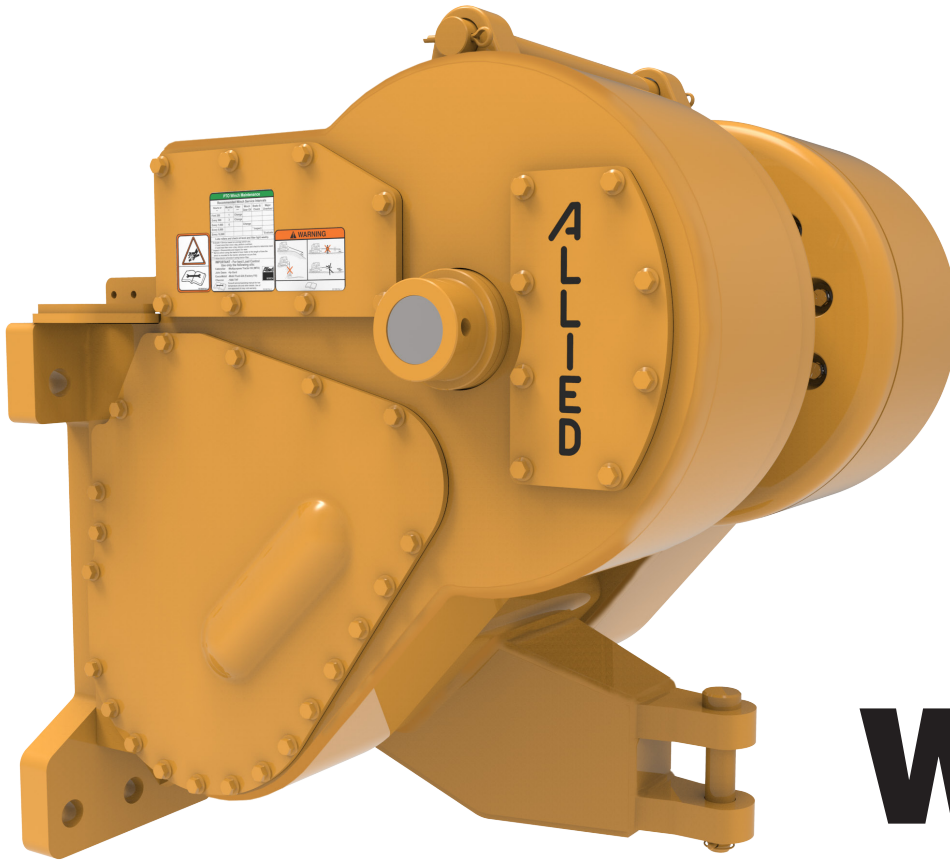


Service Manual



W12E

Electronic Controlled Towing Winch for Caterpillar Dozers

This manual must be with the vehicle on which this winch is installed.

Applicable to winches with serial numbers:

- AW12E**1749**** and later

A Product of

Allied Systems
COMPANY

Sherwood, OR USA

Please check the Allied Systems website regularly for updates to this manual.
www.alliedsystems.com

Safety Precautions

Read, understand and observe the precautions on the following pages to prevent injury to personnel and damage to equipment.

Winch serial number _____

Date put into service _____

**NOTE: This publication may be translated to different languages for sole purpose of easy reference in non-English speaking locations.
Should there be differences in interpretations to the text,
please refer to the English language edition published by Allied Systems Company
as the controlling document.**

Safety Summary

General Safety Notices

The following pages contain general safety warnings which supplement specific warnings and cautions appearing elsewhere in this manual. All electrical and hydraulic equipment is dangerous. You must thoroughly review and understand the Safety Summary before attempting to operate, troubleshoot or service this winch.

The following symbols and terms are used to emphasize safety precautions and notices in this manual:

DANGER

The “DANGER” symbol indicates a hazardous situation which, if not avoided, will result in serious injury or death. Carefully read the message that follows to prevent serious injury or death.

WARNING

The “WARNING” symbol appears wherever incorrect operating procedures or practices could cause serious injury or death. Carefully read the message that follows to prevent serious injury or death.

CAUTION

The “CAUTION” symbol appears where a hazardous situation which, if not avoided, could result in minor to moderate injury and equipment damage.

NOTICE

This signal word alerts to a situation that is not related to personal injury but may cause equipment damage.

NOTE: ...

The term “NOTE” highlights operating procedures or practices that may improve equipment reliability and/or personnel performance.

NOTE: All possible safety hazards cannot be foreseen so as to be included in this manual. Therefore, you must always be alert to potential hazards that could endanger personnel and/or damage the equipment.

Safety Regulations

Each country has its own safety legislation. It is in the operator’s own interest to be conversant with these regulations and to comply with them in full. This also applies to local by laws and regulations in force on a particular worksite.

Should the recommendations in this manual deviate from those in the user’s country, the national regulations should be followed.

Operation, Inspection, and Maintenance Warnings

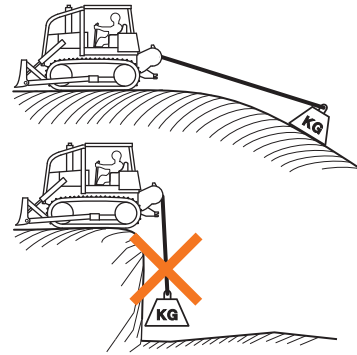
WARNING

Obey the following cautions and warnings before using your winch to avoid equipment damage, personal injury or death.

- Do not operate the winch unless you are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.
- 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 perform maintenance on a machine that is in motion.
- Inspect the winch before each use:
 - » Make sure that the controls and instruments operate correctly.
 - » Report the need for repairs immediately.
 - » Do not work with a damaged or worn wire rope.
 - » Do not use a winch that needs repairs.

» If the wire rope and ferrule must be removed from the drum, make sure the end of the wire rope and ferrule are controlled when the ferrule is released. The end of the wire rope can suddenly move from the drum like a compressed spring when the ferrule is released, and cause an injury.

- Stay in the operator's seat when operating the winch.
- Do not stand on the vehicle when operating the winch.
- Avoid winch operation near people or other machines.
- Never stand nor permit others to stand in the bight (loop) of a wire rope.
- Do not stand nor permit others to be near the winch or wire rope when there is tension on the wire rope.
- Observe jobsite rules.
- Be in complete control at all times.
- 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 wire rope 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, which will cause damage.
- When the winch is not in use, make sure the control lever is in **BRAKE-ON** position and the winch brake is applied.
- Do not use winch as a hoist. Dozer and skidder mounted winches are designed for towing.



- Always inspect wire rope, tail chain and other rigging components for wear, damage, broken strands or abuse before use.
- Never use wire rope, tail chain or other rigging that is worn-out, damaged or abused.
- Never overload wire rope, tail chain or rigging.
- Wire rope and tail chain will fail if worn-out, overloaded, misused, damaged, improperly maintained or abused. Wire rope or tail chain failure may cause serious injury or death!



- Do not terminate wire rope to tail chain by the use of a knot.
- Do not handle wire rope if the hook end is not free. A load could break away, suddenly tensioning the wire rope, resulting in serious injury or death.
- Stay clear of wire rope entry areas (fairlead or arch rollers, winch drum etc).

- Make sure ground personnel are in plain view of the operator, and at a distance of at least 1½ times the working length of the wire rope.
- Make sure that any hand signals used by ground personnel are clearly defined and understood by everyone involved.
- Do not attempt to “jerk” or “shock” a load free. Doing so can cause loads in excess of the rated capacity of the wire rope, winch, or mounting hardware.
- Replace any parts only with genuine Allied Winch parts. Refer to Parts Manual 599782W.
- Maintain **a minimum of three (3) complete wraps of wire rope** on the drum for normal operation. It may help to paint the last five wraps of wire rope a contrasting color, to serve as a visual indicator.
- Do not handle wire rope with bare hands. Wear leather gloves at all times.
- Align the dozer with the load to prevent side loading the winch, and to maintain even spooling of the wire rope.
- If applying tension to the wire rope manually during spooling:
 - » ensure that the operator is winching in slowly,
 - » keep your hands and clothing well clear of any rollers or the winch drum,
 - » do not maintain tension by letting the wire rope to slip through your hands,
 - » use a hand-over-hand technique to maintain tension.
- Be aware of the ground conditions, and make sure the ground and dozer are stable enough to pull the intended load.
- Do not attempt to pull loads in excess of the rated capacity of the winch.
- Keep yourself informed of any applicable codes, regulations and standards for the job.
- Your winch may have temperature shut-off system for protection of dozer and winch. Manual override of high temperature shut-off will cause damage to dozer and winch.
- This winch is neither intended, designed, nor rated for any application involved in the lifting or moving of personnel.
- Use only the lubricants listed in the Recommended Oil List. See page 1-11 for details.
- Do not weld on any part of the winch. Contact Allied Systems if weld repairs are needed.
- The hydraulic system must be kept clean and free of contamination at all times.
- Be aware of the hazards of pressurized hydraulics:
 - » Wear personal protective equipment, such as gloves and safety glasses, whenever servicing or checking a hydraulic system.
 - » Assume that all hydraulic hoses and components are pressurized. Relieve all hydraulic pressure before disconnecting any hydraulic line.
 - » Never try to stop or check for a hydraulic leak with any part of your body; use a piece of cardboard to check for hydraulic leaks.
 - » Small hydraulic hose leaks are extremely dangerous, and can inject hydraulic oil under the skin, even through gloves.
 - » Infection and gangrene are possible when hydraulic oil penetrates the skin. See a doctor immediately to prevent loss of limb or death.



Product Modifications

- Any alterations to the winch that have not been approved by Allied Systems Company, or use of any non-OEM replacement parts, will void the warranty, and may introduce serious safety hazards.
- Any non-OEM parts used, or any alterations made are done so at your own risk to personnel safety. This includes the addition of accessories and attachments not manufactured or approved by Allied Systems Company.

Ordering Parts:

When ordering replacement parts, give the unit serial number, part number, name of part and quantity required.

For any further information on parts, service or ordering, consult your local winch dealer, or contact Allied Systems Company:

Allied Systems Company
21433 SW Oregon Street
Sherwood, OR 97140 U.S.A.

Phone: 502-625-2560
Fax: 502-625-5132
E-Mail: parts@alliedsystems.com

Also see our website, www.alliedsystems.com, where the most current copy of this manual is always available.

Contents

Safety Summary	i	Troubleshooting Analysis Check Chart for Operators	2-24
Section 1: General	1-1	Troubleshooting Analysis Check Chart for Service Personnel	2-26
Introduction	1-1	Joystick Troubleshooting.	2-30
Description	1-1		
Unit Identification.....	1-2		
Installation Drawings	1-3		
Serial Number Codes.....	1-4		
Nameplate.....	1-4		
Warning and Maintenance Decals	1-4		
Gear Train	1-5		
Operation and Control	1-6		
Capacities & Specifications	1-7		
Recommended Oil List.....	1-7		
Winch Oil Capacity.....	1-7		
Hydraulic Specifications	1-7		
Bolt Torque Specifications	1-8		
Section 2: Electronic Controls	2-1	Section 3: Repairs	3-1
Hydraulic System.....	2-1	General	3-1
Valve Manifold Assembly & Hydraulic Schematic	2-2	Winch Removal	3-1
Forward & Reverse Clutches.....	2-4	Winch Disassembly.....	3-1
Oil Brake	2-4	Gear Arrangement for Ratio 7	3-2
Accumulator Valve.....	2-4	PTO Shaft Removal & Disassembly	3-3
Check Valve.....	2-4	Oil Brake Removal & Disassembly.....	3-5
Sequence of Operation	2-7	Hydraulic Pump Removal & Disassembly	3-8
- BRAKE-ON	2-7	Pump Disassembly.....	3-11
- LINE-IN	2-8	General Inspection.....	3-11
- LINE-OUT	2-9	Pump Gear.....	3-11
- BRAKE OFF	2-10	Pump Front and Backplates	3-12
Electronic Control Module	2-11	Pump Body.....	3-12
Bluetooth Adapter.....	2-11	Clutch Shaft Location	3-13
IQAN Connections.....	2-11	Clutch Shaft Removal & Disassembly	3-14
Service	2-12	Oil Clutch Disassembly	3-16
Maintenance Points.....	2-12	Intermediate Shaft Removal.....	3-20
Maintenance Schedule.....	2-12	Brake Shaft Removal.....	3-21
Checks Before Operation	2-13	Drum Shaft & Drum Removal.....	3-22
Checks During Operation.....	2-13	Winch Assembly.....	3-25
Hydraulic System Pressure Checks	2-14	Visual Inspection.....	3-25
Pressure Gauges	2-14	Drum Shaft & Drum Installation.....	3-28
Hydraulic System Test Ports	2-14	Intermediate Shaft Installation.....	3-32
Relief Valve and Adjustment.....	2-15	Brake Shaft Installation	3-33
System Pressure Check.....	2-16	Oil Clutch Reassembly.....	3-34
Brake Pressure Check	2-17	Clutch Shaft Reassembly & Installation	3-39
Cooling Oil Pressure Check	2-18	Oil Brake Reassembly & Installation	3-42
Line In Pressure Check.....	2-19	PTO Shaft Reassembly & Installation	3-45
Line Out Pressure Check	2-20	Hydraulic Pump Reassembly	3-48
Accumulator Pressure Check.....	2-21	Hydraulic Pump Installation.....	3-50
Accumulator Recharging Steps.....	2-22	Winch Installation	3-52
		Special Tools.....	3-53

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General

Introduction

This service manual is for the W12E winch. The following information is included in this manual:

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

Section 2. Electronic Controls focuses on the system formation, provides a guide for periodic maintenance, checks and adjustments, and lists common problems and the possible causes and corrections for a winch with electronic controls.

Section 3. Repairs describes the removal, disassembly, assembly, and installation of the winch.

Description

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

The W12E winch has a **BRAKE-OFF** function, which permits the wire rope to be pulled from the drum.

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

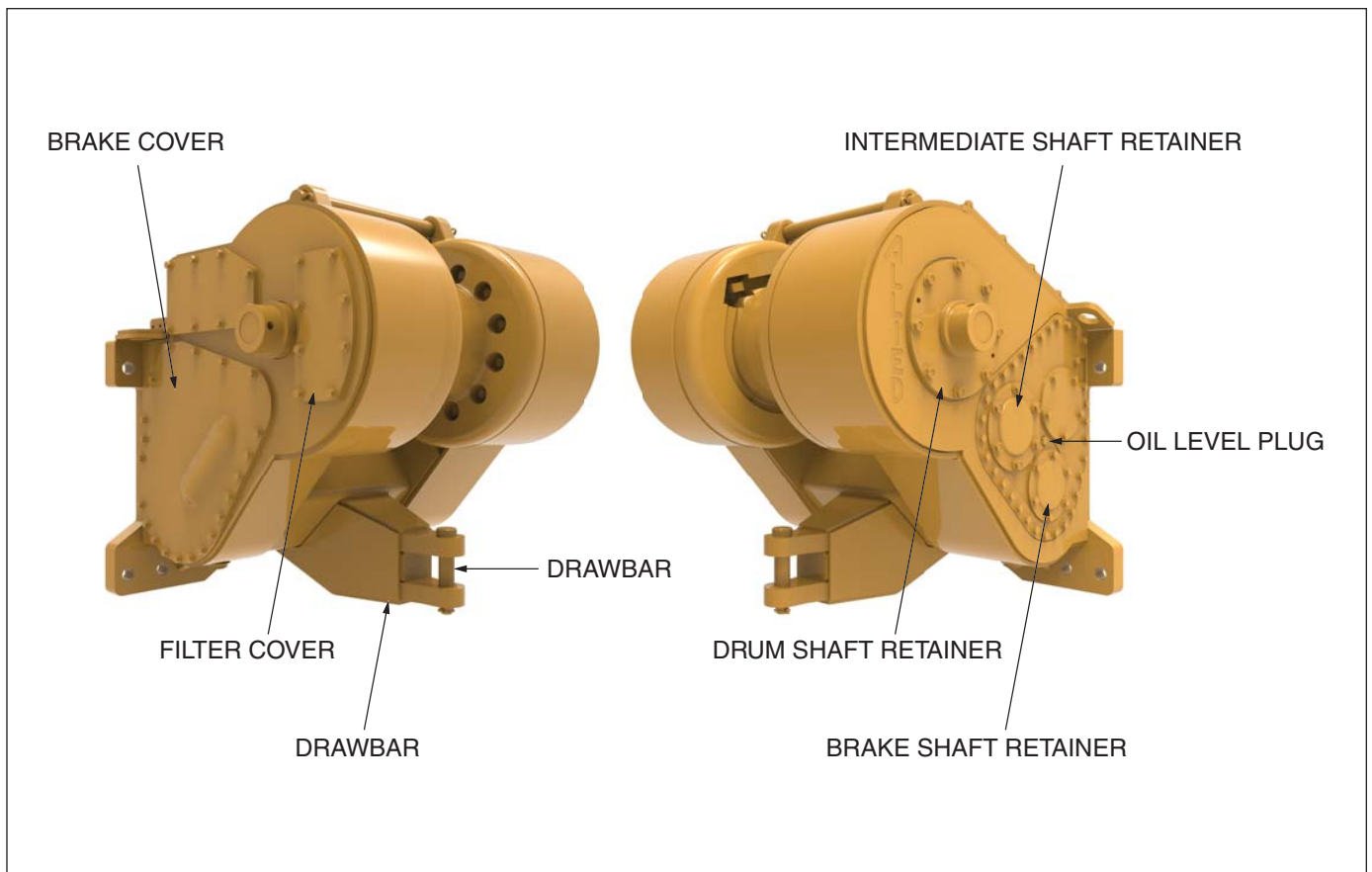
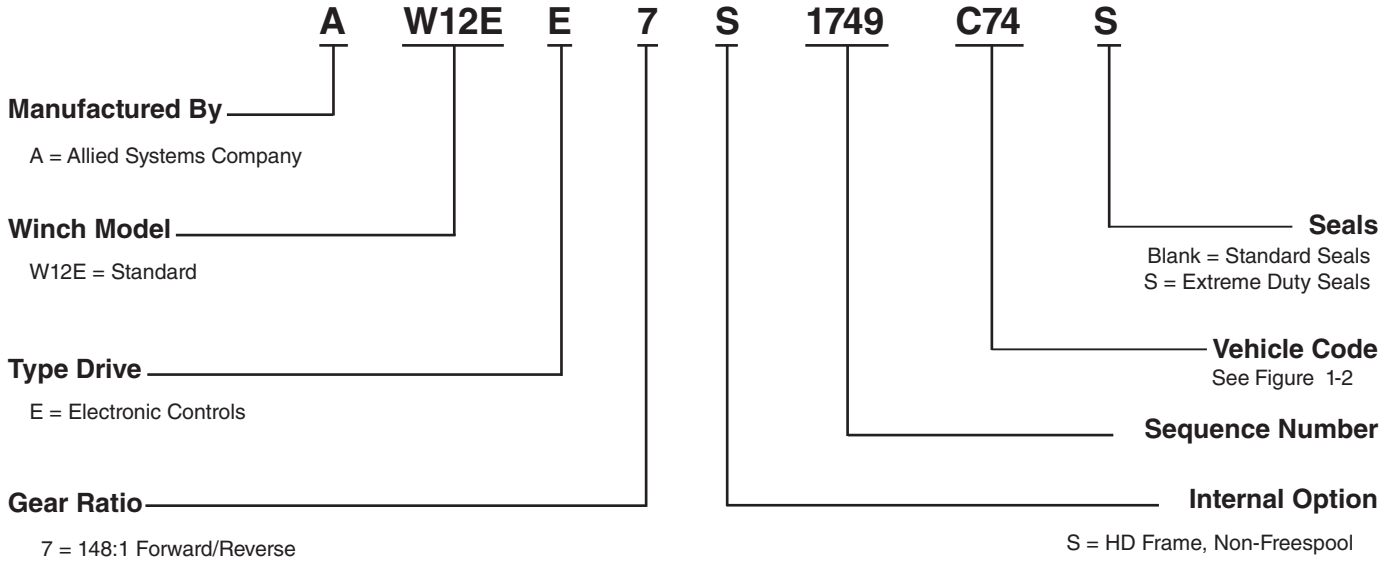


Figure 1-1 Model Views (Equal Speed Shown)

Unit Identification

Allied Winch S/N Nameplate Data For Dozer Mountings



Note: In Addition to the serial number plate, the serial number is stamped on to the left hand side of the frame.

Figure 1-2 Dozer or Skidder Identification and Gear Ratio (Continued on next page)

Vehicle Code	Gear Ratio	Caterpillar Model and Serial Number Prefix, Where Applicable
74	⑦	583T, D8T, PL83, PL87
75	⑦	D9T
76	⑦	D10T/T2

W12E INSTALLATION DRAWINGS BY DOZER

Winch Serial Number	Description	Installation Drawing Part Number
Electronic Control		
W12EE7S----C74	W12E CAT D8T Build	2317544
W12EE7S----C75	W12E CAT D9T	
W12EE7S----C76	W12E CAT D10T/T2	

- Notes:**
1. This list is for operators to keep track of necessary information of their winch installation drawings by dozers.
 2. If any of the installation drawings listed above is needed, please contact the Service Department of Allied Systems Company at 503-625-2560.

Figure 1-3 List of Installation Drawings

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

Each winch is shipped from the factory with a nameplate as shown in Figure 1-4. The nameplate is stamped with:

- winch model
- winch serial number
- maximum bare drum line pull
- maximum wire rope diameter

DO NOT operate the winch with larger diameter wire rope. If the nameplate is missing, DO NOT operate the winch until its capacity is known.

The serial number for the winch is also stamped into the frame next to the nameplate.

Warning and Maintenance Decals

A Warning Decal and a Maintenance Decal are located on the winch as shown in Figure 1-5. If the Warning Decal or

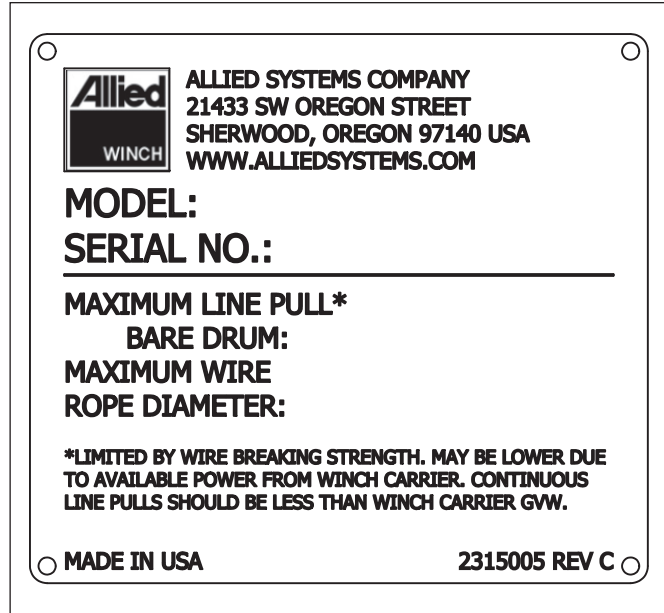


Figure 1-4 Nameplate

the Maintenance Decal has been damaged, install a new one in the location shown.

Model decals are used on both sides of the winch frame as shown. Replace as necessary.

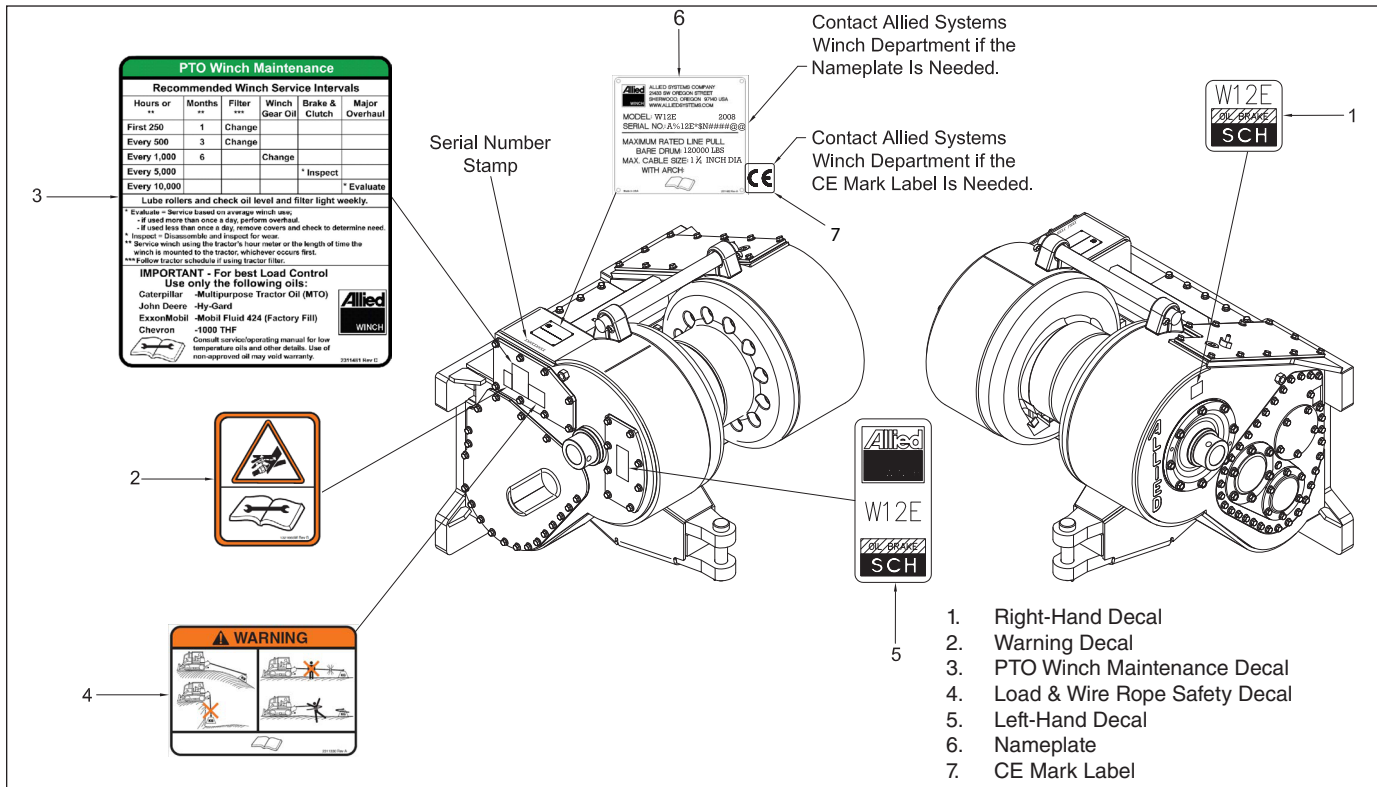


Figure 1-5 Decal Installation

Gear Train (Ratio #7, See Figure 1-6 & Figure 1-7)

The gear train (Figure 1-6) 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 1-7.

NOTE: PTO Rotation (CCW or CW) is determined by standing behind dozer and looking forward at the PTO shaft entering the winch case.

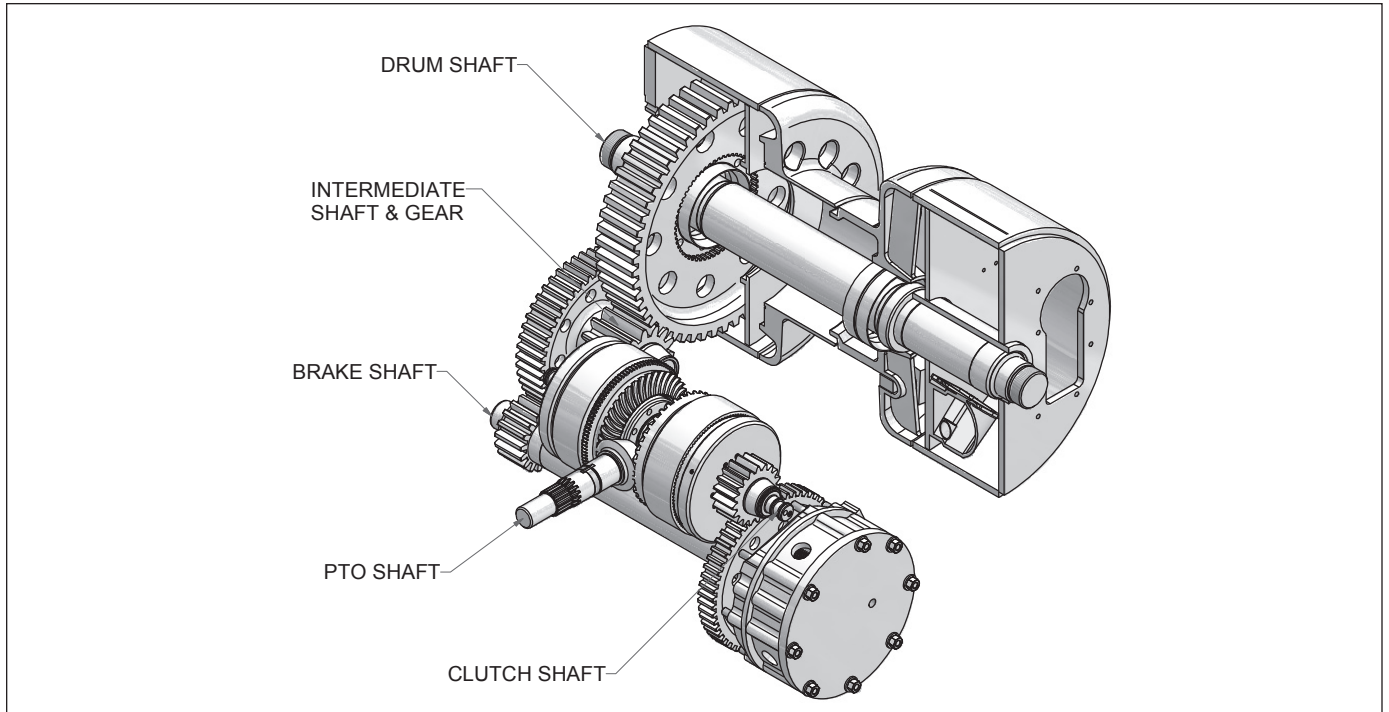


Figure 1-6 Gear Train (Ratio #7)

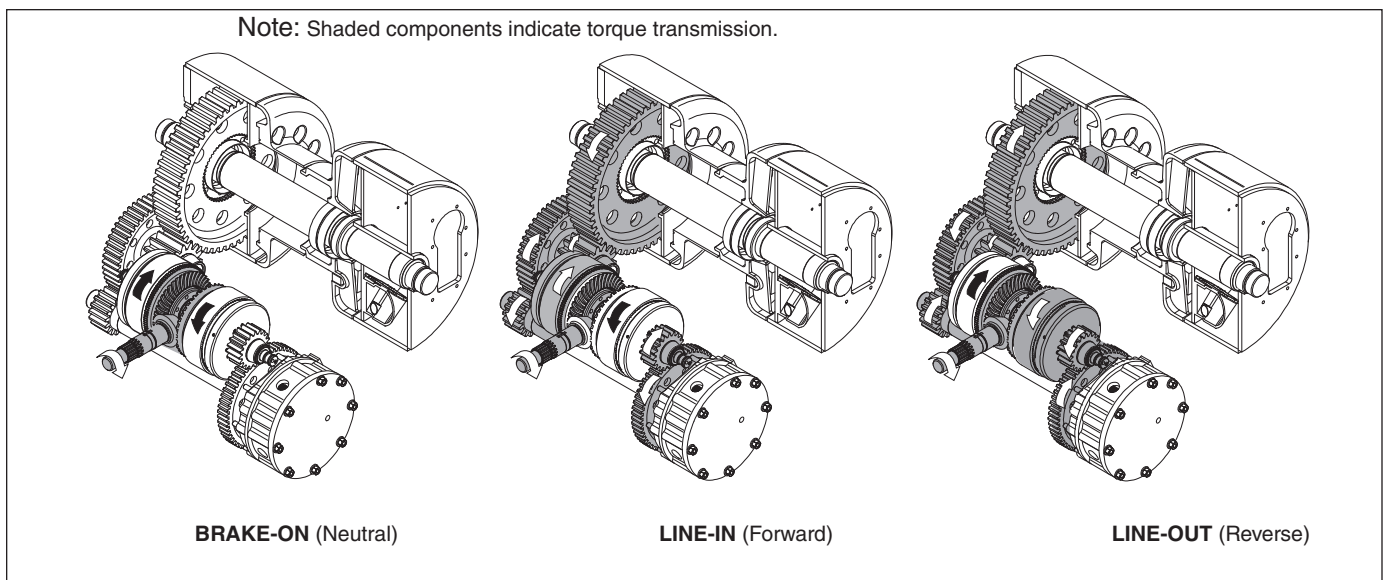


Figure 1-7 Gear Train Rotation Torque Transfer (Ratio #7)

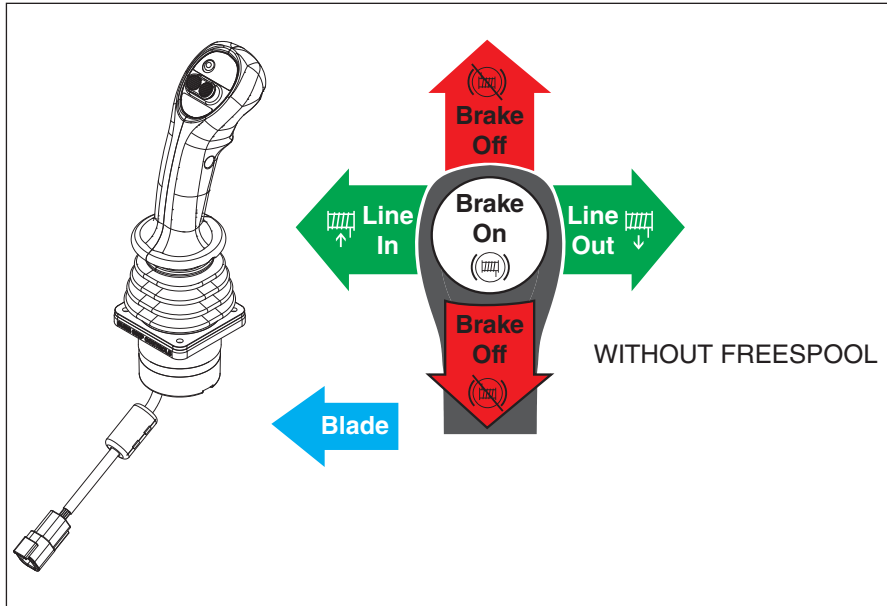


Figure 1-8 Typical Winch Electronic Controls

Operation and Control, Electronic Controls (See Figure Figure 1-8)

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

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

Description of Operations

BRAKE-OFF is the only detented position on the control lever, and the operator must pull the lever to release it from that position. A spring arrangement on the lever returns the lever from the **LINE-IN** and **LINE-OUT** positions to the **BRAKE-ON** position. With the lever in the **BRAKE-OFF** position, oil pressure releases the brake but wire rope cannot be pulled from the winch by hand because of friction in the clutches, brake and gear train. The **BRAKE-OFF** position is used when the operator has a load attached to the winch wire rope. The operator can move the dozer forward without moving the load.

LINE-OUT position applies the reverse clutch and releases the brake. The winch will unwind the wire rope at a speed controlled by the PTO speed of the dozer and the weight of the load.

BRAKE-ON 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.

LINE-IN position applies the forward clutch and releases the brake. The winch will wind the wire rope at a speed controlled by the PTO speed of the dozer.

Inching is used for fine control of the load. When the control lever is slowly moved to a position between **BRAKE-ON** and **LINE-IN** or between **BRAKE-ON** and **LINE-OUT**, inching occurs.

NOTE: Inching rapidly increases the temperatures of the clutch, the brakes and the oil, and will accelerate clutch and brake wear.

Inching (LINE-IN). This operation is used to slowly move a load toward the dozer. As the control lever is moved gradually towards the **LINE-IN** position, the control valve will cause the oil pressure to slowly release the brake and slowly apply the forward clutch. As the brake is released, the clutch takes control and begins to move the load.

Inching (LINE-OUT). This operation will release the brake as the reverse clutch is applied. This permits the weight of the load, with assistance from the reverse clutch, to unwind wire rope from the winch drum against the resistance of the brake. The operator controls the resistance of the brake by the position of the control lever.

Capacities and Specifications

Recommended Oil List

Recommended Oils* - General Conditions			
Manufacturer	Oil Type	Ambient Temperature Range	
		°F	°C
ExxonMobil	Mobil Fluid 424 (Factory fill)	-13 to 104	-25 to 40
John Deere	Hy-Gard™	-13 to 122	-25 to 50
Chevron	1000 THF	-13 to 104	-25 to 40
Caterpillar	Multipurpose Tractor Oil (MTO)	-13 to 104	-25 to 40
Case	Hy-Tran Ultra	-20 to 122	-29 to 50
Recommended Oils* - Low Temperature Conditions			
Manufacturer	Oil Type	Ambient Temperature Range	
		°F	°C
ExxonMobil	Mobil Fluid LT	-40 to 86	-40 to 30
John Deere	Low Viscosity Hy-Gard	-40 to 86	-40 to 30
Chevron	THF W	-40 to 86	-40 to 30

* Note: Use of non-recommended oils may void warranty.

Figure 1-9 Recommended Oil List

Winch Oil Capacity

Winch Model	Oil Capacity
W12E	Approx. 32.0 Gal. (120 L.)

Figure 1-10 Winch Oil Capacity

NOTE: Dropboxes will hold about 2 gallons.

Hydraulic Specifications

Pump Flows (Gear Ratio)	9.5 gpm (Ratio #7) at 1000 RPM
Operating pressure	225 psi (1,550 kPa)
Valve (E Controls)	Multiple Solenoid
Filters	Full flow magnetic strainer 20 micron paper filter

Bolt 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)
 5/16 UNC 20 ft-lbs (3 kg-m)

NOTE: All torque values given with threads lubricated.

ITEM	W12E	
	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
Drum Shaft Assembly RH Bearing Retainer Capscrews Drum Gear to Adapter Capscrews Drum Shaft Nuts Drum to Adapter Capscrews	150 180 400 155	20 25 55 22
Clutch Assembly Clutch Piston Housing Capscrews Clutch Piston Housing Setscrews	70 40	10 6
Brake Assembly Cover Nuts	130	18
Control Valve Mounting Capscrews	50	7
Winch Mounting to Dozer Studs Capscrews (1) Nuts (All Except Inside Nuts) (1) Inside Nuts (Castle Type with Cotter)	500* 500* 500 (2)	69* 69* 69 (2)
* With Loctite		
(1) Unless otherwise specified on installation drawings.		
(2) Hand tight plus rotate to next castle slot on nut.		

Figure 1-11 Bolt Torque Specifications

Electronic Controls

Hydraulic System (See Figure 2-1)

The operation of the winch is controlled by an internal hydraulic system. When the dozer'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 Figure 2-7 through Figure 2-10.

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

distributes 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 dozer PTO is not operating.

The operation of the winch is controlled by the clutches and the brake.

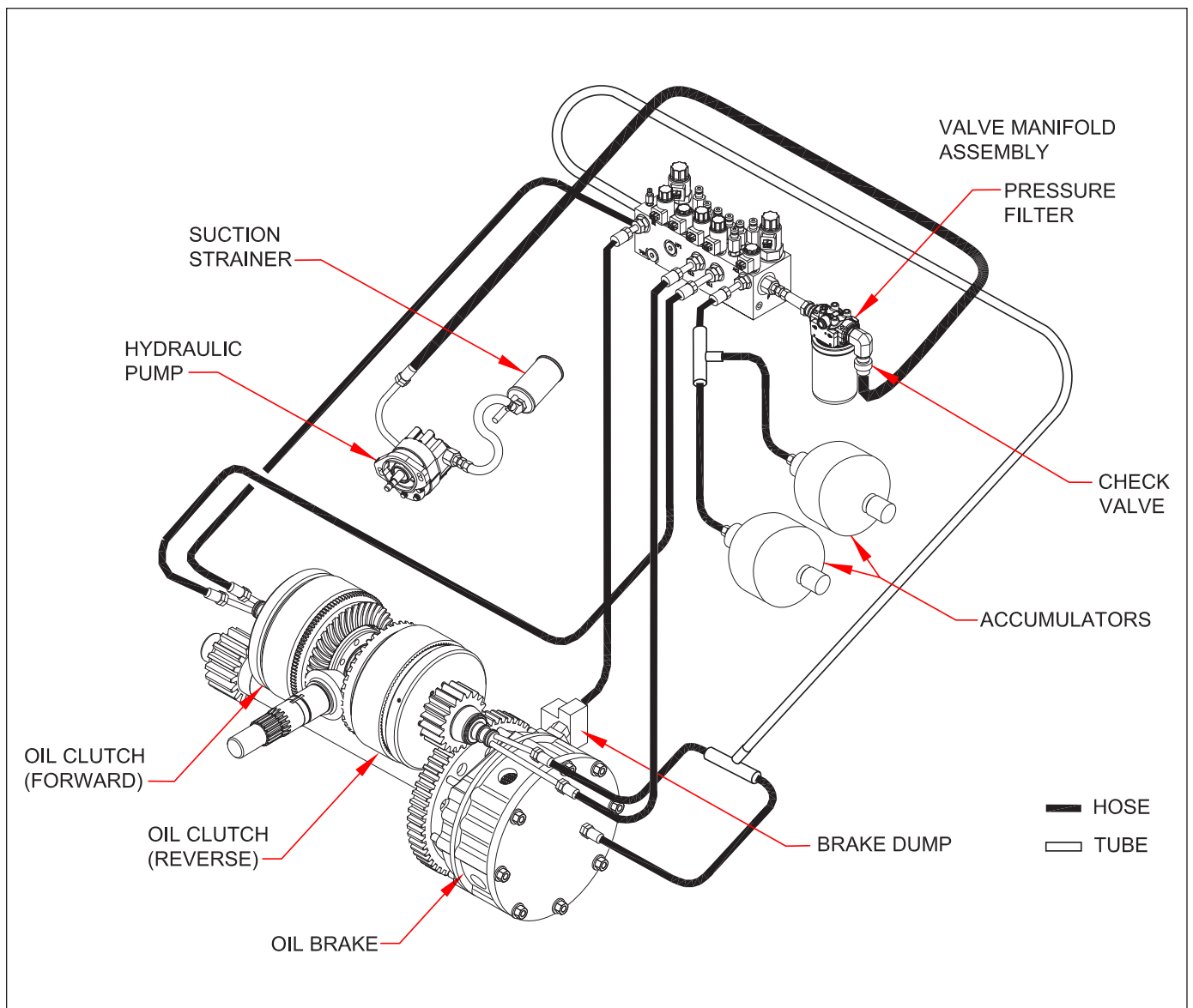


Figure 2-1 Hydraulic System

Valve Manifold Assembly

The valve manifold assembly controls the flow of hydraulic oil to and from the clutches, and brake. Passages inside the valve body connect the oil flow with the functions

that control the winch. Various cartridge solenoid valves within the manifold open and close passages to apply and release the clutches and brake (See Figure 2-2 through Figure 2-3). See Figure 2-7 through Figure 2-10 for gauge ports' connections and functions.

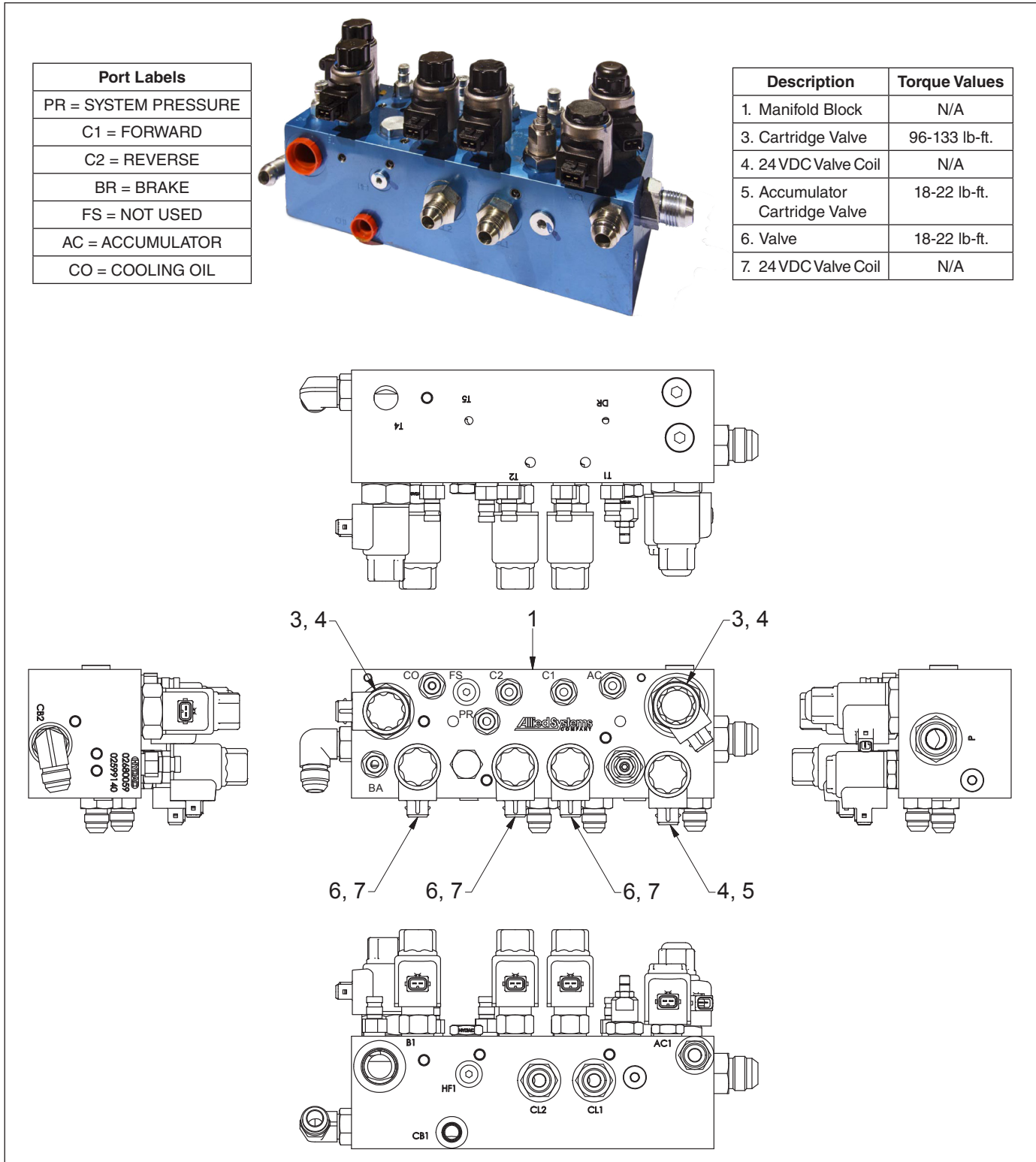


Figure 2-2 Valve Manifold Assembly and Hydraulic Schematic (1)
First Used on S/N AW12E-1575

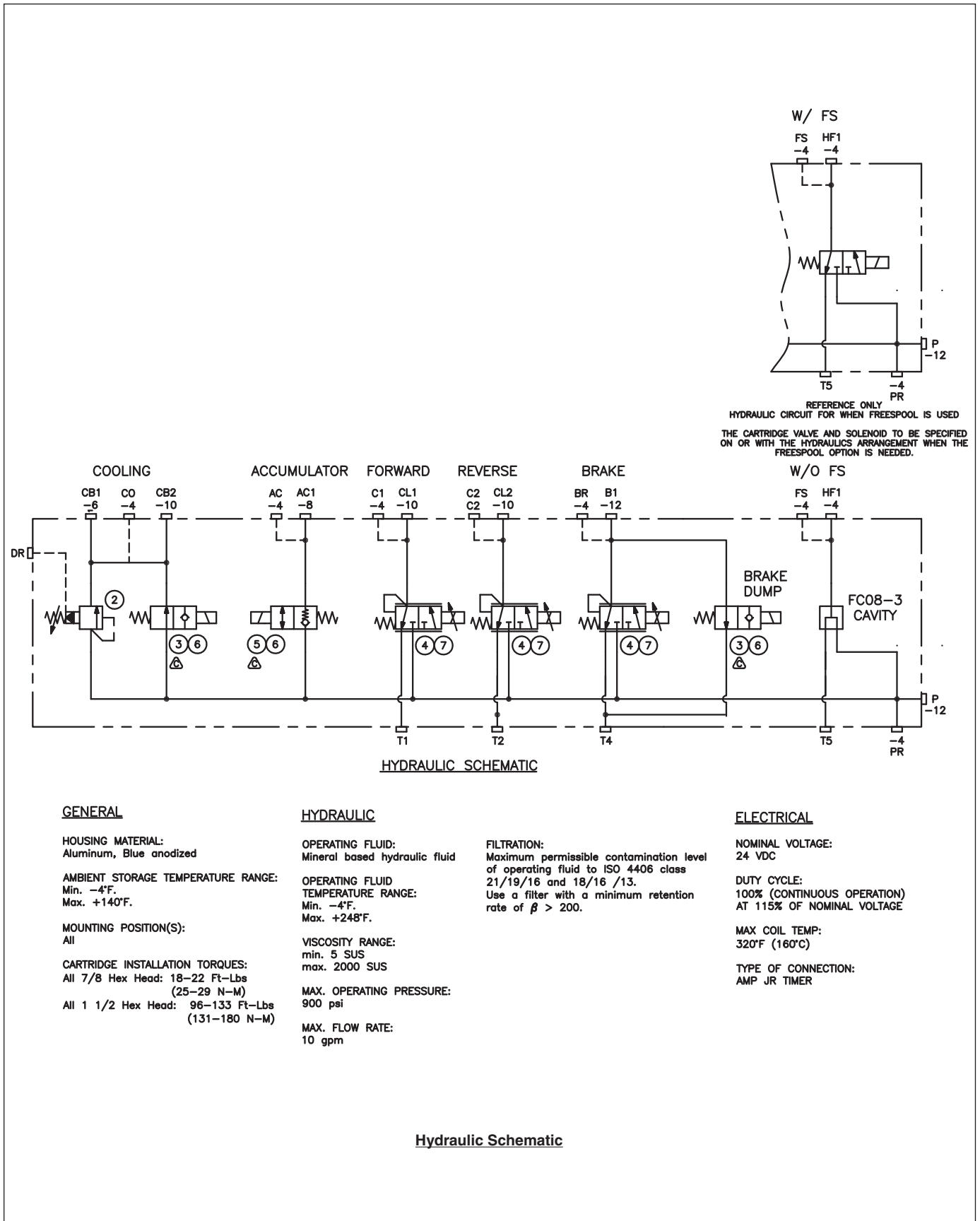


Figure 2-3 Valve Manifold Assembly and Hydraulic Schematic (2)

Forward and Reverse Clutches

(See Figure 2-4 & Figure 2-5)

Oil Brake

(See Figure 2-6)

Accumulator Valve

(See Figure 2-17)

The accumulator valve is located in the manifold. As the hydraulic system builds up pressure, oil can flow past the check ball in the valve and on into the accumulator. When the control lever is moved to the **LINE-IN, LINE-OUT** or **BRAKE-OFF** position, an electronic signal opens the accumulator valve to allow its pressurized oil to join the oil from the pump. It remains open while these functions are activated so that the accumulator can be recharged by pump flow. Numerous quick shifts of the handlever can deplete the accumulator quicker than it is being recharged. Therefore, the accumulator valve is also open for the first 8 seconds of being in the **BRAKE-ON** position.

Check Valve

(See Figure 2-11) For Reference

The check valve prevents accumulator oil from reverse flowing through the pump.

Forward and Reverse Clutches

The forward clutch (Figure 2-4) and reverse clutch (Figure 2-5) are multi-disc types that are hydraulically applied and spring released.

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

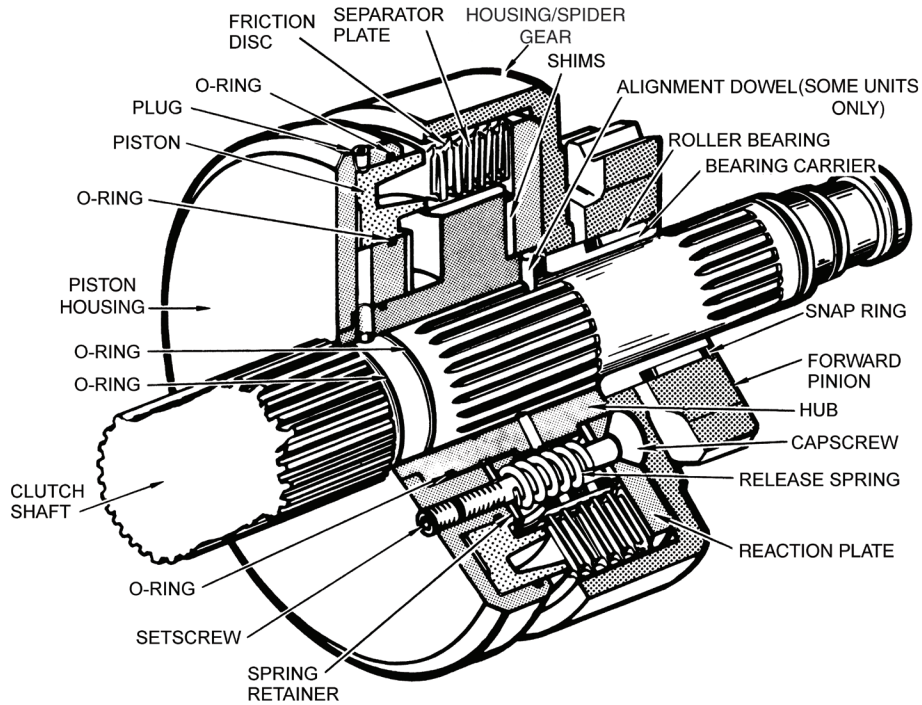


Figure 2-4 Forward Clutch (Ratio #7)

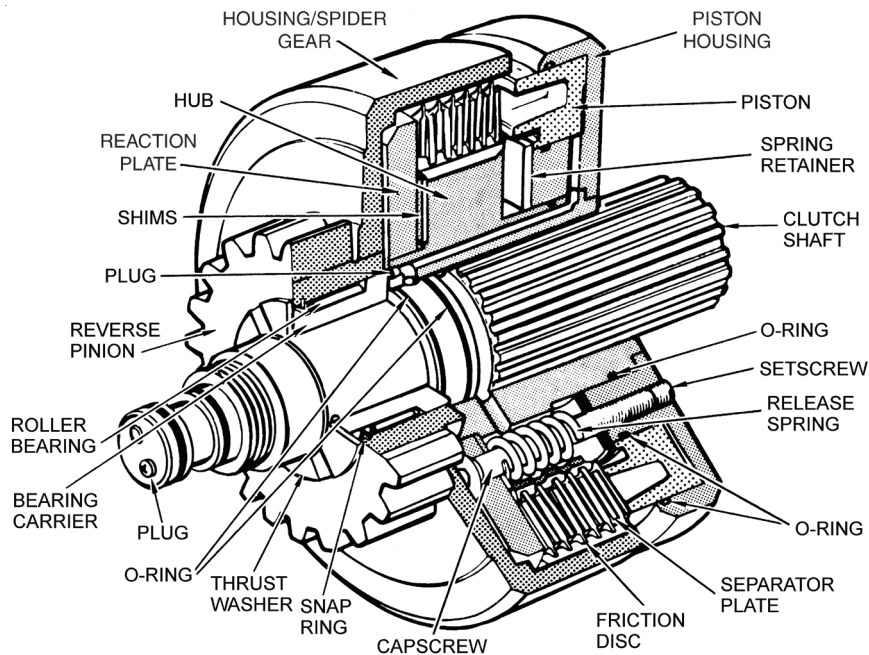


Figure 2-5 Reverse Clutch (Ratio #7)

Oil Brake Assembly (See Figure 2-6)

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. A brake stroke limiter prevents the brake piston from full movement, which minimizes oil required from pump an/or accumulators during release. It also minimizes re-engagement time.

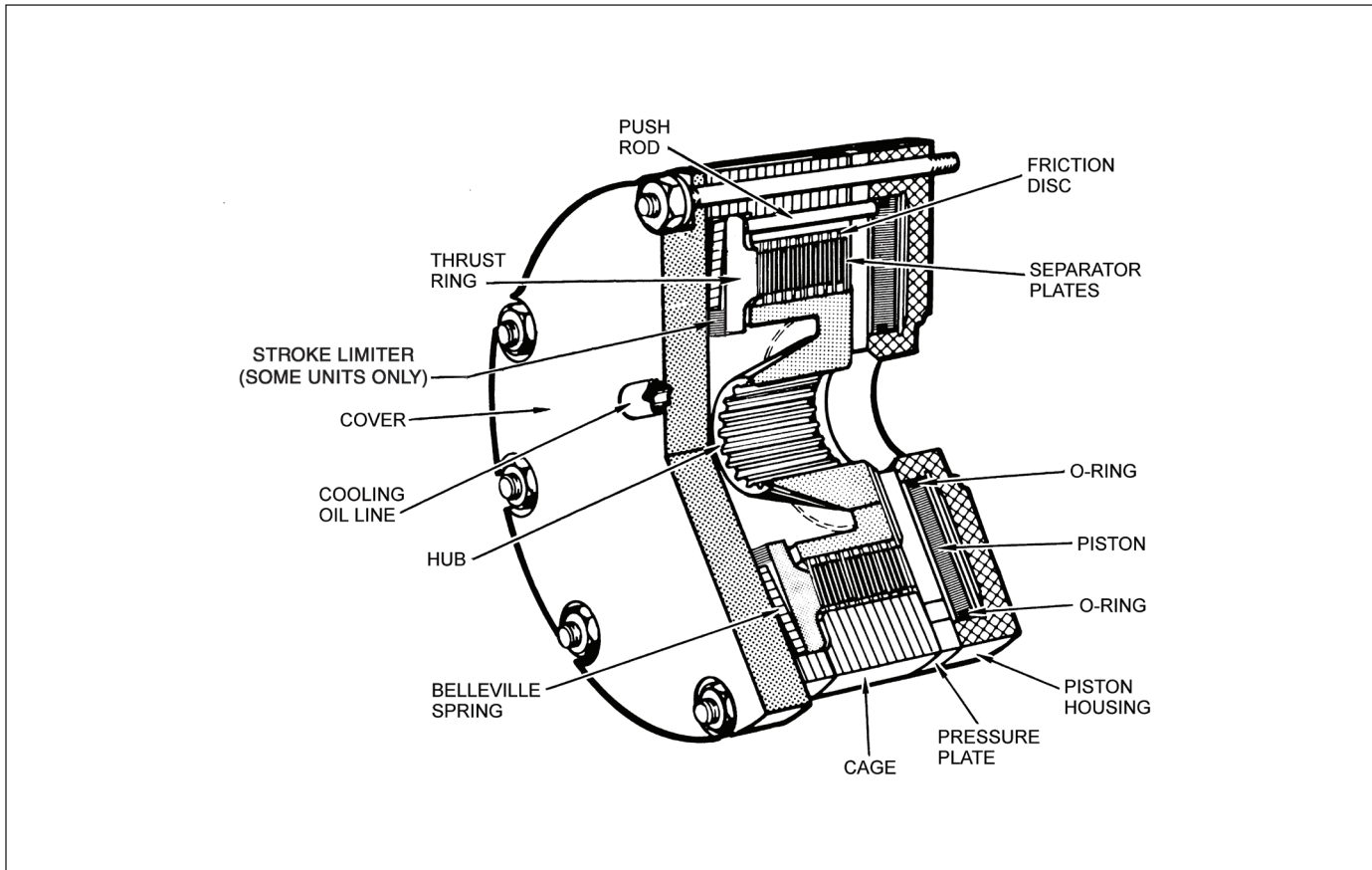


Figure 2-6 Oil Brake Assembly

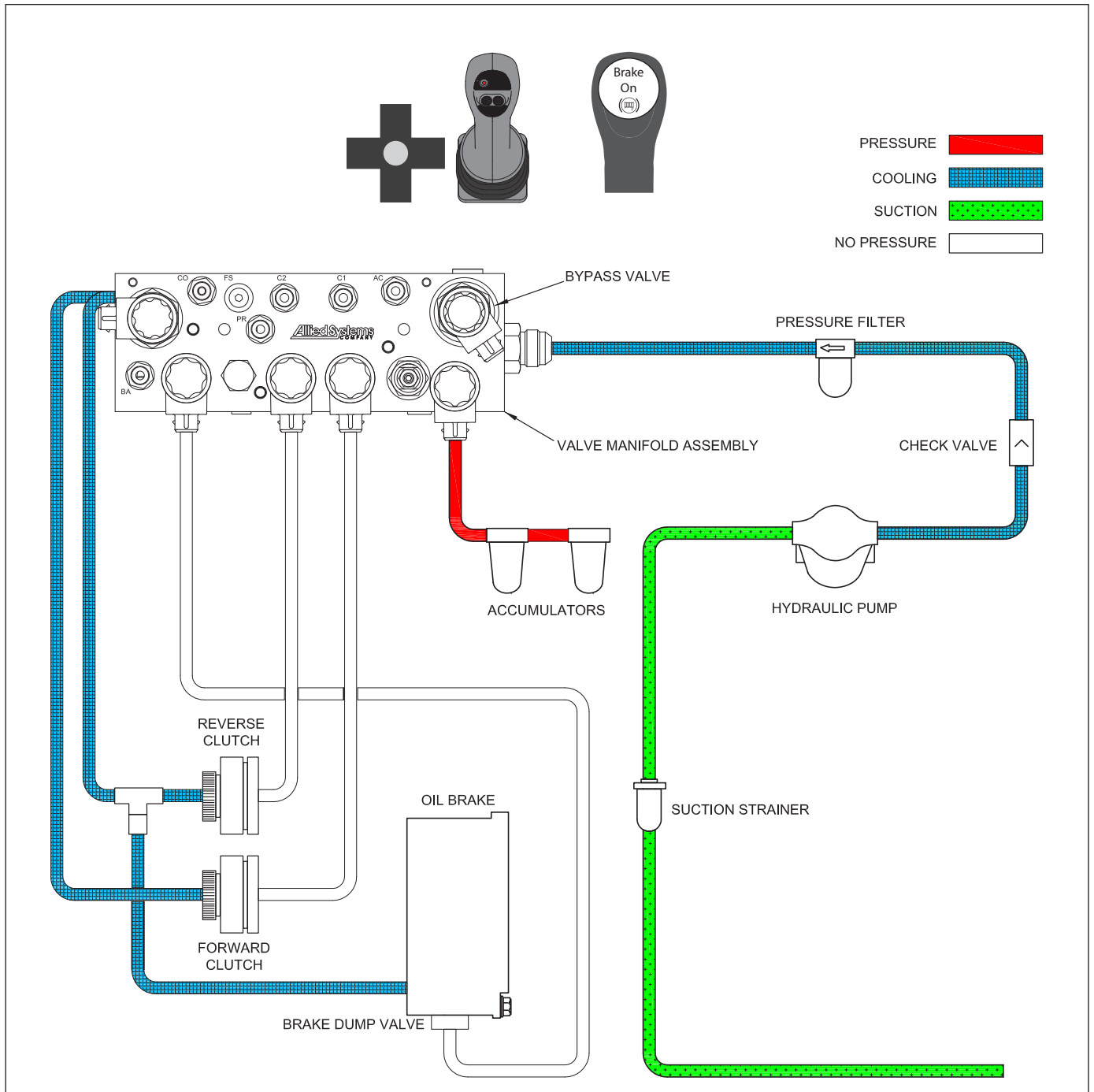


Figure 2-7 Hydraulic System, BRAKE-ON (Neutral)

Sequence of Operation, BRAKE-ON

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

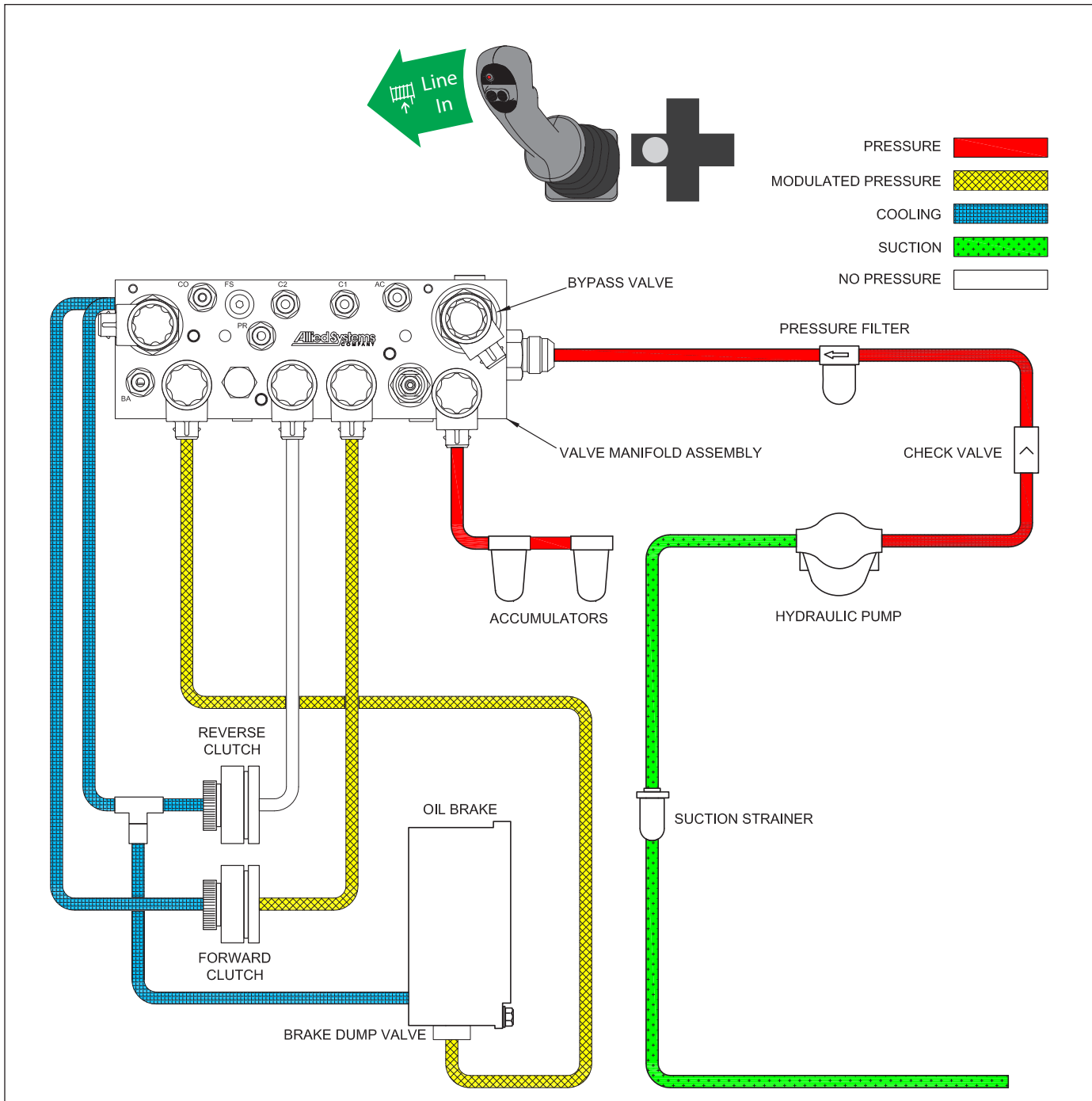


Figure 2-8 Hydraulic System, LINE-IN (Forward)

Sequence of Operation, LINE-IN

For **LINE-IN** (forward) operation, the operator pulls to the left on the control lever, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. 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 control lever from the **BRAKE-ON** position). Full pressure is applied to the clutch when the control lever is in full **LINE-IN** position. Brake pressure is limited to just above brake release pressure for faster response.

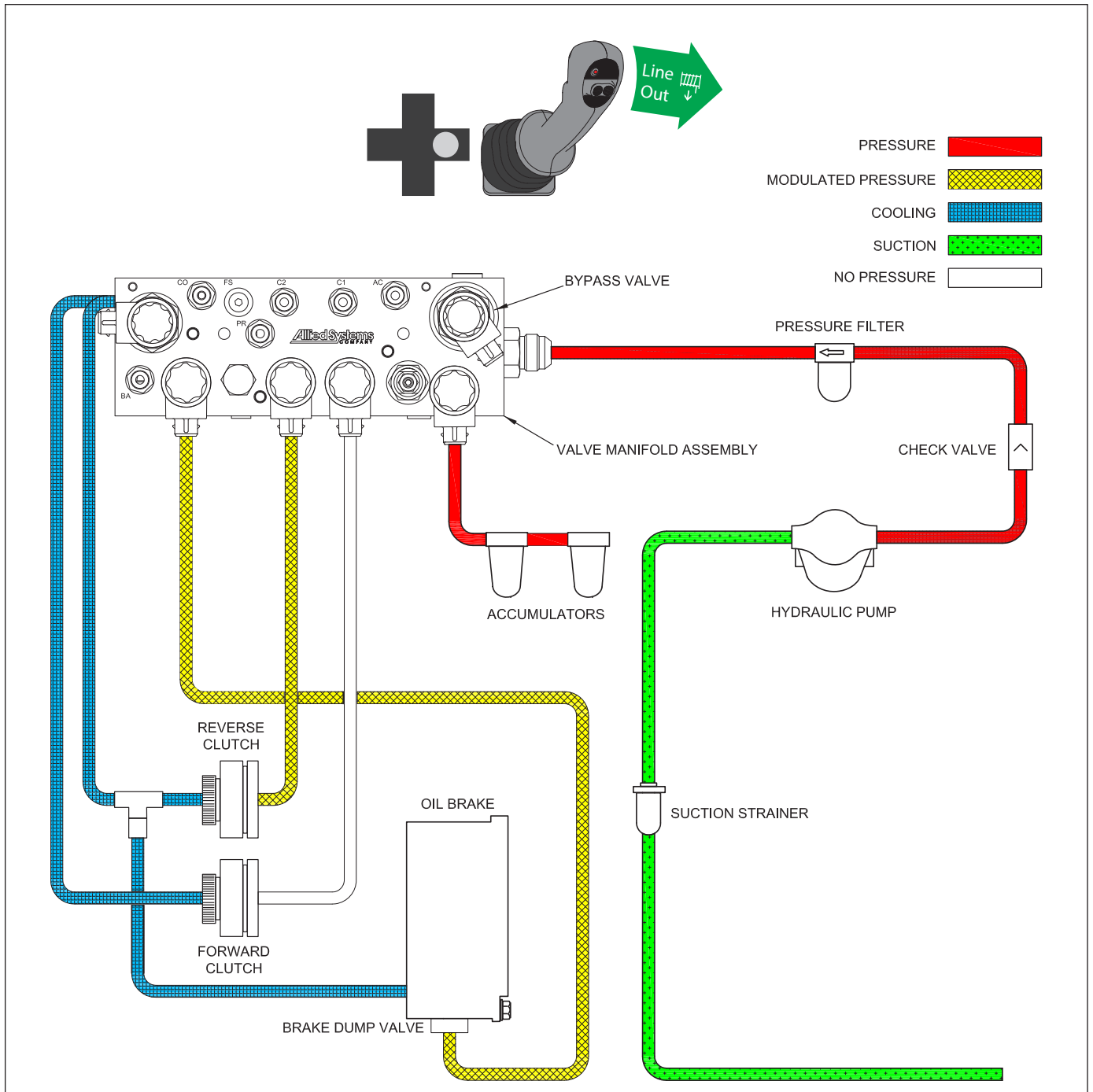


Figure 2-9 Hydraulic System, LINE-OUT (Reverse)

Sequence of Operation, LINE-OUT

LINE-OUT (reverse) operation is achieved by pushing the control lever to the right 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. Brake pressure increases. The proportional brake and reverse clutch valves open according to the control module program.

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

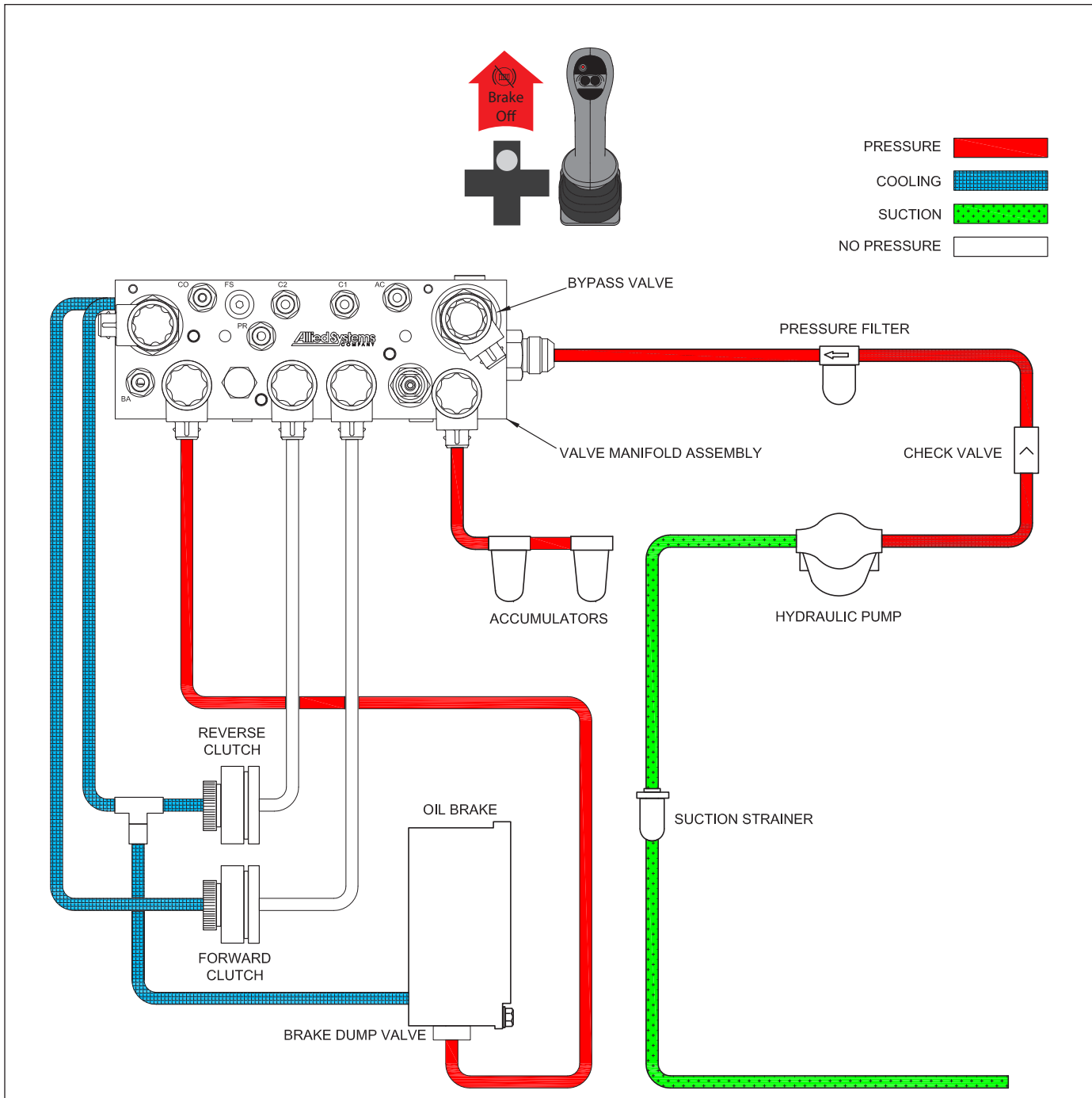


Figure 2-10 Hydraulic System, BRAKE-OFF

Sequence of Operation, **BRAKE-OFF**

BRAKE-OFF is achieved by pushing the control lever upwards from the **BRAKE-ON** position. This position is detented and the control lever must be moved manually to return it to the **BRAKE-ON** position.

The bypass valve closes as the accumulator valve opens. Brake pressure increases, and fully releases the brake.

Electronic Control Module

The MC4x/XC4x has a sturdy upgraded and easily accessed design that has been relocated inside of the filter cover and offers an (optional) improved Bluetooth Diagnostics Adapter.

Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 1-5) for further information.

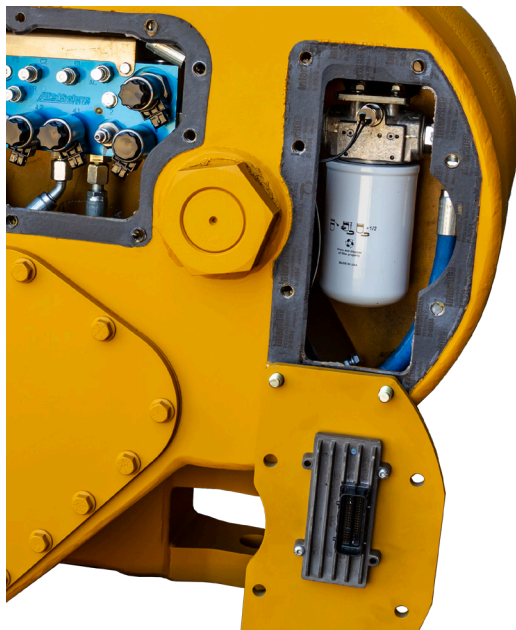
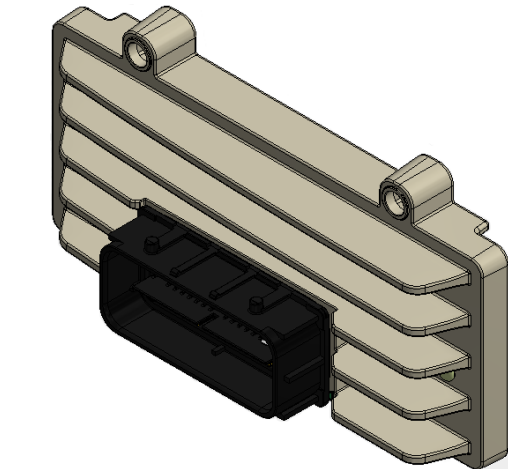


Figure 2-11 Electronic Controller Module

Bluetooth Diagnostics Adapter (Optional)

The bluetooth adapter works with the ECM in the eControls system. It conveniently allows users to see live winch diagnostics data on either an iOS (IQANsync) or Android (IQANrun) device with the appropriate downloaded application.

Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-6) for further information.



Figure 2-12 Bluetooth Adapter

IQANgo

(Android and iOS) is a mobile application defined as a slimmed down version of IQANrun. These are the key features that are included: system information, log management, measure, adjust and sending and receiving files. IQANgo uses WiFi, Bluetooth or Internet in order to connect to the eControl system.

Refer to service manual (599069w): W6G, W8L, W12E eControls (Section 3-1) for further information.

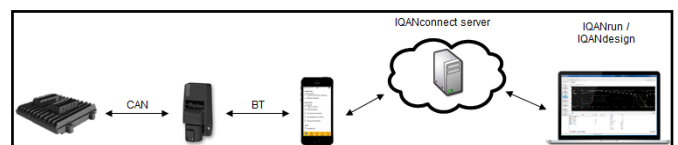


Figure 2-13 IQANgo

Service

This subsection provides the instructions for performing maintenance and making checks and adjustments.

Standard shop tools are used in doing the work described in this subsection.

Maintenance Points

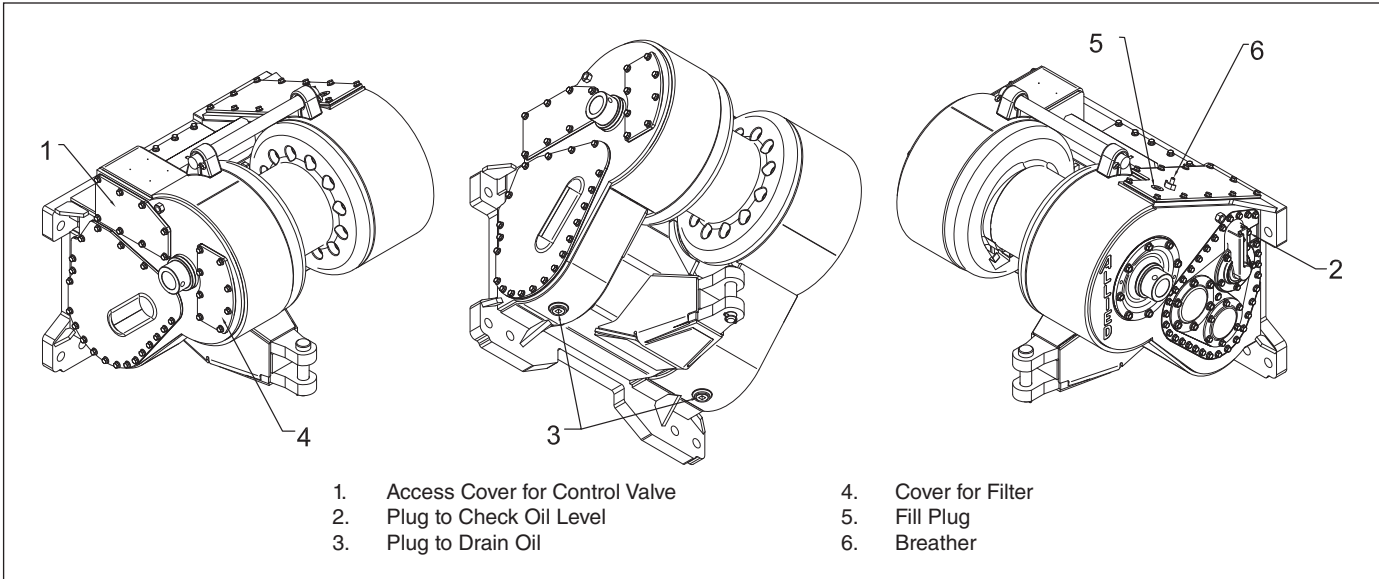


Figure 2-14 W12E Maintenance Points (Ratio #7 shown)

Maintenance Schedule

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating

time on the hour meter of the dozer to determine the maintenance time for the winch.

INTERVAL	PROCEDURE OR QUANTITY	SPECIFICATION
50 hours or weekly	Check oil level at plug (item 2). Add oil as necessary through fill plug (item 5). Do not operate dozer when checking the oil level.	See Figure 1-9 – Recommended Oil List.
	Check winch control lever.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 1-5) for further information.
	Clean the breather (item 6).	Remove debris around breather.
	Lubricate the rollers on the fairlead assembly, if the winch is so equipped.	Use multi-purpose grease with 2-4% molybdenum disulfide.
500 hours or every 3 months	Clean the oil suction screen and magnets.*	Use a new gasket between the cover and the suction tube.
	Clean the breather in the fill plug.	Clean the breather with solvent if needed.
	Check oil filter light, if continuously illuminated with winch warm, replace the filter.	Replace the filter.*
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) [†] . Check the oil level at item 2.	See Figure 1-9 – Recommended Oil List.

Figure 2-15 Maintenance Schedule

Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Figure 2-15, Maintenance Schedule.

Checks During Operation

The Troubleshooting Chart in this Section 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.

NOTE: No lubrication or adjustment is required for the new type control lever.



CAUTION

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

Hydraulic System Pressure Checks

The hydraulic oil and filter(s) should be maintained as indicated in the Maintenance Schedule. Dirty or restricted filters may cause inaccurate pressure readings.

Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Remove wire rope from drum to prevent entanglement during pressure checks since the drum will rotate during the tests. Inspect the wire rope for damage as it is being unspooled.

WARNING

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

WARNING

Always wear gloves when handling wire rope.

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. See Figure 2-16.

Pressure gauges

Two 400 psi (2800 kPa) calibrated pressure test gauges are required to perform the hydraulic pressure checks.



Figure 2-16 Remove Control Valve Cover Plate (Current Production with Blue Manifold Shown)

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

WARNING

Place control lever in **BRAKE-ON** to prevent accidental discharge of pressurized oil stored in the accumulator.

Manifold Port Labels	
Circuit or Function	
Brake	BR
Cooling	CO
Freespool	FS (Plugged)
Pressure Relief	PR
Reverse Clutch	C2
Forward Clutch	C1
Accumulator	AC

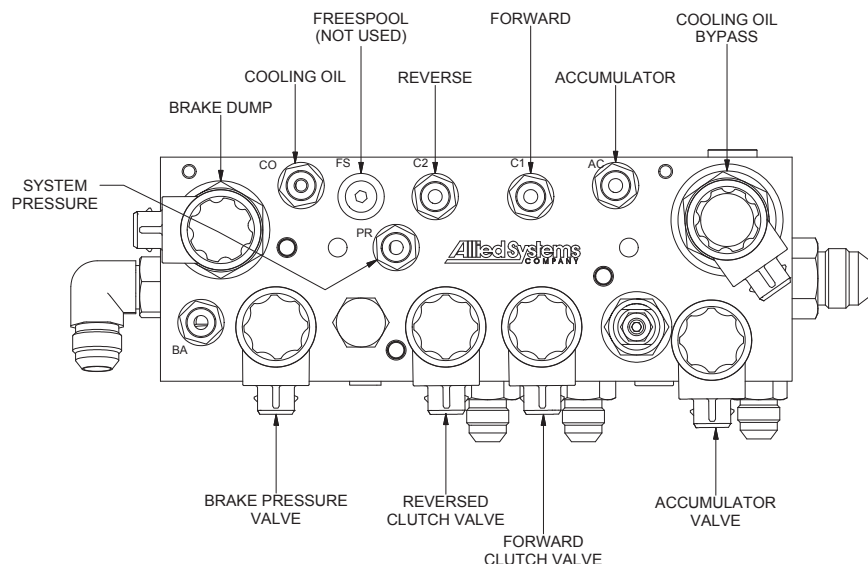


Figure 2-17 Hydraulic Gauge Port Labels

Relief Valve and Adjustments

A pressure relief valve is installed in the valve manifold assembly to prevent excessive hydraulic oil pressure. It is a spring loaded, poppet-type valve mounted below the valve manifold assembly's inlet port. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. When pressure starts to rise above [(220±5 psi (1520±35 kPa)] at the inlet port, 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.

The system PR port should be reading [(220±5 psi (1520±35 kPa)] when the control lever is in the BRAKE-OFF position and the engine is running at 1000 RPM. Please refer to the following instructions if the pressure at the PR port is lower or higher than [(220±5 psi (1520±35 kPa)].

Instructions

1. Locate the manifold (see Figure 2-16) and then identify the relief valve (see Figure 2-18).
2. Start the dozer.
3. Set the dozer engine to a minimum of 1,000 RPM.
4. Move the joystick to the **BRAKE-OFF** position.
5. Start by loosening the locknut on the relief valve.
6. Turn the adjusting screw clockwise to increase pressure and counterclockwise to decrease pressure.
7. After adjusting, recheck the pressure readings to ensure they are within the specified range [(220±5 psi (1520±35 kPa)].
8. Once the desired pressure is achieved, tighten the locknut to secure the adjustment.
9. Perform a final check to confirm the pressure is stable and within the correct range.

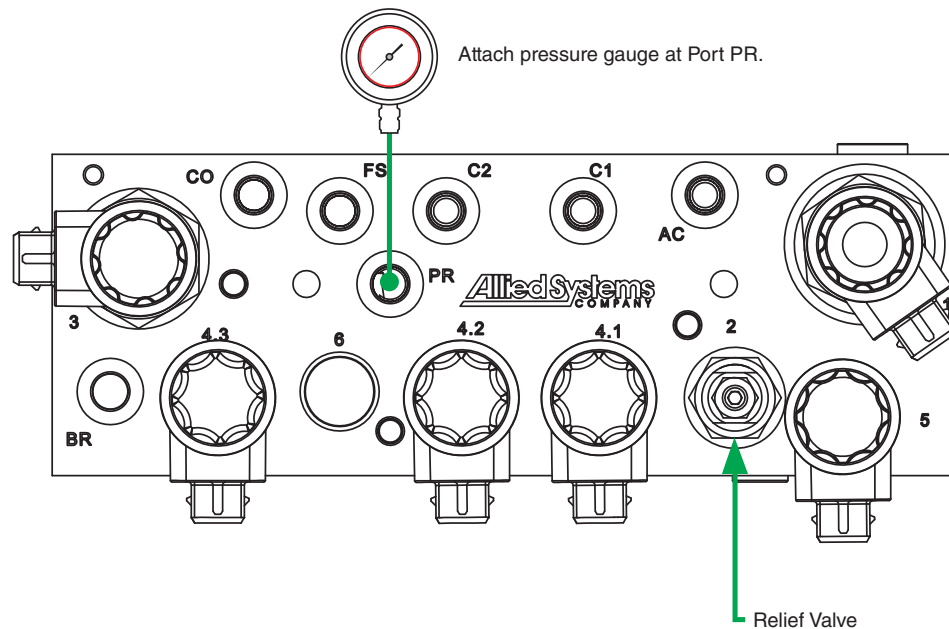


Figure 2-18 Relief Valve Adjustment

System Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to system pressure port. See Figure 2-20.

Port labels:

- **PR**

Instructions

1. Shut down the engine.
2. Connect pressure gauge to the system pressure port.
3. Start the engine.
4. Set the PTO to 1,000 RPM.
5. Move the control lever to the **BRAKE-OFF** position. Hold the control lever at its maximum travel position.
6. Check that the pressure is within the range shown in Figure 2-19.

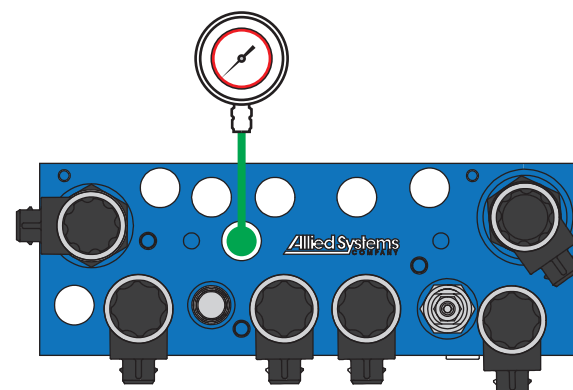
Troubleshooting

If the pressure observed differs from the values shown in Figure 2-19, check the following:

1. Improper setting at the relief valve (see Figure 2-18).
2. Dirty filter or strainer.
3. Loose strainer cover.
4. Leaks at the pressure hoses or fittings.
5. Defects at the hydraulic pump, indicated by low pressure and pressure increases with increased engine RPM.

Pressure in PSI [kPa]	
Min	Max
210 [1,448]	230 [1,586]

Figure 2-19 Hydraulic Pressure Readings



Manifold PN: 2314998

Figure 2-20 Gauge at System Pressure Port

Brake Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to brake port. See Figure 2-22.

Port labels:

- **BR**

Instructions

1. Verify that the system pressure is correct.
2. Shut down the engine.
3. Connect pressure gauge to the brake port.
4. Start the engine.
5. Set the PTO to 1,000 RPM.
6. Move the control lever to the **BRAKE-OFF** position. Hold the control lever in its detented position.
7. Check that the pressure is within the range shown in Figure 2-21.

Troubleshooting

If the pressure observed differs from the values shown in Figure 2-21, check the following:

1. Improper setting at the relief valve (see Figure 2-18).
2. Malfunctions at the suction strainer or pressure filter.
3. Leaks at the pressure hoses or fittings.
4. Defective brake piston seals.
5. Malfunction with brake dump valve or solenoid.
6. Defects at the hydraulic pump, indicated by low pressure and pressure increases with increased engine RPM.
7. If your readings are high for this test and your manifold is silver, your control program may need to be updated. Contact Allied Systems Service Department at 503.625.2560 for details.

Pressure in PSI [kPa]	
Min	Max
200 [1,379]	240 [1,655]

Figure 2-21 Hydraulic Pressure Readings



Manifold PN: 2314998

Figure 2-22 Gauge at Brake Port

Cooling Oil Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to cooling oil port. See Figure 2-24.

Port labels:

- **CO**

Instructions

1. Verify that the system pressure is correct.
2. Shut down the engine.
3. Connect pressure gauge to the cooling oil port.
4. Start the engine.
5. Set the PTO to 1,000 RPM.
6. Ensure the control lever is in the **BRAKE-ON** position.
7. Check that the pressure is within the range shown in Figure 2-23.

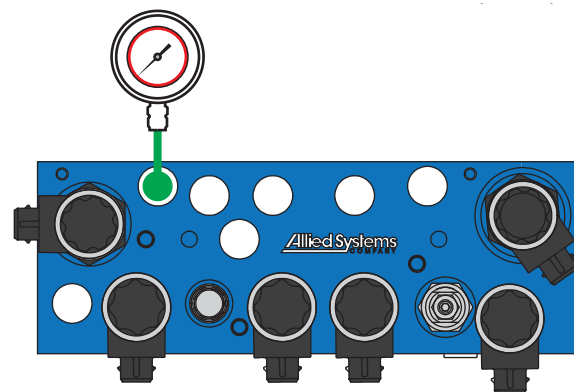
Troubleshooting

If the cooling oil pressure is too high or too low, overheating can occur. If the pressures observed differ from what is described above, check the following:

1. Malfunctions at the bypass valve.
2. Leaks or blockage at the pressure hoses or fittings.

Pressure in PSI [kPa]	
Min	Max
3 [21]	65 [448]

Figure 2-23 Hydraulic Pressure Readings



Manifold PN: 2314998

Figure 2-24 Gauge at Cooling Oil Port

LINE-IN Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to **LINE-IN** port. See Figure 2-26.

Port labels:

- **C1**

General

Whether a particular port shown here is associated with **LINE-IN** or **LINE-OUT** depends on the direction of the PTO rotation of your dozer.

Instructions

1. Shut down the engine.
2. Connect pressure gauge to port shown.
3. Start the engine.
4. Set the PTO to 1,000 RPM.
5. Place the control lever in **BRAKE-OFF** to build up the accumulator system pressure.
6. The pressure reading should be near 0 psi.
7. Move the control lever in the **LINE-IN** position. Hold the control lever at its maximum travel position. The pressure gauge should indicate increased pressure.
8. Check that the pressure is within the range shown in Figure 2-25.

Troubleshooting

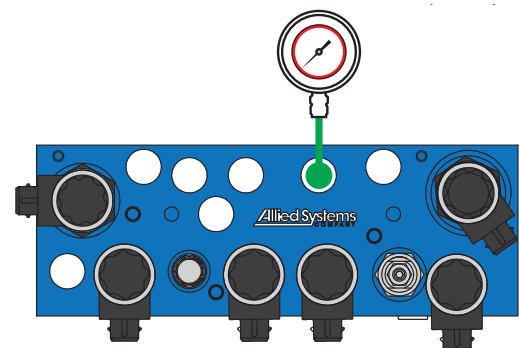
If pressure observed differs from the value shown in Figure 2-25, check the following:

1. Damaged or worn clutch piston seals.
2. Damaged or worn valve manifold assembly parts.
3. Broken seal rings on clutch shaft.
4. Damaged O-rings on clutch shaft.
5. Leaks at the pressure hoses or fittings.

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.

Pressure in PSI [kPa]	
Min	Max
190 [1,310]	240 [1,655]

Figure 2-25 Hydraulic Pressure Readings



Manifold PN: 2314998

Figure 2-26 Gauge at LINE-IN Port

LINE-OUT Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to **LINE-OUT** port. See Figure 2-28.

Port labels:

- **C2**

General

Whether a particular port shown here is associated with **LINE-IN** or **LINE-OUT** depends on the direction of the PTO rotation of your dozer.

Instructions

1. Shut down the engine.
2. Connect pressure gauge to port shown.
3. Start the engine.
4. Set the PTO to 1,000 RPM.
5. Place the control lever in **BRAKE-OFF** to build up the accumulator system pressure.
6. The pressure reading should be near 0 psi.
7. Move the control lever in the **LINE-OUT** position. Hold the control lever at its maximum travel position. The pressure gauge should indicate increased pressure.
8. Check that the pressure is within the range shown in Figure 2-27.

Pressure in PSI [kPa]	
Min	Max
190 [1,310]	240 [1,655]

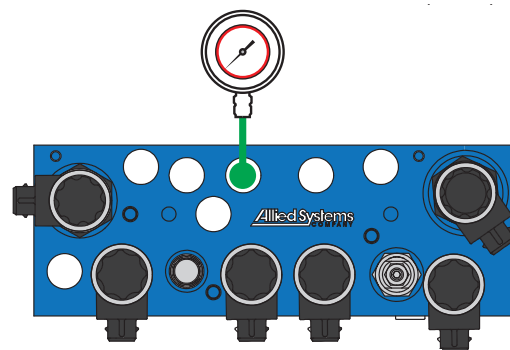
Figure 2-27 Hydraulic Pressure Readings

Troubleshooting

If pressure observed differs from the value shown in Figure 2-27, check the following:

1. Damaged or worn clutch piston seals.
2. Damaged or worn valve manifold assembly parts.
3. Broken seal rings on clutch shaft.
4. Damaged O-rings on clutch shaft.
5. Leaks at the pressure hoses or fittings.

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.



Manifold PN: 2314998

Figure 2-28 Gauge at LINE-OUT Port

Accumulator Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to accumulator port. See Figure 2-30.

Port labels:

- **AC**

General

This check determines if the accumulator is functioning and has the correct nitrogen charge.

Instructions

1. Shut down the engine.
2. Connect a pressure gauge to the accumulator port.
3. Start the engine.
4. Set the PTO to a minimum of 1,000 RPM.
5. Place the joystick in the **BRAKE-OFF** position and hold for 1 minute. This is to ensure the accumulator has a full supply of oil. Pressure should read (220 +/- 5 psi).
6. Return the joystick to **BRAKE-ON**.
7. Wait 30 seconds, until the accumulator valve closes.
8. Observe the pressure reading. It should remain within the range shown in Figure 2-29 for several minutes.

Recharging (See Next Page)

If the accumulator needs to be recharged, charge with dry nitrogen to [115 +/-5 psi (793 kPa)].

Pressure in PSI [kPa]	
Min	Max
215 [1,482]	225 [1,551]

Figure 2-29 Hydraulic Pressure Readings



Manifold PN: 2314998

Figure 2-30 Gauge at Accumulator Port

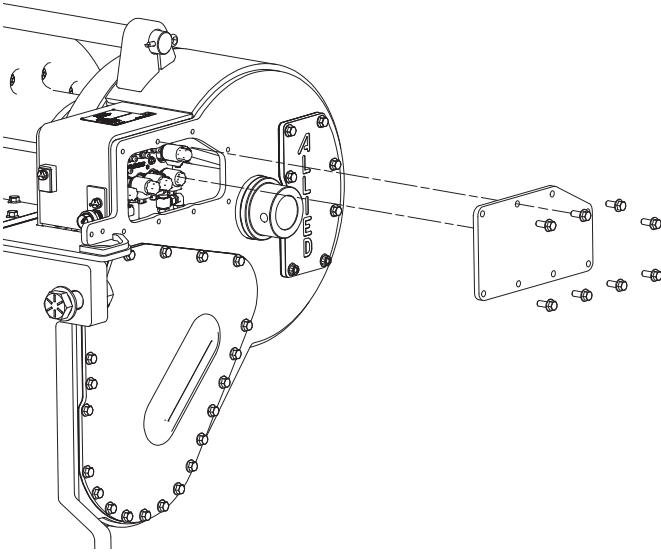
Accumulator Recharge

Preparation

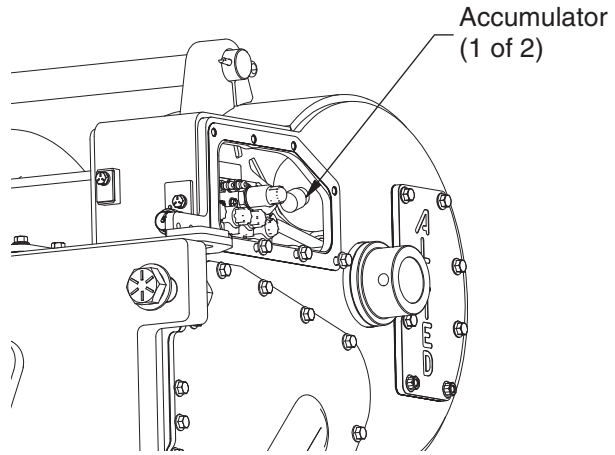
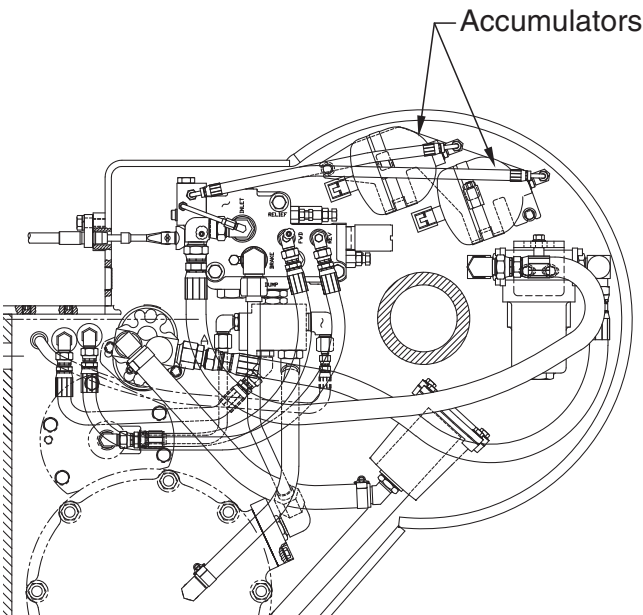
Ensure the machine is off and all hydraulic pressure is relieved. Remove the manifold cover and locate the accumulator as seen below.

Instructions

1. Locate and remove the manifold cover.

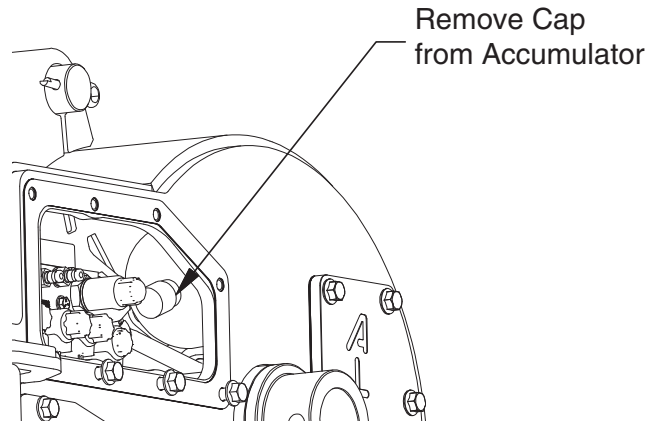


2. There are two accumulators to be recharged.

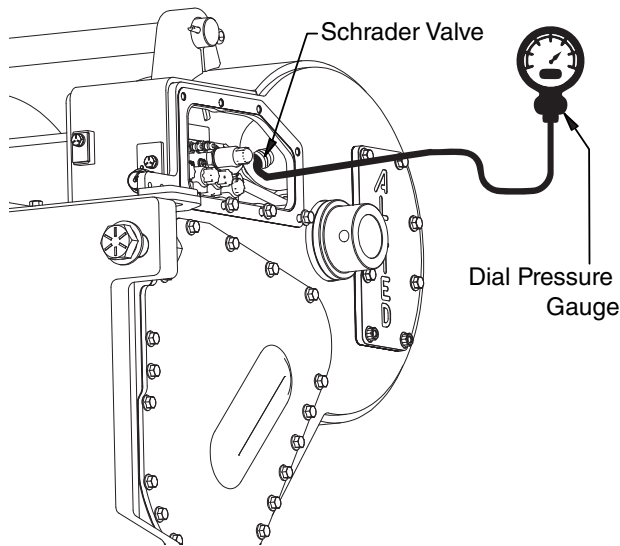


⚠ WARNING

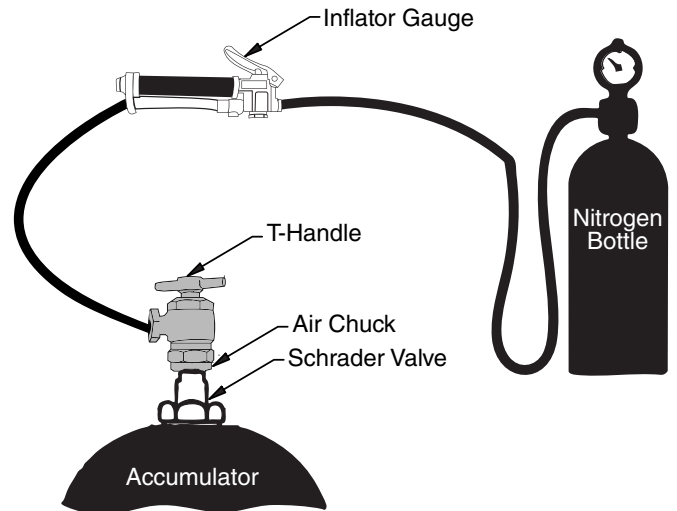
Wear gloves and eye protection for the following steps due to a possible buildup of oil within the accumulator.



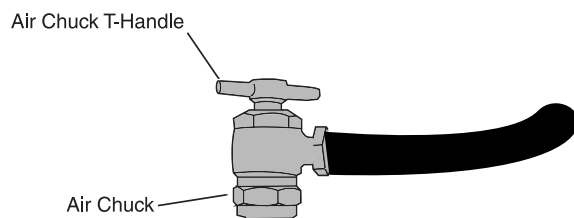
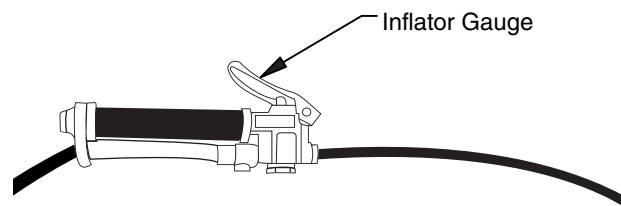
3. Remove the seal cap on the gas side of the accumulator.



4. Check the nitrogen pressure with a dial pressure gauge connected to the schrader valve. If the pressure is within range: [115 +/-5 psi (793 kPa)], there is no need to recharge the accumulators.
5. **Proceed to steps 6-14 if the nitrogen level is too low.**



7. Connect the inflator gauge to the nitrogen bottle and install the t-handle on the accumulator by screwing the air chuck to the schrader valve and tighten to prevent any leakage. Turn the T-handle clockwise to depress the valve core.
8. Open the regulator valve on the nitrogen bottle. Use the inflator gauge to slowly fill the accumulator.
9. When target pressure is reached, close the valve on the nitrogen source. To allow for the effects of temperature transfer, the accumulator should be allowed to stand for a minimum of 15 minutes to allow the temperature to stabilize before a final reading of the precharge pressure is taken.
10. Screw the air chuck T-handle counter-clockwise to close the accumulator gas valve.
11. Unscrew the air chuck from the accumulator gas valve.
12. Refer to Step 4 and check the nitrogen pressure. It should read [115 +/-5 psi (793 kPa)].
13. Remove the hose carefully.
14. Make sure the accumulator gas valve is sealing effectively upon hand-tightening the seal cap on the accumulator.



6. Use a standard automotive inflator gauge and an air chuck for convenient access through the manifold cover.

Nitrogen Pressure is Too High

1. Release pressure in the accumulator by partially depressing the schrader valve with the dial pressure gauge until the pressure is within the range of [115 +/-5 psi (793 kPa)].
2. Make sure the accumulator gas valve is sealing effectively upon hand-tightening the seal cap on the accumulator.

Troubleshooting

This subsection includes Figure 2-31, Troubleshooting Analysis Check Chart for Operator, Figure 2-32, Troubleshooting Analysis Check Chart for Service Personnel, and Figure 2-33, Troubleshooting Chart

for Electronic Control Module. 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.

Figure 2-31 Troubleshooting Analysis Check Chart for Operators

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular.	Hydraulic oil is too cold.	Put the control lever in the BRAKE-OFF 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.
	Wrong oil.	Drain oil and replace with correct grade. Refer to Figure 1-9, for the Recommended Oil List.
	Dozer PTO speed too low.	Increase dozer engine speed to at least 1000 RPM for good performance.
Low oil pressure.	Clogged suction strainer.	Check and clean or replace suction strainer.
Overheating.	Plugged pressure filter.	Replace filter.
	Plugged suction strainer.	Check suction strainer, clean or replace.
	One or both clutches dragging.	Check by placing control lever in BRAKE-OFF . Normally drum will rotate slowly in either direction. If the reverse clutch is dragging, the drum will rotate in the LINE-OUT direction. If forward clutch is dragging the drum will rotate in the LINE-IN direction and it will take more than 100 lbs of line pull to prevent drum rotation.
	Prolonged inching.	Avoid continuous operation in the inching zone.
Winch will not operate in any function.	Low oil level.	Add oil.
	If an error is detected, a message will be presented with a error code on module. There are cases that the module will either turn off or shut down the outputs, to increase safety.	Return joystick to neutral position and attempt function again.
Clutch does not apply correctly at low PTO RPM.	PTO stalled (0 RPM).	Increase dozer RPM.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 3.
Brake slipping or drum backspin on fast shift from neutral to forward.	Brake releases at low pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 3.
Brake releases before reverse clutch engagement.	Faulty reverse clutch valve or coil.	Check reverse clutch valve and coil.
Noisy buzz emanating from winch valve.	Air in relief valve.	This is not a detrimental condition. Noise may be intermittent.

(Continued on next page)

Figure 2-31 Troubleshooting Analysis Check Chart for Operators (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch noisy.	Ring and pinion out of adjustment.	Set ring and pinion backlash.
	Air in oil.	1. Check for suction leaks. 2. Add oil.
	Gears and bearings worn.	Replace components.
Joystick LED blinking.	Open or shorted coil.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-1) for further information.
LED on eControl Module blinking Red.	Red blinking code indicate an error is detected on either the input or output, usually meaning a wiring error.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-2) for further information.
Winch is running at high RPM with warm oil.	Filter is clogged.	Change filter and oil. NOTE: Change filter only after first 250 hours of operation when winch is rebuilt.
	Cold oil is causing filter bypass.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-1) for further information.
	Electrical short circuit.	Check filter bypass switch circuit of wiring harness.

Figure 2-32 Troubleshooting Analysis Check Chart for Service Personnel

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular.	Low oil pressure.	Do Oil Pressure Test in Service subsection, and see the item of Low Oil Pressure on this page.
	Wrong oil.	Drain oil and replace with correct grade. Refer to Figure 1-9 for the Recommended Oil List.
	Accumulator malfunction.	Check accumulator and recharge/replace as necessary.
	Hydraulic system suction leaks. Observe oil exiting lube valve while dozer is operating. Suction leaks will cause oil to foam.	Check the following for air leaks: <ol style="list-style-type: none"> 1. Suction hose to pump connection. 2. Pump shaft seal. 3. Suction filter cover and gasket. 4. Suction hose for cracks or collapsed sections.
	Brake pressure fluctuates, air in valve, orifice missing from brake dump fitting (last used on S/N 1228).	
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. (See Figure 2-18).
	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: <ol style="list-style-type: none"> 1. Proper leakdown time as described in Figure 2-29. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Brake dump valve malfunction.	Check for proper operation.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.

(Continued on next page)

Figure 2-32 Troubleshooting Analysis Check Chart for Service Personnel (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Overheating.	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Check suction filter and clean or replace.
	One or both clutches dragging.	Check by placing control lever in BRAKE-OFF . Normally drum will rotate slowly in either direction. If the reverse clutch is dragging, the drum will rotate in the LINE-OUT direction. If forward clutch is dragging the drum will rotate in the LINE-IN direction and it will take more than 100 lbs of line pull to prevent drum rotation.
	Low system pressure.	Adjust accordingly.
	High cooling oil pressure.	Check cooling oil pressure. Replace relief valve if required.
	Clutch/brake shaft bearings set too tight.	Adjust accordingly.
	Low oil level.	Add oil.
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.
	Electric problem.	Troubleshoot the problem accordingly.
Winch will not operate in any function.	Control lever off-center at startup.	Return control lever to neutral position and attempt function again.
	Line-In Coil Fault: Open or short. Line-Out Coil Fault: Open or short. Brake Release Coil Fault: Open or short. Accumulator Coil Fault: Open or short. Cooling Oil Coil Fault: Open or short. Brake Dump Coil Fault: Open or short.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Pages 2-1 through 2-6) for further information.
	Cartridge valve plugged.	Check valve for obstruction. Clean or replace as necessary.
	Loose or worn connector.	Check and replace as needed. Check harness continuity.
	Relief pressure not being reached.	Check bypass coil & valve—replace faulty parts.

(Continued on next page)

Figure 2-32 Troubleshooting Analysis Check Chart for Service Personnel (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Forward or reverse clutch not releasing.	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators.	Replace as necessary.
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 3.
Clutch does not apply correctly at low PTO RPM.	Accumulator not charged.	Check accumulator. Jump up and bleed down.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 3.
Low forward or reverse clutch pressure.	Broken seal rings on the clutch/brake shaft.	Replace seal rings. NOTE: 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 3.
	Damaged clutch/brake 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 clutch/brake shaft bearing retainers.	Check retainer for grooves. Replace retainer if defective, or re-sleeve.
	Damaged clutch piston or O-rings.	Check piston cavity for damage. Always repair both O-rings when clutch is repaired. Refer to Section 3.
	Pressure tube damaged.	Remove cover and inspect.
	Leaky clutch circuit.	Perform 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.	Brake releases at low pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 3.
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.
	Clutch line plugged.	Clean clutch line and orifices.
Brake releases before reverse clutch engagement.	Faulty reverse clutch valve or coil.	Check reverse clutch valve and coil.
Forward clutch engaging or releasing slowly.	Check hydraulic pressures.	Low hydraulic pressure. See (figure 2-25) on page 2-19 for instructions.
Noisy buzz emanating from winch valve.	Air in relief valve.	This is not a detrimental condition. Noise may be intermittent.

(Continued on next page)

Figure 2-32 Troubleshooting Analysis Check Chart for Service Personnel (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch noisy.	Ring and pinion out of adjustment.	Set ring and pinion backlash.
	Air in oil.	1. Check for suction leaks. 2. Add oil.
	Gears and bearings worn.	Replace components.
Winch does not engage and dozer 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.
	Brake dump stays open.	
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.
Joystick LED blinking.	Different pulse timings (1/4 second, 1/2 second, 1 second, 3 seconds) are used to indicate various error statuses.	Refer to service manual (599069w): W6G, W8L, W12E eControls (Pages 2-1 through 2-6) for further information.

Joystick

(LED) Error Codes

Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-1) for further information for the following:

LED Indicator

The joystick features an LED light that displays error codes, including issues with oil filter changes and electrical faults.

Control Functions

The joystick controls various winch functions such as Brake-On, Line-IN, Line-OUT, Brake-Off, and an optional Freespool function.

Error Indication

- 1/4 Second: Short pulse.
- 1/2 Second: Medium pulse.
- 1 Second: Long pulse.
- 3 Second: Extended pulse

Safety Feature

If critical errors occur, the winch remains in the off state even if the switch is on, ensuring safety.

See Figure 2-33 on next page.

Troubleshooting

Joystick (LED)

Error Codes Descriptions

If one of the following error codes is detected, the red activation light on the joystick will start to blink. If there are errors important to winch safety, the winch will remain in the OFF state even when the switch is in the ON position.

WARNING

Don't use the machine if an error message or error code is activated.



Pulse Timing Chart	
1/4 Second	
1/2 Second	
1 Second	
3 Second	

Function	Display
Winch On LED Off	
Winch Off LED On	
Winch Off and Error Detected +Error Code Below, Repeating	
Oil Filter Bypassing Cold oil, Plugged Filter	
Line-In Coil Fault Open or Short	
Line-Out Coil Fault Open or Short	
Brake Release Coil Fault Open or Short	
Accumulator Coil Fault Open or Short	
Cooling Oil Coil Fault Open or Short	
Brake Dump Coil Fault Open or Short	
Freespool Coil Fault Open or Short	
Joystick Fault Bad Joystick	
Low Battery. Voltage Fault Winch control module drops below 9VDC	
ECM High Temperature Fault Winch control module temperature above 85°C (185°F)	

Figure 2-33 Troubleshooting Analysis Check Chart for Service Personnel

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 Figure 3-13 on page 3-25 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 Troubleshooting Subsection in Section 2).

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 dozer.
2. Remove the wire rope from the drum. Clean the outside of the winch and the area where the winch contacts the dozer.

WARNING

Be careful when you remove the wire rope from the drum. The end of the wire rope 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. Connect slings and a crane or lifting device to the winch.

WARNING

The slings and crane used to lift the winch must have a minimum lifting capacity of 1500 kg (5000 lbs.). Gearbox and mounting bracket can add an additional 3000 lbs.

7. Remove transmission cover.
8. Remove mounting nuts or capscrews and lockwashers securing winch to dozer.

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.

Winch Disassembly

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

Figure 3-1 shows the gears and components contained within the winch housing.

Gear Arrangement

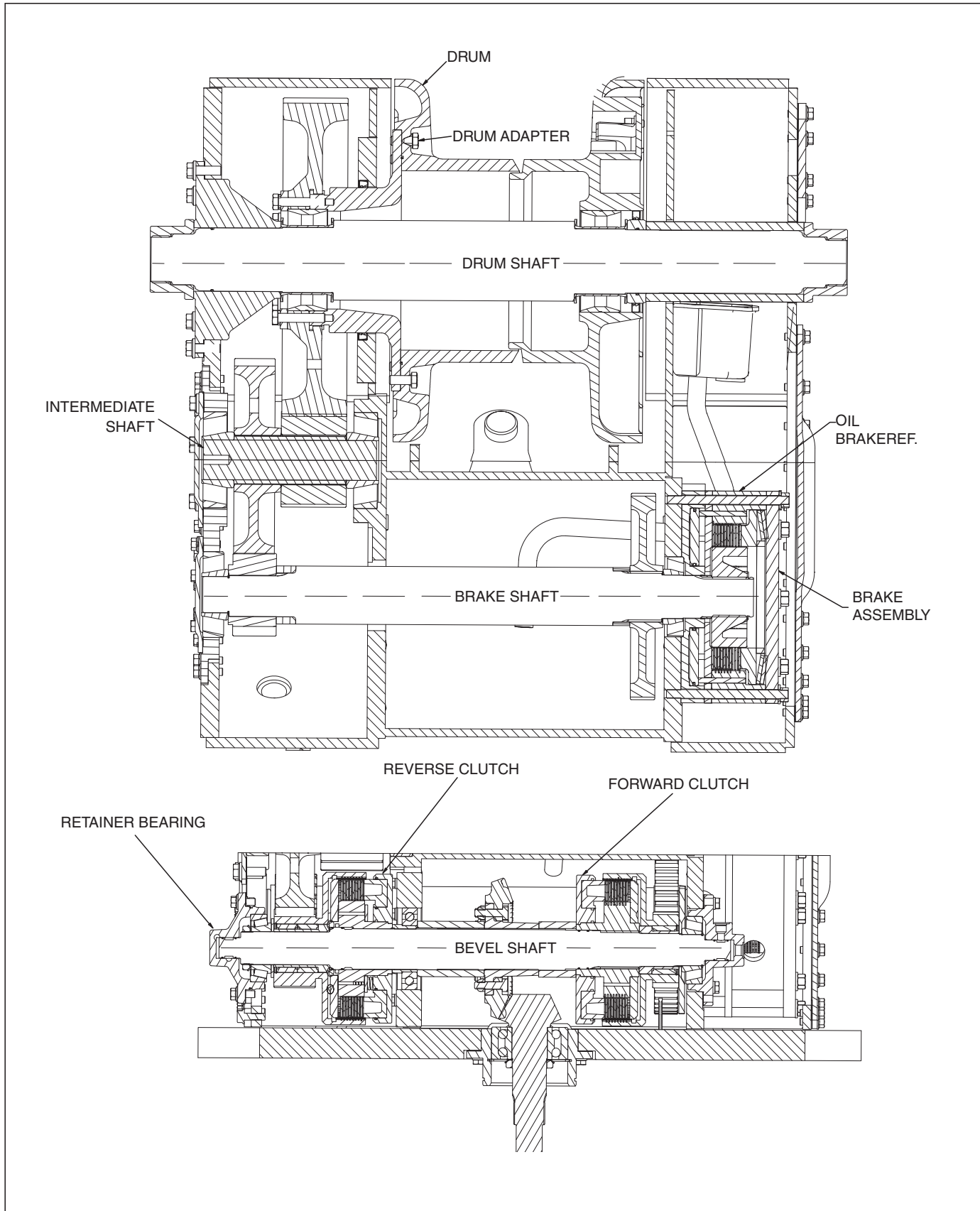


Figure 3-1 General Arrangement - Ratio #7

PTO Shaft Removal and Disassembly

Please refer to Figure 3-2 through Figure 3-5 Before removing the PTO shaft assembly, the winch must be removed from the dozer as explained above in **Winch Removal**.

1. Remove sealing capscrews. If winch is equipped with a drive adapter, refer to Step 4.
2. Pull PTO shaft assembly straight out.

CAUTION

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

3. Disassemble and inspect PTO shaft (refer to Figure 3-2 through Figure 3-4).
4. If equipped with a drive adapter, remove the drive adapter box first (refer to Figure 3-4 and Figure 3-5), then the bevel pinion gear and carrier. Disassemble and inspect as required.

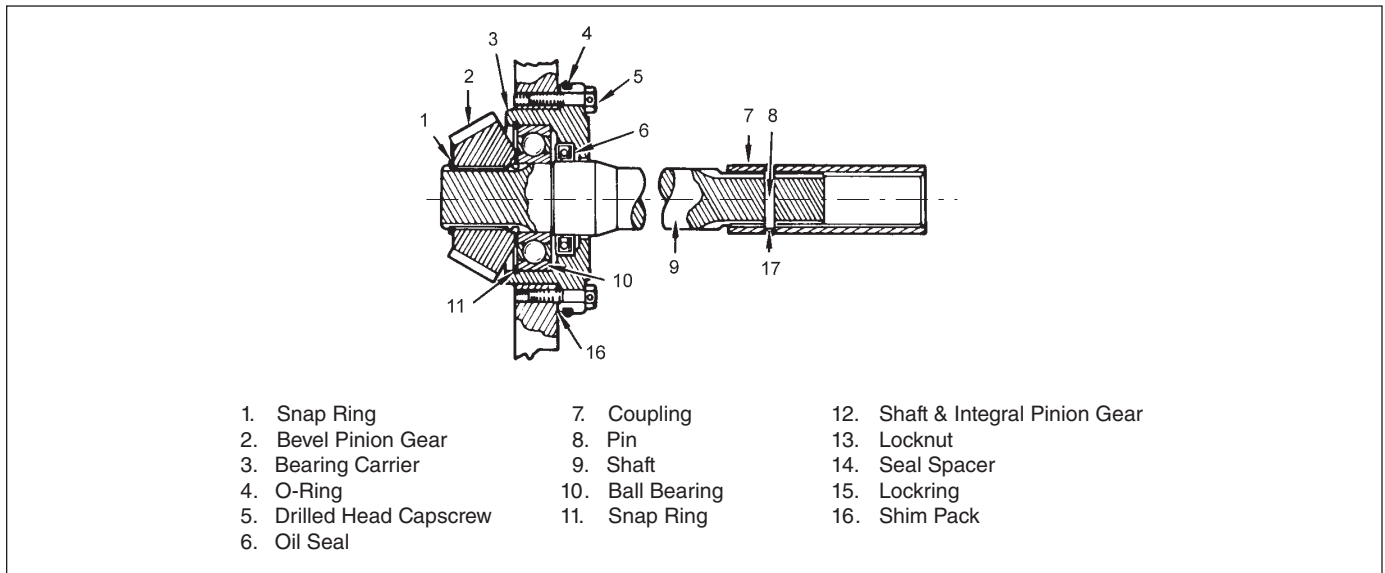


Figure 3-2 PTO Shafts

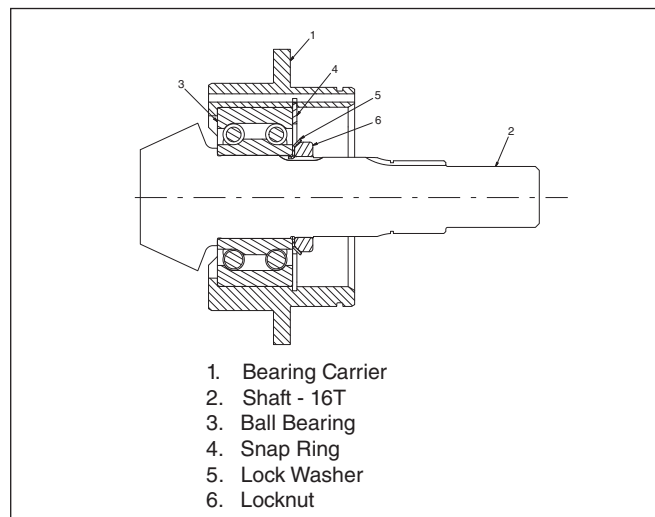


Figure 3-3 PTO Shaft for Caterpillar D8T, 583T, D9T, D10T

Repairs - PTO Shaft Removal & Disassembly

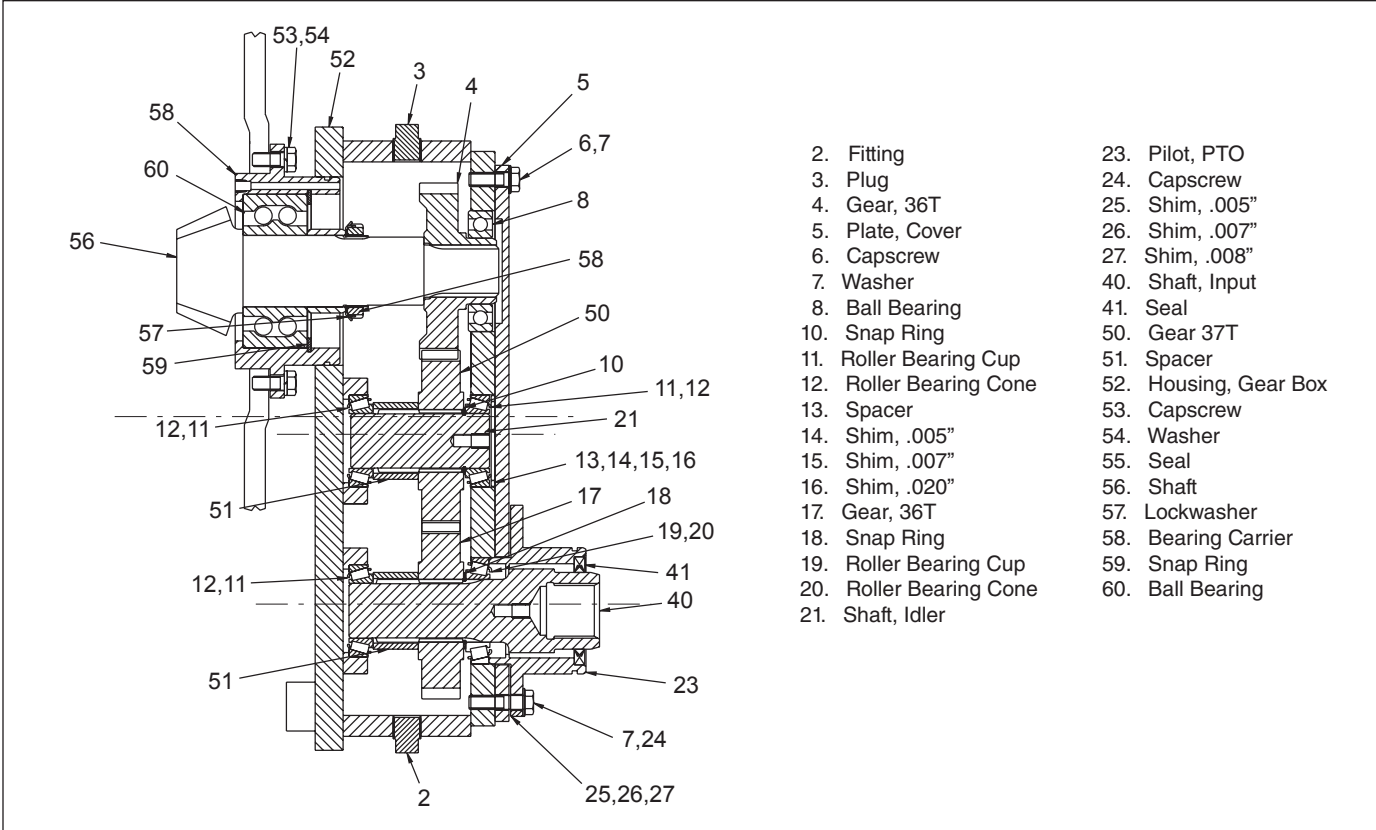


Figure 3-4 1:1 Dropbox for Caterpillar 583T, D8T
(See Chart A on page 1-2 for Dozer Identification and Gear Ratios)

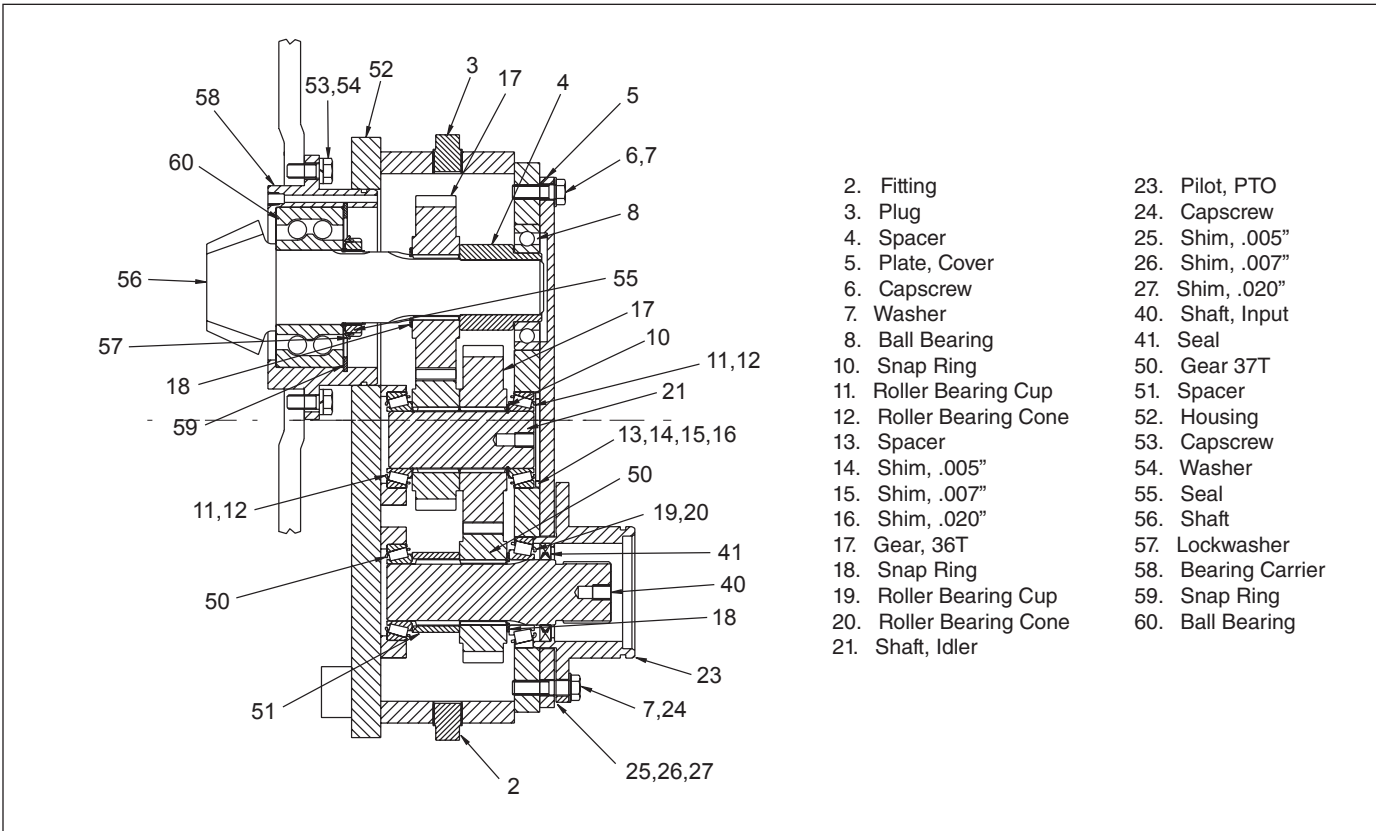
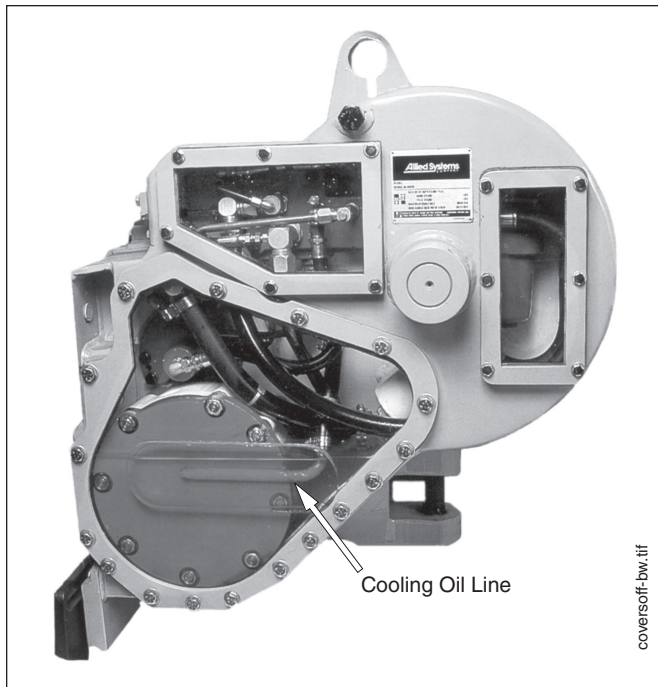


Figure 3-5 1.8:1 Dropbox for Caterpillar D9T; similar to D10T
(See Chart A on page 1-2 for Dozer Identification and Gear Ratios)

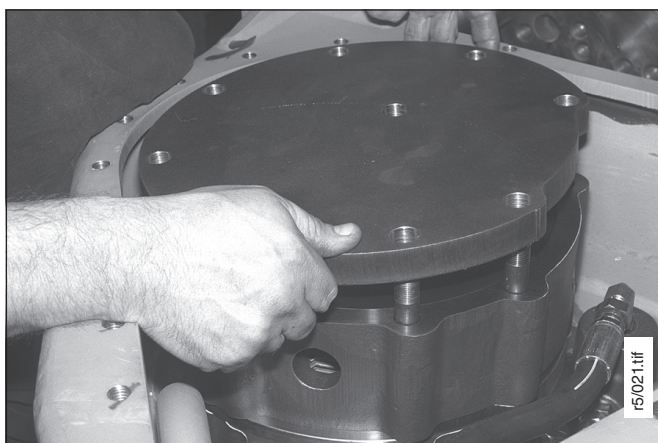
Oil Brake Removal & Disassembly

Removal and disassembly of the brake can be accomplished while the winch is mounted on the dozer. 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 Figure 3-13 on page 3-25.

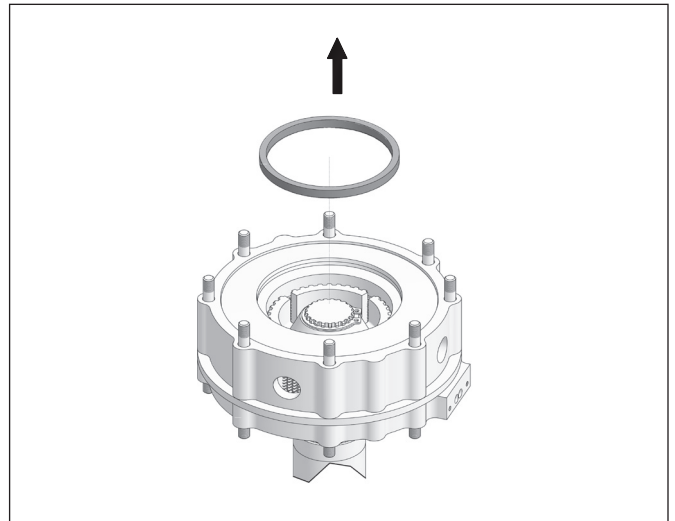
1. Drain oil from winch or position winch with left-hand side up. Remove brake assembly cover. Remove cooling oil hose line.



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



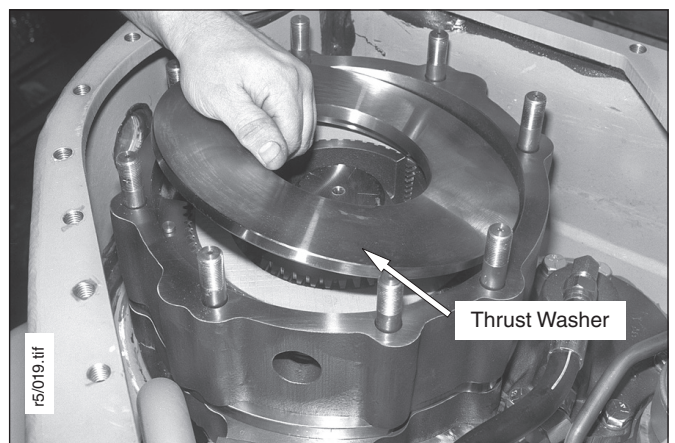
3. Remove the stroke limiter.



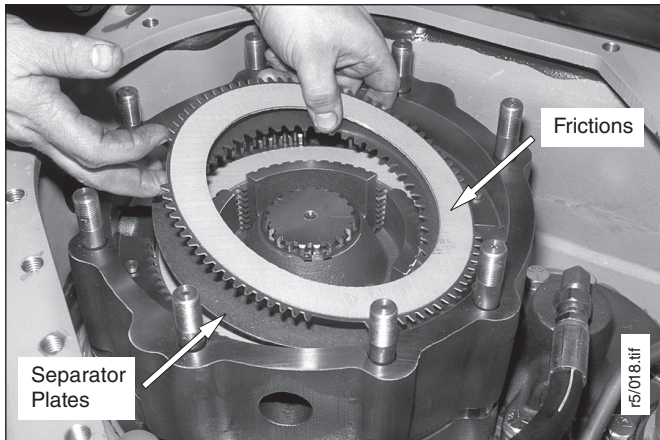
4. Remove two belleville springs from the cage assembly.



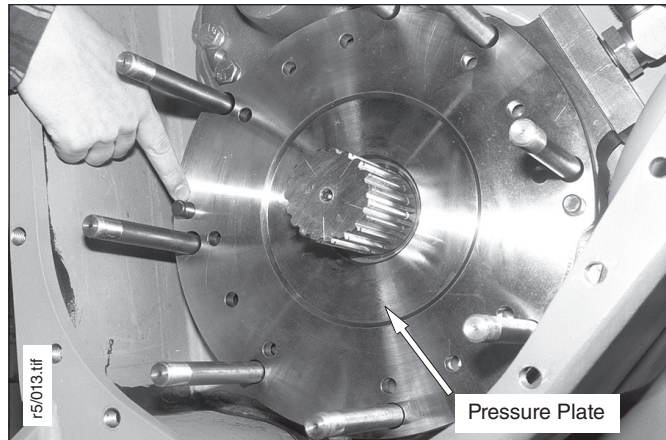
5. Remove the thrust washer.



6. Remove friction discs and separator plates from the

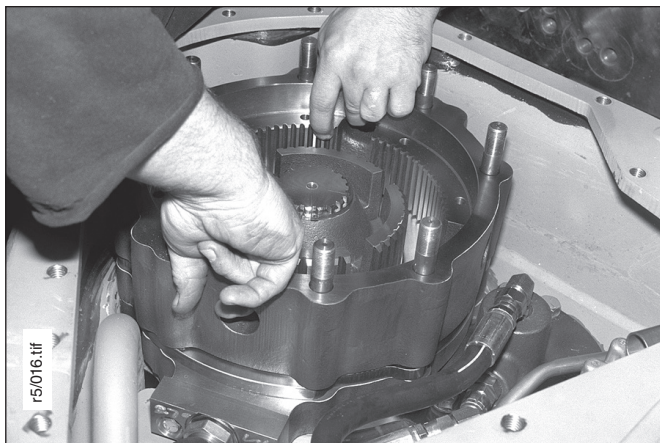


9. Remove pressure plate from studs.

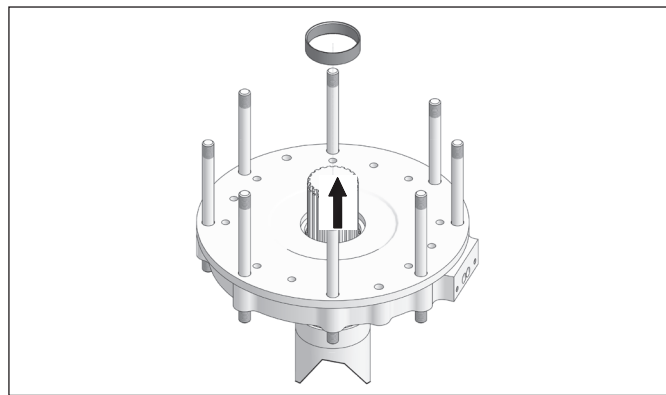


hub.

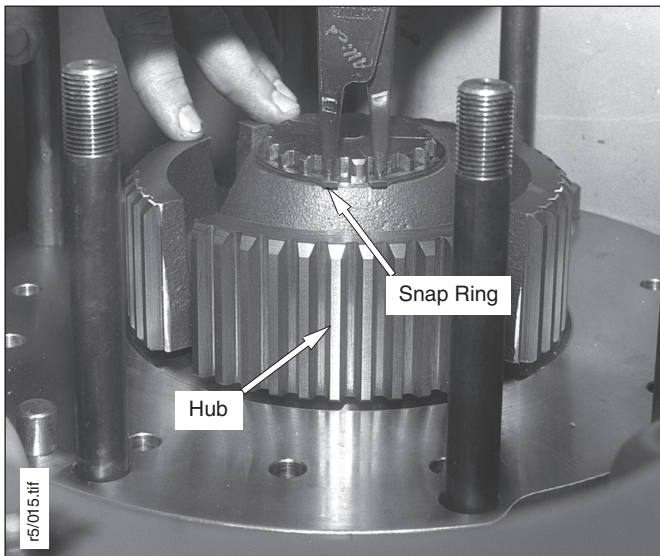
7. Remove cage from studs. It may be necessary to tap cage with a soft hammer to loosen it.



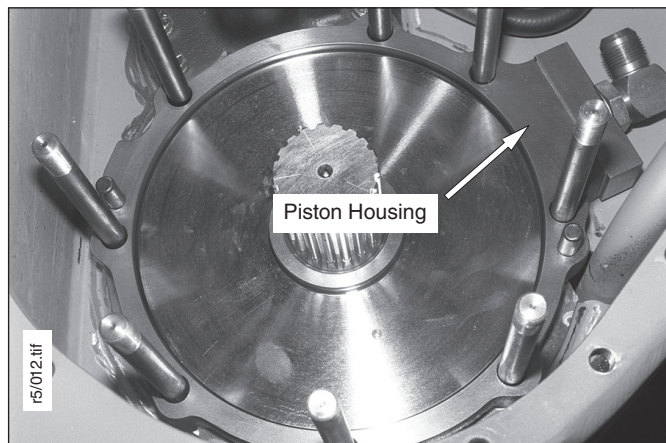
10. Remove the spacer from brake shaft.



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



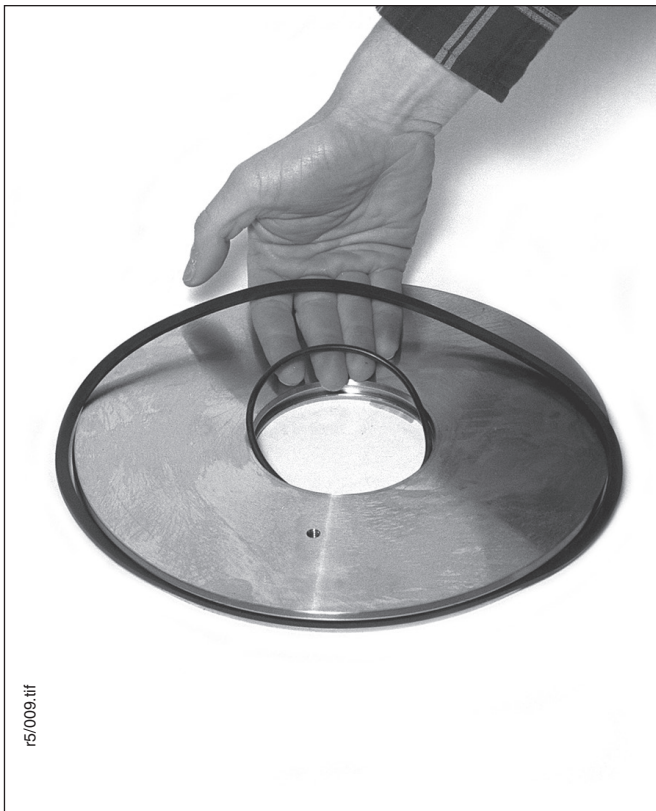
11. Slide the piston housing forward no more than one inch if only the clutch shaft bearing retainer is to be removed. To service the piston housing or brake shaft, remove the piston housing.



⚠ CAUTION

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.

12. Pull the piston out of the housing using two 1/4-inch capscrews, or pressurize housing with low-pressure air.
13. Remove two O-rings from the piston. Discard O-rings.

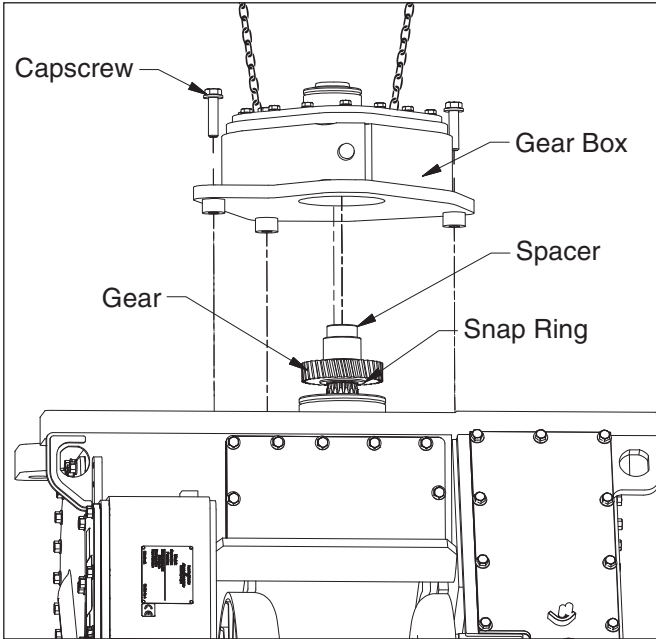


NOTE: Inspect all oil brake components as specified in Figure 3-13 on page 3-25.

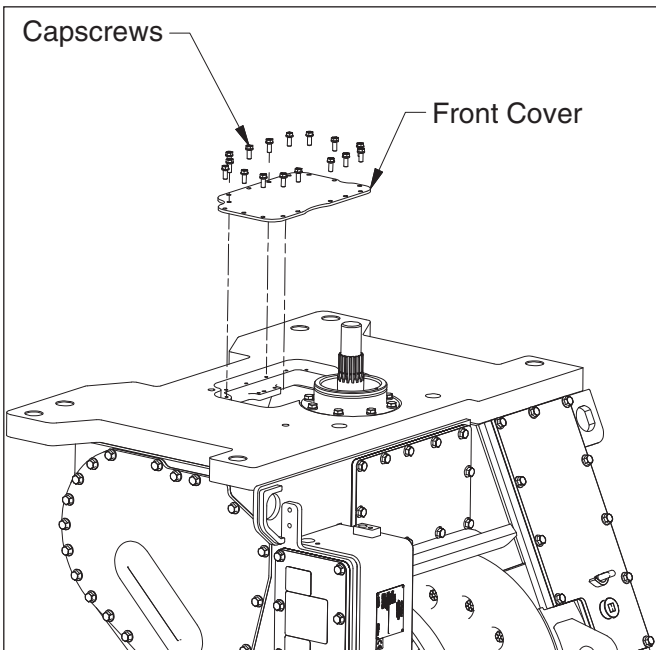
Hydraulic Pump Removal

NOTE: The winch must be removed from the dozer in order to remove the gearbox and access the hydraulic pump. Refer to Figure 3-6 for the location of the hydraulic pump.

1. Rotate the winch with the gearbox facing upwards.

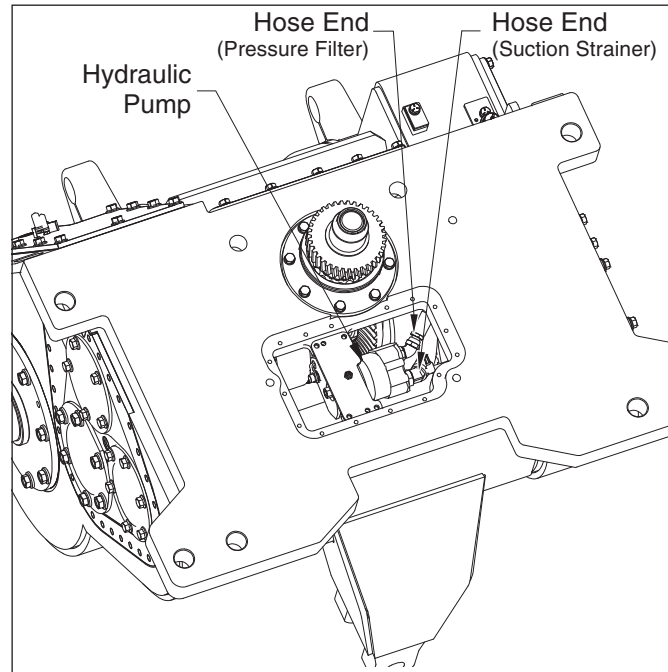


2. Remove the capscrews that fasten the gearbox to the winch frame.
3. The snap ring, gear, and spacer will remain on the PTO shaft after removing the gearbox.

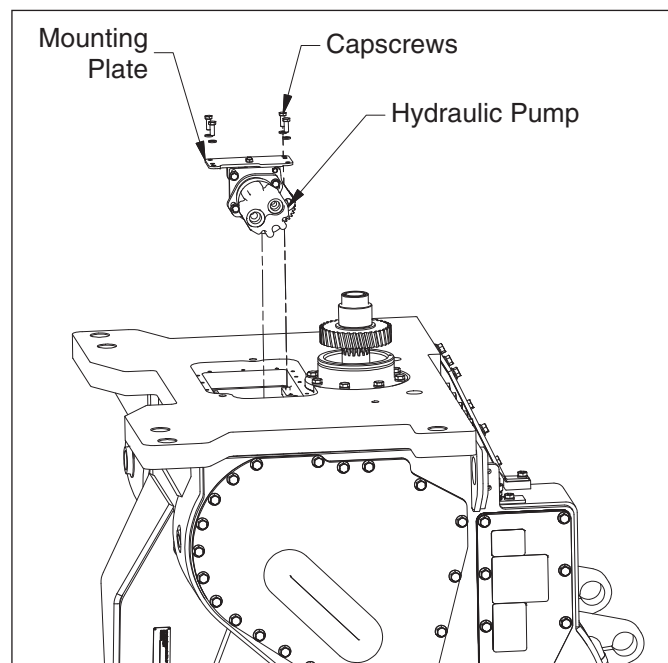


4. Remove the front cover to access the pump.

NOTE: Cleanliness is extremely important when repairing these pumps. Work in a clean area.



5. Loosen and disconnect the hose end that connects from the suction strainer.
6. Loosen and disconnect the hose end that connects from the pressure filter.



7. Remove the mounting plate and pump assembly. Proceed to page 3-10.

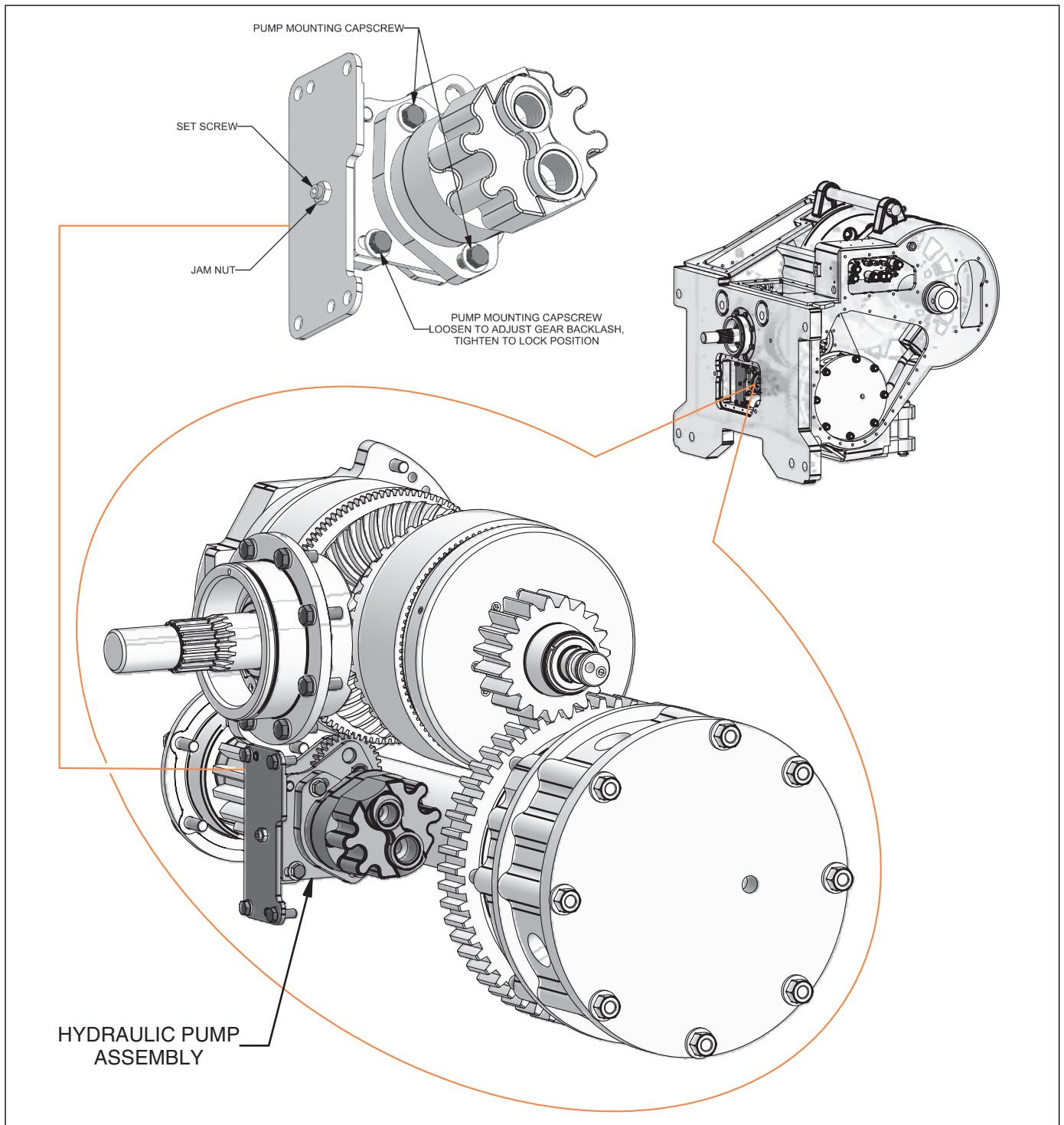


Figure 3-6 Location of Hydraulic Pump - Ratio #7

Hydraulic Pump Removal

NOTES:

1. Refer to Hydraulic Pump Removal & Disassembly on pages 3-8 and 3-9, making sure that the winch must be removed from the dozer and the input gearbox must be removed if it is equipped with the winch.

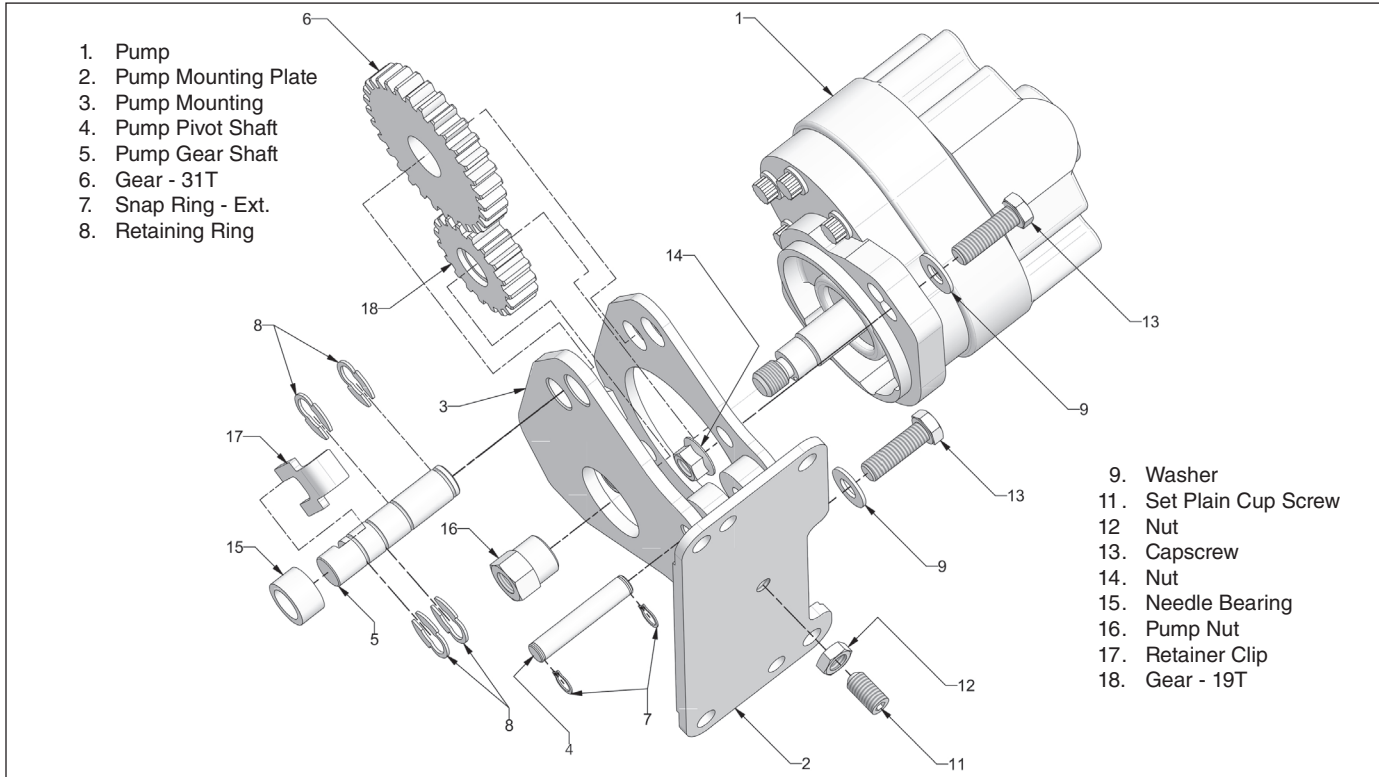
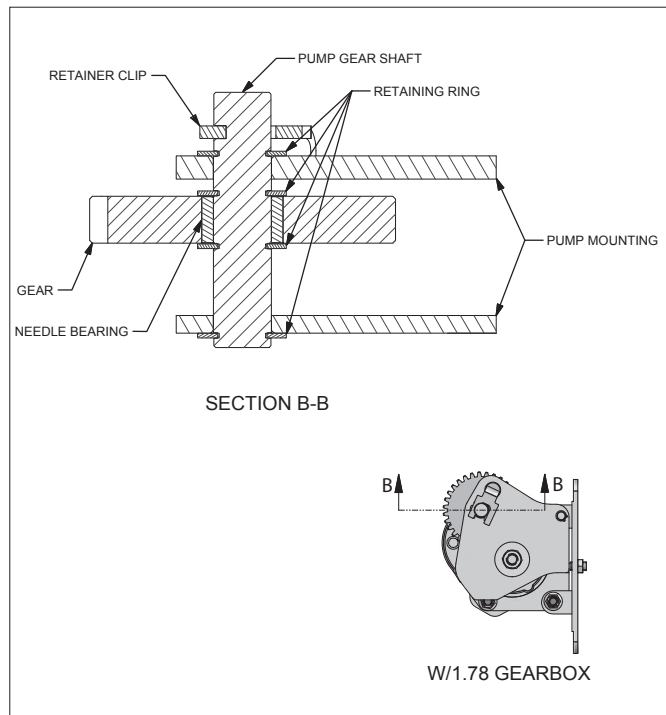
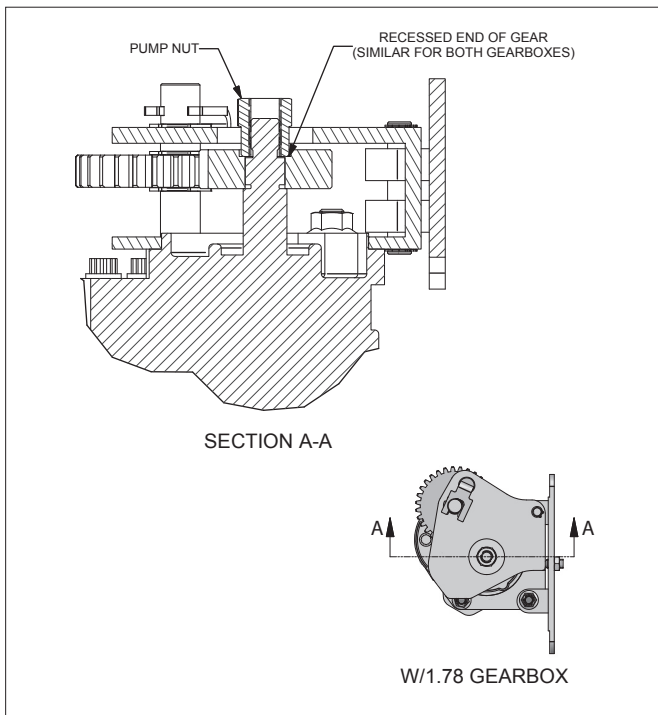


Figure 3-7 Hydraulic Pump Assembly - Ratio #7



Hydraulic Pump Disassembly

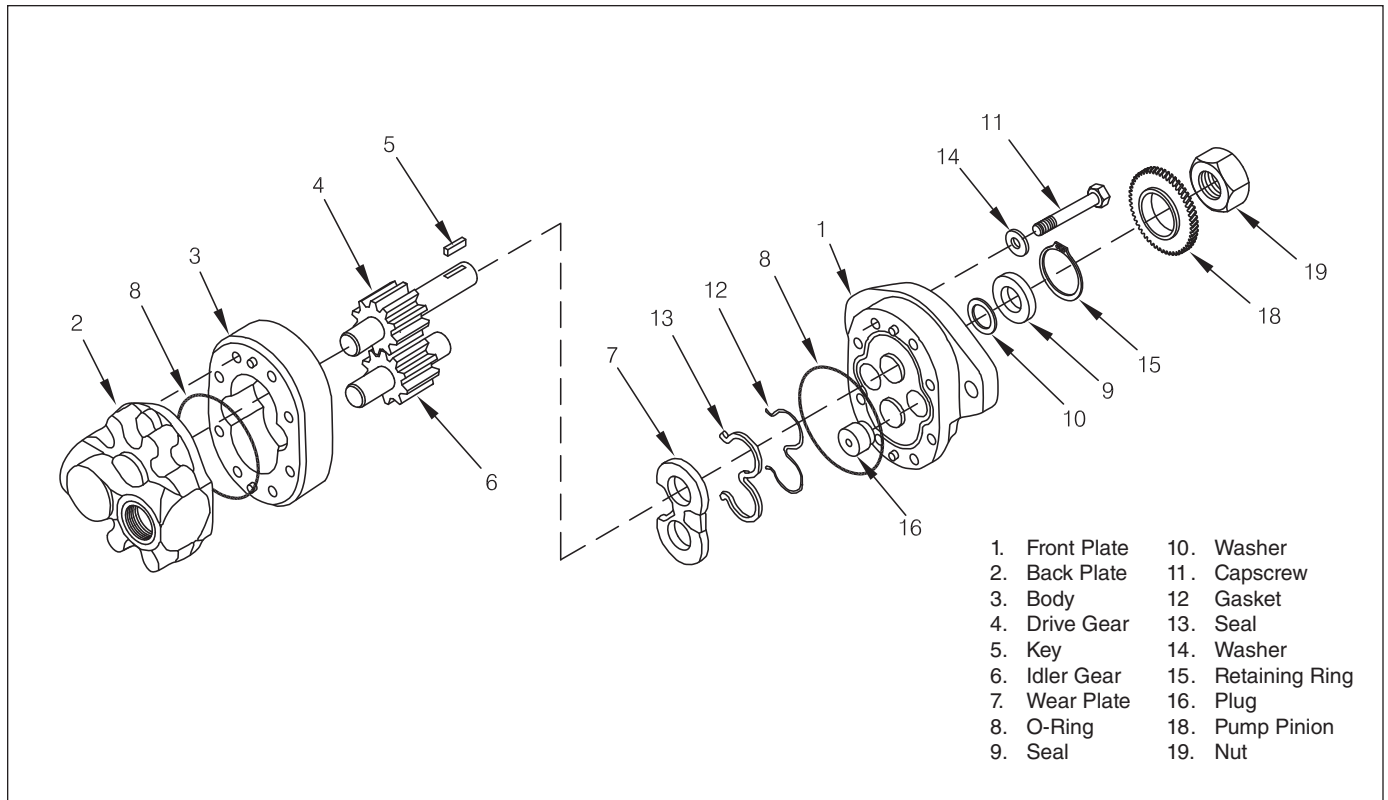


Figure 3-8 Hydraulic Pump

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 (1) from backplate (2). Body (3) will remain with either front plate or backplate.
6. To separate body from section that remains, place drive gear (4) in bearing and tap protruding end with plastic hammer.
7. Remove O-ring (8) from backplate assembly.
8. Remove wear plate (7) from front plate by prying with O-ring pick.
9. Remove plug (16) from front plate.
10. Remove wear plate seal (13) and shaft seal (9) from front plate.

General Inspection

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

Pump Gear

1. Inspect drive gear and shaft (4) 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).

NOTE: Do not repair the pump if gear or housing is worn. Replace with a new pump.

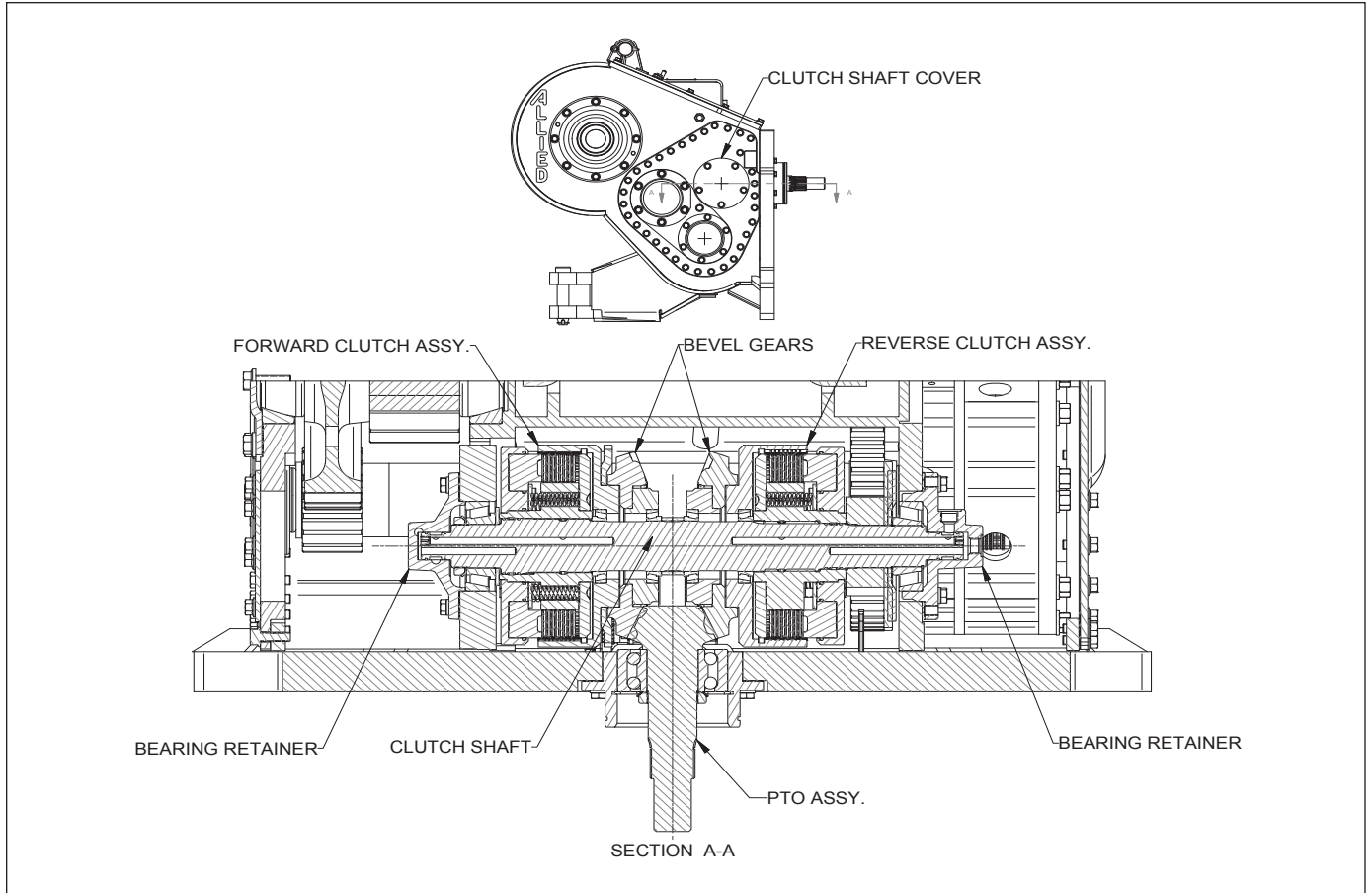


Figure 3-9 Clutch Shaft - Ratio #7

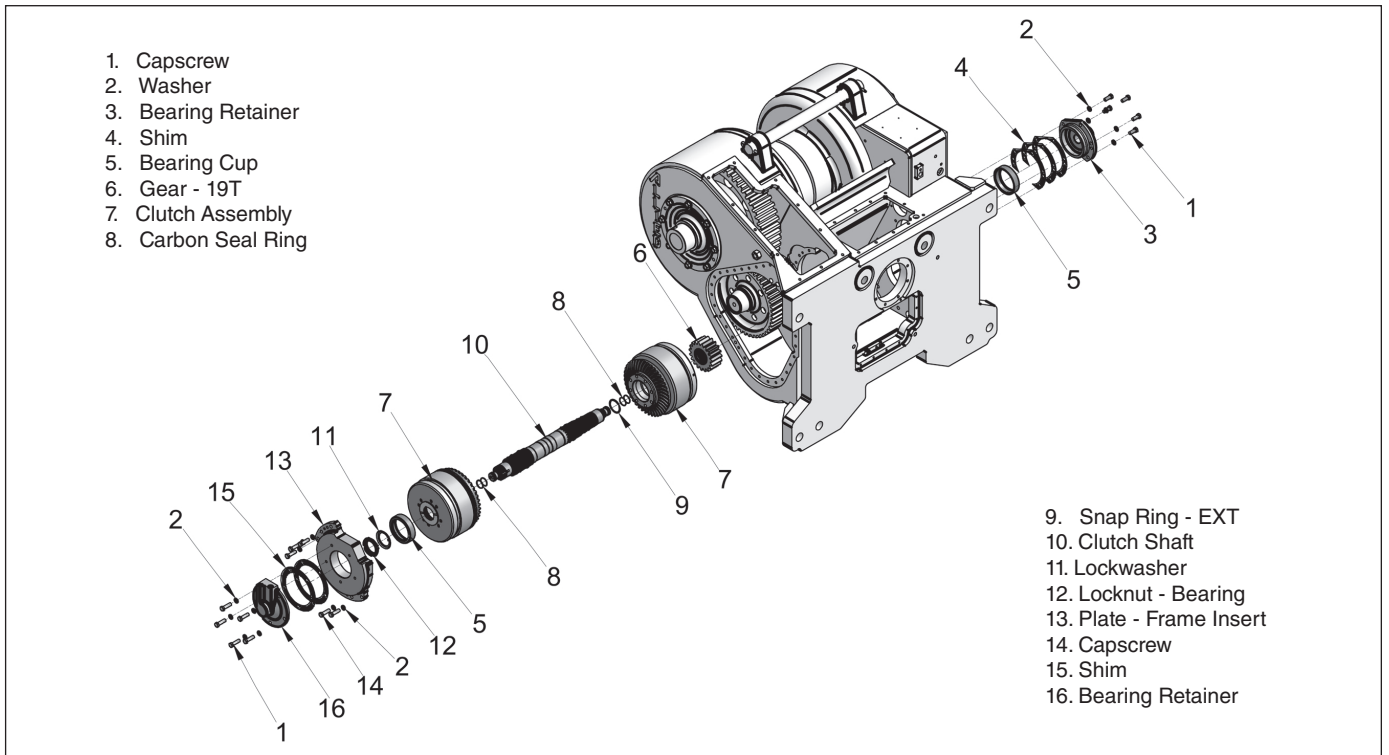
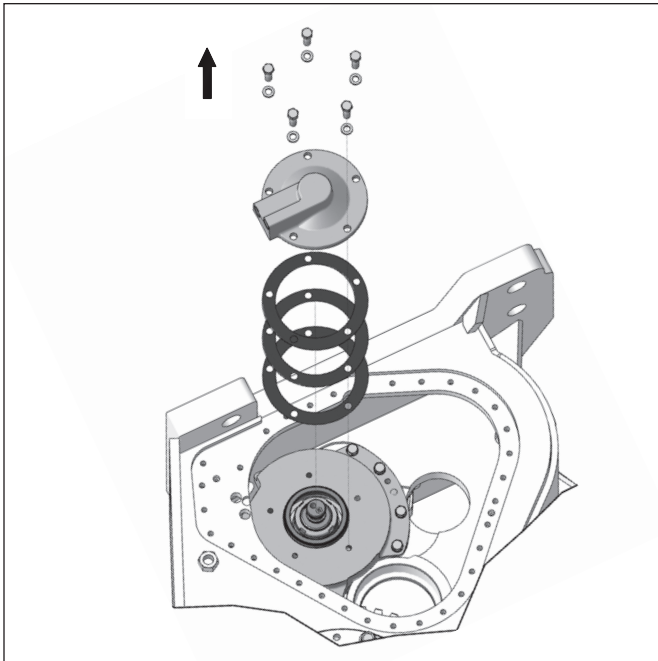


Figure 3-10 Location of Clutch Shaft - Ratio #7

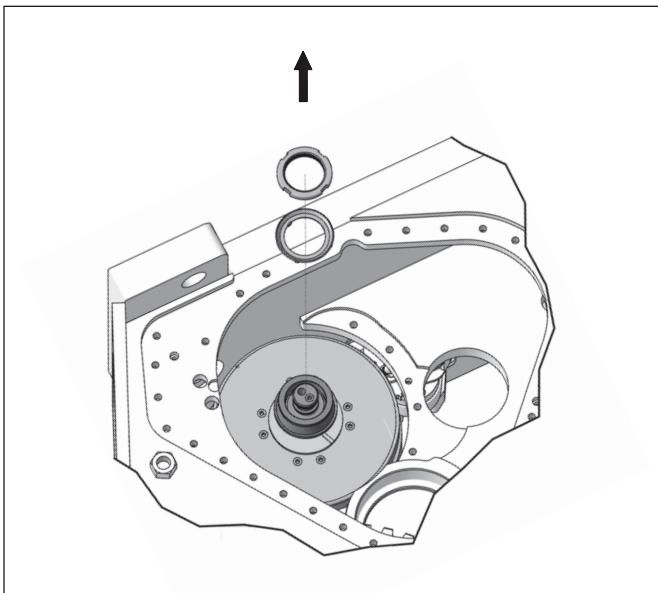
Clutch Shaft Removal & Disassembly

Note: After the intermediate shaft and the brake shaft are removed, perform the following to remove the clutch shaft.

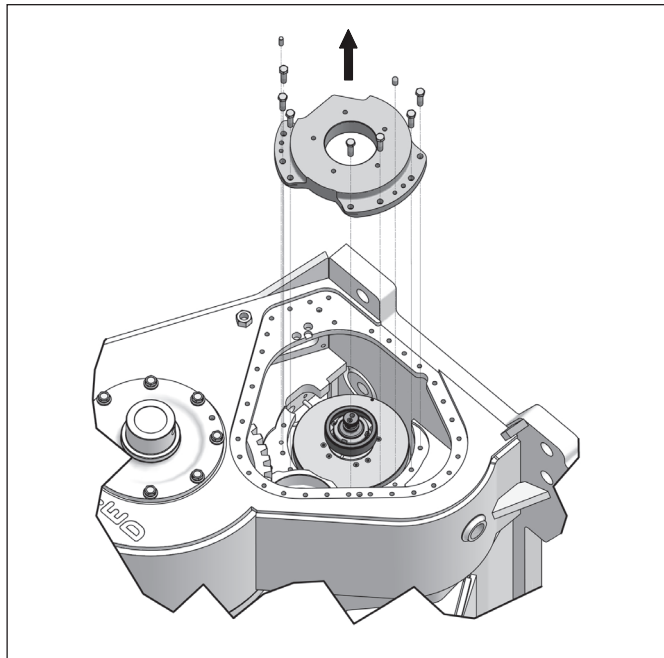
1. Remove right-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



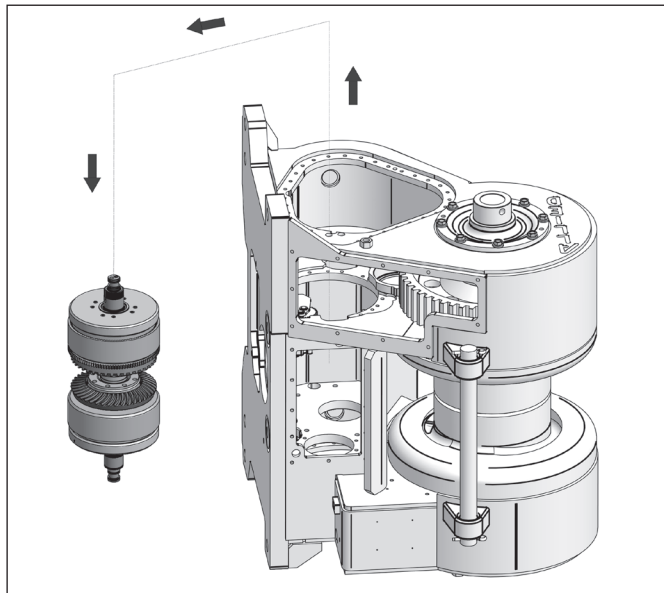
2. Straighten the lockwasher tang securing the locknut. Use clutch shaft locknut socket (see page 3-53) to remove the locknut.
3. Remove the locknut and lockwashers.



4. Attach the lifting device (see page 3-53) to the clutch shaft on the right-hand side.



6. Pull the clutch shaft, along with clutch assemblies, out of the winch frame, and place it on a working bench or a supporting stand vertically and securely.



7. Install a 1/4"-20 lifting eye (Allied P/N X-203348, see page 3-53) and pull clutch assemblies and spacers away from the shaft.

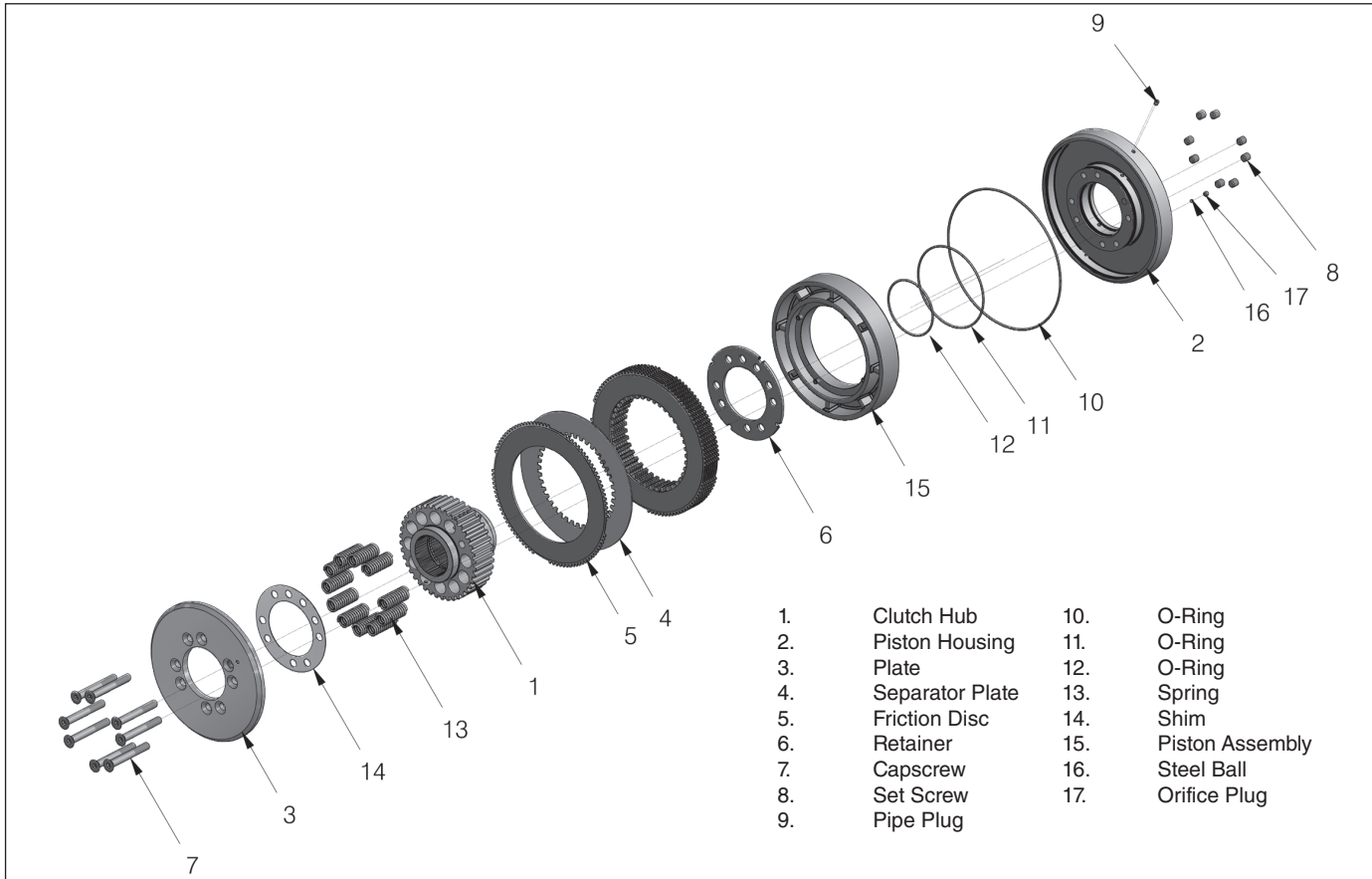


Oil Clutch Disassembly

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

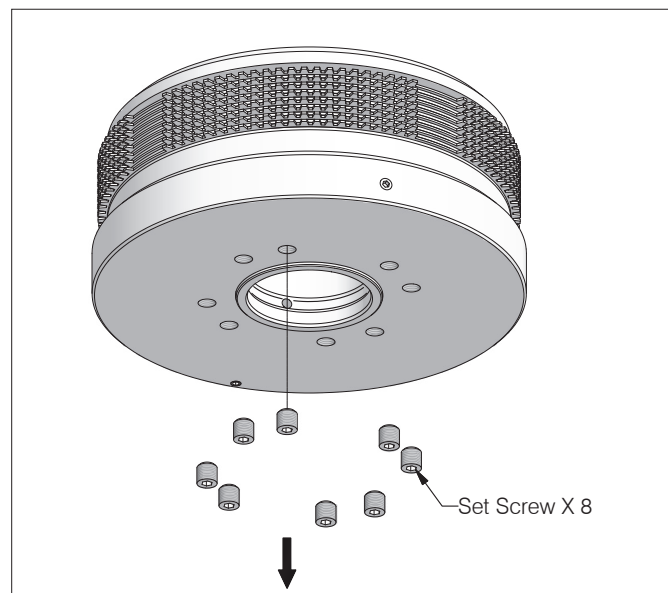
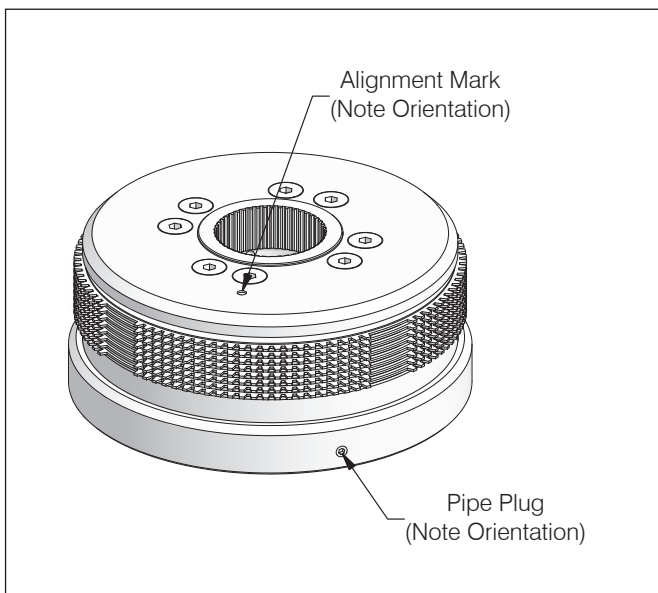
NOTE: Disassembly is essentially the same for both the forward and reverse clutches. The forward clutch is shown below.

Figure 3-11 Oil Clutch Assembly (Forward Clutch Shown)

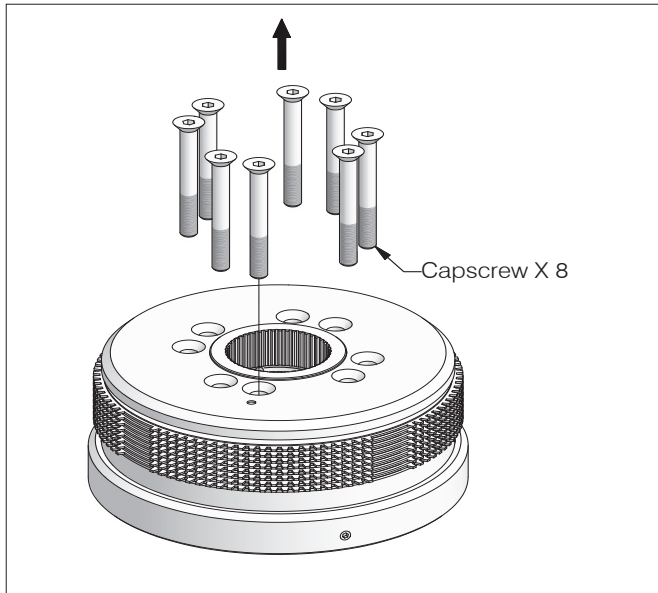


1. Before disassembling clutches, note and mark the orientation for reference during reassembly.

2. Remove set screws from the piston housing.

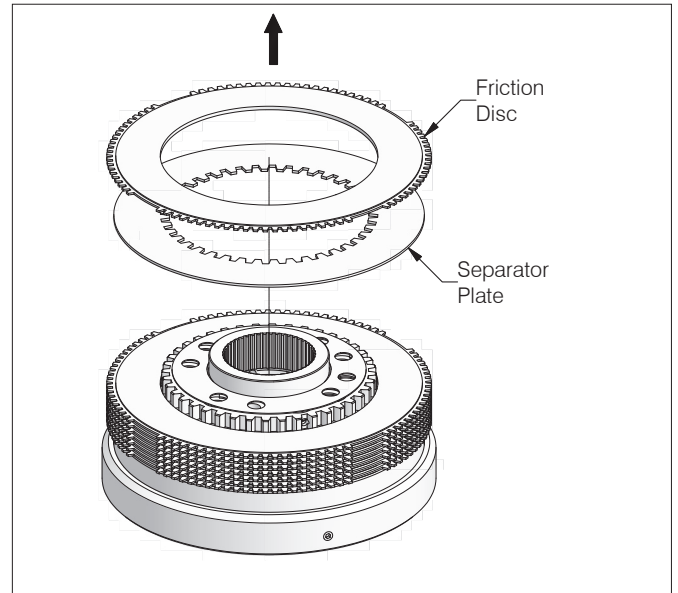


- Remove the capscrews using the a hand impact driver initially. Hold firmly so as not to damage the clutch pack.

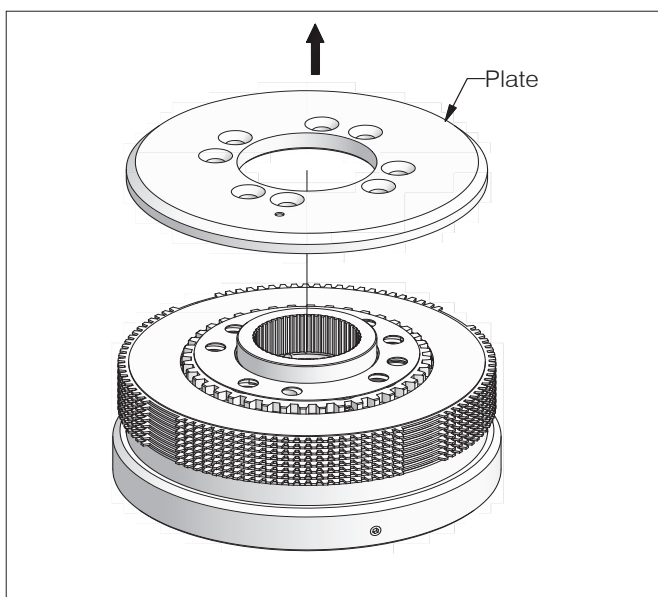


NOTE: Using a C-Clamp to compress the clutch pack will make removing capscrews easier if they are too tight in the assembly.

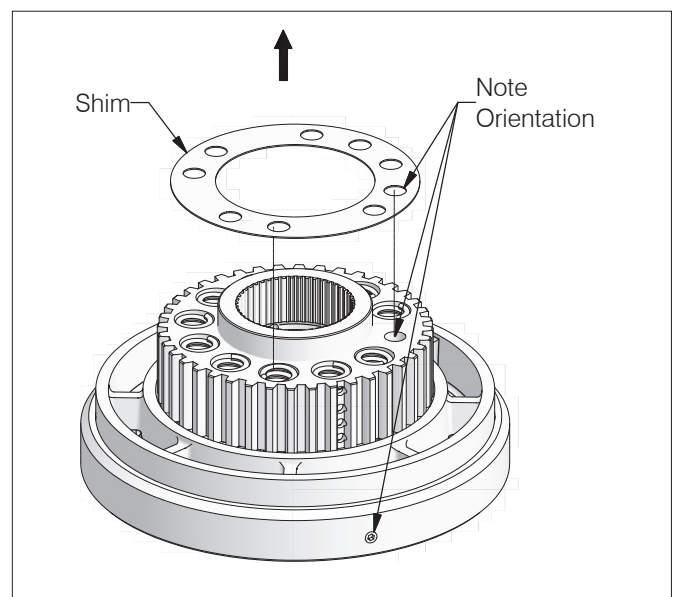
- Remove the separator plates and friction discs from the hub. Inspect as described in Figure 3-13 on page 3-25.



- Note the orientation, and mark position on cover plate and hub to aid in reassembly. Lift the plate from clutch assembly.

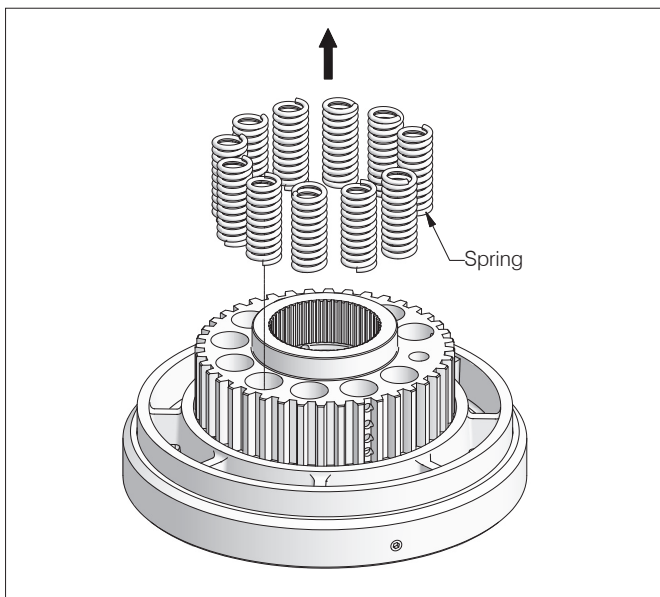


- Remove shim. Pay attention to the orientation, and note that if the shim is reassembled upside down, the holes will almost align, but not enough to reassemble properly.

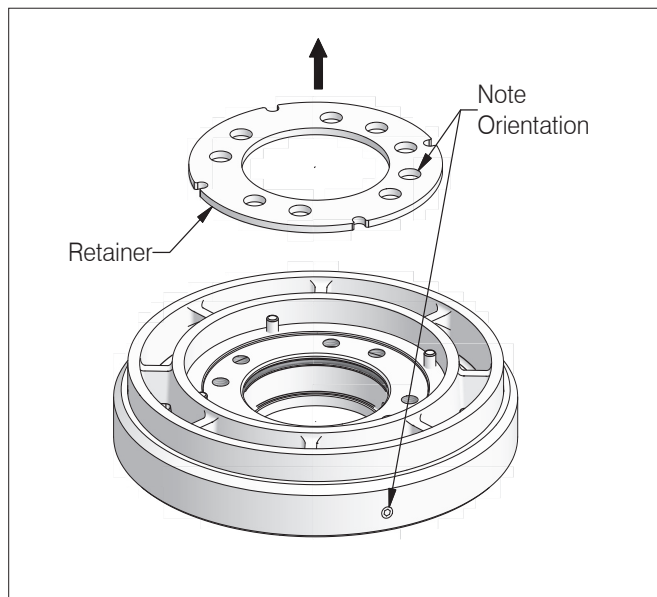


Repairs - Oil Clutch Disassembly

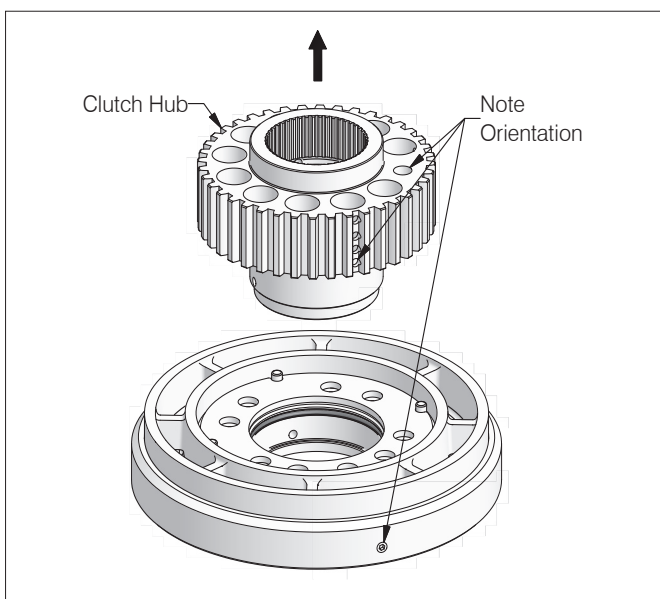
7. Remove and inspect the release springs. Refer to Figure 3-13 on page 3-25.



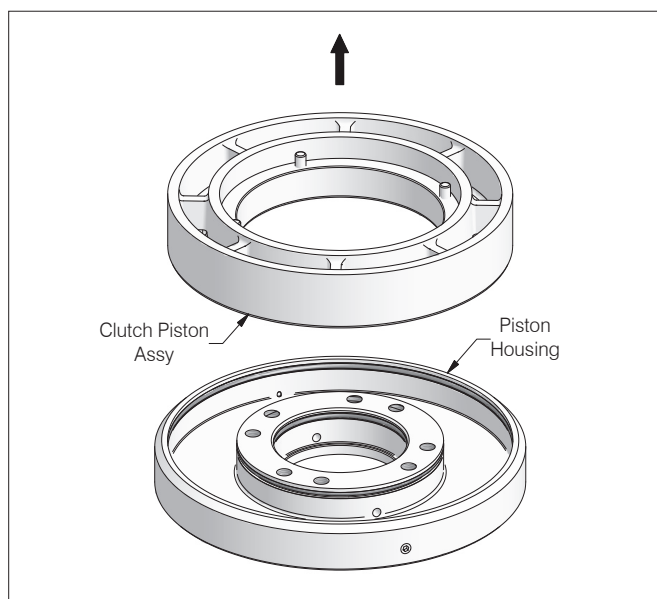
9. Remove spring retainer. Inspect for wear. Pay attention to the orientation, and note that if the retainer is reassembled upside down, the holes will almost align, but not enough to reassemble properly.



8. Remove the clutch hub from the piston housing.

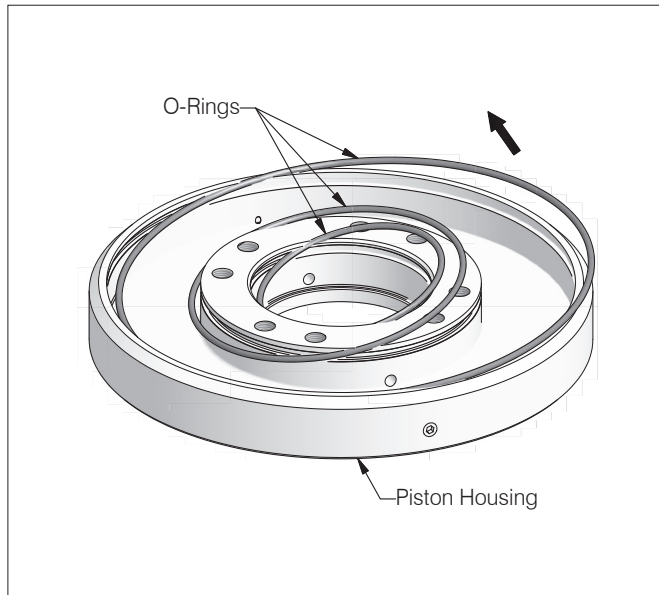


10. Remove the piston assembly from the piston housing. Inspect for wear.

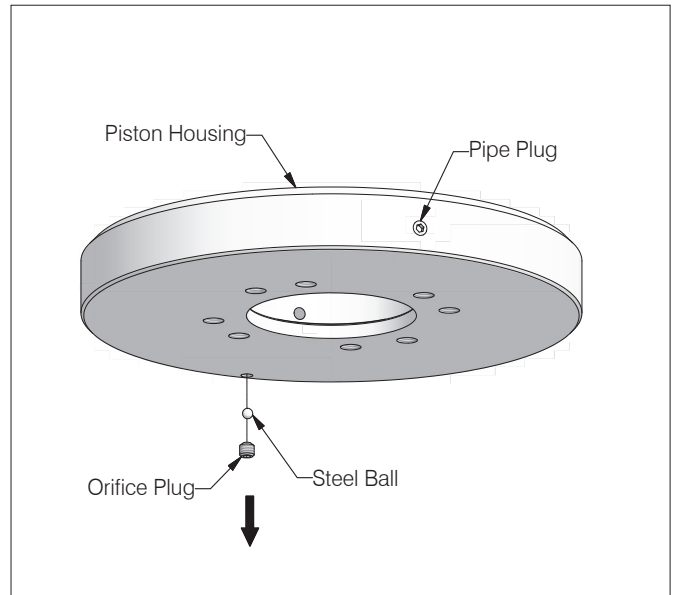


11. Remove and discard the three O-rings.

12. Remove the steel ball and the orifice plug.



NOTE: For reassembly and setting of air gap, refer to Step 11 of Oil Clutch Reassembly.



NOTE: Do not remove the pipe plug from the piston housing.

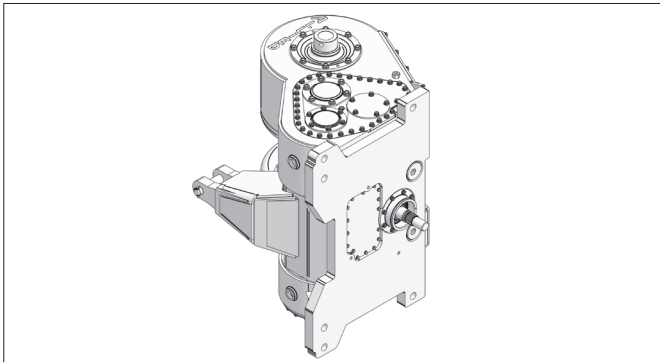
Figure 3-12 Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch winds in quickly in BRAKE-OFF (Ratio #7).	No exhaust ball valve or ball stuck.	Update winch per Service Gram.
		Plug has fallen out of piston housing or ball is not seating, allowing oil to leak.
Clutch pressure bleeds down very quickly.	No exhaust ball valve or ball stuck.	Plug has fallen out of piston housing or ball is not seating, allowing oil to leak.
Winch will tighten up on load, but will not pull.	Exhaust ball leaking or missing.	Plug has fallen out of piston housing or ball is not seating, allowing oil to leak.

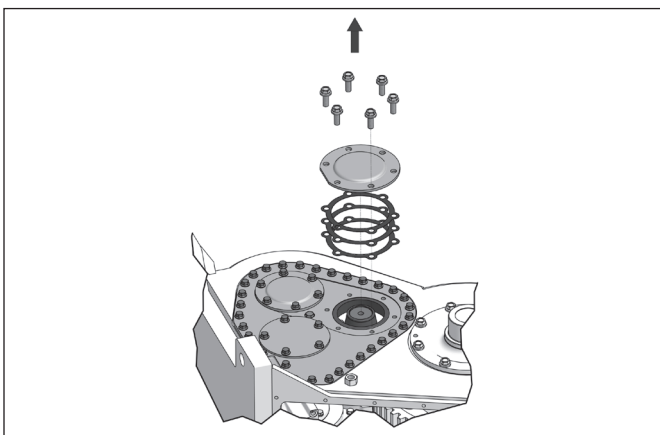
Intermediate Shaft Removal

NOTE: The intermediate shaft must be removed prior to removing the brake shaft, the clutch shaft and the drum shaft.

1. Rotate the winch until the right-hand side is on top and horizontal.

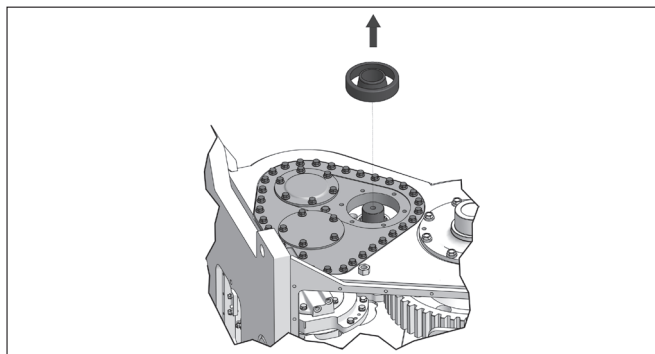


2. Remove the intermediate shaft cover and shims. Tag the shims for reference during reassembly.

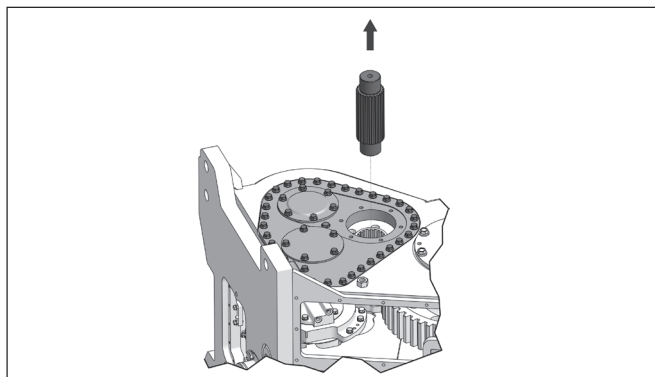


NOTE: Timken bearing cup for intermediate shaft inner support needs to be removed after the drum gear has been removed, but the cup needs to be installed prior to installation of the drum gear.

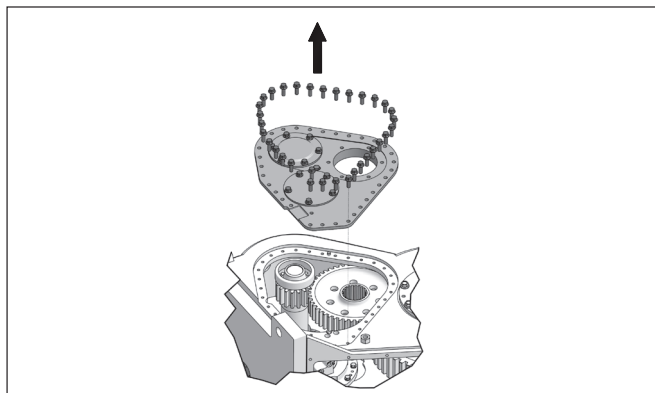
3. Remove the bearing cup and bearing cone.



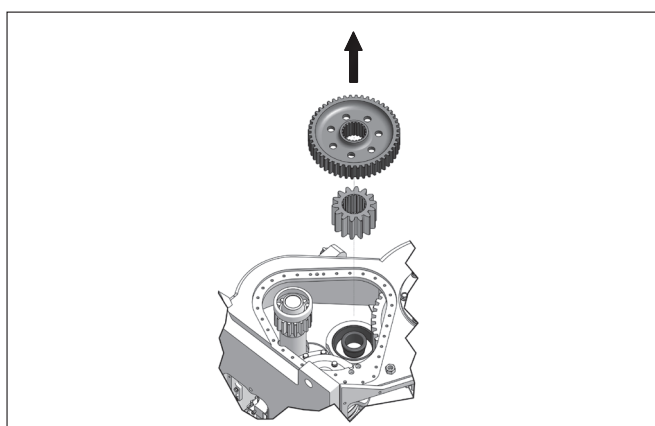
4. Remove the intermediate shaft.



5. Remove the right-hand side frame cover plate.

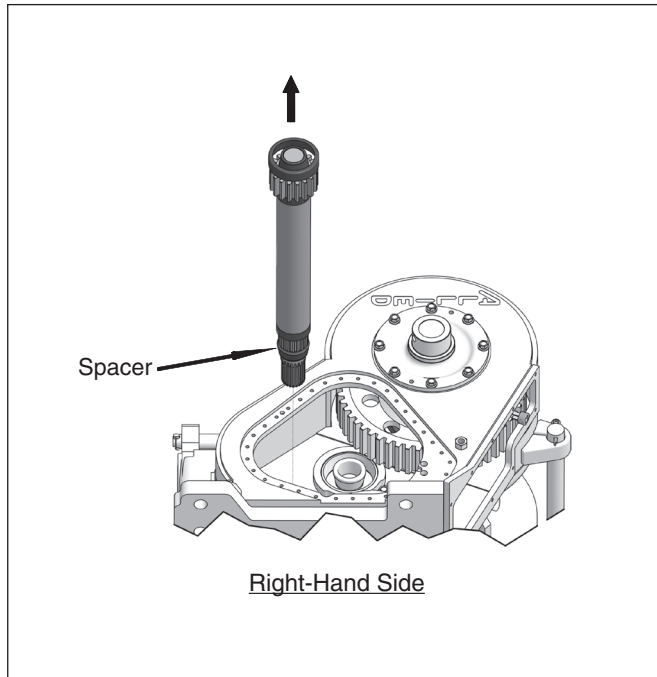


6. Remove the intermediate gear and the pinion gear.



Brake Shaft Removal

1. After removing the brake and the intermediate shaft, pull out the brake shaft along with the bearing cone, cup and the gear from the frame. During removal of the brake shaft, a spacer near the brake gear may fall off the shaft and remain inside the winch.



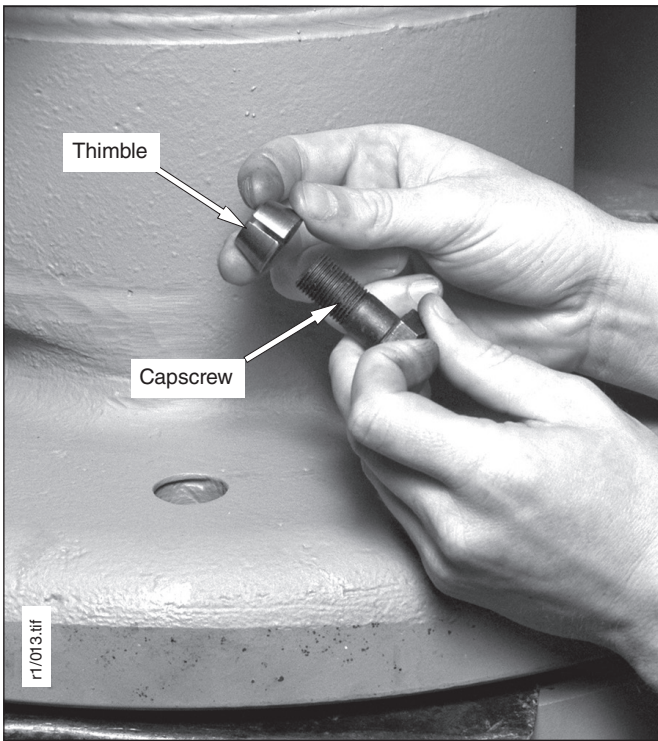
2. Left-hand side gear remains on the frame. Left-hand side cup and cone could fall from frame but may be held in place by the tight fit of the cup on the frame.

NOTE: The brake housing should remain in place during brake shaft removal so that the bearing cup does not get pushed out thereby allowing the shaft to drop out of position. The weight of these components make it difficult to correct this problem once this has occurred. The brake housing can be held in place by making a spacer out of turing and/or washers to be placed on two of the brake studs.

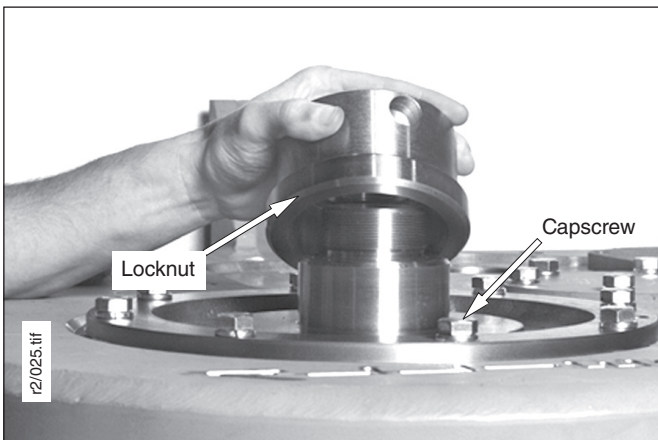
Drum Shaft & Drum Removal

Figure 3-14 on page 3-27 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 dozer. 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.

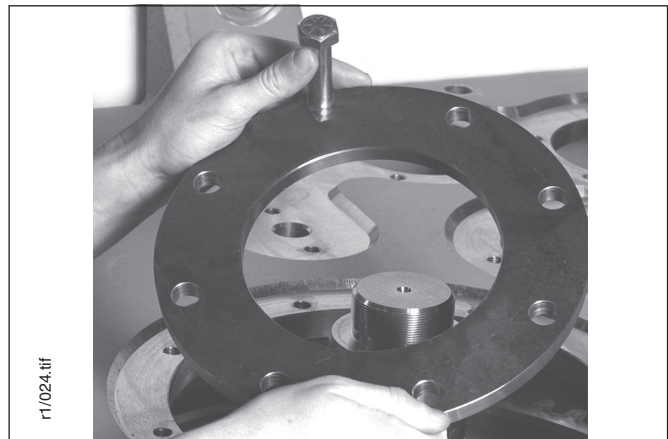


3. Remove bearing retainer and shim pack.

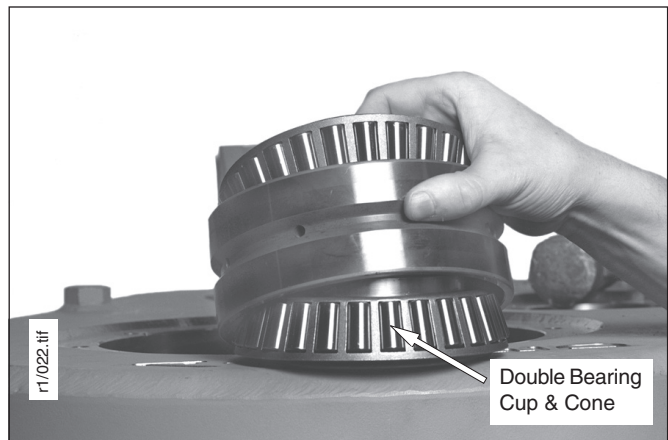


NOTE: Tag shim pack for reference during reassembly.

4. Remove retainer ring by removing retainer capscrews.



5. Remove the first tapered roller bearing cone, then the double bearing cup, spacer and second cone. Bearings must be kept at the same side with bearing cups.



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

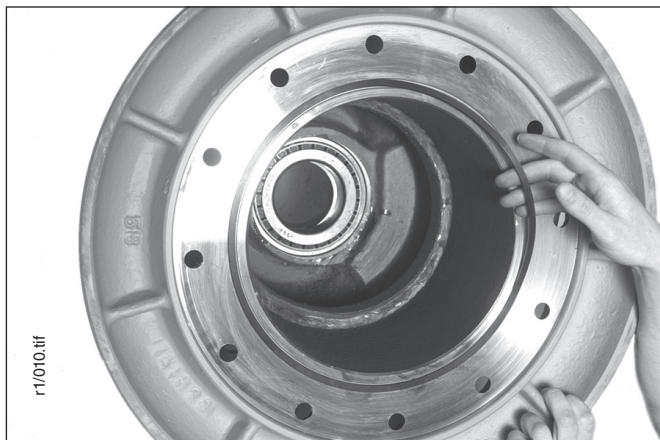
6. Attach a sling around the drum and hoist until there is no slack, then drive the shaft out the right hand side.

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

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



10. Remove and discard adapter seal.



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

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



NOTE: Refer to Figure 3-14 on page 3-27 for location of components.

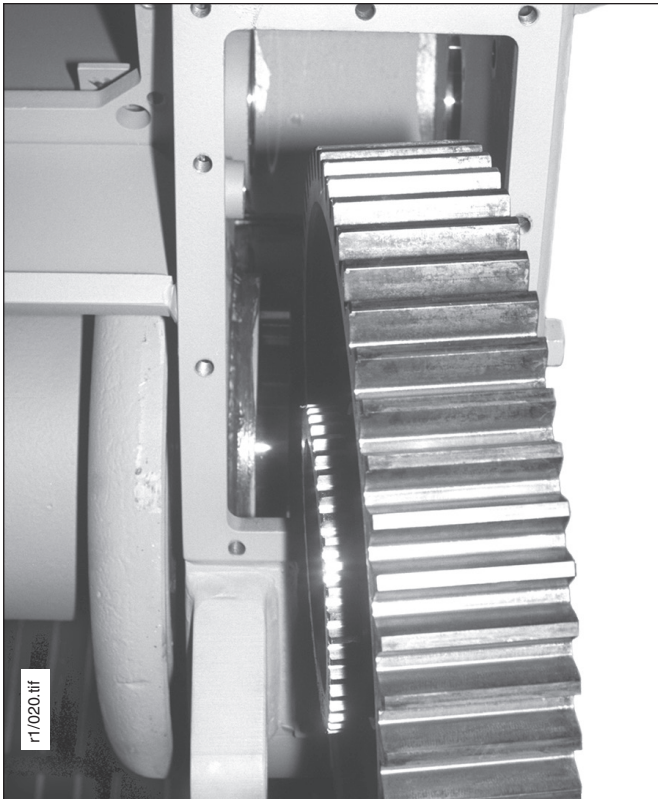
12. Remove and discard shaft seal from drum. (Seal lip should normally be pointed in.)



13. Remove and discard adapter seal from winch housing.



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



Winch Assembly

All components should be inspected for wear or damage as they are removed. Refer to Figure 3-13, 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

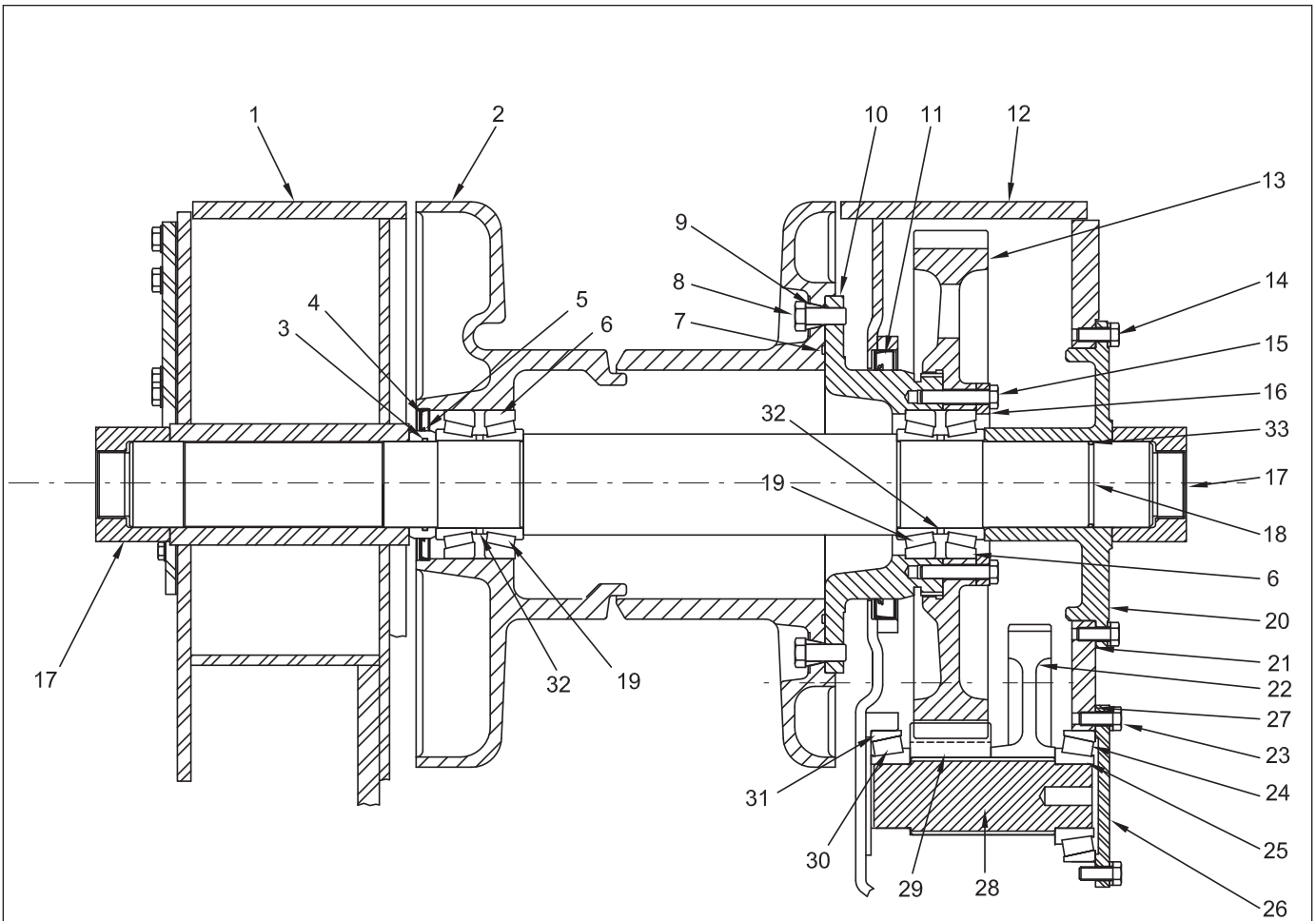
may fail when placed under a load. When in doubt, it is recommended to install a new bearing. Any component that indicates excessive wear or damage should be replaced. The following reassembly and installation sequence assumes a complete winch overhaul.

Figure 3-13 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.

Figure 3-13 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. Stack dimension.
	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.
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 cross threaded 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.



VIEWED FROM
THE BACK OF THE WINCH

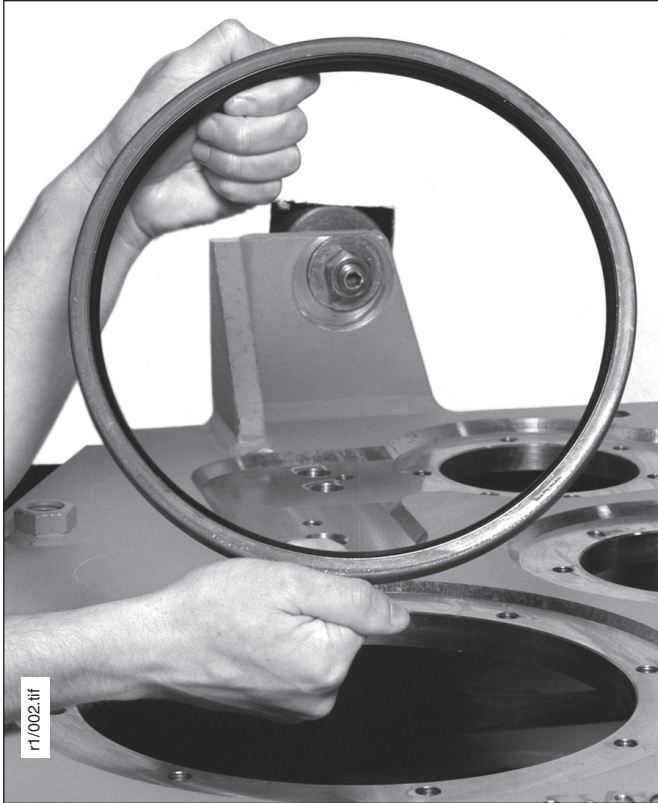
- | | |
|--------------------------------|---------------------------|
| 1. LH Winch Housing | 18. Drum Shaft |
| 2. Drum | 19. Bearing Cone (Qty. 4) |
| 3. O-Ring | 20. Drum Retainer |
| 4. Spacer | 21. Shims |
| 5. Oil Seal | 22. Intermediate Gear |
| 6. Double Bearing Cup (Qty. 2) | 23. Capscrew & 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 3-14 Location of Drum and Drum Shaft Components

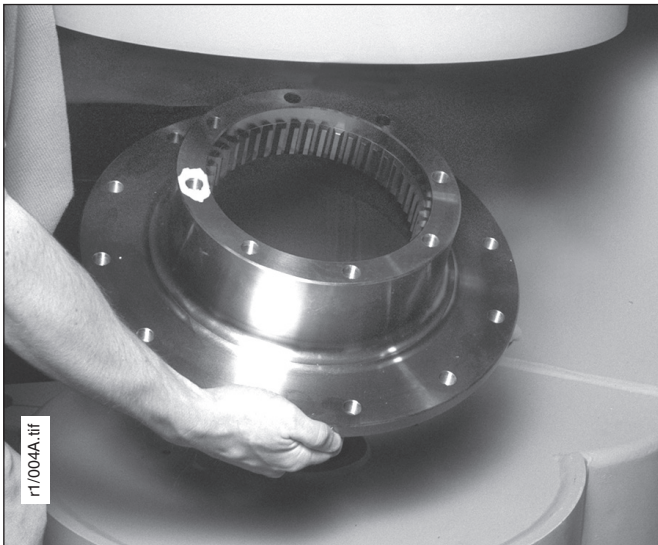
Drum and Drum Shaft Installation

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.

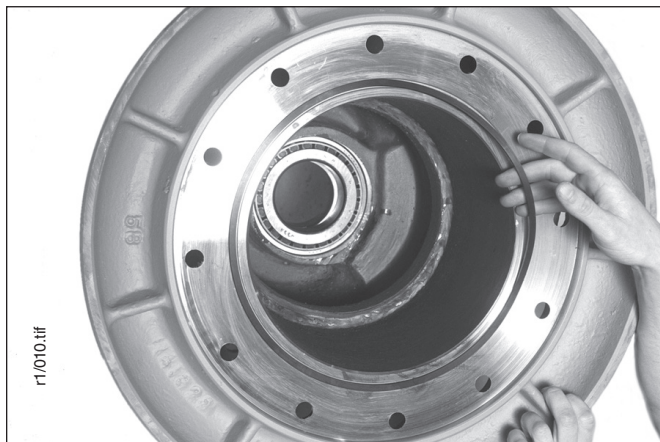


5. Install drum seal.



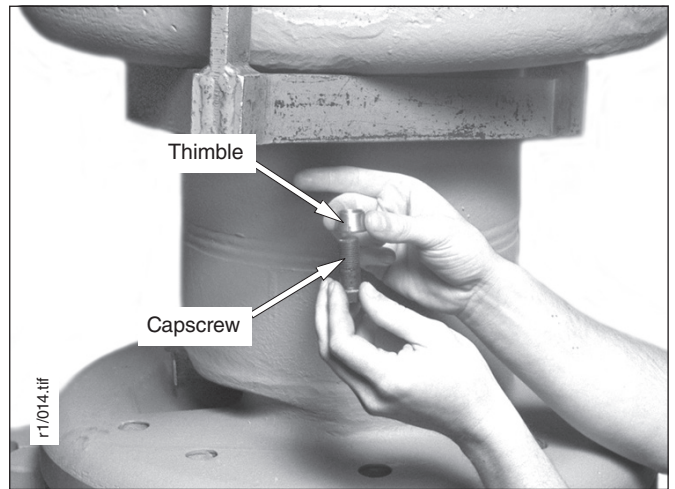
NOTE: Smooth side of seal must face outboard.

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

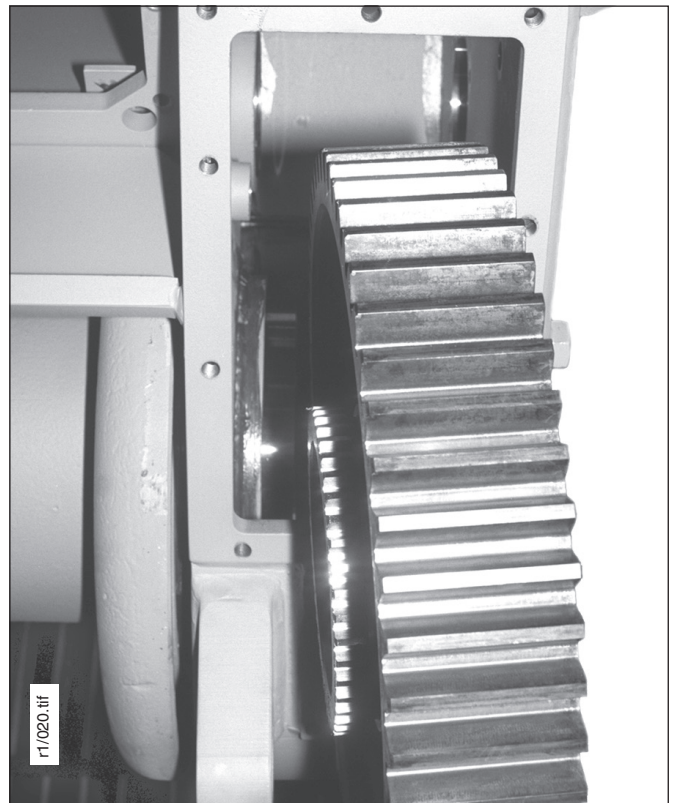


7. Move the drum into position while being careful not to move the seal ring.

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.

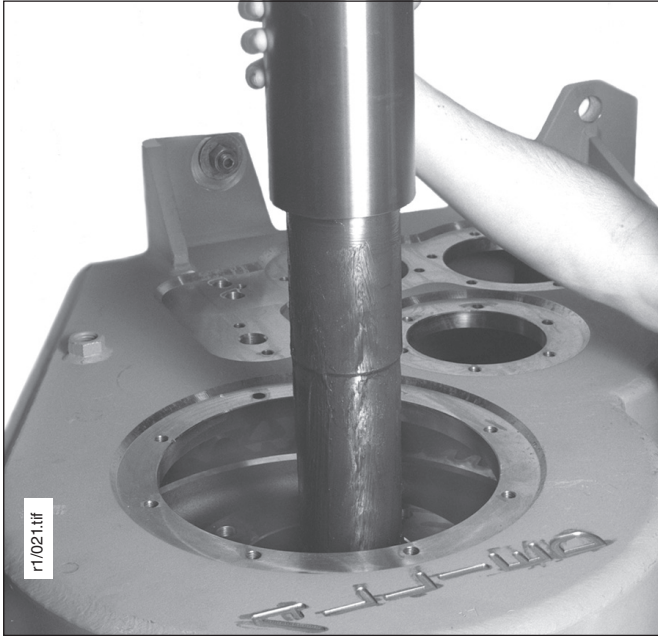


9. Install drum gear.



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.

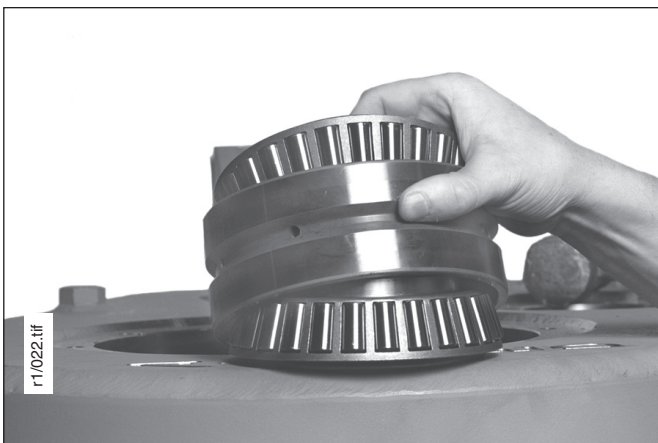
11. Make sure that double-tapered roller bearing, seal and spacer are properly seated in the left-hand side of the drum. Then install the shaft until it bottoms solidly against the left hand tapered roller bearing. Tighten left hand nut.



CAUTION

Do not hammer on drum shaft surface.

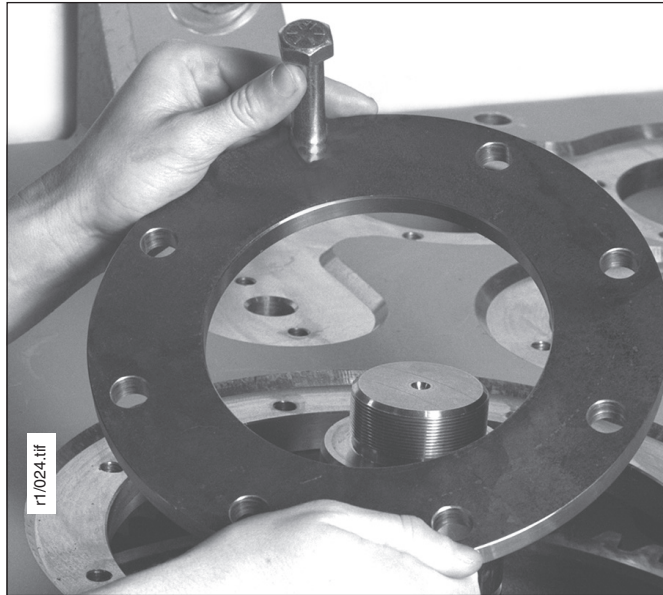
12. Remove the retainer plate, pour 2 quarts (2 liters) of the recommended oil into the drum to ensure initial bearing lubrication, and install the bearing assembly. If the spacer has a shoulder, its orientation is not important for reassembly.



WARNING

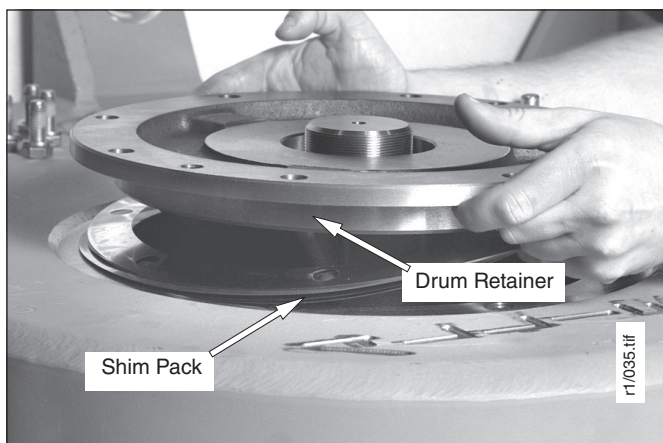
Make sure the drum gear does not fall off the adapter.

13. Install retainer plate using the eight special capscrews. Tighten capscrews to 180 ft-lbs (24 kg-m).

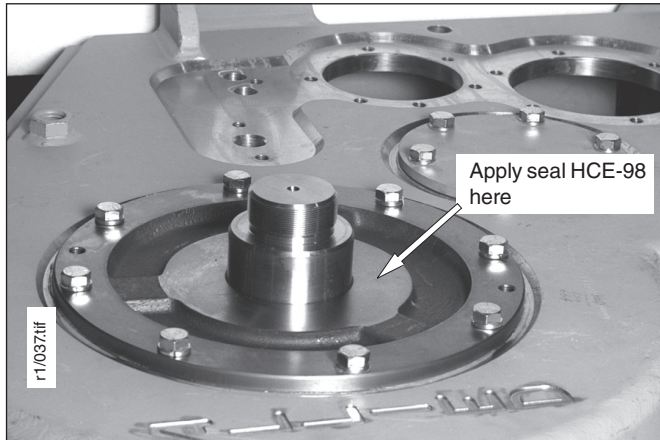


NOTE: Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.

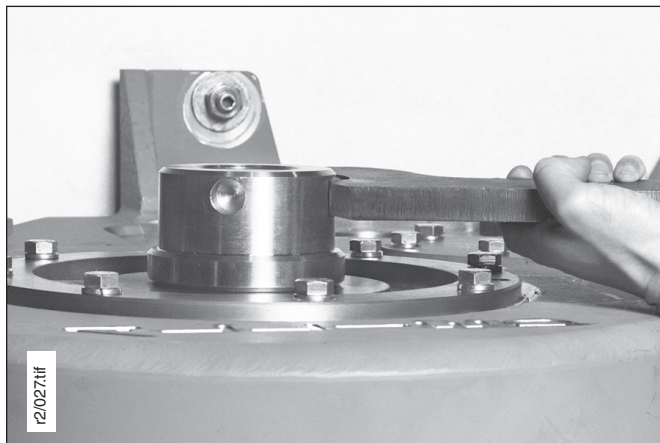
14. Set bearing retainer into place and securely tighten capscrews (do not tighten to final torque). Measure gap between retainer and winch frame in three places around the retainer. Add the three indications and divide by three to add obtain the average gap. Assemble shim pack to provide a net fit with ± 0.005 inch (0.1288 mm) tolerance.
15. Coat winch frame and bearing retainer with Loctite. Install finalized shim pack (determined in step 14). If intermediate shaft assembly not installed, install before retainer.
16. Secure retainer with capscrews and lockwashers. Tighten capscrews to 150 ft-lbs (20 kg-m).



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



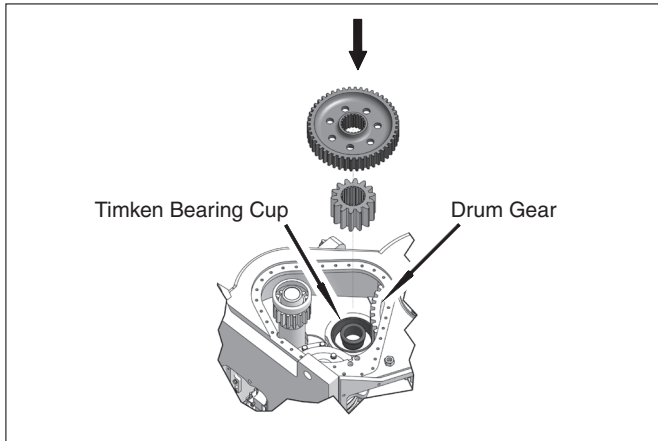
18. Tighten drum-to-adaptor capscrews to 220 ft-lbs (29 kg-m) torque.



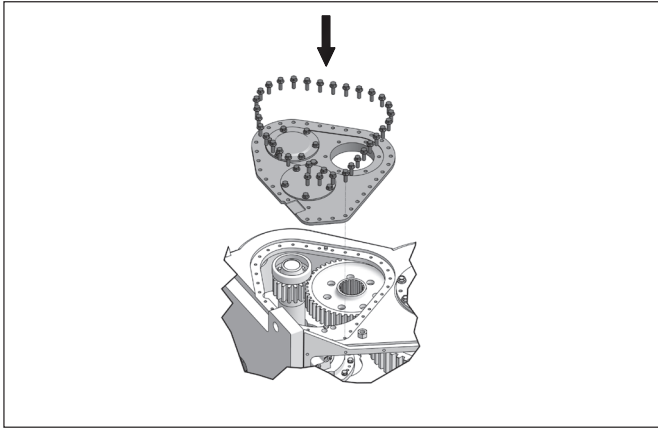
Intermediate Shaft Installation

1. Install the pinion gear and the intermediate gear.

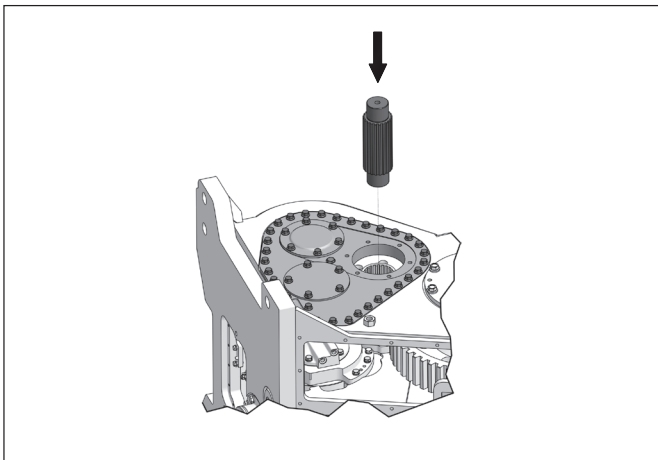
NOTE: The Timken bearing cup must be installed prior to installation of the drum gear.



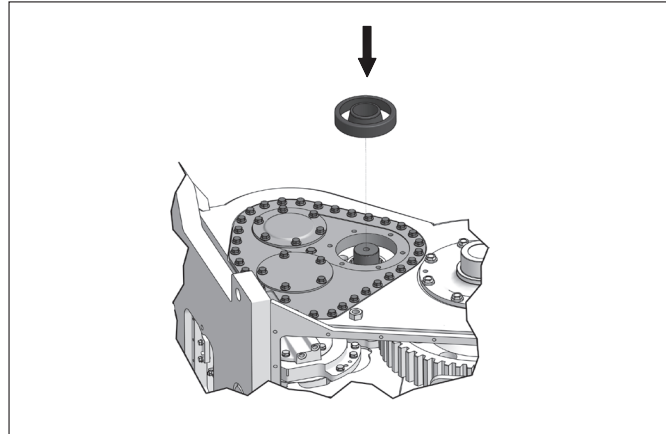
2. Install the right-hand side frame cover plate.



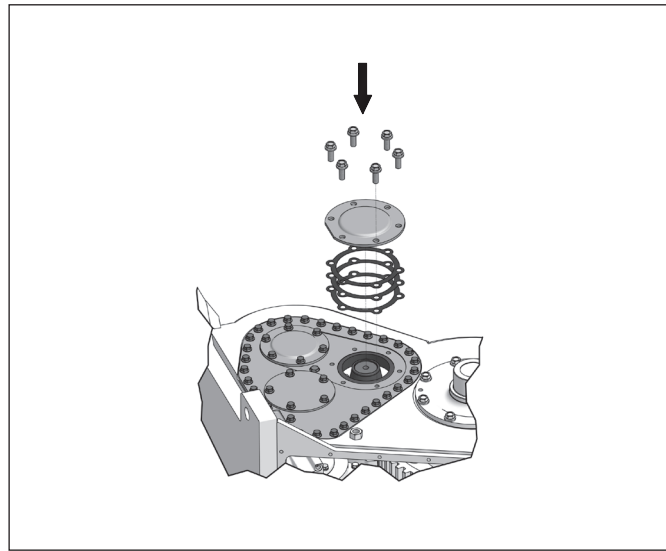
3. Remove the intermediate shaft.



4. Install the bearing cup and bearing cone.

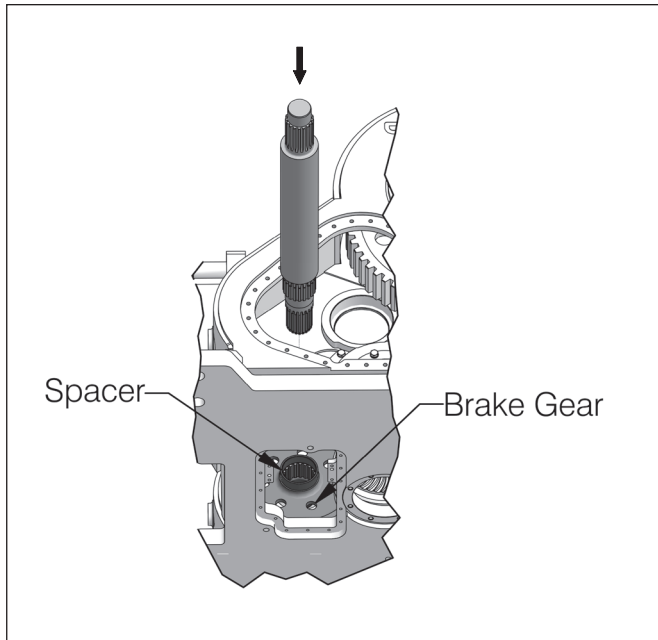


5. Install the intermediate shaft cover and shims.

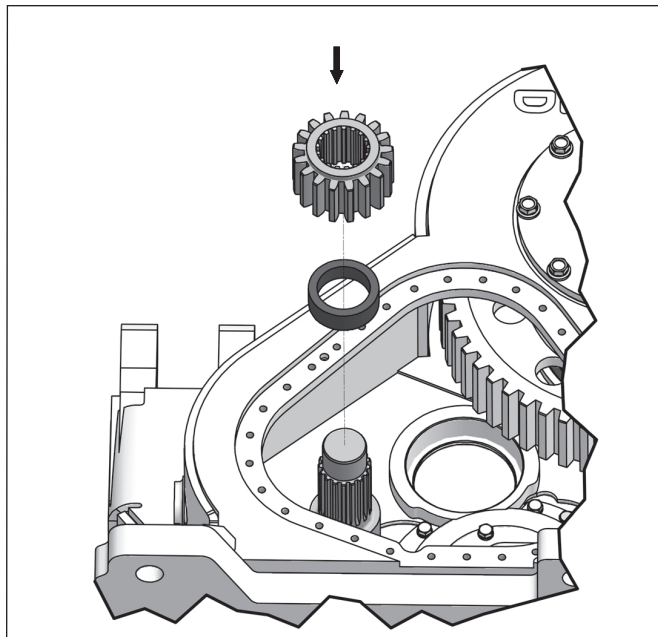


Brake Shaft Installation

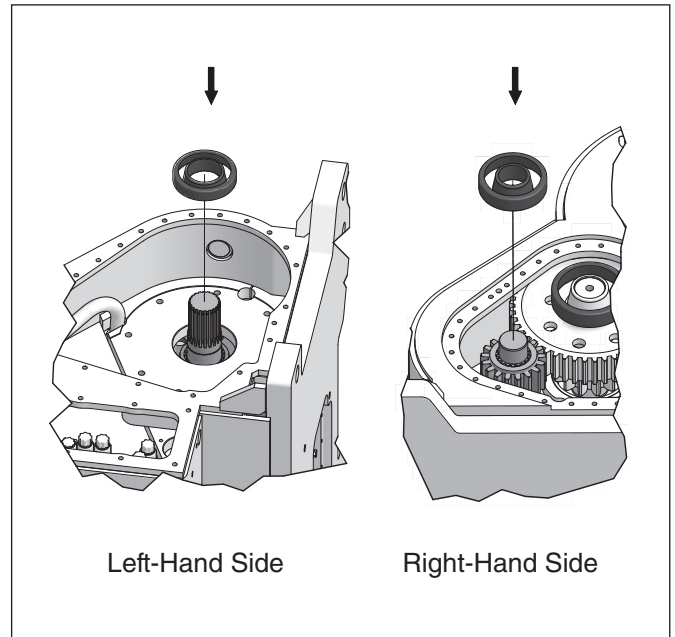
1. Perform oil brake reassembly and installation described on pages 3-42 through 3-44 first; then place the brake bearing cup and cone, the brake gear and the spacer in position into the frame (refer to step 3 in Clutch Shaft Reassembly and Installation on page 3-39); rotate the winch until the right-hand side is on top and horizontal, install the brake shaft in the winch frame.



2. Install the spacer and the gear on the shaft.



3. Place the bearing cones and cups to both sides of the shaft.



Oil Clutch Reassembly

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. The forward clutch is shown.

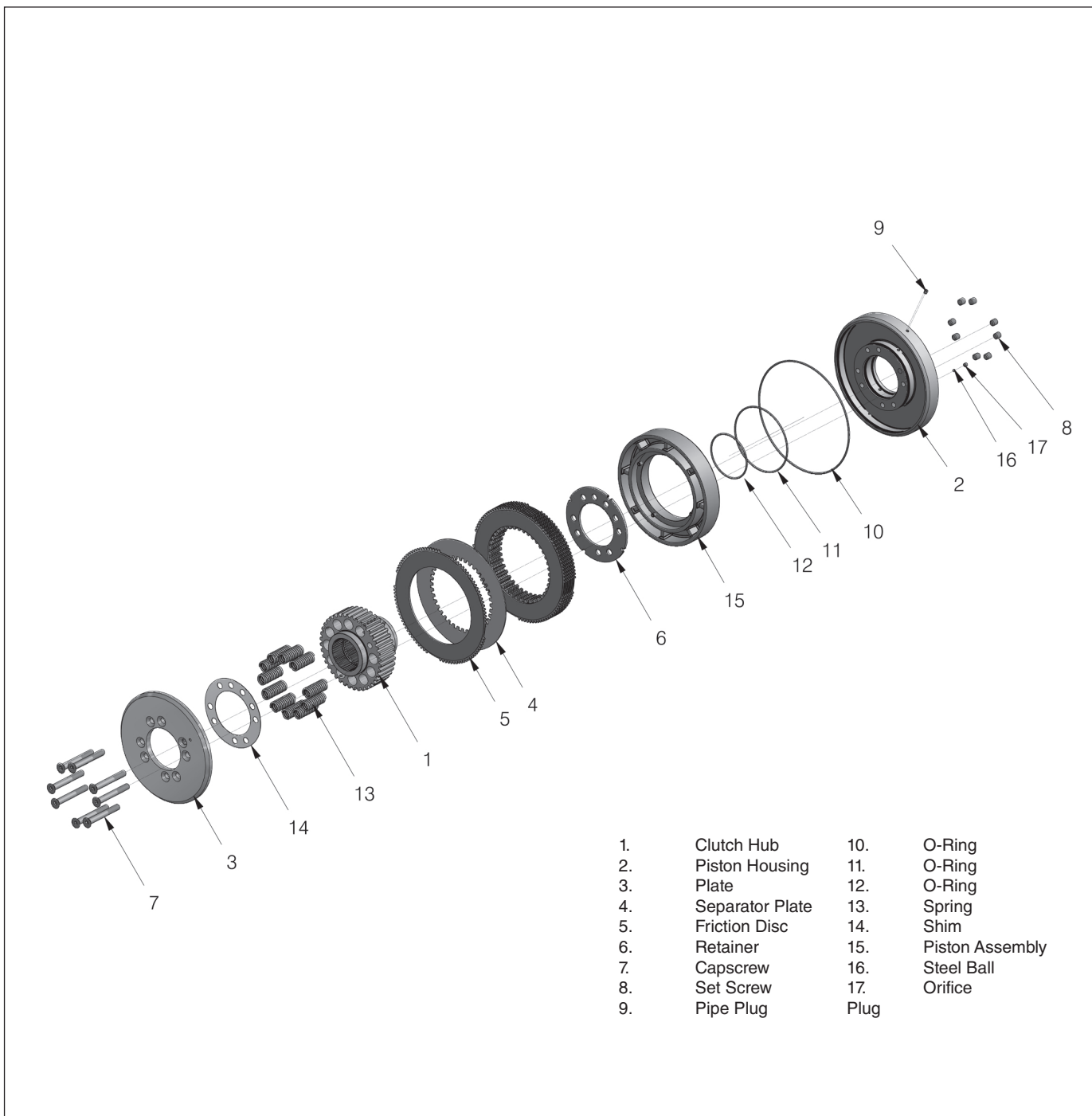
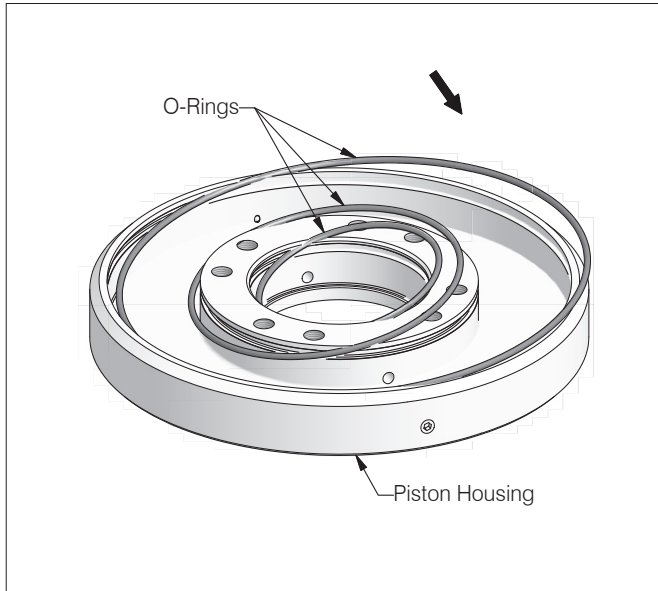


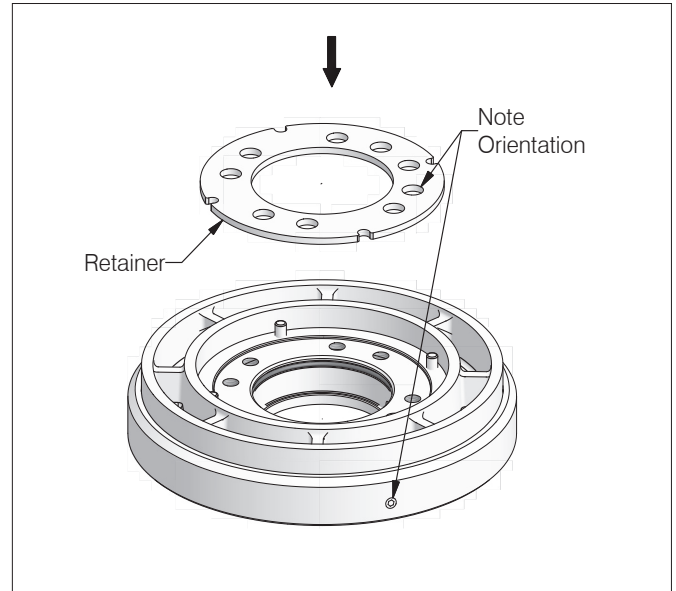
Figure 3-15 Oil Clutch Assembly

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



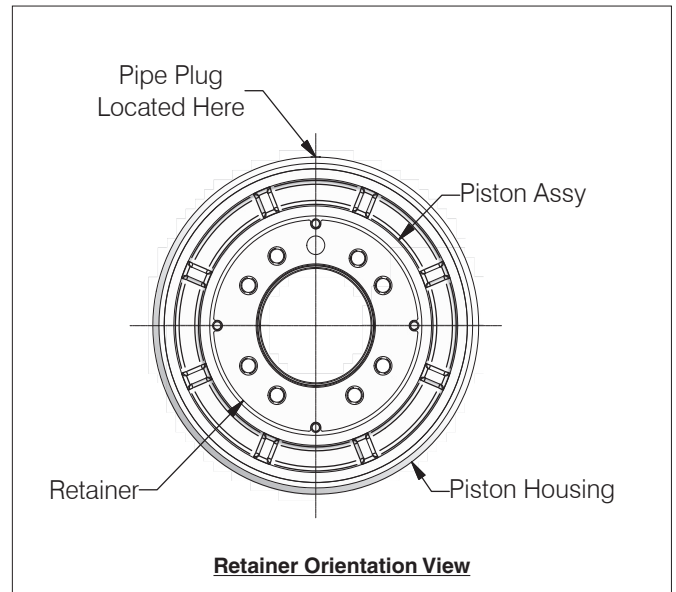
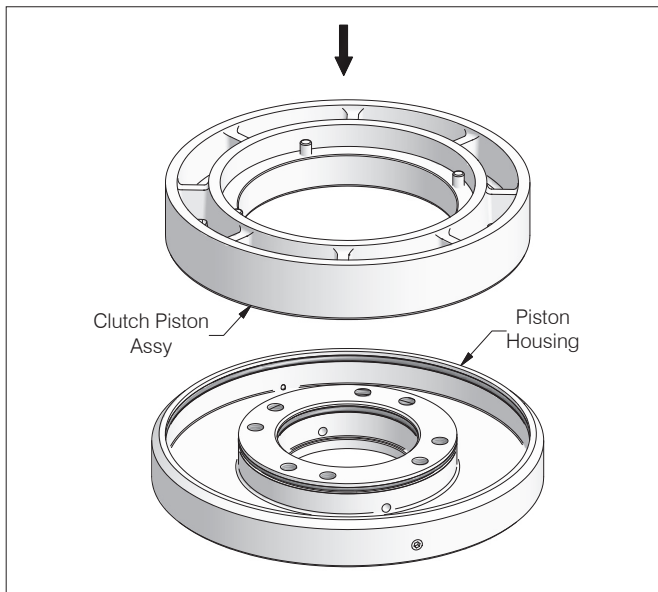
NOTE: It may be necessary to stretch both the large and the small O-ring so that it will stay in its groove during installation of the piston.

3. Install the spring retainer so holes are properly sequenced, and the threaded holes are centered with the retainer holes. Refer to the Retainer Orientation View below.



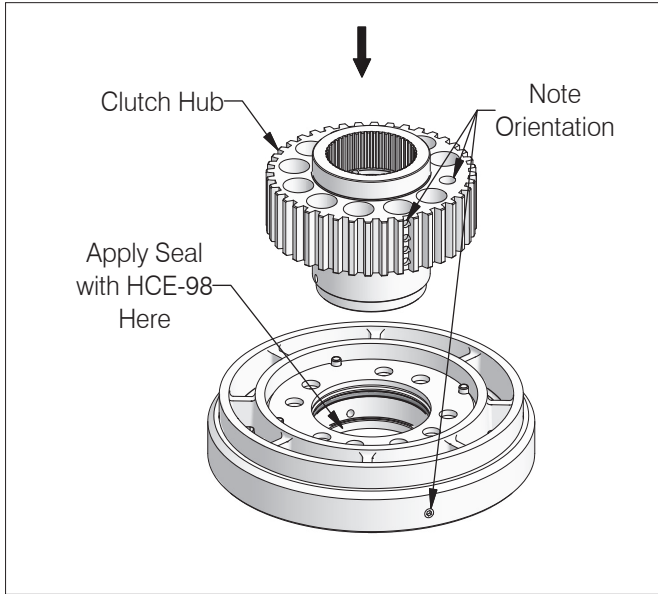
NOTE: If the retainer is reassembled upside down, the holes will almost align, but not enough to reassemble properly.

2. Carefully install the piston in the housing.

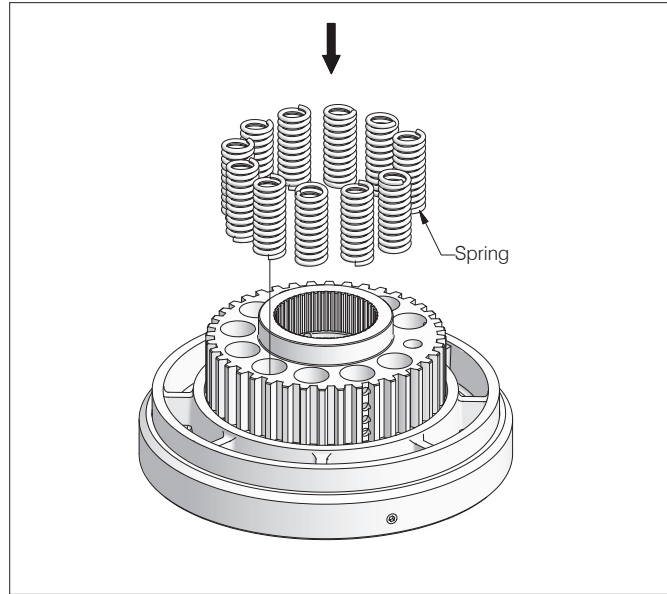


Repairs - Oil Clutch Reassembly

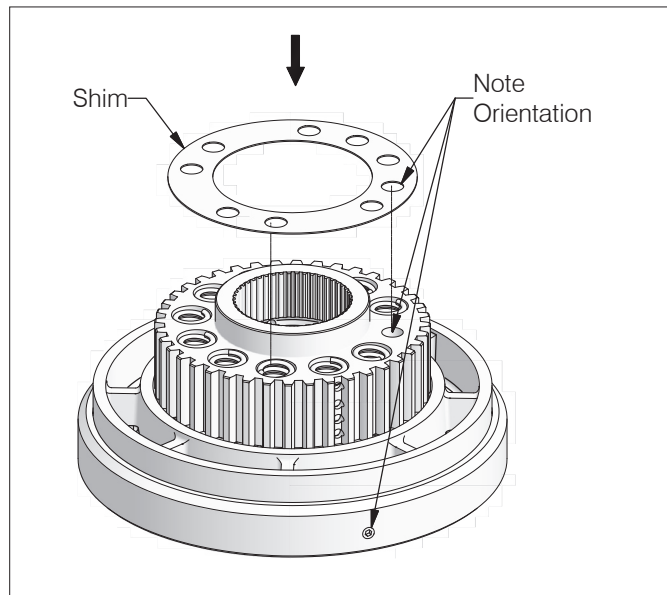
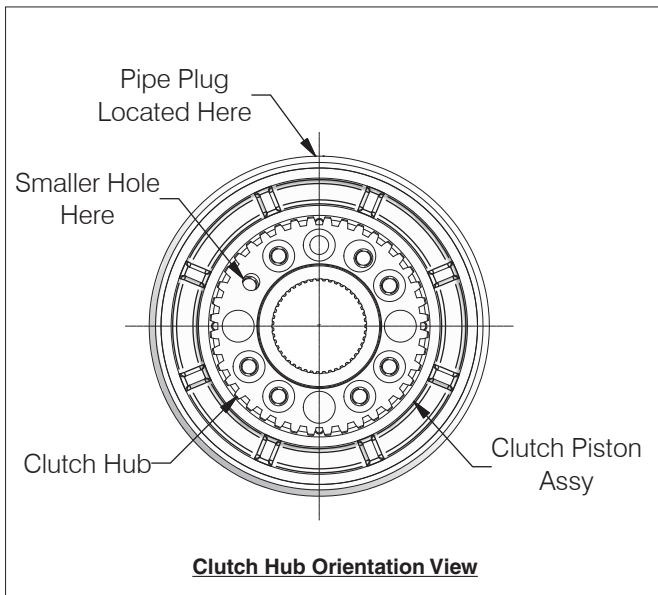
4. Install the clutch hub in the piston housing. Ensure that the holes are properly sequenced with those in the piston housing. Refer to the Clutch Hub Orientation View below.



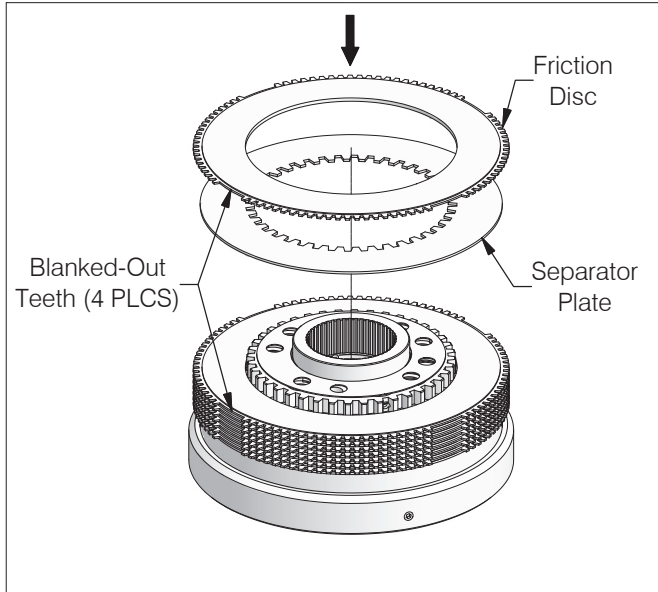
5. Install the release springs into the clutch hub.



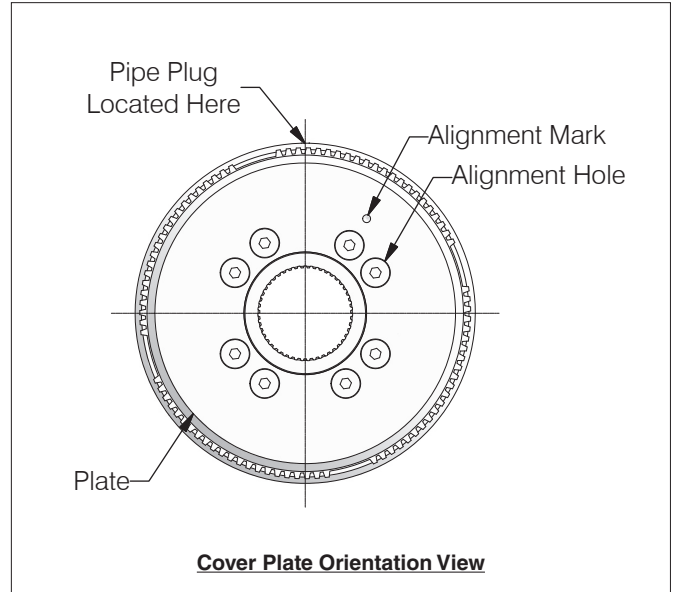
6. Install the shim. Pay attention to the orientation, and note that if the shim is reassembled upside down, the holes will almost align, but not enough to reassemble properly.



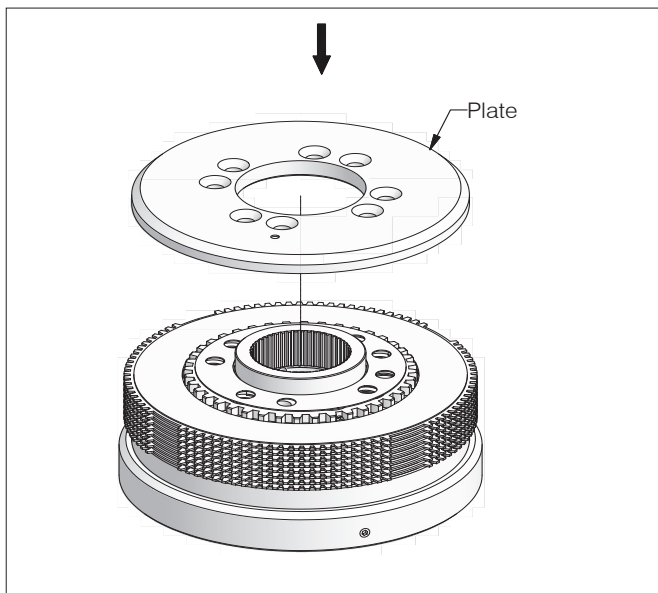
- Starting with a separator plate on the hub, alternately place the separator plates and the friction discs on the clutch hub. The W12E winch uses 8 friction discs and separator plates.



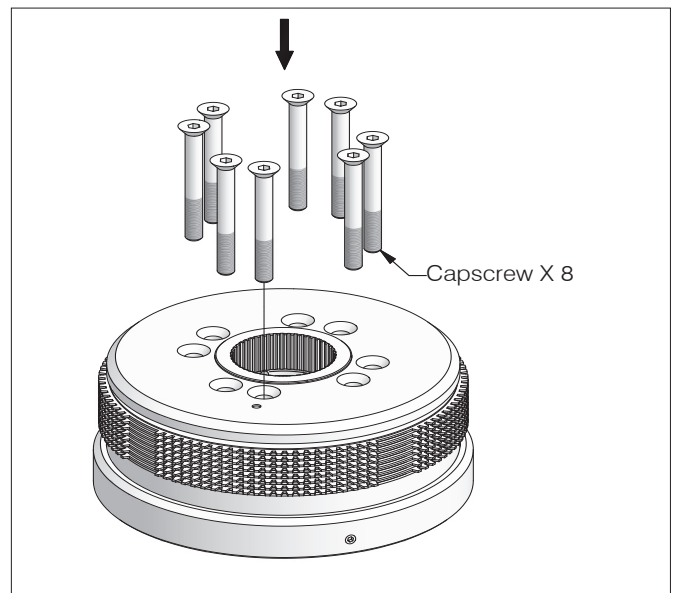
NOTE: The blanked-out teeth of the friction discs must be assembled in line.



- Install the cover plate as marked during disassembly. Pay attention to the orientation as shown in Cover Plate Orientation View below.



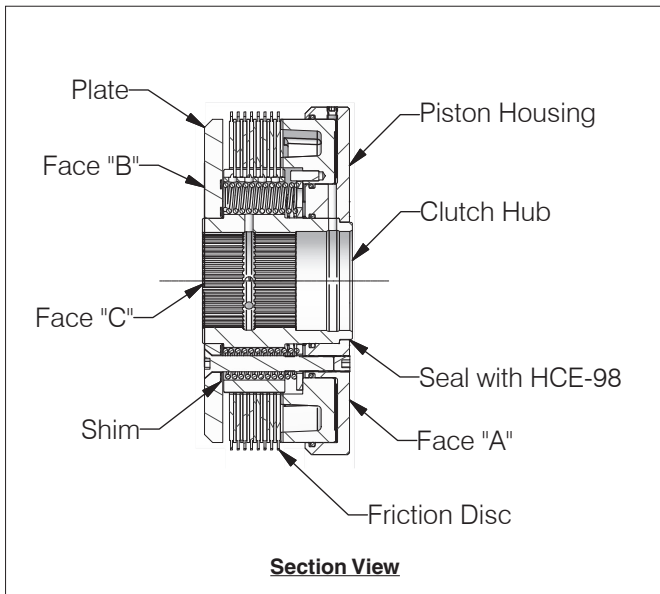
- Install capscrews by torquing them to 70 ft-lbs (10 kg-m).



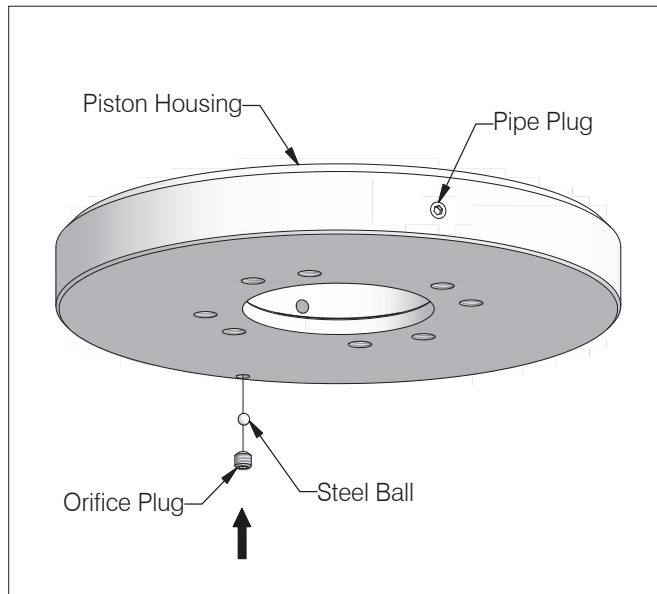
Repairs - Oil Clutch Reassembly



10. Check clearance between the cover plate and friction discs in two places. Adjust shims (refer to Step 6) only as necessary to produce a clearance of 0.140-0.180 (3.6-4.6 mm).



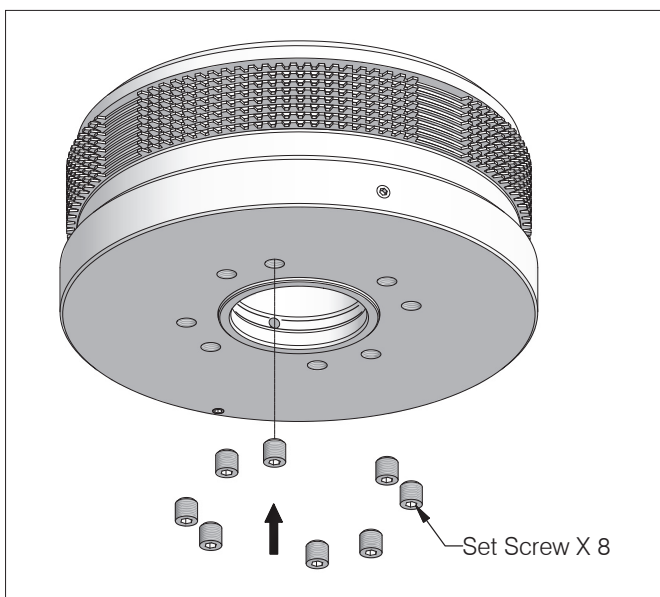
12. Apply adhesive per HCE-92 to the orifice plug. Insert and tighten the plug against the steel ball. Then back off 1-1/2 turns. Make sure that the steel ball is free floating in the hole by shaking housing and listening for the ball to rattle. Stake thread after the orifice plug is installed.



CAUTION

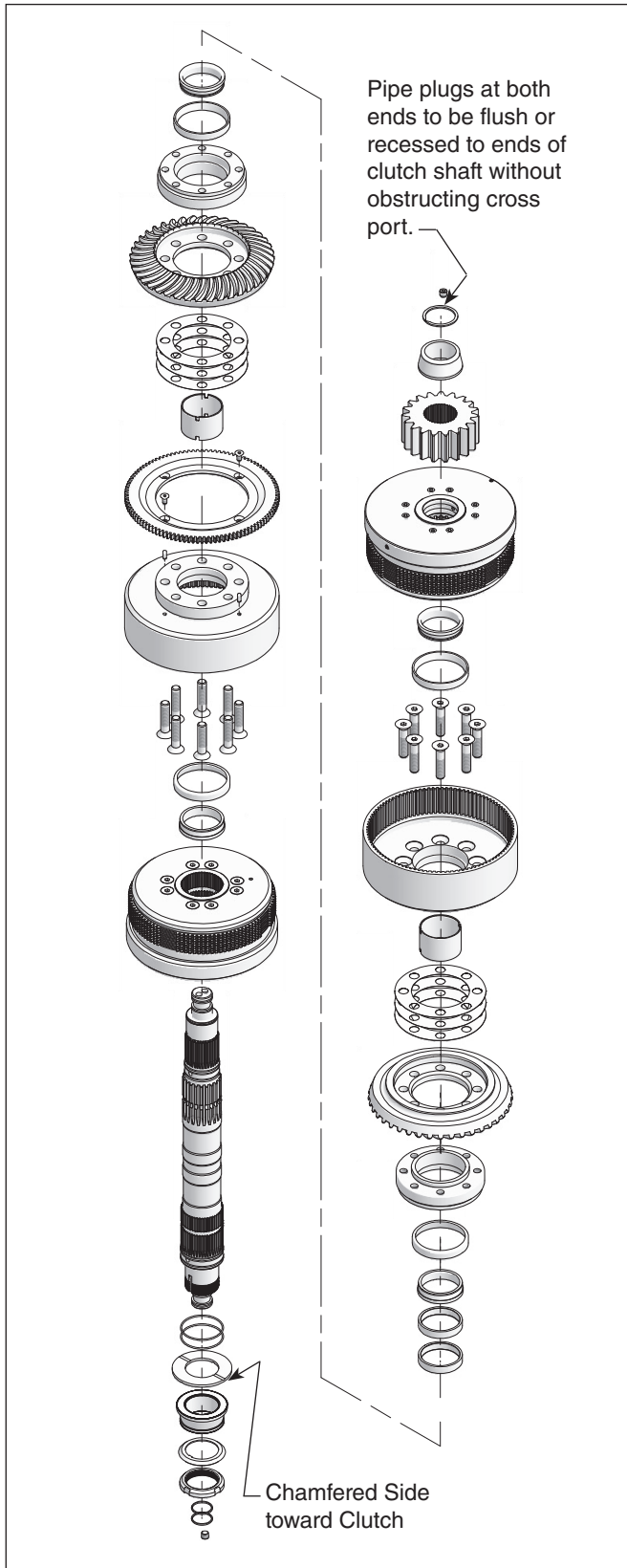
Cover plate (Face "B") must NOT extend above the face of the clutch hub (Face "C") regardless of specified clearance. Recheck clutch for proper assembly if this should occur. Refer to Section View above.

11. Install and tighten setscrews to 40 ft-lbs (6 kg-m).

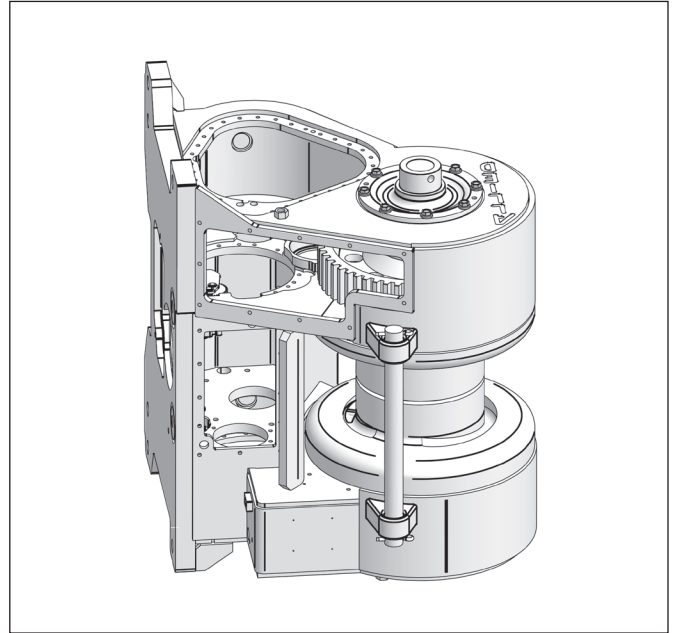


Clutch Shaft Reassembly & Installation

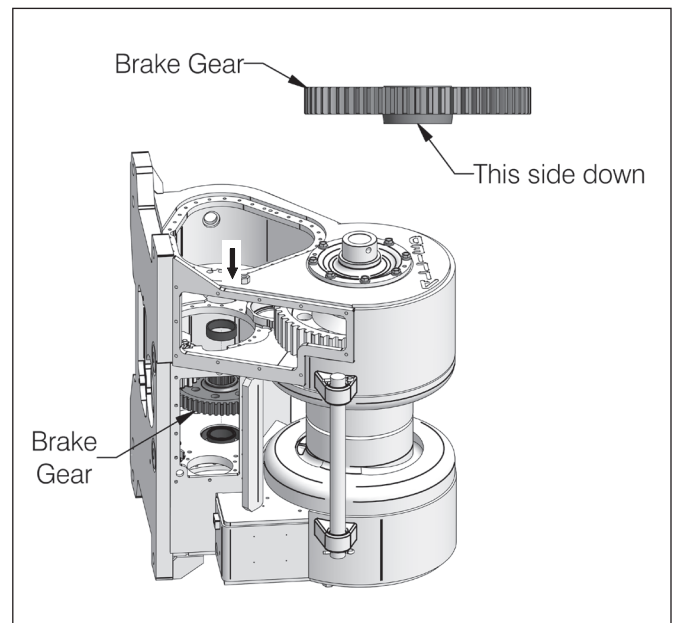
1. Install the reverse and the forward clutch assemblies, along with spacers onto the clutch shaft.



2. Rotate the winch until the right-hand side is on top and horizontal.



3. Place the brake bearing cup and cone, the brake gear and the spacer into the frame. Pay attention to the side of the gear as shown below.

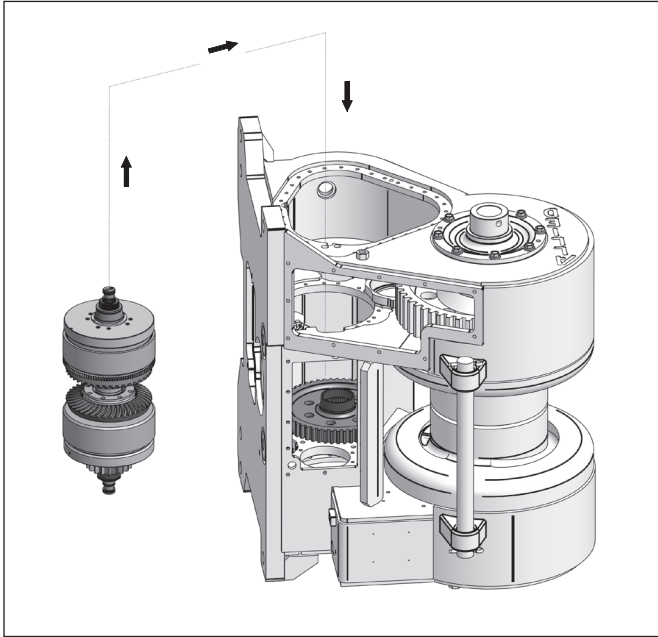


4. Remove the locknut and the lockwasher, attach the lifting device (see page 3-53) to the right-hand end of the clutch shaft.

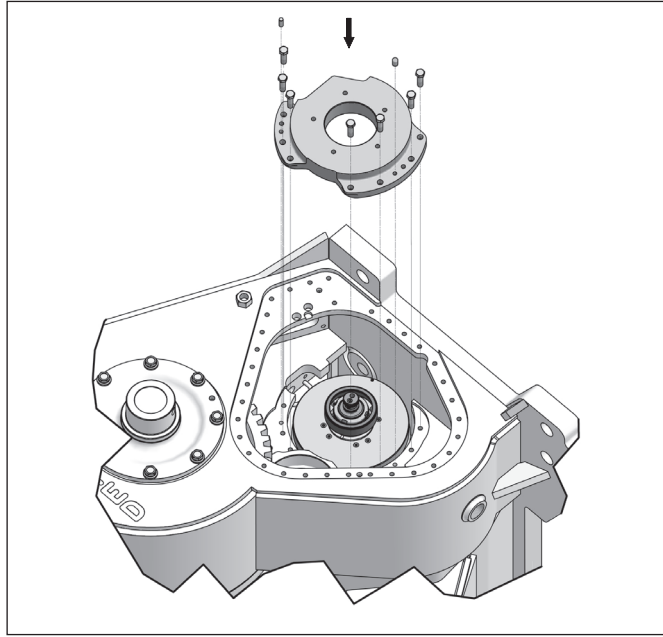
Repairs - Clutch Shaft Reassembly & Installation



5. Lift the clutch shaft, along with clutch assemblies, and place it in position into the winch frame.

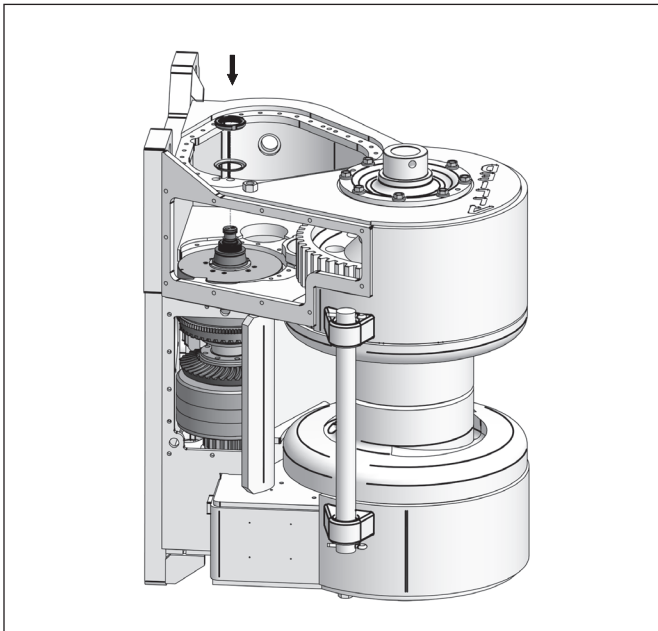


8. Install the frame insert plate from the right-hand side.

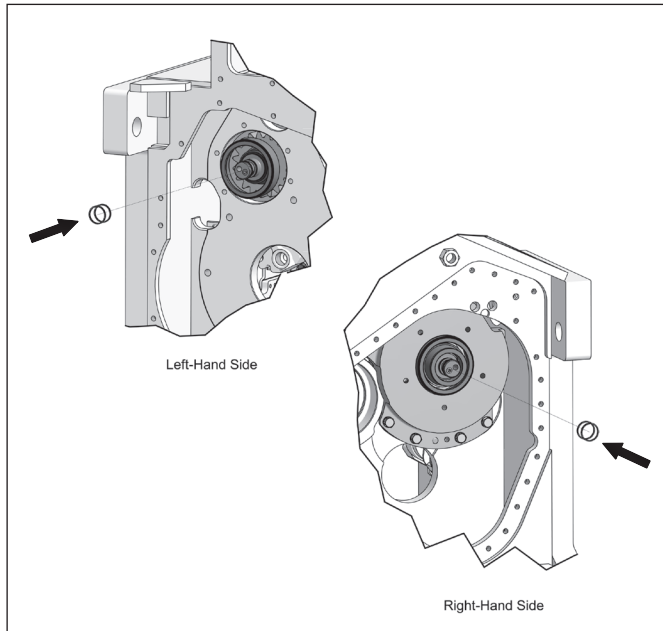


6. Remove the puller from the shaft. Install the locknut with the lockwasher on the shaft.

NOTE: Tighten the locknut to 200 ft-lbs (28 kg-m).

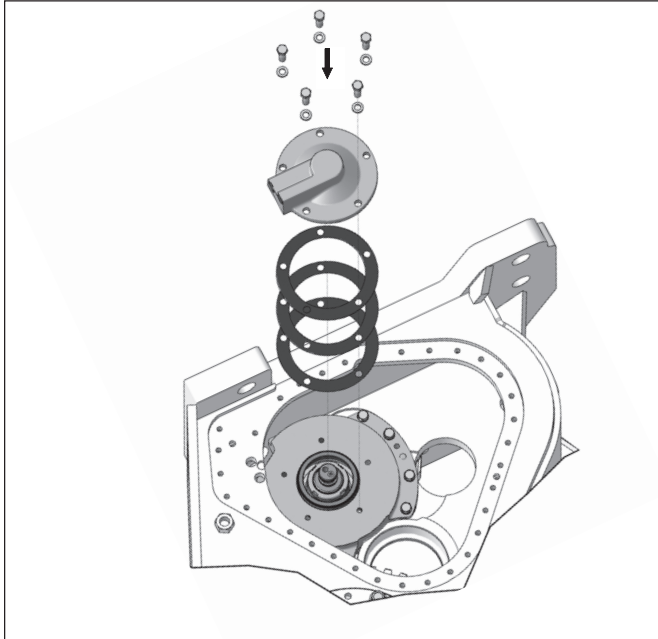


9. Place the two seal rings into the grooves on each end of the clutch shaft by expanding the seal rings just enough to slip over the ends of the shaft.

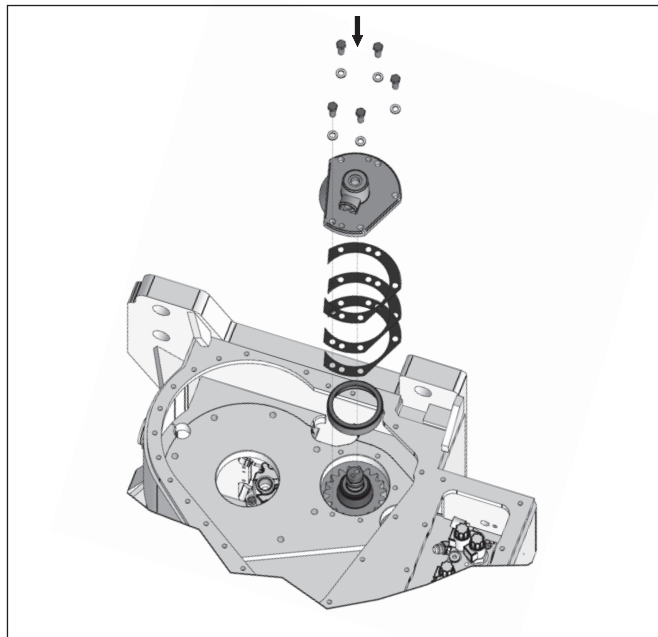


7. Bend the lockwasher tang to secure the locknut.

10. Install the shim pack and the right-hand bearing retainer.



11. Reconnect relevant hydraulic hoses near the right-hand side bearing retainer.
12. Install the left-hand side shim pack, bearing cup and retainer.

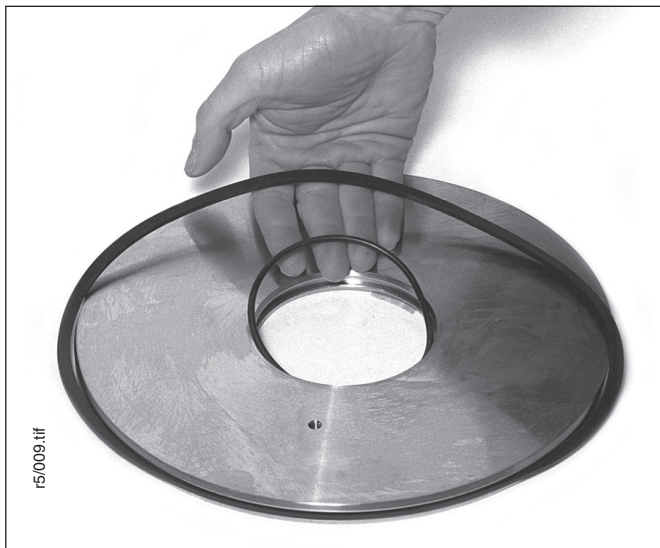


13. Reconnect relevant hydraulic hoses near the left-hand side bearing retainer.

Oil Brake Reassembly and Installation

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

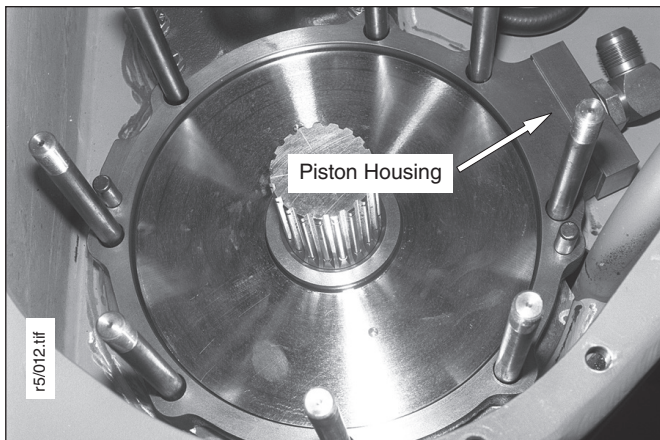
1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston housing.



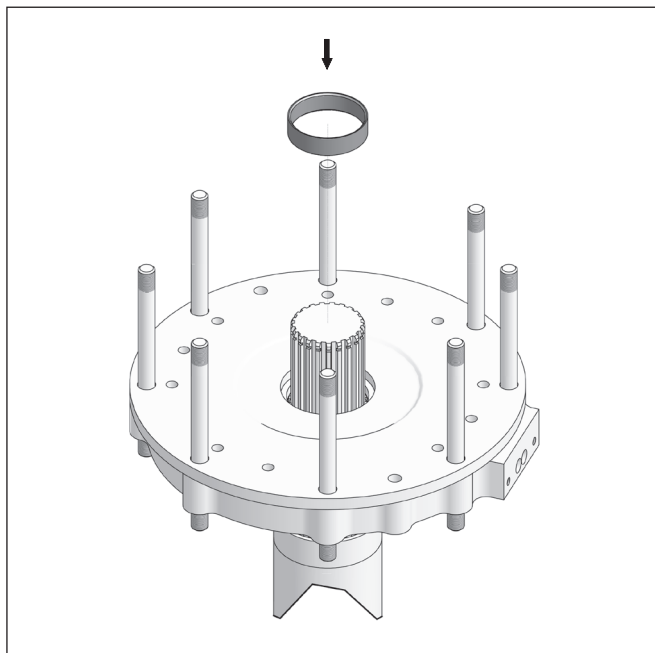
CAUTION

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

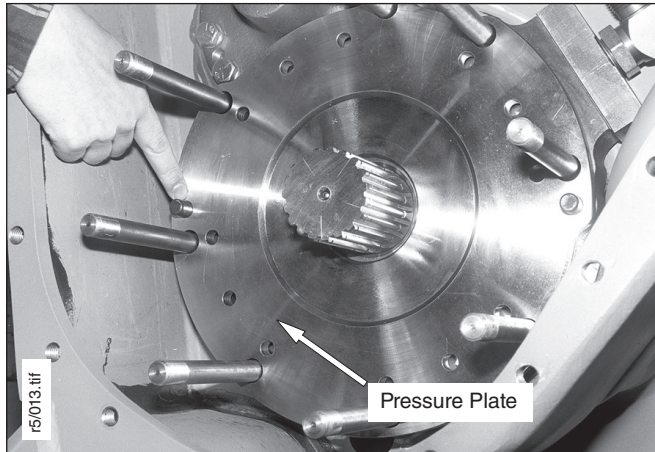
2. Install piston in housing.
3. Ensure that the left-hand bearing is securely installed over the brake shaft.
4. Slide assembled piston and piston housing in place on studs.



5. Install the spacer.



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



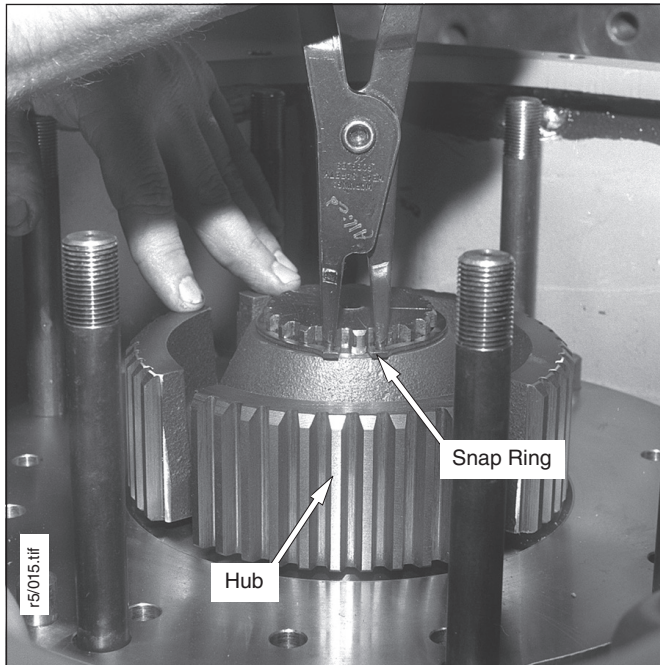
7. Install hub.

CAUTION

Do not reverse hub. Dish must face out.

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

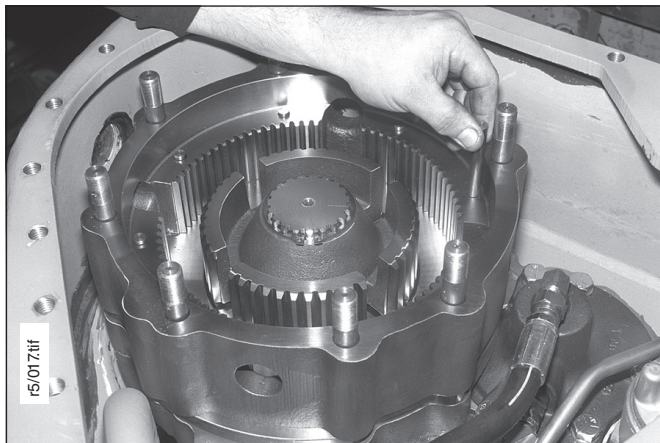
8. Install snap ring.



⚠ CAUTION

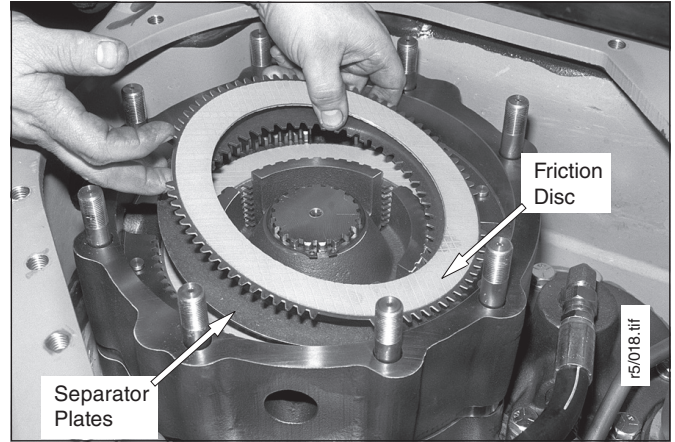
Make sure that snap ring is securely positioned in brake shaft groove.

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.

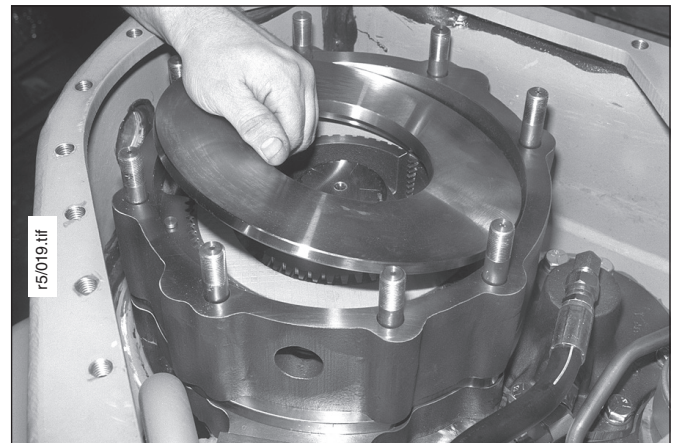
10. Install the friction discs and separator plates alternately starting with a friction disc. Align blanked-out teeth on all friction discs. 10 friction discs and 9 separator plates are used.



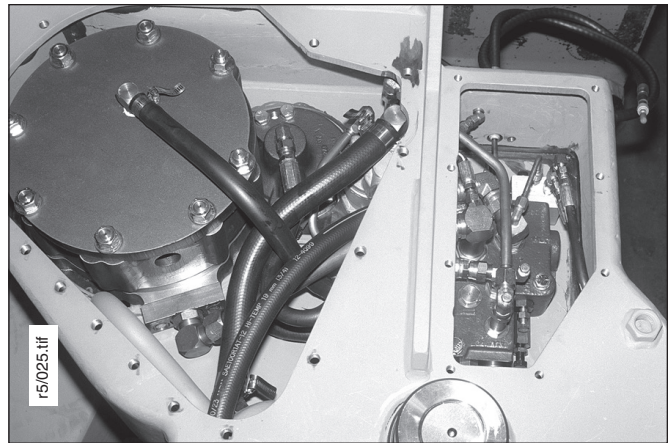
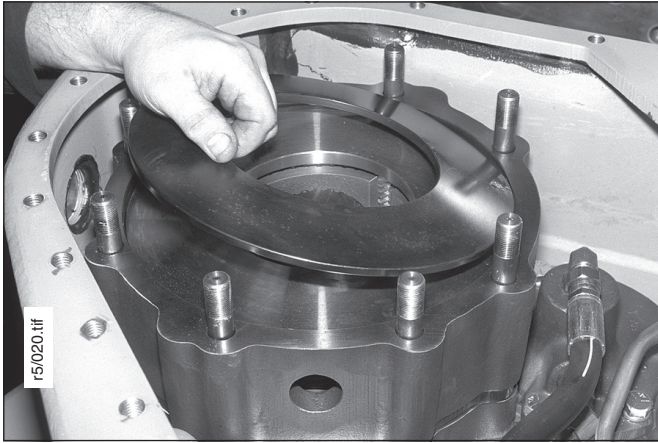
⚠ CAUTION

Face all separator plates in the same direction. All dished sides must face either inward or outward.

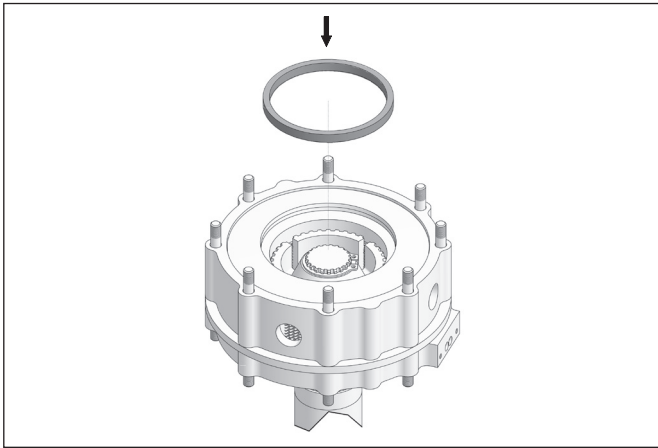
11. Install thrust ring, smooth side out.



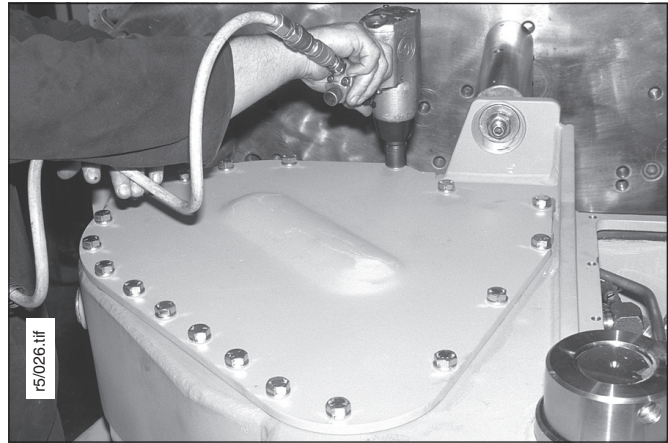
12. Install two belleville springs with curved side pointing outward.



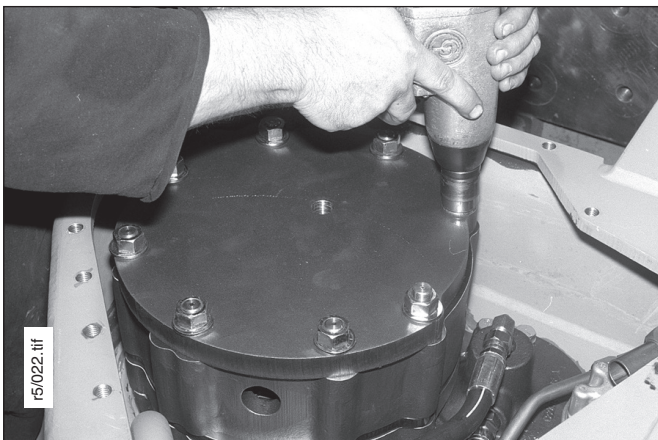
13. Install the stroke limiter.



15. Install winch covers.



14. Install cover and secure with 8 nuts and washers. Tighten nuts alternately to 130 ft-lbs (175 Nm). Install the brake pressure and cooling lines removed during disassembly.



PTO Shaft Reassembly and Installation

NOTE: If equipped with a dropbox, refer to Figures Figure 3-17 through Figure 3-18 on page 3-47 for location of components. Assembly of the PTO shaft is essentially the same for most dozers 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 step 8.

NOTE: If equipped with a dropbox, the PTO shaft assembly should be assembled and installed as described in step 8 on the next page. 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. Ensure that the snap ring is installed securely.

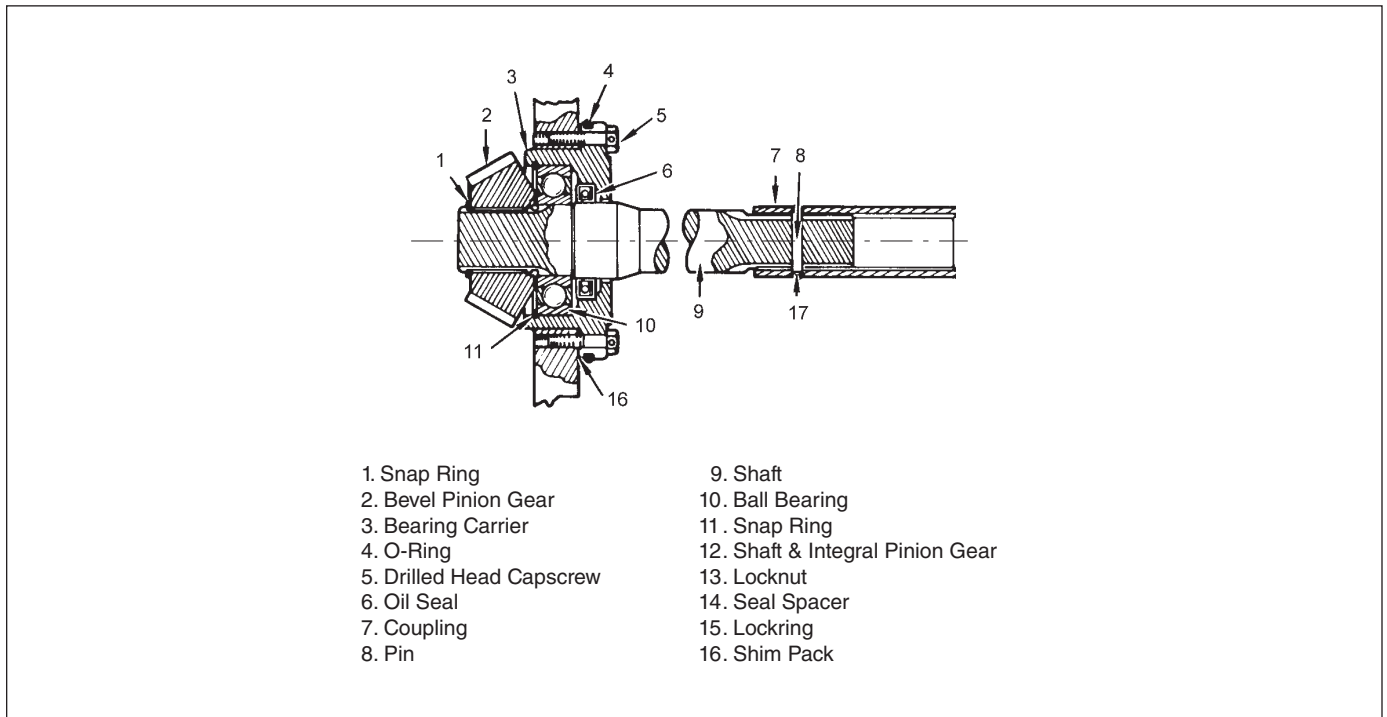
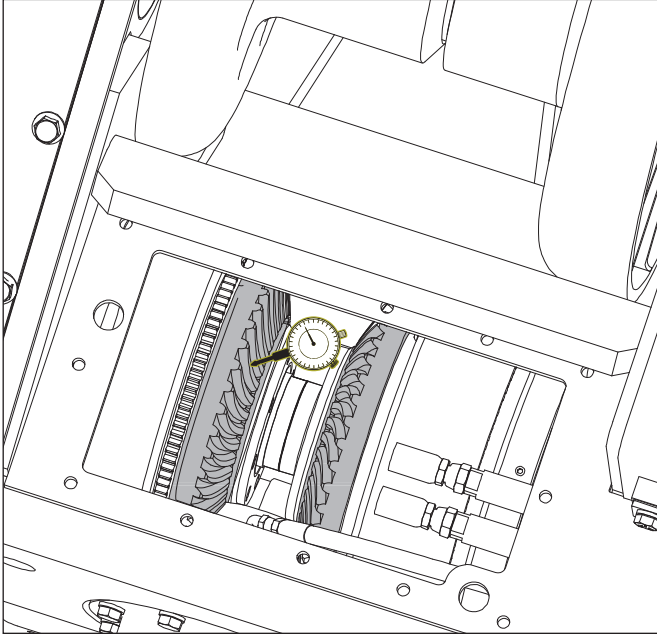
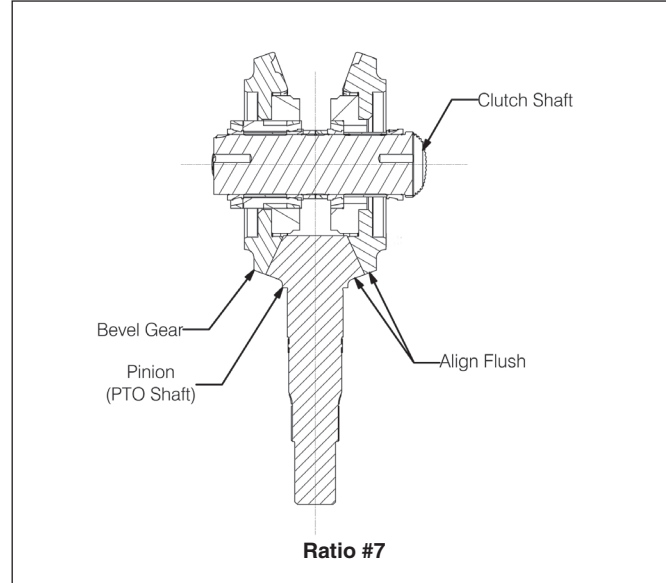


Figure 3-16 PTO Shafts

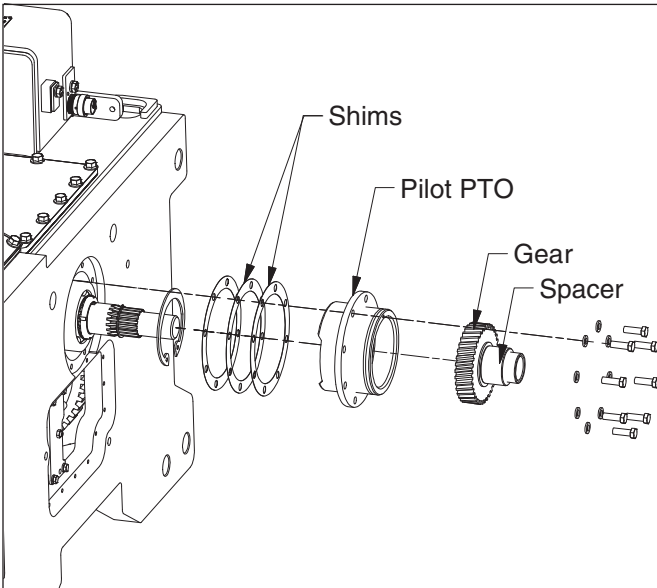
7. Connect dial indicator as shown to both spiral gears. Add or subtract shims from the two clutch shaft bearing retainers to obtain zero endplay. When zero endplay is obtained, subtract 0.000 to 0.004 in. (0.00 to 0.10 mm) of shim(s) from the retainers. This will provide the desired preload on the clutch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



9. Place the Clutch shaft in a normal operating position by forcing the ring gear away from the pinion gear laterally along the clutch shaft. Coat the ring gear teeth with Prussian Blue and rotate the PTO shaft to check the gear contact.



8. Install PTO and add or subtract shims to get heel to heel alignment. Tighten capscrews to 75 ft-lbs (10 kg-m). Lockwire capscrews upon completion of shimming.



10. Use the dial indicator to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.012 in. (0.152-0.305 mm). If the backlash is not within this range either the pinion or the ring gear will need to be moved. A gear contact pattern check will determine which gear needs to be moved. Moving the ring gear 0.0014" (0.036 mm) will change the backlash 0.001" (0.025 mm). Moving the pinion 0.004" (0.102 mm) will change the backlash 0.001" (0.025 mm). Add or subtract shims from each side in equal amounts to change the backlash without affecting the bearing preload setting.

NOTE: Adding or subtracting shims from these retainers will affect pinion-to-bevel gear backlash. See step 10.

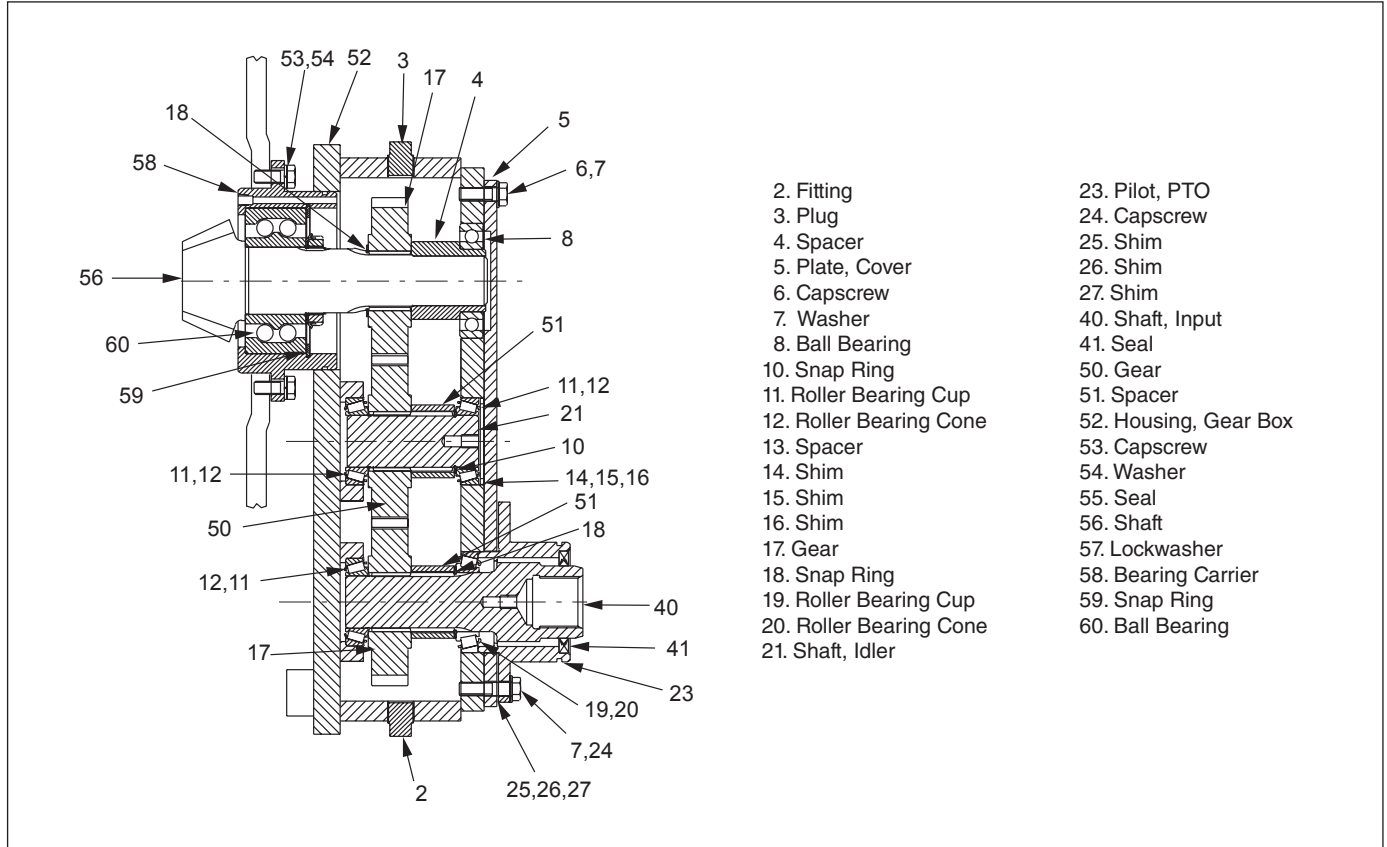
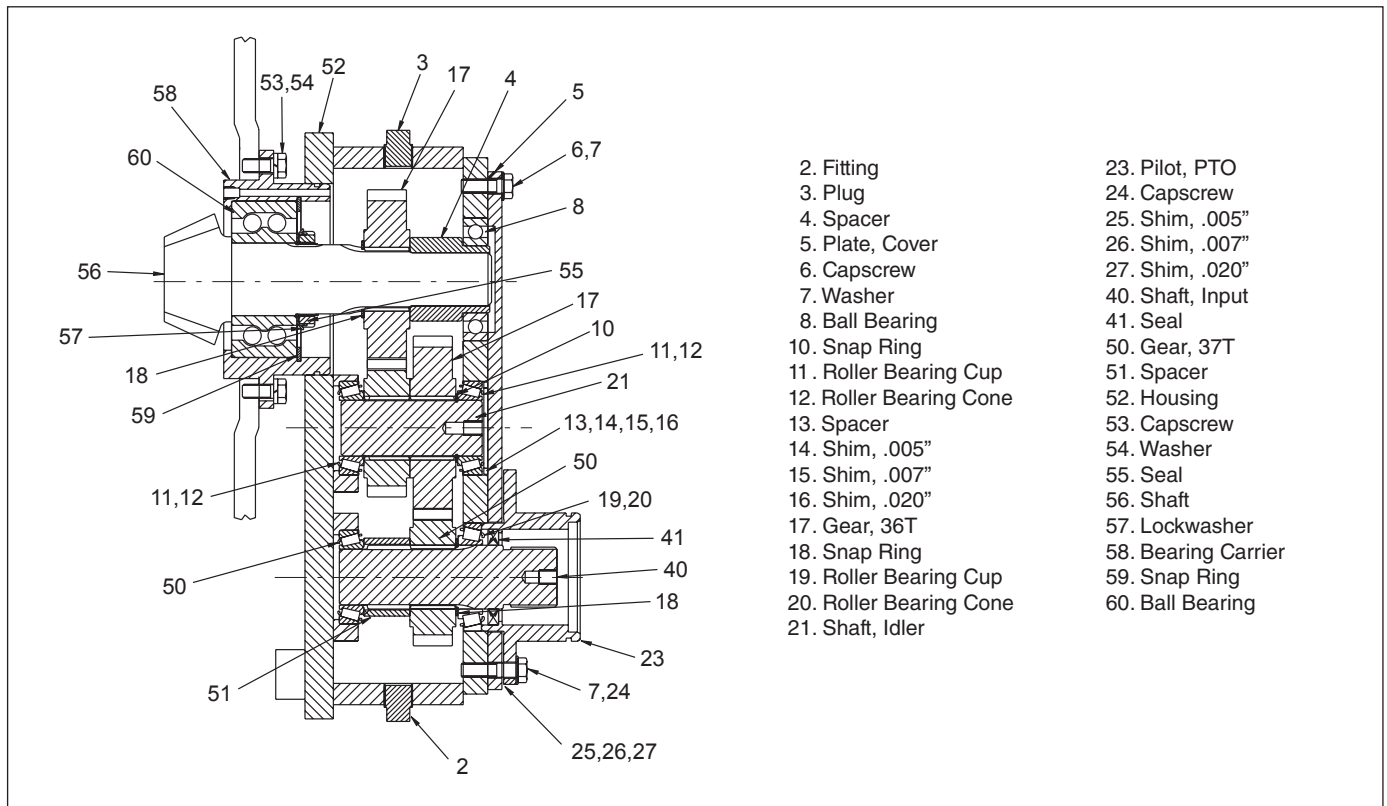


Figure 3-17 1:1 Dropbox for Caterpillar 583T



**Figure 3-18 1.8:1 Dropbox for Caterpillar D9T
(Similar to D10N/R/T)**

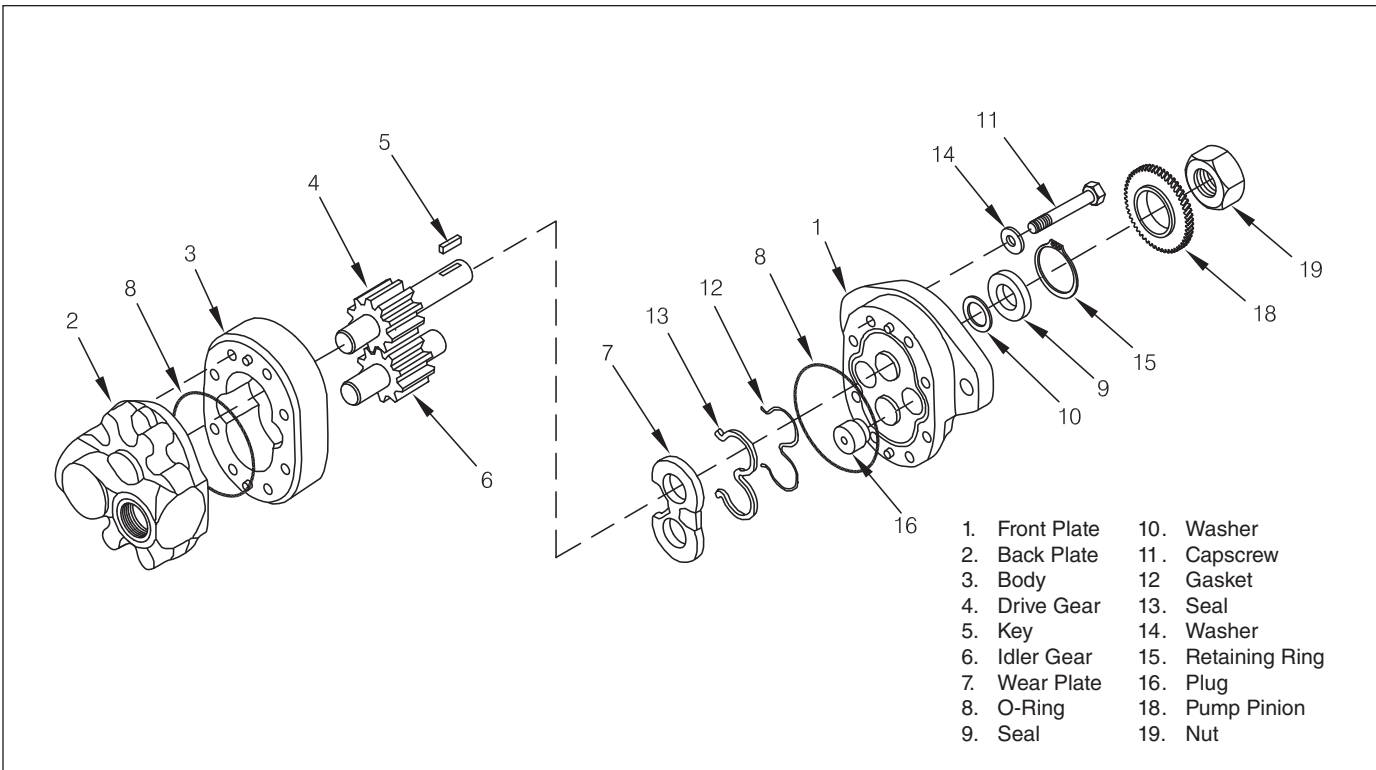


Figure 3-19 Hydraulic Pump

Hydraulic Pump Reassembly

1. Replace as new parts seal kit (7, 12, 13), O-ring (8), and shaft seal (9).
2. Press protector gasket (12) and back-up seal (13) into wear plate (7).
3. Drop plug (16) into right-side hole in the front plate (1) as shown in Figure 3-19 above.
4. Place wear plate (7), along with gasket (12) and seal (13), on top of the inside face of the front plate - bronze face up.
5. Install O-ring (8) in the groove of front plate.
6. Dip gear assembly into oil.
7. 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.
8. Install O-ring (3) in groove of backplate.
9. Slide back plate over gear shafts. Line up scribed location mark.
10. Place pump in vise, shaft down, and install capscrew (11) with washer (14). Torque evenly 25 to 28 lb/ft. (33.9 to 38.0 Nm).
11. Oil shaft seal (9) 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 (5).

NOTE: Fill the pump with the same oil used in the winch prior to installation. This is important to protect the pump from aeration during initial operation.

NOTES: Refer to Hydraulic Pump Installation on page 3-48, making sure that the winch must be removed from the dozer and the input gearbox must be removed if it is equipped with the winch.

1. Assemble the hydraulic pump assembly as illustrated below.
2. Install the assembly in the position shown in Figure 3-20.

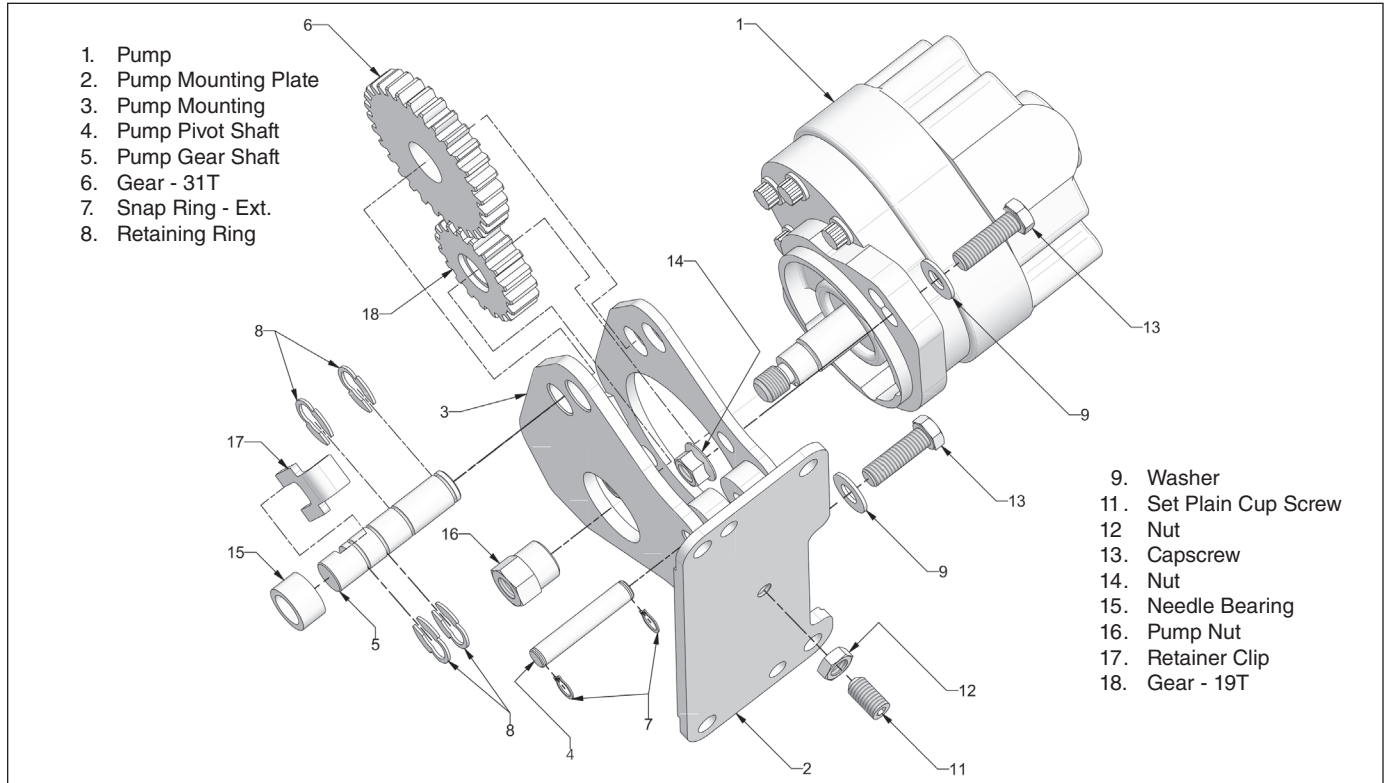
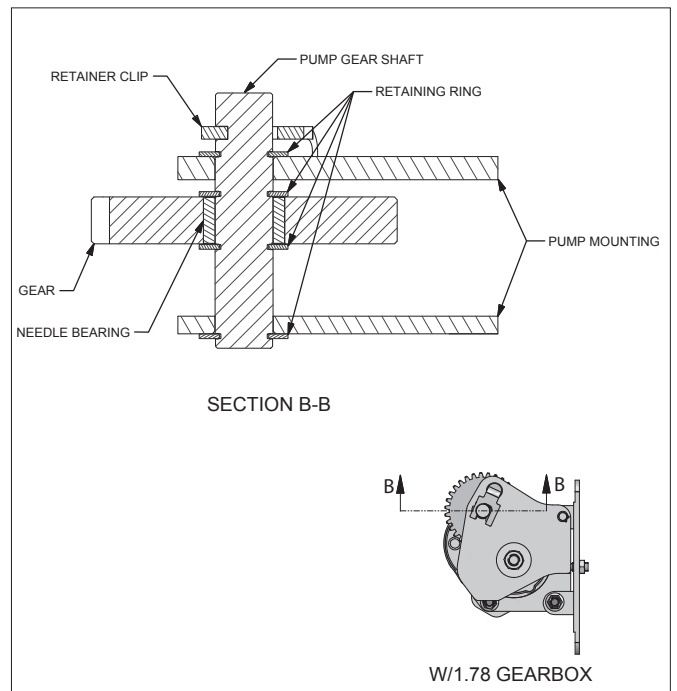
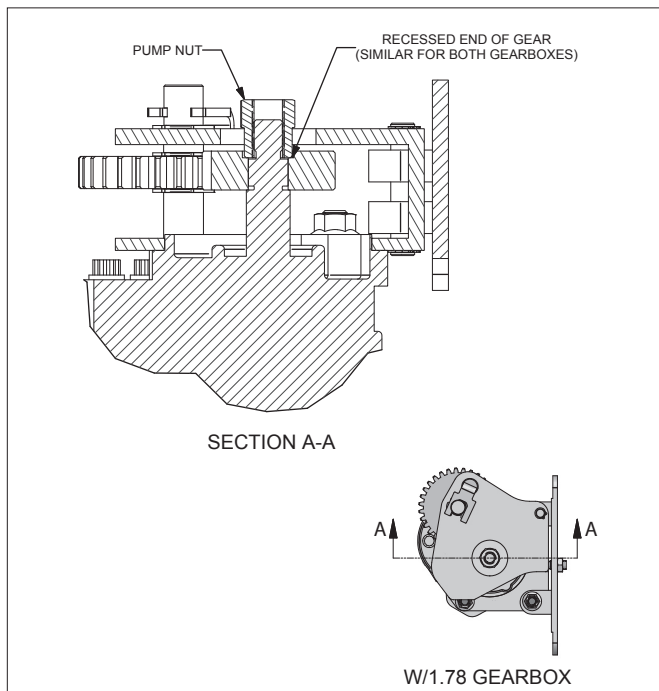


Figure 3-20 Hydraulic Pump Assembly - Ratio #7



3. Use set screw to adjust backlash between intermediate pump gear and clutch shaft pump gear during the installation. Lock position of set screw using jam nut.

NOTE: Backlash: 0.004" - 0.010"

Tighten pump mounting capscrews to 23 ft-lbs to lock position.

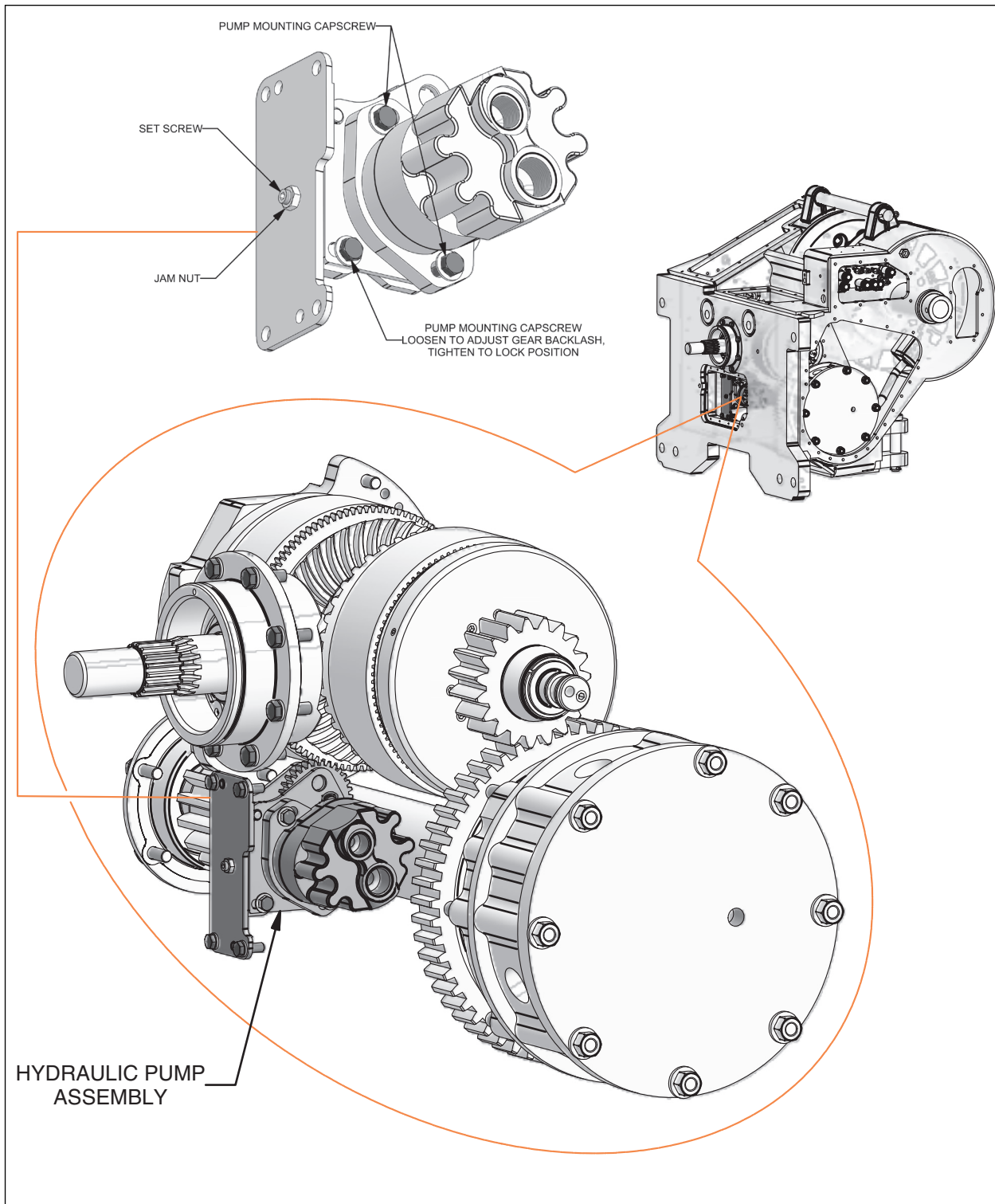
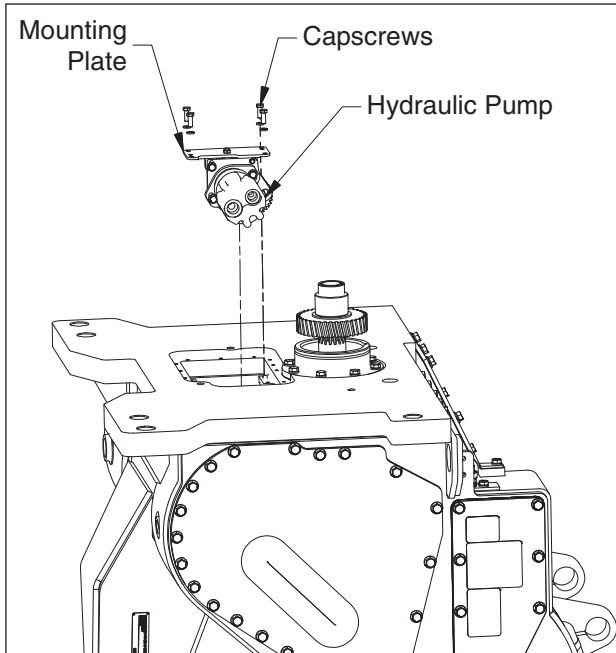


Figure 3-21 Location of Hydraulic Pump - Ratio #7

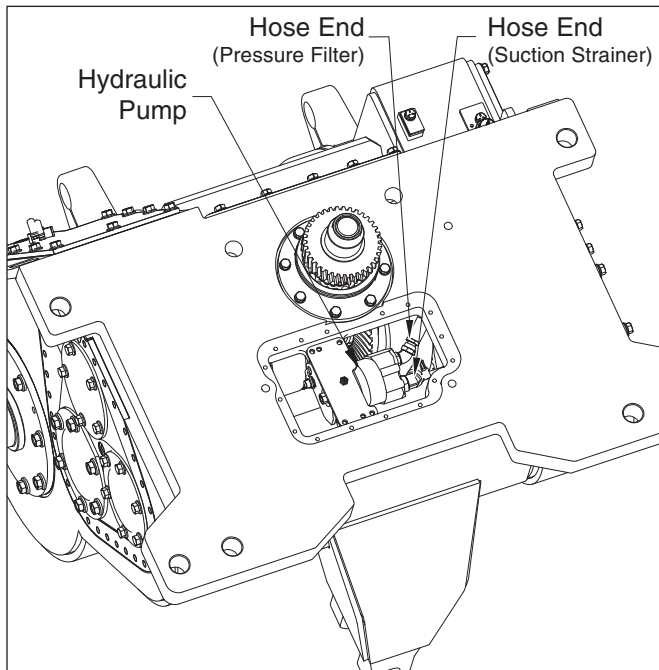
Hydraulic Pump Installation

NOTE: The winch must be removed from the dozer in order to remove the gearbox and access the hydraulic pump. Refer to Figure 3-21 for the location of the hydraulic pump.

1. Rotate the winch with the gearbox facing upwards.

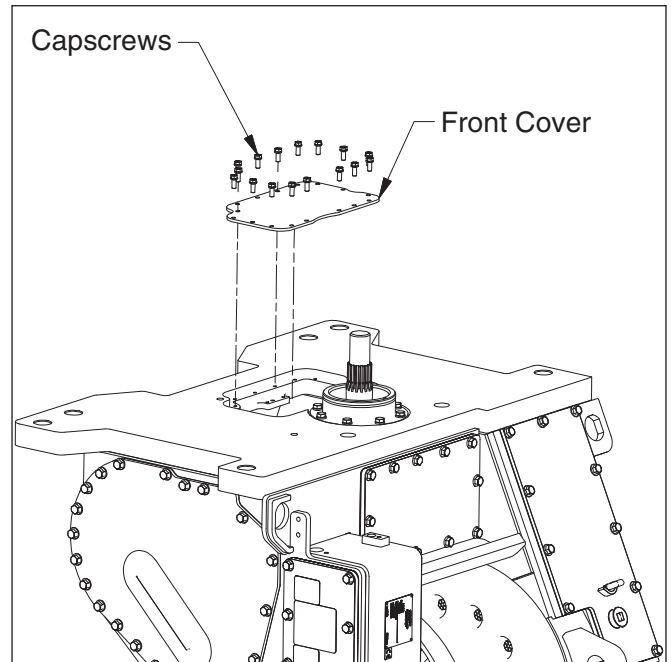


2. Fasten the pump to the mounting plate with the capscrews.

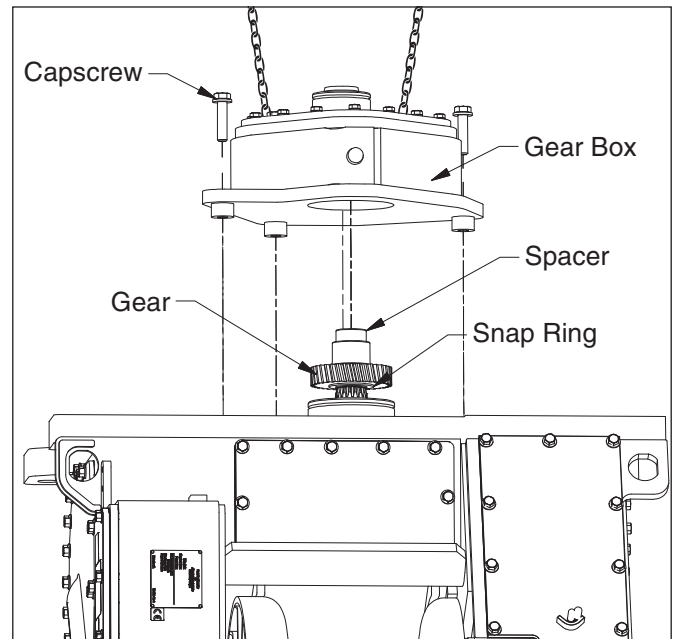


3. Connect the pump to the suction strainer with the suction hose. Connect the pump to the pressure filter with the pressure hose.

NOTE: Cleanliness is extremely important when repairing these pumps. Work in a clean area.



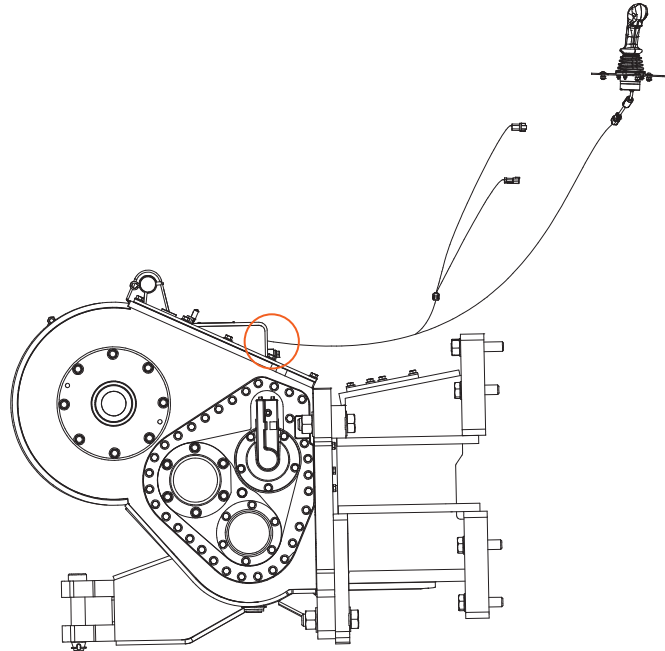
4. Install the front cover and fasten with capscrews.



5. The snap ring, gear, and spacer will remain on the PTO shaft upon installing the gearbox.

Winch installation

1. Thoroughly clean the mounting surfaces on the winch and the dozer. 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 to winch lift points.
7. Mounting faces must be parallel. Raise the winch and align the splines on the dozer PTO with the splines of the PTO coupling.



11. Install control lever assembly per mounting kit instructions. **Refer to installation drawing that is supplied with winch.**
12. Fill unit with oil.
13. Check for proper joystick function and verify hydraulic pressure settings as described in the service subsection of Section 2.
14. If there is no dropbox after winch installation, remove top cover and pry pinion towards dozer with a prybar to ensure the pinion is not jammed against the ring gear. This avoids excessive noise during winch operation.



WARNING

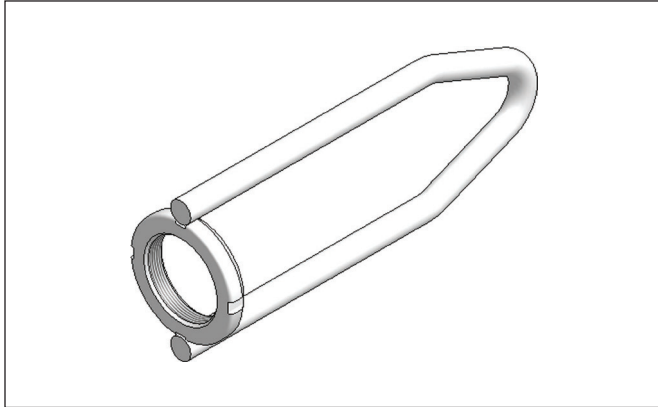
Make sure the lifting device has a minimum rated capacity of 6,000 lbs. (3,000 kg) before lifting the winch.

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 dozer.
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 dozer. On winches without dropbox, 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) or to torque specified on instruction drawing. See Figure 1-11 in Section 1 for Bolt Torque Specifications.

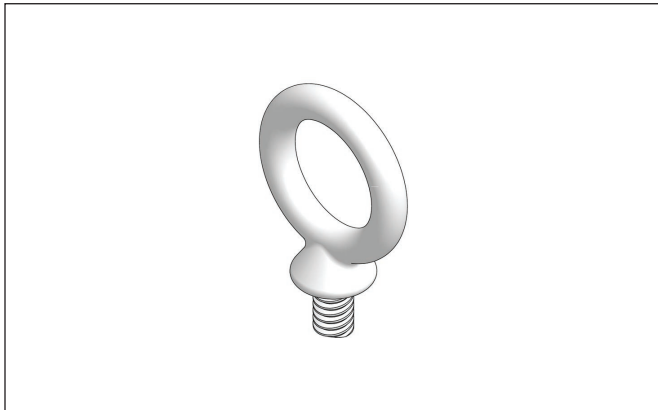
NOTE: Pressure checks according to pages 2-16 through 2-21 in Section 2 should be taken with hydraulic oil at operating temperature.

Specialized Tools

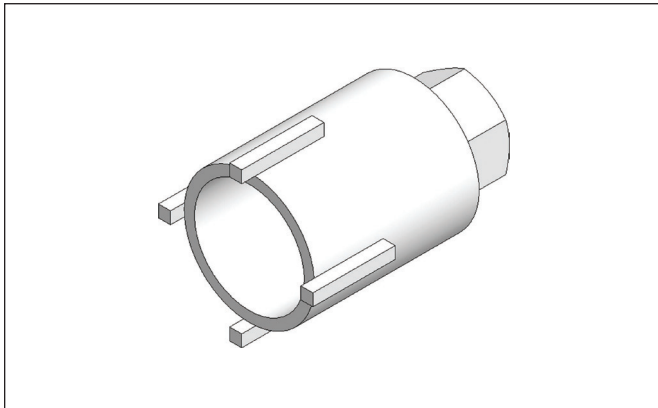
Order the following specialized tools for disassembly and reassembly of your winch.



Lifting Device
P/N X-201918



Lifting Eye
P/N X-203348



Clutch Shaft Locknut Socket
P/N X-201480

For any further information on ordering parts, or services, consult your local winch dealer, or contact Parts Department and/or Service Department of Allied Systems Company:

Allied Systems Company
21433 SW Oregon Street
Sherwood, Oregon 97140
U.S.A.

Phone: 503-625-2560

Parts Department:
Fax: 503-625-5132
E-mail: parts@alliedsystems.com

Service Department:
Fax: 503-625-7616
E-mail: service@alliedsystems.com

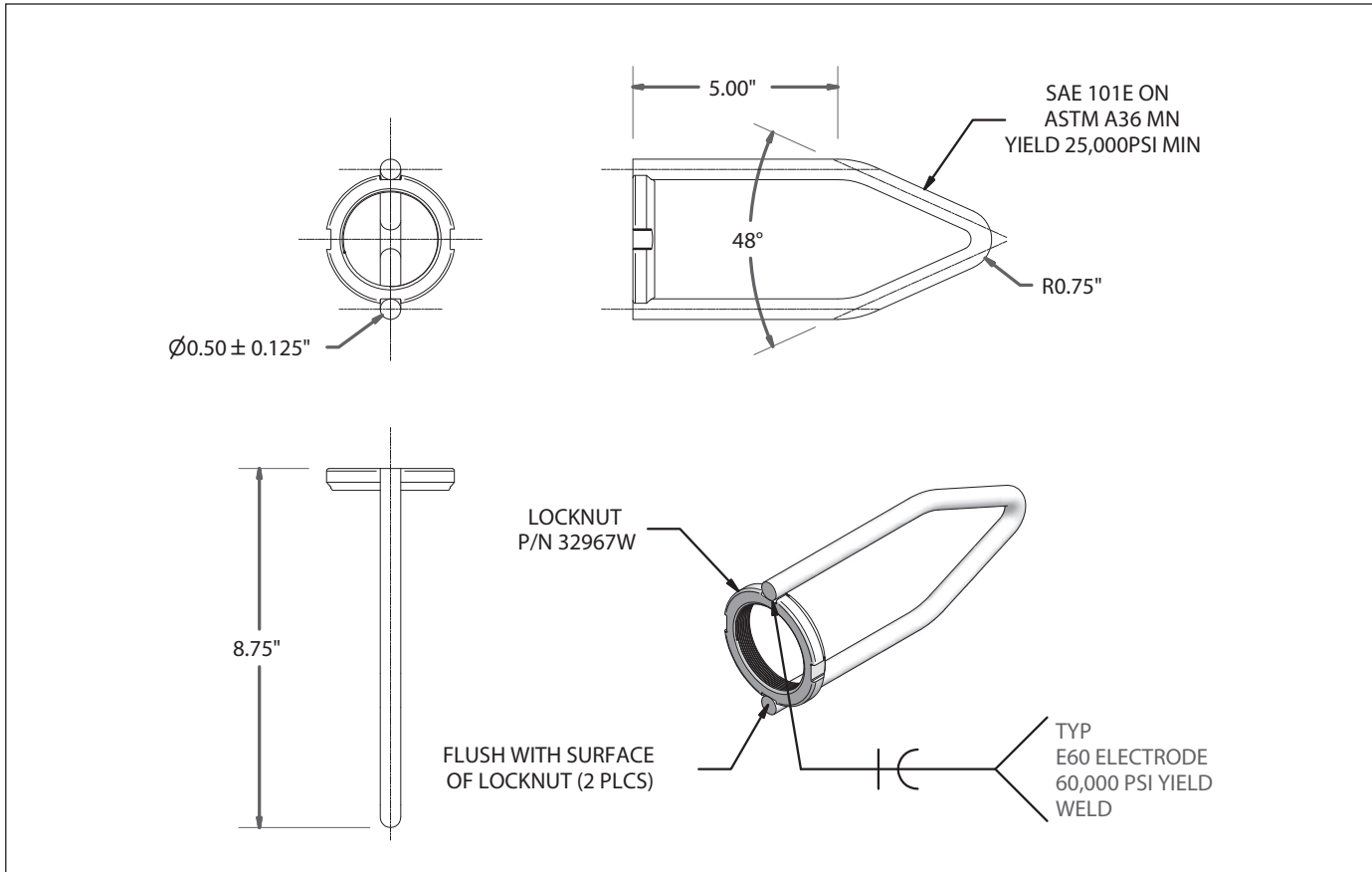


Figure 3-22 Clutch Shaft Puller (may be used instead of Clutch Shaft Driver)



To find a dealer in your area,
Call: (503) 625-2560,
Fax: (503) 625-7269 , or
Email: marketing@alliedsystems.com, or
Visit our website: <http://www.alliedsystems.com>