SERVICE MANUAL

W12D/D89D

TOWING WINCH

Form 599700W

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- Report damage or erratic operation of winch or pressure gauge immediately.
- Operate the unit efficiently.
- Do not stand while operating the tractor or the winch.
- Make sure that instruments and controls are operative before working the unit.
- Do not use control levers or handles as machine mounting assists.
- Do not use control levers or handles as hangers for clothing, water bags, grease guns, lunch pails, etc.
- Do not permit personnel in the control area when working or making checks on the machine.
- Do not allow riders on the machine or load.
- Use extreme care when operating close to other machines.
- Avoid operating near other personnel.
- Do not stand or permit others to stand in the bight (loop) of a cable.
- Do not stand or permit others to stand near the winch or cable when it is under tension.
- Do not work a damaged cable (broken wire or strands, or a decrease in the diameter of the cable are warning signs).
- Do not leave the tractor while the winch line is under tension.
- Do not anchor a double or two-part line to the winch.
- Never attempt to clean, oil or adjust a machine while it is in motion.
- Authorized operators only!

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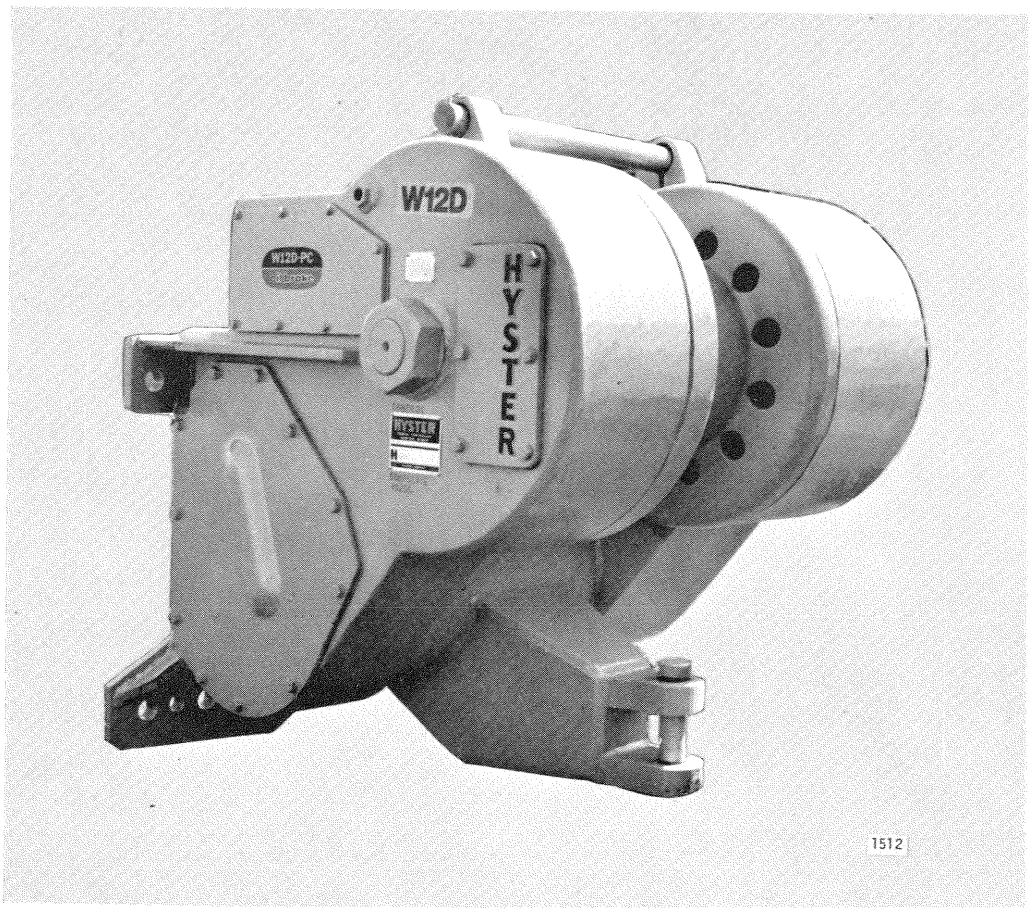
INTRODUCTION

This Service Manual contains operation, maintenance and repair instructions for the W12D Direct Drive and Power Controlled Towing winches. Instructions are also included for removal and installation of the winch on the tractor. Specification tables are provided which contain winch design data. Complete physical and functional descriptions of the winch are given to aid the repairman in understanding the operation of the winch and its subassemblies.



SPECIFICATIONS AND DESCRIPTIONS

1-1. SPECIFICATIONS.

1-2. Specifications for the W12D Direct Drive and Power Controlled Towing Winches are given in Tables 1-1 through 1-5.

1-3. SERIAL NUMBER DATA. (See Figure 1-1.)

1-4. The nameplate is located on the left-hand side of the winch frame and contains the Serial Number, Model Number and Special Application Data. The serial number is also stamped just above the nameplate. The serial number indicates the design series, manufacturing plant, serial number and year manufactured. A typical serial number designates the following:

Example:	A134	P	0000	S
	(1)	(2)	(3)	(4)

(1) The first letter and number denote the design series and model of the unit.

(2) The second letter (P) denotes the plant at which the unit was manufactured. The following letters have been assigned to the various manufacturing plants.

A. Scotland	F. France	P. Portland
B. Tacoma	G. Belgium	R. Ipswich
C. Kewanee	H. South Africa	S. Australia
D. Danville	J. Africa	T. Canada
E. Nijmegen	L. Peoria	Y. Brazil
	N. New Zealand	

(3) The number series designates the unit serial number.

(4) The final letter designates the year of unit manufacture, starting with the letter "S" indicating 1972. The letters I, O, and Q are not used.

TABLE 1-1. COMPONENT SPECIFICATIONS (Sheet 1 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Std-Speed Drum	Hi-Capacity (Lo-Speed)	
DRUM			
Barrel Diameter	14	9-1/4	5-10, Step 1
Barrel Length	10-3/4	10-3/4	5-10, Step 1
Flange Diameter	25	25	5-10, Step 1
LH Seal Bore Diameter	7.002 - 7.004	7.002 - 7.004	5-10, Step 9
Bearing Bore Diameter	7.002 - 7.004	7.002 - 7.004	5-10, Step 11
Cable Capacity (Allow for loose or unevenly spooled cable):			
1-1/8 Inch	239	300	
1-1/4 Inch	192	242	
Ferrule Sizes	J9 (1-1/8 In.), J10 (1-1/4 In.)		
DRUM SHAFT ASSEMBLY			
Shaft:			
Bearing Journal Diameter (RH and LH Side)	4.4990 - 4.5005		5-10, Step 6
Retainer Journal Diameter	4.373 - 4.375		5-10, Step 6
Gear Bore Diameter	7.002 - 7.004		5-10, Step 6
Outer Retainer:			
Bore Diameter	4.377 - 4.380		5-10, Step 3
Pilot Diameter	11.061 - 11.063		5-10, Step 3

TABLE 1-1. COMPONENT SPECIFICATIONS (Sheet 2 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Direct Drive	Power Controlled	
BEVEL GEAR SHAFT ASSEMBLY			
Shaft:			
LH and RH Bearing Journal Diameter	2.3746 - 2.3751	2.3746 - 2.3751	5-5, Step 13
Seal Ring Groove Width	None	0.125 - 0.133	5-5, Step 3
Seal Ring Groove Diameter	None	1.329 - 1.333	5-5
Seal Ring:	None		
Type		Locked Joint	5-5, Step 3
Thickness		0.0925 - 0.0935	5-5
Spacers:			
Long Spacer:			
Length	3.808 - 3.813	3.808 - 3.813	5-5, Step 10
Both Ends Parallel Within	0.002	0.002	5-5, Step 10
Short Spacer:			5-5, Step 10
Length		2.685	5-5, Step 10
Both Ends Parallel Within	0.002	0.002	5-5, Step 10
LH Bearing Retainer			
Seal Ring Bore Diameter	Not Applicable	1.500 - 1.505	5-5, Step 1 and 2
Bearing Cup Bore Diameter	4.8750 - 4.8760	4.8750 - 4.8760	5-5, Step 1 and 2
Pilot Diameter	6.747 - 6.749	6.747 - 6.749	5-5, Step 1 and 2
RH Bearing Retainer:			
Seal Ring Bore Diameter	Not Applicable	1.500 - 1.505	5-5, Step 1 and 2
Bearing Cup Bore Diameter	4.8750 - 4.8760	4.8750 - 4.8760	5-5, Step 1 and 2
Pilot Diameter	5.997 - 5.999	5.997 - 5.999	5-5, Step 1 and 2
Shaft Preload	None	0.000 - 0.004	5-16, Step 20
Bevel Gear Backlash	0.006 - 0.012	0.006 - 0.012	5-16
BRAKE SHAFT ASSEMBLY			
Shaft:			
RH Bearing Journal Diameter	2.500 - 2.501	2.500 - 2.501	5-7, Step 4
LH Bearing Journal Diameter	3.000 - 3.001	3.000 - 3.001	5-7, Step 3
LH Bearing Retainer:			
Seal Bore Diameter	4.245 - 4.247		5-2
Bearing Cup Bore Diameter	5.513 - 5.516	5.513 - 5.516	5-2
Shaft Endplay	0.006 - 0.009	0.006 - 0.009	5-15, Step 6
Brake Wheel Diameter	14 Inches	None	5-3, Step 1
INTERMEDIATE SHAFT ASSEMBLY			
Bearing Journal Diameter	2.750 - 2.751	2.750 - 2.751	5-8
Shaft Endplay	0.004 - 0.007	0.004 - 0.007	5-14
TRANSMISSION HOUSING			
Left-Hand Side:			
Bore Diameters:			
PTO Shaft Bearing Retainer	7.000 - 7.002	7.000 - 7.002	5-1, Step 2
Bevel Gear Shaft Tapered Roller Bearing Retainer	6.750 - 6.752	6.750 - 6.752	5-5, Step 2
Brake Shaft Bearing Cup Bore	5.5130 - 5.5145	5.5130 - 5.5145	5-7, Step 1
Drum Shaft Bore	4.377 - 4.380	4.377 - 4.380	5-10

TABLE 1-1. COMPONENT SPECIFICATIONS (Sheet 3 of 3)

ITEM	DESIGN DATA		REFERENCE FIGURE
	Direct Drive	Power Controlled	
TRANSMISSION HOUSING (Cont)			
Right-Hand Side			
Bore Diameters:			
Bevel Gear Shaft Retainer Bore	6.000 - 6.002	6.000 - 6.002	5-5, Step 3
Ball Bearing Bore	5.9053 - 5.9067	5.9053 - 5.9067	5-4
Drum Shaft Outer Retainer	11.065 - 11.070	11.065 - 11.070	5-10, Step 3
Intermediate Shaft Bearing Retainer	6.625 - 6.627	6.625 - 6.627	5-8, Step 1
Brake Shaft Bearing Retainer	5.9090 - 5.9110	5.9090 - 5.9110	5-7, Step 2
Drum Seal	10.998 - 11.002	10.998 - 11.002	5-10, Step 10
CLUTCH ASSEMBLY			
2nd Reduction Gear Bore Diameter	3.4999 - 3.5013	None	5-4
Dental Clutch Groove Width	0.510 - 0.515	None	5-4
Bearing Carrier Diameter	2.7494 - 2.7500	None	5-4
Piston:	None		5-6
Outside Diameter		9.996 - 9.998	
Inside Diameter		6.000 - 6.002	
Piston Housing	None		5-6
Piston Cavity:			
Large Diameter		10.006 - 10.008	
Inside Diameter		3.626 - 3.628	
Hub - Small Diameter	None	3.623 - 3.625	5-6
Friction Disc:			
Overall Width		0.122 - 0.128	
Minimum Thickness, Friction Material		0.020	
Separator Plates	None		5-6
Width		0.080 - 0.084	
Dish		0.020 - 0.030	
Cooling Oil Valve Spring:	None		5-6
Free Length		2-11/16	
Pressure at Two Inches		11.0 Oz.	
Disc-to-Plate Clearance		0.065 - 0.125	
OIL BRAKE ASSEMBLY	None		
Brake Apply Spring:			
Dish		0.325 - 0.335	5-2, Step 3
Pressure at 1/4-Inch Deflection		8000 - 8750 Lbs.	5-2, Step 3
Piston:			
Outside Diameter		12.246 - 12.248	5-2, Step 12
Inside Diameter		4.255 - 4.260	5-2, Step 12
Piston Housing			
Piston Bore:			
Large Diameter		12.253 - 12.255	5-2, Step 9
Small Diameter		4.243 - 4.246	5-2, Step 9
Inside Diameter		3.035 - 3.040	5-2, Step 9
Push Rod:			
Diameter		0.373 - 0.375	5-2
Length		3.422 - 3.425	
Friction Discs:			5-2
Overall Width		0.122 - 0.128	
Minimum Thickness, Friction Material		0.020	
Separator Plates Width		0.080 - 0.084	5-2
Separator Plates Dish		0.020 - 0.030	

TABLE 1-2. HYDRAULIC SPECIFICATIONS

ITEM	DESIGN DATA		REFERENCE FIGURE
	Direct Drive	Power Controlled	
CONTROL VALVE	None		5-11
High Pressure Relief		220 (±5) PSI	
Cooling Oil Pressure		2 - 5 PSI	
Brake Cooling Oil Pressure		10 - 30 PSI	
Neutral Return Spring (W-10 Spool)	None		
Free Length		2.00	
Pressure at 1.562 Inches		43 (±5) Lbs.	
Pressure at 0.875 Inches		110 (±11) Lbs.	
Relief Valve Spring	None		
Free Length		2.56	
Pressure at 2.0 Inches		50 (±5) Lbs.	
Reverse Overlap Valve Spring	None		
Free Length		2.56	
Pressure at 2.0 Inches		50 (±5) Lbs.	
Forward Overlap Valve Spring	None		
Free Length		1.50	
Pressure at 0.875 Inches		6.9 (±0.5) Lbs.	
Pressure at 0.372 Inches		12.4 (±1) Lbs.	
COOLING OIL RELIEF VALVE			
Valve Spring:	None		5-11
Free Length		1.750	
Pressure at 1.06 Inches		1.23 (±0.10) Lbs.	
BRAKE COOLING OIL RELIEF VALVE	None		5-11
Valve Spring:			
Free Length		1.855	
Pressure at 1.67 Inches		2.43 (0.12) Lbs.	
Pressure at 1.29 Inches		7.38 (±0.35) Lbs.	
FILTERS	None		4-2
Pressure		25 Micron Cartridge	
Suction		50 Mesh Screen With Magnets	
Relief Valve Opening Pressure		(50 ±5) PSI	
OIL			
Capacity	18 Gal.	22 Gal.	4-1
Type:			
Above +10°F	SAE 90 EP Multi-Purpose Gear Oil, MIL-L-2105B	Automatic Transmission Fluid (Dexron)	
Below +10°F	SAE 10 Lube Oil Series 3, MIL-L-45199 or MIL-L-2104B	Same as Above +10°F	
Above -10°F	Same as Below +10°F	Same as Above +10°F	
Below -10°F	Same as Below +10°F	SAE 5W Lube Oil Series 3, MIL-L-45199 or MIL-L-2104B	

TABLE 1-3. TORQUE SPECIFICATIONS

ITEM	DESIGN DATA		REFERENCE FIGURE
	Direct Drive	Power Controlled	
TORQUE VALUES			
NOTE: All torques given in foot-pounds and with threads lubricated.			
Bevel Gear Shaft Assembly			
Bearing Retainer Bolts:			
LH Side	88	88	5-16, Step 22
RH Side	88	88	5-16, Step 22
Bearing Locknut	None	200 (±25)	5-16, Step 17
Control Valve Mounting Capscrews	None	15	5-11
Drum Shaft Assembly			
Bearing Retainer (RH Side)	88	88	5-16, Step 22
Internal and External	146	146	5-13, Step 9
Drum to Adapter	225	225	5-13, Step 14
Intermediate Shaft Assembly:			
Bearing Retainer Capscrews	88	88	5-14, Step 5
Brake Assembly:			
Oil Brake Cover Nuts	None	200	5-17, Step 12
Brake Compartment Cover Capscrews	88	88	1-1
PTO Shaft Assembly Retainer Capscrews	75	75	5-16, Step 19

1-5. PHYSICAL DESCRIPTION.

1-6. Towing Winch. (See Figure 1-1.)

1-7. The W12D Towing Winch is manufactured as a Direct Drive or Power Controlled towing winch. The Direct Drive version employs dental clutches with related mechanical linkage to shift the winch gear train to forward, neutral, or reverse. A brake drum and band arrangement with related mechanical linkage provides braking on the Direct Drive winch. The Direct Drive winch is primarily designed for use on direct drive and torque converter tractors equipped with an interruptable power-take-off (PTO). The Power Controlled winch can be used on direct drive, torque converter and powershift tractors equipped with a constant-running PTO. The Power Controlled winch is basically the same as the Direct Drive winch except multiple disc clutch packs are hydraulically actuated to shift the winch to forward, neutral, or reverse. Also, the Power Controlled winch uses a multiple disc oil brake assembly for braking. All major gear train and brake assembly components for the Direct Drive and Power Controlled winches are mounted inside of a fabricated weldment. The PTO shaft assembly, bevel gear shaft assembly and brake shaft assembly are mounted in the center and left-hand section of the weldment. The brake assembly and associated linkage are mounted in the left-hand section. The drum gear, intermediate shaft assembly and reverse clutch assembly are mounted in the right-hand section of the weldment. A control valve, cooling oil relief valve and related hydraulic hoses serve as the control mechanism on the Power Controlled Winch. The control valve is mounted at the top, left-hand section of the weldment. Mechanical linkage is used to control the operation of the Direct Drive winch.

1-8. DIRECT DRIVE GEAR TRAIN. (See Figure 1-2.) The direct drive gear train consists primarily of five shaft assemblies; the PTO shaft assembly, bevel gear shaft assembly, brake shaft assembly, intermediate shaft assembly, and drum shaft assembly. The PTO shaft assembly is integral on the Lo-Speed winch. On the Standard-Speed winch, the bevel pinion is splined and locked with a snap ring to the PTO shaft. The bevel gear shaft assembly contains two straight cut pinion gears, two dental clutches, four spacers, two single taper roller bearings at each end of the shaft, and one ball bearing for center support. The brake shaft assembly turns between two single taper roller bearings. This shaft serves to transfer torque to the intermediate gear when the unit is in forward and prevents the gear train from turning when the brake is applied. The intermediate shaft assembly contains a large intermediate spur gear and a drum pinion gear that are splined together on a shaft between two taper roller bearings. This assembly transfers the torque to the large drum gear. The drum shaft assembly is aligned between two matched double

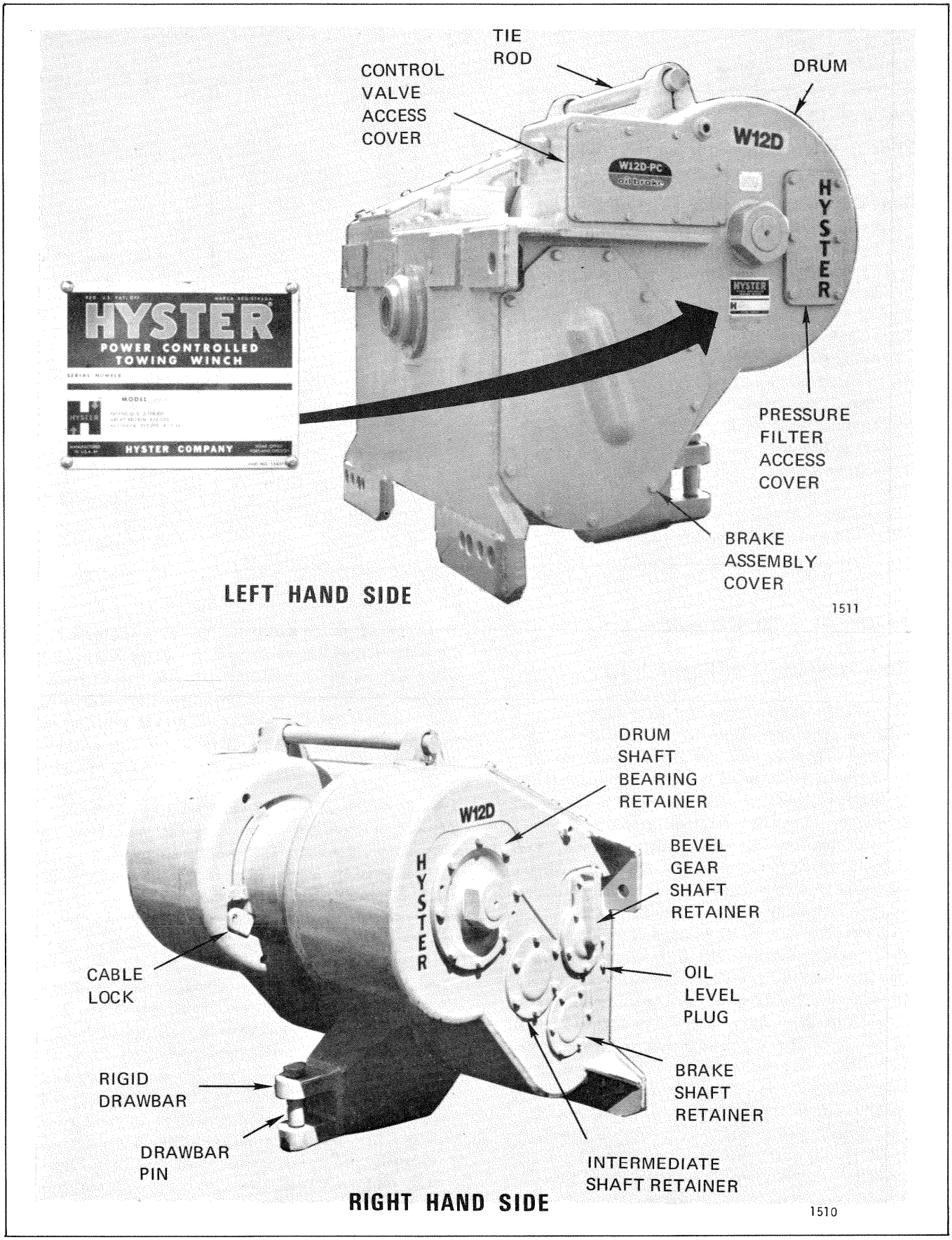
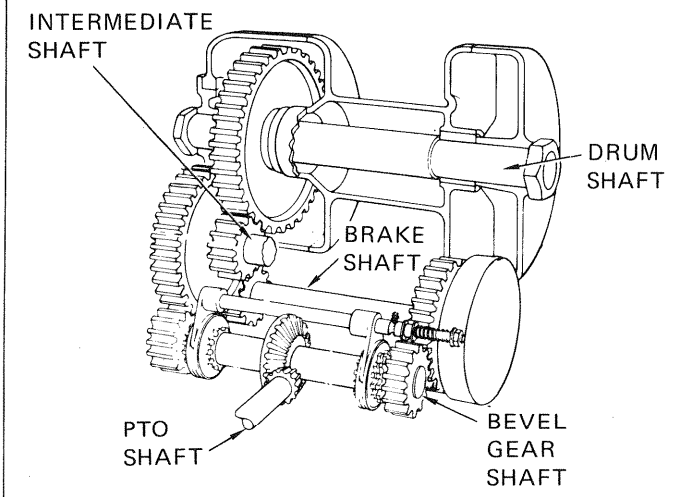
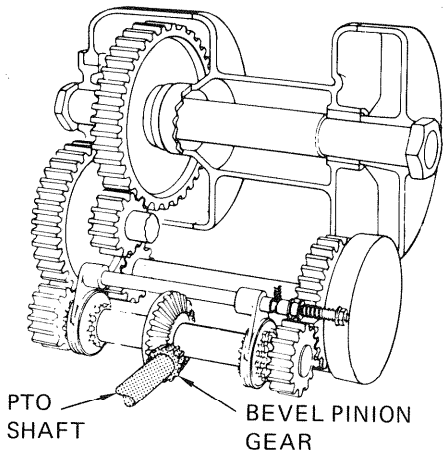


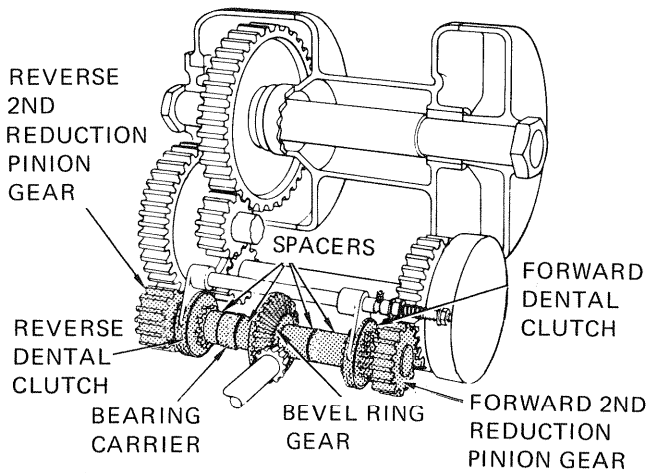
FIGURE 1-1. W12D TOWING WINCH



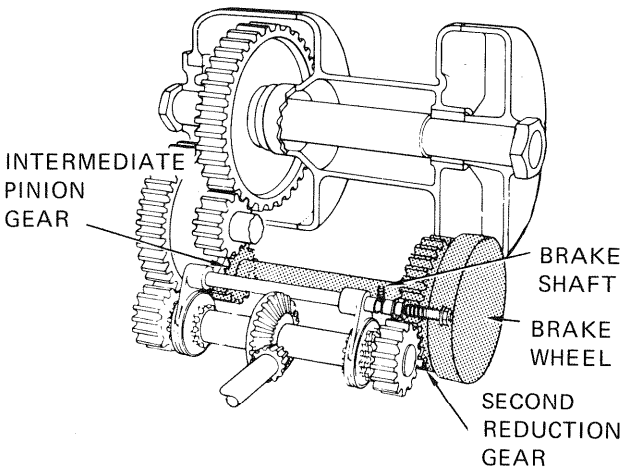
SHAFT ASSEMBLIES



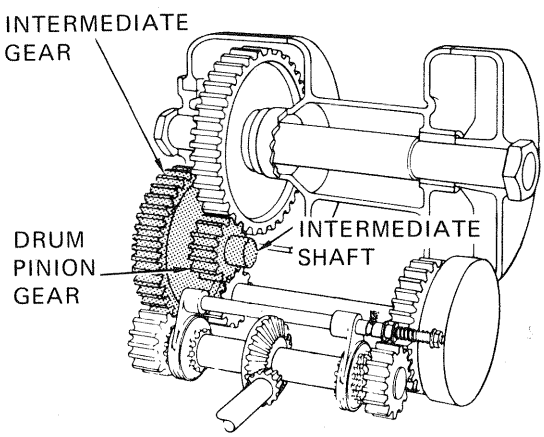
PTO SHAFT ASSEMBLY



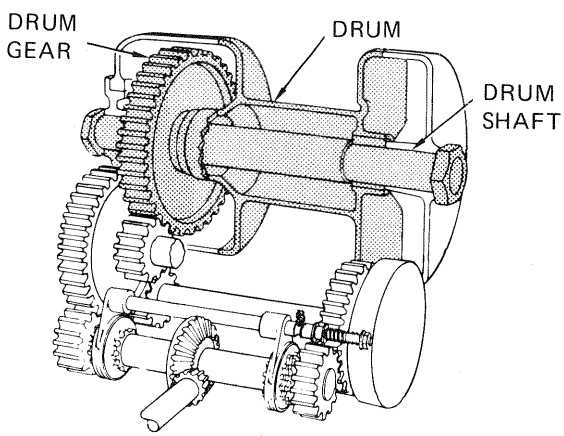
BEVEL GEAR SHAFT ASSEMBLY



BRAKE SHAFT ASSEMBLY



INTERMEDIATE SHAFT ASSEMBLY



DRUM SHAFT ASSEMBLY

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FIGURE 1-2. DIRECT DRIVE GEAR TRAIN

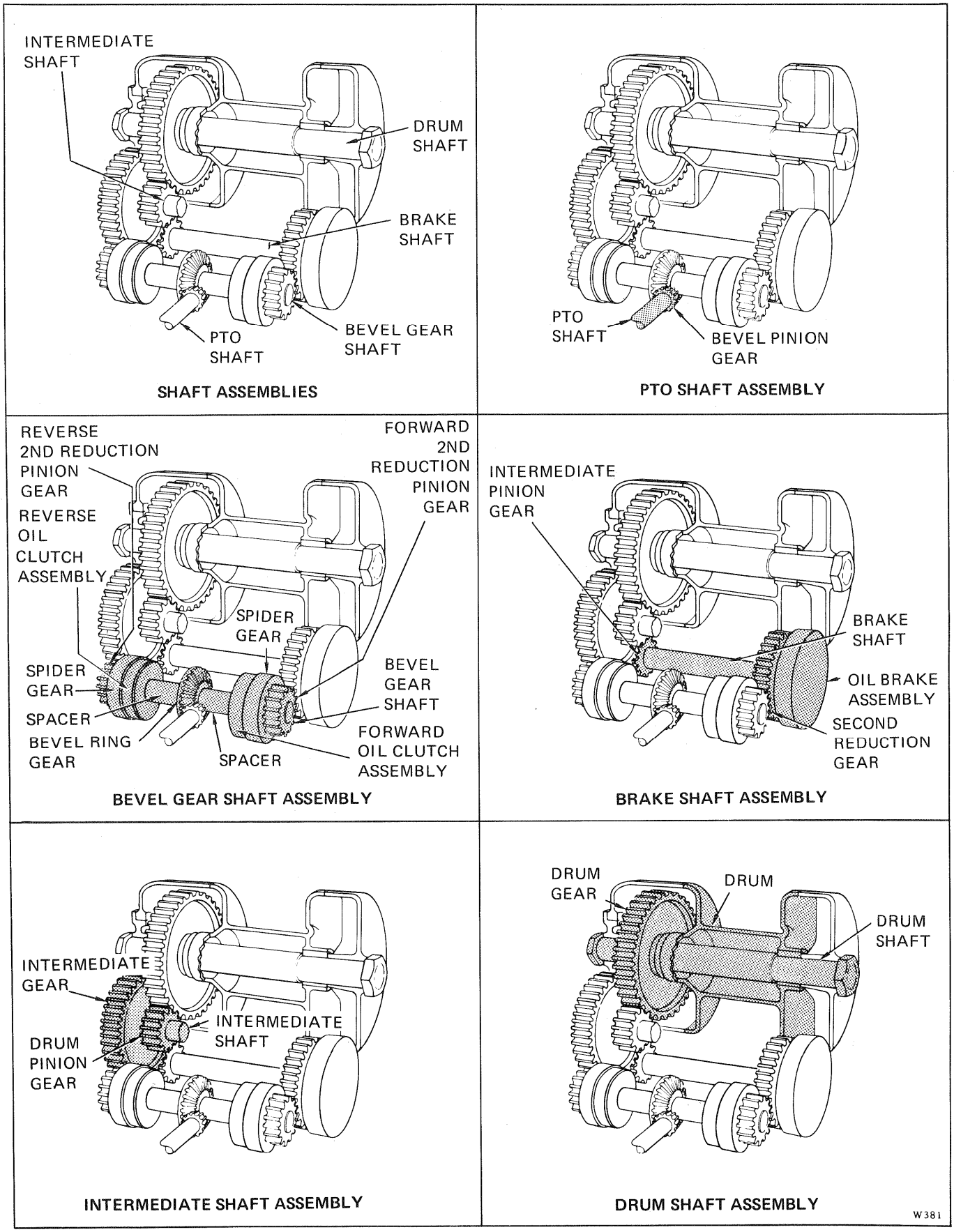


FIGURE 1-3. POWER CONTROLLED GEAR TRAIN

taper roller bearings. The drum shaft is secured to the winch frame and therefore, DOES NOT rotate. The drum gear is bolted and splined to an adapter plate which is bolted to the drum. This allows the drum, adapter plate, and drum gear to rotate around the shaft. All drive train gears are heat treated to provide maximum service life.

1-9. POWER CONTROLLED GEAR TRAIN. (See Figure 1-3.) The Power Controlled gear train is essentially the same as the direct drive gear train except multiple disc clutch packs replace the dental clutches. Manufacturing differences between the Direct Drive and the Power Controlled frames are great enough that interchangeability of components should not be attempted. The Power Controlled bevel gear shaft is center drilled on each end and cross drilled at the clutch pack locations to allow oil under pressure to flow to the clutches. A cast iron seal ring on each end of the bevel gear shaft prevents this pressurized oil from escaping between the bearing retainers and the shaft ends. The clutch spider gears rotate on roller bearings independently of the bevel gear shaft. The Power Controlled bevel gear shaft assembly is preloaded between two taper roller bearings as opposed to an endplay condition with the Direct Drive bevel gear shaft assembly.

1-10. DIRECT DRIVE CLUTCH ASSEMBLY. (See Figure 1-4.) The Direct Drive Clutch assembly consists primarily of a reverse dental clutch, forward dental clutch, two clutch hubs, right-hand shifter fork, left-hand shifter fork, shifter shaft, detent ball and detent spring. The shifter forks are secured to the shaft with a lockscrew and lockwire. The shaft is connected through a shifter crank assembly to the clutch control cable. The detent ball and spring hold the shifter fork in the Neutral position. The compression spring absorbs the shifting force until the external teeth of the dental clutch hub align with the external dental teeth of the pinion gear. When the teeth are aligned, the dental clutch will slide onto the dental teeth of the pinion gear. This completely engages the bevel gear shaft to the pinion gear.

1-11. POWER CONTROLLED OIL CLUTCH ASSEMBLY. (See Figure 1-5.) The oil clutch assembly used in the Power Controlled winch consists of a piston retainer plate, clutch piston, six friction discs, six separator plates, cooling oil valve assembly, clutch hub, six release springs and a cover plate. The clutch piston is installed inside of the retainer plate and is sealed by two O-rings. The body of the cooling oil valve is externally threaded and is screwed into one of the retainer bores. The clutch hub is installed over the cooling oil valve and rests on the retainer plate. The hub is internally splined to mate with the bevel gear shaft and is externally splined to mate

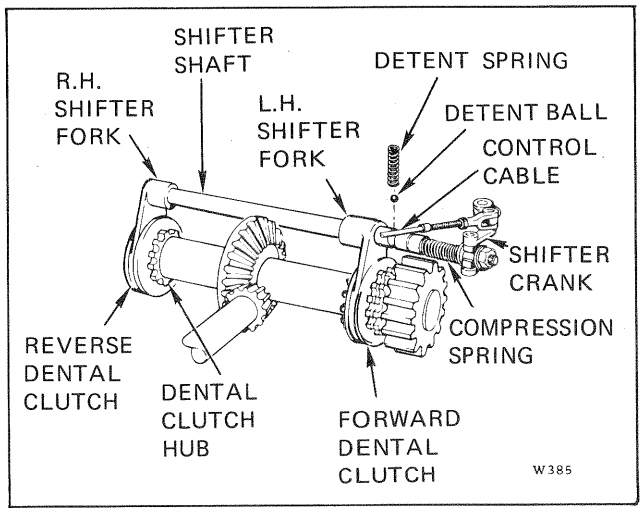


FIGURE 1-4. DIRECT DRIVE CLUTCH ASSEMBLY

with the six separator plates. The six separator plates and friction discs are alternately mounted over the external splines of the clutch hub. The separator plates are dished and have internal teeth that mate with the external splines of the clutch hub. The separator plates must, therefore, rotate with the hub during operation of the clutch assembly. The friction discs are sintered bronze discs having external teeth. These teeth mate with the internal splines of a spider gear that is positioned over all discs during final assembly of the clutch. The friction discs rotate with the spider gear. The six release springs are installed into the six bores in the clutch hub. During clutch operation, pressurized oil flows into a cavity between the clutch piston and retainer plate. This oil forces the clutch piston away from the retainer plate and compresses the separator plates against the friction discs. The separator plates are always rotating with the bevel gear shaft during operation of the winch. Compressing the separator plates against the friction discs causes the friction discs to rotate. The friction discs are externally splined to the spider gear and, therefore, rotate the spider gear. Depending upon the clutch assembly, the spider gear then transfers torque to either the intermediate pinion or brake shaft pinion gear. When the pressurized oil is removed, the six release springs force the separator plates in the opposite direction, which releases the friction discs. At this time, the spider gear stops because the friction discs are no longer rotating. When the clutch assembly is released (separator plates and friction discs separated), cooling oil flows through the cooling oil valve to lubricate and cool the discs.

1-12. DIRECT DRIVE DRY BRAKE ASSEMBLY. (See Figure 1-6.) The dry brake assembly is an external band-type with mechanical linkage. The dry brake assembly includes a brake wheel, brake band assembly, brake lever assembly, adjusting link, brake link,

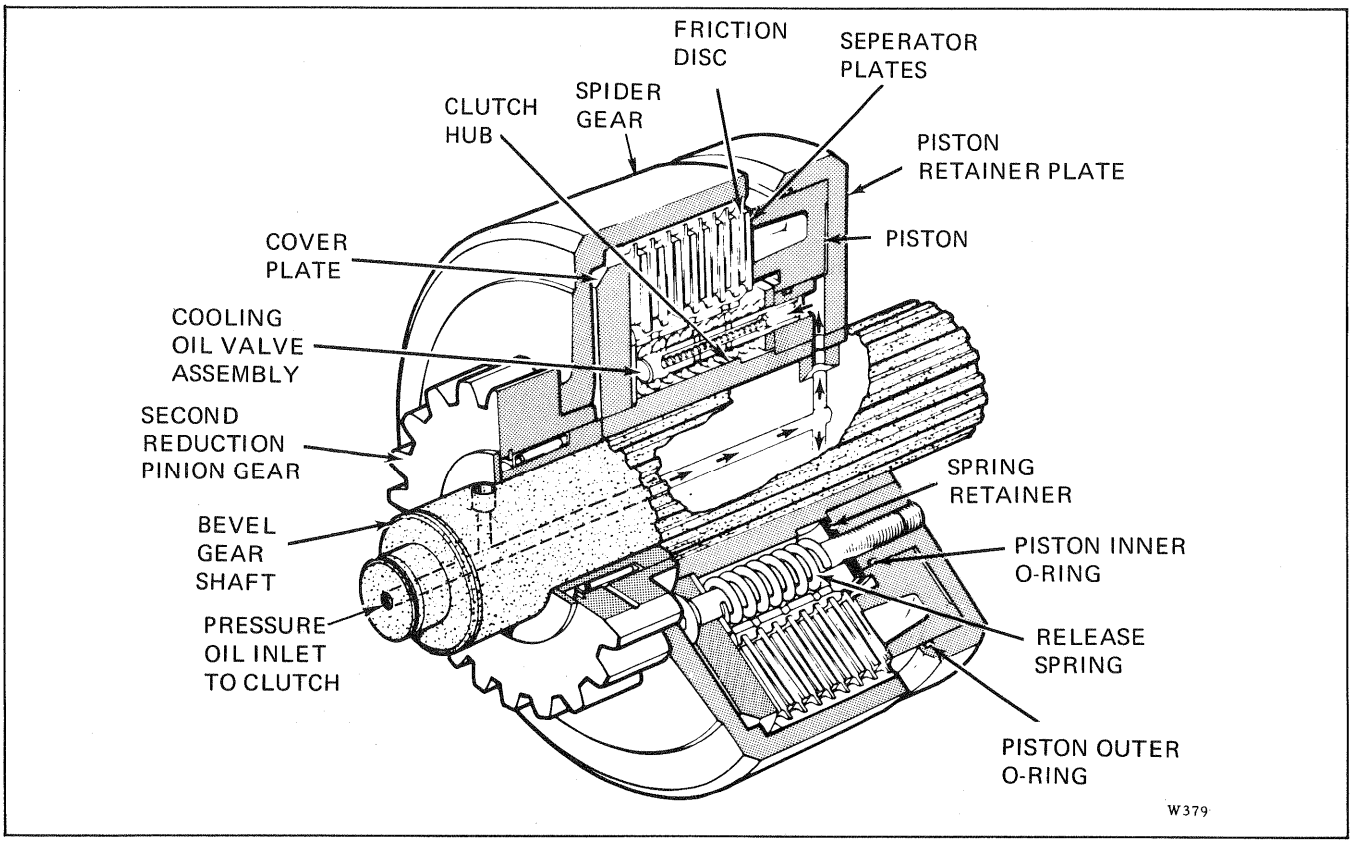


FIGURE 1-5. POWER CONTROLLED OIL CLUTCH ASSEMBLY

and brake crank assembly. The cast-iron brake wheel is splined to the LH side of the brake shaft and is retained by a snap ring. The brake band assembly has oilite-bushed pin bores welded to each end. A segmented lining is riveted to the brake band. When the control cable is pulled, the crank assembly rotates and causes the lever assembly to apply the brake. This brake assembly is self-energizing.

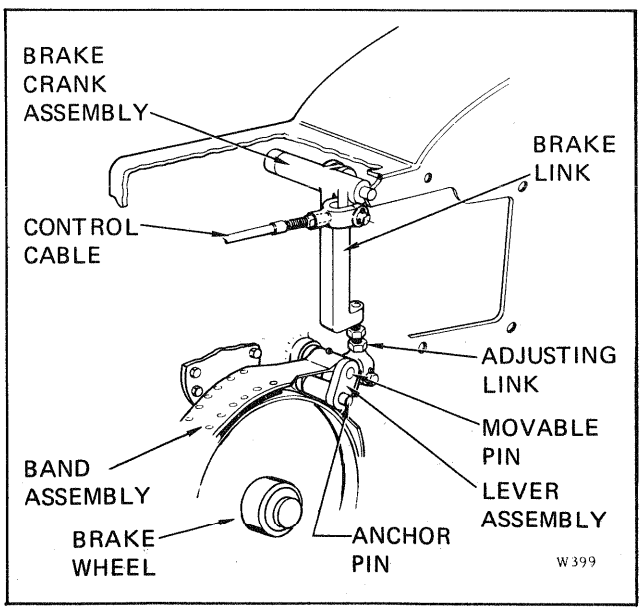


FIGURE 1-6. DIRECT DRIVE DRY BRAKE ASSEMBLY

1-13. DIRECT DRIVE AUTOMATIC BRAKE ASSEMBLY (OPTIONAL). (See Figure 1-7.) The automatic brake assembly consists primarily of a brake wheel, hub, pawl assembly, drag rings, oil seals, ball bearings, cover, and vent plug. The hub is splined to the brake shaft and is retained by a snap ring.

1-14. The brake wheel has an internal ratchet ring and revolves around the hub on two ball bearings, except when the pawl assembly engages the ratchet ring and locks up the hub and wheel. The pawl assembly and drag rings are attached to the hub and the position of the pawl is such that it will retract and not engage the ratchet when the winch gear train rotation is forward (line in). As soon as the rotation direction reverses (line out), the pawl is caught by the ratchet teeth, the brake will lock up and stop any pay out of line when the brake handlever is set.

1-15. POWER CONTROLLED OIL BRAKE ASSEMBLY. (See Figure 1-8.) The oil brake assembly consists primarily of a cover, belleville spring, thrust ring, piston housing, piston, cage, hub, pressure plate, eleven friction discs, ten separator plates, and eight push rods. The separator plates are dished

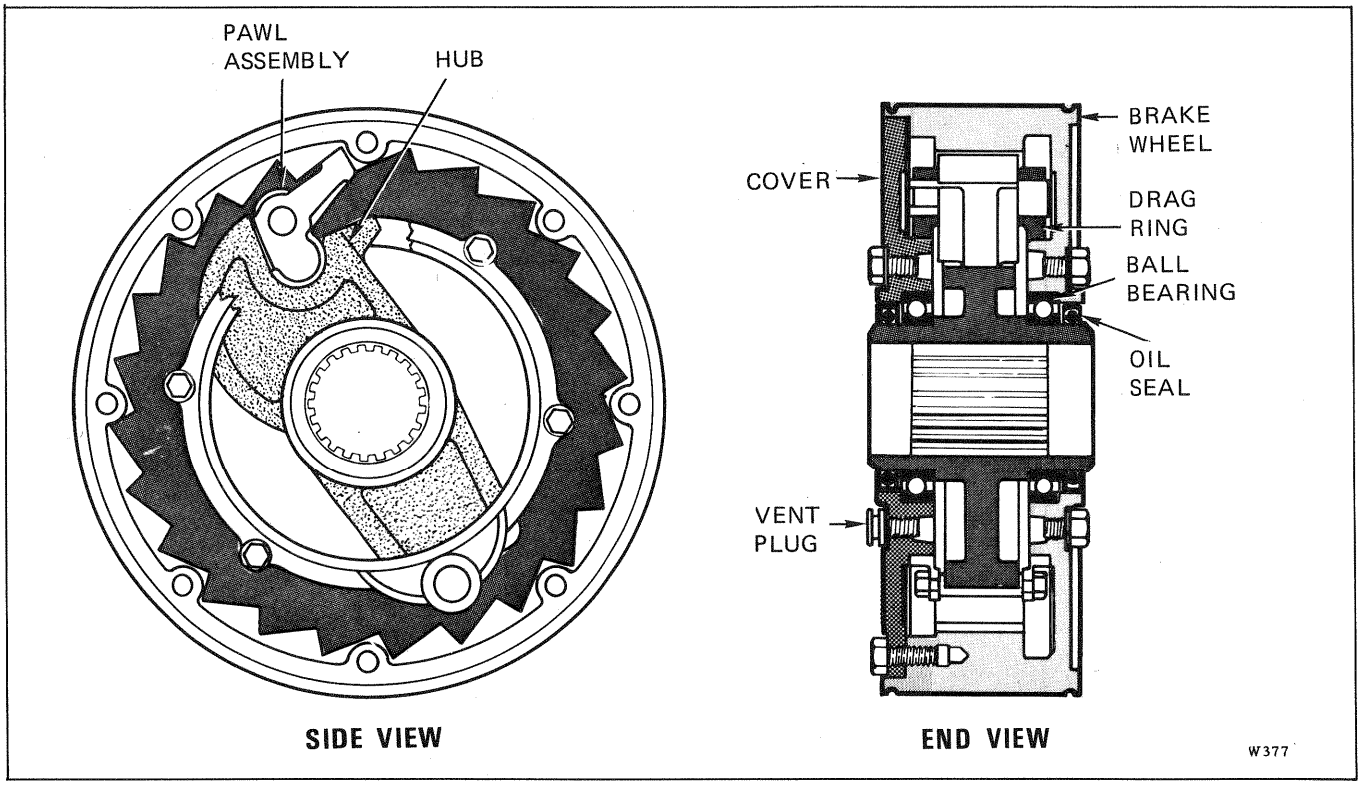


FIGURE 1-7. DIRECT DRIVE AUTOMATIC BRAKE ASSEMBLY (OPTIONAL)

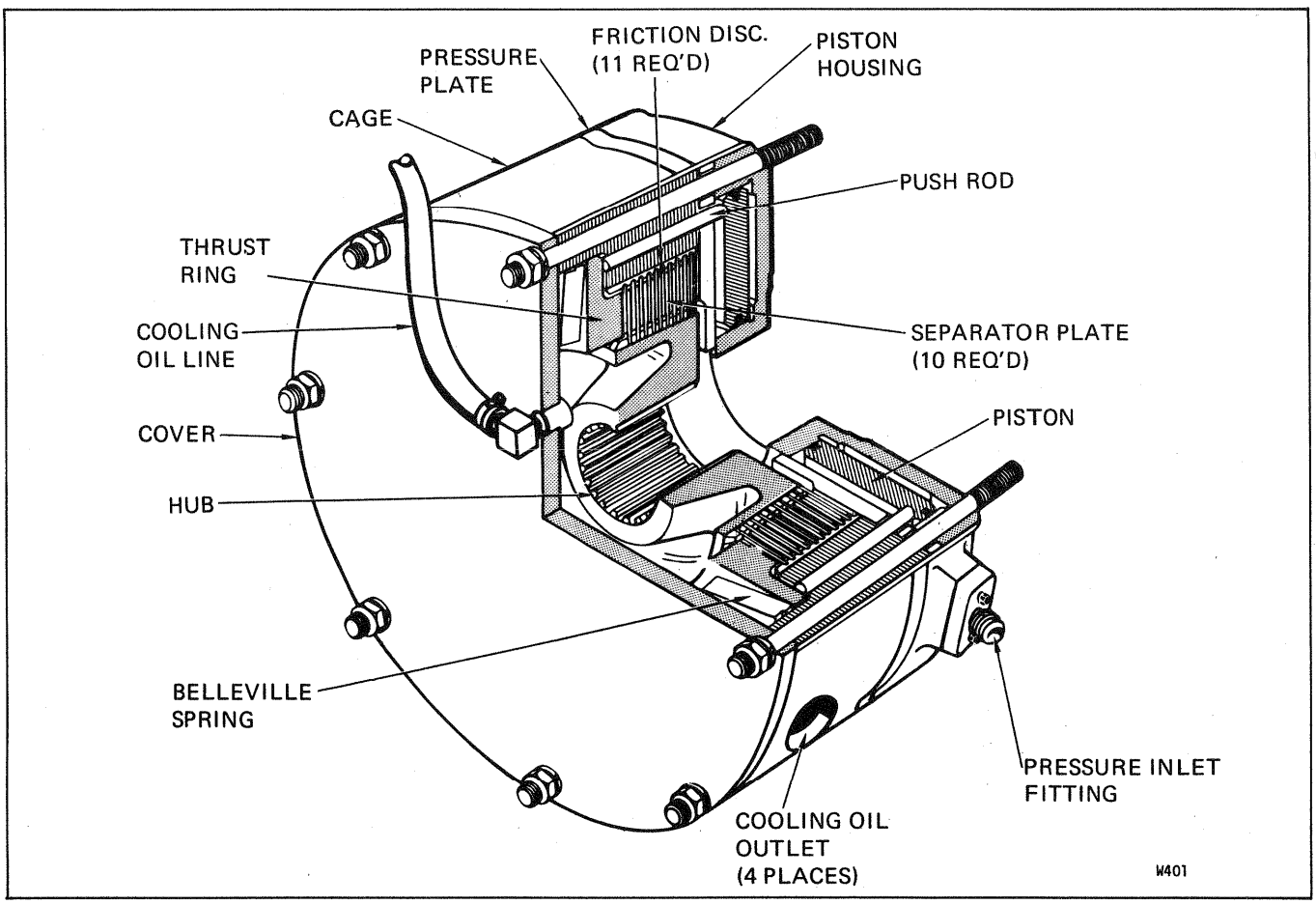


FIGURE 1-8. POWER CONTROLLED OIL BRAKE ASSEMBLY

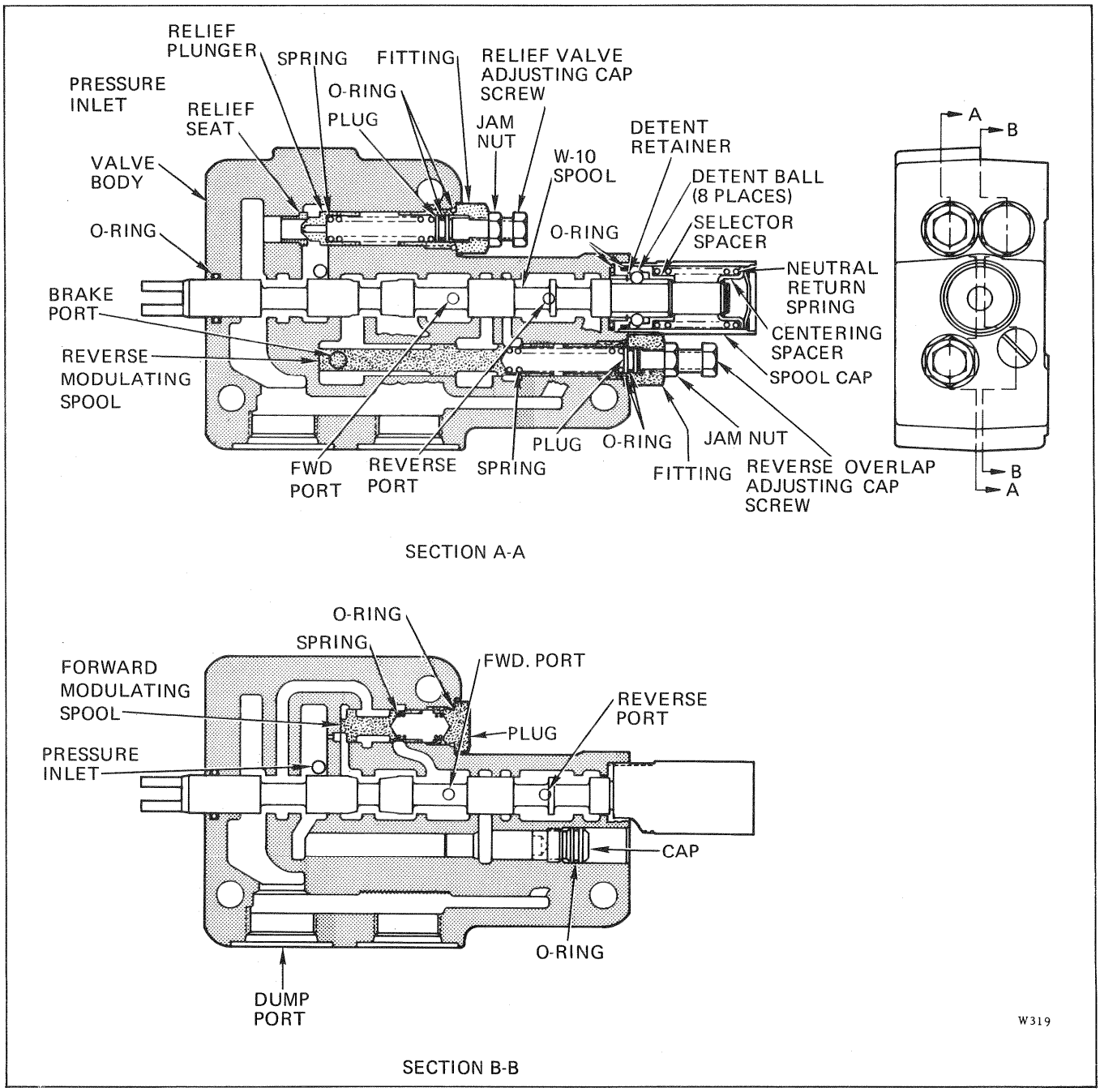


FIGURE 1-9. CONTROL VALVE ASSEMBLY, POWER CONTROLLED WINCH

and have internal lugs that are indexed with the external splines on the hub. The external lugs of the friction discs are indexed with the internal splines of the cage. The hub is splined to the LH side of the brake shaft and is retained by a snap ring.

1-16. The cage is secured by eight studs between the brake cover and pressure plate. The belleville spring pushes against the thrust ring which compresses the friction disc assembly. Since the friction discs are splined to the stationary cage and separator plates to the shaft through the hub, this will prevent the brake shaft from turning, thus applying the brake. The brake is released by hydraulic pressure input between the piston and piston housing. The oil forces the piston out, pushing the push pin, thrust ring, and belleville spring away, releasing the friction disc assembly.

1-17. CONTROL VALVE ASSEMBLY (POWER CONTROLLED WINCH). (See Figure 1-9.) The control valve assembly is used to control the flow of hydraulic oil to and from the oil brake and clutch. The valve assembly is an open center valve consisting primarily

of a valve body, relief valve assembly, a control spool assembly, and forward and reverse overlap valves. Passages within the valve body connect the spool bores with inlet, forward, reverse, brake, brake cooling oil and dump ports either directly or through varying flow paths governed by the spool. Moving the spool connects these passages to obtain the desired hydraulic oilflow or pressure buildup. The relief valve assembly consists of a plunger and seat, plunger spring, adjusting capscrews and jam nut, special fitting, O-ring plug and O-ring seal.

1-18. The adjusting capscrew varies the spring pressure against the plunger which regulates the hydraulic system maximum pressure. The control spool assembly consists primarily of a spool (W-10), detent balls, retainer, neutral return spring, snap ring, O-rings, and cap assembly. A ring provides a mechanical stop for the spool in the forward position. In the reverse position, spool travel is limited by spool contact with the detent balls. Further spool travel in the reverse direction will cause the detent balls to lock the spool in the brake-off position. The neutral return spring ensures that the control spool returns to NEUTRAL when the handlever is released or moved out of detent. The forward overlap valve consists primarily of a spool, spool spring, and plug. The spool serves as a secondary control device by moving against spring force when hydraulic pressure against the spool face has risen to 20 PSI. The resulting movement of the spool aligns a pressure passage with the forward clutch port. The reverse overlap consists of a spool, spool spring, adjusting capscrew and jam nut, special fitting, O-ring plug and O-ring seals. The spool serves as a secondary control device by moving against spring force when hydraulic pressure against the spool face has risen to 120 PSI. The resulting movement of the spool aligns a pressure passage with the reverse clutch port. The adjusting capscrews vary the spring loading on the spool and allow precise adjustment for the reverse clutch engagement pressure.

1-19. CLUTCH COOLING OIL RELIEF VALVE ASSEMBLY (POWER CONTROLLED WINCH). (See Figure 1-10.) The clutch cooling oil relief valve is a spring-loaded, poppet-type valve installed in the control valve rear dump port. The valve consists of a fitting assembly, poppet, plug, spring, O-ring seals, and back-up washer. The fitting assembly serves as a housing for the other parts. The plug has a stem which serves as a guide for the poppet. The poppet shaft serves as a guide for the spring. One O-ring seals the plug in the fitting assembly and the other O-ring, with a back-up washer, seals the fitting assembly in the control valve dump port. The cooling oil relief valve is a low-pressure valve that provides sufficient back pressure to ensure that all cavities in

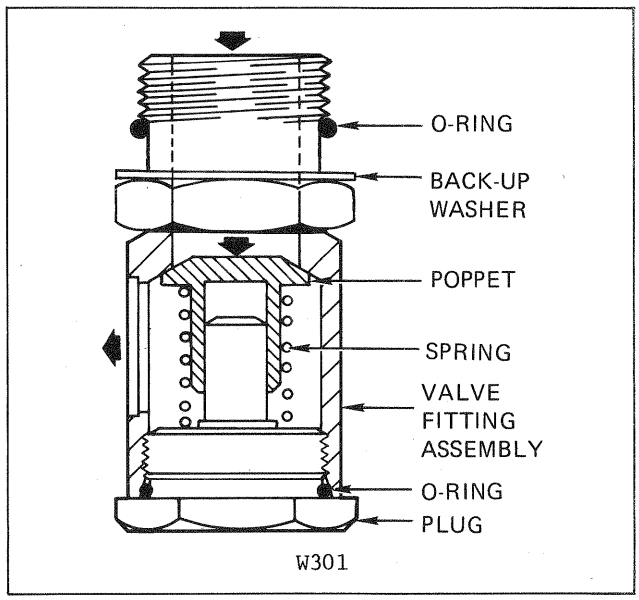


FIGURE 1-10. COOLING OIL RELIEF VALVE ASSEMBLY, POWER CONTROLLED WINCH

the control valve, clutch engagement lines, and brake release line are filled with oil and that enough oil flows to the clutch discs to remove excess heat. Discharged oil from the relief valve is dumped to the winch lower brake compartment through an outlet port in the valve fitting assembly and drain hose.

1-20. BRAKE COOLING OIL RELIEF VALVE ASSEMBLY (POWER CONTROLLED WINCH). (See Figure 1-11.) The brake cooling oil relief valve is a spring-loaded poppet type valve installed as a plug in the control valve front dump port. The valve

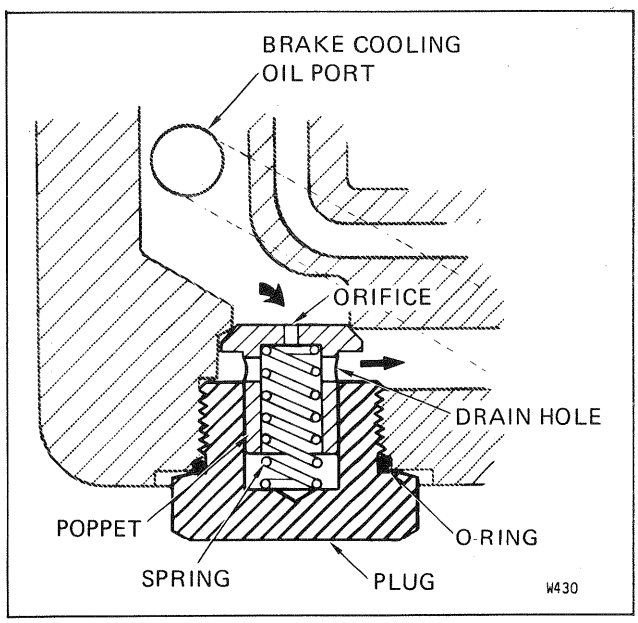


FIGURE 1-11. BRAKE COOLING OIL RELIEF VALVE ASSEMBLY, POWER CONTROLLED WINCH

consists of a poppet, plug, spring and O-ring seal. The seat for the poppet and mating threads for the plug are part of the control valve port. The spring is retained in the poppet bore and holds the poppet against the seat. The poppet shaft is guided by the plug bore. The O-ring seals the plug in the control valve port. An orifice is drilled in the poppet head and outlet holes are drilled in the poppet shaft to allow some oil to flow through the valve at a controlled back pressure. When the oil is cold or too thick to flow properly through the orifice, an excessive back pressure will build up and force open the poppet against the spring to relieve the pressure. This prevents excessive pressure build-up in the brake cooling oil line which might interfere with normal brake release.

1-21. Handling Gear.

1-22. DIRECT DRIVE WINCH. (See Figure 1-12.) The handling gear used to control the operation of the Direct Drive winch consists of a clutch handlever, brake handlever assembly and mounting bracket with

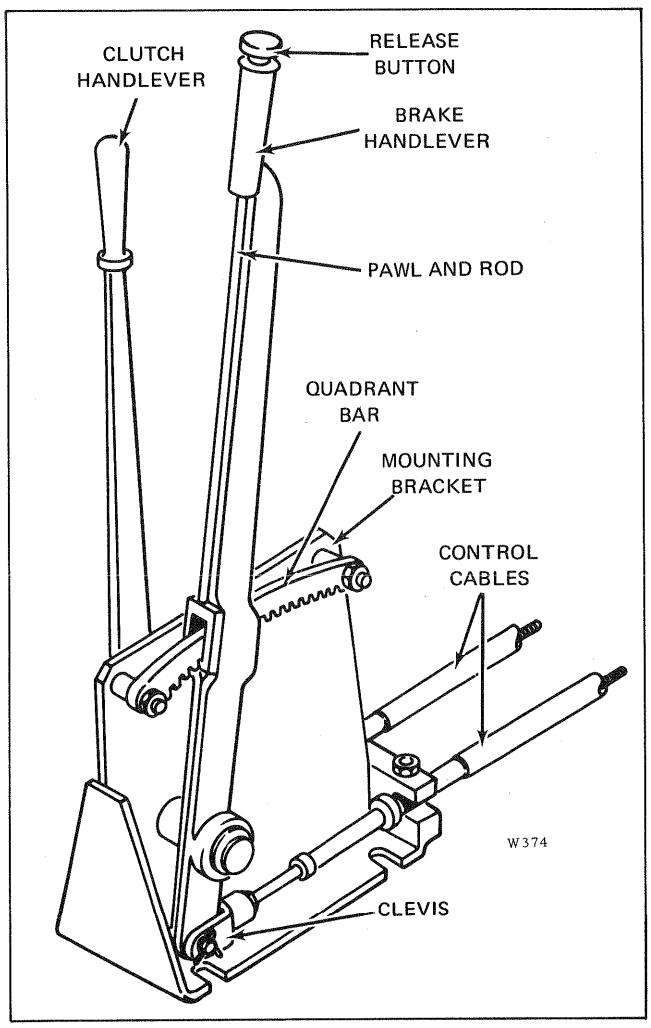


FIGURE 1-12. DIRECT DRIVE HANDLING GEAR

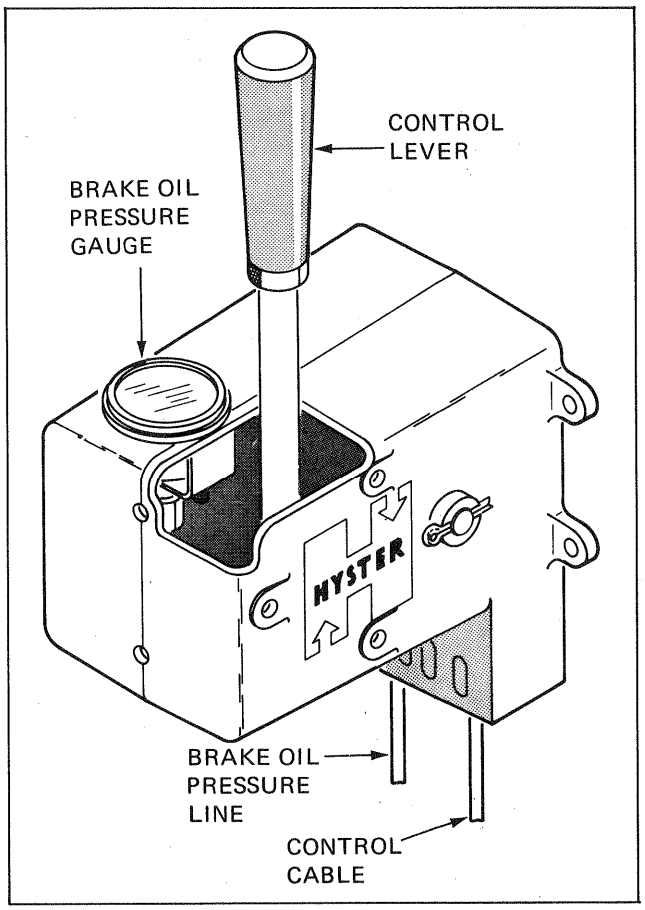


FIGURE 1-13. POWER CONTROLLED HANDLING GEAR

an attached quadrant bar. The handling gear is mounted at the front, left-hand side of the operator's seat. The clutch handlever controls the dental clutches through a control cable attached to the bottom of the handlever. The brake handlever can be positioned and locked at various positions along the quadrant bar. The position of the handlever along the quadrant bar determines the extent that the brake is applied or released. A release button at the top of the brake handlever must be depressed before the handlever can be moved forward to release the brake.

1-23. POWER CONTROLLED WINCH. (See Figure 1-13.) The handling gear for the power controlled winch has only one hand control lever. The control lever assembly consists mainly of a housing, handlever assembly, pivot pin, and pressure gauge. The handlever assembly is mounted on the pivot pin within the housing. A push-pull cable links the handlever to the winch control valve spool. Threaded ends on the push-pull cable allow for adjustment of the control valve spool. The housing is usually mounted on the RH side of the operator's seat and is positioned so that the handlever moves from right to left to obtain FORWARD (line in) position, and left to right to obtain

REVERSE (line out) position. The pressure gauge indicates operating brake release pressure.

1-24. FUNCTIONAL DESCRIPTION.

1-25. Direct Drive Gear Train. (See Figure 1-14.)

1-26. The PTO shaft assembly rotates clockwise as viewed from the front of the tractor. Torque is transmitted from the PTO bevel pinion gear to the bevel gear shaft ring gear. This causes the bevel gear shaft to rotate clockwise as viewed from the LH side. In Neutral, the bevel gear shaft, the bevel ring gear, the spacers, and the dental clutches rotate, but the pinion gears do not. This is because neither clutch is engaged. In Forward, the LH dental clutch is moved toward the LH side to engage the forward second reduction pinion gear. This will cause torque to be transferred from the pinion gear to the brakeshaft second reduction gear, forcing the brakeshaft assembly to rotate counterclockwise. The brakeshaft intermediate pinion gear will now turn the large intermediate gear, causing the intermediate shaft assembly to rotate clockwise. The intermediate shaft drum pinion gear will now turn the large drum gear and drum counterclockwise. In Reverse, the RH dental clutch is moved toward the RH side to engage the reverse second reduction pinion gear. This will cause torque to be transferred from the pinion gear to the large intermediate gear, causing the intermediate shaft assembly to rotate counterclockwise. The intermediate shaft pinion gear will now turn the large drum gear and drum clockwise.

1-27. Power Controlled Gear Train. (See Figure 1-14.)

1-28. The PTO shaft assembly rotates clockwise as viewed from the front of the tractor. Torque is transmitted from the PTO bevel pinion gear to the bevel gear shaft ring gear. This causes the bevel gear shaft to rotate clockwise as viewed from the LH side. In Neutral, the bevel gear shaft, the bevel ring gear, the spacers, and the oil clutches rotate, but the second reduction pinion gears do not. This is because neither clutch is engaged. In Forward, the LH (forward) oil clutch assembly is locked-up to the forward spider gear by hydraulic pressure. This will cause torque to be transferred from the forward second reduction pinion gear to the brakeshaft second reduction gear forcing the brakeshaft assembly to rotate counterclockwise. The brakeshaft pinion gear will now turn the large intermediate gear causing the intermediate shaft assembly to rotate clockwise. The intermediate shaft drum pinion gear will now turn the large drum gear and drum counterclockwise. In Reverse, the RH reverse oil clutch assembly is locked-up to the reverse spider gear by hydraulic pressure. This will cause torque to be transferred from the reverse second reduction pinion gear to the large intermediate gear causing the intermediate shaft assembly to rotate counterclockwise. The intermediate shaft drum pinion gear will now turn the large drum gear and drum clockwise.

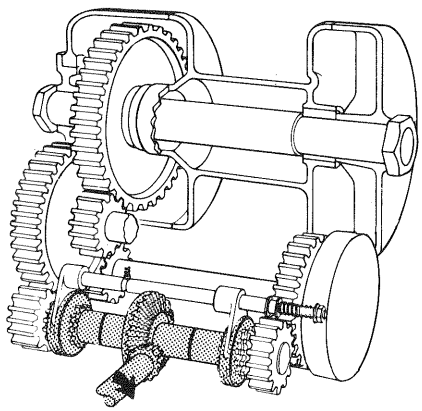
1-29. Hydraulic System. (See Figure 1-15.)

1-30. The hydraulic system consists primarily of a foot valve suction filter, hydraulic pump assembly, pressure filter, control valve assembly, forward oil clutch, reverse oil clutch, oil brake, pressure gauge, clutch cooling oil relief valve, brake cooling oil relief valve, and associated hydraulic lines. The hydraulic pump assembly supplies oil necessary for operation of the system. The filters remove contaminates from the oil. The control valve, which is actuated by the handling gear, distributes and regulates the flow of hydraulic oil. The forward and reverse oil clutches lock-up and transmit torque under high oil pressure and disengage when under low pressure. The oil brake releases under high oil pressure, fully applies under no or low oil pressure, and partially applies under intermediate pressure. The pressure gauge is mounted on the handling gear and indicates brake release pressure. The clutch cooling oil relief valve regulates oil flow to dump and provides enough back pressure to ensure adequate oil flow for cooling the clutches when disengaged. The brake cooling oil relief valve regulates oil flow from the front to the rear low pressure sections of the control valve to ensure adequate back pressure for cooling oil to the brake. The valve also protects the brake system from over-pressure, which could cause trouble in releasing the brake.

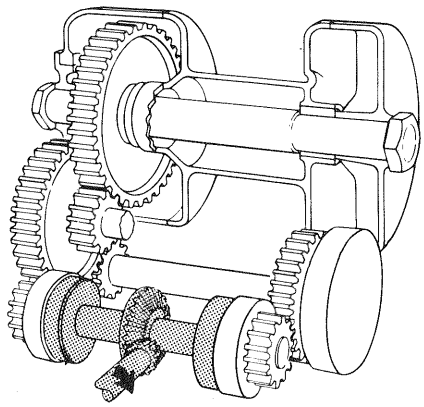
1-31. OPERATIONAL MODES. There are five modes of winch operation. These modes are as follows (refer to paragraphs 1-32 through 1-37):

1. NEUTRAL
2. FORWARD (line in)
3. BRAKE INCHING (inching line out)
4. REVERSE (line out)
5. BRAKE OFF (semi-free spool).

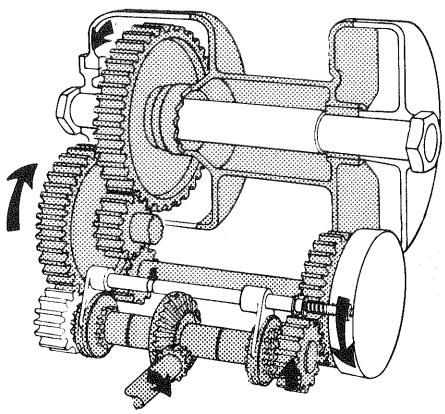
1-32. HYDRAULIC SYSTEM IN NEUTRAL. (See Figure 1-16.) The system is placed in NEUTRAL by moving the single control handlever to the Neutral position. The handlever transmits this movement through the mechanical push-pull cable from the spring-loaded control valve spool. With the spool in



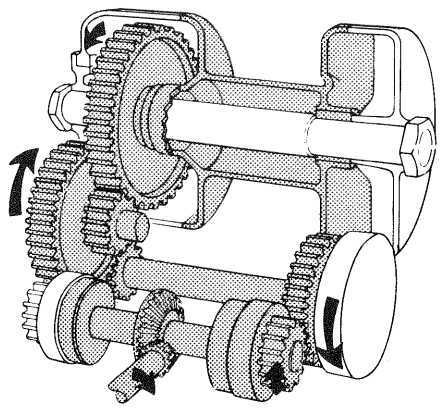
NEUTRAL, DIRECT DRIVE



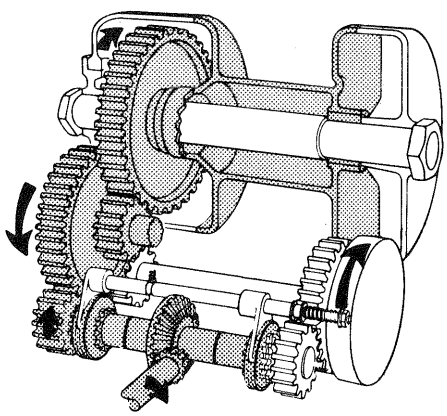
NEUTRAL, POWER CONTROLLED



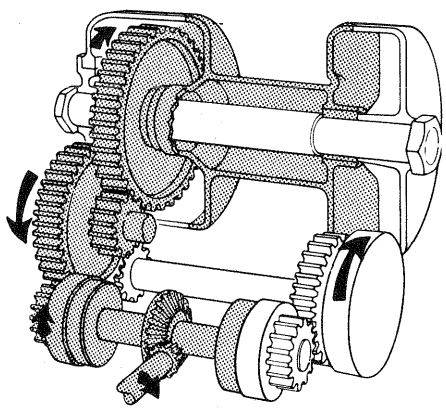
FORWARD, DIRECT DRIVE



FORWARD, POWER CONTROLLED



REVERSE, DIRECT DRIVE



REVERSE, POWER CONTROLLED

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FIGURE 1-14. TORQUE TRANSFER

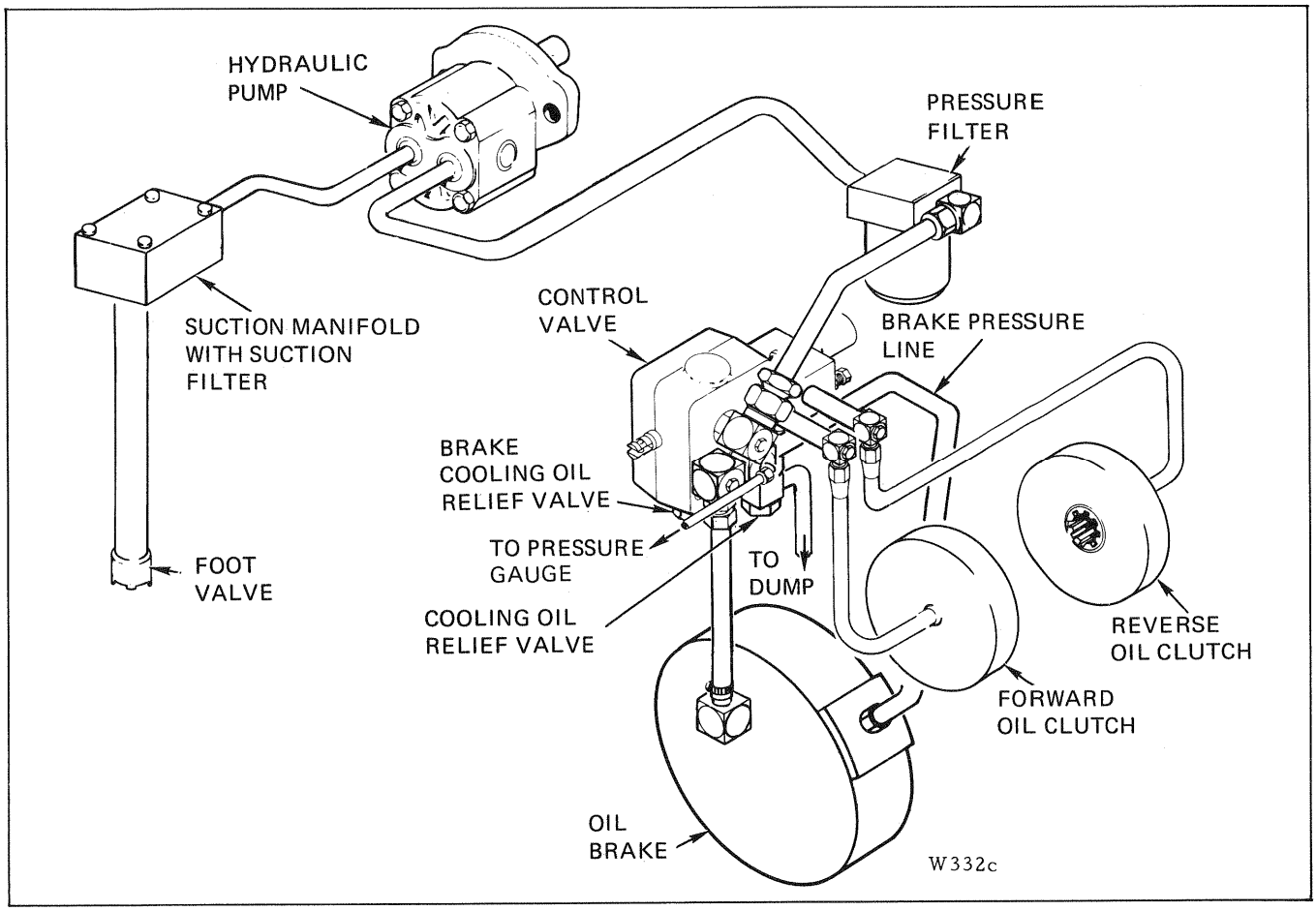


FIGURE 1-15. HYDRAULIC SYSTEM INTERCONNECTION DIAGRAM

the neutral position, the hydraulic pump draws oil from the reservoir, through the foot valve and suction filter, and delivers it through the pressure filter to the control valve inlet port. The neutral spool position allows the oil to flow through the open center valve into the low pressure core passage, and out the dump port with only enough flow restriction to ensure all cavities of the valve remaining full while undergoing normal leakage rates. The only hydraulic work that is done by the oil, other than maintaining leakage flow, is to open a spring loaded poppet in the cooling oil relief valve. This relief valve is located in the control valve dump port and opens when hydraulic pressure, in the working portion of the hydraulic system, rises above 2 PSI. This pressure is not high enough to release the brake or actuate either oil clutch assembly but is adequate to lubricate and cool both clutches and keep the flow cavities full. The excess oil flowing past the open poppet is discharged directly to dump.

1-33. HYDRAULIC SYSTEM IN FORWARD. (See Figure 1-17.) The system is placed in FORWARD (line in) by pulling the control handlever all the way back to the Forward position. The handlever transmits this movement to the control spool in the control valve by mechanical push-pull cable and the position is recognized by a detent stop without lock. With the spool in the Forward position, the open-center flow passage around the spool and out the dump port is blocked. Pressure builds up rapidly in the control valve pressure inlet and forward overlap valve supply core passages. Oil flows from the inlet passage to the brake release port and forward overlap pilot passage through a 0.095 inch diameter orifice. This orifice momentarily retards pressure buildup and softens clutch engagement and brake release. As soon as oil pressure at the pilot end of the forward overlap valve spool rises above 20 PSI, the spring-loaded spool will move, shunting high pressure oil directly from the forward overlap valve supply core passage to the forward clutch port passage where it is transmitted to the clutch for engagement pressure. The forward overlap valve ensures that brake release pressure buildup leads the forward clutch engagement pressure buildup by 20 PSI.

A second high-pressure supply to the forward clutch port passage is opened by the control valve control spool during the final 20 percent of spool travel to the

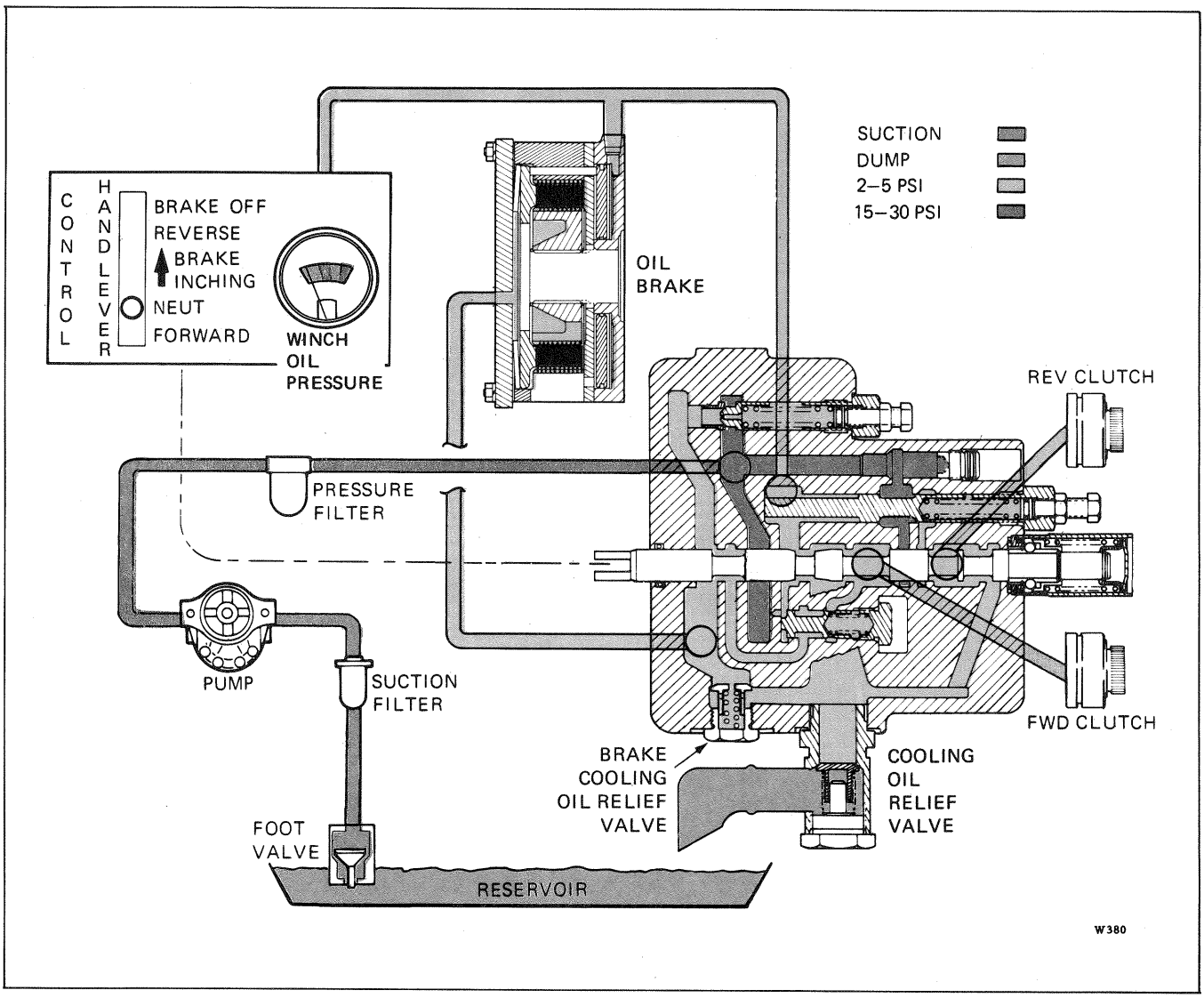


FIGURE 1-16. HYDRAULIC SYSTEM IN NEUTRAL

FORWARD position. At this point, high-pressure oil from the forward clutch port bleeds through an orifice in the spring side of the forward overlap valve spool, balancing the pressure at the pilot end of the spool and returning the overlap valve to the off position.

When inlet pressure starts to rise above 220 (±5) PSI, the excess pressure forces the spring-loaded plunger in the relief valve off its seat and high-pressure oil is bypassed to the forward, low-pressure core passage, relieving the excess pressure. A 0.03 inch diameter orifice in the relief valve plunger tip dampens surges by allowing oil, trapped behind the plunger, to escape slowly. Bypassed oil from the relief valve mixes with other leakage oil in the forward, low-pressure passage. This oil is transmitted to the oil brake for cooling and lubrication. The low-pressure oil for brake cooling is regulated by an orifice in the brake cooling oil relief valve poppet. After passing through the orifice and drain holes in the poppet, the residual oil mixes with other leakage oil in the rear, low-pressure passage. If the oil is too cold and thick to pass freely through the poppet orifice, the back pressure in the forward passage will increase until the poppet opens at 20 PSI, allowing oil to bypass the orifice to reduce back pressure. Oil in the rear, low-pressure passage leaves the control valve through the reverse clutch line for clutch cooling. Any residual oil is discharged to dump through the cooling oil relief valve.

1-34. HYDRAULIC SYSTEM IN BRAKE INCHING. (See Figure 1-18.) The system is placed in BRAKE INCHING (gradual brake release) by slowly pushing the control handlever out of the Neutral position toward the Reverse position. The handlever transmits this movement to the control valve control spool

by a mechanical push-pull cable. The hydraulic system flow conditions at the beginning of initiating brake inching are as described in paragraph 1-33. As the control spool moves off the Neutral position, the open-center flow passage around the spool and into the low pressure core passage is blocked. Pressure builds up in the control valve inlet passage with a restricted flow outlet to the brake release port passage through a 0.095 inch diameter orifice. The orifice retards brake-release pressure buildup. Pressure buildup is further retarded by a restricted flow path to dump around a tapered portion of the control spool. The farther the control spool moves away from Neutral, the more the taper closes off the flow path to dump and the higher the build-up of brake-release pressure. When the brake-release pressure reaches approximately 120 PSI, the pressure is sufficient to shift the reverse overlap valve spool. This connects the brake release pressure port to the reverse clutch port. The reverse overlap valve assures that brake release pressure buildup leads the reverse clutch engagement pressure buildup by approximately 110 PSI. In this way, brake release is progressive and gradual with full release occurring after positive reverse clutch engagement.

When pressure starts to rise above 220 (±5) PSI, in the control valve cavity at the inlet port, the excess pressure forces the spring-loaded plunger in the relief valve off its seat and high-pressure oil is bypassed to the forward, low pressure passage, relieving the excess pressure. A 0.031 inch diameter orifice in the relief valve plunger tip dampens surges by allowing oil, trapped behind the plunger, to escape slowly. Bypassed oil from the relief valve mixes with other leakage oil and the combined discharge from the control valve is pressure regulated by the brake cooling oil relief valve. Some of this regulated leakage is routed to the forward clutch for cooling the clutch discs.

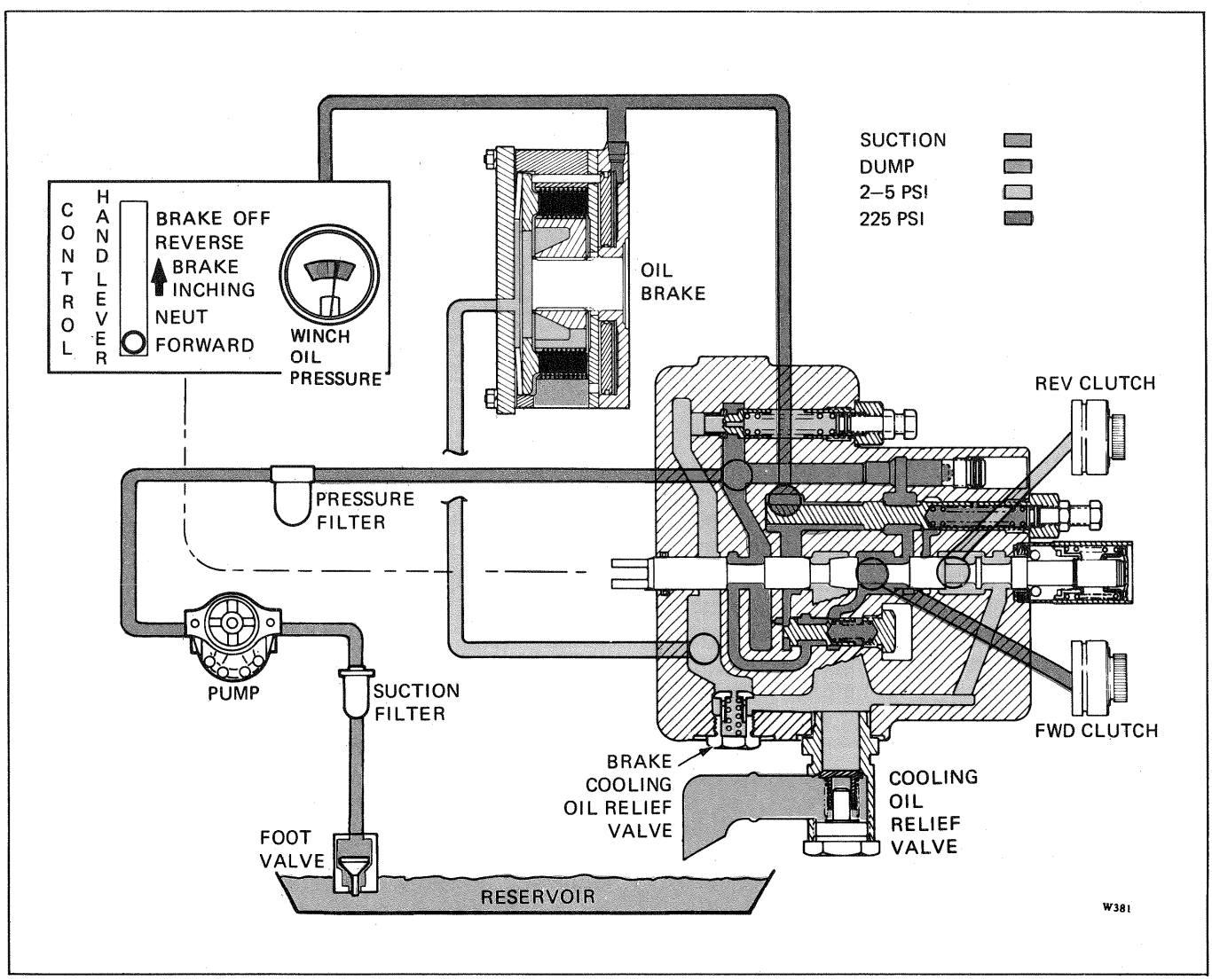


FIGURE 1-17. HYDRAULIC SYSTEM IN FORWARD

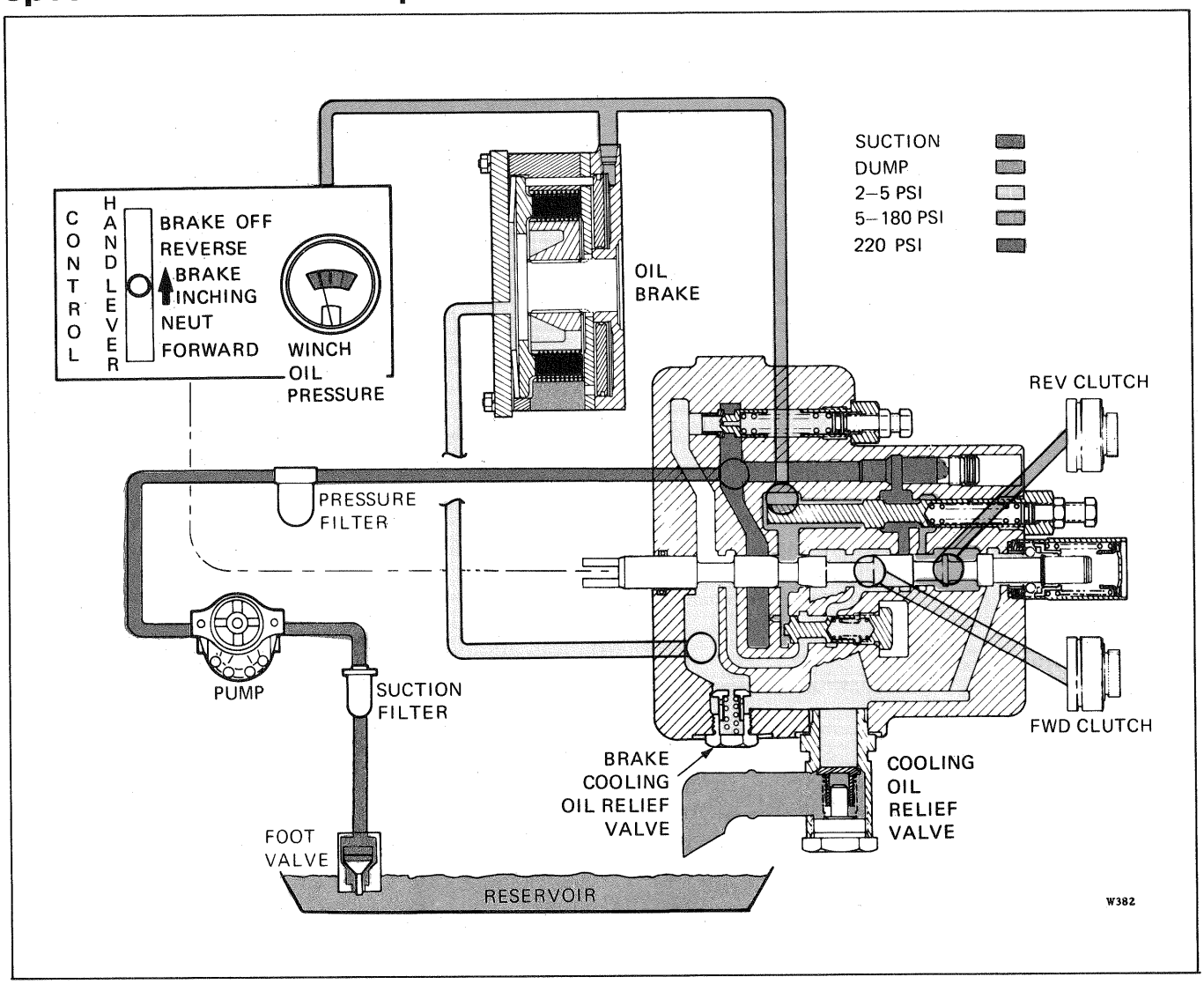


FIGURE 1-18. HYDRAULIC SYSTEM IN BRAKE INCHING

1-35. HYDRAULIC SYSTEM IN REVERSE. (See Figure 1-19.) The system is placed in REVERSE (line out) by pushing the control handlever to the Reverse position. The handlever transmits this movement to the control valve spool by a mechanical push-pull cable. With the control spool in the Reverse position, the open-center passage around the spool and into the low-pressure passage is blocked. Pressure builds up rapidly in the control valve inlet passage and in the passage leading to a cavity just forward of the reverse clutch port. A space between lands on the control spool provides a passage between the two cavities so that oil is routed to the reverse clutch.

Brake release pressure is built up downstream of a 0.095 inch diameter orifice between the valve inlet port and the brake release port. During the final increment of spool travel, oil is routed around a spool land to the brake release port. A tapered relief on the control spool land prevents rapid pressure buildup. Pressure in the inlet port is regulated to 220 (±5) PSI by the control valve relief valve as described in paragraph 1-33.

1-36. HYDRAULIC SYSTEM IN BRAKE OFF. (See Figure 1-20.) The system is placed in BRAKE OFF (free-spool) by pushing the control handlever all the way forward to the BRAKE OFF position. The handlever transmits this movement to the valve spool by a mechanical push-pull cable. The hydraulic system flow conditions prior to initiating handlever movement are the same as in NEUTRAL or REVERSE. With the control spool in the BRAKE OFF position, all high-pressure flow paths are blocked by the valve spool except the pressure flow path to the brake release port. Pressure increases rapidly in the brake port and fluid pressure to the brake piston fully releases the brake. Brake release pressure is

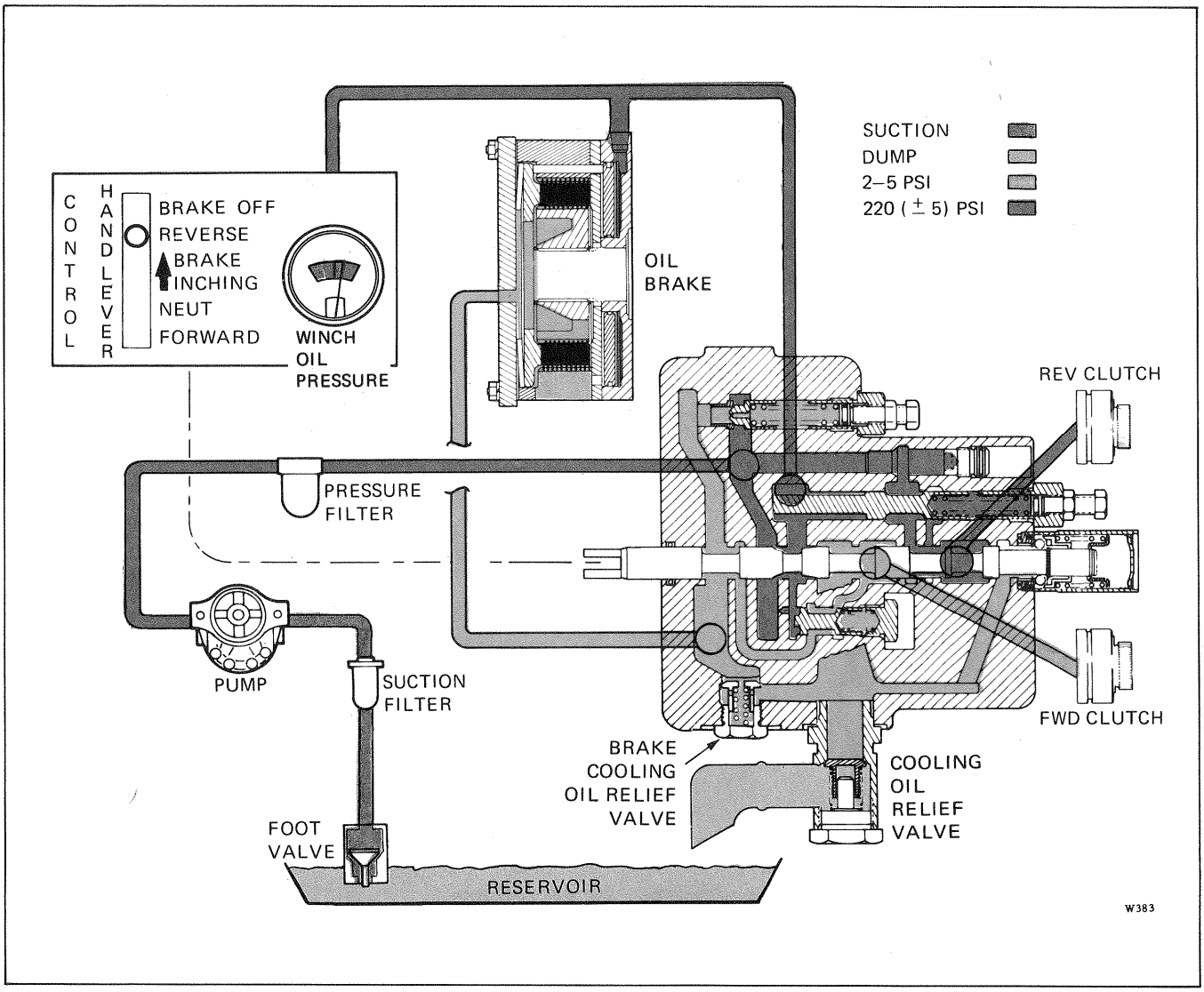


FIGURE 1-19. HYDRAULIC SYSTEM IN REVERSE

limited by the relief valve as described in paragraphs 1-33 through 1-35. Some bypassed relief valve oil and leakage oil is transmitted to the brake and forward and reverse clutch assemblies to provide cooling for the brake and clutch discs. Operation in BRAKE OFF should be limited to avoid overheating the oil as the pump works against full output pressure in this position. The Brake Off operation is not a true free-spool condition as it does not mechanically disengage the drum pinion gear.

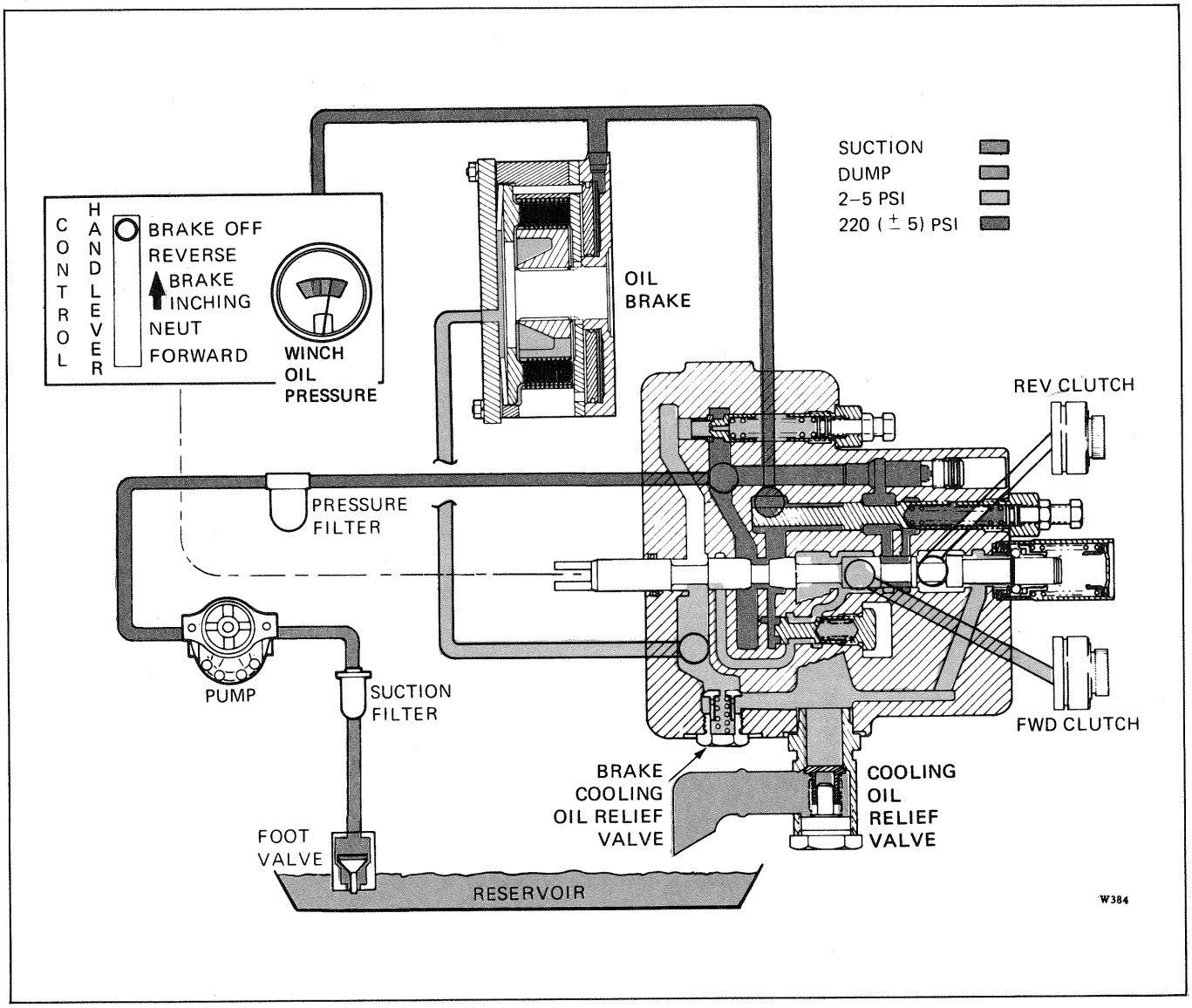


FIGURE 1-20. HYDRAULIC SYSTEM IN BRAKE OFF

2-1. GENERAL.

2-2. The W12D Direct Drive and Power Controlled winches use tractor mounted controls. These controls allow the operator to either pay-out or pull-in line easily without leaving the tractor. Every operator must know the exact operating procedure of these controls prior to operating the winch.

2-3. OPERATIONAL PRECAUTIONS.

2-4. Observe the following PRECAUTIONS to prevent injury to personnel and damage to equipment.

a. Report damage or erratic operation of winch or pressure gauge immediately.

b. Do not stand while operating the tractor or the winch.

c. Make sure that instruments and controls are operative before operating the unit.

d. Do not use control levers or handles as machine mounting assists.

e. Do not use control levers or handles as hangers for clothing, water bags, grease guns, lunch pails, etc.

f. Do not permit personnel in the control area when working or making checks on the machine.

g. Do not allow riders on the machine or load.

h. Use extreme care when operating close to other machines.

i. Avoid operating near other personnel.

j. Do not stand or permit others to stand in the bight (loop) of a cable.

k. Do not stand or permit others to stand near the winch or cable when it is under tension.

l. Do not use a damaged cable (broken wire or strands, or a decrease in the diameter of the cable, are warning signs).

m. Do not leave the tractor while the winch line is under tension.

n. Do not anchor a double or two-part line to the winch.

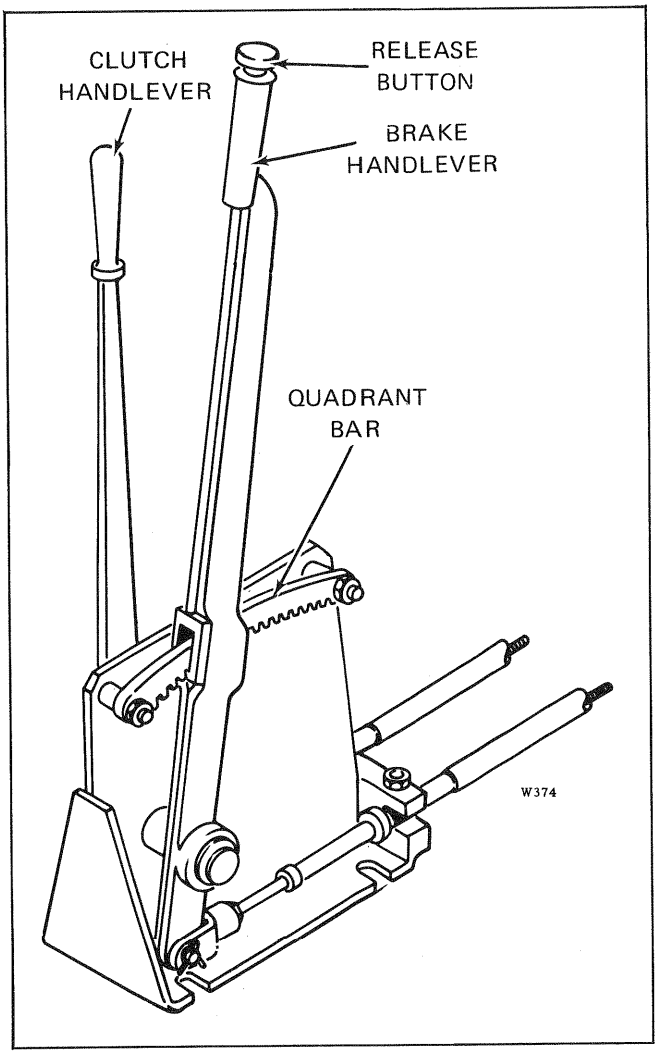


FIGURE 2-1. OPERATING CONTROLS FOR DIRECT DRIVE WINCH

o. Never attempt to clean, oil, or adjust a machine while it is in motion.

p. Authorized operators only!

2-5. OPERATING PROCEDURES.

2-6. Direct Drive Winch. (See Figure 2-1.)

2-7. SETTING THE BRAKE. To set the brake, pull back on the Brake Handlever. The brake will remain in BRAKE APPLIED until manually moved.

2-8. RELEASING THE BRAKE. To release the brake, proceed as follows:

a. Pull back slightly on the Brake Handlever.

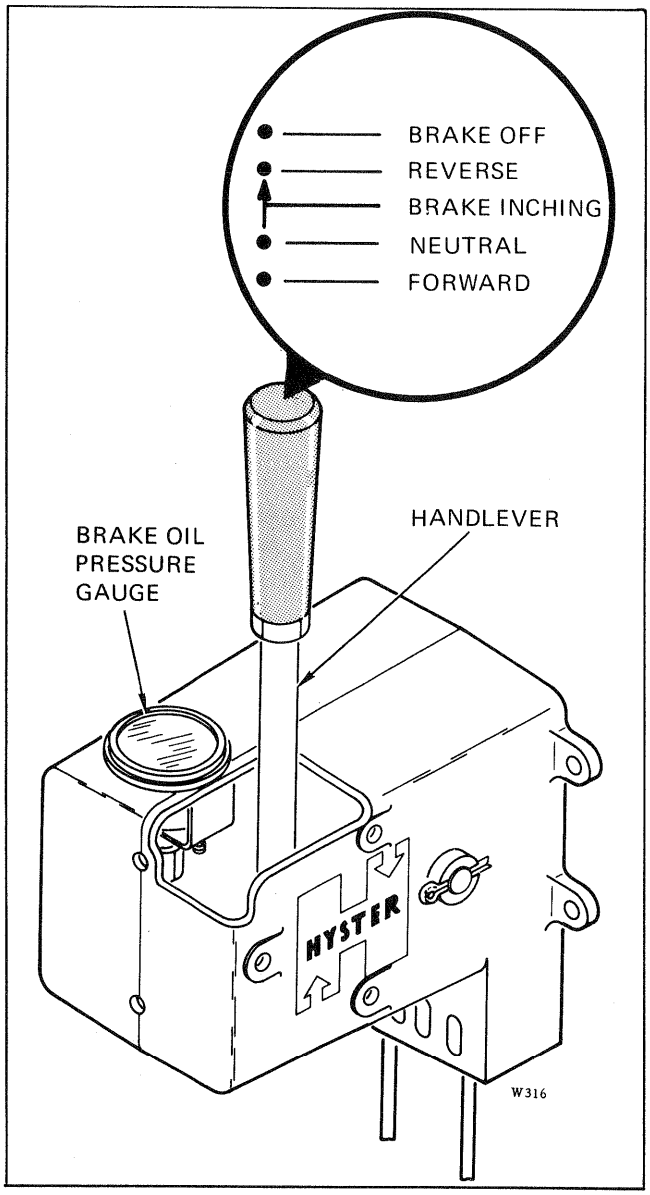


FIGURE 2-2. OPERATING CONTROL FOR POWER CONTROLLED WINCH

b. Depress the release button.

c. Push the brake Handlever forward.

NOTE If the winch is equipped with the optional automatic brake (see Figure 1-7), the winch may haul-in line with the mechanical brake set, but the brake must be released to pay-out line.

2-9. HAULING-IN LINE. To haul-in line, proceed as follows:

a. Disengage the tractor master clutch.

b. Place the tractor transmission in NEUTRAL.

c. Pull the Clutch Handlever all the way back to the FORWARD position.

d. Release the brake (refer to paragraph 2-8).

e. Engage the tractor master clutch.

NOTE Line speed is varied by throttling the tractor engine.

2-10. STOPPING THE WINCH. To stop the winch, proceed as follows:

a. Throttle down the engine.

b. Disengage the tractor master clutch and apply the brake at the same time.

NOTE The brake may be set before the tractor master clutch is disengaged if the winch is equipped with an automatic brake.

2-11. PAYING-OUT LINE UNDER POWER. To pay-out line under power, proceed as follows:

a. Disengage the tractor master clutch.

b. Push the winch Clutch Handlever past NEUTRAL and into REVERSE.

c. Release the brake (refer to paragraph 2-8).

d. Engage the tractor master clutch.

NOTE Line speed is varied by throttling the engine.

2-12. SHIFTING TO NEUTRAL. To shift to NEUTRAL, proceed as follows:

a. Disengage the tractor master clutch.

b. Move the Clutch Handlever to NEUTRAL (straight up).

CAUTION Do not operate the winch while the tractor is in motion.

2-13. Power Controlled Winch. (See Figure 2-2.)

2-14. The single hand control lever is used to select any one of five modes of operation: NEUTRAL, FORWARD (line in), BRAKE INCHING (gradual brake release), REVERSE (line out) and BRAKE OFF (free-spooling). The Brake Inching position will be found useful where a finer control for paying out line is required, such as pipelining, matching pipe flanges, rescue work, etc. The Brake Off position allows semi-free-spool operation where cable can be payed out without power to the PTO drive shaft.

2-15. OPERATION. To operate the winch, proceed as follows:

a. For NEUTRAL, the handlever is spring-centered to NEUTRAL and will remain in this position until moved by hand. The handlever will automatically return to NEUTRAL from any position, except BRAKE-OFF. In NEUTRAL, the brake is fully applied. The winch brake oil pressure gauge will be in the lower green zone.

b. For FORWARD, pull handlever all the way to the left (toward operator) to the FORWARD position and hold. In FORWARD, the brake is completely released, the forward clutch engaged, and the drum will haul-in line at a rate dependent on load and tractor engine speed. The winch brake oil pressure gauge will be in the upper green zone.

CAUTION Do not stall the tractor converter for prolonged periods of time.

c. For BRAKE INCHING, ease handlever slowly to the right (away from operator) through the BRAKE INCHING band shown on decal near handlever. This will gradually release the brake. As the brake nears the release point, the tractor torque converter and winch reverse clutch will assume control of the load to inch line out under power. The winch brake oil pressure gauge will rise from the lower green zone, pass through the red zone, and remain in the upper green zone as the handlever approaches REVERSE.

d. For REVERSE, push the handlever to the right (away from operator) until a stop is felt and lever is in REVERSE. Hold in this position.

WARNING Do not force the lever past the stop. This will place the winch in the BRAKE OFF detent, resulting in possible uncontrolled line pay-out.

In REVERSE, the brake is completely released, the reverse clutch engaged, and the drum will pay out line against resistance of the tractor torque converter. Tractor engine speed may be increased from idle to increase line speed. The winch brake oil pressure gauge will rise quickly through the red zone to the upper green zone.

e. For BRAKE OFF, push the handlever all the way to the right (away from operator) into the BRAKE OFF detent position. The handlever will remain in this position until manually pulled out of detent. The winch brake oil pressure gauge will be in the upper green zone. In BRAKE OFF position, winch drum will free-spool.

CAUTION Do not operate winch for extended periods of time in the BRAKE OFF position. Overheating may result due to the hydraulic pump working continuously at full pressure output.

3-1. GENERAL.

3-2. Tables 3-1 and 3-2 are trouble analysis check charts that include the most common troubles that may be encountered, the probable cause of the trouble, and the corrective action that should be taken to restore the winch to normal operating condition. The information contained in Table 3-1 applies to the Direct Drive winch. The information contained in Table 3-2 applies to the Power Controlled winch.

TABLE 3-1. TROUBLE ANALYSIS CHECK CHART FOR DIRECT DRIVE WINCH (Sheet 1 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hard to Shift into Forward or Reverse	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Control cable improperly adjusted.	Check and adjust as necessary. Refer to paragraph 4-9.
	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Dental clutch too tight on hub teeth or teeth rough.	Remove dental clutch, dress teeth with fine stone, and replace parts if necessary.
Will Not Stay in NEUTRAL Position	Detent ball and spring damaged or sticking.	Replace spring if broken. Check that ball is free in the bore. Lubricate ball, spring and bore.
	Annular groove on shifter shaft elongated.	Replace shifter shaft.
	Dental clutches installed backwards.	Install the dental clutch so chamfered ramp will face pinion gear.
Jumps Out of Gear	Dental teeth worn.	Check for dental teeth wear on: a. Dental Clutch. b. Dental Clutch hub. c. Forward pinion gear. d. Reverse pinion gear. Replace above components if teeth are rounded.
	Shifter fork improperly positioned on the shifter shaft.	Check for loose anchor screw on: a. Forward shifter fork. b. Reverse shifter fork. Tighten securely and lock with lockwire.
	Dental clutches installed backwards.	Install the dental clutch so chamfered ramp will face pinion gear.
	Shifter forks installed backwards.	Install the shifter fork so anchored end faces toward the center of the winch.
Brake Not Holding or Hard to Apply	Water in brake compartment resulting from condensation or marine use.	Drain water from brake compartment each day if necessary.

TABLE 3-1. TROUBLE ANALYSIS CHECK CHART FOR DIRECT DRIVE WINCH (Sheet 2 of 2)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Brake Not Holding or Hard to Apply (Cont.)	Brake lining saturated with oil.	Replace lining, clean brake wheel and adjacent surfaces, locate and eliminate source of oil contamination.
	Improper clearance between brake band assembly and brake wheel.	Check that clearance is approximately 1/32-inch. Refer to paragraph 4-13.
	Worn brake lining.	Replace with new lining.
	Brake cable improperly adjusted.	Adjust cable ends so Brake Handlever applies brake before it reaches end of travel. Refer to paragraph 4-14.
	Brake control cable assembly not anchored securely.	Check for loose connection of control cable housing to the: a. Handling Gear mounting bracket. b. Winch control housing bracket. Tighten securely and lock with jam nut.
	Control cable damaged.	Check for pinched, rusted, or broken cable housing. Replace if found defective.
	Brake linkage set for overwind operation and winch is used for underwind operation.	Change linkage for underwind operation. Refer to paragraph 4-19.
	Brake linkage set for underwind operation and winch is used for overwind operation.	Change linkage for overwind operation. Refer to paragraph 4-15.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 1 of 4)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Erratic Operation	Low oil level.	Add oil as necessary. Refer to Table 4-1.
	Pump cavitating due to air leaks in hydraulic system.	Check the following for air leaks: a. Suction manifold cover gasket. b. Suction manifold cover screw tightness. c. Suction hose to manifold connection. d. Suction hose to pump connection. e. Suction hose for cracks or collapsed condition. f. Suction manifold pick-up tube weld connection to manifold. g. Pump shaft seal. **CAUTION** Use only Hyster Approved gaskets and hoses.
	Stuck or clogged suction foot valve.	Clean or replace foot valve as necessary to remove restriction.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 2 of 4)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Erratic Operation (Cont.)	Push-pull cable out of adjustment.	Check for proper adjustment as outlined in paragraph 4-27. Adjust if necessary. Double check push-pull cable casing to be sure it is securely anchored on both ends.
	Tractor engine idling too low.	Adjust to correct idle RPM.
	Oil viscosity too high.	Drain oil and refill with specified hydraulic oil. Refer to Table 4-1.
	Oil too cold.	Allow oil to warm before operating the winch.
	Low oil pressure.	Refer to LOW OIL PRESSURE troubleshooting procedures.
Low Oil Supply Pressure	Refer to ERRATIC OPERATION troubleshooting procedures.	
	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary.
	Defective or improperly adjusted relief valve.	Check relief valve setting with pressure gauge as outlined in paragraph 4-25. Replace Relief Valve Assembly if defective. **NOTE** Do not rely on brake release pressure gauge when adjusting relief pressure. Always use a calibrated gauge.
	Brake Oil Pressure Gauge defective.	Check gauge reading against a calibrated gauge. Replace if gauge is faulty.
	Internal slippage (leakage) in the pump.	Check pump for pressure output only after all the above checks have been made.
Oil Brake Not Releasing	Refer to LOW OIL PRESSURE troubleshooting procedure.	
	Refer to LOSS OF OPERATING OIL PRESSURE IN BRANCH LINES troubleshooting procedure.	
	Brake cooling oil relief valve stuck in closed position.	Check relief valve poppet for freedom of operation (refer to Section 5). Check for correct specification spring (refer to Table 1-1).
	Friction disc/separator plate pack thickness excessive.	Replace high limit discs and plates with thinner ones (see Figure 5-17).

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 3 of 4)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Overheating	Operating in BRAKE-OFF too long.	Position handlever in NEUTRAL when free spool condition is not required. In BRAKE-OFF position the pump continually works against high pressure release.
	Spool travel improperly adjusted.	Check and adjust as necessary. Refer to paragraph 4-26.
	Excessive inching.	Allow oil to cool periodically. **NOTE** Install heat exchanger if excessive inching is necessary.
	Clutch cooling oil valve not opening.	Check and clean valve. Replace valve, if necessary (see Figure 5-6).
	Plugged suction filter.	Remove suction filter, clean, and replace. See Figure 4-3.
	High cooling oil pressure.	Check cooling oil pressure (refer to paragraph 4-25). Replace cooling oil relief valve assembly if reading is over 7 PSI at the forward or reverse port. Refer to paragraph 4-25, step u.
	Insufficient clutch assembly clearance.	Adjust to correct clearance. See Figure 5-12.
	Check causes listed above.	Check all points listed above.
Loss of Operating Oil Pressure in Branch Lines	Control valve spool travel improperly adjusted.	Check spools for correct travel. Refer to paragraph 4-26.
	Broken cast iron seal ring on the bevel gear shaft.	Replace: a. LH seal ring if low pressure is indicated when handlever is shifted to FORWARD. b. RH seal ring if low pressure is indicated when handlever is shifted to REVERSE. **NOTE** A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on bevel gear shaft and adjust if necessary to prevent additional breakage of seal rings. See Figure 5-16.
	Damaged bevel gear shaft seal ring grooves.	Check grooves for taper, scoring, and rust. Replace or rebuild shaft if surfaces between the inner side of groove and seal ring are not flat.
	Damaged bevel gear shaft bearing retainers.	Check retainers for grooves, scoring, and rust. Replace retainers if found defective.
	Defective spline seals on the bevel gear shaft.	Always replace these seals when the bevel gear shaft has been removed. See Figure 5-16.

TABLE 3-2. TROUBLE ANALYSIS CHECK CHART FOR POWER CONTROLLED WINCH (Sheet 4 of 4)

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Loss of Operating Oil Pressure in Branch Lines (Cont.)	Damaged clutch piston, piston retainer, or O-rings.	Check piston and piston retainer cavity for damage. Replace if scored or broken. Always replace both O-rings when clutch is repaired. See Figure 5-12.
	Clutch cooling oil valve plunger not seating.	Check and clean valve. Replace spring if weak or broken. See Figure 5-6.
	Damaged brake piston, piston housing, or O-rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace both O-rings when brake is repaired.
Oil Brake Slipping	Worn friction discs.	Replace the friction discs and separator plates if too thin or scored. See Figure 5-17 and Table 1-1.
	Notches worn in brake assembly cage or hub.	Replace the cage and/or hub. See Figure 5-17.
	Broken belleville spring.	Replace with a new spring. See Figure 5-17.
Brake Releases Before Clutch Engagement	Overlap valve in control valve not functioning or out of adjustment.	Check overlap valve springs (refer to Table 1-1). On reverse (line out), check adjustment of reverse overlap valve (refer to paragraph 4-25, step p).
High Oil Level	Engine oil transferring past pump shaft seal into winch hydraulic system (only on some tractor applications).	Replace pump shaft seal. Refer to Section 6.
Forward or Reverse Oil Clutch Not Engaging	Refer to LOW OIL SUPPLY PRESSURE troubleshooting procedures.	
	Refer to LOSS OF OPERATING OIL PRESSURE IN BRANCH LINES troubleshooting procedures.	
	Worn friction discs.	Replace the friction discs and separator plates if too thin or scored. See Figure 5-17 and Table 1-1.
Forward or Reverse Oil Clutch not Releasing	Broken or weak release springs.	Check springs and replace as necessary (see Figure 5-6 and Table 1-1).
	Too little operating clearance in friction disc pack.	Measure gap between cover plate and top friction disc and adjust shims as necessary (see Figure 5-12).

4-1. GENERAL.

4-2. This section contains instructions for performing SafeGuard Maintenance, adjustment of control linkage and the hydraulic system, and for unit painting. All instructions given in this section may be performed using standard shop tools. No special tools are required.

4-3. SafeGuard MAINTENANCE.

4-4. SafeGuard Maintenance is a planned maintenance program which includes periodic inspection and lubrication. SafeGuard Maintenance should be correlated closely with the operating hours recorded on the tractor SERVICE METER.

4-5. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE. (Refer to Table 4-1.)

4-6. The following table is outlined in two schedules: the hourly schedule and the periodic schedule. If the unit is operated more than eight hours per day, the hourly schedule should be followed. If the unit is operated eight hours or less per day, the periodic schedule should be followed.

TABLE 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 1 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
4-1	Oil Level (Direct Drive)		√		C H A N G E		18 Gals.	SAE 90, MIL-L-2105B, for temperatures above +10°F. SAE 10, MIL-L-2104B, or MIL-L-45199 Series 3, for temperatures +10°F and lower.	Check winch oil at level plug Ⓐ on right side of winch. Add oil as required at plug Ⓑ. Drain oil at plug Ⓒ and Ⓓ. **NOTE** When checking winch oil level on winches mounted on powershift tractors, stop engine to obtain correct reading. For winches mounted on direct drive tractors, disengage tractor master clutch to obtain correct reading. **CAUTION** If winch is new or overhauled, drain after 50 hours of operation, then flush, refill, replace pressure filter element, and service suction filter.
4-1	Oil Level (Power Controlled)		√		C H A N G E		22 gals.	Automatic Transmission Fluid "DEXRON", for temperatures above -10°F. SAE 5W, MIL-L-2104B, or MIL-L-45199 Series 3, for temperatures -10°F and lower.	
4-1	Brake and Transmission Compartments (Direct Drive)		√				Variable	Water and/or oil.	Remove plug Ⓓ and drain any accumulation of water or oil in brake compartment. Replace plug Ⓓ. Loosen plug Ⓒ and drain any accumulation of water in

TABLE 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 2 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
	Brake and Transmission Compartments (Direct Drive) (Cont.)								transmission compartment. Tighten plug Ⓒ when oil appears.
2-1 2-2 2-3	Handling Gear	√					Few drops.	SAE 30.	Lubricate fulcrum pin connections and other moving parts at end of each eight hour shift.
4-1 4-2	Suction Filter (Power Controlled Only)			S E R V I C E			One	Refer to Parts Manual.	Remove suction filter Ⓔ, clean thoroughly, and reinstall. **CAUTION** If winch is new or overhauled, remove suction filter Ⓔ after first 50 hours of operation, clean thoroughly and reinstall. **CAUTION** Suction manifold cover gasket must be in good condition to prevent air leaks. Replace with Hyster approved gasket.
5-2 5-28	Suction Hose Clamps (Power Controlled Only)		√						Check both ends of suction hose to see that hose clamps are TIGHT. Retighten hose clamps as necessary.
5-2	Control Cables		√						Check both ends of each cable housing to see that they are securely anchored. Retighten set screw, U-bolt, or bracket bolt as applicable. Check winch end of power control cable for condition of roll pin anchor.
4-1	Automatic Brake (Optional, Direct Drive Only)				S E R V I C E			High temperature grease as follows: Atlantic Richfield (Thermogrease)	Remove automatic brake assembly Ⓕ. Disassemble and clean automatic brake assembly components. Pack the two bearings with a high temperature grease. Put

TABLE 4-1. SafeGuard MAINTENANCE AND SERVICE INSPECTION SCHEDULE (Sheet 3 of 3)

REFER TO FIG. NO.	ITEM	SCHEDULE (Hour/Period) 8/ dy	50/ wk	500/ 3 mo	1000/ 6 mo	2000/ 1 yr	QUAN.	TYPE	PROCEDURE
	Automatic Brake (Optional, Direct Drive Only) (Cont.)				S E R V I C E			Mobil Oil (Mobil-temp Grease #1) Shell Oil (Darina Grease 1) Standard Oil (Chevron Industrial Grease) Texaco (Thermatex EP #1) Union Oil (Strona HT-1) Sun Oil (Sunaplex 991 EP) BP Australia (Energrease HTB2)	a heavy film of high temperature grease on ratchet ring, pawl assembly, and hub. DO NOT completely fill automatic brake assembly with grease or attempt to grease brake through the vent plug. **CAUTION** Always install oil seals so that lips of both seals are pointing inward.
4-1	Cable Guide Rolls (Optional)	√						Multi-purpose Grease	Lubricate two grease fittings Ⓖ.
4-1	Fairlead (Optional)	√						Multi-purpose Grease	Lubricate six grease fittings Ⓗ.
4-1	Swiveling Drawbar (Optional)	√						Multi-purpose Grease	Lubricate one grease fitting Ⓙ.
4-1 4-2	Pressure Filter (Power Controlled Only)			C H A N G E			One	Refer to Parts Manual.	Replace with Hyster approved filter element Ⓚ. Coat O-ring and backup ring with multi-purpose grease to ensure a leak proof seal between filter and case.
5-23 (Step 17)	Bevel Gear Shaft Locknut					√		Refer to Parts Manual if necessary to replace lockwasher.	Pry lockwasher tangs away from locknut flats and retighten locknut to 200 ft-lbs torque. Bend lockwasher tangs over locknut flats

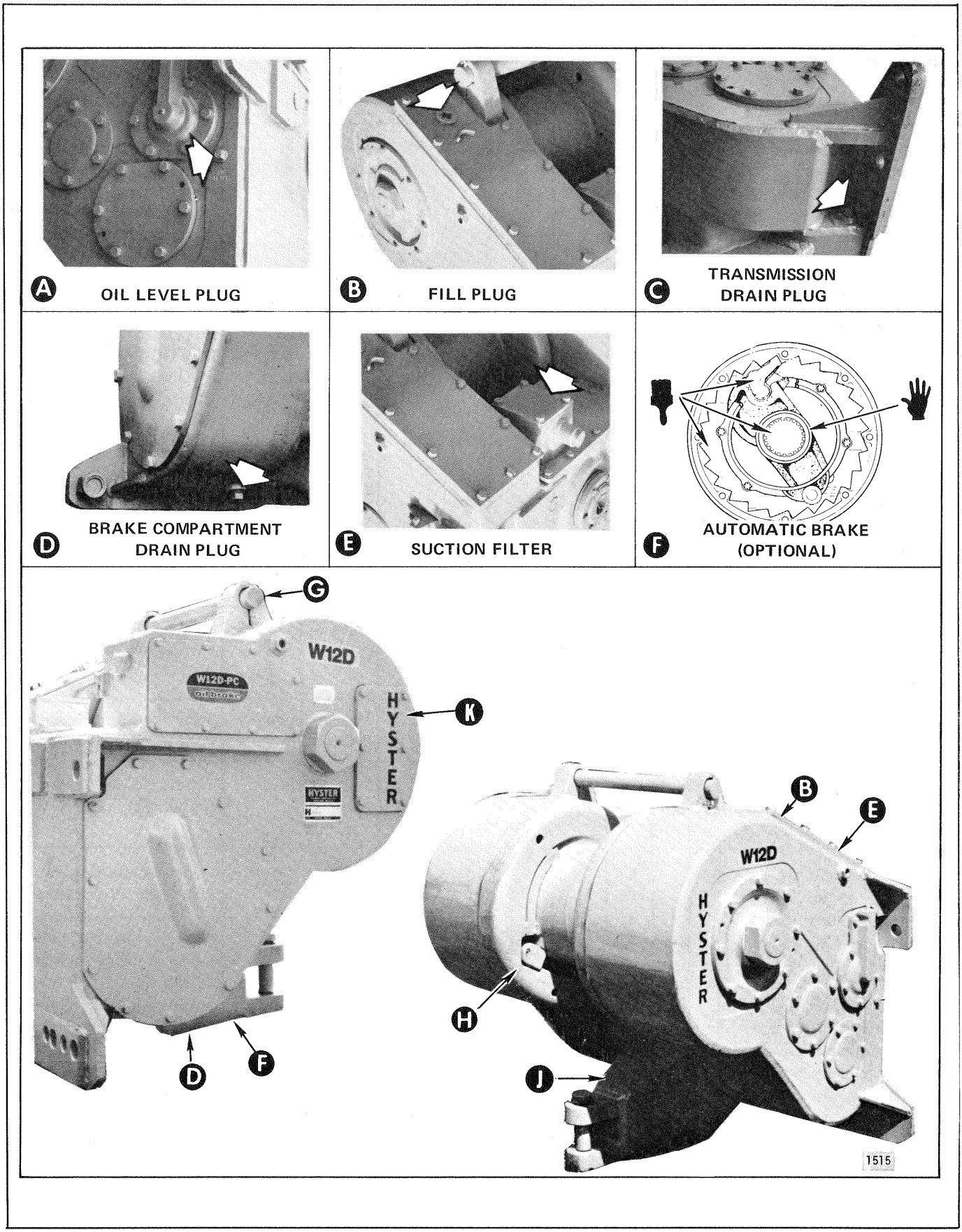


FIGURE 4-1. SafeGuard MAINTENANCE DIAGRAM (Sheet 1 of 2)

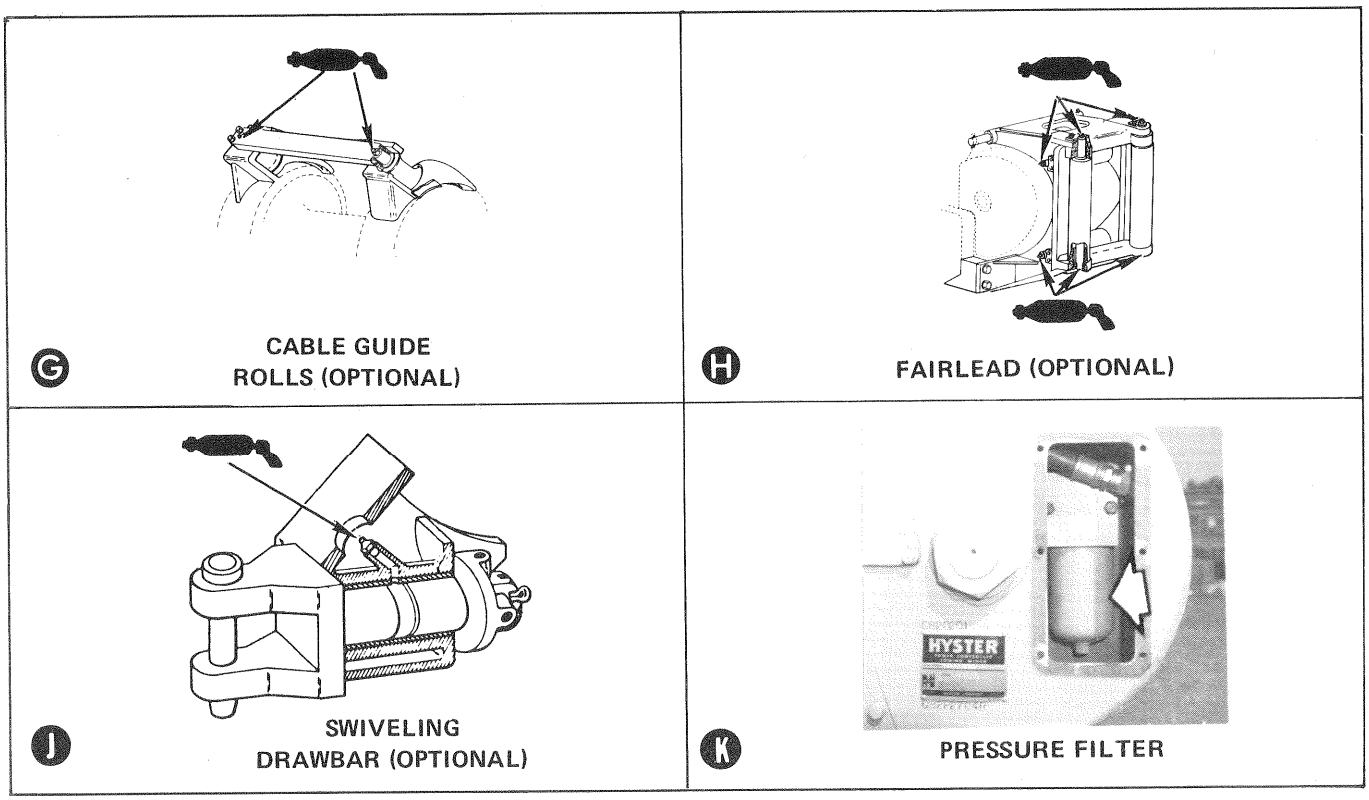


FIGURE 4-1. SafeGuard MAINTENANCE DIAGRAM (Sheet 2 of 2)

4-7. ADJUSTMENT PROCEDURES.

4-8. Adjustment procedures for the Direct Drive Winch are limited to minor mechanical linkage adjustments. The Power Controlled Winch requires mechanical adjustments plus hydraulic system adjustments.

4-9. Direct Drive Winch Adjustments.

4-10. The handling gear that controls the operation of the Direct Drive Winch is mounted to the floor plate at the front, left-hand side of the operator's seat. The linkage connecting the handlevers to the clutches and brake will periodically require minor adjustments.

4-11. ADJUSTING CLUTCH HANDLEVER. (See Figures 4-3 and 4-5.) The Clutch Handlever (see figure 2-1) controls the dental clutches through a plastic-lined control cable. The shifter assembly will shift the dental clutches into Forward, Neutral and Reverse positions when the control cable to the clutch handlever is properly adjusted. To adjust the position of the clutch handlever, proceed as follows:

a. Remove the LH upper access cover and place the shifter assembly in Neutral (see Figure 4-3). The shifter linkage will positively detent to this position.

b. Adjust the rod end, at the winch control housing, so that the small cable grommet, threaded cable end, and center of the clevis pin are at dimension Ⓐ and Ⓑ, respectively, as shown in Figure 4-5.

NOTE Allow the clutch handlever to move as adjustments are made. The shifter assembly must remain in NEUTRAL during the measurement check.

c. Adjust the control cable rod end at the clutch handlever as necessary to place the handlever vertical and in the center of travel when the shifter assembly is in Neutral.

d. Make sure that Forward, Neutral and Reverse can be selected by moving the Clutch Handlever to the corresponding position.

e. Ensure that jam nuts are tight at each cable rod end.

4-12. ADJUSTING THE BRAKE. The Brake Handlever (see Figure 2-1) controls the brake through a plastic-lined control cable (identical to the clutch control cable). Two adjustments are required to properly adjust the brake. Refer to paragraphs 4-13 and 4-14.

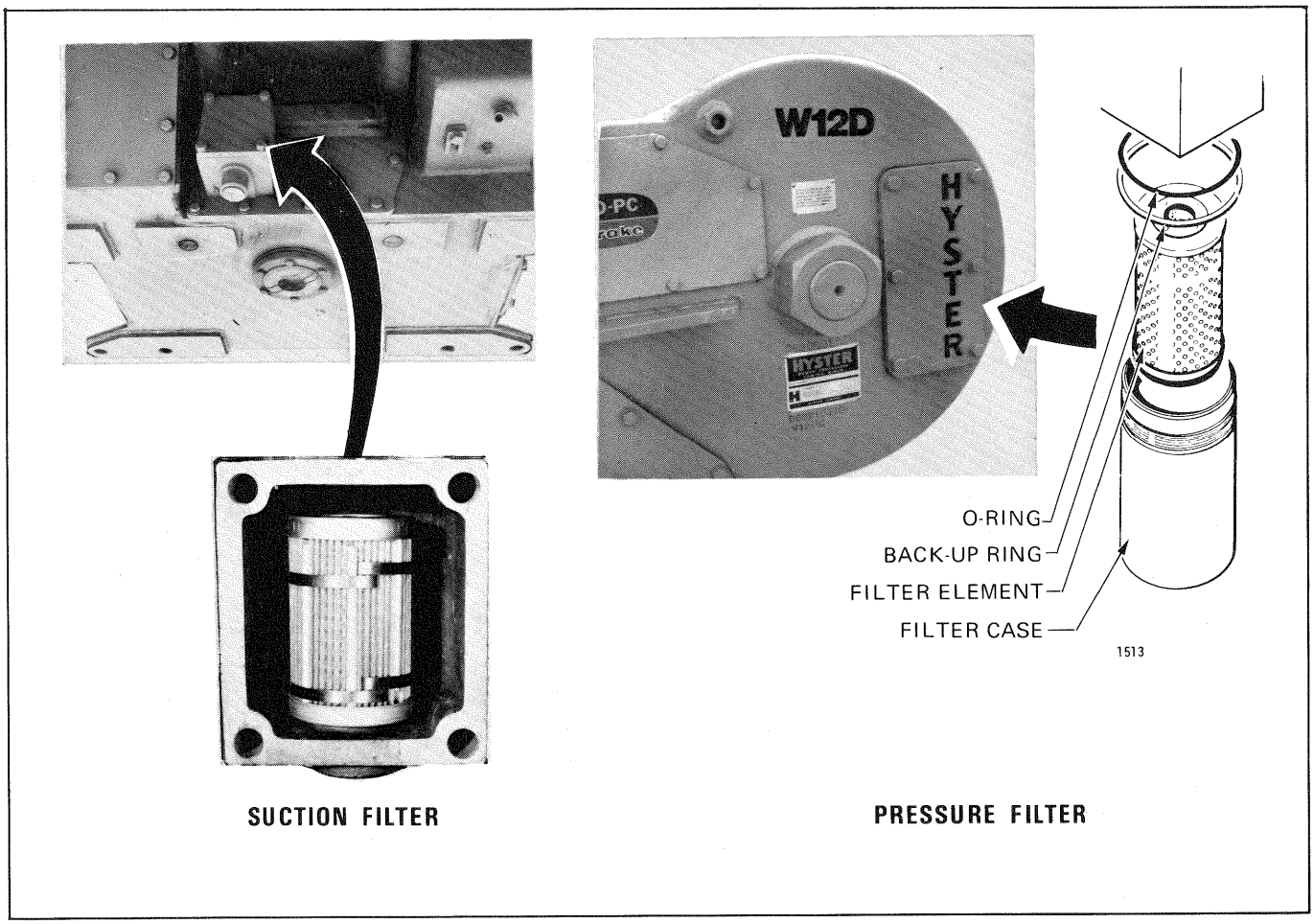


FIGURE 4-2. SUCTION AND PRESSURE FILTERS, POWER CONTROLLED WINCH

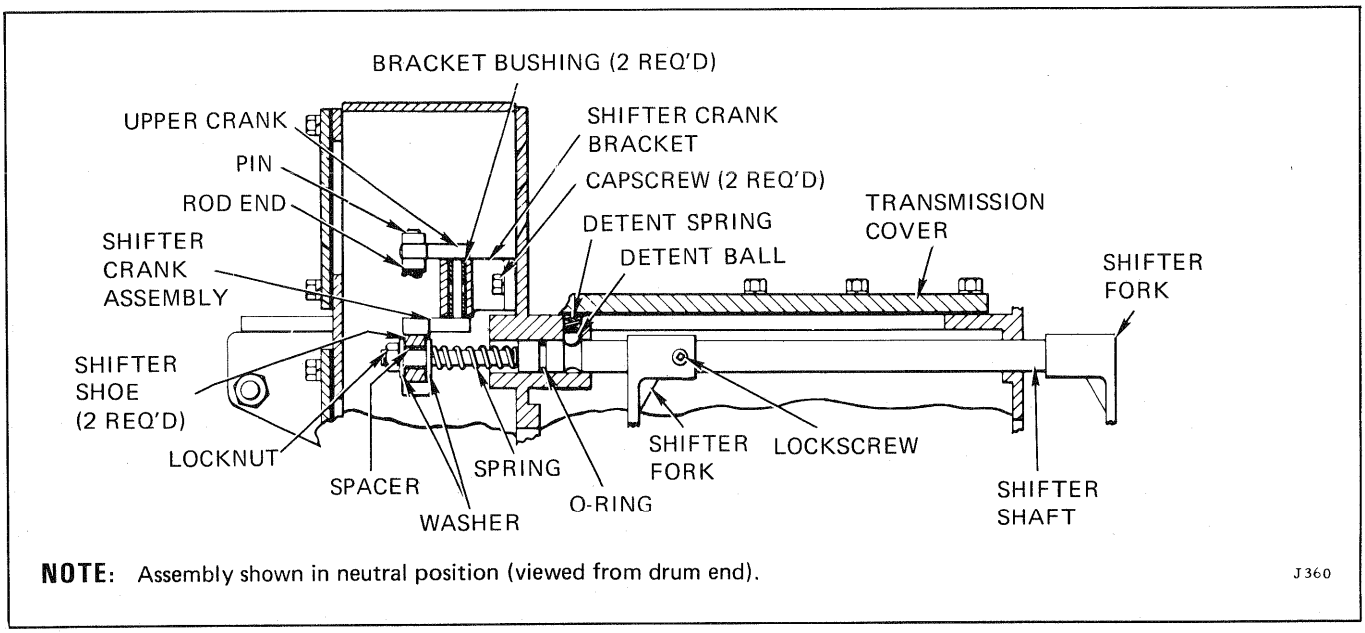


FIGURE 4-3. DIRECT DRIVE SHIFTER ARRANGEMENT

4-13. BRAKE BAND ADJUSTMENT. (See Figure 4-4.) To adjust the brake band, proceed as follows:

a. Remove the small brake cover from the left-hand side of the winch.

b. Push the brake handlever to its full release position.

c. Loosen jam nut (A).

d. Turn adjusting link (B) until there is approximately 1/32-inch clearance between the brake band and brake wheel or until there is just enough clearance to prevent "brake drag".

e. Tighten jam nut (A).

f. Replace the brake cover.

4-14. BRAKE HANDLEVER ADJUSTMENT. (See Figure 4-5.) To adjust the positioning of the Brake Handlever, proceed as follows:

a. Adjust the brake band. (Refer to paragraph 4-13.)

b. Loosen cable rod end jam nut.

c. Adjust the control cable at the winch control housing end until dimension (C) is obtained (distance between the cable end and the centerline of the rod end pin).

d. Tighten the jam nut.

e. Push the Brake Handlever to the full release position.

f. Adjust the push-pull cable at the Brake Handlever end until dimension (D), Figure 4-5, is obtained. Tighten jam nut.

4-15. OVERWIND ADJUSTMENT PROCEDURE. When the cable passes over the top of the drum during forward rotation, the drum is said to be overwinding. Unless otherwise specified, the winch is set to overwind at the factory. The bevel gear shaft assembly, brake assembly, and drum assembly must be rearranged when using an original underwind winch for overwind operation (refer to paragraphs 4-15 through 4-18).

4-16. Bevel Gear Shaft Overwind Arrangement. (See Figure 4-6.) To arrange the bevel gear shaft for overwind operation, proceed as follows:

a. Pull the bevel gear shaft from the right-hand side of the winch far enough to enable switching of the bevel gear and the spacers. Refer to Section 5.

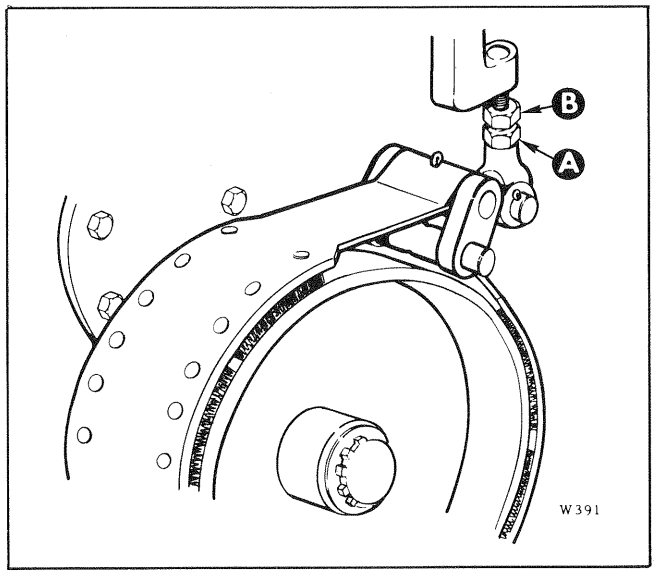


FIGURE 4-4. BRAKE BAND ADJUSTMENT DIAGRAM, DIRECT DRIVE WINCH

b. Arrange the spacers and bevel gear so the bevel gear meshes on the right-hand side of the PTO shaft assembly.

c. Install bevel gear shaft.

NOTE This change in operation may affect gear lash, but should not affect the shaft endplay. However, both should be checked and adjusted if necessary.

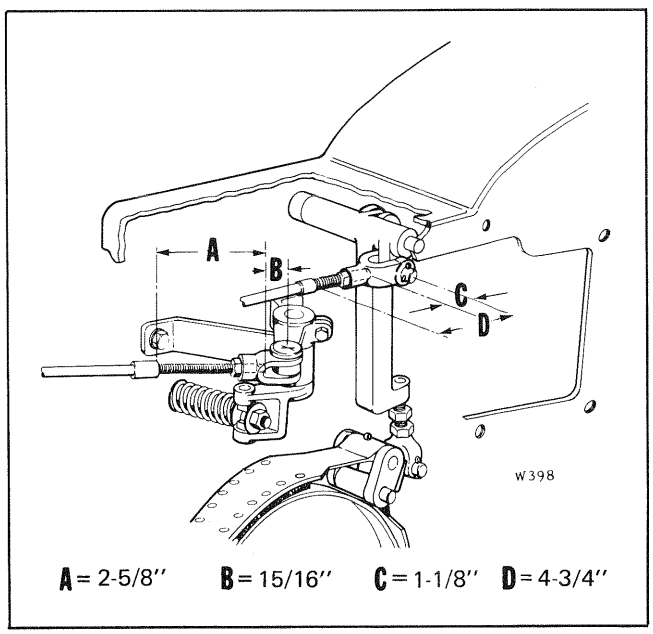


FIGURE 4-5. ADJUSTMENT OF BRAKE LINKAGE DIRECT DRIVE WINCH

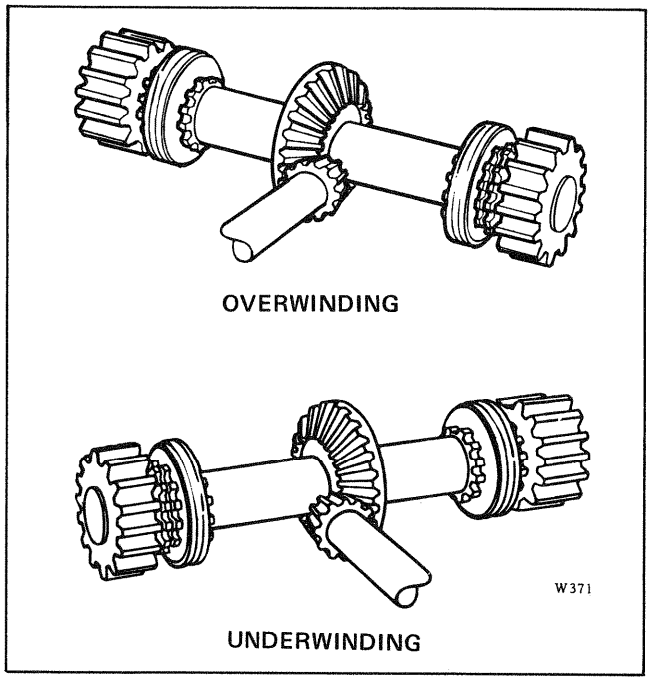


FIGURE 4-6. BEVEL GEAR SHAFT OVERWIND AND UNDERWIND ARRANGEMENT

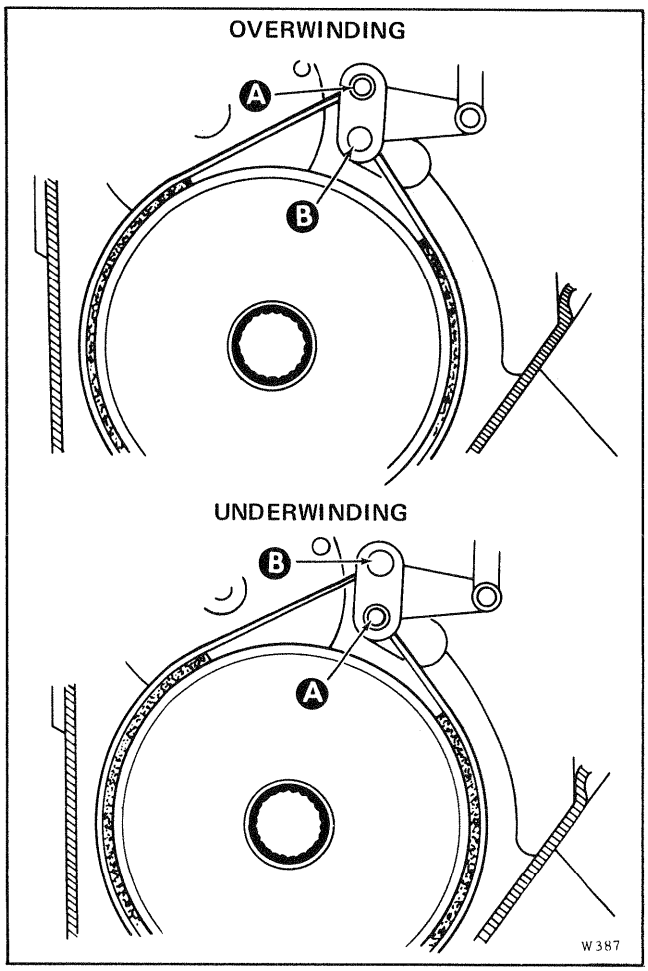


FIGURE 4-7. BRAKE BAND OVERWIND AND UNDERWIND ARRANGEMENT

4-17. Brake Assembly Arrangement. If the winch is equipped with a standard brake wheel, follow procedure a. Follow procedure b if the winch is equipped with an optional automatic brake.

a. Brake Band. (See Figure 4-7.) Change the anchoring end of the brake band by changing the positions of pins Ⓐ and Ⓑ.

NOTE Pin Ⓐ connects the moveable end of the band to the crank. This pin is 4-5/8 inches long and has a cotter pin hole in the center. Pin Ⓑ is 6-3/8 inches long and has a tapped hole in the end. It anchors the band and provides a pivot for the crank.

b. Automatic Brake (Optional). (See Figure 4-8.) Interchange position of brake band pins Ⓐ and Ⓑ per step a above. Remove the automatic brake assembly and reinstall so that the word OVERWINDING is facing outward.

4-18. Drum Assembly Arrangement. (See Figure 4-9.) The cable on the drum must be anchored and wound in the opposite direction for overwind operation. To setup the drum for overwind operation, follow procedure a for Hi-Capacity (Lo-Speed) drum and procedure b for standard drum:

WARNING Use extreme care when removing the cable end ferrule from the drum. When the cable lock is removed, the cable may spring out with extreme force.

a. Hi-Capacity (Lo-Speed Drum:

1. Unwind the cable

2. Unscrew capscrew (4) and remove ferrule lock (3) and ferrule (2).

3. Break or cut the tack welds securing the filler (1) and smooth the ragged edges of filler and groove by grinding.

4. Tack weld the filler in the overwind position.

5. Lock ferrule (2) in overwind position with ferrule lock (3) and capscrew (4).

b. Standard-Speed Drum:

1. Unwind the cable.

2. Unscrew capscrew (3) and remove ferrule lock (6) and ferrule (4).

3. Reverse the position of the filler (2) from underwind to overwind.

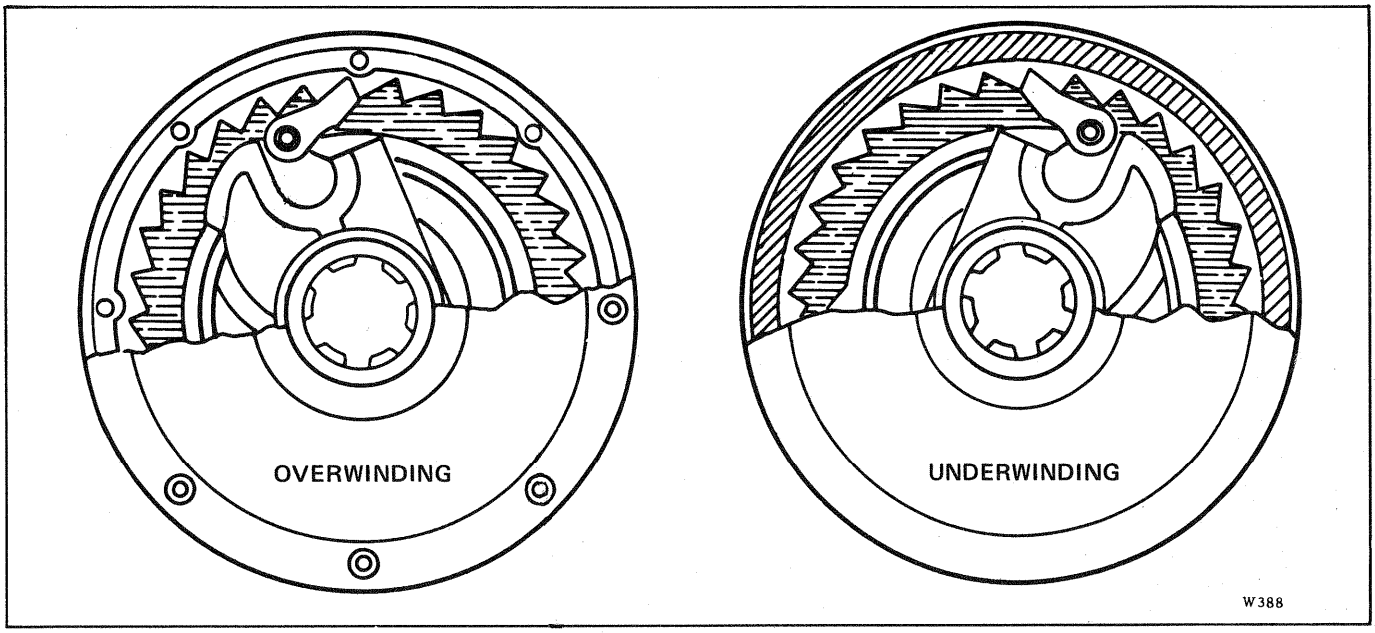


FIGURE 4-8. AUTOMATIC BRAKE (OPTIONAL) OVERWIND AND UNDERWIND ARRANGEMENT

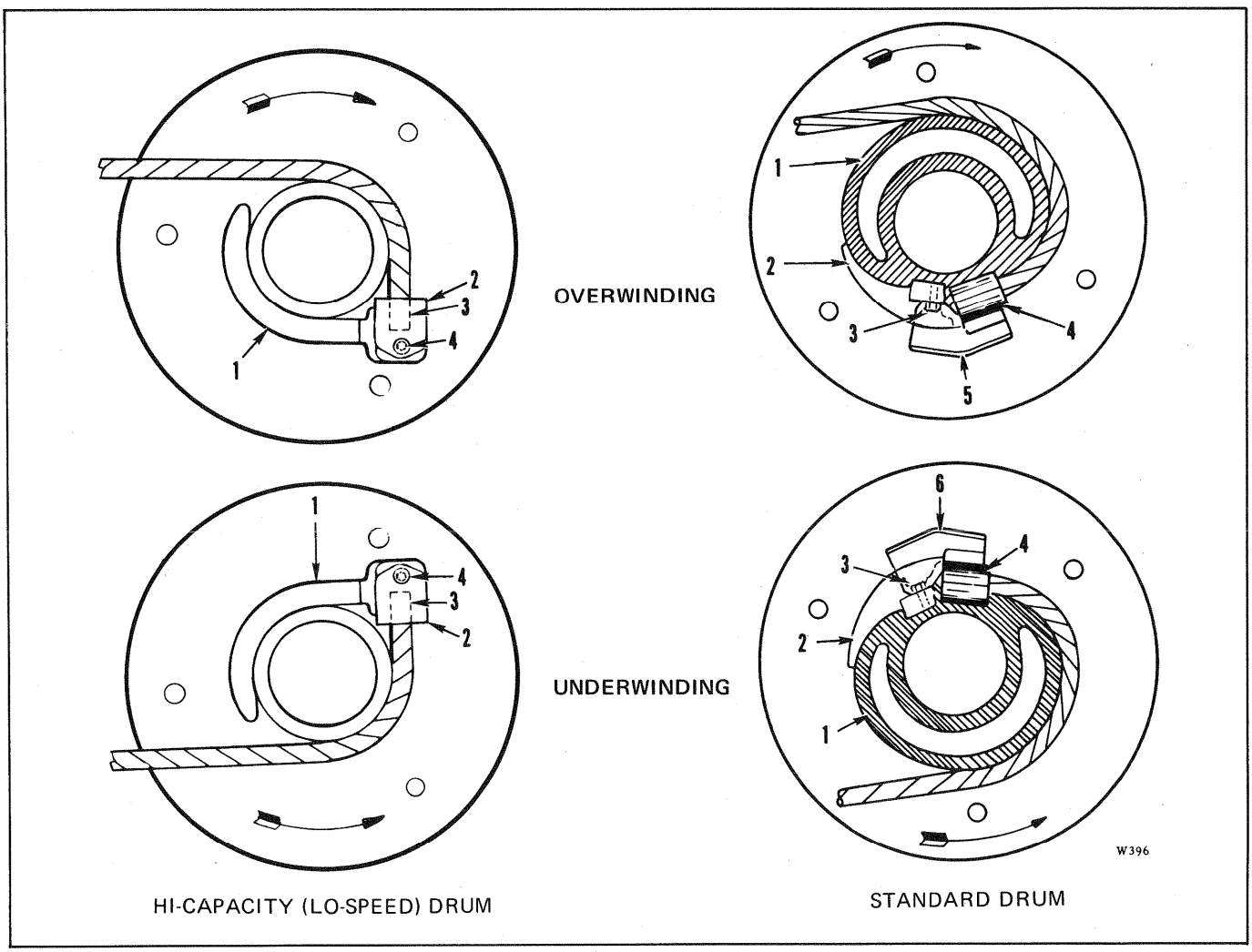


FIGURE 4-9. WINCH DRUM OVERWIND AND UNDERWIND ARRANGEMENT

4. Place ferrule (4) in overwind position and secure with ferrule lock (5) and capscrew (3).

NOTE The overwind ferrule lock (5) is different than the underwind ferrule lock (6).

4-19. UNDERWIND ADJUSTMENT PROCEDURE. When the cable is pulled under the drum during forward rotation, the drum is said to be UNDERWINDING. Unless otherwise specified, the winch is set for overwind at the factory. The bevel gear shaft assembly, brake assembly, and drum assembly must be rearranged when using an original overwind winch for underwind operation (refer to paragraphs 4-20 through 4-22).

4-20. Bevel Gear Shaft Arrangement. (See Figure 4-7.) To arrange the bevel gear shaft for underwind operation, proceed as follows:

a. Pull the bevel gear shaft from the right-hand side of the winch (see Figure 5-5) far enough to enable switching of the bevel gear and the spacers.

b. Arrange the spacers and bevel gear so that the bevel gear meshes on the left-hand side of the PTO shaft assembly.

c. Install bevel gear shaft (see Figure 5-16).

NOTE This change in operation may affect gear lash, but it should not affect the shaft endplay. However, both should be checked and adjusted if necessary.

4-21. Brake Assembly Arrangement. If the winch is equipped with a standard brake wheel, follow procedure a. Follow procedure b if the winch is equipped with an optional automatic brake.

a. Brake Band. (See Figure 4-8.) Change the anchoring end of the brake band by changing the positions of pins Ⓐ and Ⓑ.

NOTE Pin Ⓐ connects the moveable end of the band to the crank. This pin is 4-5/8 inches long and has a cotter pin hole in the center. Pin Ⓑ is 6-3/8 inches long and has a tapped hole in the end. It anchors the band and provides a pivot for the crank.

b. Automatic Brake (Optional). (See Figure 4-9.) Interchange position of brake band pins Ⓐ and Ⓑ per procedure a above. Remove the automatic brake assembly and reinstall so that the word UNDERWINDING IS facing to the outside.

4-22. Drum Assembly Arrangement. (See Figure 4-10.) The cable on the drum must be anchored and wound in the opposite direction for UNDERWIND operation. To setup the drum for underwind operation, follow procedure a for Hi-Capacity (Lo-Speed) drum and procedure b for Standard drum:

WARNING Use extreme care when removing the cable end ferrule from the drum. When the cable lock is removed, the cable may spring out with extreme force.

a. Hi-Capacity (Lo-Speed) Drum:

1. Unwind the cable.

2. Unscrew capscrew (4) and remove ferrule lock (3) and ferrule (2).

3. Break or cut the tack welds securing the filler (1) and smooth the ragged edges of filler and groove by grinding.

4. Tack weld the filler in the underwind position.

5. Lock ferrule (2) in underwind position with ferrule lock (3) and capscrew (4).

b. Standard Speed Drum:

1. Unwind the cable.

2. Unscrew capscrew (3) and remove ferrule lock (5) and ferrule (4).

3. Reverse the position of the filler (2) from overwind to underwind.

4. Place ferrule (4) in underwind position and secure it with ferrule lock (6) and capscrew (3).

NOTE The underwind ferrule lock (6) is different than the overwind ferrule lock (5).

4-23. Power Controlled Winch Adjustments.

4-24. The checks and adjustments for the power controlled winch include hydraulic system pressure checks, a control valve spool travel check, and a control cable adjustment. The procedures for the hydraulic system pressure checks include the adjustment of the relief valve and reverse overlap valve.

4-25. HYDRAULIC SYSTEM PRESSURE CHECKS. (See Figure 4-10.) Ensure that handling gear and control cable operate freely without binding before starting check. To check hydraulic system pressures, proceed as follows:

a. Remove cable from drum to prevent entanglement during pressure checks.

WARNING Tractor engine must be OFF before disconnecting line. Be extremely careful when removing the cable lock. The cable may spring away from the drum.

PRESSURE, PSI				
PRESSURE PORT	FORWARD	NEUTRAL	REVERSE	BRAKE OFF
A	220 (± 10)	35 MAX.	220 (± 10)	220 (± 5)
B	220 (± 10)	2-5	2-5	2-5
C	2-5	2-5	220 (± 10)	2-5
D	220 (± 10)	2-5	220 (± 10)	220 (± 10)
E	15-30	10-13	15-30	15-30

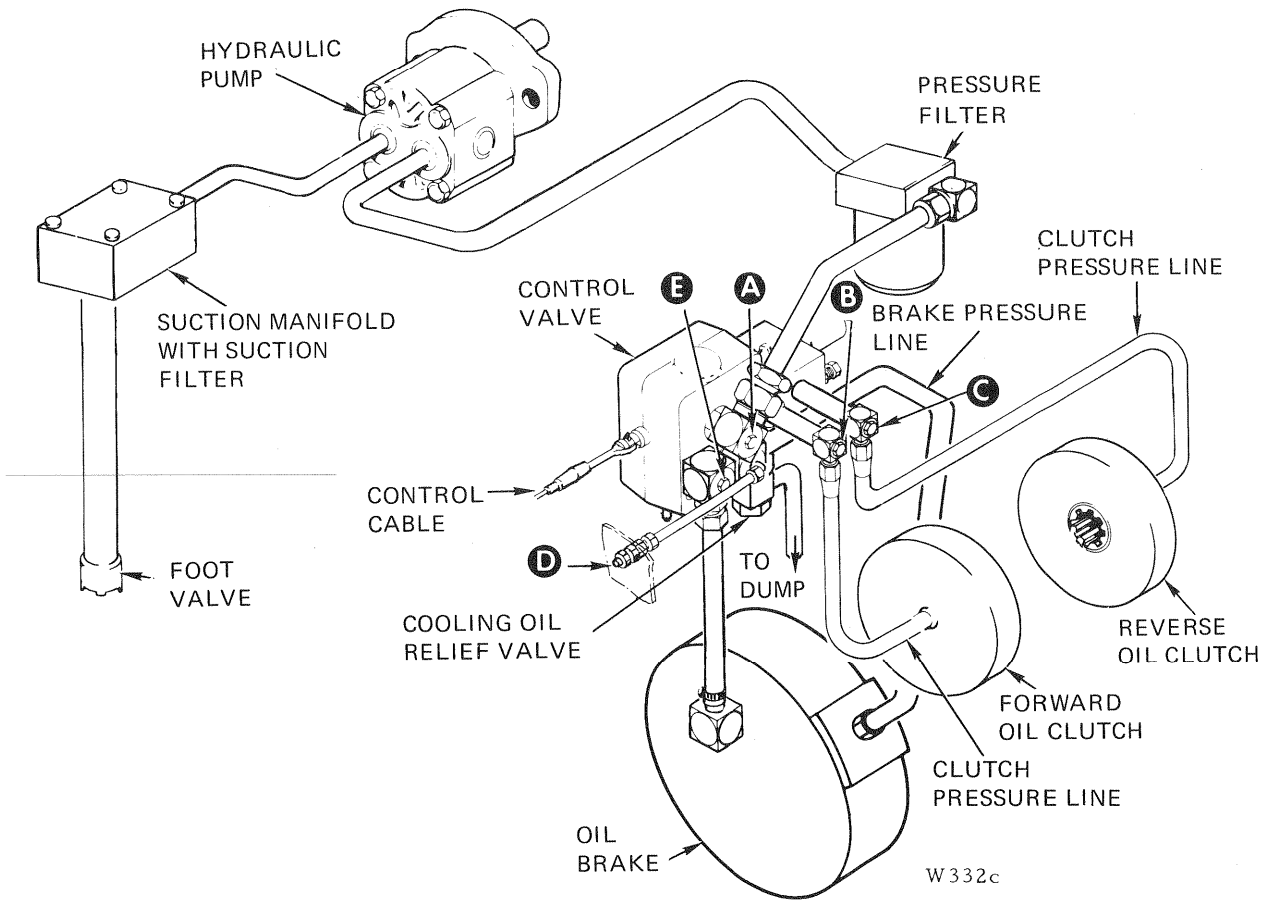


FIGURE 4-10. HYDRAULIC SYSTEM PRESSURE CHECKS

b. Remove control valve access cover plate on upper, forward portion of left side of winch housing.

c. Remove plug from control valve INLET port (A) and connect a 400 PSI pressure test gauge to the port.

d. Start tractor engine, warm up, and stabilize engine speed at 1500 RPM. When winch hydraulic oil temperature is 100-140 degrees F, read pressure gauge with handlever in BRAKE OFF (free-spool position). Pressure should be 220 (±5) PSI. If pressure is not correct, then:

1. Loosen relief valve locknut.

2. Turn adjusting capscrew IN to increase pressure or OUT to decrease pressure. Retighten locknut after readjustment is completed.

e. Shut down tractor engine and transfer test pressure gauge to FWD port (B). Install plug in INLET port (A).

f. Start engine and stabilize speed at 1500 RPM with winch oil temperature at 100-140 degrees F.

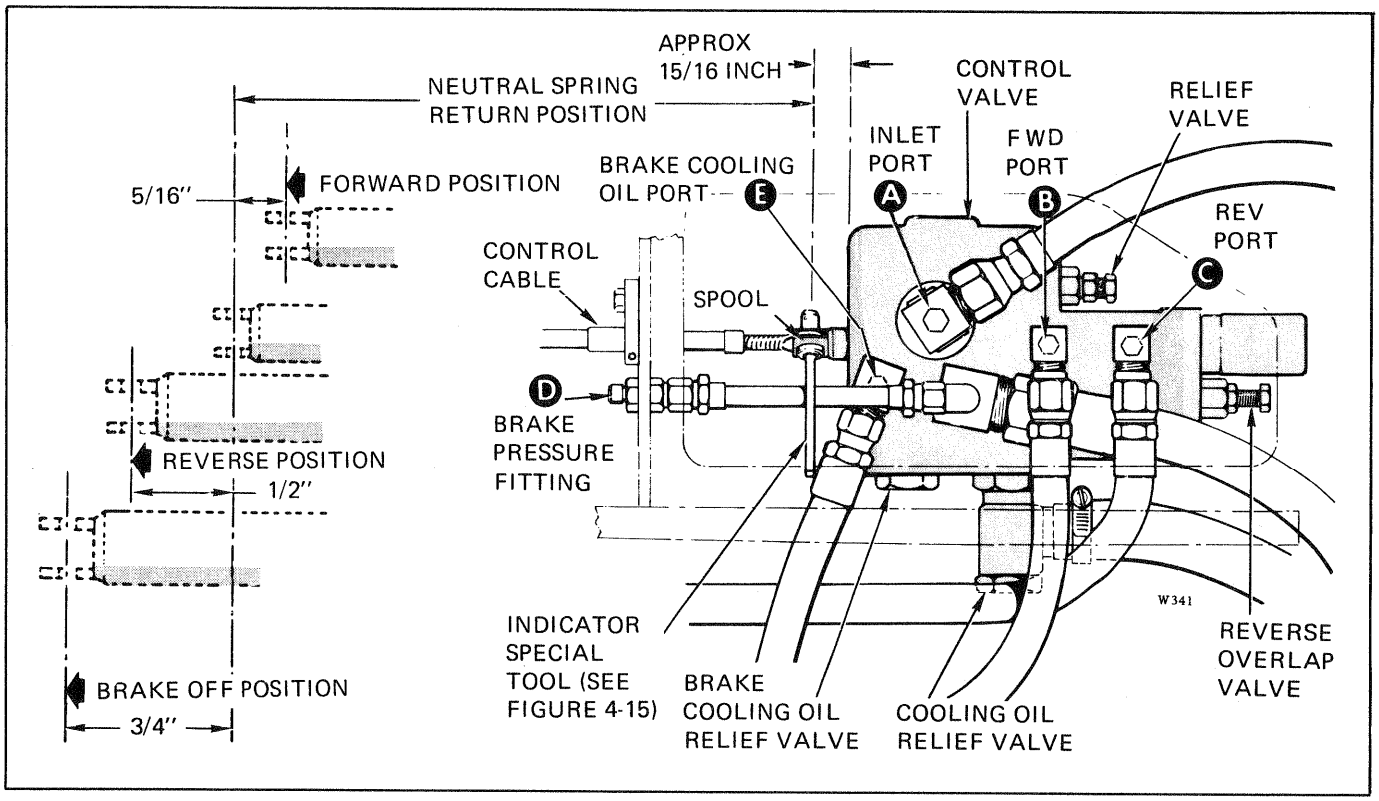


FIGURE 4-11. CONTROL VALVE SPOOL TRAVEL CHECK

g. Check pressure at FWD port (B) with handlever in NEUTRAL. Pressure should be too low to read on a 400 PSI gauge (less than 10 PSI). If there is an indication of high oil pressure (greater than 10 PSI), proceed directly to step t.

h. Check pressure at FWD port (B) with handlever in FORWARD. Pressure should be 220 (±10) PSI. If pressure is not correct, check control cable adjustment (refer to paragraph 4-27) and control spool travel (refer to paragraph 4-26).

i. Shut down engine and transfer pressure gauge to REV port (C). Install plug in FWD port (B).

j. Start engine and stabilize speed at 1500 RPM with winch oil temperature at 100-140 degrees F.

k. Check pressure at REV. port (C) with handlever in NEUTRAL. Pressure should be too low to read on a 400 PSI gauge (less than 10 PSI). If there is an indication of high oil pressure (greater than 10 PSI), proceed directly to step t.

l. Check pressure at REV port (C) with handlever in REVERSE. Pressure should be 220 (±10) PSI. If pressure is not correct, check control cable adjustment (refer to paragraph 4-27) and control spool travel (refer to paragraph 4-26). Move handlever back to NEUTRAL.

m. Remove the rod-end pin, which is used to attach the control cable to the control valve spool, and insert the indicator special tool (see Figure 4-13) to connect control cable to spool.

n. Using the edge of the indicator special tool as a guide, apply a NEUTRAL reference mark on the winch housing cover flange. The mark is used to measure spool movement off NEUTRAL.

o. Slowly move lever toward REVERSE until movement of control valve spool measures 3/8 (±1/64) inch travel from NEUTRAL (see Figure 4-11). Block or tie handlever or apply clamp to valve spool to prevent control valve spool from returning to NEUTRAL.

p. With engine speed at 1500 RPM and winch oil temperature at 100-140 degrees F, check pressure at REV port (C). Pressure should be 140 (±5) PSI less than the pressure reading obtained at port (A) (step d). If pressure is not correct, then:

1. Loosen reverse overlap valve locknut.

2. Turn reverse overlap adjusting capscrew IN to decrease port (C) pressure, or OUT to increase pressure. Retighten locknut after adjustment is completed. Unblock handlever, remove indicator special tool, and replace rod-end pin.

q. Shut down tractor engine. Disconnect oil pressure line to handling gear pressure gauge at bulkhead union fitting (D). Connect test pressure gauge to fitting (D) and install port (C) plug.

NOTE Use of a test gauge at fitting (D) eliminates the possibility of inaccurate readings from a faulty handling gear pressure gauge.

r. Stabilize engine speed at 1500 RPM with winch oil temperature at 100-140 degrees F.

s. Check pressure at brake fitting (D) with handlever in FORWARD, REVERSE, and BRAKE OFF. Pressure should be 220 (±10) PSI for each position. If pressure is not correct, review previous procedures and repeat as necessary.

t. Shut down engine and remove 400 PSI pressure test gauge.

u. Repeat pressure checks at BRAKE fitting (D), FWD port (B), and REV port (C) with handlever in NEUTRAL only and using a low range pressure test gauge such as an 80 or 100 PSI gauge. Pressure should be 2-5 PSI at each port or fitting. If pressure is not correct, perform the following:

1. Check control cable adjustment (refer to paragraph 4-27). Check for cable binding which would prevent valve spool from automatically returning to NEUTRAL. If necessary, replace control cable.

2. Check for control valve spool binding (refer to paragraph 4-26).

3. Replace poppet and/or spring in the non-adjustable cooling oil relief valve.

v. Transfer low range pressure test gauge to the COOLING port (E).

w. Check pressures at port (E) with oil temperature at 70-140 degrees F, varying tractor engine speeds and different positions of the control handlever. Pressure at port (E) should range from 10 to 30 PSI. If pressure is not correct, perform the following:

1. If pressure is too high, check for a stuck poppet or clogged orifices in the brake cooling oil relief valve. Clean or replace parts as necessary (refer to Section 5).

2. If pressure is too low, check for a stuck poppet or weak or broken spring in the brake cooling oil relief valve. Clean or replace parts as necessary (refer to Section 5).

x. If both high and low pressure checks are completed, remove test gauges, replace any port plugs, and replace control valve access cover plate on winch housing.

4-26. CONTROL VALVE SPOOL TRAVEL CHECK. (See Figure 4-12.) A spool travel check should be made to ensure that the spool mechanical stops will limit spool travel to the exact linear placement for each of the three principal control positions off NEUTRAL. Pressures are included, for reference only, to tie together corresponding mechanical position and valve hydraulic function. If hydraulic pressure readings are measured, observe procedures given in paragraph 4-25. The control valve spool is self-positioned to NEUTRAL by the neutral return spring which is a part of the W-10 spool assembly. The three other travel positions are determined by spool assembly internal stops and detent. If spool travel is found to be out of adjustment, the spool assembly should be repaired or replaced (refer to Section 5). Ensure that handling gear and control cable operate freely without binding before starting check. Perform the spool travel check as follows:

a. Install indicator special tool (see Figure 4-13) in place of the rod end pin which attaches control cable to end of control valve spool.

b. Check Neutral position of spool. In this position, spool end should protrude 15/16-inch from the valve body. Pressure at port (A) should be 35 PSI maximum, 2-5 PSI at ports (B) and (C) and fitting (D), and 10-30 PSI at port (E).

c. Using the edge of the indicator special tool as a guide, apply a NEUTRAL reference mark on the winch housing cover flange.

d. Move spool into body until it bottoms. This position is FORWARD and should be at 5/16-inch travel from NEUTRAL as shown in Figure 4-11. Pressure at port (B) should be 220 (±10) PSI.

e. Move spool out of body until the first stop is felt. This position is REVERSE and should be at 1/2-inch travel from NEUTRAL as shown in Figure 4-11. Pressure at port (C) should be 220 (±10) PSI.

f. Move spool out of body, past the stop felt in step d, into the detent lock-up position. This position is BRAKE OFF and should be at 3/4-inch travel from NEUTRAL as shown in Figure 4-11. Pressure at fitting (D) should be 220 (±10) PSI.

NOTE Spool is self-holding in BRAKE OFF. If spool does not lockup in this position, the detent parts should be repaired or the spool assembly replaced.

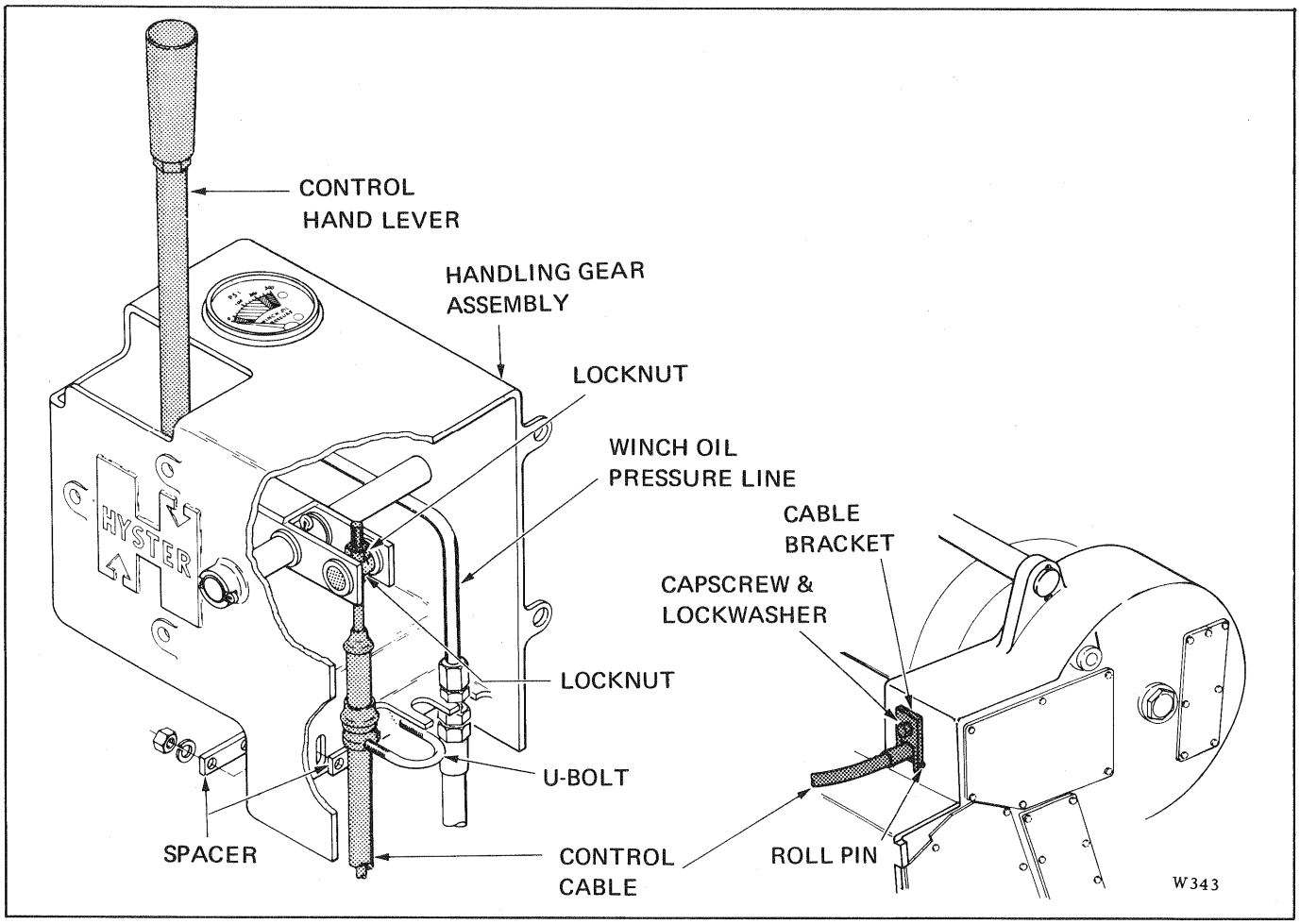


FIGURE 4-12. CONTROL CABLE ADJUSTMENT

g. Push the spool out of detent and allow spool to return to NEUTRAL. Remove indicator special tool and replace it with the rod end pin removed in step a.

4-27. CONTROL CABLE ADJUSTMENT. (See Figure 4-12.) A single teflon-lined control cable connects the handlever, on the handling gear assembly, to the spool end of the winch control valve. Cable adjustment is limited to synchronizing the handlever position to control valve spool position and ensuring that full spool travel is not restricted by the handling gear assembly housing. Adjust cable as follows:

a. Check control valve spool travel (refer to paragraph 4-26).

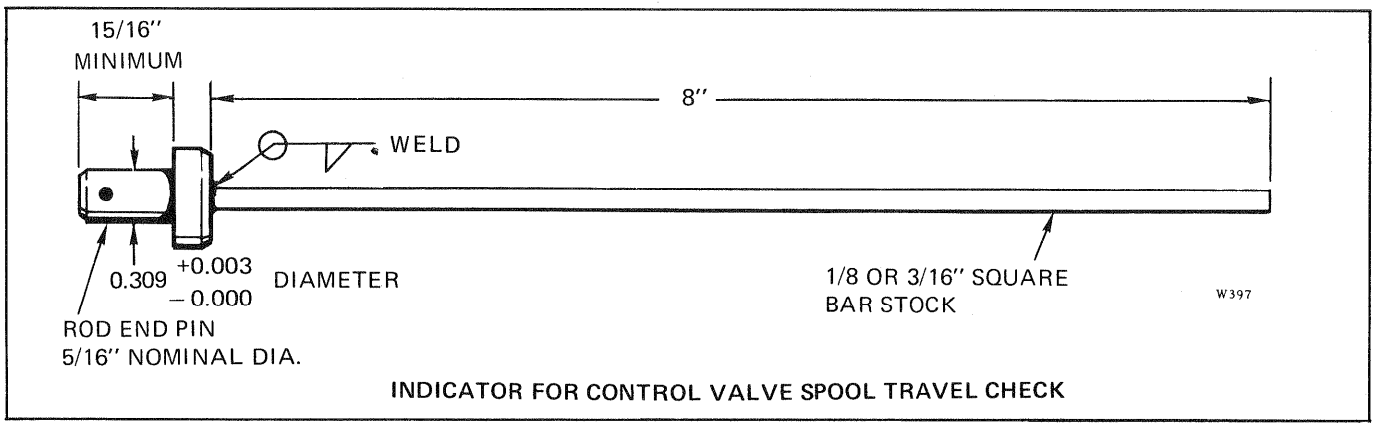


FIGURE 4-13. INDICATOR TOOL

b. Ensure that cable bracket, at winch end of control cable, is securely attached to winch housing and that roll pin in bracket is engaged in cable end groove.

c. Check position of handlever with control valve in NEUTRAL. The lever should be approximately vertical. If not, correct as follows:

1. Loosen nuts on U-bolt that clamp the control cable to the handlever housing. With U-bolt engaged in cable end groove, move U-bolt up or down in elongated slots to improve position of handlever. Tighten nuts securely.

2. If U-bolt elongated slots provide insufficient travel, loosen locknuts on cable end and adjust nuts as required to extend or retract cable threaded end in hole in handlever pin.

d. Move handlever to FORWARD and BRAKE OFF positions and check to ensure that handlever does not hit housing in either position. If interference is found, repeat step c.

4-28. OVERWIND AND UNDERWIND ADJUSTMENT PROCEDURE. Follow the same procedure as listed for the Direct Drive Winches. (Refer to paragraph 4-15, or 4-19, except omit brake/assembly arrangement.)

4-29. UNIT PAINTING. (See Figure 4-14.)

4-30. Upon completion of unit overhaul or major repairs, paint the exterior sections of the winch as follows:

a. Remove any corrosion or peeling paint using a stiff wire brush or coarse sandpaper. Scrape off any deteriorated decals.

b. Touch-up bare metal surfaces using zinc chromate primer. Allow primer to air-dry for a minimum of four hours.

c. Install all bearing retainers and covers. Cover the winch Nameplate, Filter Service Plate, HYSTER letter decals, and Caution decal with masking tape or grease.

d. Spray paint the entire external surface of the winch with HYSTER YELLOW enamel.

4-31. DECAL, NAMEPLATE, AND SERVICE PLATE INSTALLATION.

4-32. A Caution Decal is located on the drum gear cover, as shown in Figure 4-14. Make sure that all markings on the decal are clearly legible and that the decal is installed in the correct location. If the decal has been lost or damaged, install a new decal in the proper location.

4-33. The unit nameplate is located on the left-hand side of the winch housing near the drum shaft nut as shown in Figure 4-14. Data contained on the nameplate is given in paragraph 1-5. If the nameplate has been damaged, install a new nameplate in the location shown in Figure 4-14. Use drive screws for nameplate installation.

4-34. A filter service plate is located on the left-hand side of the winch housing as shown in Figure 4-14. If the service plate has been damaged, install a new plate in the location shown. Use drive screws to retain the plate on the housing.

4-35. The W12D model decals and HYSTER letter decals are used on both sides of the winch housing as shown in Figure 4-14. Replace as necessary.

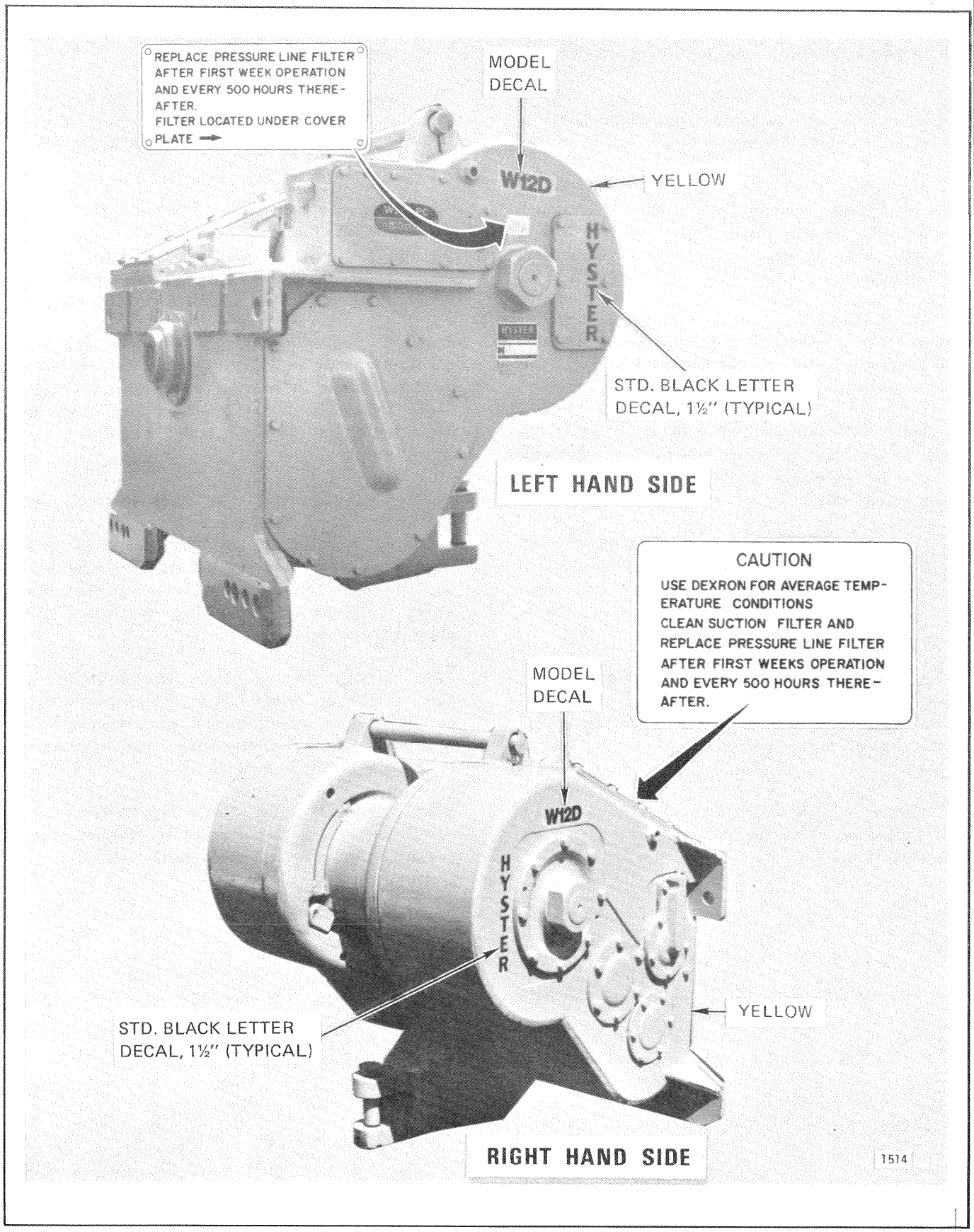


FIGURE 4-14. PAINTING AND DECAL INSTALLATION

5-1. GENERAL.

5-2. This section contains overhaul instructions for the W12D Direct Drive and Power Controlled Winches. Overhaul instructions include removal and disassembly of all major shaft assemblies, inspection of components, reassembly, and installation. Micrometer symbols have been added to the disassembly illustrations to show critical wear points. It is recommended that these measurements be taken at the time of disassembly so that defective parts may be ordered and replaced prior to reassembly. If the winch is to be completely overhauled, perform the removal and disassembly, inspection, and reassembly procedures in the sequence of the following paragraphs. Always use the troubleshooting procedures given in Section 3 to locate a malfunction before performing major overhaul of the unit. Make all checks in a systematic manner. Haphazard checking wastes time and can cause further damage. Review and perform any adjustments that may be the cause of a malfunction (refer to Section 4).

5-3. This section does not include instructions for removal and installation of the winch on the tractor or removal, overhaul, and installation of the power controlled winch hydraulic pump. This information is given in Section 6, Mounting Instructions.

5-4. COMPONENT REMOVAL INSTRUCTIONS.

5-5. All major assemblies (except the brake shaft and PTO shaft) can be removed with the winch mounted on the tractor. Most major components of the brake shaft can be removed with the winch mounted, however, the brake shaft will not clear the tractor tracks for complete removal of the shaft. The winch must, therefore, be removed from the tractor before removing the brake shaft.

5-6. Removal and Disassembly of PTO Shaft Assembly.

5-7. Removal and disassembly of the PTO shaft is shown in Figure 5-1. Before removing the PTO shaft assembly, the winch must be removed from the tractor (refer to Section 6).

5-8. Removal and Disassembly of Oil Brake Assembly (Power Controlled Winch).

5-9. Removal and disassembly of the oil brake assembly used in the Power Controlled winch is shown in Figure 5-2. Removal and disassembly of the brake can be accomplished while the winch is mounted on the tractor. During disassembly, place all parts in a clean container to protect from dust, dirt and moisture.

5-10. Removal of Dry Brake and Automatic Brake (Direct Drive Winch).

5-11. Removal of the dry brake (or optional automatic brake) with brake and clutch linkage is shown in Figure 5-3. Removal of the dry brake can be accomplished with the winch mounted on the tractor. During disassembly, check all parts for damage and wear (refer to Table 1-1).

5-12. Removal and Disassembly of Bevel Gear Shaft Assembly. (See Figures 5-4 and 5-5.)

5-13. Removal and disassembly of the bevel gear shaft assembly is shown in Figure 5-5. Removal of the bevel gear shaft and associated components can be accomplished with the winch mounted on the tractor. Prior to removal of the bevel gear shaft, perform the following:

a. Drain oil from winch (see Figure 4-1).

b. Remove all brake components as shown in Figure 5-2 or 5-3, depending upon the winch model.

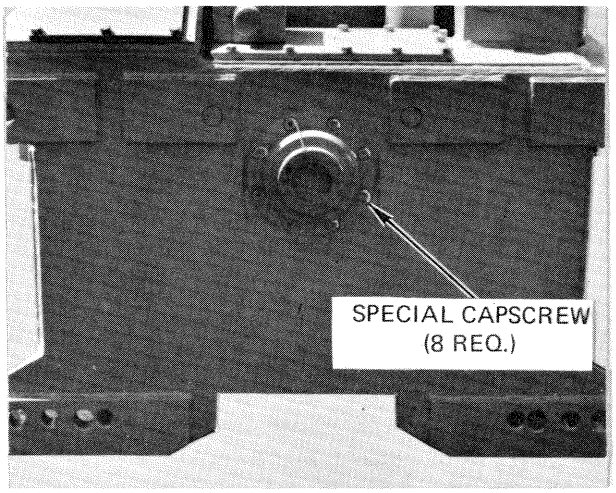
c. Remove the hydraulic hose from the bearing retainer at the LH end of the bevel gear shaft (Power Controlled winches only).

d. Remove the brake connecting linkage (Direct Drive winch only).

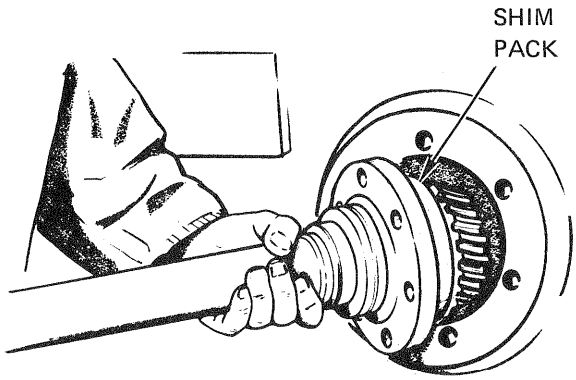
e. On direct drive models, slowly unscrew to relieve spring compression, and remove the nut from the LH end of the shifter shaft (see Figure 5-4). Cut the lockwire retaining the shifter fork lockscrews and loosen lockscrews. Pull out shifter shaft being careful not to drop the forks.

WARNING Compression force of spring when installed is equal to 60 pounds.

NOTE Procedures given in Figure 5-5 are for the bevel gear shaft used in Power Controlled winches. These procedures can be used for Direct Drive winches by omitting all references to hydraulic components. Figure 5-4 shows the bevel gear shaft assemblies used in both the Power Controlled and Direct Drive winches.

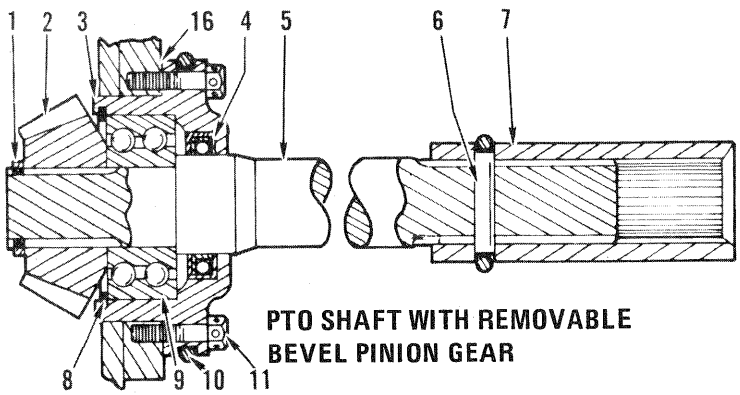


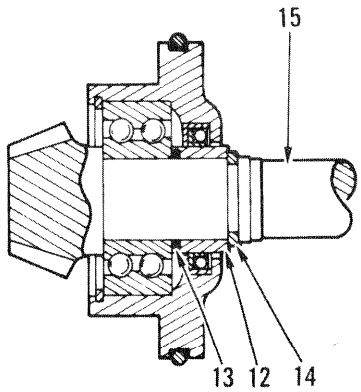
STEP 1. Remove the wire locking the eight special capscrews, then remove the capscrews.



STEP 2. Pull PTO shaft assembly straight out.

CAUTION: Tag the shim pack so that exact number of shims are re-installed.





STEP 3. Disassembly PTO shaft as required.

1. Snap Ring
2. Bevel Pinion Gear
3. Bearing Carrier
4. Oil Seal
5. PTO Shaft (Removable Gear)
6. Pin and Lock Ring
7. Coupling
8. Snap Ring
9. Ball Bearing
10. O-ring
11. Drilled Head Capscrew
12. Seal Spacer
13. O-ring
14. Snap Ring
15. PTO Shaft (Integral Gear)
16. Shim Pack

NOTE: The PTO shaft with integral bevel pinion gear is used on most Standard Speed winches (refer to Section 6 for specific type used). On shafts with removable pinion gear, the gear is splined on the shaft and retained by a snap ring.

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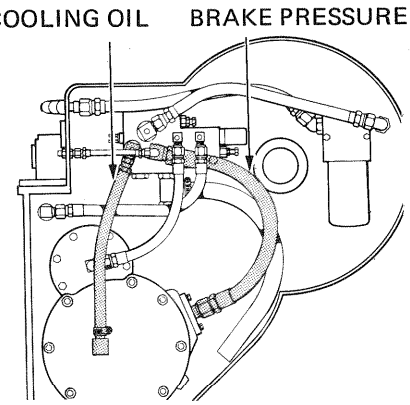
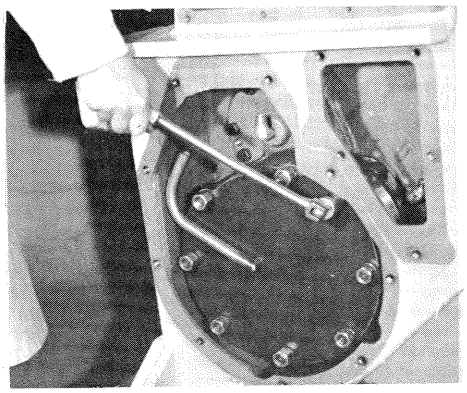
FIGURE 5-1. REMOVAL AND DISASSEMBLY OF PTO SHAFT ASSEMBLY

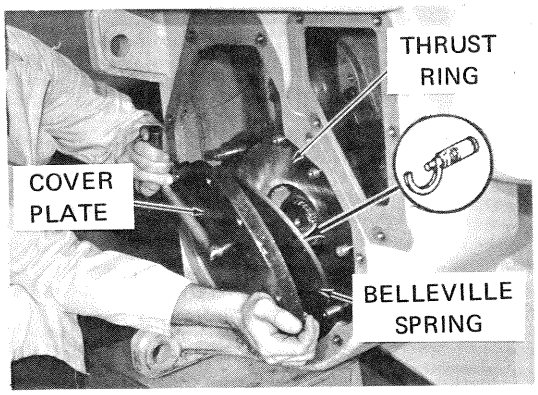
NOTE: Drain oil from winch (See Figure 4-1) or position winch with left-hand side up. Remove brake assembly cover.



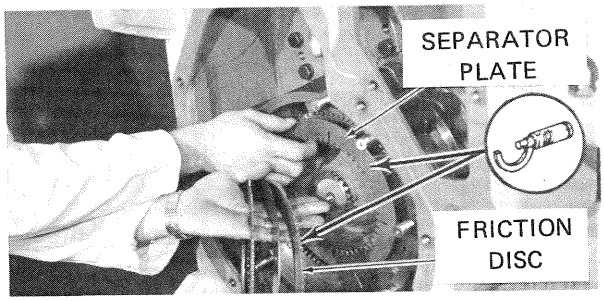
STEP 1. Remove cooling oil and brake pressure hose lines.



STEP 2. Remove eight locknuts and lockwashers from oil brake assembly.

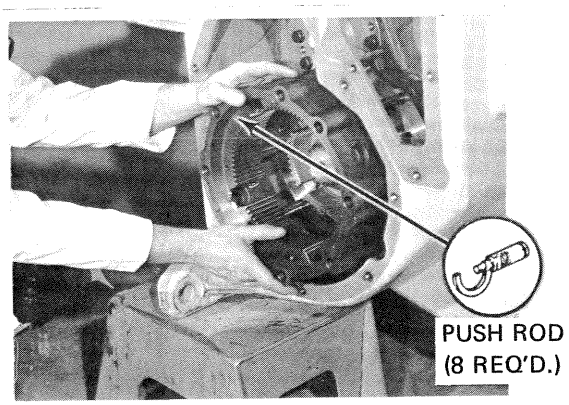


STEP 3. Remove cover plate, belleville spring and thrust ring from cage assembly.

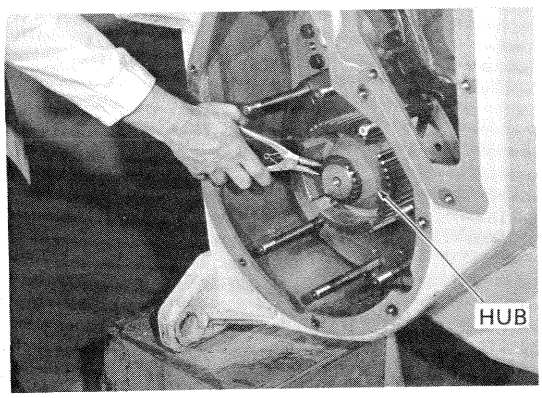


STEP 4. Remove 11 friction discs and 10 separator plates from the hub.

CAUTION: Keep friction discs and separator plates in order. They must contact the same mating surface when re-installed.



STEP 5. Remove cage from studs. It may be necessary to tap cage with a soft hammer to loosen.



STEP 6. Remove snap ring from brake shaft, pull hub off brakeshaft.

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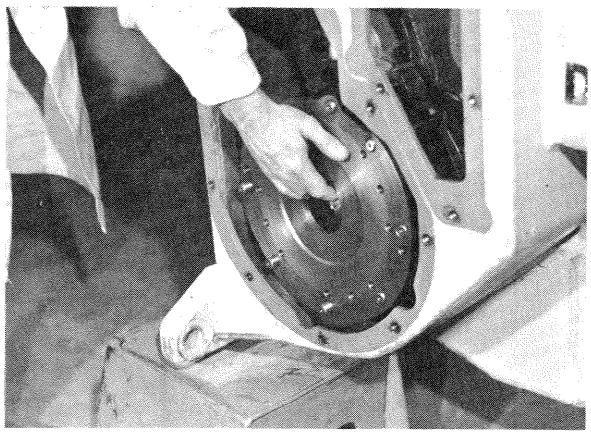
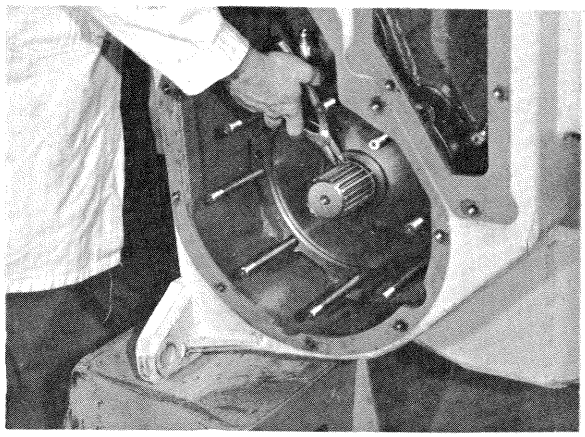
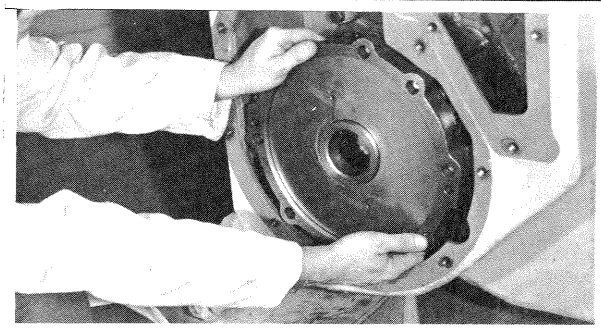
FIGURE 5-2. REMOVAL AND DISASSEMBLY OF OIL BRAKE ASSEMBLY (POWER CONTROLLED WINCH) (Sheet 1 of 2)



STEP 7. Remove pressure plate from studs.

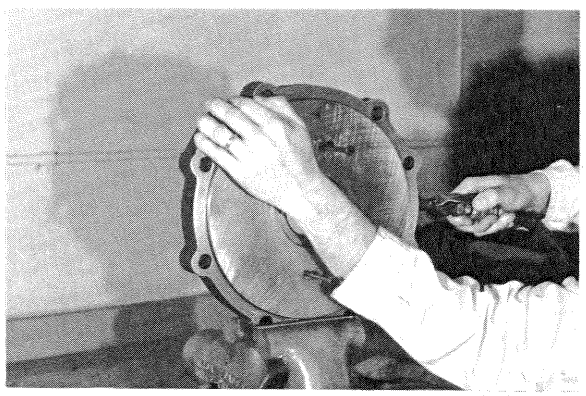


STEP 8. Remove snap ring from brake shaft.

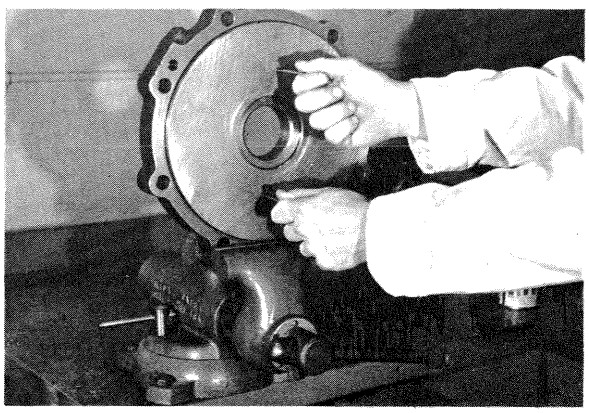


STEP 9. Remove piston housing with piston in place.

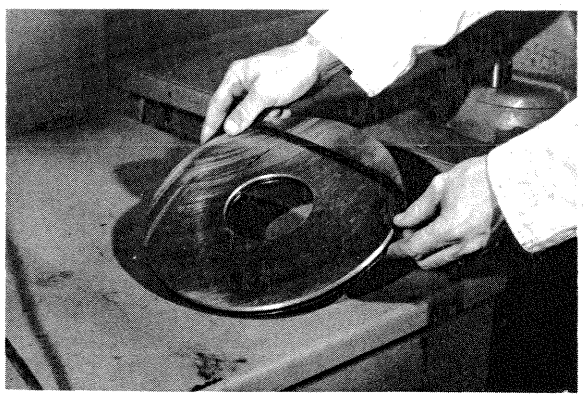
CAUTION: Use case to prevent loss of L.H. brake shaft bearing until brake shift



STEP 10. Place piston housing in vise. Start piston from housing by applying compressed air to piston housing pressure port.



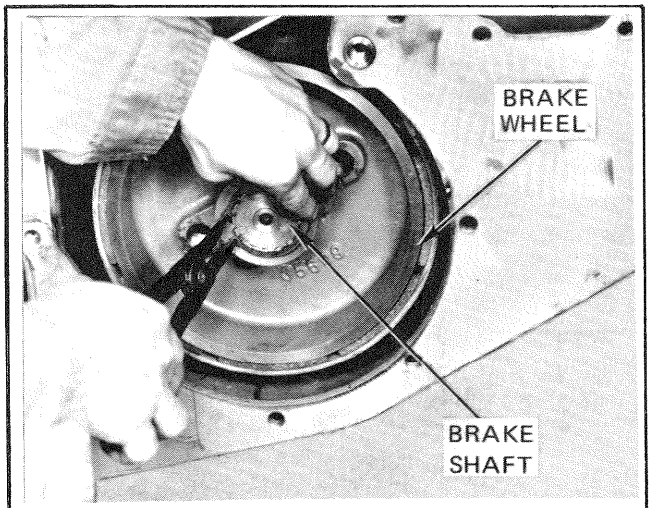
STEP 11. Pull piston out of housing using two 1/4 inch capscrews.



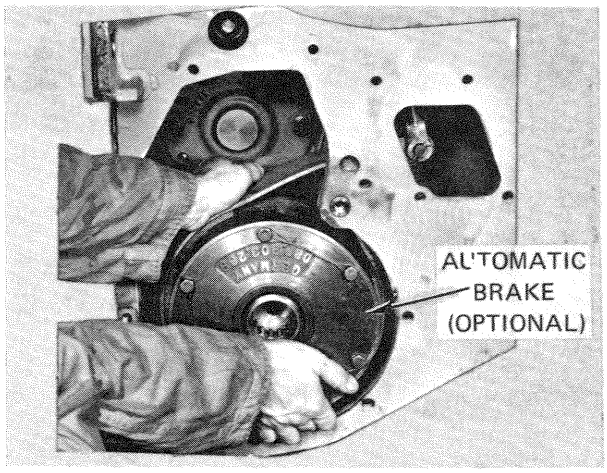
STEP 12. Remove two O-rings from the piston. Discard O-rings.

1520

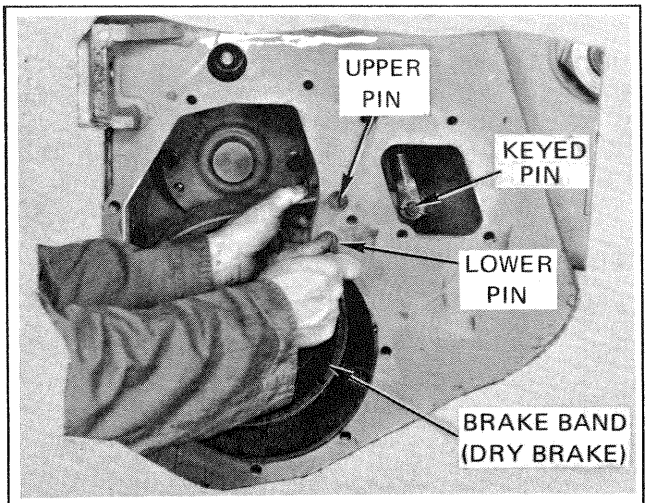
FIGURE 5-2. REMOVAL AND DISASSEMBLY OF OIL BRAKE ASSEMBLY (POWER CONTROLLED WINCH) (Sheet 2 of 2)



STEP 1. Remove snap ring from brake shaft.

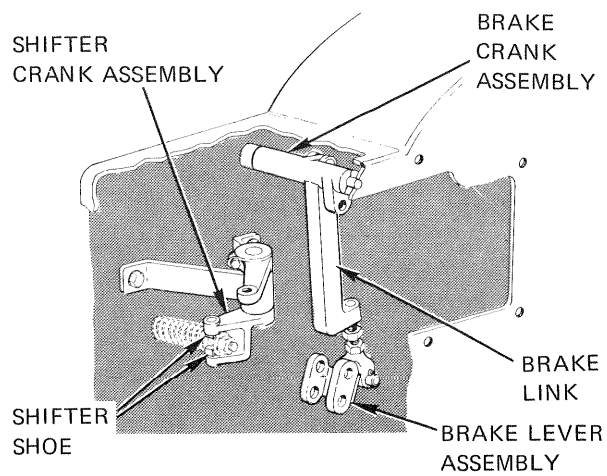


STEP 2. Remove brake wheel from brake shaft (optional automatic brake shown).



STEP 3. Remove upper and lower pins and brake band.

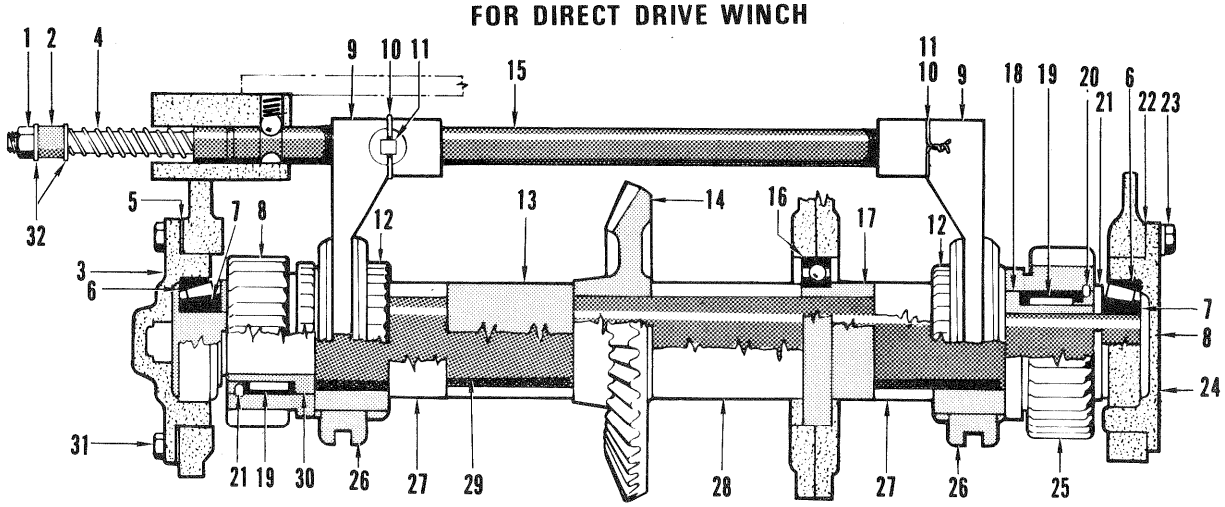
NOTE: The shorter pin is cotterpinned to the center of the brake band pin boss. A 1/2-20 UNF capscrew may be screwed into the threaded end of the longer pin to aid in pin removal.



STEP 4. Note position of upper crank on linkage, shaft end of shifter crank assembly and apply index marks to aid alignment on reassembly. Remove remaining brake and dental clutch linkage.

FIGURE 5-3. REMOVAL OF DRY BRAKE AND AUTOMATIC BRAKE (DIRECT DRIVE WINCH)

FOR DIRECT DRIVE WINCH



1. LOCKNUT
2. SPACER
3. L.H. BEARING RETAINER
4. SPRING
5. SHIM(S)*
6. BEARING CUP
7. BEARING CONE
8. FWD. 2ND REDUCTION PINION GEAR
9. SHIFTER FORK
10 LOCKWIRE
11. LOCKSCREW
12. DENTAL CLUTCH HUB
13. SPACE (MEDIUM)
14. BEVEL RING GEAR
15. SHIFTER SHAFT
16. BALL BEARING
17. BEARING CARRIER
18. BEARING CARRIER
19. ROLLER BEARING
20. SNAP RING
21. THRUST WASHER
22. SHIM(S)*
23. CAPSCREW - LOCKWASHER
24. R.H. BEARING RETAINER
25. REV. 2ND REDUCTION PINION GEAR
26. DENTAL CLUTCH
27. SPACER (SHORT)
28. SPACER (LONG)
29. BEVEL GEAR SHAFT
30. BEARING CARRIER
31. CAPSCREW - LOCKWASHER (6 REQ'D)
32. WASHER

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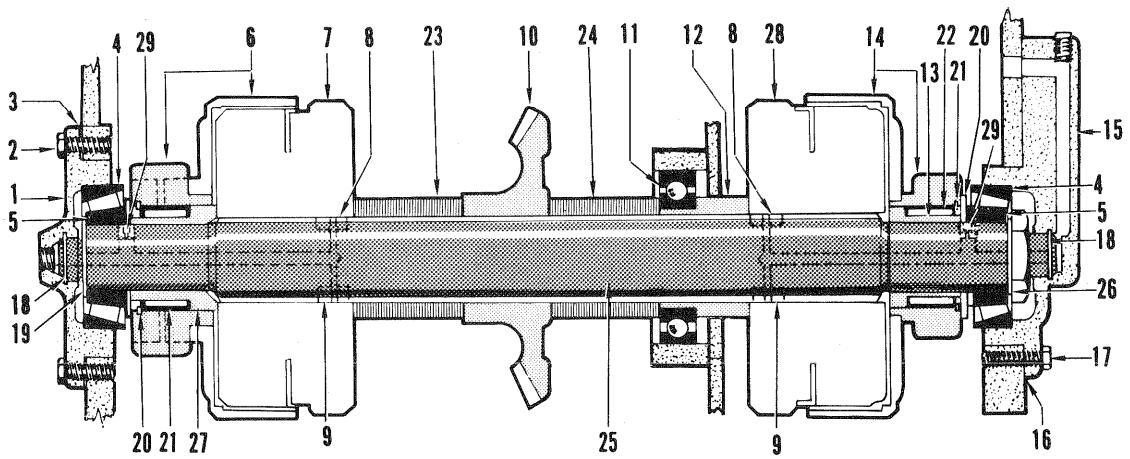
FOR POWER POWER CONTROLLED WINCH

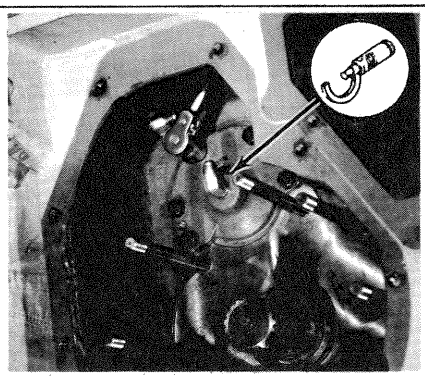


1. L.H. BEARING RETAINER
2. CAPSCREW - LOCKWASHER
3. SHIM(S)*
4. BEARING CUP
5. BEARING CONE
6. FORWARD SPIDER GEAR (INCLUDES 2ND REDUCTION PINION)
7. FORWARD CLUTCH ASSEMBLY
8. SEAL (THREE TEETH)
9. SEAL (TWO TEETH)
10. BEVEL RING GEAR
11. BALL BEARING
12. BEARING CARRIER
13. BEARING CARRIER
14. REV. SPIDER GEAR (INCLUDES 2ND REDUCTION PINION)
15. R.H. BEARING RETAINER
16. SHIM(S)*
17. CAPSCREW - LOCKWASHER
18. SEAL RING
19. SNAP RING
20. THRUST WASHER
21. SNAP RING
22. ROLLER BEARING
23. SPACER (SHORT)
24. SPACER (LONG)
25. BEVEL GEAR SHAFT
26. LOCKWASHER - LOCKNUT
27. BEARING CARRIER
28. REVERSE CLUTCH ASSEMBLY
29. ORIFICE PLUG

* SHIM(S) AVAILABLE IN 0.005, 0.007 and 0.020 - INCH THICKNESS

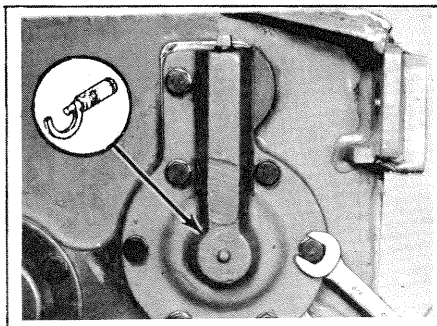
FIGURE 5-4. BEVEL GEAR SHAFT, LOCATION OF COMPONENTS

NOTE: Prior to removal and disassembly of the bevel gear-shaft assembly, perform the procedures given in paragraph 5-13.



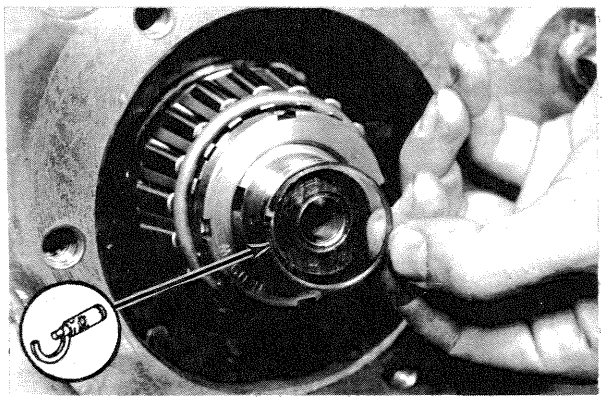
STEP 1. Remove left-hand bearing retainer with shims by removing the five capscrews.

NOTE: Keep shim pack with the retainer to aid reassembly.

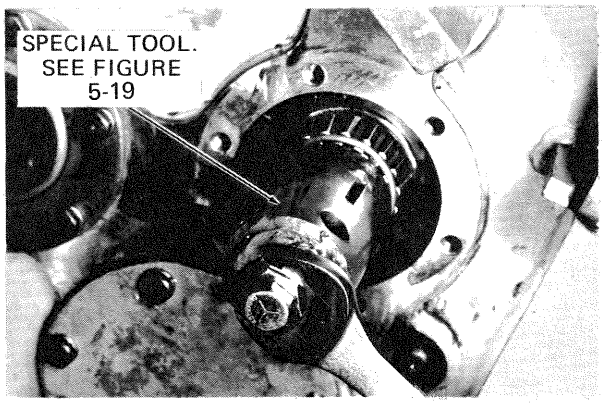


STEP 2. Remove right hand bearing retainer with shims by removing the seven capscrews. On power controlled models, disconnect hydraulic hose.

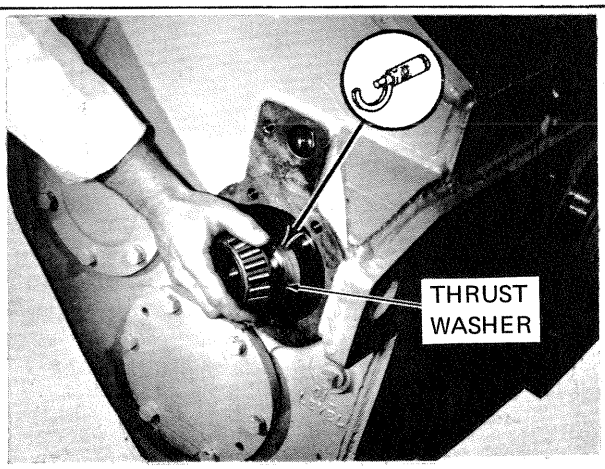
NOTE: Keep shim pack with the retainer to aid reassembly.



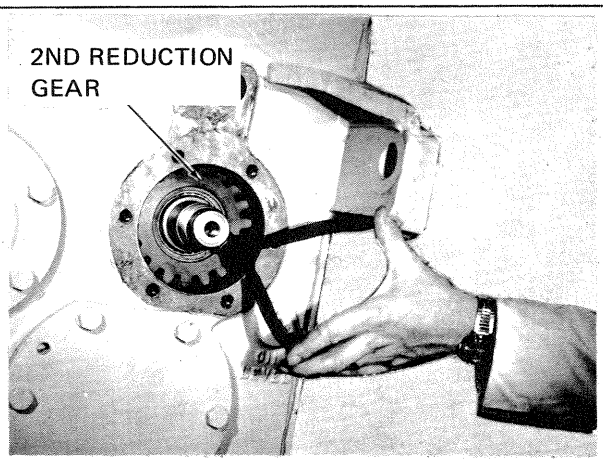
STEP 3. Remove cast-iron seal rings (one on each end of bevel gear shaft). Expand seal rings just enough to slip over the end of the shaft.



STEP 4. Straighten the lockwasher tangs securing the locknut. Remove locknut by turning counterclockwise. Remove lockwasher.



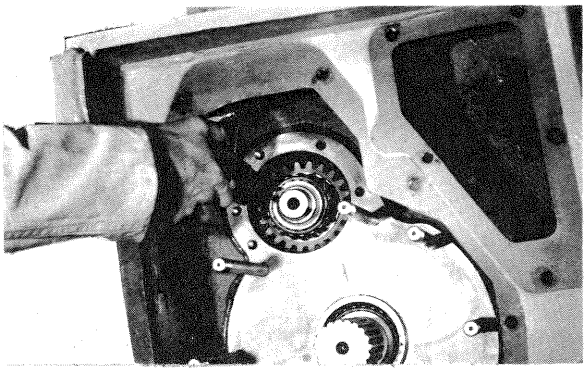
STEP 5. Remove taper roller bearing and thrust washer.



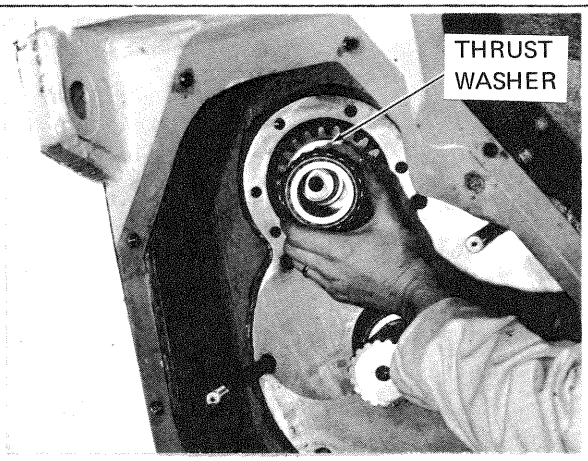
STEP 6. Remove the internal snap ring from the reverse spider gear bore.

1526

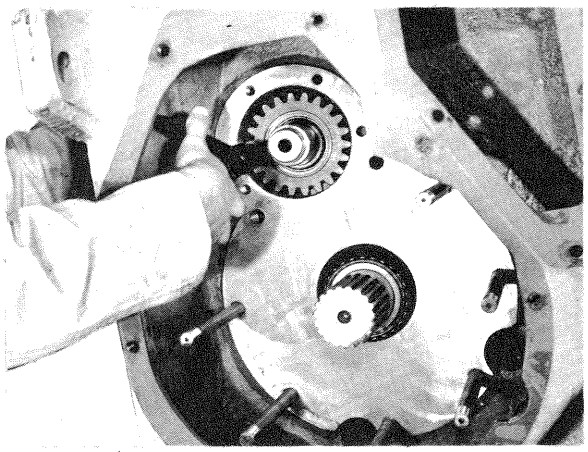
FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 1 of 3)



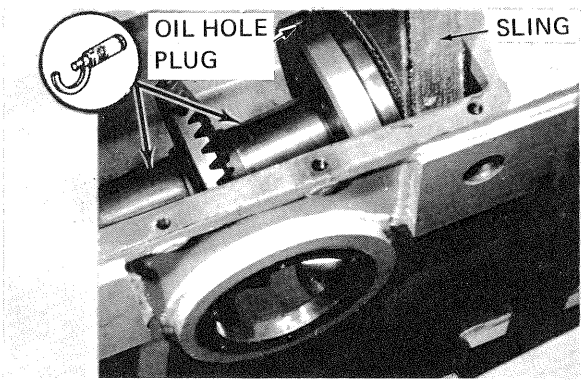
STEP 7. Remove external snap ring from left-hand end of the bevel gear shaft. It may be necessary to tap right-hand end of bevel gear shaft to relieve pressure on snap ring.



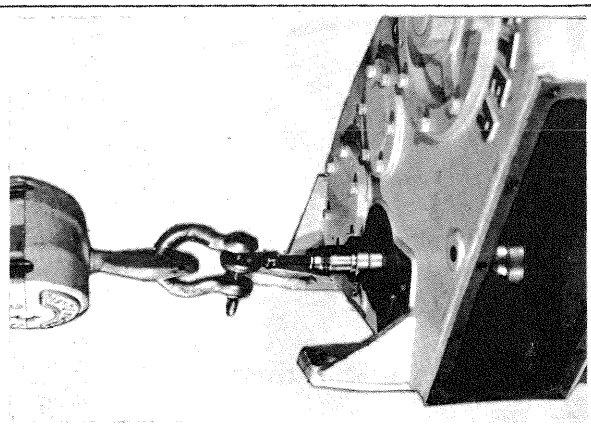
STEP 8. Remove taper roller bearing and thrust washer.



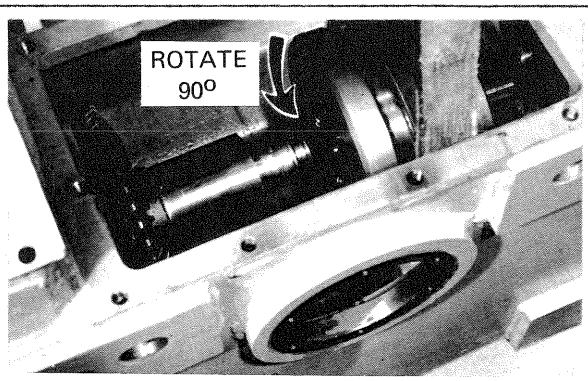
STEP 9. Remove the internal snap ring from the fwd. 2nd reduction pinion gear bore.



STEP 10. Install a sling around fwd clutch assembly or attach a cable to a lifting eye installed in oil hole with plug removed. Hoist until sling or cable just starts to lift clutch assembly.



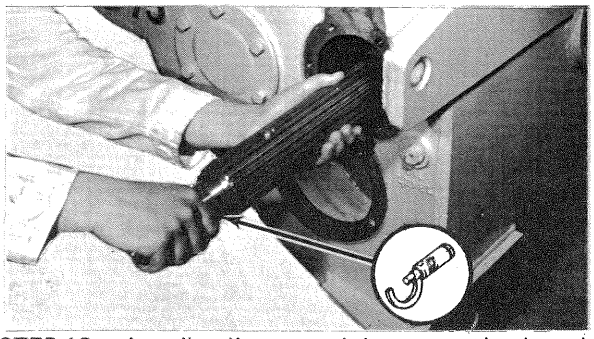
STEP 11. Pull bevel gear shaft straight out.
CAUTION: Pull out just far enough for removal of forward clutch pack.



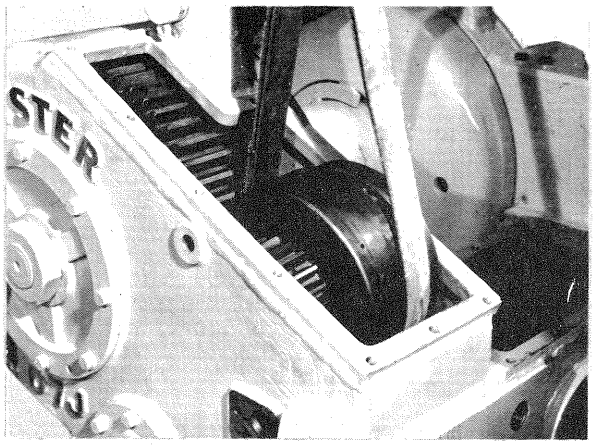
STEP 12. Remove forward clutch pack by rotating 90° from position shown. Lift straight out after rotating. Remove bevel gear and two spacers (3 for D.D.)

1527

FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 2 of 3)



STEP 13. Install a sling around the reverse clutch pack or use lifting eye. Hoist until sling or cable just starts to lift clutch pack, then remove bevel gear shaft. Restrain center ball bearing and bearing carrier from falling into compartment.



STEP 14. Remove reverse clutch assembly, bearing carrier, and center ball bearing.

1528

FIGURE 5-5. REMOVAL AND DISASSEMBLY OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 3 of 3)

5-14. Disassembly of Clutch Assemblies (Power Controlled Winch Only).

5-15. Disassembly of the clutch assemblies used in the Power Controlled winch is shown in Figure 5-6. Removal of the clutch assemblies is shown in Figure 5-5.

5-16. Removal of Brake Shaft Assembly.

5-17. Removal of the brake shaft assembly is shown in Figure 5-7. The brake shaft cannot be removed when the winch is mounted on the tractor. Prior to removal of the brake shaft assembly, perform the following:

a. Remove the winch from the tractor (refer to Section 6).

b. Drain oil from winch (see Figure 4-1).

c. Remove all brake components as shown in Figure 5-2 or 5-3, depending upon the winch model.

NOTE If removal of the brake shaft second reduction gear is not necessary, the brake shaft can be removed with the bevel gear shaft installed. To remove the brake shaft reduction gear, the bevel gear shaft must be removed as shown in Figure 5-5.

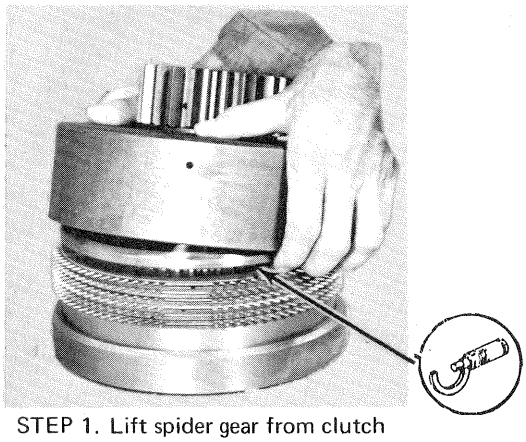
5-18. Removal of Intermediate Shaft Assembly.

5-19. Removal of the intermediate shaft and associated components is shown in Figure 5-8. The intermediate shaft can be removed with the winch mounted on the tractor. Prior to removal of the intermediate shaft, intermediate gear, and drum pinion gear, sufficient clearance can be obtained by removing the drum shaft bearing retainer as shown in Figure 5-10, Step 3.

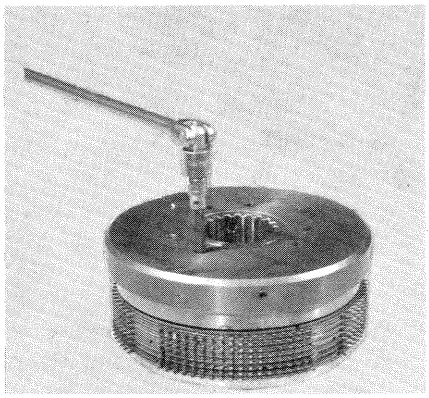
NOTE Figure 5-8 shows the winch removed from the tractor with the bevel gear shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but is not necessary for removal of the intermediate shaft only.

5-20. Removal of Drum Shaft and Drum.

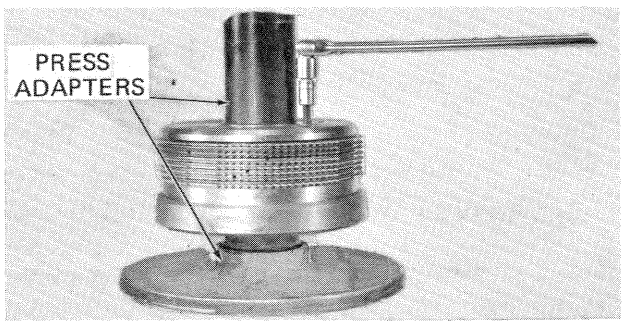
5-21. Removal of the drum shaft and drum is shown in Figure 5-10 (see Figure 5-9 for component location). The winch should be removed from the tractor before the drum shaft and drum are removed. Special tools will aid removal of the drum shaft and drum; see the illustration of special tools (Figure 5-20) and locally fabricate the tools if possible. Do not attempt to remove heavy components (such as the drum or drum gear) by hand. Use the recommended attachments whenever possible. Removal of the intermediate shaft (see Figure 5-8) and the reverse clutch assembly (see Figure 5-5) is required prior to removal of the drum shaft and drum.



STEP 1. Lift spider gear from clutch pack.

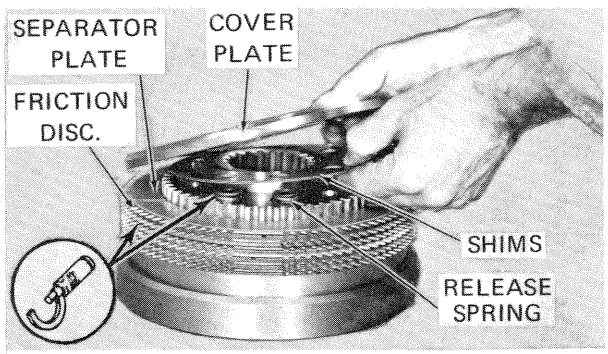


STEP 2. Remove eight set screws that lock the special capscrews on opposite end of clutch.



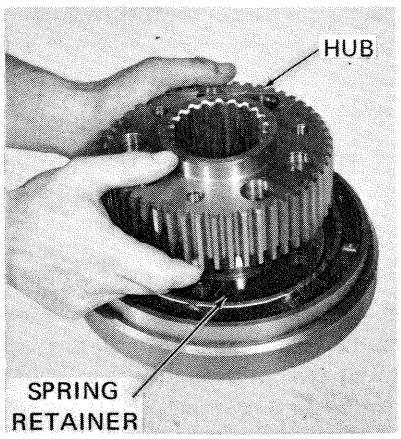
STEP 3. Remove eight special capscrews. Hold assembly in press as shown.

CAUTION: The press adapters should contact the hub only. Apply only enough pressure to prevent the assembly from turning when capscrews are removed.

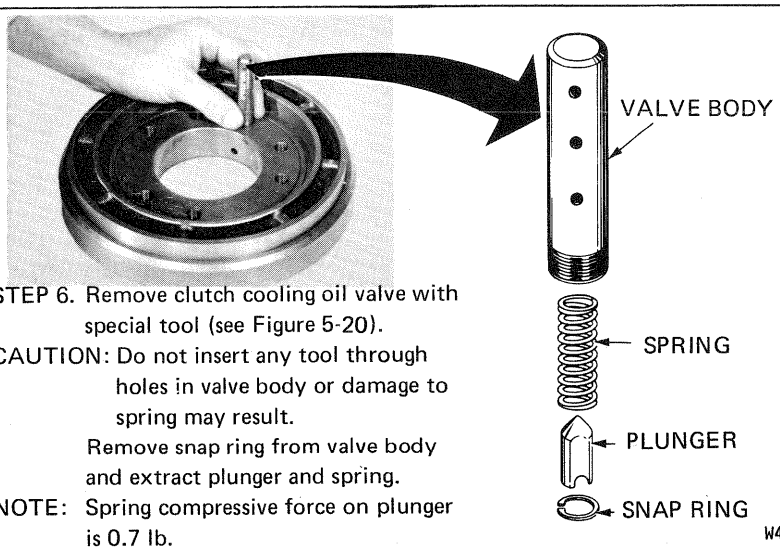


STEP 4. Lift cover plate, shim, eight release springs, eight friction discs, and eight separator plates from clutch hub.

CAUTION: Keep friction discs and separator plates in order. They must contact same surface when reinstalled



STEP 5. Remove hub and spring retainer from piston retainer.



STEP 6. Remove clutch cooling oil valve with special tool (see Figure 5-20).

CAUTION: Do not insert any tool through holes in valve body or damage to spring may result.

Remove snap ring from valve body and extract plunger and spring.

NOTE: Spring compressive force on plunger is 0.7 lb.

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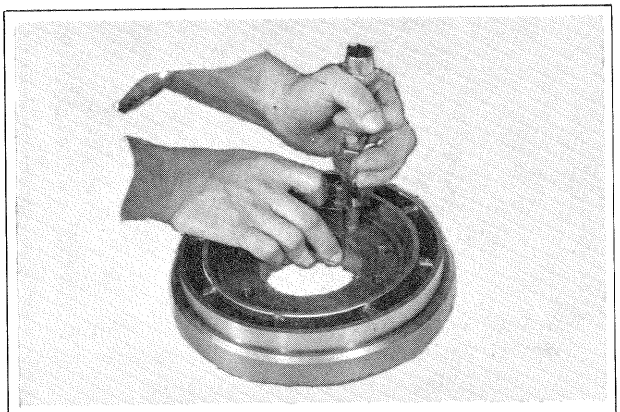
FIGURE 5-6. DISASSEMBLY OF CLUTCH ASSEMBLY (POWER CONTROLLED WINCH) (Sheet 1 of 2)



STEP 7. Remove the clutch piston from piston retainer by applying compressed air at the cooling oil valve port. Then remove two o-rings.

FIGURE 5-6. DISASSEMBLY OF CLUTCH ASSEMBLY (POWER CONTROLLED WINCH) (Sheet 2 of 2)

5-22. Removal of Control Valve (Power Controlled Winch Only).

5-23. Access to the control valve may be obtained by removing the control valve access cover plate on the upper left-hand side of winch housing. Improved access to adjacent hydraulic fittings can be made by also removing the brake cover plate. Remove the control valve as follows (see Figure 5-11):

a. Detach the control cable from the valve spool clevis (refer to Section 6).

b. Disconnect the inlet pressure line, brake pressure line, brake pressure gauge line, brake cooling oil line, forward and reverse clutch pressure lines at their respective valve port fittings.

c. Remove dump hose line connection at cooling oil relief valve.

d. Remove the three sets of capscrews and lockwashers and remove control valve, with attached cooling oil relief valve.

NOTE Refer to paragraph 5-30 for control valve repairs.

5-24. CLEANING.

5-25. When parts are removed from the winch, remove accumulated grease and dirt using mineral spirits or other suitable cleaning solvents. Never inspect parts coated with excessive amounts of grease or dirt. Damage to a part may not be obvious unless thoroughly cleaned. Steam clean all external surfaces of the winch prior to reassembly.

CAUTION Do not use oily (dirty) solvents to clean the brake brand used in the direct drive winch. Use only clean solvents to remove grease or oil from the brake lining.

5-26. BEVEL GEAR SHAFT OIL PASSAGES. Ensure that the oil passage in each end of the bevel gear shaft is clean. To aid in cleaning the passages, remove the four seals from the inboard holes and the two orifice plugs from the outboard holes. Use air to blow out any accumulated dirt.

5-27. VISUAL INSPECTION.

5-28. Table 5-1 contains procedures for visual inspection of all critical parts of the winch assembly.

5-29. MINOR REPAIRS.

5-30. Control Valve Repairs (Power Controlled Winch).

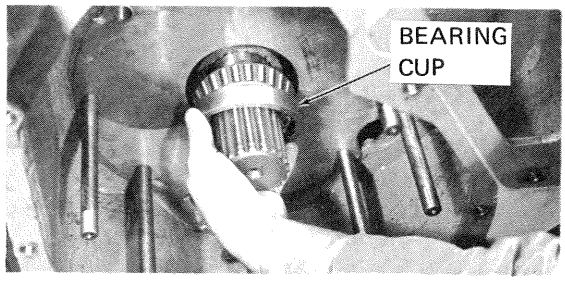
5-31. Repair of the control valve is limited to removal and replacement of individual components as shown in Figure 5-11. Replace components as required, if found to be defective or not meeting the specifications listed in Table 1-1. The following procedures should be observed:

CAUTION Do not attempt to machine any part of the control valve. If parts are found to be defective, replace the part. Do not hone the valve spool bores.

a. Discard all old O-rings. Lubricate all new O-rings with hydraulic oil before installation.

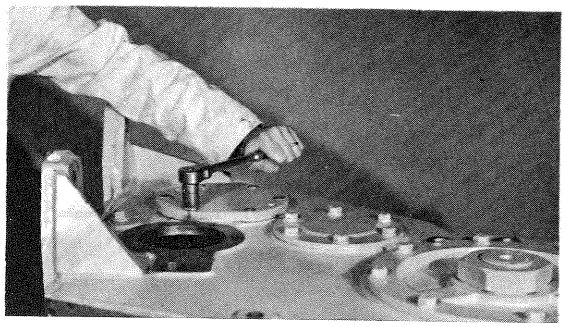
b. Check all threads in the valve body and on external fittings. If threads in the valve body have been damaged, re-thread using same size tap. Make sure that all metal chips are removed from the valve ports.

c. Check all springs for weak or collapsed coils (see Table 1-1 for spring specifications).



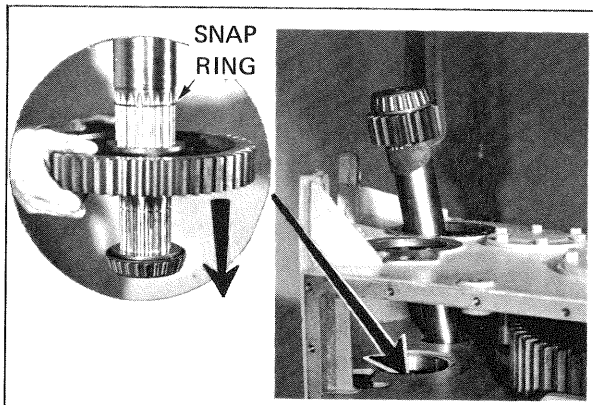
NOTE: Prior to removal and disassembly of the brake shaft, perform the procedures given in paragraph 5-17.

STEP 1. Remove left-hand bearing cup (outer race). Tag cup for reference during reassembly.

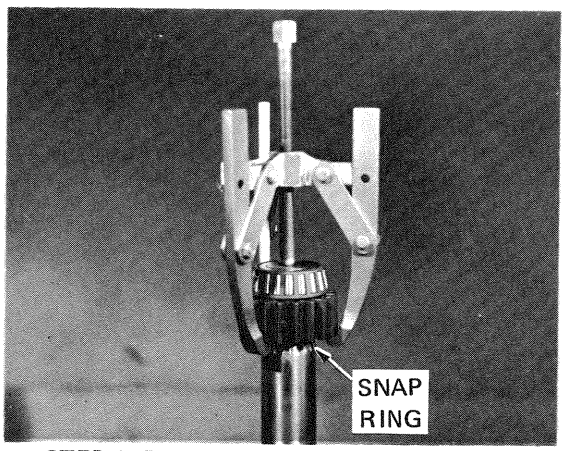


STEP 2. Position winch with right-hand side facing upward. Remove bearing retainer and shim pack.

NOTE: Keep shim pack with the retainer to aid reassembly.



STEP 3. Pull brake shaft out of winch housing to approximate position shown. Tap bearing off of shaft using reduction gear as driver. Remove reduction gear and snap ring.



STEP 4. Remove bearing and pinion gear with puller. Remove snap ring.

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FIGURE 5-7. REMOVAL OF BRAKE SHAFT ASSEMBLY

5-32. Cooling Oil Relief Valves (Power Controlled Winch).

5-33. COOLING OIL RELIEF VALVE REPAIR. Repair is limited to replacement of individual components as shown in Figure 5-11. Check spring for weak or collapsed coils (see Table 1-1 for spring specifications).

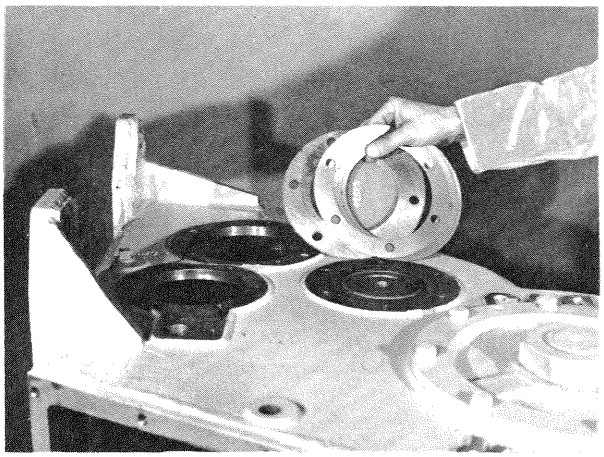
5-34. BRAKE COOLING OIL RELIEF VALVE REPAIR. Repair is limited to replacement of individual components as shown in Figure 5-11. Ensure that orifices in poppet are open and that poppet spring is free of weak or collapsed coils (see Table 1-1 for spring specifications).

5-35. REASSEMBLY AND INSTALLATION.

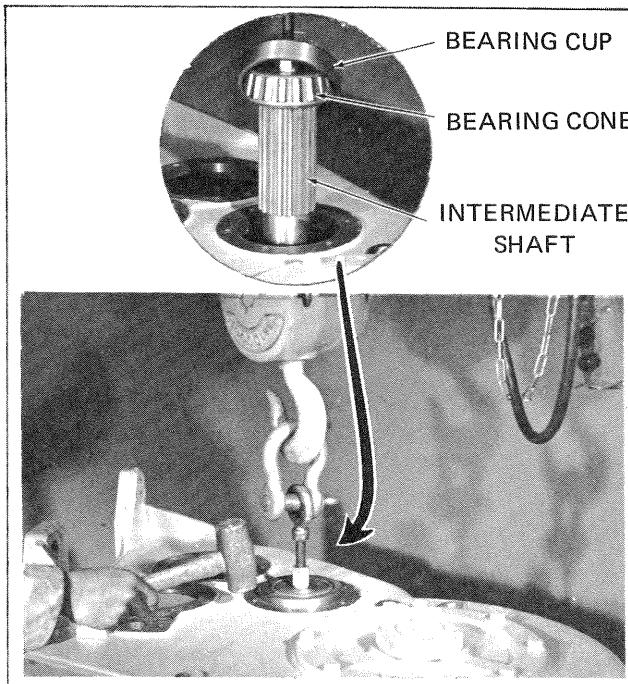
5-36. Before reassembly and installation of the winch, make sure that all removed parts have been inspected as specified in Table 5-1. Check all measurements specified in Table 5-1 and as shown in the disassembly illustrations. Replace any part that is not within the specified limits. Carefully check all bearings that have been removed. Used bearings often appear to be satisfactory, but may fail when placed under a load. When in doubt, installation of new bearings is recommended. New bearings may prevent future troubles.

CAUTION Apply a light coat of sealing compound (John Crane, or equal) to all external bearing retainers and cover plate capscrews.

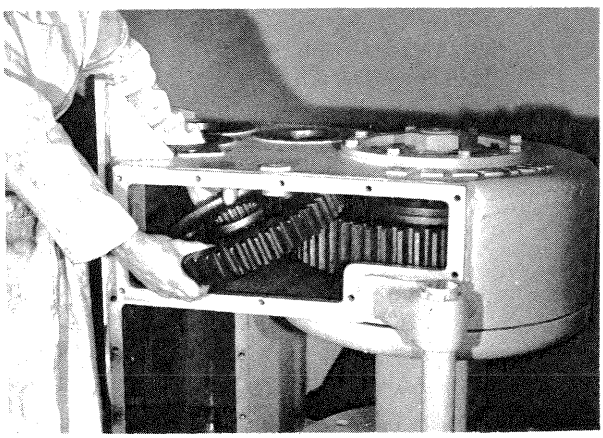
NOTE: The following illustrations show the winch removed from the tractor and positioned on its side with the brake shaft and bevel gear shaft removed. Removal of these shafts is not necessary for ON TRACTOR REPAIR of the intermediate shaft. Remove the drum shaft bearing retainer (see figure 5-10) to obtain the necessary clearance for removal of the intermediate shaft gears.



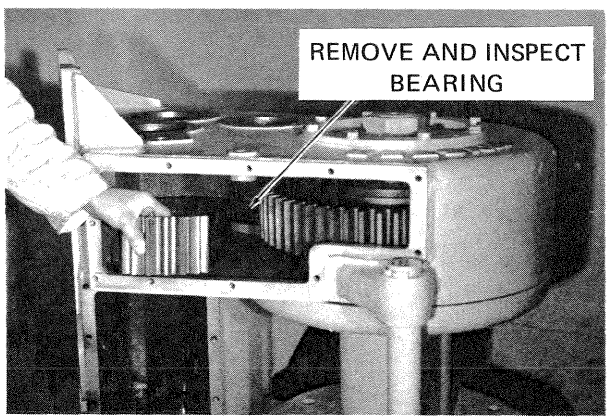
STEP 1. Remove the right-hand bearing retainer with shims. Tag shims for reference during reassembly.



STEP 2. Screw a 5/8-inch eyebolt into the end of intermediate shaft and pull out shaft. Tap on winch frame to break loose the bearing.



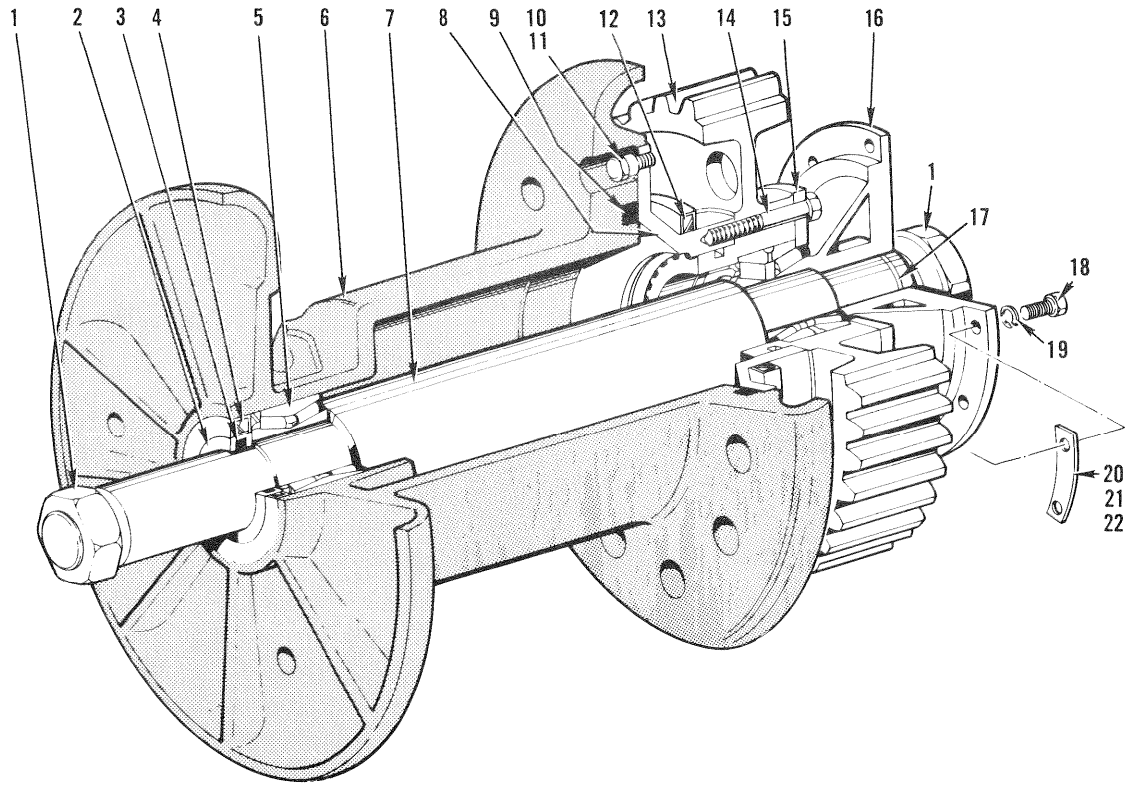
STEP 3. Remove intermediate gear.



STEP 4. Remove the drum pinion and bearing.

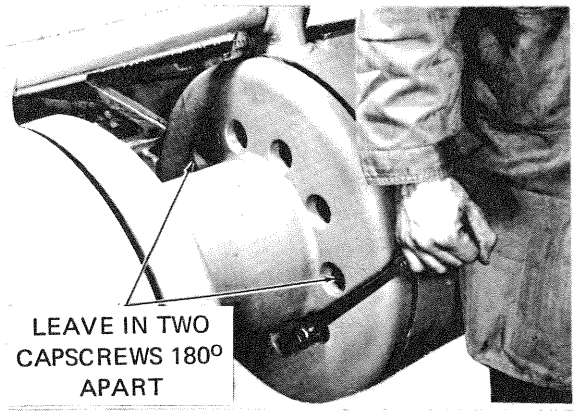
1521

FIGURE 5-8. REMOVAL OF INTERMEDIATE SHAFT ASSEMBLY



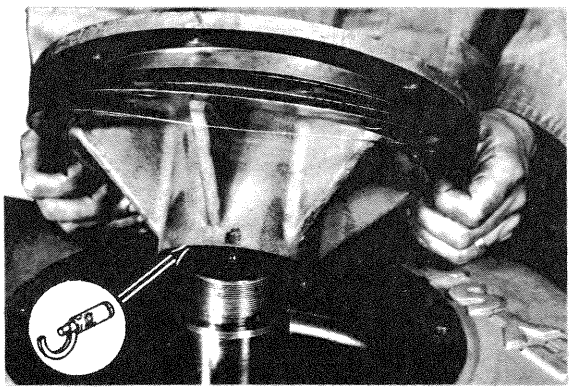
1. NUT (2 REQ'D)
2. SPACER
3. O-RING
4. OIL SEAL
5. L.H. BEARING ASSEMBLY
6. DRUM
7. DRUM SHAFT
8. ADAPTER
9. SEAL RING
10. CAPSCREW (12 REQ'D)
11. DOWEL (12 REQ'D)
12. OIL SEAL
13. DRUM GEAR
14. PLACE BOLT (8 REQ'D)
15. RETAINER PLATE
16. BEARING RETAINER
17. O-RING
18. CAPSCREW (8 REQ'D)
19. LOCKWASHER (8 REQ'D)
20. SHIM, 0.005 - INCH (AS REQ'D)
21. SHIM, 0.007 - INCH (AS REQ'D)
22. SHIM, 0.020 - INCH (AS REQ'D)

FIGURE 5-9. DRUM SHAFT AND DRUM ARRANGEMENT



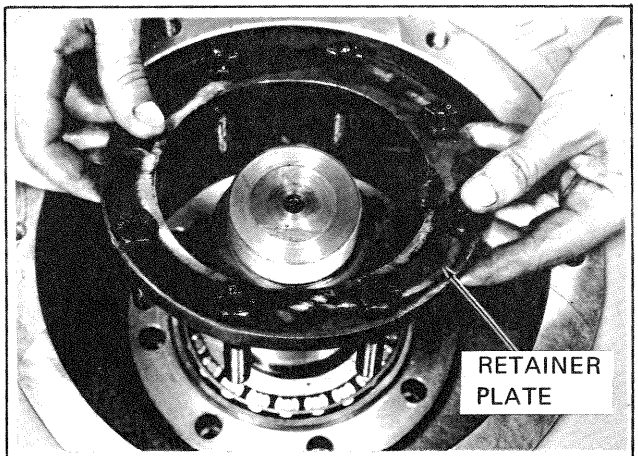
STEP 1. Loosen the 12 drum capscrews, then remove 10 capscrews leaving two located 180 degrees apart.

STEP 2. Remove left-hand drum shaft locknut, then turn winch so that right-hand side faces upward. Remove second drum shaft locknut.

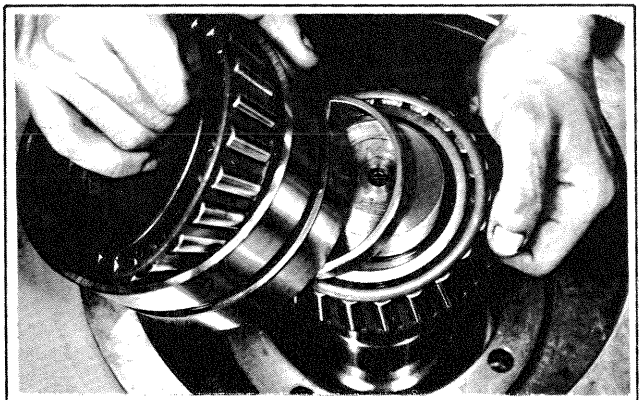


STEP 3. Remove bearing retainer and shim pack.

NOTE: Tag shim pack for reference during reassembly.

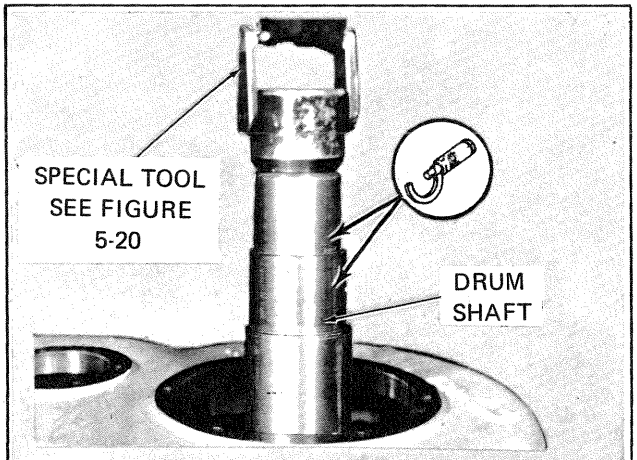


STEP 4. Remove retainer plate by removing the eight special capscrews.



STEP 5. Remove double taper roller bearing assembly.

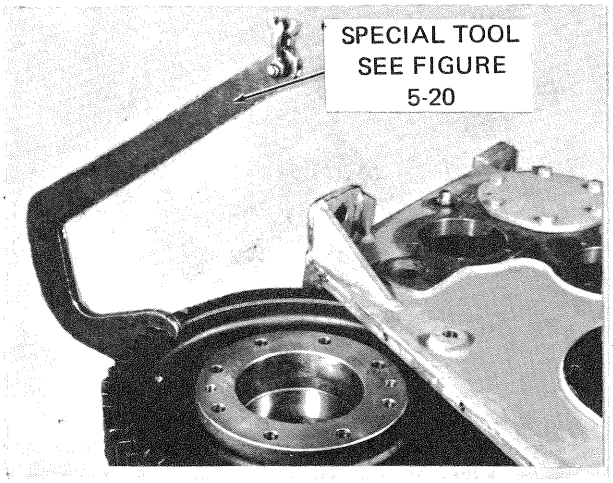
NOTE: Bearing assembly may be removed with the drum shaft if it is seized to the shaft.



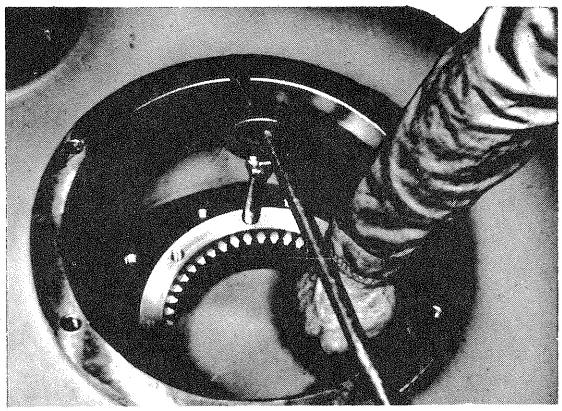
STEP 6. Remove drum shaft using special attachment.

1524

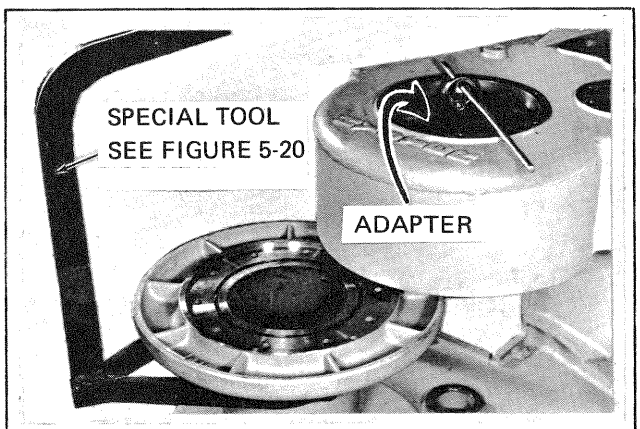
FIGURE 5-10. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 1 of 2)



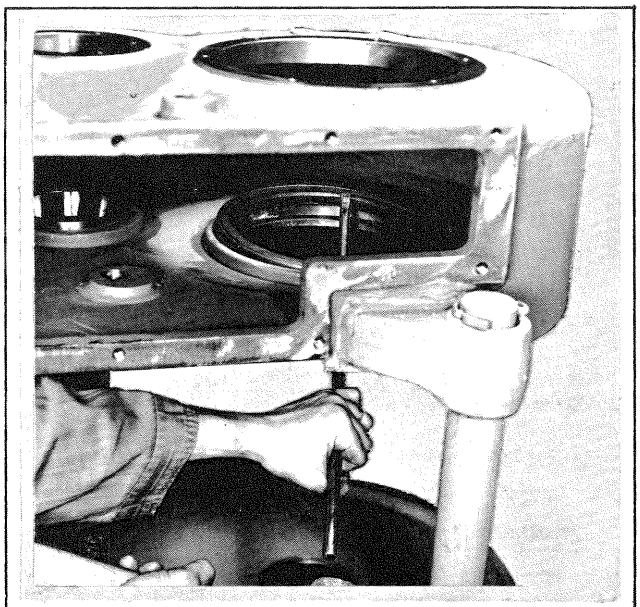
STEP 7. Remove drum gear using special attachment.



STEP 8. Hold adapter as shown, then remove two remaining drum capscrews.

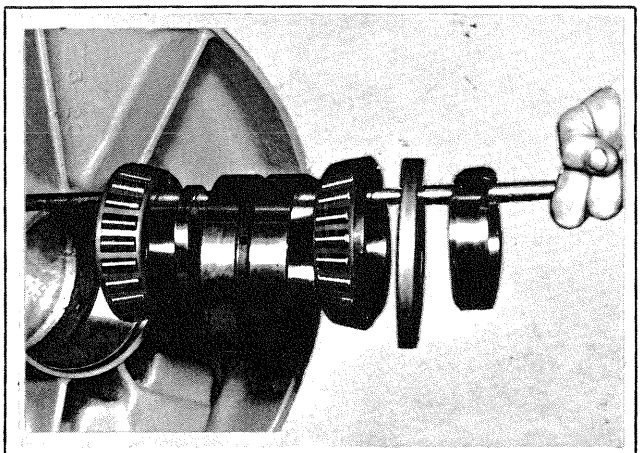


STEP 9. Remove from winch frame using attachment as shown. Remove adapter.



STEP 10. Remove drum seal.

NOTE: This seal must be replaced with a new Hyster Approved seal during installation.



STEP 11. Remove double taper roller bearing assembly.

1525

FIGURE 5-10. REMOVAL OF DRUM SHAFT AND DRUM (Sheet 2 of 2)

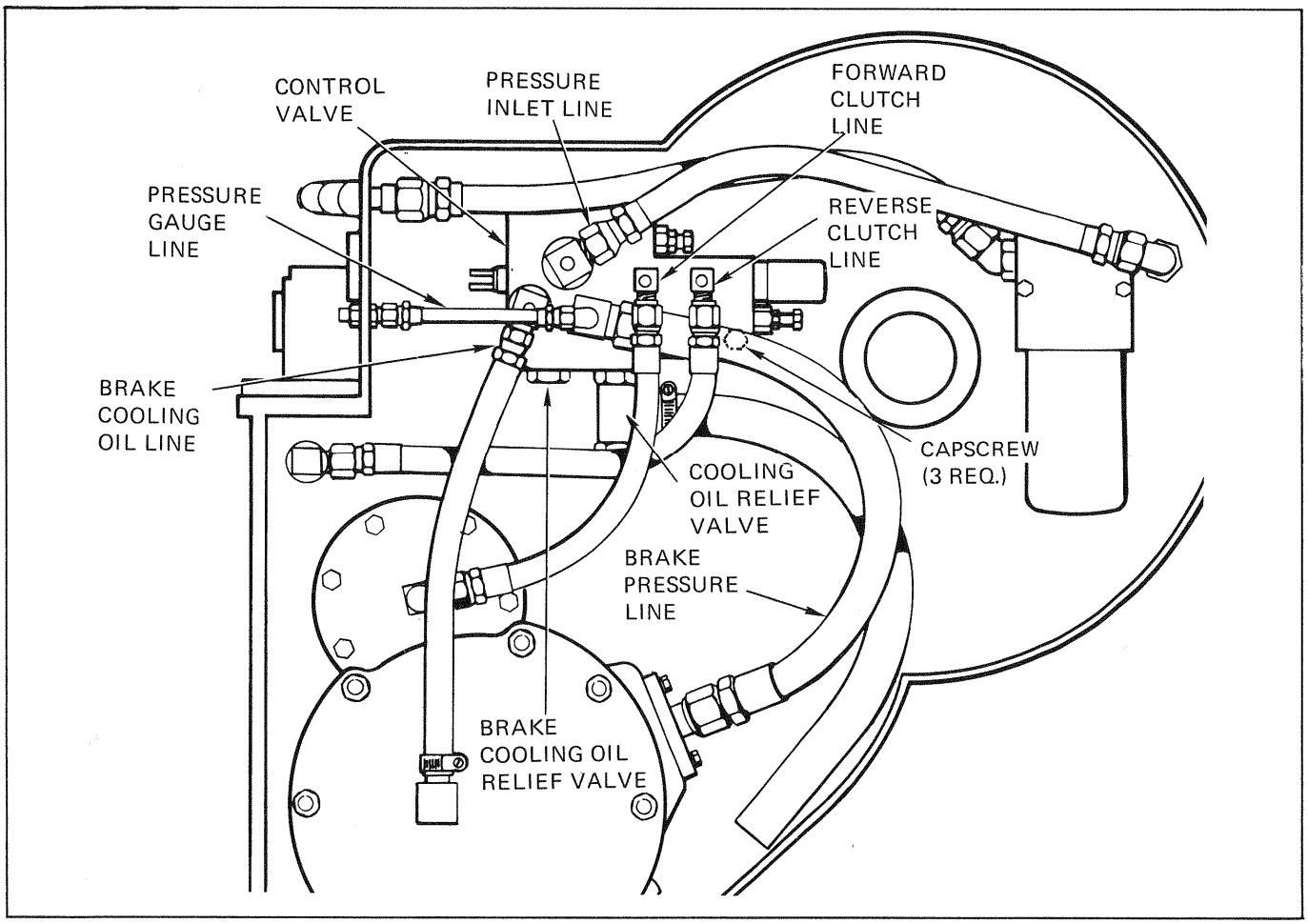


FIGURE 5-11. CONTROL VALVE REPAIR, POWER CONTROL WINCH (Sheet 1 of 2)

5-37. Reassembly of Clutch Assemblies (Power Controlled Winch).

5-38. Reassembly of the clutch assemblies used in the Power Controlled winch is shown in Figure 5-12.

CAUTION Make certain that all parts have been thoroughly cleaned prior to reassembly. Dirt particles will seriously affect operation of the clutch assembly.

5-39. Installation of Drum and Drum Shaft.

5-40. Reassembly and installation of the drum and drum shaft is shown in Figure 5-13. Location of components is shown in Figure 5-9. During installation of the drum and drum shaft, see the illustration of special tools (Figure 5-20) and locally fabricate the tools if possible. The intermediate shaft and reverse clutch assembly must be removed before installation of the drum and drum shaft.

5-41. Installation of Intermediate Shaft Assembly.

5-42. Installation of the intermediate shaft and associated components is shown in Figure 5-14. Figure 5-14 shows the winch removed from the tractor with the bevel gear shaft and brake shaft removed. However, the intermediate shaft can be installed with the winch mounted on the tractor and with only the drum shaft bearing retainer removed for the necessary clearance.

5-43. Installation of Brake Shaft Assembly.

5-44. Installation of the brake shaft and associated components is shown in Figure 5-15. The brake shaft and reduction gear must be installed before installation of the bevel gear shaft assembly. The brake shaft cannot usually be installed when the winch is mounted on the tractor unless the tractor tracks are removed or disconnected. The brake shaft must be adjusted for 0.006 to 0.009 inch endplay.

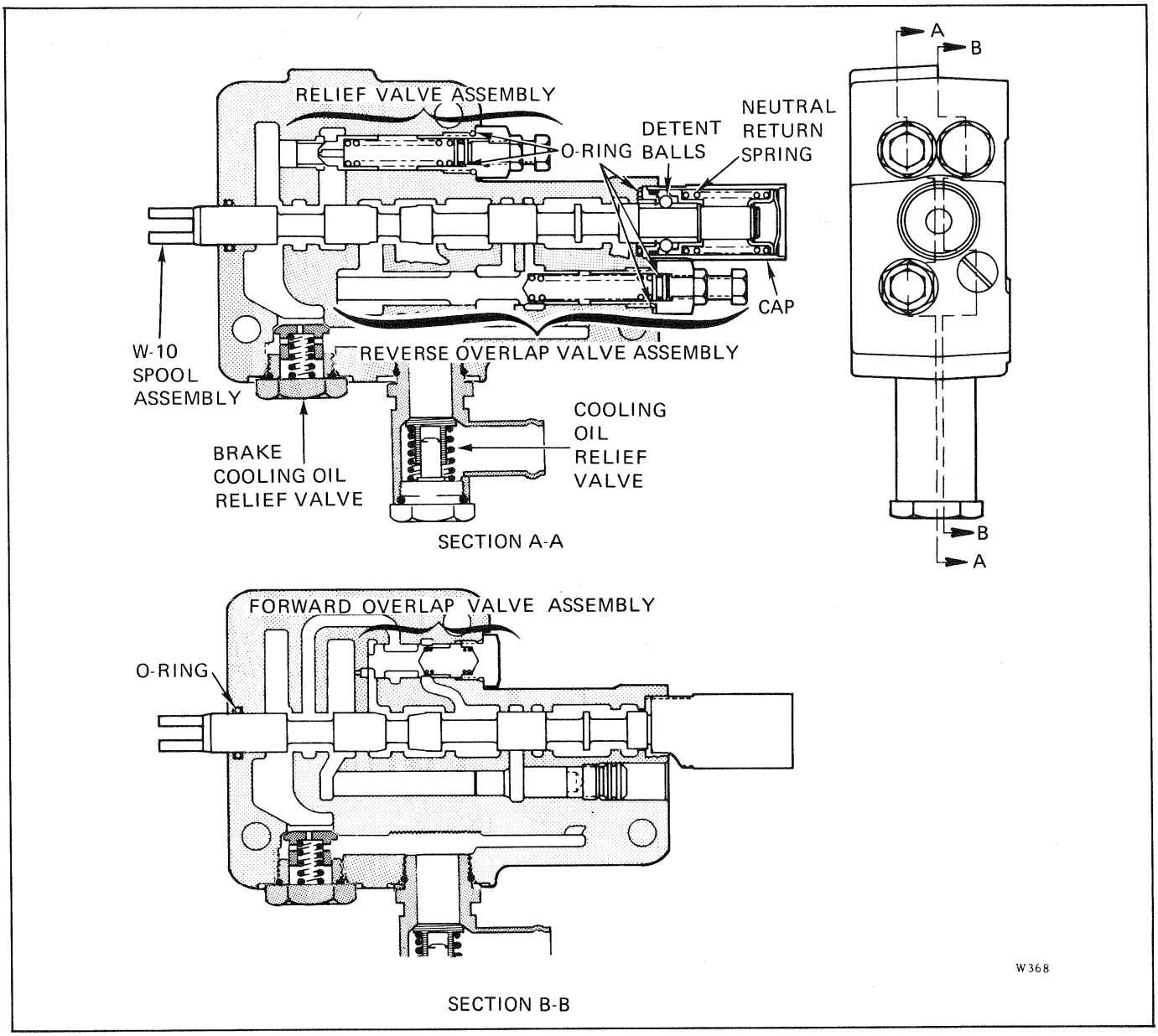


FIGURE 5-11. CONTROL VALVE REPAIR, POWER CONTROL WINCH (Sheet 2 of 2)

TABLE 5-1. VISUAL INSPECTION (Sheet 1 of 5)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft with Integral Bevel Pinion Gear	Check for broken or worn bevel gear teeth. Also check spline for wear or twisting.	Replace shaft if gear teeth are broken or severely worn or if splines are not true.
PTO Shaft, with Removable Bevel Pinion Gear	Check splines for wear or twisting.	Replace shaft if splines are severely worn or twisted.
PTO Shaft Bevel Gear (Removable)	Check for broken or worn bevel gear teeth.	Replace bevel gear if teeth are broken or severely worn.

TABLE 5-1. VISUAL INSPECTION (Sheet 2 of 5)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Bevel Gear Shaft, Direct Drive	Check for deep scratches or scoring on bearing journals at each end of shaft.	Machine bearing journal as required but do not exceed minimum dimensions given in Table 1-1.
Bevel Gear Shaft, Power Controlled Winch	Check for deep scratches or scoring journals at each end of shaft.	Machine bearing journal as required but do not exceed minimum dimensions given in Table 1-1.
	Inspect bevel gear shaft seal ring grooves for taper, scoring, burrs, and corrosion.	Replace or repair shaft if mating surfaces between the inner side of groove and seal are not FLAT.
	Check for broken, scored, pitted, and corroded cast iron seal rings.	Replace seal rings if worn or damaged slightly.
	Check threads on right-hand end of bevel gear shaft for scoring or distortion: a. Puller Hole (internal threads). b. Locknut (external threads).	Dress threads with a thread chaser.
	Check for broken or severly worn splines.	Replace shaft if splines are broken or severely worn.
	Inspect spline seal counterbore for damage.	Replace or rebuild shaft if a new spline seal will not seat properly.
	Check for damaged or enlarged orifice plugs.	Replace plugs if damaged or if orifice hole diameter is not within specifications (see Table 1-1).
Bevel Gear Shaft Bearing Retainers	Check retainer bearing bore and seal ring bore for grooves, scoring, and rust.	Replace if scored, rusted, or if they are not within specifications given in Table 1-1.
Dental Clutch, Direct Drive Winch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Bevel Gear Shaft Spacers	Inspect spacer ends for scoring, mushrooming, or corrosion.	Replace if damaged in any way or if they are not within specifications given in Table 1-1.
Bevel Gear Shaft Pinion Gears, Direct Drive Winch	Check for broken or worn teeth and scoring or galling in bearing bore.	Replace pinion gears if teeth are broken or severely worn, or if bearing bore is badly scored or if diameter exceeds the maximum dimension given in Table 1-1.
Bevel Gear	Check for broken or worn teeth.	Replace if teeth are broken or severly worn.

TABLE 5-1. VISUAL INSPECTION (Sheet 3 of 5)

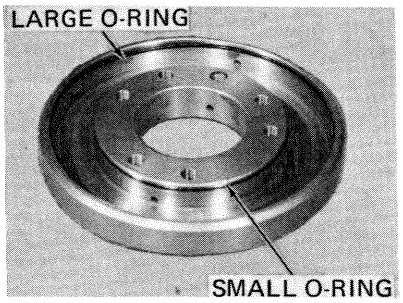
ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Bevel Gear (Cont.)	Inspect gear hub faces for scoring, mushrooming, or corrosion.	The gear should be replaced if the hub faces are defective in any way. **NOTE** Do not machine gear faces. Overall length of components is critical.
Clutch Assembly, Power Controlled Winch	Check for plugged oil holes in clutch hub and cooling oil valve. Also check cooling oil valve body for bore roughness, plunger for free movement, and plunger spring for weak or collapsed coils.	Clean oil holes as necessary. See Figure 5-6, Step 6. Replace cooling oil valve body, plunger, or spring if not within specifications listed in Table 1-1.
	Carefully inspect friction discs for facing wear, distortion, and damaged teeth.	Replace friction disc if oil grooves are worn from sintered bronze facing, or if width is below minimum noted in Table 1-1, or if distorted in any way.
	Carefully inspect separator plates to verify that surfaces are conical (dished) and that other surfaces are not worn excessively or unevenly.	Replace separator plate if conical surface is flat, or if other surfaces are warped, scored, or below minimum thickness specified in Table 1-1. **NOTE** Separator plates must be dished to assist clutch release.
	Inspect piston retainer plate O-ring grooves, piston cavity and center bore for scoring, burrs, and corrosion.	Replace piston retainer plate if damaged or does not meet specifications given in Table 1-1.
	Check for weak or collapsed release springs.	Replace spring(s) if free length or pressure/deflection response is not within specifications listed in Table 1-1.
	Inspect spider gear for broken or worn gear teeth. Check for broken welds between pinion gear and spider gear hubs. Inspect bearing bore for scoring or galling.	Replace gear if teeth are broken or severely worn or if there are any apparent cracks. Replace gear if bearing bore is badly scored or if diameter exceeds the maximum dimension given in Table 1-1.
Oil Brake Assembly, Power Controlled Winch	Check for cracked or broken belleville spring or evidence of spring collapse.	Replace spring if cracked or broken or below specified deflection/force listed in Table 1-1.
	Inspect oil brake cover for scoring, burrs, cracks, or warpage.	Replace cover if damage affects sealing or proper contact with belleville spring.
	Inspect thrust ring faces for grooves or surface depressions.	Replace ring if surfaces are excessively worn.

TABLE 5-1. VISUAL INSPECTION (Sheet 4 of 5)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Oil Brake Assembly, Power Controlled Winch (Cont.)	Carefully inspect friction discs for facing wear, distortion, and damaged teeth.	Replace friction disc if oil grooves are worn from sintered bronze facing, if width is below minimum noted in Table 1-1, or if distorted in any way.
	Carefully inspect separator plates to verify that surfaces are conical (dished) and that other surfaces are not worn excessively or unevenly.	Replace separator plates if conical surface is flat, or if other surfaces are warped, scored, or below minimum thickness specified in Table 1-1. **NOTE** Separator plates must be dished to assist brake release.
	Inspect piston housing O-ring grooves, center bore and bearing cup bore for scoring, burrs, and corrosion.	Replace piston housing if damaged or outside specifications given in Table 1-1.
	Inspect brake cage for wear, scoring, burrs, and cracks.	Replace cage if splines are notched or cage is cracked.
	Inspect brake hub for wear, scoring, burrs, and cracks.	Replace hub if splines are notched or hub is cracked.
	Check push rods for grooves, mushrooming, and end faces out of square.	Replace if damaged enough to cause binding or if diameter, length, or end squarness do not meet specifications given in Table 1-1.
	Carefully check aligning dowels for grooves and distortion.	Replace if damaged sufficiently to cause binding or misalignment.
Brakeshaft	Check for deep scratches or scoring on bearing journals at each end of shaft, and oil seal surface on Direct Drive.	Machine bearing journal as required but do not exceed minimum dimensions in Table 1-1.
	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Brakeshaft Gears	Check for broken or worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Brakeshaft Bearing Retainers	Check LH and RH retainer bearing bore and seal bore for grooves, scoring, and rust.	Replace if scored, rusted, or if they are not within specifications listed in Table 1-1.
Brake Wheel, Direct Drive Winch	Check braking surface for wear, grooving, or scoring.	Machine outer surface as required but do not exceed minimum dimension listed in Table 1-1.
Intermediate Shaft	Check for deep scratches or scoring on bearing journals at each end of shaft.	Machine bearing journal as required but do not exceed minimum dimensions in Table 1-1.

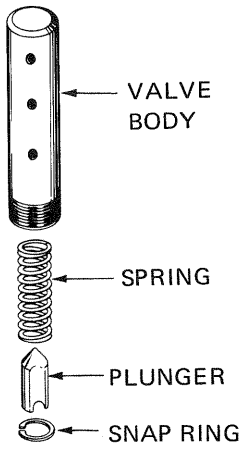
TABLE 5-1. VISUAL INSPECTION (Sheet 5 of 5)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Intermediate Shaft (Cont.)	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Intermediate Gears	Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gears if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing journal at each end of shaft.	Machine shaft as required but do not exceed minimum dimensions specified in Table 1-1.
	Check for cross threaded or damaged threads. Inspect LH seal journal and RH O-ring groove for corrosion.	Dress threads with thread chaser. Remove corrosion with fine abrasive cloth or paper as necessary.
Drum Gear	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth. Check bearing bore diameter for scoring and galling and pilot surfaces for rust and corrosion.	Replace gear if teeth are broken or severely worn or if bearing bore and pilot diameters are outside of limits specified in Table 1-1.
Drum	Inspect seal ring groove for burrs, scoring, and rust.	Replace drum or repair drum groove if a new seal ring will not seat properly.
	Check for scoring, galling or corrosion in bearing bore and seal bore.	Replace if surface is badly damaged or if diameter exceeds the maximum listed in Table 1-1.
Drum Adapter	Carefully inspect double seal contact surface for deep scratches, burrs, and rust.	Replace if damaged.
Dental Clutch Shift Linkage, Direct Drive Winch	Check shifter shaft, forks, spacer, shoes, crank assembly, and crank bracket for excessive wear, galling, corrosion, or damage.	Replace parts, as necessary, if excessively damaged, corroded, or if dimensions of wear surfaces are not within limits listed in Table 1-1.
	Check detent and spacer springs for weak or collapsed coils.	Replace springs if free length or pressure/deflection response is not within specifications listed in Table 1-1.
Dry Brake and Automatic Brake Linkage, Direct Drive Winch	Check brake link, crank, lever assembly, band assembly and attaching pins for excessive wear, galling, corrosion, or damage.	Replace parts, as necessary, if excessively damaged, corroded, or if dimensions of wear surfaces are not within specifications listed in Table 1-1.
	Check brake band assembly for excessive lining wear.	Replace lining if worn within 1/32-inch from rivet heads.

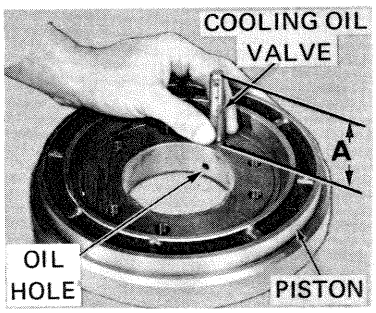


STEP 1. Install two new O-rings. Lubricate piston retainer cavity.

NOTE: It may be necessary to stretch large O-ring so it will stay in its groove when piston is installed.



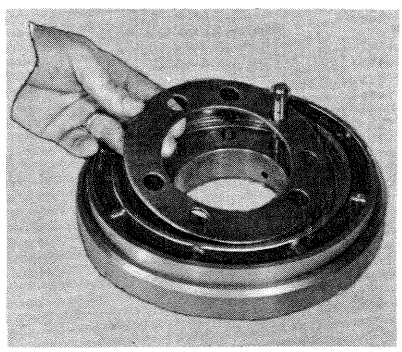
STEP 2. Insert spring and plunger into cooling oil valve body with pointed end of plunger next to spring. Secure with snap ring.



STEP 3. Install piston and cooling oil valve. Tighten valve with special tool (See Fig. 5-20) until distance from face of piston retainer to end of valve (Dimension A) is 2-13/32 (+0, −1/32) inches and holes in valve body are aligned with oil hole in piston retainer and holes in hub, when installed (see Step 5).

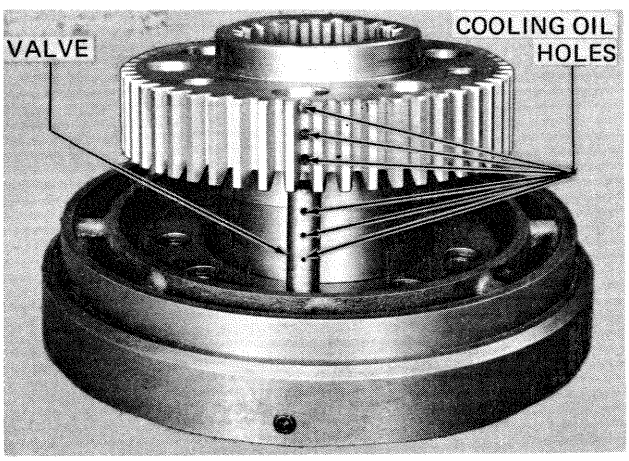
NOTE: If threads are loose for final position of valve, remove and apply thread locking compound such as Loctite.

CAUTION: Do not insert any tool through valve body. It will damage spring.



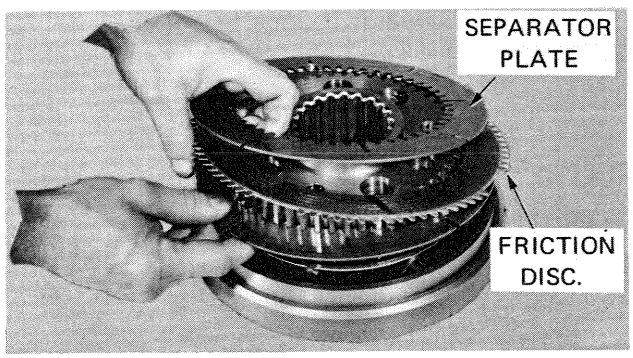
STEP 4. Install spring retainer.

NOTE: Holes are sequenced so spring retainer can only be installed as shown.



STEP 5. Install clutch hub.

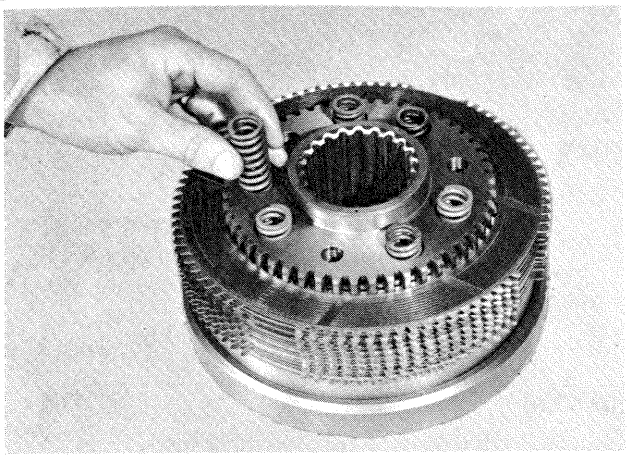
CAUTION: Cooling oil holes in the clutch hub must align with the holes in cooling oil valve.



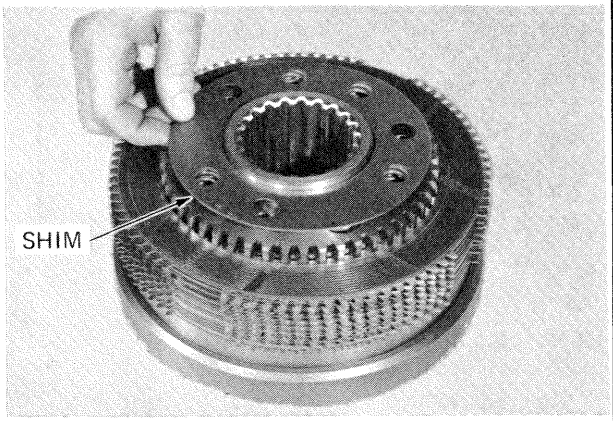
STEP 6. Place eight separator plates and eight friction discs ALTERNATELY on clutch hub with blanked out teeth in friction discs in line.

CAUTION: Separator plates must be placed next to piston. Separator plates are slightly conical (dished). Install ALL the plates facing the same direction.

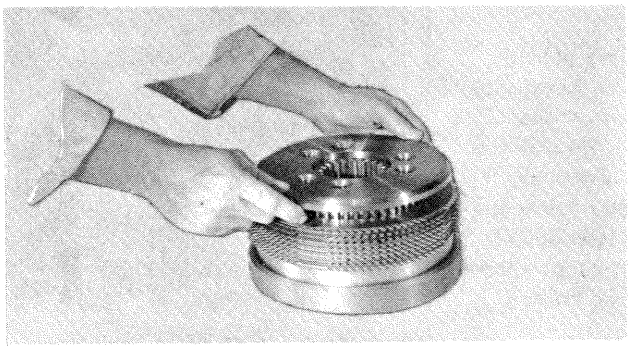
FIGURE 5-12. REASSEMBLY OF CLUTCH ASSEMBLY, POWER CONTROLLED WINCH (Sheet 1 of 3)



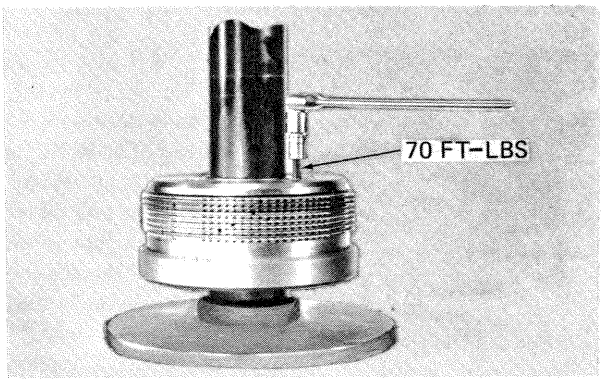
STEP 7. Install eight release springs.



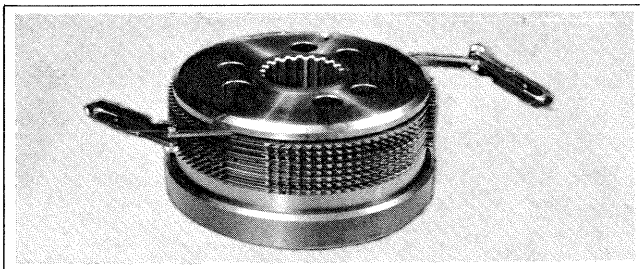
STEP 8. Install shim if required (See STEP 11).
CAUTION: Holes are sequenced so shim can only be installed as shown.



STEP 9. Install cover plate.
CAUTION: Holes are sequenced so cover plate can only be installed as shown.

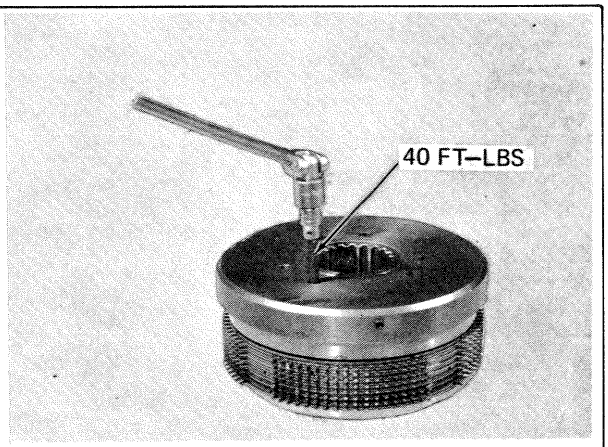


STEP 10. Install and tighten eight special capscrews.
CAUTION: The press adapters should contact the hub only. Apply only enough pressure to prevent assembly from turning when capscrews are tightened.



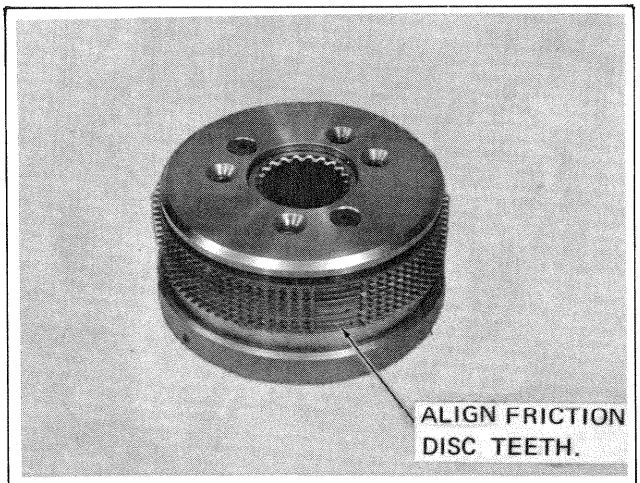
STEP 11. Measure distance between cover plate and top friction disc with two feeler gauges placed 180° apart as shown. Gap should be 0.065 to 0.125 inch. Add or delete shims as required to obtain correct clearance (see STEP 8).

CAUTION: When only one feeler gauge is used, friction disc will tip slightly giving false clearance.

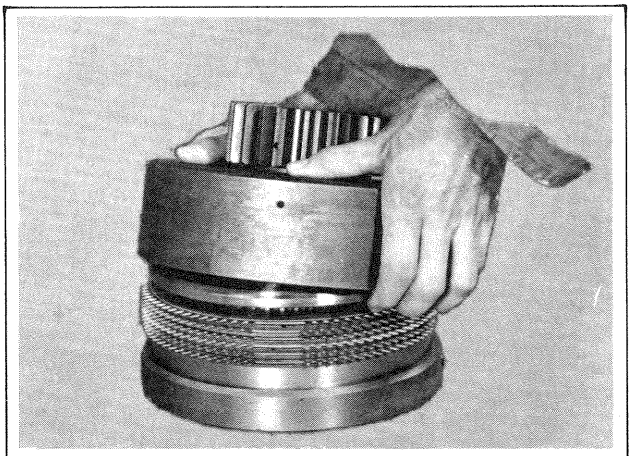


STEP 12. Tighten eight set screws that lock the special capscrews.

FIGURE 5-12. REASSEMBLY OF CLUTCH ASSEMBLY, POWER CONTROLLED WINCH (Sheet 2 of 3)



STEP 13. Align friction discs as shown.



STEP 14. Carefully slide spider gear over clutch pack.

FIGURE 5-12. REASSEMBLY OF CLUTCH ASSEMBLY, POWER CONTROLLED WINCH (Sheet 3 of 3)

5-45. Reassembly and Installation of Bevel Gear Shaft Assembly (Power Controlled Winch).

5-46. Reassembly and installation of the bevel gear shaft assembly used in the Power Controlled winch is shown in Figure 5-16. Installation of the bevel gear shaft can be accomplished with the winch mounted on the tractor. The bevel gear shaft must be adjusted for 0.000 to 0.004 inch preload.

NOTE The reduction gear (see Figure 5-15) must be installed before installation of the bevel gear shaft assembly. This is due to insufficient clearance for installing the reduction gear when the bevel gear shaft is installed.

5-47. Reassembly and Installation of Bevel Gear Shaft Assembly (Direct Drive Winch).

5-48. Reassembly and installation of the bevel gear shaft assembly used in the Direct Drive winch is essentially the same as for the bevel gear shaft used in the Power Controlled winch (see Figure 5-16). Reassemble and install the bevel gear shaft as shown in Figure 5-16, observing the following:

a. See Figure 5-4 for location of bevel gear shaft components.

b. The Direct Drive winch is equipped with dental clutches. Install the dental clutch so that the chamfered ramp faces toward the pinion gear.

c. Install the bevel gear and two spacers for either Underwind or Overwind operation. Refer to paragraph 4-15 or 4-19.

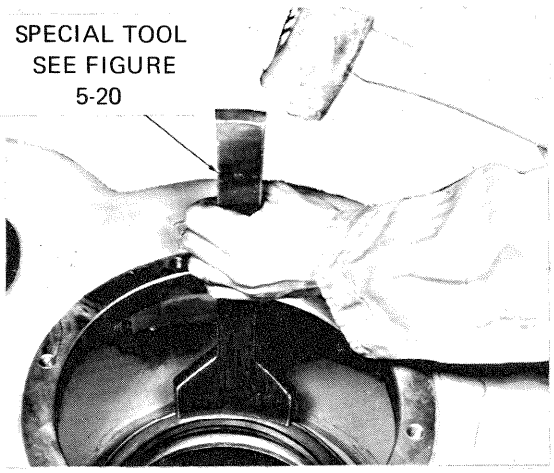
d. The bevel gear shaft must be adjusted for 0.006 to 0.009 inch endplay. This adjustment requires a different procedure than that used for preload adjustment for the Power Controlled winch. (See Figure 5-16.)

5-49. Reassembly and Installation of Oil Brake Assembly (Power Controlled Winch).

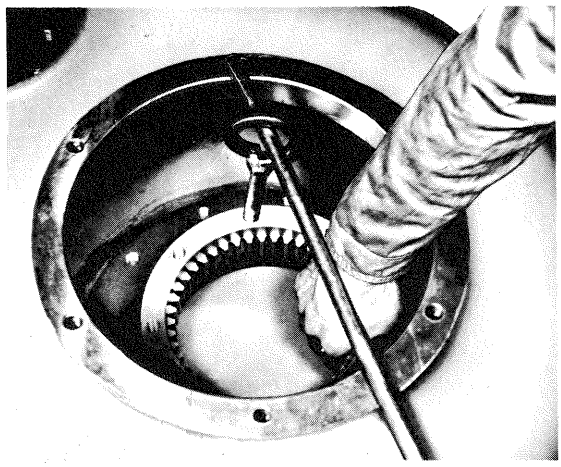
5-50. Reassembly and installation of the oil brake assembly used in the Power Controlled winch is shown in Figure 5-17. Reassembly and installation of the oil brake can be accomplished with the winch mounted on the tractor. Make sure that the bevel gear shaft has been installed prior to installation of the brake assembly. If new friction discs and separator plates are used, ensure that the stack does not exceed 2.240 inches in thickness when loaded to 100 pounds, between flat surfaces.

5-51. Installation of Dry Brake and Automatic Brake (Direct Drive Winch).

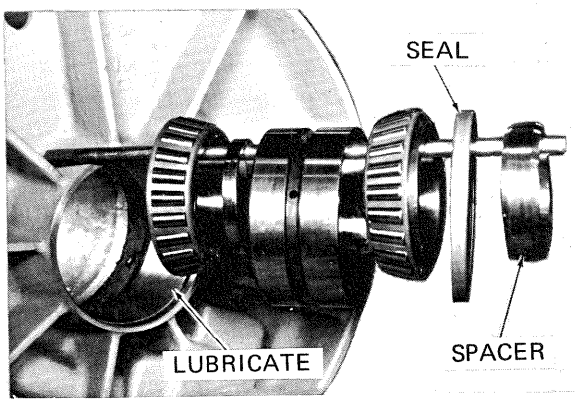
5-52. Installation of dry brake (or optional automatic brake) and brake and clutch linkage is shown in Figure 5-18. Installation procedures shown in Figure 5-18 apply to both the dry brake and optional automatic brake.



STEP 1. Lubricate seal bore with Lubriplate or other light lube grease. Install double-lip seal with smooth side down. Use seal driver as shown to prevent seal distortion.

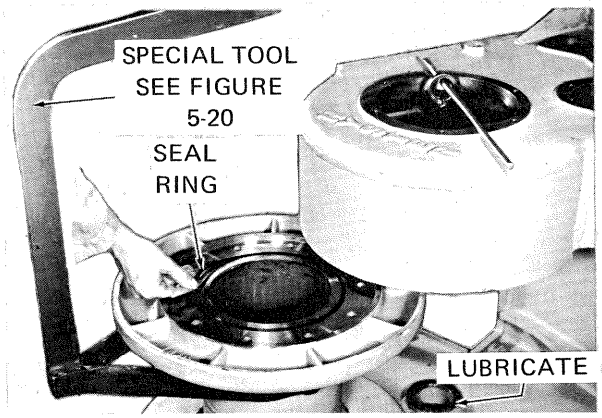


STEP 2. Position drum adapter by lifting it up through double-lip seal. Hold in place with bar and eyebolt as shown.



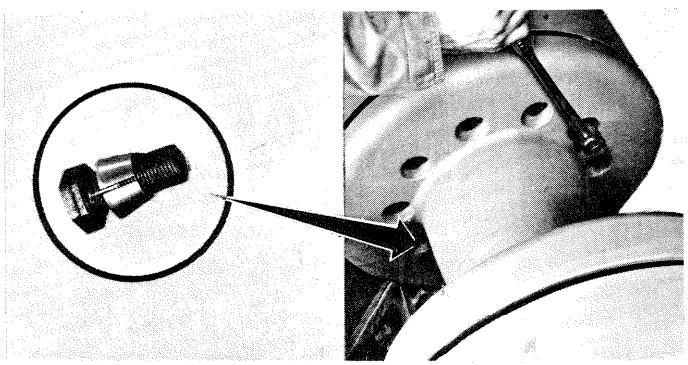
STEP 3. Lubricate drum bore with Lubriplate or other light lube grease, then install double-taper roller bearing, seal, and spacer as shown.

NOTE: Smooth side of seal must face inward.



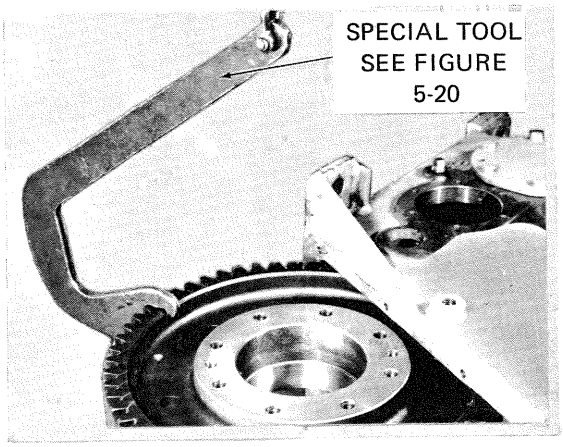
STEP 4. Lubricate left-hand drum shaft bore. Coat seal ring and groove with permatex or other suitable sealing compound. Install seal ring, then place drum in position using special attachment.

STEP 5. Align adapter and drum holes, then install the 12 locking dowels and capscrews. Tighten progressively and evenly to insure uniform compression of seal ring without shifting. Do not tighten to final torque of 200 ft-lbs.

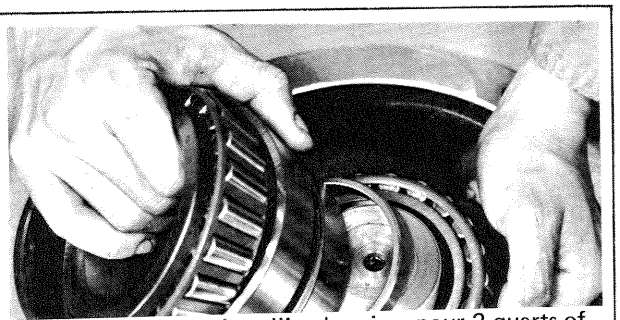


1533

FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 1 of 3)

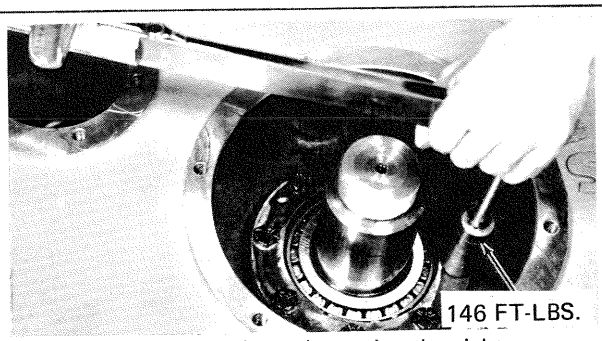


STEP 6. Install drum gear using special attachment as shown.



CAUTION: Prior to installing bearing, pour 2 quarts of oil over drum shaft to insure initial bearing lubrication (SAE 10 oil for P.C. and SAE 90 for D.D. winch).

STEP 8. Install bearing assembly. Install bearing parts in sequence shown. Tap into place.



STEP 9. Install retainer plate using the eight special capscrews. Tighten capscrews to 146 ft-lbs.

NOTE: Capscrews cannot be installed unless drum gear and drum adapter have been aligned as shown in Step 7.

STEP 7. Rotate drum gear to align match mark on gear with match mark on drum adapter. Make sure that double taper roller bearing, seal and spacer are properly seated in drum (see step 3). Lubricate drum shaft and drum gear bore, then install drum shaft using special attachment as shown. Remove sling and drive shaft down through drum gear until shaft bottoms solidly against lower taper roller bearing.

CAUTION: Hammer on special attachment only. Do not hammer on drum shaft surface.

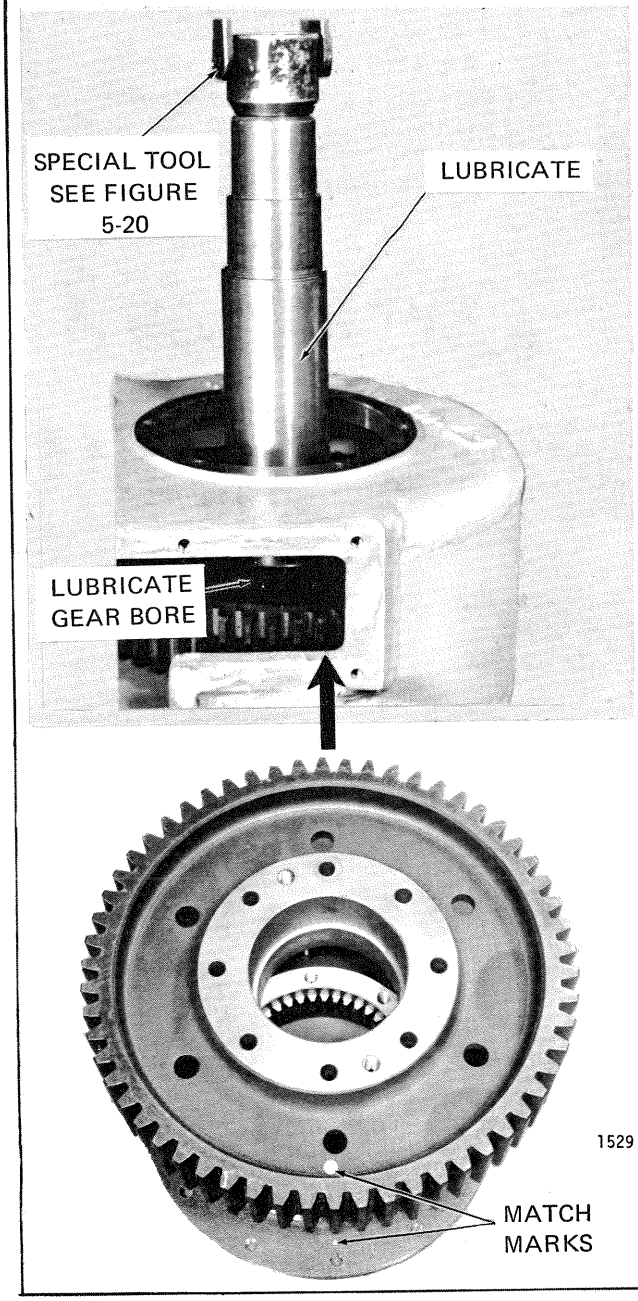
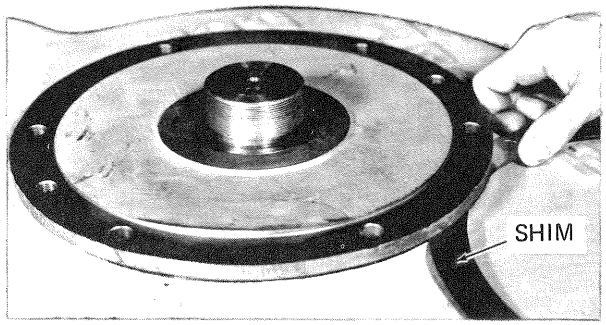
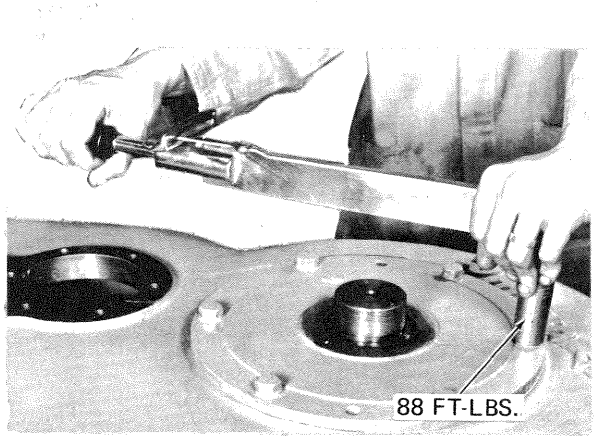


FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 2 of 3)

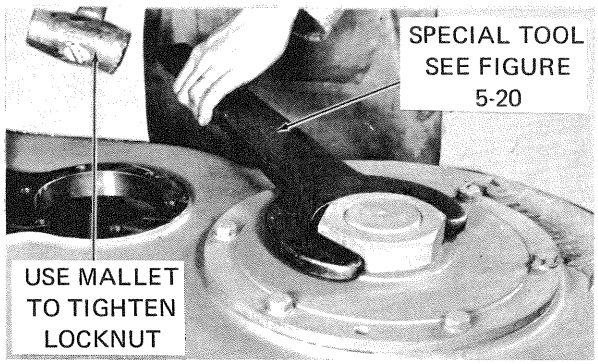


STEP 10. Set bearing retainer into place. Determine shim pack by sliding segment of shim between retainer and winch frame. Add shims until slight drag is felt. Remove retainer.

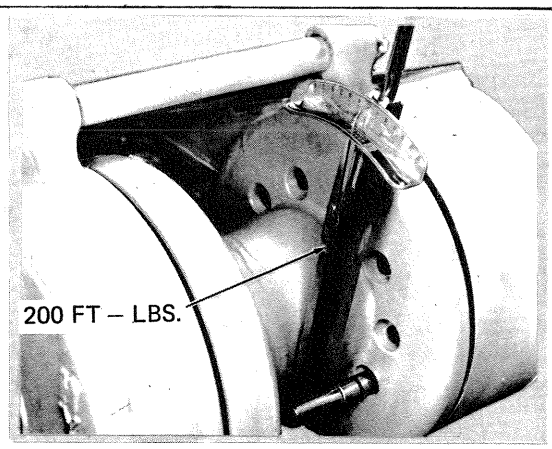
STEP 11. Coat winch frame and bearing retainer flange with permatex or other suitable sealing compound. Install shim pack (determined in Step 10).



STEP 12. Secure retainer using eight capscrews and lockwashers. Tighten capscrews to 88 ft-lbs.



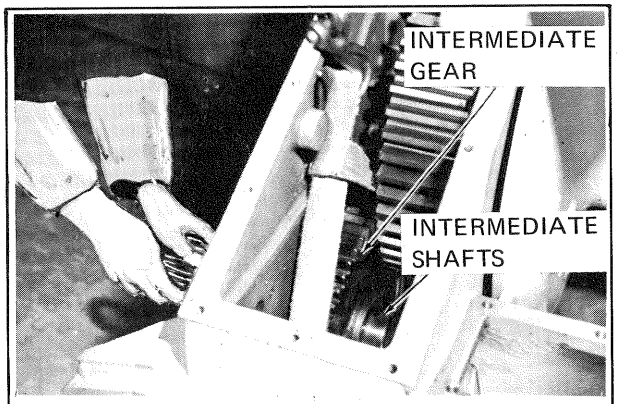
STEP 13. Coat locknut threads with permatex or other suitable sealing compound. Install nut and tighten securely as shown. Place winch in normal operating position and install locknut on opposite end of drum shaft.



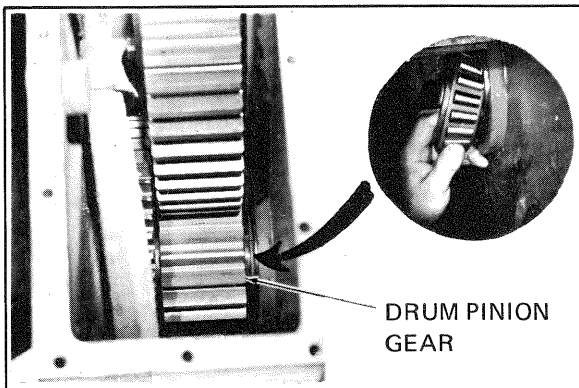
STEP 14. Tighten Drum-to-Adapter capscrews to 200 ft-lbs.

1530

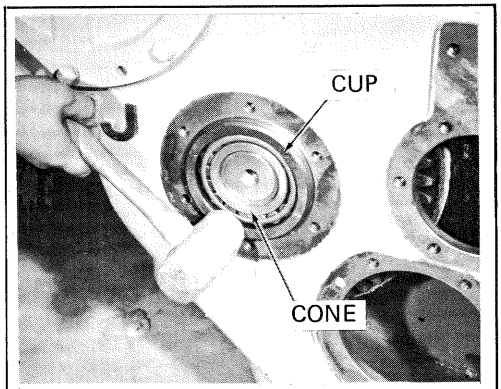
FIGURE 5-13. INSTALLATION OF DRUM AND DRUM SHAFT (Sheet 3 of 3)



STEP 1. Position intermediate gear in housing and install intermediate shaft far enough to support the gear.



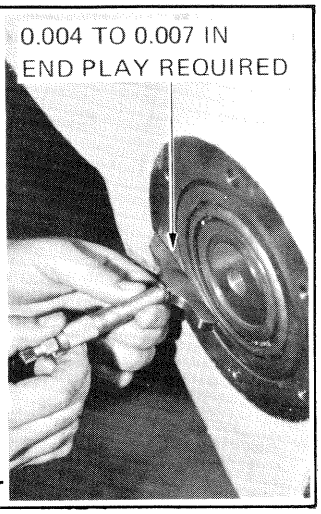
STEP 2. Install the intermediate shaft bearing and drum pinion gear. Tap the shaft through the pinion gear and against the bearing.

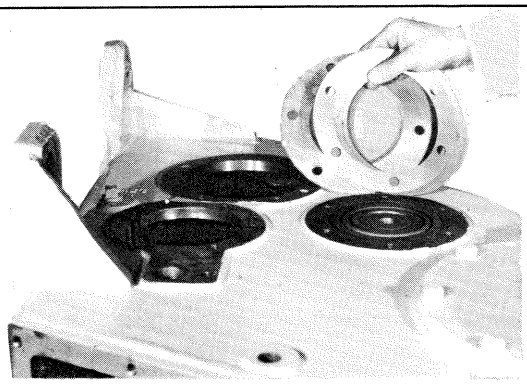


STEP 3. Install the bearing cone (inner race) and bearing cup (outer race). Make sure that cup is firmly seated against the bearing cone.

STEP 4. Measure the distance from the face of the bearing cup to the winch housing. Add shim pack 0.004 to 0.007 inch greater than the measured distance. For example, if the measure distance is 0.004 inch, add a shim pack with a total thickness of 0.008 to 0.011 inch. This will allow 0.004 to 0.007 inch endplay of the shaft.

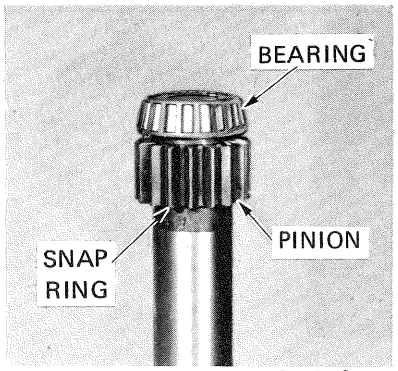
NOTE: Shafts requiring a shim pack greater than 0.020 are not uncommon.



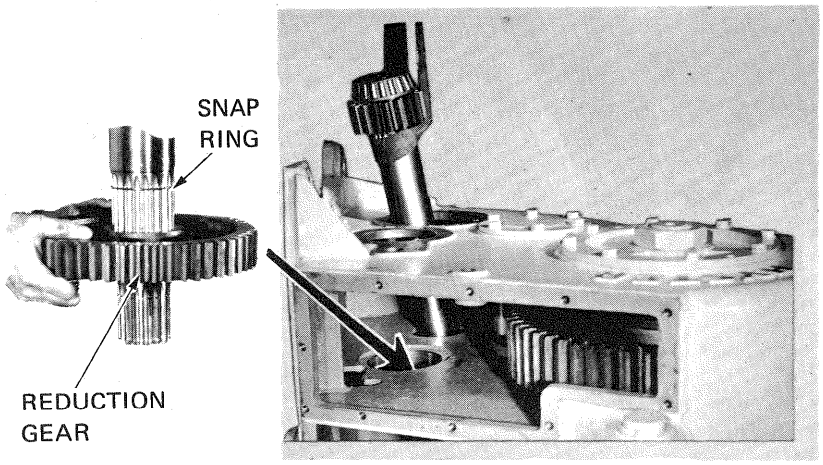


STEP 5. Install finalized thickness shim pack and bearing retainer. Tighten the six capscrews to 88 ft-lbs. torque.

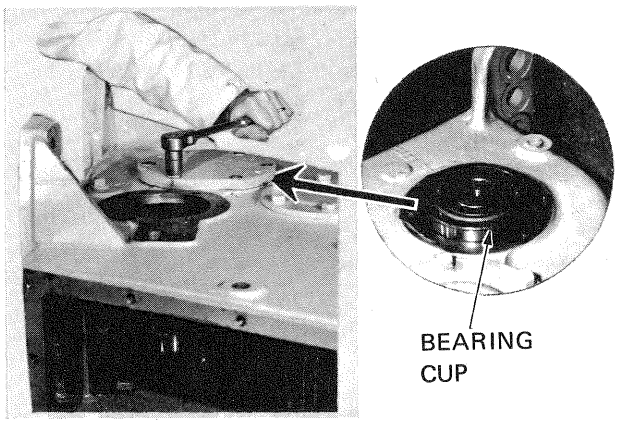
FIGURE 5-14. INSTALLATION OF INTERMEDIATE SHAFT ASSEMBLY



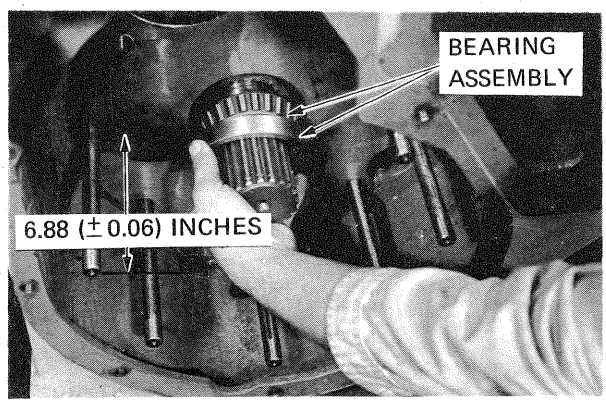
STEP 1. Install snap ring in shaft groove, RH end. Press pinion and bearing on brake shaft until pinion is seated against snap ring.



STEP 2. Install snap ring on LH end of shaft. Lower shaft into winch housing and install Reduction Gear.



STEP 3. Install bearing cup on right-hand end of shaft. Install retainer using three capscrews only. Tighten capscrews snugly.



STEP 4. Set winch in normal operating position. Check mounting studs for tightness and correct projection from housing. Install LH bearing assembly.

STEP 5. Place brake piston housing (P.C. winch as shown) or LH bearing retainer (D.D. winch) in position. Install brake piston housing temporarily to retain bearing by using three 4-3/4 inch long spacers and three nuts spaced equally. On direct drive winch, secure LH bearing retainer by tightening six capscrews securely.

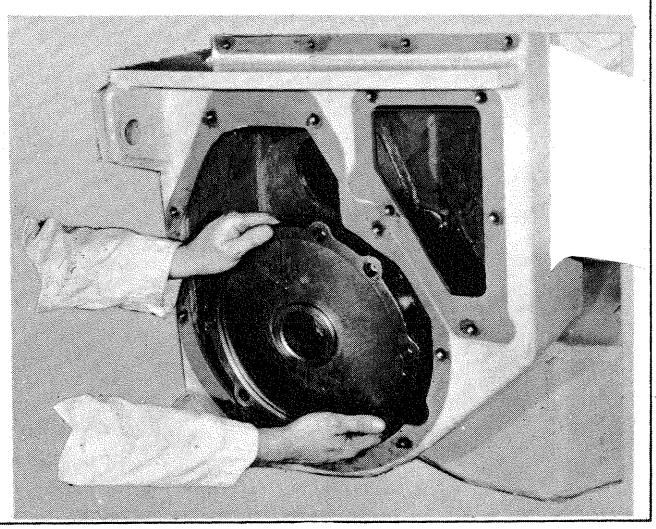


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FIGURE 5-15. INSTALLATION OF BRAKE SHAFT (Sheet 1 of 2)

STEP 6. Adjust shaft endplay as follows:

a. Using moderate pressure tap R.H. bearing retainer to seat brake shaft components.

b. Loosen the three capscrews previously installed in Step 3 above. Tighten capscrews finger tight only.

c. Measure gap between retainer and winch frame. Measure in three places around retainer. Add the three indications and divide by 3. This will give the average gap. Add shim pack 0.007 inch greater than the average gap. This will place 0.007 inch endplay on the brake shaft bearings.

d. Replace RH bearing retainer with final shim pack in place. Tighten six capscrews securely.

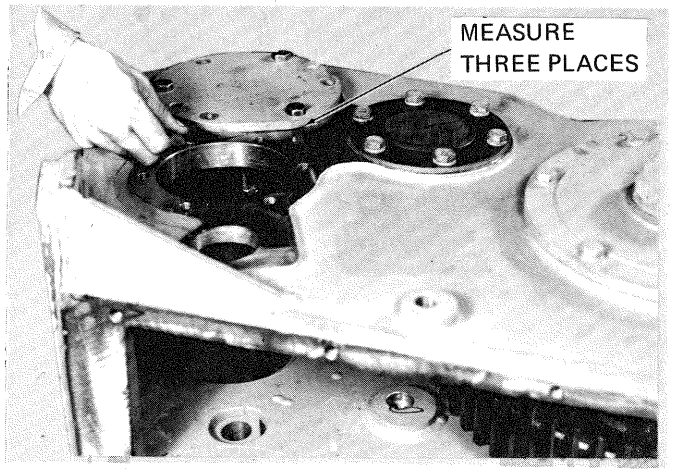

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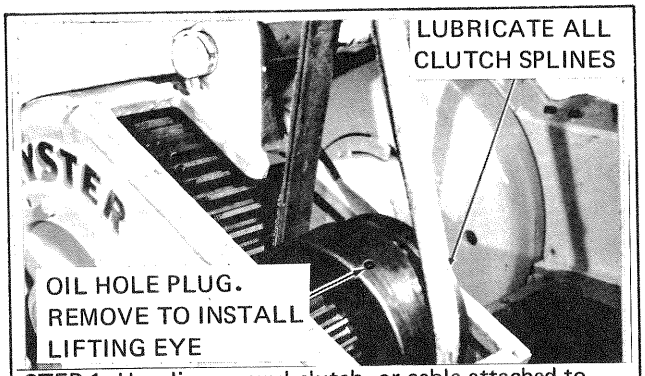
FIGURE 5-15. INSTALLATION OF BRAKE SHAFT (Sheet 2 of 2)

5-53. Installation of Suction Manifold (Power Controlled Winch).

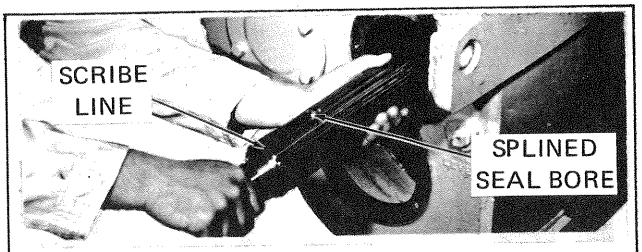
5-54. Installation of the suction manifold with filter is shown in Figure 5-19. It may be necessary, in some tractor installations, to remove the suction manifold prior to mounting the winch on the tractor. In such cases, it is advisable to install the manifold, with partially tightened capscrews to prevent the entrance of dirt until winch is mounted on the tractor. Install new gaskets at both the base and cover of the suction manifold to avoid loss of pump suction. Never use old gaskets.

5-55. SPECIAL TOOLS.

5-56. Figure 5-20 shows the special tools required during overhaul and repair of the winch.

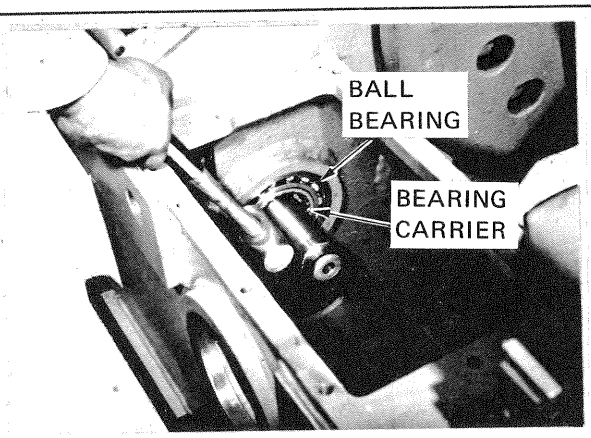


STEP 1. Use sling around clutch, or cable attached to lifting eye installed in oil hole, to lower reverse clutch assembly into housing. Position clutch so that oil hole is up as shown. Replace plug if removed.



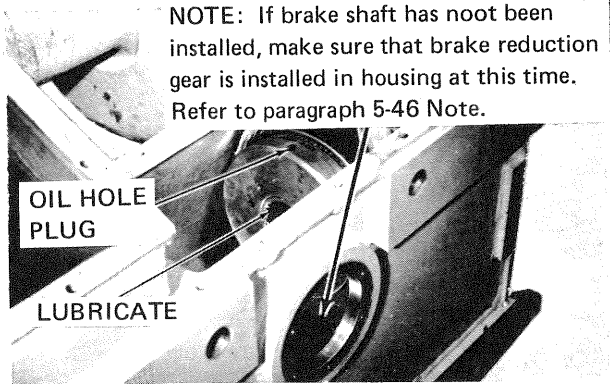
STEP 2. Position bevel gear shaft so that splined seal bore is directly in line with the oil hole plug at the top of reverse clutch assembly, then insert shaft. Make sure that scribe line on spline faces up. Lubricate entire shaft.

CAUTION: Make sure that the splined seals are removed before inserting the shaft. Splined seals may be damaged if installed at this time.

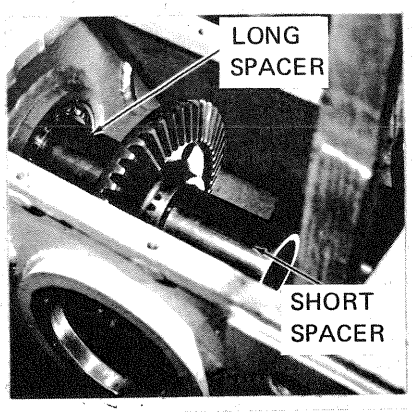


STEP 3. Install carrier and center ball bearing. Make sure that bearing face is flush with winch frame.

NOTE: If brake shaft has noot been installed, make sure that brake reduction gear is installed in housing at this time. Refer to paragraph 5-46 Note.

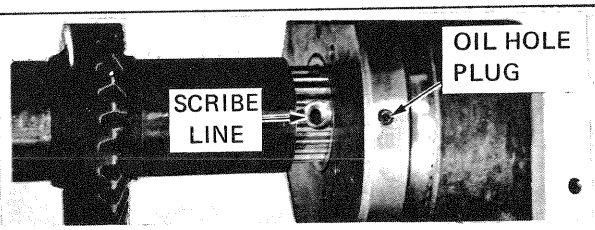


STEP 4. Using sling or lifting eye as in Step 1, lower forward clutch assembly into housing as shown. Rotate clutch assembly so that oil hole plug is at the top as shown.



STEP 5. Install the two spacers and bevel gear.

NOTE: Bevel gear and spacers are shown in overwind position. Refer to Paragraph 4-19. for underwind.



STEP 6. Tap bevel gear shaft through forward clutch assembly to position shown. Make sure that splined seal bore is aligned with plug at top of forward clutch assembly.

CAUTION: Splined seal bore and plug in clutch assembly must be exactly aligned. Misalignment of only one spline distance will impede flow of cooling oil during operation of winch. Use scribe line on shaft spline for reference.

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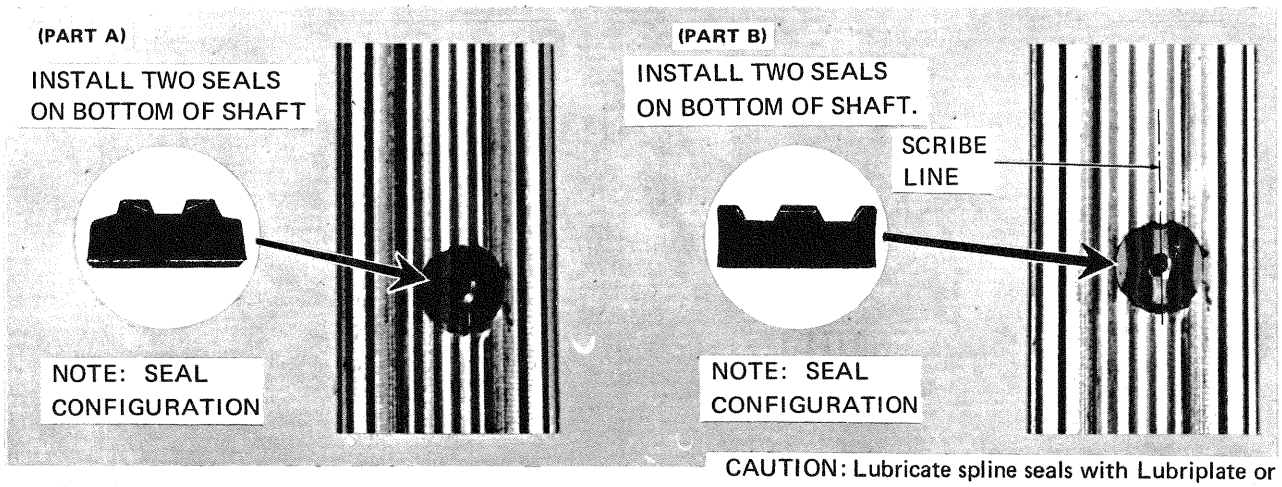
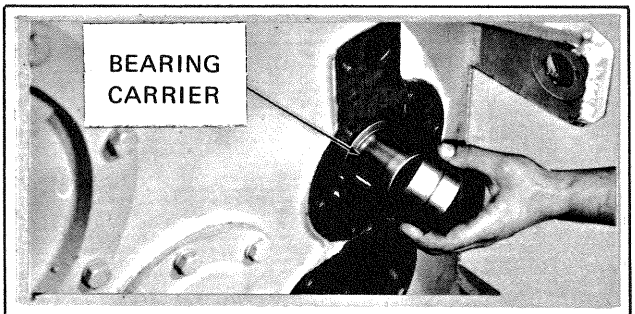
FIGURE 5-16. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 1 of 4)



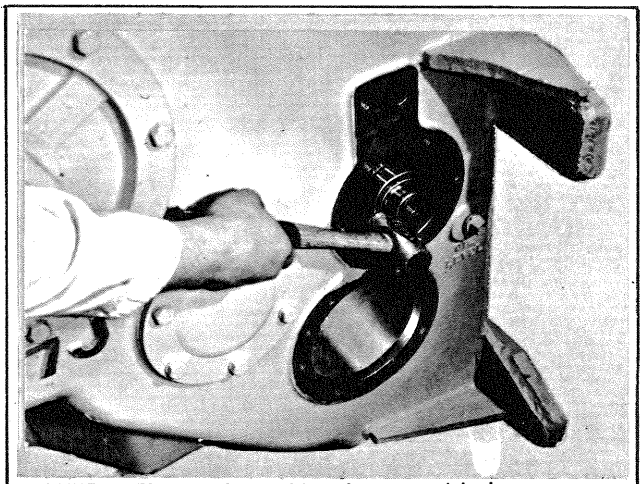
STEP 7. Carefully insert the four splined seals.

CAUTION: Lubricate spline seals with Lubriplate or equivalent prior to installation.

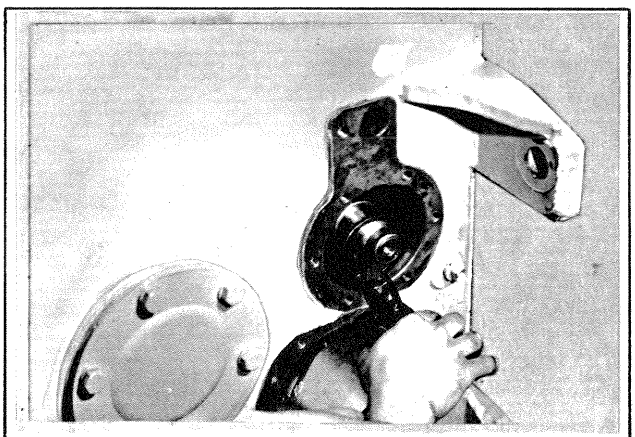


STEP 8. Carefully tap bevel gear shaft through the clutch assemblies. Install bearing carrier and roller bearing on RH end of shaft.

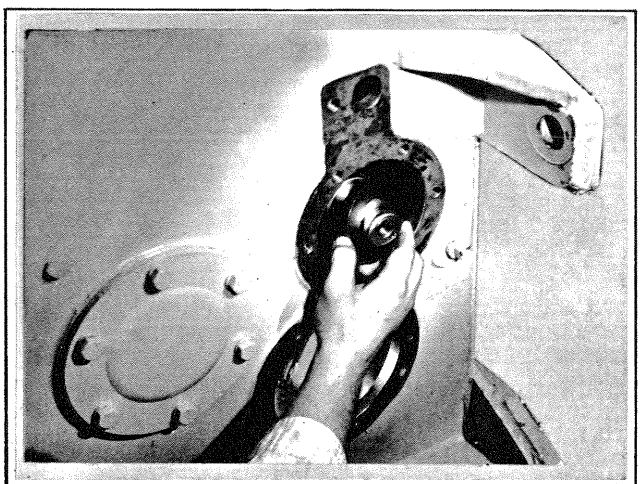
CAUTION: Use care to prevent interchanging LH and RH bearing carriers. The two bearing carriers are identical except that RH carrier is slightly wider. (See Table 1-1.)



STEP 9. Tap carrier and bearing assembly into reverse 2nd reduction pinion gear.



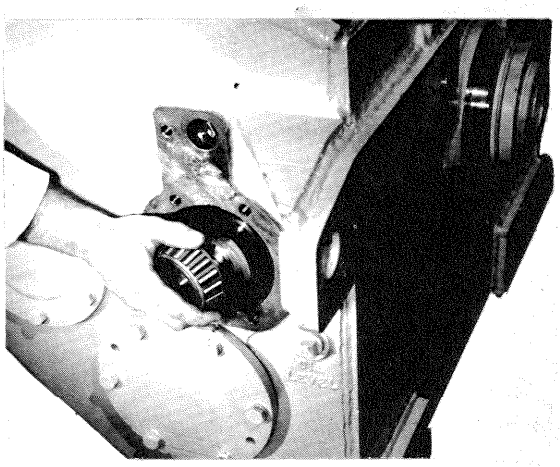
STEP 10. Install snap ring, making sure that it is properly seated in the pinion gear bore groove.



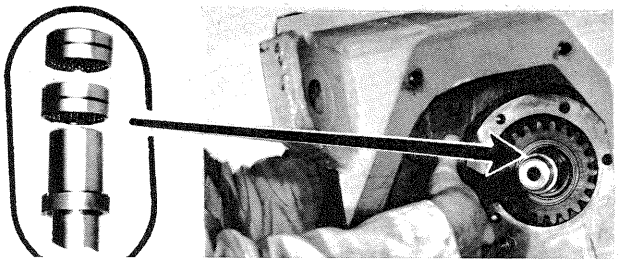
STEP 11. Install thrust washer.

1534

FIGURE 5-16. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 2 of 4)

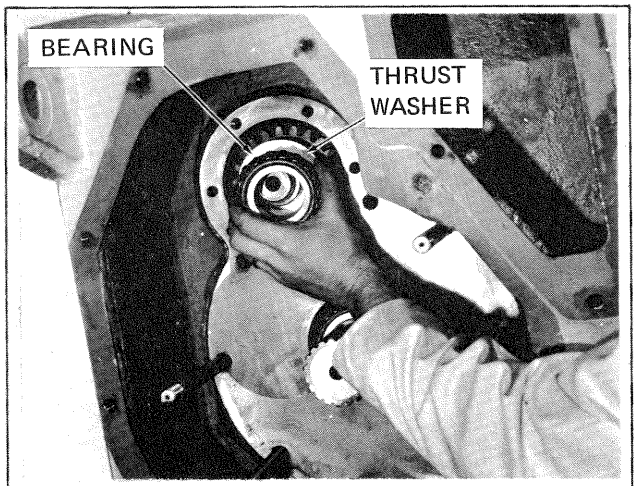


STEP 12. Install bearing.

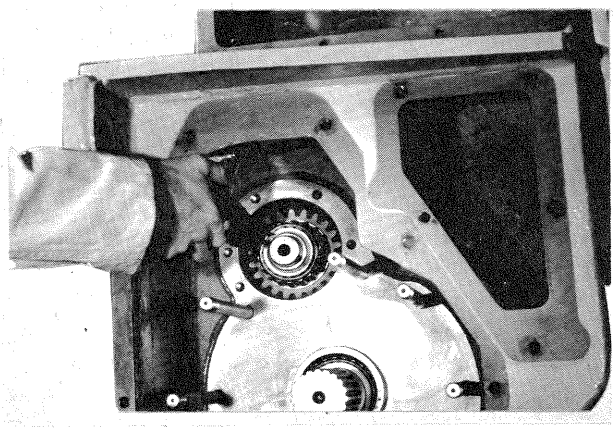


STEP 13. Install bearing carrier and roller bearing on LH end of shaft. Tap bearing into place in 2nd reduction pinion gear, then install snap ring.

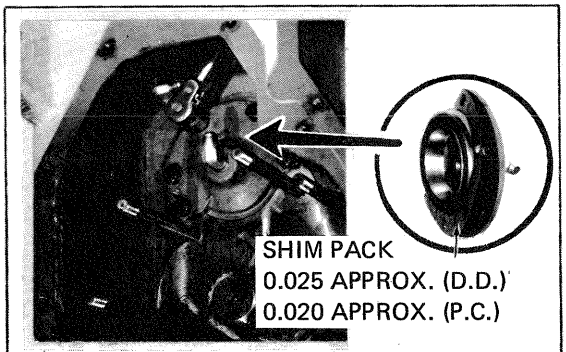
NOTE: If there is insufficient clearance for installing snap ring, the bearing carriers may be interchanged with RH carrier. Check the carrier width and identify. (See Step 8.)



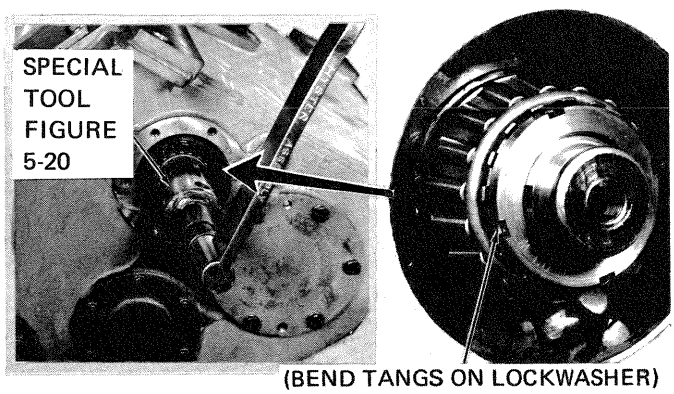
STEP 14. Install thrust washer and bearing.



STEP 15. Tap bearing against thrust washer then install snap ring.



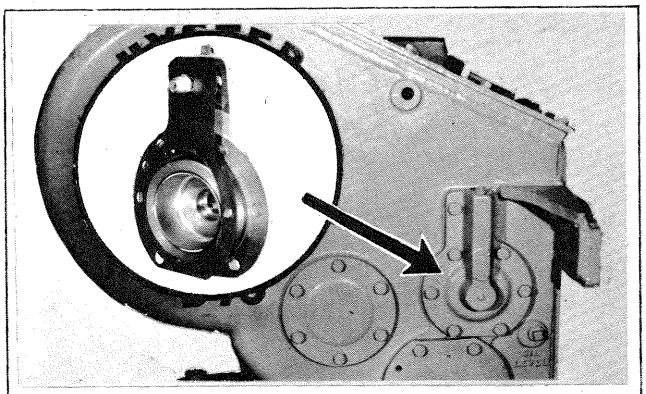
STEP 16. Install approximately 0.025 inch shim pack for D.D. winch and 0.020 inch shim pack for P.C. winch on LH bearing retainer, and install retainer. Tighten capscrews snugly but not to final torque.



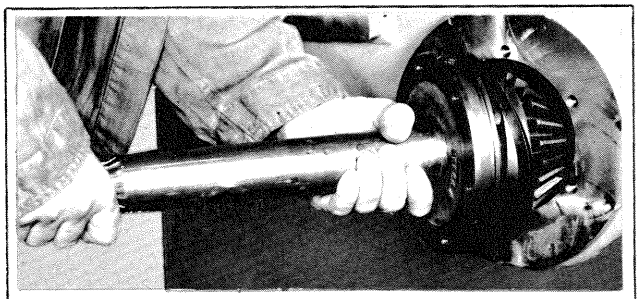
STEP 17. Install lockwasher and locknut on RH end of gear shaft. Tighten locknut 175-225 lbs. Bend lockwasher tangs over flats of locknut.

1535

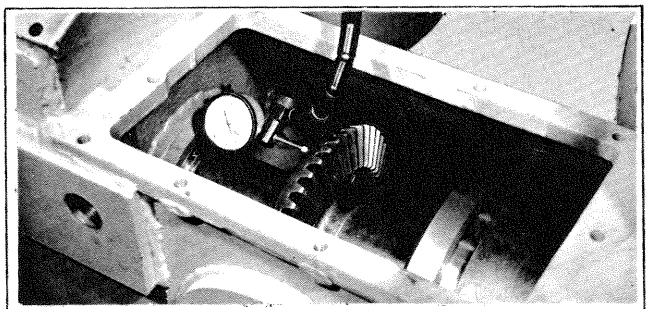
FIGURE 5-16. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 3 of 4)



STEP 18. Install approximately 0.040 shim pack on RH bearing retainer and install retainer. Tighten capscrews snugly but less than final torque.

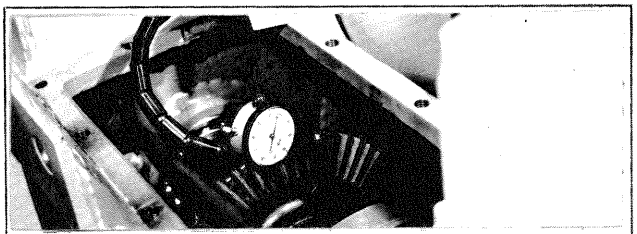


STEP 19. Install approximately 0.025 inch shim pack on PTO shaft and install shaft. Tighten capscrews securely. Check that PTO pinion teeth are positioned in center of bevel gear teeth. Add or subtract shims at PTO shaft to center gear teeth. Tighten capscrews to 69 ft-lbs. and secure with 18 gauge lockwire.



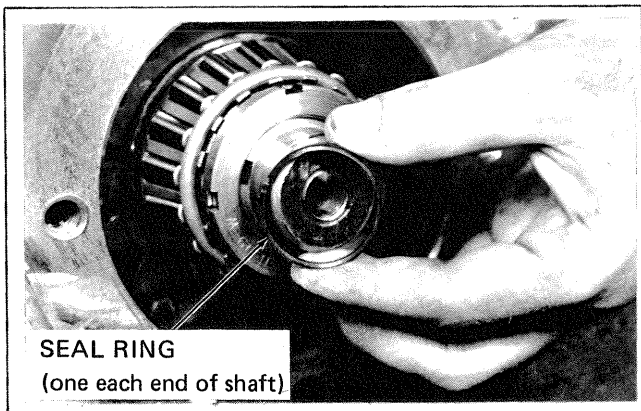
STEP 20. Connect dial indicator as shown to measure bevel gear shaft endplay. Add or subtract shims from the two bearing retainers to obtain 0.003 inch endplay (P.C. winch) or 0.006-0.009 inch endplay (D.D. winch). On the P.C. winch only, subtract 0.005 inch shim from either the RH or LH retainer to obtain 0.000-0.004 inch preload.

NOTE: Adding or subtracting shims from these retainers will effect pinion-to-bevel gear backlash. See Step 21.



STEP 21. Connect dial indicator as shown to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.012 inch. If less than 0.006, remove shims from RH bearing retainer as required. Add same amount to retainer at opposite end of shaft to maintain preload/or endplay. If greater than 0.012, remove shims from LH retainer as required. Add same amount to RH retainer to maintain preload/or endplay.

NOTE: Before checking backlash on D.D. winch, place a prybar between the forward clutch pack and winch frame. Apply medium pressure to move gearshaft toward RH side of winch. This will place bevel gear in normal operating position. The bevel gear tends to move toward the RH side of winch when turned by PTO pinion during winch operation.



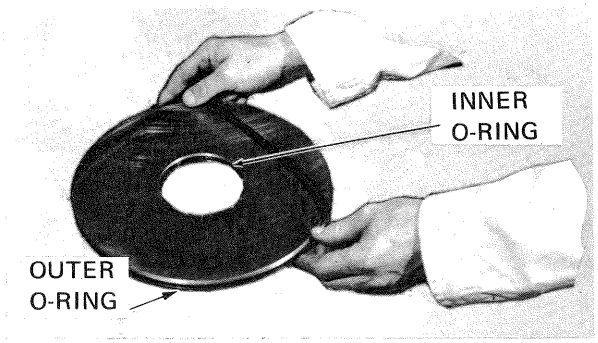
SEAL RING
(one each end of shaft)

STEP 22. Remove RH and LH bearing retainers, then install two cast-iron seal rings. Re-install retainers (with shims) and tighten capscrews to 88 ft-lbs.

CAUTION: Use care when expanding seal rings. Seal ring material is fragile and breaks easily.

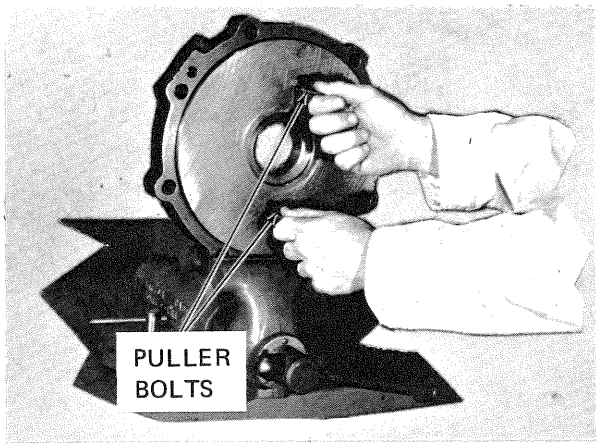
1536

FIGURE 5-16. REASSEMBLY AND INSTALLATION OF BEVEL GEAR SHAFT ASSEMBLY (Sheet 4 of 4)

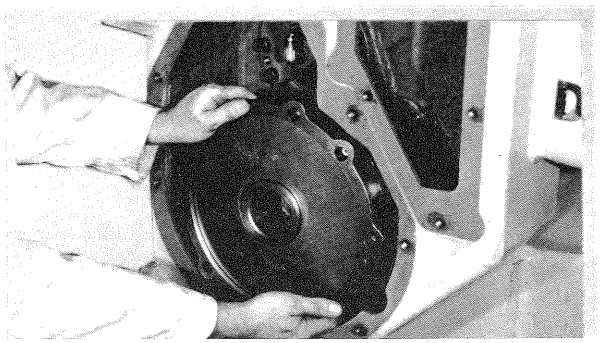


STEP 1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston ring.

CAUTION: Use only Hyster approved O-rings to insure proper sealing.

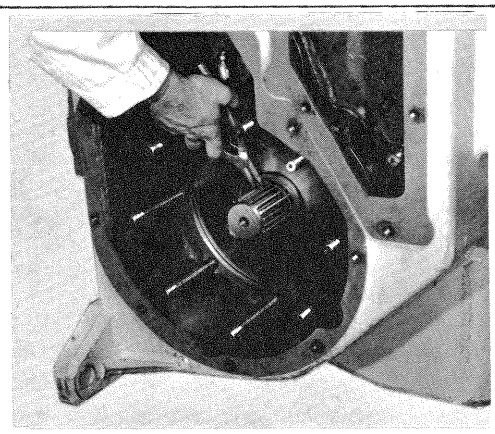


STEP 2. Install piston in housing, then remove puller bolts.



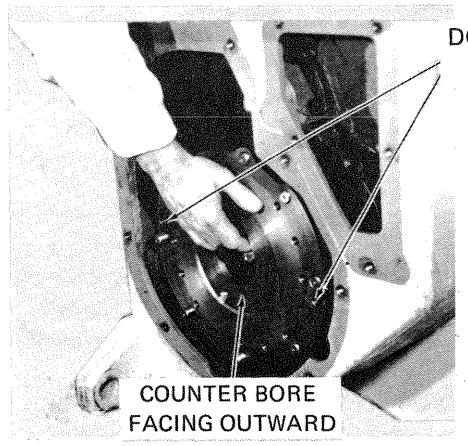
STEP 3. Slide assembled piston housing in place on studs, if not already installed (See Step 4 and Step 5, Figure 5-15). Remove three sets of nuts and spacers from studs, if installed.

NOTE: Make sure that bearing on brake shaft is properly positioned before installing housing.

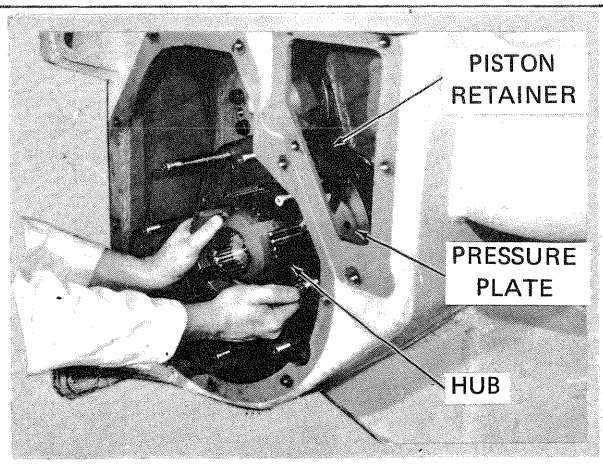


STEP 4. Install snap ring.

CAUTION: Make sure that snap ring is securely positioned in brake shaft groove.



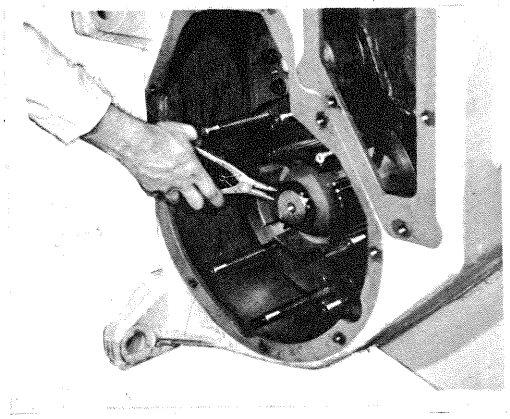
STEP 5. Install plate. Push plate against piston housing. Then install dowel pins.



STEP 6. Install hub as shown.

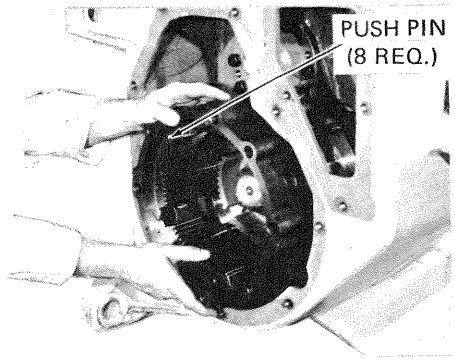
CAUTION: Do not reverse hub. 1516

FIGURE 5-17. REASSEMBLY AND INSTALLATION OF OIL BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 1 of 2)



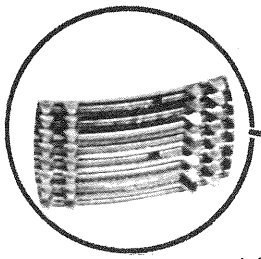
STEP 7. Install snap ring.

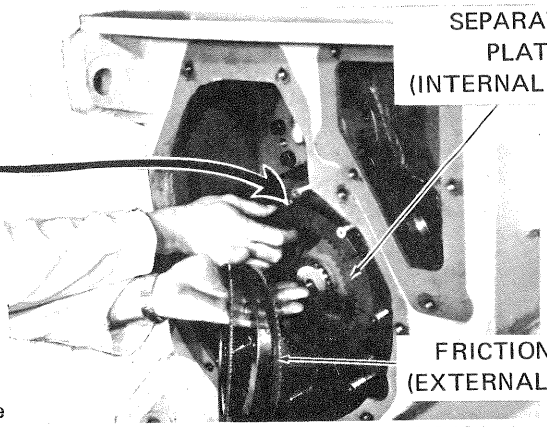
CAUTION: Make sure that snap ring is securely positioned in brake shaft groove.



STEP 8. Install cage against pressure plate. Then install eight push pins.

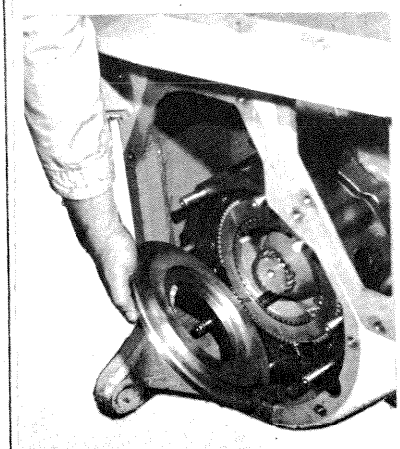
NOTE: Holes in cage are sequenced so that cage can only be installed as shown.





STEP 9. Install the 11 friction discs and 10 separator plates ALTERNATELY starting with a friction disc. Align friction disc slots as shown.

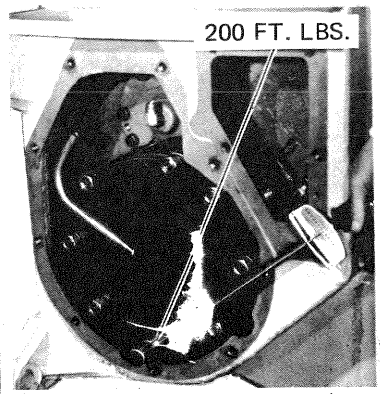
CAUTION: Separator plates are conical (dished). Face all separator plates in the same direction. All dished sides must face either inward or outward. Max. thickness of plate and disc stack must not exceed 2.240 inches when compressed between flat surfaces by 100 lbs. load.



STEP 10. Install thrust ring.

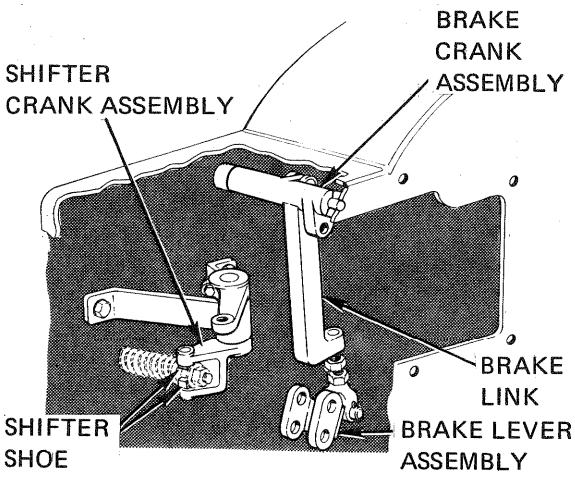
STEP 11. Install belleville spring and brake cover.

CAUTION: Concave side of belleville spring must face inward.

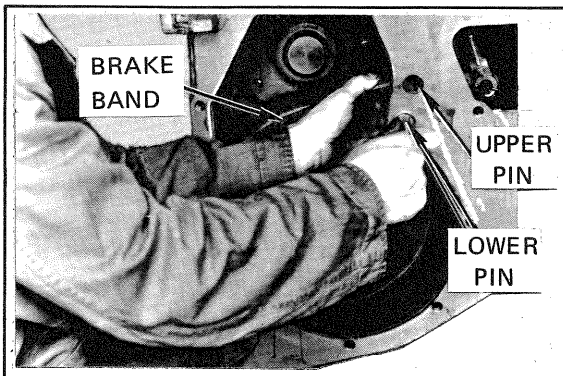


STEP 12. Install eight nuts (with lockwashers). Tighten nuts alternately to 200 ft.-lbs. 1517

FIGURE 5-17. REASSEMBLY AND INSTALLATION OF OIL BRAKE ASSEMBLY, POWER CONTROLLED WINCH (Sheet 2 of 2)



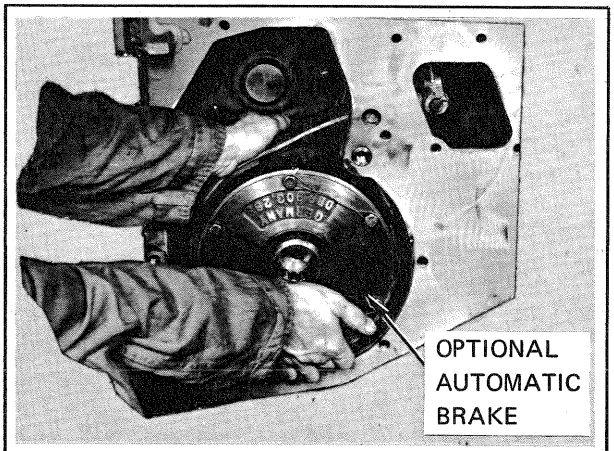
STEP 1. Install brake and dental clutch linkage. Position upper crank on splined end of shifter crank assembly so that upper crank arm is at 90 degrees with shifter control cable axis when shifter shaft is in detent (neutral) position. Adjust shifter linkage as described in paragraph 4-11.



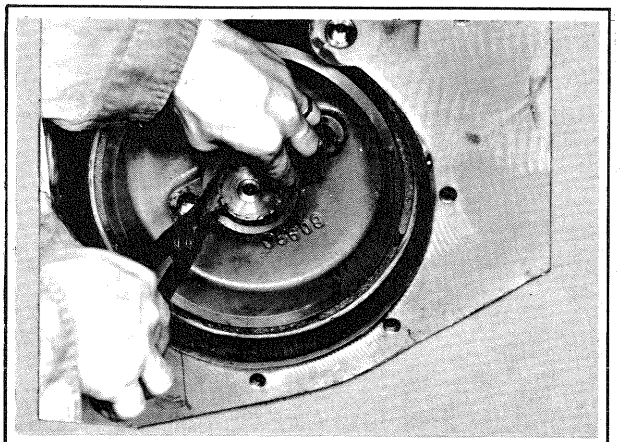
STEP 2. Hold brake band in place and install upper and lower pin. Align cotter pin holes in center of shorter pin and insert cotter pin.

CAUTION: Refer to paragraph 4-17 or 4-21 for correct pin and band arrangement (overwind or underwind).

NOTE: Thread a 1/2-20 UNF capscrew loosely into threaded end of longer pin to aid pin installation.



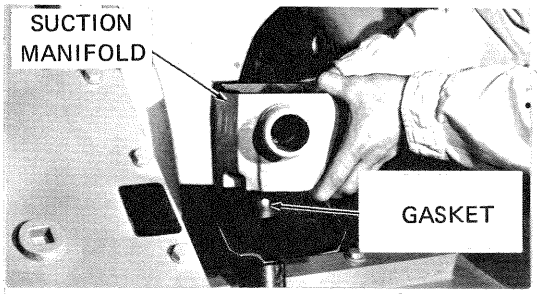
STEP 3. Slide brake wheel onto brake shaft (optional automatic brake shown).



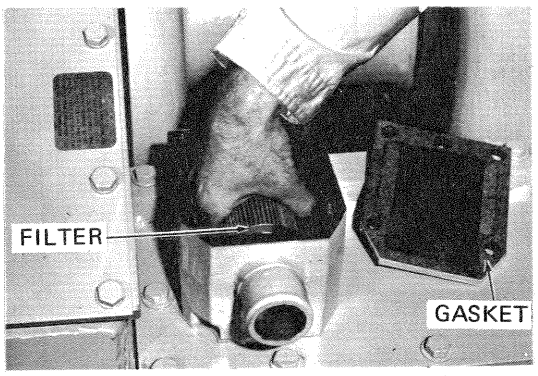
STEP 4. Install snap ring on brake shaft. Adjust brake linkage as described in paragraph 4-12.

1537

FIGURE 5-18. INSTALLATION OF DRY BRAKE, AUTOMATIC BRAKE AND BRAKE AND CLUTCH LINKAGE (DIRECT DRIVE WINCH)



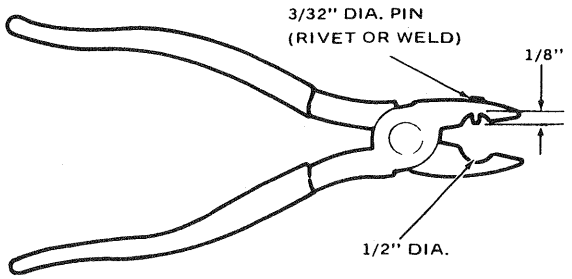
STEP 1. Install suction manifold and transmission cover with new gasket.



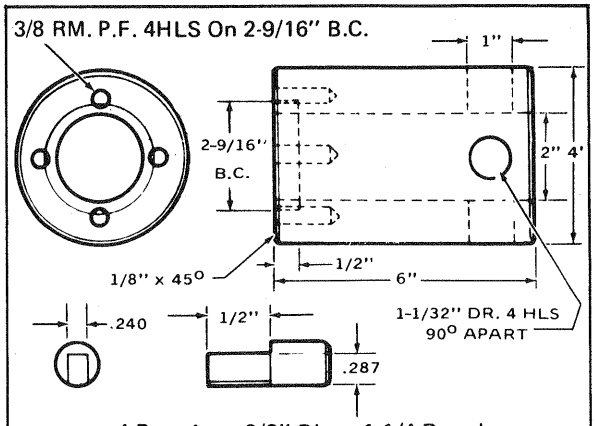
STEP 2. Install filter element and cover (with new gasket). Do not over-tighten the filter element. The filter is difficult to remove if over-tightened. 1539

FIGURE 5-19. INSTALLATION OF SUCTION MANIFOLD, POWER CONTROLLED WINCH

Note: Modify Lineman's Plier As Shown.

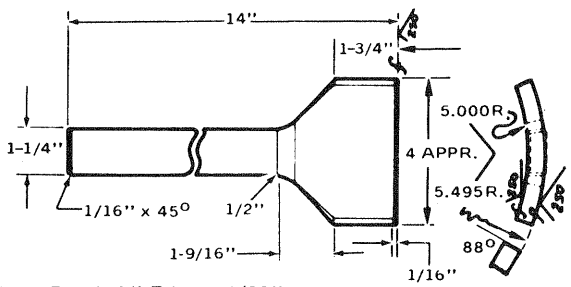


CLUTCH COOLING OIL VALVE REMOVAL AND INSTALLATION (Power Controlled Only)



4 Req. Alter 3/8" Dia. x 1-1/4 Dowel

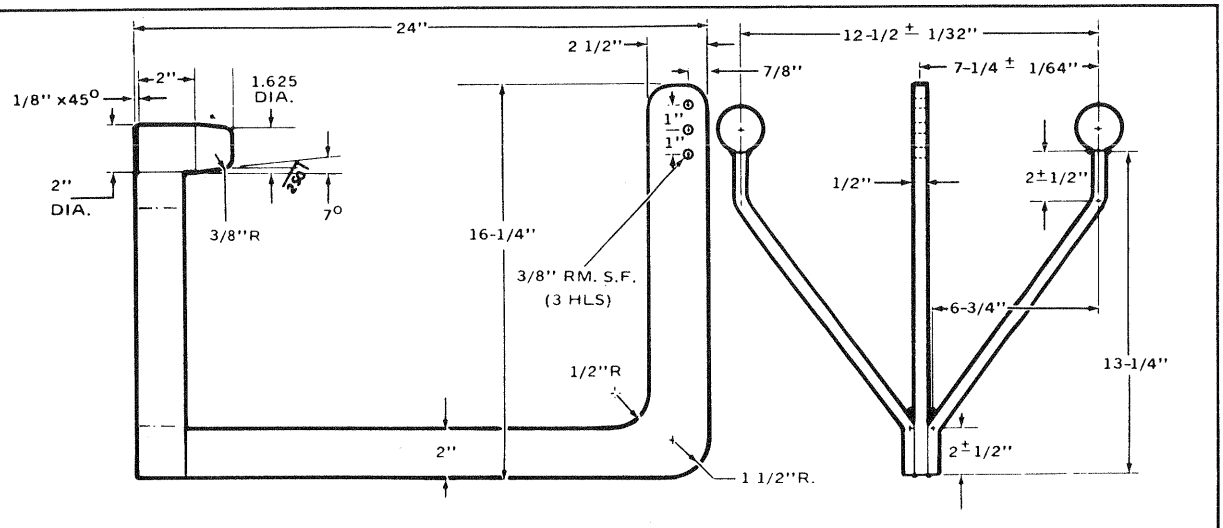
BEVEL GEAR SHAFT LOCKNUT REMOVAL AND INSTALLATION (Power Controlled Only)



Note: Break All Edges - 1/32"

One Req'd 1" x 4" x 14-1/8" H.C. No. 17 HF.

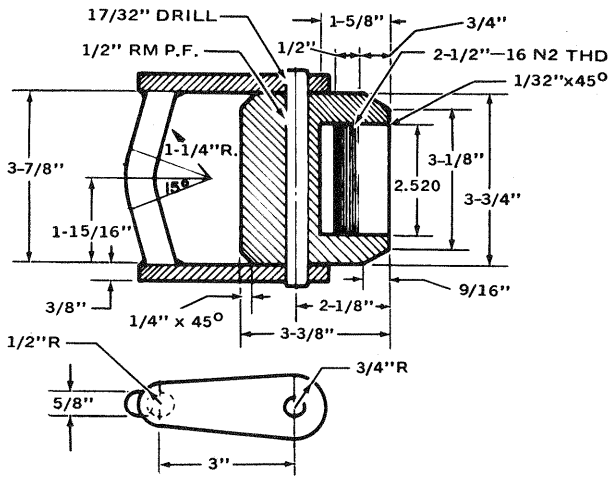
DRUM OIL SEAL INSTALLATION



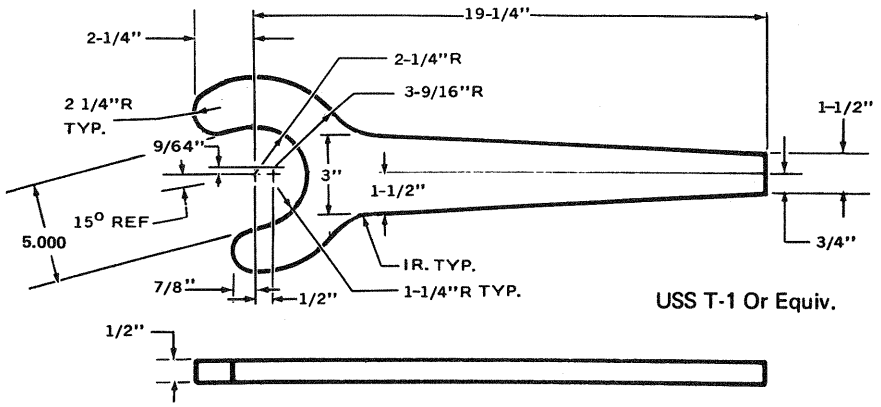
DRUM REMOVAL AND INSTALLATION

J362

FIGURE 5-20. SPECIAL TOOLS (Sheet 1 of 2)



DRUM SHAFT REMOVAL AND INSTALLATION



DRUM SHAFT NUT REMOVAL AND INSTALLATION

J363

FIGURE 5-20. SPECIAL TOOLS (Sheet 2 of 2)

INSTALLATION AND REMOVAL

6-1. GENERAL.

6-2. This section contains winch-to-tractor and pump-to-tractor mounting information. Instructions for tractor alterations and other specific data required for initial installation of the winch and pump are covered by the drawings supplied with the mounting kit.

CAUTION The winch and hydraulic pump are designed to be mounted on a specific tractor model, avoid mounting on a different tractor make or model.

6-3. SERIAL NUMBER DATA.

6-4. The winch serial number prefix (refer to Section 1) identifies the winch as either Direct Drive or Power Controlled. It also identifies the tractor make and model on which the winch will be mounted.

6-5. WINCH INSTALLATION.

6-6. Tractor Preparation.

6-7. Perform the following steps prior to installing the winch:

a. Complete the tractor alterations as indicated in the mounting kit instructions.

b. Clean all mounting surfaces on the tractor.

c. Check the condition of the mounting studs on the tractor. Replace any studs that are bent or otherwise damaged. Minor thread damage may be dressed with a thread chaser.

NOTE Be sure all seals and plugs are installed as indicated by mounting kit instructions.

d. Install 0-rings over studs as indicated by mounting instructions.

e. Check mounting kit instructions for proper application of Loctite to studs.

6-8. Winch Preparation.

6-9. Perform the following steps prior to installing the winch:

a. Remove the suction manifold on Power Controlled winches and the winch transmission cover on all winches.

b. Remove all shipping plugs and tape from PTO shaft opening and stud holes.

c. Clean all mounting surfaces on the winch.

d. Assemble PTO Group per mounting kit instructions.

e. Install PTO shaft assembly in winch as shown in Figure 6-1.

f. Carefully check bevel gear backlash and bevel gear shaft endplay or preload (See Figure 6-1).

g. Install O-ring over PTO shaft carrier.

h. Assemble coupling on PTO shaft.

NOTE Be sure pin and lock ring are secure.

i. Install breather in upper right hand cover.

j. Remove side cover on the control lever housing used with Power Controlled winches.

6-10. Installation.

6-11. Observe the following during mounting of the winch:

a. Install two 7/8 UNC x 2 1/2 inch (63.50 mm) capscrews or lifting eyes at each side of the winch.

WARNING Before raising the winch into position, ensure that the lifting device is in safe operating condition and has a rating of at least 3,000 pounds (1360.8 kg). Carefully check the cable or chain for damage.

b. Carefully check all hydraulic hoses and hose fittings for damage and general condition on Power Controlled winches.

c. Raise the winch and align the splines on the tractor PTO with the splines of the PTO coupling.

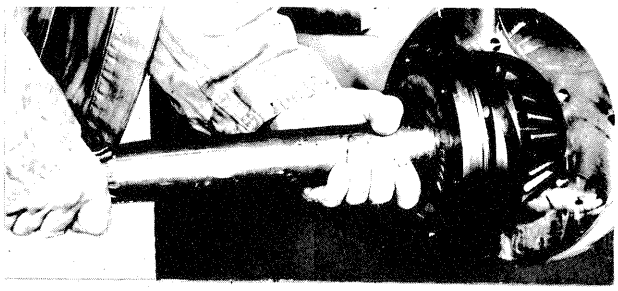
d. Align the studs with the mounting holes to prevent thread damage.

e. Route Direct Drive winch push-pull cables to the control levers as the winch is moved in against the rear tractor face.

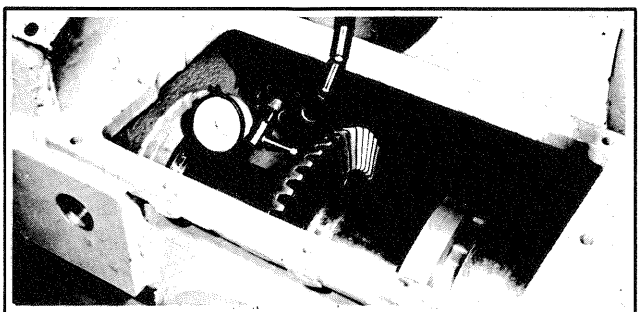
f. Loosely install the two, top inboard nuts before the winch is fully seated against the tractor.

g. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts alternately at each side of the winch to pull the winch evenly against the tractor. Final torque on the plain hex nuts should

Installation and Removal

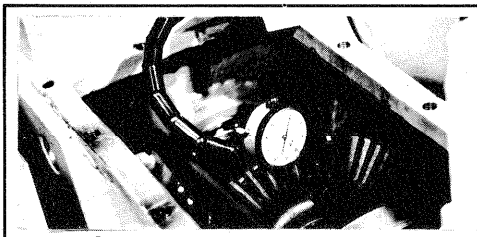


STEP 1. Install approximately 0.025 inch shim pack on PTO shaft and install shaft. Tighten capscrews securely. Check that PTO pinion teeth are positioned in center of bevel gear teeth. Add or subtract shims at PTO shaft to center gear teeth. Tighten capscrews to 69 ft-lbs. and secure with 18 gauge lockwire.



STEP 2. Connect dial indicator as shown to measure bevel gear shaft endplay. Add or subtract shims from the two bearing retainers to obtain 0.003 inch endplay (P.C. winch) or 0.006-0.009 inch endplay (D.D. winch). On the P.C. winch only, subtract 0.005 inch shim from either the RH or LH retainer to obtain 0.000-0.004 inch preload.

NOTE: Adding or subtracting shims from these retainers will effect pinion-to-bevel gear backlash. See Step 3.



STEP 3. Connect dial indicator as shown to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.012 inch. If less than 0.006, remove shims from RH bearing retainer as required. Add same amount to retainer at opposite end of shaft to maintain preload/or endplay. If greater than 0.012, remove shims from LH retainer as required. Add same amount to RH retainer to maintain preload/or endplay.

NOTE: Before checking backlash on D.D. winch, place a prybar between the forward clutch pack and winch frame. Apply medium pressure to move gearshaft toward RH side of winch. This will place bevel gear in normal operating position. The bevel gear tends to move toward the RH side of winch when turned by PTO pinion during winch operation.

FIGURE 6-1. PTO SHAFT INSTALLATION

be 550 ± 20 ft.-lbs. (73.06 ± 2.76 kg-m). Final torque on the slotted jam nuts should be 200 ± 20 ft.-lbs. (27.66 ± 2.76 kg-m).

CAUTION Be sure cotter pins are installed on all mounting studs as specified in the mounting kit instructions.

6-12. Final Installation. (Direct Drive Winch.)

6-13. With the winch installed on the tractor, perform the following steps:

a. Install transmission cover with a new gasket. Tighten capscrews to 88 ft.-lbs. (12.17 kg-m) torque.

b. Install control lever assembly per mounting kit instructions.

c. Attach push-pull cables to respective positions.

d. Adjust cables as described in Paragraphs 4-11 and 4-14.

e. Check oil level in transmission compartment.

f. Replace side covers. Tighten capscrew to 88 ft.-lbs. (12.17 kg-m) torque.

6-14. Final Installation. (Power Controlled Winch.)

6-15. With the winch installed on the tractor, perform the following steps:

a. Install transmission cover and suction manifold with new gaskets. Tighten capscrews to 88 ft.-lbs. (12.17 kg-m) torque.

b. Connect suction and pressure hoses to their respective fittings as specified in the mounting kit instructions.

c. Install control lever assembly per instructions in the mounting kit.

d. Attach push-pull cable(s) to control lever assembly.

e. Attach cable bracket to winch.

f. Install pump and related hardware as specified in mounting kit instructions. See Paragraph 6-16.

g. Tighten hose fittings and clamps securely.

h. Attach push-pull cable to valve and secure cable bracket to winch.

i. Check hydraulic oil level.

j. Adjust control cable and check hydraulic pressure settings as described in Paragraphs 4-23 through 4-27.

NOTE Pressure checks should be taken with hydraulic oil at operating temperature. Run winch in Brake-Off position to raise temperature.

WARNING All checks and adjustments to be made with a bare drum.

6-16. PUMP INSTALLATION.

6-17. Install pump and related hardware following the procedures in the mounting kit instructions. Observe the following during pump installation:

a. Install pump drive components.

b. Be sure all O-rings and gaskets are properly installed.

NOTE If the pump requires an adapter, between the pump and the tractor accessory drive, apply plastic gasket compound (Loctite Co. 68-41 or equivalent) to the mating surfaces.

c. Torque all capscrews as specified.

d. Install hydraulic fittings securely.

e. Route suction and pressure hoses.

f. Prime the pump by filling the suction hose with hydraulic oil.

g. Secure hoses using clamps supplied.

h. Check to ensure all connections are tight.

6-18. INSPECTION.

6-19. Prior to operating the winch, check the following:

a. No leakage.

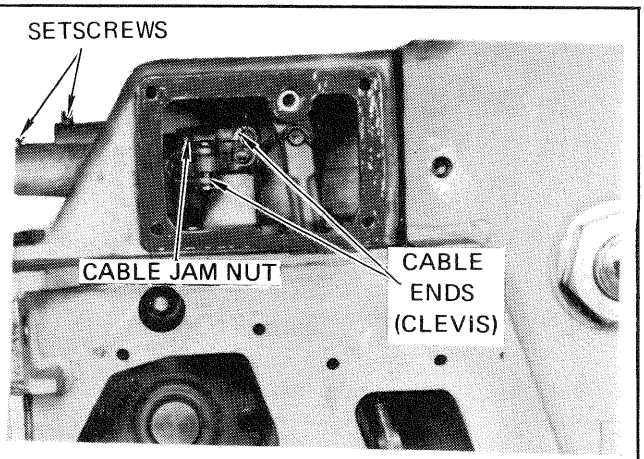
b. Proper oil levels.

c. All mounting nuts are tightened to specifications.

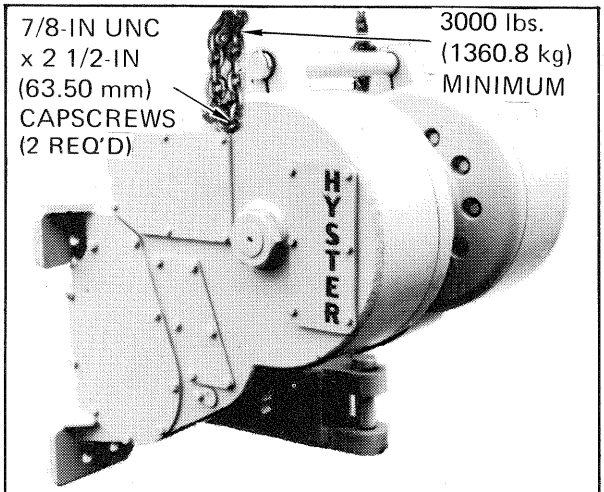
d. All covers are securely installed.

e. Ensure that all hydraulic hoses are properly routed to prevent chafing.

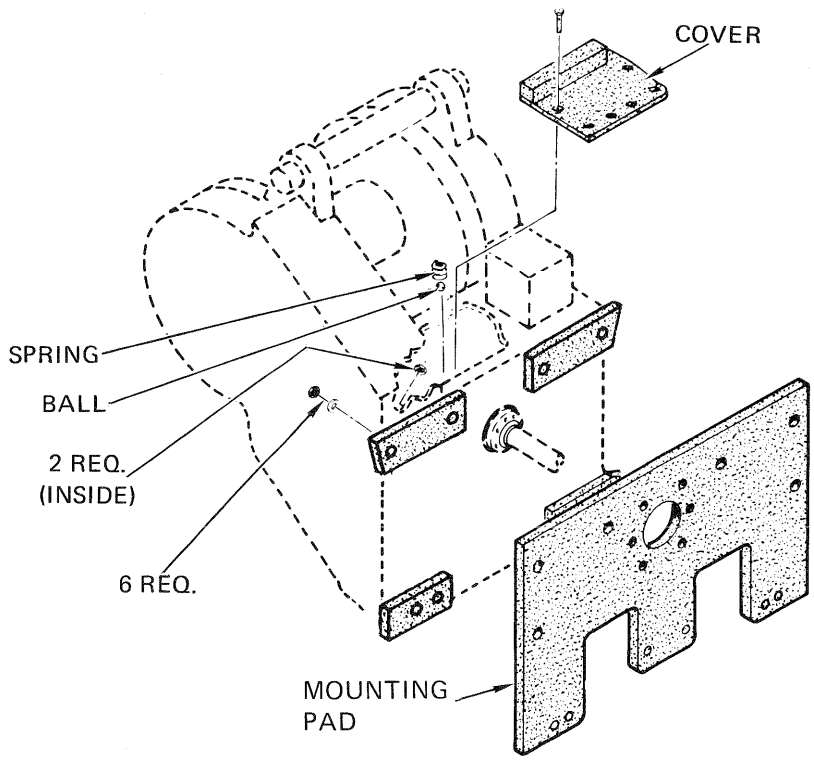
f. Ensure that the hydraulic pump is primed.



STEP 1. Loosen the two setscrews on the cable anchor block. Remove the control housing cover, then disconnect the cable end (clevis) at end of each cable.



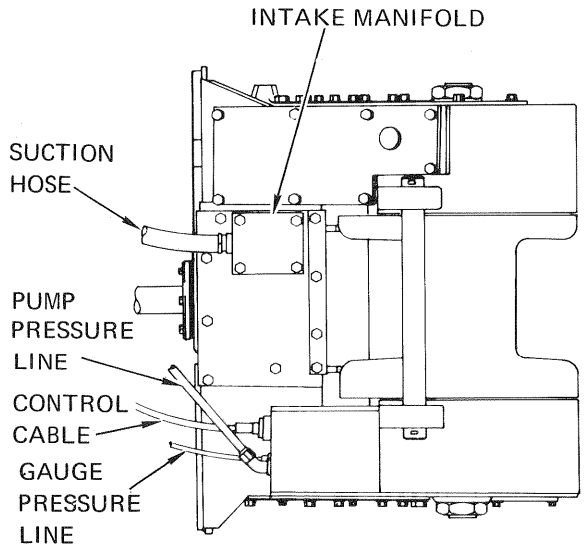
STEP 2. Connect lifting device to winch. Winch will be balanced when connected as shown.



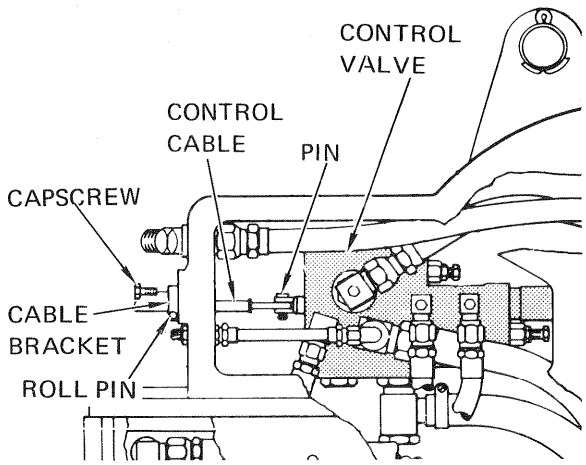
NOTE: When removing the eight nuts, loosen all nuts slightly, then pry winch away from mounting pad. Loosen all nuts again and pry winch again. Continue this sequence until winch can be removed.

STEP 3. Remove transmission cover. Be careful not to lose detent ball and spring. Remove the eight nuts and lockwashers attaching winch to mounting pad.

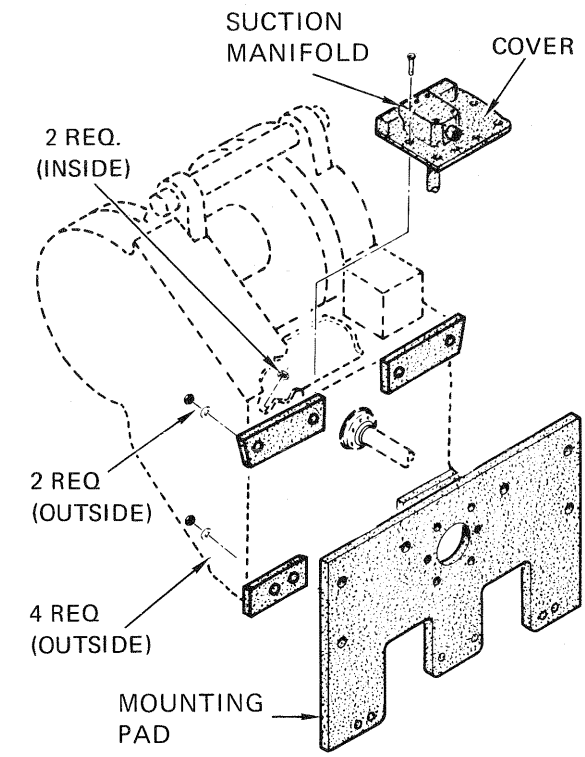
FIGURE 6-2. REMOVAL OF DIRECT DRIVE WINCH

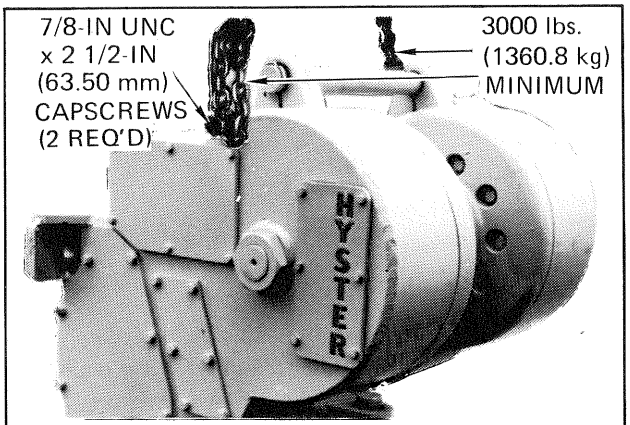


STEP 1. Remove suction hose from intake manifold. Disconnect pump pressure line. Disconnect gauge pressure line.



STEP 2. Remove access cover plate. Remove cotter pin and detach blade end of control cable from control valve spool clevis. Remove capscrew holding cable bracket to housing, and pull out control cable. If neccessary to remove cable bracket, remove roll pin.





STEP 3. Connect lifting device to winch. Winch will be balanced when connected as shown.

STEP 4. Remove suction manifold and cover. Remove the eight nuts and lockwashers attaching winch to mounting pad.

NOTE: When removing the eight nuts, loosen all nuts slightly, then pry winch away from mounting pad. Loosen all nuts again and pry winch again. Continue this sequence until winch can be removed.

FIGURE 6-3. REMOVAL OF POWER CONTROLLED WINCH

Installation and Removal

6-20. WINCH REMOVAL.

6-21. Removal — (Direct Drive Winch.) (See Figure 6-2.)

WARNING If winch is to be disassembled, the line must be removed. Use extreme care when removing the cable end ferrule from the drum. When the cable lock is removed, the cable may spring out with extreme force.

6-22. Remove the winch as shown in Figure 6-2. Observe the following during removal:

a. Clean external surfaces of winch to remove accumulated grease and dirt.

b. Remove transmission cover.

c. Remove control cables from winch.

d. Attach lifting device as shown in Figure 6-2.

WARNING Make sure that the lifting device has a minimum capacity of 3,000 pounds (1360.8 kg) before lifting the winch off the mounting pad.

e. Drain oil from winch.

f. Remove nuts from mounting studs.

g. Remove winch from tractor.

6-23. Removal (Power Controlled Winch.) (See Figure 6-3.)

WARNING If winch is to be disassembled the line must be removed. Use extreme care when removing the cable end ferrule from the drum. When the cable lock is removed, the cable may spring out with extreme force.

6-24. Remove the winch as shown in Figure 6-3. Observe the following during removal:

a. Clean external surfaces of winch to remove accumulated grease and dirt.

b. Remove suction manifold and transmission cover.

c. Remove control cable(s) from winch.

d. Remove hydraulic hoses.

e. Attach lifting device as shown in Figure 6-3.

WARNING Make sure that the lifting device has a minimum capacity of 3,000 pounds (1360.8 kg) before lifting the winch off the mounting pad.

f. Drain oil from winch.

g. Remove nuts from mounting studs.

h. Remove winch from tractor.

6-25. PUMP REMOVAL. (Power Controlled Winch.)

6-26. Remove the hydraulic pump as follows:

a. Thoroughly clean all surfaces around pump.

b. Disconnect hoses at the inlet and outlet fittings.

c. Cap all open lines and ports.

NOTE If pump is belt driven loosen capscrews securing pump to mounting bracket. Rotate the pump so that the drive belt can be removed from the sheaves. Keep bracket, pump and sheave together as assembly.

d. Remove mounting capscrews and remove pump.

NOTE Do not remove the adapter used with gear driven pumps unless it is necessary to replace the coupling or gasket between the adapter and traction accessory drive housing.

CAUTION Do not disassemble pump. Repair of the hydraulic pump is limited to replacement of the entire assembly.

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