**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.
# T56 On-Vehicle Service and Troubleshooting

1-1 Maintenance ................................................................. 1-1  
1-2 Troubleshooting ........................................................... 1-1  
1-3 Transmission Removal .................................................. 1-4  
1-4 Transmission Installation ............................................... 1-5  

# T56 Transmission Disassembly Procedures

2-1 Shifter ............................................................................... 2-1  
2-2 Extension Housing ......................................................... 2-1  
2-3 Speedometer Gear/Rotor .................................................. 2-5  
2-4 Reverse Speed Gear ........................................................ 2-5  
2-5 Reverse Shift Fork .......................................................... 2-6  
2-6 5th/6th Driven Gear ....................................................... 2-6  
2-7 Countershaft Extension Assembly .................................... 2-7  
2-8 Transmission Case .......................................................... 2-7  
2-9 Guide Plate ...................................................................... 2-8  
2-10 Shift Rail Assemblies and Gear Clusters ......................... 2-8  

# T56 Subassembly Cleaning, Inspection, Repair or Replacement

3-1 Cleaning .......................................................................... 3-1  
3-2 Inspection ........................................................................ 3-1  
3-3 Repair or Replacement .................................................... 3-5  
3-4 Input Shaft ....................................................................... 3-6  
3-5 Mainshaft ........................................................................ 3-7  
3-6 Countershaft ..................................................................... 3-9  
3-7 Countershaft Extension Assembly .................................... 3-10  
3-8 Synchronizers .................................................................. 3-12  
3-9 Shift Rail and Fork Assemblies ........................................ 3-14  
3-10 Transmission Front Adapter .......................................... 3-16  
3-11 Transmission Case .......................................................... 3-17  
3-12 Extension Housing .......................................................... 3-18  

# T56 Transmission Assembly Procedures

4-1 Shift Rail Assemblies and Gear Clusters .......................... 4-1  
4-2 Transmission Case ........................................................... 4-2  
4-3 Countershaft Extension Assembly ................................... 4-3  
4-4 5th/6th Driven Gear ......................................................... 4-3  
4-5 Reverse Shift Fork ........................................................... 4-3  
4-6 Reverse Speed Gear .......................................................... 4-3  
4-7 Speedometer Gear/Rotor .................................................. 4-4  
4-8 Extension Housing ............................................................ 4-4  
4-9 Shifter ............................................................................ 4-5  

# Shimmin Procedures

5-1 Input Shaft, Mainshaft and Countershaft .......................... 5-1  
5-2 Countershaft Extension ................................................... 5-1  

# Specification

6-1 Fastener Tightening Specification ..................................... 6-1  
6-2 Shiming Specifications ..................................................... 6-1  
6-3 Lubricant Specifications ................................................... 6-1  
6-4 Endplay Tool Specifications ............................................ 6-2
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.


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.

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

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

a. Wipe drain and fill plugs (1 and 2) and surrounding areas clean.
b. Place suitable container under transmission
c. Remove drain plug (1).
d. Remove fill plug (2).
e. Allow all lubricant to drain.
f. Install drain plug (1) and torque to 20 lb. ft. (27 N.m).
g. 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.
h. 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>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will not shift (control lever Moves)</td>
<td>Control lever assy broken or damaged</td>
<td>Replace control lever and housing assy</td>
</tr>
<tr>
<td></td>
<td>Damaged offset lever, shift plate, or selector arm, loose rail bushings. Broken roll pins in offset levers of selector arm.</td>
<td>Remove extension or adapter and case cover. Check for damaged parts. Replace damaged parts.</td>
</tr>
<tr>
<td>Hard shift or control lever will not move into gear</td>
<td>Clutch not releasing</td>
<td>Adjust or replace clutch</td>
</tr>
<tr>
<td></td>
<td>Improper or low transmission lubricant</td>
<td>Add or drain and replace with proper lubricant (refer to paragraph 1-1-3)</td>
</tr>
<tr>
<td></td>
<td>Shifter rail binding</td>
<td>Remove extension or adapter and case cover. Check for damaged parts. Replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>Binding of sliding synchronizers or gears</td>
<td>Remove extension and case to check that synchronizers and gears slide freely on shafts. Remove and replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>If reverse only, seized backup switch</td>
<td>Remove and check backup switch. Replace if seized</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged flywheel pilot bushing</td>
<td>Replace pilot bushing</td>
</tr>
<tr>
<td></td>
<td>Bell housing misaligned</td>
<td>Align bell housing to within 0.010 inch TIR on face and in bore</td>
</tr>
<tr>
<td></td>
<td>Skip shift solenoid activated (plunger extended)</td>
<td>Check solenoid function-replace</td>
</tr>
<tr>
<td>Gears clash when shifting</td>
<td>Engine idle speed too high</td>
<td>Adjust idle speed to specifications</td>
</tr>
<tr>
<td></td>
<td>Clutch damaged or out of adjustment</td>
<td>Adjust or replace clutch</td>
</tr>
<tr>
<td></td>
<td>Bent shift forks or worn fork pads</td>
<td>Disassemble and check. Replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>Damaged synchronizer</td>
<td>Disassemble and check for damaged synchronizer parts. Replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>Pilot bearing between input shaft and output shaft binding</td>
<td>Disassemble and check bearing rollers, input shaft ID and output shaft OD. Replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>Bell housing misaligned</td>
<td>Align bell housing to within 0.010 inch TIR on face and in bore</td>
</tr>
<tr>
<td></td>
<td>Damaged gears</td>
<td>Disassemble and check for gear damage. Replace damaged gears</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged flywheel pilot bushing</td>
<td>Replace pilot bushing</td>
</tr>
<tr>
<td>Transmission jumps out of gear</td>
<td>Synchronizer damaged or excessively worn</td>
<td>Disassemble and check for worn or damaged synchronizer parts. Replace damaged parts.</td>
</tr>
<tr>
<td></td>
<td>Blocking ring damaged, worn index slots or friction surfaces worn or damaged</td>
<td>Disassemble and check blocking ring for wear or damage. Replace worn or damaged parts</td>
</tr>
<tr>
<td></td>
<td>Excessive countershaft end play</td>
<td>Disassemble and check. Replace worn or damaged parts. Reshim if necessary</td>
</tr>
<tr>
<td></td>
<td>Shifting fork loose on shift rail; worn or damaged fork or fork pads</td>
<td>Disassemble and check for wear or damage. Replace worn or damaged parts</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>REMEDY</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Transmission locked in one gear</strong></td>
<td>Fork or offset lever loose on shift rail</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged forks, offset lever, shift rail, broken roll pins in offset levers.</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged synchronizer</td>
<td>Disassemble and check for worn or damaged synchronizer parts. Replace worn or damaged parts</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged gears</td>
<td>Disassemble and check for worn or damaged gears. Replace worn or damaged gears.</td>
</tr>
<tr>
<td><strong>Transmission noise</strong></td>
<td>Improper or low transmission lubricant</td>
<td>Add or drain and replace with proper lubricant</td>
</tr>
<tr>
<td></td>
<td>Loose bolts or other attaching parts</td>
<td>Make sure all attaching parts are torqued to specifications</td>
</tr>
<tr>
<td></td>
<td>Improper flywheel housing to engine crankshaft alignment</td>
<td>Check alignment and correct if necessary per vehicle service manual</td>
</tr>
<tr>
<td></td>
<td>Noisy transmission bearings</td>
<td>Disassemble and check bearings, bearing rollers and parts in which they operate for wear or damage. Replace worn or damaged parts</td>
</tr>
<tr>
<td></td>
<td>Noisy gears</td>
<td>Disassemble and check for worn or damaged gears (including speedometer gear). Replace worn or damaged gears</td>
</tr>
<tr>
<td><strong>Transmission leakage</strong></td>
<td>Leakage from other components</td>
<td>Verify transmission leakage. Thoroughly clean all exposed surfaces, then check for leaks</td>
</tr>
<tr>
<td></td>
<td>Vent or breather clogged</td>
<td>Remove vent tube and clean or replace</td>
</tr>
<tr>
<td></td>
<td>Too much or improper lubricant</td>
<td>Remove fill plug to check for excess, or drain an replace</td>
</tr>
<tr>
<td></td>
<td>Loose bolts at sealing faces</td>
<td>Torque bolts to specifications</td>
</tr>
<tr>
<td></td>
<td>Improperly applied sealant</td>
<td>Separate and thoroughly clean leaking surfaces. Reapply sealant. Replace parts and torque bolts to specifications</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged oil seal</td>
<td>Replace oil seal</td>
</tr>
<tr>
<td></td>
<td>Shifter base loose</td>
<td>Replace shifter assembly</td>
</tr>
<tr>
<td><strong>High effort shift from 5/6 gate to reverse gate</strong></td>
<td>Reverse lockout assembly or solenoid malfunction.</td>
<td>Check lockout assembly function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check solenoid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace parts as required</td>
</tr>
<tr>
<td><strong>Jump out of gear (Reverse)</strong></td>
<td>Reverse lockout assembly or solenoid malfunction</td>
<td>Check lockout assembly function</td>
</tr>
<tr>
<td></td>
<td>High side effort on 4 to 5 shift overriding reverse lockout assembly allowing high speed shift attempt into reverse gate.</td>
<td>Disassemble transmission and replace reverse gear/synchronizer assembly damaged parts</td>
</tr>
</tbody>
</table>
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.

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.

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.

- 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.
SECTION 2
T56 TRANSMISSION DISASSEMBLY PROCEDURES

2-1. SHIFTER

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.

2-2. EXTENSION HOUSING

2-2-1. REMOVE

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

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 2-1. Shifter

Figure 2-2. Extension Housing
Figure 2-3. T56 Transmission Disassembled View
### Legend for T56 Six-Speed Manual Transmission, Figure 2-3

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Transmission Front Adapter (GM) 58 Pin, Dowel</td>
</tr>
<tr>
<td>1B</td>
<td>Transmission Front Adapter (Ford A/M) 59 Switch, Back-up Lamp</td>
</tr>
<tr>
<td>1C</td>
<td>Transmission Front Adapter (Viper) 60 Plug, Fill</td>
</tr>
<tr>
<td>1D</td>
<td>Transmission Adapter Plate Assembly (GM A/M) 61 Gear, 5th/6th Driven</td>
</tr>
<tr>
<td>2</td>
<td>Plug 62 Synchronizer Assembly, Reverse</td>
</tr>
<tr>
<td>3</td>
<td>Pin, Dowel 63 Spring, Reverse Synchronizer</td>
</tr>
<tr>
<td>4</td>
<td>Pin, Dowel 64 Key, Reverse Synchronizer</td>
</tr>
<tr>
<td>5</td>
<td>Bushing, Shift Rail 65 Hub, Reverse Synchronizer</td>
</tr>
<tr>
<td>6</td>
<td>Seal, Input Shaft 66 Sleeve, Reverse Synchronizer</td>
</tr>
<tr>
<td>7</td>
<td>Shim, Input Shaft 67 Retainer, Reverse Synchronizer key</td>
</tr>
<tr>
<td>8</td>
<td>Race, Input Shaft Bearing 68 Washer, Thrust</td>
</tr>
<tr>
<td>9</td>
<td>Bearing, Input Shaft Tapered 69 Ring, Snap</td>
</tr>
<tr>
<td>10</td>
<td>Shaft, Input 70 Ring, Reverse Gear Blocker</td>
</tr>
<tr>
<td>11</td>
<td>Race, Input Shaft Bearing 71 Washer, Wave</td>
</tr>
<tr>
<td>12</td>
<td>Ring, 4th Gear Blocker 72 Bearing, Reverse Gear Needle</td>
</tr>
<tr>
<td>13</td>
<td>Ring, snap 73 Gear, Reverse</td>
</tr>
<tr>
<td>14</td>
<td>Synchronizer Assembly, 3rd/4th 74 Washer, Thrust</td>
</tr>
<tr>
<td>15</td>
<td>Spring, 3rd/4th synchronizer 75 Ring, snap</td>
</tr>
<tr>
<td>16</td>
<td>Key, 3rd/4th Synchronizer 76 Spacer</td>
</tr>
<tr>
<td>17</td>
<td>Hub, 3rd/4th Synchronizer 77 Bearing, Rear Mainshaft</td>
</tr>
<tr>
<td>18</td>
<td>Sleeve, 3rd/4th Synchronizer 78 Spacer</td>
</tr>
<tr>
<td>19</td>
<td>Ring, 3rd Gear Blocker 79 Ring, Snap</td>
</tr>
<tr>
<td>20</td>
<td>Gear, 3rd Speed 80 Ring, snap</td>
</tr>
<tr>
<td>21</td>
<td>Bearing, 3rd Gear Needle 81 Rotor, Speedo</td>
</tr>
<tr>
<td>22</td>
<td>Bearing, Mainshaft Small Tapered 82 Gear, Speedo</td>
</tr>
<tr>
<td>23</td>
<td>Mainshaft 83 Ring, Snap</td>
</tr>
<tr>
<td>24</td>
<td>Bearing, 2nd Gear Needle 84 Ring, Snap</td>
</tr>
<tr>
<td>25</td>
<td>Gear, 2nd Speed 85 Race, Mainshaft Bearing</td>
</tr>
<tr>
<td>26</td>
<td>Washer, Thrust 86 Housing, Transmission Extension</td>
</tr>
<tr>
<td>27</td>
<td>Cone, Inner 87 Sensor, Electronic Speed</td>
</tr>
<tr>
<td>28</td>
<td>Cone, Friction 88 Bolt, Speed Sensor</td>
</tr>
<tr>
<td>29</td>
<td>Ring, 2nd Gear Blocker 89 Solenoid, Reverse Lockout</td>
</tr>
<tr>
<td>30</td>
<td>Synchronizer Assembly, 1st/2nd 90 Bolt, Reverse Lockout Assembly</td>
</tr>
<tr>
<td>31</td>
<td>Spring, 1st/2nd Synchronizer 91 Reverse Lockout Assembly</td>
</tr>
<tr>
<td>32</td>
<td>Key, 1st/2nd Synchronizer 92 Bushing, Shift Rail</td>
</tr>
<tr>
<td>33</td>
<td>Hub, 1st/2nd Synchronizer 93 Lever, Rear Offset</td>
</tr>
<tr>
<td>34</td>
<td>Sleeve, 1st/2nd Synchronizer 94 Pin, Rear Offset Lever Roll</td>
</tr>
<tr>
<td>35</td>
<td>Ring, 1st Gear Blocker 95 Cup, Isolator</td>
</tr>
<tr>
<td>36</td>
<td>Cone, Friction 96 Shifter Assembly</td>
</tr>
<tr>
<td>37</td>
<td>Cone, Inner 97 Bolt, Shifter Assembly</td>
</tr>
<tr>
<td>38</td>
<td>Washer, Thrust 98 Boot, Shifter</td>
</tr>
<tr>
<td>39</td>
<td>Ring, Snap 99 Seal and Boot, Rear Output</td>
</tr>
<tr>
<td>40</td>
<td>Bearing, 1st Gear Needle 100 Bolt, Transmission Extension Housing</td>
</tr>
<tr>
<td>41</td>
<td>Gear, 1st Speed 101 Plug, Drain</td>
</tr>
<tr>
<td>42</td>
<td>Bearing, Mainshaft Large Tapered 102 Shim, Countershaft</td>
</tr>
<tr>
<td>43</td>
<td>Race, Mainshaft Bearing 103 Race, Countershaft Bearing</td>
</tr>
<tr>
<td>44</td>
<td>Case, Transmission 104 Bearing Countershaft Tapered</td>
</tr>
<tr>
<td>45</td>
<td>Bolt, Shift Lever Guide 105 Countershaft</td>
</tr>
<tr>
<td>46</td>
<td>Bolt, Shift Lever Guide 106 Bearing, Countershaft Tapered</td>
</tr>
<tr>
<td>47</td>
<td>Bolt, Shift Detent Cover 107 Race, Countershaft Bearing</td>
</tr>
<tr>
<td>48</td>
<td>Cover, Shift Detent 108 Washer, Thrust</td>
</tr>
<tr>
<td>49</td>
<td>Bushing, Shift Rail 109 Gear, 6th Drive</td>
</tr>
<tr>
<td>50</td>
<td>Pin, Front Offset Lever Roll 110 Bearing, 6th Gear Needle</td>
</tr>
<tr>
<td>51</td>
<td>Lever, Front Offset 111 Fork, Reverse Shift</td>
</tr>
<tr>
<td>52</td>
<td>Spring, Shift Detent 112 Pad, Reverse Shift Fork</td>
</tr>
<tr>
<td>53</td>
<td>Ball, Shift Detent 113 Ring, Snap</td>
</tr>
<tr>
<td>54</td>
<td>Bolt, Shift Guide plate 114 Ring, 6th Gear Blocker</td>
</tr>
<tr>
<td>55</td>
<td>Plate, Shift Guide 115 Spacer</td>
</tr>
<tr>
<td>56</td>
<td>Detent Assembly, Shift 116 Ring, Snap</td>
</tr>
<tr>
<td>57</td>
<td>Magnet 117 Synchronizer Assembly, 5th/6th</td>
</tr>
</tbody>
</table>

2-4
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.

da. Speedometer gear snap ring (80).

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.
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.

---

2-6. 5TH/6TH DRIVEN GEAR

2-6-1. REMOVE OR DISCONNECT

♦ 5th/6th driven gear (61).

---

![Figure 2-6. Reverse Shift Fork](image)

![Figure 2-7. 5th/6th Driven Gear](image)
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).

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 2-8. Countershaft Extension Assembly](image)

![Figure 2-9. Shift Detent Assembly](image)
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).

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

1 Transmission Front Adapter
10 Shaft, Input
23 Mainshaft
105 Countershaft
140 Rail Assembly, 5th/6th and Reverse Shift
153 Rail Assembly, 1st/2nd 3rd/4th Shift
156 Plate, Interlock
175 Lever, Skip Shift
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
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.

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.

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.

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>
<thead>
<tr>
<th>PART</th>
<th>INSPECTION</th>
<th>ACCEPT/REJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All parts (including all spring)</td>
<td>Check for cracks</td>
<td>Replace parts with cracks</td>
</tr>
<tr>
<td></td>
<td>Check for distortion</td>
<td>Replace parts that are bent, distorted or out of round</td>
</tr>
<tr>
<td>All threaded parts</td>
<td>Check for stripped, crossed or otherwise damaged threads</td>
<td>Replace parts with threads that cannot be cleaned up using a suitable tap or die</td>
</tr>
<tr>
<td>Transmission case, front adapter, extension</td>
<td>Check mating faces for burrs or other damage that would prevent proper seating of mating faces</td>
<td>Remove small burrs per paragraph 3-3-2. Otherwise replace damaged parts</td>
</tr>
<tr>
<td>Control lever and housing assy</td>
<td>Check for smooth operation without excessive end or side play</td>
<td>Replace assy if control lever binds or operates with excessive play in housing</td>
</tr>
<tr>
<td>Control lever and housing assy and rear offset lever with isolator cup</td>
<td>Check mating operating surfaces for scoring or excessive wear. Check isolator cup for looseness</td>
<td>Replace parts/assemblies that are excessively worn or damaged or if isolator cup is loose</td>
</tr>
<tr>
<td>Extension, Bushing assy</td>
<td>Check bushing ID for scoring or other damage</td>
<td>Replace assy if bushing is damaged</td>
</tr>
<tr>
<td>Guide plate</td>
<td>Check detent guide plate (18) for scoring, excessively worn grooves or other damage</td>
<td>Replace assy if detent guide plate damaged or excessively worn</td>
</tr>
<tr>
<td>Ball</td>
<td>Check for grooves or flat spots</td>
<td>Replace damaged ball</td>
</tr>
<tr>
<td>Shift rail assy</td>
<td>Check for distortion</td>
<td>Replace bent parts</td>
</tr>
<tr>
<td></td>
<td>Check for grooves, burrs or other damage</td>
<td>Remove small burrs per paragraph 3-3-2. Otherwise replace damaged parts</td>
</tr>
<tr>
<td></td>
<td>Check OD for wear</td>
<td>Replace if step wear found</td>
</tr>
<tr>
<td>Shift forks</td>
<td>Check for scored or worn bore for rail</td>
<td>Replace damaged forks</td>
</tr>
<tr>
<td></td>
<td>Chipped or broken tabs for inserts</td>
<td>Replace damaged forks</td>
</tr>
<tr>
<td>Inserts</td>
<td>Check for wear</td>
<td>Replace if step wear or grooves found</td>
</tr>
<tr>
<td>Selector arm assy interlock and selector plates</td>
<td>Check for wear or scoring</td>
<td>Replace if scoring, worn edges or step wear found</td>
</tr>
<tr>
<td>Synchronizer sleeves and hubs</td>
<td>Engage sleeve with mating hub, aligning index marks. Check that parts slide freely but without rotational play</td>
<td>Replace complete synchronizer assembly if there is binding or rotational play Paragraph 3-2-2</td>
</tr>
<tr>
<td>Synchronizer sleeves</td>
<td>Check for grooves for wear or damage</td>
<td>Replace complete synchronizer assembly if step wear or scoring found</td>
</tr>
<tr>
<td>Synchronizer hubs</td>
<td>Check splines per paragraph 3-2-3</td>
<td>Paragraph 3-2-3</td>
</tr>
<tr>
<td></td>
<td>Check insert grooves for burrs, step wear or damage</td>
<td>Remove small burrs per paragraph 3-3-2. Replace complete synchronizer assembly if step wear or damage found</td>
</tr>
<tr>
<td>Blocking rings</td>
<td>Check clutch teeth per paragraph 3-2-2</td>
<td>Paragraph 3-2-2</td>
</tr>
<tr>
<td></td>
<td>Check index slots for wear or damage</td>
<td>Replace if index slots show step wear or damage</td>
</tr>
<tr>
<td>PART</td>
<td>INSPECTION</td>
<td>ACCEPT/REJECT</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Blocking rings and cones</td>
<td>Check friction surfaces for excessive wear, scoring or other damage</td>
<td>Replace worn or damaged parts</td>
</tr>
<tr>
<td>Gears</td>
<td>Check gear teeth per paragraph 3-2-2</td>
<td>Paragraph 3-2-2</td>
</tr>
<tr>
<td></td>
<td>Check bearing bores</td>
<td>Replace if scored or excessively worn</td>
</tr>
<tr>
<td>Bearing cups and cones</td>
<td>Check cups, rollers and races for chipping, galling scoring or other damage</td>
<td>Replace damaged bearing cups or cones</td>
</tr>
<tr>
<td></td>
<td>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</td>
<td>Replace bearing cones with loose or damaged rollers</td>
</tr>
<tr>
<td>Shafts</td>
<td>Check for distortion</td>
<td>Replace shafts that are bent or out of round</td>
</tr>
<tr>
<td></td>
<td>Check bearing journals</td>
<td>Replace if scored or damaged</td>
</tr>
<tr>
<td></td>
<td>Check splines per paragraph 3-2-3</td>
<td>Paragraph 3-2-3</td>
</tr>
<tr>
<td>Needle bearings and rollers</td>
<td>Check rollers and races for chipping, galling, scoring or other damage</td>
<td>Replace damaged bearings and rollers</td>
</tr>
<tr>
<td>Thrust washers</td>
<td>Check for scoring or excessive wear</td>
<td>Replace parts that show step wear, are scored or otherwise damaged</td>
</tr>
<tr>
<td>Countershaft, countershft Extension</td>
<td>Check for distortion</td>
<td>Replace if bent or out of round</td>
</tr>
<tr>
<td></td>
<td>Check bearing journals</td>
<td>Replace if scored or damaged</td>
</tr>
<tr>
<td></td>
<td>Check splines per paragraph 3-2-3</td>
<td>Paragraph 3-2-3</td>
</tr>
<tr>
<td>Transmission case</td>
<td>Check bearing bores</td>
<td>Replace case if bearing bores scored or damaged</td>
</tr>
<tr>
<td>Reverse lockout Assy</td>
<td>Check for locked and crash through operation. Check solenoid function for operation</td>
<td>Replace if sticking or not operating</td>
</tr>
<tr>
<td>Skip shift solenoid</td>
<td>Check for operation</td>
<td>Replace if sticking or not operating</td>
</tr>
</tbody>
</table>
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

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
a. 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).
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. 1st speed gear (41).
c. 1st speed gear caged needle bearing (40)
d. Snap ring (39).
e. 1st speed gear blocker ring assembly.
   1. Thrust washer (38).
   2. Inner cone (37).
   3. Friction cone (36).
   4. Blocker ring (35).

f. 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 1st/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 exits.
   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.

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.

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.

3-7
Figure 3-6. Mainshaft

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

3-8
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

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.

- b. Bearing (129) for roughness of rotation, burred or pitted conditions. Replace if these conditions exist.

- c. 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

- 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.

- a. 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 not 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.

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 on 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)
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 condition 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 tangs 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.
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.

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.

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 of 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).
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.
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).
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.
   b. Mainshaft bearing race (85).
   c. Mainshaft bearing race snap ring (84).

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).
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).

![Countershaft Extension Assembly](image)

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.

![5th/6th Driven Gear](image)

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).
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.

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).
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)

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. 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).

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.

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

c. Extension housing bolts (110).
d. Tighten.
   ♦ Bolts (100) to 26 lb. ft. (35 N.m).

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. Countershift 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

A Countershaft Shimming Procedure
B Input Shaft/Mainshaft Shimming Procedure
10 Shaft, Input
23 Mainshaft
44 Case, Transmission
105 Countershaft
NOTE: Countershaft Shimming Procedure Must Be Performed First. Countershaft and Correct Shim Must Be Installed During This Procedure.

Figure 5-2. Countershaft Extension Shimming Procedure
# SECTION 6
## SPECIFICATIONS

### 6-1. FASTENER TIGHTENING SPECIFICATIONS

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

* Disassembled Parts Illustration, Figure 2-3

### 6-2. SHIMMING SPECIFICATIONS

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

* 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. ENDPLOY TOOL SPECIFICATIONS

Figure 6-1. Endplay Tool