

Service Manual

Fuller Medium Heavy Transmissions TRSM0226

October 2007



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RT-906 SERIES

Twin Countershaft ROADRANGER® Transmissions 6 forward speeds - 2 reverse speeds

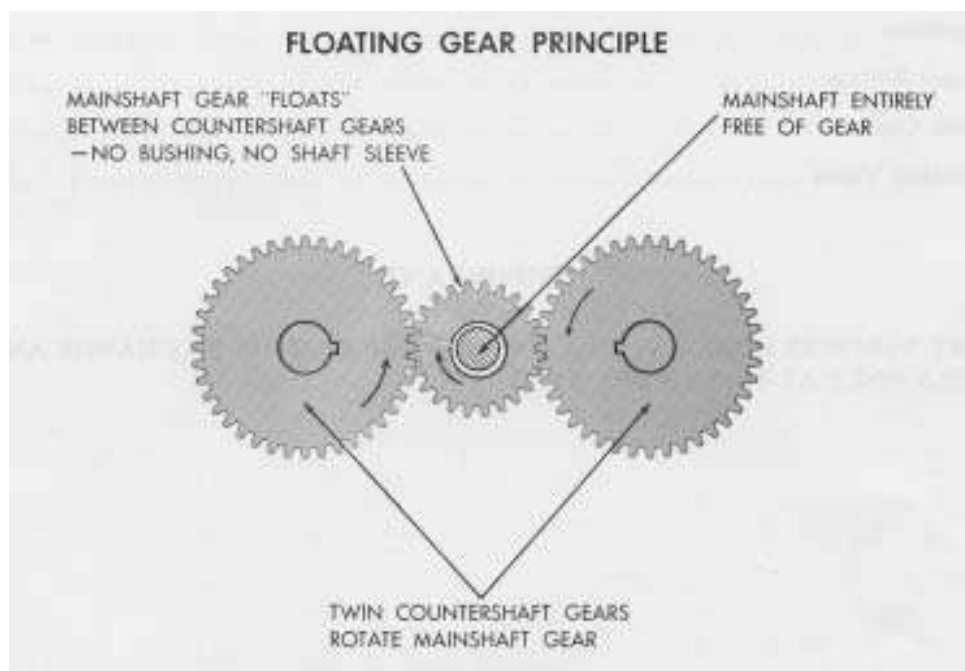
Six forward speeds are obtained with a 3-speed section and a 2-speed range or auxiliary section. The 3 speeds of the front section are used once through low range of the auxiliary, and once through the high range (direct), of the auxiliary.

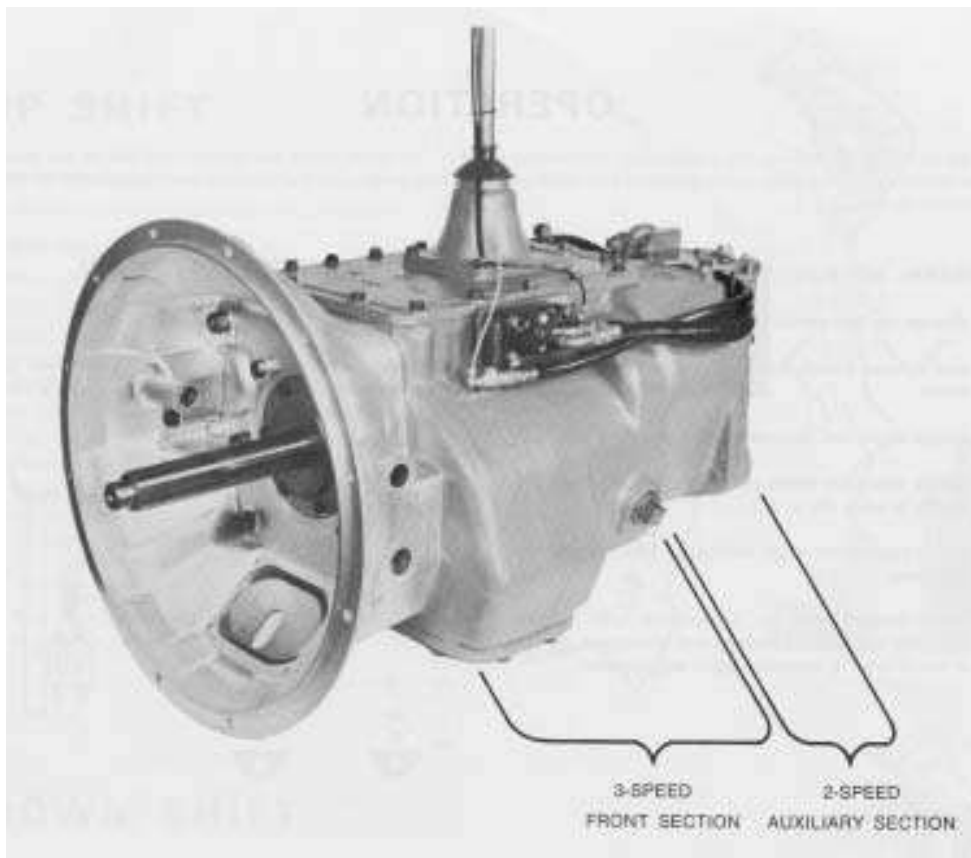
With the ROADRANGE design, all 6-speeds are controlled with one lever which is shifted through a 3-position shift pattern. A range control valve on the gear shift lever is used to pre-select the range shifts which are automatic and synchronized. The range shift air cylinder is built into the transmission.

The RT-906 series is of twin countershaft design, engineered and developed by Fuller. Splitting torque through the transmission reduces gear tooth pressures and wear. . . promotes longer transmission life.

The floating mainshaft gears of the twin countershaft design eliminates gear bushings and sleeves. Conical clutching teeth are standard on these constant mesh transmissions, providing smooth shifts and help preventing gear clash.

FLOATING GEAR PRINCIPLE





GEAR RATIOS		
RT-906		% STEPS
6TH	1.00	56%
5TH	1.56	"
4TH	2.47	58%
RANGE SHIFT		52%
3RD	3.76	56%
2ND	5.85	"
1ST	9.27	58%
Hi Reverse	2.73	
Low Reverse	10.24	

SPECIFICATIONS

SPEEDS: 6 Forward, 2 Reverse

TORQUE CAPACITY: 900 LB.-FT.

CLUTCH HOUSING SIZE: SAE No. 1 or No. 2

POWER TAKE-OFF:

Openings - Two SAE standard, short length, for 6/8 pitch gears.

Right Side - Regular duty type, 6-bolt.

Bottom - Heavy duty type, 8-bolt.

Drive Gear Speeds-

Right Side: 45 tooth gear turning at .700 engine speed.

Bottom: 47 tooth gear turning at .700 engine speed.

WEIGHT: 565 lbs.

LENGTH: 30 7/8" from face of clutch housing to end of splines on tailshaft.

OIL CAPACITY: 26 pints

OPERATION

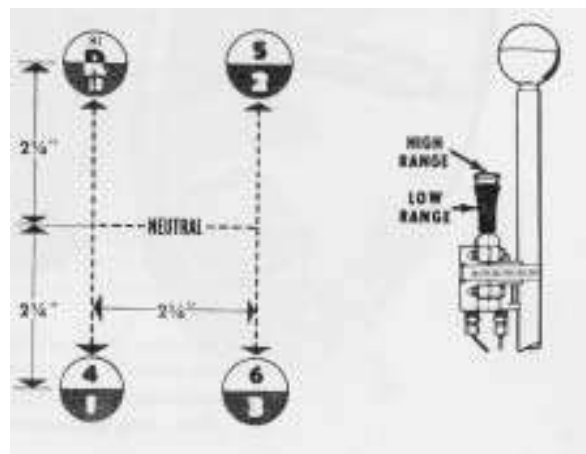
In the following instructions, it is assumed that the driver is familiar with motor trucks and tractors, and that he can coordinate the necessary movements of the shift lever and clutch pedal to make progressive and selective gear engagements in either direction, up or down.

GENERAL INSTRUCTIONS

- Always use first speed gear to start vehicle.
- Use normal double clutching procedures between shifts.
- Range shifts are automatic after pre-selection.
- Range shifts are made only when shifting from 3rd to 4th or from 4th to 3rd.
- Use a light touch when shifting, do not slam or jerk lever.
- When shifting into 1st or Reverse with vehicle standing still, quickly engage and disengage clutch, if necessary, to complete gear engagement.

SHIFT PATTERN

Six forward speeds are obtained with only three gear shift lever positions, use three positions in low range and repeat pattern in high range.



USE RANGE CONTROL BUTTON ONLY AS DESCRIBED

- Don't shift from high range to low range at high vehicle speeds.
- Don't make range shifts with the vehicle moving in reverse gear.



“STOP” SIGN OR “SLOW” SIGN

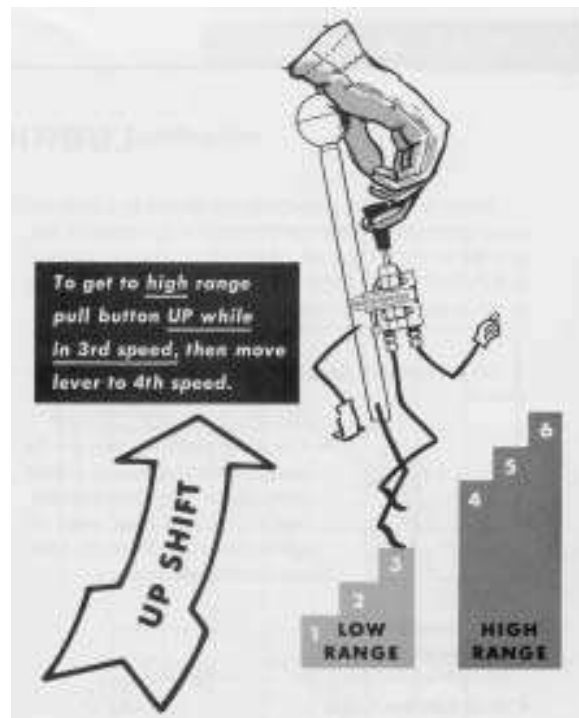
When slowing down for a “stop” or “slow” sign, shift down through the individual steps. By following this procedure, the compression of the engine will slow the vehicle. The life of chassis and trailer brakes are thus prolonged.



UP SHIFT

Let's step into the cab.

- A. Move the gear shift lever to the neutral position.
- B. Start the engine.
- C. Wait for the vehicle's air system to reach normal line pressure.
- D. Now, check the range control button, this **MUST** be in a down position. If it is in the UP position, push it down and transmission will shift to low range.
- E. Start the vehicle and shift progressively through 1st and 2nd and to 3rd, using normal double clutching procedures.
- F. When in 3rd and **READY FOR THE NEXT UPWARD SHIFT**, pull the range control button up and move the lever to the 4th speed position. As the shift lever passes through neutral, the transmission will automatically shift from low range to high range.
- G. With the transmission now in high range, shift progressively to 5th and 6th.



DOWN SHIFT

- A. When shifting down, move the shift lever from 6th to 5th and to 4th.
- B. When in 4th and **READY FOR THE NEXT DOWNWARD SHIFT**, push the range control button down and move the shift lever to the 3rd speed position. As a shift lever passes through neutral, the transmission will automatically shift from high range to low range.
- C. With the transmission in low range, shift downward from 3rd to 2nd and to 1st.



LUBRICATION

Proper lubrication procedures are the key to a good all-round maintenance program. If the oil is not doing its job, or if the oil level is ignored, all the maintenance procedures in the world are not going to keep the transmission running or assure long transmission life.

Oil is important, because here are some of the things it must do:

- Provide a protective film - to protect surface of heavily loaded parts such as gear teeth and bearings, thus preventing metal to metal contact which causes scoring, scuffing and seizure.
- Act as a coolant - to dissipate heat.
- Have sufficient fluidity - to follow, coat and cushion all loaded surfaces.
- Be chemically stable - to withstand heat and agitation without separation, gumming-up, oxidizing or corroding.
- Be non-foaming - to prevent excessive foam and increased volume under severe conditions.
- Be free of sediment and water - to prevent sludge and rust.

Fuller Transmissions are designed so that the internal parts operate in a bath of oil circulated by the motion of gears and shafts. Grey iron parts have built-in channels where needed, to help lubricate bearings and shafts.

Thus, all parts will be amply lubricated if these procedures are closely followed:

1. Maintain oil level. Inspect regularly.
2. Change oil regularly.
3. Use the correct grade and type of oil.
4. Buy from a reputable dealer.

LUBRICATION CHANGE AND INSPECTION HIGHWAY USE	
First 3,000-5,000 miles (4827 - 8045 Km)	Change transmission oil on new units.
Every 5,000 miles (8045 Km)	Inspect oil level. Check for leaks.
Every 50,000 miles (80,450 Km)	Change transmission oil.
OFF-HIGHWAY	
First 30 hours	Change transmission oil on new units.
First 40 hours	Inspect oil level. Check for leaks.
Every 500 hours	Change transmission oil where severe dirt conditions exist.
Every 1,000 hours	Change transmission oil (Normal off-highway use).
Change Oil Filter Element, If So Equipped, At Each Oil Change.	

RECOMMENDED LUBRICANTS ON-HIGHWAY VEHICLES		
TYPE	GRADE	TEMPERATURE
Heavy Duty Engine Oil MIL-L-2104C, or MIL-L-46152, or API-SE, or API-CC	SAE 50 or SAE 40 SAE 30	Above + 10°F. (-12.5°C.) Below + 10°F.
Mineral Gear Oil R and O Type	SAE 90 SAE 80W	Above + 10°F. Below + 10°F.
OFF-HIGHWAY		
Heavy Duty Engine Oil MIL-L-2104C, or MIL-L-46152, or API-SE, or API-CC	SAE 50 or SAE 40 SAE 30	Above + 10°F. Below + 10°F.
Special Recommendation - For extreme cold weather where temperature is consistently below 0°F.		
Heavy Duty Engine Oil MIL-L-2104C, or MIL-L-46152, or API-SE, or API-CC	SAE 20W	Below 0°F. (-18°C.)

Miscellaneous Lubricants

O-Rings and Surfaces - Dowling Corning #200 Silicone, 30,000 Centistokes. Union Carbide L-45 Silicone, 30,000 Centistokes.

Lubrication

Proper Oil Level

Make sure oil is level with filler opening. Because you can reach oil with your finger does not mean oil is at proper level.



Draining Oil

Drain transmission while oil is warm. To drain oil, remove the drain plug at bottom of case. Clean the drain plug before re-installing.

Refilling

Clean area around filler plug and remove plug from side of case. Fill transmission to the level of the filler opening. If transmission has two filler openings, fill to level of rear opening on single countershaft models; fill to level of both openings on twin countershaft models.

The exact amount of oil will depend on the transmission inclination and model.

Do not over fill. This will cause oil to be forced out of the case through mainshaft openings.

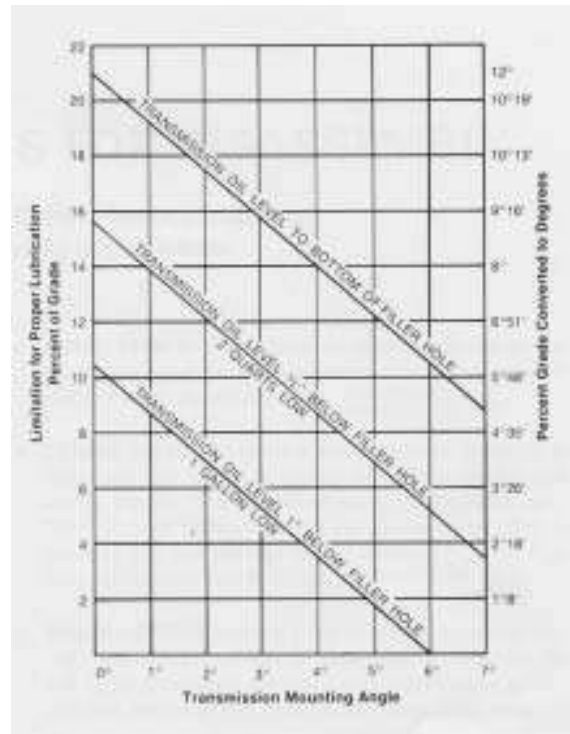
Adding Oil

It is recommended that types and brands of oil should not be intermixed because of possible incompatibility.

Operating Temperature

It is important that the transmission operating temperature does not exceed 250°F. (120°C.) for an extended period of time. Operating temperatures above 250°F. will cause breakdown of the oil and shorten transmission life.

The following conditions in any combination can cause operating temperatures of over 250°F: (1) Operating consistently at roadspeeds under 20 MPH, (2) High engine RPM, (3) High ambient temperature, (4) Restricted air flow around transmission, (5) Exhaust system too close to transmission, (6) high horsepower, over-drive operation. High operating temperatures may require more frequent oil changes.



External cooler kits are available to keep the transmission operating temperature under 250°F. when the conditions described above are encountered.

If the transmission operating angle is more than 12 degrees, improper lubrication can occur. The operating angle is the transmission mounting angle in the chassis plus the percent of upgrade (expressed in degrees).

The above chart illustrates the safe percent of upgrade on which the transmission can be used with various chassis mounting angles. For example: If you have a 4 degree transmission mounting angle, then 8 degrees (or 14 percent of grade) is equal to the limit of 12 degrees. If you have a 0 degree mounting angle, the transmission can be operated on a 12 degree (21 percent) grade.

Anytime the transmission operating angle of 12 degrees is exceeded for an extended period of time the transmission should be equipped with an oil pump or cooler kit to insure proper lubrication.

Note on the chart the effect low oil levels can have on safe operating angles. Allowing the oil level to fall ½" below the filler plug hole reduces the degree of grade by approximately 3 degrees (5.5)

PROPER LUBRICATION LEVELS ARE IMPORTANT!

GENERAL PRECAUTIONS FOR DISASSEMBLY

IMPORTANT: Read this section before starting the detailed disassembly procedures.

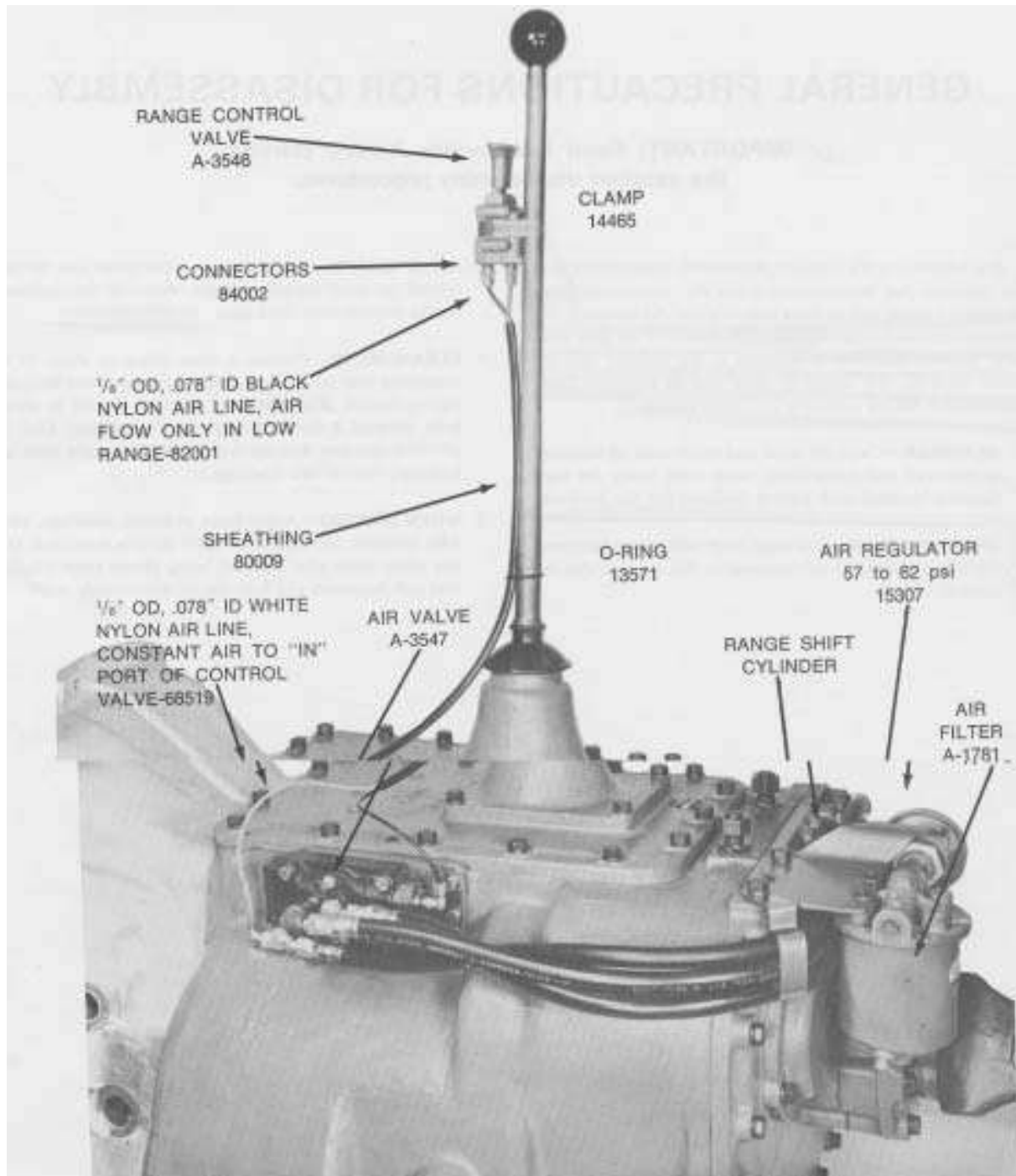
It is assumed in the detailed disassembly instructions that the lubricant has been drained from the transmission, the necessary linkage and air lines removed and the transmission has been removed from the chassis. Removal of the gear shift lever housing assembly is included in the detailed instructions; however, this assembly must also be removed from transmission before removing unit from vehicle.

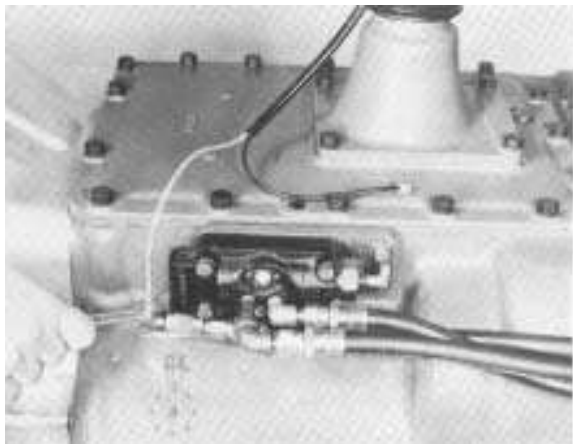
1. **BEARINGS** - Carefully wash and relubricate all bearings as removed and protectively wrap until ready for use. Remove bearings with pullers designed for this purpose.
2. **SNAP RINGS** - Remove snap rings with pliers designed for this purpose. Rings removed in this manner can be reused.
3. **INPUT SHAFT** - The clutch or input shaft can be removed without removing the countershafts or mainshaft or drive gear.
4. **CLEANLINES** - Provide a clean place to work. It is important that no dirt or foreign material enters the unit during repairs. The outside of the unit should be carefully cleaned before starting the disassembly. Dirt is abrasive and can damage bearings.
5. **WHEN DRIVING** - Apply force to shafts, housings, etc., with restraint. Movement of some parts is restricted. Do not apply force after the part being driven stops solidly. Use soft hammers and bars for all disassembly work.

DISASSEMBLY INSTRUCTIONS

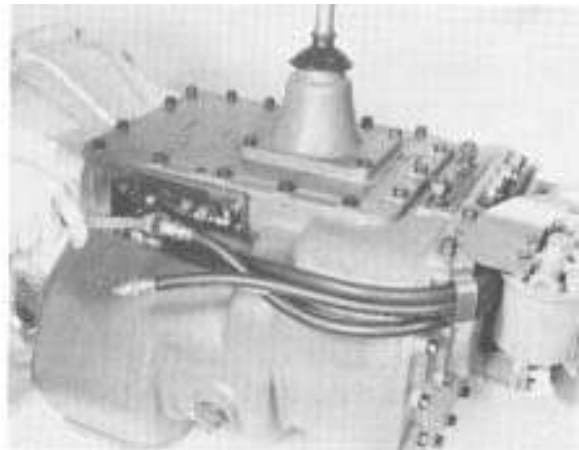
I. SHIFTING CONTROLS

A. To Remove the Range Shift Air System

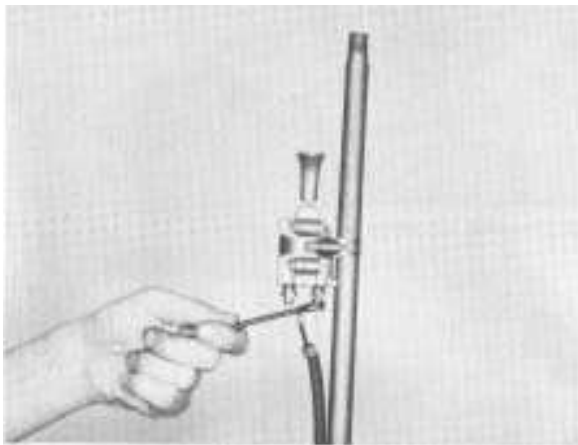




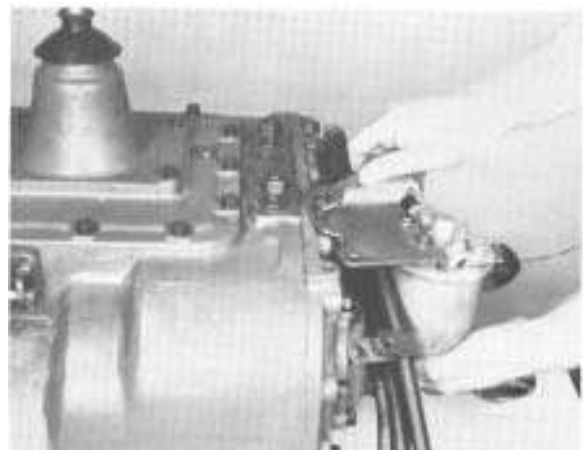
1. Disconnect the range control air lines from ai valve.



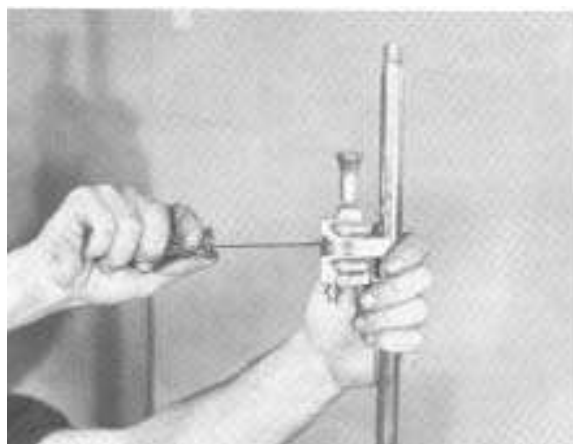
4. Remove air lines from air valve.



2. Disconnect air lines from range control valve.
(unscrew ball grip from lever)



5. Remove hose clamp, air filter and regulator assembly
from transmission.



3. Remove control valve from gear shift lever.



6. Remove air lines from range shift cylinder.



7. remove the air shift valve.



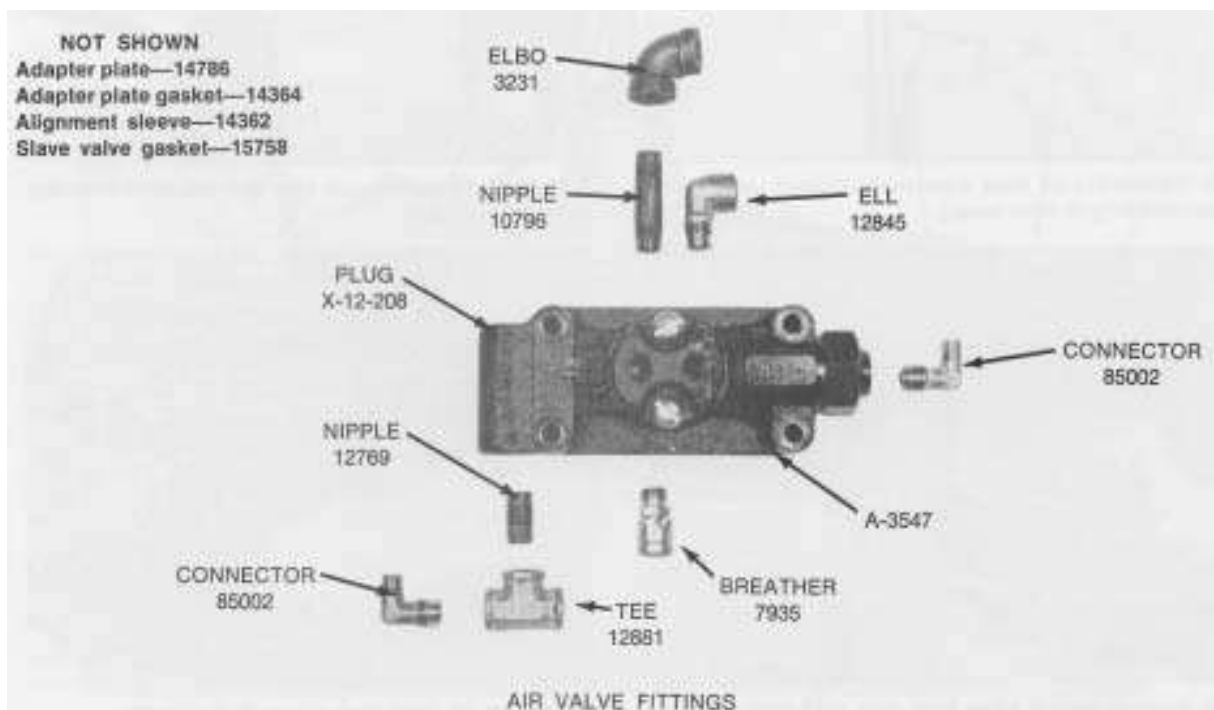
9. Remove spring and actuating pin.



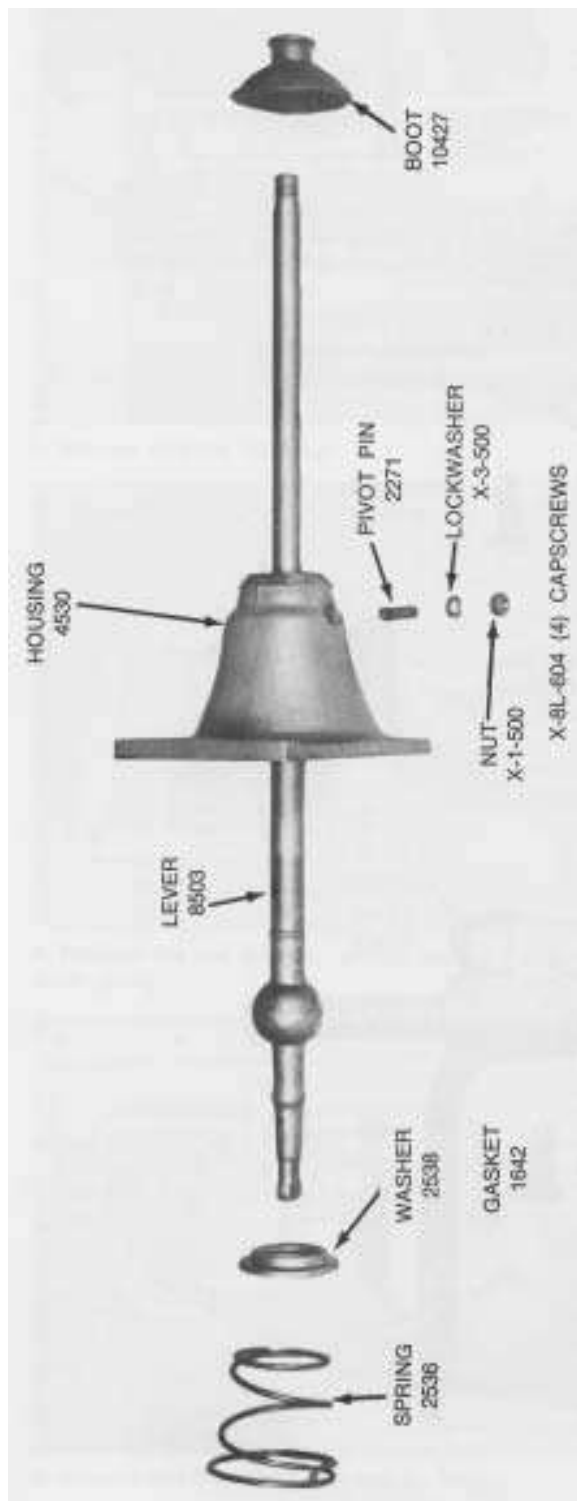
8. Remove alignment sleeve from air valve.



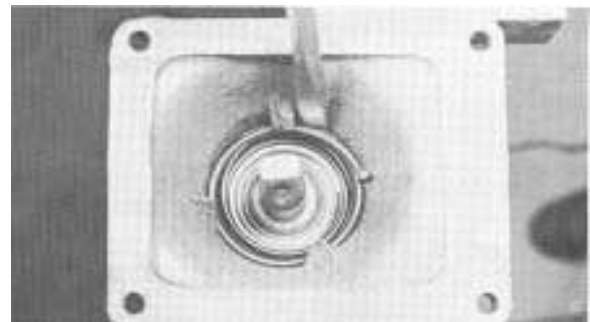
10. Remove air valve adapter plate.



B. TO DISASSEMBLE THE GEAR SHIFT LEVER HOUSING ASSEMBLY



1. Remove gear shift lever housing assembly.



2. Remove tension springs.

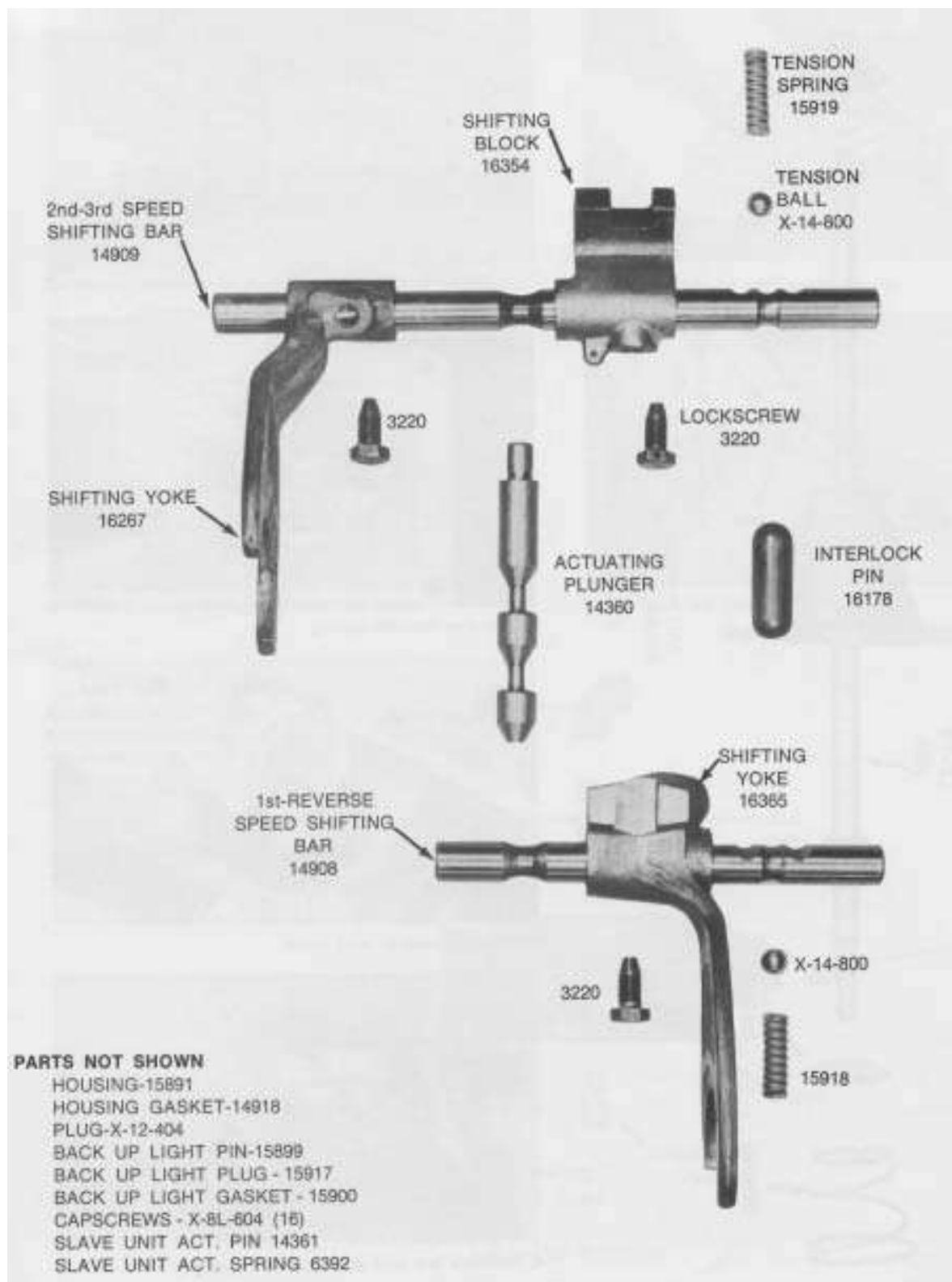


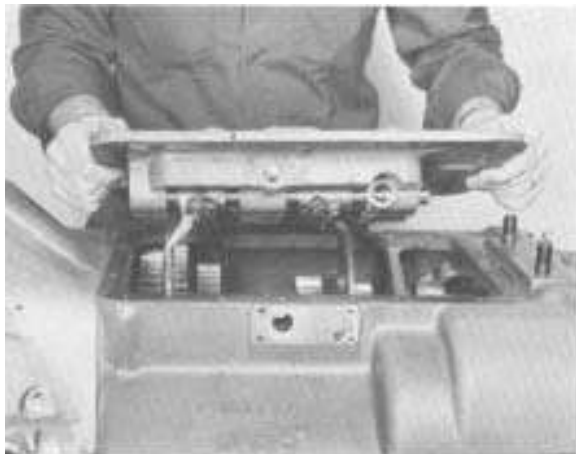
3. Remove washer and lever.



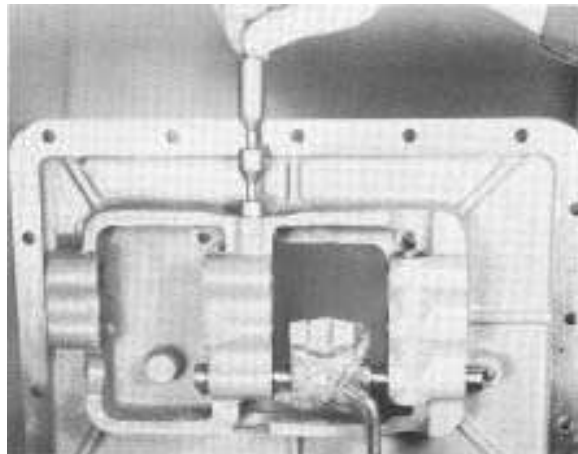
4. Remove nut and pivot pin if necessary.

C. To Disassemble the Shift Bar Housing Assembly

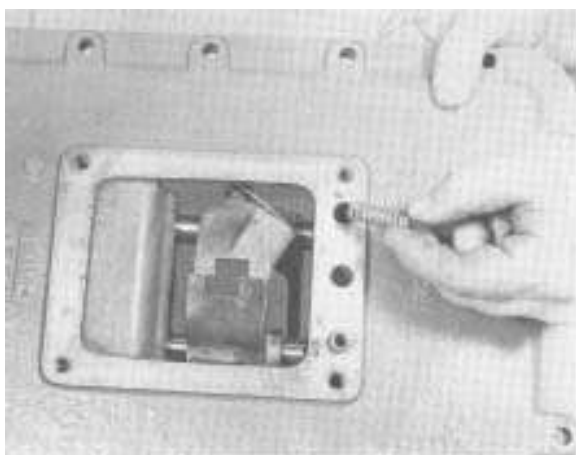




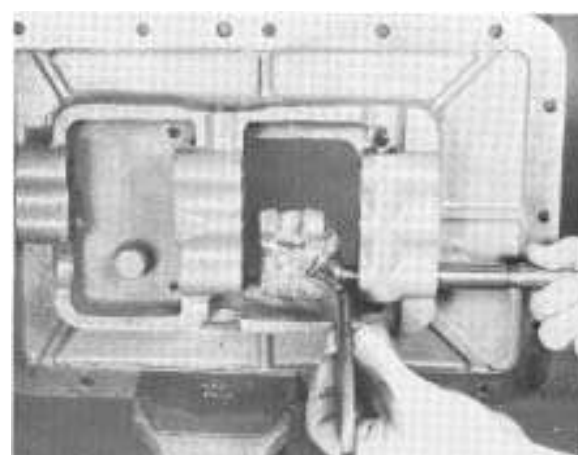
1. Remove Shift Bar Housing.



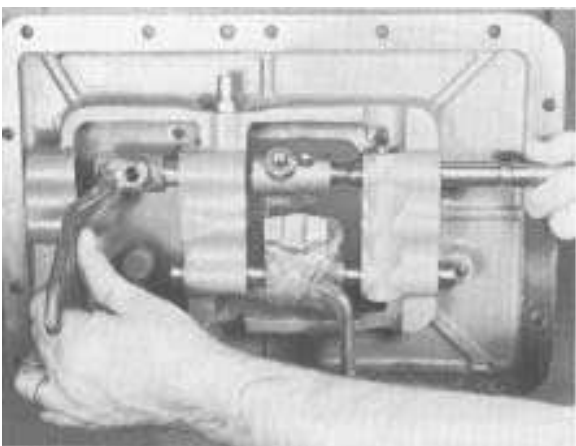
4. Remove actuating Plunger.



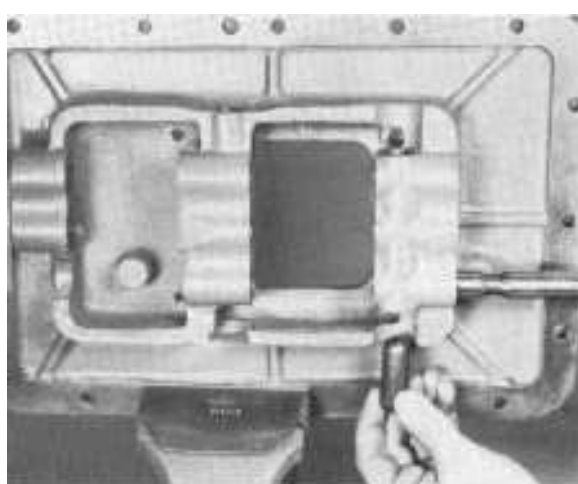
2. Remove two springs; remove ball under each spring.



5. Remove 1st-reverse speed shift bar and yoke.

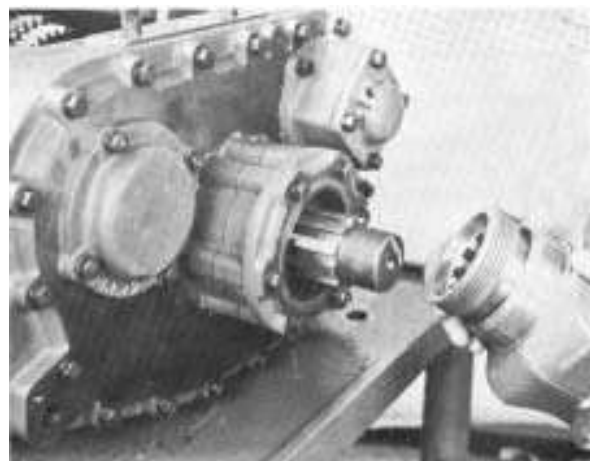
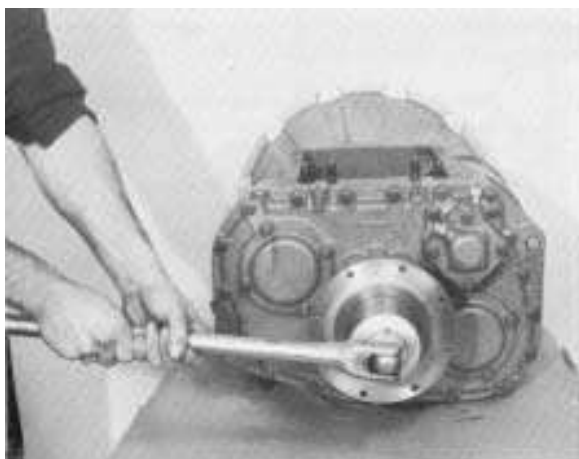
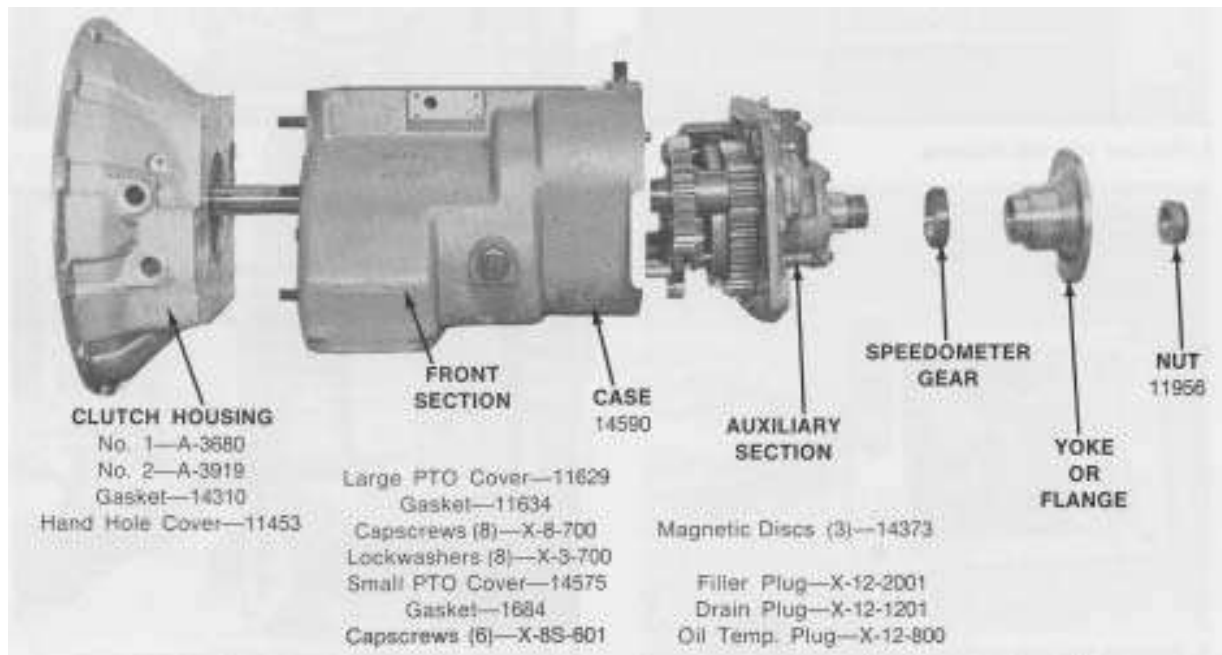


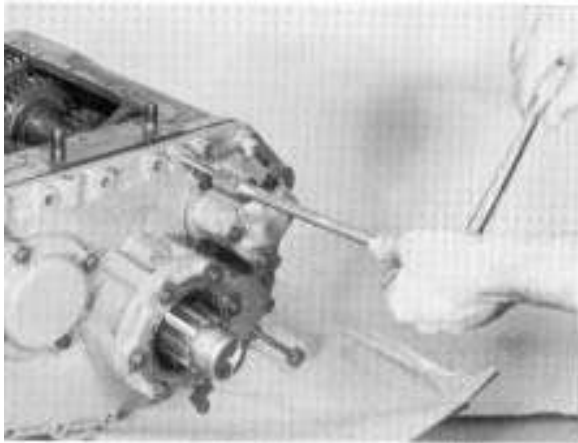
3. Remove 2nd-3rd speed shift bar.



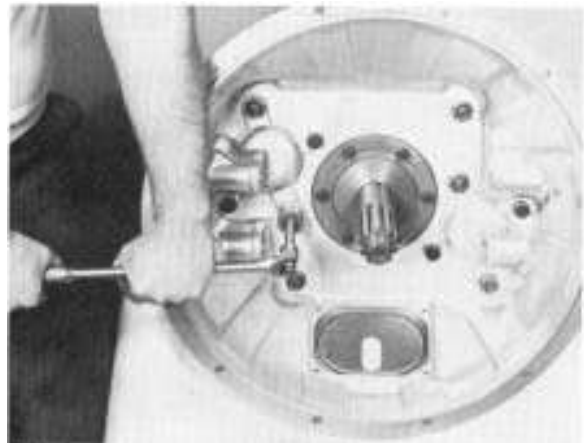
6. remove interlock pin from boss as last bar is withdrawn.

II. COMPANION FLANGE, AUXILIARY, AND CLUTCH HOUSING REMOVAL

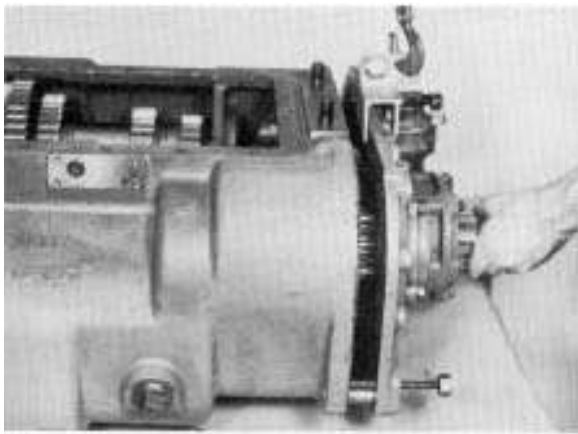




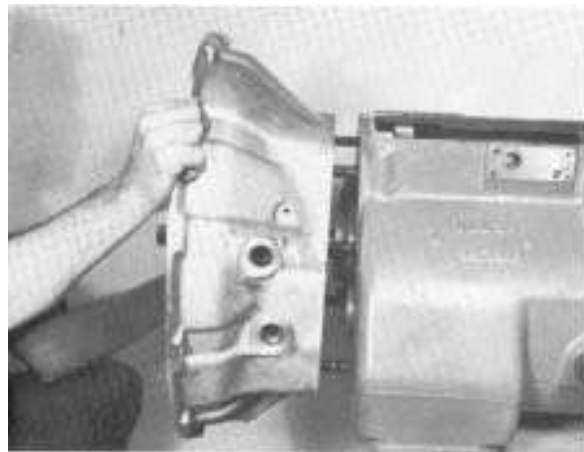
3. Remove cap screws which attach auxiliary section to case; use puller screws to break gasket seal.



5. Remove bolts and nuts which attach clutch housing to case.



4. Pull auxiliary section straight to the rear and from transmission case.

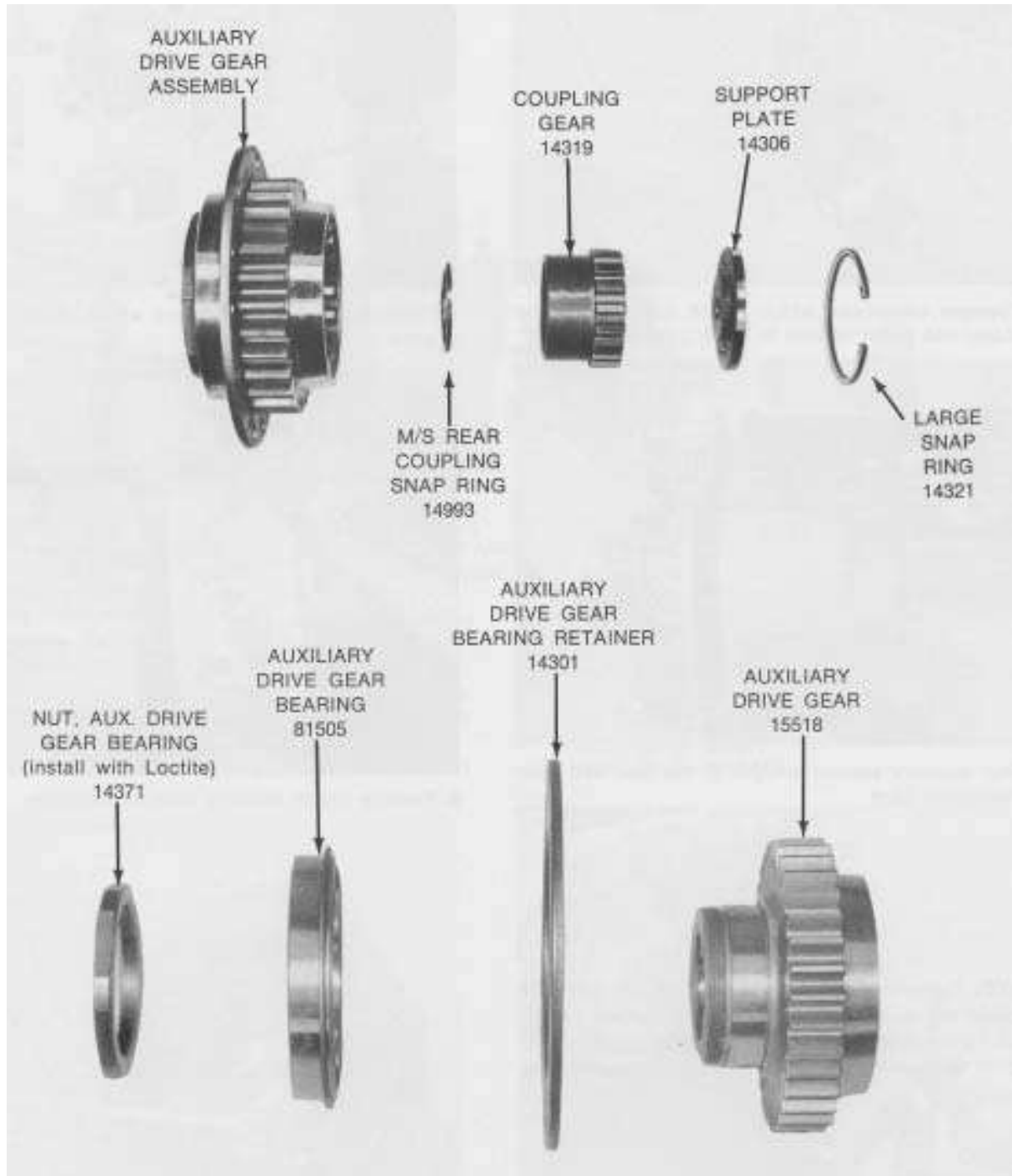


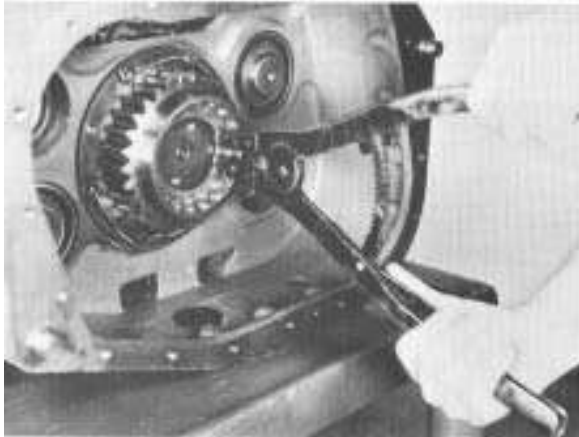
6. Remove clutch housing from transmission.

NOTE: Transmission can also be set vertically to remove the auxiliary section. Block under clutch housing to prevent damage to drive gear shaft, and lift the auxiliary upward and from transmission case.

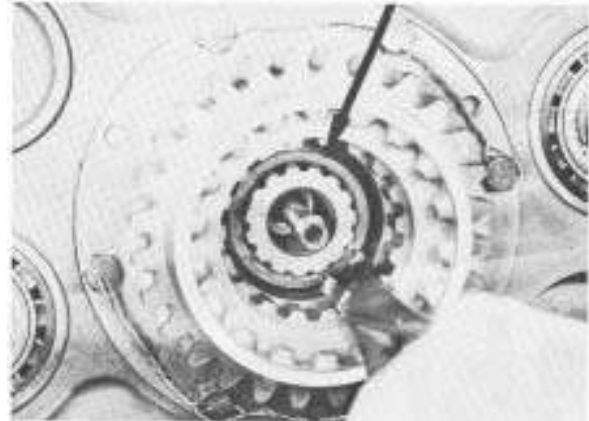
III. FRONT SECTION

A. To remove and Disassemble the Auxiliary Drive Gear Assembly





1. Remove large snap ring from ID of auxiliary drive gear.



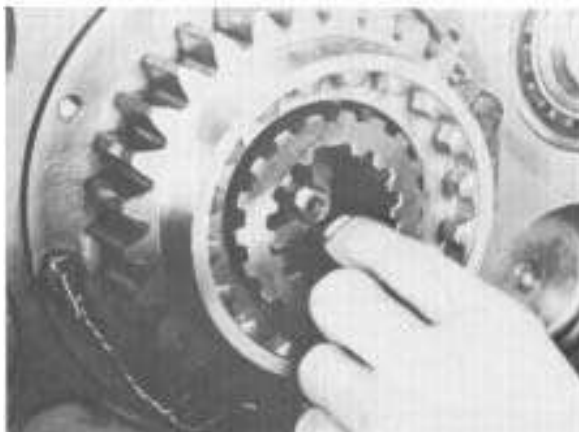
4. remove the rear coupling snap ring from groove in mainshaft.



2. Insert puller screws and remove quill support plate from gear.



5. Remove lockwire and capscrews, insert puller screws and pull the auxiliary drive gear assembly from case bore.

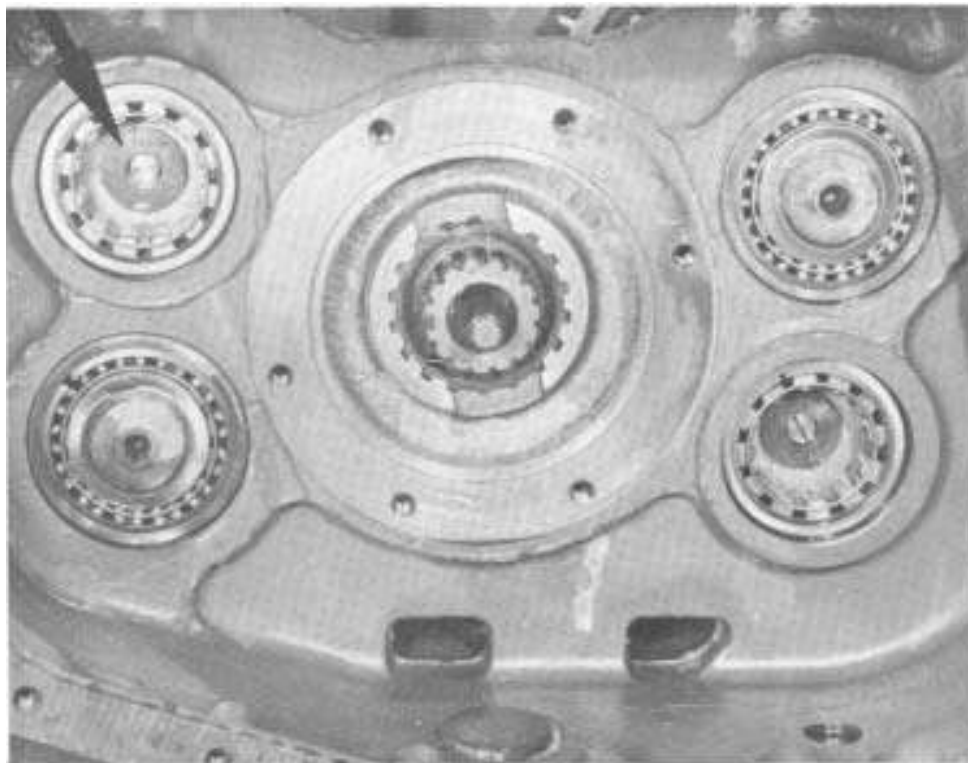
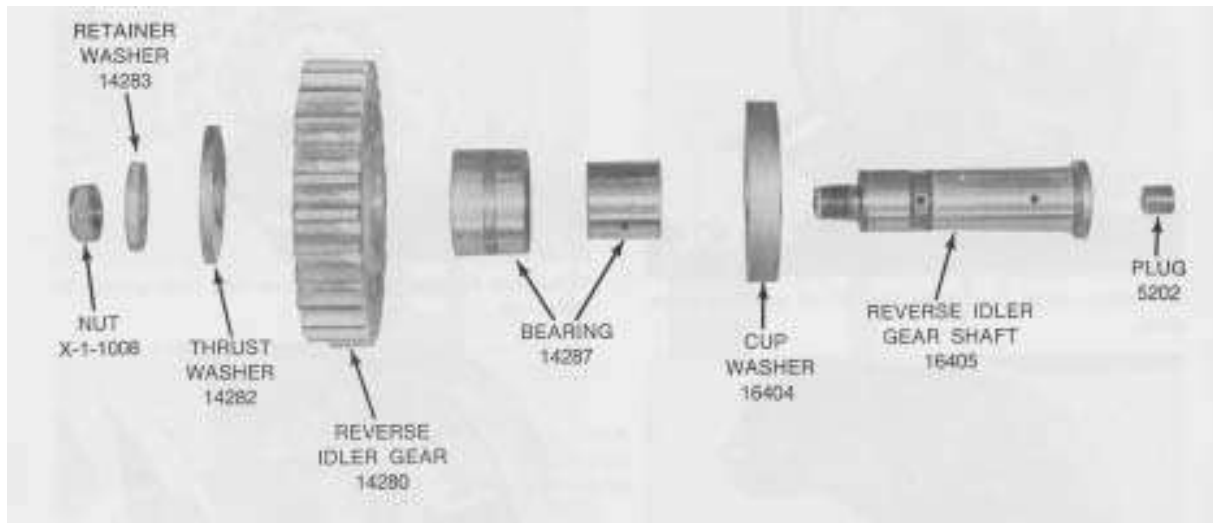


3. Remove coupling gear from splines of mainshaft and bore of gear.



6. Remove auxiliary drive gear bearing nut, left-hand thread. Press retainer ring and bearing from drive gear.

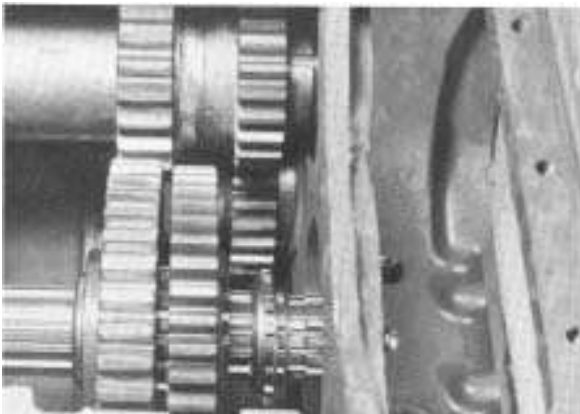
B. To Remove and Disassemble the left Reverse Idler Gear Assembly



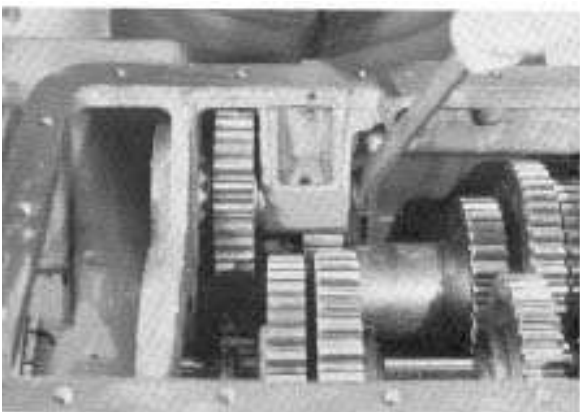
NOTE: To remove the left reverse idler gear, the reverse gear on the mainshaft must be moved forward to provide the necessary clearance.



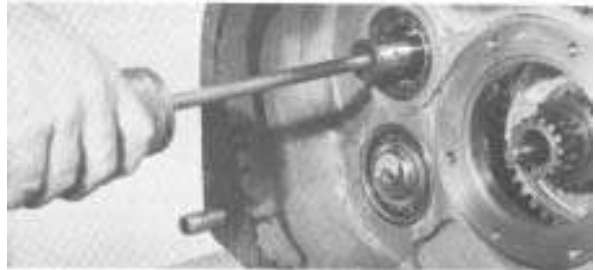
1. Remove snap ring from ID of the reverse gear.



2. Move reverse gear as far forward as possible on the shaft.



3. Remove retaining nut and washer from idler shaft threads.



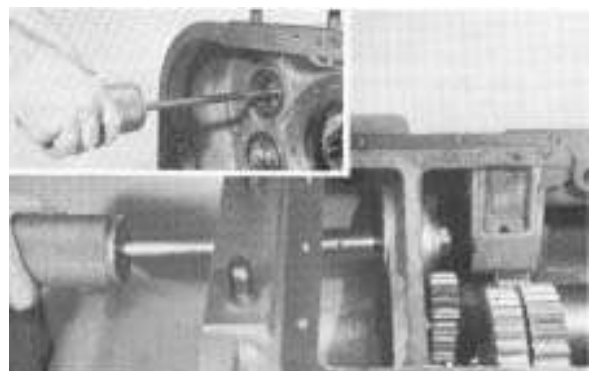
4. remove oil plug and attach impact puller, threaded 1/2-13; pull shaft from gear.



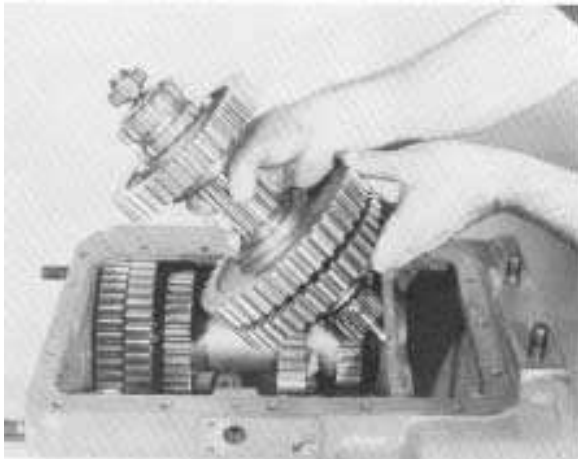
5. Remove reverse idler gear and washer from case.



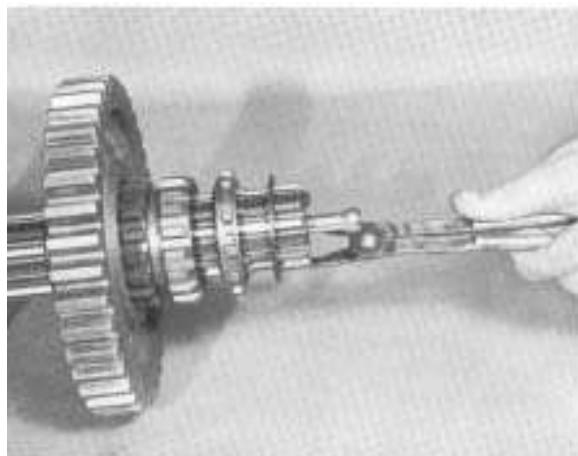
6. Remove bearing inner sleeve from gear; press bearing inner race from gear if necessary.



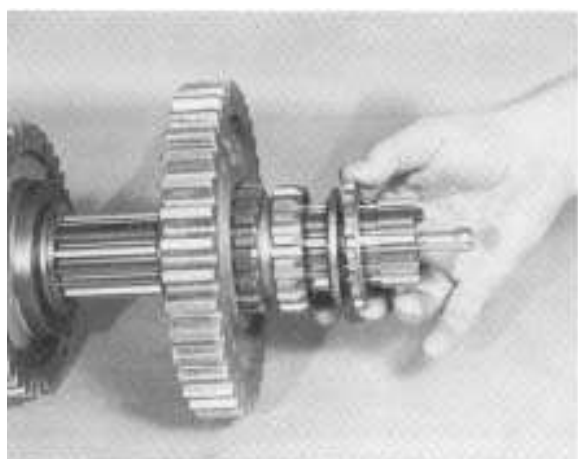
7. Re-insert shaft through bearing and install thrust washer, retainer washer and nut on thread end; use as puller to remove bearing. Make sure nut is fully threaded on shaft.



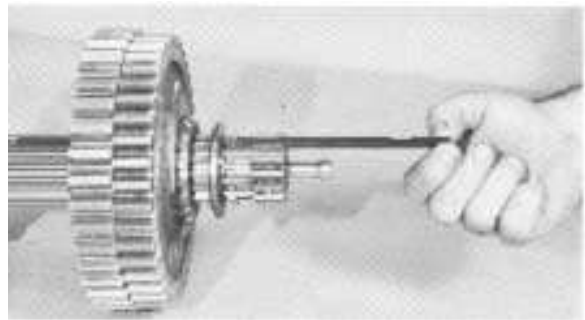
1. Lift mainshaft assembly from case.



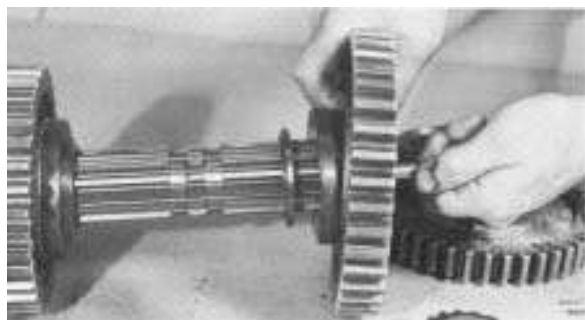
2. Remove the front coupling snap ring from groove in mainshaft.



3. Remove the reverse gear spacer.



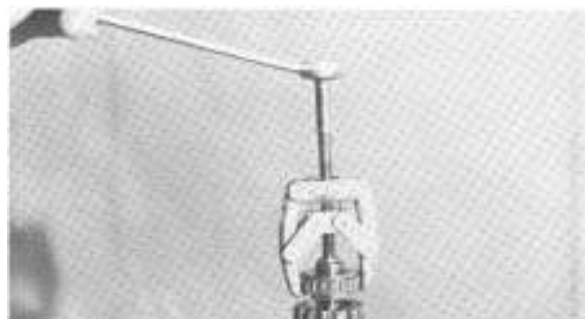
4. Pull key from mainshaft to free washers, spacers and gears.



5. remove washers ,spacers and gears from mainshaft. if necessary, remove snap rings from ID of gears.

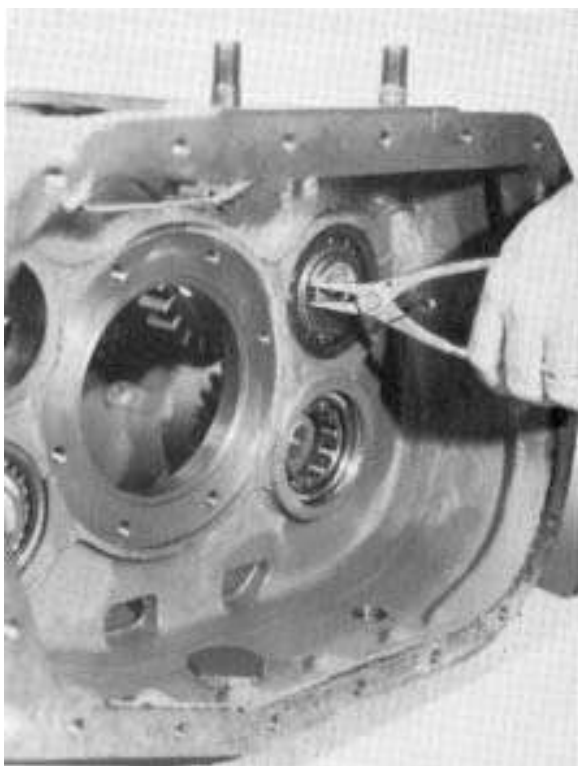
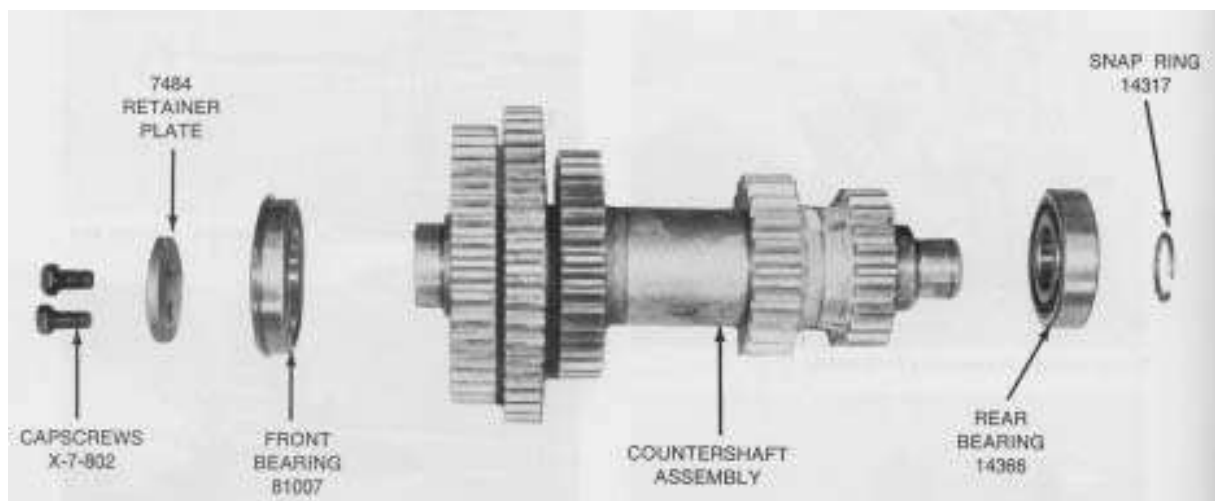


6. Place mainshaft in vise and remove snap ring from front quill.

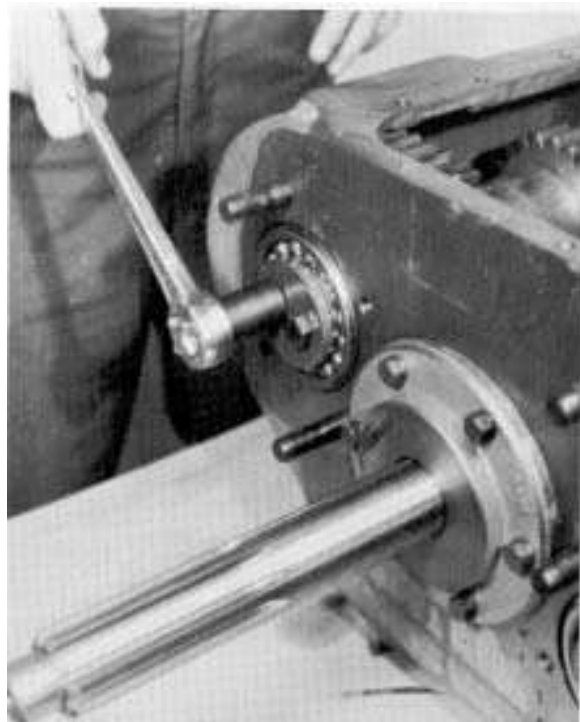


7. Pull roller bearing from front quill.

D. To Remove the Countershaft Bearings



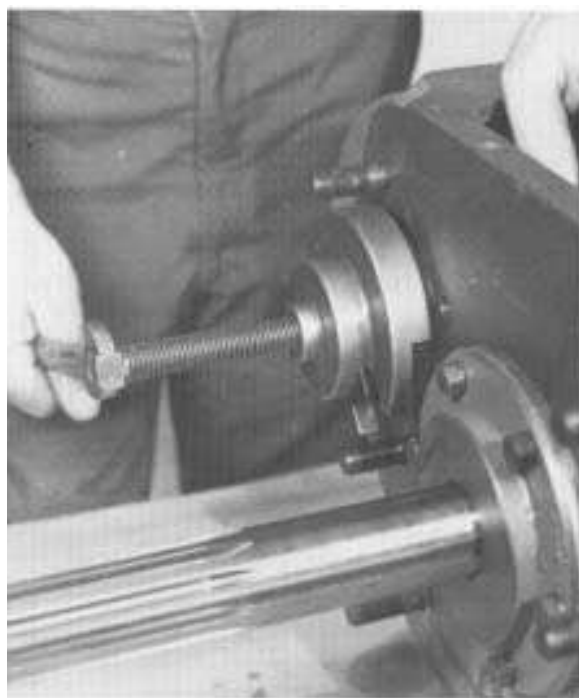
1. Remove snap ring from rear of right countershaft.



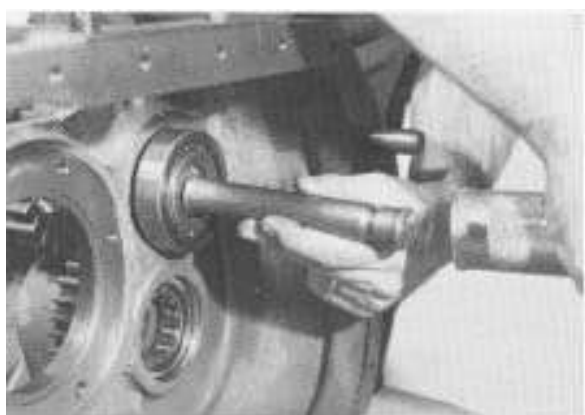
2. Remove the bearing retainer plate from front of right countershaft.



3. Move countershaft to the rear as far as possible, this will move rear bearing to the rear and partially unseat front bearing.



6. Use exposed snap ring to pull front bearing from countershaft



4. Block between rear bearing and case and move countershaft forward to unseat rear bearing. NOTE: It may be necessary to use soft bar and punch from inside case to move rear bearing to the rear far enough to clear case bore.

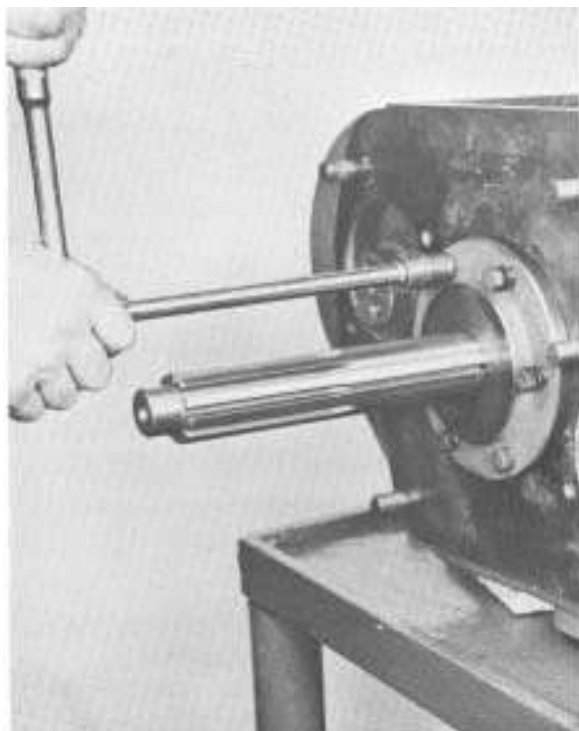
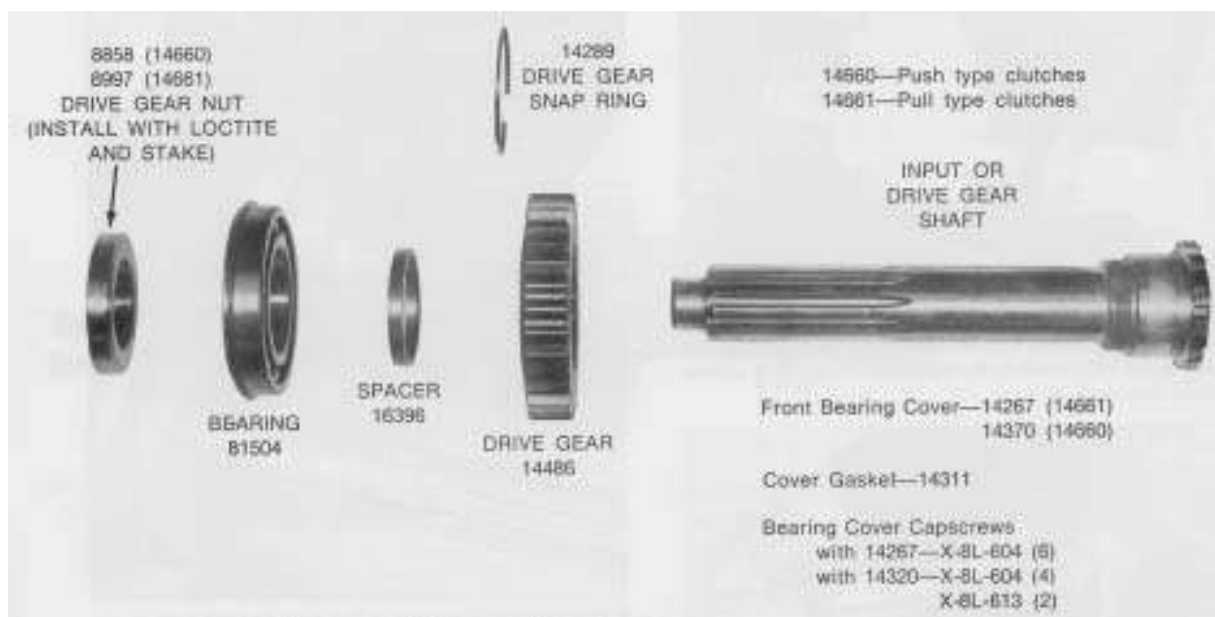


5. Front bearing snap ring will be exposed when countershaft is moved forward as shown in step 4.

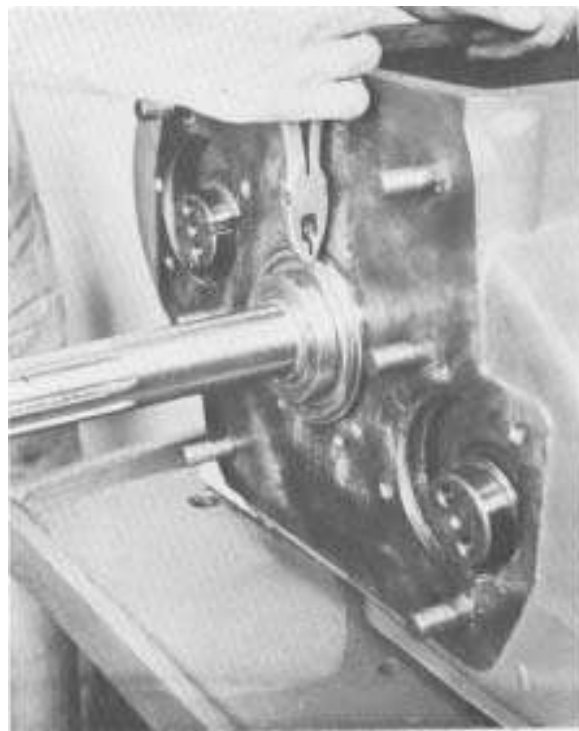


7. Remove bearings from left countershaft in the same manner as bearings were removed from right countershaft.

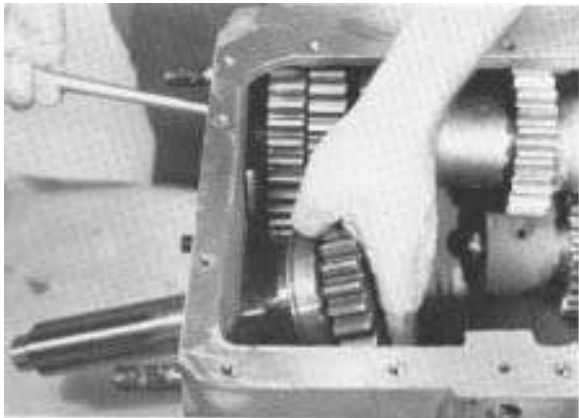
E. To Remove and Disassemble the drive Gear Assembly



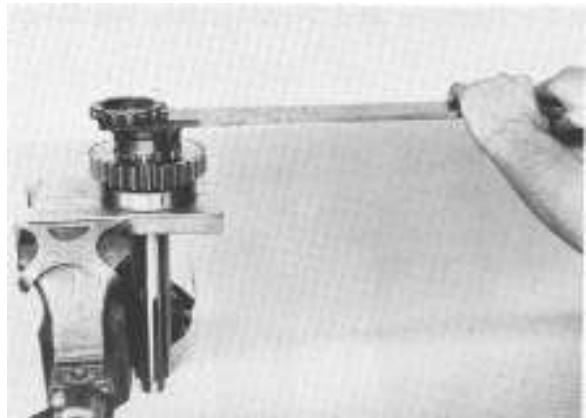
1. Turn out capscrews and remove the front bearing cover.



2. Tap drive gear assembly forward and remove snapping from drive gear bearing.



3. Remove drive gear by moving to inside of case and working past countershafts.



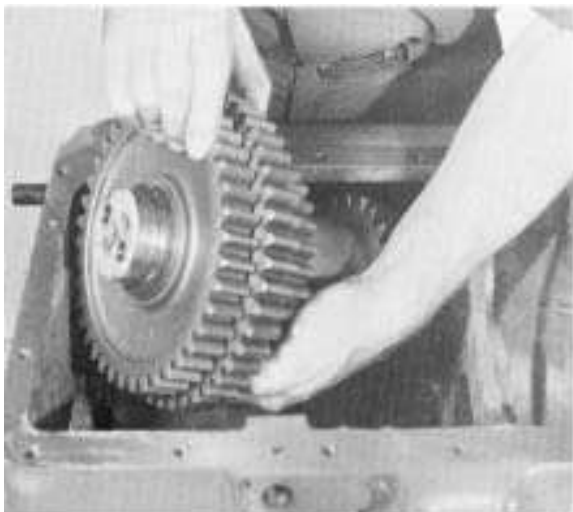
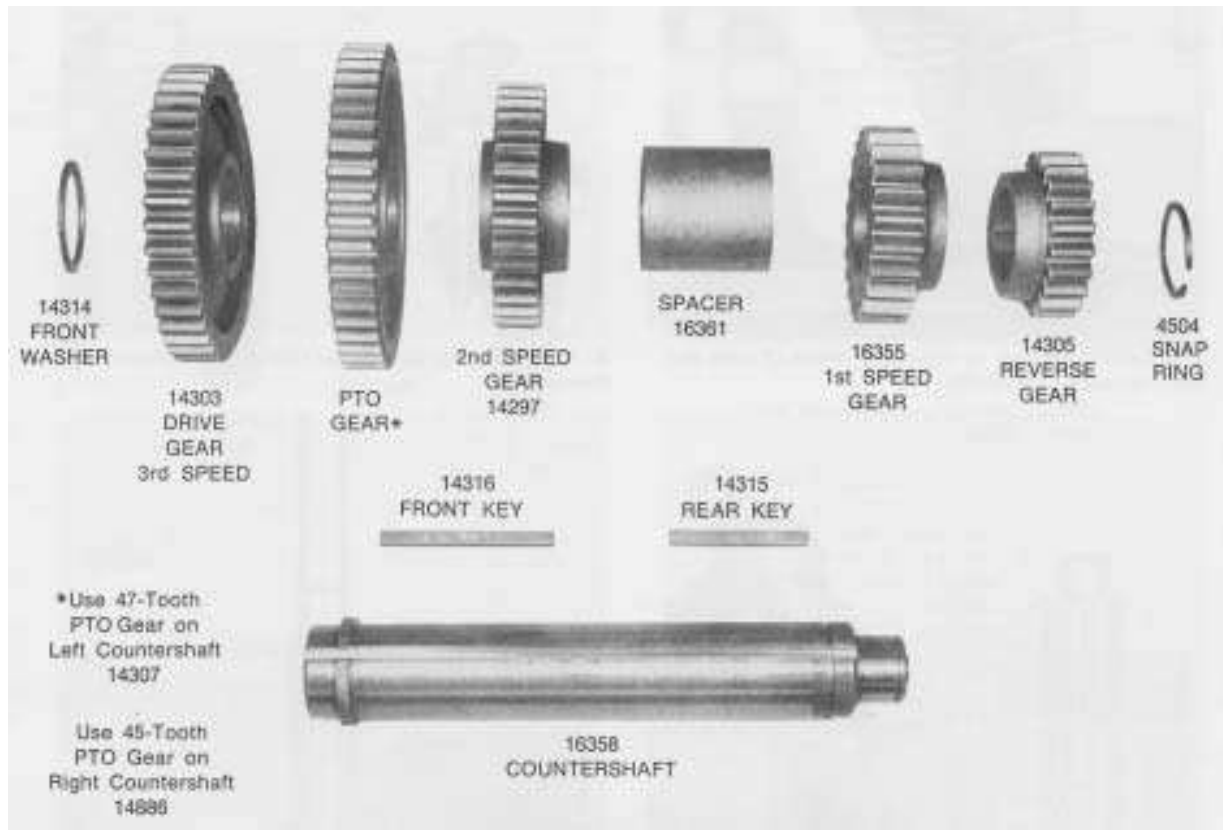
4. Relieve drive gear bearing nut at points where peened into shaft.

5. Turn drive gear bearing nut from shaft, left-hand thread.

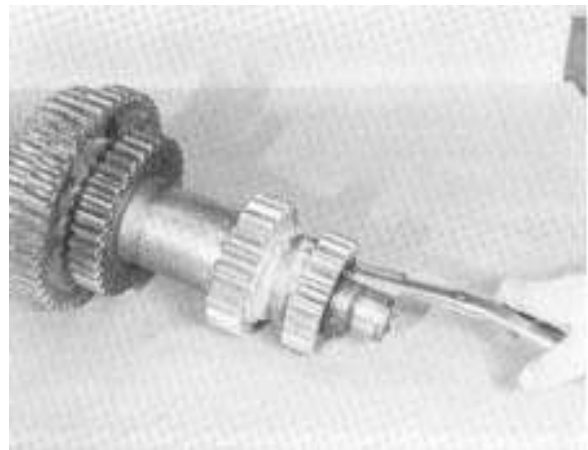


6. press shaft through gear and bearing; Remove snapping from ID of drive gear if necessary.

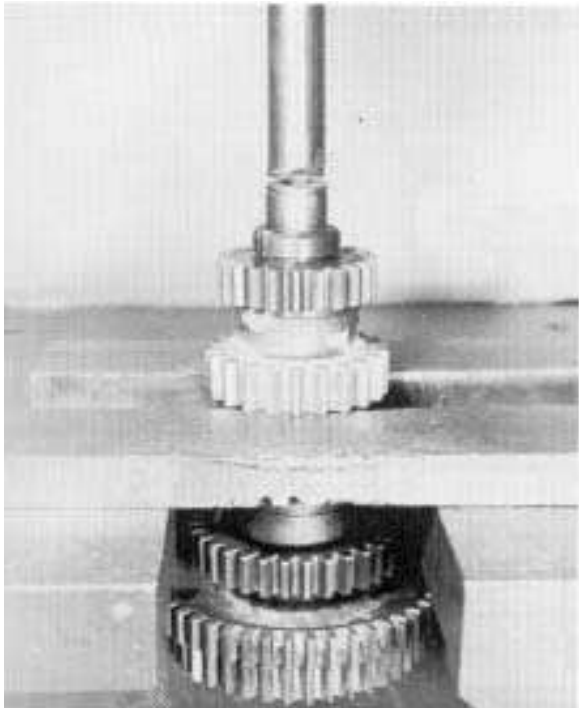
F. To Remove and Disassemble the Countershaft Assembly



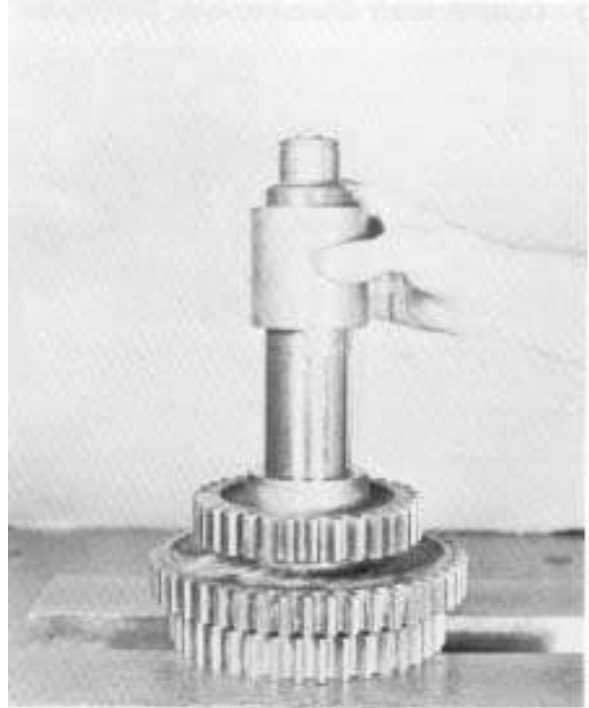
1. Remove the right and left countershaft assemblies from case.



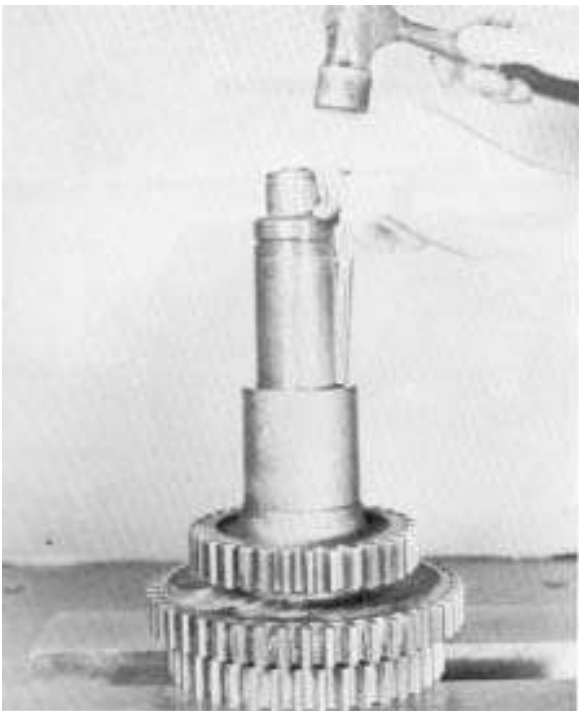
2. Remove snap ring from rear of countershaft.



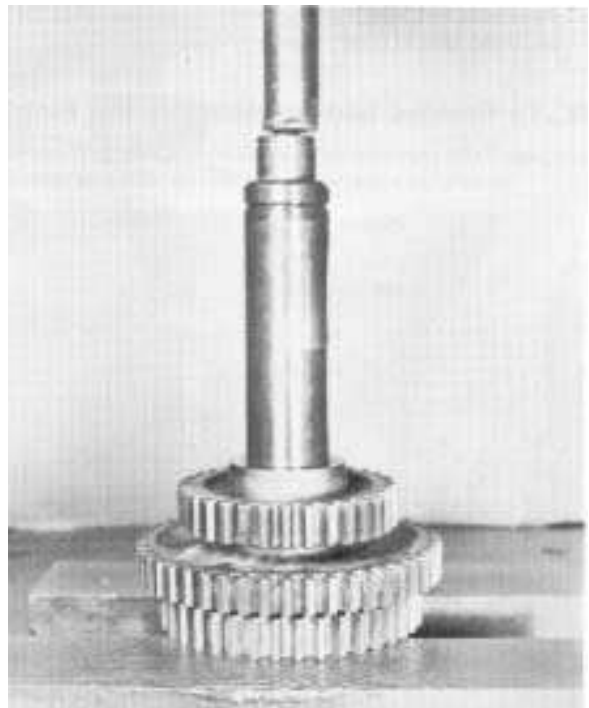
3. Press the reverse and 1st speed gear from countershaft.



5. Remove spacer from countershaft.



4. Remove rear key from keyway in countershaft.



6. Press the 2nd speed gear, PTO gear, and drive gear from countershaft.

F. Countershaft Disassembly, Continued

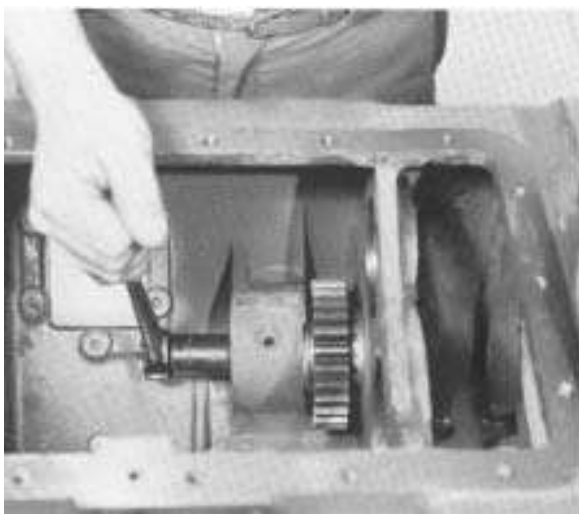


NOTE: Both countershafts are identical, except for the number of teeth on the PTO gears, thus they are Disassembled in the same manner.

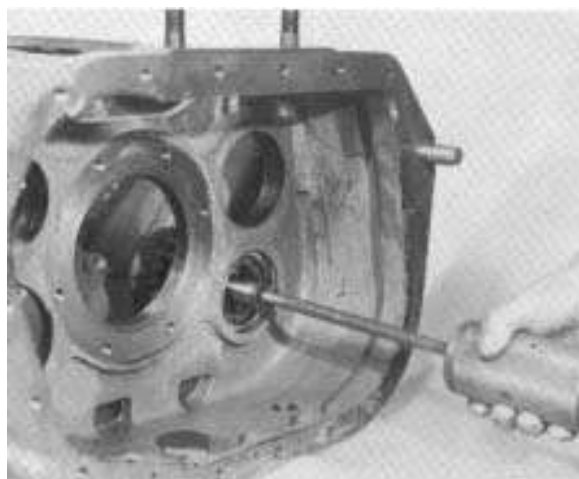
7. Remove front key from keyway in countershaft.
Remove front spacer from countershaft.

G. To Remove and Disassemble the Right Reverse Idler Gear Assembly

See page 20 for exploded view of left reverse idler gear assembly which is exactly the same as the right reverse idler gear assembly.

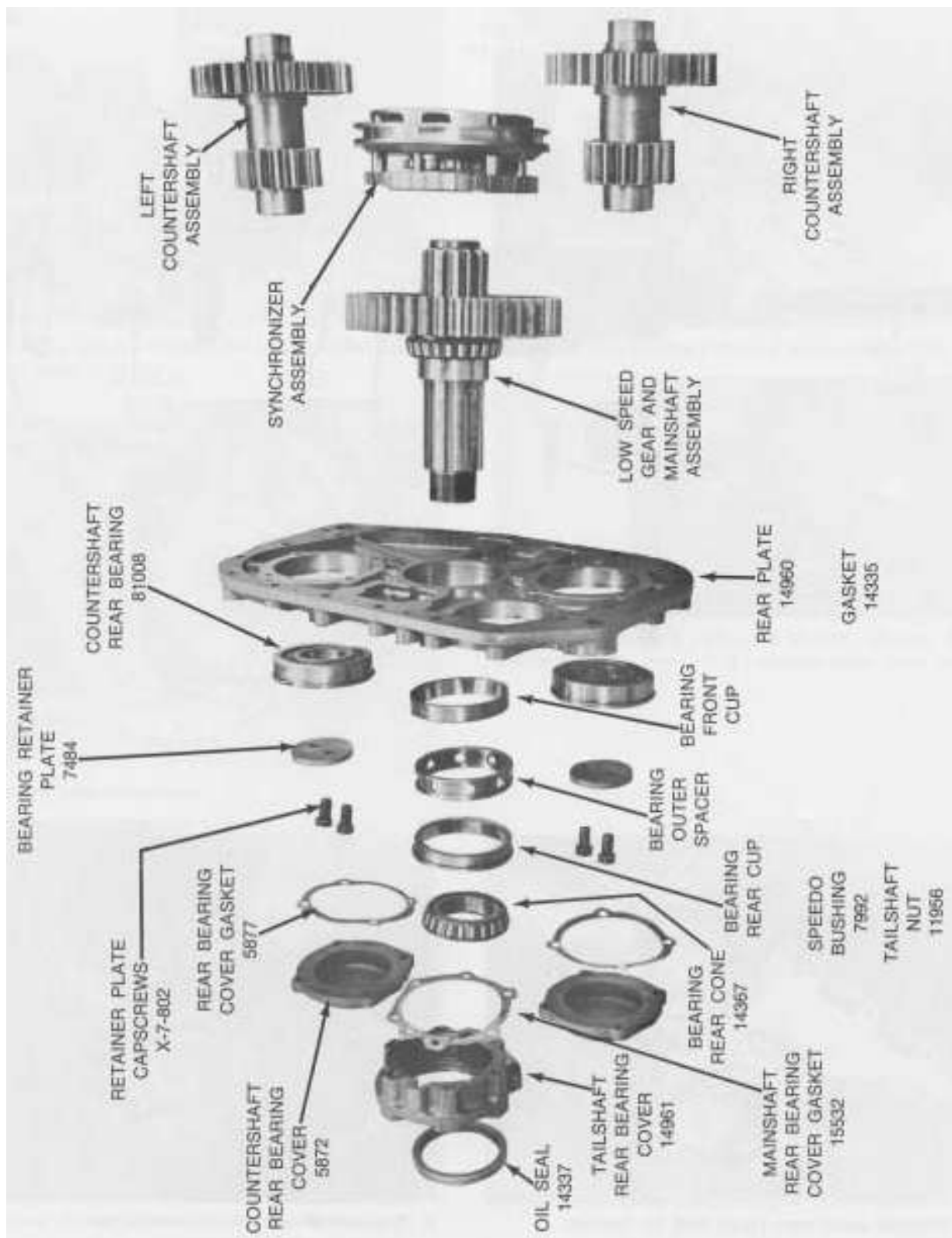


1. Remove the retaining nut and washer from the reverse idler gear shaft.

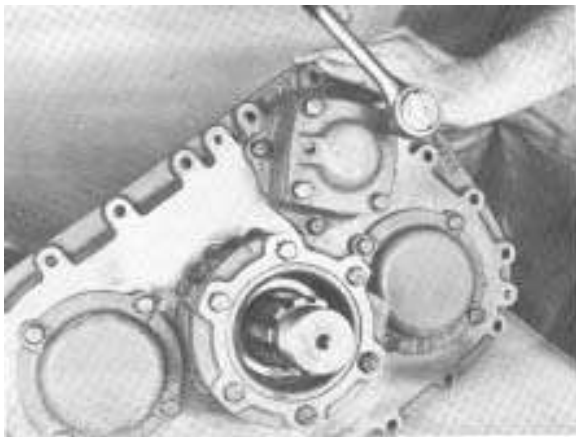
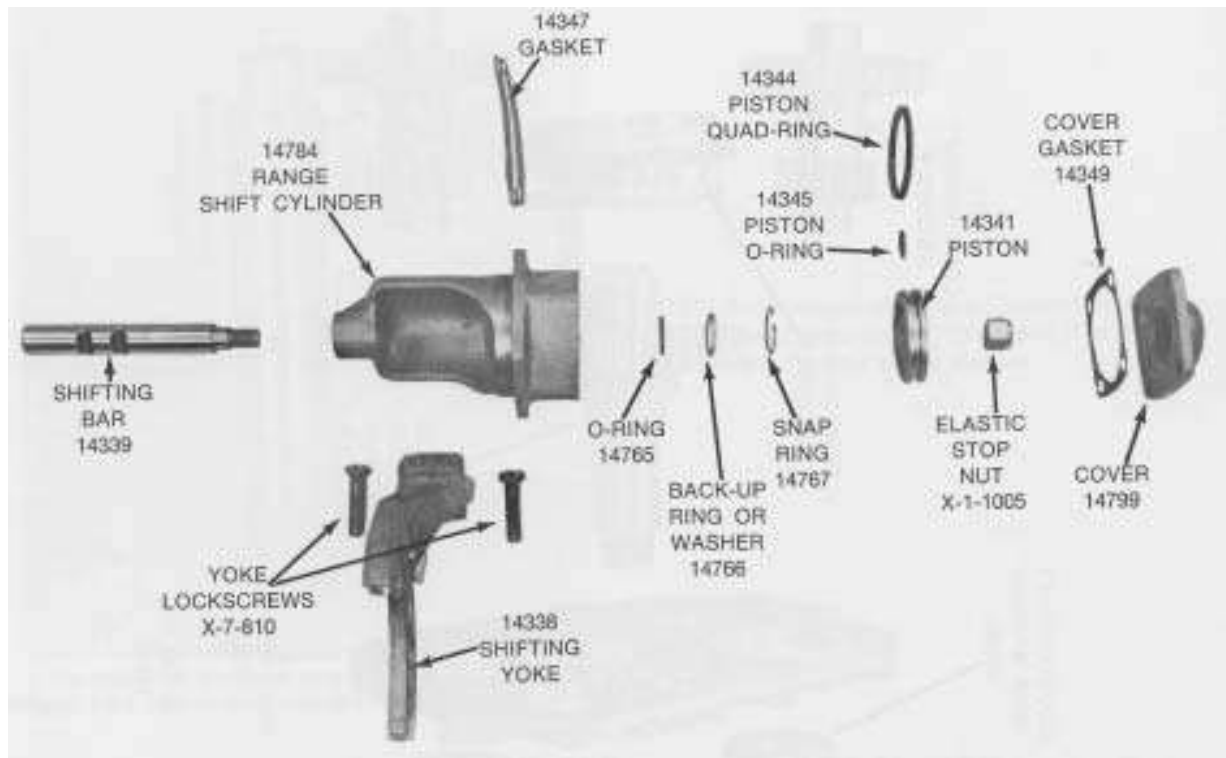


2. Use puller to remove shaft. Remove parts in the same manner as shown for the left reverse idler gear assembly, page 20.

IV.AUXILIARY SECTION



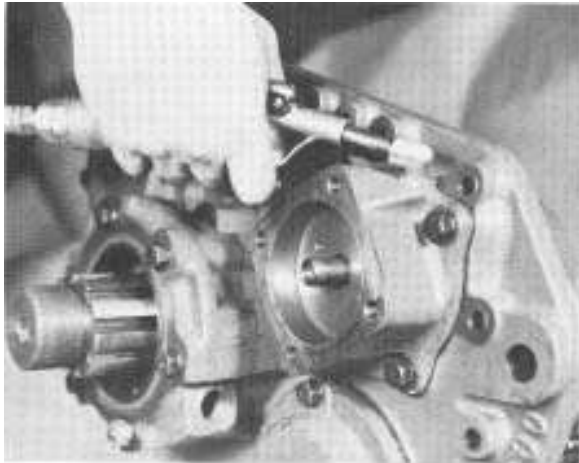
A. To Remove and Disassemble the Range shift Cylinder Assembly



1. Remove cover from range shaft air cylinder.



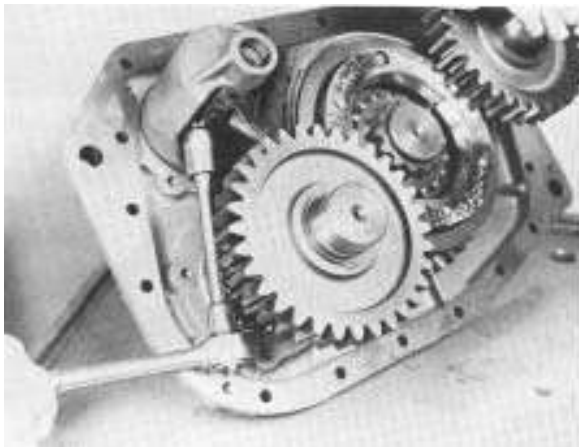
2. Turn nut from air cylinder shifting bar



3. Use air to remove piston from cylinder. **Do not** stand in back of piston.



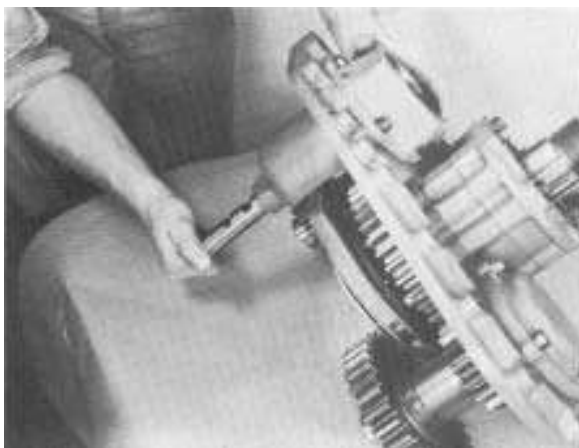
6. Remove the shifting yoke and shift cylinder



4. Remove Yoke lock screws

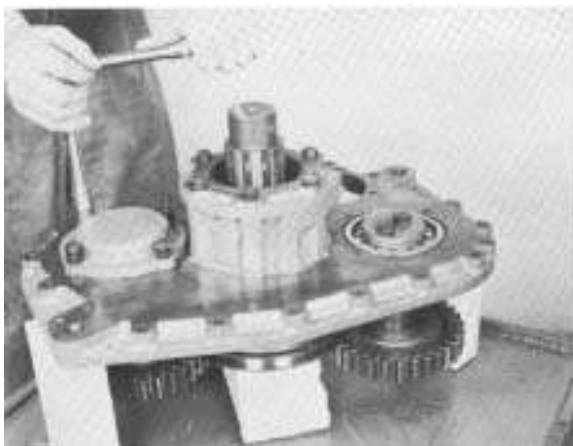
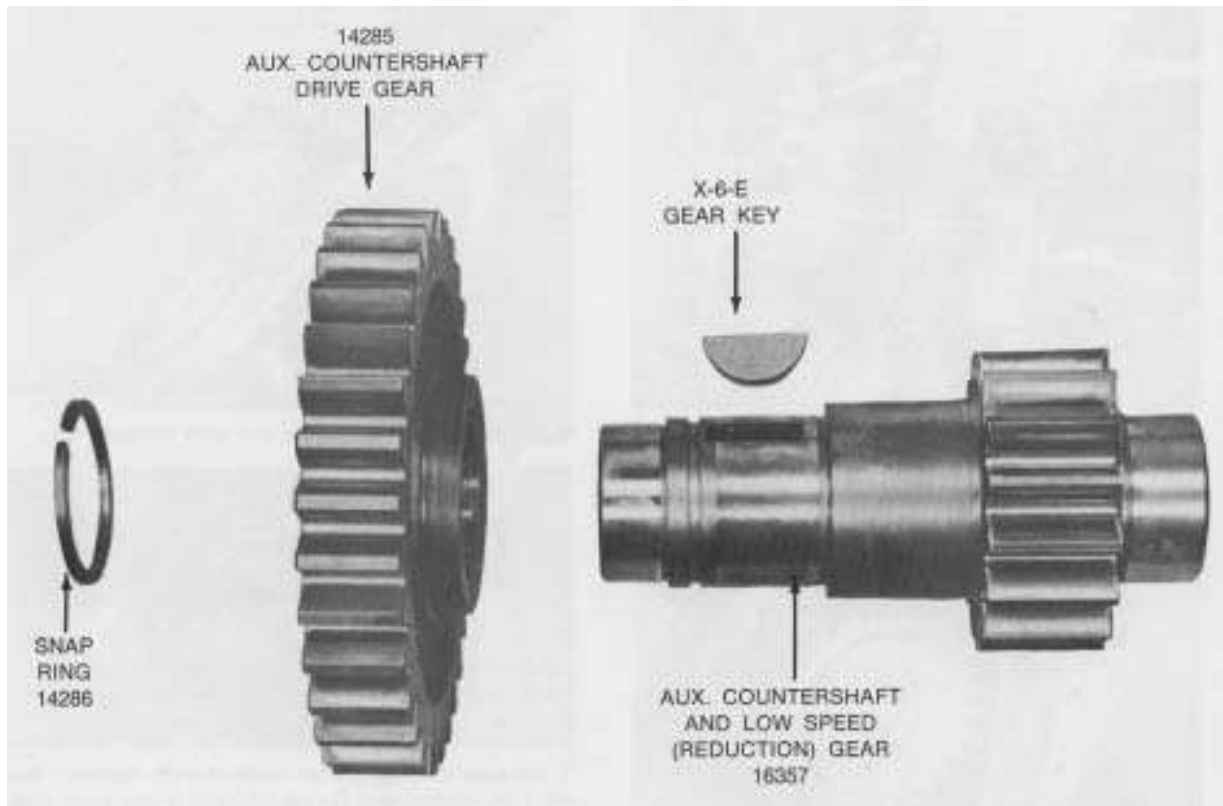


7. Remove snap ring from bore in shift cylinder; this will free washer and O-ring installed under snap ring

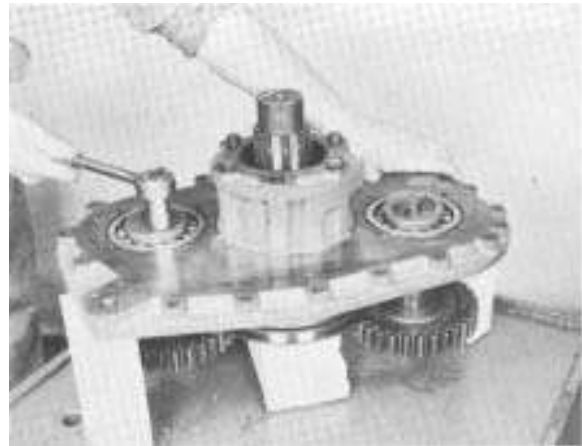


5. Remove shifting bar from housing and yoke hub.

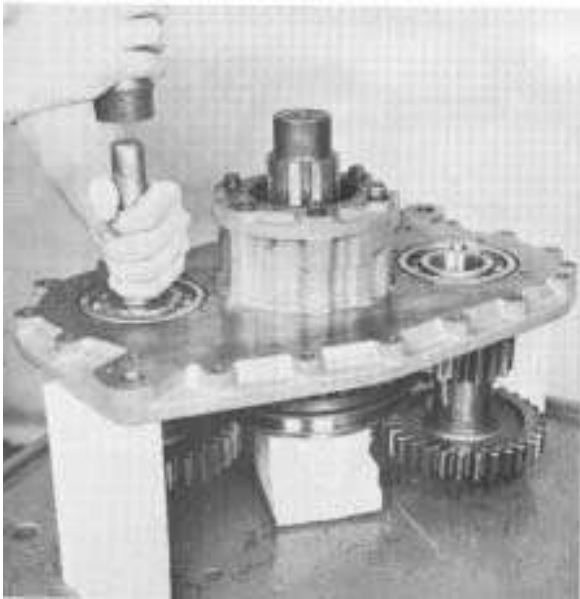
B. To Remove and Disassemble the Countershaft Assemblies



1. turn out capscrews and remove the countershaft rear bearing covers.

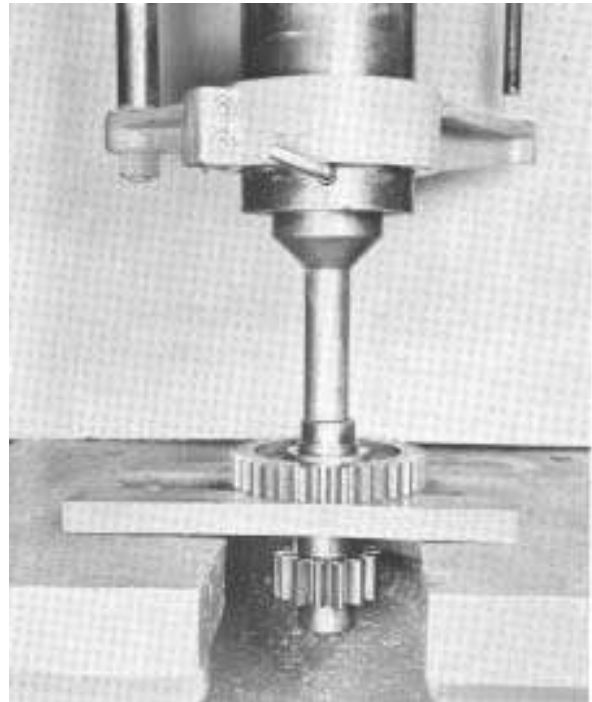


2. Cut lockwire and remove the bearing retainer plates.



3. Move countershafts forward to unseat from bearings.

(NOTE: blocking under synchronizer assembly in addition to blocking under rear plate) Bearings are removed from rear plate by tapping evenly to the rear.

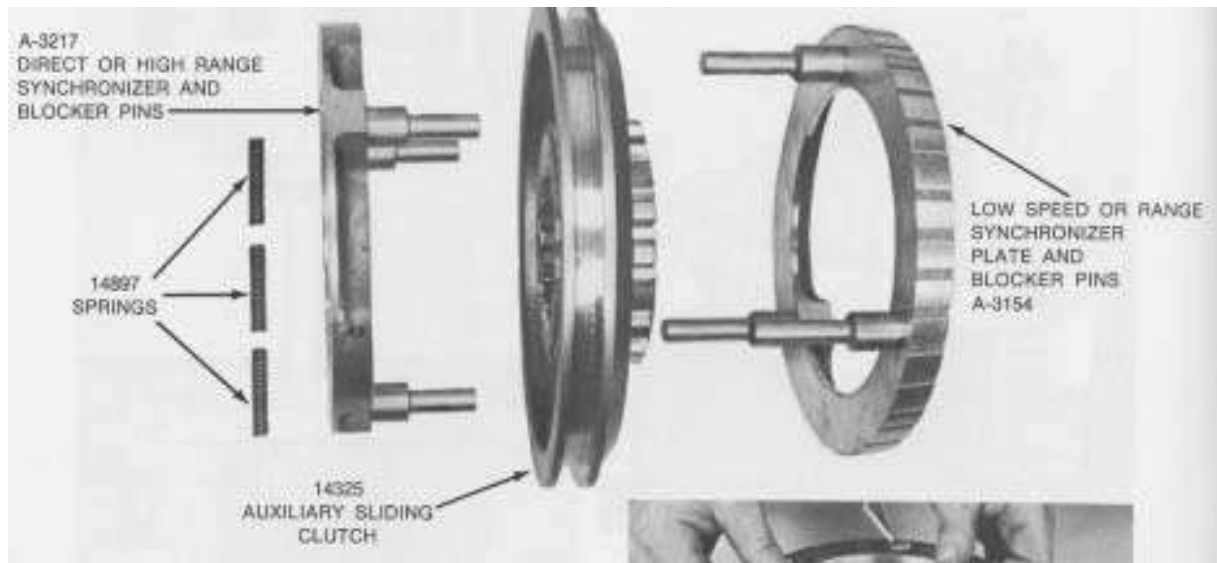


5. Press drive gears from countershafts, remove keys from shafts if necessary.



4. Remove snap rings from countershafts.

C. To Remove and Disassemble the Synchronizer Assembly



1. Remove synchronizer assembly from output shaft as a complete unit.

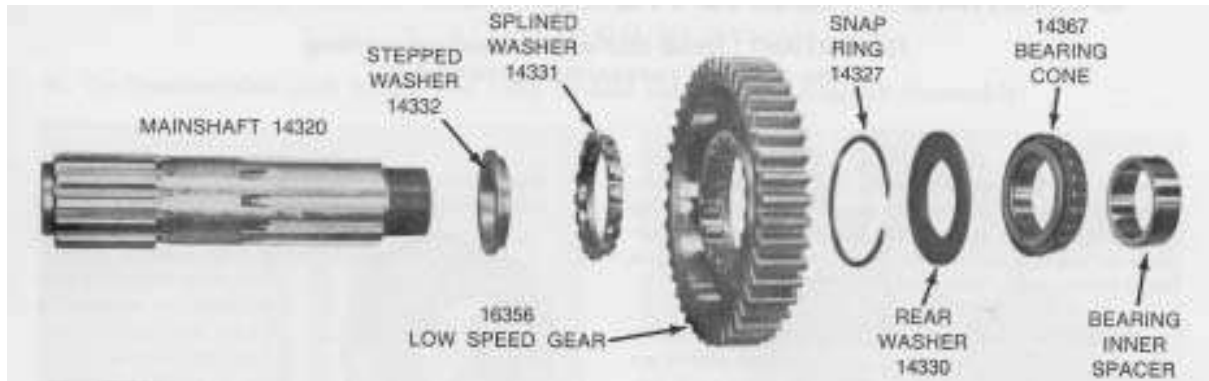


2. pull direct synchronizer from blocker pins of low speed synchronizer. Place cloth over ring during removal as springs direct ring will be released at arrow locations.



3. Remove sliding clutch gear from low speed synchronizer.

D. To Remove and Disassemble the Low Speed Gear and Tailshaft Assembly



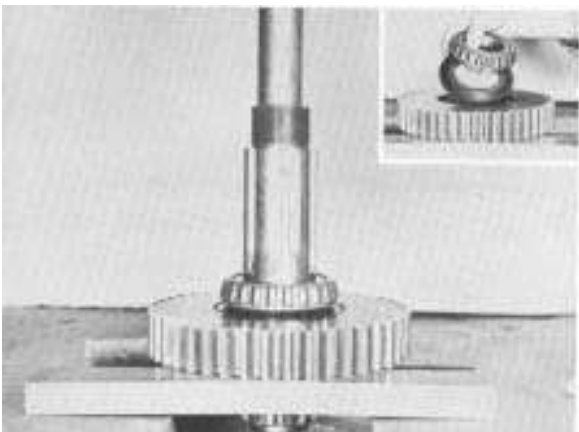
1. Remove low speed gear and output shaft as a complete unit by moving forward and through bearing. (NOTE blocking under rear plate)



3. Turn out capscrews and remove the rear bearing cover. If necessary, remove oil seal from cover.



4. Remove the bearing rear cone.



2. Use gear as a base to press bearing from output shaft and free the gear and washers. If necessary, remove snap ring from gear. remove splined washer and stepped washer from shaft.

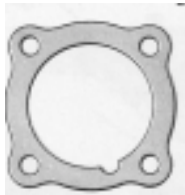


5. Remove the two bearing cups and outer spacer from bore.

GENERAL PRECAUTIONS FOR REASSEMBLY

IMPORTANT: Read this section before starting the detailed reassembly procedures.

Make sure that interiors of case and housings are clean. It is important that dirt be kept out of transmission during reassembly. Dirt is abrasive and can damage polished surfaces of bearings and washers. Use certain precautions, as listed below, during reassembly.



1. GASKETS - Use new gaskets throughout the transmission as it is being rebuilt. Make sure all gaskets are installed, as omission of gasket can result in oil leakage or misalignment of bearing covers (See "Location of Gaskets" heading).

2. **CAPSCREWS** - To prevent oil leakage, use shellac on all capscrews. See torque rating chart for recommended torque.
3. **ASSEMBLY** - Refer to the assembly illustration, pages 27-34, as a guide to reassembly.
4. **INITIAL LUBRICATION** - Coat all thrust washers and splines of shafts with Lubriplate during installation to provide initial lubrication, preventing scoring and galling.
5. **AXIAL CLEARANCES** - Maintain the following axial clearances:

Mainshaft Forward Speed Gears 005"-.011

Mainshaft Reverse Speed Gear 005-.023

Reverse Idler Gear 011-.032

Mainshaft 002-.008



6. BEARINGS - Use of flanged-end bearing drivers is recommended for the installation of bearings. These drivers apply equal force to both races of bearing, preventing damage to balls and races and maintaining correct bearing alignment with shaft and bore. If tubular or sleeve type driver is used, apply force only to inner race.

7. **UNIVERSAL JOINT COMPANION FLANGE** - Pull the companion flange tightly into place with the mainshaft nut, using 450-500 ft. lbs. of torque. Make sure the speedometer gear is not used, a replacement spacer of the same width must be used. Failure to pull the yoke or flange tightly into place will permit the shaft to move axially with resultant damage to rear bearing.



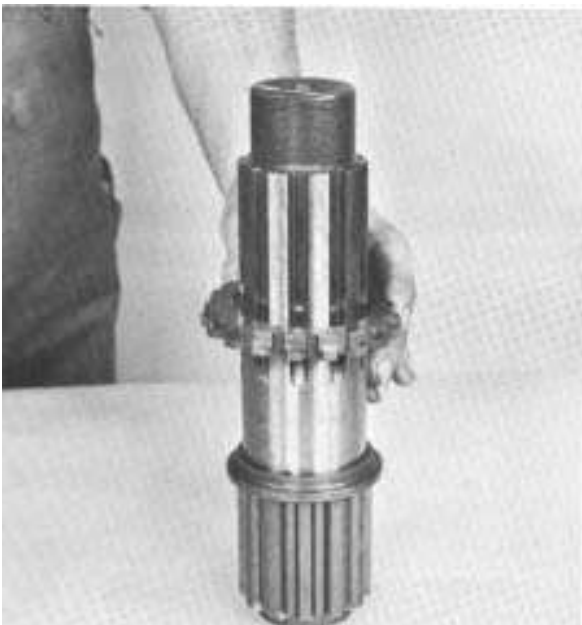
RASSEMBLY INSTRUCTIONS

I. AUXILIARY SECTION

A. To Reassemble and Install the Low Speed Gear and Tailshaft Assembly



1. Install stepped washer on auxiliary mainshaft.



2. Install splined washer on shaft and against stepped washer.



3. Install snap ring in ID of low speed gear.



4. Install low speed gear on shaft.



5. Install rear washer on shaft.



6. Install front cone of rear bearing on shaft; seat against washer. (heating of bearing cones will facilitate installation. Use heat lamps and do not heat over 275 degrees F.



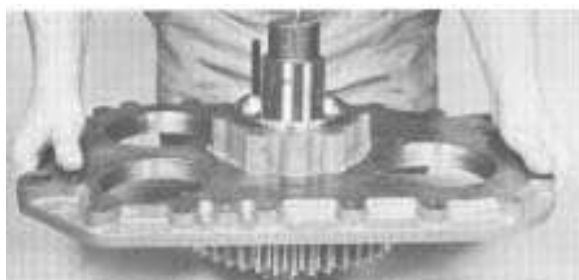
7. Install bearing inner spacer on shaft and against bearing cone.



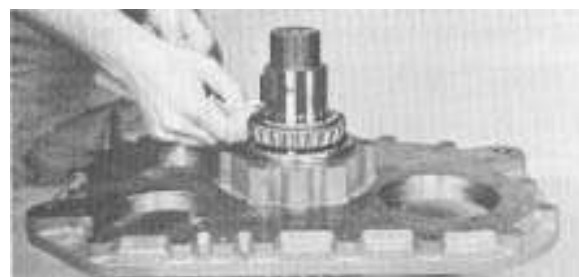
8. Place front cup of bearing partially in rear bore, taper to the inside.



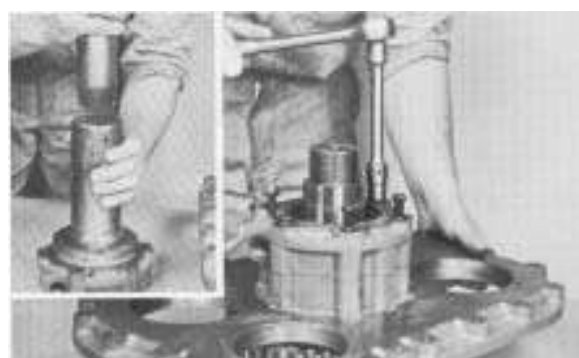
9. Tap all three units, front cup, outer spacer and rear cup evenly into bore until lip on rear seats on housing.



10. Place rear plate on shaft and front bearing cone.



11. Install bearing rear cone on shaft and into rear cup.



12. Install the rear bearing cover. make sure oil seal has been installed in rear bearing cover.

B. To Reassemble and Install the Synchronizer Assembly



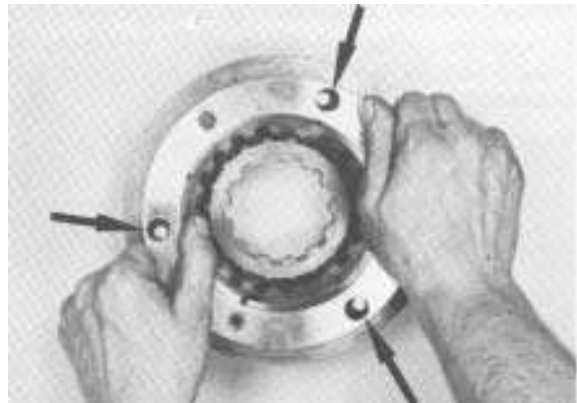
1. Install sliding clutch gear on pins of the lowspeed synchronizer.



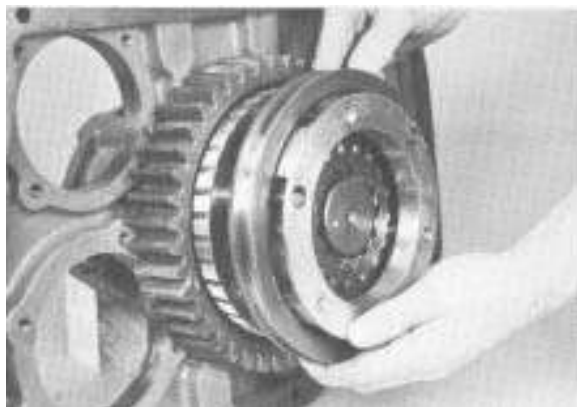
2. Install the three springs in direct synchronizer.



3. Place direct synchronizer over pins of the low speed synchronizer with springs against the low speed blocker pins.



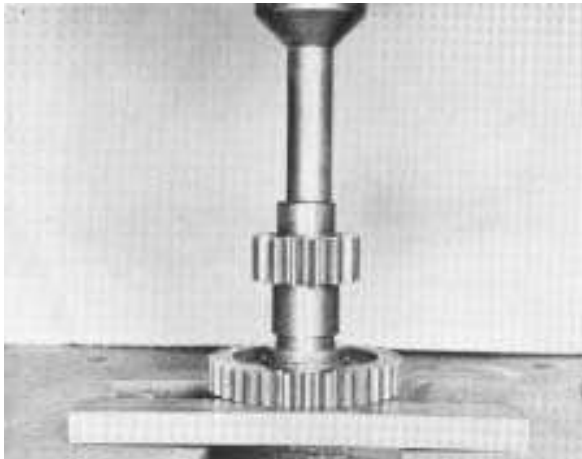
4. Compress springs to fully seat direct synchronizer on pins of low speed synchronizer.



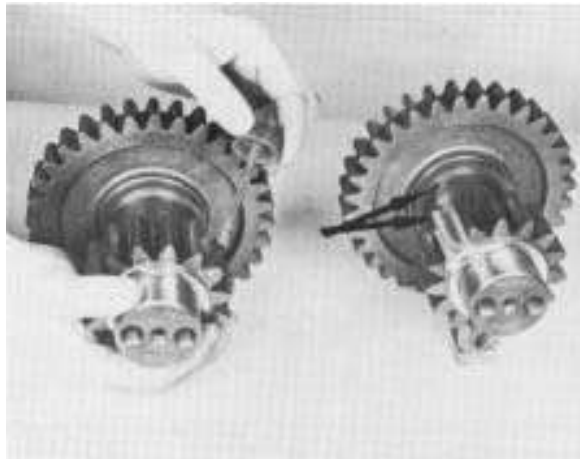
5. Install synchronizer assembly on splines of output shaft.

C. To Reassemble, Time and Install the Countershaft Assembly

NOTE: Both countershafts are assembled in the same manner.



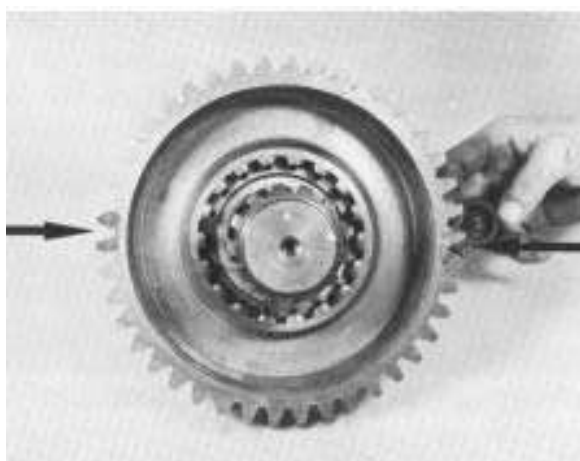
1. Install keys in keyways of auxiliary countershaft and press drive gear on eachshaft; long hub against shaft sholder.



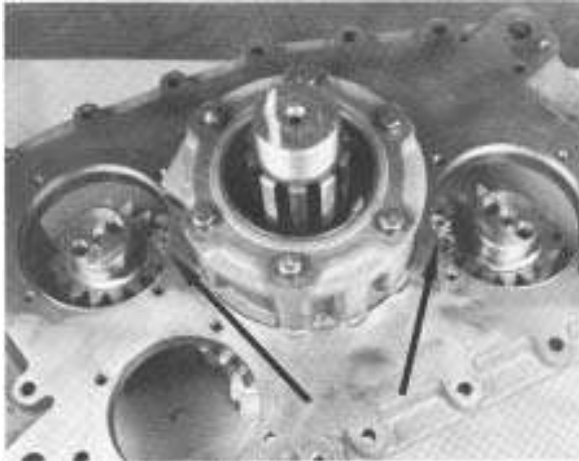
3. Mark timing teeth on countershaft low speed gears. Each tooth is aligned with keyway and stamped with an "O".



2. Install snap ring on front of each countershaft.



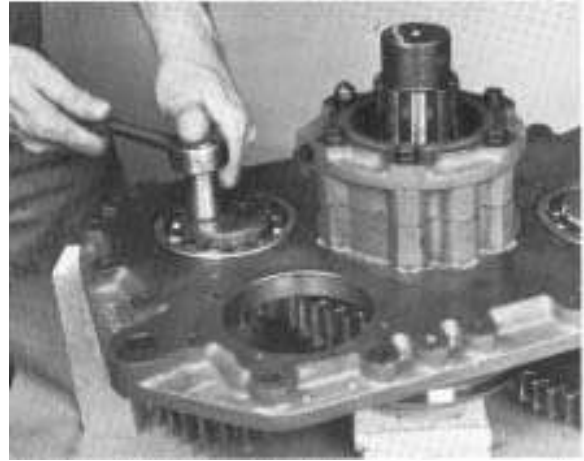
4. Mark two timing teeth on each side of low speed gear, directly opposite. mark any two adjacent teeth; then mark the two adjacent teeth which are directly opposite the first set of marked.



5. Place countershafts into position and time gears by meshing marked tooth on each countershaft between the two marked teeth on low speed gear. (rear plate is placed on blocking, approximately 8" high. Blocking must also be placed under synchronizer assembly).



6. Install rear bearings on countershafts and into rear bores.

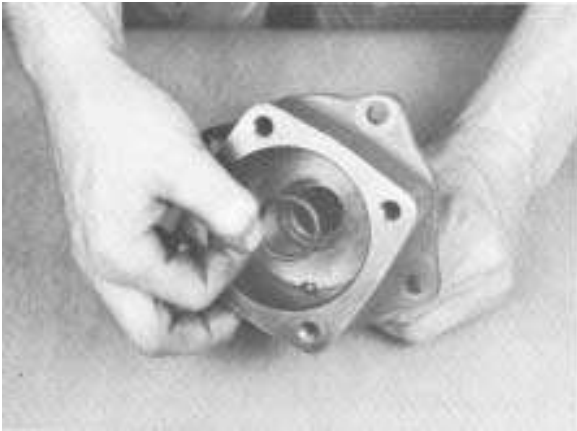


7. Install bearing retainer plates on countershafts. Tighten and wire securely.



8. Install rear bearing covers, tighten cap screws securely.

D. To Reassemble and Install the range Shift Cylinder Assembly



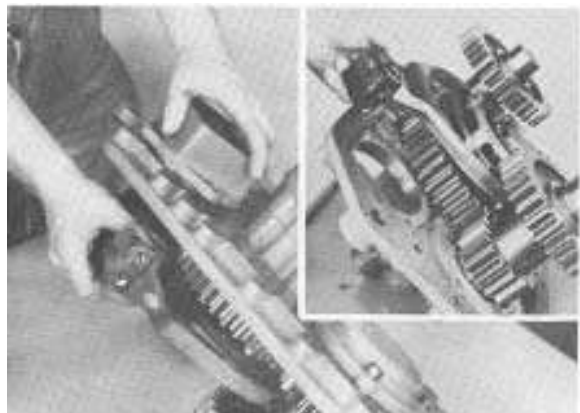
1. Install O-ring in bore of range shift air cylinder.



2. Install washer in shift cylinder against O-ring.



3. Install snap ring in shift cylinder to secure washer and O-ring.



4. Install shift cylinder and position shifting yoke in sliding clutch and cylinder housing



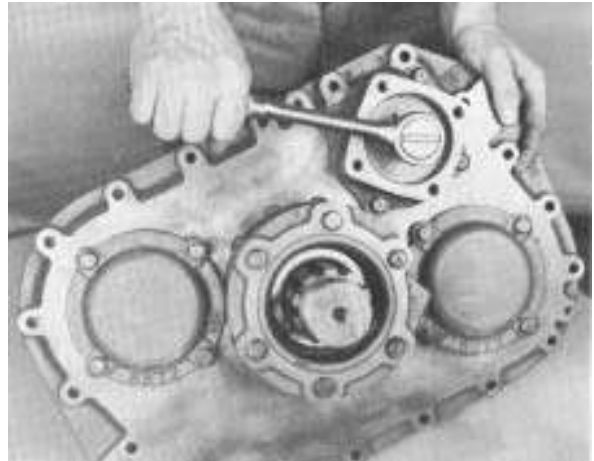
5. Install the shifting bar; align notches with capscrew bores in yoke.



6. Install yoke lock screws, tighten and wire securely. Correctly position cylinder and install capscrews which attach cylinder to rear plate.



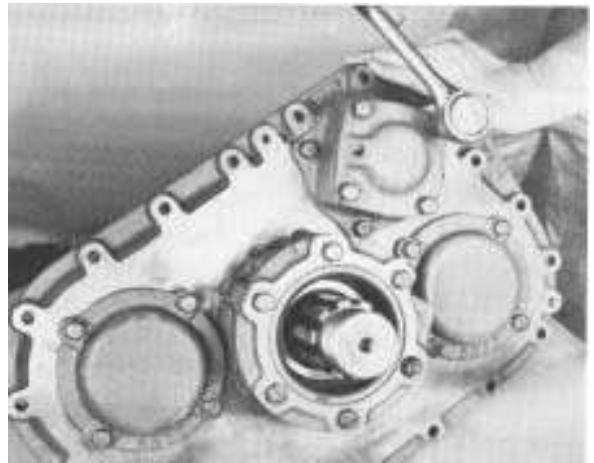
7. Install O-ring in ID of piston.



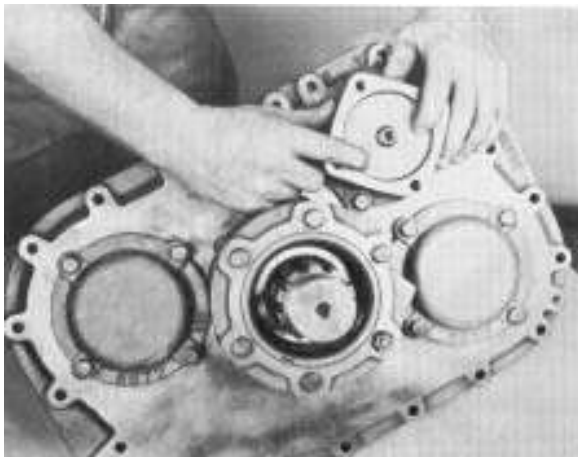
10. Install elastic stop nut on shifting bar.



8. Install O-ring on OD of piston.



11. Install shift cylinder cover.



9. Install piston on shifting bar and into cylinder bore.

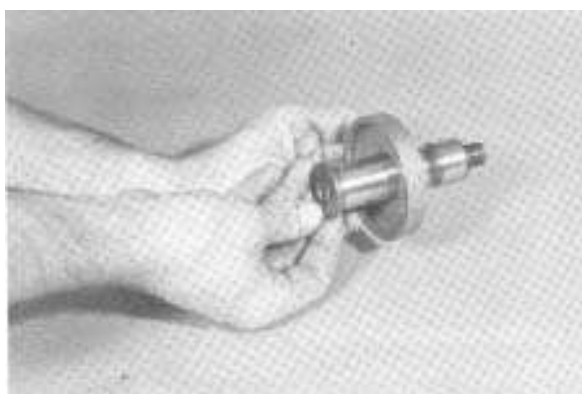
II. FRONT SECTION

A. To Reassemble and Install the Right Reverse Idler Gear Assembly

Before starting the assembly, check to make sure all three magnetic discs are placed in the bottom of the case. These can be installed with “3M Brand” adhesive, no. EC 1300.



1. Install plug in reverse idler shaft.



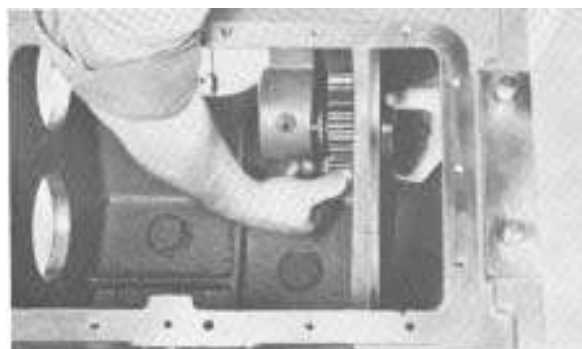
2. Install cup on reverse idler shaft.



3. Install bearing inner race on shaft and against cup.



4. Press needle bearing in bore of reverse idler gear.



5. Install reverse idler gear and thrust washer on shaft as shaft is inserted into bore. make sure needle bearing in gear seats on inner race evenly before completing installation of shaft.



6. Install elastic stop nut and retainer washer on shaft. (if desired the auxiliary countershaft front bearing can now be installed in the right reverse idler bore).

B. To Reassemble and install the Countershaft Assemblies

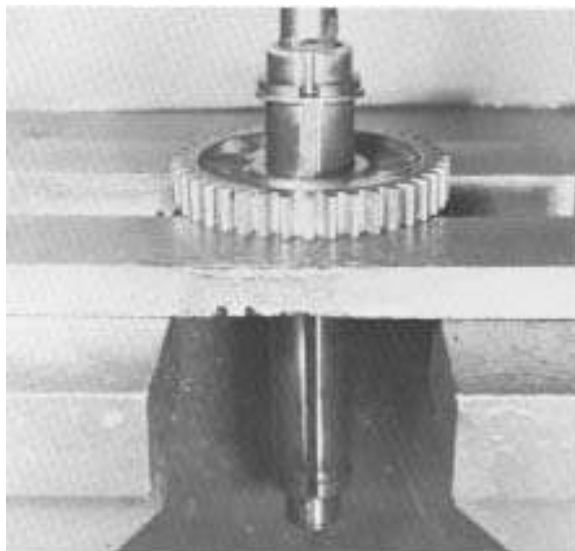
Except for the number of teeth on the power take-off gears, the countershafts are identical and assembled in the same manner.



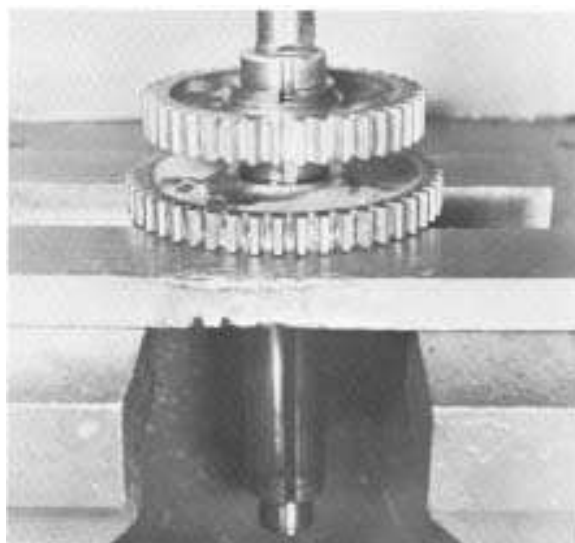
1. Install the countershaft front spacer.



2. Install the front key in countershaft.



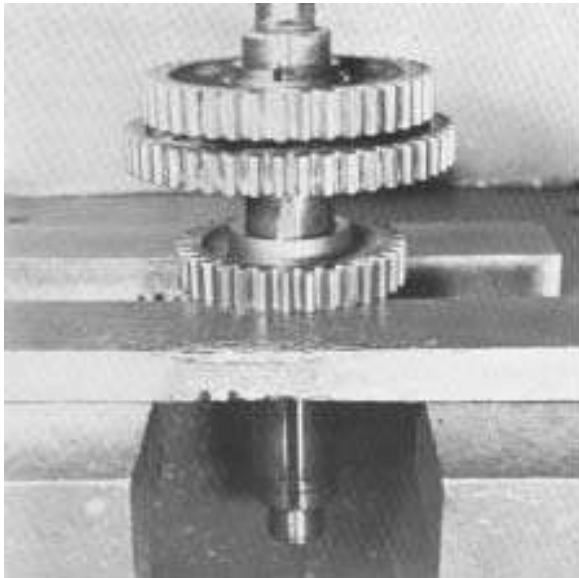
3. Press the drive gear (3rd speed) on countershaft, long hub to the rear.



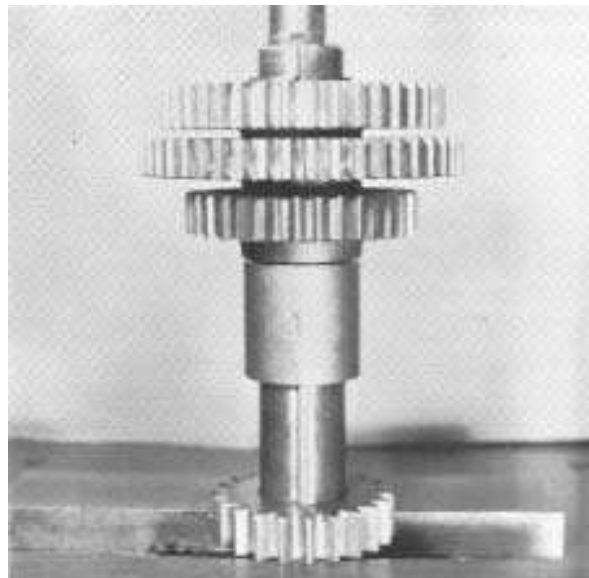
4. press the power tak-off gear on shaft, bullet nose of teeth to the rear.

The left-side countershaft takes a 47 tooth PTO gear; the right -side countershaft takes a 45-tooth gear; After installing PTO gear on countershaft, mark assembly either left or right to correspond with installed PTO gear.

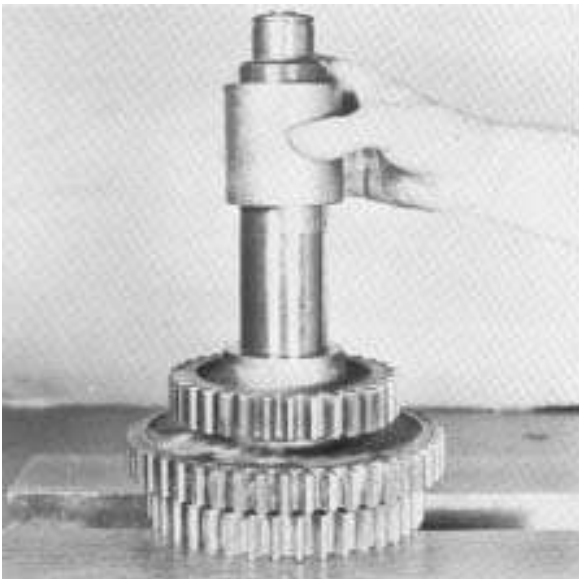
B. Countershaft Assemblies, Continued



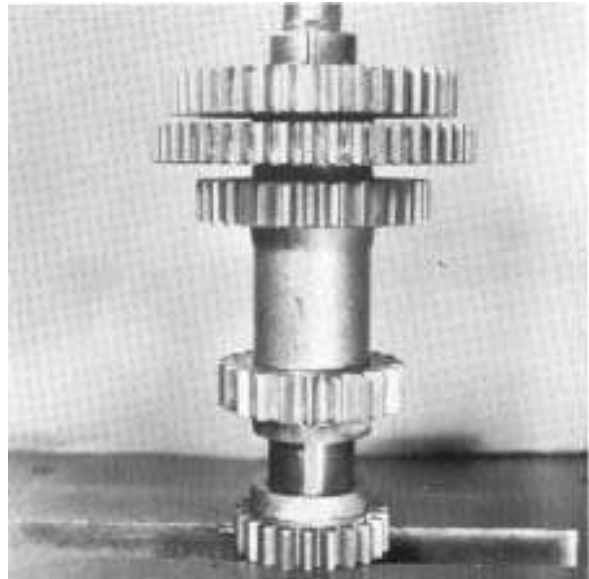
5. Press 2nd speed gear on countershaft, long hub to the rear.



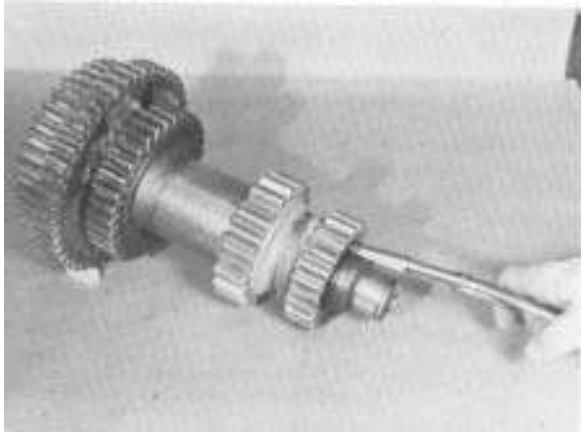
7. Press 1st speed gear on countershaft, long hub to the rear.



6. Install spacer on countershaft and install the rear key in keyway in countershaft; groove in spacer towards front of shaft.



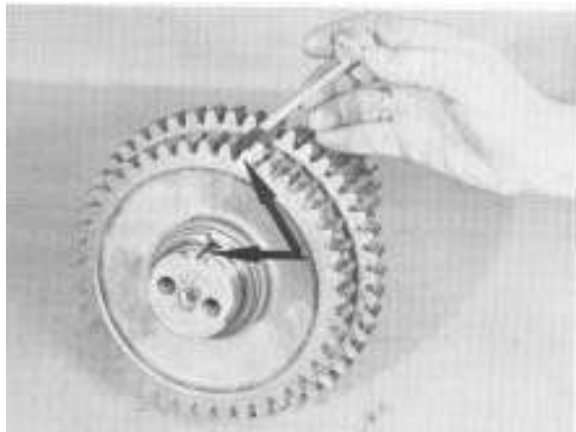
8. Press the reverse gear on countershaft, long hub to the front.



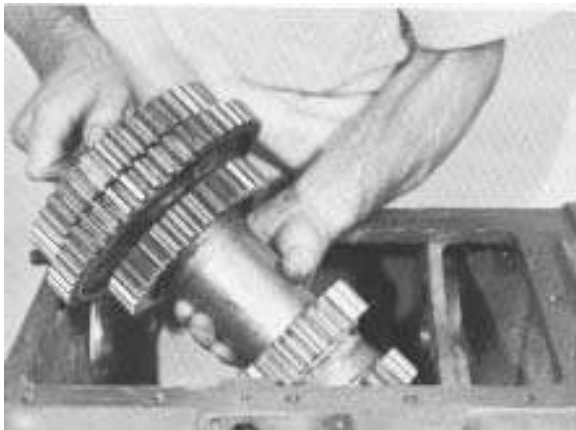
9. Install snap ring in groove at rear of countershaft.



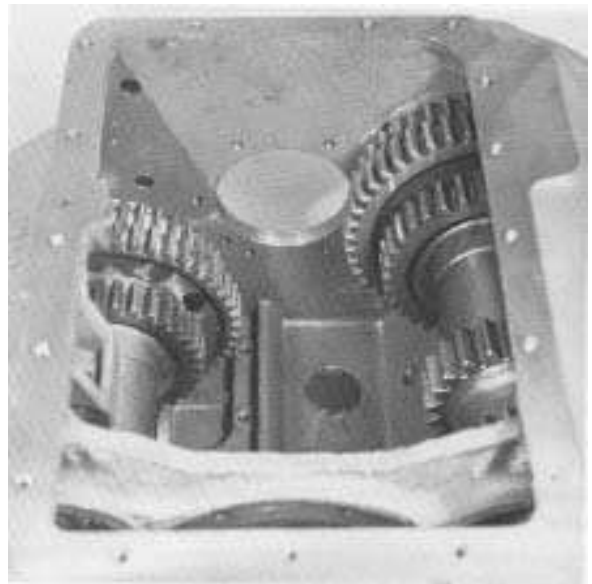
12. Place the right countershaft assembly (45-Tooth PTO gear) into position in case. Do not install bearings.



10. mark timing tooth on each countershaft drive gear. Tooth is aligned with keyway and is stamped with an "O".



11. Place the left countershaft assembly (47 tooth PTO gear) into position in case. Do not install bearings.

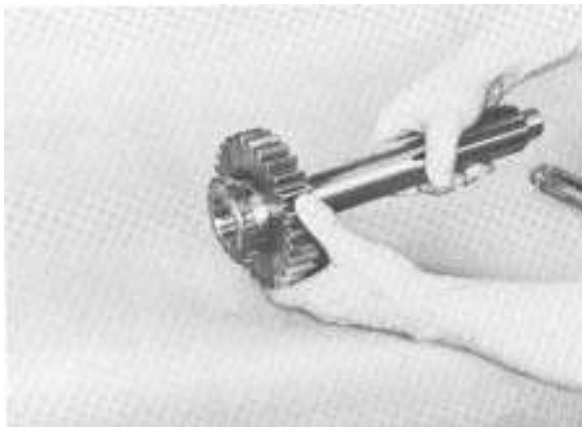


13. Countershafts in position in case.

C. To Reassemble and Install the Drive Gear Assembly



1. Install snap ring in ID of drive gear.



2. Install drive gear on splines of shaft, snap ring of gear towards the front.



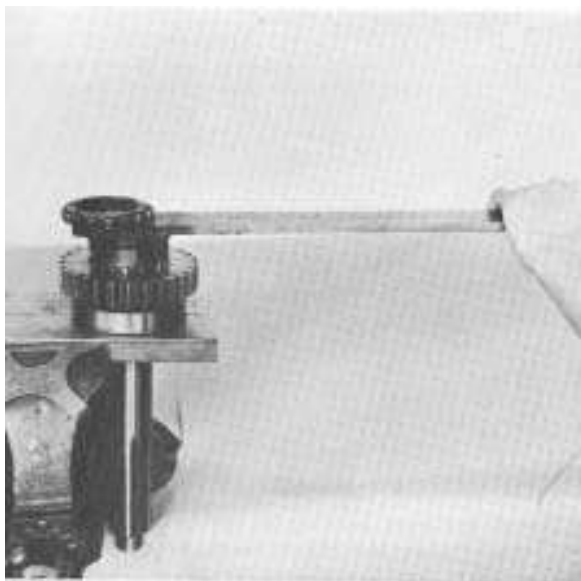
3. Install spacer on shaft.



4. Drive gear bearing installed on shaft; a press fit.



5. Apply grade AVV loctite sealant to threads of drive gear nut. Also apply sealant to threads of shaft.



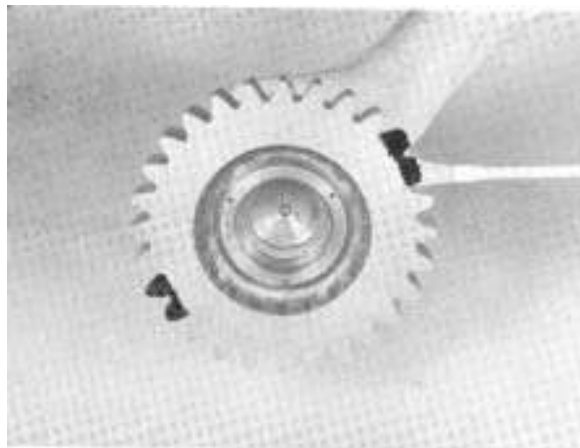
6. Install the drive gear bearing nut, Left hand thread. Use 250-300 ft.lb. of torque.

Note: If torque wrench is not available, torque can be approximated by multiplying the pounds of pull times the length of wrench handle. For example: If there are 150 pounds of pull on a wrench with a two-foot handle, multiply 150×2 which equals 300 ft. lb. of torque. Ordinary pull scales can be used to measure pounds of pull.

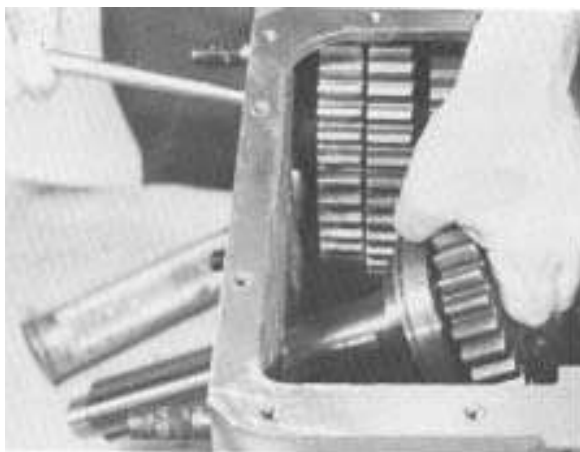


7. Peen nut into the two slots of shaft.

To hasten the hardening of loctite, place the assembly under heat lamps 10 to 15 minutes.



8. Mark drive gear teeth for timing, two adjacent teeth plus two adjacent teeth directly opposite.

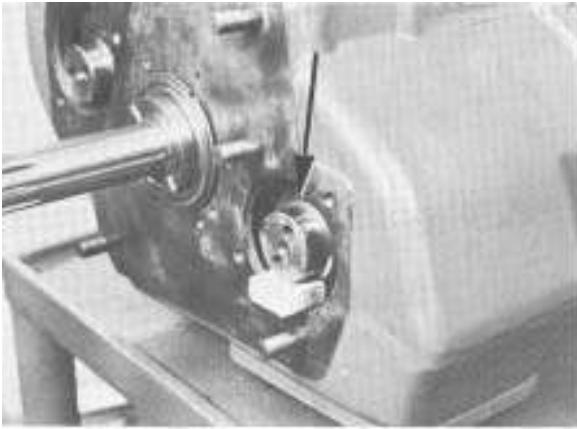


9. Insert clutch shaft through bore from inside case, working drive gear past countershaft gears to seat bearing in front bore.

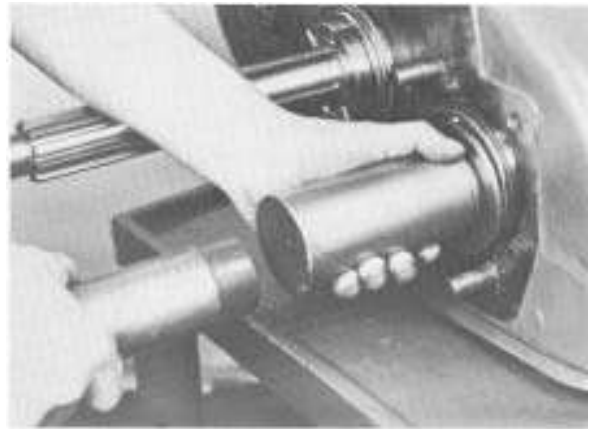


10. Install snap ring on drive gear bearing.

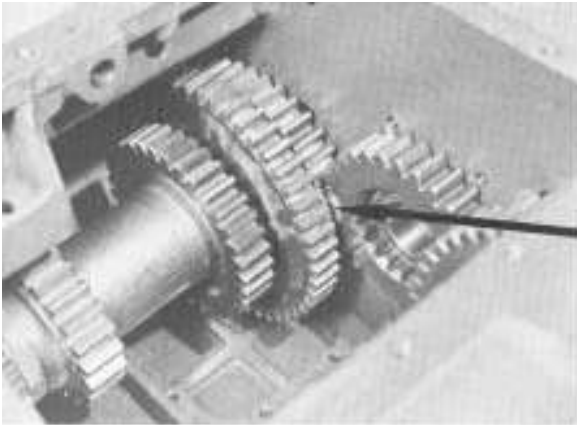
D. To Install the Countershaft Bearing and Tim the Gearing



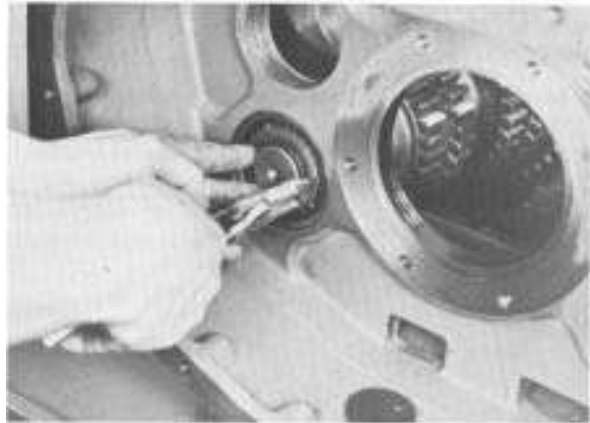
1. Center front of left countershaft in case bore.



4. Install front bearing on left countershaft. make sure timing teeth are still in mesh.



2. Mesh the timing tooth of left coountershaft with timing teeth of drive gear.



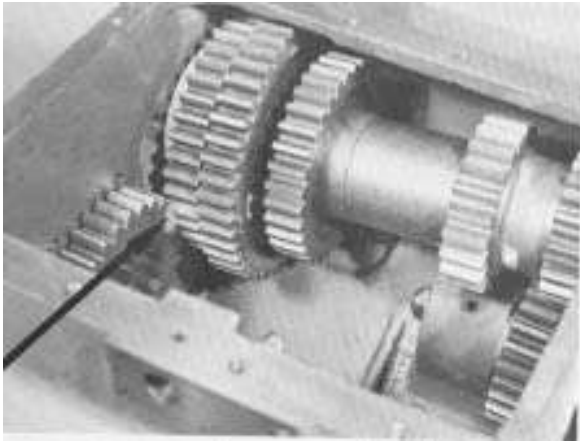
5. Install the snap ring on rear of left countershaft.



3. Install rear bearing on left countershaft and into case bore.



6. Install the bearing retainer plate on front of left countershaft. Tighten and wire securely.



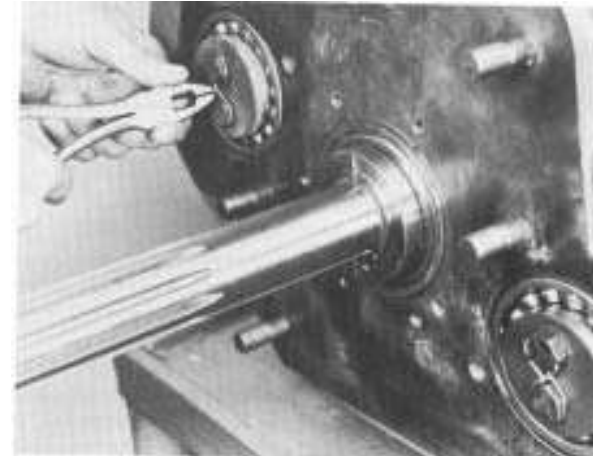
7. Mesh timing tooth of right countershaft with the two timing teeth on drive gear.



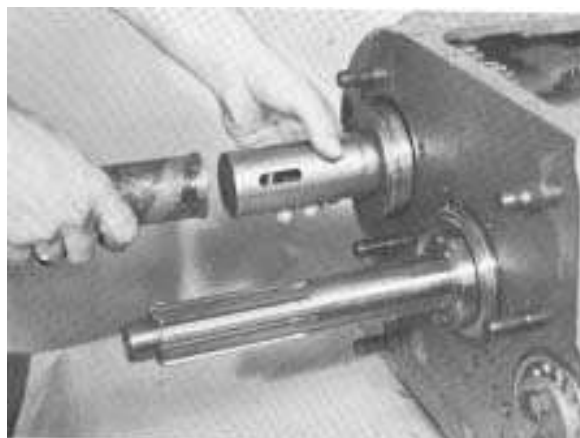
10. Install the snap ring on rear of right countershaft.



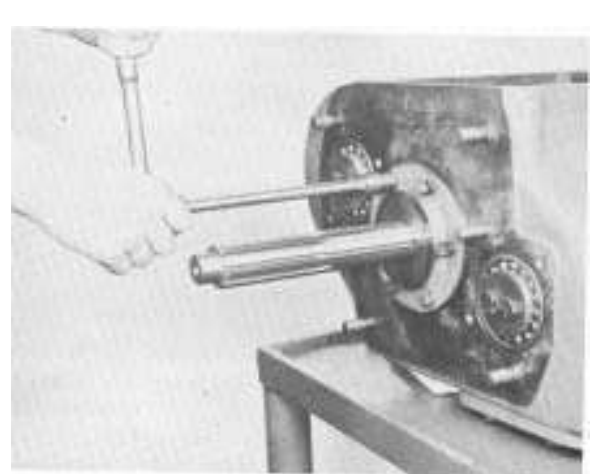
8. With front of shaft centered to bore, Install the rear bearing on right countershaft and in case bore.



11. Install the bearing retainer plate on right countershaft. Tighten and wire securely.



9. Install the front bearing on right countershaft and in case bore.



12. Install the drive gear bearing cover.

E. To Reassemble and install the mainshaft Assembly

For reference purposes, the gear washers are internally splined and contain a square keyway. The gear spacers are externally splined to engage splines of gears. There is one washer and one spacer for each gear.

Axial Clearance (end play) limits are:

Forward speed gears--.005" to .012"

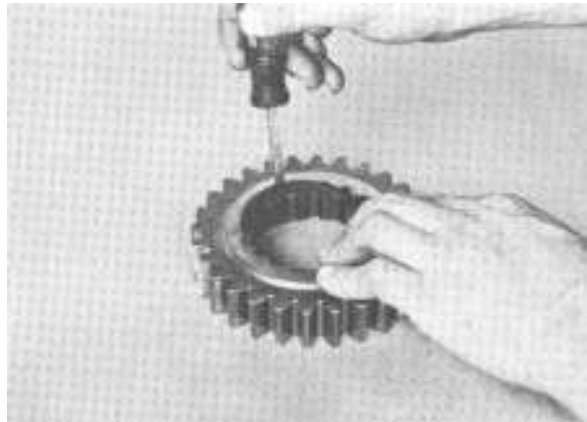
Reverse speed gear --.005" to .038"

Washers are used to obtain the correct limits; six thicknesses are available as follows:

PART NO.	LIMITS	COLOR CODE
14274	.248--.250	White
14275	.253--.255	Green
14276	.258--.260	Orange
14277	.263--.265	Purple
14278	.268--.270	Yellow
14279	.273--.275	Black

Always use the low limit washer (14274) in the Reverse, 1st speed gear positions and 2nd speed gear stop position (see assembly procedures).

In most cases, when setting up the reverse gear clearance, the low limit washer will give the correct clearance. However, if desired, this clearance can be measured before the mainshaft assembly is installed in the case. This is done by securing the reverse gear in position on mainshaft with the reverse gear snap ring and the front coupling snap ring; then, secure auxiliary drive gear assembly in position at rear of mainshaft with the rear coupling snap ring.



1. Install snap ring in ID of all mainshaft gears except the reverse speed gear.



2. Install the reverse gear washer on shaft, flat side down, and insert key through keyway in washer. (use 14274 low limit washer).



3. Install the first-reverse sliding clutch on shaft.

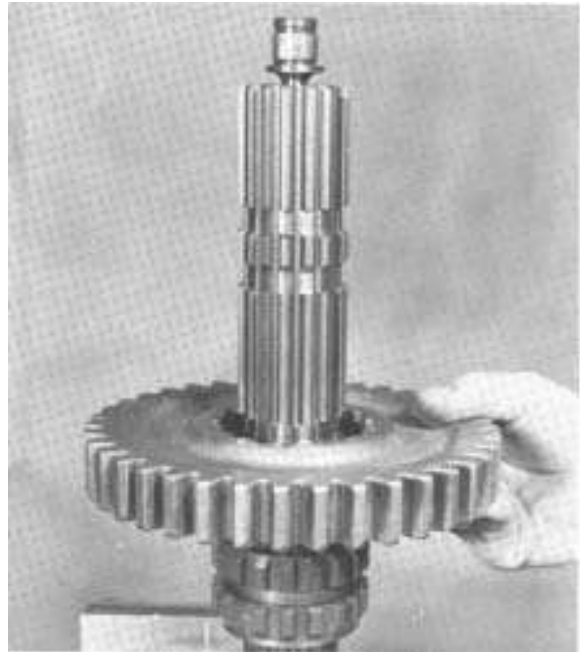


4. Install the first speed gear washer, flat side up, engaging keyway with key. (use 14274 low limit washer).

The key is to be moved upwards to engage each part (except gears) as it is placed on mainshaft.



5. Install the first speed gear spacer, flat side next to washer.



6. Install the first speed gear on shaft and splines of spacer.

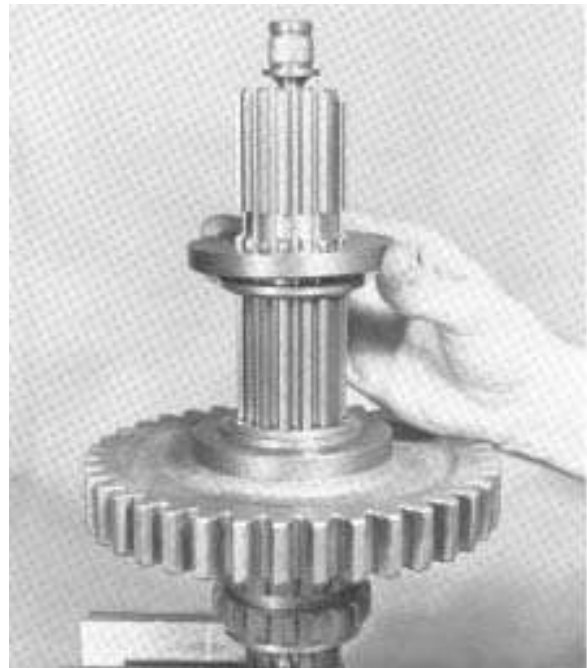


7. Install the first speed gear stop, move key up to lock in position.

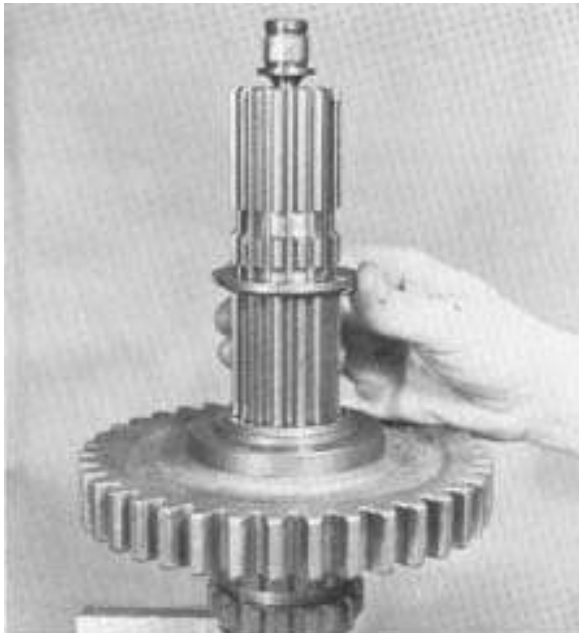
Mainshaft Assembly, Continued



8. Install the first speed gear stop washer flat side down, engaging keyway with key. (use 14274-14279 washer to obtain correct end play. Use feeler gauge between hub of gear and stop to obtain reading).



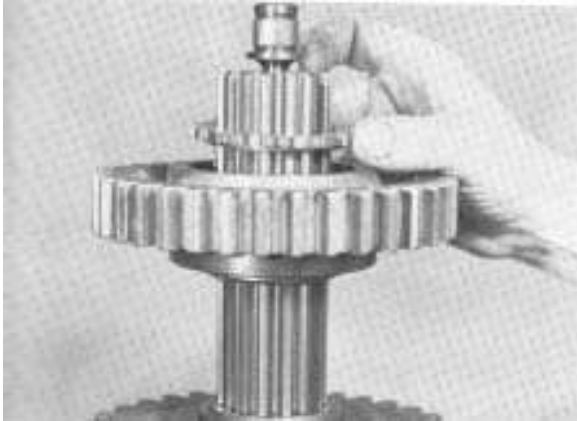
10. Install 2nd speed gear stop.



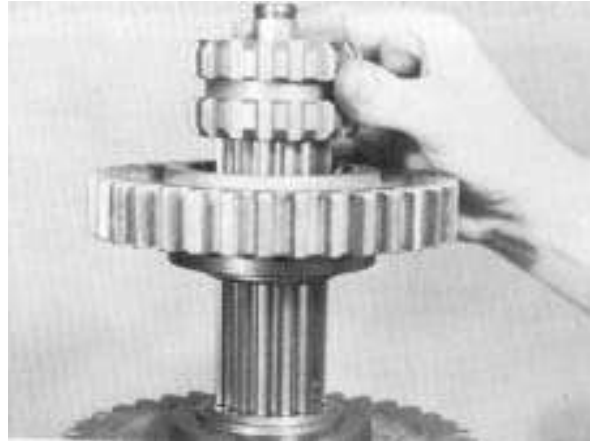
9. Install the 2nd speed gear stop washer, flat side up engaging keyway with key. (use 14274 Low limit washer.)



11. Install the 2nd speed gear , clutching teeth up.



12. Install the 2nd speed gear spacer into hub of gear, flat side up.



15. Install sliding clutch gear on mainshaft.



13. Install the 2nd speed gear washer in hub of gear, flat side down.



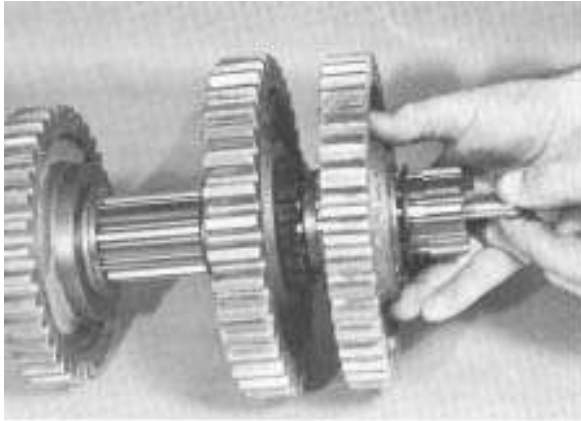
16. Install bearing on front of shaft. Photo shows special tool which seats bearing without changing quill location.



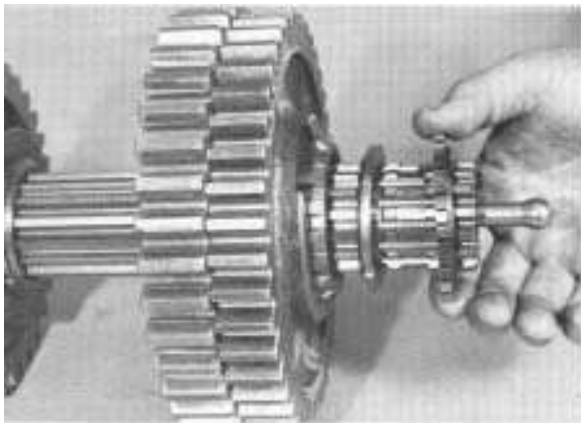
14. turn the 2nd speed gear washer until washer splines align with splines of shaft; lock with long key. (use 14274-14279 washer to obtain correct end play. take reading with feeler gauge between gear hub and gear stop.)



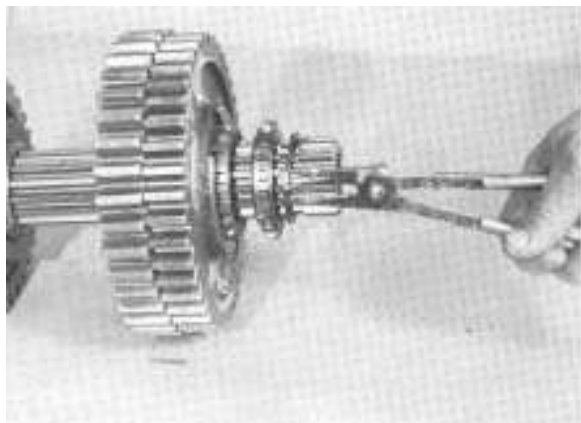
17. Install snap ring on quill to secure bearing.



18. Install reverse gear on mainshaft and against 1st speed gear, snap ring groove to the rear.



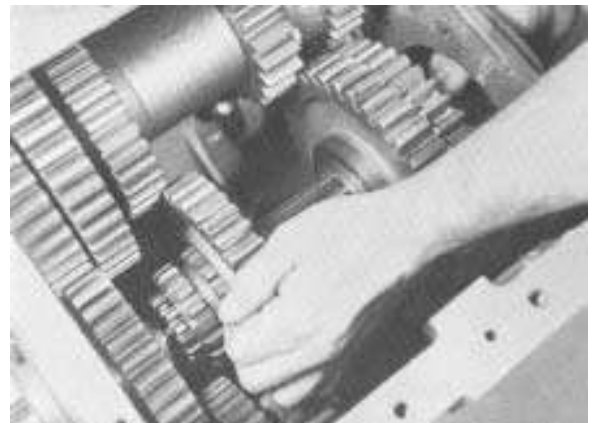
19. Install the reverse gear, splined spacer on shaft and against washer, flat side towards washer.



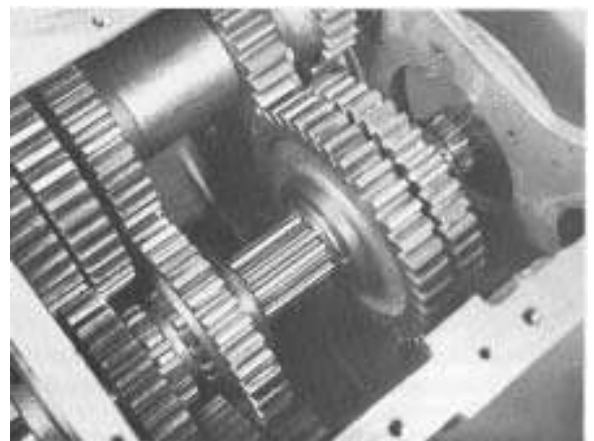
20. Install the front coupling snap ring on mainshaft to secure long key.



21. From inside case, insert rear of mainshaft through rear bearing bore; lower assembly into position.



22. Align 1st and 2nd speed gear teeth on mainshaft with those on countershaft; move assembly forward to seat quill bearing in drive gear pocket.

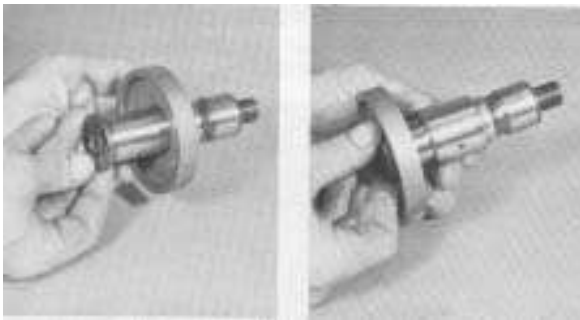


23. Mainshaft assembly correctly positioned

F. To Assemble and Install the Left Reverse Idler gear Assembly



1. Install plug in reverse Idler gear



2. Install cup and bearing inner sleeve on shaft.



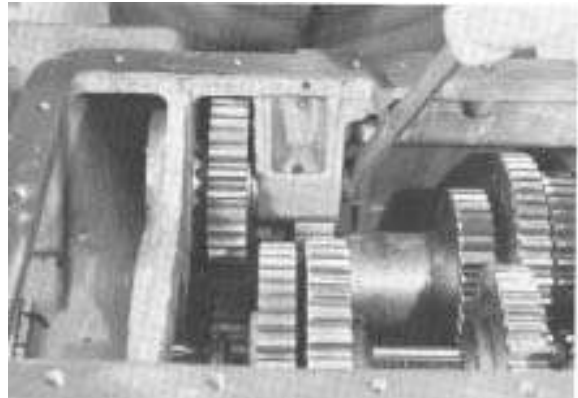
3. press needle bearing into bore of reverse idler gear.



4. Place thrust washer and gear into position in case and insert shaft through gear and into boss.



5. seat shaft in bore; make sure needle bearing is aligned with bearing sleeve.



6. Install washer and retainer nut on threads of shaft.

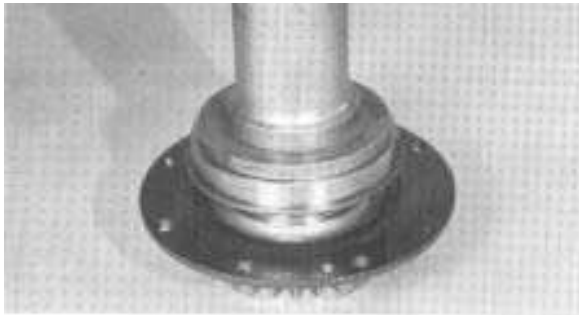


with reverse idler gears and install snap ring in ID of gear.

G. To Reassemble and Install the Auxiliary Drive Gear Assembly



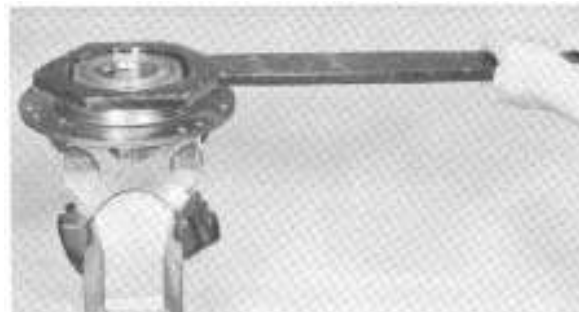
1. Place retainer ring on auxiliary drive gear.



2. Press bearing on drive gear



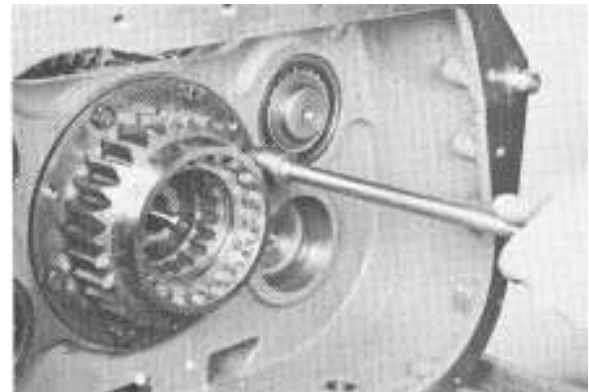
3. Apply loctite Grade AVV sealant to threads of auxiliary drive gear nut and drive gear.



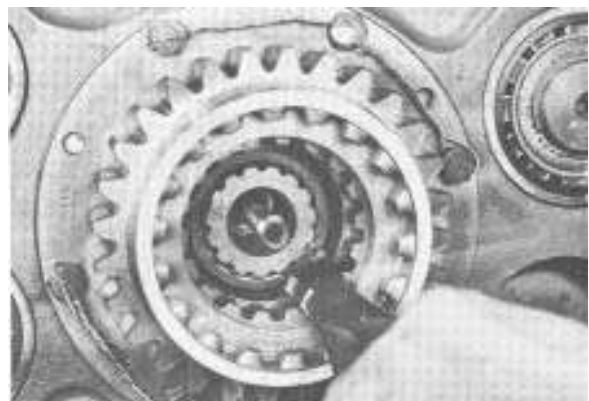
4. Install bearing Nut, left-hand thread.



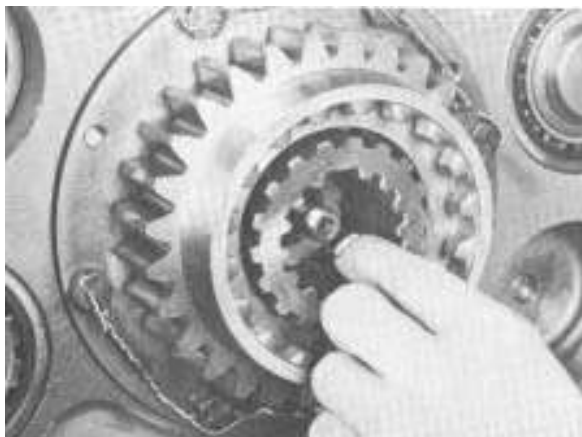
5. Install auxiliary drive gear assembly into case bore and over rear of mainshaft. Do not burr the face or edge of the tapered synchronizer surface.



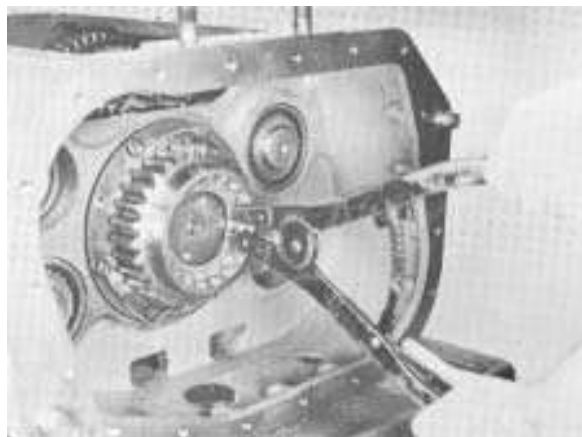
6. Install the six capscrews to attach retainer ring to case. wire capscrews in groups of three.



7. Pull mainshaft to the rear and install the mainshaft coupling snap ring in groove in mainshaft and groove in key.



8. Install the coupling gear in bore of auxiliary drive gear and splines of mainshaft.

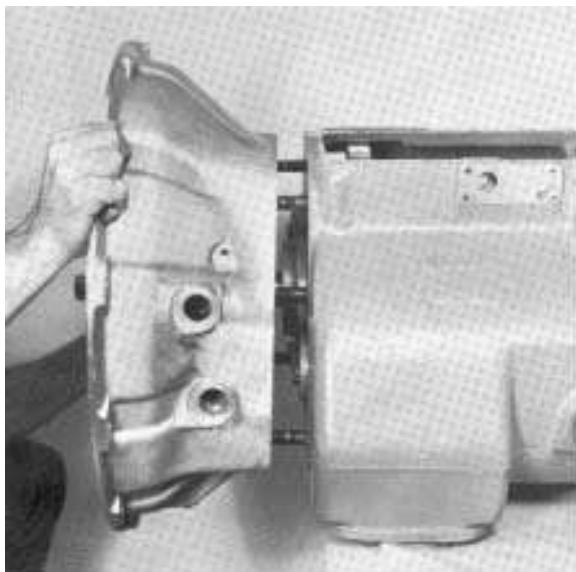


10. Install the snap ring in auxiliary drive gear.

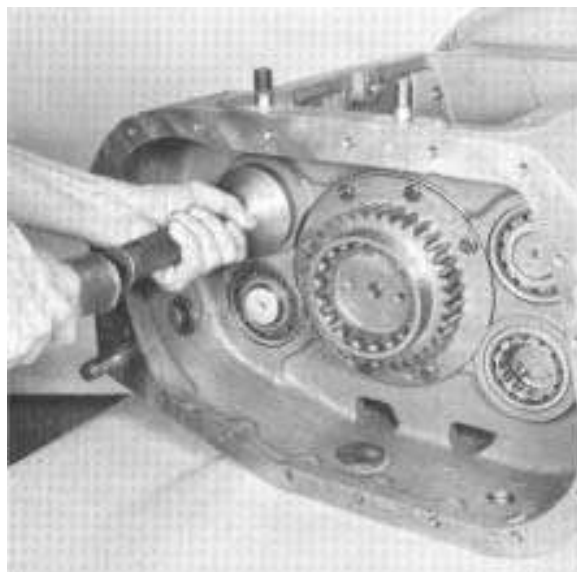


9. Install the rear quill support plate, flat side to the rear.

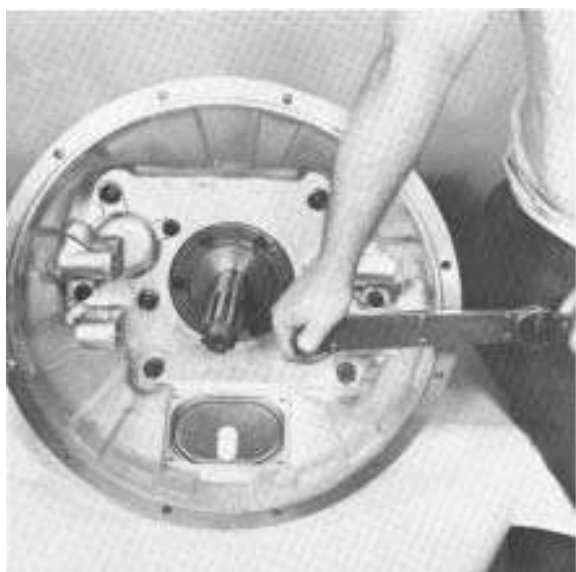
III. Clutch Housing, Auxiliary Section, and Companion Flange Installation



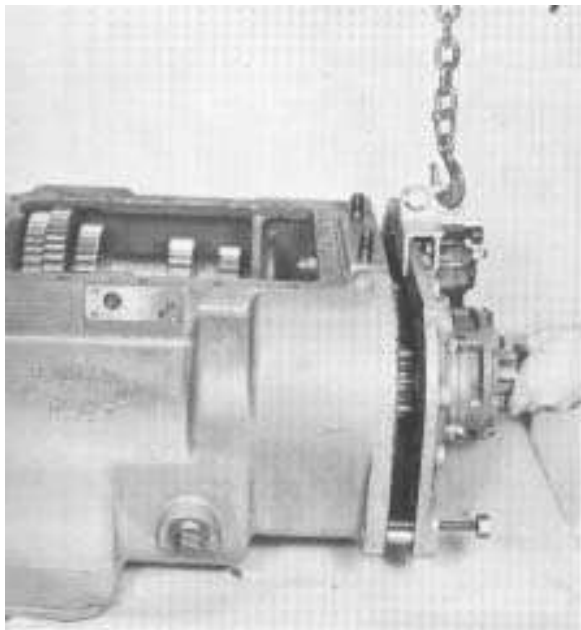
1. Install Gasket and clutch housing on studs in front of housing; pilot on front bearing cover.



3. Recheck front section to make sure all parts have been installed: seat auxiliary countershaft front bearing in reverse idler bores if not previously installed, check to make sure both snap rings are installed on countershafts, check dowel pins, check for snap ring in ID of auxiliary drive gear.



2. Install plain washers and nuts on six studs; Install shakeproof washers and four bolts. Use correct Torques:
Nuts---170--185 ft.lbs.
Bolts 70--75 ft.-lbs.

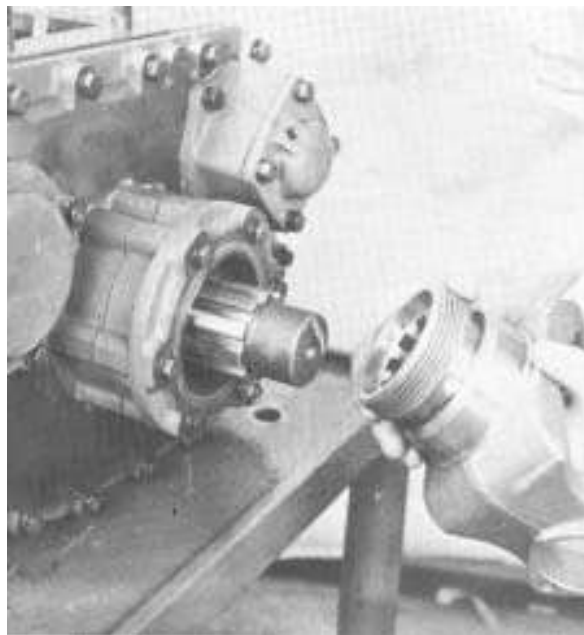


4. Install the auxiliary section on front section.

Place a chain hoist on auxiliary assembly to properly balance and hold its weight.

move the auxiliary section evenly onto rear of transmission. The two countershaft drive gears will mesh with the auxiliary drive gear, and front of countershaft will seat in the two bearing installed in the front section. move the assembly evenly, rotating drive gear if necessary, to properly mesh gears. Install attaching capscrews and tighten securely.

NOTE: Auxiliary section can also be installed by setting front section vertically on wood blocks and by lowering the auxiliary evenly on transmission.



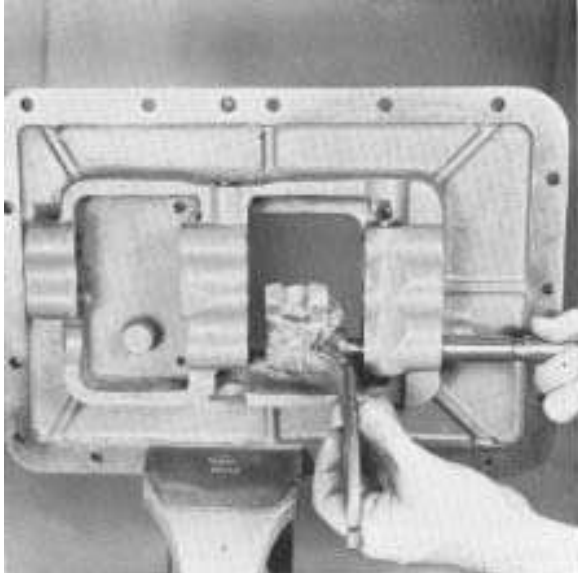
5. Install the speedometer drive gear on hub of flange or yoke. if speedometer gear is not used, install a replacement spacer of the same width.



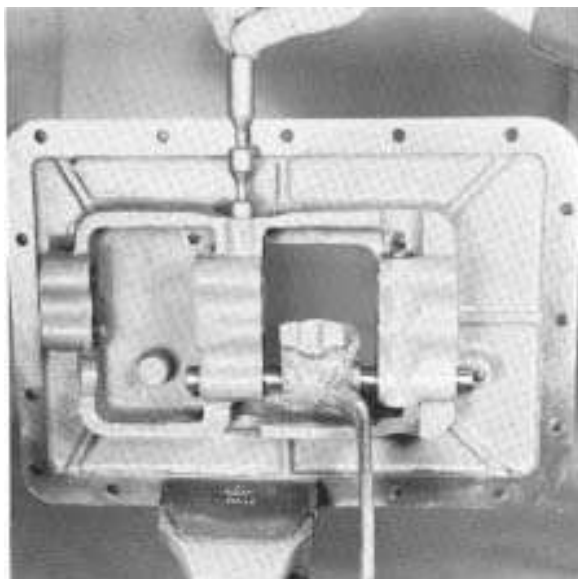
6. Lock transmission by engaging two gears with the sliding clutch gears; install flange or yoke on splines of output shaft and secure with nut, using correct torque of 450-500 ft.lb..

IV. Shifting Controls

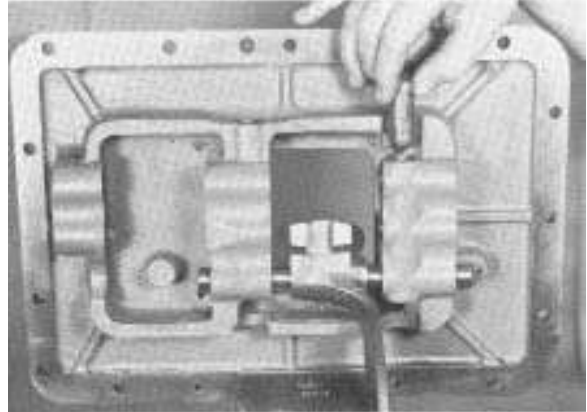
A. To Assemble and Install the Shifting Bar Housing Assembly



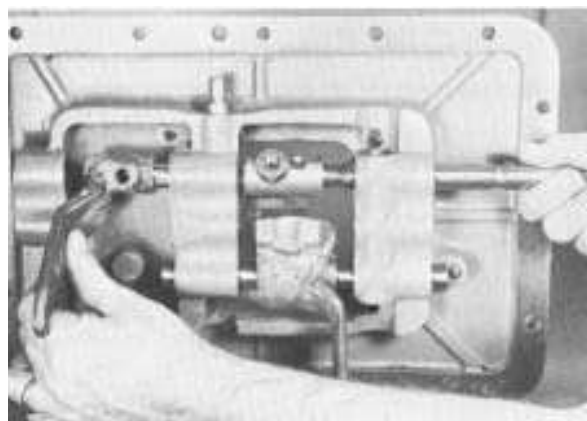
1. Install the first-reverse shifting bar yoke. Install lock-screw, tighten and wire securely



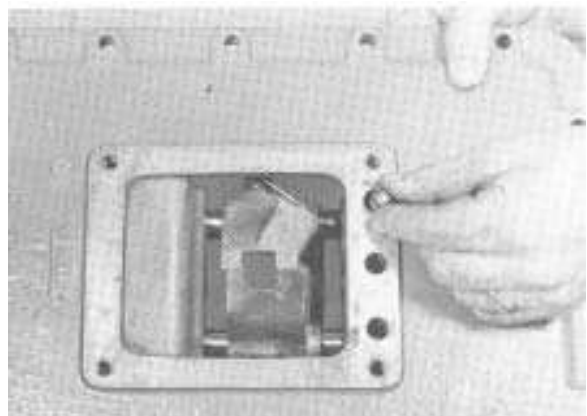
2. Install the actuating plunger.



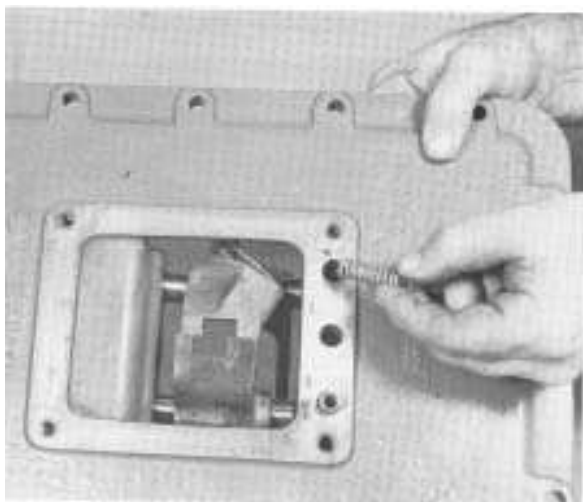
3. Install the interlock pin.



4. Install the second-third speed shifting bar Install lock-screws, tighten and wire securely.



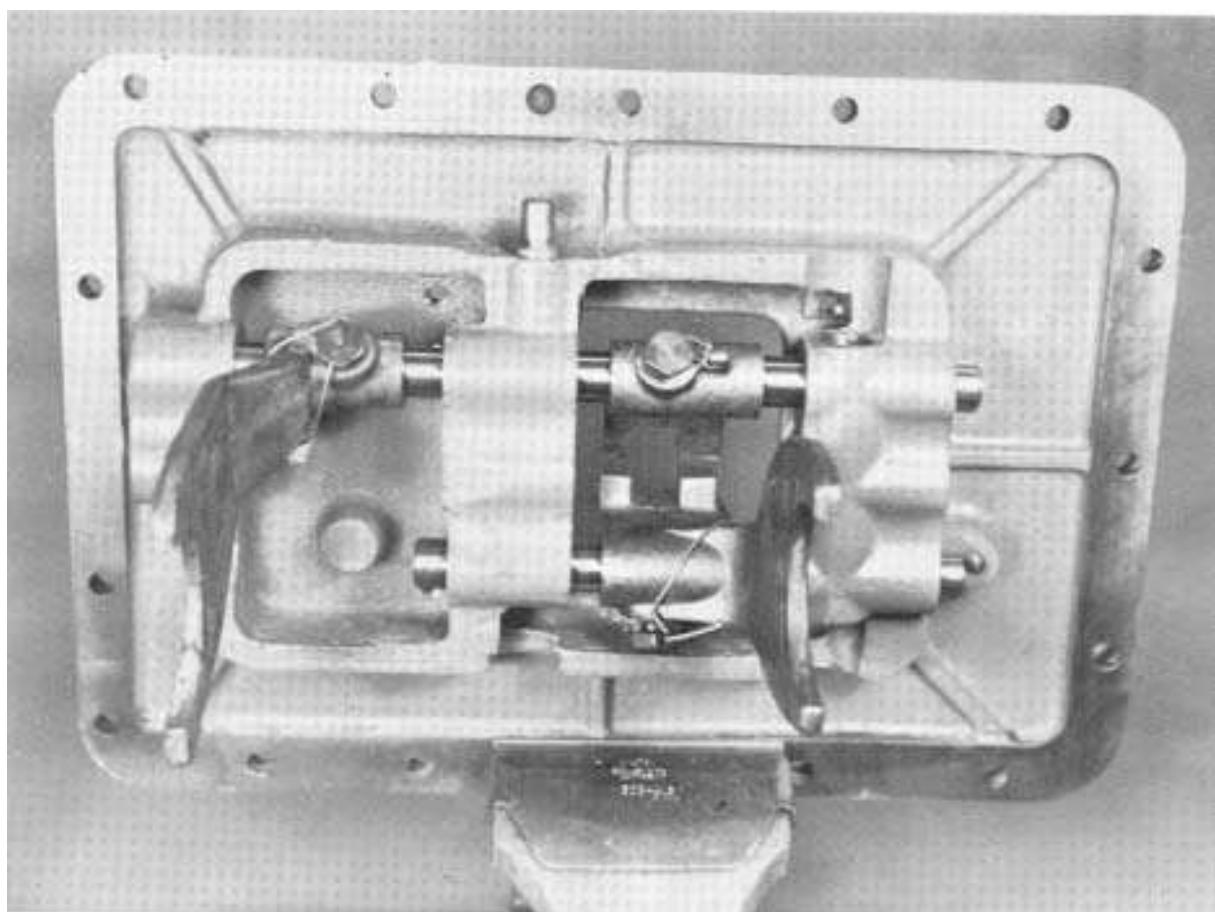
5. Install the two tension balls in bores at bar locations.L



6. Install tension springs. Install the orange spring in 1st-reverse rail position; green spring 2nd-3rd position.



7. Install the shifting bar housing on transmission, fitting yoke forks into slots in sliding clutch gears.



Shifting bar housing correctly assembled

B. To Reassemble and install the Gear Shift Lever Housing Assembly



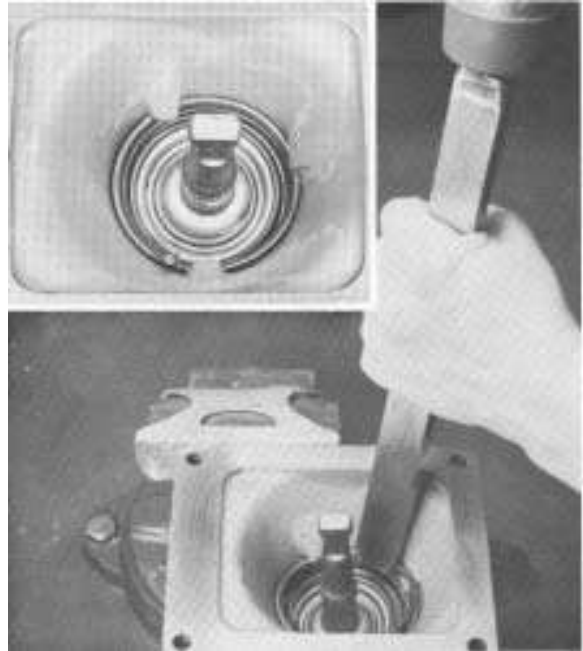
1. install lockwasher and nut on gear shift lever pivot pin.



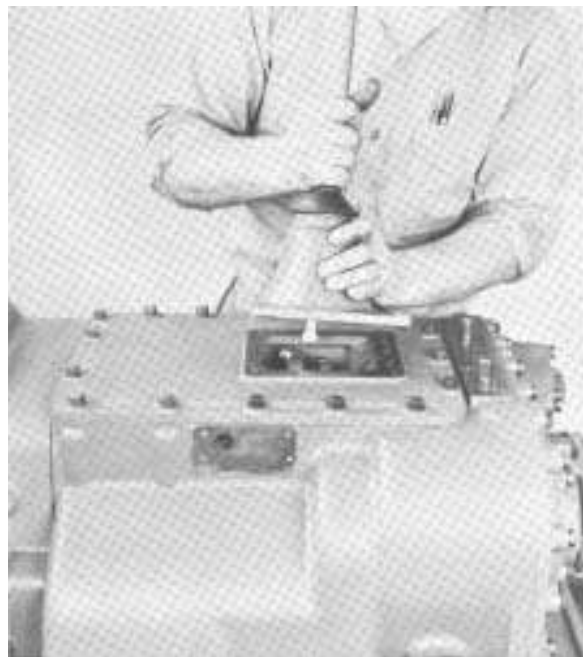
2. Install gear shift lever in housing, inserting pivot pin in slot in pivot ball of lever.



3. Place the tension spring washer in housing.

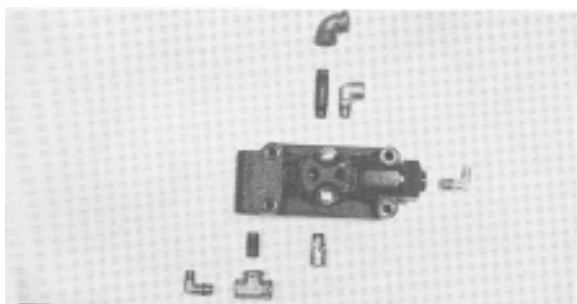


4. Seat the tension spring under lugs in housing. Insert shows spring correctly seated.



5. Install the gear shift lever housing on shifting bar housing, fitting lever into shifting slots in housing.

C. To Install the Range Shift Air System



1. Air valve and fittings. See page 12 for part numbers.



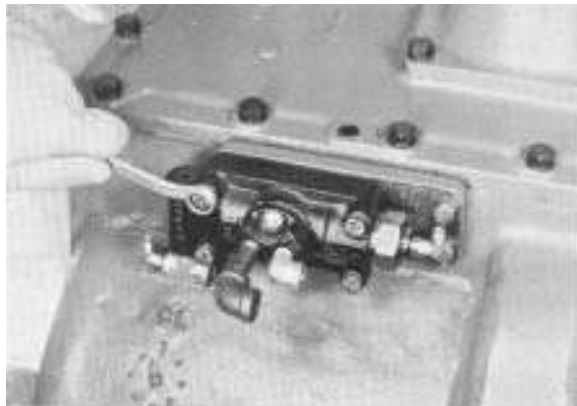
2. Install gasket and the air valve adapter plate. This takes two x-8-425 caoscrews, and two x-8-410 capscrews with x-3-400 washers. Make sure adapter plate is perfectly aligned with bore in case.



3. Install the actuating pin and spring in bore.



4. Install the alignment sleeve in air valve.



5. Install the air valve and gasket; use air to move piston either all the way forward or to the rear before installing air valve.

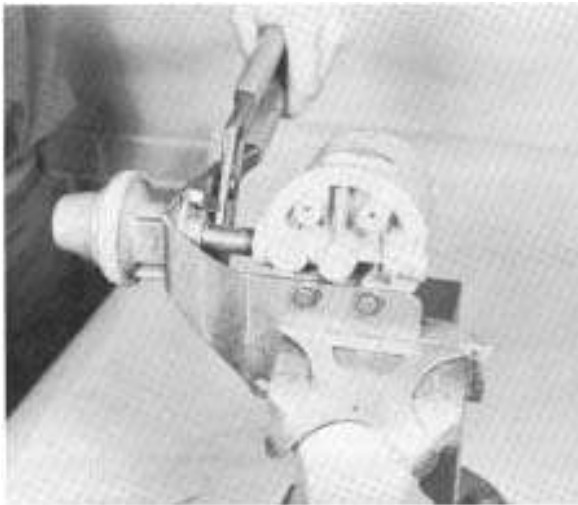


6. Install the high range air line between port in range cylinder cover and rear port in air valve.

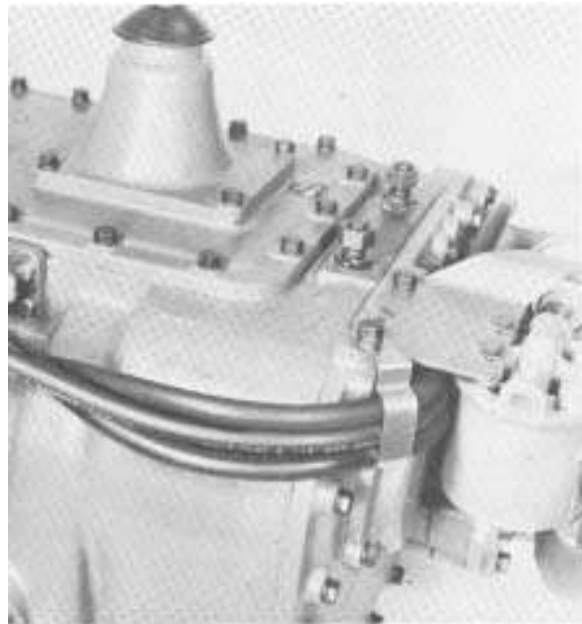


7. Install the Low range air line between port in range cylinder and front port to air valve.

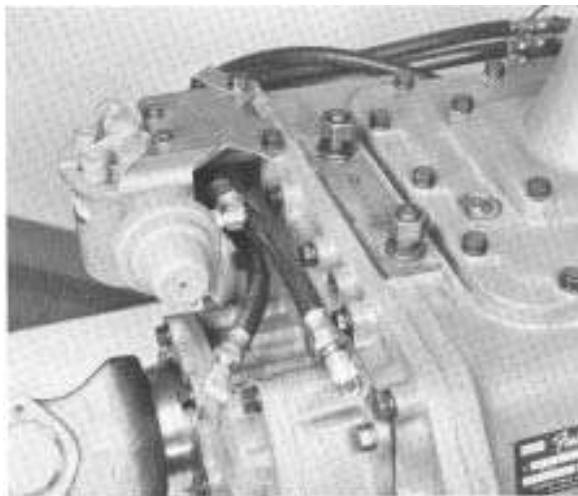
C. Range Shift Air Syatem, Continued



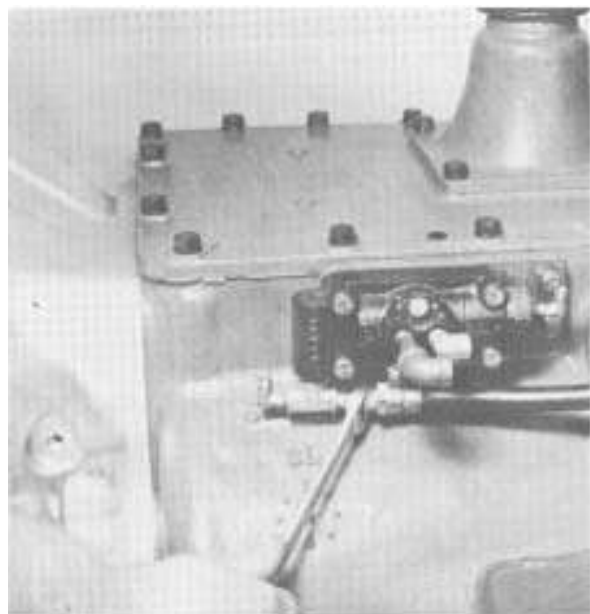
8. Secure bracket to air regulator with hexagonal nut. Nipple is installed in air filter and bracket attached loosely with the two capscrews; nut and washer are placed on nipple and regulator threaded on nipple.



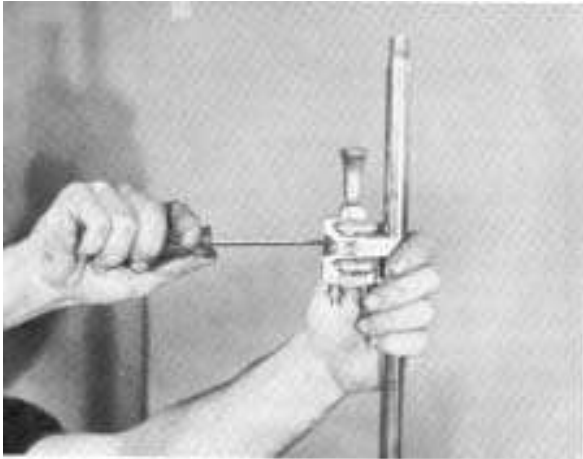
10. View of filter and regulator assembly properly installed and with hose clamped in position.



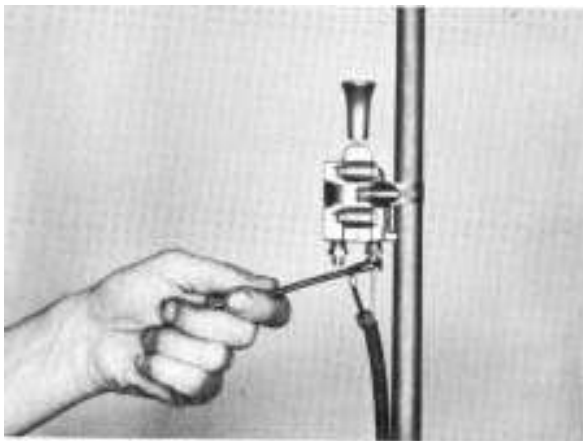
9. Install supply air line in output port of air regulator and install filter and regulator assembly on transmission.



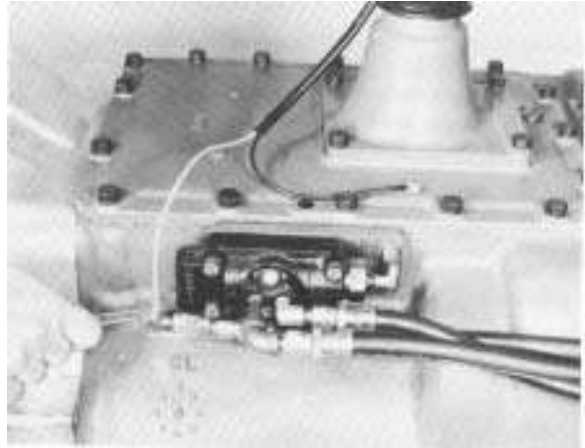
11. Connect the supply air line from regulator to the tee in air valve.



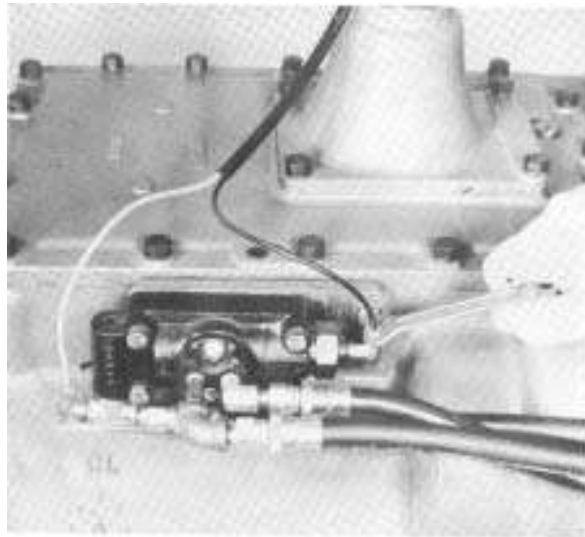
12. Install the range control valve on gear shift lever with clamp. Position control valve so that top of button in "up" position is approximately 6" below top of lever. Install ball grip.



13. Install the range control air lines valve. Black line is connected to the "out" port, and the white line is connected to the "in" or supply port.

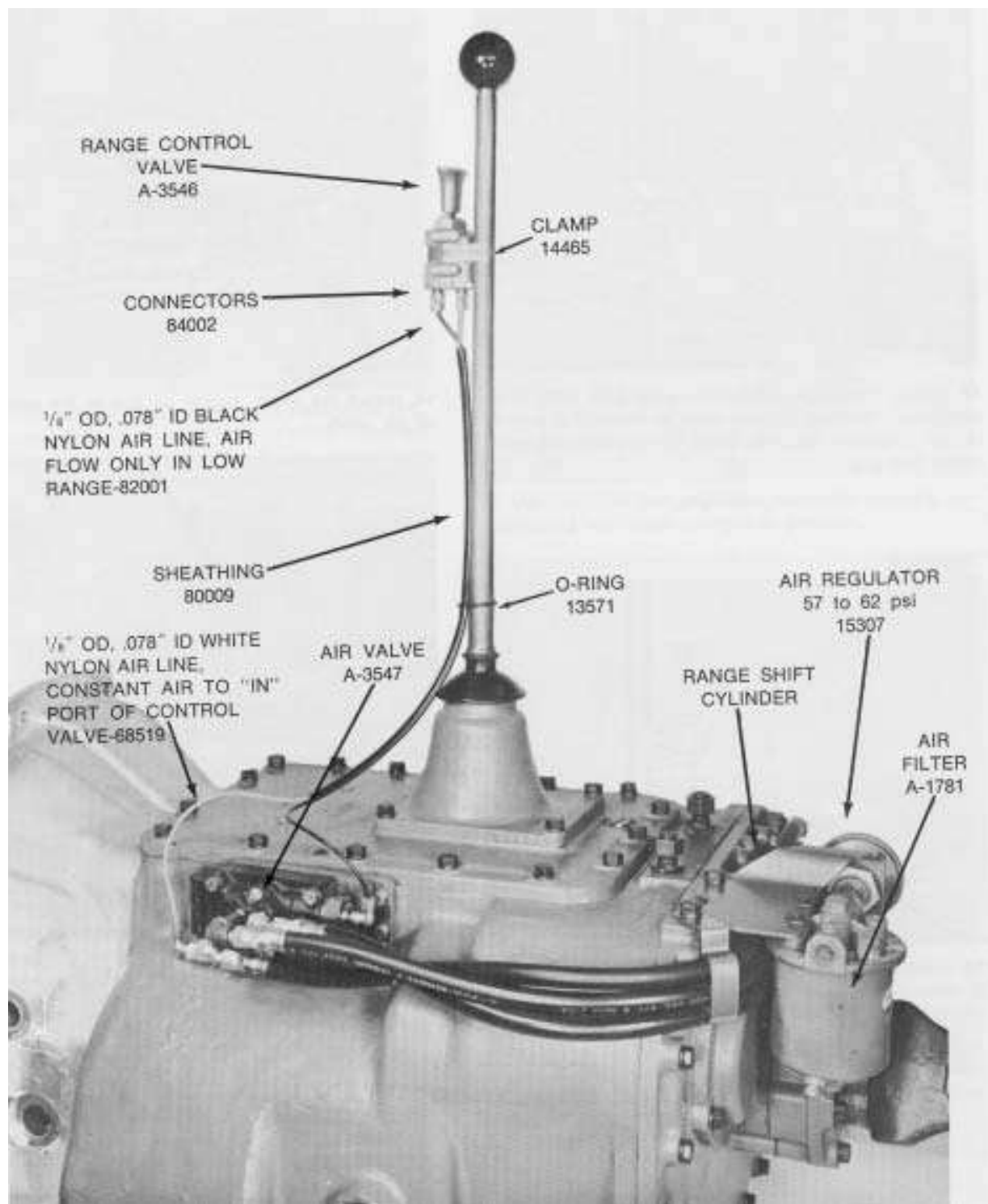


14. install the white supply port of air valve.



15. Install the black air line at hex-end air port on air valve.

AIR SYSTEM



RANGE SHIFT AIR SYSTEM

Operation

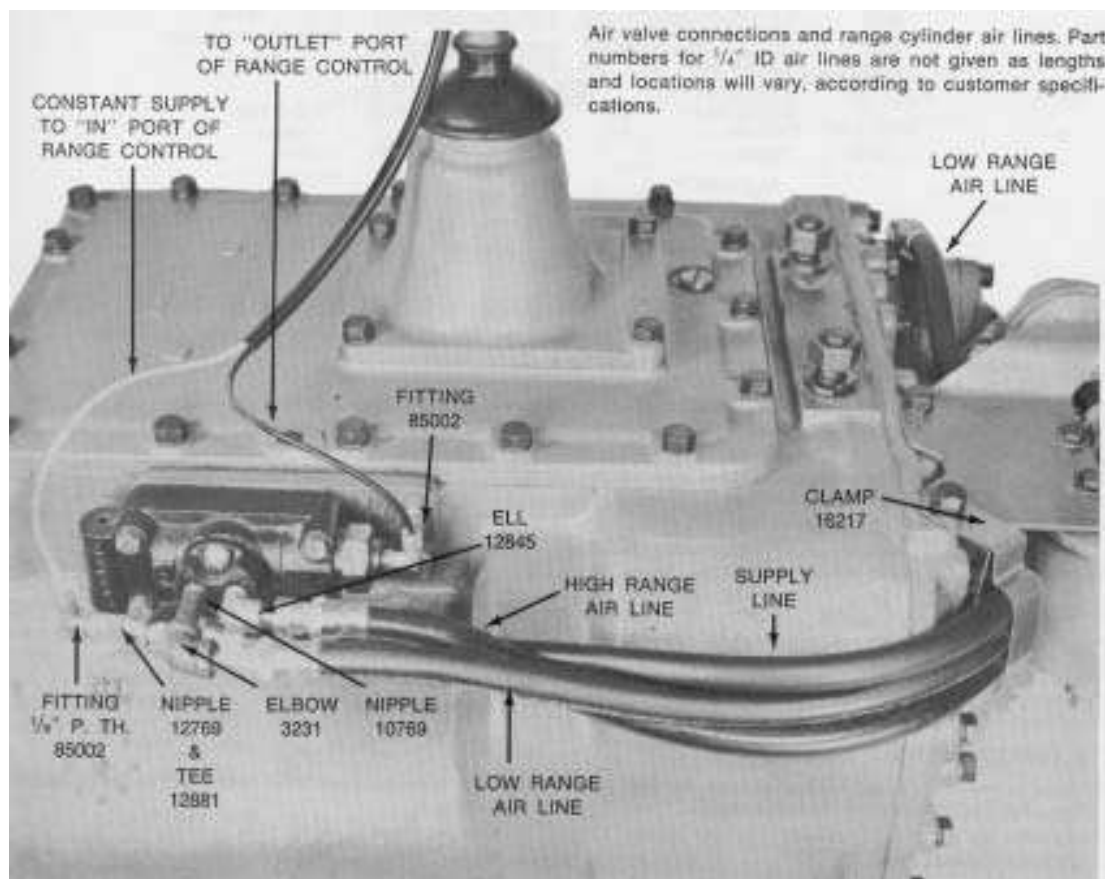
This system consists of an air filter, regulator, air valve, control valve, shift cylinder, fittings and connecting lines. See page 70.

Constant regulated air is supplied to the bottom port of the air valve located on the side of the transmission. It is also supplied to the "in" port of the control valve on gear shift lever.

With the control button down, air passes through the control valve and to the end port of the air valve. This aligns the actuating piston in air valve for low range porting, allowing air from the constant supply to flow through the low range port in front, side of air valve and to the low range port in the shift cylinder, located in the auxiliary section. Air on this port moves the range shift piston and bar to the rear to engage the low range gear.

With the control button up, the control valve is closed and air is removed from the end port of air valve. This aligns the actuating piston in air valve for high range porting, allowing air from the constant supply to flow through the high range port in rear, side of air valve and to the high range port in the shift cylinder cover. Air on this port moves the range shift piston and bar forward to engage the high range gear.

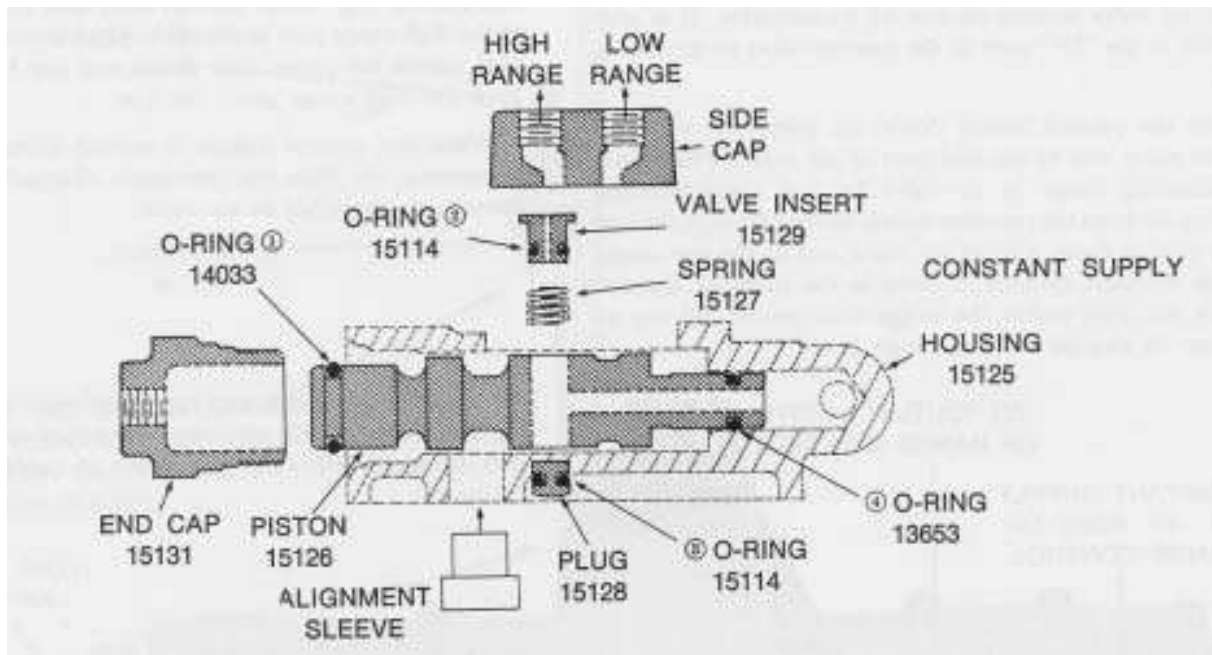
When the control button is moved from one position to another, air from the previously charged line exhausts through the breather in air valve.



Air Valve Operation

With the range control button up the control valve shuts off the air supply to the end cap. Thus, the constant air entering at the constant supply port forces the piston to the rear. The constant air also flows through a channel in the center of the piston and to an external port which is aligned with the high range port of the air valve.

With the control button down the control valve opens and supplies air to the end cap. Since the piston area is larger on this end of the piston, it is forced in the opposite direction. The external air port in the piston is now aligned with the low range port of the air valve.



Exploded view of air valve. Part Numbers, which are subject to change, are FULLER part numbers. The alignment sleeve is not part of the assembly, but must be installed in the housing for proper pre-select operation.

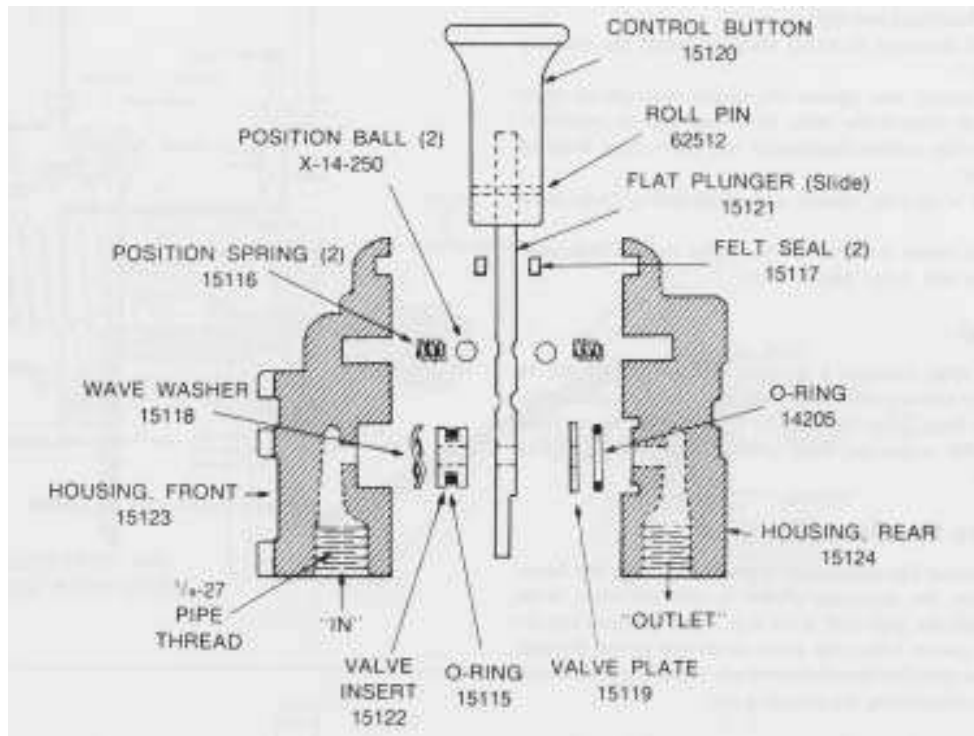
The four O-rings are indicated by circled numbers. If any of these are defective, there will be a constant air leak out of the exhaust on the air valve. In normal operation, exhaust will occur only for an instant as the range shift is made. The following chart is to be used as a guide to determine defective O-rings.

Defective O-rings	RESULTS
1	Constant leak through exhaust in low range only.
2 or 3	Constant leak through exhaust in both ranges.
4	Constant leak through exhaust in high range; steady but low volume leak through exhaust in low range.

To Disassemble Air Valve

1. Turn out the two capscrews and remove the side cap from valve body.
2. Remove the insert valve from piston and remove O-ring from the insert valve.
3. Remove the spring from the piston.
4. Turn end cap from valve body and withdraw piston from bore.
5. Remove the two O-rings from piston.
6. Remove the nylon plug from piston and remove O-ring from plug.

Control Valve Operation



Control Valve Operation

If the o-rings or parts in the control valve are defective there will be a constant air leak out the exhaust located on bottom of control valve.

A defective insert valve O-ring will result in a constant leak through exhaust in both ranges and valve will not make range shifts.

A defective housing O-ring will result in a constant, low volume leak through exhaust in low range only.

If the slide is assembled backwards, there will be a constant leak through exhaust in high range. When installing slide in control valve make sure that slot in slide faces the outlet port.

To Disassemble the Control Valve

1. Place control valve with rear housing (outlet side) on bench and remove the four screws to separate front and rear housings.
2. Remove the slide and the two position balls and springs.

3. remove the flat metal seal from outlet side and remove the O-ring from body.

4. Remove the valve insert from front housing and remove the O-ring from the valve insert.

5. Remove the wave washer installed under valve insert.

6. Remove the two felt wipers from valve housing.

Punch out roll pin and remove control button from slide.

Table 1: Air Valve O-ring Sizes, III. C

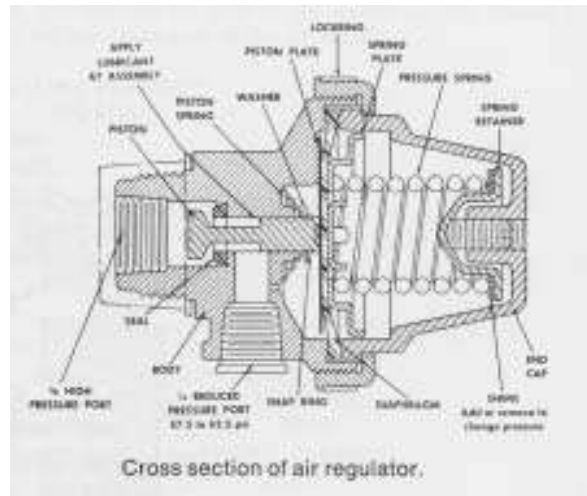
Qty.	Part No.	Location	ID	Width
2	15114	Valve Insert and Plug	.208	.070
1	14033	Piston	.549	.103
1	13653	Piston	.364	.070

Table 2: Control Valve O-ring Sizes, III. D

Qty.	Part No.	Location	ID	Width
1	15115	Valve Insert	.301	.070
1	14205	Housing	.375	.062

Air Regulator Disassembly

1. Mount the air regulator in vise to bring slight pressure against body and end cap.
2. Back off the large lockring which attaches the end cap to body.
3. Slowly loosen vise against the spring pressure of regulator and remove the parts from end cap of regulator.
4. Remove the rubber diaphragm and plate from body of regulator.
5. Remove snap ring, washer and small spring from input piston.
6. Push the piston out through the input port of regulator.
7. Remove seal from piston bore..

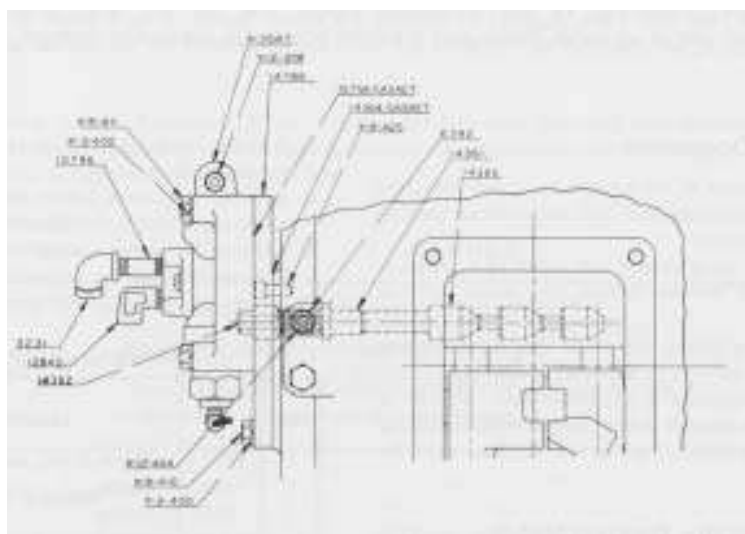


Air Filter

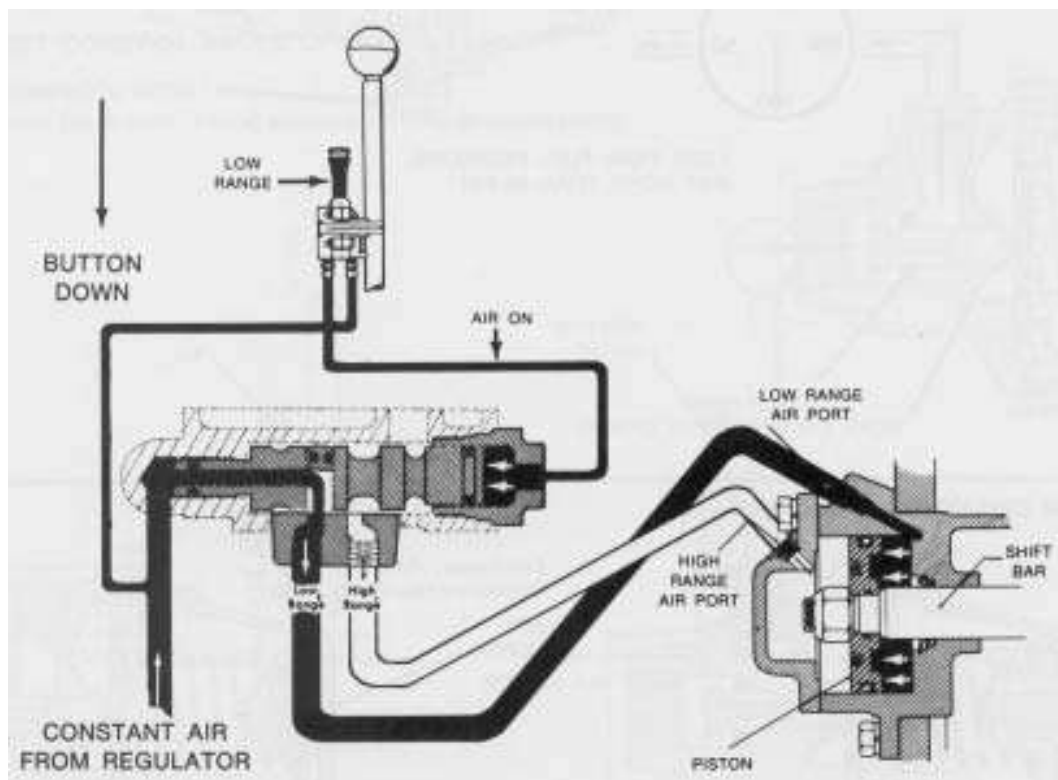
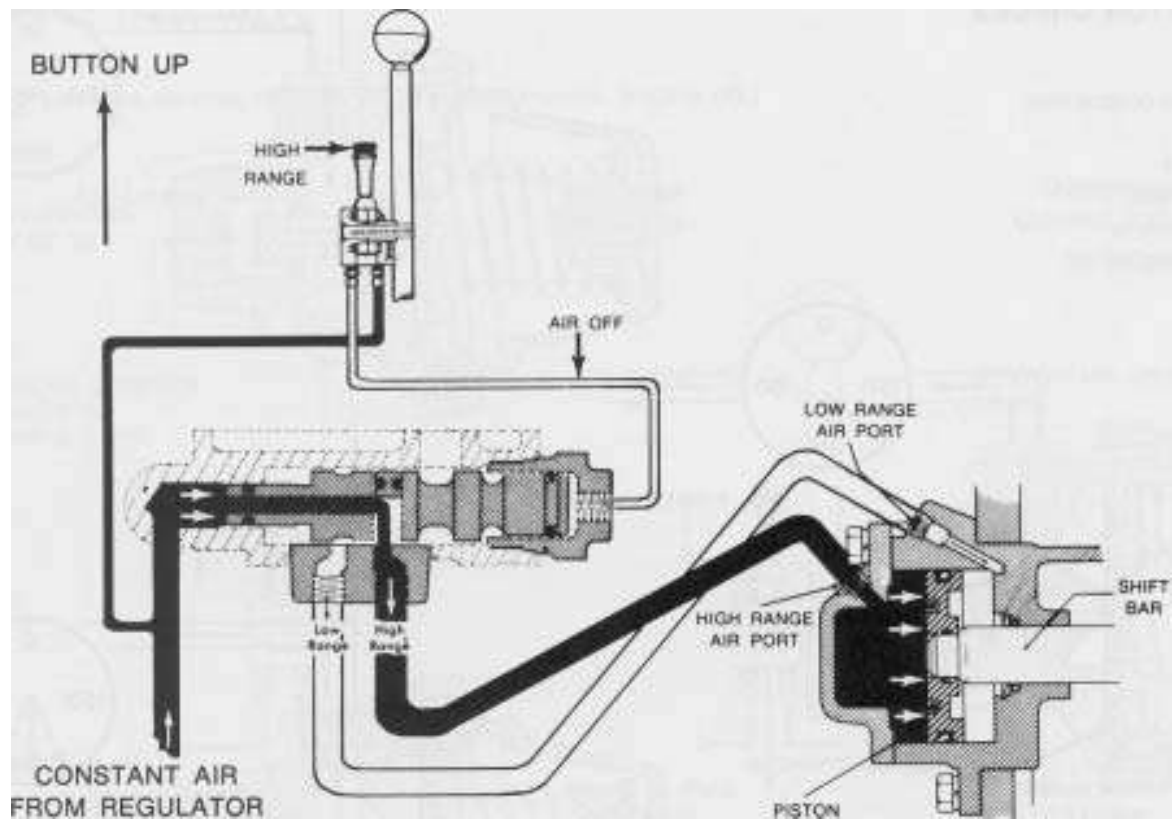
The air filter contains a replaceable filter which can be removed by turning out the bolt at the top of the filter and disengaging the body from cover. The filter should be serviced every 10,000 miles, or more often under high humidity conditions.

Air Valve Pre-Selection

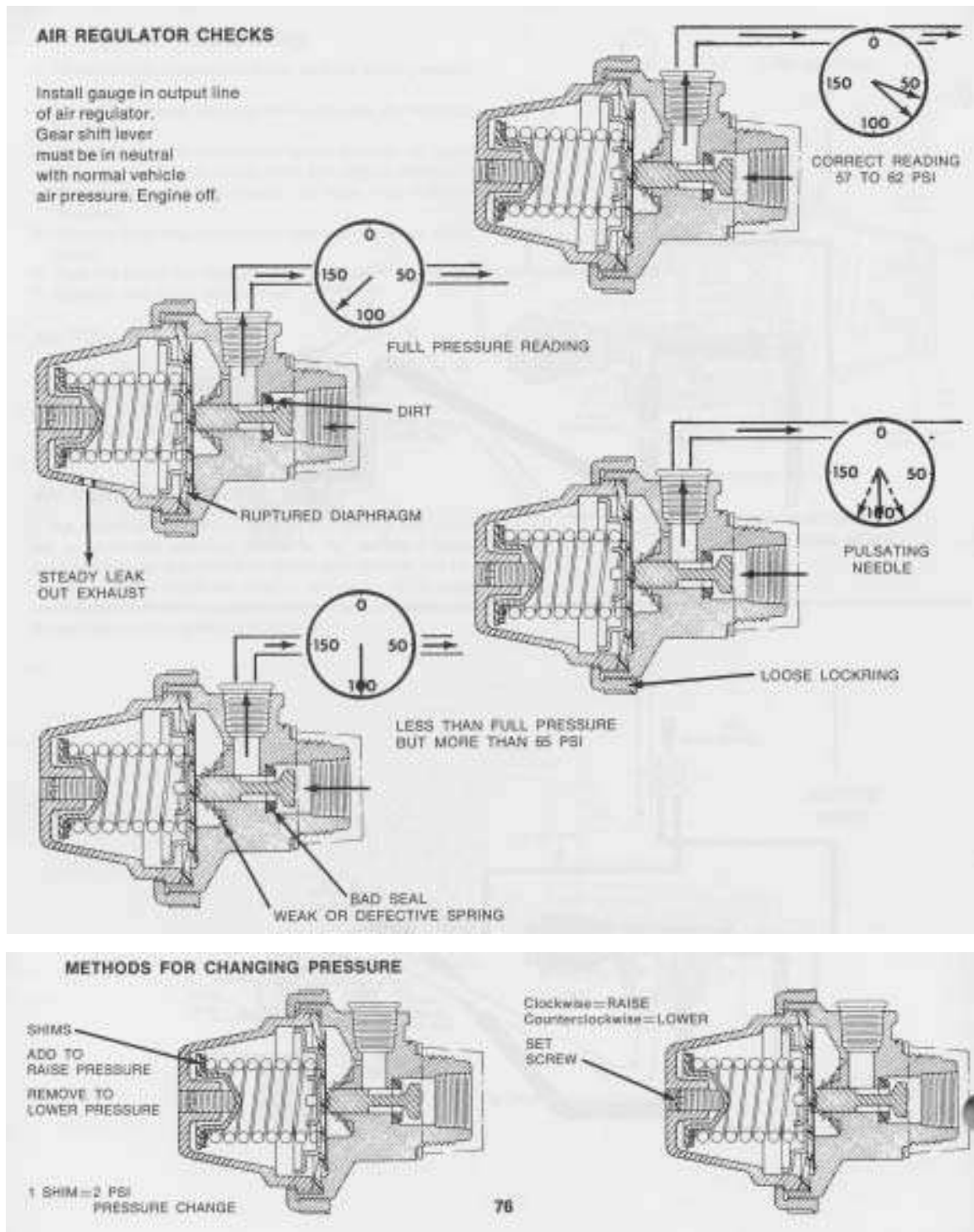
An actuating pin protruding from the shifting bar housing prevents the actuating piston in the air valve from moving while the gear shift lever is in a gear position and releases the piston when the lever is moved to or through neutral. See detailed installation of air valve for installation precaution concerning the actuating pin.



Range Shift- Air System Operation

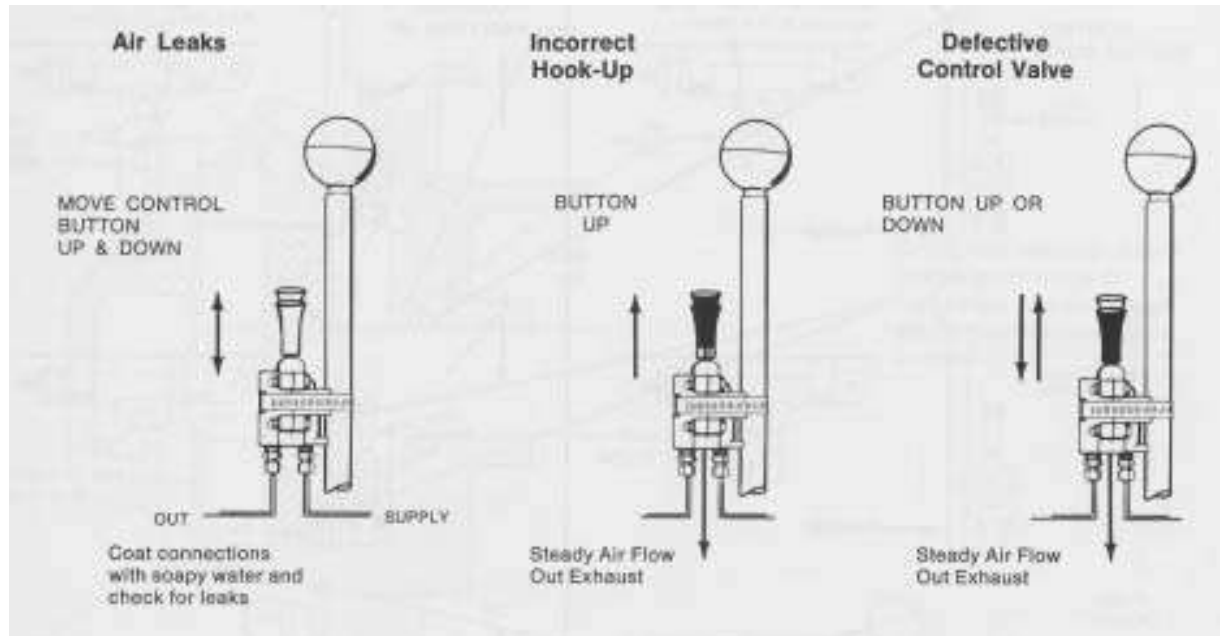


Range Shift Air System- Troubleshooting

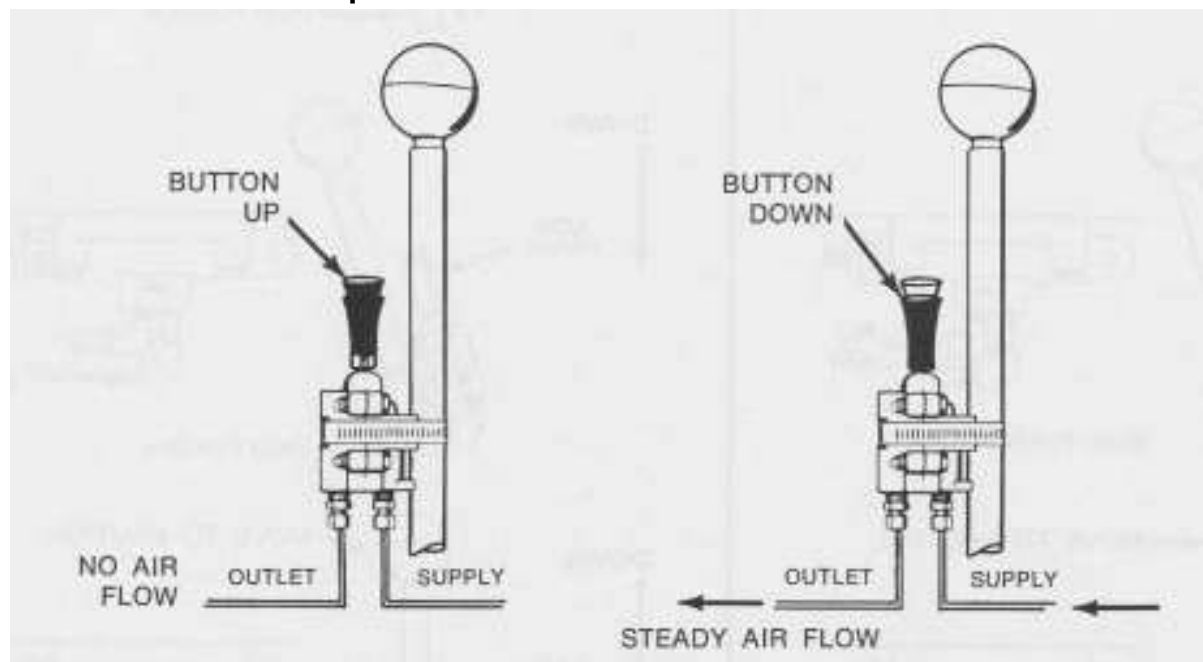


Range Shift Air System- Troubleshooting

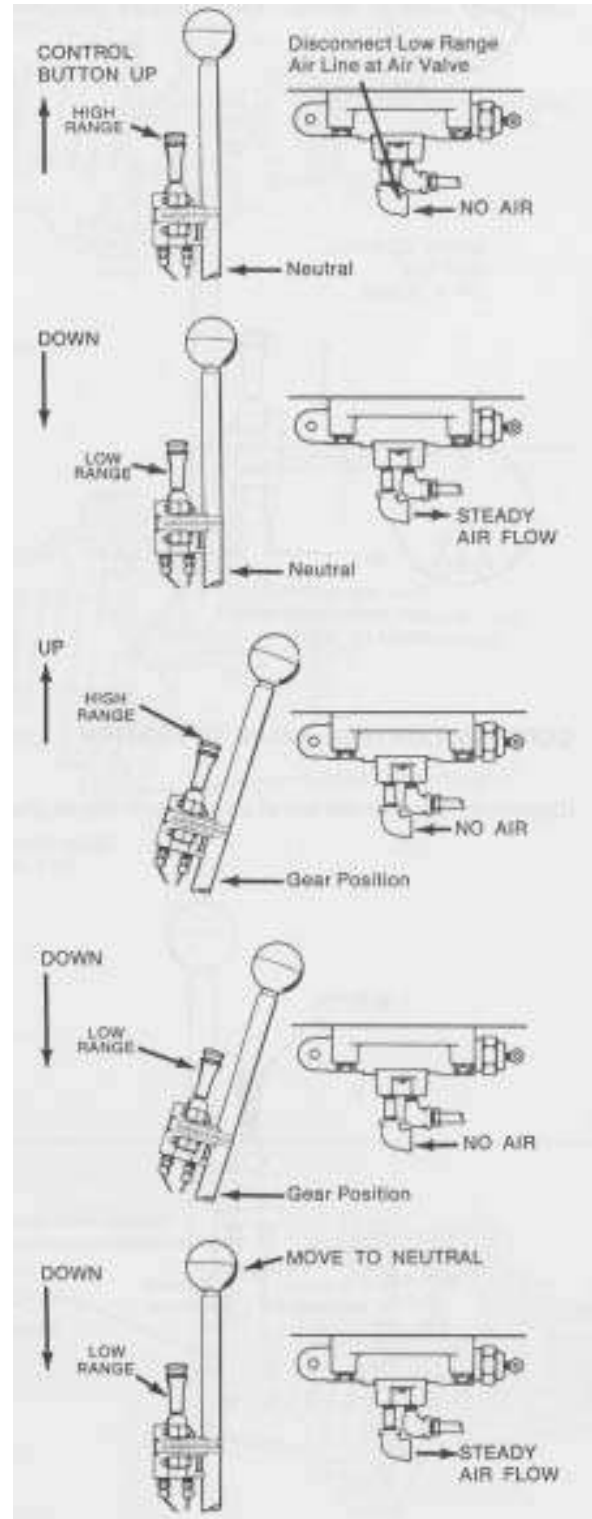
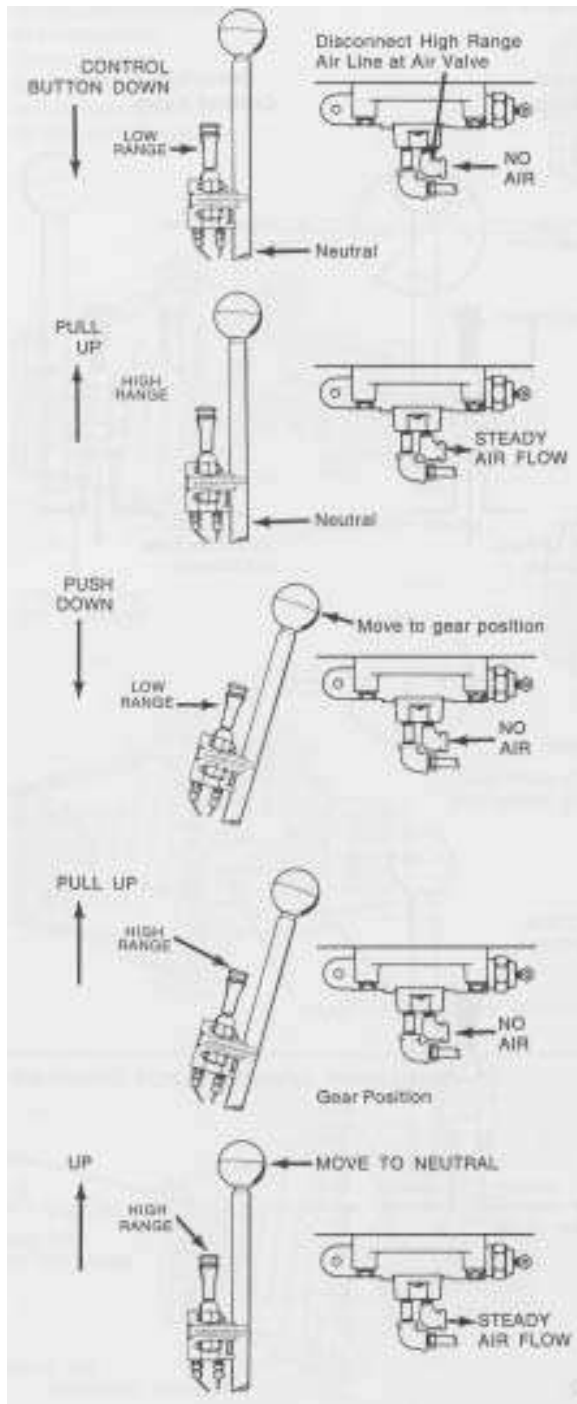
To Check Control valve



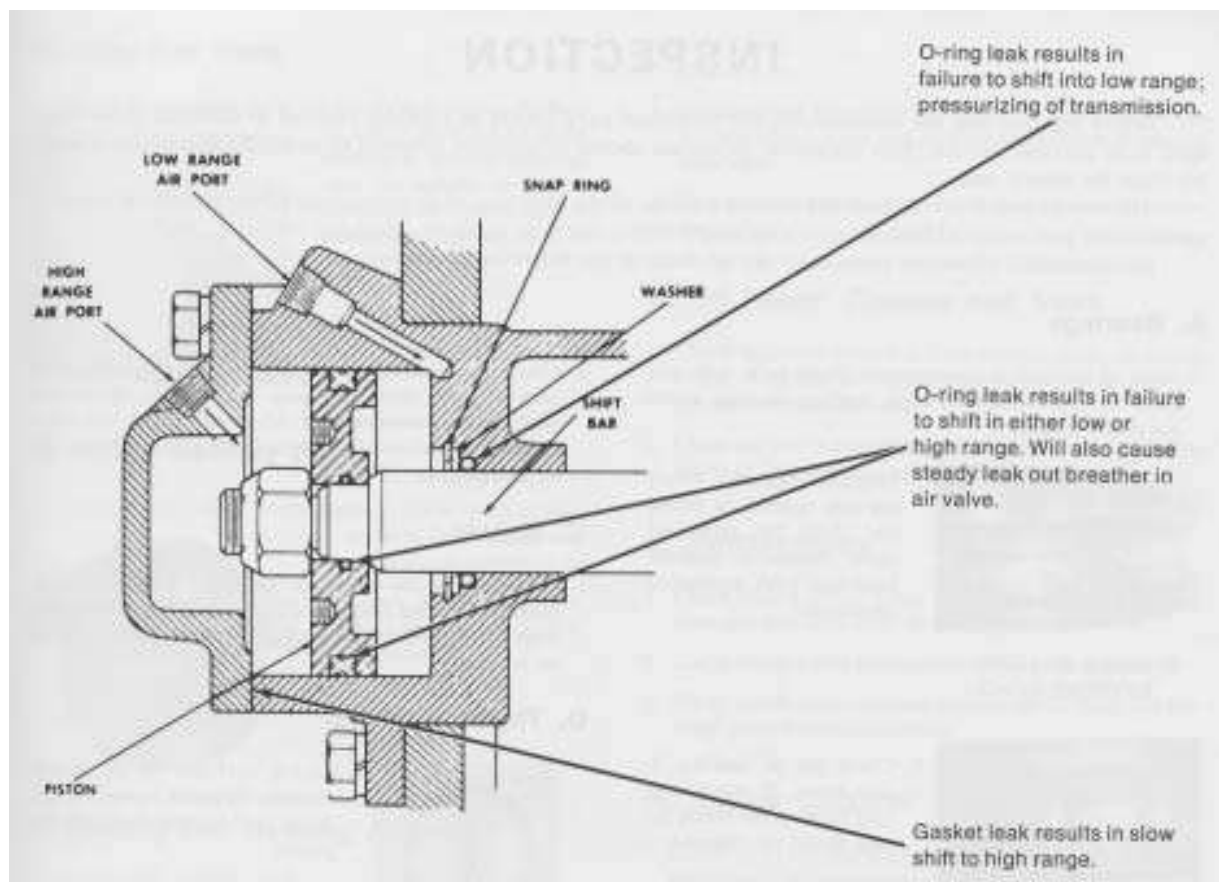
Correct Control Valve Operation



For Correct Operation (Normal Line Pressure, Engine Off)



Range Shift Air System- Troubleshooting



Inspection

Before reassembling the transmission, the individual parts should be carefully checked to eliminate those damaged from previous service. This inspection procedure should be carefully followed to insure the maximum of wear life from the rebuilt unit.

The cost of a new part is generally a small fraction of the total cost of downtime and labor, should the use of a questionable part make additional repairs necessary before the next regularly scheduled overhaul.

Recommended inspection procedures are set forth in the following checklist:

A. Bearings

1. Wash all bearings in clean solvent. Check balls, rollers and races for pits and spalled areas. Replace bearings which are pitted or spalled.
2. Lubricate bearings which are not spalled or pitted and check for axial and radial clearances. Replace bearings with excessive clearances.



3. Check fits of bearings in case bores. If outer races turn freely in the bores, the case should be replaced.

B. Gears

1. Check operating gear teeth for pitting on the tooth faces. Gears with pitted teeth should be replaced.
2. Check all engaging gear teeth. Gears with teeth worn, tapered or reduced in length from clashing in shifting should be replaced.
3. Check axial clearances of gears. Where excessive clearance is found, check gear snap ring, washer, spacer and gear hub for excessive wear. Maintain .005 - .012 axial clearance of main-shaft forward speed gears, .005 minimum on reverse gear.

C. Splines

1. Check splines on all shafts for wear. If sliding clutch gears, companion flange or clutch hubs have worn into the sides of the splines, the shafts in this condition should be replaced.

D. Thrust Washers

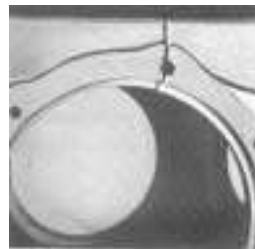


1. Check surfaces of all thrust washers. Washers scored or reduced in thickness should be replaced.

E. Reverse Gear and Shaft

1. Check bearing sleeve for wear from action of roller bearings.

F. Gray Iron Parts



1. Check all gray iron parts for cracks and breaks. Replace or repair parts found to be damaged. Heavy casting may be welded or brazed providing the cracks do not extend into bearing bores or bolting surfaces.

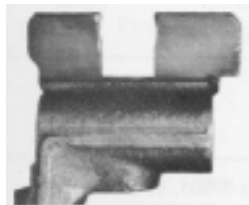
G. Clutch Release Parts

1. Check clutch release parts. Replace yokes worn at cam surfaces and bearing carrier worn at contact pads.
2. Check pedal shafts. Replace those worn at bearing surfaces.



H. Shifting Bar Housing Assembly

1. Check yokes and blocks for wear at pads and lever slot. Replace worn parts.
2. Check yokes for alignment.
3. Check yokes for excessive wear; replace worn yokes.
4. Check lock screws in yokes and blocks.



Tighten and rewire those found loose.

5. If housing has been dismantled, check neutral notches of shifting bars for wear from interlock balls. Bars indented at points adjacent to the neutral notch should be replaced.

I. Gear Shift Lever Housing Assembly

1. Check spring tension on shift lever. Replace tension spring and washer if lever moves too freely.
2. If housing is dismantled, check pivot or spade pin and corresponding slot in lever for wear. Replace both parts if worn.

5.

J. Bearing Covers

1. Check covers for wear from thrust of adjacent bearing. Replace covers worn and grooved from thrust of bearing outer race.
2. Check bores of covers for wear. Replace those worn oversize.

K. Oil Return Threads and Seals

1. Check oil return in front bearing cover. If sealing action of threads has been destroyed by contact with input shaft, replace cover.
2. Check oil seal in mainshaft rear bearing cover. If sealing action of lip has been destroyed, replace seal.

L. Sliding Clutches

1. Check all yokes and yoke slots in sliding clutches for extreme wear or discoloration from heat.
2. Check engaging teeth of sliding clutches for partial engagement pattern.

M. Front Bearing Cover

1. Check inside hub of front bearing cover for wear caused by backing off of drive gear bearing nut.

Reassemble Precautions

Make sure that interiors of case and housings are clean. It is important that dirt be kept out of transmission during reassembly. Dirt is abrasive and can damage polished surfaces of bearings and washers. Use certain precautions, as listed below, during reassembly.

1. **GASKETS** - Use new gaskets throughout the transmission as it is being rebuilt. Make sure all gaskets are installed, as omission of gasket can result in oil leakage or misalignment of bearing covers (See "Location of Gaskets" heading).
2. **CAPSCREWS** - To prevent oil leakage, use thread sealant on all cap screws.
3. **ASSEMBLY** - Refer to the disassembly illustration as a guide to reassembly.
4. **INITIAL LUBRICATION** - Coat all thrust washers and splines of shafts with Lubriplate during installation to provide initial lubrication, preventing scoring and galling.

TORQUE RATINGS

CAPSCREWS AND NUTS

Recommended torque ratings, location and size of capscrews and nuts are listed below. caoscrew lenghts are given for referance purposes as a guide for installation at proper locations.

Correct torque application is extremely important to assure long transmission life and dependable performance. Over-tightening or under-tightening can result in poor installation and, in many instances, eventually cause damage to transmission gears, shafts,or bearings. Do not torque capscrews dry.

Table 1: CAPSCREWS

Qty.	Part No.	Size	Location	Torque Rating Foot-Pounds
2	x-8s-429	1/4-20x 3/4	Air filter to bracket x-10-401	10-15
2	x-8-425	1/4-20x 5/8	Air valve adapter plate	15-20
2	x-8-410*	1/4-20x 7/8	Air valve adapter plate, rear x-3-400	15-20
4	x-8-411*	1/4-20x1 3/4	Air Valve x-3-400	15-20
6	x-8s-601	3/8-16x 3/4	PTO cover, small	18-23**
2	x-8L-601	3/8-16x 3/4	Air filter bracket to case	35-45
6	x-8-612	3/8-16x 1	Auxiliary drive gear bearing retainer	35-45
6	x-8L-604	3/8-16x1 1/4	Frontbearing cover	35-45
16	x-8L-604	3/8-16x1 1/4	Shift bar housing	35-45
4	x-8L-604	3/8-16x1 1/4	gear shift lever huosing	35-45
8	x-8L-604	3/8-16x1 1/4	Auxiliary countershaft rear bearing covers	35-45
4	x-8L-604	3/8-16x1 1/4	Auxiliary range shift cylinder to rear plate	35-45
4	x-8L-604	3/8-16x1 1/4	Auxiliary range shift cylinder cover	35-45
15	x-8L-609	3/8-16x1 3/4	Rear plate to case	35-45
4	x-8-614*	3/8-16x 2	Auxiliary housing x-3-600	35-45
6	x-8-616*	3/8-16x 2 3/4	Rear bearing cover (5) x-3-600 (1) x-3-605, Bottom right	35-45
8	x-8-700*	7/16-14x 1 1/4	PTO cover, large x-3-700	50-65
2	x-8-809	1/2-13x 1 1/2	Clutch housing x-3-806	70-75
2	x-8-822	1/2-13x 3 1/2	Clutch housing x-3-805	70-75
4	x-7-802	1/2-20x 1	Countershaft front bearing retainer	50-65
4	x-7-802	1/2-20 x 1	Auxiliary countershaft rear bearing retainer	50-65
2	x-7-810	1/2-20 x 2	Range shift yoke	50-65

*THESE CAPSCREWS REQUIRE LOCKWASHERS. Those not starred have lockwashers as part of the capscrew assembly, or do not require lockwashers. ** 10-15 ft.lb. when used with oil filter.

NUTS

Table 1:

Qty.	Part No.	Size	Location	Torque Rating Foot-Pounds
1	x-1-500	5/8-24	Gear shift lever pivot pin	15-20
6	x-1-1005	5/8-18	Clutch housing. (Aluminum to case	170-185
2	x-1-1008	5/8-18	Reverse Idler Shaft	75-80
2	x-1-1000	5/8-18	case-Vertical Mtg. Studs	170-185
6	x-1-1000	5/8-18	Case to Clutch Housing (cast Iron)	170-185
1	x-1-1005	5/8-18	Range cylinder shift bar	70-80
1	11956	2-16	Output Shaft	450-500

GASKETS

Table 2:

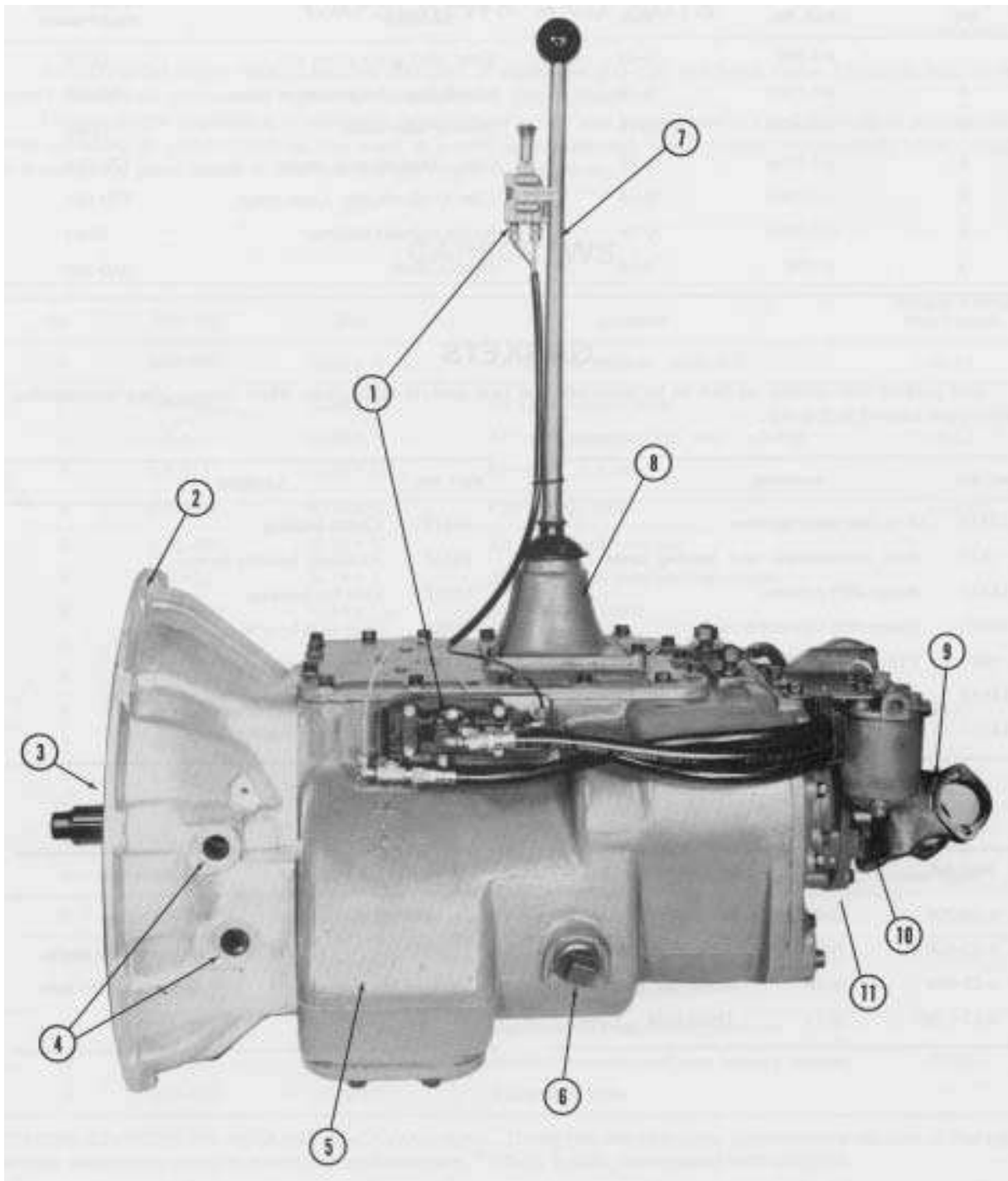
Part No.	Location	Part No.	Location
15532	Aux. rear bearing cover	14310	Clutch housing
5877	Aux. countershaft rear bearing cover (2)	14335	Auxiliary housing to case
14347	Range shift cylinder	14918	Shift bar housing
14349	Range shift cylinder cover	1642	Gear shift lever housing
1684	PTO cover, Small	14364	Air valve adapter plate
11634	PTO cover, Large	15758	Air Valve
14311	Front bearing cover	15900	Reverse switch hole plug

PLUGS

Table 3:

Part No.	Size	Location	Part No.	Size	Location
x-12-208	1/8-27	Air valve	x-12-2001	1 1/4 P	Filter hole
x-12-800	1/2-14	heat gauge bore	5202	1/2-13	Reverse idler shafts
x-12-404	1/4-18	Shift bar housing	15917	9/16-18	reverse switch hole
x-12-1201	3/4-14	Drain hole			

Preventive Maintenance Check Chart



Preventive Maintenance Check Chart

Checks without Partial Disassembly of Chassis or cab

1. Air System and Connections

a. Check for leaks, worn air lines, loose connections for looseness.

2. Clutch housing Mounting

a. Check all capscrews in bolt circle of clutch housing for looseness.

3. Clutch Release Bearing

a. Remove hand hole cover and check radial and axial clearances in release bearing.

b. Check relative position of thrust surface of release bearing with thrust sleeve on push type clutches.

4. Clutch Pedal Shaft and Bores

a. Pry upwards to check for wear.

b. If excessive movement is found, remove clutch release mechanism and check bushings in bores and wear on shafts.

5. Gear Lubricant

a. Change at specified service intervals.

b. Use only gear oils as recommended. See lubrication section.

6. Filler and Drain Plugs

a. Remove filler plug and check level of lubricant at specified intervals. Tighten filler and drain plugs securely.

7. Gear Shift Lever

a. Check for looseness and free play in housing. If lever is loose in housing, proceed with check no. 8.

8. Gear Shift Lever Housing Assembly

a. Remove air lines at air valve and remove the gear shift lever housing assembly from transmission.

b. Check tension spring and washer for set and rear.

c. Check the gear shift lever pivot pin and pivot pin slot for wear.

d. Check bottom end of gear shift lever for wear and check slot of yokes and blocks in shift bar housing for wear at contact points with shift lever.

Checks With Driveline Dropped

9. Universal joint Companion Flange Nut

a. Check for tightness. Tighten to recommended torque.

Checks With Universal Joint Companion Flange Removed

10. Output Shaft

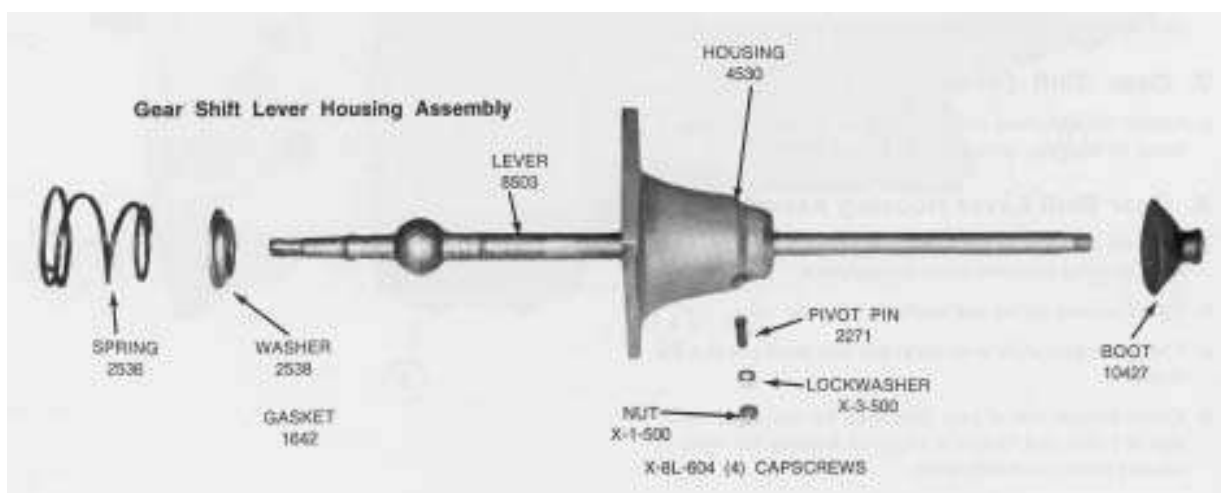
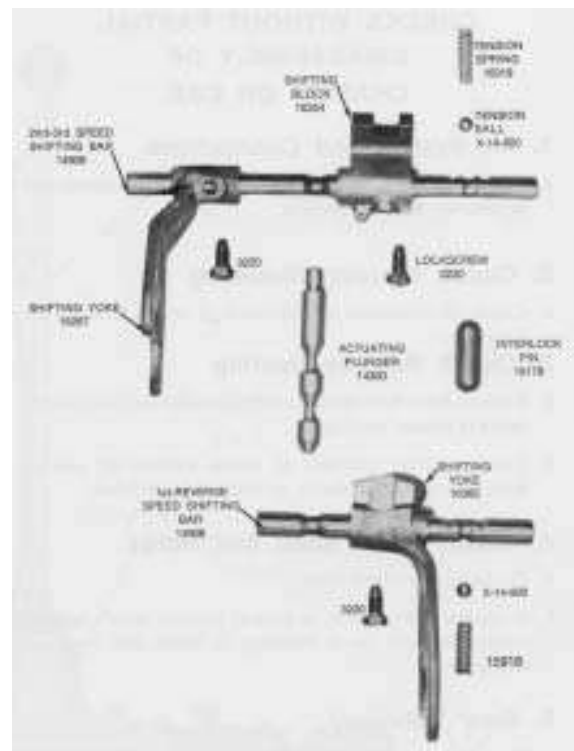
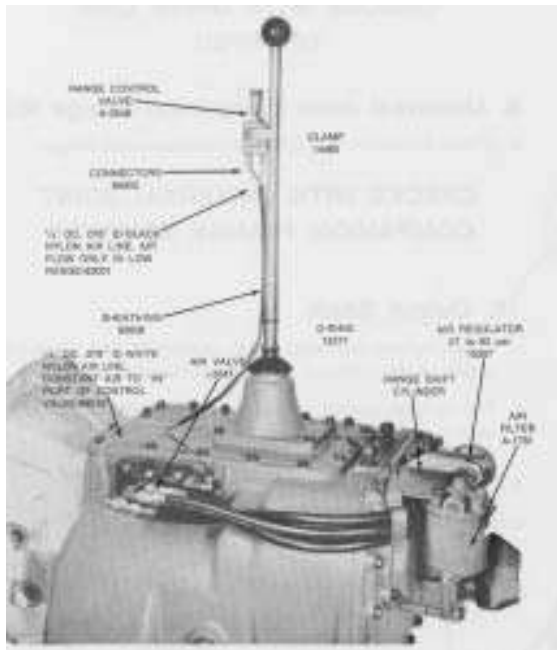
a. Check splines for wear from movement and churning action of the universal joint companion flange.

b. Pry upward against output shaft to check radial clearance in mainshaft rear bearing.

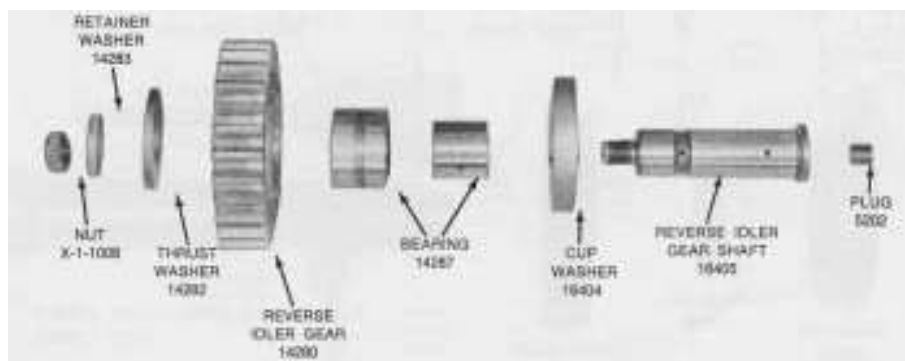
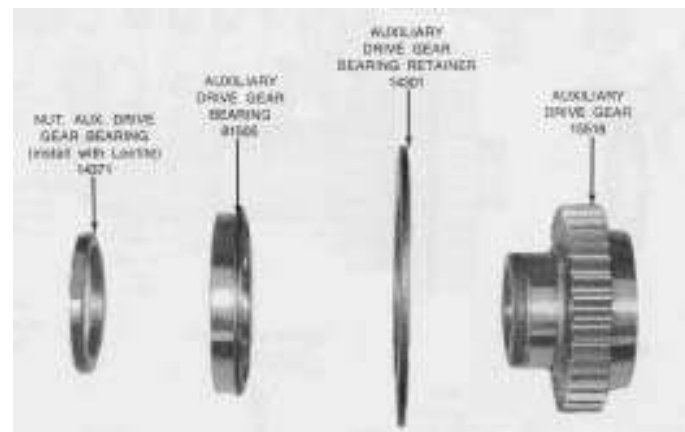
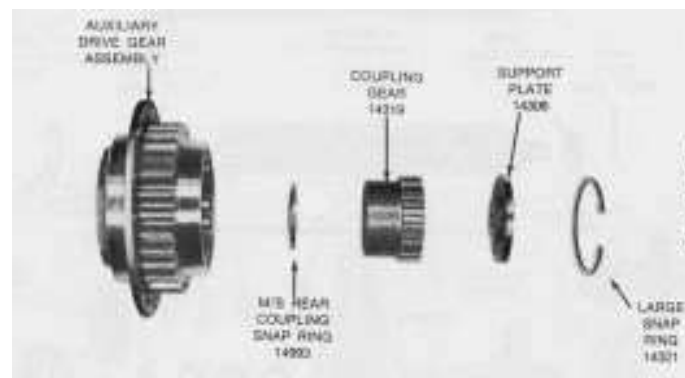
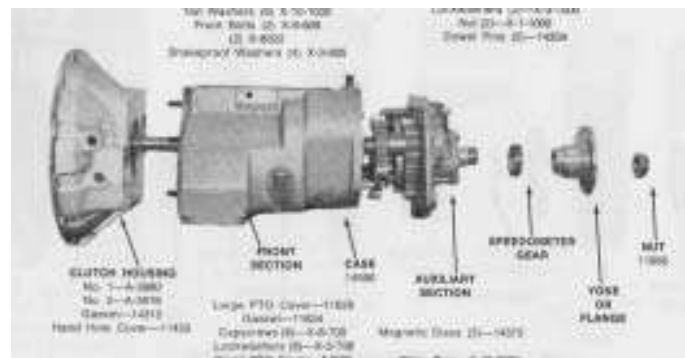
11. Mainshaft Rear Bearing Cover

a. Check oil seal for wear.

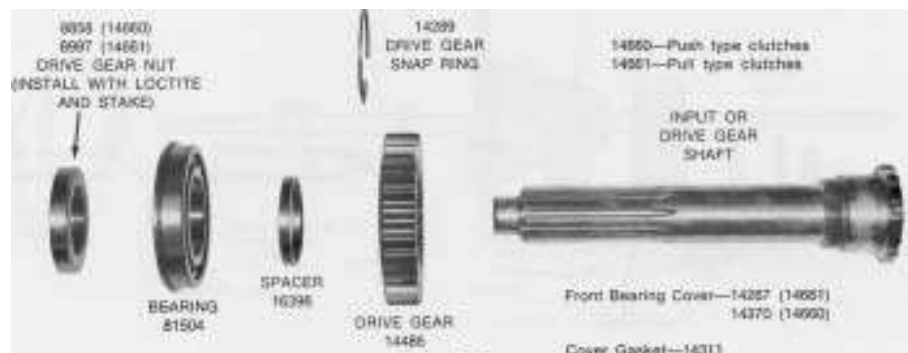
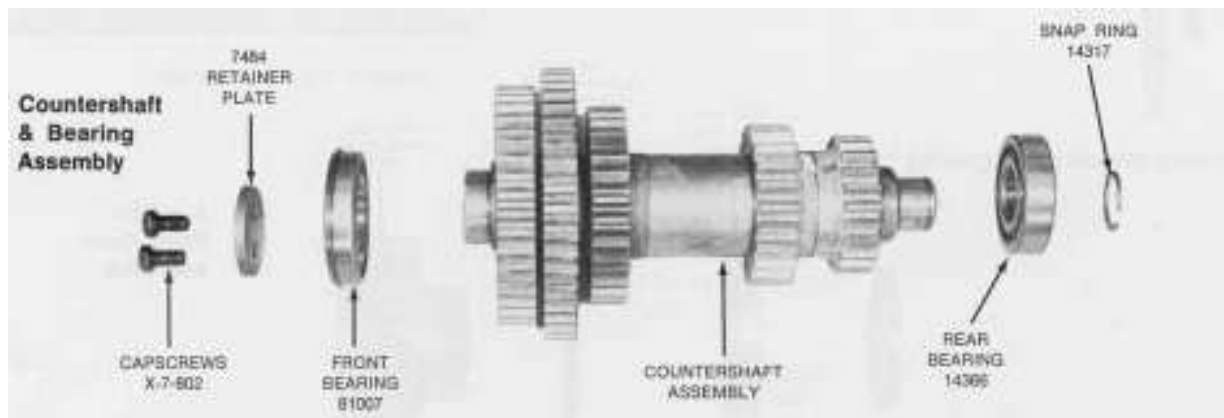
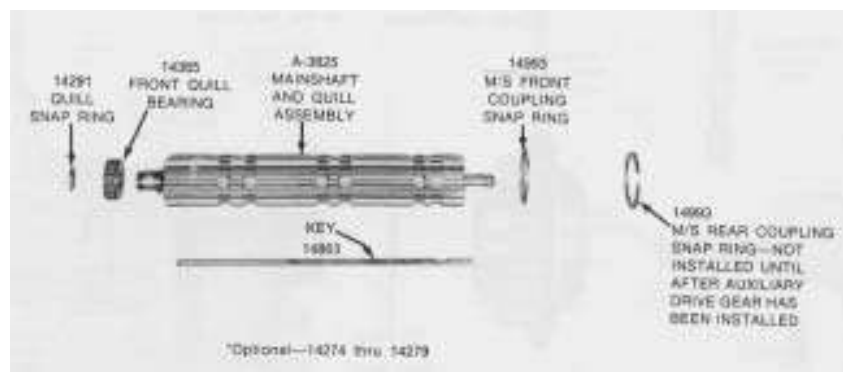
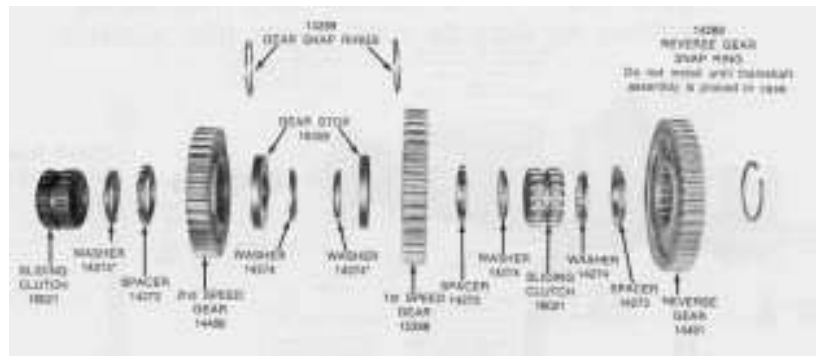
Parts Reference



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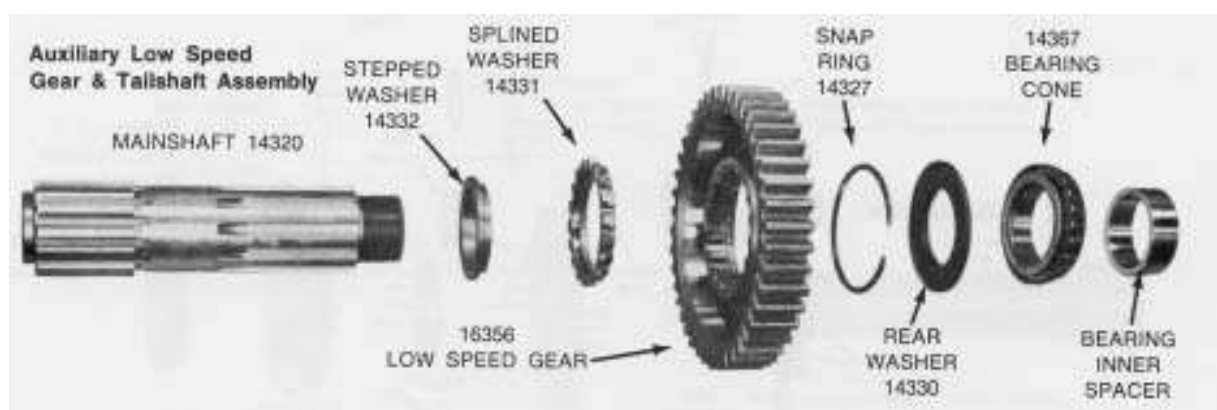
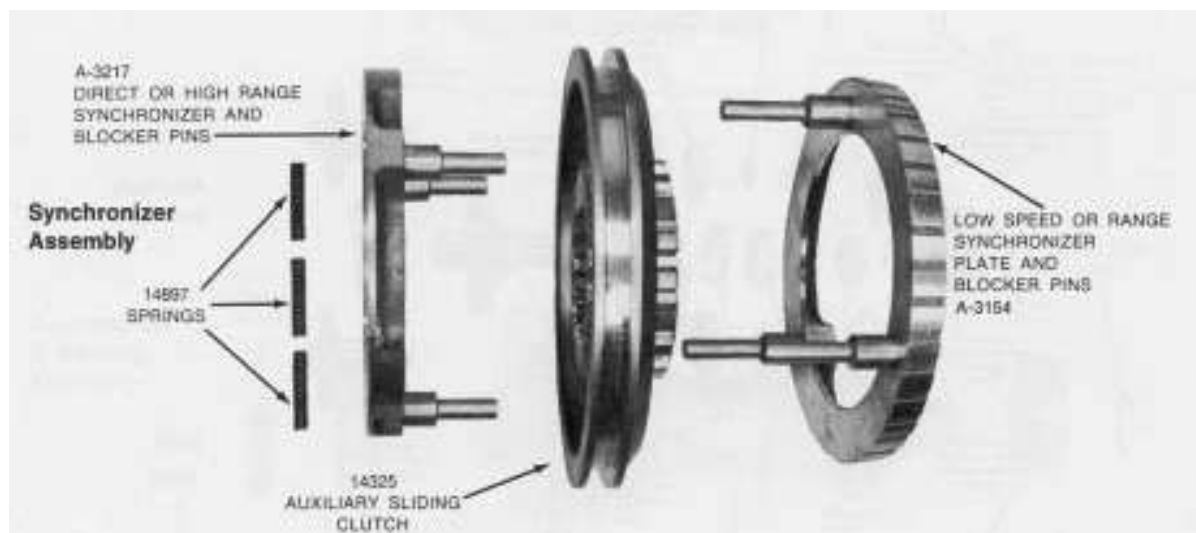
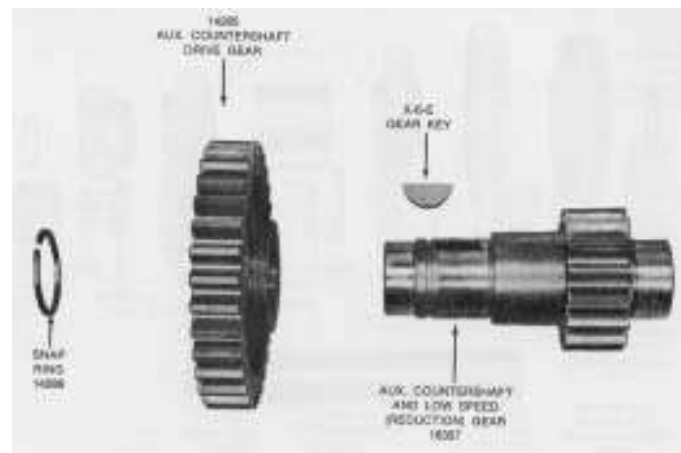


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