

## **IMPORTANT SAFETY NOTICE**

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability. There are numerous variations in procedures, techniques, tools and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

### **NOTES, CAUTIONS, AND WARNINGS**

- As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. NOTES give you added information that will help you to complete a particular procedure. CAUTIONS are given to prevent you from making an error that could damage the vehicle. WARNINGS remind you to be especially careful in those areas where carelessness can cause personal injury. The following list contains some general WARNINGS that you should follow when you work on a vehicle.
- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle with the vehicle jacked up.
- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transmission, set it in PARK unless instructed otherwise for a specific operation. If you have a manual transmission, it should be in REVERSE (engine OFF) or NEUTRAL (engine ON) unless instructed otherwise for a specific operation. Place wood blocks (4" x 4" or larger) to the front and rear surfaces of the tires to provide further restraint from inadvertent vehicle movement.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep yourself and your clothing away from the moving parts, when the engine is running, especially the fan and drive belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on the vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle. Tie long hair securely behind the head.
- Keep hands and other objects clear of the radiator fan blades, Electric cooling fans can start to operate at any time by an increase in underhood temperatures, even though the ignition is in the OFF position. Therefore, care should be taken to ensure that the electric cooling fan is completely disconnected when working under the hood.
- Disconnect the negative battery ground cable before using any electric welding equipment.

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# SECTION 1

## T56 ON-VEHICLE SERVICE AND TROUBLESHOOTING

### 1-1 MAINTENANCE

**1-1-1. GENERAL.** The only periodic maintenance required for the TREMEC T56 Transmission is to maintain proper lubrication.

**1-1-2. LUBRICATION SCHEDULE.** Refer to the Vehicle Owner's Manual or Service Manual.

#### CAUTION

Excessive temperatures may break down the transmission lubricant (refer to vehicle service manual for maximum allowable temperature). If there is reason to believe that the transmission has been subjected to temperatures exceeding 275° F, change the lubricant immediately.

**1-1-3. APPROVED LUBRICANT.** Most T56 transmission models use Dexron® II automatic transmission fluid. Refer to the vehicle owner's manual or service manual for lubricant specifications.

#### CAUTION

Do not mix different brands or types of transmission lubricant. **DO NOT USE GEAR OIL IN THE T56 TRANSMISSION SINCE THIS MAY DAMAGE THE BLOCKING RING MATERIAL.**

**1-1-4. CHECKING LUBRICANT LEVEL.** Proceed as follows:

#### NOTE

To check or drain the lubricant, the transmission should be warm. This is best done shortly after engine shutdown.

- Wipe fill plug (2) and surrounding area clean.
- Remove fill plug (2).
- When transmission is full, lubricant will just drip out fill plug opening.
- Add approved lubricant if required.
- Install fill plug (2) and torque to 20 lb. ft (27 N.m.)

**1-1-5. CHANGING LUBRICANT.** Proceed as follows:

- Wipe drain and fill plugs (1 and 2) and surrounding areas clean
- Place suitable container under transmission
- Remove drain plug (1).
- Remove fill plug (2).
- Allow all lubricant to drain.
- Install drain plug (1) and torque to 20 lb. ft. (27 N.m).
- Add lubricant through fill plug opening until lubricant just begins to drip back out of opening.

#### NOTE

The amount of lubricant required varies from model to model. Refer to the vehicle service manual for transmission capacity.

- Install fill and torque to 20 lb. ft (27 N.m).

### 1-2. TROUBLESHOOTING

**1-2-1. GENERAL.** In the event of operating difficulty, it is recommended that the transmission (engine) be shut down. In most cases, to accurately pinpoint the source of trouble, it may be necessary to remove and disassemble, or partially disassemble, the transmission. Specific inspection procedures for detail parts of the transmission are provided in Section 3.

#### WARNING

##### Towing:

Drive shaft **MUST** be disconnected vehicle is to be towed. Failure to do so **WILL** result in internal transmission damage.

**1-2-2. TROUBLESHOOTING CHART.** Table 1-1 lists troubles which may be encountered along with possible causes and remedies.

**TABLE 1-1. TROUBLESHOOTING CHART**

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>REMEDY</b>
Will not shift (control lever Moves)	Control lever assy broken or damaged  Damaged offset lever, shift plate, or selector arm, loose rail bushings. Broken roll pins in offset levers of selector arm.	Replace control lever and housing assy  Remove extension or adapter and case cover. Check for damaged parts. Replace damaged parts.
Hard shift or control lever will not move into gear	Clutch not releasing  Improper or low transmission lubricant  Shifter rail binding  Binding of sliding synchronizers or gears  If reverse only, seized backup switch  Worn or damaged flywheel pilot bushing  Bell housing misaligned  Skip shift solenoid activated (plunger extended)	Adjust or replace clutch  Add or drain and replace with proper lubricant (refer to paragraph 1-1-3)  Remove extension or adapter and case cover. Check for damaged parts. Replace damaged parts  Remove extension and case to check that synchronizers and gears slide freely on shafts. Remove and replace damaged parts  Remove and check backup switch. Replace if seized  Replace pilot bushing  Align bell housing to within 0.010 inch TIR on face and in bore  Check solenoid function-replace
Gears clash when shifting	Engine idle speed too high  Clutch damaged or out of adjustment  Bent shift forks or worn fork pads  Damaged synchronizer  Pilot bearing between input shaft and output shaft binding  Bell housing misaligned  Damaged gears  Worn or damaged flywheel pilot bushing	Adjust idle speed to specifications  Adjust or replace clutch  Disassemble and check. Replace damaged parts  Disassemble and check for damaged synchronizer parts. Replace damaged parts  Disassemble and check bearing rollers, input shaft ID and output shaft OD. Replace damaged parts  Align bell housing to within 0.010 inch TIR on face and in bore  Disassemble and check for gear damage. Replace damaged gears  Replace pilot bushing
Transmission jumps out of gear	Synchronizer damaged or excessively worn  Blocking ring damaged, worn index slots or friction surfaces worn or damaged  Excessive countershaft end play  Shifting fork loose on shift rail; worn or damaged fork or fork pads	Disassemble and check for worn or damaged synchronizer parts. Replace damaged parts.  Disassemble and check blocking ring for wear or damage. Replace worn or damaged parts  Disassemble and check. Replace worn or damaged parts. Reshim if necessary  Disassemble and check for wear or damage. Replace worn or damaged parts

**TABLE 1-1. TROUBLESHOOTING CHART (CONTINUED)**

PROBLEM	POSIBLE CAUSE	REMEDY
Transmission locked in one gear	<p>Fork or offset lever loose on shift rail</p> <p>Worn or damaged forks, offset lever, shift rail, broken roll pins in offset levers.</p> <p>Worn or damaged synchronizer</p> <p>Worn or damaged gears</p>	<p>Remove extension and case to check for loose parts on shift rail. Replace roll pin(s). If still loose, replace shift rail and/or attached parts as required</p> <p>Remove extension or adapter and case cover. Check for wear or damage. Check reverse fork and 5/6 fork for missing snap ring(s). Replace damaged parts</p> <p>Disassemble and check for worn or damaged synchronizer parts. Replace worn or damaged parts</p> <p>Disassemble and check for worn or damaged gears. Replace worn or damaged gears.</p>
Transmission noise NOTE: Make sure noise is coming from transmission and not clutch release bearing or other components.	<p>Improper or low transmission lubricant</p> <p>Loose bolts or other attaching parts</p> <p>Improper flywheel housing to engine crankshaft alignment</p> <p>Noisy transmission bearings</p> <p>Noisy gears</p>	<p>Add or drain and replace with proper lubricant</p> <p>Make sure all attaching parts are torqued to specifications</p> <p>Check alignment and correct if necessary per vehicle service manual</p> <p>Disassemble and check bearings, bearing rollers and parts in and on which they operate for wear or damage. Replace worn or damaged parts</p> <p>Disassemble and check for worn or damaged gears (including speedometer gear). Replace worn or damaged gears</p>
Transmission leakage	<p>Leakage from other components</p> <p>Vent or breather clogged</p> <p>Too much or improper lubricant</p> <p>Loose bolts at sealing faces</p> <p>Improperly applied sealant</p> <p>Worn or damaged oil seal</p> <p>Shifter base loose</p>	<p>Verify transmission leakage. Thoroughly clean all exposed surfaces, then check for leaks</p> <p>Remove vent tube and clean or replace</p> <p>Remove fill plug to check for excess, or drain and replace</p> <p>Torque bolts to specifications</p> <p>Separate and thoroughly clean leaking surfaces. Reapply sealant. Replace parts and torque bolts to specifications</p> <p>Replace oil seal</p> <p>Replace shifter assembly</p>
High effort shift from 5/6 gate to reverse gate	<p>Reverse lockout assembly or solenoid malfunction.</p>	<p>Check lockout assembly function</p> <p>Check solenoid</p> <p>Replace parts as required</p>
Jump out of gear (Reverse)	<p>Reverse lockout assembly or solenoid malfunction</p> <p>High side effort on 4 to 5 shift overriding reverse lockout assembly allowing high speed shift attempt into reverse gate.</p>	<p>Check lockout assembly function.</p> <p>Disassemble transmission and replace reverse gear/synchronizer assembly damaged parts</p>

## 1-3. TRANSMISSION REMOVAL

**1-3-1. GENERAL.** The following paragraphs provide procedures for removing the T56 transmission.

**1-3-2. OTHER COMPONENTS.** Before or during transmission removal, it may be necessary to remove or disconnect other components. This is required to provide access to or clearance for the transmission (and transfer case, if used). Since these components vary widely from vehicle to vehicle, specific instructions are not provided in this manual. Refer to the vehicle service manual. Such components may include:

- a. Console or similar cover.
- b. Parking brake lever and controls.
- c. Wiring and/or vacuum harness.
- d. Exhaust system components.
- e. Clutch components.
- f. A skid plate or protective covers on the underside of the vehicle.

**1-3-3. SUPPORTING TRANSMISSION.** Before removing any parts which attach or support the transmission, support the transmission on a suitable jack or stand. The jack or stand must be capable of supporting and holding the transmission independently. Also the jack or stand shall be capable of lowering, raising and moving the transmission laterally.

### 1-3-4. PROCEDURES WITH VEHICLE ON FLOOR.

Before raising the vehicle, proceed as follows:

- a. Position vehicle over suitable hoist.

#### WARNING

**When using a drive-on lift, be sure to properly chock the wheels to prevent the vehicle from rolling off.**

- b. Disconnect negative battery terminal.
- c. Shift vehicle into neutral and release parking brake.
- d. Remove shift lever (see figure 1-1):
  1. Detach bottom of boot (1) so that it can be raised to provide access to lower end of shift lever. Boot attachment methods may vary from that shown.
  2. If shift lever is threaded on, loosen lock nut (2), then remove shift lever (4) using wrench on flats (5) provided.
  3. If shift lever is attached with screws (3), then remove screws (3) and shift lever (4).

**1-3-5. LIFTING VEHICLE.** Lift vehicle on suitable hoist, allowing clearance for removal of transmission, and related components such as propeller shaft, cross members and supports. If unsure, refer to vehicle service manual for approved lift points.

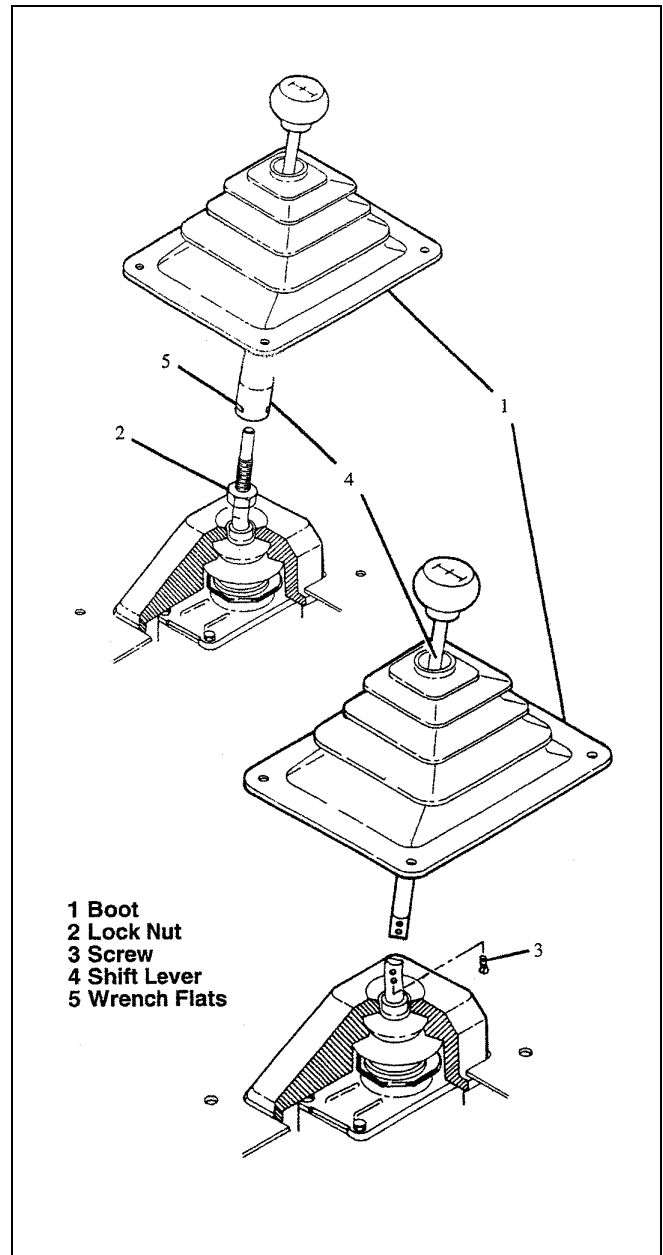


Figure 1-1. Shift Lever

**1-3-6. DRAINING LUBRICANT.** Drain lubricant from transmission. Reinstall fill and drain plugs.

**1-3-7. REMOVING REAR PROPELLER SHAFT.** The rear propeller shaft is splined to the transmission output shaft. It will be necessary to disconnect the rear end of the propeller shaft first, then move the shaft rearward to disengage the splines. Support the propeller shaft to prevent it from dropping. Bend universal joints just enough to permit shaft removal, otherwise damage may result. Refer to the vehicle service manual for specific procedures.

## 1-4. TRANSMISSION INSTALLATION

**14-1. GENERAL.** Install transmission in vehicle from which it was removed as described in the following paragraphs. Note the following:

### CAUTION

**T56 transmissions are not necessarily interchangeable from vehicle to vehicle. Installation of the transmission in a vehicle other than that from which it was removed may result in premature failure.**

- a. The following paragraphs provide procedures for installing the T56 transmission.
- b. Before or during removal of the transmission, parts not specifically related to the transmission may have been removed to provide access or clearance. Be sure to reinstall these components exactly as they were prior to removal (refer to paragraph 1-3-2).
- c. The transmission must be supported on a suitable jack or stand capable of raising the transmission into position, aligning and moving it to engage the drive splines.

**1-4-2. INSTALLING TRANSMISSION.** Proceed as follows:

- a. Apply thin coat of high temperature grease to input shaft spline on transmission.
- b. Shift transmission into high gear and raise on jack or stand. Align transmission with clutch housing.

### CAUTION

**Make sure transmission is in exact alignment with clutch before engaging splines. Do not force transmission input shaft into clutch, otherwise damage may result. If necessary, turn transmission output shaft to align input shaft spline with that in clutch.**

- c. Carefully move transmission forward, engaging splines in clutch, until transmission mounting flange contacts clutch housing.

### CAUTION

**Keep transmission completely supported by jack or stand until bolts attaching transmission to clutch housing (4) are installed and torqued. Do not allow transmission to "hang" from clutch by splined shaft since this may damage input bearings.**

- d. Make sure mounting holes in transmission (10) and clutch housing (4) are aligned and install bolts (11). Torque bolts to 55 lb. Ft. (75 N.m.). Do not remove jack or stand at this time.
- e. Install cross member. Install bolts and lockwashers attaching transmission to transmission mount. Torque bolts to 35 lb. Ft. (50 N.m.).
- f. Remove jack or stand supporting transmission.

- a. Install speed sensor electrical harness or speedometer cable (location may vary).
- b. Install back-up switch electrical connection and any other electrical connectors that were removed.
- c. Install any supplemental supports or braces that were removed during transmission removal.

### WARNING

**Be sure to fill transmission with proper fluid (refer to paragraph 1-1-3), otherwise transmission will be damaged when engine is started. If vehicles is driven, transmission could lock up, causing personal injury.**

**1-4-3. INSTALLING REAR PROPELLER SHAFT.** Proceed as follows:

- a. Make sure rear propeller shaft is properly lubricated.
- b. Apply thin coat of high temperature grease to output shaft spline on transmission.
- c. Carefully insert front end of rear propeller shaft into transmission. Use care not to damage oil seal.
- d. Connect rear end of rear propeller shaft at differential (refer to vehicle service manual for specific instructions).

**1-4-4. FILLING TRANSMISSION WITH LUBRICANT.** Fill transmission with proper lubricant.

**1-4-5. COMPLETION OF INSTALLATION.**

- a. Lower vehicle to floor.
- b. Install shift lever (see figure 1-1).
  1. If shift lever is attached with screws, align screw holes in shift lever (4) and transmission control lever and install screws.
  2. If shift lever is threaded on, screw shift lever (4) onto transmission control lever. Hold in desired position with wrench across flats and tighten nut up against shift lever (4) to 34 lb. Ft. (47 N.m).
  3. Reattach bottom of boot (1).
- a. Connect negative battery terminal.

## SECTION 2

### T56 TRANSMISSION DISASSEMBLY PROCEDURES

#### 2-1. SHIFTER

- a. Put transmission in 3rd/4th neutral position.
- b. Remove four shifter bolts (97).
- c. Remove shifter (96).

##### Inspect

Isolator cup (95) for wear. Replace rear offset lever (93) if wear is excessive or isolator cup (95) is loose.

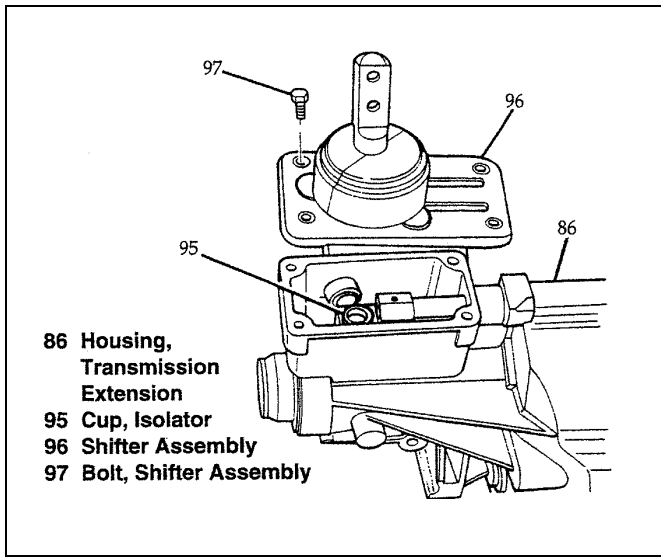


Figure 2-1. Shifter

#### 2-2. EXTENSION HOUSING

##### 2-2-1. REMOVE

- a. Drain plug (101) and drain transmission fluid.
- b. Rear offset lever roll pin (94).

##### Important

If isolator cup (95) is not fully retained in rear offset lever with adhesive, replace rear offset lever assembly(93).

- c. Rear offset lever (93) and isolator cup (95) assembly.
  - d. Extension housing bolts (100).
  - e. Extension housing (86).
- ◆ With transmission in horizontal position, slide extension housing (86) off shift rails (140 and 149).

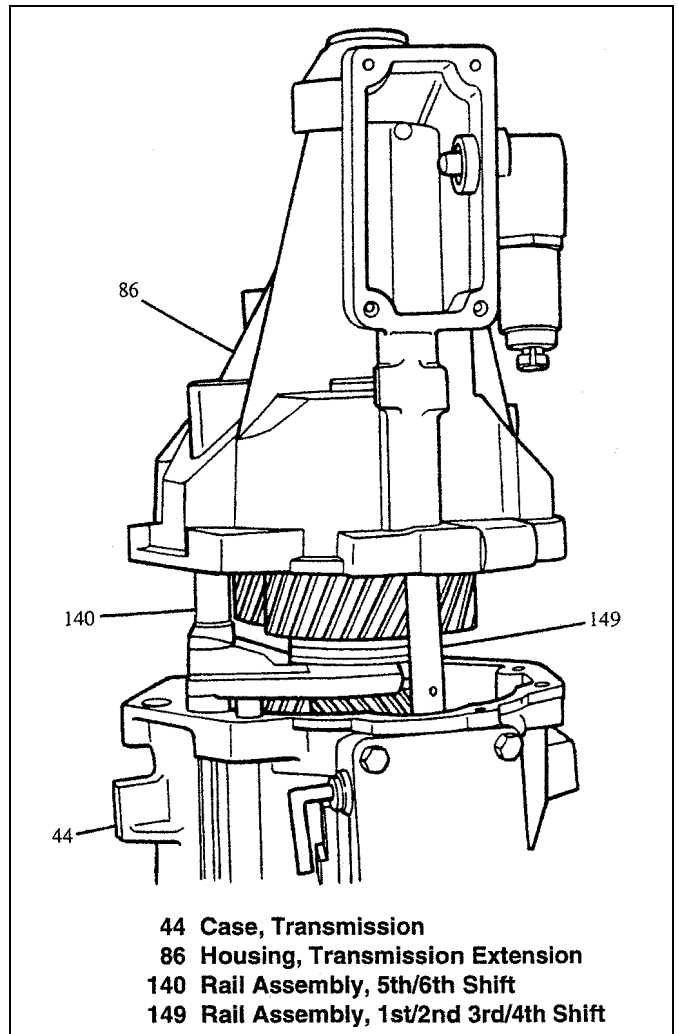


Figure 2-2. Extension Housing



# T56 TRANSMISSION DISASSEMBLED VIEW

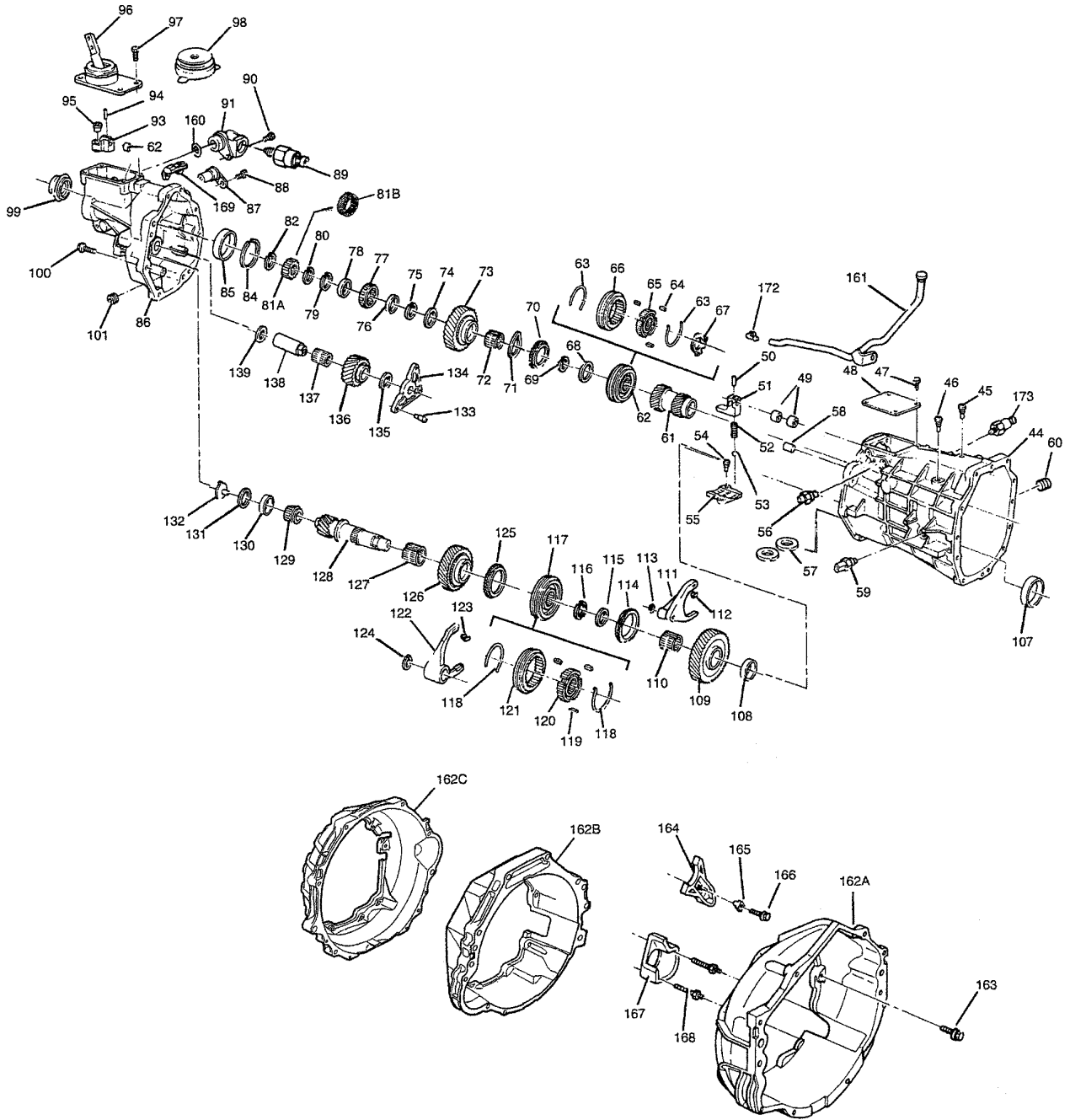
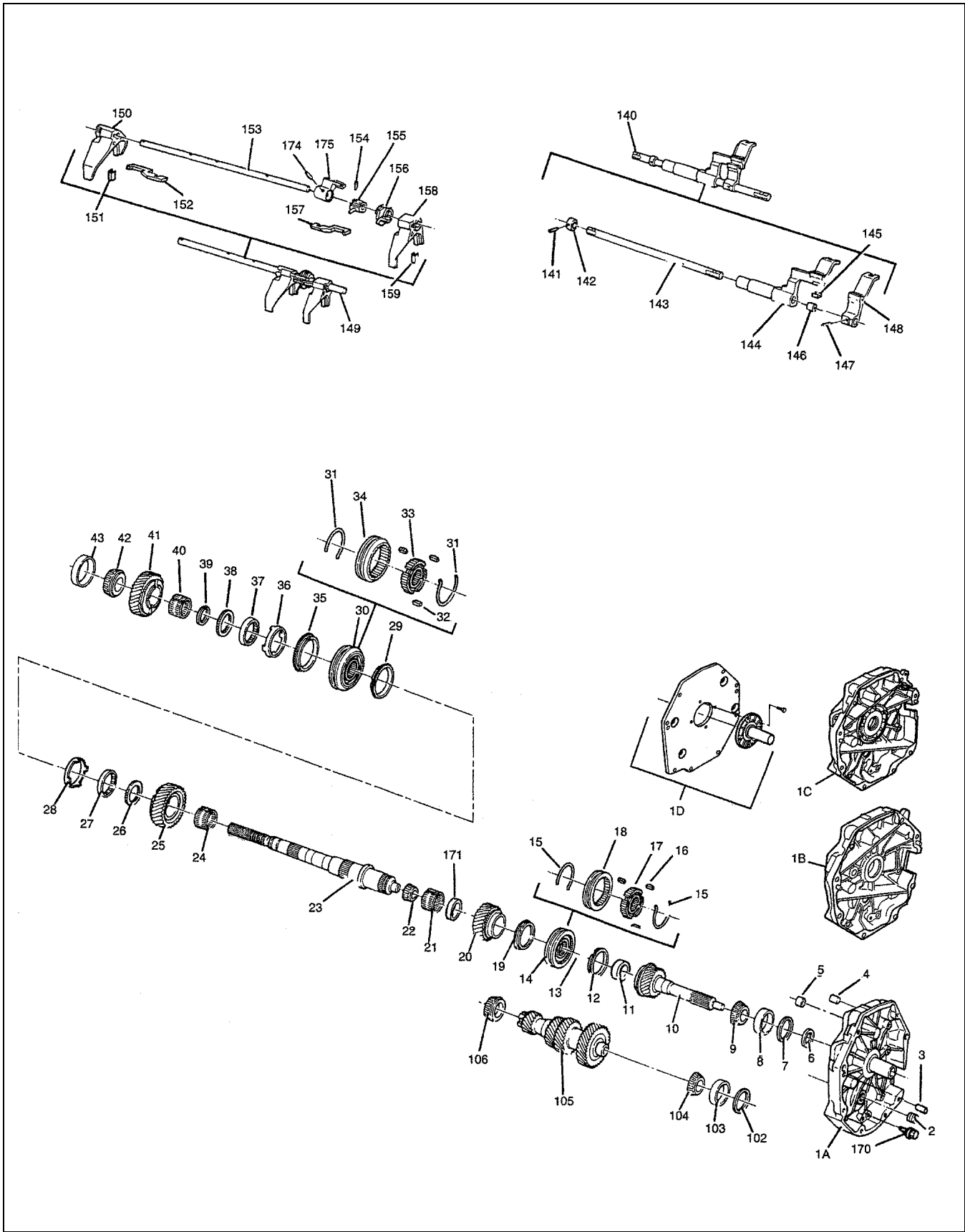


Figure 2-3. T56 Transmission Disassembled View



**LEGEND FOR. T56 SIX-SPEED MANUAL TRANSMISSION, FIGURE 2-3**

1A	Transmission Front Adapter (GM)	58	Pin, Dowel	118	Spring, 5th/6th Synchronizer
1B	Transmission Front Adapter (Ford A/M)	59	Switch, Back-up Lamp	119	Key, 5th/6th Synchronizer
1C	Transmission Front Adapter (Viper)	60	Plug, Fill	120	Hub, 5th/6th Synchronizer
1D	Transmission Adapter Plate Assembly (GM A/M).	61	Gear, 5th/6th Driven	121	Sleeve, 5th/6th Synchronizer
2	Plug	62	Synchronizer Assembly, Reverse	122	Fork, 5th/6th Shift
3	Pin, Dowel	63	Spring, Reverse Synchronizer	123	Pad, 5th/6th Shift Fork
4	Pin, Dowel	64	Key, Reverse Synchronizer	124	Ring, Snap
5	Bushing, Shift Rail	65	Hub, Reverse Synchronizer	125	Ring, 5th Gear Blocker
6	Seal, Input Shaft	66	Sleeve, Reverse Synchronizer	126	Gear, 5th Drive
7	Shim, Input Shaft	67	Retainer, Reverse Synchronizer key	127	Bearing, 5th Gear Needle
8	Race, Input Shaft Bearing	68	Washer, Thrust	128	Extension, Countershaft
9	Bearing, Input Shaft Tapered	69	Ring, Snap	129	Bearing, Countershaft Extension
10	Shaft, Input	70	Ring, Reverse Gear Blocker	130	Tapered Race, Countershaft Extension Bearing
11	Race, Input Shaft Bearing	71	Washer, Wave	131	Shim, Countershaft Extension
12	Ring, 4th Gear Blocker	72	Bearing, Reverse Gear Needle	132	Funnel, Oil
13	Ring, snap	73	Gear, Reverse	133	Bolt, Reverse Idler Shaft Bracket
14	Synchronizer Assembly, 3rd/4th	74	Washer, Thrust	134	Bracket, Reverse Idler Shaft
15	Spring, 3rd/4th synchronizer	75	Ring, snap	135	Washer, Reverse Idler Gear Thrust
16	Key, , 3rd/4th Synchronizer	76	Spacer	136	Gear, Reverse Idler
17	Hub, , 3rd/4th Synchronizer	77	Bearing, Rear Mainshaft	137	Bearing, Reverse Idler Gear Roller
18	Sleeve, , 3rd/4th Synchronizer	78	Spacer	138	Shaft, Reverse Idler Gear
19	Ring, 3rd Gear Blocker	79	Ring, Snap	139	Washer, Reverse Idler Gear Thrust
20	Gear, 3rd Speed	80	Ring, snap	140	Rail Assembly, 5th/6th Shift Rail
21	Bearing, 3rd Gear Needle	81	Rotor, Speedo	141	Pin, Roll
22	Bearing, Mainshaft Small Tapered	82	Gear, Speedo	142	Collar
23	Mainshaft	83	Ring, Snap	143	Rail, Shift
24	Bearing, 2nd Gear Needle	84	Ring, Snap	144	Lever 5th/6th Shift Rail
25	Gear, 2nd Speed	85	Race, Mainshaft Bearing	145	Pad, 5th/6th Shift Rail Lever
26	Washer, Thrust	86	Housing, Transmission Extension	146	Bushing, 5th/6th Shift Rail Lever
27	Cone, Inner	87	Sensor, Electronic Speed	147	Pin, Roll
28	Cone, Friction	88	Bolt, Speed Sensor	148	Lever, Reverse Shift Rail
29	Ring, 2nd Gear Blocker	89	Solenoid, Reverse Lockout	149	Rail Assembly, 1st/2nd 3rd/4th Shift
30	Synchronizer Assembly, 1st/2nd	90	Bolt, Reverse Lockout Assembly	150	Fork, 1st/2nd Shift
31	Spring, 1st/2nd Synchronizer	91	Reverse Lockout Assembly	151	Pad, 1st/2nd Shift Fork
32	Key, 1st/2nd Synchronizer	92	Bushing, Shift Rail	152	Link, Shift
33	Hub, 1st/2nd Synchronizer	93	Lever, Rear Offset	153	Rail, Shift
34	Sleeve, 1st/2nd Synchronizer	94	Pin, Rear Offset Lever Roll	154	Pin, Roll
35	Ring, 1st Gear Blocker	95	Cup, Isolator	155	Shift Selector Assembly
36	Cone, Friction	96	Shifter Assembly	156	Plate, Interlock
37	Cone, Inner	97	Bolt, Shifter Assembly	157	Link, Shift
38	Washer, Thrust	98	Boot, Shifter	158	Fork, 3rd/4th Shift
39	Ring, Snap	99	Seal and Boot, Rear Output	159	Pad, 3rd/4th Shift Fork
40	Bearing, 1st Gear Needle	100	Bolt, Transmission Extension Housing	160	O-Ring, Reverse Lockout Assembly
41	Gear, 1st Speed	101	Plug, Drain	161	Tube, Vent
42	Bearing, Mainshaft Large Tapered	102	Shim, Countershaft	162A	Housing, Clutch Adapter (GM)
43	Race, Mainshaft Bearing	103	Race, Countershaft Bearing	162B	Housing, Clutch Housing (ford A/M)
44	Case, Transmission	104	Bearing Countershaft Tapered	16C	Housing, Clutch Housing (Viper)
45	Bolt, Shift Lever Guide	105	Countershaft	163	Bolt, Clutch Adapter Housing
46	Bolt, Shift Lever Guide	106	Bearing, Countershaft Tapered	164	Fork, Clutch
47	Bolt, Shift Detent Cover	107	Race, Countershaft Bearing	165	T-Handle, Clutch Fork Pivot
48	Cover, Shift Detent	108	Washer, Thrust	166	Bolt, Clutch Fork Pivot
49	Bushing, Shift Rail	109	Gear, 6th Drive	167	Housing, Clutch Actuator Adapter
50	Pin, Front Offset Lever Roll	110	Bearing, 6th Gear Needle	168	Bolt, Clutch Actuator Adapter Housing
51	Lever, Front Offset	111	Fork, Reverse Shift	169	Bumper, Transmission
52	Spring, Shift Detent	112	Pad, Reverse Shift Fork	170	Bolt, Transmission Adapter Plate
53	Ball, Shift Detent	113	Ring, Snap	171	Spacer
54	Bolt, Shift Guideplate	114	Ring, 6th Gear Blocker	172	Fitting, Vent Tube
55	Plate, Shift Guide	115	Spacer	173	Solenoid, Skip Shift
56	Detent Assembly, Shift	116	Ring, Snap	174	Pin, Roll
57	Magnet	117	Synchronizer Assembly, 5th/6th	175	Lever, Skip Shift

## 2-3. SPEEDOMETER GEAR/ROTOR

### 2-3-1. REMOVE OR DISCONNECT

- a. Sealing ring.
- b. Speedometer gear snap ring (82).
- c. Speedometer gear (81B) or rotor (81A).
- d. Use gear puller to remove steel speed sensor rotor (81A).
  - ◆ For models with plastic speedometer gear (81B) the gear will slide off freely.
- a. Speedometer gear snap ring (80).

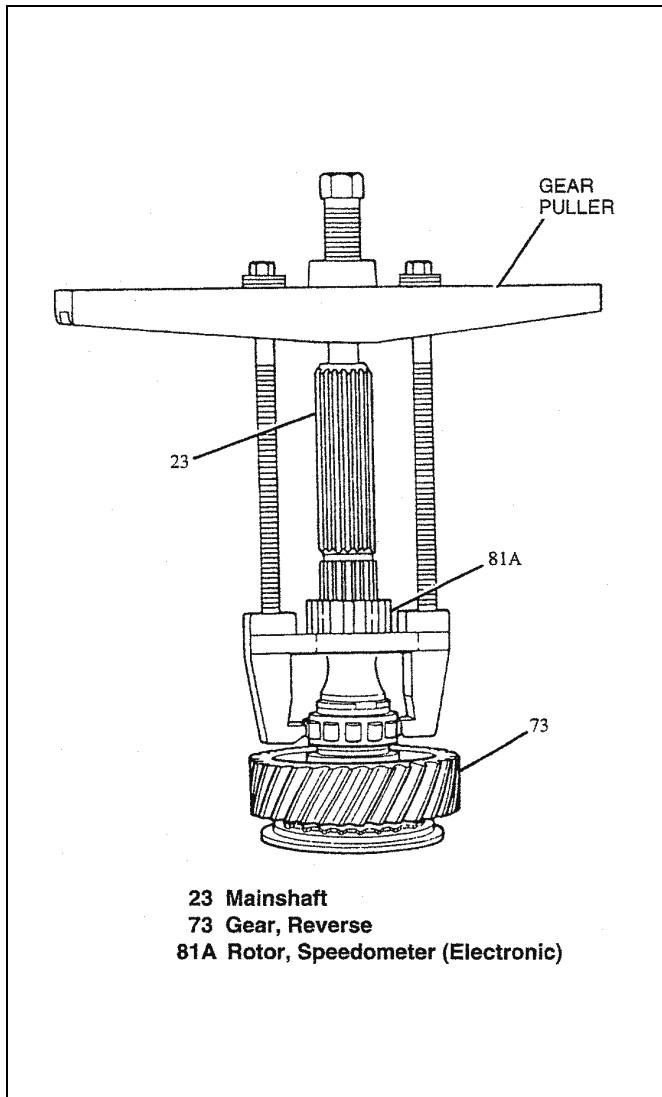


Figure 2-4. Speedometer Gear

## 2-4. REVERSE SPEED GEAR

### 2-4-1. REMOVE OR DISCONNECT

- a. Roller bearing snap ring (79).
- b. Spacer (78).
- c. Roller bearing (77).
- d. Spacer (76).
- e. Snap ring (75).
- f. Thrust washer (74).
- g. Reverse speed gear (73).
- h. Caged needle bearing (72).
- i. Wave washer (71).
- j. Blocker ring (70).

Under normal use the reverse synchronizer is forced against the snap ring (75) making removal difficult. Lightly tap reverse synchronizer hub forward to relieve pressure on snap ring and remove.

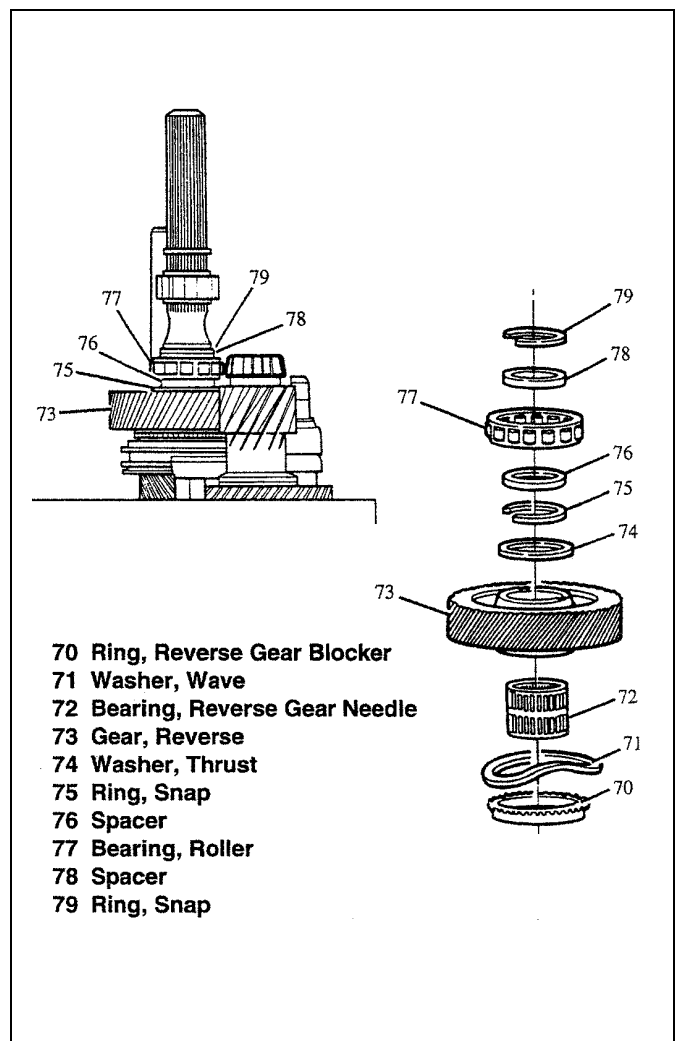


Figure 2-5. Reverse Speed Gear

## 2-5. REVERSE SHIFT FORK

### 2-5-1. REMOVE OR DISCONNECT

- a. Reverse synchronizer snap ring (69).
- b. Reverse shift fork snap ring (113) and discard

#### IMPORTANT

This reverse shift fork snap ring (113) must be replaced whenever it is removed. When replacing snap ring, the flat side of snap ring must face forward toward reverse fork.

- c. Reverse shift fork (111), synchronizer (62) and thrust washer (68) at the same time.

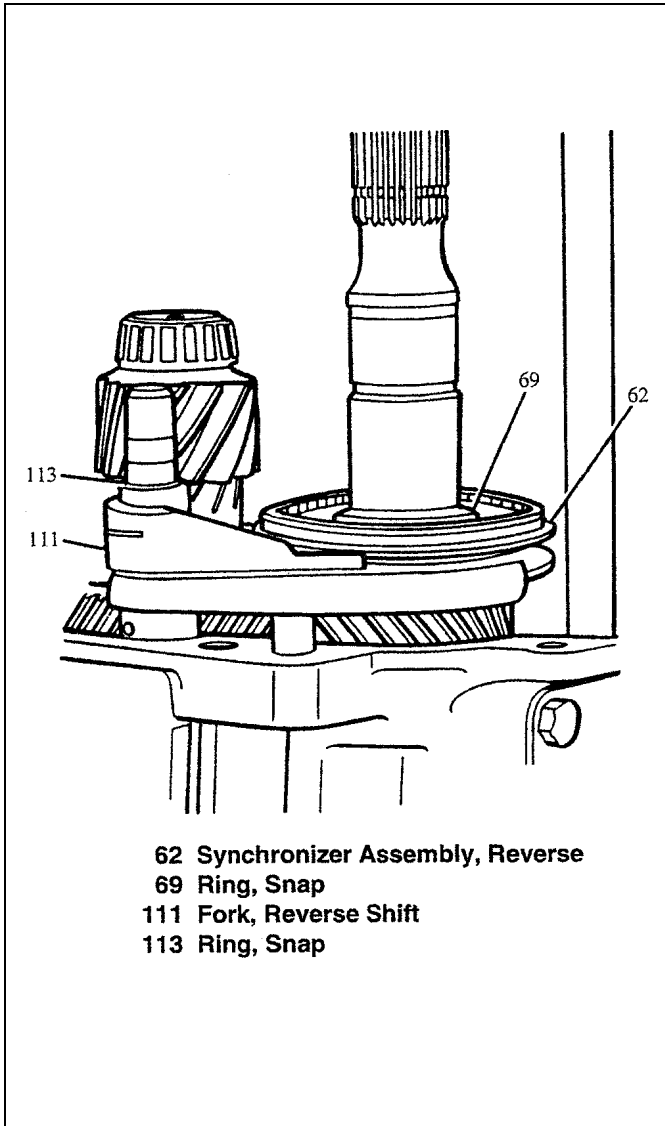


Figure 2-6. Reverse Shift Fork

## 2-6. 5TH/6TH DRIVEN GEAR

### 2-6-1. REMOVE OR DISCONNECT

- ◆ 5th/6th driven gear (61).

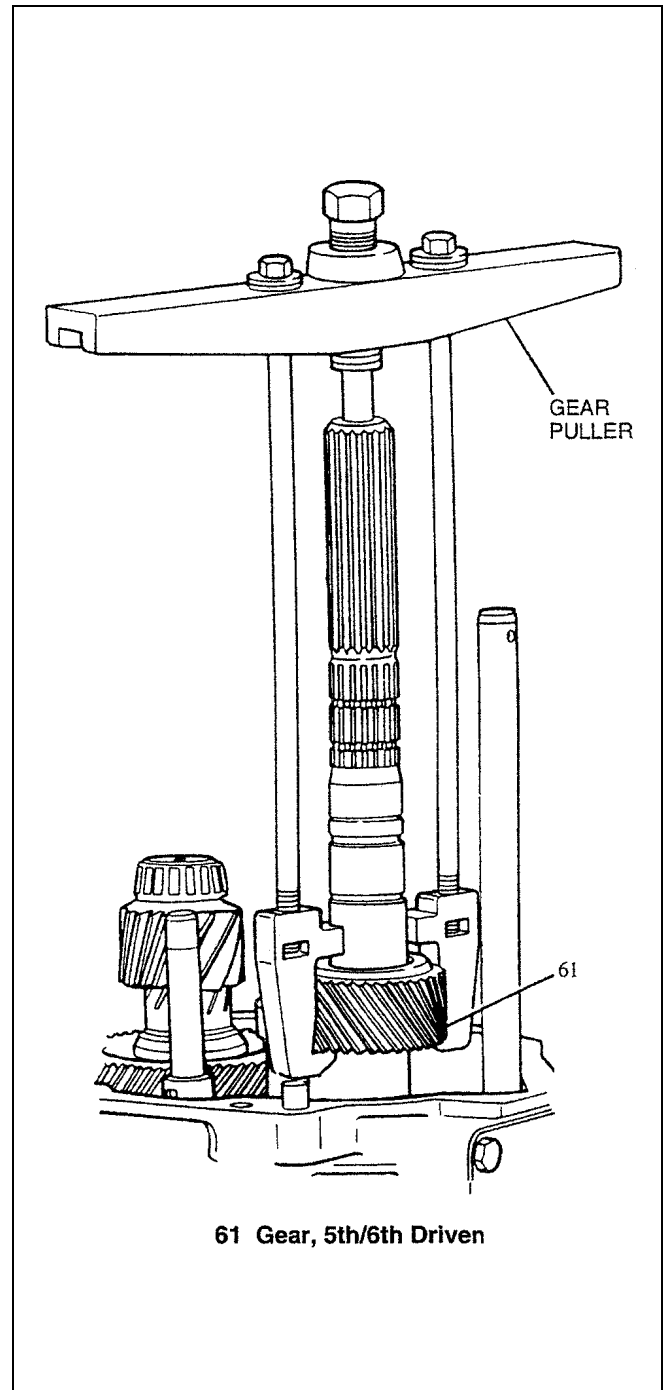


Figure 2-7. 5th/6th Driven Gear

## 2.7. COUNTERSHAFT EXTENSION ASSEMBLY

### 2-7-1. REMOVE OR DISCONNECT

- a. 5th/6th shift fork snap ring (124).
- b. Countershaft extension assembly with 5th/6th shift fork (122).

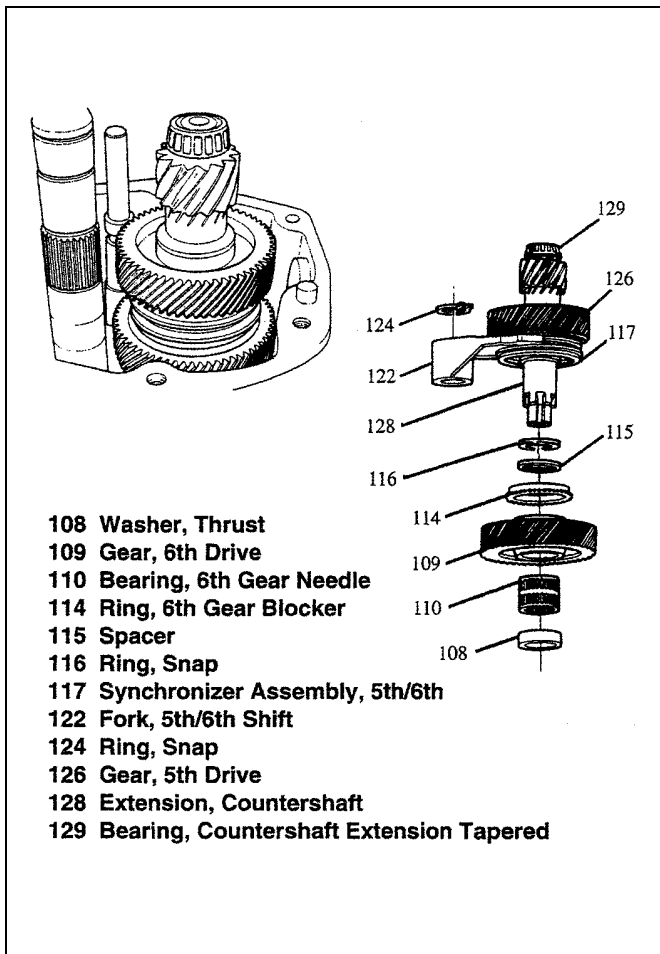


Figure 2-8. Countershaft Extension Assembly

## 2-8. TRANSMISSION CASE

### 2-8-1. REMOVE OR DISCONNECT

- a. Cover Plate bolts (47).
- b. Cover plate (48).
- c. Roll pin (182).
  1. Skip shift lever rollpin (182).
  2. Skip shift lever (183).
- a. Front offset lever rollpin (50). Drive down until it is loose.
- b. 8 of the 10 adapter plate to transmission case bolts (178).
- c. Rotate transmission into vertical position.
- d. Last 2 adapter plate to transmission case bolts (178).
- e. Shift lever guide bolts (45 and 46).
- f. Magnets (57).
- g. Transmission case (44) and front offset lever (51).
  1. Slide transmission case (44) up off of gear clusters and shift rail components.
  2. Hold offset lever (51) against guideplate (55) to prevent release of detent ball (53) and spring (52).

#### IMPORTANT

Separate offset lever rollpin from offset lever to prevent reassembly with rollpin inside offset lever.

1. Note that the loose detent ball (53) and spring (52) will come out.

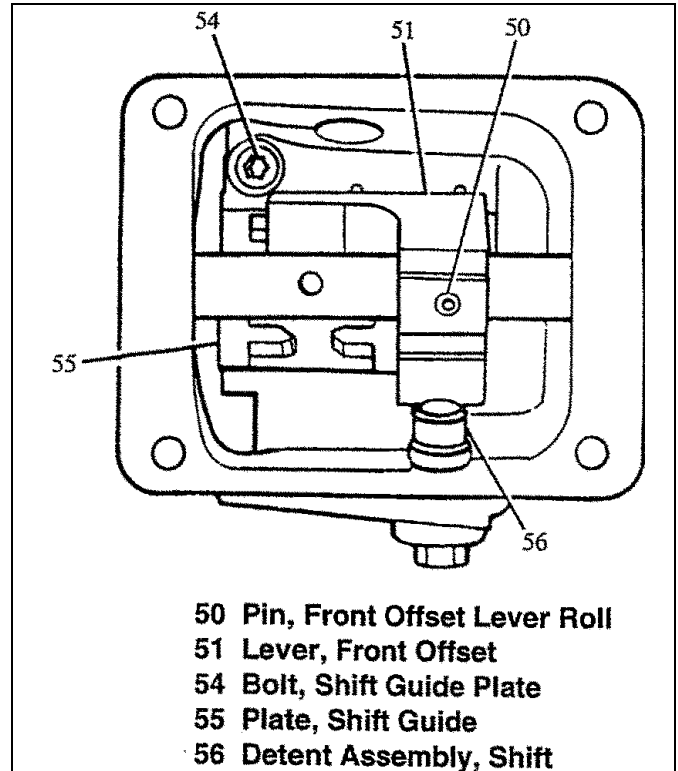


Figure 2-9. Shift Detent Assembly.

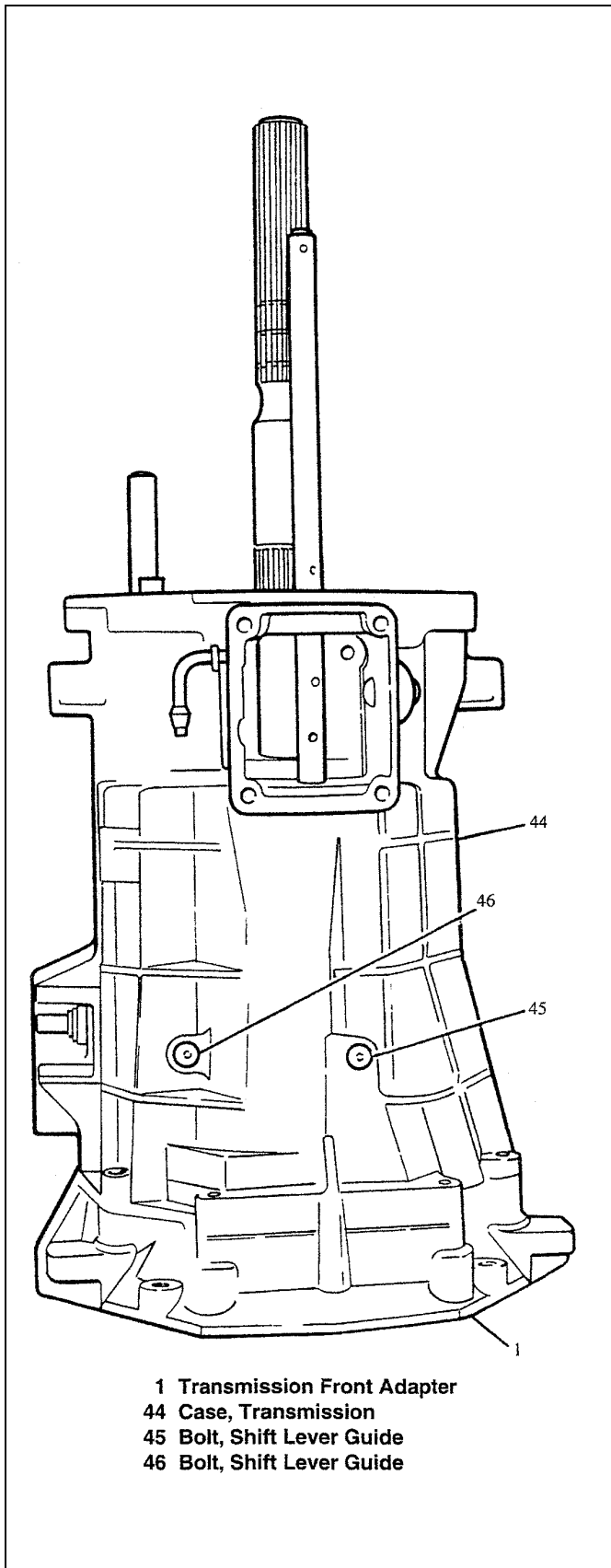


Figure 2-10. Transmission Case

## 2-8-2. CLEAN

- ◆ Case (44) and magnets (57) with solvent and dry with compressed air.

## 2-9. GUIDE PLATE

**2-9-1. REMOVE OR DISCONNECT.** Do NOT remove unless it is necessary to replace guideplate due to excessive wear or other damage.

- a. Shift guide plate bolts (54).
- b. Guide plate (55).

## 2-10. SHIFT RAIL ASSEMBLIES AND GEAR CLUSTERS

### 2-10-1. REMOVE OR DISCONNECT

- a. Rotate 5th/6th and reverse shift rail levers (140) off shift interlock plate (156).
- b. 5th/6th and reverse shift rail assembly (140).
- c. Countershaft (105).

- ◆ Lift up mainshaft (23) enough to remove countershaft (105).

- a. Mainshaft (23) and 1st/2nd 3rd/4th shift rail assembly (149).

- ◆ Remove components as an assembly.

- a. 1st/2nd 3rd/4th shift rail assembly (149) from mainshaft (23).
- b. 4th gear blocker ring (12).
- c. Input shaft (10).

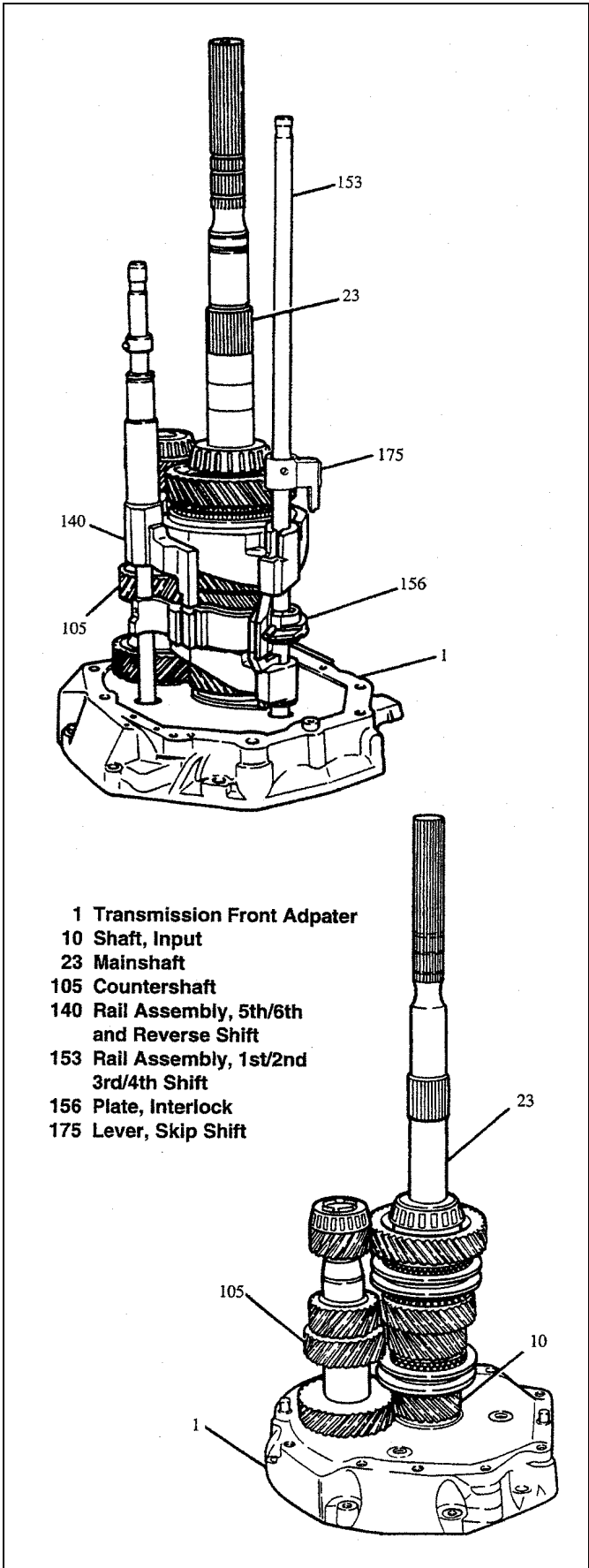


Figure 2-11. Shift Rail Assembly and Gear Clusters



# SECTION 3

## T56 SUBASSEMBLY CLEANING, INSPECTION, REPAIR OR REPLACEMENT

### 3-1. CLEANING

#### NOTE

Prior to cleaning transmission case, check magnets in case bottom for presence of metal particles. Larger, granular or irregular shaped particles indicate chipping or similar damage. Smaller, powder-like particles indicate uneven or excessive wear. If metal particles are detected, be on the lookout for damage or wear when inspecting rotating parts and those with which they mate.

**3-1-1. GENERAL CLEANING PROCEDURE.** Carefully scrape parts to remove old sealant using care not to damage metal surfaces. Wash parts in cleaning solvent to remove old lubricant and dirt deposits. Use a bristle brush to remove caked-on deposits. Parts that cannot be cleaned by brushing may be scraped but use care no to damage metal surfaces.

**3-1-2. DRYING CLEANED PARTS.** Dry parts with low pressure (20 psi max) compressed air. Wiping parts dry could leave lint deposits. Hold bearings to prevent them from spinning when drying.

**3-1-3. LUBRICATING BEARINGS.** Immediately after cleaning, lubricate anti-friction bearings listed below with transmission lubricant (refer to paragraph 1-1-3). Rotating or spinning dry, unlubricated bearings could result in damage. Cover lubricated bearings to protect from dust.

### 3-2. INSPECTION

**3-2-1. GENERAL INSPECTION PROCEDURES.** Visually inspect all parts except o-rings and oil seals, which should be replaced with new parts, or parts in kit if service kit is used. Inspect for damage or excessive or uneven wear. Reject parts with damage or wear that would affect serviceability of the part. Table 3-1 describes what parts need to be inspected, what to check for on each part, and the repair/replace criteria. Inspection terms used in this section are as follows:

**Burr:** Local rise of material forming protruding sharp edge.

**Chip:** An area from which a small fragment has been broken off or cut.

**Crack:** Surface break of line nature indicating partial or complete separation of material.

**Excessive wear:** Heavy or obvious wear beyond expectations considering conditions of operation.

**Indentation:** Displacement of material caused by localized heavy contact.

**Galling:** Breakdown (or build-up) of metal surface due to excessive friction between parts. Particles of the softer material are torn loose and welded to the harder material.

**Nick:** Local break or notch. Usually displacement of material rather than loss.

**Scoring:** Tear or break in metal surface from contact under pressure. May show discoloration from heat produced by friction.

**Step wear:** Heavy wear that produces a step that can be seen or felt between adjacent contact and non-contact surfaces.

**Uneven wear:** Condition of localized, unevenly distributed wear. Includes hollows, shiny spots, uneven polish and other visual indications.

**3-2-2. GEAR OR CLUTCH TEETH INSPECTION.** When specified, inspect gear or clutch teeth as follows:

#### NOTE

Do not confuse contact patterns with normal tool marks that are a result of manufacture. Typical tool marks are shown in figure 3-1.

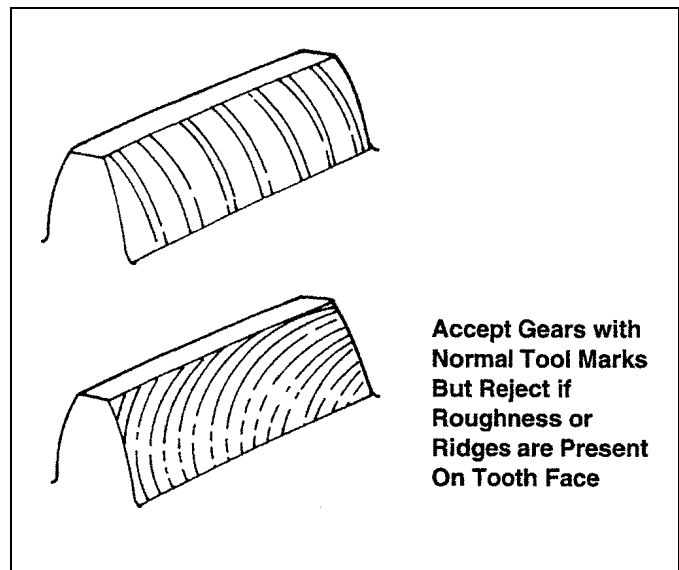


Figure 3-1. Normal Gear Tooth Tool Marks

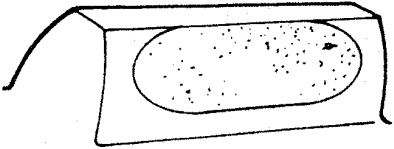
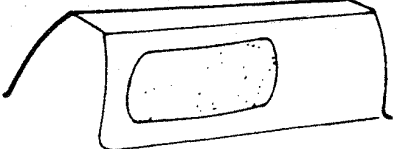
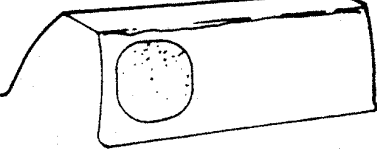
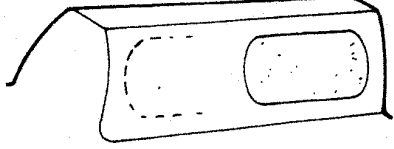
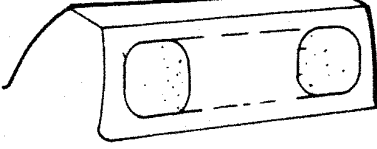

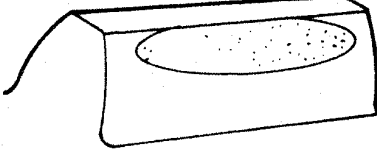
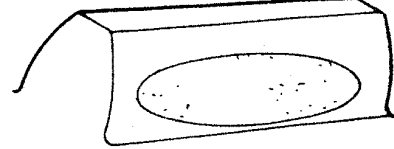

DESCRIPTION	ACCEPT	REJECT
Desired Contact Pattern		
End Contact Pattern		
Traveling Contact Pattern (Moves From Side to Side)		
High Contact Pattern		
Low Contact Pattern		

Figure 3-2. Gear Tooth Contact Patterns

- a. Check gear tooth contact patterns. Contact patterns likely to be encountered are shown in figure 3-2. Parts with contact patterns shown in the ACCEPT column are OK for further service provided they meet all other inspection requirements. Parts with contact patterns shown in the REJECT column are unacceptable and must be rejected –no repairs are authorized.
- a. Check clutch teeth. Inspect clutch teeth for rounding as shown in figure 3-3. Face rounding will cause the clutch to jump out. Reject such parts. Clutch teeth with rounding on the end are usable but will cause hard shifting. In general, clutch teeth with chips may be blend-repaired in the same manner as gear teeth (figure 3-4) except as shown on figure 3-3.
- b. Check gear teeth for chips. Compare tooth chips or nicks with those shown in figure 3-4. Parts with small chips as shown in the REPAIR column may be blend-repaired (refer to paragraph 3-3-1) and reused. Chips or broken teeth as shown in the REJECT column are not repairable and the part must be rejected.

**3-2-3. SPLINE TEETH INSPECTION.** Check for broken or chipped spline teeth (see figure 3-4 and refer to paragraph 3-3-1). Small chips may be blend-repaired in the same manner as gear teeth. If any spline tooth is broken, the part must be rejected. Spline teeth will not show contact patterns as gear teeth do. However, they may show evidence of step wear which is cause for rejection.

**TABLE 3-1. PARTS INSPECTION**

<b>PART</b>	<b>INSPECTION</b>	<b>ACCEPT/REJECT</b>
All parts (including all Spring)	Check for cracks	Replace parts with cracks
	Check for distortion	Replace parts that are bent, distorted or out of round
All threaded parts	Check for stripped, crossed or otherwise damaged threads	Replace parts with threads that cannot be cleaned up using a suitable tap or die
Transmission ease, front adapter, extension	Check mating faces for burrs or other damage that would prevent proper seating of mating faces	Remove small burrs per paragraph 3-3-2. Otherwise replace damaged parts
Control lever and housing assy	Check for smooth operation without excessive end or side play	Replace assy if control lever binds or operates with excessive play in housing
Control lever and housing assy and rear offset lever with isolator cup	Check mating operating surfaces for scoring or excessive wear. Check isolator cup for looseness	Replace parts/assemblies that are excessively worn or damaged or if isolator cup is loose
Extension, Bushing assy	Check bushing ID for scoring or other damage	Replace assy if bushing is damaged
Guide plate	Check detent guide plate (18) for scoring, excessively worn grooves or other damage	Replace assy if detent guide plate damaged or excessively worn
Ball	Check for grooves or flat spots	Replace damaged ball
Shift rail assy	Check for distortion	Replace bent parts
	Check for grooves, burrs or other damage	Remove small burrs per paragraph 3-3-2. Otherwise replace damaged parts
	Check OD for wear	Replace if step wear found
Shift forks	Check for scored or worn bore for rail	Replace damaged forks
	Chipped or broken tabs for inserts	Replace damaged forks
Inserts	Check for wear	Replace if step wear or grooves found
Selector arm assy interlock and selector plates	Check for wear or scoring	Replace if scoring, worn edges or step wear found
Synchronizer sleeves and hubs	Engage sleeve with mating hub, aligning index marks. Check that parts slide freely but without rotational play	Replace complete synchronizer assembly if there is binding or rotational play
	Check clutch teeth per paragraph 3-2-2	Paragraph 3-2-2
Synchronizer sleeves	Check for grooves for wear or damage	Replace complete synchronizer assembly if step wear or scoring found
Synchronizer hubs	Check splines per paragraph 3-2-3	Paragraph 3-2-3
	Check insert grooves for burrs, step wear or damage	Remove small burrs per paragraph 3-3-2. Replace complete synchronizer assembly if step wear or damage found
Blocking rings	Check clutch teeth per paragraph 3-2-2	Paragraph 3-2-2
	Check index slots for wear or damage	Replace if index slots show step wear or damage

**TABLE 3-1. PARTS INSPECTION (CONTINUED)**

<b>PART</b>	<b>INSPECTION</b>	<b>ACCEPT/REJECT</b>
Blocking rings and cones	Check friction surfaces for excessive wear, scoring or other damage	Replace worn or damaged parts
Gears	Check gear teeth per paragraph 3-2-2  Check bearing bores	Paragraph 3-2-2  Replace if scored or excessively worn
Bearing cups and cones	Check cups, rollers and races for chipping, galling scoring or other damage  Make sure bearing cone is lubricated. Slowly rotate rollers, feeling for binding, roughness or flat spots. Rollers must rotate smoothly without side or end play	Replace damaged bearing cups or cones  Replace bearing cones with loose or damaged rollers
Shafts	Check for distortion  Check bearing journals  Check splines per paragraph 3-2-3	Replace shafts that are bent or out of round  Replace if scored or damaged  Paragraph 3-2-3
Needle bearings and rollers	Check rollers and races for chipping, galling, scoring or other damage	Replace damaged bearings and rollers
Thrust washers	Check for scoring or excessive wear	Replace parts that show step wear, are scored or otherwise damaged
Countershaft, countershaft Extension	Check for distortion  Check bearing journals  Check splines per paragraph 3-2-3	Replace if bent or out of round  Replace if scored or damaged  Paragraph 3-2-3
Transmission case	Check bearing bores	Replace case if bearing bores scored or damaged
Reverse lockout Assy	Check for locked and crash through operation. Check solenoid function for operation	Replace if sticking or not operating
Skip shift solenoid	Check for operation	Replace if sticking or not operating

**3-3. REPAIR OR REPLACEMENT**

Parts which are rejected at inspection shall be replaced unless repair procedures specified in the following paragraphs, or other obvious minor repair, will restore the part to complete serviceability.

**3-3-1. GEAR AND CLUTCH TOOTH REPAIR.**

Repair shall be limited to blend-repair of chips within the limits shown in figures 3-3 and 3-4.

- a. Blend-repair chips using a suitable hand-held, high speed grinding tool.
- b. Blend chip into surrounding base metal, but do not remove any more metal than necessary.
- c. Blend all sharp edges into smooth contour. Sharp edges may chip again or develop cracks.

**3-3-2. REMOVING SMALL BURRS.** Use a suitable abrasive stone to remove burrs. Be careful to remove only raised material, not base metal.

**3-3-3. PARTS REPLACEMENT.** Replace rejected parts that are not repairable. If there is any doubt about the serviceability of a part, replace it.

**3-3-4. SERVICE KIT.** A service kit, containing bearings, snap rings, oil seals and other small parts that normally require replacement, may be available. Refer to the Tremec T56 Transmission Parts Catalog for availability and part number.

**3-3-5. SYNCHRONIZER ASSEMBLIES.** The following parts are matched sets, selected at manufacture. If either part of the matched set must be replaced, replace the complete synchronizer assembly.

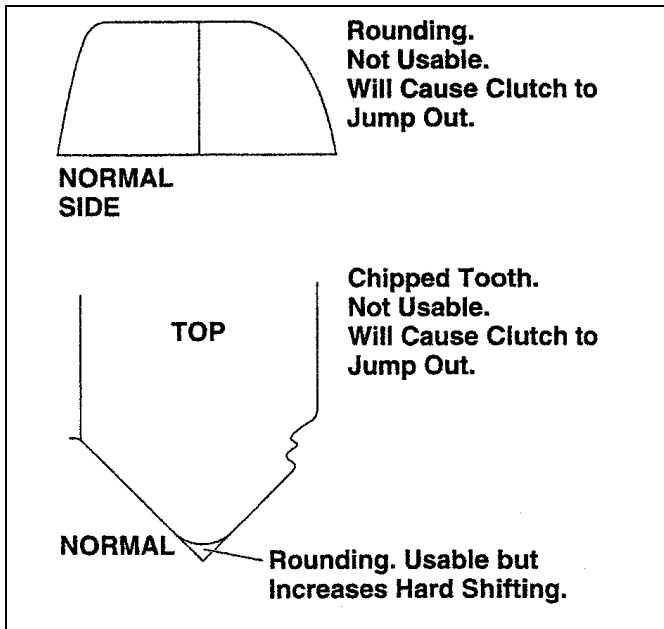


Figure 3-3. Clutch Tooth Inspection

<b>REPAIR</b>	
<b>Corner Chip At Drive Face</b>	
<b>O.D. Edge Chip At Drive Face. May Extend Slightly Into Contact Pattern</b>	
<b>Corner Chip At Coast Face</b>	
<b>Side Edge Chip At Drive Face</b>	
<b>REJECT</b>	
<b>Chip Within Contact Pattern</b>	
<b>Chip Completely Through Tooth (Considered to be Broken)</b>	

Figure 3-4. Gear Tooth Chips

### NOTICE

When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

## 3-4. INPUT SHAFT

### 3-4-1. DISASSEMBLE

#### Important

Do not replace tapered bearing (9) unless inspection shows bearing or race damage

### 3-4-2. CLEAN

- ◆ Input shaft components with solvent and dry with compressed air.

### 3-4-3. INSPECT

- Input shaft components.
  1. Shaft (10) and spline for excessive wear or cracks. Replace if these conditions exist.
  2. Gear teeth and clutch teeth for excessive wear, pitting, scoring, spalling or fractures.
  3. Bearing (9) for roughness of rotation, burred or pitted conditions. Replace if these conditions exist.
- a. If scuffed, nicked, burred or scoring conditions cannot be reconditioned by hand with a soft stone or crocus cloth, replace the component.
- b. When replacing bearing (9) also replace bearing race (8).

### 3-4-4. ASSEMBLE

- ◆ New input shaft tapered bearing (9) to input shaft (10).

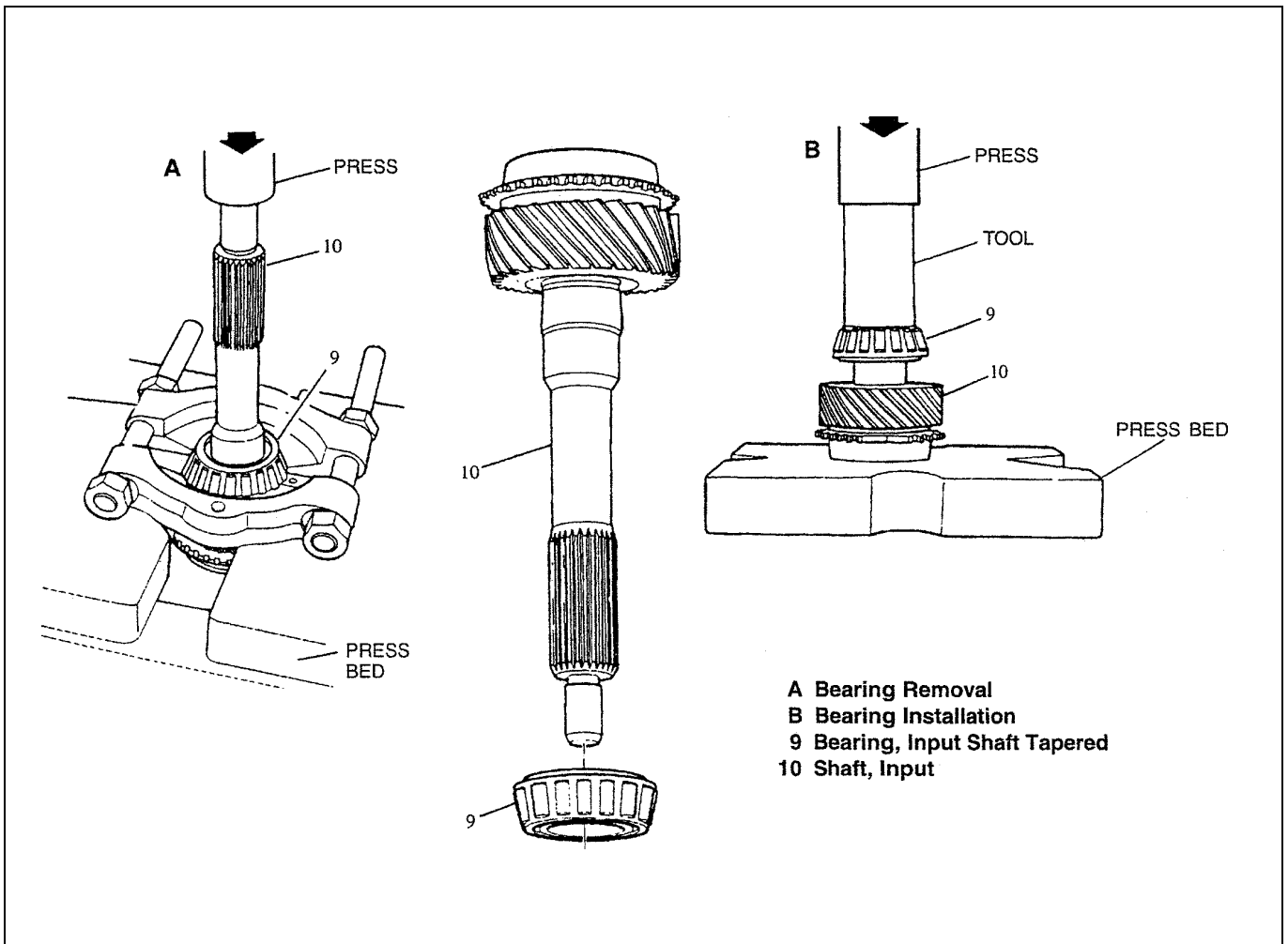


Figure 3-5. Input Shaft

### 3-5. MAINSHAFT

#### 3-5-1. DISASSEMBLE

##### **Important**

##### **Identify and mark blocker rings. DO NOT MIX**

- a. Mainshaft large tapered bearing (42) and O-ring.
  - b. 1 st speed gear (41).
  - c. 1 st speed gear caged needle bearing (40)
  - d. Snap ring (39).
  - e. 1 st speed gear blocker ring assembly.
    1. Thrust washer (38).
    2. Inner cone (37).
    3. Friction cone (36).
    4. Blocker ring (35).
- 
- a. 2nd speed (25) using hydraulic press.
    1. 1st/2nd synchronizer assembly (30), 2nd speed gear blocker ring (29), friction cone (28), 2nd speed gear inner cone (27), and thrust washer (26), will press off with 2nd speed gear (25).
    2. Mark position of 1<sup>st</sup>/2nd synchronizer assembly (30) to assure reassembly in same orientation.
- 
- a. 2nd speed gear caged needle bearing (24).
  - b. 3rd/4th synchronizer snap ring (13).
  - c. 3rd speed gear (20) using V-blocks and hydraulic press.
    1. 3rd/4th synchronizer assembly (14) and 3rd speed gear blocker ring (19) will press off with 3rd speed gear (20).
    2. Mark position of 3rd/4th synchronizer assembly (14) to assure reassembly in same orientation.
- 
- a. Spacer (179).
  - b. 3rd speed gear caged needle bearing (21).

##### **Important**

##### **Do not replace tapered bearing (22) unless inspection shows bearing damage.**

- c. Mainshaft small tapered bearing (22) using hydraulic press.

#### 3-5-2. CLEAN

- ◆ Mainshaft components with solvent and dry with compressed air.

#### 3-5-3. INSPECT

- a. Mainshaft components
  1. Shaft (23) and spline for excessive wear or cracks. Replace if these conditions exist.
  2. Gear teeth (20, 25 and 41) and clutch teeth (2) for excessive wear, pitting, scoring, spalling or fractures.
  3. Bearings (22 and 42) for roughness of rotation, burred or pitted conditions. Replace if these conditions exist.

4. Synchronizer (14 and 30). Refer to "Synchronizers" in this section.

- a. When replacing bearings (22 or 42) also replace bearing races (11 or 43).
- b. If scuffed, nicked, burred or scoring conditions cannot be reconditioned by hand with a soft stone or crocus cloth, replace the component.

#### 3-5-4. ASSEMBLE

- a. New mainshaft small tapered bearing (22) using V-blocks and hydraulic press.
- b. 3rd speed gear caged needle bearing (21).
- c. Spacer (179).
- d. 3rd speed gear (20).
- e. 3rd speed gear blocker ring (19).

##### **Important**

##### **When pressing the 3rd/4th synchronizer assembly (14):**

- A. Orient the assembly back to original position as marked.
- B. Start press operation. STOP before keys engage blocker ring slots.
- C. Lift and rotate 3rd speed gear (20) to engage keys with blocker ring.
- D. Continue to press until seated.

- a. 3rd/4th synchronizer assembly (14) using hydraulic press.
- b. 3rd/4th synchronizer snap ring (13).
- c. 2nd speed gear caged needle bearing (24).
- d. 2nd speed gear (25).
- e. Thrust washer (26).
- f. 2nd speed gear inner cone (27).
- g. Friction cone (28).
- h. 2nd speed gear blocker ring (29).

##### **Important**

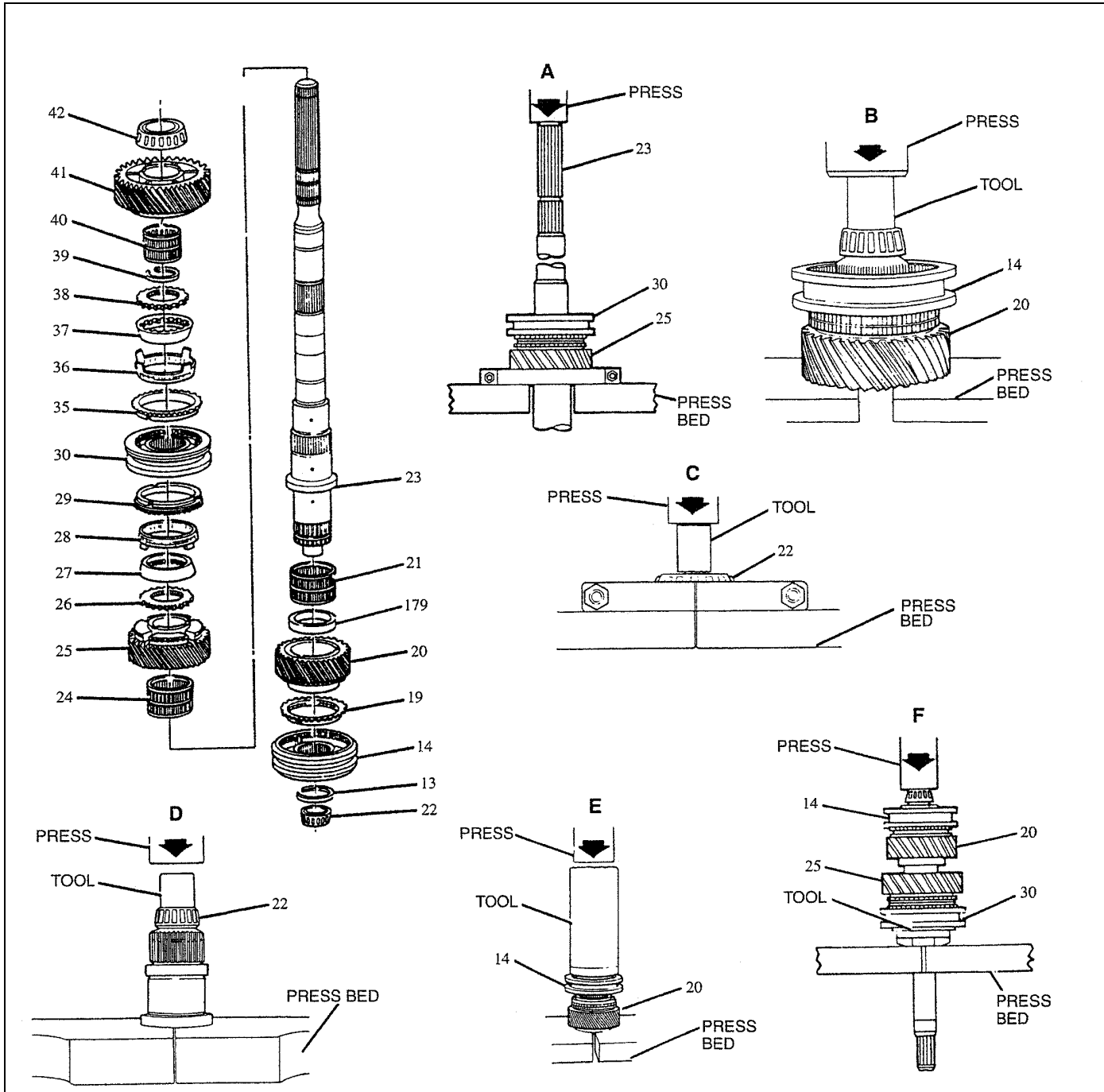
##### **When pressing the 1st/2nd synchronizer assembly (30):**

- A. Orient the assembly back to original position as marked.
- B. Start press operations. STOP before keys engage blocker ring slots.
- C. Lift and rotate 2nd speed gear (25) to engage keys with blocker ring.
- D. Continue to press until seated.

- a. 1st/2nd synchronizer assembly (30) using hydraulic press.
- b. 1st speed gear blocker ring assembly.

1. Blocker ring (35).
2. Friction cone (36).
3. Inner cone (37).
4. Thrust washer (38).

- p. Snap ring (39).
- q. 1st speed gear caged needle bearing (40).
- r. 1st speed gear (41).
- s. Mainshaft large tapered bearing (42) and O-ring.



- |  |  |  |  |
|--|--|--|--|
| <p><b>A</b> 2nd Gear Removal<br/> <b>B</b> 3rd Gear Removal<br/> <b>C</b> Bearing Removal<br/> <b>D</b> Bearing Installation<br/> <b>E</b> 3rd/4th Synchronizer Installation<br/> <b>F</b> 1st/2nd Synchronizer Installation</p> | <p><b>13</b> Ring, Snap<br/> <b>14</b> Synchronizer Assembly, 3rd/4th<br/> <b>19</b> Ring, 3rd Gear Blocker<br/> <b>20</b> Gear, 3rd Speed<br/> <b>21</b> Bearing, 3rd Gear Needle</p> | <p><b>22</b> Bearing, Mainshaft Small Taper<br/> <b>23</b> Mainshaft<br/> <b>24</b> Bearing, 2nd Gear Needle<br/> <b>25</b> Gear, 2nd Speed<br/> <b>26</b> Washer, Thrust<br/> <b>27</b> Cone, Inner<br/> <b>28</b> Cone, Friction<br/> <b>29</b> Ring, 2nd Gear Blocker<br/> <b>30</b> Synchronizer Assembly, 1st/2nd<br/> <b>35</b> Ring, 1st Gear Blocker<br/> <b>36</b> Cone, Friction</p> | <p><b>37</b> Cone, Inner<br/> <b>38</b> Washer, Thrust<br/> <b>39</b> Ring, Snap<br/> <b>40</b> Bearing, 1st Gear Needle<br/> <b>41</b> Gear, 1st Speed<br/> <b>42</b> Bearing, Mainshaft Large Taper<br/> <b>179</b> Spacer</p> |
|--|--|--|--|

Figure 3-6. Mainshaft



### 3-6. COUNTERSHAFT

#### 3-6-1. DISASSEMBLE

##### Important

Do not replace tapered bearing (104 and 106) unless inspection shows bearing damage.

- a. Small tapered bearing (104) using hydraulic press.

- ◆ Discard tapered bearing (104).

- a. Large tapered bearing (106) using hydraulic press.

- ◆ Discard tapered bearing (106).

#### 3-6-2. CLEAN

- ◆ Countershaft with solvent and dry with compressed air.

#### 3-6-3. INSPECT

- a. Countershaft components.

1. Shaft (105) for excessive wear or cracks. Replace if these conditions exist.
2. Gear teeth for excessive wear, pitting, scoring, spalling or fractures.
3. Bearings (104 and 106) for roughness of rotation, burred or pitted conditions. Replace if these condition exist.

- a. When replacing bearings (104 or 106) also replace bearing races (103 or 107).

- b. If scuffed, nicked, burred or scoring conditions cannot be reconditioned by hand with a soft stone or crocus cloth, replace the component.

#### 3-6-4. ASSEMBLE

- a. New large tapered bearing (106) using hydraulic press.
- b. New small tapered bearing (104) using hydraulic press.

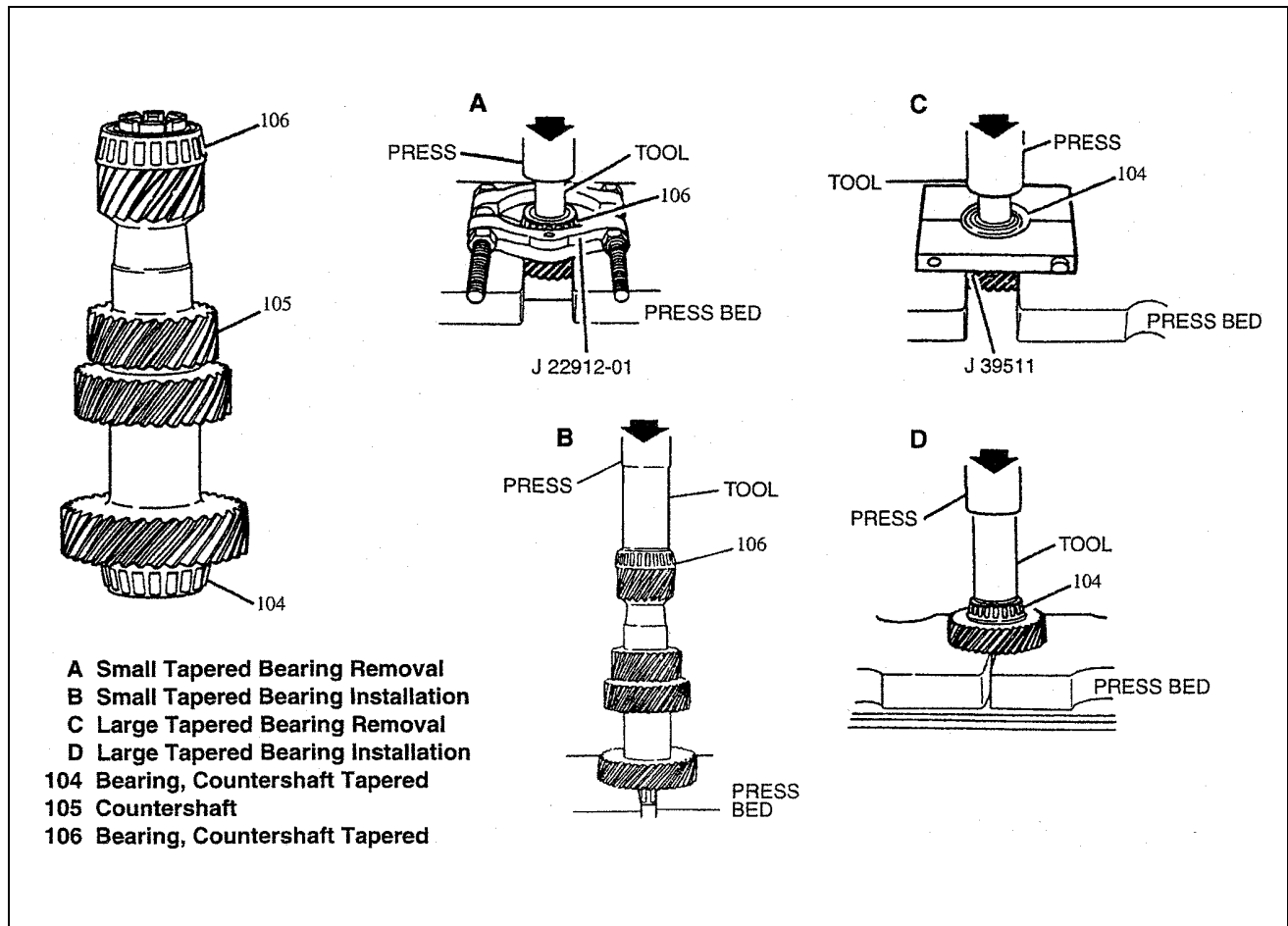


Figure 3-7. Countershaft

### 3-7. COUNTERSHAFT EXTENSION ASSEMBLY

#### 3-7-1. DISASSEMBLE

- a. 5th /6th shift fork (122).
- b. Thrust washer (108).
- c. 6th drive gear (109).
- d. Caged needle bearing (110).
- e. Spacer (115).
- f. 6th drive gear blocker ring (114).
- g. 5th/6th synchronizer snap ring (116) and discard.

#### **Important**

**Snap ring (116) must not be reused. Always replace with new snap ring when reassembling unit.**

- h. 5th drive gear (126) using hydraulic press.
  1. 5th/6th synchronizer assembly (117) and 5th drive gear blocker ring (125) will press off with 5th drive gear (126).
  2. Mark position of 5th/6th synchronizer assembly (117) to assure reassembly in same orientation.
- a. 5th drive gear caged needle bearing (127).

#### **Important**

**Do not replace small tapered bearing (129) unless inspection shows bearing damage.**

- b. Small tapered bearing (129) using hydraulic press.

#### 3-7-2. CLEAN

- a. Countershaft extension components with solvent and dry with compressed air.
- b. Make sure oil holes through bearing journals and center hole are clean.

#### 3-7-3. INSPECT

- a. Countershaft extension components.
  1. Shaft (128) and spline for excessive wear or cracks. Replace if these condition exist.
  2. Gear teeth and clutch teeth (109 and 126) for excessive wear, pitting, scoring, spalling or fractures.

1. Bearing (129) for roughness of rotation, burred or pitted conditions. Replace if these conditions exist.
2. Synchronizer (117). Refer to "Synchronizer" in this section.

- a. When replacing bearing (129) also replace bearing race (130).
- b. If scuffed, nicked, burred or scoring conditions cannot be reconditioned by hand with a soft stone or crocus cloth, replace the component.

#### 3-7-4. ASSEMBLE

- a. New small tapered bearing (129) using V-blocks and hydraulic press.
- b. 5th drive gear caged needle bearing (127).
- c. 5th drive gear (126).
- d. 5th drive gear blocker ring (125).

#### **Important**

**When pressing the 5th/6th synchronizer assembly (117):**

- A. Orient the assembly back to original position as marked.
- B. Start press operation. STOP before keys engage blocker ring slots.
- C. Lift and rotate 5th drive gear (126) to engage keys with blocker ring.
- D. Continue to press until seated.

- a. 5th/6th synchronizer assembly (117) using hydraulic press.
- b. New 5th/6th synchronizer snap ring (116).

#### **Important**

**Snap ring (116) must always be replaced. When replacing snap ring, the flat side of snap ring must face forward toward reverse gear.**

- c. 6th drive gear blocker ring (114).
- d. 6th drive gear spacer (115).
- e. 6th drive gear caged needle bearing (110).
- f. 6th drive gear (109).
- g. 6th drive gear thrust washer (108).
- h. 5th/6th shift fork (122).

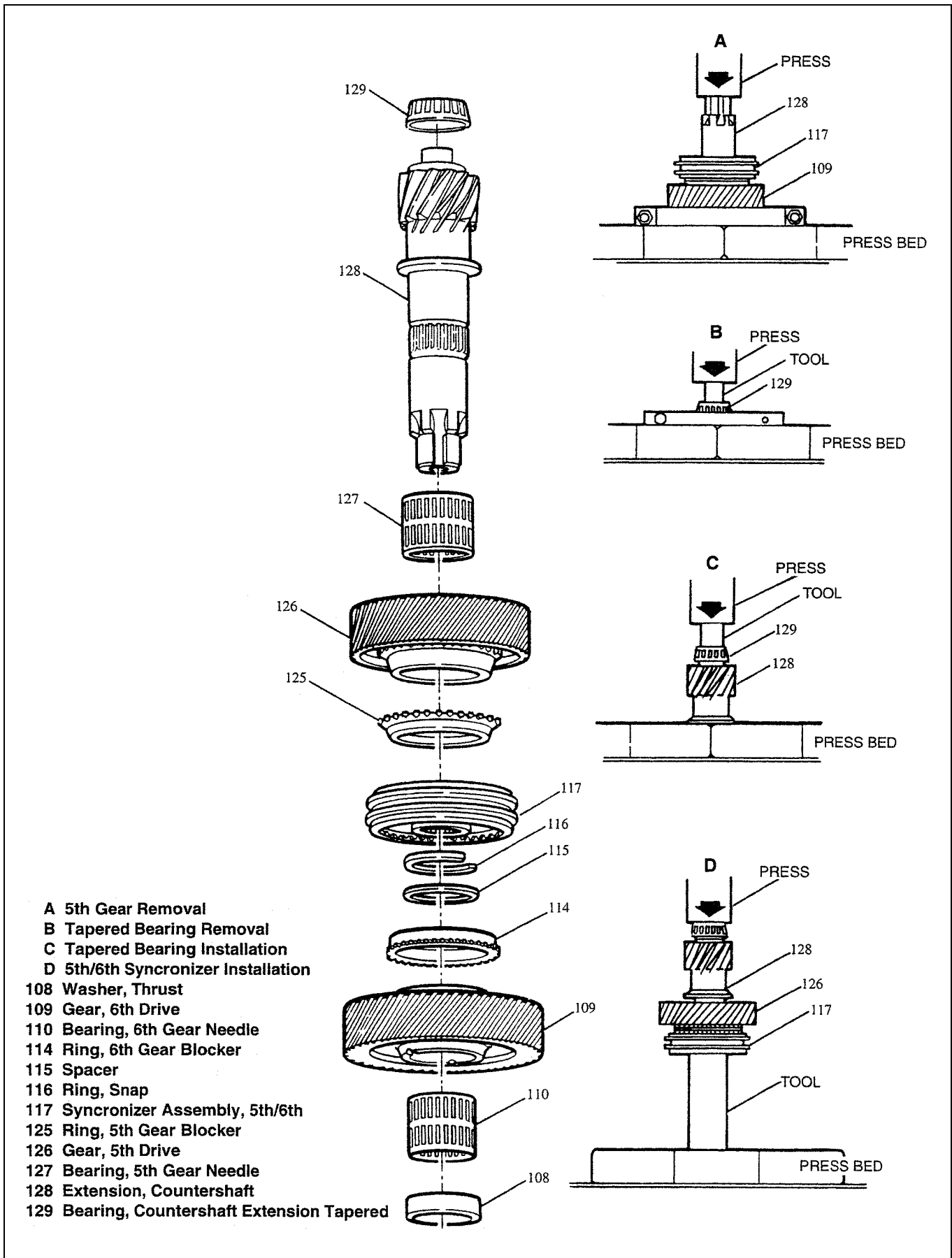


Figure 3-8. Countershaft Extension

### 3-8. SYNCHRONIZER

#### 1ST/2ND, 3RD/4TH, 5TH/6TH SYNCHRONIZERS

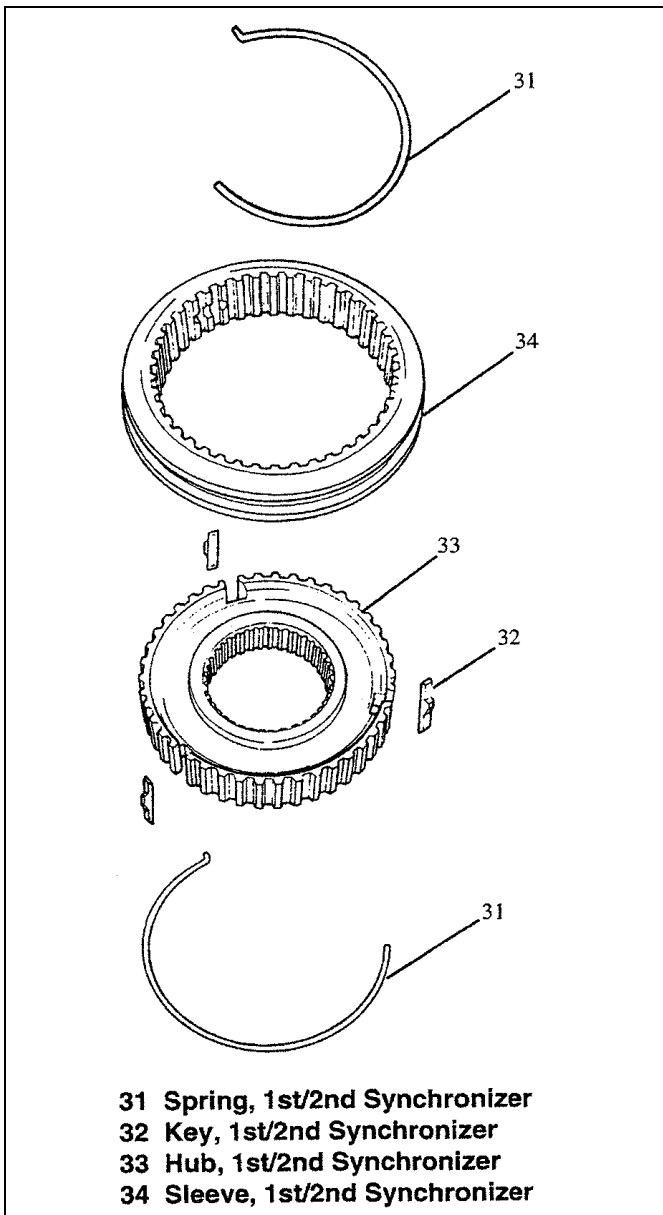
##### Important

Synchronizer components are no interchangeable. Keep synchronizer components separate. Synchronizer hubs and sleeves are a selected assembly and should be kept together as originally assembled.

Note location of ID groove on synchronizer sleeve and reposition to original orientation when reassembling unit

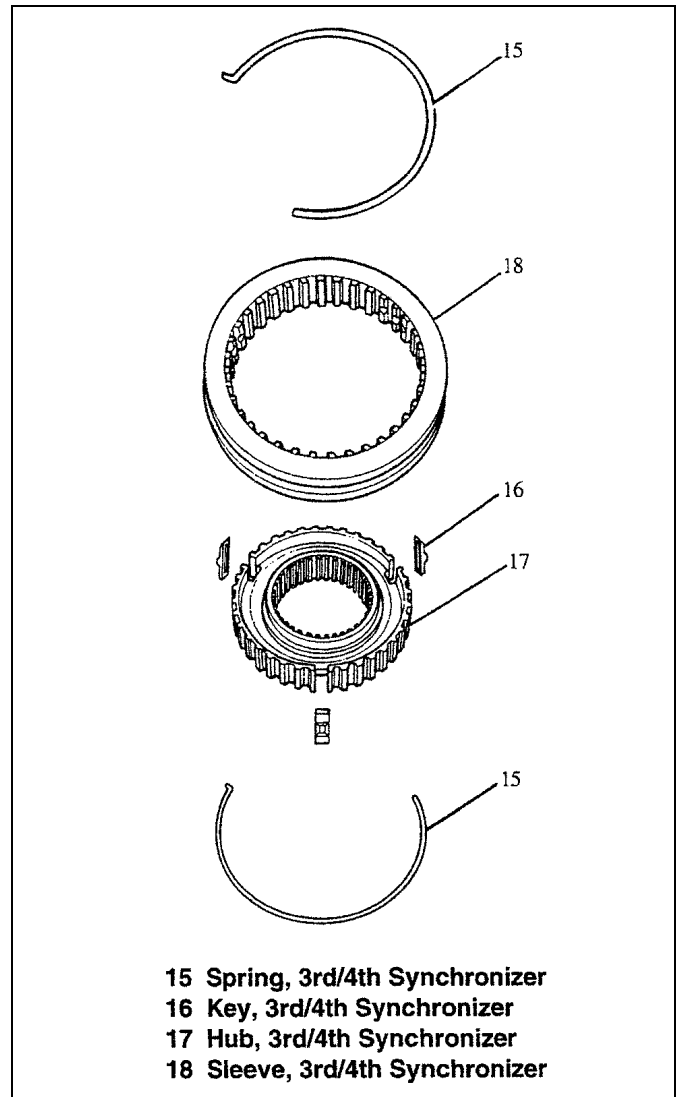
#### 3-8-1. DISASSEMBLE

- a. Synchronizer spring (15), (31), (118) using a small bladed screwdriver.



**31 Spring, 1st/2nd Synchronizer**  
**32 Key, 1st/2nd Synchronizer**  
**33 Hub, 1st/2nd Synchronizer**  
**34 Sleeve, 1st/2nd Synchronizer**

Figure 3-9. 1st/2nd Synchronizer.



**15 Spring, 3rd/4th Synchronizer**  
**16 Key, 3rd/4th Synchronizer**  
**17 Hub, 3rd/4th Synchronizer**  
**18 Sleeve, 3rd/4th Synchronizer**

Figure 3-10. 3rd/4th Synchronizer

- a. Turn synchronizer assembly (14), (30), (117) over.
- b. Synchronizer spring (15), (31), (118) using a small bladed screwdriver.
- c. Keys (16), (32), (119).
- d. Synchronizer sleeve (18), (34), (121) from hub (17), (33), (120).

#### 3-8-2. CLEAN

- ◆ Synchronizer components with solvent and dry with compressed air.

#### 3-8-3. INSPECT

- a. Synchronizer components.
  1. Teeth for wear, nicked, burred or broken teeth. Replace hub and sleeve if excessive wear exists.
  2. Keys for wear or distortion. Replace if these conditions exist.
  3. Springs for distortion, cracks or wear. Replace if these conditions exist.

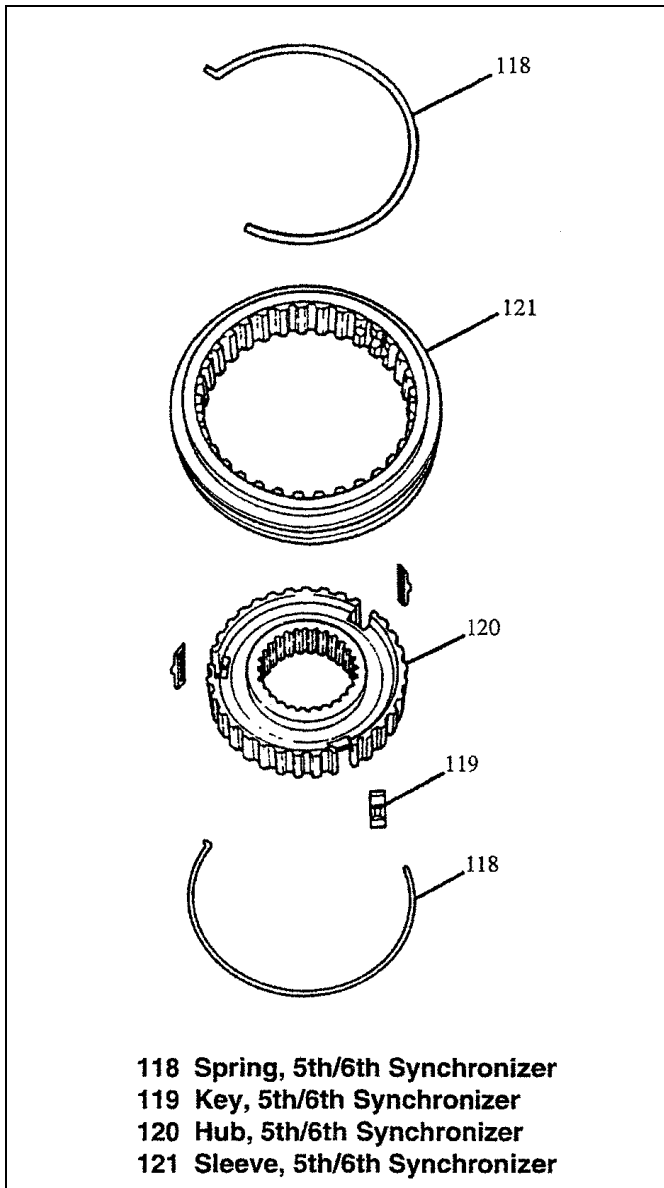


Figure 3-11. 5th/6th synchronizer

- a. If scuffed, nicked or burred conditions cannot be corrected by hand with a soft stone or crocus cloth, replace the component.

**3-8-4. ASSEMBLE**

- a. Synchronizer (18), (34), (121) to hub (17), (33), (120).
  - ◆ Align key openings in hub (17), (33), (120) with cuts in synchronizer sleeve (18), (34), (121).
- a. Keys (16), (32), (119) with slots facing hub (17), (33), (120).
- b. Synchronizer spring (15), (31), (118) using a small-bladed screwdriver.
  - ◆ Locate spring tang to one of the key slots.
- d. Turn synchronizer assembly (14), (30), (117) over.

- e. Synchronizer spring (15), (31), (118) using a small bladed screwdriver.
  - ◆ Locate spring tang on same key but wind in opposite direction.

**REVERSE SYNCHRONIZER**

**3-8-5. DISASSEMBLE**

- a. Synchronizer spring (63) using a small-bladed screwdriver.
- b. Synchronizer sleeve (66) from hub (65) by pressing against inner hub (65).
- c. Turn hub (65) over.
  - ◆ Keys (64) will slide out from hub (65)

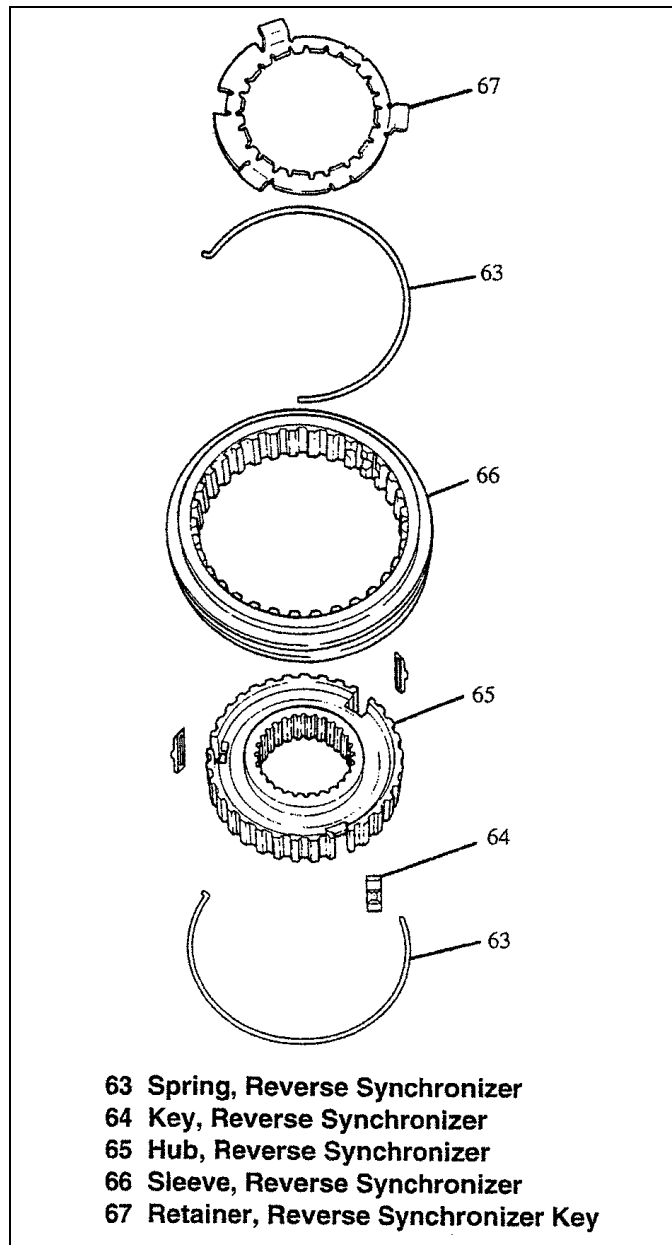


Figure 3-12. Reverse Synchronizer

- a. Synchronizer key retainer (67) using a small-bladed screwdriver through key slots of hub (65) and discard retainer (67). Do not remove unless necessary to rebuild synchronizer assembly.
- b. Synchronizer spring (63) using a small-bladed screwdriver.

### 3-8-6. CLEAN

- ◆ Synchronizer components with solvent and dry with compressed air.

### 3-8-7. INSPECT

- a. Synchronizer components.
  1. Teeth for wear, nicked, burred or broken teeth. Replace hub and sleeve if excessive wear exists.
  2. Keys for wear or distortion. Replace if these conditions exist.
  3. Springs for distortion, cracks or wear. Replace if these conditions exist.
  4. Retainer for distortion. Replace if this condition exists.
- a. If scuffed, nicked or burred conditions cannot be corrected by hand with a soft stone or crocus cloth, replace the component.

### 3-8-8. ASSEMBLE

- a. Synchronizer sleeve (66) to hub (65).
  - ◆ Align key openings in hub (65) with cuts in synchronizer sleeve (66).
- b. Keys (64) with slots facing hub (65).
- c. Synchronizer spring (63) using a small-bladed screwdriver.
  - ◆ Locate spring tang to one of the key slots.
- d. Turn synchronizer assembly (62) over.
- e. Synchronizer spring (63) using a small-bladed screwdriver.
  - ◆ Locate spring tang on same key but wind in opposite direction.
- f. New synchronizer key retainer (67).
  - ◆ Locate key retainer tangs over synchronizer keys (64).

## SYNCHRONIZER BLOCKER RING

### 3-8-9. INSPECT

- a. Gear cones, clutch teeth and blocker rings for excessive wear.
- b. Synchronizer sleeve and gear clutch teeth for evidence of gear clash or cause of hop-out.
- c. Measure the gap between the blocker ring and the speed gear. Make sure the correct blocker ring is measured with the correct gear and the blocker ring is fully seated on the gear.

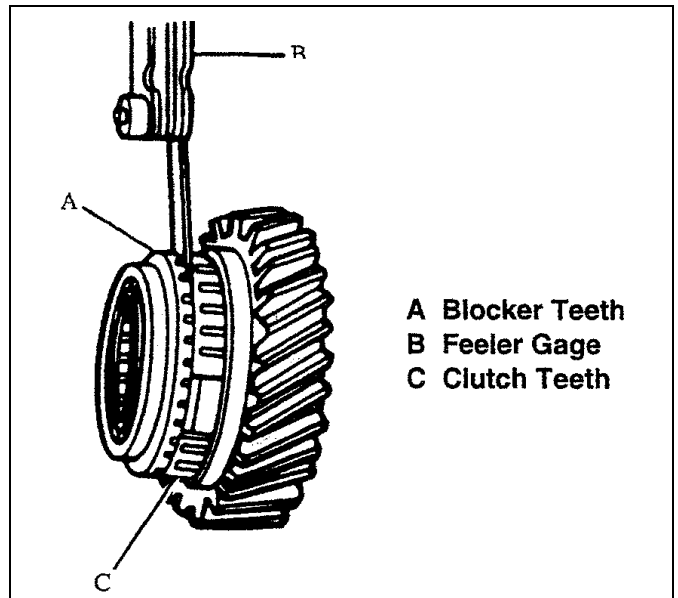


Figure 3-13. Measuring blocker Ring Wear.

- a. Replace blocker rings for 1st, 2nd, 3rd, 4th, 5th and 6th gears if the wear gap is less than .020 in. (.5mm)
- b. Replace the reverse blocker ring if the wear gap is less than 0.30 in (.8mm) when measured without the wave washer (71) in between the blocker ring and reverse gear.

## 3-9. SHIFT RAIL AND FORK ASSEMBLIES

### 1ST/2DN 3RD/4TH SHIFT RAIL ASSEMBLY

#### 3-9-1. DISASSEMBLE

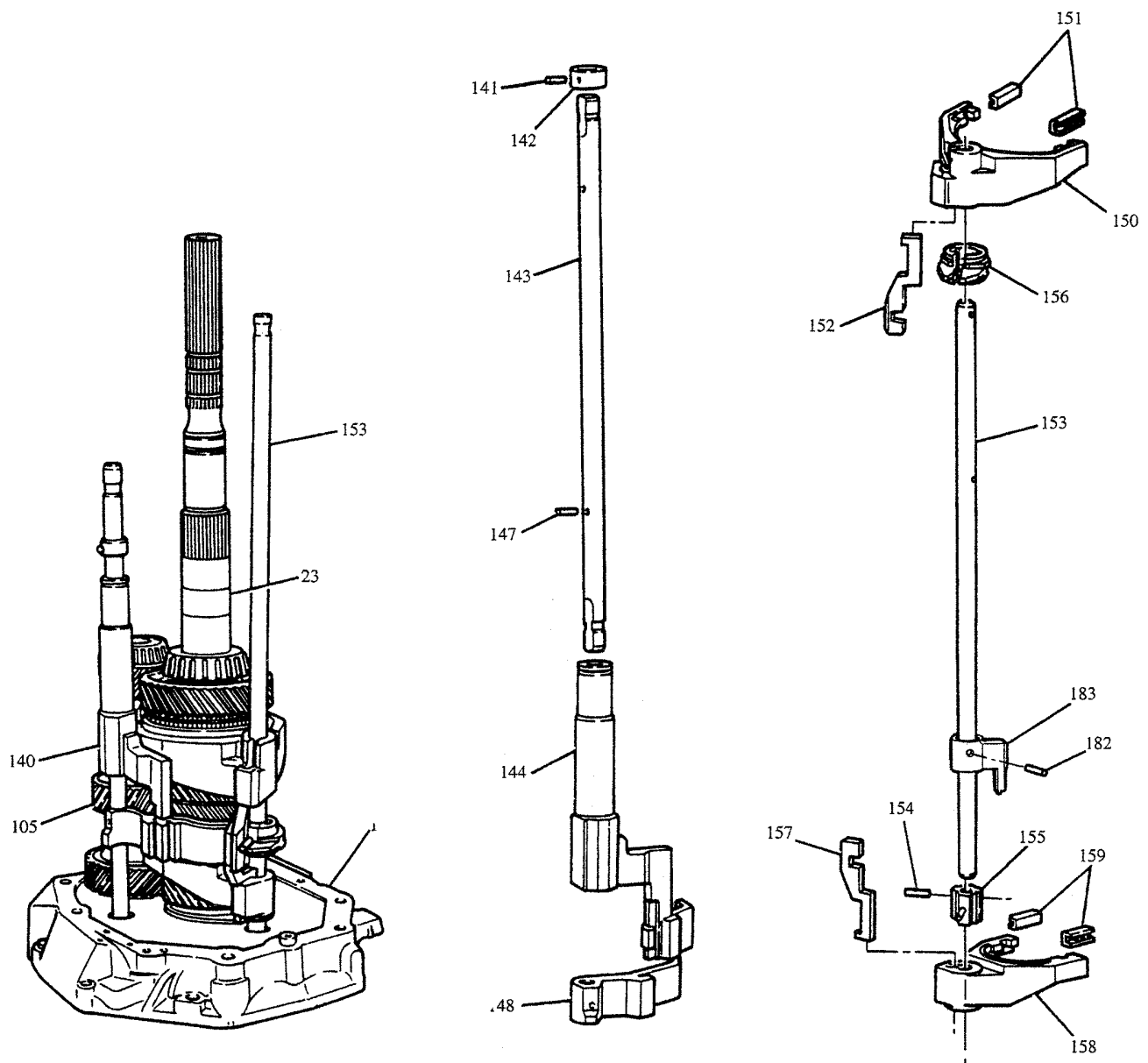
- a. Rotate selector pin (155) until opposite shift links (152 and 157).
- b. 3rd/4th shift fork (158) with shift link (157) from rail (153).
- c. 1st/2nd shift fork (150) with shift link (152) from rail (153).
- d. Interlock plate (156) form rail (153).
- e. Selector pin roll pin (154).
- f. Shift selector assembly (155).

#### 3-9-2. CLEAN

- ◆ Shift rail and fork assembly components with solvent and dry with compressed air.

#### 3-9-3. INSPECT

- a. Shift rail and fork assembly components.
  1. Rail (153) for excessive wear or burrs. Replace if these conditions exist.
  2. Shift forks (150 and 158) for excessive wear, fracture or distortion. Replace if these conditions exist.



- 1 Transmission Front Adapter
- 23 Mainshaft
- 105 Countershaft
- 140 Rail Assembly, 5th/6th and Reverse Shift
- 141 Pin, Roll
- 142 Collar
- 143 Rail, Shift
- 144 Lever, 5th/6th Shift Rail
- 147 Pin, Roll
- 148 Lever, Reverse Shift Rail
- 150 Fork, 1st/2nd Shift

- 151 Pad, 1st/2nd Shift Fork
- 152 Link, Shift
- 153 Rail Assembly, 1st/2nd 3rd/4th Shift
- 154 Pin, Roll
- 155 Pin, Selector
- 156 Plate, Interlock
- 157 Link, Shift
- 158 Fork, 3rd/4th Shift
- 159 Pad, 3rd/4th Shift Fork
- 182 Pin, Roll
- 183 Lever, Skip Shift

Figure 3-14. Shift Rail and Fork Assemblies

1. Shift links (152 and 157) for excessive wear, fracture or distortion. Replace if these conditions exist.
2. Shift fork nylon inserts (151 and 159) for excessive wear. Replace if this condition exists.

#### 3-9-4. ASSEMBLE

- a. Shift selector assembly (155).
- b. Selector pin roll pin (154).
- c. Interlock plate (156) to rail (153).
- d. 1st/2nd shift fork (150) with shift link (152) to rail (153).
- e. 3rd/4th shift fork (158) with shift link (157) to rail (153).
- f. Align selector pin (155) with slots in shift links (152 and 157).

#### 5TH/6TH, REVERSE SHIFT RAIL ASSEMBLY

##### 3-9-5. DISASSEMBLE

- a. Collar roll pin (141).
- b. Collar (142).
- c. 5th/6th shift rail lever (144) from rail (143).

##### **Important**

**Do not replace bushings (146) unless inspection shows bushing damage.**

- d. 5th/6th shift rail lever bushings (146).
- e. Reverse shift rail lever roll pin (147).
- f. Reverse shift rail lever (148) from rail (143).

##### 3-9-6. CLEAN

- ◆ Shift rail assembly components with solvent and dry with compressed air.

##### 3-9-7. INSPECT

- a. Shift rail assembly components.
  1. Rail (143) for excessive wear or burrs. Replace if these conditions exist.
  2. Shift rail levers (144 and 148) for excessive wear, fracture or distortion. Replace if these conditions exist.
  3. Shift rail lever nylon insert for excessive wear. Replace if this condition exists.
  4. Shift rail lever bushings (146) for excessive wear. Replace if this condition exists.

##### 3-9-8. ASSEMBLE

- a. Reverse shift rail lever (148) to rail (143).
  1. Locate reverse shift rail lever (148) to roll pin hole at opposite end of rail (143) from snap ring groove.
  2. Notched edge of reverse shift rail lever should face towards other roll pin hole.

- a. Reverse shift rail lever roll pin (147).
- b. 5th/6th shift rail lever bushings (146).
- c. 5th/6th shift rail lever (144) to rail (143).
- d. Collar (142).
- e. Collar roll pin (141).

#### 3-10. TRANSMISSION FRONT ADAPTER

##### 3-10-1. DISASSEMBLE

- a. Input shaft bearing race (8) and shim (7).
- b. Countershaft bearing race (103) and shim (102).
- c. Adapter plug (2).
- d. Input shaft seal (6).

##### **Important**

**Measure depth of seal installation.**

##### **Important**

**Do not replace bushing (5) unless inspection shows bushing damage.**

##### 3-10-2. CLEAN

- ◆ Adapter components with solvent and dry with compressed air.

##### 3-10-3. INSPECT

- a. Adapter components.
  1. Bearing races (8 and 103) and bores for wear, scratches or grooves.
  2. Bushing (5) for excessive wear or burrs. Replace if this condition exists.
  3. Case for cracks, sealing surfaces for nicks, burrs or scratches. If case is cracked, it must be replaced.
- a. If scratches, grooves or nicks cannot be removed by hand with a soft stone or crocus cloth, replace the components.

##### 3-10-4. ASSEMBLE

- a. 1st/2nd, 3rd/4th shift rail bushing (5).
- b. Input shaft seal (6).

##### **Important**

**Reinstall to original depth.**

##### **Important**

**Do not install shims (102 and 7) until after performing "Shimming Procedures" later in this section.**

- c. Countershaft bearing race (103).
- d. Input shaft bearing race (8).



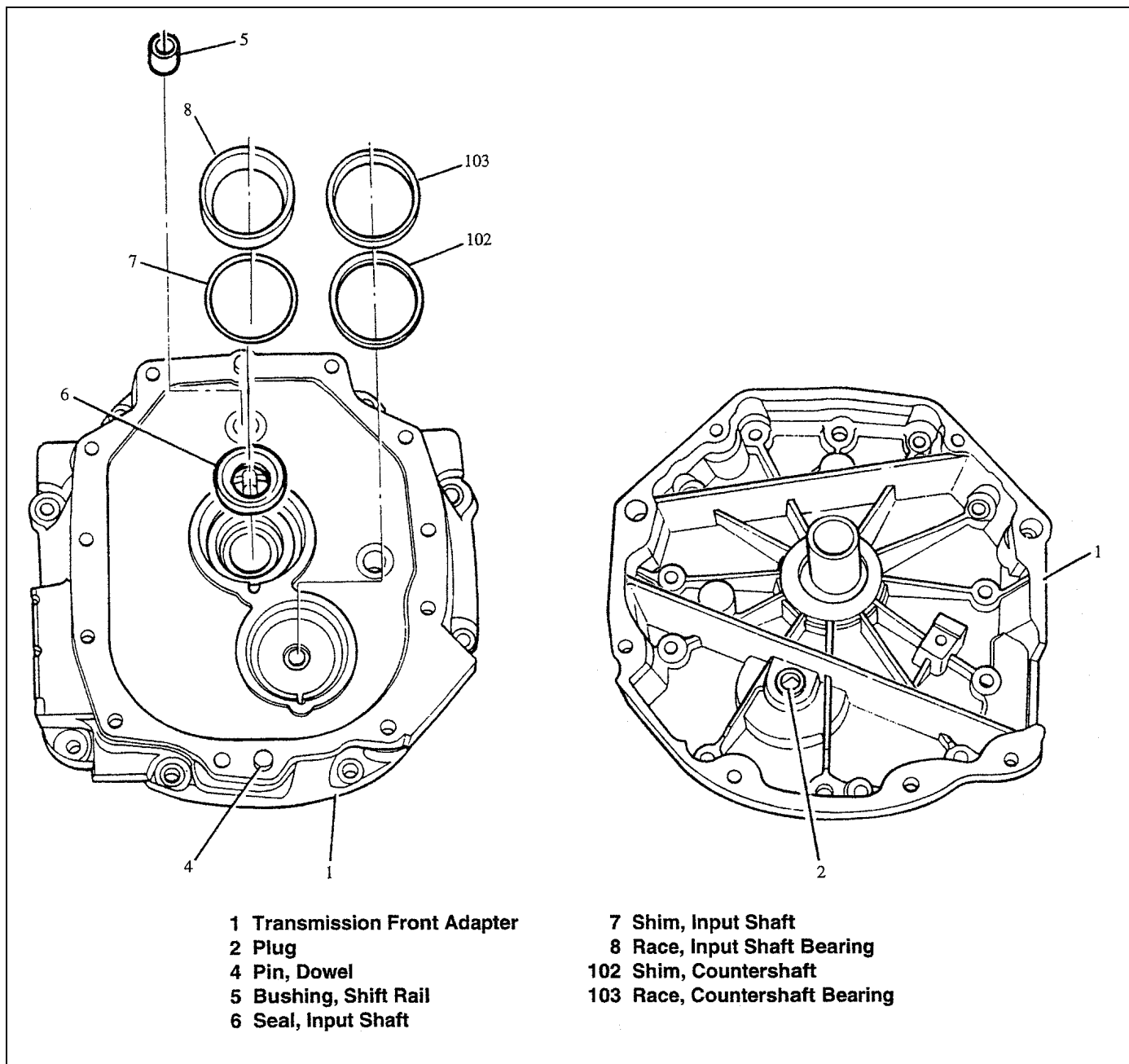


Figure 3-15. Transmission Front Adapter

### 3-11. TRANSMISSION CASE

#### 3-11-1. DISASSEMBLE

- a. Fill plug (60).
- b. Backup lamp switch (59).
- c. Skip shift solenoid(185).

#### 3-11-2. INSPECT

- a. Skip shift solenoid (185).
  1. With no voltage source connected, the solenoid plunger should be retracted within case.
  2. Applying a 12V source to the connector, the solenoid plunger should extend .18 in. Minimum.

#### Important

Do not replace bearing races (107 and 43) unless inspection shows bearing race damage.

Do not replace shift rail bushings (49) unless inspection shows damage or bushing is loose. Loose bushing can be reinstalled by carefully cleaning area and using anaerobic adhesive.

- a. Countershaft bearing race (107).
- b. Mainshaft bearing race(43).

#### 3-11-3. CLEAN

- ◆ Transmission case components with solvent and dry with compressed air.

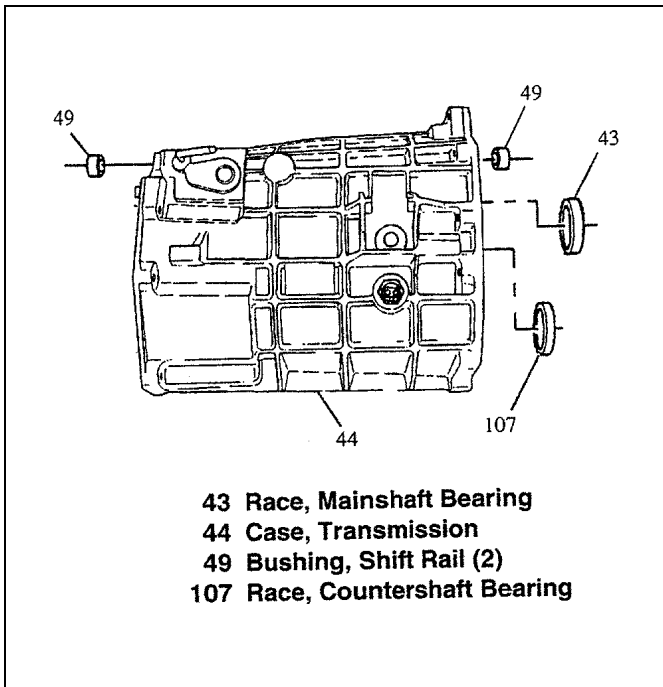


Figure 3-16. Transmission Case

### 3-11-4. INSPECT

- a. Transmission case components.
  1. Bearing races (43 and 107) and bores for wear, scratches or grooves.
  2. Bushing (49) for excessive wear. Replace if this condition exists.
  3. Case (44) for cracks, threaded openings for damaged threads, sealing surfaces for nicks, burrs or scratches. If case is cracked, it must be replaced.
- a. If scratches, grooves or scoring cannot be removed by hand with a soft stone or crocus cloth, replace the component.

### 3-11-5. ASSEMBLE

- a. 1st/2nd, 3rd/4th shift rail bushings (49).
- b. Mainshaft bearing race (43)
- c. Countershaft bearing race (107).
- d. Skip shift solenoid (185).
- e. Backup lamp switch (59).
- f. Tighten
  - ◆ Switch (59) to 20 lb. Ft. (27 N.m)
- g. Fill plug (60) with sealant.
- h. Tighten
  - ◆ Fill plug (60) to 13 lb. Ft. (18 N.m).
- i. Guide plate (55) and guide plate bolts (54).
- j. Tighten
  - ◆ Bolts (54) to 16 lb. Ft. (22 N.m)

## 3-12. EXTENSION HOUSING

### 3-12-1. DISASSEMBLE

#### Important

**Do not remove idler bracket and idler gear unless components are damaged and need replacement.**

- a. Reverse idler shaft bracket bolts (133).
- b. Reverse idler shaft bracket (134).
- c. Reverse idler gear thrust washer (135).
- d. Reverse idler gear (136).
- e. Roller bearing (137).
- f. Thrust washer (139).
- g. Reverse idler shaft (138).
- h. Countershaft extension bearing race (130).
- i. Shim (131).
- j. Funnel (132).
- k. Plug (101).
- l. Reverse lockout assembly bolt (90).

#### CAUTION

**The reverse lockout assembly is under spring pressure. Do not attempt to repair internal components. Must be replaced as an assembly.**

### 3-12-2. INSPECT

- a. reverse lockout assembly (91). (See figure 3-18).
  1. With no voltage source connected to solenoid, the plunger should be extended .30 in. (7.6mm) minimum.
  2. Applied force required to "crash thru" the lockout mechanism should fall within the range of 30 to 50 lb.
  3. When force is released, the plunger should return to the original extended position.
  4. Applying a 12V source to the solenoid connector, the applied force to move the plunger to the retracted position should be 5 lb. Maximum.
  5. When force is released, the plunger should return to the original extended position.
- a. Reverse lockout solenoid (89).
  1. Remove solenoid from the reverse lockout assembly by rotating counter-clockwise.
  2. With no voltage source connected, the solenoid plunger should be extended .18 in. (4.5mm) minimum.
  3. Applying a 12V source to the connector, the solenoid plunger should retract within case.
- a. Reverse lockout assembly (91).
- b. Vehicle speed sensor bolt (88).
- c. Vehicle speed sensor (87).

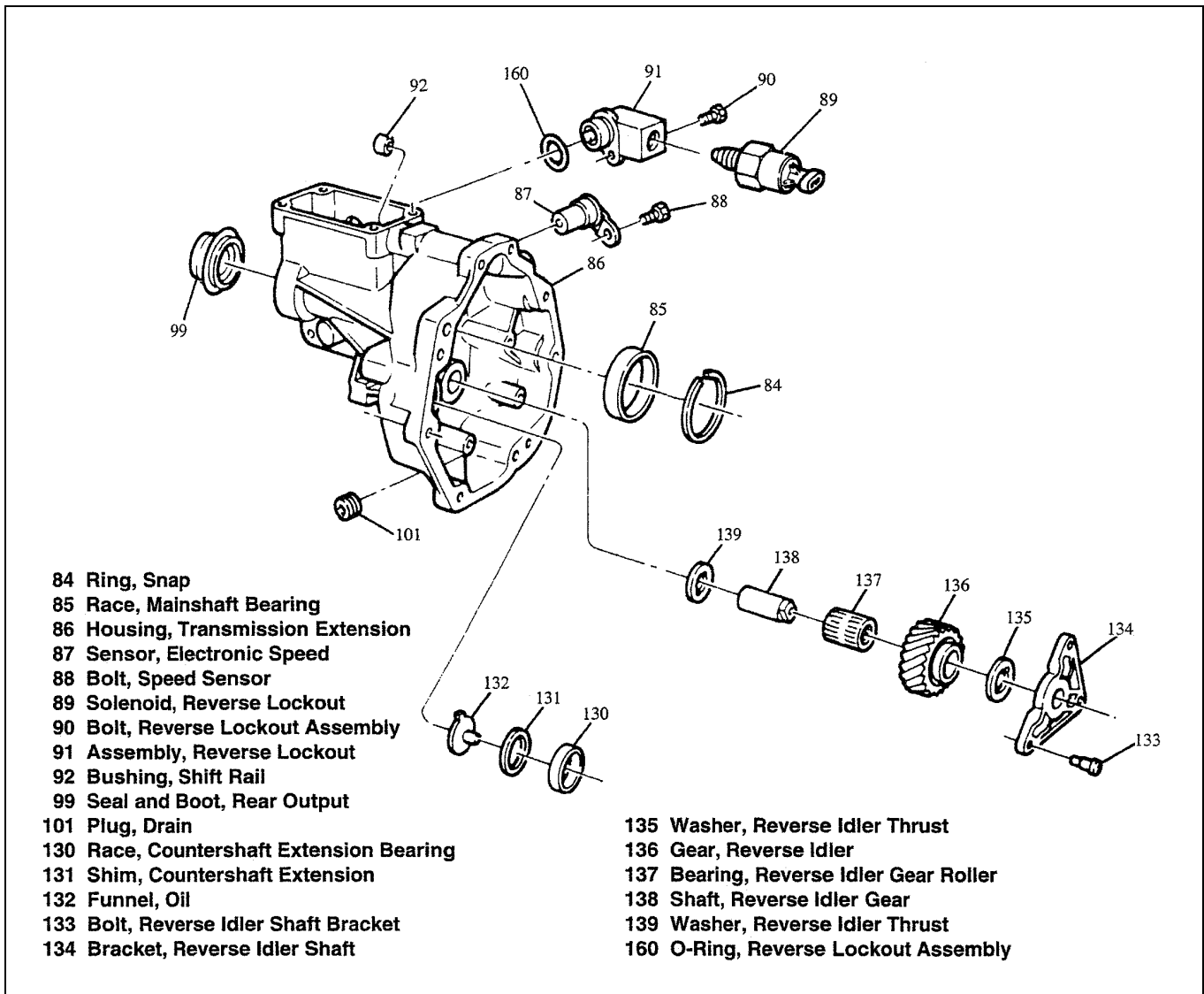


Figure 3-17. Transmission Extension Housing

- a. Rear seal and boot (99).
  - ◆ Pry out seal and boot (99) with suitable tool and discard.
- b. Mainshaft bearing race snap ring (84).

**Important**

**Do not replace bearing race (85) unless inspection shows bearing race damage.**

- c. Mainshaft bearing race (85).

**Important**

**Do not replace bushing (92) unless inspection shows bushing damage.**

**3-12-3. CLEAN**

- ◆ Extension housing components with solvent and dry with compressed air.

**3-12-4. INSPECT**

- a. Extension housing components.
  - 1. Bearing races (85 and 130) and bores for wear, scratches or grooves.
  - 2. Bushing (92) for excessive wear or burrs. Replace if this condition exists.
  - 3. Case (86) for cracks, sealing surfaces for nicks, burrs or scratches. If case is cracked, it must be replaced.
- a. If scratches, grooves or nicks cannot be removed by hand with a soft stone or crocus cloth, replace the component.

**3-12-5. ASSEMBLE**

- a. Shift rail bushing (92).
- b. Mainshaft bearing race (85).
- c. Mainshaft bearing race snap ring (84).

- a. Rear seal and boot (99).
  - ◆ Locate drain hole in rear seal and boot (99) down.
- b. Vehicle speed sensor (87).
- c. Vehicle speed sensor bolt (88).
- d. Tighten.
  - ◆ Bolt (88) to 84 lb. In. (10 N.m)
- e. Assemble reverse lockout assembly (91).

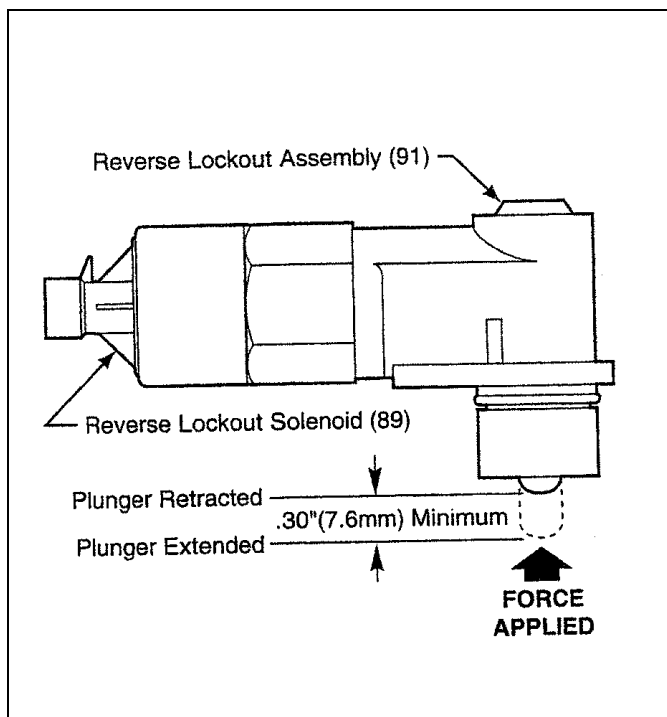


Figure 3-18. Reverse Lockout Assembly

- f. Reverse lockout solenoid (89) to reverse lockout assembly 91.
- g. Tighten
  - ◆ Solenoid (89) to 30 lb. Ft. (40 N.m)
- h. O-Ring (160) to assembly (91).
- i. Reverse lockout assembly.
- j. Reverse lockout assembly bolt (90).
- k. Tighten
  - ◆ Bolt (90) to 13 lb. Ft. (18 N.m).
- l. Plug (101) with sealant.
- m. Tighten
  - ◆ Plug (101) to 13 lb. ft. (18 N.m).
- n. Countershaft extension bearing race (130).

**Important**

**Do not install shim (131) until after performing "Shimming Procedures" in Section 5.**

## SECTION 4

# T56 TRANSMISSION ASSEMBLY PROCEDURES

### 4-1. SHIFT RAIL ASSEMBLIES AND GEAR CLUSTERS

#### 4-1-1. REQUIRED

- ◆ Transmission Assembly Lube

**4-1-2. INSTALL OR CONNECT.** Lubricate all components as assembly progresses. Use Transmission Assembly Lube or equivalent.

- a. Selective shims (7 and 102). Refer to "Input Shaft, Mainshaft and Countershaft" in "Shimming Procedures" in Section 5.
  - b. Input shaft bearing race (8).
  - c. Countershaft bearing race (103).
  - d. Input shaft (10) and 4th gear blocker ring (12).
  - e. Shift rail assembly (149) to mainshaft assembly.
  - f. Mainshaft assembly with shift rail assembly (149).
  - g. Countershaft assembly.
    1. Lift up mainshaft assembly enough to install countershaft assembly.
    2. Install countershaft assembly.
    3. Lift mainshaft assembly enough to rotate input shaft (10) to engage synchronizer keys (16) with 4th gear blocker ring (12).
- a. 5th/6th and reverse shift rail (140)
- ◆ Align slots of shift rail levers with interlock plate (156).

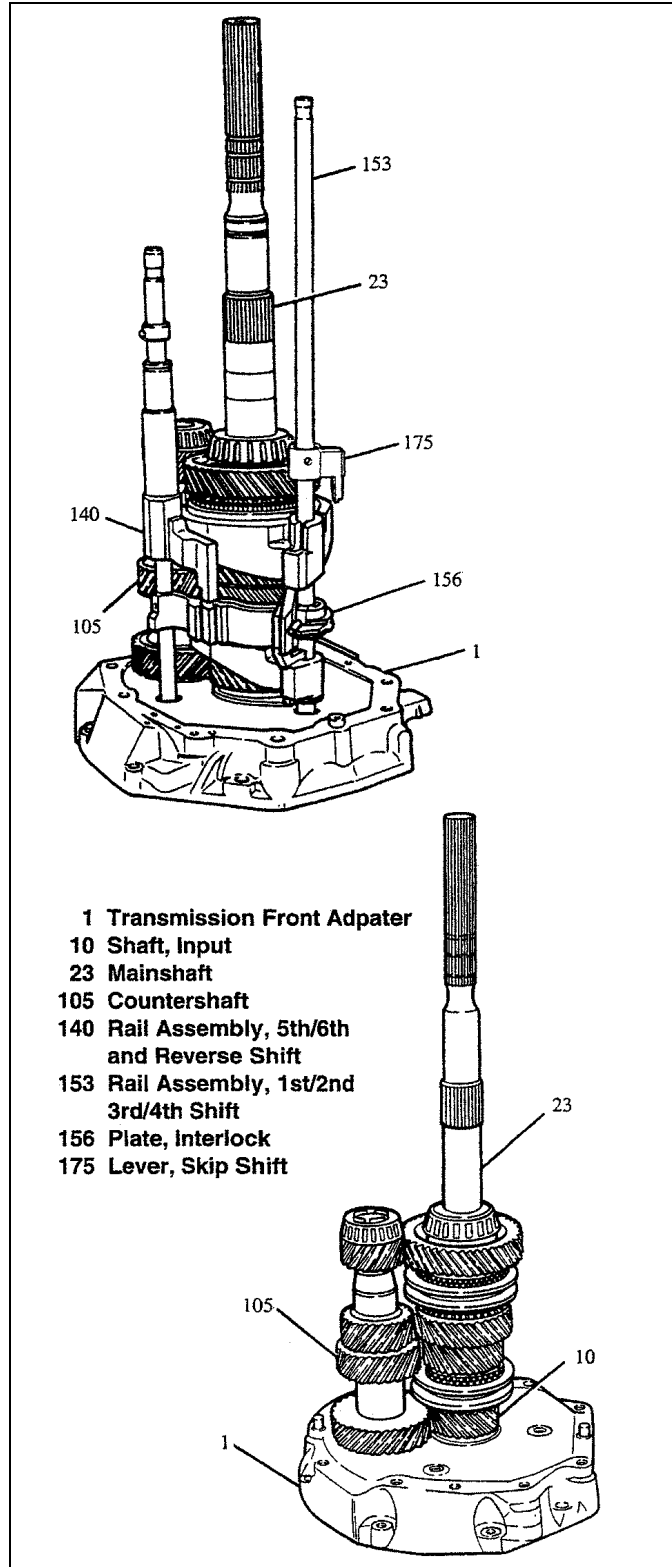


Figure 4-1. Shift Rail Assemblies and Gear Clusters

## 4-2. TRANSMISSION CASE

**4-2-1. INSTALL OR CONNECT.** Lubricate all components as assembly progresses. Use Transmission Assembly Lube.

- a. Sealant at transmission case to adapter plate mating surface
  - ◆ Assemble detent ball in offset lever.
- b. Transmission case (44) and front offset lever (51).

### Important

- ◆ Make sure transmission is in **NEUTRAL** to keep 3rd/4th shift rail from engaging.
- ◆ Compress front offset lever (51) together while sliding onto shift rail (149) to prevent spring release of inner components.
- ◆ Slide transmission case (44) onto gear clusters and shift rail components.

- a. Shift lever guide bolts (45 and 46).
  - ◆ Pull up 5th/6th and reverse shift rail assembly (140) enough to align the slot of the shift interlock plate (156) with guide bolt hole.
- a. Tighten.
  - ◆ Bolts (45 and 46) to 20 lb. Ft. (27 N.m).
- a. Adapter to transmission case bolts (178).
- b. Tighten.
  - ◆ Bolts (178) to 26 lb. Ft. (35 N.m).
- a. Front offset lever roll pin (50).

### Important

**Be sure that roll pin has been removed from offset lever before installing roll pin into hole.**

- b. Roll pin (182).
- c. Shift detent assembly (56).
- d. Tighten.
  1. Apply anaerobic thread locker Loctite #242 to threads of shift detent of shift detent assembly (56).
  2. Shift detent assembly (56) to 30 lb. ft. (40 N.m).
- a. Cover plate (48).
  - ◆ Apply sealant to mating surface of cover plate (48).
- a. Cover plate bolts (47).
- b. Tighten
  - ◆ Bolts (47) to 15 lb. Ft. (20 N.m).

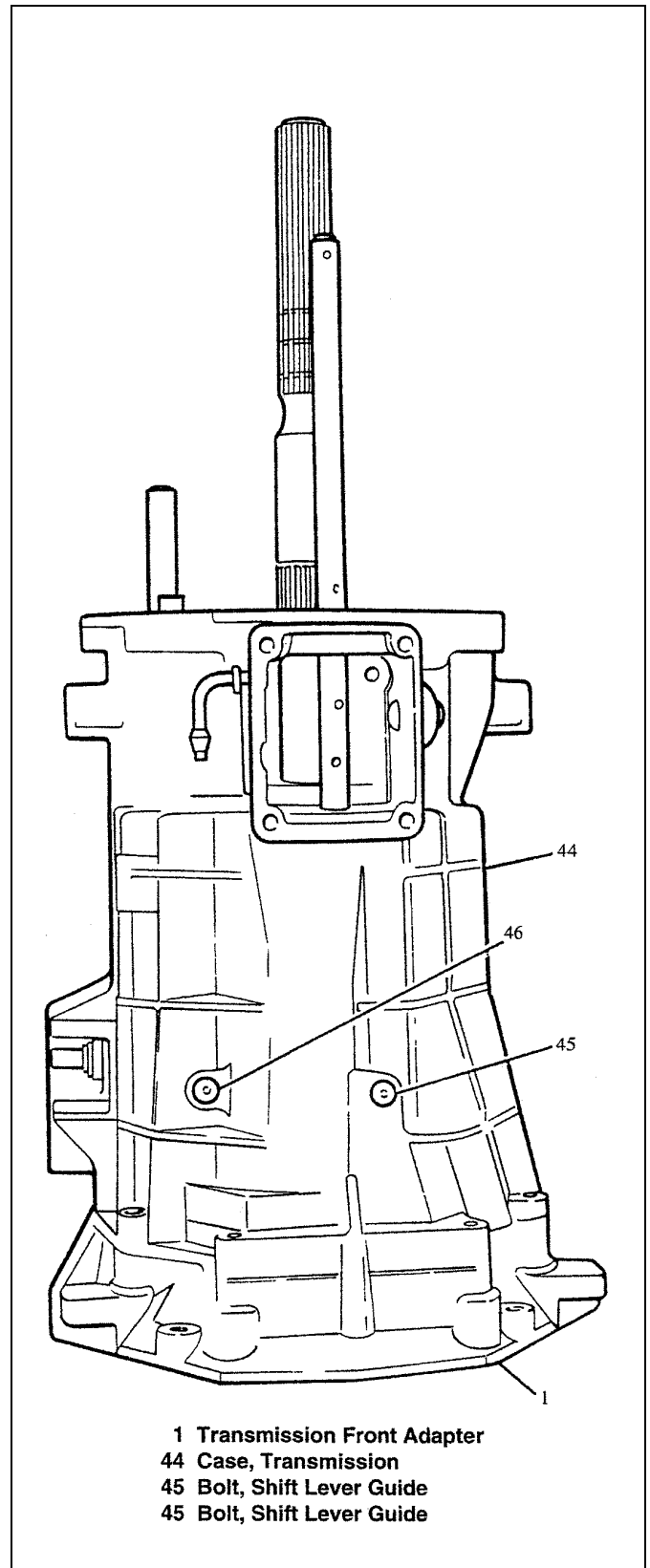


Figure 4-2. Transmission Case

### 4-3. COUNTERSHAFT EXTENSION ASSEMBLY

#### 4-3-1. INSTALL OR CONNECT

- a. Countershaft extension assembly and 5th/6th shift fork (122) with transmission in horizontal position.
  - ◆ Ensure splines of countershaft extension (128) engage splines of countershaft (105).
- a. 5th/6th shift fork snap ring (124).

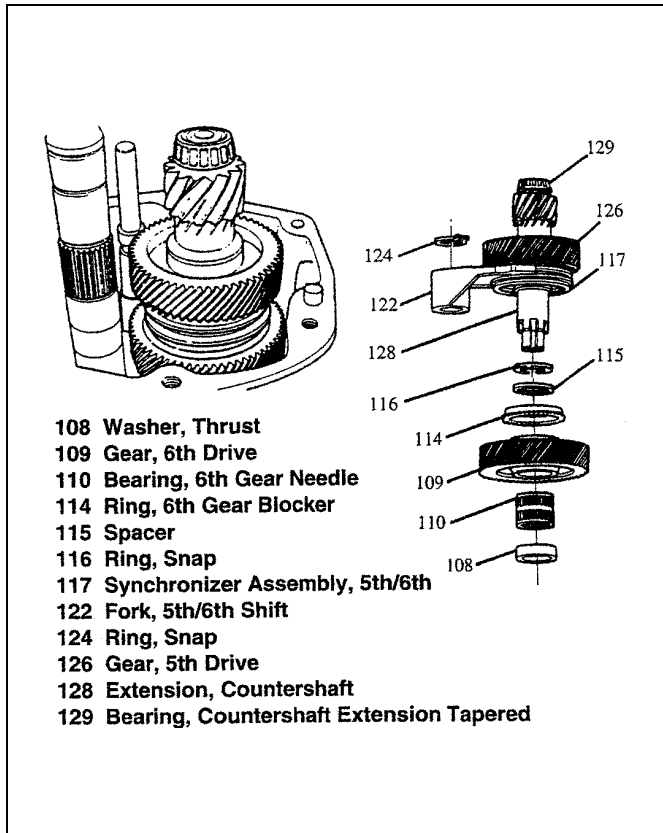


Figure 4-3. Countershaft Extension Assembly.

### 4-4. 5TH/6TH DRIVEN GEAR

#### 4-4-1. INSTALL OR CONNECT.

- ◆ 5th/6th driven gear (61).
  1. Smaller OD gear down.
  2. Engage splines of 5th/6th driven gear (61) to shaft splines (23) before pressing gear onto shaft.
  3. Rotate gear/shaft to align 6th gear teeth while installing 5/6 driven gear.

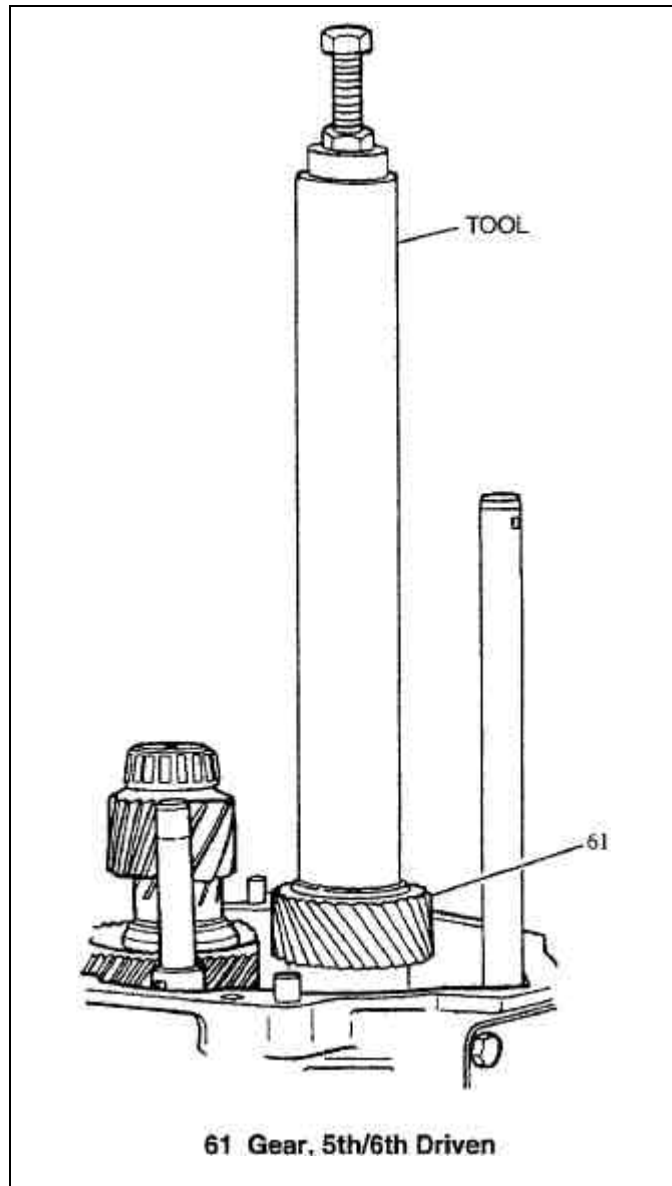


Figure 4-4. 5th/6th Driven Gear

### 4-5. REVERSE SHIFT FORK

#### 4-5-1. INSTALL OR CONNECT

- a. Reverse shift fork (111), synchronizer (62) and thrust washer (68) at the same time.
- b. New reverse shift fork snap ring (113).
- c. Reverse synchronizer snap ring (69).

### 4-6. REVERSE SPEED GEAR

#### 4-6-1. INSTALL OR CONNECT

- a. Blocker ring (70).
- b. Wave washer (71).
  - ◆ Install wave (71) so concave side faces blocker ring (70).
- c. Needle bearing (72).

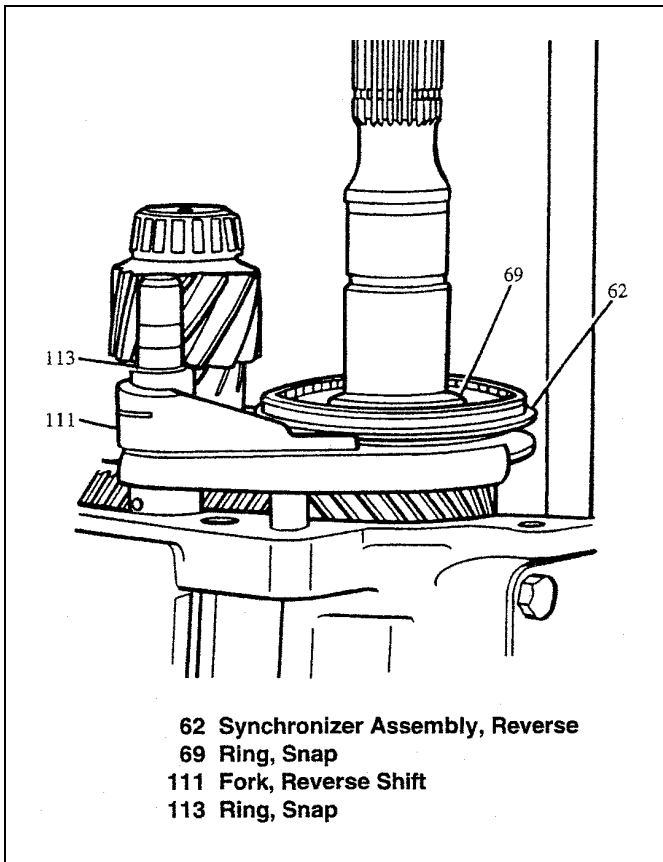


Figure 4-5. Reverse Shift Fork

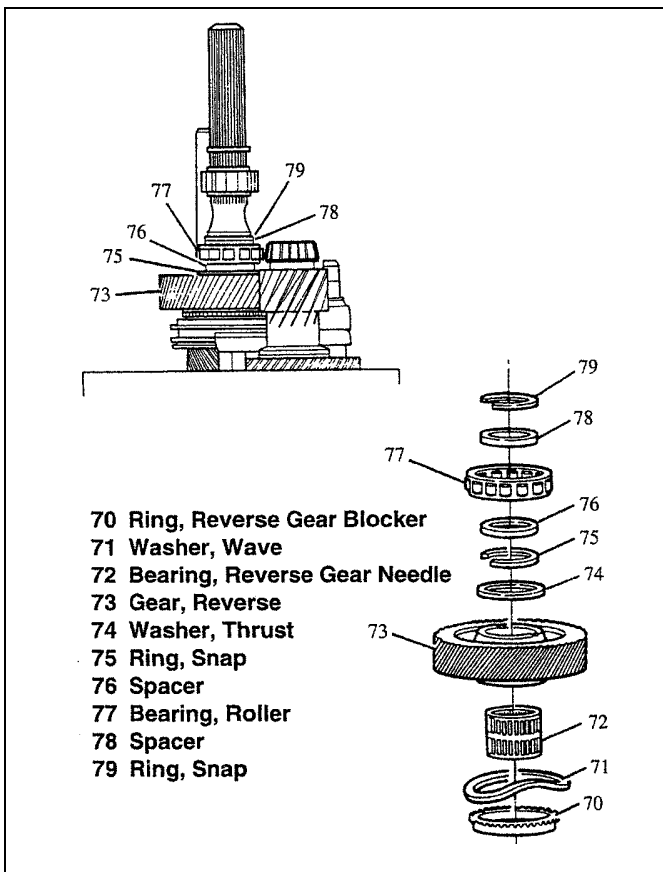


Figure 4-6. Reverse Speed Gear

- a. Reverse speed gear (73).
- b. Thrust washer (74).
- c. Snap ring (75).
- d. Spacer (76).
- e. Roller bearing (77).
- f. Spacer (78).
- g. Roller bearing snap ring (79).

#### 4-7. SPEEDOMETER GEAR/ROTOR

##### 4-7-1. INSTALL OR CONNECT

1. Speedometer gear snap ring (80).
2. Speedometer gear (81B) or rotor (81A).
3. Speedometer gear snap ring (82).
4. Sealing ring.

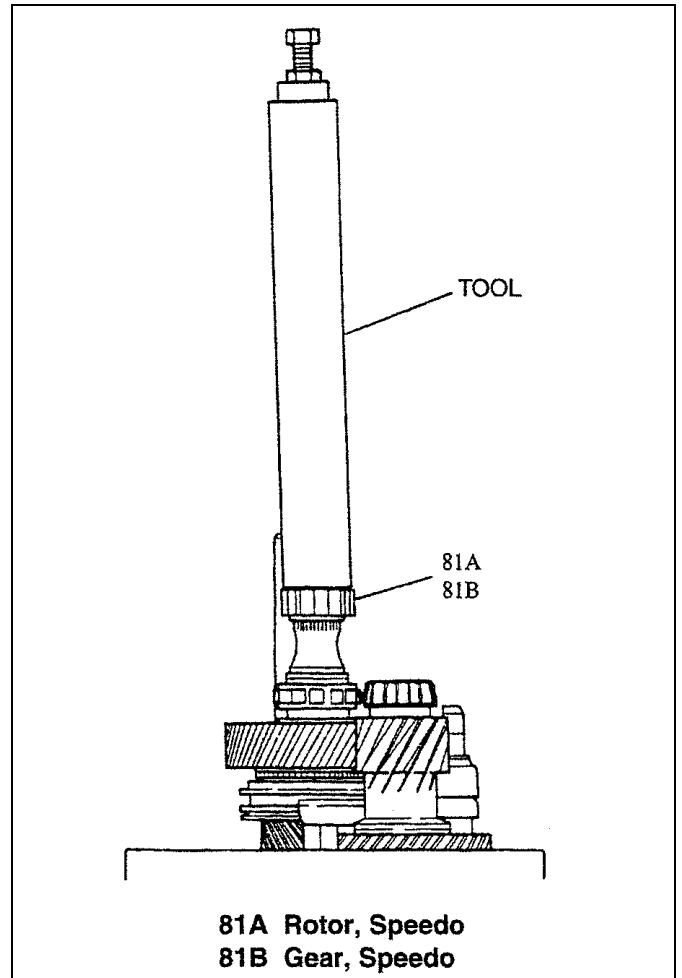


Figure 4-7. Speedometer Gear

#### 4-8. EXTENSION HOUSING

##### 4-8-1. INSTALL OR CONNECT

- a. Funnel (132).
- b. Selective shim (131). Refer to "Countershaft Extension" under "Shimming Procedures" in this section.
- c. Countershaft extension bearing race (130).



- a. Reverse idler shaft (138).
- b. Thrust washer (139).
- c. Roller bearing (137).
- d. Reverse idler gear (136).
- e. Reverse idler gear thrust washer (135).
- f. Reverse idler shaft bracket (134).
- g. Reverse idler shaft bracket bolts (133).

- ◆ Apply anaerobic sealant Loctite #242 to threads of bolts (133).

- a. Tighten
  - ◆ Bolts (133) to 18 lb. Ft. (25 N.m).
- b. Extension housing (86).
  1. Apply sealant at extension housing to transmission case mating surface.
  2. Align 5th/6th and reverse shift rail (140) with extension housing bore.
- a. Extension housing bolts (100) and transmission bumper (177). (If so equipped).
- b. Tighten
  1. Apply Teflon pipe thread sealant to threads of bolts retaining transmission bumper (2).
  2. Bolts (100) to 26 lb. Ft. (35 N.m).
- a. Rear offset shift lever (93) assembly.
- b. Rear offset shift lever roll pin (94).

#### 4-9. SHIFTER

##### 4-9-1. INSTALL OR CONNECT

- a. Shifter (96).
  - ◆ Apply sealant at extension housing to shifter mating surface.
- b. Bolts (97).
- c. Tighten
  - ◆ Bolts (97) to 15 lb. Ft. (20 N.m).

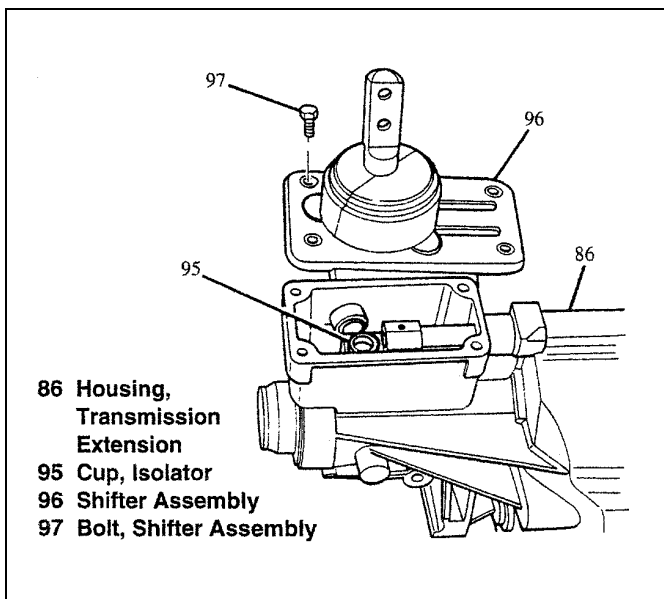


Figure 4-9. Shifter

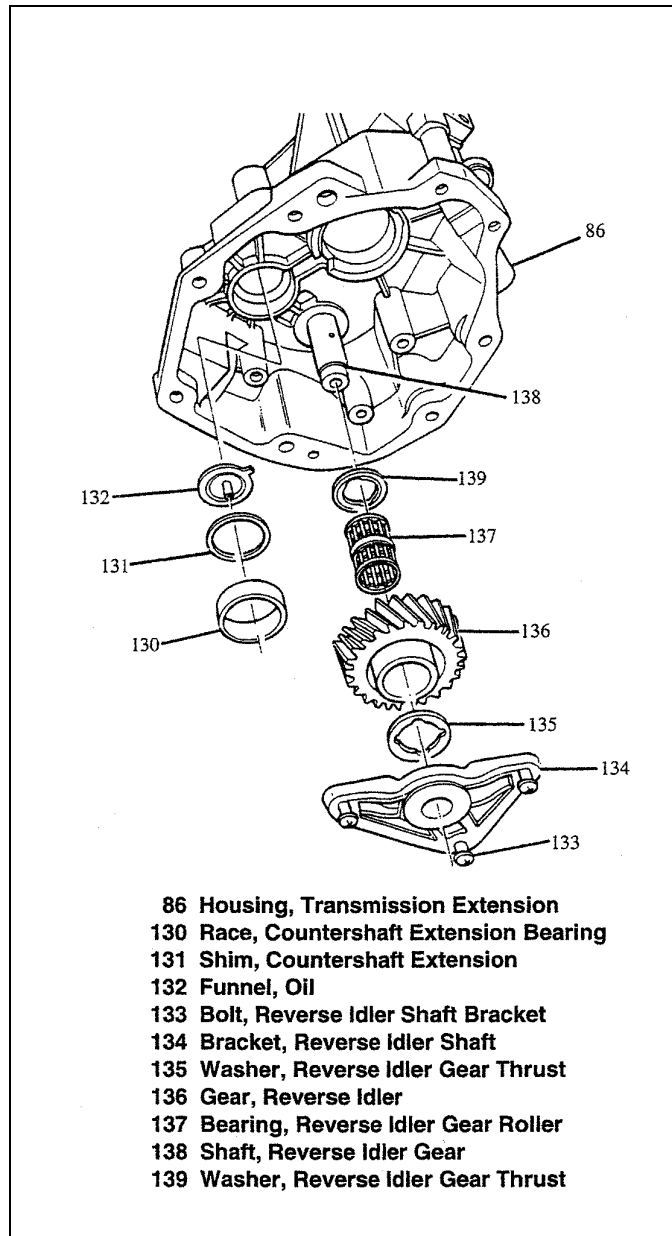


Figure 4-8. Extension Housing

## SECTION 5

# SHIMMIN PROCEDURES

### 5-1. INPUT SHAFT, MAINSHAFT AND COUNTERSHAFT

#### 5-1-1. TOOLS REQUIRED

- a. Dial Indicator Set
- b. Countershaft End Play Measuring Tool (Fig. 6-1)

#### 5-1-2. INSTALL OR CONNECT

- a. Position transmission in vertical position.
- b. Input shaft (10) to adapter (1).
- c. Mainshaft (23) to input shaft (10).
- d. Countershaft (105).
  1. Lift up mainshaft (23) enough to install countershaft (105).
  2. Install countershaft (105).
- a. Transmission case (44).
- b. Adapter to transmission case bolts (178).
- c. Tighten
  - ◆ Bolts (178) to 26 lb. Ft. (35 N.m.)
- d. Place tip of dial indicator on end of mainshaft (23).
- e. Measure
  1. Input shaft/mainshaft end play by moving input shaft (10) up and down.
  2. Select shim (6) to achieve 0.000 to 0.002 in. (0.00 to 0.05 mm) end play.
- a. Place tip of dial indicator on end of countershaft (105).
- b. Place end play measuring tool through adapter plate plug hole to engage threads in countershaft extension and tighten to eliminate any free play in counter shaft joint.
- c. Measure
  1. Countershaft end play moving countershaft (105) up and down.
  2. Select shim (102) to achieve 0.000 to 0.002 in. (0.00 to 0.05 mm) preload.

#### 5-1-3. REMOVE OR DISCONNECT

- a. Adapter to transmission case bolts (167).
- b. Transmission case (44).
- c. Countershaft (105).
  1. Lift up mainshaft (23) enough to remove countershaft (105).
  2. Remove countershaft (105).
- a. Mainshaft (23).
- b. Input shaft (10) from adapter (1).
- c. Input shaft bearing race (8).
- d. Countershaft bearing race (103).

### 5-2. COUNTERSHAFT EXTENSION

#### 5-2-1. TOOLS REQUIRED

- a. Dial Indicator Set
- b. Countershaft Extension End Play Measuring Rod

#### 5-2-2. INSTALL OR CONNECT

##### Important

**This 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.**

- a. Position transmission in horizontal position.
- b. Countershaft extension (128) to countershaft (105) making sure splines fully engage.
- c. Extension housing (86).
- d. Extension housing bolts (110).
- e. Tighten.
  - ◆ Bolts (100) to 26 lb. ft. (35 N.m).
- a. End play tool through adapter plate plug hole and screw into countershaft extension. Do not tighten. There must be free play in countershaft joint.
- b. Dial indicator so tip is on end of end play tool.
- c. Measure
  1. Position transmission in vertical position.
  2. Countershaft extension end play moving countershaft extension (128) up and down.
  3. Select shim (131) to achieve 0.002 to 0.005 in. (0.05 to 0.13 mm) end play.
- a. Install adapter plug (2)
  - ◆ Apply Teflon pipe thread to plug threads (2).
- b. Tighten
  - ◆ Plug (2) to 20 lb. ft. (27 N.m).

#### 5-2-3. REMOVE OR DISCONNECT

- a. Extension housing bolts (100).
- b. Extension housing (86).
- c. Countershaft extension (128).
- d. Countershaft extension bearing race (130).

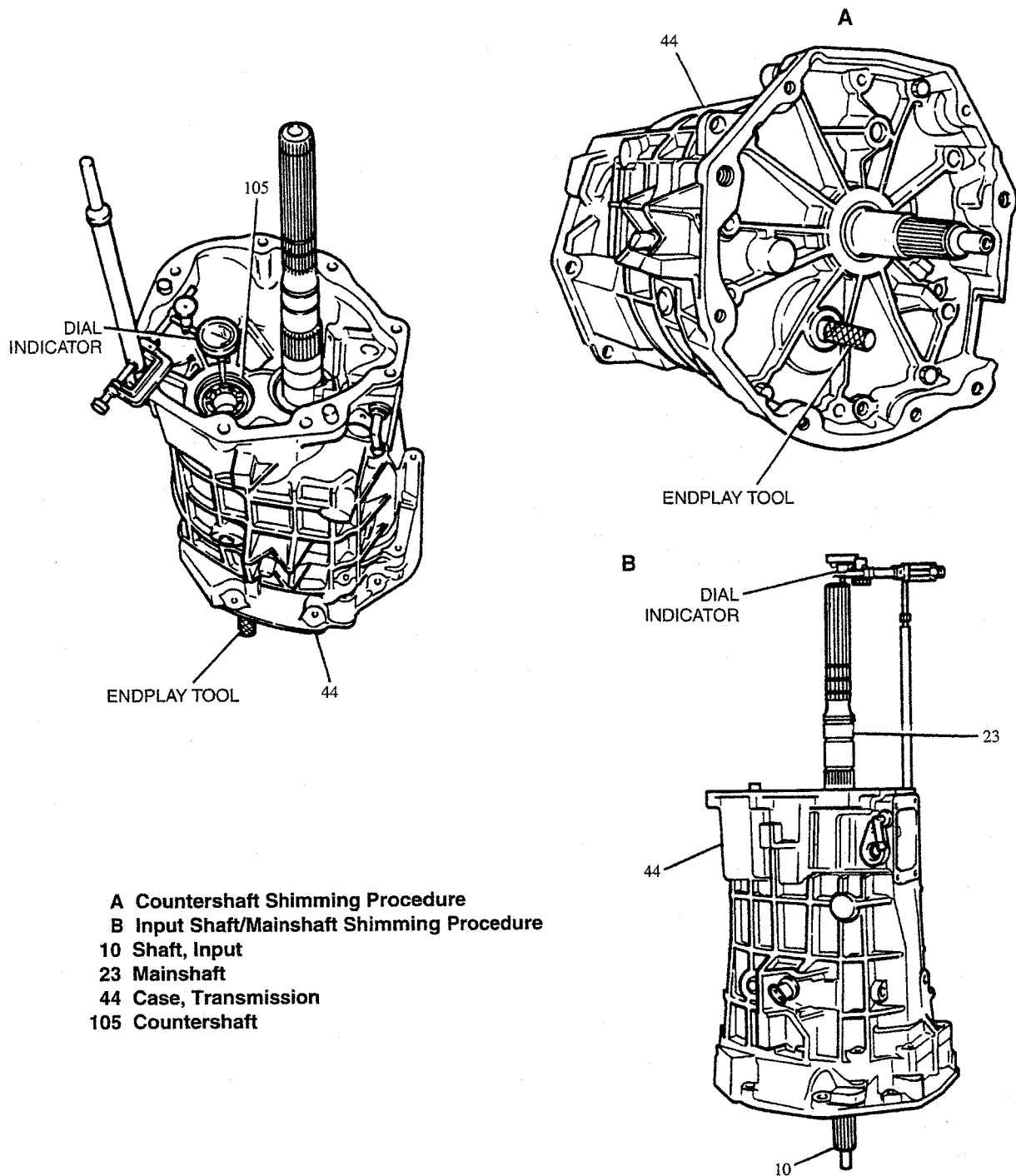


Figure 5-1. Input Shaft, Mainshaft and Countershaft Shimming Procedure

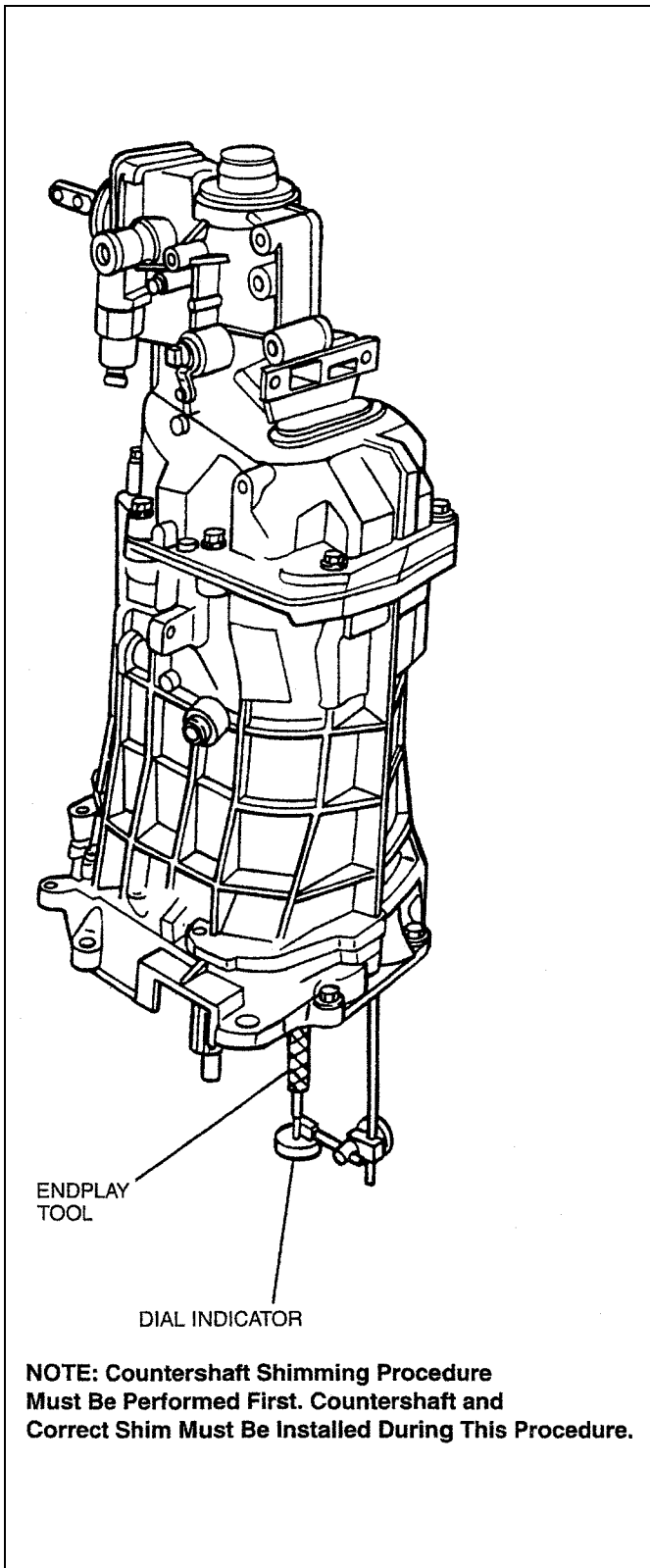


Figure 5-2. Countershaft Extension Shimming Procedure

## SECTION 6 SPECIFICATIONS

### 6-1. FASTENER TIGHTENING SPECIFICATIONS

No.*	DESCRIPTION	TORQUE
2	Adapter Plug	20 lb. ft. (27 N.m)
178	Adapter to Transmission Case Bolts	26 lb. ft. (35 N.m)
59	Backup Lamp Switch	20 lb. ft. (27 N.m)
166	Clutch Fork Bolt	18 lb. ft. (25 N.m) w/ Loctite 242
163	Clutch Housing to Adapter Bolt	26 lb. ft. (35 N.m)
48	Cover Plate Bolts	15 lb. ft. (20 N.m)
101	Extension Housing Plug	20 lb. ft. (27 N.m)
100	Extension Housing to Transmission Case Bolts	26 lb. ft. (35 N.m)
133	Reverse Idler Shaft Bracket Bolts	18 lb. ft. (25 N.m) w/ Loctite 242
90	Reverse Lockout Assembly Bolt	13 lb. ft. (18 N.m)
89, 181	Reverse Lockout Solenoid, Skip Shift Solenoid	30 lb. ft. (40 N.m)
97	Shifter Bolts	15 lb. ft. (27 N.m)
56	Shift Detent Assembly	30 lb. ft. (40 N.m)
45, 46	Shift Lever Guide Bolts	20 lb. ft. (27 N.m)
54	Shift Guide Plate Bolts	16 lb. ft. (22 N.m)
60	Transmission Case Fill Plug	20 lb. ft. (27 N.m)
88	Vehicle Speed Sensor Bolt	7.5 lb. ft. (10 N.m)

\* Disassembled Parts Illustration, Figure 2-3

### 6-2. SHIMMING SPECIFICATIONS

SHIM No. *	DESCRIPTION	SHIM TO ATTAIN
7	Input Shaft/Mainshaft Shim	Endplay of 0.000-0.002 inch (0.0 to 0.05 mm).
102	Countershaft Shim	Preload of 0.000-0.002 inch (0.0 to 0.05 mm)
131	Countershaft Extension Shim	Endplay of 0.002-0.00 inch (0.05 to 0.13 mm).

\* Disassembled Parts Illustration, Figure 2-3

### 6-3. LUBRICANT SPECIFICATIONS

Lube Capacity (Approximately).....4.1 Quarts (or 130 oz.)  
After refill, fluid level must be checked as outlined under Checking Lubricant Lever in Section 1-1-4.  
Recommended Lube .....Dexron®-III, IIE

### 6-4. ENDPLAY TOOL SPECIFICATIONS

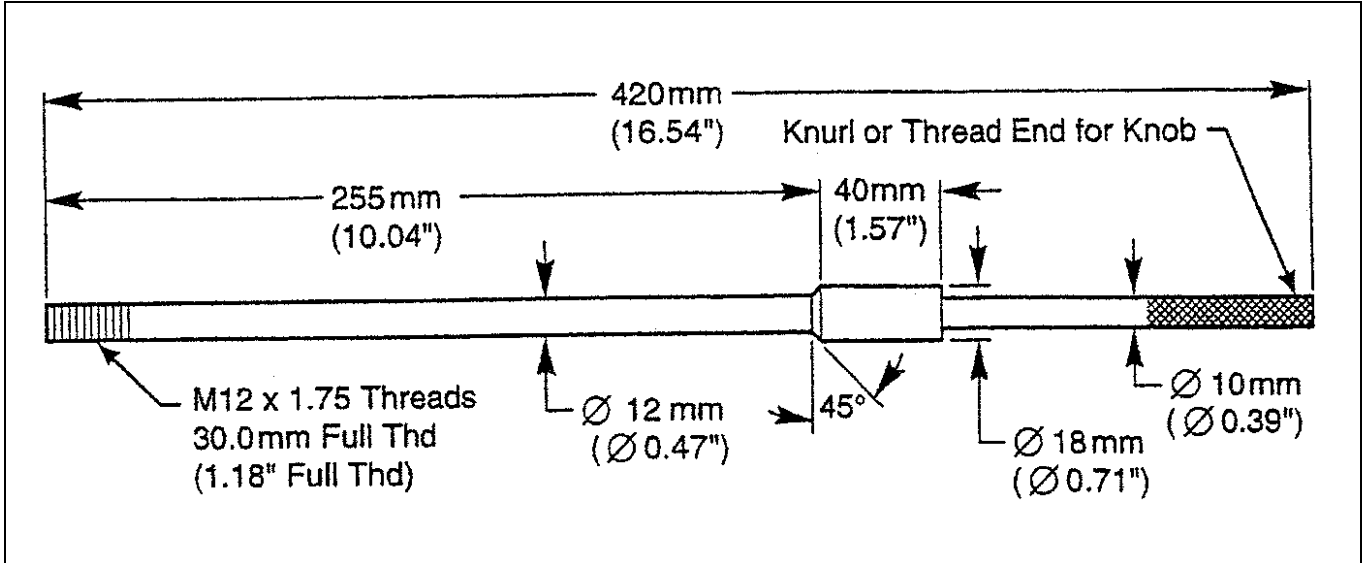


Figure 6-1. Endplay Tool

