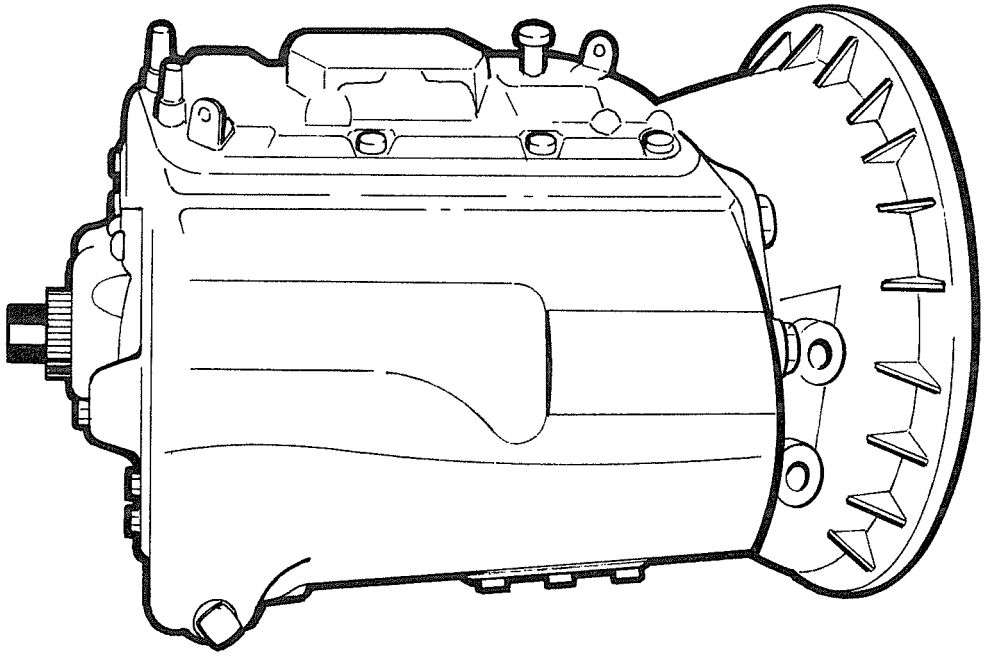
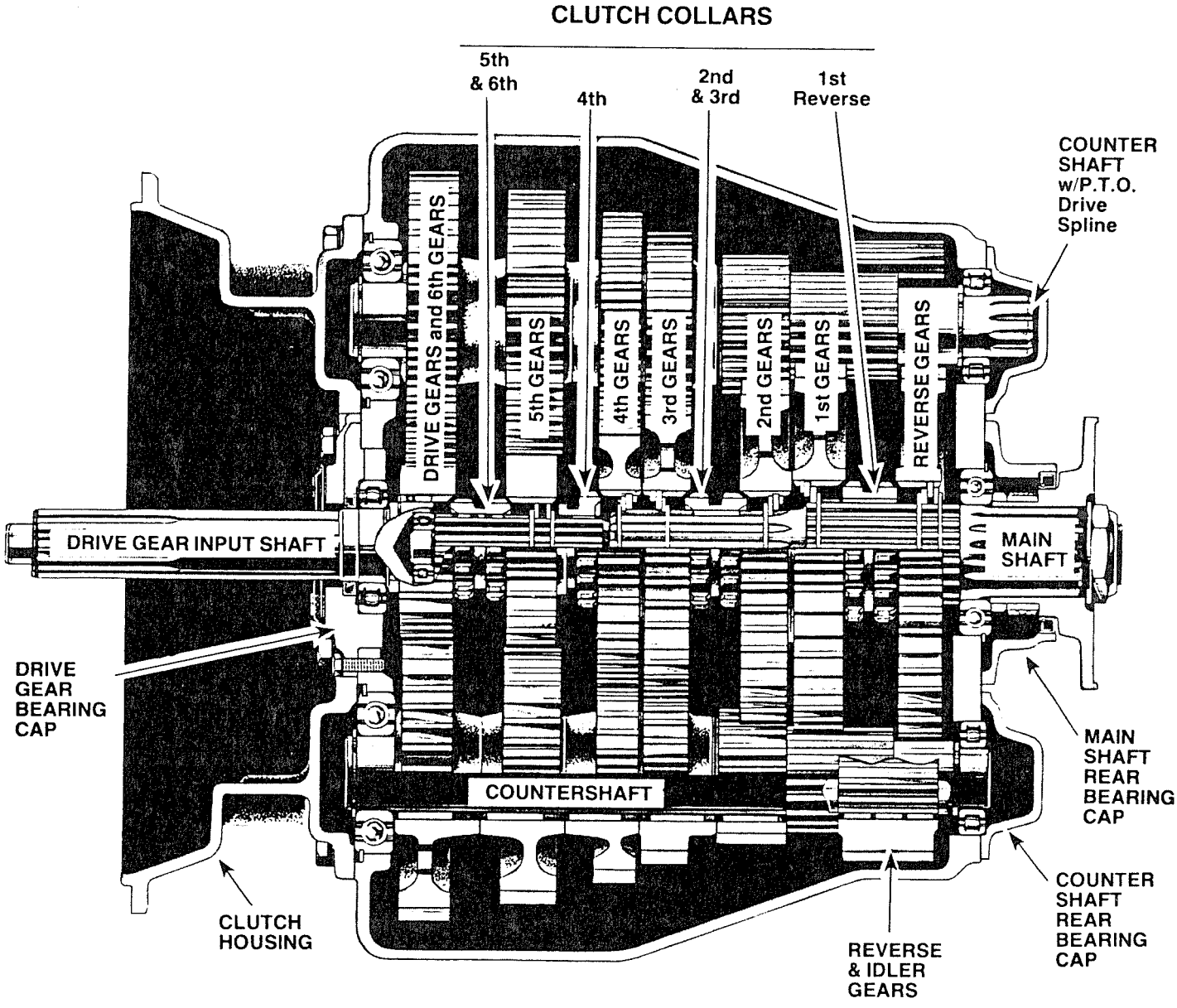
TRANSMISSION



TRANSMISSION

DESCRIPTION

PREVOST vehicles are equipped with a «SPICER 1362B» six speed manual transmission as standard equipment. «ALLISON HT740D four speed and HT754CR» five speed automatic transmissions are available as optional equipment. This section deal with maintenance procedures for the «spicer 1362B» transmission and with the «ALLISON HT740D and HT754CR» automatic transmissions.



CUTAWAY VIEW OF MANUAL TRANSMISSION

TRANSMISSION

Maintenance

To insure proper lubrication and operating temperatures in these units it is most important that the proper lubricants be used and that correct oil levels be maintained.

Recommended Lubricants

The lubricants listed below are recommended, for use in all Spicer mechanical transmissions.

DO NOT USE EXTREME PRESSURE ADDITIVES, such as found in multi-purpose or rear axle type lubricants. These additives are not required in Spicer transmissions, and may in some cases create transmission problems. Multi-purpose oils, as a group, has relatively poor oxidation stability, a high rate of sludge formation and a greater tendency to react on or corrode the steel and bronze parts.

Oil Changes

We recommend an initial oil change and flush after the transmission is placed in actual service. This change should be made any time following 3000 miles (4827 km), but never exceed 5000 miles (8045 km), of over-the-road service. In off-highway use, the change should be made after 24 and before 100 hours of service have elapsed. There are many factors that influence the following oil change periods and we have not specified a definite mileage interval.

In general, it is suggested that a drain and flush period be scheduled every 50,000 miles (80,450 km) for normal over-the-highway operations. The oil level in the transmission should be checked every 5,000 miles (8,045 km) on-highway. When it is necessary to add oil we recommend that types or brands of oil should not be mixed. The correct oil level in Spicer transmissions is established by the «full» mark on the transmission oil dipstick.

Refill

PREVOST vehicles are equipped with an oil reserve tank located in the upper right area of the engine compartment. To refill transmission, proceed as follows.

1. Open the transmission oil fill valve located under oil reserve tank.

2. Open the oil reserve fill door and cap.

3. Pour oil in the oil reserve tank until «FULL» mark on the transmission oil dipstick is reached.

4. Close transmission oil fill valve and then, continue to pour oil until oil reserve tank is full. Level can be checked through transparent tube on the side of oil reserve tank.

5. Close oil reserve fill door and cap.

Overfilling

Do not overfill the transmission. Overfilling usually results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug up oil ports and build up on splines and bearings. Overflow of oil escapes onto clutch or parking brakes causing additional trouble.

■ **Caution:** Do not tow vehicles equipped with Spicer transmission without first pulling the axles or disconnecting the drive shaft. Lubrication of the internal gear train is inadequate when the vehicle is towed.

Oil recommendations:

Temperature	Grade	Type
Above 0°F	SAE 40	Heavy duty engine oil
Below 0°F	SAE 30	Meeting MIL-L-2104C or MIL-L-46152

Removal and reinstallation

To remove transmission, proceed as follows:

1. With transmission control in neutral position, raise vehicle and block vehicle body securely.

2. Remove winter pan and crossmember from under the transmission.

3. Disconnect control rod universal joint from transmission shifter remote control.

4. Disconnect propeller shaft at transmission companion flange. Refer to section 09, Propeller Shaft Removal and Replacement for the appropriate procedure. Disconnect speedometer wire at connector.

5. Disconnect clutch control rod from rear clutch cross shaft lever; remove bracket between rear clutch cross shaft support and engine support.

6. Remove magnetic drain plug and drain transmission oil. Clean magnetic drain plug before reinstalling.

7. Remove dipstick tube and oil fill tube.

8. Disconnect neutral start switch and back up switch.

9. Remove all wiring harnesses from their supports.

10. Place a transmission jack under transmission. Remove the twelve clutch housing bolts, and slide the transmission straight back from the engine.

■ **Caution:** Damage to the pilot shaft and to the clutch cover assembly may result if transmission is tilted up and down or sideways during removal.

TRANSMISSION

11. Raise vehicle to obtain sufficient clearance so the transmission can be removed from the side of the vehicle.

To reinstall transmission, proceed as follows.

■ **Caution:** During re-installation, care should be taken to ensure that the pilot shaft is aligned with splines of clutch driven discs. Do not use excessive force to bring the engine and transmission case together. Refer to Section 2 (Clutch) for information regarding alignment of clutch driven discs in reassembly.

1. With vehicle raised, raise transmission assembly at engine level, and guide splined shaft into position in clutch disc hubs. Align clutch housing holes, and install twelve clutch housing bolts.

2. Connect clutch control and install the clutch cross shaft reinforcement.

3. Connect propeller shaft at componion flange on transmission. Refer to section 09, Propeller Shaft Removal and Replacement for correct procedure.

4. Connect transmission control rod universal joint to transmission remote control. Make sure that transmission controls are properly adjusted as directed under «Shifting Control» in this section.

5. Reinstall dipstick tube and oil fill tube.

6. Reinstall all wiring harnesses on their supports.

7. Connect neutral start switch, back up switch and speedometer wire.

8. Fill transmission as directed under «Maintenance» in this section.

DISASSEMBLY AND REASSEMBLY

General Precautions for Disassembly

IMPORTANT

Read this section before starting the detailed disassembly procedure.

Follow each procedure closely in each section, making use of both the text and the pictures.

Rebuild Facilities

A suitable holding fixture or overhaul stand is desirable but not necessary to rebuild this unit. The flat bottom of the transmission case provides a suitable working platform when the unit is placed on a sturdy shop table.

For easier working conditions, table height should be 28-30 inches. A light chain hoist should be used to handle the mainshaft and countershafts during removal and reassembly procedures.

Cleanliness

Transmissions should be steam cleaned prior to disassembly. Seal all openings before steam cleaning to prevent entry of dirt and water which can damage serviceable parts.

Dirt is abrasive and will cause premature wear of bearings and other parts. We suggest that mechanics have a small wash tank to clean parts just prior to reassembly.

Bearings

When a transmission is removed at relatively low mileage, bearings should be removed with pullers designed for this purpose. Wrap the bearings to keep out dirt. Clean, inspect and lubricate all bearings just prior to reassembly. If accumulated mileage is over 150,000 miles, we suggest that all bearings be replaced.

End Yokes & Flanges

Hammering on end yokes and flanges to remove or install them is not only destructive to the yoke or flange itself, but can also cause serious internal damage. Hammering destroys or mutilates the pilot diameters and warps or bends the flange. Hammering on end yokes will close-in the bearing bores or misalign yoke lugs and result in early failures of journal needle bearings, etc.

Serious damage can be done internally to bearings, thrust faces and washers, pilot bearings, etc., by hammering on external parts.

In most designs when the yoke/flange locknuts are tightened and secure, the internal bearings and gears are in proper location. When the yoke/flange is driven on the shaft, two conditions can exist.

(a) If the bearing fit is tight on the shaft, then usually the bearings will brinell as they must absorb the pounding forces.

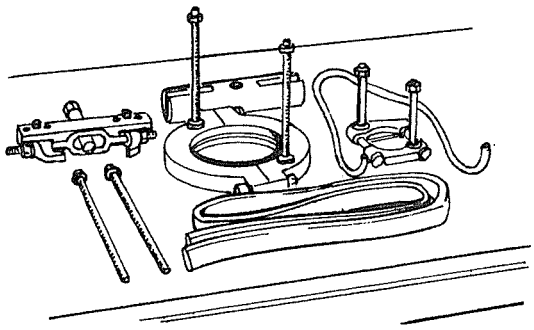
(b) If the bearing is loose, the shaft will keep moving inward until it is stopped by the internal parts such as pilot bearing thrust washers, etc.

TRANSMISSION

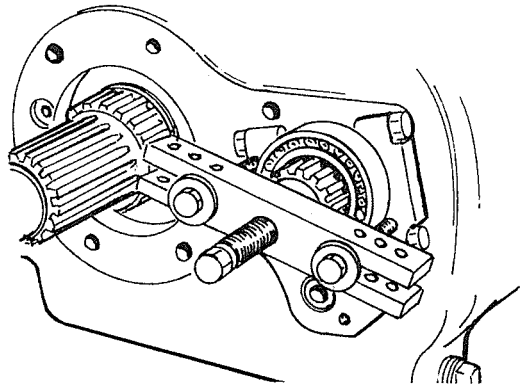
Tool Reference

Tools

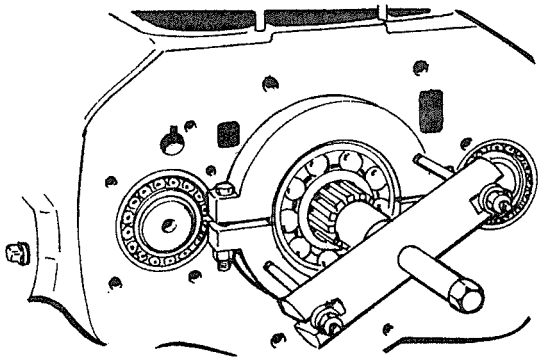
Spicer Transmission can be repaired with ordinary mechanic's hand tools, however this procedure is not only time consuming but could damage otherwise reusable parts. To reduce maintenance costs and vehicle downtime, we recommend using the special tools shown in this section.



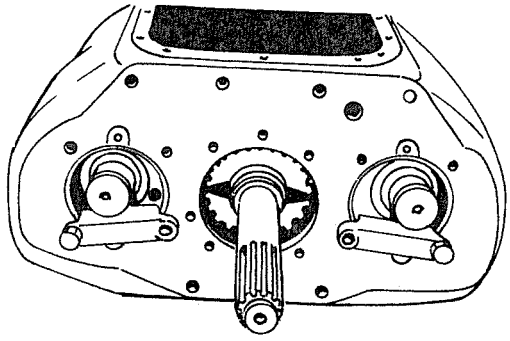
Suggested pullers and alignment tools.



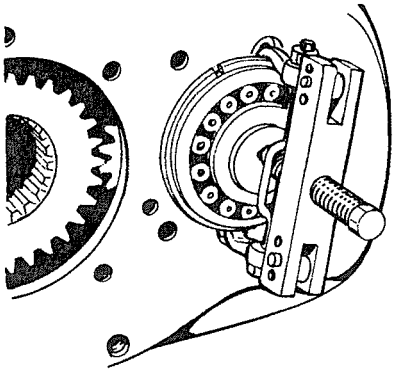
Countershaft rear bearing puller (Snap-on — CJ 950).



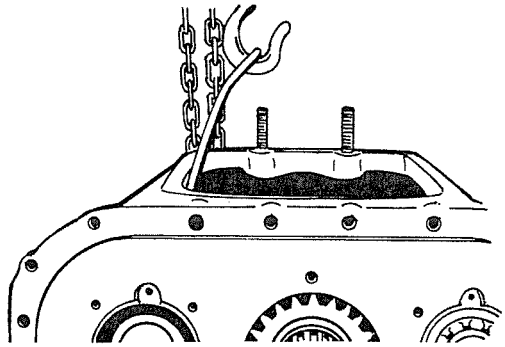
Reversible input and output bearing puller — (Kent Moore J 24348). Used with end yoke remover (J 7804-01).



Countershaft alignment blocks — Kent Moore (J 28720). Provides maximum clearance for mainshaft assembly installation. Allows countershafts to be rotated for timing purposes.



Countershaft front bearing puller (Snap-on — CJ 80).



Countershaft lift hook — (Kent Moore J 23667). Holds countershaft in time while centering the countershaft in the case bore for easier bearing installation.

TRANSMISSION

Remote Control Assembly

Disassembly

Remove six capscrews and lockwashers and separate the remote control from the shifter housing.

1. Remove set screw from universal joint assembly and pull universal joint from the rod.

2. Remove four capscrews and lockwashers holding end cover and gasket in place.

3. Remove set screw from joint shift rod finger and tap rod through cross holes in housing.

4. Remove finger from housing.

5. Remove set screw from inner shift finger.

6. Slide rod and bracket assembly from inner shift finger.

7. Be careful not to lose key from rod or shift finger.

8. Remove seals from cross holes in housing.

Inspection

Check shift fingers for excessive wear. Check all bores and rods for excessive wear or scuffing.

Clean parts thoroughly and apply light coat of grease to pivot points when reassembling.

Assembly

1. Install new key in rod and bracket assembly and install into remote housing, sliding shift finger (inner) on end of rod.

2. Line up set screw hole and install set screw, and torque 40 to 50 lbs. ft.

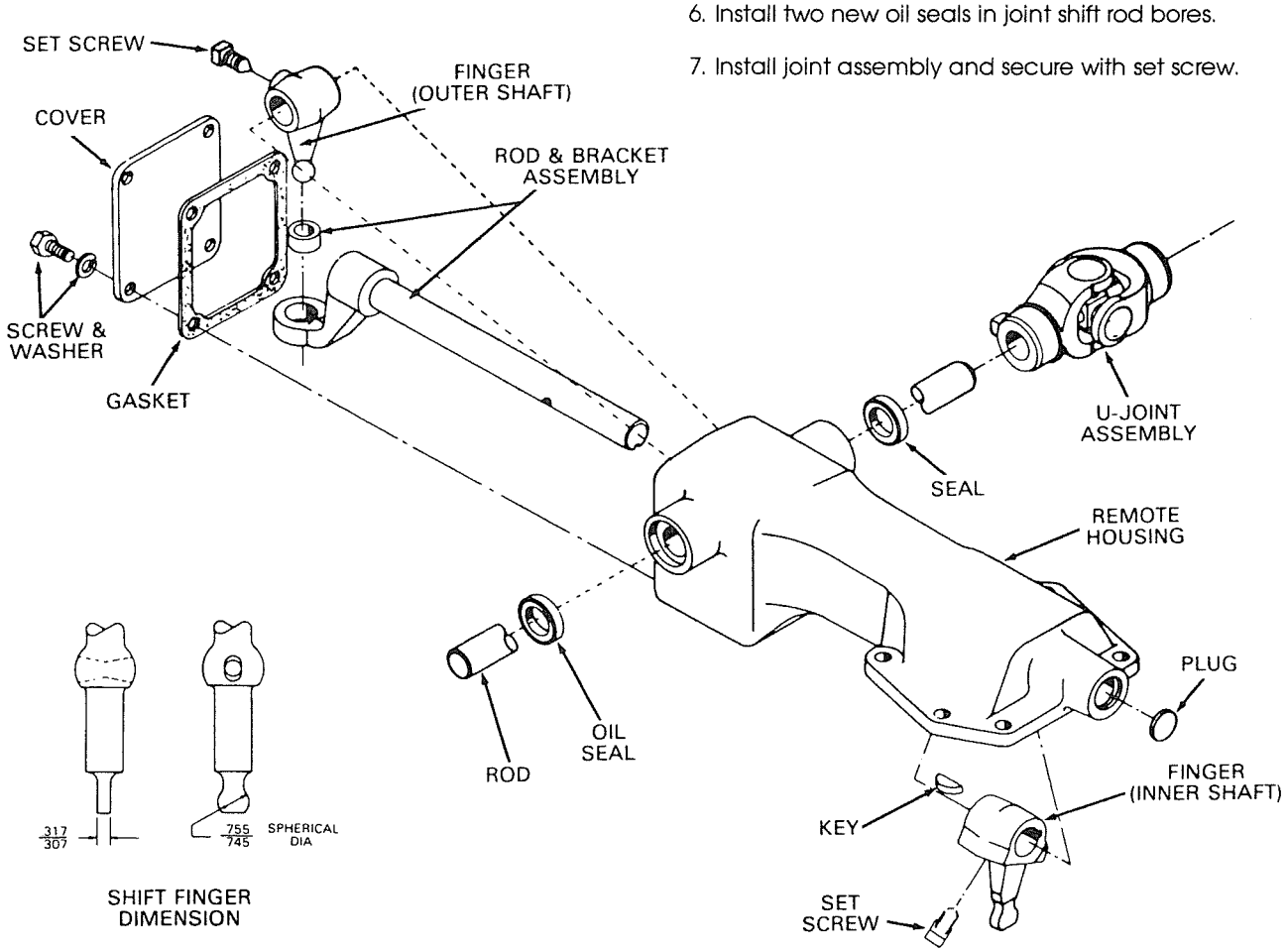
3. Install joint shift rod through cross holes and through outer finger, making sure finger is inserted into bracket.

4. Align set screw hole and install same, and torque 40 to 50 lbs. ft.

5. Install end cover and secure with four capscrews and lockwashers.

6. Install two new oil seals in joint shift rod bores.

7. Install joint assembly and secure with set screw.



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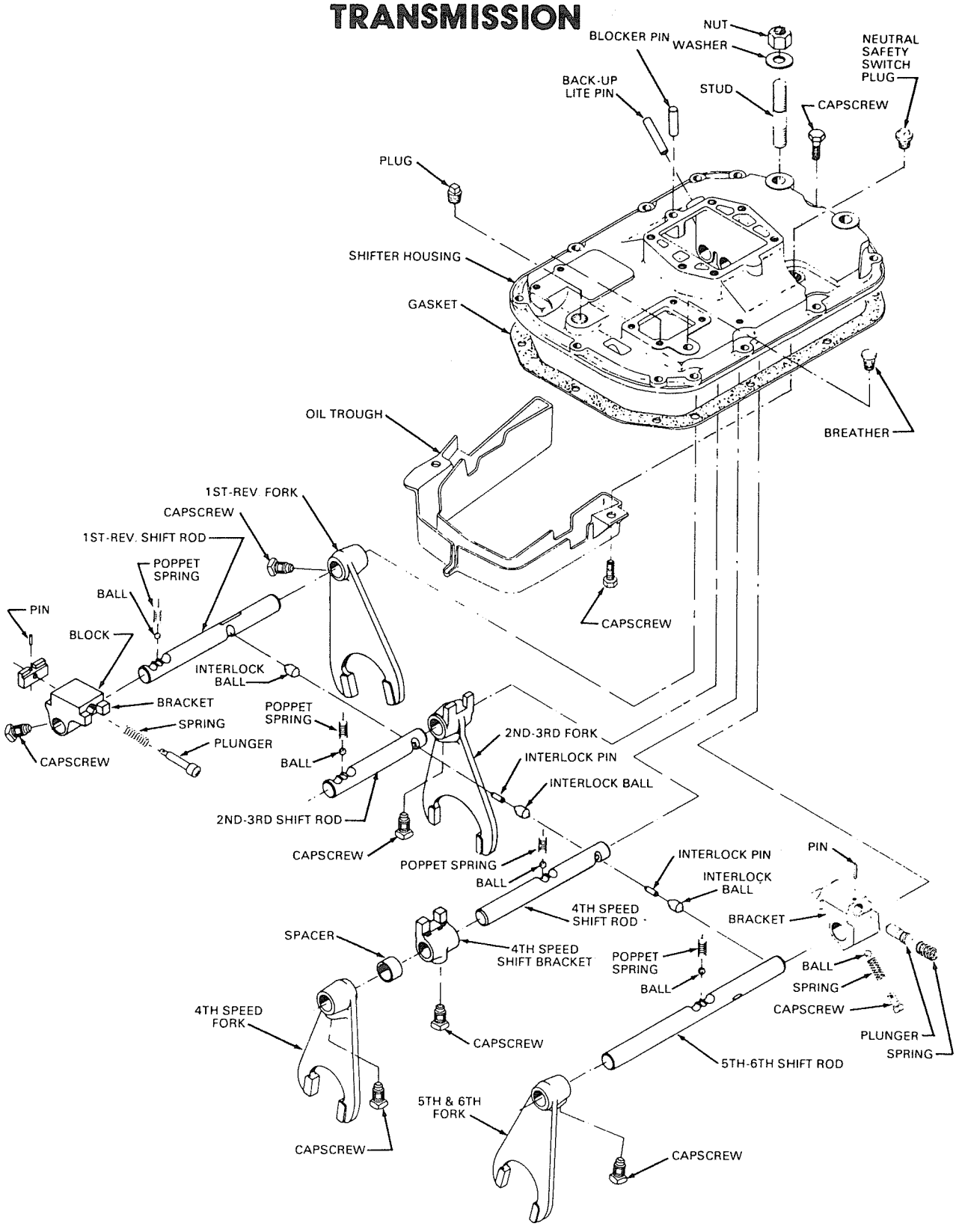
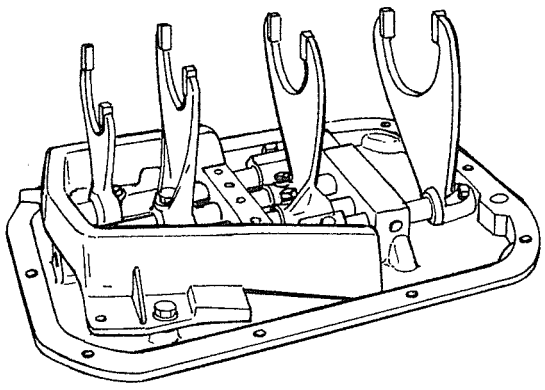


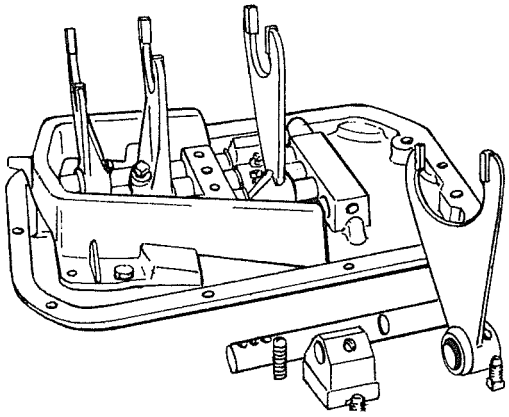
SHIFTER HOUSING
CENTER CONTROL

TRANSMISSION

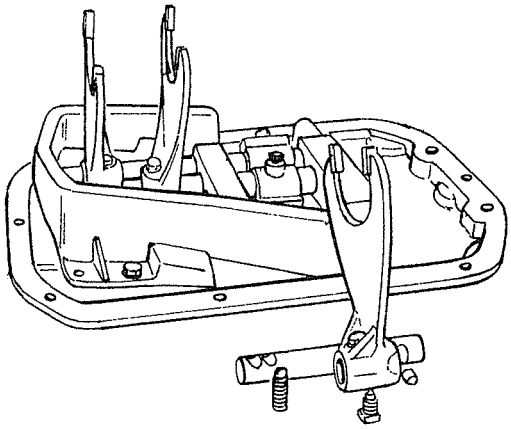
Shifter Housing Disassembly



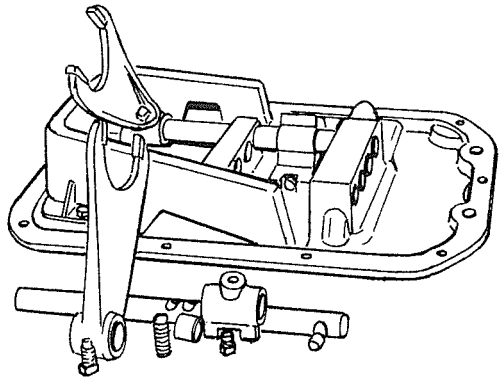
1. Place the cover on a bench with the forks in the neutral position.



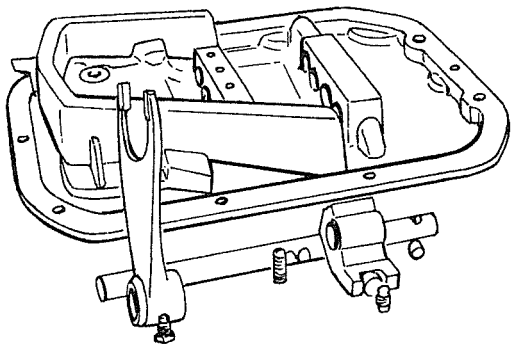
2. Remove the 1st-Reverse fork and bracket set screws. As parts are being removed, use care so that the poppet ball and spring are not lost.



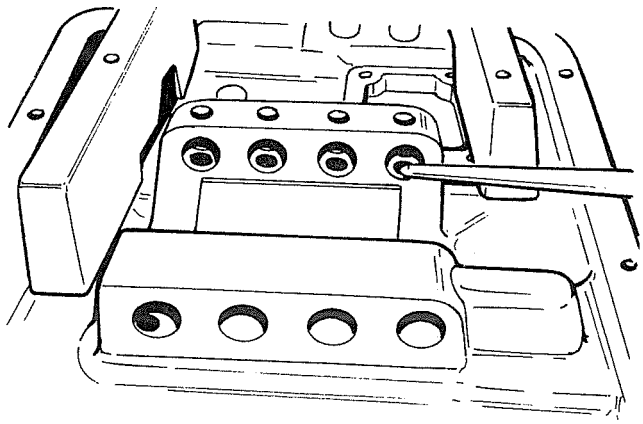
3. Remove the set screw from the 2nd-3rd fork. Tap the rod rearward and remove the poppet ball and spring. As the shift rod is pulled from the rear of the housing, be sure not to lose the interlock pin located in the rod.



4. In the same manner, remove the 4th speed fork and bracket. Recover the poppet ball and spring and also the interlock pin and ball.



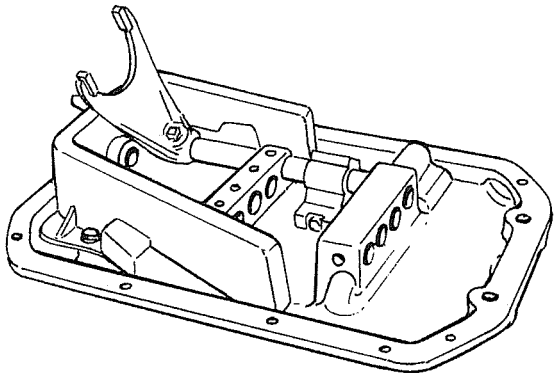
5. Next, remove the 5th-6th fork and bracket to complete the disassembly of the shifter housing.



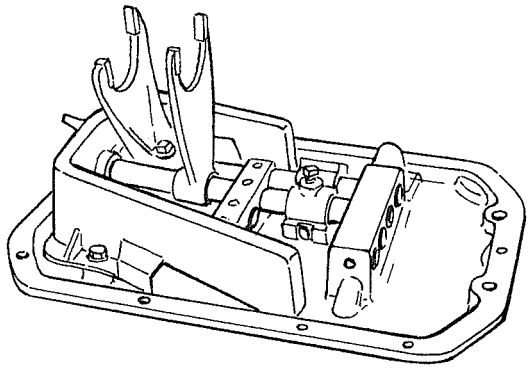
6. Check the poppet holes for chipping or other signs of wear. Since sharp corners are required to insure the proper functioning of the shift rods, any worn holes will result in the unit sticking in gear.

TRANSMISSION

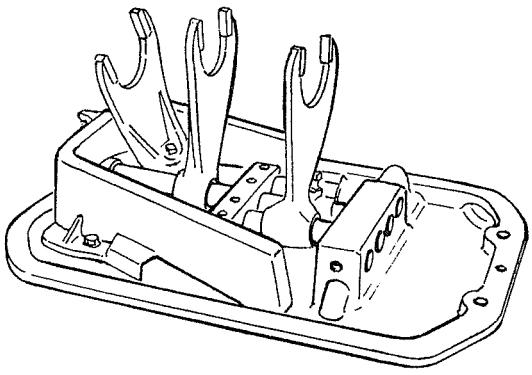
Shifter Housing Reassembly



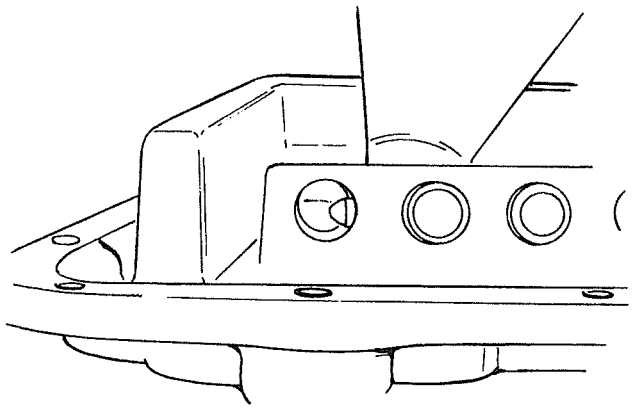
1. After inspection, the shifter housing is ready for reassembly. Install the 5th-6th shift bracket and fork. Torque the set screws 34 to 41 pounds feet (46 to 56 Nm).



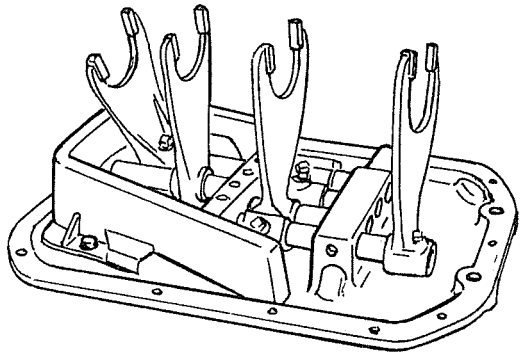
2. Install the 4th speed fork and bracket. Be sure to check each shift rod for free movements as the reassembly progresses.



3. Install the 2nd-3rd shift fork.

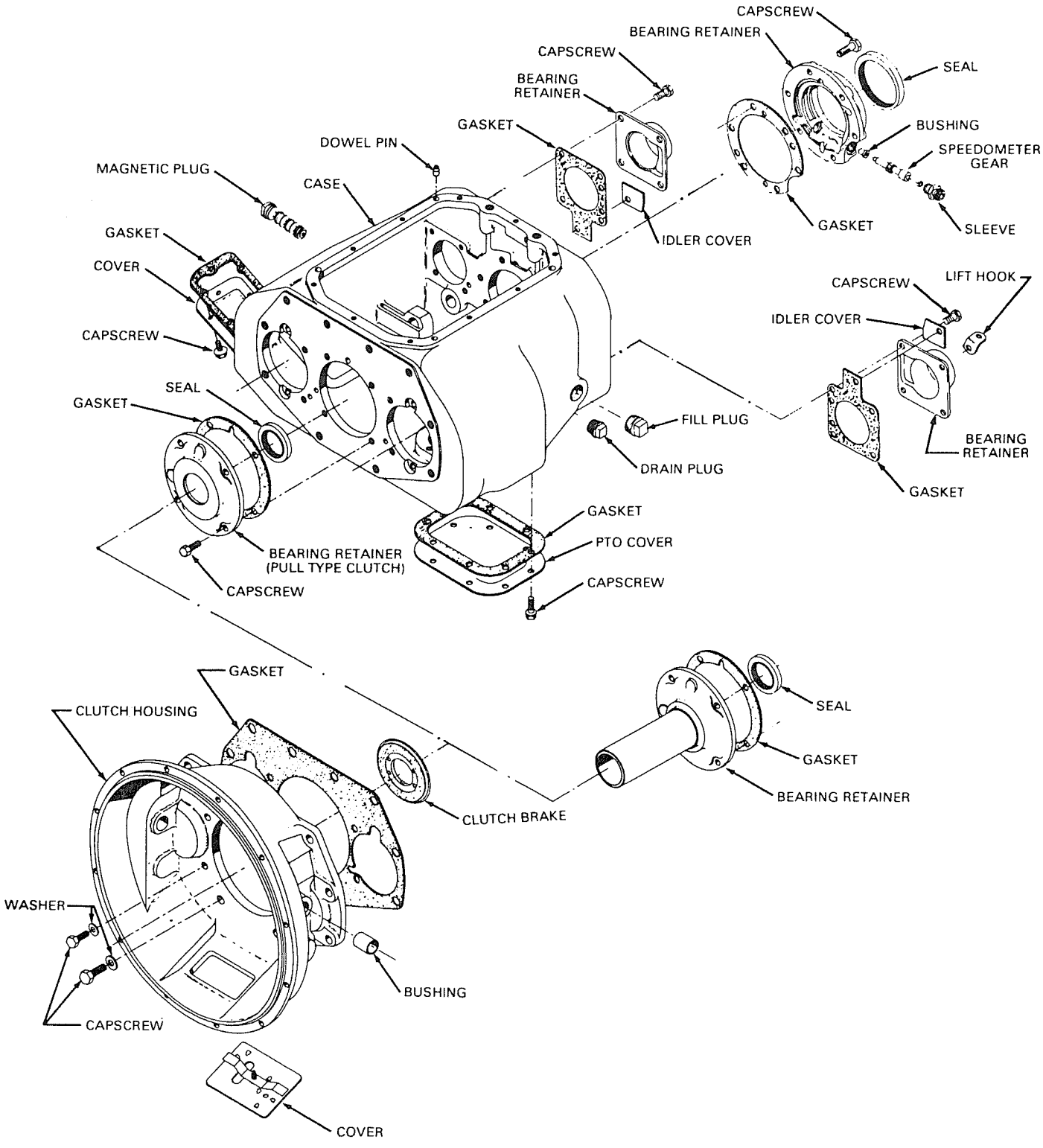


4. During the installation of each shift rod, careful attention is needed to insure the proper installation of all interlock balls. These interlocks prevent the transmission from being shifted into two gears at the same time.



5. With the shifter housing reassembly completed, it is advisable to check for the proper functioning of these interlocks. Shift one fork into gear; if all interlocks are installed correctly, none of the other forks will shift into gear.

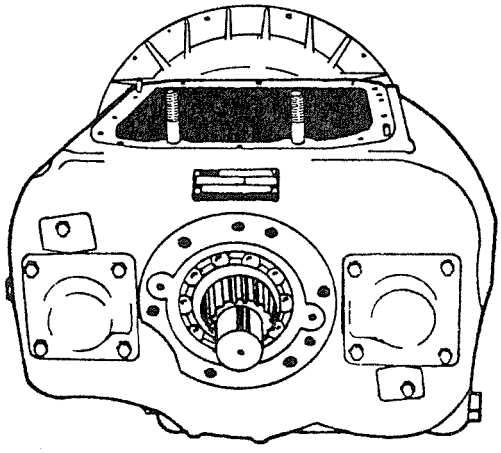
TRANSMISSION



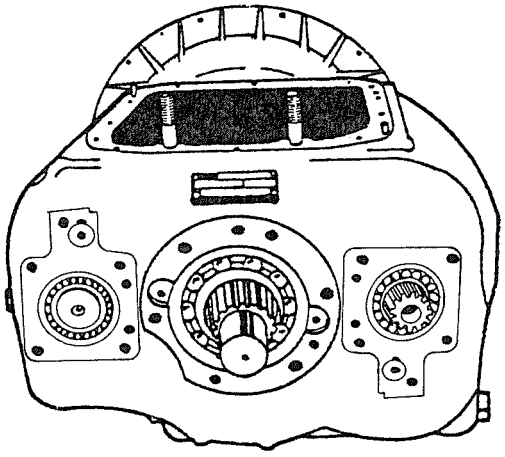
CASE SUB-ASSEMBLY

TRANSMISSION

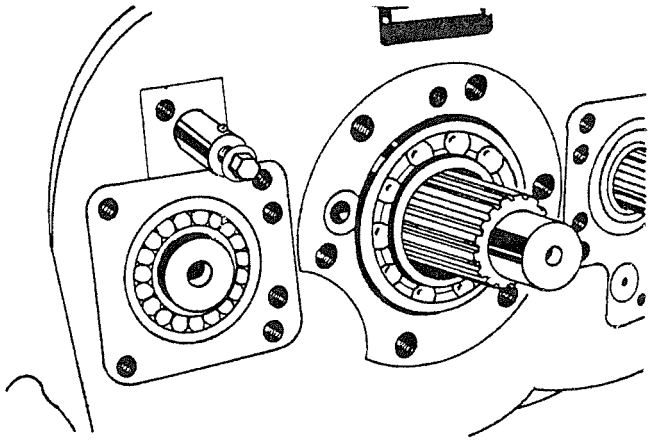
Gears and Case Disassembly



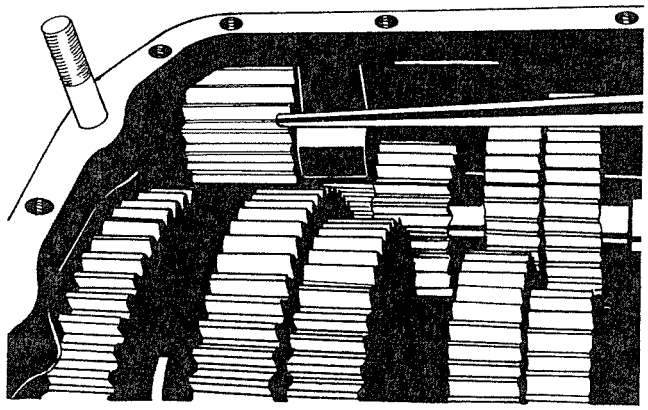
1. Now that the shifter housing is removed, continue the disassembly of the transmission by removing the output bearing cap and gasket.



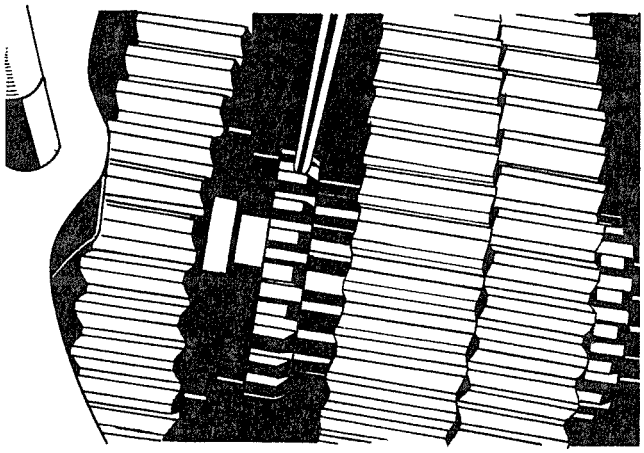
2. Remove the countershaft bearing retainers.



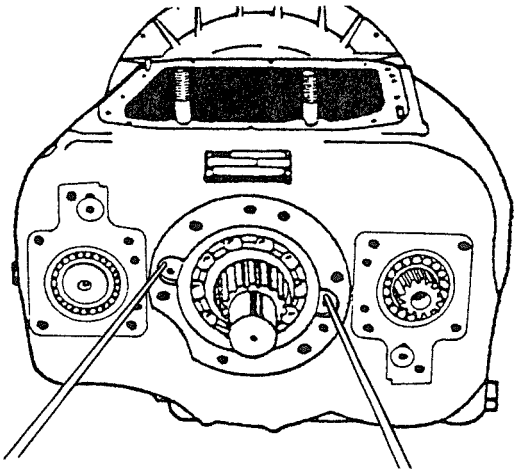
3. Insert a capscrew into the upper reverse idler shaft and remove the shaft. Do not lose the lockball in the shaft.



4. Roll the upper reverse idler gear toward the side of the case.

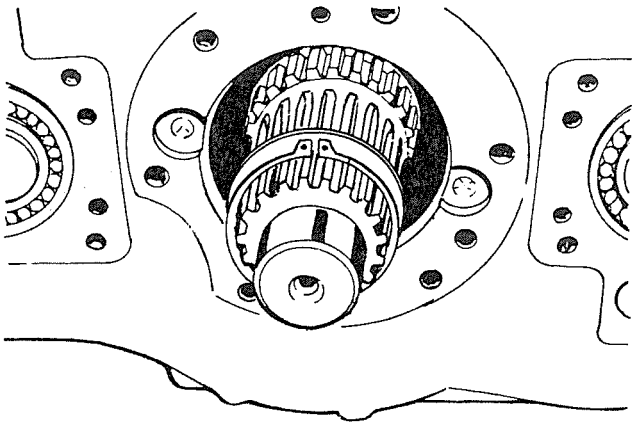


5. Engage the 1st-Reverse collar into reverse gear.

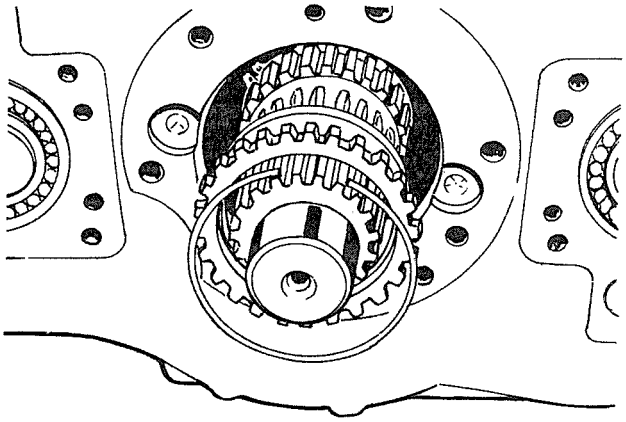


6. These milled slots facilitate the removal of this output bearing.

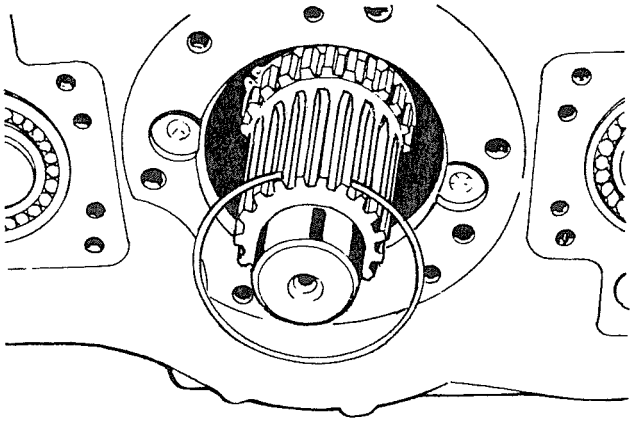
TRANSMISSION



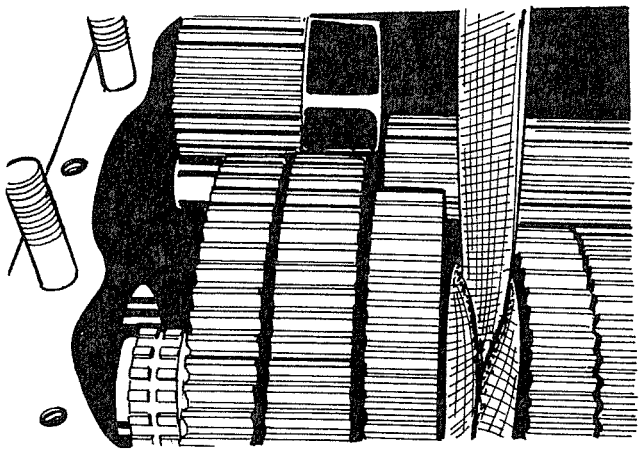
7. Remove the mainshaft snap ring and the internally splined thrust washer.



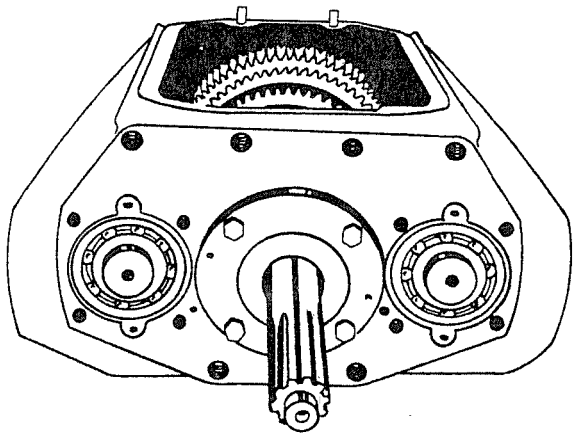
8. Next, remove the gear bore snap ring and both the externally and internally splined thrust washers.



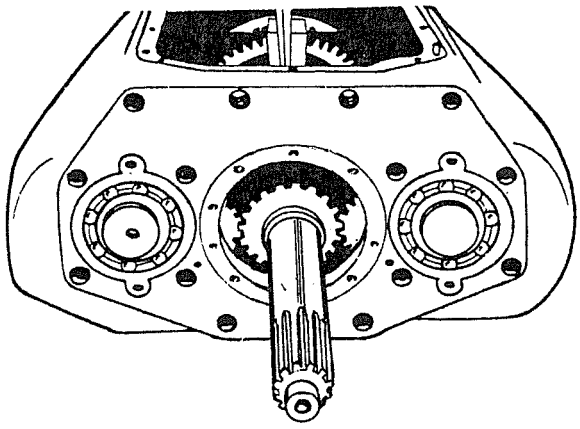
9. Finally, remove the remaining gear bore snap ring.



10. Now, butt the 1st and reverse gears together. Secure both gears with lockwire to provide the necessary clearance for removal of the mainshaft assembly.

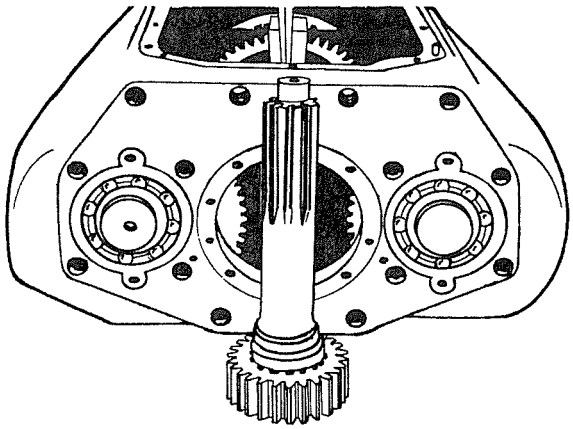


11. Remove the clutch housing.

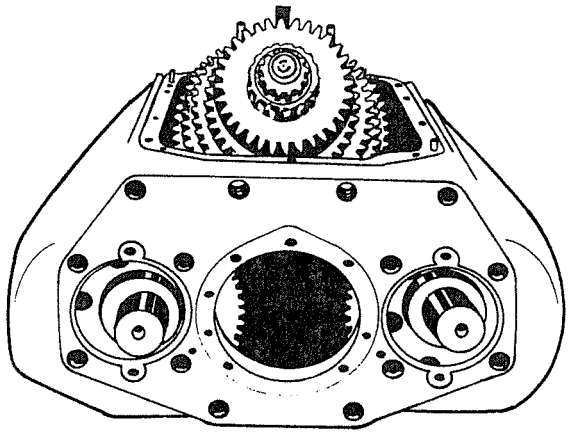


12. Remove the input bearing cap.

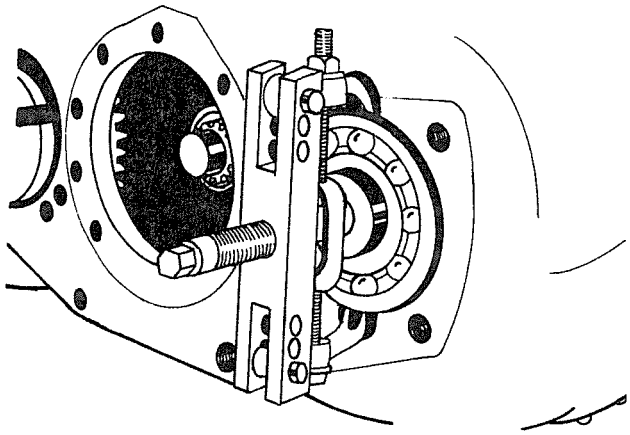
TRANSMISSION



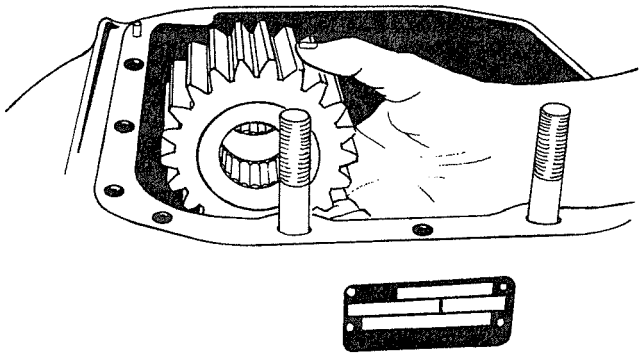
13. Remove the input gear.



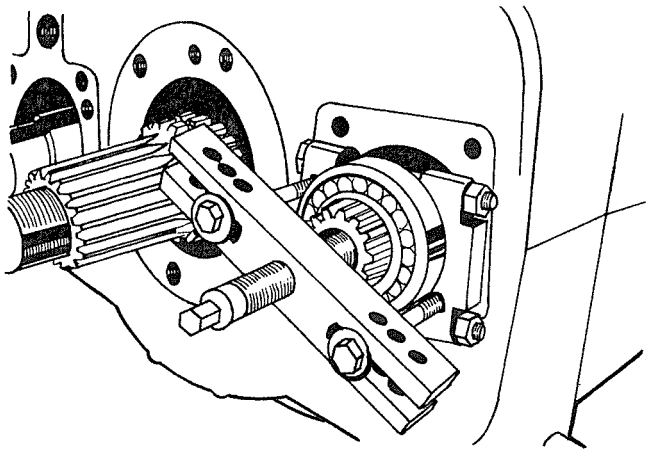
16. To provide adequate clearance for mainshaft removal, move both countershafts forward and toward the side of the case. Then lift the mainshaft assembly out of the case.



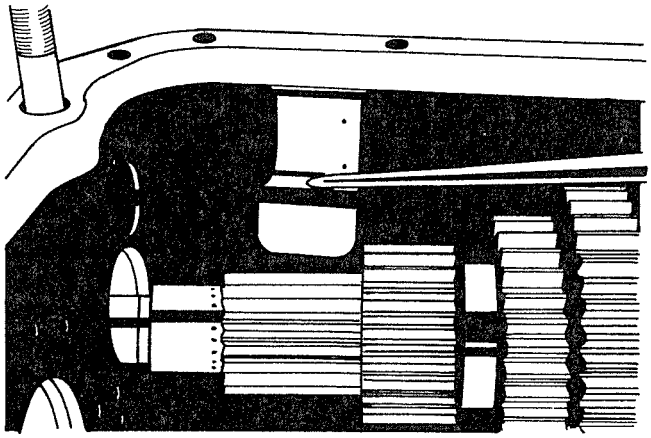
14. Using a puller, remove the countershaft front bearings.



17. Remove the upper reverse idler gear.

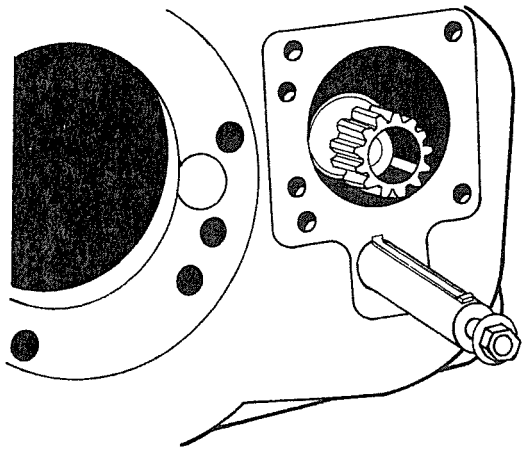


15. Now, move the countershafts to the rear as far as possible and install a puller for bearing removal.

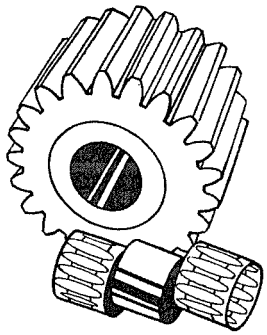


18. Because of this upper idler boss interference, remove the right side countershaft first, then the left.

TRANSMISSION



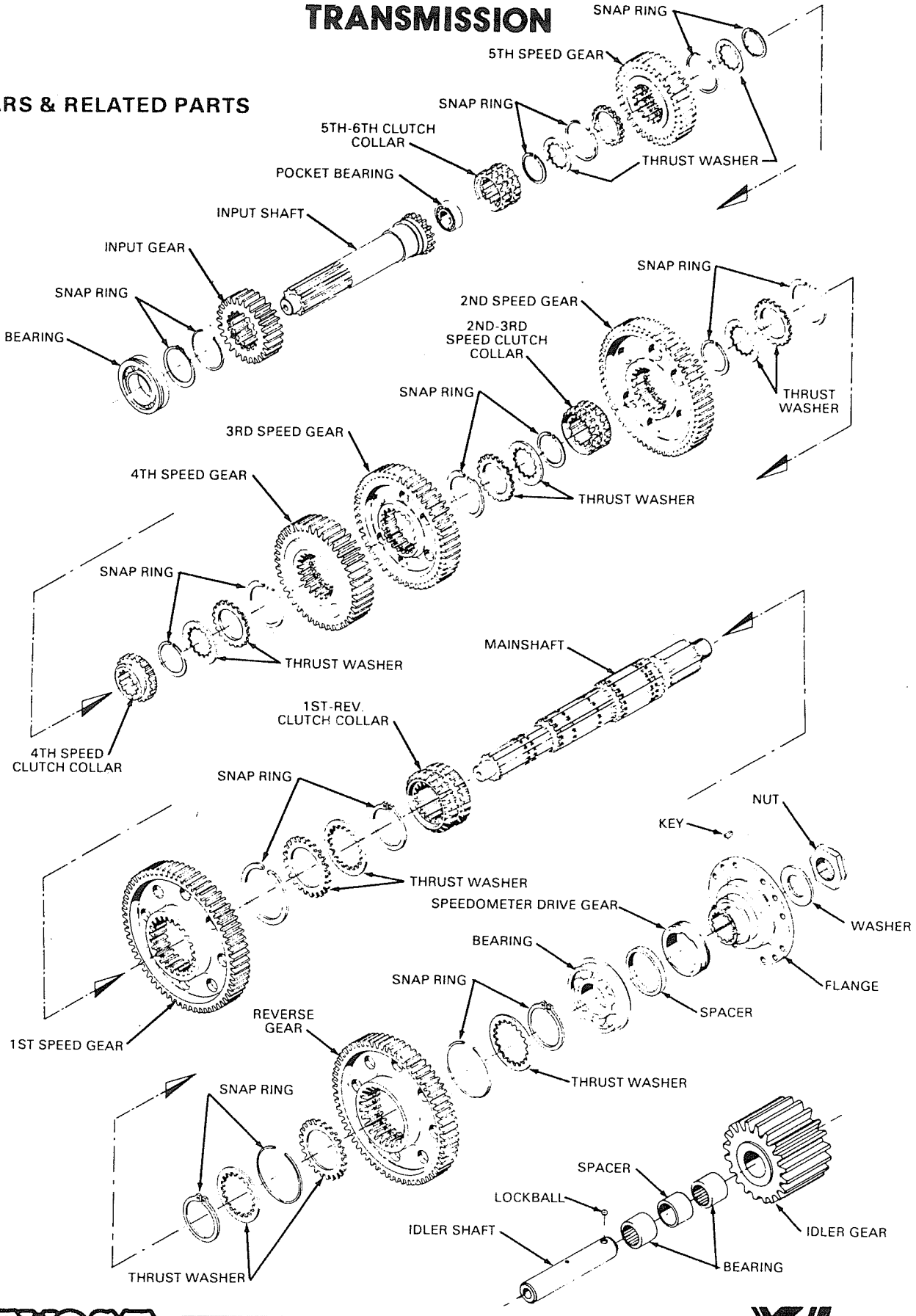
19. Remove both the lower reverse idler shaft and gear.



20. Check both the idler gear and bearings for wear.

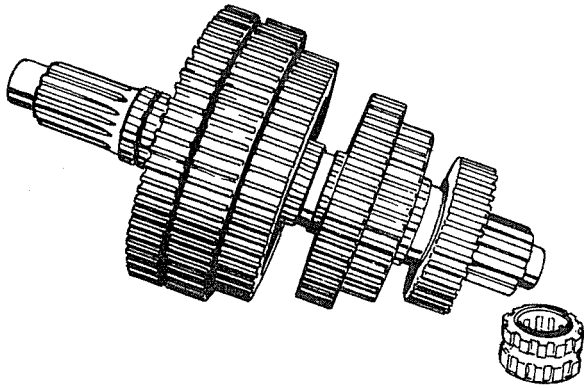
TRANSMISSION

GEARS & RELATED PARTS

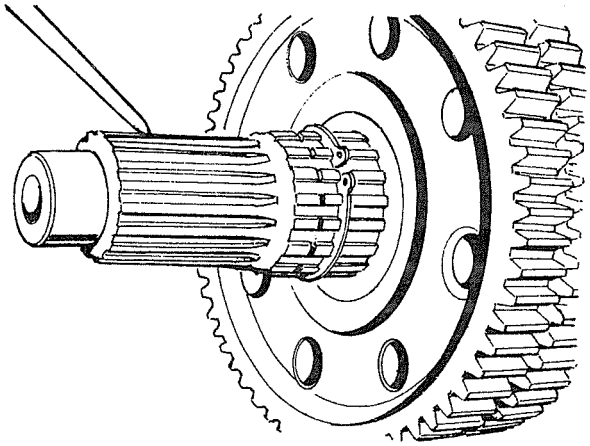


TRANSMISSION

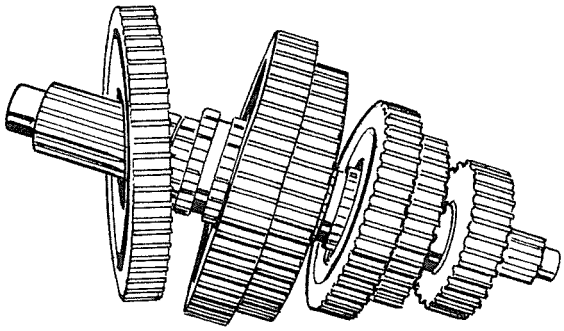
Mainshaft disassembly and reassembly



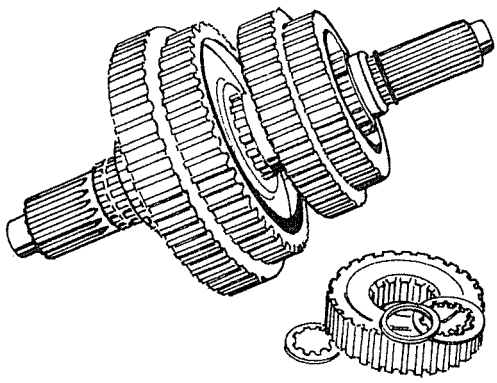
1. Begin the mainshaft disassembly by removing the clutch collar.



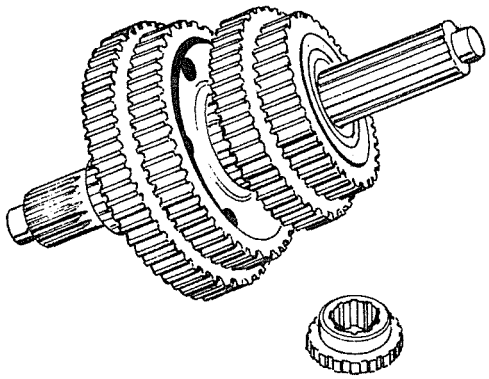
2. This diameter of the mainshaft has been enlarged, thus increasing the torque capacity.



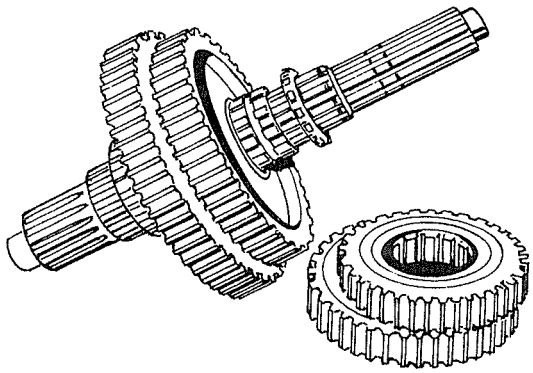
3. Cut the lockwire and remove reverse gear.



4. Remove the snap ring and 5th speed gear.

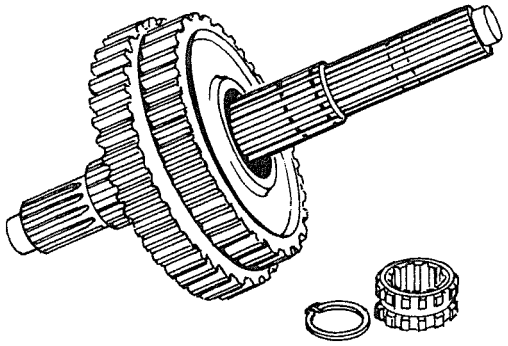


5. Remove another snap ring and the 4th speed clutch collar.

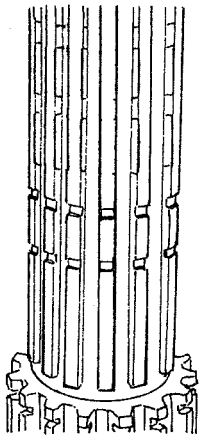


6. After removing the next snap ring, lift both the 4th and the 3rd speed gears from the mainshaft.

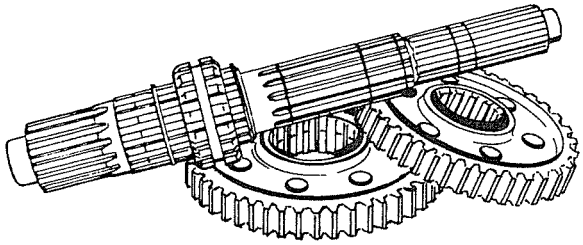
TRANSMISSION



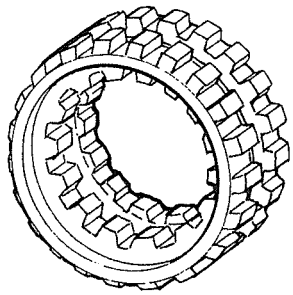
7. The 2nd-3rd speed clutch collar may be removed.



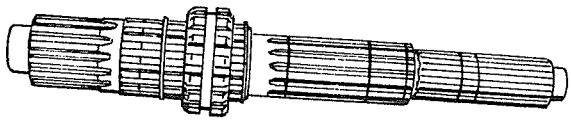
10. Spicer utilizes «gear locks» to maintain clutch collar engagement. The mainshaft splines have machined grooves.



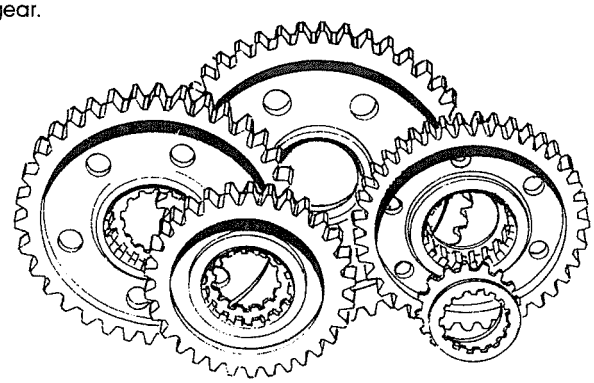
8. Another snap ring secures both the 2nd speed and the 1st speed gears to the mainshaft.



11. While the clutch collar has a relieved area on the internal diameter that provides sharp corners, when «in gear», these edges lock together to keep the transmission in the selected gear.

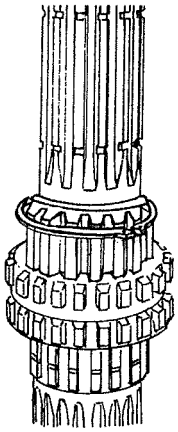


9. All that remains on the mainshaft are two snap rings and the 1st-Reverse clutch collar.

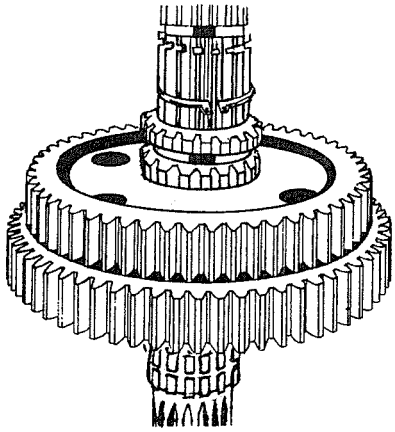


12. Reassembly of the mainshaft may now begin. Apply a light coat of oil on all thrust washer faces. All mainshaft gears contain a set of these thrust washers. The externally splined washer is positioned against the gear bore snap ring and the internally splined washer against the snap ring on the mainshaft.

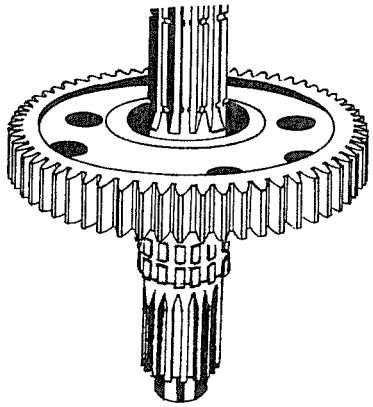
TRANSMISSION



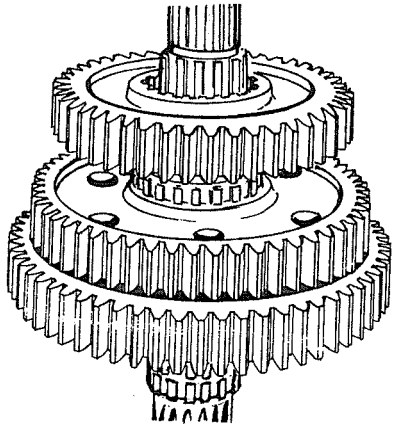
13. Install the 1st-Reverse clutch collar between the mainshaft snap rings.



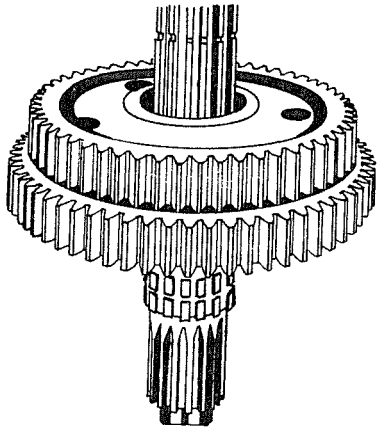
16. Slide the 2nd-3rd clutch collar onto the mainshaft.



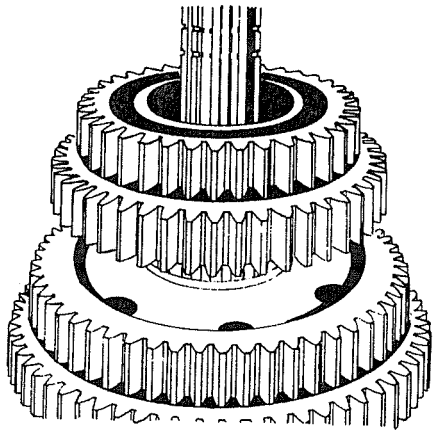
14. Next, the 1st speed gear, complete with thrust washers, is placed on the mainshaft.



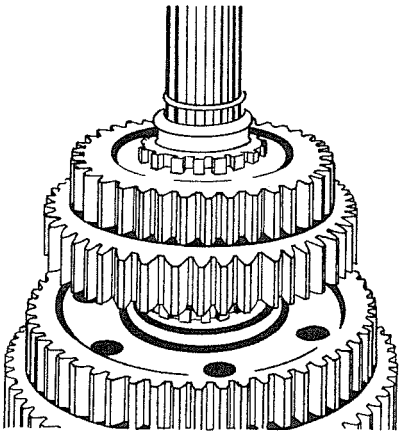
17. Place the 3rd speed gear on the mainshaft with the clutch teeth down.



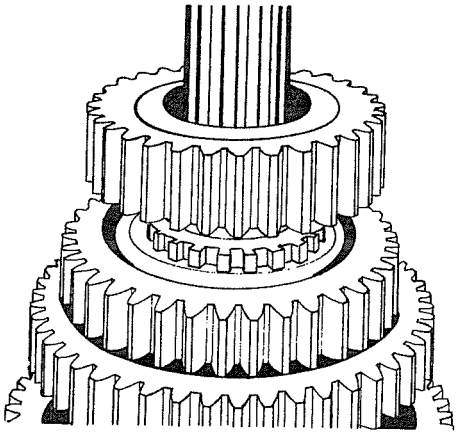
15. Place the 2nd speed gear on the mainshaft and secure with a mainshaft snap ring.



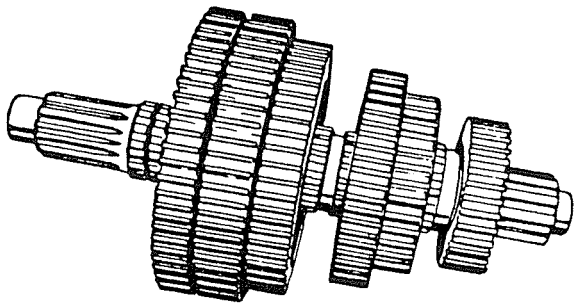
18. The 4th speed gear is installed next and secured with a mainshaft snap ring.



19. Slide the 4th gear clutch collar onto the mainshaft.



20. Then place the 5th speed gear on the mainshaft and secure with a snap ring.



21. Install the reverse gear and butt it against the 1st speed gear. Secure with lockwire.

TRANSMISSION

Inspection

Prior to reassembling the mainshaft, certain individual parts should be examined. Parts damaged from previous service should be eliminated to insure maximum rebuild life.

These suggested inspection procedures should be followed:

Clutch Collars: Both the internal and external teeth must have sharp edges. Rounded corners or excessive chipping will cause gear jumping. Also, examine fork slots for wear.

Gears: Examine for broken or cracked operating teeth. Also, check for any unusual wear patterns. Clutching teeth must not show excessive wear.

Thrust Washers: Check for flatness or excessive face wear (cracks, scoring, etc.).

Snap Rings: Examine for distortion or loss of tension. New snap rings are recommended with every rebuild.

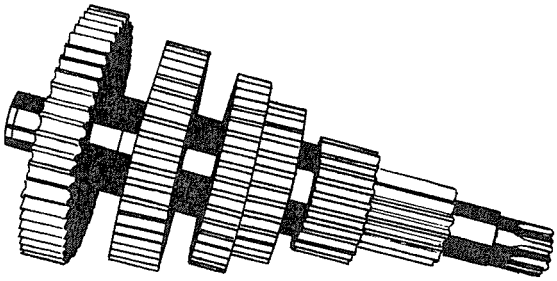
Mainshaft: Check spline gearlocks for sharp corners. Worn or ironed out gearlocks will produce gear jumping. Also, check for chipped splines at snap ring grooves.

TORQUE SPECIFICATIONS FOR NUTS AND CAPSCREWS

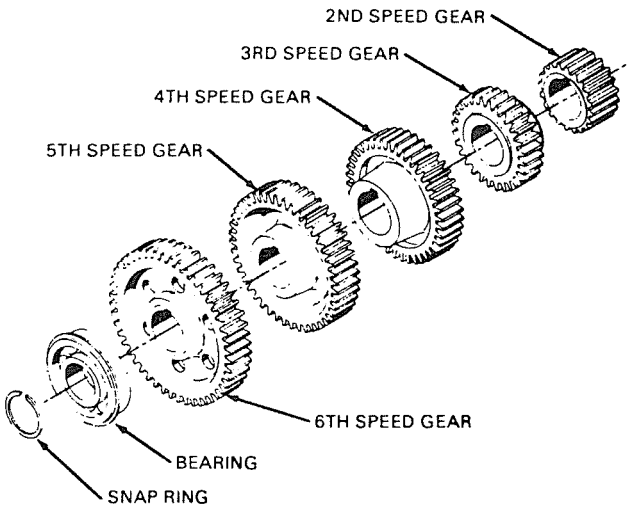
NOM. THREAD SIZE (DIA.)	PART NAME	WRENCH TORQUE LBS. FT.			
		NON-LOCKING TYPE		LOCKING TYPE (Bonded Nylon Patch)	
		MIN.	MAX.	MIN.	MAX.
.250	Cap Screw or Nut	7	10	10	13
.312	"	13	17	20	24
.375	"	25	32	34	41
.438	"	40	50	52	62
.500	"	60	80	78	98
.562	"	90	115	112	137
.625	"	120	150	150	180
.750	"	200	250	240	290
1.250	Nut			500	550
1.375	"			550	600
1.750	"			550	600
	PTO Aperature Cover Capscrews				
.375	Capscrew	10	15	19	24
.438	"	20	25	32	37
	Shift Fork Or Bracket Set Screws	Lockwire Type			
.375	Set Screw	25	32	34	41
.438	"	40	50	52	62

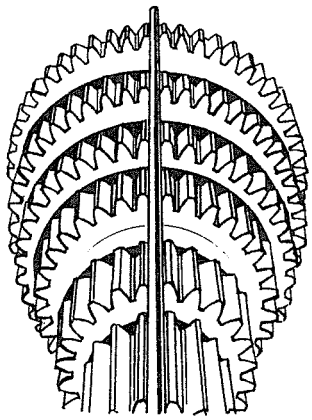
TRANSMISSION

Countershaft disassembly and reassembly

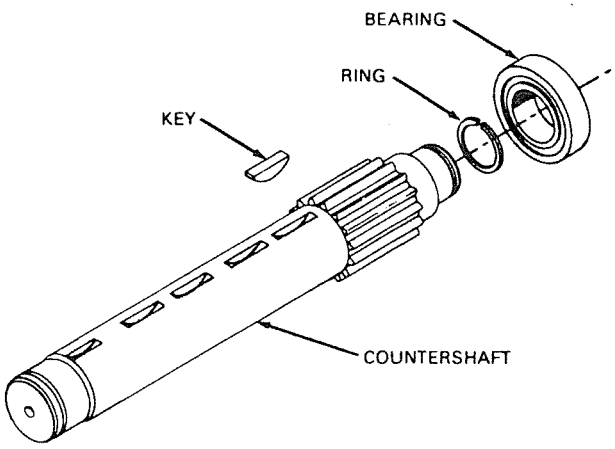


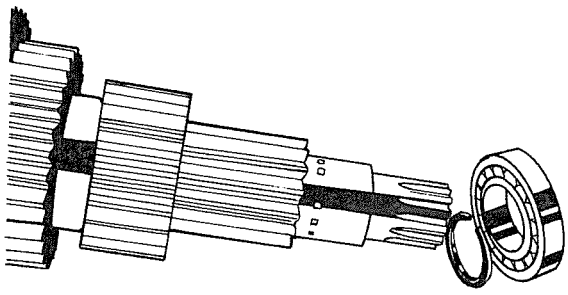
1. This view shows the hub direction of the gears. The first-reverse gear is an integral part of the shaft, while the remaining gears are secured with individual Woodruff keys under each gear.





2. If you place a straight edge between these painted teeth, every gear on the countershaft will be in line. When you set these shafts in time, these marks will be directly across from each other.

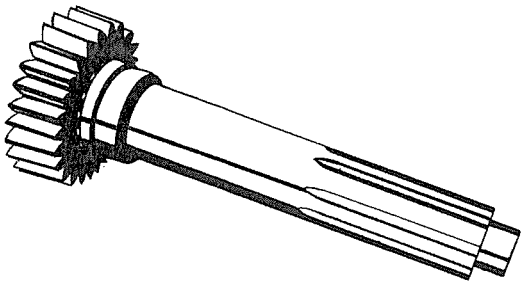




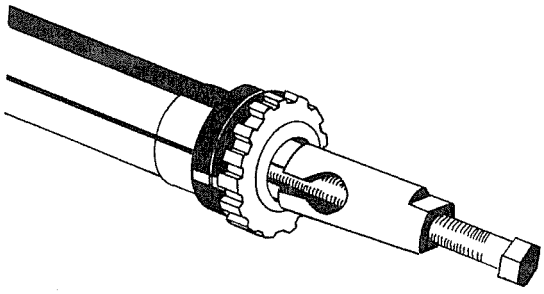
3. The countershaft rear bearing requires a spacer ring for proper location.

TRANSMISSION

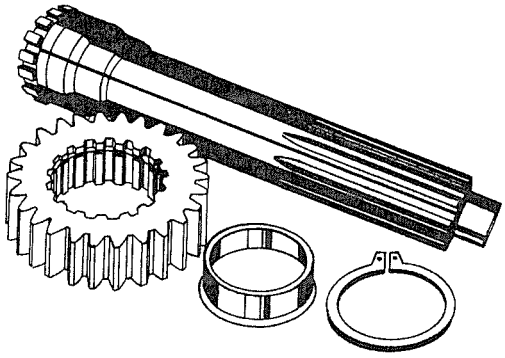
Input gear disassembly and reassembly



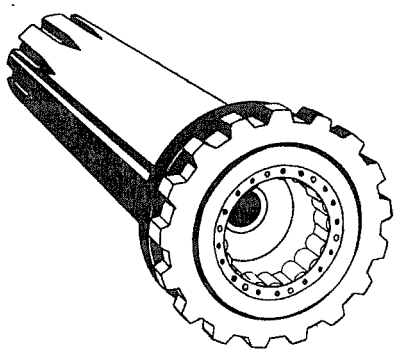
1. The input gear and shaft are separate components secured with a snap ring.



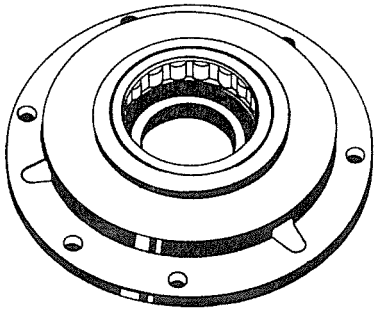
4. Remove the pocket bearing. Kent-Moore puller J-29128 is recommended.



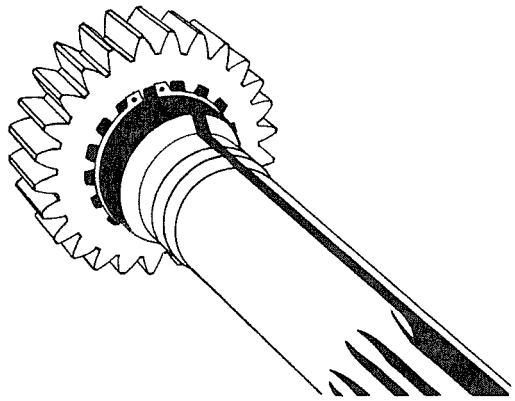
2. This view shows the input sub-assembly when disassembled.



5. This new style pocket bearing is reversible.



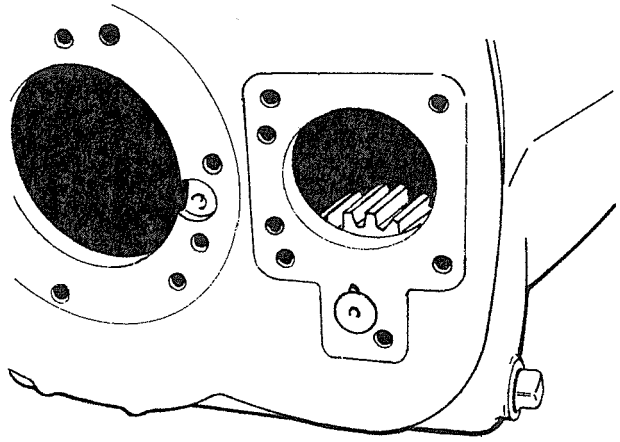
3. The input bearing is a press fit into the input bearing cap.



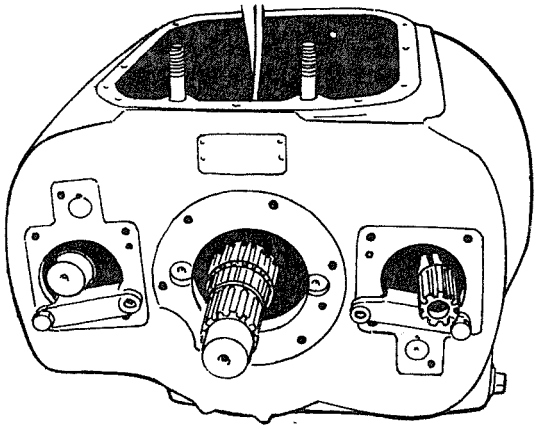
6. The snap ring in the input shaft secures the gear in its proper location.

TRANSMISSION

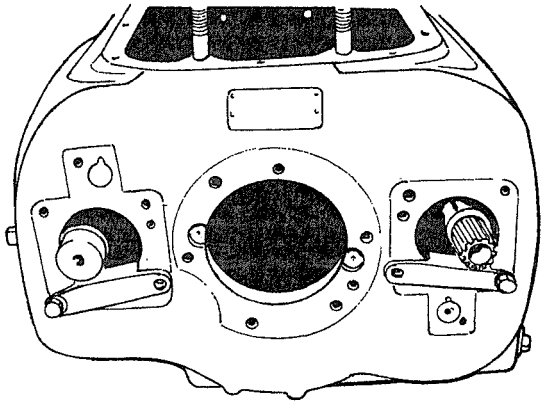
Gears and case reassembly



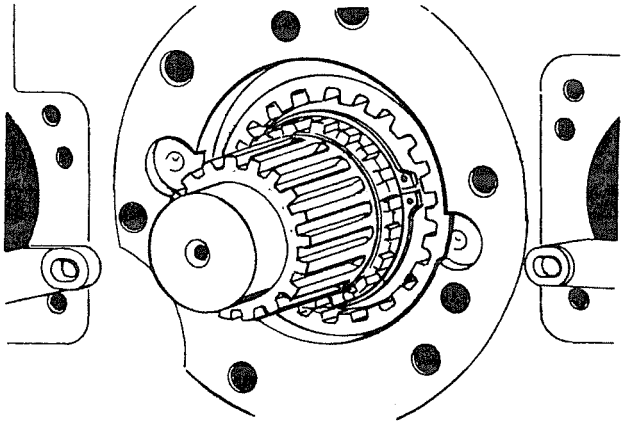
1. Reassembly of the transmission begins by placing the lower reverse idler gear and the shaft into the case.



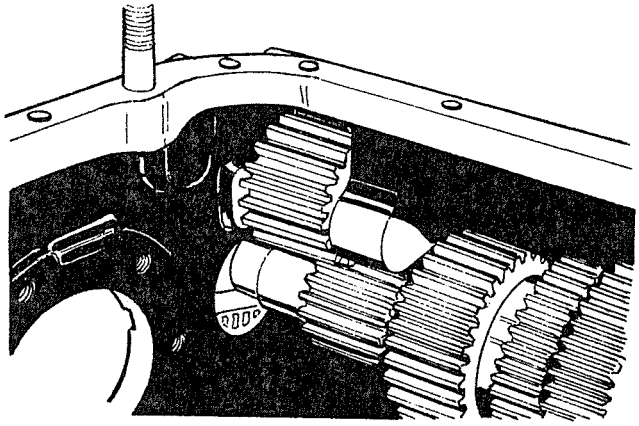
4. Lower the mainshaft assembly into the case.



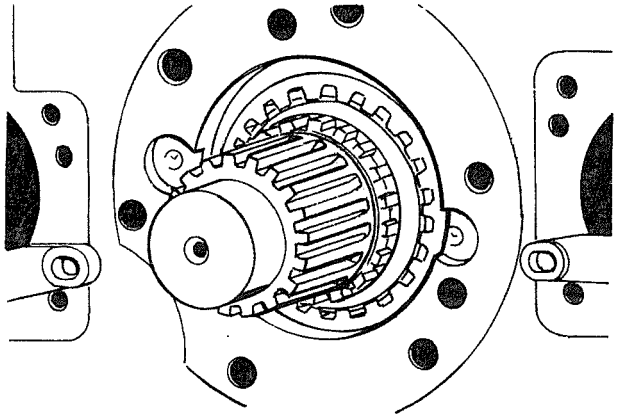
2. Install the left side countershaft first, then the right side. Kent-Moore alignment blocks J-28720 are recommended.



5. Cut and remove the lockwire. Slide the reverse gear rearward and install the first gear bore snap ring.

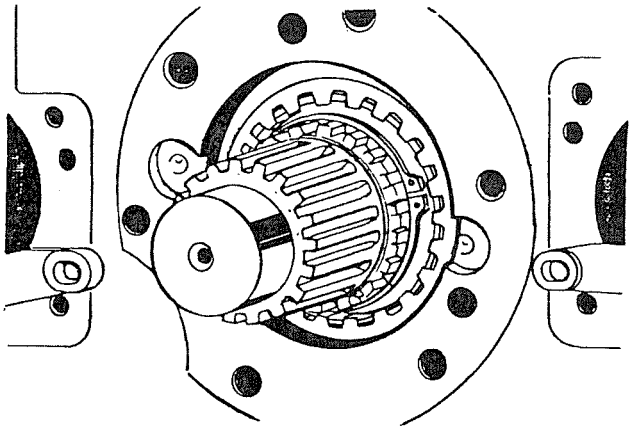


3. Set the upper reverse idler gear into the case. However, do not install the shaft at this time.

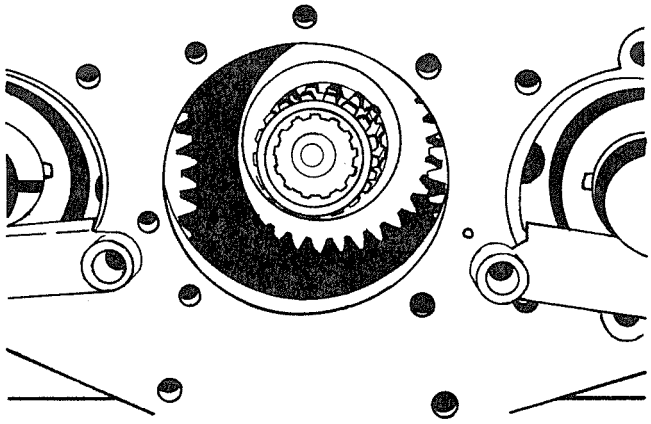


6. Next, place both the internally and the externally splined thrust washers into the bore and secure these washers with the remaining gear bore snap ring.

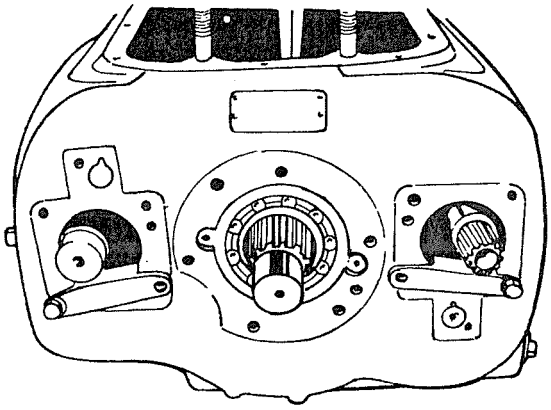
TRANSMISSION



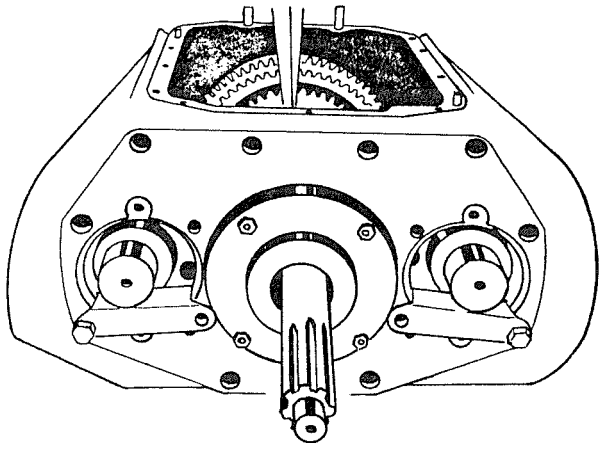
7. Finally, install the internally splined thrust washer and secure it with the mainshaft snap ring.



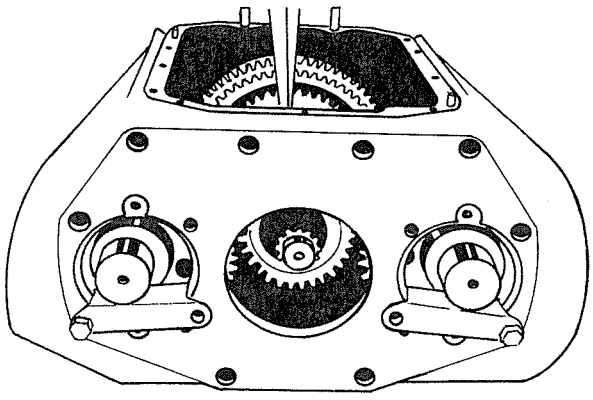
10. Install the 5th-6th clutch collar.



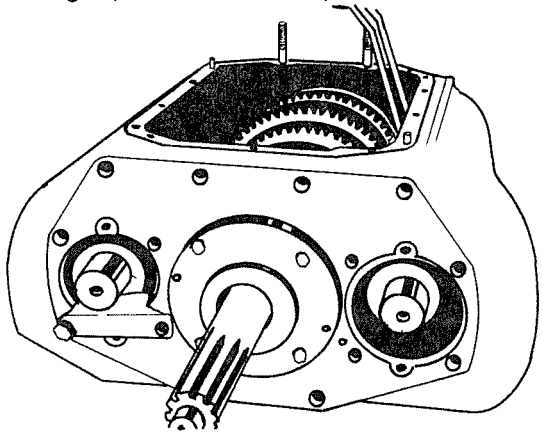
8. Slide the output bearing onto the shaft and using a suitable driver, install the bearing.



11. Place the input sub-assembly into the case, then install the input bearing cap and secure with capscrews.

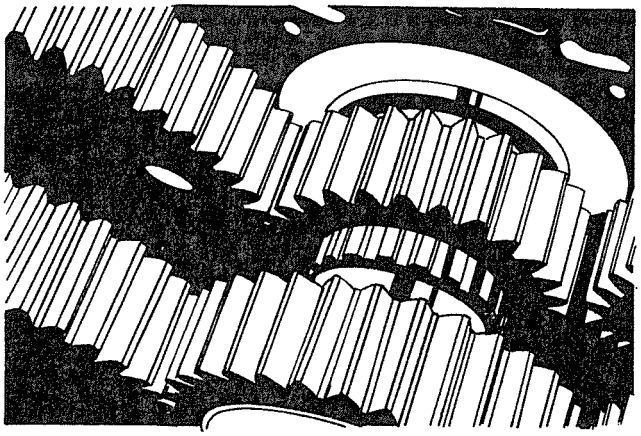


9. Align the countershaft timing marks toward the center of the case.

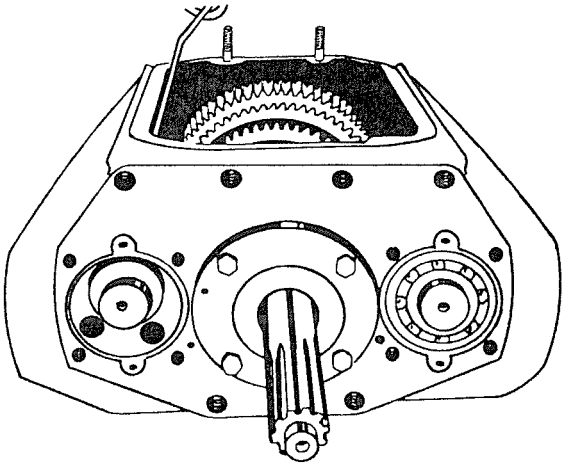


12. With the aid of a countershaft lift hook, Kent-Moore J-23667, set the countershaft in time.

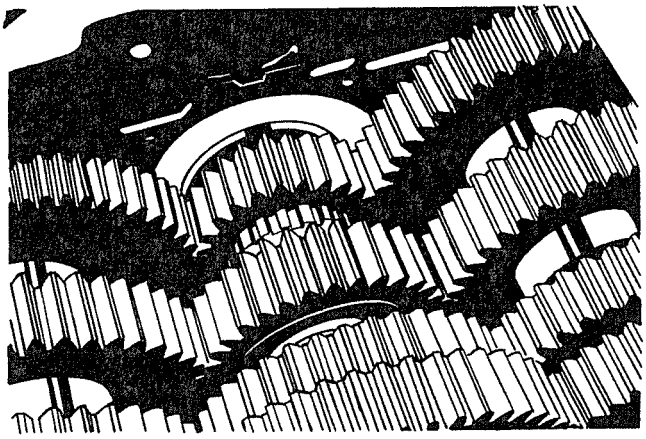
TRANSMISSION



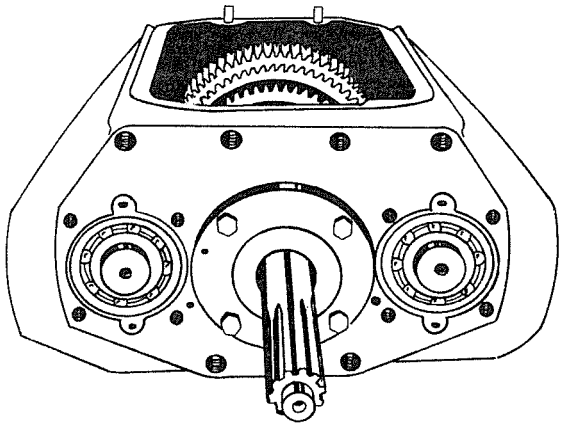
13. This is accomplished by matching paint marks.



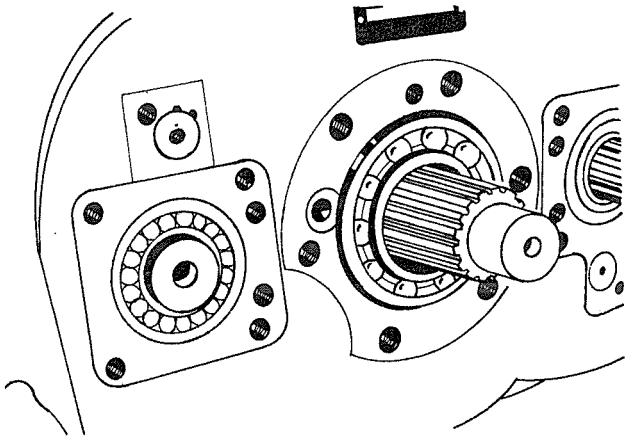
14. Install both the front and the rear bearings.



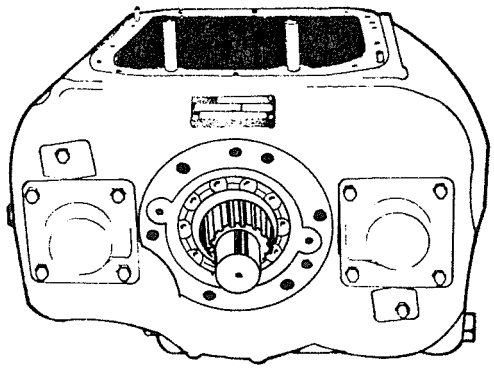
15. Repeat this procedure for the remaining countershaft.



16. The input shaft may now be rotated to check for correct timing. If the shaft turns freely, the unit is in time. If it locks up, check the timing marks for proper alignment.

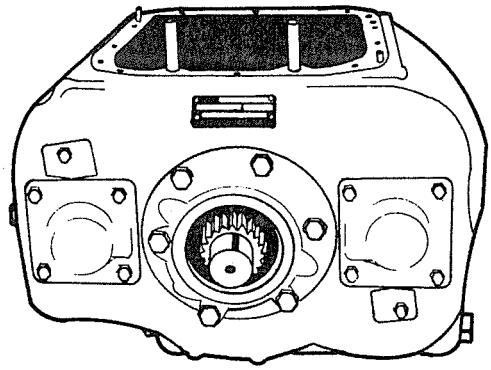


17. Install the upper reverse idler shaft with lockball. It is necessary to lift up on the mainshaft reverse gear to obtain proper alignment.

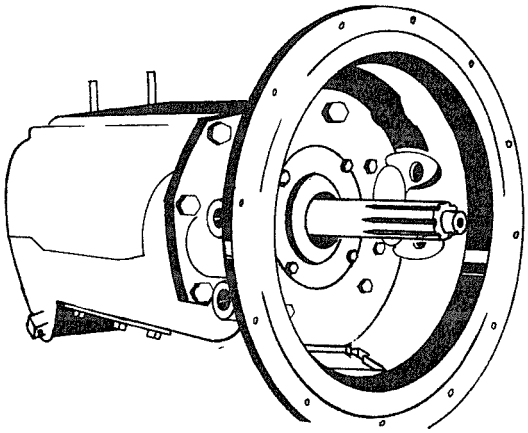


18. Secure the countershaft rear bearing retainers with capscrews. Torque 34 to 41 pounds feet (46 to 56 Nm).

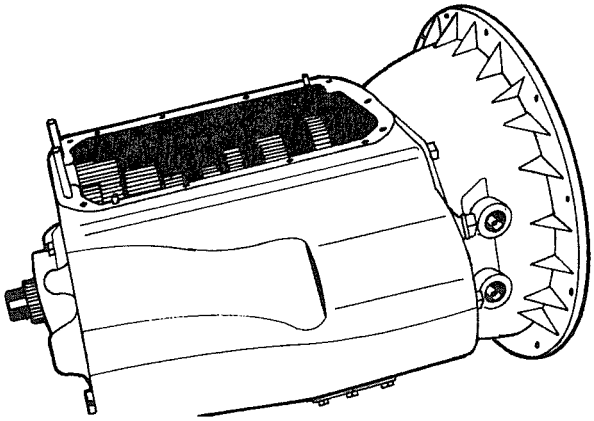
TRANSMISSION



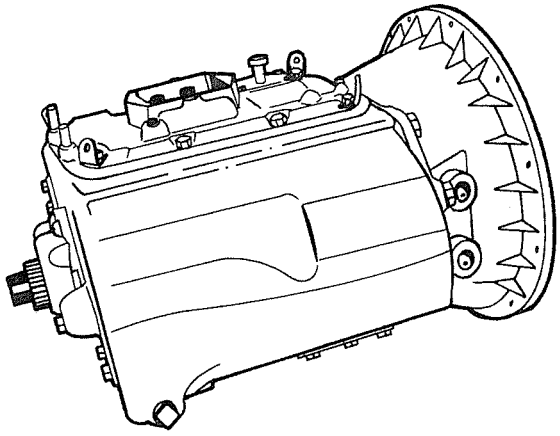
19. Place the output bearing cap on the case and secure with capscrews.



20. Assemble the clutch housing to the case.



21. Shift all the clutch collars into the neutral position.



22. Place the shifter housing in its proper location and secure with capscrews.

TRANSMISSION

TROUBLE SHOOTING

Important Procedure

When locating and correcting unit power or auxiliary transmission troubles, a systematic procedure should be followed.

Road test whenever possible. Mechanics usually get second or third hand reports of trouble experienced with the unit and these reports do not always accurately describe the actual conditions. Sometimes symptoms seem to indicate trouble in the transmission; while, actually the trouble may be caused by the axle, propeller shaft, universal joint, engine or clutch. This is especially true of complaints on noise. Therefore, before removing transmission or related components to locate trouble, always road test to check possibility that trouble may exist in other closely associated units. If the mechanic can drive, road testing will be more effective; however, just riding with the driver can be very informative.

Check Functioning Prior to Disassembly

If remote controls are used, a careful check of the remote and connecting linkage to transmission must be made. The remote unit must be in good working order if the transmission is expected to shift satisfactorily.

Many times the answer to the trouble is apparent when the unit is inspected prior to disassembly, but this evidence is often lost when the parts are separated. If possible, check the unit prior to disassembly. Bear in mind that a careful inspection of the unit should be made as each disassembly step is performed.

Inspect Thoroughly During Disassembly

It is poor practice to disassemble a unit or complete transmission as quickly as possible without bothering to examine the parts as they come down. It happens many times that a mechanic has completely disassembled a unit and failed to find the cause of the trouble because he did not bother to examine the parts as they came apart. After the transmission is disassembled, check the lubricant for foreign particles which often reveal sources of trouble that are overlooked during the disassembly.

Repair or Replace Worn Parts

Many times the parts or critical adjustments that have caused the trouble are not replaced or corrected because the mechanic will only inspect and replace parts that have failed completely. All pieces should be accurately examined because the broken parts are often just the result and not the cause of the trouble. All parts that are broken or worn and no longer meet specifications should be replaced. On large units, like a transmission, it is suggested that a mechanic replace parts that are worn to the extent that they do not have a long service life remaining. This avoids another teardown on the unit in the near future. It is also good practice, at this time, to make the changes or modifications recommended to bring the transmission up to date and increase the service life of the unit.

Noisy Operation

Noise is usually very elusive and generally not the fault of the transmission; therefore, mechanics should road test to determine if the driver's complaint of noise is actually in the transmission.

In numerous instances, drivers have insisted that the noise was in the transmission, however, investigations revealed the noise to be causes by one of the following conditions:

(a) Fan out of balance or blades were bent.

(b) Defective vibration dampers.

(c) Crankshafts out of balance.

(d) Flywheels out of balance.

(e) Flywheels mounting bolts loose.

(f) Engine rough at idle producing rattle in gear train.

(g) Clutch assembly out of balance.

(h) Engine mounts loose or broken.

(i) Power-take-off engaged.

(j) Universal joints worn out.

(k) Propeller shafts out of balance.

(l) Universal joint angles out of plane or at excessive angle.

(m) Center bearings in drive line dry, not mounted properly, etc.

(n) Wheels out of balance.

(o) Tire treads humming or vibrating at certain speeds.

(p) Air leaks on suction side of induction system, especially with turbo-chargers.

Mechanics should try to locate and eliminate noise by means other than transmission removal, or overhaul. However, if the noise appears to be in the transmission, try

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to break it down into the following classifications. If possible, determine what position the gear shift lever is in when the noise occurs. If the noise is evident in only one gear position, the cause of the noise generally traceable to the gears in operation.

(a) Growl and humming or, more serious, a grinding noise. These noises are caused by worn, chipped, rough or cracked gears. As gears continue to wear, the grinding noise will be noticeable, particularly in the gear position that throws the greatest load on the worn gear.

(b) Hissing or, more serious, a thumping or bumping-type noise. Hissing noises can be caused by bad bearings. As bearings wear and retainers start to break up, etc., the noise could change to a thumping or bumping.

(c) Metallic rattles within the transmission usually result from a variety of conditions. Engine torsional vibrations are transmitted to the transmission through the clutch. In heavy duty equipment, clutch discs with vibration dampers are not used, so a rattle, particularly in neutral, is common with diesel equipment. In general, engine speeds should be 600 RPM or above to eliminate objectionable rattles and vibration during the idle. A defective or faulty injector would cause a rough or lower idle speed and a rattle in the transmission. Rattle could also be caused by excessive backlash in P.T.O. unit mounting.

(d) Improper lubricants or lack of lubricant can produce noises. Transmissions with low oil levels sometimes run hotter than normal, as there is insufficient lubricant to cool and cover the gears.

Improved highways permit sustained high speeds. The fact that engines and entire power trains can now cruise at a h igher RPM can introduce vibration frequencies, that were not critical in the past. At slower speeds these items would get by or only pass through critical period while accelerating or decelerating through the gears.

In the past, drive line vibrations such as bent tubes, joints out of phase or alignment, bad angles to short couples, clutches out of balance, gears and shafts in transmission out of balance, were fairly obvious. These items will become more critical in vehicles running at sustained high speeds.

Critical vibrations associated with higher speeds are not the old thumping or bumping type but are high frequency vibrations which sting or tingle the soles of your feet, tickle the end of your fingers, etc. This type of vibration will cause gear seizures, broken synchronizer pins, bearing failure due to retainer rivet failures, promote brinelling, fretting corrosion, etc.

(e) Gear whine is usually caused by lack of backlash between mating gears — improper shimming of P.T.O. units is the big offender here.

Noise in Neutral

Possible Causes:

(a) Misalignment of transmission.

(b) Worn flywheel pilot bearing.

(c) Worn, or scored countershaft bearings.

(d) Worn, or rough reverse idler gear.

(e) Sprung, or worn countershaft.

(f) Excessive backlash in gears.

(g) Worn mainshaft pilot bearing.

(h) Scuffed gear tooth contact surface.

(i) Insufficient lubrication.

(j) Use of incorrect grade of lubricant.

Noise in Gear

Possible Causes

(a) Worn, or rough mainshaft rear bearing.

(b) Rough, chipped, or tapered sliding gear teeth.

(c) Noisy speedometer gears.

(d) Excessive end play of mainshaft gears.

(e) Refer to conditions listed under Noise in Neutral.

Oil Leaks

Possible Causes

(a) Oil level too high.

(b) Wrong lubricant in unit.

(c) Non-shielded bearing used as front or rear bearing cap. (Where applicable).

(d) Seals (if used) defective or omitted from bearing cap, wrong type seal used, etc.

(e) Transmission breather omitted, plugged internally, etc.

(f) Capscrews loose, omitted or missing from remote control, shifter housing, bearing caps, P.T.O. or covers, etc.

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(g) Oil drain-back openings in bearing caps or case plugged with varnish, dirt, covered with gasket material, etc.

(h) Broken gaskets, gaskets shifted or squeezed out of position, pieces still under bearing caps, clutch housing, P.T.O. and covers, etc.

(i) Cracks or holes in castings.

(j) Drain plug loose.

(k) Also possibility that oil leakage could be from engine.

(l) Speedometer adaptor or connections.

Walking or Jumping Out of Gear

If the units are walking out of gear it could be caused by:

(a) Interference or resistance in the shift mechanism preventing full engagement of the sliding clutch gear or

(b) If the gear has been shifted completely into position some other malfunction which could move the gear or the shift itself out of its proper location.

If remote controls are used, the mechanic must satisfy himself that the remote units are satisfactory and that transmission is actually at fault. One other point that should be noted is whether the unit walks out of gear under drive (while pulling a load) or on a coast load. Also, does the gear hop occur on smooth or only on rough roads. A number of items that would prevent full engagement of gears are:

(a) Improperly positioned forward remote control which limits full travell forward and backward from the remote neutral position.

(b) Improper length shift rods or linkage that limits travel of forward remote from neutral position.

(c) Loose bell cranks, sloppy ball and socket joints.

(d) Shift rods, cables, etc., too spongy, flexible, or not secured properly at both ends.

(e) Worn or loose engine mounts if forward unit is mounted to frame.

(f) Forward remote mount too flimsy, loose on frame, etc.

(g) Set screws loose at remote control joints or on shift forks inside remote or even inside transmission unit.

(h) Shift fork pads or groove in sliding gear or collar worn excessively.

(i) Worn taper on gear clutch teeth.

(j) Transmission and engine out of alignment either vertically or horizontally.

A few items which could move the gear or shaft out of proper position, particularly on rough roads are:

(a) Use of heavy shift lever extensions.

(b) Shift rod poppet springs broken.

(c) Shift rod poppet notches worn.

(d) Shift rod bent or sprung out of line.

(e) Shift fork pads not square with shift rod bore.

(f) Excessive end-play in drive gear, mainshaft or countershaft, caused by worn bearings, retainers, etc.

(g) Thrust washers worn excessively or missing.

Hard Shifting

An improperly operating clutch will interfere with the proper shifting of gears in any transmission. It is important that the release mechanism also be used in proper working order. If the mechanic is sure that a full and complete clutch release is being made, the following could be a few of the possible causes for hard shifting complaints:

(a) No lubricant in remote control units. Forward remote is isolated and is often overlooked. However, many remote controls used on transmissions and auxiliaries require separate lubrication.

(b) No lubricant in (or grease fittings on) U-joints or swivels of remote controls.

(c) Lack of lubricant or wrong lubricant used, causing buildup of sticky varnish and sludge deposits on splines of shaft and gears.

(d) Badly worn or bent shift rods.

(e) Improper adjustment on shifter linkage.

(f) Sliding clutch gears tight on splines of shaft.

(g) Clutch teeth burred over, chipped or badly mutilated due to improper shifting.

(h) Binding or interference of shift lever with other objects or rods inside the cab or near the remote control island.

(i) Driver not familiar with proper shifting procedure for this transmission. Also includes proper shifting if used with 2-speed axle, auxiliary, etc.

(j) Clutch or drive gear pilot bearing seized, rough, or dragging.

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(k) Clutch brake engaging too soon when clutch pedal is depressed.

(l) Wrong lubricant especially if E.P. type lubricant are added.

(m) Free running gears, seized or galled on either the thrust face or diameters.

Sticking in Gear

(a) Clutch not releasing.

(b) Sliding clutch gears tight on splines.

(c) Chips wedged between or under splines of shaft and gear.

(d) Improper adjustment excessive wear or lost motion in shifter linkage.

(e) Clutch brake set too high on clutch pedal — locking gears behind hopping guard.

Bearing Failures

The service life of most transmissions either main or auxiliaries is governed by the life of the bearings. Majority of bearing failures can be attributed to vibration and dirt. Some of the more prominent reasons for unit removal with bearing failures are:

(a) Worn out due to dirt.

(b) Fatigue of raceways or balls.

(c) Wrong type or grade of lubricant.

(d) Lack of lubricant.

(e) Vibrations — breakup of retainer & brinelling of races — fretting corrosion.

(f) Bearings tied-up due to chips in bearings.

(g) Bearings set-up too tight or too loose.

(h) Improper assembly — brinelling bearing.

(i) Improper fit of shafts or bore.

(j) Acid etch of bearings due to water in lube.

(k) Overloading of vehicle. Overload from engine or engine too large for transmissions used.

Dirt

More than 90% of all ball bearing failures are caused by dirt which is always abrasive.

Dirt may enter the bearings during assembly of the units or be carried into the bearing by the lubricant while in service. Dirt may enter through seals, breather or even dirty containers used for addition or change of lubricant.

Softer material such as dirt, dust, etc., usually forms abrasive paste or lapping compounds within the bearings themselves since the unit pressure between the balls and raceways makes a perfect pulverizer. The rolling motion tends to entrap and hold the abrasives. As the balls and raceways wear, the bearings become noisy. The lapping action tends to increase rapidly as the fine steel from the balls and rollway adds to the lapping material.

Hard coarse materials such as chips, etc., may enter the bearing during assembly from hammers, drifts, power chisels, etc., or be manufactured within the unit during service from raking teeth, etc. These chips produce small indentation in balls and races. Jamming of these hard particles between balls and races may cause the inner face to turn on shaft, or the outer race to turn in the housing.

Fatigue

All bearings are subject to fatigue and must be replaced eventually. Your own operating experience will dictate mileage replacement of bearings showing only normal wear.

Corrosion

Water, acid and corrosive materials formed by deterioration of lubricant, will produce reddish-brown coating and small etched holes over outer and exposed surfaces of race. Corrosive oxides also act as lapping agent.

Brinelling caused by improper assembly or removal — usually hammering with off-center blows. Use drivers, preferably under an arbor, or puller.

Shaft Fits

Excessive looseness under load is very objectionable because it produces a creeping or slipping of the inner ring on the rotating shaft. This causes the surface metal of shafts to scrub or wear off.

Bearing fits on rotating shafts are usually specified as tight. When play or looseness, even .001", exists between the bearing and shaft, there is a very powerful force tending to rotate the inner race on the shaft; this force is caused by the looseness or lost motion between the parts and disappears when no looseness exists.

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Removal of Bearings

It is far more difficult to remove bearings from a shaft than to put them on. In most cases it is necessary to remove the bearing by pulling on the outer-race which can damage the balls or races. Since such damage is seldom visible, it does not become known until after complete reassembly. It is good preventative maintenance to replace most ball bearings during the overhaul period. If a bearing is not going to be replaced, avoid removal during low mileage rebuild.

Interchangeability

All ball bearings (whether manufactured here or abroad) are interchangeable in regard to — standardized dimensions, tolerances and fits. However, for a given shaft size there are standard bearings for light, medium, and heavy-duty service.

Numbers and symbols stamped on inner and outer races of bearings designate size and type.

Numbering systems of different bearing manufacturers, however, have not been standardized. Consult interchangeable tables and use proper bearings for replacement parts.

Clutch Trouble Shooting

Faulty clutch operation interferes with proper shifting of gears in any transmission. The two following paragraphs describe the most common problems encountered with Spicer clutches.

(a) If the clutch slips or does not engage properly, first check the internal clutch adjustment. If adjustment does not remedy the situation, check for weak pressure springs, no free pedal, worn or oily clutch facings and binding release mechanism.

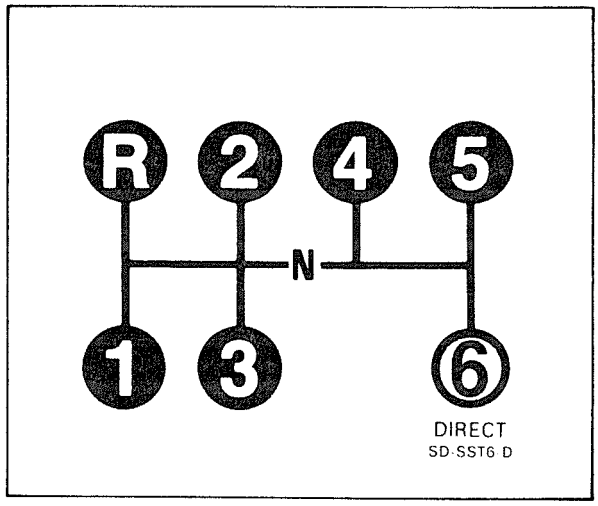
(b) If the clutch drags or does not release properly, check the internal clutch adjustment. Some other causes for clutch drag are: intermediate plate sticking on drive pins or drive lugs; pressure plate not retracting; driven disc distorted or warped; splines worn on main drive gear of transmission; clutch release bearing dammaged; bushing in release sleeve dragging on transmission drive gear.

«Spicer» 1362-B 6 speed transmission

Specifications:

— Speeds:	6 forward, 1 reverse
— Torque capacity:	950 — 1400 lbs ft. (1290 — 1896 Nm)
— Length:	28 1/8" (715 mm)
— Weight:	545 lbs (247 kg)
— Clutch:	15½" (394 mm) 2 plate
— Oil capacity:	41 pts. U.S. (341 mp. Pts) (19 liters)

Shift pattern:



Ratios:

GEAR	RATIO	% STEP
1	8.53	
2	4.87	75
3	3.00	62
4	1.90	58
5	1.33	43
6	1.00	33
REV.	8.53	

TRANSMISSION

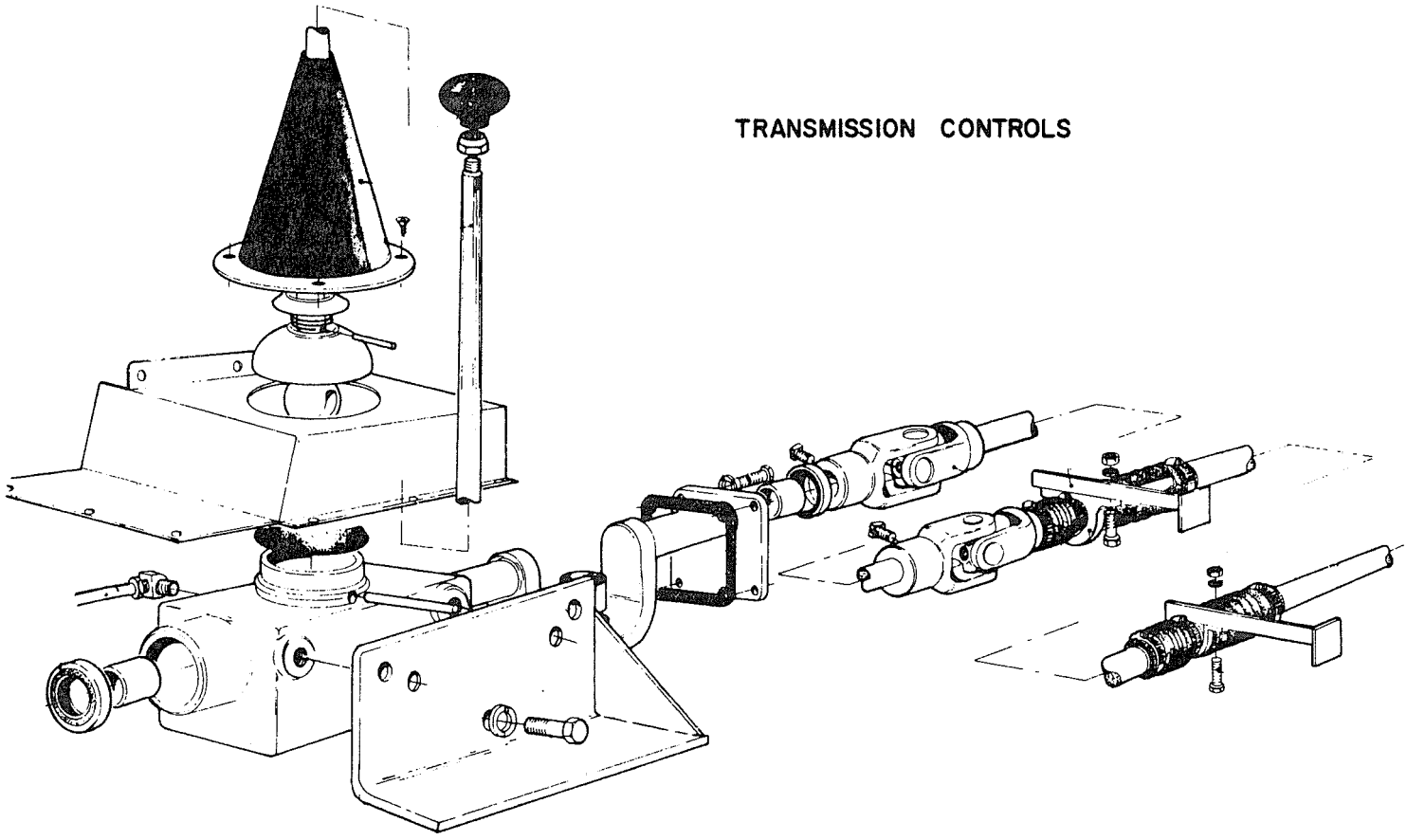
Shifting control

Description:

The shifting control is a single-roll type which does not require a solenoid for reverse.

Gear range selection is made by a conventional shift lever mounted in a tower, which is bolted to vehicle frame, near driver's seat. A shift rod located in the base of shift lever tower is connected to a control rod which runs from front to rear, under vehicle floor.

The movement of the shift lever is transmitted to transmission through rods, universal joints, and transmission remote control. Transmission control rods from shift lever to transmission remote control are supported as per the following illustration.



TRANSMISSION CONTROLS

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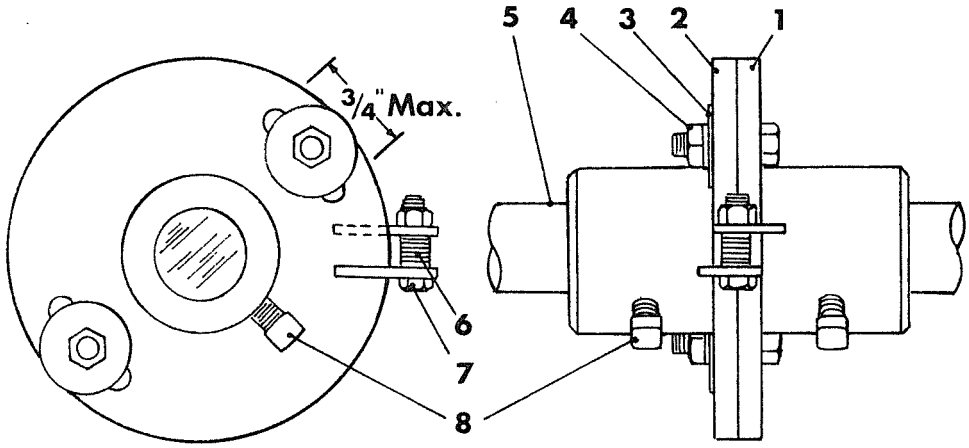
Control rod adjustment

The lateral stroke of the shift lever can be adjusted by a flange connection located on the rear section of the control rod. To adjust control rod, proceed as follows:

1. Loosen flange connection cap screws.

2. Add or remove shims in order to obtain the proper lateral stroke of the shift lever.

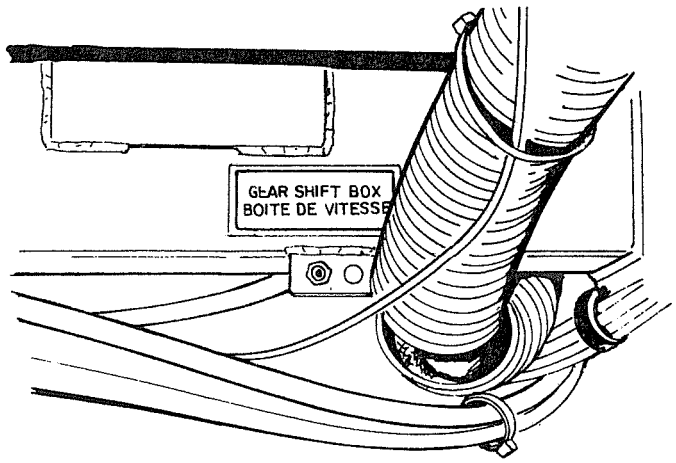
3. Tighten flange connection cap screws.



1. Half of Flange Connection
2. Half of Flange Connection
3. Flat Washer
4. Flange Adjusting Screw & Nut & Lock washer
5. Shaft
6. Adjustment Washers
7. Adjusting Screws
8. Set Screws

Transmission controls lubrication

To obtain proper operation of the transmission controls, control rod universal joints and control tower should be lubricated every 10,000 miles with a chassis lubricant that can resist to heat and the washing effects of water. There are four (4) points of lubrication for the control rod, one on each universal joint. The lubrication fitting for control tower is located at the rear of the steering compartment, on the upper right corner.



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Control tower replacement

1° Removal:

To remove control tower, proceed as follows:

1. Remove shift lever ball.

2. Remove control tower cover located at the base of shift lever.

3. Disconnect lubrication tube and universal joint from control tower.

4. Remove control tower retaining bolts from control tower bracket.

5. Remove control tower through vehicle floor.

2° Installation:

To install control tower, proceed as follows:

1. Install control tower assembly to control tower bracket and tighten retaining bolts.

2. Connect lubrication tube and universal joint to control tower.

3. Reinstall control tower cover and shift lever ball.

4. Check control rod adjustment.

Automatic transmission

Detailed service procedures for the Allison 740D and 754CR automatic transmission may be found in the «Allison Transmissions HT700D Series Service Manual».

Changing oil filter element

To change oil filter element, proceed as follows:

1. Drain the filter by removing the plug (13) at the bottom of the center stud (11).

2. Loosen the center stud (11). The shell (2), the filter element (3), and adapter (14) may now be removed from the base casting (1).

3. Remove the adapter (14) and discard the two «O» Rings (4 & 5).

4. Remove and discard the filter element (3).

5. Thoroughly clean any dirt or oil from the base casting (1).

6. Rinse out the inside of the shell (2) with solvent and wipe it dry.

7. Install the thick section «O» Ring (5) into the internal groove of the adapter (14). Install the thin section «O» Ring (4) into the external groove of the adapter.

8. Apply oil to the «O» Rings in the adapter and place the adapter on the shell (2).

9. Install the new filter element (3) into the shell.

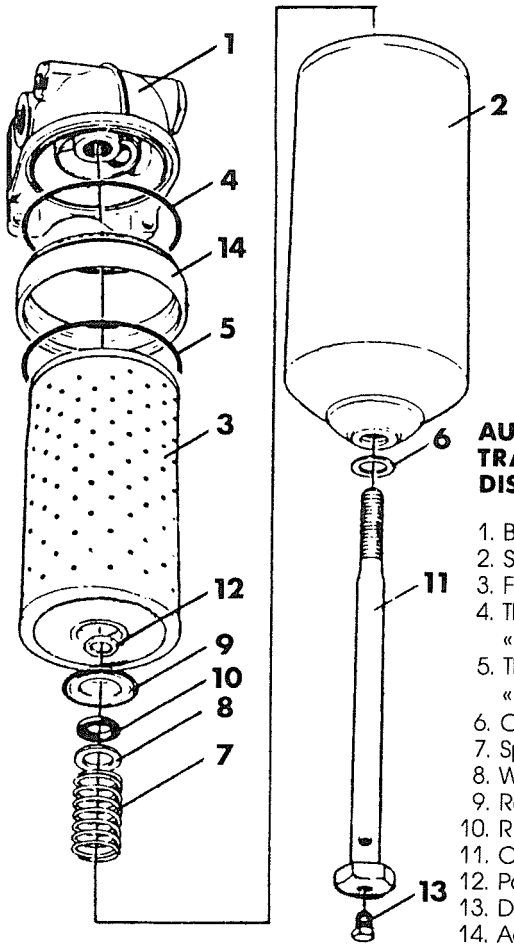
10. Install adapter, shell, and filter element assembly on the base casting (1) and tighten the center stud (11) to 50-60 ft. lbs. (68-81 Nm).

11. Install the drain plug (13) into the center stud.

12. Run the engine and check for leaks around the base casting (1) and adapter (14).

☐ **Note:** A leak may occur if the base casting was not adequately cleaned.

13. Check the oil and bring to proper level with «Dexron» or «Dexron II».



AUTOMATIC TRANS. FILTER DISASSEMBLY

1. Base Casting.
2. Shell.
3. Filter Element.
4. Thin Section «O» Ring.
5. Thick Section «O» Ring.
6. Copper Gasket.
7. Spring.
8. Washer.
9. Retainer.
10. Rubber Seal.
11. Center Stud.
12. Pal Nut.
13. Drain Plug.
14. Adapter.

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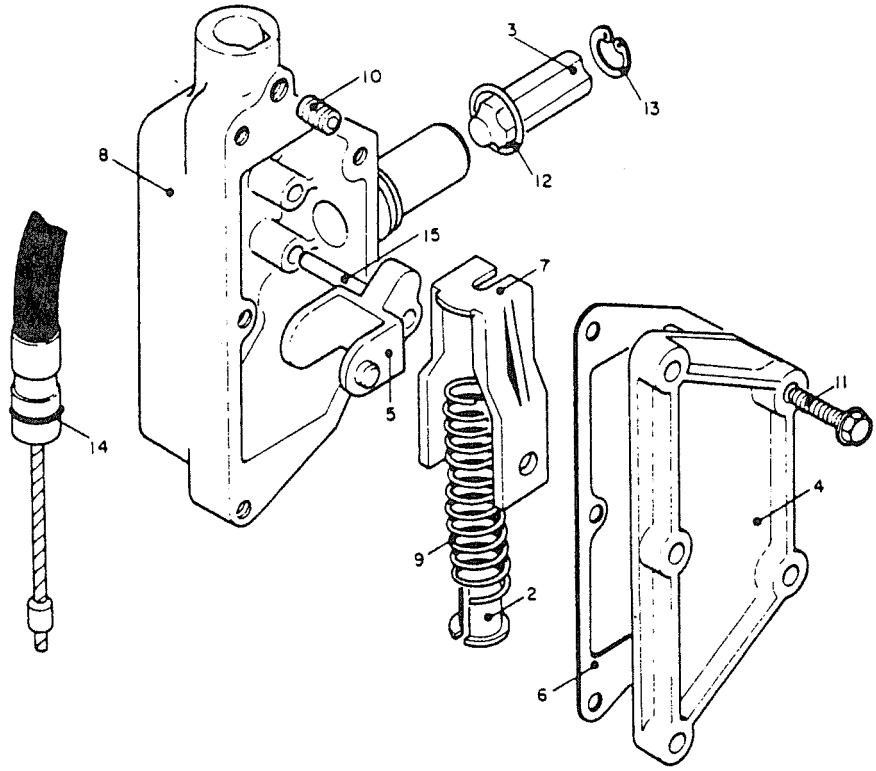
Modulator valve adjustment

Rotate the governor pivot lever to the full throttle position. Pull the cable until it is internally bottomed. Adjust trunnion on end of cable to permit a «free pin» with fuel control lever. Install and secure pin. Check linkage for proper return to idle position. Check cable for proper travel, should be approximately 1.187" minimum (30.162 mm) and/or 1.56" maximum (39.62 mm).



Modulator valve

2. Thimble.
3. Plunger.
4. Cover.
5. Lever.
6. Gasket.
7. Spring Retainer.
8. Housing.
9. Spring.
10. Set Screw.
11. Cap Screw.
12. «O» Ring.
13. Retainer.
14. «O» Ring.
15. Dowel Pin.

Shifter cable adjustment

Place shifter lever in neutral position. Loosen shifter cable adjusting nut. Place shifter cable lever in neutral position. Then, tighten shifter cable adjusting nut.

Removal and Replacement

Automatic transmission and engine should be removed as a unit. A fork lift is required to perform this procedure. Refer to section 01, engine removal and replacement, for the appropriate procedure.

It is also possible to remove the automatic transmission independently from engine by performing the following instructions:

1. Using safe lifting equipment, raise vehicle in order to allow tag axle removal. Refer to section II. Tag axle removal and replacement for correct procedure.

2. Remove propeller shaft from vehicle. Refer to section 09, Propeller shaft removal and replacement for the appropriate procedure.

3. Disconnect and remove all wiring harnesses from transmission. Remove transmission oil cooler hoses from transmission. Remove power steering hose bracket from transmission.

4. On vehicles equipped with a series 92 engine, open right engine side door and remove holding tank hose and auxiliary holding tank, if applicable. Then, remove the plug located on the left side (starter side) of the torque converter housing.

5. On vehicles equipped with a series 71 engine, remove winter pan from under vehicle. Then remove the upper plug located on the right side of the torque converter housing.

6. Disconnect torque converter at flex disc assembly by removing the 12 retaining bolts through the plug hole. To align retaining bolts plug hole, rotate crankshaft pulley clockwise until you can reach the bolt through the hole.

■ **Caution:** Do not rotate crankshaft pulley counterclockwise to avoid loosening of the crankshaft pulley retaining bolt.

TRANSMISSION

7. Using suitable jacks, firmly support rear end of engine and transmission. Then remove the 24 retaining bolts of the torque converter housing.

8. Disconnect transmission support at engine cradle. Then slide the transmission straight back from the engine.

● **Warning:** Make sure that rear end of engine is firmly supported when removing transmission. Severe damage and/or injuries may occur if it is not performed.

9. Lower transmission in order to be able to remove it from the side of the vehicle.

■ **Caution:** When removing or reinstalling the transmission, special care should be taken not to tilt the transmission forward to prevent the torque converter from falling off the transmission.

To reinstall the automatic transmission, reverse the above mentioned procedure.

☐ **Note:** Torque converter retaining bolts must be tightned to a torque of 120 ft. lbs (160 Nm).