



# SERVICE MANUAL

For Power Controlled Winches

**W6F**  
**W8L**  
**W12E**

A PRODUCT OF  
**Allied Systems**  
COMPANY  
SHERWOOD, OREGON USA

# CUSTOMER EDITION

# Safety Precautions

**Observe the following precautions to prevent injury to personnel and damage to equipment.**

Do not operate winch unless tractor is equipped with a rear screen for operator protection against cable breakage.

Authorized operators only!

Report damage or erratic operation of the winch immediately.

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 clothes, 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 around other machines.

Avoid operating near anyone working or standing.

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

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

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

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

Avoid pulling the hook over the drum and through the throat of the winch.

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

When not operating the winch, always leave it in neutral with the brake on.

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

Use extreme care when removing cable and ferrule from the drum. When the ferrule is released, the cable may spring out with force.

Winch serial number \_\_\_\_\_

Date put into service \_\_\_\_\_

## Warning



### WARNING

**Failure to follow these instructions can cause serious injury or death.**

**Authorized, trained operator only.**

#### **Know the equipment:**

Know the operating, inspection, and maintenance instructions in the operating manual. Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the cable breaks.

#### **Inspect the winch before use:**

Make sure that the controls and instruments operate correctly. Report the need for repairs immediately. Do not work with a damaged or worn cable. Do not use a winch that needs repairs. If the ferrule and cable must be removed from the drum, make sure the end of the cable and ferrule are controlled when the cable is released. The end of the cable can suddenly move from the drum like a compressed spring when the ferrule is released, causing an injury.

#### **Protect yourself:**

Do not use the control levers for hand holds when entering or leaving the vehicle. Do not permit other people near the control area when you inspect or repair a machine. Never inspect, repair, or do maintenance on a machine that is in motion. Stay in the operator's seat. Do not stand on the vehicle when operating the winch.

#### **Keep a clear work area:**

Avoid winch operation near people or other machines. Never stand or permit others to stand in a bight (loop) of the cable. Do not stand nor permit others to be near the winch or cable when there is tension on the cable. Observe jobsite rules. Be in complete control at all times.

#### **Use common sense:**

Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc. Do not leave the vehicle when the winch cable is under tension. Do not permit riders on the vehicle or load. Do not use the winch as an anchor for a double or two-part line. Do not pull the hook through the throat or over the drum and cause damage. When the winch is not in use, make sure the control lever is in **brake on** position so that the winch brake is applied.



### WARNING

**Indicates a condition that can cause personal injury!**



### CAUTION

**Indicates a condition that can cause property damage!**

**NOTE: Whenever information exists that requires additional emphasis beyond the standard text, the term "NOTE" is used.**



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## General

### Introduction

This service manual is for the W6F, W8L and W12E winches. The following information is included in this manual:

**Section 1. General** includes operation descriptions of systems and components as an aid for troubleshooting and repair.

**Section 2. Troubleshooting** lists common problems and the possible causes and corrections.

**Section 3. Service** provides a guide for periodic maintenance, checks and adjustments.

**Section 4. Repairs** describes the removal, disassembly, assembly, and installation of the winch.

**W12E Electronic Controls Addendum** provides the systems descriptions as well as troubleshooting and maintenance procedures for the W12E winch with Electronic Controls option (W12EE).

**NOTE: Please refer to the addendum for all information related to the W12EE winch.**

### Description

The W6F, W8L and W12E Winches are Power Forward (LINE IN) and Power Reverse (LINE OUT) winches used on tractors with a constant running power takeoff (PTO). The winch utilizes a Self Contained Hydraulic (SCH) system where all hydraulic power is produced internally inside the winch case. The design of the winch case permits different arrangements of PTO gear assemblies to fit different tractors that use these winches. (See Section 4 for the PTO gear assemblies.)

The W6F, W8L and W12E winches have a BRAKE OFF function, which permits the cable to be pulled from the drum. A FREESPOOL function is standard on the W6F winch (except in Asia) and is available as an option on the W8L winch. The FREESPOOL function is not available on the W12E winch.

The W6F winch has a maximum line pull capacity of 266,880 N (60,000 lbf) when there is one layer or less of cable on the drum.

The W8L winch has a maximum line pull capacity of 355,480 N (80,000 lbf) when there is one layer or less of cable on the drum.

The W12E winch has a maximum line pull capacity of 533,760 N (120,000 lbf) when there is one layer or less of cable on the drum.

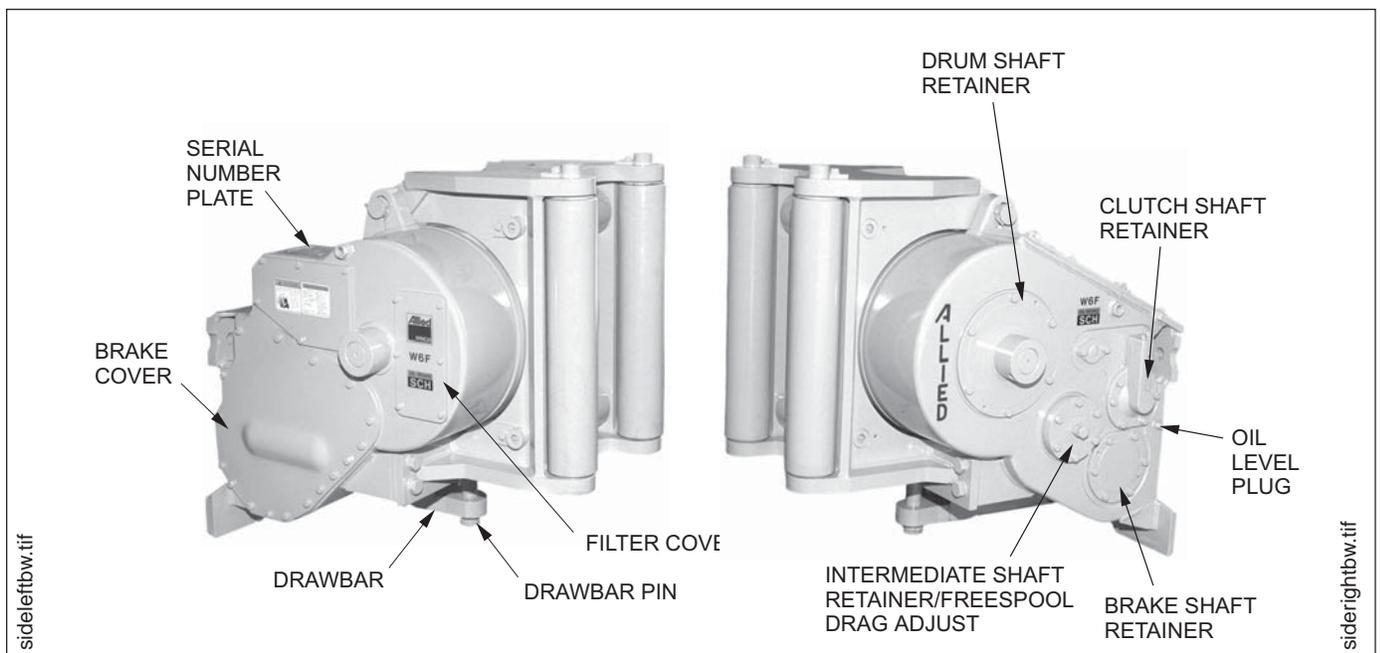
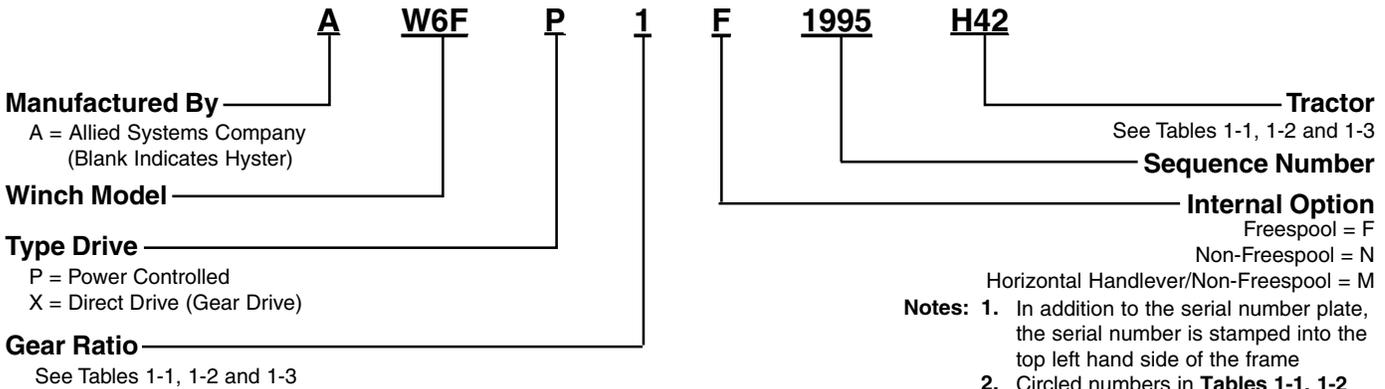


Figure 1-1 Model Views (Winch Shown with Optional Fairlead Installed)

## Unit Identification

### Allied Winch S/N Nameplate Data For Tractor Mountings



- Notes:**
- In addition to the serial number plate, the serial number is stamped into the top left hand side of the frame
  - Circled numbers in **Tables 1-1, 1-2 and 1-3** indicate possible gear ratios.

**Table 1-1 Tractor Identification and Gear Ratio for W6F Winch**

Tractor Make Model and Starting Tractor Serial Number Where Applicable										
C O D E	A New Holland/ Fiat-Hitachi	C Caterpillar	E John Deere	F FMC	G Terex	H Dresser	K Komatsu	M MF	R JI Case	X Xuanhua
32			750/750B w/Cab 3 4 6 8							
40		527 1 2 6 8 9								
41	11B PS 1	D5B 24X 25X D5E-PS 95J 96J 1 2 4	750/750B w/o Cab 3 4 6 8			TD15B/C PS 175C 1 2 4 6 8 9	D60-6DD D7OLE 2 3 4 6 8	D600C/D 1	1550 2 3 4 6 8 9	T150F 1 2 6 8
42	11B DD 1	D5B D53-DD 22X 23X 26X 1 2 4	850/850B w/Cab 2 3 4 6 8 9			TD15BG DD 501 1 2 4	D65A/E6 1 2 4			
43	12G 1	D6D PS 3X 4X 5X 10K 76A 1 2 4 6 8 9	850/850B w/o Cab 2 3 4 6 8 9			250C/E 1 2 4 6 8 9	D65S-6 1			
44	14B PS 14 C FL 14B 1	D6D DD 3X 5X 74A 99J 1 2 4 6 8	855 1			TD15E PS 1 2 4 6 8 9	D75S-3 1			
45	14B 14C DD FD14 DD 1 2 3 6 8 9	977 1 2 4	750C 6 8			TD15E DD 1 2 4 6 8	D65E-8 D68-1 1 2			
46	14C FL14C FD14 1 2 3 6 8 9	977L 1 2 4	850C 2 6 8 9				D65EX-12 1 2			
47	10C PS 1 2 3 6 8 9						D61EX-12 1 2			
48	FD14E 1 2 6 8 9									
480		D6H/D6R PS 1 2 4 6 8 9								
481		D6H DD 1 2 4 6 8 9								

**Gear Code = Fwd Ratio / Rev Ratio**

1 = 45.10:1 / 19.47:1	6 = 106.40:1 / 45.9:1
2 = 56.40:1 / 24.3:1	7 = 27.90:1 / 12.1:1
3 = 64.90:1 / 28.1:1	8 = 85.20:1 / 36.8:1
4 = 81.00:1 / 35.0:1	9 = 55.6:1 / 45.9:1
5 = 44.00:1 / 19.0:1	

**Table 1-2 Tractor Identification and Gear Ratio for W8L Winch**

Tractor Make Model and Starting Tractor Serial Number Where Applicable						
<b>C</b> <b>O</b> <b>D</b> <b>E</b>	<b>A</b> Fiat Hitachi/ New Holland	<b>C</b> Caterpillar	<b>G</b> Terex	<b>H</b> Dresser	<b>K</b> Komatsu	<b>M</b> MF
<b>51</b>	16B PS S/N 10301 & UP (1) (2)	D7F/G PS *a (1) (2) (3) (7)	D700A (1) (2) (3)	TD20E/G PS (1) (2) (3) (7)	D80A-12 (2)	D700C (1)
<b>52</b>	16B DD S/N 10301 & UP (2)	D7F/G DD *b (2) (3)			D85A-12 (1) (2)	
<b>53</b>	AB/BD 20 PS 20B FL20 (2)	572 *c (1) (2) (3)			D85E/P-18 D85A E/P-18 (1) (2) (3) (7)	
<b>54</b>	20 DD (2)	983-38K D7H D7R PS (1) (2) (3) (7)			D85E/P-21 (1) (2) (3) (7)	
<b>55</b>	FD/FL20 FP60 (1) (2) (3) (7)	D8N *d (3)			D83-1 D85ESS-1 (2) (3) (7)	
<b>56</b>	DX/FD255L (1) (2) (3) (7)	D8N *e D8R (3) (7)			D135A (3)	
<b>57</b>					D85ESS-2 *f (1) (5) (6)	

\*a Caterpillar D7 PS S/N 92V, 93E1752 & UP, 94N5660 & UP, 65V

\*b Caterpillar D7 DD S/N 91V, 93N, 64V & 45W

\*c Caterpillar 572 40U & 6J

\*d Caterpillar prior to D8N S/N 5TJ0001, same as C56 for AW8L-2293 & up

\*e Caterpillar D8N S/N 5TJ0001 & UP

\*f Komatsu D85ESS-2 Gear Ratio 1 & 5 are both 90.1:1

**Gear Code = Forward Ratio / Reverse Ratio**

1 = 49.8:1 / 19.9:1

2 = 71.6:1 / 38.6:1

3 = 94.0:1 / 37.6:1

4 = 84.0:1 / 33.6:1 (No Longer Available)

5 = 90.1:1 / 36.0:1 (No Longer Available)

6 = 68.8:1 / 27.5:1

7 = 47.1:1 / 31.1:1

**Table 1-3 Tractor Identification and Gear Ratio for W12E Winch**

Tractor Make Model and Starting Tractor Serial Number Where Applicable					
<b>C</b> <b>O</b> <b>D</b> <b>E</b>	<b>A</b> Fiat-Hitachi/ New Holland	<b>C</b> Caterpillar	<b>G</b> Terex	<b>H</b> Dresser	<b>K</b> Komatsu
<b>60</b>					D275A (4)
<b>61</b>	21-C (3) FD30 (3) (4)	D8K PS (1) (3) (4)	D750A (3) (4)	TD25C PS (3) (4)	D155A-1 & 2 (3)
<b>62</b>	FD40B 31 (3)	D9 PS (1) (3) (4)	D800 (3) (4)		D355
<b>63</b>	41-B (3)	583 Serial No: 78V 61A (1) (3) (4)		TD25E PS (3) (4)	
<b>64</b>	FD30B/C (1) (3) (4)	594 Serial No: 96V 62H (1) (3) (4)		TD25E/G (3) (4)	D375A-1 (1)
<b>65</b>	FD40 (4)	D8L D9N D9R (Clutch Br. Steer) (4)		TD40 (4)	
<b>66</b>		D10N D10R (4)			
<b>67</b>		583R (4)			
<b>68</b>		D9R (Diff. Steering) (4)			

**Gear Code**  
 1 = 46.10:1  
 3 = 60.40:1  
 4 = 83.60:1

## Serial Number Codes

The serial number codes are described on page 1-2 of this manual. The nameplate with the serial number code is found on the top left hand side of the winch case. The serial number code is also stamped on the left hand side of the winch frame.

## Nameplate

The rated capacity for the winch, as it is equipped, is shown on the nameplate. Each winch is shipped from the factory with a nameplate as shown in Figure 1-2. If the nameplate is missing, or the cable does not match the information on the nameplate, do not operate the winch until its capacity is known and a new nameplate is installed. Each winch must be operated within its rated capacity as shown on the nameplate.

If the winch is equipped with a log arch, the maximum cable size may be reduced. Refer to the nameplate for details.

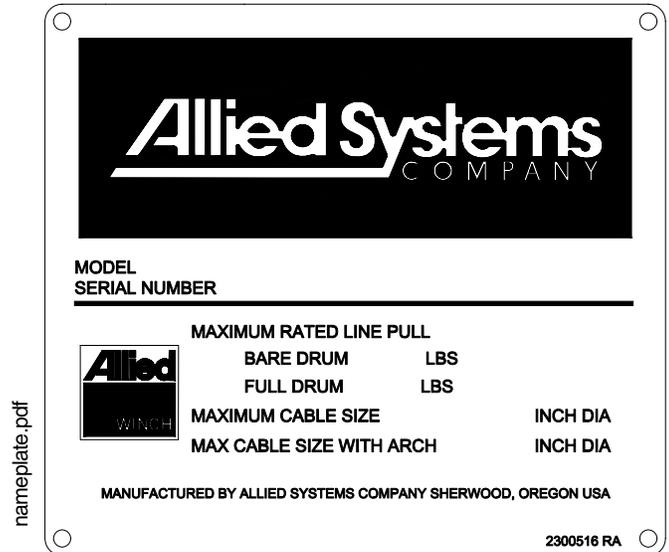


Figure 1-2 Nameplate

## Capacities and Specifications

### Approved Oil List

The type of oil used in current Allied winches affects the line control. Use ONLY the following oils in the W6F, W8L and W12E winches:

Company	Brand
Amoco Oil Company	Amoco 1000 Fluid
Exxon Company	Torque Fluid 56
John Deere	Hy-Gard Transmission & Hydraulic Oil
Sun Oil Company	Sunfleet TH Universal Tractor Fluid

Table 1-4 Approved Oil List

NOTE: For operation in temperatures below -23°C (-10° F), use John Deere J20D “Low Viscosity Hygard” or equivalent.

### Winch Capacities

Cable Diameter	Capacity For 254 mm (10 in) Drum Diameter	Capacity For 178 mm (7 in) Drum Diameter
19 mm (3/4 in)	113 m (307 ft)	129 m (425 ft)
22 mm (7/8 in)	89 m (293 ft)	93 m (305 ft)
25 mm (1 in)	63 m (206 ft)	72 m (237 ft)

NOTES: Loosely or unevenly spooled line will change capacities. Use flexible cable with independent wire rope center.

Table 1-5 Drum Line Capacities for W6F

Cable Diameter	Capacity For 305 mm (12 in) Drum Diameter	Capacity For 203 mm (8 in) Drum Diameter
22 mm (7/8 in)	89 m (293 ft)	93 m (305 ft)
25 mm (1 in)	63 m (206 ft)	72 m (237 ft)
28.6 mm (1 1/8 in)	65 m (214 ft)	68 m (224 ft)

NOTES: Loosely or unevenly spooled line will change capacities. Use flexible cable with independent wire rope center.

Table 1-6 Drum Line Capacities for W8L

Cable Diameter	Capacity For 355 mm (14 in) Drum Diameter	Capacity For 235 mm (9.5 in) Drum Diameter
28 mm (1 1/8 in)	67 m (220 ft)	84 m (276 ft)
32 mm (1 1/4 in)	53 m (175 ft)	67 m (220 ft)

NOTES: Loosely or unevenly spooled line will change capacities. Use flexible cable with independent wire rope center.

Table 1-7 Drum Line Capacities for W12E

Winch Model	Oil Capacity
W6F	14.5 Gal (55 L)
W8L	20.0 Gal (76 L)
W12E	22.0 Gal (83 L)

Table 1-8 Winch Oil Capacities

### Hydraulic Specifications

- Pump ..... Gear Type  
10-13 gpm (38-50 l/min) at 1000 rpm
- Operating pressure ..... 225 psi (1,550 kPa)
- Valve ..... One Spool
- Filters ..... Full flow magnetic strainer  
20 micron paper cartridge

## Winch Torque Specifications

**NOTE: Unless otherwise specified, torque:**  
**1/2 UNC to 50 ft-lbs (7 kg-m)**  
**3/8 UNC to 25 ft-lbs (4 kg-m)**

**NOTE: All torque values given with threads lubricated**

Table 1-9 Torque Specifications

ITEM	W6F		W8L		W12E	
	ft-lbs	kg-m	ft-lbs	kg-m	ft-lbs	kg-m
PTO Shaft Assembly Bearing Carrier Capscrews	75	10	75	10	75	10
Clutch Shaft Assembly Bearing Retainer Capscrews Bearing Locknut	75 200	10 28	75 200	10 28	75 200	10 28
Pump Mounting Capscrews	25	4	25	4	25	4
Brake Shaft Assembly Bearing Retainer Capscrews	75	10	75	10	75	10
Intermediate Shaft Assembly Bearing Retainer Capscrews	75	10	75	10	75	10
Freespool Shift Shaft	75	10	75	10	75	10
Drum Shaft Assembly RH Bearing Retainer Capscrews Drum Gear to Adapter Capscrews Drum Shaft Nuts Drum to Adapter Capscrews	75 75 400 200	10 10 55 28	75 150 400 200	10 20 55 28	150 225 400 200	20 31 55 28
Clutch Assembly Clutch Piston Housing Capscrews Clutch Piston Housing Setscrews	70 40	10 6	70 40	10 6	70 40	10 6
Brake Assembly Cover Nuts	130	18	130	18	130	18
Control Valve Mounting Capscrews	50	7	50	7	50	7
Winch Mounting to Tractor Studs Capscrews Nuts (All Except Inside Nuts) Inside Nuts (Castle Type with Cotter)	500* 500* 500 Hand	69* 69* 69 Hand	500* 500* 500 Hand	69* 69* 69 Hand	500* 500* 500 Hand	69* 69* 69 Hand
* With Loctite						

## Gear Train (See Fig. 1-3 & 1-4)

The gear train (Figure 1-3) consists of:

1. a PTO shaft assembly
2. a clutch shaft assembly
3. a brake shaft assembly
4. an intermediate shaft assembly; and
5. a drum shaft assembly

Torque transfer during operation is shown in Figure 1-4.

**NOTE: PTO Rotation is determined by standing behind tractor and looking forward at the PTO shaft entering the winch case.**

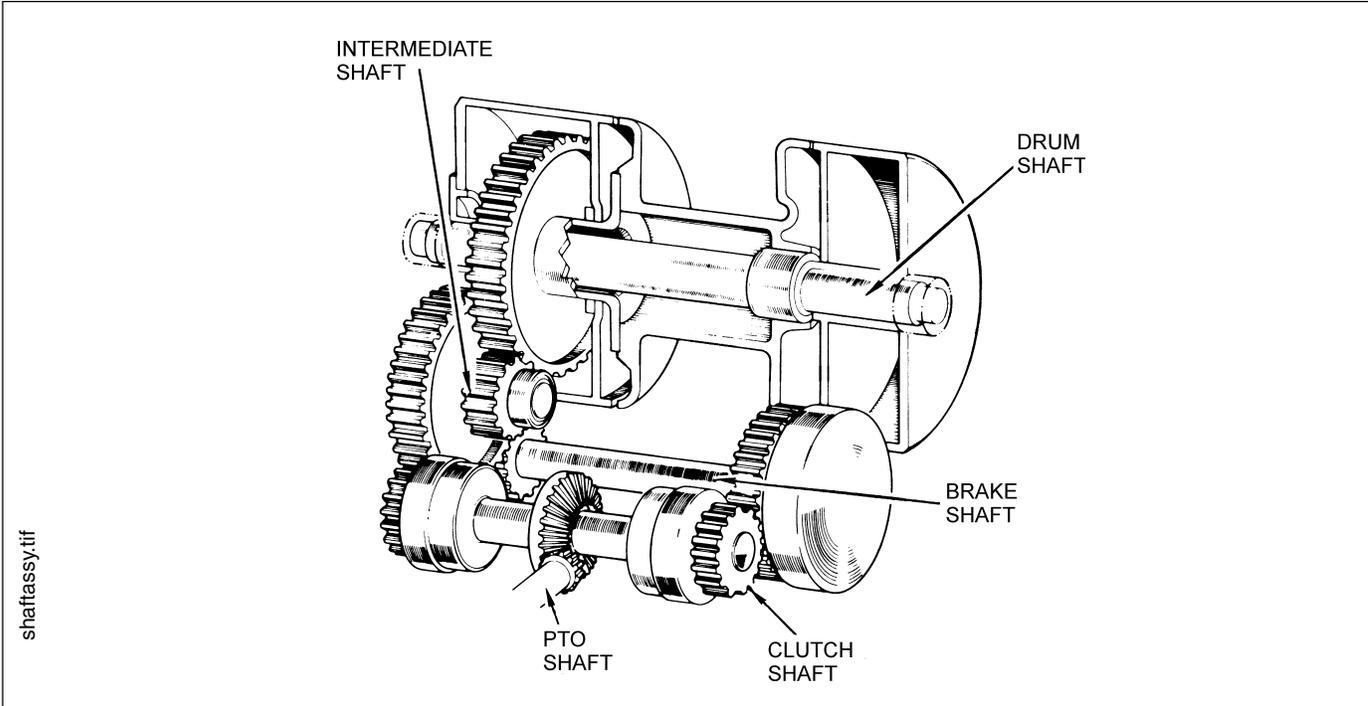


Figure 1-3 Gear Train

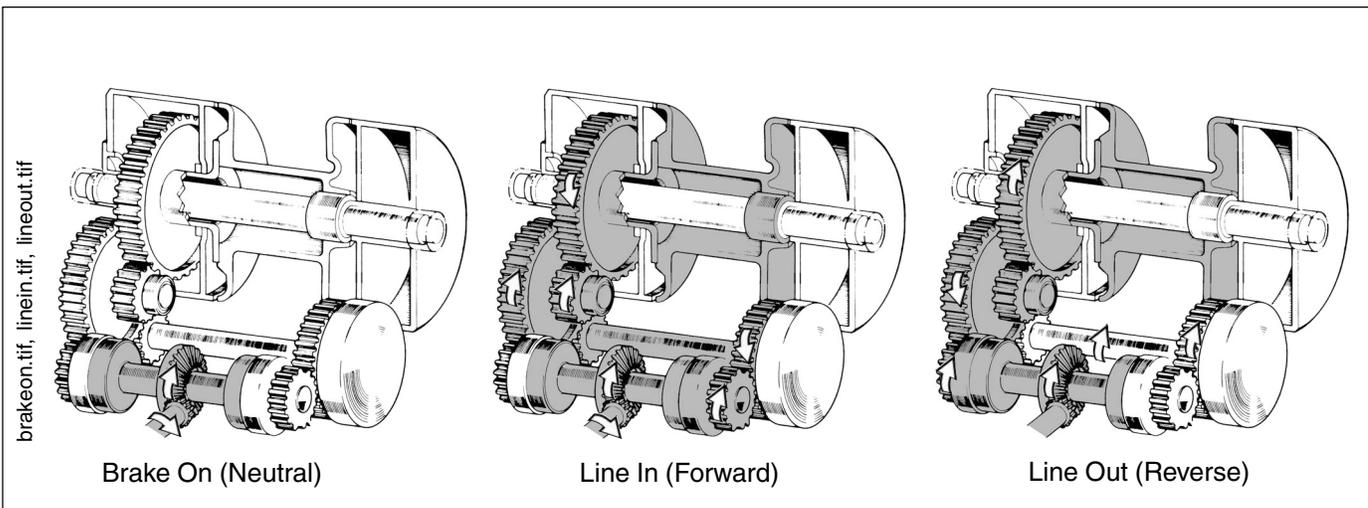


Figure 1-4 Gear Train Rotation Torque Transfer

**Freespool Operation (W6F & W8L Only; See Fig. 1-5)**

The FREESPOOL arrangement allows mechanical disengagement of the drum gear from the remainder of the gear train. When the FREESPOOL handlever is shifted, the dental clutch engages or disengages the drum pinion and intermediate gear.

When the FREESPOOL control lever is moved to the FREESPOOL position, the sliding sleeve disengages the drum pinion gear from the intermediate gear. The gear train is disengaged from the drum gear so that the cable can be pulled from the drum by hand. Only the drum and drum pinion gear rotates when the cable is pulled during FREESPOOL operation. The resistance to rotation by the drum during FREESPOOL is controlled by the preload on the bearings for the intermediate shaft.

**! WARNING**

**WARNING:** When the control lever is moved to the freespool position it will release the gear train and any load that may be on the cable. An uncontrolled release of the load may occur. Loss of the load can result in injury and damage.

If the FREESPOOL control lever cannot be moved to engage the gear train for power operation, apply the clutch to move the gear train a small amount. This action will align the splines in the dental clutch so that the intermediate gear can be engaged.

The power control lever must be in the BRAKE ON or BRAKE OFF positions to operate the FREESPOOL con-

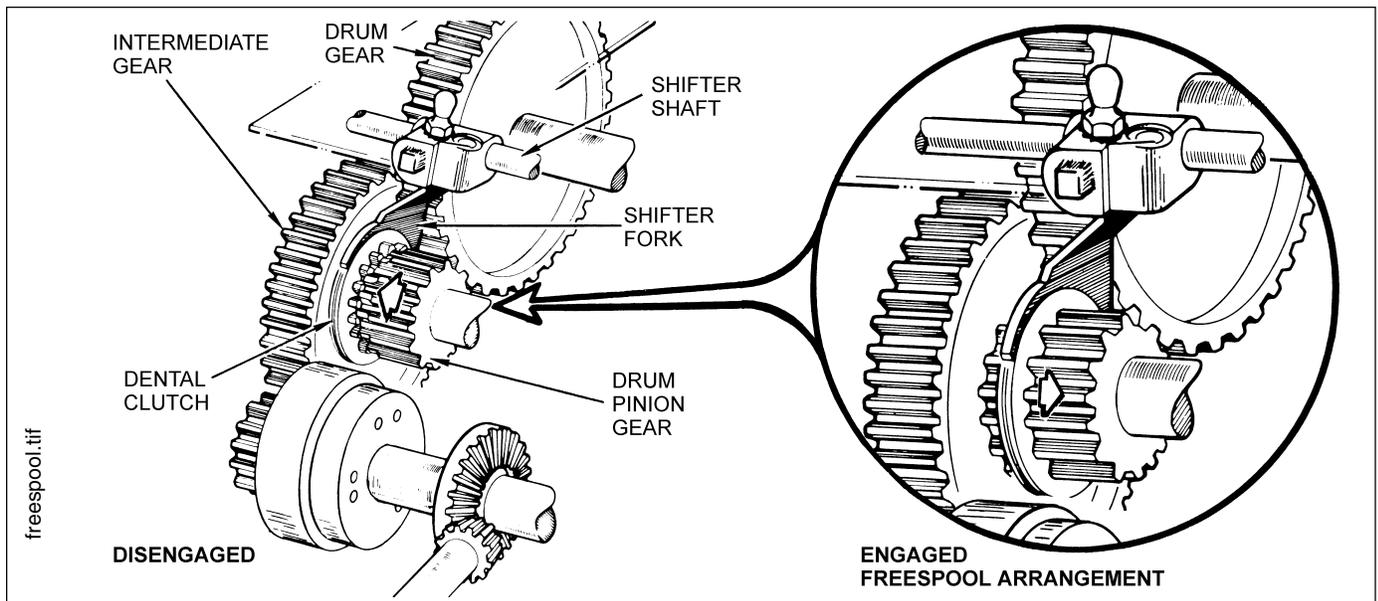


Figure 1-5 Freespool

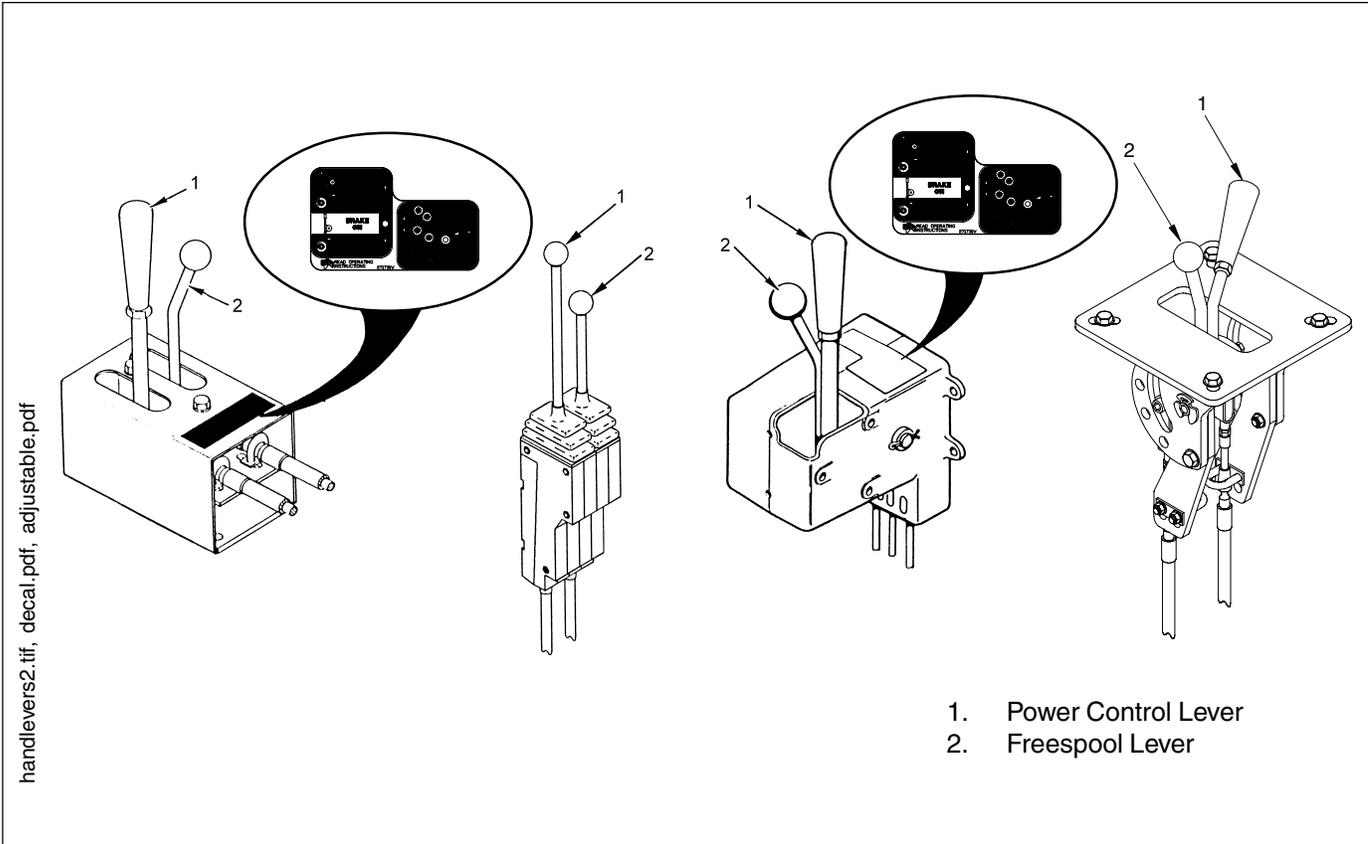


Figure 1-6 Typical Winch Controls

## Operation and Control (See Fig. 1-6)

The control lever assembly has a power control lever for winch control (See Fig 1-6). If the winch does not have the FREESPOOL function, the second control lever is not used. Both control levers are connected to the winch through control cables. The power control lever is connected to the spool in the control valve. The power control lever is used to select one of the following operations:

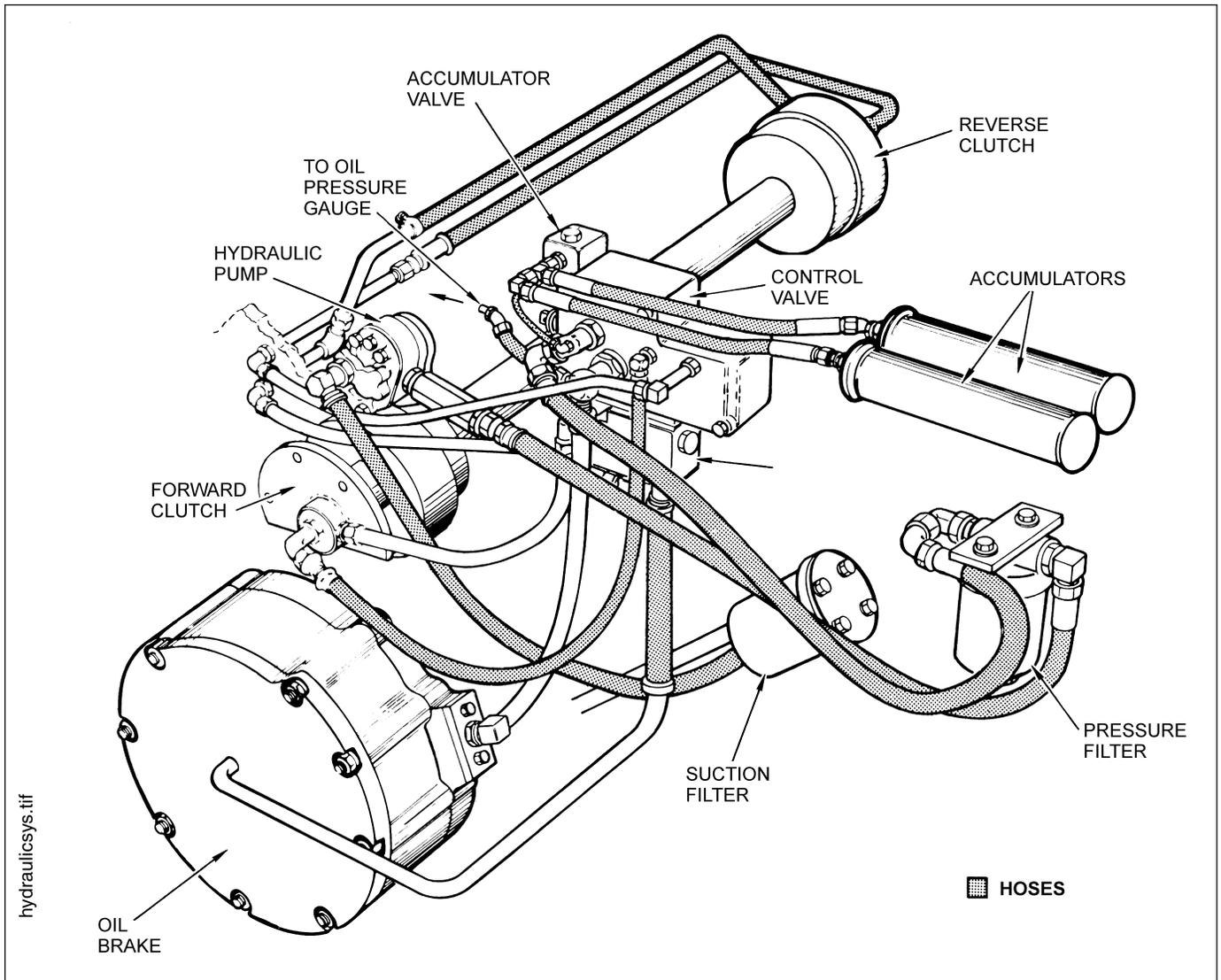
- BRAKE OFF
- LINE OUT
- BRAKE ON
- LINE IN

Except for the BRAKE OFF position, a spring arrangement on the spool of the control valve returns the spool and power control lever to the BRAKE ON position. A ball and detent arrangement will hold the spool and control lever in BRAKE OFF, and the operator must pull the control lever to release it from that position.

The BRAKE ON position is a neutral position. No hydraulic pressure is applied to the brake or the clutches. Springs apply the brake so that the winch drum will not rotate.

The BRAKE OFF position has a detent and is a neutral position for the clutches. Hydraulic pressure is applied to release the brake. The winch will not rotate easily because of friction in the clutches, brake, and gear train. Cable cannot be pulled from the winch by hand. The BRAKE OFF position is different from the FREESPOOL position where the drum is disengaged from the gear train. The BRAKE OFF position is used when the operator has a load on the winch cable. The operator can move the tractor forward without moving the load.

A second control lever disengages and engages a dental clutch to control the FREESPOOL operation. The FREESPOOL control lever has two positions: POWER and FREESPOOL. The FREESPOOL control lever disengages the gear train so that the cable can be pulled from the winch by hand.



**Figure 1-7 Hydraulic System**

**Hydraulic System (See Fig.1-7)**

The operation of the winch is controlled by an internal hydraulic system. This system directs the flow of oil for winch control functions. The suction and pressure filters remove contaminants from the oil. The hydraulic pump supplies pressurized oil for the system. The control valve is connected by a cable to the control lever. The control valve distributes and regulates the flow and pressure of hydraulic oil to the clutches and brake while maintaining the cooling oil flow.

A separate accumulator valve, mounted on the front of the control valve body, controls the release of pressurized oil from the accumulators. The accumulators provide pres-

surized oil for a limited amount of actuation if the hydraulic pump is not functioning. This allows the release of the winch brake when the tractor engine or the hydraulic pump is not operating.

The operation of the winch is controlled by the clutches and the brake except when the intermediate shaft is disengaged for FREESPOOL.

When the tractor's PTO is operating, the hydraulic system provides pressure and flow. The hydraulic flow path of the various functions is depicted in Fig. 1-14 through Fig. 1-18.

## Forward and Reverse Clutches (See Fig. 1-8 and 1-9)

The forward clutch (Figure 1-9) and reverse clutch (1-10) are multi-disc types that are hydraulically applied and

spring released. Oil flow through the clutches is maintained under all operating conditions for cooling.

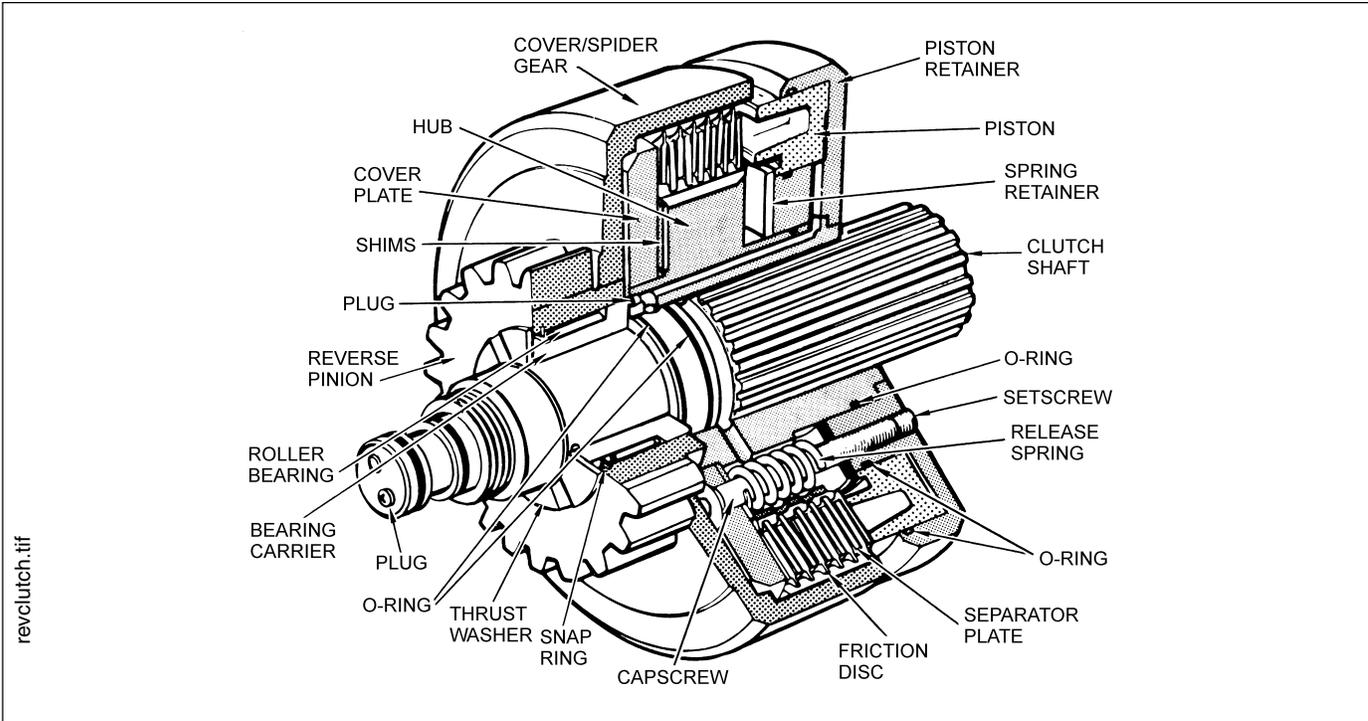


Figure 1-8 Reverse Clutch

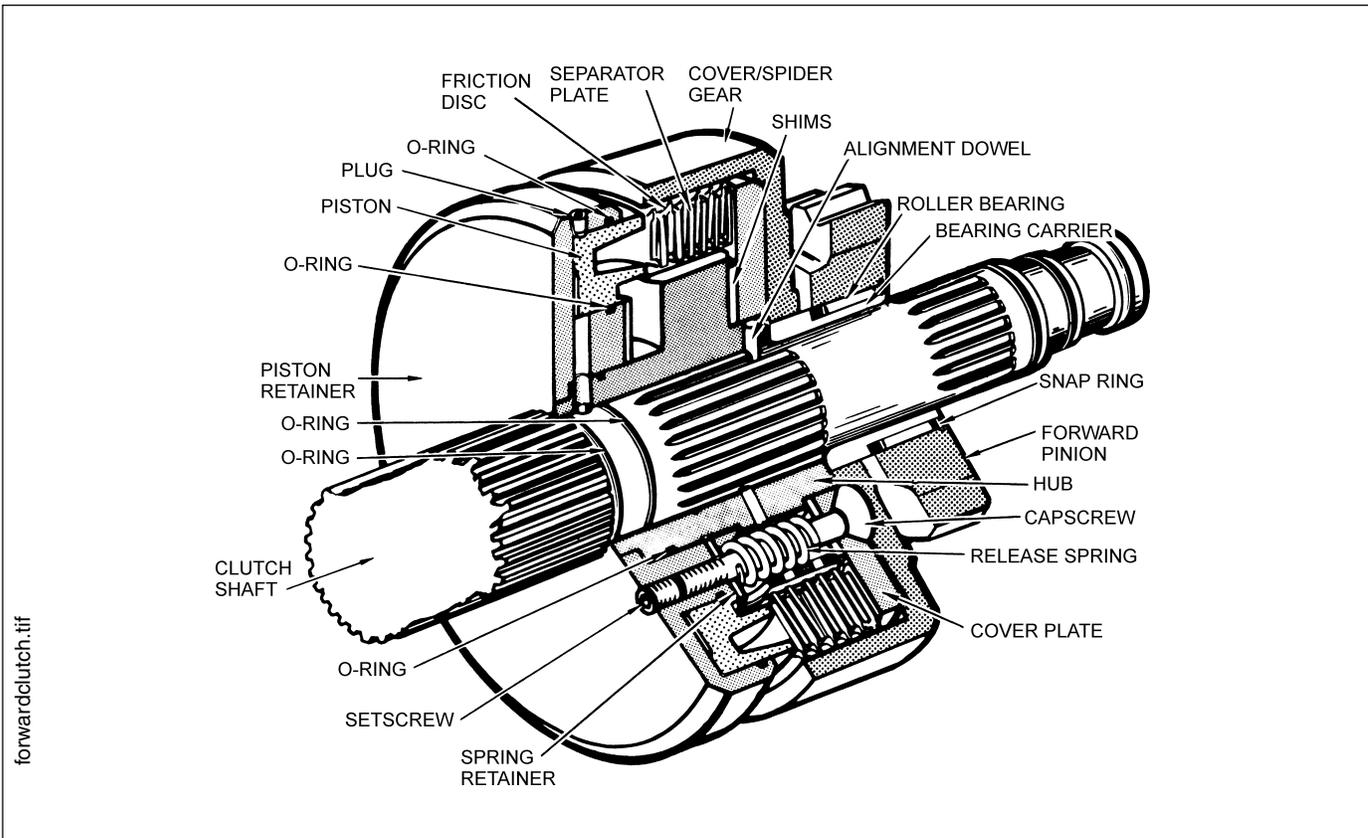
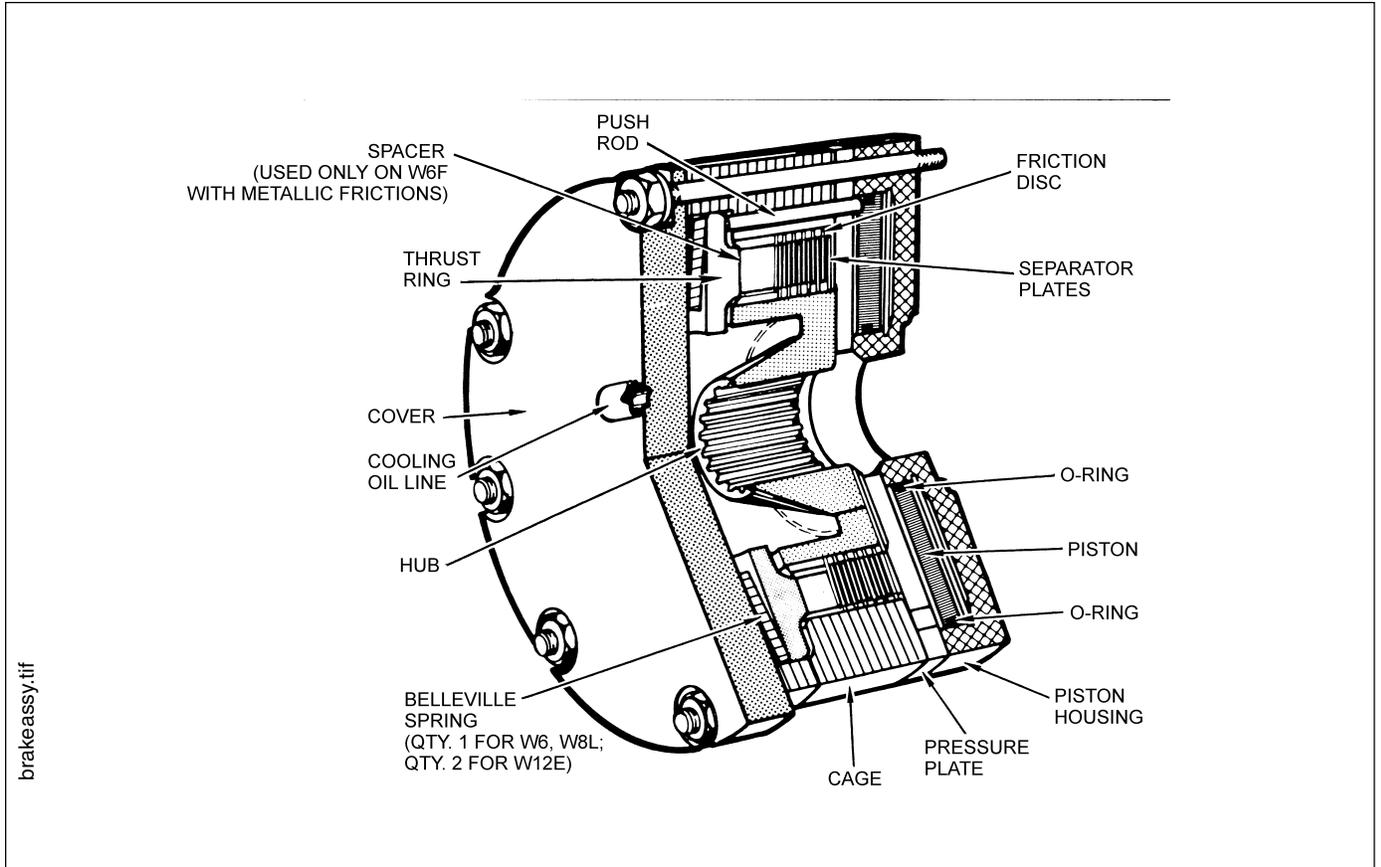


Figure 1-9 Forward Clutch



**Figure 1-10 Oil Brake Assmbly**

**Oil Brake Assembly (See Fig. 1-10)**

The oil brake is a multi-disc brake that is spring applied and hydraulically released. When pressurized oil is directed into the cavity between the piston and piston housing, the

piston moves outward, compressing the belleville spring, which then releases the brake.

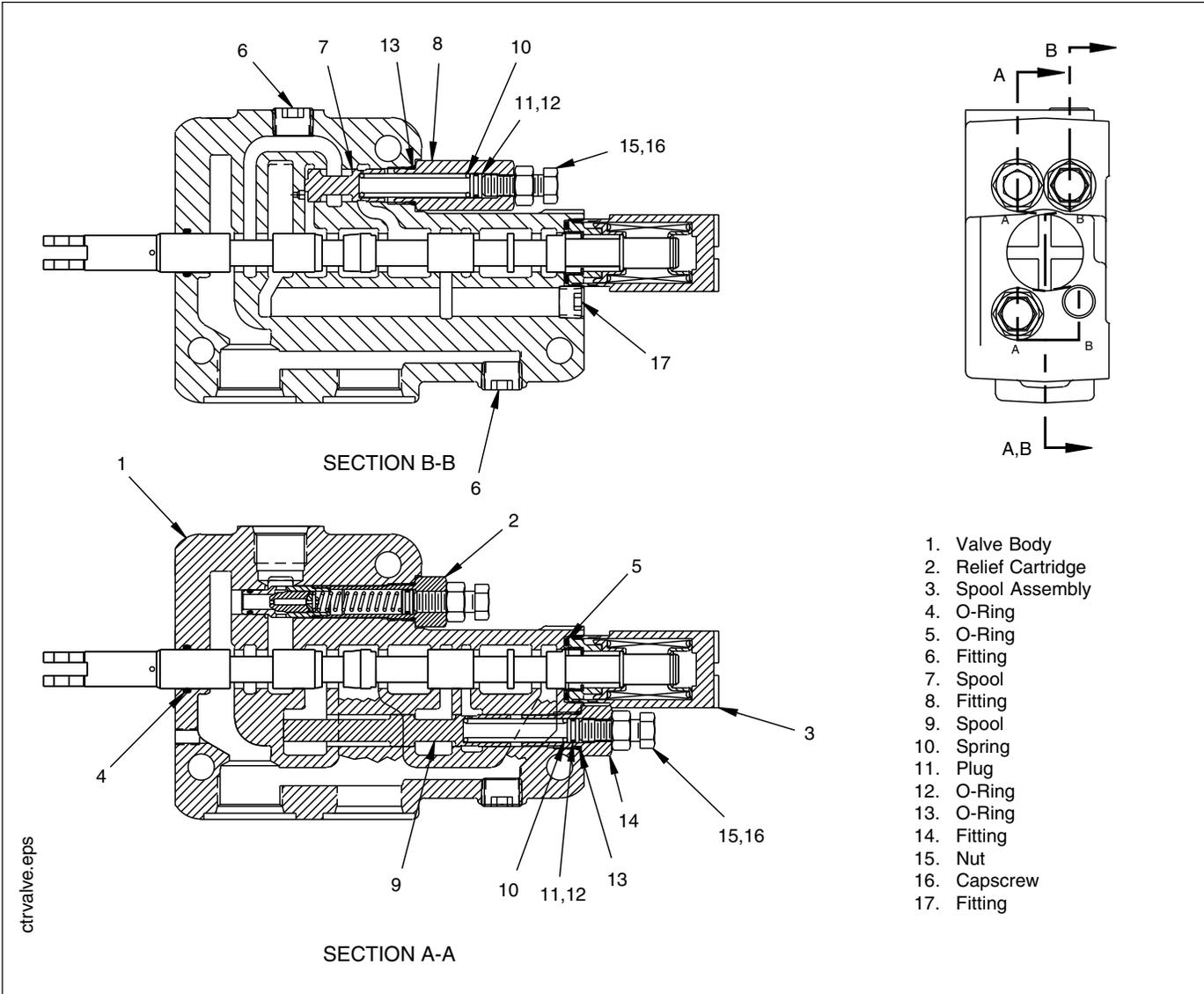


Figure 1-11 Hydraulic Control Valve

### Hydraulic Control Valve (See Fig. 1-11)

The hydraulic control valve is a single spool valve installed inside the winch frame. The flow of hydraulic oil to and from the clutches and brake is controlled by the control valve. Passages inside the valve body connect the oil flow and pressure with the functions that control the winch. The control valve spool opens and closes passages to apply and release the clutches and brake.

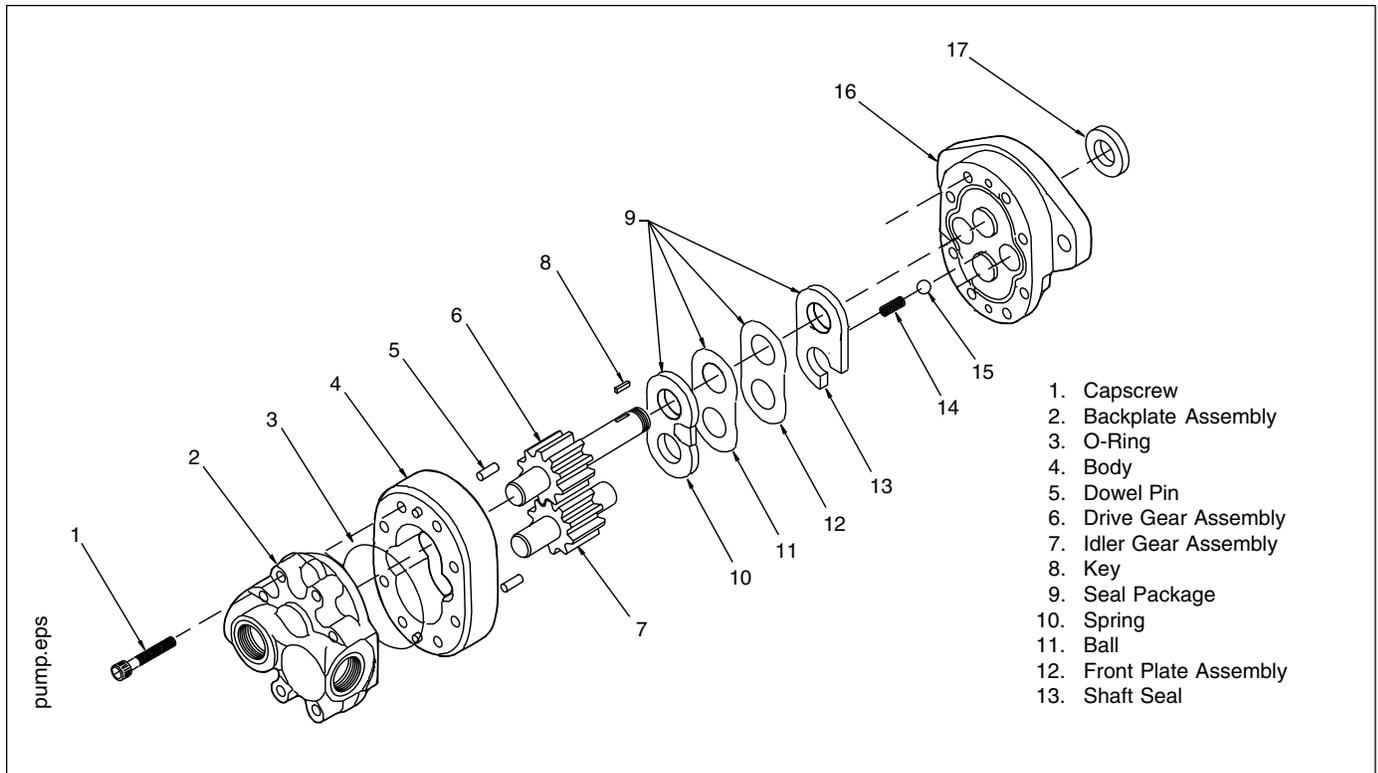
The control valve spool is connected by a cable to the control lever for operator operation. Built-in pressure modulators automatically ensure positive clutch engagement before the brake is fully released. The forward modulator and reverse modulator are adjustable. The control valve spool is spring loaded in the BRAKE ON position and has a detented position to hold it in the BRAKE OFF position.

### Hydraulic Control Relief Valve

A relief valve is in the control valve to prevent excessive hydraulic oil pressure. The valve is a spring loaded, pop-pet-type valve mounted in the control valve dump port. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. Oil from the relief valve is discharged directly to the inside of winch housing.

### Hydraulic Pump (See Fig. 1-12)

The hydraulic pump is a fixed displacement gear pump that supplies the hydraulic flow necessary for operation of the winch. The pump shaft is driven by a spur gear off of the input shaft. The pump inlet port is connected to the winch suction filter. The outlet is connected through the pressure filter to the control valve inlet port.



**Figure 1-12 Hydraulic Pump**

## Accumulators

Two accumulators joined by a tee fitting are connected to the hydraulic system. The bladders have a nitrogen precharge so that the oil stored in the accumulators will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts and if the PTO shaft stalls. The W6F and W8L have two accumulators and the W12E has three accumulators. They are charged with nitrogen to 100 psi.

## Accumulator Valve

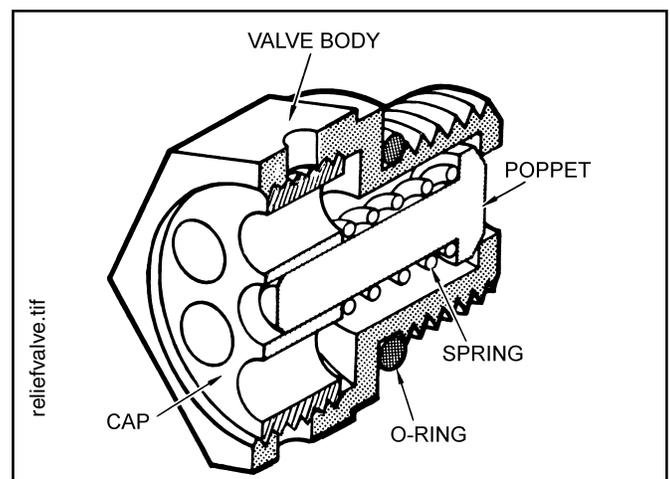
The accumulator valve is mounted adjacent to the control valve and is actuated by the control valve spool cam. As the hydraulic system builds up pressure, oil can flow past the check ball in the valve to be stored in the accumulators. When the control valve spool is moved to the LINE IN or LINE OUT position, a cam on the spool pushes up on the accumulator valve pin. This pin lifts the check ball off its seat to release the oil stored in the accumulators. If the PTO should stall so the hydraulic pump does not provide sufficient flow, the stored oil will be released, thus releasing the brake and applying the clutch. This prevents further drag on the PTO shaft.

## Cooling Oil Relief Valve (See Figure 1-13)

The cooling oil relief valve is a spring-loaded, poppet-type valve. The valve is mounted in the control valve dump port

and maintains cooling oil pressure at 8 psi (0.6 kg/cm<sup>2</sup>). Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. Oil from the relief valve is discharged directly into the inside of the winch housing.

Turning the center cap clockwise will increase pressure. Newer units have holes drilled into the valve body flats for access to the cap's threads. Threads can be upset with a punch when correct pressure is obtained, therefore locking the cap into position.



**Figure 1-13 Cooling Oil Relief Valve**

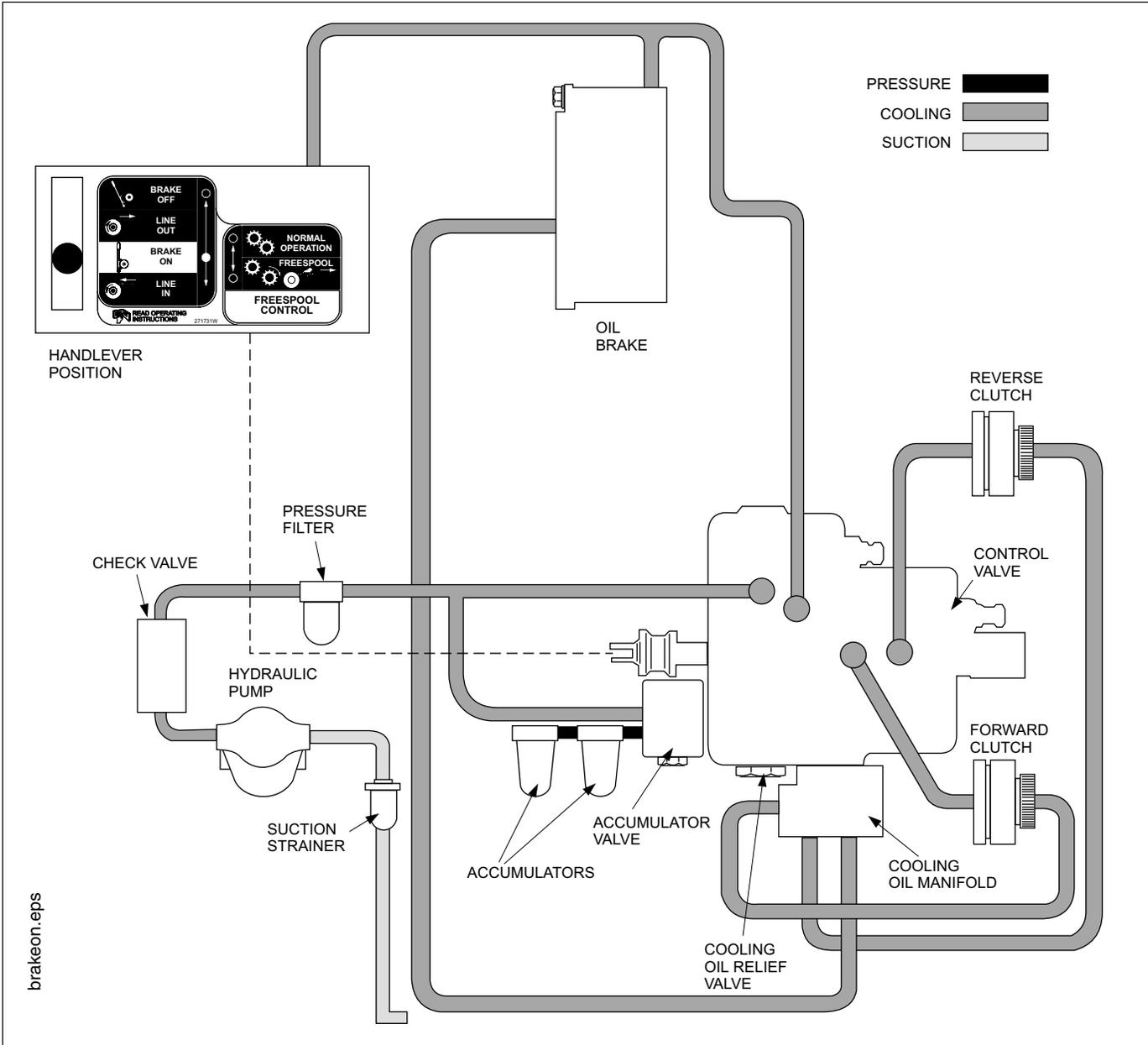
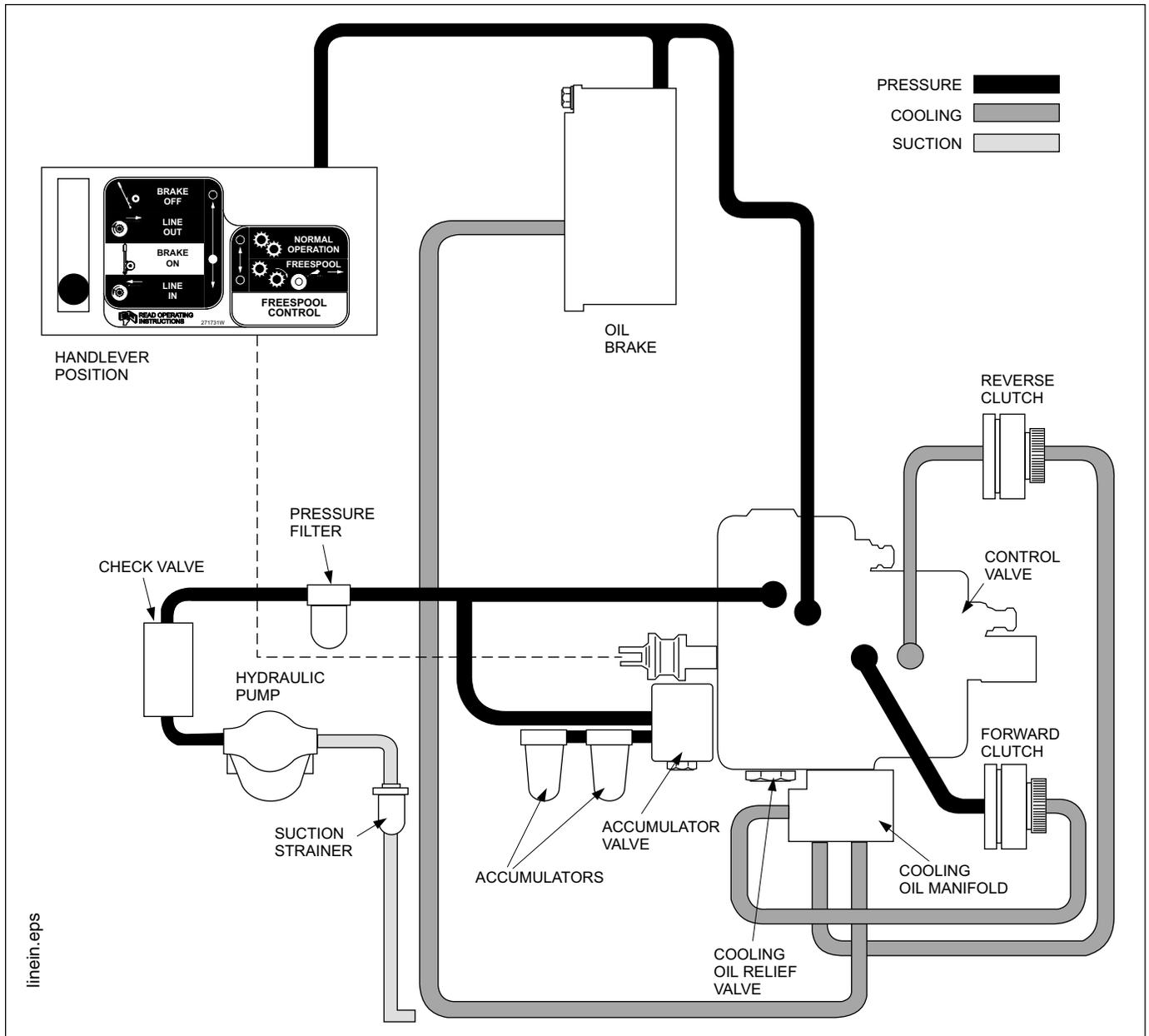


Figure 1-14 Hydraulic System - BRAKE ON (Neutral)

## Sequence of Operation - BRAKE ON

The control valve spool is spring centered to neutral. In this position, oil entering the open center valve flows into the low pressure core passages. The cooling oil relief valve maintains hydraulic pressure in the cooling oil pas-

sage at 8 psi (55 kPa). Cooling oil flows out of the cooling oil manifold to lubricate and cool the brake and clutch assemblies. Excess flow goes directly to the sump.



**Figure 1-15 Hydraulic System - LINE IN (Forward)**

**Sequence of Operation - LINE IN**

For LINE IN (forward) operation, the operator pulls back on the lever, which causes the spool to move into the valve, closing off the flow of oil to the cooling passage. This allows a pressure buildup in the inlet passage. Oil flows from the inlet passage to the brake passage through an orifice, producing a pressure drop between the inlet and brake passage, depending on the amount of oil flow. As the brake port to sump is closed off by the spool, the oil flow to sump is reduced, allowing the brake pressure to build up. As the brake pressure increases, the forward modulator valve will regulate the oil pressure to the forward clutch and maintain a constant 50 psi (345 kPa) pressure differential between the brake and clutch through the inching mode. At the end of the spool travel, a direct port

to the clutch is opened.

**NOTE: On a fast shift, the spool moves into the full forward position, routing oil directly to the forward clutch and bypassing the forward modulator valve completely, thereby avoiding any delay in operation.**

When pressure starts to rise above 220±5 psi (1520±35 kPa) at the inlet port passage, the spring loaded poppet in the relief valve will bypass the excess flow to the cooling passage. An orifice in the relief valve poppet prevents oil from becoming trapped behind the poppet and causing a hydraulic lock.

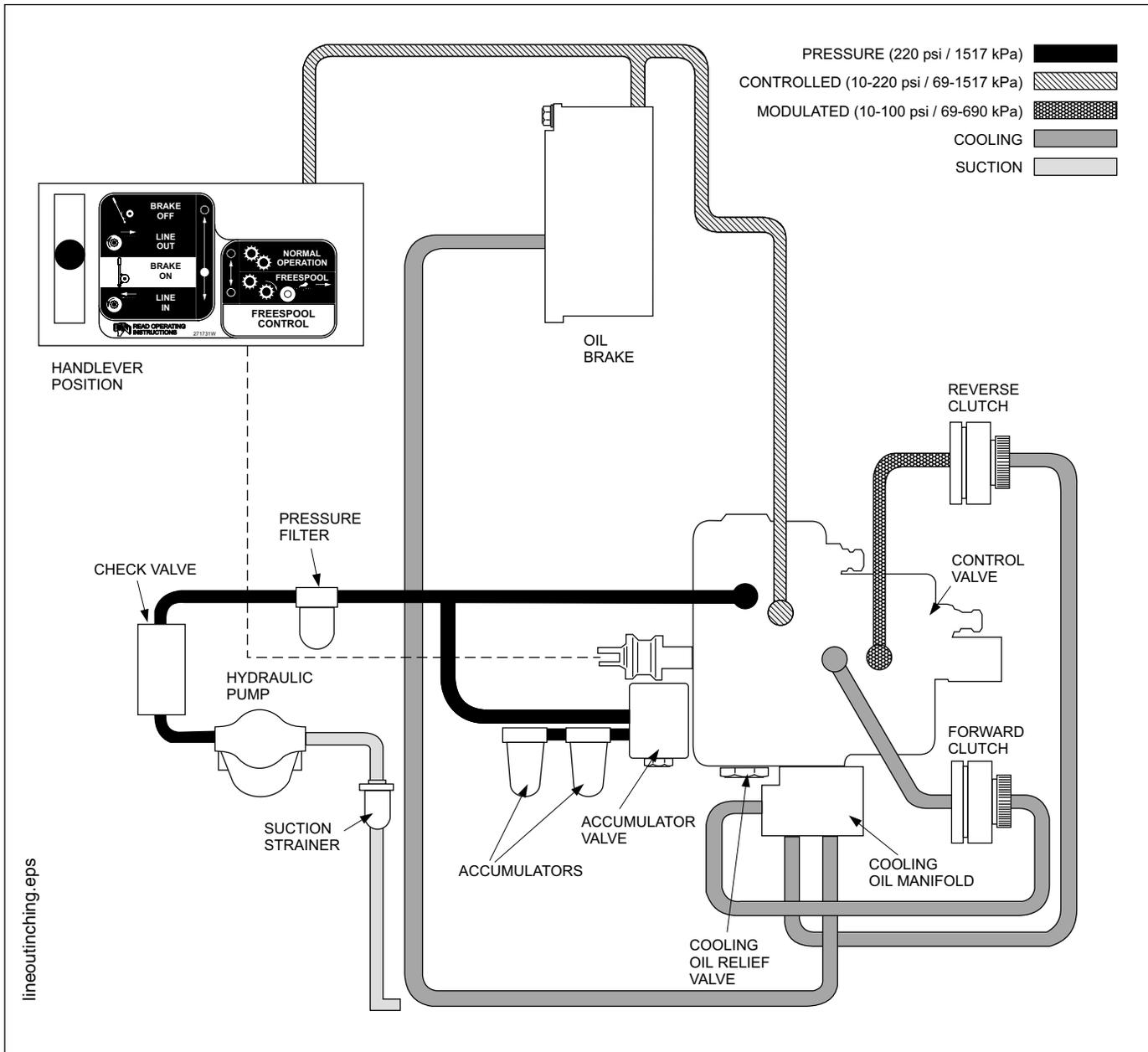


Figure 1-16 Hydraulic System - LINE OUT INCHING

## Sequence of Operation - LINE OUT INCHING

LINE OUT INCHING (gradual brake release) is achieved by slowly pushing the control lever out of the brake on (neutral) position towards the line out (reverse) position. As the control spool moves, the flow of oil to the cooling passage is blocked. This allows pressure to build up in the inlet passage. Oil flows from the inlet passage to the brake passage through an orifice, producing a pressure drop between the inlet and brake passages, depending on the

amount of oil flow. As the brake port to sump is closed off by the spool, the oil flow to sump is reduced, allowing the brake pressure to build up. As the brake pressure increases, the reverse modulator valve will regulate the oil pressure at the reverse clutch and maintain a constant 120 psi (827 kPa) pressure differential between the brake and the clutch through the inching mode.

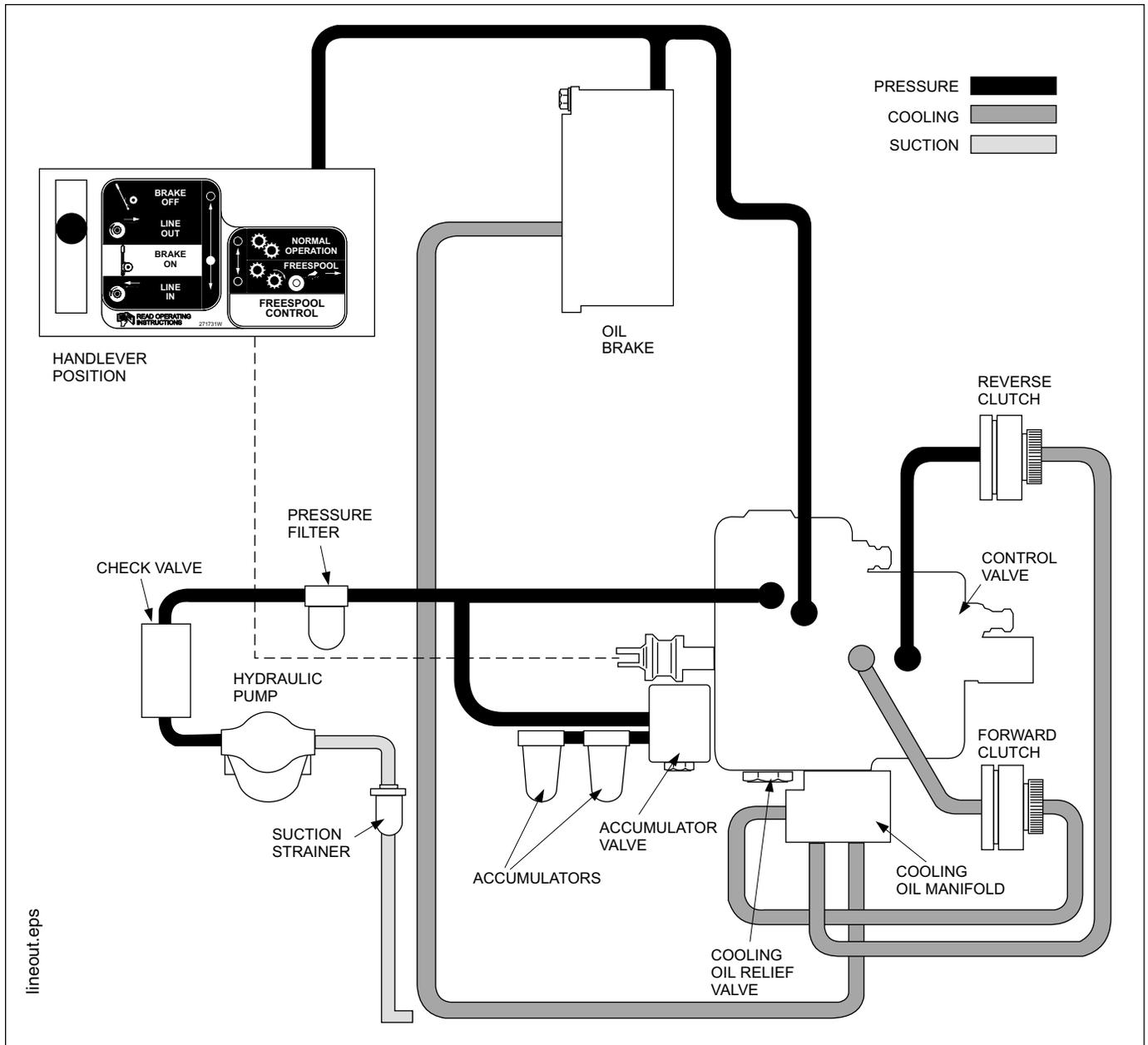


Figure 1-17 Hydraulic System - LINE OUT (Reverse)

### Sequence of Operation - LINE OUT

LINE OUT, or reverse, is achieved by pushing the control lever to the reverse position, thereby pulling the control spool out. As the control spool moves, the flow of oil to the cooling passage is blocked. This allows pressure to build up in the inlet passage. Oil flows from the inlet passage to the brake passage through an orifice, producing a pressure drop between the inlet and brake passages, depending on the amount of oil flow. As the brake port to sump is closed off by the spool, the oil flow to sump is reduced, allowing the brake pressure to build up. As the brake pressure increases, the reverse modulator valve will regulate the the oil pressure to the reverse clutch and main-

tain a constant 120 psi (827 kPa) pressure differential between brake and clutch through inching mode. At the end of spool travel, a direct port to the reverse clutch is opened.

**NOTE: On a fast shift, the spool moves into the full reverse position, routing oil directly to the reverse clutch and bypassing the reverse modulator valve completely, thereby avoiding any delay in operation.**

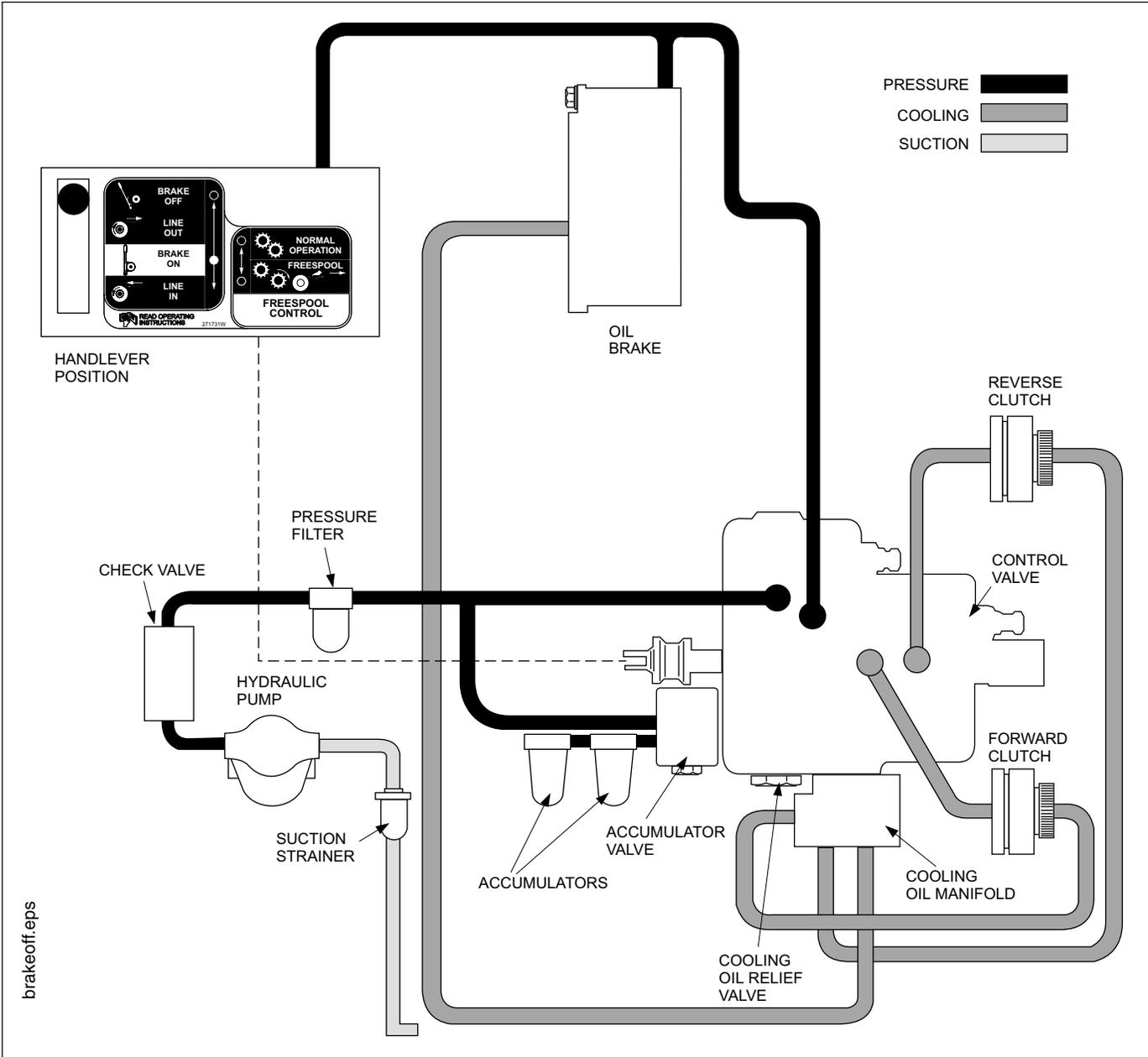


Figure 1-18 Hydraulic System - BRAKE OFF

## Sequence of Operation - BRAKE OFF

BRAKE OFF is achieved by pushing the control lever to the BRAKE OFF position. This position is detented and the control lever must be moved manually to return it to the neutral position. With the control spool in BRAKE OFF

position, oil flow to the clutches is blocked and high pressure oil flows directly to the brake port to fully release the brake.

## Troubleshooting

### General

This section includes Tables 2-1 and 2-2, trouble analysis check charts. The charts list the most common troubles that may be encountered. A possible cause and recommended corrective action are listed to restore the winch

to normal operating condition. Table 2-1 applies to all W6F, W8L and W12E winches and Table 2-2 applies to W6F and W8L winches equipped with optional FREESPOOL.

**Table 2-1 Troubleshooting Analysis Check Chart**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular	Hydraulic oil is too cold.	Put the control lever in the <b>BRAKE OFF</b> position. Run the engine at 1000 rpm to warm the oil before operating the winch.
	Low oil level.	Add hydraulic oil to the correct level.
	Low oil pressure.	See item on troubleshooting low oil pressure directly below.
	Wrong oil.	Drain oil and replace with correct grade. Refer to the approved oil list in Section 1.
	Accumulator malfunction.	Check accumulator and recharge/replace as necessary.
	Tractor engine idling too low.	Increase tractor idle speed.
	Hydraulic system suction leaks. Observe oil exiting lube valve while tractor is operating. Suction leaks will cause oil to foam.	Check the following for air leaks: 1. Suction hose to pump connection 2. Pump shaft seal 3. Suction filter cover and gasket 4. Suction hose for cracks or collapsed sections
	Control cables need adjustment.	Check for correct adjustment as outlined in Section 3. Make sure the ends of the cables are fastened correctly. Double-check push-pull cable housing to ensure it is securely anchored on both ends. Be sure control lever has full movement and is not hitting housing.
Low oil pressure	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.
	Defective or improperly adjusted oil relief valve; poppet may be stuck open.	Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective.
	Clogged suction filter.	Check and clean or replace suction filter.
	Oil brake leaking internally (indicated by low brake pressure).	Repair as required.
	Defective hydraulic pump.	Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.
Brake does not release or winch stalls during low RPM shift	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Pressure modulator set too low.	Turn modulator screw IN for earlier brake release. Increase sequence differential.
	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace both seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.

Table 2-1 (continued) Troubleshooting Analysis Check Chart

PROBLEM	POSSIBLE CAUSE	CORRECTION
Overheating	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Remove suction filter, clean and replace.
	One or both clutches dragging.	Check by placing handlever in <b>BRAKE OFF</b> . Normally drum will rotate slowly in the <b>LINE IN</b> direction. If the reverse clutch is dragging, the drum will rotate in the <b>LINE OUT</b> direction. If forward clutch is dragging the drum will rotate positively in the <b>LINE IN</b> direction and it will take more than 100 lbs. of line pull to prevent drum rotation.
	Low system pressure.	Adjust accordingly.
	Low or high cooling oil pressure.	Check cooling oil pressure. Replace cooling oil relief valve if required.
	Bevel shaft bearings set too tight.	Adjust accordingly.
	Control spool travel improperly adjusted.	Check and adjust as necessary.
	Excessive inching.	Avoid continuous operation in the inching zone.
Oil brake slipping or drum backspin on fast shift from neutral to forward	Low brake release pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 4.
Brake releases before forward clutch engagement	Modulator valve in control valve not functioning.	Check forward modulator valve.
	Low brake release pressure.	See "Oil Brake Slipping" troubleshooting item above.
Brake releases before reverse clutch engagement	Modulator valve in control valve not functioning.	Check forward modulator valve. Adjust or replace as necessary.
Low forward or reverse clutch pressure	Broken seal rings on the bevel gear shaft.	Replace seal rings. <b>NOTE:</b> A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on clutch/brake shaft and adjust it if necessary to prevent additional breakage of seal rings; refer to Section 4.
	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 retainer for grooves. Replace retainer if defective, or re-sleeve.
	Damaged clutch piston, piston retainer or O-rings.	Check piston and piston retainer cavity for damage. Always repair both O-rings when clutch is repaired. Refer to Section 4.
	Reverse pressure hose damaged by bevel gear.	Remove cover and inspect.
	Leaky clutch circuit.	Perform clutch bleed-down test on clutch circuit.
Winch will not operate while tracks are turning	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage. Inspect magnetic suction screen.

**Table 2-1 (continued) Troubleshooting Analysis Check Chart**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Forward or reverse oil clutch not engaging	Low oil pressure.	See "Low Oil Pressure" troubleshooting item above.
	Low forward or reverse clutch pressure.	See troubleshooting for "Low Forward or Reverse Clutch Pressure" item above.
	Inadequate piston travel.	Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.
Forward or reverse oil clutch not releasing	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators	Replace as necessary.
	Lube pressure high.	Test and re-set.

**Table 2-2 Troubleshooting Analysis Check Chart for FREESPOOL Option**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Hard to shift	Linkage binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Shifting collar too tight on splines or splines rough.	Remove shifting collar, dress splines with fine stone, and replace parts if necessary.
	Dental clutch installed backwards.	Install clutch so that chamfered ramp faces drum pinion gear.
	Ball detent spring load too much.	Back off on spring plug.
Jumps out of gear	Control linkage improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Worn drum pinion gear bushing.	Replace bushing and related parts as necessary.
	Detent ball and spring loose, damaged or sticking.	Clean or replace as necessary.
Winch will not freespool	Linkage improperly adjusted.	Check and adjust as necessary.
	Intermediate shaft assembly damaged, rusted or preloaded.	Adjust or repair as necessary. Refer to Section 4.
	Drum shaft assembly damaged, rusted or binding.	Adjust or repair as necessary.
Winch freespools too easily	Insufficient preload on intermediate shaft.	On winches <b>with</b> exterior Freespool Drag Adjust: Tighten preload on the intermediate shaft.  On winches <b>without</b> exterior Freespool Drag Adjust: Remove shims as required to preload shaft. Refer to Section 4.
Winch freespools too hard	Too much preload on intermediate shaft.	On winches <b>with</b> exterior Freespool Drag Adjust: Loosen preload on the intermediate shaft.  On winches <b>without</b> exterior Freespool Drag Adjust: Add shims as required to preload shaft. Refer to Section 4.  <b>NOTE:</b> It may be necessary to use a slide hammer on the shaft to unload the bearing race because of the fit in the bore.



## Service

### General

This section provides the instructions for performing maintenance and making checks and adjustments. Standard shop tools are used in doing the work described in this section.

### Maintenance

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating time on the hour meter of the tractor to determine the maintenance time for the winch.

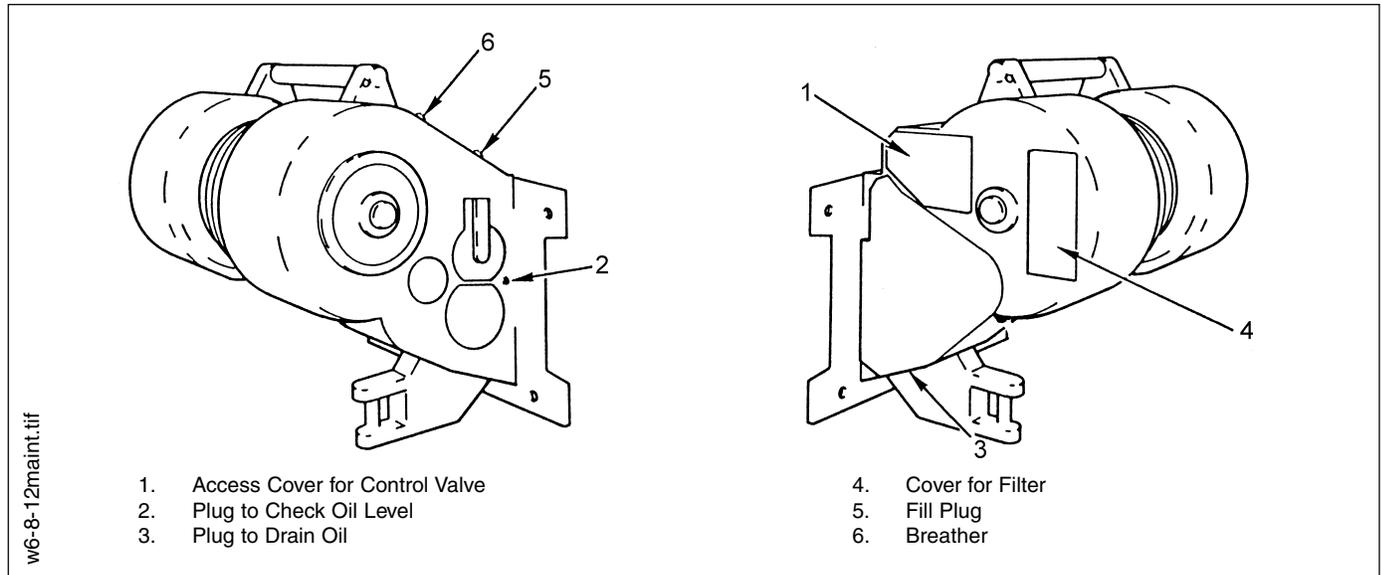
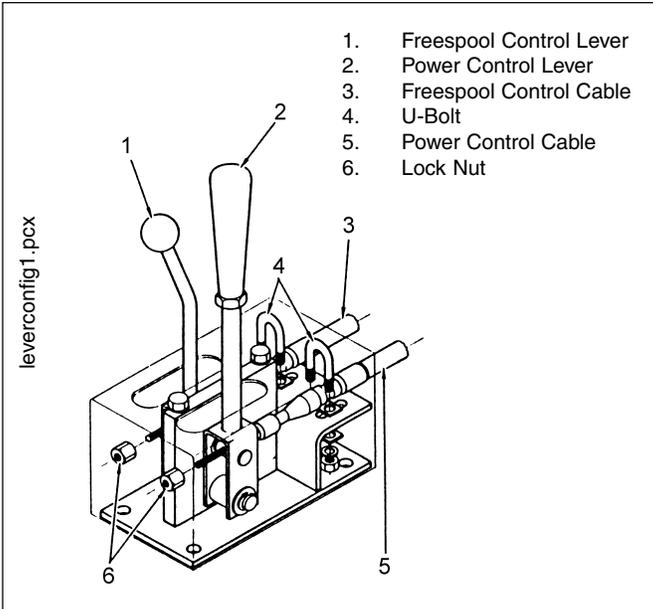


Figure 3-1 W6F, W8L & W12E Maintenance Points

Table 3-1 Maintenance Schedule

INTERVAL	PROCEDURE OR QUANTITY	SPECIFICATION
50 hours or weekly *	Check oil level at plug (item 2). Add oil as necessary. <b>Do not operate the tractor when checking the oil level.</b>	See Table 1-4 – Approved Oil List.
	Lubricate the winch control lever and the <b>FREESPOOL</b> control lever.	Use SAE 30 oil on the linkage as needed. Check that the control cable and control housing are fastened correctly. Tighten U-bolts if required.
	Clean the breather in the fill plug.	Remove debris around breather. Clean the breather with solvent if necessary.
	Lubricate the rollers on the cable guide rolls, integral arch or fairlead assembly if the winch is equipped with this option.	Use multi-purpose grease with 2-4% molybdenum disulfide.
500 hours or every 3 months	Clean the oil suction screen and magnets.*	Tilt the tractor approximately 15° to prevent loss of oil when the cover is removed. Use a new gasket between the cover and the suction tube.
	Clean the breather in the fill plug.	Clean the breather with solvent.
	Replace the filter.*	See the <b>Parts Manual</b> for filter element and cover gasket. When replacing, be sure to lubricate filter seal ring between element and filter head.
1000 hours or every 6 months	Change the hydraulic oil. Drain oil from plug (item 3). Clean the oil strainer. Through fill plug (item 5), add: <ul style="list-style-type: none"> <li>• 14.5 gallons (55 liters)<sup>†</sup> for W6F</li> <li>• 20 gallons (76 liters)<sup>†</sup> for W8L</li> <li>• 22 gallons (83 liters)<sup>†</sup> for W12E</li> </ul> Check the oil level at item 2.	See Table 1-4 – Approved Oil List.
* NOTE: Clean the oil strainer screen and change the oil filter after the first 50 hours on new and rebuilt winches.		
† Amount of oil may vary slightly with tractor.		



**Figure 3-2 Control Cable Adjustments**

## Checks Before Operation

Check that the cable and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Table 3-1, Maintenance Schedule.

## Checks During Operation

The Troubleshooting Chart in Section 2 can be used by the operator to identify a problem with the winch operation. A trained service person is needed for additional troubleshooting and repair that requires disassembly of parts of the winch.

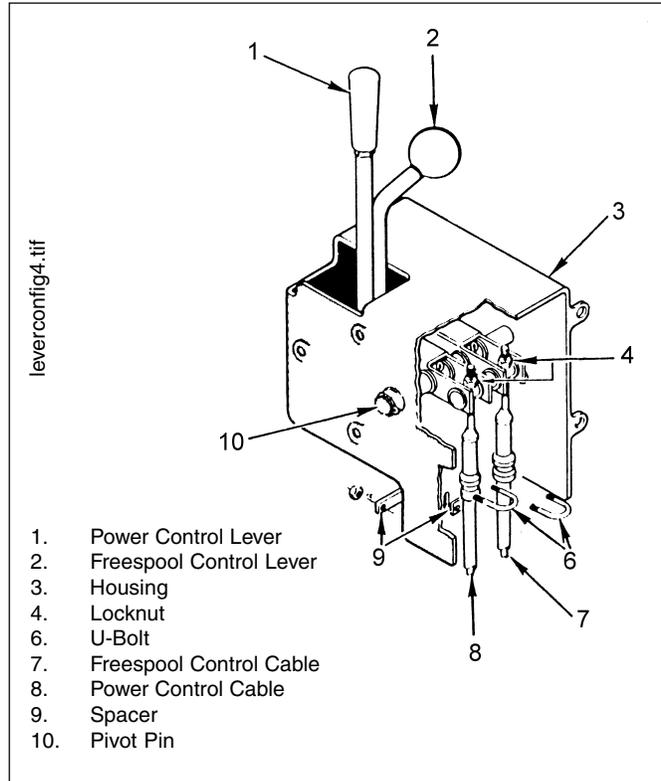
## Checks and adjustments

The checks and adjustments for the winch are as follows:

- Control Cable Adjustments
- Freespool adjustment
- Hydraulic system checks

### Control Cable Adjustments

A single control cable connects the power lever to the hydraulic control valve spool. Check the operation of the power control lever to make sure it moves smoothly and will return to the BRAKE ON position. The power control lever will stay in BRAKE OFF when pushed into DETENTED position. Cable adjustment is not necessary except to ensure full spool travel. To adjust hand levers depicted in Figures 3-2 through 3-4, proceed as follows:

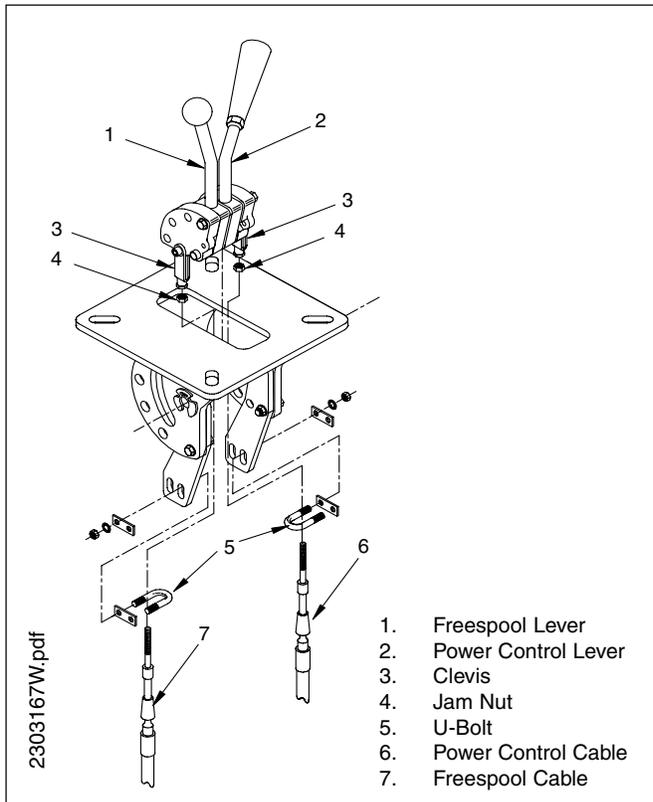


**Figure 3-3 Control Cable Adjustments (this configuration last used in 1993)**

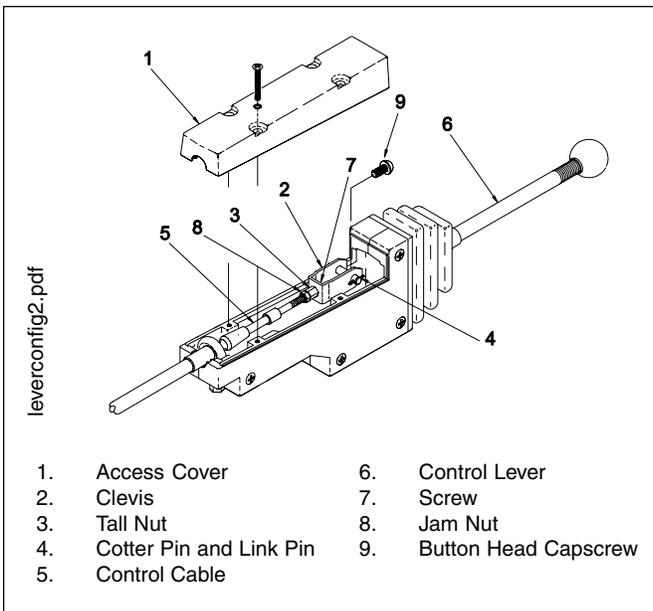
1. Ensure that the cable bracket at winch end of control cable is securely attached to the winch housing.
2. Check the position of the handlever with control valve in BRAKE ON. The lever should be approximately vertical. If not, loosen nuts on U-Bolt that clamps the control cable to the handlever housing. Move U-Bolt up or down the elongated slots to improve position of handlever. Tighten nuts securely.
3. Move handlever to LINE IN and BRAKE OFF positions and ensure that the lever holds in the BRAKE OFF position. Check to ensure that the handlever does not hit the housing in either position. If interference is found, repeat step 2.

To adjust the handlever depicted in Figure 3-5, proceed as follows (refer to Fig. 3-5):

1. Adjust handlever position so full valve spool stroke is attained by screwing cable in or out of tall nut.
2. Install cable adapter in groove on handlever cover and attach cover.
3. Check for complete lever travel. Repeat steps 1 and 2 if adjustment is still incorrect.



**Figure 3-4 Control Cable Adjustments (this configuration used on W8L only)**



**Figure 3-5 Control Cable Adjustments**

**FREESPOOL Cable Adjustment**

The only adjustment necessary is to position the handlever so that it allows the linkage to shift the FREESPOOL mechanism to normal and FREESPOOL positions. Check the operation of the FREESPOOL lever for smooth operation. Each of the two positions has a detent.

Check that the positions of the FREESPOOL lever are the same as the position indicators on the control housing. Loosen the U-bolt that holds the control cable in the housing to adjust the control lever. Make sure the control lever does not hit the housing at the end of its travel. The linkage and cable must be adjusted so that the FREESPOOL shifter mechanism will slide the drum pinion gear to both detent positions.

**FREESPOOL Drag Adjustment for AW6F-4061 and below, and AW8L-2032 and below, without Exterior Drag Adjust**

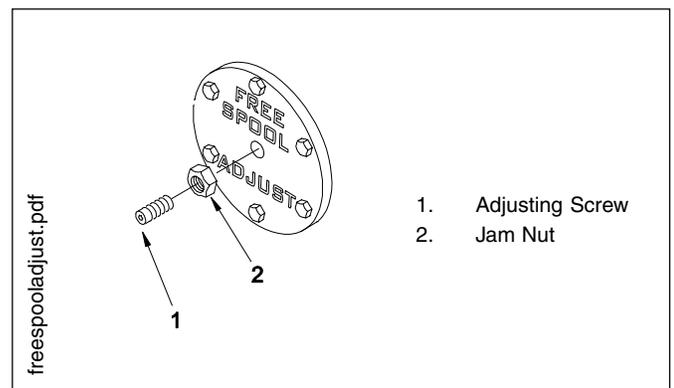
The preload on the bearings of the intermediate shaft controls the resistance to rotation of the drum during the FREESPOOL operation. The resistance to rotation is correct when the drum can be rotated by hand, but the drum will not rotate more than one-half revolution freely.

The addition or removal of shims for the preload on the bearings of the intermediate shaft requires the removal of the cover for the intermediate shaft. This adjustment is normally only necessary if the winch has had an overhaul. See Section 4 if this adjustment is required.

**FREESPOOL Drag Adjustment for AW6F-4062 and above, and AW8L-2033 and above, with Exterior Drag Adjust (See Figure 3-5)**

The preload on the bearings of the intermediate shaft controls the resistance to rotation of the drum during the FREESPOOL operation. The resistance to rotation is correct when the drum can be rotated by hand, but the drum will not rotate more than one-half revolution freely.

On W6F winches S/N 4062 and above, and W8L winches S/N 2033 and above, an adjusting screw is located in the center of the bearing retainer for the intermediate shaft; please refer to Figure 3-5. This screw can be tightened or loosened to adjust the preload on the intermediate shaft. The jam nut will maintain the FREESPOOL setting.



**Figure 3-6 FREESPOOL Adjustments**

## Hydraulic System Pressure Checks (Fig. 3-7)

The hydraulic oil and filter(s) should be maintained as indicated in the Maintenance Schedule. If any problems are found, they should be corrected before operating the winch.

### Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Remove cable from drum to prevent entanglement during pressure checks since the drum will rotate during the tests.



### WARNING

Vehicle engine must be shut OFF before disconnecting drum cable. Be careful when you remove the cable from the drum. The end of the cable can move like a compressed spring, causing an injury when the ferrule is released from the drum.



### WARNING

Always wear gloves when handling cable.

2. Start the engine and place the winch in BRAKE OFF to raise the oil temperature to at least 20°C (70°F).
3. Remove any dirt from the left side of the winch. Remove control valve access plate.
4. Stabilize engine speed at 1000 RPM for all tests.
5. Leave test plugs securely installed unless testing that port.
6. After completing all pressure checks and making the necessary adjustments ensure that all plugs and hoses are securely installed.
7. Install control valve access plate and tighten capscrews.

### Pressure gauges

Two 400 psi (28 kg/cm<sup>2</sup>) and one 30 psi (2 kg/cm<sup>2</sup>) calibrated pressure test gauges are required to perform the hydraulic pressure checks.

**NOTE: Shut off the tractor engine when connecting and disconnecting test gauges.**



### WARNING

Place handlever in BRAKE ON to prevent accidental discharge of pressurized oil stored in the accumulators.

### Brake Pressure Check

With the engine shut off, connect one high pressure gauge to Brake Port D with a ¼" JIC (37° flare) female adapter. Start the engine and refer to Table 3-2. Adequate brake pressure is required to fully release the brake. If the pressure is not as specified, check for:

1. Improper relief valve setting or malfunction
2. Suction or pressure filter malfunction
3. Leaking pressure hoses or fittings
4. A defective hydraulic pump. A defective pump is usually indicated by low pressure and pressure increases with increased engine RPMs.

### Cooling Oil Pressure Check

With the engine shut off, connect one low pressure gauge to Port C. Start the engine and see the Cooling section in Table 3-2. If the cooling oil pressure is too high, it can stroke the clutch piston and drag the clutch pack. The result is overheating. Low cooling oil pressure will not produce enough cooling oil flow and cause overheating. Check for a defective cooling oil relief valve.

Adjust relief valve as follows:

1. Start engine and place handlever in BRAKE OFF.
2. Loosen relief valve locknut. Turn relief valve adjusting capscrew IN to increase pressure and OUT to decrease pressure. Adjust pressures as shown in Table 3-2.
3. Tighten locknut after adjustment is completed.
4. Recheck pressure reading and repeat steps 2 and 3 if necessary.

### Accumulator Pressure Check

With the engine shut off, connect one low pressure gauge to Port D. This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe

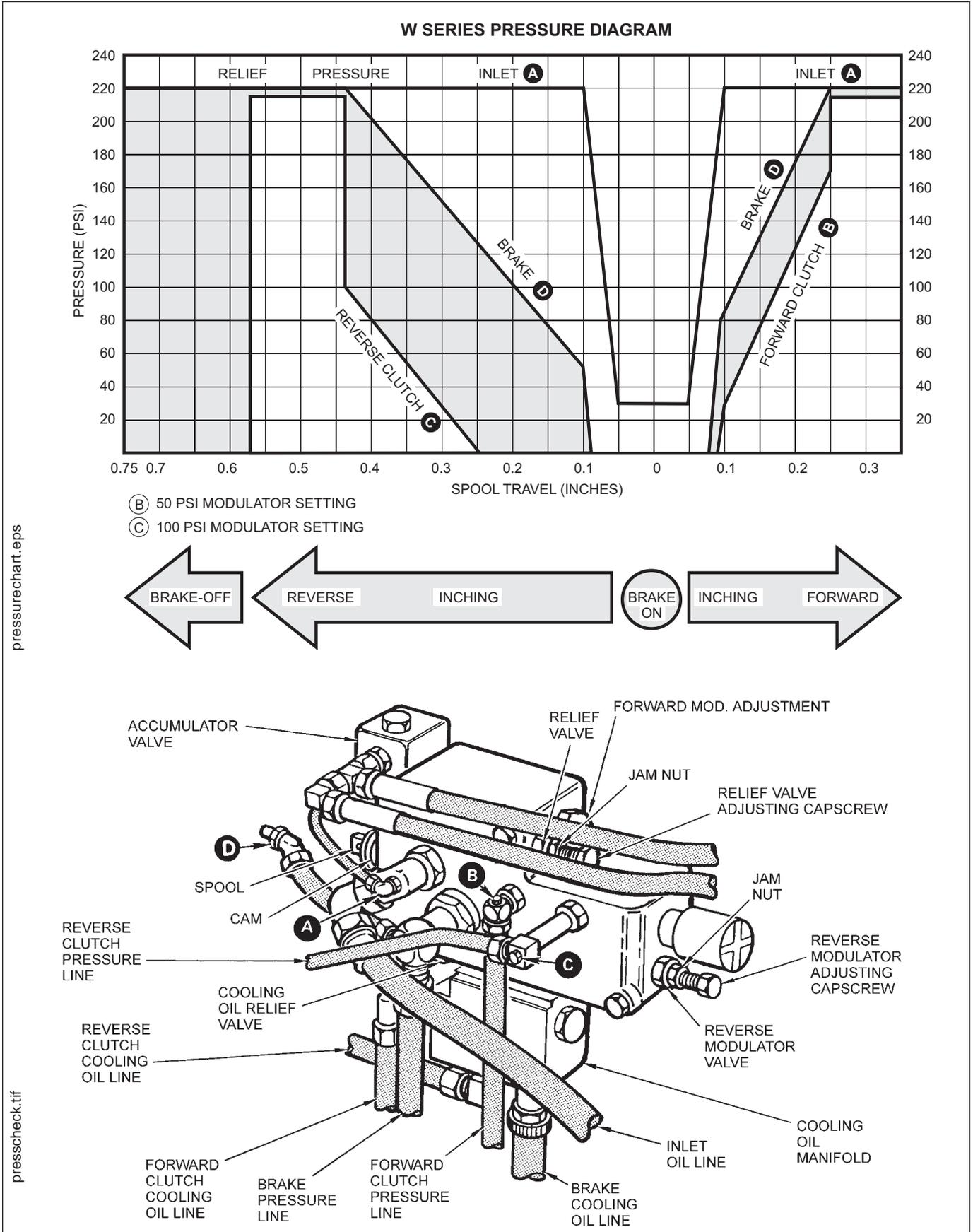


Figure 3-7 Hydraulic System Pressure Checks

the following while referring to the accumulator section in Table 3-2.

1. With engine running, place handlever in BRAKE OFF and rev engine to maintain 220 psi (1520 kPa) for one minute. This will ensure that the accumulators will have a full supply of oil.
2. Return handlever to BRAKE ON.
3. Shut the engine off and wait one minute.
4. Place the handlever in the BRAKE OFF position. This will release the oil in the accumulators. Observe the initial pressure reading and the time for the pressure to drop below that specified in Table 3-2.

If the leak down time is less than specified in Table 3-2, repeat steps 1 through 4, but do not delay in placing the handlever in BRAKE OFF after the engine is shut down. If the leak down time is greater than that measured when waiting one minute, then there is either a leak in the lines between the accumulators and the accumulator valve or a leaking accumulator check valve. Low accumulator gas pressures will tend to stall the winch on a low engine rpm shift. To determine if accumulators have any gas pressure, remove valve stem protective cover and push gently on valve stem. A ruptured bladder will emit oil. Accumulators are not rebuildable.

## Forward Clutch Pressure Check and Forward Modulator Valve Check

With the engine shut off, connect one low pressure gauge to Port B. Start the engine and place handlever in BRAKE OFF to build up the accumulator system pressure. Place handlever in LINE IN position and check FORWARD (LINE IN) clutch and LINE IN INCHING pressures as indicated in Table 3-2. On a fast shift the clutch pressure should come up with the brake pressure. In LINE IN INCHING the clutch pressure should lag the brake release pressure as shown in Table 3-2. If the pressure differential is too low the brake will not release soon enough and cause it to stall. If the pressure differential is too high the brake will release too soon and cause backspinning of the drum.

If the forward clutch pressure is not as specified in Table 3-2, check for:

1. Leaking pressure hoses or fittings
2. Damaged or worn clutch piston seals
3. Improper control valve spool movement
4. Broken seal rings on clutch shaft

5. Damaged O-rings on clutch shaft. Troubleshooting information is given in Section 2.

If the LINE IN INCHING pressure differential is not as specified in Table 3-2, remove the forward modulator valve and check for defective or dirty parts. To adjust the modulator valve, proceed as follows:

1. Loosen the forward modulator adjustment locknut. With engine running move the handlever toward LINE IN until the brake pressure reads 140 PSI (9.5 kg/cm<sup>2</sup>). Use 180 PSI (12.7 kg/cm<sup>2</sup>) for Komatsu D65.
2. Turn the adjusting capscrew IN to decrease Forward Clutch Pressure, or OUT to increase pressure until the Forward Clutch Pressure is less than the brake pressure by the amount specified in Table 3-2.
3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

## Reverse Clutch Pressure Check and Reverse Modulator Valve Adjustment

Shut off the engine and connect the high pressure gauge to Reverse Clutch Port C. Start the engine. Place the handlever in LINE OUT and check reverse clutch and LINE OUT INCHING pressures as indicated in Table 3-2. On a fast LINE OUT shift the clutch pressure should come up with the brake pressure. In LINE OUT INCHING the clutch pressure should lag the brake release pressure as shown in Table 3-2. If the pressure differential is too low the brake will not release soon enough and cause drag. If the pressure differential is too high the brake will release too soon and cause backspinning of the drum.

If the reverse clutch pressure is not as specified in Table 3-2, check for:

1. Leaking pressure hoses or fittings
2. Damaged or worn clutch piston seals
3. Improper control valve spool movement
4. Broken seal rings on clutch shaft
5. Damaged O-rings on clutch shaft. Troubleshooting information is given in Section 2.

If the LINE OUT INCHING pressure differential is not as specified in Table 3-2, proceed as follows:

1. Loosen the reverse modulator adjustment locknut and start engine. Move the handlever towards LINE-OUT until the brake pressure reads 140 PSI (9.8 kg/cm<sup>2</sup>).

**Table 3-2 Hydraulic System Pressure Tests**

ITEM FUNCTION	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	D – Brake	1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	Brake Off	220 psi (15.5 kg/cm <sup>2</sup> ) Pressure not to exceed 250 psi (17.6 kg/cm <sup>2</sup> ) at high idle	Adjust relief valve
Cooling	C – Cooling	1 – 30 psi gauge	Brake On	8-11 psi (0.57-0.825 kg/cm <sup>2</sup> ) at full throttle	Check or replace cooling oil relief valve
Accumulator	D – Brake	1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	1. Brake Off 2. Brake On 3. Stop engine 4. Brake Off  5. Repeat if required	220 psi (15.5 kg/cm <sup>2</sup> ) None None—wait 1 minute 145 psi (10.6 kg/cm <sup>2</sup> ) immediately & 100 psi (7 kg/cm <sup>2</sup> ) minimum after 30 seconds	1. Check hydraulic lines for leaks 2. Replace accumulator valve 3. Check for defective accumulators
Line In (Forward)	B – Forward	1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	Line In	220 psi (15.5 kg/cm <sup>2</sup> )	Refer to Section 2, Table 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures
Line In (Inching)	B – Forward D – Brake	2 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	Vary between Brake On and Line In	Port B 50 psi (3.5 kg/cm <sup>2</sup> ) less than Port D* (Deere 750/755 & Komatsu use 90 psi [6.3 kg/cm <sup>2</sup> ])	Check or replace forward modulator valve
Line Out (Reverse)	C – Reverse	1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	Line Out	220 psi (15.5 kg/cm <sup>2</sup> )	Refer to Section 2, Table 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures
Line Out (Inching)	C – Reverse D – Brake	2 – 400 psi (25 kg/cm <sup>2</sup> ) gauge	Vary between Brake On and Line Out	Port C 120 psi (8.4 kg/cm <sup>2</sup> ) less than Port D	Adjust reverse modulator

\* The pressures specified are based on winches equipped with paper-type friction materials in the brake and clutches. All W8L and W12E winches are equipped with paper-type friction materials in the brake and clutches. The W6F models, however, used metal friction materials in early models, which require different modulator pressure adjustments as follows:

FRICTION MATERIAL TYPE		PRESSURE DIFFERENTIAL BETWEEN BRAKE & CLUTCH		SERIAL NUMBER SEQUENCE BREAKS
Clutch	Brake	Line In Inching	Line Out Inching	W6F
Metal	Metal	20 psi (1.4 kg/cm <sup>2</sup> )	80 psi (5.6 kg/cm <sup>2</sup> )	Prior to 1689
Metal	Paper	20 psi (1.4 kg/cm <sup>2</sup> )	100 psi (7.0 kg/cm <sup>2</sup> )	1689-1999
Paper	Paper	50 psi (3.5 kg/cm <sup>2</sup> )	120 psi (8.4 kg/cm <sup>2</sup> )	2000-up

Pressure readings may vary ± 5 psi (0.4 kg/cm<sup>2</sup>).

**NOTE: All John Deere Mountings use paper frictions in clutches and brake regardless of serial number.**

**NOTE: Engine @ 1000 rpm and oil temperature @ 70° F (20° C) minimum**

Use 180 PSI for Komatsu D65.

2. Turn the adjusting capscrew IN to decrease Reverse Clutch Pressure, or OUT to increase pressure until Reverse Clutch Pressure is less than the brake pressure by the amount shown in Table 3-2.
3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

## Control Valve Spool Travel Check (See Fig. 3-8)

It may be necessary to check spool travel when control valve pressures do not meet specifications. Figure 3-8 shows the correct travel for the various spool positions. The control valve spool is self-positioned to BRAKE ON. The three other travel positions are determined by spool assembly internal stops and a detent assembly in the spool end cap. If spool travel is found to be out of adjustment, the spool assembly or complete control valve assembly should be replaced. Ensure that the spool end cap is installed securely, then perform the check for smooth return of handlelever to neutral from any other position. Any binding or sticking should be investigated by removing the spool cap and examining parts for wear.

**NOTE: The spool is detented in BRAKE OFF. If spool does not lock up in this position, examine the detent parts inside the spool end cap and repair or replace as necessary.**

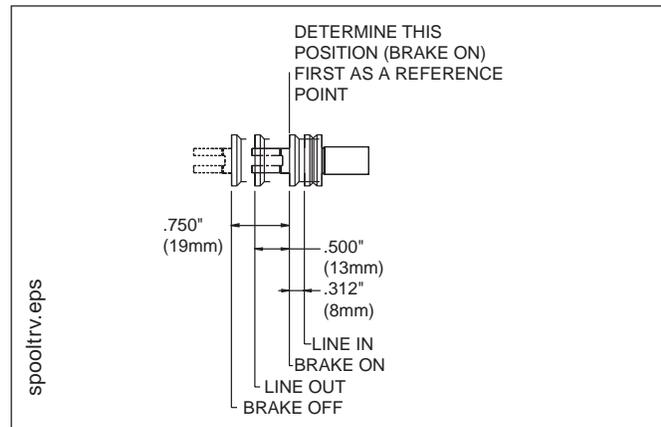


Figure 3-8 Control Valve Spool Travel

## Decal, Nameplate and Service Plate Installation

The unit nameplate, a Warning Decal and a Filter Service Plate are located on the winch as shown in Figure 3-9. If the nameplate has been damaged, obtain a new one and install the new nameplate in the location shown in Figure 3-8. If the Warning Decal or Filter Service Plate have been

damaged, install a new one in the location shown.

The W6F, W8L and W12E model decals are used on both sides of the winch frame as shown. Replace as necessary.

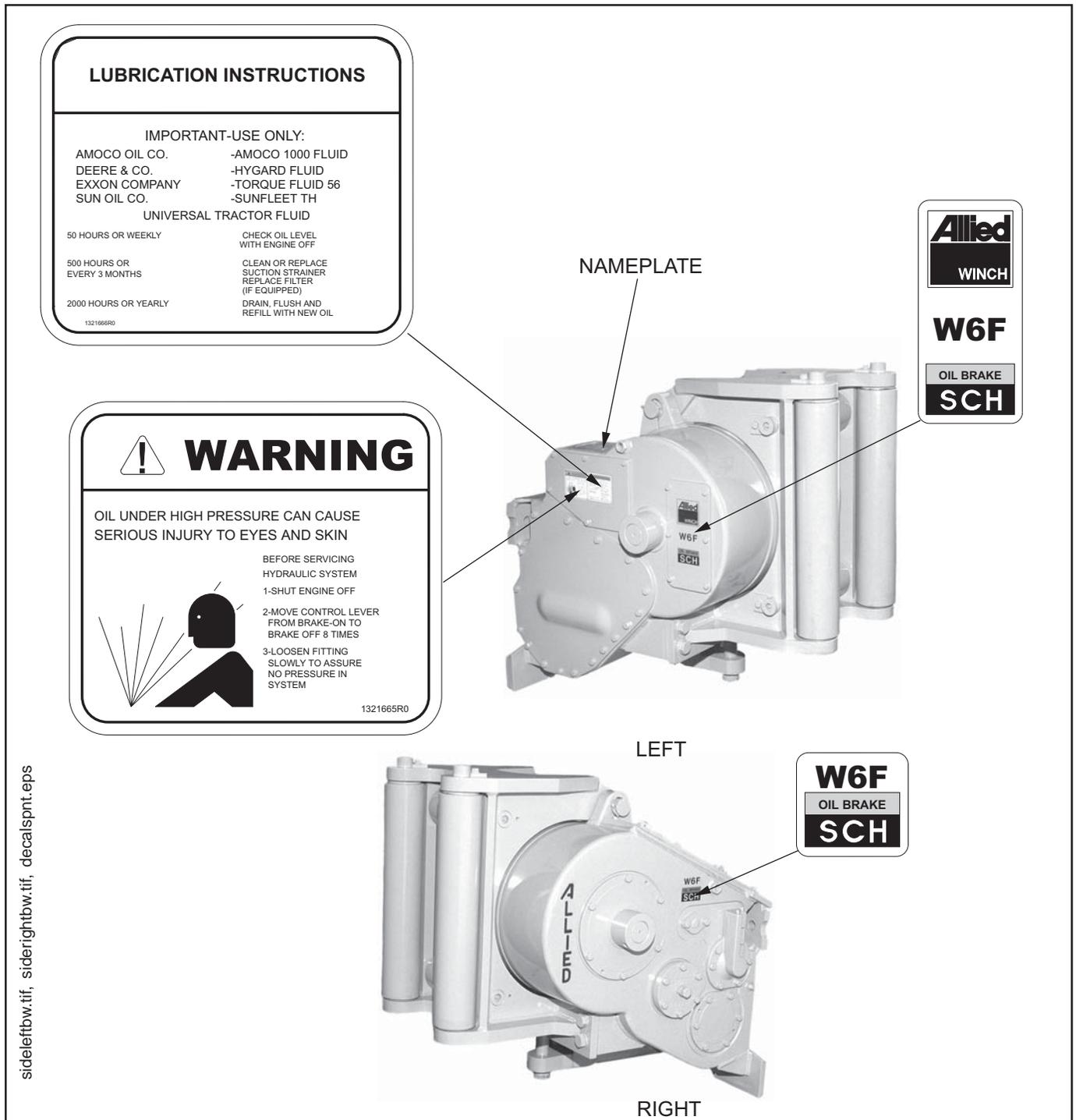


Figure 3-9 Decal Installation



## Repairs

### General

This section includes the removal and disassembly of all major shaft assemblies, inspection of components, and reassembly and installation. The wear points detailed in Table 4-1 should be inspected at the time of disassembly so that worn parts may be ordered and replaced prior to reassembly. If the winch is to be completely overhauled, perform the removal, disassembly, inspection and reassembly procedures in the sequence of the following paragraphs.

**NOTE: Always use the troubleshooting procedures given in Section 2 to locate a malfunction before performing a 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 3).

Use new seals, gaskets and O-rings when installing components.

### CAUTION

**Cleanliness is of extreme importance in the repair and overhaul of any hydraulic unit. Before attempting any repairs, the exterior of the winch must be thoroughly cleaned to prevent the possibility of contamination.**

### Winch removal

1. Remove the arch or fairlead from the winch. If these accessories are left on the winch, the winch will not remain level when lifted from the tractor.
2. Remove the cable from the drum. Clean the outside of the winch and the area where the winch contacts the tractor.

### WARNING

**Be careful when you remove the cable from the drum. The end of the cable can move like a compressed spring, causing an injury when the ferrule is released from the drum.**

3. Move the control lever to the LINE IN position at least three times to discharge the pressure in the accumulator.

4. Remove the control valve cover.
5. Disconnect control cable and freespool cable from winch.
6. Connect slings and a crane or lifting device to the winch. Install lifting eyes (refer to Figure 4-38) into the lifting holes provided in the frame.

### WARNING

**The slings and crane used to lift the winch must have a minimum lifting capacity of 1500 kg (3000 lb.).**

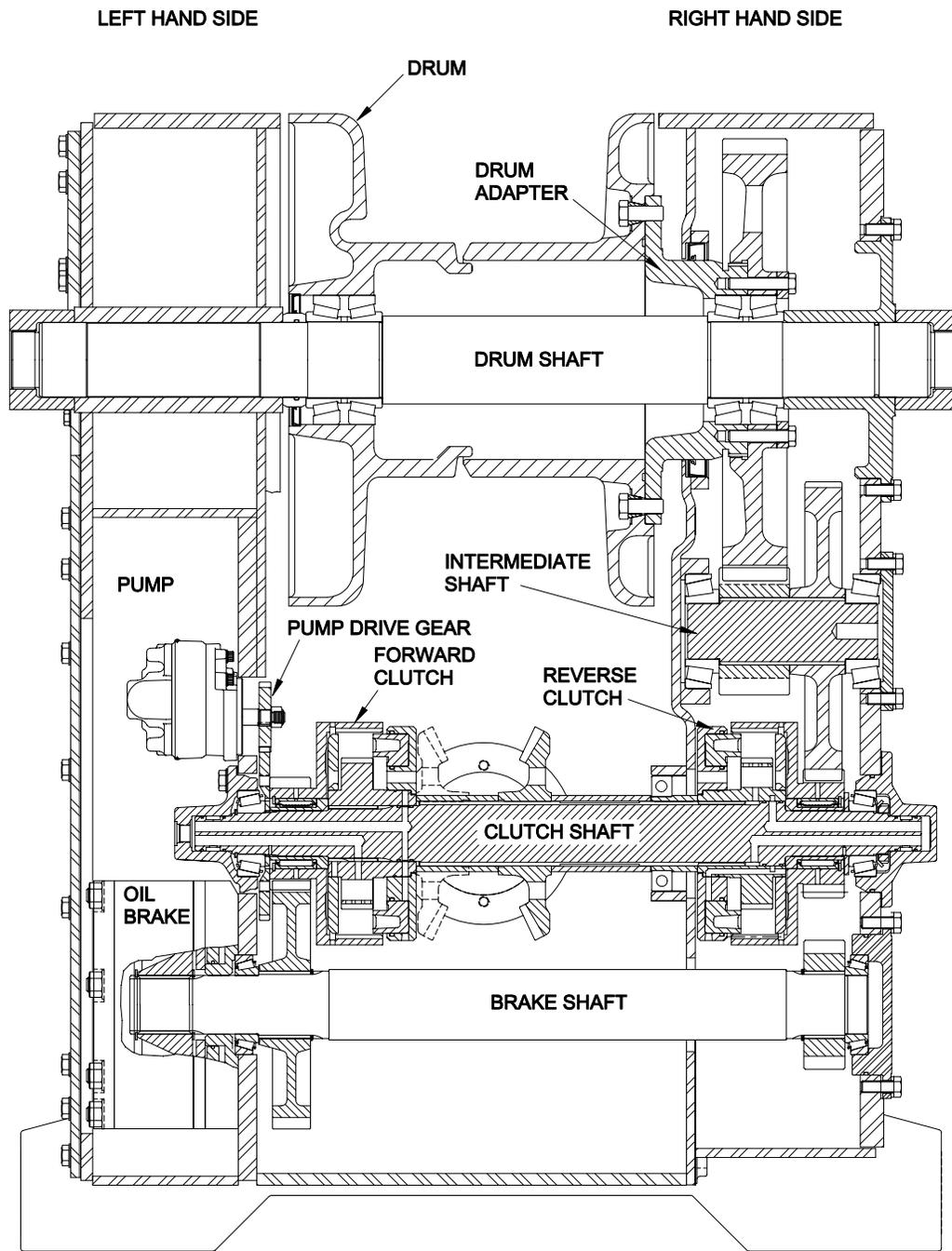
7. Drain the oil from the winch.
8. Remove transmission cover.
9. Remove mounting nuts or capscrews and lockwashers securing winch to tractor.

**NOTE: When removing the mounting nuts or capscrews, 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.**

### Disassembly of the winch

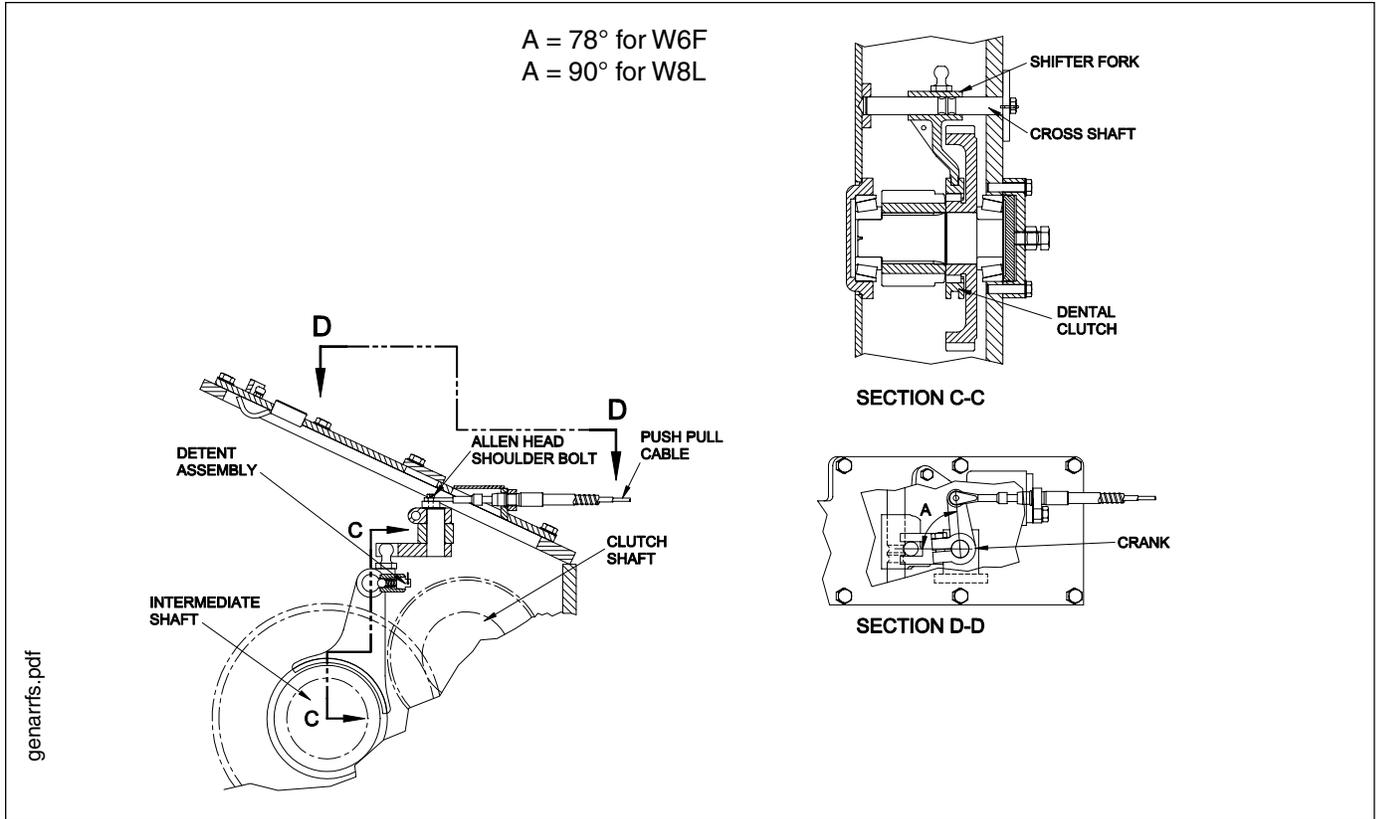
Most repairs require disassembly of the winch, although many major assemblies can be removed from the winch with the winch still on the tractor. The procedures in this section describe a complete unit overhaul with the winch removed from the tractor. However, winch removal is not necessary for removal of individual shaft assemblies. Disassemble the winch as necessary to make repairs.

Figures 4-1 and 4-2 show the gears and components contained within the winch housing.



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Figure 4-1 General Arrangement, Non-Freespool

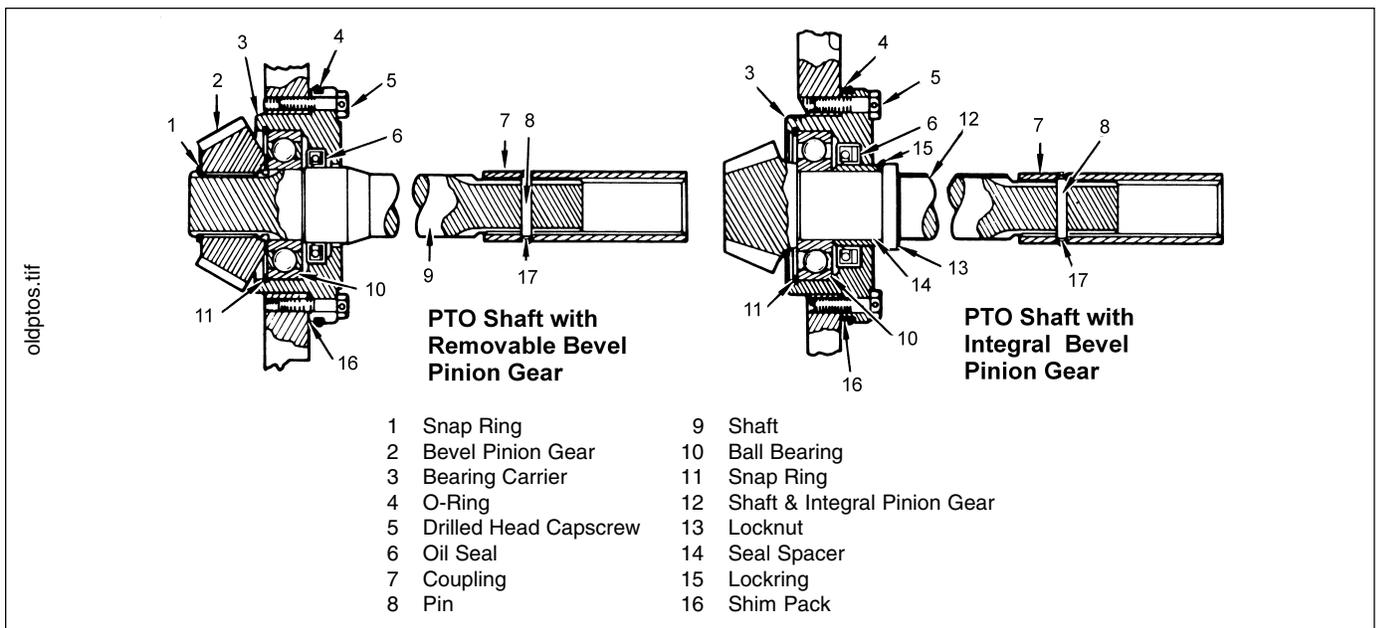


**Figure 4 -2 Freespool Arrangement**

**PTO Shaft Removal and Disassembly**

Please refer to Figures 4-3 to 4-16. Before removing the PTO shaft assembly, the winch must be removed from the tractor as explained above in **Winch Removal**.

1. Remove sealing capscrews. If winch is equipped with a drive adapter, refer to Step 4.



**Figure 4 -3 PTO Shafts - Last Used on W6FP-3699, W6FX-3699 & AW6F-1000; Last Used on W8LP-2099 & AW8L-1000; Current on W12E**

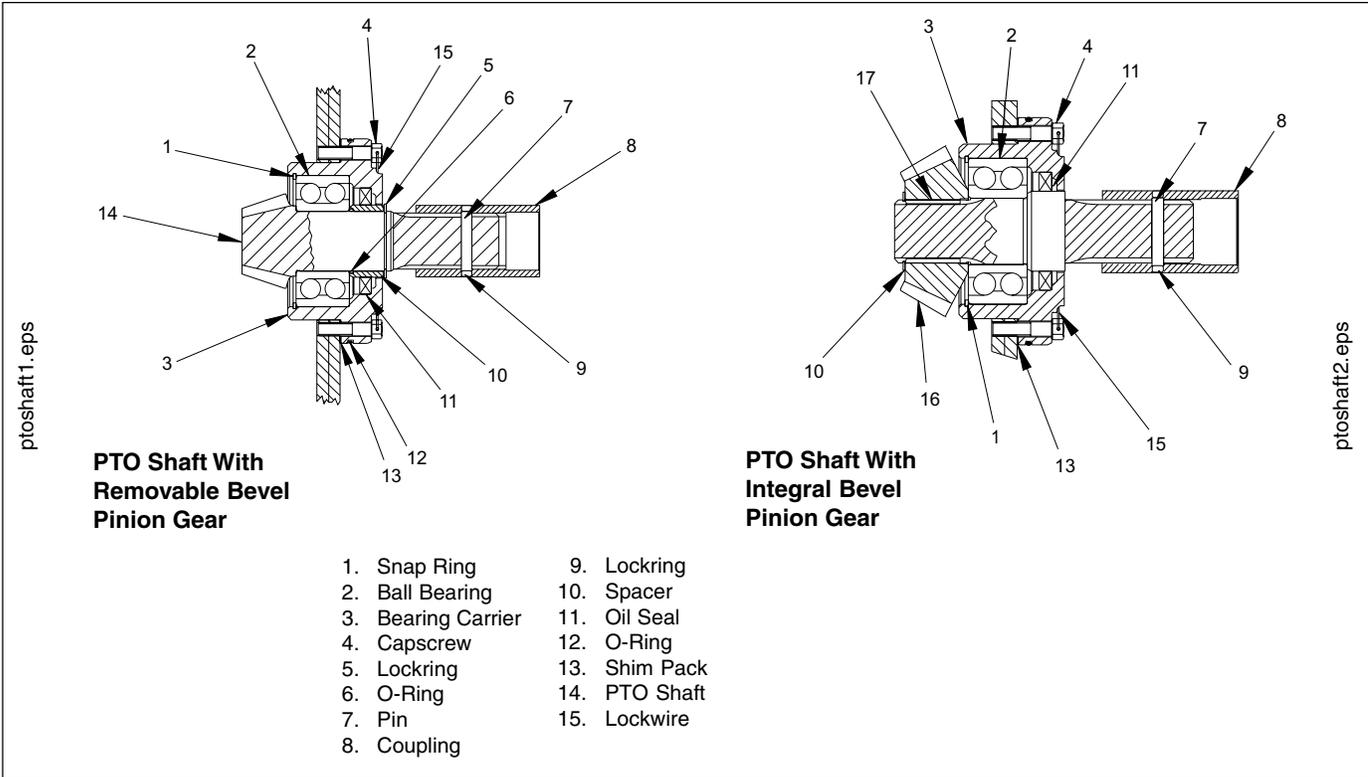


Figure 4-4 PTO Shafts, First Used on AW6F-1001 & AW8L-1001

2. Pull PTO shaft assembly straight out.

**CAUTION**

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

3. Disassemble and inspect PTO shaft (refer to Figures 4-3 through 4-9).
4. If equipped with a drive adapter, remove the drive adapter box first (refer to Figures 4-10 through 4-16), then the bevel pinion gear and carrier. Disassemble and inspect as required.

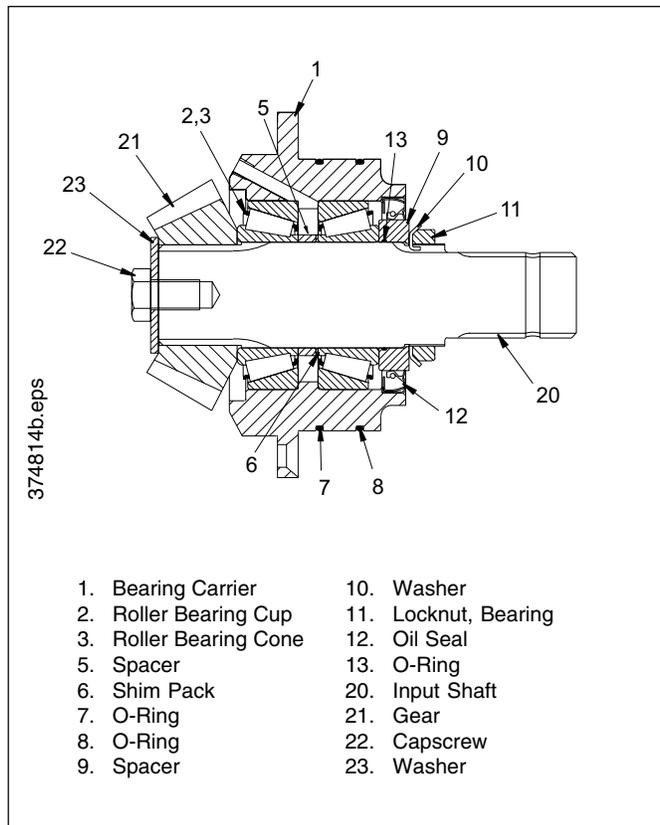
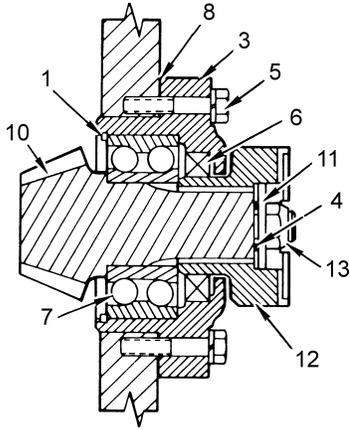
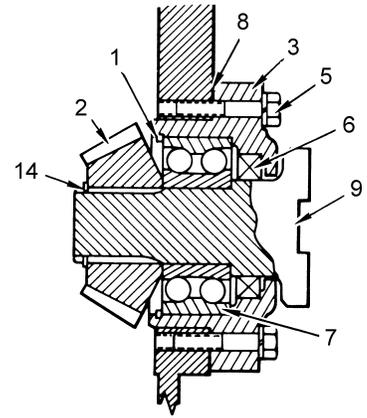


Figure 4-5 PTO Shaft on W12E for Caterpillar D8,L, D9N & D10N; Komatsu 375A-1; New Holland FH/FD30B

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- 1. Snap Ring
- 2. Bevel Pinion Gear
- 3. Bearing Carrier
- 4. O-Ring
- 5. Capscrew & Washer
- 6. Oil Seal
- 7. Ball Bearings
- 8. Shim Pack
- 9. Shaft
- 10. Shaft with Integral Pinion
- 11. Washer
- 12. Yoke
- 13. Nut
- 14. Snap Ring

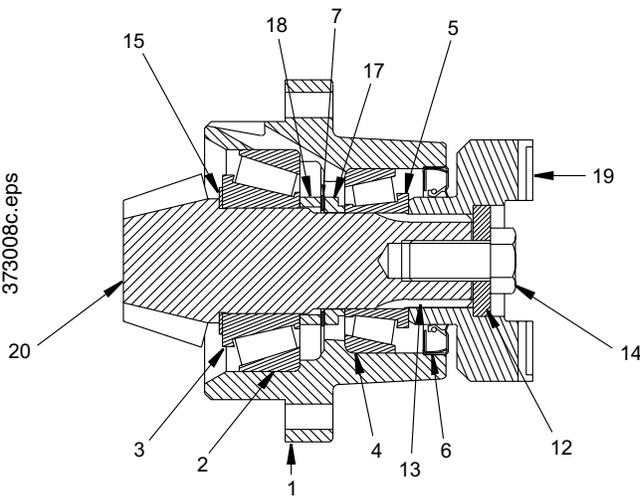


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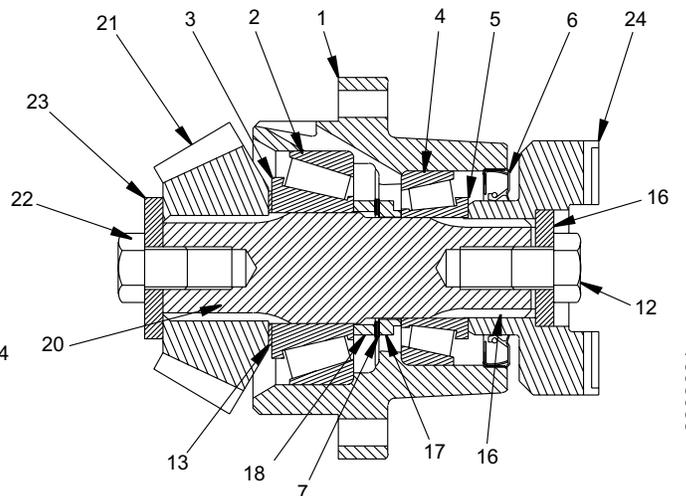
**John Deere 755**  
**John Deere 750 - Last Used on W6F-7143 & AW6F-1000**

**John Deere 855**  
**John Deere 850 - Last Used on W6F-7143 & AW6F-1000**

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- 1. Bearing Carrier
- 2. Bearing Cup
- 3. Bearing Cone
- 4. Bearing Cup
- 5. Bearing Cone
- 6. Seal
- 7. Shim Pack
- 12. Washer
- 14. Capscrew
- 15. Thrust Washer
- 17. Spacer
- 18. Spacer
- 19. Yoke
- 20. Shaft
- 21. PTO Shaft
- 22. Gear
- 23. Capscrew
- 24. Washer



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**John Deere 750/850 - First Used on W6F-7144 & AW6F-1001**  
**John Deere 750/850A**  
**John Deere 750/850B - First Used on W6F-7144 & AW6F-1001,**  
**Gear Ratios 3, 4, 6, 8 & 9 Only**  
**John Deere 750/850C, Gear Ratios 6, 8 & 9 Only**

**John Deere 750/850B & 750/850C, Gear Ratios 1 & 2 Only**

Figure 4-6 W6F John Deere PTO Shafts

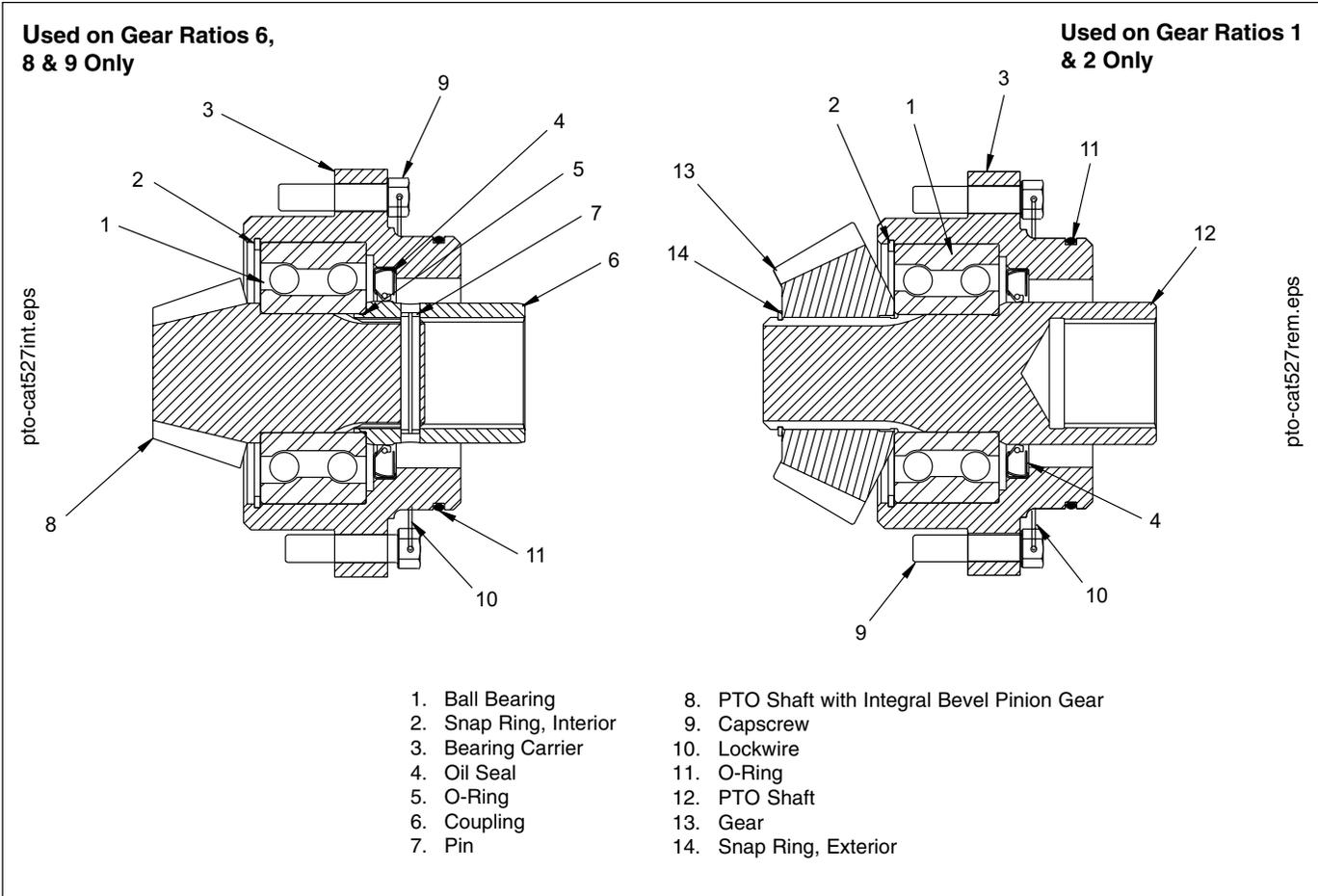
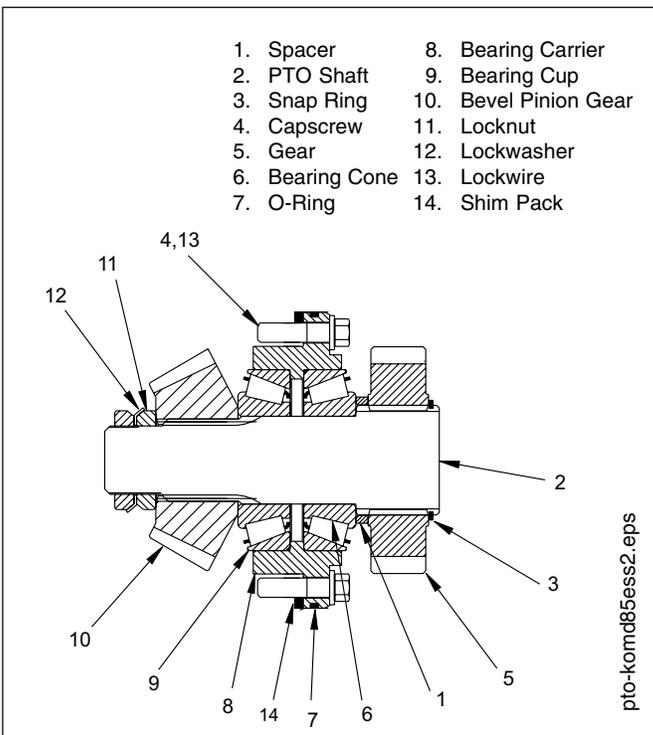
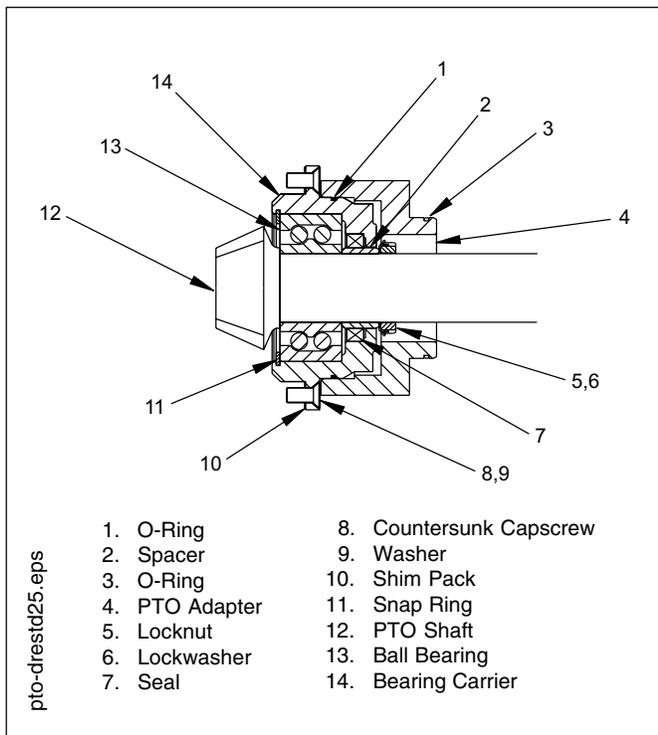


Figure 4-7 PTO Shaft on W6F for Caterpillar 527



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Spacer</li> <li>2. PTO Shaft</li> <li>3. Snap Ring</li> <li>4. Capscrew</li> <li>5. Gear</li> <li>6. Bearing Cone</li> <li>7. O-Ring</li> </ul> | <ul style="list-style-type: none"> <li>8. Bearing Carrier</li> <li>9. Bearing Cup</li> <li>10. Bevel Pinion Gear</li> <li>11. Locknut</li> <li>12. Lockwasher</li> <li>13. Lockwire</li> <li>14. Shim Pack</li> </ul> |
|---|---|



- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. O-Ring</li> <li>2. Spacer</li> <li>3. O-Ring</li> <li>4. PTO Adapter</li> <li>5. Locknut</li> <li>6. Lockwasher</li> <li>7. Seal</li> </ul> | <ul style="list-style-type: none"> <li>8. Countersunk Capscrew</li> <li>9. Washer</li> <li>10. Shim Pack</li> <li>11. Snap Ring</li> <li>12. PTO Shaft</li> <li>13. Ball Bearing</li> <li>14. Bearing Carrier</li> </ul> |
|---|--|

Figure 4-8 PTO Shaft on W8L for Komatsu D85ESS-2

Figure 4-9 PTO Shaft on W12E for Dresser TD25E/G

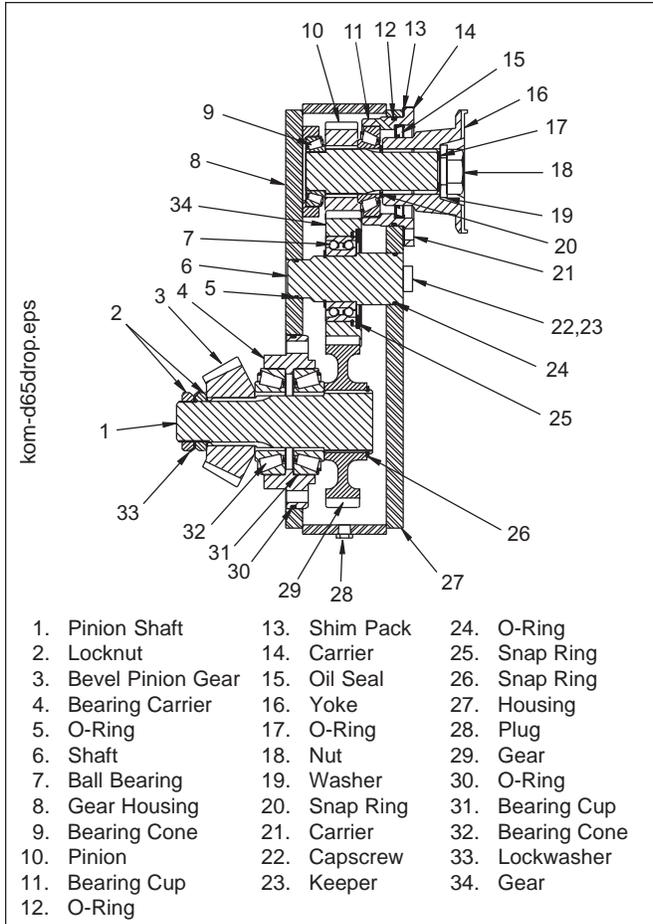


Figure 4-10 Dropbox on W6F for Komatsu D61EX-12 & D65EX-12

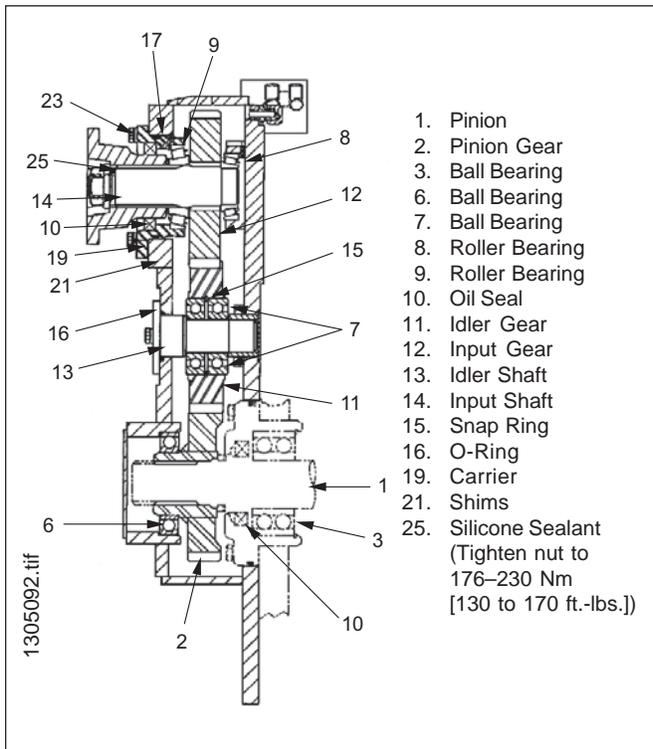


Figure 4-13 Dropbox on W8L for Komatsu D83-1 & D85ESS-2

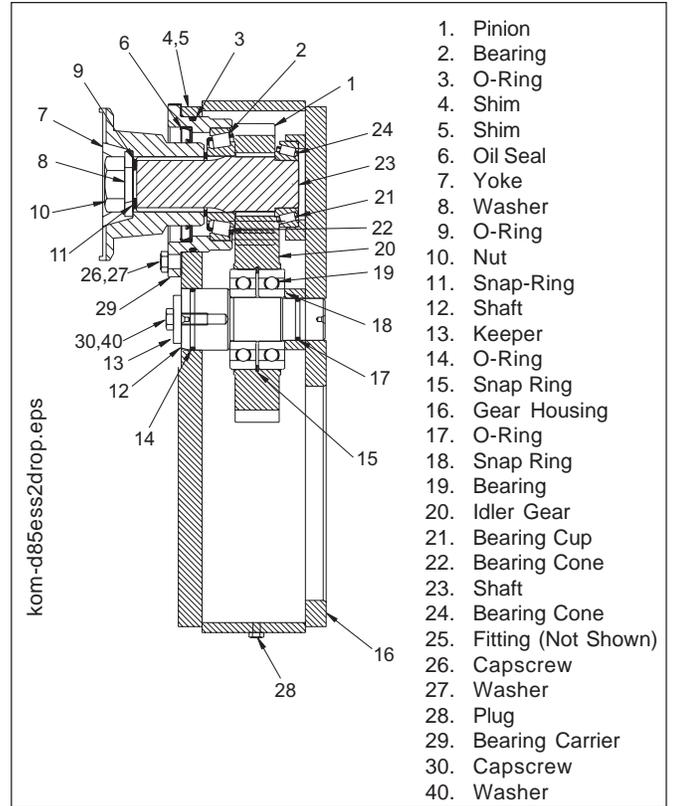


Figure 4-11 Dropbox on W8L for Komatsu D85ESS-2

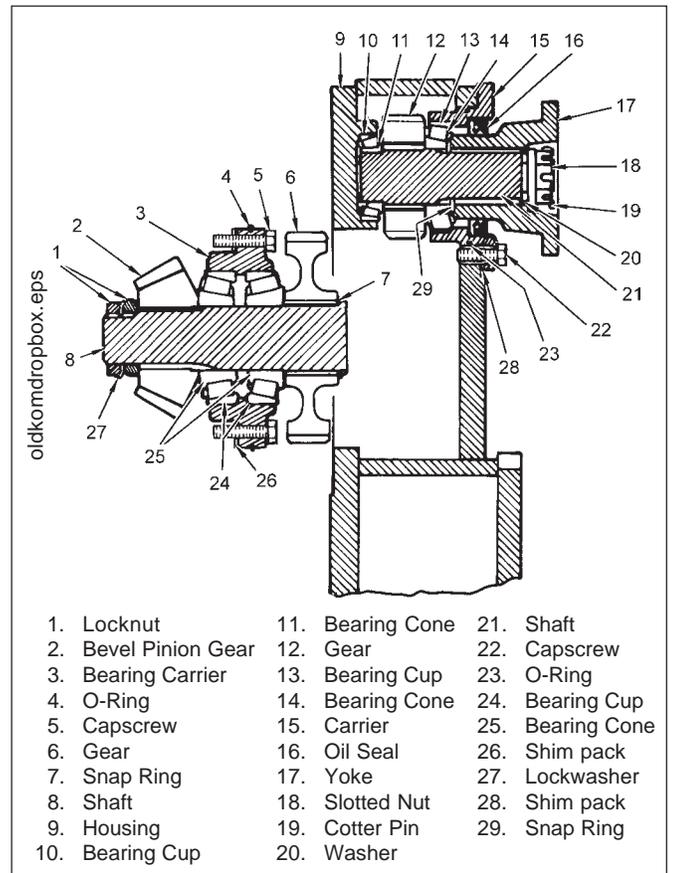


Figure 4-14 Dropbox on W6F for Komatsu D65E-6, D65E-7, D65E-8 & D68E-1

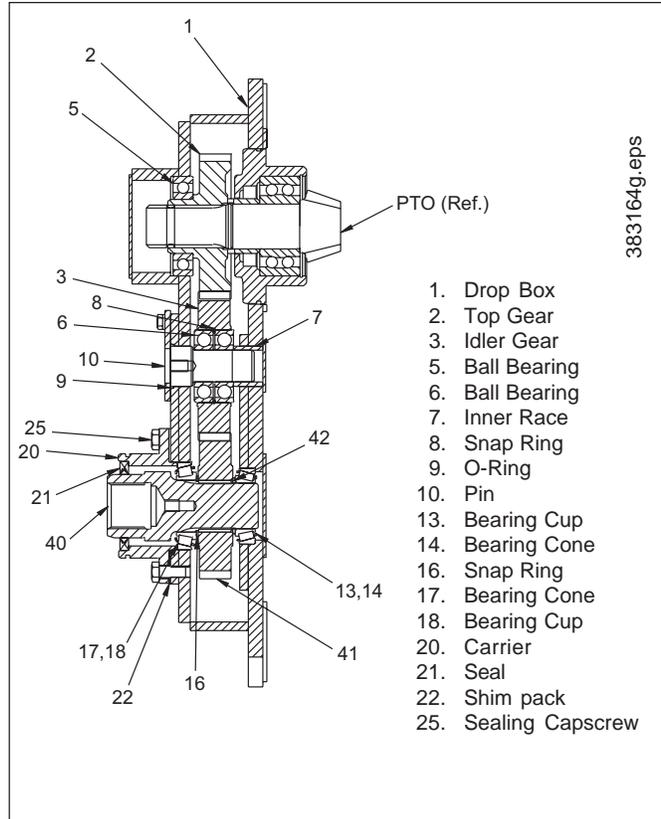
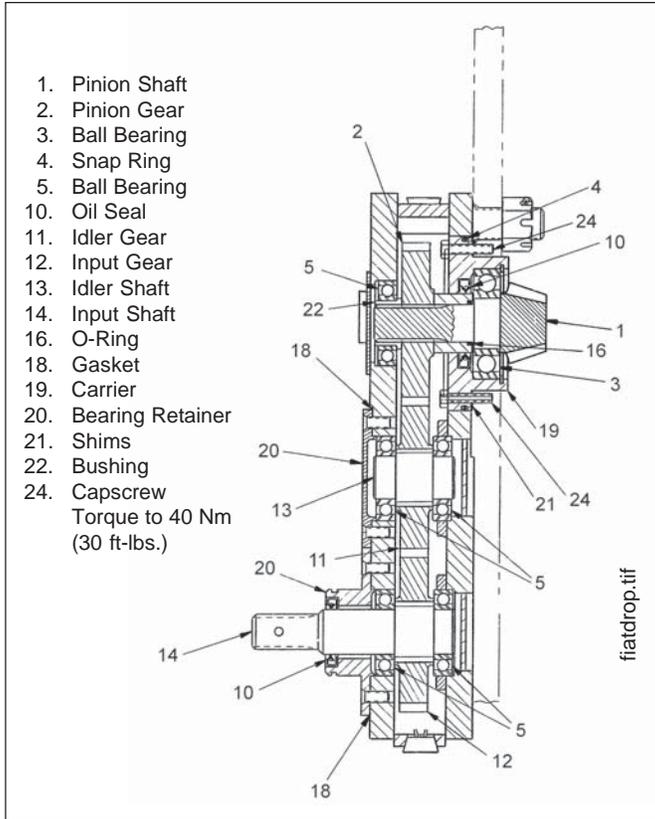


Figure 4-15 Dropbox on W6F for New Holland Construction 10C, 14B & 14C, FD14E

Figure 4-16 Dropbox on W6F & W8L for Caterpillar D6H/R, D7H PS, D8N, D7R & D8R

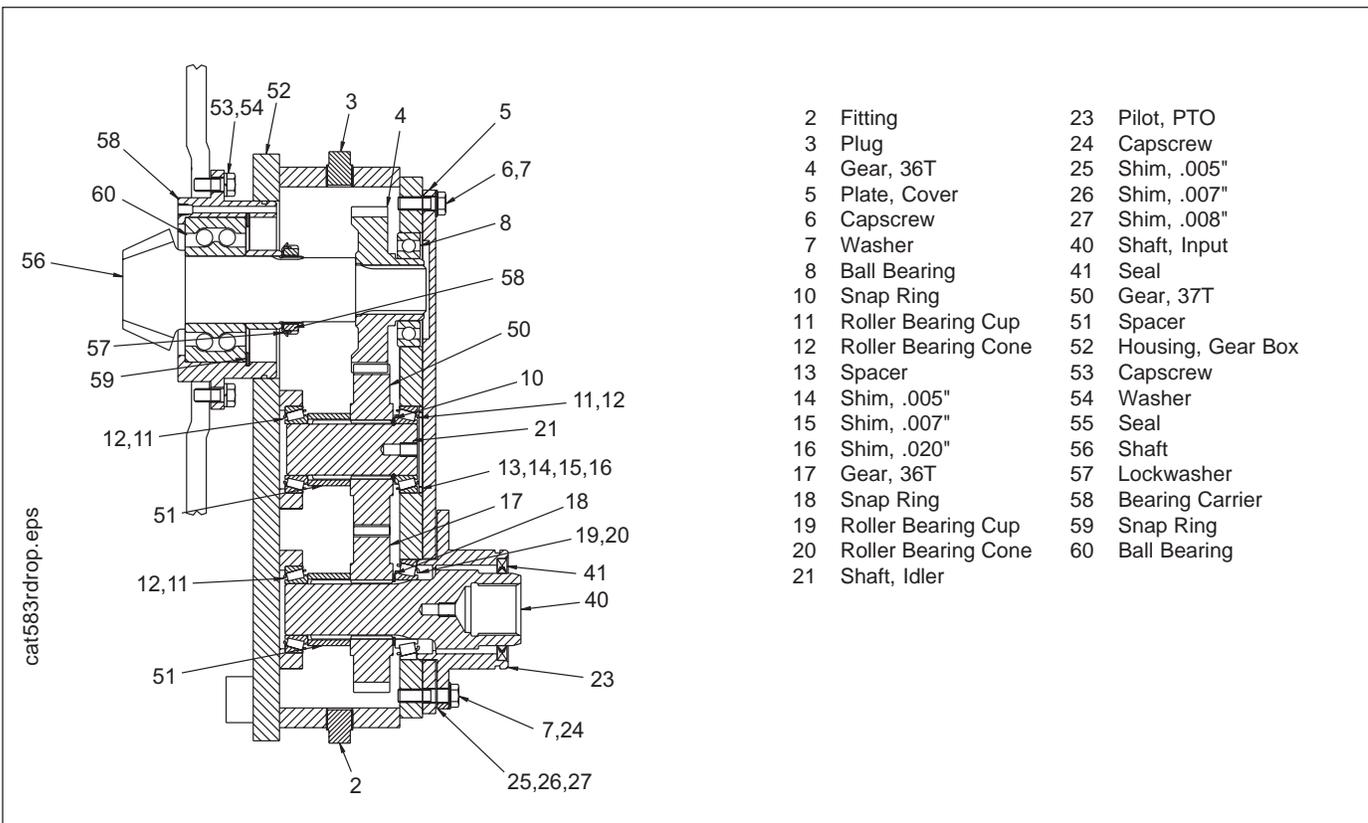


Figure 4-17 Dropbox on W12E for Caterpillar 583R - Last Used on S/N AW12E-1103

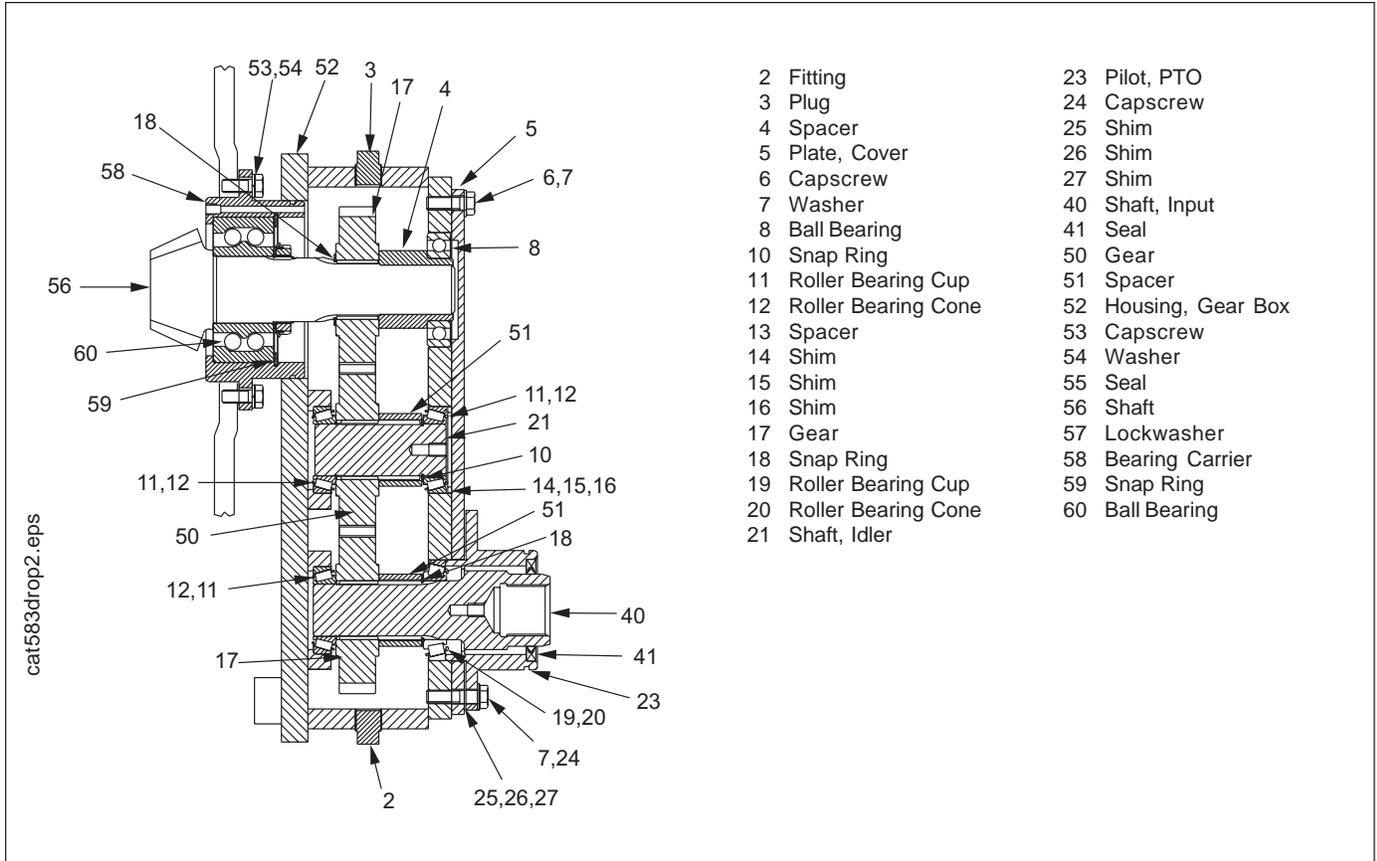


Figure 4-18 Dropbox on W12E for Caterpillar 583R - First Used on S/N AW12E-1104

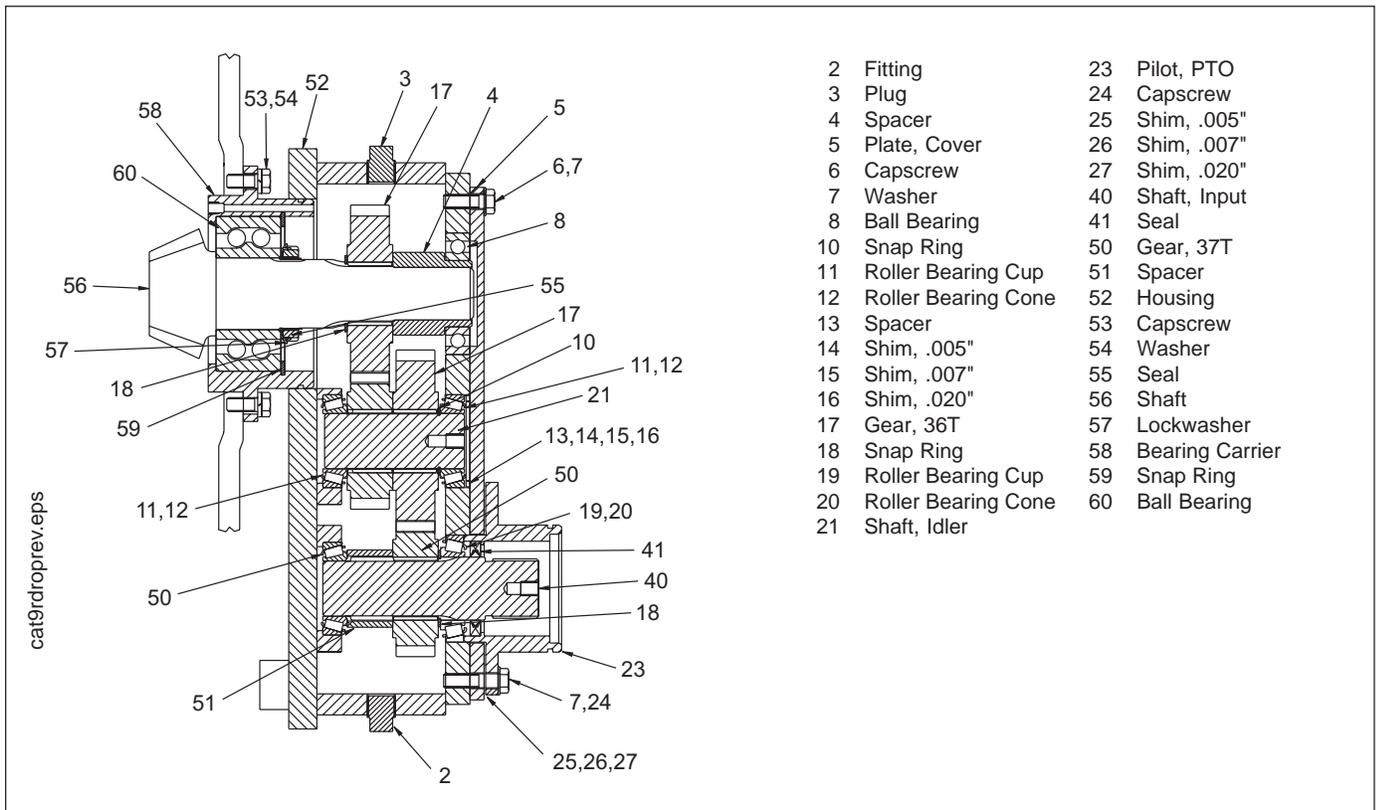


Figure 4-19 Dropbox on W12E for Caterpillar D9R

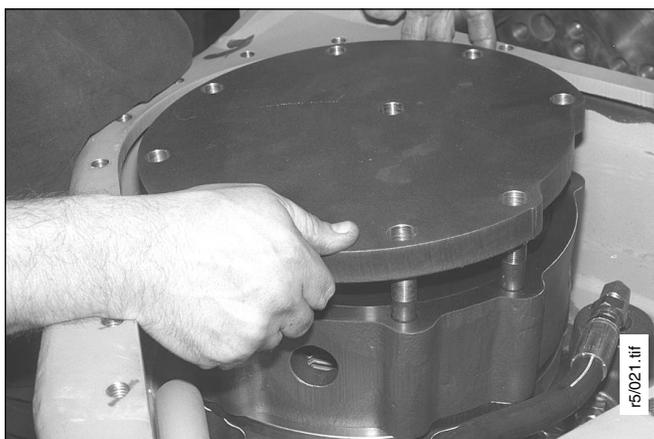
## Oil Brake Removal & Disassembly

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 them from dust, dirt and moisture. Inspect all parts for damage and wear as specified in Table 4-1.

1. Drain oil from winch or position winch with left-hand side up. Remove brake assembly cover. Remove cooling oil hose line.



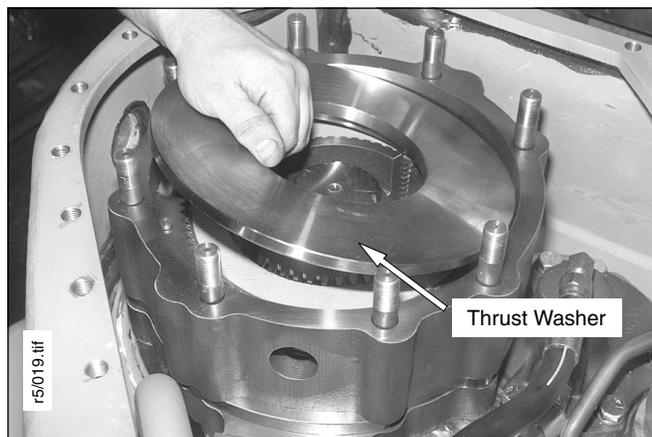
2. Loosen the locknuts evenly, then remove the brake assembly cover.



3. Remove belleville springs from cage assembly. The W6F and W8L use 1 spring, whereas the W12E uses 2.

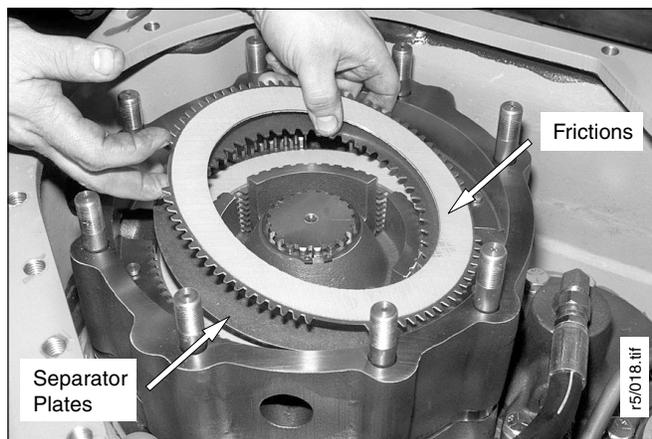


4. Remove the thrust washer.



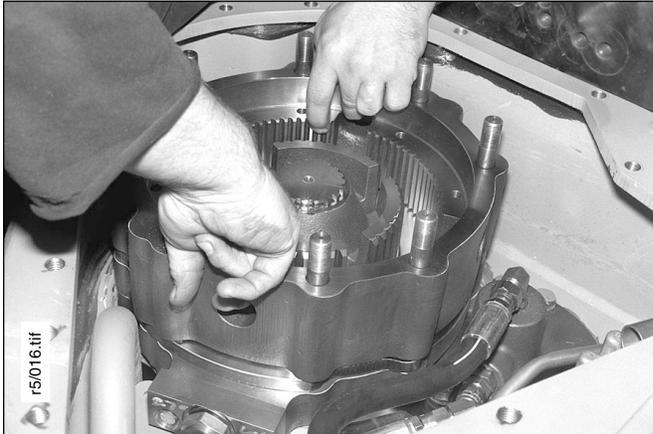
**NOTE: A spacer ring (not shown) is used on W6F with metallic frictions.**

5. Remove friction discs and separator plates from the hub.

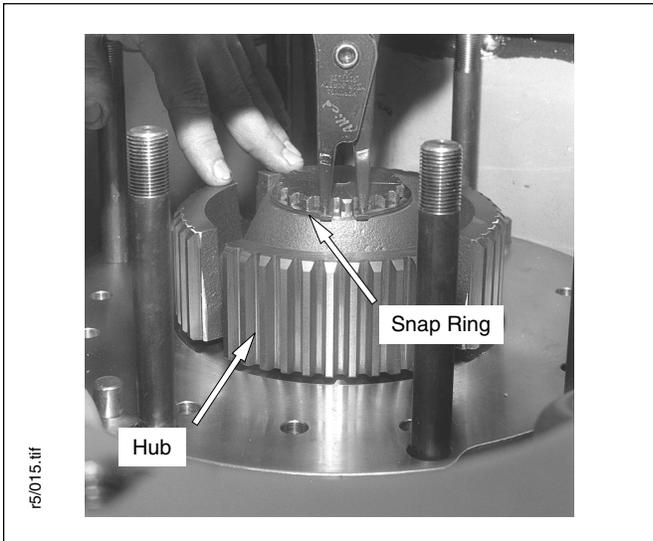


**NOTE: Paper frictions are shown. Earlier W6F models use metallic frictions.**

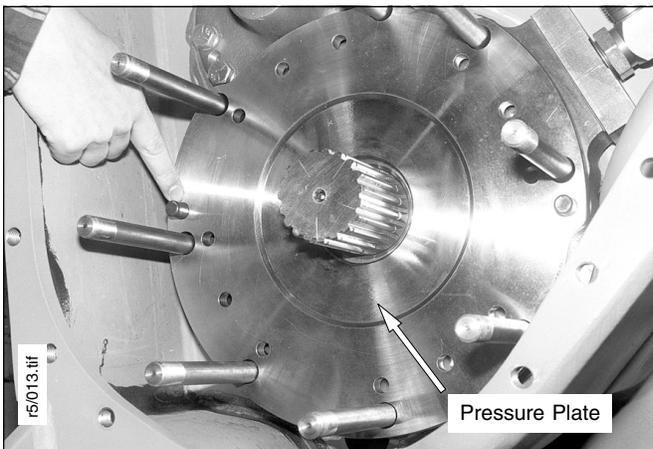
6. Remove cage from studs. It may be necessary to tap cage with a soft hammer to loosen it.



7. Remove snap ring from brake shaft and pull hub off brakeshaft.



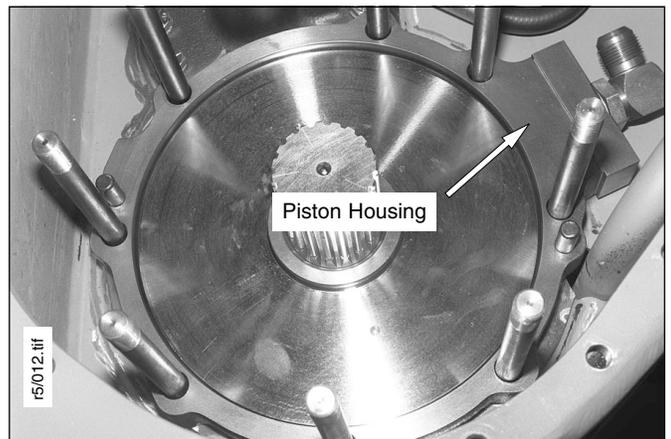
8. Remove pressure plate from studs.



9. Remove snap ring from brake shaft on W6F and W8L. A spacer is used on the W12E.



10. Slide the piston housing forward no more than one inch if only the clutch shaft bearing retainer is to be removed. To service the piston housing or brake shaft, remove the piston housing.

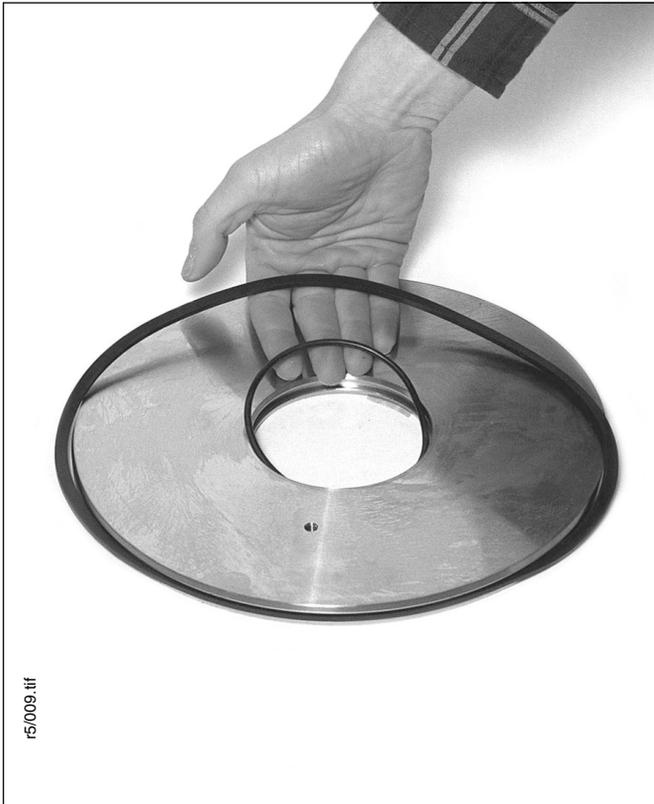


**⚠ CAUTION**

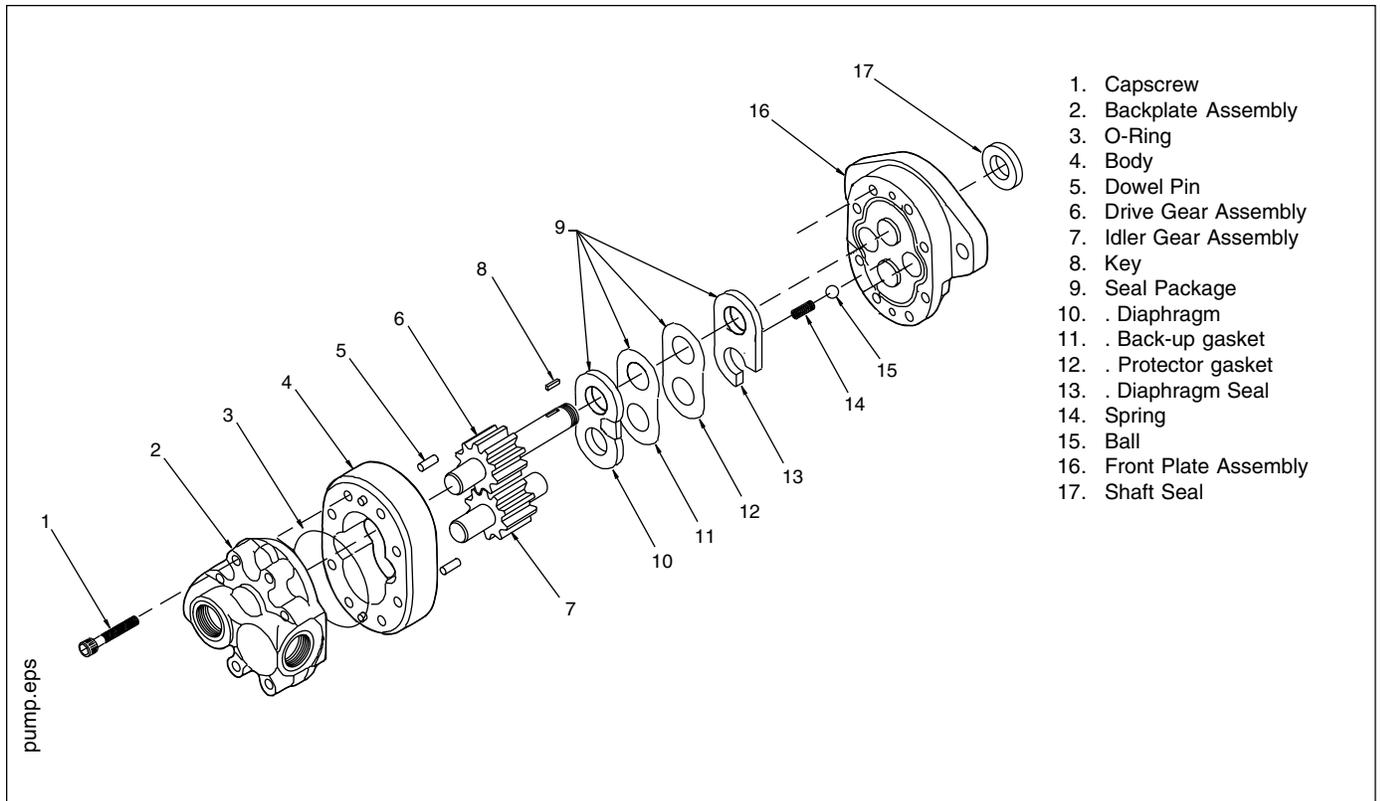
**CAUTION:** If the brake shaft is not to be removed, ensure that the bearing cup behind the piston housing remains in the winch case bore. If the cup falls out, the shaft will drop down and the right-hand bearing will drop out of its cup.

11. Pull the piston out of the housing using two 1/4-inch cap screws, or pressurize housing with low-pressure air.

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



**NOTE:** Inspect all oil brake components as specified in Table 4-1.



1. Capscrew
2. Backplate Assembly
3. O-Ring
4. Body
5. Dowel Pin
6. Drive Gear Assembly
7. Idler Gear Assembly
8. Key
9. Seal Package
10. . Diaphragm
11. . Back-up gasket
12. . Protector gasket
13. . Diaphragm Seal
14. Spring
15. Ball
16. Front Plate Assembly
17. Shaft Seal

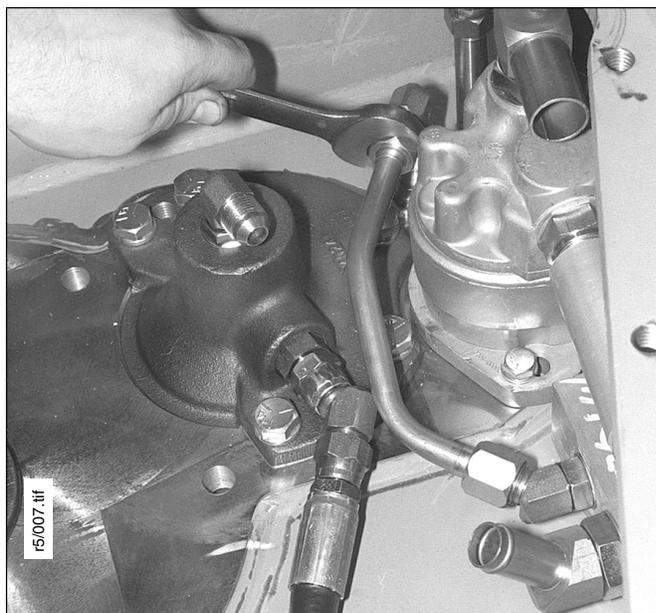
**Figure 4-19 Hydraulic Pump**

**Hydraulic Pump Removal & Disassembly**

To remove the hydraulic pump the winch must be removed from the tractor and the input carrier must be removed. Cleanliness is extremely important when repairing these pumps. Work in a clean area.

1. Loosen suction hose at suction manifold. Remove steel tube from valve to RH side of brake housing.

2. Loosen pressure hose from pump check valve. Remove the two capscrews securing the pump, then remove the pump. See Figure 4-17 for an exploded view of the pump.



**Pump Disassembly**

1. Clean the pump thoroughly with solvent, kerosene, or other non-corrosive cleaning fluid which will not affect rubber components.
2. Clamp pump in vise, shaft down.
3. Scribe a line across the three sections of the pump to act as a guide in reassembly.
4. Remove capscrews.
5. Remove from vise. Hold pump in hands and bump shaft against wooden block to separate front plate (16) from backplate (2). Body (4) will remain with either front plate or backplate.
6. To separate body from section that remains, place drive gear (6) in bearing and tap protruding end with plastic hammer.

# Repairs - Pump Removal & Disassembly



7. Remove O-Ring (3) from backplate assembly.
8. Remove diaphragm (10) from front plate by prying with O-Ring pick.
9. Remove spring (14) and balls (15) from front plate.
10. Remove diaphragm seal (13) and shaft seal (17) from front plate.

## Pump Inspection

1. Clean and dry all parts.
2. Remove nicks and burrs from all parts.

## Pump Gear

1. Inspect drive gear shaft (6) for broken keyway.
2. Inspect all bearing points for excessive wear and rough surfaces.
3. Replace gear assembly if shafts measure less than .6580 in (17.40 mm) in bearing area.
4. Inspect gear face for scoring and excessive wear.

5. Assure that snap rings are in grooves on either side of drive and idler gears.
6. If edge of gear teeth are sharp, dull with emery cloth.

## Pump Front and Backplates

1. Oil grooves in bearings should line up with dowel pin holes.
2. Replace plate if inner diameter of bearings exceed .691 in. (17.55 mm).
3. Bearings in front plate should be flush with island in groove pattern.
4. Check for scoring on face of backplate, replace if wear exceeds .0015 in (.038 mm).

## Pump Body

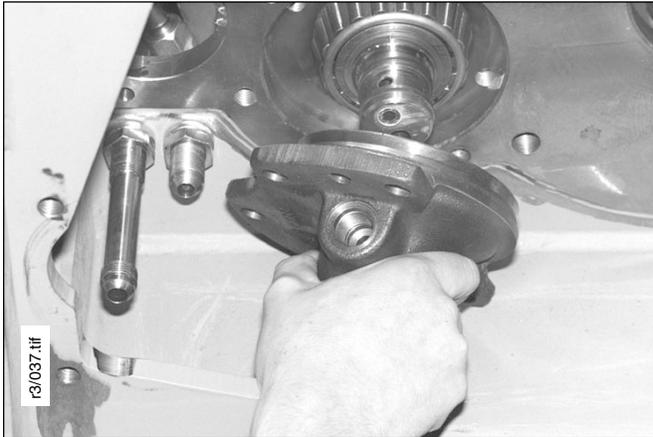
1. Check inside gear pockets for excessive scoring or wear of body.
2. Replace body if inner diameter of gear pocket exceeds 1.719 in. (43.66 mm).

## Clutch Shaft Removal & Disassembly

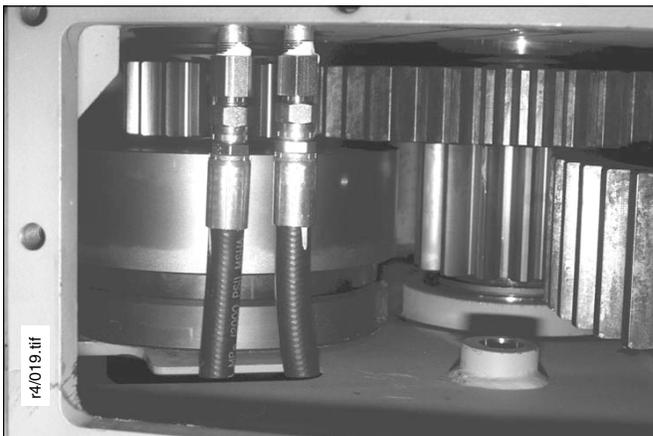
Figure 4-1 shows the location of clutch shaft components. Removal of the clutch shaft and associated parts can usually be accomplished with the winch mounted on the tractor. Prior to removal of the clutch shaft, perform the following:

- a) Drain oil from winch.
- b) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section, steps 1 through 10.
- c) If equipped with freespool option remove freespool shifter shaft and fork.

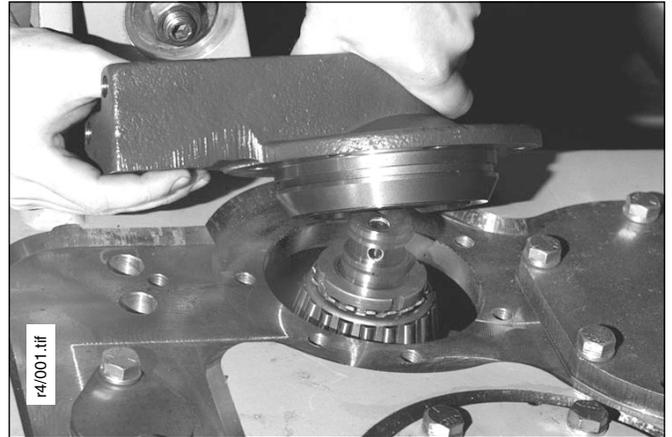
1. Disconnect hydraulic lines from the left-hand bearing retainer.
2. Remove left-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



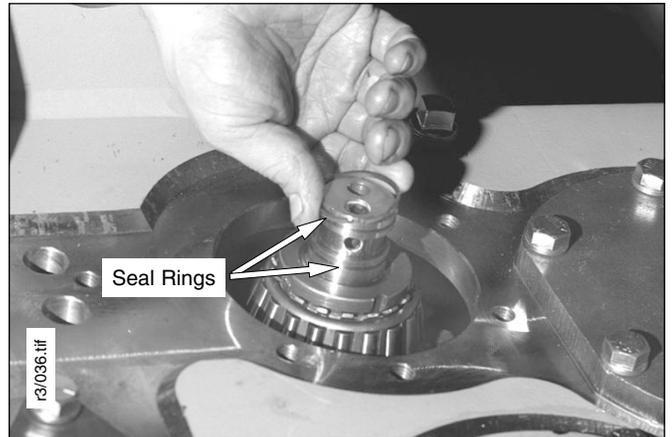
3. Remove hydraulic lines and fittings from the right hand bearing retainer.



4. Remove right-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



5. Remove the two seal rings from each end of the clutch shaft. Expand the seal rings just enough to slip over the end of the shaft.



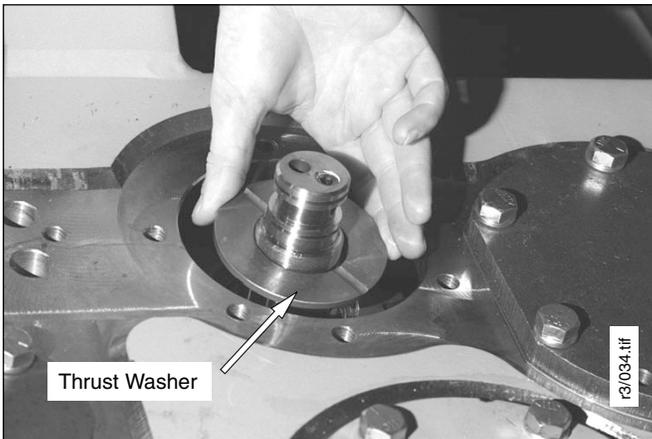
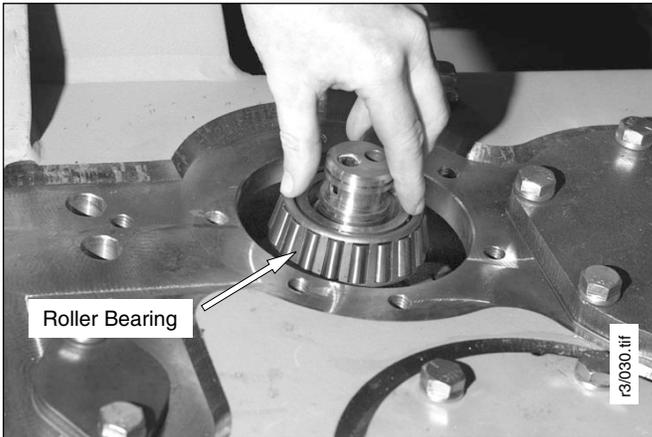
6. Straighten the lockwasher tang securing the locknut. Use special tool illustrated in Figure 4-35 to remove the locknut.

7. Remove the locknut and lockwashers.



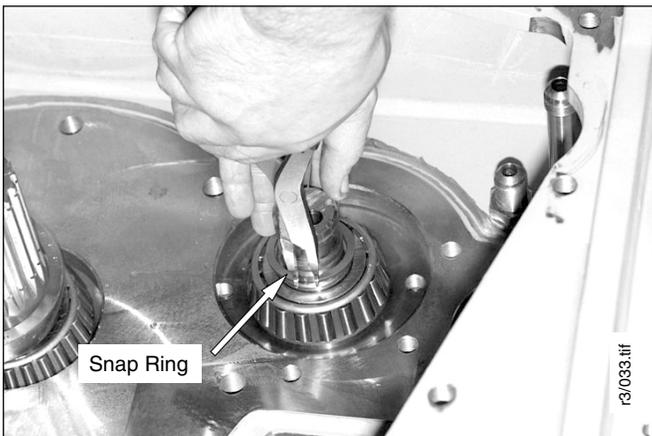
# Repairs - Clutch Shaft Removal & Disassembly

8. Remove the tapered roller bearing and thrust washer.



9. Remove the internal snap ring from the reverse spider gear bore.

10. Remove the external snap ring from the left-hand end of the clutch shaft.

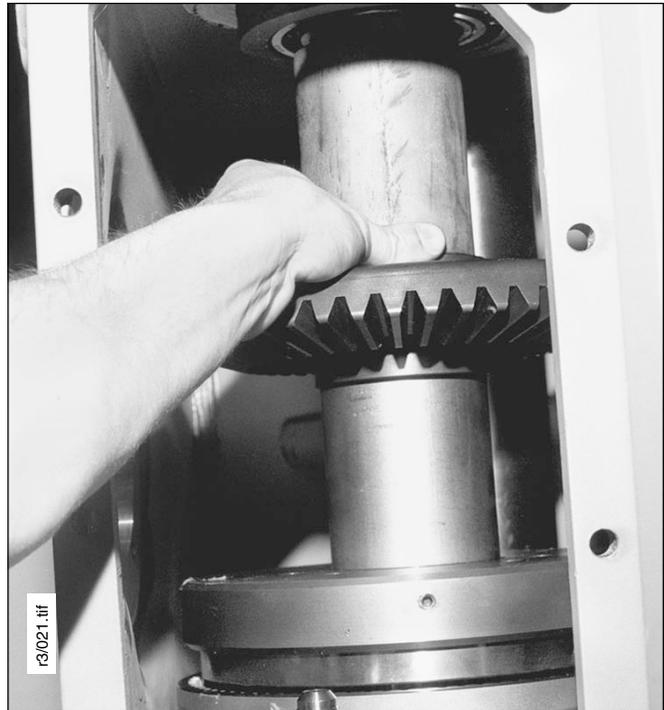


11. Remove the left-hand tapered roller bearing. Wrap end of shaft with tin or cardboard so gear will slide off end of shaft.



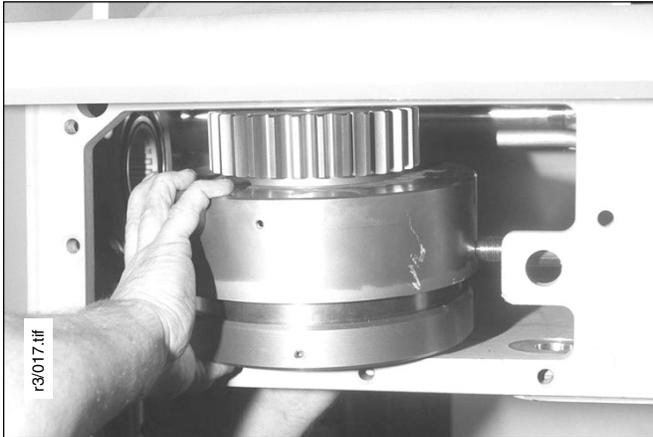
12. Attach puller to clutch shaft on right-hand side using special tool held in place with the bearing locknut or using special drift drive shaft from the left side.

13. Pull the clutch shaft out far enough to remove the spacer between the bevel ring gear and the forward clutch assembly.

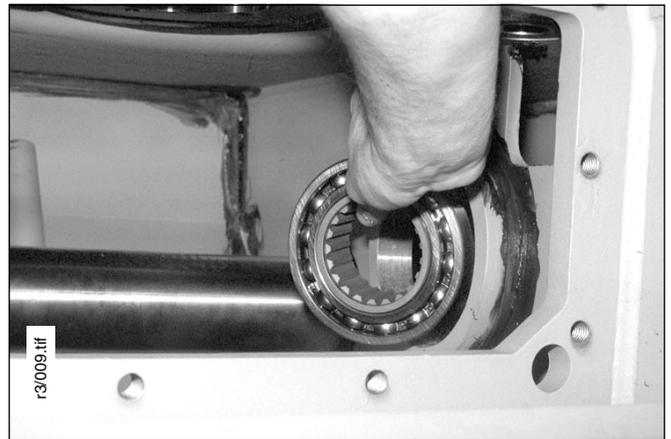


14. Remove the bevel ring gear and RH spacer. Remove the PTO pinion gear (if splined gear) or remove PTO before removing clutch assembly.

15. Install lifting eye (see Figure 4-38) in the 1/16 inch pipe tap hole of the forward clutch pack and lift out. For the W8L and W12E a nylon rope sling may be used.



17. Remove the ball bearing and carrier.



16. Secure the reverse clutch pack with heavy wire or a lifting eye. Then carefully withdraw the shaft.



18. Install the 1/4 inch tapped hole lifting eye (refer to Figure 4-38) and remove the reverse clutch assembly. For the W8L and W12E a nylon rope sling may be used.



## Oil Clutch Disassembly

This section details the disassembly of the oil clutches. Removal of the clutch assemblies is shown in the **Clutch Shaft Removal & Disassembly** section.

**NOTE: Disassembly is essentially the same for both the forward and reverse clutches. The forward clutch is shown.**

1. Remove the snap ring from the pinion gear bore, then remove and tag the roller bearing and carrier for reference during reassembly.



2. Lift the spider/pinion gear assembly from the clutch pack.



3. Remove the setscrews that lock the special capscrews on the opposite side of the clutch.
4. Remove the special capscrews using the a hand impact driver initially. Hold firmly so as not to damage the clutch pack.

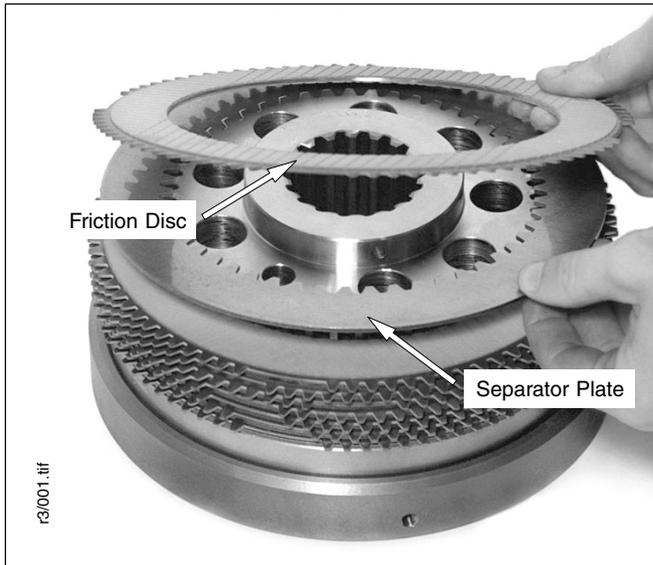


5. Match mark position on cover plate and hub to aid in reassembly. Lift cover plate from clutch assembly.

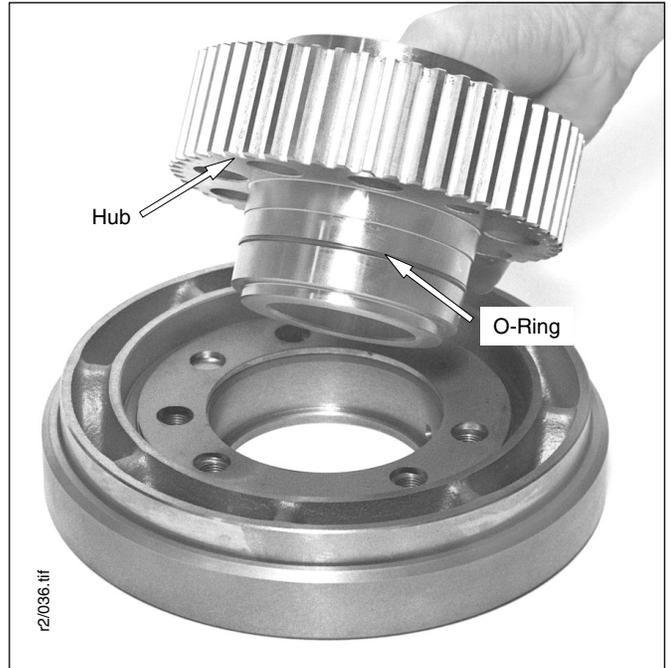


6. Remove and tag shims.

7. Remove the separator plates and friction discs from the hub. Inspect as described in Table 4-1.



9. Remove hub from piston housing. Remove and discard O-ring.



8. Remove and inspect the release springs. Refer to Table 4-1.



10. Remove spring retainer. Inspect for wear.

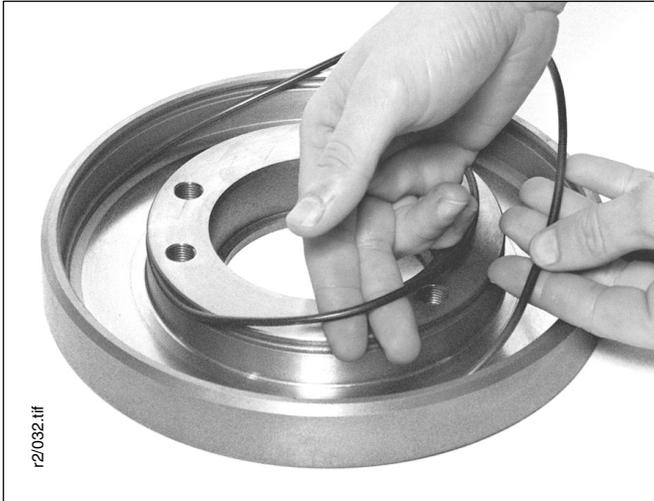


11. Remove piston from piston housing. Inspect for wear.



**NOTE:** Arrangement shown for paper-type frictions.

12. Remove and discard the two O-rings.

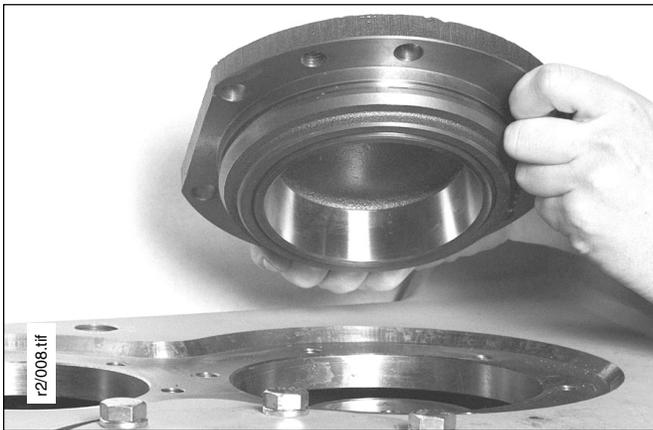


**NOTE:** For reassembly and setting of air gap, refer to page 4-44, Step 11.

## Brake Shaft Removal

The brake shaft may not always be removed from the winch when mounted on the tractor. Prior to removal of the brake shaft assembly, perform the following:

- a) Remove the winch from the tractor (see **Winch Removal** section at the beginning of this chapter).
  - b) Drain oil from winch.
  - c) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section.
  - d) Remove the brake shaft as shown in the following steps.
1. Remove right-hand bearing retainer. Tag shims for reference during reassembly.



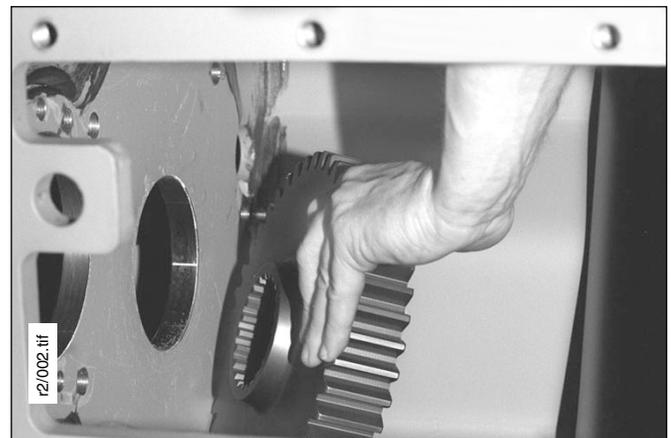
2. Pull brake shaft partially out of winch housing.
3. Tap the left-hand bearing off of shaft using reduction gear as driver.



4. Withdraw shaft from housing.



4. Remove gear from winch housing.



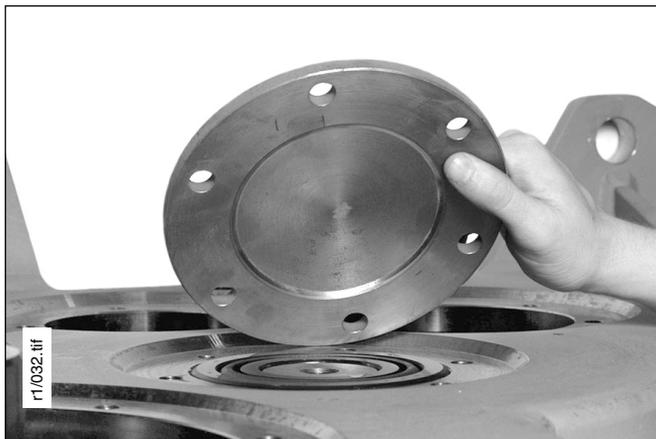
## Intermediate Shaft Removal, Non Freespool

The intermediate shaft can be removed with the winch mounted on the tractor.

**NOTE:** The following steps show the winch removed from the tractor with the clutch shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but it is not necessary for the removal of the intermediate shaft only.

**NOTE:** The instructions below apply only to a winch NOT equipped with the optional freespool arrangement. Refer to the next section, Intermediate Shaft Removal, Freespool, for instructions relevant to winches equipped with the freespool option.

1. Remove the intermediate shaft cover.



2. Screw a 3/4-16 UNF slide hammer into the end of the intermediate shaft and partially pull it out. (W8L takes 3/4-10 UNC.)

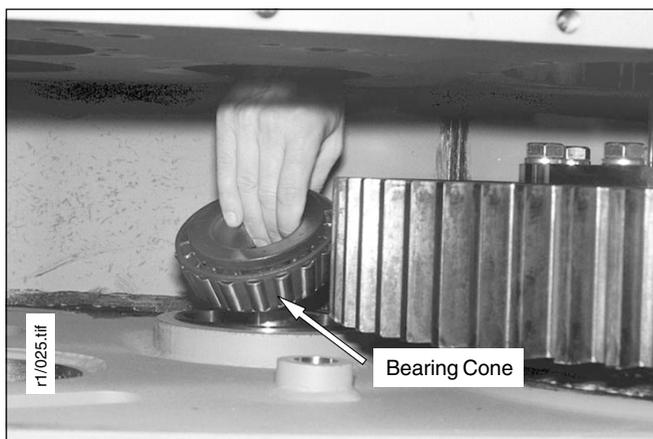
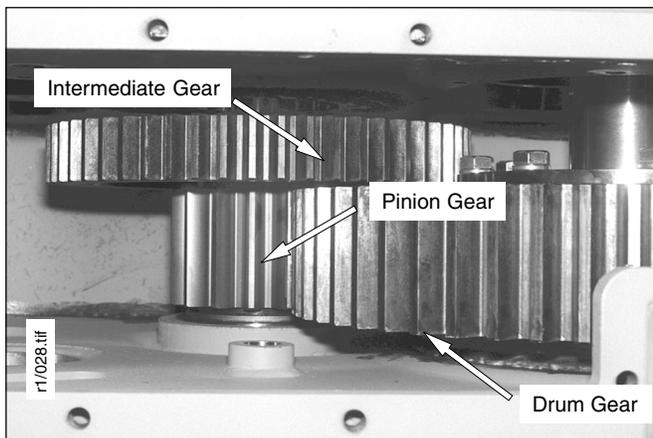
3. Remove bearing cup and cone.



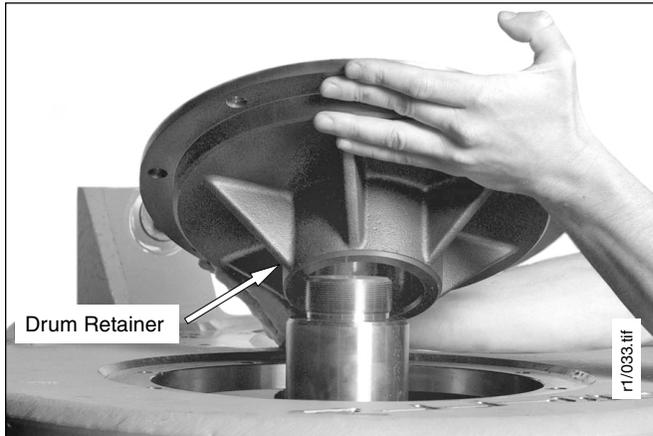
4. Remove the intermediate shaft, while ensuring that the intermediate gear does not fall.



5. Remove the drum pinion gear and the inner bearing cone.



6. Remove drum shaft retainer prior to removing intermediate gear. See **Drum Shaft and Drum Removal** section that follows.



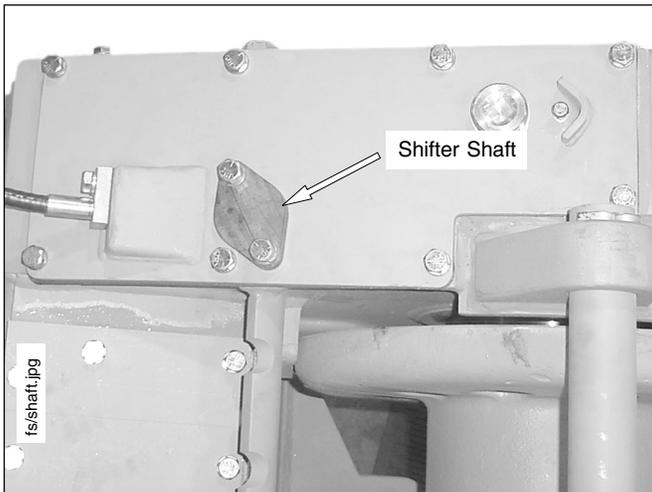
## Intermediate Shaft Removal, Freespool

The intermediate shaft can be removed with the winch mounted on the tractor.

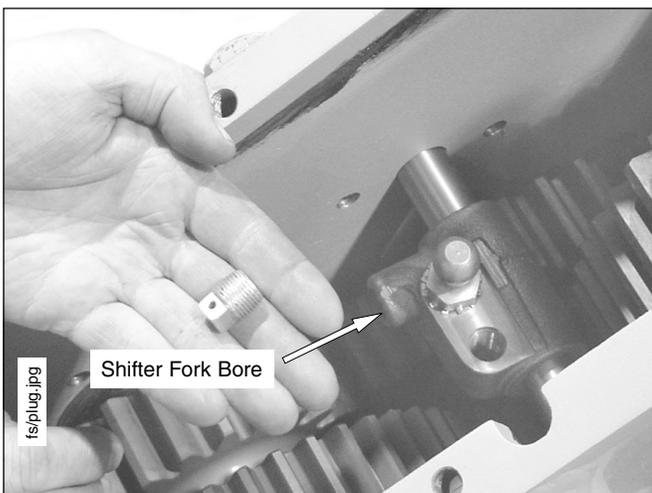
**NOTE:** The following steps show the winch removed from the tractor with the clutch shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but it is not necessary for the removal of the intermediate shaft only.

**NOTE:** The instructions below apply only to a winch equipped with the optional freespool arrangement. Refer to the previous section, Intermediate Shaft Removal, Non Freespool, for instructions relevant to winches without the freespool option.

1. Remove the capscrews securing the shifter shaft and the cover.



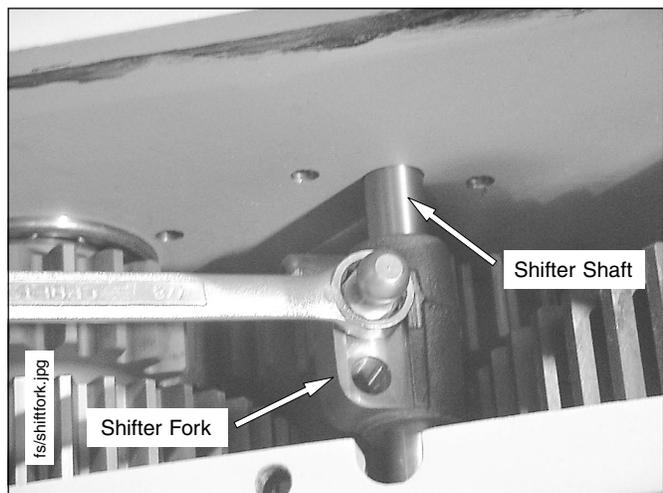
2. Remove the plug and spring from the freespool shifter fork.



3. Use a magnet to remove the detent ball.



4. Withdraw the shaft and remove the fork.



5. Remove the intermediate shaft cover.

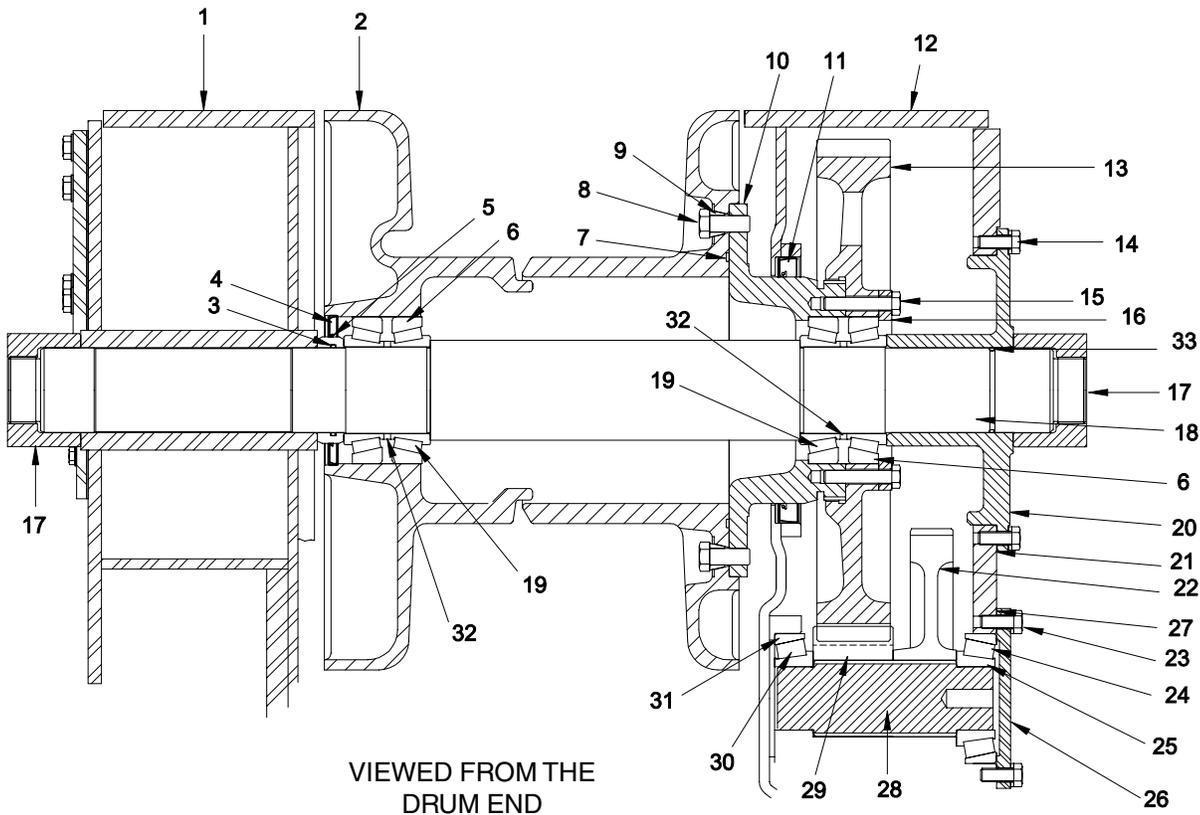


6. Tag shims for reference during reassembly (not shown).

**NOTE: The above step is relevant only to AW6F-4061 and below, and AW8L-2032 and below without exterior freespool drag adjust. Exterior freespool adjust covers do not require shims.**

7. Screw a 3/4-16 UNF slide hammer into the end of the intermediate shaft and partially pull it out. (W8L takes 3/4-10 UNC.)
8. Remove the drum pinion gear and the inner bearing cone. Refer to Figure 4-2 for the location of components.
8. Remove bearing cup and cone and the intermediate shaft, while ensuring that the intermediate gear does not fall.
10. Remove intermediate gear.

**NOTE: Remove drum shaft retainer prior to removing intermediate gear. See Drum Shaft and Drum Removal section that follows.**



**NOTE: Intermediate Shaft Assembly Shown Is Not Equipped with Freespool**

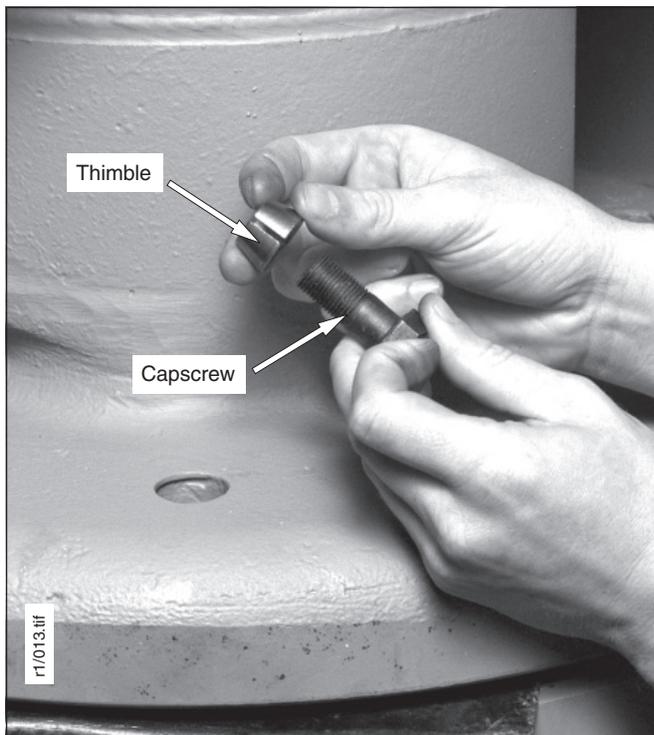
- |                                |                           |
|--------------------------------|---------------------------|
| 1. LH Winch Housing            | 18. Drum Shaft            |
| 2. Drum                        | 19. Bearing Cone (Qty. 4) |
| 3. O-Ring                      | 20. Drum Retainer         |
| 4. Spacer                      | 21. Shims                 |
| 5. Oil Seal                    | 22. Intermediate Gear     |
| 6. Double Bearing Cup (Qty. 2) | 23. Capscrew & Washer     |
| 7. Seal Ring                   | 24. Bearing Cup           |
| 8. Capscrew (Qty. 10)          | 25. Retaining Plate       |
| 9. Thimble (Qty. 10)           | 26. Bearing Cone          |
| 10. Drum Adapter               | 27. shims                 |
| 11. Oil Seal                   | 28. Intermediate Shaft    |
| 12. RH Winch Housing           | 29. Drum Pinion Gear      |
| 13. Drum Gear                  | 30. Bearing Cone          |
| 14. Sealing Capscrew & Washer  | 31. Bearing Cup           |
| 15. Capscrew                   | 32. Spacer (Qty. 2)       |
| 16. Retainer Plate             | 33. O-Ring                |
| 17. Shaft Nut                  |                           |

Figure 4-20 Location of Drum and Drum Shaft Components

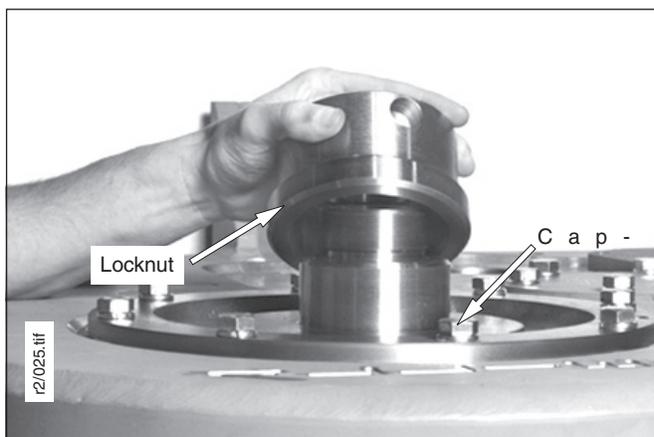
## Drum Shaft & Drum Removal

Figure 4-18 shows the location of drum and drum shaft components. Do not attempt to remove heavy components such as the drum or drum gear by hand. Always use a lifting device and the recommended attachments whenever possible. Removal of the drum and drum shaft can be accomplished with the winch on the tractor. To remove the drum gear it will be necessary to first remove the intermediate shaft (see **Intermediate Shaft Assembly Removal** section) and the clutch assembly (see **Clutch Shaft Removal and Disassembly** section).

1. Loosen the drum capscrews, then remove capscrews with thimbles, leaving two located 180° apart.



2. Remove both drum shaft locknut and the retainer capscrews.

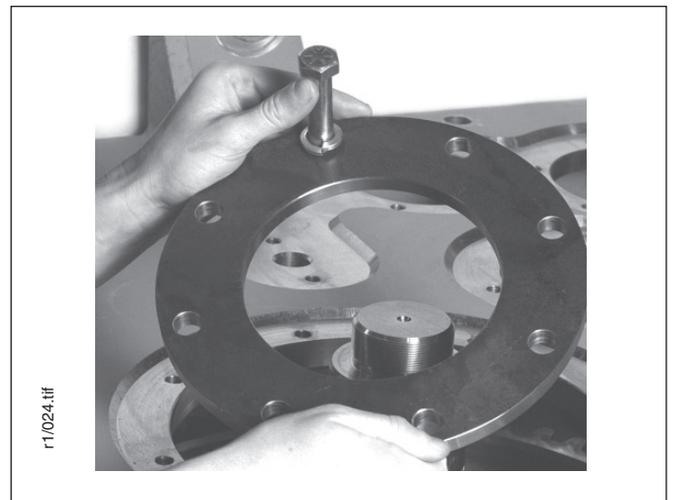


3. Remove bearing retainer and shim pack.



**NOTE:** Tag shim pack for reference during reassembly.

4. Remove retainer ring by removing retainer capscrews.



5. Set bearing retainer removed in Step 3 back in place, and screw locknut removed in Step 2 back in place. This will allow the bearing retaining plate to be used as a fixture for pulling the shaft from the drum. On W6F and W8L, use 1/2-UNC jacking screws to break drum shaft free. On W12E, use two 5/8-UNC jacking screws to break drum shaft free.

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

6. On W6F and W8L, install two 1/2-UNC ASTM F541 or equivalent eyebolts into the retainer 180° apart. On W12E, screw two 5/8-UNC ASTM F541 or equivalent eyebolts into retainer 180° apart.

# Repairs - Drum Shaft & Drum Removal



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

7. Attach a sling around the drum and hoist until there is no slack, then drive the shaft out the right hand side.

**NOTE:** support or sling the drum gear so that it does not fall during shaft removal.

8. Remove two remaining drum capscrews.
9. Carefully remove the drum from winch frame. Ensure that the adapter does not fall.
10. Remove adapter.



11. Remove and discard adapter seal.



**NOTE:** This seal must be replaced with a new Allied Systems Company-approved seal during reassembly.

12. Remove double tapered roller bearing assembly and seal spacer from the left-hand end of the drum.

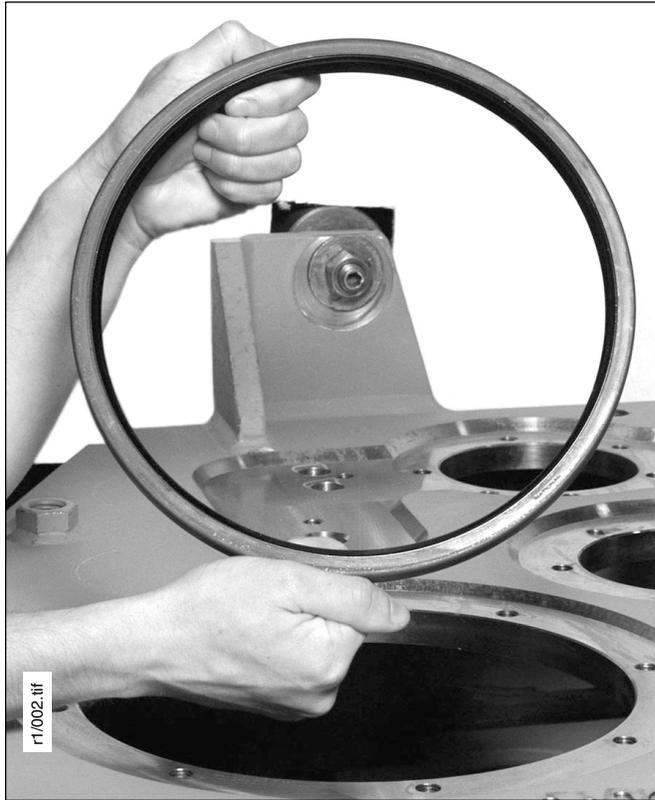


**NOTE:** Refer to Figure 5-10 for location of components.

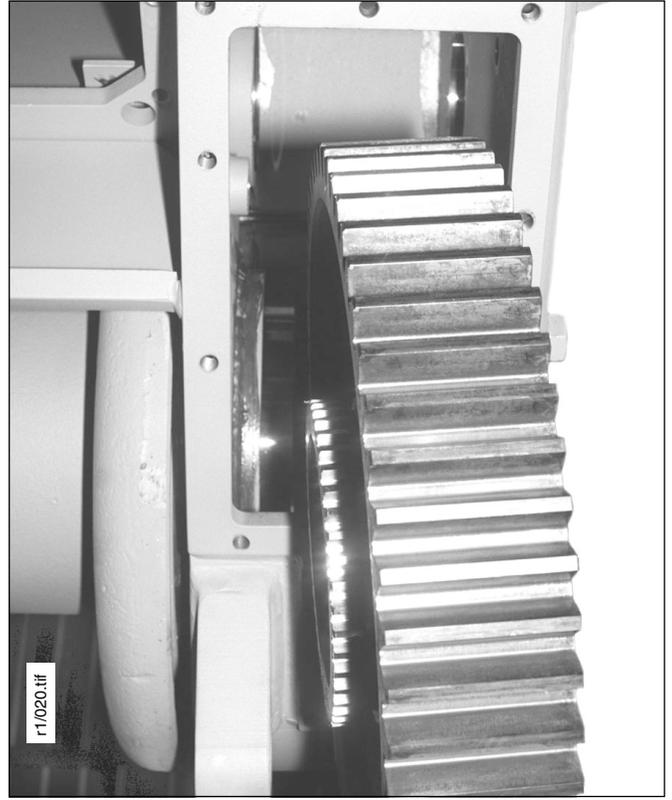
13. Remove and discard shaft seal from drum. (Seal lip should normally be pointed in.)



14. Remove and discard adapter seal from winch housing.



15. Using a suitable lifting device, the drum gear can now be removed.



## Assembly of the Winch

All components should be inspected for wear or damage as they are removed. Refer to Table 4-1, Visual Inspection. All seals that were removed should be replaced during assembly. Carefully inspect all bearings that have been removed. Used bearings often appear satisfactory, but

may fail when placed under a load. When in doubt, it is recommended to install a new bearing. Any component that indicates excessive wear or damage should be replaced. The following reassembly and installation sequence assumes a complete winch overhaul.

**Table 4 -1 Visual Inspection**

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft with Integral Bevel Pinion	Check for broken or severely worn bevel gear teeth. Also check splines for wear or twisting. Observe tooth contact wear pattern.	Replace shaft if gear teeth are broken or severely worn, or if splines are not true.
PTO Shaft with Removable Bevel Pinion	Check splines for wear or twisting.	Replace shaft if splines are severely worn or twisted.
Bevel Pinion (Removable)	Check for broken or severely worn gear teeth.	Replace bevel pinion if teeth are broken or severely worn.
Clutch Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	Inspect clutch shaft O-ring grooves for taper, scoring, burrs and corrosion.	Replace or repair shaft if surfaces of the seal groove are not damaged.
	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 clutch shaft for scoring or distortion of plugholes (internal threads) or locknut (external threads).	Dress threads with a thread chaser.
	Check for broken or severely worn splines.	Replace shaft if splines are broken or severely worn.
	Inspect cast iron seal ring grooves for damage.	Dress grooves or replace shaft if seal will not seat properly.
	Check for damage on enlarged plugs in the shaft ends.	Replace plugs if damaged.
Clutch Shaft Bearing Retainers	Check retainer seal ring bore for grooves, scoring and rust.	Replace if scored or rusted. May be bushed if scored.
Clutch Shaft Spacers	Inspect spacer ends for scoring or corrosion.	Replace if damaged in any way.
Bevel Gear	Check for broken or worn teeth.	Replace if teeth are broken or severely worn.
	Inspect gear hub faces for scoring, wear or corrosion. Check rivets between gear and hub for tightness.	The gear should be replaced if the hub faces are defective in any way.
Forward and Reverse Clutch Assemblies	Check for plugged oil holes in clutch hub.	Clean oil holes as necessary.
	Carefully inspect friction discs for facing wear, distortion and damaged teeth.	Replace friction disc(s) if oil grooves are worn from facing, or if distorted in any way.
	Carefully inspect separator plates to verify that surfaces are not worn excessively or unevenly.	Replace separator plates if surfaces are warped or scored. Paper friction separators are flat. Bronze friction separators are dished.
	Inspect piston retainer plate, O-ring grooves, piston cavity and center bore for scoring, burrs and corrosion. Look for any internal cracks.	Replace piston retainer plate if damaged.
	Check for wear or collapsed release springs.	Replace spring(s) if distorted or damaged in any way.
	Inspect spider gear for broken or worn gear teeth. Be sure pinion gear is secured to spider gear. Inspect bearing bore for scoring or galling.	Replace gear if teeth are broken or severely worn, or if pinion gear has broken free from spider gear. Replace gear if bearing bore is badly scored.

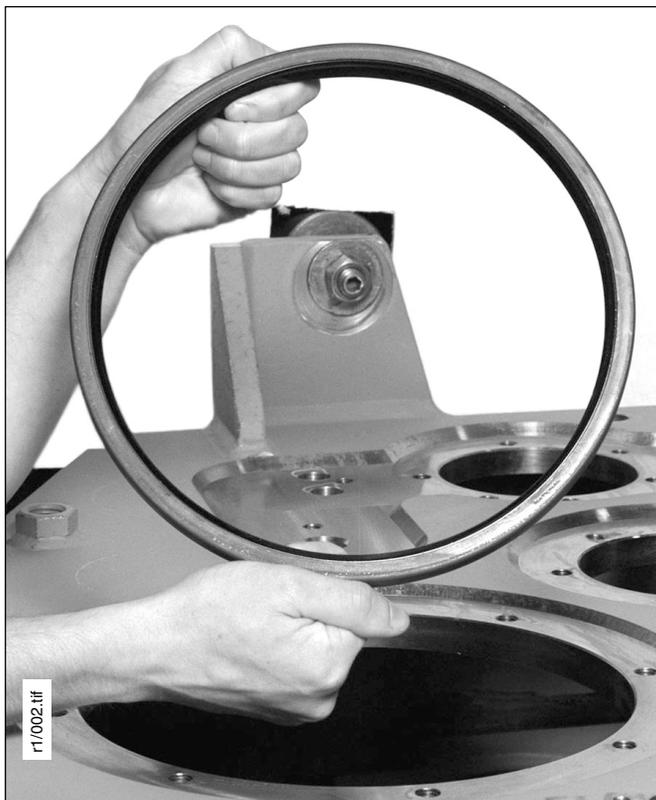
**Table 4 -1 Visual Inspection (continued)**

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Brake Assembly	Check for cracked or broken belleville spring(s).	Replace spring(s) if cracked or broken.
	Inspect oil brake cover for scoring, burrs, cracks or warping.	Replace cover if damage affects sealing or proper contact with belleville spring.
	Carefully inspect friction discs for facing wear, distortion and damaged teeth.	Replace friction discs if oil grooves are worn from facing or distorted in any way. Replace if brake release pressure is low.
	Carefully inspect separator plates to verify that surfaces are not worn excessively or unevenly.	Replace separator plates if surfaces are warped or scored.
	Inspect piston housing O-ring grooves and center bore for scoring, burrs and corrosion.	Replace piston housing if damaged.
	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 straightness, mushrooming and end faces out of square.	Replace if damaged enough to cause binding or if diameter, length or end squareness is distorted.
	Check studs for tightness and depth in frame.	Tighten if loose.
	Carefully check aligning dowels for grooves and distortion.	Replace if damaged sufficiently to cause binding or misalignment.
Brake Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	Check for broken or severely worn splines. Check for spline straightness.	Replace if splines are twisted or severely worn.
Brake Shaft Gears	Check for broken or worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Intermediate Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	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.
Freespool Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing surfaces.	Dress surface or replace shaft if severely worn.
	Check O-ring groove and seal surface.	Dress groove or replace shaft if severely worn.
	Check for crossthreaded or damaged threads.	Dress threads with thread chaser.
Drum Gear	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Drum	Inspect quad-ring groove for burrs, scoring and rust.	Replace drum or rebuild drum groove if a new quad-ring will not seat properly.
Drum Adapter	Carefully inspect double seal contact surface for deep scratches, burrs and rust.	Replace if damaged.
Winch Frame	Check area around drum and drum adapter for damage if cable has slipped between cable guard and winch frame.	Consult the factory.

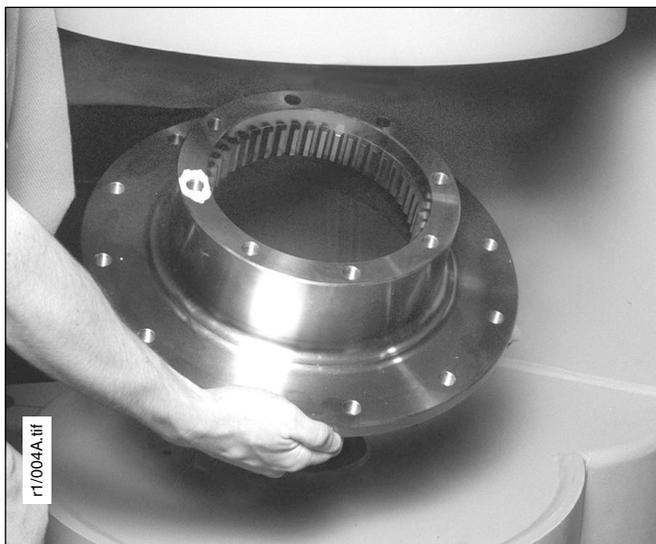
## Drum and Drum Shaft Installation

If the drum gear was removed, it must be installed prior to installation of the intermediate shaft and reverse clutch assembly.

1. Lubricate seal bore with Lubriplate or other light lube grease. Install double-lip seal with smooth side toward the drum in the right hand side of the frame.



2. Install drum adapter by pushing it through the double-lip seal.



3. Lubricate the left-hand drum bore with Lubriplate or other light lube grease, then install double tapered roller bearing assembly.



4. Replace drum spacer O-ring and install spacer in drum bore.



5. Install drum seal.



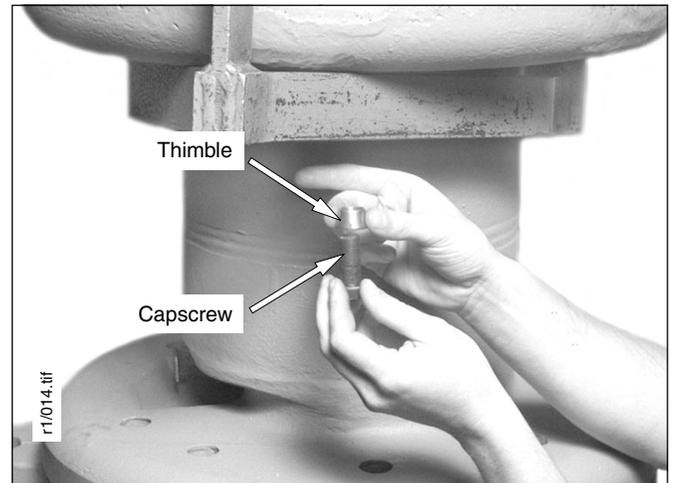
**NOTE: Smooth side of seal must face outboard.**

6. Lubricate right-hand drum bore. Coat right-hand seal ring and groove with O-ring lube. Install new seal ring.



7. Move the drum into position while being careful not to move the seal ring.

8. Align adapter and drum holes, then install the thimbles and screws. Tighten progressively and evenly to ensure uniform compression of seal ring. Do not tighten to final torque.



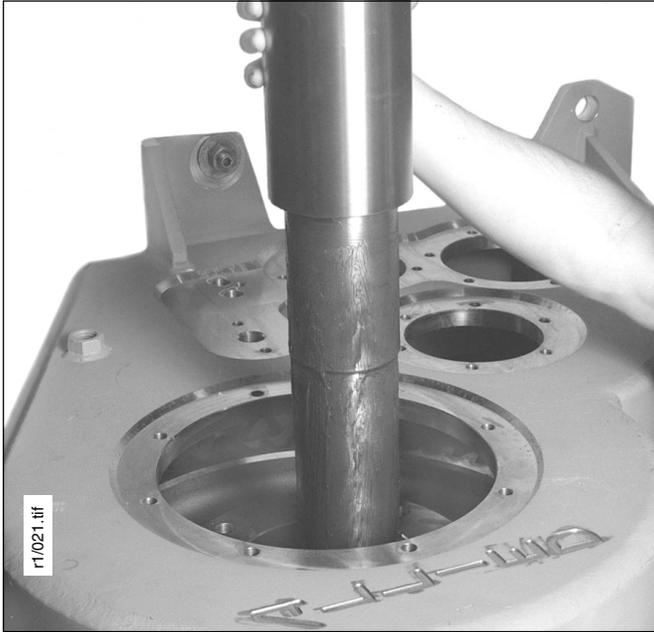
9. Install drum gear.



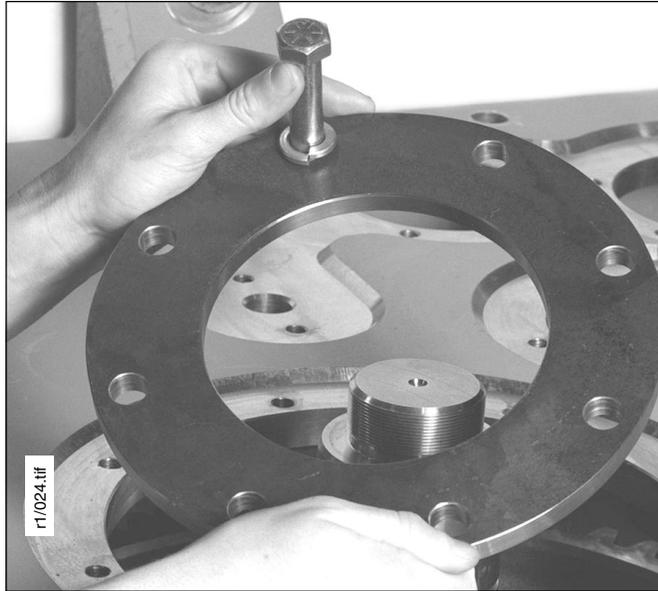
10. Align drum gear with adapter and temporarily secure the drum gear to the adapter, using the retainer plate and two capscrews. This will ensure that the gear will not fall during installation of the shaft.

11. Pour 2 quarts (2 liters) of DEXRON oil into the drum to ensure initial bearing lubrication.

- Make sure that double-tapered roller bearing, seal and spacer are properly seated in the left-hand side of the drum. Then install the shaft until it bottoms solidly against the left hand tapered roller bearing. Tighten left hand nut.



- Install retainer plate using the eight special capscrews. Tighten capscrews on W6F 75 ft-lbs (10 kg-m), W8L 146 ft-lbs (20 kg-m) and W12E 225 ft-lbs (31 kg-m).

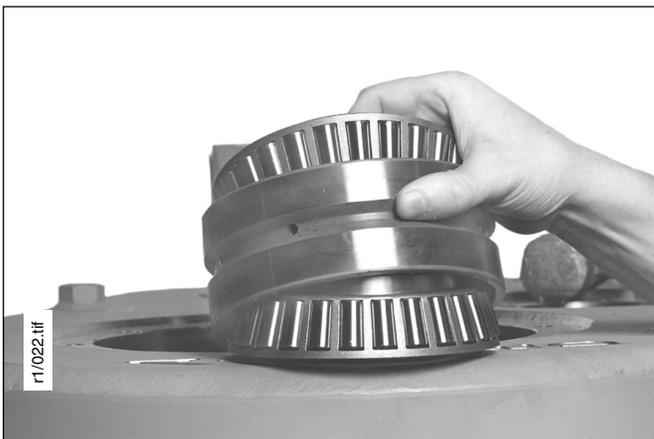


**NOTE:** Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.

**CAUTION**

**CAUTION:** Do not hammer on drum shaft surface.

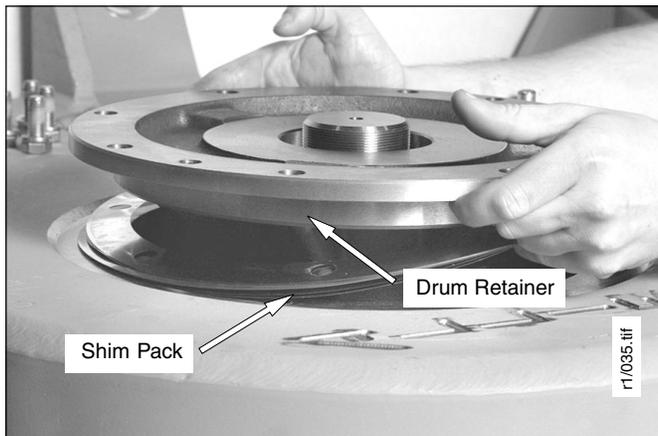
- Remove the retainer plate and install the bearing assembly.



**NOTE:** Bearings go in reverse order from that shown above.

- Set bearing retainer into place and securely tighten capscrews (do not tighten to final torque). Measure gap between retainer and winch frame in three places around the retainer. Add the three indications and divide by three to add obtain the average gap. Assemble shim pack to provide a net fit with  $\pm 0.005$  inch (0.1288 mm) tolerance.

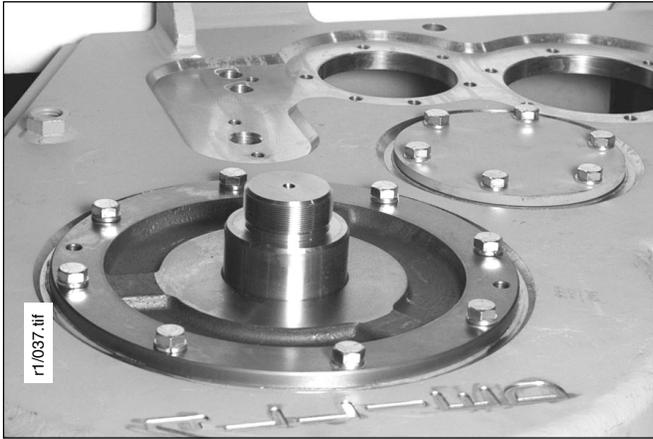
- Coat winch frame and bearing retainer with Loctite. Install finalized shim pack (determined in step 15). If intermediate shaft assembly not installed, install before retainer.



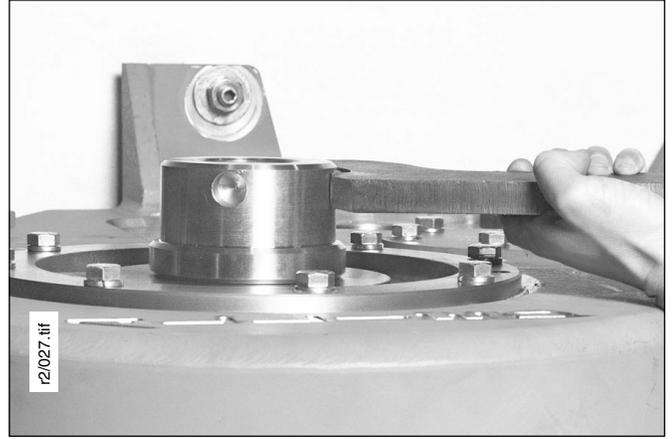
**WARNING**

**WARNING:** Make sure the drum gear does not fall off the adapter.

17. Secure retainer with capscrews and lockwashers. Tighten capscrews to 75 ft-lbs (W6F and W8L) or 150 ft-lbs (W12E).



18. Coat shaft nut threads with John Crane or other suitable sealing compound. Install both shaft nuts and torque to 400 ft-lbs (55 kg-m).



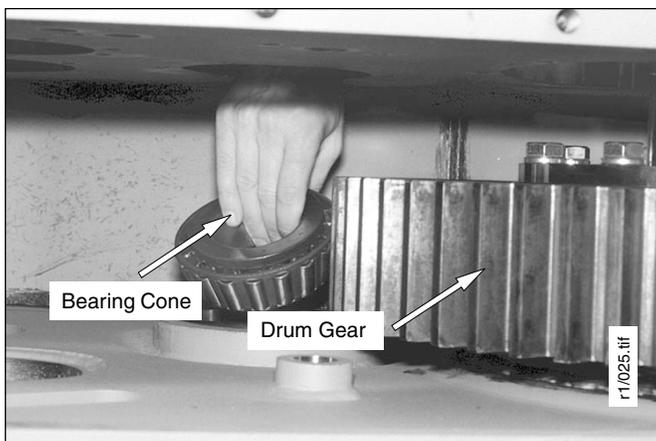
19. Tighten drum-to-adapter capscrews to 200 ft-lbs (27 kg-m) torque.

## Intermediate Shaft Installation, Non Freespool

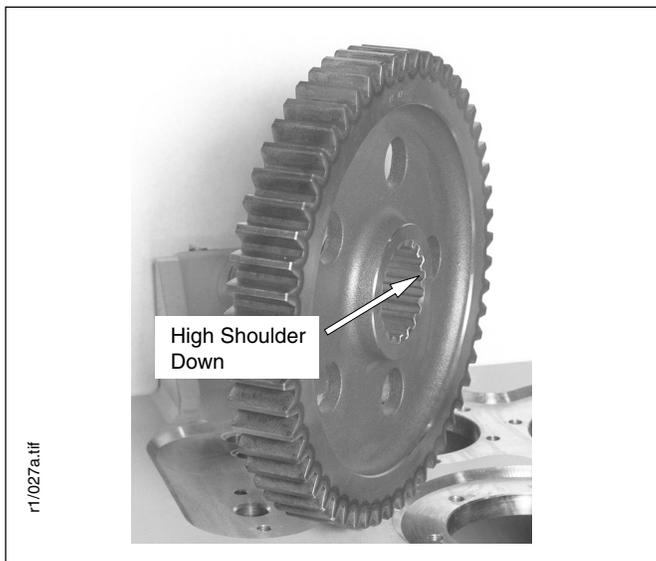
These figures show the winch removed from the tractor with the clutch shaft and brake shaft removed.

**NOTE: The winch is shown equipped without the optional freespool arrangement. For instructions on how to install an intermediate shaft on a freespool winch, refer to the next section, Intermediate Shaft Installation, Freespool.**

1. Install inner bearing assembly if previously removed. Use a liberal amount of lubriplate or other light lube grease to hold the inner bearing cone in place.

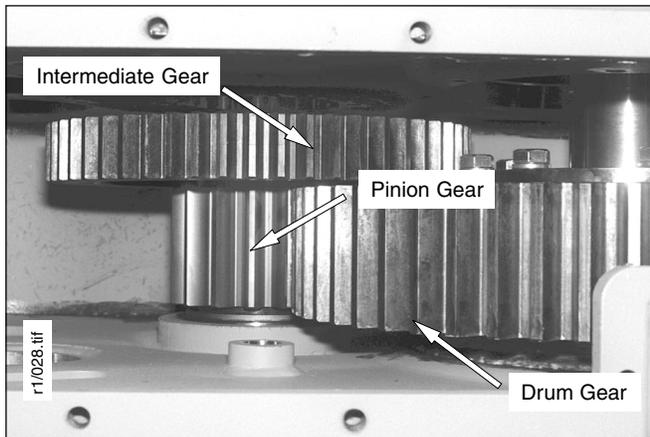


2. Position intermediate gear in housing. Install intermediate shaft far enough to support the gear.



**NOTE: Install intermediate gear with high shoulder down, towards the drum gear, to set enough clearance between the intermediate gear and the drum gear.**

3. Position the pinion gear so that the teeth are splined to the intermediate shaft.



4. Install the outer bearing assembly. Make sure that the cup is firmly seated against the bearing cone.

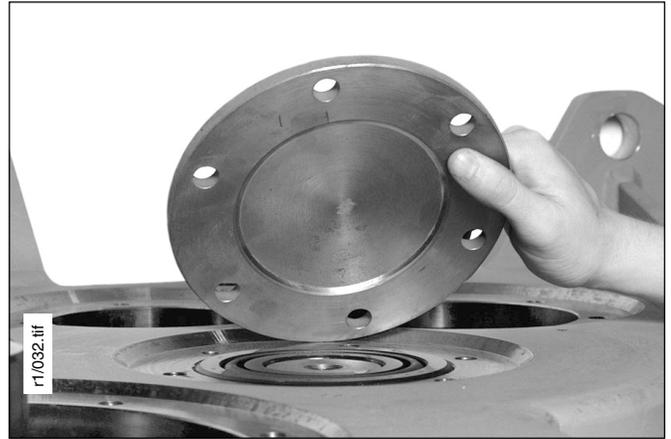


- Using a depth gauge measure the distance from the face of the bearing cup to the winch housing. Add a shim pack of 0.004 to 0.007 in. (0.102-0.178 mm) greater than the measured distance. For example, if the measured distance is 0.004 in. (0.102 mm), add a shim pack with a total thickness of 0.008 to 0.011 in. (0.203-0.279 mm). This will allow 0.004 to 0.007 in. (0.102 to 0.178 mm) endplay of the shaft.



**NOTE:** Shafts requiring a finalized shim pack of 0.020 in. (0.510 mm) are not uncommon.

- Coat the winch frame and retainer with Loctite or other suitable sealing compound. Install finalized shim pack and retainer.



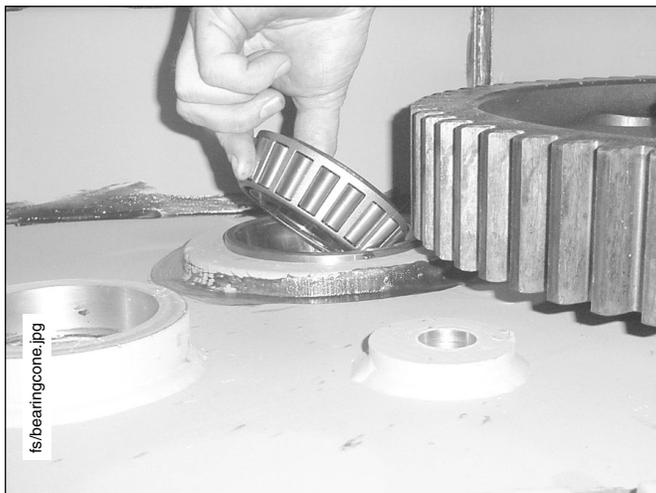
- Tighten the six capscrews to 75 ft-lbs (10 kg-m).

## Intermediate Shaft Installation, Freespool

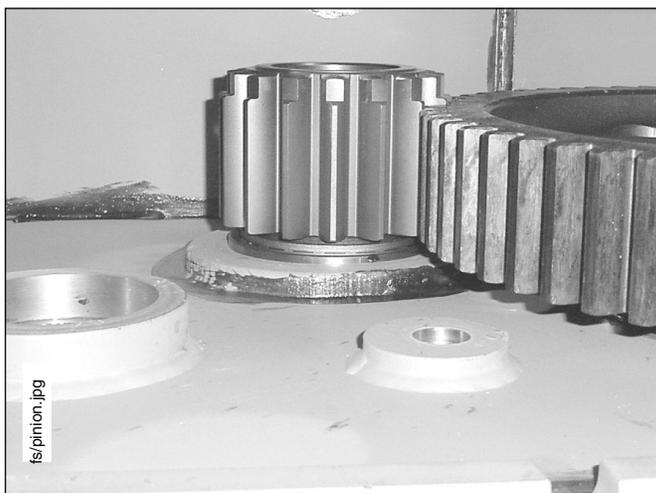
These figures show the winch removed from the tractor with the clutch shaft and brake shaft removed.

**NOTE: The winch is shown equipped with the optional freespool arrangement. For instructions on how to install an intermediate shaft on a winch without freespool, refer to the previous section, Intermediate Shaft Installation, Non Freespool.**

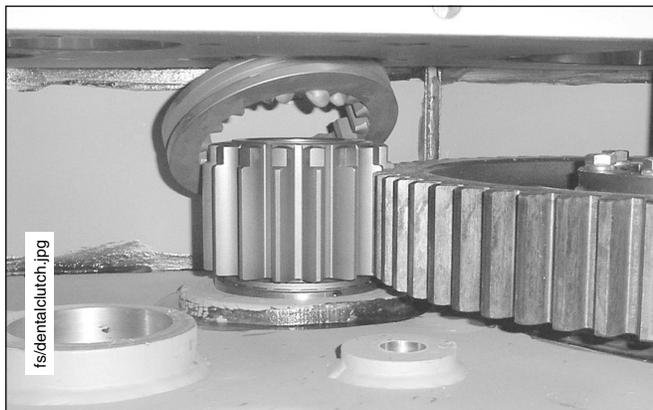
1. Install inner bearing assembly if previously removed. Use a liberal amount of lubriplate or other light lube grease to hold the inner bearing cone in place.



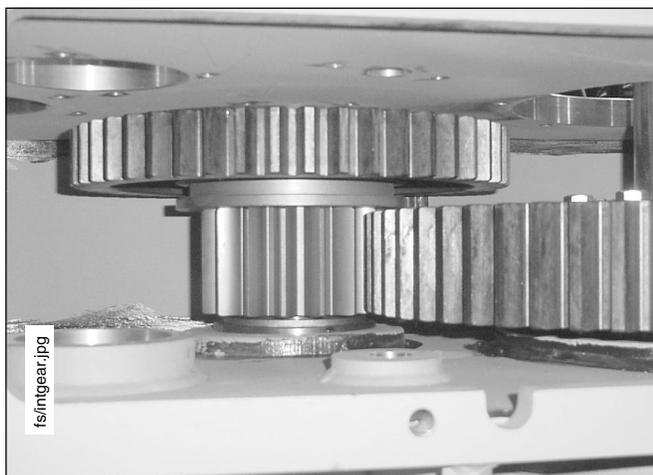
2. Position the freespool drum pinion in the housing.



3. Place dental clutch on pinion gear. Ensure chamfered ramp faces pinion.



4. Position intermediate gear in housing.



**NOTE: Install intermediate gear with high shoulder down.**

5. Install intermediate shaft.



6. Install the outer bearing cup and cone. Make sure that the cup is firmly seated against the bearing cone.



**NOTE: The following step only applies to AW6F-4061 and below, and AW8L-2032 and below without exterior freespool drag adjust.**

7. To adjust the freespool drag, loosen the bearing slightly as detailed in Step 6 of the **Intermediate Shaft Removal, Freespool** section. Place the winch in freespool and measure the rolling torque of the drum by placing 25 ft-lb (3.5 kg-m) torque wrench on one of the eight drum nuts. Keep the wrench handle pointed straight out from the drum center. The torque should be 12-15 ft-lbs (1.7-2.0 kg-m). Add or remove shims from the intermediate shaft retainer to reduce or increase torque respectively.

**NOTE: The following step only applies to AW6F-4062 and above, and AW8L-2033 and above, with exterior freespool drag adjust.**

8. Install new O-ring on freespool piston and install piston in freespool adjust cover.



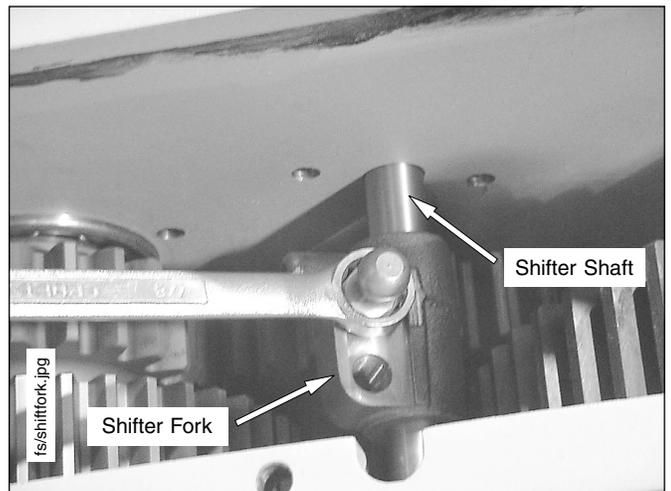
6. Coat the winch frame and retainer with Loctite or other suitable sealing compound. Install shim pack (if necessary) and cover.



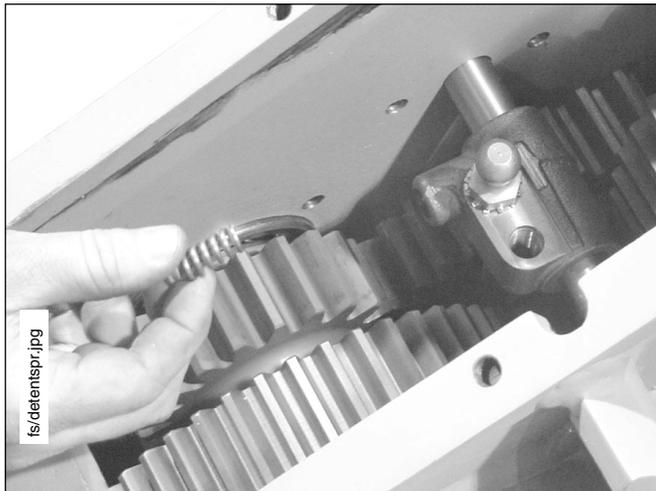
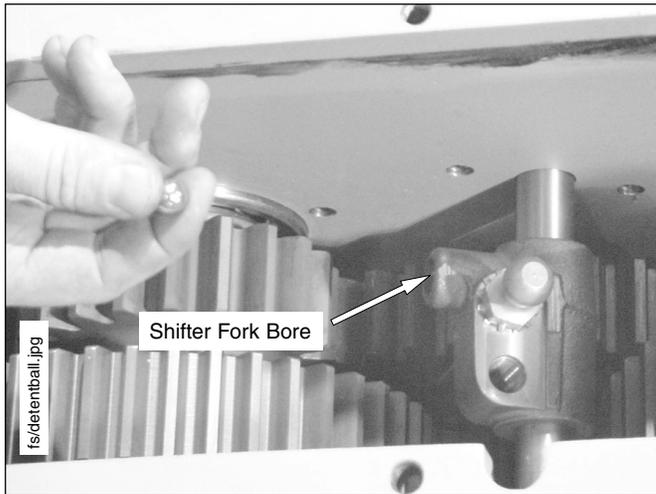
7. Tighten the six capscrews to 75 ft-lbs (10 kg-m).



8. Position the freespool shifter fork on the dental clutch and install the shifter shaft.



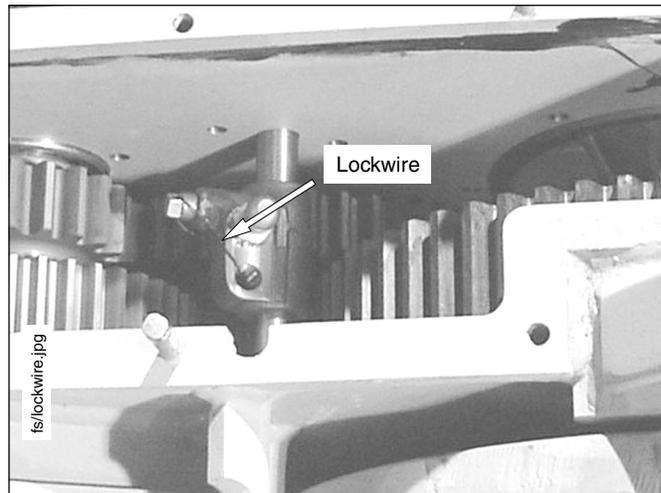
9. Install detent ball and spring into bore of the shifter fork.



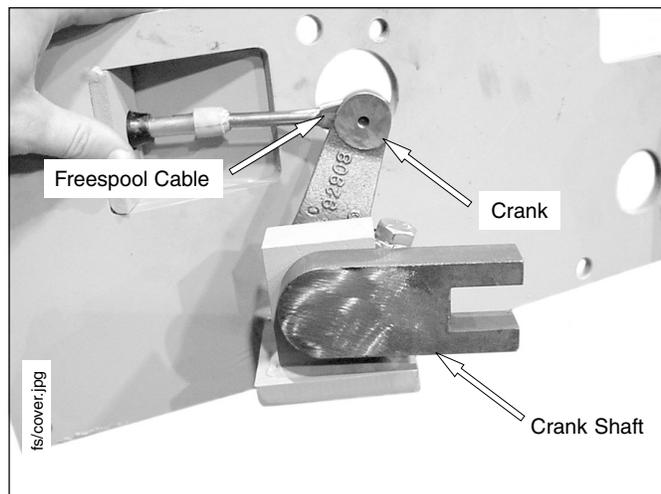
10. Install plug securely.



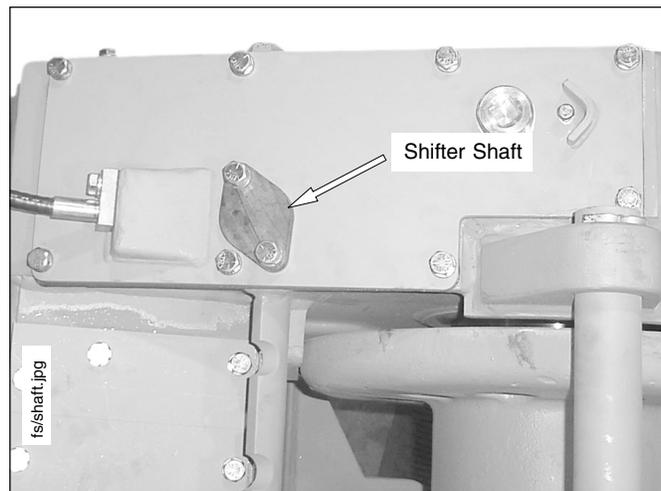
11. Lockwire as shown.



13. Assemble crank shaft, crank and freespool cable on cover as shown.



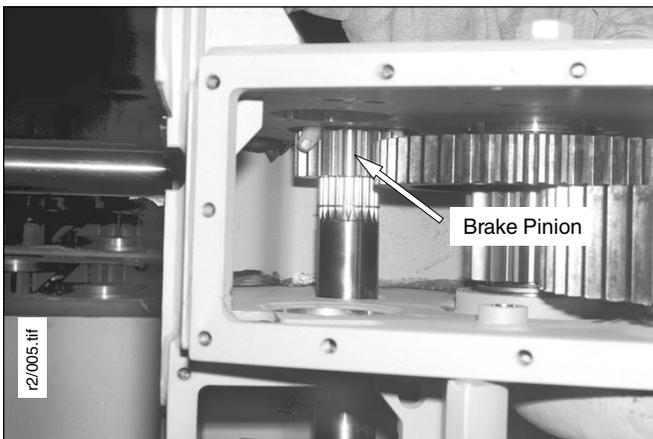
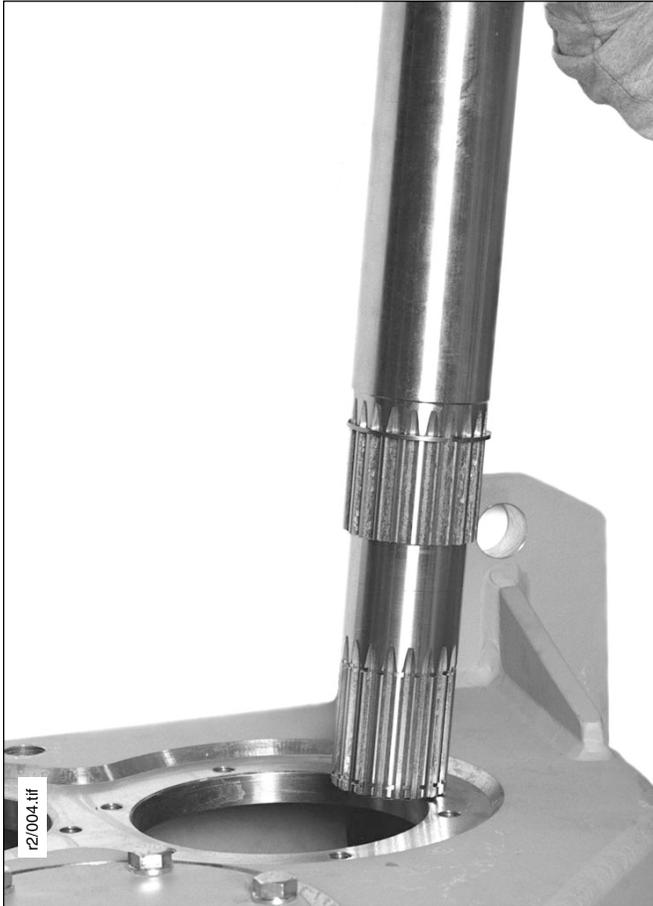
12. Install cover. Tighten capscrews on shifter shaft to 75 ft-lbs (10 kg-m).



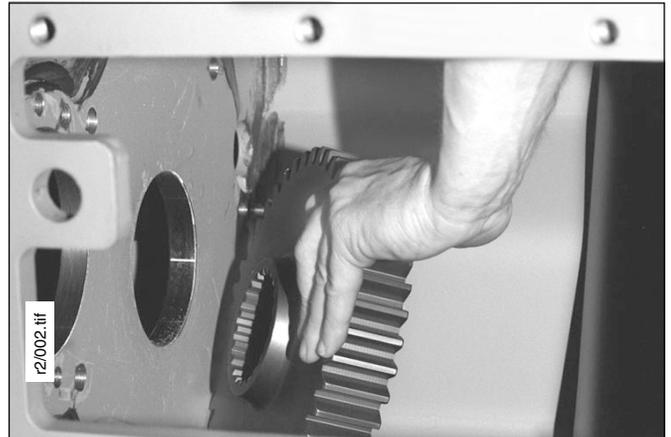
**Brake Shaft Installation**

The brake shaft and reduction gear must be installed before installation of the clutch shaft assembly.

1. Place shaft into winch housing and press pinion and bearing cone on right-hand end of brake shaft.



2. Install reduction gear and bearing cone on the left-hand end of the shaft.



**CAUTION**

**CAUTION:** Install gear with the long hub side towards the left-hand end of the shaft.

3. Install left-hand bearing cup into housing.



**NOTE:** Be careful not to bump shaft or cup will come out of bore.

4. Install right-hand bearing assembly and retainer without shim pack and tighten capscrews securely. Do not tighten to final torque at this time. Leave O-ring off retainer at this time.



5. Adjust shaft endplay as follows:
  - a. Using moderate pressure tap RH bearing retainer to seat brake shaft components.
  - b. Loosen the capscrews previously installed in Step 4 above. Tighten capscrews finger tight only.
  - c. Measure gap between retainer and winch frame in three places around retainer. Add the three measurements and divide by 3 to obtain the average gap. Assemble shim pack 0.000 to 0.004 in. (0.000-0.102 mm) less than the average gap. This will place the desired preload on the brake shaft bearings.

**NOTE: the clutch shaft and brake assembly must be installed prior to adjusting the brake shaft endplay. See the following Oil Brake Reassembly and Installation section.**

6. Coat winch frame and retainer with sealing compound. Replace RH bearing retainer complete with final shim packs and O-rings. Use Loctite between shims for sealing in place. Tighten six capscrews to 75 ft-lbs (10 kg-m) torque.

**Oil Clutch Reassembly**

**⚠ CAUTION**

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

**NOTE:** Reassembly is essentially the same for both the forward and reverse clutches.

1. Install two new O-rings in piston housing. Lubricate piston cavity with O-ring lube.



**NOTE:** It may be necessary to stretch the large O-ring so that it will stay in its groove during installation of the piston.

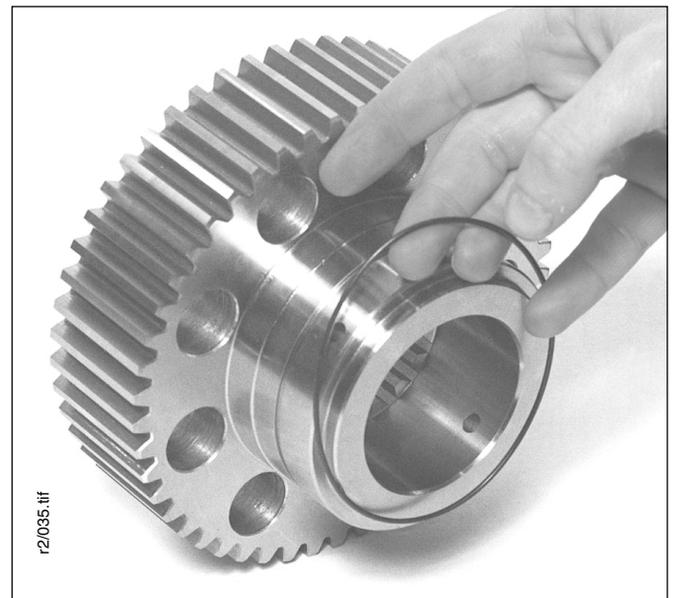
2. Carefully install the piston in the housing.



3. Install the spring retainer so holes are properly sequenced.



4. Install new O-ring on the hub. Lubricate with O-ring lube.



# Repairs - Oil Clutch Reassembly

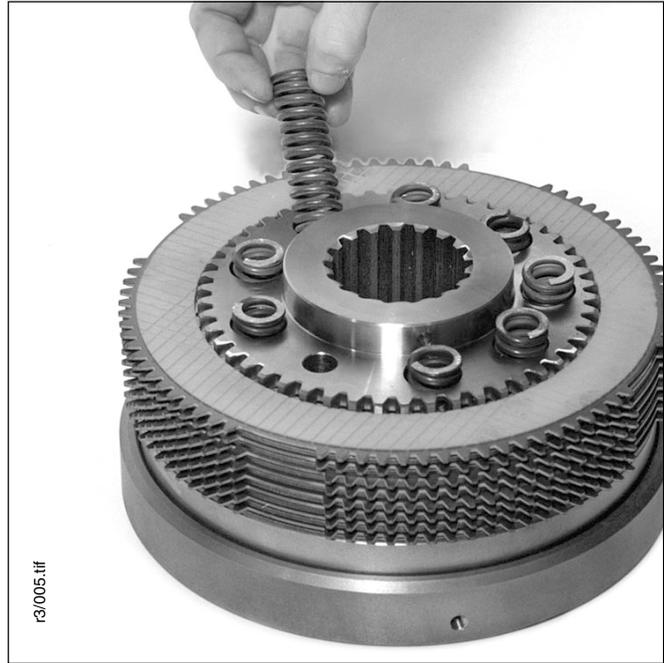


5. Install hub in piston housing. Ensure that the holes are properly sequenced with those in the piston housing.

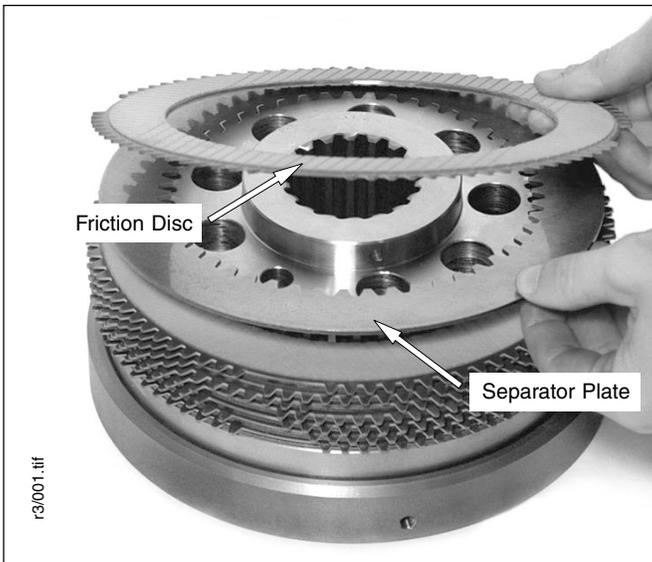


**NOTE: Keep the blanked-out teeth of the friction discs in line.**

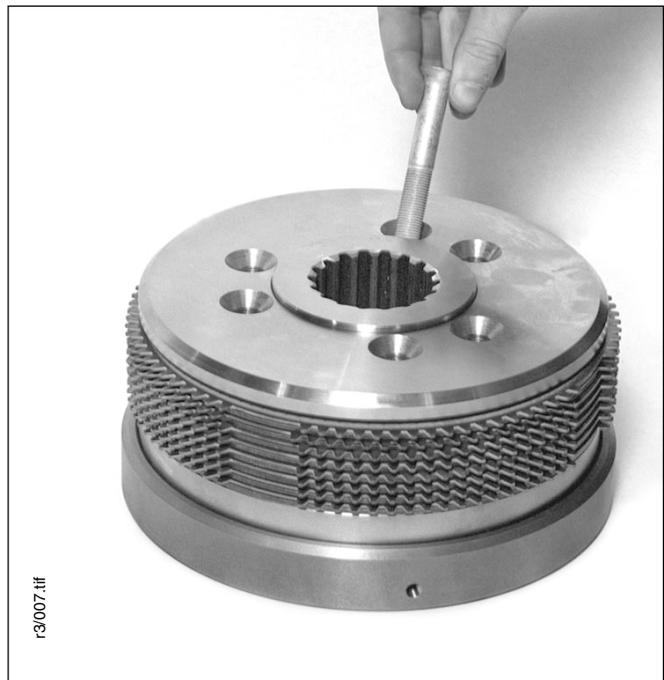
7. Install the release springs and 2 pins. The W6F and W8L use 8 springs, whereas the W12E uses 11 springs.



6. Starting with a separator plate on the hub, alternately place the separator plates and the friction discs on the clutch hub. The W6F uses 6 friction discs and separator plates, while the W8L and W12E use 8 friction discs and separator plates.



8. Install shims as tagged during removal.
9. Install the cover plate and capscrews as marked during disassembly. The W6F uses 6 capscrews, while the W8L and W12E require 8.



**NOTE: For W6F winches equipped with metallic friction discs, separator plates are slightly conical (dished). All the plates must be installed facing the same direction.**

10. Torque capscrews to 70 ft-lbs (10 kg-m).
11. Check clearance between the cover plate and friction discs in two places. Adjust shims (refer to Step 8) only as necessary to produce a clearance of 0.140-0.180 (3.6-4.6 mm) for all winches with paper frictions. For W6F models with metallic frictions, the clearance should be 0.085-0.125 inches (2.2-3.2 mm).



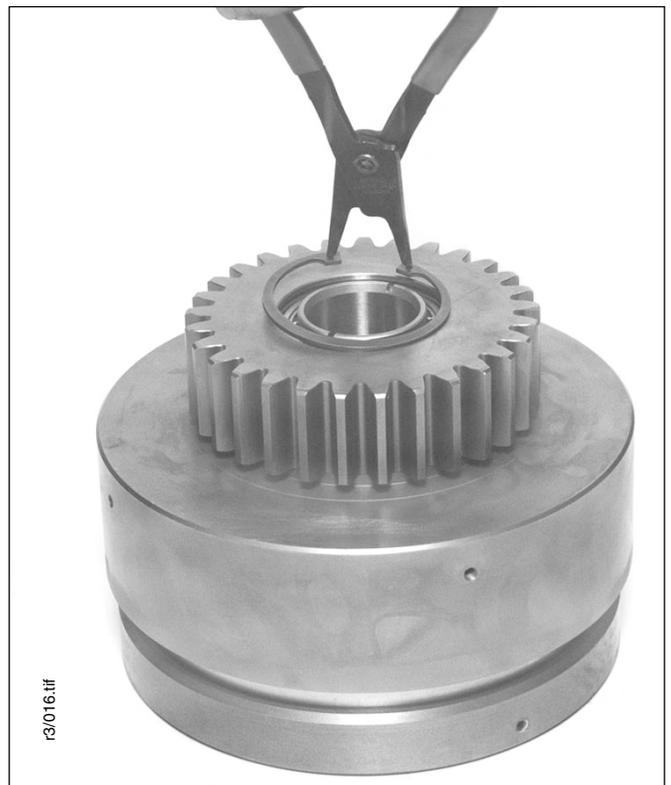
**CAUTION**

**CAUTION:** Cover plate must NOT extend above the face of hub regardless of specified clearance. Recheck clutch for proper assembly if this should occur.

12. Tighten setscrews to 40 ft-lbs (6 kg-m).
13. Carefully place spider/pinion assembly over clutch pack. Ensure the friction discs do not move out of alignment. Align blanked out teeth.



14. **This step applies to the forward clutch only.** Install roller bearing and carrier as tagged during removal. Secure with snap ring in the pinion bore.

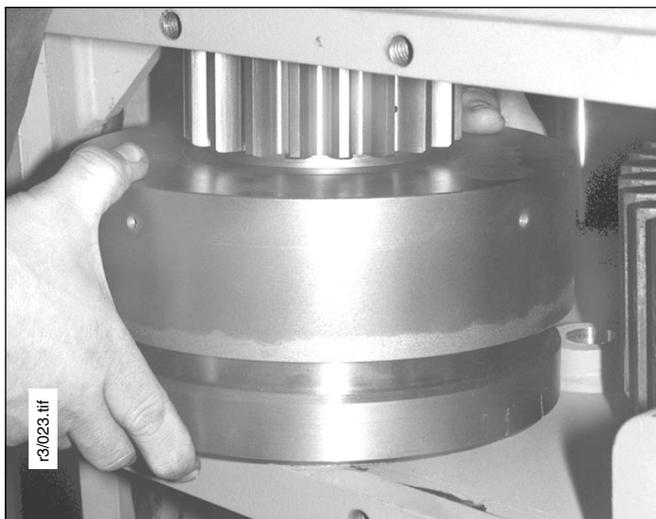


## Clutch Shaft Reassembly and Installation

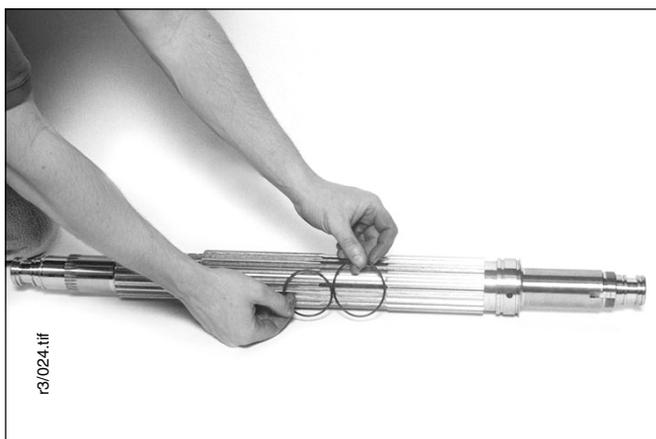
See Figure 4-1 for the location of clutch shaft components.

**NOTE: The reduction gear (see Brake Shaft Installation, Step 2) must be installed before installation of the clutch shaft assembly. This is due to insufficient clearance for installing the reduction gear when the bevel gear shaft is installed.**

1. Using lifting eye installed in the spider or in the piston housing oil hole, lower the reverse clutch assembly into the housing.

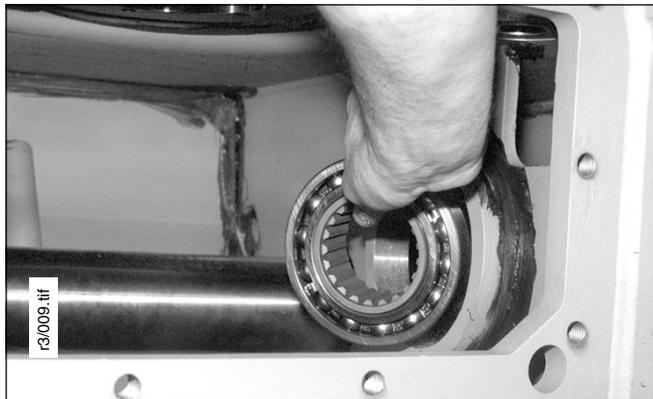


2. Install new O-rings on the clutch shaft and lubricate the entire shaft.



3. Position the clutch shaft so the blanked-out tooth is up. The pipe plug in the RH end of the shaft will be down.

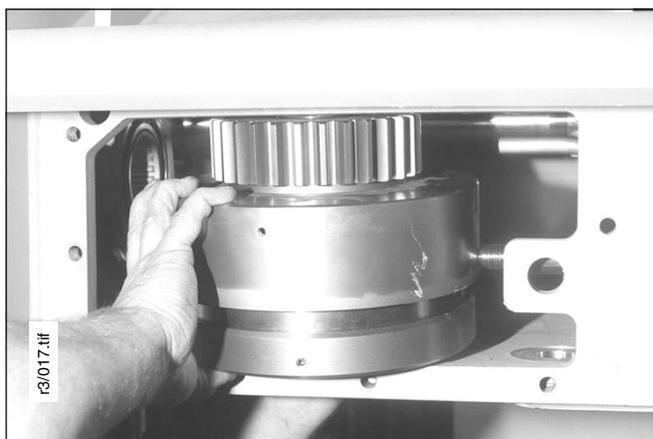
4. Install ball bearing and bearing carrier.



5. Place the pump drive gear in the housing as shown. The drive gear can be held in position by temporarily installing capscrews from the RH clutch shaft retainer into the two threaded holes provided in the gear. Ensure that the dished side of the gear faces toward the brake compartment.



6. Install forward clutch assembly into the housing.



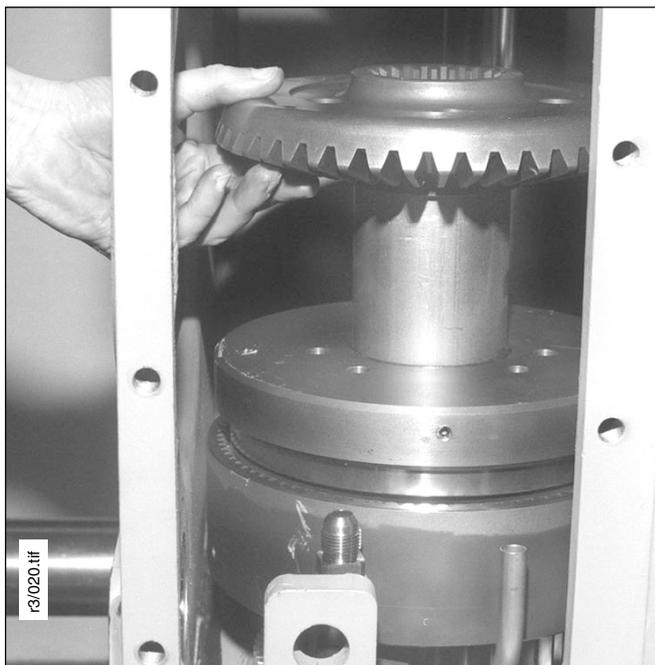
**NOTE: Keep the oil hole plug in the piston housing on top. Scribe a vertical line on the housing for alignment with blanked-out spline on shaft.**

**NOTE: Ensure that the bearing and bearing carrier are installed as shown in the Oil Clutch Reassembly section, Step 14.**

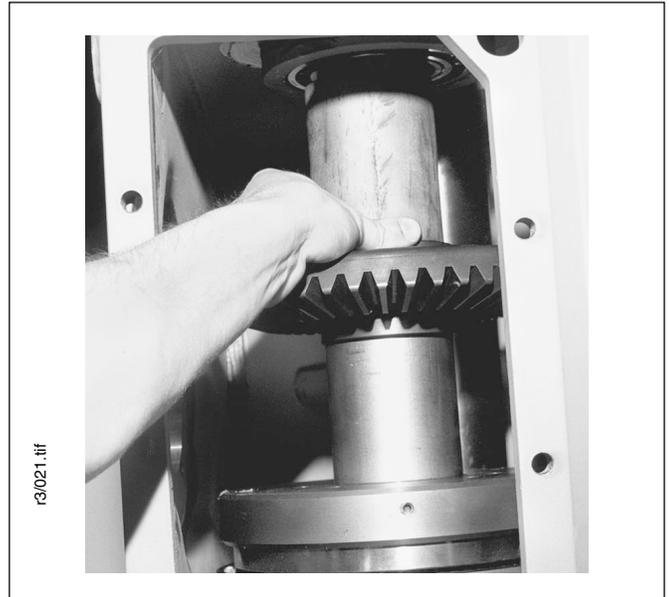
7. Install spacer next to forward clutch.



8. Insert the ring gear.



9. Insert clutch shaft far enough to install spacer between bevel gear and bearing and carrier.



**NOTE: Bevel gear and spacers are shown for clockwise PTO shaft rotation (as viewed from behind tractor). For D65, D75, Fiat-Hitachi/New Holland tractors install bevel gear as shown in Figure 4-1.**

10. To install the clutch shaft in the forward clutch assembly, the blanked-out tooth on the shaft spline must engage the alignment dowel in the forward clutch hub. Mark the right-hand end of the shaft to indicate the position of the blanked-out tooth. Rotate the clutch shaft so that the blanked-out tooth on the shaft is facing up and therefore in alignment with the oil plug hole in the clutch piston housing (refer to Step 6). Using the capscrew in the pump drive gear, position the gear so that the shaft can be pushed through the clutch assembly and gear. Use a pry bar to hold the forward clutch to the right so that the shaft can be pushed through far enough to facilitate lining the pump gear up on the shaft.





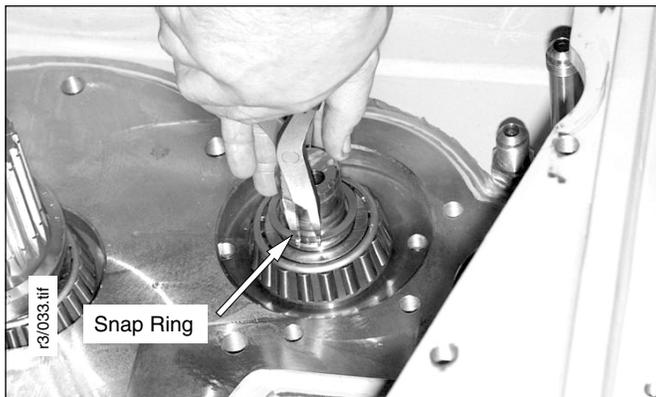
## CAUTION

**CAUTION:** Be sure to replace the pipe plug if it is removed from piston housing oil hole in order to install the lifting eye.

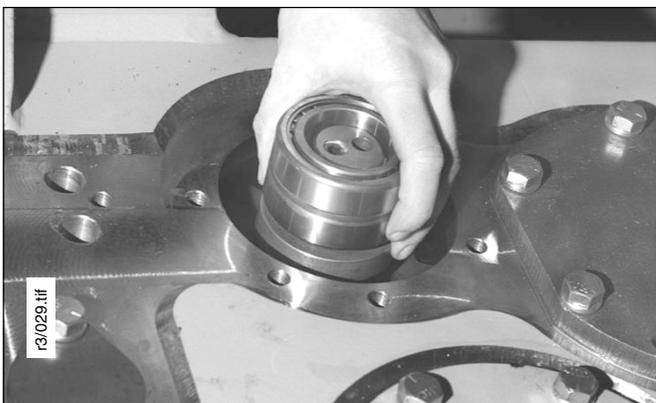
11. Remove capscrews from pump drive gear and install tapered roller bearing cone on left-hand end of the clutch shaft.



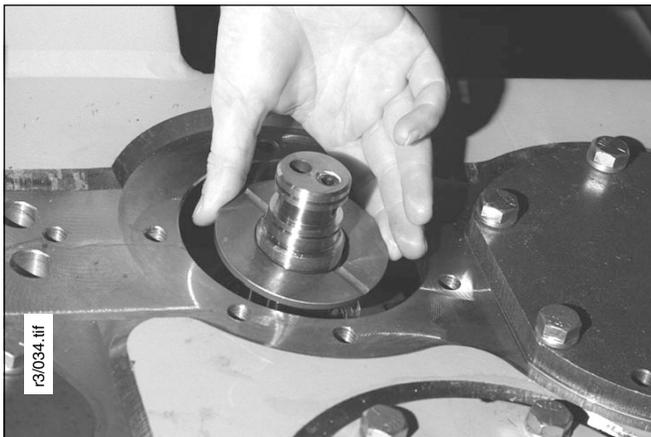
12. Secure the bearing with the snap ring.



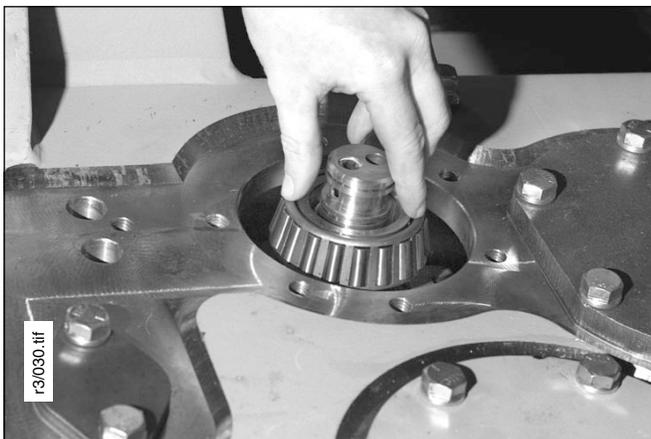
13. Pull shaft back towards the right. Install the roller bearing and carrier in the reverse clutch assembly and secure with the internal snap ring.



14. Install the thrust washer over the right-hand end of the shaft.



15. Install the tapered roller bearing.



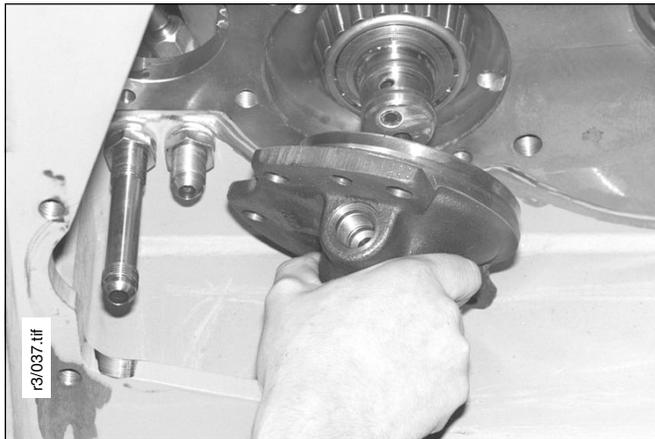
16. Install the lock ring and special nut as shown.



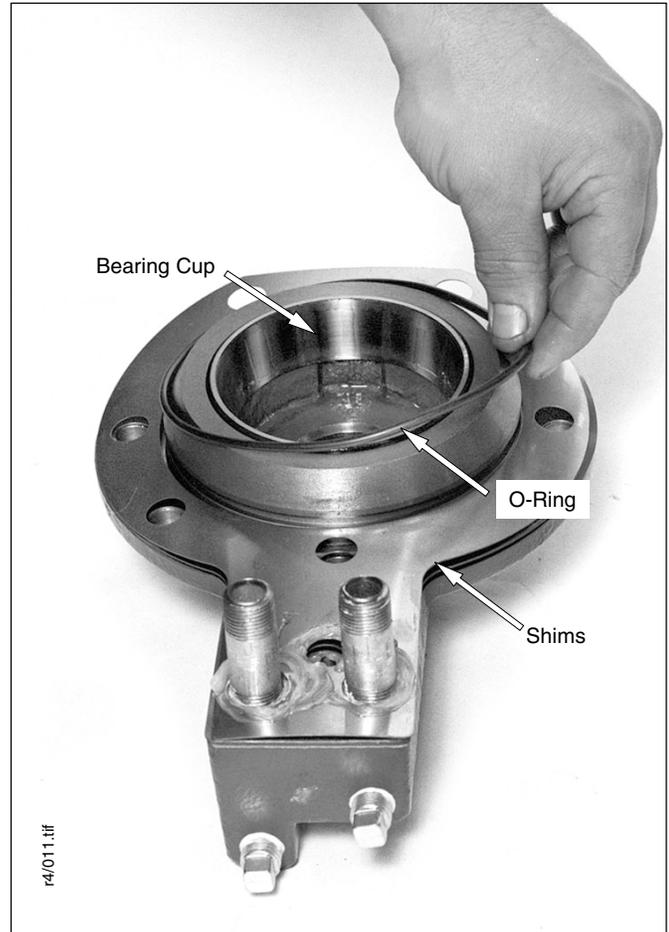
17. Use special tool specified in Figure 4-35 to tighten the locknut to 200 ft-lbs (28 kg-m). Bend two locking tangs over flats of locknut.



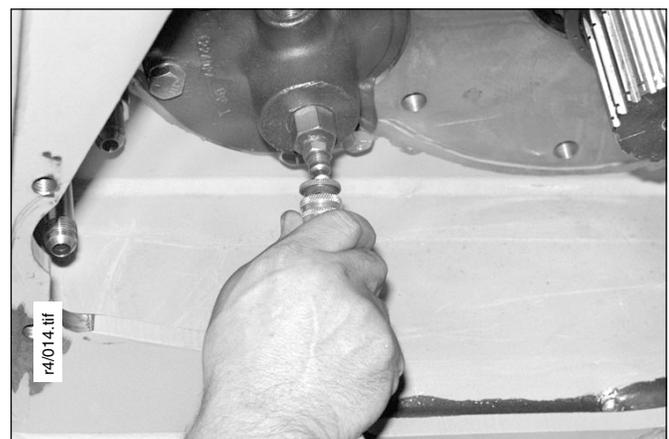
18. If removed, install bearing cup in the left-hand retainer. Assemble an approximately 0.025 in. (0.635 mm) shim pack on the left-hand bearing retainer, then install retainer. Tighten capscrews securely. Do not tighten to final torque or install cast-iron seal rings at this time.



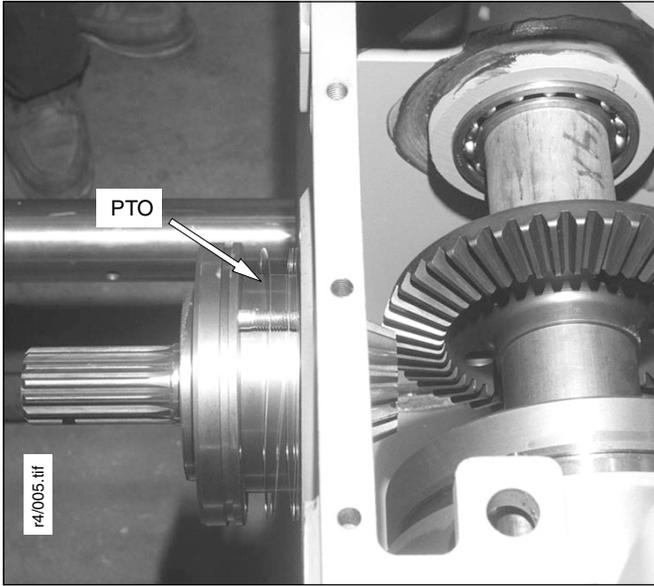
19. If removed, install bearing cup and O-ring in the right-hand retainer. Assemble a shim pack approximately 0.040 in. (1.02 mm) thick on the right-hand bearing retainer and install retainer. Do not install cast iron seals. Tighten capscrews securely. Do not tighten to final torque at this time.



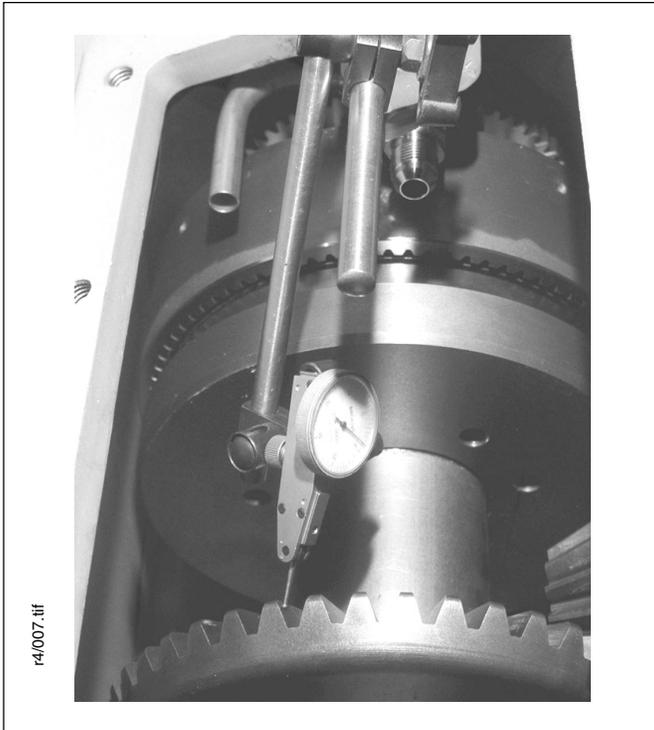
20. Apply air pressure to oil port on each end of the shaft and check clutch piston for movement. When air pressure is applied piston should move approximately 1/8 inch (3 mm) to 3/19 inch (5 mm).



21. Assemble PTO shaft as described in the **PTO Shaft Reassembly and Installation** section, if previously disassembled. Install PTO and add or subtract shims to get heel to heel contact. Tighten capscrews to 75 ft-lbs (10 kg-m). Lockwire capscrews upon completion of shimming.



22. Connect dial indicator as shown. Add or subtract shims from the two clutch shaft bearing retainers to obtain zero endplay. When zero endplay is obtained, subtract 0.000 to 0.004 in. (0.00 to 0.10 mm) of shim(s) from the retainers. This will provide the desired preload on the clutch shaft.

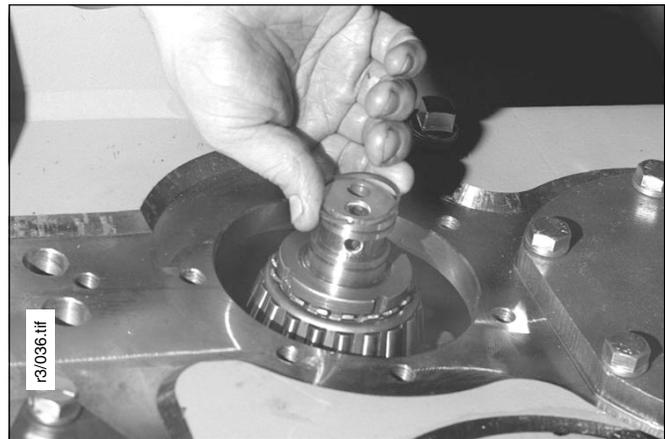


**NOTE: Adding or subtracting shims from these retainers will affect pinion-to-bevel gear backlash. See step 23.**

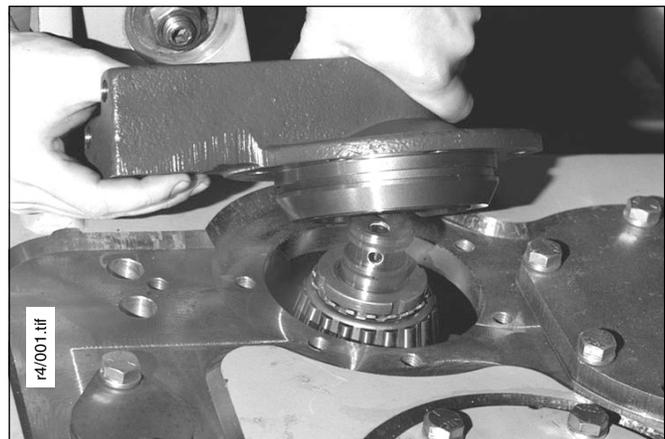
23. Use dial indicator to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.014 in. (0.152-0.356 mm). If less than 0.006 in. (0.152 mm) remove shims from right-hand bearing retainer as required. Add same amount to left-hand retainer to maintain endplay (preload). RH and LH shims are not interchangeable.

**NOTE: Prior to checking pinion-to-bevel gear backlash place the clutch shaft in a normal operating position by forcing the ring gear away from the pinion gear laterally along the clutch shaft. Check the gear contact as shown in PTO Shaft Reassembly and Installation section section, step 5.**

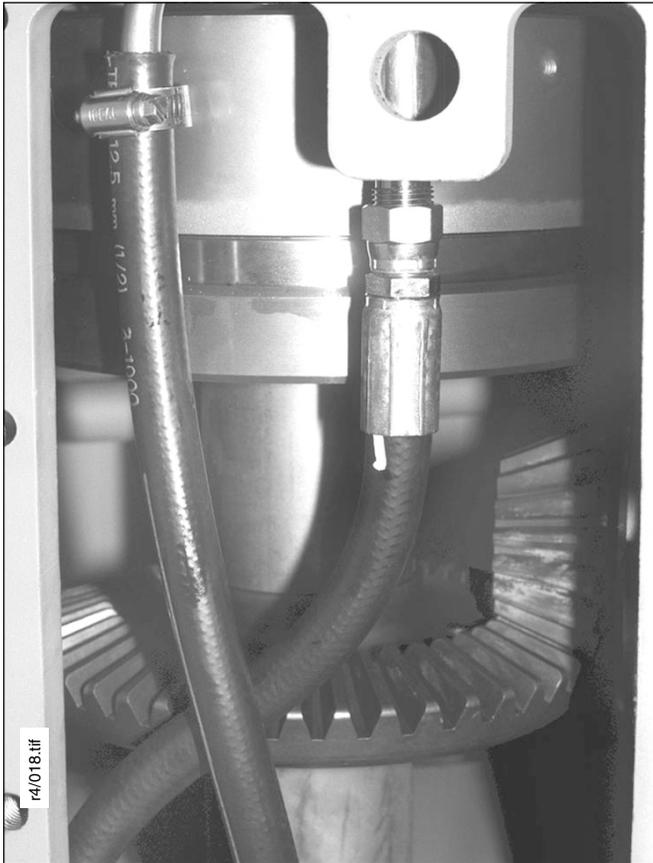
24. Remove both bearing retainers and install the cast iron seal rings.



25. Install a new O-ring on the bearing retainer. Lube bore and O-ring. Coat the shim packs with Loctite. Carefully install both bearing retainers with their finalized shim packs.



26. Tighten capscrews on both bearing retainers to 75 ft-lbs (10 kg-m).
27. Install clutch crossover hoses as shown and tighten securely. Twist pressure hose to route away from bevel gear. Lock in rotated position.



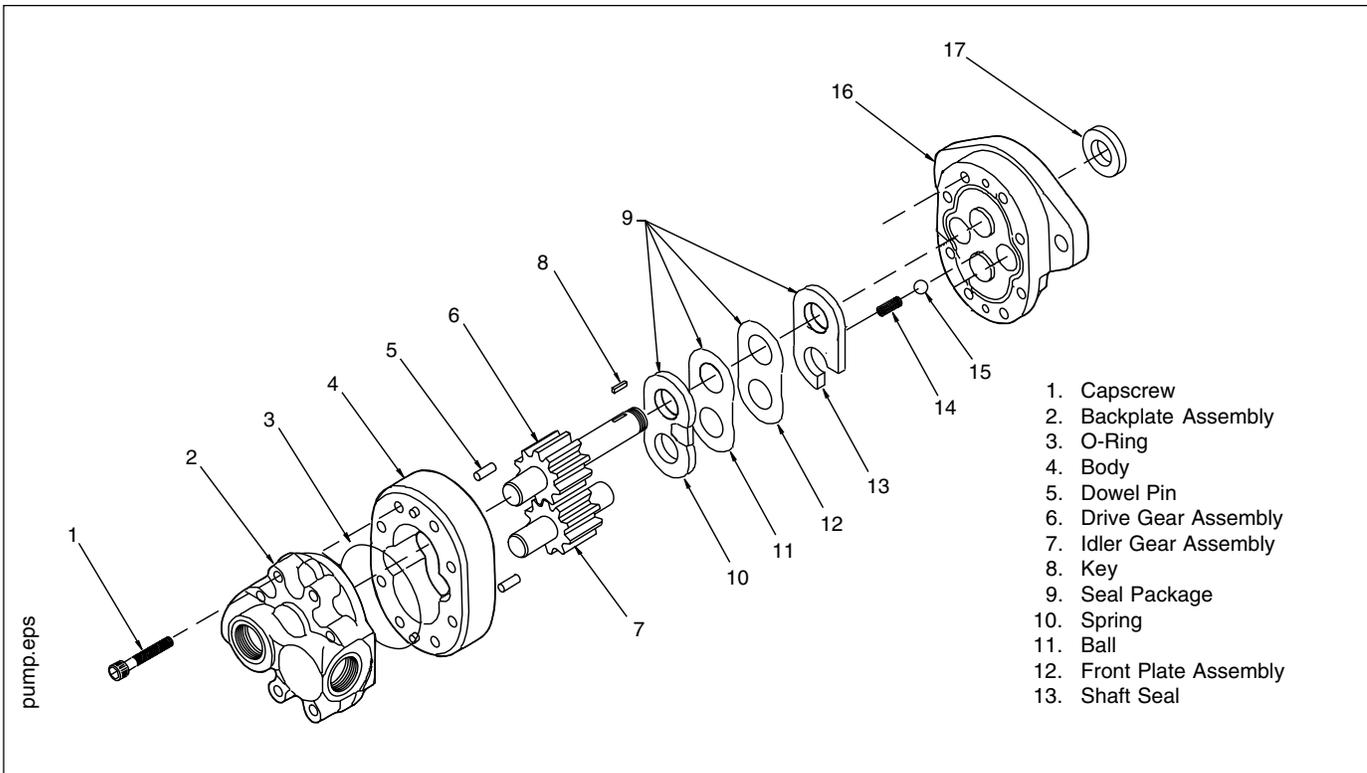


Figure 4-19 Hydraulic Pump

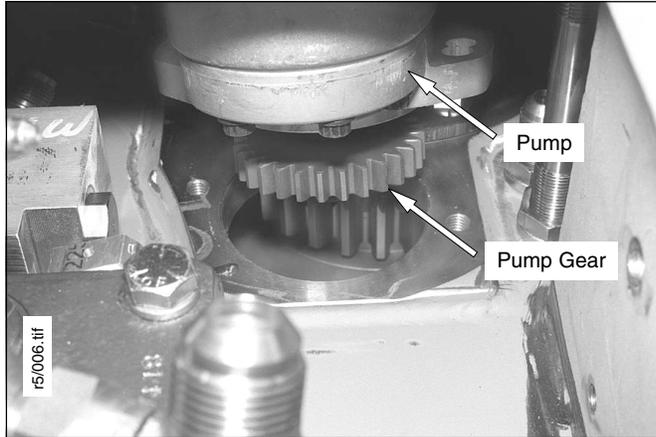
## Hydraulic Pump Reassembly & Installation

1. Replace as new parts seal kit (9), O-Ring (3), and shaft seal (17).
2. Tuck diaphragm seal (13) into grooves in front plate with open part of "V" section down.
3. Press protector gasket (12) and back-up gasket (11) into diaphragm seal.
4. Drop steel balls (15) into respective seats and place springs (14) over balls.
5. Place diaphragm (10) on top of back-up gasket - bronze face up.
6. Entire diaphragm must fit inside raised rim of the diaphragm seal.
7. Dip gear assembly into oil and slip into front plate bearings.
8. Install dowel pins.
9. Apply a thin coat of petroleum jelly to both milled gear pockets of body. Slip body over gears onto front plate with half moon port cavities in body facing backplate. Check if scribed location mark lines up.
10. Install O-Ring (3) in groove of backplate.
11. Slide backplate over gear shafts until dowel pins are engaged. Line up scribed location mark.
12. Place pump in vise, shaft down, and install capscrews (1). Torque evenly 25 to 28 lb/ft. (33.9 to 38.0 Nm).
13. Oil shaft seal (17) with petroleum jelly and work shaft seal over drive gear shaft taking care not to cut rubber sealing lip.
14. Seat shaft seal carefully by tapping with plastic hammer.
15. Add a generous portion of clean oil to both ports to ensure that the pump is adequately lubricated. Rotate pumpshaft by hand. Pump will have small amount of drag but should turn freely after short period of use.
16. Replace the driveshaft key (15).

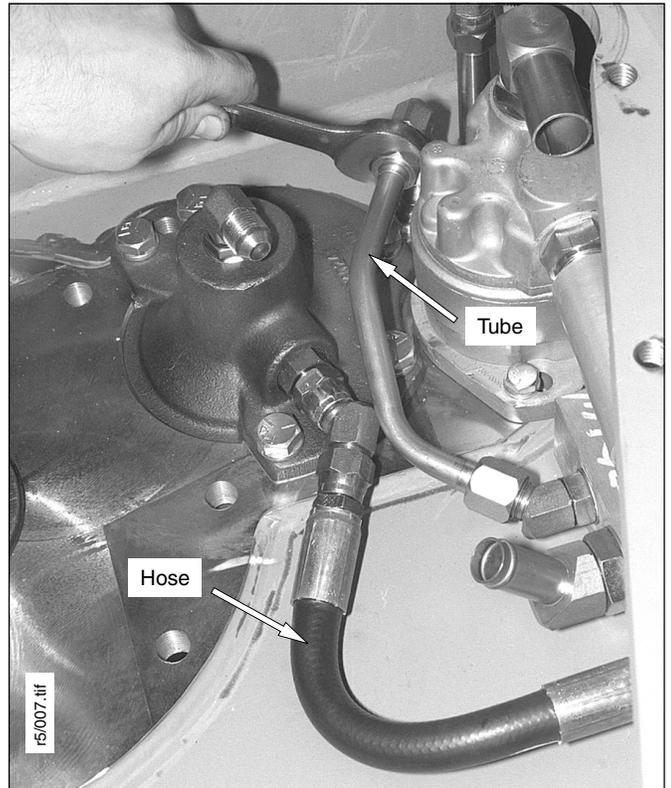
**NOTE: To prime the pump, fill it with heavy oil such as SAE 90W prior to installation. This is important to protect the pump from aeration during initial operation.**

## Pump Installation

1. Position pump in winch housing and secure with the two capscrews. Tighten capscrews to 25 ft-lbs (4 kg-m).



2. Install hoses and tube. Ensure they are tightened securely.

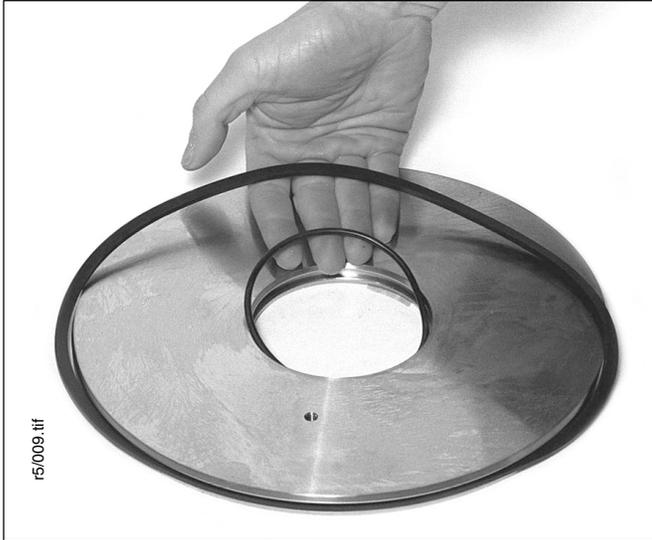


**NOTE:** Install hose before installing tube.

## Oil Brake Reassembly and Installation

Make sure the clutch shaft has been installed prior to installation of the brake assembly.

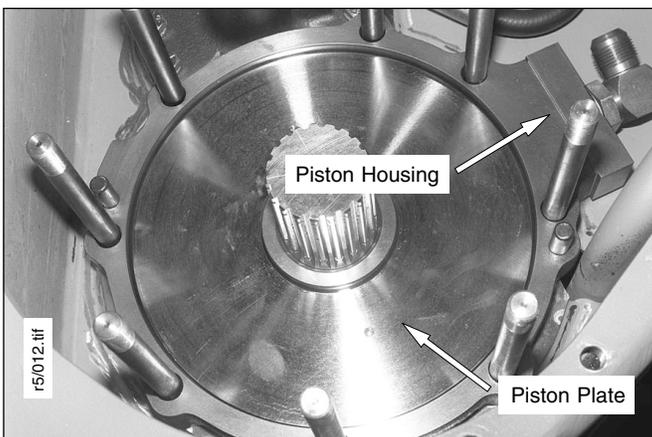
1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston housing.



### CAUTION

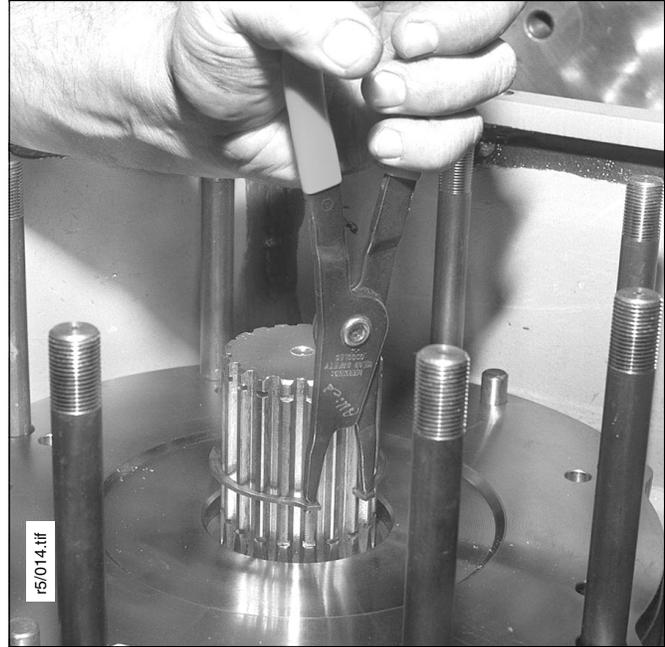
**CAUTION:** Use only Allied Systems Company-approved O-rings to ensure proper sealing.

2. Install piston in housing.
3. Ensure that the left-hand bearing is securely installed over the brake shaft.
4. Slide assembled piston and piston housing in place on studs.



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

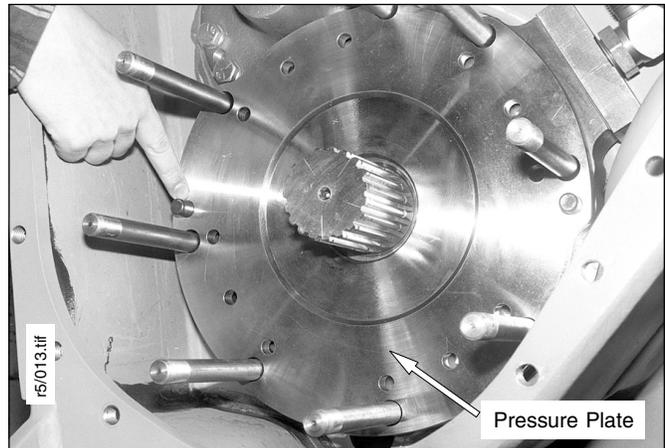
5. Install snap ring on W6F and W8L. The W12E uses a spacer.



### CAUTION

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

6. Install pressure plate. Push plate against piston housing. Then install dowel pins.



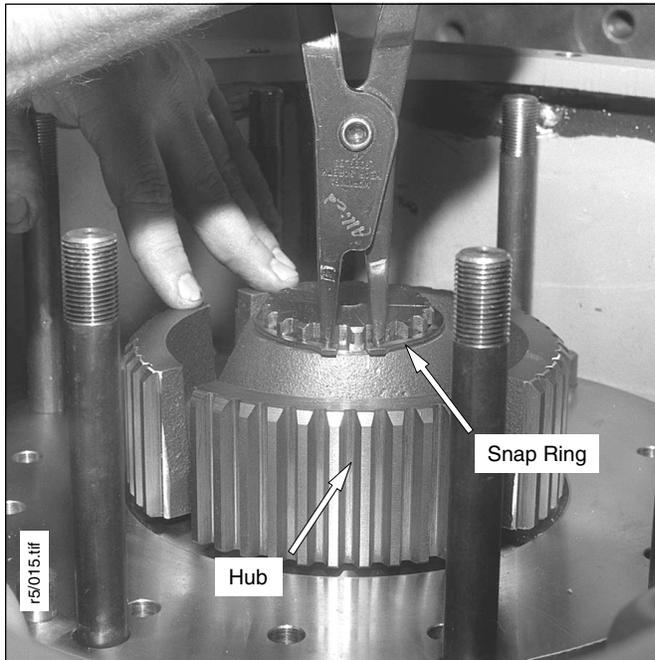
7. Install hub.



### CAUTION

**CAUTION:** Do not reverse hub. Dish must face out.

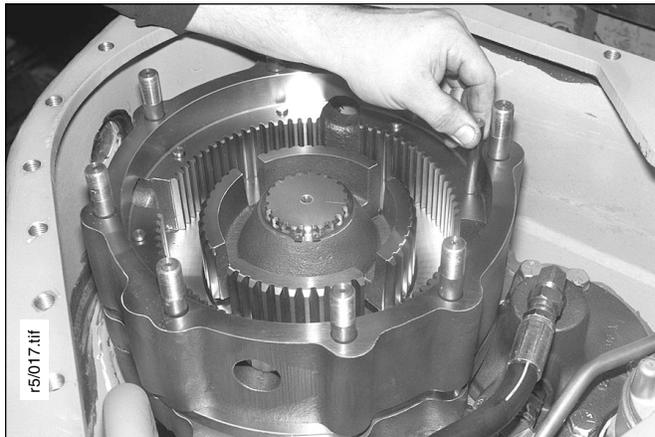
8. Install snap ring.



**CAUTION**

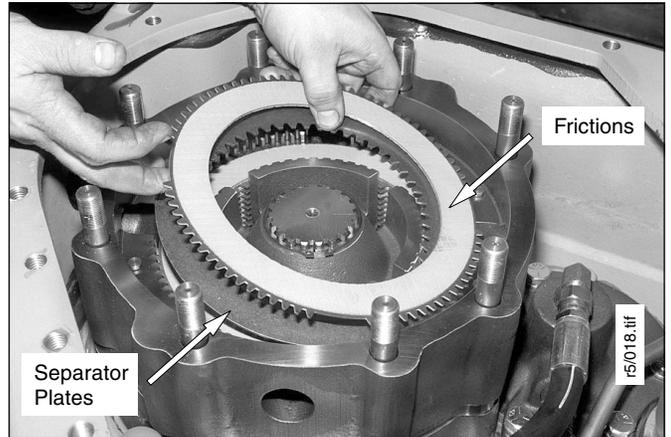
**CAUTION:** Make sure that snap ring is securely positioned in brake shaft groove.

9. Install cage against pressure plate. Then install 8 push pins.



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

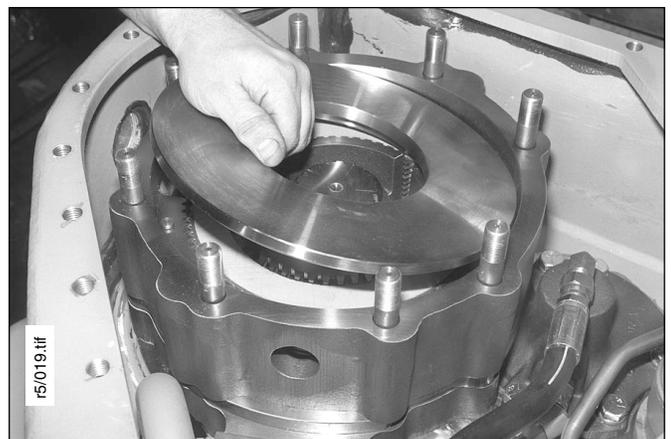
10. Install the friction discs and separator plates alternately starting with a friction disc. Align blanked-out teeth on all friction discs. 10 friction discs and 9 separator plates are used.



**CAUTION**

**CAUTION:** For W6F winches prior to W6F-1689 equipped with 7 metallic friction discs, the 6 separator plates are conical (dished). Face all separator plates in the same direction. All dished sides must face either inward or outward.

11. Install spacer in early W6F winches only (not shown).  
12. Install thrust ring, smooth side out.



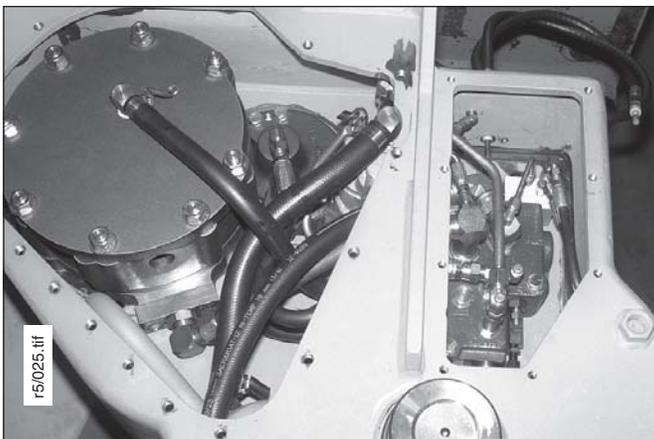
13. Install belleville spring with curved side pointing outward. W6F and W8L winches use one belleville spring, whereas the W12E requires two.



15. Install winch covers.



14. Install cover and secure with 8 nuts and washers. Tighten nuts alternately to 130 ft-lbs (18 kg-m). Install the brake pressure and cooling lines removed during disassembly.



## PTO Shaft Reassembly and Installation

**NOTE:** If equipped with a dropbox refer to Figures 4-27 to 4-34 for location of components. Assembly of the PTO shaft is essentially the same for most tractors as shown in steps 1 through 5.

1. Install new oil seal in the bearing carrier.
2. Install bearing and secure with snap ring.
3. Place the carrier on the shaft, taking care not to damage the seal.
4. Place bevel pinion on shaft and secure with snap ring. For low-speed on W12E PTO shafts, use Loctite and torque to 100 ft-lbs (13.8 kg-m).
5. Assemble shim pack and install PTO shaft as described in the Clutch Shaft Reassembly and Installation section, steps 21 through 23. Coat the ring gear teeth with Prussian Blue and rotate the PTO shaft to check the gear contact.

**NOTE:** If equipped with a dropbox, the PTO shaft assembly should be assembled and installed as described in the Clutch Shaft Reassembly and Installation section, step 21. After the PTO shaft is installed the adapter box can be placed over the PTO shaft assembly and secured with the winch.

### Correct/Incorrect tooth contact:

A high contact indicates pinion is too far out. Set the pinion to the correct depth by removing shims from the carrier.

A low contact indicates pinion is too deep. Set the pinion to the correct depth by adding shims to the carrier.

6. Install PTO coupling on shaft and secure with lockpin and spiral snap ring. Ensure that the snap ring is installed securely.

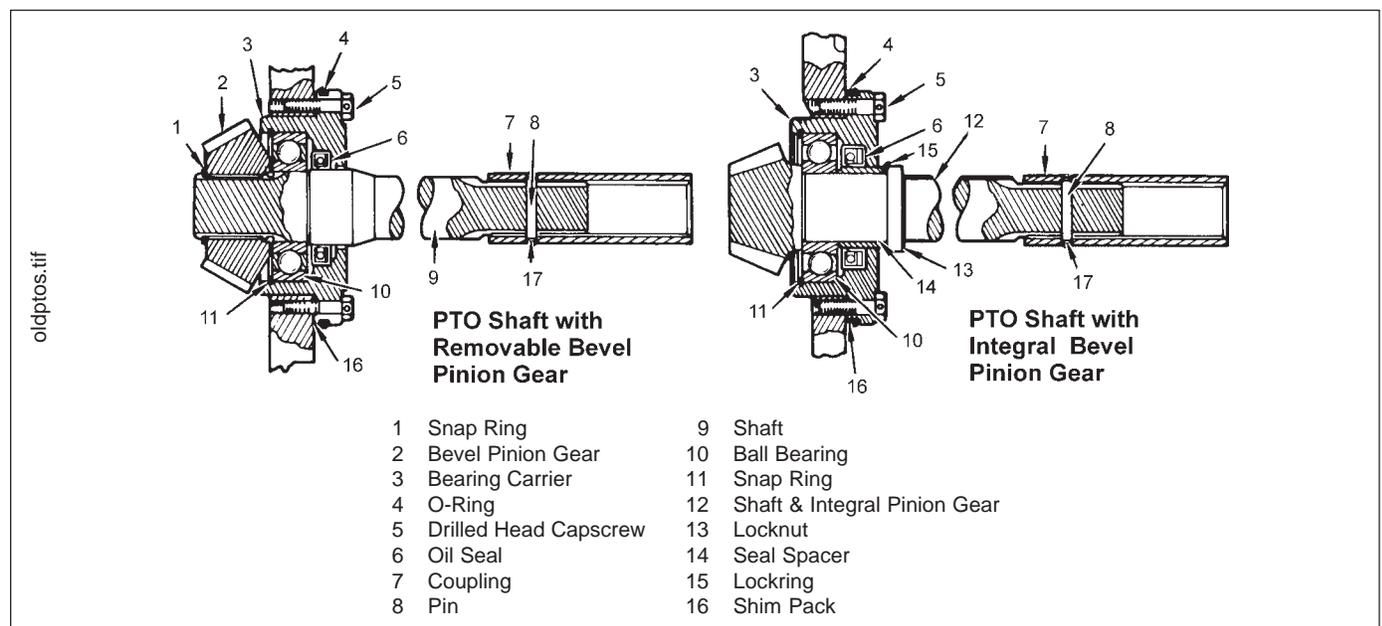


Figure 4 -22 PTO Shafts - Last Used on W6FP-3699, W6FX-3699 & AW6F-1000; Last Used on W8LP-2099 & AW8L-1000; Current on W12E

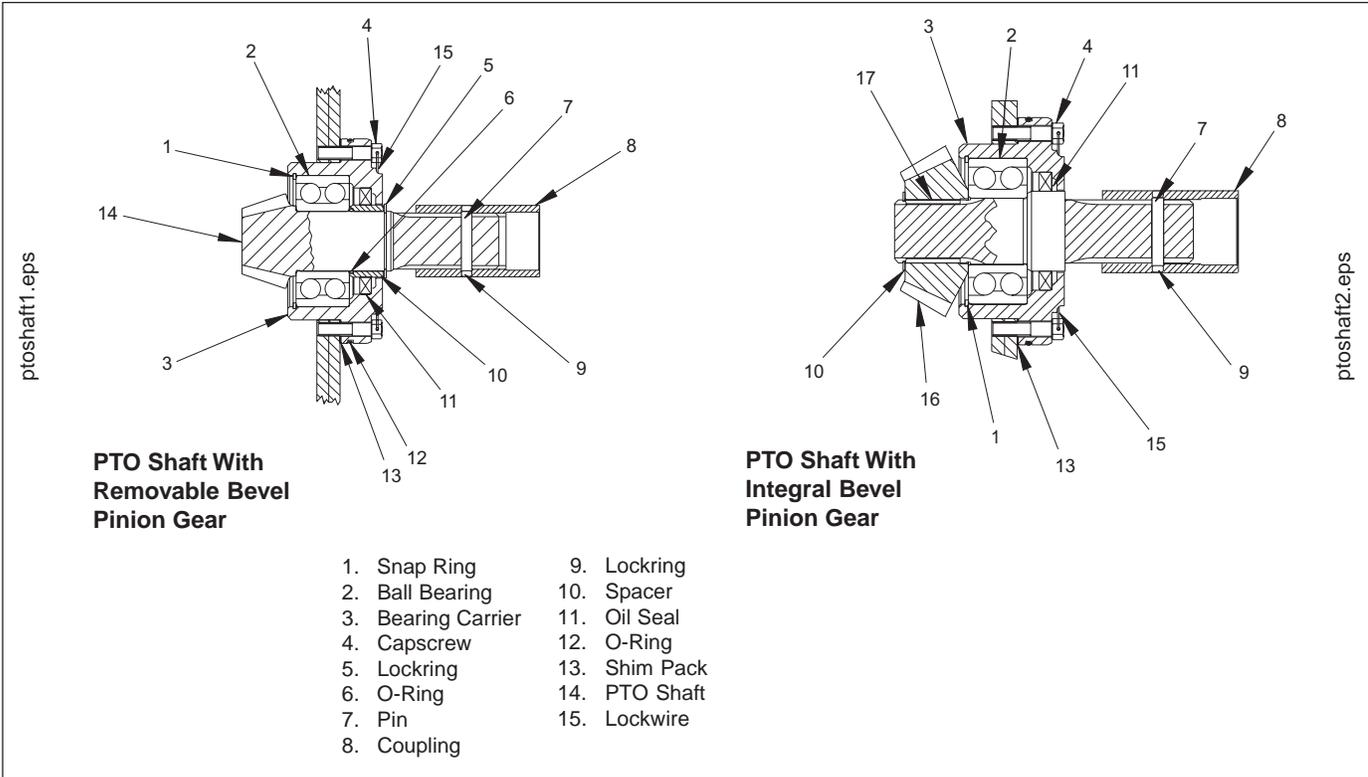


Figure 4-23 PTO Shafts, First Used on AW6F-1001 & AW8L-1001

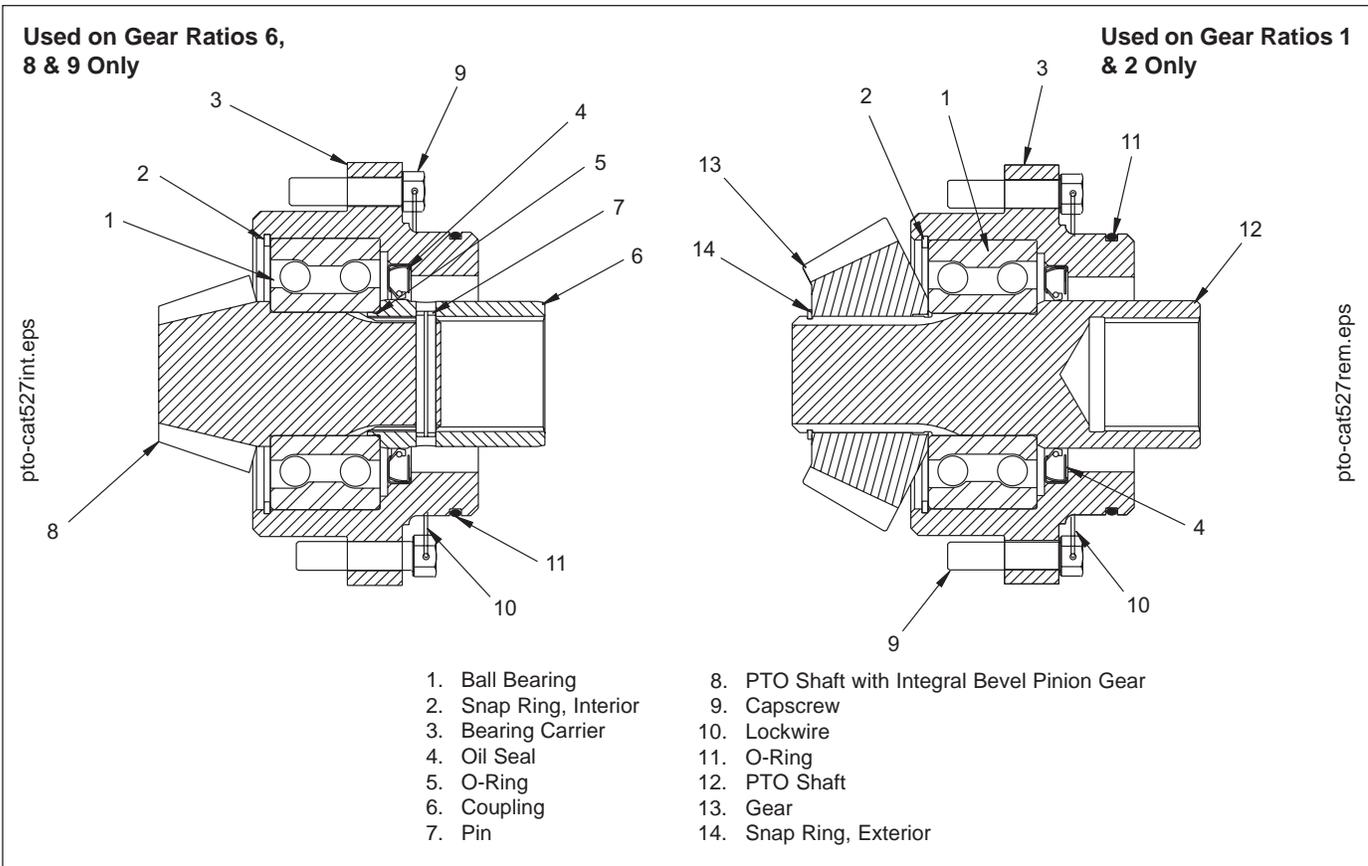
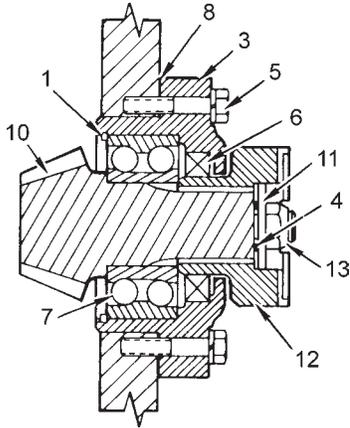
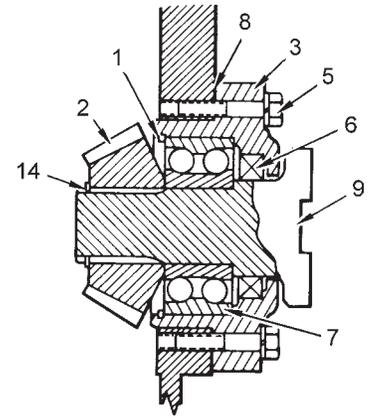


Figure 4-24 PTO Shaft on W6F for Caterpillar 527

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1. Snap Ring
2. Bevel Pinion Gear
3. Bearing Carrier
4. O-Ring
5. Capscrew & Washer
6. Oil Seal
7. Ball Bearings
8. Shim Pack
9. Shaft
10. Shaft with Integral Pinion
11. Washer
12. Yoke
13. Nut
14. Snap Ring

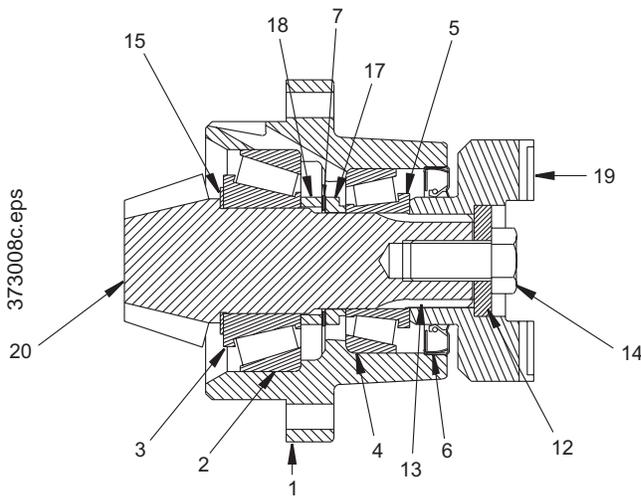


oldjdp2.tif

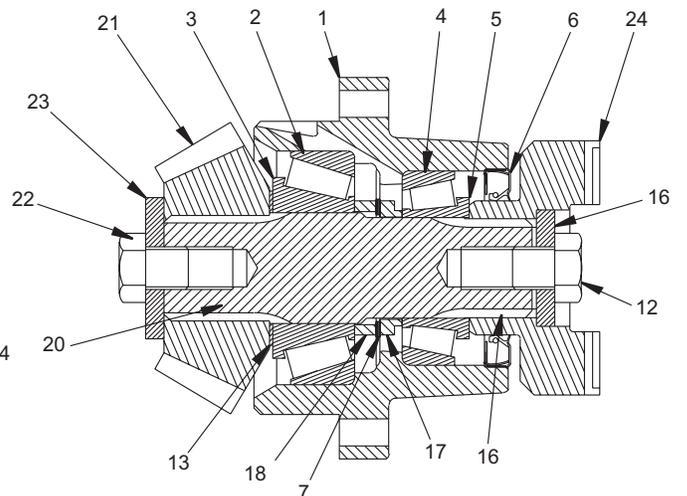
**John Deere 755**  
**John Deere 750 - Last Used on W6F-7143 & AW6F-1000**

**John Deere 855**  
**John Deere 850 - Last Used on W6F-7143 & AW6F-1000**

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1. Bearing Carrier
2. Bearing Cup
3. Bearing Cone
4. Bearing Cup
5. Bearing Cone
6. Seal
7. Shim Pack
12. Washer
14. Capscrew
15. Thrust Washer
17. Spacer
18. Spacer
19. Yoke
20. Shaft
21. PTO Shaft
22. Gear
23. Capscrew
24. Washer



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**John Deere 750/850 - First Used on W6F-7144 & AW6F-1001**  
**John Deere 750/850A**  
**John Deere 750/850B - First Used on W6F-7144 & AW6F-1001,**  
**Gear Ratios 3, 4, 6, 8 & 9 Only**  
**John Deere 750/850C, Gear Ratios 6, 8 & 9 Only**

**John Deere 750/850B & 750/850C, Gear Ratios 1 & 2 Only**

**Figure 4-25 W6F John Deere PTO Shafts**

# Repairs - PTO Shaft Reassembly & Installation

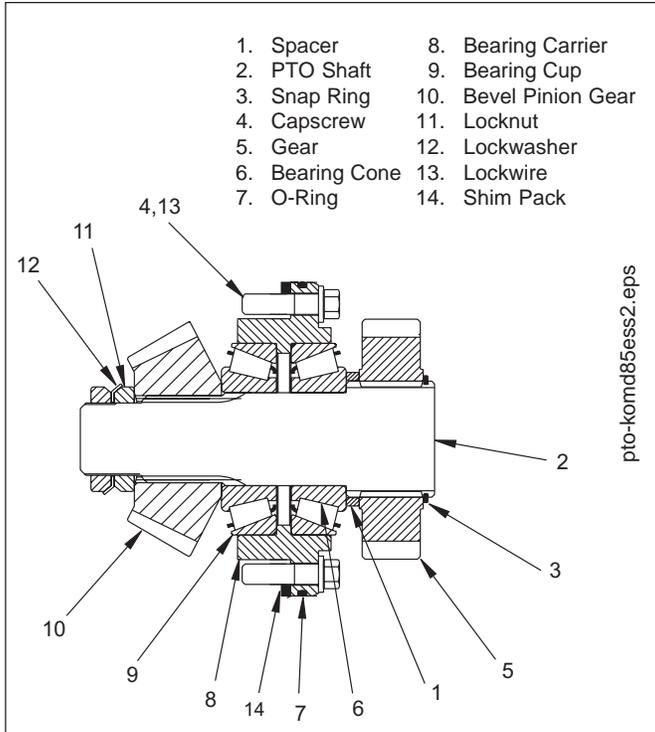


Figure 4-26 PTO Shaft on W8L for Komatsu D85ESS-2

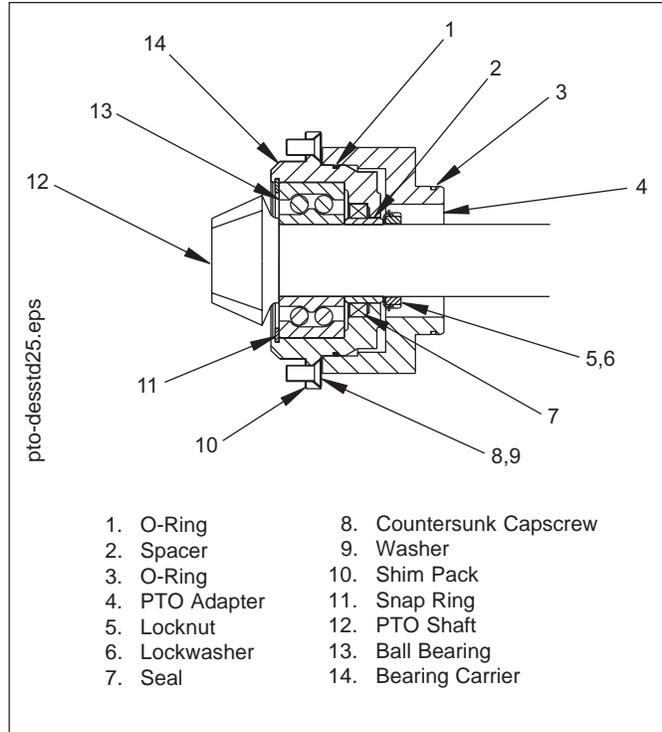


Figure 4-27 PTO Shaft on W12E for Dresser TD25E/G

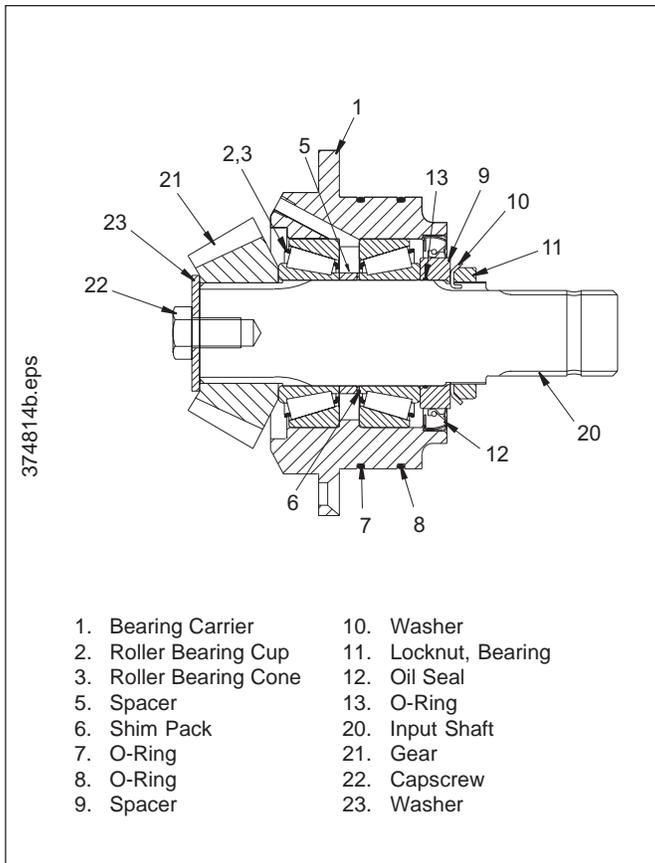


Figure 4-28 PTO Shaft on W12E for Caterpillar D8,L, D9N & D10N; Komatsu 375A-1; New Holland FH/FD30B

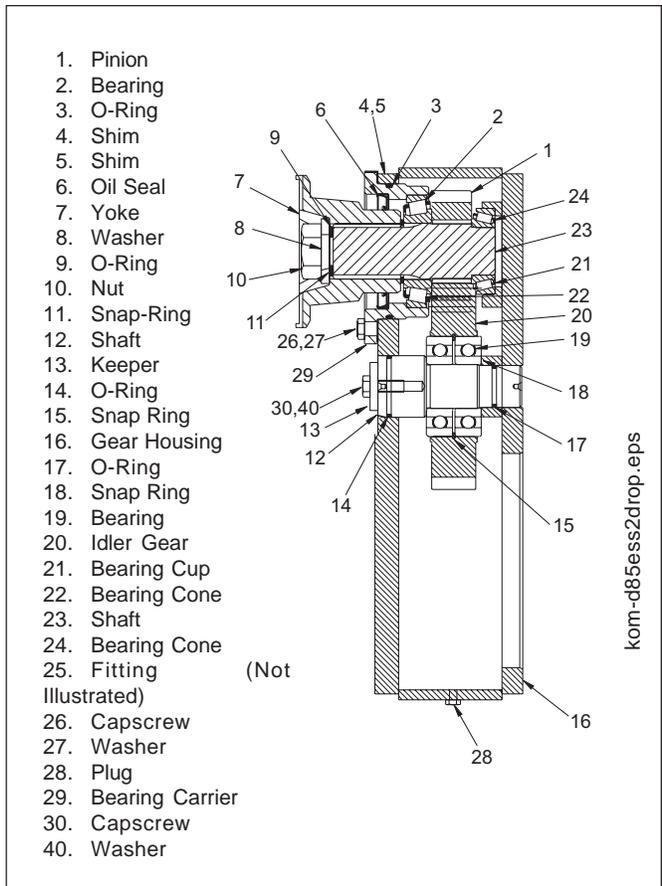
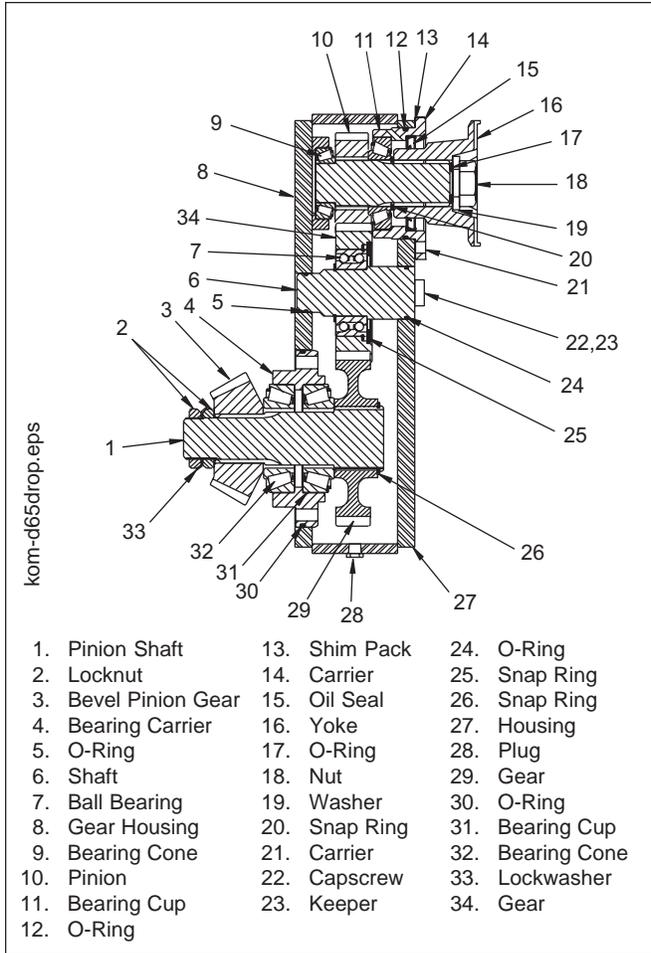
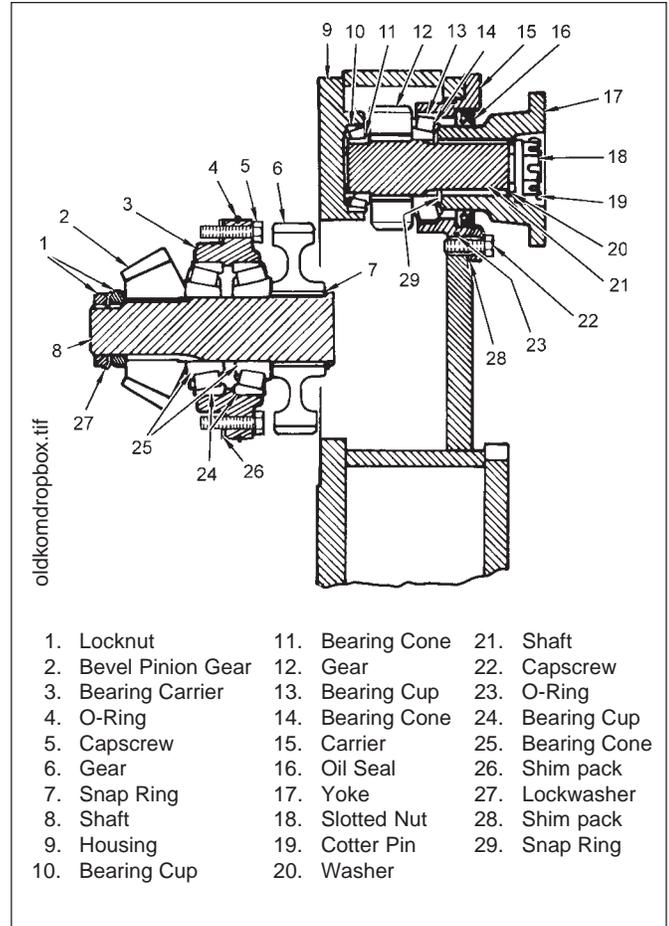


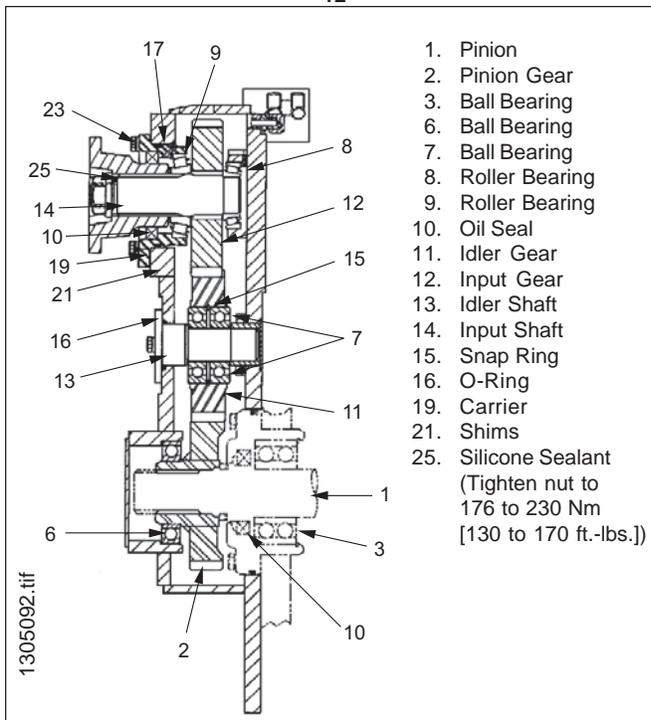
Figure 4-29 Dropbox on W8L for Komatsu D85ESS-2



**Figure 4-30 Dropbox on W6F for Komatsu D61EX-12 & D65EX-12**



**Figure 4-31 Dropbox on W6F for Komatsu D65E-6, D65E-7, D65E-8 & D68E-1**



**Figure 4-32 Dropbox on W8L for Komatsu D83-1 & D85ESS-2**

# Repairs - PTO Shaft Reassembly & Installation

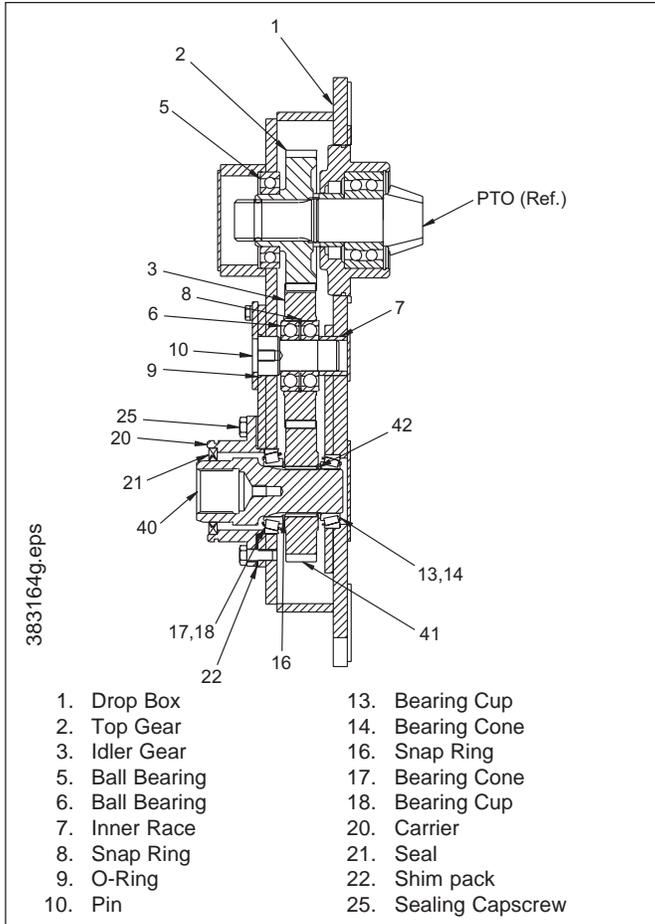


Figure 4-33 Dropbox on W6F & W8L for Caterpillar D6H/R, D7H PS, D8N, D7R & D8R

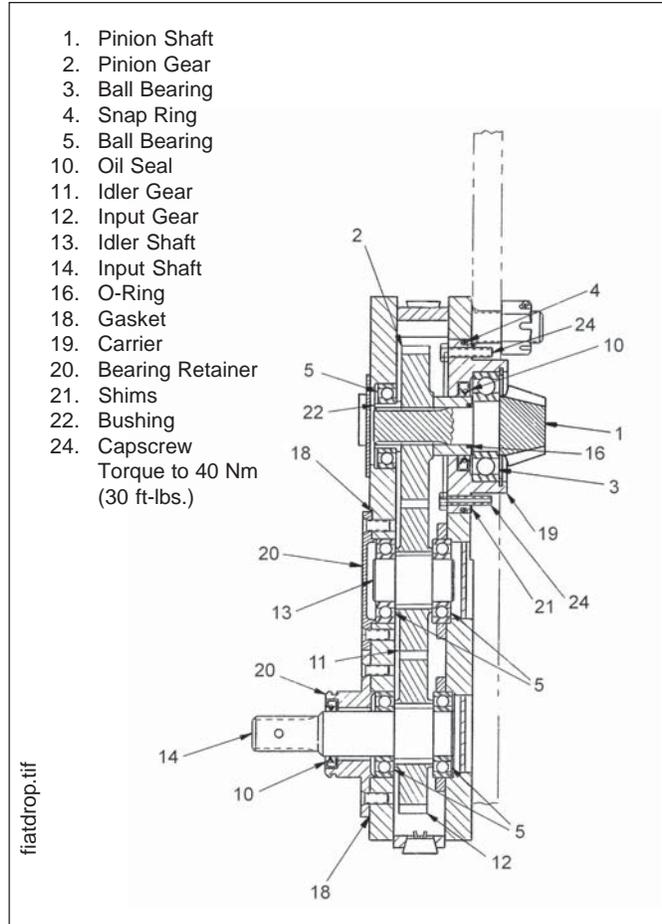


Figure 4-34 Dropbox on W6F for New Holland Construction 10C, 14B & 14C, FD14E

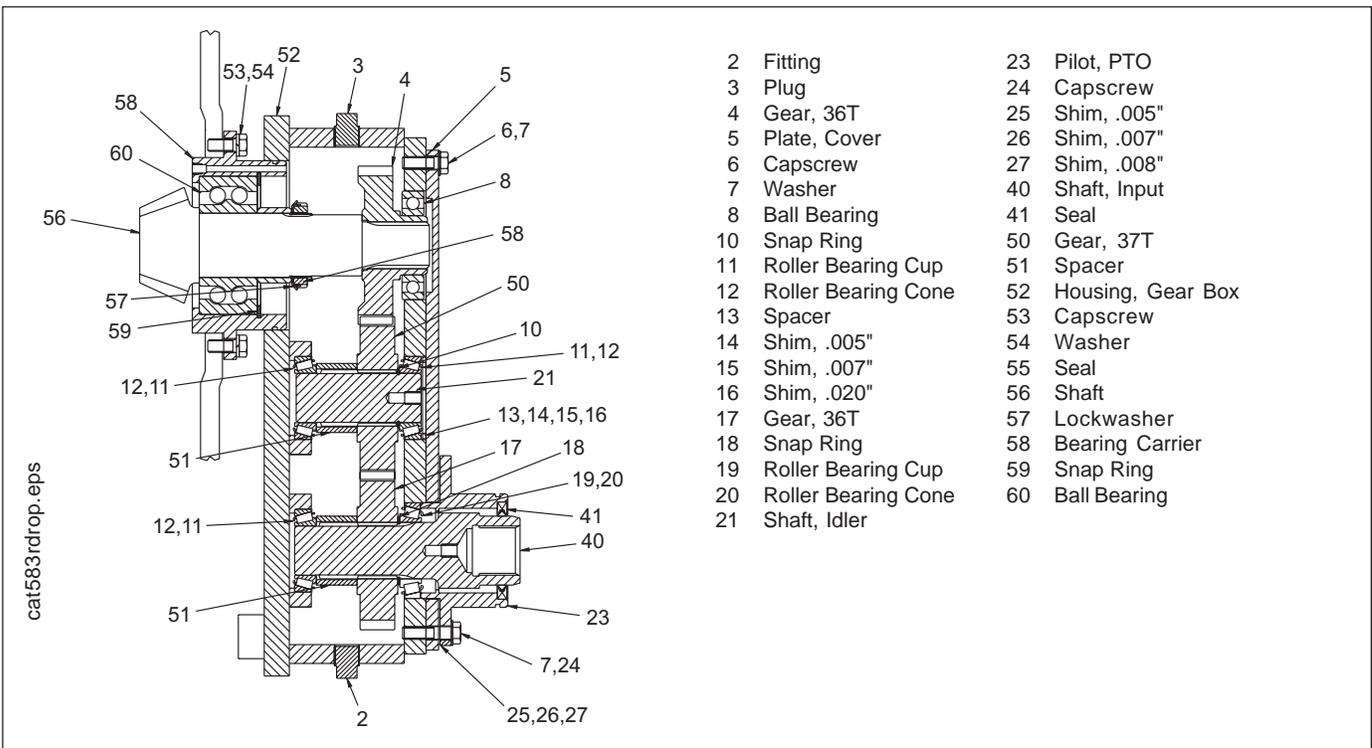
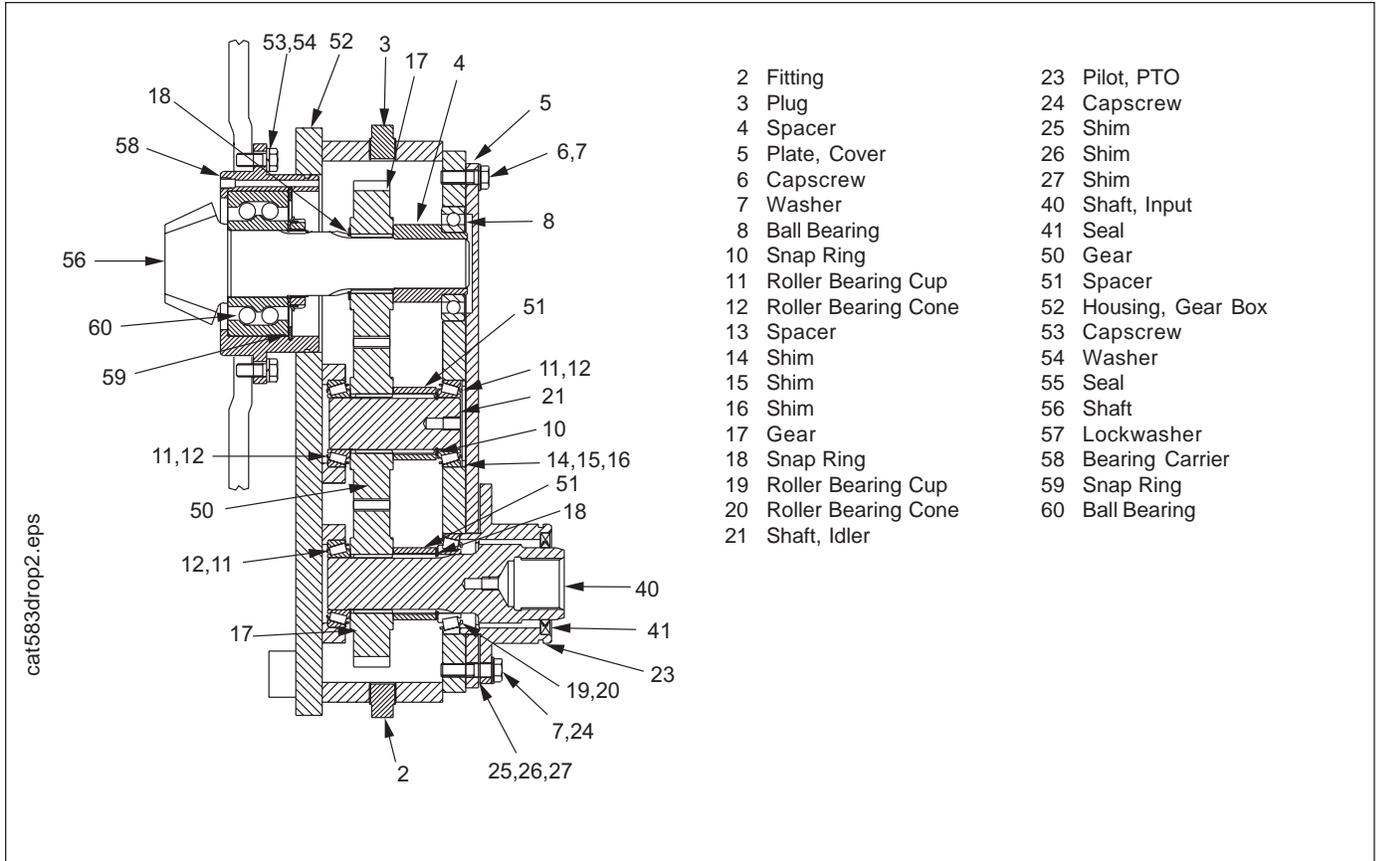
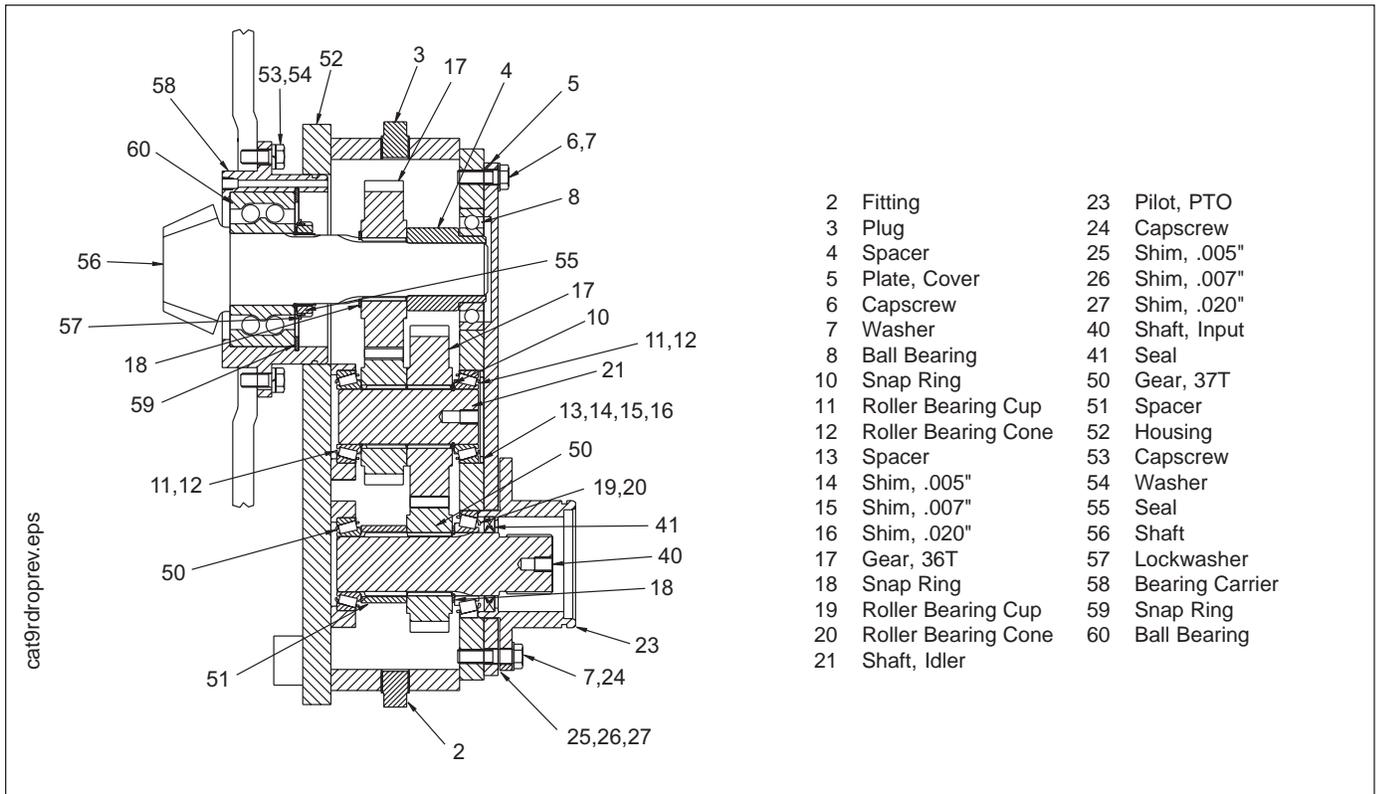


Figure 4-35 Dropbox on W12E for Caterpillar 583R - Last Used on AW12E-1103



**Figure 4-36 Dropbox on W12E for Caterpillar 583R - First Used on AW12E-1104**



**Figure 4-37 Dropbox on W12E for Caterpillar D9R**

## Winch installation

1. Thoroughly clean the mounting surfaces on the winch and the tractor. Clean the mounting holes and hardware of dirt, grit and oil.
2. Lubricate the PTO shaft splines with grease, where applicable.
3. Check the condition of the mounting studs on the vehicle. Ensure that all studs are tight. Replace any studs that are loose, bent or otherwise damaged. Minor thread damage may be dressed with a thread chaser.
4. Loctite all studs.
5. Install mounting adapter, if required.
6. Attach sling or chain fall to lift points.
7. Raise the winch and align the splines on the tractor PTO with the splines of the PTO coupling.

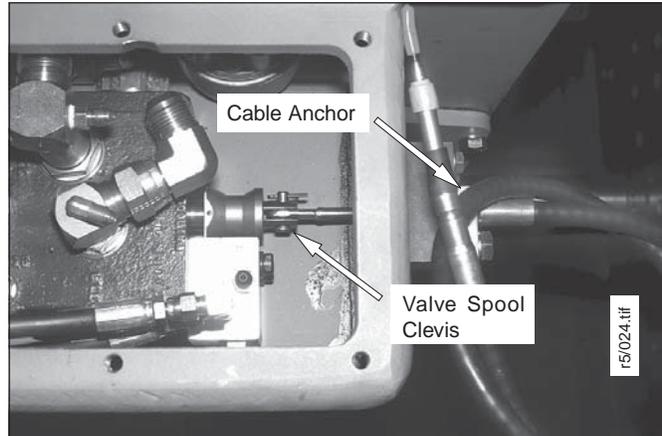


### WARNING

**WARNING: Make sure the lifting device has a minimum rated capacity of 6,000 lbs. (3,000 kg) before lifting the winch.**

8. Align the studs with the mounting holes to prevent thread damage.
9. Loosely install the two top nuts or capscrews before the winch is fully seated against the tractor.
10. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts/capscrews alternately at each side of the winch to pull the winch evenly against the tractor. The two top inboard nuts should be snug then turned on to the next slot so that the cotter pin can be installed. All outboard nuts should be tightened to 500 ft-lbs (69 kg-m). Torque all nuts and capscrews as specified in Table 1-9.
11. Install control lever assembly per mounting kit instructions.
12. Attach push-pull cable(s) to control lever assembly.
13. Attach cable bracket(s) to winch. Do not tighten fasteners at this time.

14. Attach push-pull cable(s) to control valve clevis and freespool, then tighten cable bracket(s) to winch.



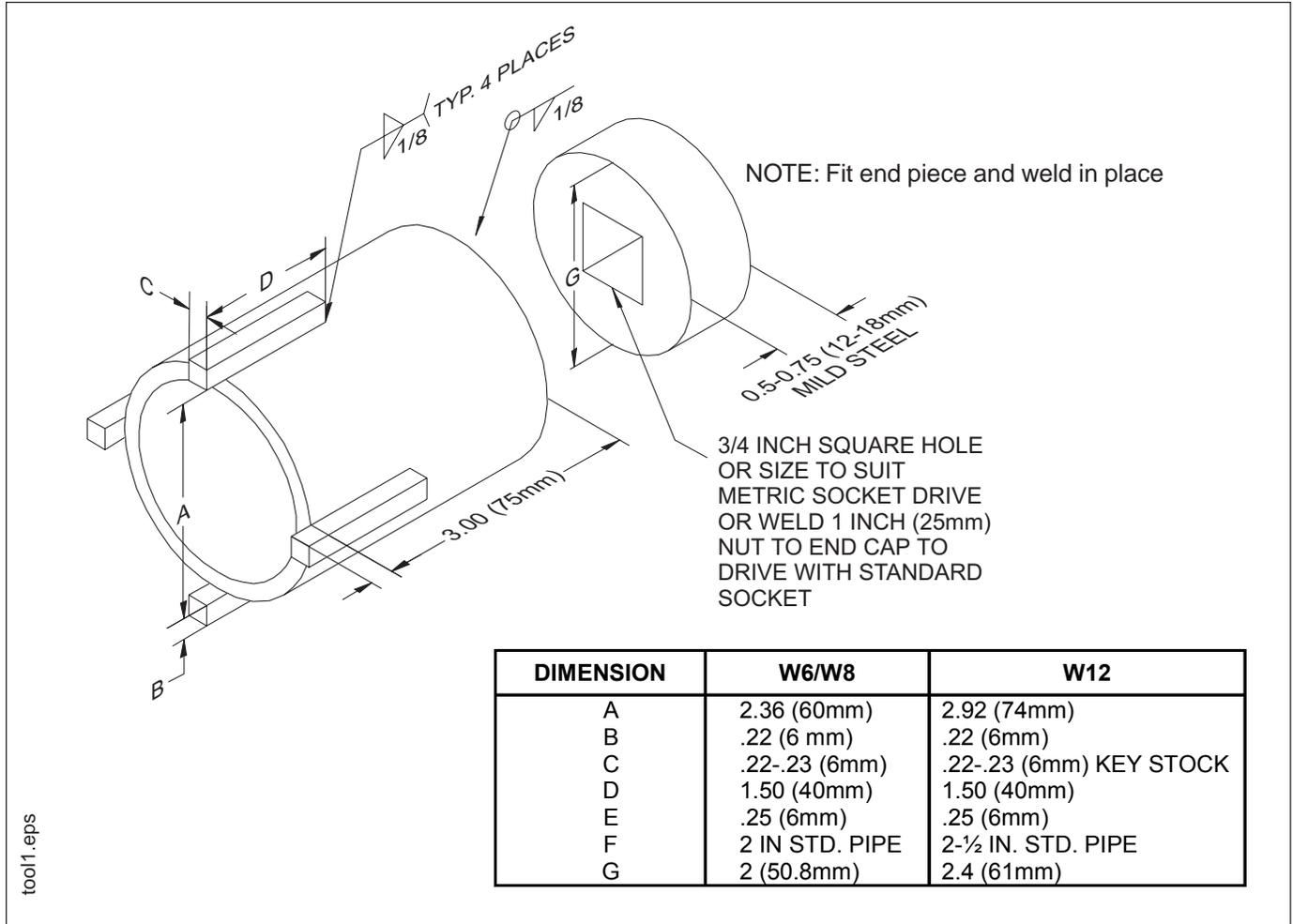
15. Fill unit with oil.
16. Adjust control cable and check hydraulic pressure settings as described in Section 3.
17. After winch installation, remove top cover and pry pinion towards tractor with a prybar to ensure the pinion is not jammed against the ring gear. This avoids excessive noise during winch operation.

**NOTE: Pressure checks in accordance to table 3-2 should be taken with hydraulic oil at operating temperature.**

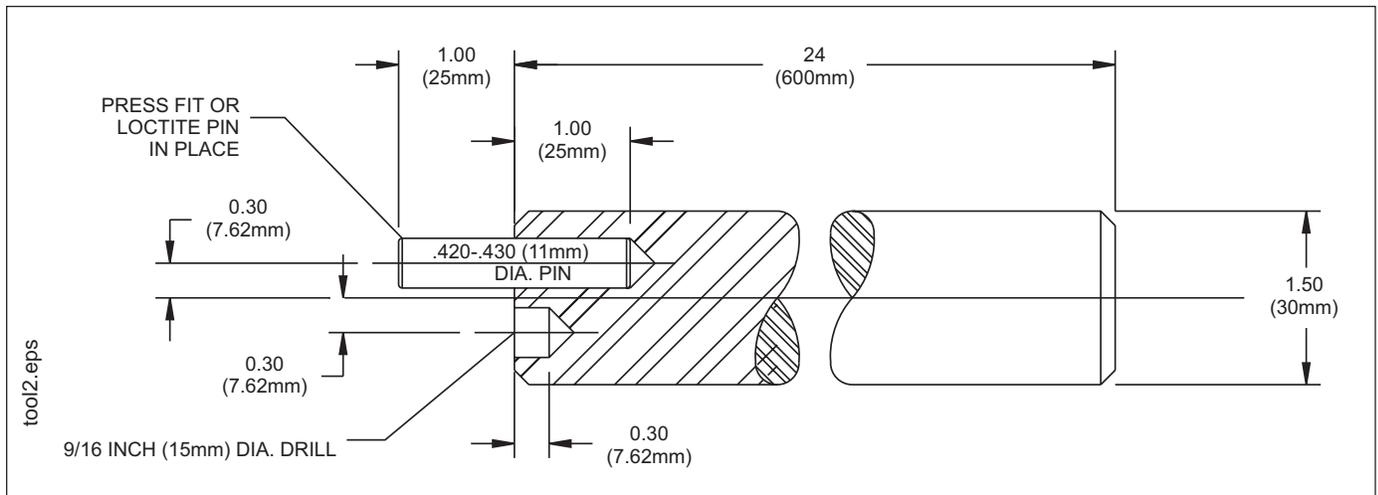
**Special Tools**

The following are special tools that may be fabricated to facilitate the execution of the overhaul procedures.

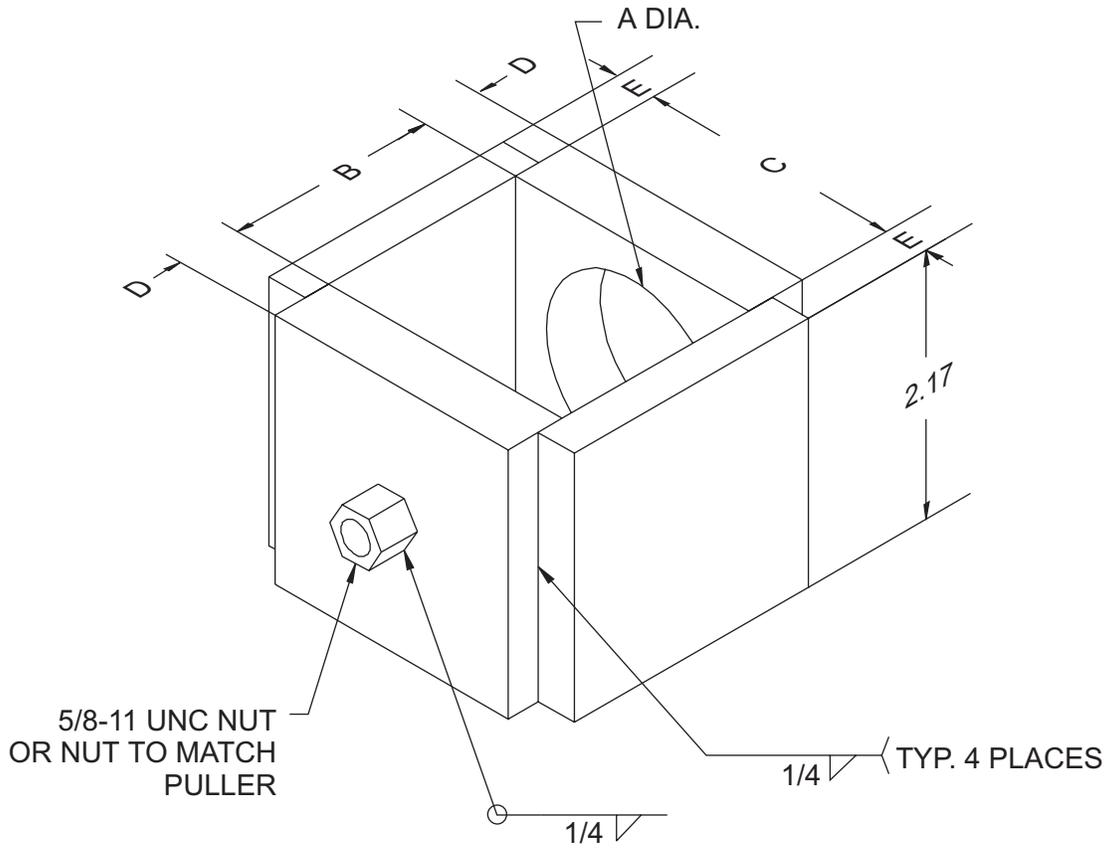
**NOTE: All dimensions in the following drawings are in inches, with dimensions in millimeters enclosed by parantheses.**



**Figure 4-38 Clutch Shaft Locknut Socket**



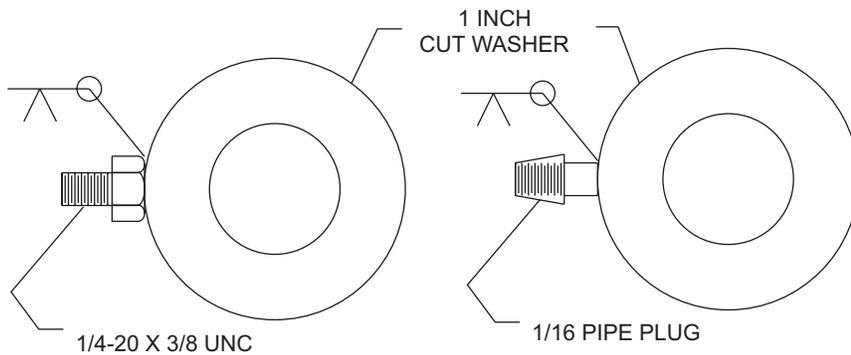
**Figure 4-39 Clutch Shaft Driver**



DIMENSION	W6/W8	W12
A	1.880-1.890 (47.75-48.01mm)	2.380-2.390 (60.45-60.71mm)
B	2.10 (54mm)	2.60 (66)
C	2.75 (70mm)	3.25 (83)

tool4.eps

Figure 4-40 Clutch Shaft Puller (may be used instead of Clutch Shaft Driver)



tool3.eps

Figure 4-41 Lifting Eye



# SERVICE MANUAL ADDENDUM

## **W12E Winch Electronic Controls Option**

A PRODUCT OF  
**Allied Systems**  
COMPANY  
SHERWOOD, OREGON USA

# CUSTOMER EDITION

# Safety Precautions

**Observe the following precautions to prevent injury to personnel and damage to equipment.**

- Do not operate winch unless tractor is equipped with a rear screen for operator protection against cable breakage.
- Authorized operators only!
- Report damage or erratic operation of the winch immediately.
- 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 clothes, 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 around other machines.
- Avoid operating near anyone working or standing.
- Do not stand or permit others to stand in a bight (loop) of the cable.
- Do not stand or permit others to stand near the winch or cable when it is under tension.
- Do not work with a damaged cable (broken wire strands, or a decrease in the diameter of a cable, are warning signs).
- Do not leave the tractor while the winch line is under tension.
- Avoid pulling the hook over the drum and through the throat of the winch.
- Do not anchor a double or two-part line to the winch.
- When not operating the winch, always leave it in neutral with the brake on.
- Never attempt to clean, oil or adjust a machine while it is in motion.
- Use extreme care when removing cable and ferrule from the drum. When the ferrule is released, the cable may spring out with force.

Winch serial number \_\_\_\_\_

Date put into service \_\_\_\_\_

## Warning



### **WARNING**

**Failure to follow these instructions can cause serious injury or death.**

**Authorized, trained operator only.**

#### **Know the equipment:**

Know the operating, inspection, and maintenance instructions in the operating manual. Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the cable breaks.

#### **Inspect the winch before use:**

Make sure that the controls and instruments operate correctly. Report the need for repairs immediately. Do not work with a damaged or worn cable. Do not use a winch that needs repairs. If the ferrule and cable must be removed from the drum, make sure the end of the cable and ferrule are controlled when the cable is released. The end of the cable can suddenly move from the drum like a compressed spring when the ferrule is released, causing an injury.

#### **Protect yourself:**

Do not use the control levers for hand holds when entering or leaving the vehicle. Do not permit other people near the control area when you inspect or repair a machine. Never inspect, repair, or do maintenance on a machine that is in motion. Stay in the operator's seat. Do not stand on the vehicle when operating the winch.

#### **Keep a clear work area:**

Avoid winch operation near people or other machines. Never stand or permit others to stand in a bight (loop) of the cable. Do not stand nor permit others to be near the winch or cable when there is tension on the cable. Observe jobsite rules. Be in complete control at all times.

#### **Use common sense:**

Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc. Do not leave the vehicle when the winch cable is under tension. Do not permit riders on the vehicle or load. Do not use the winch as an anchor for a double or two-part line. Do not pull the hook through the throat or over the drum and cause damage. When the winch is not in use, make sure the control lever is in **brake on** position so that the winch brake is applied.



### **WARNING**

**Indicates a condition that can cause personal injury!**



### **CAUTION**

**Indicates a condition that can cause property damage!**

**NOTE: Whenever information exists that requires additional emphasis beyond the standard text, the term "NOTE" is used.**



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## General

### Introduction

This service manual addendum is for W12E winches with electronic controls. The following information is included in this addendum:

**Section 1. General** includes operation descriptions of systems and components as an aid for troubleshooting and repair.

**Section 2. Troubleshooting** lists common problems and the possible causes and corrections.

**Section 3. Service** provides a guide for periodic maintenance, checks and adjustments.

### Description

The W12E Electronic Winch (W12EE) is a Power Forward (LINE IN) and Power Reverse (LINE OUT) winch used on

tractors with a constant running power takeoff (PTO). The winch utilizes a Self Contained Hydraulic (SCH) system where all hydraulic power is produced internally inside the winch case. The design of the winch case permits different arrangements of PTO gear assemblies to fit different tractors that use these winches.

The W12EE winch has a maximum bare drum line pull capacity of 533,760 N (120,000 lbf).

### Serial Number Codes

The serial number codes are described on page 1-2 of this manual. A nameplate with the serial number code is found on the top left hand side of the winch case. The serial number code is also stamped on the left hand side of the winch frame.

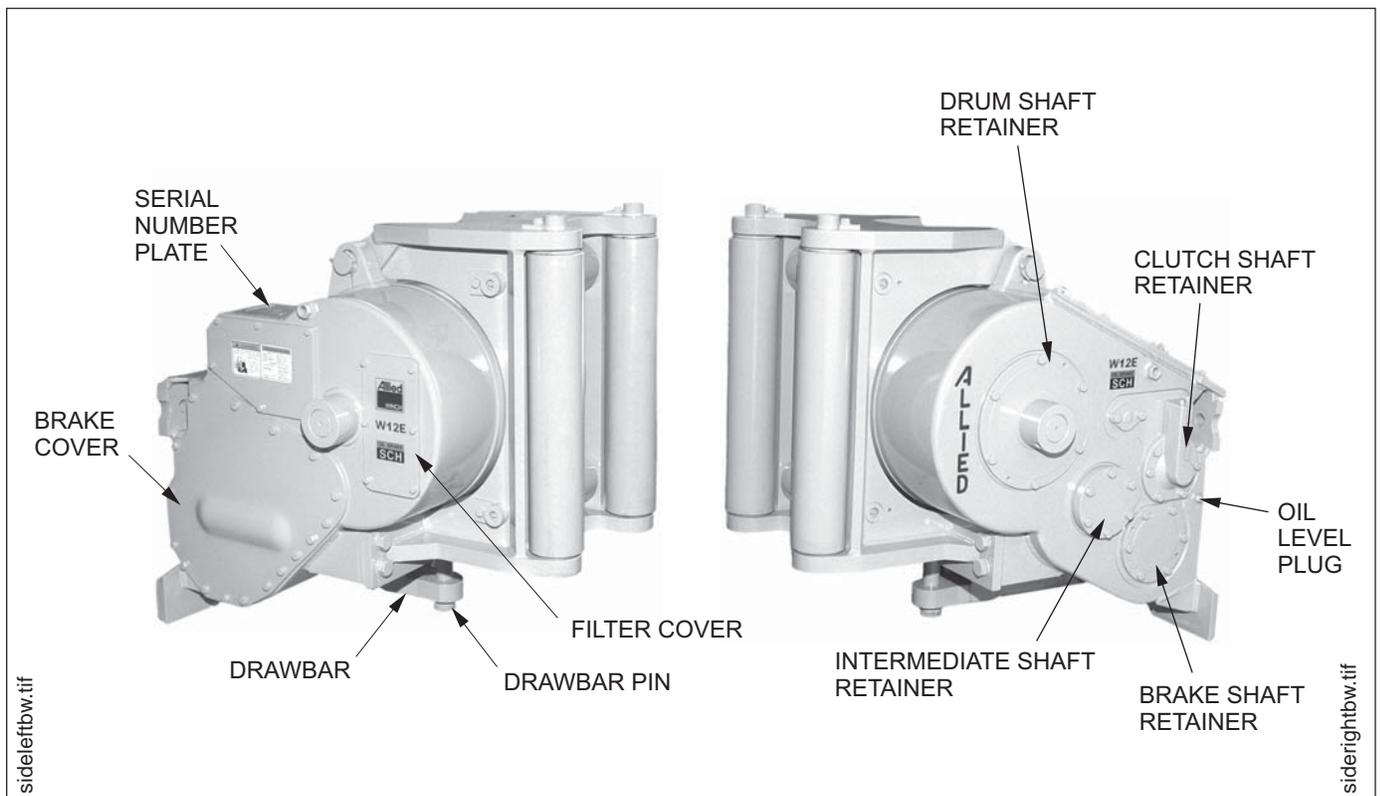
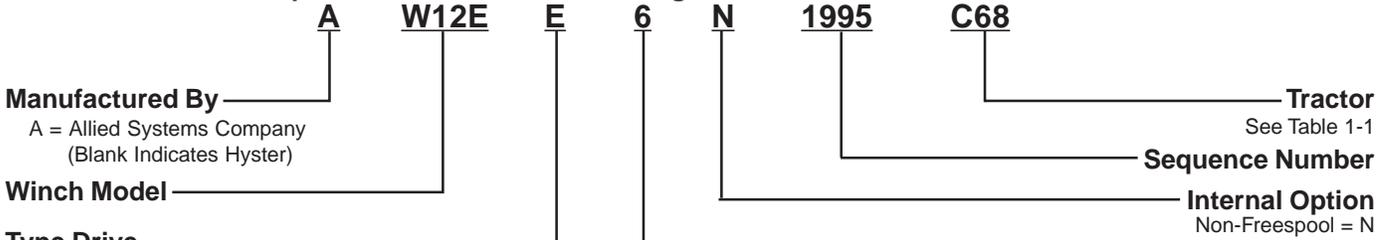


Figure 1-1 Model Views (Winch Shown with Optional Fairlead Installed)

## Unit Identification

### Allied Winch S/N Nameplate Data For Tractor Mountings



- Notes:**
- In addition to the serial number plate, the serial number is stamped into the top left hand side of the frame.
  - Circled numbers in **Table 1-1** indicate possible gear ratios.

**Table 1-1 Tractor Identification and Gear Ratio for W12E Winch**

Tractor Make Model and Starting Tractor Serial Number Where Applicable					
C O D E	A Fiat-Hitachi/ New Holland	C Caterpillar	G Terex	H Dresser	K Komatsu
60					D275A (4)
61	21-C (3) FD30 (3) (4)	D8K PS (1) (3) (4)	D750A (3) (4)	TD25C PS (3) (4)	D155A-1 & 2 (3)
62	FD40B 31 (3)	D9 PS (1) (3) (4)	D800 (3) (4)		D355
63	41-B (3)	583 Serial No: 78V 61A (1) (3) (4)		TD25E PS (3) (4)	
64	FD30B/C (1) (3) (4)	594 Serial No: 96V 62H (1) (3) (4)		TD25E/G (3) (4)	D375A-1 (1)
65	FD40 (4)	D8L D9N D9R (Clutch Br. Steer) (4)		TD40 (4)	
66		D10N D10R (4)			
67		583R (4)			
68		D9R (Diff. Steering) (4) (6)			

## Nameplate

The rated capacity for the winch, as it is equipped, is shown on the nameplate. Each winch is shipped from the factory with a nameplate as shown in Figure 1-2. If the nameplate is missing, or the cable does not match the information on the nameplate, do not operate the winch until its capacity is known and a new nameplate is installed. Each winch must be operated within its rated capacity as shown on the nameplate.

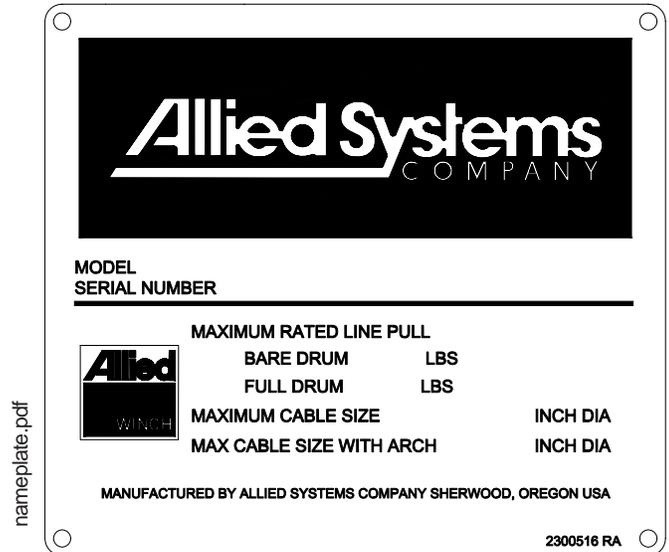


Figure 1-2 Nameplate

## Capacities and Specifications

### Approved Oil List

The type of oil used in current Allied winches affects line control. Use ONLY the following oils in the W12EE winch:

Company	Brand
Amoco Oil Company	Amoco 1000 Fluid
Exxon Company	Torque Fluid 56
John Deere	Hy-Gard Transmission & Hydraulic Oil
Sun Oil Company	Sunfleet TH Universal Tractor Fluid

Table 1-2 Approved Oil List

### Hydraulic Specifications

Oil Capacity .....	22.0 Gal (83 L)
Pump .....	Gear Type 10-13 gpm (38-50 l/min) at 1000 rpm
Operating pressure .....	220 psi (1,517 kPa)
Valve .....	Cartridge valve manifold assembly
Filters .....	Full flow magnetic strainer 16 micron synthetic fiber cartridge

**NOTE: For operation in temperatures below -23°C (-10° F), use John Deere J20D “Low Viscosity Hygard” or equivalent.**

### Winch Drum Capacities

Cable Diameter	Capacity For 355 mm (14 in) Drum Diameter	Capacity For 235 mm (9.5 in) Drum Diameter
28 mm (1 1/8 in)	67 m (220 ft)	84 m (276 ft)
32 mm (1 1/4 in)	53 m (175 ft)	67 m (220 ft)

NOTES: Loosely or unevenly spooled line will change capacities. Use flexible cable with independent wire rope center.

Table 1-3 Drum Line Capacities for W12E

## Winch Torque Specifications

**NOTE: Unless otherwise specified, torque:**  
**1/2 UNC to 50 ft-lbs (7 kg-m)**  
**3/8 UNC to 25 ft-lbs (4 kg-m)**

**NOTE: All torque values given with threads lubricated**

ITEM	TORQUE VALUES	
	ft-lbs	kg-m
PTO Shaft Assembly Bearing Carrier Capscrews	75	10
Clutch Shaft Assembly Bearing Retainer Capscrews Bearing Locknut	75 200	10 28
Pump Mounting Capscrews	25	4
Brake Shaft Assembly Bearing Retainer Capscrews	75	10
Intermediate Shaft Assembly Bearing Retainer Capscrews	75	10
Freespool Shift Shaft	75	10
Drum Shaft Assembly RH Bearing Retainer Capscrews Drum Gear to Adapter Capscrews Drum Shaft Nuts Drum to Adapter Capscrews	150 225 400 200	20 31 55 28
Clutch Assembly Clutch Piston Housing Capscrews Clutch Piston Housing Setscrews	70 40	10 6
Brake Assembly Cover Nuts	200	28
Control Valve Mounting Capscrews	13	2
Winch Mounting to Tractor Studs Capscrews Nuts (All Except Inside Nuts) Inside Nuts (Castle Type with Cotter)	500* 500* 500 Hand	69* 69* 69 Hand
* With Loctite		

Table 1-4 Torque Specifications

## Gear Train (See Fig. 1-3 & 1-4)

The gear train (Figure 1-3) consists of:

1. a PTO shaft assembly
2. a clutch shaft assembly
3. a brake shaft assembly
4. an intermediate shaft assembly; and

5. a drum shaft assembly

Torque transfer during operation is shown in Figure 1-4.

**NOTE: PTO Rotation is determined by standing behind tractor and looking forward at the PTO shaft entering the winch case.**

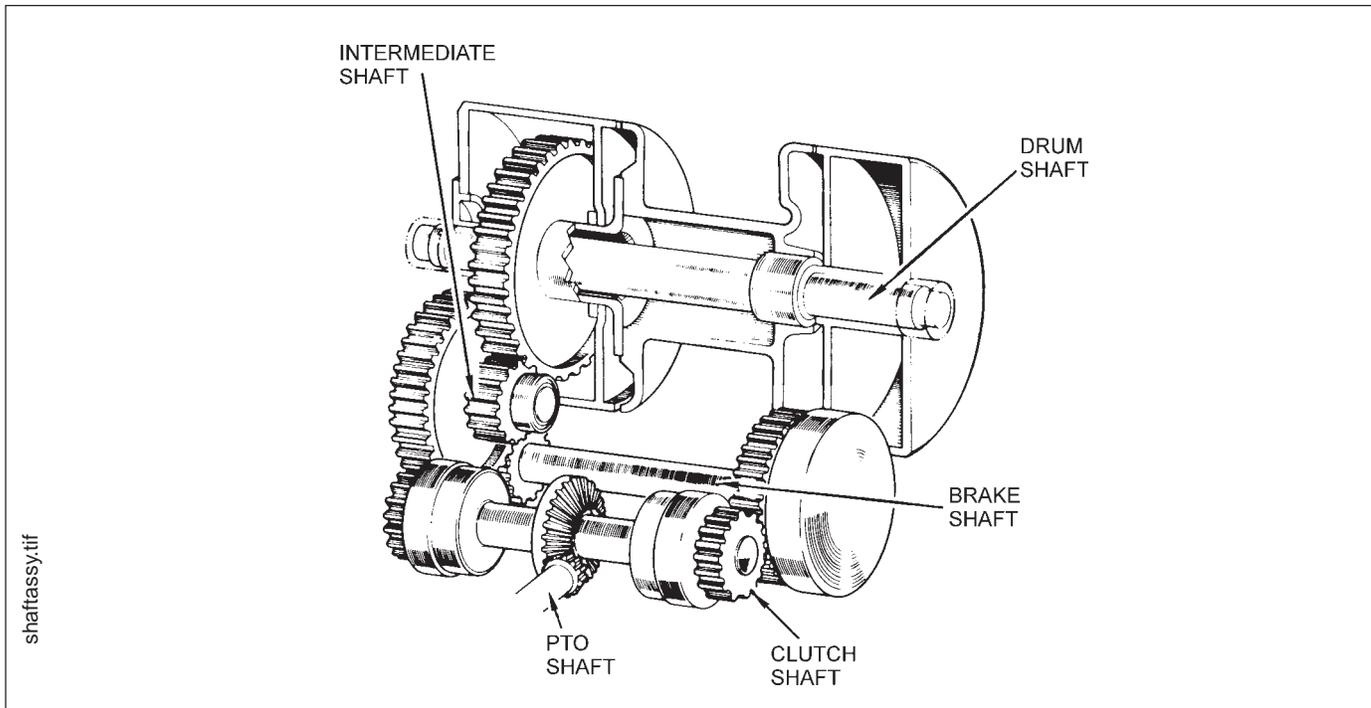


Figure 1-3 Gear Train

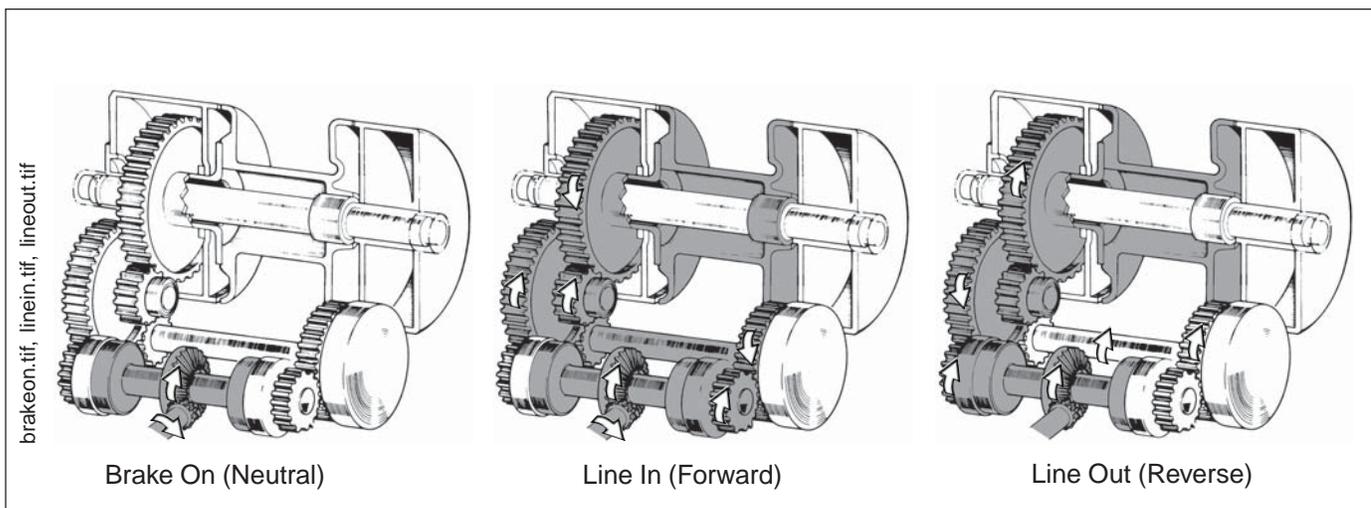


Figure 1-4 Gear Train Rotation Torque Transfer

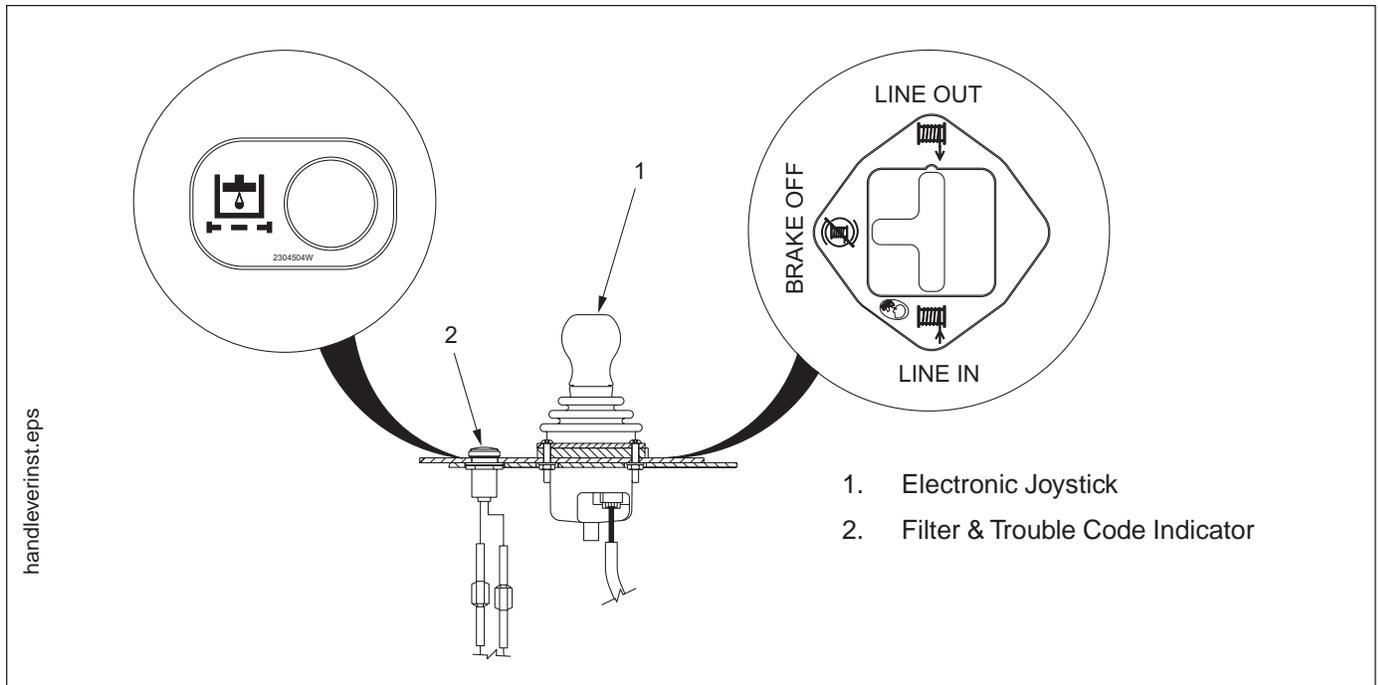


Figure 1-5 Electronic Winch Controls

## Operation and Control (See Fig. 1-5)

The electronic control assembly has one control lever (see Figure 1-5). The control lever is connected to the winch through electrical wiring, an electronic control module and a solenoid-actuated valve manifold assembly. This lever is used to select one of the following operations:

- BRAKE OFF
- LINE OUT
- BRAKE ON
- LINE IN

**NOTE:** The filter LED on the joystick plate illuminates momentarily at startup. This is part of the normal system check. Consult the troubleshooting guide in Section 2 if the light does not turn off.

**NOTE:** The winch will not operate until the joystick is briefly centered after startup.

**BRAKE OFF** is the only detented position on the lever; the operator must pull the control lever to release it from that position. A collar and spring arrangement on the handlever returns the lever from the **LINE IN** and **LINE OUT** positions to the **BRAKE ON** position.

**WARNING**

**Do not use BRAKE OFF with a suspended load, as fallback will occur.**

**BRAKE ON** is a neutral position. No hydraulic pressure is applied to the brake or the clutches. Springs apply the brake so the winch drum will not rotate.

**LINE IN** position applies the forward clutch and releases the brake. The winch will wind the cable at a speed controlled by the PTO speed of the tractor.

**LINE OUT** position applies the reverse clutch and releases the brake. The winch will unwind the cable at a speed controlled by the PTO speed of the tractor and the weight of the load.

**BRAKE OFF** position releases the brake through oil pressure but cable cannot be pulled from the winch by hand because of friction in the clutches, brake and gear train. **BRAKE OFF** is used to move the tractor away from the load while keeping the cable tight.

**WARNING**

Moving the control lever with the engine OFF and the keyswitch ON may result in accumulator discharge and brake release, which will cause load fallback.

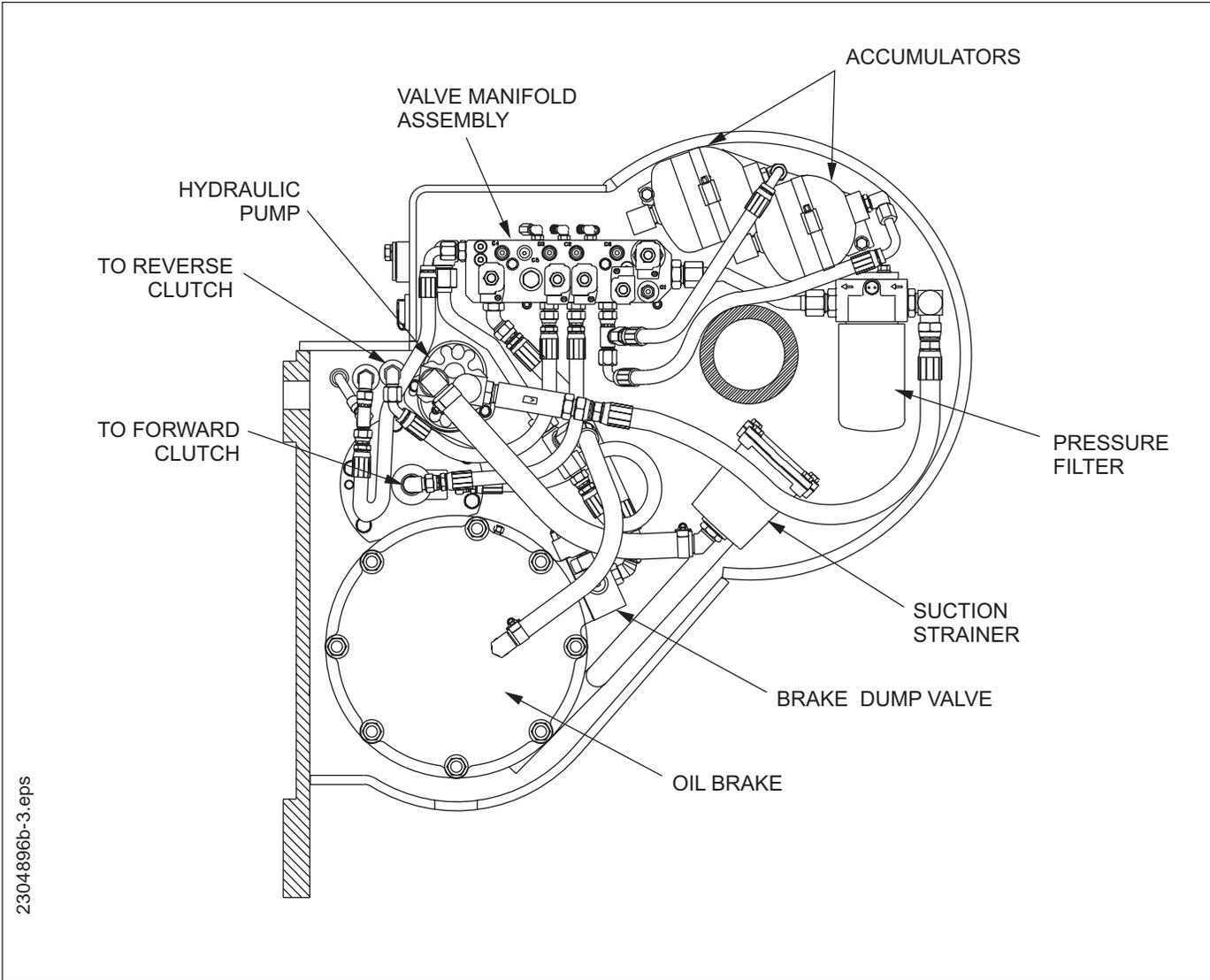


Figure 1-6 Hydraulic System

## Hydraulic System (See Fig.1-6)

The operation of the winch is controlled by an internal hydraulic system. When the tractor's PTO is operating, this system provides pressure and directs the flow of oil for the main winch functions. The hydraulic flow path of these various functions is depicted in Figures 1-12 through 1-15.

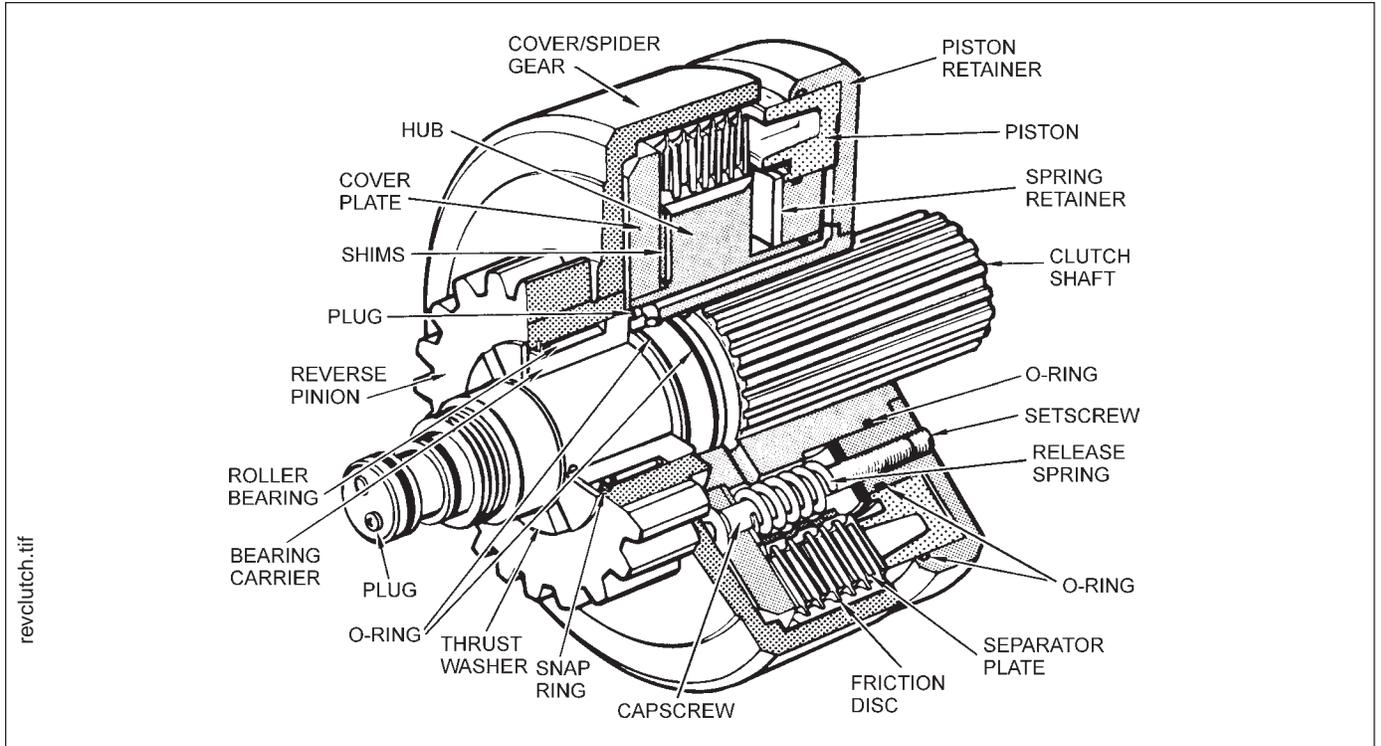
The suction strainer and pressure filter remove contaminants from the oil. The hydraulic pump supplies pressurized oil for the system. The valve manifold assembly dis-

tributes and regulates the flow and pressure of hydraulic oil to the clutches and brake while maintaining the cooling oil flow. It also controls the release of pressurized oil from the accumulators. The accumulators provide pressurized oil for a limited amount of actuation if the hydraulic pump is not functioning. This allows the release of the winch brake when the tractor engine or the hydraulic pump is not operating.

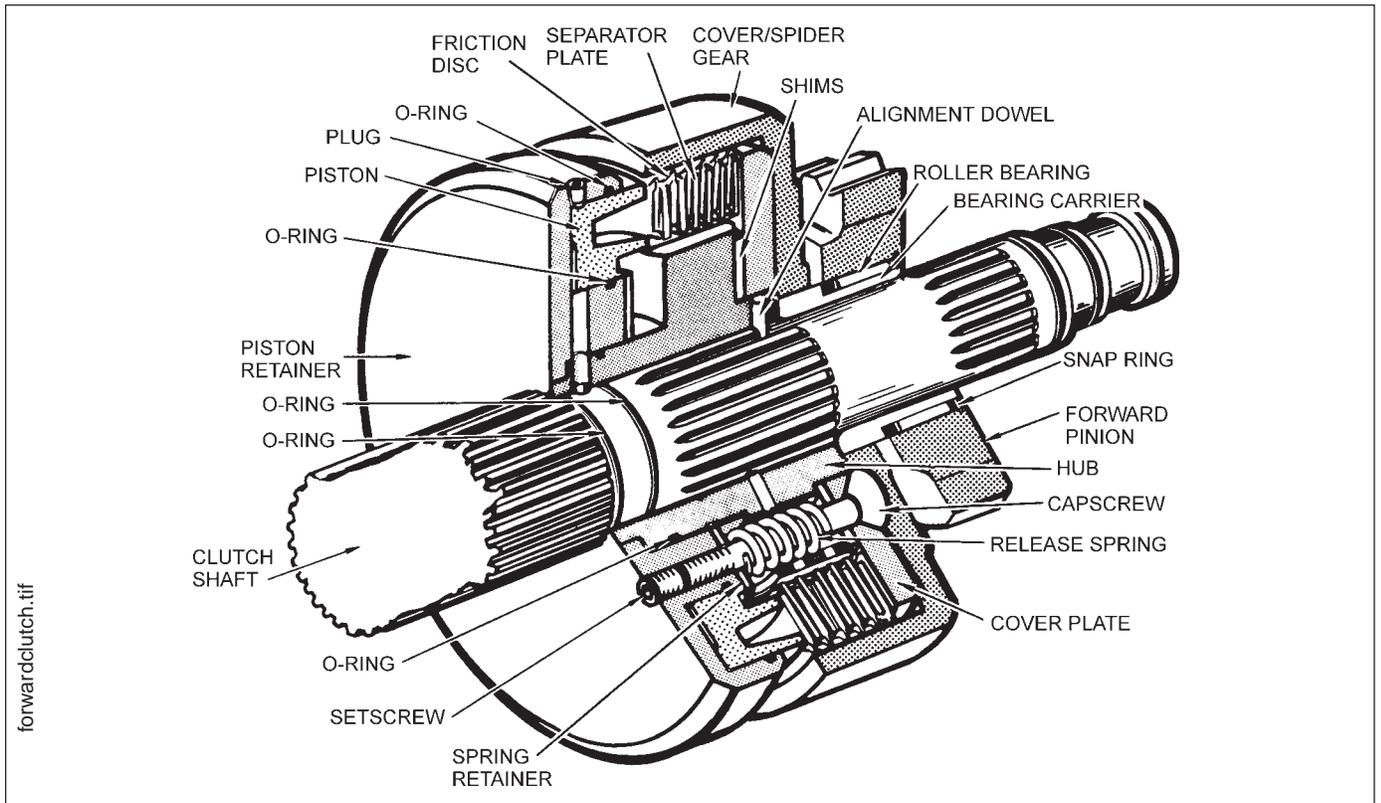
**Forward and Reverse Clutches (See Fig. 1-7 and 1-8)**

The forward clutch (Figure 1-7) and reverse clutch (Figure 1-8) are multi-disc types that are hydraulically applied and

spring released. The clutches are cooled by the continuous oil flow maintained during all operating conditions.



**Figure 1-7 Reverse Clutch**



**Figure 1-8 Forward Clutch**

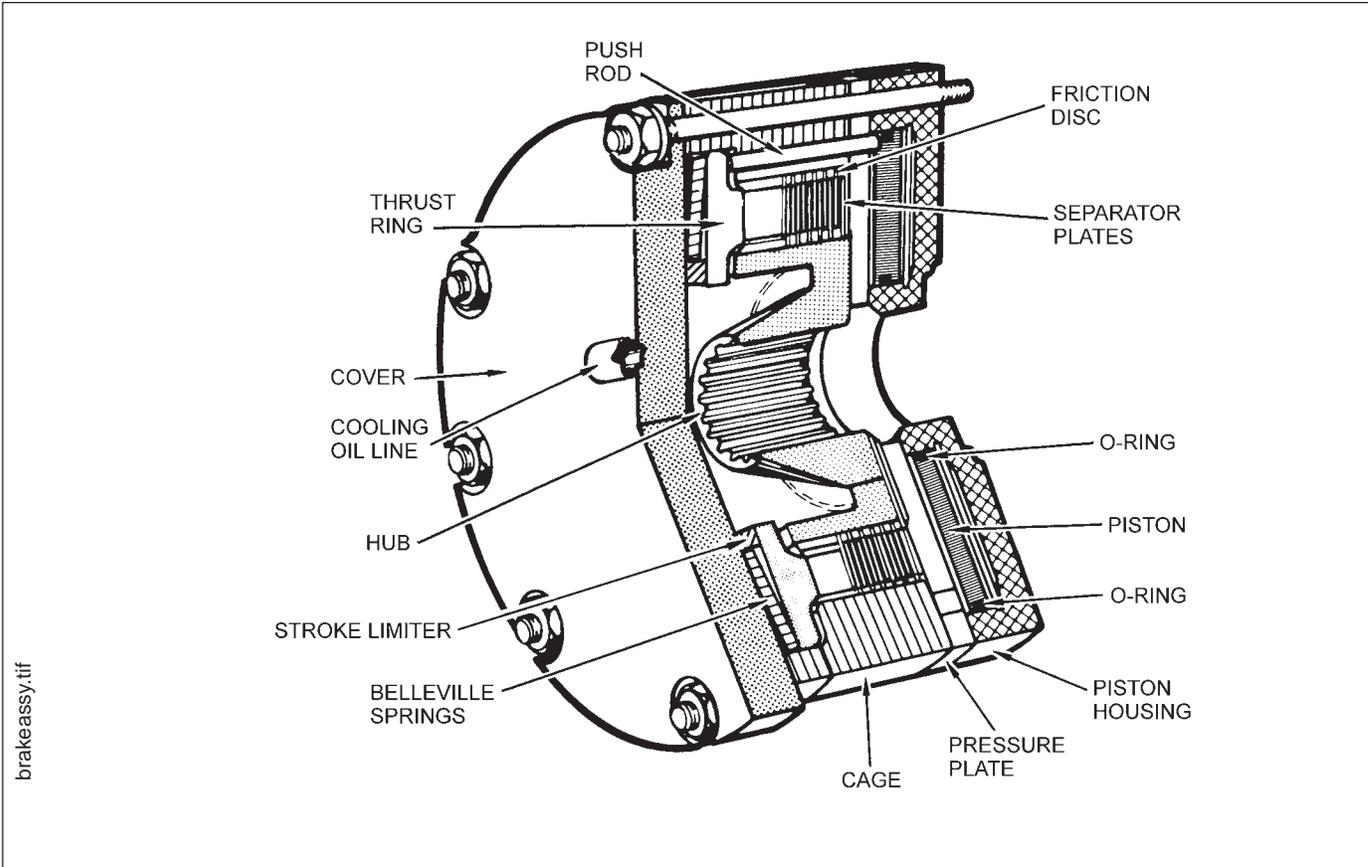


Figure 1-9 Oil Brake Assmby

### Oil Brake Assembly (See Fig. 1-9)

The multi-disc oil brake is spring applied and hydraulically released. When pressurized oil is directed into the cavity between the piston and piston housing, the piston moves

outward, compressing the belleville springs, which then releases the brake.



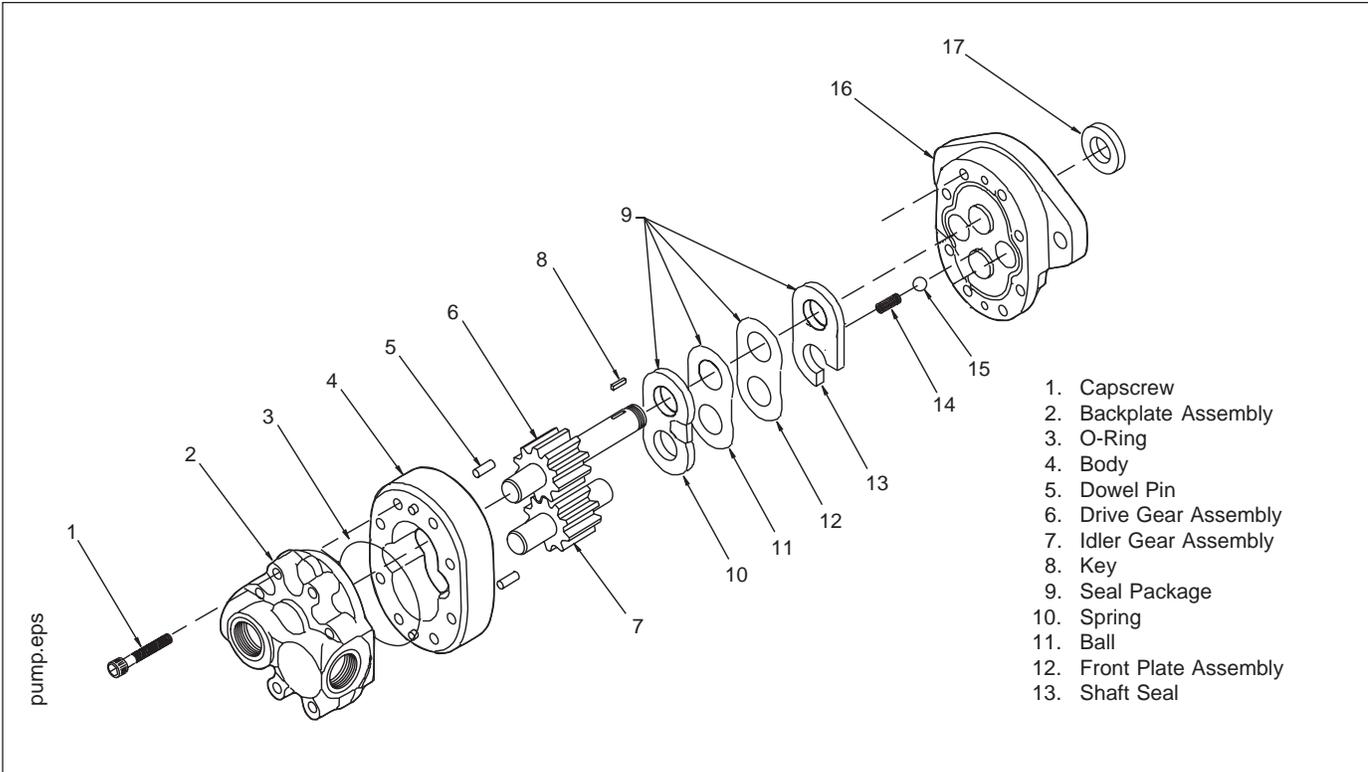


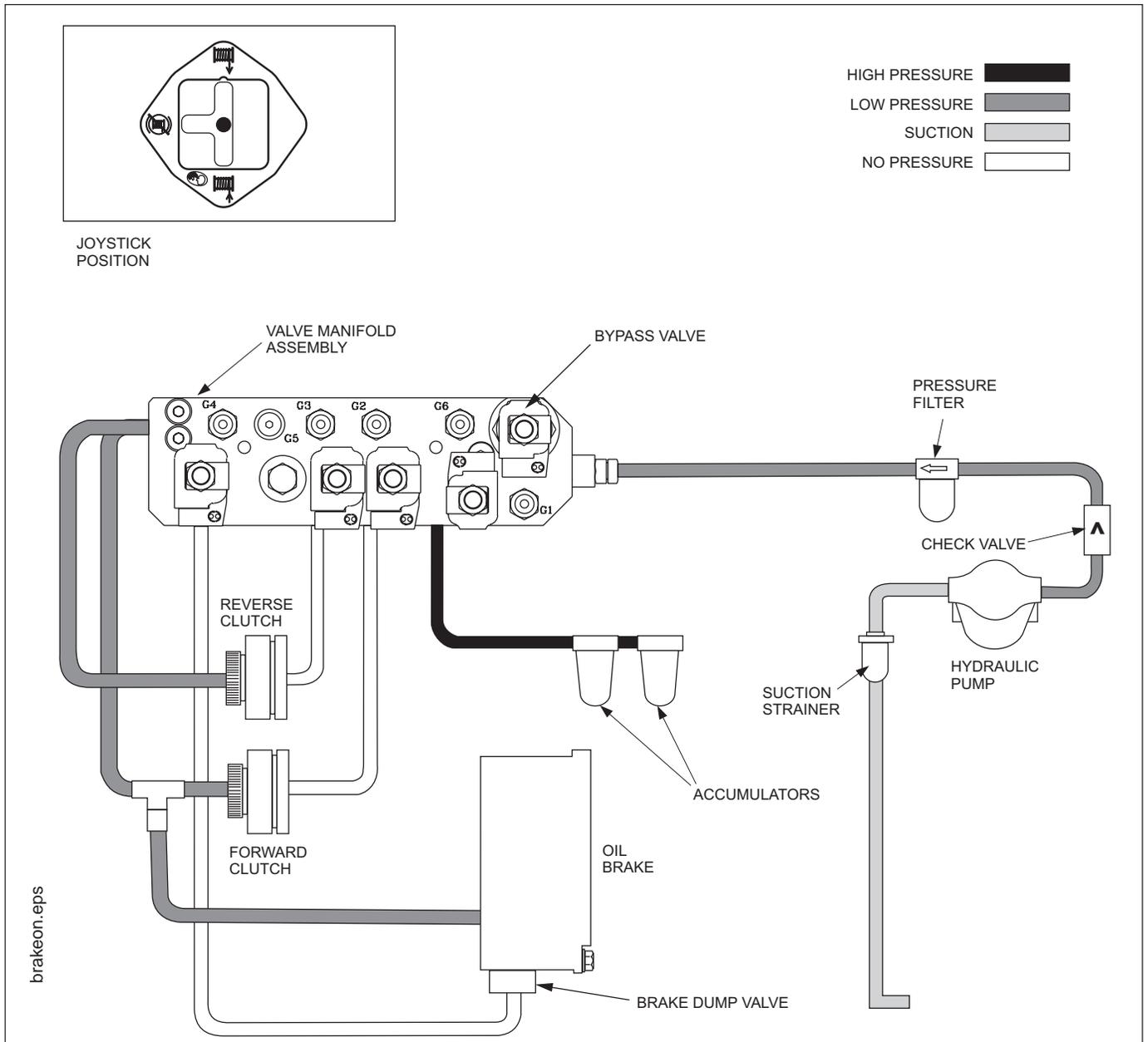
Figure 1-11 Hydraulic Pump

## Hydraulic Pump (See Fig. 1-11)

The hydraulic pump is a fixed displacement gear pump that supplies the hydraulic flow necessary for operation of the winch. The pump shaft is driven by a spur gear off of the input shaft. The pump inlet port is connected to the winch suction filter. The outlet is connected to the control valve inlet port via the pressure filter.

## Accumulators

Two accumulators are connected to the hydraulic system. The bladders are charged with nitrogen to 115 psi so the oil stored in the accumulators will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts and if the PTO shaft stalls.



**Figure 1-12 Hydraulic System - BRAKE ON (Neutral)**

**Sequence of Operation - BRAKE ON**

Oil flows through the bypass valve to cool and lubricate the brake and clutch frictions. The brake dump valve is open and ensures the brake is locked.

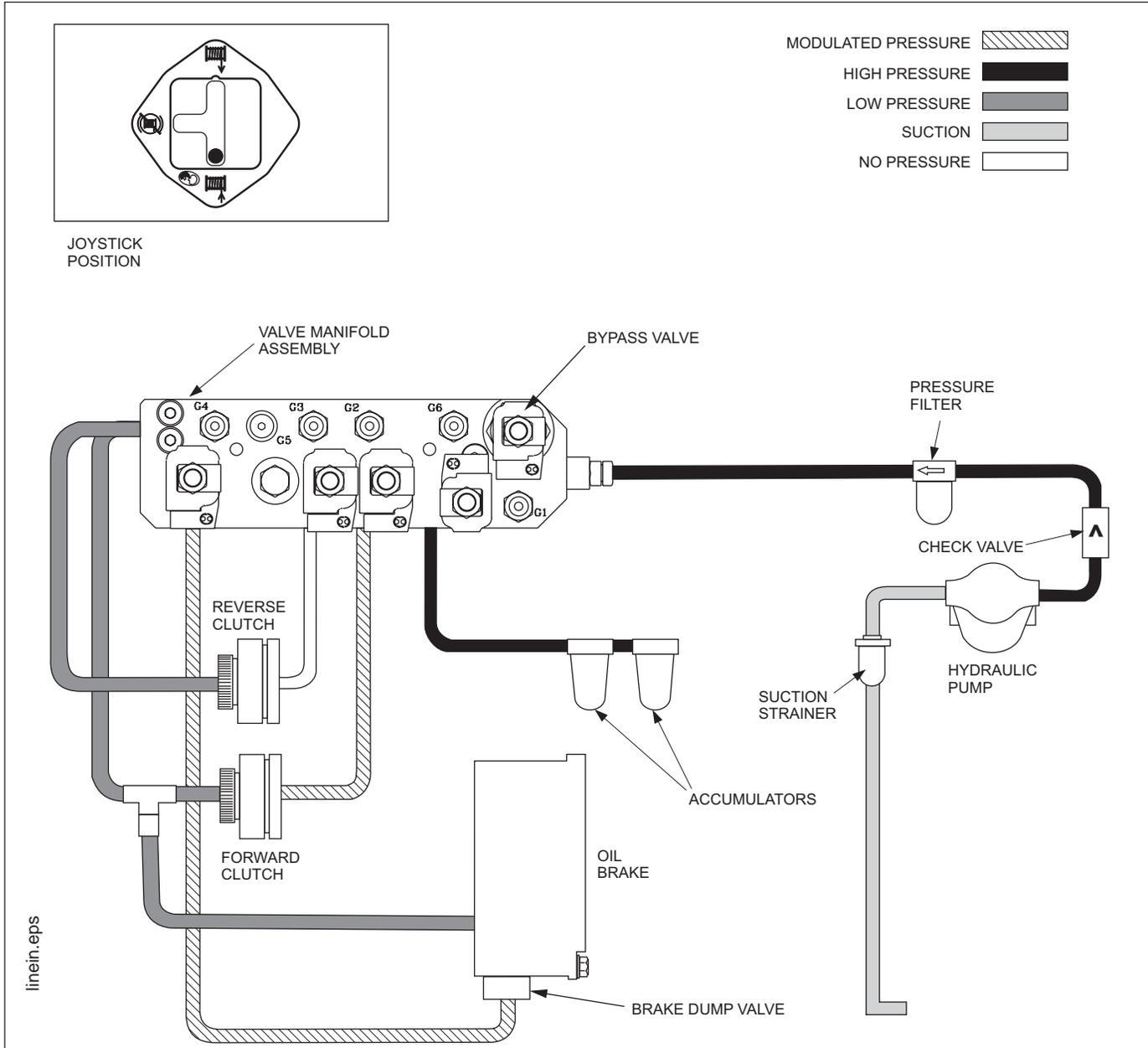
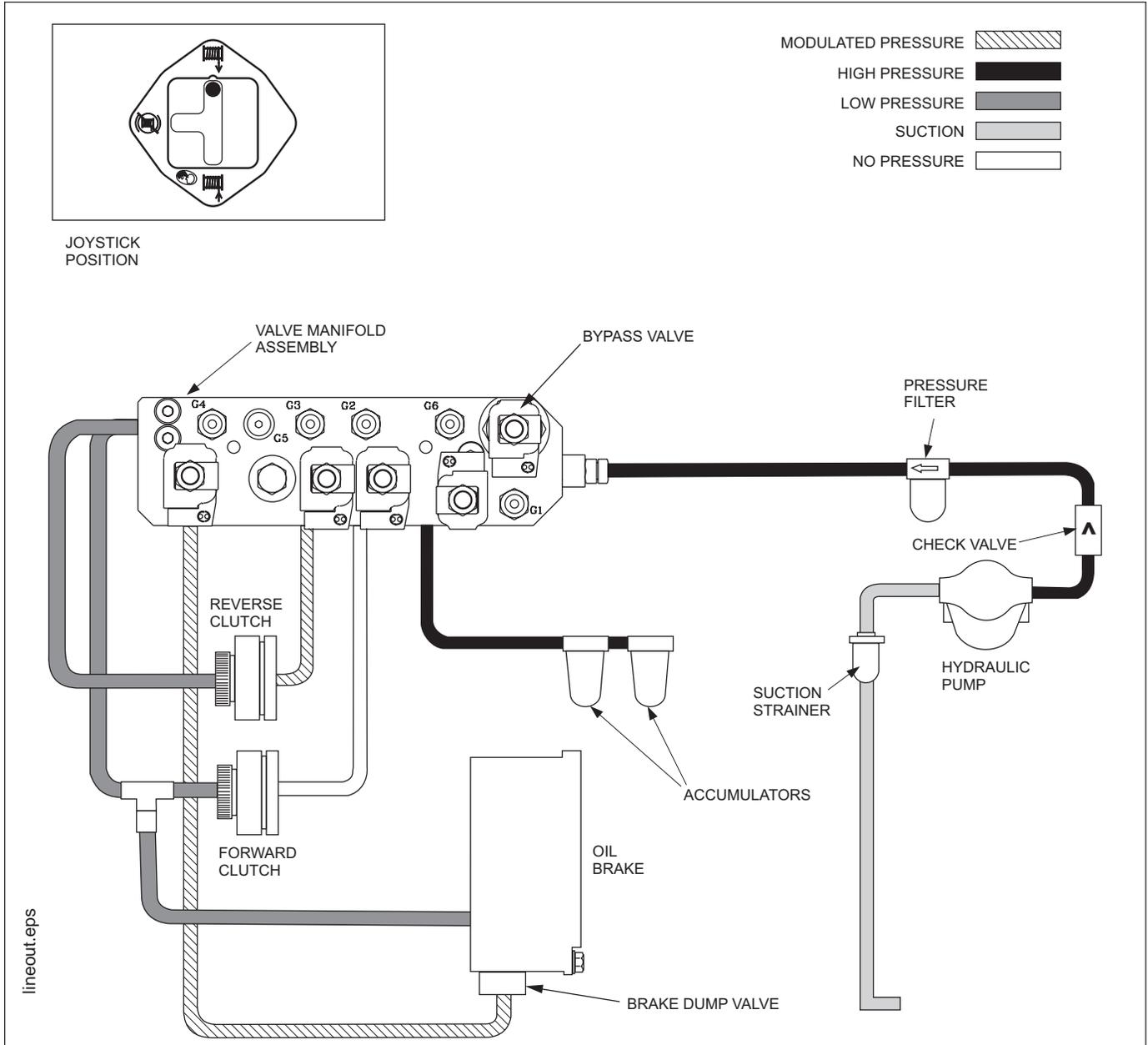


Figure 1-13 Hydraulic System - LINE IN (Forward)

## Sequence of Operation - LINE IN

For LINE IN (forward) operation, the operator pulls back on the joystick, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. The brake dump valve closes so brake pressure can increase. The proportional brake and forward clutch valves open according to the control module program. Modulated pressure to

the clutch and brake is supplied during inching (slight movement of the joystick from the BRAKE ON position). Full pressure is applied to the clutch when the joystick is in full LINE IN position. Brake pressure is limited to just above brake release pressure for faster response.



**Figure 1-14 Hydraulic System - LINE OUT INCHING**

**Sequence of Operation - LINE OUT**

LINE OUT (reverse) operation is achieved by pushing the joystick forward from the BRAKE ON position, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. The brake dump valve closes so that brake pressure can increase. The proportional brake and reverse clutch valves open according to the control mod-

ule program. Modulated pressure to the clutch and brake is supplied during inching (slight movement of the joystick from the BRAKE ON position). Full pressure is applied to the clutch when the joystick is in full LINE OUT position. Brake pressure is limited to just above brake release pressure for faster response.

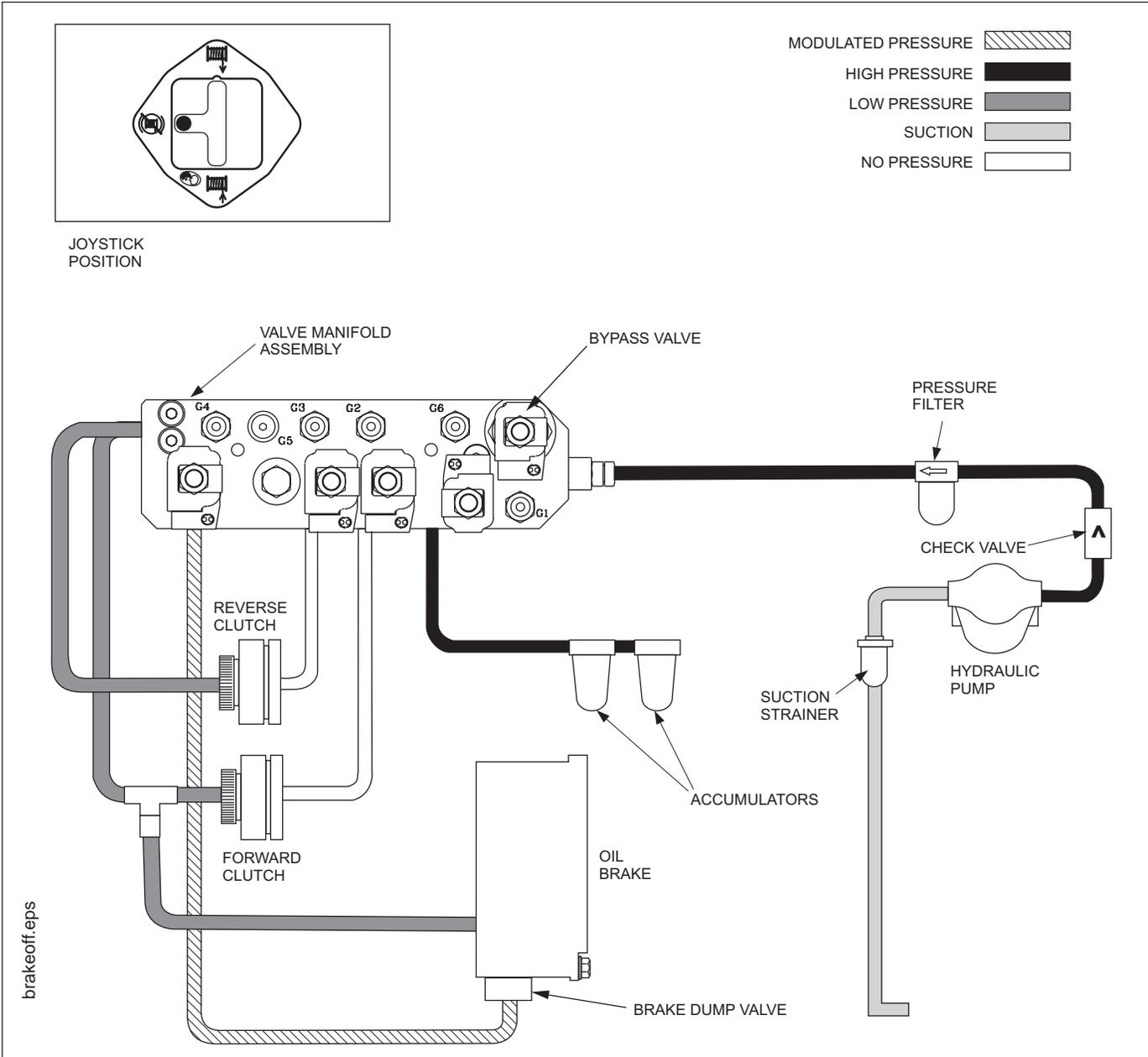


Figure 1-15 Hydraulic System - BRAKE OFF

## Sequence of Operation - BRAKE OFF

BRAKE OFF is achieved by pushing the joystick to the left of the BRAKE ON position. This position is detented and the joystick must be moved manually to return it to the neutral position. The bypass valve closes as the accumulator valve opens. The brake dump valve closes so brake pressure can increase. The proportional brake valve modulates brake pressure based on joystick position and the control program, making brake off inching possible.

**WARNING**

Brake-off inching is not intended for heavy suspended loads, as unintended load fallback can occur.

## Troubleshooting

### General

This section includes:

- Table 2-1, a trouble analysis check chart
- Table 2-2, an electronic control module (ECM) LED description chart
- Table 2-3, a basic ECM troubleshooting chart.

The charts list the most common troubles that may be encountered.

Table 2-1 Troubleshooting Analysis Check Chart

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular	Hydraulic oil is too cold.	Put the control lever in the <b>BRAKE OFF</b> position. Run the engine at 1000 rpm to warm the oil before operating the winch.
	Low oil level.	Add hydraulic oil to the correct level.
	Low oil pressure.	See item on troubleshooting low oil pressure directly below.
	Wrong oil.	Drain oil and replace with correct grade. Refer to the approved oil list in Section 1.
	Accumulator malfunction.	Check accumulator and recharge/replace as necessary.
	Tractor engine idling too low.	Increase tractor idle speed.
	Hydraulic system suction leaks. Observe oil exiting lube valve while tractor is operating. Suction leaks will cause oil to foam.	Check the following for air leaks: 1. Suction hose to pump connection 2. Pump shaft seal 3. Suction filter cover and gasket 4. Suction hose for cracks or collapsed sections
Low oil pressure	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.
	Defective or improperly adjusted oil relief valve; poppet may be stuck open.	Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective.
	Clogged suction strainer.	Check and clean or replace suction strainer.
	Oil brake leaking internally (indicated by low brake pressure).	Repair as required.
	Defective hydraulic pump.	Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.
Brake does not release or winch stalls during low RPM shift	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace both seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.

Table 2-1 (continued) Troubleshooting Analysis Check Chart

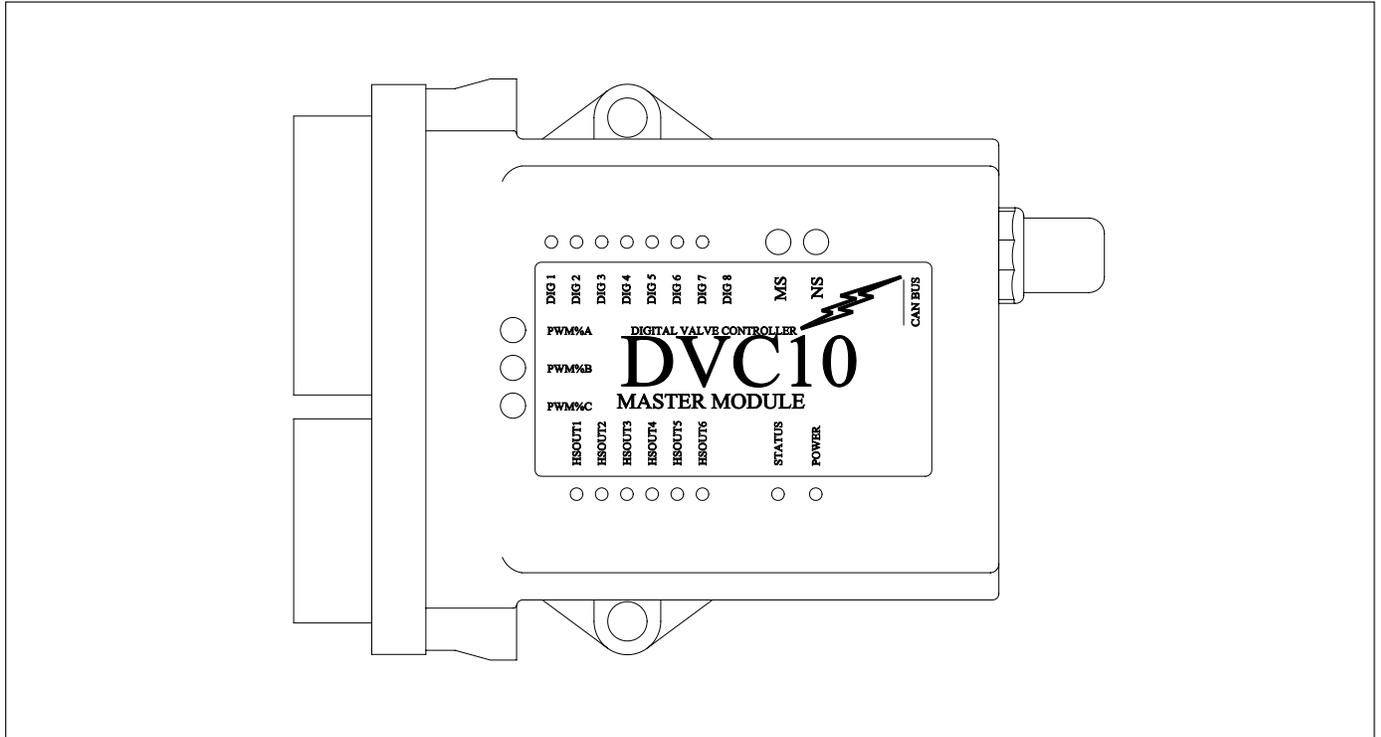
PROBLEM	POSSIBLE CAUSE	CORRECTION
Overheating	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Remove suction filter, clean and replace.
	One or both clutches dragging.	Check by placing joystick in <b>BRAKE OFF</b> . Normally drum will rotate slowly in the <b>LINE IN</b> direction. If the reverse clutch is dragging, the drum will rotate in the <b>LINE OUT</b> direction. If forward clutch is dragging the drum will rotate positively in the <b>LINE IN</b> direction and it will take more than 100 lbs. of line pull to prevent drum rotation.
	Low system pressure.	Adjust accordingly.
	Low or high cooling oil pressure.	Check cooling oil pressure. Replace relief valve if required.
	Bevel shaft bearings set too tight.	Adjust accordingly.
	Excessive inching.	Avoid continuous operation in the inching zone.
	Low oil level.	Add oil.
	Clogged suction strainer/filter.	Check and clean or replace the suction strainer.
Winch will not operate while tracks are turning	Accumulator system malfunction.	Check for: <ol style="list-style-type: none"> <li>1. Correct leakdown time as described in Section 3.</li> <li>2. Leaking accumulator valve.</li> <li>3. Leak in accumulator lines.</li> <li>4. Damaged or defective accumulators.</li> </ol>
	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage. Inspect magnetic suction screen.
Winch will not operate in any function.	Joystick off-center at startup.	Return joystick to neutral position and attempt function again.
	Control module not powered.	Check fuse & replace if necessary.
	Joystick DC-DC converter malfunction.	Replace converter if the red & green LEDs are not lit.
	Control module fault.	Check status indicator on module. Red LED should <b>not</b> be illuminated. If it is, consult factory.
	Coil open or shorted.	<ol style="list-style-type: none"> <li>1. Check module output LEDs. Flashing LED indicates open or shorted circuit.</li> <li>2. Check wiring harness continuity.</li> <li>3. Replace faulty coil.</li> </ol> <p><b>Note: A working coil will have 15 to 50Ω resistance and will be magnetized when energized.</b></p>
	Cartridge valve plugged.	Replace valve if pressure at appropriate gauge port is not close to relief pressure with coil energized.
	Loose or worn connector.	Check and replace as needed.
Forward or reverse clutch not releasing	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators	Replace as necessary.

Table 2-1 (continued) Troubleshooting Analysis Check Chart

PROBLEM	POSSIBLE CAUSE	CORRECTION
Forward or reverse clutch not engaging	Low oil pressure.	See "Low Oil Pressure" troubleshooting item above.
	Low forward or reverse clutch pressure.	See troubleshooting for "Low Forward or Reverse Clutch Pressure" item below.
	Inadequate piston travel.	Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.
Clutch does not apply correctly at low PTO rpm.	Accumulator not charged.	Check accumulator.
	PTO stalled (0 rpm).	Increase tractor rpm.
Low forward or reverse clutch pressure	Broken seal rings on the bevel gear shaft.	Replace seal rings. <b>NOTE:</b> A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on clutch/brake shaft and adjust it if necessary to prevent additional breakage of seal rings; refer to Section 4.
	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 retainer for grooves. Replace retainer if defective, or re-sleeve.
	Damaged clutch piston, piston retainer or O-rings.	Check piston and piston retainer cavity for damage. Always repair both O-rings when clutch is repaired. Refer to Section 4.
	Reverse pressure hose damaged by bevel gear.	Remove cover and inspect.
	Leaky clutch circuit.	Perform clutch bleed-down test on clutch circuit.
	Faulty valve or coil.	Check valve and coil for proper operation. Check Coil for voltage.
Brake slipping or drum backspin on fast shift from neutral to forward	Low brake release pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 4.
Brake releases before forward clutch engagement	Faulty forward clutch valve or coil.	Check forward clutch valve and coil.
	Low brake release pressure.	See "Brake Slipping" troubleshooting item above.
Brake releases before reverse clutch engagement	Faulty reverse clutch valve or coil.	Check reverse clutch valve and coil. Adjust or replace as necessary.
Noisy buzz emanating from winch.	Air in relief valve.	This is not a detrimental condition. Noise may be intermittent.
Joystick will not detent in brake off.	Detent mechanism worn or broken.	1. Replace joystick assembly. 2. Adjust detent spring force (see <b>Joystick &amp; Lubrication Adjustment</b> in Section 3 for procedure).
Joystick does not return to neutral when released.	Insufficient lubrication.	Lubricate detent pin (see <b>Joystick Lubrication &amp; Adjustment</b> in Section 3 for procedure).
	Excessive detent force.	Remove knob and adjust detent force (see <b>Joystick Lubrication &amp; Adjustment</b> in Section 3 for procedure).
	Joystick is in detented position (brake off).	Move joystick out of detent.

Table 2-1 (continued) Troubleshooting Analysis Check Chart

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch does not engage and tractor engine draws down in LINE IN or LINE OUT.	Plugged brake valve.	Replace valve.
	Faulty brake coil.	Replace coil.
	Open or shorted brake circuit.	Check wiring harness. See "Winch will not operate in any function" above.
Winch does not engage and/or load rolls out in LINE IN or LINE OUT.	Plugged forward or reverse valve.	Replace valve.
	Faulty forward or reverse coil.	Replace coil.
	Open or shorted forward/reverse circuit.	Check wiring harness. See "Winch will not operate in any function" above.
Filter LED blinking.	Open or shorted coil.	See the <b>Control Module Troubleshooting</b> section in this chapter for more information.
Filter LED illuminated.	Filter is clogged.	Change filter and oil. <b>NOTE: Change filter only after first 50 hours of operation when winch is new or freshly rebuilt.</b>
	Cold oil is causing filter bypass.	Monitor LED condition. If LED remains illuminated after normal operating temperature has been reached, change oil and filter.
	Electrical short circuit.	Check filter bypass switch circuit of wiring harness.



**Figure 2-1 Electronic Control Module**

**Table 2-2 Electronic Control Module LED Description Chart (See Figure 2-1)**

<b>LED</b>	<b>Function</b>	<b>Normal (Powered) Condition</b>
MS	Module status	Lit (green) after power-up. While downloading a program to the module, MS and NS LEDs will flash in an alternating fashion.
NS	Network status	Lit or flashing after power-up. While downloading a program to the module, MS and NS LEDs will flash in an alternating fashion.
DIG1-DIG8	Digital inputs	Not used.
PWM%A	FWD/REV modulation	Solid red to green in FWD or REV.
PWM%B	Brake modulation	Solid red to green in FWD, REV or Brake-off.
PWM%C	Fault detection	Solid at startup.
HSOUT1	Forward output	FWD operation.
HSOUT2	Reverse output	REV operation.
HSOUT3	Brake output	FWD, REV or Brake-off operation.
HSOUT4	Accumulator/Cooling output	FWD, REV or Brake-off operation.
HSOUT5	Freespool output	Not used on W12E.
HSOUT6	Brake dump output	FWD, REV or Brake-off operation.
STATUS	Not used	N/A
POWER	Power indicator	Lit after power-up.

Table 2-3 Electronic Control Module Troubleshooting Chart

LED status	Fault description	Probable cause	Corrective action
PWM%C lit	Winch won't function	Joystick off-center at startup	Center joystick
PWM%C & HSOUTx flashing	Shorted or open output circuit	Wiring harness failure	Check appropriate circuit from module to valve
		Faulty coil	Replace coil if resistance is outside of 15-50Ω range
PWM%C flashing; HSOUTx may be lit, but not flashing	Winch won't function or only allows one function	Joystick out of calibration	Replace joystick or send to factory for calibration
MS lit (steady red)	Winch won't function	Module fault	Turn power off, then on. If MS light is still steady red, replace module.

## Interfacing with the Electronic Control Module (ECM)

The ECM regulates the cartridge valves on the valve manifold assembly, based on joystick input and a preset computer program. Occasionally, it may be necessary to download a new control program for the ECM or perform higher-level electronic control system troubleshooting through the ECM interface. Should this be necessary, a CD with the relevant software and a communication cable are available from Allied Systems. The files may also be downloaded from Allied Systems' e-Commerce website. Please contact a dealer or call Allied Systems for more information.

## Service

### General

This section provides the instructions for performing maintenance and making checks and adjustments. Standard shop tools are used in doing the work described in this section.

### Maintenance

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating time on the hour meter of the tractor to determine the maintenance time for the winch.

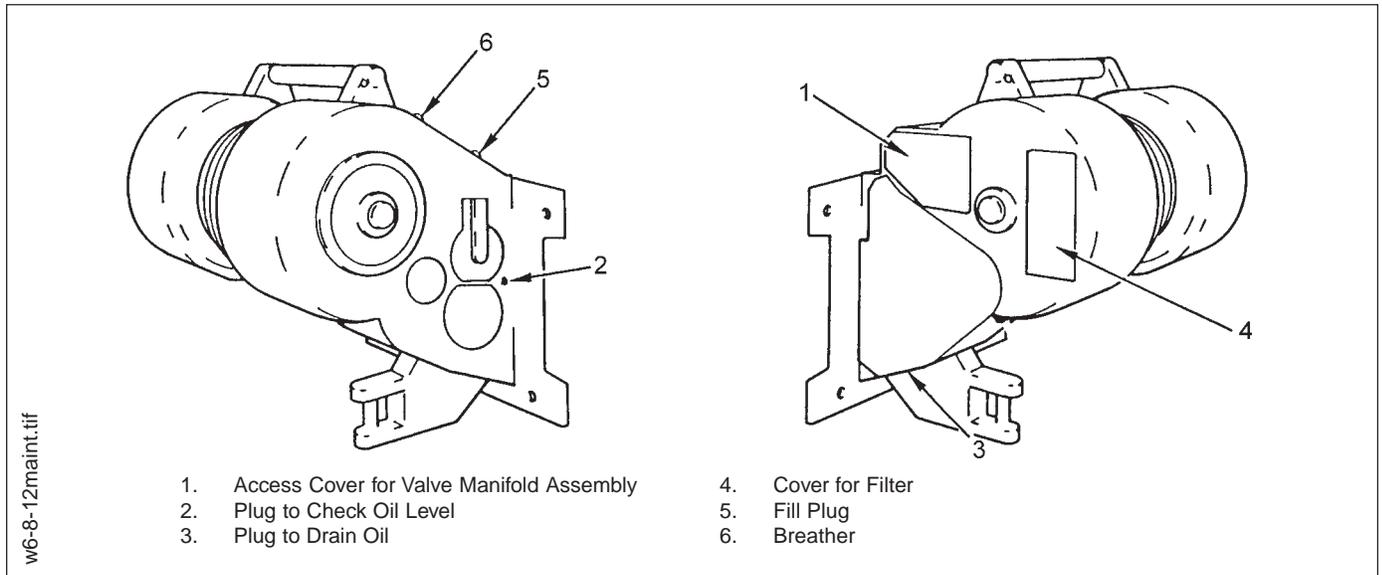


Figure 3-1 W12E Maintenance Points

Table 3-1 Maintenance Schedule

INTERVAL	PROCEDURE OR QUANTITY	SPECIFICATION
50 hours or weekly *	Check oil level at plug (item 2). Add oil as necessary. <b>Do not operate the tractor when checking the oil level.</b>	See Table 1-2 – Approved Oil List.
	Clean the breather in the fill plug.	Remove debris around breather. Clean the breather with solvent if necessary.
	Lubricate the rollers on the cable guide rolls or fairlead assembly if the winch is equipped with either option.	Use multi-purpose grease with 2-4% molybdenum disulfide.
500 hours or every 3 months	Clean the oil suction screen and magnets.*	Tilt the tractor approximately 15° to prevent loss of oil when the cover is removed. Use a new gasket between the cover and the suction tube.
	Clean the breather in the fill plug.	Clean the breather with solvent.
	Replace the filter.*	See the <b>Parts Manual</b> for filter element and cover gasket. When replacing, be sure to lubricate filter seal ring between element and filter head.
1000 hours or every 6 months	Change the hydraulic oil. Drain oil from plug (item 3). Clean the oil strainer. Through fill plug (item 5), add 22 gallons (83 liters) of oil. Check the oil level at item 2.	See Table 1-2 – Approved Oil List.
* <b>NOTE: Clean the oil strainer screen and change the oil filter after the first 50 hours on new and rebuilt winches.</b>		
† Amount of oil may vary slightly with tractor.		

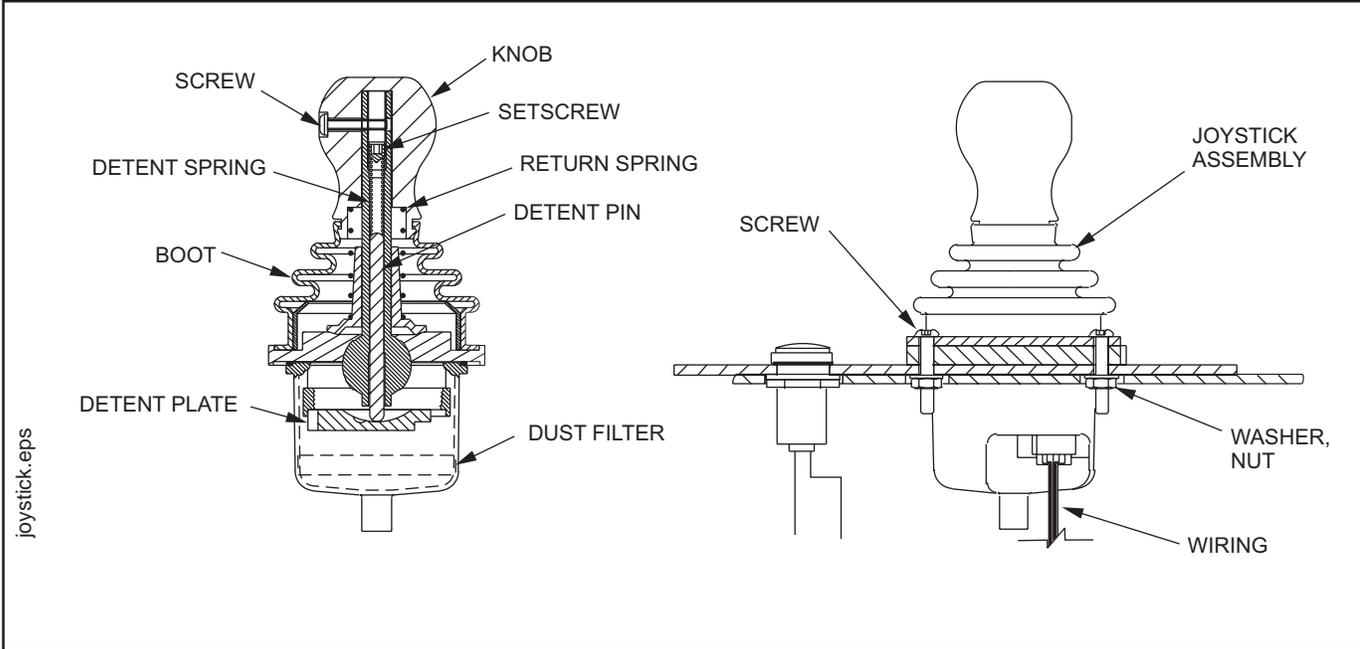


Figure 3-2 Joystick

### Checks Before Operation

Check that the cable and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Table 3-1, Maintenance Schedule.

### Checks During Operation

The troubleshooting charts in Section 2 can be used by the operator to identify a problem with the winch operation. A trained service person is needed for additional troubleshooting and repair that requires disassembly of parts of the winch.

### Joystick Lubrication & Adjustment (See Fig. 3-2)

**CAUTION**

Make sure vehicle engine is OFF before performing any of these procedures.

**CAUTION**

Removing the Detent Plate from the joystick may cause a calibration error, which will prevent proper winch response.

### Joystick Detent Pin Lubrication

1. Unscrew joystick assembly from bracket.
2. Push down on knob to balance spring force and re-

move screw on joystick knob. Lift knob and boot from joystick.

3. Remove setscrew and detent spring.
4. Apply a few drops of oil on top of detent pin inside bore.
5. Install spring, then setscrew.
6. Move joystick from BRAKE ON to BRAKE OFF and back to ensure detent force is satisfactory. If not, adjust detent force (see **Adjusting Joystick Detent Force** below).
7. Place boot and knob over joystick, ensuring boot is securely installed, then install knob screw.
8. Install joystick assembly on bracket.

### Adjusting Joystick Detent Force

1. Remove screw on joystick knob. Lift knob and boot from handlever.
2. Using an Allen wrench, turn the setscrew inwards to increase detent force, or outwards to decrease detent force.
3. Move joystick from BRAKE ON to BRAKE OFF and back again. If detent force is still unsatisfactory, adjust setscrew again.

**NOTE: Detent force is different with knob installed, since the compressed return spring works against the detent force..**

4. Place boot and knob over joystick assembly, ensuring boot is securely installed, then install knob screw.

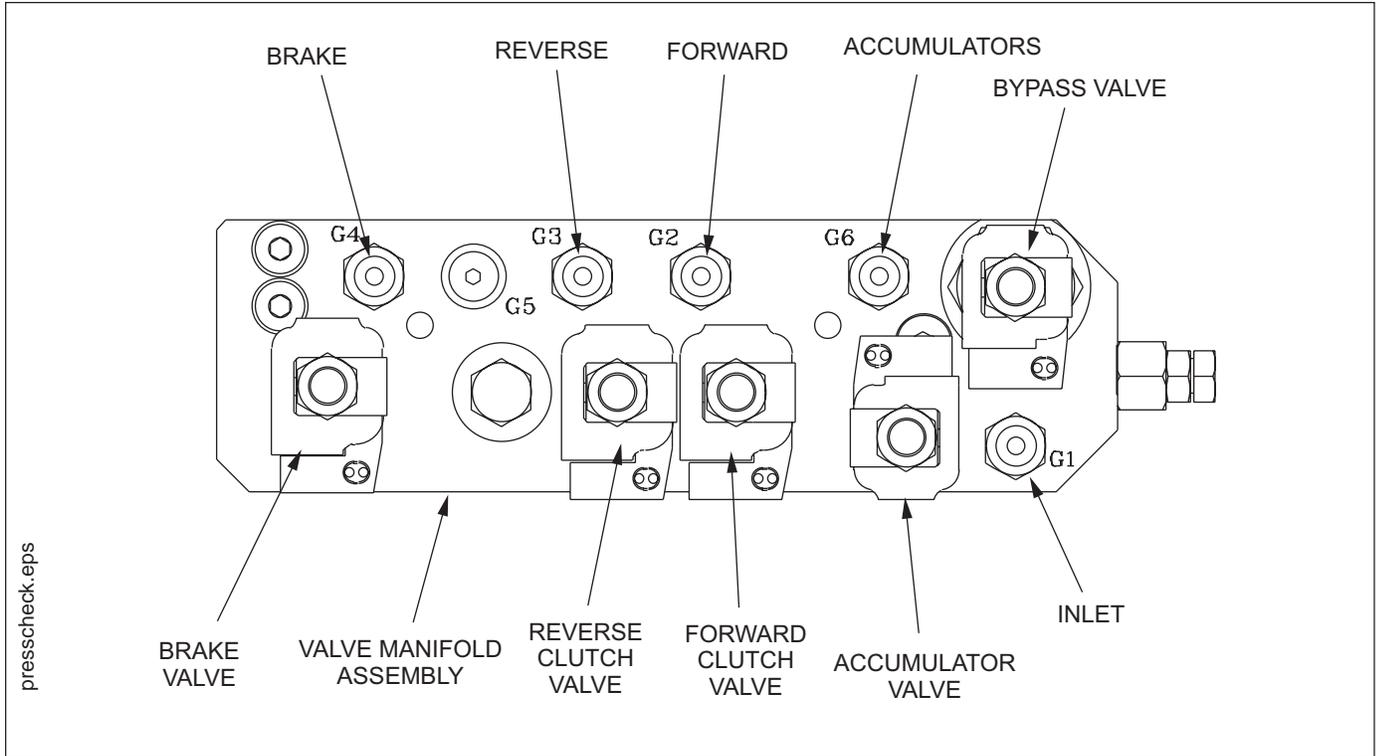


Figure 3-3 Hydraulic Pressure Test Ports

### Hydraulic System Pressure Checks (See Fig. 3-3)

The hydraulic oil and filter(s) should be maintained as indicated in the Maintenance Schedule. If any problems are found, they should be corrected before operating the winch.

#### Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Remove cable from drum to prevent entanglement during pressure checks since the drum will rotate during the tests.

2. Start the engine and place the winch in BRAKE OFF to raise the oil temperature to at least 27°C (80°F).
3. Remove any dirt from the left side of the winch. Remove control valve access cover.
4. Stabilize engine speed at 1000 RPM for all tests.
5. Install control valve access cover and tighten capscrews.

#### Pressure gauges

Two 400 psi (28 kg/cm<sup>2</sup>) calibrated pressure test gauges are required to perform the hydraulic pressure checks.

**NOTE:** Shut off the tractor engine when connecting and disconnecting test gauges.

**! WARNING**

Vehicle engine must be shut OFF before disconnecting drum cable. Be careful when you remove the cable from the drum. The end of the cable can move like a compressed spring, causing an injury when the ferrule is released from the drum.

**! WARNING**

Place joystick in BRAKE ON to prevent accidental discharge of pressurized oil stored in the accumulators.

**! WARNING**

Always wear gloves when handling cable.

## Brake Pressure Check

With the engine shut off, connect a pressure gauge to Brake Port G4. Start the engine and refer to Table 3-2. Adequate brake pressure is required to fully release the brake. If the pressure is not as specified, check for:

1. Improper relief valve setting or malfunction.
2. Suction strainer or pressure filter malfunction.
3. Leaking pressure hoses or fittings.
4. A defective hydraulic pump. A defective pump is usually indicated by low pressure and pressure increases with increased engine RPM.

## Cooling Oil Pressure Check

With the engine shut off, connect a pressure gauge to Port G1. Start the engine and see the Cooling section in Table 3-2. If the cooling oil pressure is too high or too low, overheating can occur.

## Accumulator Pressure Check

With the engine shut off, connect a pressure gauge to Port G4. This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe the following while referring to the Accumulator section in Table 3-2.

1. With engine running, place joystick in BRAKE OFF and rev engine to maintain 220 psi (1520 kPa) for one minute. This will ensure the accumulators have a full supply of oil.
2. Return joystick to BRAKE ON.
3. Shut the engine off and wait one minute, then turn key to the "ON" position but **do not start the engine**.
4. Place the joystick in the BRAKE OFF position. This will release the oil in the accumulators. Observe the initial pressure reading and the time for the pressure to drop below that specified in Table 3-2.

If the leak down time is less than specified in Table 3-2, repeat steps 1 through 4, but do not delay in placing the joystick in BRAKE OFF after the engine is shut down. If the leak down time is greater than that measured when waiting one minute, there is probably a leak in the lines between the accumulators and the valve manifold assembly.

Accumulator valve performance can be checked by connecting a gauge to Port G6. After ensuring the accumulators are charged, place the joystick in neutral. The pres-

sure at G6 should remain above 200 psi for several minutes.

Low accumulator gas pressures tend to stall the winch on a low engine rpm shift. To determine if accumulators have any gas pressure, remove valve stem protective cover and push gently on valve stem. A ruptured bladder will emit oil. Accumulators are not rebuildable.

## Forward Clutch Pressure Check

With the engine shut off, connect a pressure gauge to Port G2. Start the engine and place joystick in BRAKE OFF to build up the accumulator system pressure. Place joystick in LINE IN position and check forward clutch. On a fast shift the clutch pressure should come up with the brake pressure. If the pressure differential is too low the brake will not release soon enough and cause it to stall. If the pressure differential is too high the brake will release too soon and cause backspinning of the drum.

If the forward clutch pressure is not as specified in Table 3-2, check for:

1. Leaking pressure hoses or fittings.
2. Damaged or worn clutch piston seals.
3. Damaged or worn valve manifold assembly parts.
4. Broken seal rings on clutch shaft.
5. Damaged O-rings on clutch shaft. Troubleshooting information is given in Section 2.

## Reverse Clutch Pressure Check

Shut off the engine and connect a pressure gauge to Reverse Clutch Port G3. Start the engine. Place the joystick in LINE OUT and check reverse clutch pressure as indicated in Table 3-2. On a fast LINE OUT shift the clutch pressure should come up with the brake pressure. If the pressure differential is too low the brake will not release soon enough and cause drag. If the pressure differential is too high the brake will release too soon and cause backspinning of the drum.

If the reverse clutch pressure is not as specified in Table 3-2, check for:

1. Leaking pressure hoses or fittings.
2. Damaged or worn clutch piston seals.
3. Damaged or worn valve manifold assembly parts.
4. Broken seal rings on clutch shaft.
5. Damaged O-rings on clutch shaft. Troubleshooting information is given in Section 2.

Table 3-2 Hydraulic System Pressure Tests

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	G4 – Brake	400 psi (28 kg/cm <sup>2</sup> ) gauge	Brake Off	220 psi (15.5 kg/cm <sup>2</sup> )	Adjust relief valve.
Cooling	G1 – Inlet	400 psi (28 kg/cm <sup>2</sup> ) gauge	Brake On	Less than 140 psi (10 kg/cm <sup>2</sup> )	Check plumbing for leakage or blockage; check bypass valve.
Accumulator	G4 – Brake	400 psi (28 kg/cm <sup>2</sup> ) gauge	<ol style="list-style-type: none"> <li>1. Brake Off</li> <li>2. Brake On</li> <li>3. Stop engine</li> <li>4. Brake Off</li> <li>5. Repeat if required</li> </ol>	<ol style="list-style-type: none"> <li>1. 220 psi (15.5 kg/cm<sup>2</sup>)</li> <li>2. None</li> <li>3. None—wait 1 minute</li> <li>4. 150 psi (11 kg/cm<sup>2</sup>) immediately &amp; 100 psi (7 kg/cm<sup>2</sup>) minimum after 30 seconds</li> </ol>	<ol style="list-style-type: none"> <li>1. Check hydraulic lines for leaks.</li> <li>2. Replace accumulator valve.</li> <li>3. Check for defective accumulators.</li> </ol>
Line In (Forward)	G2 – Forward	400 psi (28 kg/cm <sup>2</sup> ) gauge	Line In	220 psi (15.5 kg/cm <sup>2</sup> )	Refer to Section 2, Table 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.
Line Out (Reverse)	G3 – Reverse	400 psi (28 kg/cm <sup>2</sup> ) gauge	Line Out	220 psi (15.5 kg/cm <sup>2</sup> )	Refer to Section 2, Table 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.

## Decal, Nameplate and Service Plate Installation

The unit nameplate, a Warning Decal and a Filter Service Plate are located on the winch as illustrated in Figure 3-4. If any of these is damaged, install new ones in the locations shown.

The W12EE model decals are used on both sides of the winch frame as shown. Replace as necessary.

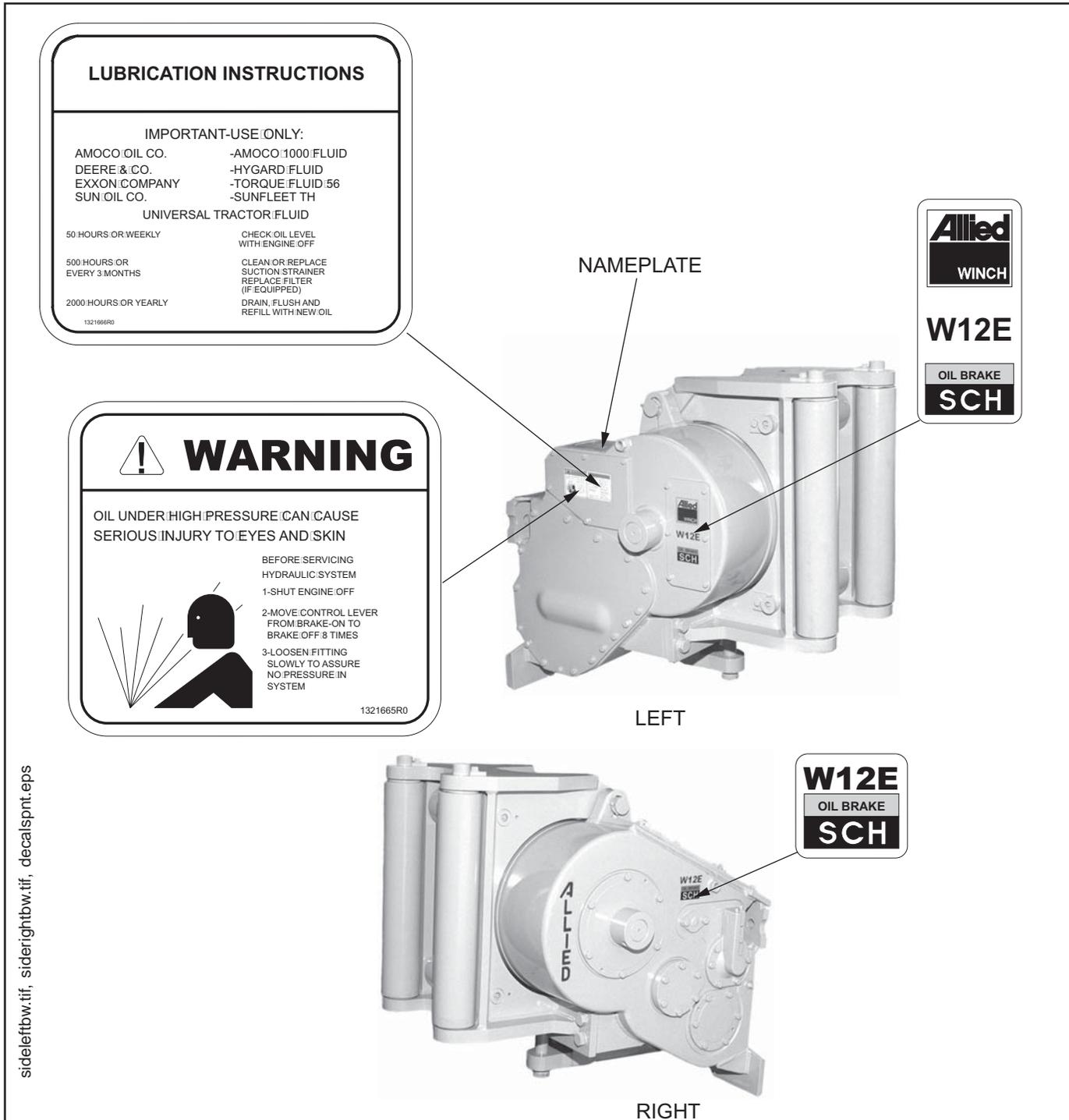


Figure 3-4 Decal Installation



To find a dealer in your area,  
Call: 503.625.2560,  
Fax: 503.625.7269 , or  
Email: [marketing@alliedsystems.com](mailto:marketing@alliedsystems.com)

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