INDEX
FD50 DOZER
SERVICE MANUAL SET
FORM NO. 73158172

Service manual set is arranged in the following order		Individual manuals are also available in translation in form numbers listed below			
Service Manuals	ENGLISH Form No.	ESPAÑOL (Spanish)	FRANÇAIS (French)	ITALIANO (Italian)	DEUTSCH (German)
Engine Related	73148709				
Turbocharger					
Transmission	73148441				
Steering Clutches & Brakes	73148247				
Final Drives	73148248				
Undercarriage	73148249				
Cab	73149751				
Hydraulic	73142645				
Electrical	73146366				
Binder	73155403				

The following additional Service Manuals, in English, are not included in the Manual Set, but may be ordered from a Fiatallis dealer:

FIATALLIS®

Index card 73158195

Cut along the dotted lines and insert in spline of binder

FD50 DOZER SERVICE MANUAL SET FORM 73158172

SAFETY RULES

In lifting and handling heavy parts, slings must be of adequate strength for the purpose intended and must be in good condition.

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 207 kPa (30psi) according to local or national requirements.

Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding or burning. Wear dark safety glasses near welding. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.

Remove sharp edges and burrs from reworked parts.

Be sure all mechanics tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.

Do not strike hardened steel parts with anything other than a soft iron or non-ferrous hammer.

3.5.4
Install the intake tubes, Fig. 4 (2) on air cleaner (4) and secure with clamps (3).

3.6 AIR CLEANER INSTALLATION

3.6.1
Lift air cleaner assemblies, Fig. 4 (4) and work into position on brackets, (18). Secure the assemblies to mounting brackets.

3.6.2
Install rubber elbows, Fig. 4 (9) to the air intake elbows, (8) and (10) and secure them with clamps.

3.6.3
Remove inlet and outlet covers from the air cleaners. Using a new O-ring, Fig. 4 (7) install the intake elbows, (8 and 10) and tighten securely.

3.6.4
Work the rubber elbows, Fig. 4 (9) onto the turbocharger and secure with clamps.

3.6.5
Remove tape or plugs from indicator hoses and fittings. Connect the hoses, Fig. 4 (12 and 13) to intake elbows, (8 and 10).

3.6.6
Refer to 2.2 for the installation of the hood. Close the upper left and right side panel doors.

4.4.3
Using a bar, compress the fan belt tightener; work the fan drive belts into position on pulleys. Remove the bar.

4.4.4
Remove the caps used to seal the hydraulic hoses and fittings when hydraulic lines were disconnected. Use new O-rings, and connect hydraulic hoses from the dozer cylinders and supply hoses to the cross-over tubes.

4.4.5
Install hoses, Fig. 8 (4) and tubes (5, 6) on the engine. Secure hoses (2) to tubes (5 and 6) with clips (3).

4.4.6
Refer to paragraph 4.2 for the installation of the radiator, hood side plates and hood.

6.6.3 ENGINE RESTART

6.6.3.1
Place the transmission control lever in neutral, the engine shut off control in the down position. Place the throttle lever in the low idle position and start the engine.

WARNING

- Never attempt to operate machine or attachment except when seated in the operator's seat. Keep head, body, limbs, hands and feet inside the operator's compartment to reduce exposure to hazards outside operator's compartment.
- Warn all people who may be servicing or working around machine before starting engine.
- Do not run engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
- Keep people clear of attachments and tools while in raised position, to prevent possible injury.
- Observe all start up and shut down procedures and WARNINGS listed in the Operation and Maintenance Instruction Manual.

6.6.3.2
Allow the engine to operate at low idle for a few minutes. Moniter all gauges. (Consult the Operators Manual for start-up procedure) oil pressure gauge must register in operating range . Allow engine coolant temperature to stablized. (Coolant temperature gauge must register in operating range).

6.6.3.3
Advance throttle position, and increase engine r.p.m. and continue to monitor all gauges. If all systems check normal resume operation.

6.6.3.4
If engine fails to advance to high idle, return the throttle lever to the low idle position. Locate the engine protection system control mounted on the left side of engine.

6.6.4 ENGINE PROTECTION SYSTEM RESET

6.6.4.1
Located on the lower half of the control Fig. 16 (9) is the reset lever. To reset turn lever 180° C.W.

6.6.4.2
Repeat procedure 6.6.3.3. If engine still fails to accelerate to high idle it will be necessary to check the integrity of both the coolant loss valve (10) and the coolant sensor (1).

6.6.4.3
With engine at low idle both engine oil pressure and coolant temperature gauges registering normal operating range.

6.6.4.4
Loosen connector on hose (2) at tee (12) If a heavy and continous flow of engine oil occurs this is an indication that the coolant sensor has failed and is stuck in the open position.

6.6.4.5
Replace coolant sensor (1) and repeat procedure 6.6.4.3.

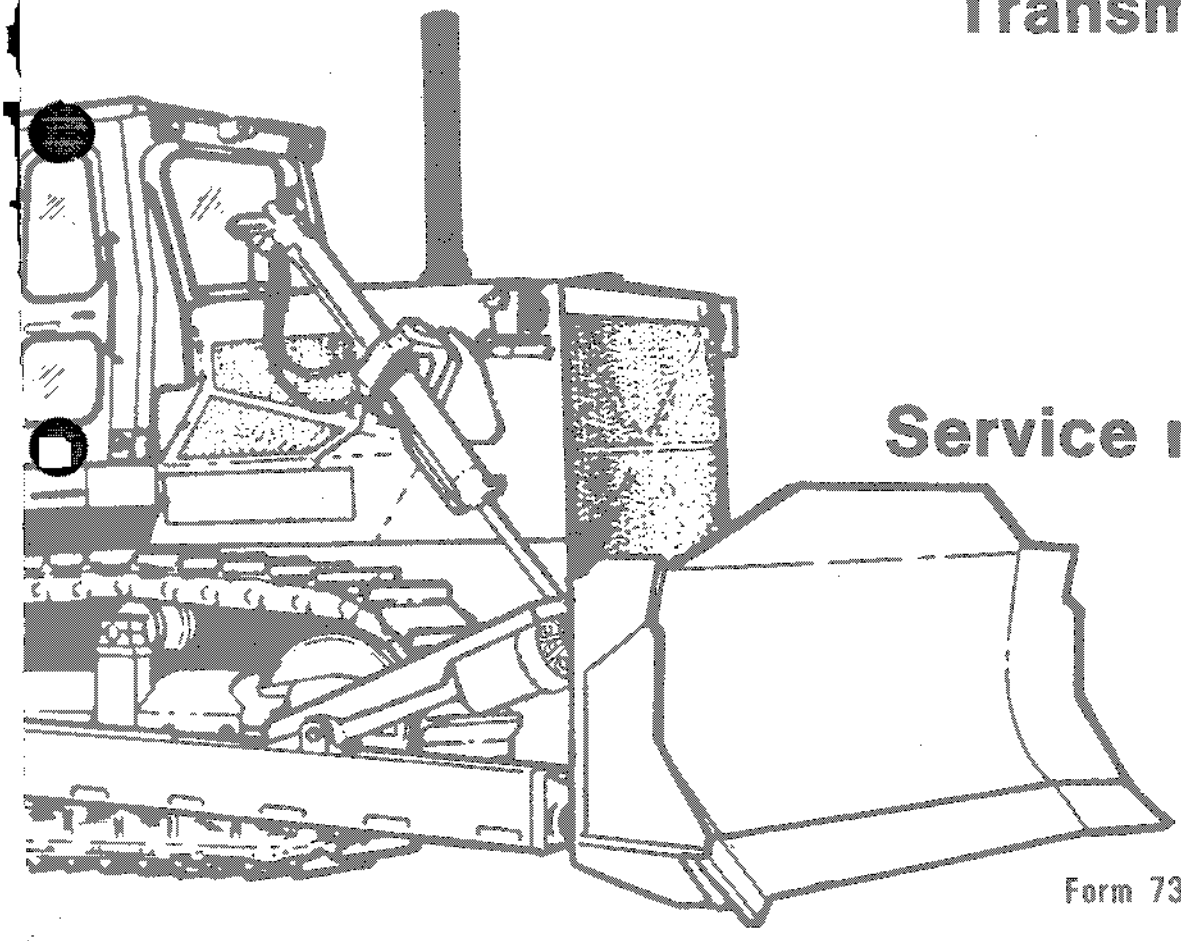
6.6.4.6
If engine still fails to acclerate to high idle, repeat procedure 6.6.4.3. Loosen connector on hose (3) at coolant loss valve (10). If a heavy and continous flow of engine oil occurs this is an indication that the coolant loss valve has failed and is stuck in the open position. Replace coolant loss valve (10) and repeat procedure 6.6.4.3. If engine still fails to accelerate to high idle consult Engine Service Manual.

FIATALLIS

FD50

CRAWLER TRACTOR

Transmission



Service manual

Form 73148441 English
7–85

SAFETY RULES

In lifting and handling heavy parts, slings must be of adequate strength for the purpose intended and must be in good condition.

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 207 kPa (30psi) according to local or national requirements.

Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding or burning. Wear dark safety glasses near welding. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.

Remove sharp edges and burrs from reworked parts.

Be sure all mechanics tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.

Do not strike hardened steel parts with anything other than a soft iron or non-ferrous hammer.

TOPIC 3 TROUBLESHOOTING

NOTE: Always make certain hydraulic system is filled to proper level with specified lubricant before troubleshooting.

TROUBLE	POSSIBLE CAUSE	REMEDY
Starter will not turn engine	Transmission speed shift lever not in neutral-start.	Lock speed shift lever in neutral-start position with safety lock lever.
	Neutral safety switch out of adjustment or broken.	Adjust or replace neutral safety switch (6.3.4).
	If speed shift lever is in neutral-start position and safety switch is working properly, the engine is at fault.	See Engine Service Manual for troubleshooting procedure.
Tractor will not move in either direction (it is assumed that parts of the tractor not included in this manual have been eliminated as the source of trouble)	No pressure in hydraulic system.	Observe transmission pressure gauge on cowl. If gauge indicates no pressure, check main pressure and make necessary adjustments (refer to PRESSURE CHECKING). If pressure is indicated, continue to next possible cause.
	Automatic safety brake not released (this actually stalls the torque converter -therefore will be accompanied by a drop in engine speed when shift is made).	Refer to Steering Clutches and Brakes Section.
	Speed shift linkage out of adjustment or broken.	Adjust and/or repair linkage (6.3.4).
	Input clutch or transmission clutches failing to engage.	Move shift lever through all positions and observe drive shaft. If drive shaft turns, input clutch is engaging -failure is in transmission. Check transmission clutch apply pressures and/or flows. If drive shaft does not turn, input clutch is not engaging; check input clutch apply pressure.

PRESSURE (PSI) / SHIFT LEVER POSITION	MAIN	CONV. AND TRANS LUBE	INPUT CLUTCH	FWD	REV	1ST	2ND	3RD	SHIFT INHIBIT SYSTEM			
									FWD. VALVE Fig.4-3(9)	REV. VALVE Fig.4-3(10)	FWD. PUMP Fig.4-3(11)	REV. PUMP Fig.4-3(12)
NEUTRAL	175-220	80-90							0	0	80-120	80-120
PTO	175-220	80-90	175-200	175-200					175-220	0	180-200	80-120
*1 FWD.	175-220	80-90	175-200	175-200		175-200			175-220	0	180-200	Note 1
*2 FWD.	175-220	80-90	175-200	175-200			175-200		175-220	0	180-200	Note 1
*3 FWD.	175-220	80-90	175-200	175-200				175-200	175-220	0	180-200	Note 1
1 REV.	175-220	80-90	175-200		175-200	175-200			0	175-220	Note 2	180-200
2 REV.	175-220	80-90	175-200		175-200		175-200		0	175-220	Note 2	180-200
3 REV.	175-220	80-90	175-200		175-200			175-200	0	175-220	Note 2	180-200

FLOW (GPM) / SHIFT LEVER POSITION	RPM	NEUT	PTO	1ST	2ND	3RD	*1ST FWD	*2ND FWD	*3RD FWD	*1ST REV	*2ND REV	*3RD REV
TRANSMISSION PUMP	1450	39-46										
	High Idle	62-68										
TRANSMISSION CLUTCH APPLY	1450	3-4	6-7	6-7	6-7	6-7	8-10	8-10	8-10	8-10	8-10	8-10
INPUT CLUTCH APPLY	1450								1.5-2			1.5-2
TORQUE CONVERTER IN	1450								32-37			32-37
	High Idle								52-57			52-57
TRANSMISSION LUBE	1450						22-27	22-27	22-27	22-27	22-27	22-27
	High Idle						38-42	38-42	38-42	38-42	38-42	38-42

NOTES:

1. 80-100 psi less than gauge #11.
2. 80-100 psi less than gauge #12

* Disengage steering clutches when checking pressures and/or flow

1 psi = 0.069 bar
1 psi = 0.07 kg/cm^2
1 gpm = 3.78 lit/min

SPECIFIED PRESSURES AND FLOWS

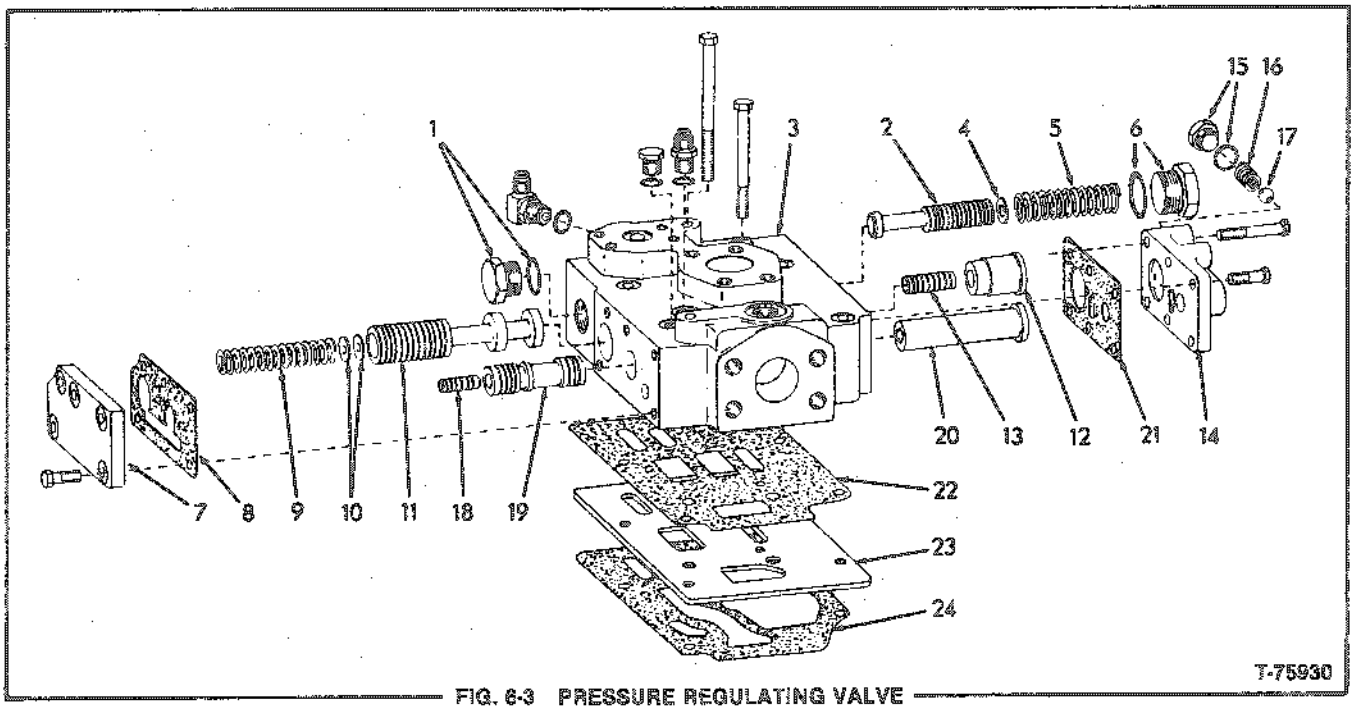


FIG. 6-3 PRESSURE REGULATING VALVE

1. Plug w/O-ring
2. Flow regulating piston
3. Body
4. Shim (if required)
5. Torque converter/transmission lube pressure regulating spring
6. Plug w/O-ring
7. End cover
8. Gasket
9. Main pressure regulating spring
10. Shims (if required)
11. Flow regulating piston
12. Guide
13. Power piston
14. End cover
15. Plug w/O-ring
16. Cold oil relief spring
17. Ball
18. Power piston
19. Input clutch flow regulating piston
20. Stop
21. Gasket
22. Gasket (marked 215527)
23. Separator plate
24. Gasket (marked 225737)

6.2 PRESSURE REGULATING VALVE

NOTE: Refer to paragraph 1.2.3 for description and operation of valve.

6.2.1 REMOVAL AND DISASSEMBLY

6.2.1.1
Valve is located on lower right rear side of torque converter, Fig. 6-4. Remove access hole cover from transmission bottom guard and stand up through access hole to reach valve.

6.2.1.2
Disconnect oil lines from valve, Fig. 6-4; remove valve and separator plate from torque converter. Cover ends of oil lines.

6.2.1.3
Remove end covers, Fig. 6-5 (7) (14) and plugs (1) (6); pull components from valve body. Identify all parts; keep shims (if any) with proper spring.

6.2.1.4
Remove plug, Fig. 6-5 (15) from end cover (14); pull spring (16) and ball (17) from end cover.

6.2.2 INSPECTION

6.2.2.1
Clean oil passages in valve body and end cover; check pistons for freedom of movement in bores; check bores for excessive wear. Check springs for proper tension (12.2).

6.2.3 ASSEMBLY AND INSTALLATION

NOTE: Lightly lubricate all parts prior to assembly.

6.2.3.1
Install check ball, Fig. 6-5 (17) and spring (16) in end cover (14). Install plug (15); plug can be tightened after installing end cover on valve body.

6.5.3.5
Install driven gear and shaft into top bore; install drive gear and shaft. Lubricate top of gears liberally.

6.5.3.6
Install remaining wear plate with bronze side toward gears and relief pocket on left (pressure side).

6.5.3.7
Place remaining isolation plate on right side of wear plate (either side up) and position remaining Teflon, nylon and rubber rings as shown in Fig. 6-10.

6.5.3.8
Install flange oil seal, Fig. 6-9 (1) with suitable driver; spring side of seal in. Secure with snap ring (2).

6.5.3.9
Be certain machined surface of flange is smooth (no burrs) and clean; grease O-ring groove and install O-ring; coat drive shaft splines with grease and install flange.

6.5.3.10
Install capscrews (with flat washers) and SNUG down only. Attempt to turn shaft; shaft should turn with light drag (MAX. 14 Nm (10 lbs.ft.) torque). If shaft will not turn as described, disassemble pump and examine for burrs, foreign material, interference, and proper assembly.

6.5.3.11
Torque capscrews evenly to 108 - 122 Nm (80 - 90 lbs.ft.) and test again for rotation.

6.5.3.12
If pump is tested prior to installation, refer to 12.5 for bench test specifications.

6.5.3.13
Before installing pump, check pump driving shaft bearing in torque converter housing, Fig. 8-61. Remove snap ring (22) for access to bearing.

6.5.3.14
Place O-ring on pump mounting flange and install pump. Tighten pump attaching capscrews and nuts to 149 - 163 Nm (110 - 110 lbs.ft.).

6.5.3.15
Connect hoses to pump. Torque suction line capscrews to 115 - 129 Nm (85 - 96 lbs.ft.). Torque pressure line capscrews to 76 - 87 Nm (56-64 lbs.ft.).

6.5.3.16
Check hydraulic sysem pressures and/or pump flow.

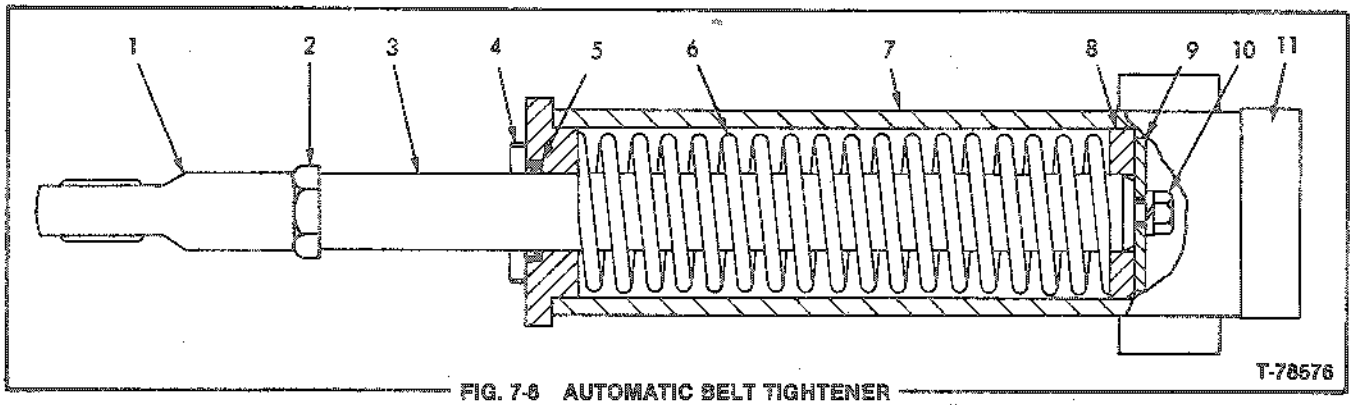


FIG. 7-8 AUTOMATIC BELT TIGHTENER

1. Rod end
2. Nut
3. Shaft
4. Roll pin
5. Seal
6. Spring
7. Tube
8. Block (spring seat)
9. Flat washer
10. Capscrew w/lockwasher
11. Cap

7.6 FAN DRIVE BELT ADJUSTMENT

7.6.1
Correct belt tension is maintained by the spring loaded belt tightener, Fig. 7-3. The belt tightener automatically takes up wear in the belts until the roll pin, Fig. 7-8 (4), in the belt tightener shaft contacts the end of the tube (7). At this point, the fan belts must be replaced. Replace the belts only as a set.

7.7 AUTOMATIC BELT TIGHTENER

7.7.1 REMOVAL AND DISASSEMBLY

7.7.1.1
Belt tightener is located behind the oil radiator, Fig. 7-3. Open the right access door, Fig. 7-1 (6) to reach the tightener.

7.7.1.2
Pry the idler, Fig. 7-3, away from the belt tightener enough to loosen the fan belts. Block the tightener in this position by placing a metal spacer between the end of the tightener and the roll pin in belt tightener shaft.

7.7.1.3
Remove capscrew attaching idler lever to the belt tightener shaft. Remove the rod ends from mounting bracket at other end of tightener and remove the tightener.

7.7.1.4
Remove rod end, Fig. 7-8 (1), and back the nut (2) off nearly to the end of the shaft. Place the assembly in a vise with the clamping force on the nut. Pull the shaft out of the tube far enough to remove the roll pin (4). Collapse the tube over the shaft to release tension from the spring. The rear cap (11) will be forced off the tube by the spring.

7.7.1.5
Remove the assembly from the vise and the nut from shaft. Pull shaft out rear of housing and remove the spring. Do not remove the hardware from rear of shaft unless it is to be replaced. Remove seal (5) only if it is to be replaced.

7.7.2 INSPECTION

7.7.2.1
Inspect shaft bore in end cover and seal contact area on shaft. Replace either if too rough to dress down with crocus cloth.

7.7.2.2
Check spring tension (12.11); replace spring if weak.

7.7.3 ASSEMBLY AND INSTALLATION

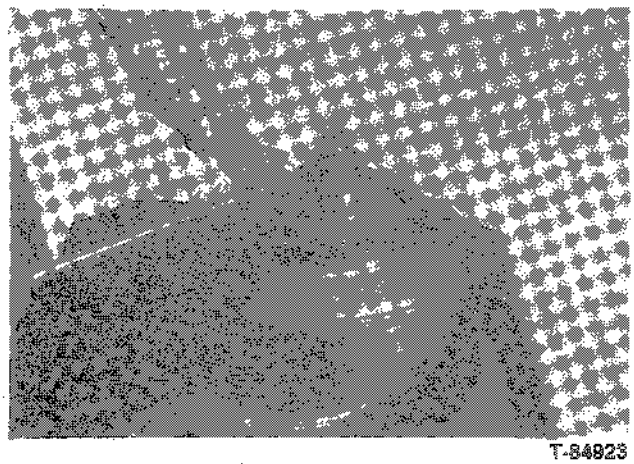
7.7.3.1
Coat the inside of tube and shaft bore in end of tube with anti-seize compound.

7.7.3.2
Install seal, Fig. 7-8 (5) in end of tube with sealing lip out.

8.5.3.5
ROTATING HOUSING, GUIDE WHEEL CARRIER, AND REAR BEARING CARRIER. Do not use carriers if splines are twisted or if I.D. is severely worn by sealing rings. Check I.D. of bushing in rotating housing and guide wheel carrier. Replace either bushing if its I.D. at any point is more than 76.5 mm (3.010 in.).

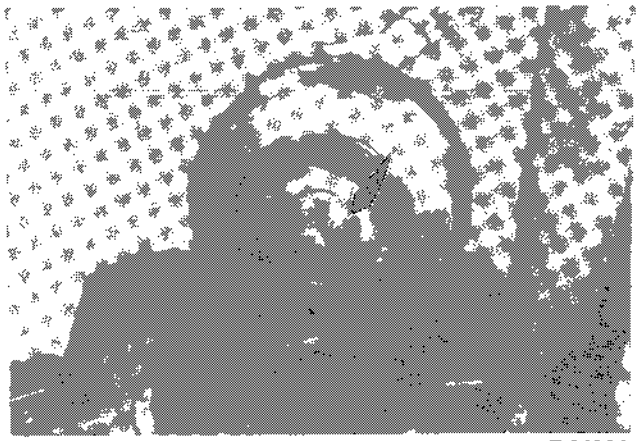
8.5.3.5.1
Bushing replacement notes:

a . Use care when removing old bushing to prevent burrs in the bore.
b . Lubricate O.D. of new bushing with light oil. Do not use bonding type sealer.
c . Press bushing into bore until flush with outer edge of bore. Remove any burrs from end of bushing after it is installed.
d . Check bushing I.D. after assembly. Specified I.D. is 76.3 - 76.4 mm (3.0035 - 3.0065 in.). If I.D. is out of specs at any point, remove the bushing and check its bore for an out-of-round condition. Replace housing or carrier if out-of-round condition exists. Do not attempt to ream the bushing.



T-84923

FIG. 8-40 INSTALLING INPUT CLUTCH FLANGE



T-84924

FIG. 8-41 ACCESSORY DRIVE GEAR THRUST WASHER

8.6 TORQUE CONVERTER ASSEMBLY

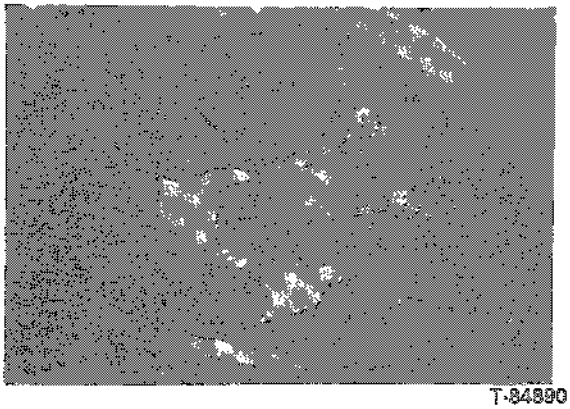
8.6.1
Match up marks made at disassembly and attach input clutch flange to rotating housing, Fig. 8-40. Torque attaching capscrews to 104 - 115 Nm (77 - 85 lbs.ft.). Lubricate I.D. of flange freely.

8.6.2
Check accessory drive gear thrust washer, Fig. 8-41. Replace if pin holes are enlarged.

8.6.3
Set rotating housing in gear housing, Fig. 8-42. Install "L" shaped bearing race and bearing in housing.

T-84925

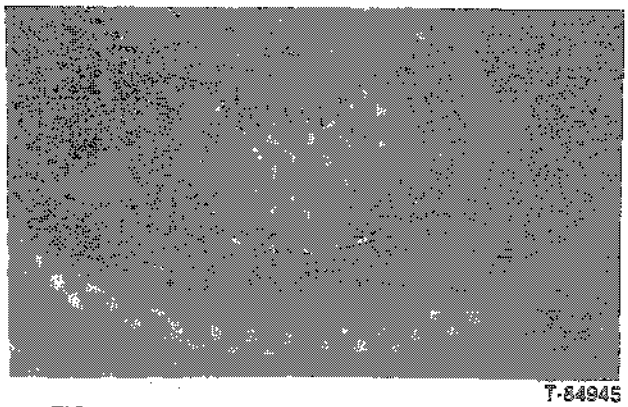
FIG. 8-42 INSTALLING ROTATING HOUSING



T-84890

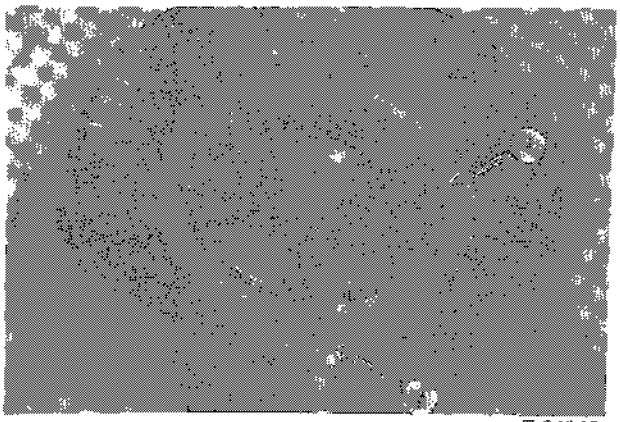
FIG. 8-71 ACCESSORY DRIVE GEAR THRUST WASHER

1. Thrust washer 2. Drive gear



T-84945

FIG. 8-72 ACCESSORY DRIVE GEAR INSTALLED



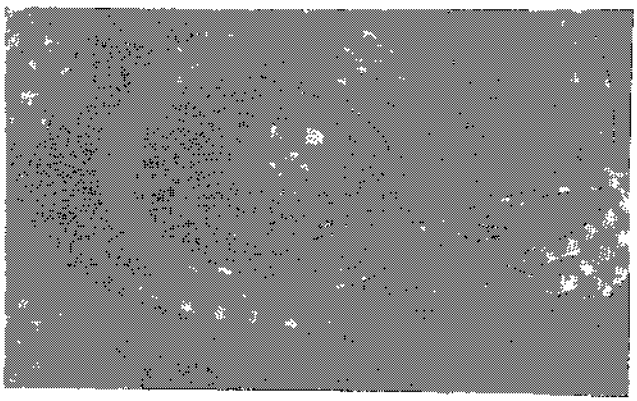
T-84946

FIG. 8-73 BACK PLATE INSTALLED

1. Back plate 2. Block

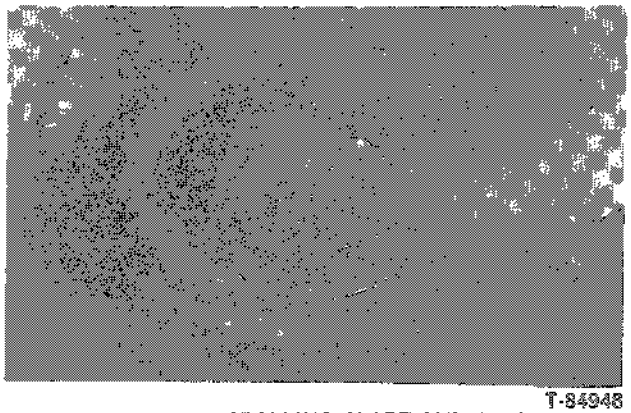
8.8 INPUT CLUTCH ASSEMBLY

8.8.1
Install thrust washer, Fig. 8-71 (1), locating on roll pins. Make sure pin holes are not enlarged.



T-84947

FIG. 8-74 INSTALLING CLUTCH HUB AND SNAP RING



T-84948

FIG. 8-75 INSTALLING PLATE AND RING

8.8.2
Install accessory drive gear, Fig. 8-72.

8.8.3
Install clutch back plate, Fig. 8-73. Block solidly under back plate to hold it about flush with accessory drive gear.

IMPORTANT: The reason for blocking behind back plate is to prevent the clutch plates from dropping off the back side of the clutch hub and becoming wedged between the clutch hub and back plate before clutch is completely assembled.

8.8.4
Install clutch hub on flange. Secure with snap ring, Fig. 8-74.

8.8.5
Install plate inside clutch hub; seat pins on plate in holes in end of flange. Secure plate at O.D. with ring, Fig. 8-75.

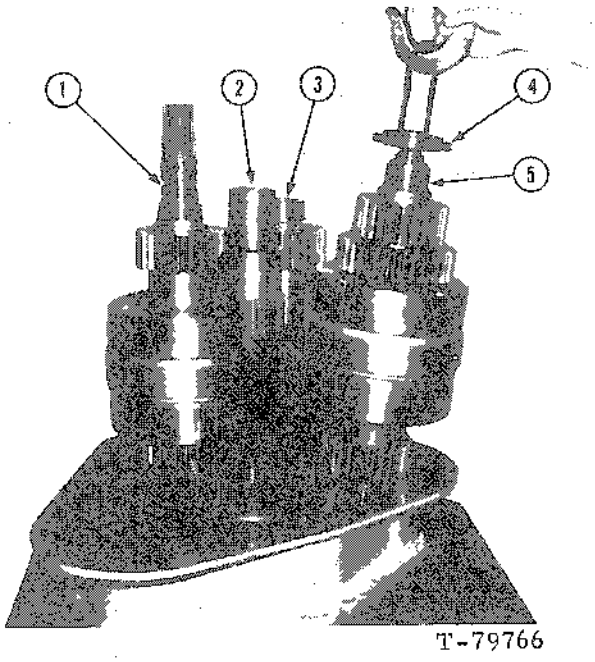


FIG. 9-11 REMOVING CLUTCH SHAFTS

1. Forward/reverse clutch shaft
2. Bevel pinion shaft
3. Countershaft
*4. Lifting bracket (75300534)
5. First/second range clutch shaft
*Refer to SERVICE TOOLS

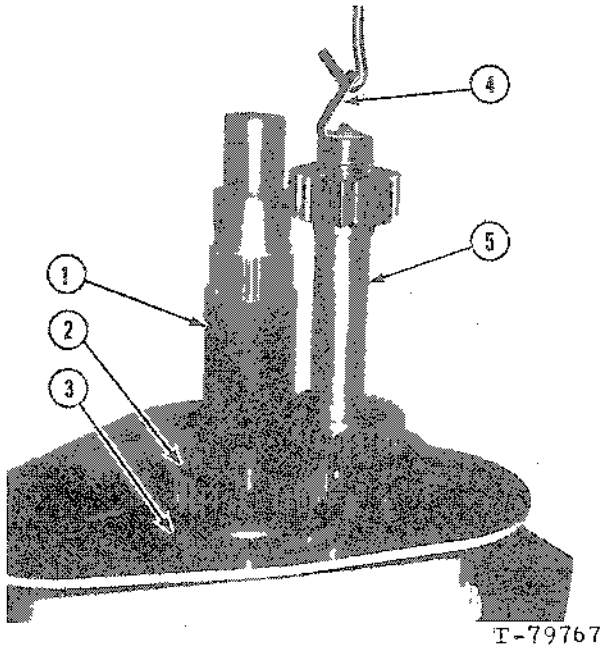


FIG. 9-12 REMOVING COUNTER SHAFT

1. Sleeve
2. 3rd speed gear
3. 1st speed gear
4. Lifting eye
5. Countershaft

NOTE: Tie front bearing adjustment shims to front bearing retainer to prevent loss.

9.2.1.5
Install bevel pinion shaft supporting plate, Fig. 9-5 (1) on table; turn capscrew (2) up against bevel pinion so capscrew is supporting the weight of the bevel pinion shaft.

9.2.1.6
Remove end washer, Fig. 9-6 (1) from pinion shaft. Install four pusher screws, Fig. 9-7 (2) in front bearing support; alternately turn pusher screws to push front bearing support from shaft.

NOTE: Tie pinion depth adjustment shims to front bearing support to prevent loss.

9.2.1.7
Remove oil sealing rings, Fig. 9-7 (1) from each clutch shaft. Put several wraps of tape around front part of each shaft to protect sharp edges on sealing ring grooves and oil grooves.

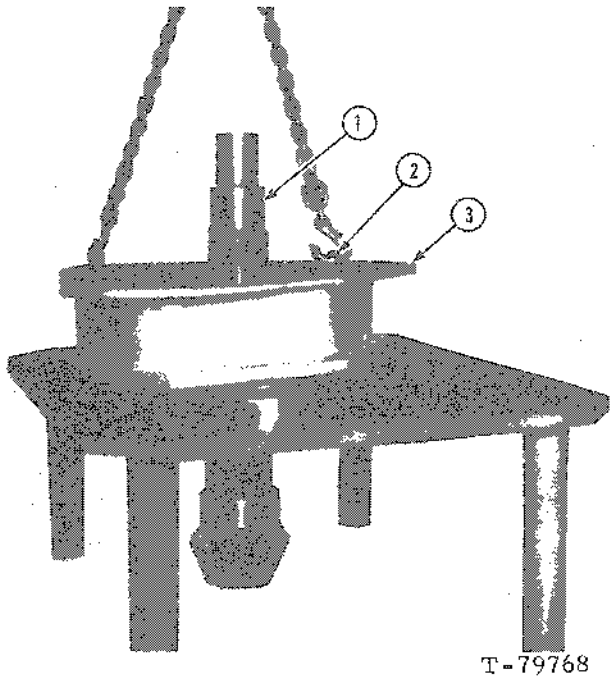
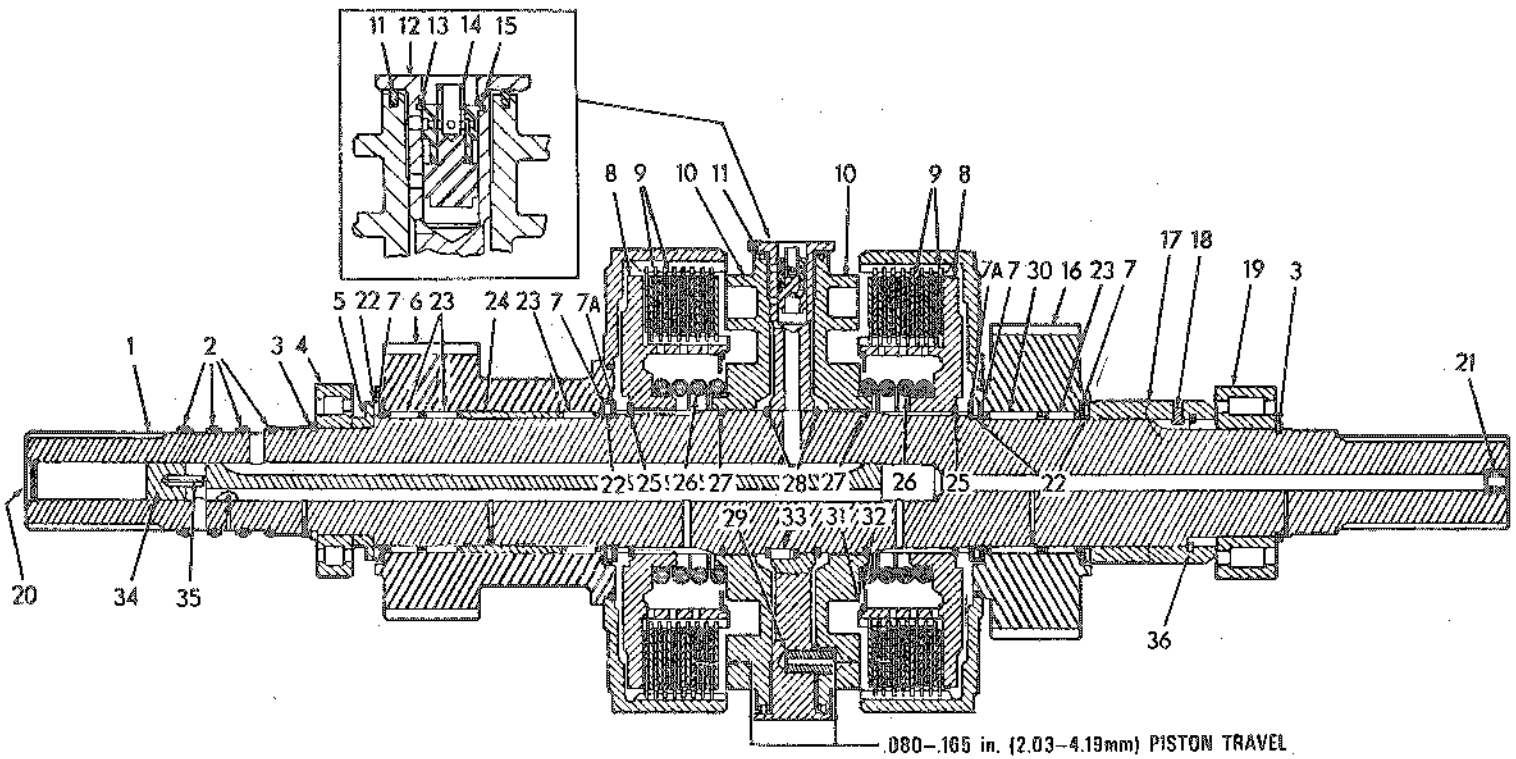


FIG. 9-13 REMOVING REAR COVER FROM BEVEL PINION SHAFT

1. Bevel pinion shaft
2. Lifting eye
3. Rear cover



1. Shaft
2. Front sealing rings
3. Snap ring
4. Front bearing
5. Bearing spacer
6. Front drum and gear (reverse)
7. Thrust washer-4.18" (106.17mm) O.D.

7A. Thrust washer-3.26" (82.8mm) I.D.

8. Clutch hub
9. Clutch plates
10. Clutch actuating piston
11. Piston sealing ring
12. Piston housing (Includes item 29)
13. Snap ring
14. Dump valve spool
15. Dump valve sleeve
16. Rear clutch drum and gear (forward)
17. Spacer
18. Pin
19. Rear bearing
20. Snap ring
21. Solid plug
22. Thrust bearing
23. Bearing (small)
24. Spacer
25. Snap ring
26. Return spring
27. Shaft sealing ring
28. Snap ring
29. Piston locating pin
30. Bearing (large)
31. Snap ring
32. Baffle
33. Housing locating pin
34. Valve
35. Spring pin
36. Snap ring

FIG. 9-30 FORWARD/REVERSE CLUTCH SHAFT T-75600

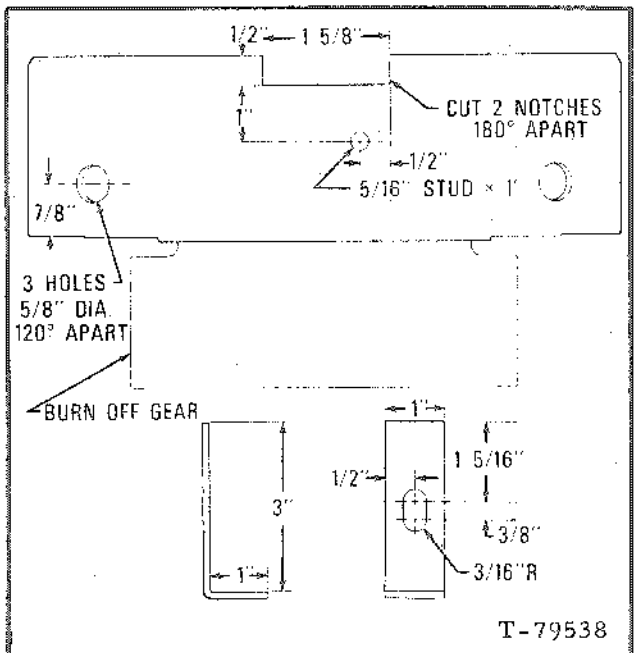


FIG. 9-39 REWORKED CLUTCH DRUM

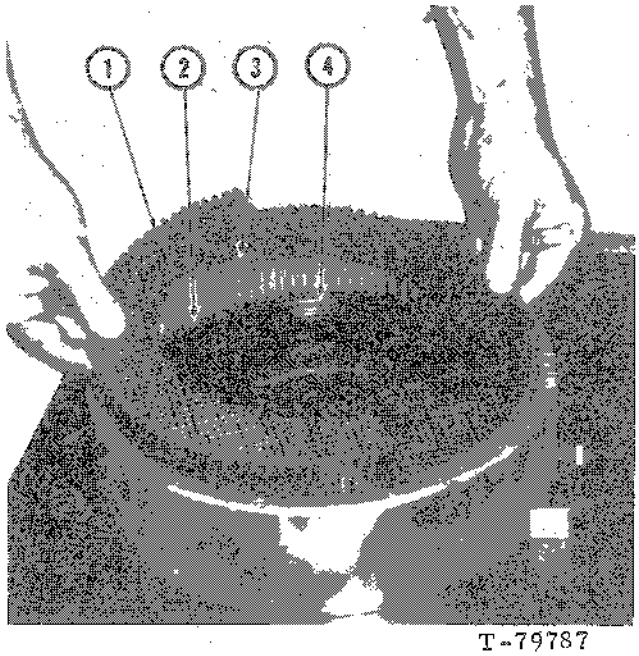


FIG. 9-40 INSTALLING CLUTCH PLATES IN DRUM (9.5.1.7)

1. Clutch plate (bi-metallic)
2. Clutch plate (steel)
3. Reworked clutch drum
4. Clutch hub

9.5.1.15
Insert a short piece of 9.53 mm (.375") O.D. tubing into a short piece of 9.53 mm (.375") I.D. air hose. Insert the other end of tubing into oil hole in clutch shaft as shown in Fig. 9-53. Apply 3.4 - 4.1 bar (50 - 60 psi) air pressure into oil hole to check for proper operation. With air applied, piston (3) should move out to compress clutch pack and dump valve spool (4) should retract as far as possible. When air pressure is removed, the piston and dump valve spool should return to their original position. Repeat this procedure for the opposite piston and dump valve.

IMPORTANT: To prevent possible damage to the seal rings do not exceed 4.1 bar (60 psi) while checking clutch asemblies.

9.5.1.16
Install magnetic base on clutch hub as shown in Fig. 9-49A. Mount dial indicator with indicator rod as shown. Be certain that indicator rod is resting on piston and not on snap ring or piston housing.

9.5.1.17
Apply pressure to piston as described in 9.5.1.15 and set gauge to zero. Release piston and check travel. Piston travel should be 2.03 - 4.19 mm (.080 - .165").

9.5.2 COUNTERSHAFT ASSEMBLY

9.5.2.1
Install spacer, Fig. 9-21 (7), gear (9) and snap ring (10) from rear end of shaft. Install spacer (7), gear (6) and snap ring (5) from front end of shaft.

NOTE: Both gears can be installed either direction on shaft.

9.5.2.2
Use a bearing heater similar to the one in Fig. 9-51 and heat bearing races to 121°C. (250°F). Use a temperature indicating crayon to control temperature. Install races on shaft; make certain they are properly seated on shaft.

9.5.3 INSTALLATION OF COMPONENTS IN REAR COVER

9.5.3.1
Install spiral snap ring, Fig. 9-20 (19) in its groove in rear cover. Install locking pin, Fig. 9-20 (31) in rear pinion bearing outer race. Install bearing and outer race assembly into rear cover; make certain locking pin is aligned with groove in rear cover. Bearing can be

FIG. 9-61 MEASURING GAP FOR BEARING ADJUSTMENT SHIMS (9.5.4.14)

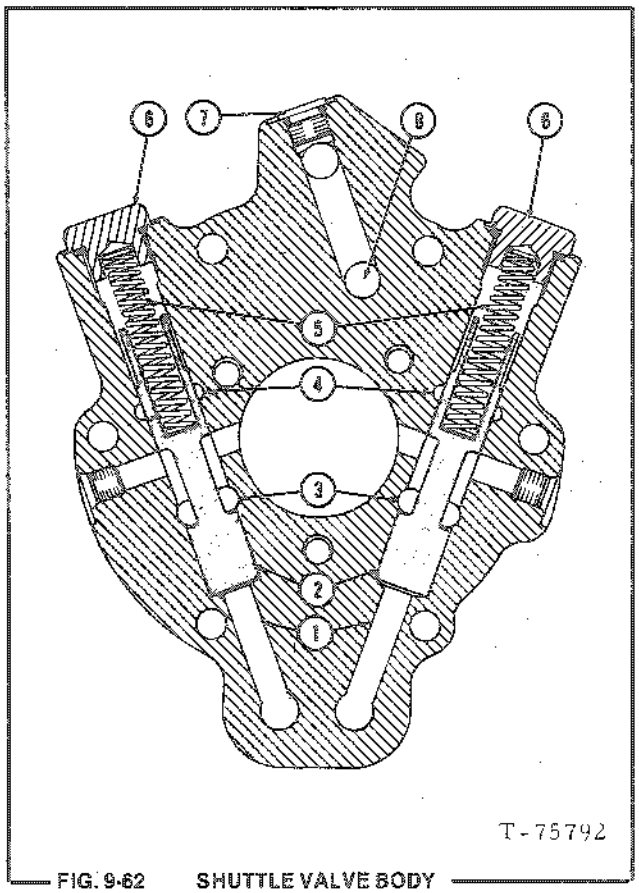


FIG. 9-62 SHUTTLE VALVE BODY

1. Signal pressure inlet
2. Piston
3. Sump outlet
4. Main pressure inlet
5. Spring
6. Plug w/O-ring
7. Plug w/O-ring
8. Lube oil inlet

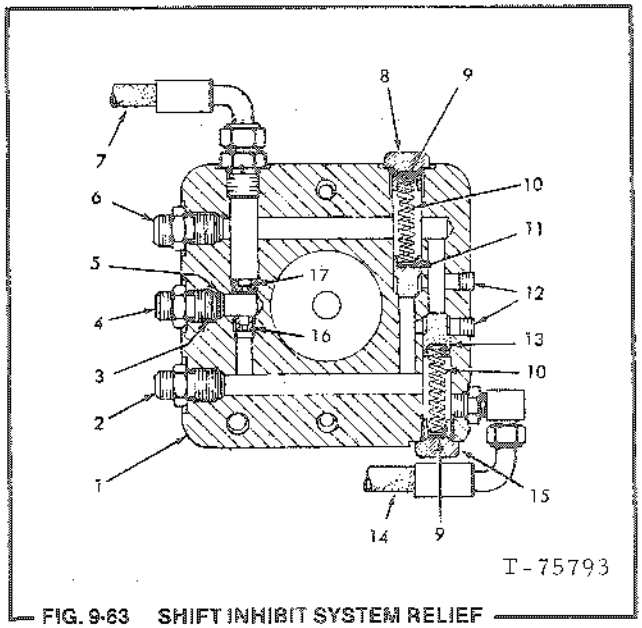


FIG. 9-63 SHIFT INHIBIT SYSTEM RELIEF VALVES AND RESTRICTORS

1. Bevel pinion shaft front bearing retainer
2. Outlet to forward end of shift inhibit piston
3. Spring
4. Main circuit oil inlet
5. Screen
6. Outlet to reverse end of shift inhibit piston
7. Hose to test panel (Inh. Rev.)
8. Plug
9. Pressure adjusting shims
10. Relief valve spring
11. Relief valve (on pressure side of pump in forward)
12. Pipe plugs
13. Relief valve (on pressure side of pump in reverse)
14. Hose to test panel (Inh. Fwd.)
15. Plug
16. Drilled pipe plug (on suction side of pump in reverse)
17. Drilled pipe plug (on suction side of pump in forward)

9.5.4.13

Install end washer, Fig. 9-20 (2) on bevel pinion shaft; shim adjustment - .000 - .025 mm (.000" - .010") clearance between retainer, Fig. 9-20 (2) and end of shaft (21) torque capscrews to 148.95 -183.27 Nm (110-135 ft.lbs.). Hit capscrew heads with a soft iron or non-ferrous hammer several times to be certain that shaft components are properly seated; re-torque capscrews to specified torque. Repeat this procedure until capscrew torque does not change when capscrews are hit.

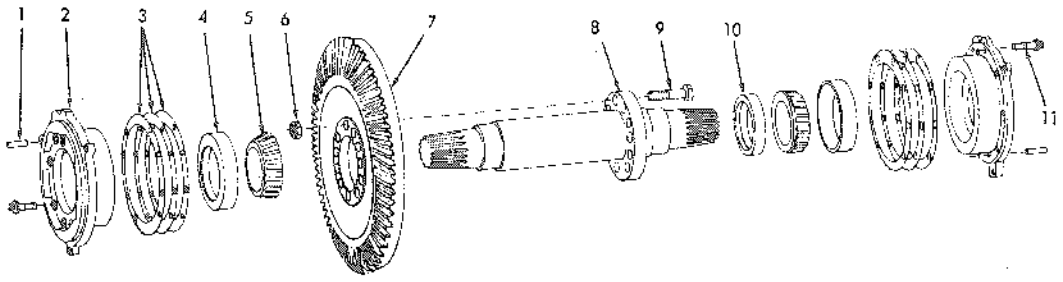


FIG. 10-3 BEVEL GEAR AND SHAFT T-75862

1. Dowel pin
2. Bearing cage
3. Bearing adjustment shims
4. Bearing cup
5. Bearing cone
6. Elastic stop nut
7. Bevel gear
8. Bevel gear shaft
9. Capscrew
10. Spacer
11. Capscrew

10.1.8
Remove bearing cups, Fig. 10-1 (4) from cages only if the bearings are to be replaced.

10.1.9.
Inspect all parts for excessive wear; replace if necessary.

10.2 INSTALLATION

NOTE: If transmission was not removed, install bevel gear shaft without gear and adjust bearing pre-load (10.3.1), then remove shaft and install gear.

10.2.1
Slide spacer, Fig. 10-1 (10) on short end of shaft, chamfer against bolt flange. Install capscrews (9) in shaft bolting flange; turn capscrews as necessary to clear spacer as they are installed.

10.2.2
Use a bearing heater and heat right bearing cone, Fig. 10-1 (5) to 121°C (250°F). Use a temperature indicating crayon to control temperature. Install bearing cone - large end first - on short end of shaft; make certain cone is seated properly against spacer.

10.2.3
Install bevel gear with teeth facing left steering clutch compartment; install shaft through right steering clutch compartment (see NOTE in 10.1.6). Slide shaft through bevel gear until nuts can be started on bevel gear attaching capscrews; tighten nuts until snug. Block under gear and shaft to hold them in position.

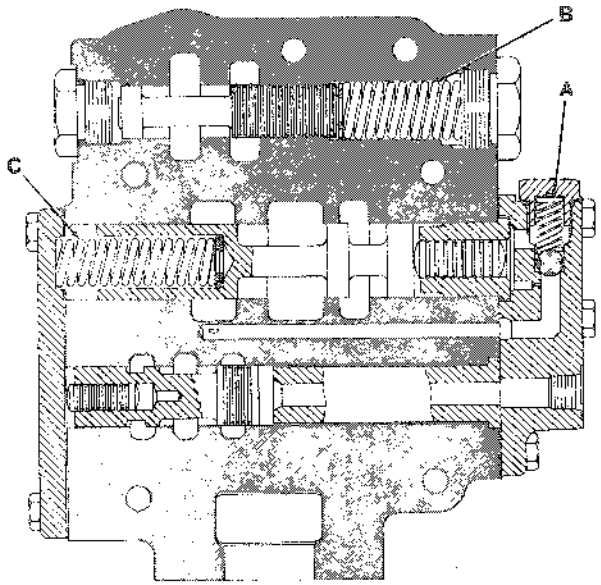
10.2.4
Heat left bearing cone in the same manner as right cone was heated (10.2.2) and install on shaft — large end first; make certain cone is properly seated against shoulder on shaft.

10.2.5
Press bearing cups, Fig. 10-1 (4) into bearing cages (2); be certain cups are seated firmly in cages. Lubricate bearings with clean oil and install each bearing cage (with original bearing adjustment shims) in bore from which it was removed. Make certain dowel pins (11) are in vertical position; start bearing cage attaching capscews (1) but do not tighten.

10.2.6
Torque nuts, Fig. 10-1 (7), on bevel gear attaching capscrews to 840-950 Nm (620-700 lbs.ft.).

IMPORTANT: Hold shaft stationary by installing an open end wrench on the head of a bevel gear attaching capscrew and jamming it against the bottom of bevel gear compartment. Do not attempt to hold shaft stationary by inserting anything between bevel gear and pinion or between bevel gear teeth and bottom of bevel gear compartment.

10.2.7
Torque bearing cage attaching capscrews to 300-380 Nm (220-280 lbs.ft.). Bump cages to be certain bearings are properly seated; retighten cage attaching capscrews if necessary. Remove blocking under shaft and gear.

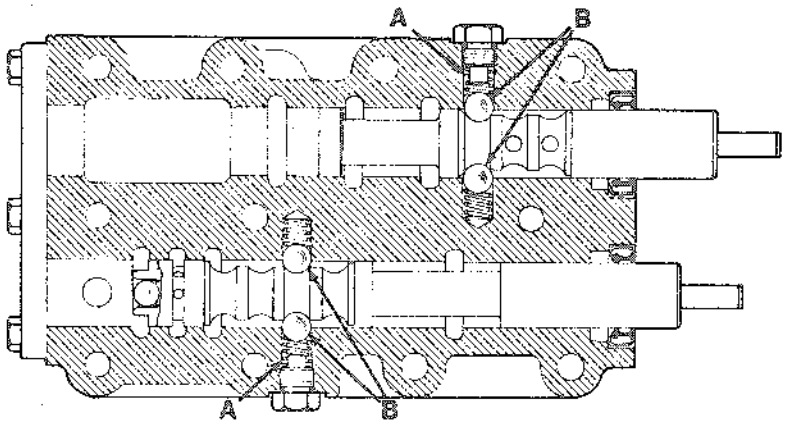


T-75725

FIG.12-2 PRESSURE REGULATING VALVE

12.2 PRESSURE REGULATING VALVE

	mm	inches	kg	lbs.
A. Cold oil relief spring				
Approximate free length	26.7	1.05		
Load when compressed	22.1	.87	3.1-3.5	6.9-7.7
B. Torque converter/transmission lube pressure regulating spring				
Approximate free length	79	3.11		
Load when compressed to:	47.2	1.86	23.7-26.2	52.25-57.75
C. Main pressure regulating spring				
Approximate free length	88.9	3.50		
Load when compressed to:	65.8	2.59	26-29	57-63



T-75726

FIG.12-3 TRAVEL CONTROL VALVE

12.3 TRAVEL CONTROL VALVE

A. Detent springs:
Approximate free length ------- 17.9mm (0.706")
Load when compressed to: ------ 14.2mm (0.560") 2.7 kg (5.9 lbs)

B. Detent ball
O.D. ---------- 11.9mm (0.469")

12.11 OIL COOLING SYSTEM

A. Thermostat temperature range	77°-82°C (165°-180°F)
B. Automatic belt tightener spring	
Approximate free length	195mm (7.7 in.)
Load when compressed to 81mm (3.2 in)	32-39 kg (71-87 lbs.)

12.12 TORQUES

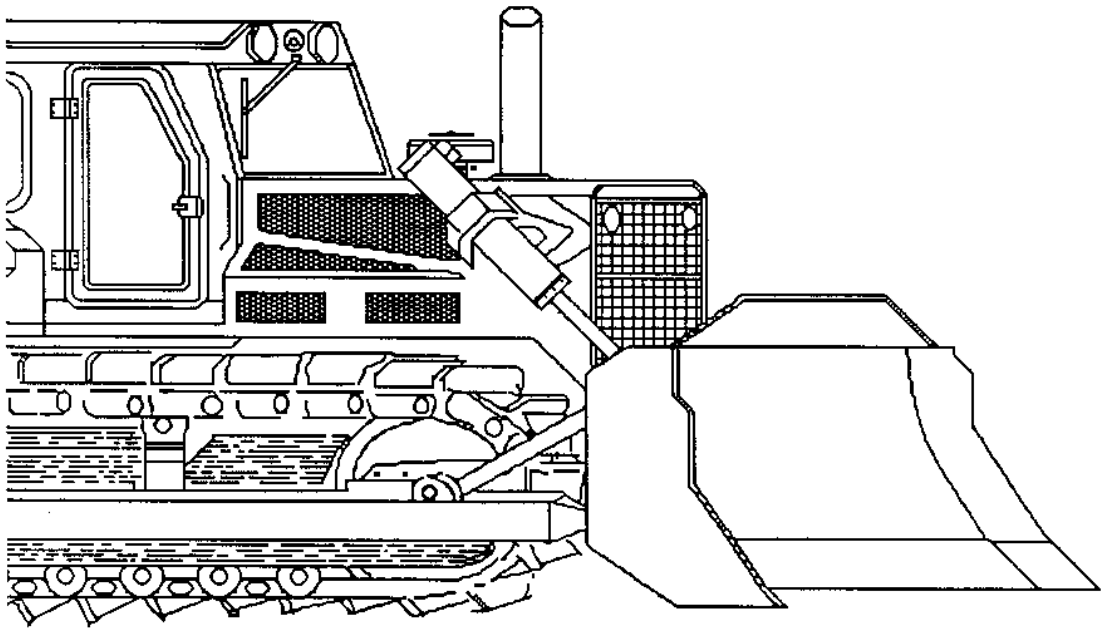
	Nm	lbs.ft.
A. Universal joint spider capscrew	129-142	95-105
B. Transmission pump housing capscrews	108-122	80-90
C. Transmission pump attaching capscrews/nuts	149-163	110-120
D. Pump mounting plate capscrews	46-52	34-38
E. Fan drive housing shaft nuts	176-230	130-170
F. Pump drive idler gear capscrew	104-115	77-85
G. Oil inlet housing to radiator capscrews	96-107	71-79
H. Thermostat housing attaching capscrews	96-107	71-79
I. Transmission filter bracket to head caspcrews	149-163	110-120
J. Hose flange attaching capscrews		
3/8 in. capscrew (lubricated)	30-33	22-24
7/16 in. capscrew	76-87	56-64
1/2 in. capscrew	115-129	85-95

FD40
FD40B
FD50

crawler tractors

service manual

STEERING CLUTCHES and BRAKES



Form 73148247 English
2/89

TOPIC 2 STEERING AND BRAKE SYSTEM LUBRICANT SPECIFICATIONS, CAPACITY AND SERVICE

2.1 LUBRICANT SPECIFICATIONS

2.1.1
Oil must meet one of the following specifications:

2.1.1.1
Transmission Fluid "Type C-3" (meeting TO-2 specifications).

2.1.1.2
Crankcase oil TO-2 qualified American Petroleum Institute (API) Service CD.

2.1.1.3
MIL-L-2104C (meeting TO-2 specifications).

2.1.2
VISCOSITY:
SAE 15W - 40 year around.

2.2 CAPACITY AND SERVICE

2.2.1
Capacity of system is 53 gallons (200.63 lit.).

2.2.2
Service consists of changing oil, replacing filter elements and changing breather. Replace filter elements and install clean oil after making major repairs to any part of the system; replace filter elements again after first 50 hours of operation. Detailed service procedures and specified service intervals are given in Operation and Maintenance Instruction manual furnished with the tractor.

NOTE: The suction line filter element on FD50 is washable; clean it rather than replace it.

TOPIC 3 TROUBLE SHOOTING

⚠ WARNING

- ⚠ Do not start the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
- ⚠ Warn all people who may be servicing or working around your machine before starting engine.
- ⚠ Never leave machine unattended with engine running.

IMPORTANT: Always be certain hydraulic system is filled to proper level with specified lubricant before trouble-shooting.

3.1 TRACTOR WILL NOT TURN EITHER DIRECTION

3.1.1
This indicates a failure in the hydraulic system. Check pressures; refer to PRESSURE CHECKING.

3.2 TRACTOR WILL NOT TURN ONE DIRECTION

3.2.1
Determine if brake or clutch is at fault by driving tractor forward (low gear) on level surface with engine running at approximately 1/2 throttle. Momentarily depress brake pedal of side in question. Do not pull steering clutch lever.

3.2.1.1
If tractor slows down but does not turn, it indicates brake is working and steering clutch is not slipping; trouble lies in hydraulic portion of steering clutch system. Check steering control linkage adjustment (5.2) and steering clutch pressure (PRESSURE CHECKING). If linkage and pressure are both O.K., check for oil leaks between steering control valve and collector ring or defective throwout mechanism (refer to STEERING CLUTCHES).

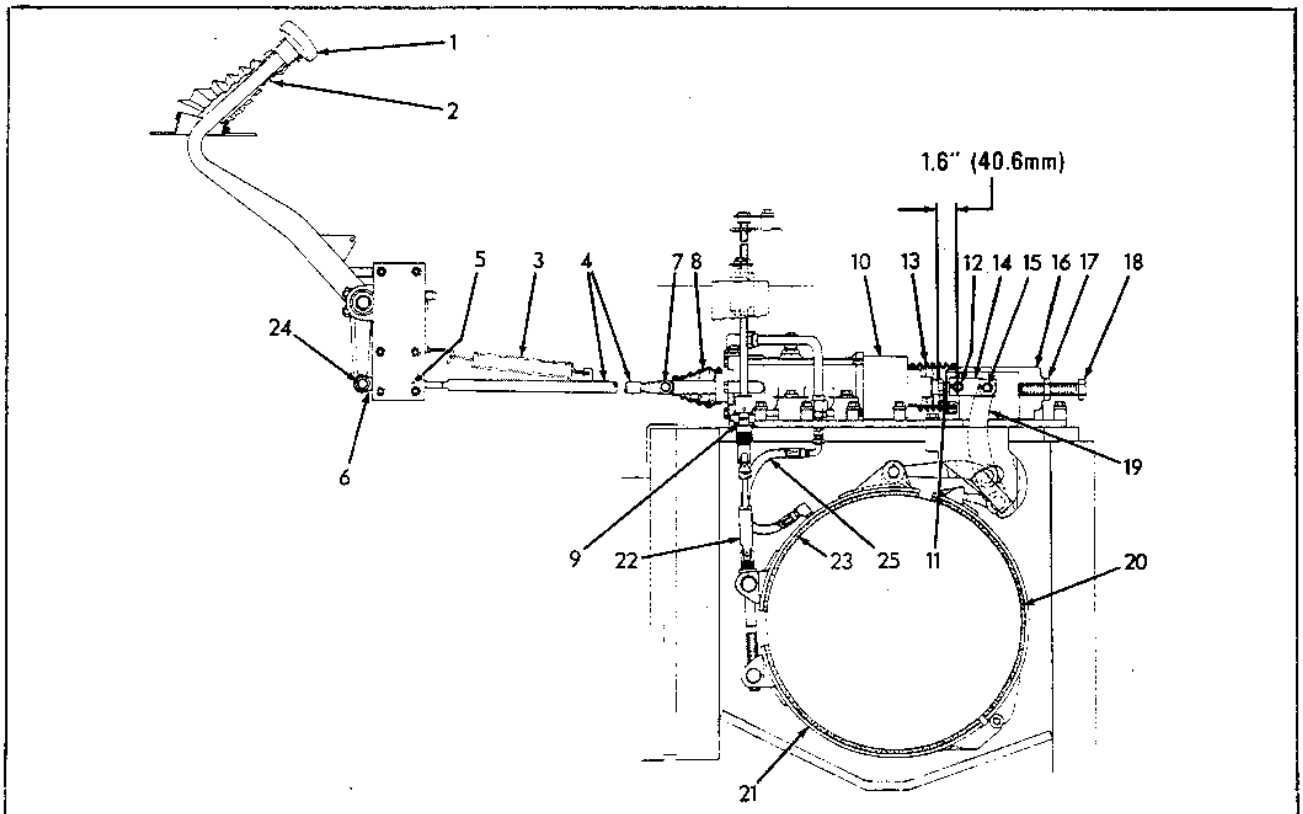


FIG. 12 BRAKE CONTROL AND LINKAGE

1. Brake pedal
2. Boot
3. Pedal return spring
4. Control rod
5. Jam nut
6. Yoke end
7. Yoke pin
8. Boot
9. Brake band adjuster
10. Brake valve
11. Eye bolt
12. Pin
13. Boot
14. Link
15. Link pin
16. Linkage cover
17. Jam nut
18. Brake over-ride screw
19. Band actuating lever
20. Rear band
21. Bottom band
22. Adjustment drive assembly
23. Top band
24. Yoke pin
25. Lube hose

5.5.1.10
Loosen clamps and remove boot (3) from rod (1) and cover (5). Carefully remove the rod (1) from cover (toward the rear).

5.5.1.11
Remove retaining ring (10) and wear ring (8), O-ring (9) and seal (4.22) from cover.

5.5.1.12
Remove piston assembly(13)from cover (19)

5.5.1.13
Remove rings (14,15 and 16) from piston grooves and discard rings. Remove seal (18) from cover and discard.

5.5.1.14
If spool (21) requires replacing, remove ring (20) and press spool from piston.

5.5.2 INSPECTION

5.5.2.1 Piston Rings, Seals and O-rings
Replace piston rings, seals and all O-rings.

5.5.2.2 Spring
The spring when compressed to 9.125" (231.77 mm), should produce 2400 lbs. (1089 kg). The approximate free length should be 13.86" (352 mm).

5.5.2.3 Rod and Front Cover
The maximum allowable clearance between the valve rod and front cover bore should not exceed 0.114mm(0.0045 in.)

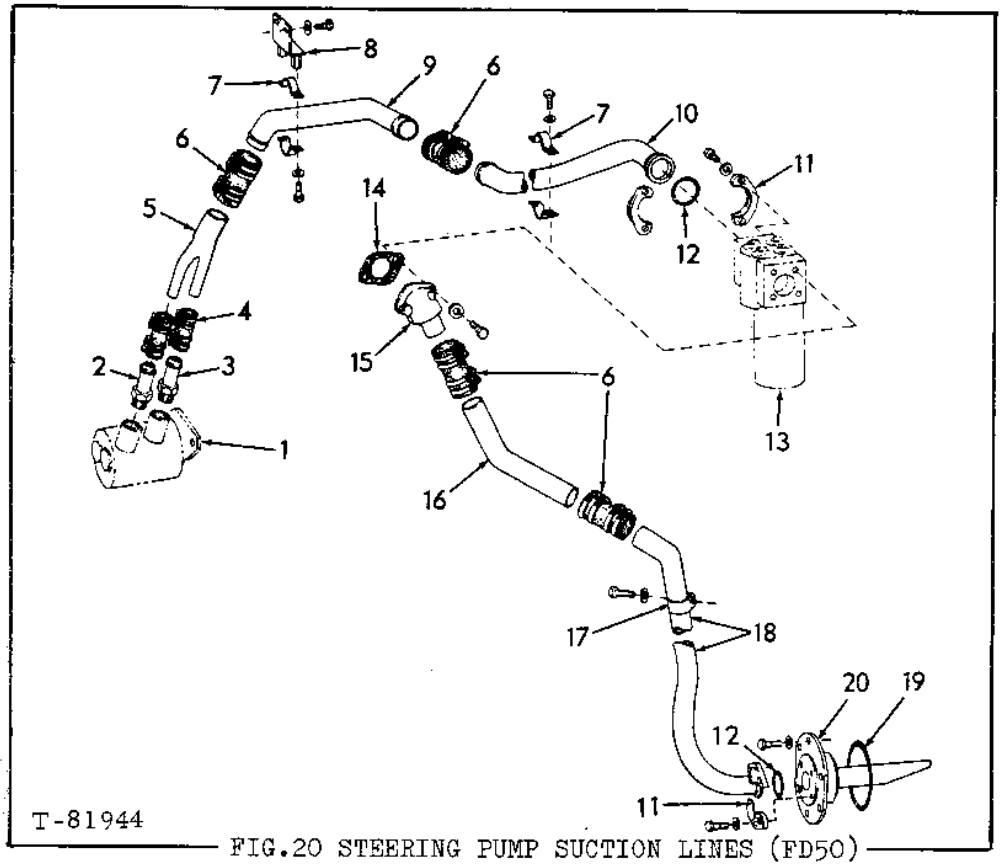


FIG.20 STEERING PUMP SUCTION LINES (FD50)

1. Pump
2. Stem
3. Stem
4. Hose
5. Tube
6. Hose
7. Clip
8. Bracket
9. Tube
10. Tube
11. Flange
12. O-ring
13. Filter
14. Gasket
15. Elbow
16. Tube
17. Clip
18. Tube
19. O-ring
20. Cover

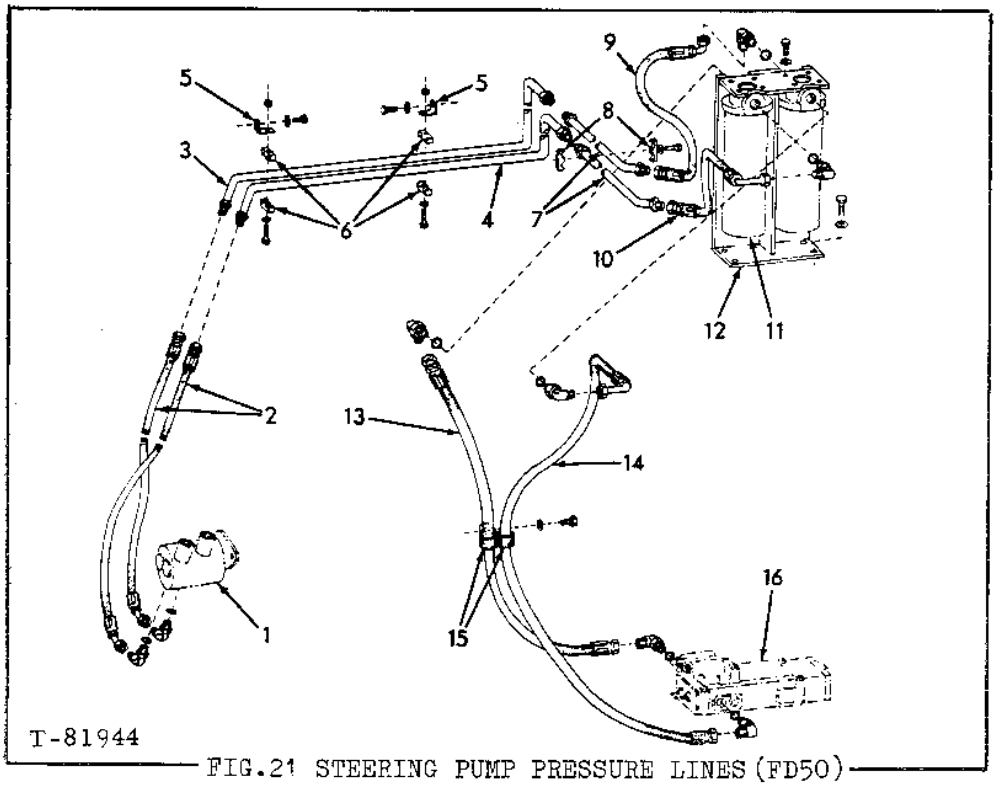
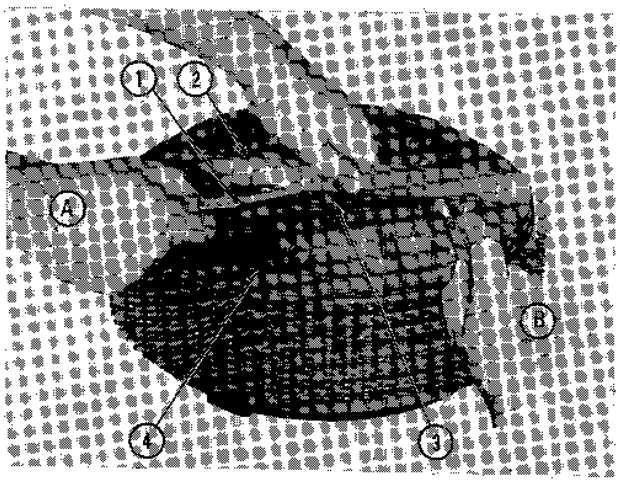


FIG.21 STEERING PUMP PRESSURE LINES (FD50)

1. Pump
2. Hose
3. Tube
4. Tube
5. Bracket
6. Clamp
7. Tube
8. Clamp
9. Hose
10. Hose
11. Filter
12. Bracket
13. Hose
14. Hose
15. Clamp
16. Valve



T-22040

FIG. 35 MEASURING DISTANCE BETWEEN CLUTCH HUB AND THROWOUT PLATE

1. Feeler gauge
2. Straight edge
3. Throwout plate
4. Clutch hub

"A" when throwout plate is below hub
"B" when throwout plate is above hub

6.5 INSTALLATION (Fig. 30)

6.5.1
If the bearing had been removed, press the throwout bearing cup (18) into the actuating piston (20) and cone assembly (17) on throwout sleeve (16); be sure both are fully seated.

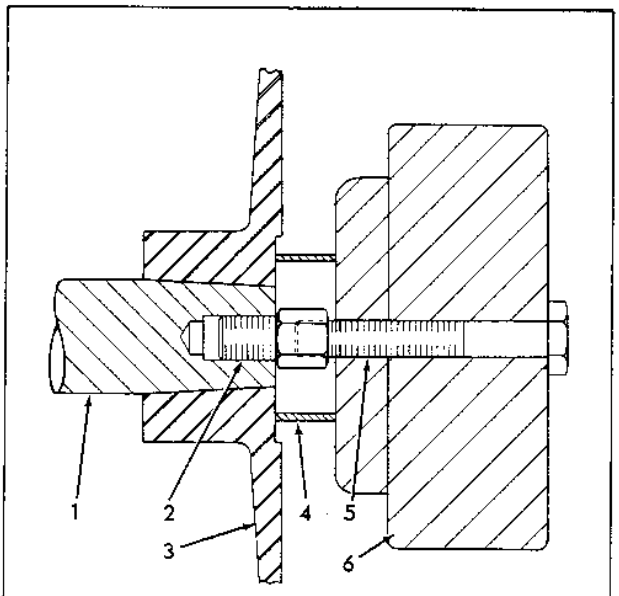
6.5.2
Install actuating piston sealing rings (19 and 21). See NOTE below.

NOTE: To make installation of seal rings easier soak the rings in hot water (180°F. -- 82°C). After installing rings in grooves, clamp rings with hose clamps and allow to cool (seal rings will take a set). Remove clamps.

6.5.3
Install piston springs (24) in holes in collector ring (22); lubricate seal rings and actuating piston (20) then carefully install piston in collector ring bore.

6.5.4
Position throwout sleeve (16) in bearing cup of actuating piston (20) and hub (12) on bevel gear shaft.

Assemble tools shown in Fig. 36 . Connect pump hose to hydraulic ram. Operate pump until a pressure of 17 ton is applied to hub. Reduce pressure and reapply 17 ton force. Remove tools.



T-79926

FIG. 36 INSTALLING STEERING CLUTCH DRIVING HUB

1. Bevel gear shaft
*2. Adapter
3. Steering clutch driving hub
*4. Installing sleeve
*5. Capscrew
6. Ram (17.5 ton)

*See Service Tools

IMPORTANT: Do not strike hub or shaft to seat hub. Hub must be installed using tools shown in Fig. 36 and hydraulic pressure only. After installing hub on shaft, hub standout must be 0.094-0.156 in. (2.39 - 3.96 mm).

6.5.5
Install washer, Fig. 30 (13) and capscrew (15) torqued to 500 -- 550 lbs. ft. (69 -- 76 m-kg). Install capscrew lock (14) and retaining capscrews torqued to 43 -- 47 lbs. ft. (6 -- 6.5 m-kg). Install lockwire in retaining capscrews as shown in Fig. 37.

6.5.6
Clean the steering clutch compartment. Check oil lines for loose connection in compartment.

6.5.7
With brake bands installed on drum, refer to Fig. 28 and install steering clutch assembly in compartment.

6.5.8
Align the driving hubs to brake drum and steering clutch and install the attaching place bolts. Remove the sling from brake bands. Torque all place bolts to a torque of 220 -- 240 lbs. ft. (30.4 -- 33.2 m-kg).

8.4 BRAKES

Depth of grooves in new lining - - - - - - - - - - - - - 5.56mm (.219")

8.5 BRAKE CONTROL VALVE

Spring free height - 352mm (13.86")

Spring load when compressed to 231.78mm (9.125") - 1089 kg (2400 lbs.)

Maximum allowable clearance between valve rod and front cover bore - - - - - - - - - - - - - .114mm (.0045")

Maximum clearance between rod O.D. and piston spool bore I.D. - - - - - - - - - - - - - - - - - - - .114mm (.0045")

Rod O.D. at piston spool bore location (Minimum) - 28.562mm (1.1245")

Piston to rear cover clearance - - - - - - - - - - - - - .15 - 36mm (.006 - .014")

Piston spool to rear cover bore clearance (Maximum) - .228 mm (.009 in.)

Wear ring I.D. (Maximum) - - - - - - - - - - - - - - - 28.677mm (1.129")

8.6 TORQUE SPECIFICATIONS

8.6.1 STEERING CLUTCH

Hub retaining capscrew - - - - - - - - - - - - - - - - - - 67.8 - 74.6 daNm (69.0 - 0.76 m-kg) (500 - 550 lbs. ft.)

Capscrew lock capscrew - - - - - - - - - - - - - - - - - - 5.8 - 6.4 daNm (5.9 - 6.5 m-kg) (43 - 47 lbs. ft.)

Pressure plate capscrews - - - - - - - - - - - - - - - - - 6.1 - 6.8 daNm (6.2 - 6.9 m-kg) (45 - 50 lbs. ft.)

Place bolts - 29.8 - 32.5 daNm (30.4 - 33.2 m-kg) (220 - 240 lbs. ft.)

8.6.2 CLUTCH AND FINAL DRIVE

Steering clutch compartment cover capscrews - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

8.6.3 CLUTCH CONTROL GROUP

Control valve mounting capscrews - - - - - - - - - - 5.4 - 6.8 daNm (5.5 - 6.9m-kg) (40 - 50 lbs. ft.)

Pump mounting capscrews

FD40(First type*) - - - - - - - - - - - - - 35-39 lbs.ft.(4.8-5.4 m-kg)

FD40 Second type**);FD50 - - - - - - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

Suction line filter mounting capscrews - FD40 - - - 10.2 daNm (10.4 m-kg)(75 lbs. ft.)

FD50 - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

Full flow filter (2) mounting capscrews - - - - - - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

8.6.4 BRAKE

Linkage cover capscrews - - - - - - - - - - - - - - - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

Band lever bracket capscrews - - - - - - - - - - - - - - 29.8 - 38.0 daNm (30.4 - 38.7 m-kg) (220 - 280 lbs. ft.)

Brake valve mounting capscrews - - - - - - - - - - - - 14.9 - 18.3 daNm (15.2 - 18.7 m-kg) (110 - 135 lbs. ft.)

*Prior to S/N 89A03103 excluding 03010,03017,03022,03023,03033,03034,03035

**S/N 89A03103 and up including 03010,03017,03022,03023,03033,03034,03035

GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine.

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black border and lettering for *WARNING* and red with white border and lettering for *DANGER* points.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Keep head, body, limbs, hands and feet inside operator's compartment at all times to reduce exposure to hazards outside the operator's compartment.

Do not allow unauthorized personnel to operate service or maintain this machine.

Always check work area for dangerous features. The following are examples of dangerous work areas: slopes, over hangs, timber, demolitions, fire, high walls, drop off, back fills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

An operator must know the machine's capabilities. When working on slopes or near drop offs be alert to avoid loose or soft conditions that could cause sudden tipping or loss of control.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps grab rails and handles at all times.

Do not use controls or hoses as hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.

For your personal protection. Do not attempt to climb on or off machine while machine is in motion.

Never leave the machine unattended with the engine running.

Always lock up machine when leaving it unattended. Return keys to authorized security. Heed all shut down procedures of the Operation and Maintenance Instruction Manual. Always set the parking brake when leaving the machine for any reason.

Do not wear rings, wrist watches, jewelry, loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vests, or respirators. Consult your employer for specific safety equipment requirements.

Do not carry loose objects in pockets that might fall unnoticed into open compartments. Do not use machine to carry loose objects by means other than attachments for carrying such objects.

DO NOT CARRY RIDERS unless the machine is equipped for carrying people to reduce personal exposure to being thrown off.

Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of the shift.

Roll Over Protective Structures are required on wheel loaders, dozer tractors, track type loaders, graders and scrapers by local or national requirements. *DO NOT* operate this machine without a Roll Over Protective Structure.

Do not operate a machine without a falling object protective structure (FOPS).

Do not operate this machine without a rear canopy screen when machine is equipped with rear mounted towing winch.

Seat belts are required to be provided with roll over protective structures or roll protection cabs by local or national regulations. Keep the safety belt fastened around you during operation.

Where noise exposure exceeds 90 dBA for 8 hours, wear authorized ear protective equipment per local or national requirements that apply.

Keep clutches and brakes on machine and attachments such as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturers at all times. *DO NOT* adjust machine with engine running except as specified.

Do not operate a machine with brakes out of adjustment. See the Operation and Maintenance Instruction Manual.

Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow Operation and Maintenance Instruction Manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

LEGEND FOR FIG. 3-1

1. Segment
2. Bolt
3. Hub
4. Lock
5. Nut
6. Outboard bearing
7. Shim (track frame positioning)
8. Shim (outboard bearing)
9. Capscrew
10. Retainer
11. Pin
12. Nut
13. O-ring
14. Capscrew
15. Outboard bearing cage
16. Outboard bearing cap
17. Seal assembly
18. Washer
19. Capscrew
20. Seal assembly
21. Cone assembly
22. Cup
23. Lock
24. Dowel
25. Capscrew
26. Cover
27. O-ring
28. Plate
29. Capscrew
30. Outer bearing cover
31. O-ring
32. Outer bearing assembly
33. Inner race
34. Snap ring (outer race)
35. Snap ring (inner race)
36. Lock ball
37. Outer race and roller assembly
38. Inner race
39. Inner bearing cage
40. Shim
41. Hub
42. O-ring
43. Lock
44. Seal
45. Capscrew w/lockwire
46. Capscrew
47. Washer assembly
48. Pinion
49. Gear
50. Lock
51. Inner bearing cage
52. O-ring
53. Shim (carrier bearing end play adjusting)
54. Capscrew
55. Inner bearing retainer
56. Plug
57. Snap ring
58. Dowel pin
59. Cone assembly
60. Cup
61. Spacer
62. Capscrew
63. Lockwire
64. Carrier assembly
65. Ring gear (outer)
66. Pin
67. Snap ring
68. Ring gear (inner)
69. Capscrew
70. O-ring
71. Spacer

Carrier Removal and Installation (3 PLANET GEARS)

T-80740

FIG. 4-18 INSTALLING INNER BEARING RETAINER

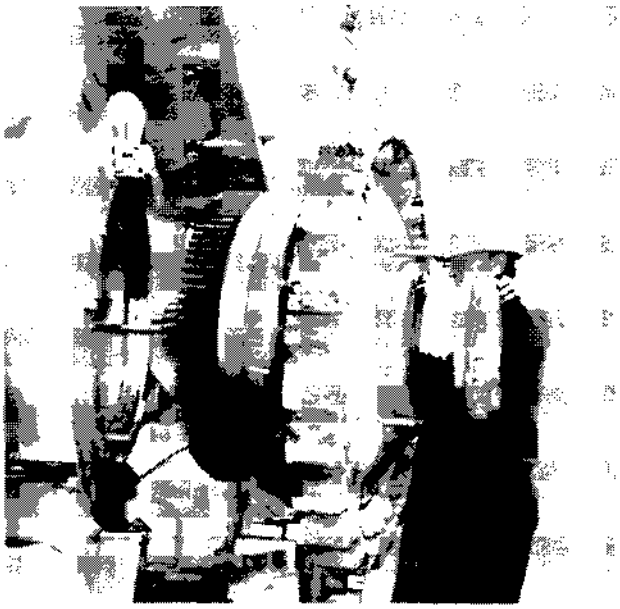
1. Bearing retainer
2. Shim pack (0.240" -- 6.1 mm) for carrier installation only

4.3.1
Make certain the dowel pin (Fig. 3-1 item 58) is installed in back of cage (51) with offset end outward.

4.3.2
Screw the bearing cage aligning rod and screw, Fig. 4-17 (2) in an inner bearing retainer capscrew hole (7 o'clock position for right final drive and 5 o'clock position for left final drive). Push guide rod all the way in.

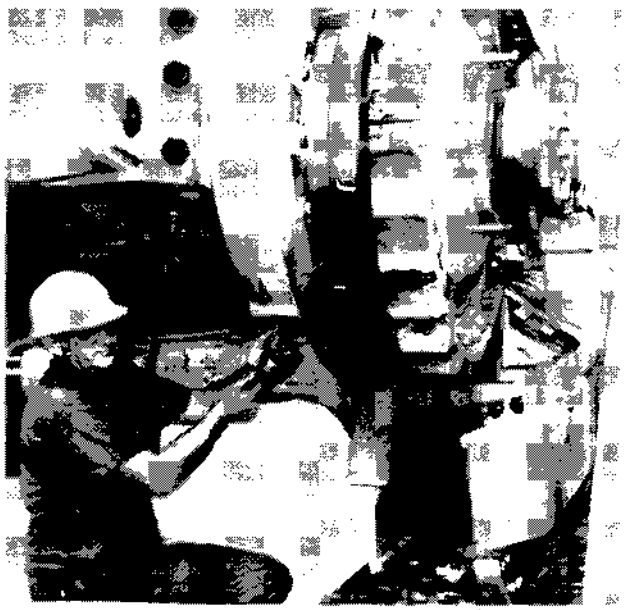
4.3.3
Align the oil drain hole of inner bearing cage with guide rod; dowel pin of cage will then align to dowel pin hole in housing. Start the bearing cage in housing bore. Assemble the puller tools as shown in Fig. 4-17 and pull cage in until it bottoms in housing bore. Remove the puller and aligning tools.

4.3.4
Refer to Fig. 4-18; make up a 0.240" (6.1 mm) shim pack (2) and install them on inner bearing retainer (1). Do not put the O-ring on retainer. Align the shim holes to holes in retainer and install retainer on housing. Secure retainer to housing with four capscrews. Install the guide plug in the retainer (in center).



T-80741

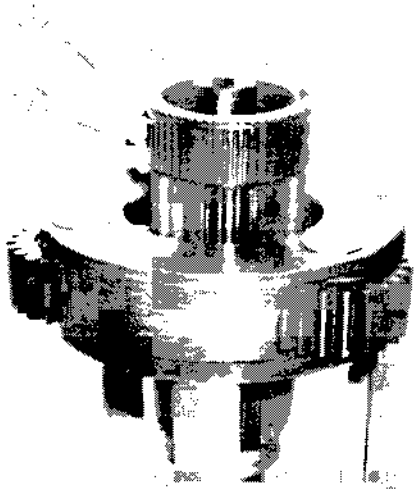
FIG. 4-19 FORCING SCREW IN CARRIER BEFORE INSTALLING CARRIER



T-80742

FIG. 4-20 ALIGNING CARRIER GEAR TO PINION

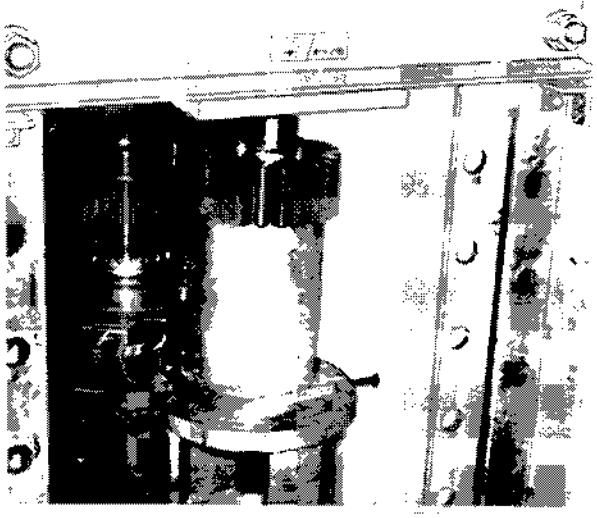
NOTE: The bearing retainer MUST NOT come in contact with bearing cage and cause a preload on inner bearing when installing the final drive carrier.



T-80800

FIG. 5-13 SUN GEAR LIFTING TOOL

1. Sun gear
2. Lifting tool 75300033



T-80765

FIG. 5-14 PRESSING BEARING FROM PLANET GEAR

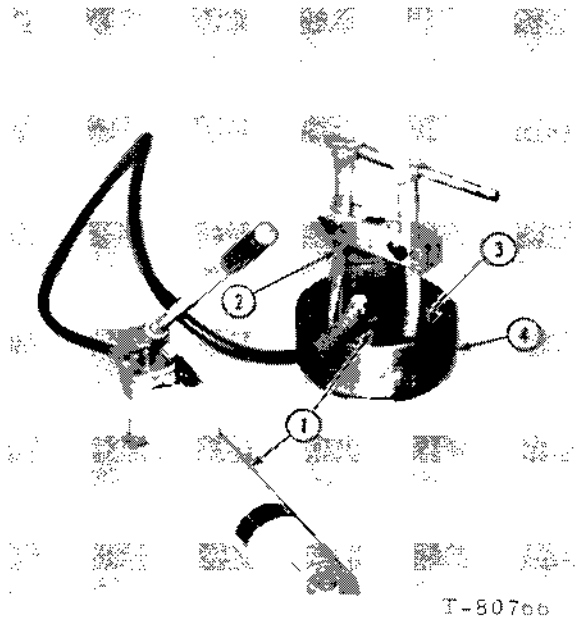
5.1.14
Install a dowel screw in inner end of shaft. Refer to Fig. 5-11; install tool (1) on dowel screw and remove the snap ring.

5.1.15
Install lube fitting adapter, Fig. 5-12 (3) in shaft. Attach a grease gun (4) on lube fitting and while pumping grease pry the sun gear (2) from shaft. Refer to Fig. 5-13; using lifting tool shown to remove sun gear.

5.1.16
Position sun gear in press (gear end up). Insert a 6.88" (174.6 mm) diameter plate on bearing and press bearing from sun gear. Clean the sun gear thoroughly. Refer to INSPECTION and Fig. 5-20; make certain sun gear is in good condition and within specification.

5.1.17
Install snap ring 75300075 between the bearings in planet gear. Using plate 75300037 on snap ring, remove bearing cup from planet gear, Fig. 5-14. Turn the planet gear over. Insert snap ring 75300075 and plate 75300037 and remove remaining bearing cup from planet gear.

5.1.18
Refer to Fig. 5-15; position plate 75294722 in bearing bore resting on cage wall. Assemble and install puller (2) and ram; remove bearing race from inner bearing cage.

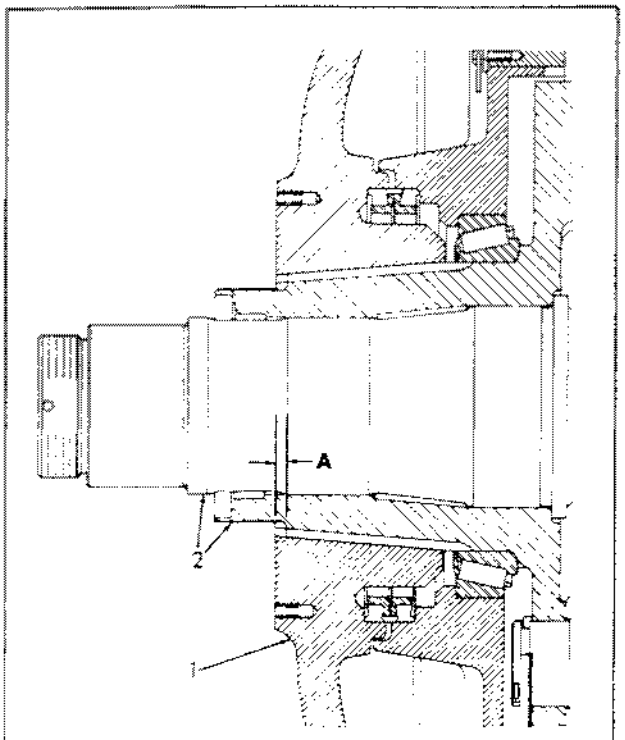


T-80766

FIG. 5-15 PULLING BEARING FROM INNER BEARING CAGE

*1. Ram (17 ton)
*2. Puller assembly
3. Puller plate 75294722
4. Inner bearing cage

*See SERVICE TOOLS

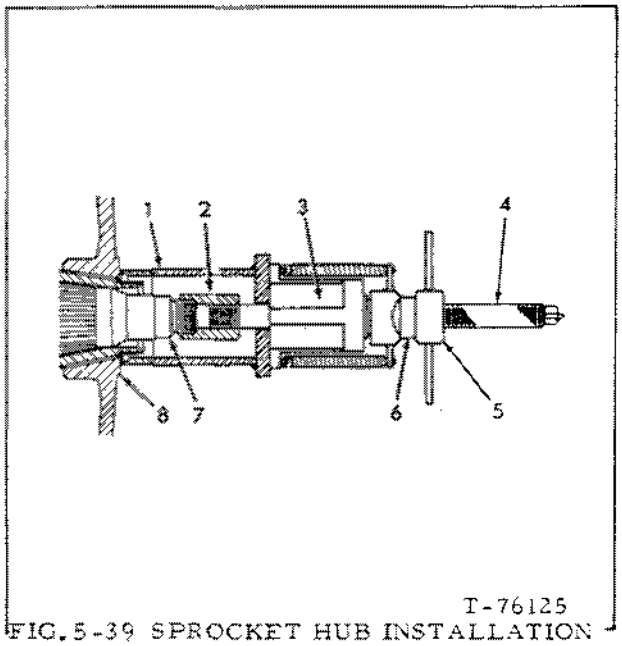


T-76877

FIG. 5-38 SPROCKET HUB STAND-OUT

1. Hub
2. Carrier assembly

Dimension A = .390" -- .459"
(9.9 -- 11.66 mm)



T-76125

FIG. 5-39 SPROCKET HUB INSTALLATION TOOLS INSTALLED - Sectional View

*1. Adapter
*2. Shaft adapter
*3. Hydraulic ram (100 ton)
*4. Ram screw
*5. Speed nut
*6. Insert
7. Carrier shaft
8. Sprocket hub

*See SERVICE TOOLS

5.4.3
Refer to Fig. 5-36; press chilled dowels in cover and inner ring gear. Remove the guide pins, install the lock plates and secure capscrews to a torque of 32 - 33 daNm (32.5 - 34 kgm)(235 - 245 lbs. ft.). Secure capscrews with tie wire. Remove temporary capscrews and install lock plates and secure them with capscrews and tie wire.

5.4.4
Remove cover from stand and invert it. Install the chilled intermediate bearing cup in bore of cover. Seat the cup with punch and hammer.

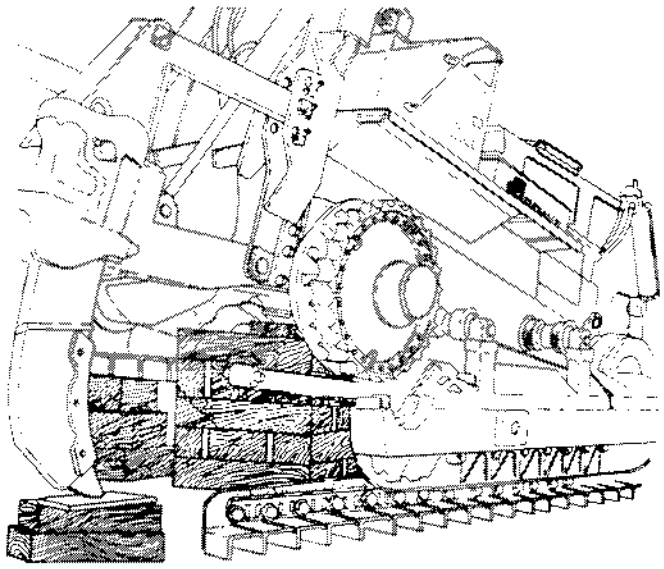
5.4.5
Position the cover on the carrier assembly.

5.5 INSTALLATION OF SPROCKET SEALS AND SPROCKET HUB

5.5.1
New rubber rings must be used every time this seal is re-assembled. Steel rings must be smooth and flat, showing good contact. Steel rings are serviced only as part of seal assembly; rubber rings are serviced separately. Make certain that seal counterbores in the sprocket hub and cover are absolutely clean and dry. The presence of oil, grease or other lubricant on either side of these surfaces will cause failure of seal in service. Remove plastic band from seal assembly and discard. Carefully slide the two steel halves apart. Make certain that the rubber ring is seated against shoulder of metal seal ring. Carefully install one half of the seal assembly in the carrier cover. Install the other half of seal in the sprocket hub. Use care to avoid touching the sealing surface of the metal seal. Fully seat the seal rubber rings in the counterbores.

IMPORTANT: If the seal faces are touched or contaminated they should be wiped clean with dry tissue paper, and oiled lightly with a tissue paper dipped in clean final drive lubricant. Do not use a shop towel for this purpose.

5.5.2
Using sling (200 lbs. -- 90.2 kg) install the sprocket hub on carrier shaft



T-80973

FIG. 6-7 BLOCKING LOCATION FOR RAISED TRACTOR

6.1.6.2
Position and crib with 8" x 10" (203.2 x 250.4 mm) hardwood blocks beneath the transmission guard or counterweight if so equipped. Blocks should be of sufficient length for good support as shown in Fig. 6-7. The bottom blocks should be at least 4' (121.92 cm) long on bottom course then cross block each layer as they are laid.

6.1.6.3
Refer to Fig. 6-6 for location of jack then using cribbed blocks for jack support and .5" (12.7 mm) thick steel plate between the jack and main housing or pivot cap, raise the tractor high enough to permit moving the pivot pin(s) in track frames(s) and block beneath transmission or counterweight (if so equipped). Remove the jack. Remove pivot pin from frame to be removed.

6.1.6.4
Relocate blocks and jack to point (4) shown in Fig. 6-6. Position steel plate between main housing and jack to protect the pivot bracket surface. While raising the tractor, add blocking for safety. For additional support and stability also block under track (below sprocket) of frame that is being raised with tractor. When tractor is high enough to permit removal of final drive, make certain that suitable wedges are used in final blocking to provide firm support.

NOTE: Removing the two bottom sprocket segments will decrease raising height about 4" (101.6 mm)

6.2 REMOVAL

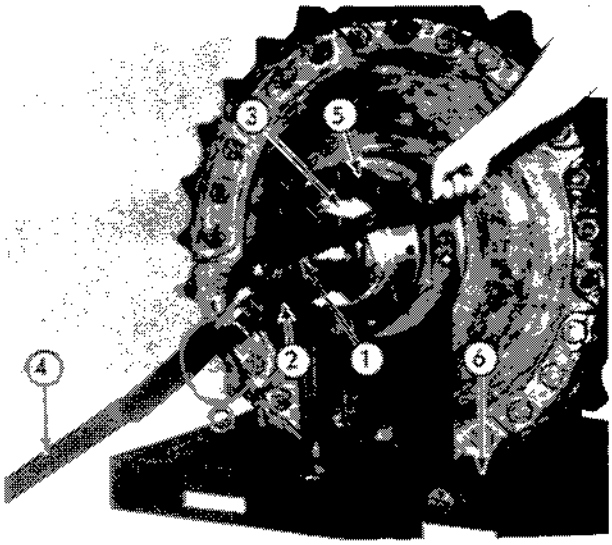
6.2.1
Remove the carrier shaft inner bearing retainer, Fig. 6-10. Discard O-ring.

6.2.2
Refer to Fig. 6-5 and remove the final drive cover capscrews through the 3 access holes (2) in sprocket hub. Rotate the sprocket hub until capscrews are aligned to hole. Be sure to remove all capscrews.

6.2.3
Refer to Fig. 6-9. Remove cork from pusher screw holes in cover. Install 3 pusher screws through access holes in sprocket hub.

6.2.4
Refer to Fig.6-8.Attach lifting bracket (1) with a 1"NC, 6"long (152 mm) grade 8 capscrew. Remove two sprocket segment capscrews 180° apart for later attachment of the cover stabilizing spacers.

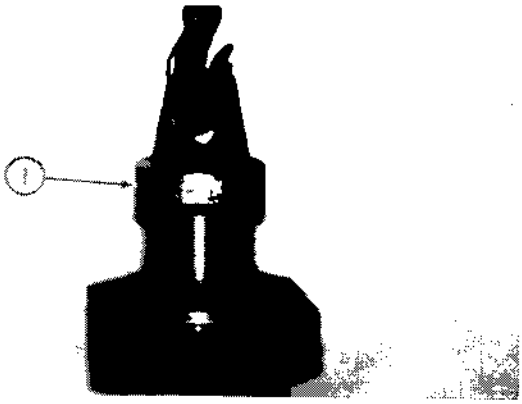
6.2.5
Attach a hoist with 6000 lb. (2725 kg) capacity to lifting bracket. Keep slack in chain until final drive cover leaves the dowel pins to prevent binding of ring gear in bore.Slowly push the final drive carrier from the housing with the 3 pusher screws.When carrier is removed as shown in Fig. 6-11, attach 2 cover stabilizing spacers (2). Completely remove the final drive carrier assembly from housing.



T-80747

FIG. 7-1 REMOVING OUTBOARD BEARING NUT

1. Socket and wrench
2. Torque wrench (28:1)
3. Nut removing socket 75300027
4. Extension
5. Outboard bearing cage
6. Backing bar



T-84830

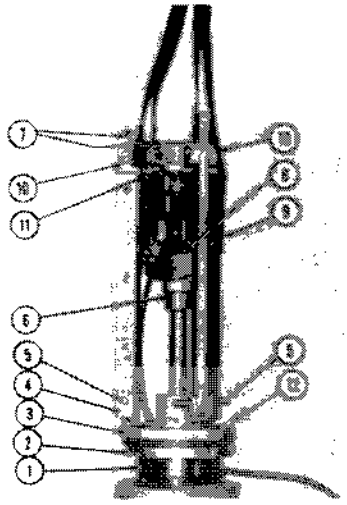
FIG. 7-2 OUTBOARD END LIFTING BRACKET

1. Lifting bracket 75300050

7.1 DISASSEMBLY

7.1.1
Remove the final drive carrier shipping cover. Remove the safety strap attached to outboard bearing cage. Remove the retainer from outboard bearing cage. Remove roll pin from outboard bearing nut.

7.1.2
Refer to Fig.7-1. Using tools as shown, remove the nut from shaft.



T-80754

FIG. 7-3 REMOVING OUTBOARD BEARING AND CAGE

1. Outboard bearing cage
* 2. Back-up ring
* 3. Adapter ring
* 4. Leg adapter
* 5. Pin
* 6. Adapter
* 7. Legs
* 8. Forcing screw
* 9. Ram
*10. Pins
*11. Y-adapter (head)
*12. Capscrews

*See Service Tools

7.1.3
Using tools shown in Fig. 7-2 rotate assembly so that outboard bearing is on top.Set assembly on stand, Fig.7-4 (6).

7.1.4
Refer to Fig.7-3; position the backing ring(2) beneath cage flange. Position adapter ring (3) on top of cage flange. Align adapter ring, cage flange and backing ring holes and secure with capscrews ('2). Install adapter (6) on end of shaft. Install leg adapters (4) in ring(3).Position legs(7)on leg adapters (4) and secure with pins (5). With Y-adapter(11)attached to ram(9),extension and adapter(6) on ram, connect and secure the legs(7) to Y-adapter(11)with pins(10). Connect pump hoses to ram and remove bearing and cage from shaft making certain seals do not fall and get damaged. Remove the tools from bearing cage.

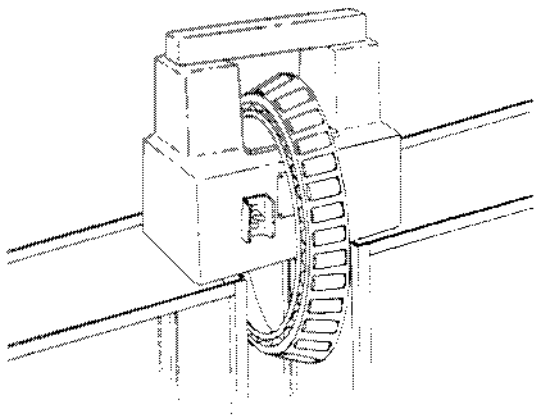
7.3.2

The items listed must be chilled unless prefixed with asterisk which may be installed without chilling, but chilling is recommended. Chill items to at least 0°F (-18°C) or colder. Chill items approximately 30 minutes in dry ice or four hours in a freezer. Items should be cleaned and lubricated with light oil before chilling. Use protective gloves when handling chilled objects.

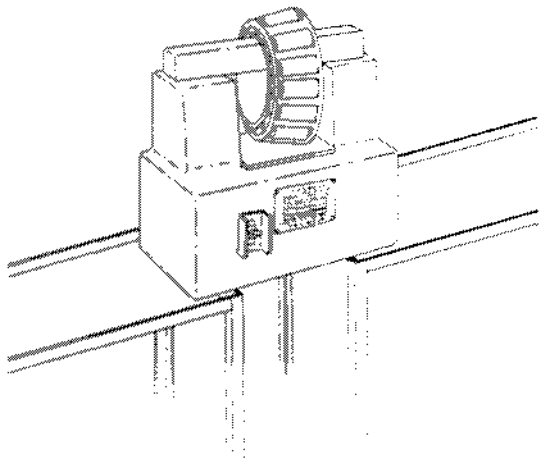
WARNING

Dry ice (solid carbon dioxide) is extremely cold and will freeze flesh on contact. Use care to prevent contact with skin, eyes, or other parts of the body to avoid personal injury.

Inner Bearing Cups
Sun Gear Bearing
Planet Bearing Cups
*Planet Pins
Inner Ring Gear Dowels

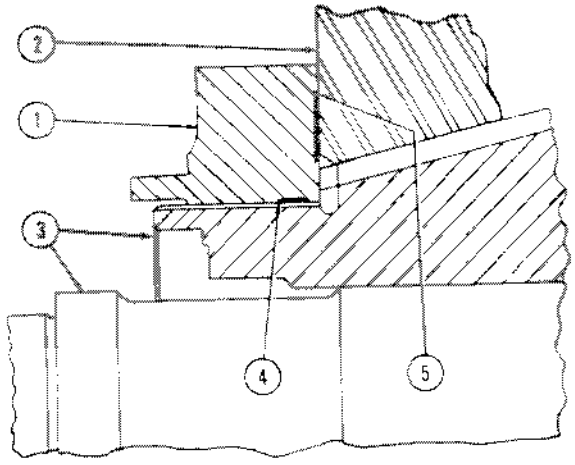


T-80780



T-80781

FIG. 7-28 HEATING BEARINGS (Typical)



T-80974

FIG.7-54 SPROCKET NUT/CARRIER SEALANTS

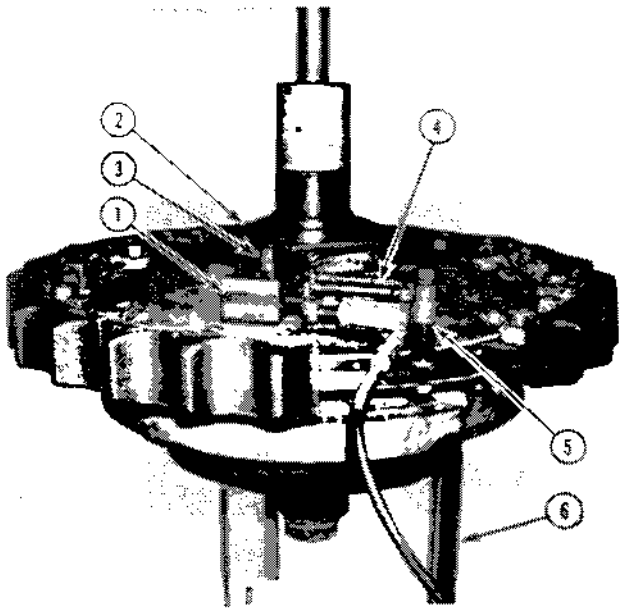
1. Sprocket hub retaining nut
2. Sprocket hub
3. Carrier
4. Sealant 75000777 (Loctite 92)
5. Thread lock 75000776 (Loctite 262)

⚠ WARNING

It is unsafe to strike hardened steel parts with anything other than a soft iron or non-ferrous hammer. When installing or removing such parts wear safety glasses with side shields and heavy gloves, etc., to reduce the possibility of injury.

7.5.9
Connect hydraulic pump hose to hydraulic ram and operate pump until a pressure of 100 tons is indicated on pump pressure gauge. Hit sprocket at three points equally spaced around hub with a heavy hammer and read pressure gauge. If pressure stays at least 95 tons, installation is complete. If pressure drops below 95 tons, operate pump to build pressure up to 100 tons. Again hit hub three times and read pressure gauge. Alternately apply pressure and hit hub until pressure holds at least 95 tons after hub has been hit.

7.5.10
Release pressure on pump and remove installing tools. As a check to be sure hub is installed correctly, measure from face of hub to edge of carrier splines. This dimension should be 9.9-11.66mm (.390" - .459"). See Fig. 7-53.



T-80755

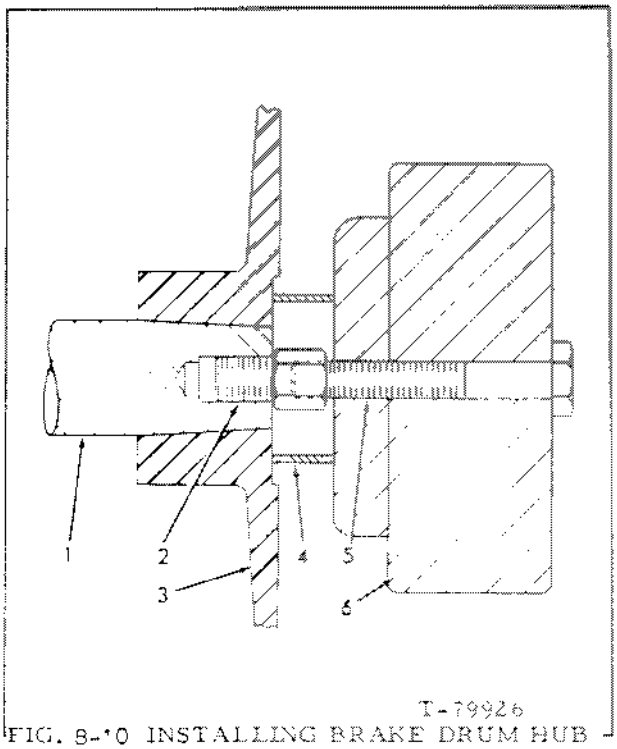
FIG. 7-55 TIGHTENING SPROCKET HUB RETAINING NUT

1. Nut wrench 75294251
2. Sprocket nut
3. Ram extension 75300059
4. Ram (7 ton)
5. Ram support 75300026
6. Floor stand 75300045

7.5.11
Refer to Fig. 7-54. Threads and face of both nut (1) and hub (2) must be dry and free of grease. Apply a continuous bead of Sealant 75000777 to threads of nut at location(4). Apply a continuous bead of Thread Lock 75000776 to face of nut at location (5). Install nut.

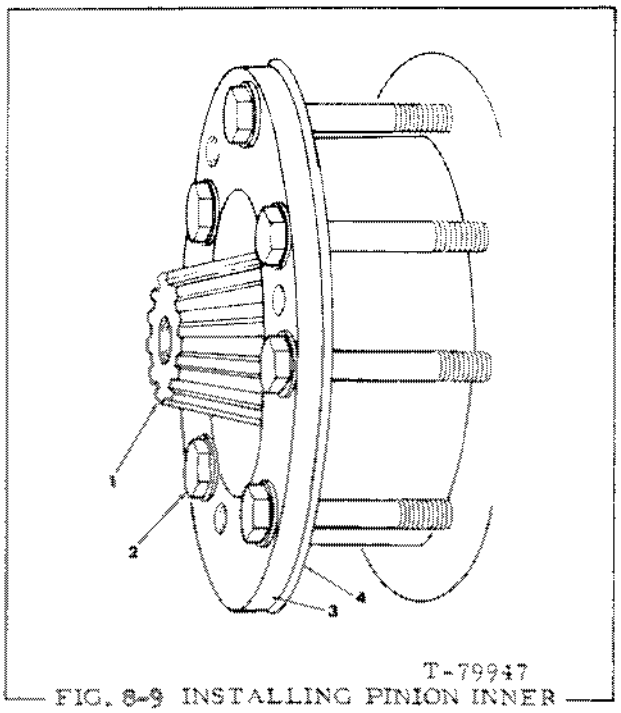
7.5.12
Using wrench on sprocket retaining nut as shown in Fig.7-55, tighten nut to 61 bar (900 psi) on gauge then locate hole for nut lock ring. Tighten enough to allow nearest hole alignment for lock ring. Do not exceed 122 bar (1200 psi) since this will exceed 813 daNm (600 lbs ft). Remove tools. Install lock ring. Torque lock ring capscrews to 13.6-17.6 daNm (100-130 lbs.ft)

T-79946
FIG. 8-8 PINION TEETH SUPPORTED IN BORE



T-79926
FIG. 8-10 INSTALLING BRAKE DRUM HUB

1. Pinion
*2. Adapter
3. Brake drum hub
*4. Installing sleeve
*5. Capscrew
6. Ram (17-1/2 ton)
*See SERVICE TOOLS



T-79947
FIG. 8-9 INSTALLING PINION INNER BEARING CAGE WITH PULLER SCREWS

1. Pinion
2. Puller screw
3. Inner bearing cage
4. Shim

8.4.10
Torque bearing cage capscrews to 220 - 240 lbs.ft(30-33 m-kg). Check shaft end play and adjust to .010"-.050"(.25-1.27 mm) loose by adding or removing shims under the bearing cage. When removing cage to make the final bearing end play adjustment, install o-ring,Fig.8-1 (9); leave the pinion seated in the outer bearing.The pinion will be supported by the carrier drive gear in this position.If carrier is not installed,support pinion as shown in Fig.8-8.

8.5 INSTALLATION OF BRAKE DRUM HUB

8.5.1
Place brake drum hub, Fig. 8-1(2), on pinion (12). Assemble tools shown in Fig. 8-10. Connect pump hose to hydraulic ram.

8.5.2
Operate pump until a pressure of 17 ton is applied to hub. Reduce pressure and reapply 17 ton force. Remove tools. Hub standout should be 0.114"-0.176" (2.9-4.5mm).

IMPORTANT: Do not strike hub or pinion to seat hub. Hub must be installed using tools shown in Fig.8-10 and hydraulic pressure only.

10.2
The following list of tools are additional items required for final drive removal, disassembly, assembly and installation.

70907061 Reducing Coupling**
70911078 1/4" pipe nipple**
70914465 Lube fitting**
70924291 Puller screw**
70930286 Guide screw (1/2"NC)(Requires removal of head)**
70934195 Pusler screw (Requires reworking to all thread)**
70934197 Puller screw**
75294539 Inner bearing cage puller plate**
75300023 Lifting bracket
75300025 Guide pins (5/8"NF)
75300026 Ram support
75300027 Outboard nut socket
75300028 Ring gear lifting bracket*
75300031 Guide plug*
75300032 Ram extension tube
75300033 Sun gear lifting bracket
75300034 Sun gear snap ring removal tool*
75300035 Planet gear bearing installation plate and outboard bearing removal plate
75300036 Planet bearing removal plate
75300037 Planet bearing removal plate (includes snap ring 75300075)
75300042 Lube fitting adapter*
75300045 Floor stand
75300046 Torque multiplier stand
75300047 Cover stabilizer screws*
75300048 Intermediate bearing cup remover*
75300050 Lifting bracket
75300051 Insert for tool #75300034*
75300054 Dowel pin remover and installer
75300055 Planet gear cup installer
75300057 Ram guide shaft
75300058 Ram extension tube
75300059 Ram extension (sprocket nut pushing)
75300060 Dowel pin removal support angle
75300061 Dowel pin installer support angle
75300075 Snap ring (used with plate 75300037)
75300124 Guide screw (5/8"NC)**
75300133 Hydraulic ram (17.5 ton)
75300809 Hydraulic ram set (17.5 ton) (Includes ram 75300133 plus an assortment of accessories)
75300972 Sprocket hub seal tool**
75301115 Cover guide**
75301116 Cover stabilizing spacer** (Includes capscrew 70924136, washer 70928169 (5/8") and capscrew 70934202, washer 70920754 (3/4")

*for 3 planet gears used FD40 prior to s/n 89A03068 excluding 03034, 03035,03036,03038.
**for 4 planet gears used FD40 s/n 89A03068 and up including 03034, 03035,03036,03038; all FD50 . Also service replacement for FD40 prior to S/n 89A03068.

SAFETY RULES

Be alert to avoid changes in traction conditions that could cause loss of control. DO NOT drive on ice or frozen ground conditions when working the machine on steep slopes or near dropoffs.

Keep the machine well back from the edge of an excavation.

Be especially careful when traveling up or down slopes. Position the bucket in such a way as to provide a possible anchorage on the ground in case of a slide.

When proceeding across a hillside proceed slowly. Never turn sharply uphill or downhill.

Avoid sidehill travel whenever possible. Drive up and down the slope. Should the machine start slipping sideways on a grade turn it immediately downhill.

In steep downhill operation, do not allow engine to overspeed. Select proper gear before starting downgrade.

There is no substitute for good judgement when working on slopes.

The grade of slope you should attempt will be limited by such factors as condition of the ground, load being handled, the type of machine, speed of machine and visibility.

NEVER COAST the machine down grades and slopes with the transmission in neutral on power shift machines or clutch disengaged on manually shifted machines.

To reduce the danger of an uncontrolled machine, choose a gear speed before proceeding down grade that will hold machine to proper speeds for conditions.

Operating in virgin rough terrain that includes previously mentioned hazards is called pioneering. Be sure you know how this is done. Danger from falling branches and upturning roots is acute in these areas.

When pushing over trees, the machine must be equipped with proper overhead guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.

Avoid brushpiles, logs or rocks. DO NOT DRIVE THE MACHINE ONTO BRUSHPILES, LOGS, LARGE ROCKS or other surface irregularities that break traction with the ground especially when on slopes or near dropoffs.

Avoid operating equipment too close to an overhang or highwall either above or below the machine. Be on the lookout for caving edges, falling objects, and slides. Beware of concealment by brush and undergrowth of these dangers.

Park in a non-operating and non-traffic area or as instructed. Park on firm level ground if possible. Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movement. Set the parking brake.

Never park on an incline without carefully blocking the machine to prevent movement.

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals as required. Also provide advance warning signals in the traffic lane for approaching traffic.

Move the machine away from pits, trenches, overhangs and overhead power lines before shutting down for the day.

When stopping operation of the machine for any reason always return the transmission or hydrostatic drive control to neutral and engage the control lock to secure the machine for a safe start up. Set parking brake, if so equipped.

Never lower attachments or tools from any position other than seated in operator's seat. Sound the horn. Make sure the area near the attachment is clear. Lower the attachment slowly. DO NOT USE float position to lower hydraulic equipment.

Always before leaving the operator's seat and after making certain all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position. Move any multipurpose tool to positive closed position. Return the controls to hold. Place transmission control in neutral and move engine controls to off position. Engage all control locks, set parking brake, and open and lock the master (key, if so equipped) switch. Consult Operation and Maintenance Instruction Manual.

Always follow the shut-down instructions as outlined in the Operation and Maintenance Instruction Manual.

MAINTENANCE

Do not perform any work on equipment that is not authorized. Follow the Maintenance or Service Manual Procedures.

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing.

Shut off engine and disengage the Power Take-Off lever if so equipped before attempting adjustments or service.

Always turn the master switch (key switch if so equipped) to the off position before cleaning, repairing, or servicing and when parking machine to forestall unintended or unauthorized starting.

Disconnect batteries and TAG all controls according to local or national requirements to warn that work is in progress. Block the machine and all attachments that must be raised per local or national requirements.

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manuals. Do not wear loose clothing or jewelry near moving parts.

Do not run engine when refueling and use care if engine is hot due to the increased possibility of a fire if fuel is spilled.

Do not smoke or permit any open flame or spark near when refueling or handling highly flammable materials.

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow. To reduce the chance of a static electricity spark, keep contact until after fuel flow is shut off.

Do not adjust engine fuel pump when the machine is in motion.

Never attempt to check or adjust fan belts when engine is running.

When making equipment checks that require running of the engine, have an operator in the operator's seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock. KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.

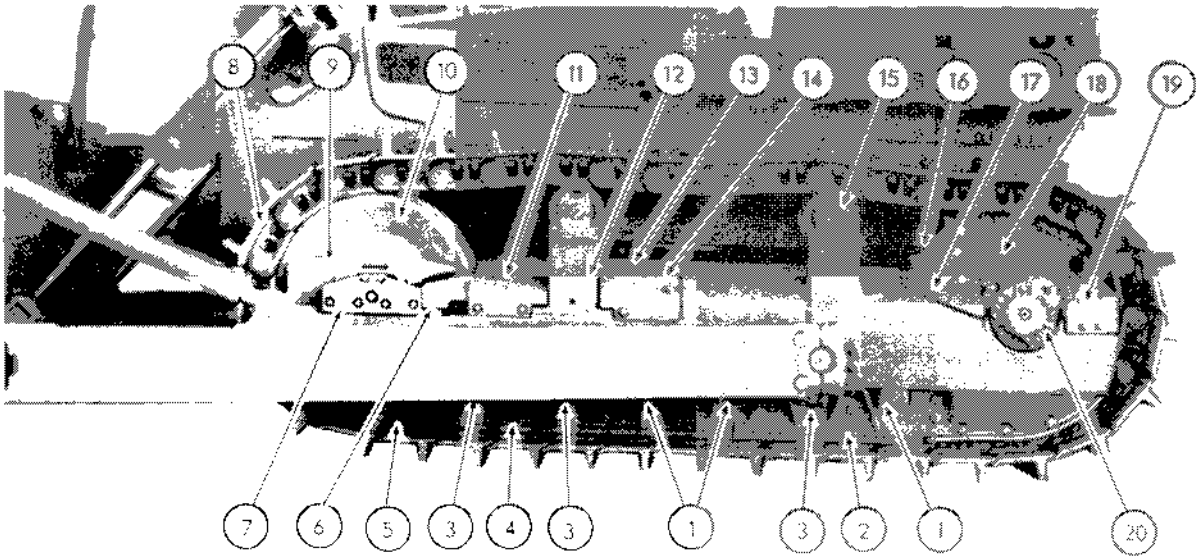


FIG. 1 UNDERCARRIAGE COMPONENTS T-79956

1. Single flange roller
2. Rear outer guard
3. Double flange roller
4. Front outer guard
5. Lower idler guard
6. Idler yoke
7. Idler gulde plate
8. Track assembly
9. Idler guard
10. Track idler
11. Yoke guard
12. Oscillating beam bracket
13. Track adjuster access plate
14. Track release guard
15. Track carrier roller
16. Sprocket segment
17. Front sprocket guard
18. Track sprocket
19. Rear sprocket guard
20. Sprocket shaft outboard bearing

1.1 GENERAL

1.1.1 Major components of undercarriage are: track frame, track rollers, track carrier rollers, track release, track idler, track, oscillating beam, sprocket segments, and track roller guards.

1.1.2 Track frame is fabricated from special steel sections welded into a rigid frame. Bottom of track frame, top of frame at idler location, oscillating beam bracket plates and track roller brackets are machined to provide accurate alignment of undercarriage components.

1.1.3 Each track frame is secured at rear by pivot shaft and sprocket shaft outboard bearing; pivot shaft is secured to bottom of main housing by pivot shaft caps. Sprocket shaft outboard bearing is installed in sprocket shaft outboard bearing cage; track frame is attached to outboard bearing cage by capscrews. Track frames support tractor main frame by use of a shock absorbing oscillating beam.

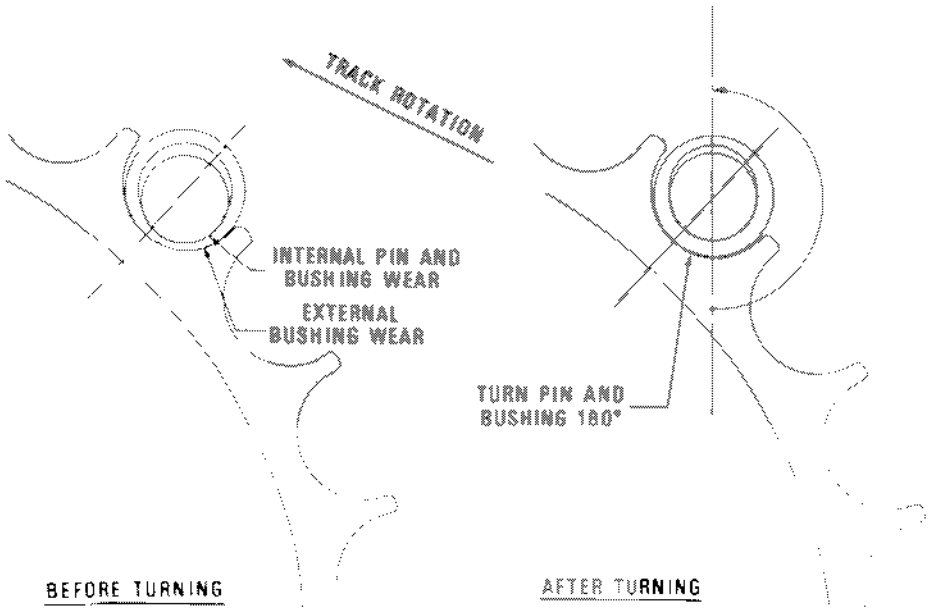


FIG. 11 PIN AND BUSHING WEAR T-72916

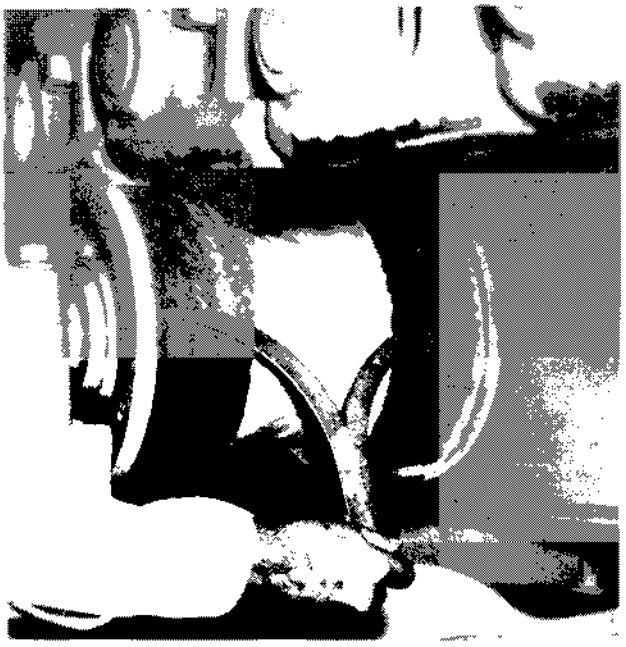


FIG. 12 CHECKING CARRIER ROLLER FLANGE WIDTH AT RIM (Track Rollers Similar) T-79032

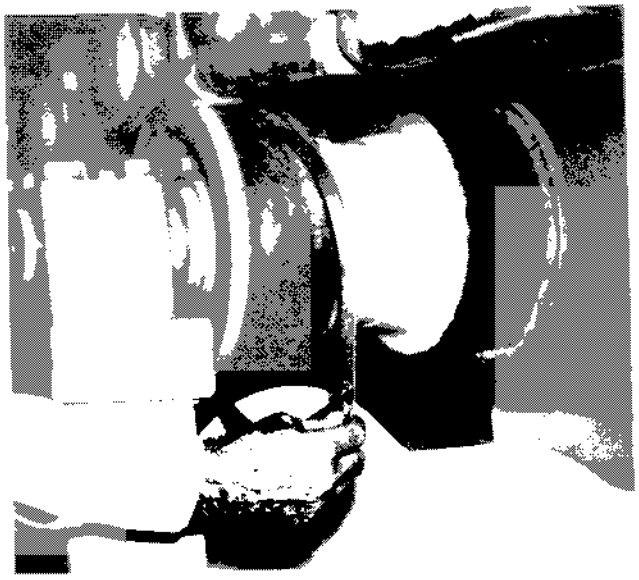


FIG. 13 CHECKING CARRIER ROLLER TREAD (Track Roller Similar) T-79033

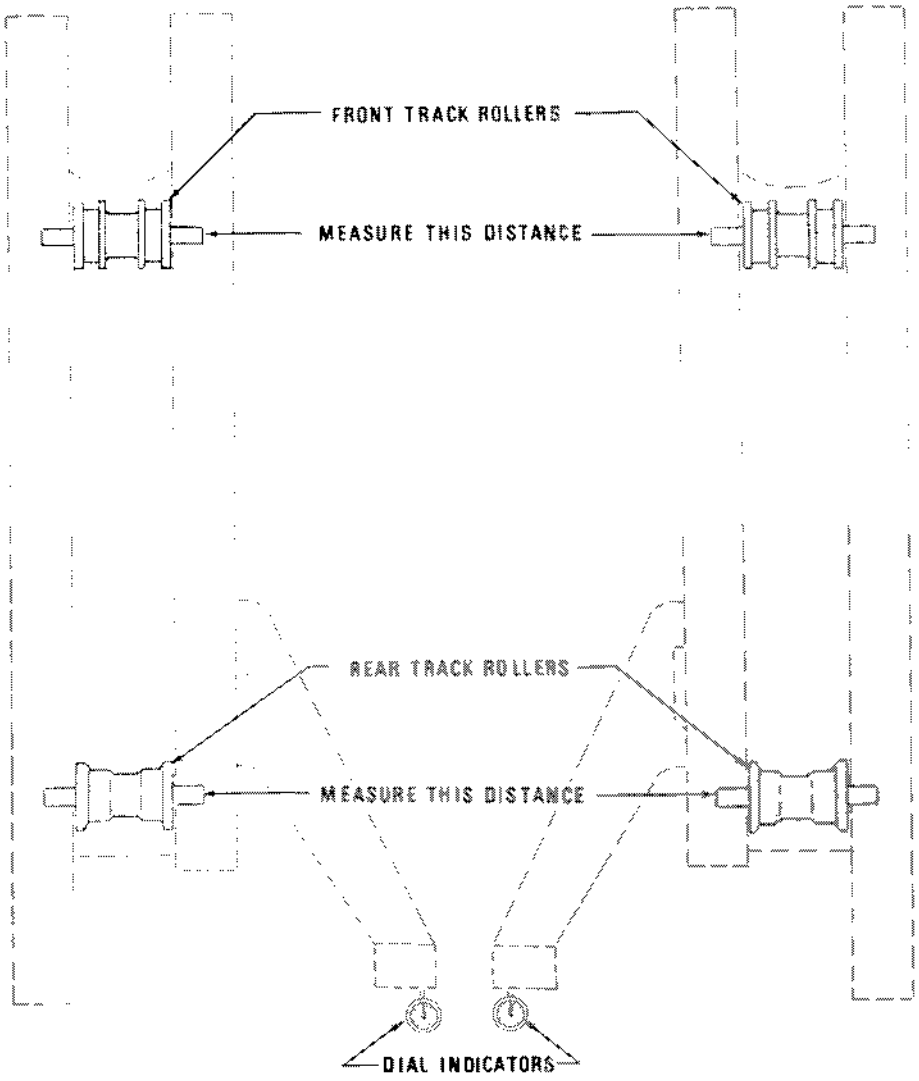


FIG. 29 MEASURING POINTS TO DETERMINE TRACK FRAME PARALLELISM T-75452

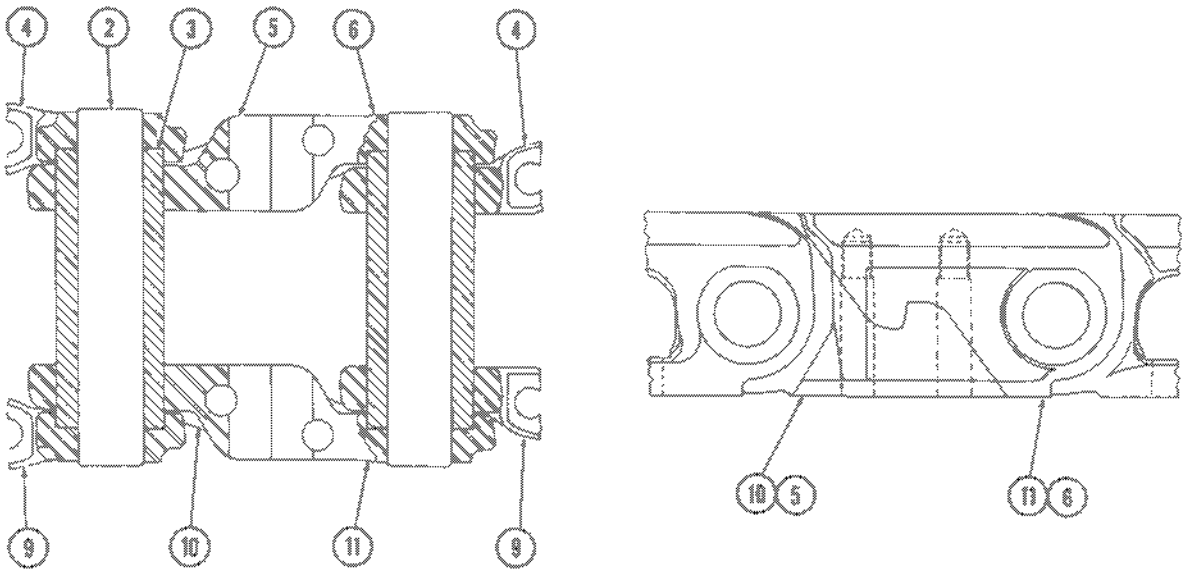


FIG. 42 NON-SEALED TRACK/TYPE B SPLIT MASTER LINKS T-84975

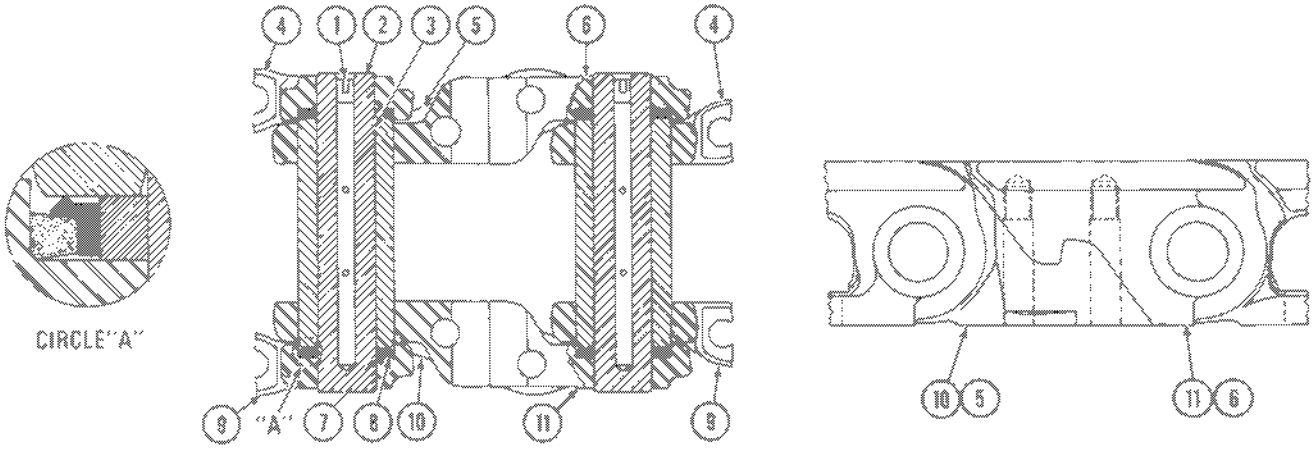


FIG. 43 SEALED TRACK/TYPE B SPLIT MASTER LINKS T-84805

Legend for Figs. 42 and 43.

1. Plug
2. Track pin
3. Bushing
4. Track link, R.H.
5. Track link, R.H.
6. Track link, R.H.
7. Spacer
8. Seal
9. Track link, L.H.
10. Track link, L.H.
11. Track link, L.H.

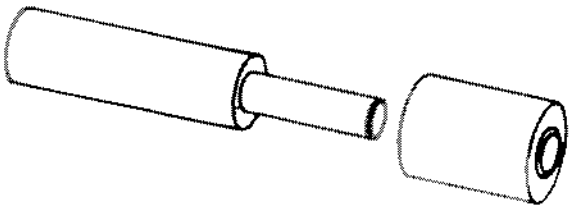


FIG. 59 RUBBER SEAL INSTALLATION TOOL SET (Mandrel and Guide, P/N 75300785) T-85112

Penetrate the plug with the nozzle needle. Hold the guide firmly against the pin and use the nozzle to force the plug through the guide and into pin.

NOTE: When pushing the nozzle needle through the plug, push against a wood block. Pushing against metal will damage the needle point.

Depress VAC (vacuum) button on pump to remove air from pins. Hold button down until gauge reading is a minimum of 50.8 cmHg (20 in.). Release the button and wait 4-5 seconds. Loss of vacuum indicates a leak. If leak exists, depress PRESS. button (right side) on pump and hold until pressure reaches 2.8 bar (40 psi) hold pressure for about 15 seconds and look for leaking oil.

NOTE: DO NOT let control handle hang on the needle as this will bend or break the needle.

If oil leaks from the joint, repeat the vacuum/pressure cycle several times (this will usually stop the leak). If still leaking, disassemble link, check parts for scratches, scoring, etc.

NOTE: Before removing lubricating nozzle from plug, release PRESS. button and momentarily depress VAC button to relieve pressure in pan. Withdraw nozzle from plug.

⚠ WARNING - If the mandrel, Fig. 59 is used to force the plug through the guide and into the pin, the soap solution must be allowed to dry before inserting lubricating nozzle through the plug, otherwise nozzle needle will not penetrate the plug but will only force the plug deeper into the pin. Note that the mandrel also regulates correct depth of plug in the pin, 5-7.5 mm (.20-.30 in.).

(Lubricating Track Links by Pour Method)

In the event a lubricating pump is not available, the pour method is a good method, but takes a lot of time.

After the complete chain is assembled (less the track shoes), turn the chain on its side, pin hole up, and pour SAE 90EP (GL-4) multi-purpose gear oil into each pin until full. Because there is air in the pin, the oil must be allowed to settle, the pin refilled, and allowed to settle several times until oil level stabilizes at 50 mm (2 in.) below the top of the pin.

NOTE: If oil level is above the 50 mm (2 in.) mark, after settling, use a suction pump to remove excess oil or a rod, pushed into the pin hole, will force the oil out.

Apply a detergent soap solution to the rubber plugs and to the I.D. of the tool guide, Fig. 59.

Insert the rubber plug into the tool guide. Hold guide firmly against the pin and use the mandrel to force the plug through the guide and into the pin. Mandrel will position the plug to the correct depth in the pin, 5 - 7.5 mm (.20 - .30 in.).

5.5.6
Install track shoes on chain assembly with cleats (grousers) toward pin end of links. Tighten track shoe bolts to 1700-1870 Nm (1250-1380 lbs.ft.).

6.5.2 Track Idler

Check the I.D. of the idler bearing bore. If the bores are greater than 212.699 mm (8.374 in.), the idler must be replaced.

Check the idler rim and center flange with measuring kit to determine wear. If rim or flange is to be built up, use dimensions given in measurement kit.

6.5.3 Idler Shaft

Inspect the bearing cone locations. If bearing cone has been turning on shaft and shows heavy wear, the shaft should be replaced.

If evidence of bent shaft is apparent, place shaft in lathe between centers and check with dial indicator. Runout should be no more than 0.051 mm (.002 in.).

6.5.4 Idler Brackets

Check the idler bracket wear at the side bar contact locations. If the distance between the upper and lower slide bar inner surfaces is greater than 99 mm (3.9 in.) for model FD50 and 94 mm (3.7 in.) for model FD40, the bracket should be replaced.

Check the bracket wear surfaces for parallelism. If they are out of parallel more than 0.51 mm (.02 in.) they should be machined or replaced. If they are machined, add shims beneath upper slide bar to obtain proper clearance when it is installed. Check upper slide bars. If they are worn more than 0.41 mm (.016 in.) they should be replaced.

6.5.5 Guide Plate

If the guide plate (portion which contacts slide bar) shows more wear than shim removal can compensate, the guide plate should be replaced.

6.5.6 Bearings

Inspect bearing cones, rollers and cups. If they are pitted, chipped or have enough surfaces, they should be replaced.

6.5.7 Seals

Inspect sealing surfaces of steel rings for scratches, nicks, or heavy grooving. These surfaces must be smooth and flat showing good contact. Check the rubber rings. If they have taken a set or have hardened, they should be replaced.

NOTE: Steel rings are serviced only as a part of seal assembly; rubber rings are serviced separately.

6.5.8 O-rings

It is advisable to replace the O-rings.

6.6 REBUILDING

6.6.1
After it has been determined track idler guiding flange and wear rim requires rebuilding by welding, it is advisable to use an automatic welder. It is recommended that idler shaft, bearings, seals and bearing retainers be removed to prevent any damage due to electrical arcing.

6.6.2
Use proper welding wire and heat to be certain that welding is accomplished around, rather than across, rim or flange. Refer to Topic 13 and 14 for dimensions for rebuilding.

==========

⚠ WARNING -Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding or burning. Wear dark safety glasses near welding. DO NOT LOOK AT THE ARC WITHOUT PROPER EYE PROTECTION.

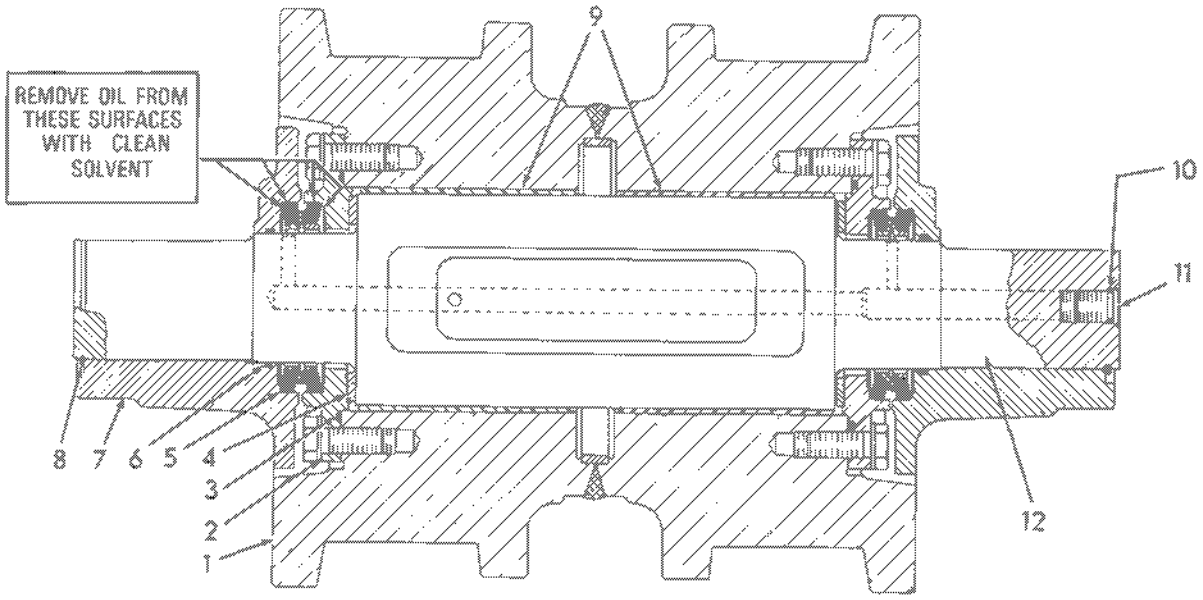


FIG. 74 TRACK ROLLER COMPONENTS T-79042

1. Roller
2. Retainer
3. O-ring
4. Thrust washer
5. Seal assembly
6. O-ring
7. End cap
8. End cap lock ring
9. Bushing
10. O-ring
11. Plug
12. Shaft

A- These surfaces must be clean and free of oil before installing seal

8.4.3 Bushing

Inspect the roller bushings and if they are badly scored or worn, the bushings should be replaced. If the bushing I.D. is more than 127.89 mm (5.035 in.) the bushings should be replaced and roller bore should be checked before new bushings are installed.

8.4.4 Seals

Inspect the roller seal assemblies and if the steel seal rings are scored, pitted, grooved, or chipped, the seal assembly must be replaced. Also inspect the rubber seal rings and if they have taken a set or show signs of having turned in retainers then the rubber seal rings should be replaced. Steel rings are available only as part of seal assembly. Rubber rings are available separately. If seals are reused and other components are replaced in roller assembly, the seal wear pattern will change and may cause seal to leak prematurely.

8.4.5 Roller

Inspect roller for cracks at the retainer capscrew holes. Replace roller if cracks are found.

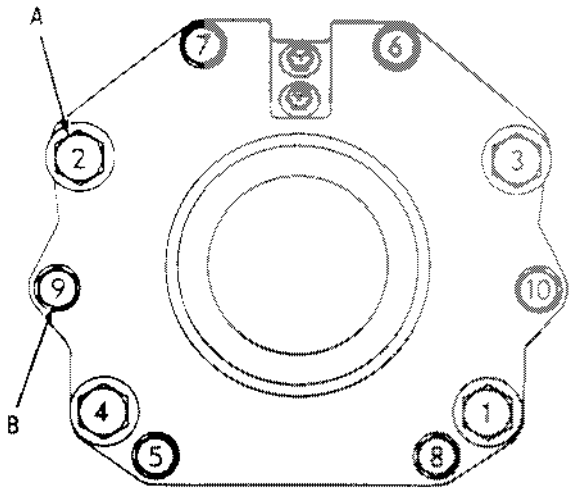


FIG. 83 CYLINDER HOUSING CAPSCREW TIGHTENING SEQUENCE T-83174

CAP-SCREW	SIZE	TORQUE
A	28.4 x 279.4 mm 1-1/8"NC x 11"	1300-1505 Nm 960-1110 lbs.ft.
B	22.2 x 76.2 mm 7/8" NC x 3"	813-963 Nm 600-710 lbs.ft.

9.2.13
Install carrier roller/oscillating beam bracket on beam; then lower beam and blocking until bracket rests lightly on track frame. Bracket must be loose enough to permit alignment of attaching capscrew holes.

9.2.14
Start all bracket-to-frame capscrews. Completely lower the oscillating beam and remove all blocks from under the beam. Torque capscrews to 2440-2847 Nm (1800-2100 lbs.ft.).

9.2.15
Refer to 5.2 and adjust track.

9.2.16
Install and secure all guards with capscrews to a torque of 515-644 Nm (380-475 lbs.ft.).

9.2.17
Refer to Fig. 80 and lubricate piston cylinder through fitting (18) with pressure gun lubricant (10-20 shots).

9.3 REMOVAL AND INSTALLATION OF TRACK ADJUSTER CYLINDER HOUSING AND RELEASE SPRING

==========

⚠ WARNING - Track release spring is assembled into machine with high compressive load. Refer to 9.3.10.

NOTE: Track must be coupled to perform this operation.

9.3.1
Refer to 5.2 and loosen the track.

9.3.2
Remove the guards from above the track adjuster and idler yoke.

9.3.3
Refer to Fig. 80 and remove the carrier roller/oscillating beam bracket-to-track frame attaching capscrews.

9.3.4
Force the track idler forward to free the idler yoke from the idler bracket dowel pins.

9.3.5
Using a 2 ton hoist or jack, raise the oscillating beam approximately 150 mm (6 in.) and place suitable blocking beneath the beam in this position.

==========

⚠ WARNING -When any supporting machine component must be removed or installed and jacks are used, be sure the support of the jack at the machine and on the ground are appropriaate to the load to be applied. Transfer the load to authorized blocking or jack stands immediately. Do not work on or under the machine or its components while supported only on a jack or other lifting device, according to local or national requirements.

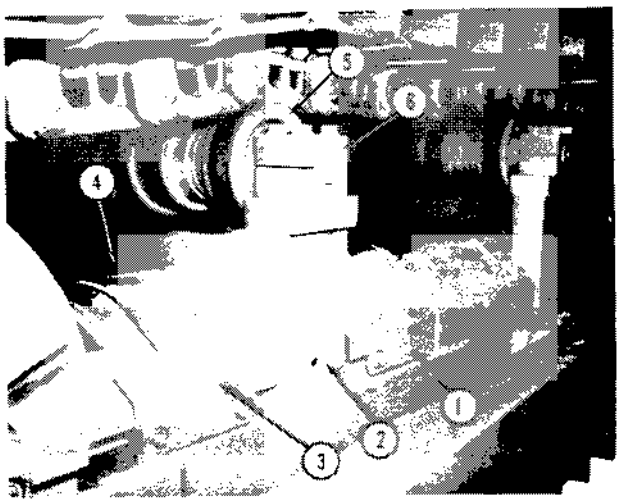


FIG. 94 OSCILLATING BEAM INSTALLED T-79959

1. Rear guard
2. Carrier roller/oscillating beam bracket
3. Front guard
4. Oscillating beam
5. Carrier roller
6. Roller mounting bracket

11.1 PERIODIC CHECK

11.1.1
Check capscrews attaching carrier roller oscillating beam pivot block for proper torque 2440-2847 Nm (1800-2100 lbs.ft.).

11.1.2
Raise front end of tractor sufficiently to remove weight and to allow oscillating beam to move freely; then check pivot shaft and pivot bushing wear by prying on the end of the beam. Normal clearance is approximately 0.38 mm (.015 in.). If the beam can be moved excessively, the pivot shaft and/or bushing is worn and must be replaced.

11.1.3
Check the torque on carrier roller oscillating beam bracket capscrews. If they are loose, retighten to 2440-2847 Nm (1800-2100 lbs.ft.).

11.1.4
Check condition of shock pads.

11.2 REMOVAL AND DISASSEMBLY

To remove the oscillating beam, remove guards, carrier roller oscillating beam bracket, one side only (whichever is preferable).

11.2.1
Remove the guards, Fig. 94, from oscillating beam bracket and track frame. Loosen and remove the carrier roller mounting bracket (6) capscrews, and remove carrier roller (15).

11.2.2
Remove capscrews from pivot shaft blocks, Fig. 95 (5). Disconnect the lube tube from elbow of pivot shaft.

11.2.3
Raise the front of the tractor sufficiently to allow the removal of bracket (6) and the oscillating beam. Block tractor in this position.

11.2.4
Remove bracket from beam and track frame.

11.2.5
Remove lube tube from elbow of pivot shaft.

11.2.6
Using a suitable sling and hoist or rolling floor jack, remove oscillating beam assembly from tractor. Beam weighs approximately 640.9 kg (1413 lbs.).

WARNING-Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

⚠ WARNING - Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Wear dark safety glasses near welding. DO NOT LOOK AT THE ARC WITHOUT PROPER EYE PROTECTION.

13.1 GENERAL INFORMATION

IMPORTANT: The information contained in this Topic supplements the wear dimensions given in Undercarriage Measuring Kit, P/N 75300081.

13.1.1
When one component is replaced or rebuilt, it is important that all mating components be carefully checked for wear which may cause mis-matching, Fig. 102, and as a result shorten the life of all components.

13.1.2
When rebuilding components by welding, it is advisable to use an automatic welding machine following the recommendations of machine manufacturer for proper welding rod and heat.

13.1.3
Weld should be smooth and when possible should be ground or machined to a smooth finish. This will extend the life of mating components.

13.1.4
Undercarriage Measuring Kit, obtained through your Fiatallis Dealer, can be used to determine when a component should be replaced or rebuilt.

13.1.5
When rebuilding track carrier rollers, track rollers, and track links, the bores should be checked AFTER welding and if they are distorted or shrunk, they should be very carefully restored to their original dimension by grinding or machining. It is important that all bores are in alignment to within .0254 mm (.001 in.) of the center line.

IMPORTANT: Do not attempt to build up teeth on sprocket segments by welding since that will cause warping of segment and make it difficult to keep segment tight on hub.

14.8 TRACK RELEASE AND ADJUSTER

Cylinder housing I.D. ----- 203.682-203.784 mm (8.019-8.023 in.).

Cylinder O.D. ----- 203.33-203.40 mm (8.005-8.008 in.).

Cylinder I.D. ----- 152.603-152.857 mm (6.008-6.018 in.).

Piston O.D. ----- 152.273-152.400 mm (5.995-6.000 in.).

(FD40) - Track release spring free length ----- 1049 mm (41.3 in. max.)

(FD40) - Spring compression at ----- 844.55 mm (33.25 in.) 40824 kg (90,000 lbs.)

(FD50) - Track release spring free length ----- 1381 mm (54.4 in. max.)

(FD50) - Spring compression at ----- 1130 mm (44.5 in.) 53,300 kg (117,500 lbs.)

FD50 41-B

Crawler Tractor

SERVICE MANUAL

CAB

75S03001-UP
42S04001-UP

Form 73149751 English

⚠ WARNING

STUDY THE OPERATION AND MAINTENANCE INSTRUCTION MANUAL THROUGH BEFORE STARTING. OPERATING, MAINTAINING, FUELING OR SERVICING THIS MACHINE.

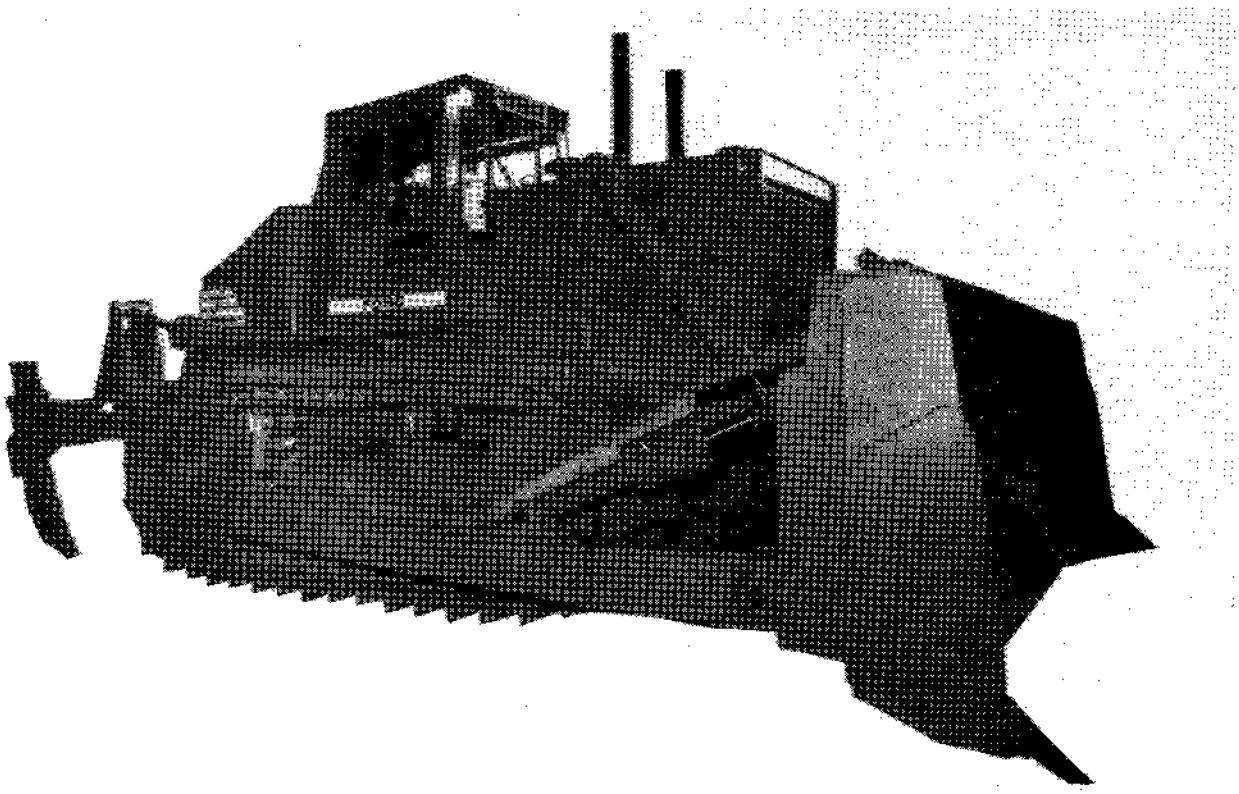
⚠ The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.

⚠ This symbol is your safety alert sign. It MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.

⚠ Read and heed all safety instructions carrying the signal words WARNING and DANGER.

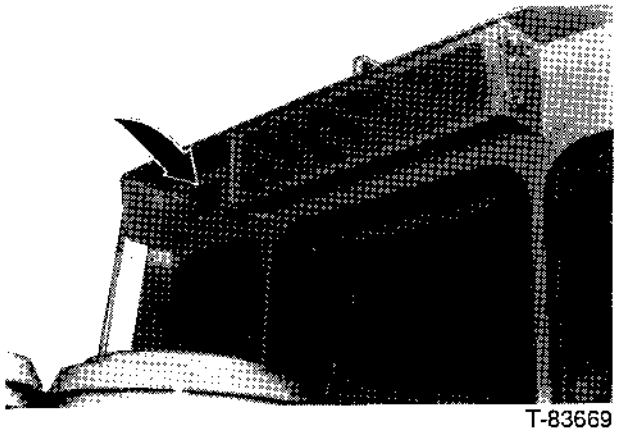
⚠ Machine mounted safety signs have been color coded yellow with black borders and lettering for warning and red with white borders and lettering for danger points.

TOPIC 1 GENERAL DESCRIPTION



T-83118

FIG. 1 CAB MOUNTED ON FD50 CRAWLER TRACTOR



T-83669

FIG. 2 SERIAL NUMBER LOCATION

1.1
Cab is certified as a roll-over protective structure (ROPS).

⚠ WARNING

The protection offered by the Roll Over Protective Structure may be impaired if it has been subjected to any modification or damage.

If replacement of glass is necessary be sure to use safety glass or equivalent.

1.2
Standard features include heater, defroster fan, front and rear window wipers, front window washers, inlet air filter, pressurizer, dome light, tinted safety glass, and soundproofing insulation.

1.3
Doors are equipped with locks and keys so cab can be secured. Doors can also be latched in the open position. Either door can be used to go into or out of the cab.

3.5.2
A replacement motor may need the sweep angle set depending upon where it is to be installed. Front windshield and rear window wipers require an 85° sweep angle. Front side window wipers require a 110° sweep angle. Replacement motors are set at 110°.

3.5.3
To change the sweep angle, remove back cover. Refer to Fig. 28 and position pin in proper hole. Install cover.

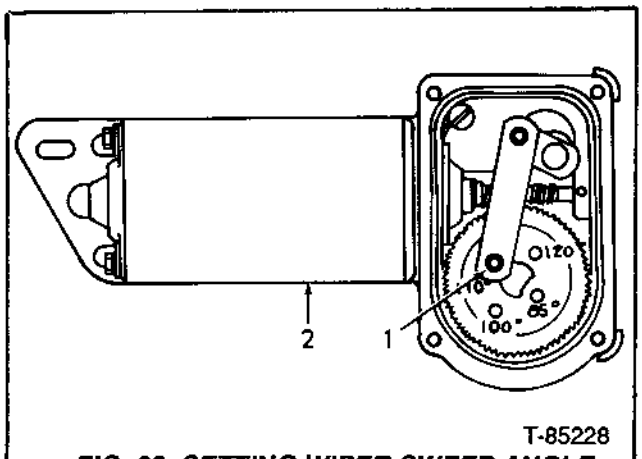


FIG. 28 SETTING WIPER SWEEP ANGLE

1. Location of pin in gear determines sweep angle.
2. Wiper motor(cover removed)

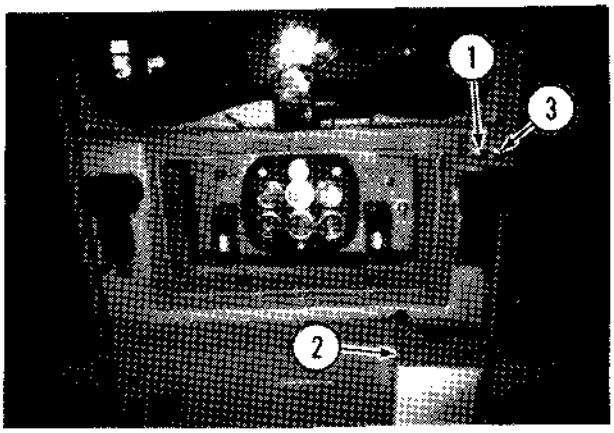


FIG. 29 FRONT WINDOW WASHERS

1. Windshield washer switch
2. Washer fluid reservoir.
3. Side window washer switch

3.6 WINDSHIELD WASHER

The washer switches, Fig. 29(1,3), located to right of instrument panel operate the washer pumps. A reservoir (2) for washer fluid is located below the switches. Always use washer fluid that is (a) suitable for prevailing temperature to prevent freezing and (b) has proper cleaning qualities. Use washers frequently to prevent a build-up on windows and to minimize scratching of windows.

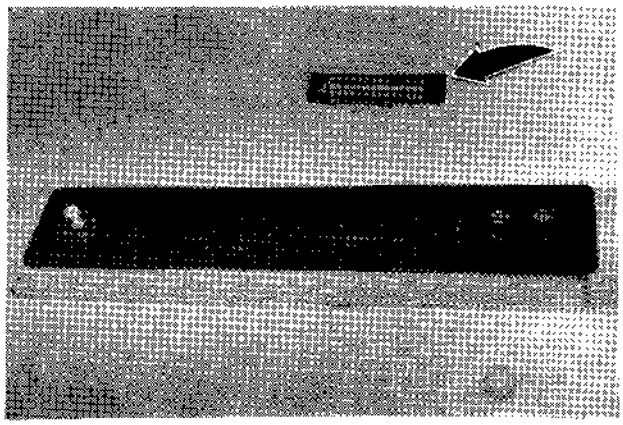


FIG. 30 DOME LIGHT

3.7 CAB DOME LIGHT

The dome light switch is located on dome light, Fig. 30. The light will provide adequate lighting in cab for locating accessory controls and switches and for the convenience of operator. It is not recommended to use dome light while operating the tractor. Use dome light only when necessary.

TOPIC 7 INSULATION

7.1 GENERAL INFORMATION

7.1.1
Cab is lined with a perforated, vinyl covered insulation. It also serves as a soundproofing material.

7.1.2
Most of the insulation in the roof is held in place with rubber buttons. This insulation can be removed to gain access to components installed in the roof. Remainder of the insulation is held in place by an adhesive.

7.2 REPAIRING INSULATION

7.2.1
Individual pieces of insulation are serviced and can be replaced if necessary.

7.2.2
If insulation is held in place by buttons, remove buttons, replace insulation and install buttons.

7.2.3
If insulation is held with adhesive, remove insulation, clean surface of cab, apply a coat of suitable adhesive to surface of cab and install insulation .

NOTE: 3M Company Soundfoam Adhesive #847 is a suitable adhesive.

⚠ DANGER

Adhesives are extremely flammable. Follow the manufacturer's instructions when applying.

7.2.4
If the insulation comes loose from the cab, it should be partially removed or peeled back and the cab surface cleaned. Apply a coating of suitable adhesive and place insulation back in position.

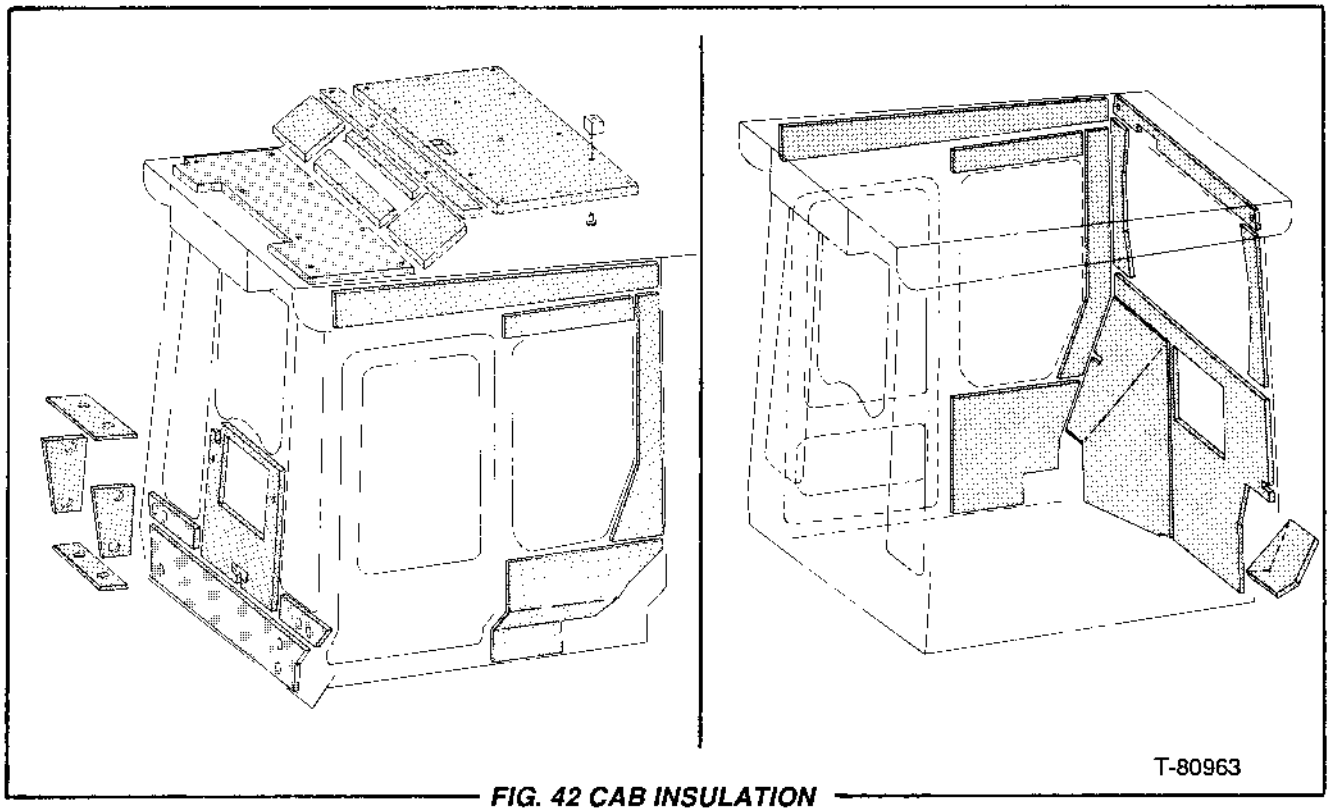


FIG. 42 CAB INSULATION

TOPIC 8 AIR CONDITIONER

8.11 MISCELLANEOUS INFORMATION

8.11.1 COLD CONTROL

If the cold control requires replacement, before removal note the location of sensing tube in evaporator coil. Replacement cold control sensing tube must be located in evaporator coil exactly as the original.

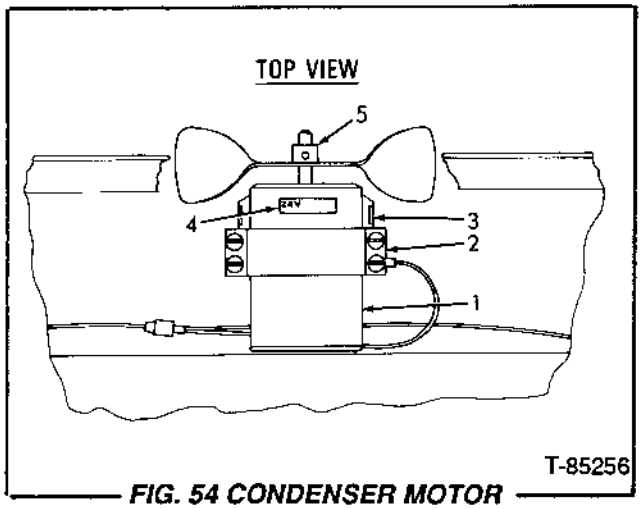


FIG. 54 CONDENSER MOTOR

1. Condenser motor
2. Mounting bracket
3. Brush housings
4. Identification tag
5. Fan blade

8.11.2 CONDENSER FANS

The brushes are the only parts of the motor that are serviced.

If the motor requires replacement, install it as follows:

- position wiring at bottom, identification tag, Fig. 54(4) at top
- insert motor until brush housings (3) are against mounting bracket (2).
- position fan blade (5) so that setscrew is at extreme rear of flat machined on shaft.

8.11.3 HOSE CLAMPS

Make certain the hose clamps are properly located (with integral gauge) on hose before tightening the clamp. Torque the clamps to 3.4Nm(30 lbs.in.)

8.11.4 RECEIVER/DRYER

The receiver/dryer contains a screen, desiccant, filter, high pressure switch and a sight glass. If system has a major failure or system has been open allowing the desiccant to become saturated with moisture, replace the receiver/dryer. To replace this unit the system must be discharged, evacuated and charged.

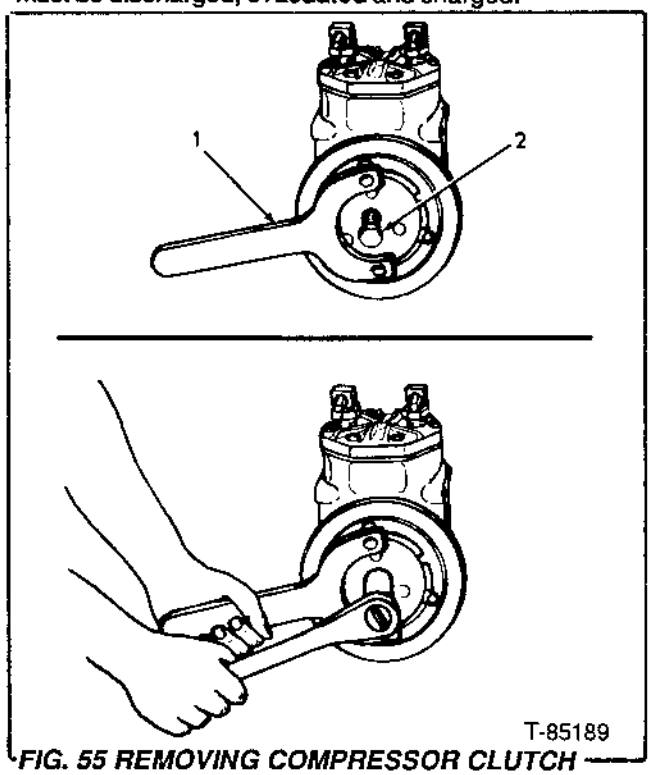


FIG. 55 REMOVING COMPRESSOR CLUTCH

1. Spanner tool
2. Forcing capscrew

8.11.5 COMPRESSOR CLUTCH REMOVAL AND INSTALLATION

8.11.5.1
Remove clutch retaining capscrew and washer. Remove drive belt.

8.11.5.2
Fabricate a spanner tool to hold clutch, Fig. 55(1). Install a 5/8"NC capscrew(2) into hub of clutch pulley to force clutch from shaft.

8.11.5.3
Install compressor clutch on shaft. Install clutch retaining capscrew and washer. Torque capscrew to 27-33Nm(20-25 lbs.ft.).

8.11.5.4
Install and adjust drive belt(4.3.4).

TOPIC 9 CAB ASSEMBLY REFERENCE ILLUSTRATIONS

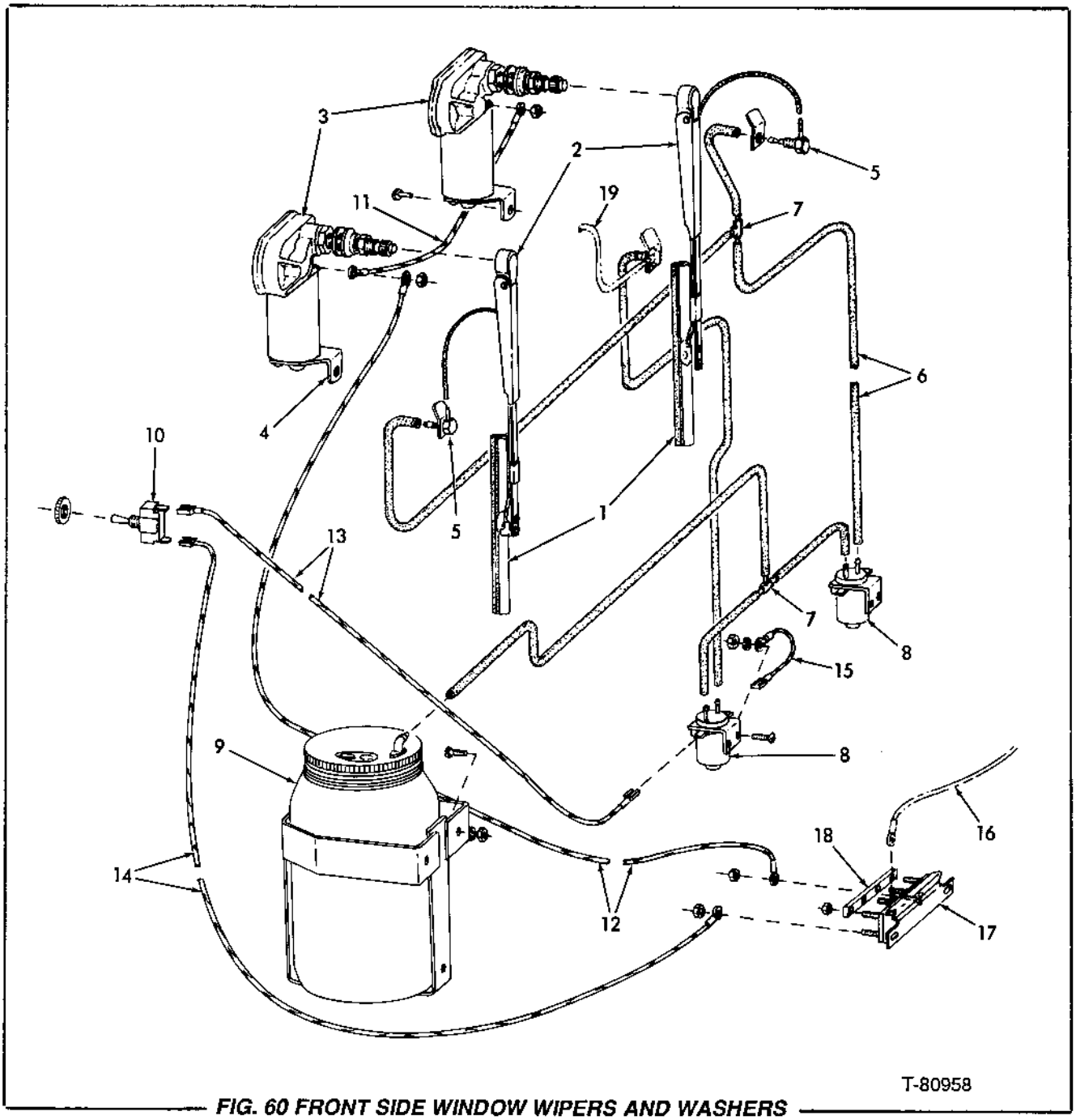


FIG. 60 FRONT SIDE WINDOW WIPERS AND WASHERS

1. *Blade*
2. *Arm*
3. *Motor*
4. *Bracket*
5. *Connection*
6. *Hose*
7. *Tee*
8. *Washer pump*
9. *Reservoir*
10. *Washer switch*
11. *Wire*
12. *Wire*
13. *Wire*
14. *Wire*
15. *Wire*
16. *Wire*
17. *Circuit breaker assembly*
18. *Plate*
19. *Windshield washer hose*

NOTES

TABLE OF CONTENTS

2.1 INTRODUCTION TO HYDRAULICS

The fundamental principle upon which all hydraulic systems are based is known as Pascal's Law, which may be stated as follows: Pressure applied to any part of a confined liquid is transmitted undiminished in all directions, and acts with equal force on all equal areas of the surfaces confining the liquid and at right angles to them. This principle, as applied to a hydraulic cylinder, causes a multiplication of hydraulic pressure times area to exert tremendous force. Oil under pressure is forced into one end of the cylinder and operates against a piston as shown in Fig. 2-1. If oil is introduced at a pressure of 69 bar (1000 psi) this same pressure is transmitted to each square cm(in.) area of the piston. If piston area is equal to 182.38 cm^2 (28.27 sq. in), there is a total force of 12,821 kg. (28,270 lbs), being applied to the piston. The piston in turn transmits this force to its attached implement.

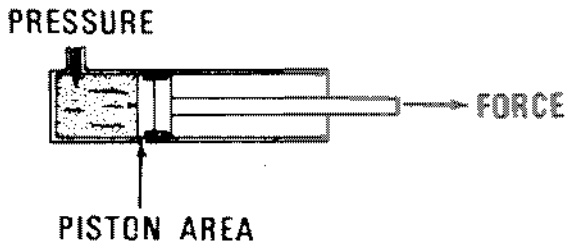
2.2 DESCRIPTION OF HYDRAULIC SYSTEM

2.2.1 GENERAL

This manual covers the function and service procedures pretaining to the repair of the FD40 and FD50 dozer and ripper hydraulics. Similar in function, the main hydraulic differences lie in the various pump locations, their output capacity, the size of hydraulic cylinders, pressure requirements, tank sizes and locations.

Figs. 2-2, 2-3. The basic system includes three pumps, two main relief valve sections, three(or four) implement control valve sections, double-acting hydraulic cylinders, overload relief valves and a hydraulic tank.

The main (dual) hydraulic pumps are mounted in tandem(one behind the other) to supply the force to operate the double-acting dozer and ripper cylinders. These pumps are mounted on, and driven from, the torque converter auxilliary drive. An additional power assist pump, either mounted tandem on the main pumps, or tandem on the transmission pump, provides power to assist control valve lever movement.



T-35095

FIG.2-1 SINGLE ACTING HYDRAULIC CYLINDER

To limit main pressure two relief valves are employed. One of the main relief valves is used in the tilt circuit and the other is used in the ripper circuit; one or both are utilized in the dozer circuit. Direction of the fluid is accomplished by two or more control valve sections. Movement of the control valve spools is hydraulically assisted to reduce the manual effort required by the operator. The double-acting cylinders allow force to be applied to either end of a cylinder, while the overload relief valves prevent excessive circuit pressures while the control valve is in the hold position.

2.2.9.6 When the control lever is placed in the"dozer float"position,Fig.2-7, master spool(5) is held in position by detent balls(9). Since the master spool is stationary, the ports in the spool and piston will align as shown in the "dozer float" illustration.

2.2.10 HYDRAULIC CYLINDERS

The function of hydraulic cylinders is to convert hydraulic power into mechanical power;however,additional functions of protection and speed are performed by the limit travel valves and quick-drop valves within the dozer cylinders.

2.2.11 LIMIT TRAVEL VALVES

The limit travel valves protect the dozer components from damage when the moldboard is fully raised or fully lowered while tilted, Fig.2-8.

As the moldboard reaches its full height, one piston will reach the end of its travel. Then the valve pins in that piston push the valve open allowing the pressurized oil to flow through the piston and return to the tank - this stops the moldboard movement.Without limit travel valves, the pressure behind the opposite piston (piston not bottomed) would tend to twist the dozer components.

LEGEND FOR FIG.2-13

1. Main hydraulic pump
2. Power assist pump
3. Upper main relief valve
4. Power assist relief valve
5. Overload relief valve
6. Oil return to tank
7. Ripper pin puller control section
8. Ripper lift control section
9. Dozer control section
10. Moldboard tilt control section
11. Lower main relief valve
12. Check valve

2.3.4 DOZER-POWER DOWN POSITION

Fig.2-13. While the dozer control lever is moving to the "lower" position, a portion of the oil from power assist pump(2) is used within the dozer power assist valve. When movement of the control lever stops, the power assist valve becomes stationary and all power assist oil flows through relief valve(4) to the tank.

Pump oil from both sets of pump gears of main hydraulic pump(1) flows past main relief valves(3 and 11), around the ripper and tilt control spools and into dozer control spool(9). Pushing check valve(12) off its seat, the oil flows to the cylinders and forces the piston rod in. Oil from the opposite end of the cylinders flows through the control spool and back to the tank.

If the piston rods cannot move due to an excessive load on the moldboard, the flow of work oil is restricted and pressure builds until it reaches the main relief valve opening pressure, causing one or both valves to open and relieve the pressure.

The purpose of check valve(12) in the "lower" end of dozer control spool(9) is to prevent a momentary reverse flow of oil when changing spool position. If this valve fails, the moldboard (if meeting resistance) will rise slightly before going down.

LEGEND FOR FIG.2-18

1. Main hydraulic pump
2. Power assist pump
3. Upper main relief valve
4. Power assist relief valve
5. Overload relief valve
6. Oil return to tank
7. Ripper pin puller control section
8. Ripper lift control section
9. Dozer control section
10. Moldboard tilt control section
11. Lower main relief valve
12. Check valve

2.3.9 RIPPER EXTRACT PIN

Fig.2-18. While the ripper pin puller control lever is moving to the "extract" position, a portion of the oil from power assist pump(2) is used within the ripper pin puller power assist valve. When movement of the control lever stops,the power assist valve becomes stationary and all power assist oil flows through relief valve (4) to the tank.

Pump oil from rear set of gears of main hydraulic pump(1)circulates and returns to the tank. Oil from the front set of gears flows past main relief valve(3) and into ripper pin puller control spool (7). Pushing check valve (12) off its seat, the oil flows to the ripper pin puller cylinder and forces the piston rod in extracting the ripper pin.

If the piston rods reaches the end of its travel, or the pin will not extract, pressure builds in the work circuit until the main relief valve opening pressure is reached and the valve opens. If overload relief valve (5) jams in the open position or is adjusted incorrectly(set lower than the main relief valve),pin puller force and reaction time will be lowered.

The purpose of check valve(12) in the control spool is to prevent a momentary reverse flow of oil when changing spool positions. If the valve on the pressure side fails, the pin puller may hesitate before reacting to the command.

DIAGNOSIS:

1. Since ripper operation is normal, anything that affects overall system operation can be disregarded.

2. Refer to Figs. 2-12 through 2-15. Compare these drawings and eliminate the hydraulic components that would be the least suspect. Overload relief valves in the tilt circuit can be disregarded because they are not used in the dozer circuit. Control valves would not be suspected since it would require two different items to fail and cause the same problems in two circuits. The cylinders fall into the same catagory as the control valves. However, if the problem is a result of overheated hydraulic oil it is possible that the piston rings in both the tilt and dozer cylinders have deteriorated at the same rate. The items that are the most suspect would be those that are common to both the dozer and tilt circuits and are not used in the ripper circuit. These items are; (a) the rear section of the main hydraulic pump and (b) the lower (left on model FD50) main relief valve.

   a. Anytime the hydraulic pump is suspected, it should be given a lower priority as pump failure is relatively uncommon.
   b. The most logical choice would be to suspect that the main relief valve has failed in some manner or is out of adjustment.

SOLUTION:

Use a flow meter or pressure gauge and make the necessary checks to the tilt or dozer circuit to verify the diagnosis, see paragraphs 3.6.3, 3.6.5, 3.7.2 or 3.7.3.

⚠ WARNING - Before moving machine or attachments be sure exposed people in the area are clear of the machine. Walk completely around machine before mounting. Sound horn.

⚠ WARNING - Never attempt to operate machine or attachment except when seated in the operator's seat. Keep head, body, limbs, hands and feet inside the operator's compartment to reduce exposure to hazards outside the operator's compartment.

⚠ WARNING - Warn all people who may be servicing or working around machine before starting engine.

⚠ DANGER - Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

⚠ WARNING - Keep people clear of attachments and tools while in raised position, to prevent possible injury.

⚠ WARNING - Observe all start up and shut down procedures and WARNINGS listed in the Operation and Maintenance Instruction Manual.

3.5 SYSTEM TESTS

3.5.1 INTRODUCTION

The following paragraphs are checks of various items that will cause system related problems.

3.5.2 CHECKING ENGINE POWER UNDER LOAD

This check will determine if the engine under load, will turn the hydraulic pump fast enough to supply specified flow.

NOTE: Hydraulic pump volume and efficiency rise as engine rpm rises. Therefore, if implement action is slow or seems to lack power, the engine may be at fault.

Check the torque converter/transmission oil. Oil level must be within Operating Range on gauge rod.

Refer to Fig.6-4. Remove acorn nut(4) and loosen jam nut(7) on the upper main relief valve. Back the adjusting screw out to flush away any dirt that may have collected at the valve. With the dozer control lever in the"lower" position, turn the adjusting screw in until the correct pressure reading is obtained.

If correct pressure readings cannot be obtained by adjustment of the valve, screens (22 and 23) may be clogged or the valve may have failed. Refer to paragraph 6.2,for the repair procedure. If inspection of the valve show it to be in satisfactory condition, the hydraulic pump has failed. See Topic 5, paragraph 5.3.

3.7.3.5 Shut off the engine and relieve hydraulic pressure. Remove the flow block plates and disconnect the pressure gauge.

3.7.3.6 Start the engine and apply down pressure on the moldboard until the idlers are raised off the ground. Place the dozer control lever to "HOLD" and shut off the engine. If the tractor drifts down at a rate exceeding 45.7mm (1.8") per minute (measure at a dozer cylinder piston rod) one or both cylinders are at fault, see paragraph 7.1.

3.7.4 PRESSURE TESTING THE RIPPER LIFT & PIN PULLER CIRCUITS

3.7.4.1 Relieve hydraulic pressure and gain access to the main hydraulic pump and to the control valve assembly. Refer to Fig.3-1 or 3-2 and adapt the pressure gauge to hydraulic check point (2). This fitting is located on the pressure tube of the front (large) section of the main hydraulic pump.

3.7.4.2 Start the engine and set engine speed to about 1/2 throttle. Slowly engage the ripper control lever and note the pressure gauge reading after the ripper lift cylinder piston rods reach the end of their stroke.

Operate the ripper in the opposite direction and again note the pressure gauge reading after the lift cylinder piston rods reach the end of their stroke. Both pressure readings must be between:

FD40 - 134-141 bar (1950-2050 psi)
FD50 - 155-162 bar (2250-2350 psi)

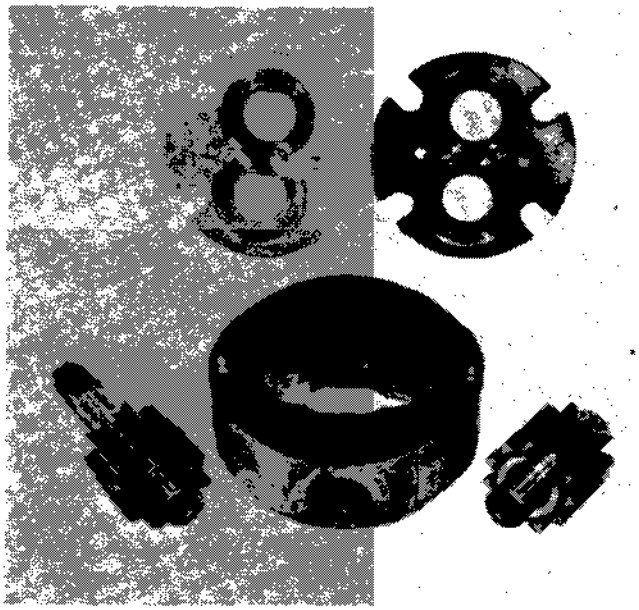
If only one pressure reading is low, the overload relief valve associated with that ripper position may have failed or needs adjustment. Refer to paragraph 3.8 for the adjustment procedure.

If both pressure readings are too low (or both are too high) adjust the main relief valve as follows:

3.7.4.3 Refer to Fig.6-4. Remove acorn nut(4) and loosen jam nut(7) on the upper main relief valve. Back the adjusting screw out to flush away any dirt that may have collected at the valve. With the ripper control in the "lower" position, turn the adjusting screw in until the correct pressure reading is obtained. Repeat paragraph 3.7.4.2 and recheck for correct pressure readings in both positions of the ripper control. Tighten the jam nut and replace the acorn nut on the relief valve.

If correct pressure readings cannot be obtained by adjustment of the valve, screens (22 and 23) may be clogged or the valve may have failed. Refer to Topic 6, paragraph 6.2 for the repair procedure. If inspection of the valve shows it to be in satisfactory condition, the ripper lift cylinder(s) or hydraulic pump may have failed.

3.7.4.4 To further isolate the fault, shut off the engine and relieve hydraulic pressure.Block off the "raise" line of each (both) cylinders with a flow block plate.



T-82415
FIG.5-9 IMPROPER INSTALLATION PROCEDURE

Fig.5-9. This pump failed during the first half-hour of operation. The fear housing cracked due to extreme high pressure. When installing a rebuilt pump, always follow the recommended break-in procedure and then check the pressure setting of the systems main relief valve.

5.3 PUMP REMOVAL, INSTALLATION AND BREAK-IN

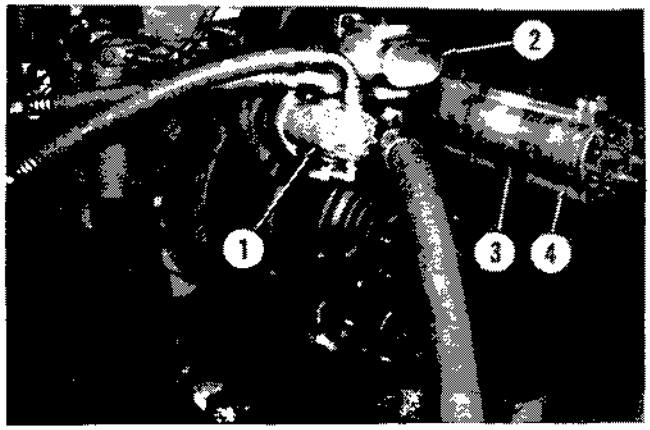
Fig.5-10,5-11. The hydraulic pump is located at the upper right rear of the torque converter. It is bolted to the gear housing and driven by the gear train. Rotation of the FD40 pump is clockwise(FD50 counterclockwise)viewed from the front. The pump is accessible when the right front floor plate is removed.

⚠ DANGER - Fluid under pressure. Always lower hydraulic equipmennt to ground. Shut off engine, move controls levers to each position several times and loosen and retighten hydraulic tank filler cap to relieve trapped pressure before loosening hydraulic connections.

Relieve hydraulic pressure and drain all the oil from the hydraulic tank.

Remove the right front floor plate and clean around the inlet and outlets. Disconnect the inlet and outlet piping from main pump and power assist pump (3rd section on FD40 - separately mounted on FD50). Remove the assembly as a unit. Cover all openings to prevent dirt from entering the system.

Remove the two capscrews and the two stud nuts that attach the pump to the gear housing. Slide the pump to the rear and remove from the tractor.



T-83776
FIG.5-10 FD40 HYDRAULIC PUMP LOCATIONS

1. Steering pump
2. Transmission pump
3. Implement pump
4. Power asist pump (3rd section)

5.3.2 PUMP INSTALLATION

Make certain that the splines of the driving gear in the torque converter are not damaged. Grease the pump shaft splines, align shaft with the driving gear splines, and slide the pump forward until it seats against the torque converter housing. Install the capscrews, lockwashers and nuts but do not tighten at this time.

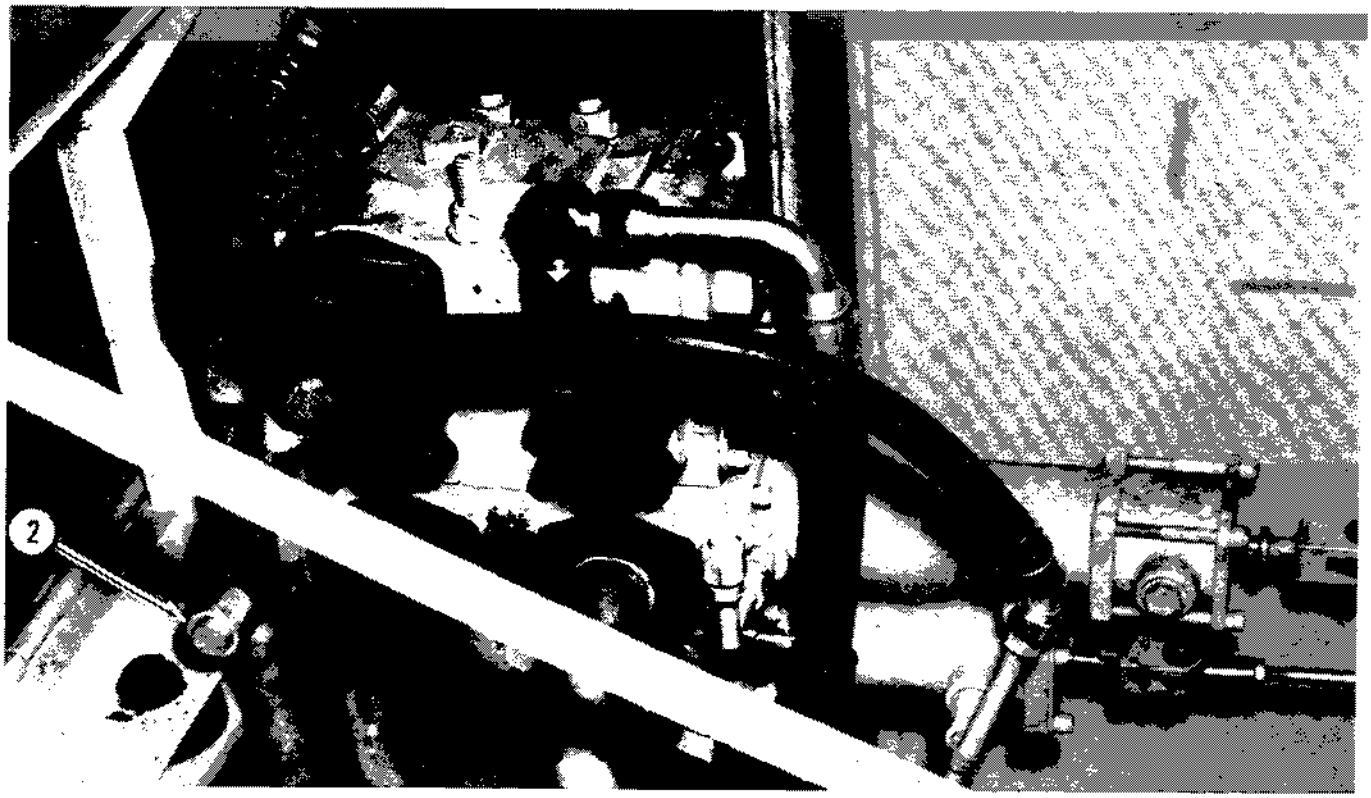


FIG.6-1 FD40 CONTROL VALVE ASSEMBLY T-82133

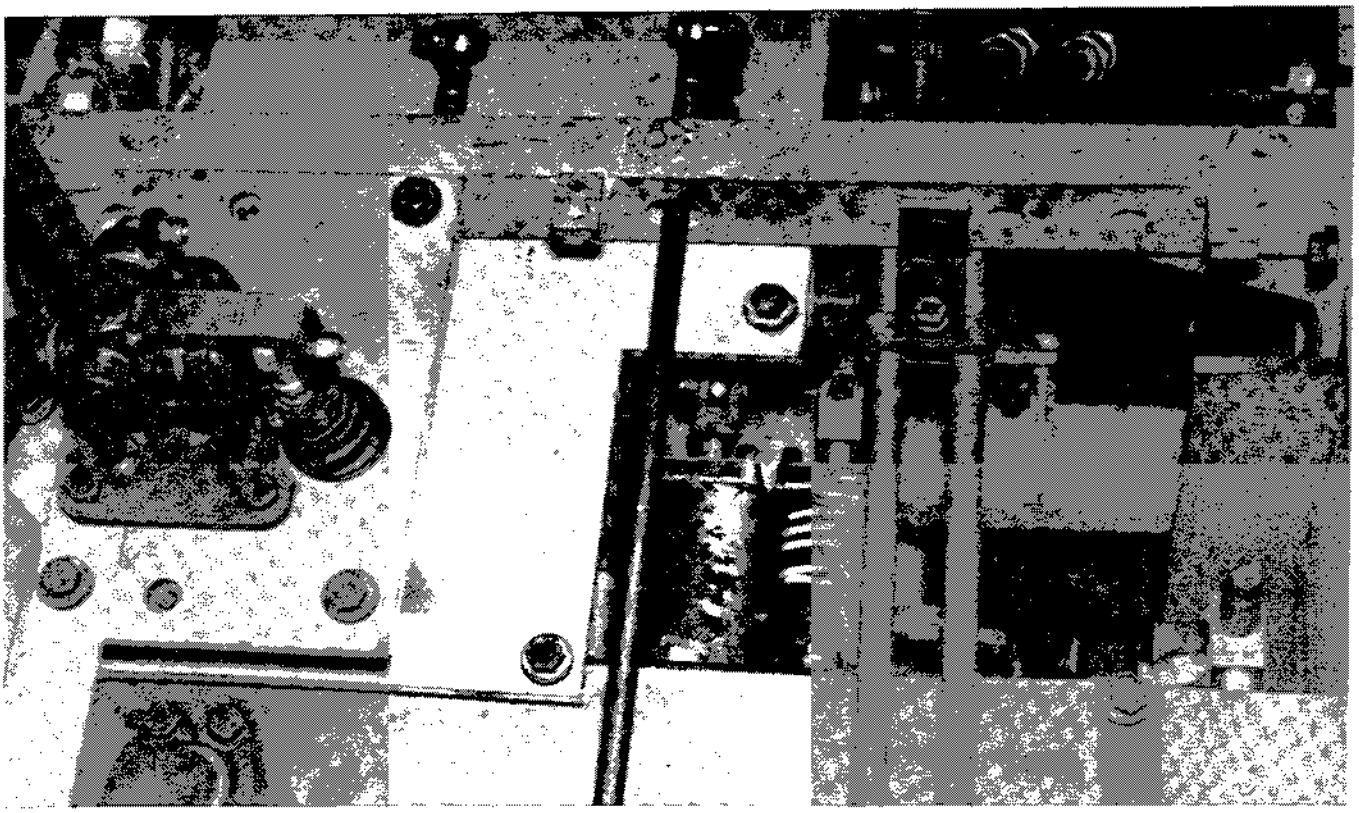


FIG.6-2 FD50 CONTROL VALVE ASSEMBLY T-82099

Insert back-up ring(15) and o-ring(16) into the groove on the inside of the cartridge. Insert poppet(19) and spring (20)into the cartridge.Position cap(21) over the end of the cartridge. The cap may appear to be too loose, but tolerances after installation will not permit it to come free.

6.4.3.4 At the other end of the cartridge, insert seat(12) spring(11) and washers(9,10). Install o-ring(8) over the threads of cap(7) and screw the cap into the cartridge. Tighten the cap securely. Install the relief valve assembly into either position in the control valve housing and tighten it securely. Assembly of the other overload relief valve is the same.

6.4.3.5 Install o-ring(2) back-up ring (3) plate(4) and end cap(5) to the end of control valve housing(1) using four capscrews and lockwashers.

6.4.3.6 Clamp valve spool(27) in a soft jawed vise.DO NOT mar the finish and DO NOT hold the spool by inserting a tool into the holes. Place check valve(26) and spring(25) into the proper end of the spool, see paragraph 6.4.2.9. Place back-up ring(23) and o-ring(24) over the threaded end of bolt(22). Apply a light coat of #75000776(Loctite 262) to the threads on the bolt.Insert the bolt into the end of the spool and tighten securely.

6.4.3.7 Place check valve(26)and spring (25) into the other end of valve spool (27). Place back-up ring(23) and o-ring (24) over the threaded end of spool lug (31). Apply a light coat of #75000776 (Loctite 262) to the threads on the spool lug.Insert spool lug into the end of valve spool and tighten securely.

6.4.3.8 Insert valve spool(27)into control valve housing(1)with the spool lug protruding from open end of housing.The valve spool may have to be turned as it is inserted into the housing due to the close tolerances.

Insert o-ring(2) and pilot sleeve(30) into the open end of the control valve housing.

6.4.3.9 Assemble piston(32) and spool (37) using pin(33).Place o-ring(34)into the groove on the piston. Place the piston and spool assembly into power assist housing(28). With a soft hammer lightly tap on the piston lug until the piston o-ring is just seated into the housing.

6.4.3.10 Insert o-ring(29) into the groove in the end of the power assist housing. Place the piston lug into the slot in the end of spool lug(31). With the soft hammer, lightly tap on the other end of the power assist housing until it seats against control valve housing. Secure power assist housing to the control valve housing using four capscrews and lockwashers.

6.4.3.11 Insert centering spring assembly(36) into the power assist housing. Check to see that the centering spring washer is up against snap ring(35A). If not, hold the shaft of spool(37) while tapping lightly on the end of the power assist housing. Secure the centering spring assembly by installing snap ring (35) into the groove in front of the centering spring washer.

6.4.3.12 Insert o-ring(38) into groove in back cap(39)and seat back cap into the cut-out in power assist housing (28).Insert o-ring(40) back-up ring(41) and seal(42) into the cut-outs in the back cap and place retainer plate(43) into position. Secure retainer plate to the power assist housing using four capscrews and lockwashers.

6.4.3.13 Lightly coat the threads on the end of the shaft with #75000776 (Loctite 262) and install yoke(44).

7.1.7.11 Fig.7-10.Insert cylinder packing guide(1) into cylinder tube(3);this prevents damaging the Teflon ring on the piston when the assembly is inserted into the threaded cylinder tube.

Lubricate the piston and insert the piston rod assembly into the cylinder tube. The assembly must be installed straight.

NOTE: If cylinder is still mounted on the tractor,one of the hydraulic lines on the upper portion of the cylinder may have to be loosened to relieve the air compressed in the cylinder as the piston is inserted.

7.1.7.12 Remove cylinder packing guide and packing plug. Lubricate the threads on the cylinder head.Screw the cylinder head into the cylinder tube and torque head to 1898-2034 Nm(1400-1500 lbs.ft).

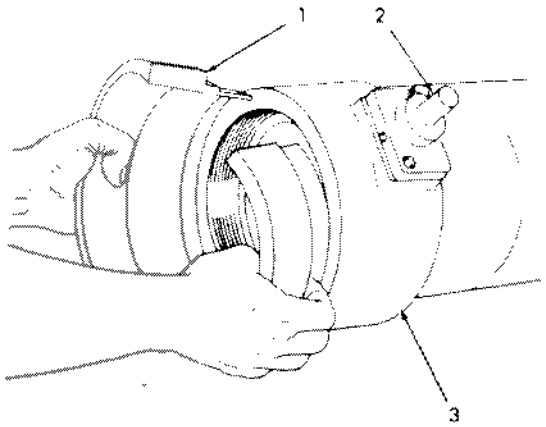


FIG.7-10 INSTALLING CYLINDER PACKING GUIDE T-75737

*1.Cylinder packing guide
*2.Packing plug
3.Cylinder tube
*see service tools

Using cylinder head socket with the tools shown in Fig.7-3,the input torque required to tighten the head assembly within specifications is (specified torque divided by 16): 119 - 127 Nm (88 - 94 lbs.ft).

7.1.7.13 Tighten the capscrews in the end plate to 54 Nm (40 lbs.ft).

7.1.7.14 If dozer cylinder is to be reinstalled on the tractor, refer to the installation in paragraph 7.1.3, and check the piston rod packing adjustment as per paragraph 7.1.4.

7.1.8 DOZER CYLINDER PISTON ROD PACKING & PISTON PACKING INSTALLATION
(FD40 eff s/n 89A03021)

7.1.8.1 Fig.7-4. Install buffer ring (41) into inner groove, and oil seal (42) into next groove of cylinder head. NOTE: Be sure open lips of oil seal face toward cylinder. Next, press a new wiper dust seal into head (open lips of seal facing out). Lubricate seals and ring with light grease.

7.1.8.2 Fig.7-5. Install pilot sleeve (1) on the piston rod. This sleeve protects the wiper and rod packing from damage when cylinder head is being installed on piston rod. Lightly coat the end of piston rod with grease and carefully install cylinder head assembly on the piston rod as shown in Fig.7-6. Use care to prevent damaging the wiper seal and the packing on the shoulder of the piston rod. Remove pilot sleeve.

7.1.8.3 Fig.5. Install back-up ring(30) and o-ring(29) on cylinder head.

7.1.8.4 Fig.7-4. Lubricate the piston (23) wear ring(38) back-up ring(39) and piston seal(40) freely with oil, and install on piston as shown (seal and rings will not have a tight fit - seal (40) gets larger as oil pressure increases.

7.1.8.5 Refer to Fig.7-4 for assembly of the limit travel valve guides and plungers. Install an o-ring(25) on each of the four limit travel guides(24). Lubricate each guide and o-ring.

7.3.7.6 Install spacer(4) the piston assembly, and a second spacer(4) on the piston rod. Lubricate the threads on the end of the piston rod, and install locknut(3).

7.3.7.7 Fig.7-3. Install rod assembly into torquing fixture. Tighten locknut (3)to a torque of 5423-5965 Nm (4000 - 4400 lbs.ft).

7.3.7.8 Using tools shown in Fig.7-3, the input torque(read on torque wrench) required to tighten locknut(3)to within specifications is(torque divided by 16) 339-373 Nm (250-275 lbs.ft).

7.3.7.9 Lubricate piston and insert piston rod assembly into cylinder tube. Assembly must be installed straight.

7.3.7.10 Lubricate the threads of the cylinder head capscrews and install the capscrews and lockwashers. Tighten capscrews evenly to a torque of 406-542 Nm (300-400 lbs.ft).

7.3.7.11 Tighten capscrews in end plate to a torque of 108-122Nm(80-90 lbs.ft).

7.3.7.12 Install cylinder on tractor per instructions in paragraph 7.3.3,and check the piston rod packing adjustment per instructions in paragraph 7.3.4.

7.4 RIPPER PITCH CYLINDERS

7.4.1 GENERAL DESCRIPTION

Ripper pitch cylinders are double acting. The piston packing consists of a teflon seal ring with a rubber inner ring. The piston also has a wear ring. The piston rod packing is multi-lip, spring loaded and shim adjusted.

7.4.2 RIPPER PITCH CYLINDER REMOVAL

⚠ WARNING - Before moving machine or attachments be sure exposed people in the area are clear of the machine. Walk completely around machine before mounting. Sound horn.

⚠ WARNING - Never attempt to operate machine or attachment except when seated in the operator's seat. Keep head, body, limbs, hands and feet inside the operator's compartment to reduce exposure to hazards outside the operator's compartment.

⚠ WARNING - Warn all people who may be servicing or working around machine before starting engine.

⚠ DANGER - Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

⚠ WARNING - Keep people clear of attachments and tools while in raised position, to prevent possible injury.

⚠ WARNING - Observe all start up and shut down procedures and WARNINGS listed in the Operation and Maintenance Instruction Manual.

⚠ WARNING - Do not work under or near unblocked or unsupported linkage, parts or machine.

⚠ WARNING - When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step plateform that meets local or national requirements to reach service point.Perform all service or maintenance carefully.

⚠ DANGER - Fluid under pressure. Always lower hydraulic equipment to ground, Shut off engine, move control levers to each position several times and loosen and retighten hydraulic tank filler cap to relieve trapped pressure before loosening hydraulic connections.

Position cylinder with the hoist so ball is in place,and collar,Fig.8-1 (22) may be secured to the moldboard. Lubricate and install collar capscrews and torque to 2440 - 2980 Nm (1800-2200 lbs.ft).

NOTE: Ball and socket should be a 0.02-0.76 mm (0.001-0.030") loose fit on the ball. Add or remove shims(20) as required.

3.Start engine and move dozer tilt control until tilt cylinder piston rod is at approximately mid-stroke. Shut off engine and adjust left tilt brace (17) until moldboard is level with the tractor. Lock the tilt brace by placing the adjusting bar in the lock provided on the back of moldboard.

NOTE: For normal dozing conditions, recommended position of moldboard is back of board perpendicular to ground (cutting edge at angle of 52° to ground). After adjusting, lock tilt brace by inserting adjusting bar into lock located on rear of moldboard.

DIAGONAL BRACES

1.Attach both diagonal braces,Fig.8-1, to moldboard. Ball and socket fit, and collar capscrew torque, of each is the same as that required for the tilt cylinder in paragraph 2 above.

IMPORTANT: Recheck all the ball fits after first 50 hours of operations.

2.Using an adjusting bar, center dozer with tractor by adjusting length of each diagonal brace until the left and right push beams are at an equal distance from the track frame. Once the push beams are aligned, lengthen each diagonal brace equally until all looseness is removed and moldboard is tight. Lock each brace by installing flex pin(17).

NOTE: Lubricate dozer linkage, raise moldboard and tilt several times to purge air from cylinder. Check oil level in reservoir.

8.3 HC (HYD. CUSHION) DOZER REMOVAL

NOTE: Moldbaord and pusher frame may be removed as a unit if desired.

MOLDBOARD

1.Lower moldboard to ground and shut off engine. Attach a suitable hoist to top of moldboard. The approximate weight of moldboard is 2722 kgm (6000 lbs).

2.Fig.8-5 or 8-6. Securely block up the front of the pusher frame to minimize tension at frame-to-moldboard pins(3) and bracket-to-moldboard pins(14).

Remove pins(3,14) and move moldboard away from the pusher frame.

PUSHER FRAME

1.Securely blockup rear of pusher frame (1)(both sides) to minimize tension at the trunnions. Approximate weight of the pusher frame is 2359-2540 kg (5200-5600 lbs).

2.Disconnect frame from trunnions by removing lockplates, capscrews and pivot caps, Fig.8-5(8) or Fig.8-6 (10).

NOTE: Individual shim packs will be found between both end of pivot caps and the pivot socket on rear of the frame. Wire each shim pack together and attach to cap to prevent loss.

3.Relieve hydraulic pressure and, disconnect both piston rods from pusher frame by removing pins(4).Secure the cylinders by connecting the shipping bracket to each cylinder.

4.Start engine and move dozer control lever to "raise" position to force piston rods into cylinder. Back tractor away from pusher frame and shut off engine. Tie piston rods to dozer lift cylinders in retracted position. Remove pins(5) from holes through rear of pusher frame.

ELECTRICAL SYSTEMS

service manual

FORM 73146366 English

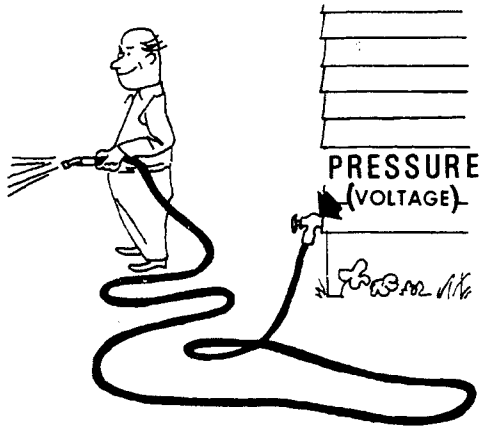
(Replaces 70695436, 73063024, 70696657)

TOPIC 2 TROUBLESHOOTING

2.1 TROUBLESHOOTING INSTRUMENTS

2.1.1
Introduction–Many different tools and instruments have been developed for checking the mechanical or electrical condition of the components of an electrical system. This specialized equipment enables quick and accurate checks in a minimum amount of time. Three basic instruments are used in the testing of electrical equipment. These instruments are the voltmeter, the ammeter, and the ohmmeter.

2.1.2
The Voltmeter–Voltage in an electrical circuit is frequently compared to water pressure in a piping system (Figure 1). The voltmeter is used to measure this electrical pressure to assist in the location of electrical malfunctions. For the applications associated with electrical systems described in this manual, greater accuracy is desired in the voltmeter than in any of the other electrical checking instruments because the most accurate settings have to be made to the voltages in these systems.

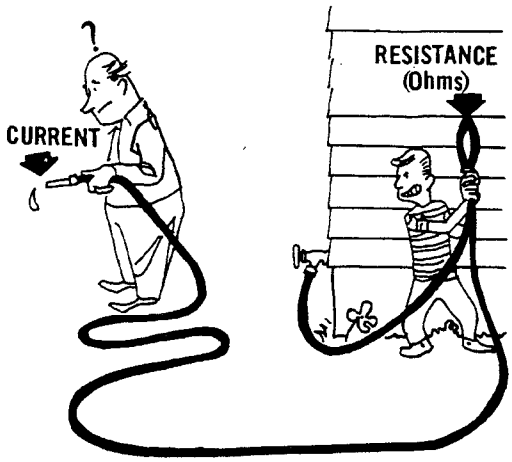


T-74522

FIG. 1 VOLTAGE IS SIMILAR TO PRESSURE IN A WATER HOSE

Voltmeters measure the difference in electrical pressure between the points where the voltmeter leads are attached. For example, a voltmeter connected across the terminal posts of a battery measures the difference in electrical pressure–the battery voltage–between the two terminals. A voltmeter connected across a resistor (in parallel, with one lead connected to each side of the resistor) measures the difference in voltage caused by the resistor. Typically, the voltage at a given point in a circuit is measured with respect to the voltage at some reference point, usually the return side of the circuit at the battery. It is often the case that one side of the battery is connected (grounded) to the conducting metal frame and chassis of the unit. In such cases, the chassis is used instead of many separate wires to the battery terminal. In general, the grounded battery terminal should be used as the reference point for the voltages in a circuit.

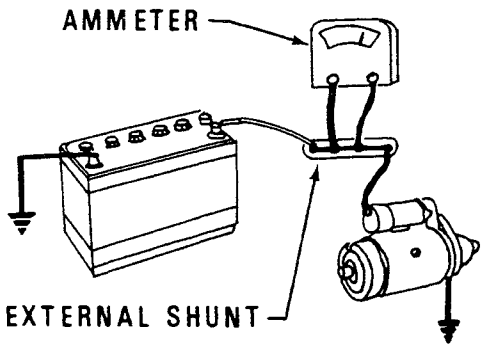
2.1.3
The Ammeter–The current past a point in an electrical circuit can be compared to the quantity of water that can flow through a particular pipe in a water system. The amount of current (measured in amperes) that will flow depends on the voltage (like pressure) available to push the current and on the amount of resistance encountered in the electrical circuit to impede it. (See Figure 2.)



T-74524

FIG. 2 AMPS AND OHMS ARE SIMILAR TO CURRENT AND RESISTANCE IN A WATER HOSE

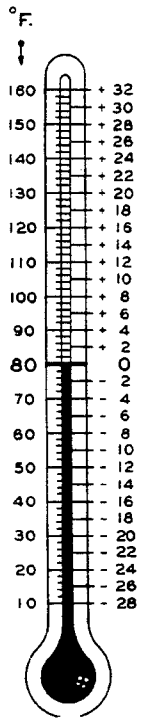
The ammeter is used to measure the flow of current. Since the current flows through the circuit, an ammeter must be connected in series with the circuit being measured. However, most ammeters cannot use all the current in the circuit in indicating a measurement, so a large, accurately measured fraction of the current is often diverted through an external path or shunt (shown in Figure 3) across the



T-74523

FIG. 3 EXTERNAL SHUNT

MEMO



EXAMPLE No. 1 —
Temperature *below* 80°F.
Hydrometer Reading 1.250
Acid Temperature 20°F.
***Subtract* .024 Sp. Gr.**
Corrected Sp. Gr. is 1.226

EXAMPLE No. 2 —
Temperature *above* 80°F.
Hydrometer Reading 1.235
Acid Temperature 100°F.
***Add* .008 Sp. Gr.**
Corrected Sp. Gr. is 1.243

(T-74527)

FIG. 22 CORRECTION FOR HYDROMETER

CAUTION

The battery electrolyte is a corrosive, acid solution. Avoid any contact of the electrolyte with skin, eyes, or clothing. If spills occur, they should be washed immediately with large amounts of water and, if possible, soap.

7.3 MAINTENANCE

7.3.1
Basic Servicing—A battery is a perishable item requiring periodic service. When a battery is properly maintained, the reward will be long and trouble-free operation. Regular maintenance should include the following steps:

1. Check the electrolyte level. Add clean water (distilled, if available) to maintain the prescribed level, but do not overfill the battery cells and cause a loss of electrolyte from spillage. Excessive use of water indicates overcharging or possible leakage.

2. Keep the top of the battery clean. When necessary, wash corrosion off the terminals with a baking soda solution, and rinse them with clear water. Use a steel brush or steel wool, if necessary, to be sure that the terminals are really clean. Coat the connections and the terminals with a very light layer of grease to retard additional corrosion.

3. Inspect the cables, clamps, and hold-down brackets. Clean them, and replace them as necessary.

7.3.2
Temperature Considerations—The electrolyte of a battery, in various states of charge, will start to freeze at the temperatures indicated below. The given temperatures indicate the approximate temperatures at which ice crystals first begin to form in the electrolyte. The electrolyte will not freeze solidly until a slightly lower temperature is reached, but solid freezing of the electrolyte may crack the battery container or damage the plates.

Specific Gravity (Corrected to 80°F (27°C)	Freezing Temperature
1.280	-90°F (-69°C)
1.250	-62°F (-55°C)
1.200	-16°F (-27°C)
1.150	+ 5°F (-15°C)
1.100	+19°F (- 7°C)

A battery charged three-fourths or more is in no danger of freezing, so batteries shoulc be kept at least three-fourths charged in winter weather.

7.3.3
Storage—If the equipment is not going to be used for more than one month, the battery should be removed and stored in a cool, dry place. During extended storage, it should be checked periodically and recharged as necessary. A battery left unused for a long period of time is subject to the crystallization of lead sulfate on the plates; this deterioration will adversely affect future performance.

7.3.4
Testing on the Unit—The electrolyte level should be checked and corrected, and the battery should be visually inspected. Signs of damage or serious abuse, like excessive corrosion, a cracked or bulging case, or cracked cell covers, will mean that the battery has to be replaced. A hydrometer test also can be performed.

The voltage of each cell of the battery may be checked with a voltmeter to be sure that each cell is properly charged. It is possible that a single cell of the battery has gone bad and has become incapable of holding a charge. This will be evident either through a low battery voltage, or a low individual cell voltage. Figure 18 illustrates the use of a special voltmeter to check the battery. Any voltmeter can be used, and the voltmeter should indicate between 1.7 and 1.8 volts per cell for battery temperatures between 70°F and 90°F (21°C and 33°C). If any cell indicates a low voltage and the situation cannot be remedied by charging (as described in Section 7.3.6), the battery will have to be replaced.

It is possible for a faulty battery to indicate sufficiently high cell voltages on a voltmeter, but still not perform satisfactorily on the unit. This is because the voltmeter

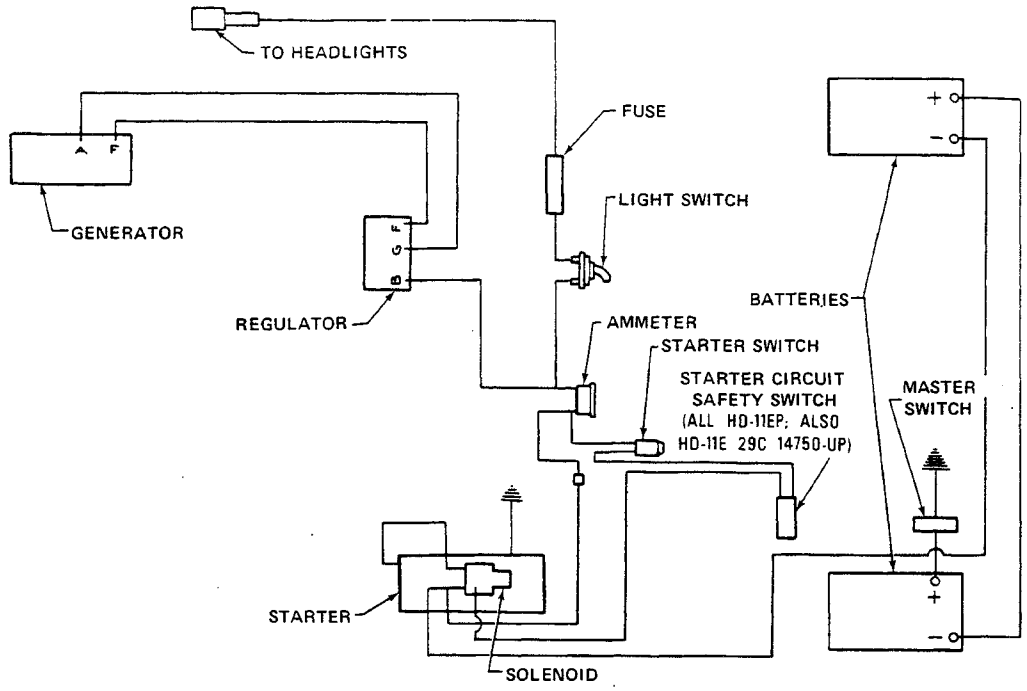


FIG. 27 HD-11 CRAWLER TRACTOR, HD11G CRAWLER LOADER (S/N 6427-up; 17L14651 through 17L16000; 29C14651 through 29C16000; 46Y14651 through 46Y16000)

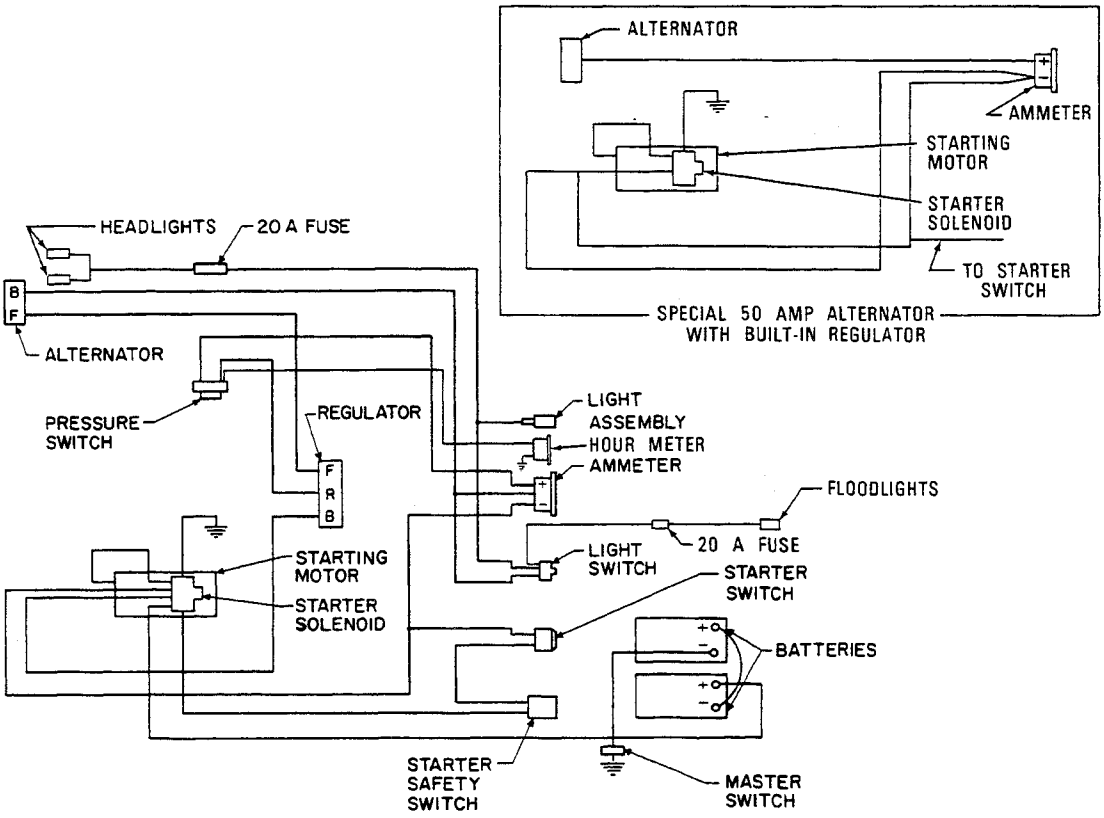
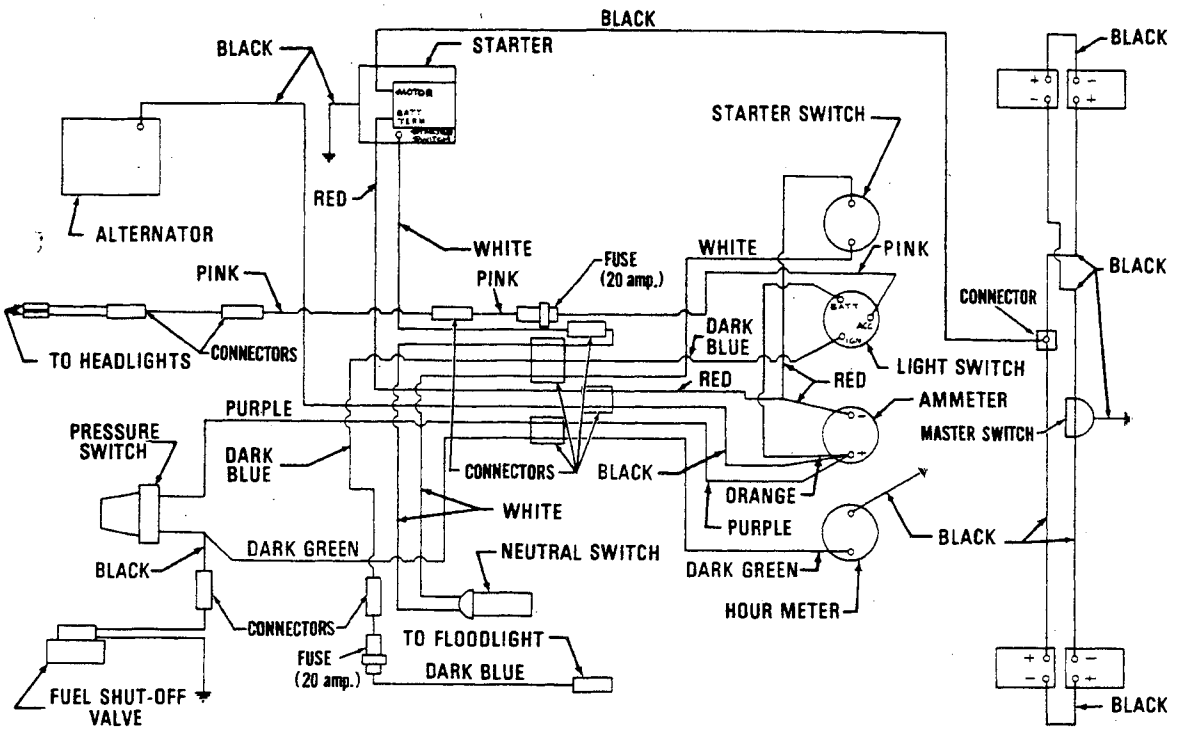
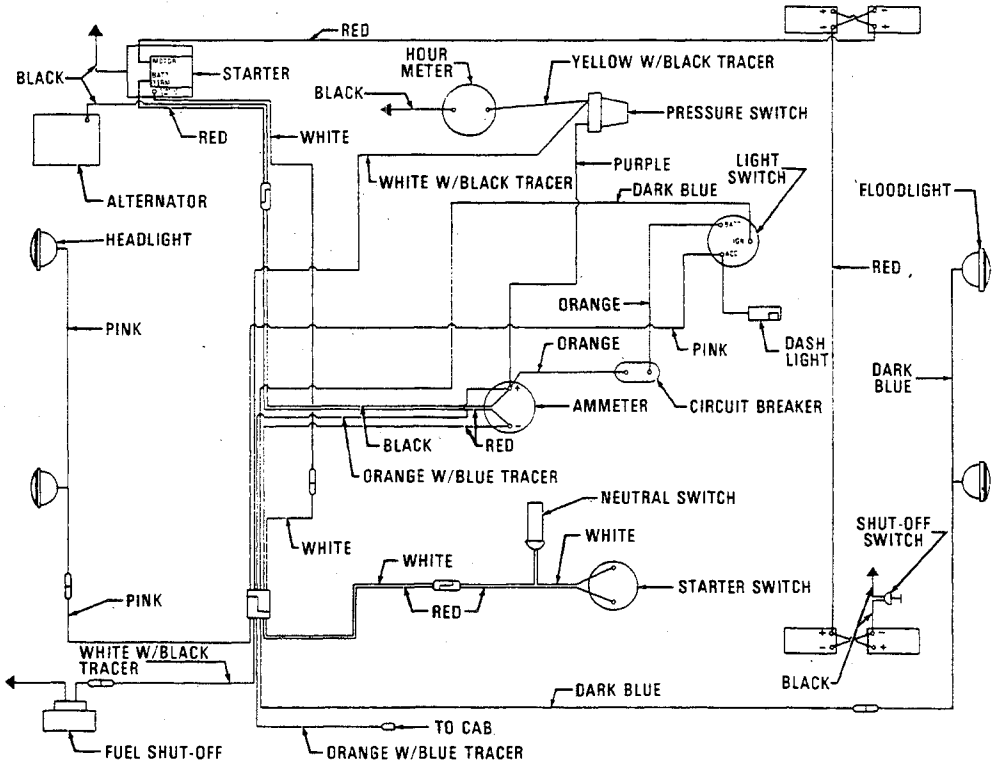


FIG. 28 11-B CRAWLER TRACTOR (S/N 16C16001-up; 25L16001-up)



HD-41

T-74508



41-B

T-78590

FIG. 39 WIRING SCHEMATIC

Study SAFETY RULES in the front of this manual thoroughly for the protection of machine and safety of personnel.

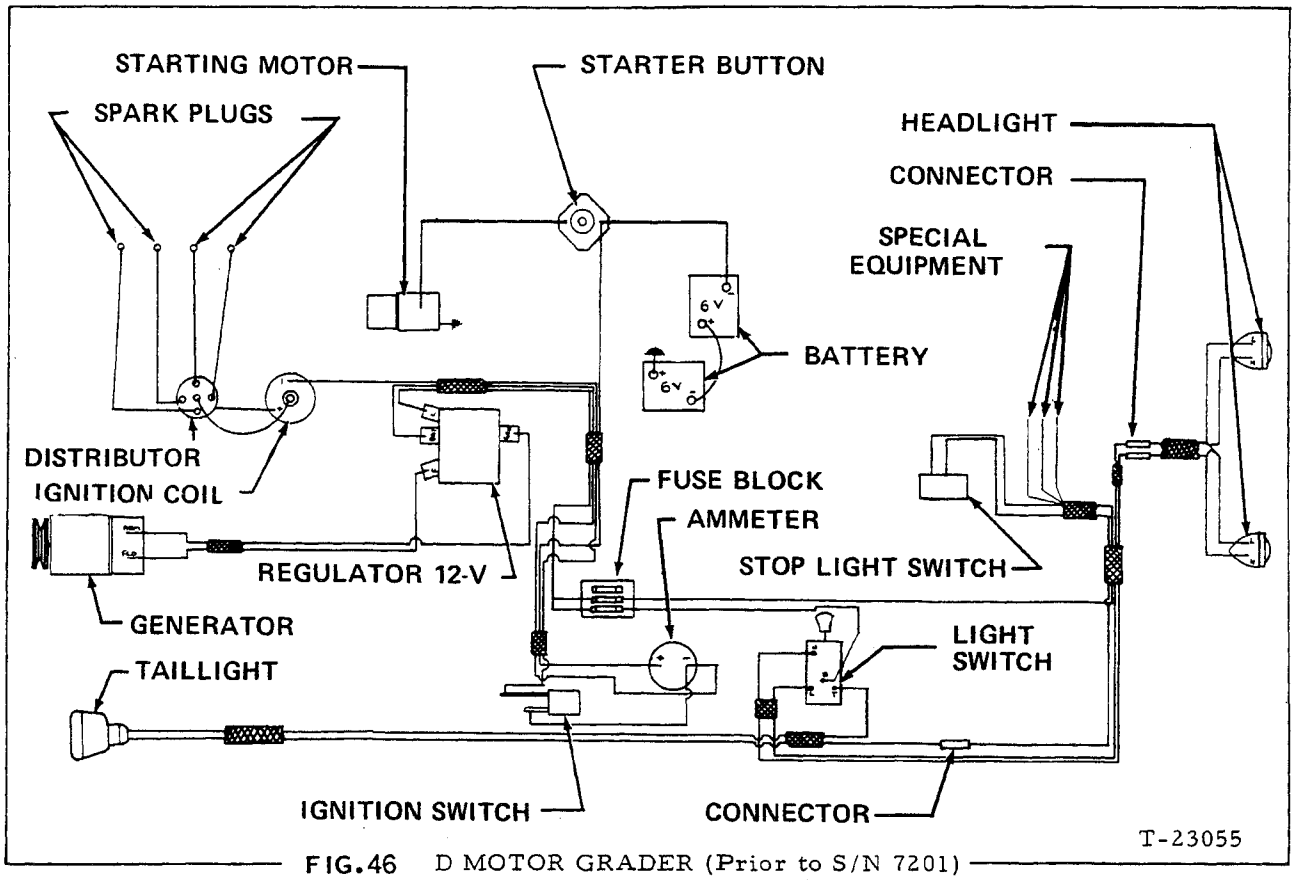


FIG. 46 D MOTOR GRADER (Prior to S/N 7201)

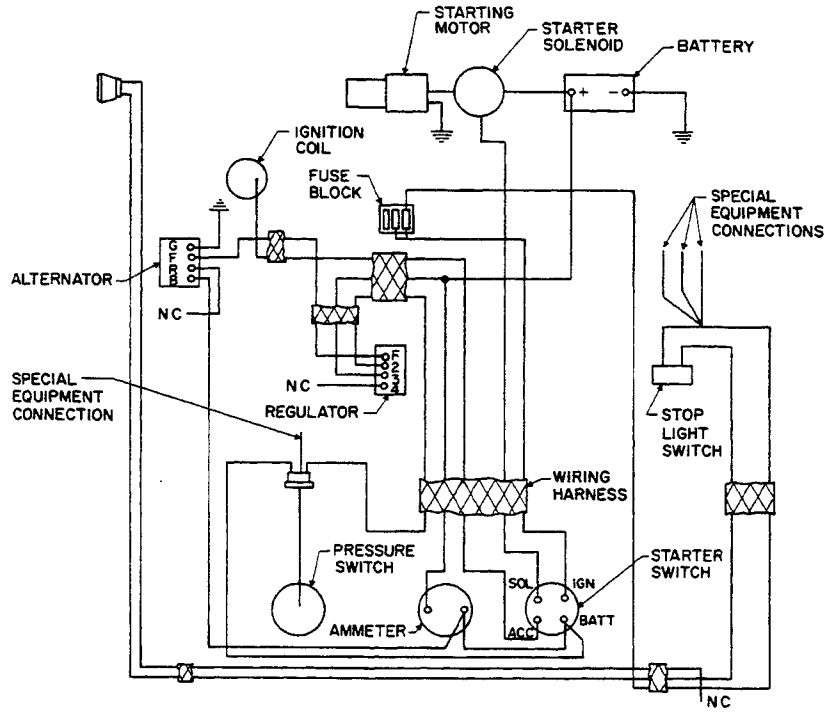


FIG. 47 D MOTOR GRADER (S/N 7201-up)

Electrical System Schematics

Legend for Fig. 59

1. Circuit Breaker
2. Circuit Breaker
3. Circuit Breaker
4. Circuit Breaker
5. Circuit Breaker
6. Circuit Breaker
7. Circuit Breaker
8. Circuit Breaker
9. Key switch
10. Hourmeter
11. Voltmeter
12. Engine start clearing switch(FG85,95 only)
13. Cold start switch
14. Cold start solenoid
15. Coldstart engine temperature switch
16. Engine oil pressure/hourmeter switch
17. Full fuel solenoid
18. Lamp diode(FG85,95 only)
19. Starter

Electrical System Schematics

Legend for Fig. 64

1. Circuit Breaker
2. Circuit Breaker
3. Circuit Breaker
4. Circuit Breaker
5. Circuit Breaker
6. Circuit Breaker
7. Circuit Breaker
8. Circuit Breaker
9. Key switch
10. Reverse alarm
11. Reverse alarm switch
12. Saddle lock pin solenoid
13. Moldboard pin switch
14. Beacon switch
15. Beacon

T-78864

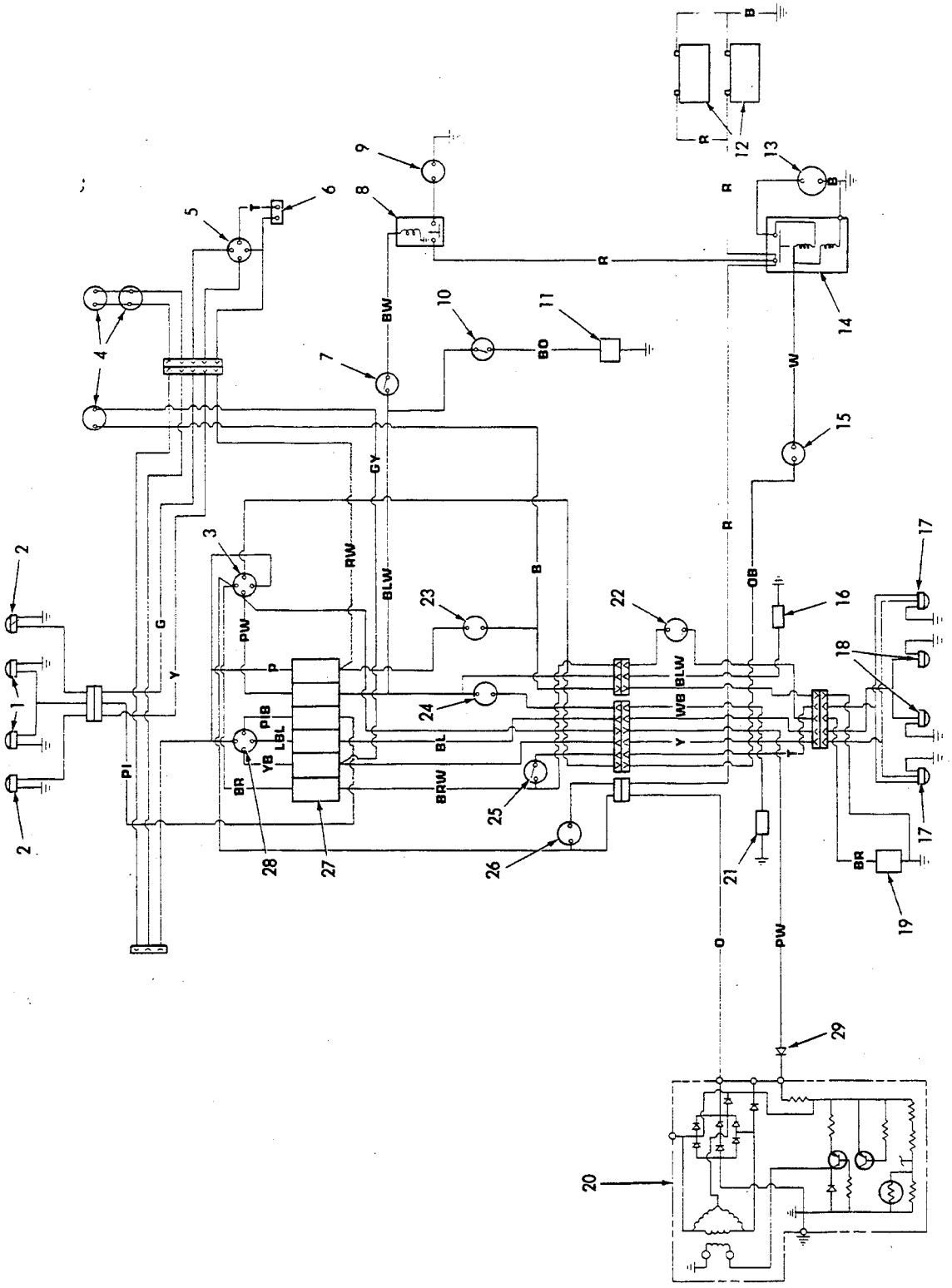
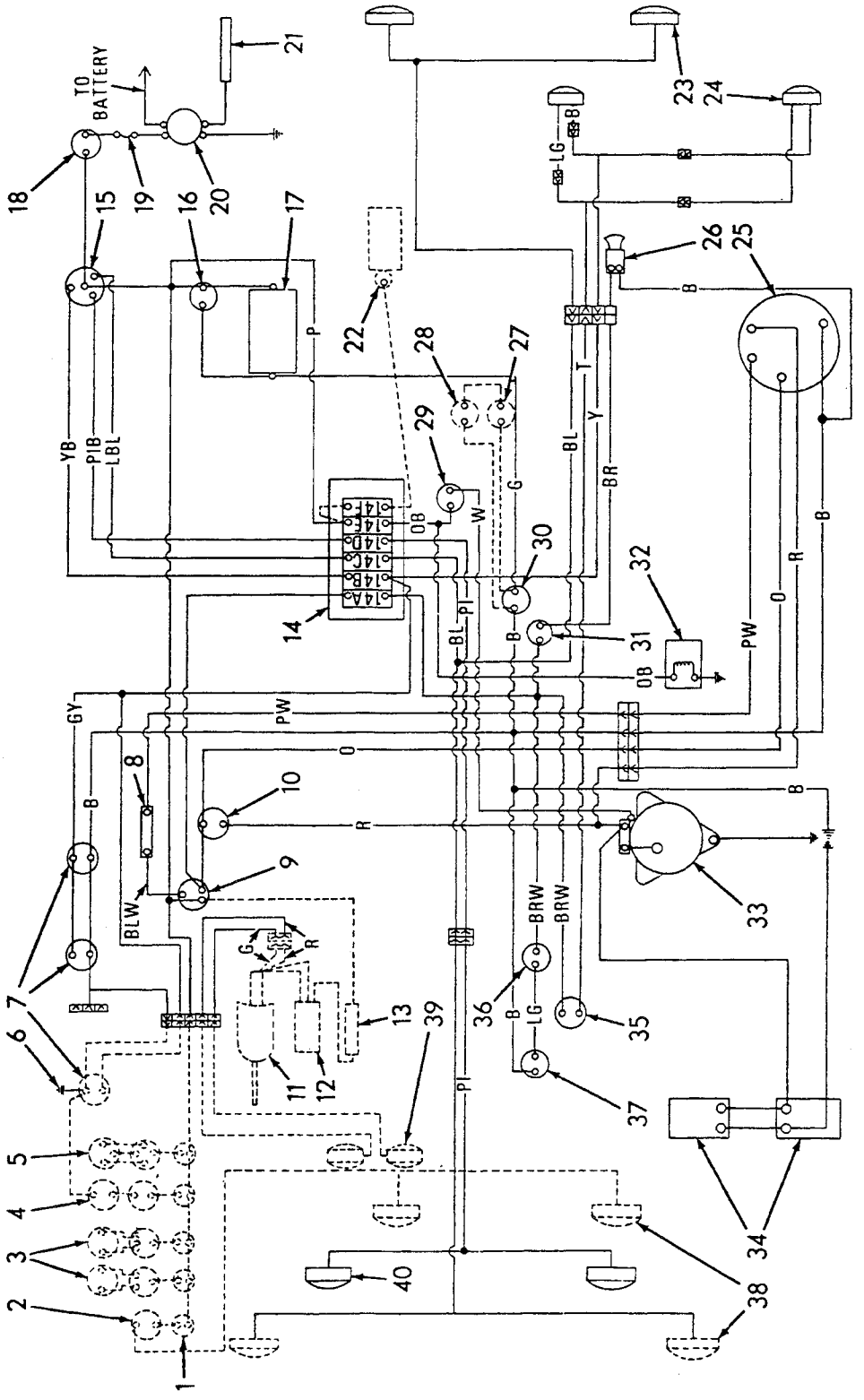


FIG. 73-345-B WHEEL LOADER



T-80419

FIG. 81 ELECTRICAL SYSTEM SCHEMATIC
(Eff. 545-B S/N 21C06870 and 605-B S/N 6863)
(Except 545-B S/N 33A07204-UP)

LEGEND FOR FIG. 49

1. Flood light switch
2. Cab defroster fans
3. Rear window wiper
4. Front window wiper
5. Cab ground
6. Instrument panel lights
7. Key switch
8. Ammeter
9. Circuit breaker junction box
9A. Stop lights - 8 amp
9B. Tail lights - 8 amp
9C. Flood lights - 15 amp
9D. Head lights - 8 amp
9E. Starter switch - 15 amp
9F. Cab heater - 8 amp
10. Low air pressure buzzer
11. Low air pressure warning light
12. Light switch
*13. Engine air heater switch
*14. Fuse
*15. Magnetic switch
*16. Air heater
17. Cab heater switch
18. Rear flood lights
19. Stop lights/tail lights
**20. Back-up alarm
21. Alternator (integral) 40, 45 or 50 amps
***22. Electric F.I.P. shut off
23. Low air pressure switch
24. Starter switch
**25. Back-up alarm pressure switch
26. Starting motor
27. Batteries
28. Stop light switch
**29. Hour meter pressure switch
**30. Hour meter
31. Optional flood lights
32. Optional turn signals
33. Fuse
34. Turn signal flasher
35. Turn signal switch
36. Head lights
37. Fuse and fuse holder
38. Resistor (part of integral alternator circuit)

See Note
*** Standard circuit after Feb. 1966 (S/N 11Y04904)
** Standard circuit after May 1966 (S/N 11Y05008)
* Standard circuit after Nov. 1977 (S/N 11Y05638)

NOTE: Not applicable to brush-type alternator

COLOR CODE FOR FIG. 49

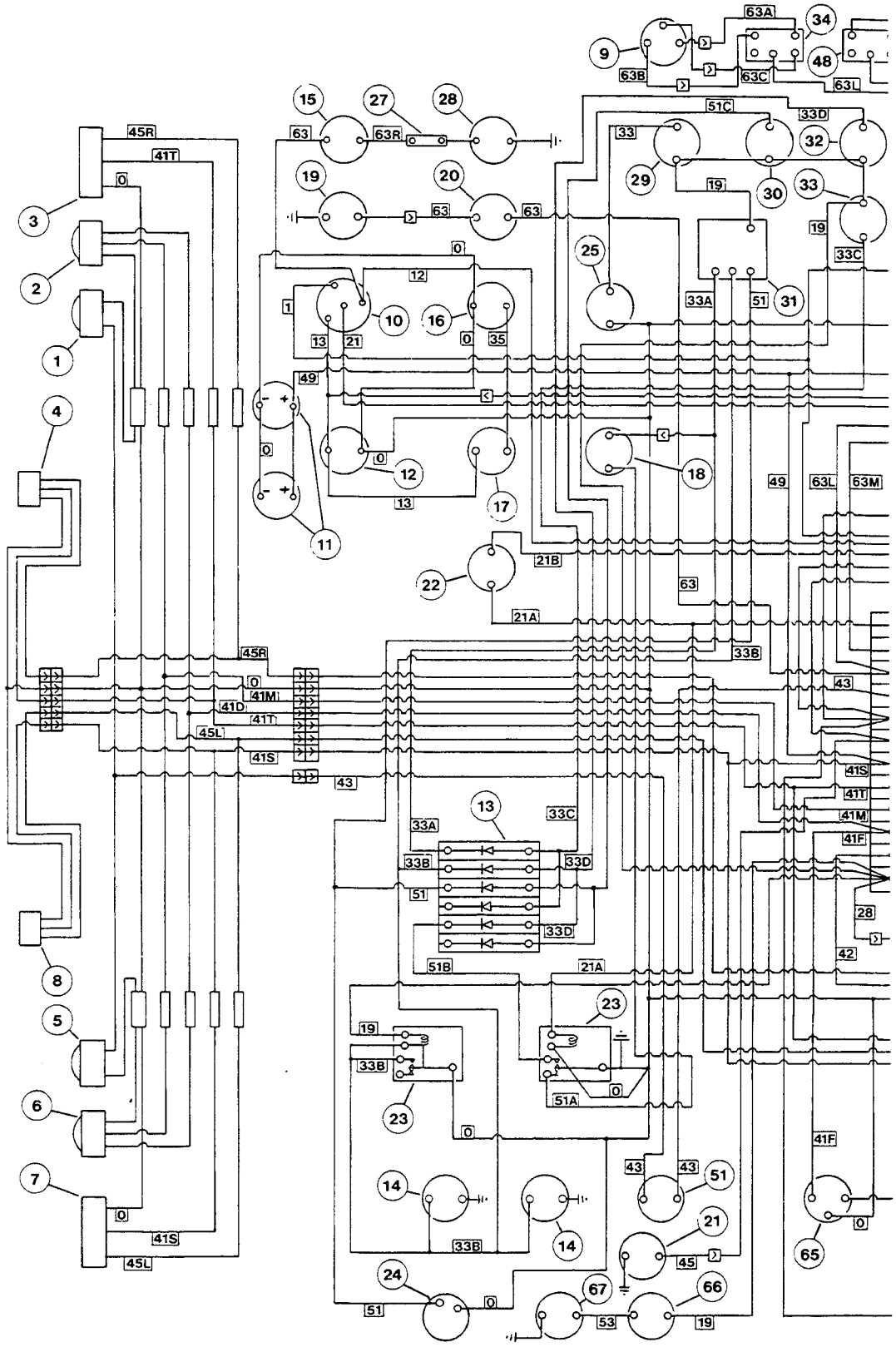
B - Black
LBl - Light Blue
Bl - Blue
Br - Brown
G - Green
LG - Light Green
Gy - Grey
O - Orange
P - Purple
Pi - Pink
R - Red
T - Tan
W - White
Y - Yellow
Br/W* - Brown with white tracer
O/B* - Orange with black tracer
Pi/B* - Pink with black tracer
Y/B* - Yellow with black tracer

LEGEND FOR FIG. 93

1. Panel Lights
2. Key Switch
3. Ammeter
4. Cab Junction Box
5. Brake Fluid Level Warning Light
6. Low Air Pressure Warning Light
7. Light Switch
8. Warning Buzzer
9. Headlight
10. Pressure Convertor Stroke Switch
11. Starter Switch
12. Pressure Switch
13. Pressure Switch
14. Back-Up Horn
15. Stop, Tail, Flasher Light
16. Alternator
17. Hourmeter
18. Starter Motor
19. Pressure Switch
20. Batteries
21. Floodlight
22. Resistor
23. Fuel Shut-Off Solenoid
24. Stoplight Switch
25. Flasher Switch
26. Flasher Unit
27. Flasher Warning Light
28. Hazard Warning Light
29. Side and Flasher Light
30. Main Beam Warning Light
31. Cab Connector
32. Diode
33. Warning Light, Floodlight

WIRING COLOUR CODE

B	—	Black
BL	—	Blue
BR	—	Brown
G	—	Green
LG	—	Light Green
GR	—	Grey
O	—	Orange
P	—	Purple
R	—	Red
T	—	Tan
DG	—	Dark Green
W	—	White
GW	—	Green/White
RB	—	Red/Black
RW	—	Red/White
YB	—	Yellow/Black
BRW	—	Brown/White
GR	—	Green/Red
BRY	—	Brown/Yellow
BRG	—	Brown/Green
BRR	—	Brown/Red
BLR	—	Blue/Red
BLW	—	Blue/White
GY	—	Green/Yellow
GB	—	Green/Black
GBR	—	Green/Brown
PB	—	Purple/Black



(LEGEND : see page 124)

FIG. 98-FR10 **ELECTRICAL**

(Loader serial no.

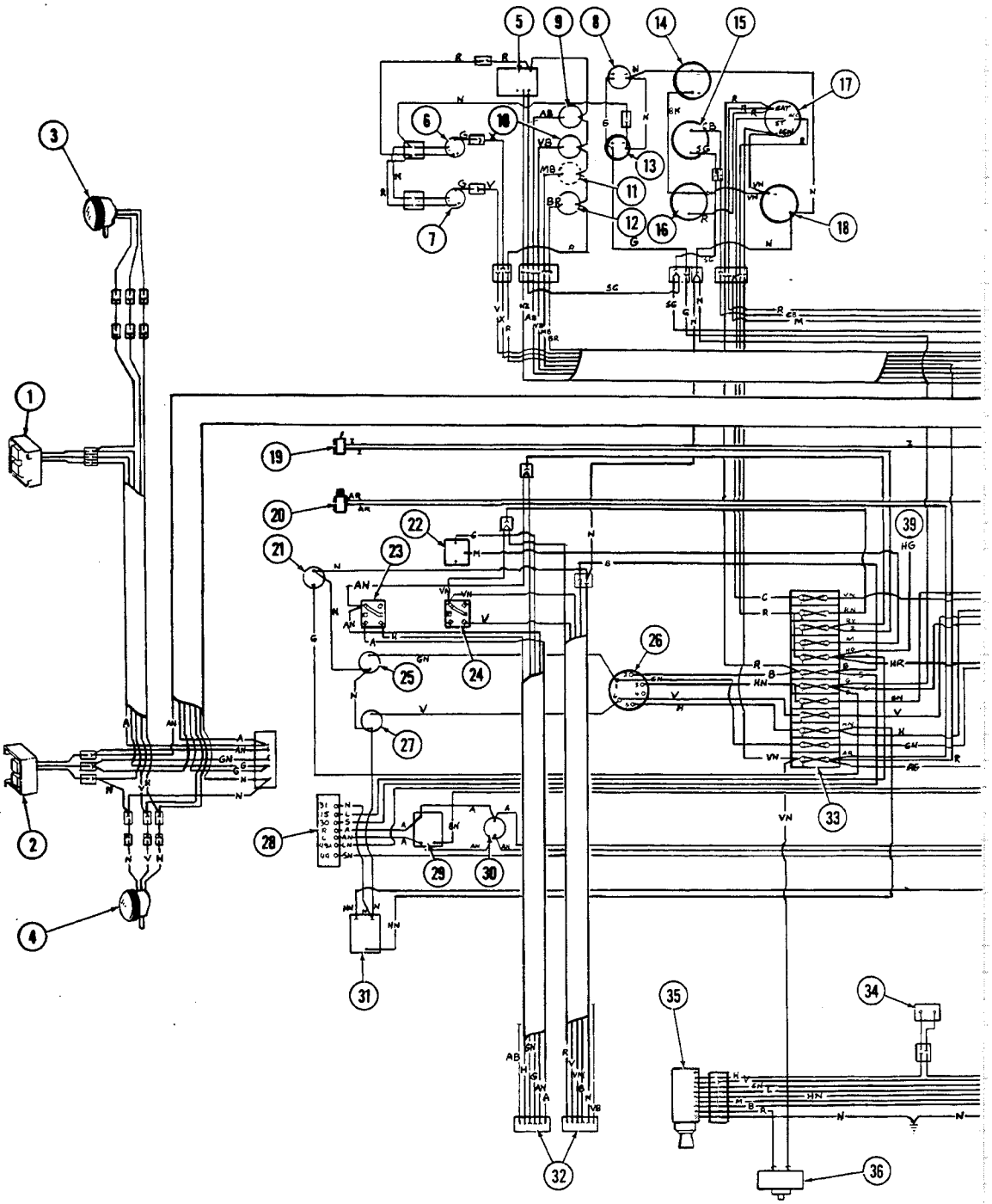
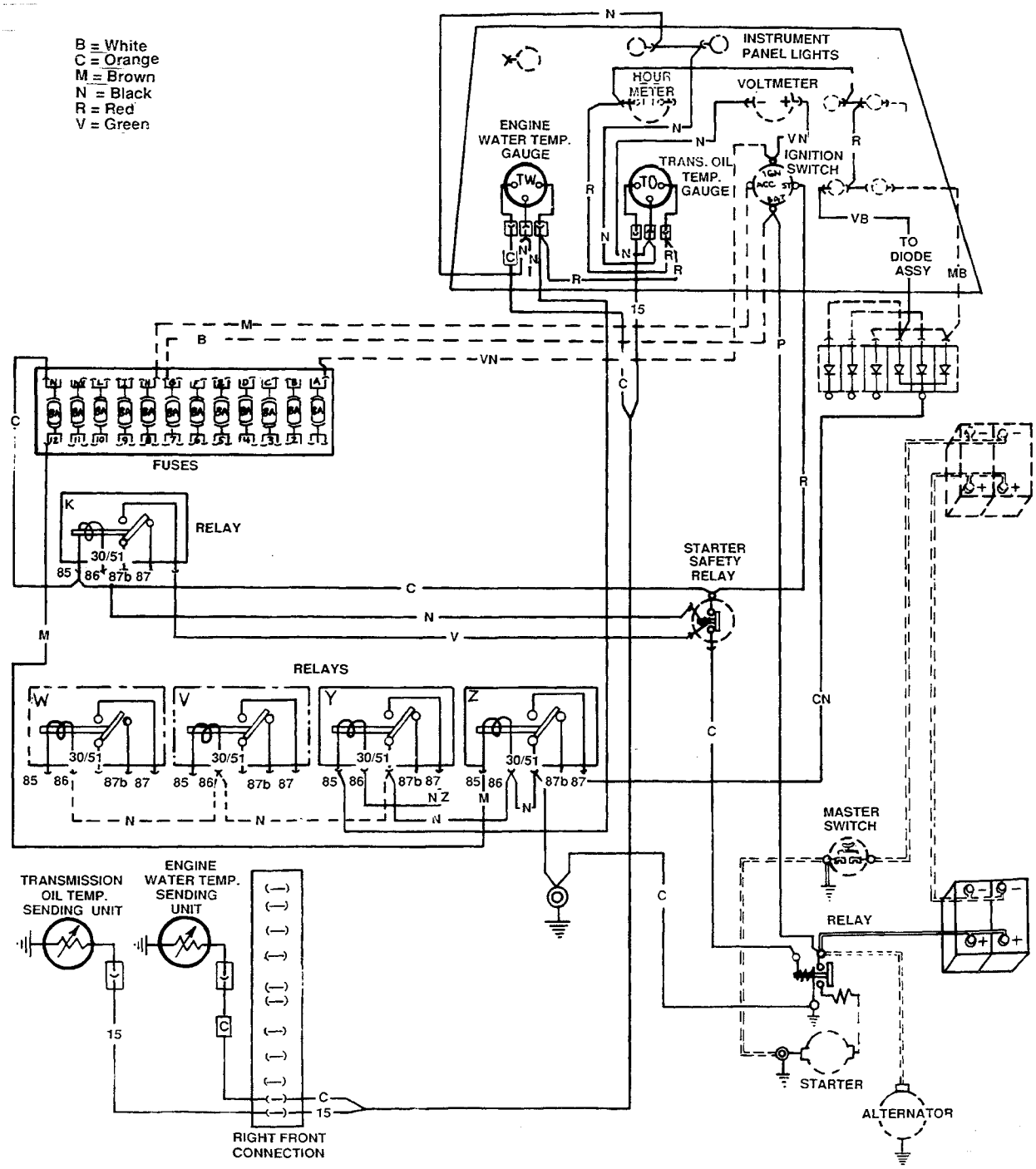


FIG. 101 FR10 (S/N 525395-UP);



T-85280

FIG. 107 FR15 (S/N 575403-UP) ENGINE WATER TEMP. and TRANS. OIL TEMP. GAUGES

NOTE:

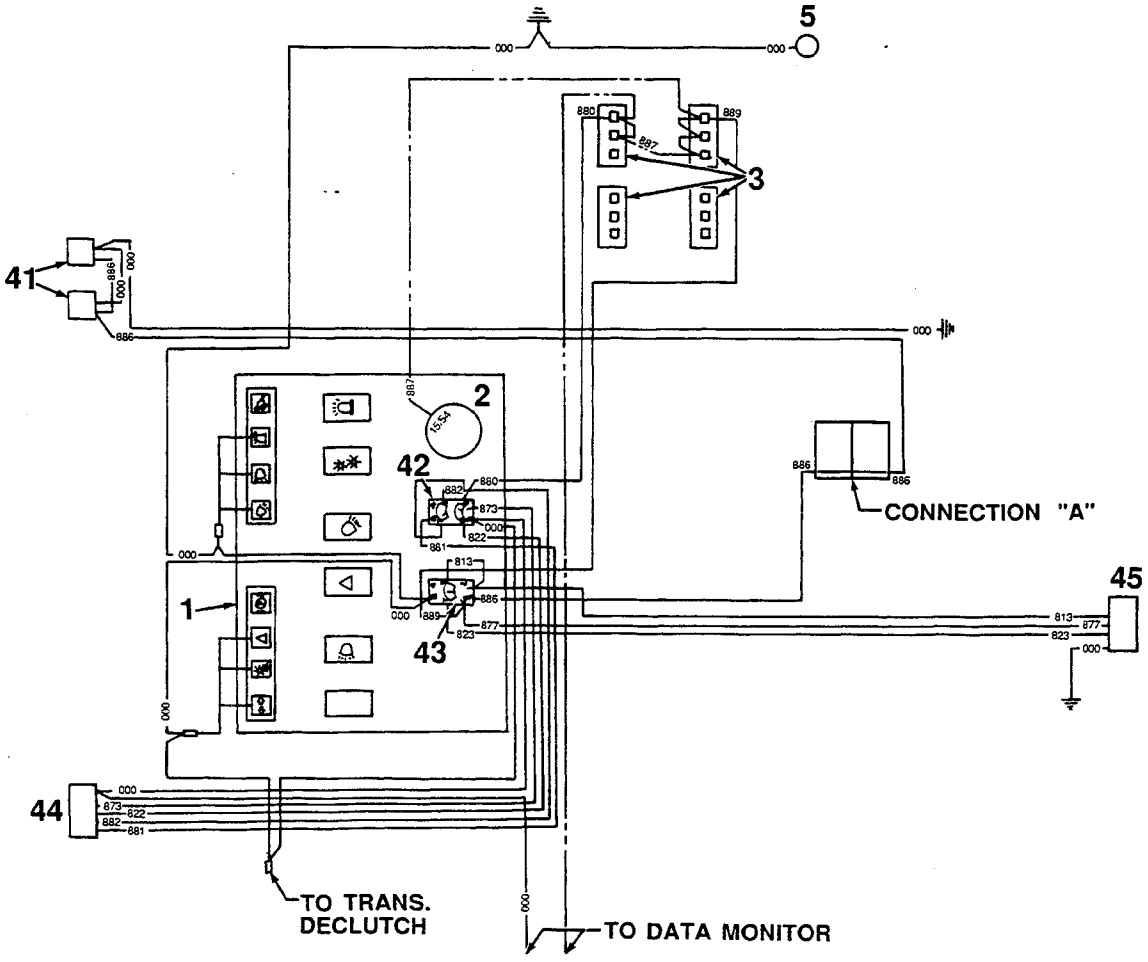
1. Circuits are identified by a number, or by a number and letter, contained in a square box. Metal tags bearing the circuit identification number are attached to each wire at all connectors and / or connection points.

2. Components are designated by a number in a circle. The following list identifies each designated component by its name.

LEGEND FOR FIG. 113

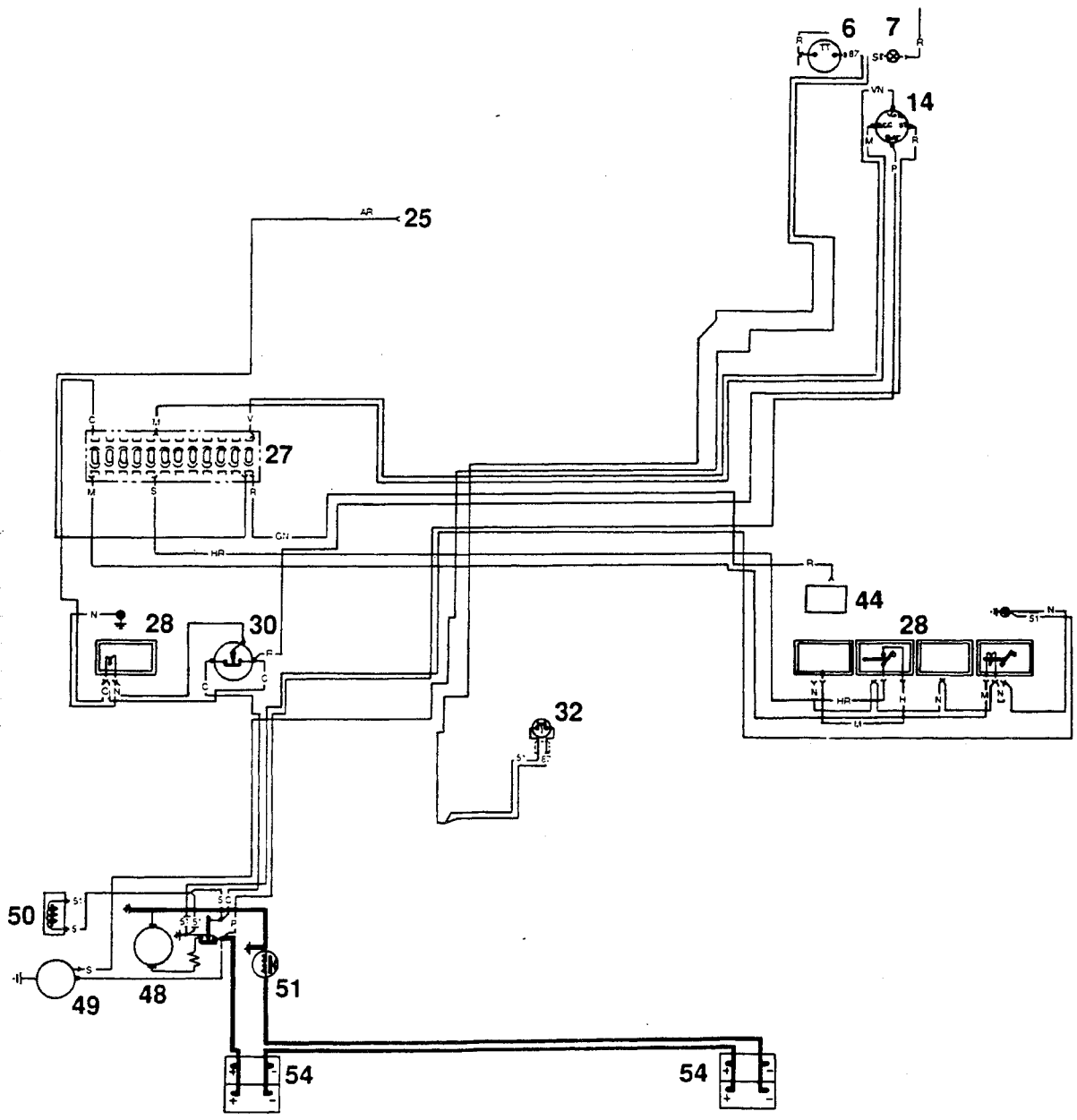
1. Right front cab floodlight
2. Right front head light
3. Right front side and turn signal/hazard flasher light
4. * Right front side and turn signal/hazard flasher light
5. Left front cab floodlight
6. Left front head light
7. Left front side and turn signal/hazard flasher light
8. * Left front side and turn signal/hazard flasher light
9. Front windscreen wiper motor
10. Ignition switch
11. Panel lights
12. Voltmeter
13. Diode assembly
14. Overstroke sensor switch
15. Rear windscreen washer switch
16. Hour meter
17. Engine oil pressure switch
18. Air pressure switch
19. Front windscreen washer pump
20. Front windscreen washer switch
21. Dome light
22. Neutral safety switch
23. Relay
24. Flow switch
25. Parking brake switch
26. Circuit breaker assembly
27. 10 amp. fuse
28. Rear windscreen washer pump
29. Parking brake "on" light
30. Emergency steering activated light
31. Buzzer
32. Brake system fault light
33. Low air pressure light
34. Front windscreen wiper switch
35. Flasher unit
36. Turn signal switch
37. Hazard warning switch
38. Light switch
39. Ether starting aid switch
40. Starter solenoid
41. Battery disconnect switch
42. Starter motor
43. Ether start solenoid
44. Thermo guard
45. Panel light
46. Heater switch
47. Heater unit
48. Rear windscreen wiper switch
49. Rear windscreen wiper motor
50. Turn signal/hazard flasher indicator light
51. Cab floodlight switch
52. Brake light switch
53. Excess fuel solenoid
54. Alternator
55. Batteries (2)
56. Alarm switch
57. Back-up alarm
58. Right rear flood light
59. Right rear turn signal/hazard flasher/tail light
60. Registration number plate light
61. Left rear flood light
62. Left rear turn signal/hazard flasher/tail light
63. Main beam warning light
64. Flood warning light
65. Fog light switch

* Fitted to Bucket Tooth Guard (Special Equipment)



T-85680

FIG. 120 FR10B WINDSHIELD WIPERS & WASHERS



T-85673

FIG. 128 FR11, 12B, 15B, 20B BATTERY FEED