

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

Introduction and Description

1-1. INTRODUCTION

1-2. PURPOSE. This manual contains maintenance, service and parts information for the T5 Five-Speed Manual Transmission.

1-3. SCOPE. As you will see in the Table of Contents, this manual provides information for maintenance, troubleshooting, disassembly, cleaning, inspection, repair or replacement, and assembly of the transmission.

1-4. T5 TRANSMISSION CLASSES. Two basic T5 transmission classes are covered in this manual: WC (world class) and NWC (non-world class). Separate disassembly (Sections 3 and 4) and assembly (Sections 6 and 7) instructions are provided for each of these classes. In other sections of the manual, variations within the classes are noted in the instructions and illustrations.

NOTE

The parts shown in the illustrations in the service instructions are typical for those used in a particular class of transmission (WC or NWC). Some parts may be encountered in service that are different in appearance than those illustrated. These "different" parts perform the same function as those illustrated.

1-5. T5 TRANSMISSION CLASS IDENTIFICATION. The T5 transmission can be identified as WC or NWC by the last three digits of the transmission part number (see Table 3-1 or 4-1 in the disassembly sections). In this manual, figure titles, lists, tables and main paragraph headings are identified as WC or NWC. When using the manual, make sure you are in the proper section for the transmission being serviced.

1-6. PART IDENTIFICATION. Each detail part shown in the exploded views in this manual for a particular transmission class (WC or NWC) is assigned an index number. This same index number is used to identify the part throughout this manual. For example, WC index number 116 (in parentheses in the text) refers to the countershaft gear in all applicable sections. The same is true for NWC index number 105.

1-7. The exploded view illustrations in Section 5 (figure 5-1 or 5-2) make it possible to view the complete transmission assembly in addition to the illustrations in the Sections 3, 4, 6 and 7 relating to a specific disassembly or assembly procedure.

1-8. PART NUMBERS. The purpose of the index numbers in the illustrations in this manual is to identify parts. Part numbers are not used. Once a part is identified, refer to the T5 Transmission Parts Catalog for the correct part number.

1-9. ABBREVIATIONS. Abbreviations, other than those in common use, found in this manual are identified in Table 1-1.

1-10. DESCRIPTION

1-11. TRANSMISSION DESCRIPTION. The T5 is a five speed, countershaft, helical gear transmission. It is fully synchronized for ease of shifting. Gear ratios vary from model to model (refer to vehicle service manual for specifications). The input and output ends of the input and output shafts are supported by tapered roller bearings. A pilot roller bearing is used between the input and output shafts. The countershaft gear is supported in tapered roller bearings for WC models and straight roller bearings for NWC models. These and other basic differences in the two classes are shown in Table 1-2.

1-12. APPLICATION. The T5 transmission is used on sports cars, small to medium sedans and coupes, compact trucks and vans, utility vehicles and similar 2-wheel and 4-wheel drive vehicles.

Table 1-1. Abbreviations

AR	As Required
Assy	Assembly
ID	Inside Diameter
NP	Not Procurable
OD	Outside Diameter
PN	Part Number
QTY	Quantity
TIR	Total Indicator Reading

Table 1-2. Basic Differences Between T5 WC and NWC Classes

FEATURE	DESCRIPTION	
	WC	NWC
Bearings under gears	Needle bearings	Journals
Blocking rings	Fiber synchronizers	Brass synchronizers
Countershaft bearings	Tapered roller bearings	Straight roller bearings

Section 2

T5 WC & NWC On-Vehicle Service and Troubleshooting

2-1. MAINTENANCE

2-2. GENERAL. The only periodic maintenance required for the T5 transmission is to maintain proper lubrication.

2-3. 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.

2-4. APPROVED LUBRICANT. Most T5 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 T5 TRANSMISSION SINCE THIS MAY DAMAGE THE BLOCKING RING MATERIAL.*

2-5. CHECKING LUBRICANT LEVEL. Proceed as follows (see figure 2-2):

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 Nm).

2-6. CHANGING LUBRICANT. Proceed as follows (see figure 2-2):

- 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 Nm).
- 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 plug and torque to 20 lb-ft (27 Nm).

2-7. TROUBLESHOOTING

2-8. 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 5.

2-9. TROUBLESHOOTING CHART. Table 2-1 lists troubles which may be encountered along with possible causes and remedies.

Table 2-1. Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY
Will not shift (control lever moves)	Control lever assy broken or damaged Damaged offset lever, shift fork, selector plate or 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 shaft or shift rail binding Binding of sliding synchronizers or gears If reverse only, seized backup switch Worn or damaged flywheel pilot bushing Bell housing misaligned	Adjust or replace clutch Add or drain and replace with proper lubricant (refer to paragraph 2-4) Remove extension or adapter and case cover. Check for damaged parts. Replace damaged parts Remove extension or adapter and case cover. Reach down into transmission and check that synchronizers and gears (parts with shifting grooves) 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
Gears clash when shifting	Engine idle speed too high Clutch damaged or out of adjustment Pilot bearing between input shaft and output shaft binding Damaged synchronizer Bell housing misaligned Damaged gear or gears Worn or damaged flywheel pilot bushing	Adjust idle speed to specifications Adjust or replace clutch Disassemble and check bearing rollers, input shaft ID and output shaft OD. Replace damaged parts Disassemble and check for damaged synchronizer parts. 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	Loose transmission or flywheel housing bolts, improper alignment 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 shaft or rail; worn or damaged fork or inserts	Torque bolts to specifications. Realign if necessary 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 roller bearings used. Disassemble and check for wear or damage. Replace worn or damaged parts

Table 2-1. Troubleshooting Chart (Cont)

PROBLEM	POSSIBLE CAUSE	REMEDY
Transmission locked in one gear	<p>Fork or offset lever loose on shaft or rail</p> <p>Worn or damaged forks, offset lever, shaft or rail</p> <p>Worn or damaged synchronizer</p> <p>Worn or damaged gears</p>	<p>Remove extension or adapter and case cover. Check for loose parts on shifter shaft or rail. Replace roll pin(s). If still loose, replaced shaft or rail and/or attached parts as required</p> <p>Remove extension or adapter and case cover. Check for wear or damage. 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 (refer to paragraph 2-4)</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>Verify transmission leakage. Thoroughly clean all exposed surfaces, then check for leaks</p> <p>Remove vent or breather 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>

2-10. TRANSMISSION REMOVAL

2-11. **GENERAL.** The following paragraphs provide procedures for removing the T5 transmission. For 4-wheel drive vehicles, instructions are also given for removing the transfer case. If the vehicle is not equipped with 4-wheel drive, disregard paragraph 2-18 and references to the transfer case in the other paragraphs.

2-12. **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.

2-13. **SUPPORTING TRANSMISSION (OR TRANSFER CASE, IF USED).** Before removing any parts which attach or support the transmission (and transfer case, if used), 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.

2-14. **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. On 4-wheel drive vehicles, shift into 4HI.
- d. Remove shift lever (see figure 2-1):

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).

2-15. **LIFTING VEHICLE.** Lift vehicle on suitable hoist, allowing clearance for removal of transmission (and transfer case, if used), and related components such as propeller shaft (or shafts), cross members and supports. If unsure, refer to vehicle service manual for approved lift points.

NOTE

On some vehicles, it may be necessary to remove or disconnect other components (refer to paragraph 2-12).

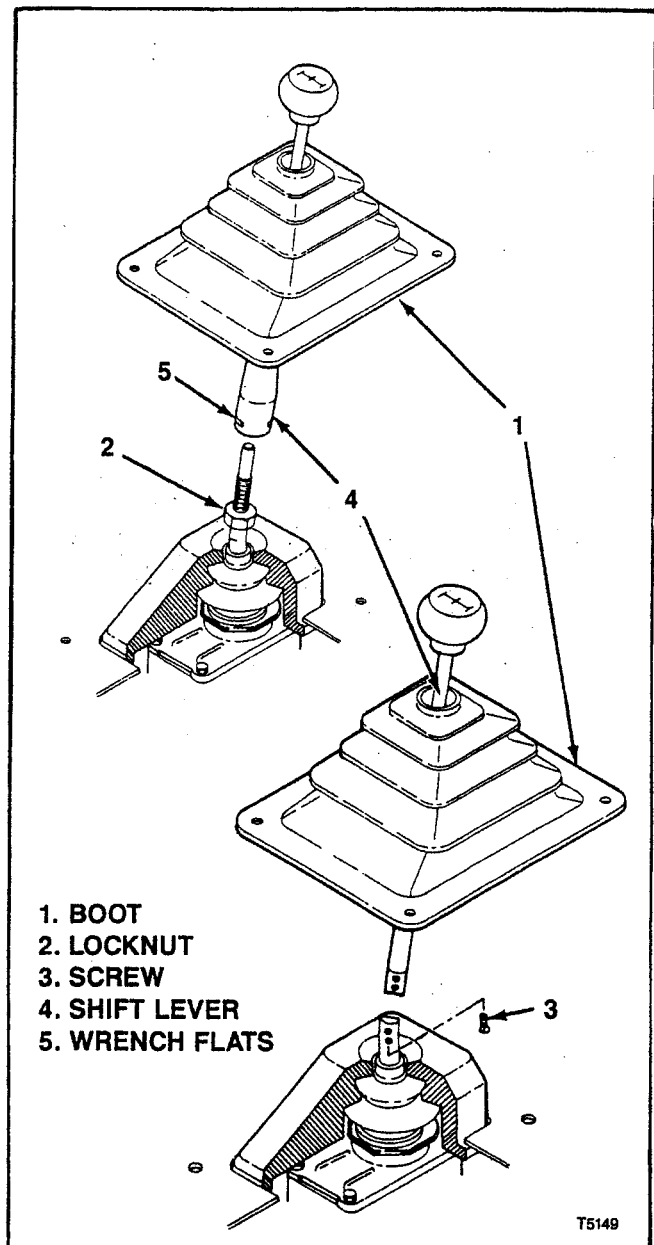
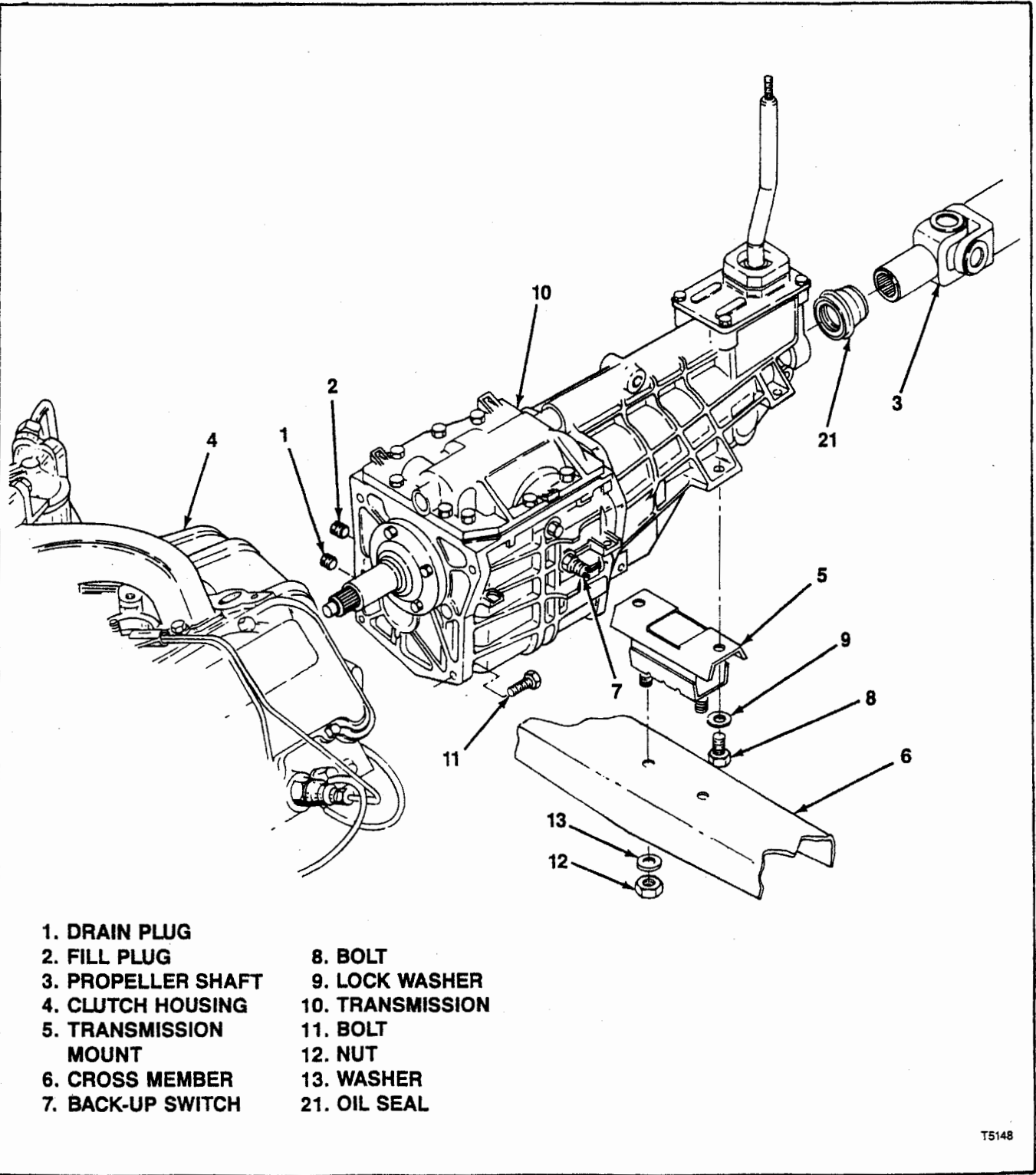


Figure 2-1. Shift Lever

2-16. **DRAINING LUBRICANT.** Drain lubricant from transmission (and transfer case, if used) (refer to paragraph 2-6, steps a through e). Reinstall fill and drain plugs.

2-17. **REMOVING REAR PROPELLER SHAFT.** The rear propeller shaft (3, figure 2-2) is splined to the transmission (or transfer case, if used) 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. DRAIN PLUG
- 2. FILL PLUG
- 3. PROPELLER SHAFT
- 4. CLUTCH HOUSING
- 5. TRANSMISSION MOUNT
- 6. CROSS MEMBER
- 7. BACK-UP SWITCH
- 8. BOLT
- 9. LOCK WASHER
- 10. TRANSMISSION
- 11. BOLT
- 12. NUT
- 13. WASHER
- 21. OIL SEAL

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Figure 2-2. Transmission

2-18. REMOVING TRANSFER CASE (4-WHEEL DRIVE VEHICLES ONLY). On 4-wheel drive vehicles, proceed as follows to remove transfer case (see figure 2-3 and 2-4 and refer to WARNING following paragraph 2-14, step a):

- a. Remove front propeller shaft (17, figure 2-3) by removing bolts (15) and retainers (16). Observe same precautions in handling front propeller shaft as for rear propeller shaft (refer to paragraph 2-17).
- b. Remove shift lever linkage and bracket attached to transfer case and transmission.
- c. Support transfer case on suitable jack or stand (refer to paragraph 2-13).

CAUTION

Make sure transfer case is completely supported by jack or stand before removing bolts (18, figure 2-4) attaching transfer case to transmission. Do not allow transfer case to "hang" from transmission by splined shaft since this may damage input bearings.

- d. Remove bolts (18) attaching transfer case (19) to transmission (10).
- e. Move transfer case (19) straight back toward rear of vehicle to completely disengage splines from transmission (10). Remove gasket (20).
- f. Carefully lower transfer case on jack or stand.

2-19. REMOVING TRANSMISSION SUPPORT BRACES. The main transmission attachment points are at the clutch housing (4, figure 2-2) and at the transmission mount (5) on the cross member (6). Supplemental support braces may or may not be used, depending on the vehicle. If used, remove supplemental support braces and any other components necessary to provide for transmission clearance.

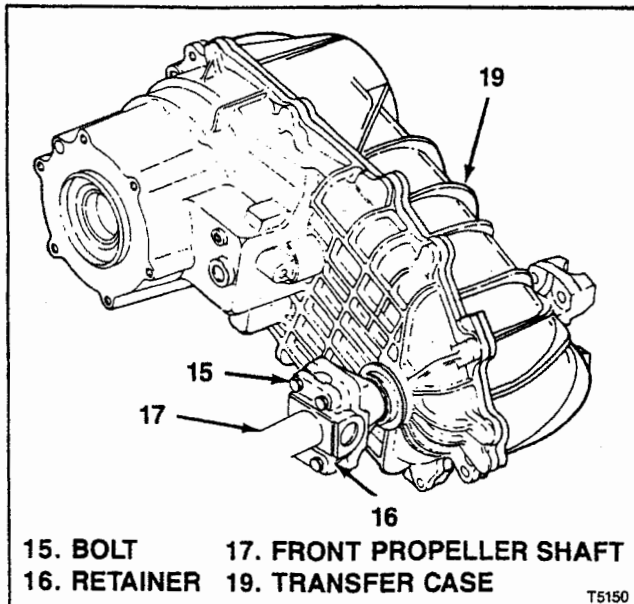


Figure 2-3. Front Propeller Shaft

2-20. REMOVING TRANSMISSION. Proceed as follows (see figure 2-2 and refer to warning following paragraph 2-14, step a):

- a. Support transmission on suitable jack or stand (refer to paragraph 2-13).
- b. Remove back-up switch electrical connection (7). Also, if used, remove neutral switch electrical connector or any others that may be used.
- c. Remove speed sensor electrical harness or speedometer cable (location may vary).
- d. Remove bolts (8) and lockwashers (9) attaching transmission (10) to transmission mount (5).
- e. Remove cross member (6).

CAUTION

Make sure transmission is completely supported by jack or stand before removing bolts (11) attaching transmission (10) to clutch housing (4). Do not allow transmission to "hang" from clutch by splined shaft since this may damage input bearings.

- f. Remove bolts (11) attaching transmission (10) to clutch housing (4).
- g. Using care not to dislodge clutch parts, move transmission (10) straight back toward rear of vehicle to completely disengage splines from clutch.
- h. Carefully lower transmission (10) on jack or stand.

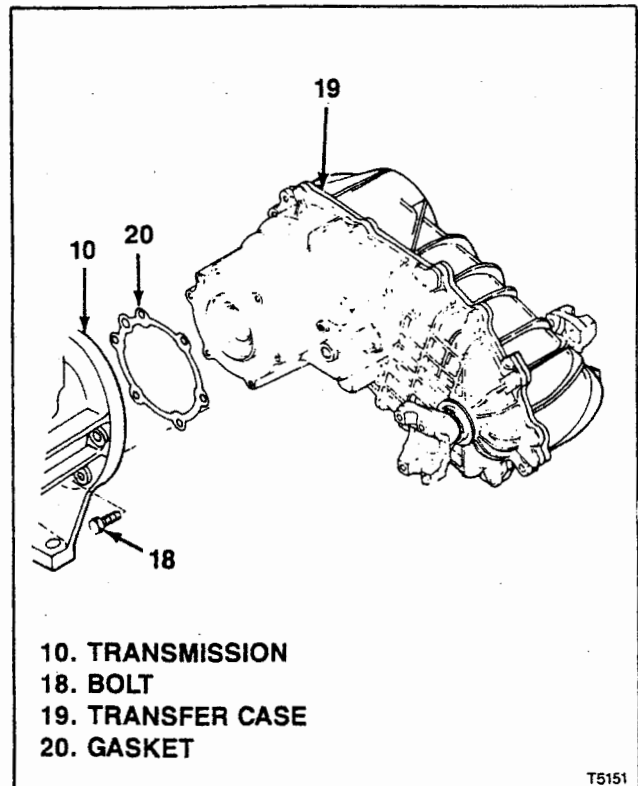


Figure 2-4. Transfer Case

2-21. TRANSMISSION INSTALLATION

2-22. **GENERAL.** Install transmission (and transfer case, if used) in vehicle from which it was removed as described in the following paragraphs. Note the following:

CAUTION

T5 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 T5 transmission. For 4-wheel drive vehicles, instructions are also given for installing the transfer case. If the vehicle is not equipped with 4-wheel drive, disregard paragraph 2-24 and references to the transfer case in the other paragraphs.

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 2-12).

c. The transmission (and transfer case, if used) must be supported on a suitable jack or stand capable of raising it the transmission into position, aligning and moving it to engage the drive splines.

2-23. **INSTALLING TRANSMISSION.** Proceed as follows (see figure 2-2):

a. Apply thin coat of high temperature grease to input shaft spline on transmission (10).

b. Shift transmission (10) into high gear and raise on jack or stand. Align transmission with clutch housing (4).

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 (10) forward, engaging splines in clutch, until transmission mounting flange contacts clutch housing (4).

CAUTION

Keep transmission completely supported by jack or stand until bolts (11) attaching transmission (10) 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 Nm). Do not remove jack or stand at this time.

e. Install cross member (6). Install bolts (8) and lockwashers (9) attaching transmission (10) to transmission mount (5). Torque bolts to 35 lb-ft (50 Nm).

f. Remove jack or stand supporting transmission.
g. Install speed sensor electrical harness or speedometer cable (location may vary).

h. Install back-up switch electrical connection (7) and any other electrical connectors that were removed.

i. Install any supplemental supports or braces that were removed during transmission removal.

WARNING

Be sure to fill transmission with proper fluid (refer to paragraph 2-4). Otherwise transmission will be damaged when engine is started. If vehicle is driven, transmission could lock up causing personal injury.

2-24. **INSTALLING TRANSFER CASE (4-WHEEL DRIVE VEHICLES ONLY).** On 4-wheel drive vehicles, proceed as follows to install transfer case (see figure 2-3 and 2-4):

a. Apply thin coat of high temperature grease to output shaft spline on transmission (10, figure 2-4).

b. Install new gasket (20) on transfer case (19) mounting face.

c. Raise transfer case (19) on jack or stand. Align transfer case with transmission (10).

CAUTION

Make sure transfer case is in exact alignment with transmission before engaging splines. Do not force transfer case onto transmission. Otherwise damage may result. If necessary, turn transfer case output shaft to align input shaft spline with that on transmission.

d. Carefully move transfer case (19) forward, engaging splines on transmission, until transfer case mounting flange contacts transmission (10).

CAUTION

Keep transfer case completely supported by jack or stand until bolts (18) attaching transfer case (19) to transmission (10) are installed and torqued. Do not allow transmission to "hang" from clutch by splined shaft since this may damage input bearings.

e. Make sure mounting holes in transmission (10) and transfer case (19) are aligned and install bolts (18). Torque bolts to 23 lb-ft (31 Nm). Remove jack or stand.

f. Attach shift lever bracket and linkage removed at transfer case removal.

g. Make sure front propeller shaft (17, figure 2-3) is properly lubricated and install. Attach to transfer case (19) with retainer (16) and bolts (15). Torque bolts to 15 lb-ft (20 Nm).

WARNING

Be sure to fill transfer case with proper fluid (refer to vehicle service manual). Otherwise transfer case will be damaged when engine is started. If vehicle is driven, transfer case could lock up causing personal injury.

2-25. INSTALLING REAR PROPELLER SHAFT.

Proceed as follows (see figure 2-2):

- a. Make sure rear propeller shaft (3) is properly lubricated.
- b. Apply thin coat of high temperature grease to output shaft spline on transmission (10) (or transfer case, if used).
- c. Carefully insert front end of rear propeller shaft (3) into transmission (10) (or transfer case, if used). Use care not to damage oil seal (21).
- d. Connect rear end of rear propeller shaft at differential (refer to vehicle service manual for specific instructions).

2-26. FILLING TRANSMISSION WITH LUBRICANT. Fill transmission (and transfer case, if used) with proper lubricant refer to paragraph 2-6, steps f through h).

2-27. COMPLETION OF INSTALLATION.

- a. Lower vehicle to floor.
- b. Install shift lever (see figure 2-1):
 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 desire position with wrench across flats (5) and tighten nut (2) up against shift lever (4) to 34 lb-ft (47 Nm).
 3. Reattach bottom of boot (1).
- c. Connect negative battery terminal.

Section 3 T5 WC Disassembly

3-1. GENERAL INFORMATION

3-2. This section provides disassembly instructions for the T5 WC transmission. The transmission class can be identified by the last three digits of the transmission part number. WC units are listed in Table 3-1. If the number for the transmission to be disassembled is not listed in Table 3-1, refer to Section 4, T5 NWC Disassembly.

3-3. During disassembly, refer to the illustrations provided with the text. In addition, an exploded view of the complete assembly can be seen on figure 5-1 in Section 5, Cleaning, Inspection, Repair or Replacement.

3-4. This section provides instructions for complete disassembly of the T5 WC transmission as would be the case for overhaul. If the transmission is not due for overhaul, and repair affecting specific parts is required, disassemble only to the extent necessary to gain access to these parts. Parts removed from the transmission as subassemblies or groups need not be disassembled for repair unless they contain the affected parts. Total disassembly is recommended to ensure that all parts are absolutely clean.

3-5. REMOVAL AND INSTALLATION OF TRANSMISSION. Refer to paragraphs 2-10 and 2-21.

3-6. T5 WC TRANSMISSION DISASSEMBLY PROCEDURES

3-7. REMOVAL OF T5 WC CONTROL LEVER AND HOUSING ASSEMBLY AND EXTERNAL COMPONENTS. Clean transmission exterior if necessary, support on suitable holding fixture and proceed as follows (see figure 3-1):

- a. Remove fill and drain plugs (1) and drain all fluid from transmission.
- b. Shift transmission into neutral at 3-4 position.

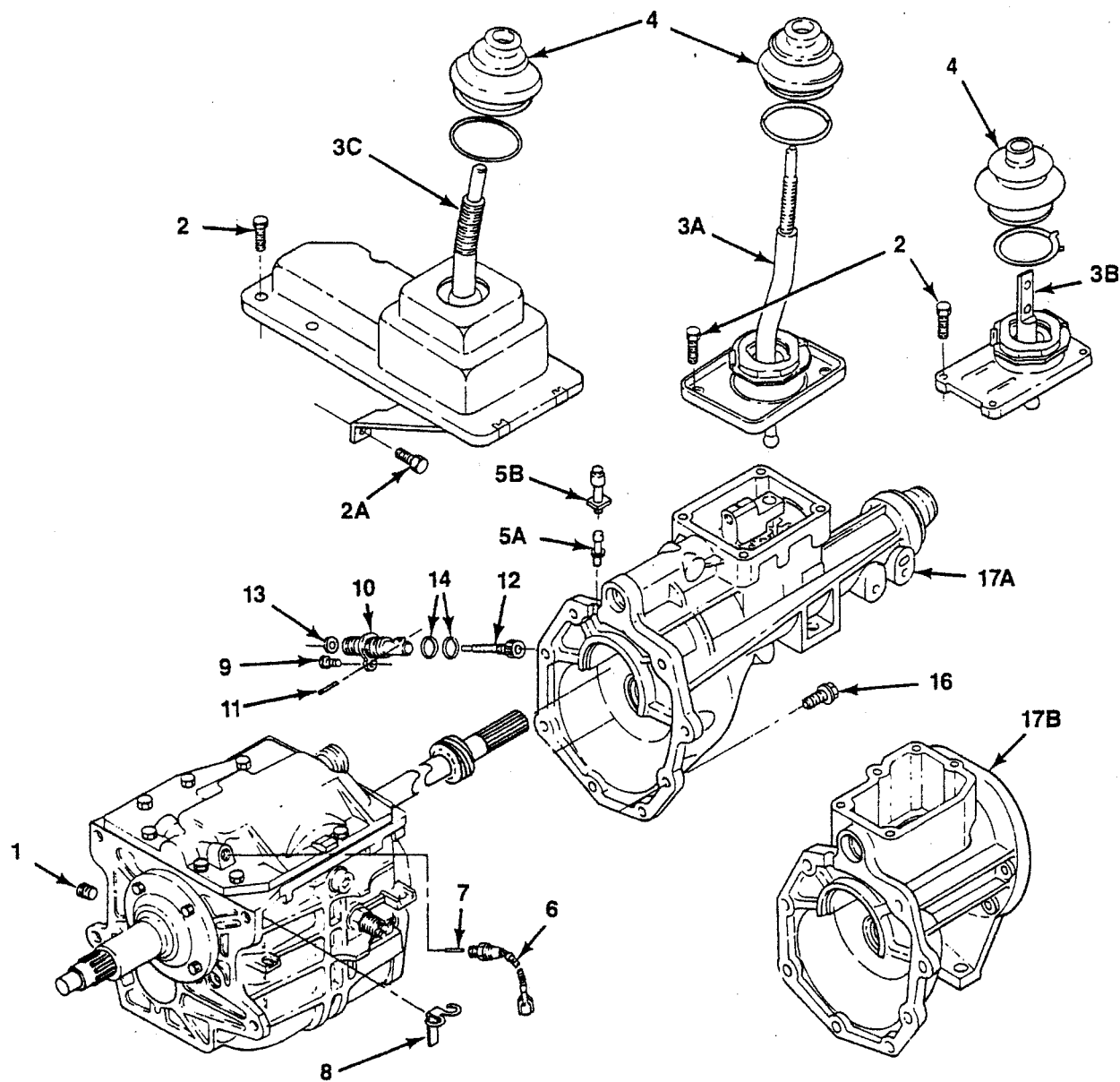
CAUTION

Failure to shift transmission into neutral at 3-4 position before removing control lever and housing assembly may result in driving roll pin (15, figure 3-2) into detent guide plate (18) when pin is removed (paragraph 3-8).

- c. Remove screws (2). If extended control lever and housing assembly (3C) is used, also remove screws (2A).
- d. If necessary, use suitable knife to break sealant bond between control lever and housing assembly (3A, 3B or 3C) and extension (17A) or adapter (17B). Remove control lever and housing assembly. Remove boot (4) only if replacement is required.
- f. Remove vent and o-ring assembly (5A) or breather (5B).
- g. As used, remove neutral switch (6), pin (7), harness retainer (8), screw (9), speedo adapter (10) roll pin (11), speedo driving gear (12) oil seal (13) and o-ring (14).

**Table 3-1. T5 WC Transmissions
Three Digits of Part Number: 1352-000-XXX)**

114 thru 116 126 134 141	155 162 165	167 thru 169 174 thru 177 184	194 thru 200 202 thru 205 207
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- | | | | |
|----------------------------------|----------------------------------|---------------------|-------------------------|
| 1. PLUG | 3C. CONTROL LEVER & HOUSING ASSY | 7. PIN | 12. SPEEDO DRIVING GEAR |
| 2. SCREW | 4. BOOT | 8. HARNESS RETAINER | 13. OIL SEAL |
| 2A. SCREW | 5A. VENT AND O-RING ASSY | 9. ADAPTER SCREW | 14. O-RING |
| 3A. CONTROL LEVER & HOUSING ASSY | 5B. BREATHER | 10. SPEEDO ADAPTER | 17A. EXTENSION ASSY |
| 3B. CONTROL LEVER & HOUSING ASSY | 6. SWITCH ASSY | 11. ROLL PIN | 17B. ADAPATER ASSY |

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Figure 3-1. T5 WC Control Lever Housing and External Components

3-8. REMOVAL OF T5 WC EXTENSION OR ADAPTER. With offset lever accessible and in neutral at 3-4 position (paragraph 3-7, step b), proceed as follows (see figure 3-2):

a. Using suitable drift, drive roll pin (15) into offset lever (20) and out of engagement with shifter shaft (29). Tap drift with hammer just until offset lever feels free on shaft.

b. Remove bolts (16).

c. If necessary, use suitable knife to break sealant bond between extension or adapter (17A or 17B) and transmission case (117). Pull extension or adapter straight out from transmission case. Offset lever (20) will slide off shifter shaft (29) with extension or adapter.

d. Remove offset lever (20), damper sleeve (21), spring (23), ball (22) and oil seal (24) from extension (17A) or adapter (17B). Remove roll pin (15) if loose or drive out of offset lever (20) if still partially installed. Do not remove detent guide plate (18) or plug (19).

e. Remove oiling funnel (25).

3-9. REMOVAL OF T5 WC CASE COVER AND DISASSEMBLY OF SHIFT FORKS. With transmission assembly upright, proceed as follows (see figure 3-3):

a. Remove bolts (26 and 27).

b. If necessary, use suitable knife to break sealant bond between case cover (38) and transmission case (117). Move case cover and attached parts toward drain plug side of transmission approximately one inch, then lift straight up.

c. Drive out pin (28).

d. Slide out shifter shaft (29), freeing shift forks (30 and 31), selector arm assembly (33), interlock plate (34) and selector plates (35) from case cover (38).

e. Remove inserts (32) from shift forks (30 and 31).

f. Remove o-ring (36) from case cover (38) but not plug (37).

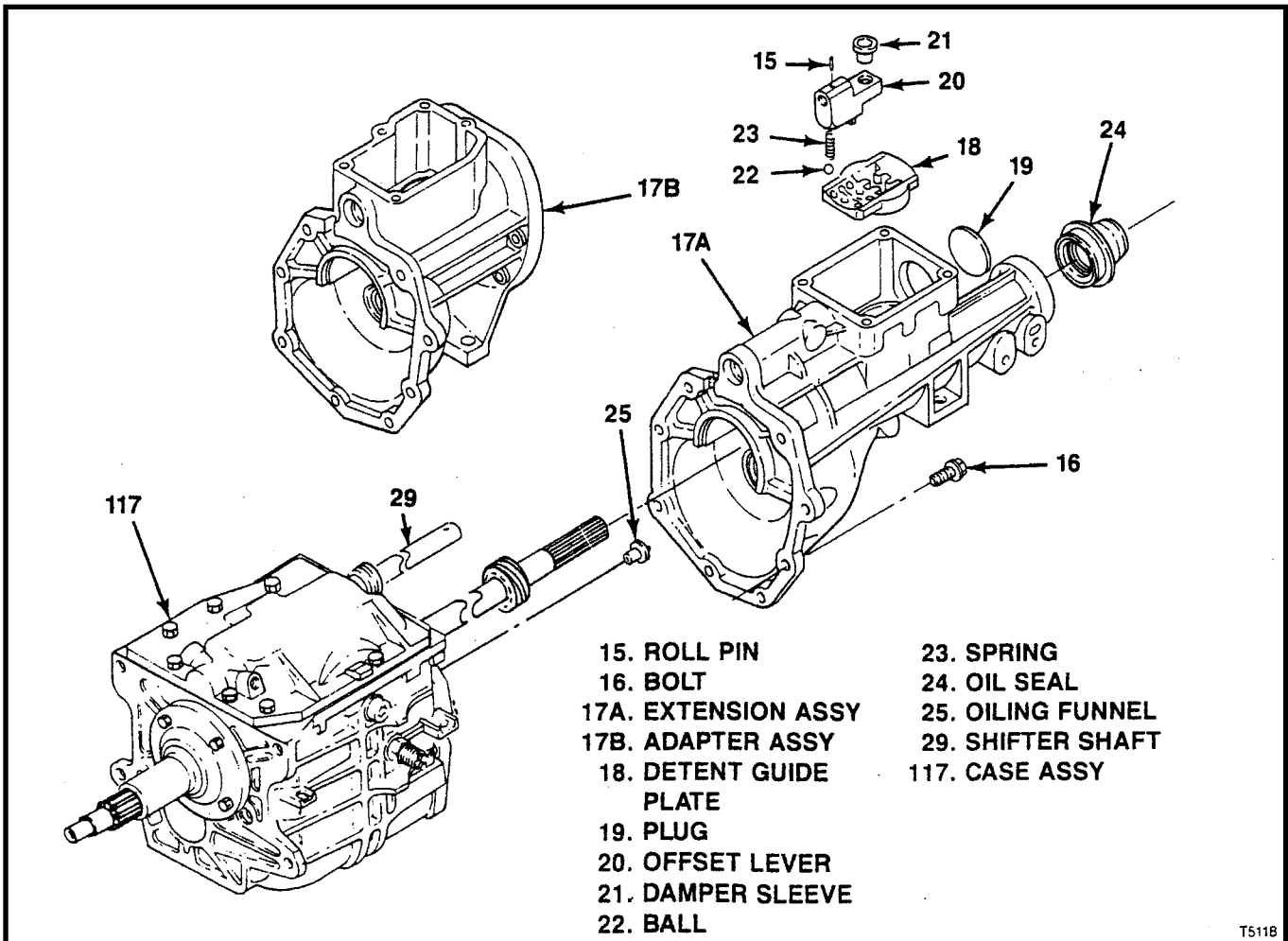


Figure 3-2. T5 WC Extension or Adapter

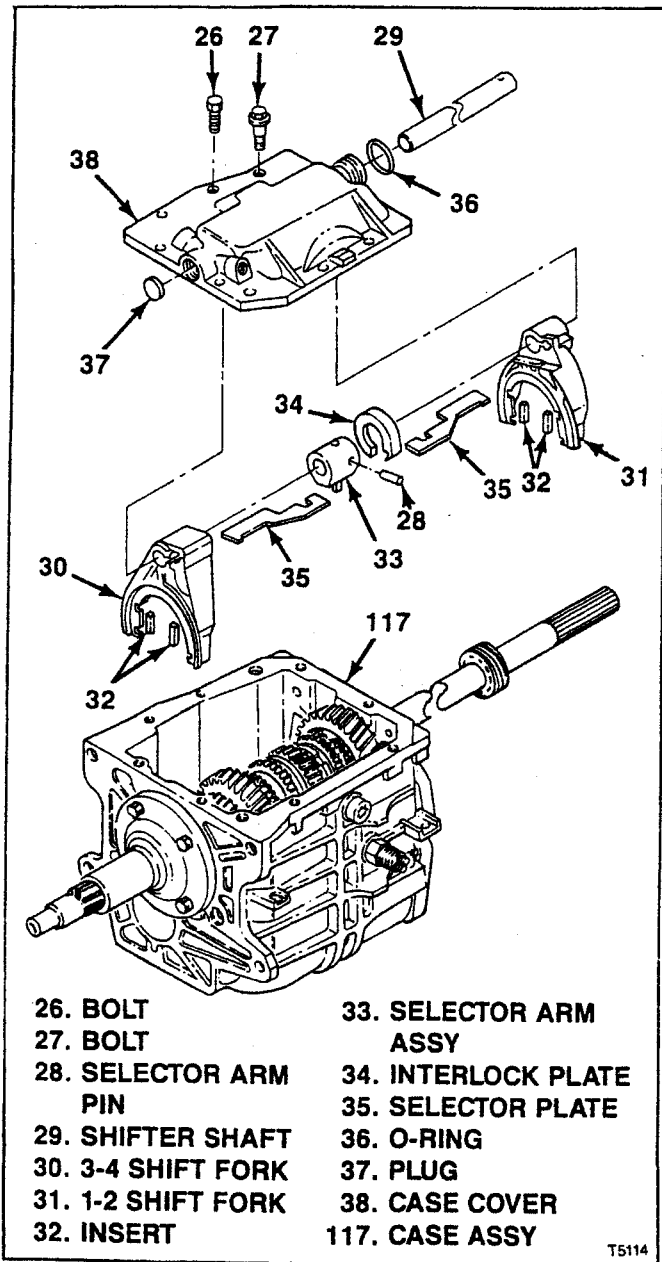


Figure 3-3. T5 WC Case Cover

3-10. REMOVAL OF T5 WC 5-R SHIFT LEVER (see figure 3-4):

- a. From inside transmission assembly, remove retaining ring (39).
- b. From outside transmission, remove pivot pin (40) and back-up switch (41).
- c. Work 5-R shift lever (42) out of engagement and lift out top of transmission case (117).

3-11. REMOVAL OF T5 WC 5TH SYNCHRONIZER, SHIFT FORK AND GEAR. At rear of transmission case (117), remove parts as follows (see figure 3-5):

- a. Remove snap ring (43) and 5th synchronizer retainer (44).
- b. Simultaneously pull 5th synchronizer assembly (45) and 5th shift fork (51) with attached shift rail assembly (53).
- c. To separate 5th shift fork (51) and shift rail assembly (53), drive out roll pin (50). Remove inserts (52) from fork.

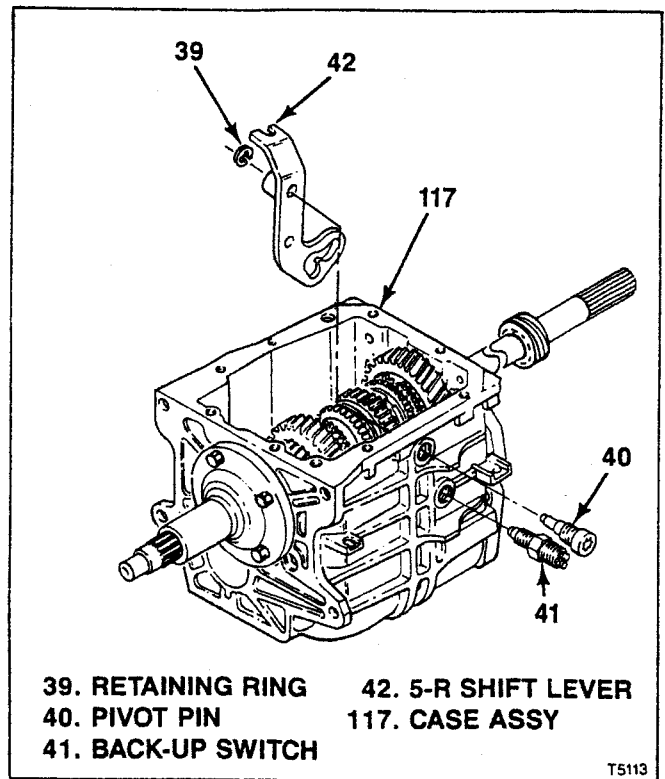


Figure 3-4. T5 WC 5-R Shift Lever

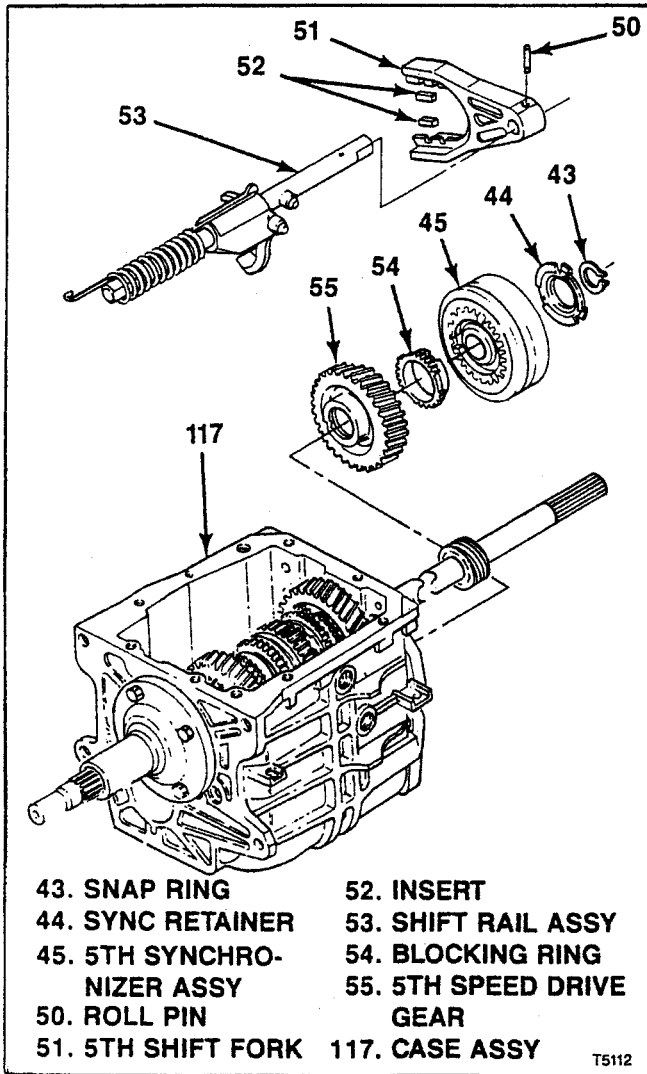


Figure 3-5. T5 WC 5th Synchronizer, Shift Fork and Gear

d. Refer to paragraph 3-19 for disassembly of 5th synchronizer assembly.
 e. Remove blocking ring (54) and 5th speed drive gear (55) from transmission.

3-12. REMOVAL OF T5 WC SPEEDOMETER GEAR. On models so equipped, remove speedometer gear as follows: (see figure 3-6):

- a. Remove one snap ring (56) from output shaft (101).
- b. Disengage clip (58) and remove speedometer gear (57) and clip.

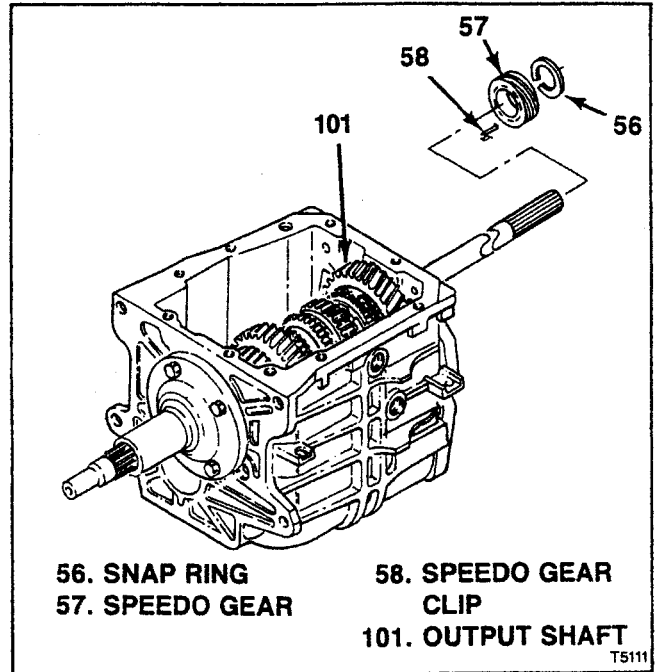


Figure 3-6. T5 WC Speedometer Gear

3-13. REMOVAL OF T5 WC INPUT SHAFT. Make alignment mark on input bearing retainer (60) and transmission case (117) and proceed as follows (see figure 3-7):

- a. Remove bolts (59).
- b. If necessary, use suitable knife to break sealant bond between input bearing retainer (60) and transmission case (117). Pull bearing retainer straight out.
- c. Use suitable puller to remove oil seal (61) from input bearing retainer (60).
- d. Remove shim(s) (62) and bearing cup (63).

e. Rotate input shaft (65) to align flat on its clutch tooth ring with countershaft (116) and remove from transmission.

f. If necessary, remove bearing cone (64) from input shaft (65) using suitable puller.

g. Remove pilot bearing between input shaft (65) and output shaft (101) as follows, depending on bearing type:

1. Individual Bearing Rollers. Remove 15 bearing rollers (66A) and spacer (67).

2. Roller Bearing Assembly. Remove bearing assembly (66B).

h. Remove thrust bearing (68) and thrust race (69) from end of output shaft (101).

3-14. REMOVAL OF T5 WC OUTPUT SHAFT GROUP. Remove output shaft group from transmission as follows (see figure 3-8):

a. Remove one snap ring (56) and 5th driven gear (70).

b. Push output shaft group (120) rearward to force bearing cup (71) out of transmission case (117). Remove bearing cup.

c. Tilt front end of output shaft group (120) up and remove through top of case.

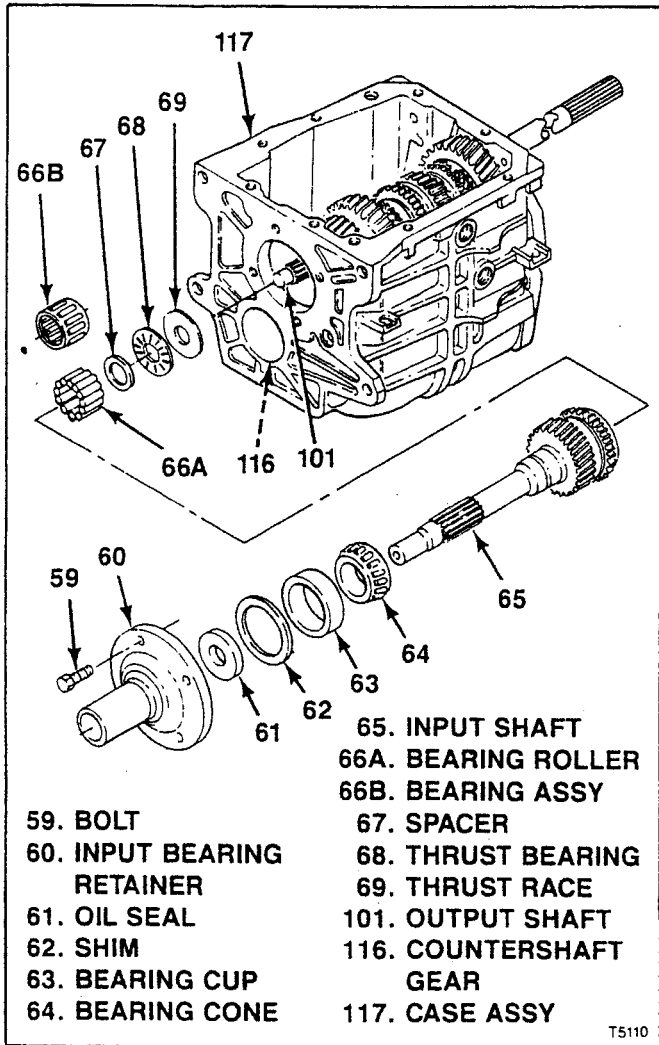


Figure 3-7. T5 WC Input Shaft

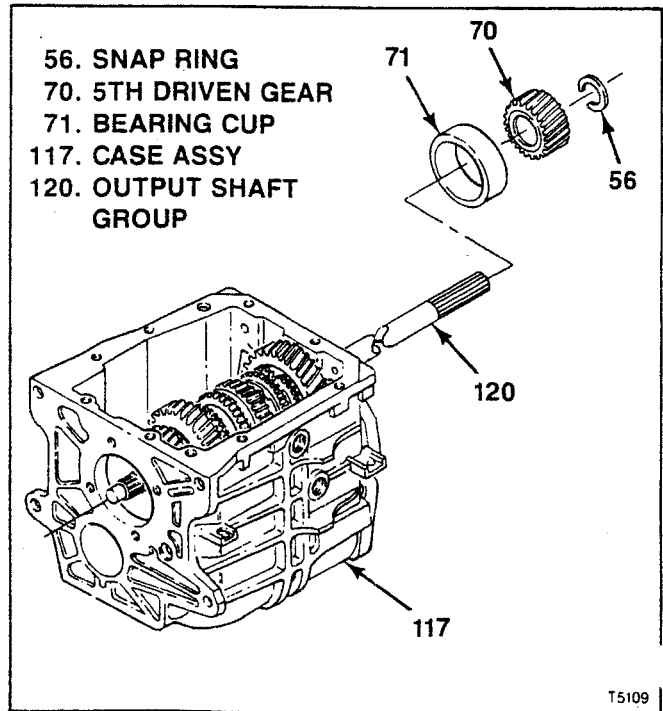


Figure 3-8. Removal of T5 WC Output Shaft Group

3-15. DISASSEMBLY OF T5 WC OUTPUT SHAFT GROUP. After removal from transmission, disassemble output shaft group as follows (see figure 3-9):

- a. Use suitable puller behind 1st speed gear (73) to pull gear and bearing cone (72).
- b. Remove 1st speed gear bearing as follows according to type:
 1. One Double-Row Bearing. Remove bearing (75A).
 2. Two Separate Bearings. Remove two bearings (75B) and spacer (75C).
- c. Remove sleeve (76).

d. At other end of output shaft group, use suitable puller behind 3rd speed gear (83) to start parts off output shaft assembly (91). Remove two blocking rings (77), 3rd-4th synchronizer assembly (78) 3rd speed gear (83), bearing (84) and spacer (85).

- e. Refer to paragraph 3-20 for disassembly of 3rd-4th synchronizer assembly.
- f. Remove snap ring (86), thrust washer (87), 2nd speed gear (88) bearing (89) and spacer (90).
- g. Refer to paragraph 3-16 for disassembly of output shaft assembly (91).

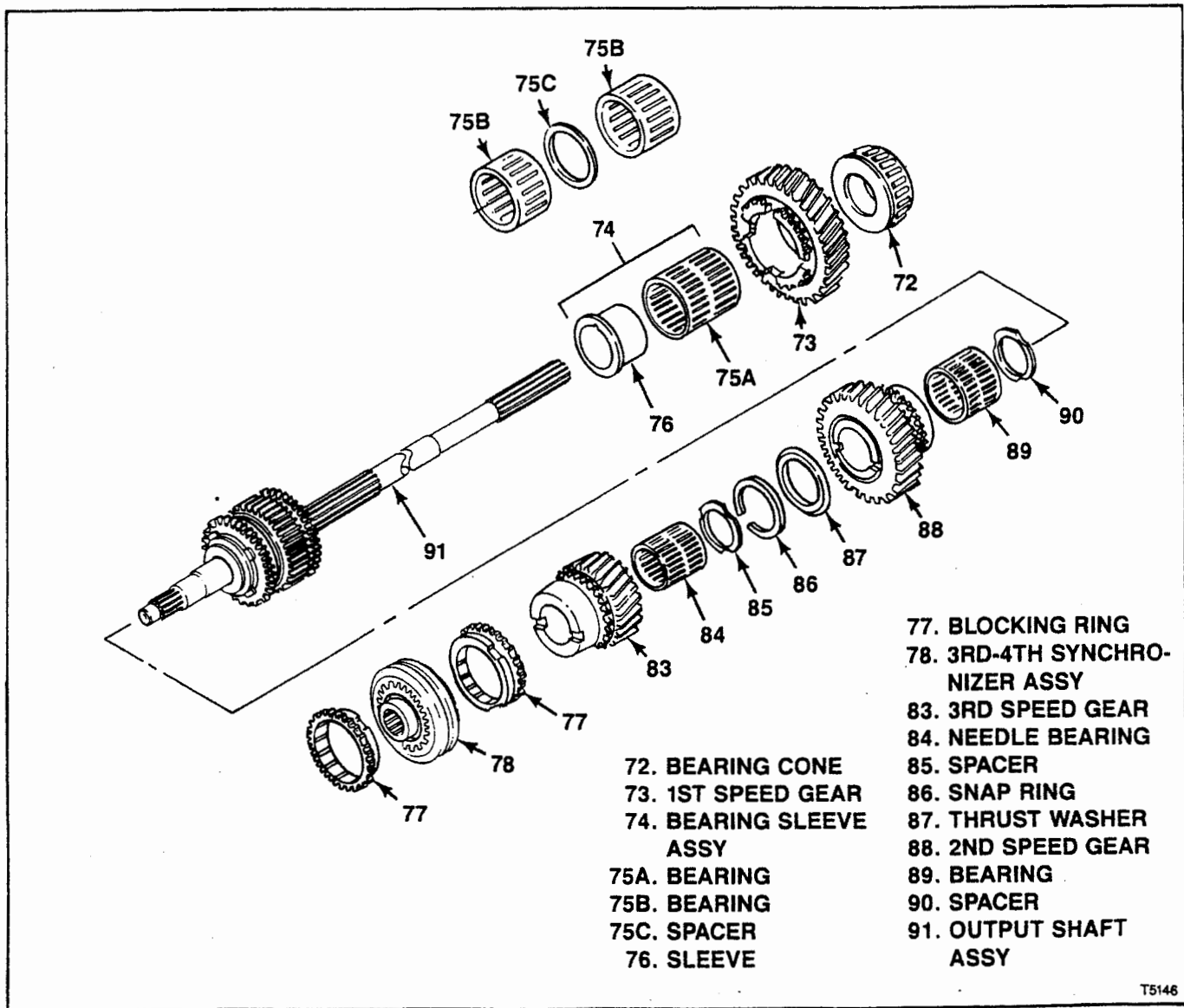


Figure 3-9. Disassembly of T5 WC Output Shaft Group

3-16. DISASSEMBLY OF T5 WC OUTPUT SHAFT ASSEMBLY (see figure 3-10):

- a. Remove retaining ring (92) and thrust washer (93).
- b. From each end of shaft and hub assembly (101), remove inner cone (94), outer cone race (95) and 1-2 blocking ring (96).
- c. Mark reverse sliding gear (98) and hub on shaft and hub assembly (101) so that clutch teeth can be assembled exactly as they were originally.
- d. Unhook and remove springs (97). Slide reverse sliding gear (98) from hub on shaft and hub assembly (101), freeing inserts (99).
- e. Remove pin (100).
- f. Do not attempt to disassemble shaft and hub assembly (101).

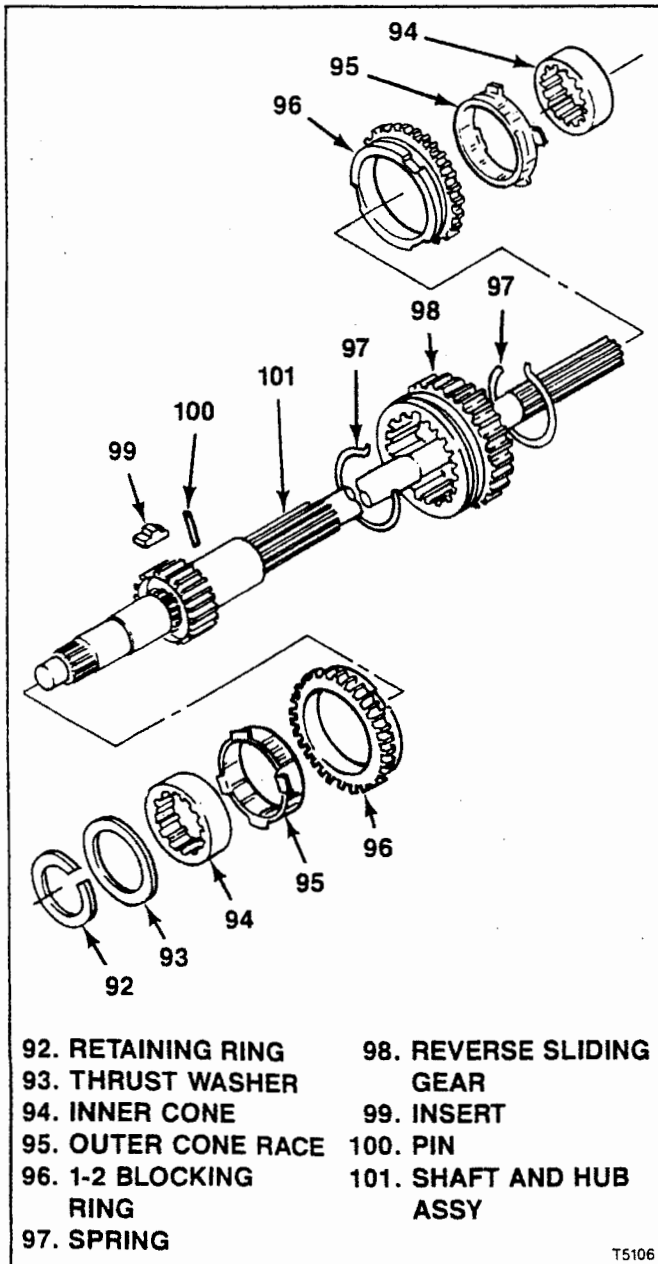


Figure 3-10. T5 WC Output Shaft Assembly

3-17. REMOVAL OF T5 WC REVERSE FORK AND IDLER GEAR (see figure 3-11):

- a. Unhook and remove spring (102) and fork pin and roller assembly (103).
- b. Bend down tabs on rear retainer (105) and remove bolts (104) and retainer. Remove shim(s) (106).
- c. Drive out roll pin (107) holding reverse idler shaft (108) in transmission case (117).
- d. Push reverse idler shaft (108) out rear of transmission case (117).
- e. Remove roll pin (107), reverse idler gear assembly (109) and o-ring (110) from transmission case (117).

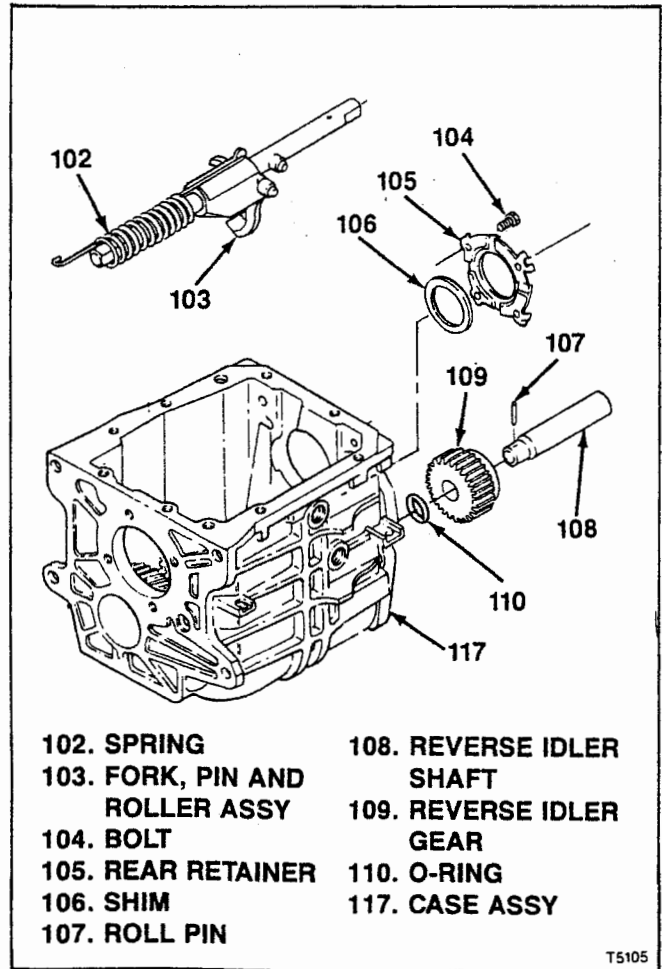


Figure 3-11. T5 WC Reverse Fork and Idler Gear

3-18. REMOVAL OF T5 WC COUNTERSHAFT GEAR (see figure 3-12):

- a. Push countershaft gear (116) rearward to force bearing cup (111) out of transmission case (117).
- b. Tilt front end of countershaft gear (116) up and remove from top of transmission case (117).
- c. Push bearing cup assembly (112) out of transmission case (117) and remove o-ring (113) from bearing cup (114).
- d. Use suitable puller to remove bearing cones (115) from countershaft gear (116) if necessary.

3-19. DISASSEMBLY OF T5 WC 5TH SYNCHRONIZER ASSEMBLY. Mark synchronizer sleeve (47) and hub (49) so that clutch teeth and faces can be assembled exactly as they were originally. Sleeve and hub are a matched set, selected at manufacture. Disassemble as follows (see figure 3-13):

- a. Unhook and remove springs (46).
- b. Slide sleeve (47) from hub (49), freeing inserts (48).

3-20. DISASSEMBLY OF T5 WC 3RD-4TH SYNCHRONIZER ASSEMBLY. Mark synchronizer sleeve (80) and hub (82) so that clutch teeth and faces can be assembled exactly as they were originally. Sleeve and hub are a matched set, selected at manufacture. Disassemble as follows (see figure 3-14):

- a. Unhook and remove springs (79).
- b. Slide sleeve (80) from hub (82), freeing inserts (81).

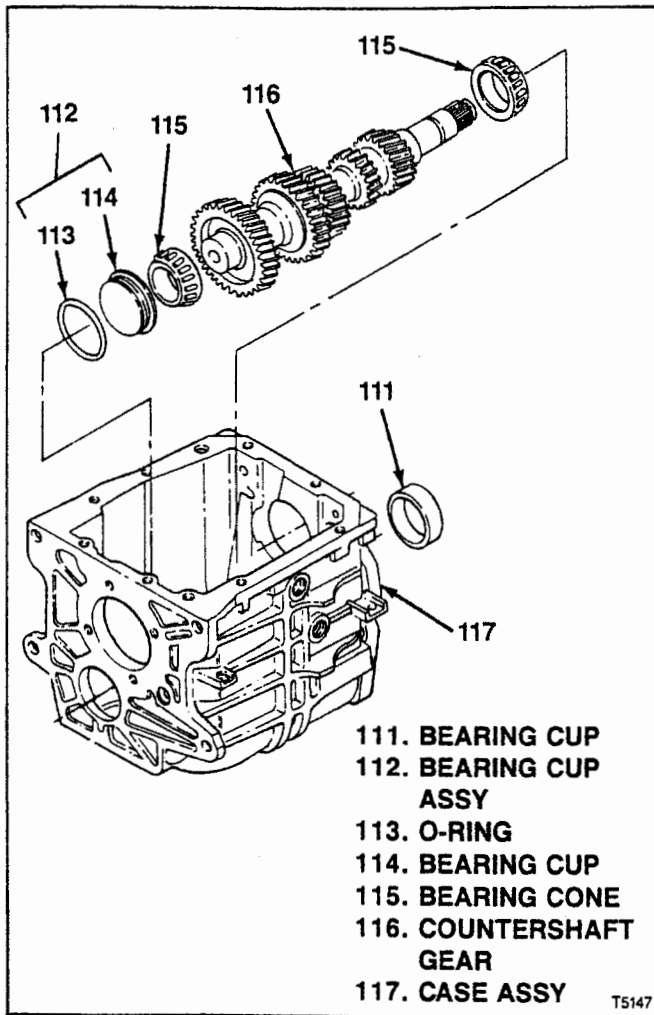


Figure 3-12. T5 WC Countershaft Gear

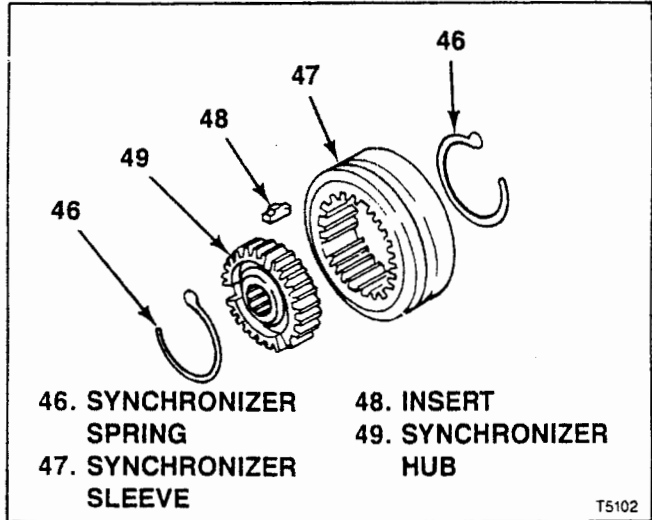


Figure 3-13. T5 WC 5th Synchronizer Assembly

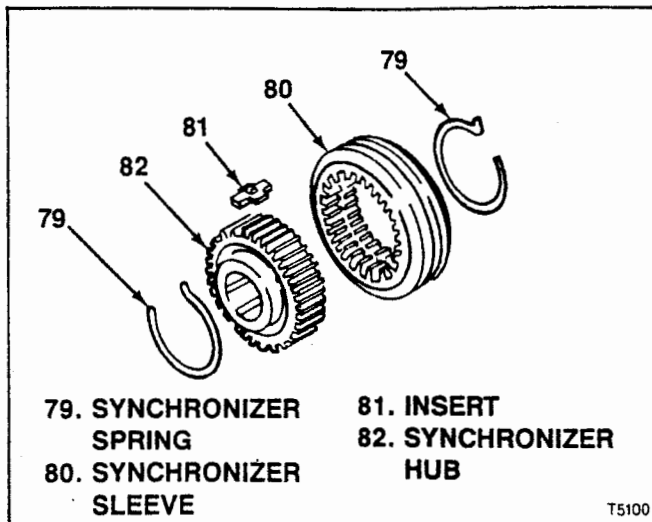


Figure 3-14. T5 WC 3rd-4th Synchronizer Assembly

Section 4

T5 NWC Disassembly

4-1. GENERAL INFORMATION

4-2. This section provides disassembly instructions for the T5 NWC transmission. The transmission class can be identified by the last three digits of the transmission part number. NWC units are listed in Table 4-1. If the number for the transmission to be disassembled is not listed in Table 4-1, refer to Section 3, T5 WC Disassembly.

4-3. During disassembly, refer to the illustrations provided with the text. In addition, an exploded view of the complete assembly can be seen on figure 5-2 in Section 5, Cleaning, Inspection, Repair or Replacement.

4-4. This section provides instructions for complete disassembly of the T5 NWC transmission as would be the case for overhaul. If the transmission is not due for overhaul, and repair affecting specific parts is required, disassemble only to the extent necessary to gain access to these parts. Parts removed from the transmission as subassemblies or groups need not be disassembled for repair unless they contain the affected parts. Total disassembly is recommended to ensure that all parts are absolutely clean.

4-5. REMOVAL AND INSTALLATION OF TRANSMISSION. Refer to paragraphs 2-10 and 2-21.

4-6. T5 NWC TRANSMISSION DISASSEMBLY PROCEDURES

4-7. REMOVAL OF T5 NWC CONTROL LEVER AND HOUSING ASSEMBLY AND EXTERNAL COMPONENTS. Clean transmission exterior, support on suitable holding fixture and proceed as follows (see figure 4-1):

- a. Remove fill and drain plugs (1) and drain all fluid from transmission.
- b. Shift transmission into neutral at 3-4 position.

CAUTION

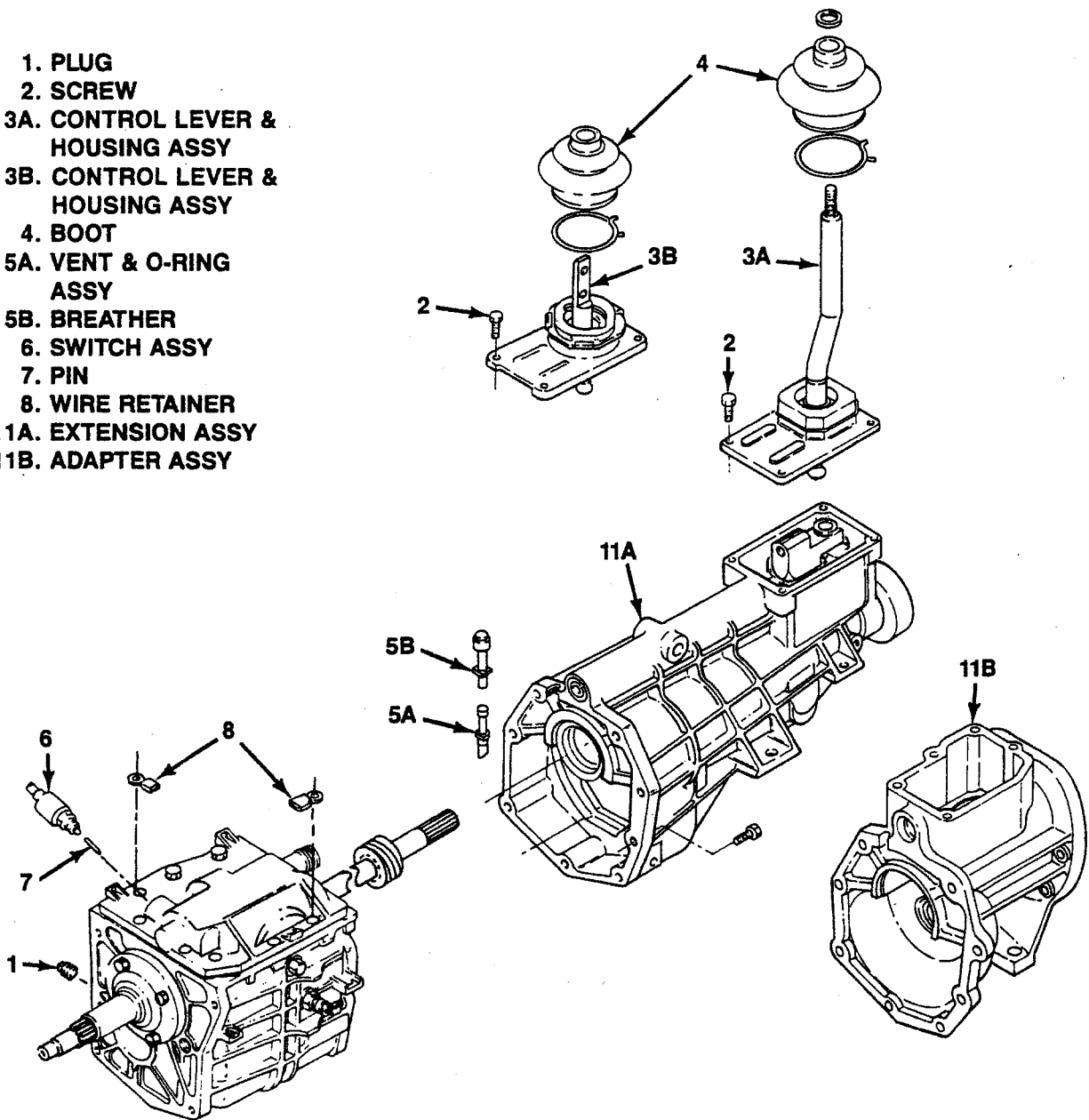
Failure to shift transmission into neutral at 3-4 position before removing control lever and housing assembly may result in driving roll pin (9, figure 4-2) into detent guide plate (18) when pin is removed (paragraph 4-8).

- c. Remove screws (2).
- d. If necessary, use suitable knife to break sealant bond between control lever and housing assembly (3A or 3B) and extension (11A) or adapter (11B). Remove control lever and housing assembly. Remove boot (4) only if replacement is required.
- e. Remove vent and o-ring assembly (5A) or breather (5B).
- g. If used, remove neutral switch (6), pin (7) and wire retainer (8).

Table 4-1. T5 NWC Transmissions
(Last Three Digits of Part Number: 1352-000-XXX)

001	047 thru 049	080	156
002	051	081	157
004 thru 008	052	083 thru 086	164
010	054 thru 056	102	166
012	058	107	170
013	059	108	181 thru 183
015 thru 018	061	110	185
026 thru 028	062	136	187
032 thru 035	065 thru 068	145	189 thru 193
042	070 thru 072	146	201
043	074 thru 078	151	206
			211

- 1. PLUG
- 2. SCREW
- 3A. CONTROL LEVER & HOUSING ASSY
- 3B. CONTROL LEVER & HOUSING ASSY
- 4. BOOT
- 5A. VENT & O-RING ASSY
- 5B. BREATHER
- 6. SWITCH ASSY
- 7. PIN
- 8. WIRE RETAINER
- 11A. EXTENSION ASSY
- 11B. ADAPTER ASSY



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Figure 4-1. T5 NWC Control Lever Housing & External Components

4-8. REMOVAL OF T5 NWC EXTENSION OR ADAPTER. With offset lever accessible and in neutral at 3-4 position (paragraph 4-7, step b), proceed as follows (see figure 4-2):

a. Using suitable drift, drive roll pin (9) into offset lever (14) and out of engagement with shifter shaft (23). Tap drift with hammer just until offset lever feels free on shaft.

b. Remove bolts (10).

c. If necessary, use suitable knife to break sealant bond between extension or adapter (11A or 11B) and transmission case (106). Pull extension or adapter

straight out from transmission case. Offset lever (14) will slide off shifter shaft (23) with extension or adapter.

d. Remove offset lever (14), damper sleeve (15), spring (17), ball (16) and oil seal (18) from extension (11A) or adapter (11B). Remove roll pin (9) if loose or drive out of offset lever (14) if still partially installed. Do not remove detent guide plate (12) or plug (13).

e. Remove oiling funnel (19).

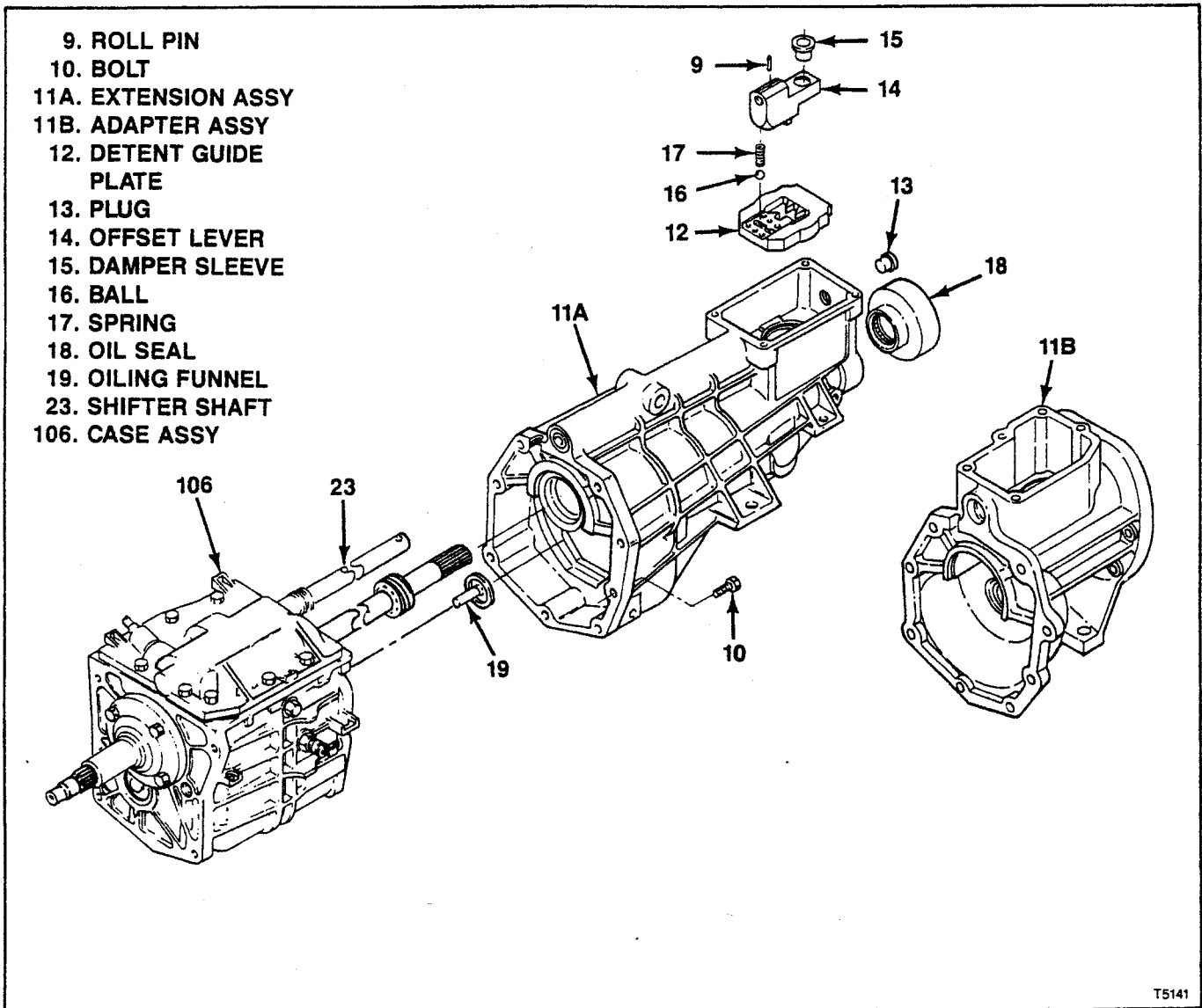


Figure 4-2. T5 NWC Extension or Adapter

4-9. REMOVAL OF T5 NWC CASE COVER AND DISASSEMBLY OF SHIFT FORKS. With transmission assembly upright, proceed as follows (see figure 4-3):

a. Remove bolts (20 and 21).

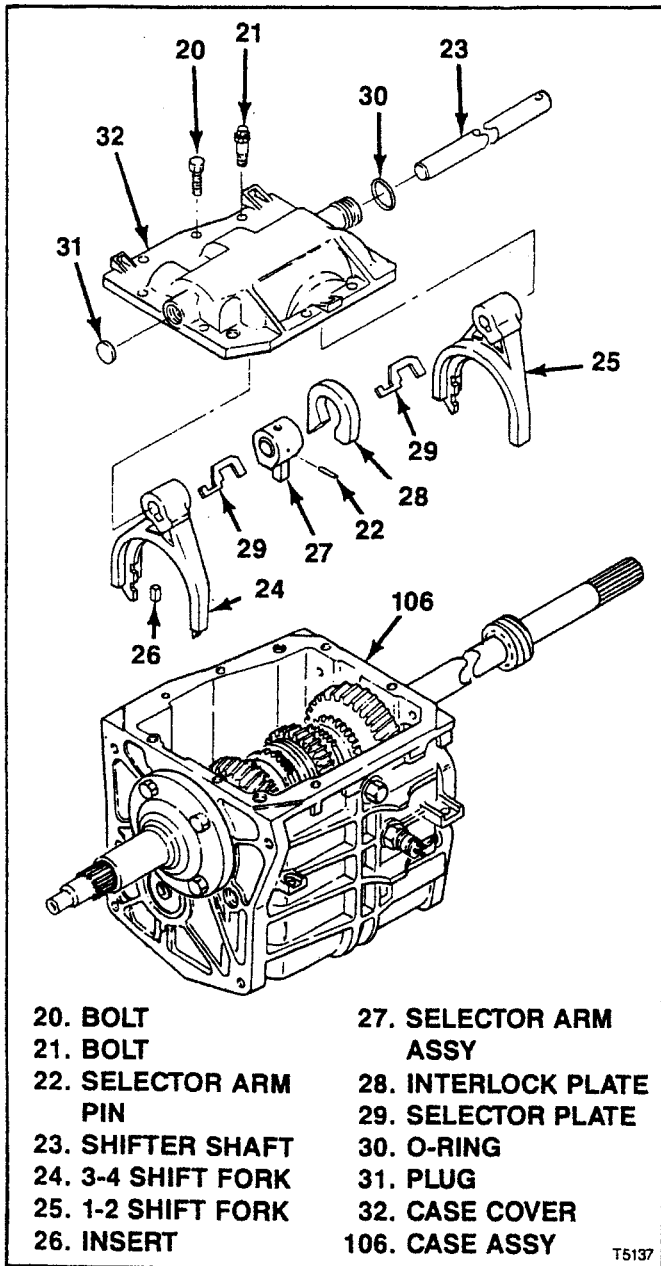


Figure 4-3. T5 NWC Case Cover

b. If necessary, use suitable knife to break sealant bond between case cover (32) and transmission case (106). Move case cover and attached parts toward drain plug side of transmission approximately one inch, then lift straight up.

c. Drive out pin (22).

d. Slide out shifter shaft (23), freeing shift forks (24 and 25), selector arm assembly (27), interlock plate (28) and selector plates (29) from case cover (32).

e. Remove inserts (26) from shift forks (24 and 25).

f. Remove o-ring (30) from case cover (32) but not plug (31).

4-10. REMOVAL OF T5 NWC 5-R SHIFT LEVER (see figure 4-4):

a. From inside transmission assembly, remove retaining ring (33).

b. From outside transmission, remove pivot pin (34) and back-up switch (35).

NOTE

On some units, 5-R shift lever is permanently attached to reverse fork, pin and roller assembly (94B, figure 4-11). Removal of 5-R shift lever as described in the following step must be deferred until reverse fork, pin and roller assembly is removed.

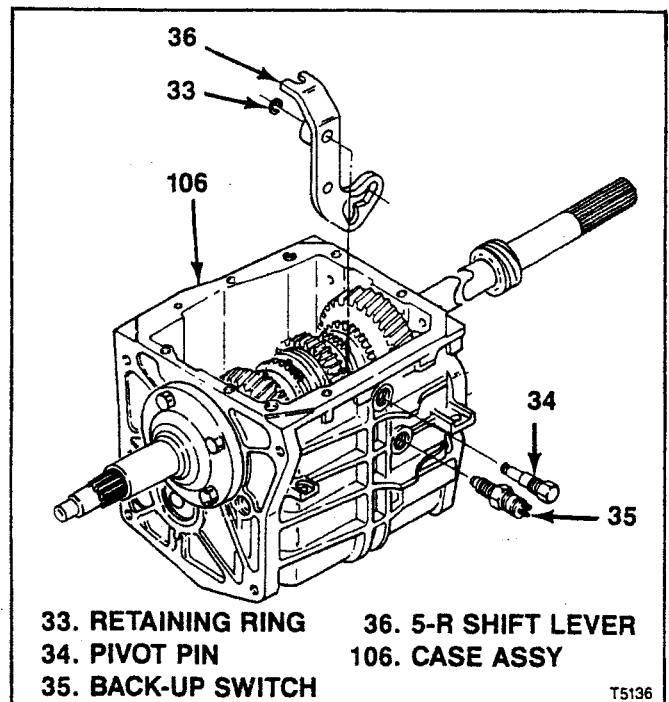


Figure 4-4. T5 NWC 5-R Shift Lever

c. Work 5-R shift lever (36) out of engagement and lift out top of transmission case (106).

4-11. REMOVAL OF T5 NWC 5TH SYNCHRONIZER, SHIFT FORK AND GEAR. At rear of transmission case (106), remove parts as follows (see figure 4-5):

a. Remove snap ring (37), thrust race (38), bearing (39) and thrust race (40).

b. Simultaneously pull 5th synchronizer assembly (41) and 5th shift fork (48) with attached shift rail assembly (50).

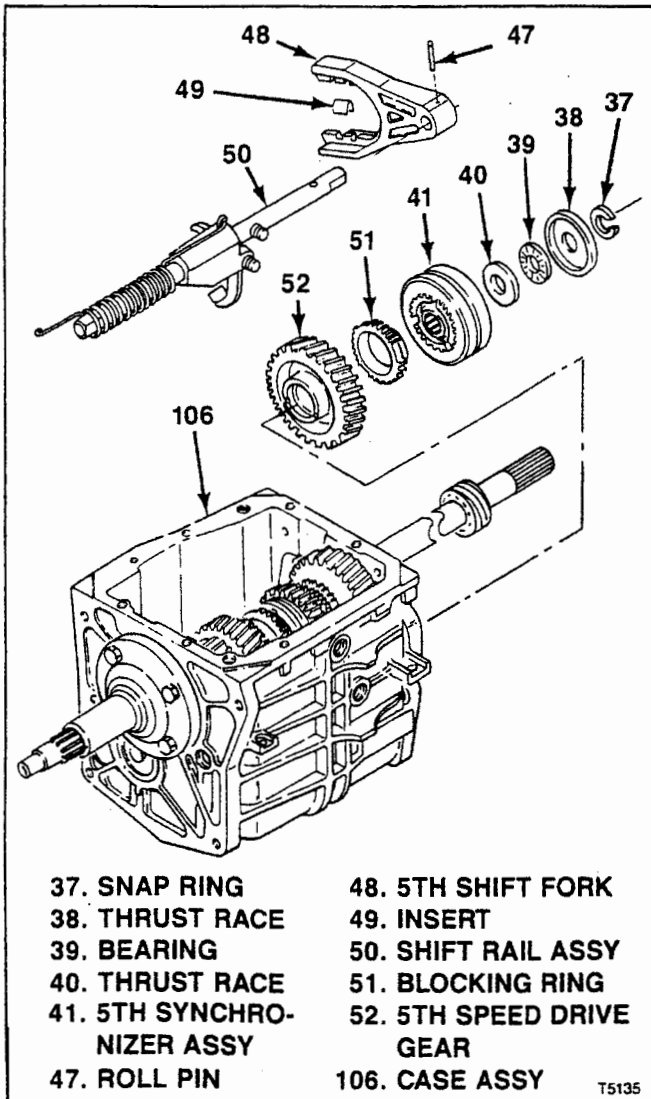


Figure 4-5. T5 NWC 5th Synchronizer, Shift Fork and Gear

c. To separate 5th shift fork (48) and shift rail assembly (50), drive out roll pin (47). Remove inserts (49) from fork.

d. Refer to paragraph 4-19 for disassembly of 5th synchronizer assembly.

e. Remove blocking ring (51) and 5th speed drive gear (52) from transmission.

4-12. REMOVAL OF T5 NWC SPEEDOMETER GEAR. On models so equipped, remove speedometer gear as follows: (see figure 4-6):

a. Remove one snap ring (53).

b. Remove speedometer gear (54) from output shaft (91) by one of the following methods, depending on attachment method:

1. Disengage clip (55A) and remove speedometer gear (54) and clip.

2. Slide speedometer gear (54) outward and remove ball (55B).

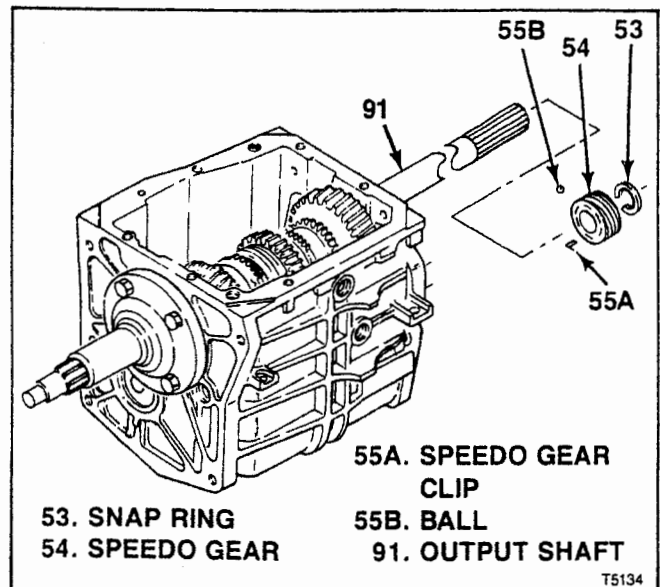


Figure 4-6. T5 NWC Speedometer Gear

4-13. REMOVAL OF T5 NWC INPUT SHAFT. Make alignment mark on input bearing retainer (57) and transmission case (106) and proceed as follows (see figure 4-7):

- a. Remove bolts (56).
- b. If necessary, use suitable knife to break sealant bond between input bearing retainer (57) and transmission case (106). Pull bearing retainer straight out.
- c. Use suitable puller to remove oil seal (58) from input bearing retainer (57).
- d. Remove shim(s) (59) and bearing cup (60).

e. Rotate input shaft (62) to align flat on its clutch tooth ring with countershaft (105) and remove from transmission.

f. If necessary, remove bearing cone (61) from input shaft (62) using suitable puller.

g. Remove 15 bearing rollers (63) installed between input shaft (62) and output shaft (91).

h. Remove thrust bearing (64) and thrust race (65) from end of output shaft (91).

4-14. REMOVAL OF T5 NWC OUTPUT SHAFT GROUP. Remove output shaft group from transmission as follows (see figure 4-8):

a. Remove one snap ring (53) and 5th driven gear (66).

b. Push output shaft group (120) rearward to force bearing cup (67) out of transmission case (106). Remove bearing cup.

c. Tilt front end of output shaft group (120) up and remove through top of case.

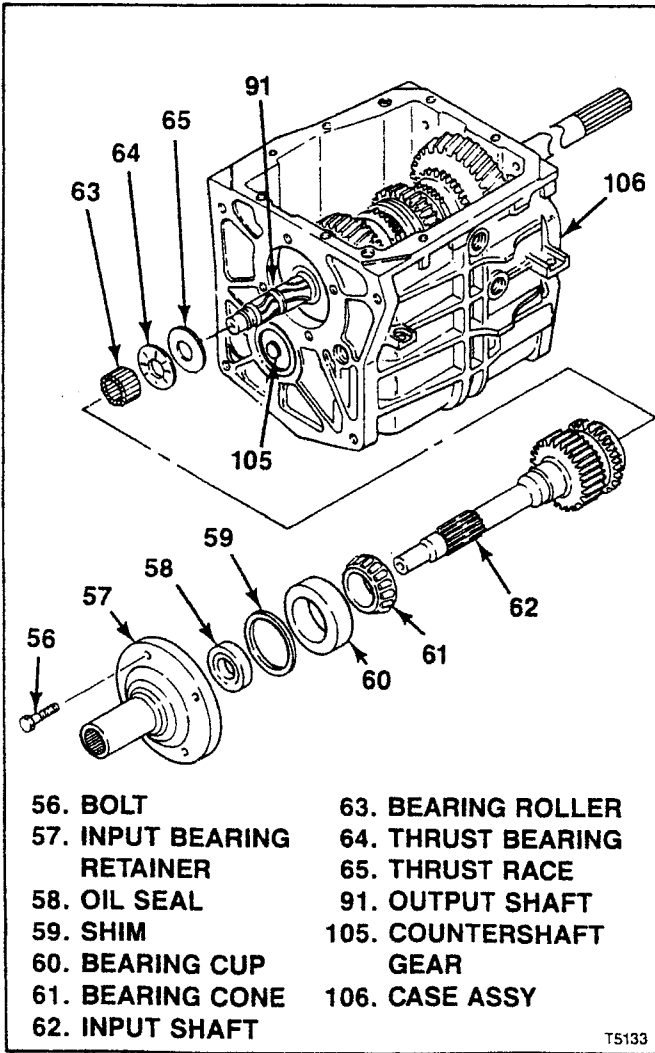


Figure 4-7. T5 NWC Input Shaft

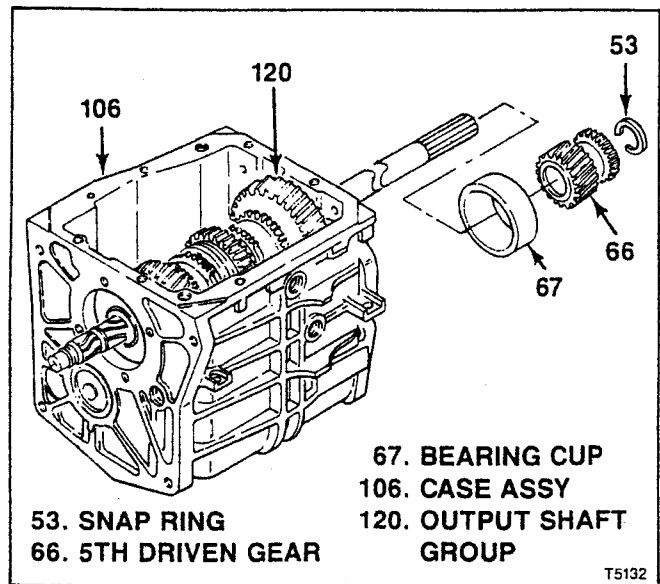


Figure 4-8. Removal of T5 NWC Output Shaft Group

4-15. DISASSEMBLY OF T5 NWC OUTPUT SHAFT GROUP. After removal from transmission, disassemble output shaft group as follows (see figure 4-9):

- a. Use suitable puller behind 1st speed gear (70) to pull gear, thrust washer (69) and bearing cone (68).
- b. Remove needle bearing (71) and thrust race (72).
- c. At other end of output shaft group, use suitable puller behind 3rd speed gear (79) to start parts off output shaft assembly (83). Remove two blocking rings (73), 3rd-4th synchronizer assembly (74) and 3rd speed gear (79).

- d. Refer to paragraph 4-20 for disassembly of 3rd-4th synchronizer assembly.
- e. Remove snap ring (80), thrust washer (81) and 2nd speed gear (82).
- f. Refer to paragraph 4-16 for disassembly of output shaft assembly (83).

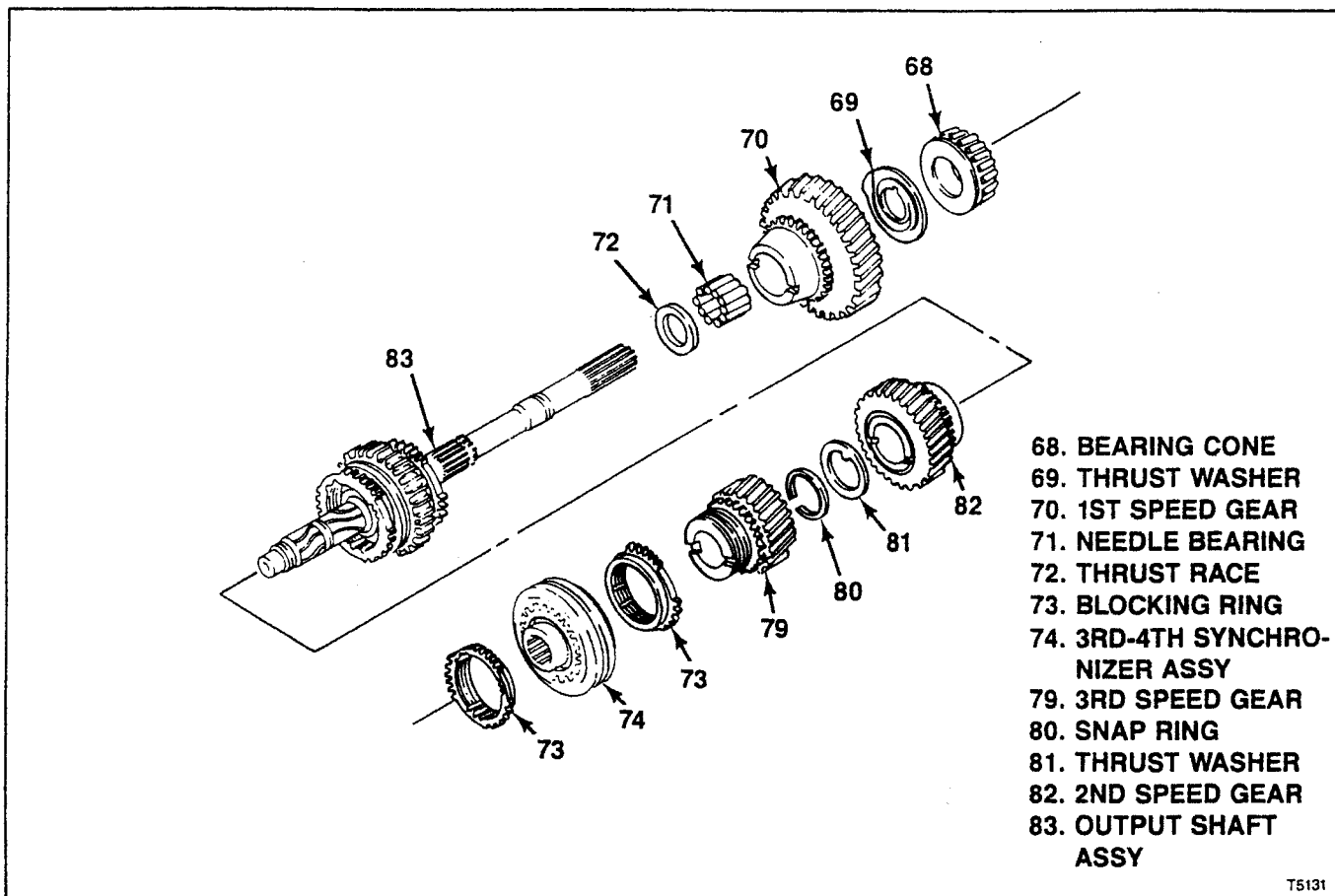


Figure 4-9. Disassembly of T5 NWC Output Shaft Group

4-16. DISASSEMBLY OF T5 NWC OUTPUT SHAFT ASSEMBLY (see figure 4- 10):

- a. From each end of shaft and hub assembly (91), remove 1-2 blocking ring (84).
- b. Mark reverse sliding gear (86) and hub on shaft and hub assembly (91) so that clutch teeth can be assembled exactly as they were originally.
- c. Unhook and remove springs (85). Slide reverse sliding gear (86) from hub on shaft and hub assembly (91), freeing inserts (87).
- d. Depending on which is used, remove pin (88), or ball (89) and spring (90).
- e. Do not attempt to disassemble shaft and hub assembly (91).

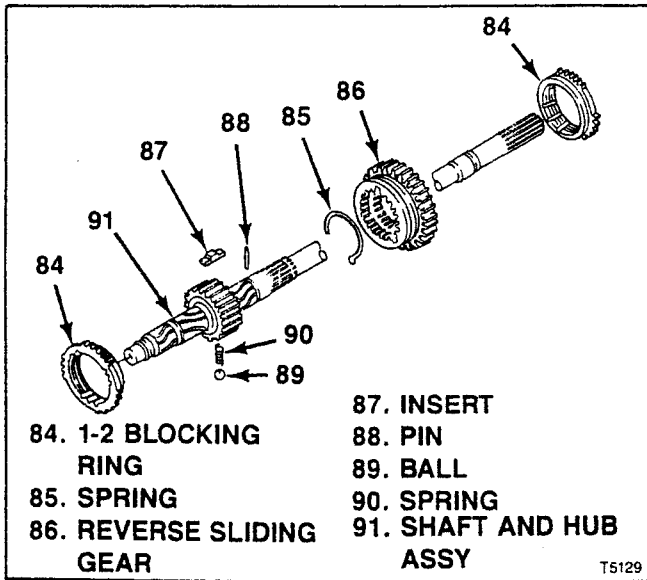


Figure 4-10. T5 NWC Output Shaft Assembly

4-17. REMOVAL OF T5 NWC REVERSE FORK AND IDLER GEAR (see figure 4-11):

- a. Depending on construction used, remove parts by one of the two following methods:
 1. Unhook and remove spring (92A) and fork, pin and roller assembly (94A).
 2. Unhook and remove spring (92B), hook (93) and fork, pin and roller assembly (94B) (with attached lever).
- b. Remove snap ring (95) and thrust washer (96).
- c. Drive out roll pin (97) holding reverse idler shaft (98) in transmission case (106).
- d. Push reverse idler shaft (98) out rear of transmission case (106).
- e. Remove roll pin (97), reverse idler gear assembly (99) and o-ring (100) from transmission case (106).

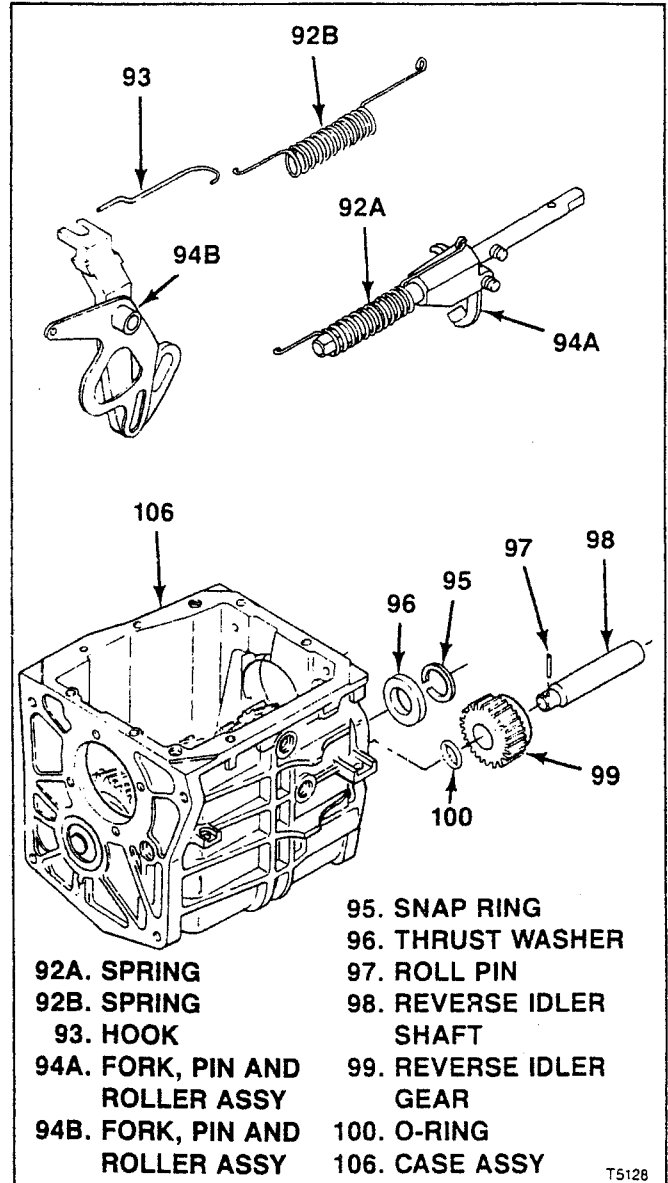


Figure 4-11. T5 NWC Reverse Fork and Idler Gear

4-18. REMOVAL OF T5 NWC COUNTERSHAFT GEAR (see figure 4-12):

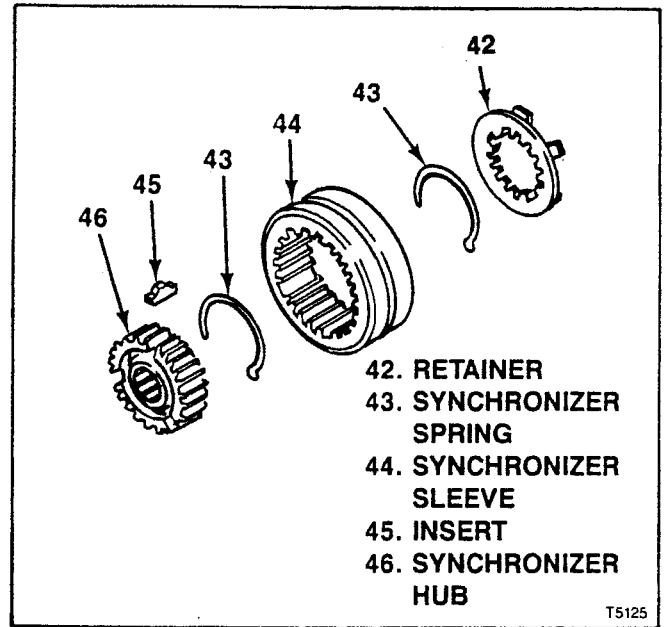
- a. Push countershaft gear (105) rearward to force bearing (101) and spacer (102) out of transmission case (106).
- b. Tilt front end of countershaft gear (105) up and remove from top of transmission case (106).
- c. Press bearing (103) from transmission case (106). Remove thrust washer (104).

4-19. DISASSEMBLY OF T5 NWC 5TH SYNCHRONIZER ASSEMBLY. Mark synchronizer sleeve (44) and hub (46) so that clutch teeth and faces can be assembled exactly as they were originally. Sleeve and hub are a matched set, selected at manufacture. Disassemble as follows (see figure 4-13):

- a. Remove retainer (42).
- b. Unhook and remove springs (43).
- c. Slide sleeve (44) from hub (46), freeing inserts (45).

4-20. DISASSEMBLY OF T5 NWC 3RD-4TH SYNCHRONIZER ASSEMBLY Mark synchronizer sleeve (76) and hub (78) so that clutch teeth and faces can be assembled exactly as they were originally. Sleeve and hub are a matched set, selected at manufacture. Disassemble as follows (see figure 4-14):

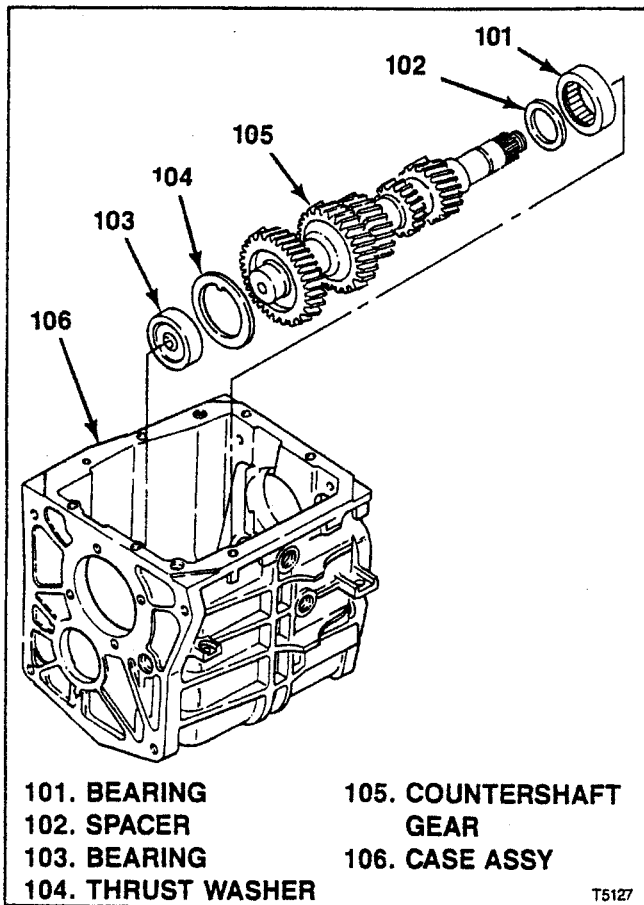
- a. Unhook and remove springs (75).
- b. Slide sleeve (76) from hub (78), freeing inserts (77).



- 42. RETAINER
- 43. SYNCHRONIZER SPRING
- 44. SYNCHRONIZER SLEEVE
- 45. INSERT
- 46. SYNCHRONIZER HUB

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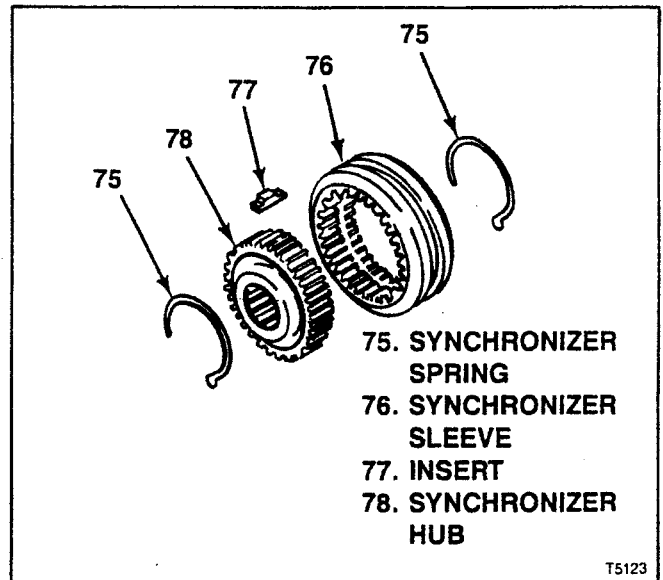
Figure 4-13. T5 NWC 5th Synchronizer Assembly



- 101. BEARING
- 102. SPACER
- 103. BEARING
- 104. THRUST WASHER
- 105. COUNTERSHAFT GEAR
- 106. CASE ASSY

T5127

Figure 4-12. T5 NWC Countershaft Gear



- 75. SYNCHRONIZER SPRING
- 76. SYNCHRONIZER SLEEVE
- 77. INSERT
- 78. SYNCHRONIZER HUB

T5123

Figure 4-14. T5 NWC 3rd-4th Synchronizer Assembly

Section 5

T5 WC & NWC Cleaning, Inspection, Repair or Replacement

5-1. CLEANING

NOTE

Prior to cleaning transmission case, check magnet cemented 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.

5-2. 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 not to damage metal surfaces.

5-3. 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.

5-4. LUBRICATING BEARINGS. Immediately after cleaning, lubricate anti-friction bearings listed below with transmission lubricant (refer to paragraph 2-4). Rotating or spinning dry, unlubricated bearings could result in damage. Cover lubricated bearings to protect from dust.

- a. **T5 WC Anti-Friction Bearings** (see figure 5-1):
 - Bearing cone (64)
 - Bearing rollers (66A) or bearing assy (66B)
 - Thrust bearing (68)
 - Bearing cone (72)
 - Bearing (75A) or bearing (75B)
 - Needle bearing (84)
 - 2nd speed bearing (89)
 - Bearing cones (115)
- b. **T5 NWC Anti-Friction Bearings** (see figure 5-2):
 - Bearing (39)
 - Bearing cone (61)
 - Bearing rollers (63)
 - Thrust bearing (64)
 - Bearing cone (68)
 - Needle bearing (71)
 - Bearing (101)
 - Bearing (103)

LEGEND FOR T5 WC, FIGURE 5-1

INDEX NO.	DESCRIPTION	QTY
1	Plug, Fill/Drain	2
2	Screw	4
2A	*Screw	2
3A	*Control Lever & Housing Assy	1
3B	*Control Lever & Housing Assy	1
3C	*Control Lever & Housing Assy, Extended	1
4	*•Boot	1
5A	*Vent & O-Ring Assy	1
5B	*Breather	1
6	Switch Assy, Neutral	1
7	Pin	1
8	Harness Retainer, Plastic	1
9	Screw, Adapter	1
10	Adapter, Speedo	1
11	Pin, Roll	1
12	Gear, Speedo Driving	1
13	Seal, Oil	1
14	O-Ring	2
15	Pin, Roll	1
16	Bolt	8
17A	*Extension, Bushing & Plate Assy	1
17B	*Adapter & Plate Assy	1
18	•Plate, Detent Guide	1
19	•Plug, Cup	1
20	Lever, Offset	1
21	Sleeve, Damper	1
22	Ball	1
23	Spring	1
24	Seal, Oil	1
25	Funnel, Oiling	1
26	Bolt	8
27	Bolt, Alignment	1
28	Pin, Selector Arm	1
29	Shaft, Shifter	1
30	Fork, Shift, 3-4	1
31	Fork, Shift, 1-2	1
32	Insert	4
33	Arm Assy, Selector	1
34	Plate, Interlock	1
35	Plate, Selector	2
36	O-Ring	1
37	Plug	2
38	Cover, Case	1
39	Ring, Retaining	1
40	Pin, Pivot	1
41	Switch, Back-Up	1
42	Lever, Shift, 5-R	1
43	Ring, Snap	1
44	Retainer, 5th Synchronizer	1
45	Synchronizer Assy, 5th	1
46	•Spring, Synchronizer	2
47	•Sleeve, Synchronizer	NP
48	•Insert	3
49	•Hub, Synchronizer	NP
50	Pin, Roll	1
51	Fork, Shift, 5th	1
52	Insert	2
53	Rail Assy, Shift	1
54	Ring, Blocking	1
55	Gear, 5th Speed Drive	1
56	Ring, Snap	2
57	*Gear, Speedo	1
58	*Clip, Speedo Gear	1
59	Bolt	4

* Used on specific models

NP = Not Procurable

LEGEND FOR T5 WC, FIGURE 5-1 (CONT)

INDEX NO.	DESCRIPTION	QTY
60	Retainer, Input Bearing	1
61	Seal, Oil	1
62	Shim	AR
63	Cup, Bearing	1
64	Cone, Bearing	1
65	Shaft, Input	1
66A	*Roller, Bearing	15
66B	*Bearing Assy	1
67	*Spacer	1
68	Bearing, Thrust, Needle	1
69	Race, Thrust	1
70	Gear, 5th Driven	1
71	Cup, Bearing	1
72	Cone, Bearing	1
73	Gear, 1st Speed	1
74	Sleeve Assy, Bearing	1
75A	*•Bearing	1
75B	*•Bearing	2
75C	*•Spacer	1
76	•Sleeve	1
77	Ring Assy, Blocking	2
78	Synchronizer Assy, 3rd-4th	1
79	•Spring, Synchronizer	2
80	•Sleeve, Synchronizer	NP
81	•Insert	3
82	•Hub, Synchronizer	NP
83	Gear, 3rd Speed	1
84	Bearing, Needle	1
85	Spacer	1
86	Ring, Snap	1
87	Washer, Thrust	1
88	Gear, 2nd Speed	1
89	Bearing, 2nd Speed	1
90	Spacer	1
91	Shaft Assy, Output	1
92	•Ring, Retaining	1
93	•Washer, Thrust	1
94	•Cone, Inner	2
95	•Race, Outer Cone	2
96	•Ring, 1-2 Blocking	2
97	•Spring	2
98	•Gear, Reverse Sliding	1
99	•Insert	3
100	•Pin	1
101	•Shaft and Hub Assy	1
102	Spring	1
103	Fork, Pin & Roller Assy, Reverse	1
104	Bolt	4
105	Retainer, Rear	1
106	Shim	AR
107	Pin, Roll	1
108	Shaft, Reverse Idler	1
109	Gear Assy, Reverse Idler	1
110	O-Ring	1
111	Cup, Bearing	1
112	Cup Assy, Bearing	1
113	•O-ring	1
114	•Cup, Bearing	1
115	Cone, Bearing	2
116	Gear, Countershaft	1
117	Case Assy, Transmission	1

*Used on specific models

NP = Not Procurable

AR = As Required

T5 NWC

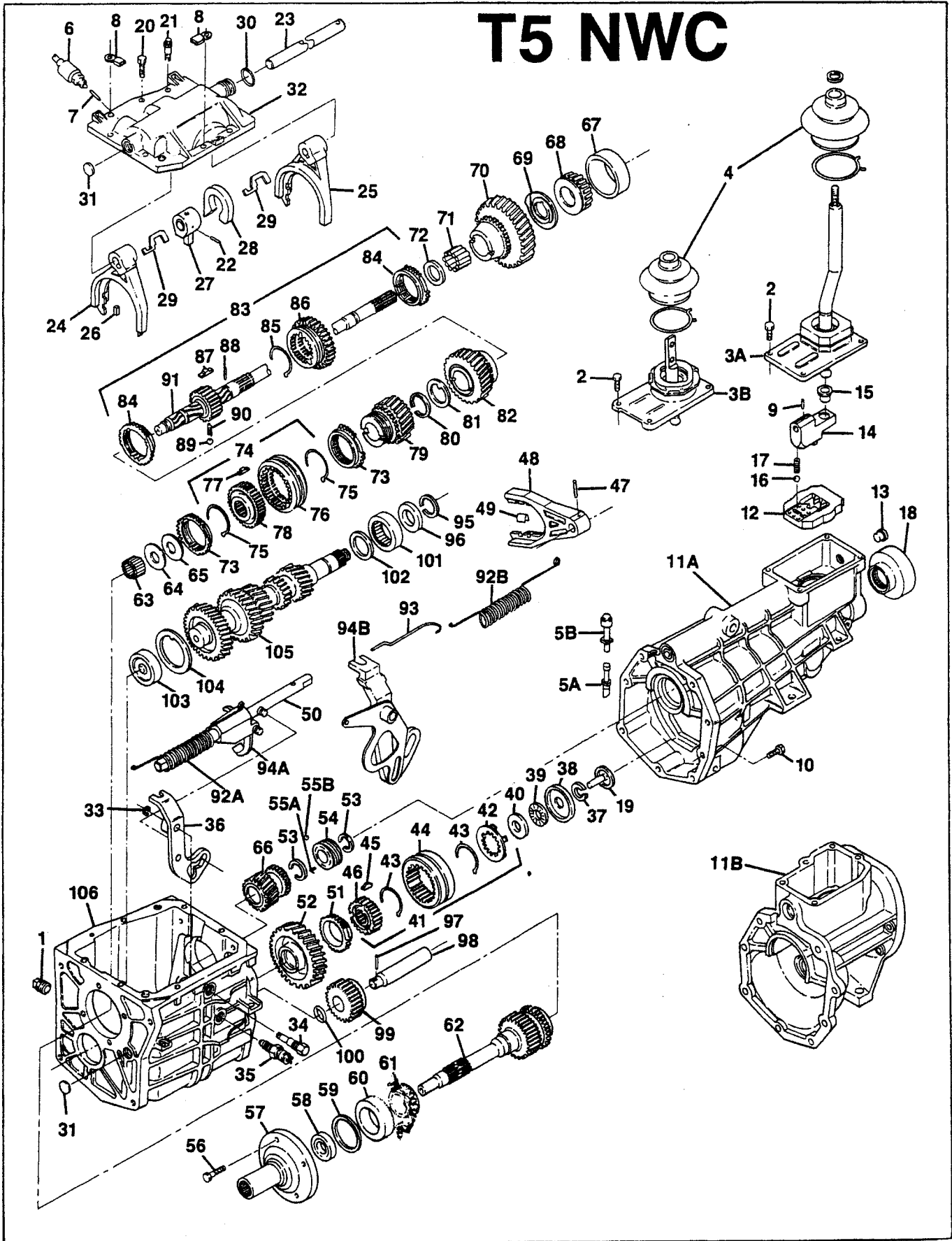


Figure 5-2. T5 NWC Manual Transmission

LEGEND FOR T5 NWC, FIGURE 5-2

INDEX NO.	DESCRIPTION	QTY
1	Plug, Fill/Drain	2
2	Screw	4
3A	*Control Lever & Housing Assy	1
3B	*Control Lever & Housing Assy	1
4	*•Boot	1
5A	*Vent & O-Ring Assy	1
5B	*Breather	1
6	*Switch Assy, Neutral	1
7	*Pin	1
8	*Retainer, Wire	1
9	Pin, Roll	1
10	Bolt	8
11A	*Extension, Bushing & Plate Assy	1
11B	*Adapter & Plate Assy	1
12	•Plate, Detent Guide	1
13	•Plug	1
14	Lever, Offset	1
15	Sleeve, Damper	1
16	Ball	1
17	Spring	1
18	Seal, Oil	1
19	Funnel, Oiling	1
20	Bolt	8
21	Bolt, Alignment	1
22	Pin, Selector Arm	1
23	Shaft, Shifter	1
24	Fork, Shift, 3-4	1
25	Fork, Shift, 1-2	1
26	Insert	4
27	Arm Assy, Selector	1
28	Plate, Interlock	1
29	Plate, Selector	2
30	O-Ring	1
31	Plug	2
32	Cover, Case	1
33	Ring, Retaining	1
34	Pin, Pivot	1
35	Switch, Back-Up	1
36	*Lever, Shift, 5-R	1
37	Ring, Snap	1
38	Race, Thrust	1
39	Bearing	1
40	Race, Thrust	1
41	Synchronizer Assy, 5th	1
42	•Retainer, 5th Synchronizer	1
43	•Spring, Synchronizer	2
44	•Sleeve, Synchronizer	NP
45	•Insert	3
46	•Hub, Synchronizer	NP
47	Pin, Roll	1
48	Fork, Shift, 5th	1
49	Insert	2
50	Rail Assy, Shift	1
51	Ring, Blocking	1
52	Gear, 5th Speed Drive	1
53	Ring, Snap	2
54	*Gear, Speedo	1
55A	*Clip, Speedo Gear	1
55B	*Ball	1
56	Bolt	4
57	Retainer, Input Bearing	1
58	Seal, Oil	1
59	Shim	AR
60	Cup, Bearing	1

* Used on specific models

NP = Not Procurable

AR = As Required

LEGEND FOR T5 NWC, FIGURE 5-2 (CONT)

INDEX NO.	DESCRIPTION	QTY
61	Cone, Bearing	1
62	Shaft, Input	1
63	Roller, Bearing	15
64	Bearing, Thrust, Needle	1
65	Race, Thrust	1
66	Gear, 5th Driven	1
67	Cup, Bearing	1
68	Cone, Bearing	1
69	Washer, Thrust	1
70	Gear, 1st Speed	1
71	Bearing, Needle	1
72	Race, Thrust	1
73	Ring, Blocking	2
74	Synchronizer Assy, 3rd-4th	1
75	•Spring, Synchronizer	2
76	•Sleeve, Synchronizer	NP
77	•Insert	3
78	•Hub, Synchronizer	NP
79	Gear, 3rd Speed	1
80	Ring, Snap	1
81	Washer, Thrust	1
82	Gear, 2nd Speed	1
83	Shaft Assy, Output	1
84	•Ring, 1-2 Blocking	2
85	•Spring	2
86	•Gear, Reverse Sliding	1
87	•Insert	3
88	*•Pin	1
89	*•Ball	1
90	*•Spring	1
91	•Shaft and Hub Assy	1
92A	*Spring	1
92B	*Spring	1
93	*Hook	1
94A	*Fork, Pin & Roller Assy, Reverse	1
94B	*Fork, Pin & Roller Assy, Reverse	1
95	Ring, Snap	1
96	Washer, Thrust	1
97	Pin, Roll	1
98	Shaft, Reverse Idler	1
99	Gear Assy, Reverse Idler	1
100	O-Ring	1
101	Bearing	1
102	Spacer	1
103	Bearing	1
104	Washer, Thrust	1
105	Gear, Countershaft	1
106	Case Assy, Transmission	1

* Used on specific models

NP = Not Procurable

5-5. INSPECTION

5-6. 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. 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.

5-7. SPECIFIC INSPECTION PROCEDURES.

Inspect parts in accordance with Table 5-1 (T5 WC) or 5-2 (T5 NWC) and as specified in the following paragraphs. Index numbers used in Table 5-1 and 5-2 are those assigned to exploded view figures 5-1 (T5 WC) and 5-2 (T5 NWC).

5-8. GEAR OR CLUTCH TEETH INSPECTION.

When specified in Table 5-1 or 5-2, 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 5-3.

a. Check gear tooth contact patterns. Contact patterns likely to be encountered are shown in figure 5-4. 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 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 5-5. Parts with small chips as shown in REPAIR column may be blend-repaired (refer to paragraph 5-12) and reused. Chips or broken teeth as shown in REJECT column are not repairable and the part must be rejected.

c. Check clutch teeth. Inspect clutch teeth for rounding as shown in figure 5-6. 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 5-5) except as shown on figure 5-6.

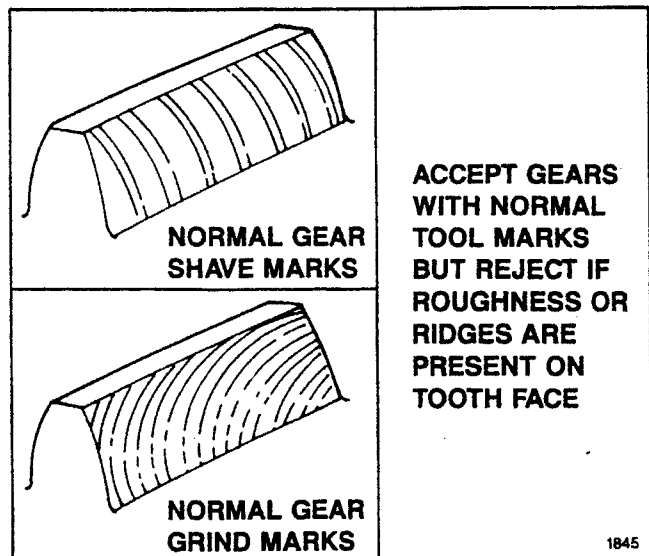
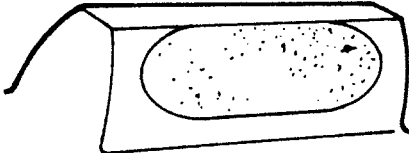
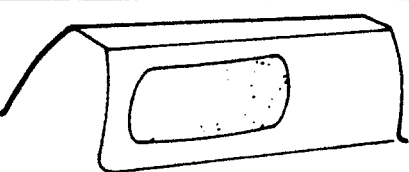
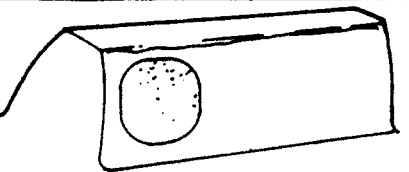
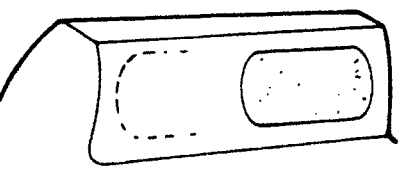
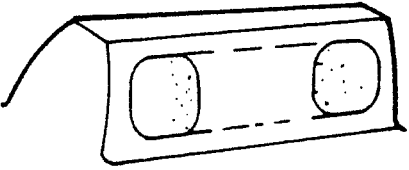
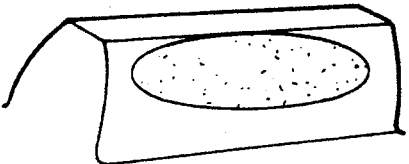
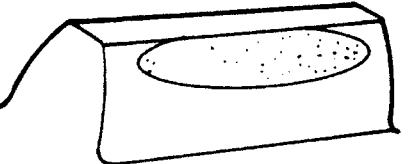
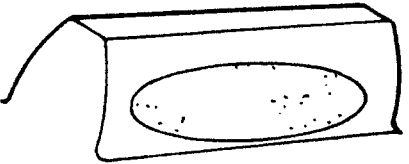



Figure 5-3. Normal Gear Tooth Tool Marks

5-9. SPLINE TEETH INSPECTION. Check for broken or chipped spline teeth. Small chips may be blend-repaired in same manner as gear teeth (see figure 5-4 and refer to paragraph 5-12). 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.

DESCRIPTION	ACCEPT	REJECT
DESIRED CONTACT PATTERN		
END CONTACT PATTERN		
TRAVELING CONTACT PATTERN (MOVES FROM SIDE TO SIDE)		
HIGH CONTACT PATTERN		
LOW CONTACT PATTERN		

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Figure 5-4. Gear Tooth Contact Patterns

Table 5-1. T5 WC Parts Inspection

PART (FIG. 5-1 INDEX NO.)	INSPECTION	ACCEPT/REJECT
All parts (including all springs)	Check for cracks Check for distortion	Replace parts with cracks 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
Control lever and housing assy (3A, 3B or 3C), extension (17A) or adapter (17B), case cover (38) and transmission case (117)	Check mating faces for burrs or other damage that would prevent proper seating of mating faces	Remove small burrs per paragraph 5-13. Otherwise replace damaged parts
Control lever and housing assy (3A, 3B or 3C)	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 (3A, 3B or 3C), damper sleeve (21) and offset lever (20)	Check mating operating surfaces for scoring or excessive wear	Replace parts/assemblies that are excessively worn or damaged
Extension, bushing and plate assy (17A)	Check bushing ID for scoring or other damage	Replace assy if bushing is damaged
Extension, bushing and plate assy (17A) or adapter and plate assy (17B)	Check detent guide plate (18) for scoring, excessively worn grooves or other damage	Replace assy if detent guide plate damaged or excessively worn
Ball (22)	Check for grooves or flat spots	Replace damaged ball
Shifter shaft (29) and shift rail assy (53)	Check for distortion Check for grooves, burrs or other damage Check OD for wear	Replace bent parts Remove small burrs per paragraph 5-13. Otherwise replace damaged parts Replace if step wear found
Shift forks (30 and 31)	Check for scored or worn bore for shaft Chipped or broken tabs for inserts	Replace damaged forks Replace damaged forks
Inserts (32 and 52)	Check for wear	Replace if step wear or grooves found
Selector arm assy (33), interlock plate (34) and selector plates (35)	Check for wear or scoring	Replace if scoring, worn edges or step wear found
Pivot pin (40)	Check for scoring or wear on bearing surface	Replace if scoring or step wear found
5-R shift lever (42)	Check pin bore and cam groove for scoring or wear	Replace if scoring or step wear found
Synchronizer sleeves (47 and 80) and hubs (49 and 82)	Engage sleeve with mating hub, aligning index marks. Check that parts slide freely but without rotational play Clutch teeth per paragraph 5-8	Replace complete synchronizer assembly if there is binding or rotational play Paragraph 5-8

Table 5-1. T5 WC Parts Inspection (Cont)

PART (FIG. 5-1 INDEX NO.)	INSPECTION	ACCEPT/REJECT
Synchronizer sleeves (47 and 80)	Check fork grooves for wear or damage	Replace complete synchronizer assembly if step wear or scoring found
Synchronizer hubs (49 and 82)	Check splines per paragraph 5-9 Check insert grooves for burrs, step wear or damage	Paragraph 5-9 Remove small burrs per paragraph 5-13. Replace complete synchronizer assembly if step wear or damage found
Inserts (48 and 80)	Check for burrs, grooves or step wear	Remove small burrs per paragraph 5-13. Replace inserts if grooves or step wear found
Shift fork (51)	Check for damage to pin hole that would prevent fork from being held securely on shifter shaft Chipped or broken tabs for inserts	Replace damaged fork Replace damaged fork
Shift rail assembly (53)	Check that cam roller turns freely. Check for scoring or step wear on roller	Replace shift rail if roller binds or is worn or damaged
Blocking rings (54, 77 and 96)	Check clutch teeth per paragraph 5-8 Check index slots for wear or damage	Paragraph 5-8 Replace if index slots show step wear or damage
Blocking rings (54, 77 and 96) and cones (95 and 96)	Check friction surfaces for excessive wear, scoring or other damage	Replace worn or damaged parts
Gears (55, 57, 65, 70, 73, 83, 88, 98, 109 and 116)	Check gear teeth per paragraph 5-8	Paragraph 5-8
Gears (55, 65, 73, 83, 88 and 98)	Check clutch teeth per paragraph 5-8	Paragraph 5-8
Gears (55, 73, 83, 88 and 109)	Check bearing bores	Replace if scored or excessively worn
Input bearing retainer (60)	Check bearing bore	Replace if scored or excessively worn
Bearing cups (63, 71, 111 and 112) and cones (64, 72 and 115)	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 (65, 101 and 108)	Check for distortion Check bearing journals	Replace shafts that are bent or out of round Replace if scored or damaged

Table 5-1. T5 WC Parts Inspection (Cont)

PART (FIG. 5-1 INDEX NO.)	INSPECTION	ACCEPT/REJECT
Shafts (65) and 101)	Check splines per paragraph 5-9)	Paragraph 5-9
Needle bearings and rollers (66A, 66B, 68, 75A, 75B, 84, and 89)	Check rollers and races for chipping, galling, scoring or other damage	Replace damaged bearings and rollers
Bearing thrust races, washers, spacers, and sleeves (69, 75C, 76, 85, 87, 90 and 93)	Check for scoring or excessive wear	Replace parts that show step wear, are scored or otherwise damaged
5th drive gear (70)	Check splines per paragraph 5-9	Paragraph 5-9
Reverse sliding gear (98) and reverse idler gear (109)	Check fork grooves for wear or damage	Replace gear if step wear or scoring found
Hub on shaft and hub assy (101) and reverse sliding gear (98)	Engage gear with hub, aligning index marks. Check that parts slide freely without rotational play Check clutch teeth per paragraph 5-8	Replace parts if there is binding or rotational play paragraph 5-8
Fork, pin and roller assy (103)	Check for worn bore for shaft Check that cam roller turns freely. Check for scoring or step wear on roller Check shift tabs for wear or damage	Replace worn or damaged assembly Replace worn or damaged assembly Replace if step wear, grooves or chipped or broken shift tabs found
Countershaft gear (116)	Check for distortion Check bearing journals Check splines per paragraph 5-9	Replace if bent our out of round Replace if scored or damaged Paragraph 5-9
Transmission case (117)	Check bearing bores	Replace case if bearing bores scored or damaged

Table 5-2. T5 NWC Parts Inspection

PART (FIG. 5-2 INDEX NO.)	INSPECTION	ACCEPT/REJECT
All parts (including all springs)	Check for cracks Check for distortion	Replace parts with cracks 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
Control lever and housing assy (3A or 3B) extension (11A) or adapter (11B), case cover (32) and transmission case (106)	Check mating faces for burrs or other damage that would prevent proper seating of mating faces	Remove small burrs per paragraph 5-13. Otherwise replace damaged parts
Control lever and housing assy (3A or 3B)	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 (3A or 3B), damper sleeve (15) and offset lever (14)	Check mating operating surfaces for scoring or excessive wear	Replace parts/assemblies that are excessively worn or damaged
Extension, bushing and plate assy (11A)	Check bushing ID for scoring or other damage	Replace assy if bushing is damaged
Extension, bushing and plate assy (11A) or adapter and plate assy (11B)	Check detent guide plate (12) for scoring, excessively worn grooves or other damage	Replace assy if detent guide plate damaged or excessively worn
Ball (16 and 89)	Check for grooves or flat spots	Replace damaged ball
Shifter shaft (23) and shift rail assy (50)	Check for distortion Check for grooves, burrs or other damage Check OD for wear	Replace bent parts Remove small burrs per paragraph 5-13. Otherwise replace damaged parts Replace if step wear found
Shift forks (24 and 25)	Check for scored or worn bore for shaft Chipped or broken tabs for inserts	Replace damaged forks Replace damaged forks
Inserts (26 and 49)	Check for wear	Replace if step wear or grooves found
Selector arm assy (27), interlock plate (28) and selector plates (29)	Check for wear or scoring	Replace if scoring, worn edges or step wear found
Pivot pin (34)	Check for scoring or wear on bearing surface	Replace if scoring or step wear found
5-R shift lever (36) or fork, pin and roller assy (94B)	Check pin bore and cam groove for scoring or wear	Replace if scoring or step wear found

Table 5-2. T5 NWC Parts Inspection (Cont)

PART (FIG. 5-2 INDEX NO.)	INSPECTION	ACCEPT/REJECT
Synchronizer sleeves (44 and 76) and hubs (46 and 78)	Engage sleeve with mating hub, aligning index marks. Check that parts slide freely but without rotational play Clutch teeth per paragraph 5-8	Replace complete synchronizer assembly if there is binding or rotational play Paragraph 5-8
Synchronizer sleeves (44 and 76)	Check fork grooves for wear or damage	Replace complete synchronizer assembly if step wear or scoring found
Synchronizer hubs (46 and 78)	Check splines per paragraph 5-9 Check insert grooves for burrs, step wear or damage	Paragraph 5-9 Remove small burrs per paragraph 5-13. Replace complete synchronizer assembly if step wear or damage found
Inserts (45, 77 and 87)	Check for burrs, grooves or step wear	Remove small burrs per paragraph 5-13. Replace inserts if grooves or step wear found
Shift fork (48)	Check for damage to pin hole that would prevent fork from being held securely on shifter shaft Chipped or broken tabs for inserts	Replace damaged fork Replace damaged fork
Shift rail assembly (50)	Check that cam roller turns freely. Check for scoring or step wear on roller	Replace shift rail if roller binds or is worn or damaged
Blocking rings (51, 73 and 84)	Check clutch teeth per paragraph 5-8 Check index slots for wear or damage Check friction surfaces for excessive wear, scoring or other damage	Paragraph 5-8 Replace if index slots show step wear or damage Replace worn or damaged parts
Gears (52, 54, 62, 66, 70, 79, 82, 86, 99 and 105)	Check gear teeth per paragraph 5-8	Paragraph 5-8
Gears (52, 62, 70, 79, 82 and 86)	Check clutch teeth per paragraph 5-8	Paragraph 5-8
Gears (52, 70, 79, 82 and 99)	Check bearing bores	Replace if scored or excessively worn
Input bearing retainer (57)	Check bearing bore	Replace if scored or excessively worn
Bearing cups (60 and 67), cones (61 and 68) and bearings (101 and 103)	Check cups, races and rollers or balls for chipping, galling scoring or other damage Make sure bearing cone or bearing is lubricated. Slowly rotate rollers or ball bearings, feeling for binding, roughness or flat spots. Rollers or balls must rotate smoothly without side or end play	Replace damaged bearing cups or cones, or ball bearings Replace bearing cones or bearings with loose or damaged rollers or races

Table 5-2. T5 NWC Parts Inspection (Cont)

PART (FIG. 5-2 INDEX NO.)	INSPECTION	ACCEPT/REJECT
Shafts (62, 91 and 98)	Check for distortion	Replace shafts that are bent or out of round
	Check bearing journals	Replace if scored or damaged
Shafts (62) and 91)	Check splines per paragraph 5-9)	Paragraph 5-9
Needle bearings and rollers (39, 63, 64 and 71)	Check rollers and races for chipping, galling, scoring or other damage	Replace damaged bearings and rollers
Bearing thrust races, washers, spacers, and sleeves (38, 40, 65, 72, 81, 96, 102 and 104)	Check for scoring or excessive wear	Replace parts that show step wear, are scored or otherwise damaged
5th driven gear (66)	Check splines per paragraph 5-9	Paragraph 5-9
Reverse sliding gear (86) and reverse idler gear (99)	Check fork grooves for wear or damage	Replace gear if step wear or scoring found
Hub on shaft and hub assy (91) and reverse sliding gear (86)	Engage gear with hub, aligning index marks. Check that parts slide freely without rotational play	Replace parts if there is binding or rotational play
	Check clutch teeth per paragraph 5-8	paragraph 5-8
Fork, pin and roller assy (94A or 94B)	Check for worn bore for shaft	Replace worn or damaged assembly
	Check that cam roller turns freely. Check for scoring or step wear on roller	Replace worn or damaged assembly
	Check shift tabs for wear or damage	Replace if step wear, grooves or chipped or broken shift tabs found
Countershaft gear (105)	Check for distortion	Replace if bent our out of round
	Check bearing journals	Replace if scored or damaged
	Check splines per paragraph 5-9	Paragraph 5-9
Transmission case (106)	Check bearing bores	Replace case if bearing bores scored or damaged

5-10. REPAIR OR REPLACEMENT

5-11. 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.

5-12. **GEAR AND CLUTCH TOOTH REPAIR.** Repair shall be limited to blend-repair of chips within the limits shown in figure 5-5 and 5-6.

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.

5-13. **REMOVING SMALL BURRS.** Use a suitable abrasive stone to remove burrs. Be careful to remove only raised material, not base metal.

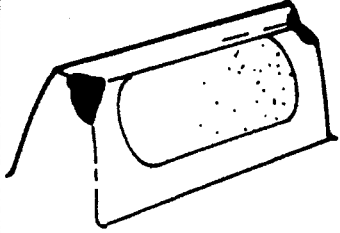
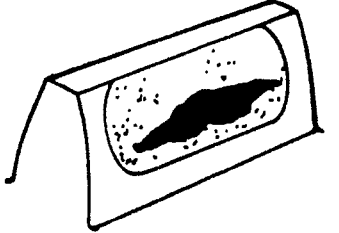
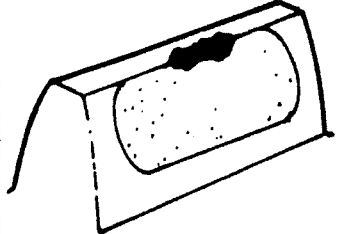
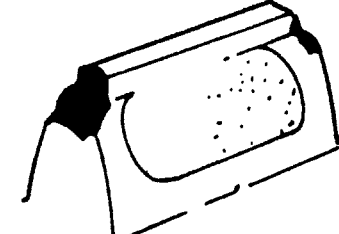
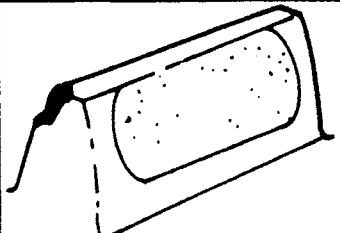
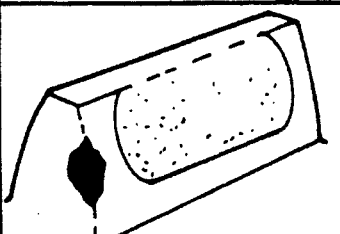
5-14. **PARTS REPLACEMENT.** Replace rejected parts that are not repairable. If there is any doubt about the serviceability of a part, replace it.

5-15. **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 Borg-Warner T5 Transmission Parts Catalog for availability and part number.

5-16. **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:

a. T5 WC Synchronizer Assemblies:
5th synchronizer assembly (45, figure 5-1)
3rd-4th synchronizer assembly (78, figure 5-1)

b. T5 NWC Synchronizer Assemblies:
5th synchronizer assembly (41, figure 5-2)
3rd-4th synchronizer assembly (74, figure 5-2)

REPAIR		REJECT	
CORNER CHIP AT DRIVE FACE		CHIP WITHIN CONTACT PATTERN	
O.D. EDGE CHIP AT DRIVE FACE. MAY EXTEND SLIGHTLY INTO CONTACT PATTERN		CHIP COMPLETELY THROUGH TOOTH (CONSIDERED TO BE BROKEN)	
CORNER CHIP AT COAST FACE			
SIDE EDGE CHIP AT DRIVE FACE			

1847

Figure 5-5. Gear Tooth Chips

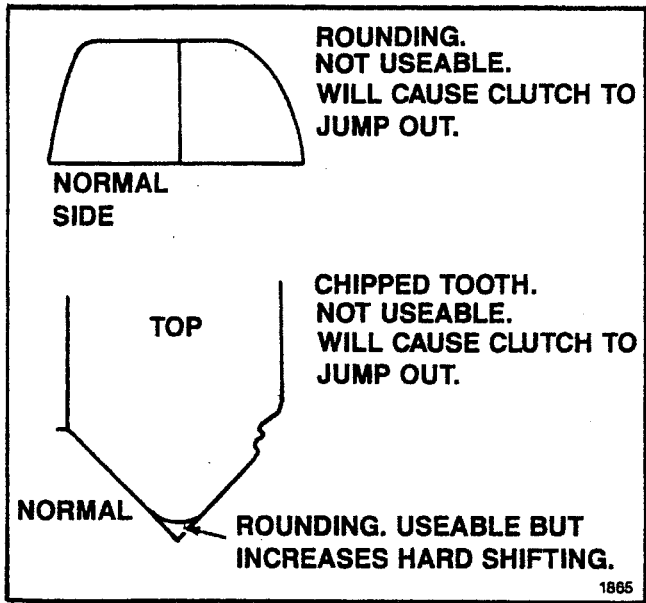


Figure 5-6. Clutch Tooth Inspection

Section 6

T5 WC Assembly

6-1. GENERAL INFORMATION

6-2. During assembly, refer to the illustrations specified in the text. In addition, an exploded view of the complete assembly can be seen on figure 5-1 in Section 5, Cleaning, Inspection, Repair or Replacement. Note the following during assembly:

a. When a torque value is specified, use a torque wrench to tighten the threaded part. Torque values are specified in the text and also in Table 6-1 at the end of this section.

b. Coat small parts with petrolatum to help hold them in place during assembly.

6-3. LUBRICATION DURING ASSEMBLY. Lubricate all internal parts, not coated with petrolatum, with approved transmission lubricant (refer to paragraph 2-4) just prior to assembly. This will ease assembly and provide initial lubrication.

a. O-rings and shaft seal lips may be damaged during assembly if not lubricated.

b. Make sure all bearings (refer to paragraph 6-5) are thoroughly lubricated before assembly. Running bearings dry, even for a brief period, will cause damage.

c. Before assembly, immerse T5 WC blocking ring assemblies (77, figure 5-1) and outer cone races (95) in approved transmission lubricant for at least one minute to thoroughly soak lining material. Soaked parts must be installed in transmission within 48 hours.

6-4. T5 WC TRANSMISSION ASSEMBLY PROCEDURES

6-5. T5 WC BEARING LUBRICATION. Before assembly, make sure that each of the following anti-friction bearings is thoroughly lubricated (refer to paragraph 6-3 and see figure 5-1):

- Bearing cone (64)
- Bearing rollers (66A) or bearing assy (66B)
- Thrust bearing (68)
- Bearing cone (72)
- Bearing (75A) or bearing (75B)
- Needle bearing (84)
- 2nd speed bearing (89)
- Bearing cones (115)

6-6. ASSEMBLY OF T5 WC 3RD-4TH SYNCHRONIZER ASSEMBLY (see figure 6-1). Be sure to assemble sleeve (80) and hub (82) aligning marks made at disassembly (see figure 6-2) so that clutch teeth and part faces are assembled exactly as they were originally. Assemble as follows:

CAUTION

Failure to assemble synchronizer sleeve and hub as they were originally could result in unsatisfactory performance.

NOTE

If synchronizer assembly is replaced, do not separate parts. Skip this paragraph and install assembly as received.

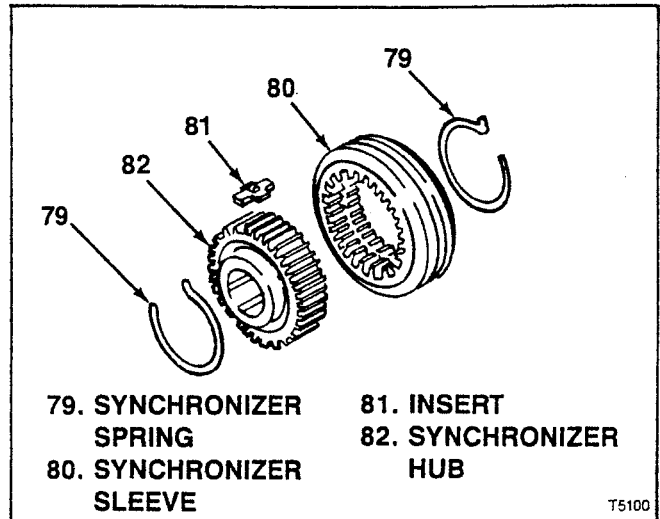


Figure 6-1. T5 WC 3rd-4th Synchronizer Assembly

a. Start sleeve (80) onto hub (82) to a position that will just permit installation of inserts (81). Install inserts (81) then engage clutch teeth fully.

b. Hook one end of one spring (79) under one of the inserts (81) and wrap around inside, under all three inserts. Hook other end of spring under insert (see figure 6-2).

c. Invert assembly. Hook remaining spring (79) under opposite end and side of same insert (81) where step b was started but wrap around inside in opposite direction from step b, under all three plates. Hook other end of spring under insert (81) (see figure 6-2).

d. Position sleeve (80) and inserts (81) so that all inserts snap into neutral position.

e. Set 3rd-4th synchronizer aside for later installation in transmission.

6-7. ASSEMBLY OF T5 WC 5TH SYNCHRONIZER ASSEMBLY (see figure 6-3). Be sure to assemble sleeve (47) and hub (49) aligning marks made at disassembly (see figure 6-4) so that clutch teeth and part faces are assembled exactly as they were originally. Assemble as follows:

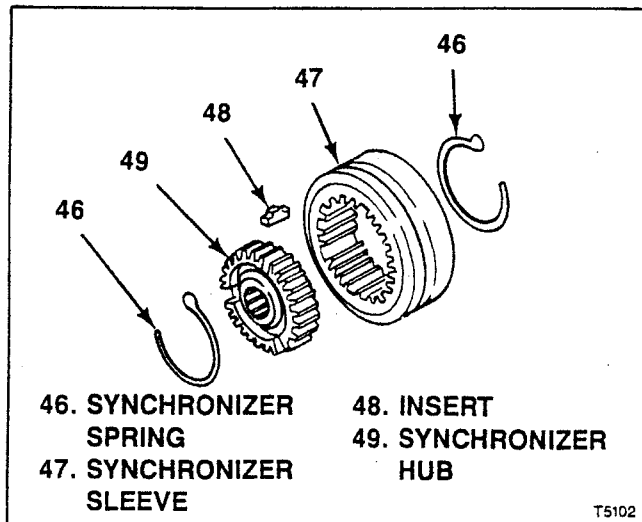
CAUTION

Failure to assemble synchronizer sleeve and hub as they were originally could result in unsatisfactory performance.

NOTE

If synchronizer assembly is replaced, do not separate parts. Skip this paragraph and install assembly as received.

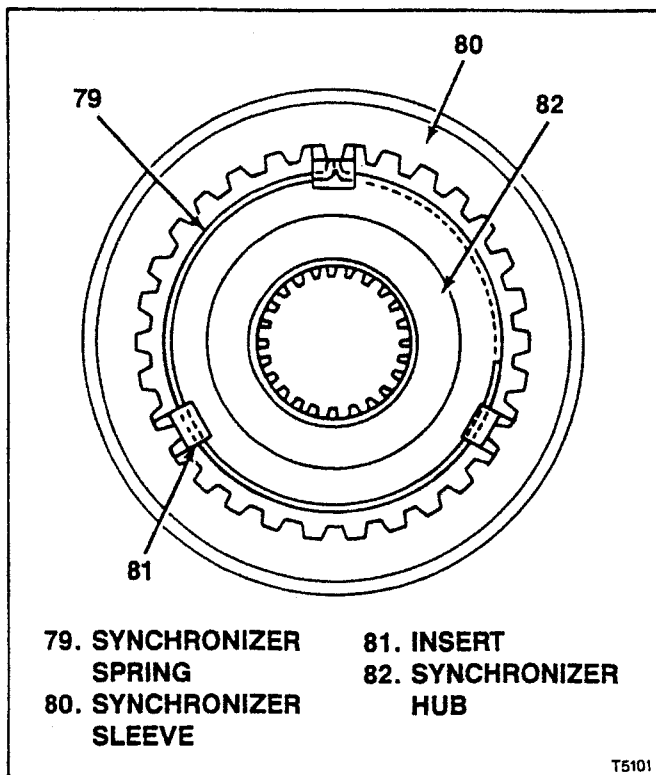
- a. Start sleeve (47) onto hub (49) to a position that will just permit installation of inserts (48). Install inserts (48) then engage clutch teeth fully.
- b. Hook one end of one spring (46) under one of the inserts (48) and wrap around inside, under all three inserts. Hook other end of spring under insert (see figure 6-4).
- c. Invert assembly. Hook remaining spring (46) under opposite end and side of same insert (48) where step b was started but wrap around inside in opposite direction from step b, under all three plates. Hook other end of spring under insert (48) (see figure 6-4).
- d. Position sleeve (47) and inserts (48) so that all inserts snap into neutral position.
- e. Set 5th synchronizer aside for later installation in transmission.



46. SYNCHRONIZER SPRING
47. SYNCHRONIZER SLEEVE
48. INSERT
49. SYNCHRONIZER HUB

T5102

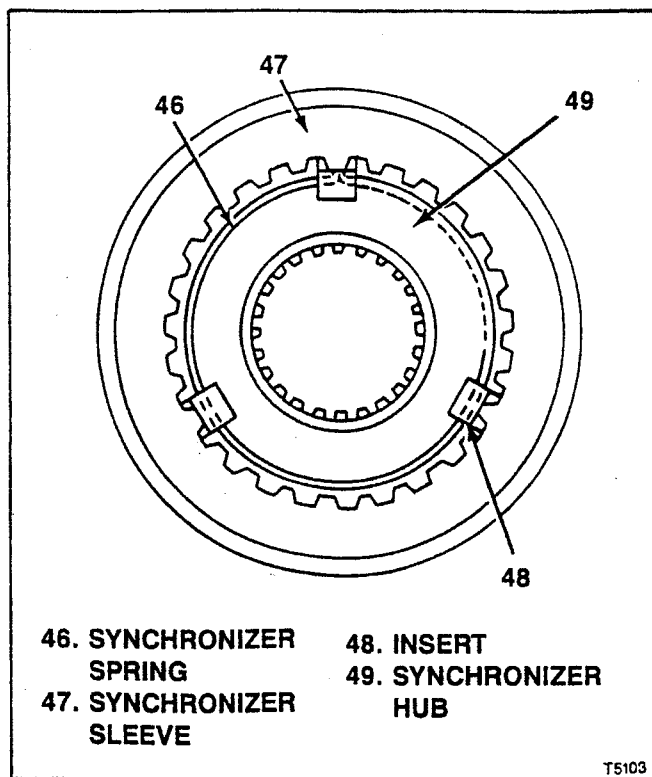
Figure 6-4. T5 WC 5th Synchronizer Assembled



79. SYNCHRONIZER SPRING
80. SYNCHRONIZER SLEEVE
81. INSERT SPRING
82. SYNCHRONIZER HUB

T5101

Figure 6-2. T5 WC 3rd-4th Synchronizer Assembled



46. SYNCHRONIZER SPRING
47. SYNCHRONIZER SLEEVE
48. INSERT
49. SYNCHRONIZER HUB

T5103

Figure 6-3. T5 WC 5th Synchronizer Assembly

6-8. ASSEMBLY AND INSTALLATION OF T5 WC COUNTERSHAFT GEAR (see figure 6-5):

a. If replaced, press bearing cones (115) on countershaft gear (116) using suitable tubular drift that contacts only bearing cone inner race. Press on bearing cones to bottom out on shaft shoulders.

b. Install o-ring (113) in groove in OD of bearing cup (114) and press cup into transmission case until cup flange seats against inside face of case.

c. Install countershaft gear (116), with bearing cones (115) through top opening of transmission case (117), rear end first. Extend rear end of countershaft gear through rear case opening enough to seat front end bearing cone in bearing cup (114).

d. Temporarily install bearing cup (111) and attach rear retainer (105) with bolts (104).

e. Using dial indicator, manually move countershaft gear (116) back and forth using firm hand force and measure end play. Record end play as dimension C.

f. Calculate T_c , thickness of shim (106) required, as follows:

$$T_c = C - 0.0018 \text{ in.}, \text{ or}$$

$$T_c = C - 0.046 \text{ mm}$$

g. Remove bolts (104), rear retainer (105) and bearing cup (111) temporarily installed. Select shim(s) (106) of thickness calculated in step f and store with bearing cup (111) until these parts are permanently installed.

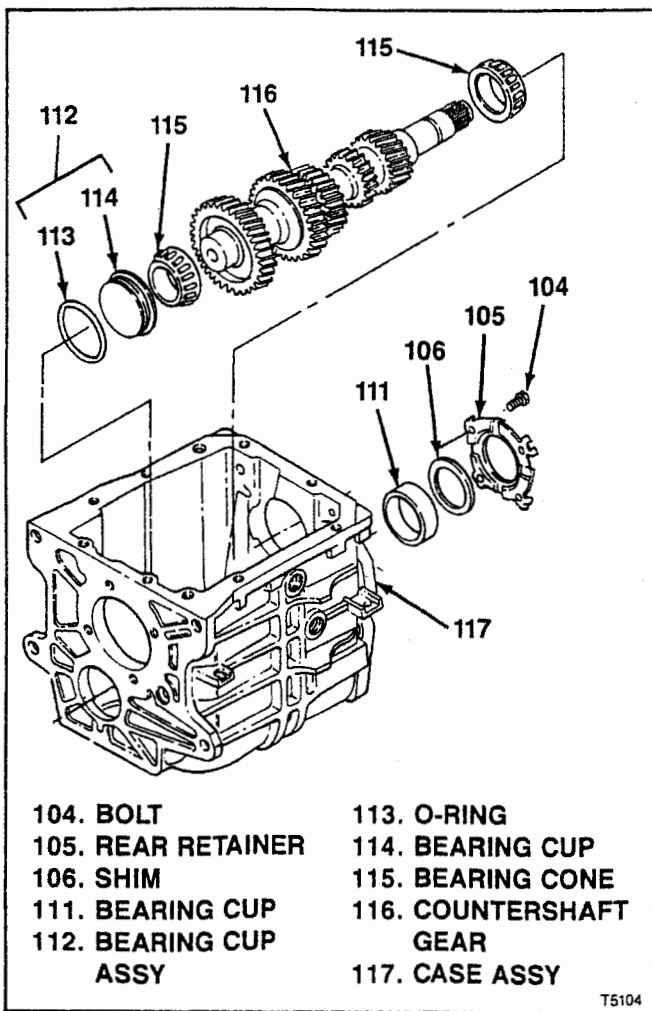


Figure 6-5. T5 WC Countershaft Gear

6-9. INSTALLATION OF T5 WC REVERSE FORK AND IDLER GEAR. With assembly completed as described through paragraph 6-8, proceed as follows (see figure 6-6):

a. Start reverse idler shaft (108) in through rear opening in transmission case (117) with pin hole in shaft pointing up toward top case opening.

b. Position o-ring (110) and reverse idler gear assembly (109) in transmission case (117) and continue to push reverse idler shaft into case, through gear, o-ring and boss inside case.

c. Install roll pin (107). Using suitable drift, tap pin into reverse idler shaft (108) until pin is centrally located in shaft.

d. Install bearing cup (111) with shim(s) (106) selected in paragraph 6-8.

e. Attach rear retainer (105) with bolts (104). Torque bolts to 15 lb-ft (20 Nm).

f. Using dial indicator, recheck end play of countershaft to be 0.0005-0.0040 in. (0.013-0.102 mm).

g. If countershaft end play is within limits, bend tabs on rear retainer (105) up, against flats on head of bolts (104).

h. Hook long end of spring (102) into fork, pin and roller assembly (103) and position these parts in transmission, engaging fork with groove in reverse idler gear (109).

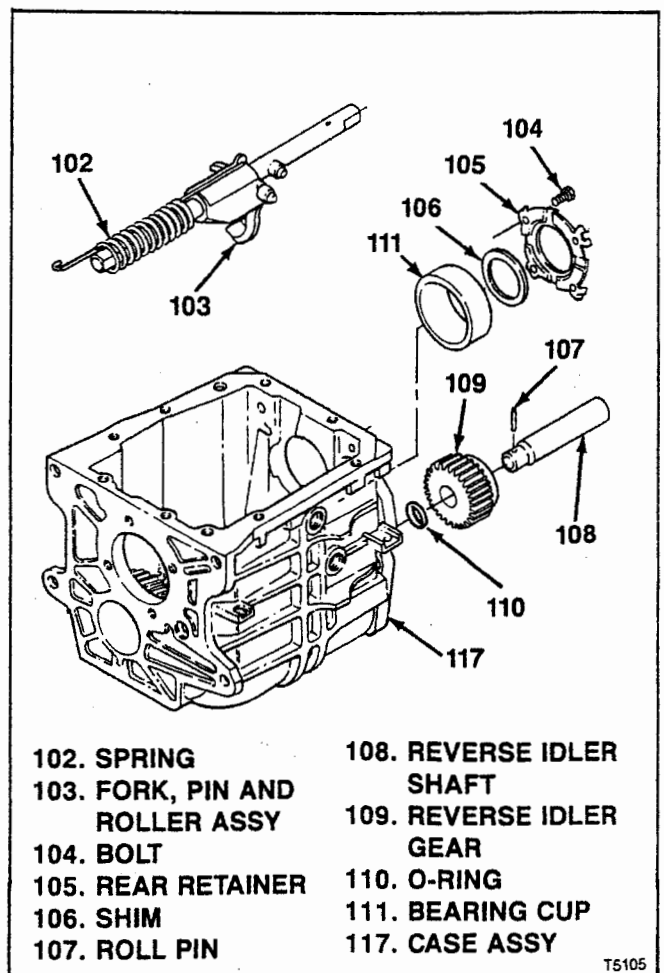


Figure 6-6. T5 WC Reverse Fork and Idler Gear

6-10. ASSEMBLY OF T5 WC OUTPUT SHAFT ASSEMBLY. On work bench, assemble output shaft assembly as follows (see figure 6-7):

- a. Install pin (100) in shaft and hub assembly (101).
- b. Be sure to assemble reverse sliding gear (98) and hub on shaft and hub assembly (101), aligning marks made at disassembly (see figure 6-8) so that clutch teeth and part faces are assembled exactly as they were originally.

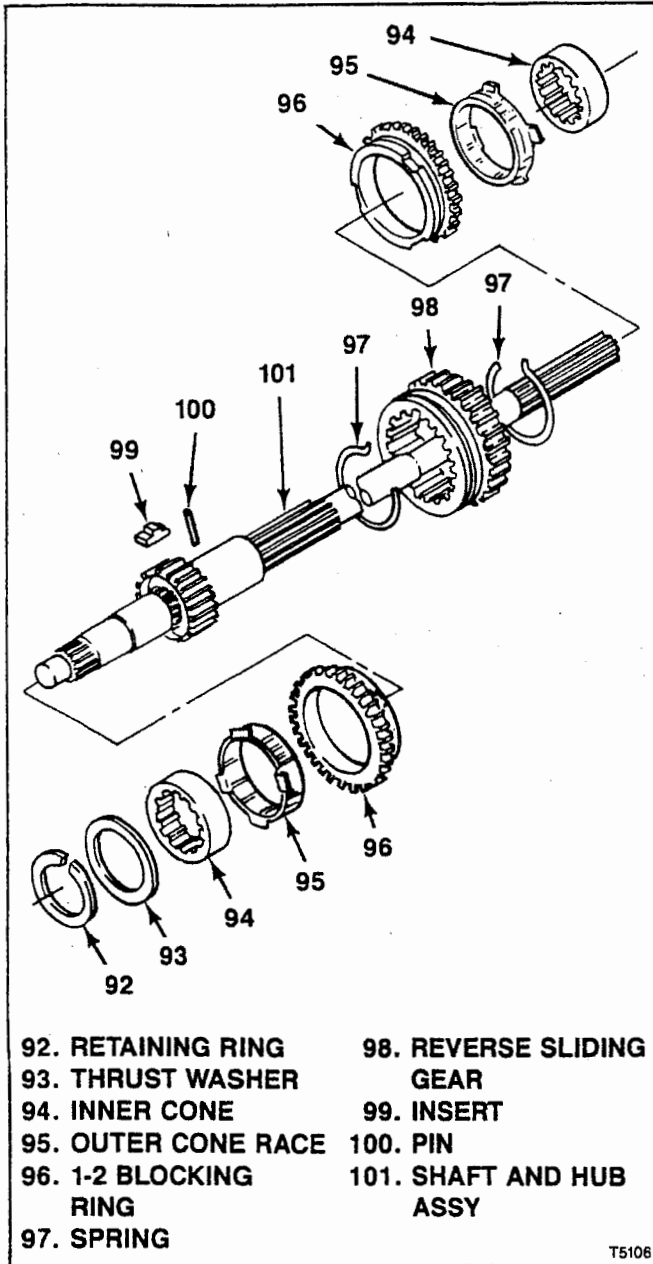


Figure 6-7. T5 WC Output Shaft Assembly

CAUTION

Failure to assemble synchronizer sleeve and hub as they were originally could result in unsatisfactory performance.

- c. Start reverse sliding gear (98) onto hub on shaft and hub assembly (101) to a position that will just permit installation of inserts (99). Install inserts (99) then engage clutch teeth fully.
- d. Hook one end of one spring (97) under one of the inserts (99) and wrap around inside, under all three inserts. Hook other end of spring under insert (see figure 6-8).
- e. At other side of assembly hook remaining spring (97) under opposite end and side of same insert (99) where step d was started but wrap around inside in opposite direction from step d, under all three plates. Hook other end of spring under insert (99) (see figure 6-8).
- f. Position reverse sliding gear (98) and inserts (99) so that all inserts snap into neutral position.
- g. At each end of shaft and hub assembly (101) install 1-2 blocking ring (96), outer cone race (95) and inner cone (94), noting the correct position and location of these parts as shown in figure 6-7. Be sure to align blocking ring notches with inserts (99).
- h. At second speed end of shaft and hub assembly (101), install thrust washer (93) and retaining ring (92).

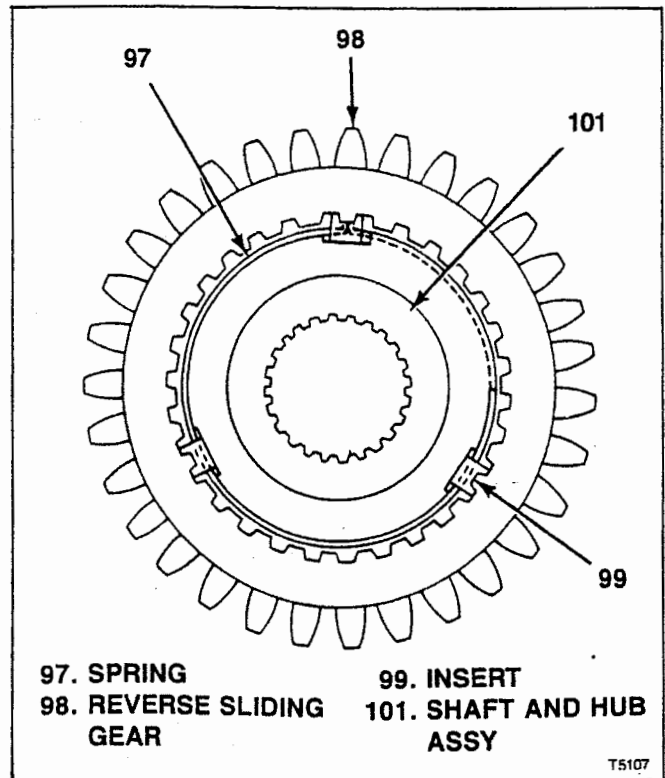


Figure 6-8. Reverse Sliding Gear Assembled

6-11. ASSEMBLY OF T5 WC OUTPUT SHAFT GROUP. After assembly of output shaft assembly (91) as described in paragraph 6-10, proceed as follows (see figure 6-9):

- a. Install spacer (90), bearing (89), 2nd speed gear (88), thrust washer (87) and snap ring (86).
- b. Install spacer (85), bearing (84), 3rd speed gear (83) and one blocking ring (77).
- c. Install 3rd-4th synchronizer assembly (78) (as assembled in paragraph 6-6), aligning notches in installed blocking ring (77) with synchronizer inserts. Use a suitable drift that bears on synchronizer hub only.
- d. Install remaining blocking ring (77), aligning notches with inserts in installed 3rd-4th synchronizer assembly (78).

- e. At other end of assembly, install sleeve (76) and 1st speed gear bearing as follows, according to type:
 1. **One Double-Row Bearing.** Install bearing (75A).
 2. **Two Separate Bearings.** Install one bearing (75B), spacer (75C) and remaining bearing (75B).
- f. Install 1st speed gear (73) and bearing cone (72). Use 5th driven gear (70) and suitable drift to press bearing on cone until it is fully seated. Bearing cone is fully seated when shaft snap ring groove is accessible at outside end of 5th driven gear. Remove drift and 5th driven gear.

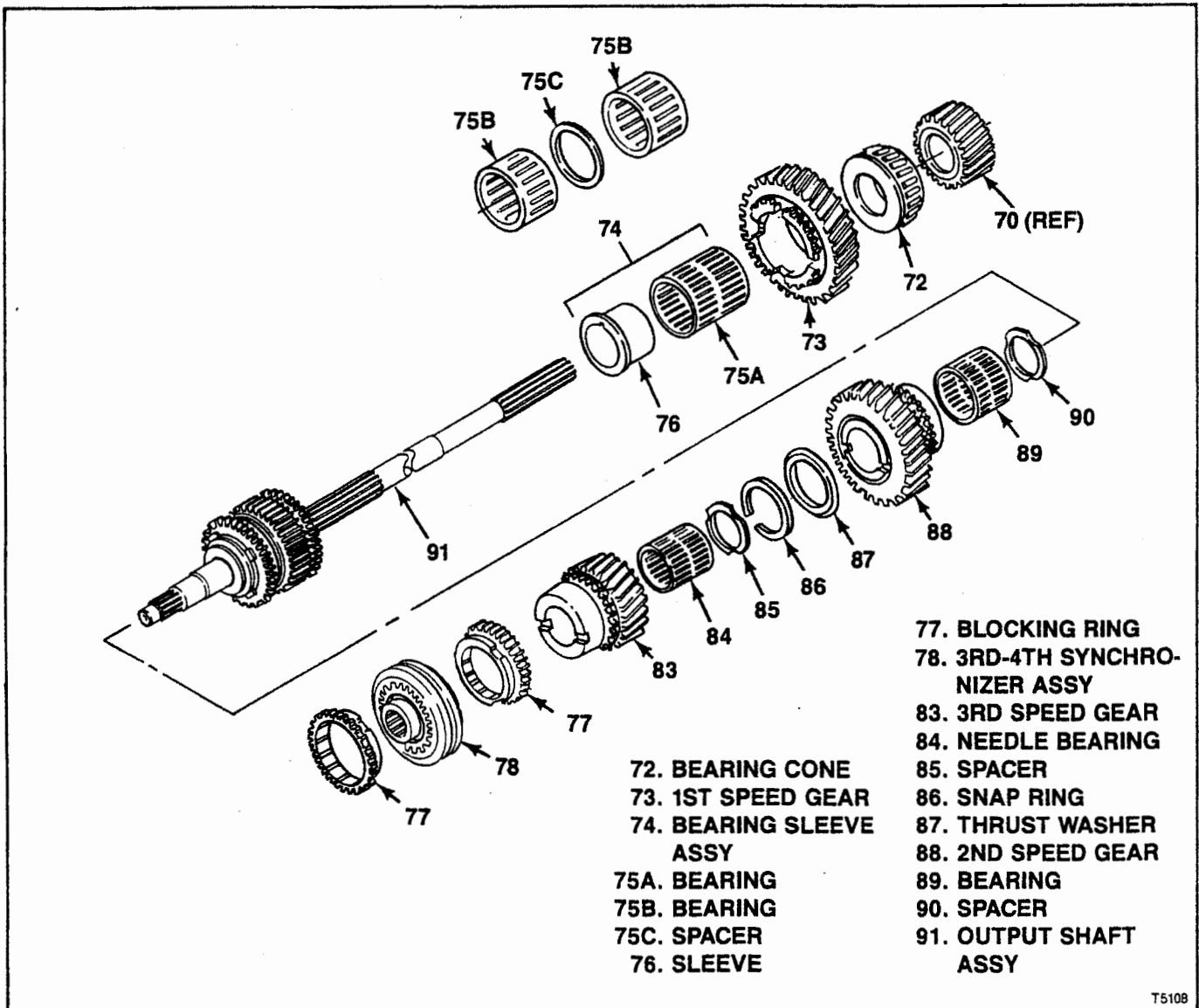


Figure 6-9. Assembly of T5 WC Output Shaft Assembly

6-12. INSTALLATION OF T5 WC OUTPUT SHAFT GROUP. After assembly of output shaft group (120) (paragraph 6-11), install as follows (see figure 6-10):

a. Tilt rear end of output shaft group (120) down and install through top opening and out rear of transmission case (117). Rest output shaft group on countershaft previously installed.

b. At rear of transmission case (117), install bearing cup (71), 5th driven gear (70) and one snap ring (56).

6-13. ASSEMBLY AND INSTALLATION OF T5 WC INPUT SHAFT. After installing output shaft, proceed as follows (see figure 6-11):

a. If removed, press new bearing cone (64) onto input shaft (65) to bottom out on shaft shoulder. Use suitable tubular drift that contacts bearing cone inner race only.

b. Install pilot bearing in input shaft (65) as follows, depending on bearing type:

1. **Roller Bearing Assembly.** Install bearing assembly (66B) in end of input shaft (65).

2. **Individual Bearing Rollers.** Coat bearing rollers (66A) with petrolatum and install in end of input shaft. Install spacer (67).

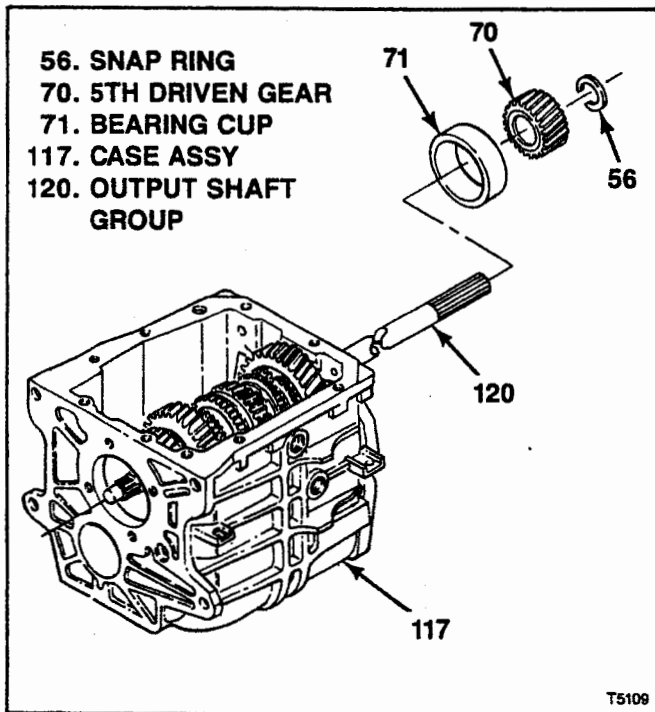


Figure 6-10. Installation of T5 WC Output Shaft Group

c. Install thrust race (69) and thrust bearing (68) on end of output shaft (101) in transmission.

d. Rotate input shaft (65) (with pilot bearing) so that flat on its clutch tooth ring aligns with countershaft (116) and install in transmission, over end of output shaft (101) using care not to dislodge bearing parts previously installed.

e. Using suitable drift, press new oil seal (61) into input bearing retainer (60).

f. Install bearing cup (63) but do not install shim(s) (62) at this time.

g. Do not use sealant on input bearing retainer at this time. Align index marks made at disassembly and install input bearing retainer (60). Attach with bolts (59) and torque to 15 lb-ft (20 Nm).

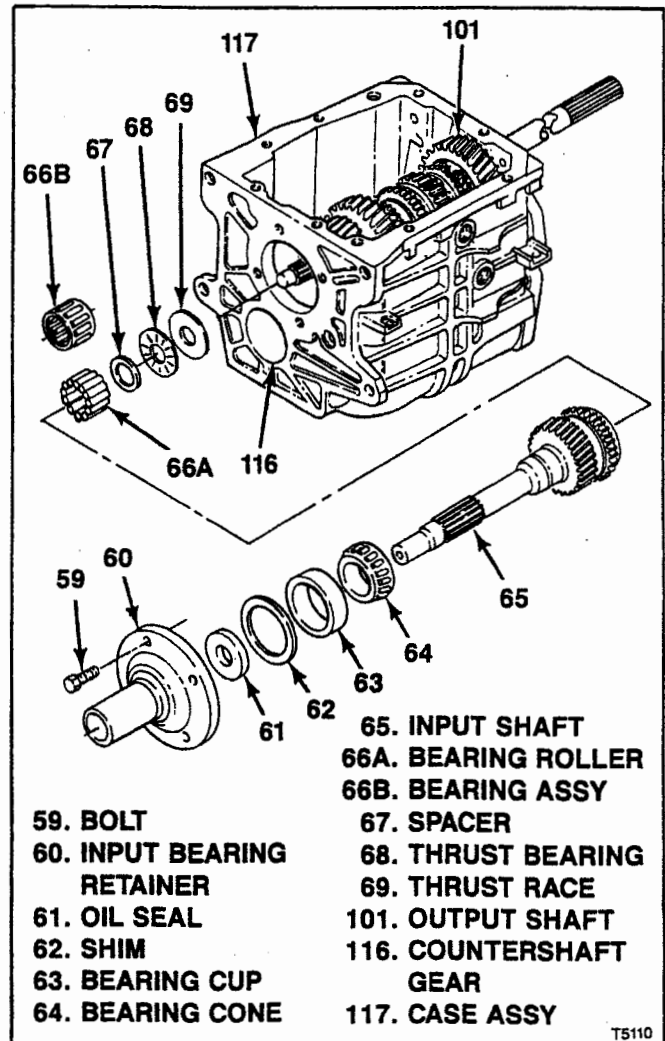


Figure 6-11. T5 WC Input Shaft

6-14. INSTALLATION OF T5 WC SPEEDOMETER GEAR. On models so equipped, install speedometer gear as follows (see figure 6-12):

- a. Position clip (58) on output shaft (101) with right angle end of clip in shaft hole. Start speedometer gear (57) onto output shaft, aligning gear slot with clip.
- b. Using suitable tubular drift, tap speedometer gear (57) onto shaft until spring end of clip (58) snaps up to retain gear.
- c. Install one snap ring (56).

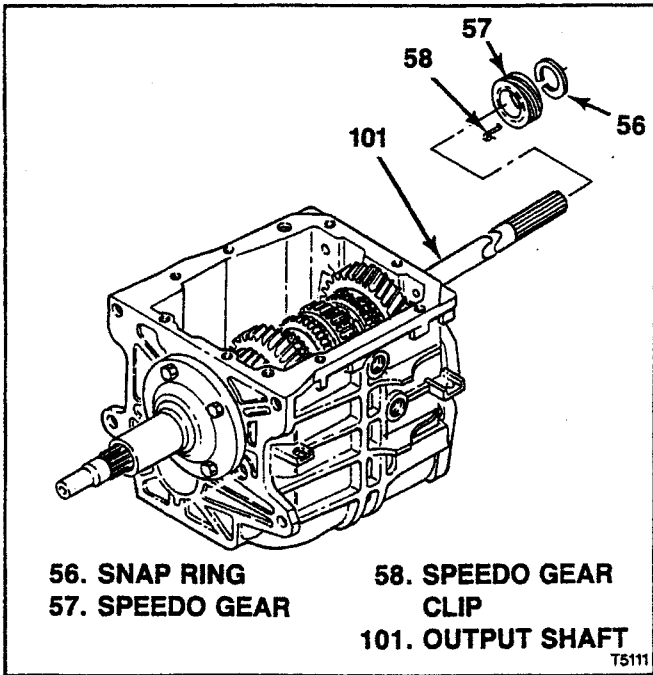


Figure 6-12. T5 WC Speedometer Gear

6-15. INSTALLATION OF T5 WC 5TH GEAR, SHIFT FORK AND SYNCHRONIZER. At rear of transmission, install parts as follows (see figure 6-13):

- a. Install 5th speed drive gear (55) and blocking ring (54) on end of countershaft gear (116, figure 6-5).
- b. Attach 5th shift fork (51) to shift rail assembly (53) with roll pin (50). Install inserts (52) on 5th shift fork.
- c. Engage 5th shift fork (51) with previously assembled (paragraph 6-7) 5th synchronizer assembly (45) and install together in transmission noting the following:
 1. Install 5th synchronizer assembly over rear end of countershaft gear.
 2. Guide shift rail assembly (53) through reverse fork, pin and roller assembly and spring (103 and 102, figure 6-6) previously installed.
- d. Install 5th synchronizer retainer (44) and snap ring (43).

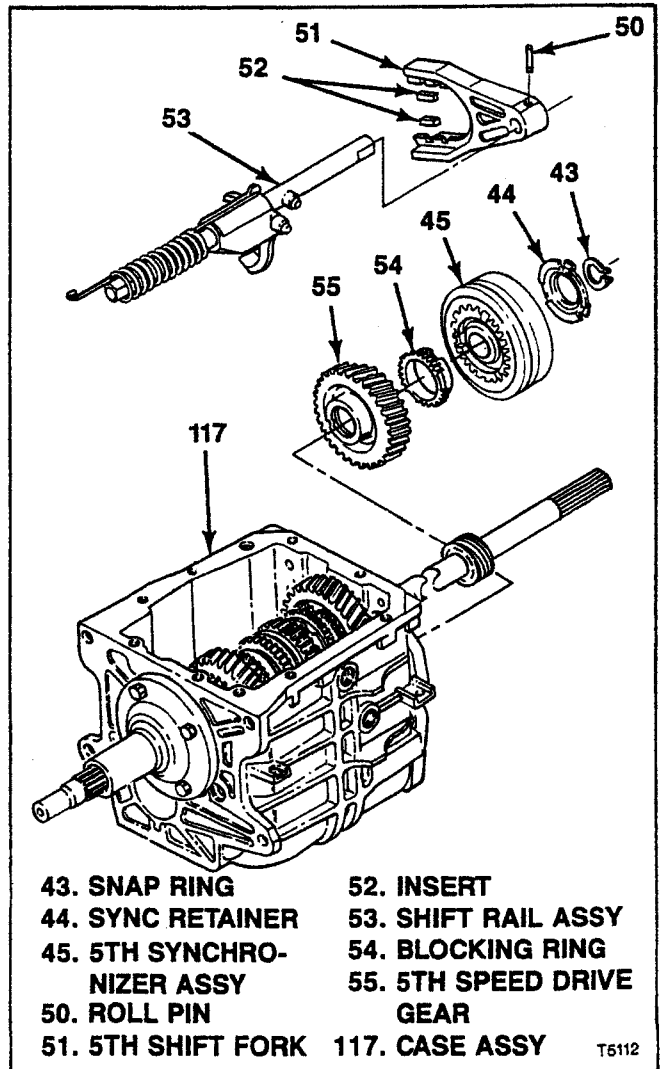


Figure 6-13. T5 WC 5th Synchronizer, Shift Fork and Gear

e. Position 1-2 shift fork (31) (with inserts and selector plate) in case cover (38) and push shifter shaft (29) just through fork. Notch in selector plate should align with semi-circular groove in cover (see figure 6-16).

f. Align gap in interlock plate (34) with projection on selector arm assembly (33) and install these parts in semi-circular groove in case cover (38). Continue to push in shifter shaft (29) until it is just through selector arm assembly (see figure 6-17).

g. Position 3-4 shift fork (30) (with inserts and selector plate) in case cover (38) so that selector plate (35) in 3-4 shift fork is between cover and selector plate (35) in 1-2 shift fork (31). Continue to push in shifter shaft (29) completely through 3-4 shift fork and into cover (see figure 6-18).

h. Align pin holes in selector arm (28) and shifter shaft (29) and drive in selector arm pin (28) using suitable drift.

i. Check for proper assembly of shift parts in cover:

1. Rotate shifter shaft (29) so that pin hole through its free end is at 90 degree angle to open face of case cover (38).

2. Check that projection on selector arm assembly (33) is engaged in notch in selector plate (35) installed in 3-4 shift fork.

j. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (117) mounting face for case cover (38). Center sealant bead between edges of face. Circle bolt holes.

k. In transmission, make sure that 1-2 synchronizer, 3-4 synchronizer and 5-R shift lever are all in neutral position.

l. Position case cover (38), with assembled parts, over transmission and gradually lower, engaging shift forks (30 and 31) with grooves in synchronizer collars in transmission. Lower case cover into position, moving it sideways just before it contacts transmission case (117) as required to align bolt holes.

m. Install bolts (26 and 27) and torque to 10 lb-ft (14 Nm).

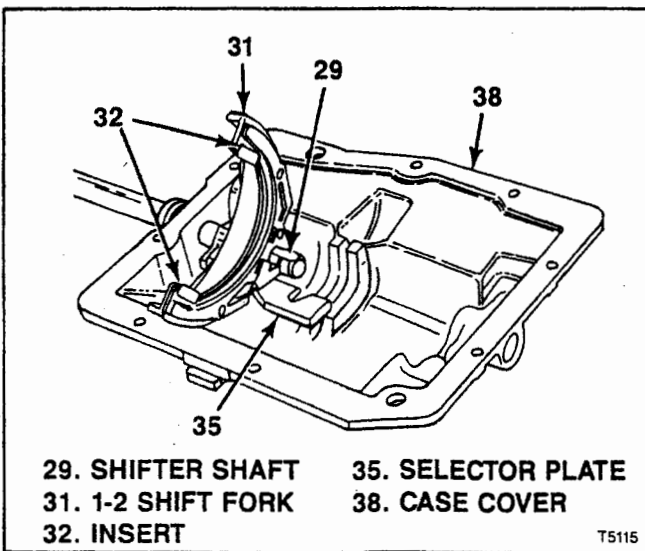


Figure 6-16. Installing T5 WC 1-2 Shift Fork

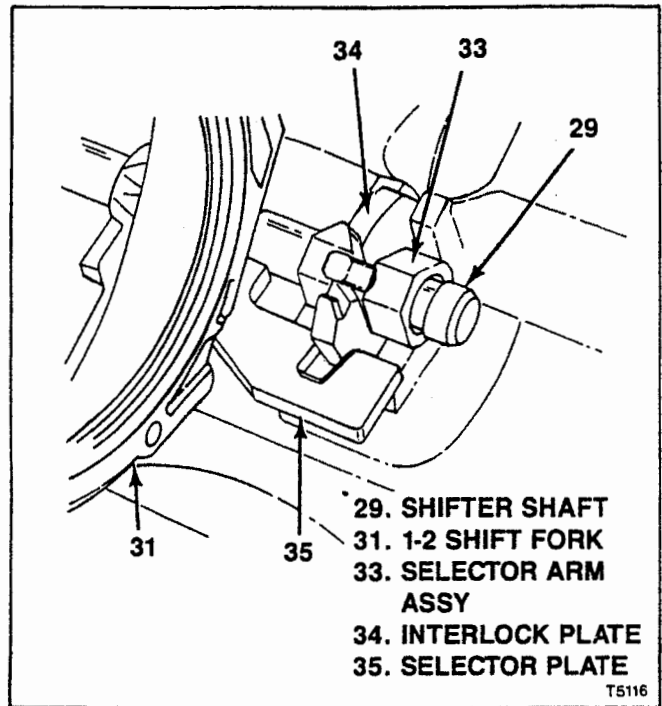


Figure 6-17. Installing T5 WC Selector Arm and Interlock Plate

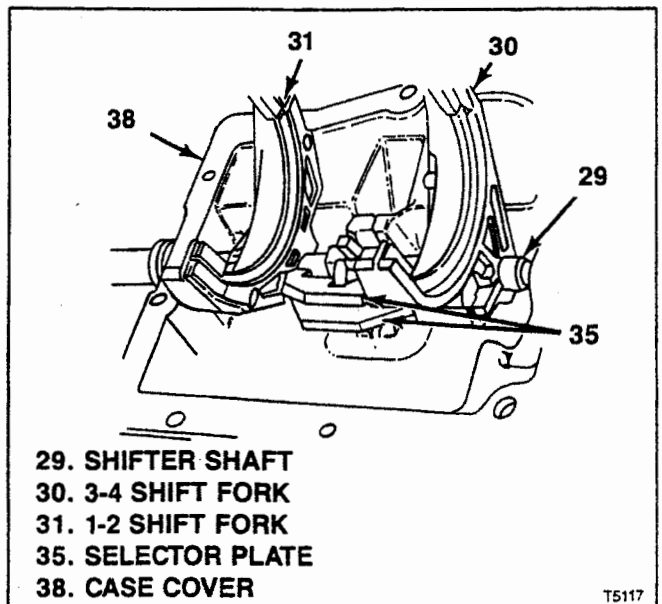


Figure 6-18. Installing T5 WC 3rd-4th Shift Fork

6-18. INSTALLATION OF T5 WC EXTENSION OR ADAPTER. With case cover installed, proceed as follows (see figure 6-19):

- a. Install oiling funnel (25) in end of shaft of countershaft gear (116, figure 6-5). Use petrolatum to help hold in place.
- b. Install damper sleeve (21) in offset lever (20).
- c. Make sure plug (19) and detent guide plate (18) are installed in extension (17A) or adapter (17B).

d. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (117) mounting face for extension (17A) or adapter (17B). Center sealant bead between edges of face. Circle bolt holes.

e. Lubricate detent guide plate (18) in extension (17A) or adapter (17B) with lithium grease. Position extension or adapter so that it easily can be picked up and installed on transmission.

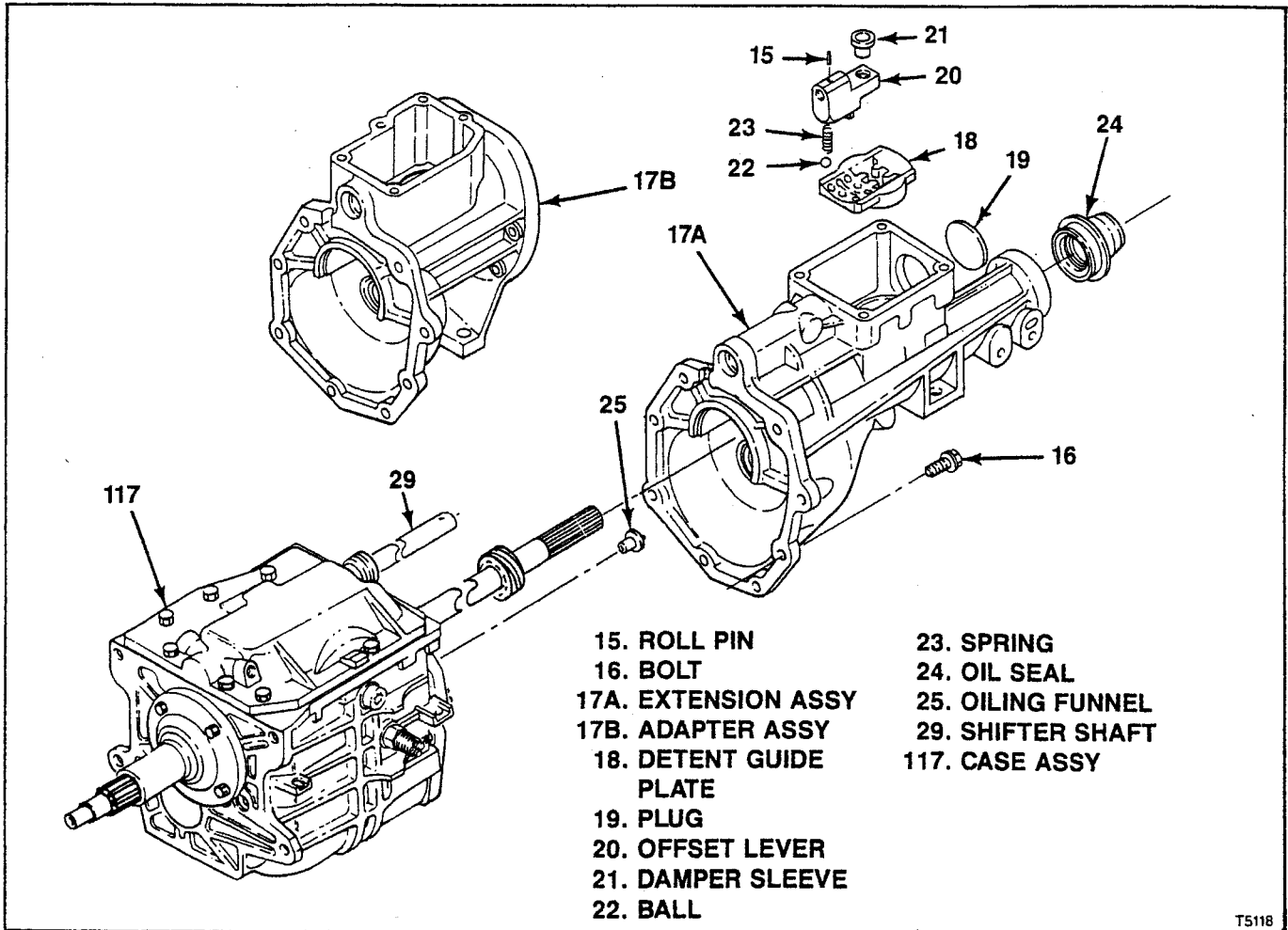


Figure 6-19. T5 WC Extension or Adapter

T5118

f. Position ball (22) in 3-4 position in detent guide plate (18) (see figure 6-20).

g. Insert spring (23) in offset lever (20). Use petroleum to hold in place.

h. Position offset lever (20) (with spring) in extension (17A) or adapter (17B), engaging open end of spring (23) on ball (22) and push down on offset lever to compress spring slightly. Holding offset lever with one hand, pick up extension or adapter with the other and move parts into position at rear of transmission. Guide offset lever over end of shifter shaft (29) while moving extension or adapter up against rear of transmission case (117).

i. Install bolts (16) and torque to 23 lb-ft (30 Nm).

j. Align pin holes in offset lever (20) and shifter shaft (29) and drive in roll pin (15).

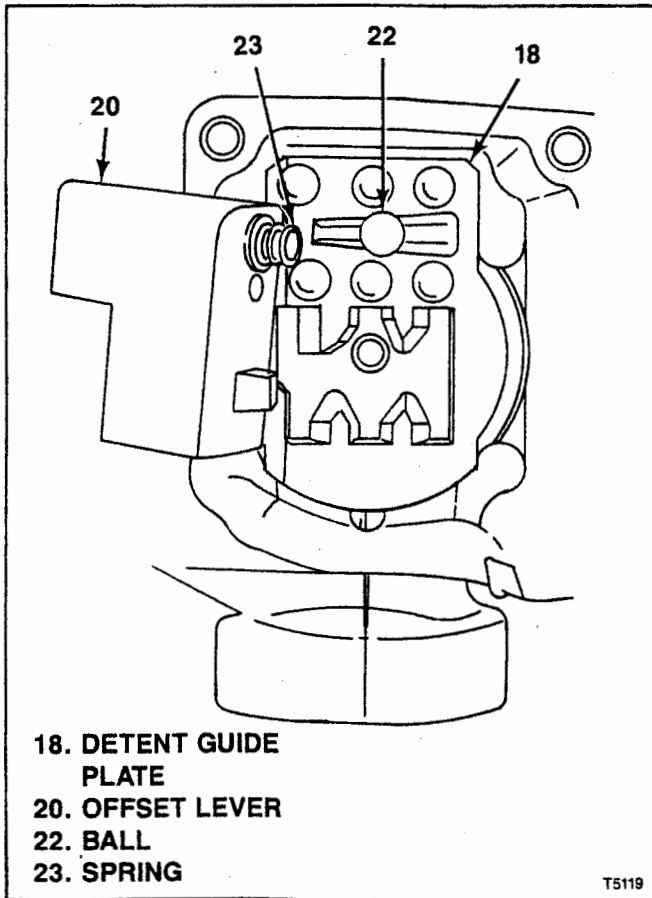


Figure 6-20. T5 WC Ball in 3rd-4th Position

6-19. ADJUSTMENT OF T5 WC INPUT/OUTPUT SHAFT BEARING PRELOAD. With both input bearing retainer and extension or adapter installed as described in preceding paragraphs, adjust input/output shaft bearing preload as follows (see figure 6-21 and 6-22):

a. Position transmission with input shaft end up.

b. Remove bolts (59, figure 6-21) attaching input bearing retainer (60) and remove bearing retainer.

c. Using hand pressure, press down firmly on input shaft (65) and bearing cup (63) to ensure that power train parts in transmission are fully seated.

d. Using suitable depth micrometer measure and record the following (see figure 6-22):

1. Dimension A, distance from top of bearing cup (63) to mounting face on transmission case (117) for input bearing retainer (60).

2. Dimension B, distance from mounting face on input bearing retainer (60) to bearing cup contact surface.

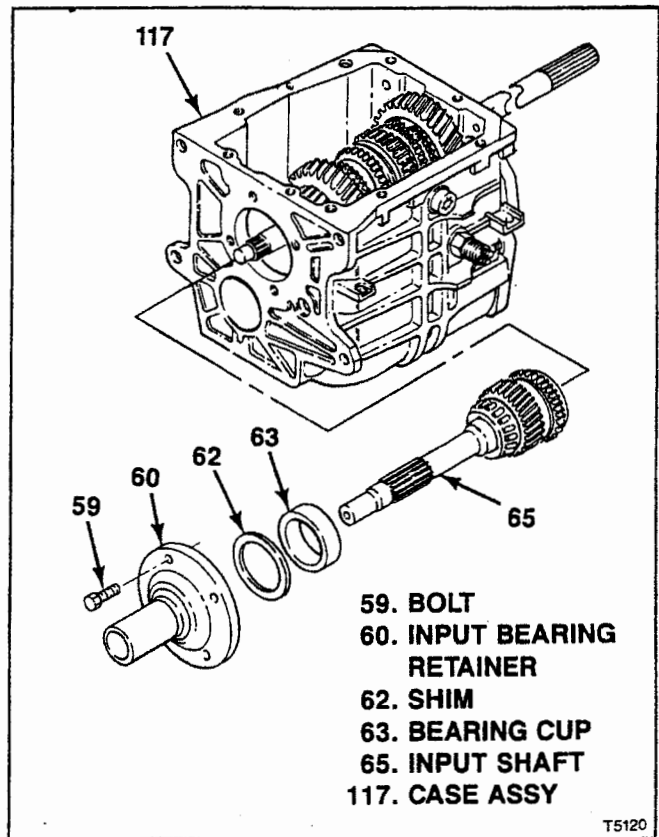


Figure 6-21. T5 WC Bearing Preload Adjustment

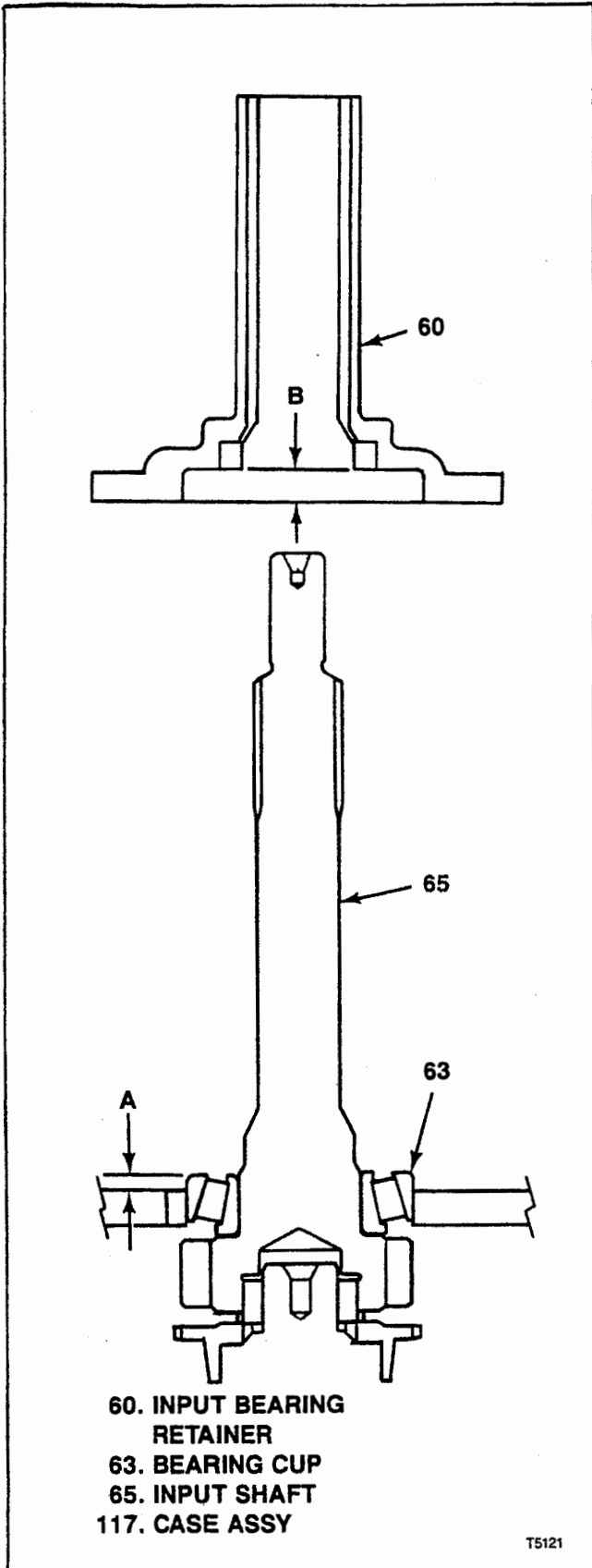


Figure 6-22. T5 WC Bearing Preload Measurements

e. Calculate T_s , thickness of bearing preload shim(s) (62) required, as follows:

$$T_s = B - A + 0.003 \text{ in.}, \text{ or}$$

$$T_s = B - A + 0.07 \text{ mm}$$

f. Select shim(s) (62) of thickness calculated at step e and install on end of bearing cup noting the following:

1. Thickest shim shall be installed adjacent to bearing cup (63). Minimum thickness of this shim shall be 0.012 in. (0.30 mm).

2. Thinnest shim shall be installed adjacent to bearing contact surface in input bearing retainer (60).

g. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (117) mounting face for input bearing retainer (60). Center sealant bead between edges of face. Circle bolt holes.

h. Align index marks made at disassembly and install input bearing retainer (60). Attach with bolts (59) and torque to 15 lb-ft (20 Nm).

6-20. INSTALLATION OF T5 WC EXTERNAL COMPONENTS AND CONTROL LEVER AND HOUSING ASSEMBLY. Complete transmission assembly as follows (see figure 6-23):

a. Install o-rings (14) on speedo adapter (10). Insert oil seal (13) and speedo driving gear (12), then install pin (11).

b. Install speedo adapter (10), with assembled parts, in transmission and attach with screw (9).

c. If used, install harness retainer (8), pin (7) and neutral switch (6).

d. Install vent and o-ring assembly (5A) or breather (5B).

e. Install control lever and housing assembly (3A, 3B or 3C):

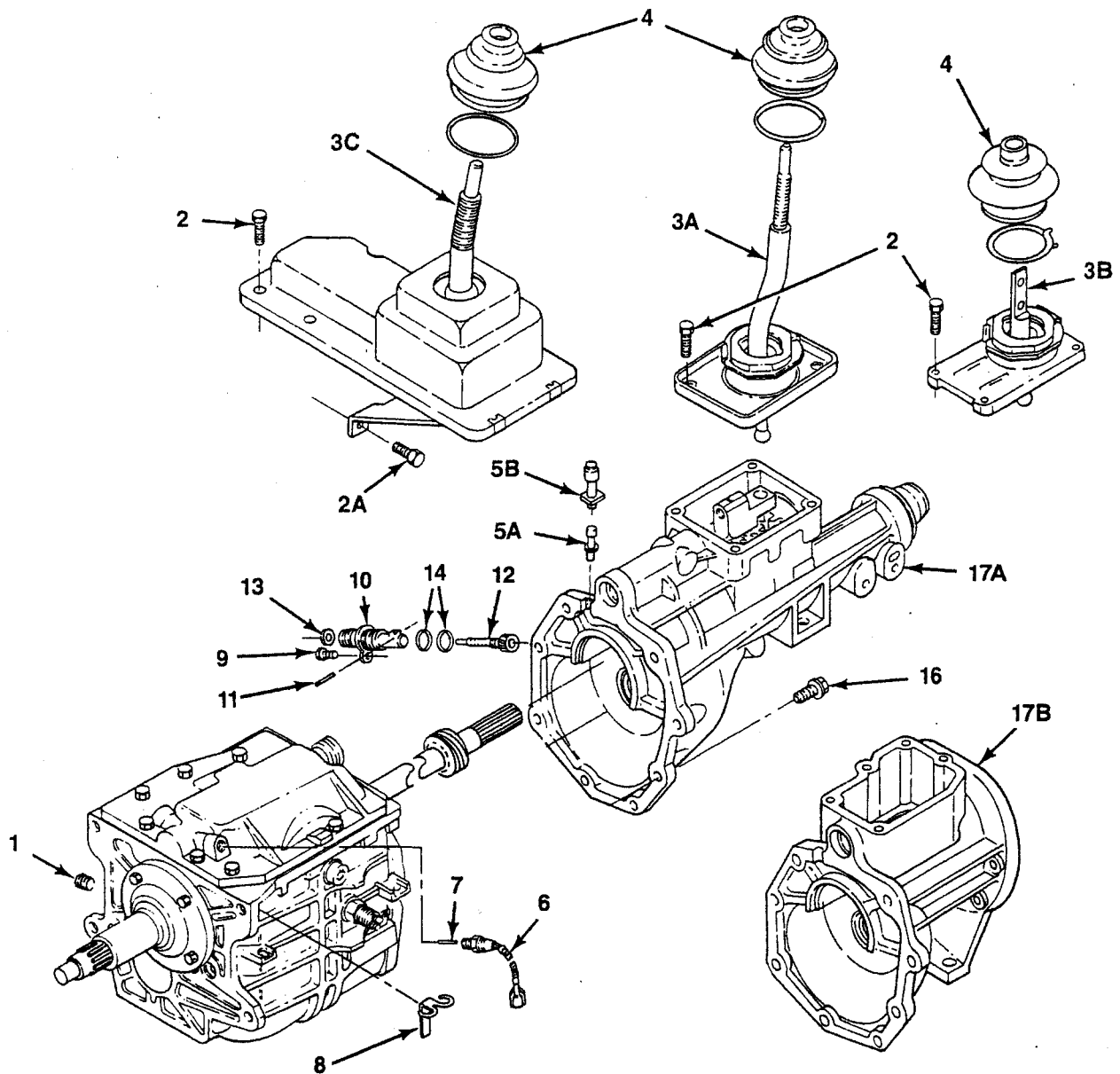
1. Install boot (4) if replaced.

2. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around extension (17A) or adapter (17B) mounting face for control lever and housing assembly (3A, 3B or 3C). Center sealant bead between edges of face. Circle bolt holes.

3. Position control lever and housing assembly (3A, 3B or 3C) on extension (17A) or adapter (17B) engaging inside end of lever in damper sleeve (21, figure 6-19) installed in offset lever (20, figure 6-19).

4. Install screws (2). If control lever and housing assembly (3C) is used, also install screws (2A). Torque all screws to 13 lb-ft (17 Nm).

f. Install fill and drain plugs (1) and torque to 20 lb-ft (27 Nm).



- | | | | |
|------------------------------------|------------------------------------|---------------------|-------------------------|
| 1. PLUG | 3C. CONTROL LEVER AND HOUSING ASSY | 7. PIN | 12. SPEEDO DRIVING GEAR |
| 2. SCREW | 4. BOOT | 8. HARNESS RETAINER | 13. OIL SEAL |
| 2A. SCREW | 5A. VENT AND O-RING ASSY | 9. ADAPTER SCREW | 14. O-RING |
| 3A. CONTROL LEVER AND HOUSING ASSY | 5B. BREATHER | 10. SPEEDO ADAPTER | 16. BOLT |
| 3B. CONTROL LEVER AND HOUSING ASSY | 6. SWITCH ASSY | 11. ROLL PIN | 17A. EXTENSION ASSY |
| | | | 17B. ADAPTER ASSY T5122 |

Figure 6-23. T5 WC Control Lever Housing and External Components

Table 6-1. T5 WC Transmission Torque Values

PART (FIG. 5-1 INDEX NO.)	TORQUE IN LB-FT	TORQUE IN Nm
Drain plug (1)	20	27
Screw (2 & 2A)	13	17
Bolt (16)	23	30
Bolt (26 & 27)	10	14
Pivot pin (40)	20	27
Bolt (59)	15	20
Bolt (104)	15	20

Section 7

T5 NWC Assembly

7-1. GENERAL INFORMATION

7-2. During assembly, refer to the illustrations specified in the text. In addition, an exploded view of the complete assembly can be seen on figure 5-2 in Section 5, Cleaning, Inspection, Repair or Replacement. Note the following during assembly:

a. When a torque value is specified, use a torque wrench to tighten the threaded part. Torque values are specified in the text and also in Table 7-1 at the end of this section.

b. Coat small parts with petrolatum to help hold them in place during assembly.

7-3. LUBRICATION DURING ASSEMBLY. Lubricate all internal parts, not coated with petrolatum, with approved transmission lubricant (refer to paragraph 2-4) just prior to assembly. This will ease assembly and provide initial lubrication.

a. O-rings and shaft seal lips may be damaged during assembly if not lubricated.

b. Make sure all bearings (refer to paragraph 7-5) are thoroughly lubricated before assembly. Running bearings dry, even for a brief period, will cause damage.

7-4. T5 NWC TRANSMISSION ASSEMBLY PROCEDURES

7-5. T5 NWC BEARING LUBRICATION. Before assembly, make sure that each of the following anti-friction bearings is thoroughly lubricated (refer to paragraph 7-3 and see figure 5-2):

- Bearing (39)
- Bearing cone (61)
- Bearing rollers (63)
- Thrust bearing (64)
- Bearing cone (68)
- Needle bearing (71)
- Bearing (101)
- Bearing (103)

7-6. ASSEMBLY OF T5 NWC 3RD-4TH SYNCHRONIZER ASSEMBLY (see figure 7-1). Be sure to assemble sleeve (76) and hub (78) aligning marks made at disassembly (see figure 7-2) so that clutch teeth and part faces are assembled exactly as they were originally. Assemble as follows:

CAUTION

Failure to assemble synchronizer sleeve and hub as they were originally could result in unsatisfactory performance.

NOTE

If synchronizer assembly is replaced, do not separate parts. Skip this paragraph and install assembly as received.

a. Start sleeve (76) onto hub (78) to a position that will just permit installation of inserts (77). Install inserts (77) then engage clutch teeth fully.

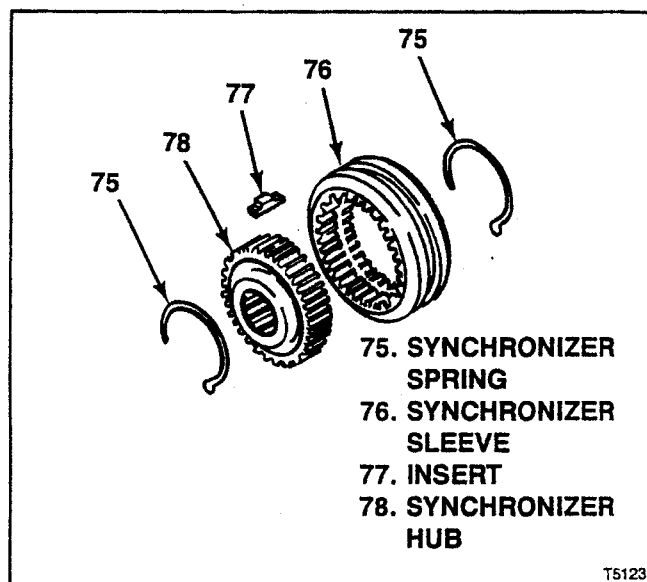


Figure 7-1. T5 NWC 3rd-4th Synchronizer Assembly

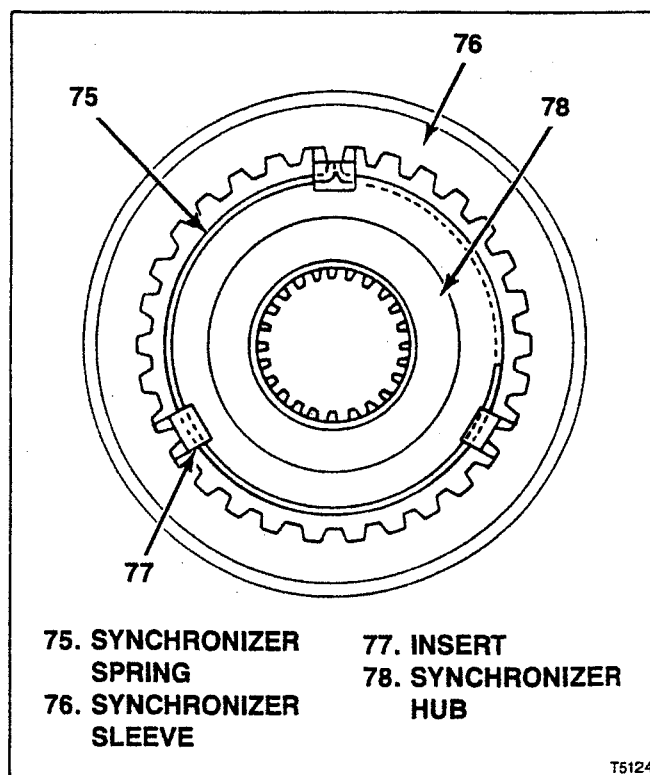
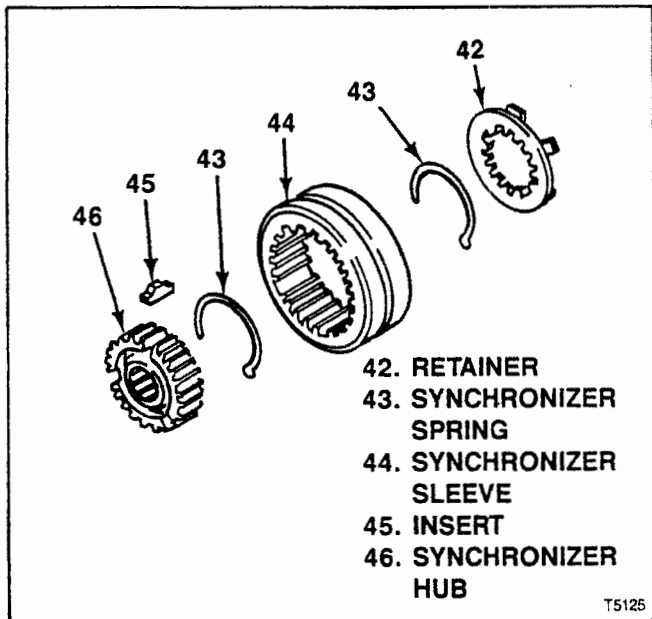


Figure 7-2. T5 NWC 3rd-4th Synchronizer Assembled

b. Hook one end of one spring (75) under one of the inserts (77) and wrap around inside, under all three inserts. Hook other end of spring under insert (see figure 7-2).

- c. Invert assembly. Hook remaining spring (75) under opposite end and side of same insert (77) where step b was started but wrap around inside in opposite direction from step b, under all three plates. Hook other end of spring under insert (77) (see figure 7-2).
- d. Position sleeve (76) and inserts (77) so that all inserts snap into neutral position.
- e. Set 3rd-4th synchronizer aside for later installation in transmission.

7-7. ASSEMBLY OF T5 NWC 5TH SYNCHRONIZER ASSEMBLY (see figure 7-3). Be sure to assemble sleeve (44) and hub (46) aligning marks made at disassembly so that clutch teeth and part faces are assembled exactly as they were originally. Assemble as follows:



- 42. RETAINER
- 43. SYNCHRONIZER SPRING
- 44. SYNCHRONIZER SLEEVE
- 45. INSERT
- 46. SYNCHRONIZER HUB

T5125

Figure 7-3. T5 NWC 5th Synchronizer Assembly

CAUTION

Failure to assemble synchronizer sleeve and hub as they were originally could result in unsatisfactory performance.

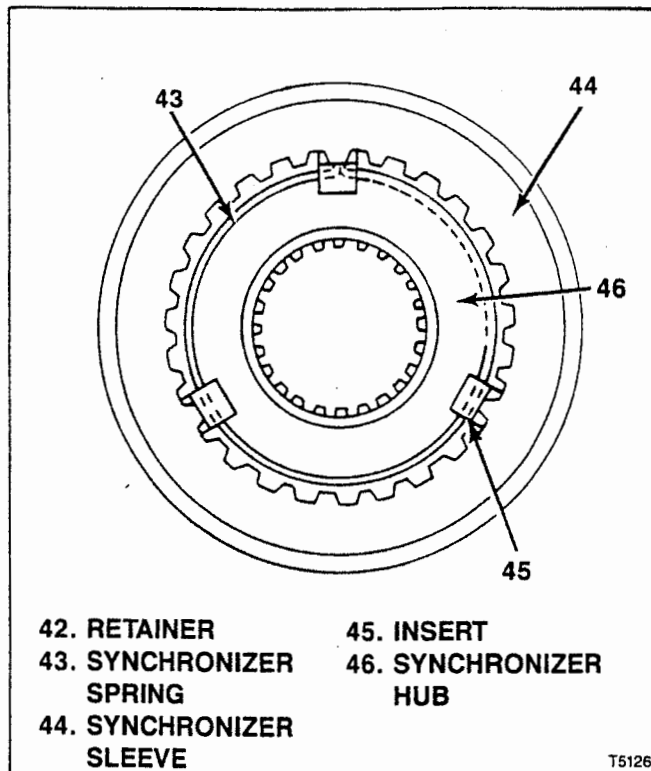
NOTE

If synchronizer assembly is replaced, do not separate parts. Skip this paragraph and install assembly as received.

- a. Start sleeve (44) onto hub (46) to a position that will just permit installation of inserts (45). Install inserts (45) then engage clutch teeth fully.
- b. Install springs (43) so that tangs at each end of both springs are in the same insert (45) (see figure 7-4).
- c. Position sleeve (44) and inserts (45) so that all inserts snap into neutral position.
- d. Install retainer (42).
- e. Set 5th synchronizer aside for later installation.

7-8. ASSEMBLY AND INSTALLATION OF T5 NWC COUNTERSHAFT GEAR (see figure 7-5):

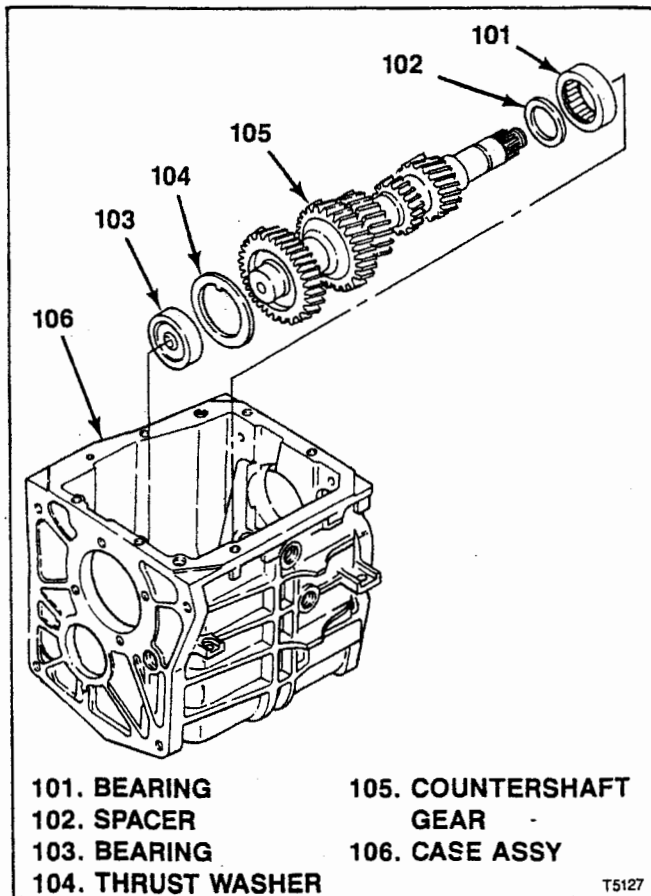
- a. If replaced, press bearing (103) into transmission case (106) using suitable drift so that bearing is flush with outside surface of case.



- 42. RETAINER
- 43. SYNCHRONIZER SPRING
- 44. SYNCHRONIZER SLEEVE
- 45. INSERT
- 46. SYNCHRONIZER HUB

T5126

Figure 7-4. T5 NWC 5th Synchronizer Assembled



- 101. BEARING
- 102. SPACER
- 103. BEARING
- 104. THRUST WASHER
- 105. COUNTERSHAFT GEAR
- 106. CASE ASSY

T5127

Figure 7-5. T5 NWC Countershaft Gear

b. Install thrust washer (104) on countershaft gear (105).

c. Install countershaft gear (105), with thrust washer (104), through top opening of transmission case (106), rear end first. Extend rear end of countershaft gear through rear case opening enough to seat front end in bearing (103).

d. Install spacer (102) and bearing (101) over end of countershaft gear (105) and into bore in transmission case (106).

7-9. INSTALLATION OF T5 NWC REVERSE FORK AND IDLER GEAR. With assembly completed as described through paragraph 7-8, proceed as follows (see figure 7-6):

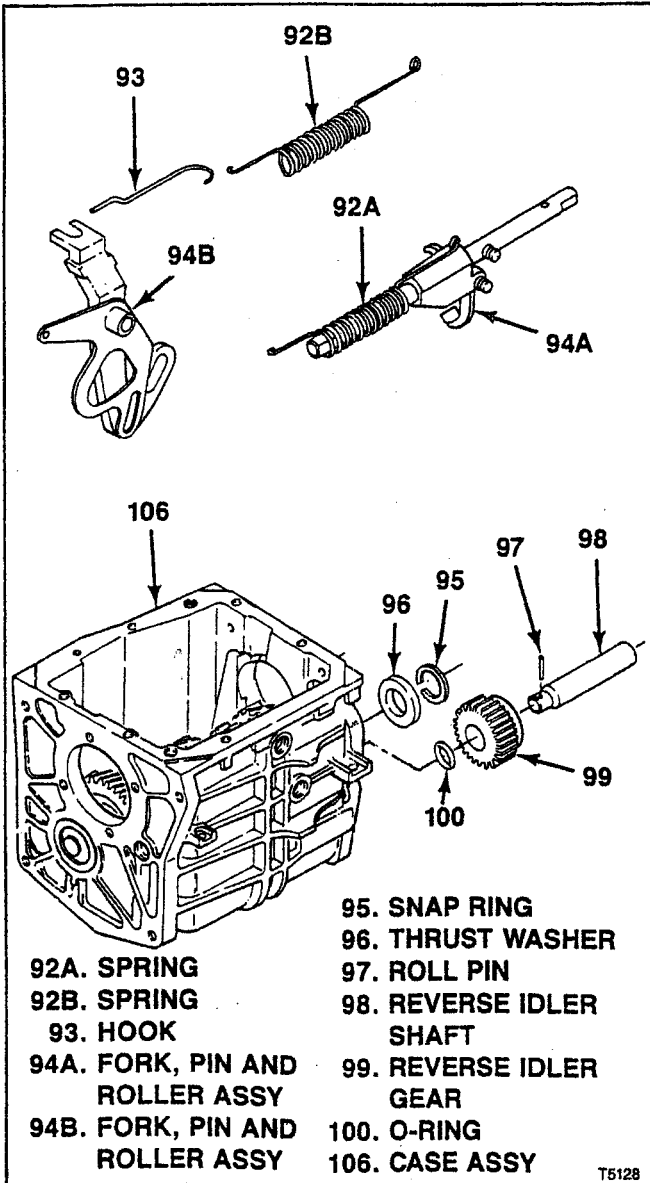


Figure 7-6. T5 NWC Reverse Fork and Idler Gear

a. Start reverse idler shaft (98) in through rear opening in transmission case (106) with pin hole in shaft pointing up toward top case opening.

b. Position o-ring (100) and reverse idler gear assembly (99) in transmission case (106) and continue to push reverse idler shaft (98) into case, through gear, o-ring and boss inside case.

c. Install roll pin (97). Using suitable drift, tap pin into reverse idler shaft (98) until pin is centrally located in shaft.

d. Install thrust washer (96). Install snap ring (95) in groove in countershaft gear (105).

e. Depending on construction used, install parts by one of the following methods:

1. Hook spring long end of spring (92A) into fork, pin and roller assembly (94A) and position these parts in transmission, engaging fork with groove in reverse idler gear.

2. Install hook (93) in fork, pin and roller assembly (94B) and spring (92B) on hook. Position these parts in transmission, engaging fork with groove in reverse idler gear.

7-10. ASSEMBLY OF T5 NWC OUTPUT SHAFT ASSEMBLY. On work bench, assemble output shaft assembly as follows (see figure 7-7):

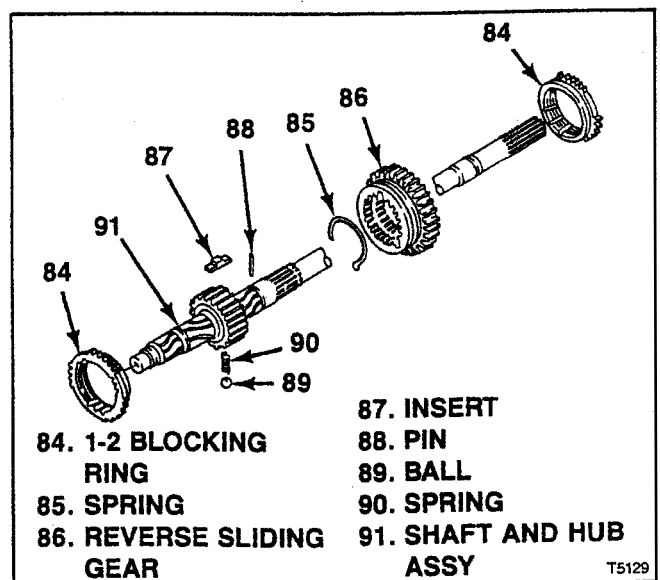


Figure 7-7. T5 NWC Output Shaft Assembly

a. Depending on which is used, install pin (88), or spring (90) and ball (89) in shaft and hub assembly (91) and hold in place.

b. Be sure to assemble reverse sliding gear (86) and hub on shaft and hub assembly (91) aligning marks made at disassembly (see figure 7-8) so that clutch teeth and part faces are assembled exactly as they were originally.

CAUTION

Failure to assemble synchronizer gear and hub as they were originally could result in unsatisfactory performance.

c. Start reverse sliding gear (86) onto hub on shaft and hub assembly (91) to a position that will just permit installation of inserts (87). Install inserts (87) then engage clutch teeth fully.

d. Hook one end of one spring (85) under one of the inserts (87) and wrap around inside, under all three inserts. Hook other end of spring under insert (see figure 7-8).

e. At other side of assembly hook remaining spring (85) under opposite end and side of same insert (87) where step d was started but wrap around inside in opposite direction from step d, under all three plates. Hook other end of spring under insert (99) (see figure 7-8).

f. Position reverse sliding gear (86) and inserts (87) so that all inserts snap into neutral position.

g. At each end of shaft and hub assembly (91) install 1-2 blocking ring (84). Be sure to align blocking ring notches with inserts (87).

7-11. ASSEMBLY OF T5 NWC OUTPUT SHAFT GROUP. After assembly of output shaft assembly (83) as described in paragraph 7-10, proceed as follows (see figure 7-9):

a. Install 2nd speed gear (82), thrust washer (81) and snap ring (80).

b. Install 3rd speed gear (79) and one blocking ring (73).

c. Install 3rd-4th synchronizer assembly (74) (as assembled in paragraph 7-6), aligning notches in installed blocking ring (73) with synchronizer inserts. Use a suitable drift that bears on synchronizer hub only.

d. Install remaining blocking ring (73), aligning notches with inserts in installed 3rd-4th synchronizer assembly (74).

e. At other end of assembly, install thrust race (72) and needle bearing (71).

f. Install 1st speed gear (70), thrust washer (69) and bearing cone (68). Use 5th driven gear (66) and suitable drift to press bearing on cone until it is fully seated. Bearing cone is fully seated when shaft snap ring groove is accessible at outside end of 5th driven gear. Remove drift and 5th driven gear.

7-12. INSTALLATION OF T5 NWC OUTPUT SHAFT GROUP. After assembly of output shaft group (120) (paragraph 7-11), install as follows (see figure 7-10):

a. Tilt rear end of output shaft group (120) down and install through top opening and out rear of transmission case (106). Rest output shaft group on countershaft previously installed.

b. At rear of transmission case (106), install bearing cup (67), 5th driven gear (66) and one snap ring (53).

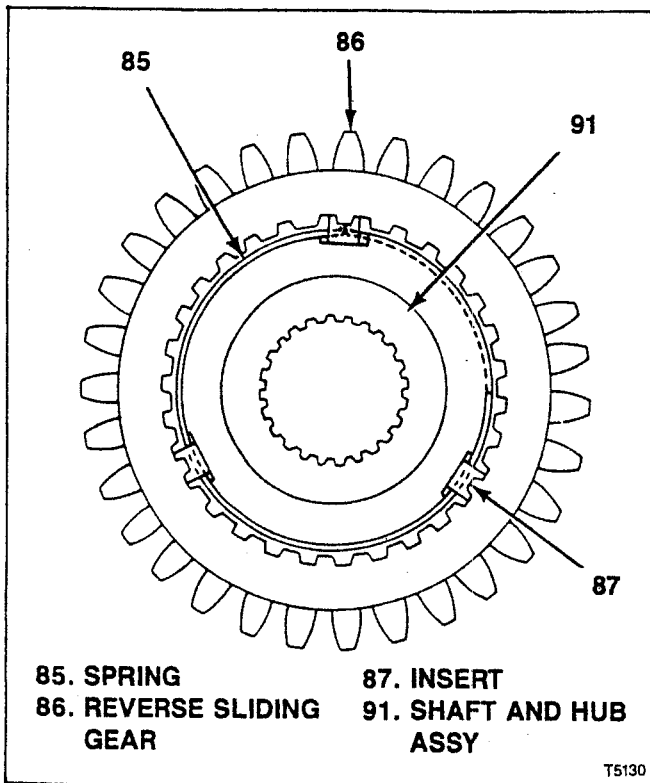


Figure 7-8. T5 NWC Reverse Sliding Gear Assembled

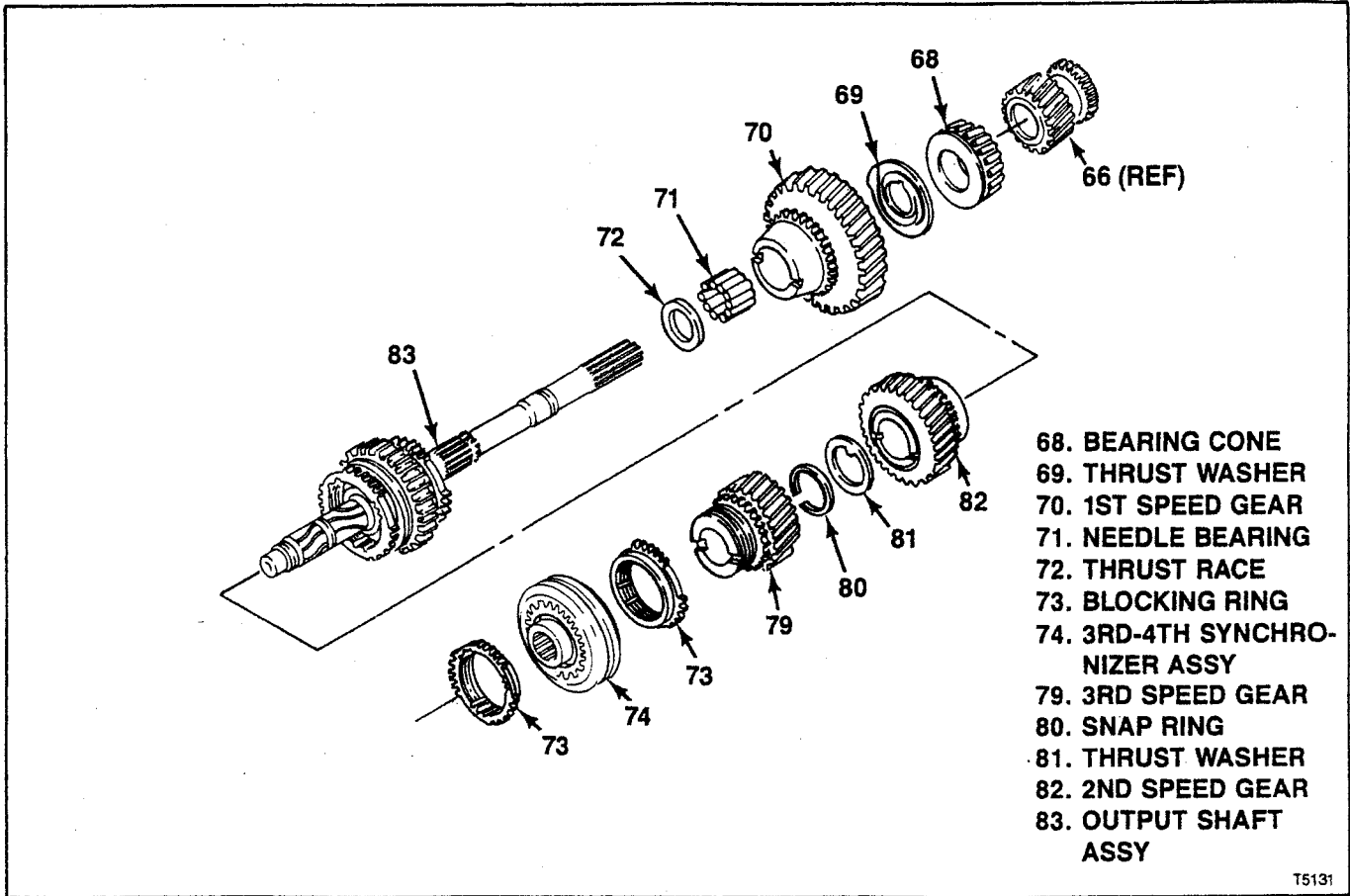


Figure 7-9. Assembly of T5 NWC Output Shaft Group

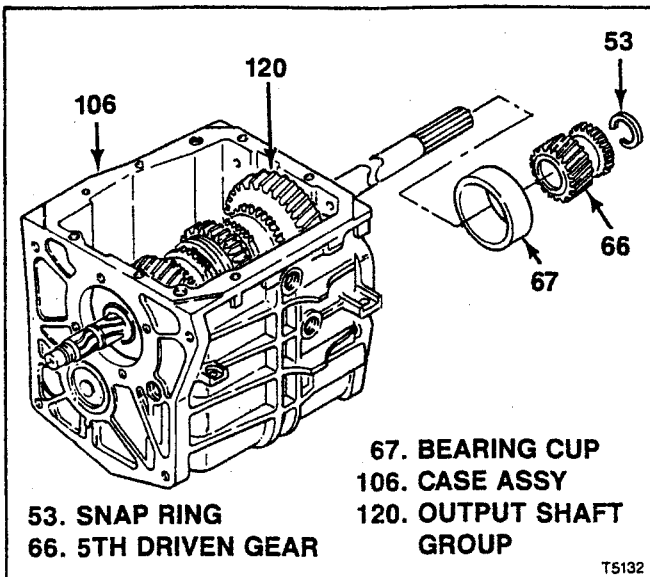


Figure 7-10. Installation of T5 NWC Output Shaft Group

7-13. ASSEMBLY AND INSTALLATION OF T5 NWC INPUT SHAFT. After installing output shaft, proceed as follows (see figure 7-11):

- a. If removed, press new bearing cone (61) onto input shaft (62) to bottom out on shaft shoulder. Use suitable tubular drift that contacts bearing cone inner race only.
- b. Coat bearing rollers (63) with petrolatum and install in end of input shaft.
- c. Install thrust race (65) and thrust bearing (64) on end of output shaft (91) in transmission.
- d. Rotate input shaft (62) (with bearing rollers) so that flat on its clutch tooth ring aligns with countershaft (105) and install in transmission, over end of output shaft (91) using care not to dislodge bearing parts previously installed.
- e. Using suitable drift, press new oil seal (58) into input bearing retainer (57).
- f. Install bearing cup (60) but do not install shim(s) (59) at this time.
- g. Do not use sealant on input bearing retainer at this time. Align index marks made at disassembly and install input bearing retainer (57). Attach with bolts (56) and torque to 15 lb-ft (20 Nm).

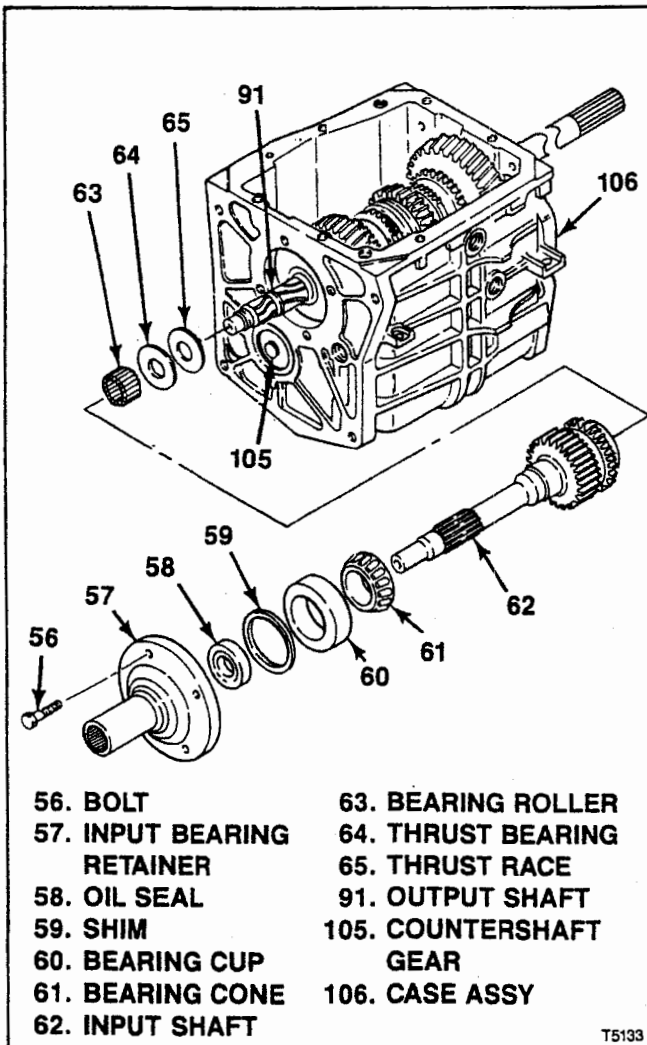


Figure 7-11. T5 NWC Input Shaft

7-14. INSTALLATION OF T5 NWC SPEEDOMETER GEAR. On models so equipped, install speedometer gear as follows (see figure 7-12):

- a. If speedometer gear is retained by a clip, proceed as follows:
 1. Position clip (55A) on output shaft (91) with right angle end of clip in shaft hole. Start speedometer gear (54) onto output shaft, aligning gear slot with clip.
 2. Using suitable tubular drift, tap speedometer gear (54) onto shaft (91) until spring end of clip (55A) snaps up to retain gear.
- b. If speedometer gear is retained by a ball, proceed as follows:
 1. Position ball (55B) in hole in output shaft (91).
 2. Slide speedometer gear (54) onto output shaft, open end of notch in gear first and aligned with ball, until gear is seated on ball.
- c. Install remaining snap ring (53).

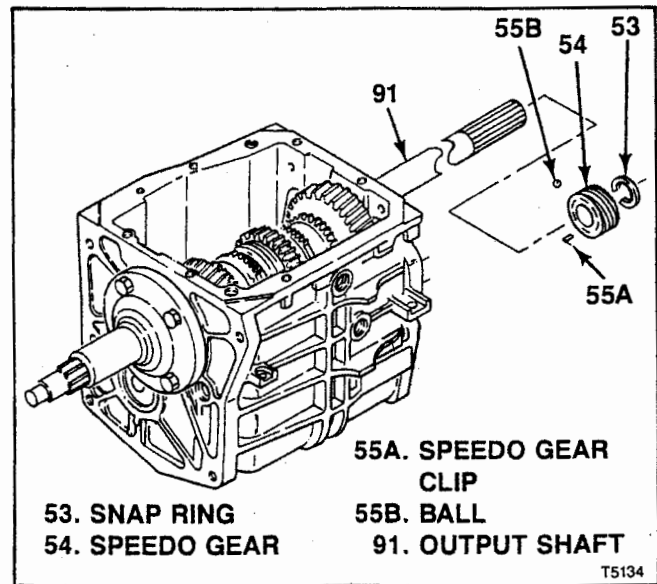


Figure 7-12. T5 NWC Speedometer Gear

7-15. INSTALLATION OF T5 NWC 5TH GEAR, SHIFT FORK AND SYNCHRONIZER. At rear of transmission case (106), install parts as follows (see figure 7-13):

- a. Install 5th speed drive gear (52) and blocking ring (51) on end of countershaft gear (105, figure 7-5).
- b. Attach 5th shift fork (48) to shift rail assembly (50) with roll pin (47). Install inserts (49) on 5th shift fork.
- c. Engage 5th shift fork (48) with previously assembled (paragraph 7-7) 5th synchronizer assembly (41) and install together in transmission noting the following:
 1. Install 5th synchronizer assembly (41) over rear end of countershaft gear (105).
 2. Guide shift rail assembly (50) through reverse fork, pin and roller assembly (94A or 94B, figure 7-6) and, when used, spring (92A, figure 7-6) previously installed.
- d. Install thrust race (40), bearing (39), and thrust race (38). Retain these parts by installing snap ring (37).

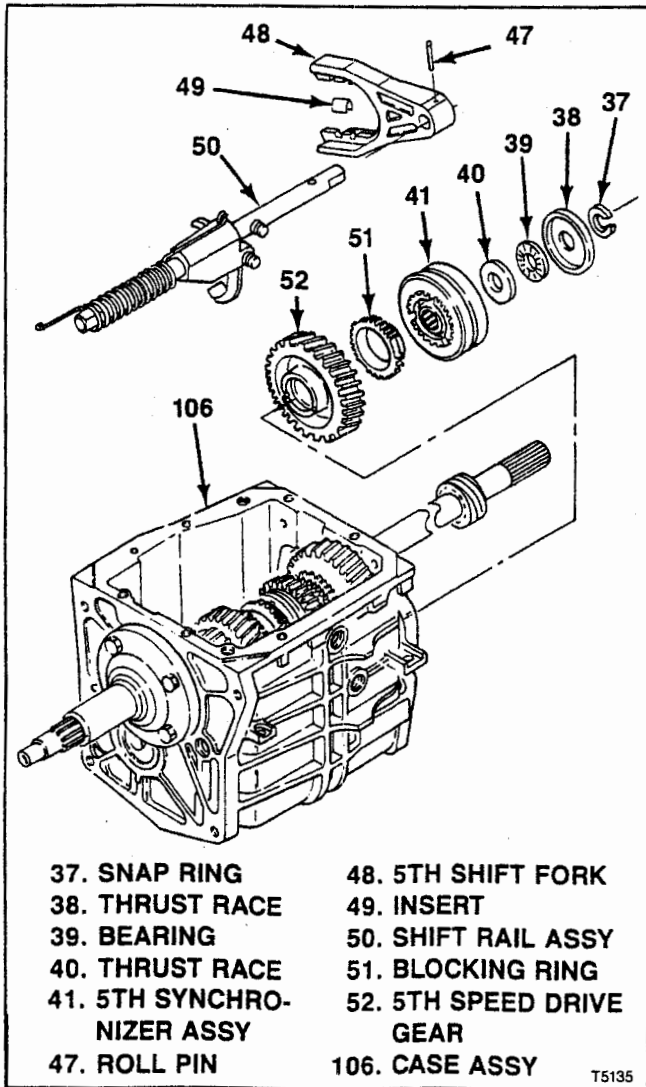


Figure 7-13. T5 NWC 5th Gear, Shift Fork and Synchronizer

7-16. INSTALLATION OF T5 NWC 5-R SHIFT LEVER (see figure 7-14):

NOTE

On units with fork, pin and roller assembly (94B, figure 7-6), 5-R shift lever is permanently attached to the fork. In the following step, it is necessary to engage lever with roller on shift rail (50, figure 7-13) only.

- a. Work 5-R shift lever (36) into engagement with rollers on previously installed shift rail assembly (50, figure 7-13) and fork, pin and roller assembly (94A, figure 7-6).
- b. From outside transmission install pivot pin (34) through case and 5-R shift lever (36 or part of 94B, figure 7-6). Torque pin to 20 lb-ft (27 Nm).
- c. Inside transmission, attach lever to pin with retaining ring (33).
- d. Install back-up switch (35).
- e. Using needle nose pliers, hook free end of previously installed spring (92A or 92B, figure 7-6) on pin in transmission case (106).

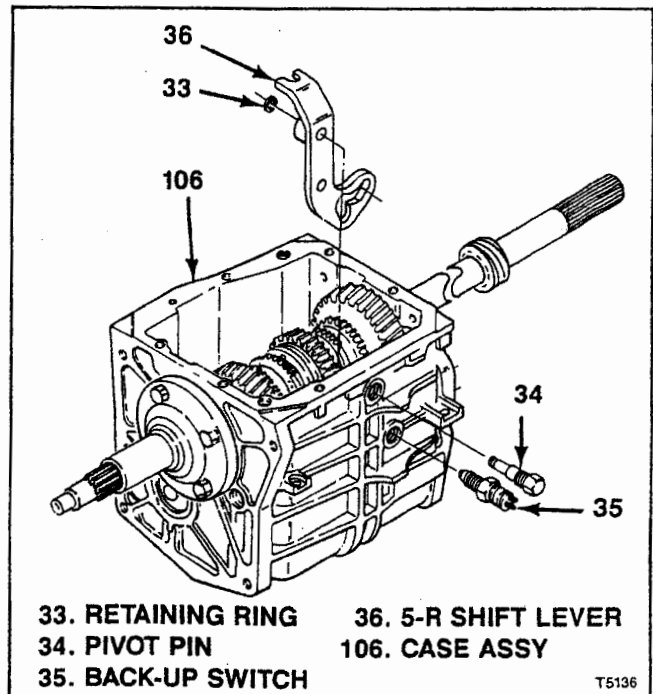


Figure 7-14. T5 NWC 5-R Shift Lever

7-17. ASSEMBLY AND INSTALLATION OF T5 NWC SHIFT FORKS AND CASE COVER. With case cover on work bench, open face up, assemble shift forks. Then, install on transmission. Proceed as follows (see figure 7-15):

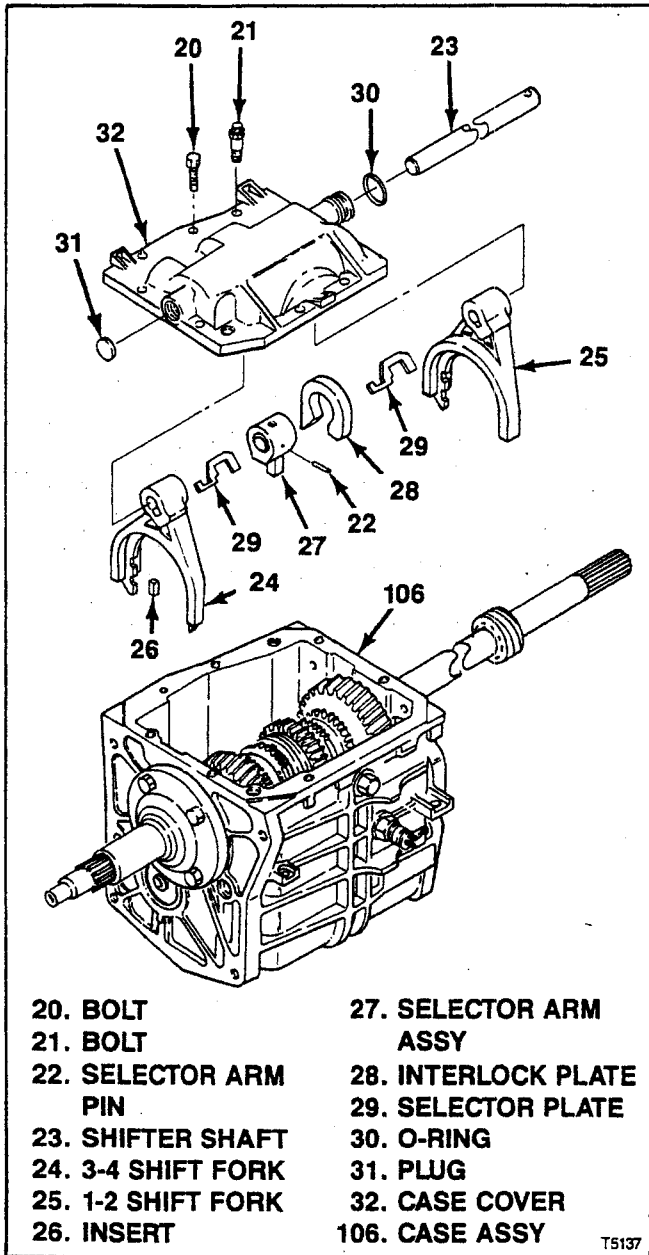


Figure 7-15. T5 NWC Case Cover

- a. Install o-ring (30) on case cover (32).
- b. Install inserts (26) on shift forks (24 and 25).
- c. Install selector plates (29) in shift forks (24 and 25).
- d. Start shifter shaft (23) into rear of case cover (32) until end of shaft is flush with inside of case cover.
- e. Position 1-2 shift fork (25) (with inserts and selector plate) in case cover (32) and push shifter shaft (23) just through fork. Notch in selector plate should align with semi-circular groove in cover (see figure 7-16).

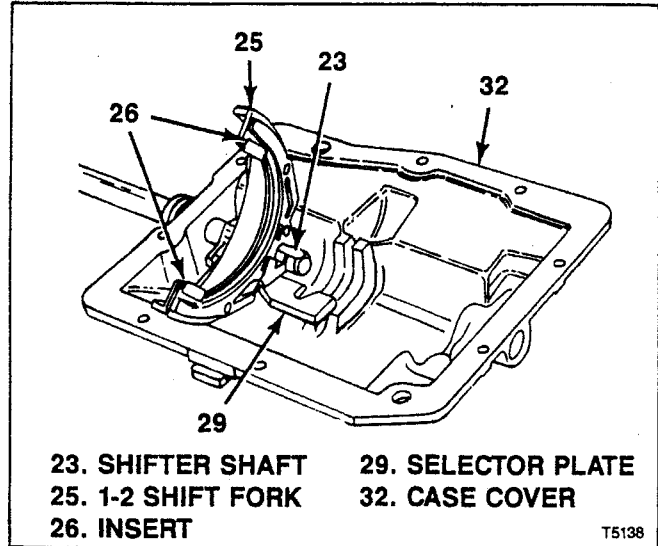


Figure 7-16. Installing T5 NWC 1-2 Shift Fork

- f. Align gap in interlock plate (28) with projection on selector arm assembly (27) and install these parts in semi-circular groove in case cover (32). Continue to push in shifter shaft (23) until it is just through selector arm assembly (see figure 7-17).

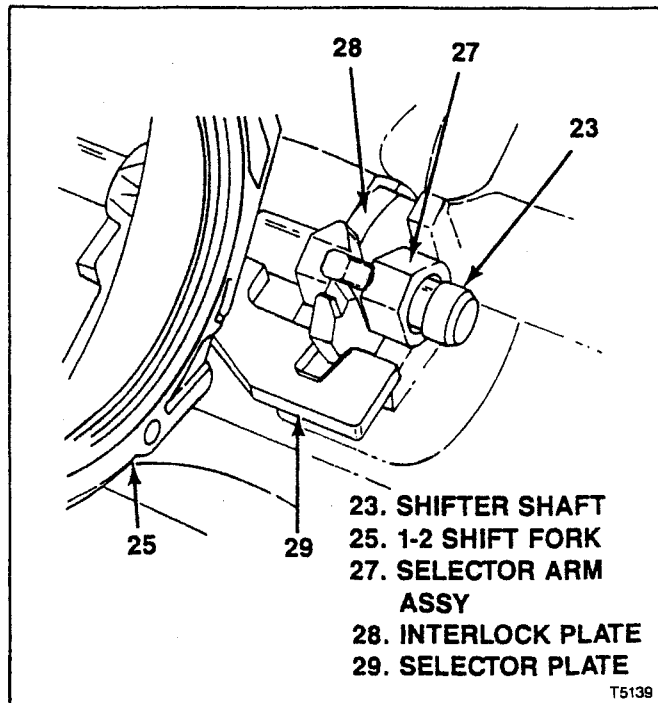


Figure 7-17. Installing T5 NWC Selector Arm and Interlock Plate

g. Position 3-4 shift fork (24) (with inserts and selector plate) in case cover (32) so that selector plate (29) in 3-4 shift fork is between cover and selector plate (29) in 1-2 shift fork (25). Continue to push in shifter shaft (23) completely through 3-4 shift fork and into cover (see figure 7-18).

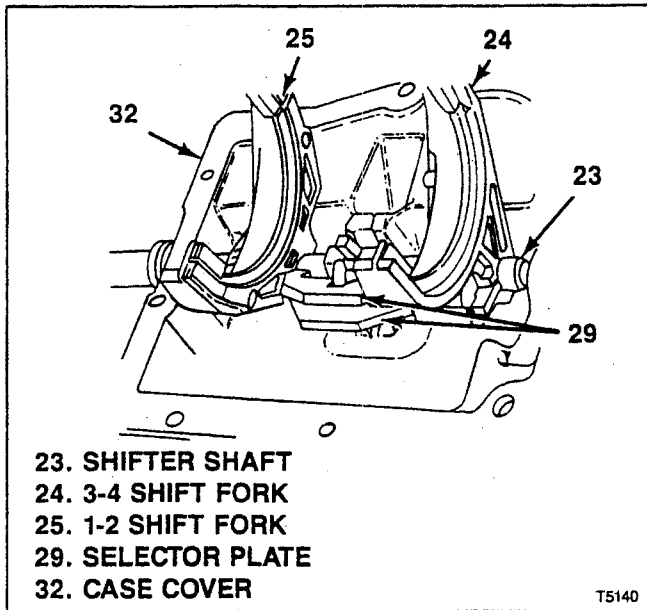


Figure 7-18. Installing T5 NWC 3rd-4th Shift Fork

h. Align pin holes in selector arm (27) and shifter shaft (23) and drive in selector arm pin (22) using suitable drift.

i. Check for proper assembly of shift parts in cover:

1. Rotate shifter shaft (23) so that pin hole through its free end is at 90 degree angle to open face of case cover (32).

2. Check that projection on selector arm assembly (27) is engaged in notch in selector plate (29) installed in 3-4 shift fork.

j. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (106) mounting face for case cover (32). Center sealant bead between edges of face. Circle bolt holes.

k. In transmission, make sure that 1-2 synchronizer, 3-4 synchronizer and 5-R shift lever are all in neutral position.

l. Position case cover (32), with assembled parts, over transmission and gradually lower, engaging shift forks (24 and 25) with grooves in synchronizer collars in transmission. Lower case cover into position, moving it sideways just before it contacts transmission case (106) as required to align bolt holes.

m. Install bolts (20 and 21) and torque to 10 lb-ft (14 Nm).

7-18. INSTALLATION OF T5 NWC EXTENSION OR ADAPTER. With case cover installed, proceed as follows (see figure 7-19):

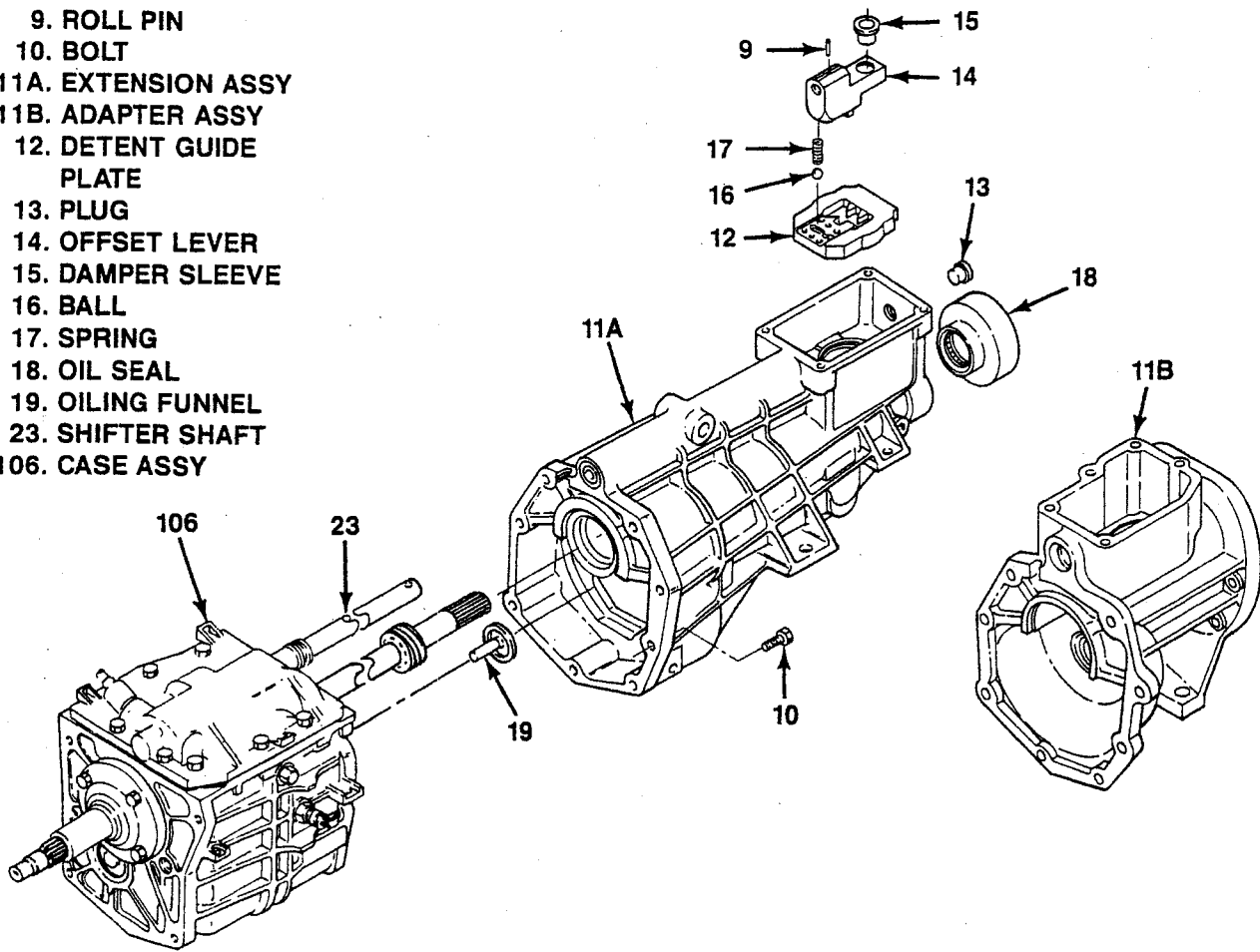
- a. Install oiling funnel (19) in end of shaft of countershaft gear (105, figure 7-5). Use petrolatum to help hold in place.

- b. Install damper sleeve (15) in offset lever (14).

- c. Make sure plug (13) and detent guide plate (12) are installed in extension (11A) or adapter (11B).

- d. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (106) mounting face for extension (11A) or adapter (11B). Center sealant bead between edges of face. Circle bolt holes.

- 9. ROLL PIN
- 10. BOLT
- 11A. EXTENSION ASSY
- 11B. ADAPTER ASSY
- 12. DETENT GUIDE PLATE
- 13. PLUG
- 14. OFFSET LEVER
- 15. DAMPER SLEEVE
- 16. BALL
- 17. SPRING
- 18. OIL SEAL
- 19. OILING FUNNEL
- 23. SHIFTER SHAFT
- 106. CASE ASSY



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Figure 7-19. T5 NWC Extension or Adapter

e. Lubricate detent guide plate (12) in extension (11A) or adapter (11B) with lithium grease. Position extension or adapter so that it easily can be picked up and installed on transmission.

f. Position ball (16) in 3-4 position in detent guide plate (12) (see figure 7-20).

g. Insert spring (17) in offset lever (14). Use petroleum to hold in place.

h. Position offset lever (14) (with spring) in extension (11A) or adapter (11B), engaging open end of spring (17) on ball (16) and push down on offset lever to compress spring slightly. Holding offset lever with one hand, pick up extension or adapter with the other and move parts into position at rear of transmission. Guide offset lever over end of shifter shaft (23) while moving extension or adapter up against rear of transmission case (106).

i. Install bolts (10) and torque to 23 lb-ft (30 Nm).

j. Align pin holes in offset lever (14) and shifter shaft (3) and drive in roll pin (9).

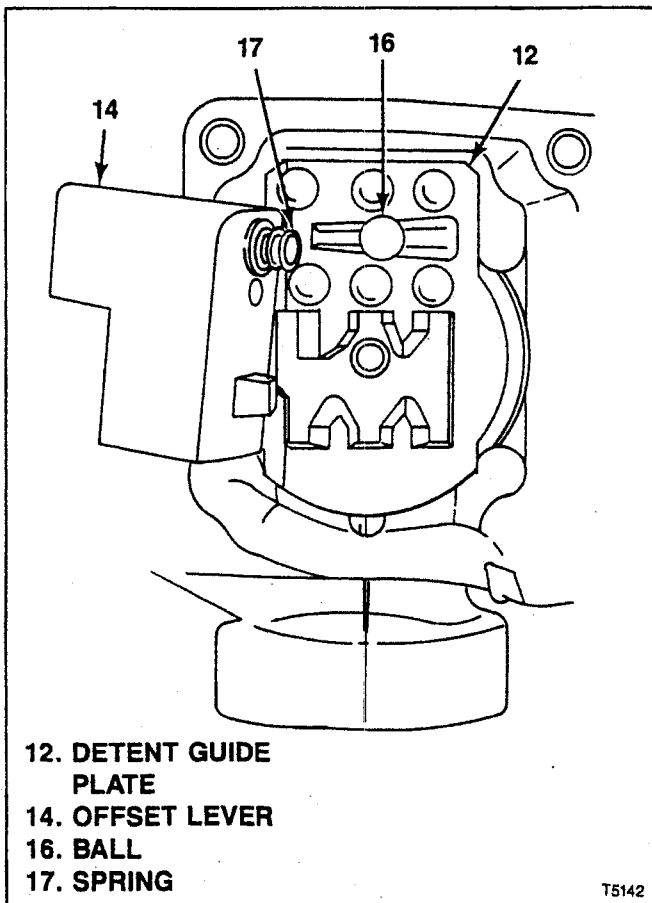


Figure 7-20. T5 NWC Ball in 3rd-4th Position

7-19. ADJUSTMENT OF T5 NWC INPUT/OUTPUT SHAFT BEARING PRELOAD. With both input bearing retainer and extension or adapter installed as described in preceding paragraphs, adjust input/output shaft bearing preload as follows (see figure 7-21 and 7-22):

a. Position transmission with input shaft end up.

b. Remove bolts (56, figure 7-21) attaching input bearing retainer (57) and remove bearing retainer.

c. Using hand pressure, press down firmly on input shaft (62) and bearing cup (60) to ensure that power train parts in transmission are fully seated.

d. Using suitable depth micrometer measure and record the following (see figure 7-22):

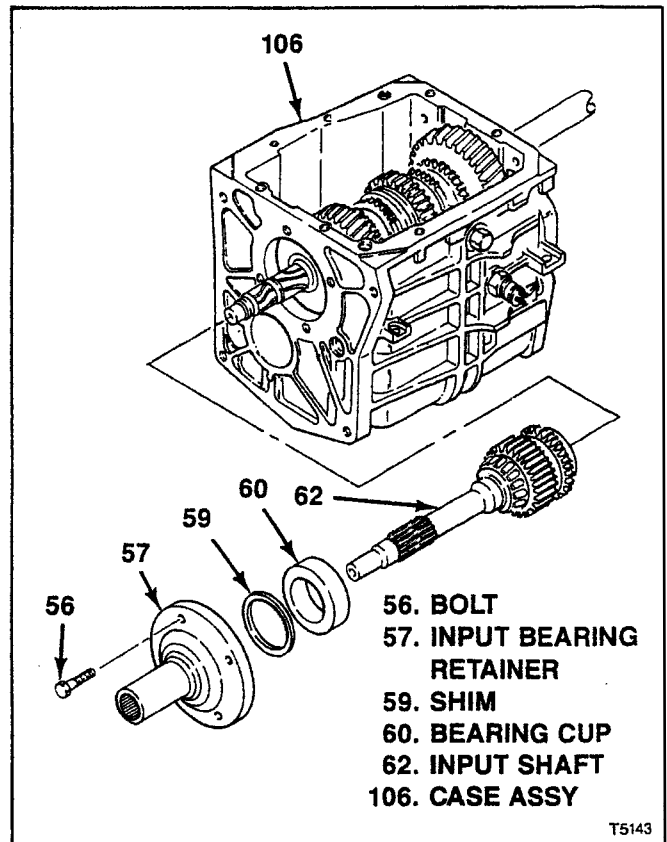


Figure 7-21. T5 NWC Bearing Preload Adjustment

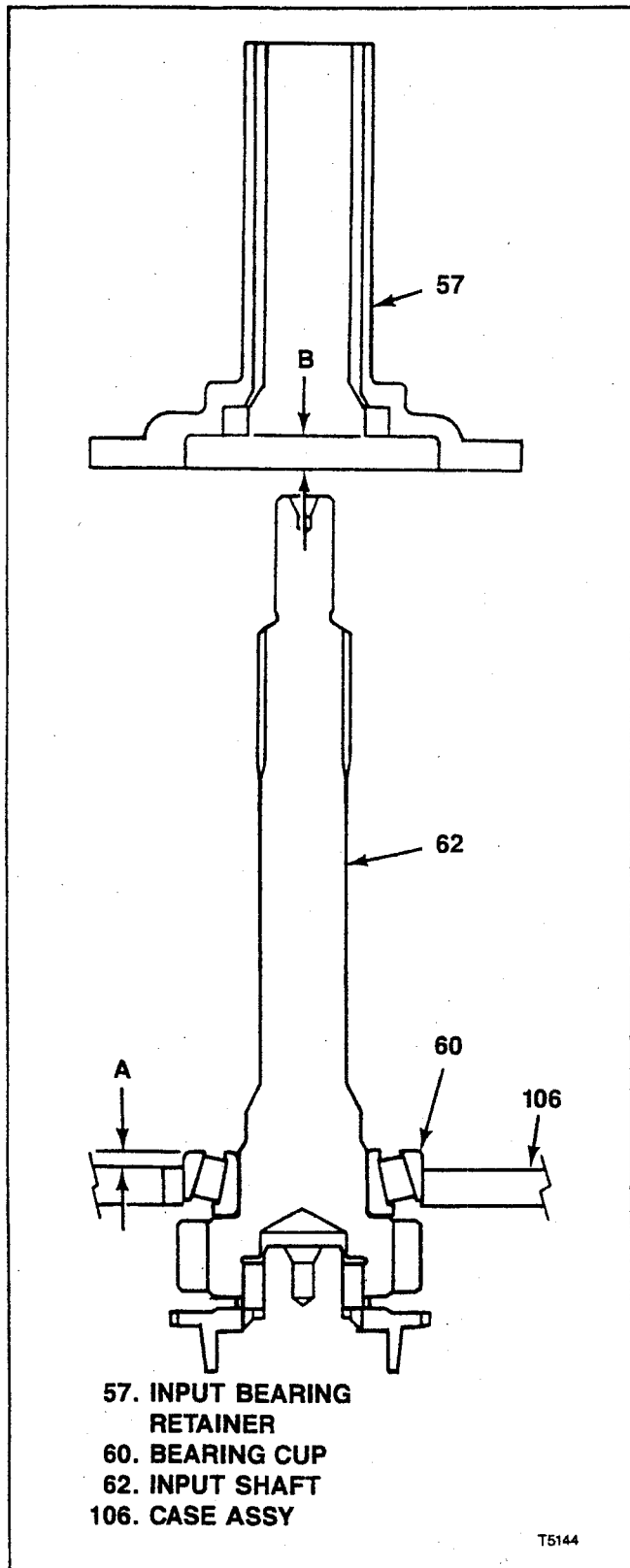


Figure 7-22. T5 NWC Bearing Preload Measurements

1. Dimension A, distance from top of bearing cup (60) to mounting face on transmission case (106) for input bearing retainer (57).

2. Dimension B, distance from mounting face on input bearing retainer (57) to bearing cup contact surface.

e. Calculate T_s , thickness of bearing preload shim(s) (59) required, as follows:

$$T_s = B - A + 0.003 \text{ in.}, \text{ or}$$

$$T_s = B - A + 0.07 \text{ mm}$$

f. Select shim(s) (59) of thickness calculated at step e and install on end of bearing cup noting the following:

1. Thickest shim shall be installed adjacent to bearing cup (60). Minimum thickness of this shim shall be 0.012 in. (0.30 mm).

2. Thinnest shim shall be installed adjacent to bearing contact surface in input bearing retainer (57).

g. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around transmission case (106) mounting face for input bearing retainer (57). Center sealant bead between edges of face. Circle bolt holes.

h. Align index marks made at disassembly and install input bearing retainer (57). Attach with bolts (56) and torque to 15 lb-ft (20 Nm).

7-20. INSTALLATION OF T5 NWC EXTERNAL COMPONENTS AND CONTROL LEVER AND HOUSING ASSEMBLY. Complete transmission assembly as follows (see figure 7-23):

a. If used, install wire retainer (8), pin (7) and neutral switch (6).

b. Install vent and o-ring assembly (5A) or breather (5B).

c. Install control lever and housing assembly (3A or 3B):

1. Install boot (4) if replaced.

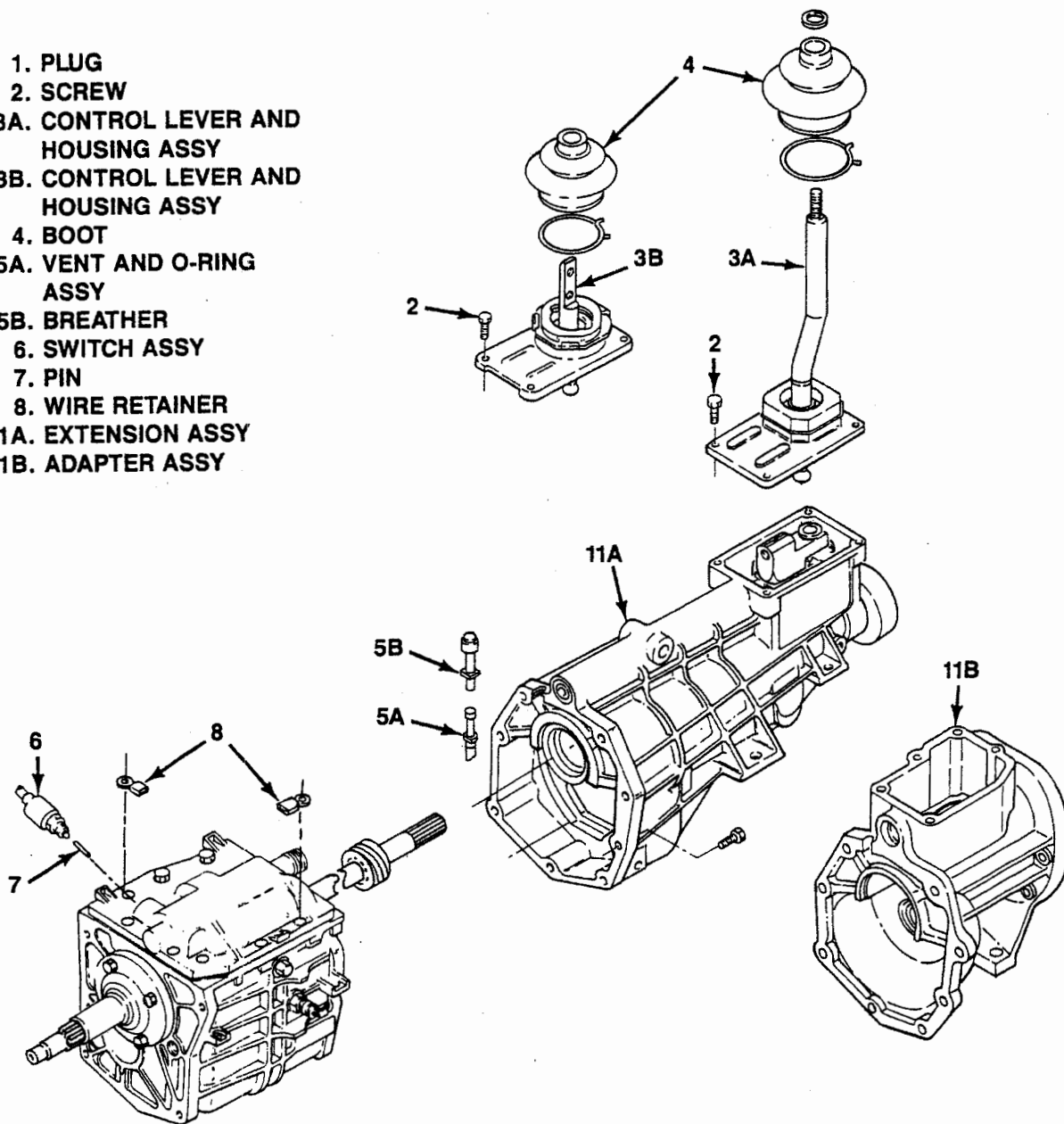
2. Apply continuous 1/16 in. (1.6 mm) bead of sealant (Neutral Cure RTV, Loctite 598) all around extension (11A) or adapter (11B) mounting face for control lever and housing assembly (3A or 3B). Center sealant bead between edges of face. Circle bolt holes.

3. Position control lever and housing assembly (3A or 3B) on extension (11A) or adapter (11B) engaging inside end of lever in damper sleeve (15, figure 7-19) installed in offset lever (14, figure 7-19).

4. Install screws (2) and torque to 13 lb-ft (17 Nm).

d. Install fill and drain plugs (1) and torque to 20 lb-ft (27 Nm).

- 1. PLUG
- 2. SCREW
- 3A. CONTROL LEVER AND HOUSING ASSY
- 3B. CONTROL LEVER AND HOUSING ASSY
- 4. BOOT
- 5A. VENT AND O-RING ASSY
- 5B. BREATHER
- 6. SWITCH ASSY
- 7. PIN
- 8. WIRE RETAINER
- 11A. EXTENSION ASSY
- 11B. ADAPTER ASSY



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Figure 7-23. T5 NWC External Components and Control Lever Housing

Table 7-1. T5 NWC Transmission Torque Values

PART (FIG. 5-1 INDEX NO.)	TORQUE IN LB-FT	TORQUE IN Nm
Drain plug (1)	20	27
Screw (2)	13	17
Bolt (10)	23	30
Bolt (20 & 21)	10	14
Pivot pin (34)	20	27
Bolt (56)	15	20