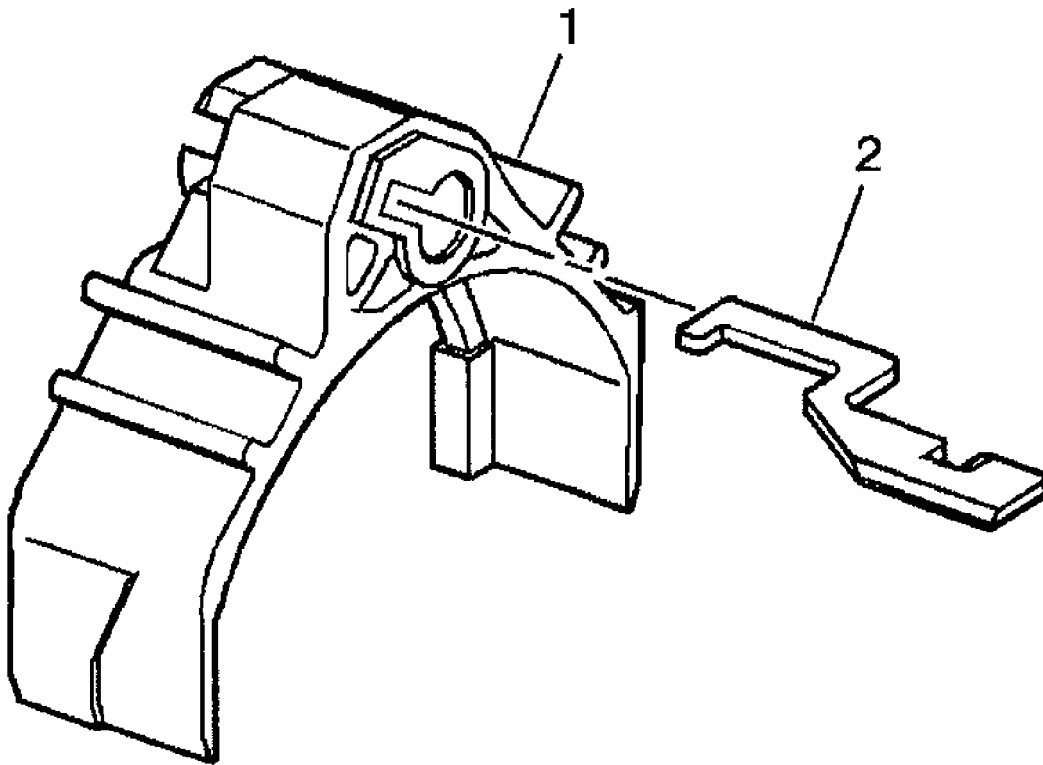
2. Remove the 1st/2nd shift fork (1) from the shift shaft (2).



G01366695

Fig. 77: Removing 1st/2nd Shift Fork From Shift Shaft
Courtesy of GENERAL MOTORS CORP.

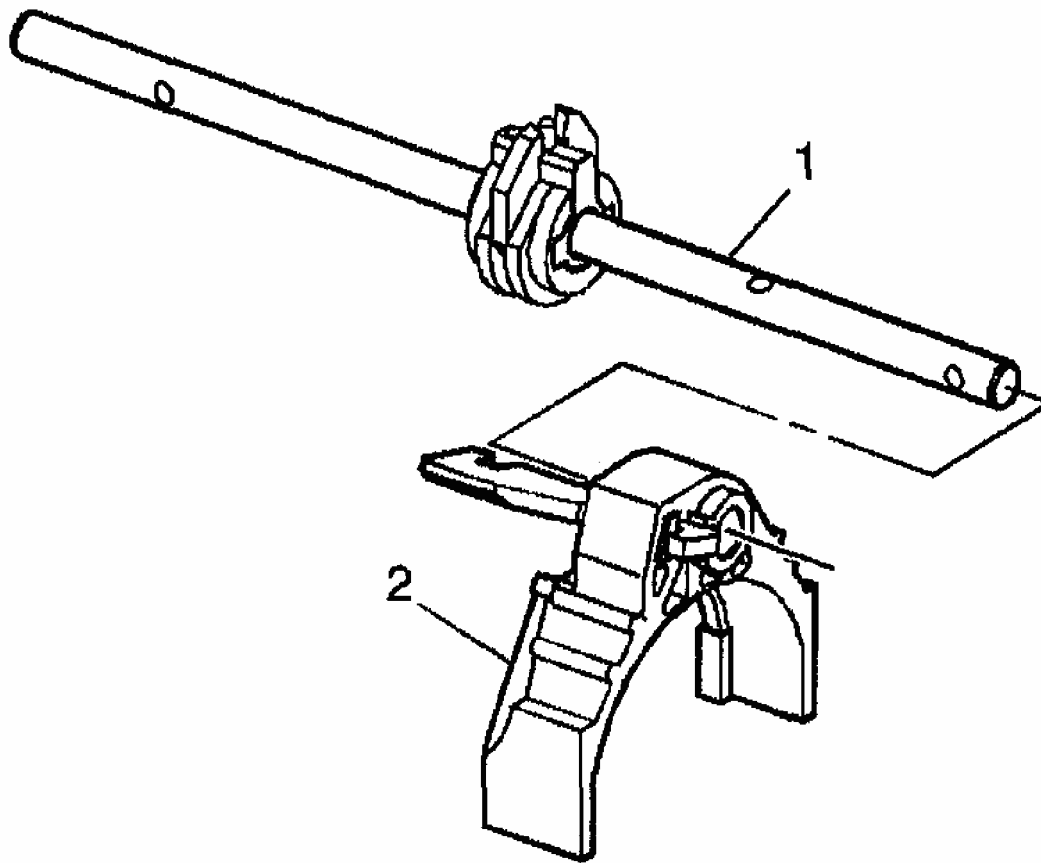
3. Remove the shift link (2) from the 1st/2nd shift fork (1).



G01366696

Fig. 78: Removing Shift Link From 1st/2nd Shift Fork
Courtesy of GENERAL MOTORS CORP.

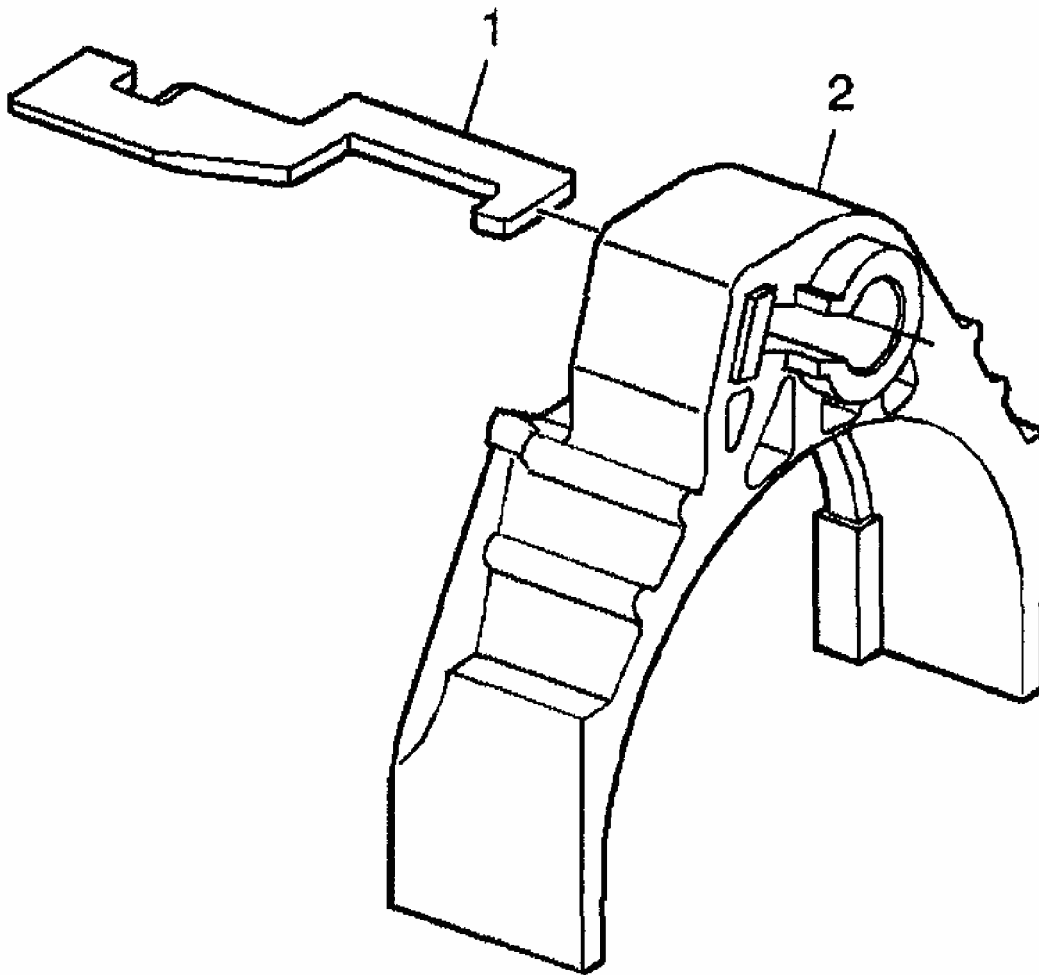
4. Remove the 3rd/4th shift fork (2) from the shift shaft (1).



G01366697

Fig. 79: Removing 3rd/4th Shift Fork From Shift Shaft
Courtesy of GENERAL MOTORS CORP.

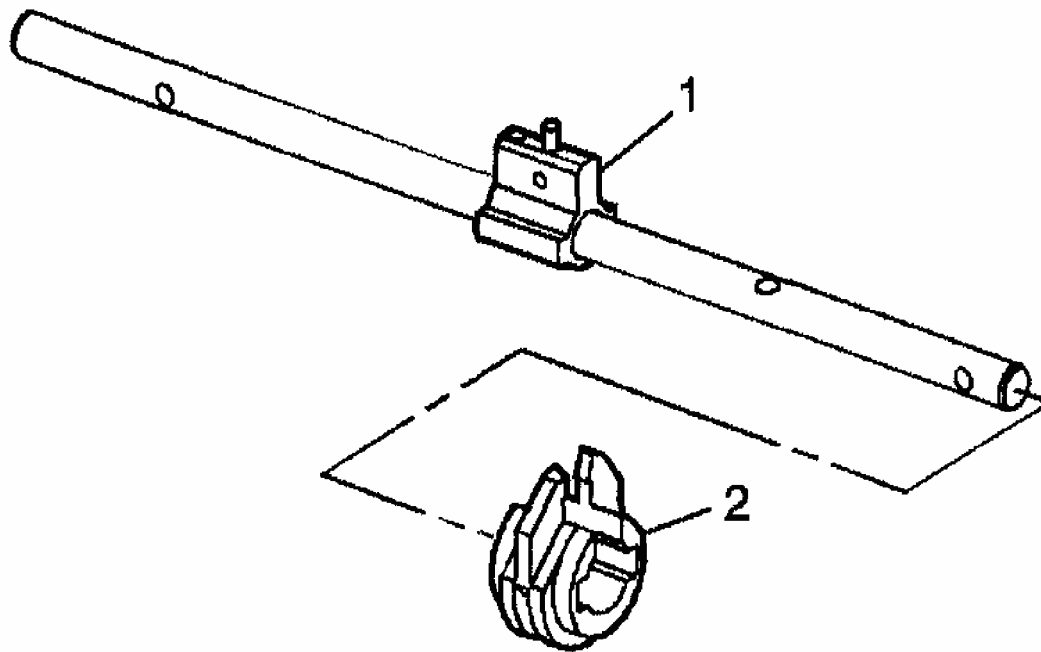
5. Remove the shift link (1) from the 3rd/4th shift fork (2).



G01366698

Fig. 80: Removing Shift Link From 3rd/4th Shift Fork
Courtesy of GENERAL MOTORS CORP.

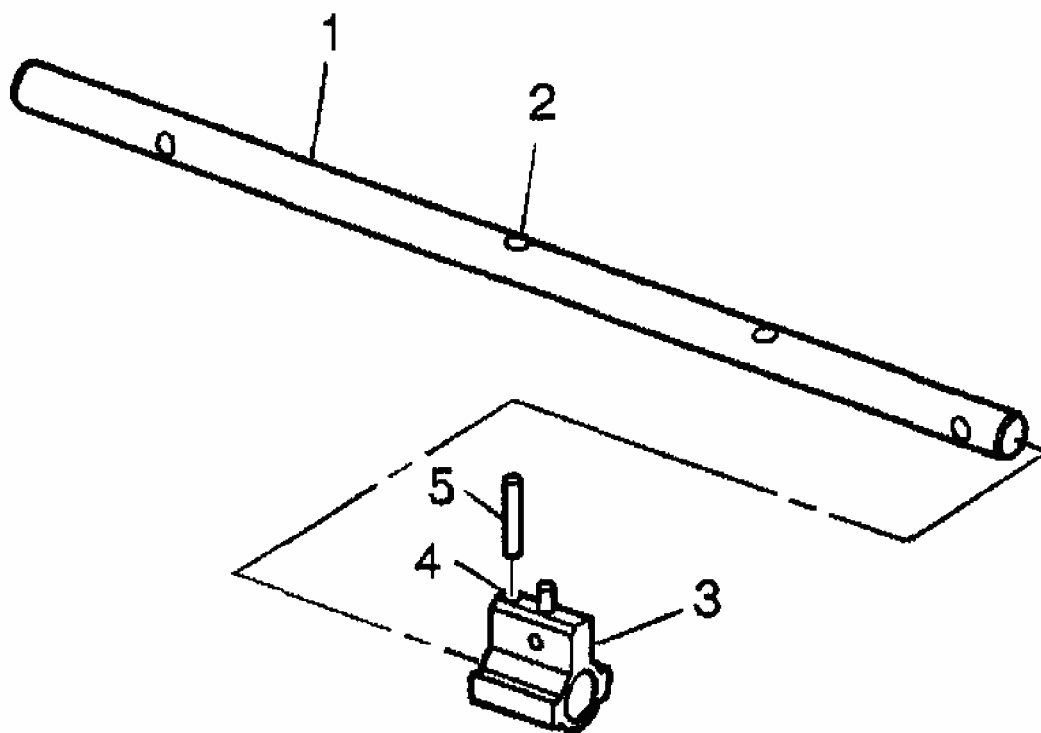
6. Remove the interlocking plate (2) from the selector pin (1).



G01366699

Fig. 81: Removing Interlocking Plate From Selector Pin
Courtesy of GENERAL MOTORS CORP.

7. Remove the selector roll pin (5).



G01366700

Fig. 82: Removing Selector Roll Pin
Courtesy of GENERAL MOTORS CORP.

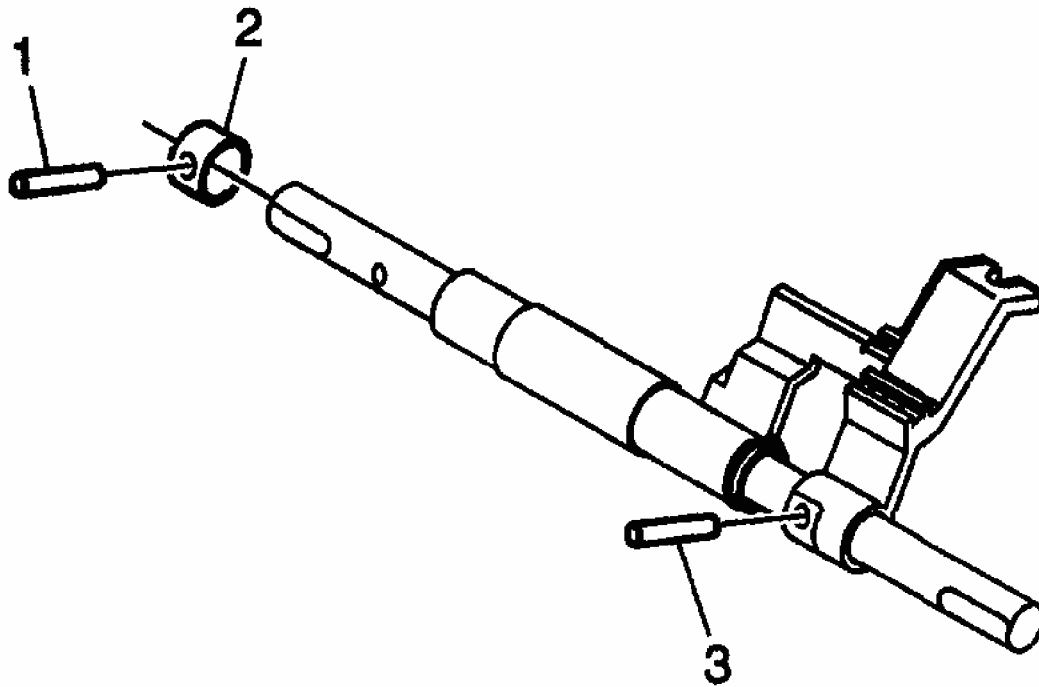
8. Remove the selector pin (3) from the shift shaft (1).

5th/6th, Reverse Shift Rail Assembly

Tools Required

- J 23907 Slide Hammer. See **Special Tools and Equipment** .
- J 39439-2 Bushing Remover. See **Special Tools and Equipment** .

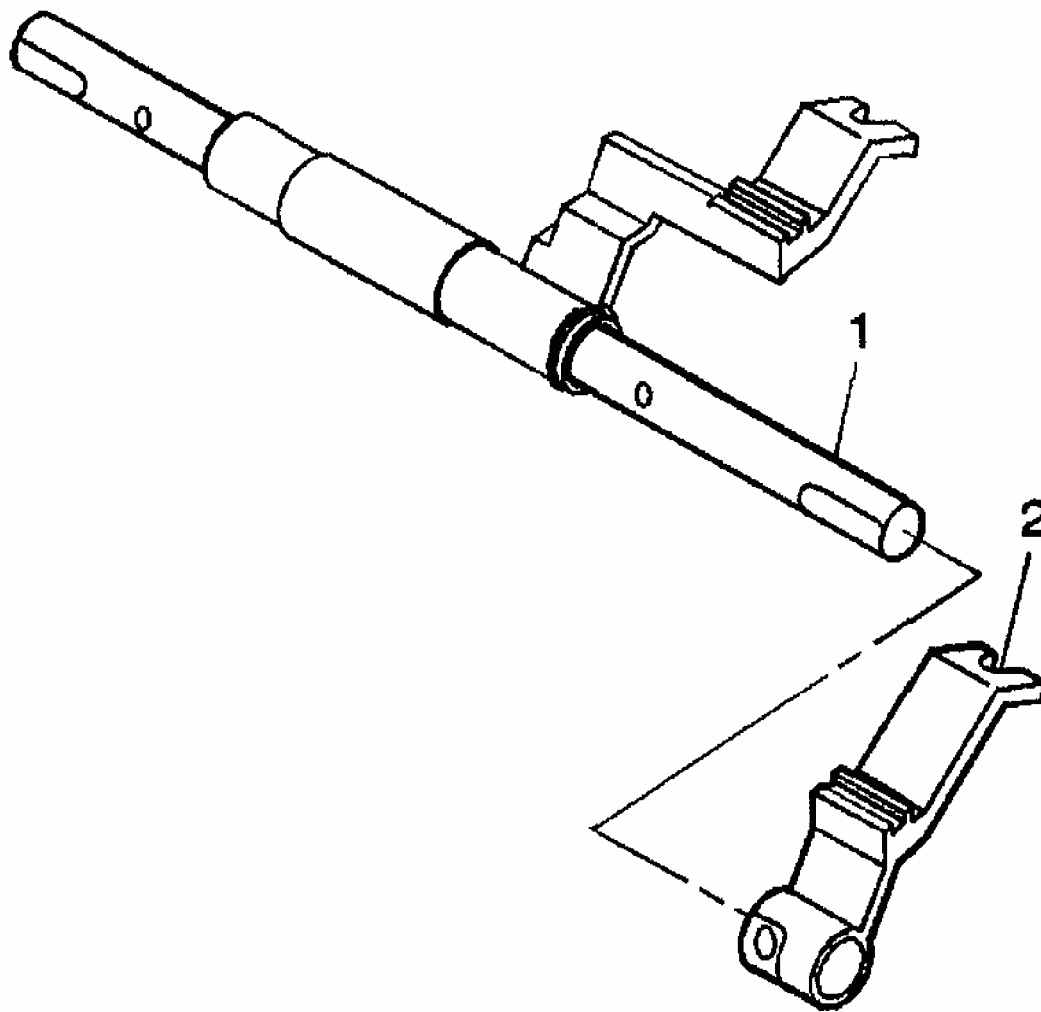
1. Remove the reverse collar roll pin (1).



G01366701

Fig. 83: Removing Reverse Collar & Roll Pin
Courtesy of GENERAL MOTORS CORP.

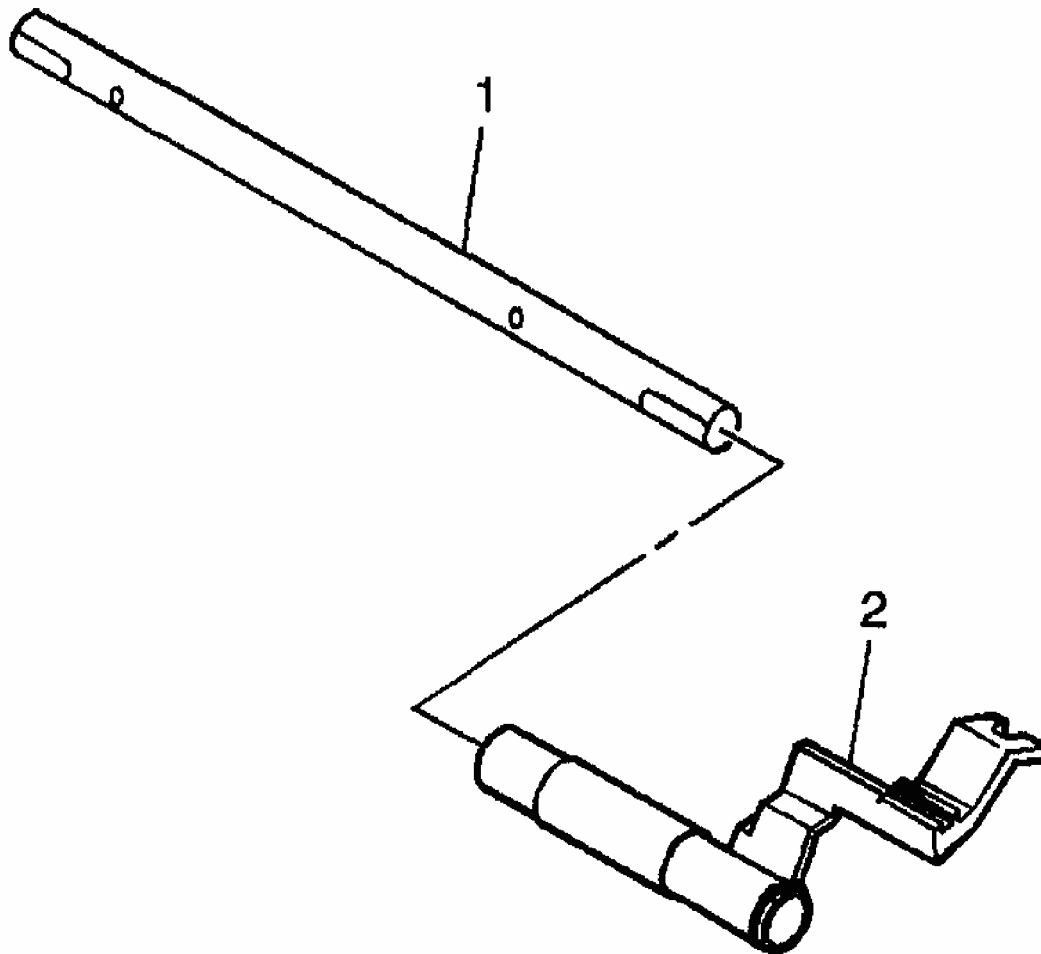
2. Remove the reverse collar (2).
3. Remove the reverse shift lever roll pin (3).
4. Remove the reverse shift lever (2) from the shift shaft (1).



G01366702

Fig. 84: Removing Reverse Shift Lever From Shift Shaft
Courtesy of GENERAL MOTORS CORP.

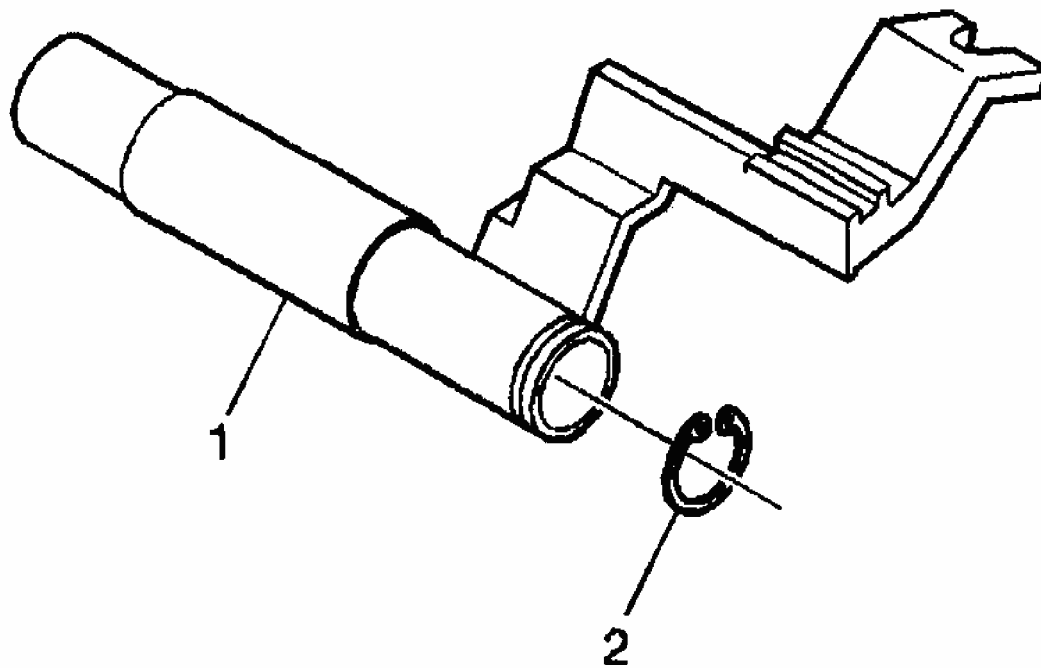
5. Remove the 5th/6th shift lever (2) from the shift rail (1).



G01366703

Fig. 85: Removing 5th/6th Shift Lever From Shift Rail
Courtesy of GENERAL MOTORS CORP.

6. Remove the snap ring (1) from the 5th/6th shift lever (2).

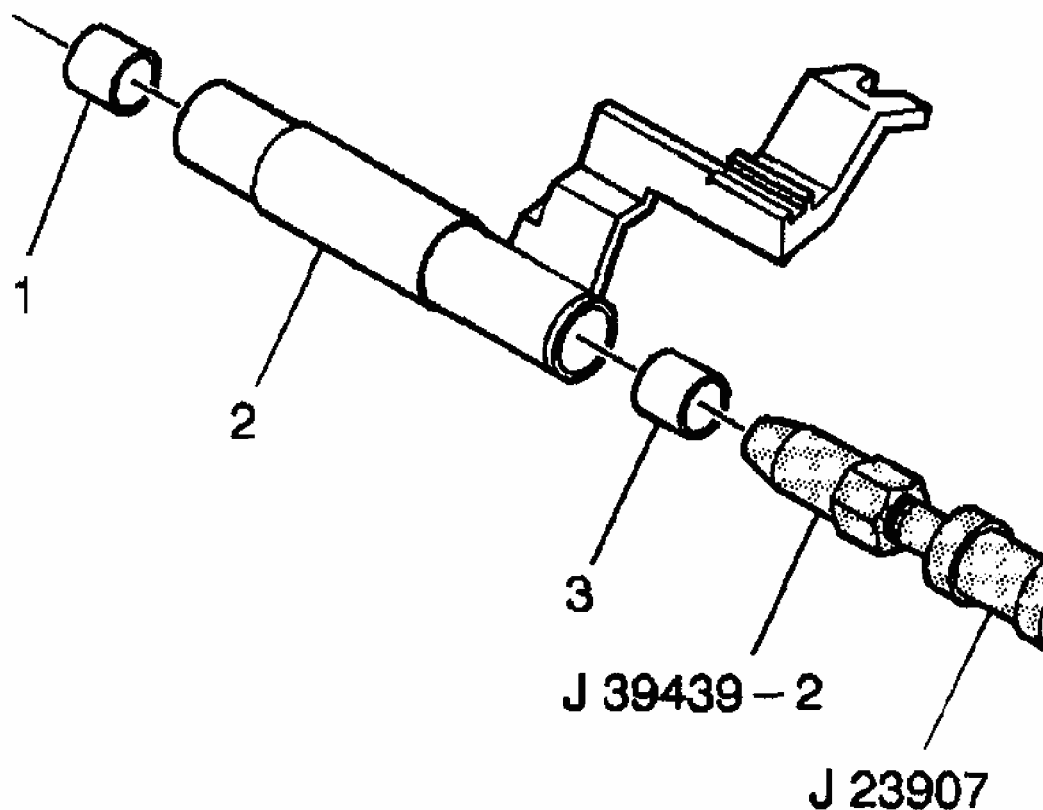


G01366704

Fig. 86: Removing Snap Ring From 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

Important: Do not replace the bushings unless inspection shows bushing damage.

7. Remove the 5th/6th shift shaft lever bushings (1) and (3) from the 5th/6th shift lever (2) using the J 23907 and the J 39439-2.

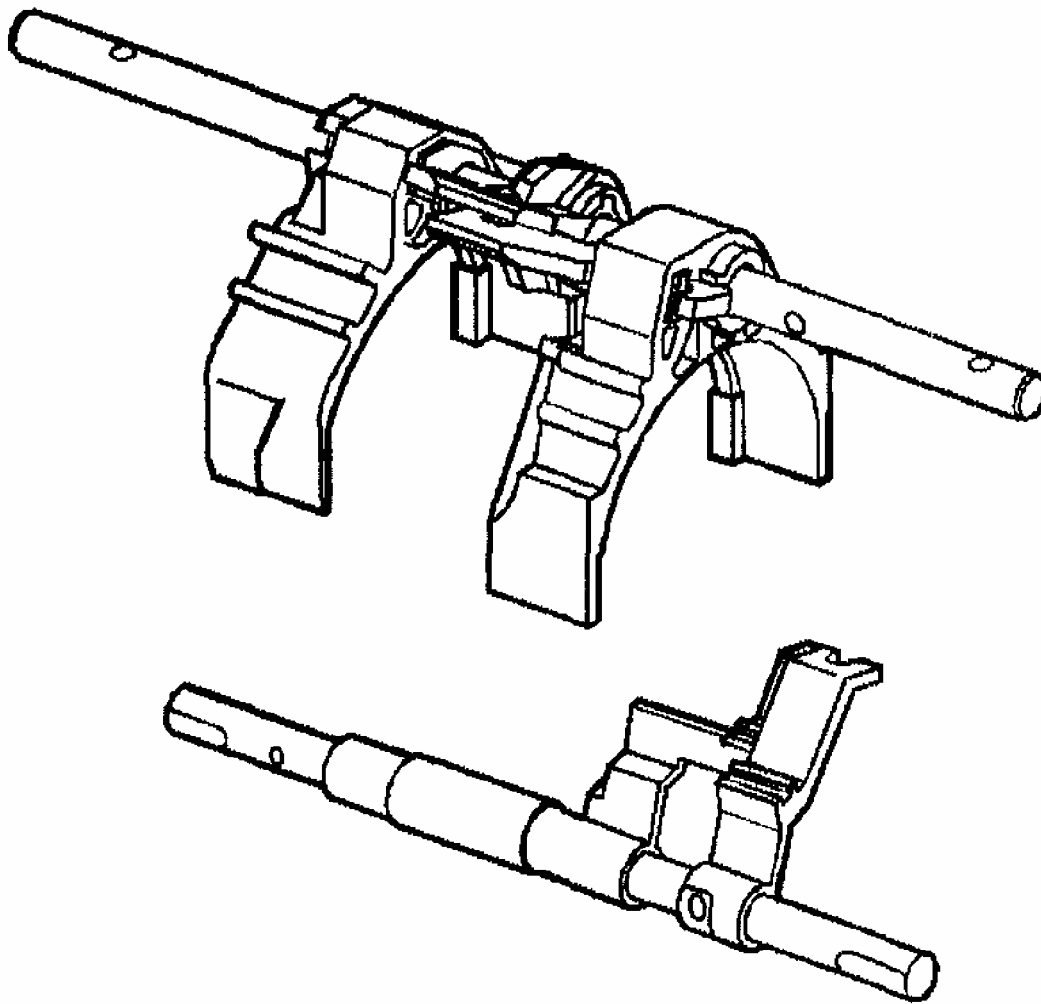


G01366705

Fig. 87: Removing 5th/6th Shift Shaft Lever Bushings From 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

SHIFT RAIL AND FORK ASSEMBLIES CLEANING AND INSPECTION

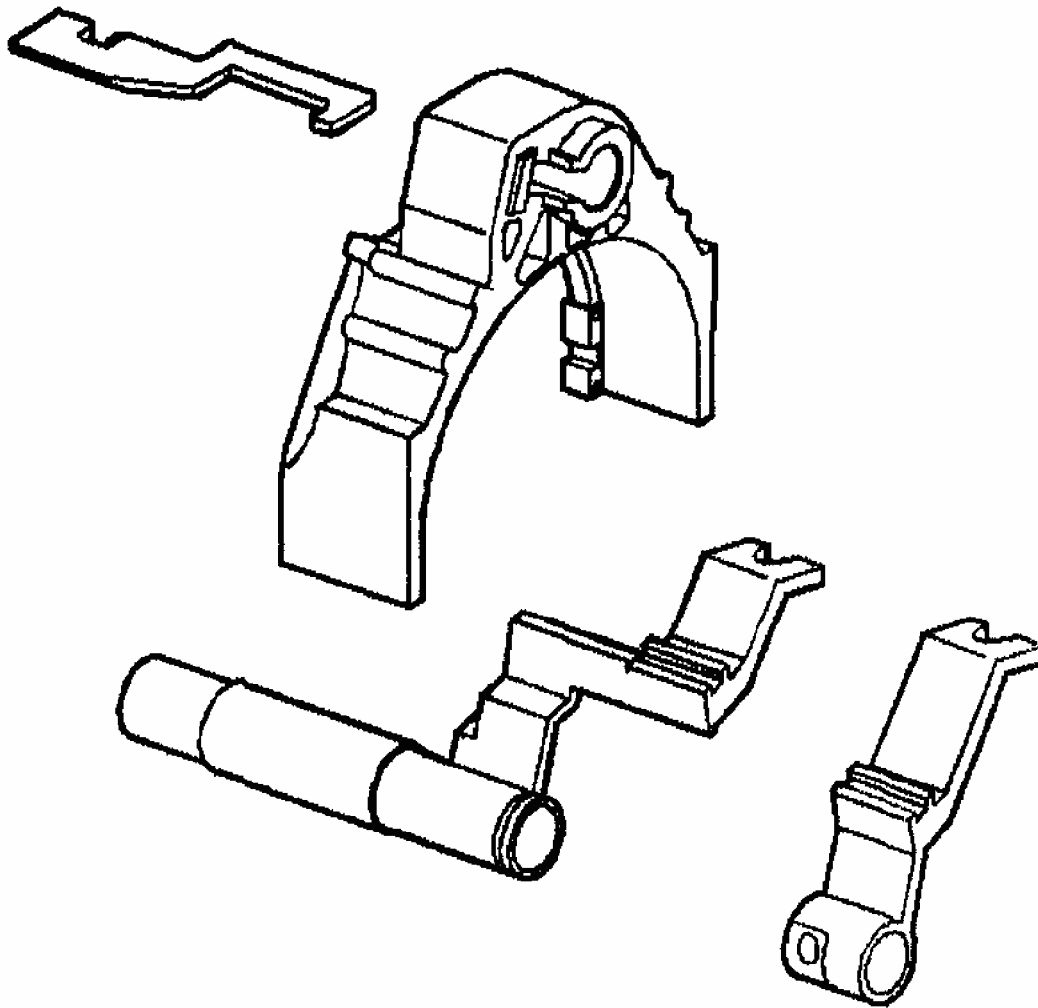
1. Clean the shift shaft and fork assembly parts with a suitable solvent. Air dry all the parts.



G01366706

Fig. 88: Cleaning Shift Shaft & Fork Assembly Parts
Courtesy of GENERAL MOTORS CORP.

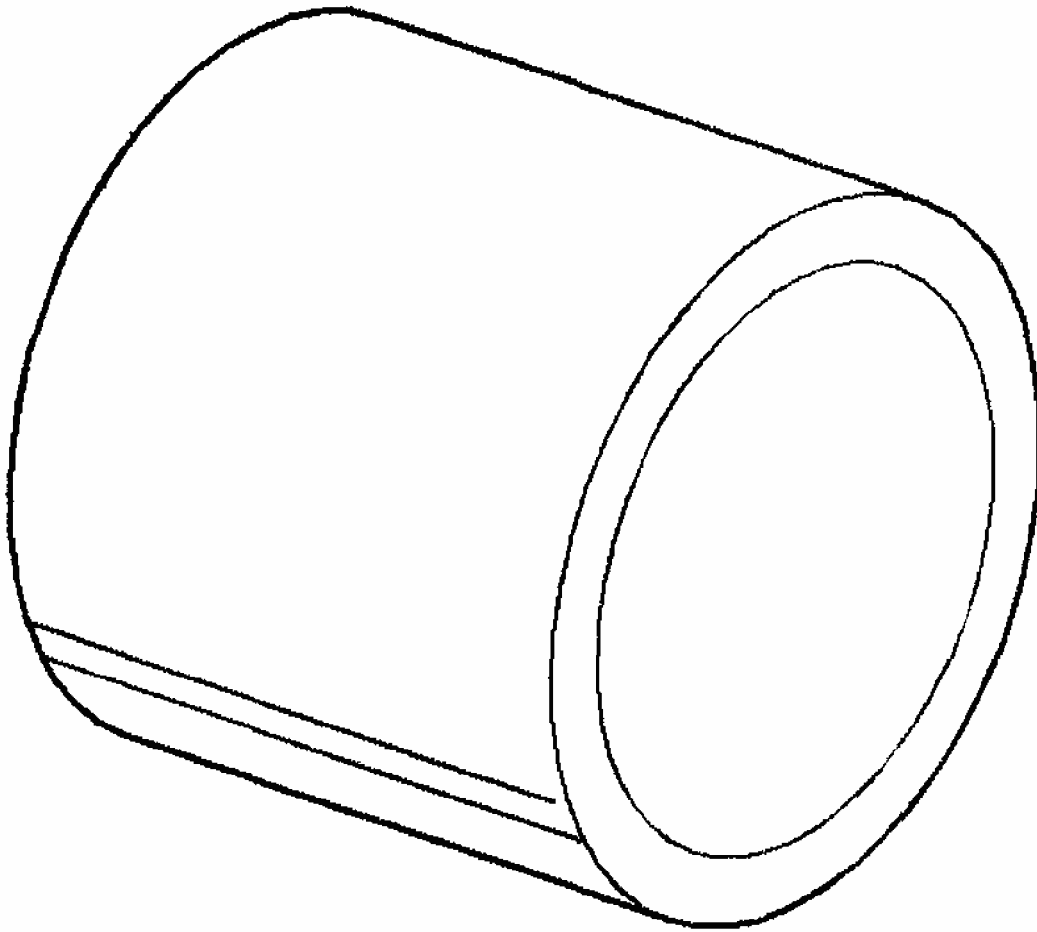
2. Inspect the shift forks and the shift links for excessive wear, fractures or distortion.



G01366707

Fig. 89: Inspecting Shift Forks & Shift Links For Excessive Wear
Courtesy of GENERAL MOTORS CORP.

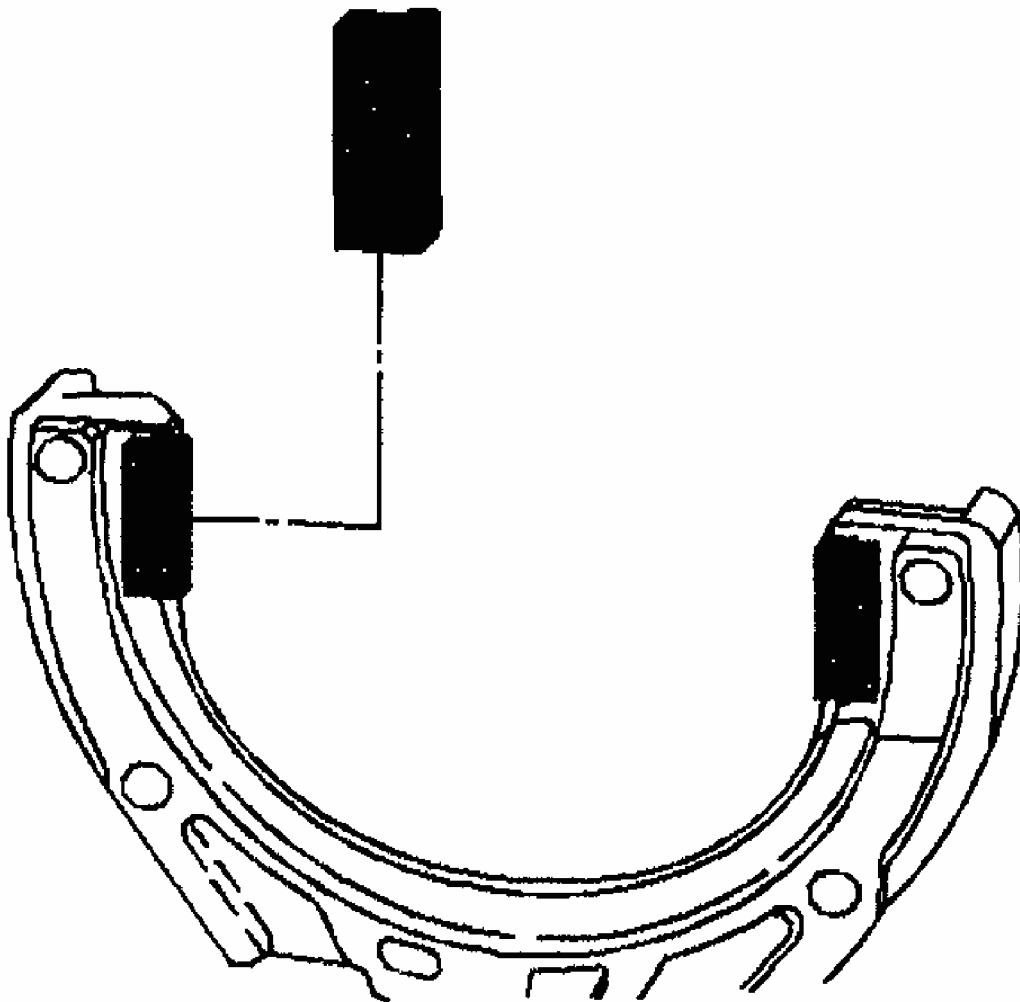
3. Inspect the shift shaft lever bushings for excessive wear.



G01366708

Fig. 90: Inspecting Shift Shaft Lever Bushings For Excessive Wear
Courtesy of GENERAL MOTORS CORP.

4. Inspect the shift fork nylon inserts for wear.



G01366709

Fig. 91: Inspecting Shift Fork
Courtesy of GENERAL MOTORS CORP.

5. Replace parts that are fractured, excessively worn, or distorted.
6. Replace an excessively worn or burred shift shaft.

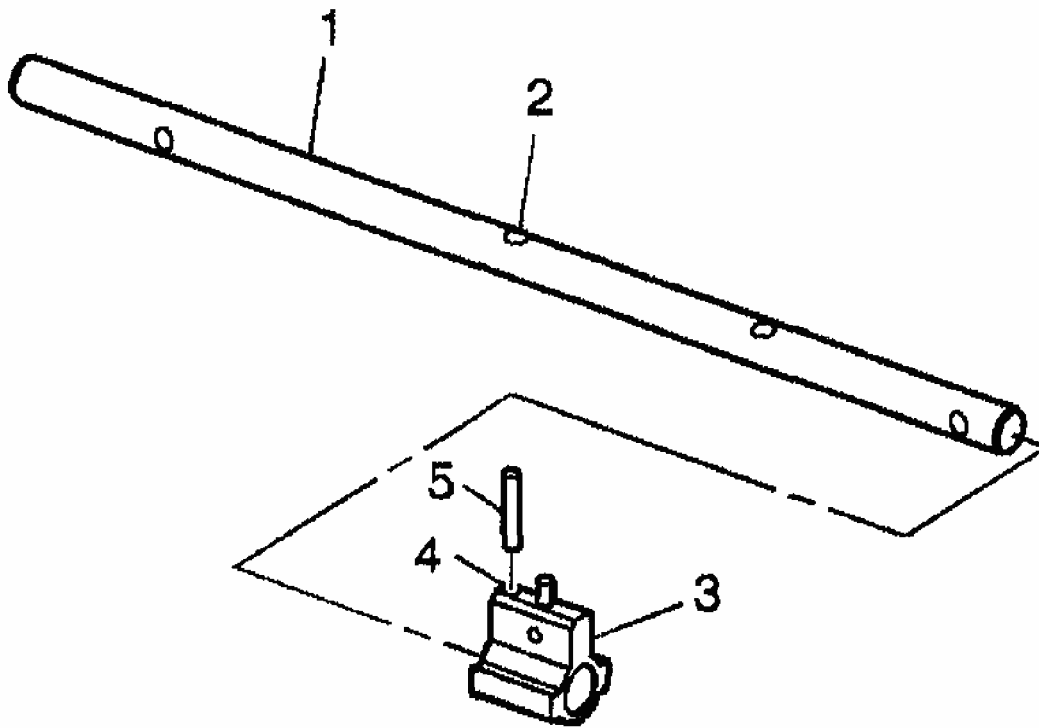
SHIFT RAIL AND FORK ASSEMBLIES ASSEMBLE

1st/2nd, 3rd/4th Shift Rail Assembly

Tools Required

J 36850 Transjel Lubricant. See **Special Tools and Equipment** .

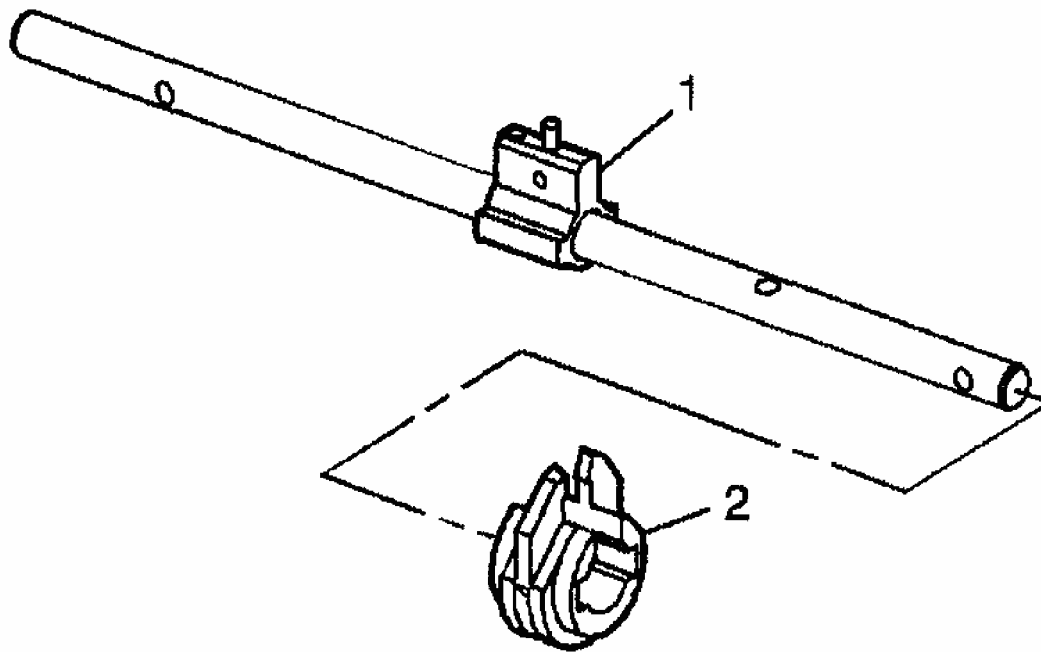
1. Install the selector pin (3) on the shift shaft (4).



G01366710

Fig. 92: Installing Selector Pin On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

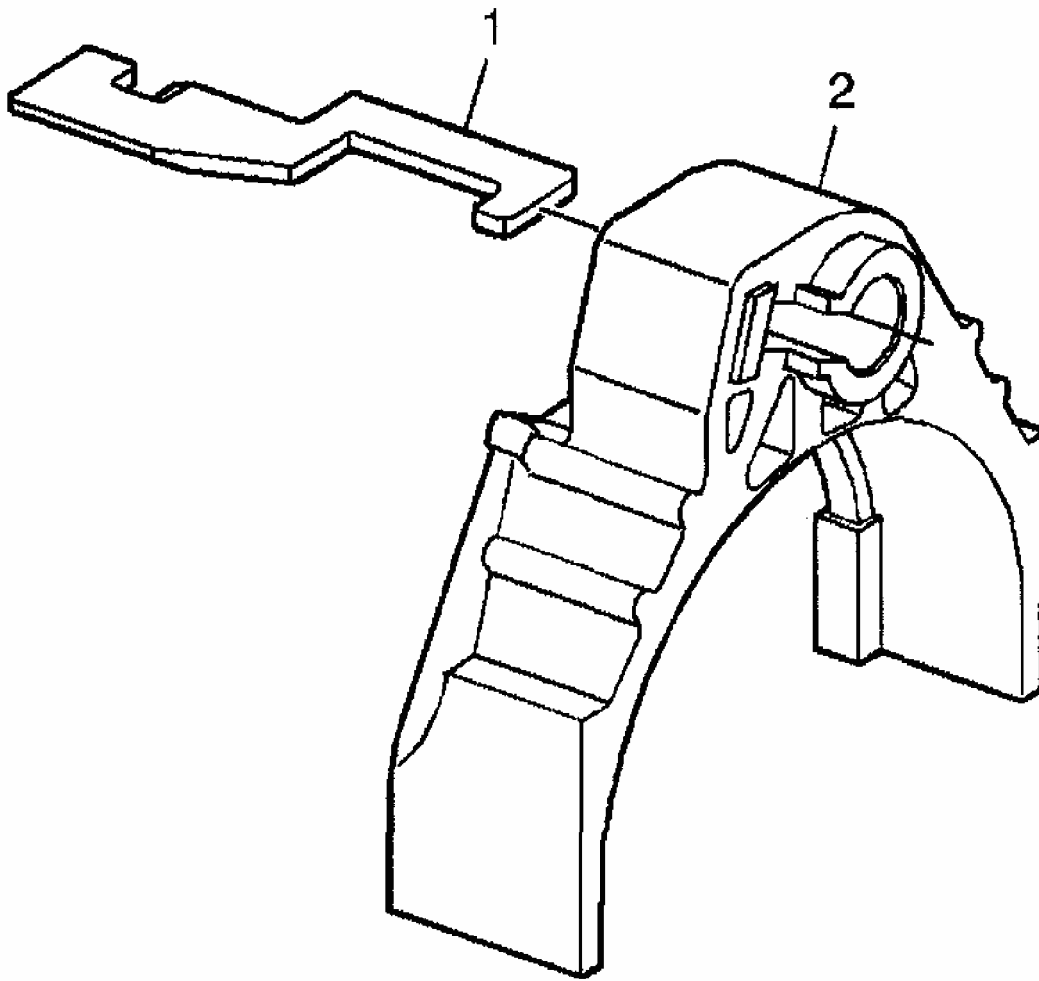
2. Align the roll pin hole on the selector pin (4) with the roll pin hole on the shift shaft (2).
3. Install the roll pin (5) through the selector pin (3) and the shift shaft (1).
4. Install the interlocking plate (2) on the selector pin (1).



G01366711

Fig. 93: Installing Interlocking Plate On Selector Pin
Courtesy of GENERAL MOTORS CORP.

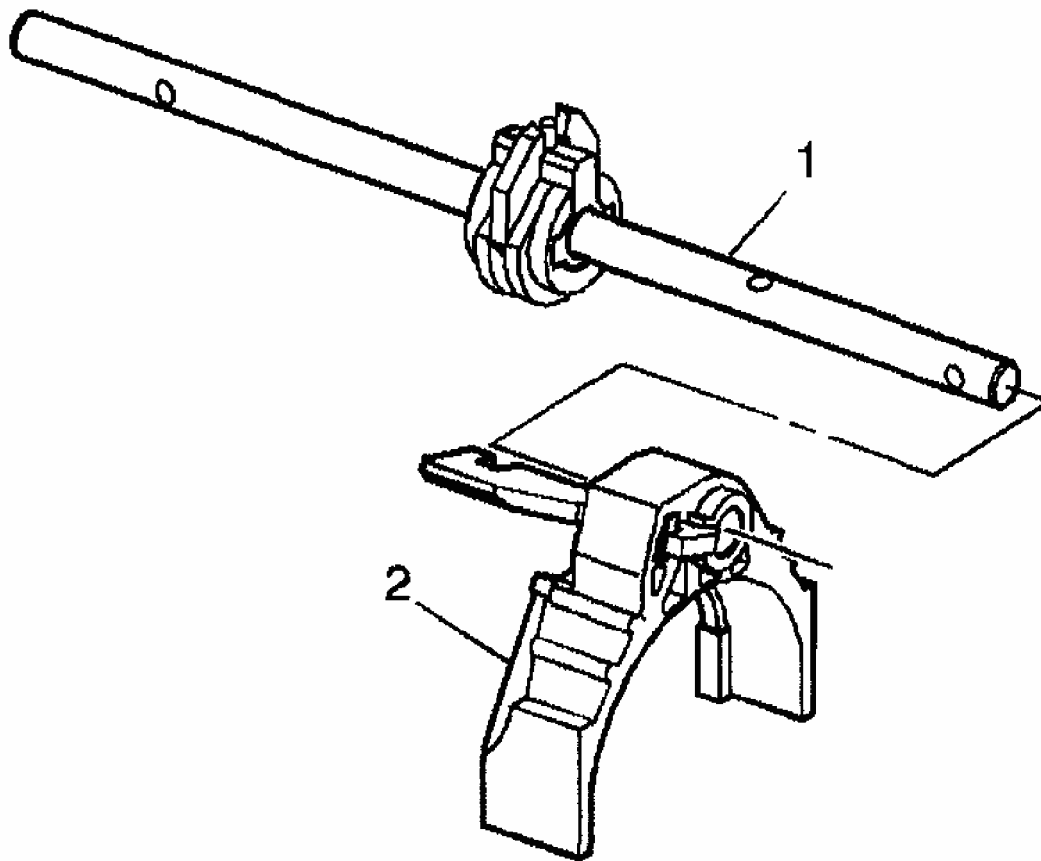
5. Install the shift link (1) in the 3rd/4th shift fork (2).



G01366712

Fig. 94: Installing Shift Link In 3rd/4th Shift Fork
Courtesy of GENERAL MOTORS CORP.

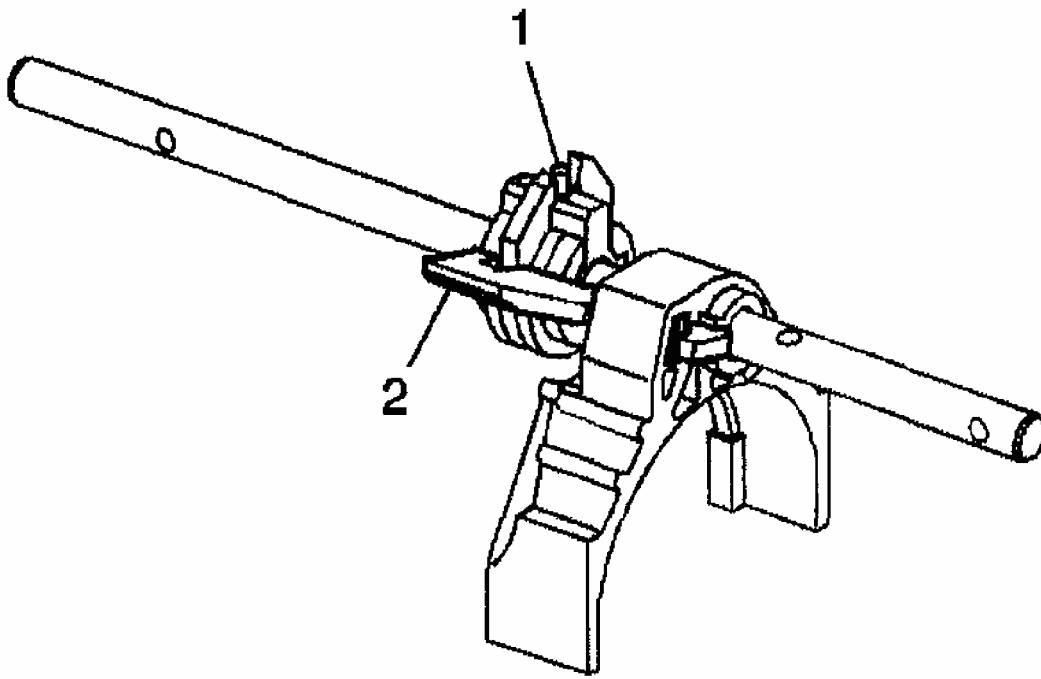
6. Install the 3rd/4th shift fork (2) on the shift shaft (1).



G01366713

Fig. 95: Installing 3rd/4th Shift Fork On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

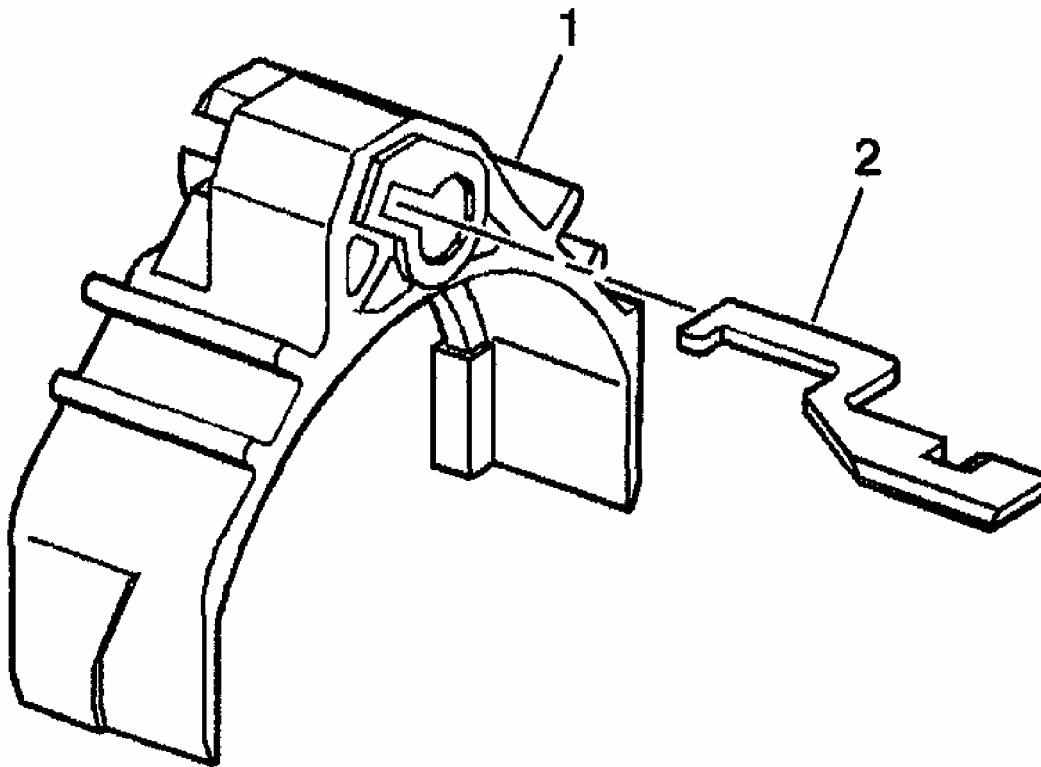
7. Align the notch on the shift link (2) with the selector roll pin (1).



G01366714

Fig. 96: Aligning Notch On Shift Link With Selector Roll Pin
Courtesy of GENERAL MOTORS CORP.

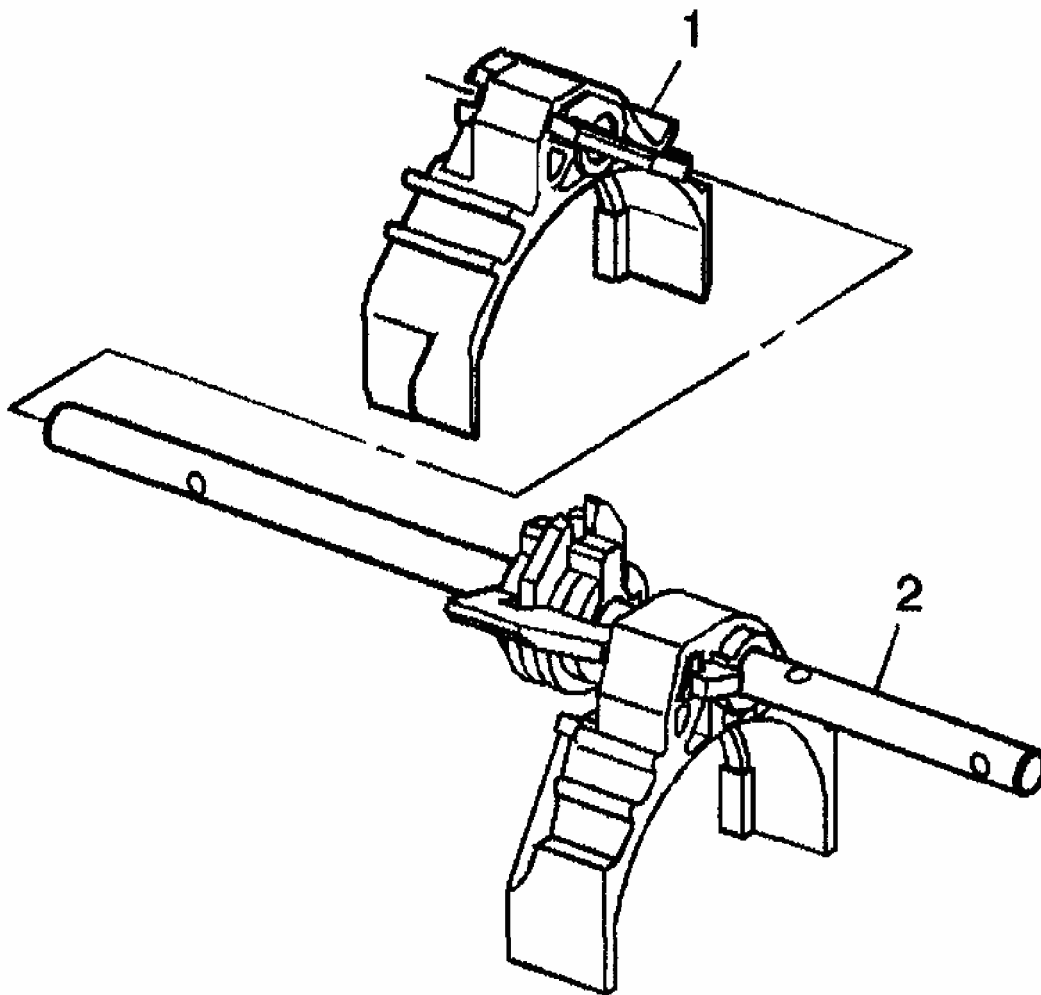
8. Install the shift link (2) with the 1st/2nd shift fork (1).



G01366715

Fig. 97: Installing Shift Link With 1st/2nd Shift Fork
Courtesy of GENERAL MOTORS CORP.

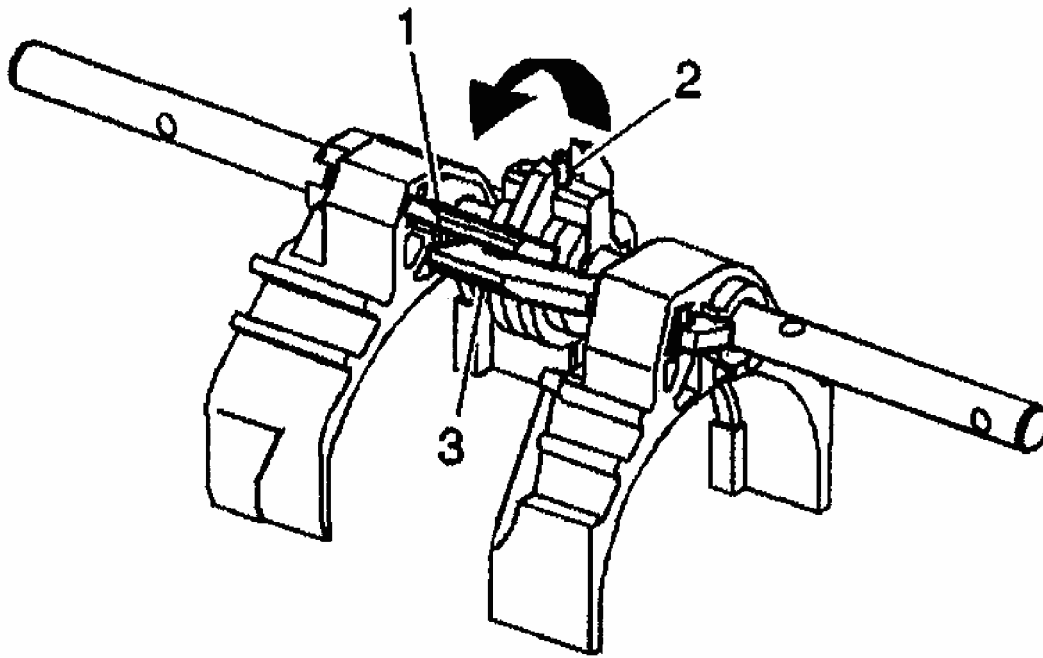
9. Install the 1st/2nd shift fork (1) on the shift shaft (2).



G01366716

Fig. 98: Installing 1st/2nd Shift Fork On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

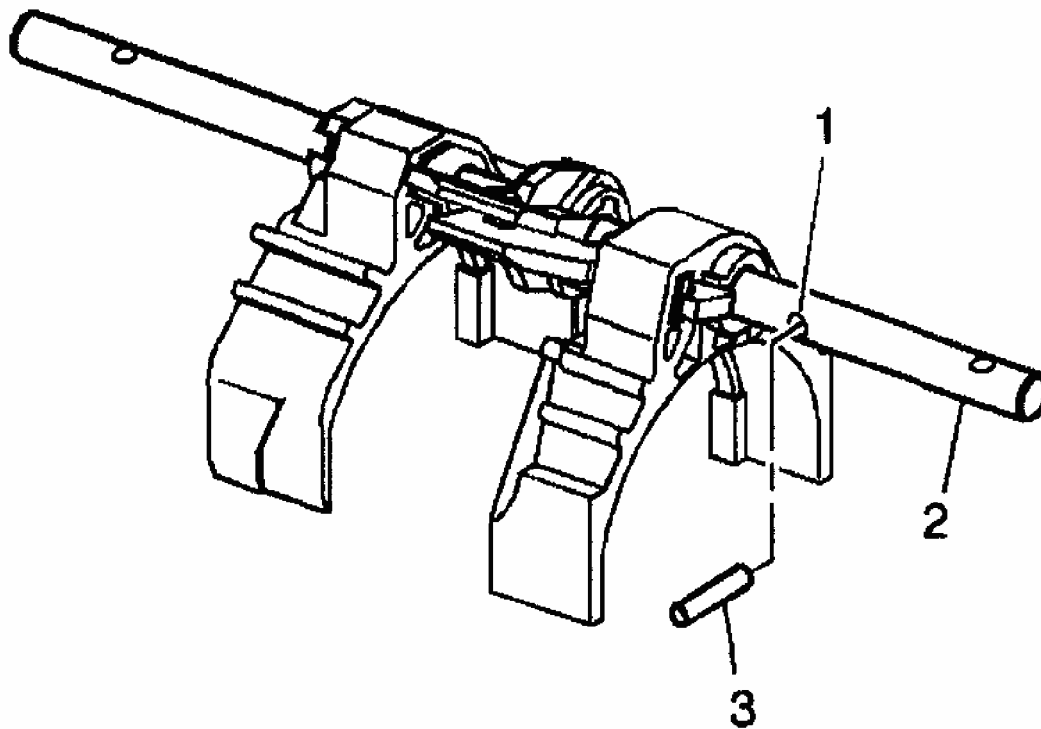
10. Install the 1st/2nd shift shaft link (1) on top of the 3rd/4th shift shaft link (3) on the interlocking plate and the selector roll pin assembly (2).



G01366717

Fig. 99: Installing 1st/2nd Shift Shaft Link On Top Of 3rd/4th Shift Shaft Link
Courtesy of GENERAL MOTORS CORP.

Important: The neutral return cam pin fits loosely in the shift shaft. Use the J 36850 to hold the neutral return cam pin in place.



G01366718

Fig. 100: Installing Neutral Return Cam Pin In Neutral Return Can Pin Hole
Courtesy of GENERAL MOTORS CORP.

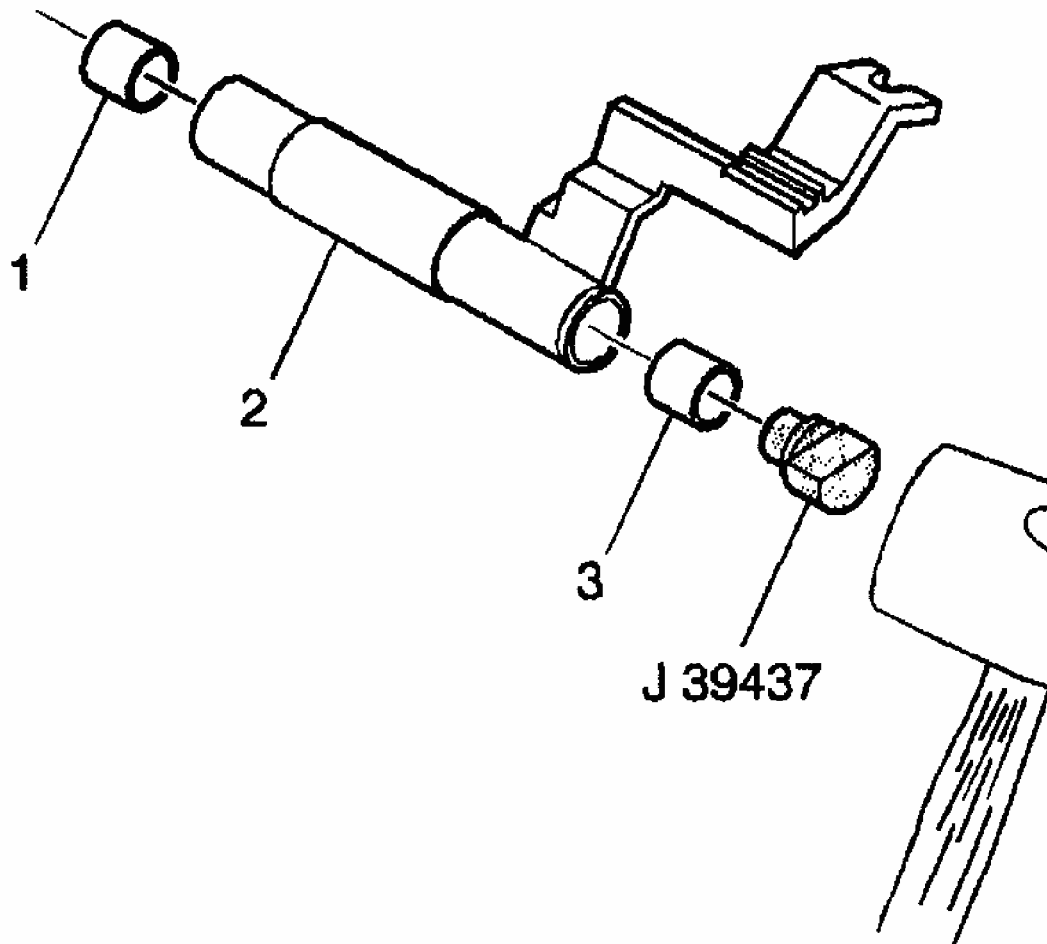
11. Install the neutral return cam pin (3) in the neutral return can pin hole (1) on the shift shaft (2).

5th/6th, Reverse Shift Rail Assembly

Tools Required

J 39437 Bushing Installer. See **Special Tools and Equipment** .

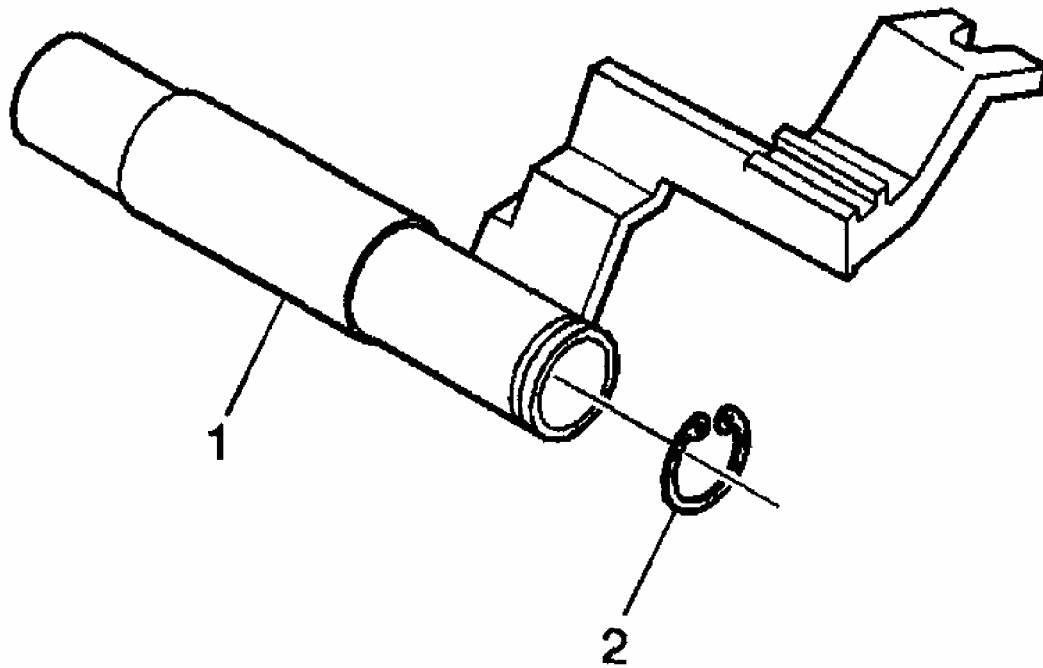
1. Install the 5th/6th shift shaft lever bushings (1) and (3) in the 5th/6th shift lever (2) using the J 39437 and a hammer.



G01366719

Fig. 101: Installing 5th/6th Shift Shaft Lever Bushings
Courtesy of GENERAL MOTORS CORP.

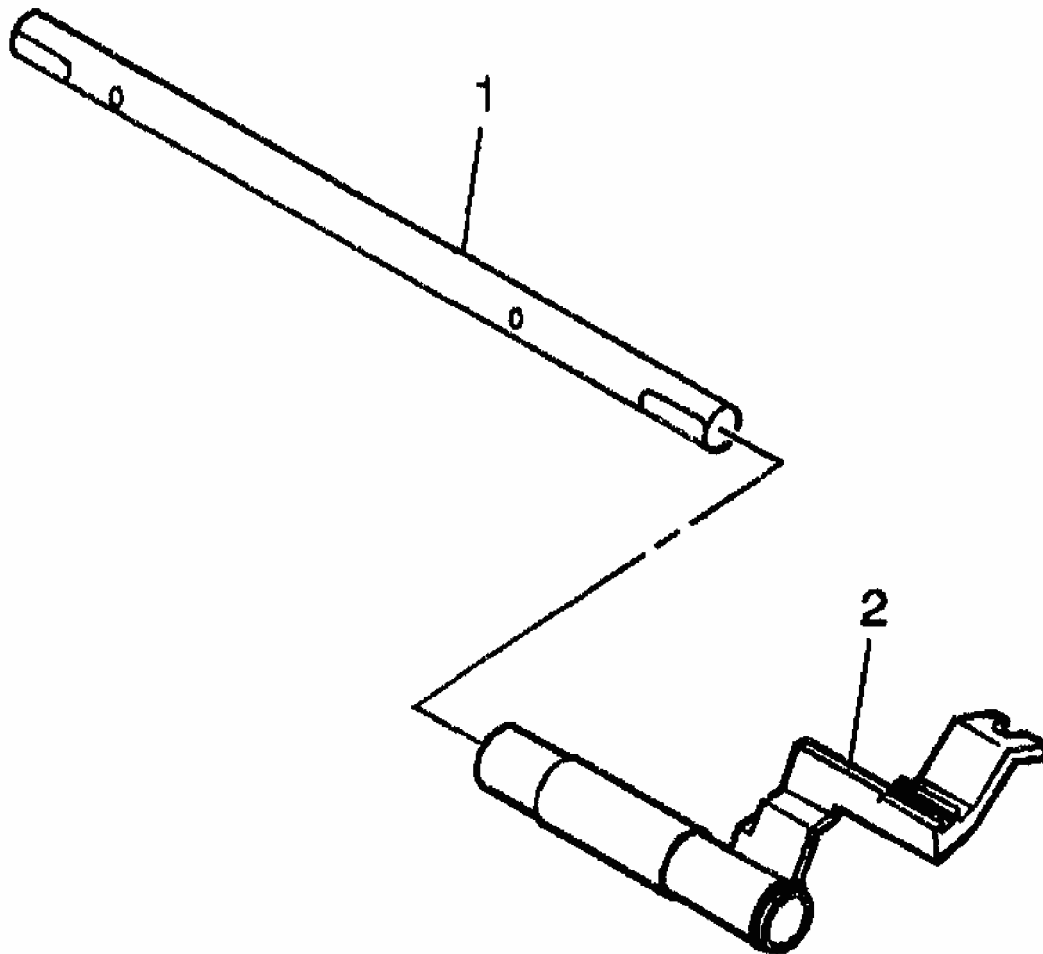
2. Install the retainer ring (1) on the 5th/6th shift lever (2).



G01366720

Fig. 102: Installing 5th/6th Shift Lever On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

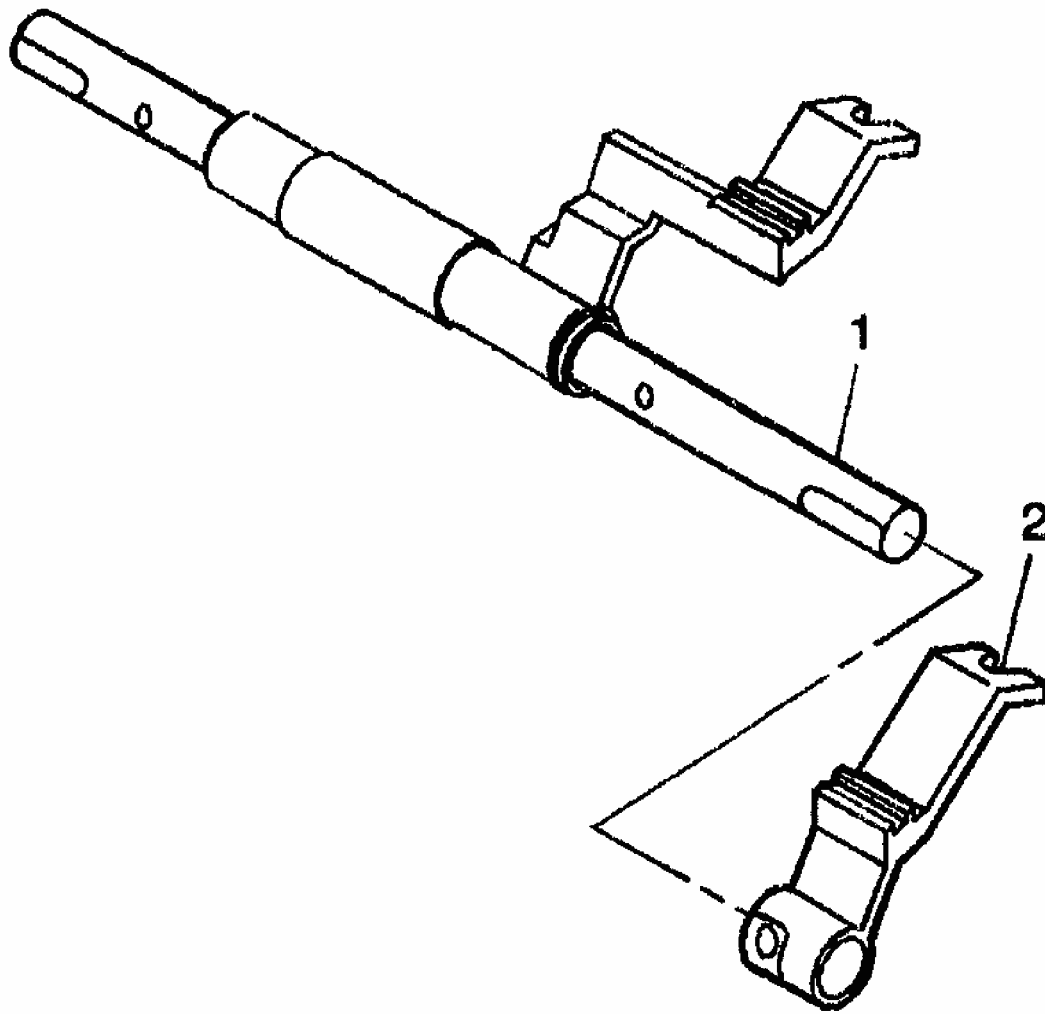
3. Install the 5th/6th shift lever (2) on the shift shaft (1).



G01366721

Fig. 103: Installing 5th/6th Shift Lever On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

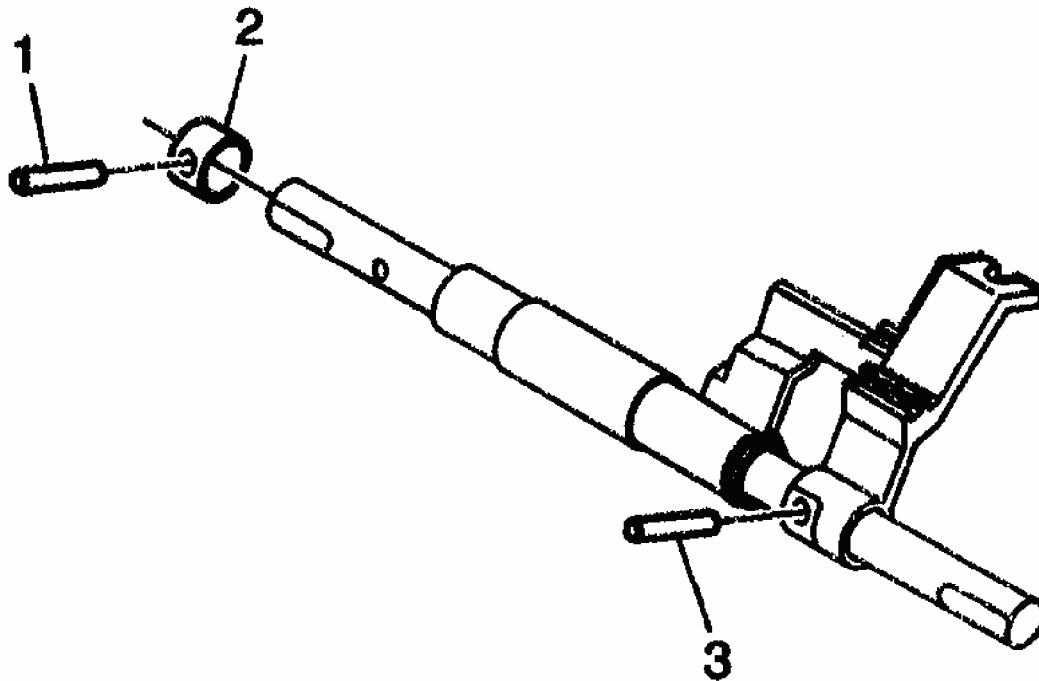
4. Install the reverse shift lever (2) on the shift shaft (1).



G01366722

Fig. 104: Installing Reverse Shift Lever On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

5. Install the reverse lever roll pin (3).



G01366723

Fig. 105: Installing Reverse Lever Roll Pin & Reverse Collar
Courtesy of GENERAL MOTORS CORP.

6. Install the reverse collar (2).
7. Install the reverse collar roll pin (1).

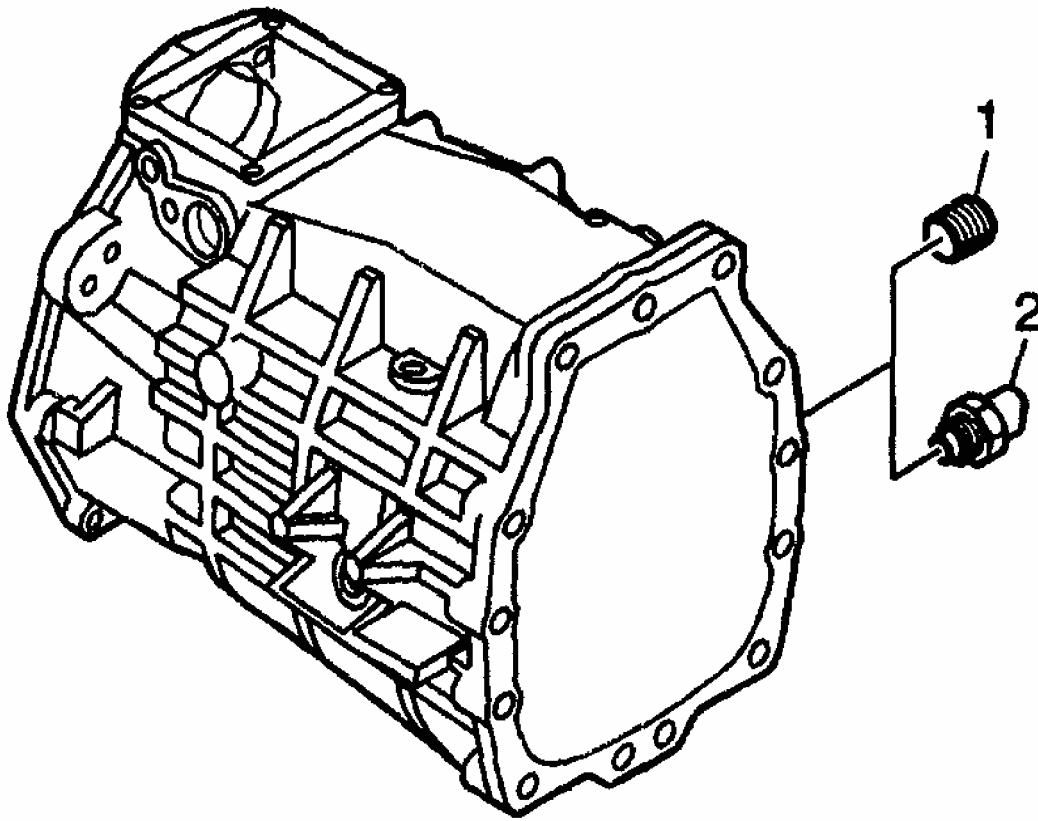
TRANS CASE AND ADAPTER PLATE DISASSEMBLE

Transmission Case

Tools Required

- J 8092 Universal Driver Handle. See **Special Tools and Equipment** .
- J 23907 Slide Hammer. See **Special Tools and Equipment** .
- J 39439-2 Bushing Remover. See **Special Tools and Equipment** .
- J 39790 Mainshaft Bearing Race Remover. See **Special Tools and Equipment** .
- J 39791 Countershaft Bearing Race Remover. See **Special Tools and Equipment** .

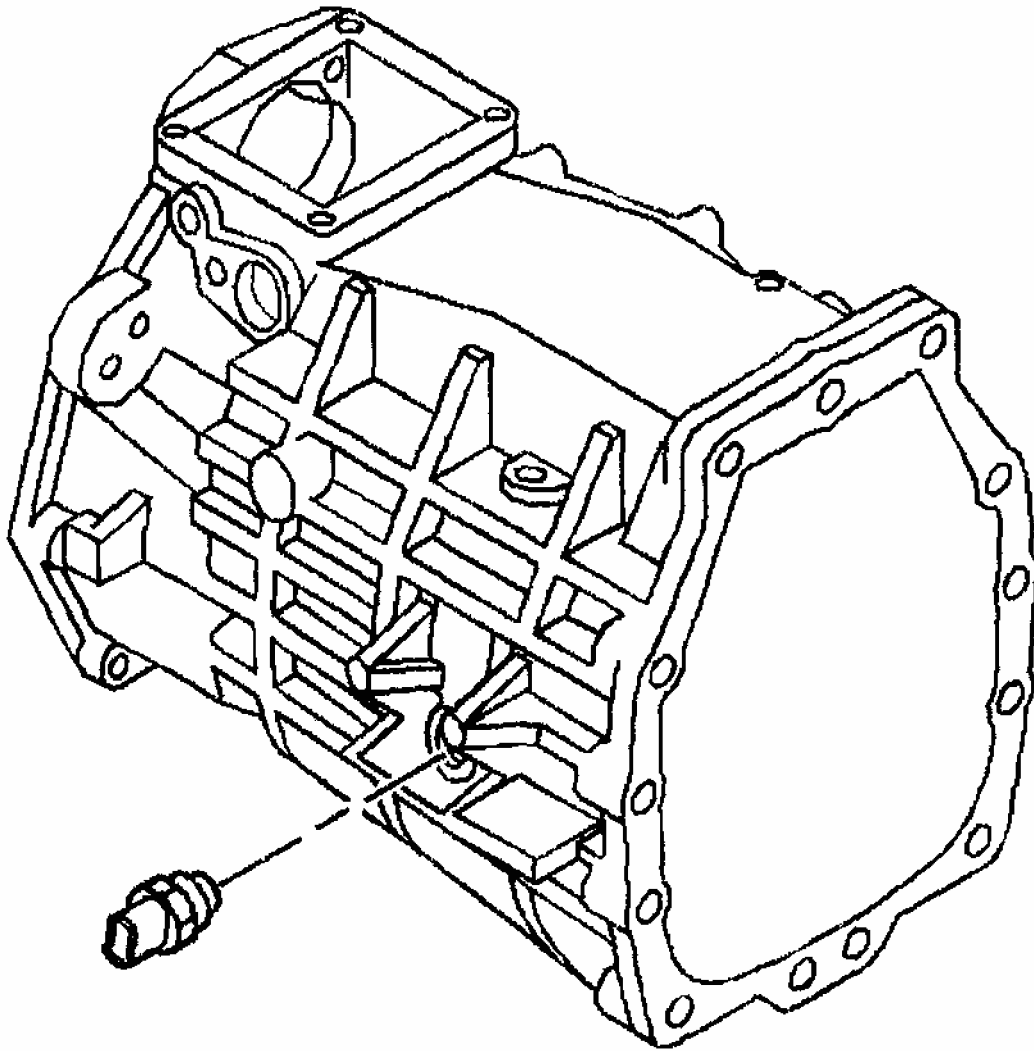
1. Remove the transmission case fill plug (1) (MM6 only).
2. Remove the temperature switch (2) (M12 only).



G01366724

Fig. 106: Removing Temperature Switch
Courtesy of GENERAL MOTORS CORP.

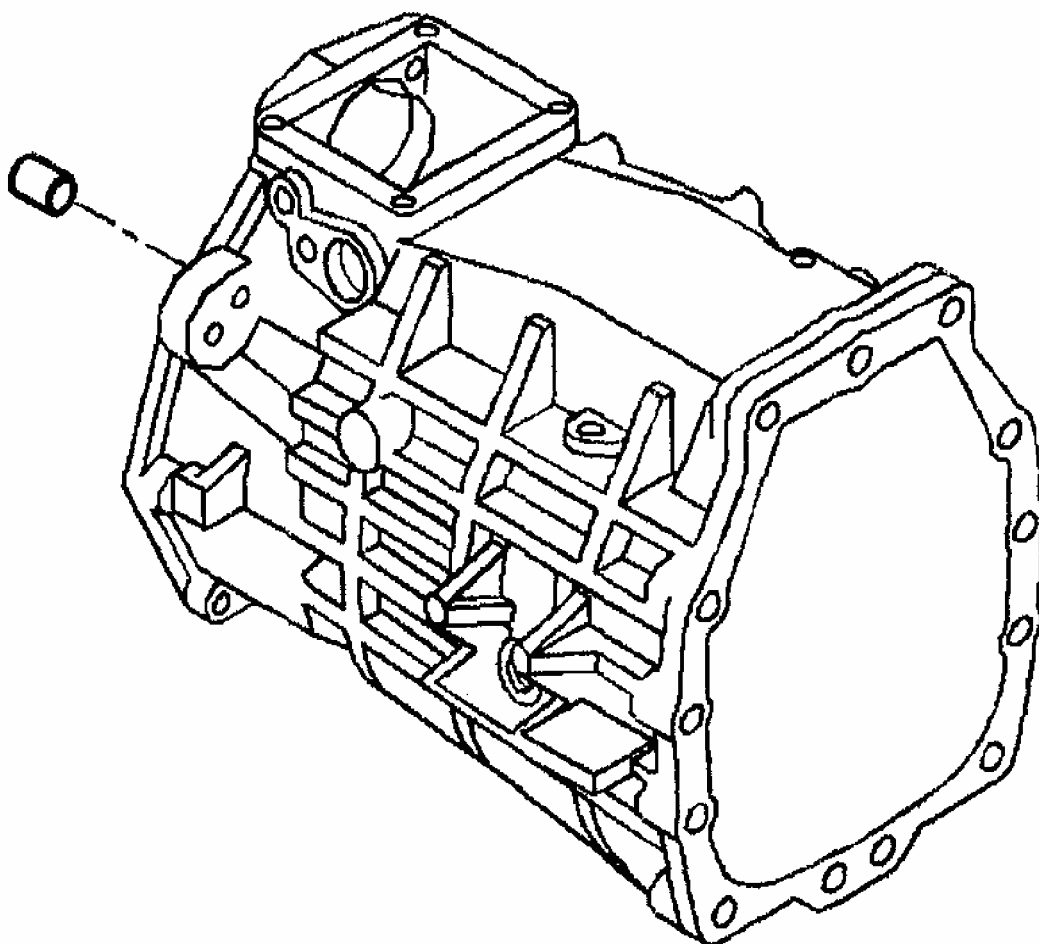
3. Remove the reverse lamp switch.



G01366725

Fig. 107: Removing Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

4. Remove the dowel pins.

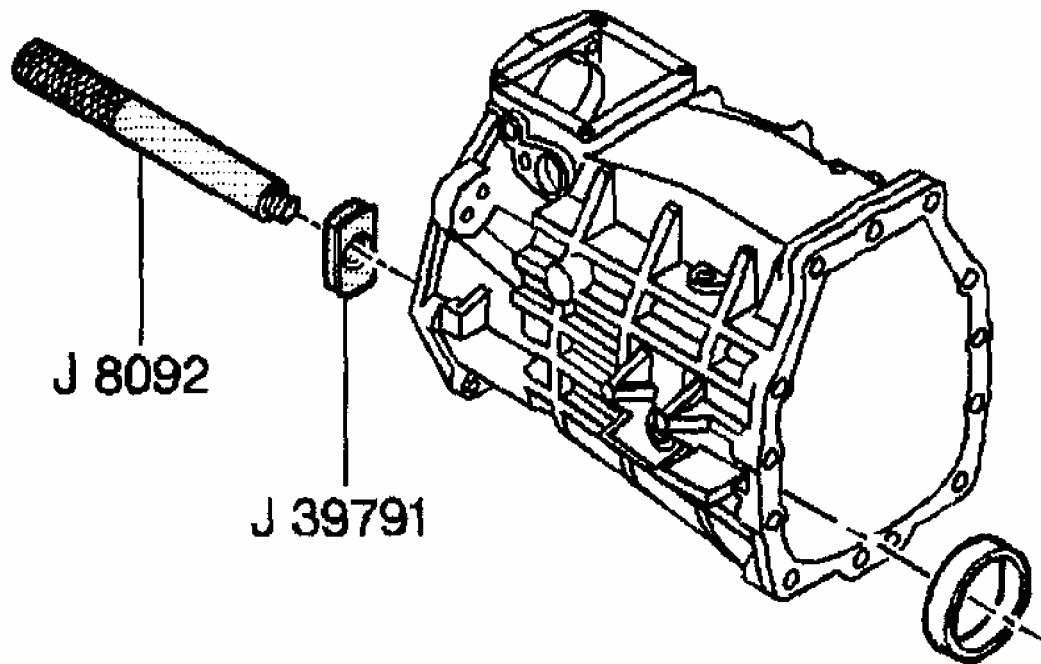


G01366726

Fig. 108: Removing Dowel Pins
Courtesy of GENERAL MOTORS CORP.

Important: Do not replace the bearing race unless inspection shows bearing race damage.

5. Remove the countershaft bearing race, using the J 8092 and the J 39791.

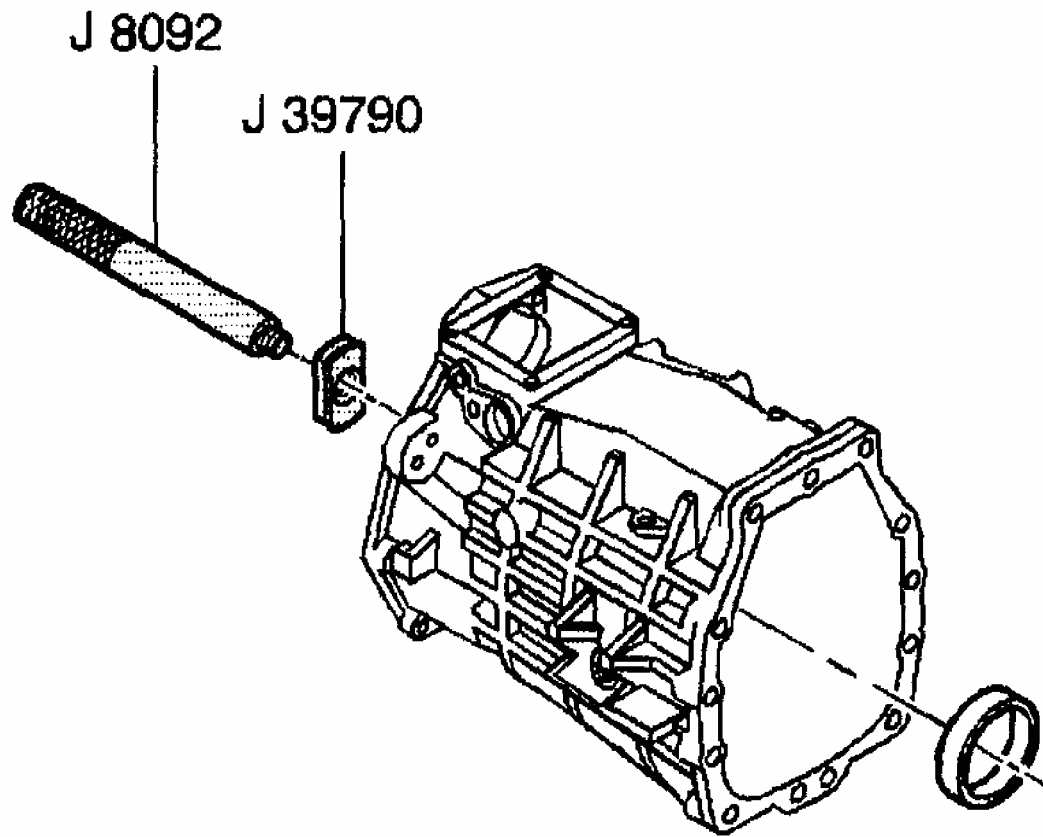


G01366727

Fig. 109: Removing Countershaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

Important: Do not replace the bearing race unless inspection shows bearing race damage.

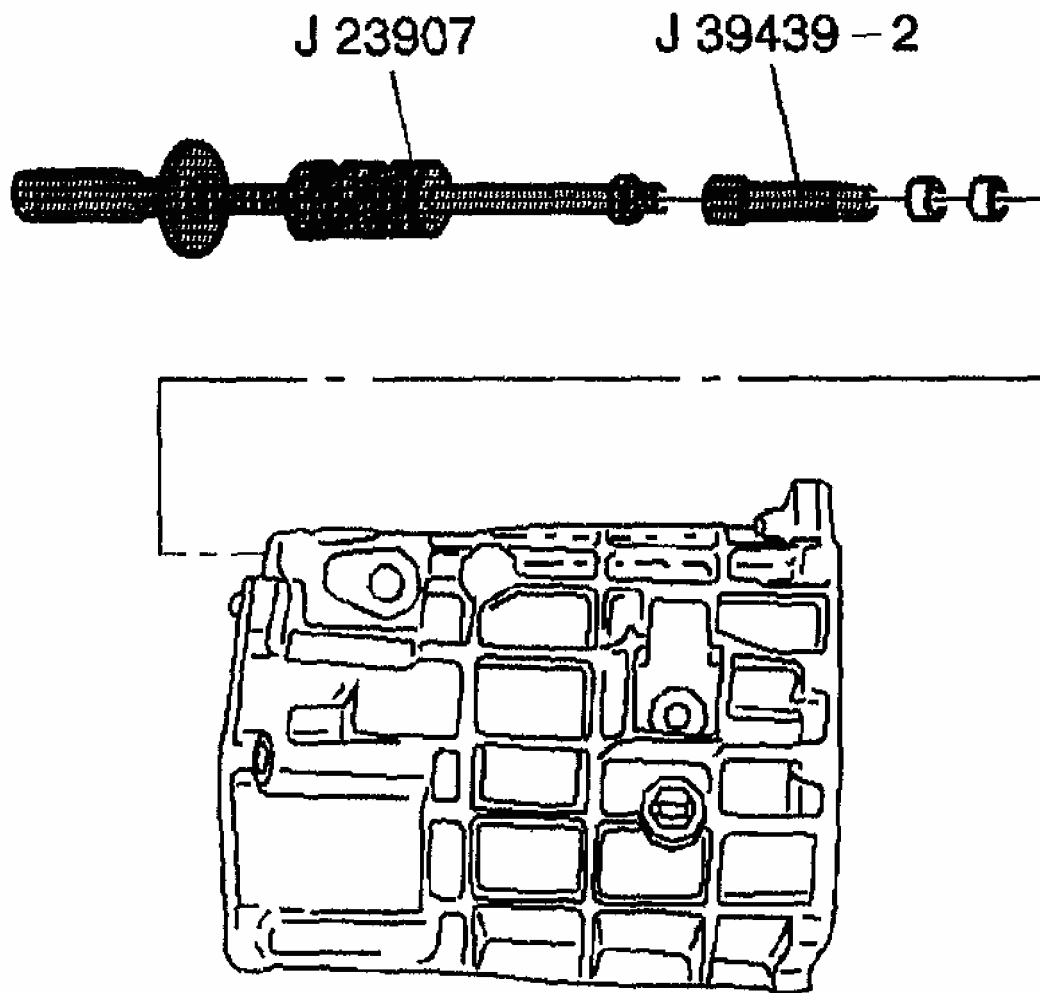
6. Remove the mainshaft bearing race, using the J 8092 and the J 39790.



G01366728

Fig. 110: Removing Mainshaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

7. Remove, the 1st/2nd and the 3rd/4th shift shaft bushings, using the J 23907 and the J 39439-2.



G01366729

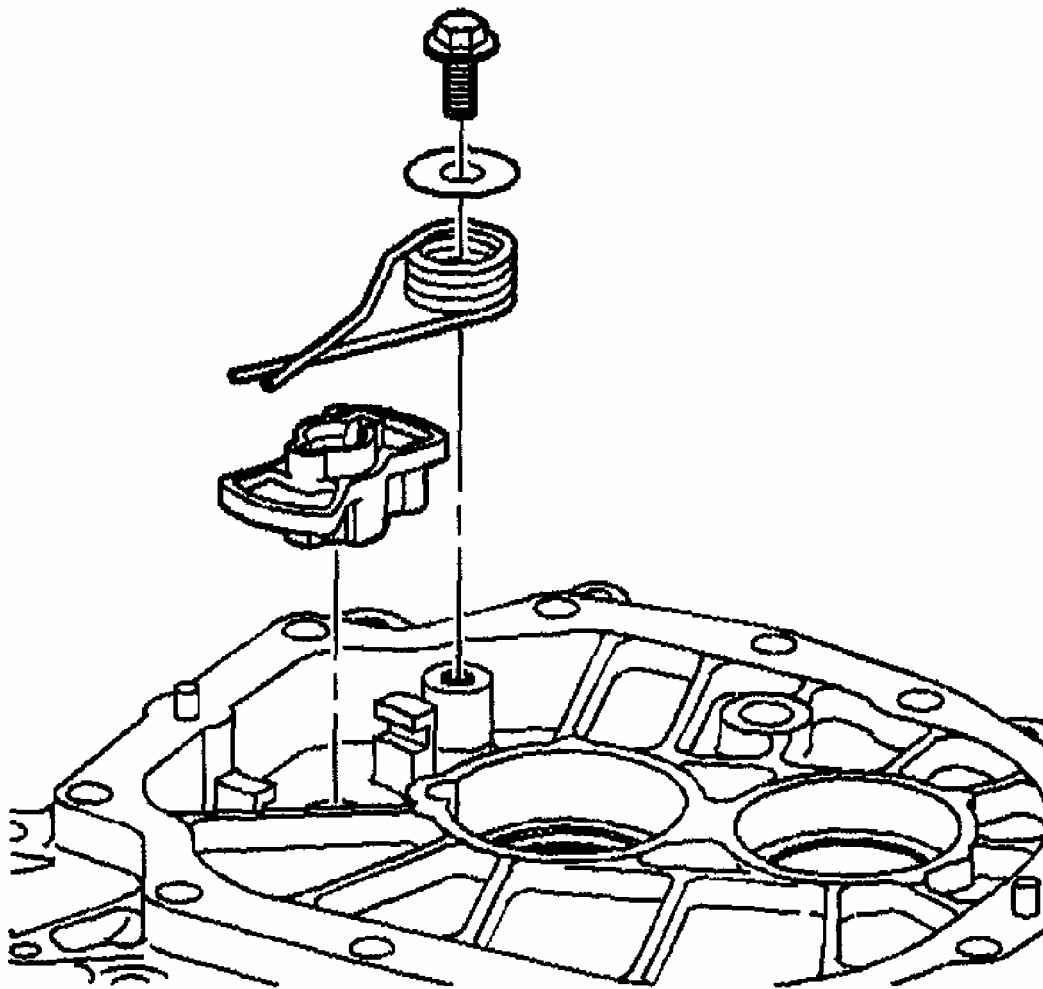
Fig. 111: Removing 1st/2nd & 3rd/4th Shift Shaft Bushings
Courtesy of GENERAL MOTORS CORP.

Adapter Plate

Tools Required

- J 23907 Slide Hammer. See Special Tools and Equipment .
- J 39439-2 Bushing Remover. See Special Tools and Equipment .

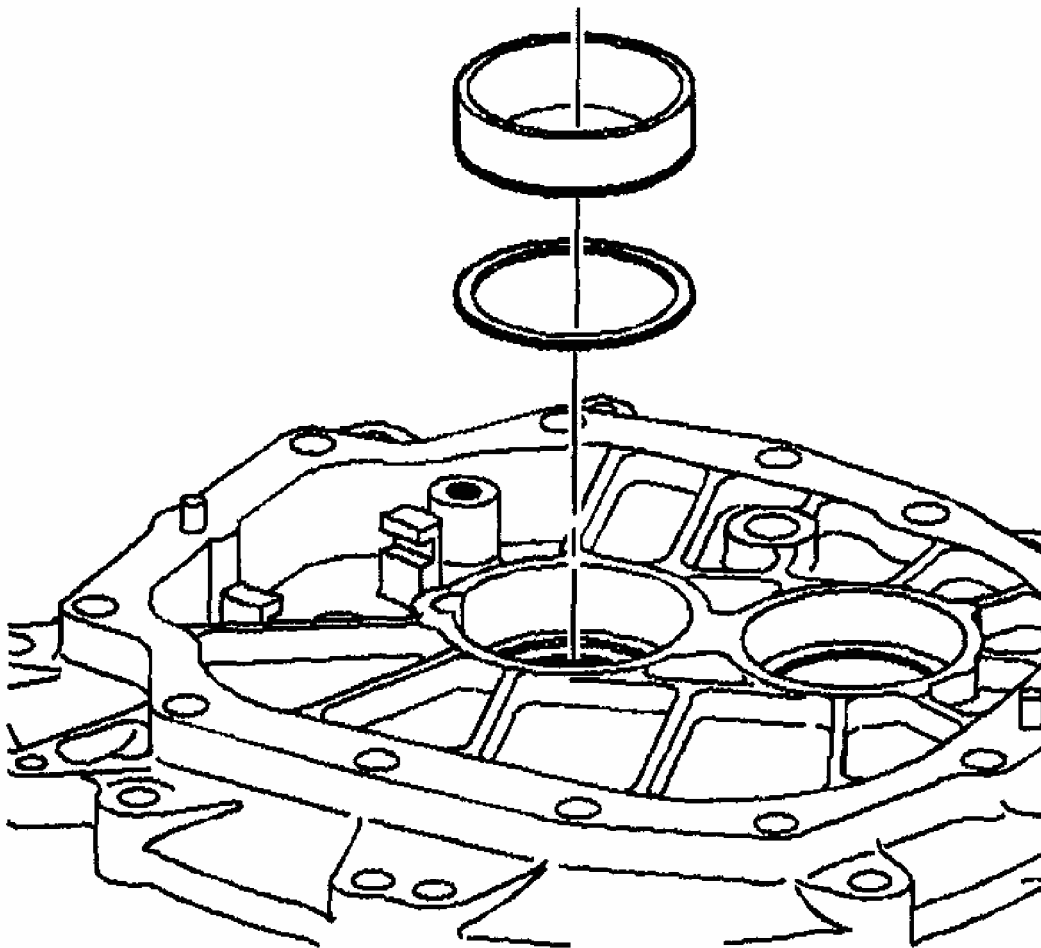
1. Remove the neutral return cam.
2. Remove the neutral return cam spring retaining bolt and washer.
3. Remove the neutral return cam spring.



G01366730

Fig. 112: Removing Neutral Return Cam Spring
Courtesy of GENERAL MOTORS CORP.

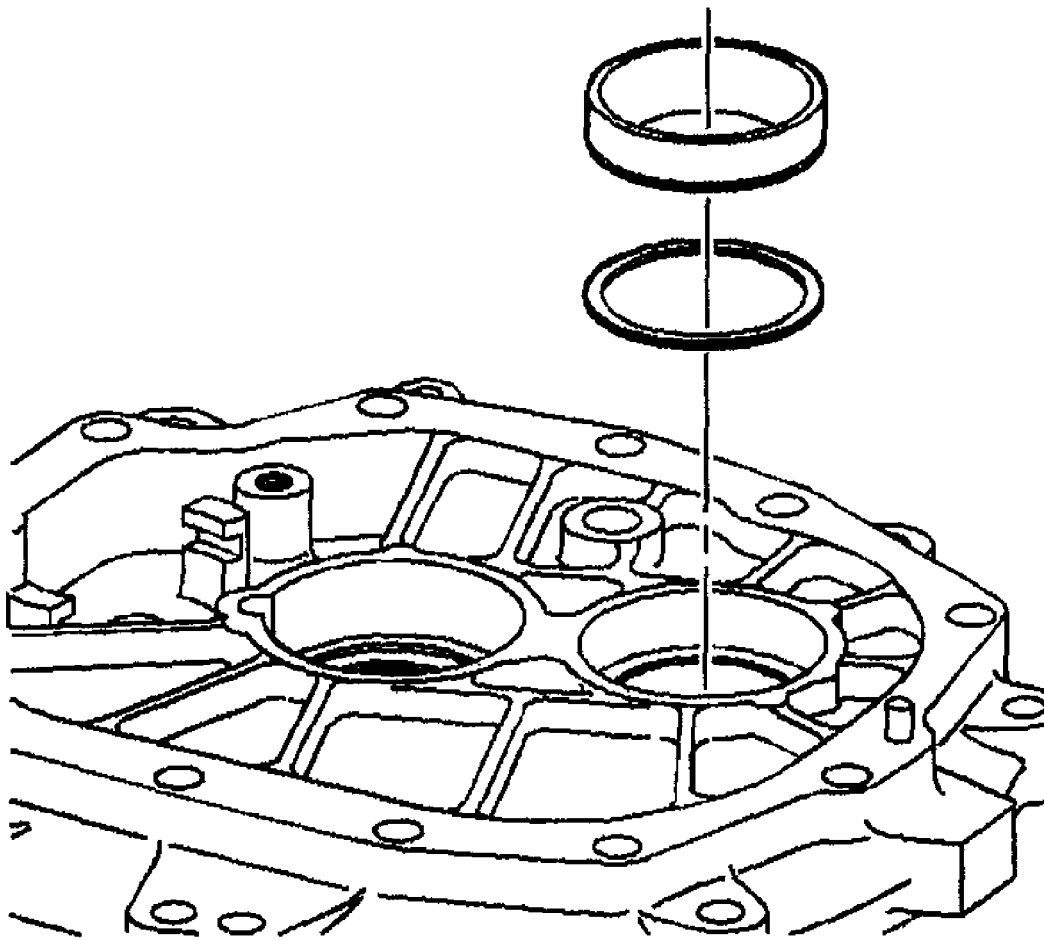
4. Remove the input shaft bearing race and the shim.



G01366731

Fig. 113: Removing Input Shaft Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

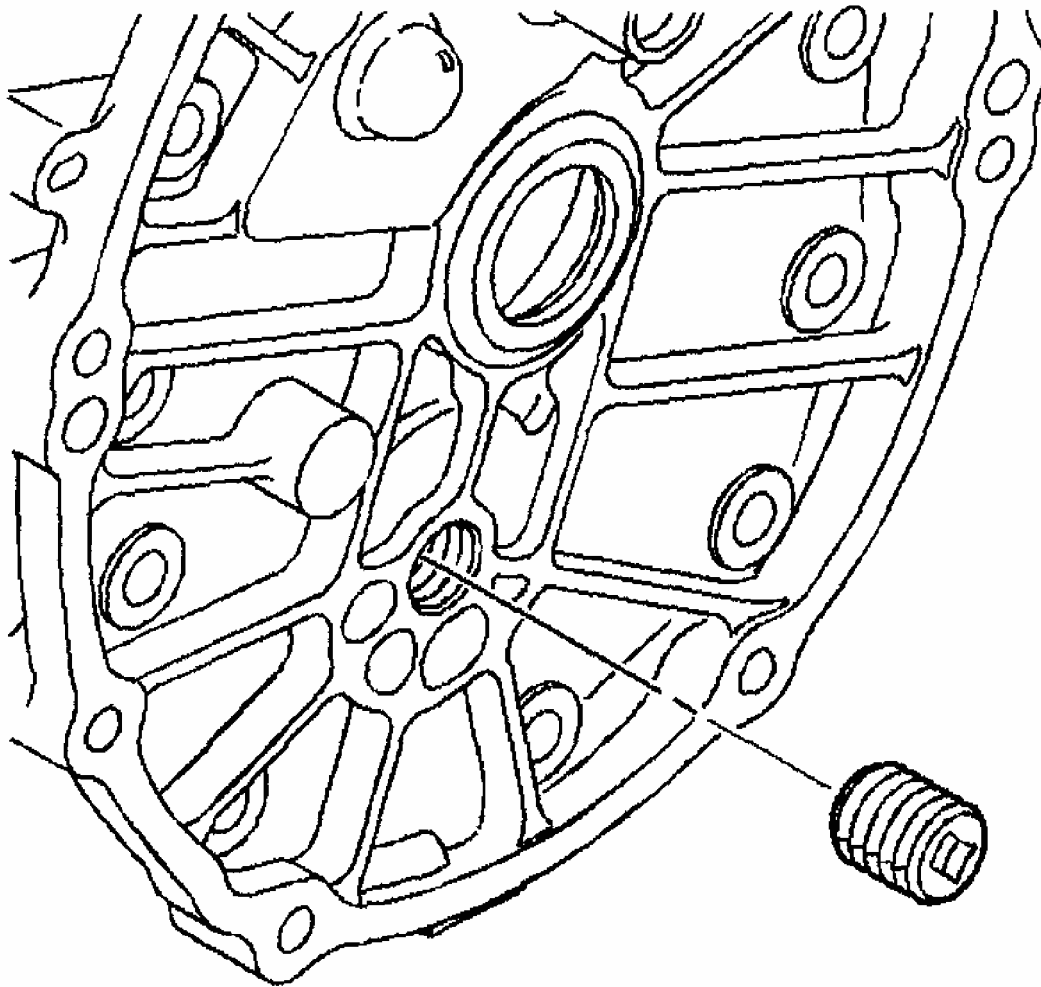
5. Remove the countershaft bearing race and the shim.



G01366732

Fig. 114: Removing Countershaft Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

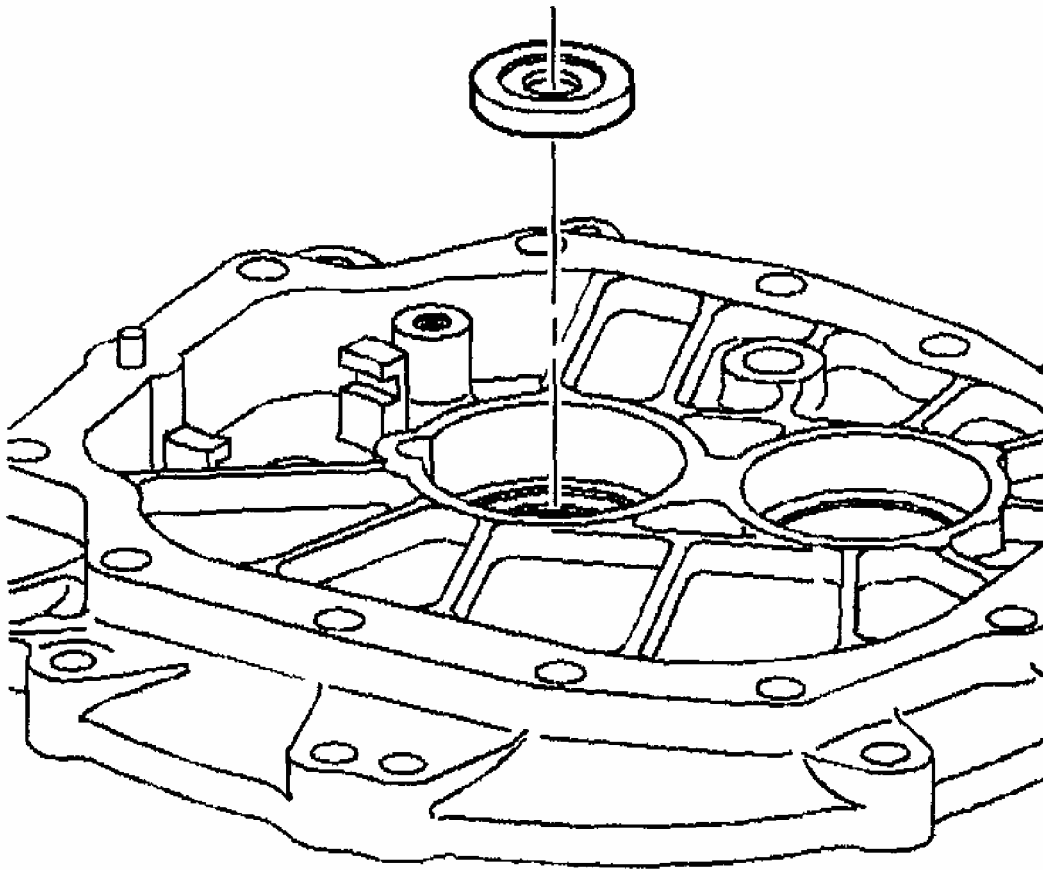
6. Remove the adapter plate plug.



G01366733

Fig. 115: Removing Adapter Plate Plug
Courtesy of GENERAL MOTORS CORP.

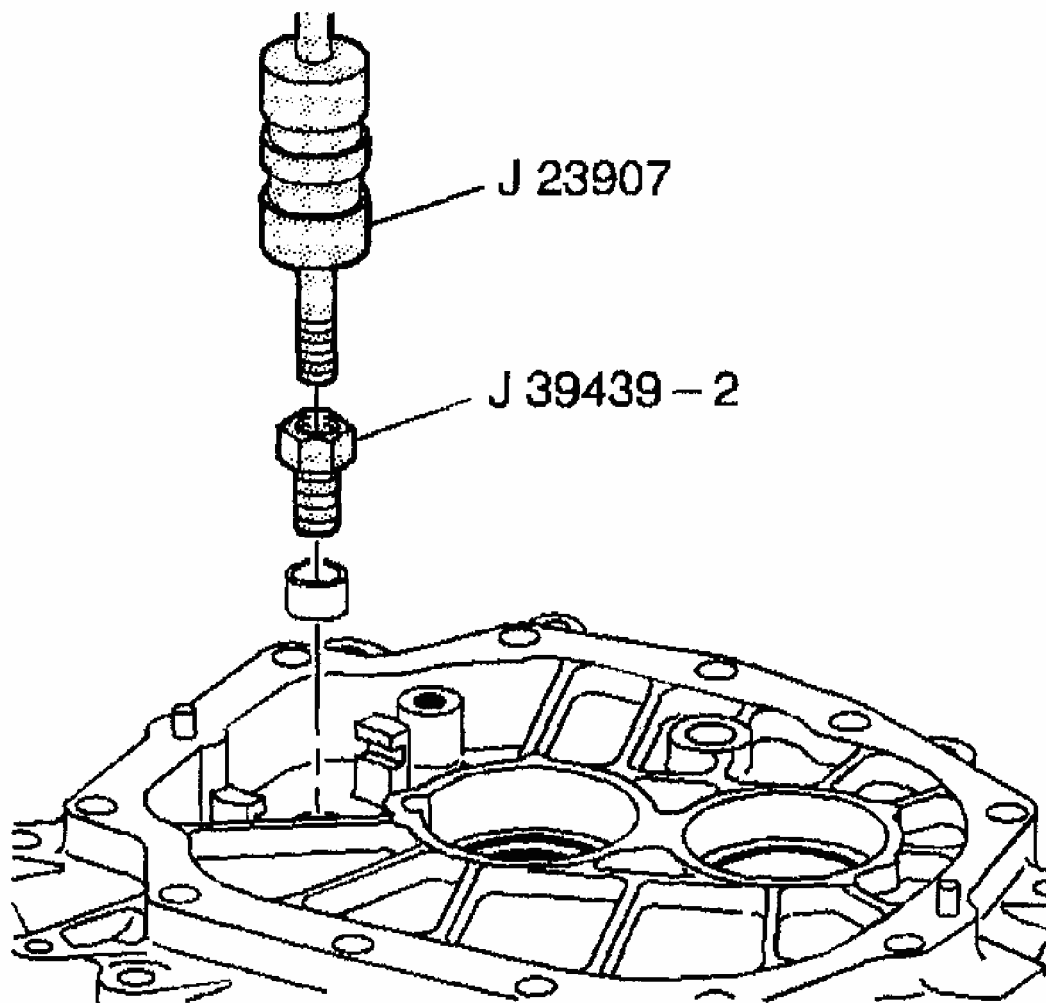
7. Remove the input shaft seal.



G01366734

Fig. 116: Removing Input Shaft Seal
Courtesy of GENERAL MOTORS CORP.

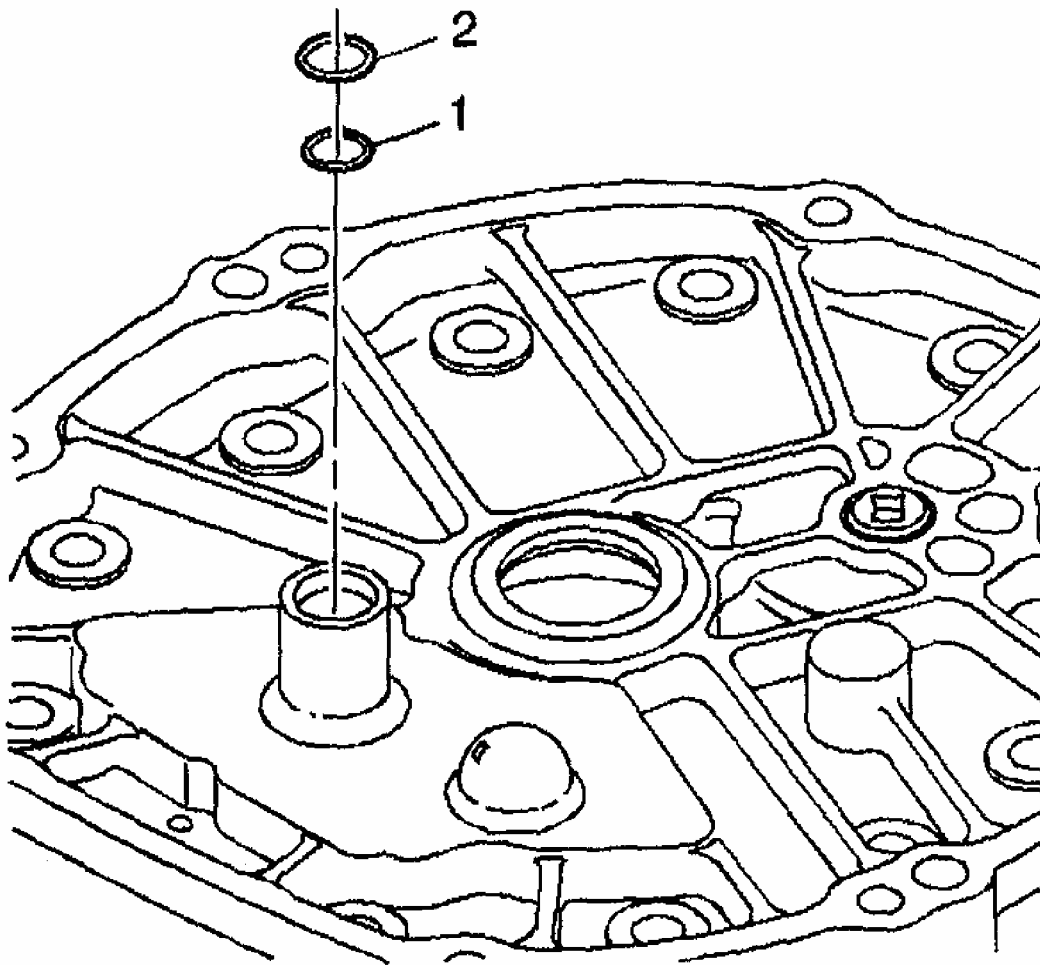
Important: Do not replace the bushing unless inspection shows bushing damage.



G01366735

Fig. 117: Removing 1st/2nd & 3rd/4th Shift Shaft Bushing
Courtesy of GENERAL MOTORS CORP.

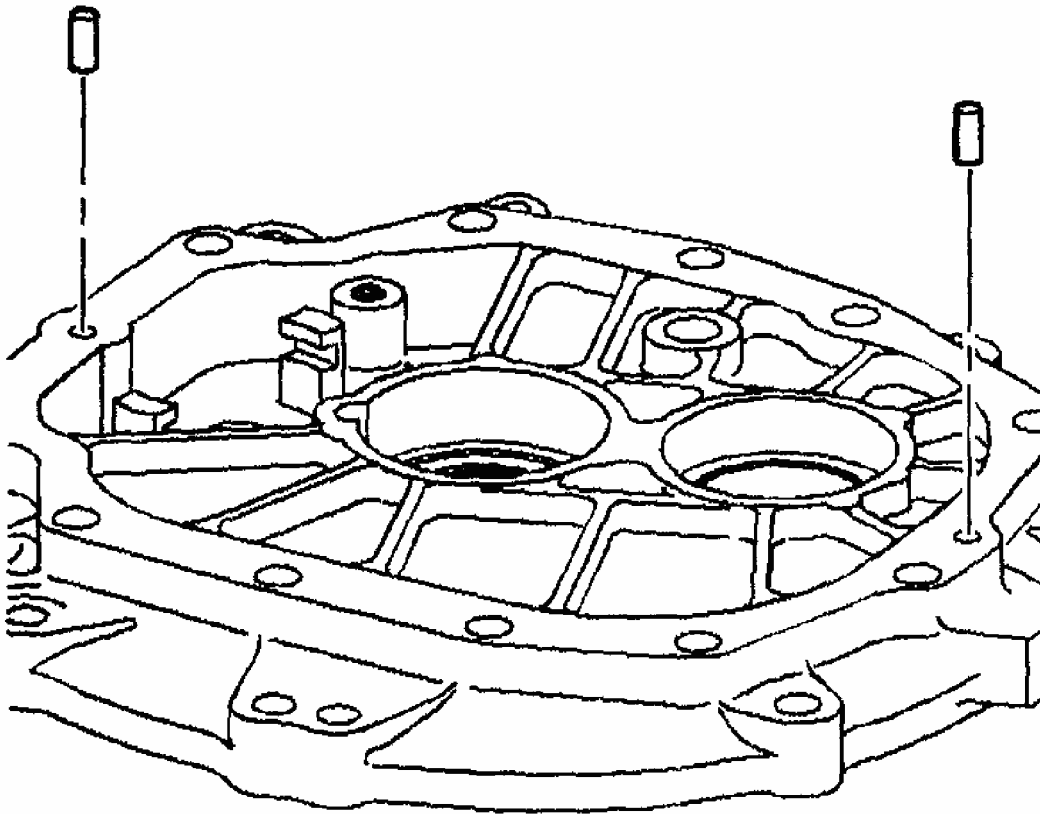
8. Remove the 1st/2nd and the 3rd/4th shift shaft bushing, using the J 23907 with the J 39439-2.
9. Remove the 1st/2nd and the 3rd/4th shift shaft seals (1) and (2).



G01366736

Fig. 118: Removing 1st/2nd And 3rd/4th Shift Shaft Seals
Courtesy of GENERAL MOTORS CORP.

10. Remove the dowel pins.



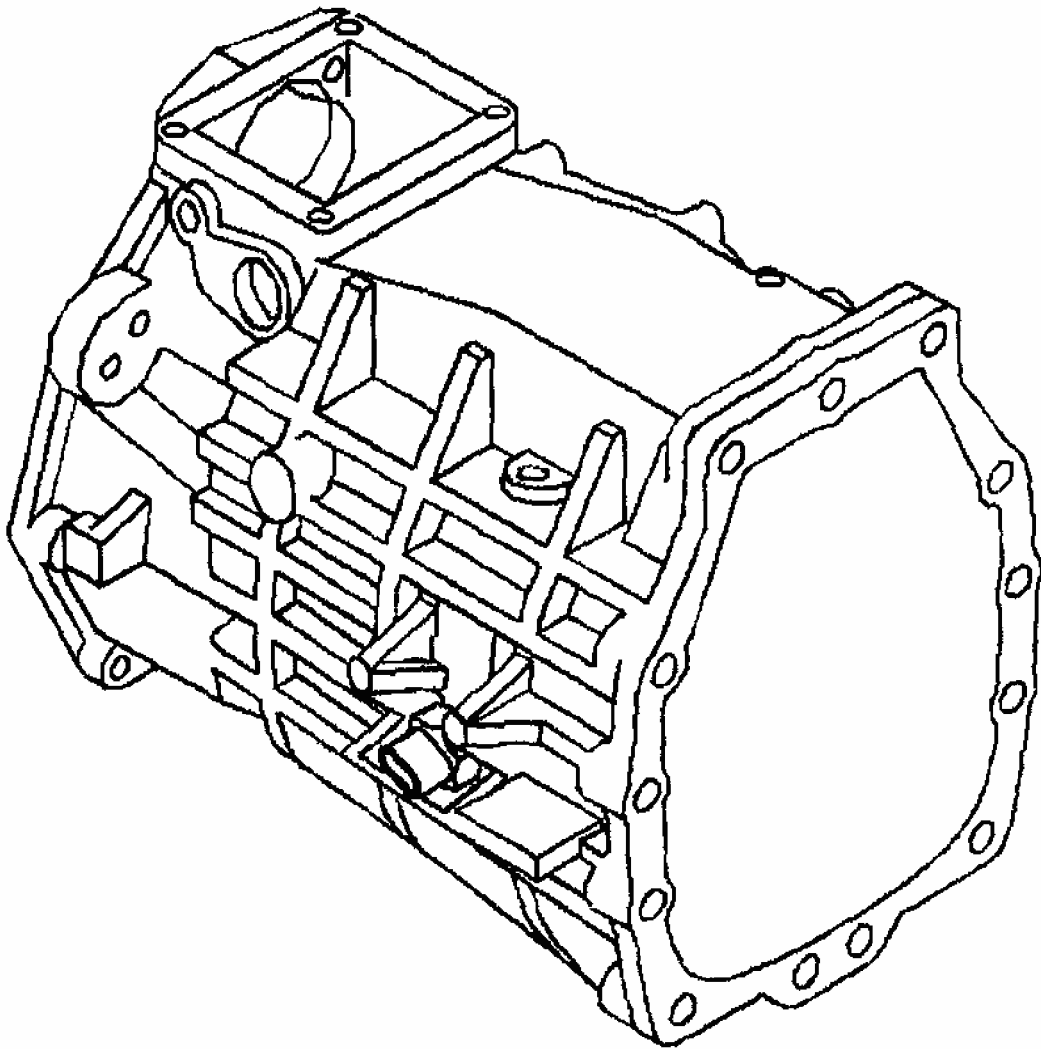
G01366737

Fig. 119: Removing Dowel Pins
Courtesy of GENERAL MOTORS CORP.

TRANS CASE AND ADAPTER PLATE CLEANING AND INSPECTION

Transmission Case

1. Clean the transmission case in a suitable solvent. Air dry the transmission case.
2. Clean all sealant material from retainer bolt threads.
3. Inspect the transmission case for the following conditions:
 1. Cracks
 2. Scratches
 3. Damaged threads
 4. Burrs
 5. Nicked mounting surfaces
 6. Damaged sealing surfaces
 7. Damaged front or rear bearing bores



G01366738

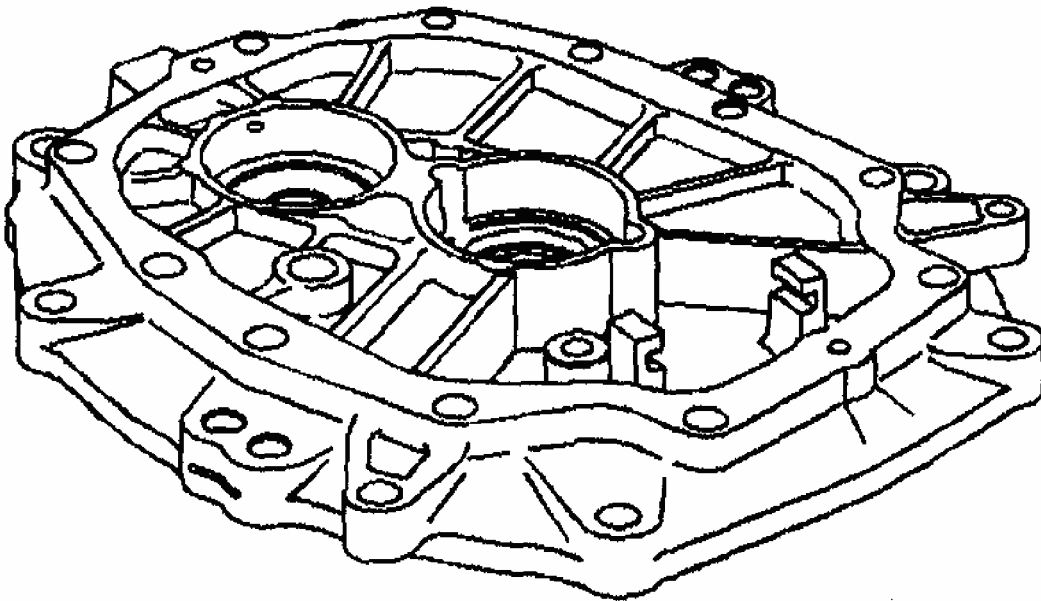
Fig. 120: Inspecting Transmission Case
Courtesy of GENERAL MOTORS CORP.

4. Inspect the machined mating surfaces for flatness with a straight edge.
5. Inspect the bearing races and bores for wear, scratches or grooves.
6. Inspect the bushing for excessive wear.
7. Use a fine mill file to dress minor scratches or burrs.
8. If scratches, or grooves or scoring cannot be removed by hand with a soft stone or crocus cloth, replace the component.
9. Clean up damaged threads with the correct size tap.
10. Replace a cracked housing.

11. Replace worn bushings.

Adapter Plate

1. Clean the adapter plate parts with a suitable solvent. Air dry all the parts.
2. Inspect the adapter plate parts for the following conditions:
 1. Cracks (replace a cracked adapter plate.)
 2. Scratches
 3. Burrs
 4. Nicked mounting surfaces
 5. Damaged sealing surfaces
 6. Damaged front or rear bearing bores



G01366739

Fig. 121: Inspecting Adapter Plate Parts
Courtesy of GENERAL MOTORS CORP.

3. Inspect the machined mating surfaces for flatness. Check the mating surfaces with a straight edge.
4. Inspect the bearing races and bores for wear, scratches or grooves.
5. Inspect the bushing for excessive wear. Replace worn bushings.
6. Use a fine mill file to dress minor scratches or burrs.
7. If scratches, or grooves or scoring cannot be removed by hand with a soft stone or

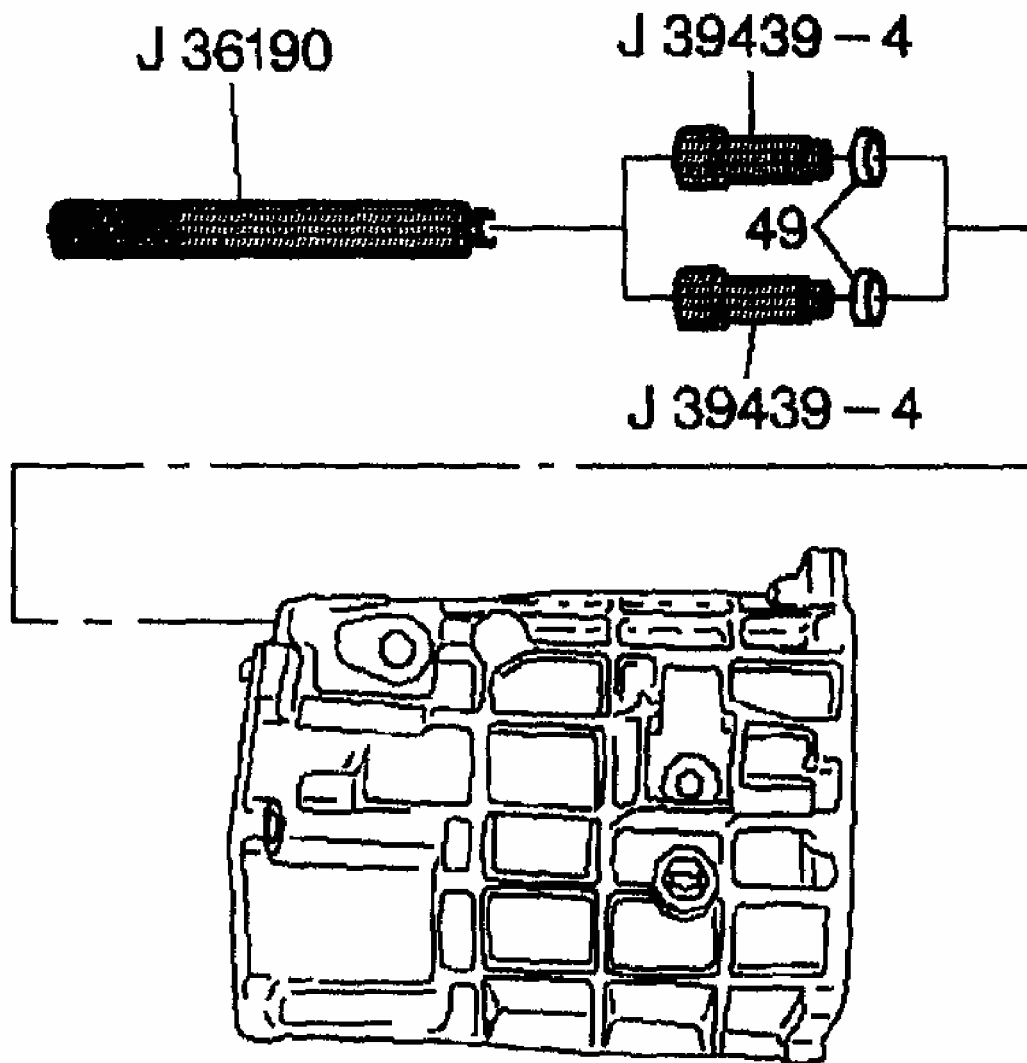
crocus cloth, replace the component.

TRANS CASE AND ADAPTER PLATE ASSEMBLE

Transmission Case

Tools Required

- J 8092 Universal Driver Handle. See **Special Tools and Equipment** .
 - J 36190 Universal Driver Handle. See **Special Tools and Equipment** .
 - J 39435 Bearing Race Installer. See **Special Tools and Equipment** .
 - J 39439-4 Bushing Installer. See **Special Tools and Equipment** .
 - J 39439-3 Bushing Installer. See **Special Tools and Equipment** .
1. Install the 1st/2nd and the 3rd/4th shift shaft bushings. Use the J 36190, the J 39439-4, and the J 39439-3.



G01366740

Fig. 122: Installing 1st/2nd & 3rd/4th Shift Shaft Bushings
Courtesy of GENERAL MOTORS CORP.

2. Install the mainshaft bearing race, using the J 8092 and the J 39435.

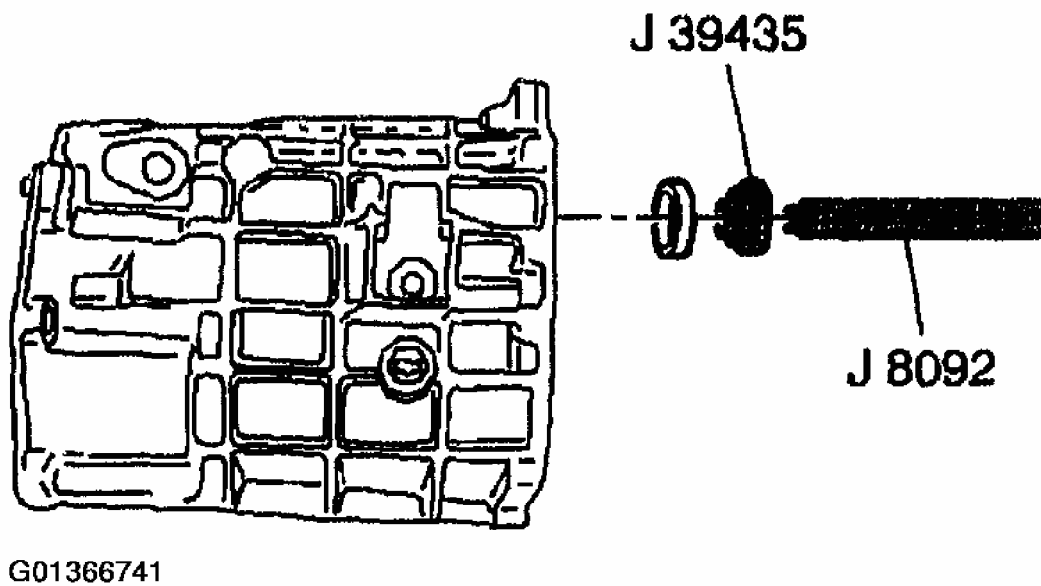


Fig. 123: Installing Mainshaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

3. Install the countershaft bearing race, using the J 8092 and the J 39435.

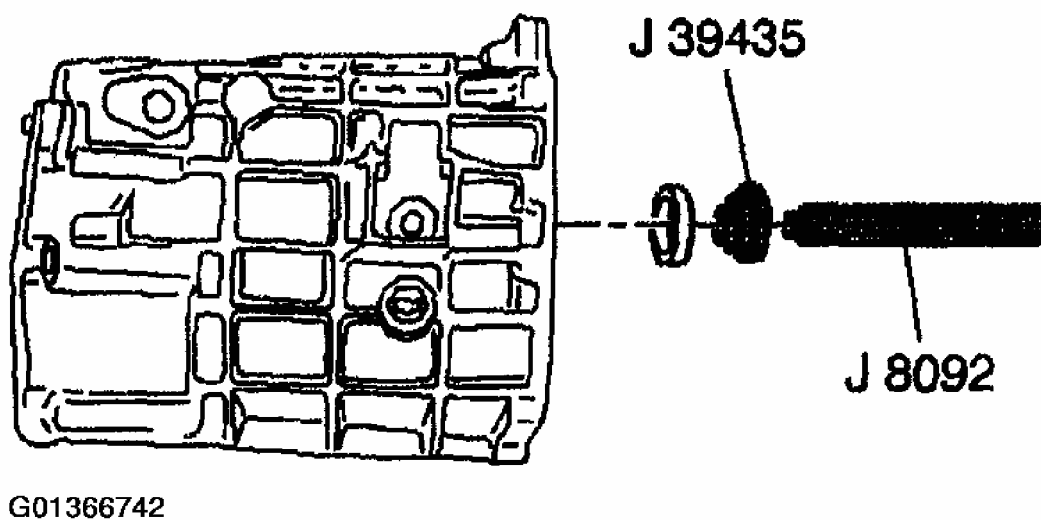
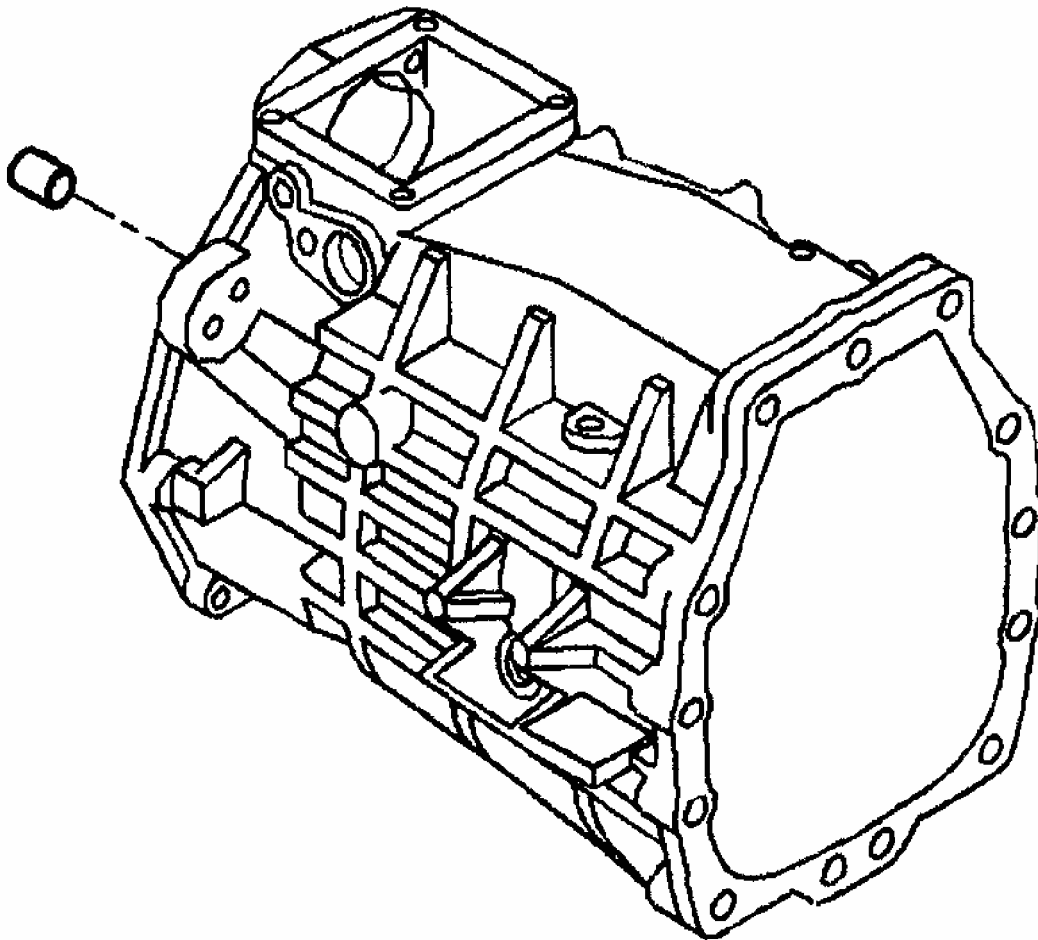


Fig. 124: Installing Countershaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

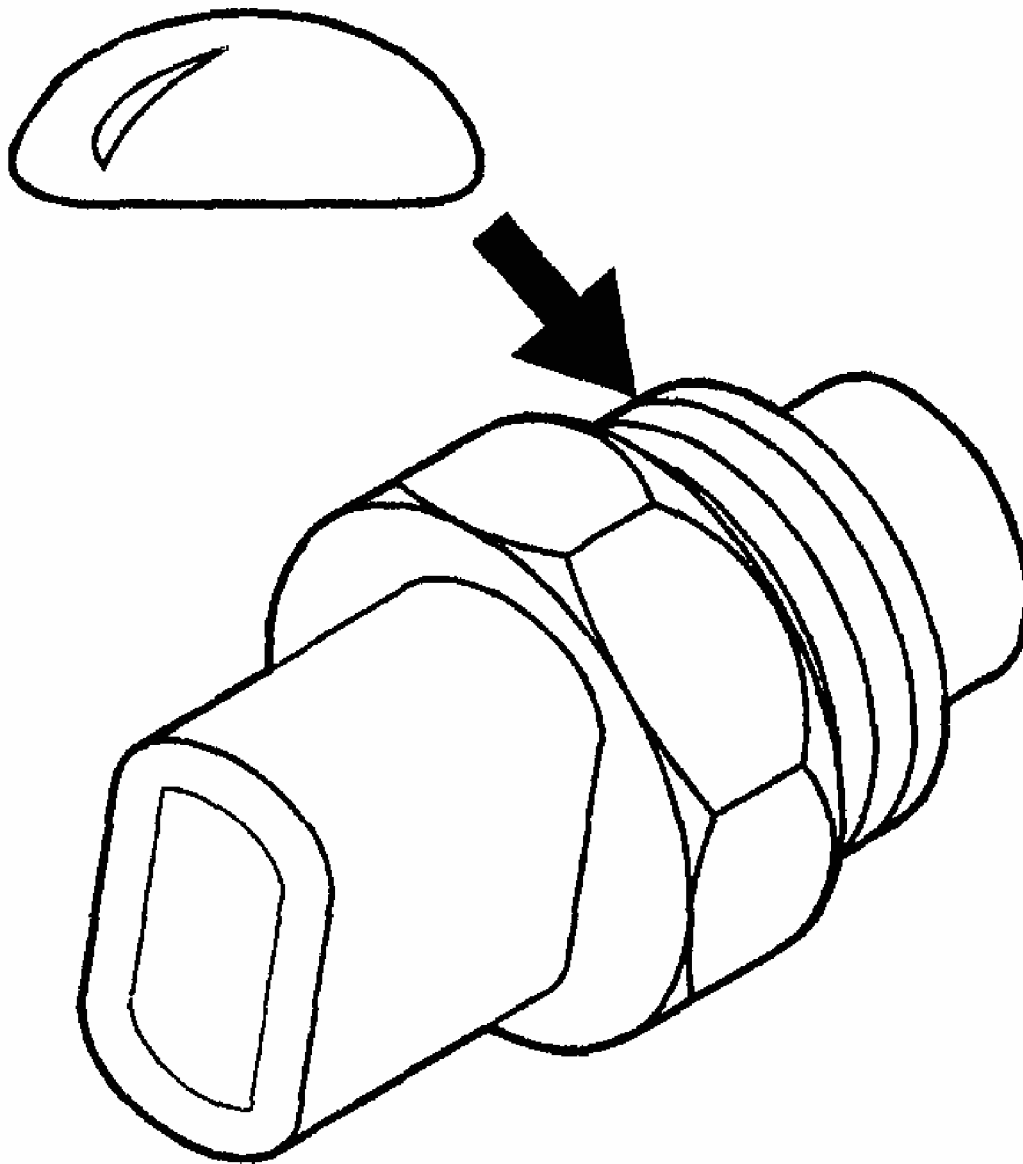
4. Install the dowel pins.



G01366743

Fig. 125: Installing Dowel Pins
Courtesy of GENERAL MOTORS CORP.

5. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480 or equivalent to the threads of the reverse lamp switch.

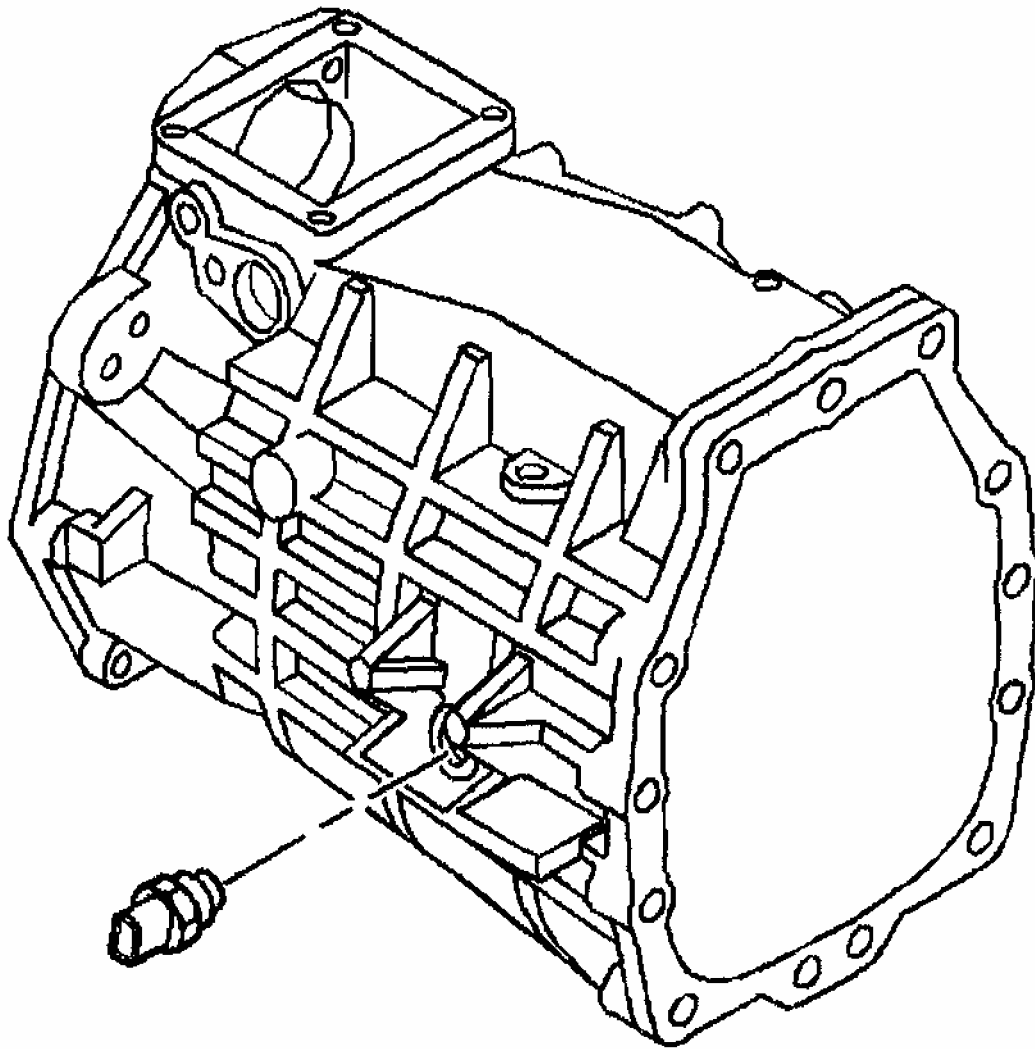


G01366744

Fig. 126: Applying Sealant To Threads Of Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

6. Install the reverse lamp switch.



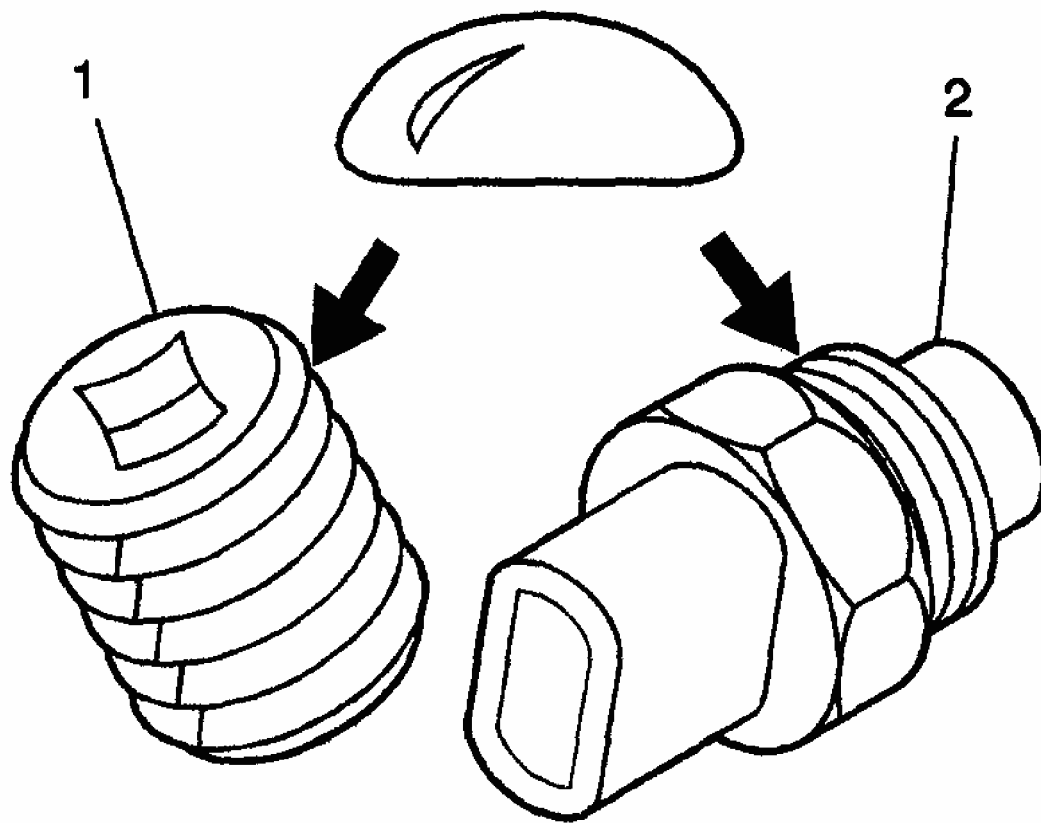
G01366745

Fig. 127: Installing Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

Tighten

Tighten the switch to 27 N.m (20 lb ft).

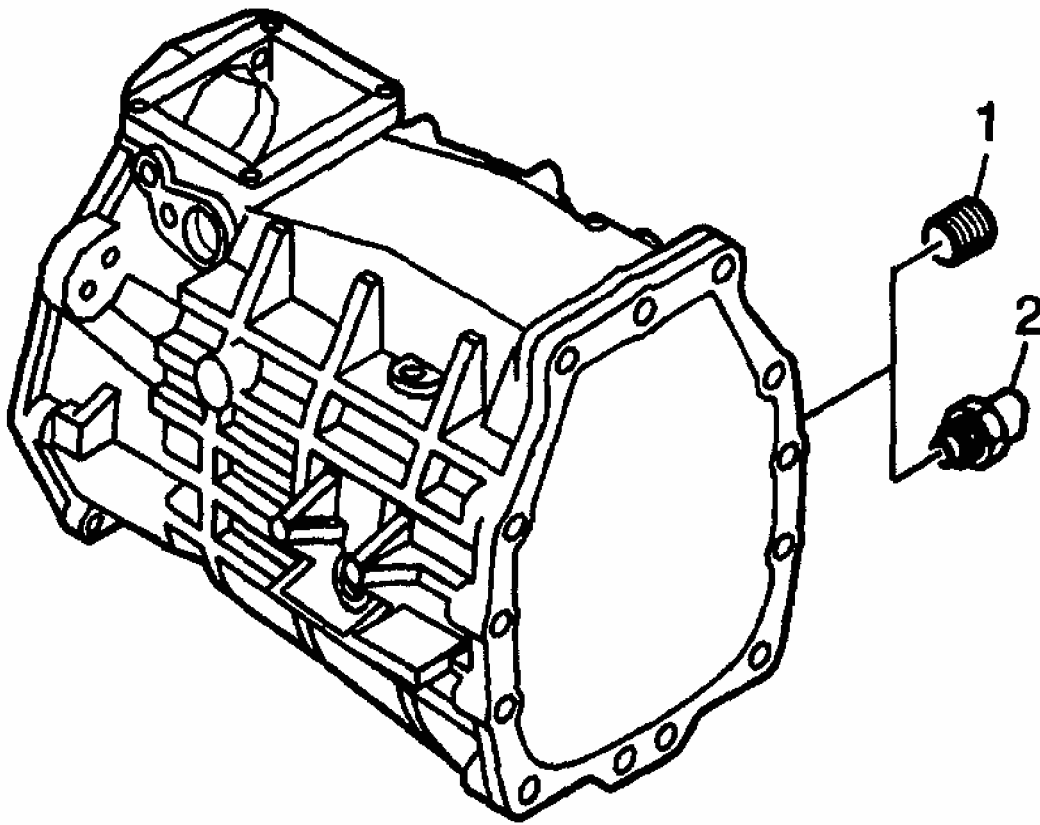
7. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480 or equivalent to the threads of the transmission case fill plug (1), MM6 only.



G01366746

Fig. 128: Applying Sealant To Threads Of Transmission Case Fill Plug
Courtesy of GENERAL MOTORS CORP.

8. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480 or equivalent to the threads of the temperature switch, M12 only.
9. Install the transmission case fill plug (1), MM6 only.



G01366747

Fig. 129: Installing Temperature Switch & Transmission Case Fill Plug
Courtesy of GENERAL MOTORS CORP.

Tighten

Tighten the transmission case fill plug to 18 N.m (13 lb ft).

10. Install the temperature switch (2), M12 only.

Tighten

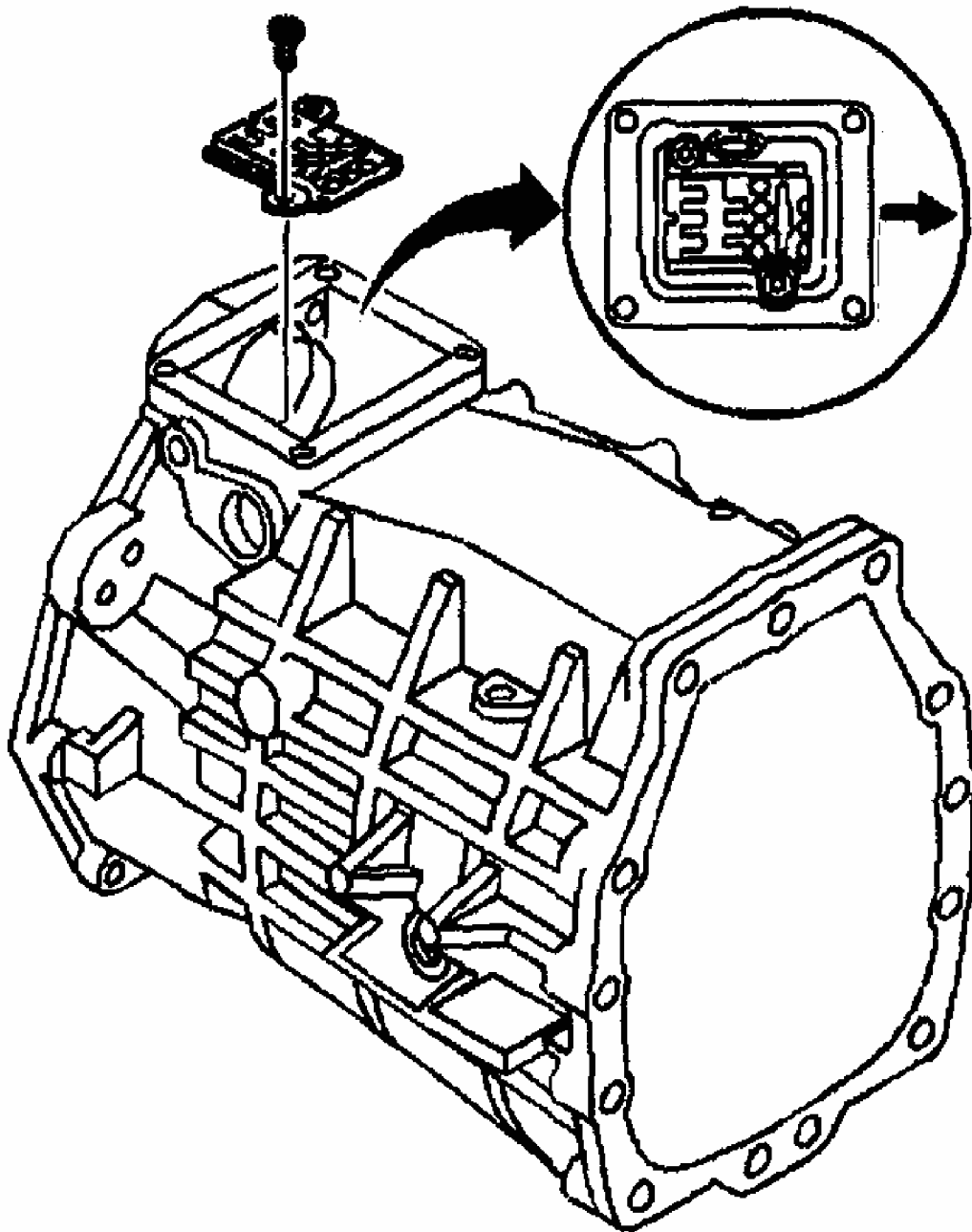
Tighten the temperature switch to 41 N.m (30 lb ft).

NOTE: The H-pattern on the guide plate must face the extension housing. If the guide plate is installed incorrectly, then damage will occur.

11. Install the guide plate and the guide plate bolts.

Tighten

Tighten the bolts to 22 N.m (16 lb ft).



G01366748

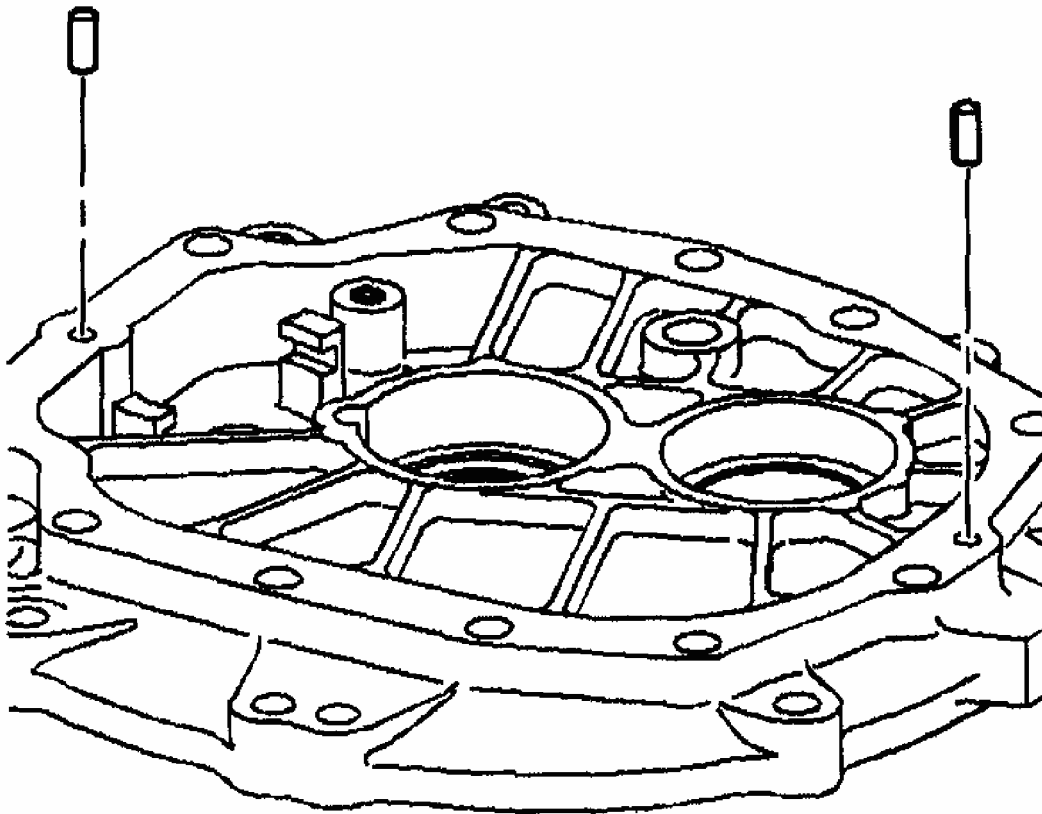
Fig. 130: Installing Guide Plate & Guide Plate Bolts
Courtesy of GENERAL MOTORS CORP.

Adapter Plate

Tools Required

- J 39433 Input Shaft Seal Installer. See Special Tools and Equipment .
- J 39439-1 Shift Rail Bushing Remover/Installer. See Special Tools and Equipment .
- J 42464 Shift Shaft Seal Installer. See Special Tools and Equipment .
- J 42496 Inner Shift Rail Inner Seal Installer. See Special Tools and Equipment .

1. Install the dowel pins.



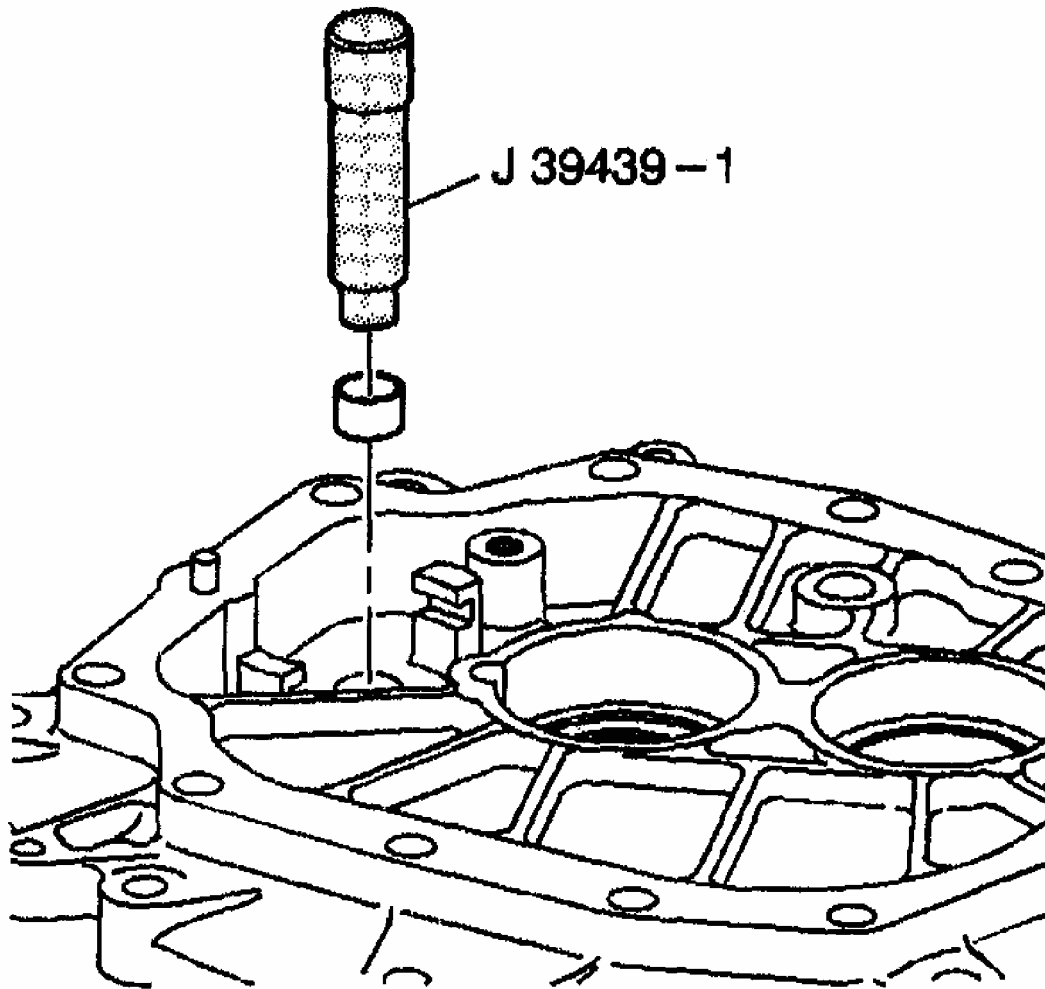
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Fig. 131: Installing Dowel Pins
Courtesy of GENERAL MOTORS CORP.

NOTE: If the 1st/2nd, 3rd/4th speed shift shaft bushing is installed incorrectly it will interfere with the inner shift rail seal causing a leak.

2. Install the 1st/2nd, 3rd/4th speed shift shaft bushing flush with adapter plate, using the J

39439-1.

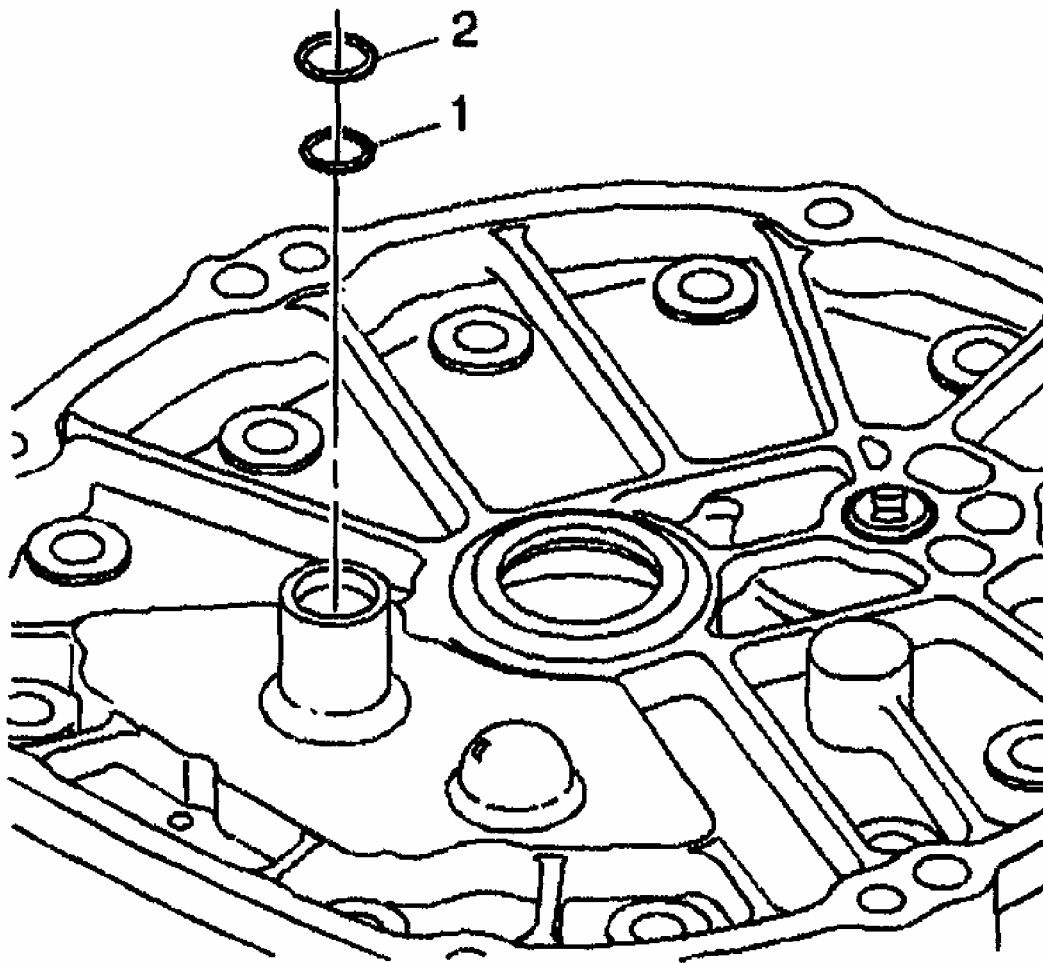


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Fig. 132: Installing 1st/2nd, 3rd/4th Speed Shift Shaft Bushing Flush With Adapter Plate

Courtesy of GENERAL MOTORS CORP.

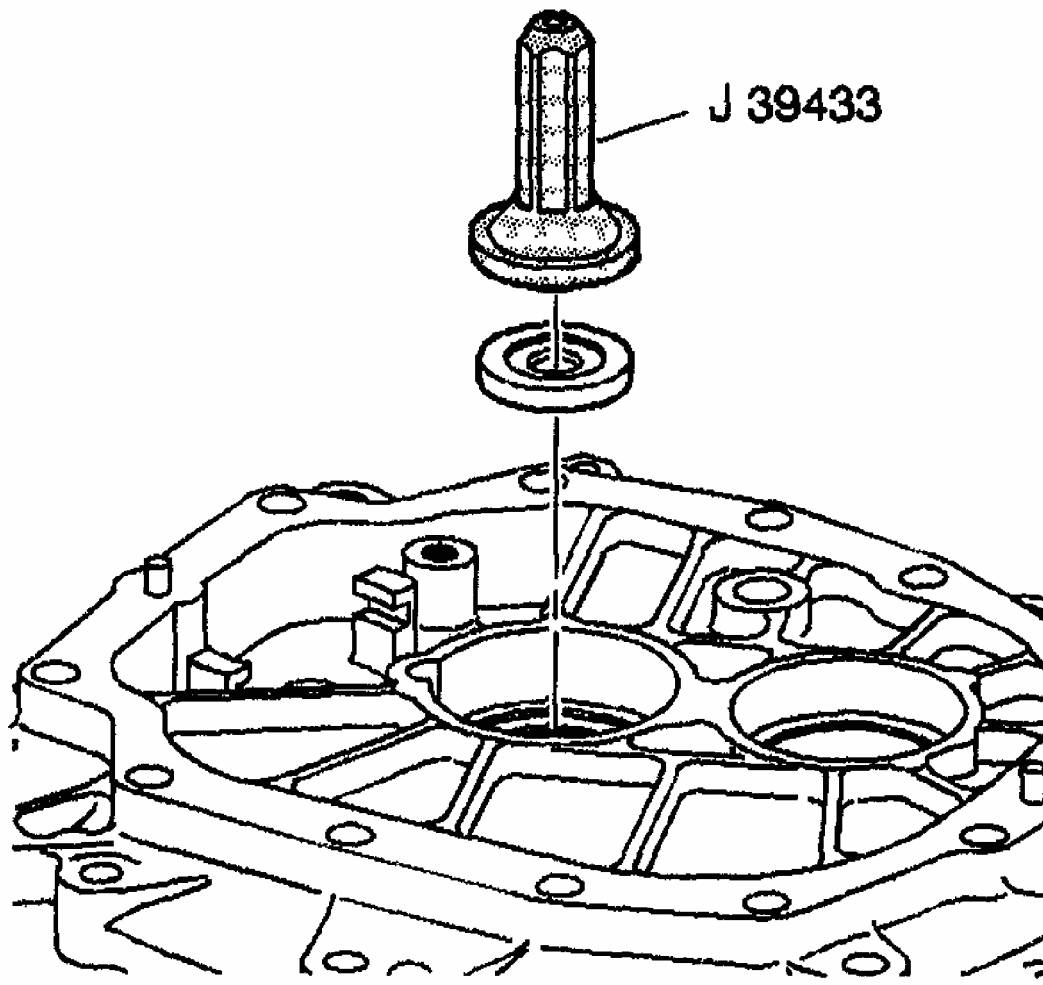
3. Install the inner shift rail seal (1) using the J 42496. Garter spring should face inside of transmission.



G01366751

Fig. 133: Installing Inner Shift Rail Seal
Courtesy of GENERAL MOTORS CORP.

4. Install the outer shift rail seal (2) using the J 42464.
5. Install the input shaft seal, using the J 39433.



G01366752

Fig. 134: Installing Input Shaft Seal
Courtesy of GENERAL MOTORS CORP.

6. Install the countershaft bearing shim and bearing race. Refer to **INPUT SHAFT, MAINSHAFT AND COUNTERSHAFT** .

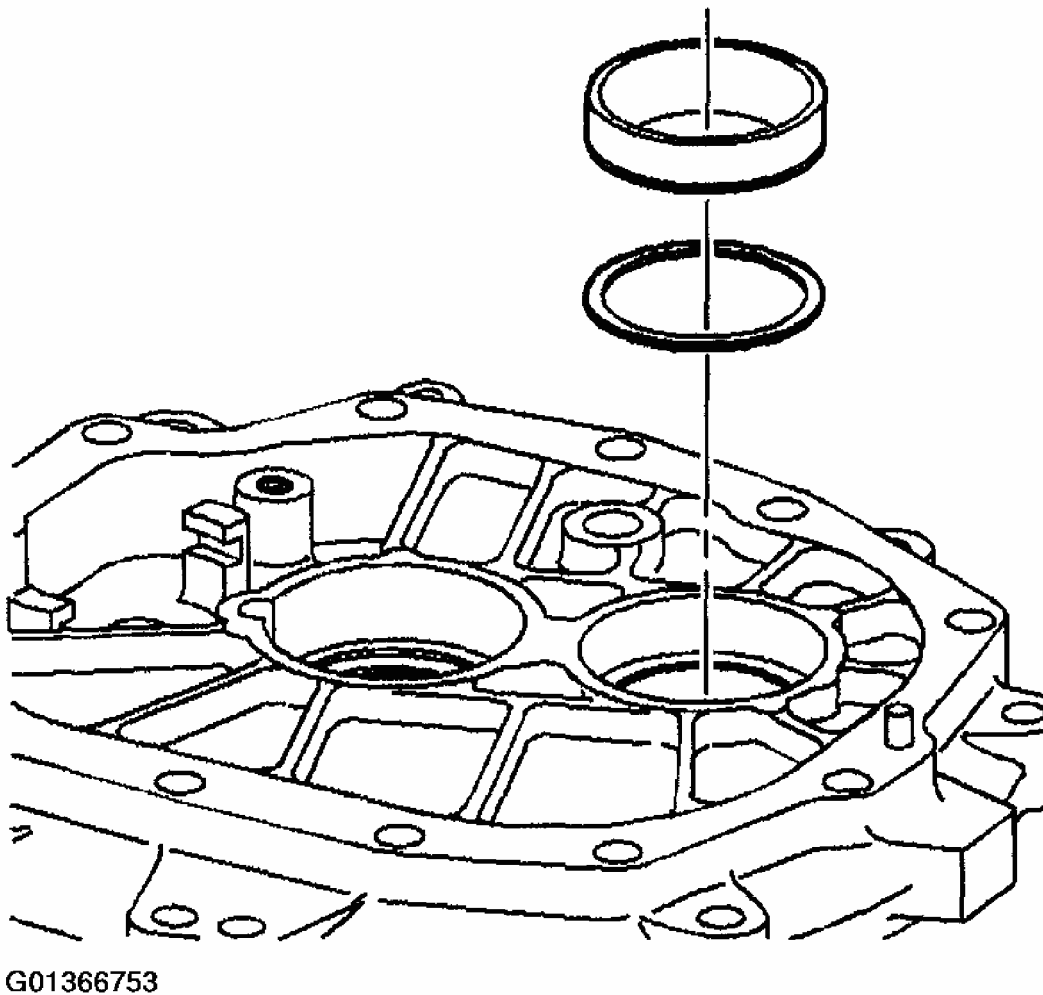
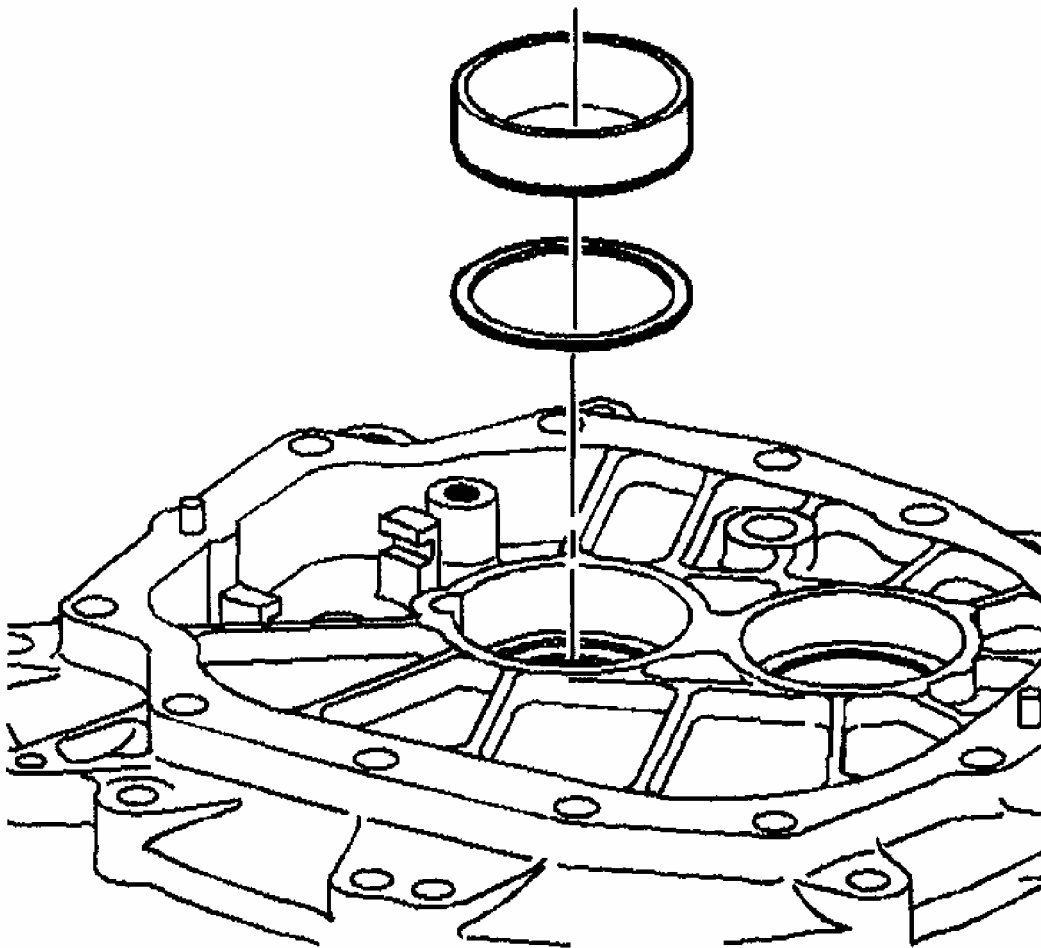


Fig. 135: Installing Countershaft Bearing Shim And Bearing Race
Courtesy of GENERAL MOTORS CORP.

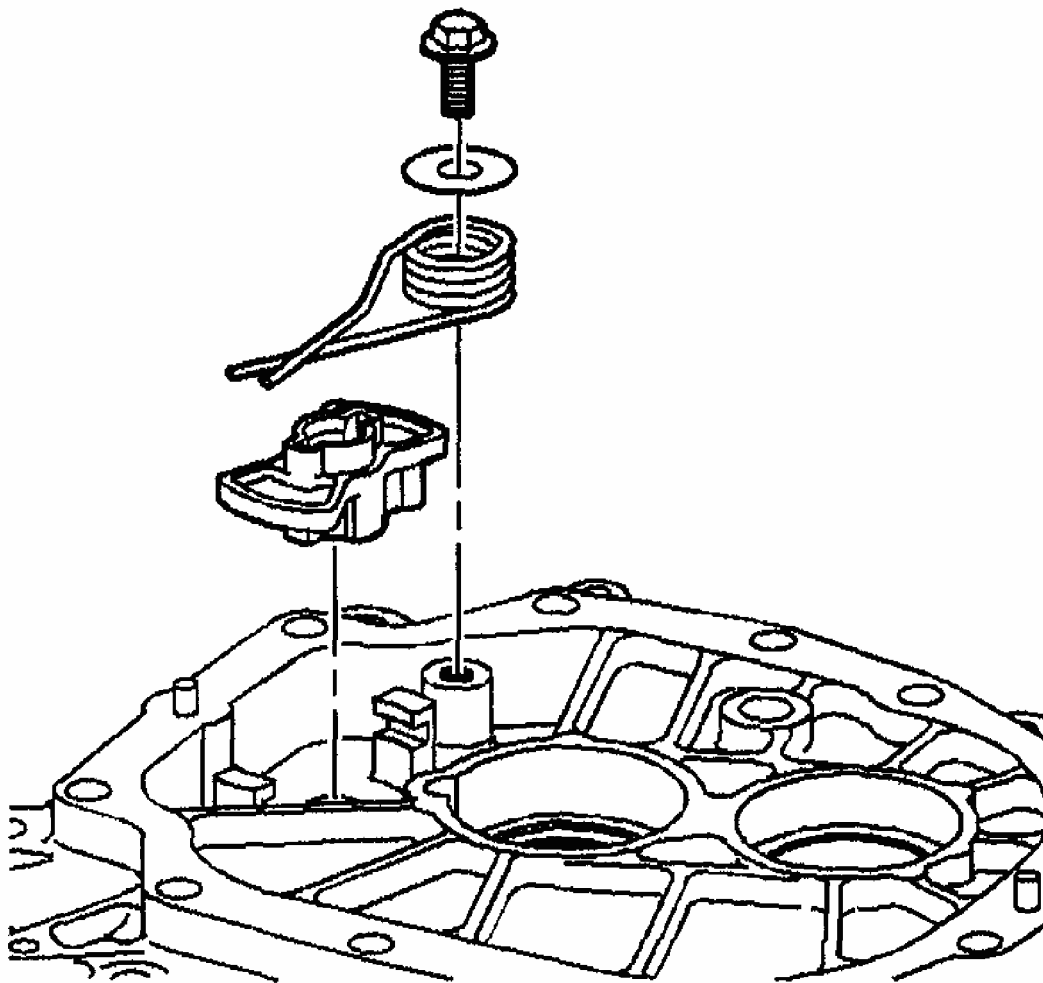
7. Install the input shaft bearing shim and bearing race. Refer to **INPUT SHAFT, MAINSHAFT AND COUNTERSHAFT** .



G01366754

Fig. 136: Installing Input Shaft Bearing Shim & Bearing Race
Courtesy of GENERAL MOTORS CORP.

8. Install the neutral return cam spring.



G01366755

Fig. 137: Installing Neutral Return Cam Spring Retaining Bolt & Washer
Courtesy of GENERAL MOTORS CORP.

9. Install the neutral return cam spring retaining bolt and washer.
10. Install the neutral return cam.

Tighten

Tighten the bolt to 25 N.m (18 lb ft).

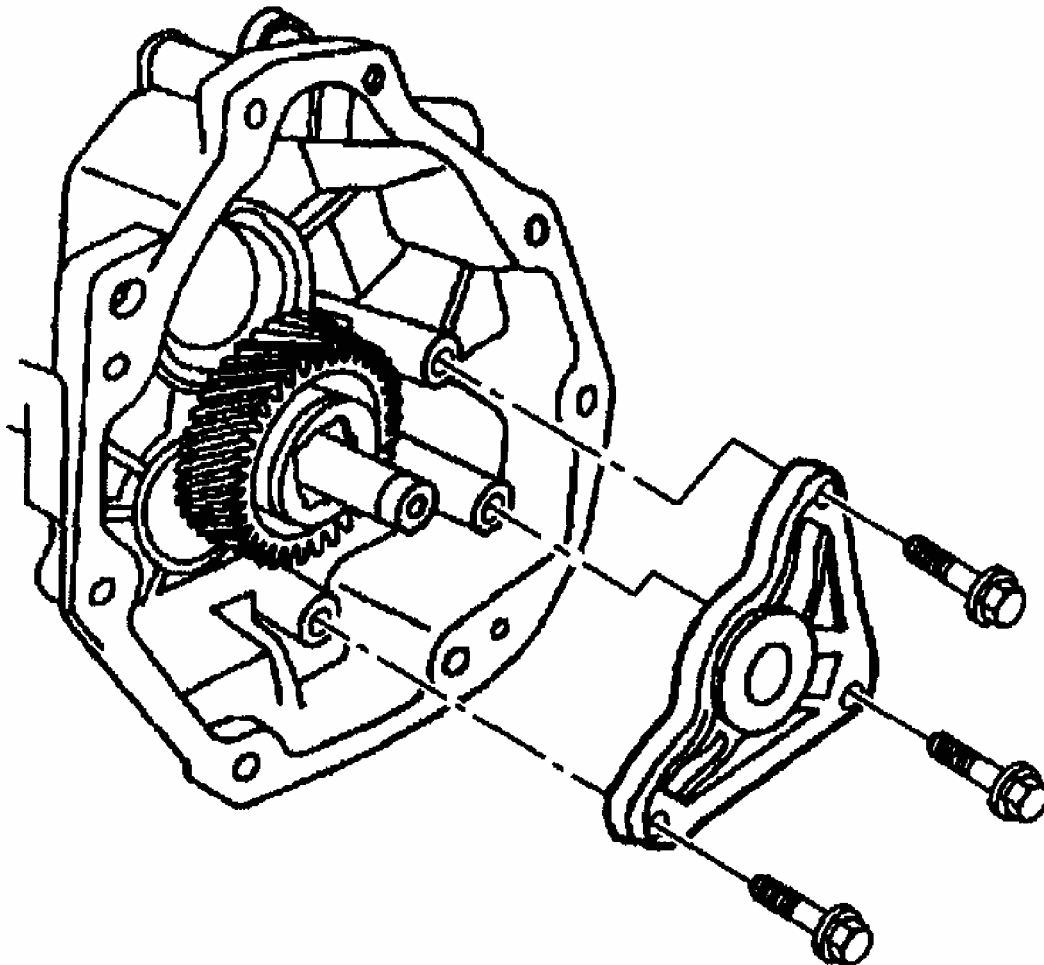
EXTENSION HOUSING DISASSEMBLE

Tools Required

- J 26941 Bearing Race Remover. See **Special Tools and Equipment** .

- J 23907 Slide Hammer. See **Special Tools and Equipment** .

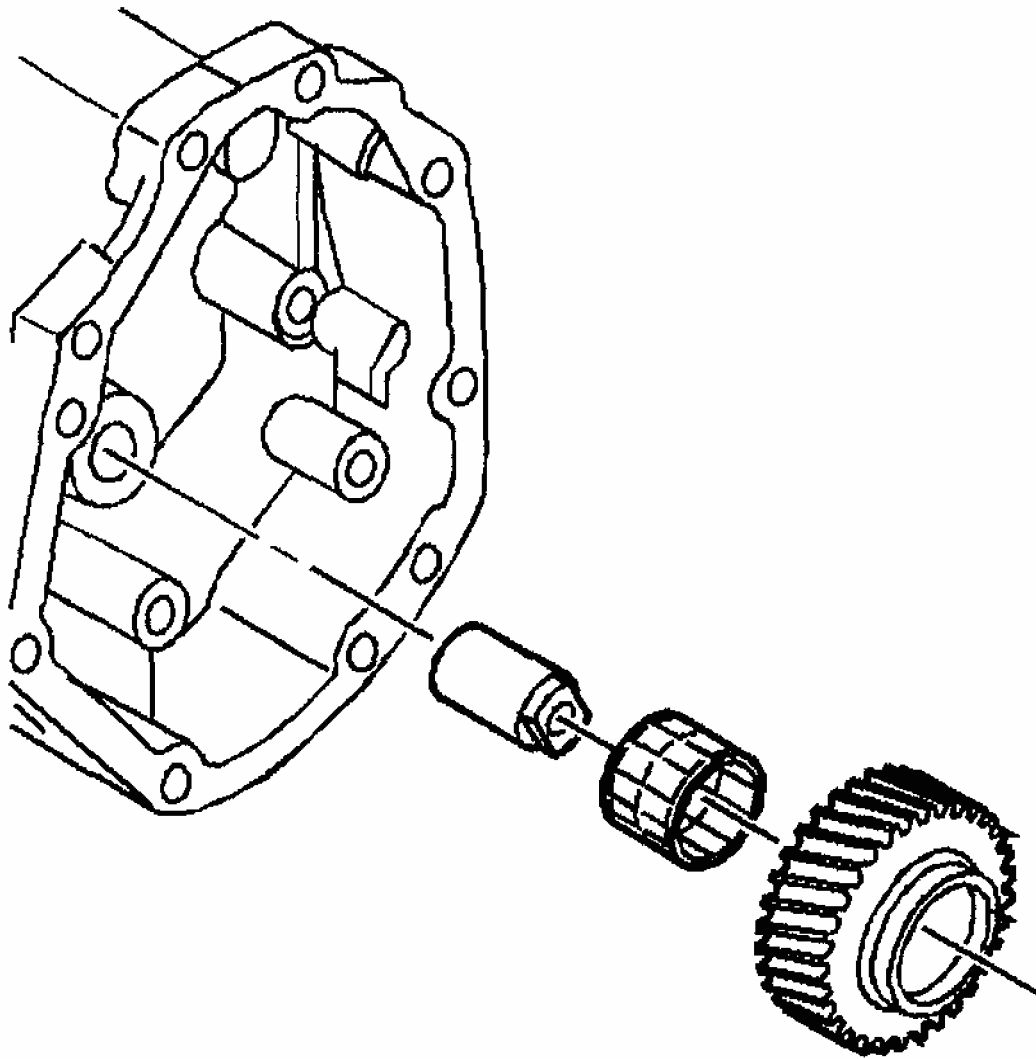
1. Remove the reverse idler shaft bracket bolts.



G01366756

Fig. 138: Removing Reverse Idler Shaft Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

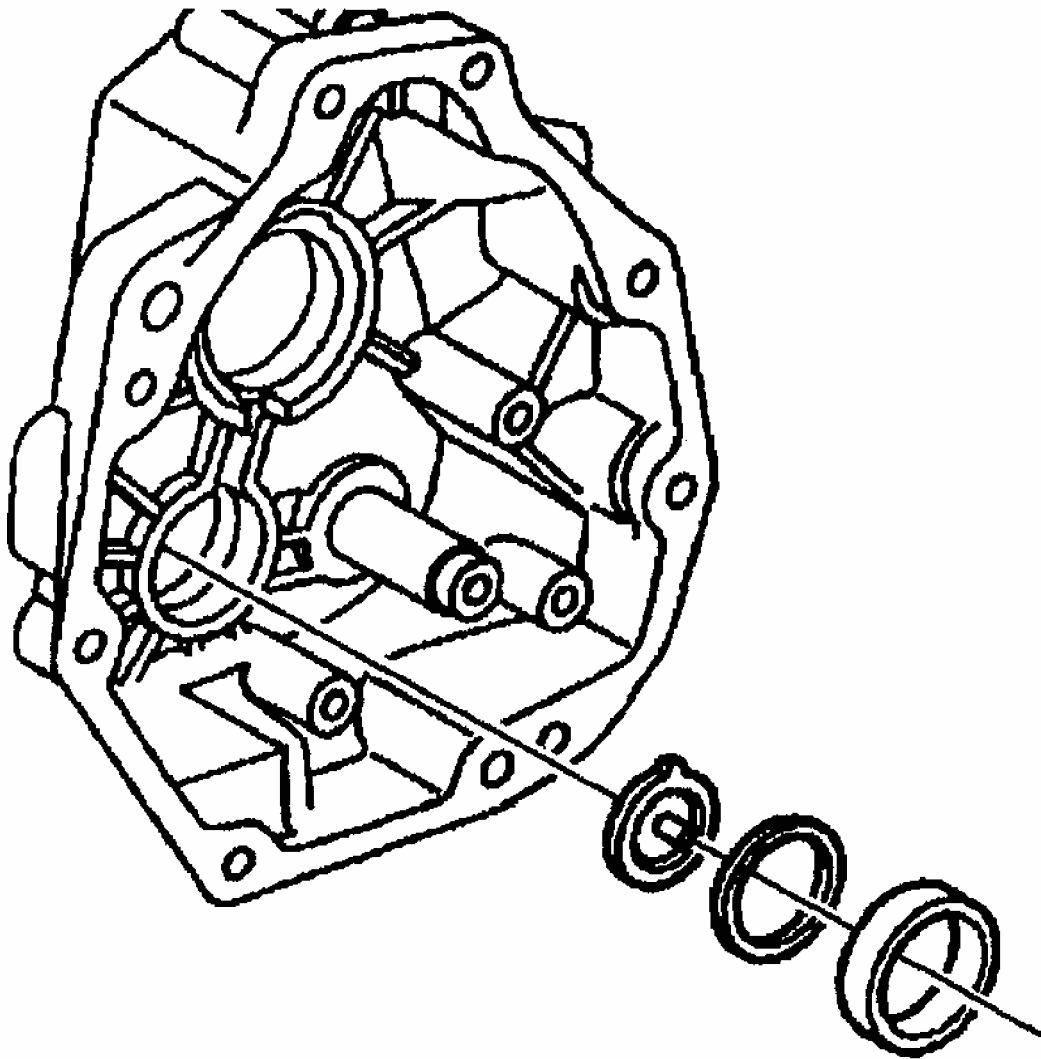
2. Remove the bracket.
3. Remove the following parts in order.
 1. The reverse idler gear
 2. The roller bearing
 3. The reverse idler shaft



G01366757

Fig. 139: Removing Reverse Idler Gear, Shaft & Roller Bearing
Courtesy of GENERAL MOTORS CORP.

4. Remove the following parts in order:
 1. The countershaft extension bearing race
 2. The shim
 3. The funnel
 4. Remove the outer and inner output shaft seals (pry out the seals with a suitable tool).



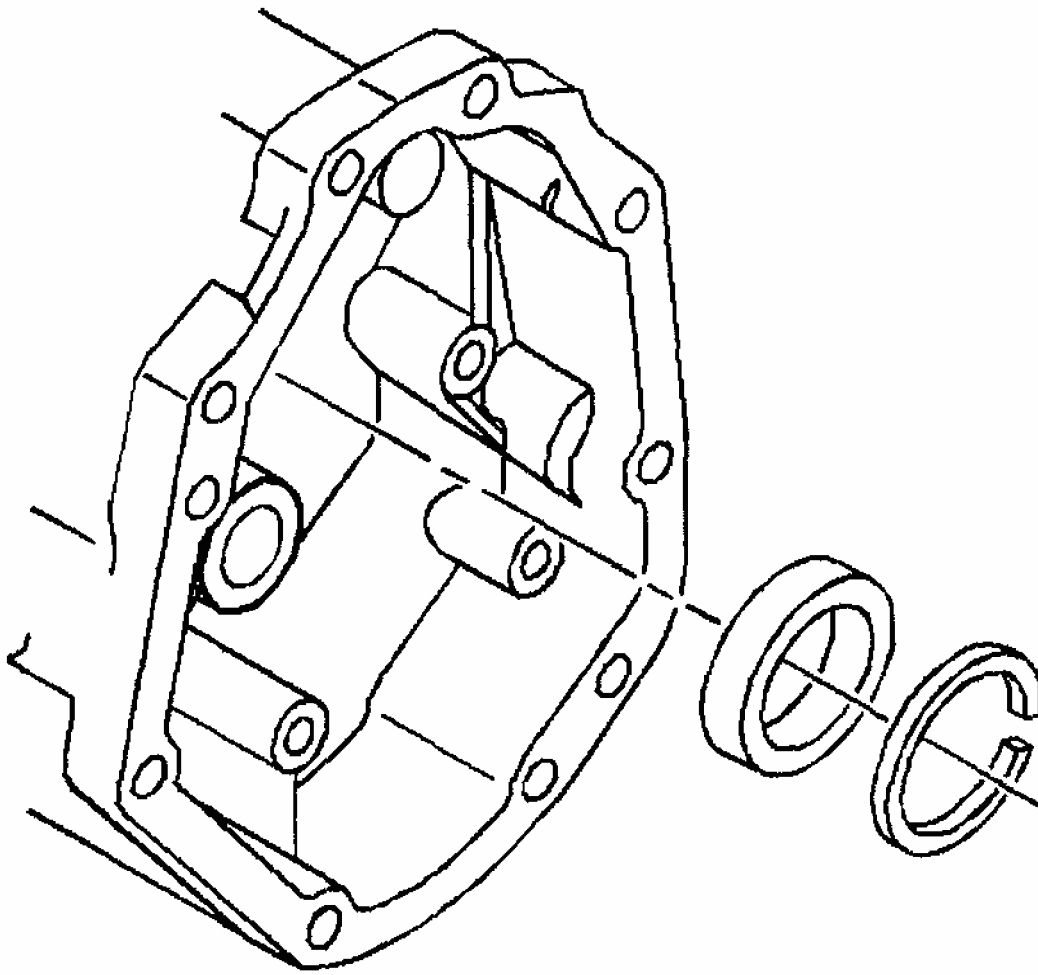
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Fig. 140: Removing Outer & Inner Output Shaft Seals
Courtesy of GENERAL MOTORS CORP.

5. Remove the mainshaft bearing race retainer ring.

Important: Do not replace the bearing race unless inspection shows bearing race damage.

6. Remove the mainshaft bearing race using the J 26941 and the J 23907.



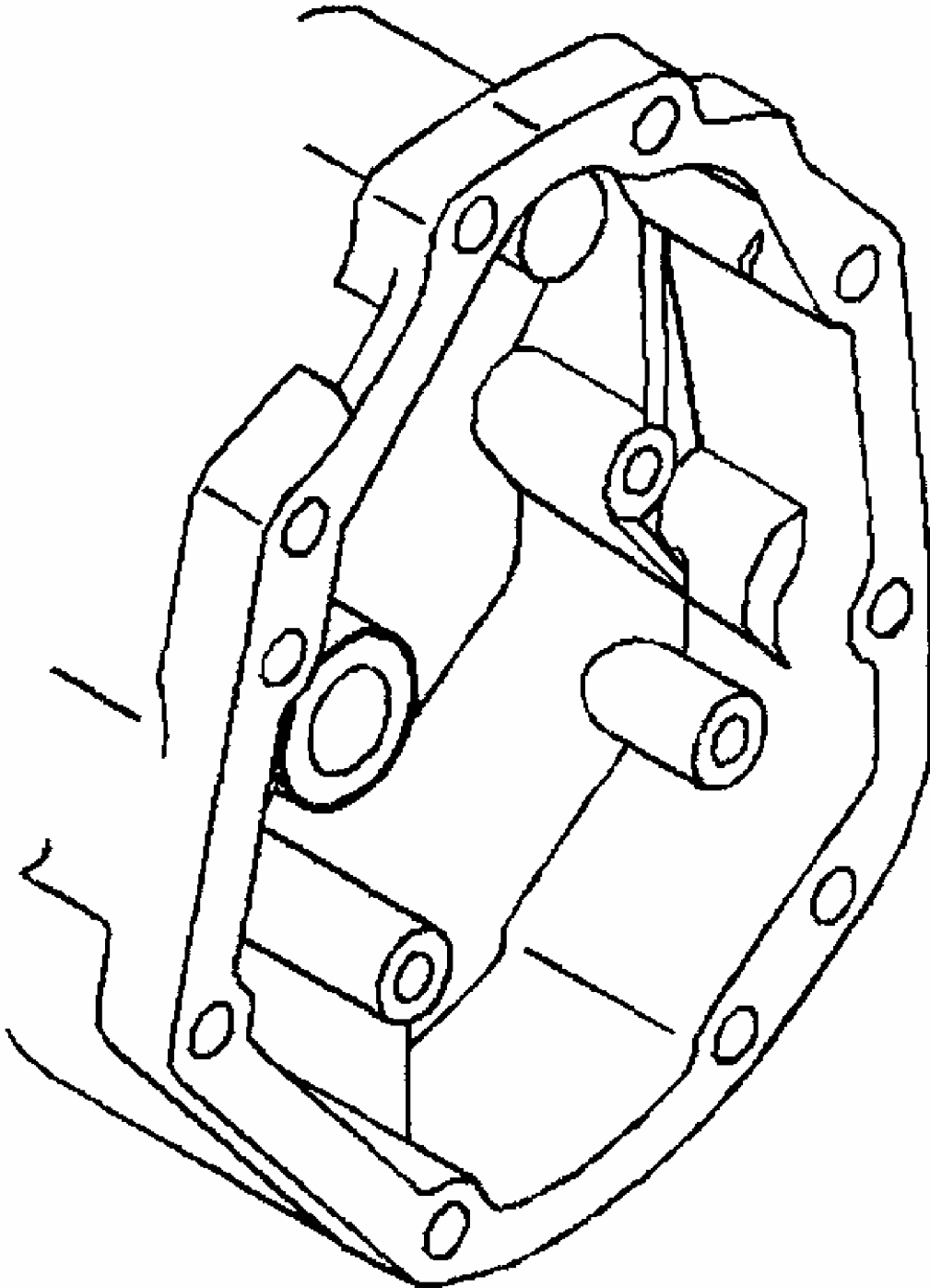
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Fig. 141: Removing Mainshaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

EXTENSION HOUSING CLEANING AND INSPECTION

1. Clean the rear extension housing in a suitable solvent. Air dry the housing.
2. Inspect the extension housing for the following:
 - Cracks
 - Scratches
 - Damaged threads
 - Burrs
 - Nicked mounting surfaces
 - Damaged sealing surfaces

- Damaged front or rear bearing bores



G01366760

Fig. 142: Inspecting Extension Housing
Courtesy of GENERAL MOTORS CORP.

3. Replace a cracked housing.
4. Clean up damaged threads with the correct size thread tap.
5. Inspect the machined mating surfaces for flatness (Check the mating surfaces with a straight edge).
6. Use a fine mill file to dress minor scratches or burrs.

EXTENSION HOUSING ASSEMBLE

Tools Required

- J 8092 Drive Handle. See Special Tools and Equipment .
 - J 26508 Inner Output Shaft Seal Installer. See Special Tools and Equipment .
 - J 39546 Bearing Race Installer. See Special Tools and Equipment .
 - J 42198 Transmission Rear Seal Installer. See Special Tools and Equipment .
1. Install the mainshaft bearing race. Use the J 39546 and the J 8092.

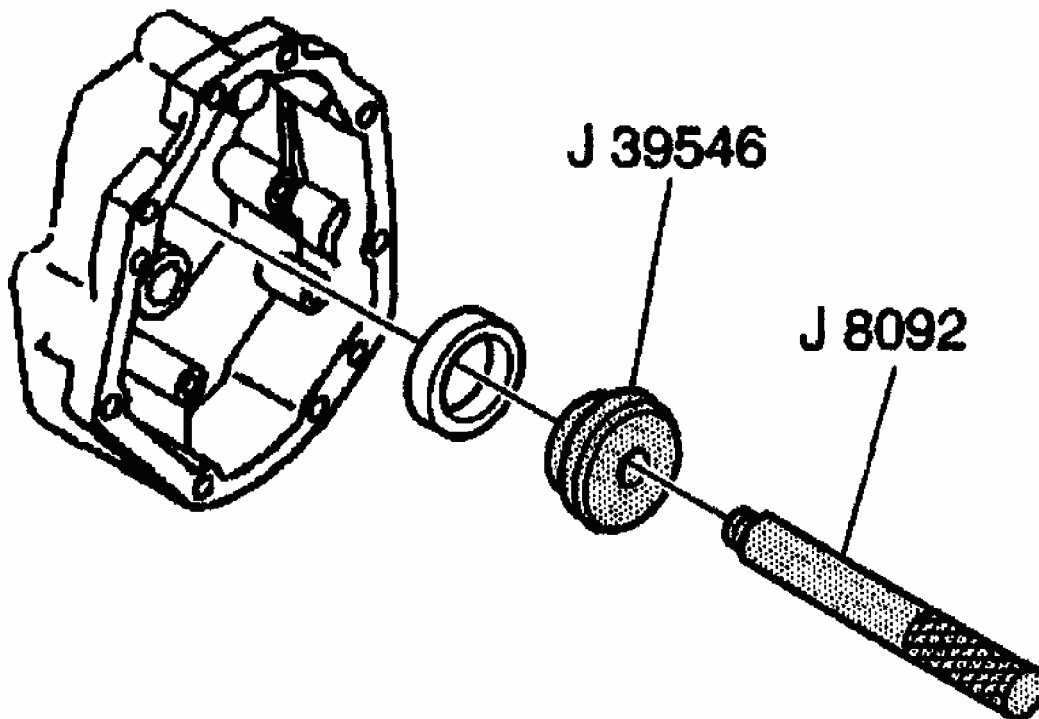
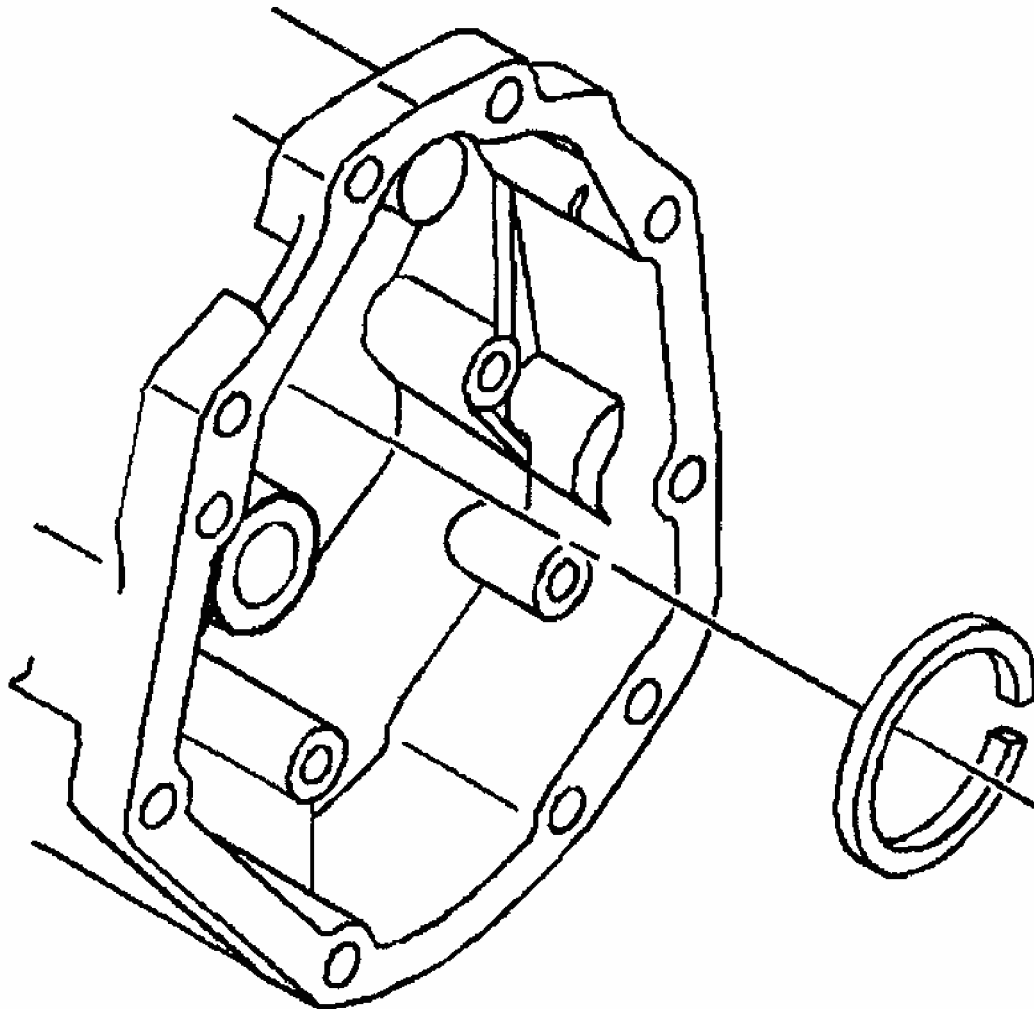


Fig. 143: Installing Mainshaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

2. Install the mainshaft bearing race retainer ring.



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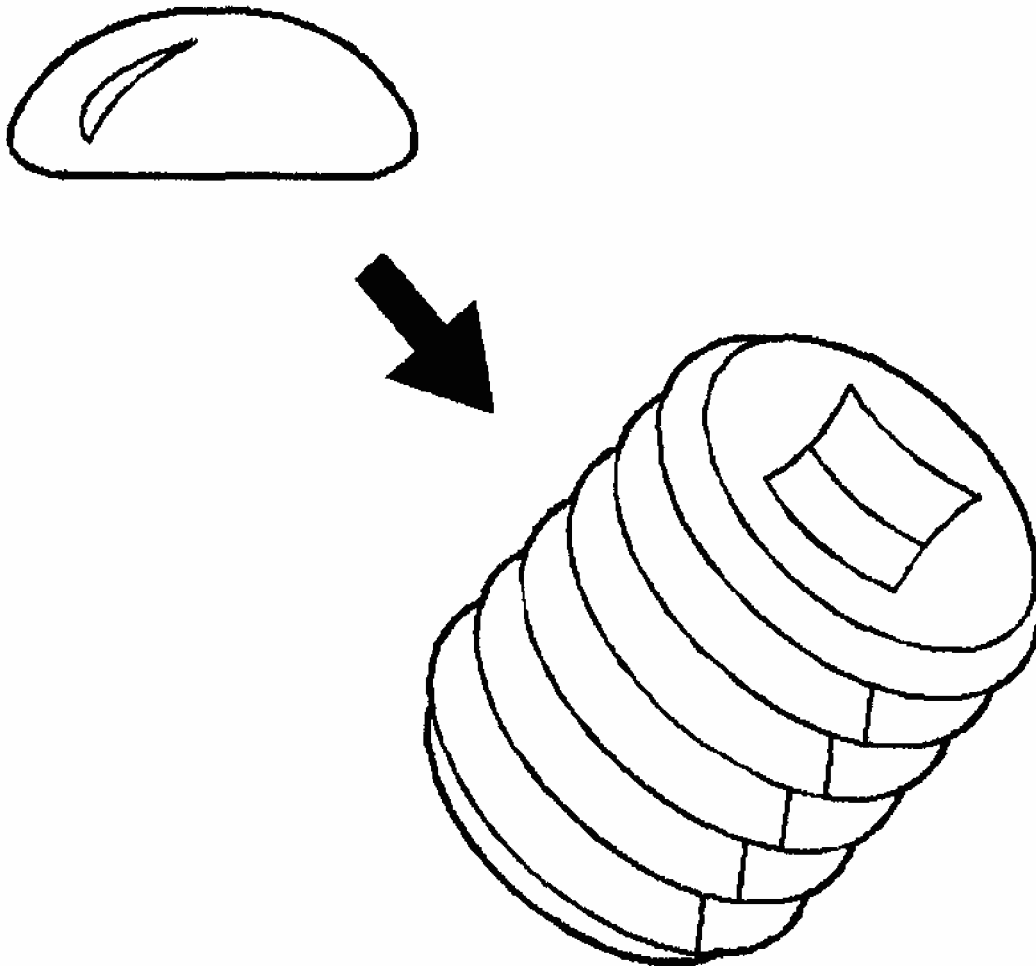
Fig. 144: Installing Mainshaft Bearing Race Retainer Ring
Courtesy of GENERAL MOTORS CORP.

NOTE: Failure to install the inner output shaft seal correctly will cause a leak.

3. Install the inner output shaft seal with garter spring facing inward, using J 26508.

NOTE: Failure to install the outer output shaft seal correctly will cause a leak.

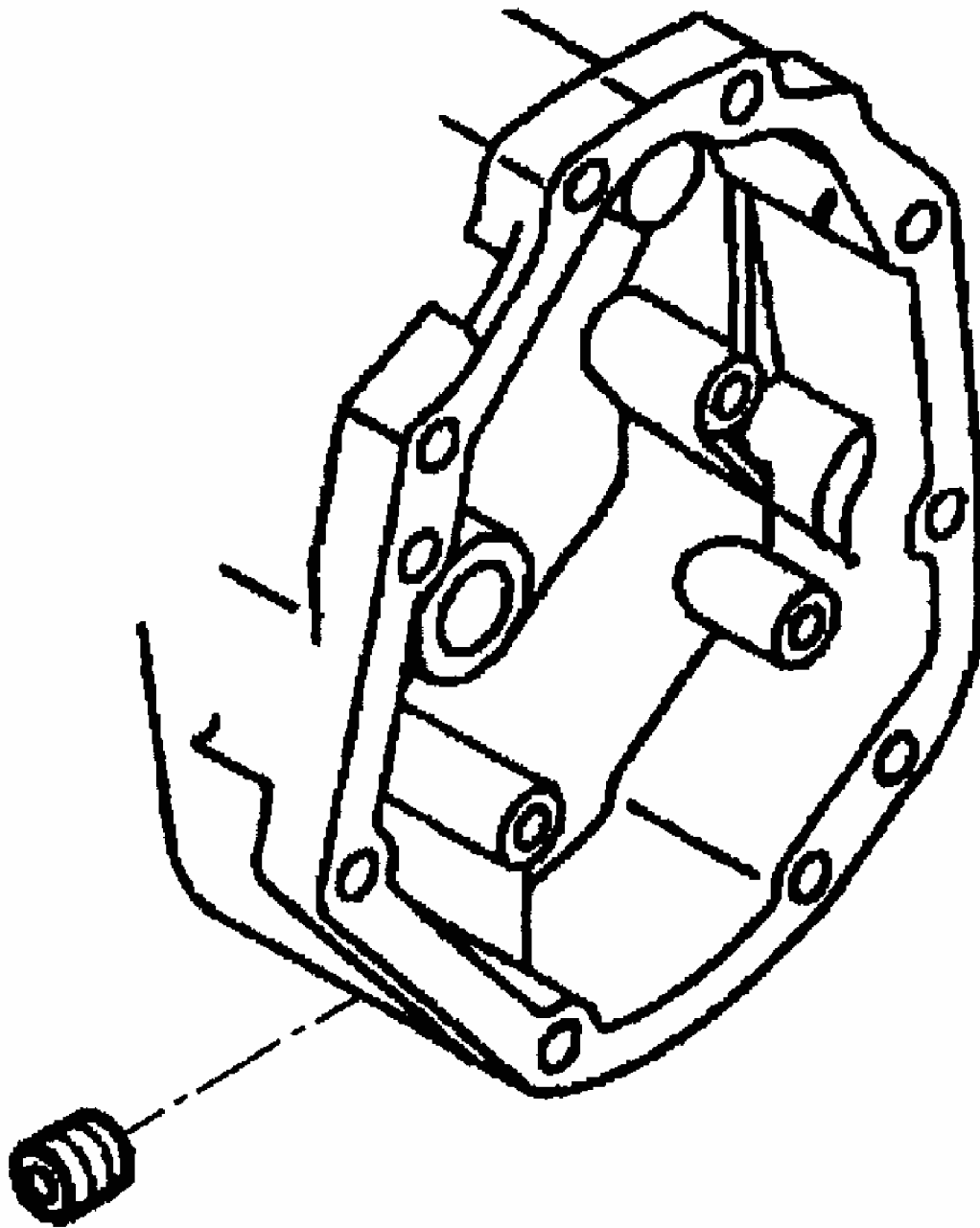
4. Install the outer output shaft seal with garter spring facing outward, using J 42198.
5. Apply thread sealer GM P/N United States 12346004, GM P/N Canada 10953480 to the transmission case drain plug.



G01366763

Fig. 145: Applying Thread Sealer To Transmission Case Drain Plug
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.



G01366764

Fig. 146: Installing Transmission Case Drain Plug
Courtesy of GENERAL MOTORS CORP.

6. Install the transmission case drain plug.

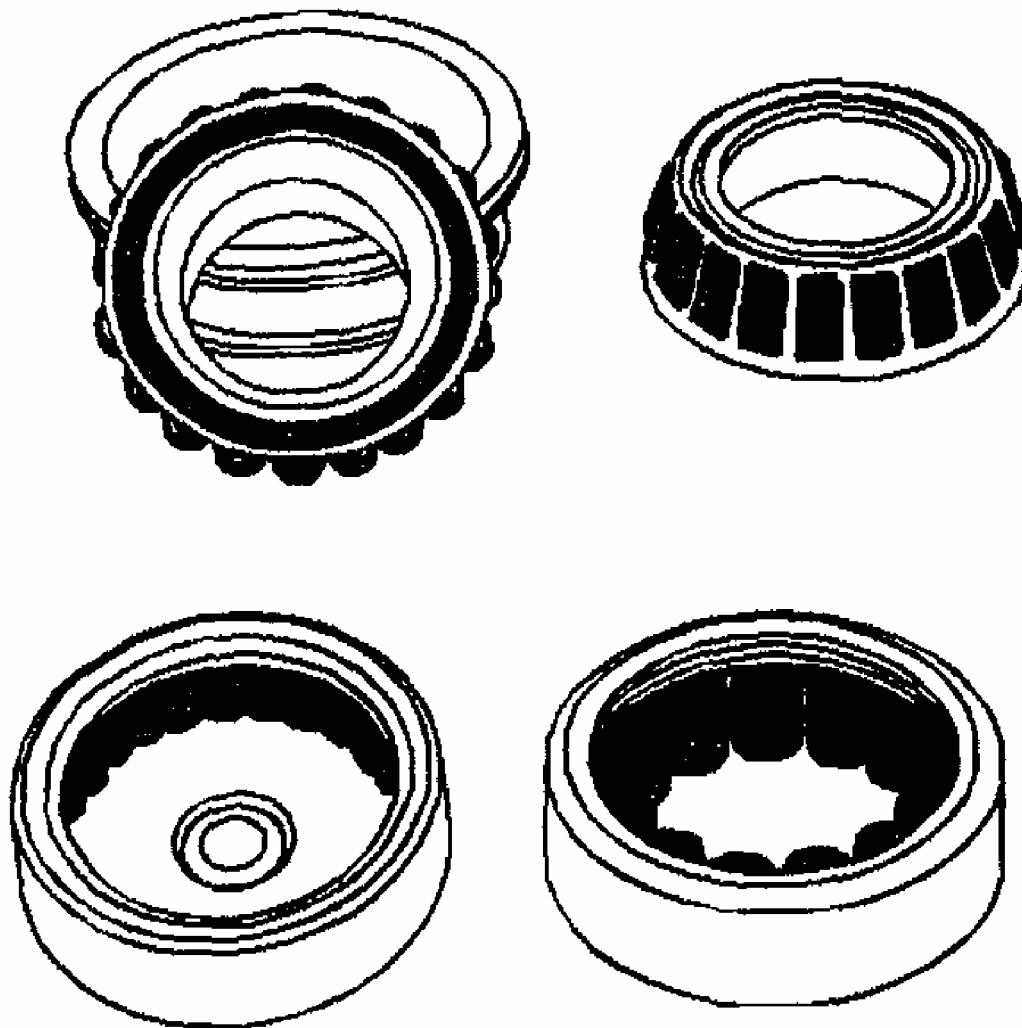
Tighten

Tighten the plug to 18 N.m (13 lb ft).

BEARINGS AND SPACERS CLEANING AND INSPECTION

NOTE: **Do not allow the bearings to spin. Turn them slowly by hand. Spinning the bearings may damage the race and the rollers.**

1. Clean all the bearing parts in a suitable solvent. Air dry all the parts.
2. Lubricate the bearings. Use Dexron(R) III transmission lubricant.
3. Inspect the bearings and journals for roughness and unusual wear or damage.
4. Inspect the mainshaft bearing journals for wear.
5. Inspect the mainshaft speed gear bearings for wear.
6. Inspect the main drive gear pilot bearing rollers for wear.
7. Replace parts which show signs of excessive wear.
8. Do not file surfaces which have been hardened and precision ground.
9. Replace worn or damaged bearings.
10. Replace mated bearing parts when only one part is damaged.



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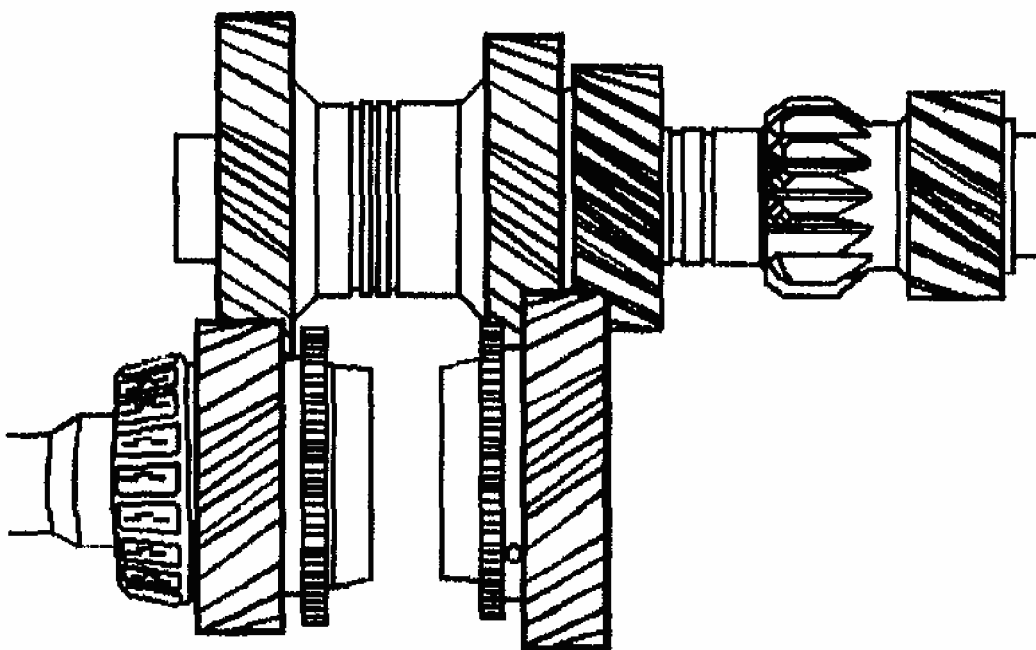
Fig. 147: Inspecting Bearings & Journals For Roughness & Unusual Wear Or Damage

Courtesy of GENERAL MOTORS CORP.

GEARS CLEANING AND INSPECTION

1. Clean all the parts in a suitable solvent. Air dry all the parts.
2. Inspect the gear tooth surfaces on all the gear sets for the following conditions:
 - Cracks
 - Pitting
 - Nicks

- Chipped gear teeth
- High spots (Small-shiny spots on the gear teeth mating surface) that could cause gear noise



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Fig. 148: Inspecting Gear Tooth Surfaces On All Gear Sets
Courtesy of GENERAL MOTORS CORP.

3. Inspect for damaged splines on the input shaft, mainshaft, and the countershaft extension.
4. Remove nicks and burrs with a soft stone or a crocus cloth.
5. Replace a burred or nicked part that cannot be reconditioned by hand.
6. Replace gears and gear assemblies that are worn or damaged.

COUNTERSHAFT EXTENSION ASSEMBLE

Tools Required

- J 5590 Press Tube. See **Special Tools and Equipment** .
 - J 39473 Mainshaft Bearing Installer. See **Special Tools and Equipment** .
1. Install a new small tapered bearing, using the J 39473, V-blocks, and a hydraulic press.

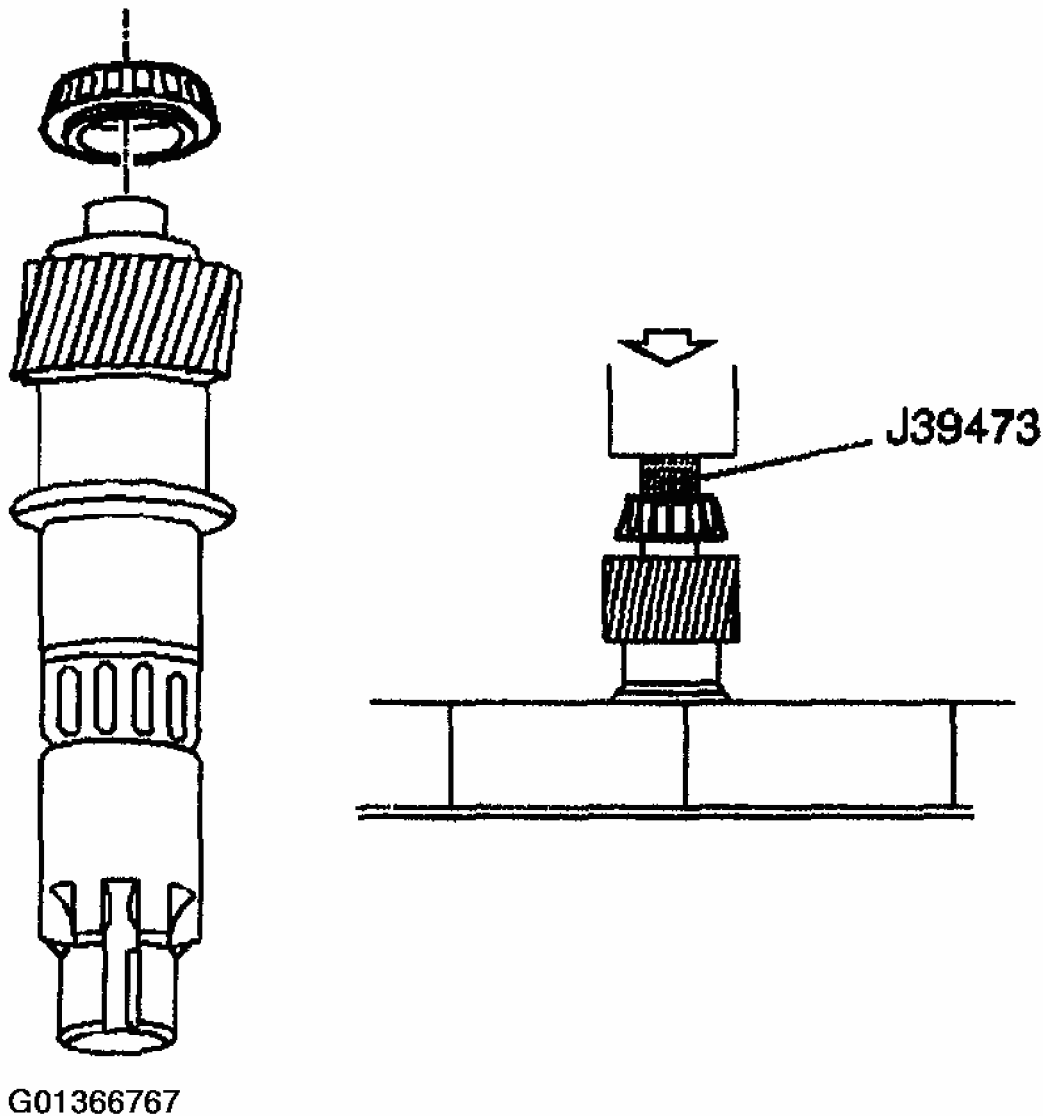
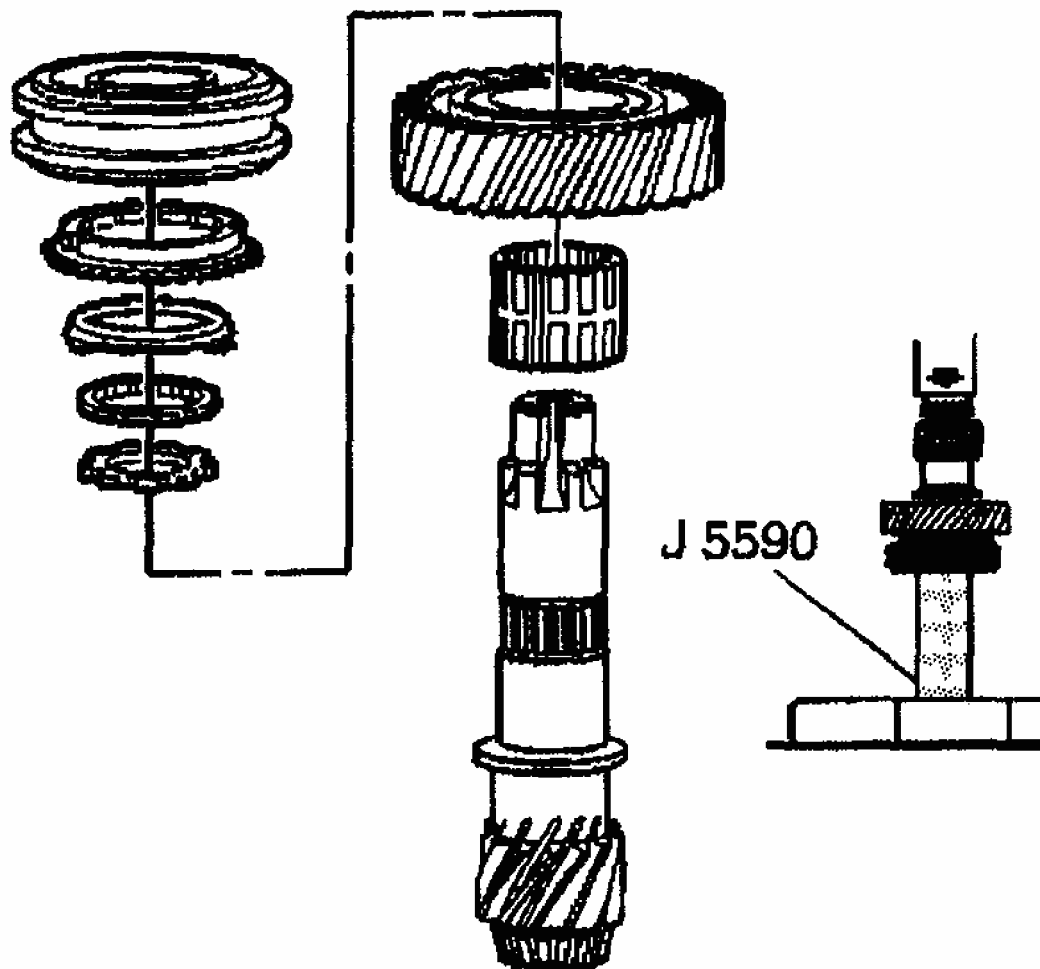


Fig. 149: Installing New Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

2. Do the following when installing the 5th/6th speed synchronizer assembly:
 1. Start the press operation.
 2. Stop pressing before the keys engage the blocking ring slots.
 3. Lift and rotate the 5th speed gear in order to engage the keys with the blocking ring.
 4. Continue pressing until the synchronizer is seated.



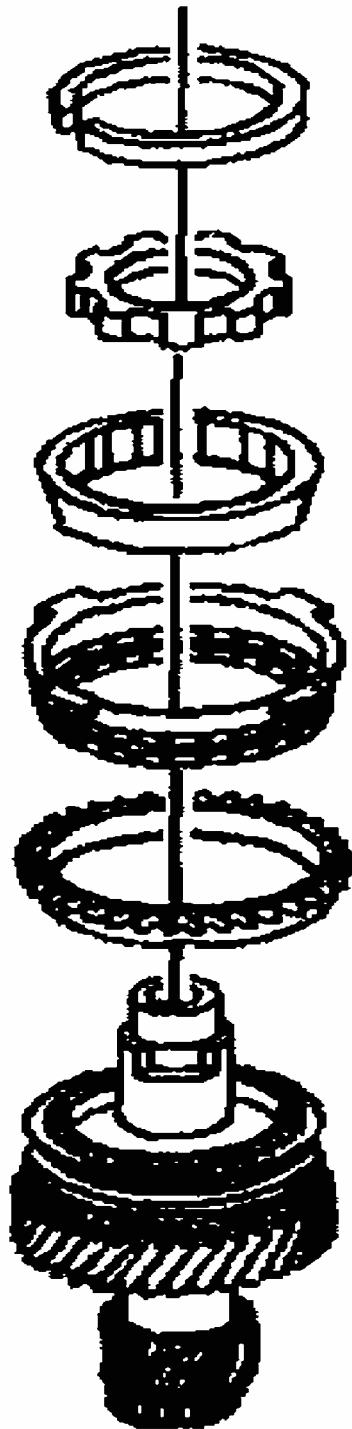
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Fig. 150: Installing 5th Speed Drive Gear Caged Needle Bearing, Drive Gear & Inner Cone

Courtesy of GENERAL MOTORS CORP.

3. Install the following parts in order:
 1. The 5th speed drive gear caged needle bearing
 2. The 5th speed drive gear
 3. The thrust washer
 4. The 5th speed drive gear inner cone
 5. The 5th speed drive gear friction cone
 6. The 5th speed drive gear blocking ring
 7. The 5th/6th speed synchronizer assembly (The inside diameter (ID) groove on the sleeve faces 5th speed gear.) Use the J 5590 and a hydraulic press.

4. Install the following parts in order:
 1. The 6th speed drive gear blocking ring
 2. The 6th speed drive gear friction cone
 3. The 6th speed drive gear inner cone
 4. The thrust washer
 5. A new 5th/6th speed synchronizer retainer ring

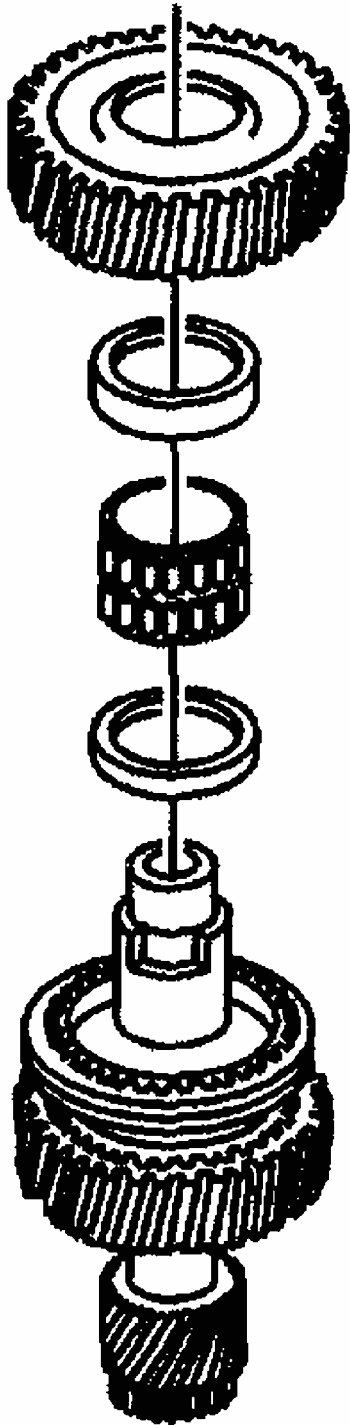


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Fig. 151: Installing 6th Speed Drive Gear Blocking Ring, Friction Cone & Inner Cone
Courtesy of GENERAL MOTORS CORP.

5. Install the following parts in order:
 1. The 6th speed drive gear spacer

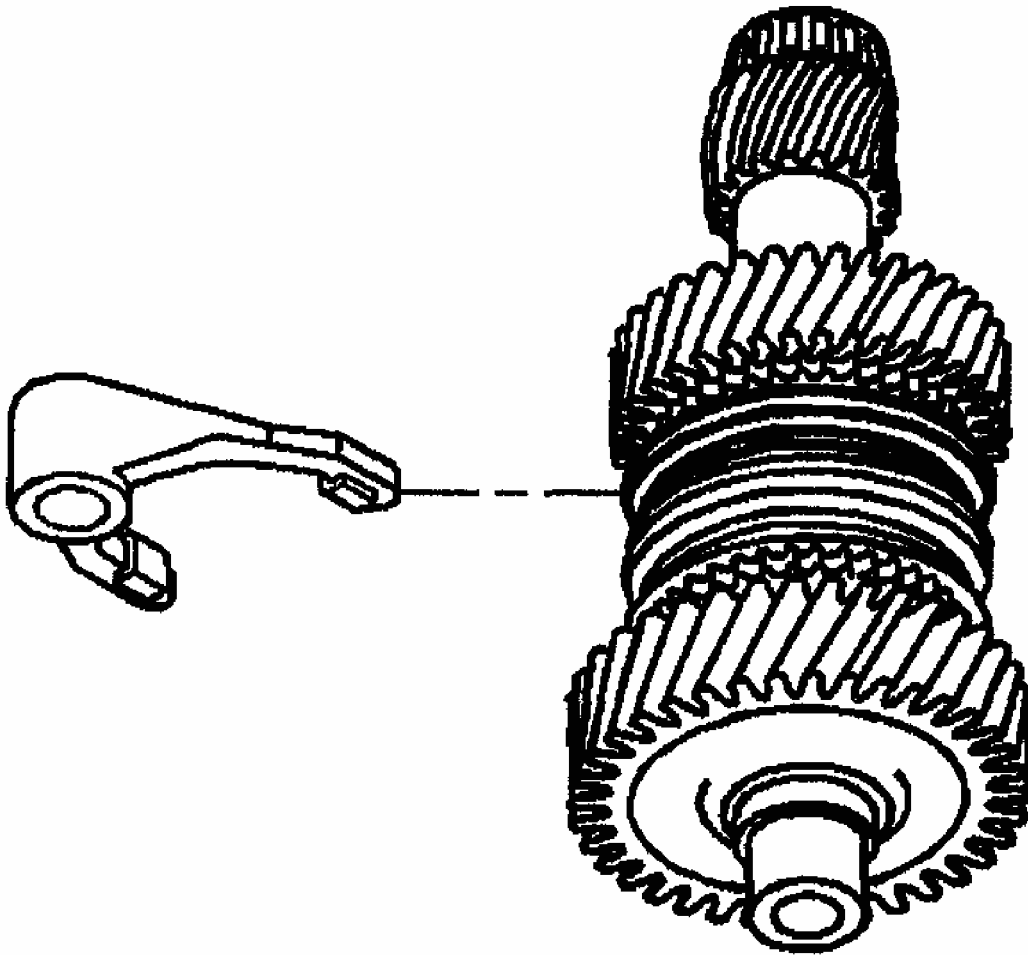
2. The 6th speed drive gear caged needle bearing
3. The 6th speed drive gear spacer
4. The 6th speed drive gear



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Fig. 152: Installing 6th Speed Drive Gear Components
Courtesy of GENERAL MOTORS CORP.

6. Install the 5th/6th speed shift fork.



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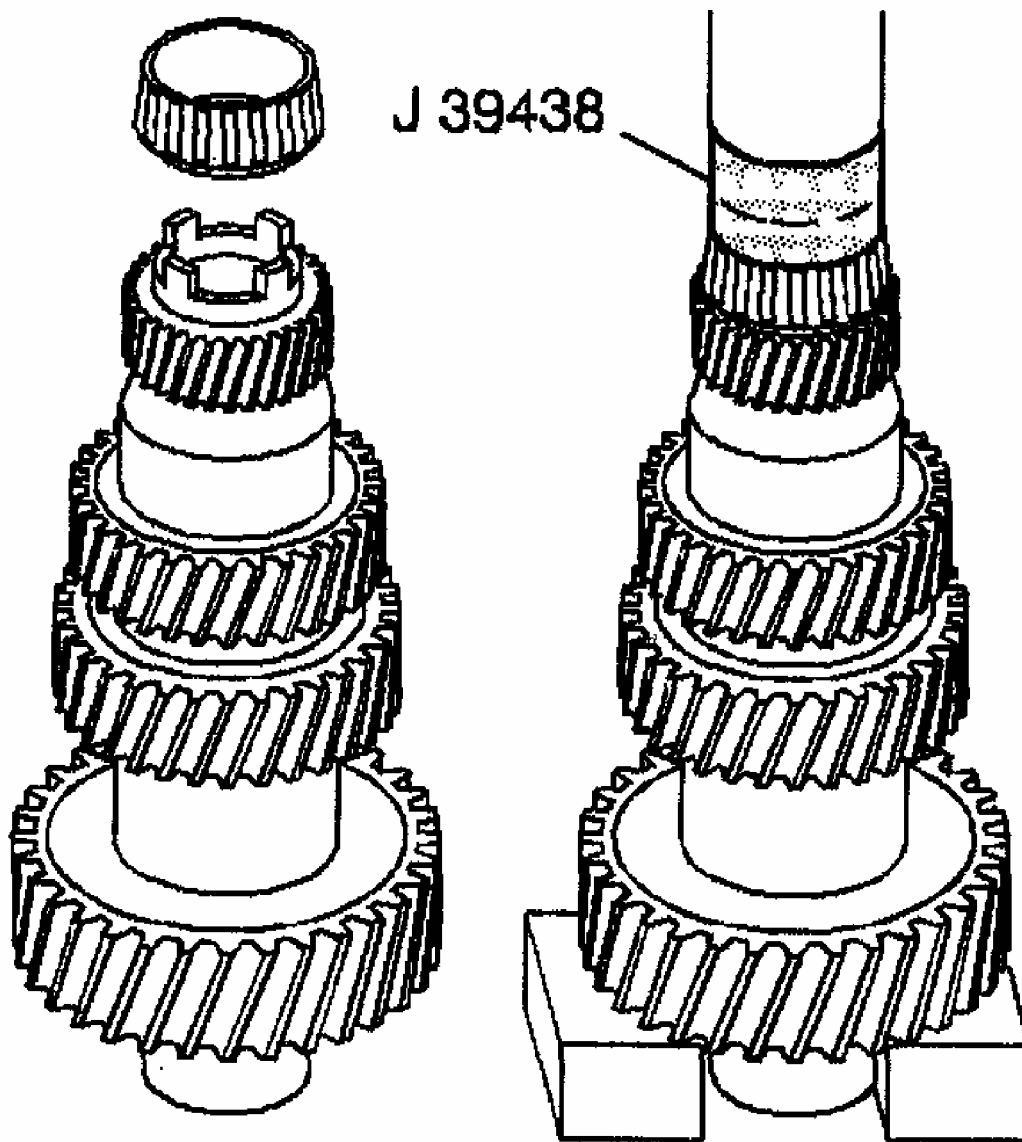
Fig. 153: Installing 5th/6th Speed Shift Fork
Courtesy of GENERAL MOTORS CORP.

COUNTERSHAFT ASSEMBLY (MAIN SHAFT)

Tools Required

- J 39438 Bearing Installer. See Special Tools and Equipment .
- J 5590 Press Tube. See Special Tools and Equipment .

1. Install a new large tapered bearing, using the J 39438, U-blocks and a hydraulic press.



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Fig. 154: Installing New Large Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

2. Install a new small tapered bearing, using the J 5590 and a hydraulic press.

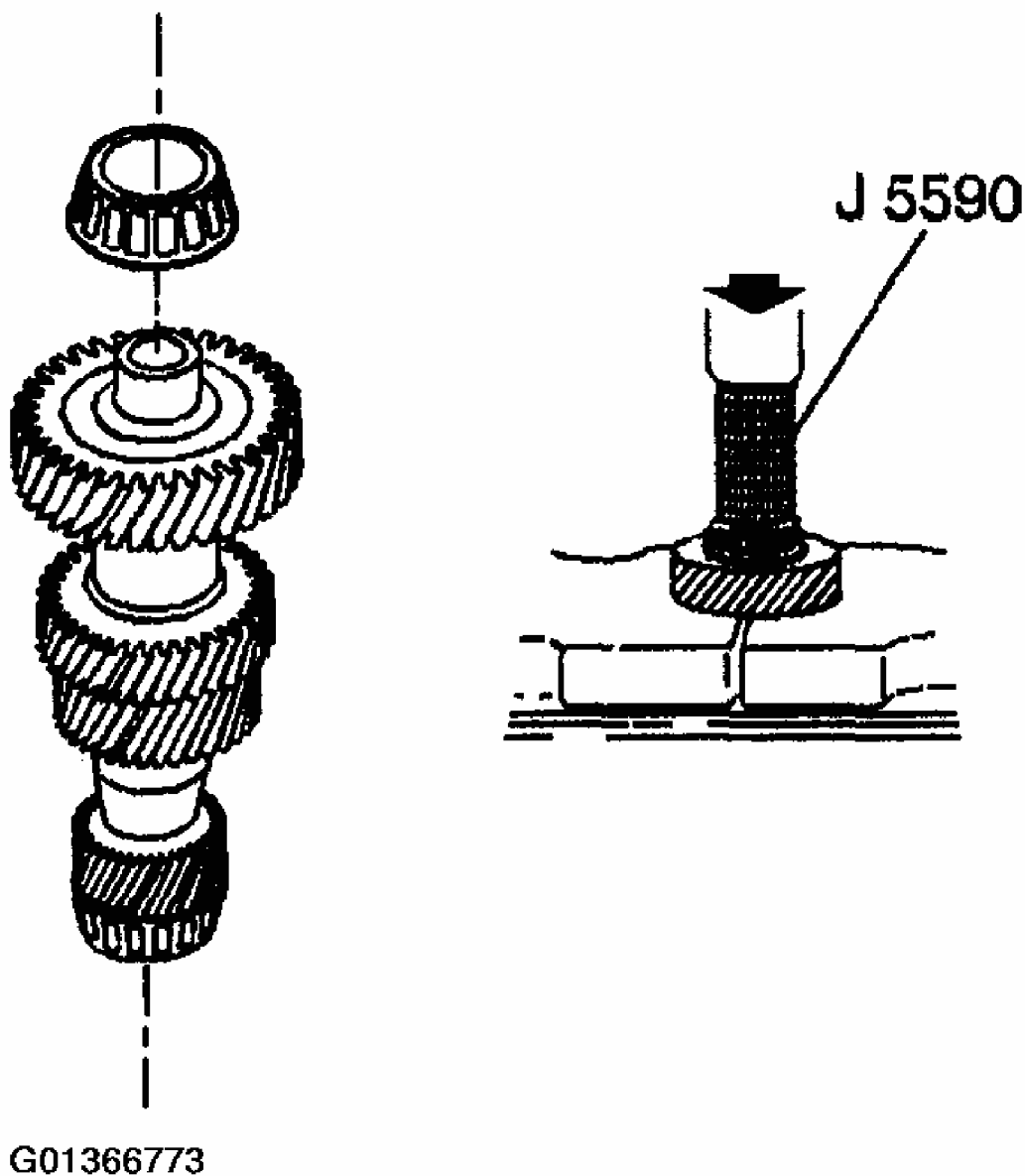


Fig. 155: Installing New Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

MAINSHAFT AND INPUT SHAFT ASSEMBLE

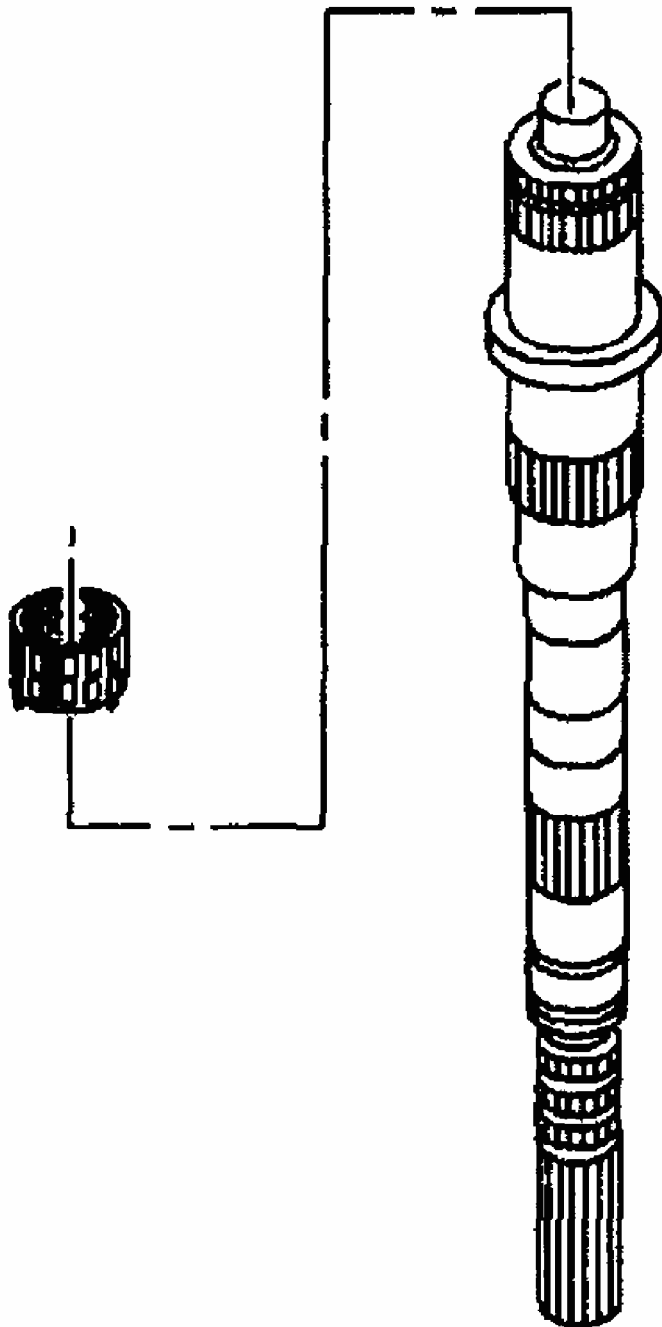
Mainshaft

Tools Required

- J 36183 Press Tube. See **Special Tools and Equipment** .
- J 36184 Press Tube Adapter. See **Special Tools and Equipment** .

- J 39371 1st/2nd Synchronizer Installer. See **Special Tools and Equipment** .
- J 39473 Mainshaft Bearing Installer. See **Special Tools and Equipment** .

1. Install the 3rd speed gear caged needle bearing and the spacer.



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Fig. 156: Installing 3rd Speed Gear Caged Needle Bearing & Spacer

Courtesy of GENERAL MOTORS CORP.

2. Check the 3rd/4th speed gear synchronizer assembly scribe marks for correct positions.

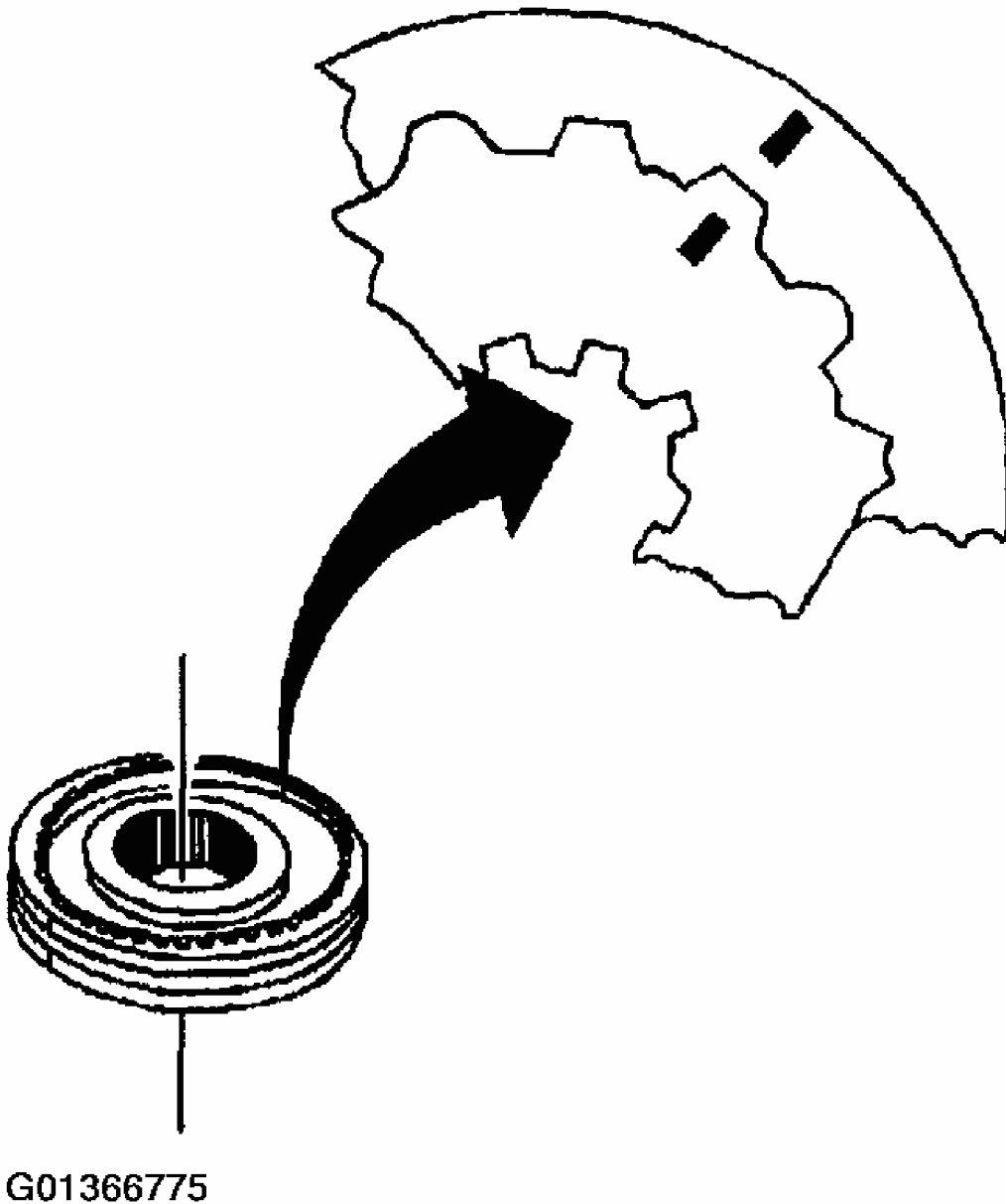


Fig. 157: Checking 3rd/4th Speed Gear Synchronizer Assembly Scribe Marks For Correct Positions

Courtesy of GENERAL MOTORS CORP.

3. Install the 3rd/4th synchronizer assembly as follows:

1. Start the press operation.
2. STOP pressing before the keys engage the blocking ring slots.
3. Lift and rotate the 3rd speed gear in order to engage the keys with the blocking ring.
4. Continue pressing until the synchronizer is seated.

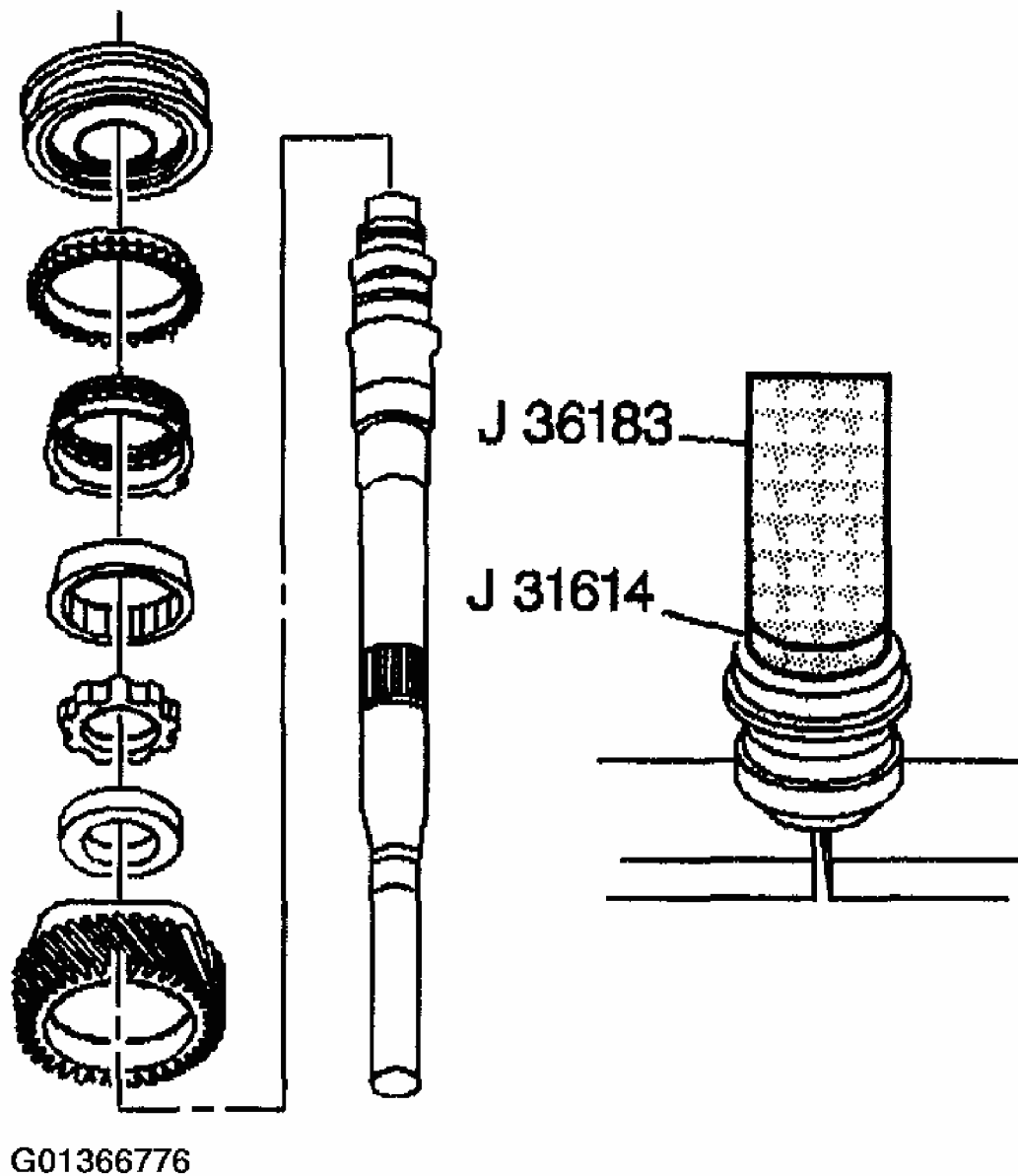
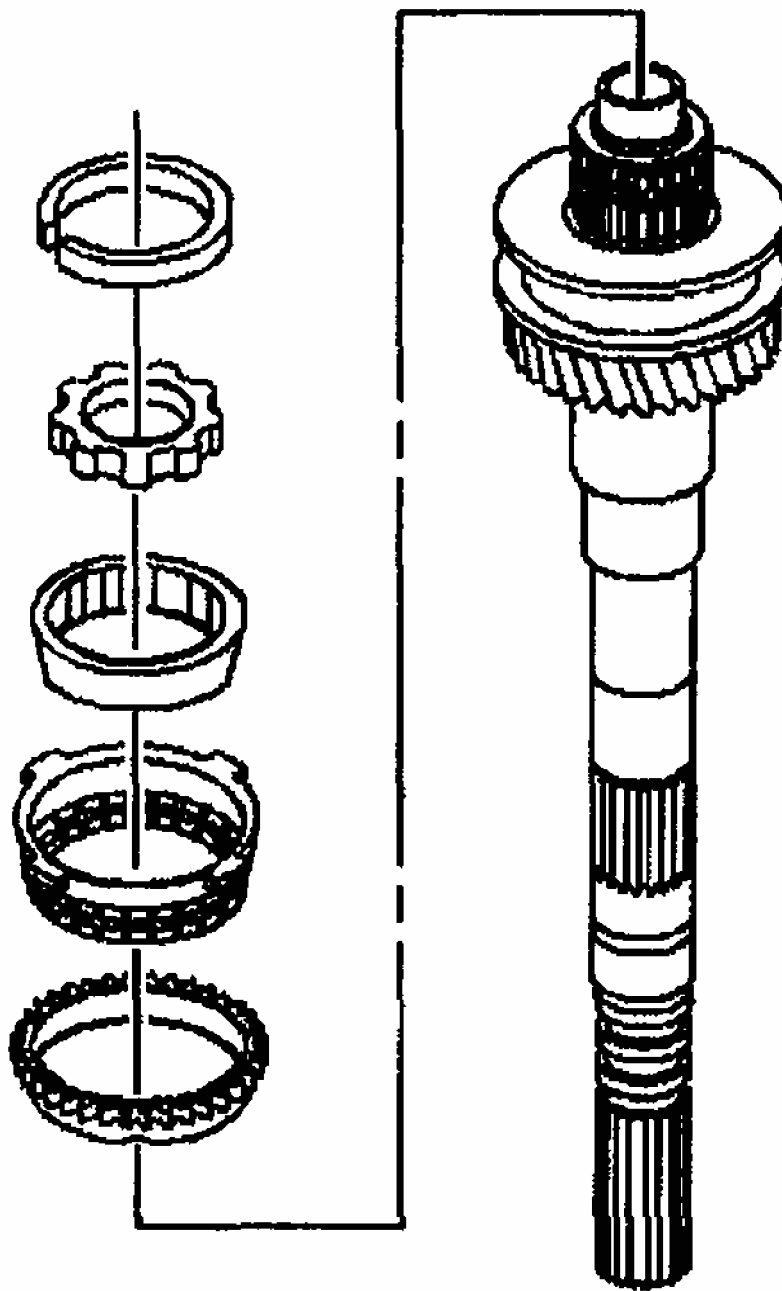


Fig. 158: Installing Different Gear & Spacer
 Courtesy of GENERAL MOTORS CORP.

4. Install the following parts in order, using the J 36183, the J 36184, and a hydraulic

press:

1. The 3rd speed gear
 2. The spacer
 3. The thrust washer
 4. The 3rd speed gear inner cone
 5. The 3rd speed gear friction cone
 6. The 3rd speed gear blocking ring
 7. The 3rd/4th speed gear synchronizer assembly (the groove on the sleeve faces the 3rd speed gear).
5. Install in the following order:
1. 4th gear blocking ring
 2. 4th gear friction cone
 3. 4th gear inner cone
 4. 4th gear thrust washer
 5. 3rd/4th synchronizer retainer ring



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Fig. 159: Installing Different Gear & Spacer
Courtesy of GENERAL MOTORS CORP.

6. Install a new mainshaft small tapered bearing, using the J 39473, V-blocks, and a hydraulic press.

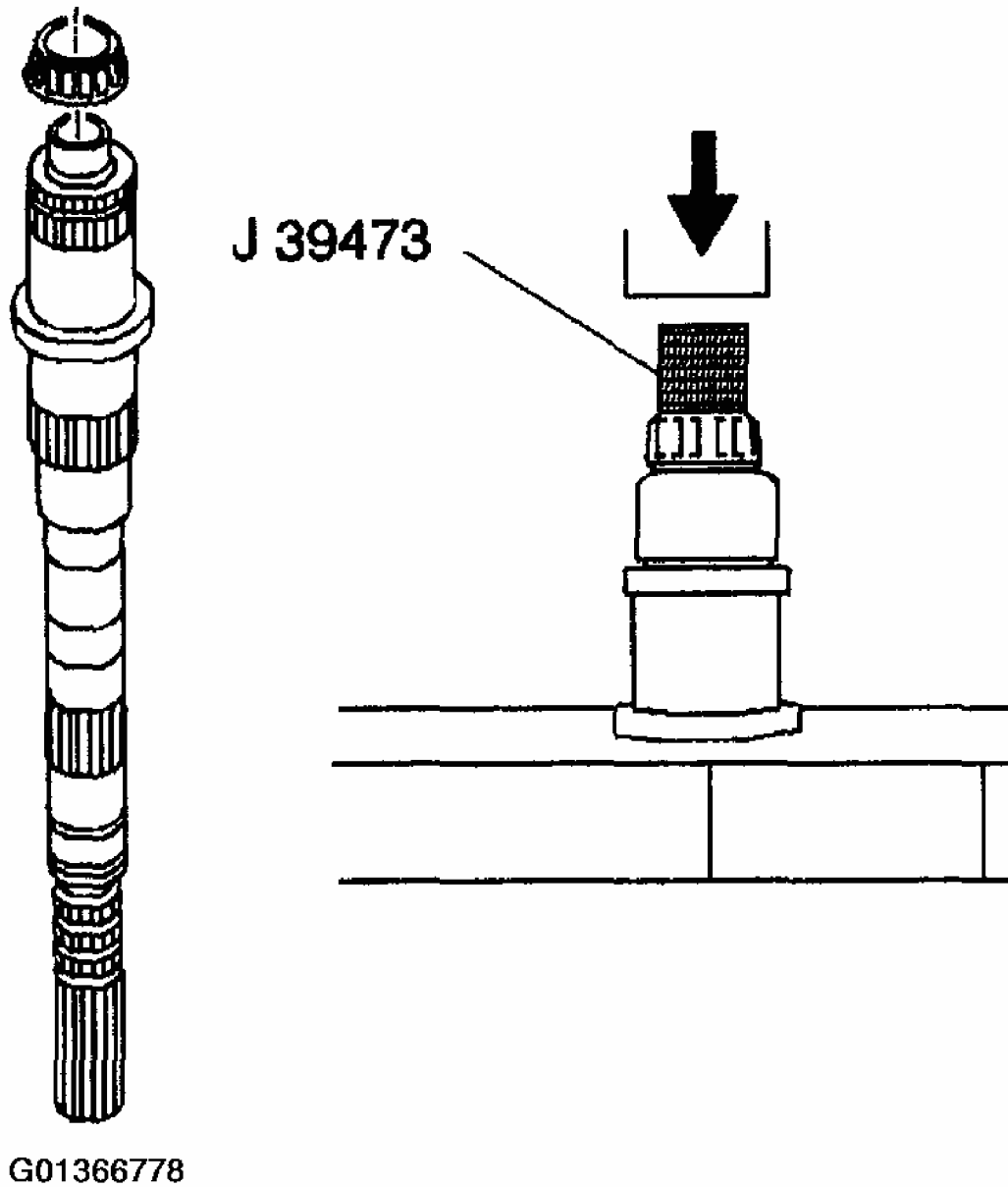
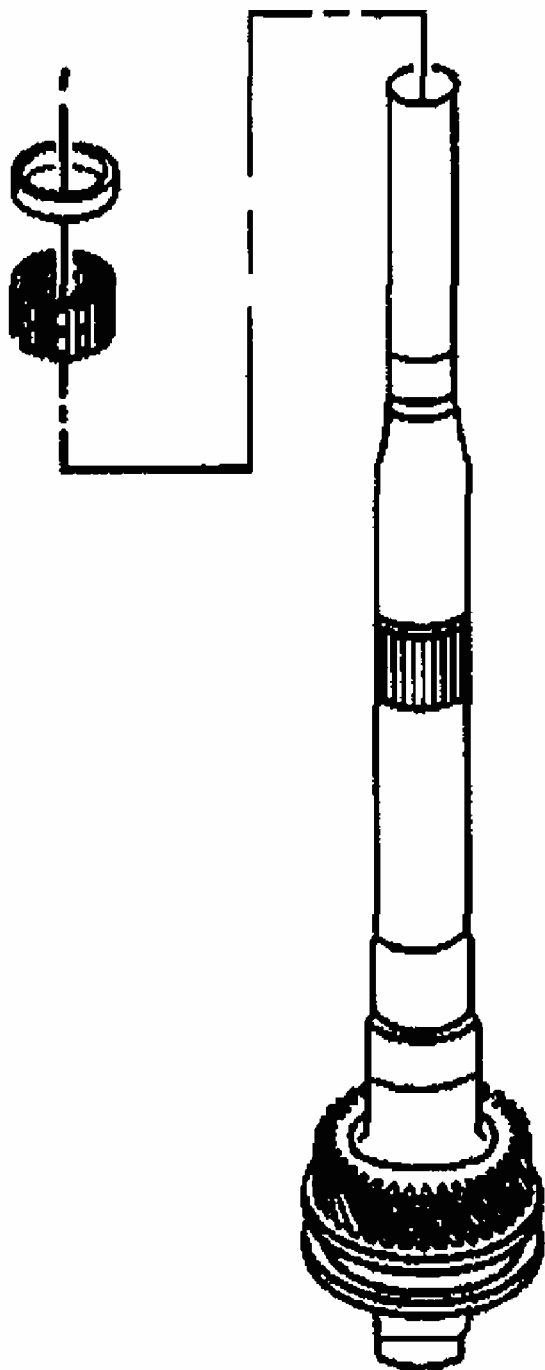


Fig. 160: Installing New Mainshaft Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

7. Install the 2nd speed gear caged needle bearing and bearing spacer.



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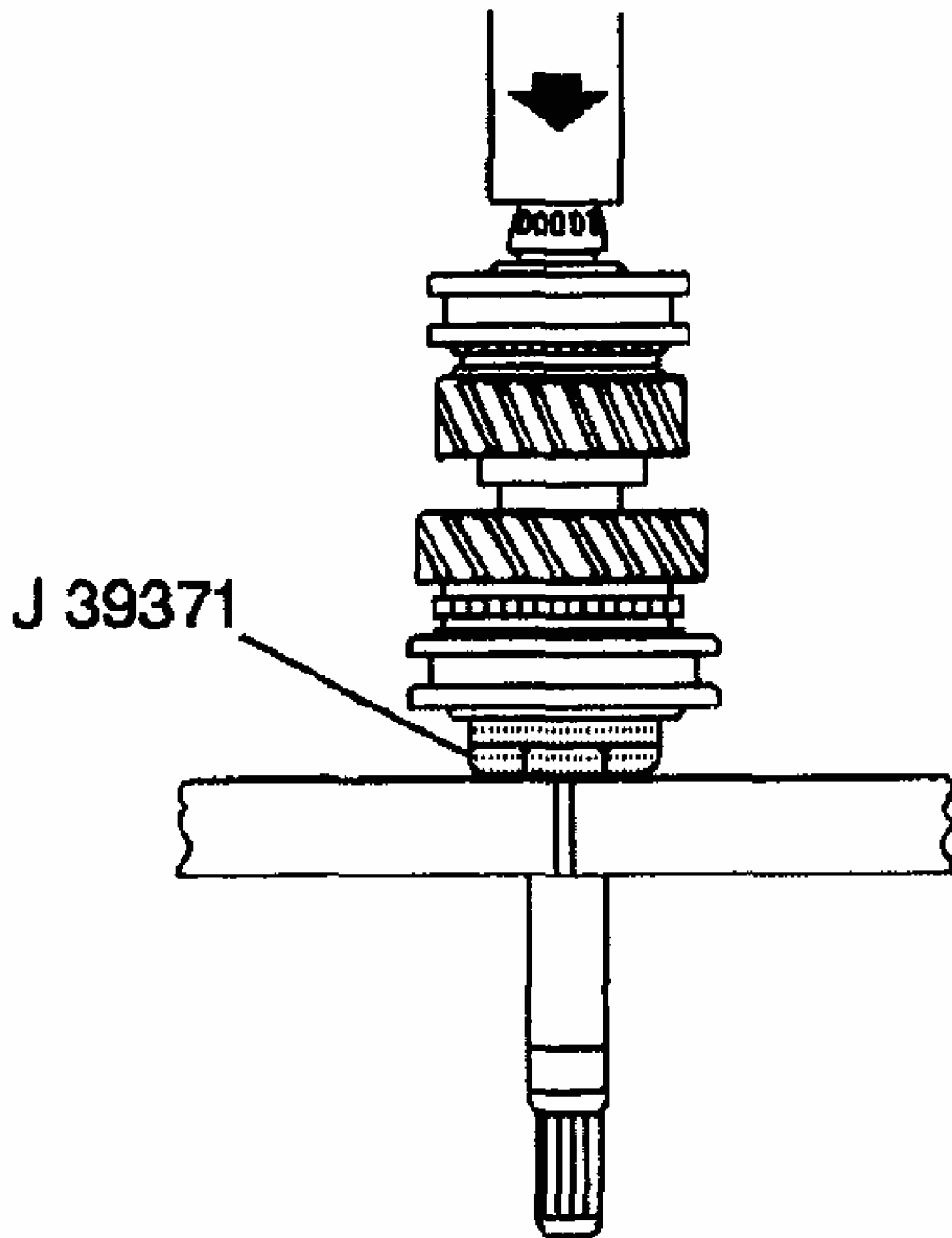
Fig. 161: Installing 2nd Speed Gear Caged Needle Bearing & Bearing Spacer
Courtesy of GENERAL MOTORS CORP.

8. Do the following when installing the 1st/2nd synchronizer assembly:
 1. Start the press operation.
 2. Stop pressing before the keys engage the blocking ring slots.

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3. Lift and rotate the 2nd speed gear in order to engage the keys with the blocking ring.
4. Continue pressing until the synchronizer is seated.
9. Install the following parts in order using the J 39371 and a hydraulic press:
 1. The 2nd speed gear
 2. The 2nd speed gear inner cone
 3. The 2nd speed gear friction cone
 4. The 2nd speed gear blocking ring
 5. The 1st/2nd synchronizer assembly (The ID groove on the sleeve faces the 1st speed gear.)

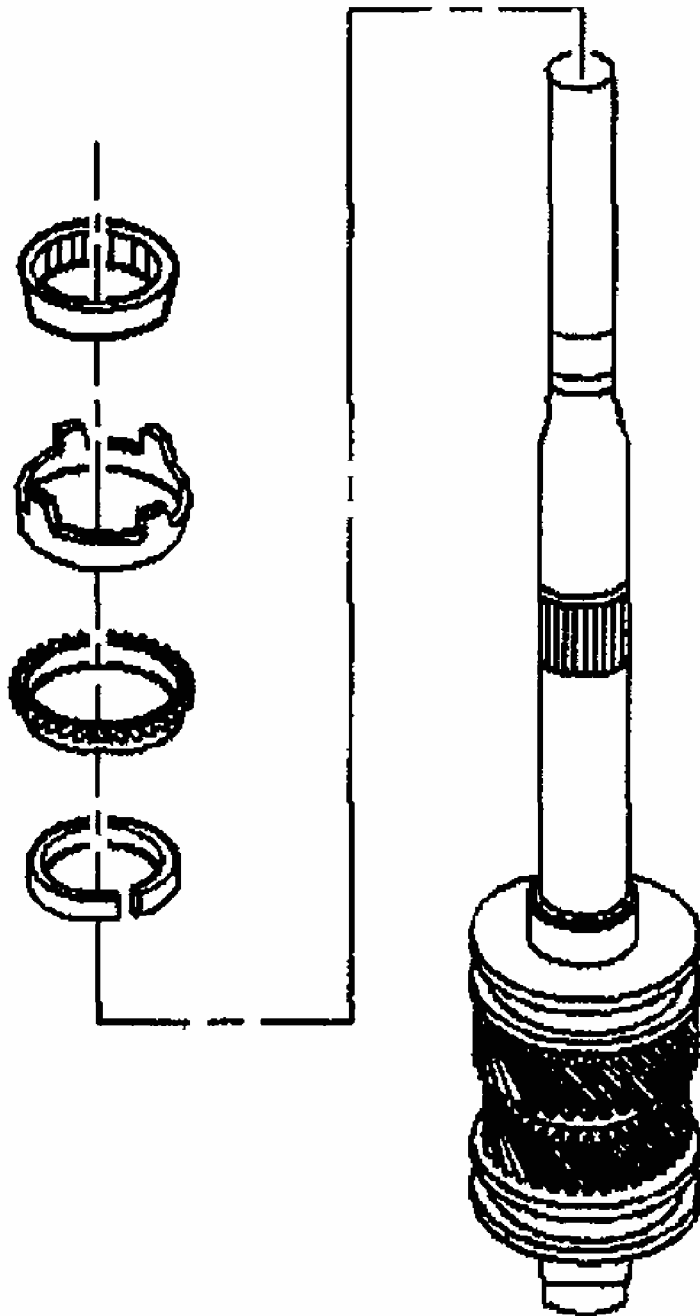


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Fig. 162: Installing 2nd Speed Gear Components In Sequence
Courtesy of GENERAL MOTORS CORP.

10. Install the following parts in order:

1. The retainer ring
2. The blocking ring
3. The friction cone
4. The inner cone

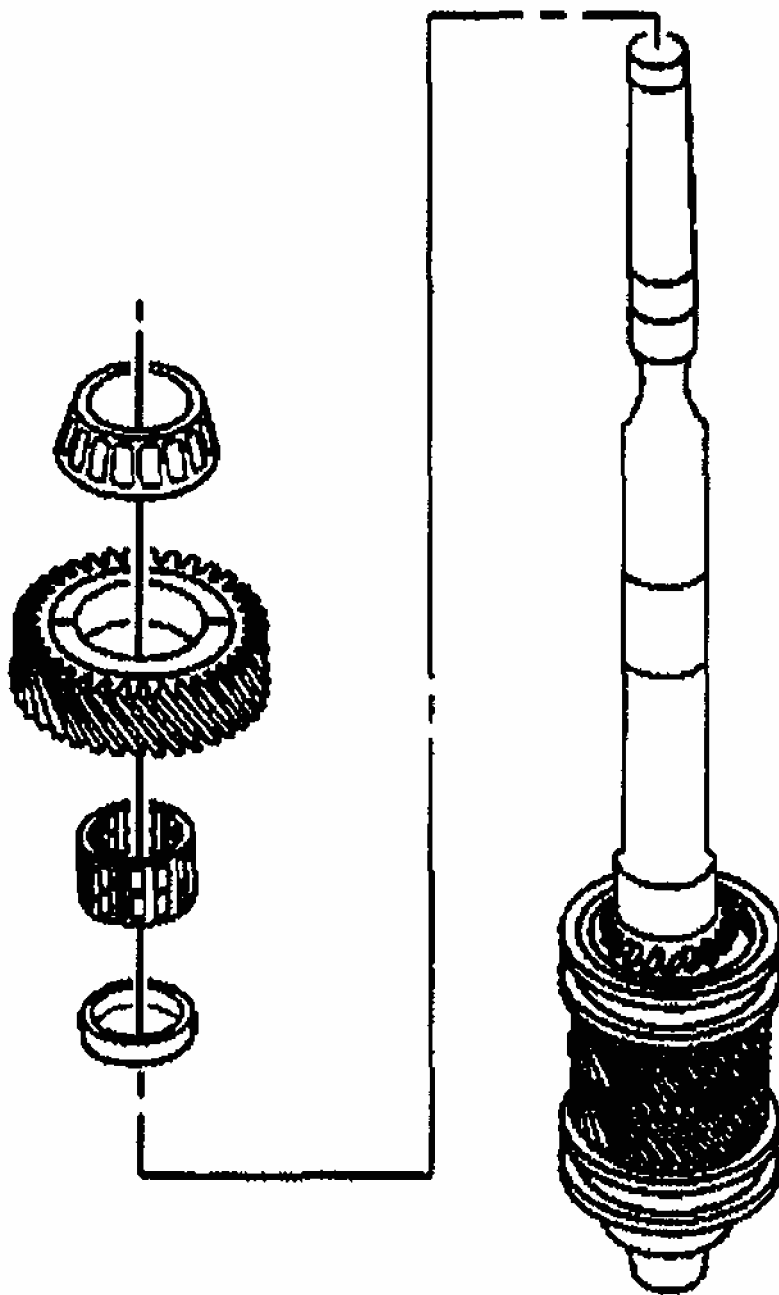


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Fig. 163: Installing Components In Sequence

Courtesy of GENERAL MOTORS CORP.

11. Install the following parts in order:
 1. The 1st speed gear bearing spacer
 2. The 1st speed gear caged needle bearing
 3. The 1st speed gear
 4. The mainshaft large tapered bearing and the O-ring seal



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Fig. 164: Installing 1st Speed Gear Components In Sequence
Courtesy of GENERAL MOTORS CORP.

Input Shaft

Tools Required

- J 28537-17 Bearing Race Installer. See Special Tools and Equipment .
- J 25234 Press Tube. See Special Tools and Equipment .

1. Install a new bearing race on the input shaft, using the J 28537-17 and a hydraulic press.

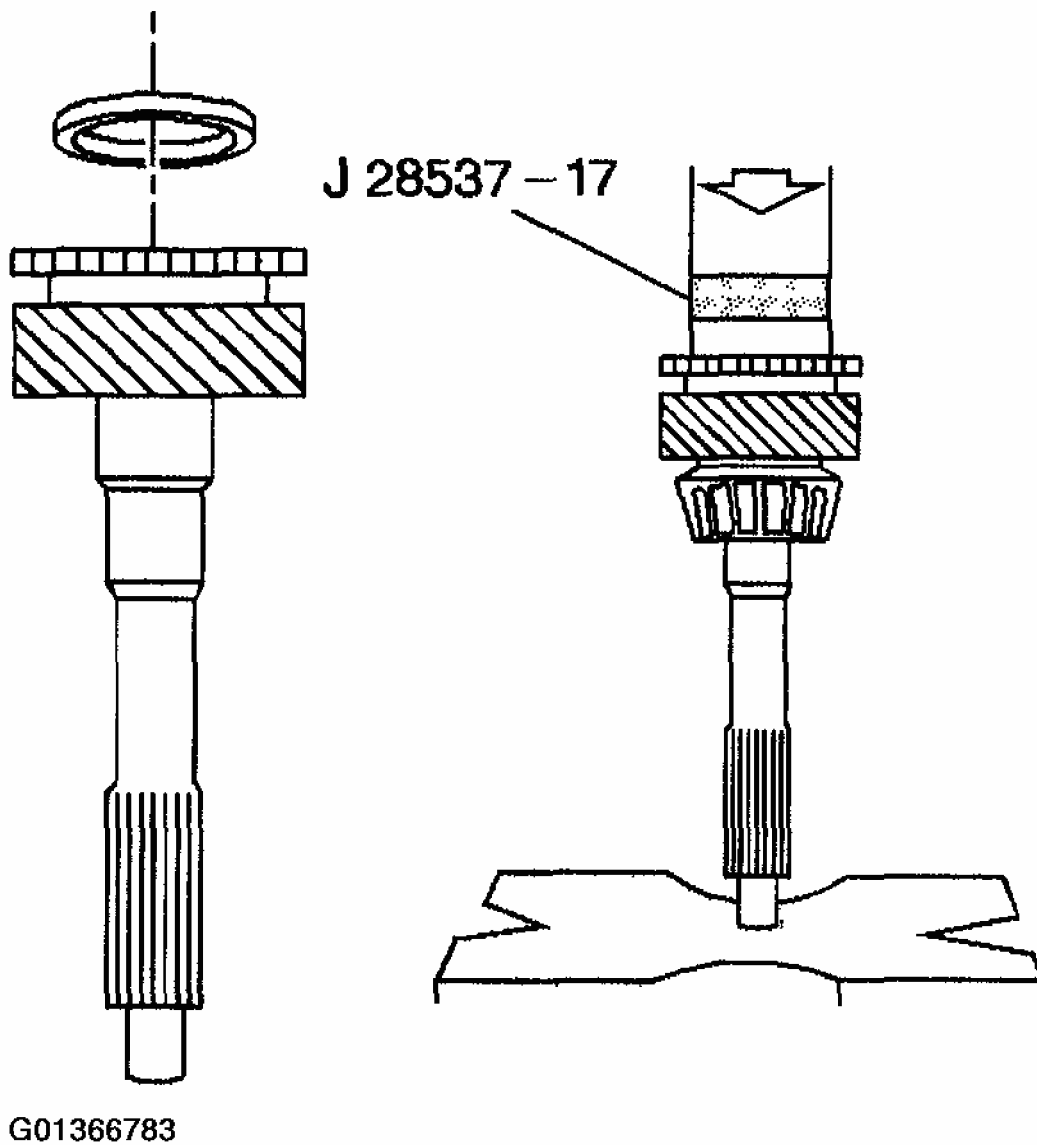


Fig. 165: Installing Bearing Race On Input Shaft
Courtesy of GENERAL MOTORS CORP.

2. Install a new tapered bearing on the input shaft. Use the J 25234 and a hydraulic press.

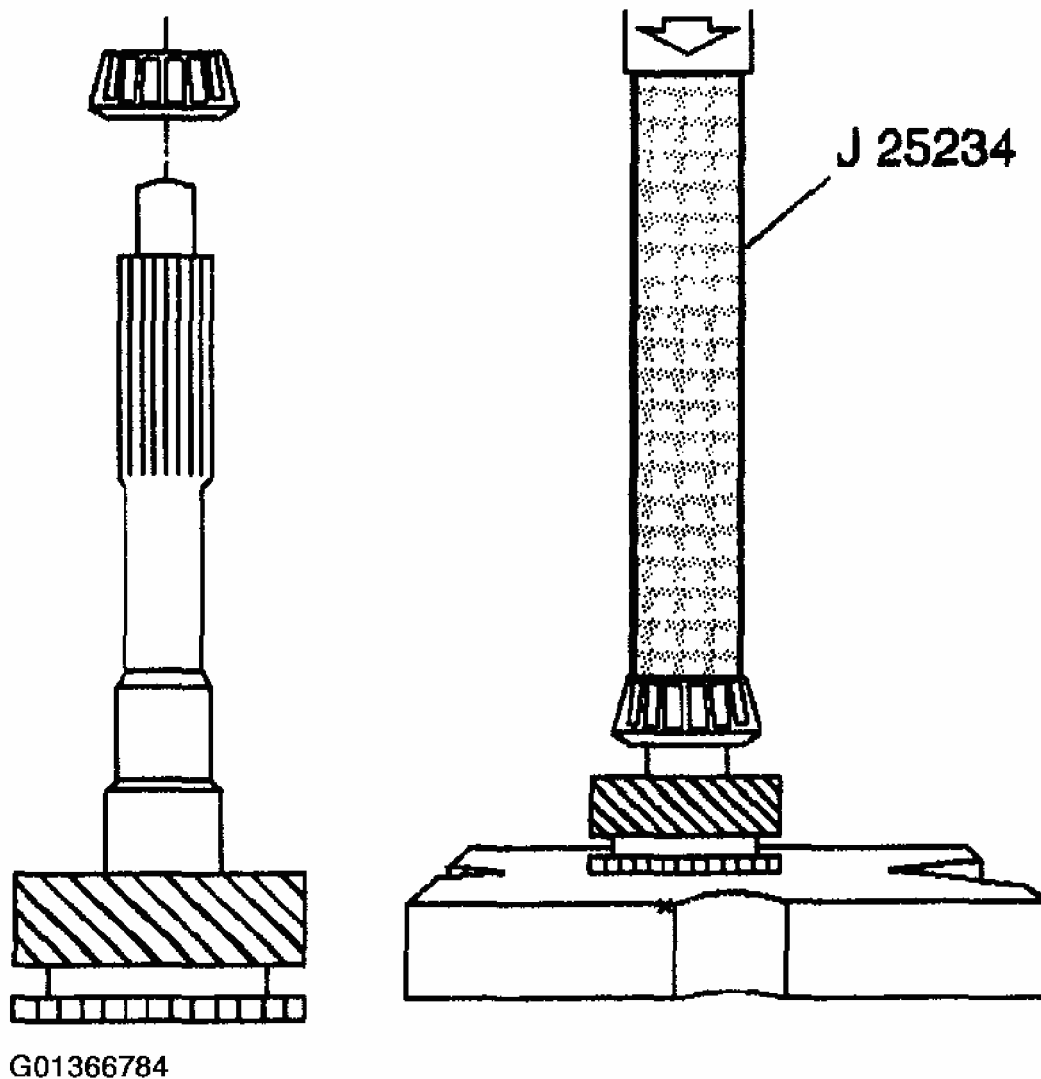


Fig. 166: Installing Tapered Bearing On Input Shaft
Courtesy of GENERAL MOTORS CORP.

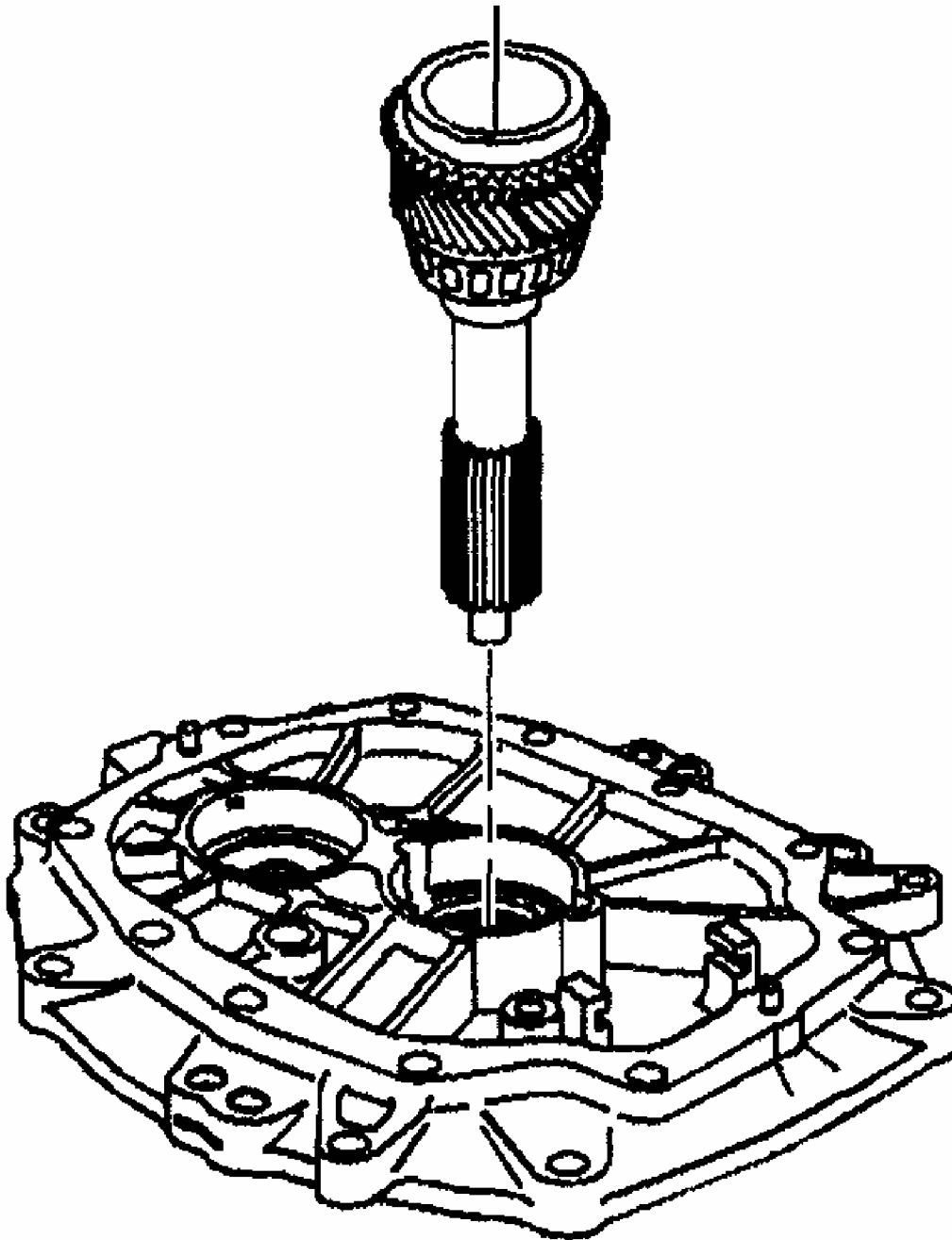
TRANSMISSION ASSEMBLY

Shift Shaft Assemblies and Gear Clusters Installation

Tools Required

J 36850 Transjel(R) Lubricant Assembly Lube. See Special Tools and Equipment .

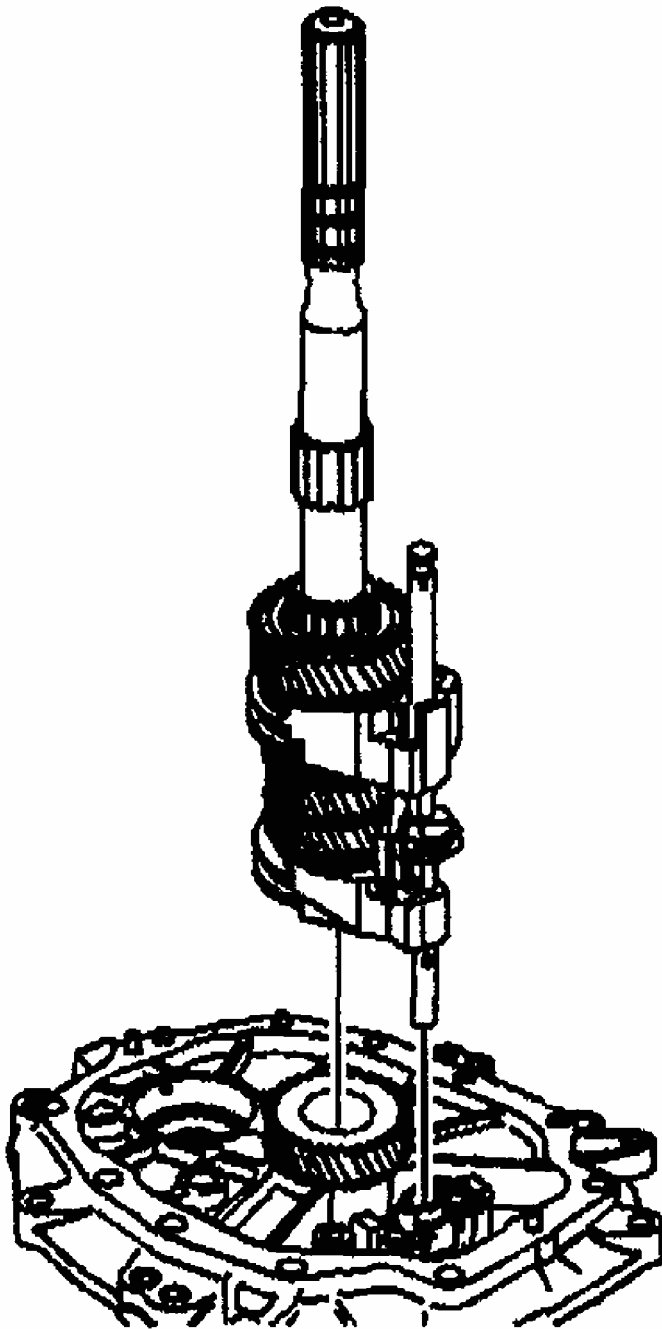
1. Lubricate all components as assembly progresses, using J 36850.
2. Install the input shaft in the adapter plate.



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Fig. 167: Installing Input Shaft In Adapter Plate
Courtesy of GENERAL MOTORS CORP.

3. Assemble the shift shaft to the mainshaft.

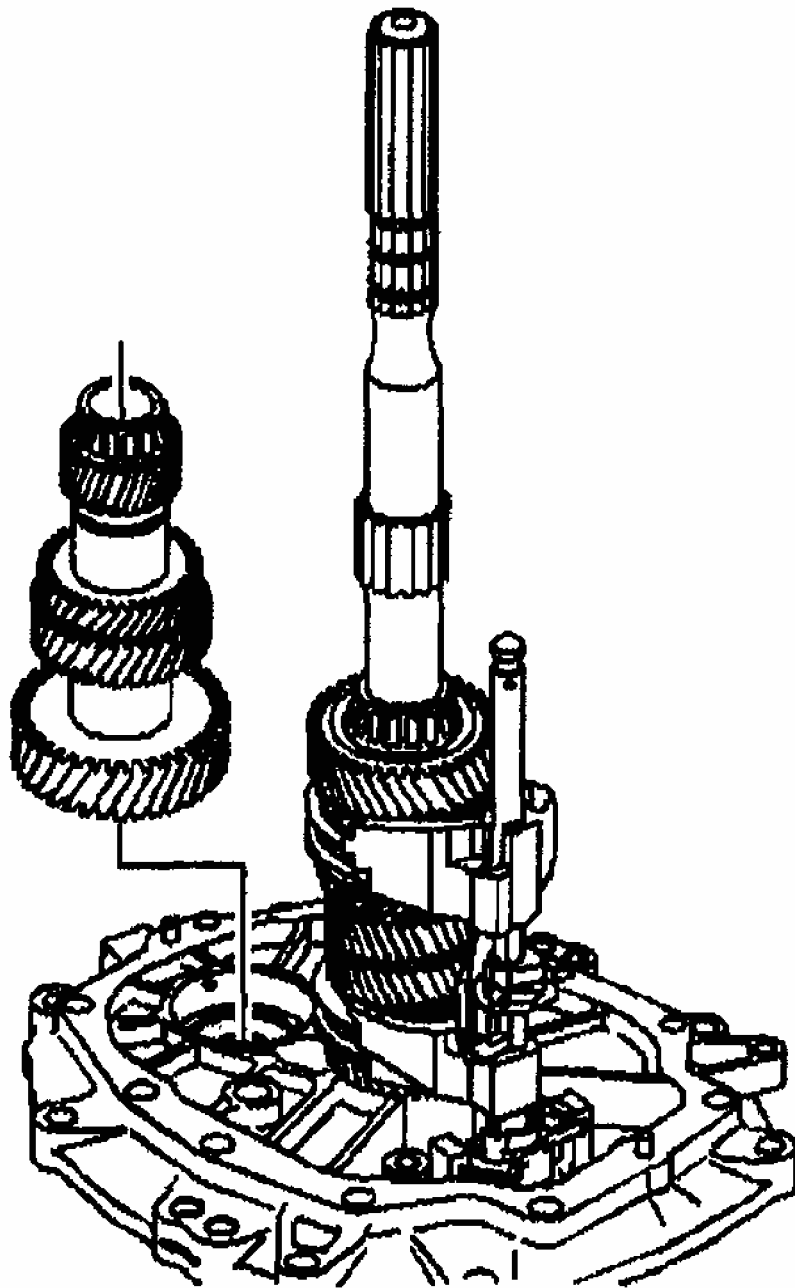


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Fig. 168: Assembling Shift Shaft To Mainshaft
Courtesy of GENERAL MOTORS CORP.

4. Install the neutral return roll pin to the shift shaft.
5. Install the mainshaft and the shift shaft assembly into the adapter plate.
6. Install the countershaft assembly using the following sequence:

1. Lift up the mainshaft assembly enough in order to install the countershaft assembly.
2. Install the countershaft assembly.
3. Lift the mainshaft assembly enough in order to rotate the input shaft to engage the synchronizer keys with 4th gear blocking ring.



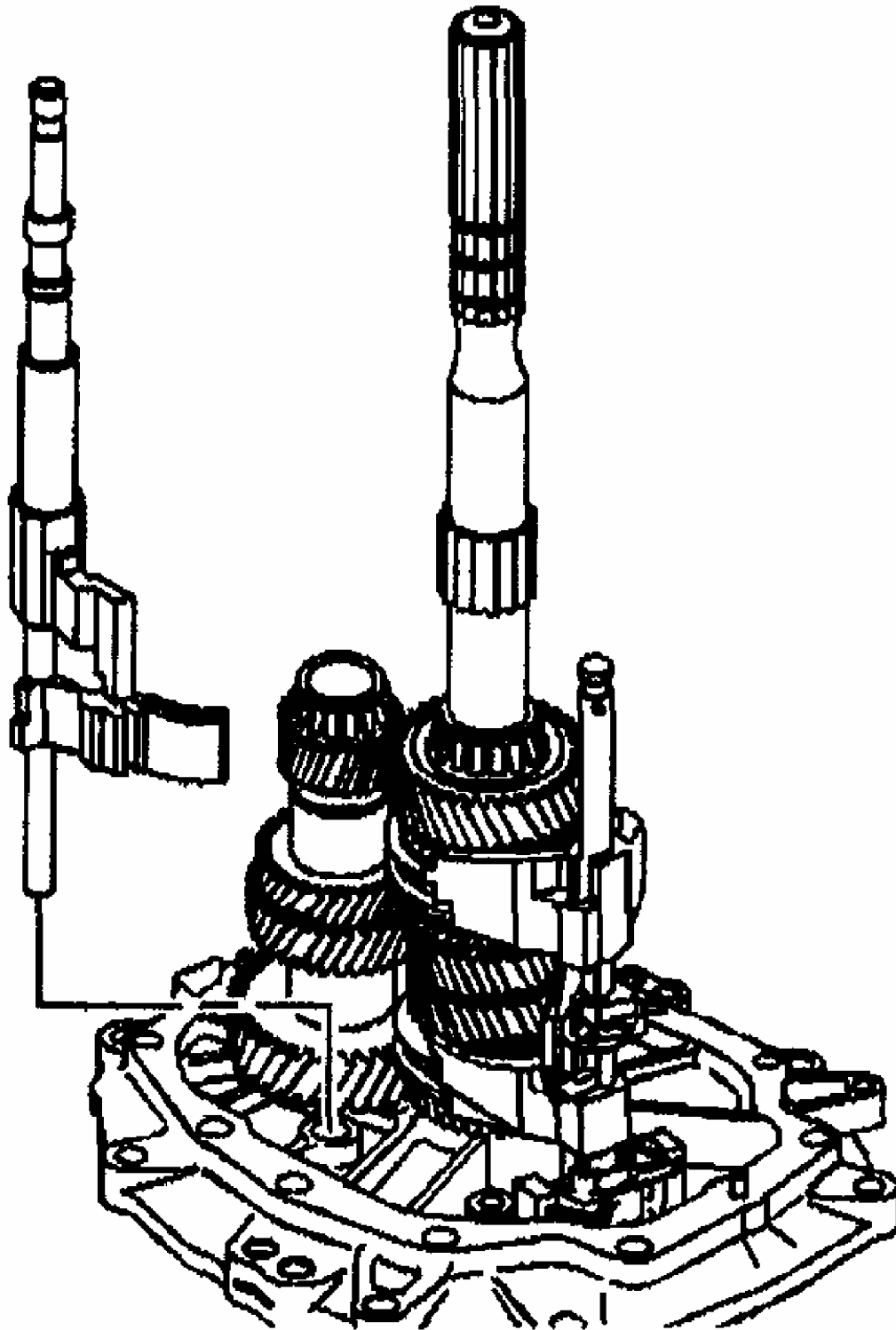
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Fig. 169: Installing Countershaft Assembly
Courtesy of GENERAL MOTORS CORP.

7. Install the 5th/6th and the reverse shift shaft. Align the slots of the shift shaft levers with the interlock plate.

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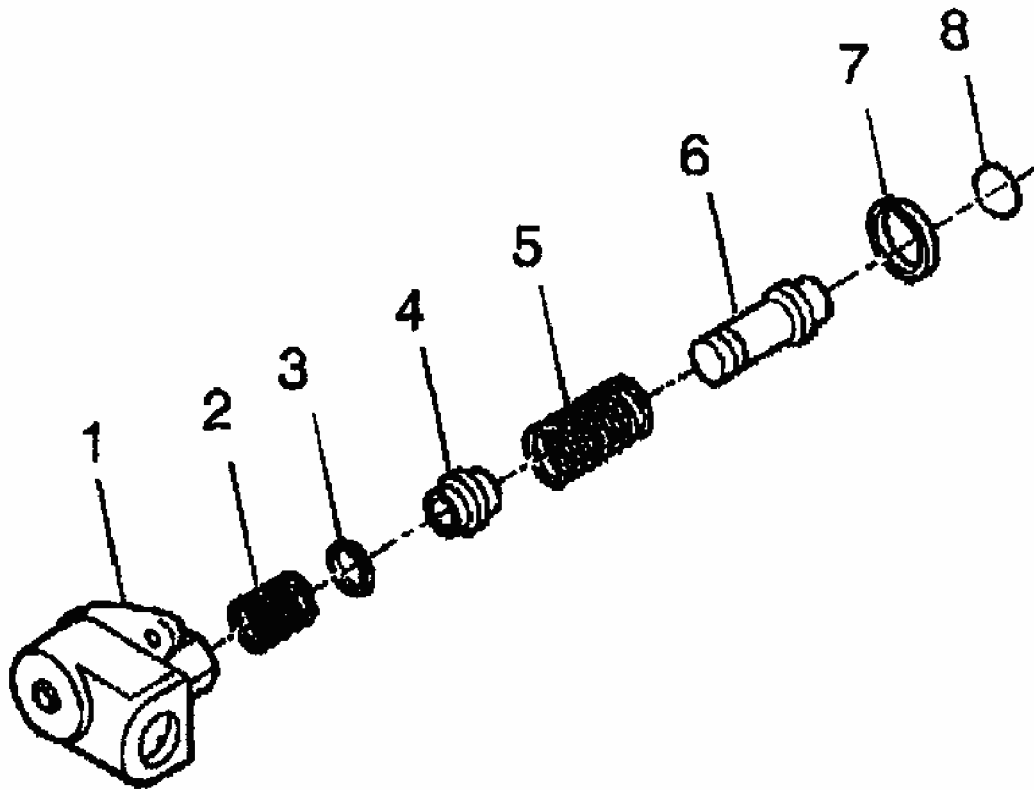
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Fig. 170: Installing 5th/6th & Reverse Shift Shaft
Courtesy of GENERAL MOTORS CORP.

Reverse Lockout Assembly Assemble

CAUTION: The reverse lockout assembly is under spring pressure.
Exercise caution when removing the retainer ring, as bodily injury may result.

1. Install the reverse lockout plunger (6).



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Fig. 171: View Of Rear Lockout Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the reverse lockout outer spring (5).
3. Install the reverse lockout collar (4).
4. Compress the reverse lockout plunger and the collar (4) in a vise and Install the retainer ring (3).

5. Install the reverse lockout inner spring (2).
6. Install the reverse lockout components in the body (1).
7. Install the retainer ring (7).
8. Install the O-ring to body (8).

Transmission Case Installation

Tools Required

- J 41099 Skip Shift Sensor Remover/Installer. See **Special Tools and Equipment** .
- J 36850 Transjel(R) Lubricant. See **Special Tools and Equipment** .

Important: Lubricate all components as the assembly progresses. Use J 36850 or the equivalent.

1. Apply sealant GM P/N United States 12345739, GM P/N Canada 10953472 or equivalent to the transmission case to adapter plate mating surface.

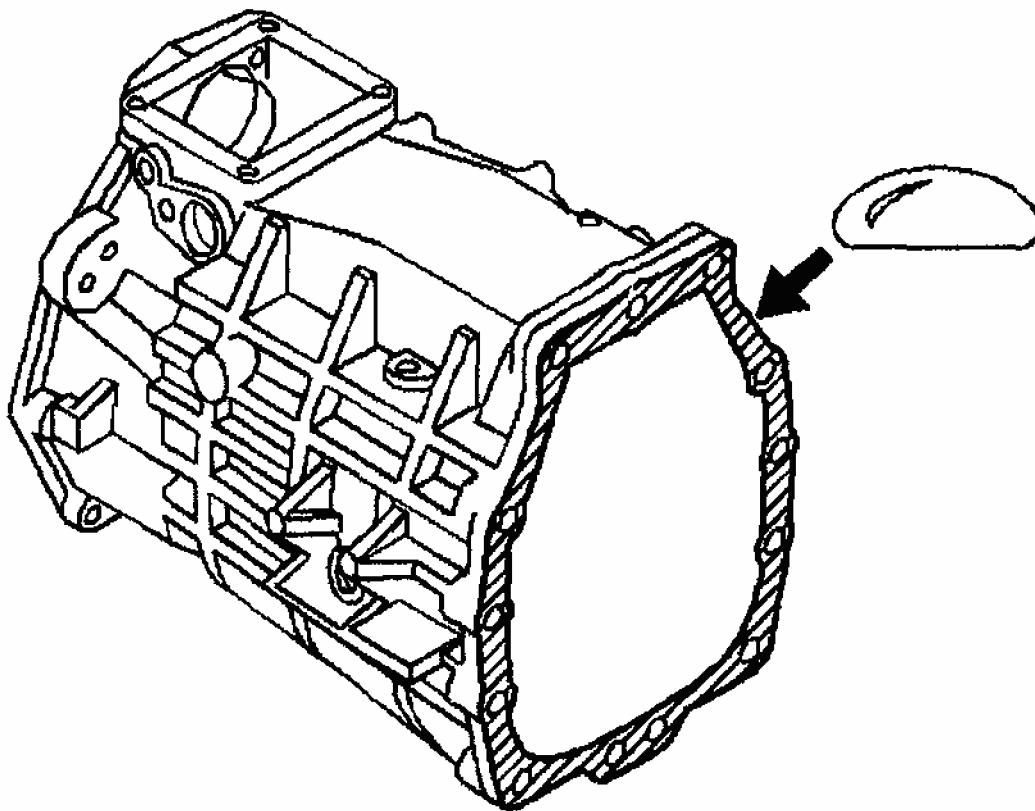
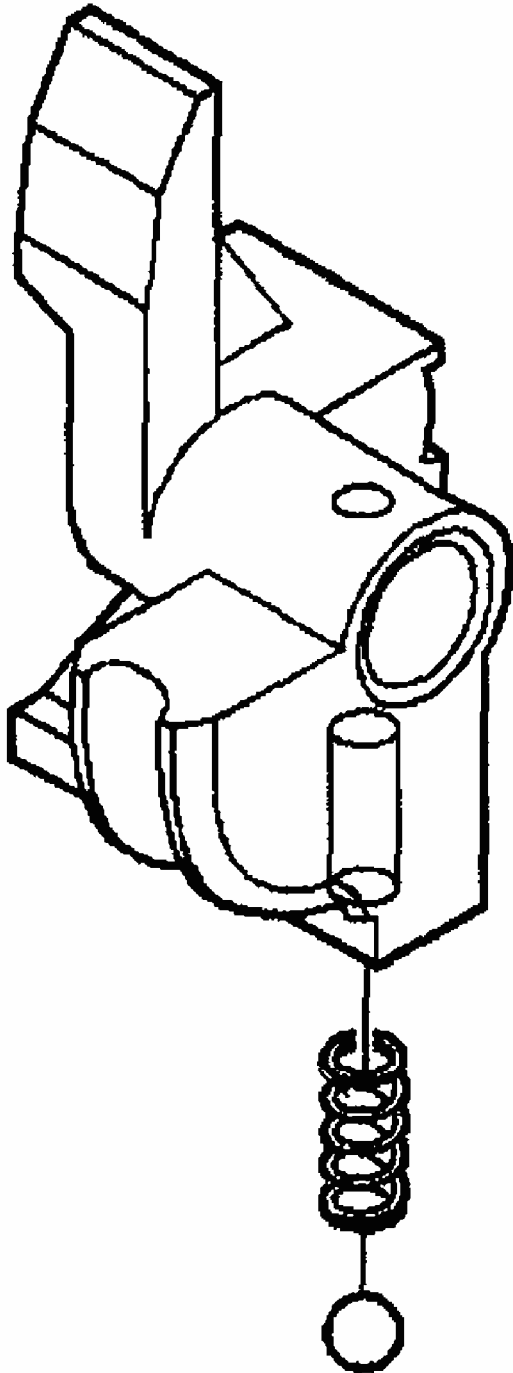


Fig. 172: Applying Sealant To Transmission Case To Adapter Plate Mating Surface

Courtesy of GENERAL MOTORS CORP.

2. Install the ball detent and the spring in the front offset lever.

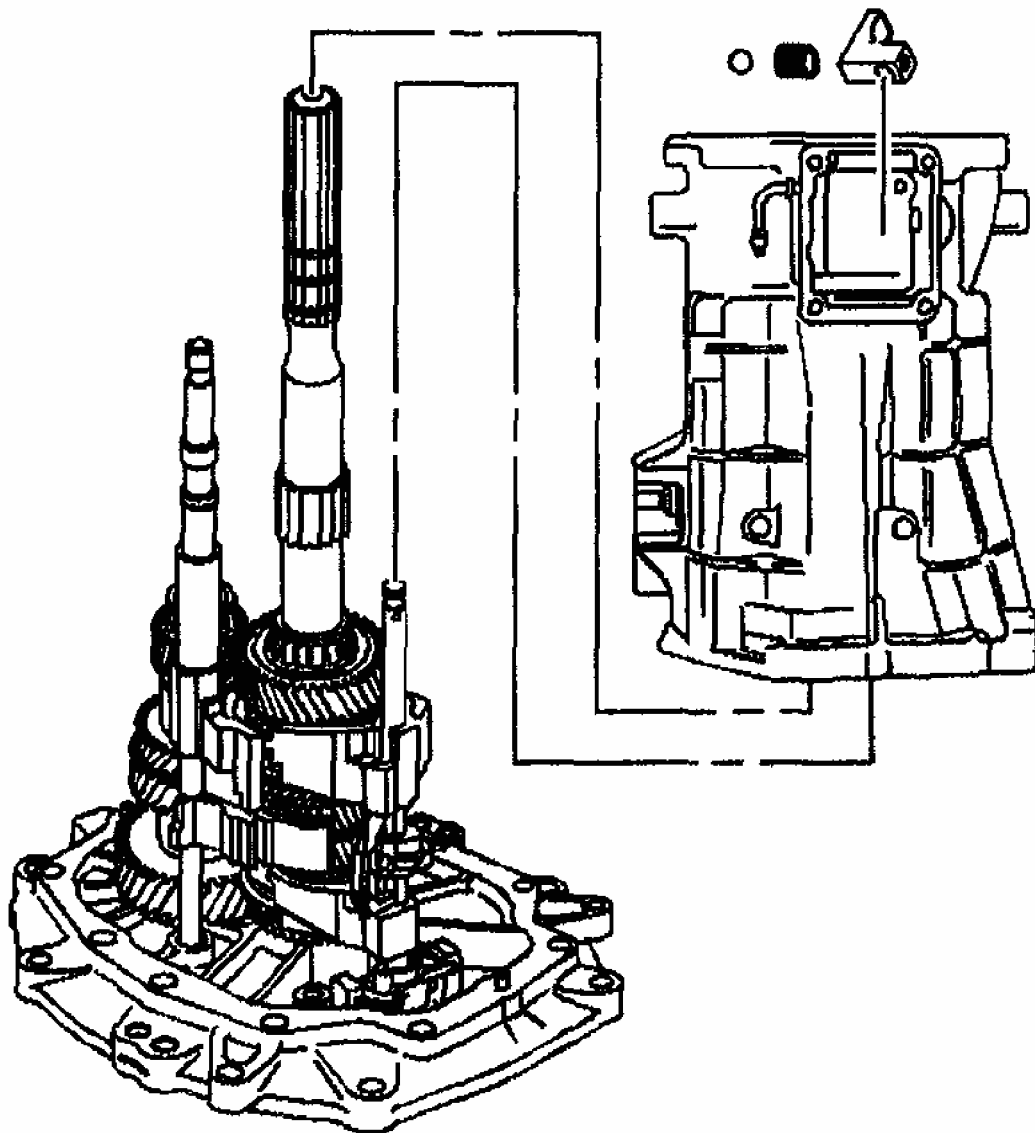


G01366791

Fig. 173: Installing Ball Detent And Spring In Front Offset Lever

Courtesy of GENERAL MOTORS CORP.

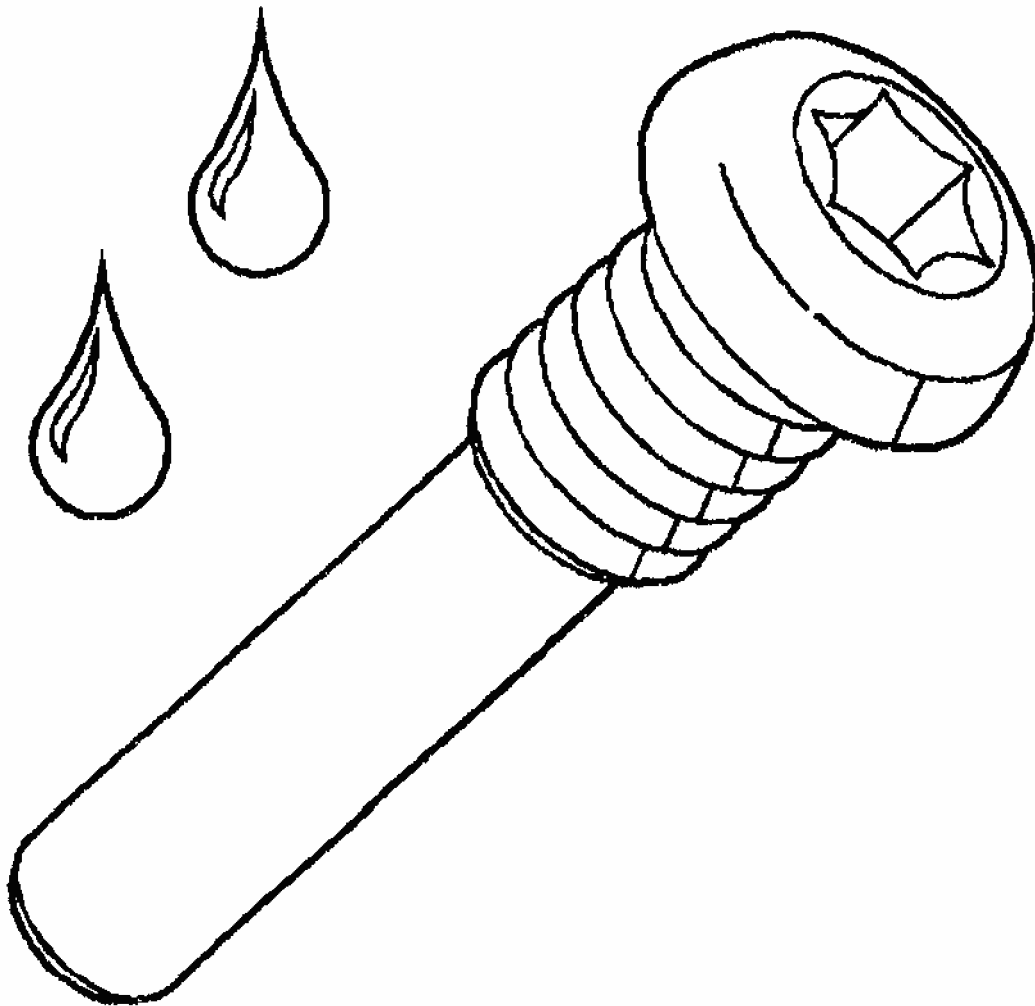
3. Do the following in order to install the transmission case and the offset lever:
 1. Shift the transmission into NEUTRAL in order to keep the 3rd/4th shift shaft from engaging.
 2. Install the offset lever.
 3. Compress the front offset lever together while sliding it onto the shift shaft. This will prevent the spring release of the inner components.
 4. Slide the transmission case onto the gear clusters and the shift rail components.



G01366792

Fig. 174: Installing Transmission Case & Offset Lever
Courtesy of GENERAL MOTORS CORP.

4. Apply threadlock GM P/N United States 12346004, GM P/N Canada 10953480 or equivalent to the threads of the shift lever guide bolts.



G01366793

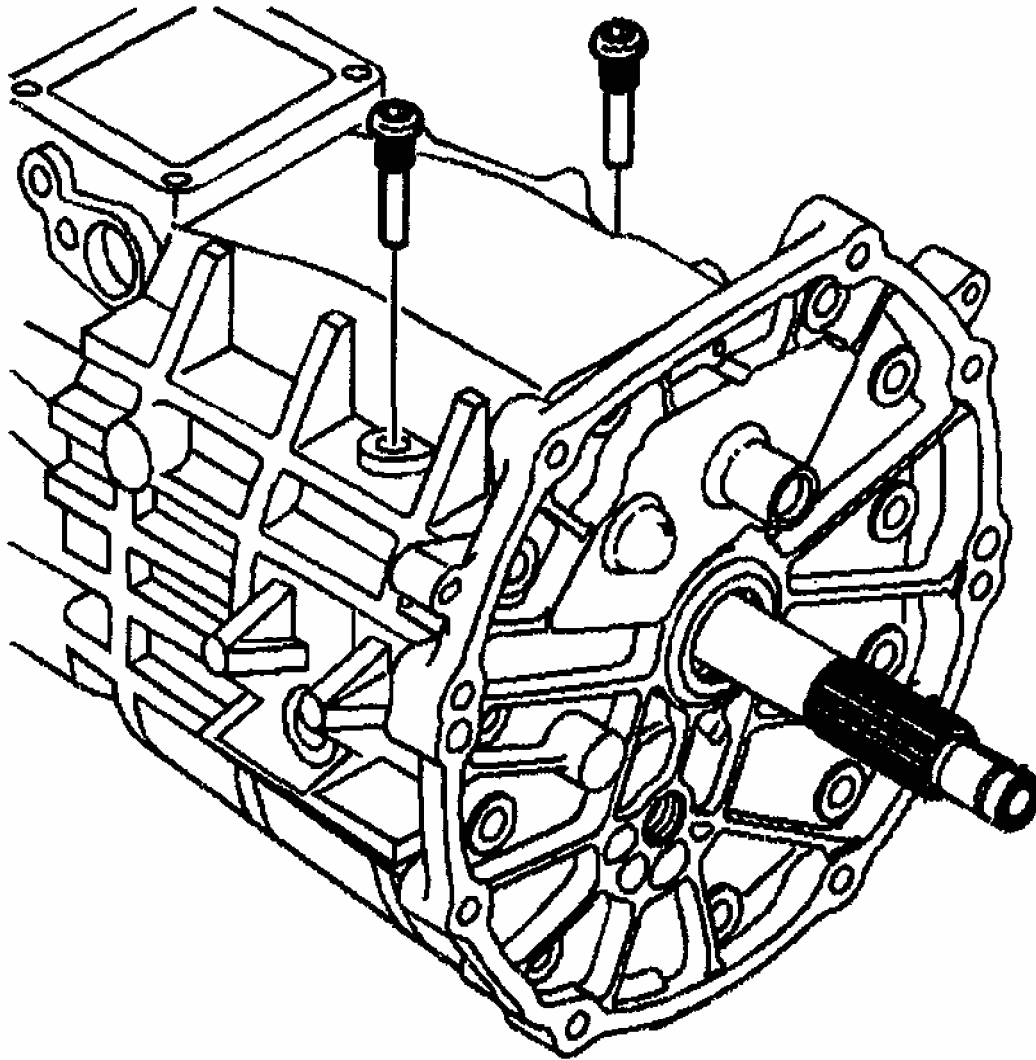
Fig. 175: Applying Threadlock To Threads Of Shift Lever Guide Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

5. Install the shift lever guide bolts and pull up on 5th/6th and reverse shift rail assembly. This will help align the slot of the shift interlock plate with the guide bolt hole.

Tighten

Tighten the bolts to 27 N.m (20 lb ft).



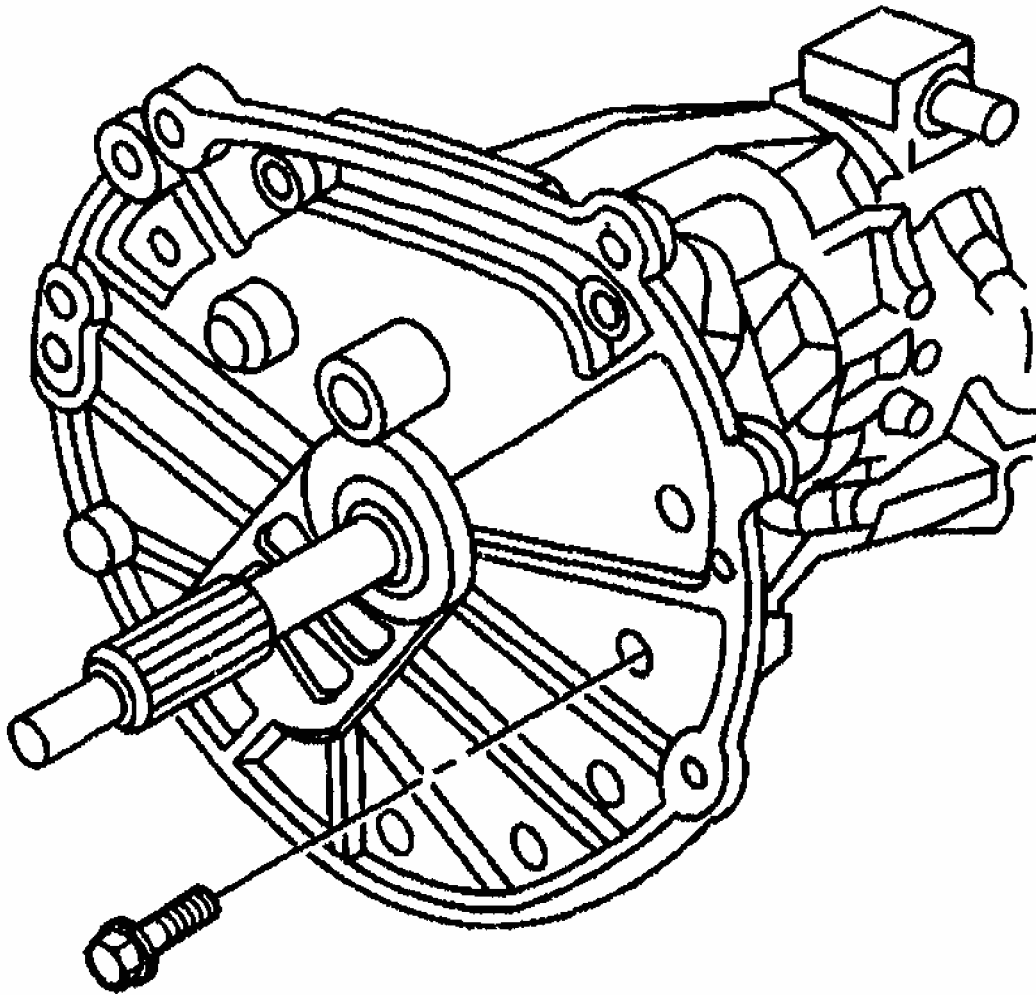
G01366794

Fig. 176: Installing Shift Lever Guide Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the adapter plate to transmission case bolts.

Tighten

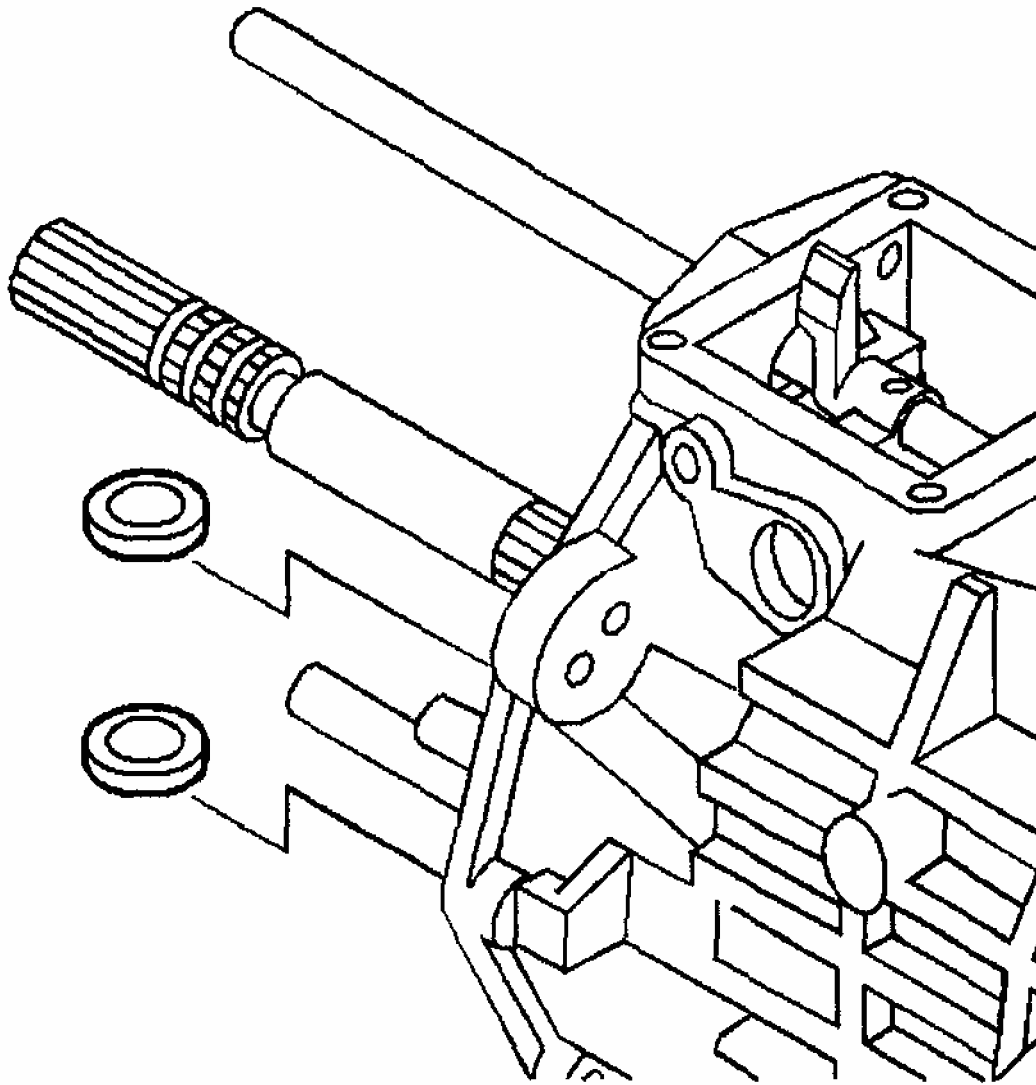
Tighten the bolts to 48 N.m (36 lb ft).



G01366795

Fig. 177: Installing Adapter Plate To Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

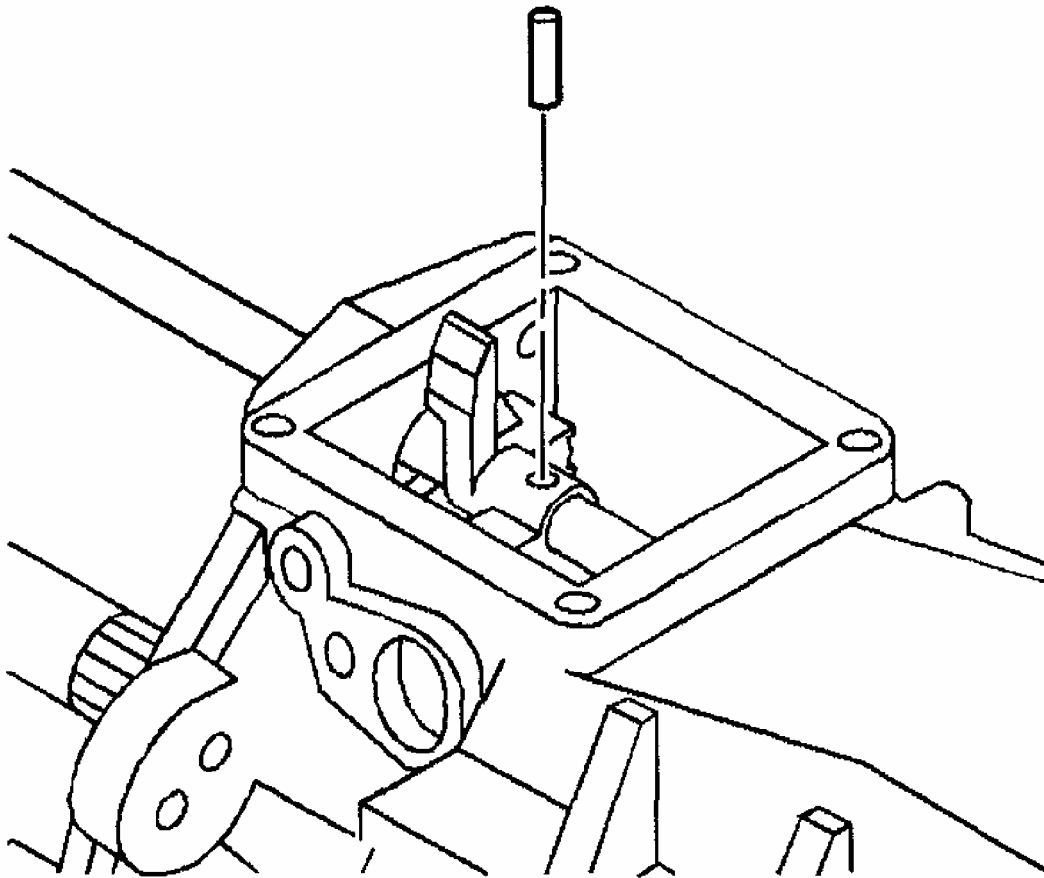
7. Install the magnets into the transmission case.



G01366796

Fig. 178: Installing Magnets Into Transmission Case
Courtesy of GENERAL MOTORS CORP.

8. Install the offset lever roll pin.



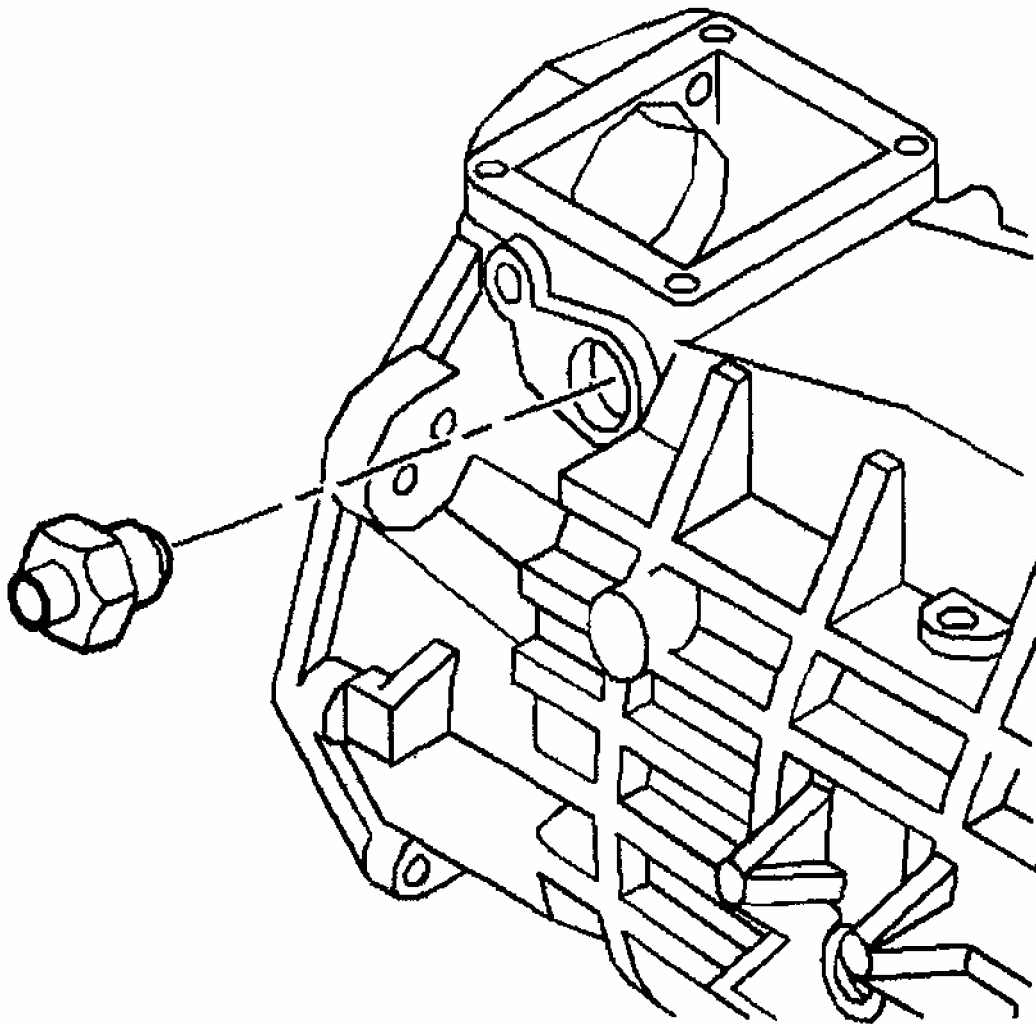
G01366797

Fig. 179: Installing Offset Lever Roll Pin
Courtesy of GENERAL MOTORS CORP.

9. Install the shift detent assembly.

Tighten

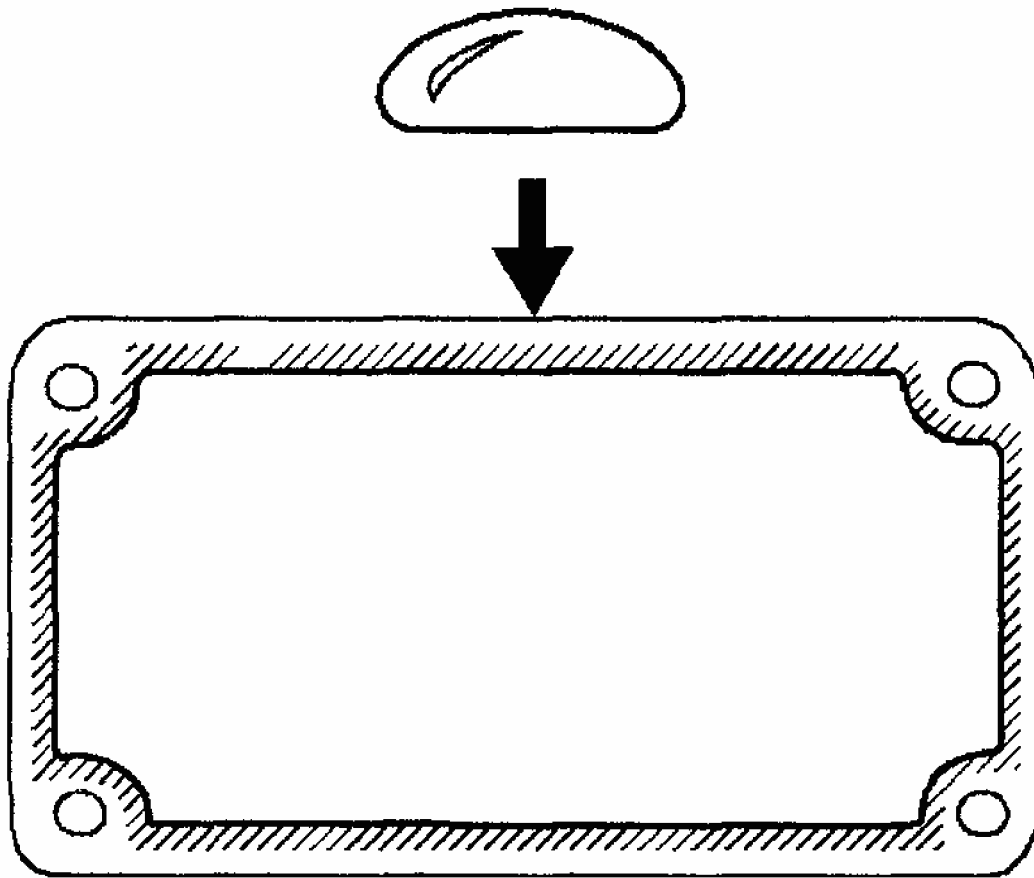
Tighten the detent assembly to 40 N.m (30 lb ft).



G01366798

Fig. 180: Installing Shift Detent Assembly
Courtesy of GENERAL MOTORS CORP.

10. Apply sealant GM P/N United States 12345739, GM P/N Canada 10953472 or the equivalent to the mating surface of the cover plate.



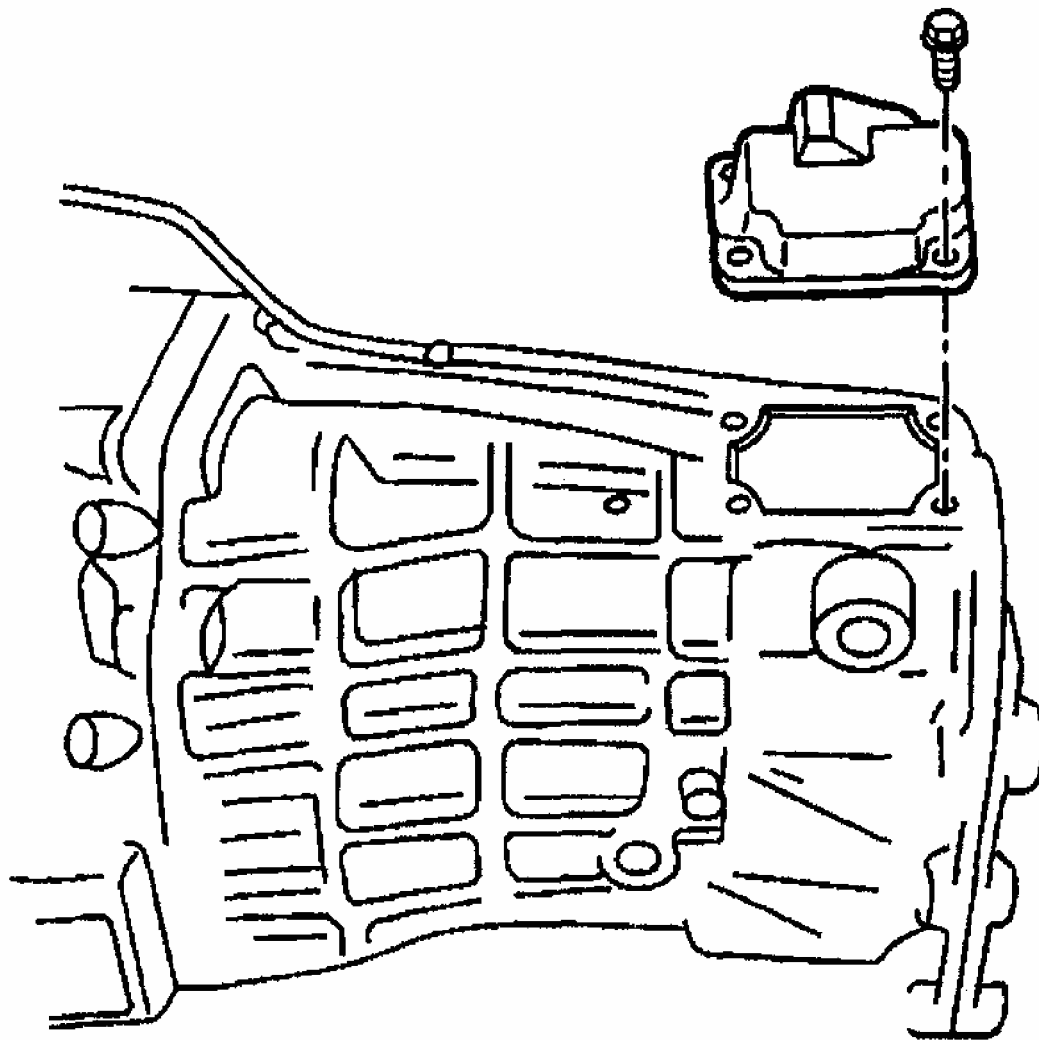
G01366799

Fig. 181: Applying Sealant To Mating Surface Of Cover Plate
Courtesy of GENERAL MOTORS CORP.

11. Install the transmission case cover and the case cover bolts.

Tighten

Tighten the bolts to 20 N.m (15 lb ft).



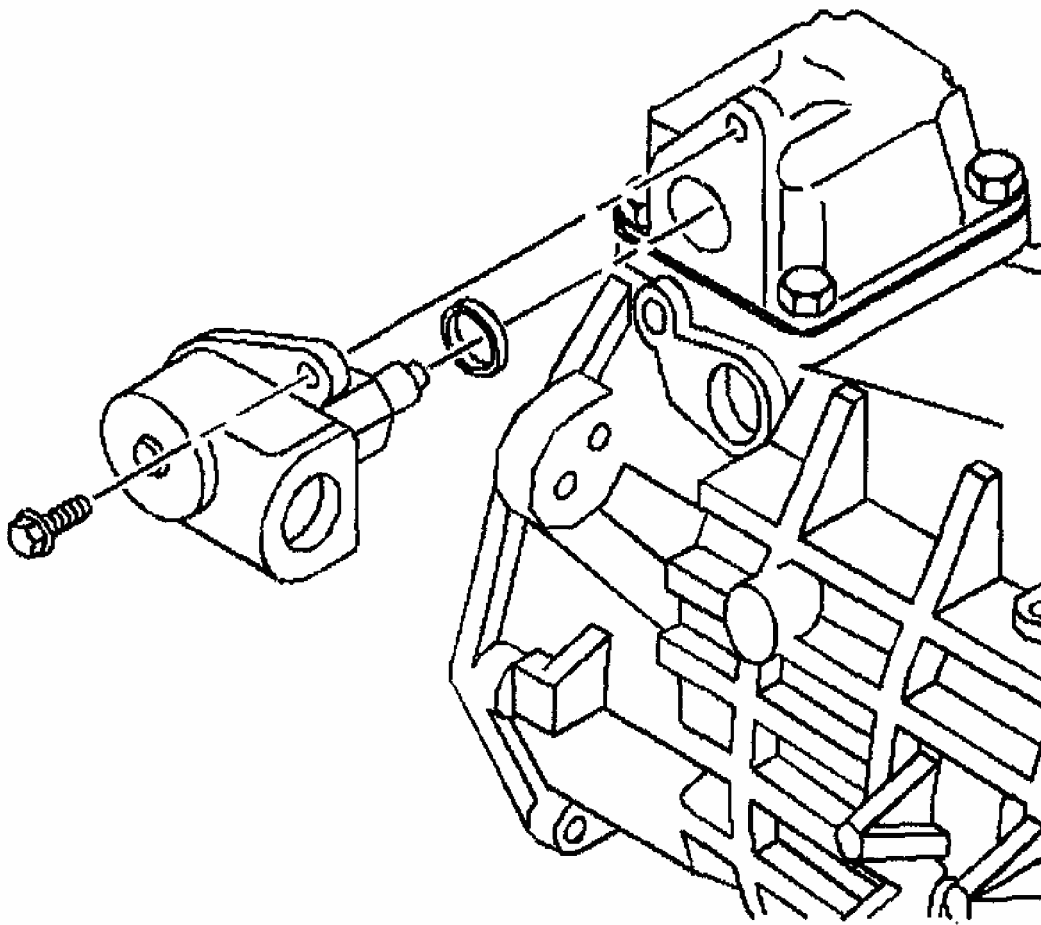
G01366800

Fig. 182: Installing Transmission Case Cover & Case Cover Bolts
Courtesy of GENERAL MOTORS CORP.

12. Install the reverse lockout body and bolt in the cover plate.

Tighten

Tighten the bolts to 18 N.m (13 lb ft).



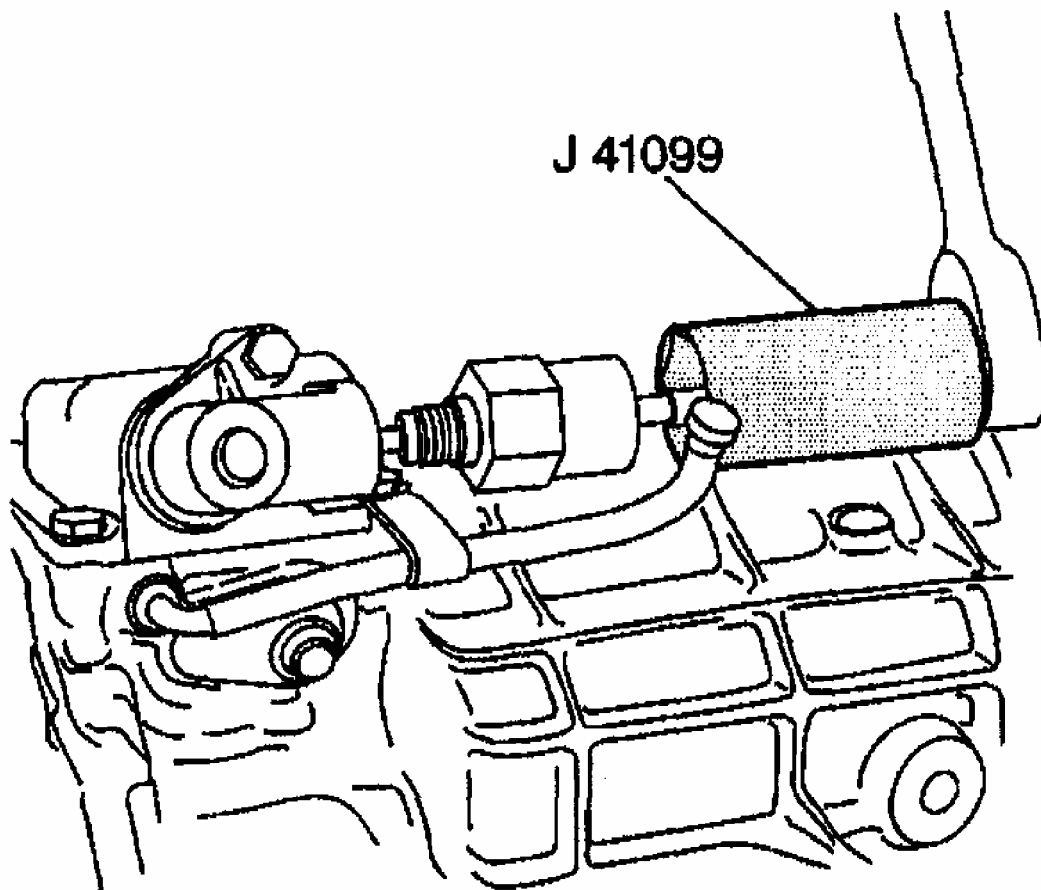
G01366801

Fig. 183: Installing Reverse Lockout Body & Bolt In Cover Plate
Courtesy of GENERAL MOTORS CORP.

13. Install the reverse lockout solenoid to reverse lockout body assembly, using the J 41099.

Tighten

Tighten the solenoid to 40 N.m (30 lb ft).



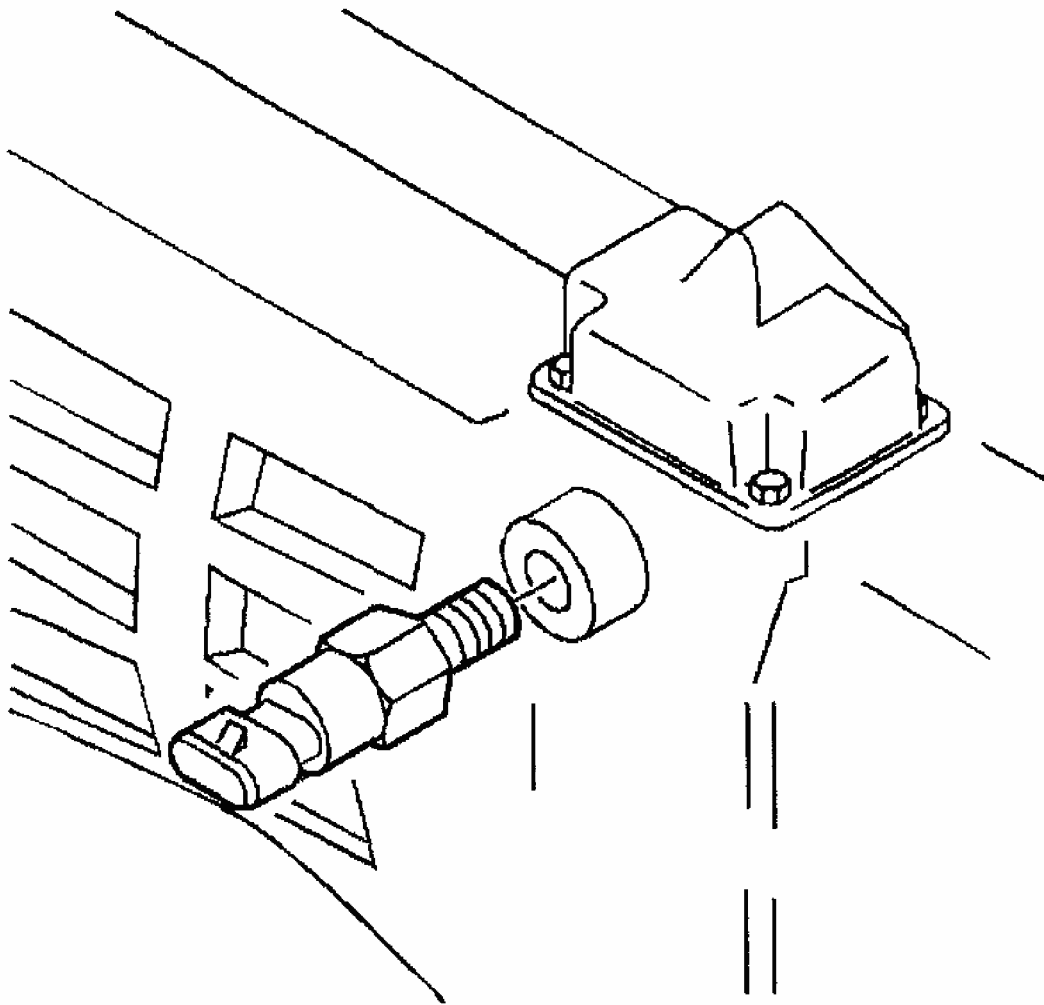
G01366802

Fig. 184: Installing Reverse Lockout Solenoid To Reverse Lockout Body Assembly
Courtesy of GENERAL MOTORS CORP.

14. Install the computer aided gear select solenoid.

Tighten

Tighten the solenoid to 40 N.m (30 lb ft).

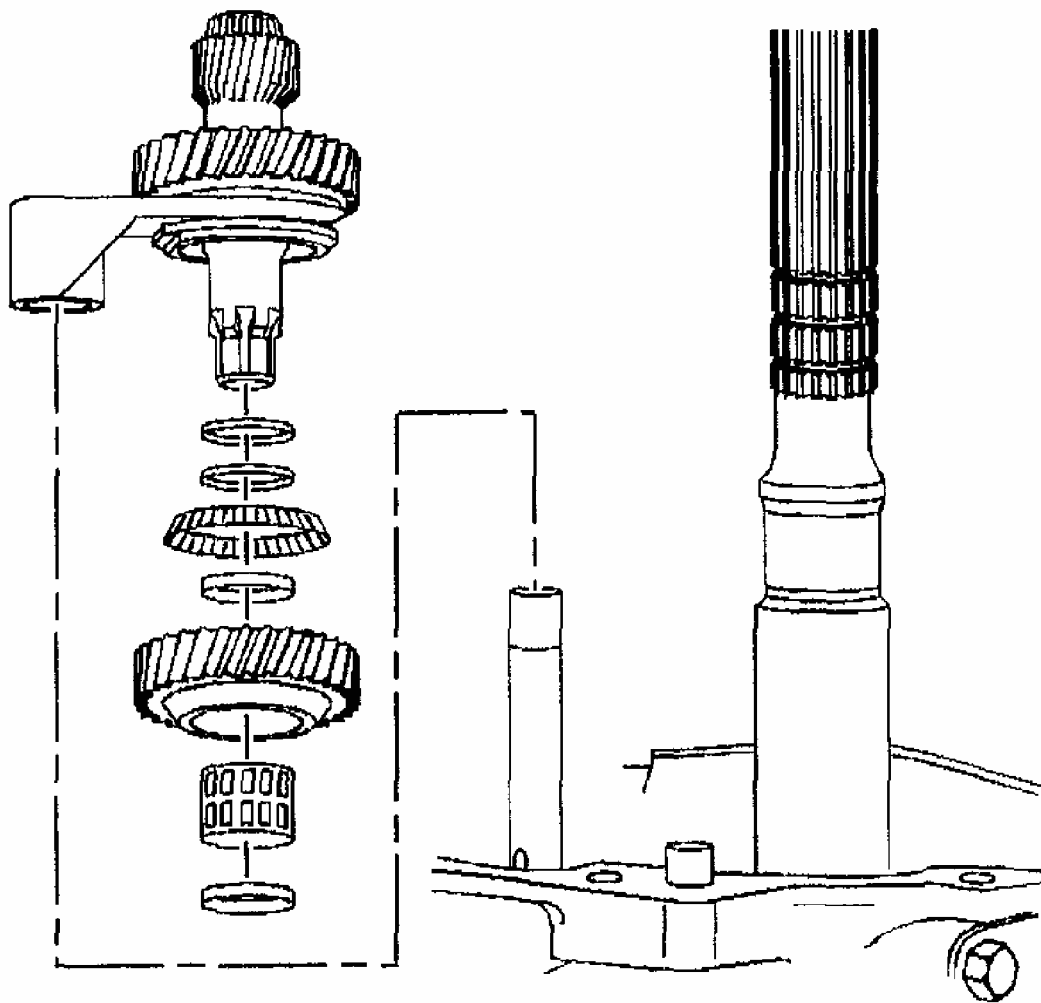


G01366803

Fig. 185: Installing Computer Aided Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

Countershaft Extension Installation

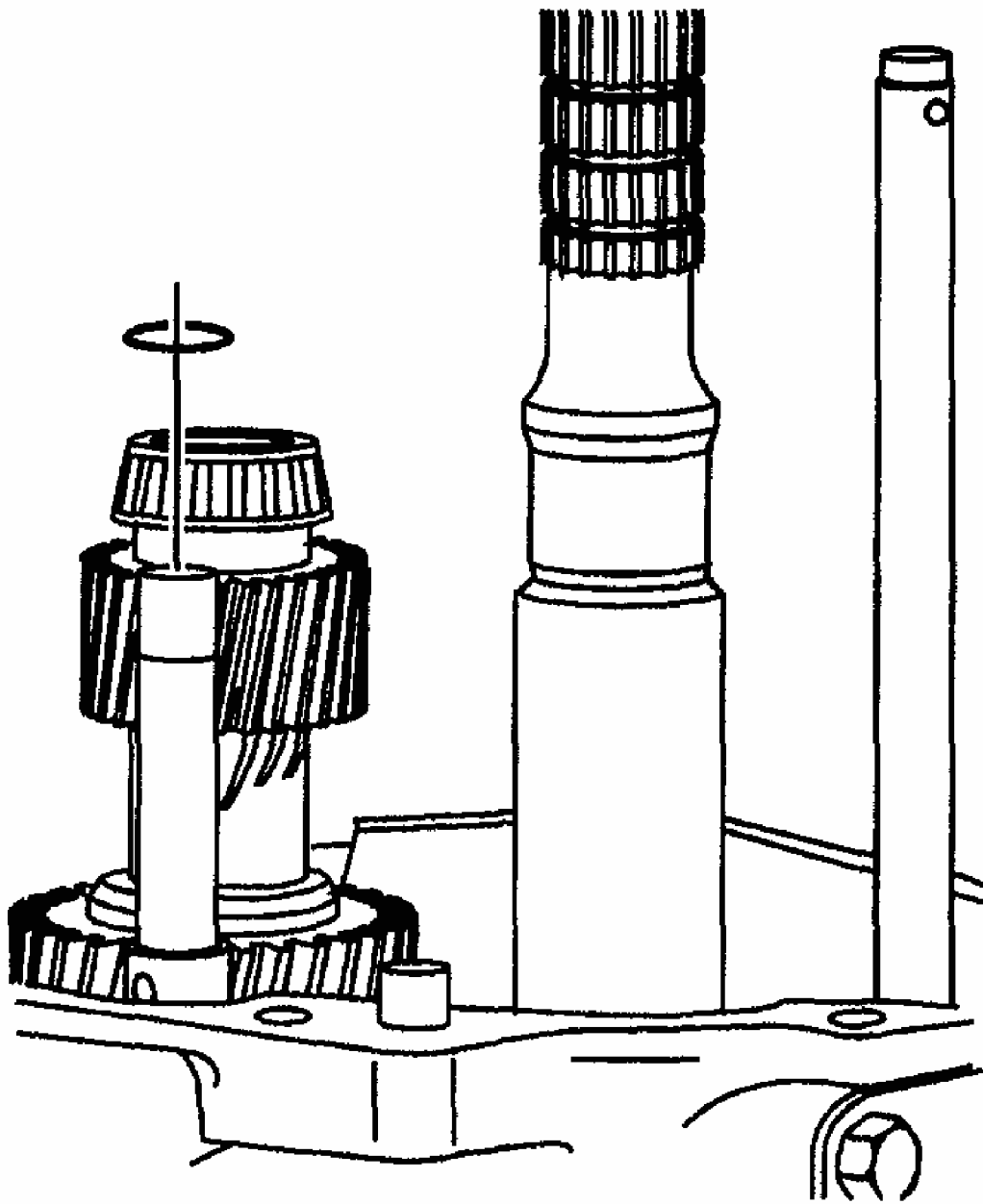
1. Position the transmission in the horizontal position.
2. Install the countershaft extension assembly and the 5th/6th shift fork. The splines of the countershaft extension must engage the splines of the countershaft.



G01366804

Fig. 186: Installing Countershaft Extension Assembly
Courtesy of GENERAL MOTORS CORP.

3. Install the 5th/6th shift fork retainer ring.



G01366805

Fig. 187: Installing 5th/6th Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

5th/6th Speed Driven Gear Installation

Tools Required

- J 39441 5th/6th Driven Gear Installer. See **Special Tools and Equipment** .

- J 39441-10 5th Gear Installer Adapter. See **Special Tools and Equipment** .

Install the 5th/6th speed driven gear using the J 39441 and J 39441-10. The smaller outside diameter (OD) of the gear faces down.

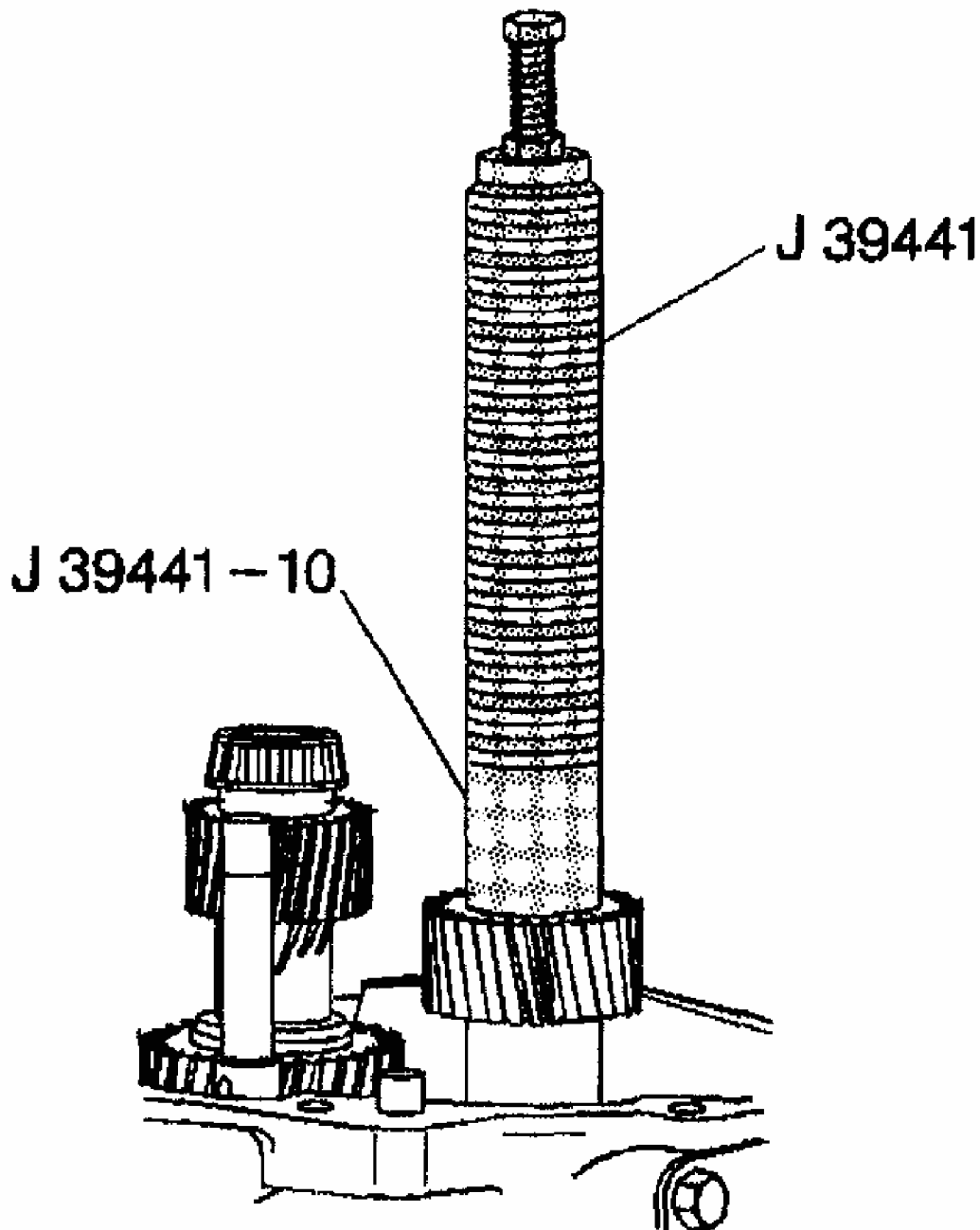
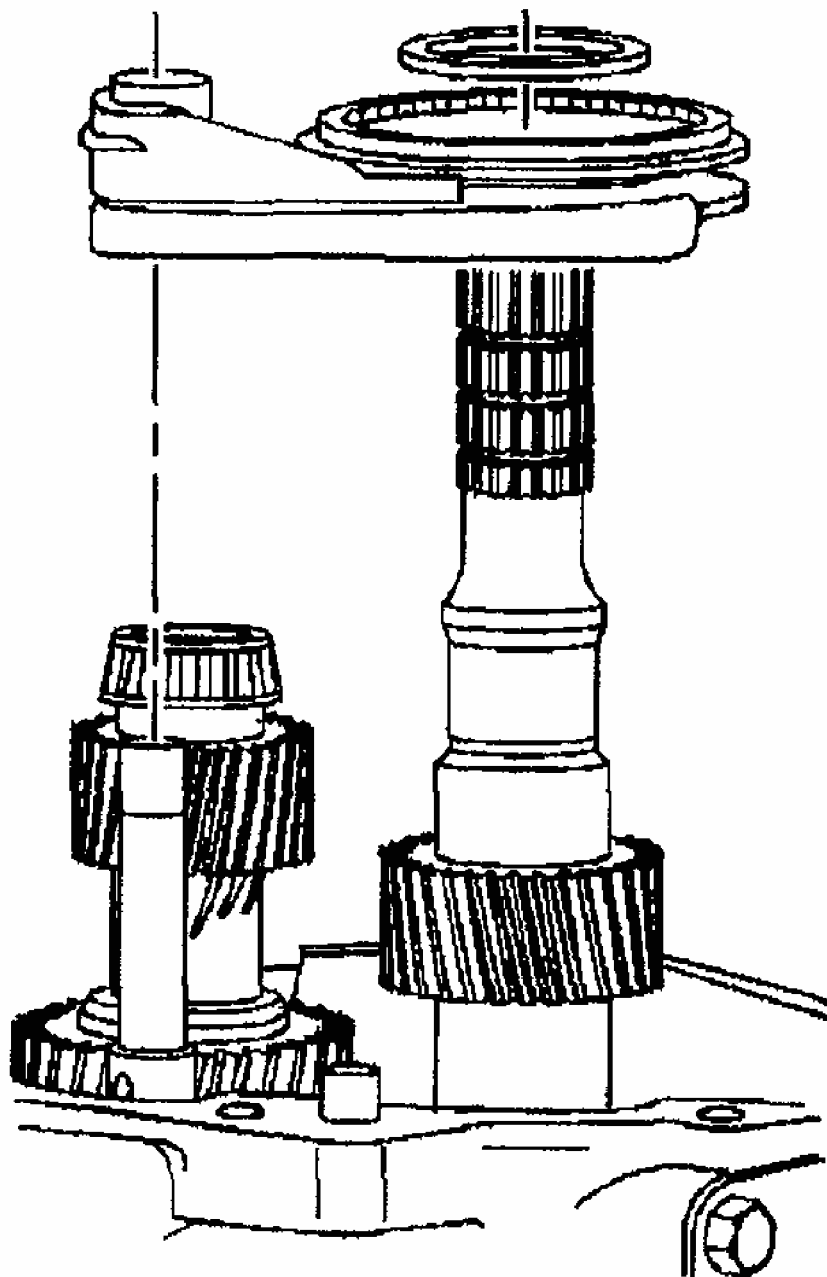


Fig. 188: Installing 5th/6th Speed Driven Gear
Courtesy of GENERAL MOTORS CORP.

Reverse Shift Fork Installation

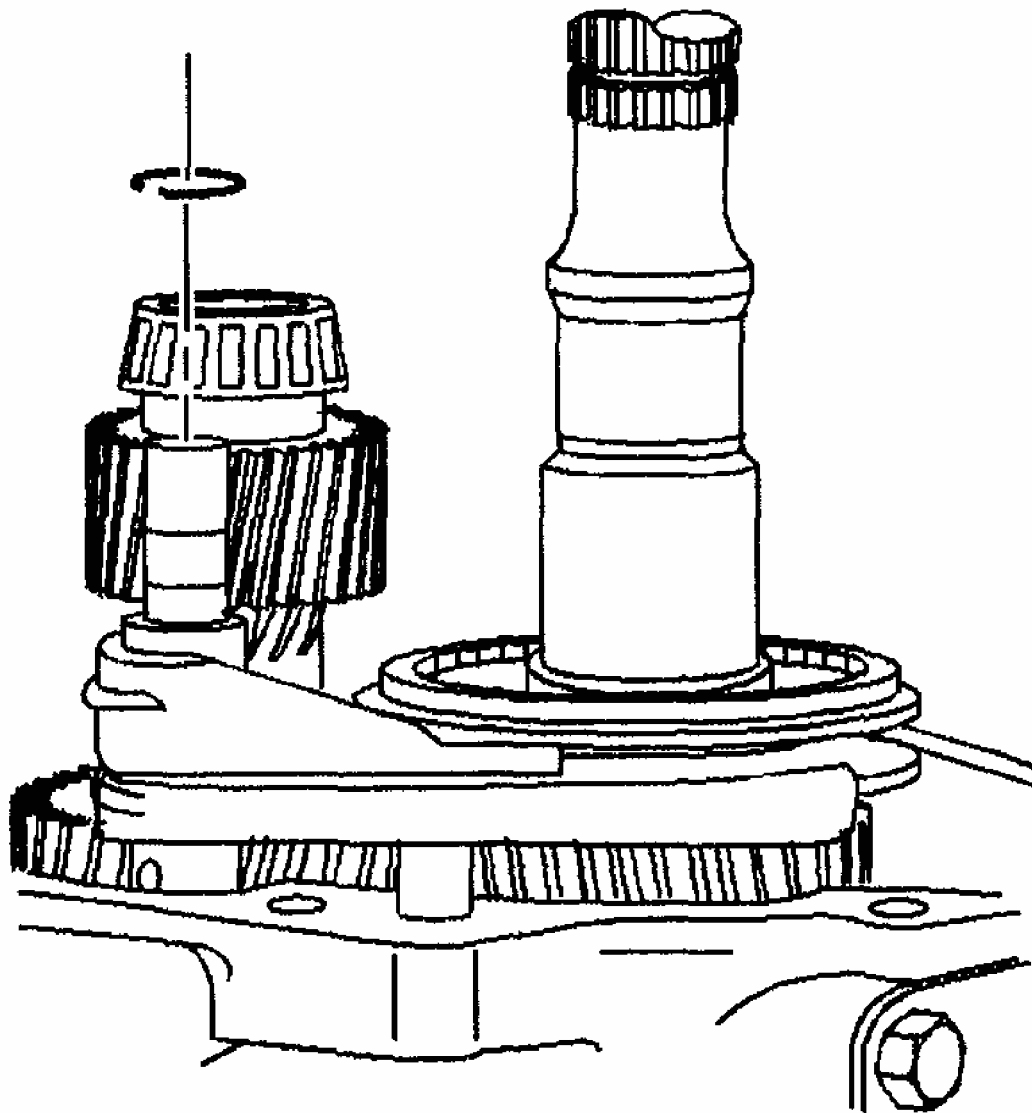
1. Install the reverse shift fork, the synchronizer and the thrust washer.



G01366807

Fig. 189: Installing Reverse Shift Fork
Courtesy of GENERAL MOTORS CORP.

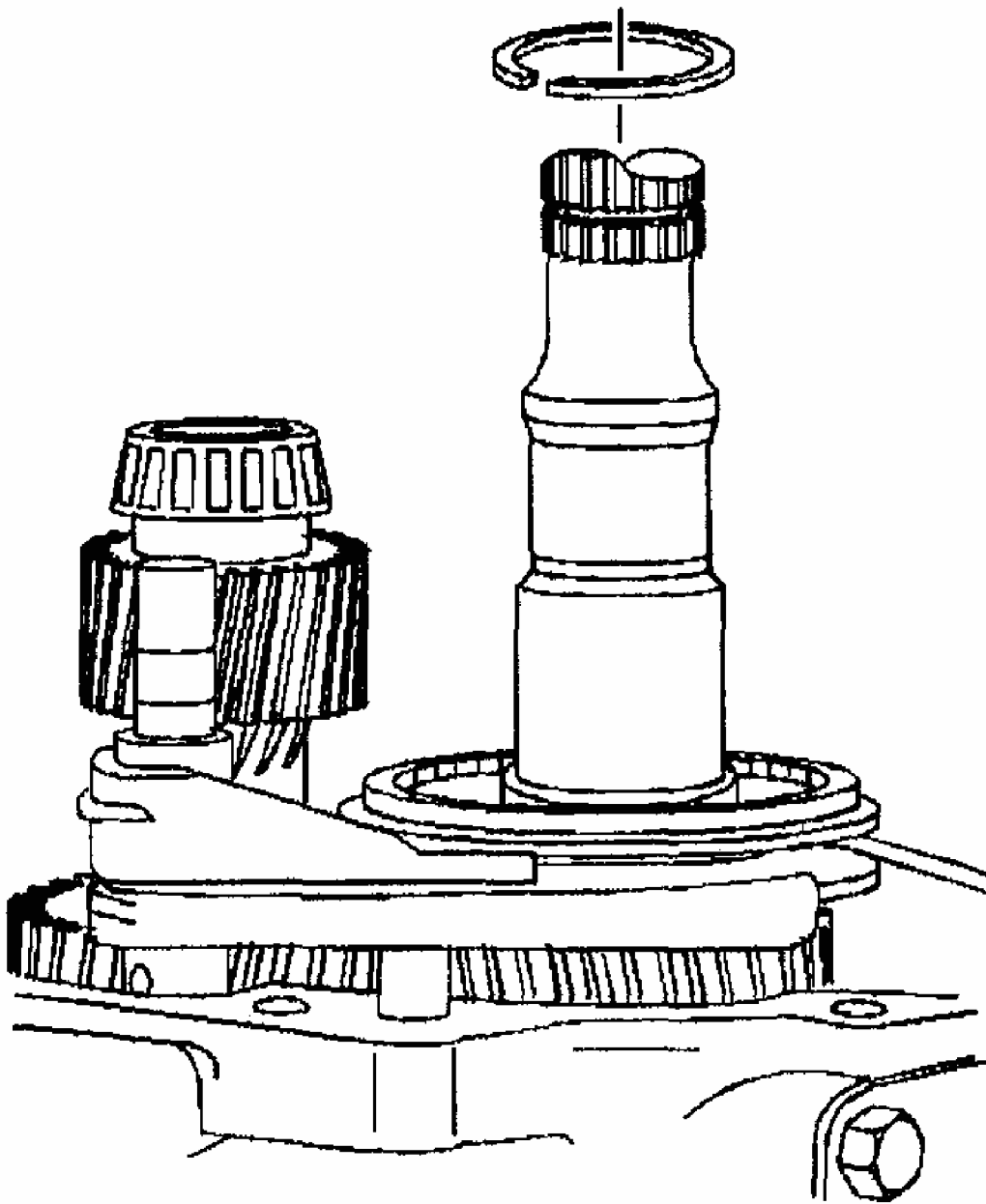
2. Install a new shift fork retainer ring.



G01366808

Fig. 190: Installing New Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

3. Install the reverse synchronizer retainer ring.



G01366809

Fig. 191: Installing Reverse Synchronizer Retainer Ring
Courtesy of GENERAL MOTORS CORP.

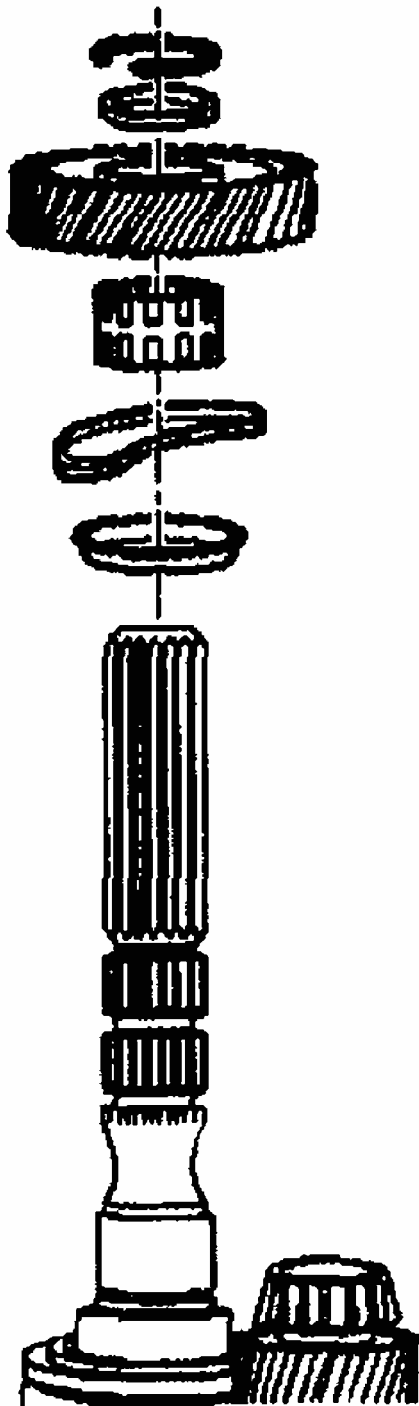
Reverse Speed Gear Installation

1. Install the following parts in order:
 1. The blocking ring

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

2. The wave washer
3. The wave washer so the concave side faces the blocking ring
4. The caged needle bearing
5. The reverse speed gear
6. The thrust washer
7. The retainer ring

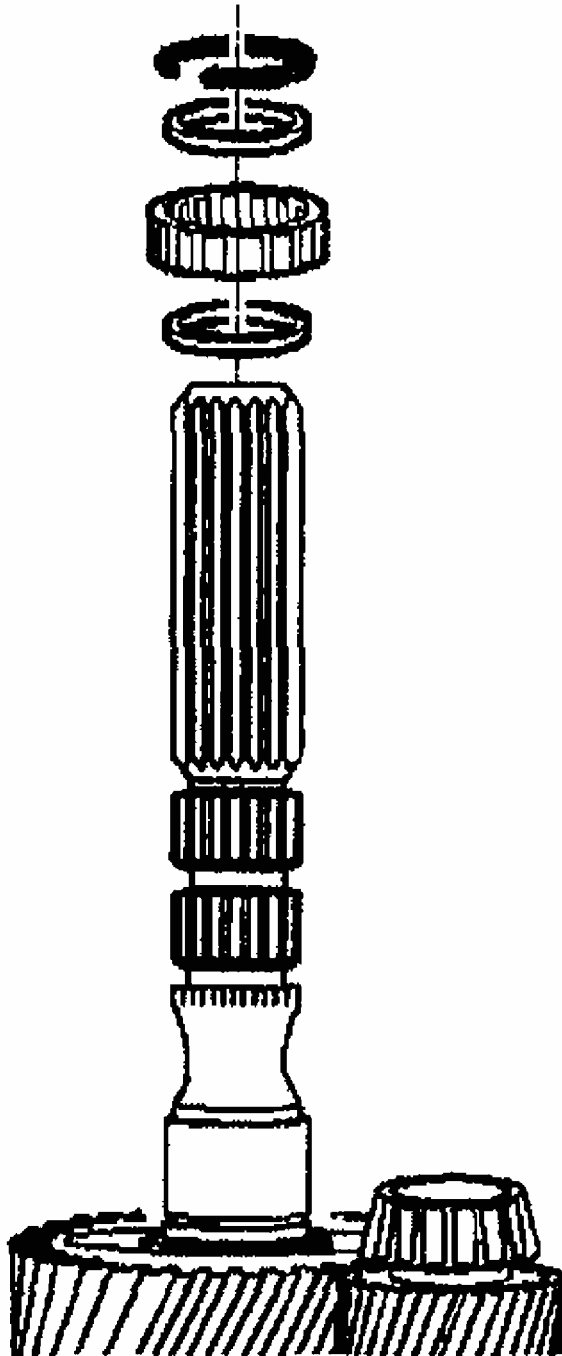


G01366810

Fig. 192: Installing Reverse Speed Gear Components
Courtesy of GENERAL MOTORS CORP.

2. Install the following parts in order:
 1. The spacer
 2. The roller bearing

3. The spacer
4. The roller bearing retainer ring



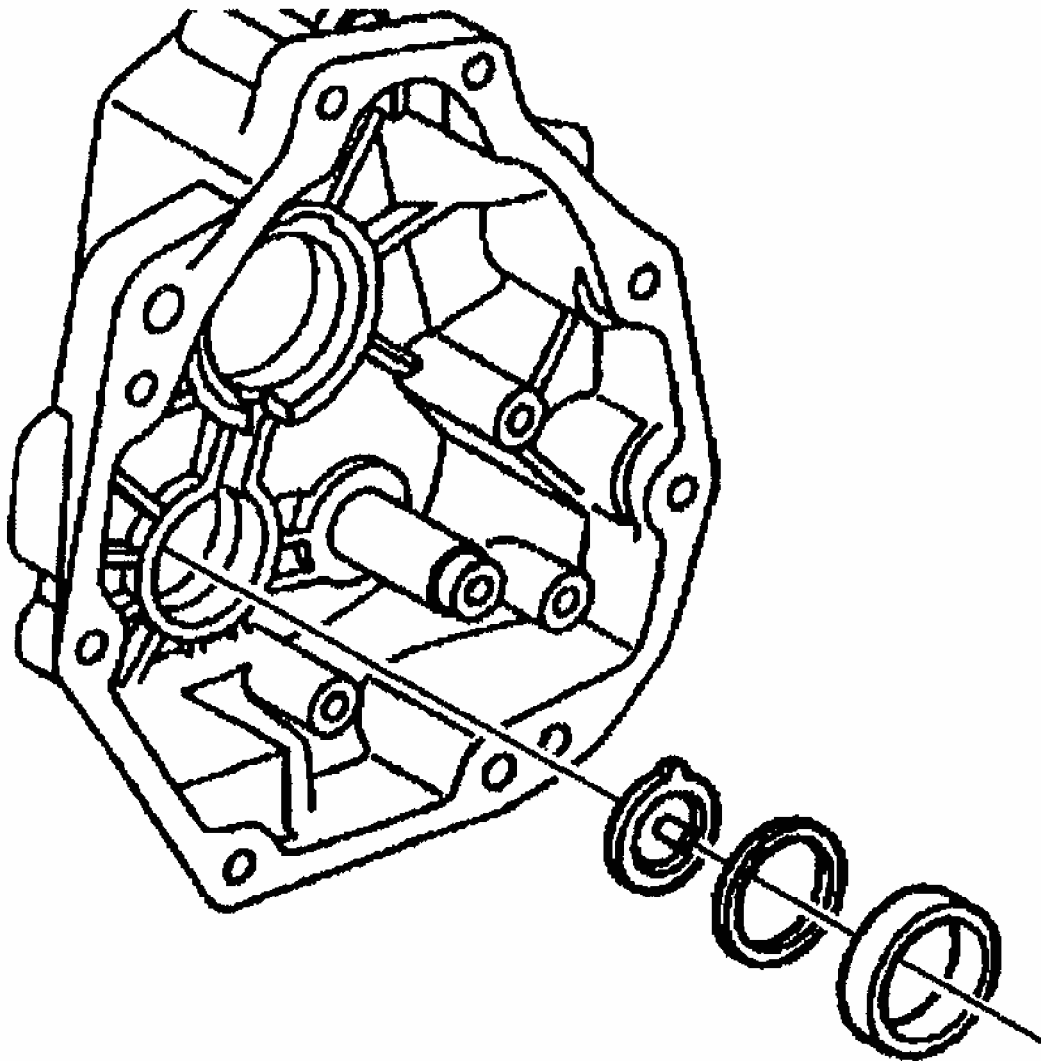
G01366811

Fig. 193: Installing Spacers, Bearing & Retaining Ring In Sequence
Courtesy of GENERAL MOTORS CORP.

Tools Required

J 44395 Transmission Holding Fixture. See Special Tools and Equipment .

1. Install the following parts in order:
 1. The funnel
 2. The selective shims. Refer to the COUNTERSHAFT EXTENSION . .
 3. The countershaft extension bearing race

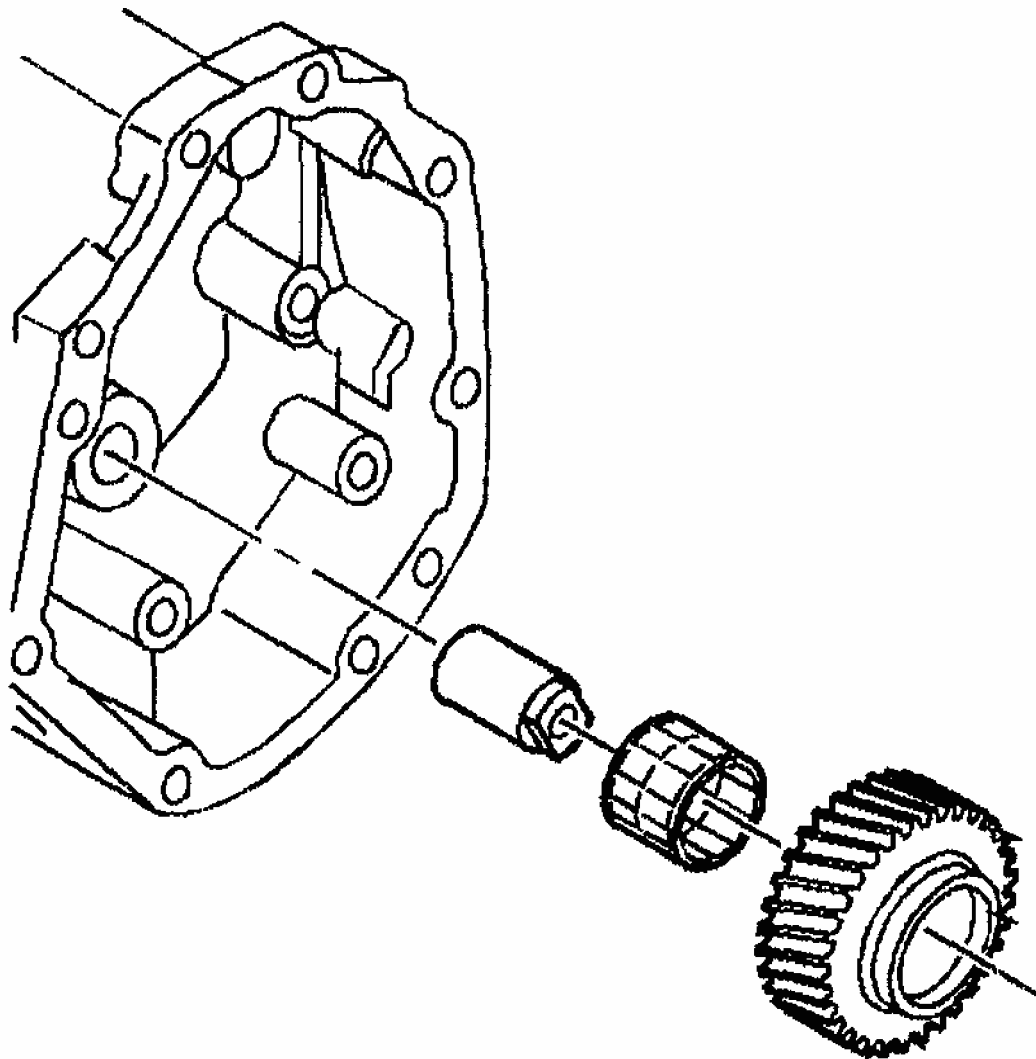


G01366812

Fig. 194: Installing Countershaft Extension Bearing Race
Courtesy of GENERAL MOTORS CORP.

2. Install the following parts in order:

1. The reverse idler shaft
2. The roller bearing
3. The reverse idler gear

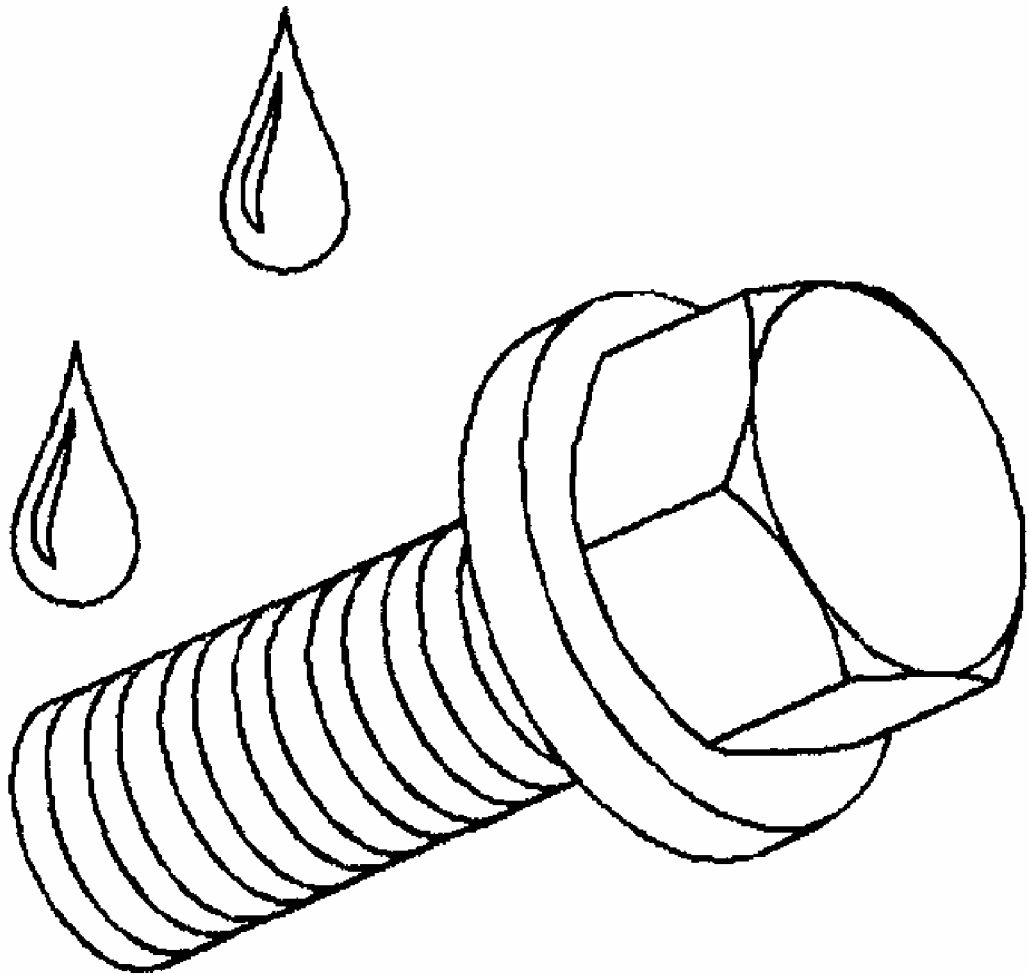


G01366813

Fig. 195: Installing Reverse Idler Shaft, Roller Bearing & Reverse Idler Gear
Courtesy of GENERAL MOTORS CORP.

3. Apply GM P/N United States 12345382, GM P/N Canada 10953489 or the equivalent to the reverse idler shaft brackets bolt threads.

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



G01366814

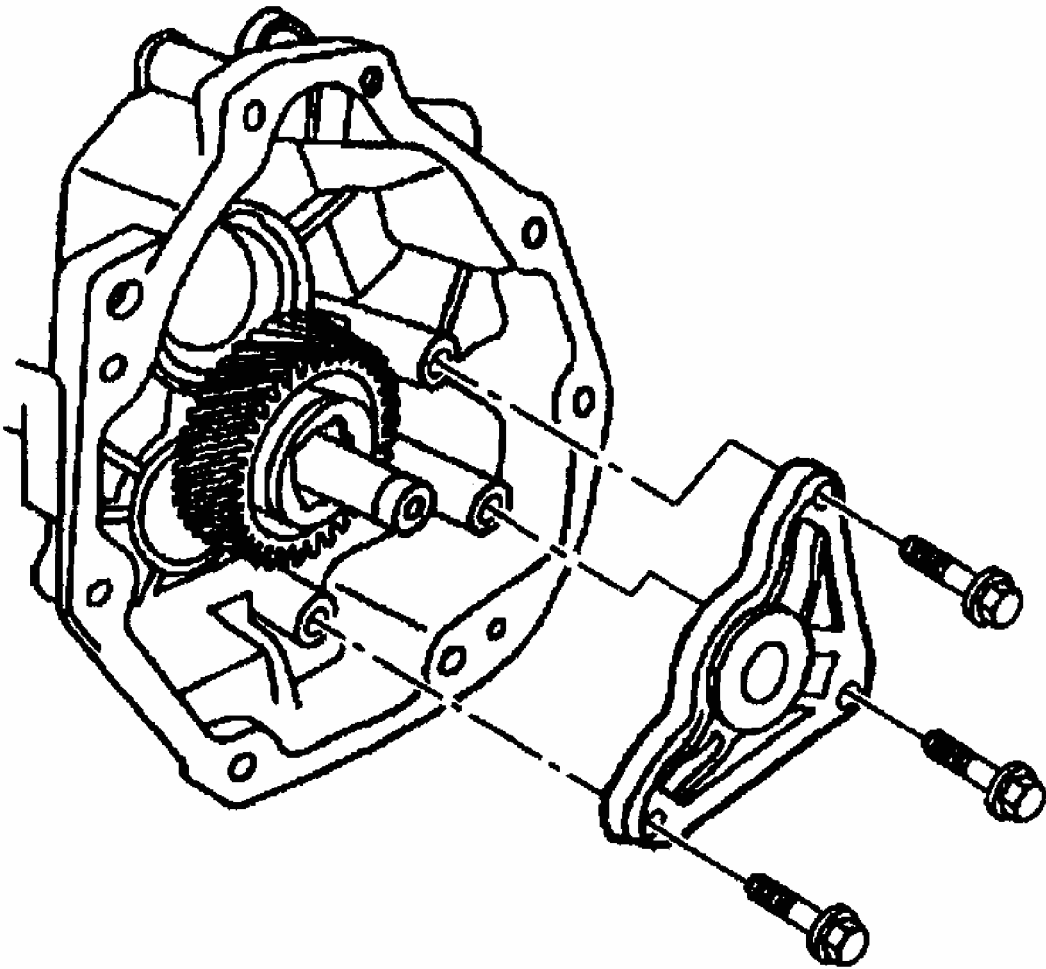
Fig. 196: Applying Sealant To Reverse Idler Shaft Brackets Bolt Threads

Courtesy of GENERAL MOTORS CORP.

4. Install the following parts in order:
 1. The reverse idler shaft bracket.
 2. The reverse idler shaft bracket bolts.

Tighten

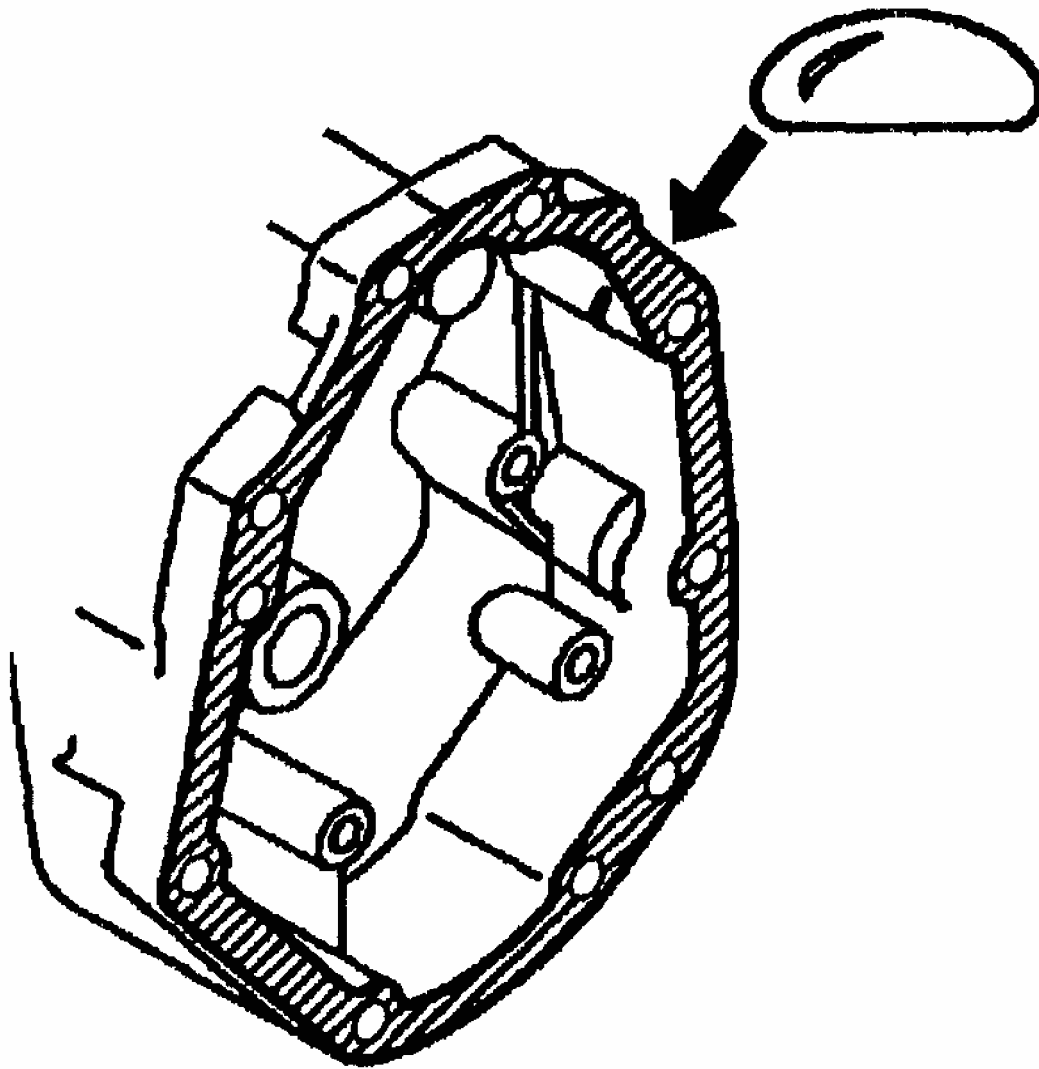
Tighten the bolts to 25 N.m (15 lb ft).



G01366815

Fig. 197: Installing Reverse Idler Shaft Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

5. Apply sealant GM P/N United States 12345739, GM P/N Canada 10953472 or equivalent to the extension housing to the transmission case mating surface.



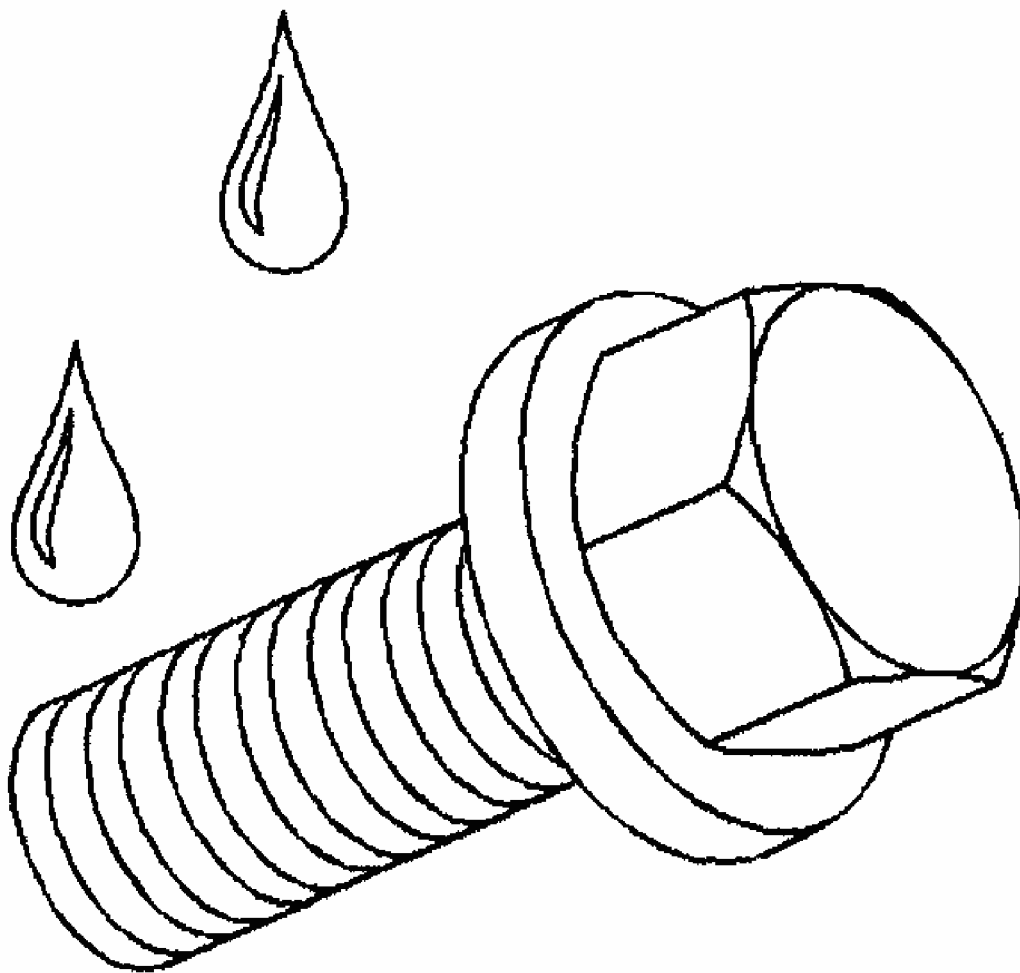
G01366816

Fig. 198: Applying Sealant To Extension Housing To Transmission Case Mating Surface

Courtesy of GENERAL MOTORS CORP.

6. Apply thread sealer GM P/N United States 12346004, GM P/N Canada 10953480 or equivalent to the top two extension housing bolts.

Important: Align the 5th/6th shift shaft to the extension housing bore in order to install the extension housing.



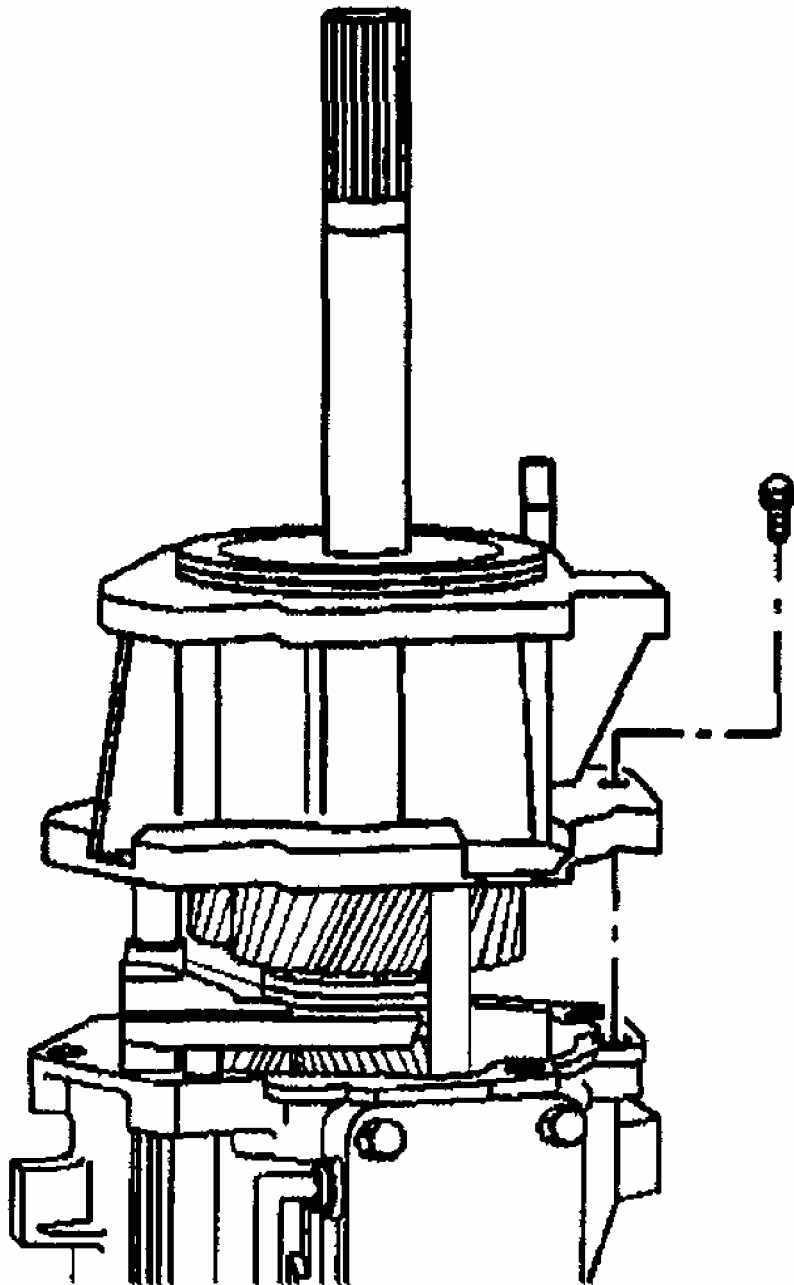
G01366817

Fig. 199: Applying Thread Sealer To Top Two Extension Housing Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install the extension housing.
8. Install the extension housing bolts.

Tighten

Tighten the bolts to 48 N.m (36 lb ft).



G01366818

Fig. 200: Installing Extension Housing Bolts
Courtesy of GENERAL MOTORS CORP.

9. Install the vent tube.
10. Remove the J 44395.

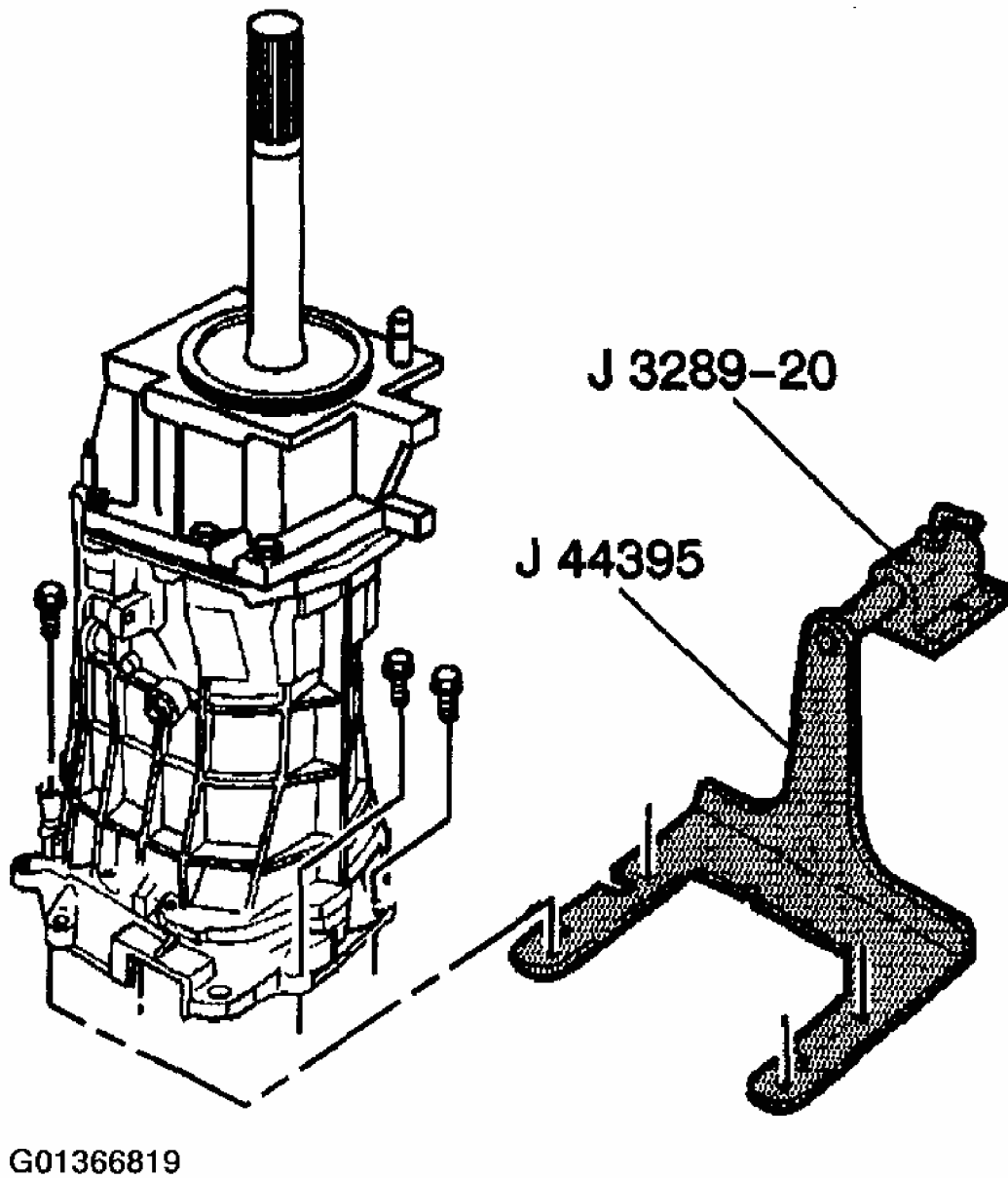
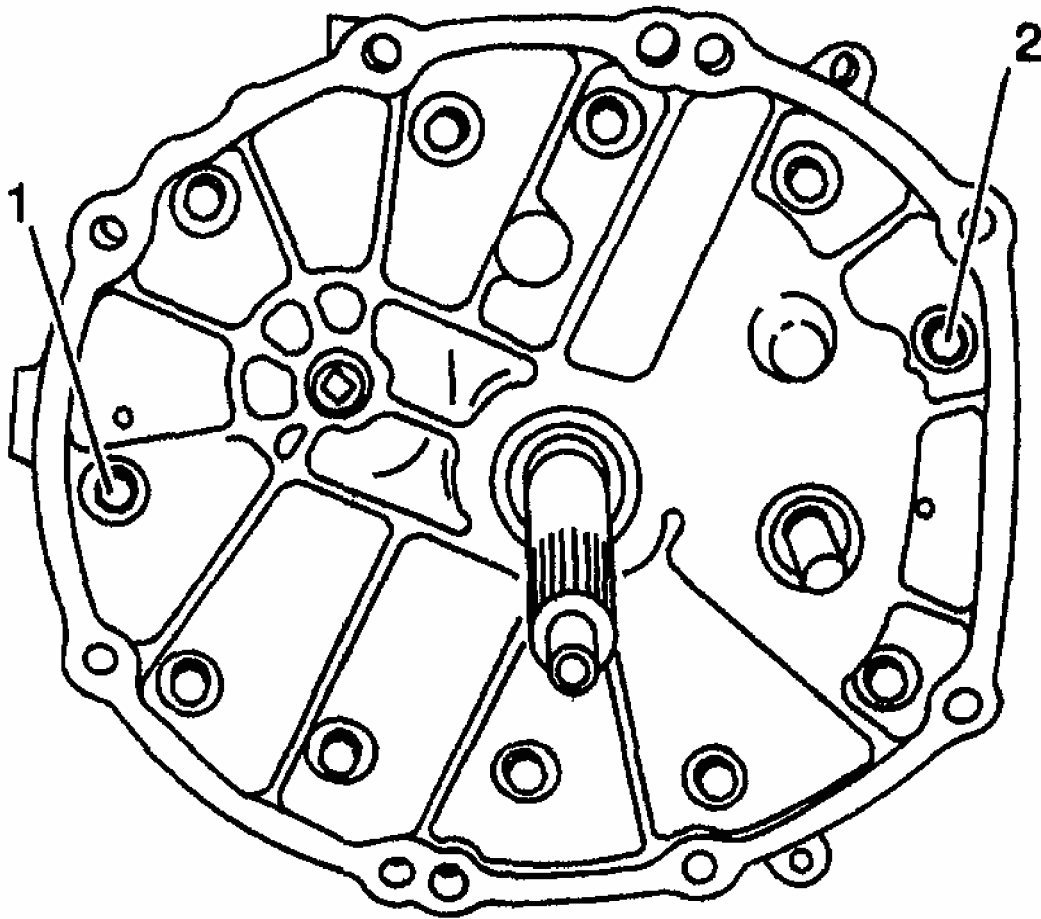


Fig. 201: Removing J 44395
Courtesy of GENERAL MOTORS CORP.

11. Install the remaining two adapter plate bolts (1) and (2).

Tighten

Tighten the adapter plate bolts to 48 N.m (36 lb ft).



G01366820

Fig. 202: Installing Adapter Plate Bolts
Courtesy of GENERAL MOTORS CORP.

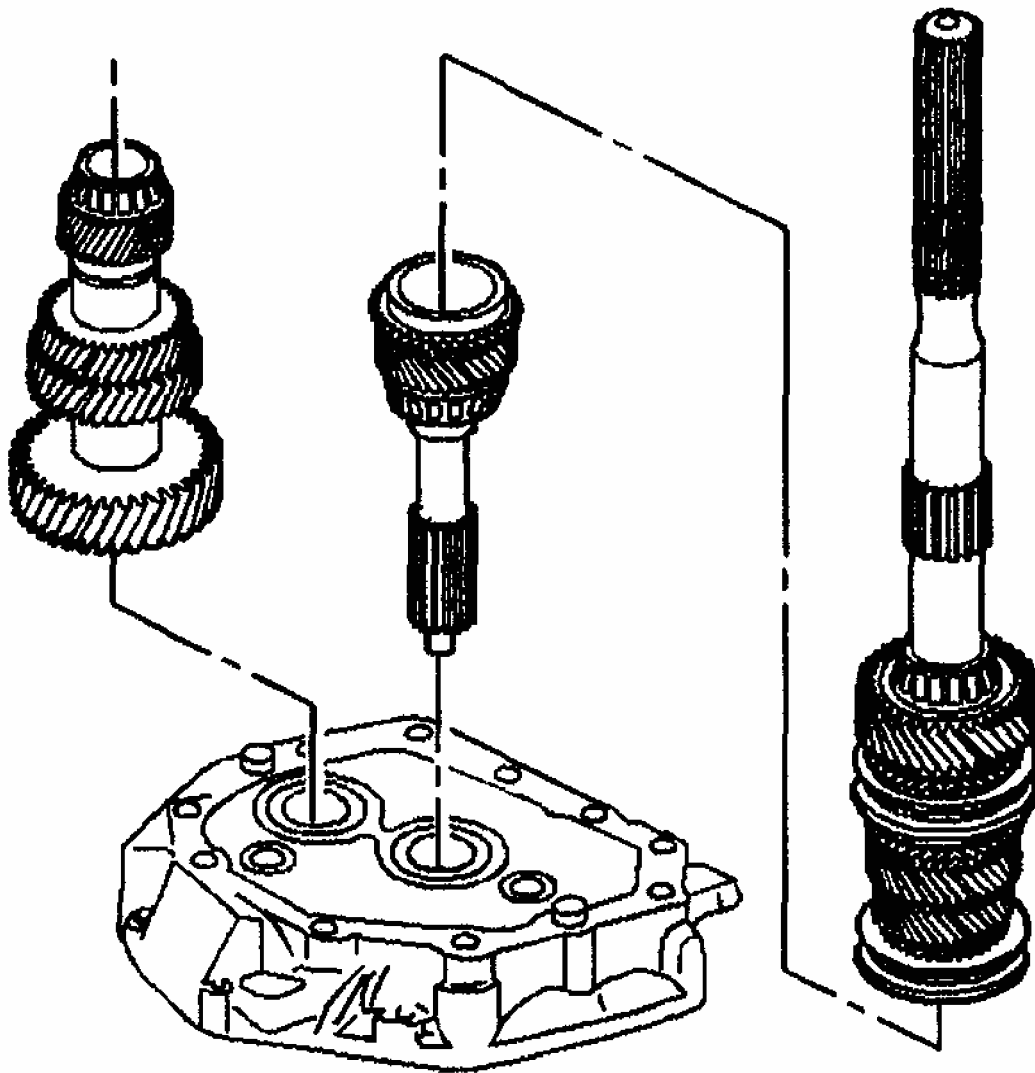
SHIMMING PROCEDURES

Input Shaft, Mainshaft and Countershaft

Tools Required

- J 8001 Dial Indicator Set. See **Special Tools and Equipment** .
- J 39444-1 Countershaft End Play Rod. See **Special Tools and Equipment** .

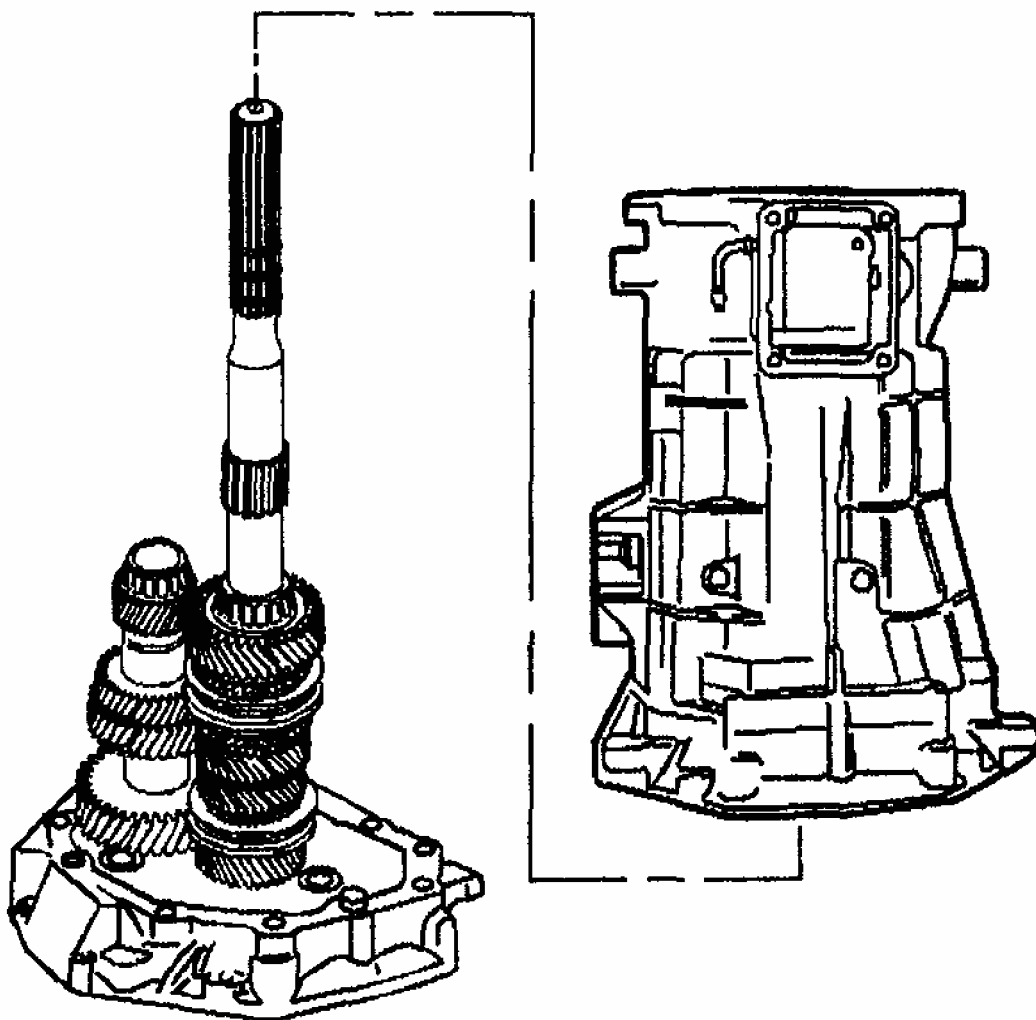
1. Rotate the transmission adapter plate to the vertical position.



G01366821

Fig. 203: Rotating Transmission Adapter Plate To Vertical Position
Courtesy of GENERAL MOTORS CORP.

2. Install the following assemblies in order:
 1. The input shaft to the adapter plate
 2. Align the 4th speed gear blocking ring to the input shaft.
 3. The mainshaft assembly
 4. The countershaft (lift up the mainshaft enough to install the countershaft.)
3. Install the transmission case.



G01366822

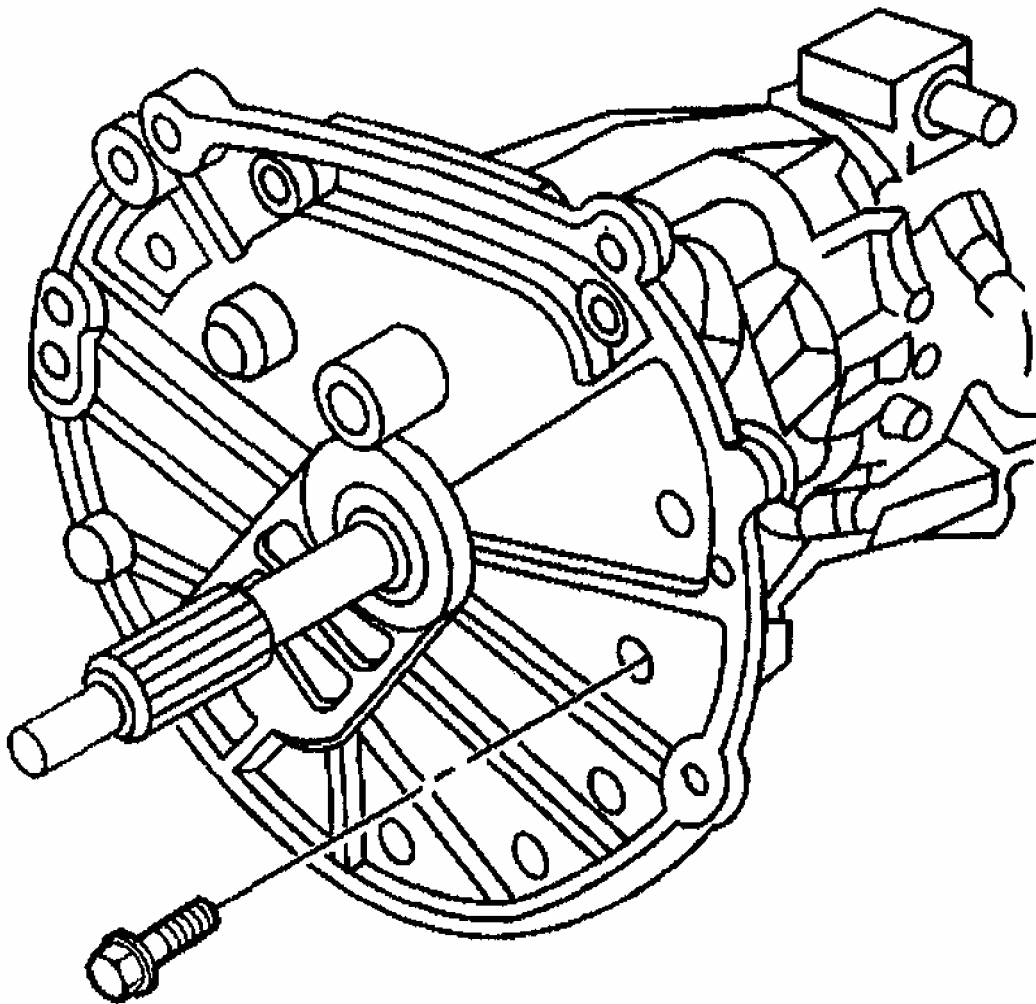
Fig. 204: Installing Transmission Case
Courtesy of GENERAL MOTORS CORP.

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

4. Install the adapter plate to transmission case bolts.

Tighten

Tighten the bolts to 35 N.m (26 lb ft).



G01366823

Fig. 205: Installing Adapter Plate To Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

5. Measure the input shaft/mainshaft end play using the following procedure:
 1. Place the tip of the J 8001-3 on the end of the mainshaft.
 2. Move the input shaft up and down.
 3. Record the measurement.

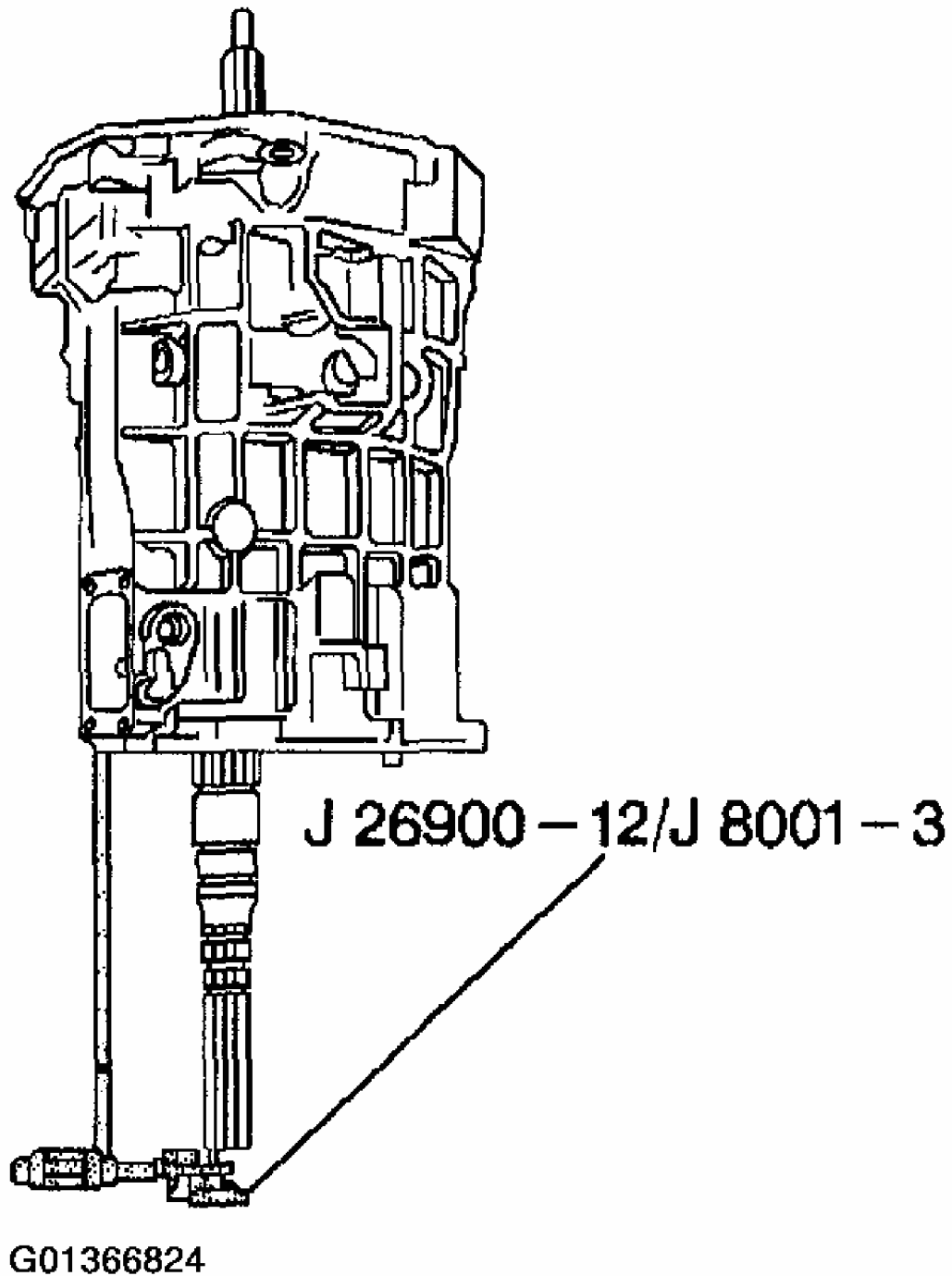
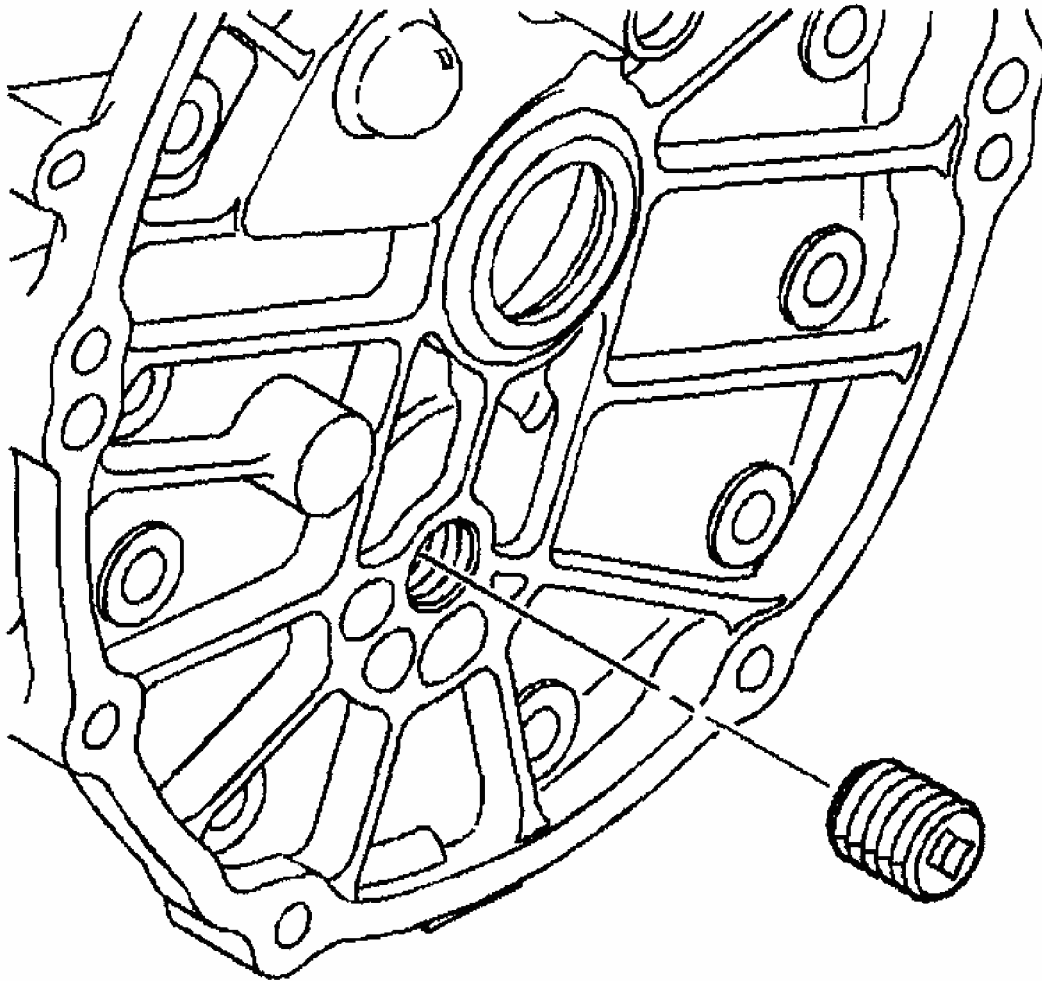


Fig. 206: Measuring Input Shaft/Mainshaft End Play
Courtesy of GENERAL MOTORS CORP.

6. Select a shim to achieve 0.00-0.05 mm (0.000-0.002 in) preload.
7. Remove the J 8001 -3.

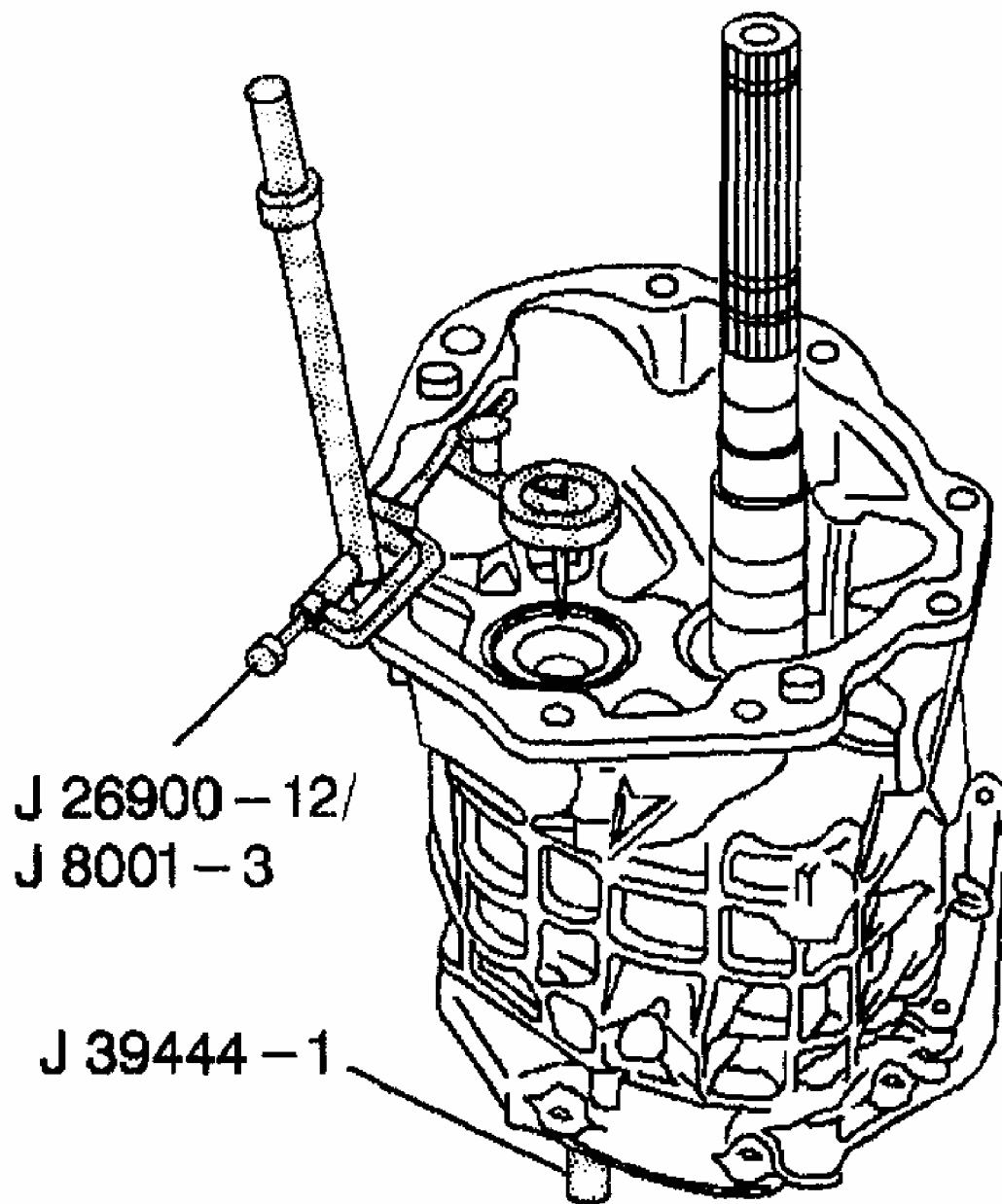
8. Remove the adapter plate plug.



G01366825

Fig. 207: Removing Adapter Plate Plug
Courtesy of GENERAL MOTORS CORP.

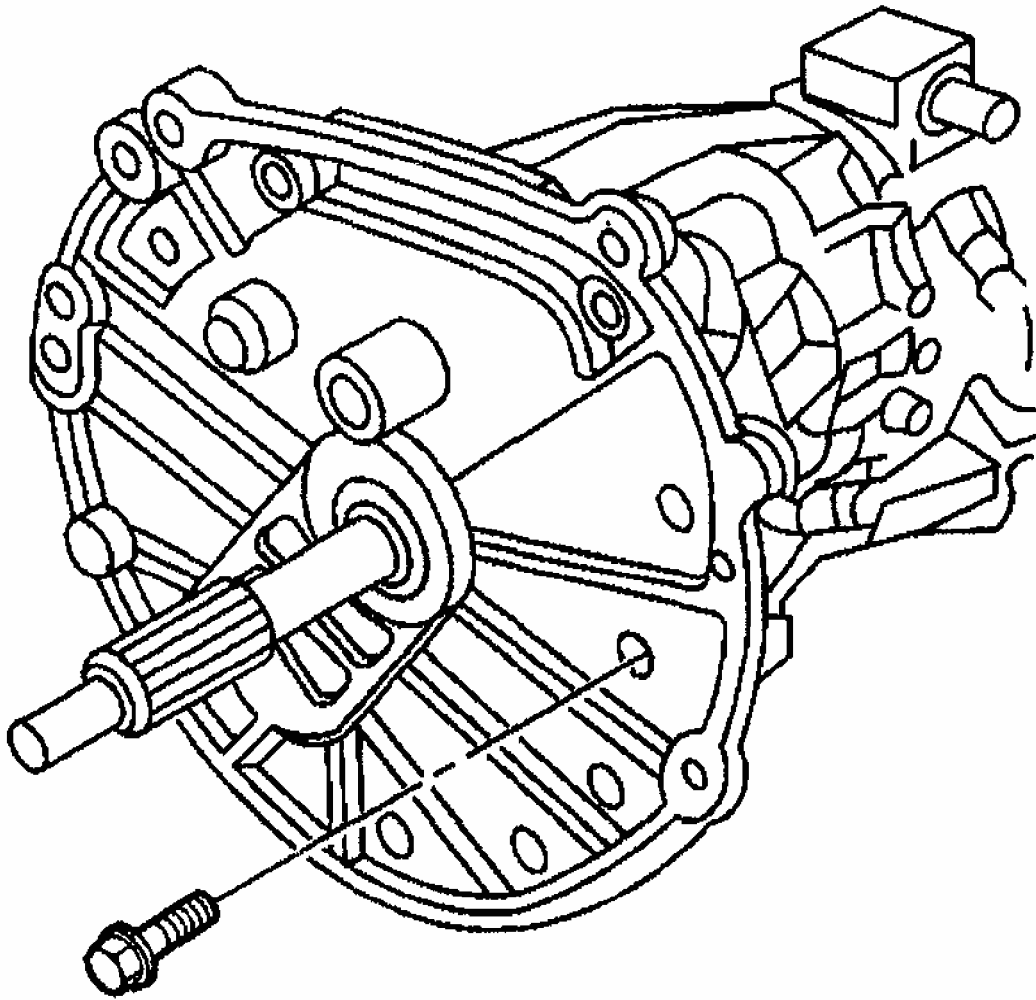
9. Place the tip of the J 8001 -3 on the end of the countershaft.
10. Measure the countershaft end play using the following procedure:
 1. Install the J 39444-1 through the adapter plate plug hole. Screw the J 39444-1 into the countershaft.
 2. Move the countershaft up and down with the countershaft end play rod J 39444-1.
 3. Remove the measurement.



G01366826

Fig. 208: Measuring Countershaft End Play
Courtesy of GENERAL MOTORS CORP.

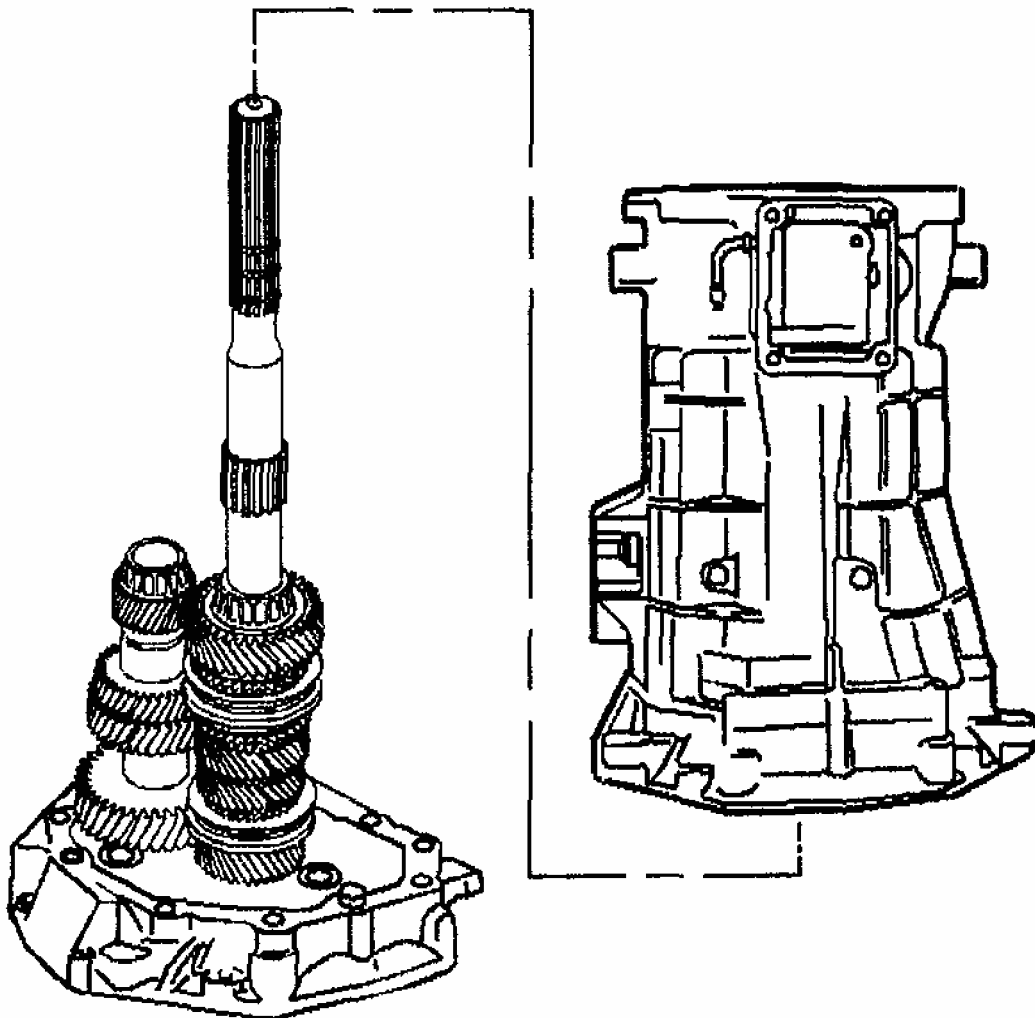
11. Select a shim to achieve 0.00-0.05 mm (0.000-0.002 in) preload.
12. Remove the J 8001 -3.
13. Remove the J 39444-1.
14. Remove the adapter plate to the transmission case bolts.



G01366827

Fig. 209: Removing Adapter Plate To Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

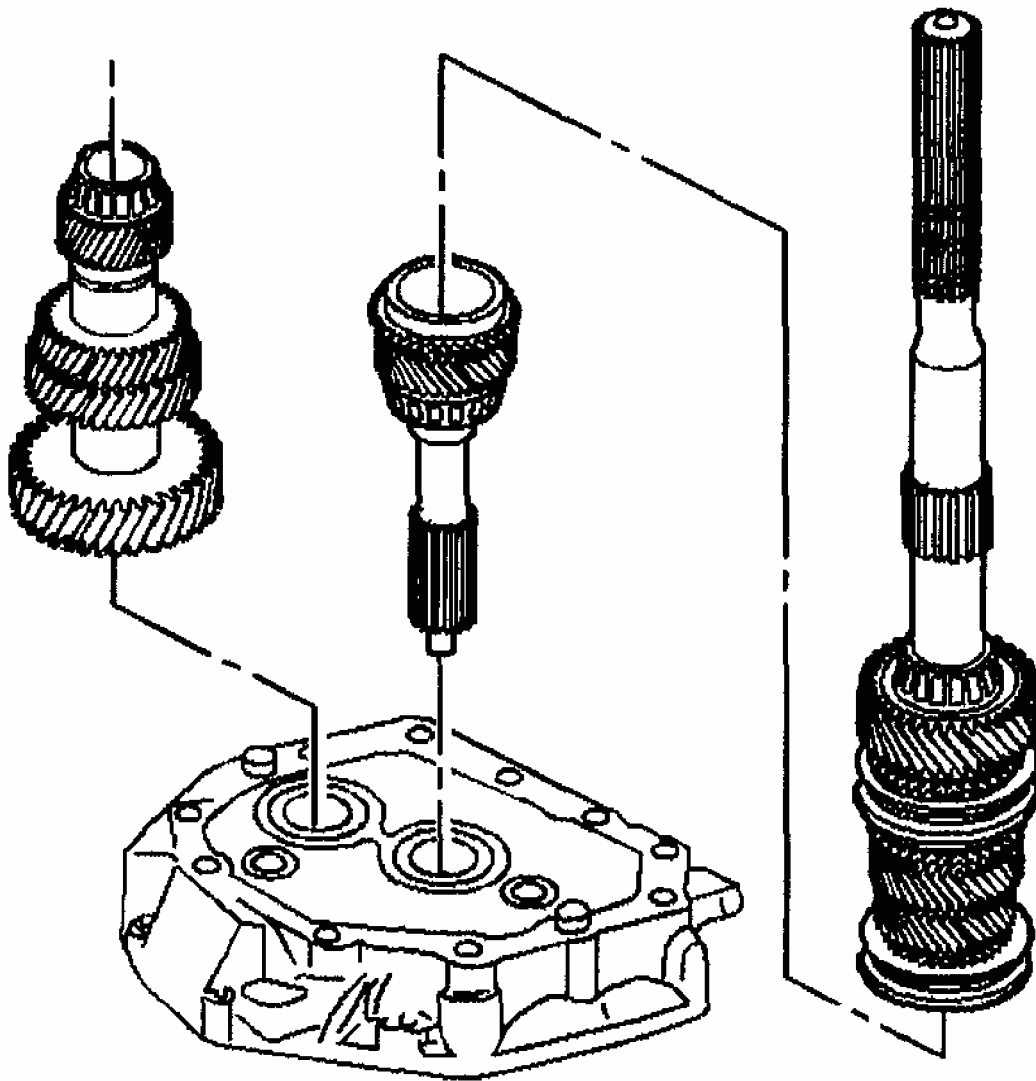
15. Remove the transmission case.



G01366828

Fig. 210: Removing Transmission Case
Courtesy of GENERAL MOTORS CORP.

16. Remove the following parts in order:
 1. The countershaft (lift up the mainshaft enough to remove the countershaft).
 2. The mainshaft assembly
 3. The input shaft from the adapter plate
 4. The input shaft bearing race
 5. The countershaft bearing race



G01366829

Fig. 211: Removing Countershaft Components In Sequence
Courtesy of GENERAL MOTORS CORP.

Countershaft Extension

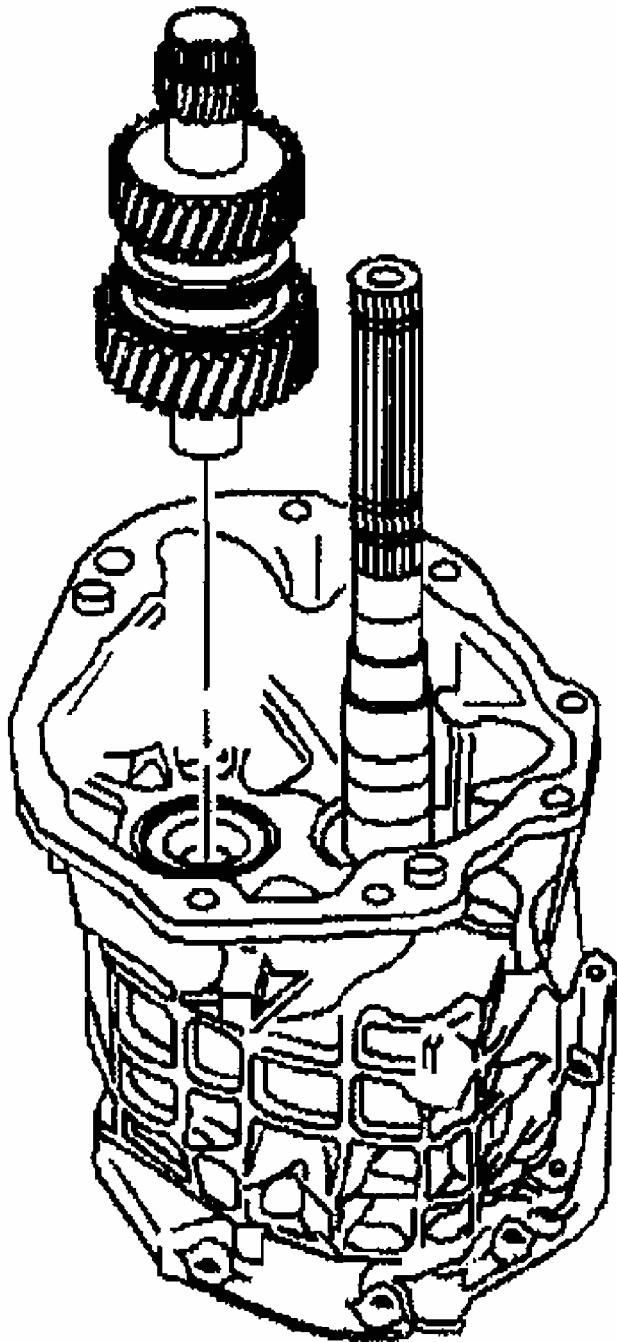
Tools Required

- J 8001 Dial Indicator Set. See **Special Tools and Equipment** .
- J 39444-2 Countershaft Extension End Play Rod. See **Special Tools and Equipment** .

Important: The following procedure cannot be performed accurately until the countershaft shimming procedure has been completed and the transmission has been assembled to the

point of installing the countershaft extension.

1. Rotate the transmission in the horizontal position.



G01366830

Fig. 212: Installing Countershaft Extension To Countershaft
Courtesy of GENERAL MOTORS CORP.

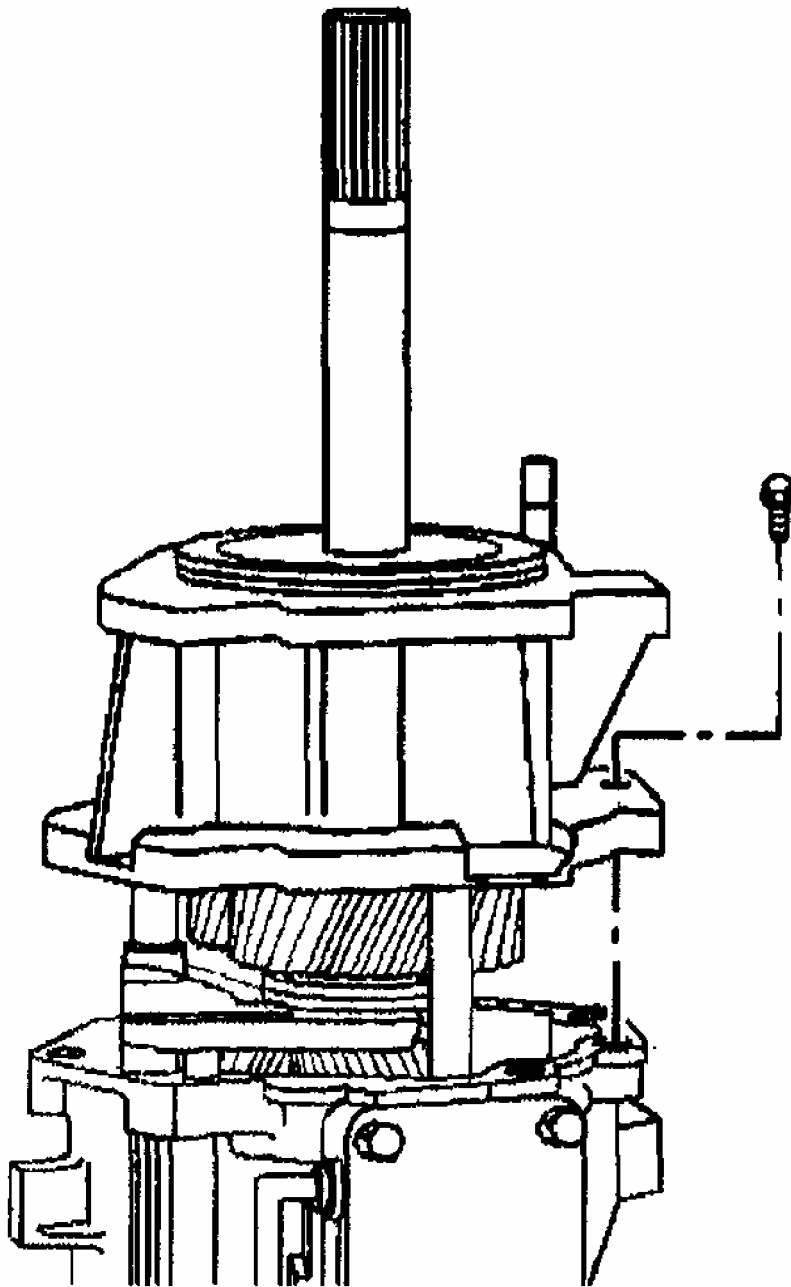
2. Install the countershaft extension to the countershaft. Make sure the splines fully engage.

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

3. Install the extension housing and the extension housing retainer bolts.

Tighten

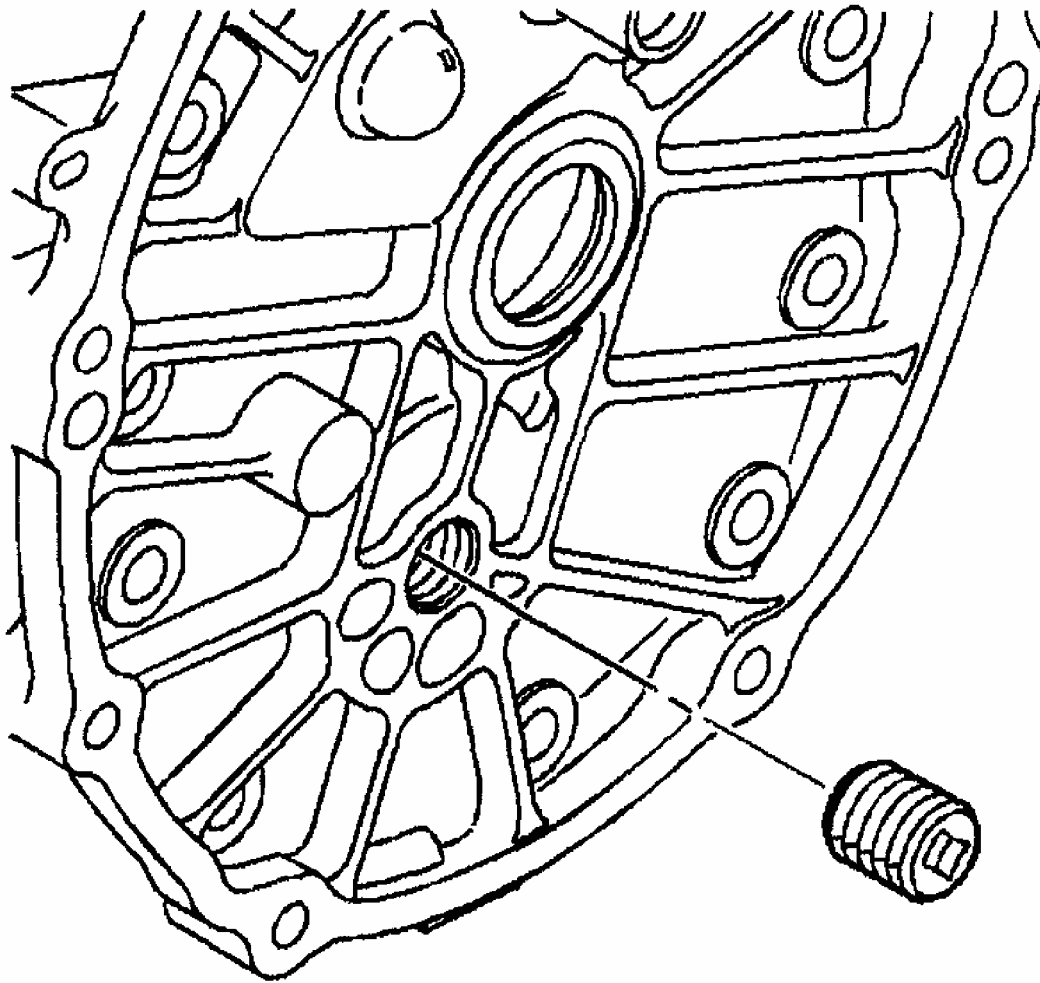
Tighten the bolts to 35 N.m (26 lb ft).



G01366831

Fig. 213: Installing Extension Housing & Extension Housing Retainer Bolts
Courtesy of GENERAL MOTORS CORP.

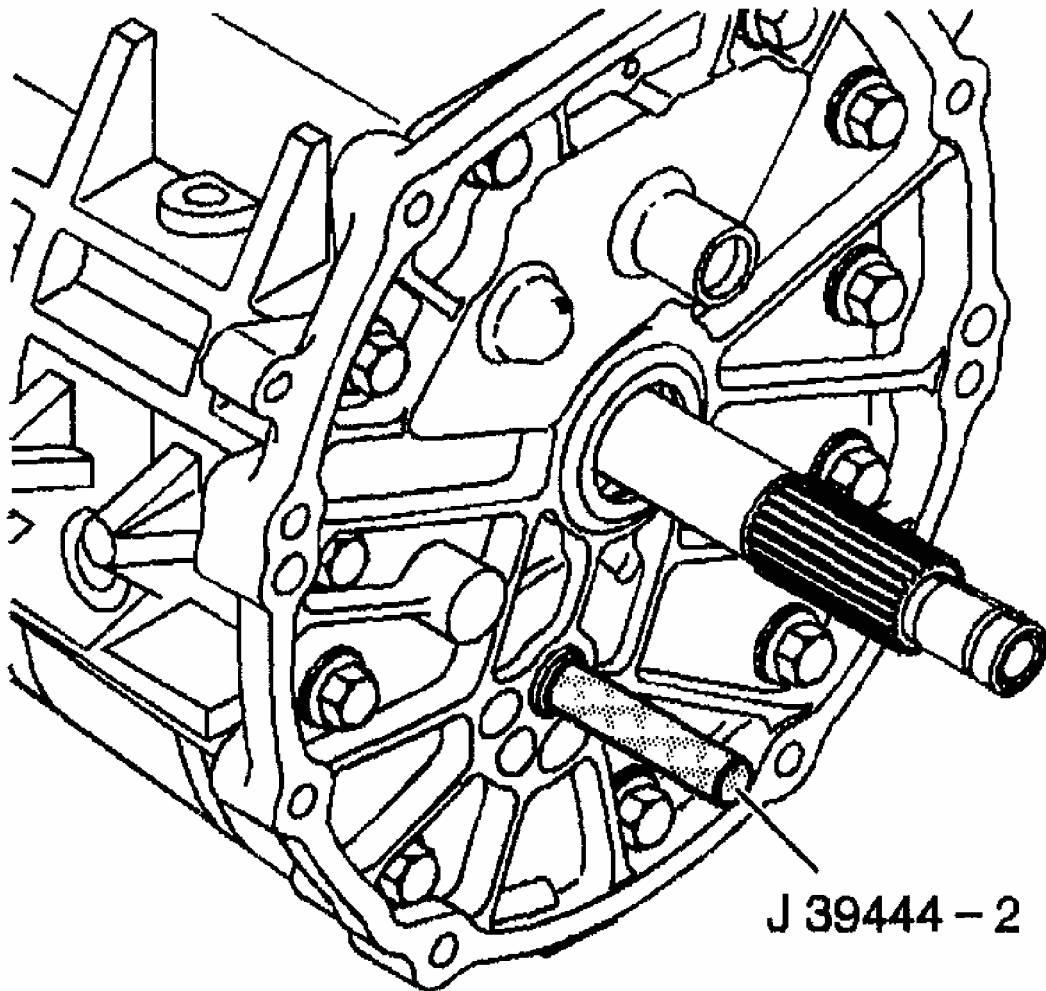
4. Remove the plug from the adapter plate.



G01366832

Fig. 214: Removing Plug From Adapter Plate
Courtesy of GENERAL MOTORS CORP.

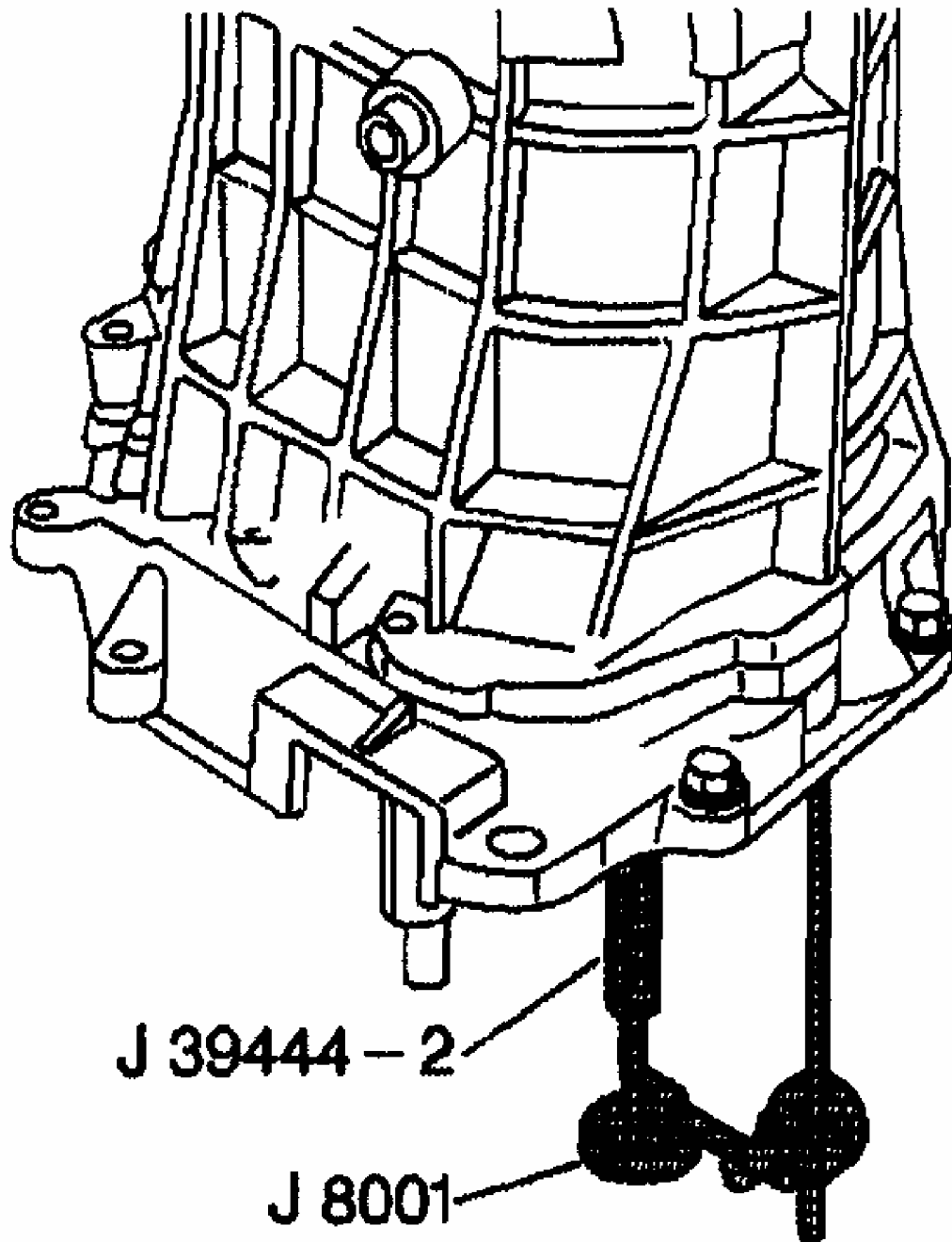
5. Install the J 39444-2 through the adapter plate plug hole.



G01366833

Fig. 215: Installing J 39444-2 Through Adapter Plate Plug Hole
Courtesy of GENERAL MOTORS CORP.

6. Screw J 39444-2 into the countershaft extension.
7. Measure the countershaft extension end play using the following procedure:
 1. Install a J 8001 so the tip is on the end of the countershaft extension end play rod.
 2. Rotate the transmission in the vertical position.
 3. Move the countershaft extension up and down using the J 39444-2.
 4. Record the measurement.

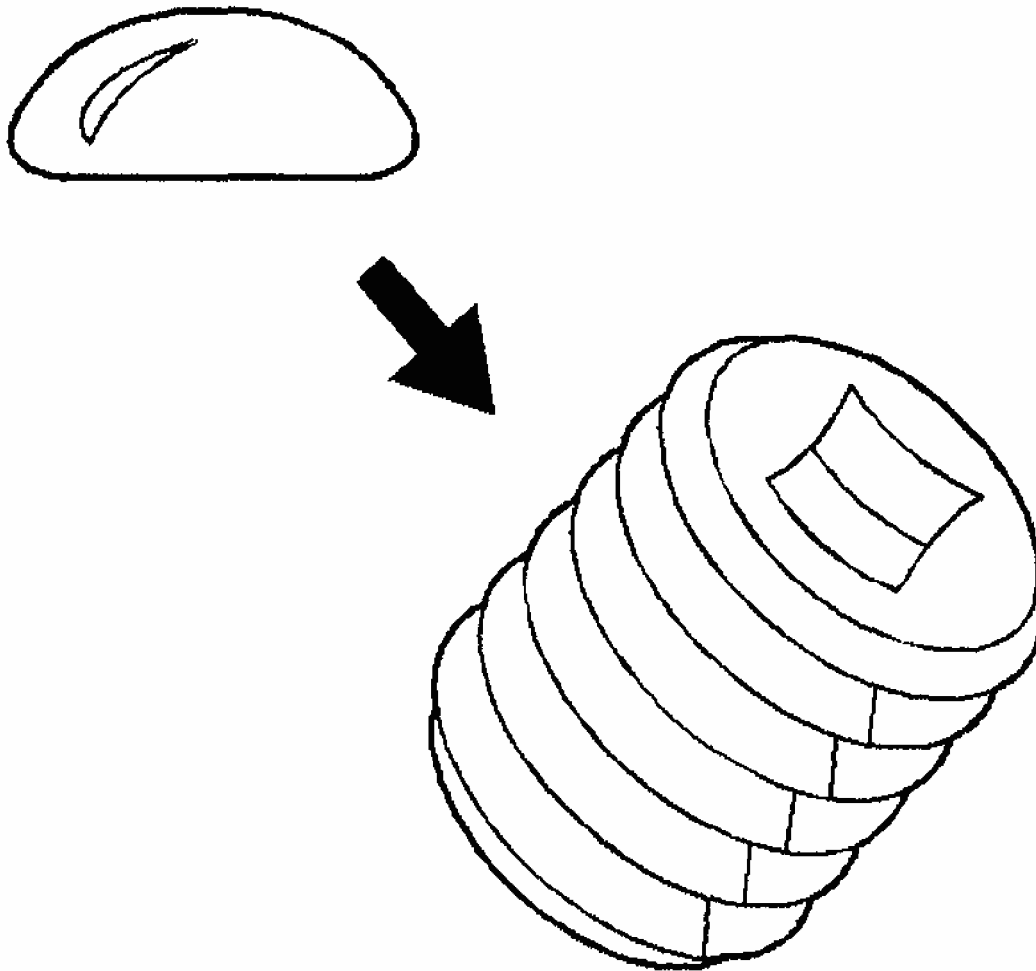


G01366834

Fig. 216: Measuring Countershaft Extension End Play
Courtesy of GENERAL MOTORS CORP.

8. Select a shim to achieve 0.05-0.13 mm (0.002-0.005 in) axial play.

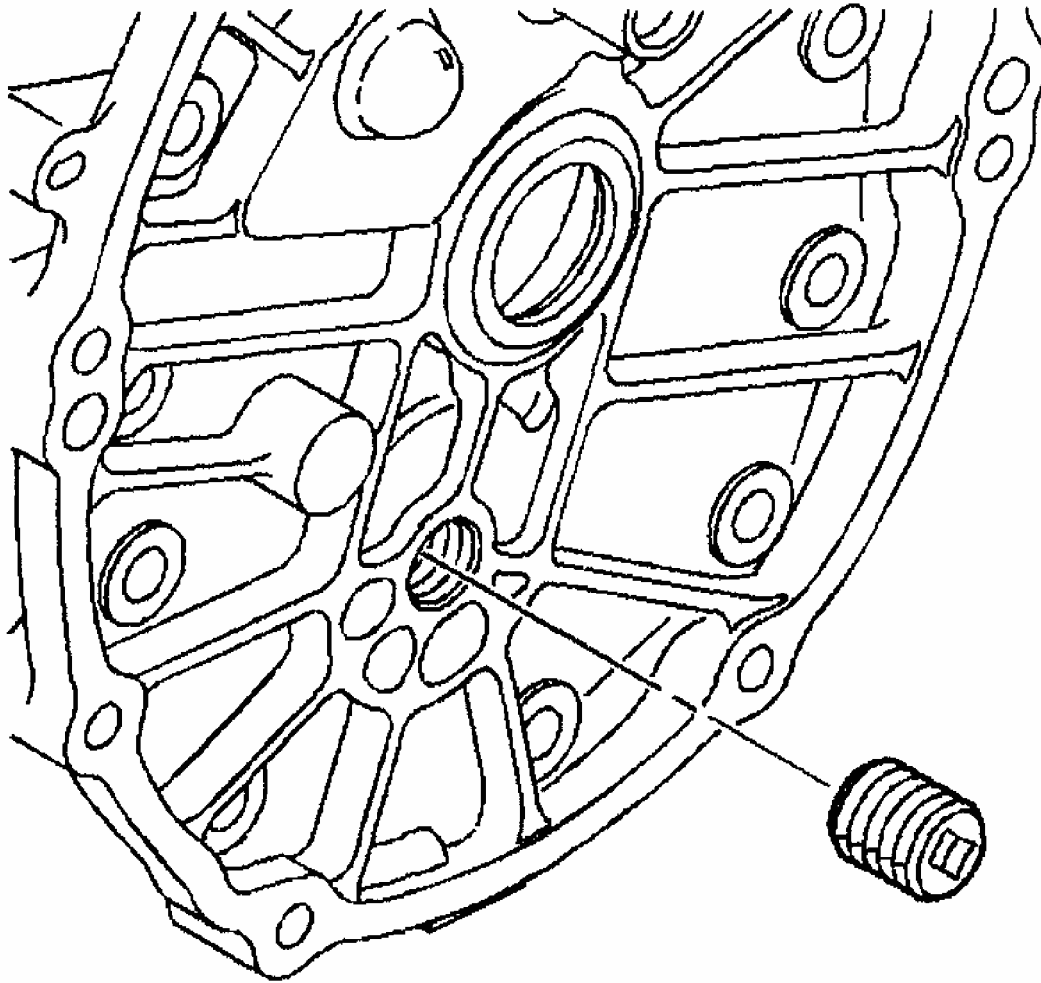
9. Remove the J 8001.
10. Remove the J 39444-2.
11. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480 or the equivalent to the plug threads.



G01366835

Fig. 217: Applying Sealant To Plug Threads
Courtesy of GENERAL MOTORS CORP.

12. Install the adapter plate plug.



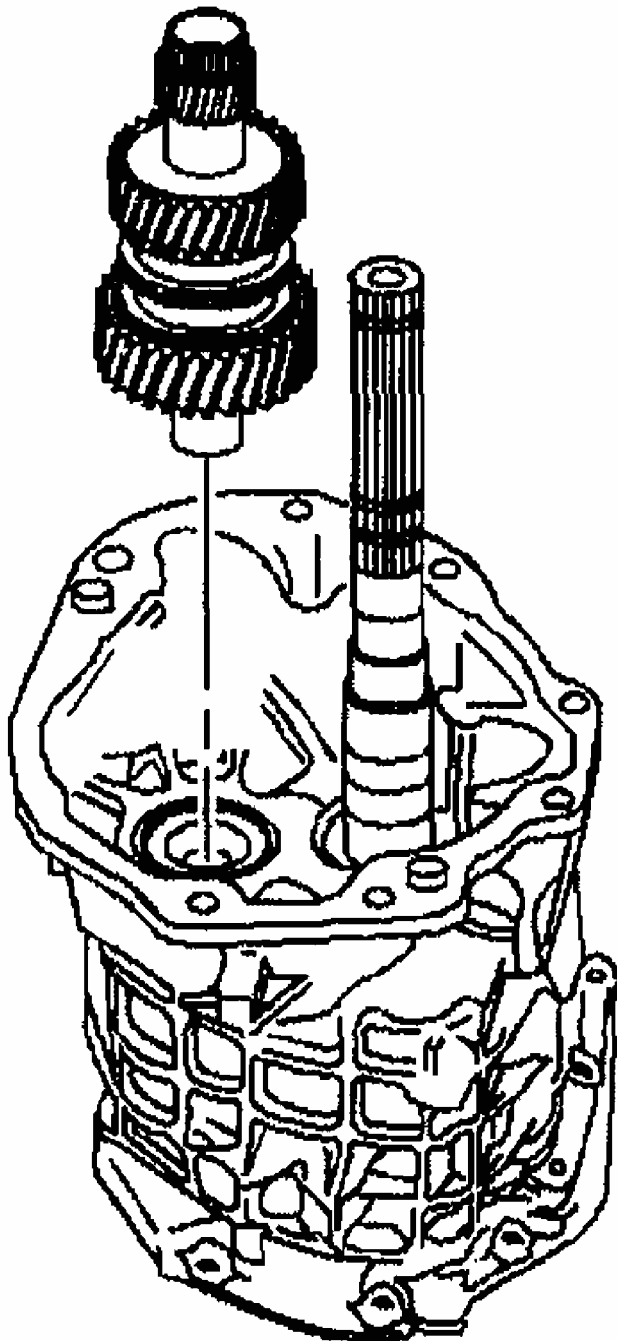
G01366836

Fig. 218: Installing Adapter Plate Plug
Courtesy of GENERAL MOTORS CORP.

Tighten

Tighten the plug to 27 N.m (20 lb ft).

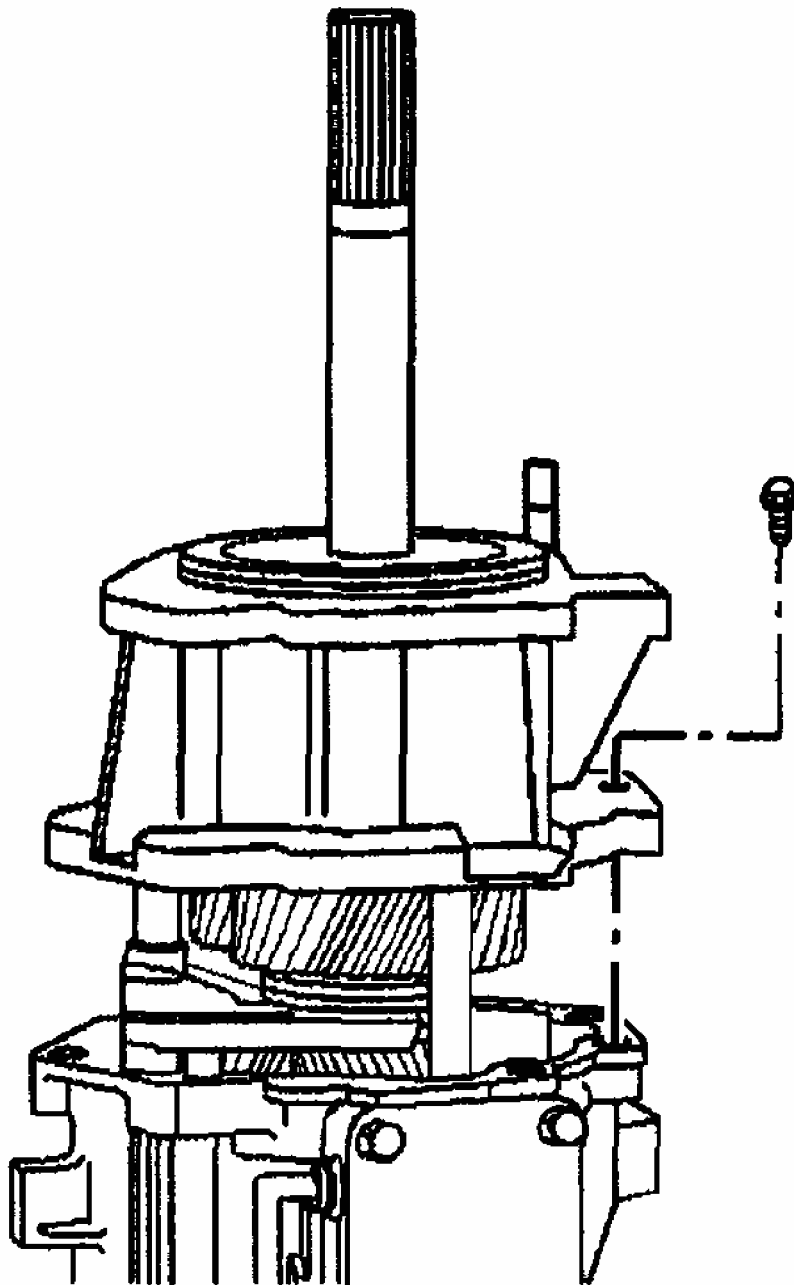
13. Install the countershaft extension.



G01366837

Fig. 219: Installing Countershaft Extension
Courtesy of GENERAL MOTORS CORP.

14. Install the countershaft extension bearing race.
15. Install the extension housing bolts and the extension housing.



G01366838

Fig. 220: Installing Extension Housing Bolts & Extension Housing
Courtesy of GENERAL MOTORS CORP.

DESCRIPTION AND OPERATION

MANUAL TRANSMISSION DESCRIPTION AND OPERATION

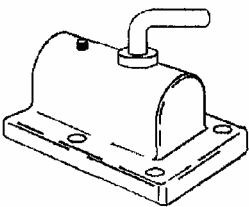
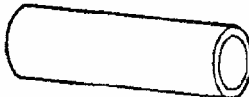
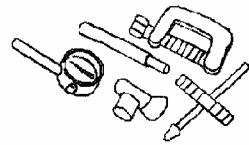

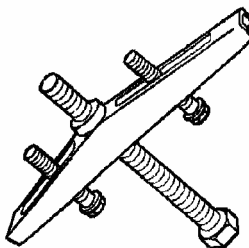
In order to ensure good fuel economy and compliance with federal fuel economy standards, 2nd and 3rd gears are inhibited when shifting out of 1st gear under the following conditions:

- Coolant temperature is above 77°C (161°F).
- Throttle is opened 35 percent or less.
- Vehicle speed is 24-34 km/h (15-21 mph).
- Reset at less than 2 km/h (1 mph).

SPECIAL TOOLS AND EQUIPMENT

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

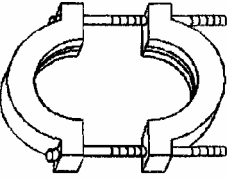
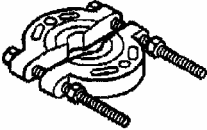
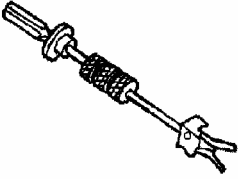
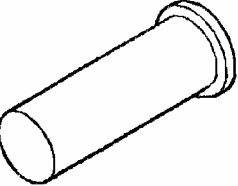
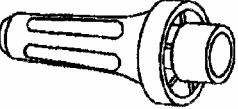
Illustration	Tool Number/ Description
	J 3289-20 Holding Fixture
	J 5590 Press Tube
	J 8001 Dial Indicator Set
	J 8092 Universal Driver Handle
	J 8433 Universal Bridge Puller

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Fig. 221: Special Tools & Equipment (1 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

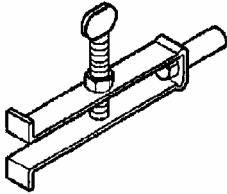
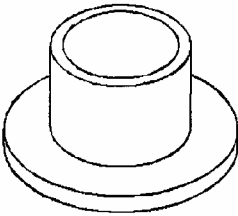
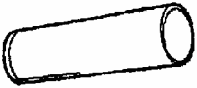
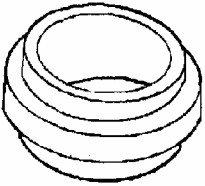
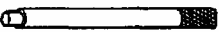
Illustration	Tool Number/ Description
	J 22910-01 Split Plate
	J 22912-01 Split Plate
	J 23907 Slide Hammer
	J 25234 Press Tube
	J 26508 Inner Output Shaft Seal Installer

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Fig. 222: Special Tools & Equipment (2 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

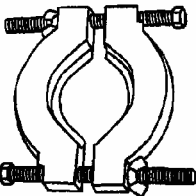
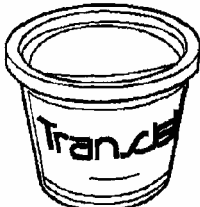
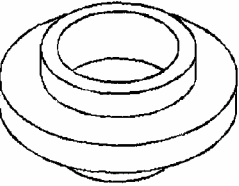
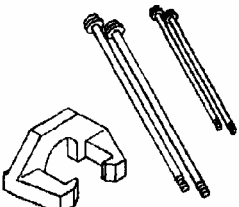
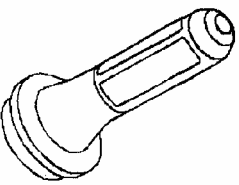
Illustration	Tool Number/ Description
	J 26941 Bearing Race Remover
	J 28537-17 Bearing Race Installer
	J 36183 Press Tube
	J 36184 Press Tube Adapter
	J 36190 Universal Driver Handle

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Fig. 223: Special Tools & Equipment (3 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

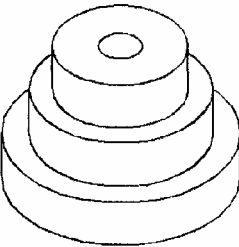
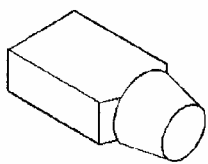
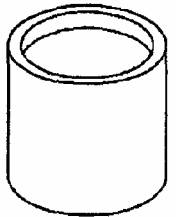
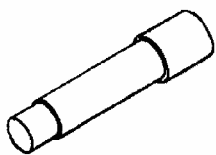
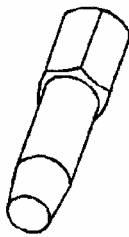
Illustration	Tool Number/ Description
	J 36513 Split Plate
	J 36850 Transjet® Lubricant
	J 39371 1st /2nd Synchronizer Installer
	J 39431-1, -2, -4 Gear Remover and Bolts
	J 39433 Input Shaft Seal Installer

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Fig. 224: Special Tools & Equipment (4 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

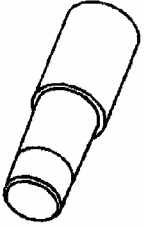
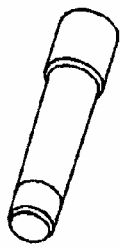
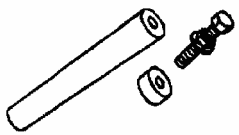

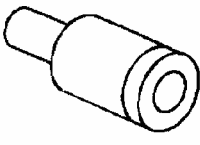
Illustration	Tool Number/ Description
	J 39435 Bearing Race Installer
	J 39437 Bushing Installer
	J 39438 Bearing Installer
	J 39439-1 Shift Rail Bushing Remover/Installer
	J 39439-2 Bushing Remover

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Fig. 225: Special Tools & Equipment (5 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

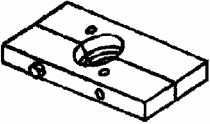
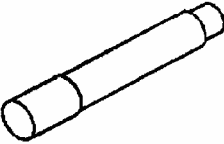
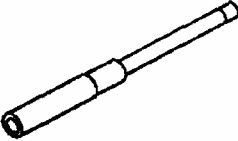
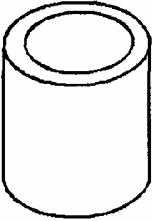
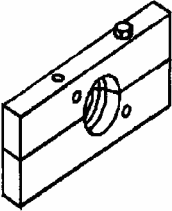
Illustration	Tool Number/ Description
	J 39439-3 Bushings Installer
	J 39439-4 Bushings Installer
	J 39441 5th /6th Driven Gear Installer
	J 39441-10 5th Gear Installer Adapter
	J 39442 Press Adapter

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Fig. 226: Special Tools & Equipment (6 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

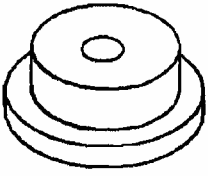
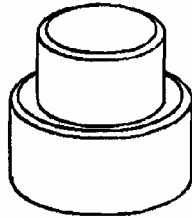
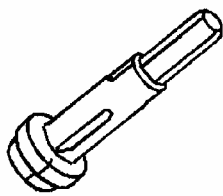
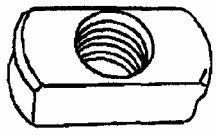
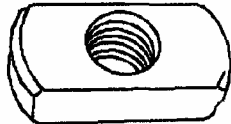
Illustration	Tool Number/ Description
	J 39443 Split Plate
	J 39444-1 Countershaft End Play Rod
	J 39444-2 Countershaft Extension End Play Rod
	J 39473 Mainshaft Bearing Installer/Adapter
	J 39511 Split Plate

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Fig. 227: Special Tools & Equipment (7 Of 10)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

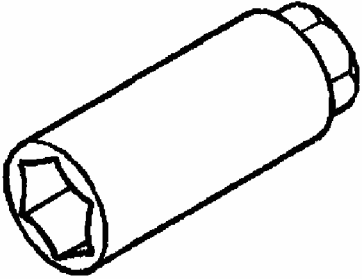
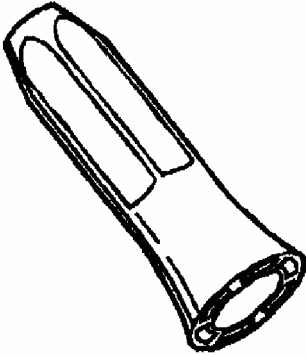
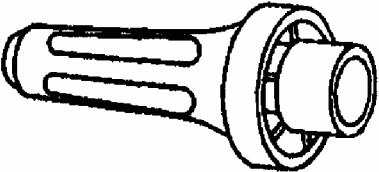
Illustration	Tool Number/ Description
	J 39546 Bearing Race Installer
	J 39547 Press Adapter
	J 39594 Bearing Race Remover
	J 39790 Mainshaft Bearing Race Remover
	J 39791 Countershaft Bearing Race Remover

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Fig. 228: Special Tools & Equipment (8 Of 10)
Courtesy of GENERAL MOTORS CORP.

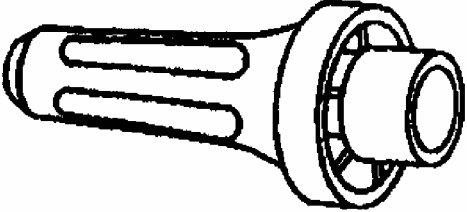
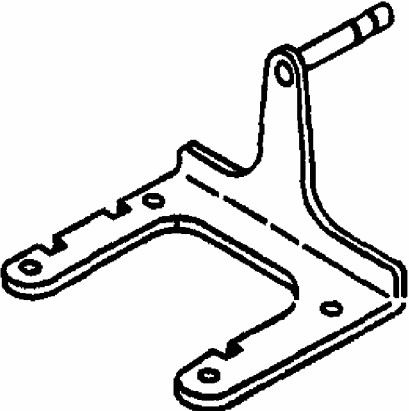
2003 Chevrolet Corvette

2003 TRANSMISSION Manual Transmission - MM6/M12 (Unit Repair) - Corvette

Illustration	Tool Number/ Description
	J 41099 Skip Shift Sensor Remover/Installer
	J 42198 Transmission Rear Seal Installer
	J 42464 Shift Shaft Seal Installer

G01366847

Fig. 229: Special Tools & Equipment (9 Of 10)
Courtesy of GENERAL MOTORS CORP.

Illustration	Tool Number/ Description
	<p data-bbox="858 580 999 619">J 42496</p> <p data-bbox="683 635 1182 674">Inner Shift Rail Seal Installer</p>
	<p data-bbox="858 1103 999 1142">J 44395</p> <p data-bbox="743 1158 1121 1234">Transmission Holding Fixture</p>

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Fig. 230: Special Tools & Equipment (10 Of 10)
Courtesy of GENERAL MOTORS CORP.