

- d. Place the overdrive gear into the press, long hub facing down. Align the key on the front of the countershaft with the keyway of the gear then press the shaft through until it meets the 3rd speed gear.
- e. Start the PTO gear onto the shaft with the bullet nose side of the teeth facing up toward the rear of the shaft. Place the drive gear into the press with the long hub against the PTO gear, align the keyway and press both gears onto the shaft.

NOTE

The lower countershaft PTO gear has 47 teeth and the upper PTO gear has 45. Mark each shaft accordingly.

- f. Install the drive gear retaining snap ring into the groove on the front of each countershaft.
- g. Install the inner bearing races onto the countershafts.
- h. Mark the countershaft drive gear in accordance with Para 68.
- i. Place the lower countershaft (fitted with 47 tooth PTO gear) into position in the case followed by the upper countershaft.
- j. Move the lower countershaft to the rear and support it by temporarily installing the bearing to centre the shaft in the rear case bore.
- k. Using a countershaft bearing driver (refer to Para 5c), start the bearing in the front case bore. Centre the countershaft in the bearing and complete the installation (refer to Figure 51).



Figure 51 – Installation of Front Countershaft Bearings

- l. Position the retainer plate on the front of the lower countershaft. Apply Loctite 242 to the threads of the capscrew, install and tension to between 122 and 136 N.m (90 to 100 lbf.ft) when the shaft can be held.
- m. Complete the installation of the rear bearing with larger ID lead chamfer leading. Install the snap ring in the groove at the rear of the countershaft.

Assembly, Installation and Timing of Main Drive Gear Assembly

63. To assemble the main drive gear assembly, proceed as follows:

- a. Mark the main drive gear for timing in accordance with Para 68. Mesh the marked tooth of the left countershaft drive gear with either set of two marked teeth on the main drive gear. Slide the input shaft through the main drive gear.
- b. Install the circlip, spacer and bearing on the input shaft with the external snap ring to the outside.

Assembly and Partial Installation of Mainshaft

64. To assemble the mainshaft (refer to Figure 52 and Figure 53), proceed as follows:

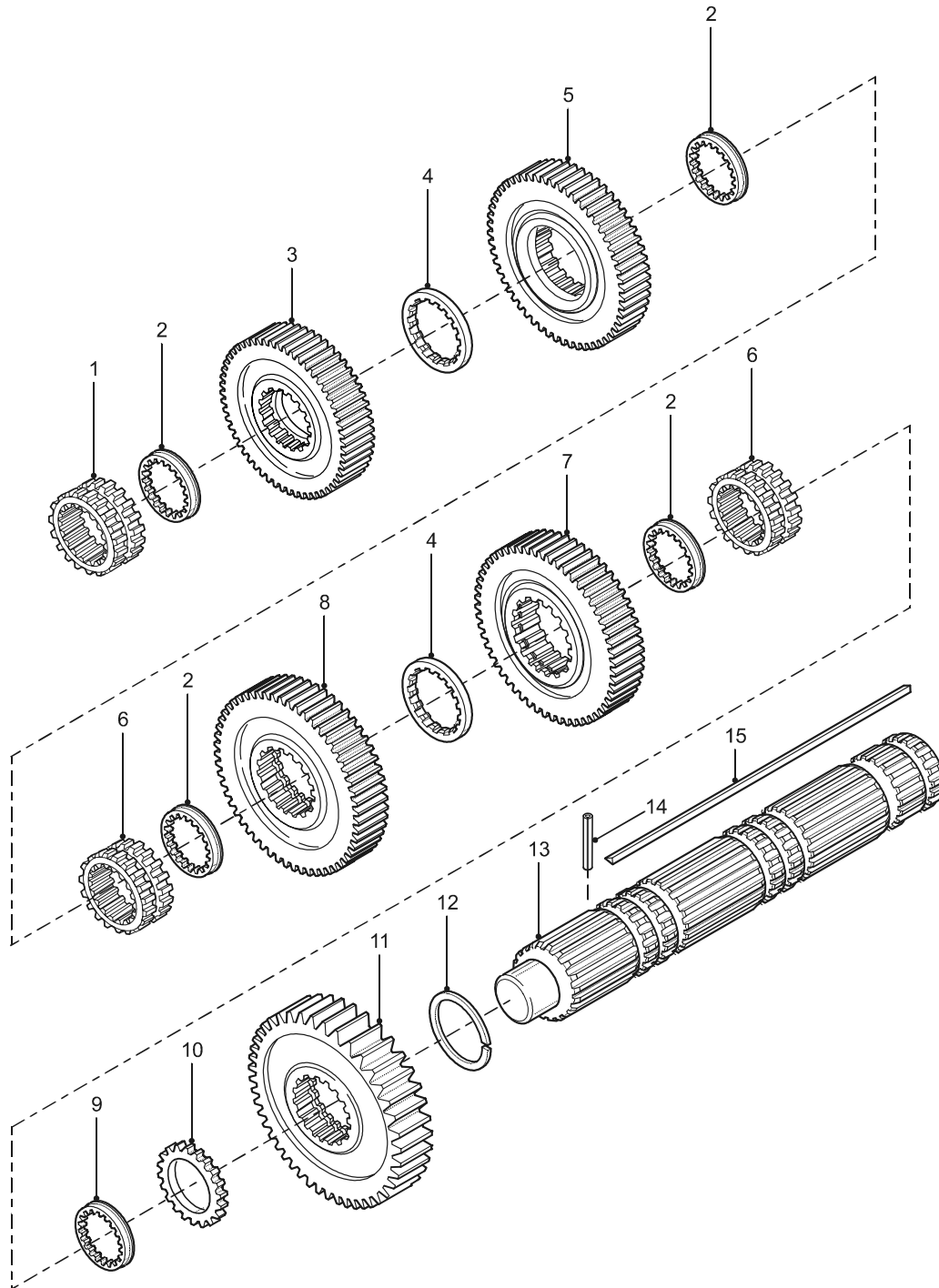
- a. Secure the mainshaft in a vice fitted with soft jaws or place it in an assembly bench with the pilot end pointing down. If previously removed, install the roll pin in the keyway.
- b. Install the overdrive gear limit washer on the mainshaft, flat side up then, rotate the washer in the 1st or bottom groove of the shaft to align the splines. Feed a plastic line up from the bottom to secure the washer (refer to Figure 54).
- c. Place the overdrive gear onto the shaft, clutching teeth down followed by the spacer washer (refer to Figure 55).

NOTE

Gear limit washers are internally splined and locked to the mainshaft by the key. Gear spacers are externally splined to engage with the clutching teeth in the gear hubs. There is one limit washer and one spacer for each gear on the mainshaft.

- d. Install the 3rd gear onto the shaft against the spacer washer with the clutching teeth up (refer to Figure 56).

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Item	Description	Item	Description	Item	Description
1.	Sliding Clutch	6.	Sliding clutch	11.	Reverse gear
2.	Limit washer	7.	1 st gear	12.	Snap ring
3.	Overdrive gear	8.	2 nd gear	13.	Main shaft
4.	Spacer washer	9.	Limit washer	14.	Roll pin
5.	3 rd gear	10.	Spacer washer	15.	Key

Figure 52 – Transmission Main Shaft Assembly

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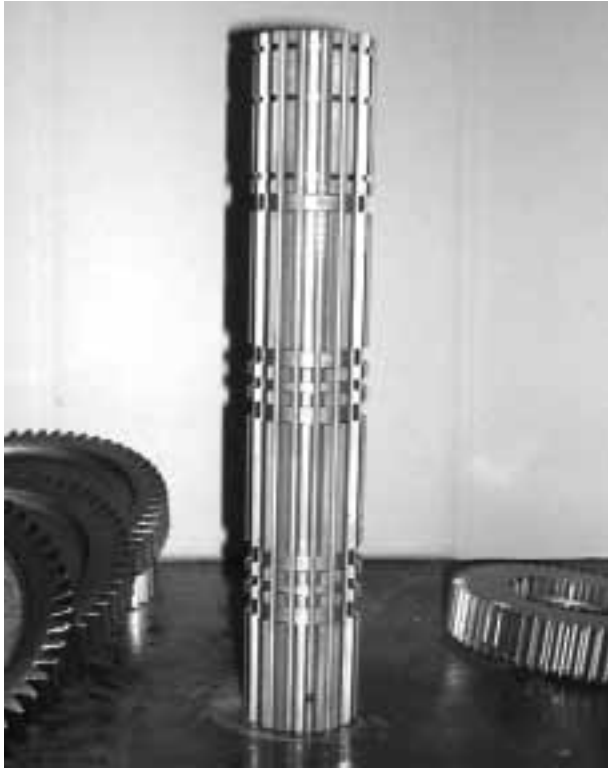


Figure 53 – Mainshaft

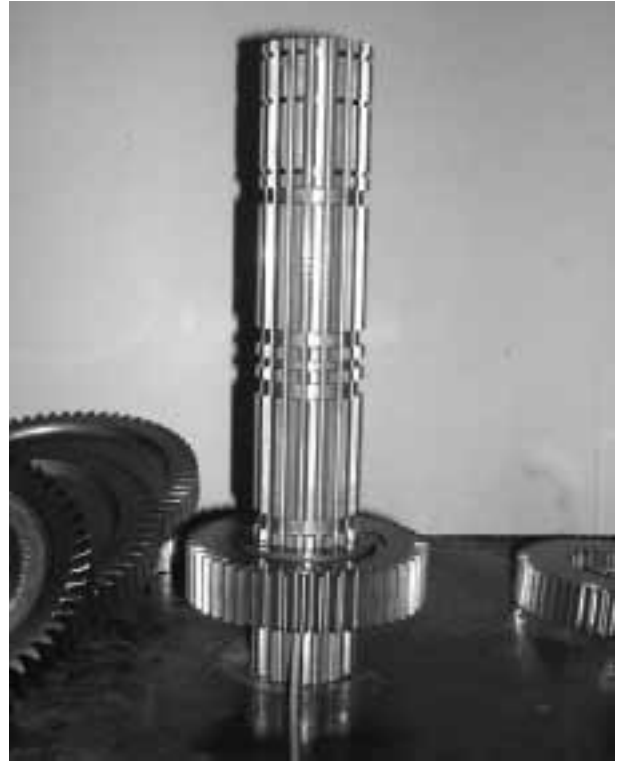


Figure 55 – Fitting OD Gear

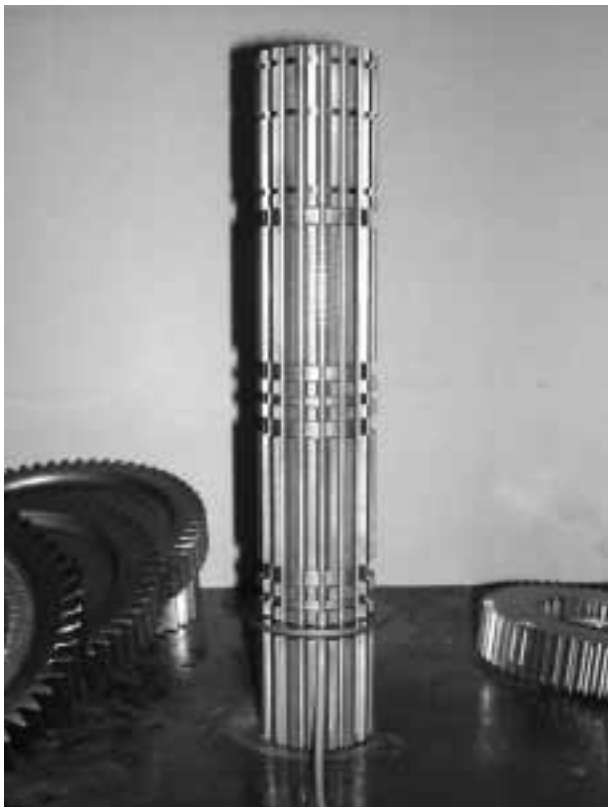


Figure 54 – Fitting OD Limit Washer

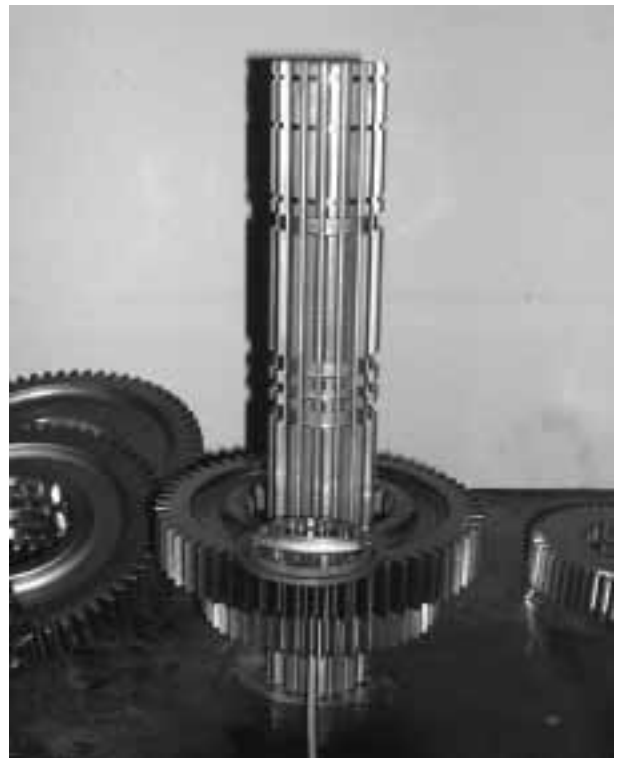


Figure 56 – Fitting 3rd Gear

- e. Install the 3rd gear limit washer, rotate the washer to align the splines and feed the plastic line up to hold the washer in place (refer to Figure 57).

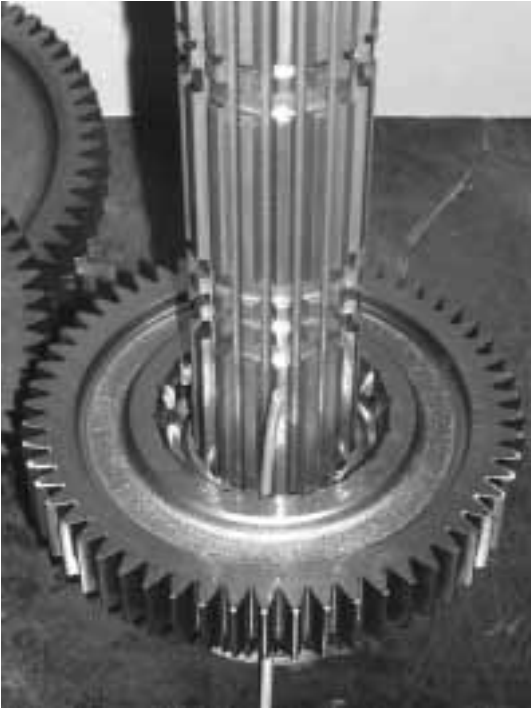


Figure 57 – Fitting 3rd Speed Limit Washer

- f. Install the 2nd/3rd speed sliding clutch, aligning the missing internal spline of the sliding clutch with the plastic line and feed the line up (see Figure 58).



Figure 58 – Installation of 2nd/3rd Speed Sliding Clutch

- g. Install the 2nd gear limit washer on the mainshaft, flat side up. Rotate the washer in the 3rd groove of the mainshaft to align the splines of the washer with those of the mainshaft and feed the plastic line up through the washer (see Figure 59).



Figure 59 – Installation of 2nd Gear Limit Washer

- h. Install the 2nd speed gear on the mainshaft, clutching teeth down followed by the spacer washer.
- i. Install the 1st speed gear on the shaft against the spacer washer, clutching teeth up as shown in Figure 60.

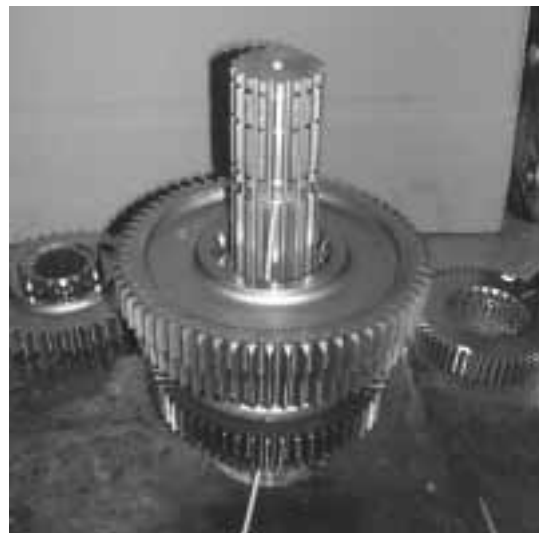


Figure 60 – Installation of 1st Gear

- j. Install the limit washer into the 1st gear and rotate the washer to align the splines then feed the plastic line up.
- k. Install the 1st/reverse sliding clutch, aligning the missing internal spline with the plastic line then feed the line up (see Figure 61).



Figure 61 – Installation of 1st/Reverse Sliding Clutch

- l.** Install the reverse gear limit washer on the mainshaft, flat side up. Rotate the washer in the 5th groove of the mainshaft to align the splines then feed the plastic line up as shown in Figure 62.



Figure 62 – Installation of Reverse Gear Limit Washer

- m.** Fit the externally splined spacer washer against the limit washer as shown in Figure 63.

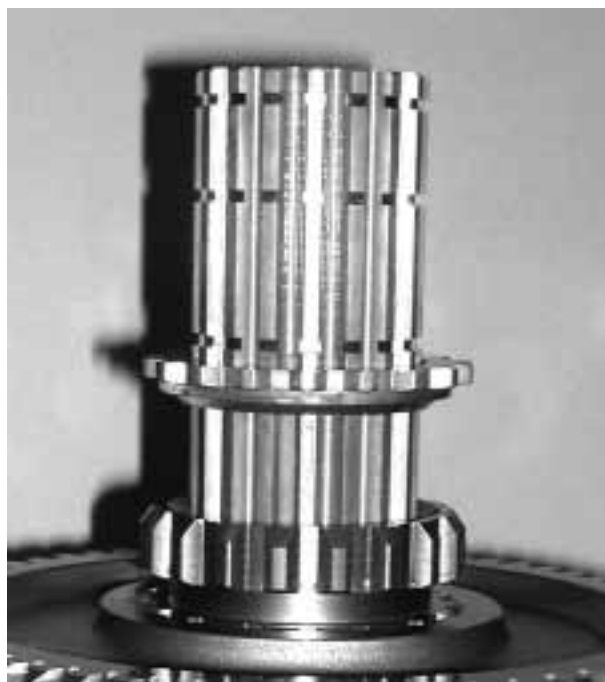


Figure 63 – Installation of Externally Splined Spacer Washer

- n.** Position the three sided key into the same spline groove as the plastic line so that the end of the key is sitting on the end of the line. Slowly pull the line out and at the same time follow it down with the key (refer to Figure 64).

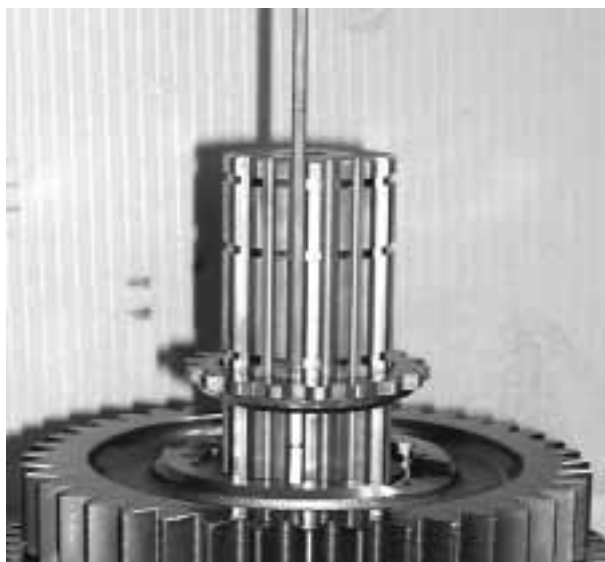


Figure 64 – Installation of Three Sided Key

- o.** Install the snap ring in 6th groove of mainshaft to retain the key in the keyway as shown in Figure 65.

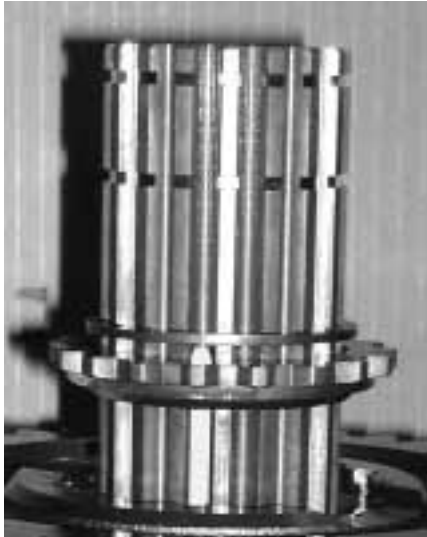


Figure 65 – Installation of Key Retaining Ring

- p. Install the reverse gear on the mainshaft, clutching teeth down and engaged with the external splines of the spacer.
- q. Block the upper countershaft against the case wall, then lower the mainshaft into position with the reverse gear held against the 1st speed gear and the rear of the shaft placed into the case bore. Move the mainshaft forward to engage the pilot end of shaft into the spigot bushing of the input shaft.

NOTE

Ensure that the marked tooth on the lower countershaft drive gear is in mesh with the marked set of teeth on the main drive gear.

- r. Centre the rear of the mainshaft in the case bore and fit the auxiliary drive gear assembly, partially seating the bearing in the bore. This is done to support the mainshaft during further installation procedures.

NOTE

Do not complete installation at this time.

Bearing Installation and Timing of Upper Countershaft

65. To install the bearing and time the upper countershaft, proceed as follows:

NOTE

It is important that the lower countershaft remains timed with the main drive gear when timing the upper countershaft.

- a. Remove the blocking from the upper countershaft assembly and place the shaft parallel to the mainshaft. Mesh the marked tooth of right countershaft drive gear with remaining set of two marked teeth on main

drive gear then temporarily install the rear bearing to centre the shaft in the case bore.

- b. Position the front countershaft bearing in the bore and install it using a countershaft bearing driver (refer to Para 5c). Install the retaining washer and cap screw (apply Loctite 242 to the threads of the capscrew) and tighten, 122 to 136 N.m (90 to 100 lbf.ft).
- c. Complete the installation of the rear bearing with larger ID lead chamfer leading. Install the snap ring in the groove at the rear of the countershaft.
- d. Move the mainshaft reverse gear to the rear then use a screwdriver to engage the sliding clutches with all forward speed gears. A sliding clutch that will not engage with a gear indicates the gear set is not in proper mesh. The bearings of the right countershaft would then need to be removed and the drive gear set re-timed.

NOTE

Do not engage the sliding clutches with more than one gear at time as this will lock the gearing and prevent the mainshaft and countershaft assemblies from rotating.

Completed Installation of Mainshaft and Auxiliary Drive Gear Assemblies

- a. Remove the auxiliary drive gear assembly from the mainshaft and rear bearing bore. **Do not allow the mainshaft to move rearward when removing the auxiliary drive gear.**
- b. Move the mainshaft reverse gear rearward as far as possible, meshing the teeth of the gear with those of the reverse idler gears.
- c. Align the external splines of the spacer with the clutching teeth of the reverse gear, then move the spacer forward on the mainshaft and into gear. Install the snap ring in the hub of the reverse gear and move the reverse gear forward on mainshaft into proper position.
- d. Reinstall the auxiliary drive gear assembly onto the rear of the mainshaft, using a flanged end driver and maul, seat the bearing in the case bore.
- e. Install and tighten the six cap screws to 35 to 45 lbf.ft (48 to 61 N.m), lock wire them in groups of three and install the snap ring in the groove at the end of the mainshaft.
- f. Install the upper reverse idler gear assembly in accordance with Para 61.

TIMING PROCEDURE



FAILURE TO PROPERLY TIME THE GEAR SETS WILL RESULT IN UNEQUAL TOOTH CONTACT CAUSING THE MAINSHAFT GEARS TO CLIMB OUT OF MESH WITH THE COUNTERSHAFT GEARS RESULTING IN SERIOUS TRANSMISSION DAMAGE.

66. It is essential that the countershaft assemblies of the front and auxiliary sections are timed to ensure proper tooth contact is made between mainshaft gears seeking to centre on the mainshaft during torque transfer and the mating countershaft gears that distribute the load evenly.

67. Timing is a simple procedure of marking the appropriate teeth of a gear set prior to installation and placing them in proper mesh when installed into the transmission. It is only necessary to time the drive gear set in the front section and the LO range gear set the auxiliary section.

68. **Timing Procedure (front section).** To time the front section of the transmission, proceed as follows:

- a. Prior to placing each countershaft assembly into the case, clearly mark the tooth located directly over the keyway of the drive gear as shown in Figure 66. This tooth is stamped with an 'O' to aid identification.

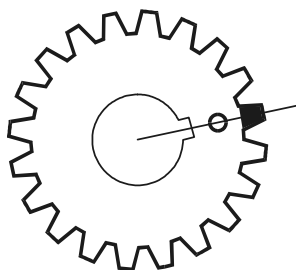


Figure 66 – Countershaft Drive Gear Timing Mark Location

- b. Mark any two adjacent teeth on the main drive gear.
- c. Mark the two adjacent teeth located directly opposite the first set marked on the main drive gear. As shown below, there should be an equal number of unmarked gear teeth on each side between the marked sets (refer to Figure 67).

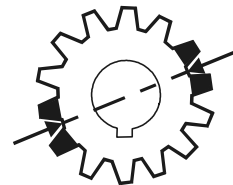


Figure 67 – Main Drive Gear Timing Marks

- d. Mesh the marked countershaft drive gear teeth with the marked main drive gear teeth. (After placing the mainshaft assembly into case, the countershaft bearings are installed to complete installation of the countershaft assemblies.)
- e. When installing the bearings on the left counter shaft, mesh the marked tooth of the countershaft drive gear with either set of the two marked teeth on the main drive gear.
- f. Repeat the procedure when installing the bearings on right countershaft, making use of the remaining set of two marked teeth on the main drive gear to time assembly (refer to Figure 68).

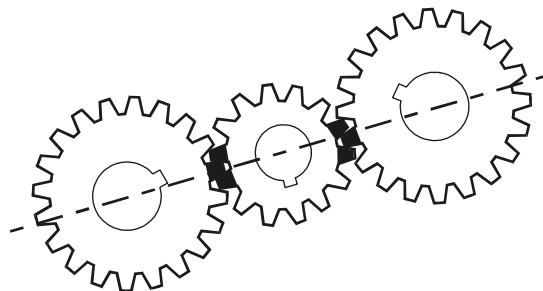


Figure 68 – Correct Gear Positions for Timing

69. **Timing Procedure (auxiliary section).** To time the auxiliary section of the transmission, proceed as follows:

- a. The auxiliary section is different from the standard because of the helical gear design; therefore, review this procedure before assembly.
- b. Mark any tooth on the LO range gear. Then mark a tooth located directly opposite the first marked.
- c. Prior to placing each auxiliary countershaft assembly into housing, mark the two teeth on the LO range gear of each auxiliary countershaft assembly stamped with the two O's. Repeat the procedure on the reduction gear of each auxiliary countershaft.
- d. Install the auxiliary countershaft in the auxiliary housing lining the timing marks on the countershaft with the LO range gear and the reduction gear.
- e. Seat the auxiliary countershaft bearings.

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70. **Installation.** To install the auxiliary section of the transmission, proceed as follows:

NOTE

The following procedure can be completed in both the horizontal and vertical positions. Care must be taken when the procedure is completed in the horizontal position as parts may move and cause damage to the auxiliary countershaft bearing covers.

- a. Install the clutch housing in accordance with Para 42 then place the transmission in the vertical position supported by two blocks of wood to prevent it tipping or damaging the input shaft.
- b. Place the front sliding clutches in the neutral position and engage the auxiliary section in gear so that the output yoke can be rotated.
- c. Lower the auxiliary section onto the transmission case, install the cap screws and tighten them to 47 to 61 N.m (35 to 45 lbf.ft).
- d. Remove the centre bolt from each shim gauge and loosen the two cover cap screws.

NOTE

Ensure countershaft bearing cover gaskets are not installed for the following procedure.

- e. Turn the cap screws in until they contact the shim gauge surface then evenly apply 8 kgf.cm (7 lbf.in) of torque to each cap screw.
- f. Rotate the output shaft six times in a clockwise direction then six times in an anti-clockwise direction to properly seat the countershaft bearings. Using a feeler gauge,

measure the clearance between the shim gauge and the auxiliary housing surface next to each cap screw. Record each measurement and average them. Refer to the helical end play chart (Table 3) and select the number in the 1st column which corresponds to the average measurement which was achieved. Follow the column to the right to determine the proper shim required by thickness, part number and shim colour. Repeat this procedure for the opposite countershaft then remove the shim gauges (refer to Figure 69).

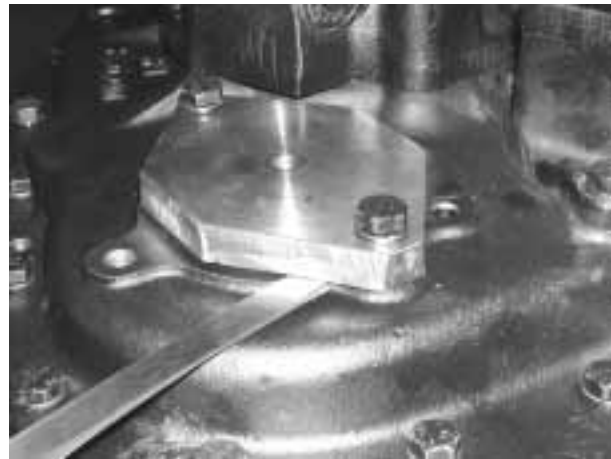


Figure 69 – Measuring Helical End Play

- g. After the correct shim has been selected, place the shim on the rear countershaft bearing cup, install the countershaft rear bearing gasket and cover. Ensure that the cover and shim are correctly aligned to prevent damage then, tighten the screws to 47 to 61 N.m (35 to 45 lbf.ft).

Table 3 – Helical End Play Chart

Feeler Gauge Average Gap (inch)	Shim Thickness (inch)	Standard Shim Part Number	Oil Pump Shim Part Number	Color Code
0.072 to 0.075	0.036 to 0.037	21452	21472	RED
0.069 to 0.0715	0.039 to 0.040	21453	21473	PINK
0.066 to 0.0685	0.042 to 0.043	21454	21474	BROWN
0.063 to 0.0655	0.045 to 0.046	21455	21475	TAN
0.060 to 0.0625	0.048 to 0.049	21456	21476	ORANGE
0.057 to 0.0595	0.051 to 0.052	21457	21477	YELLOW
0.054 to 0.0565	0.054 to 0.055	21458	21478	GREEN
0.051 to 0.0535	0.057 to 0.058	21459	21479	LIGHT BLUE
0.048 to 0.0505	0.060 to 0.061	21460	21480	LAVENDER
0.045 to 0.0475	0.063 to 0.064	21461	21481	WHITE
0.042 to 0.0445	0.066 to 0.067	21684	21686	BLACK
0.039 to 0.0415	0.069 to 0.070	21685	21687	SILVER

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NOTE

This procedure can be performed with a 0.100 inch gauging shim and the existing rear bearing covers following the same procedure.

- h.** Lock the transmission in gear by engaging two sliding clutches at the same time then apply 610 to 678 N.m (450 to 500 lbf.ft) of torque to the output yoke nut to complete the installation of the drive yoke.
- i.** Install the shift bar housing in accordance with Para 40.

GROUP 7 – TRANSFER CASE

71. For maintenance procedures related to the transfer case and transfer case oil cooler, refer to the following:

- a.** EMEI Vehicle G 703,
- b.** EMEI Vehicle G 704,
- c.** EMEI Vehicle G 7041, and
- d.** Normax Transfer Case Oil Cooler Handbook.

GROUP 9 – REAR AXLES

72. For maintenance procedures related to the rear axle group, refer to the following:

NOTE

For removal of the rear or intermediate axles refer to EMEI Vehicle G 704-2.

- a.** EMEI Vehicle G 703,
- b.** EMEI Vehicle G 704,
- c.** EMEI Vehicle G 704-1, and
- d.** EMEI Vehicle G 704-2.

GROUP 10 – FRONT AXLE

73. For maintenance procedures related to the front axle group, refer to the following:

- a.** EMEI Vehicle G 704, and
- b.** EMEI Vehicle G 704-1.

GROUP 12 – BRAKE SYSTEM

74. For maintenance procedures related to the main brake system, refer to the following:

- a.** EMEI Vehicle G 703,
- b.** EMEI Vehicle G 704,
- c.** EMEI Vehicle G 704-1, and
- d.** General Pneumatics Maintenance Manual.

GROUP 13 – SUSPENSION

75. Rear Suspension. For maintenance procedures related to the rear suspension, refer to the following:

- a.** EMEI Vehicle G 798-10,
- b.** EMEI Vehicle G 703-1, and
- c.** EMEI Vehicle G 704-2.

GROUP 15 – ELECTRICAL

76. For maintenance procedures related to the electrical system not contained in this EMEI, refer to the following:

- a.** EMEI Vehicle G 703,
- b.** EMEI Vehicle G 704, and
- c.** EMEI Vehicle G 704-1.

77. Electrical circuit diagrams for the recovery system are shown at Figure 97 and Figure 98.

GROUP 16 – FRAME

78. For maintenance procedures related to the frame and tow coupling, refer to the following:

- a.** EMEI Vehicle G 703, and
- b.** EMEI Vehicle G 799-16.

GROUP 17 – BODY

79. For maintenance procedures related to the body, refer to the following:

- a.** EMEI Vehicle G 703,
- b.** EMEI Vehicle G 704, and
- c.** EMEI Vehicle G 704-1.

DRIVERS CABIN

80. Removal. Removal of the driver's cabin is to be conducted in accordance with EMEI Vehicle G 704-1 with the following additional tasks:

- a.** Disconnect the vehicle batteries.
- b.** Remove the cab interior trim panels around the join between cabins.
- c.** Remove the bolts joining the two cabins together.
- d.** Disconnect all electrical wiring leading from the driver's cabin to the crew cabin.
- e.** Disconnect the military radio wiring from under the front of the driver's cabin floor.
- f.** Disconnect the camera wiring.
- g.** Remove the air intake stacks.

- h. Evacuate the air conditioning system then disconnect the air conditioning piping at the bulkhead fittings under the LHR corner of the cabin. Refer to Crisp-Air Air Conditioning Handbook.
- i. Slide the driver's cabin away from the crew cabin and carefully lift it off using appropriate slings and overhead crane. Ensure no wiring or air lines become snagged during lifting.

81. Installation. To install the driver's cabin, proceed as follows:

- a. Refit the cabin in reverse order to disassembly.
- b. Fit and tighten all bolts joining the driver's cabin to the crew cabin.
- c. Reconnect all electrical, radio and camera wiring.
- d. Reconnect and charge the air conditioning system. Refer to Crisp-Air Air Conditioning Handbook.
- e. Refit the trim panels.
- f. Connect the vehicle batteries, inspect and test all systems for leaks and correct operation.

CREW CABIN

82. Removal. To remove the crew cabin, proceed as follows:

- a. Remove the cabin interior trim panels around the join between cabins.
- b. Remove the bolts joining the two cabins together.
- c. Disconnect the wiring plug for the crew cabin lighting located under the lower LHR corner of the crew cab.
- d. Disconnect the radio cables from under the RHS of the crew cabin in accordance with EMEI Vehicle D 323.
- e. Remove the four mounting bolts securing the crew cabin to the sub-frame then slide the crew cabin away from the drivers cabin.
- f. Position fabric slings under each side of the crew cabin then carefully lift off using an overhead crane and spreader bar.

83. Installation. To install the crew cab, proceed as follows:

- a. Lift the crew cabin back into position. Align all bolt holes between the two cabins and the four main mounts.

- b. Loosely fit all mounting bolts to ensure correct alignment then tighten them all.
- c. Reconnect the radio and crew cabin light wiring.
- d. Refit the interior trim panels.

CABIN ISOLATION FRAME

84. Removal. To remove the cabin isolation frame, proceed as follows (refer to Figure 70):

- a. Remove the cabin assemblies in accordance with Paras 80 and 82.
- b. Remove the radiator. Refer to EMEI Vehicle D 323.
- c. Remove the power steering reservoir from its mounting and support the assembly within the engine bay.
- d. Disconnect the air lines from the throttle control pressure reducing valve and double check valve mounted to the right hand rail of the cabin sub-frame.
- e. Disconnect the air lines from the height control valves on the sub frame and the vertical height adjusting rods from their mounting points adjacent to the lower damper mountings.
- f. Slide an appropriate length of timber (approximately 100 mm square) across the top of the main chassis rails at the point where the cabins join to support the rear of the cabin isolation frame.
- g. Remove the upper damper mounting bolts from all six dampers.
- h. Disconnect the air lines from the top of the air springs and remove the upper mounting nuts from the springs.
- i. Remove the 'U' bolts securing the watts link anchor bar to the mounting brackets on the main chassis and remove the two front mounting bolts.
- j. Lift the isolation frame carefully off the chassis using an overhead crane and appropriate slings. Support the isolation frame on suitable stands or blocks.

85. Disassembly. To disassemble the cabin isolation frame, proceed as follows:

- a. Remove the driver's cabin support bar.
- b. Remove and disassemble the Watts link assembly.
- c. Remove the bracing strap, cross brace and front support plate.

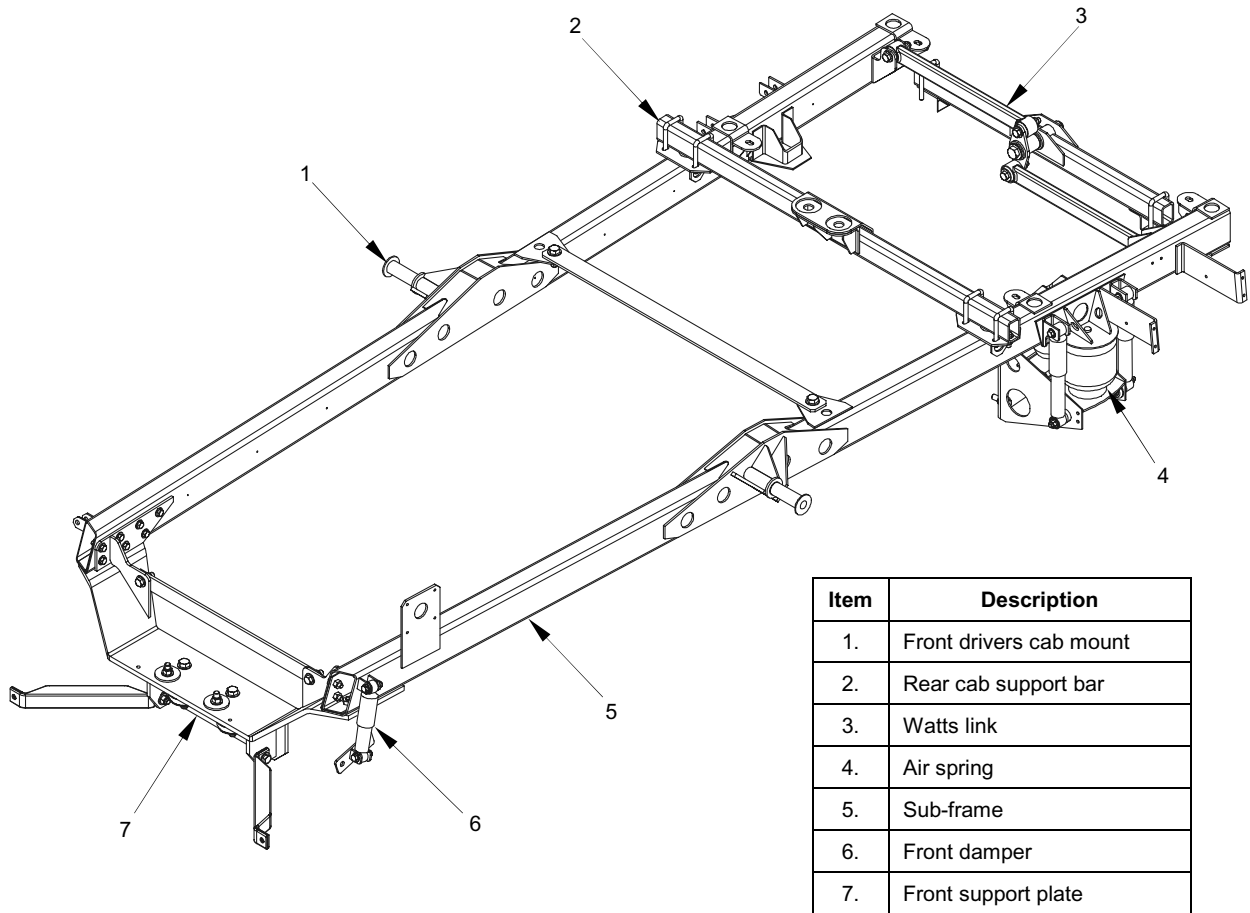


Figure 70 – Cabin Isolation Frame

86. **Cleaning and Inspection.** To clean and inspect the cabin isolation frame, proceed as follows:

- a. Clean all components using a pressure cleaner.
- b. Inspect all components for damage, wear and cracks. Repair or replace components as necessary.

87. **Assembly.** To assemble the cabin isolation frame, proceed as follows:

- a. Fit new bushes to the Watts link rods and pivot.
- b. Reassemble the isolation frame in reverse order to disassembly.

88. **Installation.** To install the cabin isolation frame, proceed as follows:

- a. Position the timber across the chassis in the same location as it was for removal, then lift the isolation frame into position.

b. Refit and tighten the front mounting bolts and the ‘U’ bolts securing the Watts link anchor bar.

c. Locate the top of the air springs into the upper mount, then refit the mounting nuts and air lines.

d. Refit and tighten the upper mounting bolts on all six dampers.

e. Reconnect vertical height control rods and air lines to the height control valves.

f. Reconnect the air lines to the throttle control pressure reducing valve.

g. Refit the power steering reservoir to the isolation frame.

h. Refit the radiator in accordance with EMEI Vehicle D 323.

i. Refit the cabin assemblies in accordance with Paras 81 and 83.

COMPLETE CABIN AND ISOLATION SYSTEM

89. Removal. To remove the cabins and isolation frame as an assembly, proceed as follows (refer to Figure 71):

- a. Remove the crane (refer to Para 155).
- b. Slide an appropriate length of timber (approximately 100 mm square) across the top of the main chassis rails at the point where the cabins join to support the rear of the cabin isolation frame.
- c. Drain all air from the vehicle and disconnect the batteries. Ensure the isolation sub-frame rests on the timber as the cab air springs deflate.
- d. Remove the radiator. Refer to EMEI Vehicle D 323.
- e. Remove the power steering reservoir from its mounting and support the assembly within the engine bay.
- f. Ensure all air lines, wiring and fittings are removed or disconnected as for cabin removal. Refer to EMEI Vehicle G 704-1.
- g. Disconnect the recovery wiring harness plug from the left hand side cabinet and secure it to the cabin isolation frame.
- h. Disconnect the air lines from the height control valves on the sub frame and disconnect the vertical height adjusting rods from their mounting points adjacent to the lower damper mountings.
- i. Remove the upper damper mounting bolts from all six dampers.
- j. Disconnect the air lines from the top of the air springs and remove the upper mounting nuts from the springs.



Figure 71 – Lifting Complete Cabin Assembly

- k. Remove the 'U' bolts securing the watts link anchor bar to the mounting brackets on the main chassis and remove the two front mounting bolts.
- l. Fit the front lifting eyes and rear lifting frame to the cabin isolation frame.
- m. Using an appropriate crane, lifting frame (refer to Para 5e) and chain slings, carefully lift the cabin assembly off the chassis. Ensure that no wiring or lines become snagged during lifting. Lower the assembly to the floor allowing it to sit on the front mount and timber blocks at the rear.

90. Installation. To install the cabins and isolation frame as an assembly, proceed as follows:

- a. Position the timber across the chassis in the same location as it was for removal.
- b. Position the upper mounting bushes and washers onto the front support bracket.
- c. Lift the assembly back onto the chassis ensuring that the front mounting holes align with the mounting bushes.
- d. Refit the lower mounting bushes and front mounting bolts.
- e. Fit and tighten the 'U' bolts securing the Watts link anchor bar to the chassis mounting angle then tighten the front mounting bolts.
- f. Disconnect the crane, remove the front lifting eyes and rear lifting bracket.
- g. Locate the top of the air springs into the upper mount then refit the mounting nuts and air lines.
- h. Refit and tighten the upper mounting bolts on all six dampers.
- i. Reconnect vertical height control rods and air lines to the height control valves.
- j. Reconnect all air lines, wiring and fittings in reverse order to removal. If necessary refer to EMEI Vehicle G 704-1.
- k. Remount the power steering reservoir to the isolation frame.
- l. Refit the radiator. Refer to EMEI Vehicle D 323.
- m. Refit the crane (refer to Para 157).
- n. Start the engine, check for air leaks and test all systems for correct operation. (Remove the timber when the air springs have inflated).

- o. Adjust the cabin ride height in accordance with EMEI Vehicle D 323.



GROUP 18 – CABIN HEATING/COOLING

- 91. For maintenance procedures related to the cab heating and cooling systems, refer to the following:
 - a. EMEI Vehicle G 703,
 - b. EMEI Vehicle G 704,
 - c. EMEI Vehicle G 704-1, and
 - d. Crisp-Air Air Conditioning Handbook.

POWER TAKE-OFFS

SIX AND EIGHT BOLT PTOS

- 92. **Removal and Installation.** Remove and install the PTOs in accordance with EMEI Vehicle D 324-1.
- 93. **Disassembly.** Disassemble the PTO in accordance with Figure 72 laying all components out in order of removal.

NOTE

The overhaul procedures are the same for both the six and eight bolt PTO units.

- 94. **Cleaning and Inspection.** To clean and inspect the PTO, proceed as follows:
 - a. Clean all components in clean solvent and blow dry with clean dry compressed air.
 - b. Inspect all components for wear and damage, paying particular attention to the gears, shafts and the piston and bore of the air cylinder.
- 95. **Assembly.** Assemble the PTO in reverse order to disassembly in accordance with Figure 72.

HYDRAULIC SUPPLY SYSTEM

- 96. This section provides maintenance information and procedures related to the hydraulic system components common to both the crane and the recovery module. For specific system information refer to the relevant sections of this EMEI.

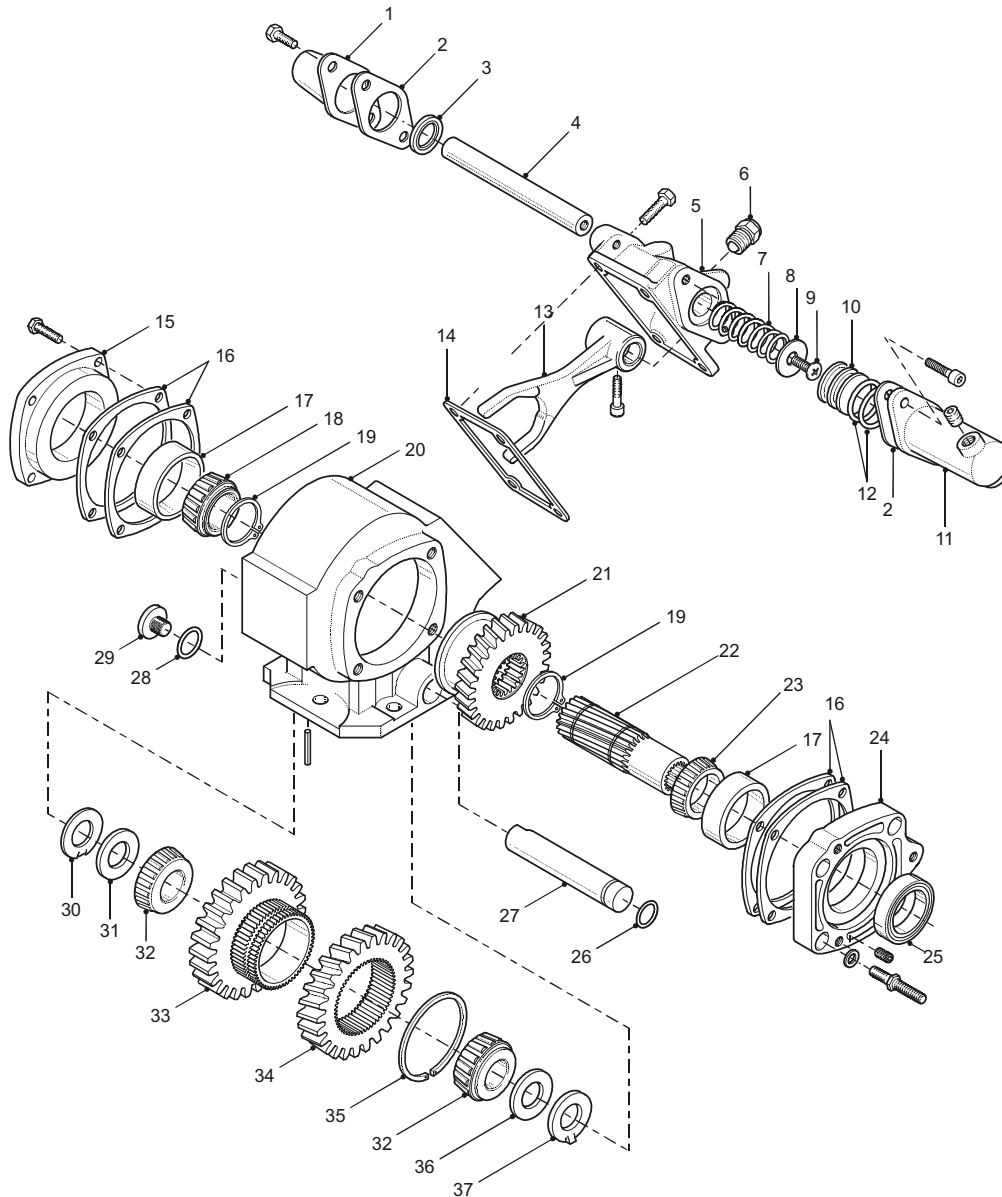
HYDRAULIC PUMPS

- 97. **Removal and Installation.** Removal and installation of the hydraulic pumps is to be conducted in accordance with EMEI Vehicle D 324-1.
- 98. The repair procedures for both the single (crane pump) and tandem (recovery system pump) are detailed within the following paragraphs. There are some differences in the procedures between the two pumps which are appropriately marked.
- 99. **Disassembly.** To disassemble the hydraulic pump/s, proceed as follows:

DO NOT GRIP ON OR NEAR ANY MACHINED SURFACES DURING ASSEMBLY OR DISASSEMBLY.

WHERE IT IS NECESSARY TO PRY COMPONENTS APART, TAKE CARE NOT TO DAMAGE MACHINED SURFACES.

- a. Place the pump in a vice with the drive shaft pointing down and match-mark all sections to enable correct reassembly.
- b. Use a socket wrench to remove the four cap screws (single pump), or hex nuts, studs and washers (tandem pump).
- c. Lift off the port end cover. The dowel pins will remain in either the port end cover or the gear housing.
- d. Remove the thrust plate.
- e. Carefully remove the drive and driven gears. Avoid tapping the gear teeth together or against other hardened surfaces. Keep these gears together as they are a matched set. Remove the thrust plate from the bearing carrier. (Tandem pump only.)
- f. Lift the gear housing from the bearing carrier. (Tandem pump only.)
- g. Carefully lift or pry off the bearing carrier to prevent damage to contact face and edges. Dowel pins will remain in either the bearing carrier or the gear housing. **Do not remove them.** (Tandem pump only.)
- h. Remove the connecting shaft and the thrust plate. Remove the driven gear, integral gear and drive shaft. Keep these together as they are a matched set. Be careful not to damage the machined surfaces of the gears.
- i. Lift or pry off the first section gear housing.
- j. Inspect all bushings for scoring or discoloration and replace if necessary. Use a bushing puller to remove bushings.
- k. Grip the shaft end cover in a vice with the mounting face down. Remove double lip seal by inserting a seal removal tool into the notch between the double lip seal and the shaft end cover. Tap the seal out and discard. Remove and discard all rubber and polymer seals.



UNCONTROLLED WHEN PRINTED

Item	Description	Item	Description	Item	Description
1.	Shifter shaft cover	14.	Gasket	27.	Idler shaft
2.	Gasket	15.	Bearing cap, closed end	28.	'O' ring
3.	Oil seal	16.	Gasket, 0.010, 0.015 or 0.020 inch	29.	Plug
4.	Shifter shaft	17.	Bearing race	30.	Washer, notched
5.	Shifter cover	18.	Bearing cone	31.	Washer, thrust bearing
6.	Switch	19.	Circlip	32.	Bearing cone
7.	Return spring	20.	PTO housing	33.	Input gear
8.	Washer	21.	Output gear	34.	Input ratio gear
9.	Screw, button head	22.	Output shaft	35.	Circlip
10.	Piston	23.	Bearing cone	36.	Idler gear spacer
11.	Cylinder	24.	Bearing cap, open end	37.	Washer, notched
12.	'O' ring	25.	Output oil seal		
13.	Shifter fork	26.	'O' ring		

Figure 72 – Power Take-Off

100. Cleaning and Inspection. To clean and inspect the hydraulic pump/s, proceed as follows:

- a. Clean all components using clean solvent and dry thoroughly with lint free cloth and dry compressed air.
- b. **Gear Housing.** Measure the wear in the cut-out area by placing a straight-edge across bore. If you can slip a 0.18 mm (0.007 inch) feeler gauge under the straight-edge in the cut-out area, replace the gear housing. Pressure pushes the gears against the housing on the low pressure side. As the hubs and bushings wear, the cut-out becomes more pronounced. Excessive cut-out in a short period of time indicates excessive pressure or oil contamination. If the relief valve settings are within prescribed limits, check for shock pressures or tampering. When the cut-out is moderate, 0.18 mm (0.007 inch) or less, the gear housing is in good condition and may be reused.
- c. **Gears.** Inspect the gear hubs and teeth and replace them if any of the following signs of damage or wear are evident:
 - (1) Scoring of gear hubs.
 - (2) Scoring, grooving or burring of the outside diameter of the teeth.
 - (3) Nicking, grooving, or fretting of teeth surfaces.
- d. **Drive Shafts.** Replace the drive shafts if there is any wear detectable by touch in the seal area or at the drive coupling. The maximum allowable wear is 0.05 mm (0.002 inch). Wear in the shaft seal area indicates oil contamination. Wear or damage to splines, keys, or keyways necessitates replacement.
- e. **Thrust Plates.** The thrust plates seal the gear section at the sides of the gears. Wear here will allow internal slippage, that is, oil will bypass within the pump. A maximum of 0.05 mm (0.002 inch) wear is allowable. Replace thrust plates if they are scored, eroded or pitted. Check centre of thrust plates where the gears mesh. Erosion here indicates oil contamination. Pitted thrust plates indicate cavitation or oil aeration. Discoloured thrust plates indicate overheating, likely due to insufficient oil.
- f. **Dowel Pins.** If either the dowel or dowel hole is damaged, the dowel or machined casting, or both, must be replaced. If more than reasonable force is required to seat dowels, the cause may be poorly deburred or

dirty parts, cocking of the dowel in the hole or improper pin-to-hole fit.

- g. **Bushings.** If gears are replaced, bushings must be replaced. Bushings should fit into the bore with a heavy press fit.
- h. **Seals and Gaskets.** Replace all rubber and polymer seals, including all 'O' rings, thrust plate channel seals, shaft seal and gasket seals.
- i. **Plugs.** Examine the plugs in the shaft end and port end covers to make sure they are in the proper position and tight.

101. Assembly. To assemble the hydraulic pump/s, proceed as follows:

- a. Stone all machined surfaces with a medium grit carborundum stone.
- b. If the bushings have been removed, deburr the bushing bores with an emery cloth. Rinse parts in solvent. Air blast all parts and wipe with a clean, lint free cloth before starting assembly.
- c. Grip the shaft end cover in a vice with the mounting flange facing down. Examine the plug/s to be sure they are securely in place. Replace only if the plugs are damaged.
- d. New plugs should be screwed in tightly. Stake the plug with a prick punch at both ends of the screwdriver slot and around edges. Peen the edge of the hole 0.8 mm to 1.5 mm (1/32 inch to 1/16 inch) with a 38 mm (1-1/2 inch) diameter steel ball. If new plug/s are being installed, coat the threads with Loctite 569 thread sealant.

NOTE

Para's 101e, f, g, and h apply to the shaft end cover, bearing carrier and port end cover.

- e. Any bushings removed from the shaft end cover, portend cover or bearing carrier should be assembled in the drive bores with the groove to the top of the unit (12 o'clock). Assemble the bushings in the driven bores with the groove to the bottom of the unit (6 o'clock).
- f. Bushings should be pressed into the bores, one at a time, using an installation tool and an arbor press. Be sure that the grooves (or seams) are positioned as stated in Para 101e. The bushings must be pressed into the bores flush with the casting face. Be sure to support the castings so that they are square and level.
- g. Repeat Para's 101a and b, stone and rinse parts.