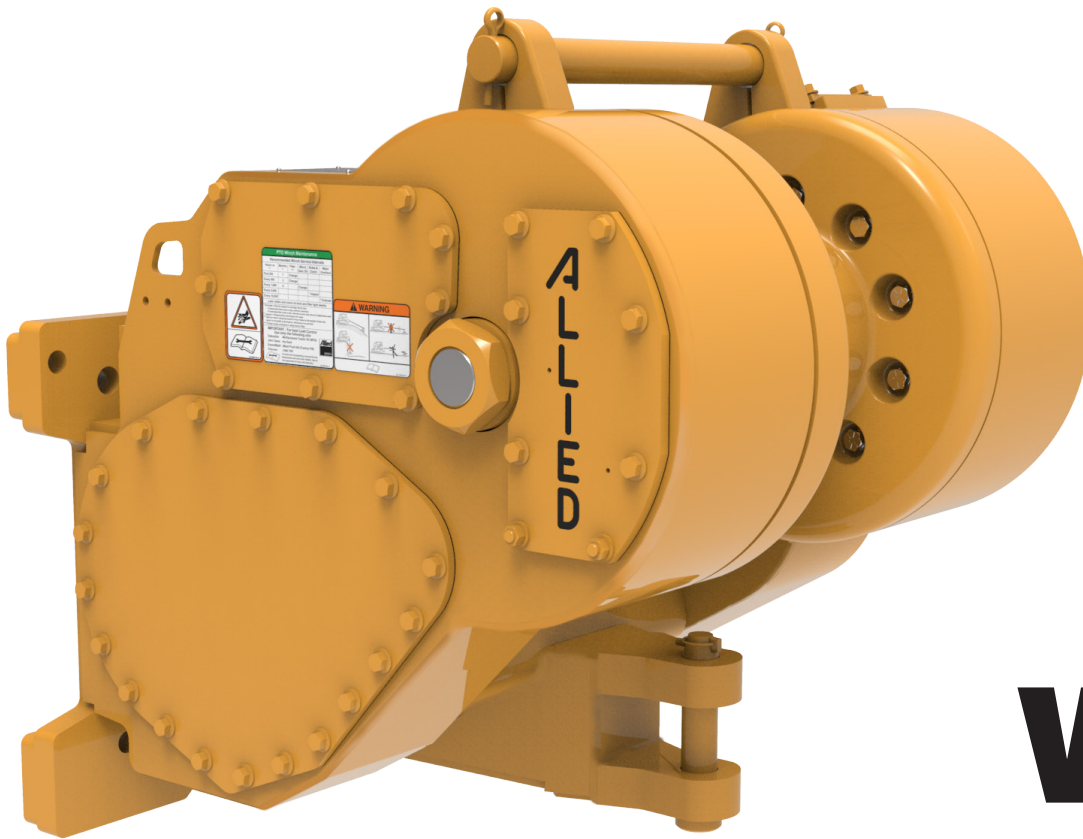


# Service Manual



# W6G

## 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:

- AW6GE6\*2057C\*\*\*
- AW6GE6\*2059C\*\*\* and later

Please check the Allied Systems website regularly for updates to this manual.  
[www.alliedsystems.com](http://www.alliedsystems.com)

A Product of

**Allied Systems**  
COMPANY

Sherwood, OR USA

# Safety Precautions

**Read, understand and observe the Safety Summary  
on pages i through iii  
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/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 death or serious injury. 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.

### 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 bylaws 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.

**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.

### **WARNING**

The winch shall not be used for hoisting.

### **WARNING**

Use hearing protection when operating winches.

### Operation, Inspection, and Maintenance Warnings

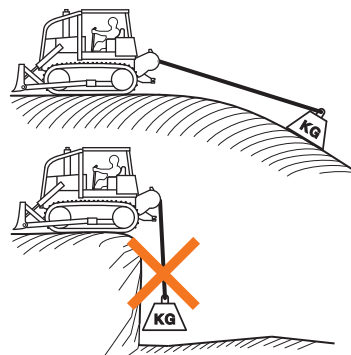


Obey the following cautions and warnings before using your winch to avoid equipment damage, personal injury or death.

- 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 599003W.
- 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 1-14 in Section 1.
- 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, the U.S.A.

Phone: 503-625-2560  
Fax: 503-625-5132  
E-Mail: [parts@alliedsystems.com](mailto:parts@alliedsystems.com)

Also see our website, [www.alliedsystems.com](http://www.alliedsystems.com), where the most current copy of this manual is always available.

## Contents

<b>Section 1: General .....</b>	<b>1-1</b>	System Pressure Test.....	2-18
Introduction.....	1-1	Brake Pressure Test .....	2-19
Description .....	1-1	Cooling Oil Pressure Test.....	2-20
Unit Identification.....	1-2	LINE-IN and LINE-OUT Pressure Test.....	2-21
Serial Number Codes.....	1-3	Accumulator Pressure Test.....	2-22
Nameplate.....	1-3	Accumulator Recharging Steps.....	2-23
Warning and Maintenance Decals .....	1-4	Troubleshooting .....	2-25
Installation Drawings .....	1-5	E-Control Troubleshooting Analysis	
Gear Train .....	1-6	Check Chart .....	2-25
Operation and Control .....	1-7	Joystick .....	2-30
Electronic Controls .....	1-7	<b>Section 3: Repairs .....</b>	<b>3-1</b>
Description of Operations .....	1-7	General .....	3-1
Capacities & Specifications .....	1-10	Winch Removal.....	3-1
Winch Drum Line Capacity.....	1-10	Winch Disassembly .....	3-1
Hydraulic Specifications .....	1-10	General Arrangement .....	3-2
Winch Oil Capacity.....	1-10	Input Carrier and PTO Removal & Disassembly.....	3-3
Recommended Oil List.....	1-10	Oil Brake Removal & Disassembly .....	3-9
Torque Specifications.....	1-11	Hydraulic Pump Removal & Disassembly.....	3-11
Winch Weight .....	1-12	Pump Disassembly.....	3-11
<b>Section 2: Electronic Controls .....</b>	<b>2-1</b>	Pump Inspection .....	3-12
Hydraulic System.....	2-1	Pump Gear.....	3-12
Valve Manifold Assembly		Pump Front & Backplates.....	3-12
and Hydraulic Schematic.....	2-2	Pump Body.....	3-12
Oil Clutches.....	2-4	Clutch Shaft Removal & Disassembly .....	3-13
Oil Brake.....	2-5	Oil Clutch Disassembly.....	3-18
Hydraulic Pump.....	2-6	Idler Shaft Removal .....	3-21
Accumulator.....	2-6	Intermediate Shaft Removal, Non-Freespool.....	3-22
Accumulator Valve.....	2-6	Intermediate Shaft Removal, Freespool.....	3-24
Check Valve.....	2-6	Drum Shaft & Drum Removal .....	3-26
Sequence of Operation - BRAKE-ON.....	2-7	Winch Assembly .....	3-30
Sequence of Operation - LINE-IN .....	2-8	Visual Inspection.....	3-30
Sequence of Operation - LINE-OUT .....	2-9	Drum Shaft & Drum Installation .....	3-32
Sequence of Operation - BRAKE OFF.....	2-10	Intermediate Shaft Installation, Non-Freespool.....	3-36
Sequence of Operation - FREESPOOL.....	2-11	Intermediate Shaft Installation, Freespool .....	3-38
Electronic Control Module.....	2-12	Idler Shaft Installation .....	3-41
Bluetooth Adapter.....	2-12	Oil Clutch Reassembly .....	3-42
IQAN Connections .....	2-12	Clutch Shaft Reassembly & Installation .....	3-45
Service .....	2-13	Hydraulic Pump Reassembly & Installation .....	3-52
Maintenance Points.....	2-13	Input Carrier Reassembly & Installation .....	3-53
Maintenance Schedule .....	2-14	Oil Brake Reassembly & Installation.....	3-60
Checks Before Operation .....	2-15	Winch Installation .....	3-63
Checks During Operation.....	2-15		
Freespool Adjustment.....	2-15		
Hydraulic System Pressure Checks .....	2-16		
Preparation.....	2-16		
Pressure Gauges .....	2-16		
Relief Valve and Adjustment.....	2-17		

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## General

### Introduction

This service manual is for the W6G 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.

The winch utilizes a Self Contained Hydraulic (SCH) system where all hydraulic power is produced inside the winch case. A hydraulic pump is connected by a gear drive to the constant running pinion. The design of the winch case permits different arrangements of PTO gear assemblies to fit different dozers that use this winch. (See repair section for the PTO gear assemblies.)

The W6G winch has **BRAKE-OFF** and **FREESPOOL** functions. The **BRAKE-OFF** and **FREESPOOL** functions permit the wire rope to be pulled from the drum.

The W6G winch has a maximum rated line pull capacity of 361,196N (81,200 lb.) when there is one layer of wire rope on the drum. When there is more than one layer of wire rope on the drum, the maximum rated line pull is reduced.

### Serial Number Codes

The serial number codes are described on pages 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.

### Description

The W6G Winch is a Power Forward (**LINE-IN**) and Power Reverse (**LINE-OUT**) winch used on dozers with a constant running power takeoff (PTO).

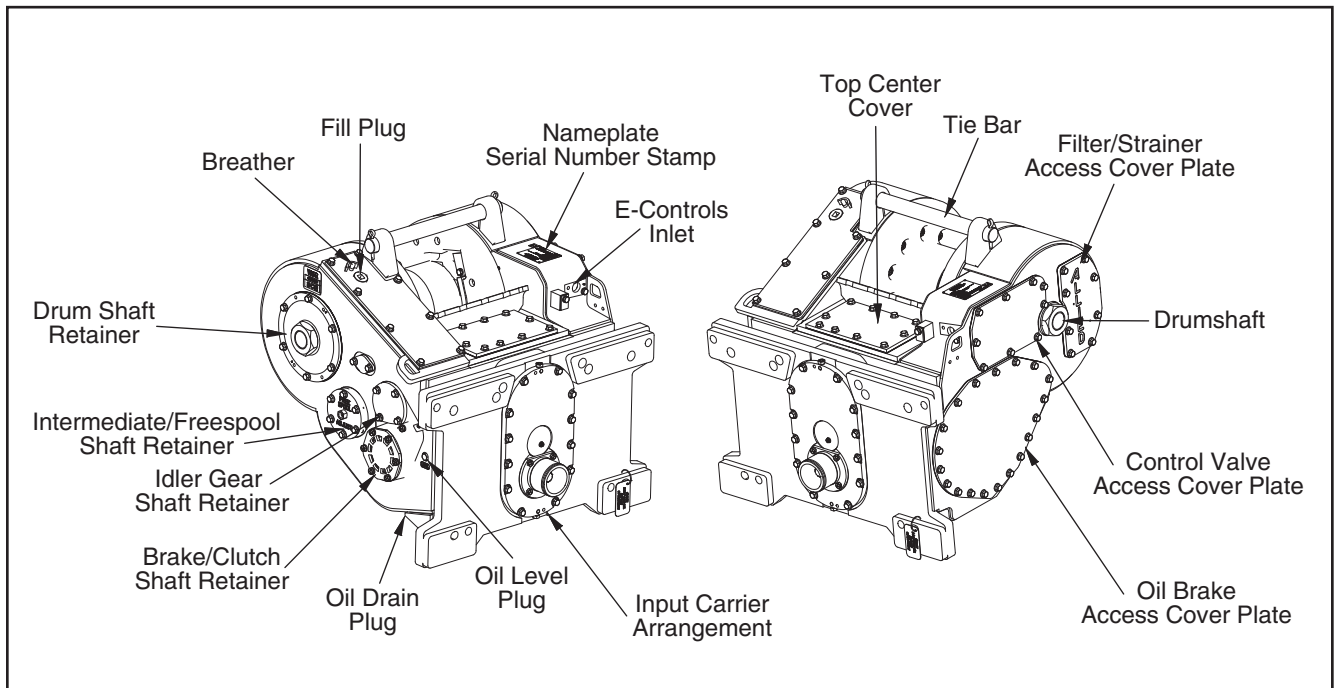


Figure 1-1 W6G Winch

## Identification - Unit

Allied Winch S/N Nameplate Data For Dozer Mountings

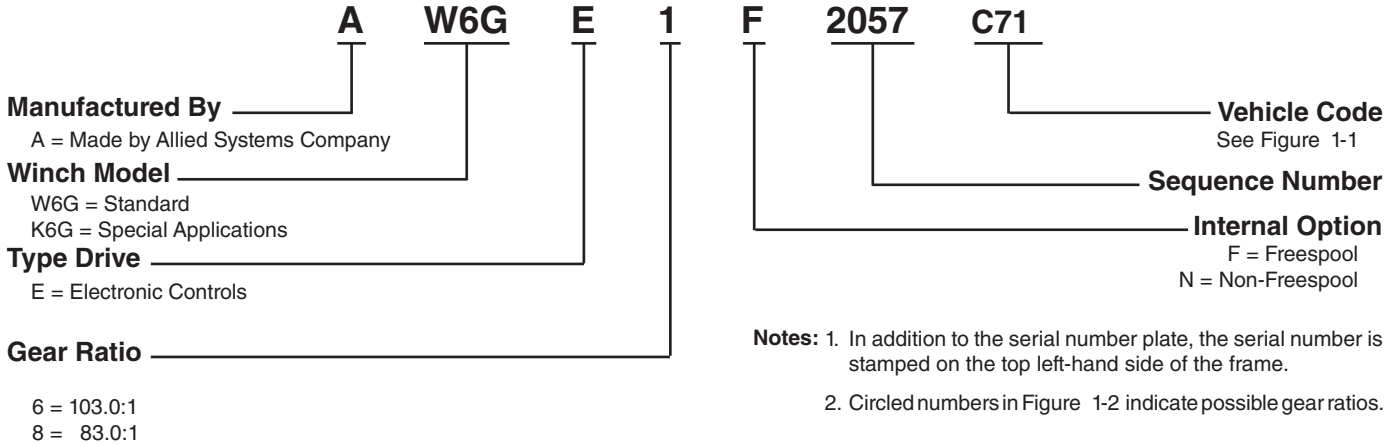


Figure 1-2 Dozer Identification and Gear Ratio

Vehicle Code	Gear Ratio	Caterpillar Model and Serial Number Prefix, Where Applicable
C71	⑥ ⑧	D6R II & III D6T
C712	⑥	D6 Build 20A
C713	⑥	D6 Build 18A, 19A
C810	⑥	D6N****
C812	⑥	D5 Build 17

\*\*\*\* Dozers (C810) with pilot operated hydraulics  
 With serial number prefixes: PBA & PER, dozer codes C810 are used for D6N.

## Nameplate

Each winch is shipped from the factory with a nameplate as shown in Figure 1-3. 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.

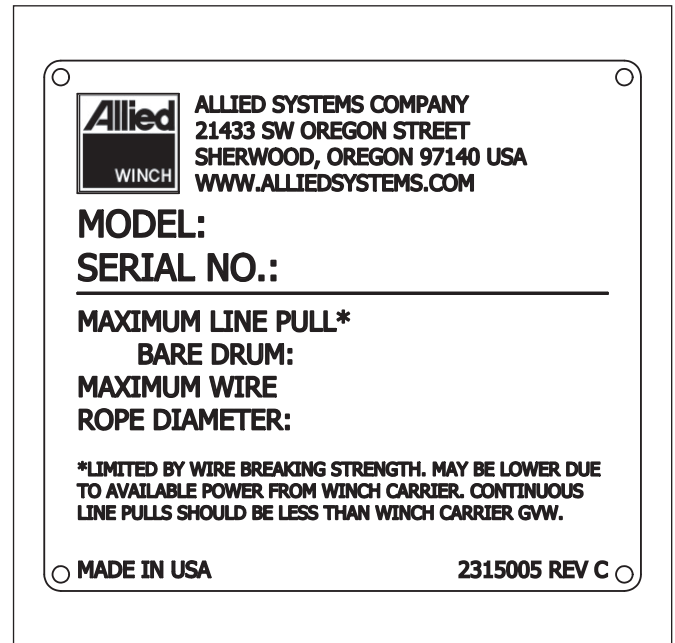


Figure 1-3 Nameplate

## Warning and Maintenance Decals

The unit nameplate, a Warning Decal and a Maintenance Plate are located on the winch as shown in Figure 1-4. If the nameplate has been damaged, obtain a new one and install the new nameplate in the location shown in the

figure. If the Warning Decal or Maintenance Plate have been damaged, install a new one in the location shown.

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

Contact Allied Systems Winch Department if the Nameplate Is Broken.

Contact Allied Systems Winch Department if the CE Mark Label Is Needed.

Serial Number stamp

Left Hand Model Decal

Right Hand Model Decal

Warning Decal

PTO Winch Maintenance Decal

Load & Wire Rope Safety Decal

Serial Number stamp



PTO Winch Maintenance					
Recommended Winch Service Intervals					
Hours or **	Months **	Filter ***	Winch Gear Oil	Brake & Clutch	Major Overhaul
First 250		1	Change		
Every 500		3	Change		
Every 1,000		6		Change	
Every 5,000					* Inspect
Every 10,000					* Evaluate

Lube rollers and check oil level and filter light weekly.

\* Evaluate \*\* Service based on average winch use.  
- if used more than once a day, perform overhaul.  
- if used less than once a day, remove covers and check to determine need.  
\*\* Inspect \*\*\* Disassemble and inspect for wear.  
\*\* Service winch using the tractor's hour meter or the length of time the winch is mounted to the tractor, whichever occurs first.  
\*\*\* Follow tractor schedule if using tractor filter.

**IMPORTANT - For best Load Control**  
Use only the following oils:  
Caterpillar - Multipurpose Tractor Oil (MTO)  
John Deere -Hy-Gard  
ExxonMobil -Mobil Fluid 424 (Factory Fill)  
Chevron -1000 THF

Consult service/operating manual for low temperature oils and other details. Use of non-approved oil may void warranty.

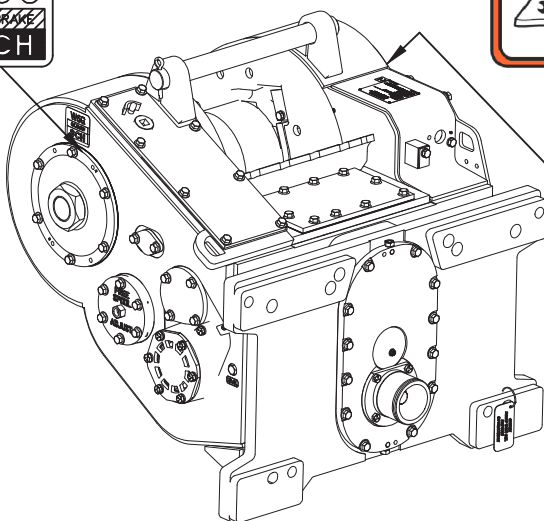
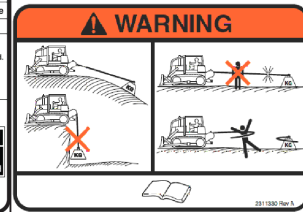
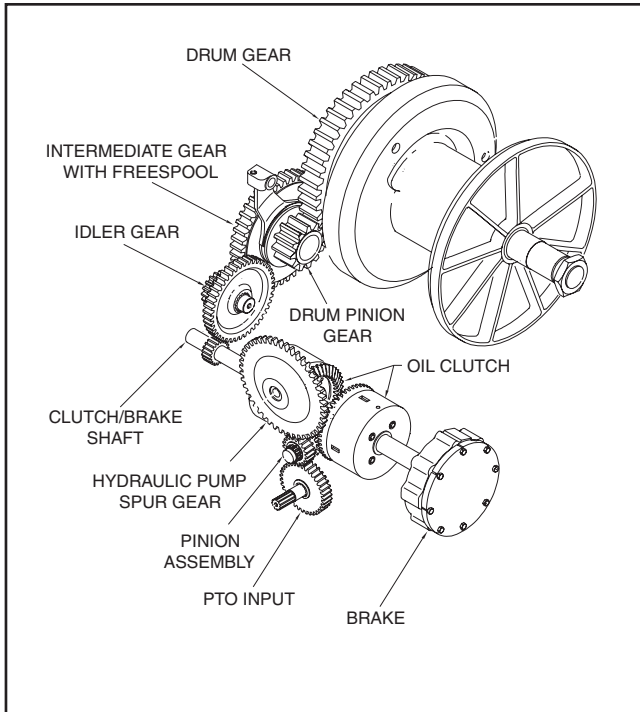


Figure 1-4 Decal Installation

**Figure 1-5 List of Installation Drawings**

Winch Serial Number	Description	Installation Drawing Part Number
	Electronic Control	
W6GE**----C71	W6G CAT D6R II & III, D6T (Ref 2313763 for Tier 4i)	2317846
W6GE**----C712	W6G CAT D6 Build 20A	2317218
W6GE**----C713	W6G CAT D6 Build 18A, 19A	2317217
W6GE**----C810	W6G CAT D6N	2314450
W6GE**----C812	W6G CAT D5 BUILD 17	2317843

- 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 Engineering Department of Allied Systems Company.



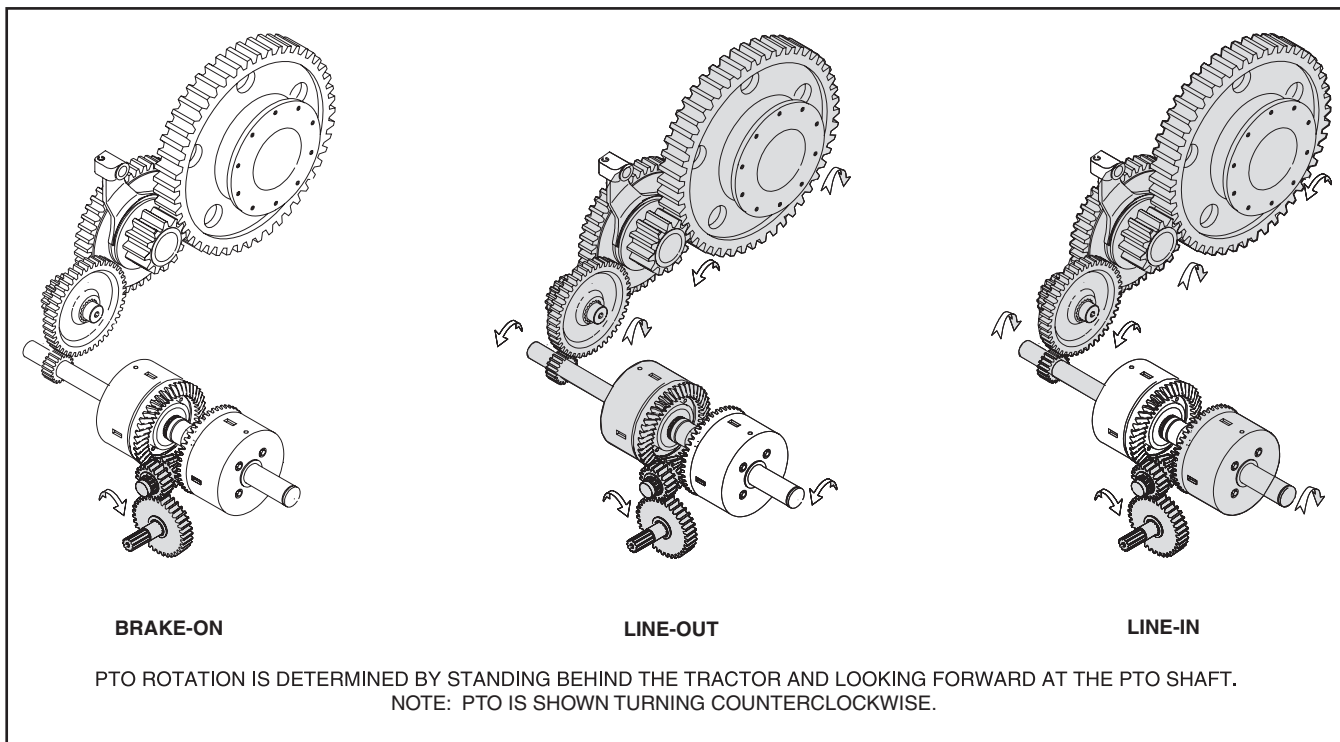
**Gear Train (See Figure 1-6)**

The pinion assembly drives the hydraulic pump from a spur gear. A bevel gear is found on each side of the pinion. One bevel gear is connected to an oil clutch for **LINE-IN**, the other for **LINE-OUT** (See Figure 1-6). An oil brake on the end of the clutch/brake shaft holds the winch drum in a fixed position when no power operation occurs. If one of the clutches is applied, the brake is released by the same oil pressure. When neither clutch is applied, a spring applies the brake.

An intermediate gear assembly provides a gear reduction to increase torque at the winch drum. A dental clutch with splines engages the drum pinion gear and the intermediate gear. The operator can disengage the dental clutch with a joystick to engage the **FREESPOOL** option.

A drum gear engages the drum pinion gear and is connected to the drum. When power is applied to the gear train, the drum will rotate in the forward or reverse direction. The drum adapter connects the drum to the drum gear. The other side of the drum runs on roller bearings held by the drum shaft. The drum shaft is connected to the winch case.

**Figure 1-6 Gear Train**



**Figure 1-7 Gear Train Rotation Torque Transfer**

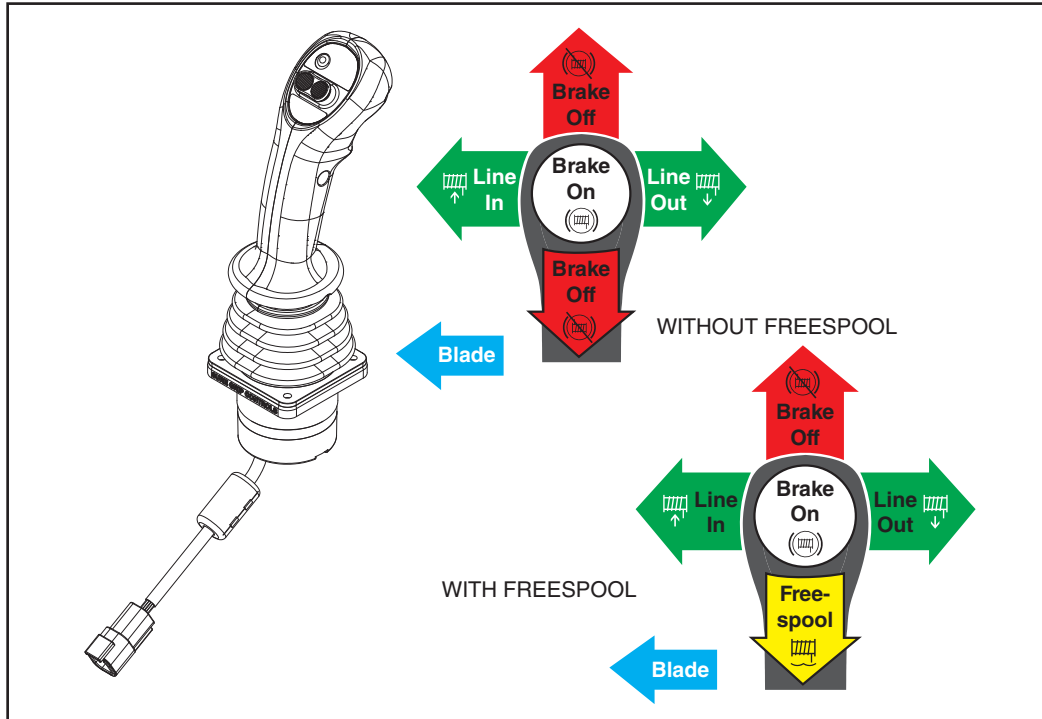


Figure 1-8 Electronic Winch Controls

## Operation and Control

### Electronic Controls

The electronic control assembly has one joystick that is connected to the winch through electrical wiring, an ECM 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**
- **FREESPOOL** (Optional)

**NOTE:** Consult the Troubleshooting subsection in Section 2 if the filter LED does not turn off.

**NOTE:** The winch will not operate unless the joystick is centered at startup.

### Description of Operations

**BRAKE-OFF** and **FREESPOOL** are detented positions on the joystick, and the operator must pull the lever to release it from those positions. The lever will return from the **LINE-IN** and **LINE-OUT** positions to the **BRAKE-ON** position when released. 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 joystick 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 joystick 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 joystick.

### **FREESPOOL Operation (See Figure 1-9 and Figure 1-10)**

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

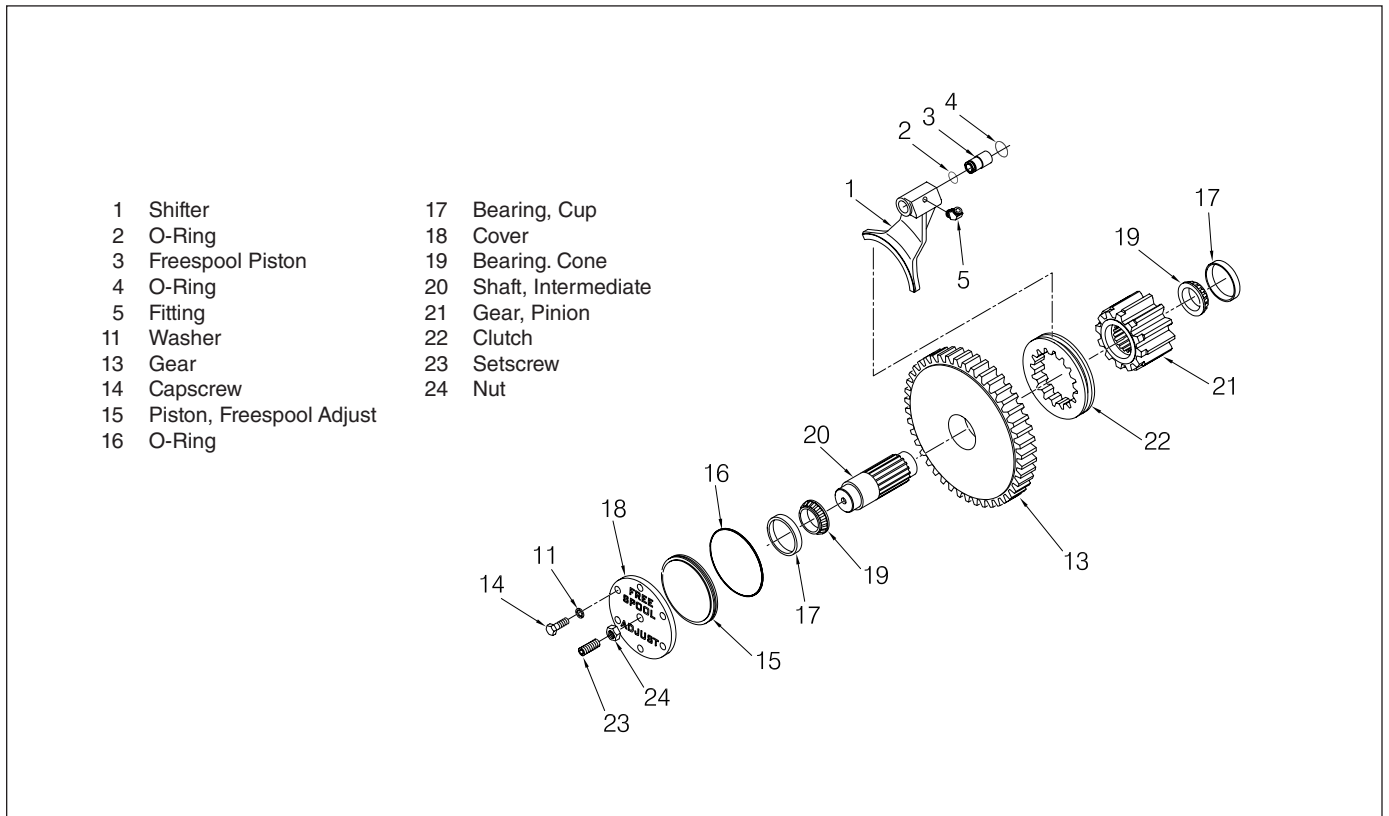


## **WARNING**

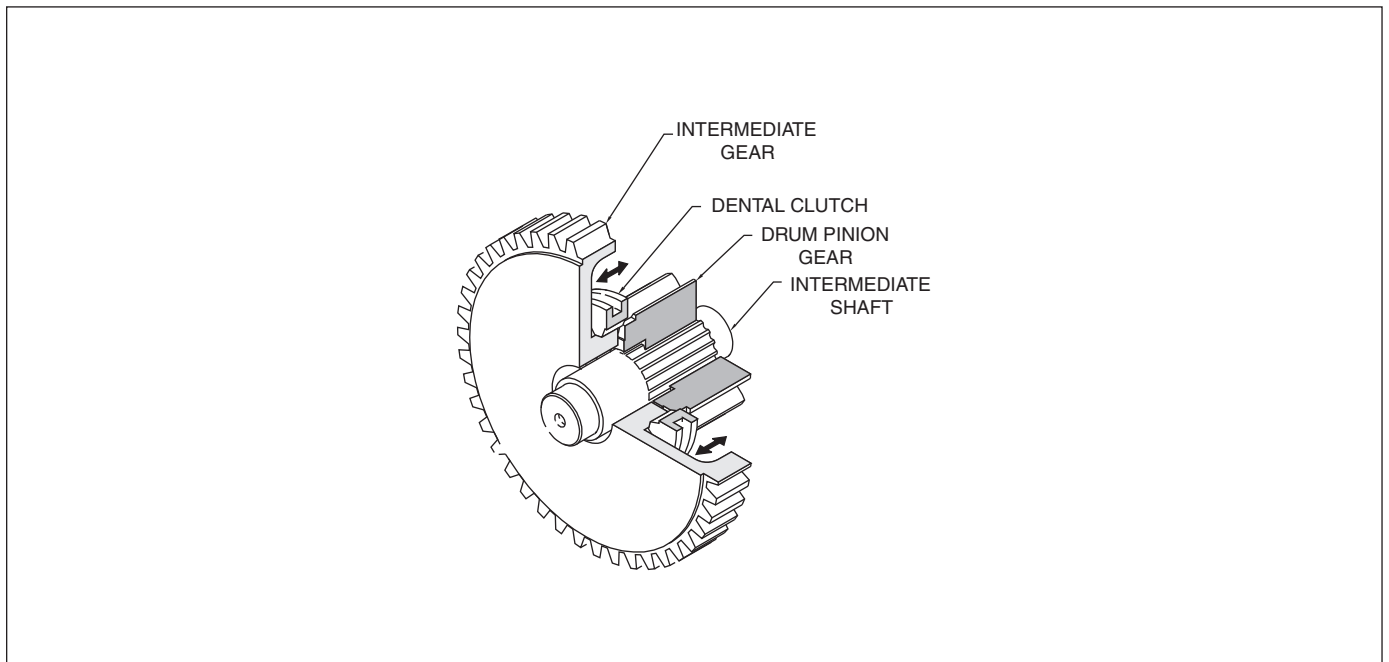
**When the control lever is moved to the FREESPOOL position, it will release the gear train and any load that may be on the wire rope. An uncontrolled release of the load may occur. Loss of the load can result in injury and damage.**

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

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



**Figure 1-9 FREESPOOL Arrangement**



**Figure 1-10 FREESPOOL Operation**



## Torque Specifications

ITEM	TORQUE VALUES		
	ft-lbs	N-m	kg-m
PTO Shaft Assembly Bearing Carrier Capscrews (1/2 UNC Gr. 8)	80	108	11
Housing Covers (1/2 UNC Gr. 8)	80	108	11
Clutch Shaft Assembly Clutch Spring Retainer Capscrews (1/4 UNC Gr. 8)	9	12	1
Bearing Retainer Housing Capscrews (1/2 UNC Gr. 8)	80	108	11
Ring Gear Capscrews (3/8 UNC Gr. 8)	33	44	4
Brake Bearing Retainer Capscrew (1/2 UNC Gr. 8)	80	108	11
Brake Cover Capscrews (5/8 UNC Gr. 8)	160	217	22
Idler Gear Bearing Carrier (1/2 UNC Gr. 8)	80	108	11
Intermediate Gear Bearing Carrier (1/2 UNC Gr. 8)	80	108	11
Pump Mounting Capscrews (3/8 UNC Gr. 5)	23	31	3
Drum Shaft Assembly Drum Gear to Adapter Capscrews (1/2 UNF Gr. 8)	90	122	12
Drum Adapter to Drum Capscrews (5/8 UNF Gr. 8))	220	298	30
Drum Shaft Nuts (2-1/2 UNC)	400	542	55
RH Bearing Retainer Capscrews (1/2 UNC Gr. 8)	80	108	11

**Figure 1-14 Torque Specifications (1)**

NOM. SIZE	THREAD SERIES	SAE GRADE 5 CAPSCREWS		SAE GRADE 8 CAPSCREWS	
		TORQUE (FT. LB. S)	TORQUE (Nm)	TORQUE (FT. LB. S)	TORQUE (Nm)
		LUBED (K=0.15)	LUBED (K=0.15)	LUBED (K=0.15)	LUBED (K=0.15)
1/4	20 UNC	6	9	9	12
	28 UNF	7	10	10	14
5/16	18 UNC	13	18	18	25
	24 UNF	14	20	20	28
3/8	16 UNC	23	31	33	44
	24 UNF	26	36	37	50
7/16	14 UNC	37	50	52	71
	20 UNF	41	56	58	79
1/2	13 UNC	57	77	80	110
	20 UNF	64	86	90	120
9/16	12 UNC	82	110	115	155
	18 UNF	91	125	130	175
5/8	11 UNC	115	155	160	215
	18 UNF	130	175	180	245
3/4	10 UNC	200	270	280	380
	16 UNF	225	300	315	425
7/8	9 UNC	320	435	455	615
	14 UNF	355	480	500	680
1	8 UNC	485	655	680	925
	14 UNS	540	735	765	1040
1 1/8	7 UNC	595	805	965	1310
	12 UNF	670	905	1080	1470
1 1/4	7 UNC	840	1140	1360	1850
	12 UNF	930	1260	1500	2050
1 3/8	6 UNC	1100	1490	1780	2420
	12 UNF	1250	1700	2040	2760
1 1/2	6 UNC	1460	1980	2370	3210
	12 UNF	1650	2230	2670	3620

Figure 1-15 Torque Specifications (2)

Winch Weight

Winch and Attachment	Weight
Winch	3,400 lb. (1,542 kg)
Arch	600 lb. (272 kg)
Fairlead	450 lb. (204 kg)
Wire Rope	350 lb. (159 kg)
<b>Total</b>	<b>4,800 lb. (2,177 kg)</b>

Figure 1-16 Winch Weight





# Electronic Controls

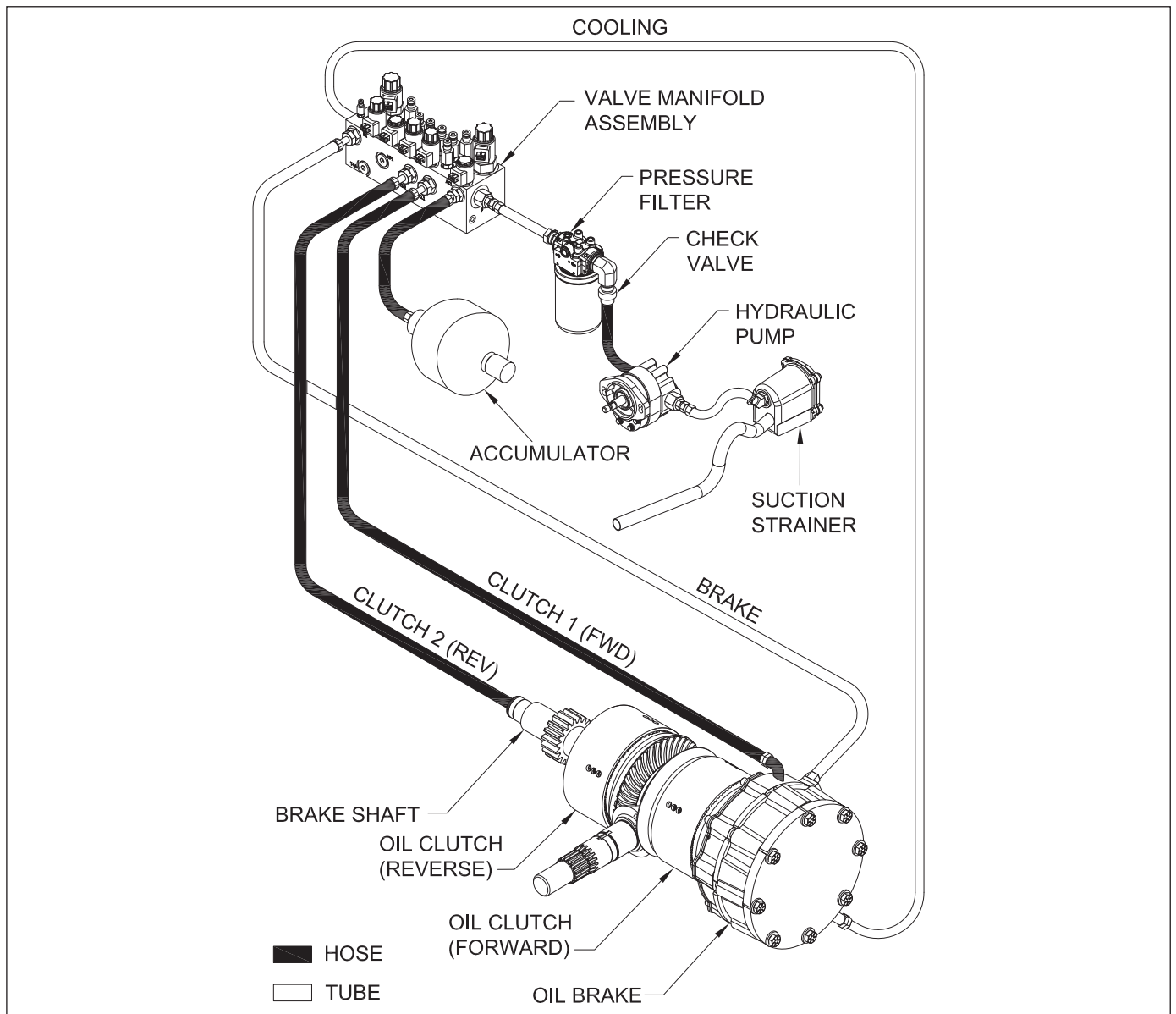
## Hydraulic System

The operation of the winch is controlled by an internal hydraulic system See (Figure 2-1). 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 2-11.

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 accumulator. The accumulator provides 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 is not operating. It also allows the winch to shift properly at low dozer RPM's.

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



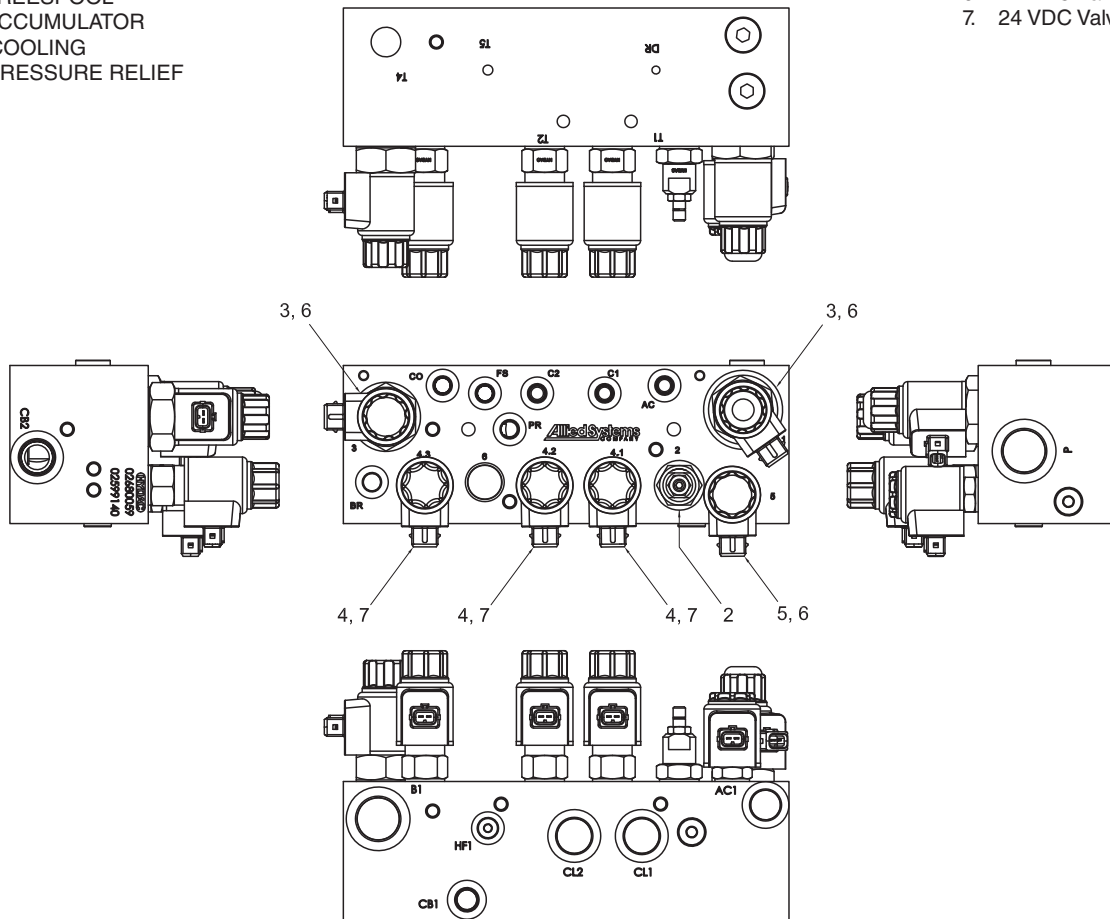
**Figure 2-1 Hydraulic System (Electronic Controls)**



### Gauge Port Labels

- C1 = FORWARD
- C2 = REVERSE
- BR = BRAKE
- FS = FREESPOOL
- AC = ACCUMULATOR
- CO = COOLING
- PR = PRESSURE RELIEF

- 2. Relief Valve
- 3. Cartridge Valve
- 4. Proportional Valve
- 5. Cartridge Valve
- 6. 24 VDC Valve Coil
- 7. 24 VDC Valve Coil

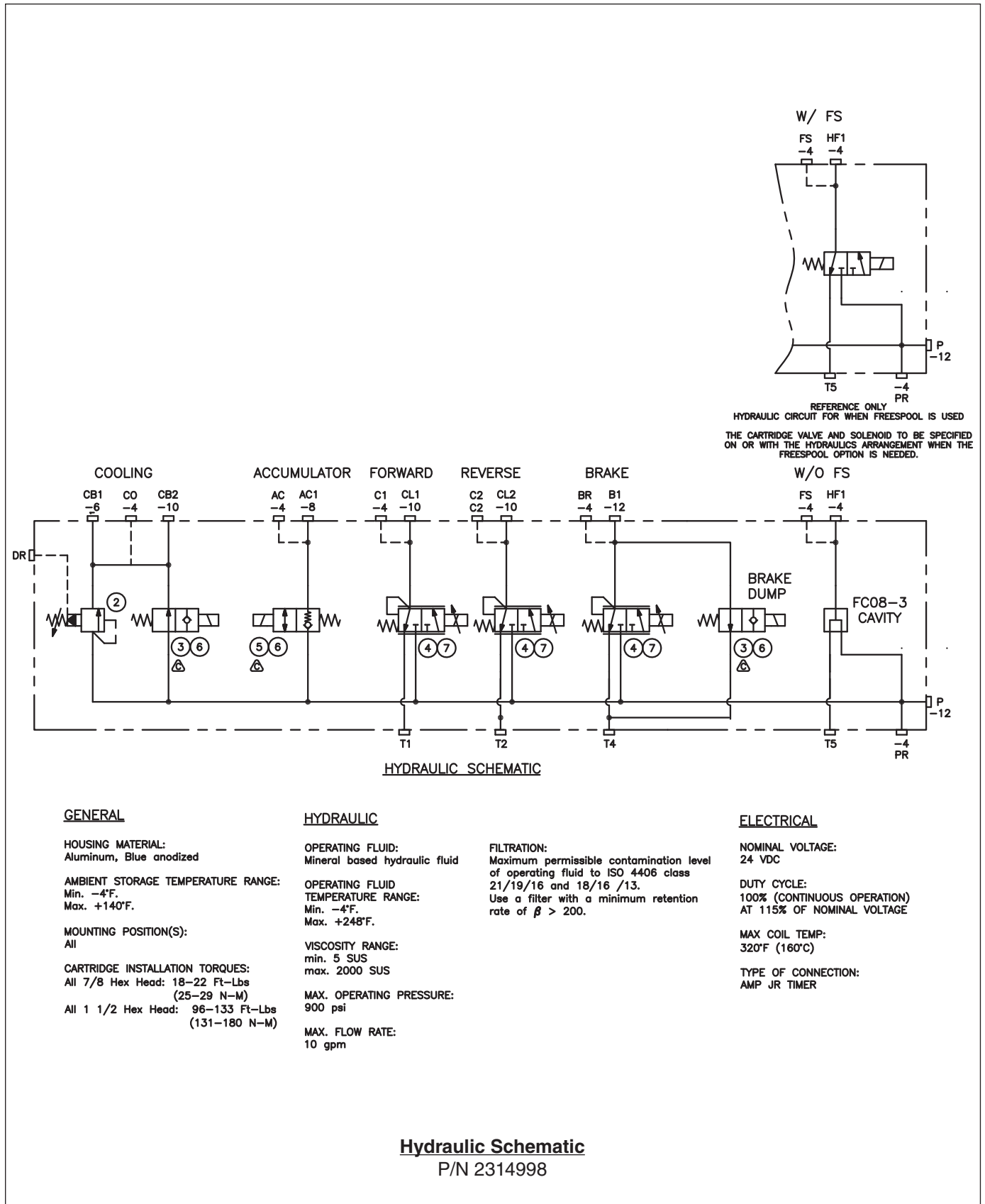


### Valve Manifold Assembly

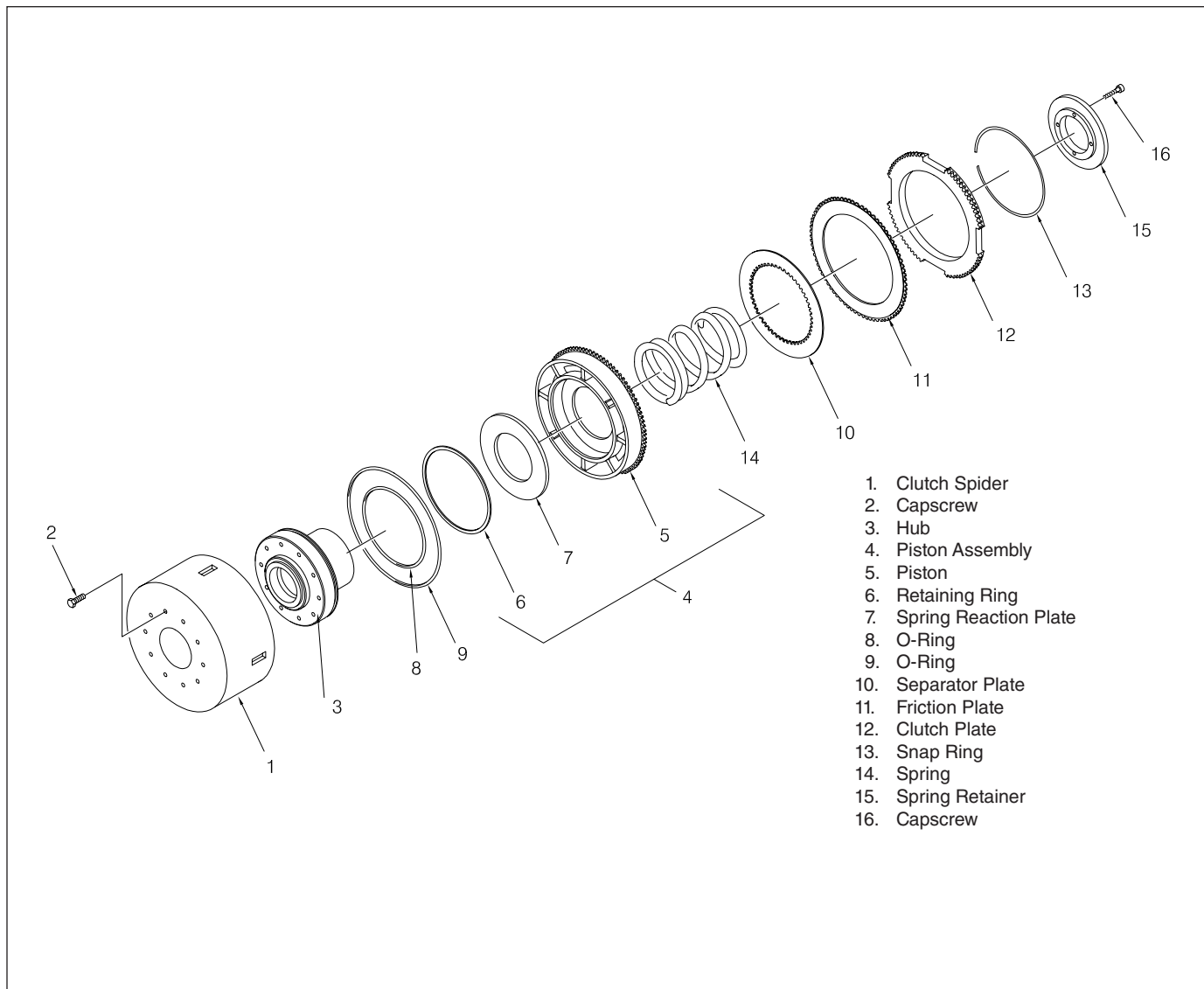
P/N 2314998

(The color of the manifold body is blue, and coils do not have leads.)

Figure 2-2 Valve Manifold Assembly and Hydraulic Schematic (1)



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

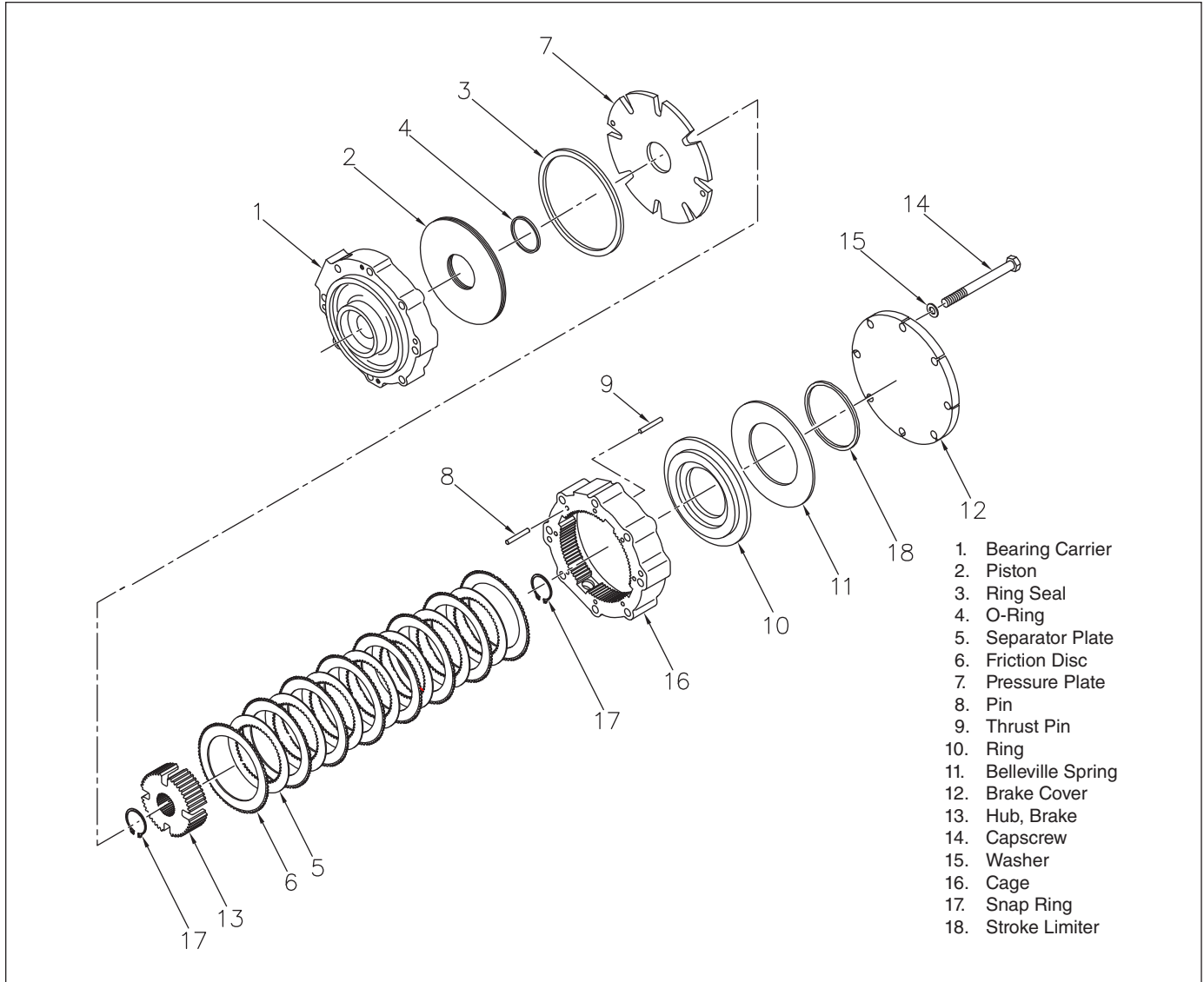


**Figure 2-4 Oil Clutch**

## Oil Clutch (See Figure 2-4)

The **LINE-IN** and **LINE-OUT** clutch assemblies are identical. Each clutch is a multi-disc type that is hydraulically applied and spring released.

The separator plates of the clutch are internally splined to the clutch hub. The friction discs have external teeth that fit the splines in the clutch spider. The separator plates rotate with the hub. The piston and clutch housing rotate with the clutch/brake shaft. Oil passages in the clutch shaft supply the oil pressure from the control valve to the piston. Hydraulic oil also cools and lubricates the bearings and internal components of the clutch. When the oil pressure pushes the piston against the separator plates and friction discs, the clutch is applied. The torque from the input shaft is transferred through the clutch and causes the winch to operate. (See Figs. 1-14 and 1-15)



**Figure 2-5 Oil Brake**

**Oil Brake (See Figure 2-5)**

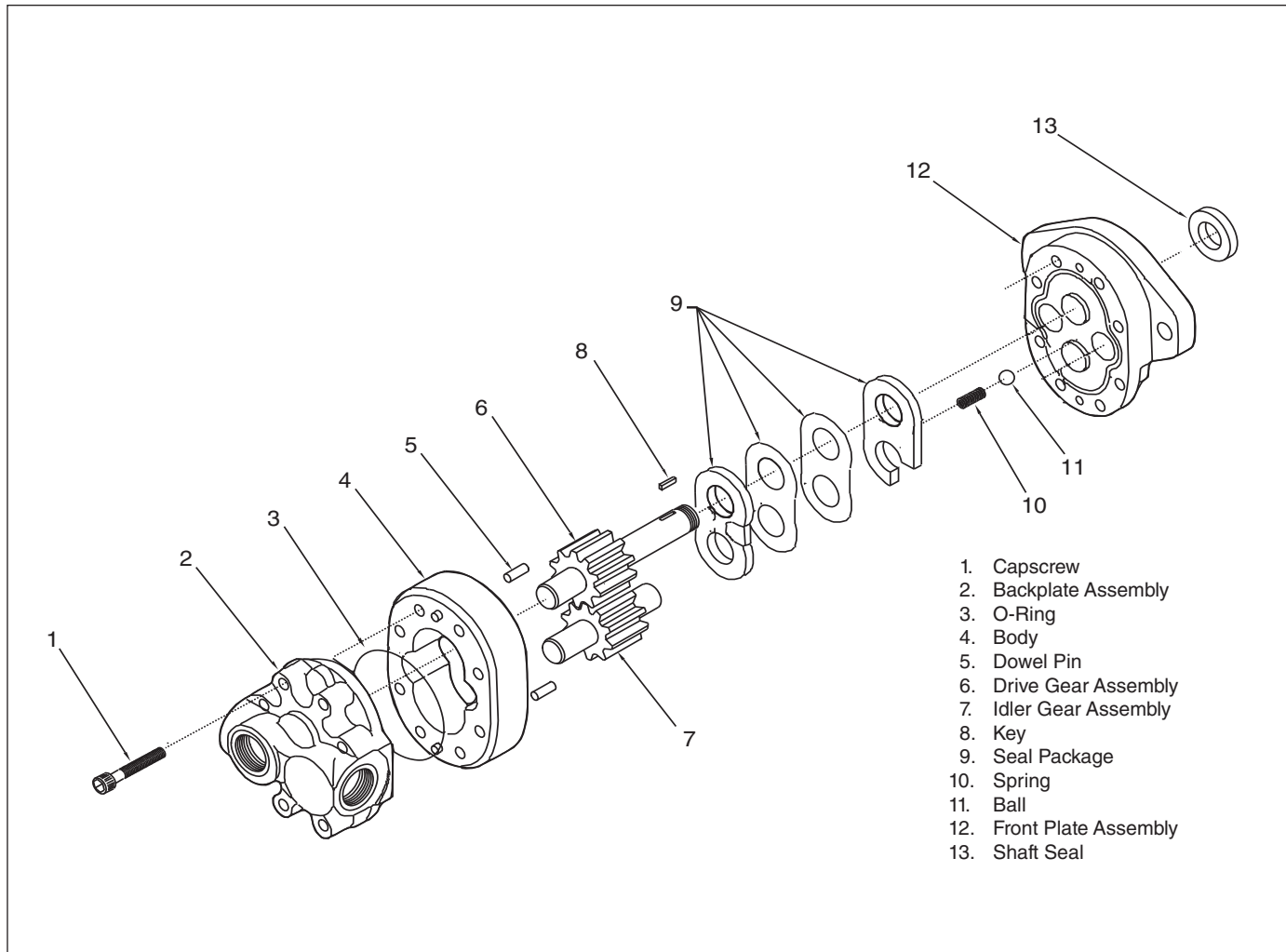
The oil brake is a multi-disc brake that is spring applied and hydraulically released. The brake hub is connected to the clutch/brake shaft with splines. The brake is applied if a clutch is not applied. When oil pressure applies a clutch, the oil pressure also releases the brake. The brake will also be released when the joystick is in the **BRAKE -OFF** position.

The brake is applied by spring pressure from a belleville spring in the brake housing. The spring pushes against a ring, applying pressure to the friction discs and the separator plates. As pressurized oil is directed into the cavity between the piston and piston housing, the piston moves outward, compressing the belleville spring which releases the brake.

The friction discs have teeth that engage the splines inside the brake housing and are held stationary. Teeth in the separator plates engage the splines in the hub and rotate with the hub.

A piston stroke limiter, used on some versions, limits the total volume of oil consumed in releasing the brake. This helps with clutch/brake timing.

When the control valve sends hydraulic pressure to apply the clutch, the hydraulic pressure also releases the brake. The hydraulic pressure causes the piston to compress the belleville spring and releases the brake. The brake is released in the **LINE-IN, LINE-OUT, and BRAKE-OFF** positions of the joystick. The **BRAKE-OFF** function applies hydraulic pressure to release the brake, but no hydraulic pressure is sent to apply the clutch. Continuous low pressure oil flow is used for cooling the brake.



1. Capscrew
2. Backplate Assembly
3. O-Ring
4. Body
5. Dowel Pin
6. Drive Gear Assembly
7. Idler Gear Assembly
8. Key
9. Seal Package
10. Spring
11. Ball
12. Front Plate Assembly
13. Shaft Seal

**Figure 2-6 Hydraulic Pump**

## Hydraulic Pump (See Figure 2-6)

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

## Accumulator

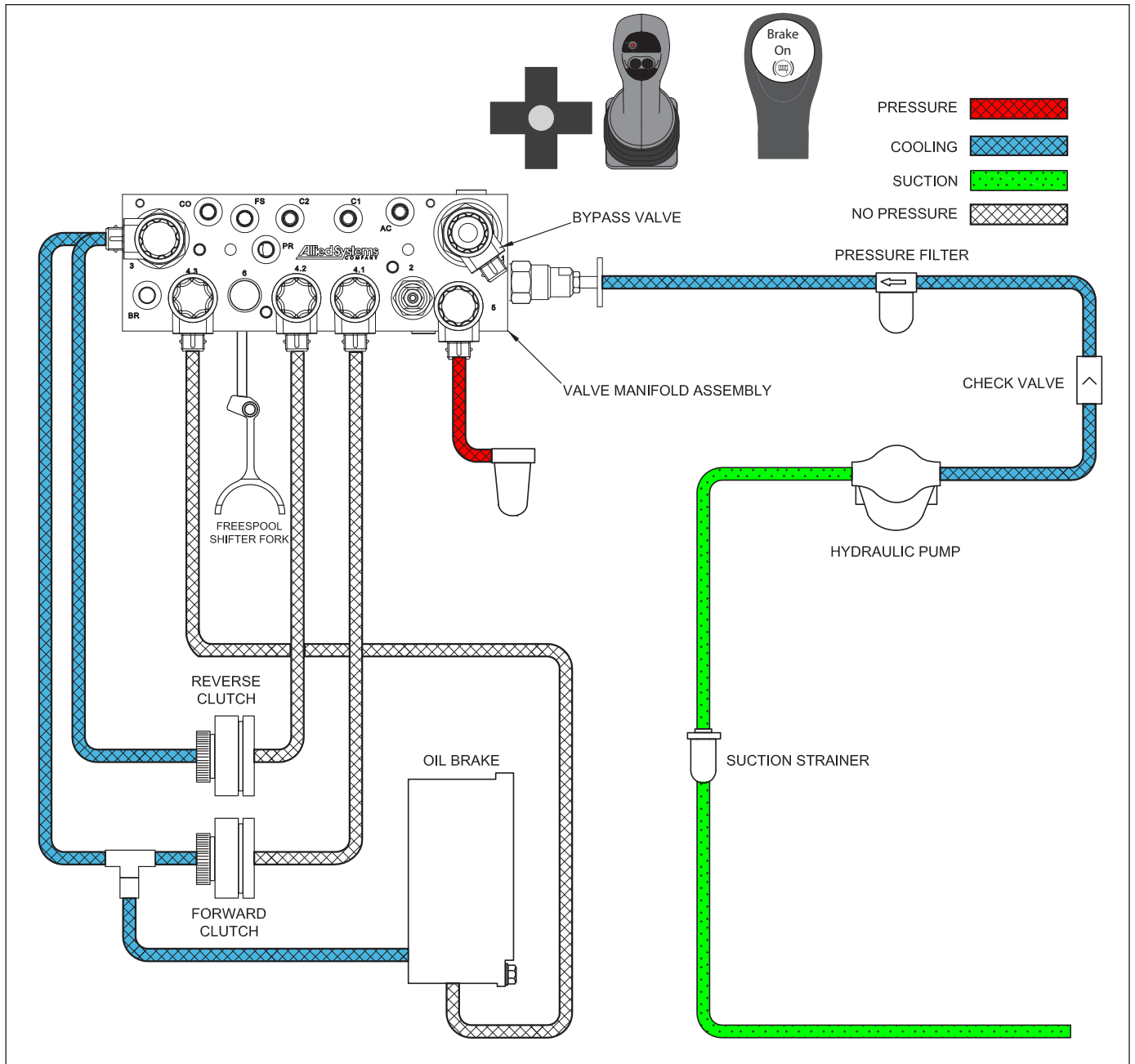
The W6G hydraulic system utilizes an accumulator. The bladder has a nitrogen charge so that the oil stored in the accumulator will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts and if the PTO shaft stalls.

## Accumulator Valve

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 joystick 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 joystick 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

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



**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.

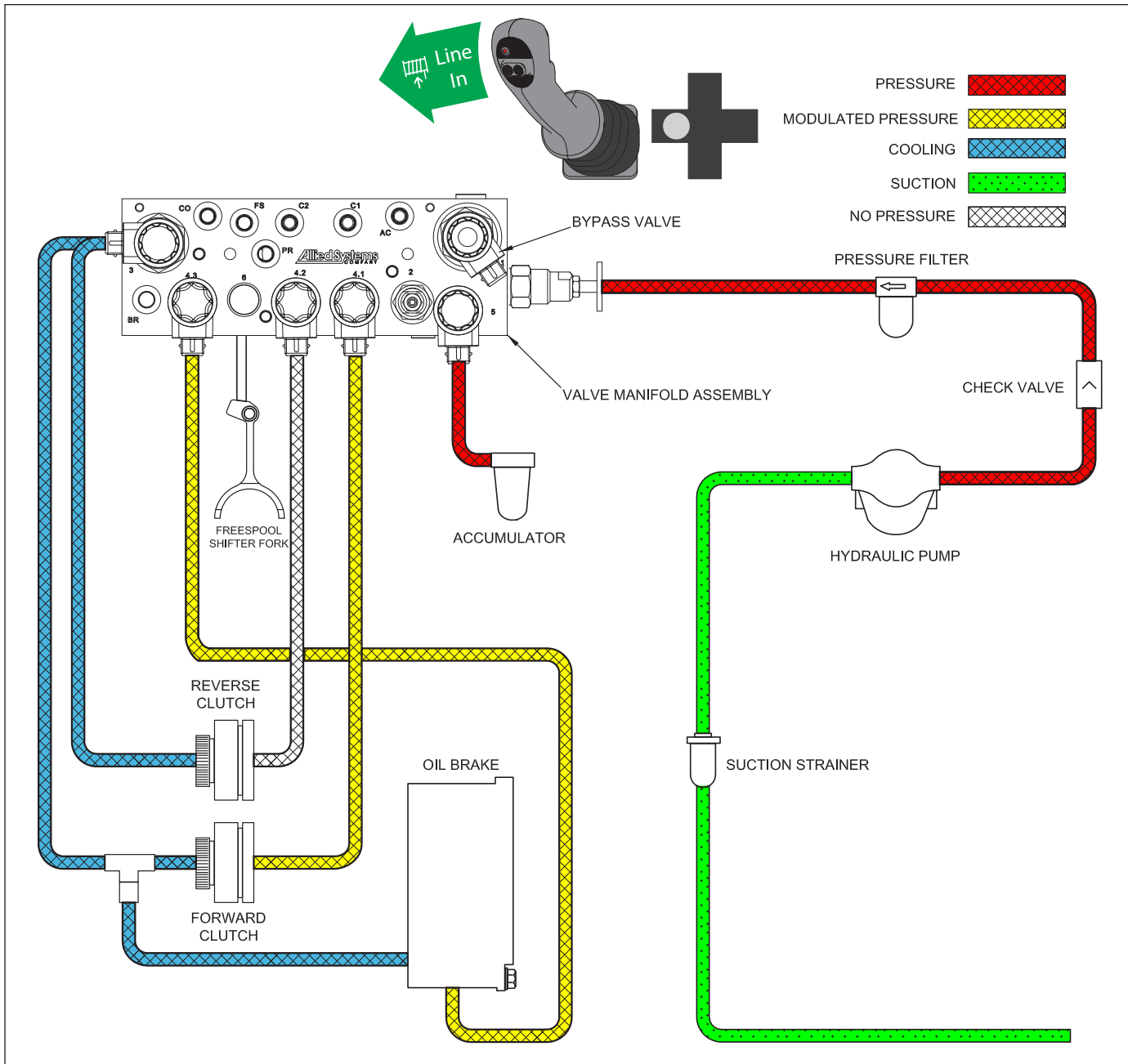
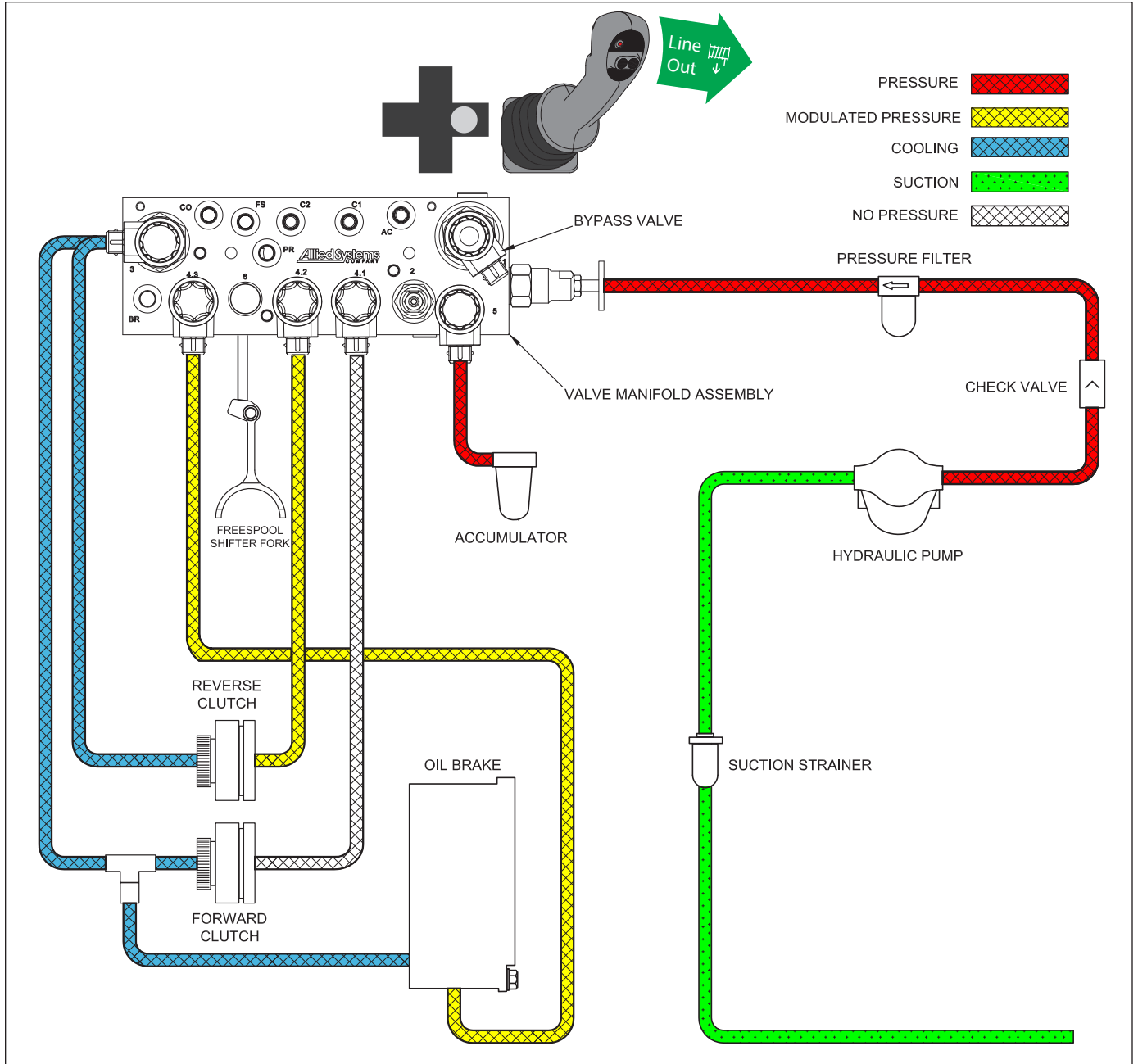


Figure 2-8 Hydraulic System, LINE-IN (Forward)

## Sequence of Operation, LINE-IN

For **LINE-IN** (forward) operation, the operator pulls to the left on the joystick, 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 joystick from the **BRAKE-ON** position). Full pressure is applied to the clutch when the joystick is in full **LINE-IN** position. Brake pressure is limited to just above brake release pressure for faster response.



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

**Sequence of Operation, LINE-OUT**

**LINE-OUT** (reverse) operation is achieved by pushing the joystick 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 joystick from the **BRAKE-ON** position). Full pressure is applied to the clutch when the joystick is in full **LINE-OUT** position. Brake pressure is limited to just above brake release pressure for faster response.

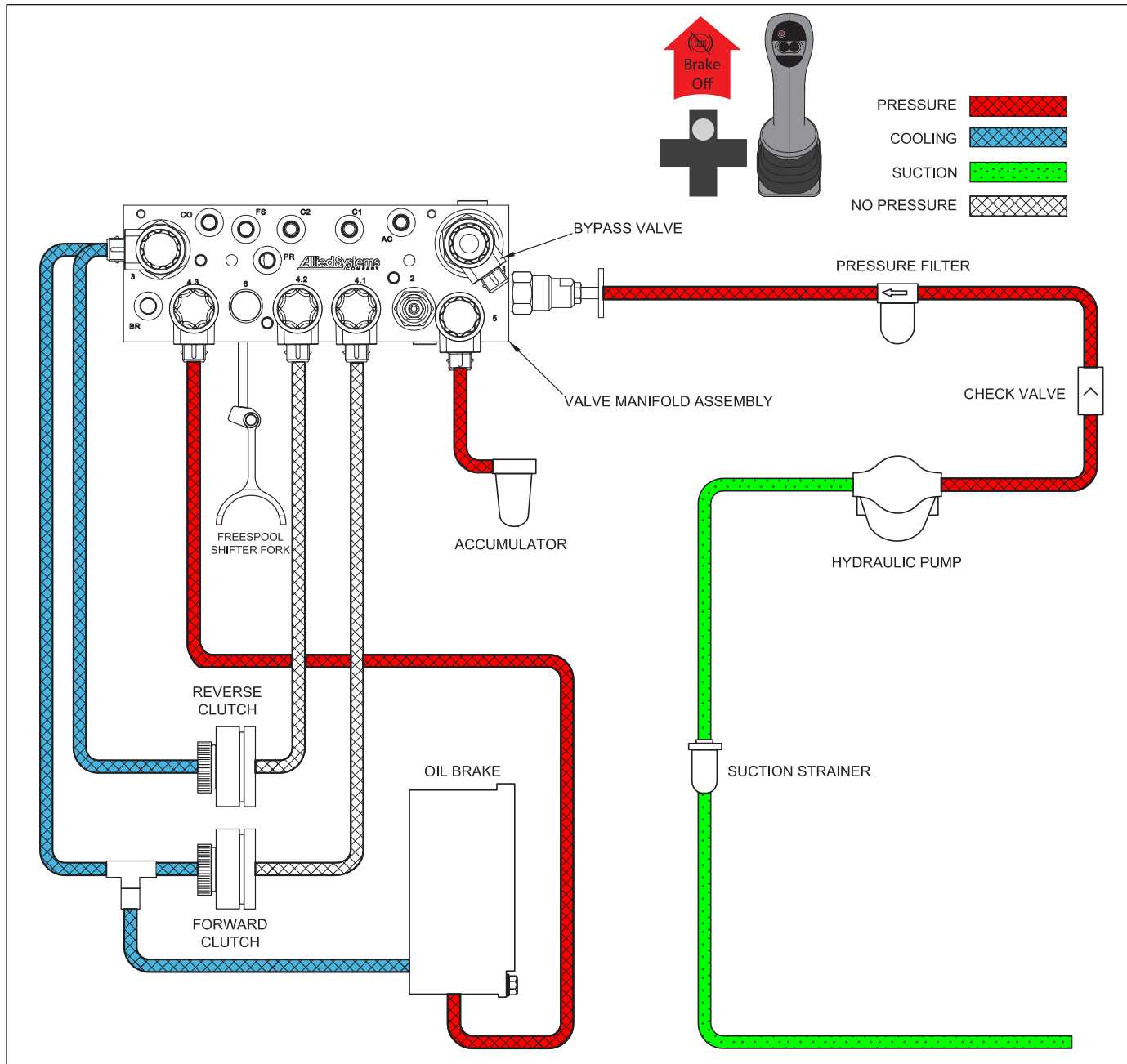
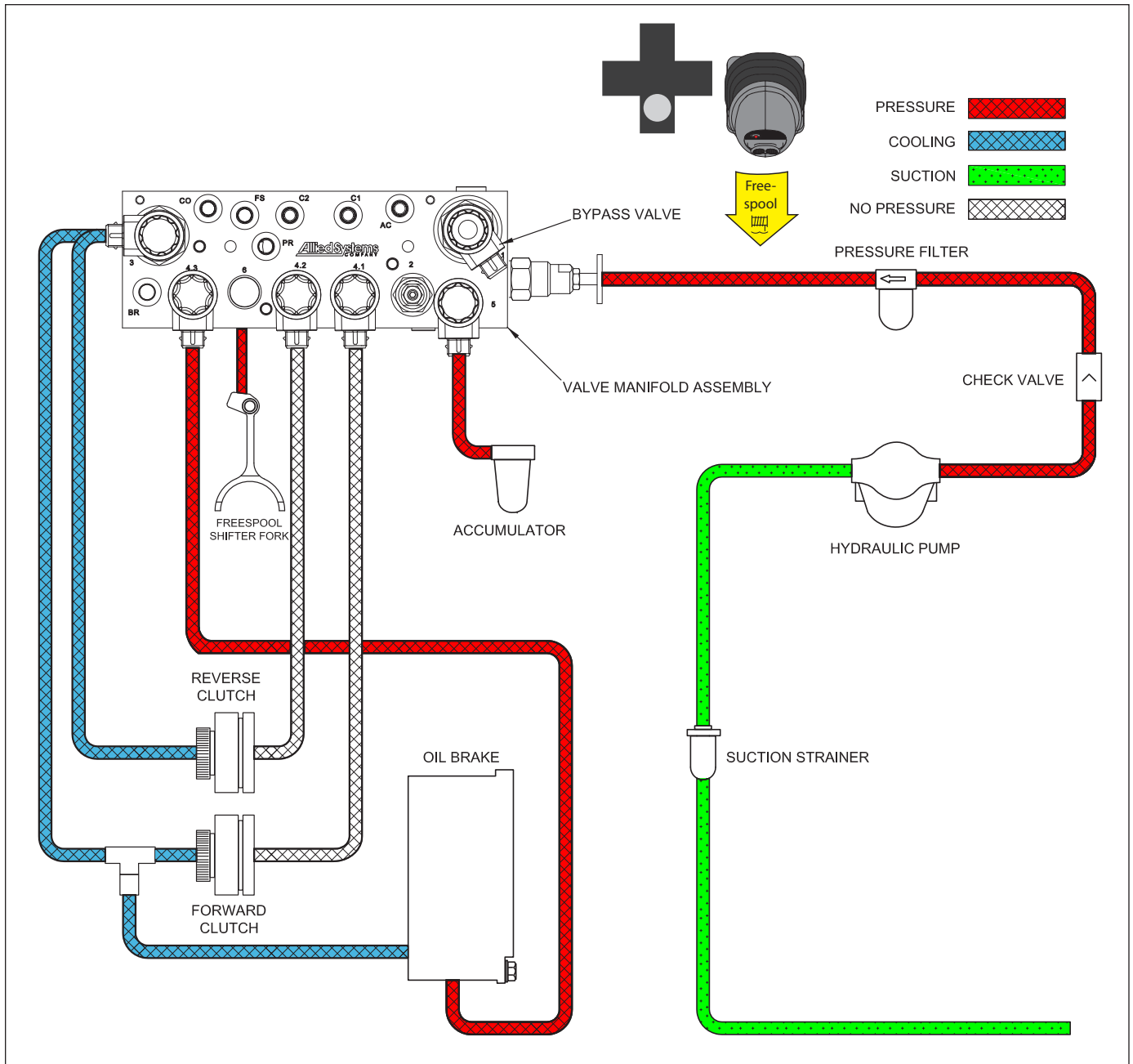


Figure 2-10 Hydraulic System, BRAKE-OFF

## Sequence of Operation, BRAKE-OFF

**BRAKE-OFF** is achieved by pushing the joystick forward from the center **BRAKE-ON** position. This position is detented and the joystick 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.



**Figure 2-11 Hydraulic System, FREESPOOL**

**Sequence of Operation, FREESPOOL**

When equipped with the **FREESPOOL** option, operation is achieved by pushing the joystick downwards from the **BRAKE-ON** position. This position is detented and the joystick must be moved manually to return it to the **BRAKE-ON** position. The bypass valve closes as the accumulator valve opens. Brake pressure increases. The freespool valve opens and supplies full pressure to the freespool shifter fork, allowing the dental clutch to disengage the drum pinion gear from the intermediate gear. The gear train is disengaged from the drum gear so wire rope can be pulled from the drum by hand.

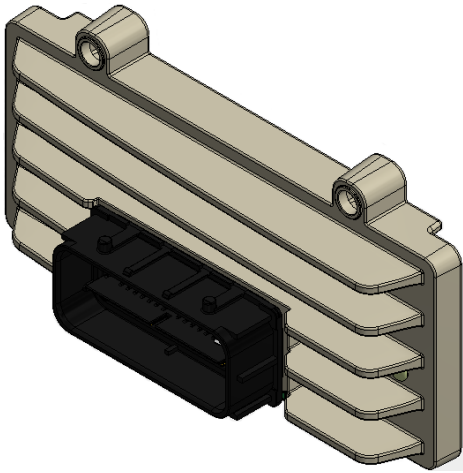
**⚠ WARNING**

**The FREESPOOL function disengages the gear train and any load that may be on the wire rope, an uncontrolled release of the load may occur. Loss of the load can result in injury and damage.**

## 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.**



## 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.



Figure 2-13 Bluetooth Adapter

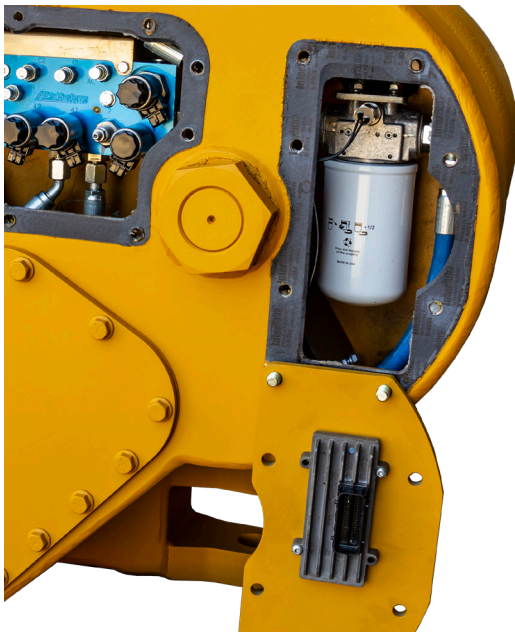


Figure 2-12 Electronic Controller Module

## 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 (Page 3-1) for further information.**

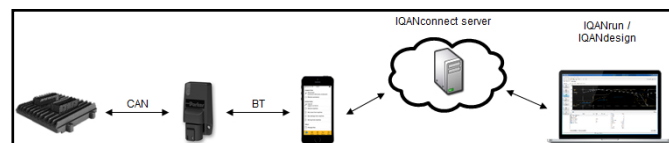


Figure 2-14 IQANgo

## 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

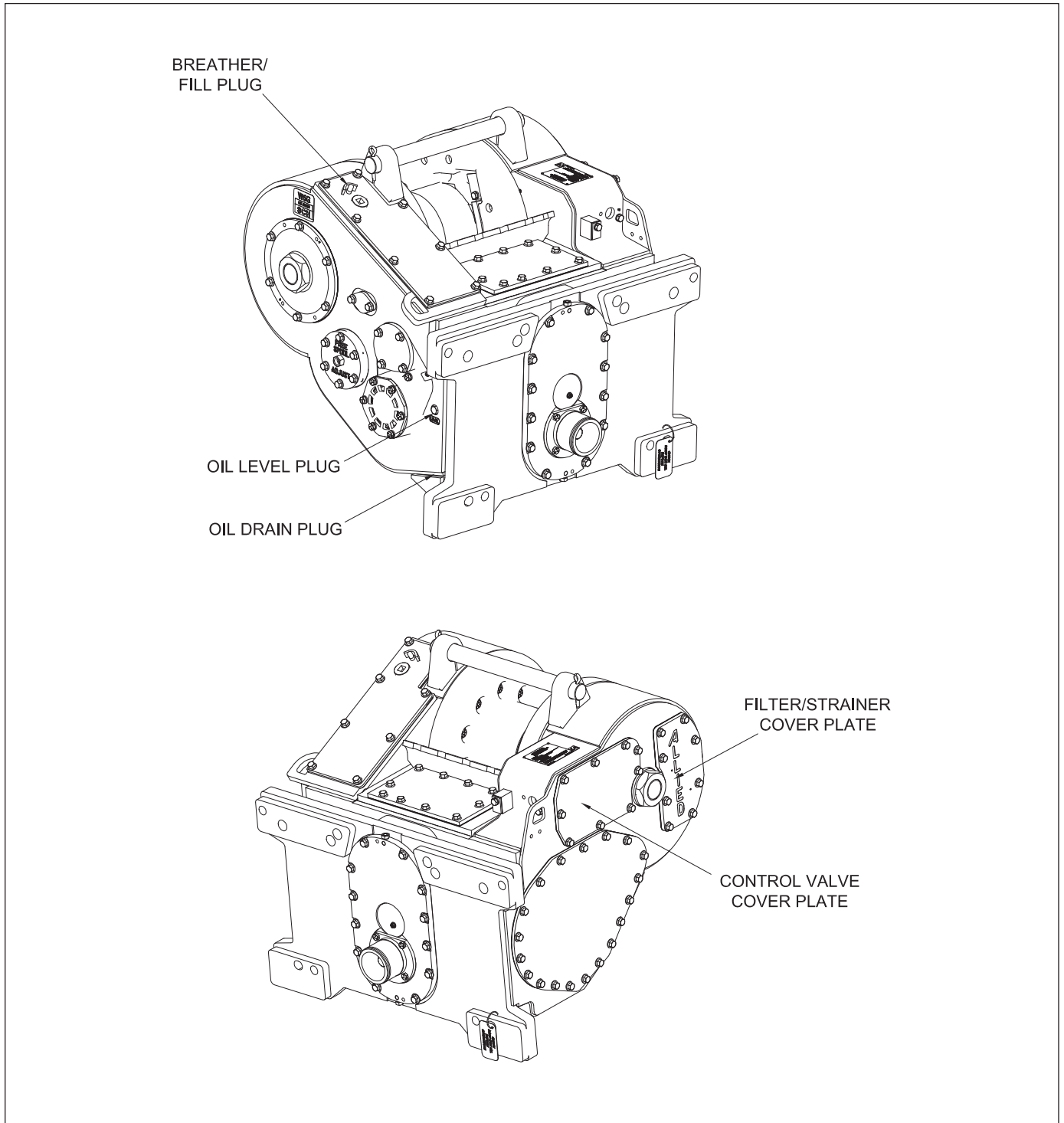


Figure 2-15 W6G Maintenance Points

## 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 at oil level plug. Add oil as necessary. Do not operate the dozer when checking the oil level.	See Figure 1-13 – Recommended Oil List.
	Clean the breather near the fill plug.	Remove debris around breather. Clean the breather with solvent if necessary.
	Lubricate the rollers on arch or fairlead assembly if the winch is equipped with either option.	Use multi-purpose grease with 2-4% molybdenum disulfide.
500 hours or every 3 months	Clean the oil suction screen and magnets.*	Tilt the dozer approximately 15° to prevent loss of oil when the cover is removed. Use a new gasket between the cover and the suction tube.
	Clean the breather near the fill plug.	Clean the breather with solvent.
	Replace the filter.*	See the Parts Manual for filter element and cover gasket. When replacing, be sure to lubricate filter sealing O-ring between element and filter head. Torque filter to 30 lbs-ft.
1000 hours or every 6 months	Change the hydraulic oil. Drain oil from plug. Clean the oil strainer. Through fill plug, add 19.5 gallons (73.8 liters) † of oil. Check the oil level oil level plug.	See Figure 1-13 – Recommended Oil List.
<p>* <b>NOTE: Clean the oil strainer screen and change the oil filter after the first 250 hours on new and rebuilt winches.</b></p> <p>† Amount of oil may vary slightly with dozer.</p>		

Figure 2-16 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 the Maintenance Schedule for the W6G winch.

## Checks During Operation

The charts in subsection of Troubleshooting 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.

**! CAUTION**

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

## Freespool Adjustment (See Figure 2-17)

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

An adjusting setscrew is located in the center of the cover for the intermediate shaft. This screw can be tightened or loosened to adjust the preload on the intermediate shaft. The jam nut will maintain the **FREESPOOL** setting. This adjustment is normally only necessary if the winch has had an overhaul.

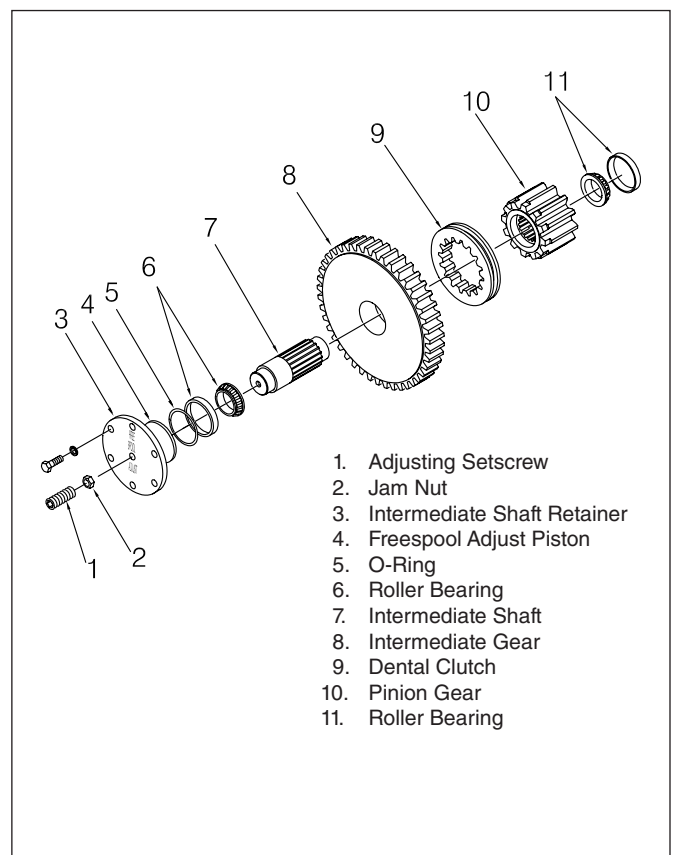


Figure 2-17 Freespool Adjustment

## 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.

### 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 2-18.

### Pressure gauges

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



Figure 2-18 Remove Control Valve Cover Plate

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

### WARNING

Place joystick 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
Pressure Relief	PR
Reverse Clutch	C2
Forward Clutch	C1
Accumulator	AC

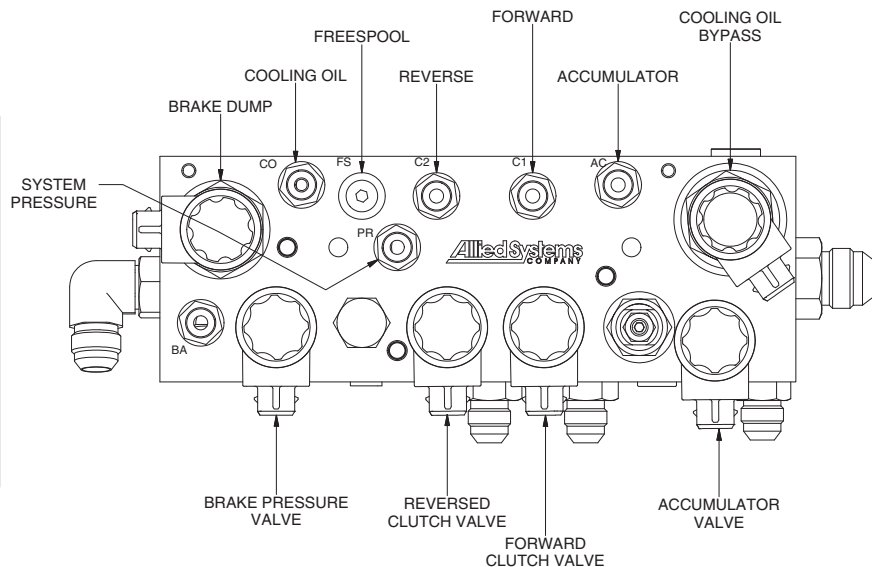


Figure 2-19 Hydraulic Gauge Port Labels

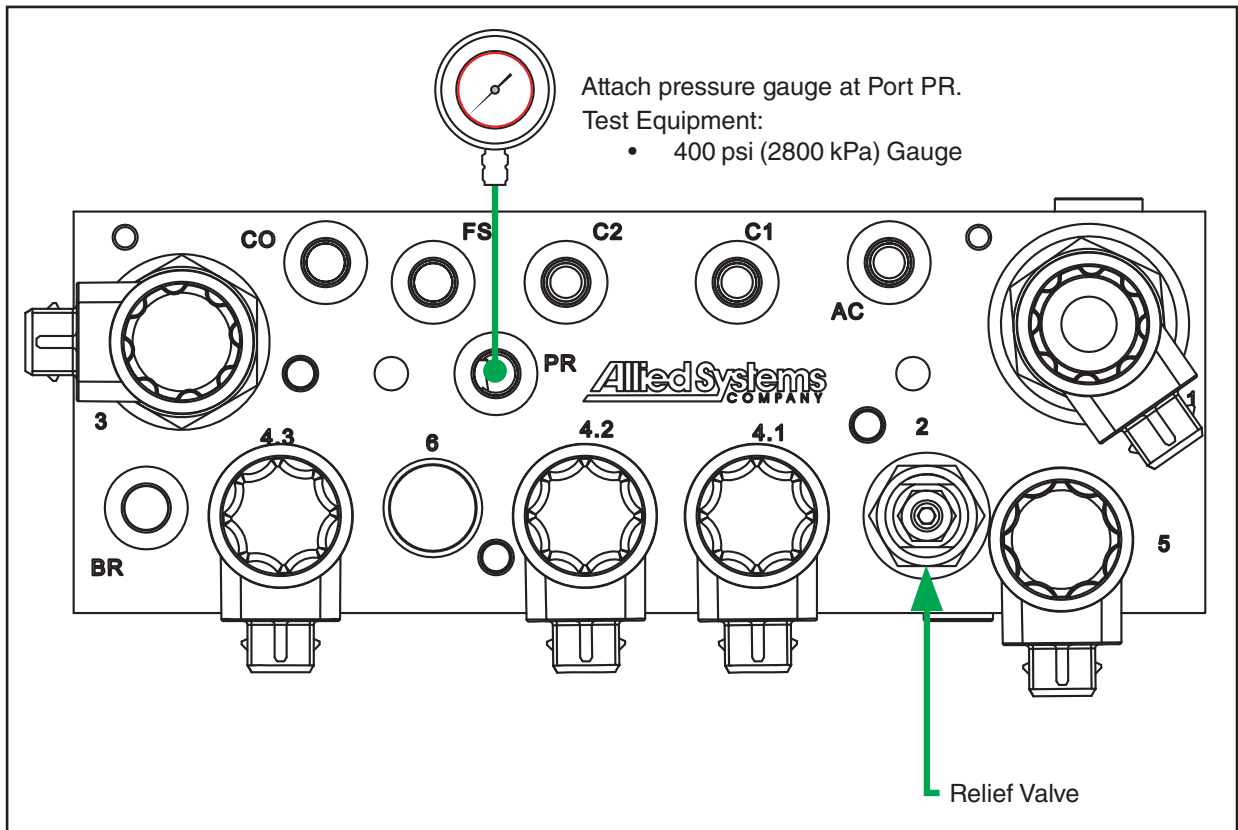
**Relief Valve and Adjustments**

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 2-18) and then identify the relief valve (see Figure 2-20).
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 2-20 Relief Valve Adjustment**

## System Pressure Test

### Test Equipment:

- 400 psi (2800 kPa) Gauge

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

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 dozer engine to a minimum of 1,000 RPM.
5. Move the joystick to the **BRAKE-OFF** position. Hold the joystick at its maximum travel position.
6. 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 2-20).
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
215 [1,482]	255 [1,758]

Figure 2-21 Hydraulic Pressure Readings

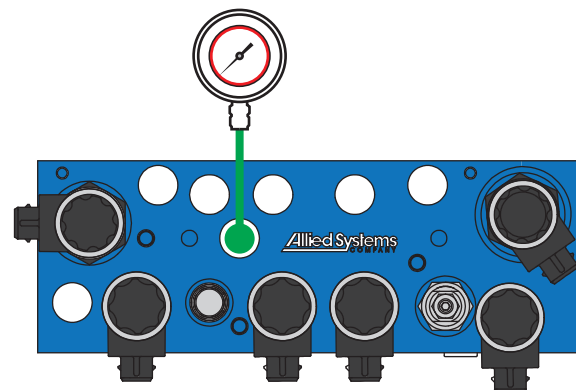


Figure 2-22 Gauge at System Pressure Port

# Brake Pressure Test

Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to brake port. See Figure 2-24.

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 dozer engine to a minimum of 1,000 RPM.
6. Move the joystick to the **BRAKE-OFF** position. Hold the joystick at its maximum travel position.
7. Check that the pressure is within the range shown in Figure 2-23.

### Troubleshooting

If the pressure observed differs from the values shown in Figure 2-23, check the following:

1. Improper setting at the relief valve (see Figure 2-20).
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.

Pressure in PSI [kPa]	
Min	Max
190 [1,310]	255 [1,758]

**Figure 2-23 Hydraulic Pressure Readings**



**Figure 2-24 Gauge at System Brake Port**

## Cooling Oil Pressure Test

### Test Equipment:

- 400 psi (2800 kPa) Gauge

Connect pressure gauge to cooling oil port. See Figure 2-26.

### 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 dozer engine to a minimum of 1,000 RPM.
6. Ensure the joystick is in the **BRAKE-ON** position.
7. Check that the pressure is within the range shown in Figure 2-25.

### 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]	150 [1,034]

Figure 2-25 Hydraulic Pressure Readings

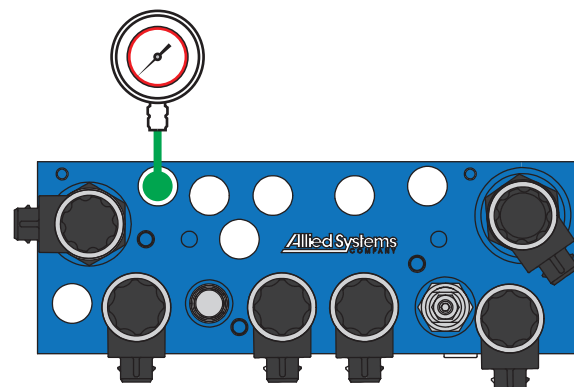


Figure 2-26 Gauge at Cooling Oil Port

## LINE-IN and LINE-OUT Pressure Test

Test Equipment:

- Two 400 psi (2800 kPa) Gauges

Connect pressure gauges to **LINE-IN** and **LINE-OUT** ports. See Figure 2-28.

Port labels:

- **C1** and **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 gauges to both ports shown.
3. Start the engine.
4. Set the dozer engine to a minimum of 1,000 RPM.
5. Place the joystick in **BRAKE-OFF** to build up the accumulator system pressure.
6. The pressure reading for both gauges should be near 0 psi.
7. Move the joystick in the **LINE-IN** position. Hold the joystick at its maximum travel position. One of the pressure gauges should indicate increased pressure.
8. Check that the pressure is within the range shown in Figure 2-27.
9. Move the joystick in the **LINE-OUT** position. Hold the joystick at its maximum travel position. The first gauge should drop back to near 0 psi, while the other pressure gauge should now indicate increased pressure.
10. Check that the pressure is within the range shown in Figure 2-27.

Pressure in PSI [kPa]	
Min	Max
190 [1,310]	255 [1,758]

Figure 2-27 Hydraulic Pressure Readings

### Troubleshooting

If either pressure observed differs from the values 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.

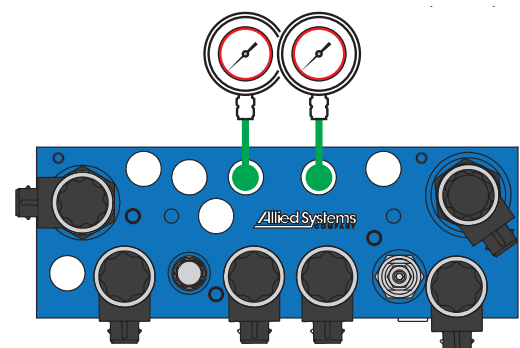


Figure 2-28 Gauges at LINE-IN & LINE-OUT Ports

## 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 in the range represented 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

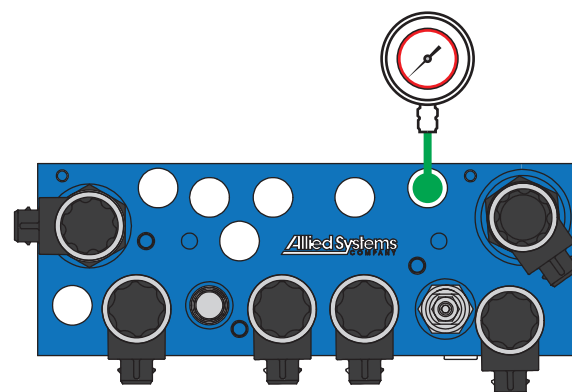


Figure 2-30 Gauge at Accumulator Port

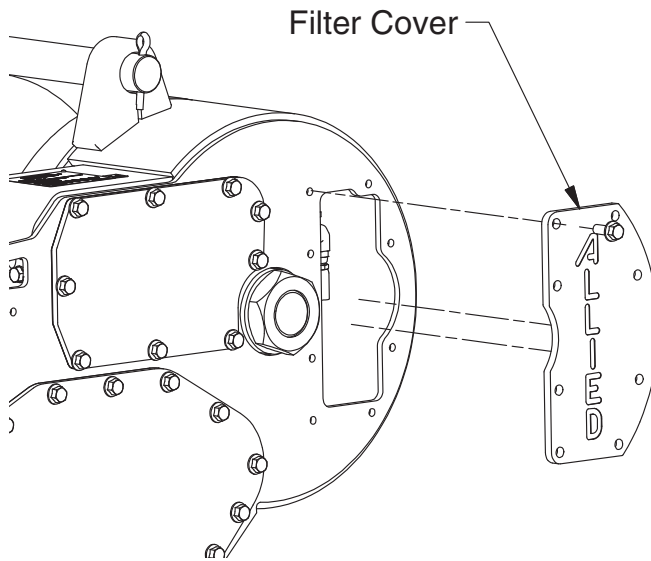
# Accumulator Recharge

## Preparation

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

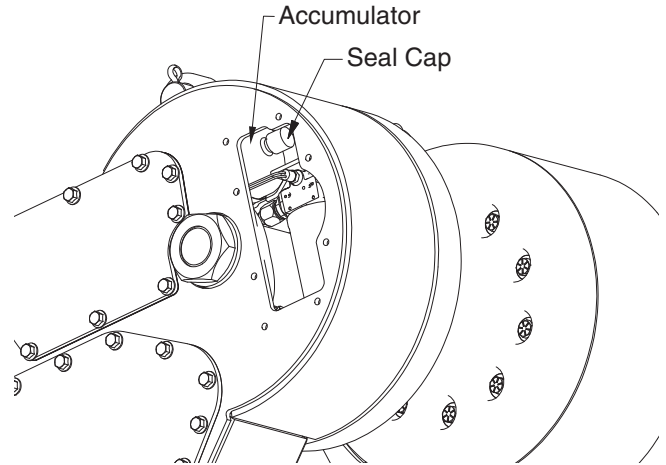
## Instructions

1. Locate the accumulator upon removing the filter cover.

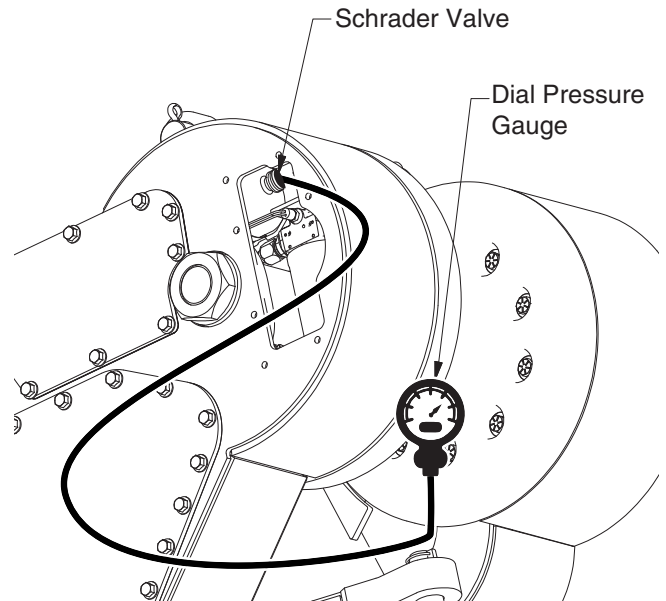
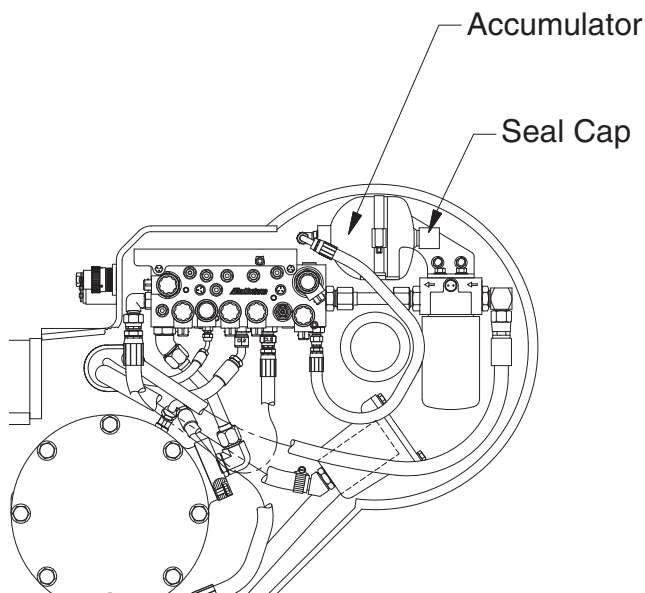


## ⚠ WARNING

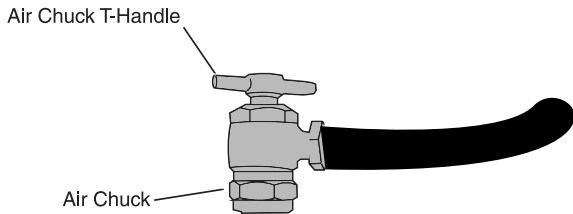
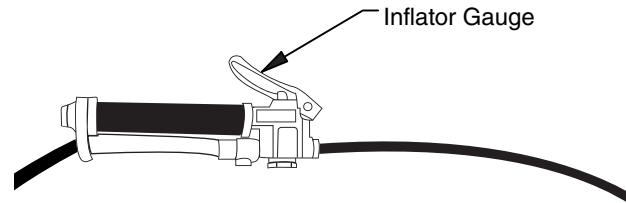
**Wear gloves and eye protection for the following steps due to a possible buildup of oil within the accumulator.**



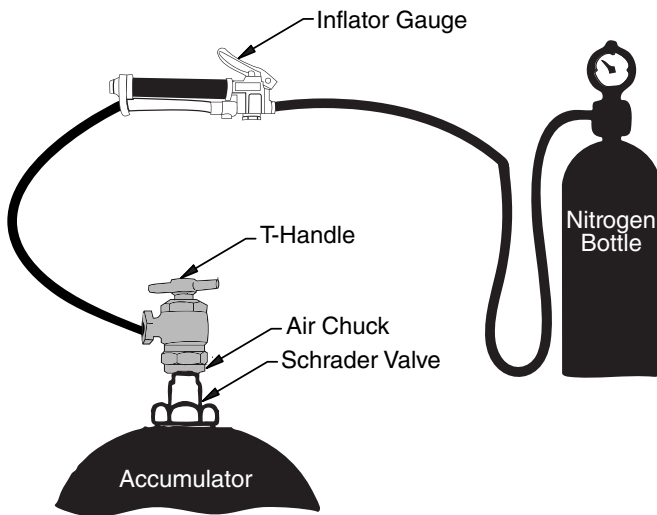
2. Remove the seal cap on the gas side of the accumulator.



3. 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 accumulator.
4. Proceed to steps 5-13 if the nitrogen level is too low.



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



6. 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.
7. Open the regulator valve on the nitrogen bottle. Use the inflator gauge to slowly fill the accumulator.
8. 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.

9. Screw the air chuck T-handle counter-clockwise to close the accumulator gas valve.
10. Unscrew the air chuck from the accumulator gas valve.
11. Refer to Step 3 and check the nitrogen pressure. It should read **[115 +/-5 psi (793 kPa)]**.
12. Remove the hose carefully.
13. Make sure the accumulator gas valve is sealing effectively upon hand-tightening the seal cap on the accumulator.

## 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 E-Controls Troubleshooting Analysis Check Chart (Figure 2-31); Troubleshooting LED codes and information for current joystick (Figure 2-32). 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 E-Controls Troubleshooting Analysis Check Chart\_1**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular.	Hydraulic oil is too cold.	Put the joystick in the <b>BRAKE-OFF</b> position. Run the engine at 1000 rpm to warm the oil before operating the winch. (See Figure 2-20).
	Low oil level.	Add hydraulic oil to the correct level.
	Low oil pressure.	See item on troubleshooting low oil pressure directly below. (See Figure 2-20).
	Wrong oil.	Drain oil and replace with correct grade. Refer to Figure 1-13, Recommended Oil List.
	Accumulator malfunction.	Check accumulator and recharge/replace as necessary.
	Dozer engine idling too low.	Increase dozer idle speed.
	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: 1. Suction hose to pump connection 2. Pump shaft seal 3. Suction filter cover and gasket 4. Suction hose for cracks or collapsed sections
Low oil pressure.	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.
	Defective or improperly adjusted oil relief valve; poppet may be stuck open.	Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective. (See Figure 2-20).
	Clogged suction strainer.	Check and clean or replace suction strainer.
	Oil brake leaking internally (indicated by low brake pressure).	Repair as required.
	Defective hydraulic pump.	Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.

Figure 2-31 E-Controls Troubleshooting Analysis Check Chart\_2

PROBLEM	POSSIBLE CAUSE	CORRECTION
Brake does not release or winch stalls during low RPM shift.	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in subsection of Service. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.
Overheating.	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Check suction filter and clean or replace.
	One or both clutches dragging.	Check by placing joystick in <b>BRAKE-OFF</b> . Normally drum will rotate slowly in either direction. If the reverse clutch is dragging, the drum will rotate in the <b>LINE-OUT</b> direction. If forward clutch is dragging the drum will rotate in the <b>LINE-IN</b> direction and it will take more than 100 lbs. of line pull to prevent drum rotation.
	Low system pressure.	Adjust accordingly.
	Low or high cooling oil pressure.	Check cooling oil pressure. Possible blocked passages. Bypass valve partially open.
	Clutch/brake shaft bearings set too tight.	Adjust accordingly.
	Excessive inching.	Avoid continuous operation in the inching zone.
	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 subsection of Service. 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.

**Figure 2-31 E-Controls Troubleshooting Analysis Check Chart\_3**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch will not operate in any function.	Control Module not powered.	Check fuse & replace if necessary.
	Joystick off-center at startup.	Return joystick to neutral position and attempt function again.
	Control module fault.	Check status indicator on module. Red LED should <b>not</b> be illuminated. If it is, consult factory.
	Coil open or shorted.	Error code on joystick indicates open or shorted circuit. Check wiring harness continuity. Replace faulty coil. <b>Note: A working coil will have 5 to 35Ω resistance and will be magnetized when energized.</b>
	Cartridge valve plugged.	Check valve for obstruction. Clean or replace as necessary.
	Loose or worn connector.	Check and replace as needed.
	Relief pressure not being reached.	Check cooling coil & cartridge - replace faulty parts.
	Activation switch off.	Check the switch and turn it off.
Forward or reverse clutch not releasing.	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators.	Replace as necessary.
	Cooling pressure too high.	Test and reset.
	Dowels out of holes.	Inspect clutch and realign dowels.
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.
	PTO stalled (0 rpm).	Increase dozer rpm.

Figure 2-31 E-Controls Troubleshooting Analysis Check Chart\_4

PROBLEM	POSSIBLE CAUSE	CORRECTION
Low forward or reverse clutch pressure.	Broken seal rings on the clutch/brake shaft.	Replace seal rings. <b>NOTE: A broken seal ring is the most common cause of a pressure differential between the two clutches.</b> 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 clutch bleed-down test on clutch circuit.
	Faulty valve or coil.	Check valve and coil for proper operation. Check coil for voltage.
Brake slipping or drum backspin on fast shift from neutral to forward.	Low brake release pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 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.
Noisy buzz emanating from winch.	Air in relief valve.	This is not a detrimental condition. Noise may be intermittent.
Winch is 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 <b>LINE-IN</b> or <b>LINE-OUT</b> .	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.

**Figure 2-31 E-Controls Troubleshooting Analysis Check Chart\_5**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch does not engage and/ or load rolls out in <b>LINE-IN</b> or <b>LINE-OUT</b> .	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.	Open or shorted coil.	<b>Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-1) for further information.</b>
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.	<b>Refer to service manual (599069w): W6G, W8L, W12E eControls (Page 2-2) for further information.</b>
Winch will not go to <b>FREESPOOL</b> function.	Intermediate gear or shaft damaged or rusted.	Adjust and repair or replace as necessary.
	Drum shaft assembly damaged, rusted or binding.	Clean or replace as necessary.
	Faulty brake or freespool valve.	Check cartridge valves and coils.
Winch goes to <b>FREESPOOL</b> function too easily.	Insufficient preload on intermediate shaft.	Tighten preload on the intermediate shaft using <b>FREESPOOL</b> drag adjustment instructions give in subsection of Service.
Winch requires too much effort to go to <b>FREESPOOL</b> function.	Too much preload on intermediate shaft.	Loosen preload on the intermediate shaft using <b>FREESPOOL</b> drag adjustment instructions give in subsection of Service.
Jumps out of gear.	Shifting fork improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Worn intermediate gear.	Replace gear.
	Pressure to FREESPOOL circuit at wrong time, winching in or out.	Verify 0 psi during winching. If pressure is present, seals on solenoid valves could be damaged, or solenoids being activated by stray voltage.
	Broken spring.	Replace spring.

## 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 2-32 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 2-32 Troubleshooting Chart for Joystick**



## 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 3-8 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 subsections of Troubleshooting 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 subsections of Service 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 joystick to the **LINE-IN** position at least three times to discharge the pressure in the accumulator.
4. Remove the control valve cover.
5. Connect slings and a crane or lifting device to the winch.

### WARNING

**Before lifting the winch, check Figure 1-16, Winch Weight, to make sure the minimum rated capacity for the slings, crane or other lifting devices exceeds the load being lifted.**

6. Drain the oil from the winch.
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.

Figure 3-1 and Figure 3-2 show the gears and components contained within the winch housing.

## General Arrangement

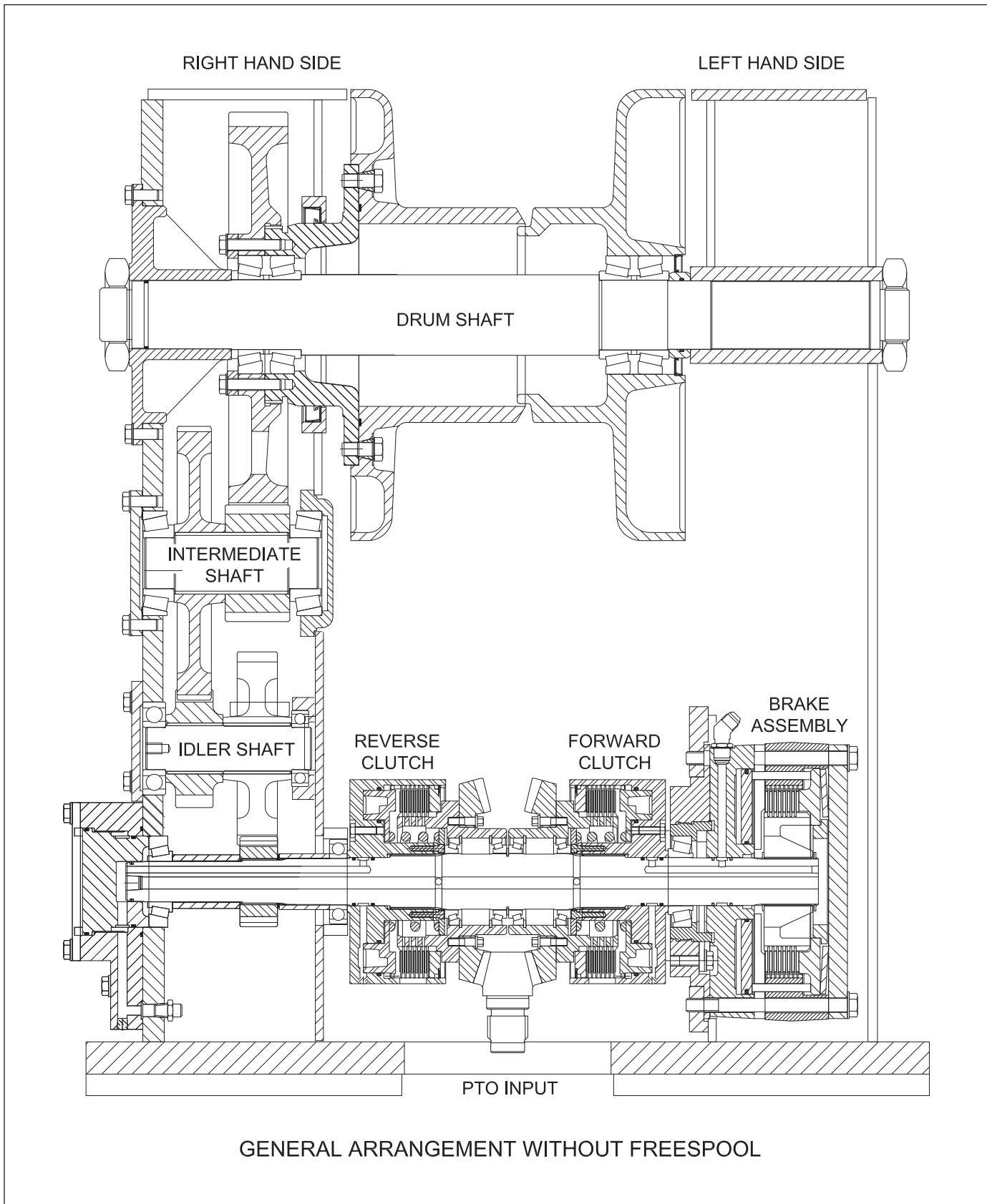


Figure 3-1 General Arrangement, Non-Freespool

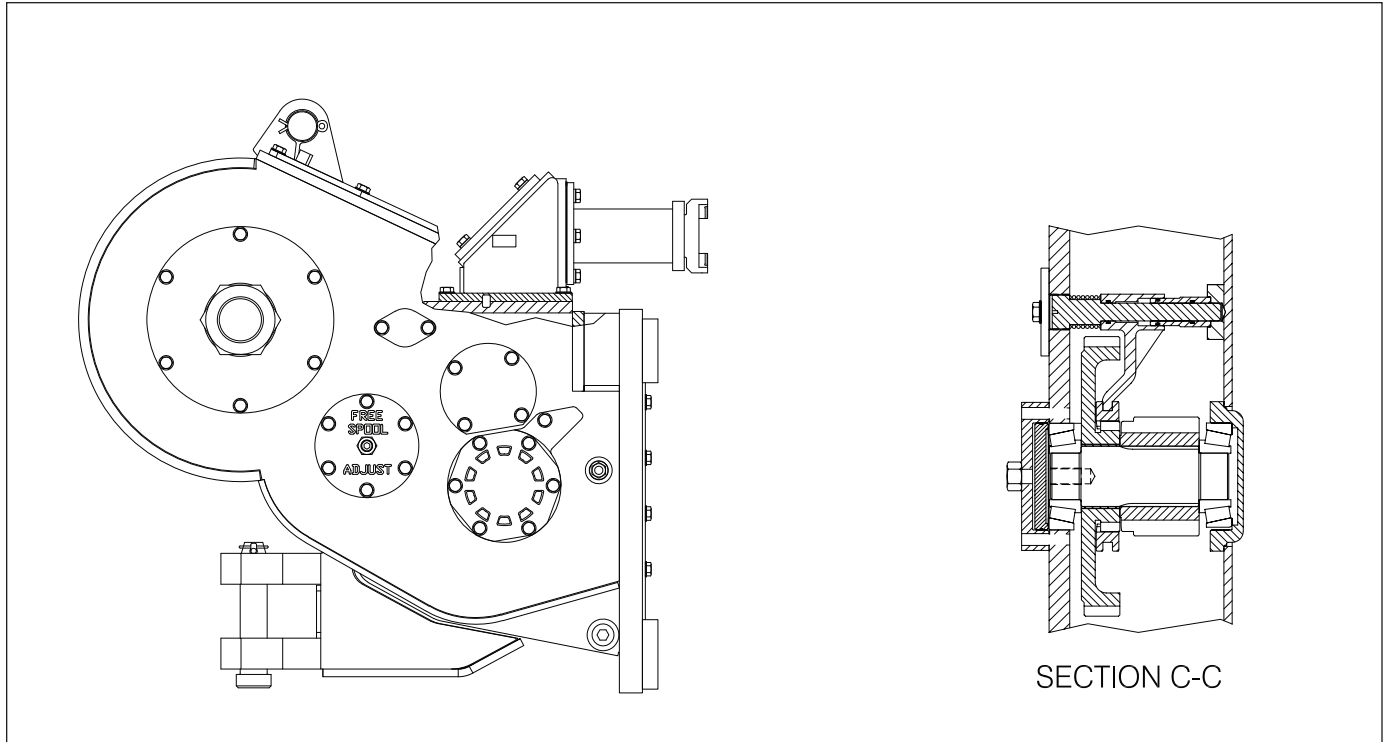


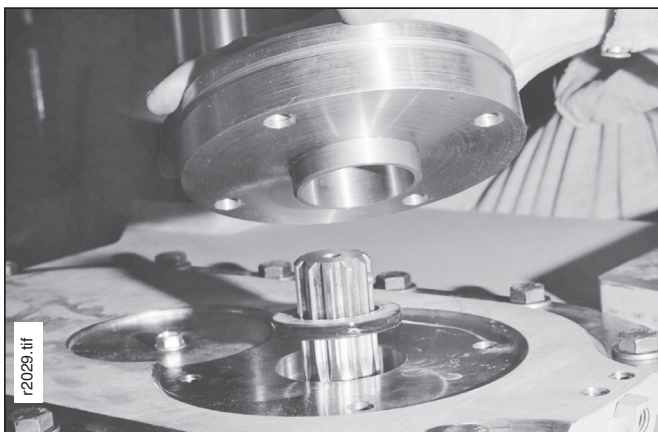
Figure 3-2 Freespool Arrangement

### Input Carrier and PTO Removal and Disassembly

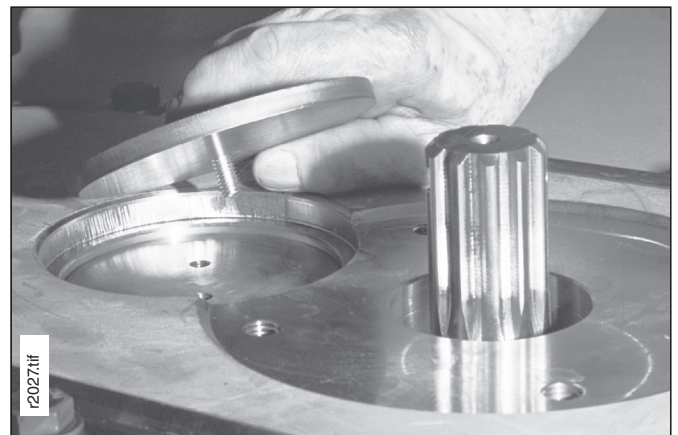
**NOTE:** Photographs for the input carrier disassembly in this section are meant for reference only. Please refer to Figure 3-3 to Figure 3-5 for the specific configuration for your dozer.

Before removing the input carrier assembly, the winch must be removed from the dozer as explained in **Winch Removal**.

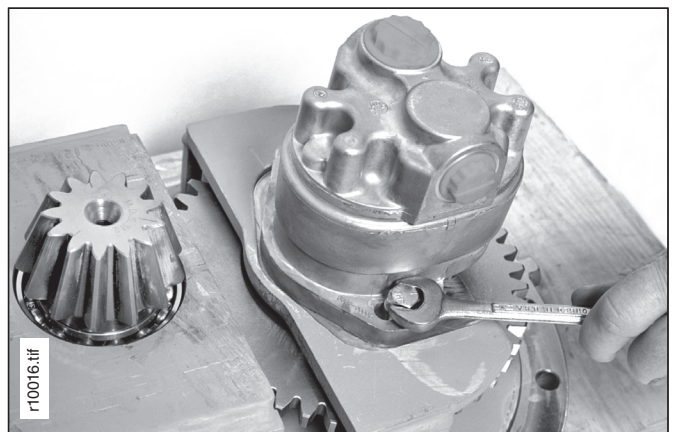
1. Remove capscrews and remove the input carrier assembly from winch using an appropriate lifting device.
2. Remove PTO pilot and seal from input carrier.



3. Remove bevel pinion keeper.

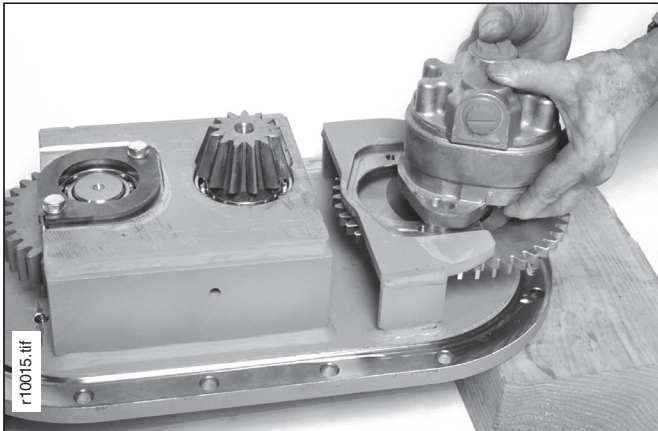


4. Disconnect hydraulic connections to pump.



# Repairs - Input Carrier and PTO Disassembly

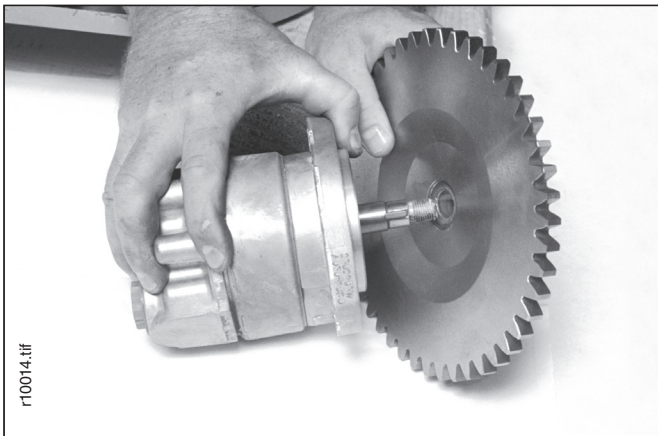
5. Remove pump and pump gear.



8. Remove bearing in pinion bearing adjuster.



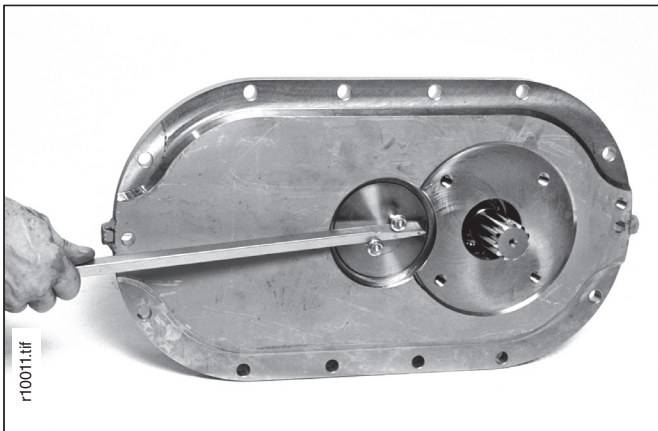
6. Remove pump from pump gear.



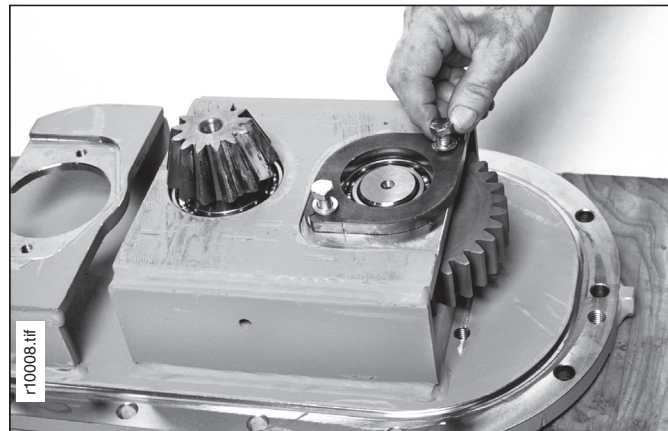
9. Remove and discard O-rings from pinion bearing adjuster.



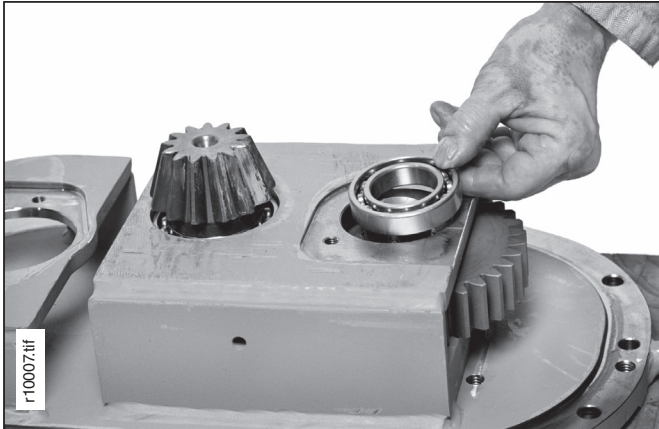
7. Insert two 3/8 UNC capscrews into holes on face of bearing adjuster. Place a metal bar between the two capscrews as shown in picture and turn counterclockwise to remove adjuster.



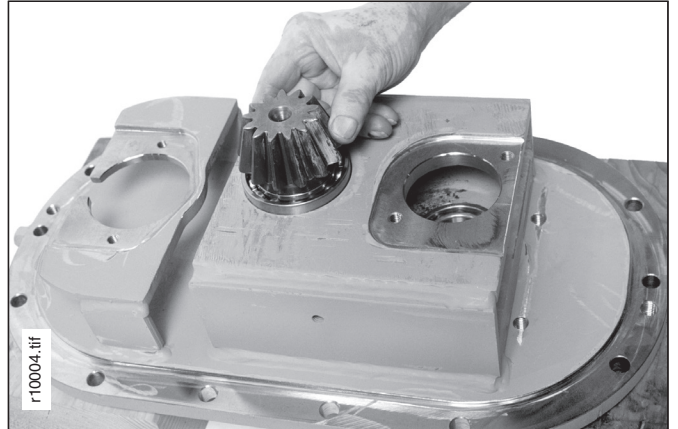
10. Remove the bearing retainer.



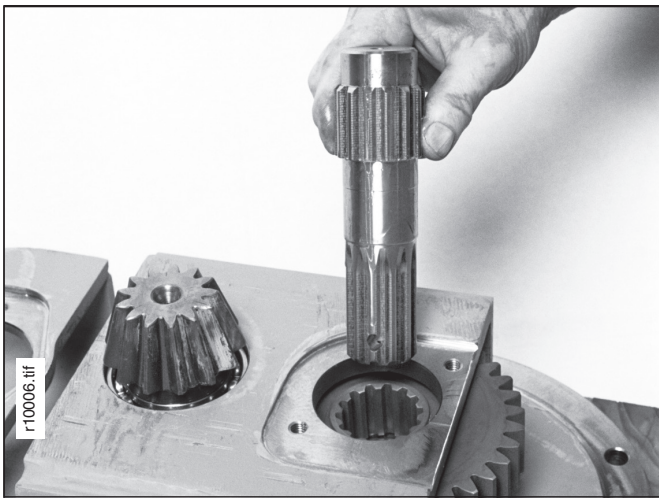
11. Remove bearing from input shaft.



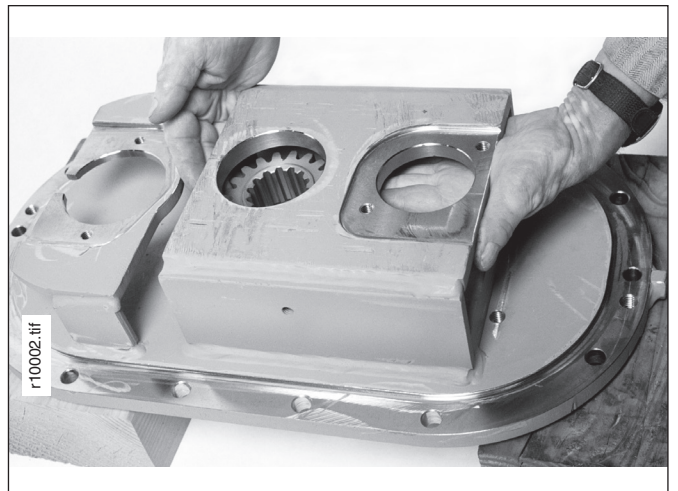
14. Remove bevel pinion gear and bearing.



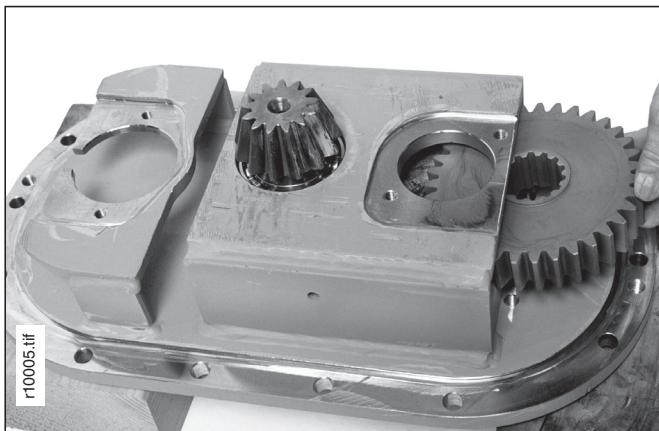
12. Remove input shaft.



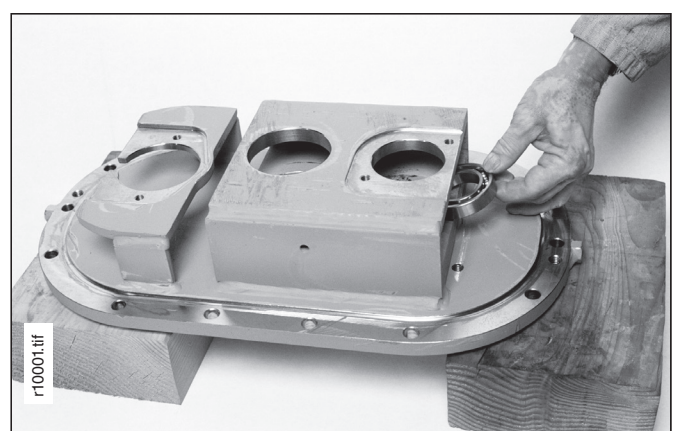
15. Remove pinion shaft gear.

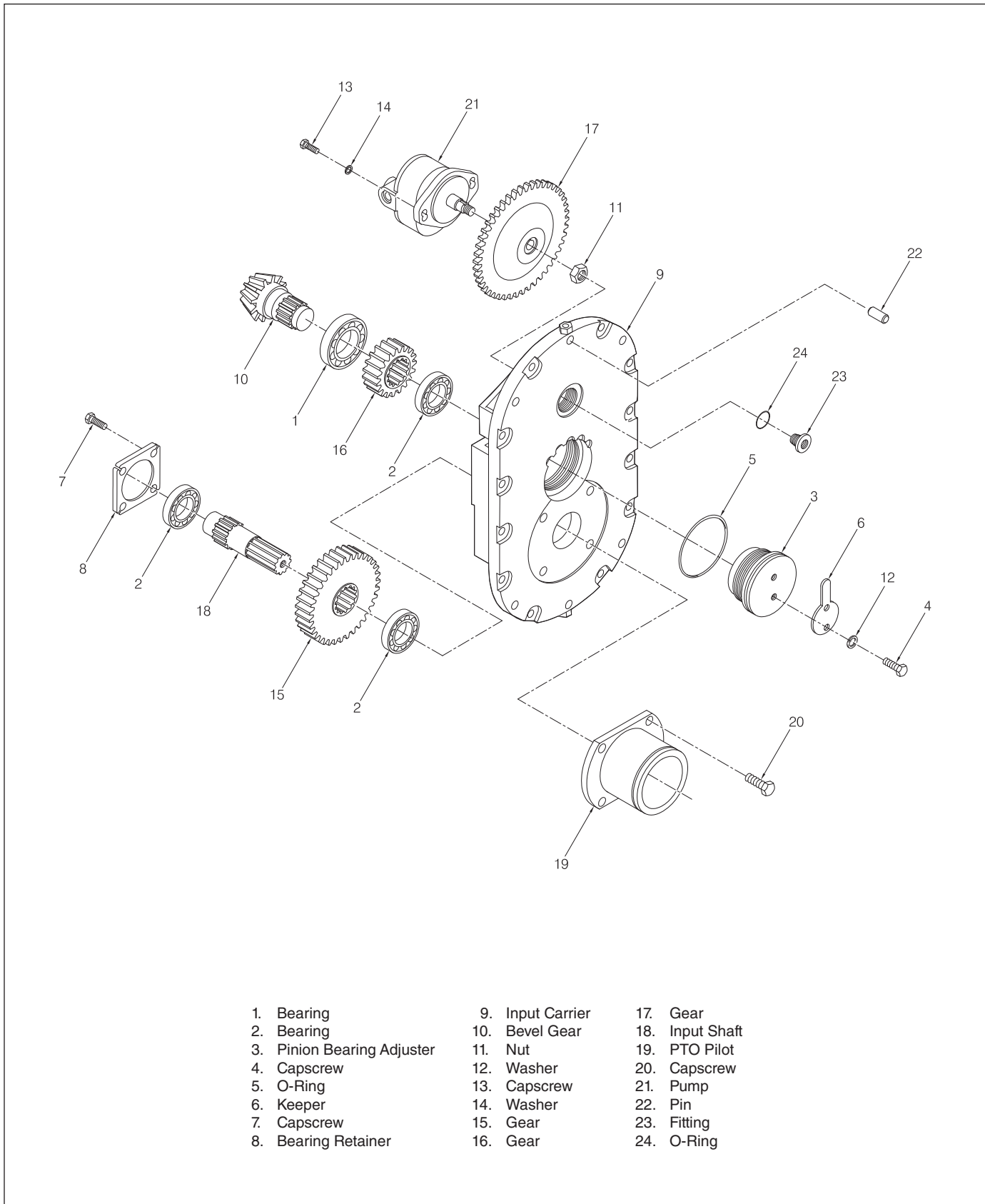


13. Remove input shaft gear.

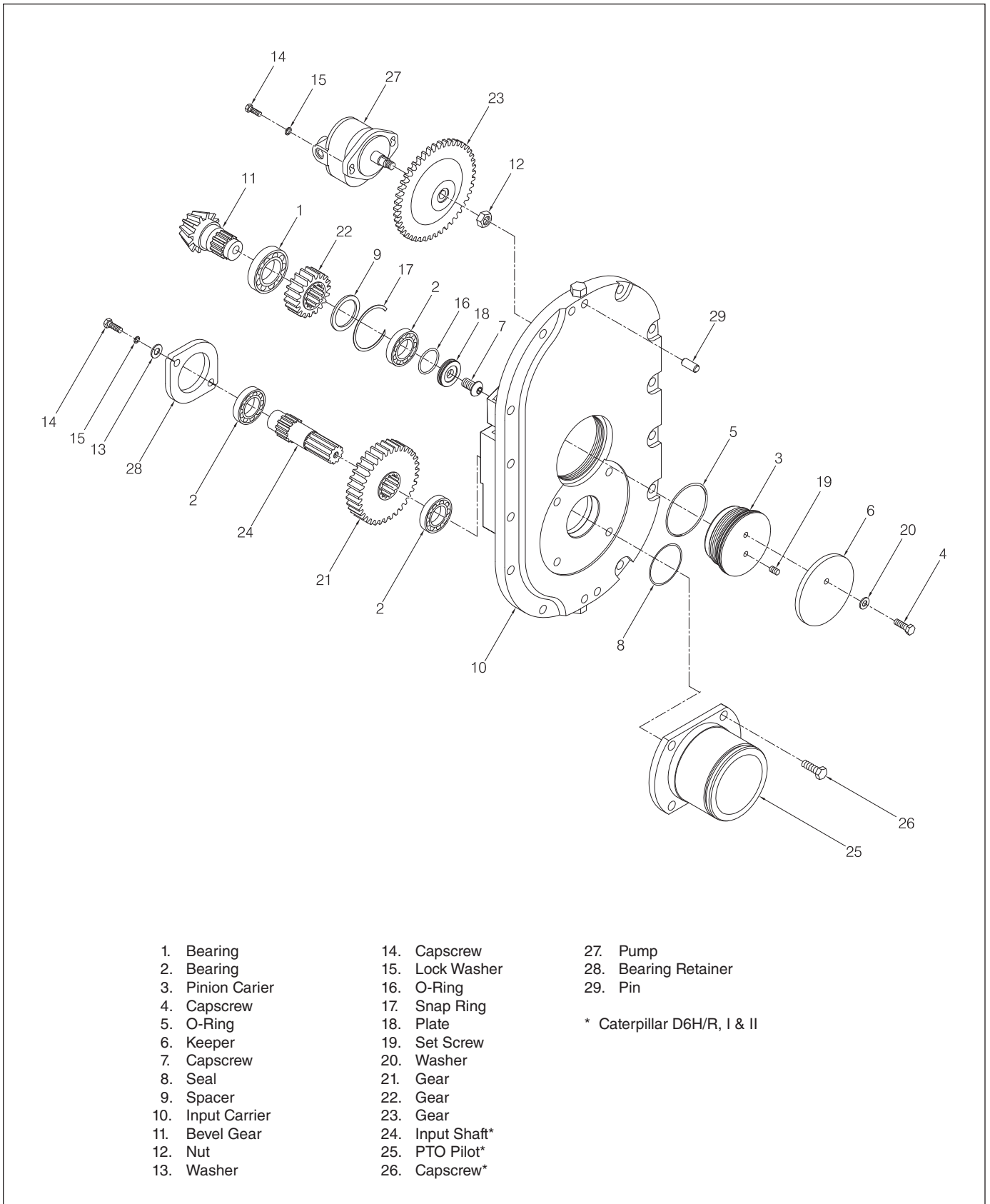


16. Remove ball bearing.





**Figure 3-3 Input Carrier Arrangement for Caterpillar D6R Series II**



**Figure 3-4 Input Carrier Arrangement for Caterpillar D6R Series II**

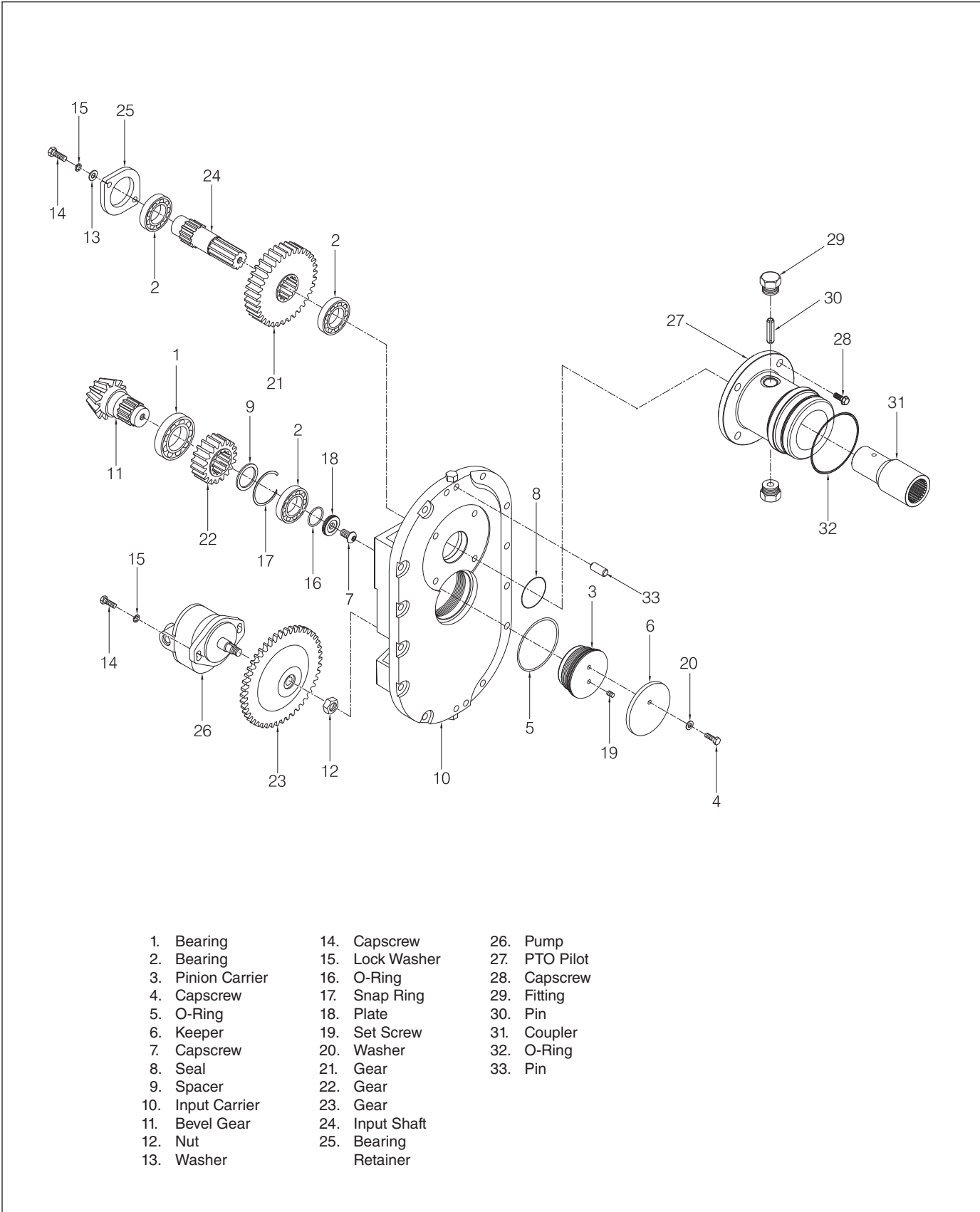
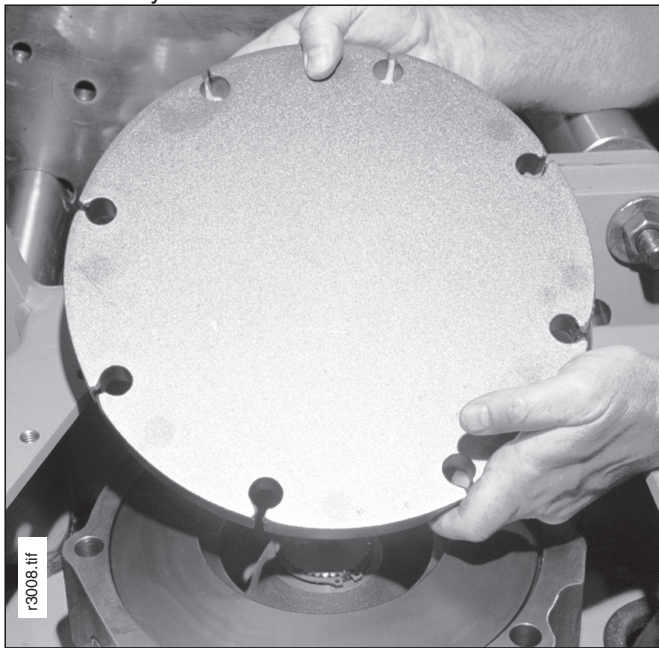


Figure 3-5 Input Carrier Arrangement for Caterpillar D6N

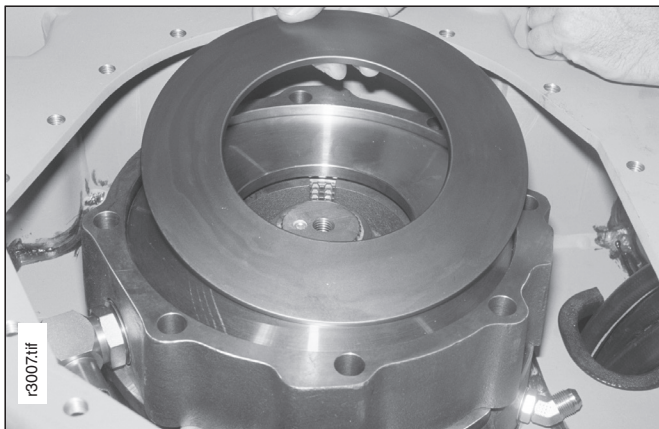
## Oil Brake Removal & Disassembly

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 3-8.

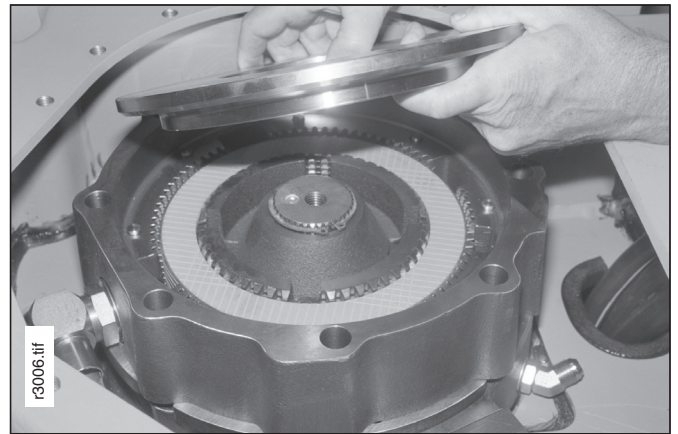
1. Drain oil from winch or position winch with left-hand side up. Remove brake cover plate.
2. Loosen the capscrews evenly, then remove the brake assembly cover.



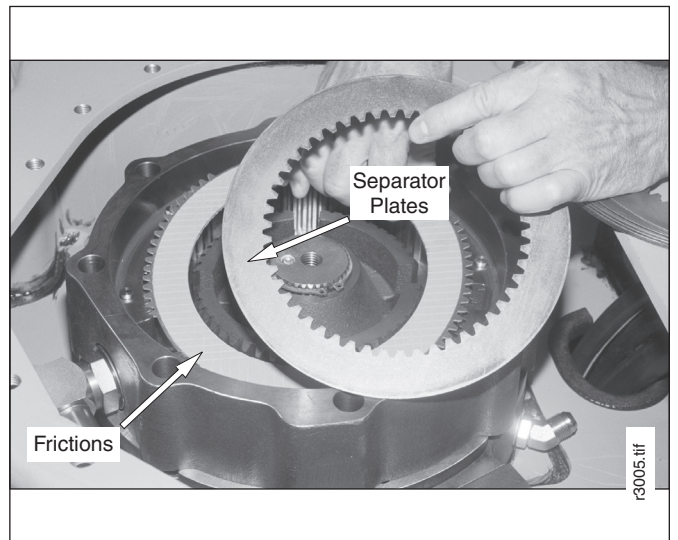
3. Remove bellville spring and stroke limiter (if applicable) from brake cage assembly.



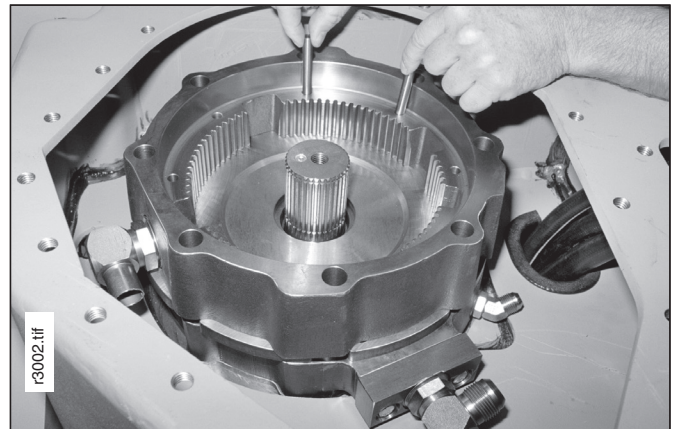
4. Remove thrust ring.



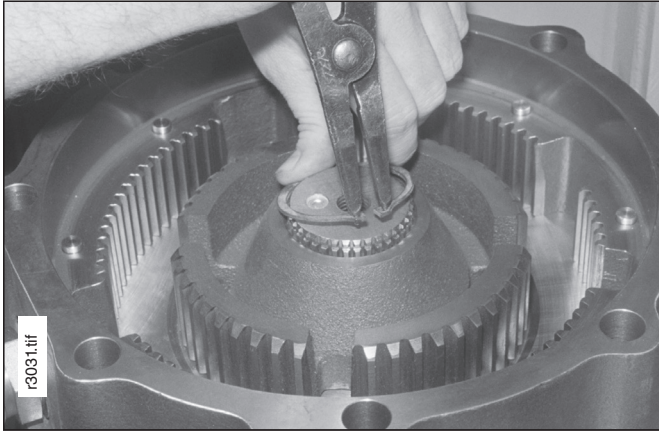
5. Remove friction discs and separator plates from the hub.



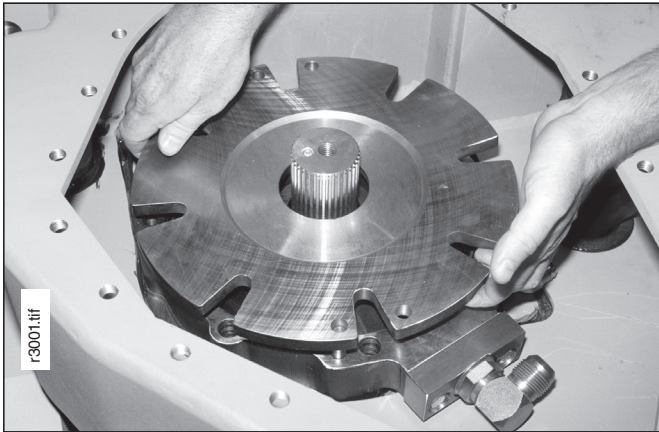
6. Remove thrust pins and cage. It may be necessary to tap cage with a soft hammer to loosen it.



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



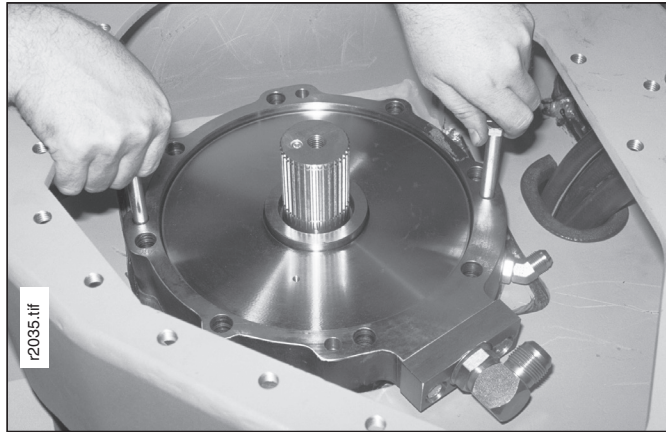
8. Remove pressure plate.



9. Remove seal rings from clutch shaft.



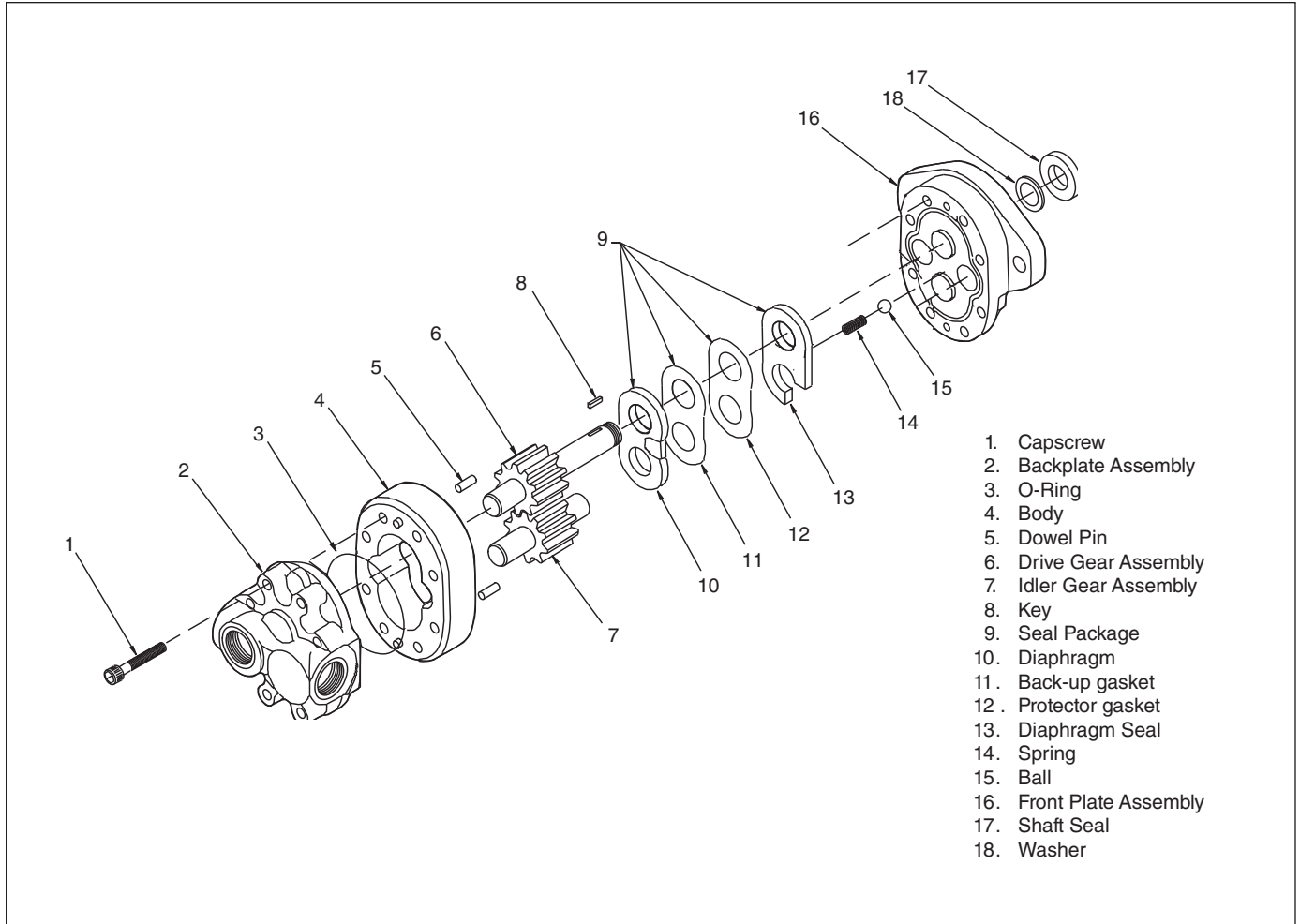
10. Remove the piston housing from winch case using two 1/2 UNC x 4-1/2 capscrews to lift housing out.



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

12. Remove two O-rings from the piston. Discard O-rings. Inspect all oil brake components as specified in Figure 3-8.





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

**Figure 3-6 Hydraulic Pump**

## Hydraulic Pump Removal & Disassembly

To remove the hydraulic pump, the winch must be removed from the dozer and the input carrier must be removed (see **Input Carrier and PTO Removal and Disassembly**). Cleanliness is extremely important when repairing these pumps. Work in a clean area.

### Pump Disassembly

1. Clean the pump thoroughly with solvent, kerosene, or other non-corrosive cleaning fluid which will not affect rubber components.
2. Clamp pump in vise, shaft down.
3. Scribe a line across the three sections of the pump to act as a guide in reassembly.
4. Remove capscrews.
5. Remove from vise. Hold pump in hands and bump shaft against wooden block to separate front plate (16) from backplate (2). Body (4) will remain with either front plate or backplate.
6. To separate body from section that remains, place drive gear (6) in bearing and tap protruding end with plastic hammer.
7. Remove O-ring (3) from backplate assembly.
8. Remove diaphragm (10) from front plate by prying with O-ring pick.
9. Remove spring (14) and balls (15) from front plate.
10. Remove diaphragm seal (13) and shaft seal (17) from front plate.

## Pump Inspection

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

## Pump Gear

1. Inspect drive gear shaft (6) for broken keyway.
2. Inspect all bearing points for excessive wear and rough surfaces.
3. Replace gear assembly if shafts measure less than .6580 in (17.40 mm) in bearing area.
4. Inspect gear face for scoring and excessive wear.
5. Assure that snap rings are in grooves on either side of drive and idler gears.
6. If edge of gear teeth are sharp, dull with emery cloth.

## Pump Front and Backplates

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

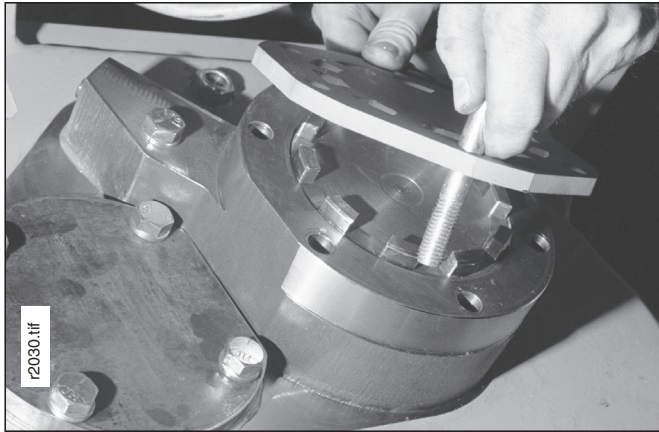
## Pump Body

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

## Clutch Shaft Removal & Disassembly

Figure 3-1 shows the location of clutch shaft components. Prior to removal of the clutch shaft, perform the following:

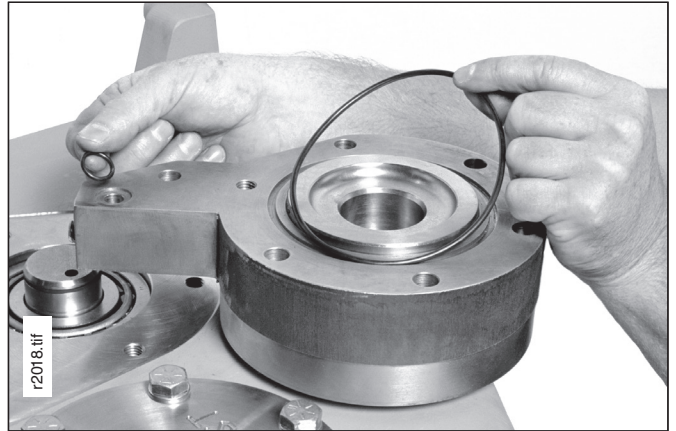
- a) Drain oil from winch.
  - b) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section, steps 1 through 10.
  - c) If equipped with freespool option, remove freespool shifter shaft and fork.
1. Remove right-hand bearing retainer keeper.



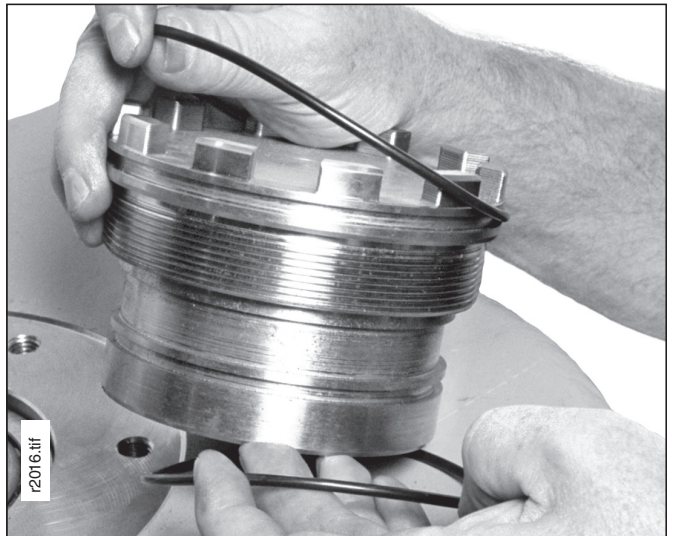
2. Remove the right-hand bearing retainer and bearing adjuster.



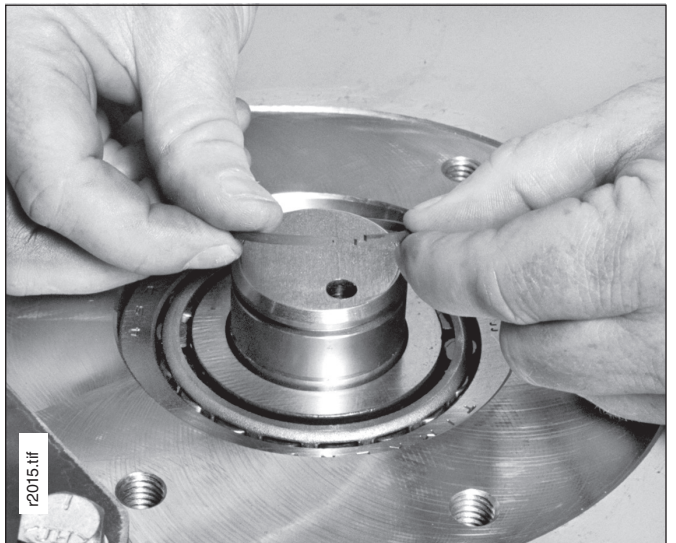
3. Remove and discard O-rings on bottom end of bearing retainer.



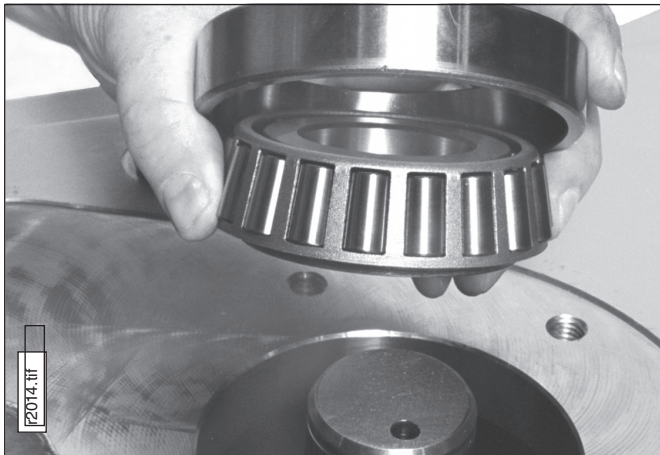
4. Remove bearing adjuster from bearing retainer. Remove and discard O-rings.



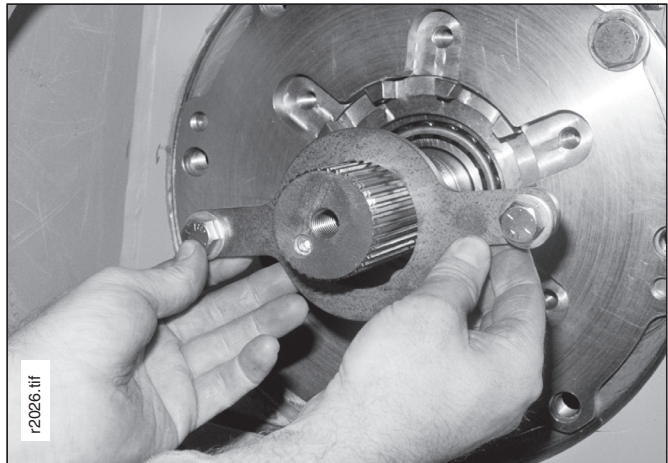
5. Remove seal ring from clutch shaft.



6. Remove bearing cup and cone.



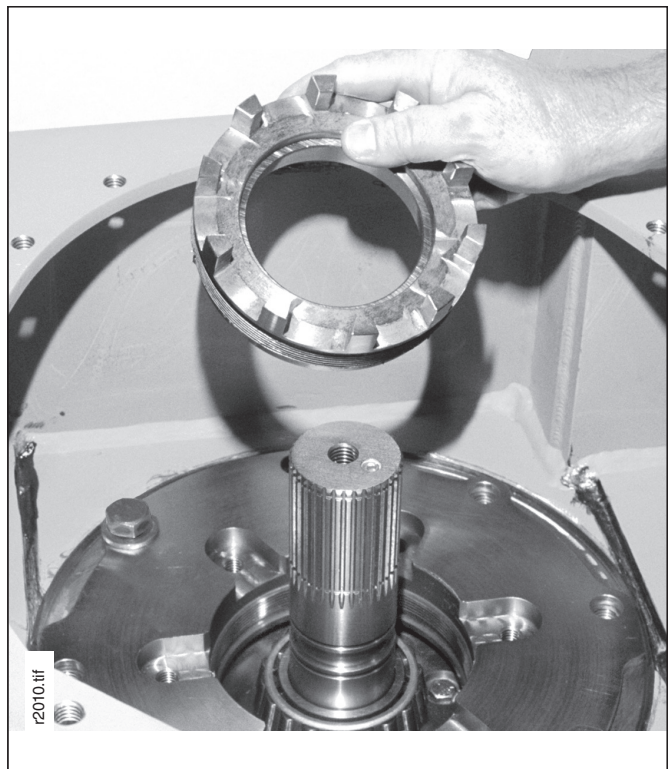
9. Remove left-hand bearing adjustment retainer.



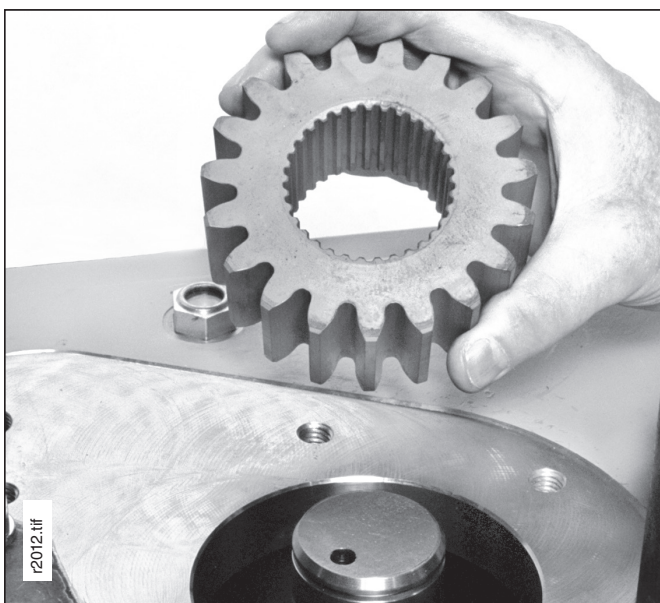
7. Remove spacer.



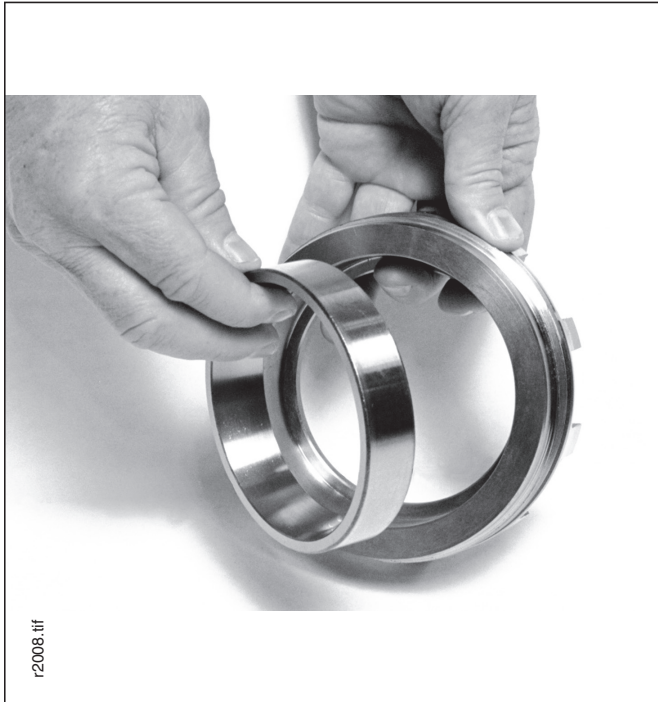
10. Remove left-hand bearing adjuster.



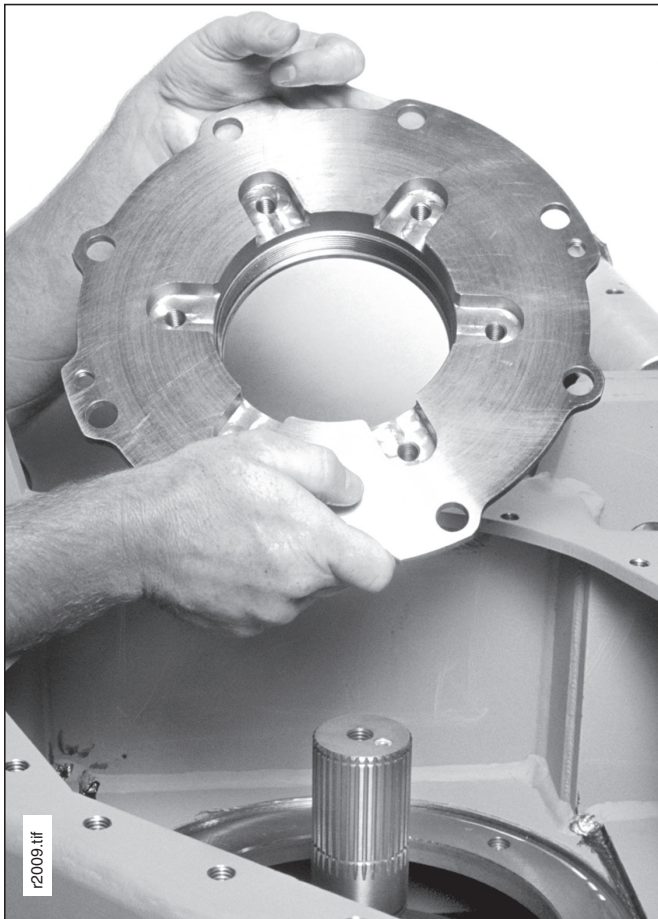
8. Remove clutch shaft gear.



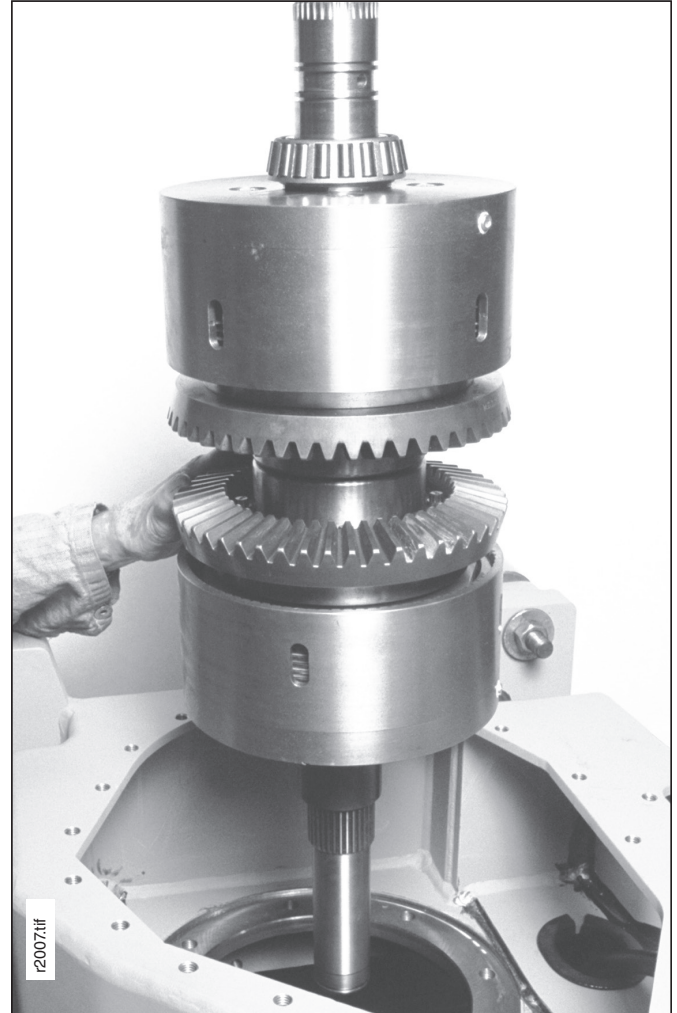
11. Remove bearing race from bearing adjuster.



12. Remove left-hand bearing retainer.



13. Using crane, remove entire clutch shaft from left-hand side of winch.



14. Remove spacer from clutch shaft.



16. Remove bearing cone, clutch assembly cap screws and clutch assembly.



15. Remove snap ring from clutch shaft.



17. Remove clutch hub.

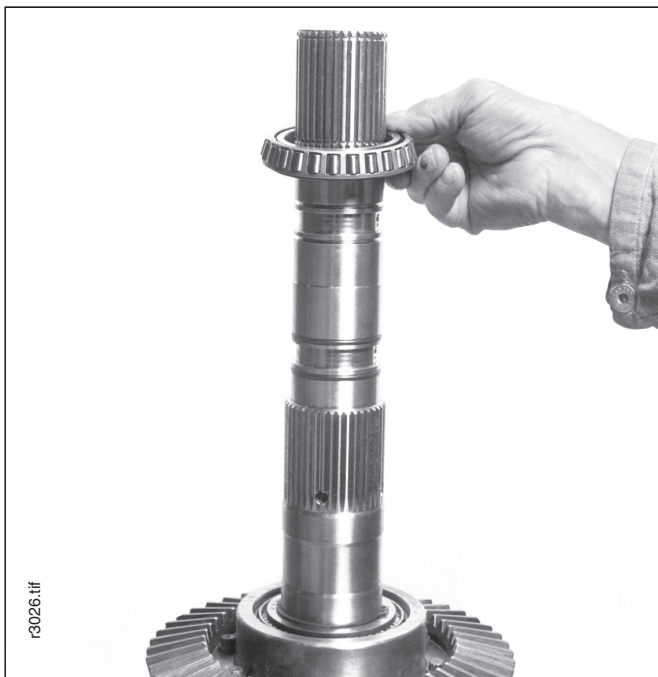


19. Remove shims or spacers.



**NOTE: Older clutch shafts may use a snap ring instead of spacers or shims.**

18. Remove bearing cone.



20. Remove clutch shaft, then remove bearing cone from clutch hub. Remove clutch hub and second clutch. A spacer and a roller bearing will be left.



## 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** subsection.

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

1. Remove the capscrews from the clutch.



2. Turn clutch assembly over, and remove clutch hub assembly.



3. Remove bearing cone from clutch assembly.



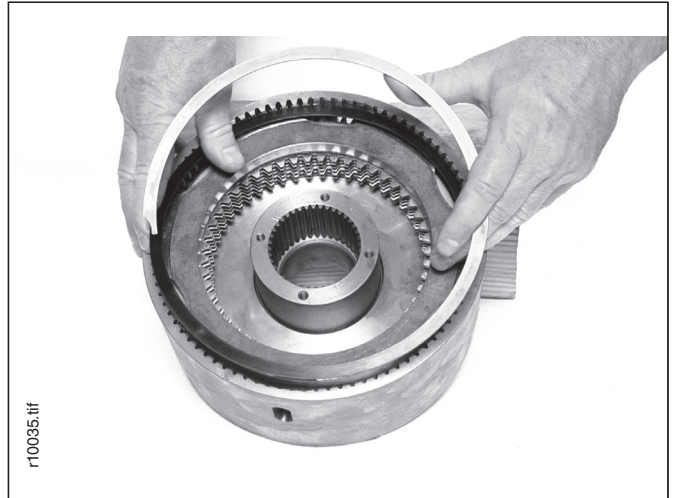
4. Remove the capscrews and ring gear from the clutch hub assembly.



5. Remove bearing bearing cup and cone from each end of clutch hub.



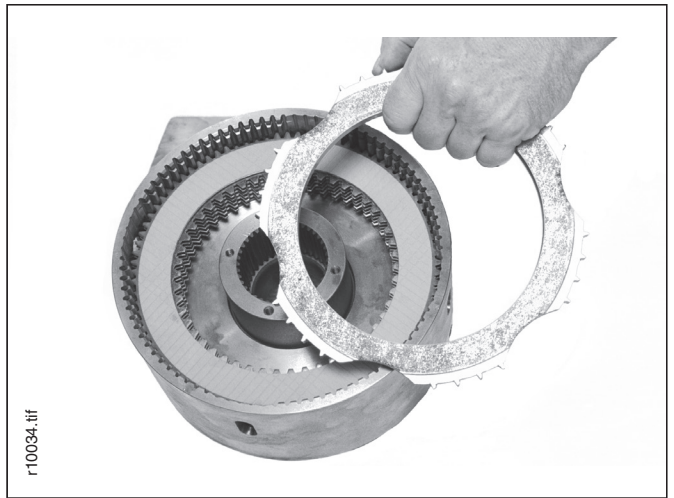
8. Remove snap ring.



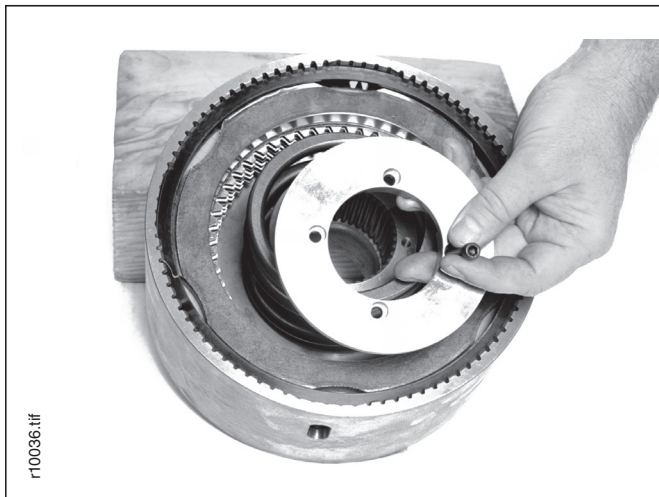
6. Remove both snap rings from clutch hub.



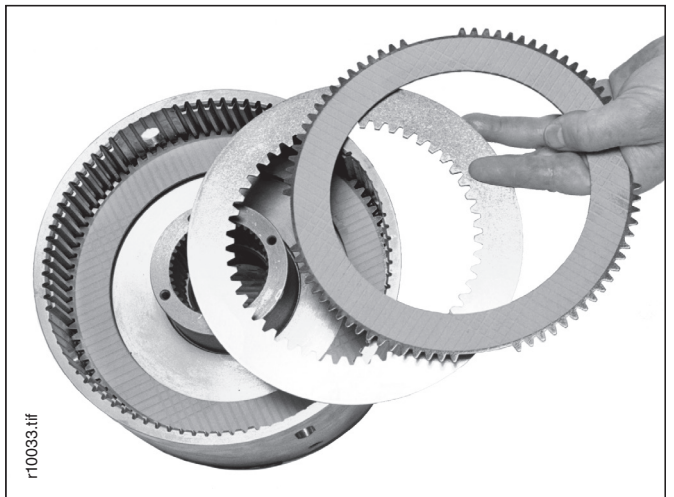
9. Remove the clutch plate. Inspect for wear.



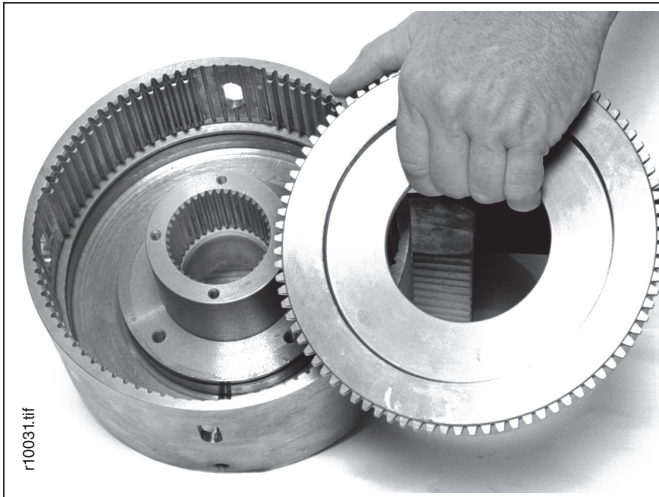
7. Remove capscrews, spring retainer and spring. Inspect for wear.



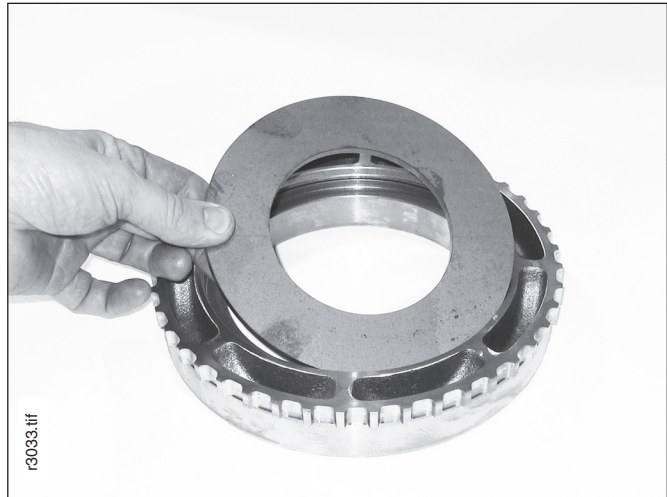
10. Remove friction and separator plates. Inspect as described in Figure 3-8.



11. Remove piston and inspect for wear.



13. Remove reaction plate.

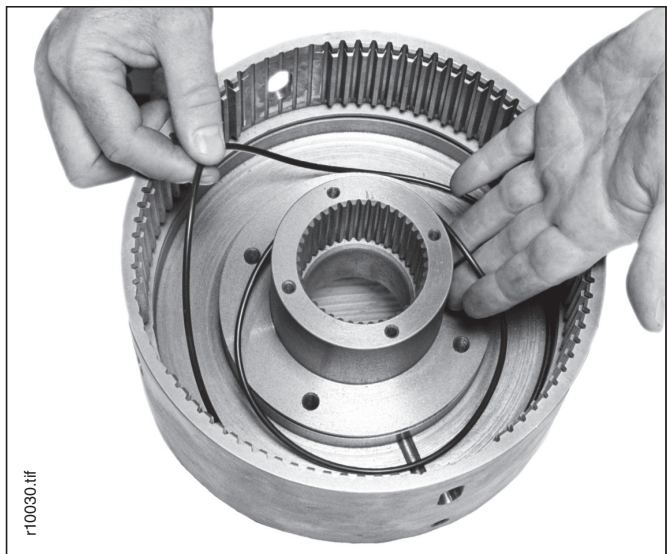


**NOTE:** For winches with older-style single-piece pistons, go to step 14. For winches with newer-style three-piece pistons, see steps 12 and 13.

12. Remove retaining ring.

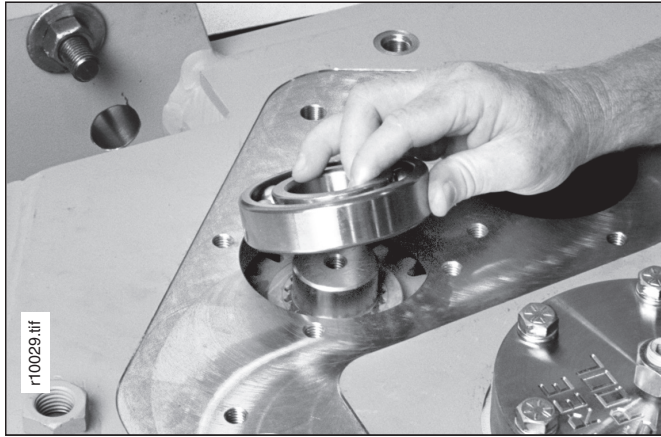


14. Remove and discard the two O-rings from clutch housing.

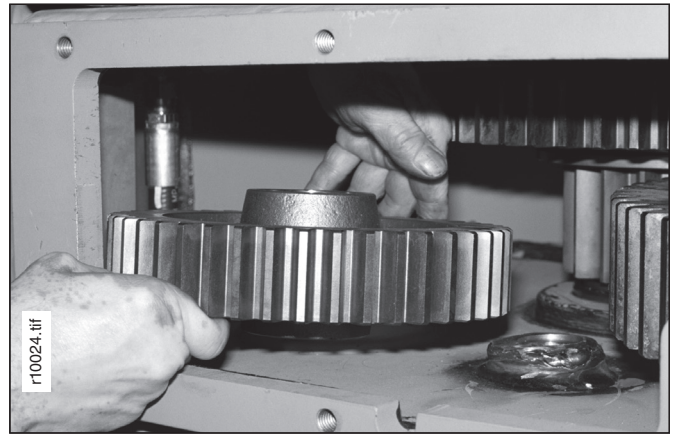


## Idler Shaft Removal

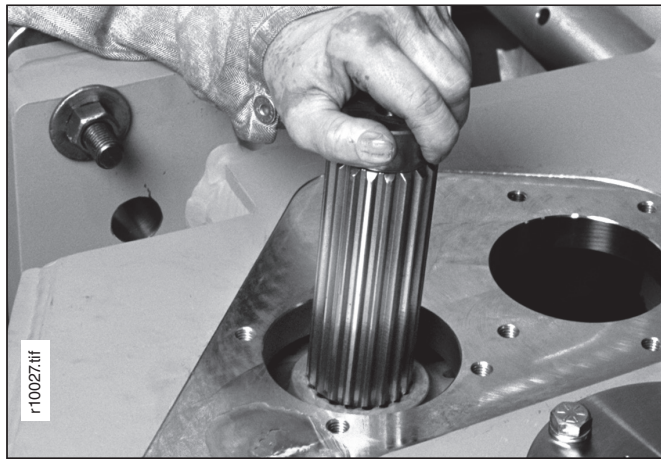
1. Remove idler gear shaft retainer and bearing.



4. Remove gear from winch housing.



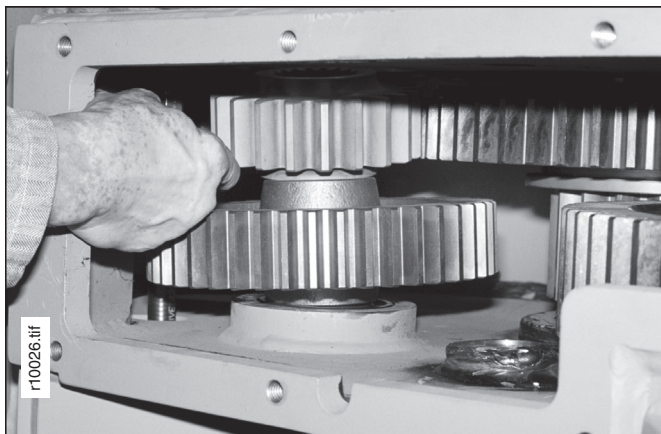
2. Withdraw idler shaft from winch housing.



5. Remove bearing.



3. Remove cover on top of winch and remove idler gear.

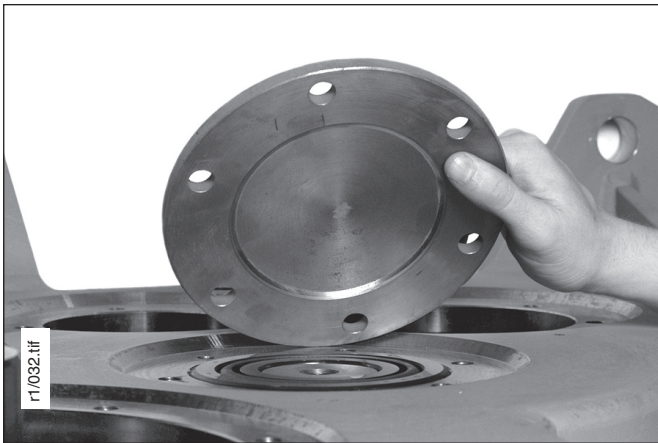


## Intermediate Shaft Removal, Non Freespool

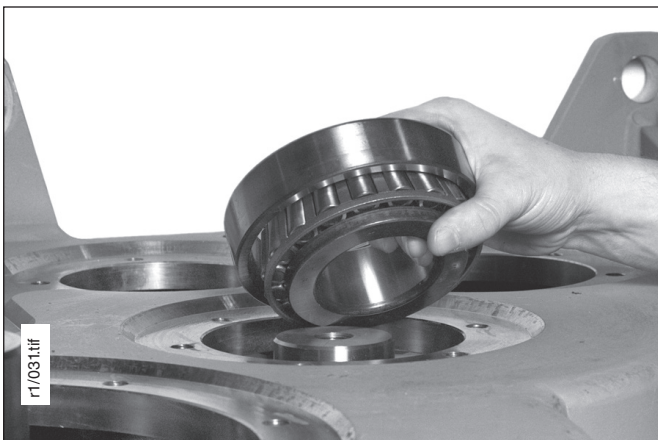
**NOTE:** The following steps show the winch removed from the dozer with the clutch shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but it is not necessary for the removal of the intermediate shaft only.

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

1. Remove the intermediate shaft cover.



2. Screw a 3/4-16 UNF slide hammer into the end of the intermediate shaft and partially pull it out.

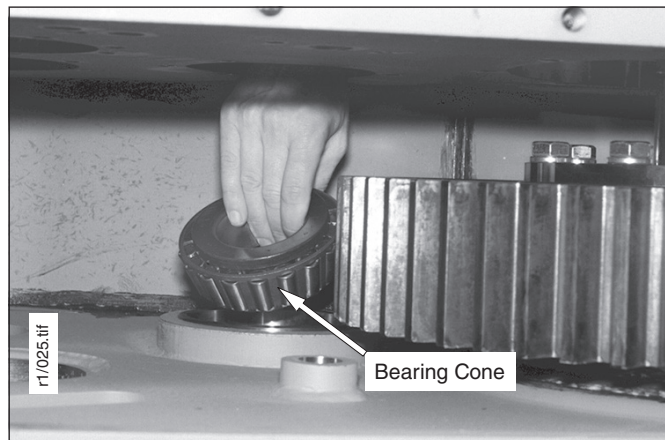
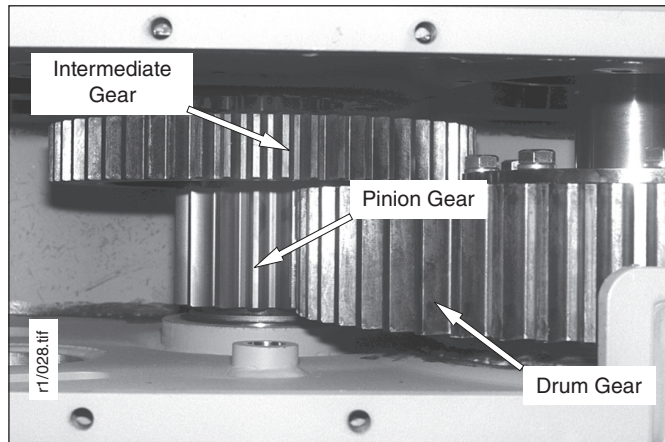


3. Remove bearing cup and cone.

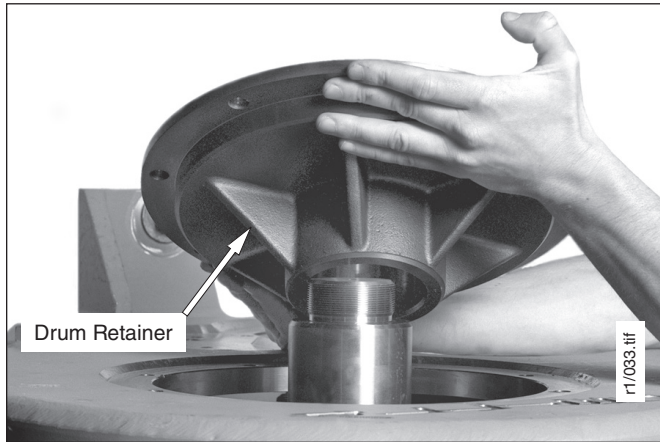
4. Remove the intermediate shaft, while ensuring that the intermediate gear does not fall.



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



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



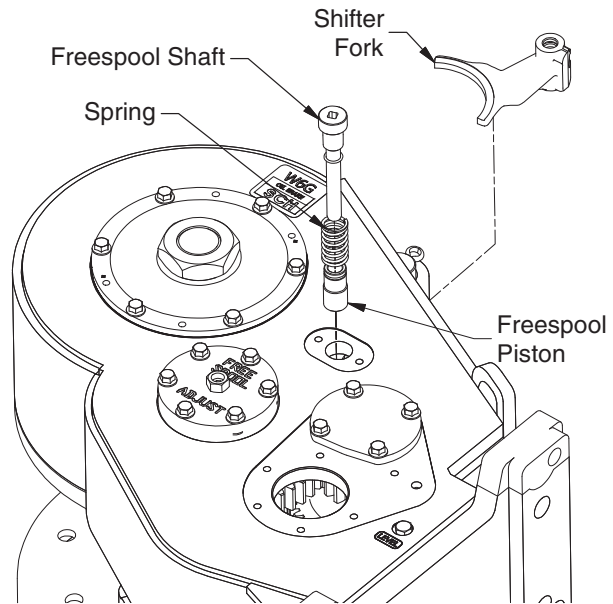
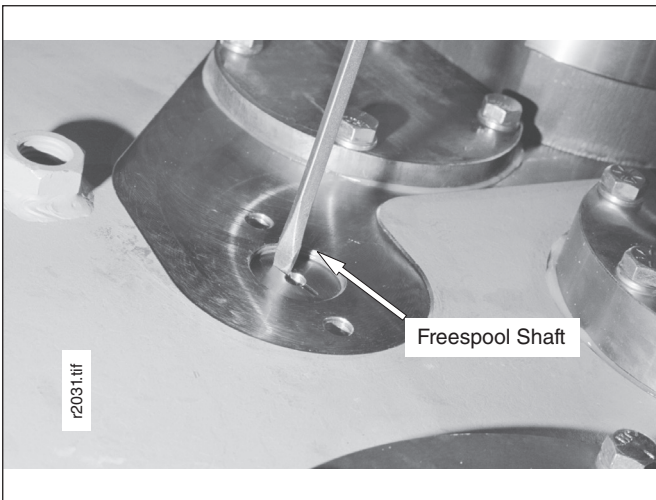
## Intermediate Shaft Removal, Freespool

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

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

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

1. Remove the capscrews securing the freespool shaft cover.

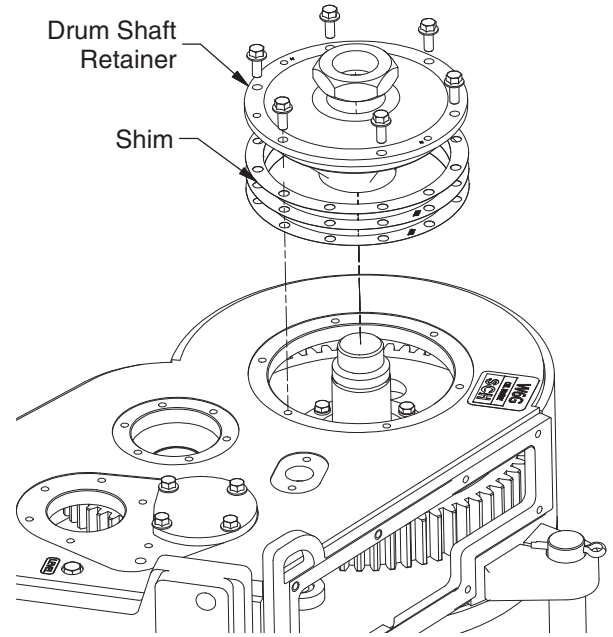
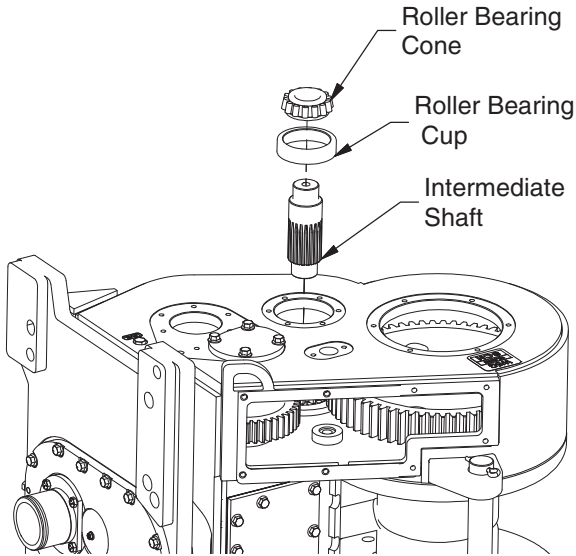


2. Withdraw the freespool shaft, spring, and remove the shifter fork from the piston.



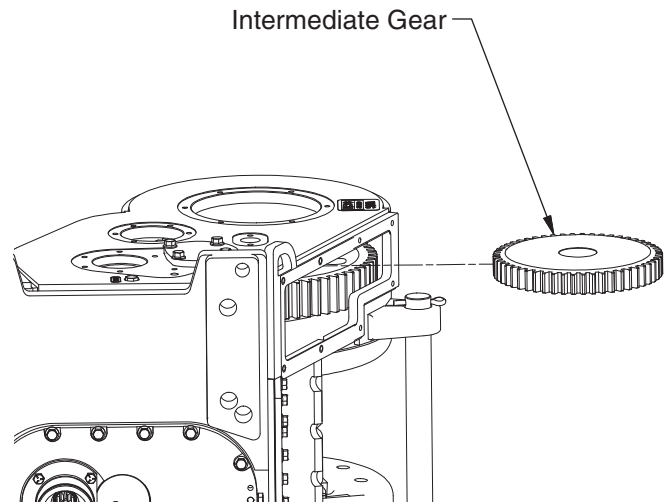
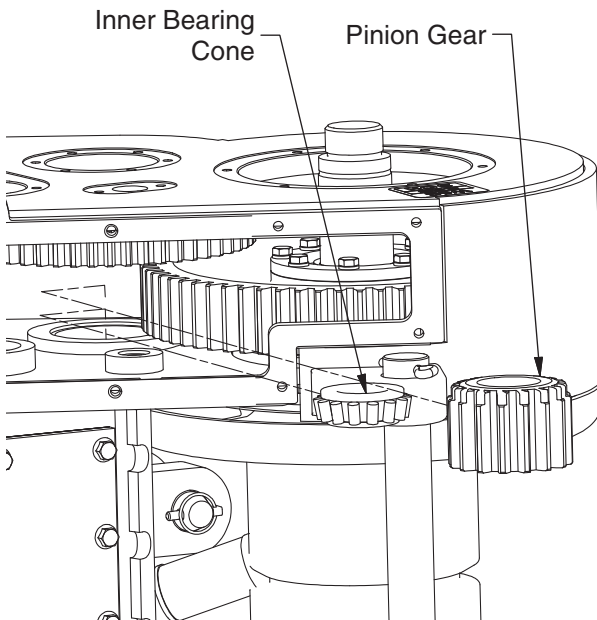
3. Remove the intermediate shaft cover.
4. Tag shims for reference during reassembly (not shown).

- Screw a 3/4-16 UNF slide hammer into the end of the intermediate shaft and partially pull it out.



- Remove bearing cup and cone and the intermediate shaft, while ensuring that the intermediate gear does not fall.

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



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

- Remove the intermediate gear.

## Drum Shaft & Drum Removal

Figure 3-7 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. To remove the drum gear, it will be necessary to first remove the intermediate shaft (see **Intermediate Shaft Assembly Removal** subsection) and the clutch assembly (see **Clutch Shaft Removal and Disassembly** subsection).

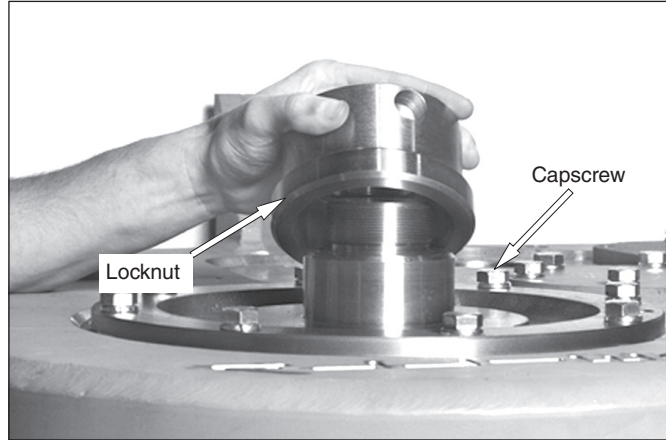
### **WARNING**

Fabricated drums weigh approximately 540 lbs (245 kg). Pay special attention when you work.

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.

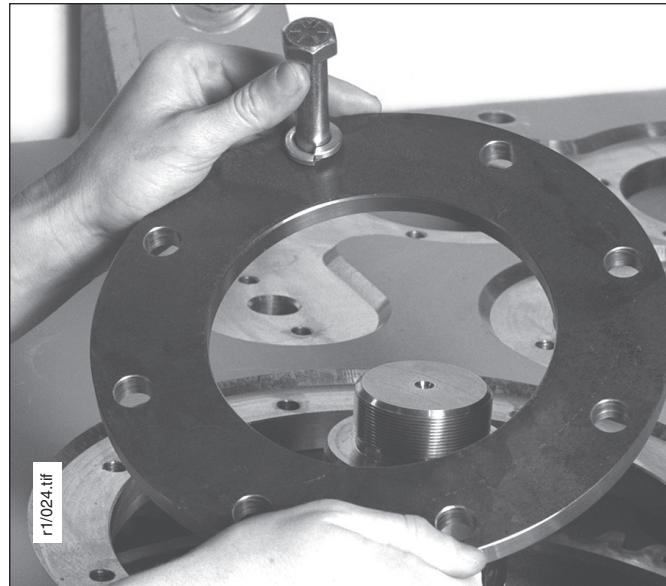


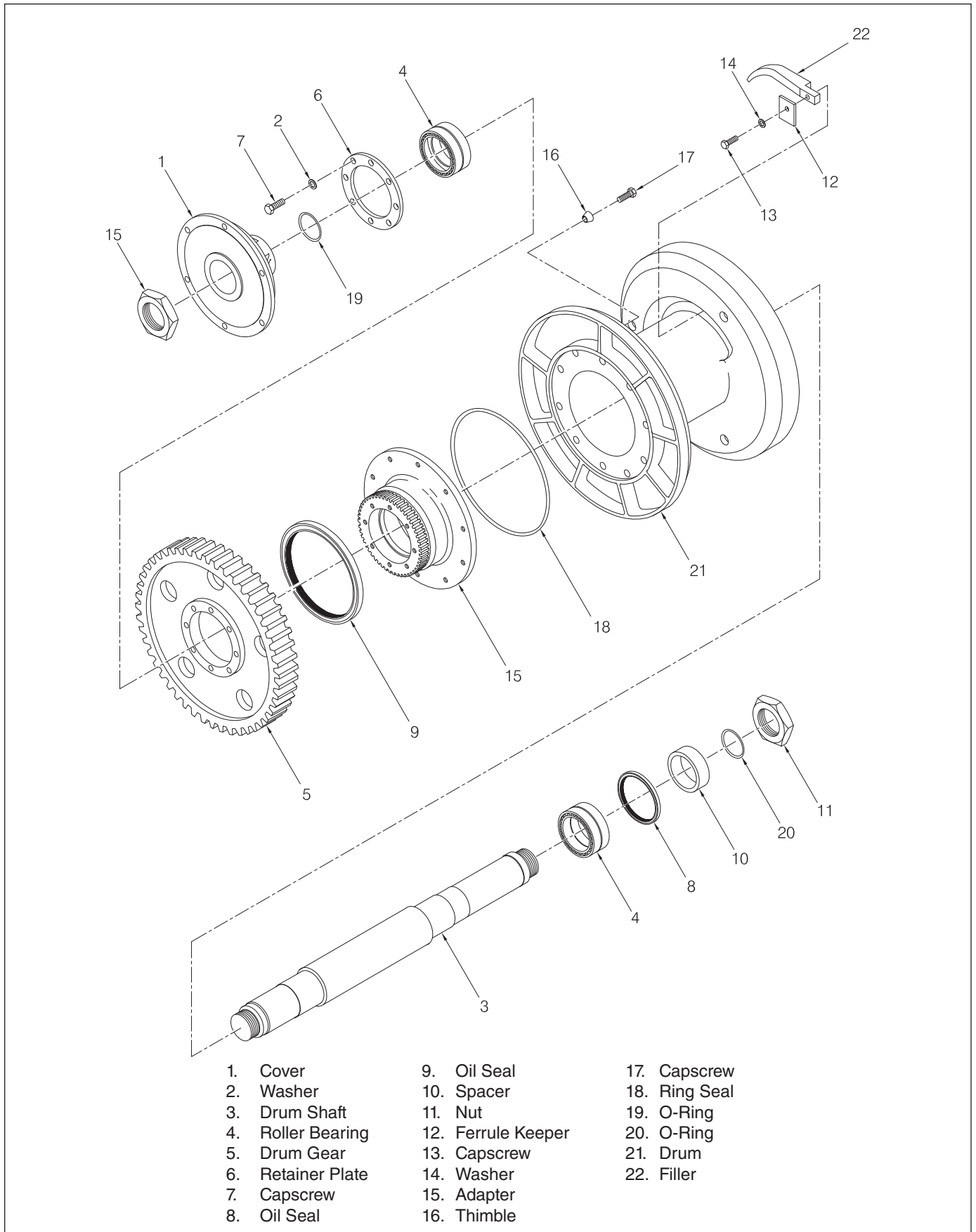
3. Remove bearing retainer and shim pack.



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

4. Remove retainer ring by removing retainer capscrews.





**Figure 3-7 Location of Drum and Drum Shaft Components**

5. 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.**

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



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

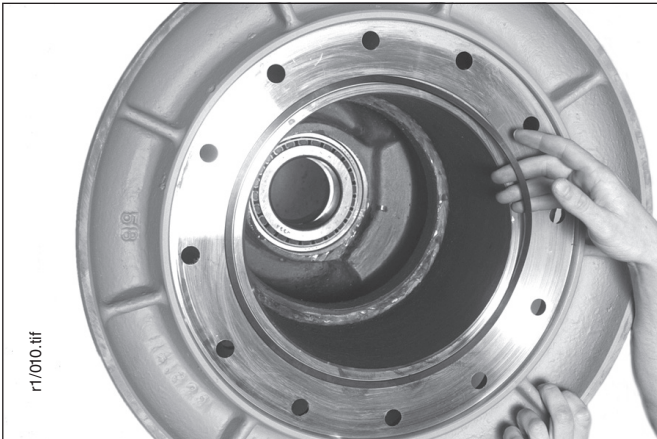
**NOTE: Bearing, cups and spacers are a matched set, and must not be interchanged with other bearing set components.**



**NOTE: Refer to Figure 3-7 for location of components.**

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

9. Remove and discard adapter seal.



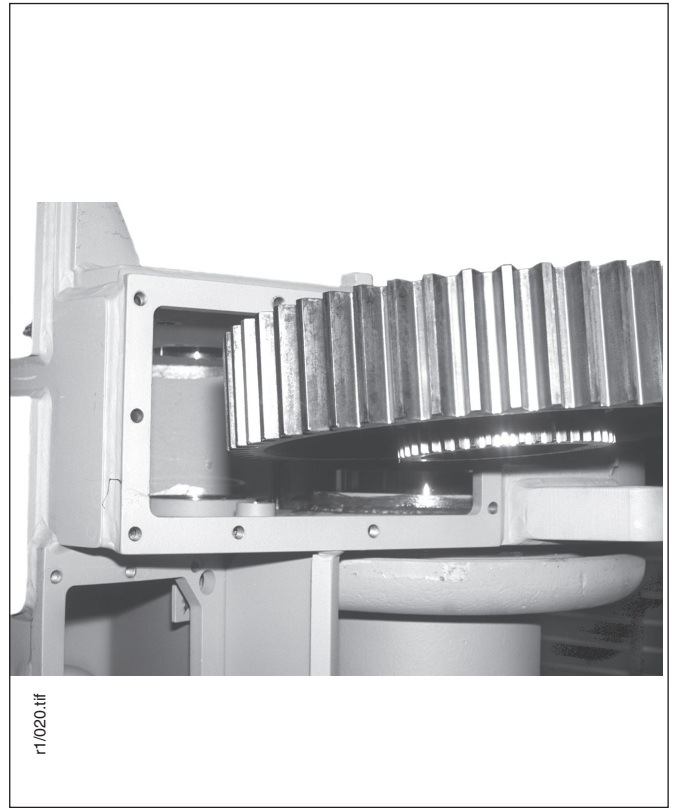
**NOTE: This seal must be replaced with a new Allied Systems Company-approved seal during reassembly.**



12. Remove and discard adapter seal from winch housing.



13. 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 3-8, 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 3-8 Visual Inspection\_1**

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.
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 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.
	Check plug hole internal threads in the shaft for scoring or distortion.	Dress threads with a thread chaser.
	Inspect clutch shaft bearings for wear or damage.	Replace worn or damaged bearings.
Clutch Shaft Bearing Retainers	Check retainer seal ring bore for grooves, scoring and rust.	Replace if scored or rusted.
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 bolts between gear and clutch for tightness.	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 wear, distortion and damaged teeth.	Replace friction disc(s) if oil grooves are worn from facing, or if distorted or damaged.
	Carefully inspect separator plates to verify that surfaces are free of large blue areas (caused by overheating) and/or not worn excessively or unevenly.	Replace separator plates if surfaces are warped or damaged.
	Inspect piston, O-ring grooves 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 spring.	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 3-8 Visual Inspection\_2**

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Brake Assembly	Check for cracked or broken belleville spring.	Replace spring 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 or distorted in any way.
	Carefully inspect separator plates to verify that surfaces are free of large blue areas (caused by overheating) and/or not worn excessively or unevenly.	Replace separator plates if surfaces are warped or scored.
	Inspect piston housing and piston for cracks and damage. Ensure O-ring grooves and sealing surfaces are undamaged.	Replace piston or piston housing if damaged. Always replace piston seals (O-rings) when brake is repaired.
	Inspect brake cage for wear, scoring, burrs and cracks.	Replace cage if splines are notched or cage is cracked.
	Inspect brake hub and shaft for wear, scoring, burrs and cracks.	Replace hub if splines are notched or hub is cracked. Replace shaft if damaged.
	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 capscrews 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.
Intermediate Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Intermediate Gears	Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gears if teeth are broken or severely worn.
Freespool Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing surfaces.	Dress surface or replace shaft if severely worn.
	Check O-ring groove and seal surface.	Dress groove or replace shaft if severely worn.
	Check for 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 wire rope has slipped between wire rope guard and winch frame.	Consult the factory.

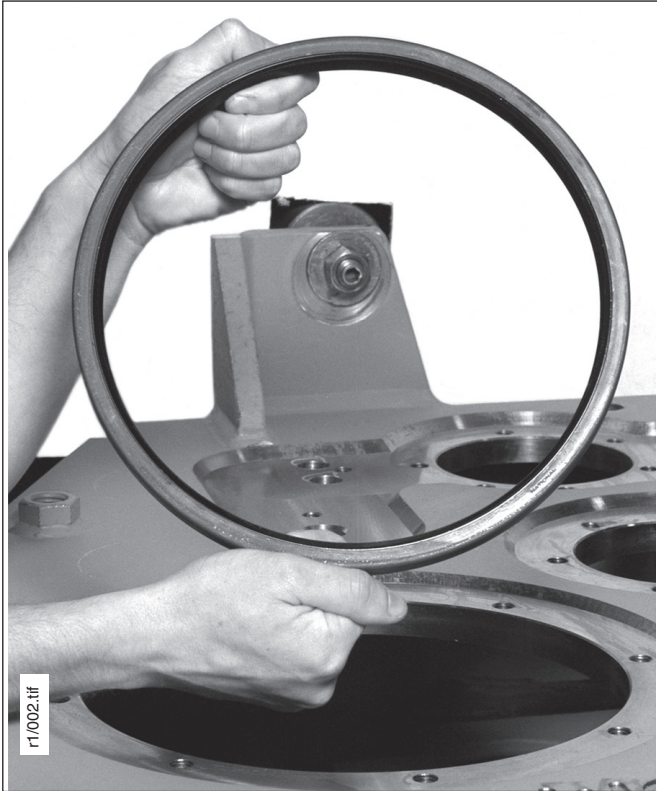
## Drum and Drum Shaft Installation

If the drum gear was removed, it must be installed prior to installation of the intermediate shaft and reverse clutch assembly. However, the intermediate shaft bearing cup must be installed prior to the drum gear. Otherwise, access to the bearing cup bore will be partially blocked.

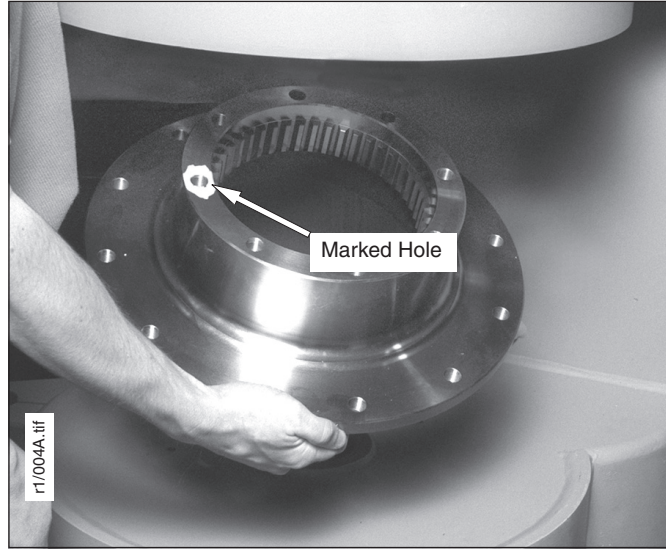
### **WARNING**

Fabricated drums weigh approximately 540 lbs (245 kg). Pay special attention when you work.

1. Coat seal bore with sealant. 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.



**NOTE:** To prevent drum adapter from falling out, insert eyebolt on marked hole, then slip metal bar through eyebolt.

3. Install drum seal.



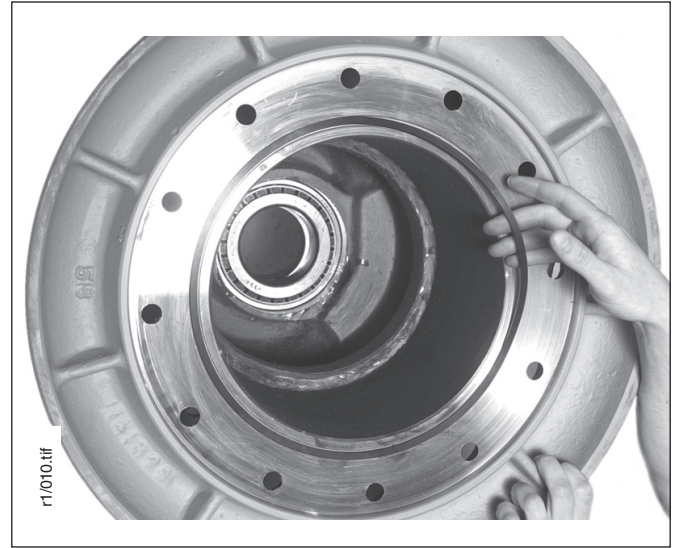
**NOTE:** Smooth side of seal must face outboard.

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

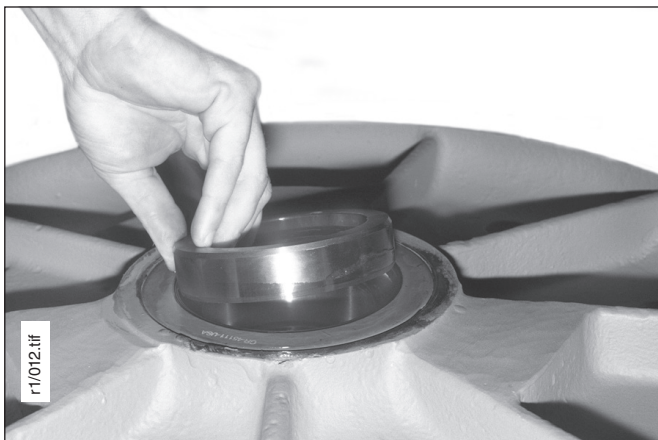
**NOTE: Bearing, cups and spacers are a matched set, and must not be interchanged with other bearing set components.**



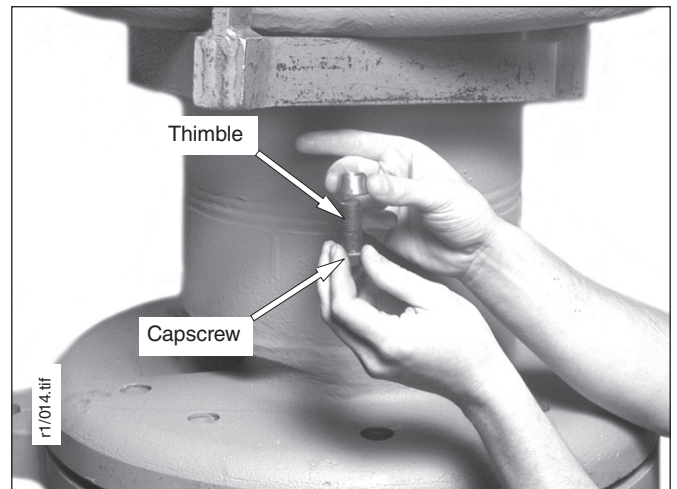
- Lubricate right-hand drum bore. Coat right-hand seal ring and groove with O-ring lube. Install new seal ring.



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



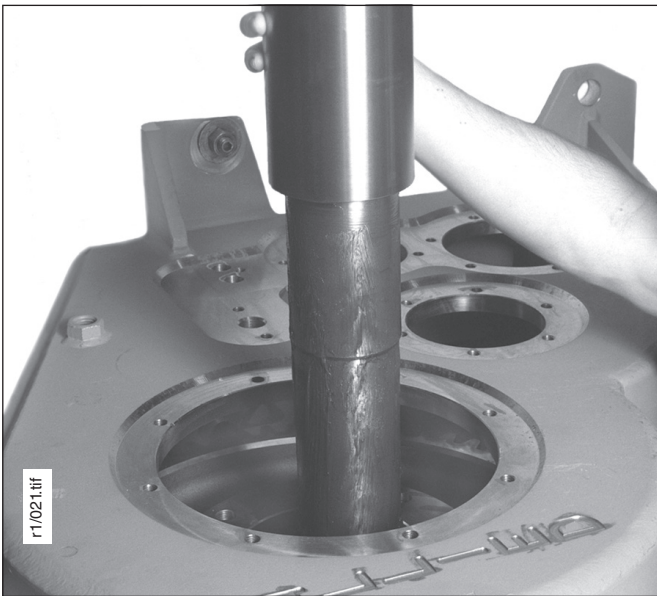
- Move the drum into position while being careful not to move the seal ring.
- Align adapter and drum holes, then install the thimbles and screws. Tighten progressively and evenly to ensure uniform compression of seal ring. Do not tighten to final torque.



9. Install drum gear.



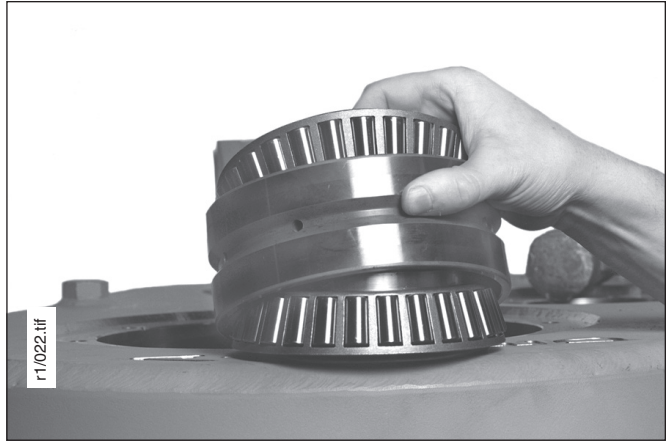
10. Align drum gear with adapter and temporarily secure the drum gear to the adapter, using the retainer plate and two capscrews. This will ensure that the gear will not fall during installation of the shaft.
11. Coat bearings in the drum with the recommended oil (see Figure 1-13) to ensure initial bearing lubrication.
12. 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.

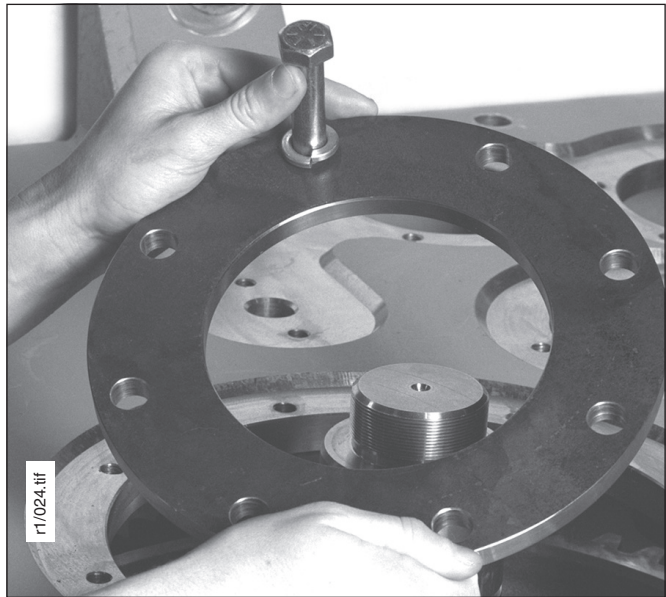
13. Remove the retainer plate and install the bearing assembly.



## WARNING

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

14. Install retainer plate using the eight special capscrews. Tighten capscrews to 90 ft-lb (12 kg-m).

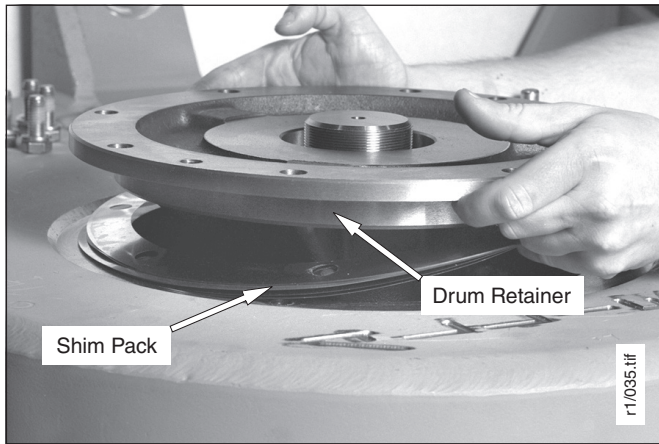


**NOTE:** Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.

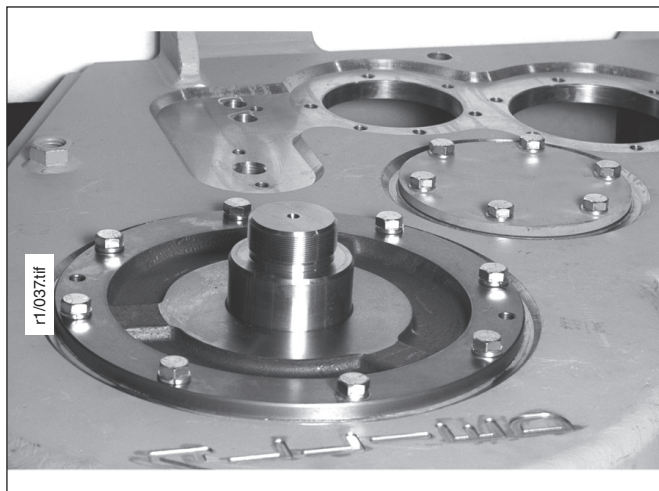
- Set drum retainer into place and tighten capscrews (do not tighten to final torque). Measure gap between retainer and winch frame in three places around the retainer. Add the three indications and divide by three to obtain the average gap. Assemble shim pack to provide a net fit with  $\pm 0.005$ 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

**NOTE: Intermediate shaft assembly must be installed before the final installation of drum retainer. See next section.**

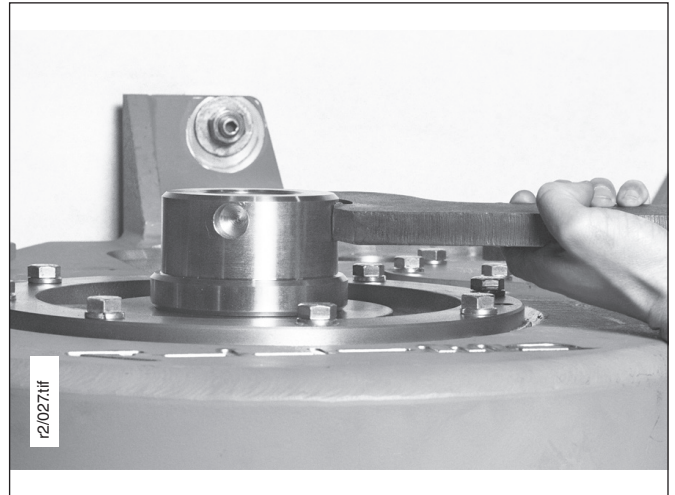
- Coat winch frame and bearing retainer with silicone. Install drum shaft O-ring. Install finalized shim pack (determined in step 15). If intermediate shaft assembly not installed, install before retainer.



- Secure retainer with capscrews and lockwashers. Tighten capscrews to 80 ft-lb (11 kg-m).



- Coat shaft nut threads with anti-seize. Install right side shaft nut and torque to 400 ft-lb (55 kg-m).



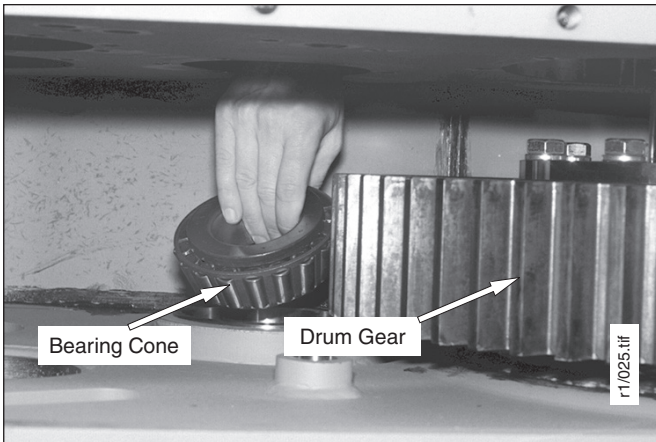
- Tighten drum-to-adapter capscrews to 220 ft-lb (30 kg-m) torque.

## Intermediate Shaft Installation, Non Freespool

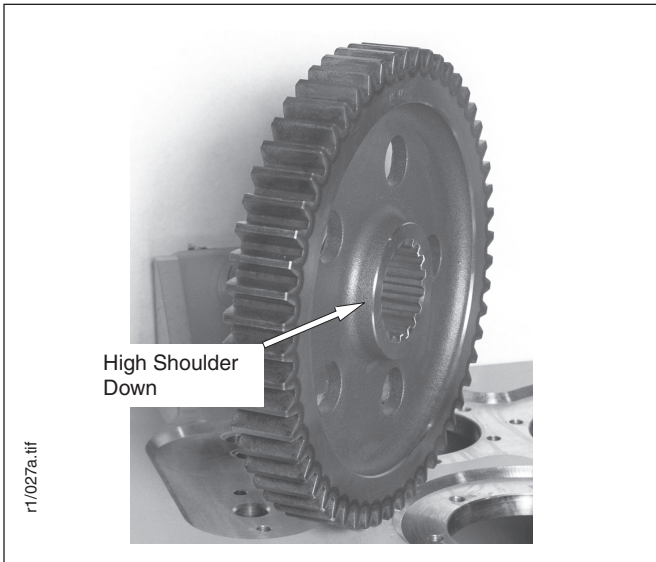
These figures show the winch removed from the dozer with the clutch shaft and brake shaft removed.

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

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

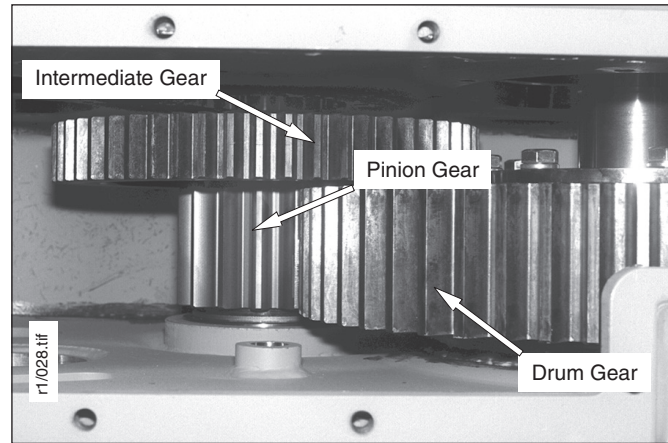


2. Position intermediate gear in housing. Install intermediate shaft far enough to support the gear.



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

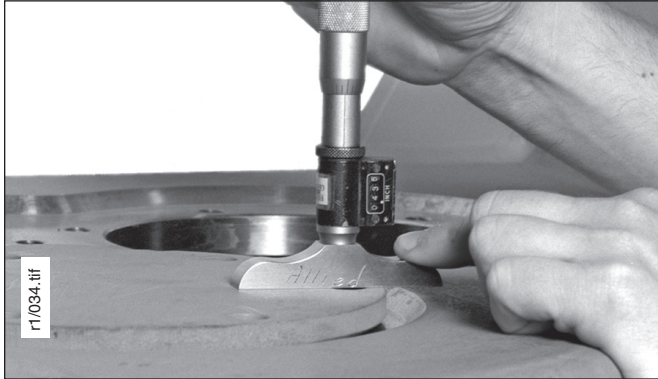
3. Position the pinion gear so that the teeth are splined to the intermediate shaft.



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

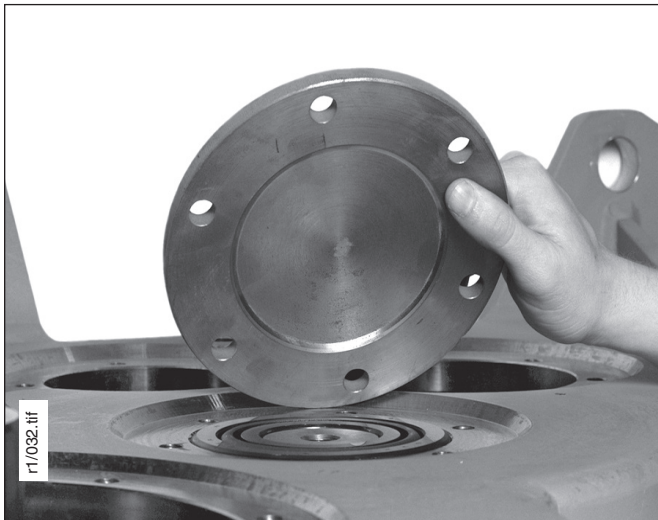


5. Using a depth gauge measure the distance from the face of the bearing cup to the winch housing. Add a shim pack of 0.004 to 0.007 in (0.102 to 0.178 mm) greater than the measured distance. For example, if the measured distance is 0.004 in (0.102 mm), add a shim pack with a total thickness of 0.008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



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

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

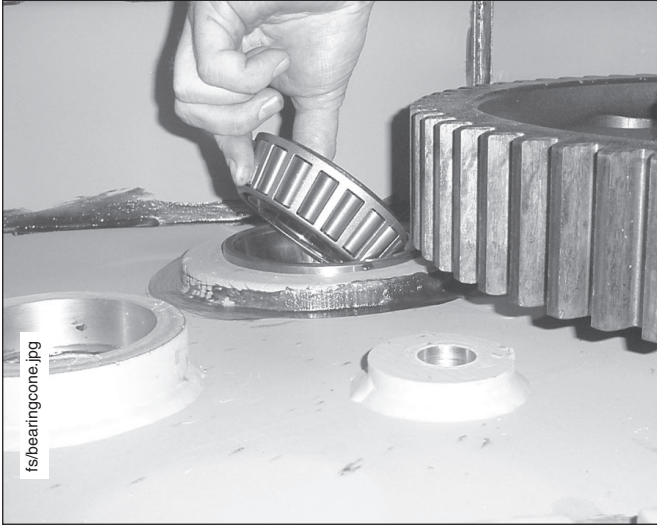


7. Tighten the six capscrews to 75 ft-lb (10 kg-m).

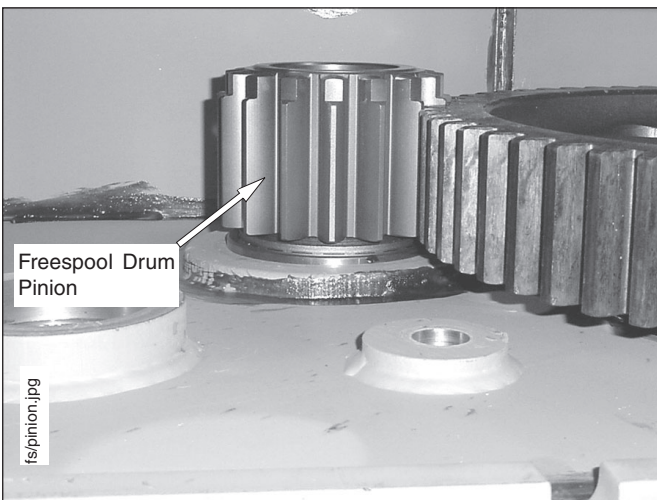
## Intermediate Shaft Installation, Freespool

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

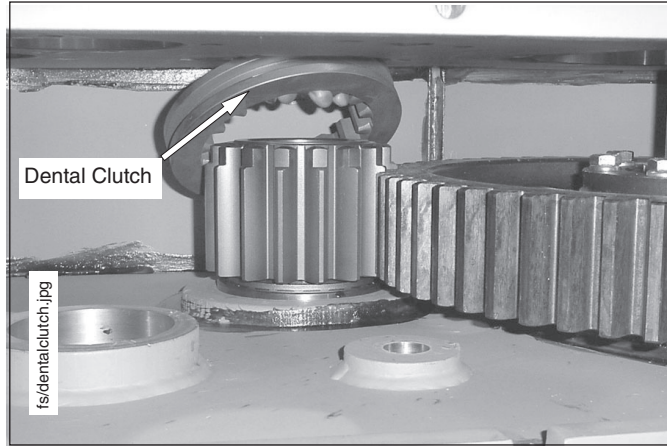
**NOTE: The winch is shown equipped with the optional freespool arrangement. For instructions on how to install an intermediate shaft on a winch without freespool, refer to the previous subsection, Intermediate Shaft Installation, Non Freespool.**



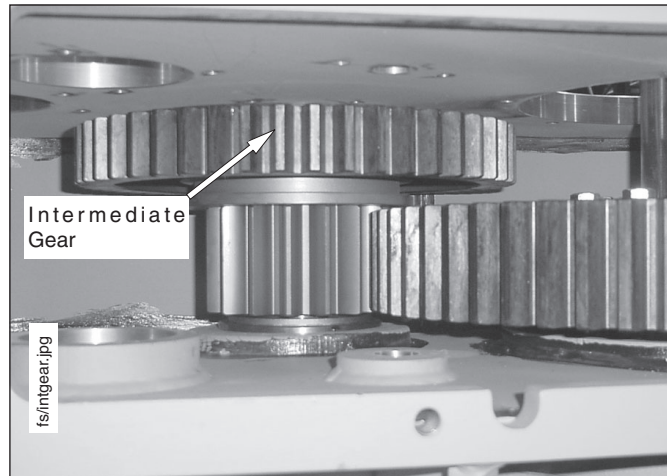
1. Install inner bearing assembly if previously removed. Use a liberal amount of lubriplate or other light lube grease to hold the inner bearing cone in place.



2. Position the freespool drum pinion in the housing.

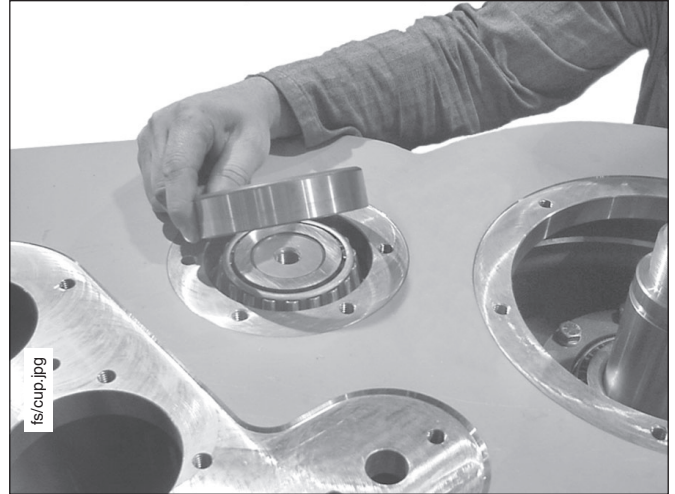
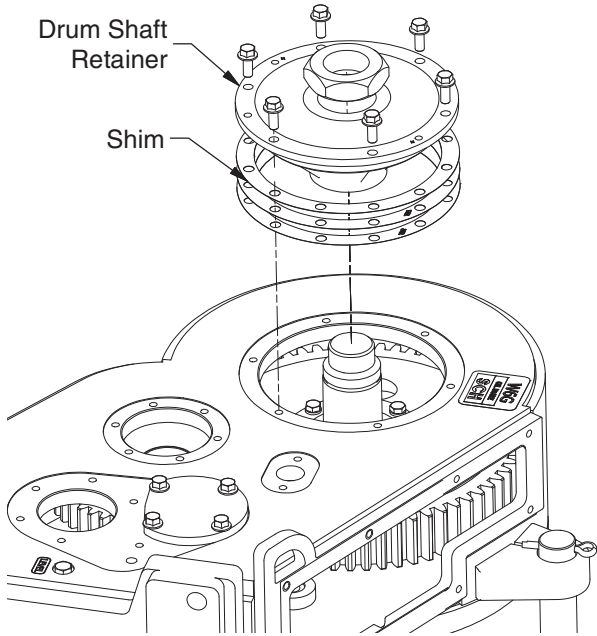


3. Place dental clutch on pinion gear. Ensure chamfered ramp faces pinion.



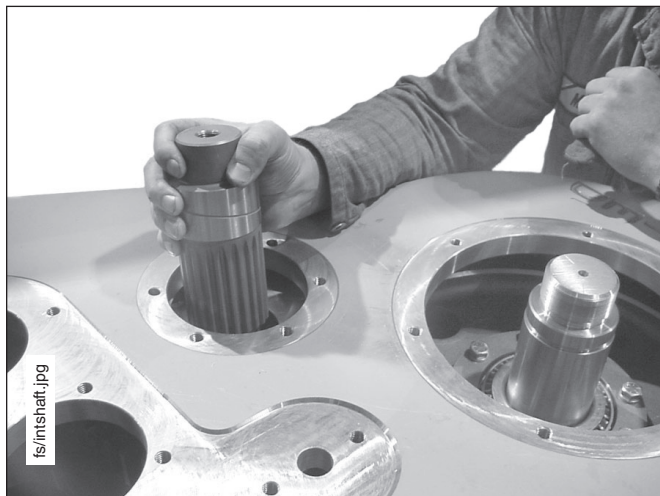
4. Position intermediate gear in housing.

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



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

**NOTE:** The drum shaft retainer may be installed before the intermediate shaft. See previous section (Drum and Drum Shaft Installation) on pages 3-32 through 3-35.



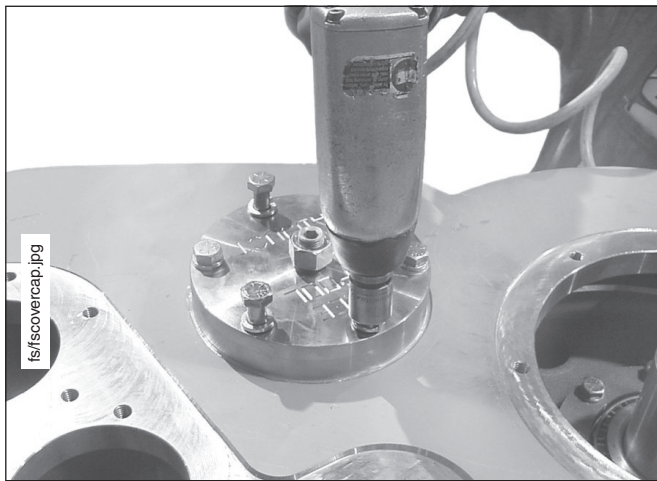
5. Install intermediate shaft.



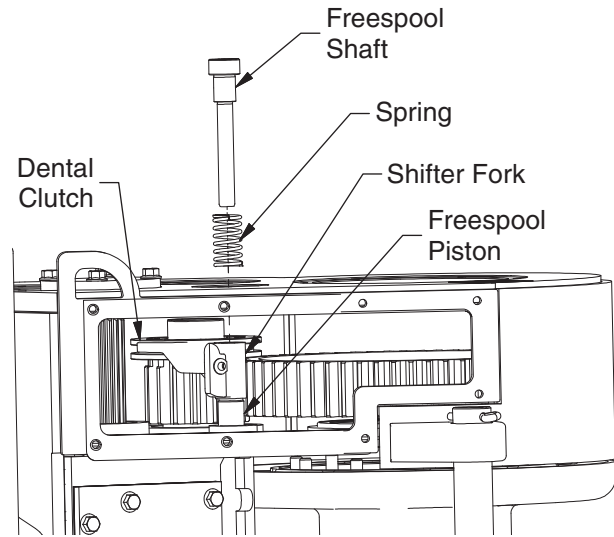
7. Install new O-ring on freespool piston and install piston in freespool adjust cover.



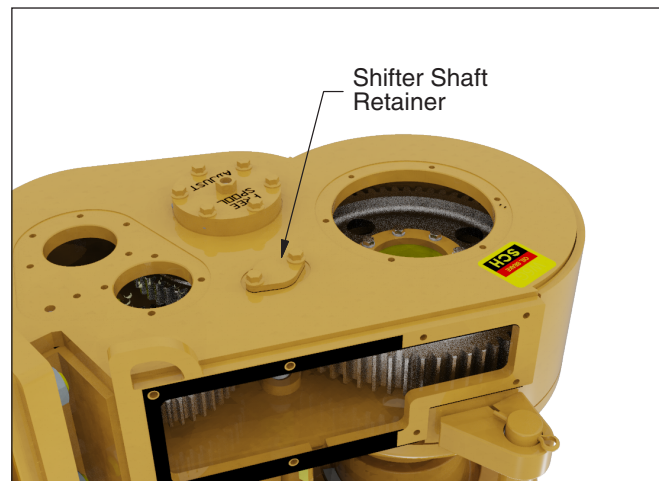
8. Coat the winch frame and retainer with silicone or other suitable sealing compound. Install shim pack (if necessary) and cover.



9. Tighten the six cap screws to 75 ft-lb (10 kg-m).



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



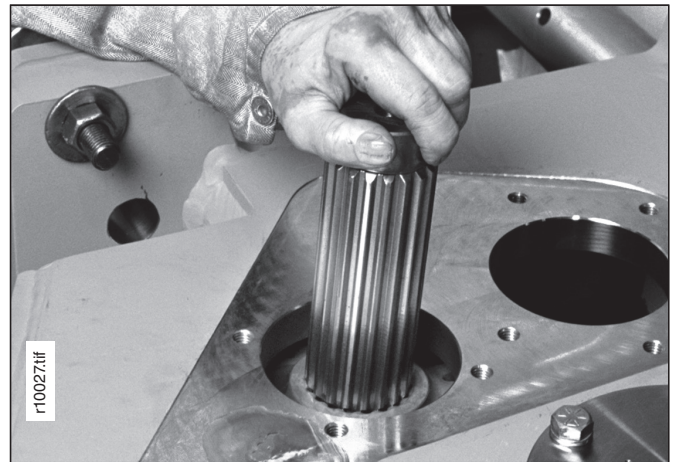
11. Install cover. Tighten cap screws on shifter shaft to 75 ft-lb (10 kg-m).

## Idler Shaft Installation

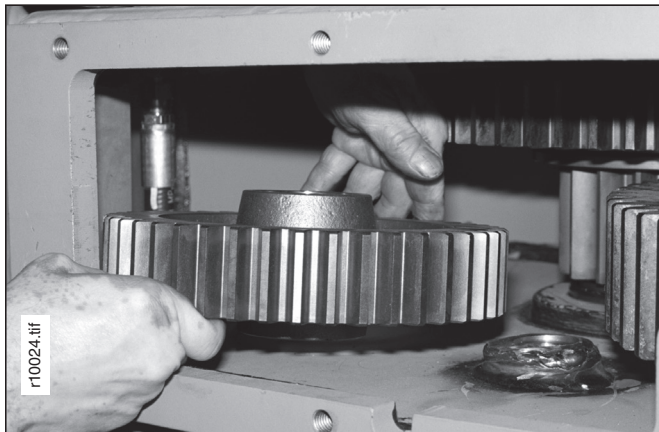
1. Insert roller bearing into winch housing.



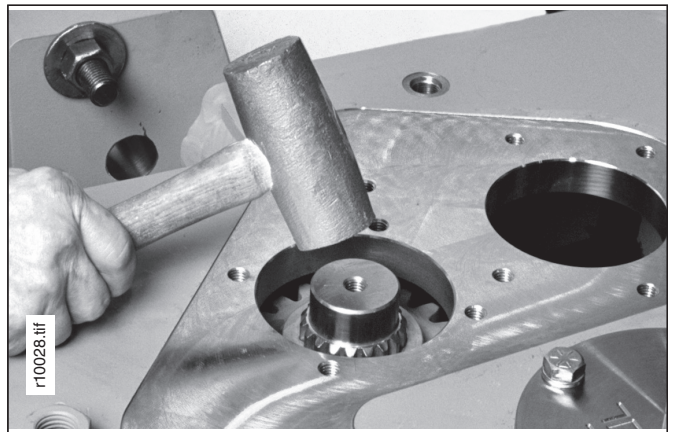
4. Lubricate idler shaft well, then insert into winch housing.



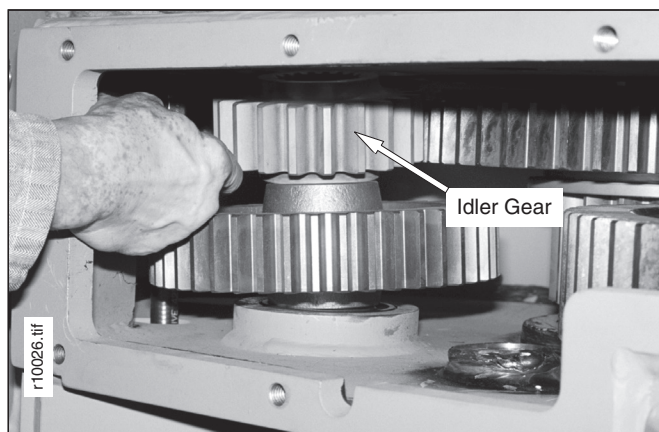
2. Insert gear on top of bearing.



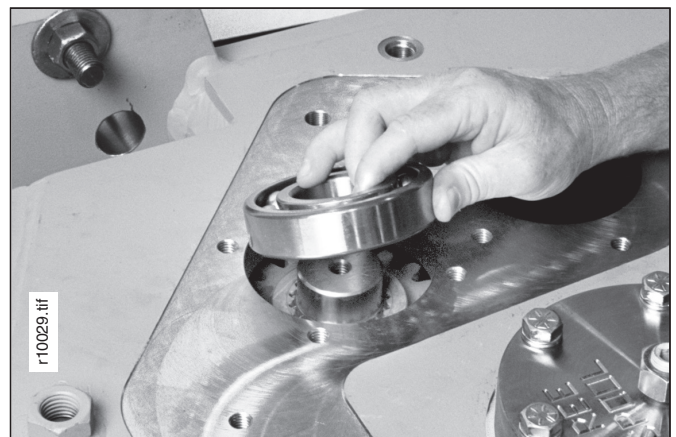
5. Tap into place gently with a soft hammer.



3. Place idler gear on top.



6. Insert bearing on top of shaft. Squeeze a bead of sealant on surface of winch and fasten idler shaft cover over it.



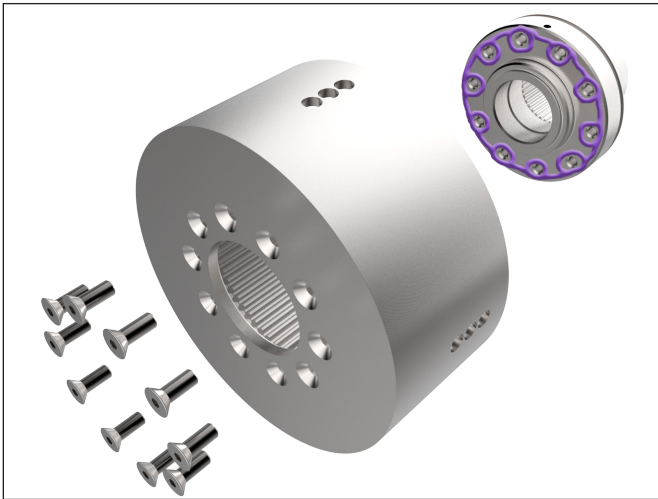
## Oil Clutch Reassembly

### CAUTION

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

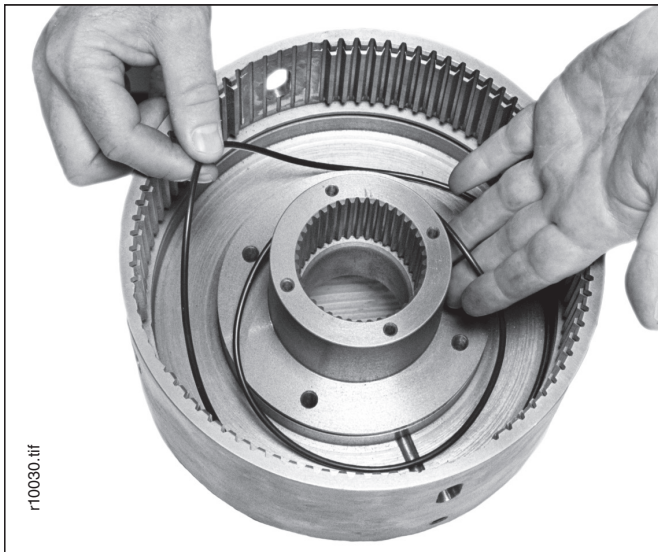
**NOTE:** Reassembly is the same for both the forward and reverse clutches.

1. If it was necessary during disassembly to separate the Spider Clutch from the Clutch Hub, apply a continuous bead of gasket eliminator as shown below. Torque 10 capscrews to 33 ft-lbs [4.56 kg-m].

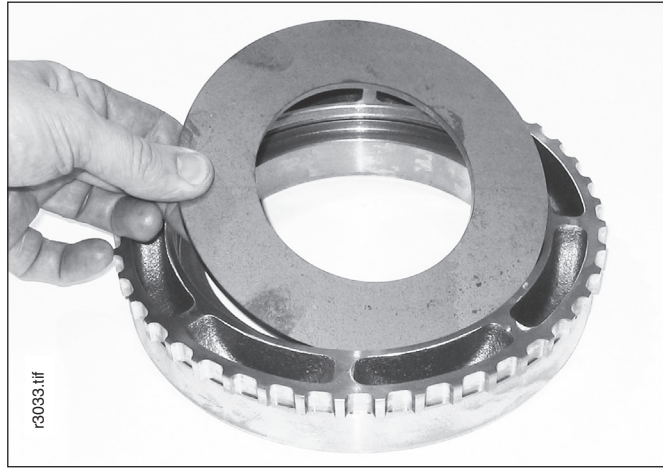


2. Install two new O-rings in clutch housing.

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



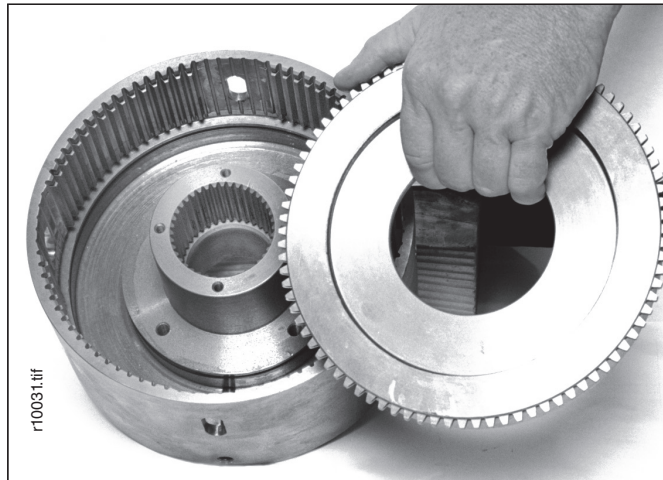
3. For winches with the old-style single-piece piston, proceed to step 5. For winches with the new-style 3-piece piston, install spring reaction plate in piston housing.



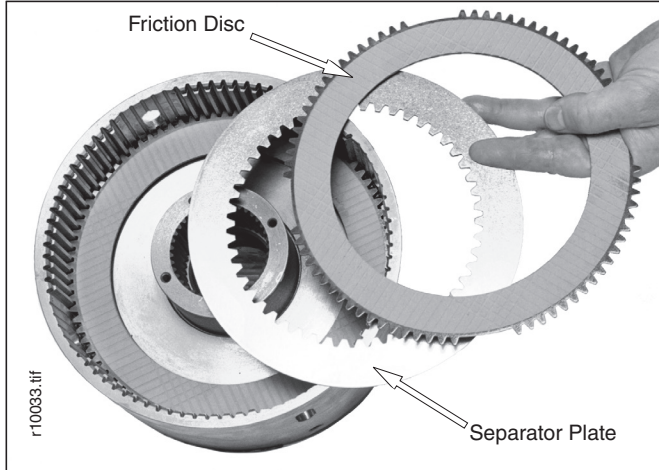
4. Install retaining ring.



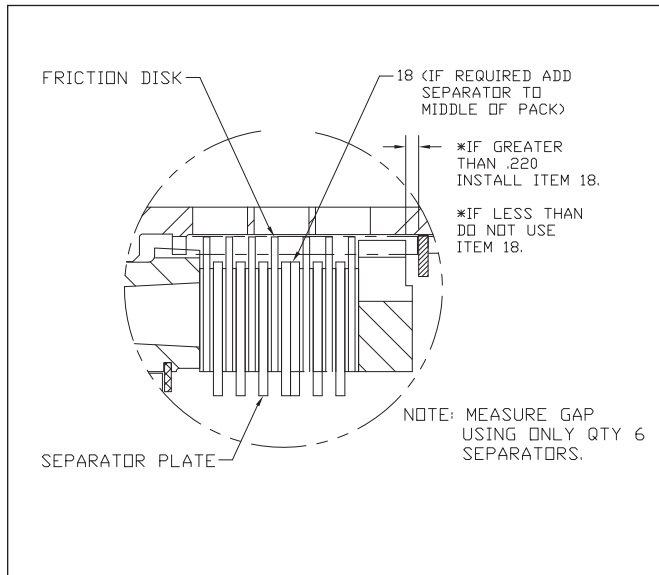
5. Lubricate piston and install in clutch housing.



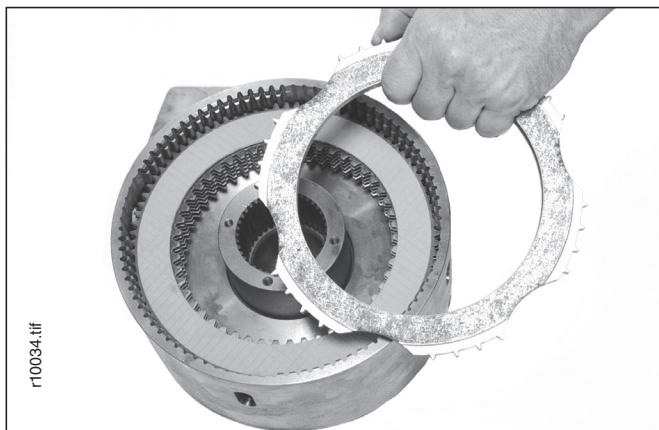
6. Place friction discs alternately with separator plates in housing. Line teeth on plates.



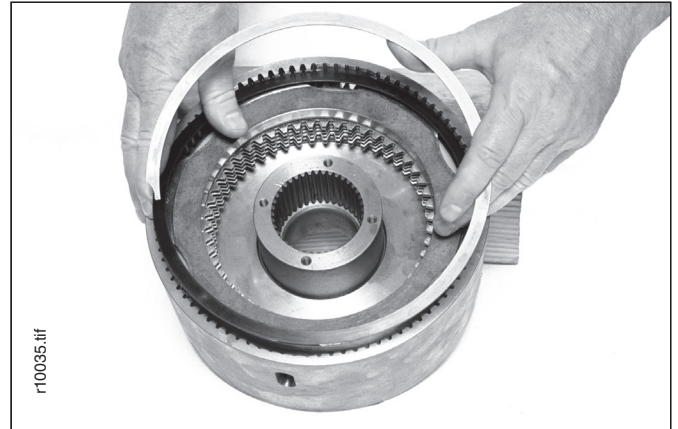
**NOTE: If air gap exceeds .220 inch (5.6 mm) between piston assembly, disc and plates, then additional separator is needed to be used as a shim to reduce the air gap. See detail below.**



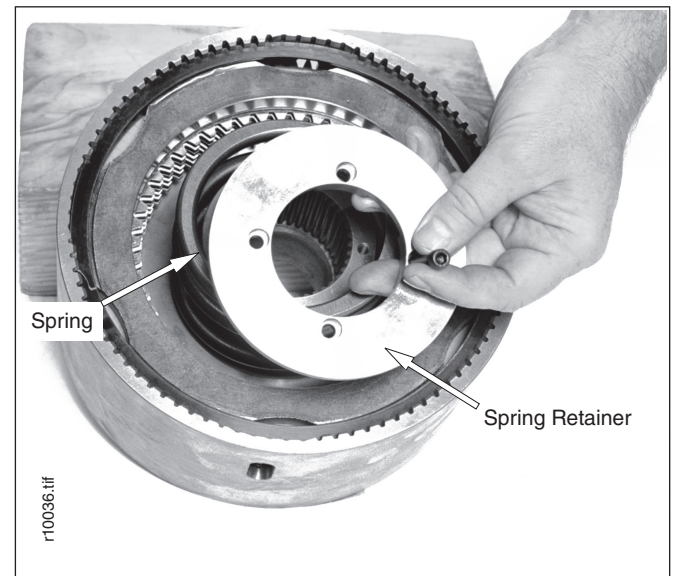
7. Place the clutch plate on top.



8. Insert the snap ring.



9. Insert spring and spring retainer. Push down firmly and fasten with capscrews.



10. Insert two snap rings in the clutch hub.



11. Insert one bearing cup into each end of hub. Tap in place with driver.



12. Place the ring gear on top of hub and fasten with capscrews.



13. Place bearing cone on top of clutch assembly.



14. Using screwdriver or similar tool, line up internal teeth of separator plates. Place clutch hub assembly on top of clutch assembly and insert.



15. Upend clutch assembly and fasten with two temporary capscrews to prevent assembly from falling apart when picked up. See **Clutch Shaft Reassembly and Installation** on following pages for installation of permanent capscrews.



## Clutch Shaft Reassembly and Installation

See Figure 3-1 for the location of clutch shaft components.

**NOTE:** The shim verification process shown in steps 1 through 5 only needs to be done if the ring gears, clutch hubs or bearing cones were replaced. If none of these components were replaced, go straight to step 6. However, if any of those components were replaced, steps 1 through 5 should be performed.

1. Set ring gear and hub assembly on a stacking tool. Place bearing cone inside assembly.



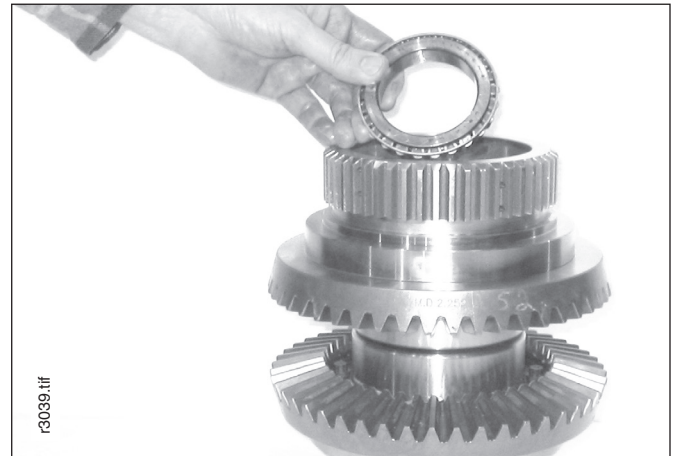
2. Stack bearing cone on top of ring gear assembly.



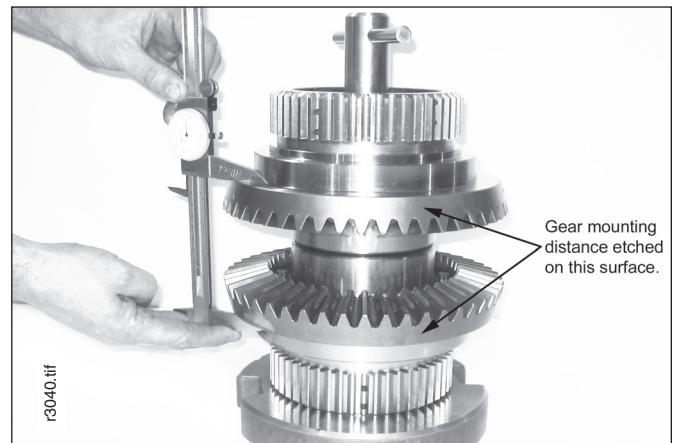
3. Stack other ring gear assembly on top.



4. Place bearing cone inside ring gear assembly.



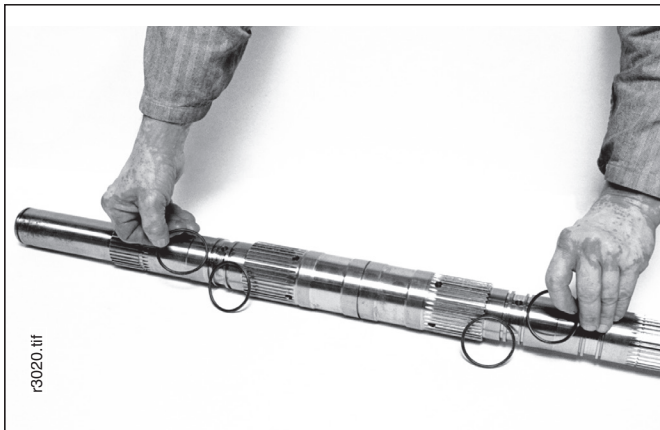
5. Ensure the components are seated tightly against each other by using a compression tool or by tapping the components firmly from the top. Measure the distance between the ring gears as shown and call this number "A". Each ring gear has a mounting distance etched on it. Add these two numbers together and call it "B". "A" needs to be within .001 inch (0.0254 mm) of "B", so note the number of shims or spacers needed to achieve this number. Shim installation is shown in step 11.



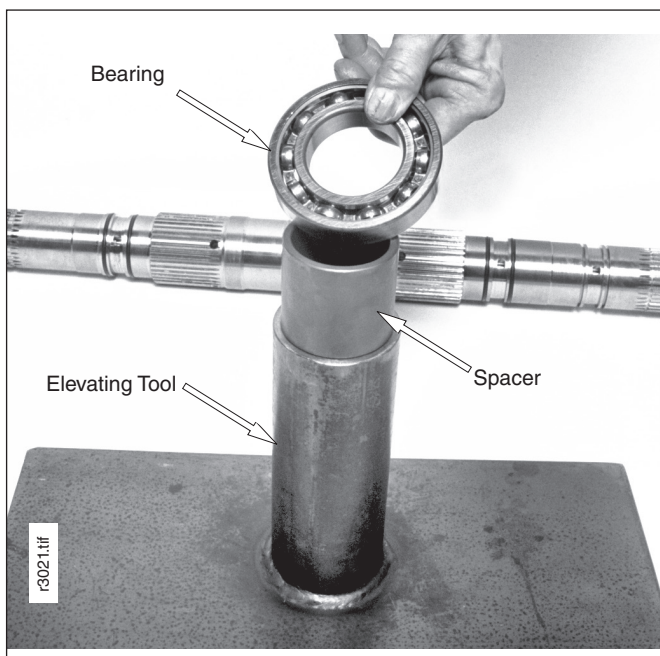
6. Remove components from stacking tool. Coat plug with sealant and insert into end of clutch shaft.



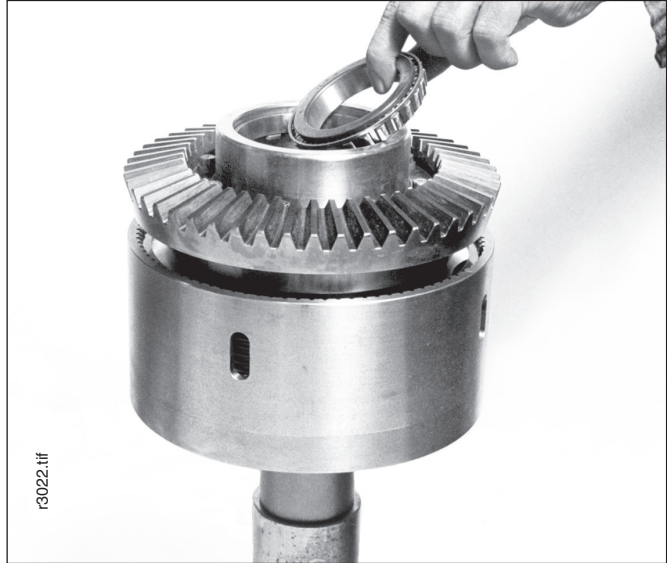
7. Install new O-rings on the clutch shaft.



8. Stack spacer and ball bearing on top of elevating tool.



9. Stack complete clutch assembly on top, and insert bearing cone.



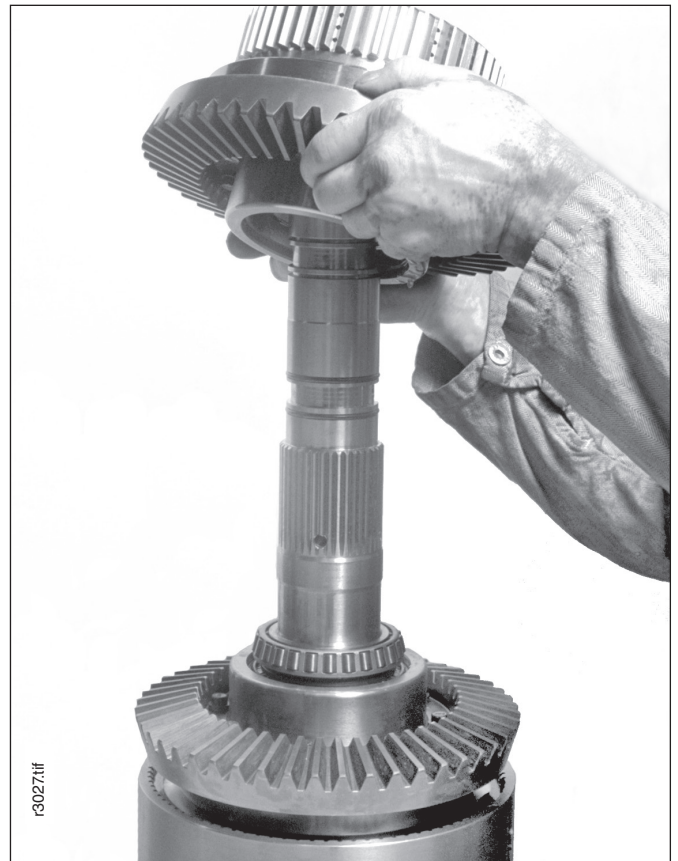
10. Insert clutch shaft.



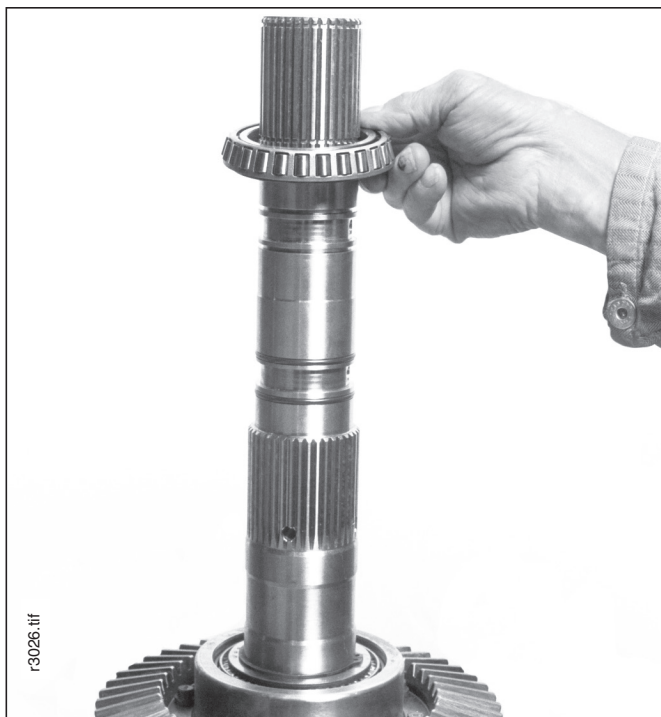
11. Insert shims or spacers. Older clutch shafts may use a snap ring instead. If any bearing cones, ring gears or clutch hubs were replaced, be sure to perform steps 1 through 5 first to determine the correct spacer or number of shims required.



13. Stack the ring gear and hub assembly on top.



12. Insert bearing cone.



14. Stack the second clutch assembly on top and install bearing cone.



15. Carefully remove clutch shaft assembly from stacking tool and install snap ring.



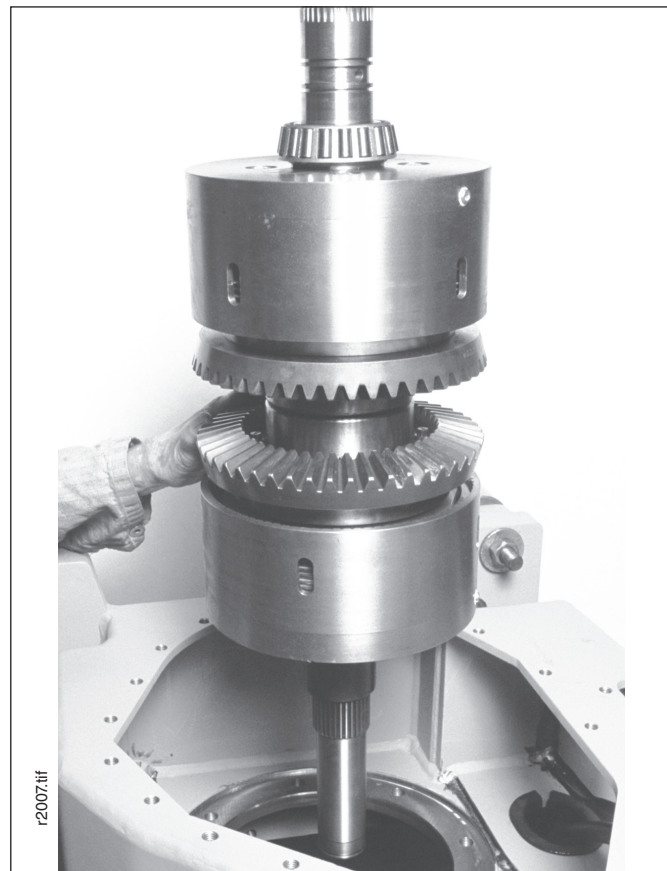
17. Tap end of shaft to seat components firmly against snap ring. Remove temporary capscrews on clutch. Coat actual capscrews with sealant and fasten on clutch assembly.



16. Install spacer.



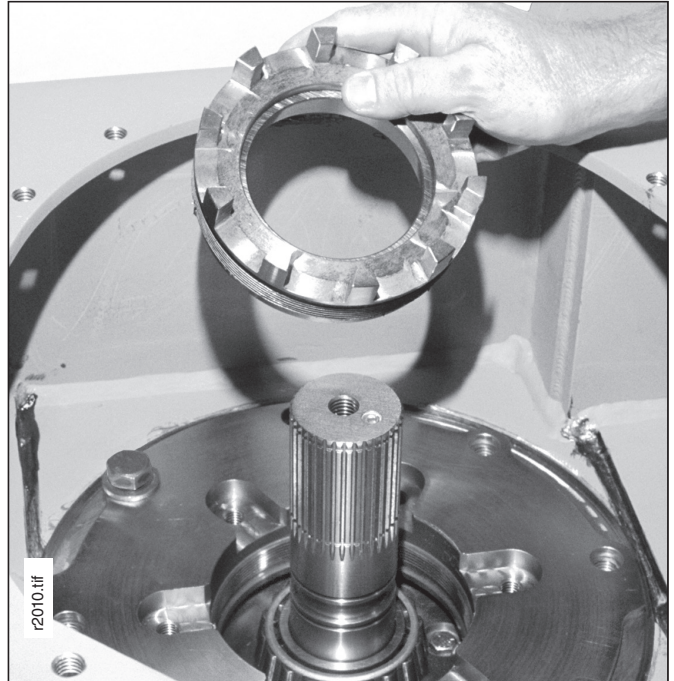
18. Using hoist, place clutch shaft assembly into left-hand side of winch.



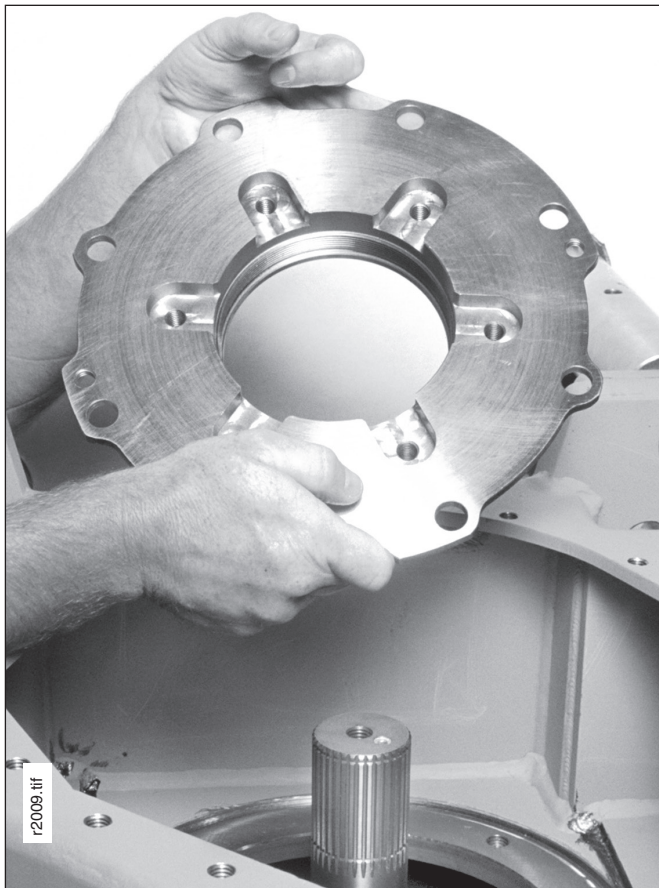
19. Press bearing race into left-hand bearing adjuster. Coat the threads with anti-seize.



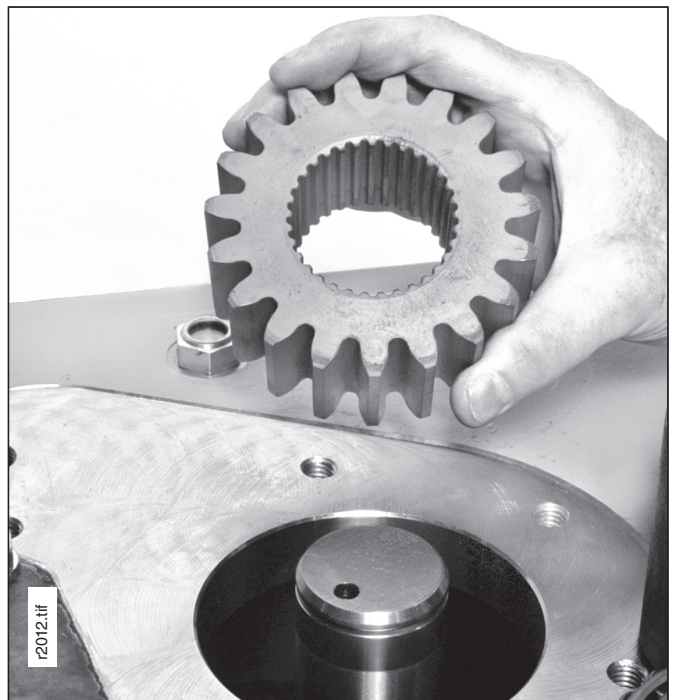
21. Insert and tighten two temporary capscrews, 5/8 UNC X 1 1/2 to hold bearing retainer, then place bearing adjuster on top.



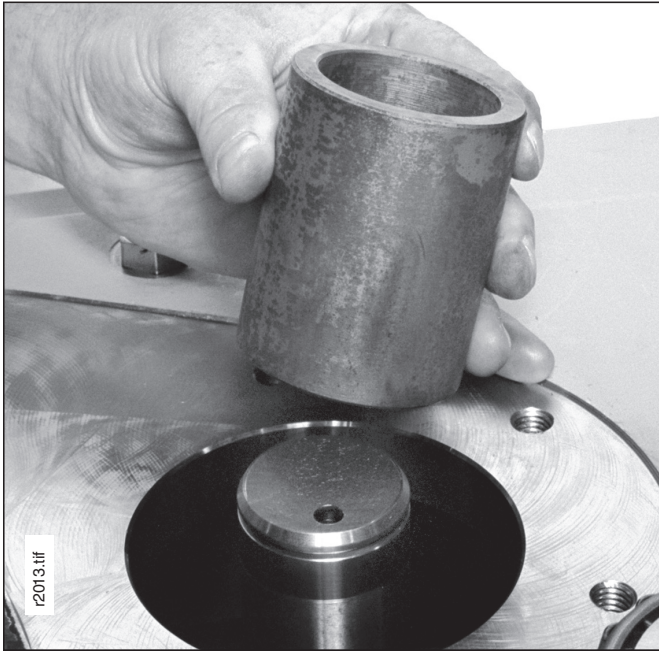
20. Place left-hand bearing retainer on top of shaft.



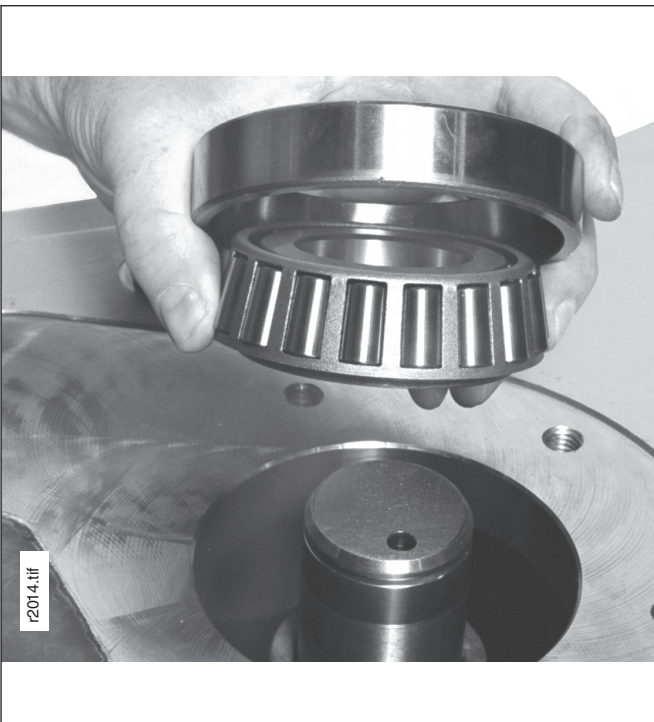
22. Turn winch over and install clutch gear on right-hand side of winch.



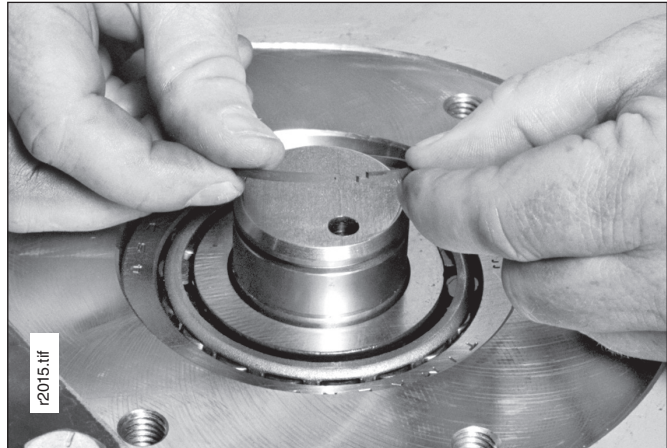
23. Place spacer on top of gear.



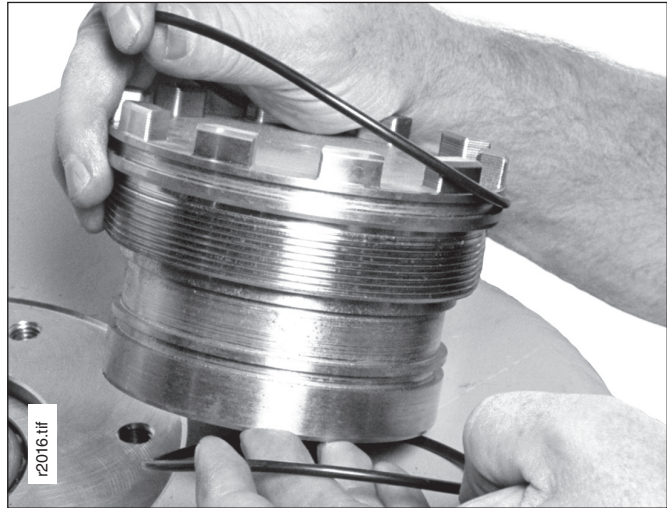
24. Place bearing cup and cone on top of spacer.



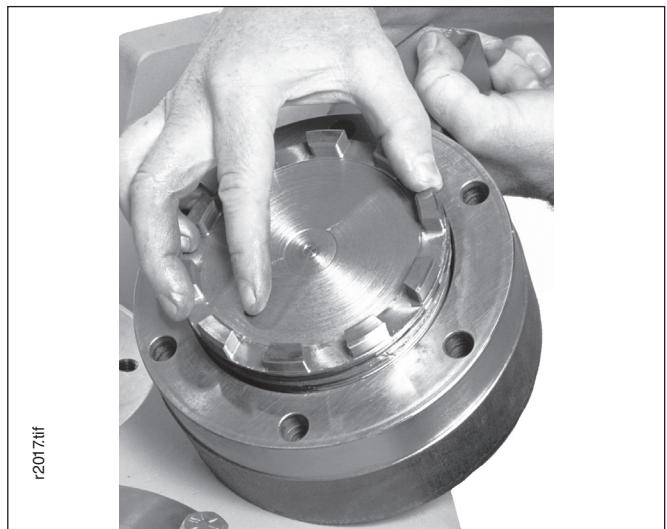
25. Insert seal ring on clutch shaft.



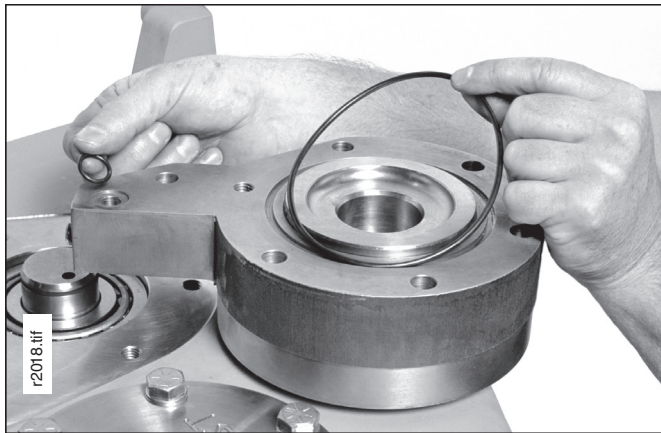
26. Insert O-rings on right-hand bearing adjuster and coat anti-seize on threads. Lubricate O-ring grooves.



27. Thread bearing adjuster into right-hand bearing retainer.



28. Place two O-rings on reverse side of right-hand bearing retainer. Secure large O-ring with a large dab of grease so the O-ring doesn't fall when retainer is upended.

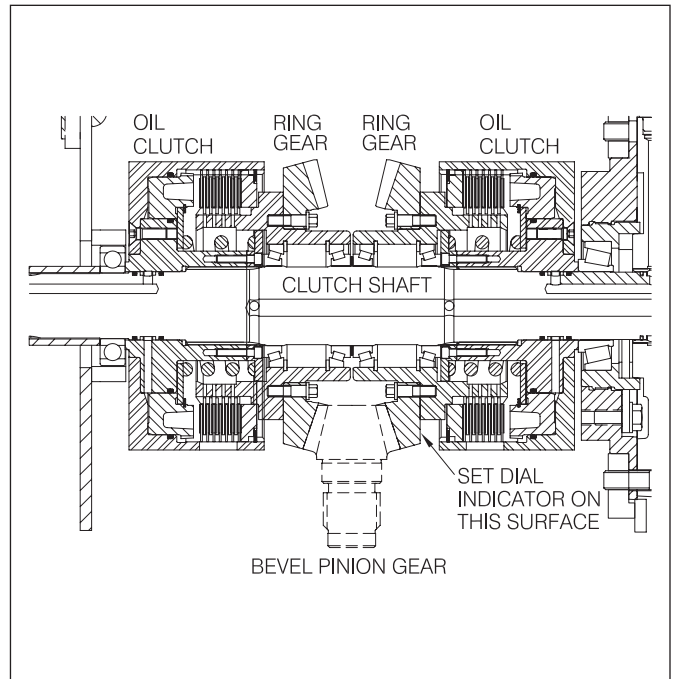


29. Fasten bearing retainer onto frame temporarily with 1/2 UNC x 3 1/2 capscrews.

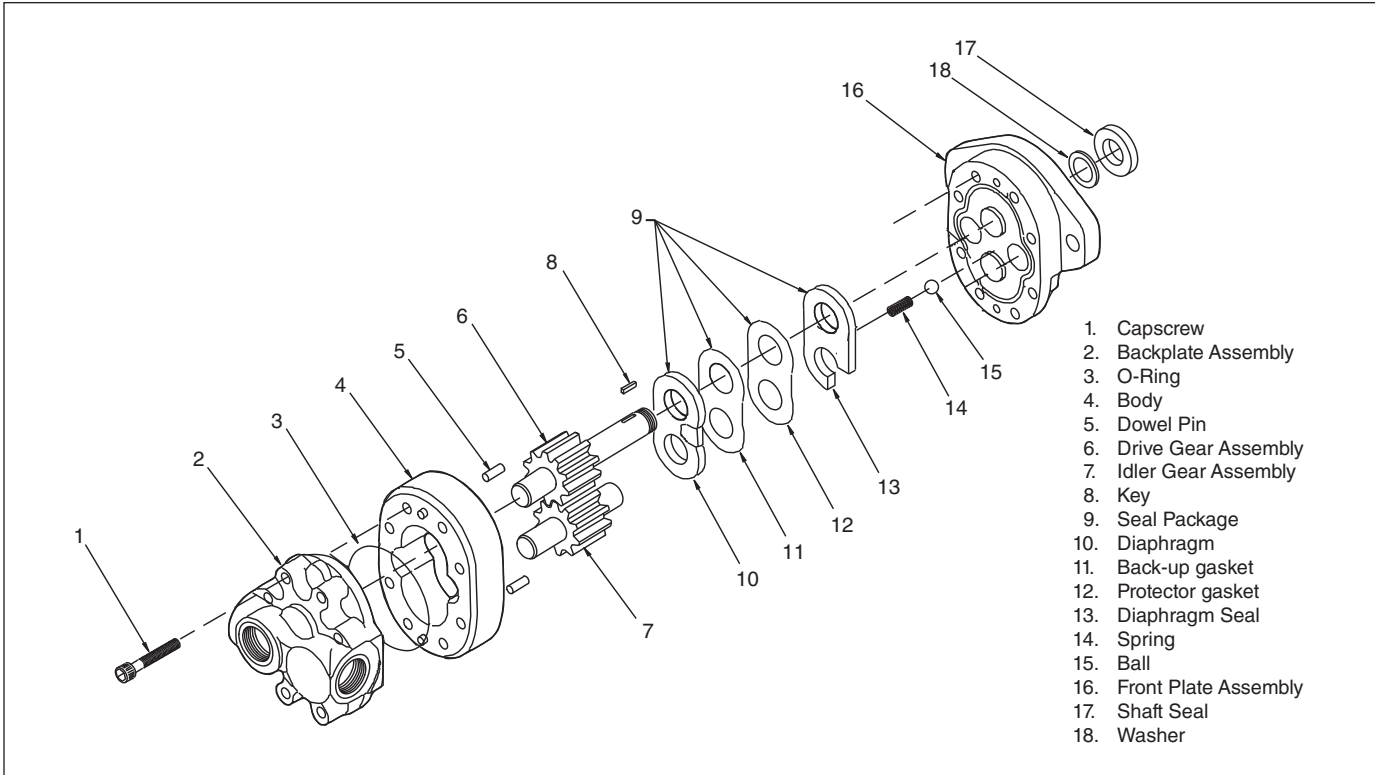


**NOTE:** Finishing up the clutch shaft installation requires setting the gear backlash, which requires installing the input carrier first. Please refer to steps 17 through 21 in the "Input Carrier Reassembly and Installation" subsection for details on these procedures.

30. Set clutch shaft endplay:



- a) Set dial indicator on ring gear surface as shown in the above illustration.
- b) Push shaft all the way to one side, towards the gear with the dial indicator. Set indicator to "0".
- c) Push shaft all the way to the other side. Record the figure measured by the dial indicator.
- d) The clutch shaft endplay needs to be between .001 inch (0.0254 mm) tight to .004 inch (0.1016 mm) loose. To adjust endplay, tighten or loosen the bearing adjusters on either end of the clutch shaft, which can be adjusted in increments of .003 inch (0.0762 mm).



**Figure 3-9 Hydraulic Pump**

## Hydraulic Pump Reassembly & Installation

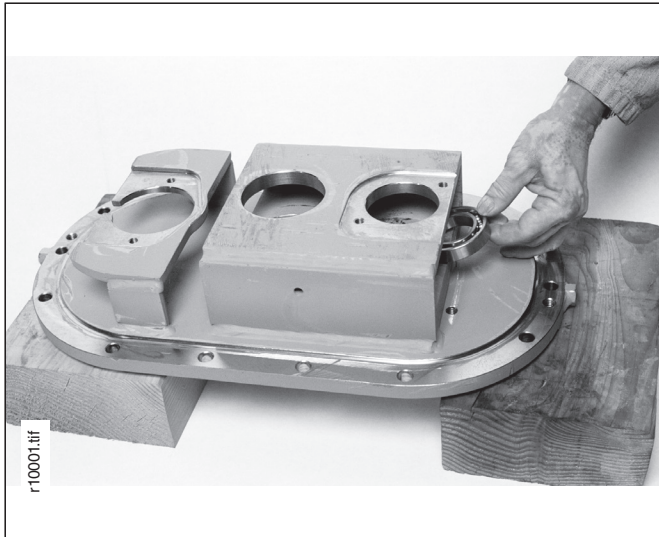
1. Replace as new parts seal kit (9), O-Ring (3), and shaft seal (17).
2. Tuck diaphragm seal (13) into grooves in front plate with open part of "V" section down.
3. Press protector gasket (12) and back-up gasket (11) into diaphragm seal.
4. Drop steel balls (15) into respective seats and place springs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

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

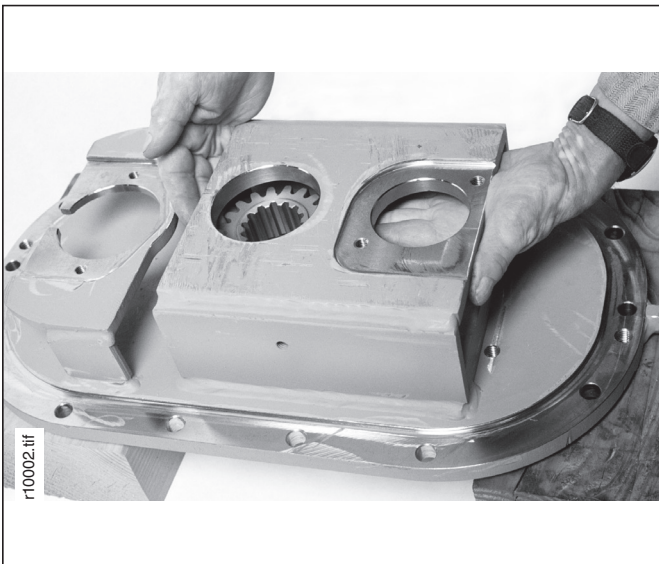
## Input Carrier Reassembly and Installation

**NOTE:** Photographs for the input carrier reassembly in this section are meant for reference only. Please refer to Figure 3-10 to Figure 3-12 and the W6G Parts Manual (P/N 599003W) for the specific configuration for your dozer.

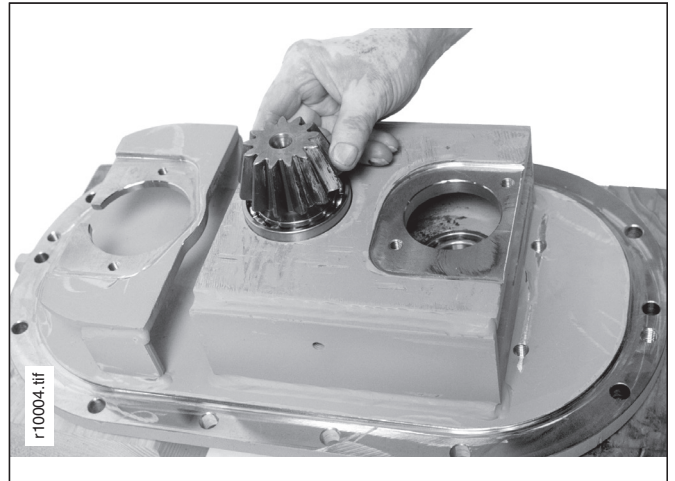
1. Set input carrier on wooden blocks for easy access. Lubricate ball bearing bore. Insert bearing and tap to seat.



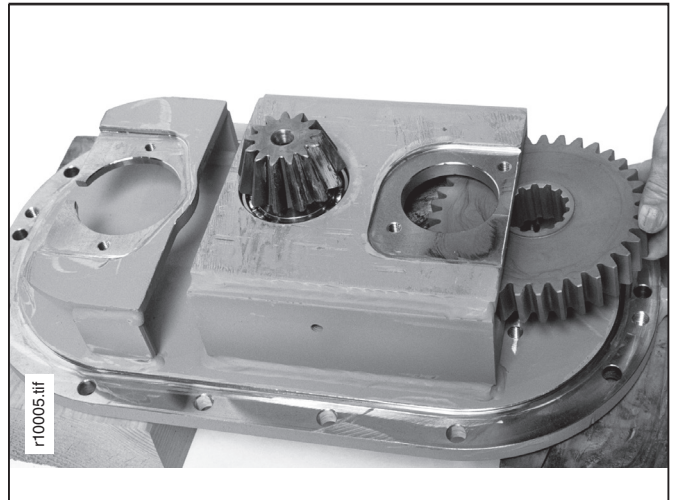
2. Insert pinion shaft gear and slide to center hole.



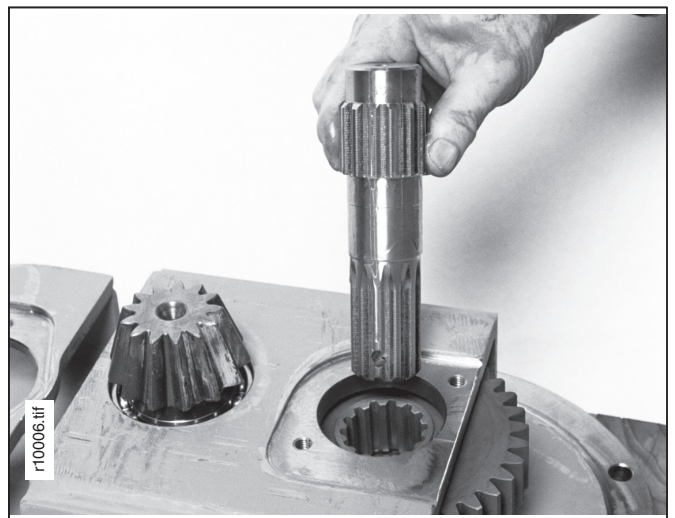
3. Lubricate bearing and set on bevel pinion gear. Insert bevel pinion gear onto pinion shaft gear.



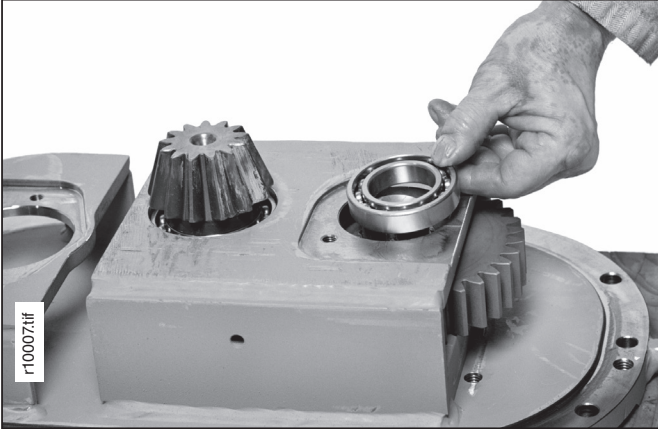
4. Insert input shaft gear.



5. Lubricate input shaft well and insert into input shaft gear. Tap gently into place.



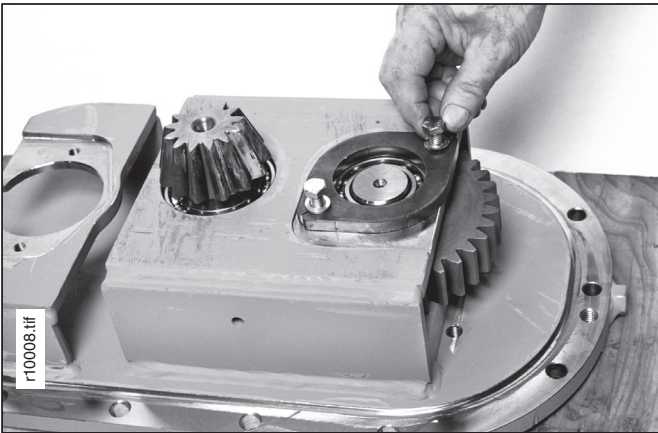
6. Lubricate ball bearing and insert on top of input shaft. Tap to seat bearing flush with face of input carrier.



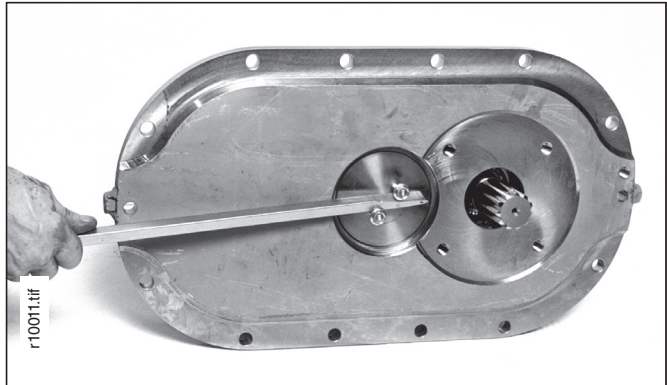
9. Seat bearing in pinion bearing adjuster and apply anti-seize compound to threads. Lubricate O-ring groove.



7. Install bearing retainer and fasten with capscrews and washers.



10. Turn carrier over and prop back with block. Insert bearing adjuster in place. Insert two 3/8 UNC capscrews and tighten bearing adjuster until O-ring just contacts chamfered surface on carrier housing using a metal bar as shown.

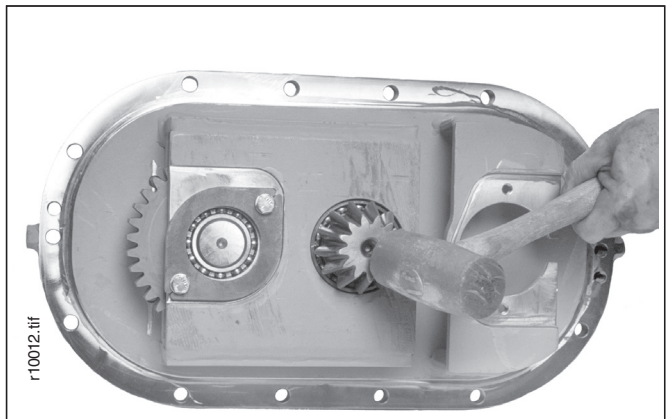


8. Insert lubricated O-ring on pinion bearing adjuster.

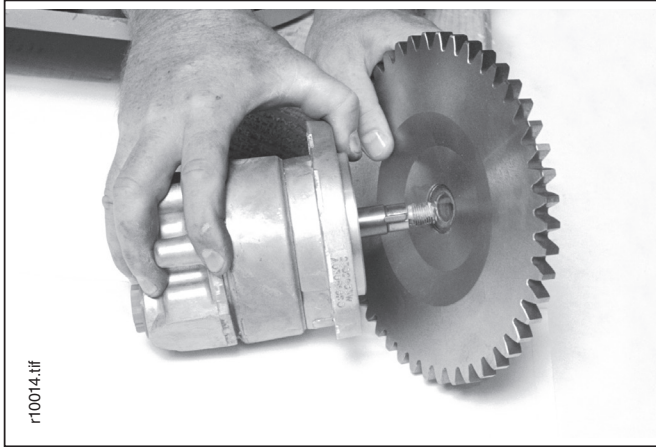


**NOTE: Ensure pinion shaft gear and input shaft gear splines are aligned. Tap lightly on bevel pinion gear if necessary.**

11. Turn carrier over again. Tap bevel pinion gear in place lightly to ensure it is seated properly on bearing and that O-ring is completely through bearing bore.

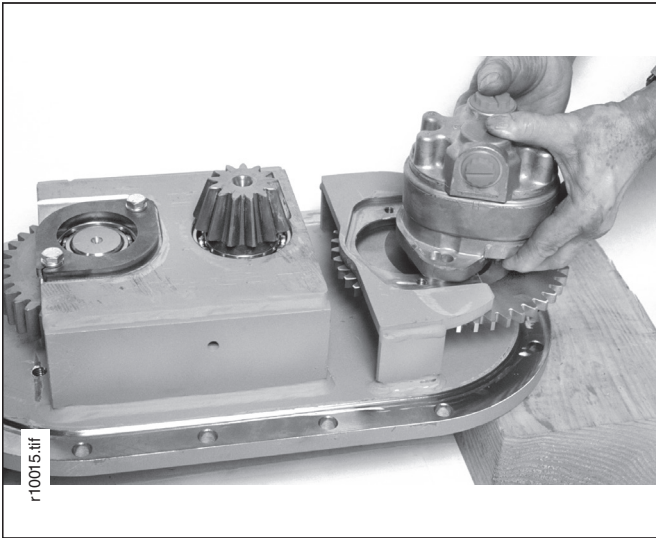


- Apply blue loctite to pump shaft threads and insert pump gear. Match keyway on gear to key on shaft. Install the nut and torque to 38-40 ft-lb (52-54 Nm).

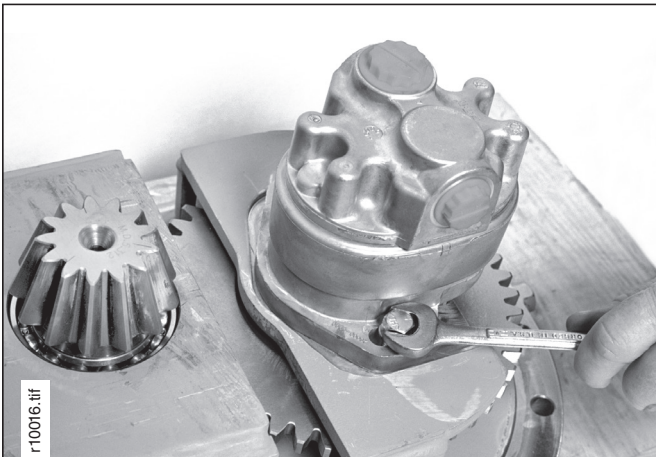


**NOTE: Ensure concave side of gear faces towards pump.**

- Insert pump and gear, and tap assembly in place.



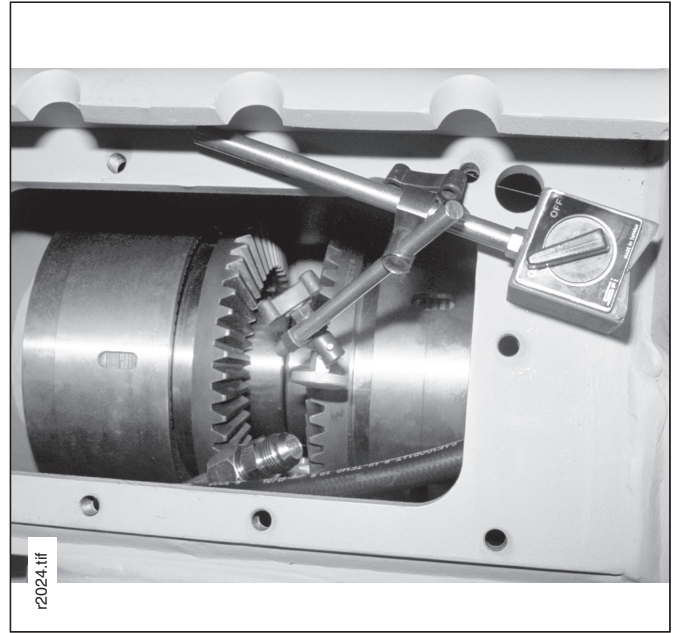
- Insert capscrews on pump and tighten.



- Plumb pump accordingly. Refer to the hydraulic arrangement specific to your dozer in the W6G Parts Manual, P/N 599003W.

- Squeeze bead of sealant on input assembly surface and install on winch.

- Set gear backlash:

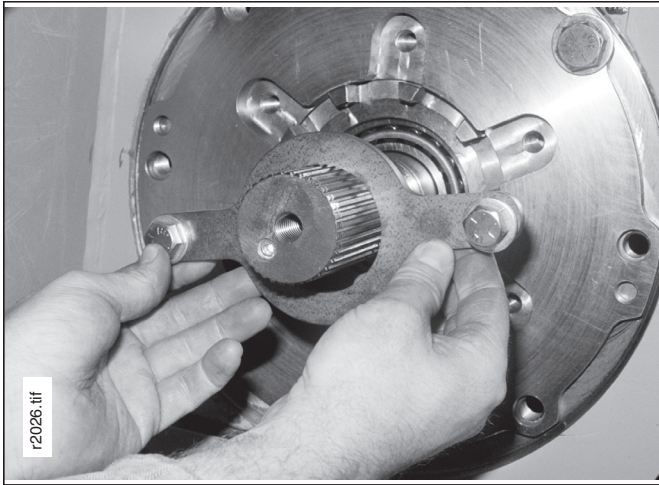


- Pry pinion forward (**away** from ring gears) to make sure the pinion is tight against the pinion bearing adjuster. If the pinion is the newer design with an O-ring on the shaft, doing this ensures the O-ring goes completely through the bearing bore.
- Set dial indicator on a ring gear tooth.
- Use dial indicator to measure backlash for that gear.

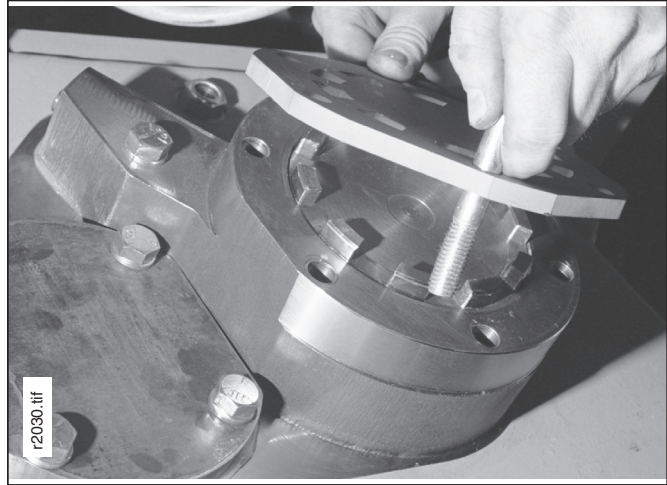
**NOTE: Do not allow pinion to rotate when measuring backlash.**

- Repeat procedure for other ring gear.
- Backlash measurements need to be between .007 inch (0.178 mm) and .014 inch (0.356 mm), and as close to identical as possible for both sides. If backlash is different for the two gears, the clutch shaft needs to be centered. To do this, use the bearing adjusters on either end of the clutch shaft, both of which can be adjusted in increments of .003 inch (0.076 mm).
- Once the backlash is identical for the two gears, tighten or loosen the pinion bearing adjuster to bring the backlash within tolerance.

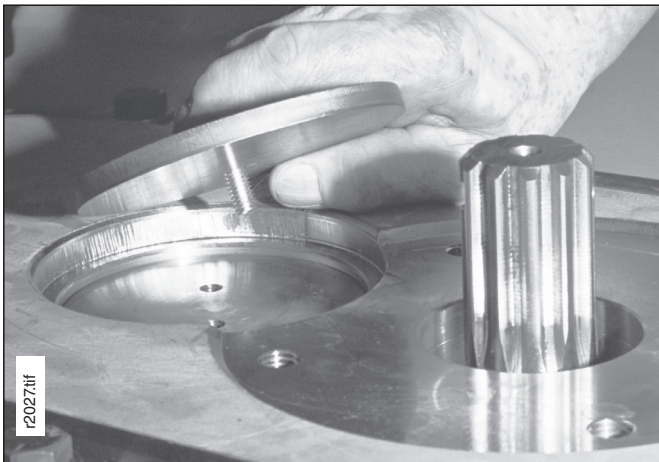
18. Install bearing keeper on left-hand side of clutch shaft.



21. Remove temporary capscrews from right-hand bearing retainer keeper, and install actual capscrews.

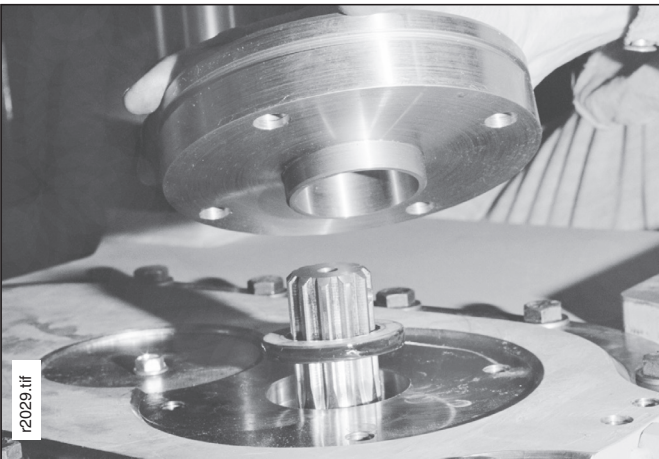


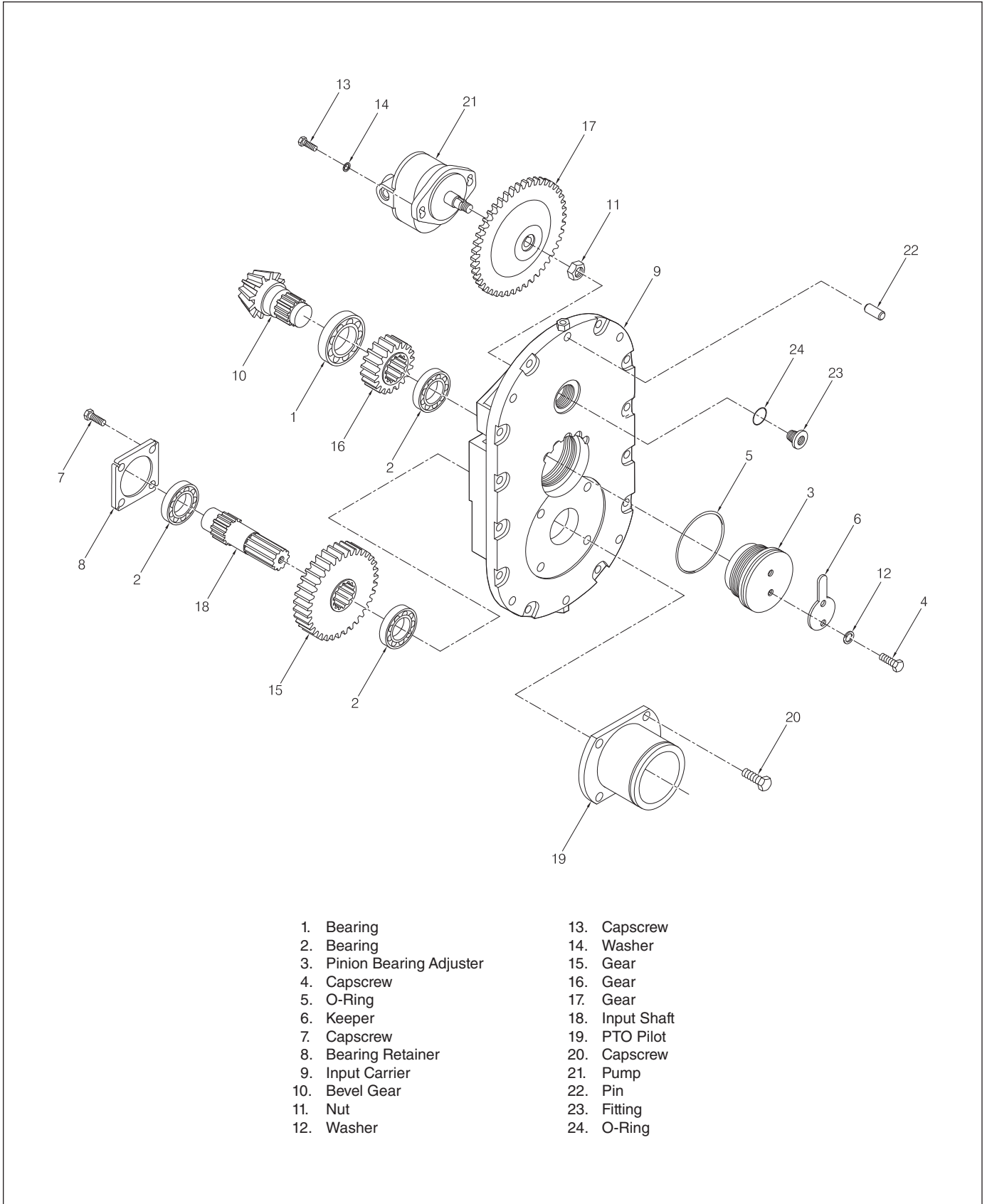
19. Install bevel pinion keeper on input carrier.



**NOTE:** New-style bevel pinion keeper is shown above. For older bevel pinion keepers, see Figure 3-10 through Figure 3-12.

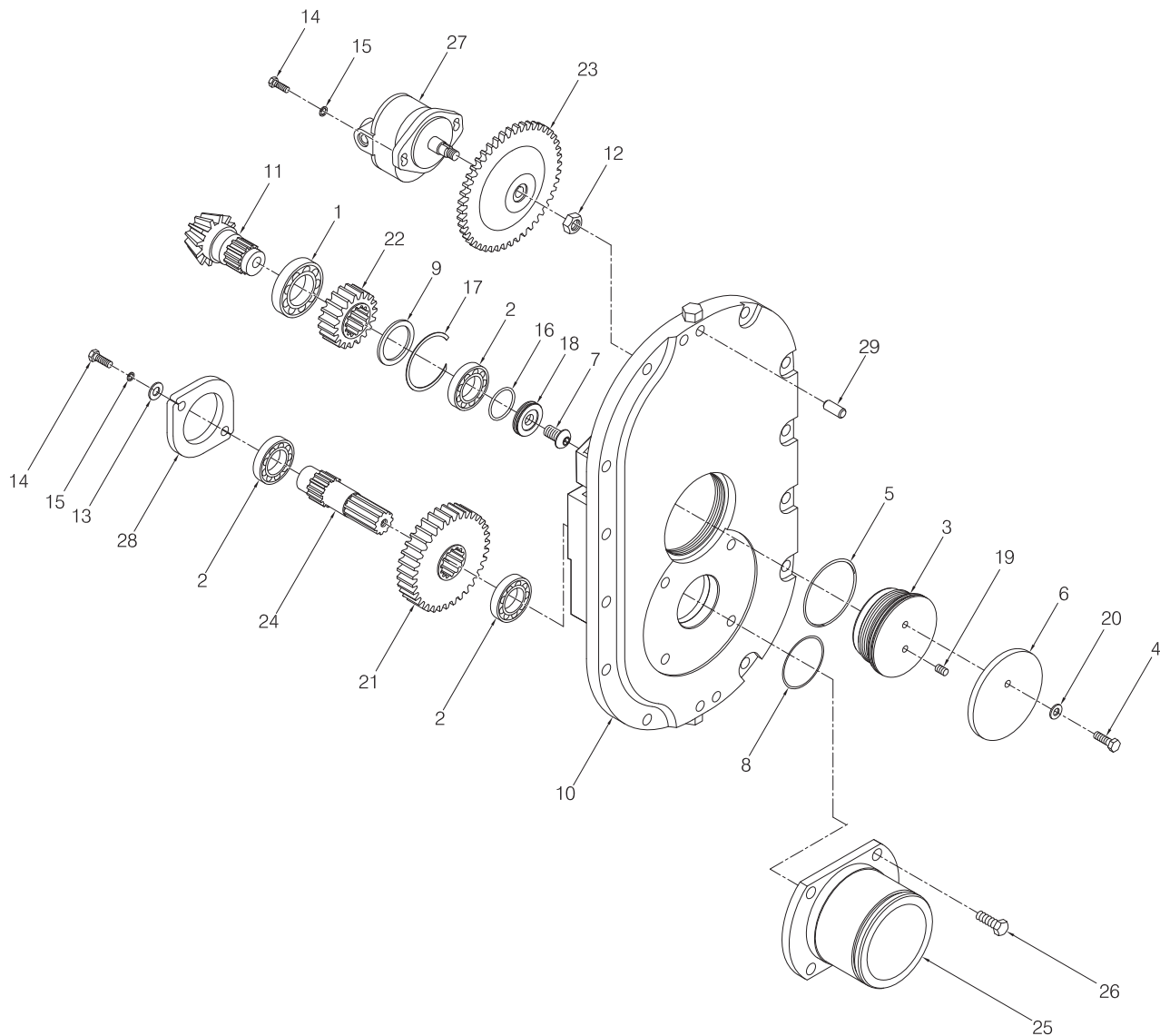
20. Install PTO pilot and greased seal on input carrier.





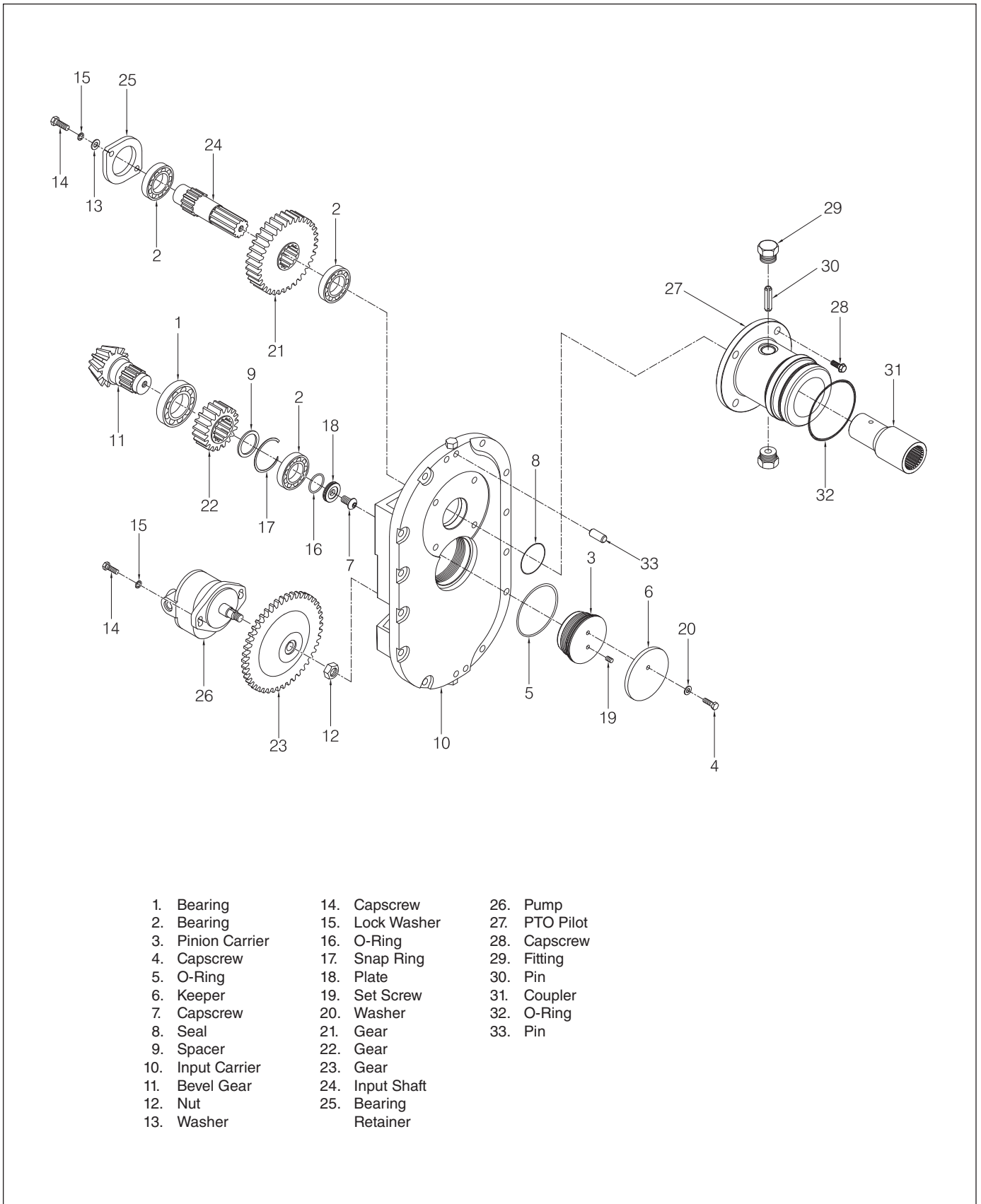
- |                            |                 |
|----------------------------|-----------------|
| 1. Bearing                 | 13. Capscrew    |
| 2. Bearing                 | 14. Washer      |
| 3. Pinion Bearing Adjuster | 15. Gear        |
| 4. Capscrew                | 16. Gear        |
| 5. O-Ring                  | 17. Gear        |
| 6. Keeper                  | 18. Input Shaft |
| 7. Capscrew                | 19. PTO Pilot   |
| 8. Bearing Retainer        | 20. Capscrew    |
| 9. Input Carrier           | 21. Pump        |
| 10. Bevel Gear             | 22. Pin         |
| 11. Nut                    | 23. Fitting     |
| 12. Washer                 | 24. O-Ring      |

**Figure 3-10 Input Carrier Arrangement for Caterpillar D6R Series II**



- |                   |                  |                             |
|-------------------|------------------|-----------------------------|
| 1. Bearing        | 14. Capscrew     | 27. Pump                    |
| 2. Bearing        | 15. Lock Washer  | 28. Bearing Retainer        |
| 3. Pinion Carrier | 16. O-Ring       | 29. Pin                     |
| 4. Capscrew       | 17. Snap Ring    |                             |
| 5. O-Ring         | 18. Plate        | * Caterpillar D6H/R, I & II |
| 6. Keeper         | 19. Set Screw    |                             |
| 7. Capscrew       | 20. Washer       |                             |
| 8. Seal           | 21. Gear         |                             |
| 9. Spacer         | 22. Gear         |                             |
| 10. Input Carrier | 23. Gear         |                             |
| 11. Bevel Gear    | 24. Input Shaft* |                             |
| 12. Nut           | 25. PTO Pilot*   |                             |
| 13. Washer        | 26. Capscrew*    |                             |

**Figure 3-11 Input Carrier Arrangement for Caterpillar D6R Series II**



- |                   |                      |               |
|-------------------|----------------------|---------------|
| 1. Bearing        | 14. Capscrew         | 26. Pump      |
| 2. Bearing        | 15. Lock Washer      | 27. PTO Pilot |
| 3. Pinion Carrier | 16. O-Ring           | 28. Capscrew  |
| 4. Capscrew       | 17. Snap Ring        | 29. Fitting   |
| 5. O-Ring         | 18. Plate            | 30. Pin       |
| 6. Keeper         | 19. Set Screw        | 31. Coupler   |
| 7. Capscrew       | 20. Washer           | 32. O-Ring    |
| 8. Seal           | 21. Gear             | 33. Pin       |
| 9. Spacer         | 22. Gear             |               |
| 10. Input Carrier | 23. Gear             |               |
| 11. Bevel Gear    | 24. Input Shaft      |               |
| 12. Nut           | 25. Bearing Retainer |               |
| 13. Washer        |                      |               |

**Figure 3-12 Input Carrier Arrangement for Caterpillar D6N**

## Oil Brake Reassembly and Installation

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

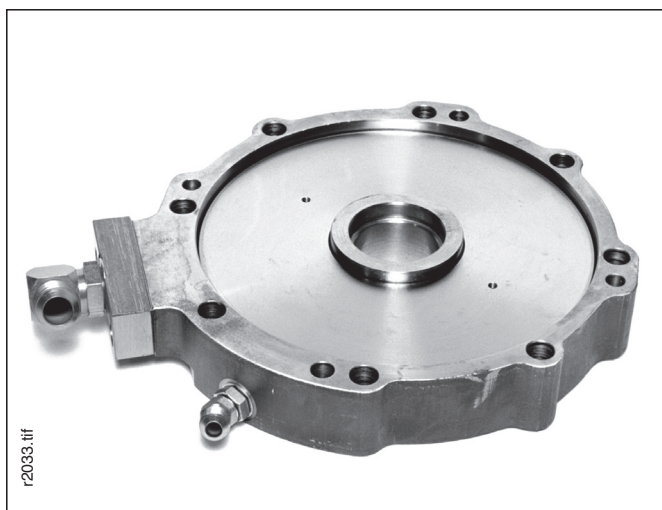
1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston cavity.



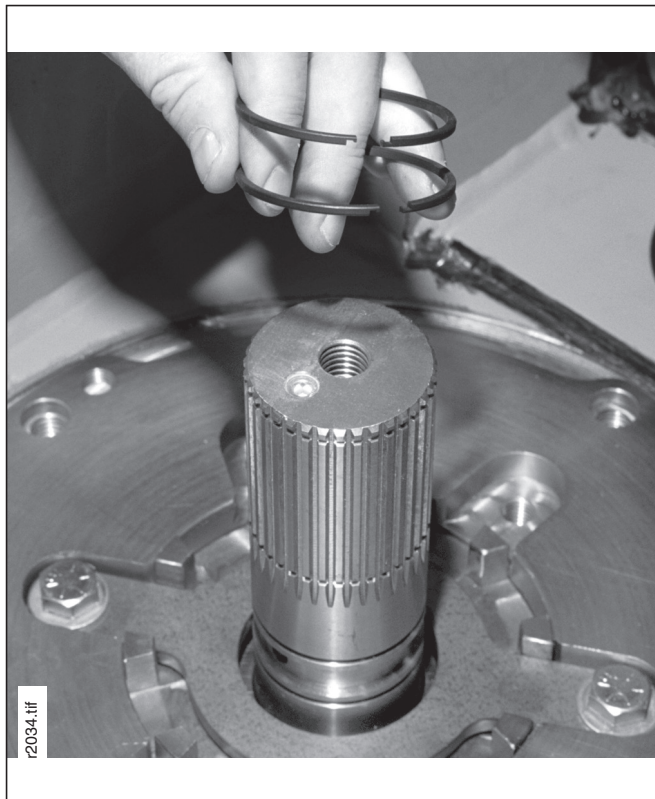
### CAUTION

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

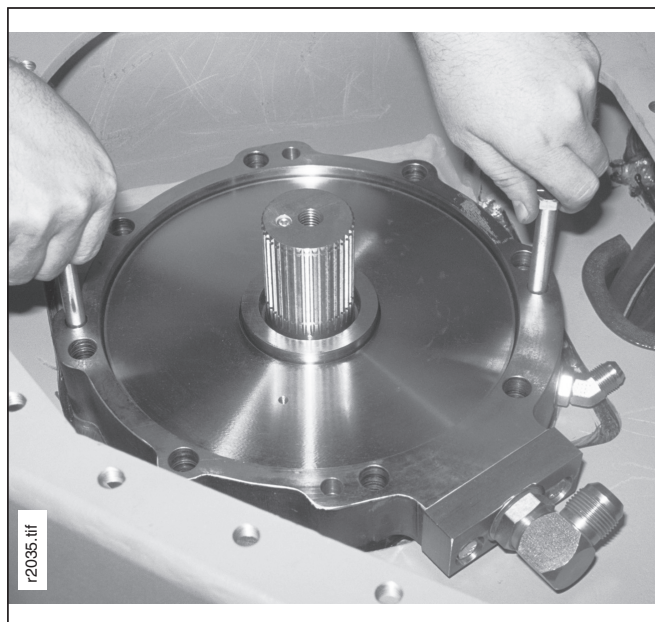
2. Lubricate the piston as well as the cavity in the brake piston housing. Install piston in housing. Ensure the two holes in the piston face up.



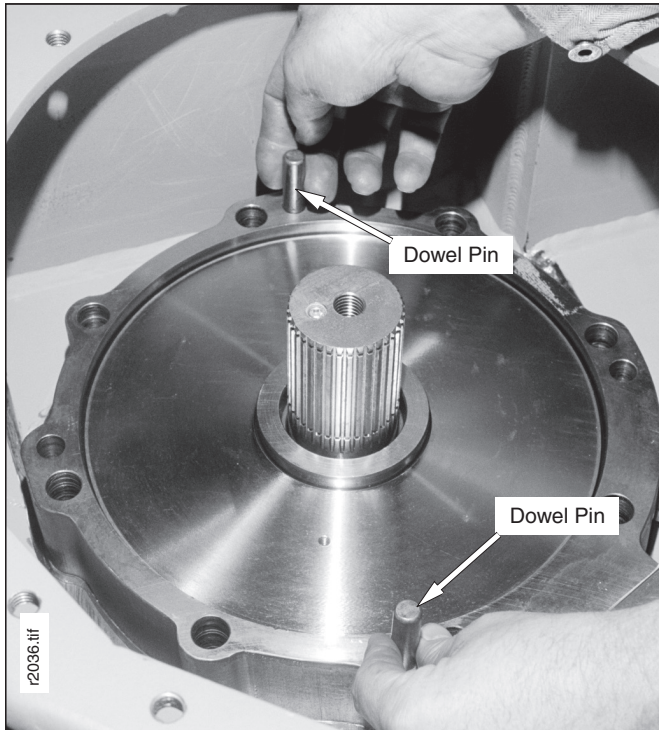
3. Insert two seal rings on the left-hand side of the clutch shaft and lubricate the grooves.



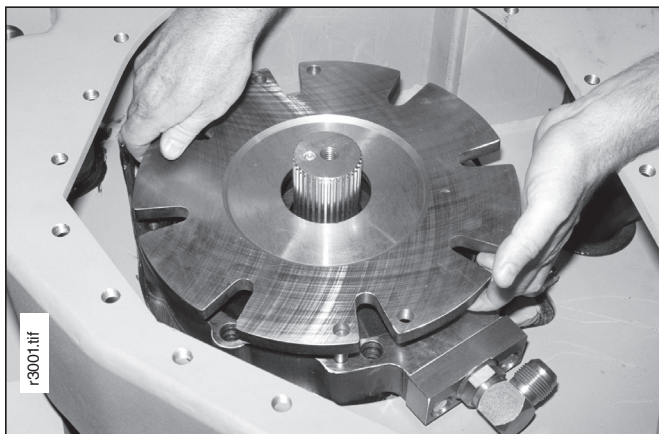
4. Using two 1/2 UNC x 4 1/2 capscrews, lift brake piston assembly and place on left-hand side of clutch shaft.



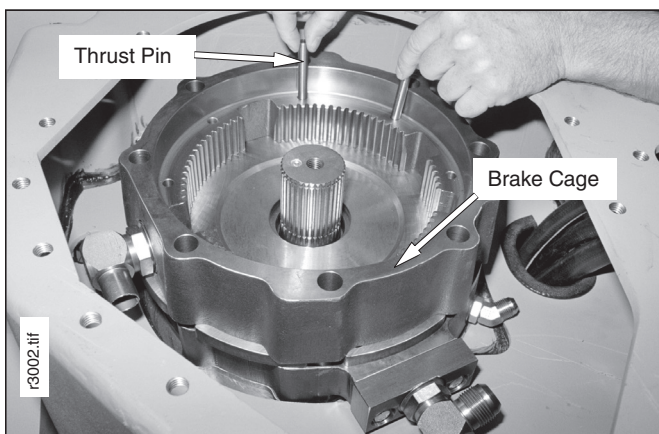
5. Insert two dowel pins in brake piston assembly.



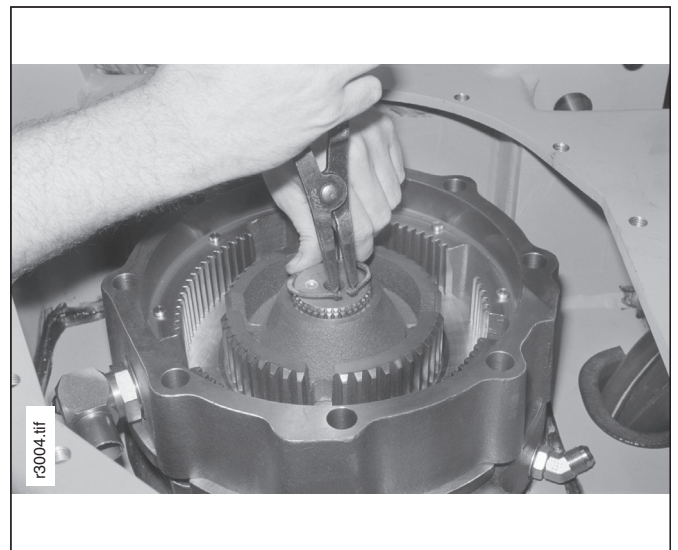
6. Place pressure plate on top of brake piston housing.



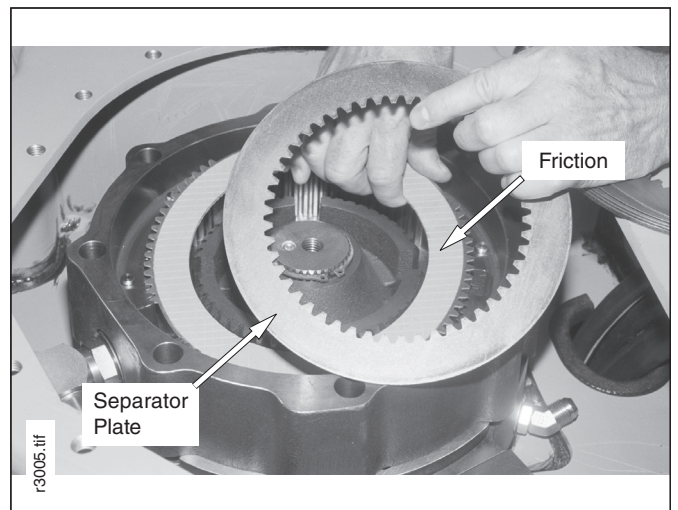
7. Place brake cage on top of brake piston housing and install thrust pins.



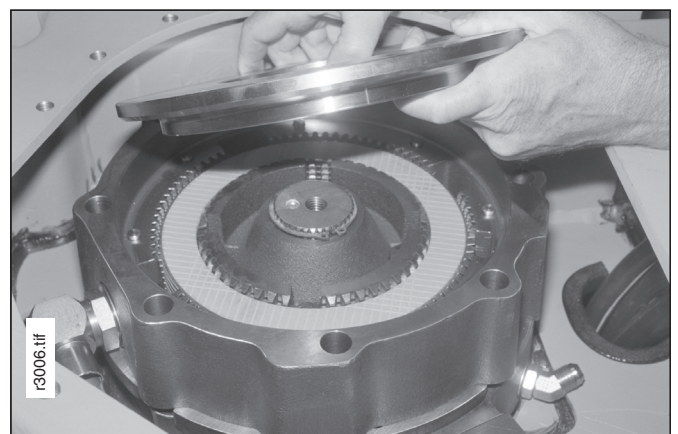
8. Install brake hub and two snap rings.



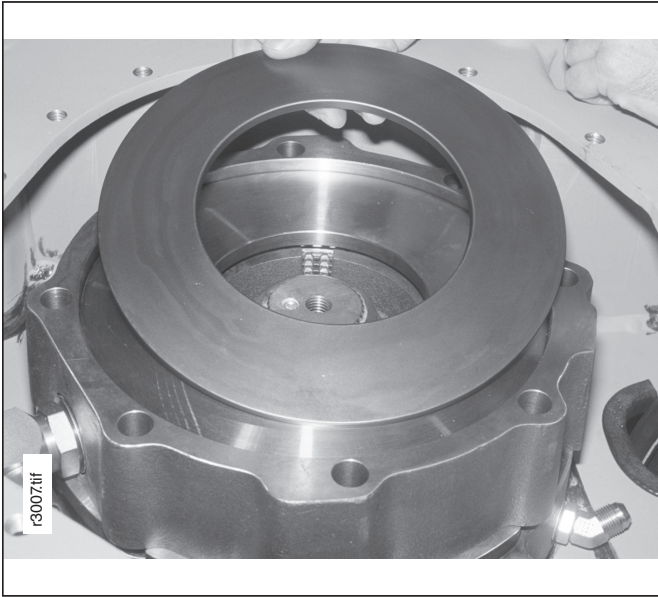
9. Install friction discs and separator plates alternately, starting with a friction disc. Align blanked-out teeth on all friction discs.



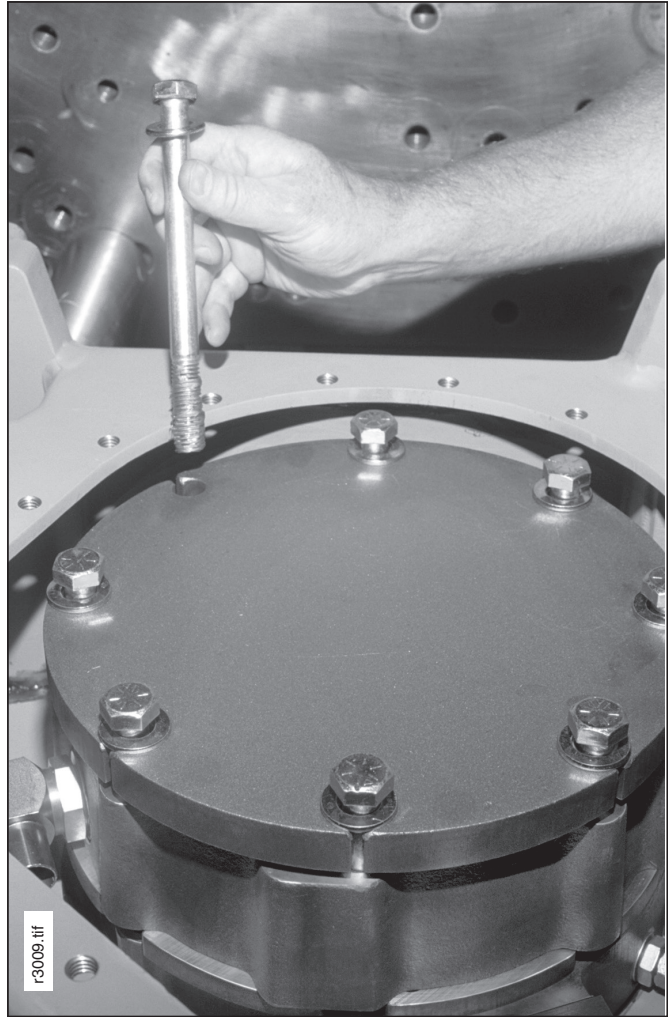
10. Insert the thrust ring, smooth side out.



11. Place the belleville spring with the convex side out on top of the thrust ring. Place and center the stroke limiter (if applicable) inside the belleville spring.



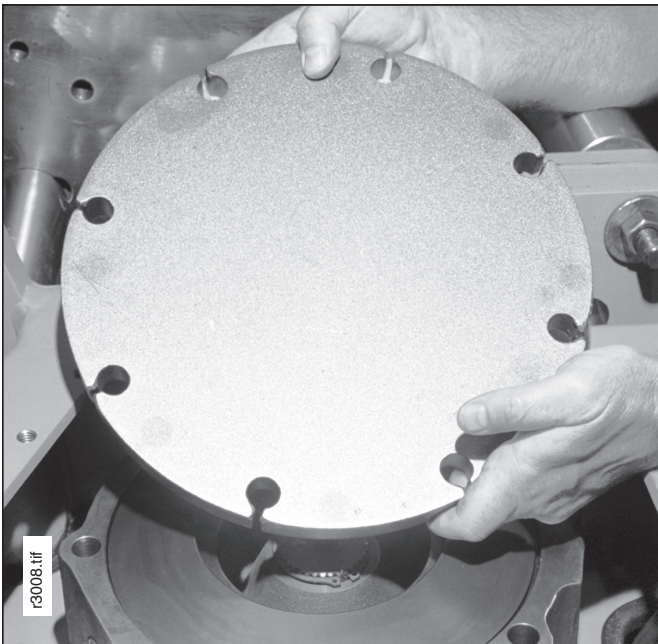
13. Fasten with capscrews lubed with anti-seize. Torque the capscrews to 160 ft-lb (22 kg-m).



## CAUTION

Make sure that the stroke limiter does not move during assembly or it can become trapped under belleville spring, and not allow brake to release properly.

12. Install the brake cover.



14. Restore hydraulic connections to brake (refer to the Hydraulic Arrangement page for your specific dozer in the W6G Parts Manual for specifics).

15. Install winch covers.

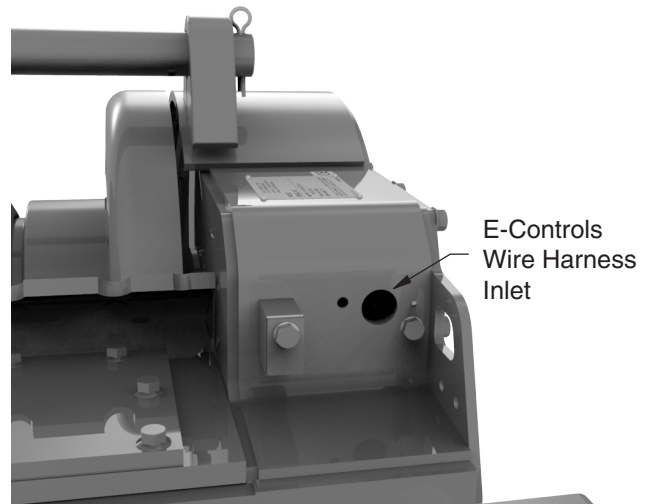
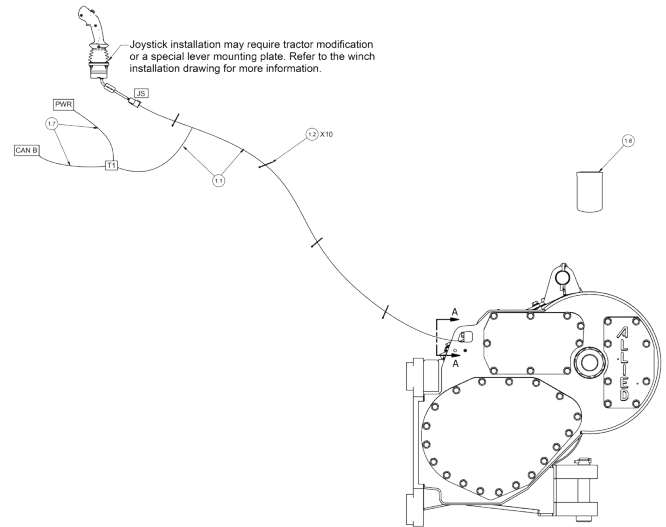
## Winch installation

1. Thoroughly clean the mounting surfaces on the winch and the dozer. Clean the mounting holes and hardware of dirt, grit and oil.
2. 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.
3. Loctite all studs.
4. Install mounting adapter, if required.
5. Attach sling or chain fall to lift points.
6. Raise the winch and align the splines on the dozer PTO with the splines of the PTO coupling.

### WARNING

**Before lifting the winch, check Figure 1-16, Winch Weight, to make sure the minimum rated capacity for the slings, crane or other lifting devices exceeds the load being lifted.**

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. The two top inboard nuts should be snug then turned on to the next slot so that the cotter pin can be installed. All outboard nuts should be tightened to 500 ft-lbs (69 kg-m). Torque all nuts and capscrews as specified in Figure 1-15.



11. Install joystick 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 subsection of Service in Section 2.

**NOTE: Pressure checks starting with Figure 2-20 should be taken with hydraulic oil at operating temperature.**



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