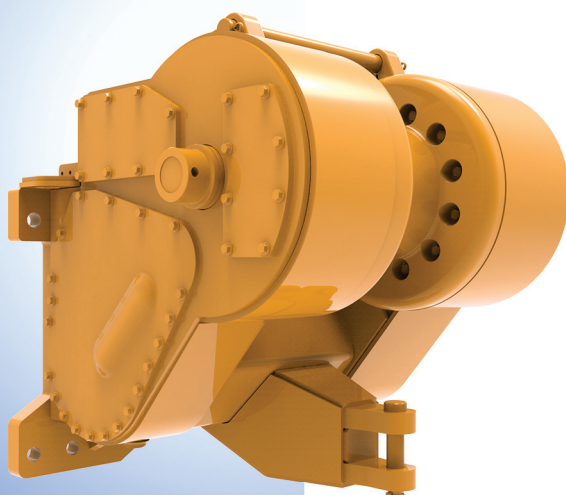




# Service Manual

## Allied W12E

### Power Controlled & Electronic Controlled Towing Winch



**APPLICABLE FOR ALLIED-BUILT WINCHES  
(SERIAL NO. AW12E-XXXX)**

**FOR HYSTER-BUILT WINCHES  
(SERIAL NO. W12E-XXXX)  
SEE SERVICE MANUAL #599787W**

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

## CUSTOMER EDITION

A PRODUCT OF  
**Allied Systems**  
COMPANY

SHERWOOD, OREGON USA

P/N 599034W

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11/21/2016

# **Safety Precautions**

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

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

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

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



## Safety Summary

### General Safety Notices

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

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



### DANGER

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



### WARNING

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



### CAUTION

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

### NOTICE

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

NOTE: ...

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

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

### Safety Regulations

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

### Operation, Inspection, and Maintenance Warnings



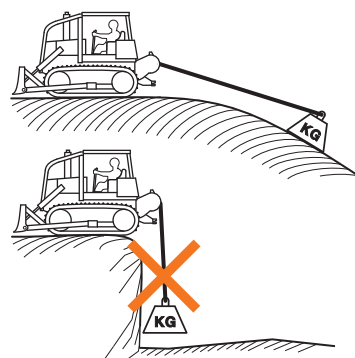
### WARNING

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

- Do not operate the winch unless you are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.
- Do not use the control levers for hand holds when entering or leaving the vehicle.
- Do not permit other people near the control area when you inspect or repair a machine.
- Never inspect, repair, or perform maintenance on a machine that is in motion.
- Inspect the winch before each use:
  - » Make sure that the controls and instruments operate correctly.
  - » Report the need for repairs immediately.
  - » Do not work with a damaged or worn wire rope.
  - » Do not use a winch that needs repairs.

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

- Stay in the operator's seat when operating the winch.
- Do not stand on the vehicle when operating the winch.
- Avoid winch operation near people or other machines.
- Never stand nor permit others to stand in the bight (loop) of a wire rope.
- Do not stand nor permit others to be near the winch or wire rope when there is tension on the wire rope.
- Observe jobsite rules.
- Be in complete control at all times.
- Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc.
- Do not leave the vehicle when the winch wire rope is under tension.
- Do not permit riders on the vehicle or load.
- Do not use the winch as an anchor for a double or two-part line.
- Do not pull the hook through the throat or over the drum, which will cause damage.
- When the winch is not in use, make sure the control lever is in **BRAKE-ON** position and the winch brake is applied.
- Do not use winch as a hoist. Tractor and skidder mounted winches are designed for towing.



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



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

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



### **Ordering Parts:**

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

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

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

Phone: 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.

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## General

### Introduction

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

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

**Section 2. Power/Cable 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 power/cable controls.

**Section 3. 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 4. Repairs** describes the removal, disassembly, assembly, and installation of the winch.

### Description

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

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

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

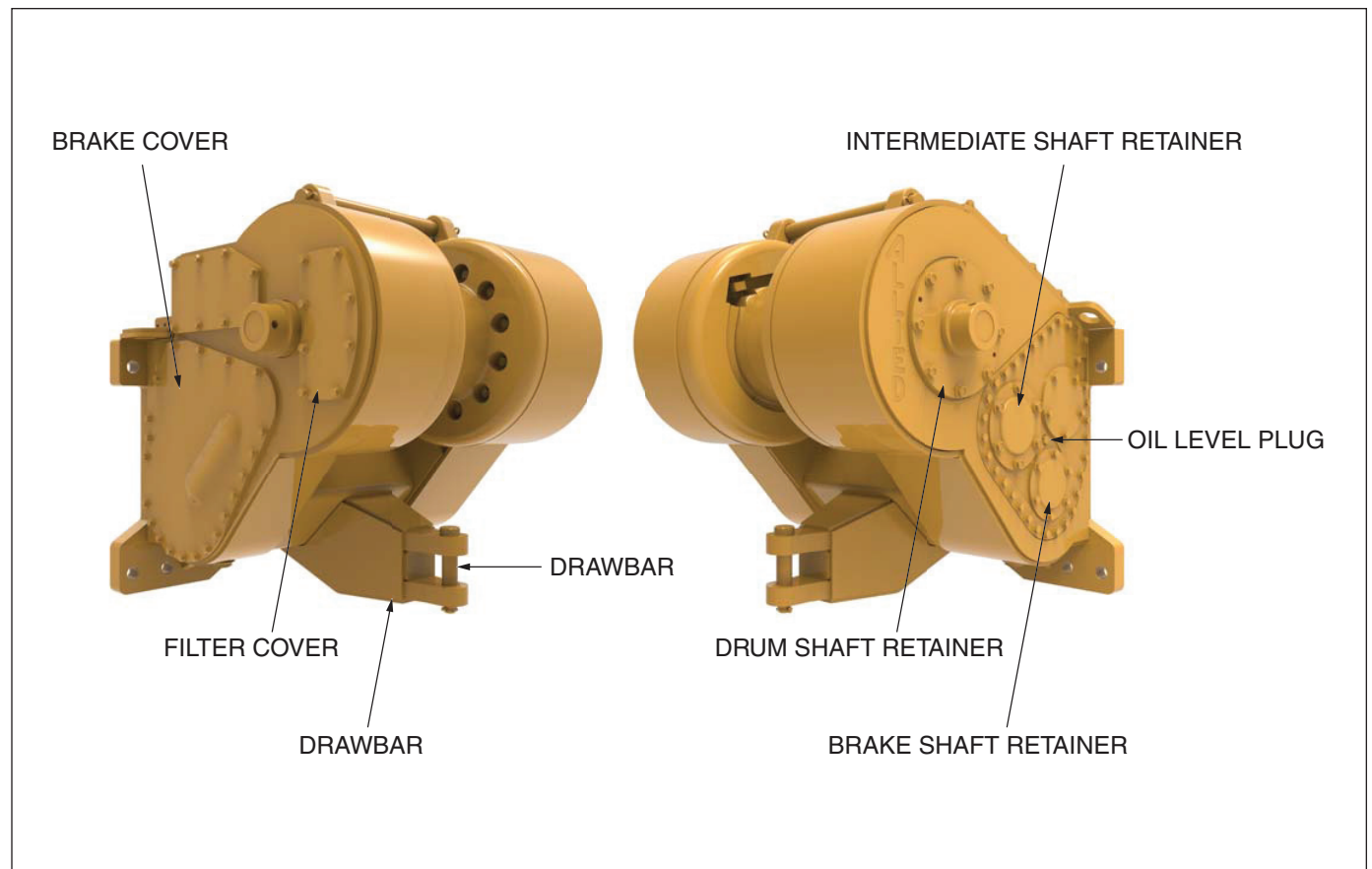
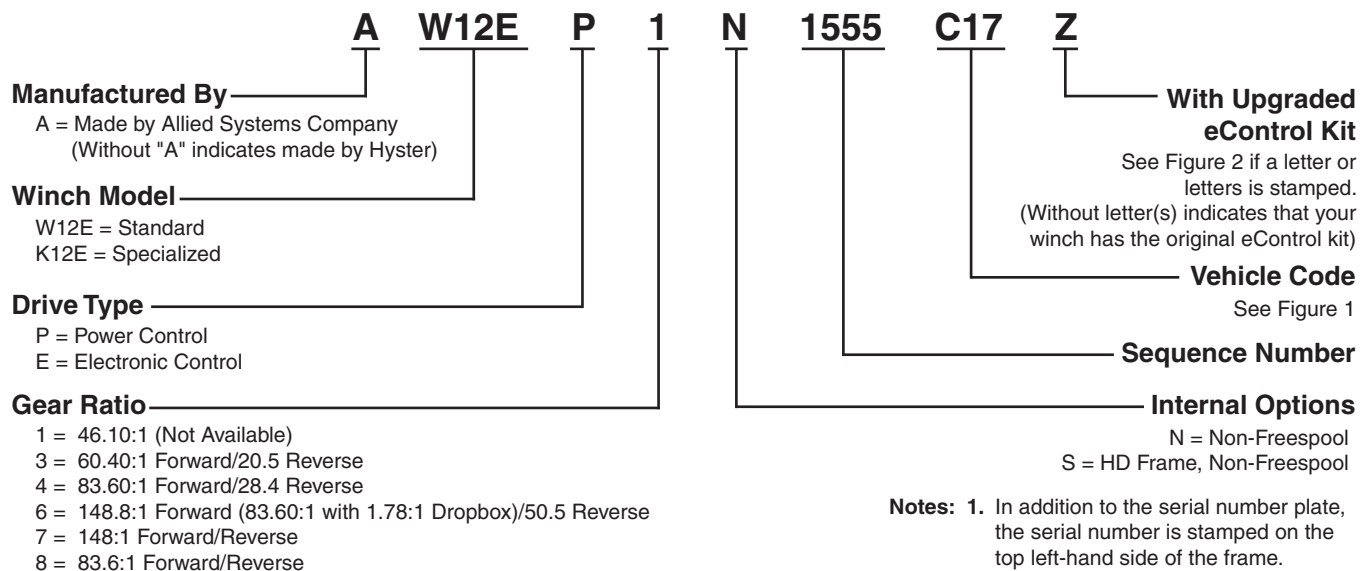


Figure 1-1 Model Views (Equal Speed Shown)

## Unit Identification

Allied Winch S/N Nameplate Data For Tractor Mountings



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

**Figure 1 - Tractor or Skidder Identification and Gear Ratio (Continued on next page)**

| Tractor Make Model and Starting Tractor Serial Number Where Applicable |                                   |   |                              |  |                    |
|--|-----------------------------------|---|------------------------------|--|--------------------|
| C<br>O<br>D<br>E   | A<br>Fiat-Hitachi/<br>New Holland | C<br>Caterpillar                                  | G<br>Terex                   | H<br>Dresser/<br>Dressta                   | K<br>Komatsu       |
| 59   |                                   | D8R Series II<br>⑥                                |                              |  |                    |
| 60   |                                   |   |                              |  | D275A-2<br>④       |
| 61   | 21C ③<br>FD30 ③ ④                 | D8K PS<br>① ③ ④                                   | 82-30, 82-30B,<br>D750A<br>③ | TD25C PS<br>③ ④                            | D155A-1 & 2<br>③ ④ |
| 62   | FD40B, FP120,<br>31<br>③          | D9 PS, D9H, 594H<br>① ③ ④                         | D800<br>③ ④                  |  |                    |
| 63   | 41-B<br>④                         | 583<br>Serial No. 78V 61A<br>① ③ ④<br>583H/K<br>④ |                              | TD25E PS<br>Serial No. 1001<br>& Up<br>③ ④ |                    |
| 64   | FD30B/C, D350<br>① ③ ④            | 594H<br>Serial No. 96V 62H<br>① ③ ④               |                              | TD25G/H/M<br>③ ④                           | D375A-1<br>①       |
| 65   | FD40<br>④                         | D8L, D9N,<br>D9R (Clutch Br.<br>Steer)<br>④, ⑥ *  |                              | TD40B/C<br>④                               |                    |

## Unit Identification

Allied Winch S/N Nameplate Data For Tractor Mountings

**Figure 1 - Tractor or Skidder Identification and Gear Ratio**

| Tractor Make Model and Starting Tractor Serial Number Where Applicable |                                   |                              |            |                          |              |
|--|-----------------------------------|------------------------------|------------|--------------------------|--------------|
| C<br>O<br>D<br>E   | A<br>Fiat-Hitachi/<br>New Holland | C<br>Caterpillar             | G<br>Terex | H<br>Dresser/<br>Dressta | K<br>Komatsu |
| 66   |                                   | D10N, D10R<br>④, ⑥           |            |                          |              |
| 67   |                                   | 583R<br>③ ④ ⑥                |            |                          |              |
| 68   |                                   | D9R (Diff. Steering)<br>④, ⑥ |            |                          |              |
| 74   |                                   | 583T, D8T,<br>⑥, ⑦           |            |                          |              |
| 75   |                                   | D9T<br>⑥, ⑦                  |            |                          |              |
| 76   |                                   | D10T<br>⑥, ⑦                 |            |                          |              |
| 79   |                                   | 587T,<br>PL83, PL87<br>⑥, ⑦  |            |                          |              |
| * Available only for D9R Clutch Brake Steer with Dropbox.              |                                   |                              |            |                          |              |

**Figure 2 - Winch eControls Modification Status**

| A LETTER OR LETTERS AT THE END OF THE WINCH SERIAL NUMBER CODE INDICATES THAT THE WINCH HAS BEEN MODIFIED WITH AN UPGRADED eCONTROL KIT. |  |
|--|--|
| LETTER   | MODIFICATION   |
| ZZ   | WINCH HAS BEEN UPGRADED TO USE MANIFOLD P/N 2314998                  |
| ZV   | WINCH HAS BEEN UPGRADED TO USE MANIFOLD P/N 2311887                  |
| Z  | WINCH HAS BEEN UPGRADED TO USE MANIFOLD P/N 2306547W                 |
| X  | A KIT HAS BEEN INSTALLED THAT ADDS AN ACTIVATION SWITCH TO THE WINCH |
| REFER TO THE eCONTROLS PROGRAM SELECTION CHART, 2305227W, FOR MORE INFORMATION   |  |

### W12E INSTALLATION DRAWINGS BY TRACTOR

| Winch Serial Number                    | Description                  | Installation Drawing Part Number |
|--|------------------------------|----------------------------------|
| <b>Electronic Control</b>              |                              |                                  |
| W12EE6N----C59                         | W12E CAT D8R SERIES II       | 2305410W                         |
| K12EE8S----C62                         | W12E CAT D9H, 594H           | 2315300                          |
| W12EE6N----C65                         | W12E CAT D9R W/ CL/BR STEER  | 2310794                          |
| W12EE6N----C66                         | W12E CAT D10N/R              | 2305222W                         |
| W12EE6N----C67                         | W12E CAT 583R                | 2310553                          |
| W12EE6N----C68                         | W12E CAT D9R, DIFF. STEER    | 2310794                          |
| W12EE6N----C76                         | W12E CAT D10T                | 2305222W                         |
| W12EE7S----C59                         | W12E CAT D8R SERIES II       | 2305410W                         |
| W12EE7S----C68                         | W12E CAT D9R W/DIFF STEER    | 2310794                          |
| W12EE7S----C74                         | W12E CAT 583T/D8T            | 2310553                          |
| W12EE7S----C75                         | W12E CAT D9T                 | 2310794                          |
| W12EE7S----C76                         | W12E CAT D10T                | 2305222W                         |
| W12EE7S----C79                         | W12E CAT 587T                | 2310553                          |
| <b>Power Control (push pull cable)</b> |                              |                                  |
| W12EP*N----A61                         | W12E CAT D8K                 | 263806W                          |
| W12EP*N----A64                         | W12E FIAT/HITACHI FD30B/C    | 388577W                          |
| W12EP*N----C63                         | W12E CAT 583H/K              | 2313207                          |
| W12EP*N----C64                         | W12E CAT 594H                | 2315144                          |
| W12EP6N----C65                         | W12E CAT D9R W/ CL/BR STEER  | 2304797W                         |
| W12EP*N----C67                         | W12E CAT 583R                | 2304847W                         |
| W12EP6N----C68                         | W12E CAT D9R, DIFF. STEER    | 2304797W                         |
| W12EP7S----C74                         | W12E CAT 583T/D8T            | 2304847W                         |
| W12EP7S----C79                         | W12E CAT 587T                | 2304847W                         |
| W12EP*N----H63                         | W12E IH OR DRESSER TD25E     | 322139W                          |
| W12EP*N----H64                         | W12E IH OR DRESSER TD25G/H/M | 322139W                          |
| W12EP*N----K60                         | W12E KOMATSU D275A-2         | 2300346W                         |
| W12EP*N----C64                         | W12E CAT 594 Pipelayer       | SKS102-25                        |

**Notes:** 1. This list is for operators to keep track of necessary information of their winch installation drawings by tractors.

2. If any of the installation drawings listed above is needed, please contact the Service Department of Allied Systems Company at 503-625-2560.

Figure 1-4 List of Installation Drawings

## Serial Number Codes

The serial number codes are described on pages 1-2 and 1-4 of this manual. The nameplate with the serial number code is found on the top left hand side of the winch case. The serial number code is also stamped on the left hand side of the winch frame.

## Nameplate

Each winch is shipped from the factory with a nameplate as shown in Figure 1-5. 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 1-5 Nameplate

## Warning and Maintenance Decals

A Warning Decal and a Maintenance Decal are located on the winch as shown in Figure 1-6. If the Warning Decal or

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

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

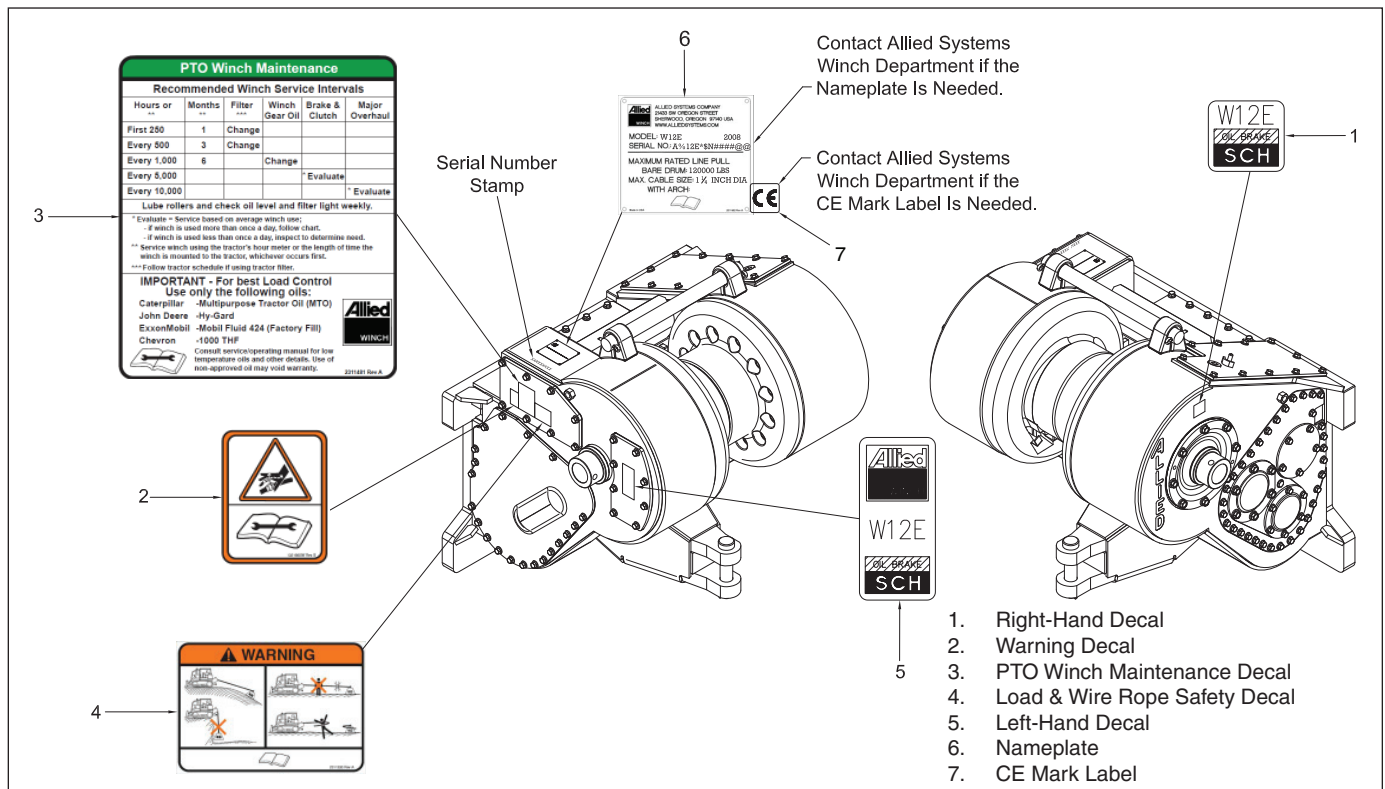


Figure 1-6 Decal Installation

## Gear Train (Except for Ratio #7, See Fig. 1-7 & 1-8)

The gear train (Figure 1-7) consists of:

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

Torque transfer during operation is shown in Figure 1-8.

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

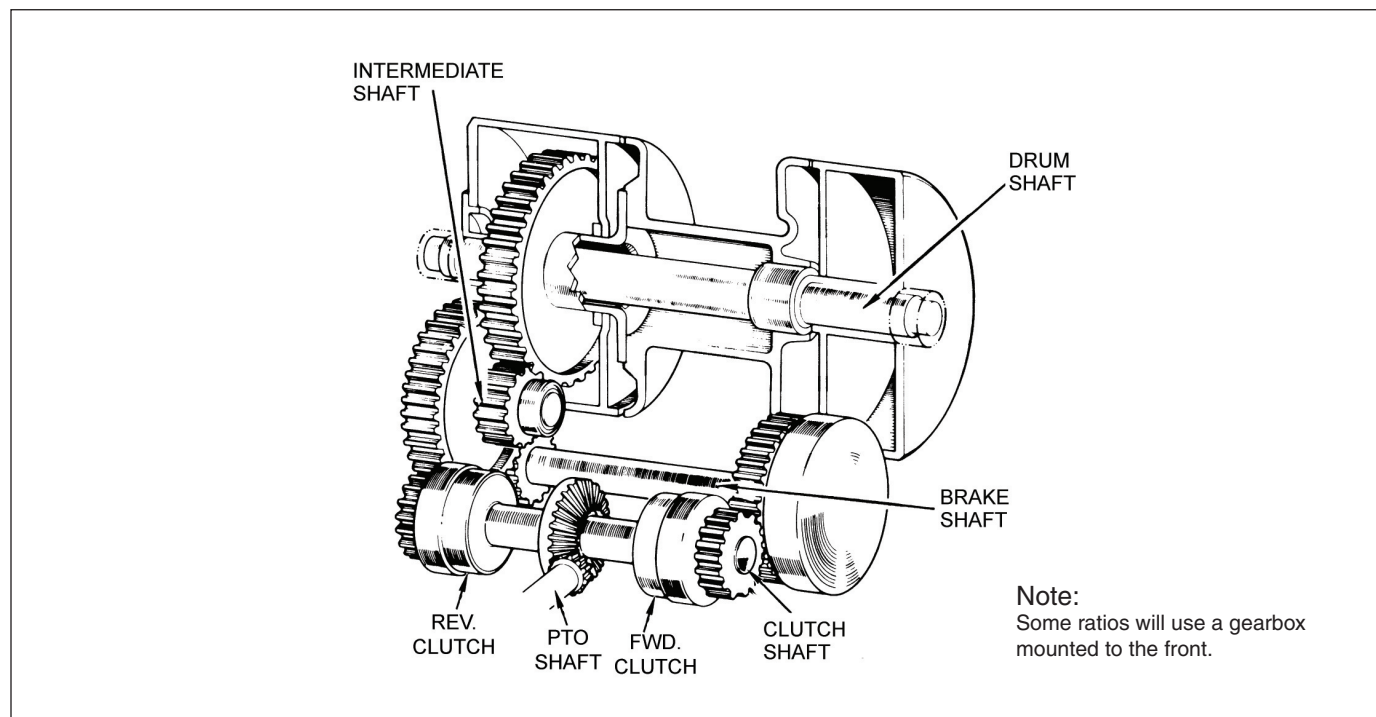


Figure 1-7 Gear Train (Except for Ratio #7)

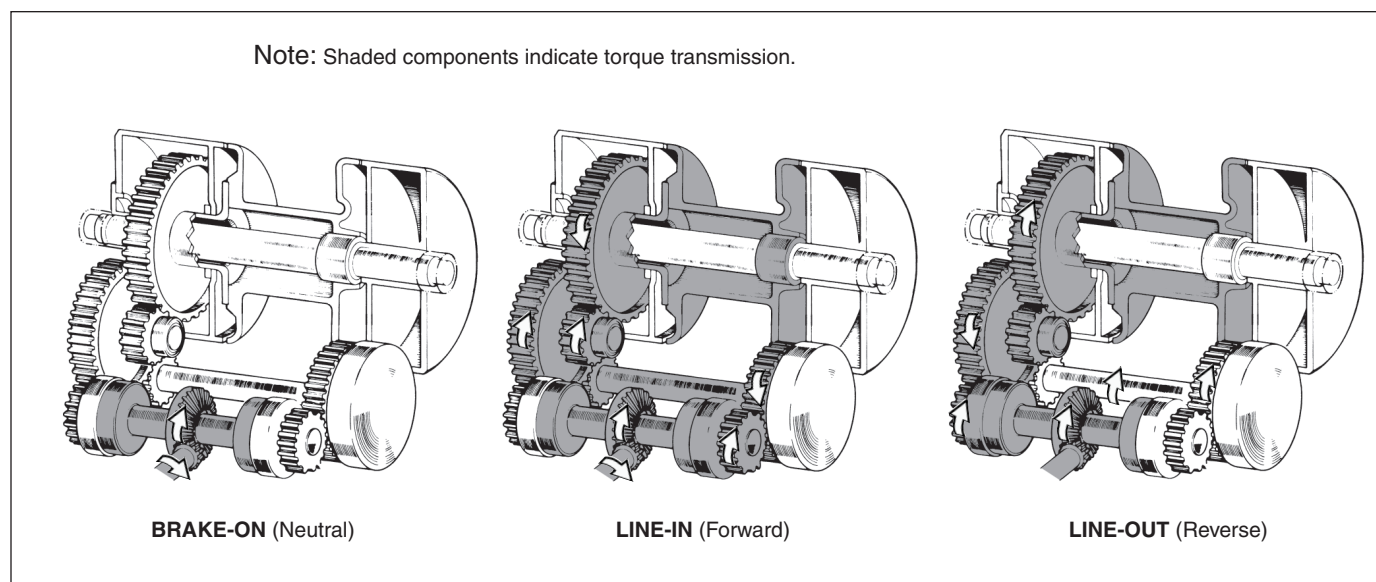


Figure 1-8 Gear Train Rotation Torque Transfer  
(Except for Ratio #7)



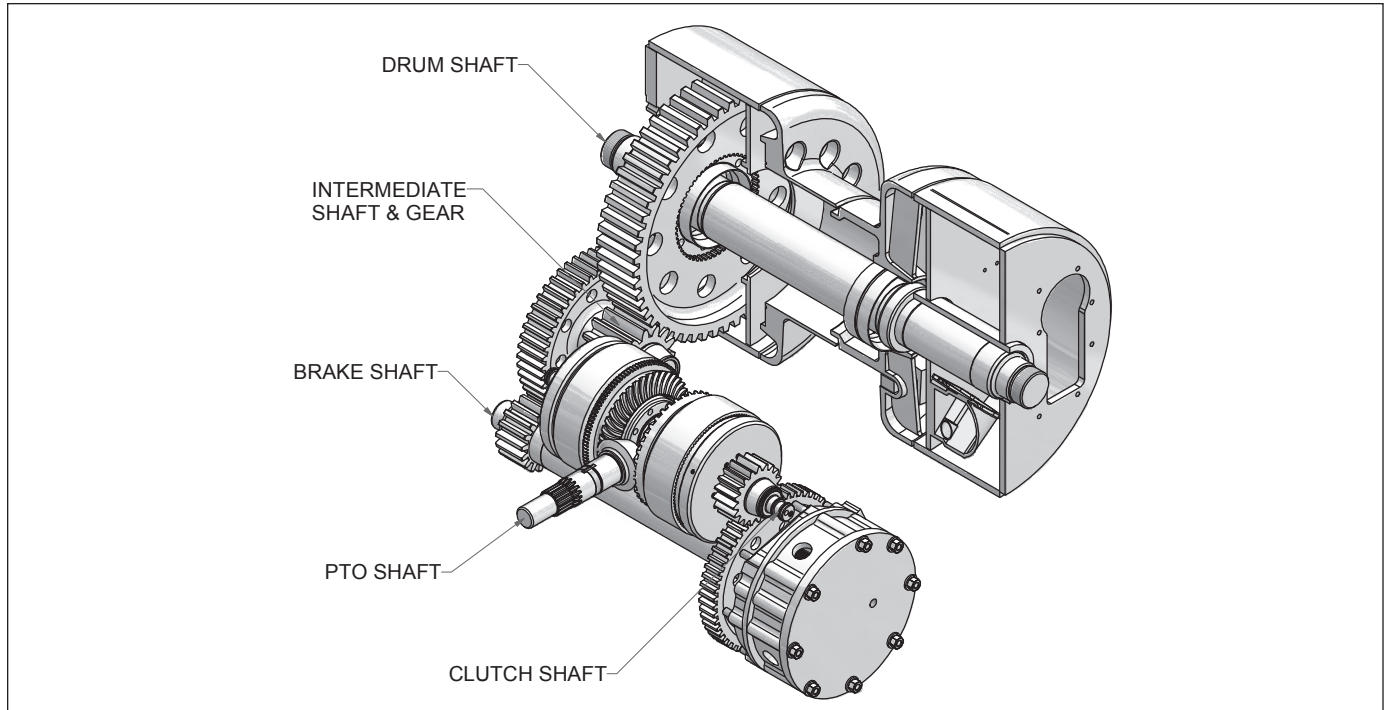
## Gear Train (Ratio #7, See Fig. 1-9 & 1-10)

The gear train (Figure 1-9) consists of:

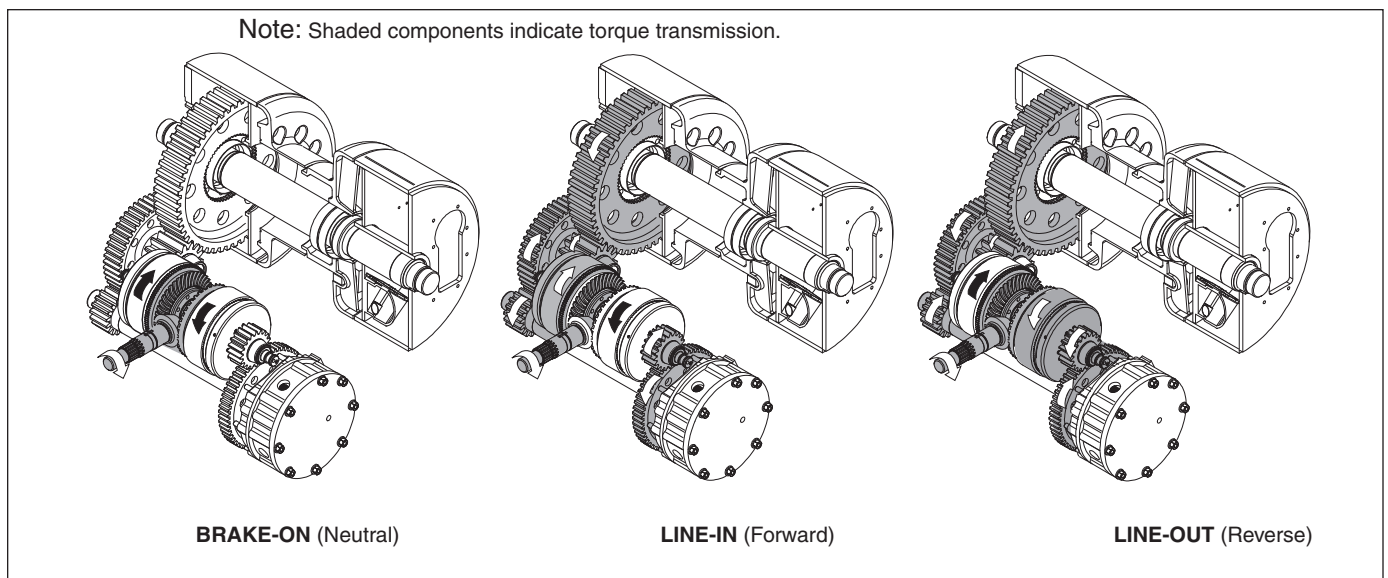
1. a PTO shaft assembly
2. a clutch shaft assembly
3. a brake shaft assembly
4. an intermediate shaft assembly; and
5. a drum shaft assembly

Torque transfer during operation is shown in Figure 1-10.

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



**Figure 1-9 Gear Train (Ratio #7)**



**Figure 1-10 Gear Train Rotation Torque Transfer (Ratio #7)**

## Operation and Control, Cable Controls (See Fig. 1-11)

The control lever assembly has a power control lever for winch control. The control lever is connected to the winch through a control cable. The power control lever, which is connected to the spool in the control valve, is used to select one of the following operations:

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

## Operation and Control, Electronic Controls (See Figs. 1-12 & 1-13)

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

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

## Description of Operations

**BRAKE-OFF** is the only detented position on the control lever, and the operator must pull the lever to release it from that position. A spring arrangement on the lever returns the lever from the **LINE-IN** and **LINE-OUT** positions to the **BRAKE-ON** position. With the lever in the **BRAKE-OFF** position, oil pressure releases the brake but wire rope cannot be pulled from the winch by hand because of friction in the clutches, brake and gear train. The **BRAKE-OFF** position is used when the operator has a load attached to the winch wire rope. The operator can move the tractor 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 tractor 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 tractor.

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

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

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

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

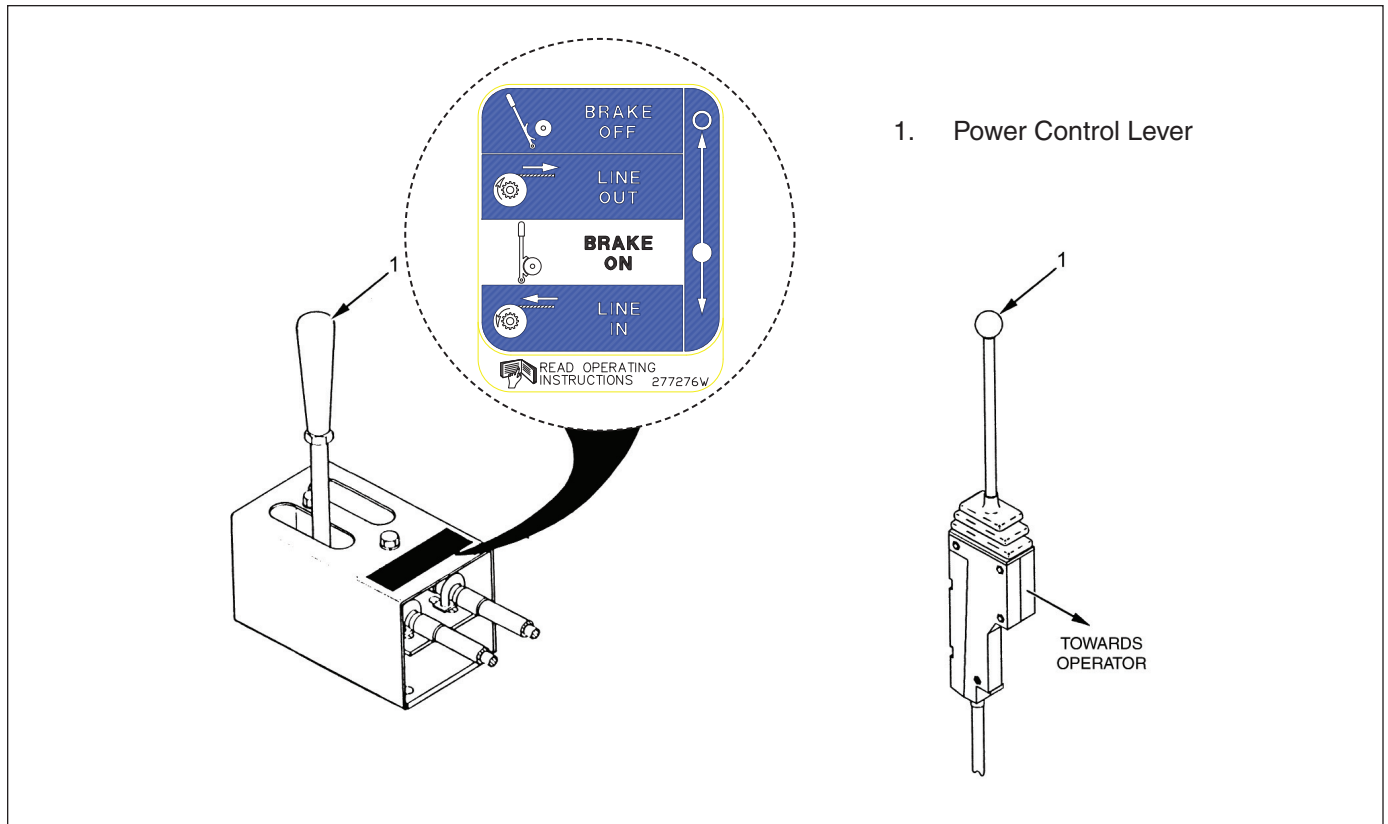


Figure 1-11 Cable Controls (Winch Control Type P)

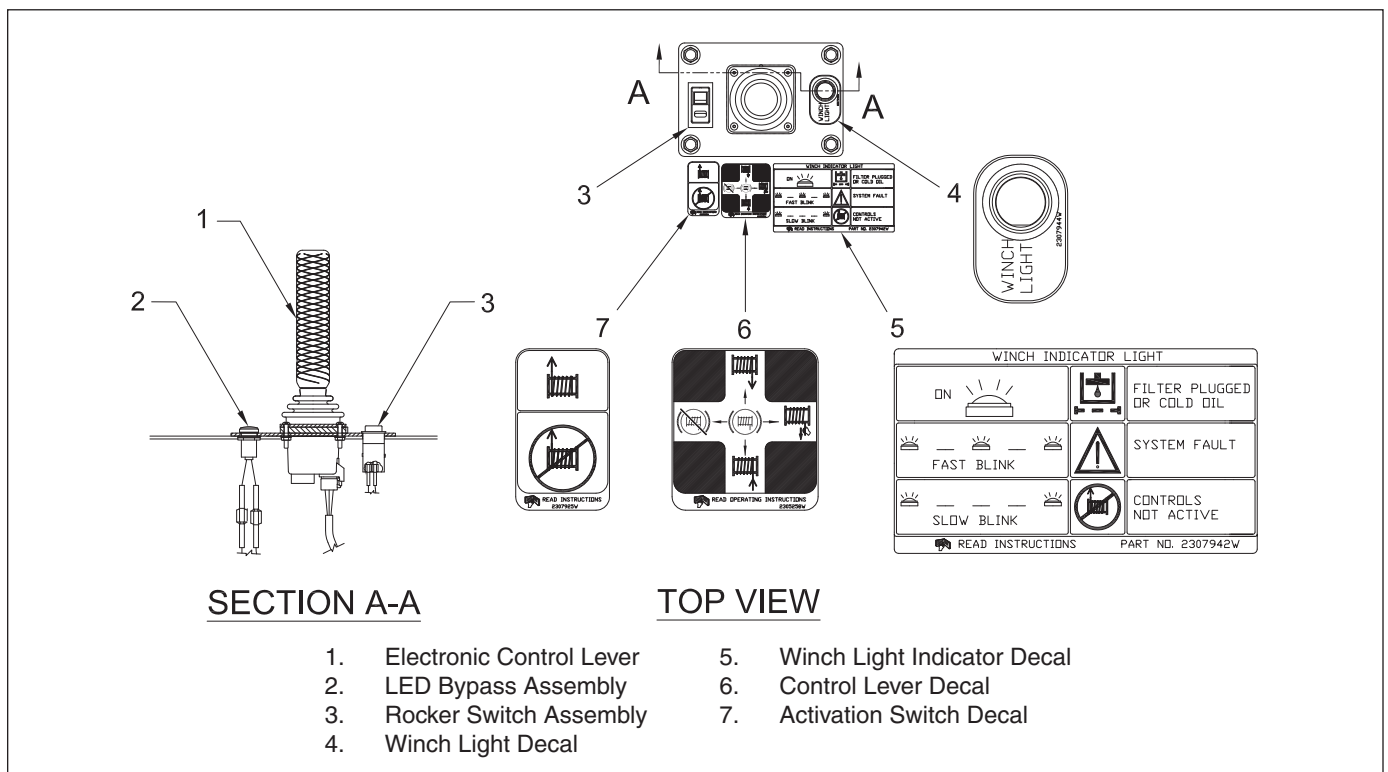
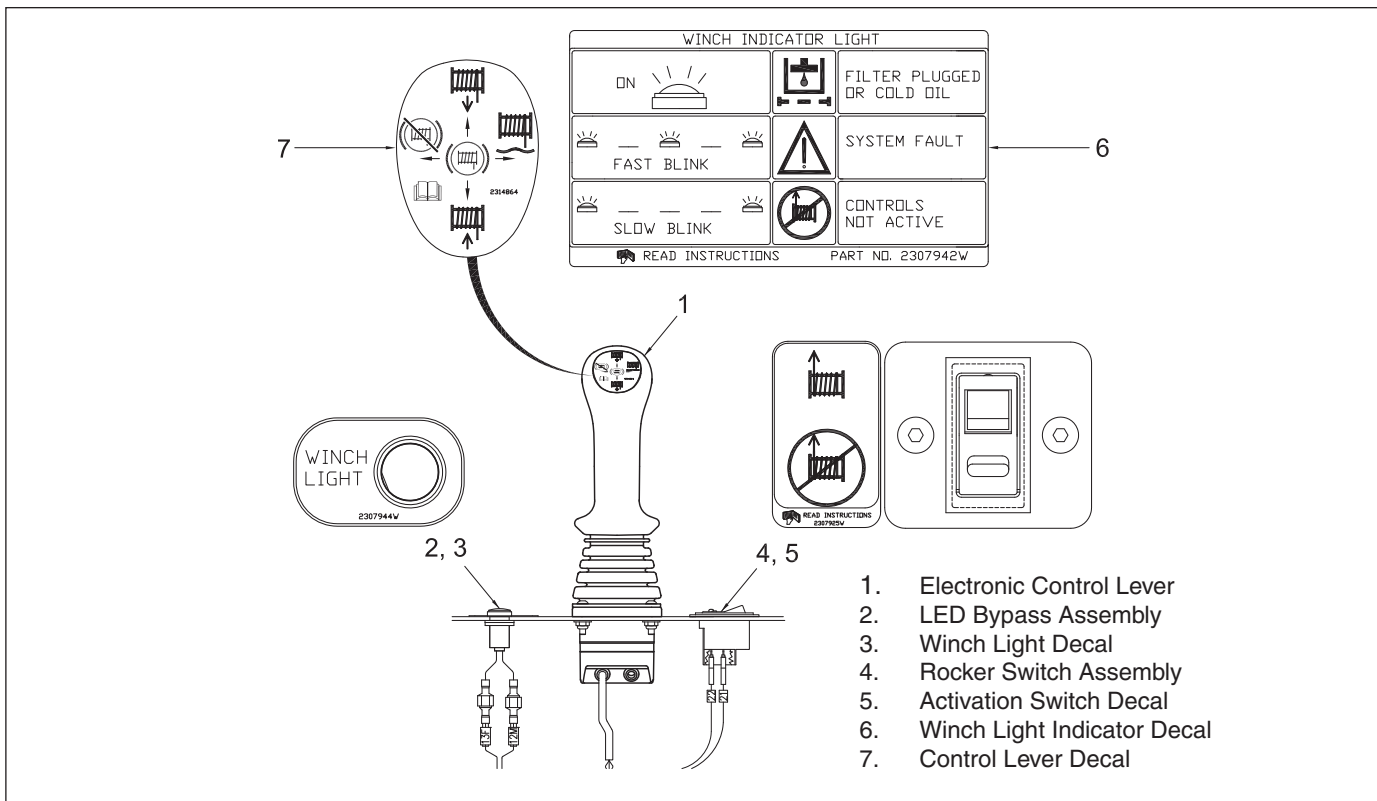


Figure 1-12 Electronic Controls (Old Type)



**Figure 1-13 Electronic Controls (New Type)**

## Capacities and Specifications

### Recommended Oil List

| Recommended Oils* - General Conditions         |                                |                           |           |
|--|--------------------------------|---------------------------|-----------|
| Manufacturer                                   | Oil Type                       | Ambient Temperature Range |           |
|  |                                | °F                        | °C        |
| ExxonMobil                                     | Mobil Fluid 424 (Factory fill) | -13 to 105                | -25 to 43 |
| John Deere                                     | Hy-Gard™                       | -13 to 122                | -25 to 50 |
| Chevron  | 1000 THF                       | -13 to 105                | -25 to 43 |
| Caterpillar                                    | Multipurpose Tractor Oil (MTO) | -13 to 104                | -25 to 40 |
| Case   | Hy-Tran Ultra                  | -20 to 122                | -30 to 50 |
| Recommended Oils* - Low Temperature Conditions |                                |                           |           |
| Manufacturer                                   | Oil Type                       | Ambient Temperature Range |           |
|  |                                | °F                        | °C        |
| ExxonMobil                                     | Mobil Fluid LT                 | -40 to 86                 | -40 to 30 |
| John Deere                                     | Low Viscosity Hy-Gard          | -40 to 86                 | -40 to 30 |
| Chevron  | THF W                          | -40 to 86                 | -40 to 30 |

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

Figure 1-14 Recommended Oil List

### Winch Oil Capacity

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

Figure 1-15 Winch Oil Capacity

**NOTE: Dropboxes will hold about 2 gallons.**

### Hydraulic Specifications

Pump Flows (Gear Ratio) .....9.6 gpm (Ratios #1-4)  
 10.9 gpm (Ratio #6)  
 9.5 gpm (Ratio #7)  
 All at 1000 RPM

Operating pressure.....225 psi (1,550 kPa)  
 Valve (P Controls).....One Spool  
 Valve (E Controls)..... Multiple Solenoid

Filters..... Full flow magnetic strainer  
 20 micron paper filter

## Bolt Torque Specifications

**NOTE: Unless otherwise specified, torque:**

**1/2 UNC to 50 ft-lbs (7 kg-m)**

**3/8 UNC to 25 ft-lbs (4 kg-m)**

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

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

| ITEM  | W12E                       |                         |
|---|----------------------------|-------------------------|
|   | ft-lbs                     | kg-m                    |
| PTO Shaft Assembly<br>Bearing Carrier Capscrews   | 75                         | 10                      |
| Clutch Shaft Assembly<br>Bearing Retainer Capscrews<br>Bearing Locknut  | 75<br>200                  | 10<br>28                |
| Pump Mounting Capscrews   | 25                         | 4                       |
| Brake Shaft Assembly<br>Bearing Retainer Capscrews  | 75                         | 10                      |
| Intermediate Shaft Assembly<br>Bearing Retainer Capscrews   | 75                         | 10                      |
| Freespool Shift Shaft   | 75                         | 10                      |
| Drum Shaft Assembly<br>RH Bearing Retainer Capscrews<br>Drum Gear to Adapter Capscrews<br>Drum Shaft Nuts<br>Drum to Adapter Capscrews              | 150<br>180<br>400<br>155   | 20<br>25<br>55<br>22    |
| Clutch Assembly<br>Clutch Piston Housing Capscrews<br>Clutch Piston Housing Setscrews   | 70<br>40                   | 10<br>6                 |
| Brake Assembly<br>Cover Nuts  | 130                        | 18                      |
| Control Valve<br>Mounting Capscrews   | 50                         | 7                       |
| Winch Mounting to Tractor<br>Studs<br>Capscrews (1)<br>Nuts (All Except Inside Nuts) (1)<br>Inside Nuts (Castle Type with Cotter)                   | 500*<br>500*<br>500<br>(2) | 69*<br>69*<br>69<br>(2) |
| <p>* With Loctite</p> <p>(1) Unless otherwise specified on installation drawings.</p> <p>(2) Hand tight plus rotate to next castle slot on nut.</p> |                            |                         |

**Figure 1-16 Bolt Torque Specifications**





## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Notes

Lined area for notes, consisting of multiple horizontal lines.

## Power/Cable Controls

### Hydraulic System (See Fig. 2-1)

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

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

pressurized oil for a limited amount of actuation if the hydraulic pump is not functioning. This allows the release of the winch brake when the tractor engine or the hydraulic pump is not operating, such as during torque convertor stall.

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

When the tractor's PTO is operating, the hydraulic system provides pressure and flow. The hydraulic flow path of the various functions is depicted in Figure 2-8 through Figure 2-12.

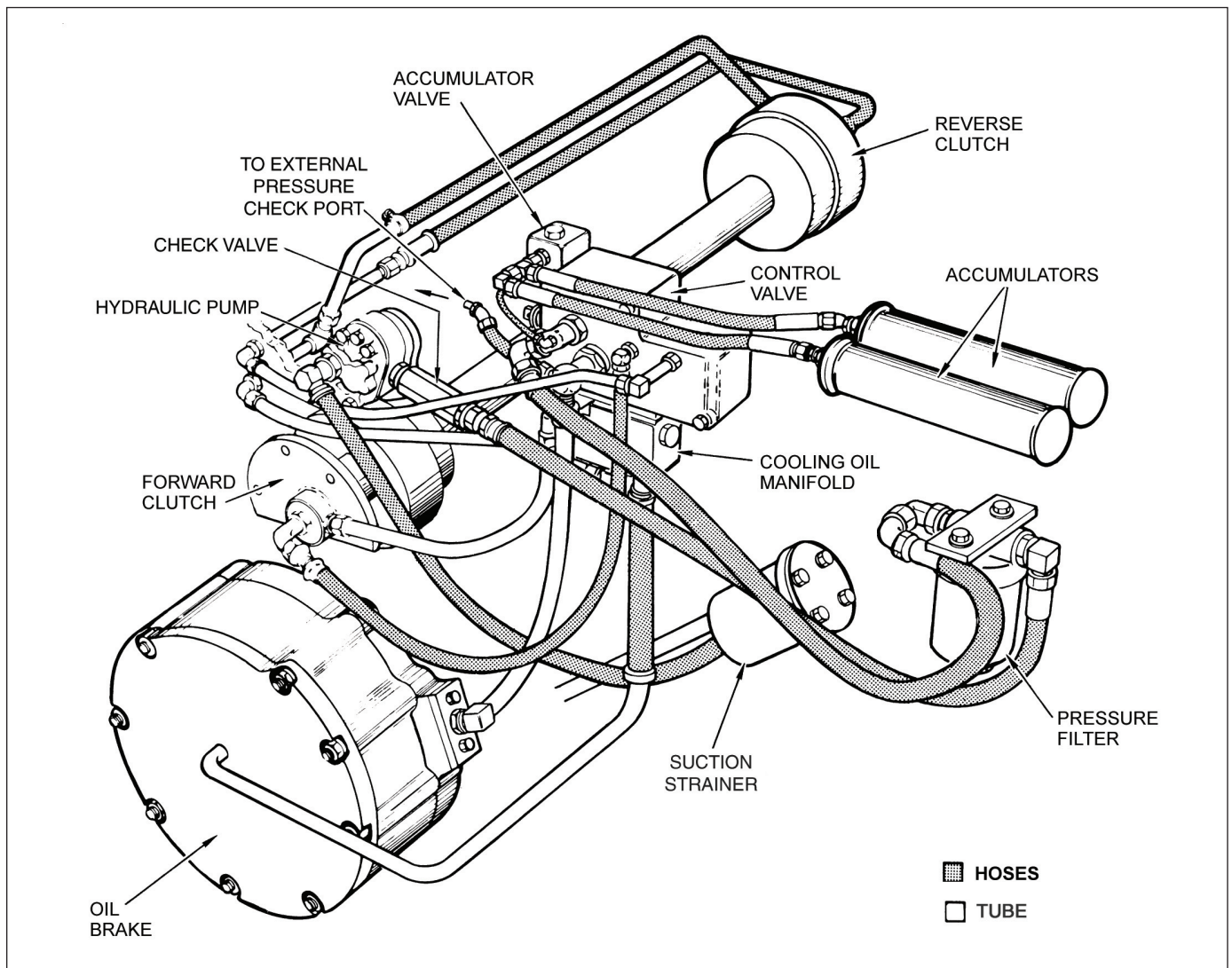


Figure 2-1 Hydraulic System

## Forward and Reverse Clutches (See Figs. 2-2 and 2-3)

The forward clutch (Figure 2-2) and reverse clutch (Figure 2-3) are multi-disc types that are hydraulically applied

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

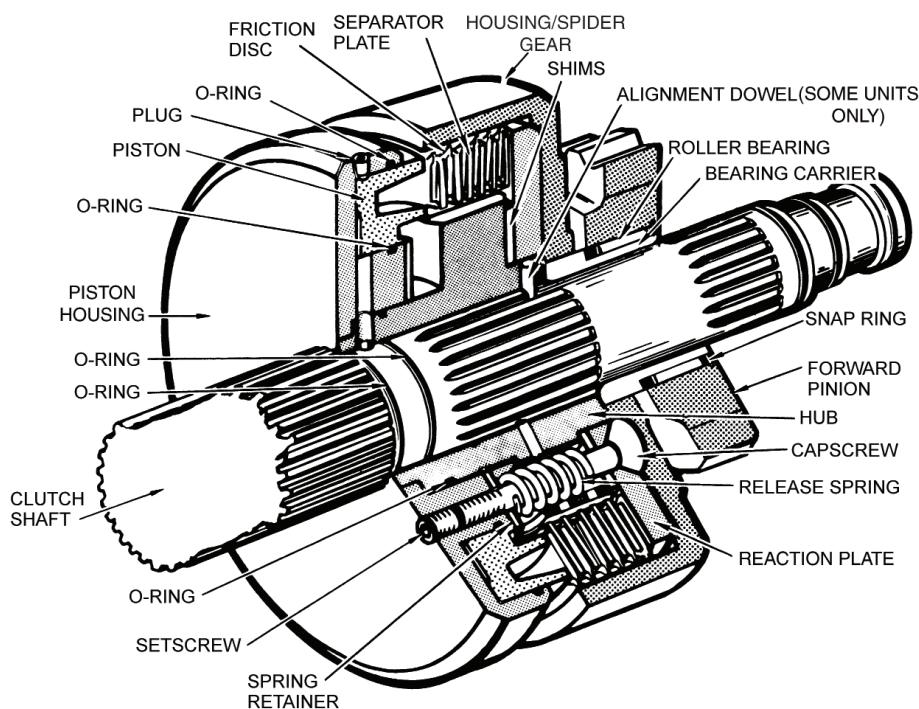


Figure 2-2 Forward Clutch (Ratios #1-6, Ratio #7 similar)

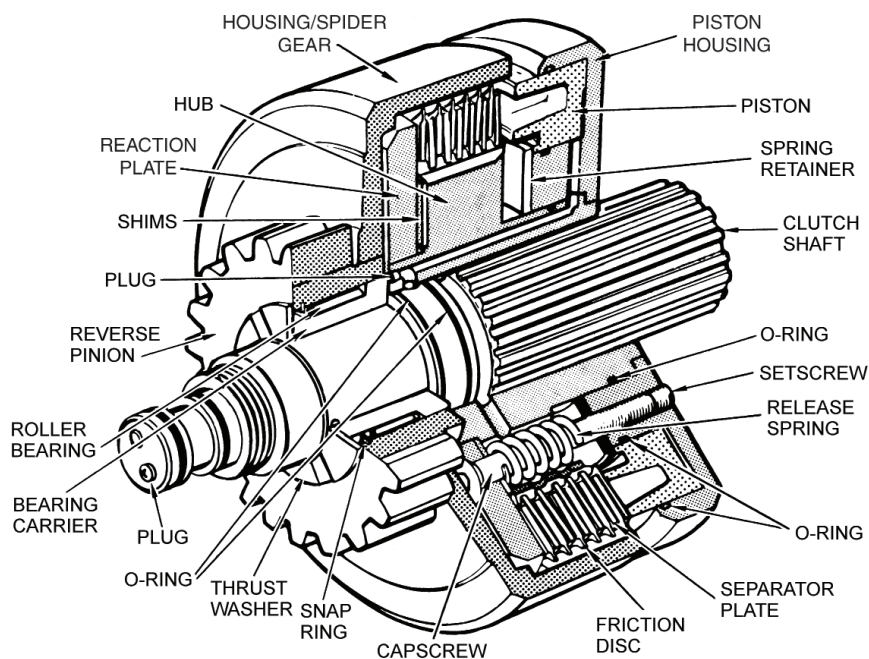


Figure 2-3 Reverse Clutch (Ratios #1-6, Ratio #7 similar)

## Oil Brake Assembly (See Fig. 2-4)

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

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

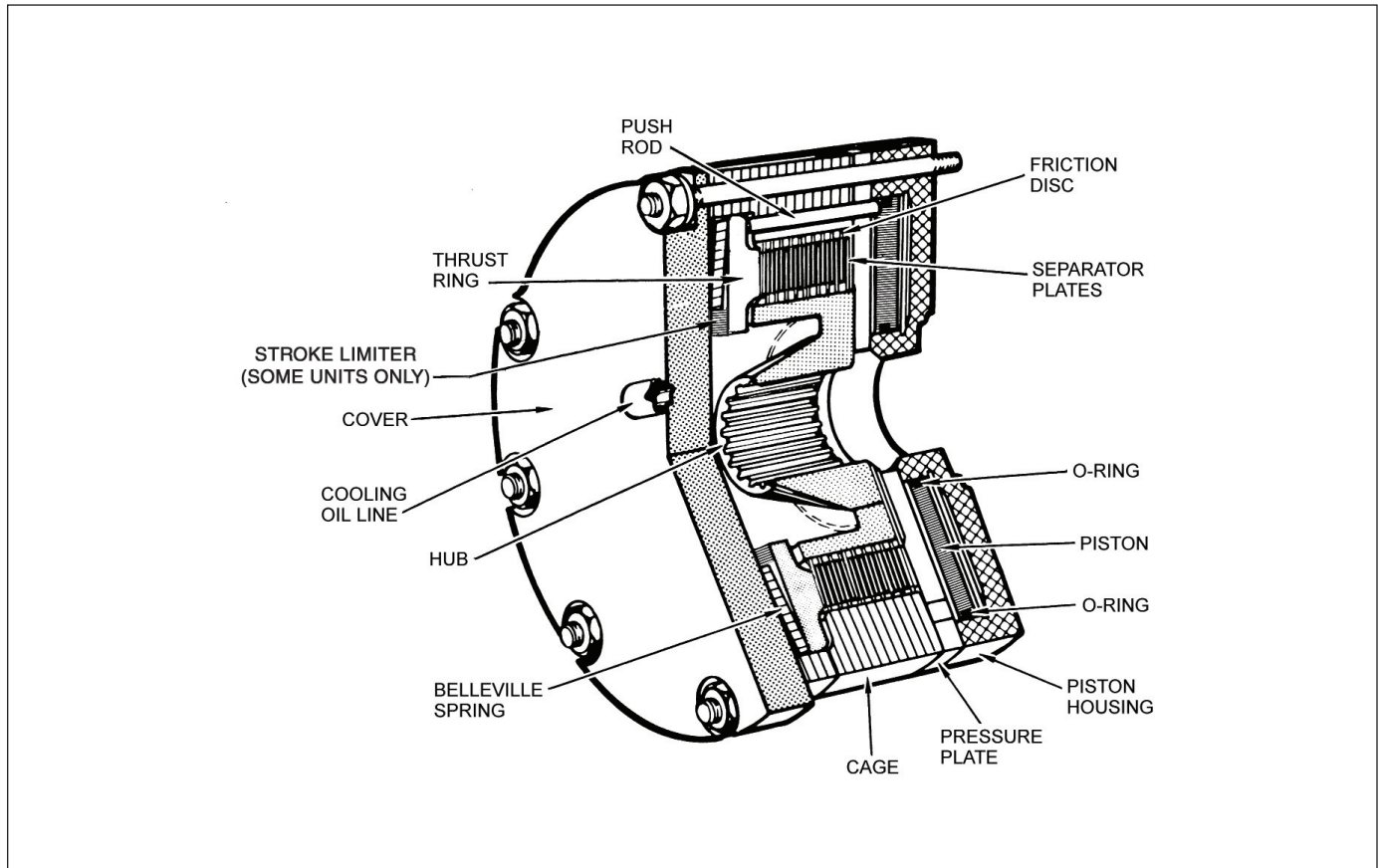


Figure 2-4 Oil Brake Assmbly

## Hydraulic Control Valve (See Fig. 2-5)

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

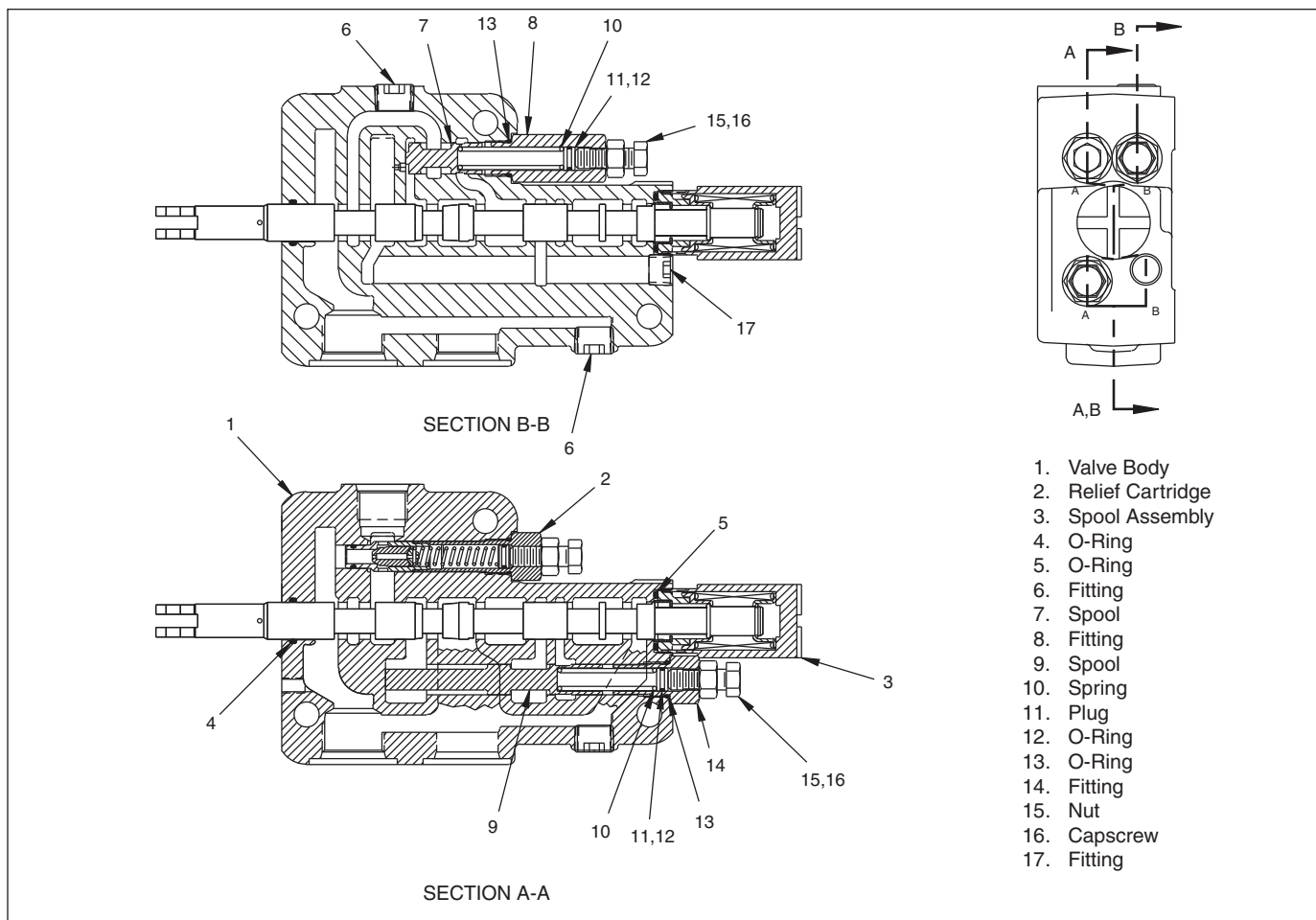
The control valve spool is connected by a cable to the control lever for operator operation. Built-in pressure modulators automatically ensure positive clutch engagement before the brake is fully released. The forward modulator and reverse modulator are adjustable. The control valve spool is spring loaded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

## Hydraulic Control Relief Valve

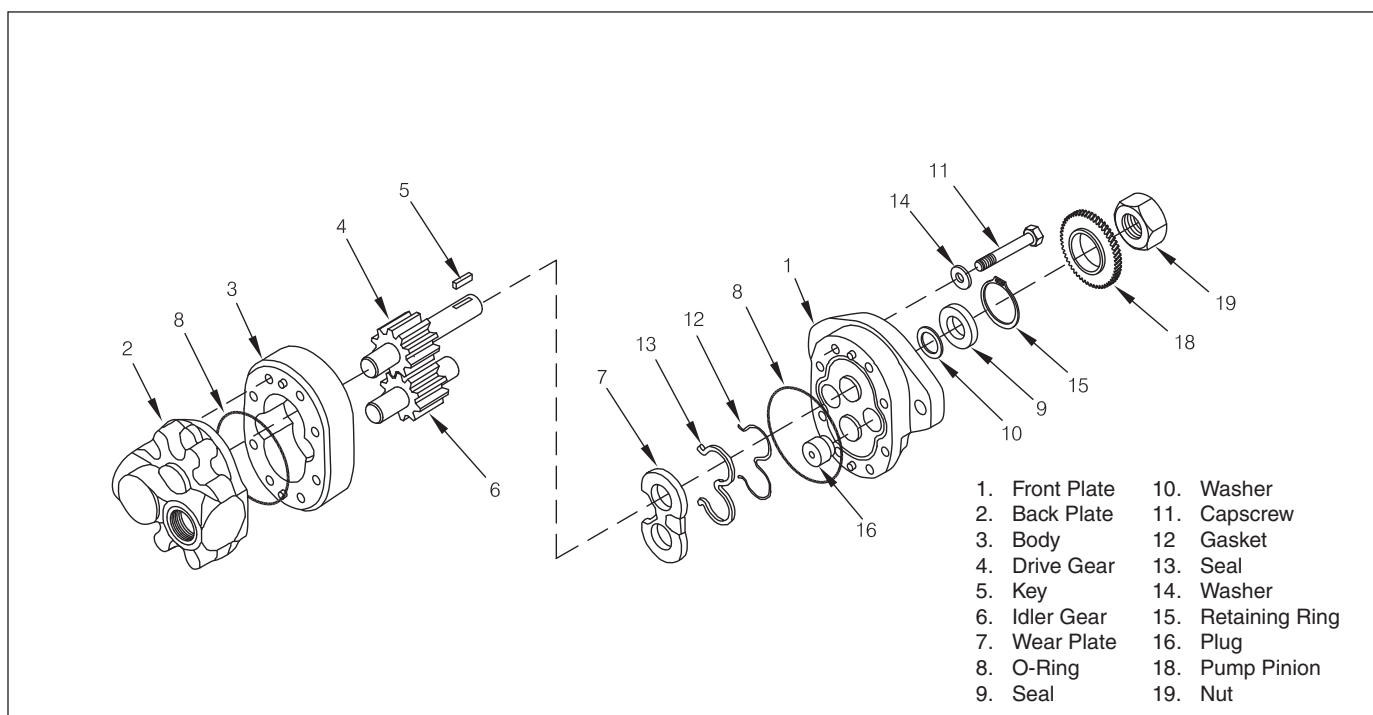
A relief valve is in the control valve to prevent excessive hydraulic oil pressure. The valve is a spring loaded, poppet-type valve. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. Oil from the relief valve is discharged directly to the cooling oil circuit. There is a separate low pressure cooling oil relief valve that prevents cooling oil from activating the clutches.

## Hydraulic Pump (See Fig. 2-6)

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



**Figure 2-5 Hydraulic Control Valve**



**Figure 2-6 Hydraulic Pump**



**Note:** See Figure 4-1 for location of hydraulic pump for Ratios #1, #3, #4 and #6; see Figure 4-23 for location of hydraulic pump for Ratio #7.

## Accumulators

The accumulators joined by a tee fitting are connected to the hydraulic system. The bladders have a nitrogen pre-charge so that the oil stored in the accumulators will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts and if the PTO shaft stalls. They are charged with nitrogen to 100-115 psi.

## Accumulator Valve

The accumulator valve is mounted to the control valve and is actuated by the control valve spool cam. When the control valve spool is moved to the **LINE-IN** or **BRAKE-OFF** or **LINE-OUT** position, a cam on the spool pushes up on the accumulator valve pin. This pin lifts the check ball off its seat to release the oil stored in the accumulators. If the PTO should stall so the hydraulic pump does not provide sufficient flow, the stored oil will be released, thus assisting release of the brake and applying of the clutch.

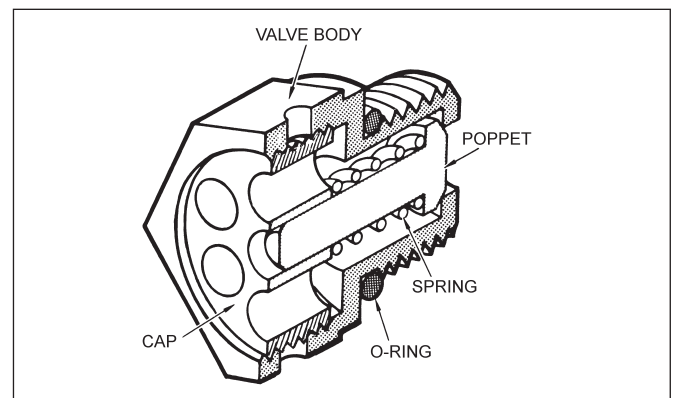
## Check Valve

The check valve prevents accumulator oil from reverse flowing through the pump when the PTO is not turning.

## Cooling Oil Relief Valve (See Figure 2-7)

The cooling oil relief valve is a spring-loaded, poppet-type valve. The valve is mounted in the control valve dump port and maintains cooling oil pressure at 12 psi (0.90 kg/cm<sup>2</sup>) max. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. Oil from the cooling relief valve is discharged directly into the inside of the winch housing.

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



**Figure 2-7 Cooling Oil Relief Valve**

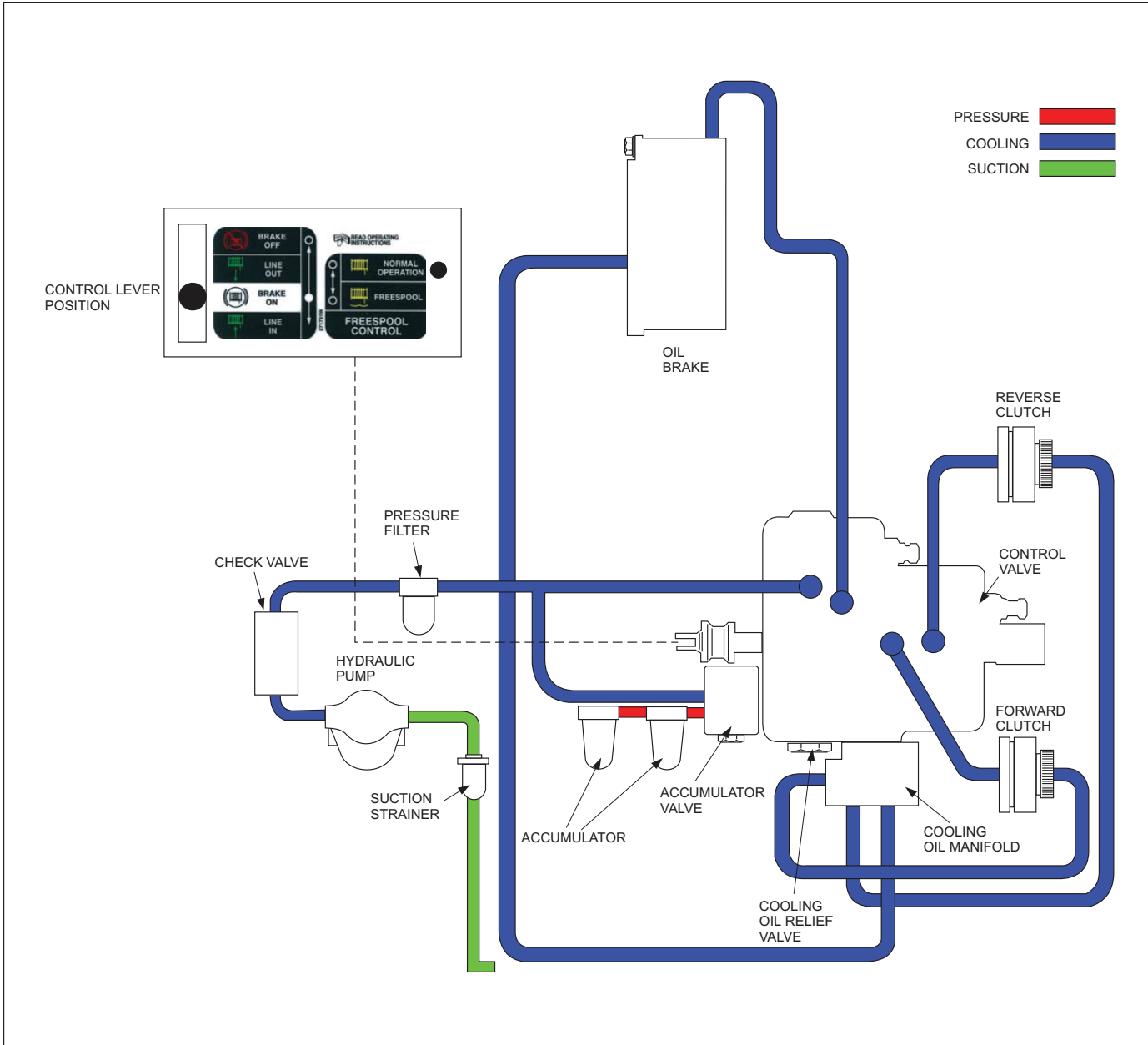


Figure 2-8 Hydraulic System - BRAKE-ON (Neutral)

## Sequence of Operation - BRAKE-ON

The control valve spool is spring centered to **BRAKE-ON**. In this position, oil entering the open center valve flows into the cooling oil passages. The cooling oil relief valve maintains hydraulic pressure in the cooling oil passage

at 10 psi (68.75 kPa). Cooling oil flows out of the cooling oil manifold to lubricate and cool the brake and clutch assemblies, and into the clutch and brake pistons. Excess flow goes directly to the sump.

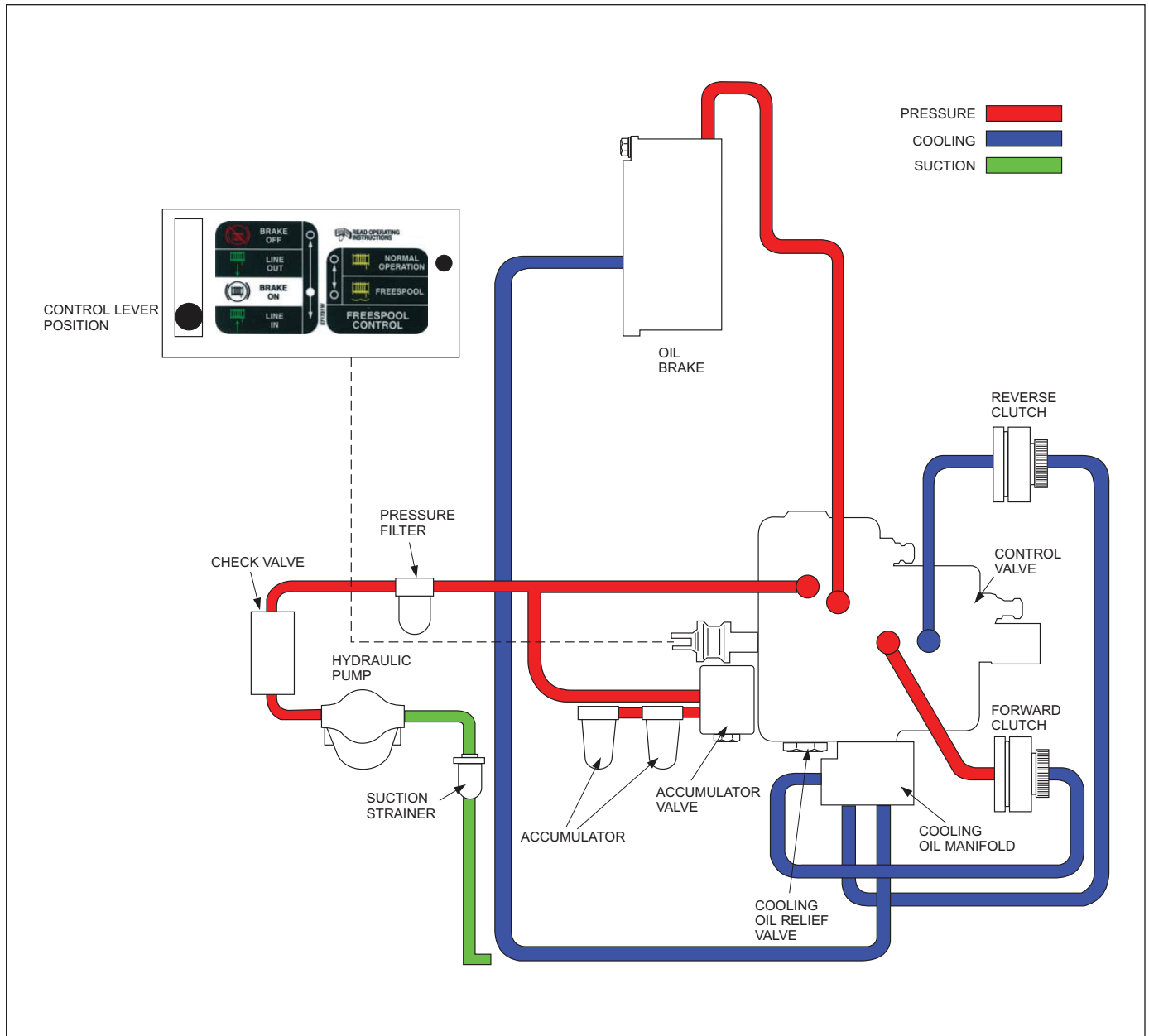


Figure 2-9 Hydraulic System - LINE-IN (Forward)

## Sequence of Operation - LINE-IN

For **LINE-IN** (forward) operation, the operator pulls the lever towards him/herself, which causes the spool to move into the valve, closing off the flow of oil to the cooling passage. This allows a pressure buildup in the inlet passage. Oil flows from the inlet passage to the brake passage through an orifice, producing a pressure drop between the inlet and brake passage, depending on the amount of oil flow. As the brake port to sump is closed off by the spool, the oil flow to sump is reduced, allowing the brake pressure to build up. As the brake pressure increases, the forward modulator valve will regulate the oil pressure to the forward clutch and maintain a constant pressure differential between the brake and clutch through the inching mode (factory preset at 50 psi for torque

converter driven PTO's). Near the end of the spool travel, a direct port to the clutch is opened.

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

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

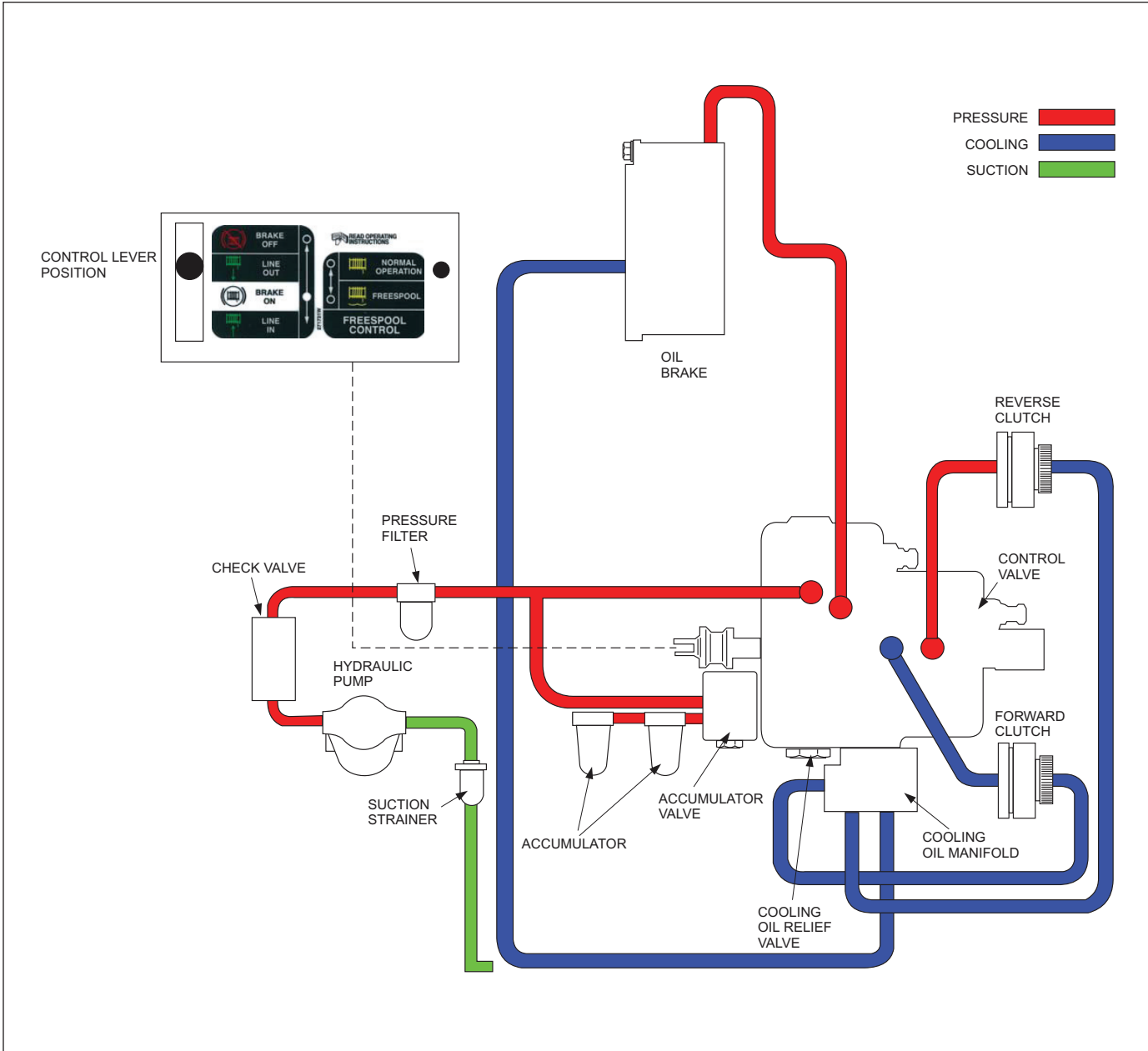


Figure 2-10 Hydraulic System - LINE-OUT (Reverse)

## Sequence of Operation - LINE-OUT & INCHING

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

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

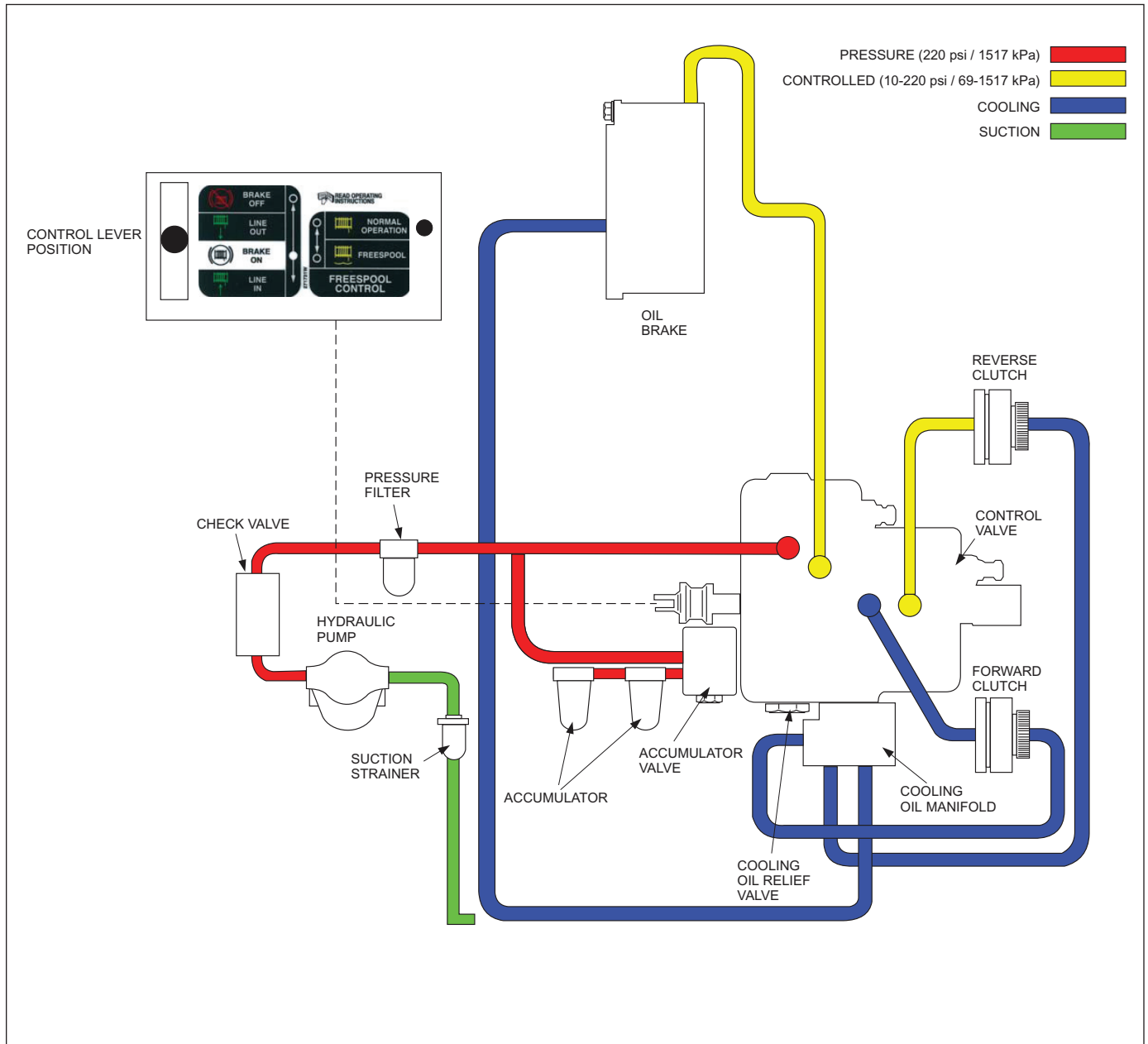


Figure 2-11 Hydraulic System - LINE-OUT INCHING

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

There is a bump on the valve spool which acts as a stop for the spool in **LINE-OUT** if too much force is placed on the spool it will go into **BRAKE-OFF** and the load will move.

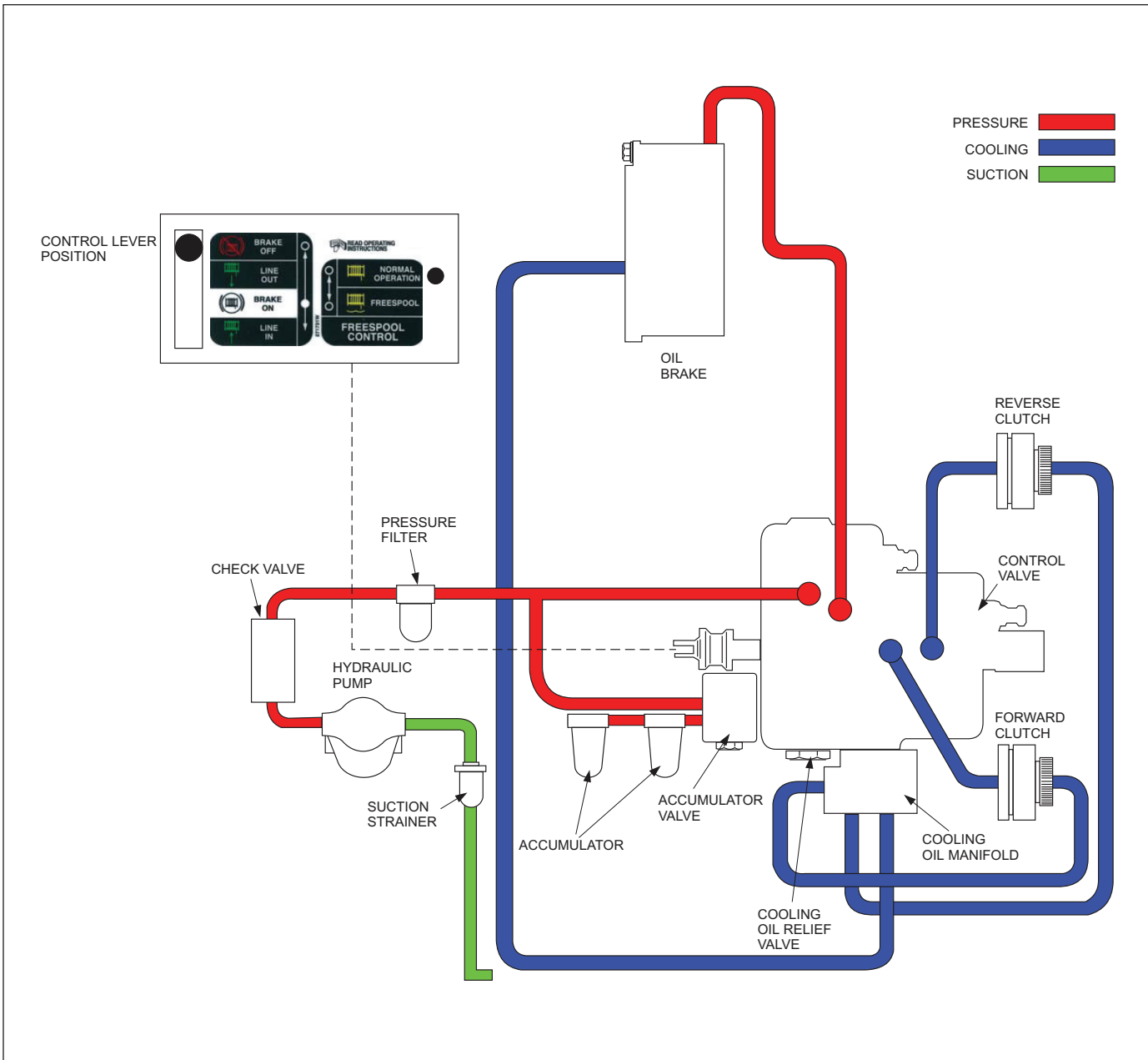


Figure 2-12 Hydraulic System - BRAKE-OFF

## Sequence of Operation - BRAKE-OFF

**BRAKE-OFF** is achieved by pushing the control lever past the **LINE-OUT** (hard push over the **LINE-OUT** stop) into the **BRAKE-OFF** position. This position is detented and the control lever will stay in **BRAKE-OFF** until it is

manually returned to the neutral position. With the control spool in **BRAKE-OFF** position, oil flow to the clutches is blocked and high pressure oil flows directly to the brake port to fully release the brake.

## Service

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

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

### Maintenance Points

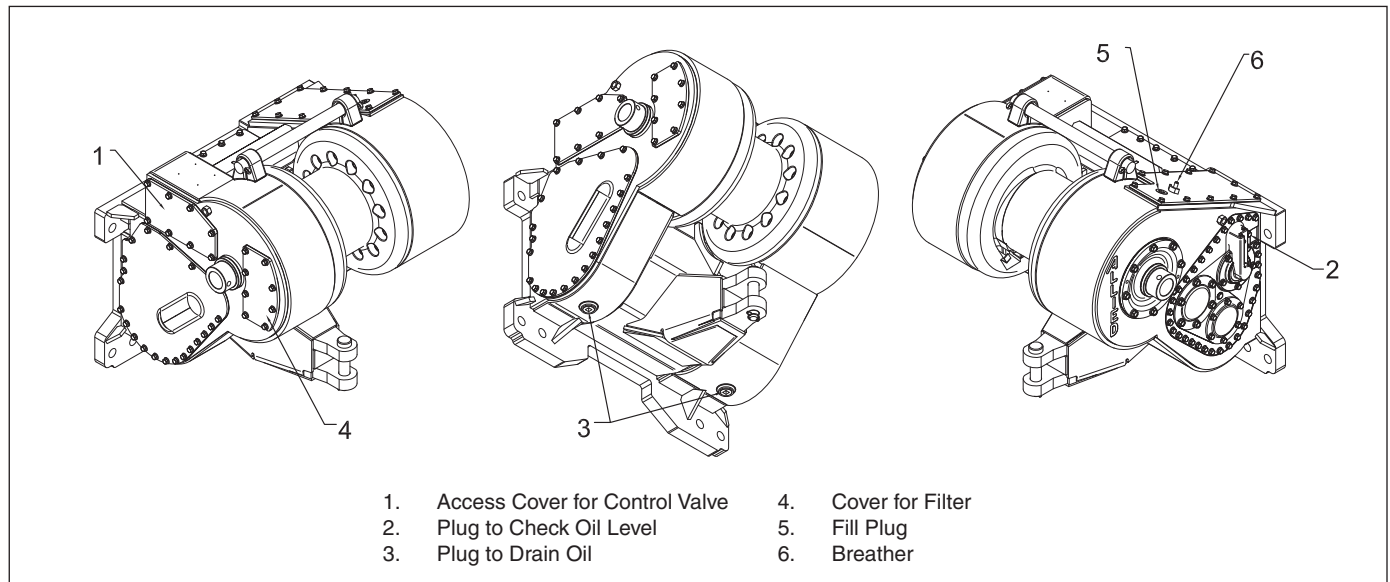


Figure 2-13 W12E Maintenance Points (Ratio #7 shown)

### Maintenance Schedule

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

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

| INTERVAL   | PROCEDURE OR QUANTITY  | SPECIFICATION  |
|--|--|--|
| 50 hours or weekly   | Check oil level at plug (item 2). Add oil as necessary through fill plug (item 5). <b>Do not operate tractor when checking the oil level.</b>                            | See Figure 1-14 – Recommended Oil List.  |
|  | Check winch control lever (cable controls). See Figs. 2-15 & 2-16.   | Use SAE 30 oil on the linkage if needed. Check that the control cable and control housing are fastened correctly. Tighten U-bolts if required.   |
|  | Clean the breather (item 6).   | Remove debris around breather.   |
|  | Lubricate the rollers on the fairlead assembly, if the winch is so equipped.   | Use multi-purpose grease with 2-4% molybdenum disulfide.   |
| 500 hours or every 3 months  | Clean the oil suction screen and magnets.*   | Use a new gasket between the cover and the suction tube.   |
|  | Clean the breather.  | Remove debris around breather.   |
|  | Replace the filter.*   | See the Parts Manual for filter element and cover gasket. When replacing, be sure to lubricate filter seal ring between element and filter head. |
| 1000 hours or every 6 months   | Change the hydraulic oil. Drain oil from plug (item 3). Clean the oil strainer. Through fill plug (item 5), add 32 gallons (120 liters)†. Check the oil level at item 2. | See Figure 1-14 – Recommended Oil List.  |
| <p>* NOTE: Clean the oil strainer screen and change the oil filter after the first 250 hours on new and rebuilt winches.<br/>† Amount of oil may vary slightly with tractor.</p> |  |  |

Figure 2-14 Maintenance Schedule



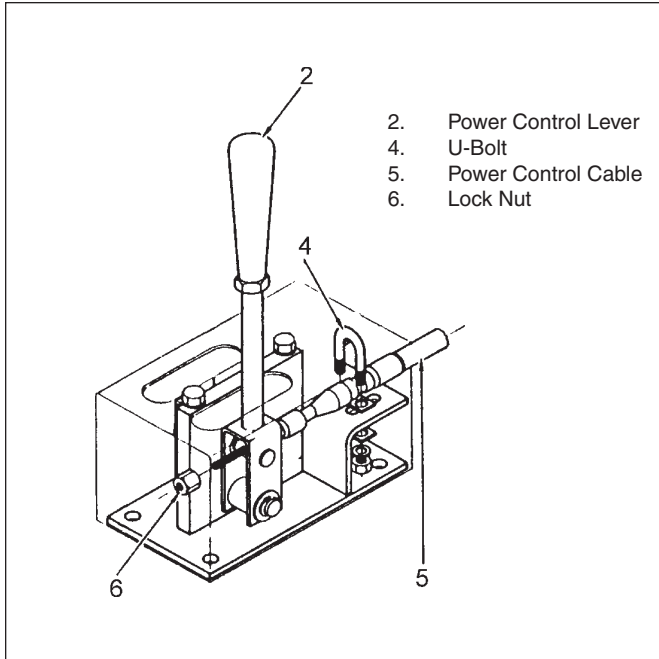


Figure 2-15 Control Cable Adjustments

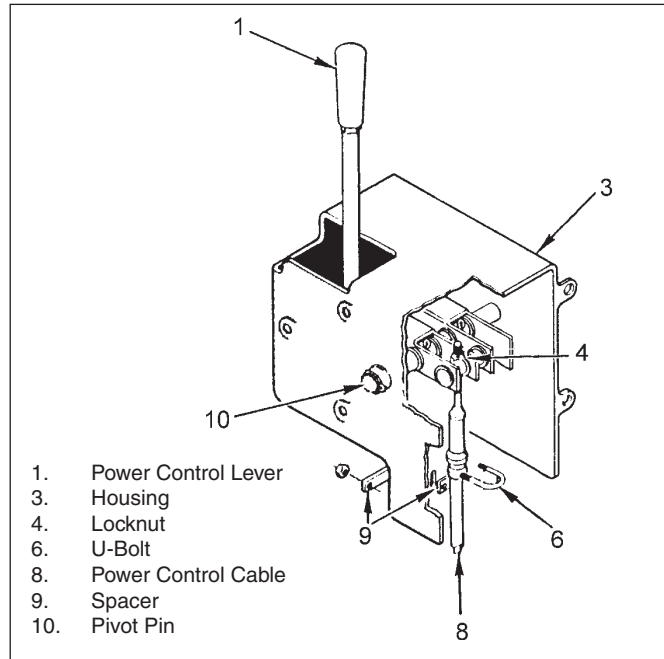


Figure 2-16 Control Cable Adjustments  
(This Configuration Last Used in 1993)

## Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Figure 2-14, Maintenance Schedule.

## Checks During Operation

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

## Checks and Adjustments

The checks and adjustments for the cable controls winch are as follows:

- Control Cable Adjustments
- Hydraulic System Checks

## Control Cable Adjustments

A single control cable connects the power lever to the hydraulic control valve spool. Check the operation of the power control lever to make sure it moves smoothly and will return to the **BRAKE-ON** position. The power control lever will stay in **BRAKE-OFF** when pushed into DETENTED position. Cable adjustment is not necessary

except to ensure full spool travel. To adjust handlevers depicted in Figures 2-15 and 2-16, proceed as follows:

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

To adjust the handlever depicted in Figure 2-17, proceed as follows:

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

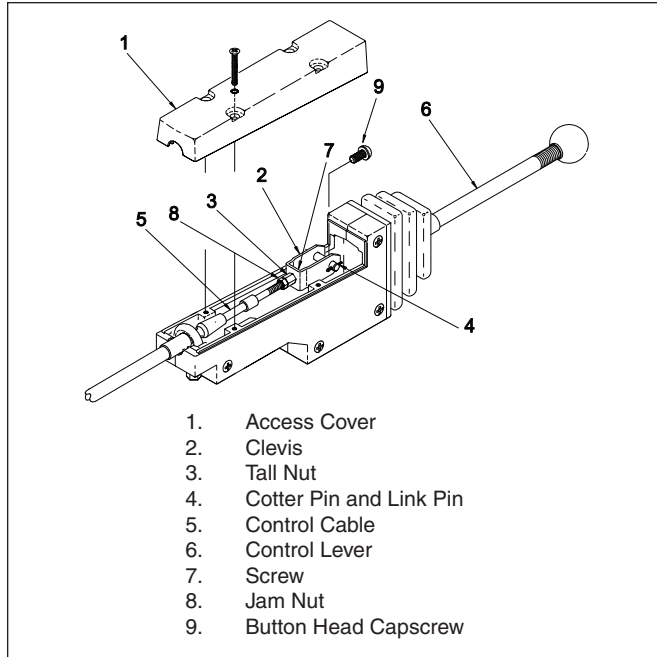


Figure 2-17 Control Cable Adjustments

## Hydraulic System Pressure Checks (Fig. 2-18)

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

### Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Check oil level.
2. 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.**

3. Start the engine and place the winch in **BRAKE-OFF** to raise the oil temperature to at least 20°C (70°F).
4. Remove any dirt from the left side of the winch. Remove control valve access cover (Figure 2-13).
5. Stabilize PTO speed at 1000 RPM for all tests unless otherwise specified.
6. Complete tests in order given. Bad results on early tests may invalidate later tests.
7. After completing all pressure checks and making the necessary adjustments ensure that all plugs and hoses are securely installed.
8. Replace gasket, install control valve access plate and tighten capscrews. Capscrews require locking and sealing compound.

### Pressure Gauges

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

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

## WARNING

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

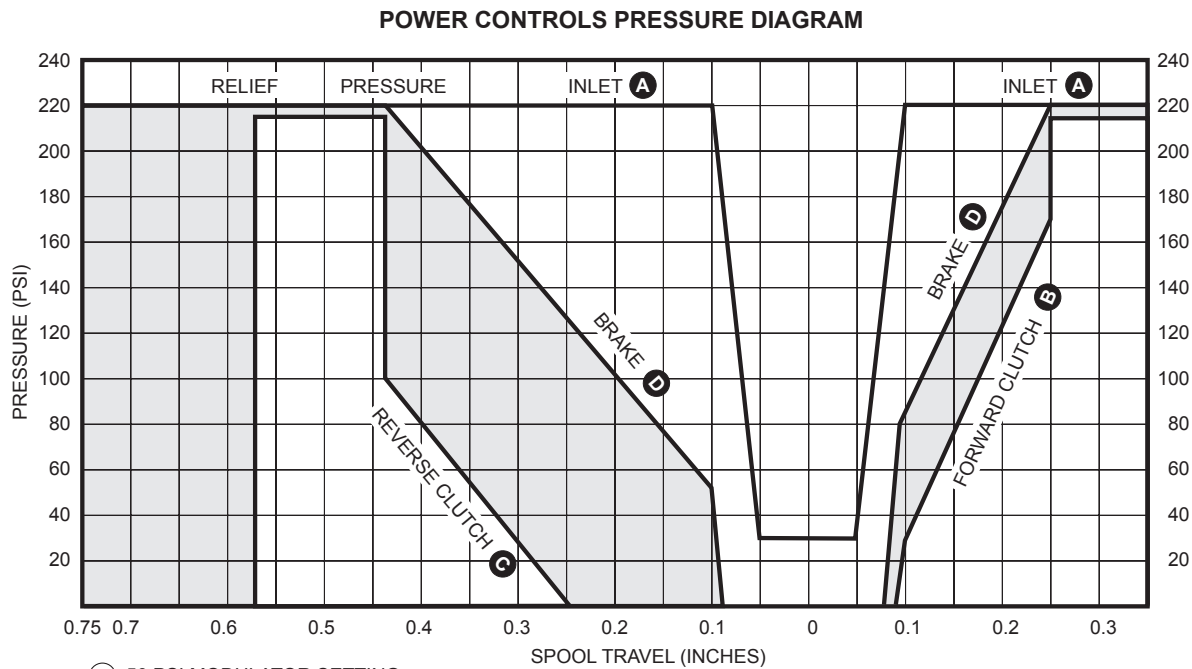
### Brake Pressure Check

With the engine shut off, connect one high pressure gauge to Brake Port D with a ¼" JIC (37° flare) female adapter. Start the engine and refer to Figure 2-20. If the pressure is not as specified, check for:

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

Adjust relief valve as follows:

1. Start engine and place control lever in **BRAKE-OFF**.
2. Loosen relief valve locknut. Turn relief valve adjusting capscrew IN to increase pressure and OUT to decrease pressure. Adjust pressures as shown in Figure 2-20.
3. Tighten locknut after adjustment is completed.



- (B) 50 PSI MODULATOR SETTING  
(C) 100 PSI MODULATOR SETTING

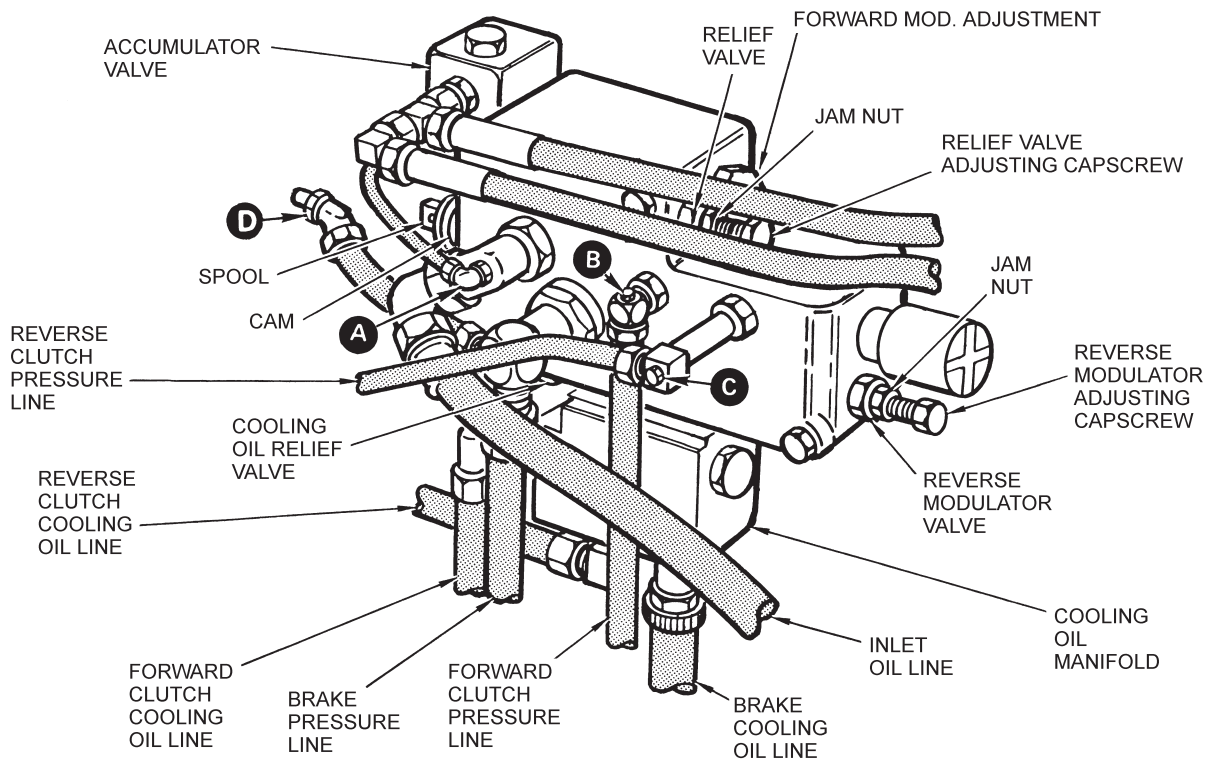


Figure 2-18 Hydraulic System Pressure Checks

4. Recheck pressure reading and repeat steps 2 and 3 if necessary.

## Cooling Oil Pressure Check

With the engine shut off and the lever in **BRAKE-ON** position, connect one 0-30 psi gauge to Port C. Start the engine and see the Cooling section in Figure 2-20. If the cooling oil pressure is too high, it can stroke the clutch piston and drag the clutch pack. The result is overheating. Low cooling oil pressure will not produce enough cooling oil flow and cause overheating. Check for a defective cooling oil relief valve. If pressure is too high, reset cooling oil relief valve; if too low, either leak or worn pump. Do not shift into **LINE-OUT** as pressure will exceed 200 psi.

## Accumulator Pressure Check

With the engine shut off, connect one 0-400 psi gauge to Port D. This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe the following while referring to the accumulator section in Figure 2-20.

1. With engine running, place control lever in **BRAKE-OFF** and rev engine to maintain 220 psi (1520 kPa) for one minute. This will ensure that the accumulators will have a full supply of oil.
2. Return control lever to **BRAKE-ON**.
3. Shut the engine off and wait one minute.
4. Quickly place the control lever in the **BRAKE-OFF** position. This will release the oil in the accumulators. Observe the maximum pressure reading and the time for the pressure to drop below that specified in Figure 2-20 (called jump up and leak down).

If the leak down time is less than specified in Figure 2-20, repeat steps 1 through 4, but do not delay in placing the control lever in **BRAKE-OFF** after the engine is shut down. If the leak down time is greater than that measured when waiting one minute, then there is either a leak in the lines between the accumulators and the accumulator valve or a leaking accumulator check valve. Low accumulator gas pressures will tend to stall the winch on a low engine rpm shift. To determine if accumulators have any gas pressure, remove accumulator stem protective cover and push gently on valve stem. A ruptured bladder will emit oil. Accumulators are rechargeable but not rebuildable.

## Forward Clutch Pressure Check and Forward Modulator Valve Check

With the engine shut off, connect one 0-400 psi gauge to Ports B and D. Lever starts in **BRAKE-ON** position. Start the engine to 1000 RPM, then

1. Move lever into **BRAKE-OFF** for 1 minute to build accumulator pressure.
2. Shift to **BRAKE-ON**.
3. Shift quickly into **LINE-IN**. Clutch and brake pressures should both read 220 psi.
4. If pressures are low, check the following:
  - (1). Leaking pressure hoses or fittings
  - (2). Damaged or worn clutch piston seals
  - (3). Improper control valve spool movement
  - (4). Broken seal rings on clutch shaft
  - (5). Damaged O-rings on clutch shaft. Troubleshooting information is given at the end of this Section.

(**LINE-IN** and **LINE-OUT** Jump Up and Leak Down tests can be done the same as **BRAKE-OFF** except you move the lever into **LINE-IN** or **LINE-OUT** instead of **BRAKE-OFF** in Step 4 of Accumulator Pressure Check. Jump up pressures should be 125 psi minimum, and leak down time to 100 psi should exceed 10 seconds.)

With the engine shut off, connect 0-400 psi gauge to Ports B and D. Start the engine to 1000 RPM, move control lever completely into **LINE-IN**. While watching both gauges, slowly move lever towards **BRAKE-ON**. When brake pressure is between 200 to 100 psi, clutch pressure should read 50 psi, less than brake pressure. In **LINE-IN INCHING**, the clutch pressure should lag the brake release pressure as shown in Figure 2-20. If the pressure differential is too low, the brake will not release soon enough and cause it to stall. If the pressure differential is too high, the brake will release too soon and cause backspinning of the drum. If the **LINE-IN INCHING** pressure differential is not as specified in Figure 2-20, remove the forward modulator valve and check for defective or dirty parts. To adjust the modulator valve, proceed as follows:



## WARNING

**The drum will rotate!**

1. Loosen the forward modulator adjustment locknut. With engine running move the control lever toward **LINE-IN** until the brake pressure reads 140 PSI (9.5 kg/cm<sup>2</sup>). Use 180 PSI (12.7 kg/cm<sup>2</sup>) for Komatsu D65.
2. Turn the adjusting capscrew IN to decrease forward clutch pressure, or OUT to increase pressure until the forward clutch pressure is less than the brake pressure by the amount specified in Figure 2-20.
3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

### Reverse Clutch Pressure Check and Reverse Modulator Valve Adjustment



## WARNING

**The drum will rotate!**

Shut off the engine and connect the high pressure gauge to reverse clutch Port C. Start the engine. Place the control lever in **LINE-OUT**, and check reverse clutch and **LINE-OUT INCHING** pressures as indicated in Figure 2-20. On a fast **LINE-OUT** shift, the clutch pressure should come up with the brake pressure. In **LINE-OUT INCHING**, the clutch pressure should lag the brake release pressure as shown in Figure 2-20. If the pressure differential is too low, the brake will not release soon enough and cause drag. If the pressure differential is too high, the brake will release too soon and cause backspinning of the drum.

If the reverse clutch pressure is not as specified in Figure 2-20, check for:

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

If the **LINE-OUT INCHING** pressure differential is not as specified in Figure 2-20, proceed as follows:

1. Loosen the reverse modulator adjustment locknut and start engine. Move the control lever towards **LINE-OUT** until the brake pressure reads 140 PSI (9.8 kg/cm<sup>2</sup>). Use 180 PSI for Komatsu D65.
2. Turn the adjusting capscrew IN to decrease reverse clutch pressure, or OUT to increase pressure until reverse clutch pressure is less than the brake pressure by the amount shown in Figure 2-20.
3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

### Control Valve Spool Travel Check (See Fig. 2-19)

It may be necessary to check spool travel when control valve pressures do not meet specifications. Figure 2-19 shows the correct travel for the various spool positions. The control valve spool is self-positioned to **BRAKE-ON**. The three other travel positions are determined by spool assembly internal stops and a detent assembly in the spool end cap. If spool travel is found to be out of adjustment, the spool assembly or complete control valve assembly should be replaced. Ensure that the spool end cap is installed securely, then perform the check for smooth return of control lever to neutral from any other position. Any binding or sticking should be investigated by removing the spool cap and examining parts for wear.

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

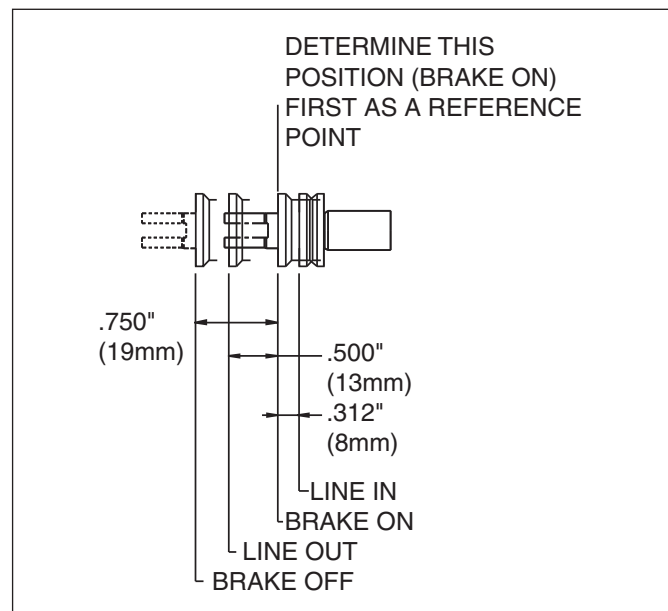


Figure 2-19 Control Valve Spool Travel

Figure 2-20 Hydraulic System Pressure Tests

**NOTES:**

1. Power Controls manifold only.
2. NOTE: Engine @ 1000 RPM and oil temperature @ 70 - 120 ° F (20 - 49° C) minimum.

| ITEM FUNCTION             | CHECK PORT               | TEST EQUIPMENT REQUIRED                    | CONTROL POSITION  | PRESSURE  | CORRECTIVE ACTION  |
|---------------------------|--------------------------|--|---|---|--|
| Brake                     | D – Brake                | 1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | <b>BRAKE-OFF</b>  | 220 psi (15.5 kg/cm <sup>2</sup> )<br>Pressure not to exceed 260 psi at high idle   | Adjust relief valve if high. If too low, increase RPM up to 500; if pressure is still too low, other repair is necessary.  |
| Cooling                   | C – Cooling              | 1 – 30 psi gauge                           | <b>BRAKE-ON</b>   | @1000 RPM, 2-10 psi (0.14 - 0.7 kg/cm <sup>2</sup> ); @ Full throttle, 12 psi Max.  | Check or replace cooling oil relief valve.   |
| Accumulator               | D – Brake                | 1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | <ol style="list-style-type: none"> <li>1. <b>BRAKE-OFF</b></li> <li>2. <b>BRAKE-ON</b></li> <li>3. Wait for accumulator and cooling valve to close</li> <li>4. Stop engine</li> <li>5. <b>BRAKE-OFF</b></li> <li>6. Repeat if required</li> </ol> | 220 psi (15.5 kg/cm <sup>2</sup> )<br><br>None<br><br>Wait 10 seconds<br><br>Wait 1 minute after stopping engine<br><br>140 psi (11 kg/cm <sup>2</sup> ) immediately & 100 psi (7 kg/cm <sup>2</sup> ) minimum after 30 seconds | <ol style="list-style-type: none"> <li>1. Check hydraulic lines for leaks.</li> <li>2. Replace accumulator valve.</li> <li>3. Check for defective accumulators.</li> </ol> |
| <b>LINE-IN</b> (Forward)  | B – Forward              | 1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | <b>LINE-IN</b>  | 220 psi (15.5 kg/cm <sup>2</sup> )  | Refer to Figure 2-21 for Low Forward or Reverse Clutch Pressure troubleshooting procedures   |
| <b>LINE-IN</b> (Inching)  | B – Forward<br>D – Brake | 2 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | Vary between <b>LINE-IN</b> and <b>BRAKE-ON</b>   | Port B 50 psi (3.5 kg/cm <sup>2</sup> ) less than Port D (Komatsu and other engine driven PTO's use 90 psi [6.3 kg/cm <sup>2</sup> ])   | Check or replace forward modulator valve   |
| <b>LINE-OUT</b> (Reverse) | C – Reverse              | 1 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | <b>LINE-OUT</b>   | 220 psi (15.5 kg/cm <sup>2</sup> )  | Refer to Figure 2-21 for Low Forward or Reverse Clutch Pressure troubleshooting procedures   |
| <b>LINE-OUT</b> (Inching) | C – Reverse<br>D – Brake | 2 – 400 psi (25 kg/cm <sup>2</sup> ) gauge | Vary between <b>LINE-OUT</b> and <b>BRAKE-ON</b>  | Port C 120 psi (8.4 kg/cm <sup>2</sup> ) less than Port D   | Adjust reverse modulator   |



## Troubleshooting

This section includes Figure 2-21, Troubleshooting Analysis Check Chart for Power Cable Controls. The chart lists 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 2-21 Troubleshooting Analysis Check Chart

| PROBLEM             | POSSIBLE CAUSE   | CORRECTION   |
|---------------------|--|--|
| Overheating.        | Plugged pressure filter.   | Replace filter.  |
|                     | Plugged suction filter.  | Remove suction filter, clean and replace.  |
|                     | One or both clutches dragging.   | Check by placing control lever in <b>BRAKE-OFF</b> . Normally drum will rotate slowly in the <b>LINE-IN</b> direction. If the reverse clutch is dragging, the drum will rotate in the <b>LINE-OUT</b> direction. If forward clutch is dragging, the drum will rotate positively in the <b>LINE-IN</b> direction and it will take more than 100 lbs. of line pull to prevent drum rotation. |
|                     | Low pressure.  | Check for leaks, then adjust accordingly.  |
|                     | Bevel shaft bearings set too tight.  | Adjust accordingly.  |
|                     | Control cable binding causing winch valve to not return to <b>BRAKE-ON</b> .   | Make sure that there are no tight bends in the control cable (minimum bend radii 5.00"), or replace cable.   |
|                     | Winch control left in <b>BRAKE-OFF</b> .   | Return lever to <b>BRAKE-ON</b> .  |
|                     | Excessive inching.   | Avoid continuous operation in the inching zone.  |
|                     |  |  |
| Operation is rough. | Hydraulic oil is too cold.   | Put the control lever in the <b>BRAKE-OFF</b> position. Run the engine at 1000 rpm to warm the oil before operating the winch.   |
|                     | Low oil level.   | Add hydraulic oil to the correct level.  |
|                     | Low system pressure.   | See item on troubleshooting low oil pressure directly below.   |
|                     | Wrong oil.   | Drain oil and replace with correct grade. Refer to Figure 1-14 the Recommended Oil List in Section 1.  |
|                     | Accumulator malfunction.   | Check accumulator and recharge/replace as necessary.   |
|                     | Tractor engine idling too low, or PTO stalled.   | Increase tractor engine speed.   |
|                     | Hydraulic system suction leaks. Observe oil exiting lube valve while tractor is operating. Suction leaks will cause oil to foam. | Check the following for air leaks:<br>1. Suction hose to pump connection.<br>2. Pump shaft seal.<br>3. Suction filter cover and gasket.<br>4. Suction hose for cracks or collapsed sections.   |
|                     | Control lever/Control cables need adjustment.  | Check for correct adjustment as outlined in Subsection of Service. Make sure the ends of the cables are fastened correctly. Double-check push-pull cable housing to ensure it is securely anchored on both ends. Be sure control lever has full movement and is not hitting housing.   |

(Continued on next page)



Figure 2-21 Troubleshooting Analysis Check Chart (continued)

| PROBLEM  | POSSIBLE CAUSE   | CORRECTION   |
|--|--|--|
| Low oil pressure.  | Leaking pressure hoses and fittings.   | Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.  |
|  | Defective or improperly adjusted oil relief valve; poppet may be stuck open. | Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective.  |
|  | Clogged suction filter.  | Check and clean or replace suction filter.   |
|  | Oil brake leaking internally (indicated by low brake pressure).              | Repair as required.  |
|  | Defective hydraulic pump.  | Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.                |
|  | Valve spool is not moving far enough.  | Check to verify the control valve spool travel (refer to Control Valve Spool Travel Check in Figure 2-19).   |
| Brake does not release or winch stalls during low RPM shift.               | Low oil pressure.  | Refer to "Low Oil Pressure" troubleshooting item above.  |
|  | Pressure modulator set too low.  | Turn modulator screw IN for earlier brake release. Increase sequence differential.   |
|  | Accumulator system malfunction.  | Check for:<br>1. Correct leakdown time as described in Figure 2-20.<br>2. Leaking accumulator valve.<br>3. Leak in accumulator lines.<br>4. Damaged or defective accumulators. |
|  | Damaged brake piston, piston housing or seal rings.                          | Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace both seals when brake is repaired.  |
|  | Low clutch pressure or low oil pump volume.                                  | Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.  |
| Oil brake slipping or drum backspin on fast shift from neutral to forward. | Worn brake plates.   | Check the required pressure to release the brake. Replace friction discs and separator plates if pressure is too low.  |
|  | Broken belleville spring.  | Replace. Refer to Section 4.   |

(Continued on next page)

Figure 2-21 Troubleshooting Analysis Check Chart (continued)

| PROBLEM  | POSSIBLE CAUSE  | CORRECTION  |
|--|---|---|
| Brake releases before forward clutch engagement. | Modulator valve in control valve not functioning.         | Check forward modulator valve.  |
|  | Low brake release pressure (same as the above).           | See "Oil Brake Slipping" troubleshooting item above.  |
| Brake releases before reverse clutch engagement. | Modulator valve in control valve not functioning.         | Check reverse modulator valve. Adjust or replace as necessary.  |
| Low forward or reverse clutch pressure.          | Leak in hydraulic system, or loose hydraulic connections. | Visually inspect winch for leaks, and ensure hydraulic connections are secure.  |
|  | Leaky clutch circuit.                                     | Perform clutch bleed-down test on clutch circuit.   |
|  | Broken seal rings on the bevel gear shaft.                | Replace seal rings.<br><b>NOTE:</b> A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on clutch/brake shaft and adjust it if necessary to prevent additional breakage of seal rings; refer to Section 4. |
|  | Damaged bevel gear shaft seal ring grooves.               | Check grooves for taper, scoring and rust. Replace or rebuild shaft if surfaces between the inner side of groove and seal ring are not flat.  |
|  | Damaged bevel gear shaft bearing retainers.               | Check retainer for grooves. Replace retainer if defective, or re-sleeve.  |
|  | Damaged clutch piston, piston retainer or O-rings.        | Check piston and piston retainer cavity for damage. Always replace both O-rings when clutch is repaired. Refer to Section 4.  |
|  | Reverse pressure hose damaged by bevel gear.              | Remove cover and inspect.   |
| Winch will not operate while tracks are turning. | Accumulator system malfunction.                           | Check for:<br>1. Proper leakdown time as described in Figure 2-20.<br>2. Leaking accumulator valve.<br>3. Leak in accumulator lines.<br>4. Damaged or defective accumulators.   |
|  | Low oil pressure.   | Refer to "Low Oil Pressure" troubleshooting item above.   |
|  | Defective PTO shaft.                                      | Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage. Inspect magnetic suction screen.   |
| Forward or reverse oil clutch not engaging.      | Low oil pressure.   | See "Low Oil Pressure" troubleshooting item above.  |
|  | Low forward or reverse clutch pressure.                   | See troubleshooting for "Low Forward or Reverse Clutch Pressure" item above.  |
|  | Inadequate piston travel.                                 | Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.   |
|  | Worn friction discs and separator plates.                 | Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Step 10 on page 4-38 in Section 4.   |

(Continued on next page)

Figure 2-21 Troubleshooting Analysis Check Chart

| PROBLEM                                      | POSSIBLE CAUSE   | CORRECTION   |
|--|--|--|
| Forward or reverse oil clutch not releasing. | Broken or weak release springs.                          | Check springs and replace as necessary.  |
|  | Warped frictions or separators.                          | Replace as necessary.  |
|  | Lube pressure high.                                      | Test and re-set cooling oil relief valve.  |
| Forward clutch engaging or releasing slowly. | Improper orientation of forward clutch and clutch shaft. | Remove and reinstall shaft with proper alignment, see Step 10 on Page 4-40 in Section 4. |



Lined area for notes, consisting of multiple horizontal lines.

## Electronic Controls

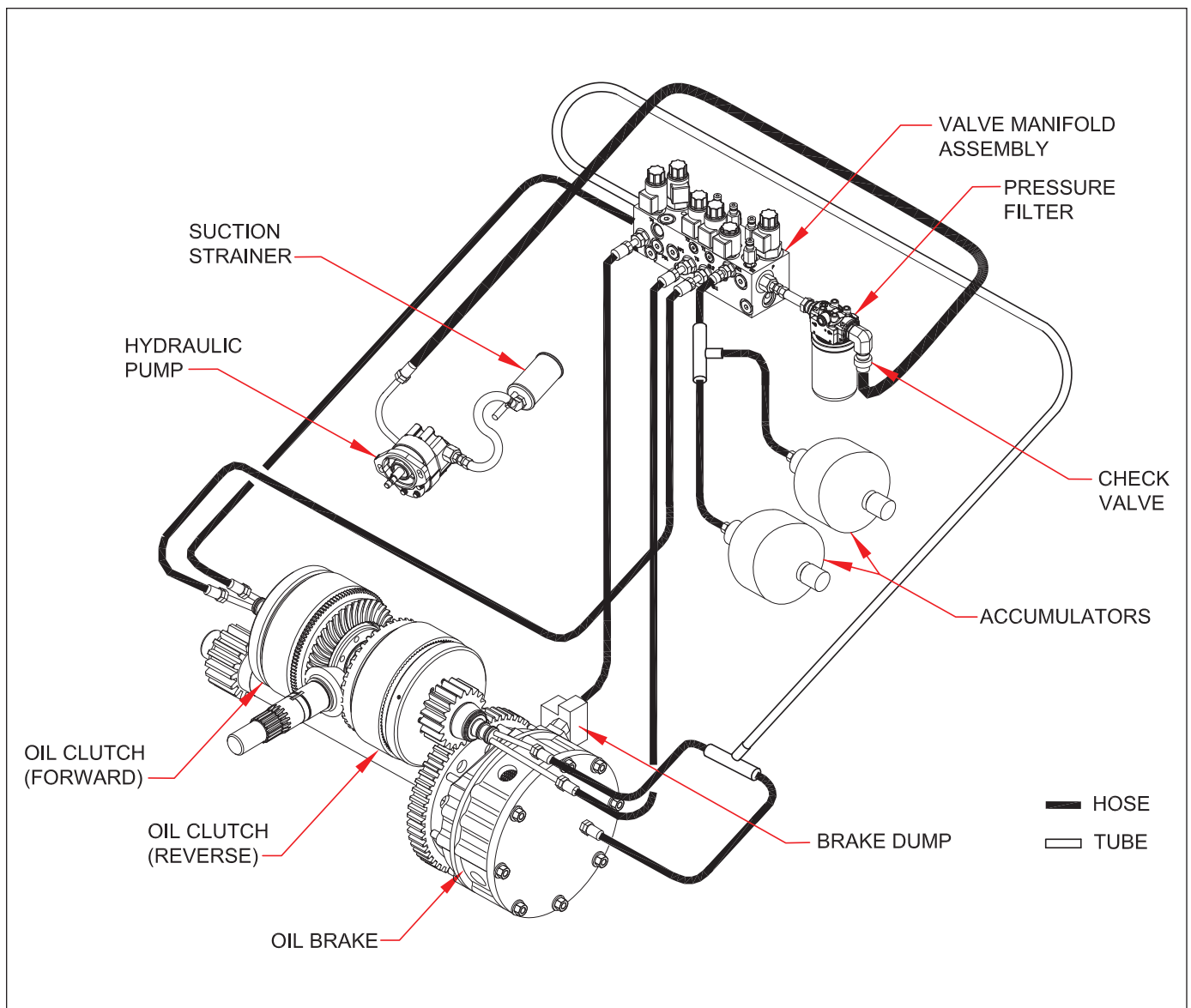
### Hydraulic System (See Fig.3-1)

The operation of the winch is controlled by an internal hydraulic system. When the tractor's PTO is operating, this system provides pressure and directs the flow of oil for the main winch functions. The hydraulic flow path of these various functions is depicted in Figures 3-6 through 3-13.

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

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

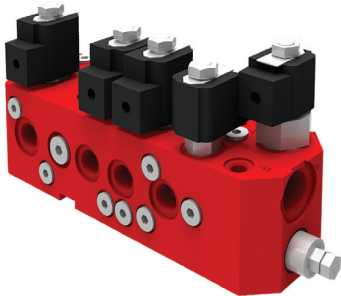
The operation of the winch is controlled by the clutches and the brake.



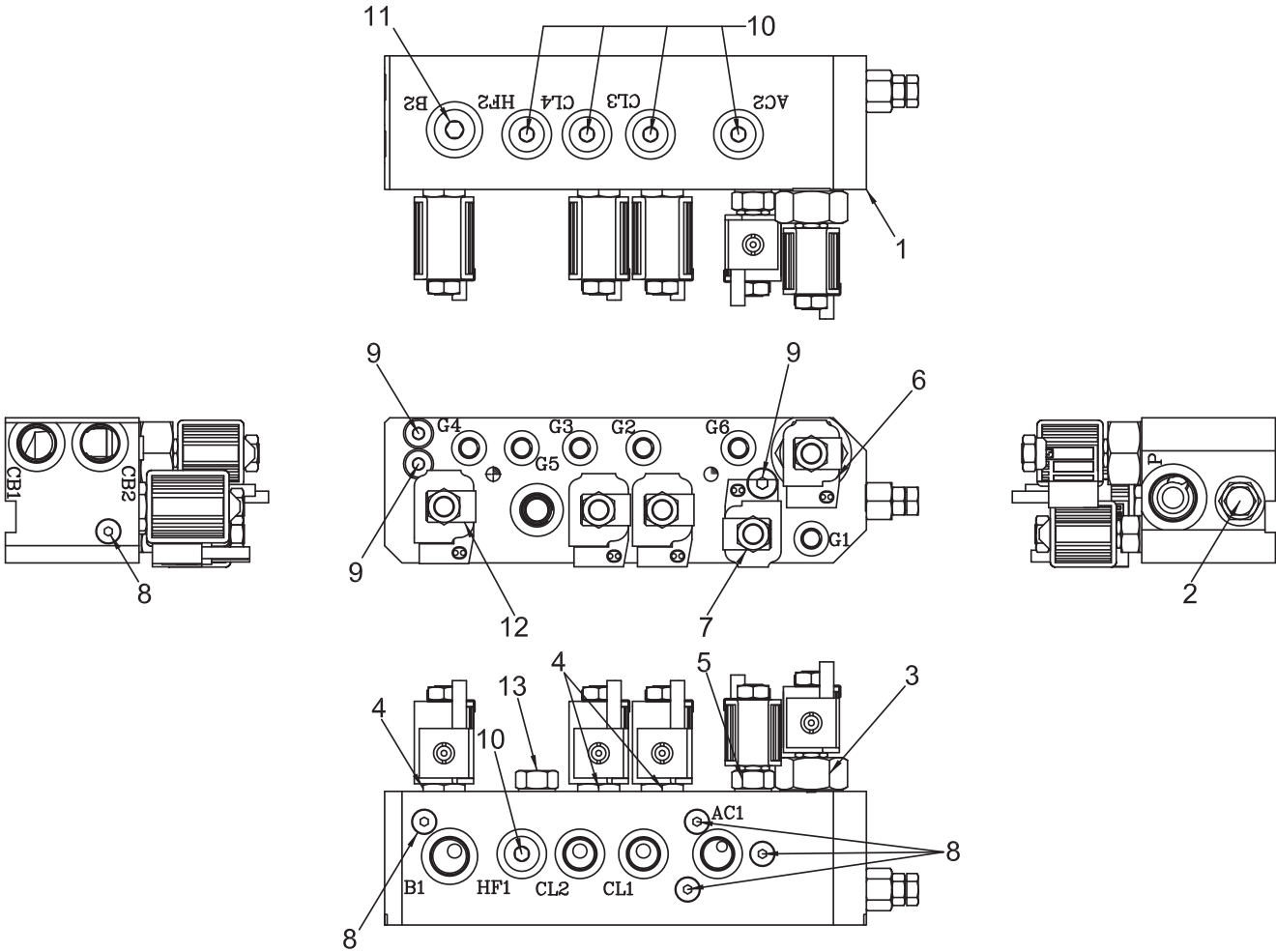
**Figure 3-1 Hydraulic System**

Valve Manifold Assembly & Hydraulic Schematic

| Port Labels      |
|------------------|
| G1 = INLET       |
| G2 = FORWARD     |
| G3 = REVERSE     |
| G4 = BRAKE       |
| G5 = NOT USED    |
| G6 = ACCUMULATOR |

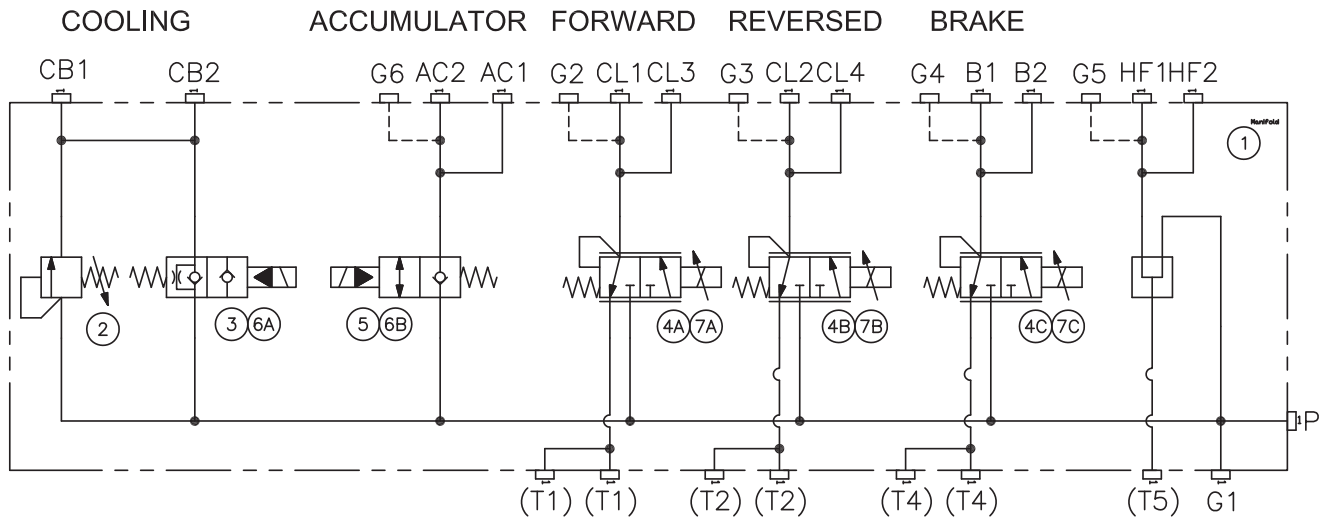


| Description              | Torque Values |
|--------------------------|---------------|
| 1. Valve Manifold Block  | N/A           |
| 2. Relief Valve          | 25 lb-ft.     |
| 3. Solenoid Poppet Valve | 80 lb-ft.     |
| 4. Solenoid Poppet Valve | 22 lb-ft.     |
| 5. Solenoid Poppet Valve | 22 lb-ft.     |
| 6. 24V Coil              | 3 lb-ft.      |
| 7. Coil Nut              | 3 lb-ft.      |
| 8. Plug                  | 7 lb-ft.      |
| 9. Plug                  | 15 lb-ft.     |
| 10. Plug                 | 30 lb-ft.     |
| 11. Plug                 | 46 lb-ft.     |
| 12. Tab Washer           | N/A           |
| 13. Cavity Plug          | N/A           |



**Valve Manifold Assembly**  
P/N 2303889W  
(The color of the manifold body is red)

Figure 3-2 Valve Manifold Assembly and Hydraulic Schematic (1)  
Last Used on S/N AW12E-1228



## PORTS:

P.....SAE #12  
 B1, B2, CB1, CB2 .....SAE # 10  
 AC1, AC2, CL1, CL2, CL3, CL4, HF1, HF2.....SAE #8  
 G1, G2, G3, G4, G5, G6, T1, T2, T4 .....SAE #4

## Hydraulic Schematic

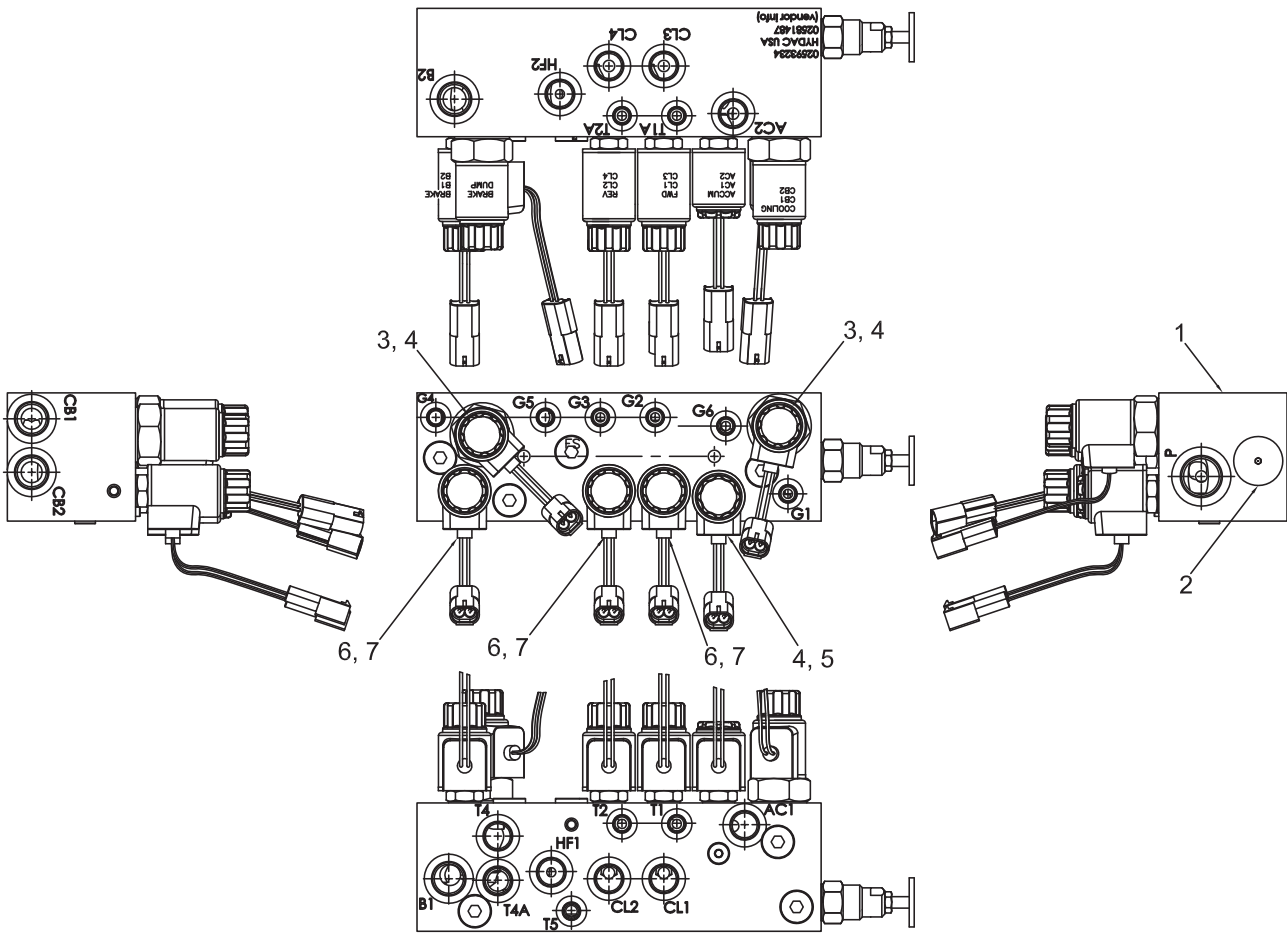
Figure 3-2 Valve Manifold Assembly and Hydraulic Schematic (2)  
 Last Used on S/N AW12E-1228



| Port Labels      |
|------------------|
| G1 = INLET       |
| G2 = FORWARD     |
| G3 = REVERSE     |
| G4 = BRAKE       |
| G5 = NOT USED    |
| G6 = ACCUMULATOR |



| Description                    | Torque Values |
|--------------------------------|---------------|
| 1. Manifold Block              | N/A           |
| 2. Relief Valve                | 30-37 lb-ft.  |
| 3. Cartridge Valve             | 96-133 lb-ft. |
| 4. 24 VDC Valve Coil           | N/A           |
| 5. Accumulator Cartridge Valve | 18-22 lb-ft.  |
| 6. Proportional Valve          | 18-22 lb-ft.  |
| 7. 24 VDC Proportional Valve   | N/A           |

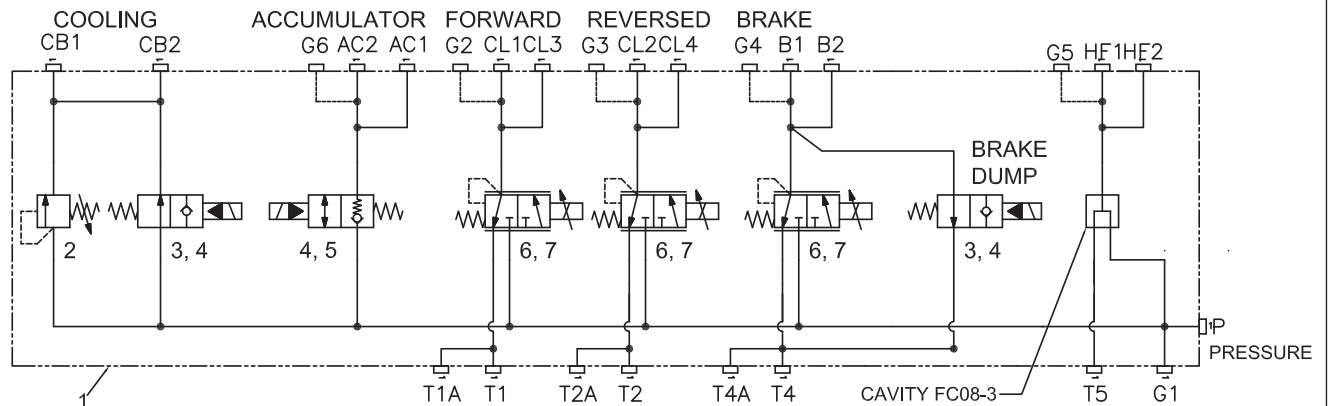


Valve Manifold Assembly

P/N 2306547W

(The color of the manifold body is silver, and coils have leads.)

Figure 3-3 Valve Manifold Assembly and Hydraulic Schematic (1)  
Used on S/N AW12E-1229 through AW12E-1456



## GENERAL

HOUSING MATERIAL  
Aluminum, anodized

AMBIENT TEMPERATURE RANGE  
min. -4°F.  
max. +140°F.

TYPE OF CONNECTION  
P = SAE-12  
B1, B2, CB1, CB2 = SAE-10  
AC1, AC2, CL1, CL2, CL3, T4,  
T4A, CL4, HF1, HF2 = SAE-8  
Others = SAE-4

MOUNTING POSITION  
Optional

## HYDRAULIC

OPERATING FLUID  
Mineral based hydraulic fluid

OPERATING FLUID  
TEMPERATURE RANGE  
min. -4°F.  
max. +248°F.

VISCOSITY RANGE  
min. 5 SUS  
max. 2000 SUS

MAX. PRESSURE  
3000 psi

MAX. FLOW RATE  
3 gpm

FILTRATION  
Maximum permissible  
contamination level of  
operating fluid to  
ISO 4406 class 21/19/16.  
Use a filter with a  
minimum minimum retention  
rate of Beta20 equal to  
or less than 100. 2026

## ELECTRICAL

SAFETY TYPE  
IP65 to DIN 40050  
Safety type applies for  
correctly fitted plugs.

NOMINAL VOLTAGE  
24 VDC

RESISTANCE  
Standard coil - 32 Ohms  
Proportional coils -2.2 Ohms

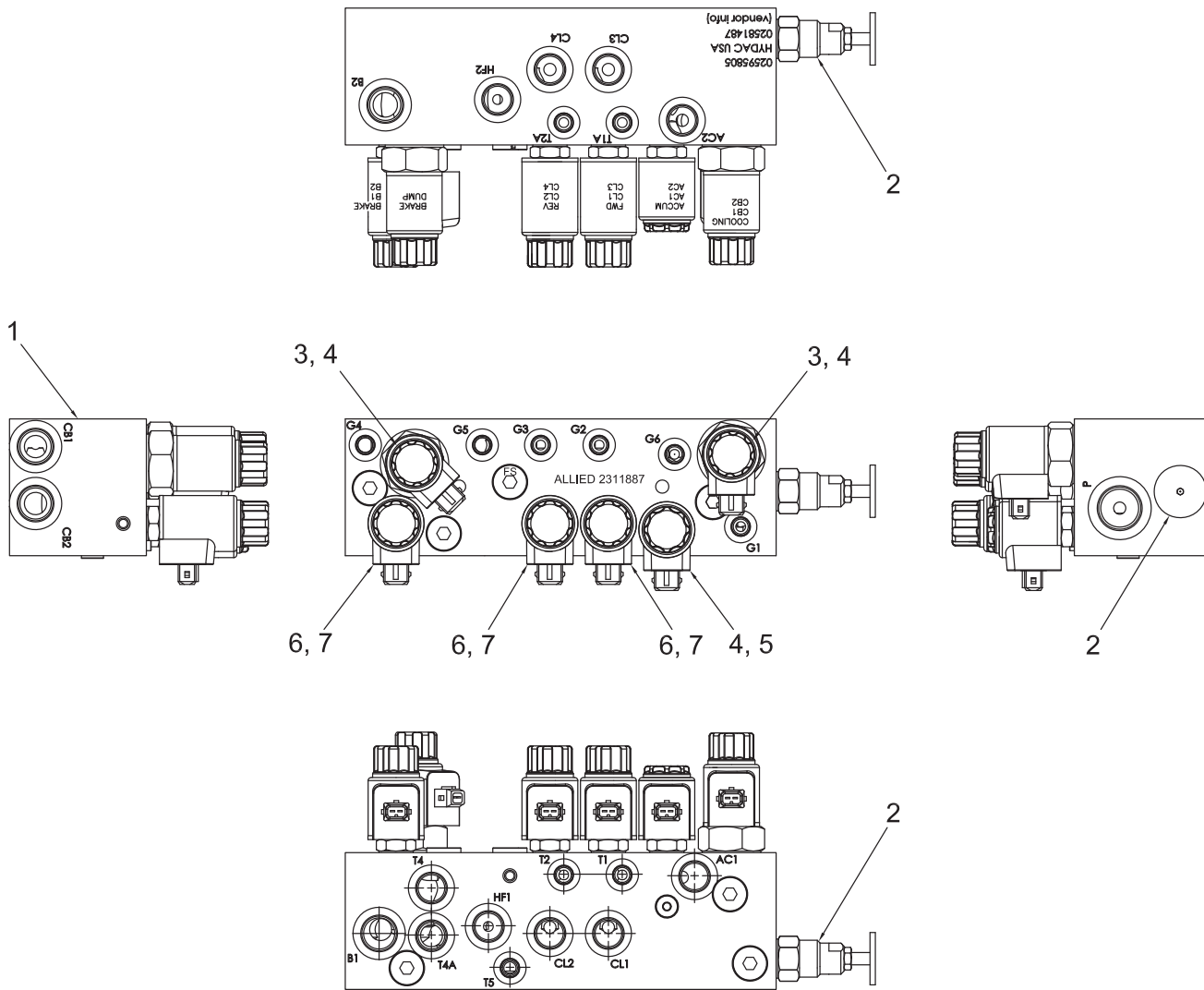
SWITCH-ON-TIME  
100%  
(CONTINUOUS OPERATION)

TYPE OF CONNECTION  
Packard on flying leads.

## Hydraulic Schematic

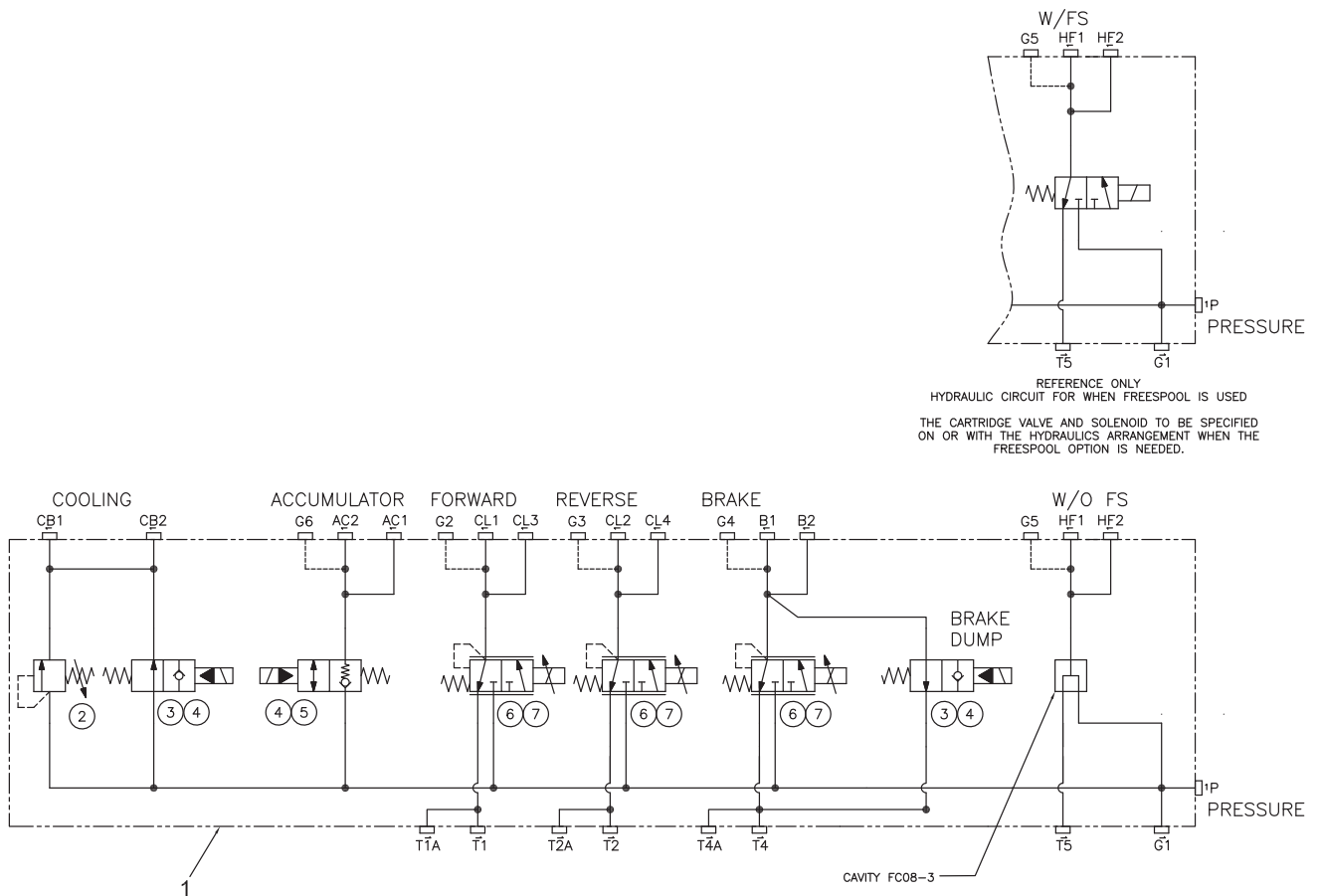
Figure 3-3 Valve Manifold Assembly and Hydraulic Schematic (2)  
Used on S/N AW12E-1229 through AW12E-1456

| Description                    | Torque Values |
|--------------------------------|---------------|
| 1. Manifold Block              | N/A           |
| 2. Relief Valve                | 30-37 lb-ft.  |
| 3. Cartridge Valve             | 96-133 lb-ft. |
| 4. 24 VDC Valve Coil           | N/A           |
| 5. Accumulator Cartridge Valve | 18-22 lb-ft.  |
| 6. Valve                       | 18-22 lb-ft.  |
| 7. 24 VDC Valve Coil           | N/A           |



**Valve Manifold Assembly**  
P/N 2311887  
(The color of the manifold body is silver, and coils do not have leads.)

**Figure 3-4 Valve Manifold Assembly and Hydraulic Schematic (1)  
Used on S/N AW12E-1457 through S/N AW12E-1574**



## GENERAL

HOUSING MATERIAL:  
Aluminum, clear anodized

AMBIENT STORAGE TEMPERATURE RANGE:  
Min. -4°F.  
Max. +140°F.

TYPE OF CONNECTIONS:  
P = SAE-12  
B1, B2, CB1, CB2 = SAE-10  
AC1, AC2, CL1, CL2, CL3, T4,  
T4A, CL4, HF1, HF2 = SAE-8  
Others = SAE-4

MOUNTING POSITION(S):  
All

CARTRIDGE INSTALLATION TORQUES:  
All 7/8 Hex Head: 18-22 Ft-Lbs  
(25-29 N-M)  
All 1 1/2 Hex Head: 96-133 Ft-Lbs  
(131-180 N-M)

## HYDRAULIC

OPERATING FLUID:  
Mineral based hydraulic fluid

OPERATING FLUID  
TEMPERATURE RANGE:  
Min. -4°F.  
Max. +248°F.

VISCOSITY RANGE:  
min. 5 SUS  
max. 2000 SUS

MAX. PRESSURE:  
3000 psi

MAX. FLOW RATE:  
3 gpm

FILTRATION:  
Maximum permissible  
contamination level of  
operating fluid to  
ISO 4406 class 21/19/16.  
Use a filter with a  
minimum minimum retention  
rate of Beta20 equal to  
or less than 100. 2026

## ELECTRICAL

NOMINAL VOLTAGE:  
24 VDC

DUTY CYCLE:  
100% (CONTINUOUS OPERATION)  
AT 115% OF NOMINAL VOLTAGE

MAX COIL TEMP:  
320°F (160°C)

TYPE OF CONNECTION:  
AMP JR TIMER

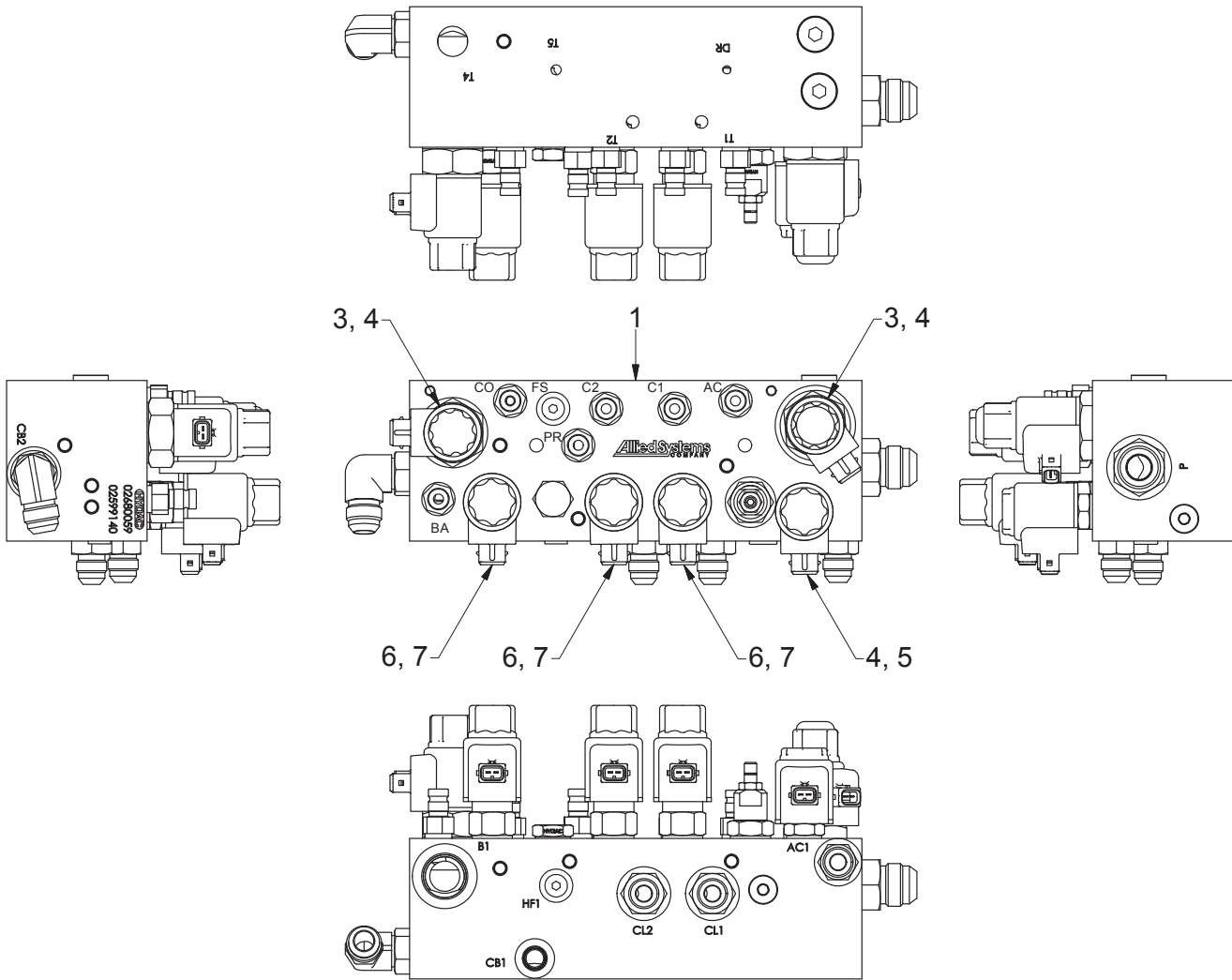
## Hydraulic Schematic

**Figure 3-4 Valve Manifold Assembly and Hydraulic Schematic (2)**  
Used on S/N AW12E-1457 through S/N AW12E-1574

| Port Labels          |
|----------------------|
| PR = SYSTEM PRESSURE |
| C1 = FORWARD         |
| C2 = REVERSE         |
| BR = BRAKE           |
| FS = NOT USED        |
| AC = ACCUMULATOR     |
| CO = COOLING OIL     |



| Description                    | Torque Values |
|--------------------------------|---------------|
| 1. Manifold Block              | N/A           |
| 3. Cartridge Valve             | 96-133 lb-ft. |
| 4. 24 VDC Valve Coil           | N/A           |
| 5. Accumulator Cartridge Valve | 18-22 lb-ft.  |
| 6. Valve                       | 18-22 lb-ft.  |
| 7. 24 VDC Valve Coil           | N/A           |

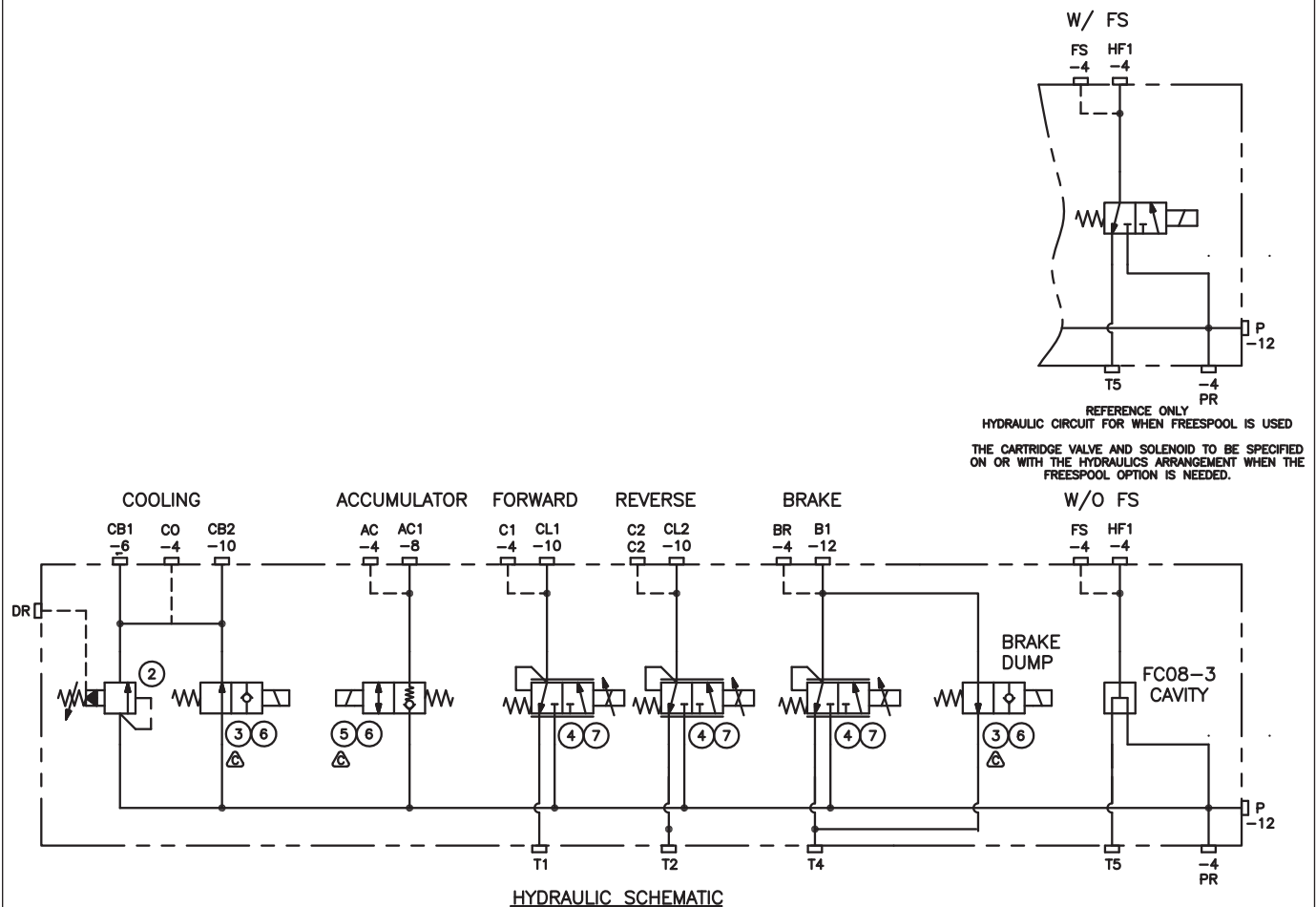


**Valve Manifold Assembly**

P/N 2315717

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

Figure 3-5 Valve Manifold Assembly and Hydraulic Schematic (1)  
First Used on S/N AW12E-1575



## GENERAL

HOUSING MATERIAL:  
Aluminum, Blue anodized

AMBIENT STORAGE TEMPERATURE RANGE:  
Min. -4°F.  
Max. +140°F.

MOUNTING POSITION(S):  
All

CARTRIDGE INSTALLATION TORQUES:  
All 7/8 Hex Head: 18-22 Ft-Lbs  
(25-29 N-M)  
All 1 1/2 Hex Head: 96-133 Ft-Lbs  
(131-180 N-M)

## HYDRAULIC

OPERATING FLUID:  
Mineral based hydraulic fluid

OPERATING FLUID  
TEMPERATURE RANGE:  
Min. -4°F.  
Max. +248°F.

VISCOSITY RANGE:  
min. 5 SUS  
max. 2000 SUS

MAX. OPERATING PRESSURE:  
900 psi

MAX. FLOW RATE:  
10 gpm

FILTRATION:  
Maximum permissible contamination level  
of operating fluid to ISO 4406 class  
21/19/16 and 18/16 /13.  
Use a filter with a minimum retention  
rate of  $\beta > 200$ .

## ELECTRICAL

NOMINAL VOLTAGE:  
24 VDC

DUTY CYCLE:  
100% (CONTINUOUS OPERATION)  
AT 115% OF NOMINAL VOLTAGE

MAX COIL TEMP:  
320°F (160°C)

TYPE OF CONNECTION:  
AMP JR TIMER

## Hydraulic Schematic

Figure 3-5 Valve Manifold Assembly and Hydraulic Schematic (2)  
First Used on S/N AW12E-1575

## Valve Manifold Assembly

The valve manifold assembly controls the flow of hydraulic oil to and from the clutches, and brake. Passages inside the valve body connect the oil flow with the functions that control the winch. Various cartridge solenoid valves within the manifold open and close passages to apply and release the clutches and brake (See Figures 3-2 through 3-5). See Figures 3-6 through 3-13 for gauge ports' connections and functions.

### Relief Valve

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  $220 \pm 5$  psi ( $1520 \pm 35$  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.

### Forward and Reverse Clutches

The reverse clutch and forward clutch for electronic controls are the same as reverse and forward clutches for cable controls (See Figures 2-2 & 2-3).

## Oil Brake

The oil brake for electronic controls is the same as the one for cable controls (See Figure 2-4).

### 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 control lever is moved to the **LINE-IN, LINE-OUT** or **BRAKE-OFF** position, an electronic signal opens the accumulator valve to allow its pressurized oil to join the oil from the pump. It remains open while these functions are activated so that the accumulator can be recharged by pump flow. Numerous quick shifts of the handlever can deplete the accumulator quicker than it is being recharged. Therefore, the accumulator valve is also open for the first 8 seconds of being in the **BRAKE-ON** position.

### Check Valve

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



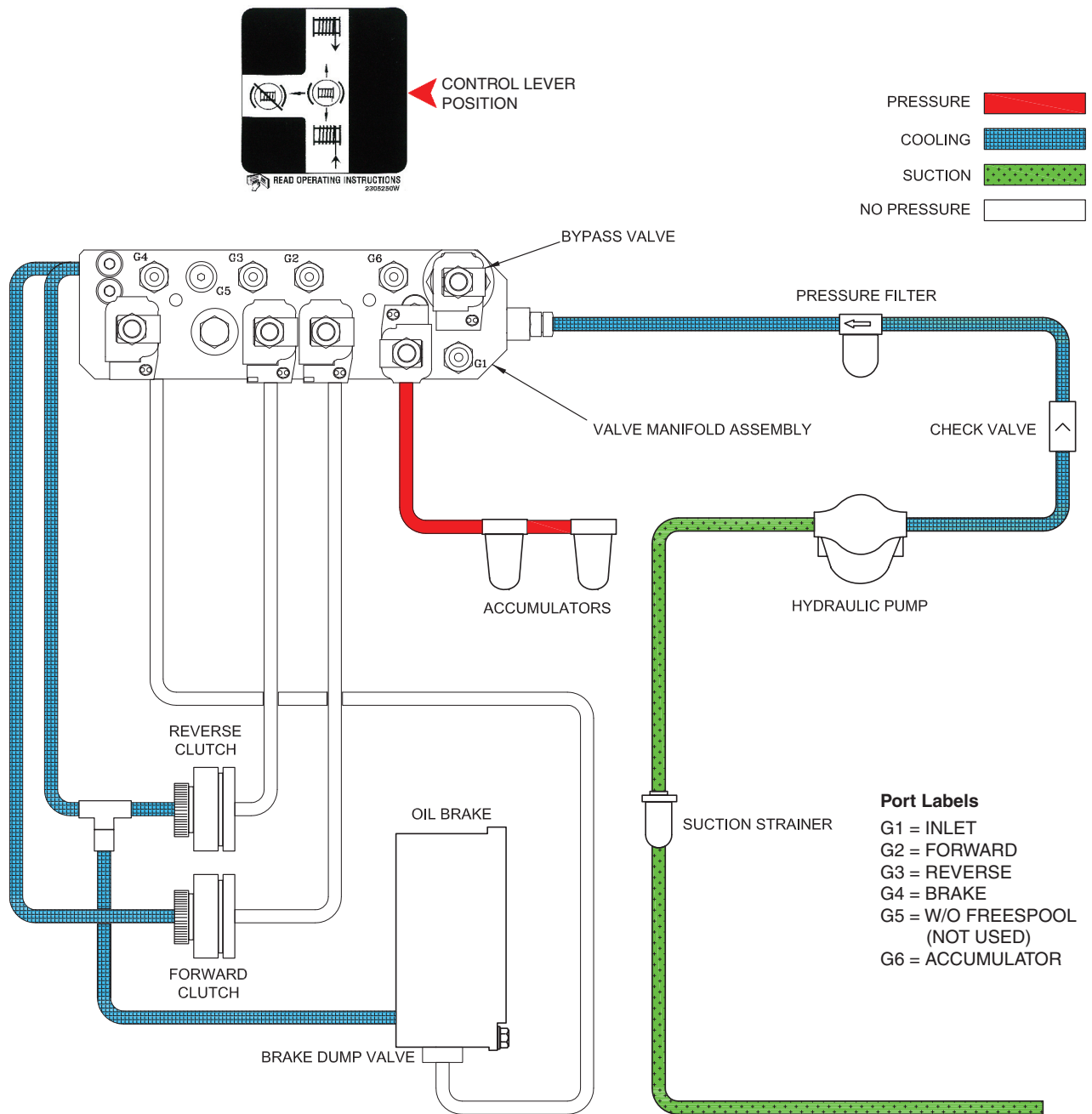


Figure 3-6 Hydraulic System - BRAKE-ON (Neutral)

**NOTE:** Figures 3-6 through 3-9 show the sequences of operation for the older type of manifold (See Figure 3-2).

## Sequence of Operation - BRAKE-ON

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

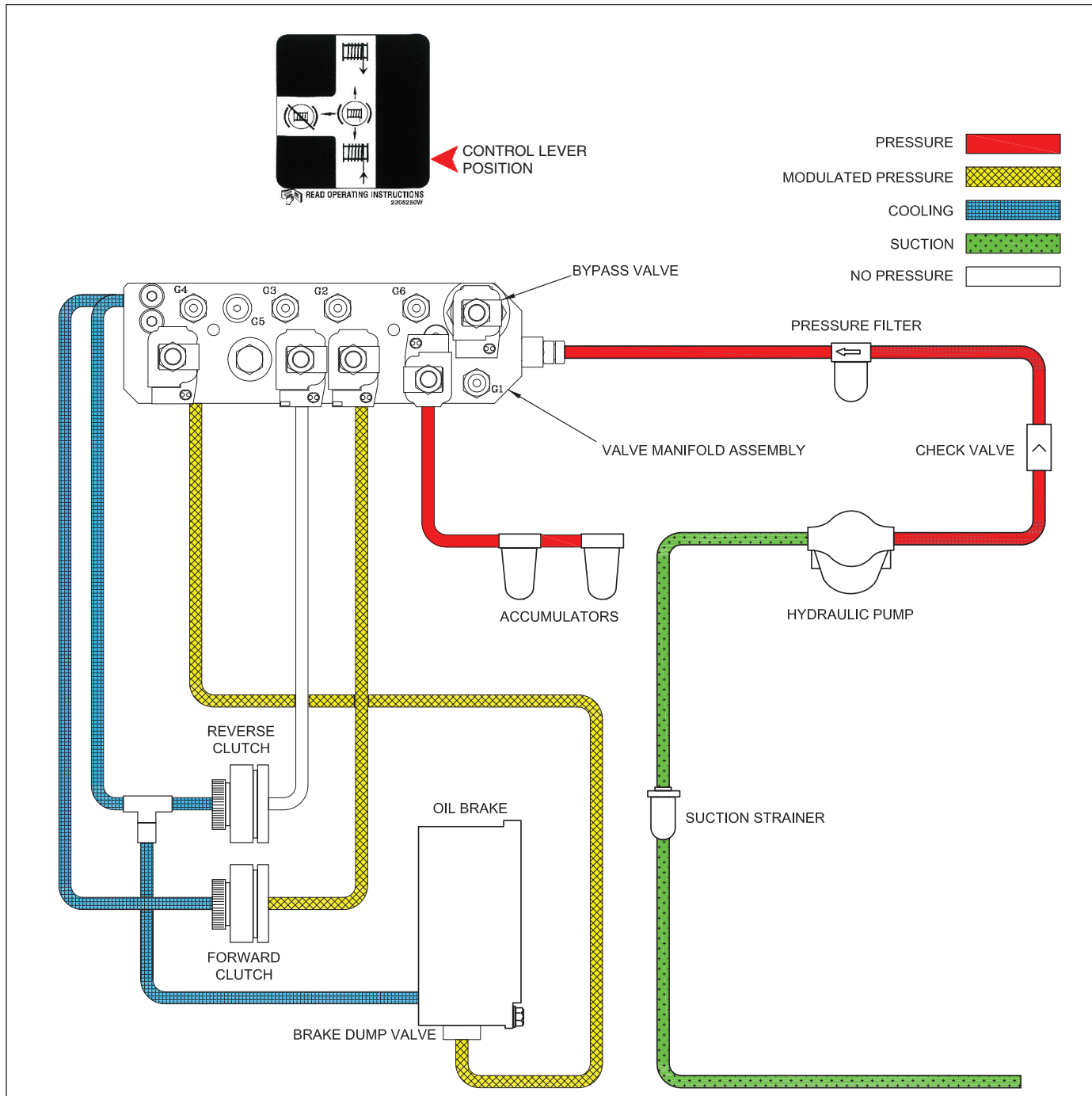


Figure 3-7 Hydraulic System - LINE-IN (Forward)

## Sequence of Operation - LINE-IN

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

and brake is supplied during inching (slight movement of the control lever from the **BRAKE-ON** position). Full pressure is applied to the clutch when the control lever is in full **LINE-IN** position. Brake pressure is limited to just above brake release pressure for faster response. Reverse clutch piston remains vented to tank. Excess oil continues to flow to coil the clutches to brake.

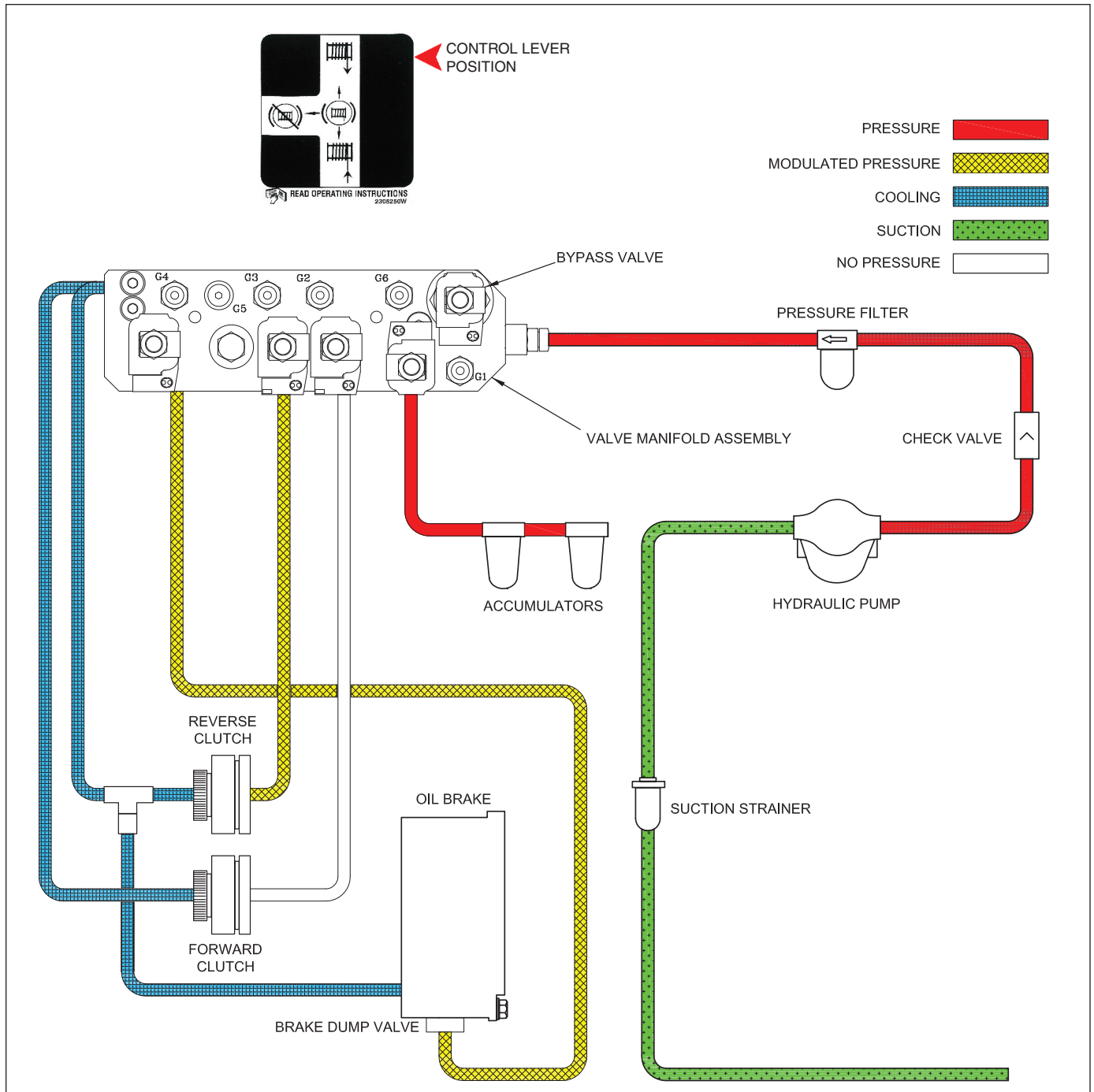


Figure 3-8 Hydraulic System - LINE-OUT (Reverse)

## Sequence of Operation - LINE-OUT

**LINE-OUT** (reverse) operation is achieved by pushing the control lever forward from the **BRAKE-ON** position, which simultaneously closes the bypass valve (brake dump closes) and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. The proportional brake and reverse clutch valves open according to the control module program. Modulated pressure to the clutch and brake is

supplied during inching (slight movement of the control lever from the **BRAKE-ON** control lever). Full pressure is applied to the clutch when the control lever is in full **LINE-OUT** position. Brake pressure is limited to just above brake release pressure for faster response. Reverse clutch piston remains vented to tank. Excess oil continues to flow to cool the clutches and brake.

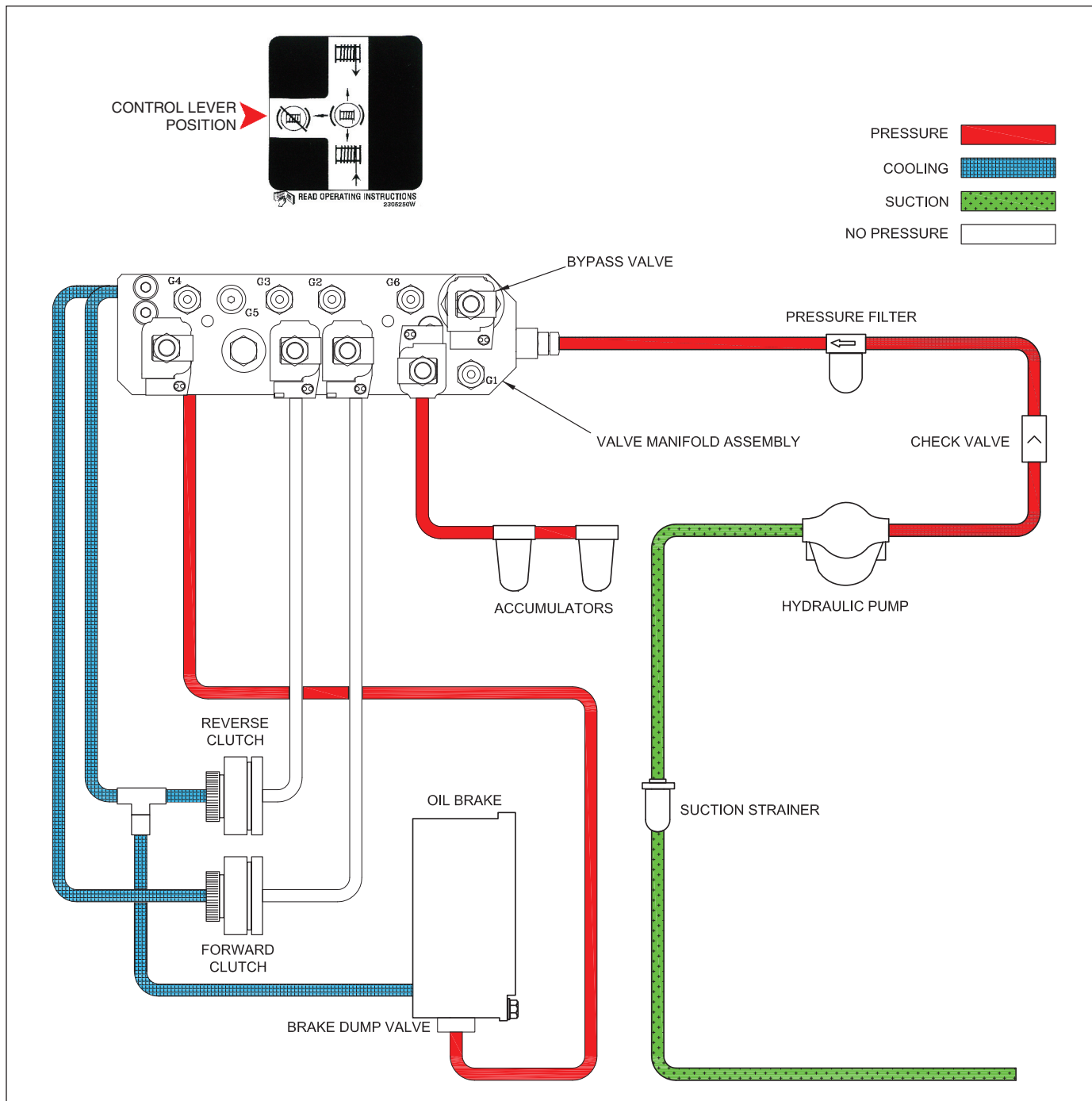


Figure 3-9 Hydraulic System - BRAKE-OFF

## Sequence of Operation - BRAKE-OFF

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



## WARNING

**BRAKE-OFF** inching is not intended for heavy suspended loads, as loss of the load can occur.

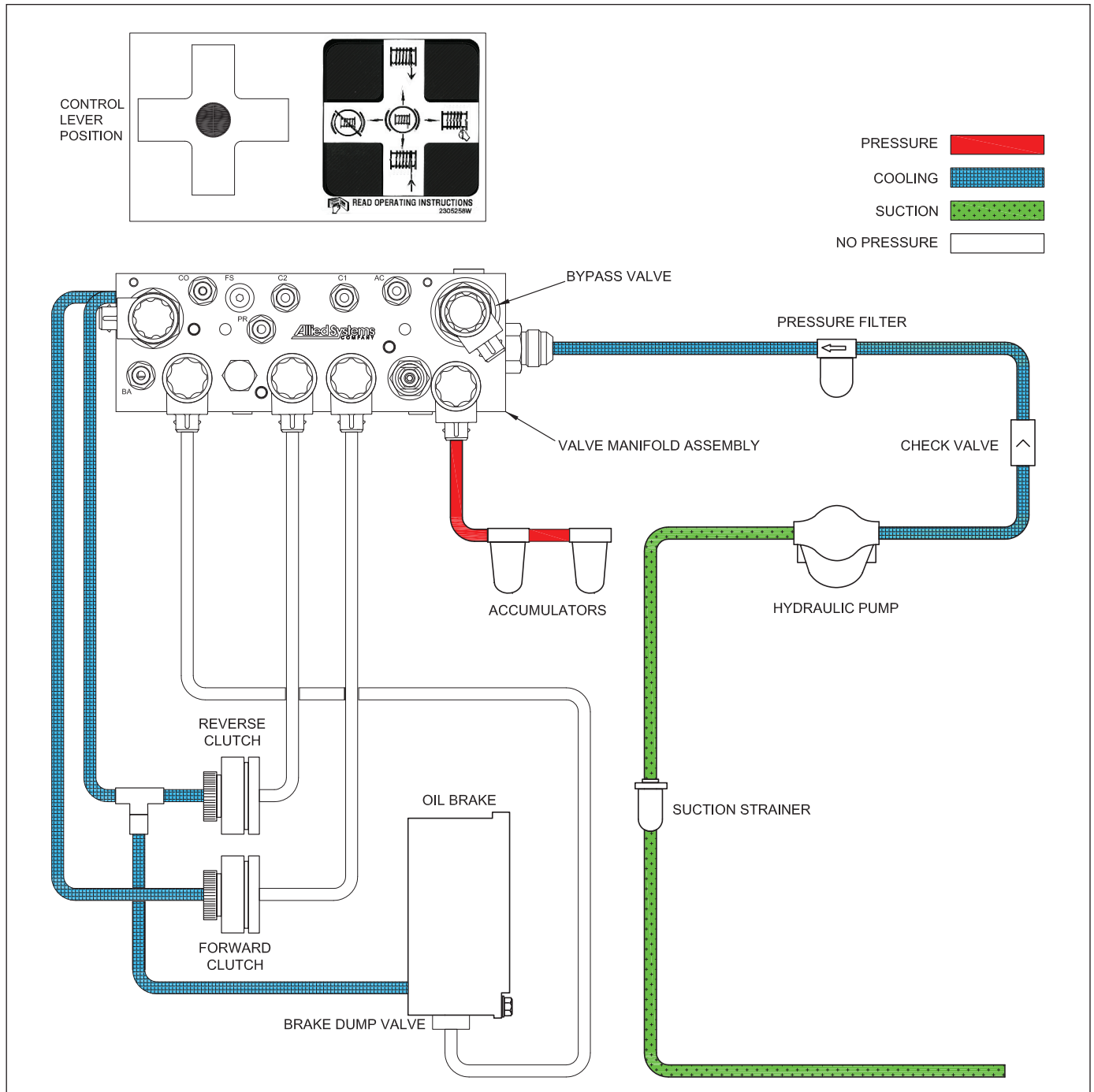


Figure 3-10 Hydraulic System, BRAKE-ON (Neutral)

**NOTE:** Figures 3-10 through 3-13 show the sequences of operation for the new type of manifold (See Figure 3-5).

## Sequence of Operation, BRAKE-ON

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

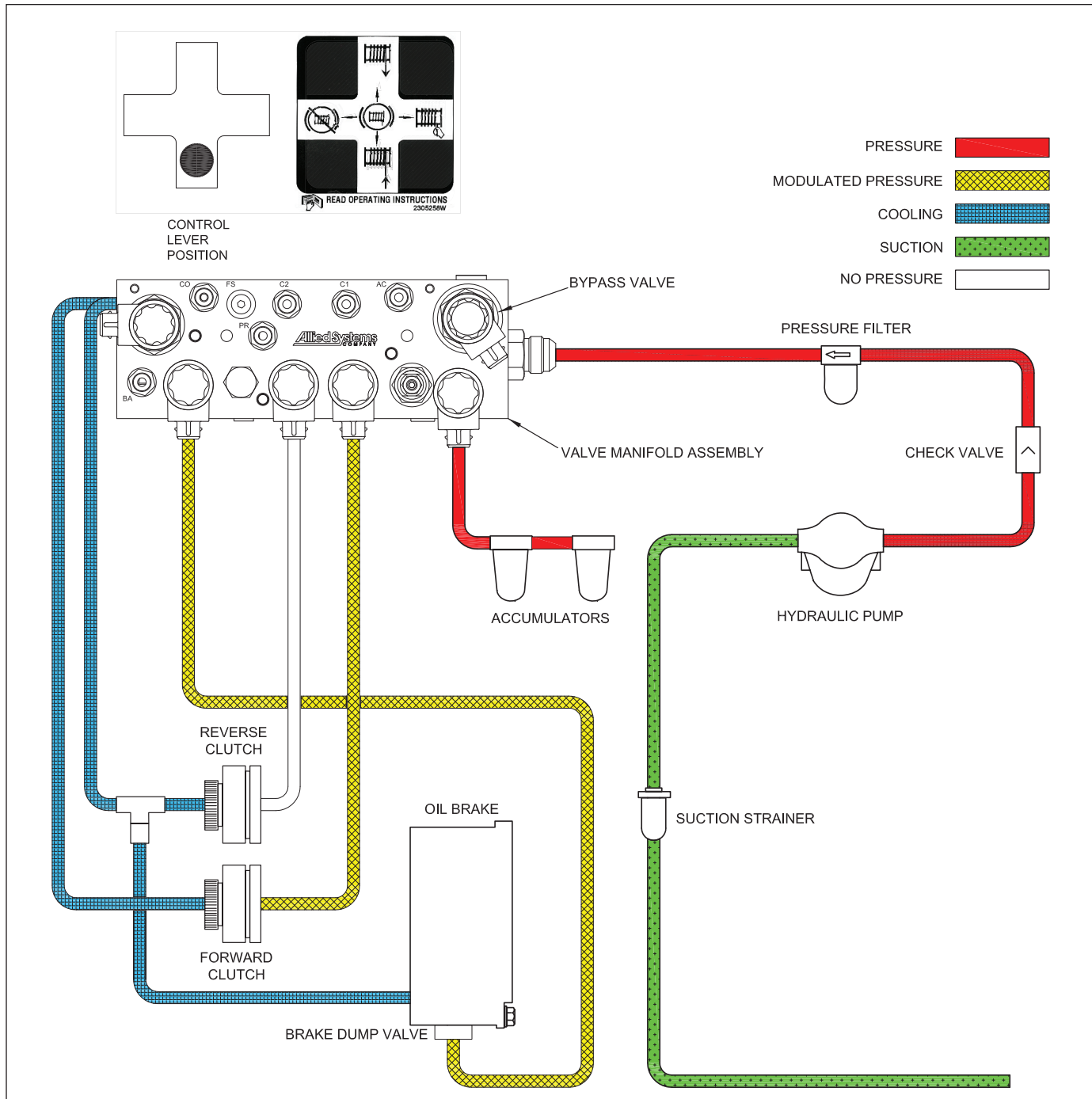


Figure 3-11 Hydraulic System, LINE-IN (Forward)

## Sequence of Operation, **LINE-IN**

For **LINE-IN** (forward) operation, the operator pulls back on the control lever, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. The proportional brake and forward clutch valves open according to the control module

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

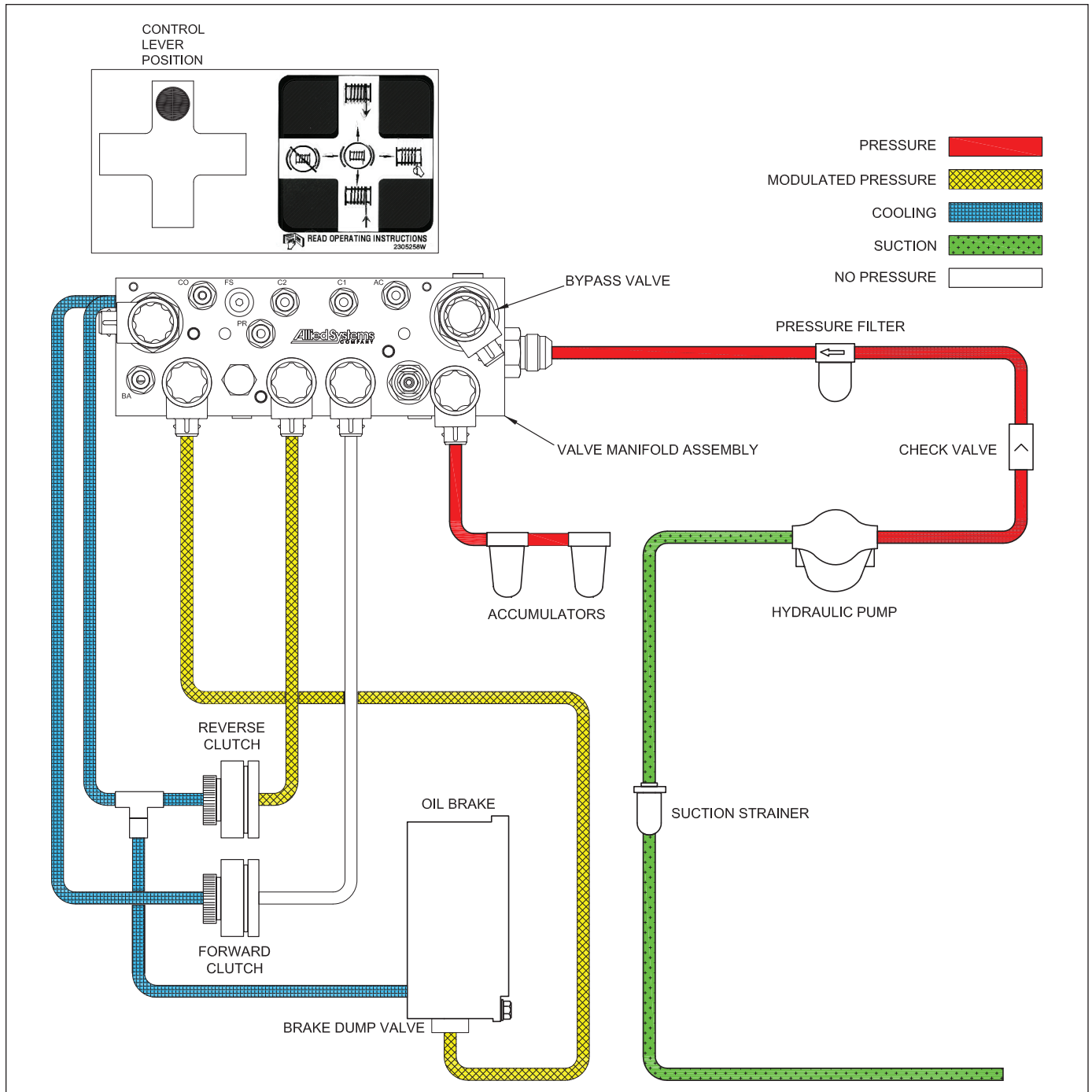


Figure 3-12 Hydraulic System, LINE-OUT (Reverse)

## Sequence of Operation, **LINE-OUT**

**LINE-OUT** (reverse) operation is achieved by pushing the control lever forward from the **BRAKE-ON** position, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. The proportional brake and reverse clutch valves open according to the control module program.

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



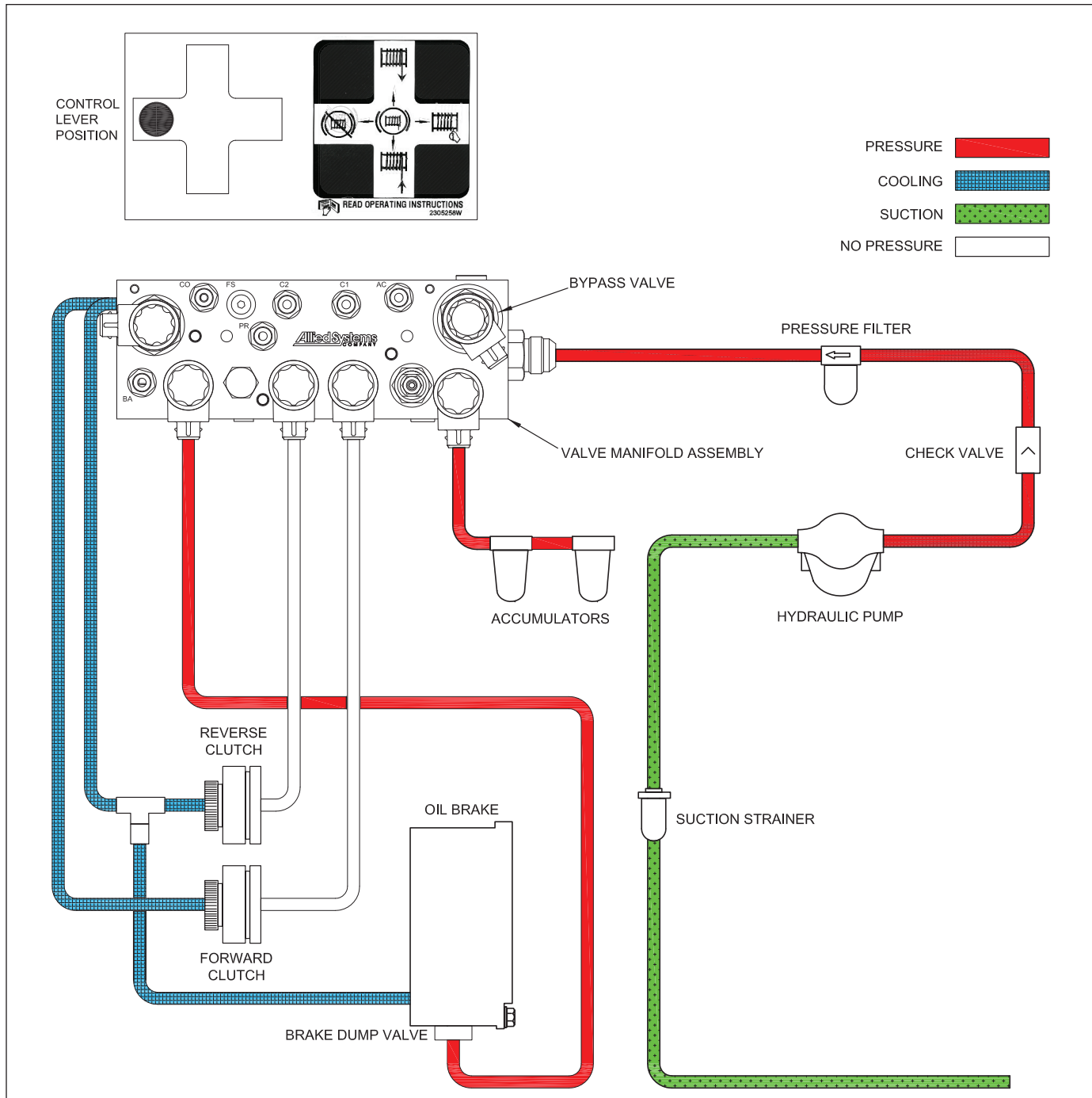


Figure 3-13 Hydraulic System, BRAKE-OFF

## Sequence of Operation, **BRAKE-OFF**

**BRAKE-OFF** is achieved by pushing the control lever to the left of the **BRAKE-ON** position. This position is detented and the control lever must be moved manually

to return it to the **BRAKE-ON** position. The bypass valve closes as the accumulator valve opens. Brake pressure increases, and fully releases the brake.

## Electronic Control Module

The DVC10, the programmable controller, has a large number of inputs and outputs allowing stand-alone

operation or it can be the controller for a large CAN Bus system with up to 16 DVC expansion modules.

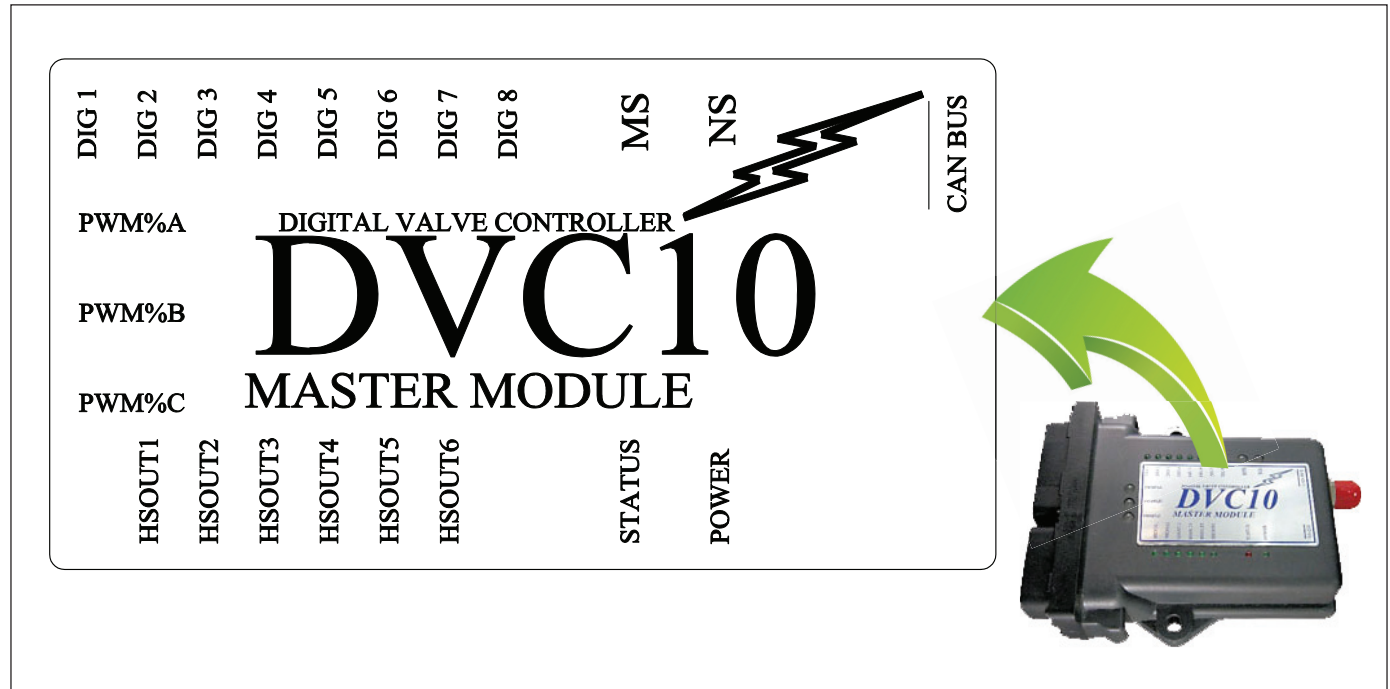


Figure 3-14 Electronic Control Module DVC10

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

\* Note: After serial number break, S/N AW12E-1457, HSOUT4 = Brake Dump/Cooling Oil Output  
HSOUT6 = Accumulator Output.

Figure 3-15 Electronic Control Module LED States For Various Functions (See Figure 3-14)

## Input / Output Functions

There are eight Input/Output Functions that can be programmed individually. The Input/Output Function gives Allied the ability to change the response of the output with the change of the input (see sample screen below). Different adjustable points on the response curve give Allied full flexibility to control non-linear responses. These functions are adjustable while the controller is running, allowing adjustment of unknown output characteristics.

| WINCH FUNCTION   | ECM LEDs<br>ILLUMINATED GREEN   |
|------------------|---|
| <b>BRAKE-ON</b>  | Power<br>MS   |
| <b>BRAKE-OFF</b> | Power<br>MS<br>HSOUT3<br>HSOUT4<br>HSOUT6<br>PWM%B                    |
| <b>LINE-IN</b>   | Power<br>MS<br>HSOUT1<br>HSOUT3<br>HSOUT4<br>HSOUT6<br>PWM%A<br>PWM%B |
| <b>LINE-OUT</b>  | Power<br>MS<br>HSOUT2<br>HSOUT3<br>HSOUT4<br>HSOUT6<br>PWM%A<br>PWM%B |

Figure 3-16 Electronic Control Module LED Description Chart

## Electronic Control Program Diagram

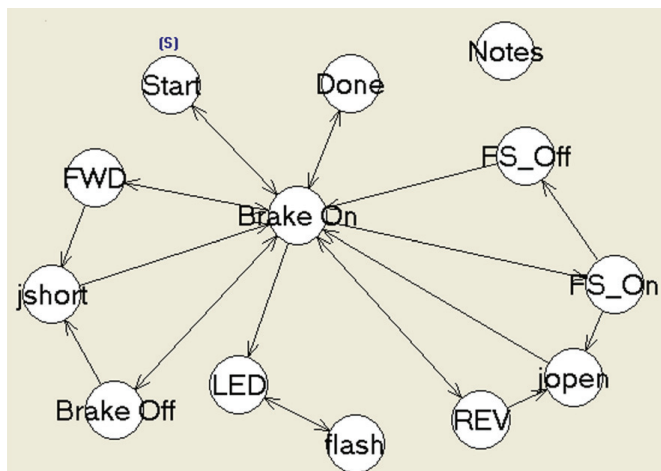


Figure 3-17 Electronic Control Program Diagram

- When the controls are first turned on, the system starts at the "Start" bubble and will only transition to **BRAKE-ON** when:
  - control lever is centered on X axis
  - control lever is centered on Y axis
  - Activation switch is turned on (i.e. controls are active) - Not all winches will have the activation switch.
- Not transitioning from "Start" to **BRAKE-ON** is a safety feature since this also prevents transitioning to **LINE-IN**, **LINE-OUT** or **BRAKE-OFF**.
- The computer system check for open circuits and short circuits for nearly all circuits.
- The filter is normally open and only closes due to pressure from oil being cold or from the filter being plugged.
- A fault detection will cause the program to transition from any portion of the program to **BRAKE-ON** and then to LED where it switches from LED to Flash and back.

NOTE: The line between LED and **BRAKE-ON** contains only one directional arrow. This means that the program will not move out of this mode without powering down the controls.

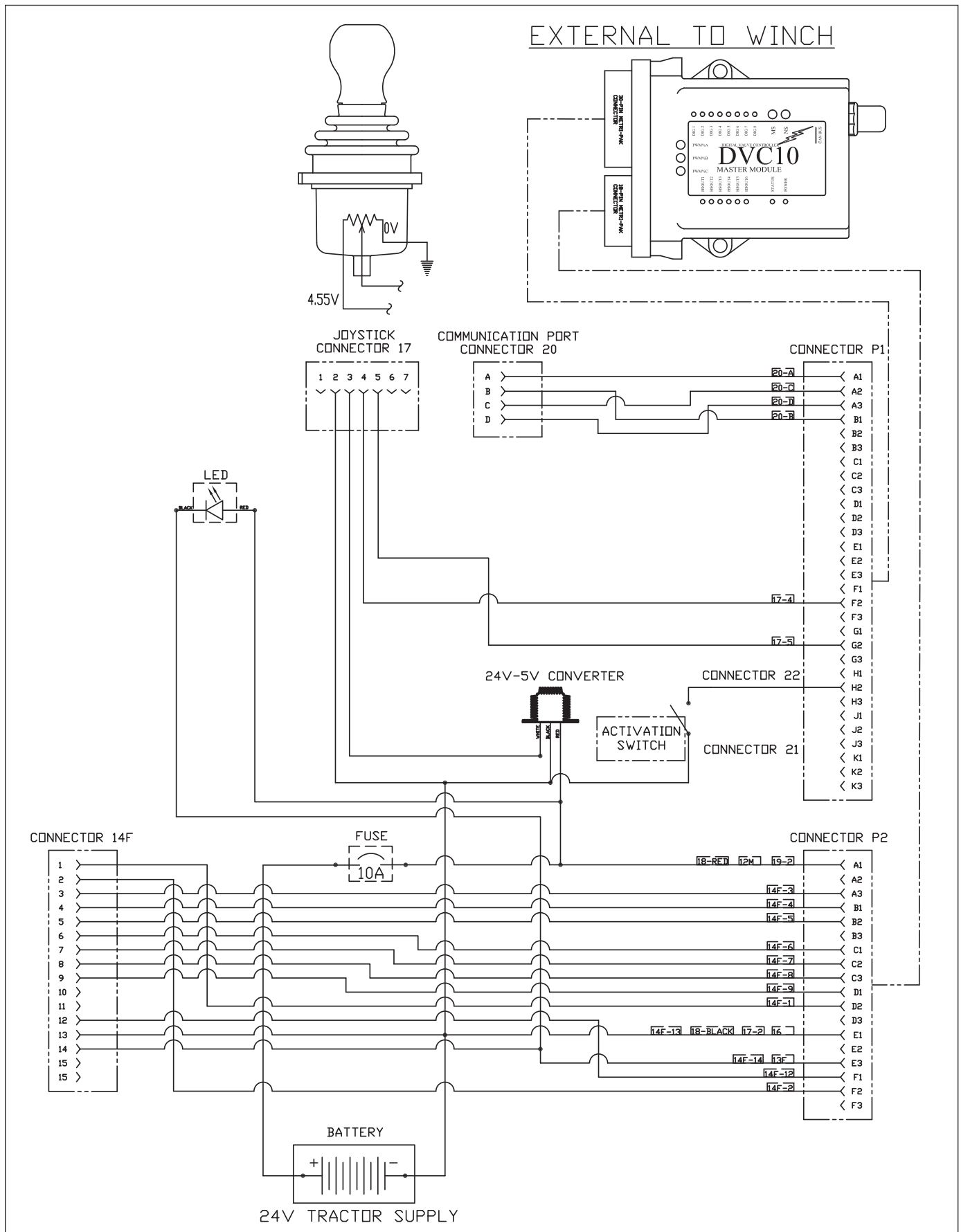
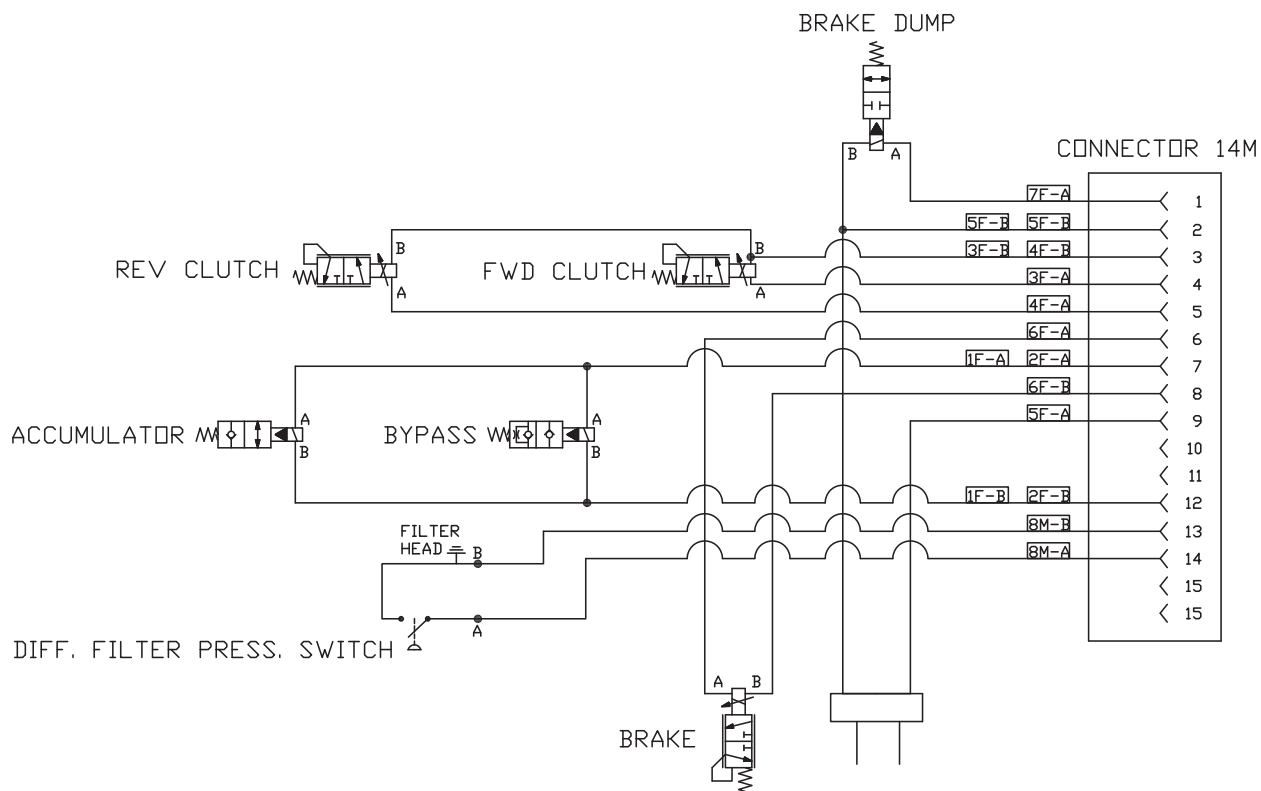


Figure 3-18 DVC10 Electronic Schematic (1)

(Continued on next page)

## INTERNAL TO WINCH



### NOTES:

- 1) EXTERNAL WIRING HARNESS CONNECTOR 14F CONNECTS TO INTERNAL HARNESS CONNECTOR 14M.
- 2) SPECIFICATIONS:
  - (VOLTAGE CONVERTER)
  - +8VDC TO +30VDC POWER INPUT RED WIRE
  - +5VDC  $\pm 5\%$  AT 40 MILLIAMPS OUTPUT WHITE WIRE
  - (JOYSTICK)
  - +5VDC POWER SUPPLY  $\pm 0.5$ VDC
  - 15 MILLIAMPS CURRENT CONSUMPTION
  - +0.5VDC TO +4.5VDC OUTPUT
  - (LED)
  - +24VDC POWER SUPPLY
  - 20 MILLIAMPS MAXIMUM SUPPLY CURRENT
  - (DVC CONTROL MODULE)
  - +8VDC TO +30VDC POWER SUPPLY
  - (SOLENOID VALVES)
  - FWD, REV, BRAKE, COOLING 1.17 AMP MAXIMUM CURRENT
  - FREESPOOL, BRAKE DUMP, ACCUMULATOR 0.8 AMP MAXIMUM CURRENT
  - +24VDC POWER SUPPLY
  - 15-50 OHMS RESISTANCE THROUGH COILS

Figure 3-18 DVC10 Electronic Schematic (2)

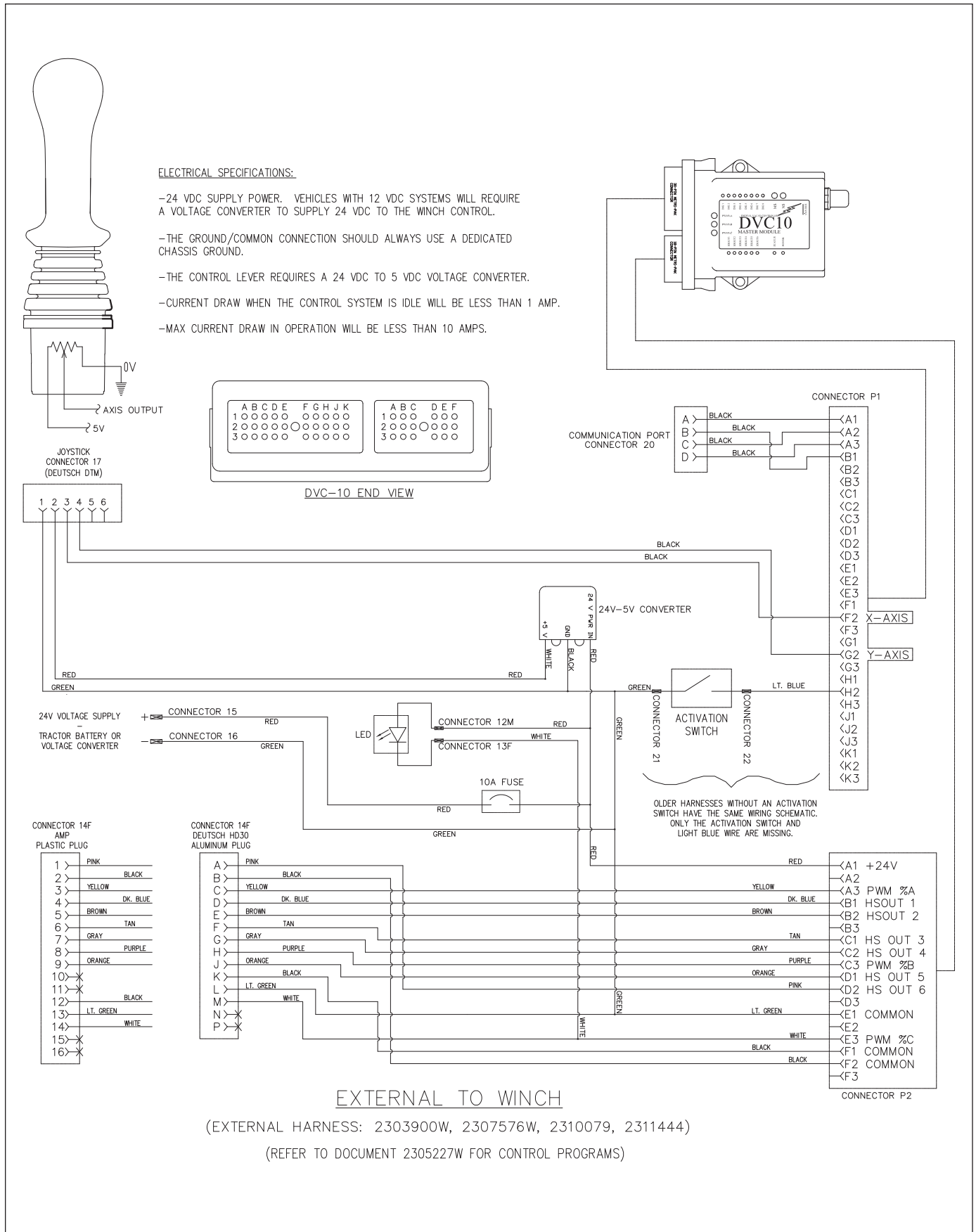
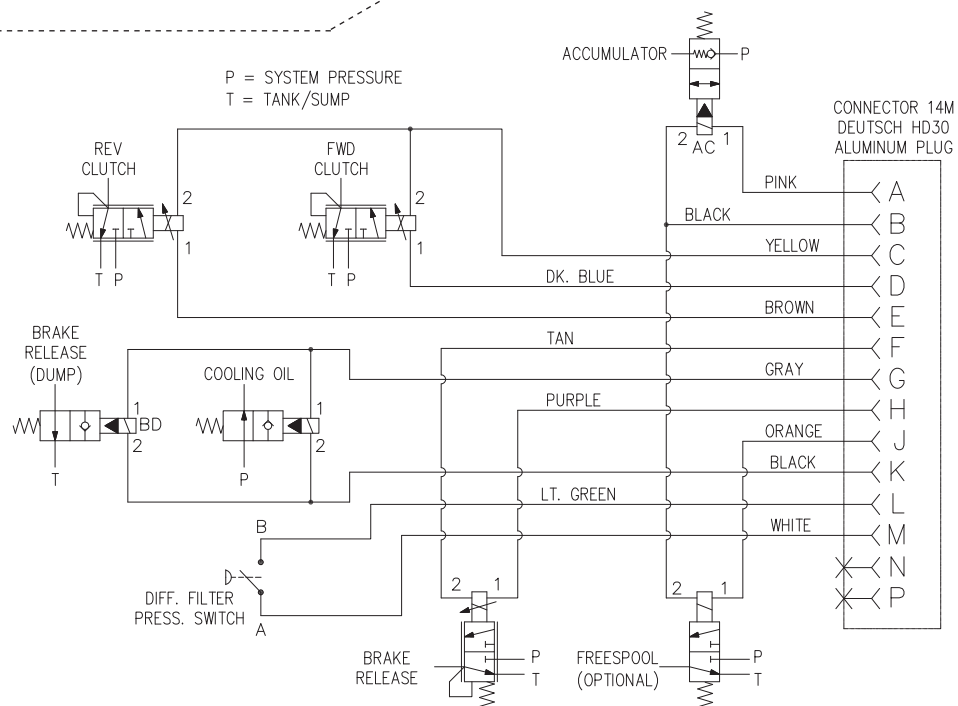
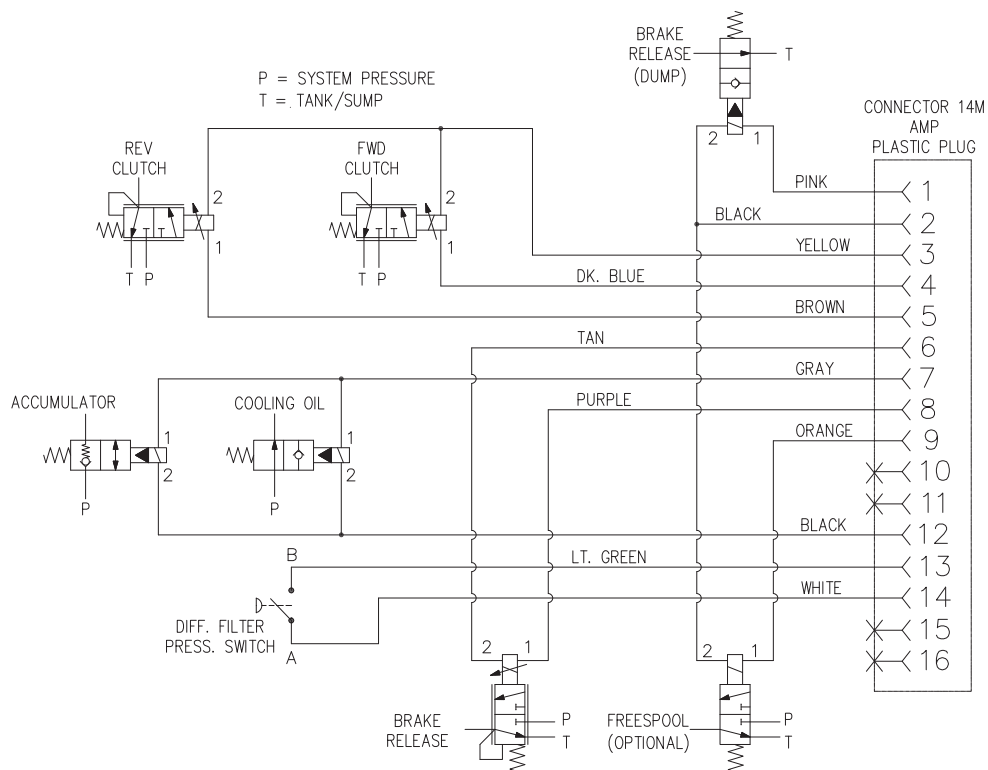


Figure 3-18.1 DVC10 New Electronic Schematic (1)

(Continued on next page)



**Figure 3-18.1 DVC10 New Electronic Schematic (2)**



## 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

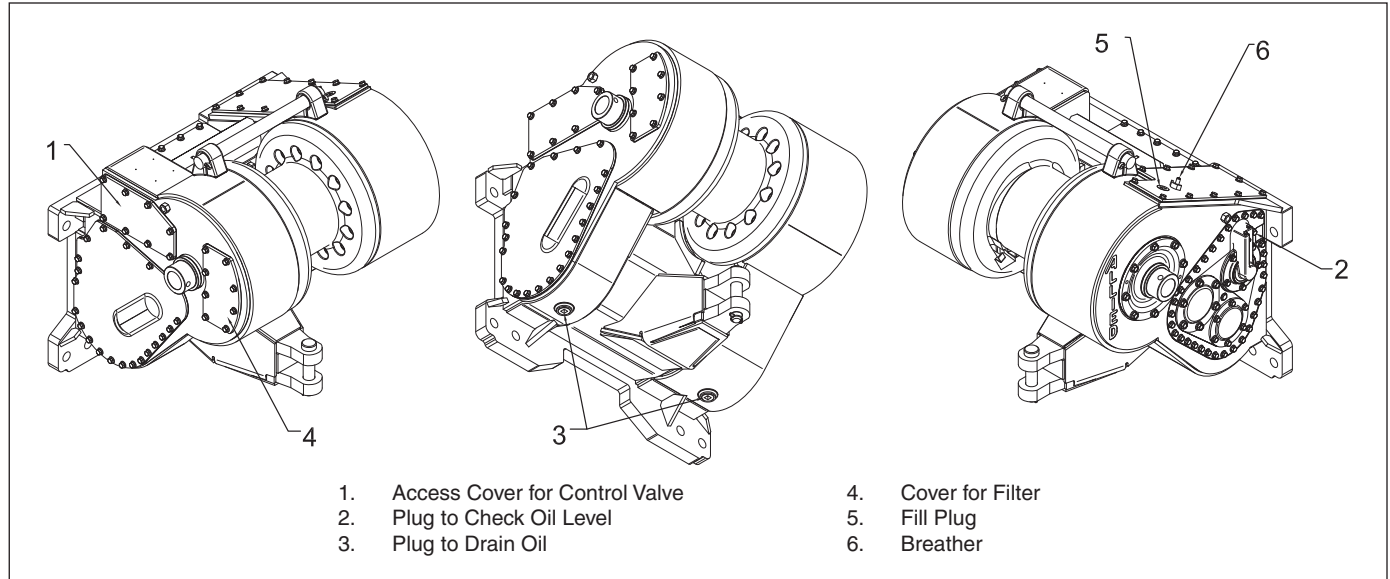


Figure 3-19 W12E Maintenance Points (Ratio #7 shown)

### Maintenance Schedule

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

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

| INTERVAL  | PROCEDURE OR QUANTITY   | SPECIFICATION  |
|---|---|--|
| 50 hours or weekly  | Check oil level at plug (item 2). Add oil as necessary through fill plug (item 5). <b>Do not operate tractor when checking the oil level.</b>                           | See Figure 1-14 – Recommended Oil List.  |
|   | Check winch control lever.  | Refer to control lever Detant Pin Lubrication and Adjusting control lever Detent Force on page 3-26. |
|   | Clean the breather (item 6).  | Remove debris around breather.   |
|   | Lubricate the rollers on the fairlead assembly, if the winch is so equipped.  | Use multi-purpose grease with 2-4% molybdenum disulfide.   |
| 500 hours or every 3 months   | Clean the oil suction screen and magnets.*  | Use a new gasket between the cover and the suction tube.   |
|   | Clean the breather in the fill plug.  | Clean the breather with solvent if needed.   |
|   | Check oil filter light, if continuously illuminated with winch warm, replace the filter.  | Replace the filter.*   |
| 1000 hours or every 6 months  | Change the hydraulic oil. Drain oil from plug (item 3). Clean the oil strainer. Through fill plug (item 5), add 22 gallons (83 liters)†. Check the oil level at item 2. | See Figure 1-14 – Recommended Oil List.  |
| * NOTE: Clean the oil strainer screen and change the oil filter after the first 250 hours on new and rebuilt winches. |   |  |
| † Amount of oil may vary slightly with tractor.   |   |  |

Figure 3-20 Maintenance Schedule

## Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Figure 3-20, Maintenance Schedule.

## Checks During Operation

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

## Control Lever Lubrication & Adjustment (See Fig. 3-21)



### CAUTION

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



### CAUTION

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

## Control Lever Detent Pin Lubrication

1. Remove Control Lever assembly from bracket.
2. Push down on knob/handle to balance spring force and remove screw on Control Lever knob/handle. Lift knob/handle and boot from Control Lever.
3. Remove setscrew and detent spring. Keep track of numbers of turns to remove screw.

4. Apply a few drops of oil on top of detent pin inside bore.
5. Install spring, then setscrew.
6. Move Control Lever from **BRAKE-ON** to **BRAKE-OFF** and back to ensure detent force is satisfactory. If not, adjust detent force (see **Adjusting Control Lever Detent Force** below).
7. Place boot and knob/handle over control lever, ensuring boot is securely installed, then install knob/handle screw.
8. Install control lever assembly on bracket. Make sure that the direction of lever traces is same as decal.

## Adjusting Control Lever Detent Force (Fig. 3-21)

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

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

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

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

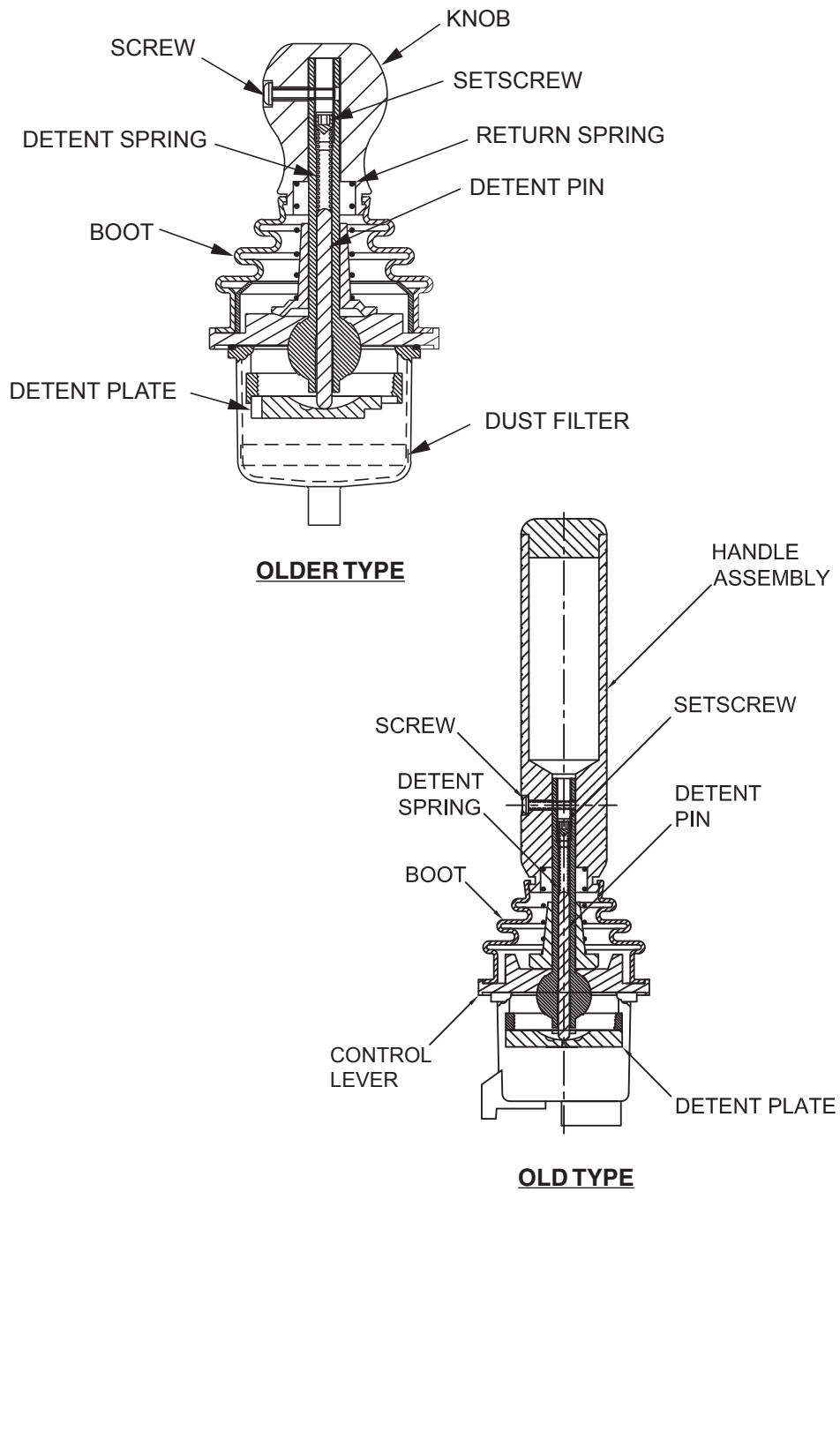


Figure 3-21 Control Levers

## Hydraulic System Pressure Checks (See Figs. 3-22 and 3-23)

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

### Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Check oil level.
2. 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.**

3. Start the engine and place the winch in **BRAKE-OFF** to raise the oil temperature to at least 27°C (80°F).
4. Remove any dirt from the left side of the winch. Remove control valve access cover (Fig. 3-19).
5. Stabilize engine speed at 1000 RPM for all tests unless otherwise specified.
6. Conduct tests in order outlined below.
7. Install control valve access cover and gasket, and tighten capscrews. (Capscrews must have sealant and locking.)

### Pressure Gauges

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

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



## WARNING

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

### Brake Pressure Check

With the engine shut off, connect a pressure gauge to Brake Port G4. Start the engine and refer to Figure 3-23. Adequate brake pressure is required to fully release the brake. If the pressure is not as specified, check for:

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

### Cooling Oil Pressure Check

With the engine shut off, connect a pressure gauge to Port G1. Start the engine and see the Cooling section in Figure 3-23. If the cooling oil pressure is too high or too low, overheating can occur.

### Accumulator Pressure Check

With the engine shut off, connect a pressure gauge to Port G4. This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe the following while referring to the Accumulator section in Figure 3-23.

1. With engine running, place control lever in **BRAKE-OFF** and rev engine to maintain 220 psi (1517 kPa) for one minute. This will ensure the accumulators have a full supply of oil.
2. Return control lever to **BRAKE-ON**.
- 2.5 The HSOUT4 light on the DVC module will go out when cooling valve and accumulator valve close. Some electronic controlled units have a charging circuit which delays these valve closings by approximately 8 seconds.
3. Shut the engine off and wait one minute, then turn key to the "ON" position but **do not start the engine**.

4. Place the control lever in the **BRAKE-OFF** position. This will release the oil in the accumulators. Observe the initial pressure reading and the time for the pressure to drop below that specified in Figure 3-23.

If the leak down time is less than specified in Figure 3-23, repeat steps 1 through 4, but do not delay in placing the joystick in **BRAKE-OFF** after the engine is shut down. If the leak down time is greater than that measured when waiting one minute, there is probably a leak in the lines between the accumulators and the valve manifold assembly.

Accumulator valve performance can be checked by connecting a gauge to Port G6. After ensuring the accumulators are charged, place the control lever in neutral. The pressure at G6 should remain above 200 psi for several minutes.

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

### Forward Clutch Pressure Check

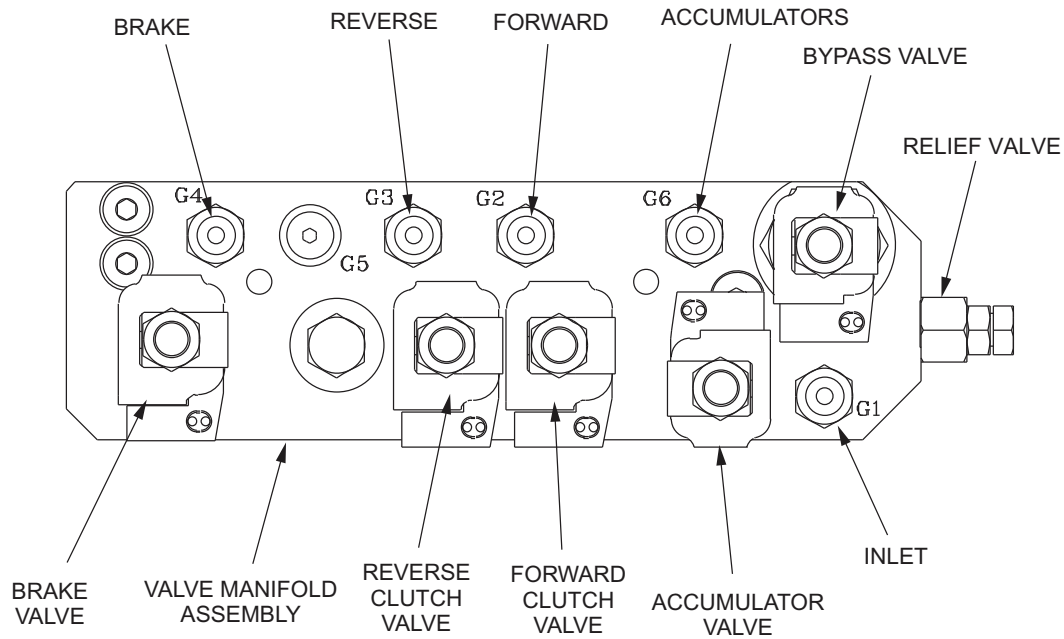
With the engine shut off, connect a pressure gauge to Port G4 and G2. Start the engine and place control lever in **BRAKE-OFF** to build accumulator pressure. Place control lever in **BRAKE-ON** and then in **LINE-IN** position and check forward clutch. On a fast shift, the clutch pressure should come up with the brake pressure. If the pressure differential is too low, the brake will not release soon enough and cause it to stall. If the pressure differential is too high, the brake will release too soon and cause backspinning of the drum.

If the forward clutch pressure is not as specified in Figure 3-23, check for:

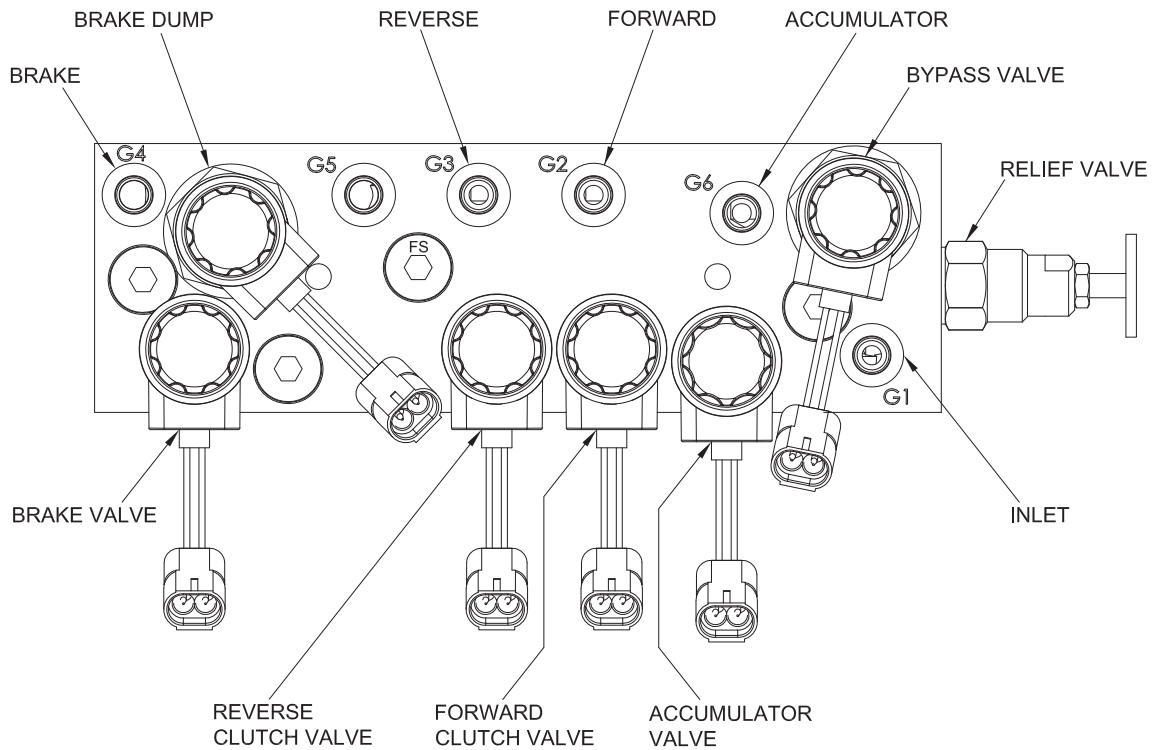
1. Leaking pressure hoses or fittings.
2. Damaged or worn clutch piston seals.
3. Damaged or worn valve manifold assembly parts.
4. Broken seal rings on clutch shaft.
5. Damaged O-rings on clutch shaft. Troubleshooting information is given below.

### Reverse Clutch Pressure Check

Shut off the engine and connect a pressure gauge to reverse clutch Port G3. Start the engine. Place the control lever in **LINE-OUT** and check reverse clutch pressure as indicated in Figure 3-23. On a fast **LINE-OUT** shift, the clutch pressure should come up with the brake pressure. If the pressure differential is too low, the brake will not release soon enough and cause drag. If the pressure differential is too high, the brake will release too soon and cause backspinning of the drum.



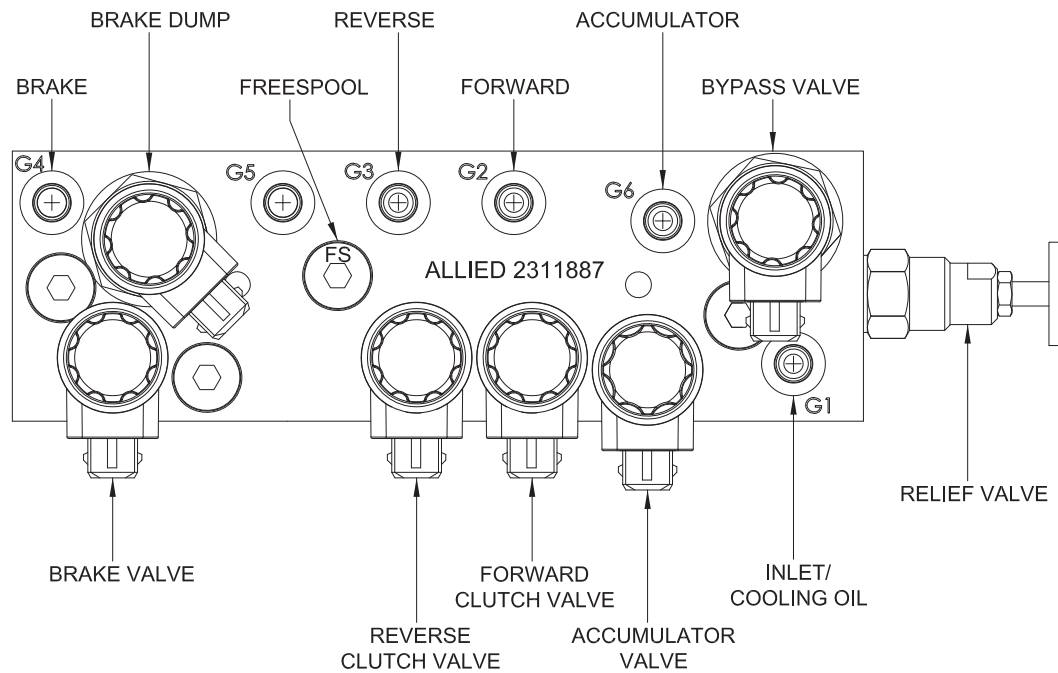
**Last Used on S/N AW12E-1228**



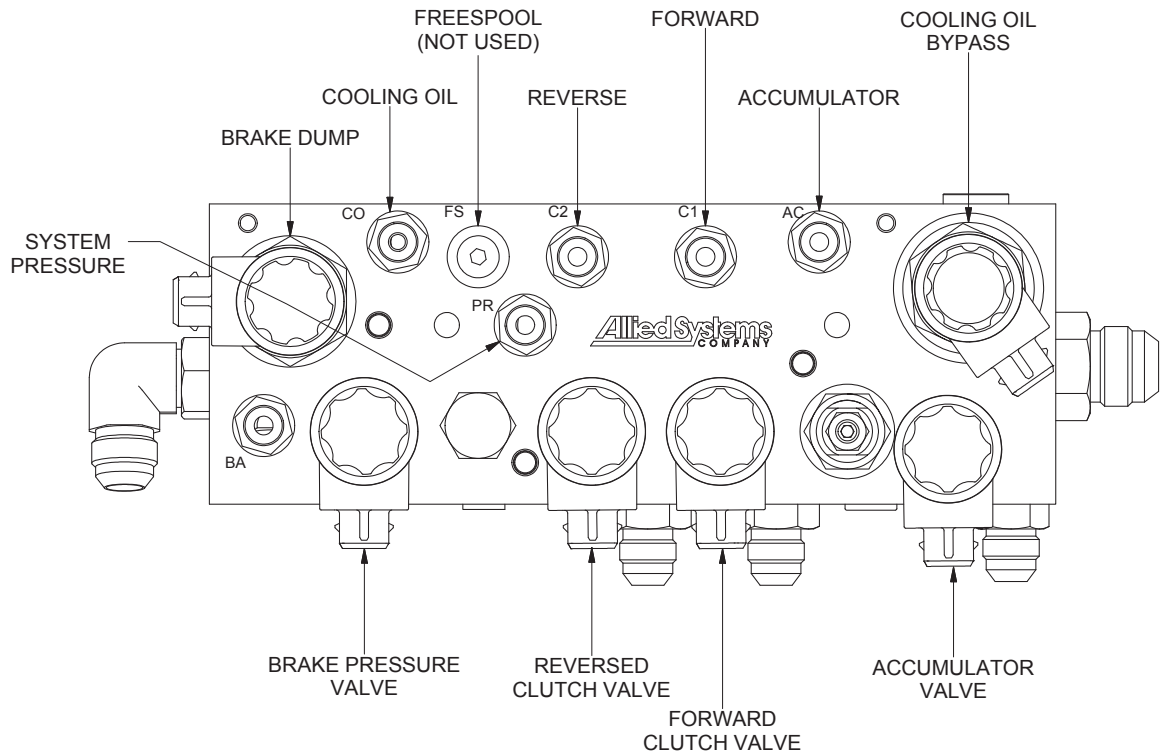
**Used on S/N AW12E-1229 through AW12E-1456**

**Figure 3-22 Hydraulic Pressure Test Ports**

(Continued on next page)



**Used on S/N AW12E-1457 through S/N AW12E-1574**



**First Used on S/N AW12E-1575**

**Figure 3-22 Hydraulic Pressure Test Ports**



## NOTES:

1. Clutch and brake pressure are modulated (0-220 psi) in proportion to joystick travel and vary by program loaded.
2. Maximum brake pressure in **LINE-IN** and **LINE-OUT** may not equal relief pressure, depending on control program.

| ITEM FUNCTION             | CHECK PORT   | TEST EQUIPMENT REQUIRED  | CONTROL POSITION   | PRESSURE   | CORRECTIVE ACTION  |
|---------------------------|--------------|--------------------------|--|--|--|
| Brake                     | G4 – Brake   | 400 psi (2800 kPa) gauge | <b>BRAKE-OFF</b>   | 170 to 220 psi (1172 to 1517 kPa).   | Adjust relief valve.   |
| Cooling                   | G1 – Inlet   | 400 psi (2800 kPa) gauge | <b>BRAKE-ON</b>  | At 1000 RPM, 50 to 85 psi (343 to 586 kPa).  | Check plumbing for leakage or blockage; check bypass valve.  |
| Accumulator               | G4 – Brake   | 400 psi (2800 kPa) gauge | <b>1. BRAKE-OFF</b><br><br><b>2. BRAKE-ON</b><br><br>3. Wait for accumulator and cooling valves to close.<br><br>4. Stop Engine.<br><br><b>5. BRAKE-OFF.</b><br>6. Repeat if required. | 1. 220 psi (1517 kPa).<br>2. None.<br><br>3. None—wait 1 minute.<br><br>4. 140 psi (962 kPa) immediately & 115 psi (794 kPa) minimum after 30 seconds. | 1. Check hydraulic lines for leaks.<br>2. Replace accumulator valve.<br>3. Check for defective accumulators. |
| <b>LINE-IN</b> (Forward)  | G2 – Forward | 400 psi (2800 kPa) gauge | <b>LINE-IN</b>   | 220 psi (1517 kPa) at full lever travel.   | Refer to Figure 3-21 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.                  |
| <b>LINE-OUT</b> (Reverse) | G3 – Reverse | 400 psi (2800 kPa) gauge | <b>LINE-OUT</b>  | 220 psi (1517 kPa) at full lever travel.   | Refer to Figure 3-21 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.                  |

Figure 3-23 Hydraulic System Pressure Tests

## Troubleshooting

This subsection includes Figure 3-24, Troubleshooting Analysis Check Chart for Operator, Figure 3-25, Troubleshooting Analysis Check Chart for Service Personnel, and Figure 3-26, Troubleshooting Chart

for Electronic Control Module. The charts list the most common troubles that may be encountered. A possible cause and recommended corrective action are listed to restore the winch to normal operating condition.

Figure 3-24 Troubleshooting Analysis Check Chart for Operators

| PROBLEM   | POSSIBLE CAUSE                                      | CORRECTION  |
|---|---|---|
| Operation is rough or not regular.              | Hydraulic oil is too cold.                          | Put the control lever in the <b>BRAKE-OFF</b> position. Run the engine at 1000 RPM to warm the oil before operating the winch.  |
|   | Low oil level.                                      | Add hydraulic oil to the correct level.   |
|   | Wrong oil.  | Drain oil and replace with correct grade. Refer to Figure 1-14, for the Recommended Oil List.   |
|   | Tractor PTO speed too low.                          | Increase tractor engine speed to at least 1000 RPM for good performance.  |
| Low oil pressure.                               | Clogged suction strainer.                           | Check and clean or replace suction strainer.  |
| Overheating.                                    | Plugged pressure filter.                            | Replace filter.   |
|   | Plugged suction strainer.                           | Check suction strainer, clean or replace.   |
|   | One or both clutches dragging.                      | Check by placing control lever in <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. |
|   | Prolonged inching.                                  | Avoid continuous operation in the inching zone.   |
| Winch will not operate in any function.         | Low oil level.                                      | Add oil.  |
|   | Control lever off-center at startup.                | Return control lever to neutral position and attempt function again.  |
|   | Control module not powered.                         | Check fuse & replace if necessary.  |
|   | Control lever 24 VDC - 5 VDC converter malfunction. | Replace converter if the red & green LEDs are not lit.  |
|   | Activation switch off.                              |   |
|   | Control module fault.                               | Check status indicator on module. Red LED should not be illuminated. If it is, consult dealer.  |
| Clutch does not apply correctly at low PTO RPM. | Coil open or shorted.                               | 1. Check module output LEDs. Flashing LED indicates open or shorted circuit.<br>2. Check wiring harness continuity.<br>3. Replace faulty coil.<br><b>Note: A working coil will have 15 to 50Ω resistance and will be magnetized when energized.</b>   |
|   | PTO stalled (0 RPM).                                | Increase tractor RPM.   |
|   | Worn friction discs and separator plates.           | Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.   |

(Continued on next page)

Figure 3-24 Troubleshooting Analysis Check Chart for Operators (continued)

| PROBLEM  | POSSIBLE CAUSE  | CORRECTION   |
|--|---|--|
| Brake slipping or drum backspin on fast shift from neutral to forward. | Brake releases at low pressure.                             | Check brake release pressure. Replace friction discs and separator plates if too thin.   |
|  | Broken belleville spring.                                   | Replace. Refer to Section 4.   |
| Brake releases before reverse clutch engagement.                       | Faulty reverse clutch valve or coil.                        | Check reverse clutch valve and coil.   |
| Noisy buzz emanating from winch valve.                                 | Air in relief valve.  | This is not a detrimental condition. Noise may be intermittent.  |
| Winch noisy.   | Ring and pinion out of adjustment.                          | Set ring and pinion backlash.  |
|  | Air in oil.   | 1. Check for suction leaks.<br>2. Add oil.   |
|  | Gears and bearings worn.                                    | Replace components.  |
| Control lever will not detent in <b>BRAKE-OFF</b> .                    | Detent mechanism worn or broken.                            | 1. Replace control lever assembly.<br>2. Adjust detent spring force (see Control Lever & Lubrication Adjustment in Section 3 for procedure). |
| Control lever does not return to neutral when released.                | Insufficient lubrication.                                   | Lubricate detent pin (see Control Lever Lubrication & Adjustment in Subsection of Service for procedure).                                    |
|  | Excessive detent force.                                     | Remove knob and adjust detent force (see Control Lever Lubrication & Adjustment in Subsection of Service for procedure).                     |
|  | Control lever is in detented position ( <b>BRAKE-OFF</b> ). | Move control lever out of detent.  |
|  | Dirt in mechanism.  | Check boot for proper seal. Remove boot and clean dirt from top portion of control lever assembly if necessary.                              |
| Filter LED blinking.   | Open or shorted coil.                                       | See the Control Module Troubleshooting section in this chapter for more information, or consult dealer.                                      |
| Filter LED illuminated continuously on at high RPM with warm oil.      | Filter is clogged.  | Change filter and oil.<br><b>NOTE: Change filter only after first 250 hours of operation when winch is rebuilt.</b>                          |
|  | Cold oil is causing filter bypass.                          | Monitor LED condition. If LED remains illuminated after normal operating temperature has been reached, change oil and filter.                |
|  | Electrical short circuit.                                   | Check filter bypass switch circuit of wiring harness.  |

Figure 3-25 Troubleshooting Analysis Check Chart for Service Personnel

| PROBLEM  | POSSIBLE CAUSE   | CORRECTION   |
|--|--|--|
| Operation is rough or not regular.                           | Low oil pressure.  | Do Oil Pressure Test in Service subsection, and see the item of Low Oil Pressure on this page.   |
|  | Wrong oil.   | Drain oil and replace with correct grade. Refer to Figure 1-14 for the Recommended Oil List.   |
|  | Accumulator malfunction.   | Check accumulator and recharge/replace as necessary.   |
|  | Hydraulic system suction leaks. Observe oil exiting lube valve while tractor is operating. Suction leaks will cause oil to foam. | Check the following for air leaks:<br>1. Suction hose to pump connection.<br>2. Pump shaft seal.<br>3. Suction filter cover and gasket.<br>4. Suction hose for cracks or collapsed sections. |
|  | Brake pressure fluxuates, air in valve, orifice missing from brake dump fitting (last used on S/N 1228).                         |  |
| Low oil pressure.  | Leaking pressure hoses and fittings.   | Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.  |
|  | Defective or improperly adjusted oil relief valve; poppet may be stuck open.   | Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective.  |
|  | Oil brake leaking internally (indicated by low brake pressure).  | Repair as required.  |
|  | Defective hydraulic pump.  | Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.                              |
| Brake does not release or winch stalls during low RPM shift. | Low oil pressure.  | Refer to "Low Oil Pressure" troubleshooting item above.  |
|  | Accumulator system malfunction.  | Check for:<br>1. Proper leakdown time as described in Figure 3-23.<br>2. Leaking accumulator valve.<br>3. Leak in accumulator lines.<br>4. Damaged or defective accumulators.                |
|  | Brake dump valve malfunction.  | Check for proper operation.  |
|  | Damaged brake piston, piston housing or seal rings.  | Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace seals when brake is repaired.   |
|  | Low clutch pressure or low oil pump volume.  | Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.  |
|  |  |  |

(Continued on next page)

Figure 3-25 Troubleshooting Analysis Check Chart for Service Personnel (continued)

| PROBLEM  | POSSIBLE CAUSE                                      | CORRECTION  |
|--|---|---|
| Overheating.                                     | Plugged pressure filter.                            | Replace filter.   |
|  | Plugged suction filter.                             | Check suction filter and clean or replace.  |
|  | One or both clutches dragging.                      | Check by placing control lever in <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.   |
|  | High cooling oil pressure.                          | Check cooling oil pressure. Replace relief valve if required.   |
|  | Clutch/brake shaft bearings set too tight.          | Adjust accordingly.   |
|  | Low oil level.                                      | Add oil.  |
| Winch will not operate while tracks are turning. | Accumulator system malfunction.                     | Check for:<br>1. Correct leakdown time as described in Section 3.<br>2. Leaking accumulator valve.<br>3. Leak in accumulator lines.<br>4. Damaged or defective accumulators.  |
|  | Low oil pressure.                                   | Refer to "Low Oil Pressure" troubleshooting item above.   |
|  | Defective PTO shaft.                                | Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage.  |
|  | Electric problem.                                   | Troubleshoot the problem accordingly.   |
| Winch will not operate in any function.          | Control lever off-center at startup.                | Return control lever to neutral position and attempt function again.  |
|  | Control module not powered.                         | Check fuse & replace if necessary.  |
|  | Control lever 24 VDC - 5 VDC converter malfunction. | Replace converter if the red & green LEDs are not lit.  |
|  | Activation switch off.                              |   |
|  | Control module fault.                               | Check status indicator on module. Red LED should not be illuminated. If it is, consult dealer.  |
|  | Coil and/or circuit open or shorted.                | 1. Check module output LEDs. Flashing LED indicates open or shorted circuit. (1/2 second ON; 1 second OFF.)<br>2. Check wiring harness continuity.<br>3. Replace faulty coil.<br><b>Note: A working coil will have 15 to 50Ω 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. Check harness continuity.  |
|  | Relief pressure not being reached.                  | Check bypass coil & valve—replace faulty parts.   |

(Continued on next page)

Figure 3-25 Troubleshooting Analysis Check Chart for Service Personnel (continued)

| PROBLEM  | POSSIBLE CAUSE  | CORRECTION  |
|--|---|---|
| Forward or reverse clutch not releasing.                               | Broken or weak release springs.   | Check springs and replace as necessary.   |
|  | Warped frictions or separators.   | Replace as necessary.   |
| Forward or reverse clutch not engaging.                                | Low oil pressure.   | See "Low Oil Pressure" troubleshooting item above.  |
|  | Low forward or reverse clutch pressure.   | See troubleshooting for "Low Forward or Reverse Clutch Pressure" item below.  |
|  | Inadequate piston travel.   | Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.   |
|  | Worn friction discs and separator plates.   | Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.   |
| Clutch does not apply correctly at low PTO RPM.                        | Accumulator not charged.  | Check accumulator. Jump up and bleed down.  |
|  | Worn friction discs and separator plates.   | Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.   |
| Low forward or reverse clutch pressure.                                | Broken seal rings on the clutch/brake shaft.  | Replace seal rings.<br><b>NOTE: A broken seal ring is the most common cause of a pressure differential between the two clutches. Check preload on clutch/brake shaft and adjust it if necessary to prevent additional breakage of seal rings; refer to Section 4.</b> |
|  | 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 4.   |
|  | Pressure tube damaged.  | Remove cover and inspect.   |
|  | Leaky clutch circuit.   | Perform bleed-down test on clutch circuit.  |
|  | Faulty valve or coil.   | Check valve and coil for proper operation. Check coil for voltage.  |
| Brake slipping or drum backspin on fast shift from neutral to forward. | Brake releases at low pressure.   | Check brake release pressure. Replace friction discs and separator plates if too thin.  |
|  | Broken belleville spring.   | Replace. Refer to Section 4.  |
| Brake releases before forward clutch engagement.                       | Faulty forward clutch valve or coil.  | Check forward clutch valve and coil.  |
|  | Low brake release pressure.   | See "Brake Slipping" troubleshooting item above.  |
|  | Clutch line plugged.  | Clean clutch line and orifices.   |
| Brake releases before reverse clutch engagement.                       | Faulty reverse clutch valve or coil.  | Check reverse clutch valve and coil.  |
| Forward clutch engaging or releasing slowly.                           | Improper orientation of forward clutch and clutch shaft (Gear Code Ratios #1-6 only). | Remove and reinstall shaft with proper alignment, see Step 10 on Page 4-40 in Section 4.  |
| Noisy buzz emanating from winch valve.                                 | Air in relief valve.  | This is not a detrimental condition. Noise may be intermittent.   |

(Continued on next page)

Figure 3-25 Troubleshooting Analysis Check Chart for Service Personnel (continued)

| PROBLEM  | POSSIBLE CAUSE                           | CORRECTION   |
|--|--|--|
| Winch noisy.   | Ring and pinion out of adjustment.       | Set ring and pinion backlash.  |
|  | Air in oil.                              | 1. Check for suction leaks.<br>2. Add oil.   |
|  | Gears and bearings worn.                 | Replace components.  |
| Control lever will not detent in <b>BRAKE-OFF</b> .  | Detent mechanism worn or broken.         | 1. Replace control lever assembly.<br>2. Adjust detent spring force (see Control Lever & Lubrication Adjustment in Subsection of Service for procedure). |
| Control lever does not return to neutral when released.                                    | Insufficient lubrication.                | Lubricate detent pin (see Control Lever Lubrication & Adjustment in Subsection of Service for procedure).  |
|  | Excessive detent force.                  | Remove knob and adjust detent force (see Control Lever Lubrication & Adjustment in Section 3 for procedure).   |
|  | Dirt in mechanism.                       | Check boot for proper seal. Remove boot and clean dirt from top portion of control lever assembly if necessary.  |
| Winch does not engage and tractor 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.  |
|  | Brake dump stays open.                   |  |
| 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.  |
| Filter LED blinking.<br>1/2 second ON;<br>1 second OFF;<br>3 seconds ON;<br>3 seconds OFF. | Open or shorted circuit and/or coil.     | See the Control Module Troubleshooting section in this chapter for more information, or consult dealer.  |

Figure 3-26 Troubleshooting Chart for Electronic Control Module

| LED STATUS   | FAULT DESCRIPTION                                 | PROBABLE CAUSE                        | CORRECTIVE ACTION   |
|--|---|---------------------------------------|---|
| PWM%C lit.   | Winch won't function.                             | Control lever off-center at startup.  | Center control lever.   |
| PWM%C & HSOUTx flashing.                                   | Shorted or open output circuit.                   | Wiring harness failure.               | Check appropriate circuit from module to valve.                           |
|  |   | Faulty coil.                          | Replace coil if resistance is outside of 15-50Ω range.                    |
| PWM%C flashing;<br>HSOUTx may be lit,<br>but not flashing. | Winch won't function or only allows one function. | Control lever output faulty.          | Replace control lever.  |
| PWM%C flashing;<br>Green to Red.                           | Winch won't function.                             | Incorrect wiring harness for program. | Verify harness and program for winch serial number.                       |
| MS lit (steady red).                                       | Winch won't function.                             | Module fault.                         | Turn power off, then on. If MS light is still steady red, replace module. |



## Interfacing with the Electronic Control Module (ECM, also called DVC)

The ECM regulates the cartridge valves on the valve manifold assembly, based on control lever input and a preset computer program. Occasionally, it may be necessary to download a new control program for the ECM or perform higher-level electronic control system troubleshooting through the ECM interface. Should this be necessary, a communication cable (P/N 2304603W) and a CD with the relevant software is available from Allied Systems. The files may also be downloaded from Allied Systems' e-Commerce website. Please contact a dealer or call Allied Systems for more information.

### DVC Controller Goes into Programming Mode When Powered on.

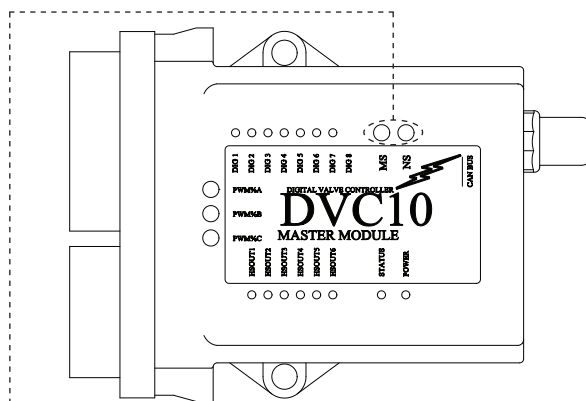
#### Background:

The DVC controller is in programming mode when its MS and NS LEDs blink green in an alternating pattern. When the controller is in normal execution mode the MS and NS LEDs will be solid green or red.

The DVC controller normally goes into programming mode when the Program Loader Monitor running on your PC is active, the cable is connected between the PC and the DVC controller, you are attempting to load an application and the DVC electrical power is switched off and back on. The DVC, when its electrical power is switched off and back on, looks at the signal from the connecting cable to decide if it should go into programming or normal execution mode. On some PCs depending on the installed software driver and the last program used, the DVC can receive a signal instructing it to go into programming mode even though the Program Loader Monitor is not operating.

#### Solution:

To insure that this does not happen, disconnect the serial cable from the PC or the DVC controller and power cycle the DVC. Reconnect the cables, and operate as normal.



#### ► Module Status & Network Status (MS/NS)

Device is being programmed (BIOS or Application Code).

#### Network Status (NS) (R/G)

- Off:  
There is no J1939 device (or other DVC5) in the project.
- Flashing green:  
J1939 device in project but communication has not been established.

- On green:  
J1939 communication has been established.
- Flashing red:  
The J1939 communication is in a timed-out state.
- On red:  
The device has detected an error that has rendered it incapable of communicating on the network.

#### Module Status (MS) (R/G)

- Off:  
There is no power applied to the Module.
- On green:  
The module is operating in a normal condition.
- Flashing green:  
Device is in standby state, may need commissioning.
- Flashing red:  
Recoverable Fault.
- On red:  
Module has an unrecoverable fault.
- Flashing Red/Green:  
Device is in self-test.

Figure 3-27 Electronic Control Module DVC10

## Re-Commissioning DVC Master Modules

### Introduction:

This procedure should be used to regain use of a DVC Master Module (DVC10) if the module Flash Memory becomes corrupt due to a power interruption during a BIOS/Application Program download or any other reason. The presenting symptoms include a module that will not communicate with a PC or other modules on the buss and the Module Status (MS) and Node Status (NS) indicators are flashing green alternately at a one second interval.

There are two procedures listed below as a guide to regaining control of a DVC Master Module. The procedures are for BIOS / Program Loader Monitor 4.0 and BIOS / Program Loader Monitor 4.2 and higher.

### BIOS / PLM Version 4.0:

Users must have a working DVC Module to establish RS232 communication with the Program Loader Monitor (PLM) before reprogramming an Un-Commissioned Master Module. If there is no working module available, the user must download and use the latest software revision release as well as the procedure for BIOS / Program Loader Monitor 4.2 and higher.

1. Connect the PC to a working DVC Module with the DVC using normal procedures and launch the PLM version 4.0.
2. When communication between the DVC and the PLM has been established, disconnect the working DVC and connect the non-working DVC.
3. Within the PLM, select the DVC10 MASTER switch to open the Main DVC10 screen. Reference Figure 3-28 below.
4. Within the Main DVC10 screen, select the Program Loader switch to open the Program Loader screen. Reference Figures 3-29, 3-30 below.
5. Within the Program Loader screen, select the module to be programmed from the pull down menu in the upper left hand corner of the screen. Reference Figure 3-31 below. If the Serial Label on the back of the module does not have a box with "REV B" written between the model number and the serial number, select DVC-10 on the pull down menu. If the Serial Label on the back of the module does have a box with "REV B" written between the model number and the serial number, select DVC-10B on the pull down menu.

6. Cycle power and wait for the unit to enter programming mode signified by the red indicator on the programming loader screen turning green and the programming buttons to be active.
7. Cycle power again and wait for the unit to enter programming mode signified by the red indicator on the programming loader screen turning green and the programming buttons to be active.
8. Select the Load BIOS switch and load the DVC10 BIOS version 4.0.
9. When the BIOS has finished loading, select the Load Application switch and load an application.
10. After the Application has loaded, cycle power.
11. On the Main screen, Figure 3-28, enter the word "victory" into the password field. The password level should change to 4.
12. On the Main DVC10 screen, Figure 3-29, select the Factory Information switch.
13. On the Factory Information screen in the same pull down menu as was on the Program Loader screen, select the same DVC10 model that was selected before downloading the BIOS / Program.
14. Select Send Changes
15. The unit should now be operational.

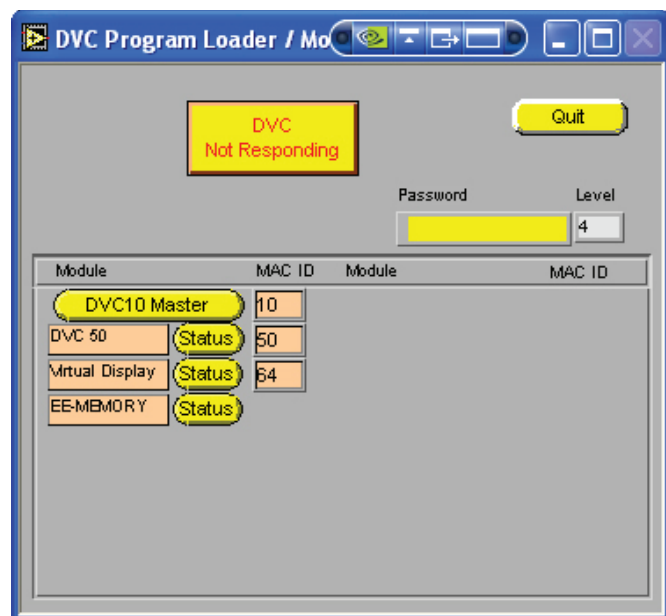


Figure 3-28

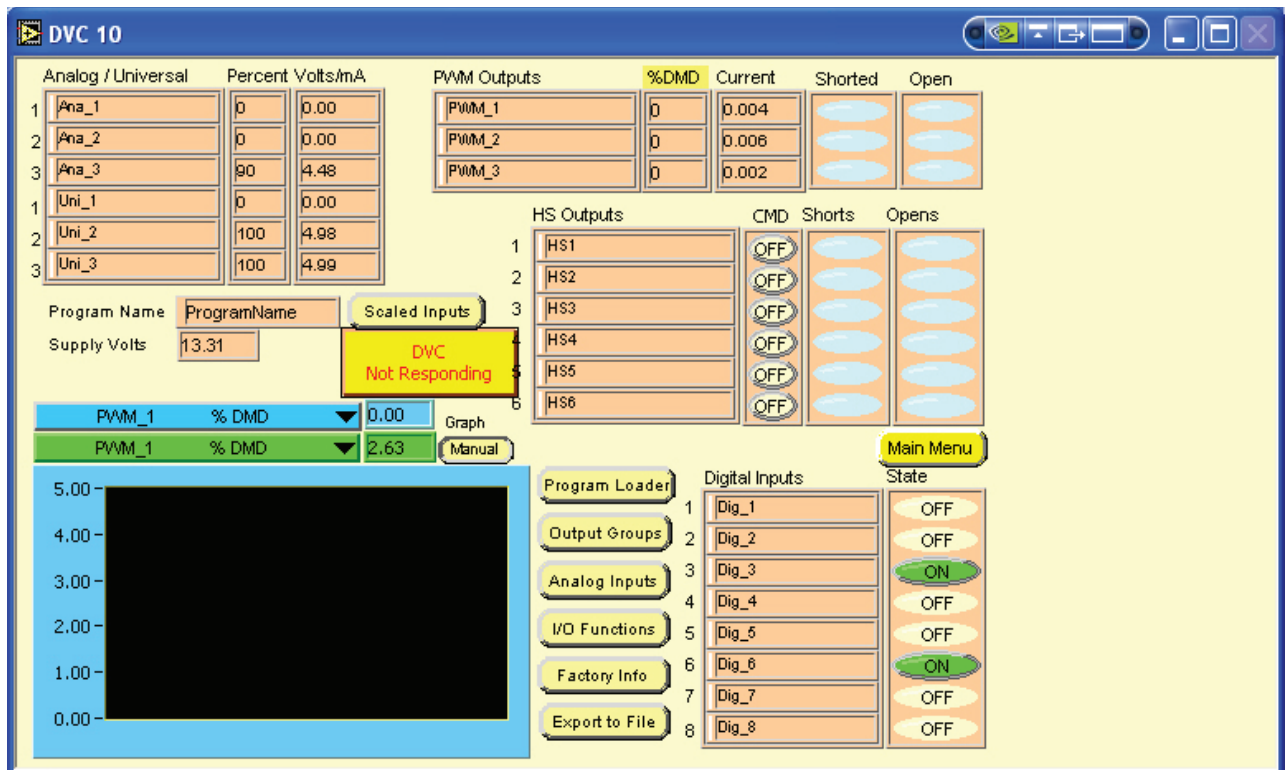


Figure 3-29

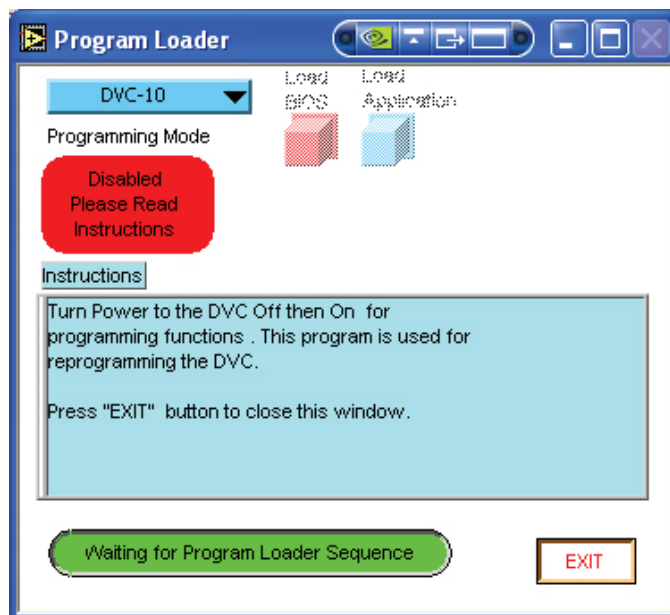


Figure 3-30

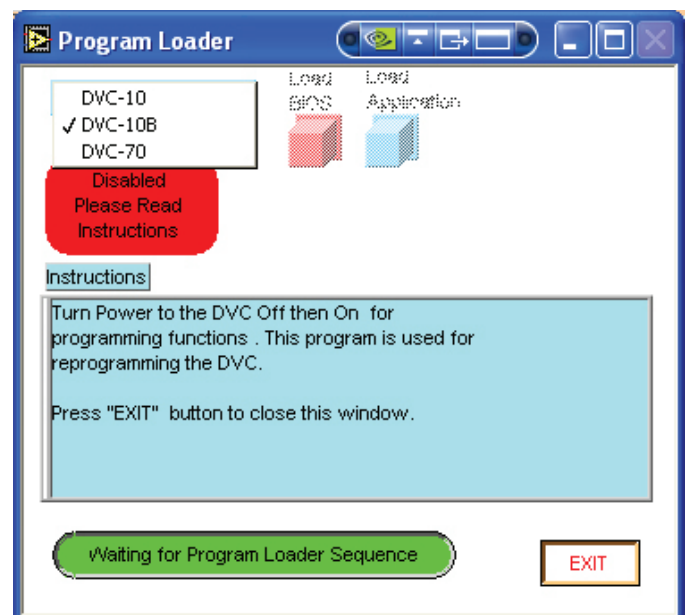


Figure 3-31

## **BIOS / PLM Version 4.2 and Higher:**

This procedure should be used with PLM version 4.2 and higher.

1. Within the PLM, select the DVC10 MASTER switch to open the Main DVC10 Screen. Reference Figure 3-28.
2. Within the Main DVC10 screen, select the Program Loader switch to open the Program Loader screen. Reference Figures 3-29 and 3-30.
3. Cycle Power and wait for the unit to enter programming mode signified by the red indicator on the programming loader screen turning green and the programming buttons to be active.
4. Select the Load BIOS switch and load the DVC10 BIOS version 4.x.
5. When the BIOS has finished loading, select the Load Application switch and load an application.
6. After the Application has loaded, cycle power.
7. The unit should now be operational.

[illegible]



Notes

Lined area for notes, consisting of multiple horizontal lines.

## 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 4-11 on page 4-24 should be inspected at the time of disassembly so that worn parts may be ordered and replaced prior to reassembly. If the winch is to be completely overhauled, perform the removal, disassembly, inspection and reassembly procedures in the sequence of the following paragraphs.

**NOTE: Always use the troubleshooting procedures given in Section 2 and Section 3 to locate a malfunction before performing a major overhaul of the unit. Make all checks in a systematic manner. Haphazard checking wastes time and can cause further damage.**

Review and perform any adjustments that may be the cause of a malfunction (refer to Troubleshooting Subsections in Section 2 and Section 3).

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



### CAUTION

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


### Winch Removal

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



### WARNING

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

3. Move the control lever to the **LINE-IN** position at least three times to discharge the pressure in the accumulator.
  4. Remove the control valve cover (if leaving lever on tractor).
  5. Disconnect control cable from winch (if leaving lever on tractor).
  6. Connect slings and a crane or lifting device to the winch.
-  **WARNING**
- The slings and crane used to lift the winch must have a minimum lifting capacity of 1500 kg (5000 lbs.). Gearbox and mounting bracket can add an additional 3000 lbs.**
7. Remove transmission cover.
  8. Remove mounting nuts or capscrews and lockwashers securing winch to tractor.

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

### 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 tractor. The procedures in this section describe a complete unit overhaul with the winch removed from the tractor. However, winch removal is not necessary for removal of individual shaft assemblies. Disassemble the winch as necessary to make repairs. Drain the oil from the winch before disassembly.

Figure 4-1 on page 4-2 shows the gears and components contained within the winch housing.



## Gear Arrangement

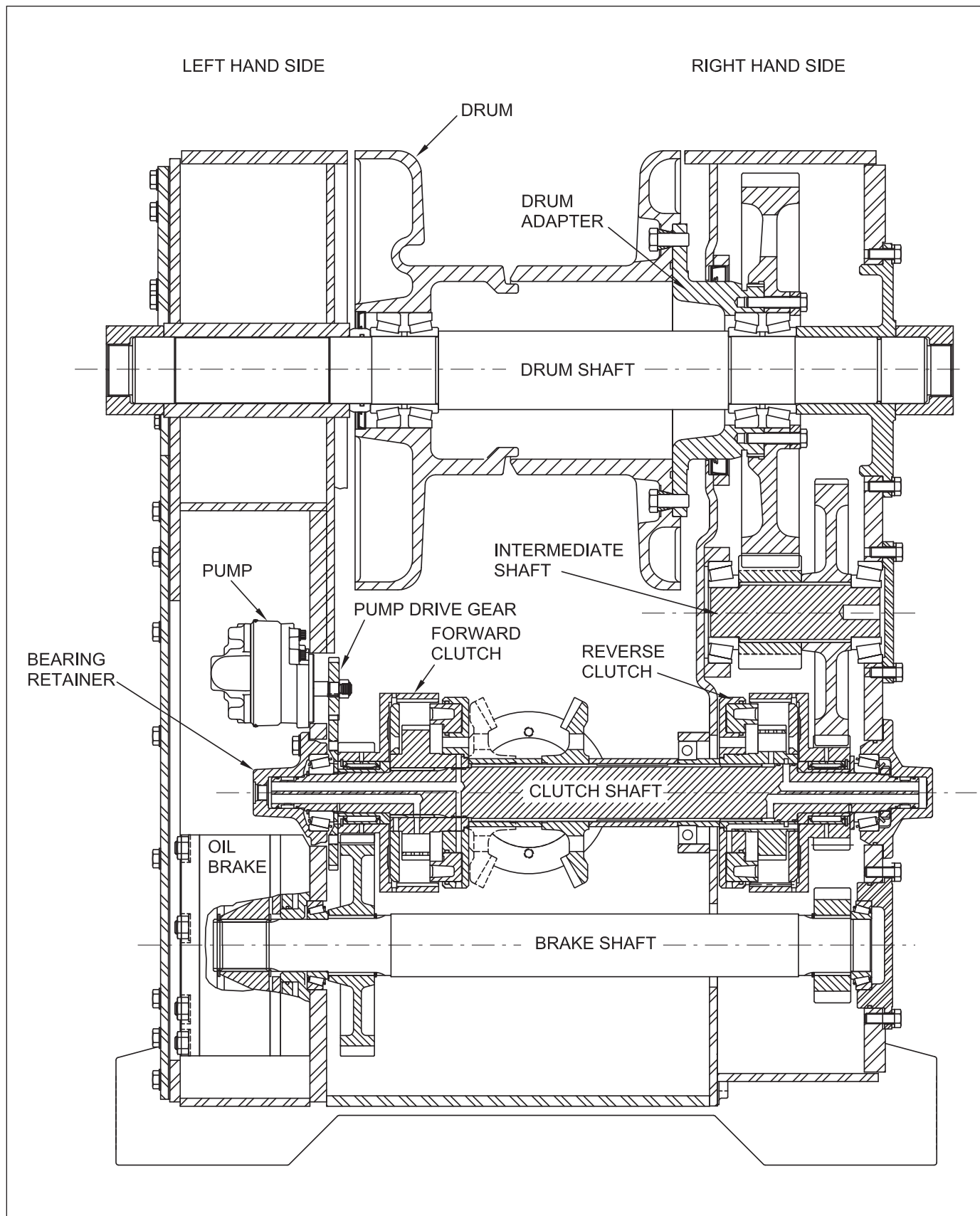


Figure 4-1 General Arrangement - Ratios #1, 3, 4 & 6

**NOTE:** This subsection includes steps and procedures of both removal/disassembly and reassembly/installation information for Ratios #1, #3, #4 and #6. Please refer to the next subsection for the specific steps and procedures with Ratio #7.

## PTO Shaft Removal and Disassembly

Please refer to Figures 4-2 through 4-6. Before removing the PTO shaft assembly, the winch must be removed from the tractor as explained above in **Winch Removal**.

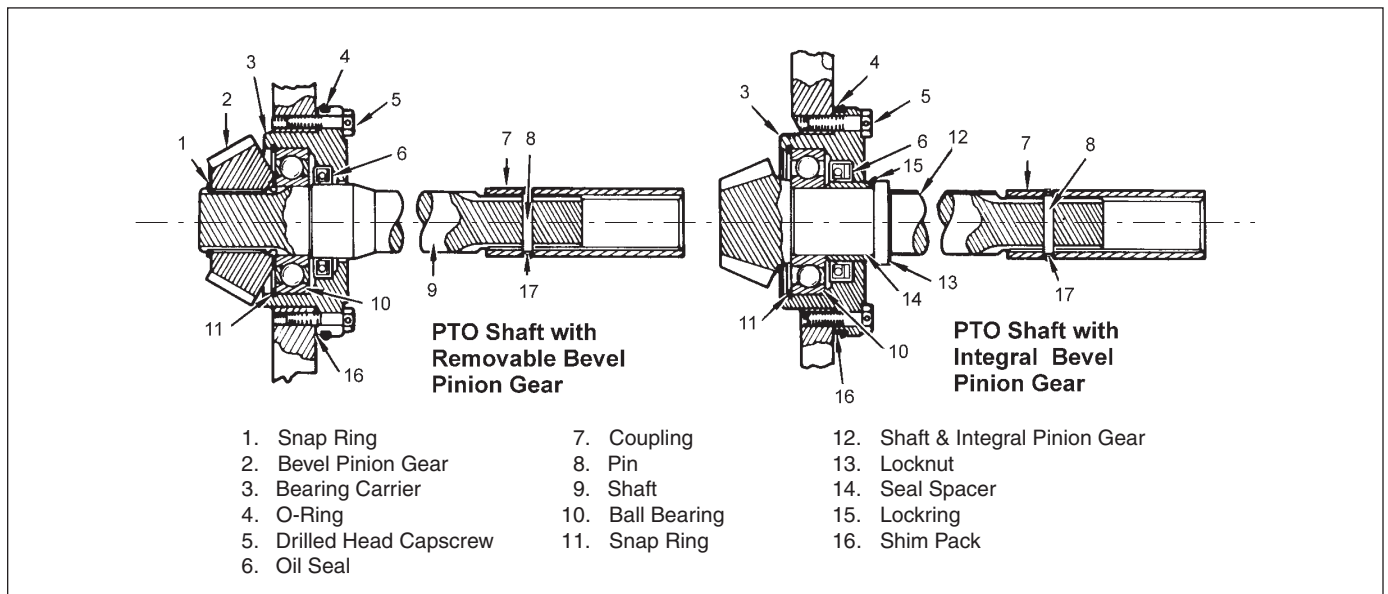
1. Remove sealing capscrews. If winch is equipped with a drive adapter, refer to Step 4.

2. Pull PTO shaft assembly straight out.

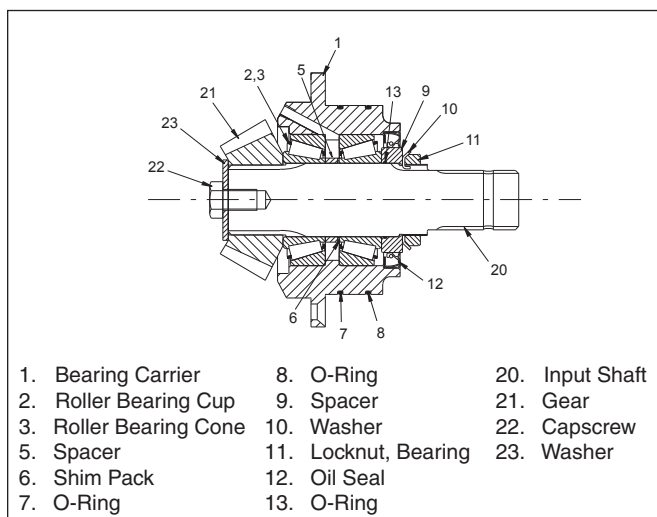


**Tag the shim pack so that the exact number of shims are re-installed.**

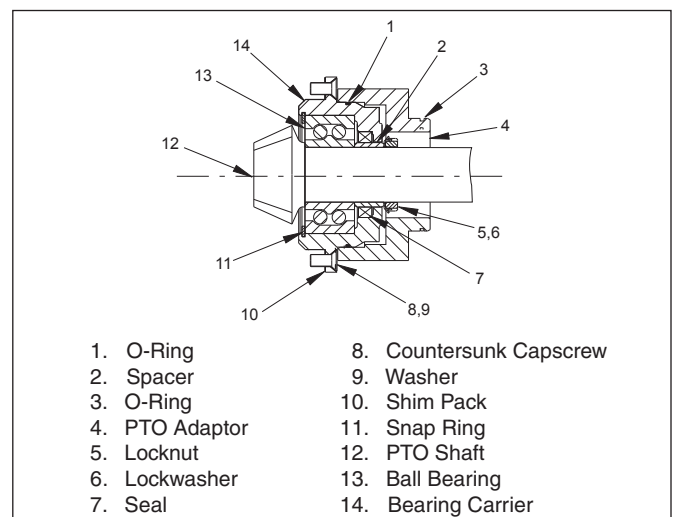
3. Disassemble and inspect PTO shaft (refer to Figures 4-2 through 4-4).
4. If equipped with a drive adapter, remove the drive adapter box first (refer to Figures 4-5 and 4-6), then the bevel pinion gear and carrier. Disassemble and inspect as required.



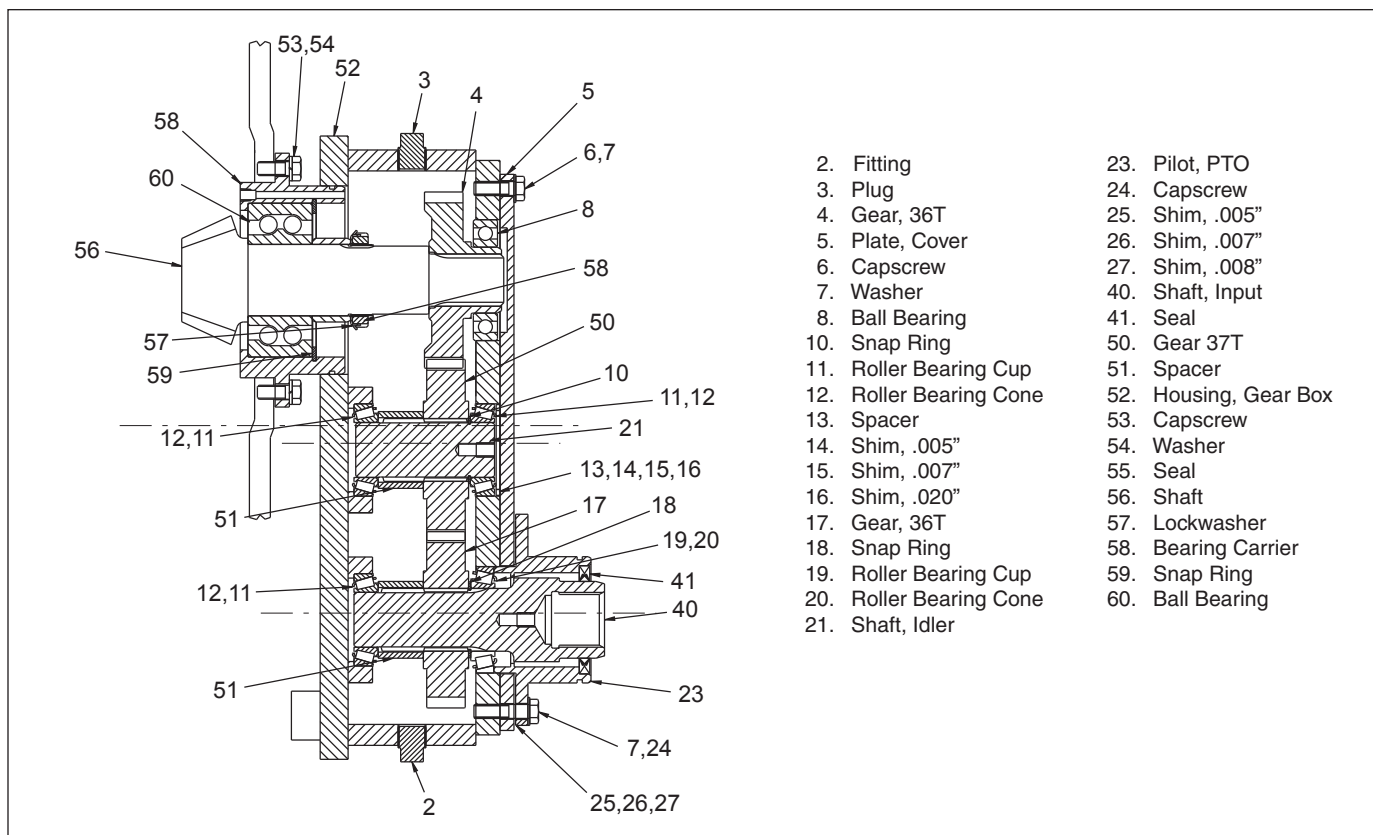
### Figure 4-2 PTO Shafts



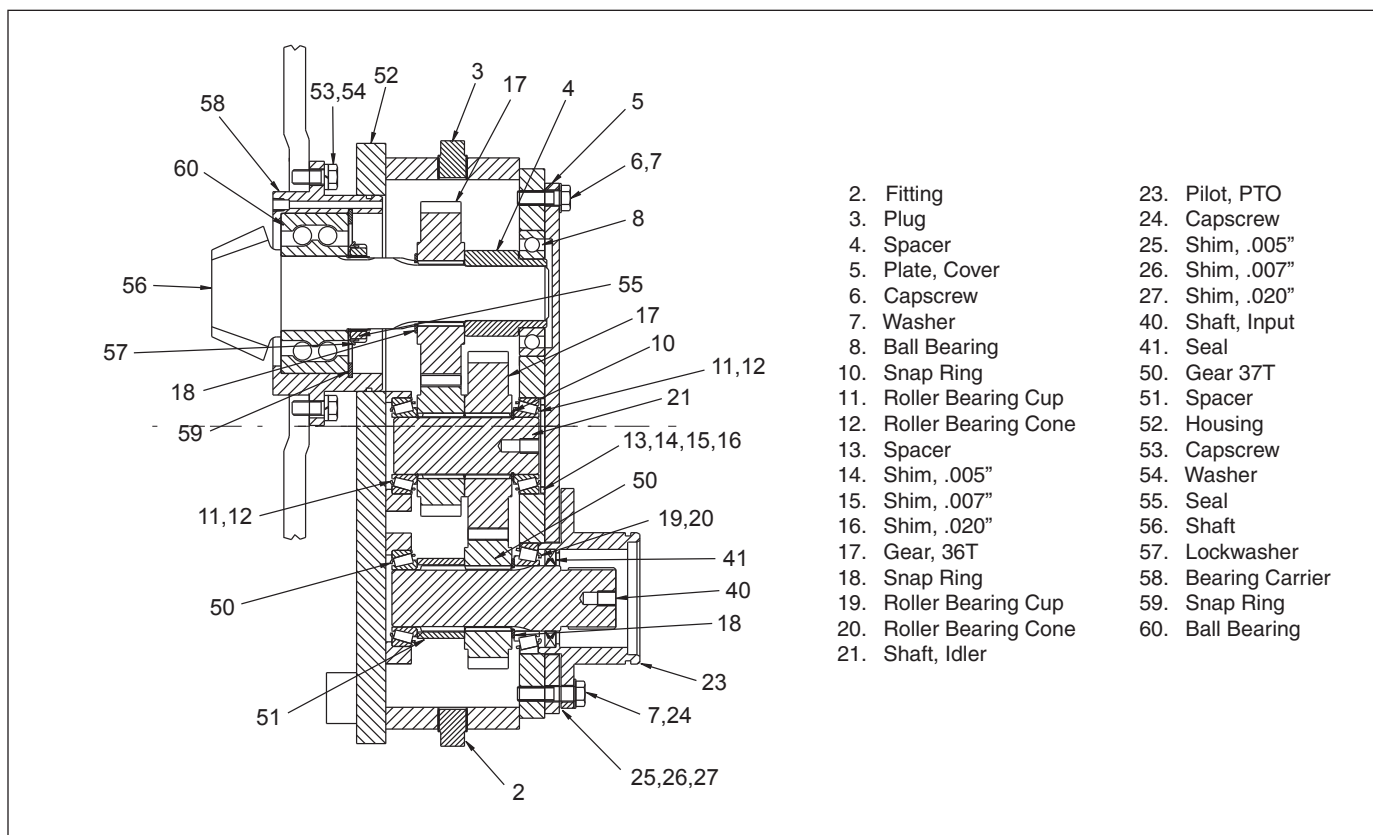
**Figure 4-3 PTO Shaft for Caterpillar D8, L, D9N & D10N; Komatsu 375A-1; New Holland FH/FD30B**



**Figure 4-4 PTO Shaft for Dresser TD25E/G**



**Figure 4-5 1:1 Dropbox for Caterpillar 583R, 583T, 587T, D8R, D8T**  
(See Chart A on page 1-2 for Tractor Identification and Gear Ratios)

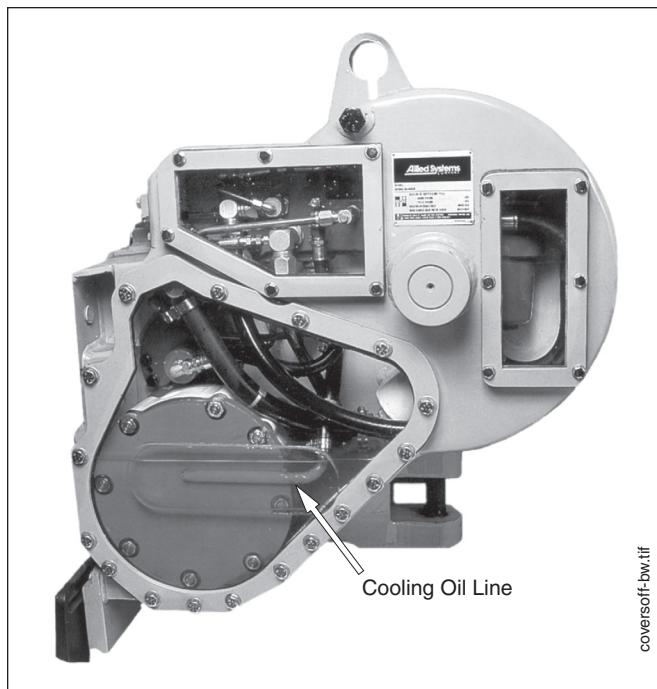


**Figure 4-6 1.8:1 Dropbox for Caterpillar D9N, D9R, D9T; similar to D10N/R/T**  
(See Chart A on page 1-2 for Tractor Identification and Gear Ratios)

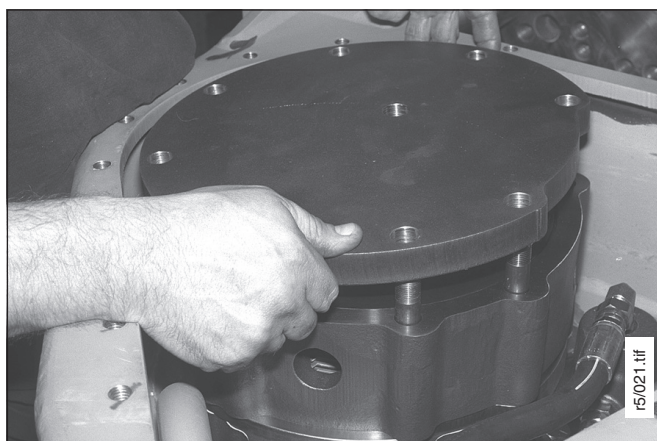
## Oil Brake Removal & Disassembly

Removal and disassembly of the brake can be accomplished while the winch is mounted on the tractor. During disassembly, place all parts in a clean container to protect them from dust, dirt and moisture. Inspect all parts for damage and wear as specified in Figure 4-11 on page 4-24.

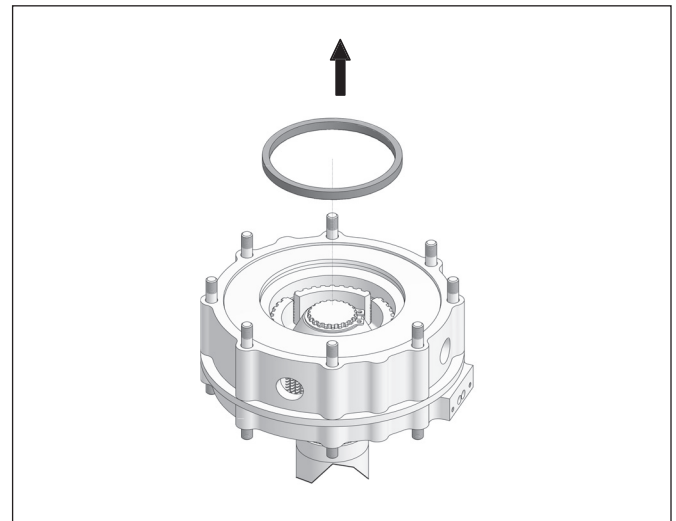
1. Drain oil from winch or position winch with left-hand side up. Remove brake assembly cover. Remove cooling oil hose line.



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



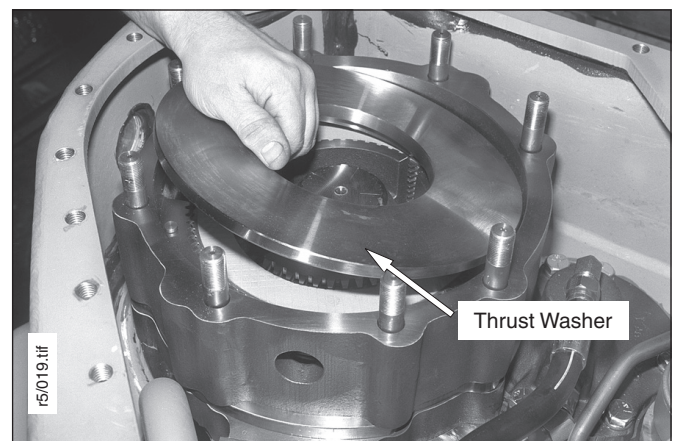
3. Remove the stroke limiter.



4. Remove two belleville springs from the cage assembly.

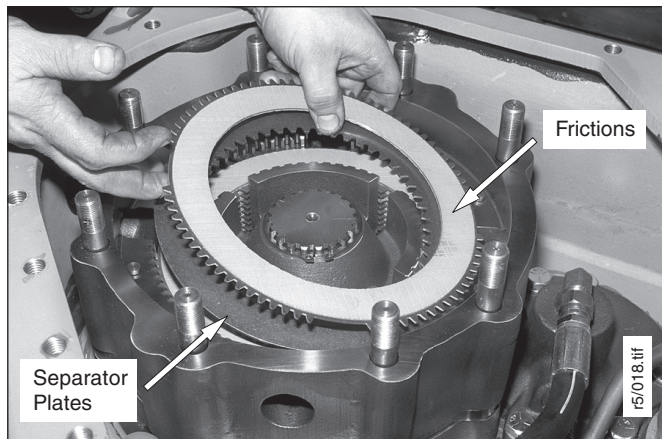


5. Remove the thrust washer.

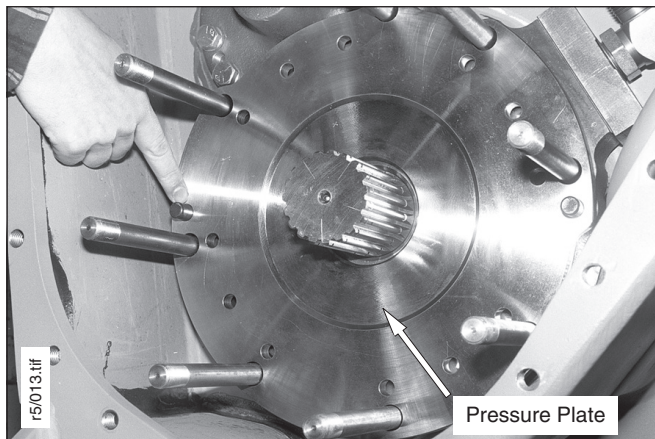




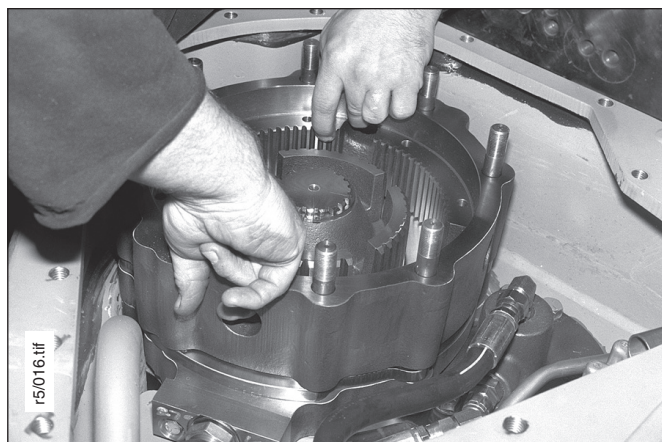
6. Remove friction discs and separator plates from the hub.



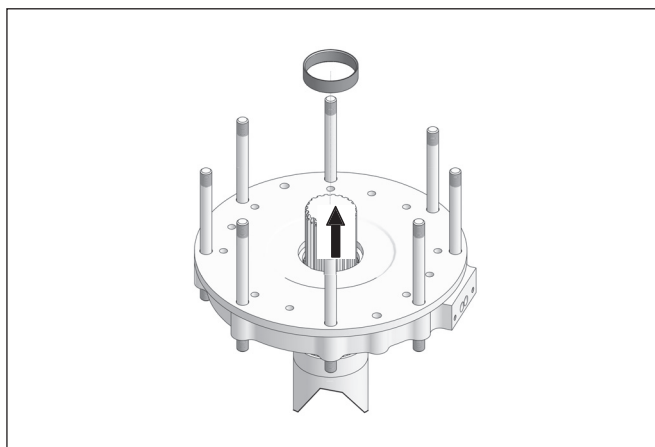
9. Remove pressure plate from studs.



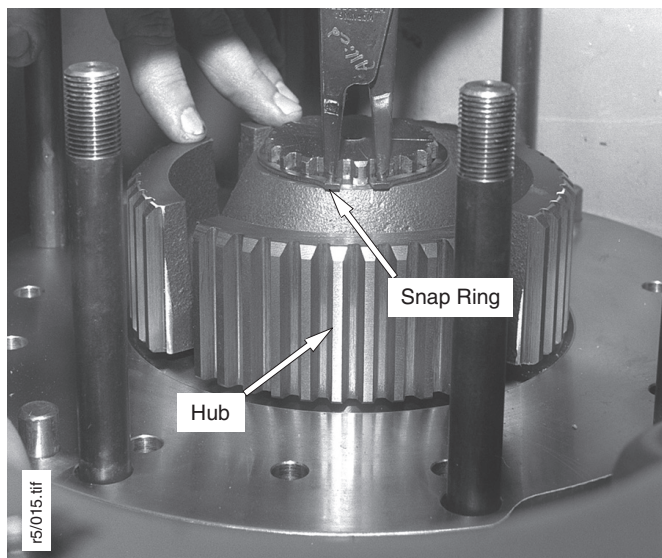
7. Remove cage from studs. It may be necessary to tap cage with a soft hammer to loosen it.



10. Remove the spacer from brake shaft.



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



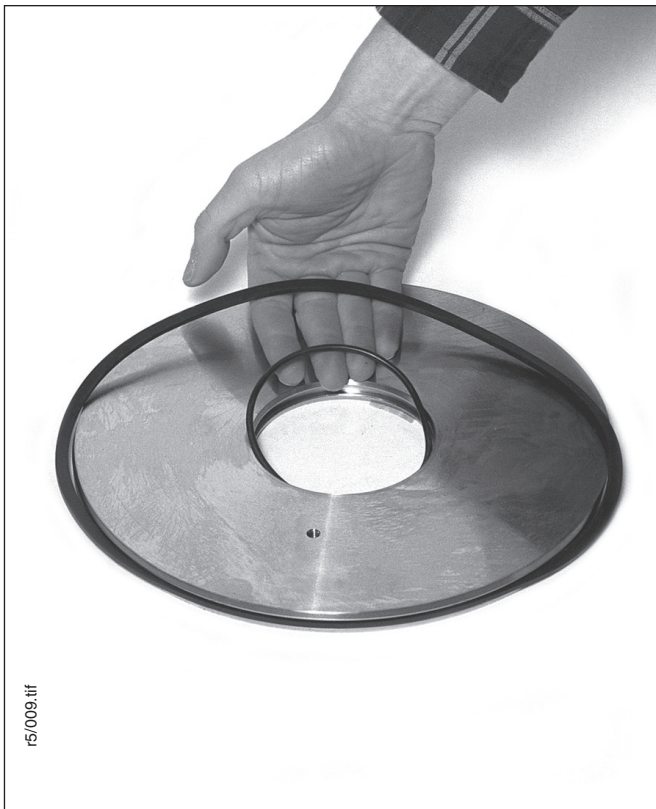
11. Slide the piston housing forward no more than one inch if only the clutch shaft bearing retainer is to be removed. To service the piston housing or brake shaft, remove the piston housing.



**CAUTION**

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

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



**NOTE:** Inspect all oil brake components as specified in Figure 4-11 on page 4-24.



## Hydraulic Pump Removal & Disassembly (for all ratios)

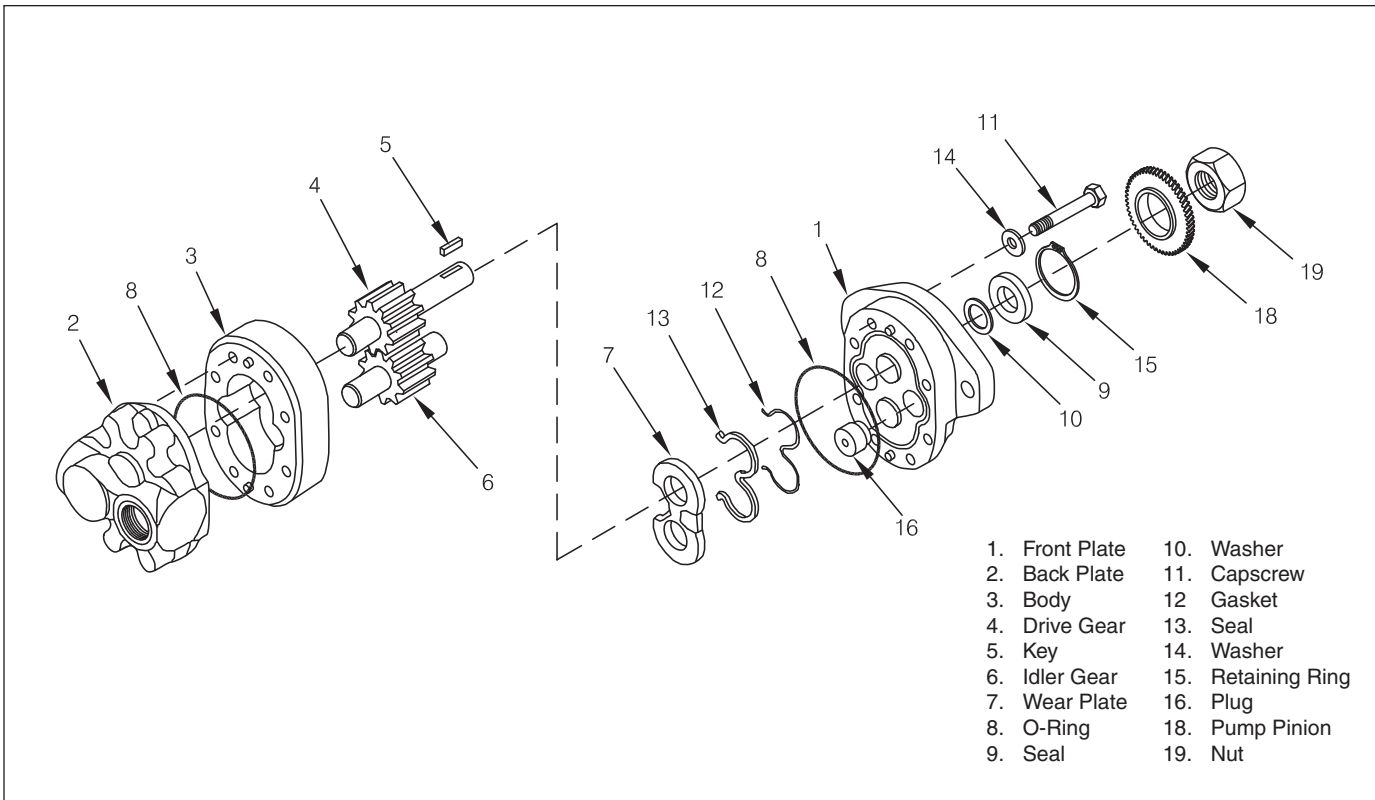


Figure 4-7 Hydraulic Pump

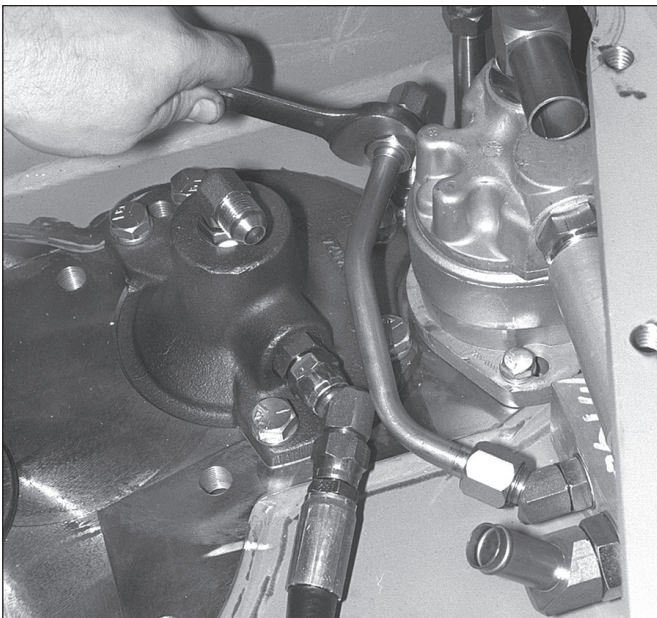
**NOTE: Cleanliness is extremely important when repairing these pumps. Work in a clean area.**

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

2. Loosen pressure hose from pump check valve. Remove the two capscrews securing the pump, then remove the pump. See Figure 4-7 for an exploded view of the pump.

### Pump Disassembly

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





7. Remove O-ring (8) from backplate assembly.
8. Remove wear plate (7) from front plate by prying with O-ring pick.
9. Remove plug (16) from front plate.
10. Remove wear plate seal (13) and shaft seal (9) from front plate.

### General Inspection

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

### Pump Gear

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

### Pump Front and Backplates

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

### Pump Body

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

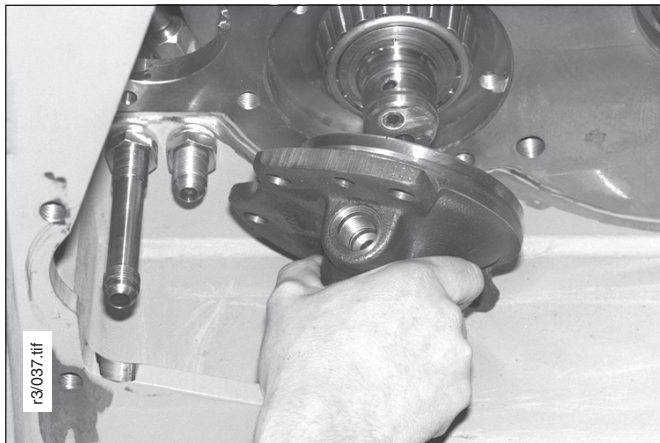
**NOTE: Do not repair the pump if gear or housing is worn. Replace with a new pump.**

## Clutch Shaft Removal & Disassembly

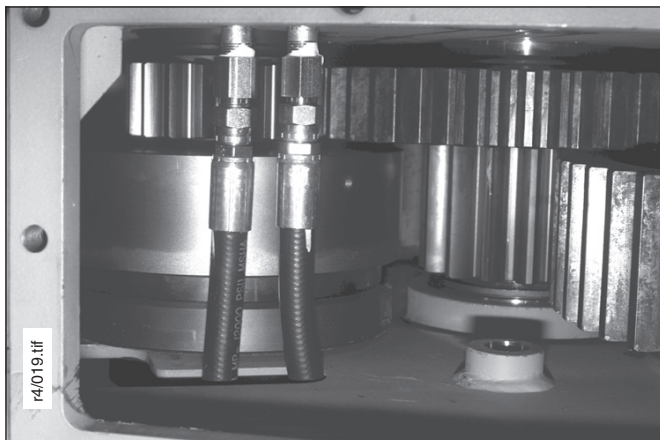
Figure 4-1 on page 4-2 shows the location of clutch shaft components. Removal of the clutch shaft and associated parts can usually be accomplished with the winch mounted on the tractor, except for Ratio #7. Prior to removal of the clutch shaft, perform the following:

- a) Drain oil from winch.
- b) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section, steps 1 through 11.

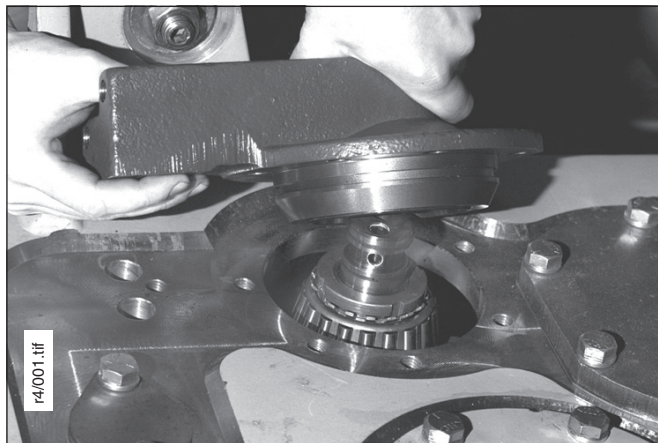
1. Disconnect hydraulic lines from the left-hand bearing retainer.
2. Remove left-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



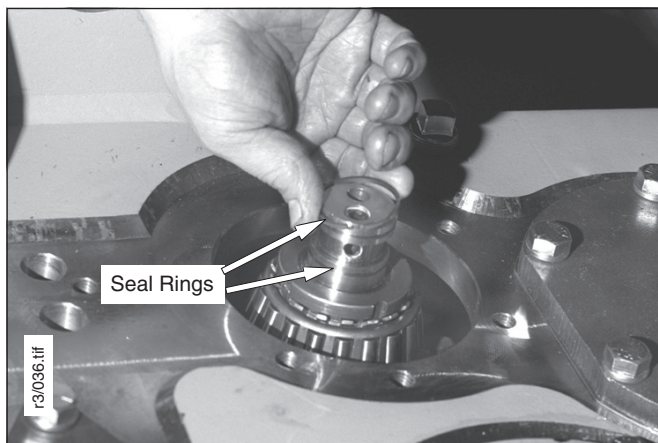
3. Remove hydraulic lines and fittings from the right hand bearing retainer.



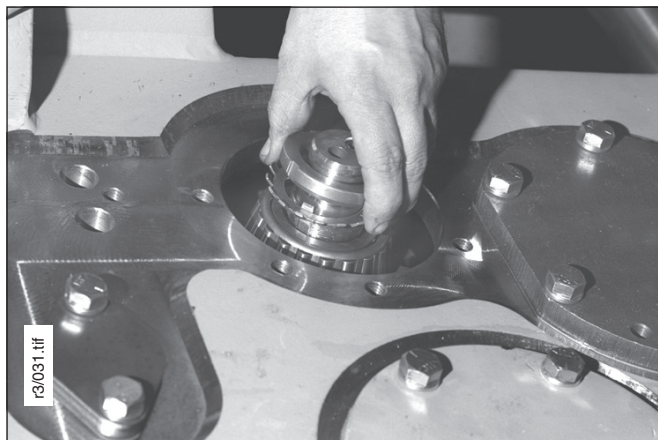
4. Remove right-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



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

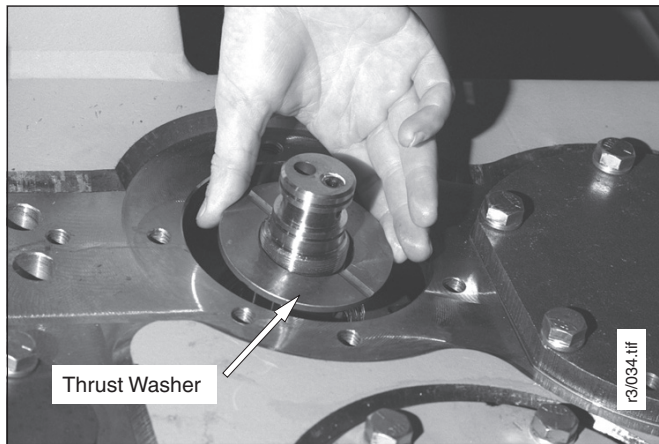
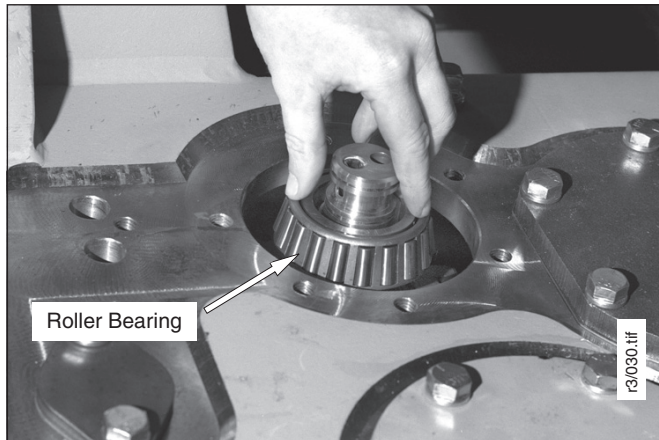


6. Straighten the lockwasher tang securing the locknut. Use clutch shaft locknut socket illustrated on page 4-66 to remove the locknut.
7. Remove the locknut and lockwashers.

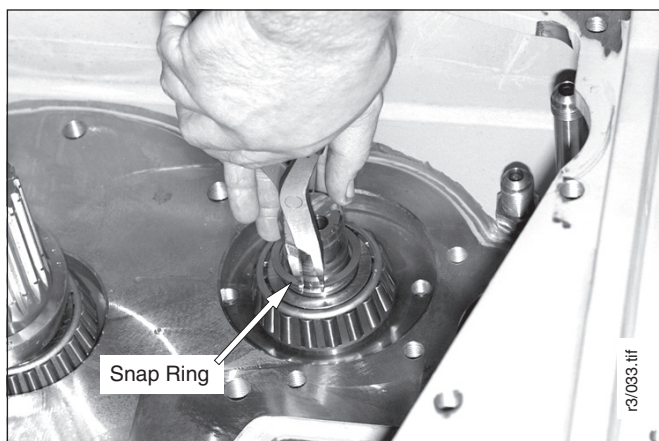




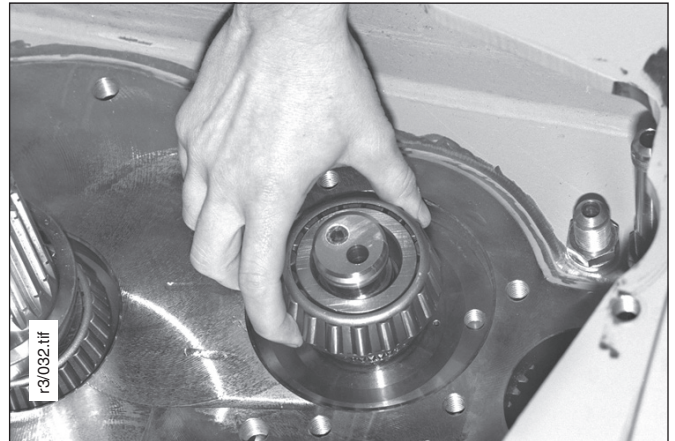
8. Remove the tapered roller bearing and thrust washer.



9. Remove the internal snap ring from the reverse spider gear bore.
10. Remove the external snap ring from the left-hand end of the clutch shaft.

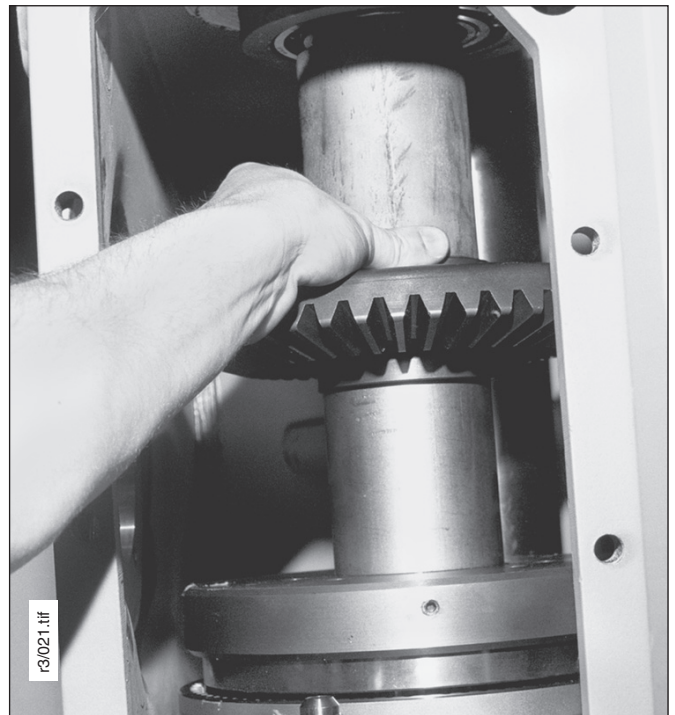


11. Remove the left-hand tapered roller bearing. Wrap end of shaft with tin or cardboard so gear will slide off end of shaft.



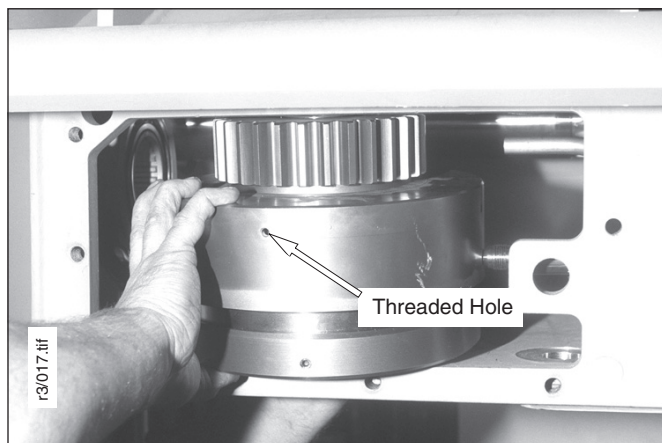
12. Attach lifting device to clutch shaft on right-hand side using special tool held in place with the bearing locknut (see page 4-66) from the left side.

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

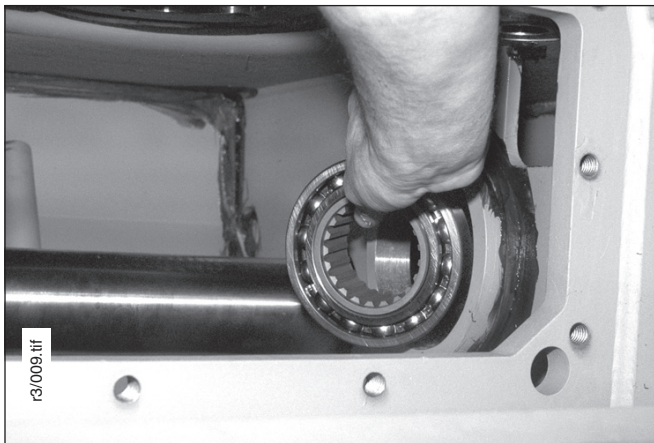


14. Remove the bevel ring gear and RH spacer. Remove the PTO pinion gear (if splined gear) or remove PTO before removing clutch assembly.

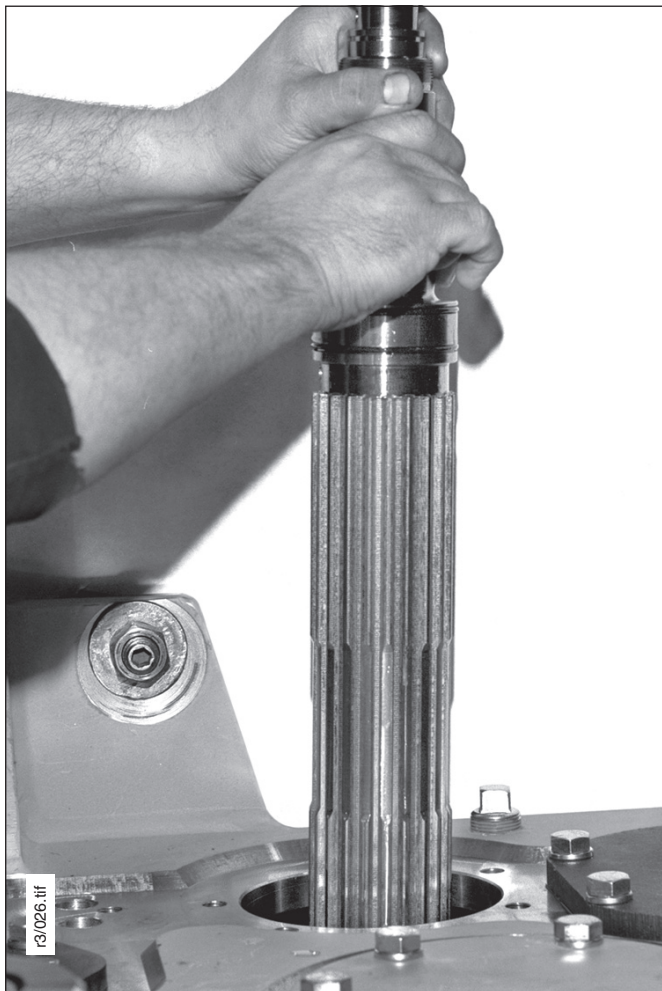
15. Install a 1/4"-20 lifting eye (Allied P/N X-203348, see page 4-66) in the 1/4"-20 threaded hole of the forward clutch pack and lift out. A nylon rope sling may be used.



17. Remove the ball bearing and carrier.



16. Secure the reverse clutch pack with heavy wire or a 1/4"-20 lifting eye. Then carefully withdraw the shaft.



18. Install a 1/4"-20 lifting eye and remove the reverse clutch assembly. A nylon rope sling may be used.



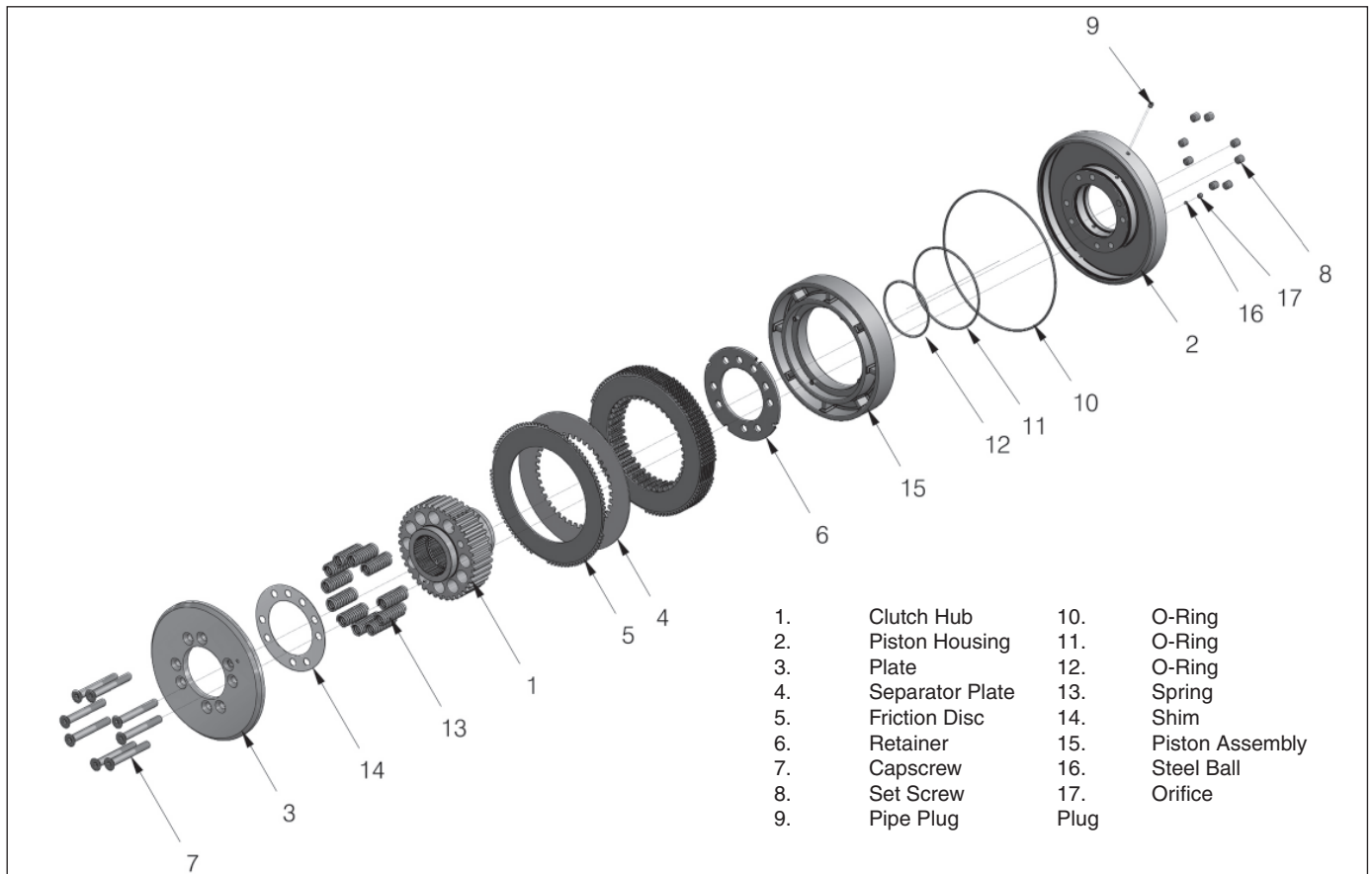


## Oil Clutch Disassembly (for All Ratios)

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

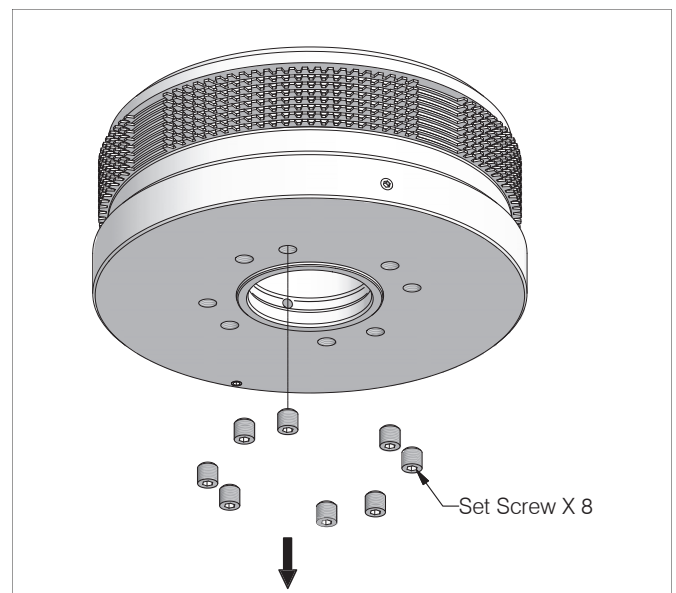
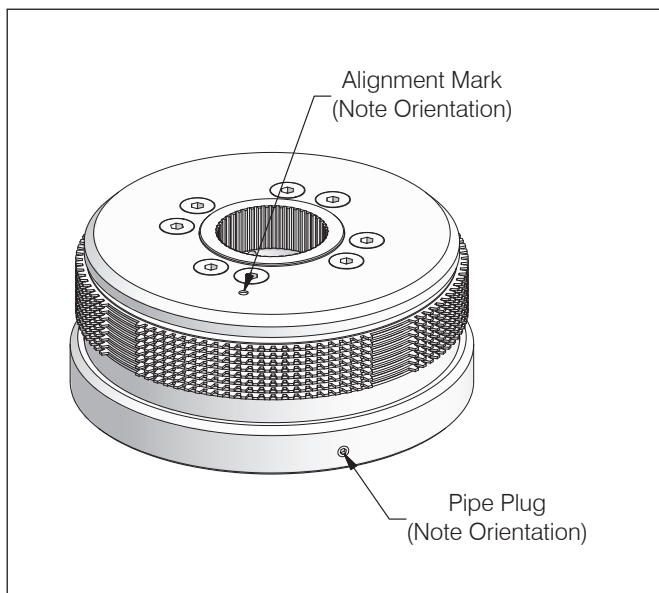
**NOTE: Disassembly is essentially the same for both the forward and reverse clutches. The forward clutch for Ratio #7 is shown below.**

Figure 4-8 Oil Clutch Assembly (Forward Clutch Shown)

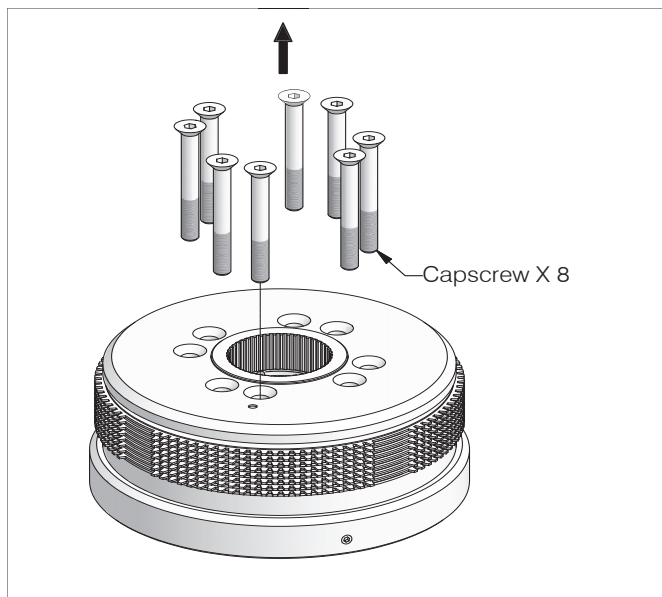


1. Before disassembling clutches, note and mark the orientation for reference during reassembly.

2. Remove set screws from the piston housing.

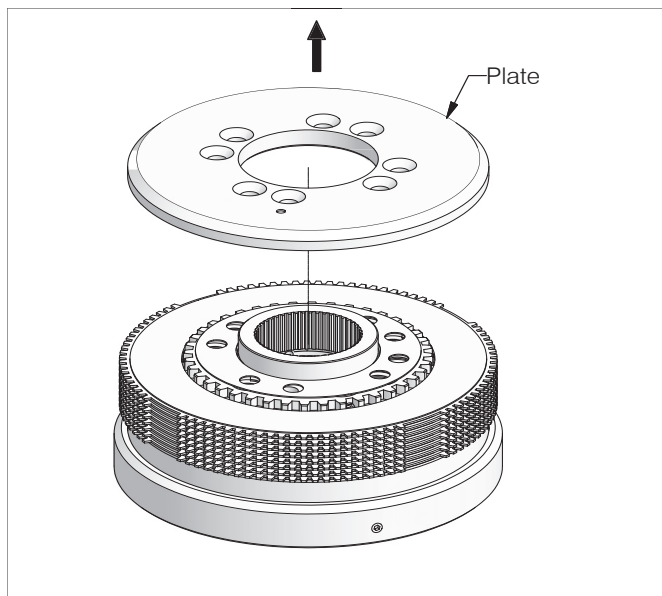


3. Remove the capscrews using the a hand impact driver initially. Hold firmly so as not to damage the clutch pack.

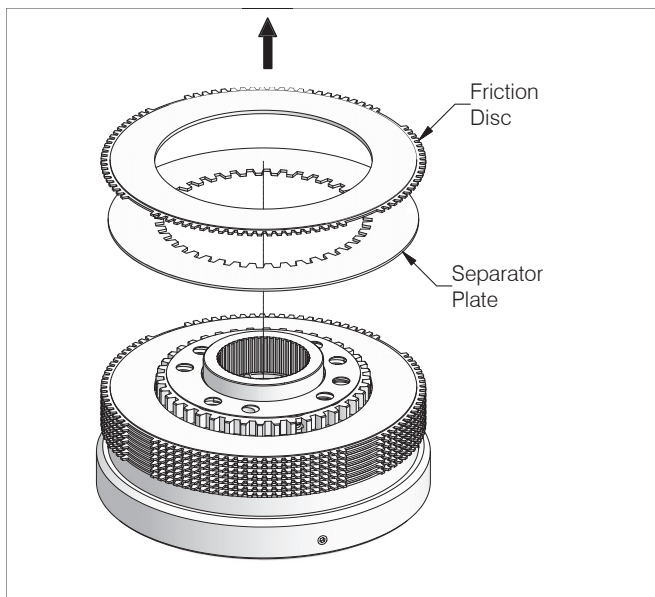


**NOTE:** Using a C-Clamp to compress the clutch pack will make removing capscrews easier if they are too tight in the assembly.

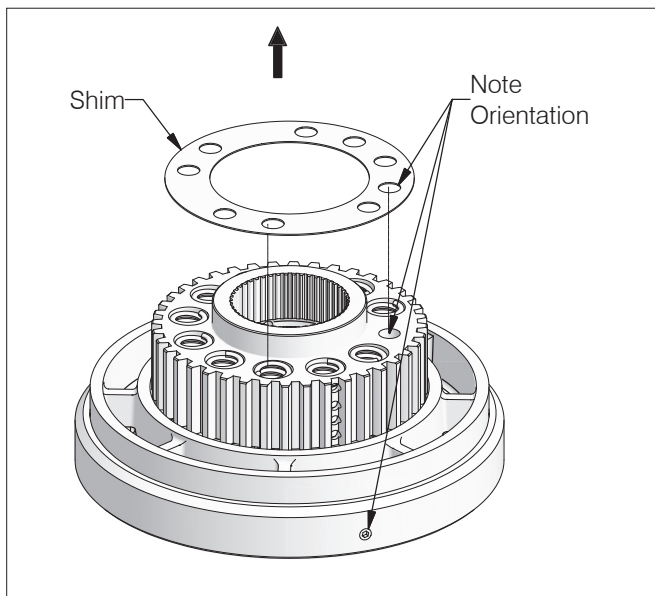
4. Note the orientation, and mark position on cover plate and hub to aid in reassembly. Lift the plate from clutch assembly.



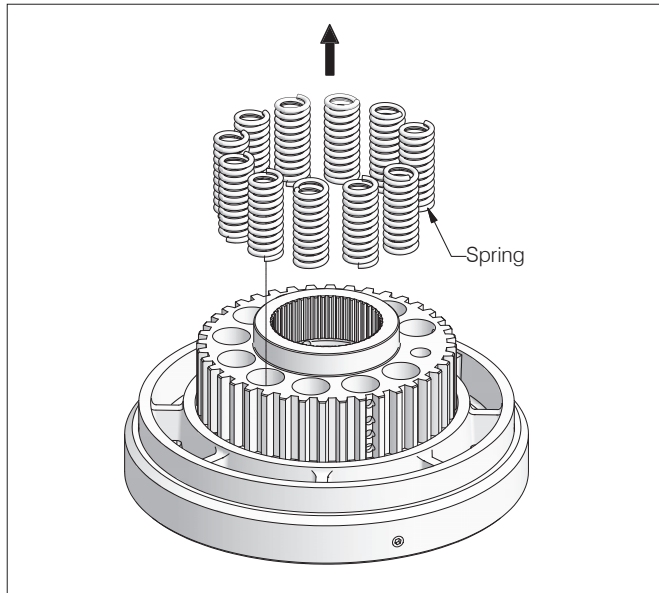
5. Remove the separator plates and friction discs from the hub. Inspect as described in Figure 4-11 on page 4-24.



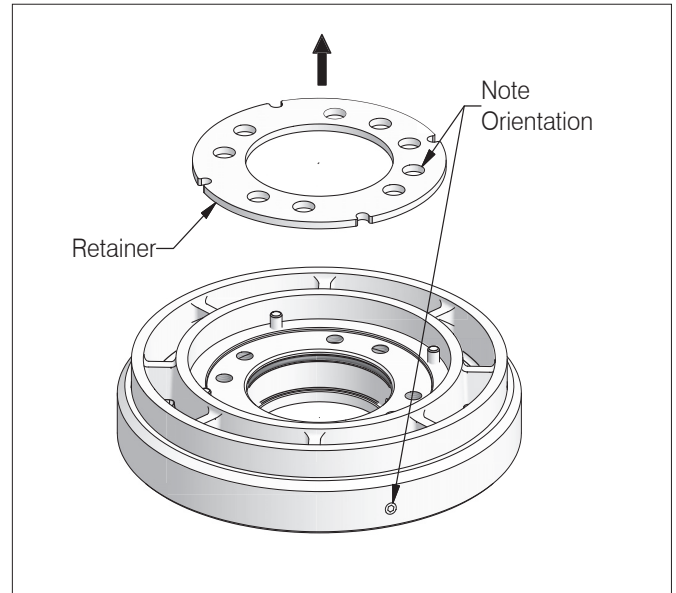
6. Remove shim. Pay attention to the orientation, and note that if the shim is reassembled upside down, the holes will almost align, but not enough to reassemble properly.



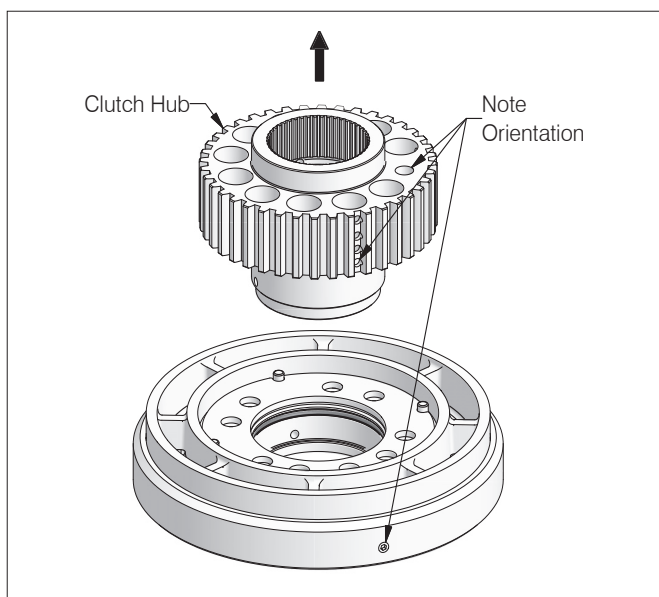
7. Remove and inspect the release springs. Refer to Figure 4-11 on page 4-24.



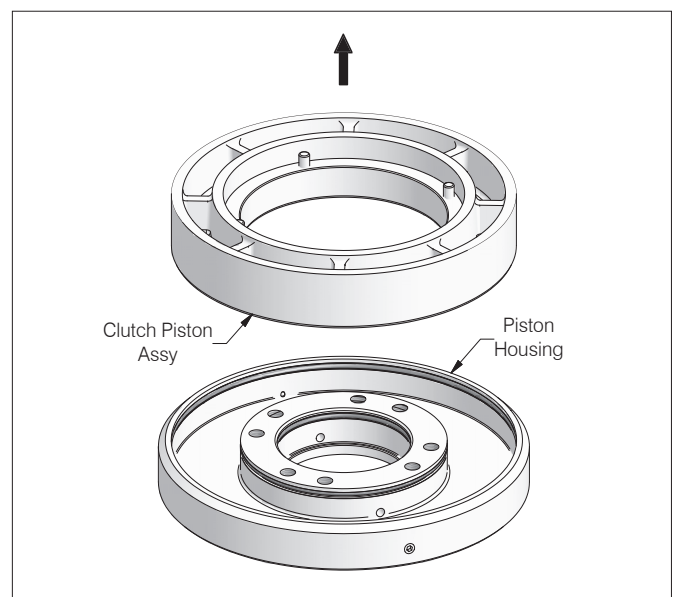
9. Remove spring retainer. Inspect for wear. Pay attention to the orientation, and note that if the retainer is reassembled upside down, the holes will almost align, but not enough to reassemble properly.



8. Remove the clutch hub from the piston housing.

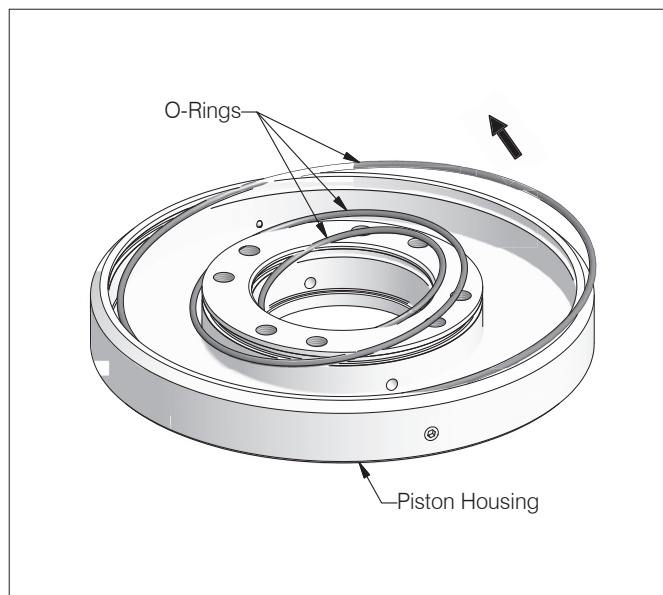


10. Remove the piston assembly from the piston housing. Inspect for wear.



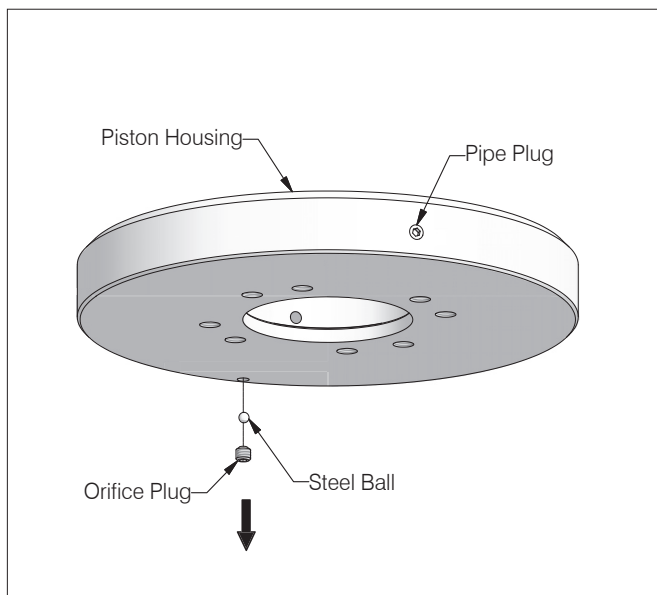


11. Remove and discard the three O-rings.



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

12. Remove the steel ball and the orifice plug.



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

Figure 4-9 Troubleshooting

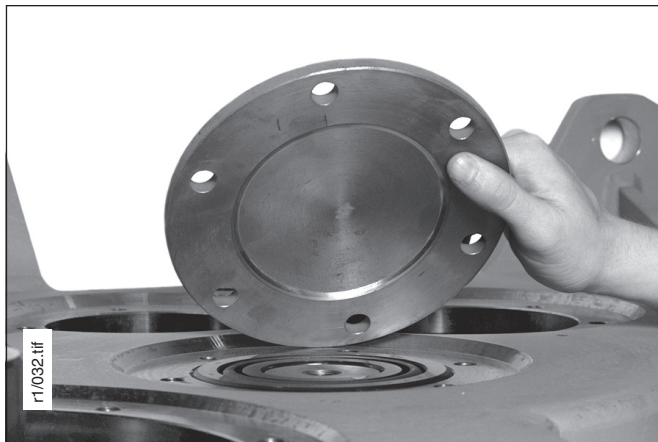
| PROBLEM   | POSSIBLE CAUSE                       | CORRECTION  |
|---|--------------------------------------|---|
| Winch winds in quickly in BRAKE-OFF (Ratio #7).   | No exhaust ball valve or ball stuck. | Update winch per Service Gram.  |
|   |                                      | Plug has fallen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

## Intermediate Shaft Removal

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

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

1. Remove the intermediate shaft cover.

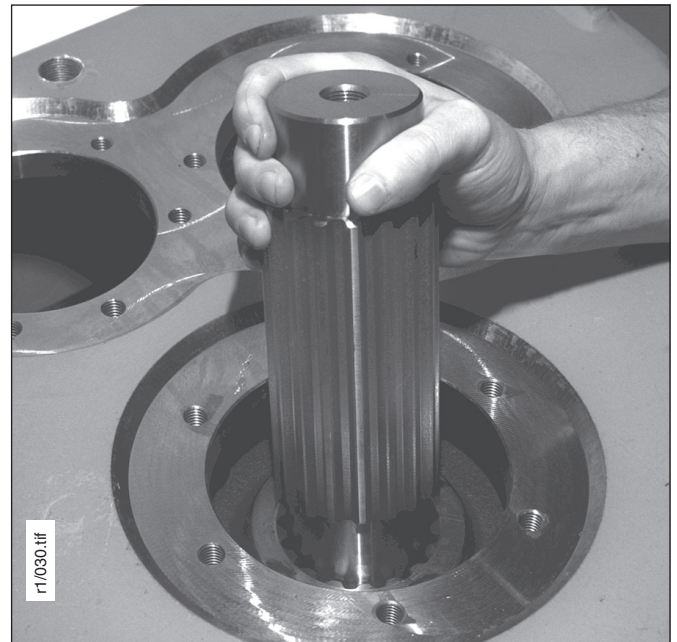


2. Screw a 3/4-16 UNF slide hammer into the end of the intermediate shaft and partially pull it out.

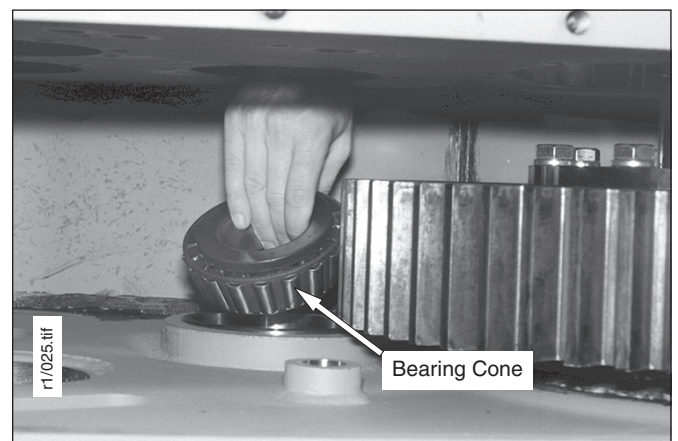
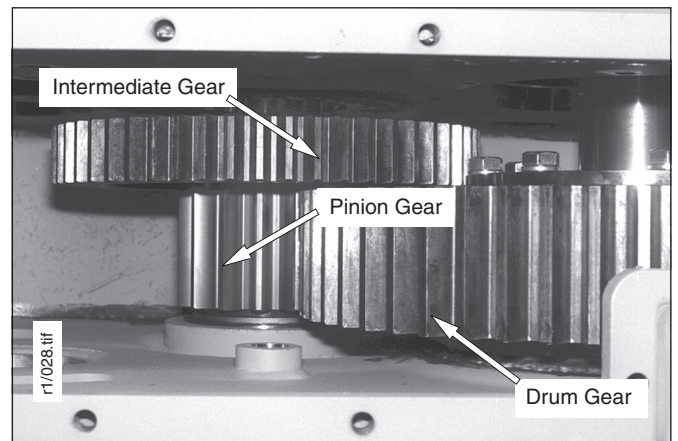
3. Remove bearing cup and cone.



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.



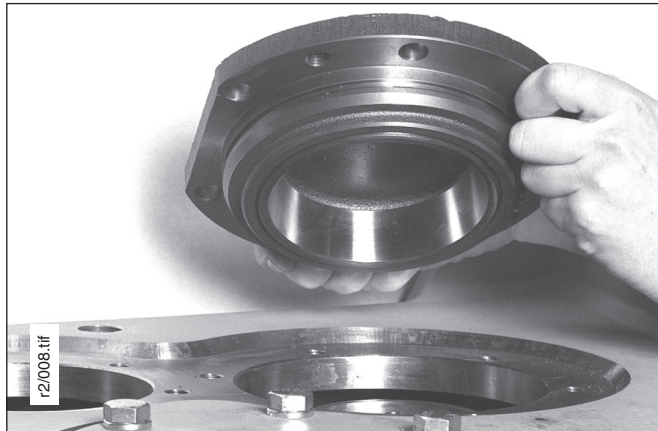
6. Remove drum shaft retainer prior to removing intermediate gear. See **Drum Shaft and Drum Removal** subsection that follows.



## Brake Shaft Removal

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

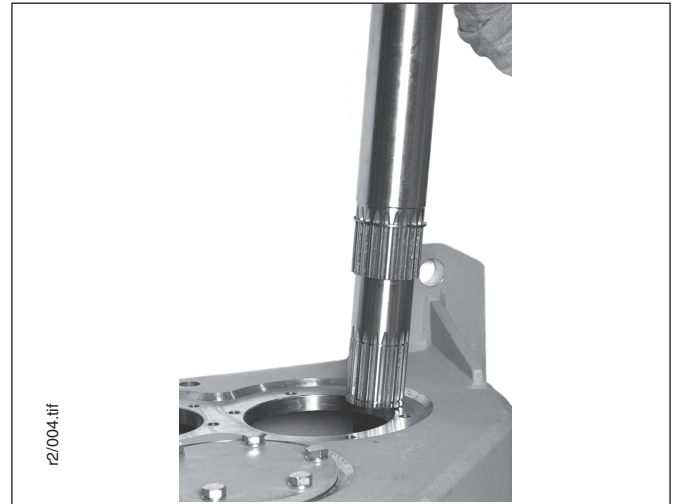
- a) Remove the winch from the tractor (see **Winch Removal** section at the beginning of this chapter).
  - b) Drain oil from winch.
  - c) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section.
  - d) Remove the brake shaft as shown in the following steps.
1. Remove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



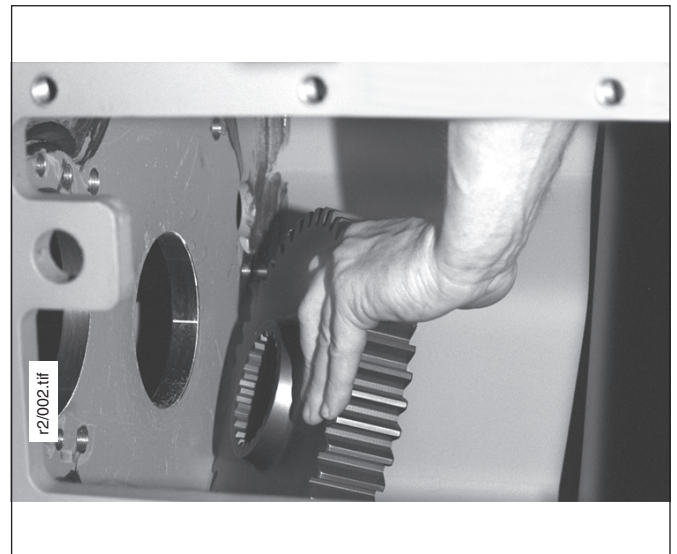
2. Pull brake shaft partially out of winch housing.
3. Tap the left-hand bearing off of shaft using reduction gear as driver.



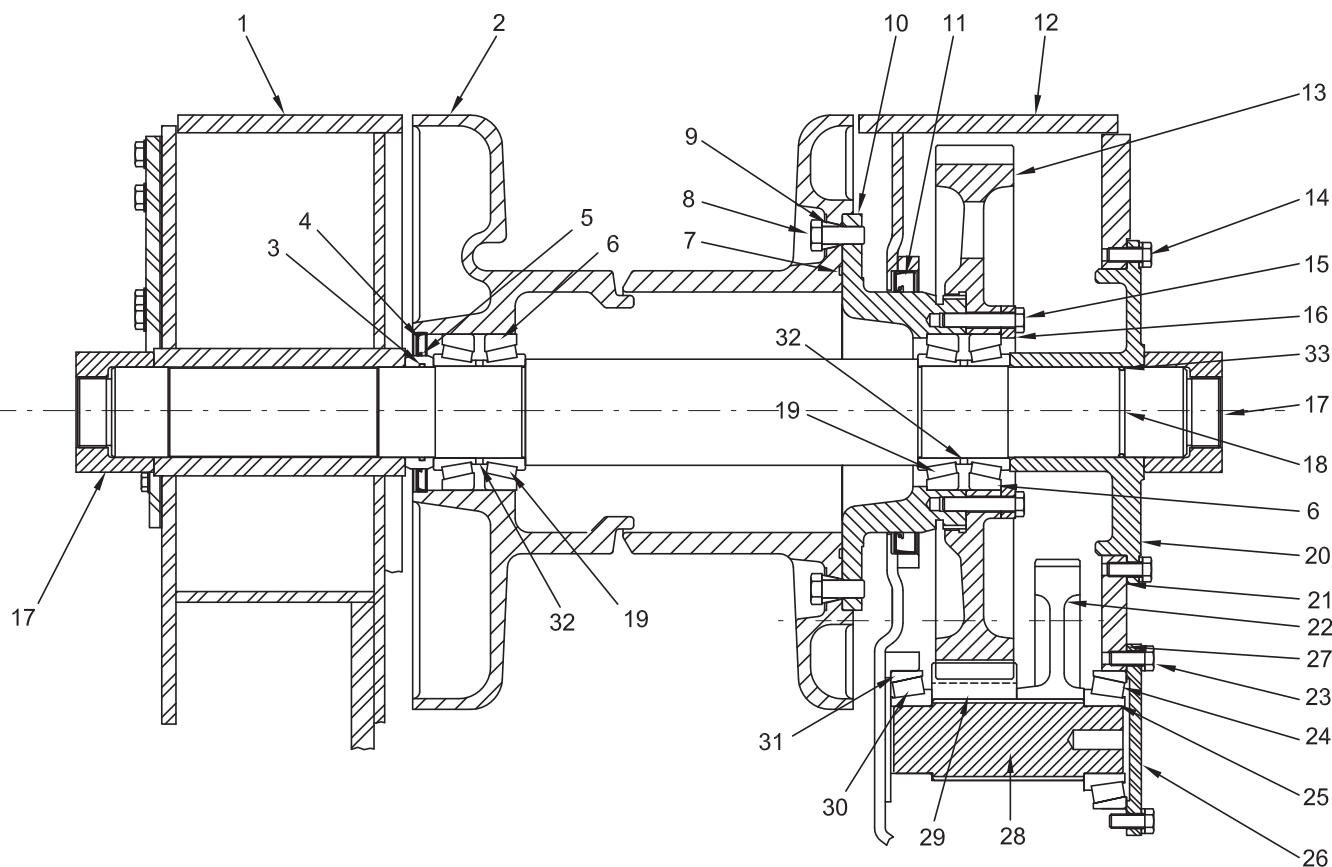
4. Withdraw shaft from housing.



5. Remove gear from winch housing.







VIEWED FROM  
THE BACK OF THE WINCH

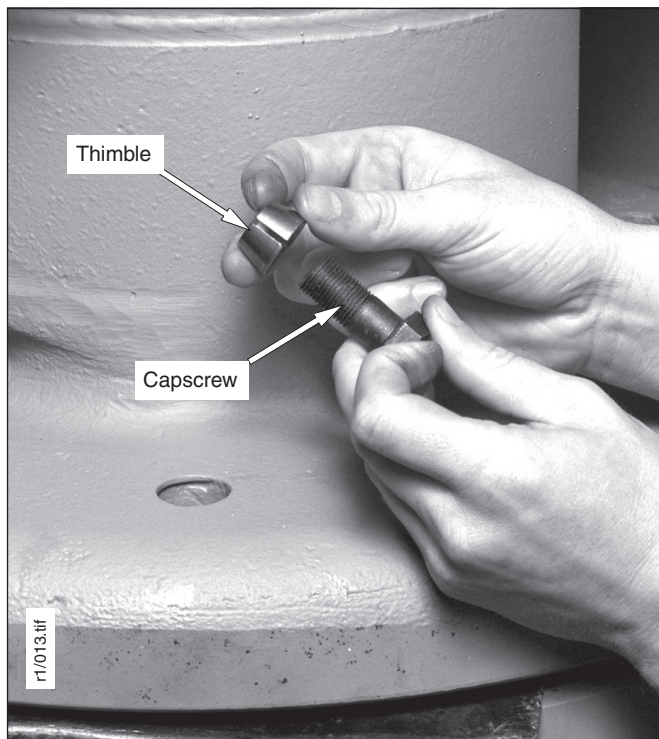
- |                                |                           |
|--------------------------------|---------------------------|
| 1. LH Winch Housing            | 18. Drum Shaft            |
| 2. Drum                        | 19. Bearing Cone (Qty. 4) |
| 3. O-Ring                      | 20. Drum Retainer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

Figure 4-10 Location of Drum and Drum Shaft Components

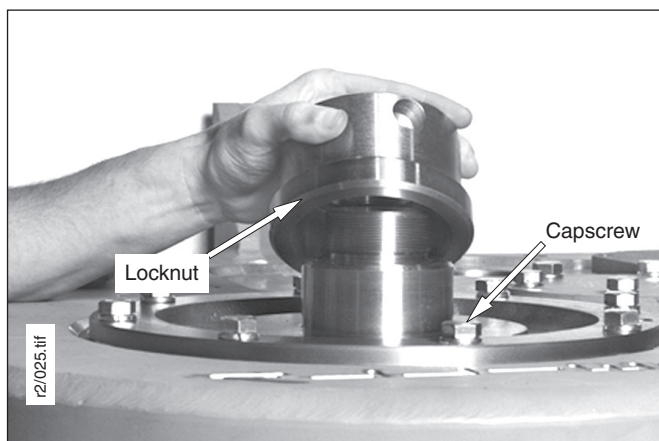
## Drum Shaft & Drum Removal (for all ratios)

Figure 4-10 on page 4-20 shows the location of drum and drum shaft components. Do not attempt to remove heavy components such as the drum or drum gear by hand. Always use a lifting device and the recommended attachments whenever possible. Removal of the drum and drum shaft can be accomplished with the winch on the tractor. To remove the drum gear it will be necessary to first remove the intermediate shaft (see **Intermediate Shaft Assembly Removal** section) and the clutch assembly (see **Clutch Shaft Removal and Disassembly** section).

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



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

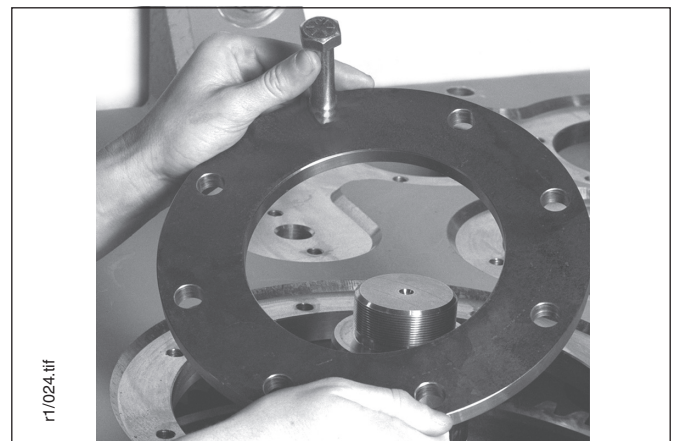


3. Remove bearing retainer and shim pack.

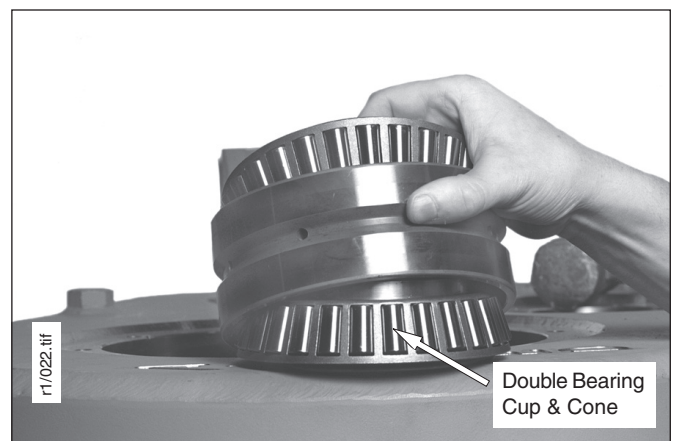


**NOTE:** Tag shim pack for reference during reassembly.

4. Remove retainer ring by removing retainer capscrews.



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





# Repairs - Ratios #1, #3, #4 & #6



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

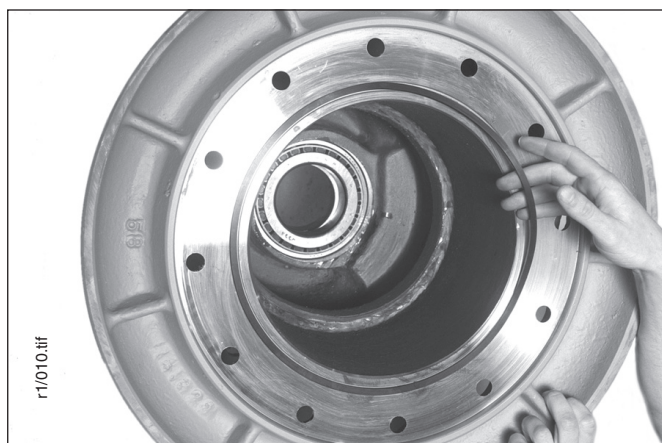
6. Attach a sling around the drum and hoist until there is no slack, then drive the shaft out the right hand side.

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

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



10. Remove and discard adapter seal.



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

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



**NOTE:** Refer to Figure 4-10 on page 4-20 for location of components.

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

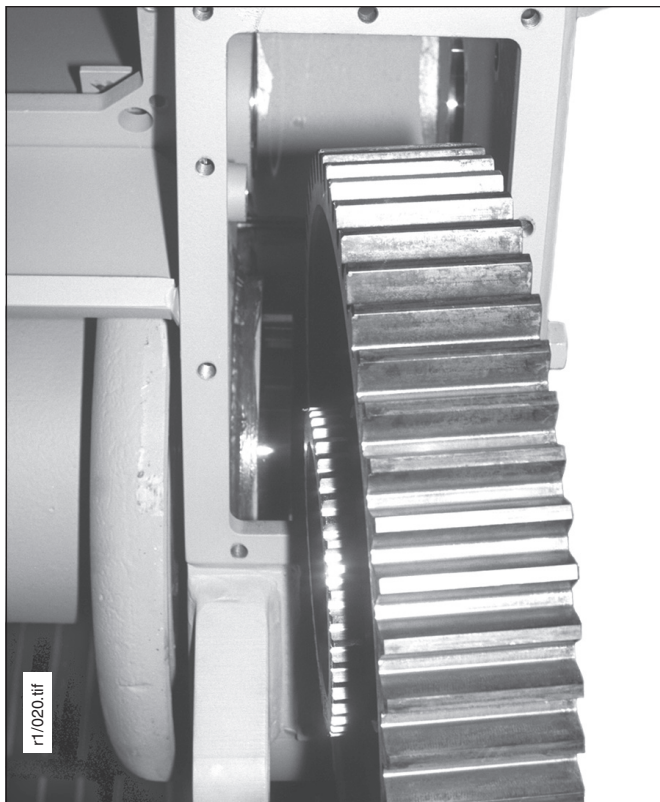




13. Remove and discard adapter seal from winch housing.



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



## Winch Assembly

All components should be inspected for wear or damage as they are removed. Refer to Figure 4-11, 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 4-11 Visual Inspection**

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

**Figure 4-11 Visual Inspection (continued)**

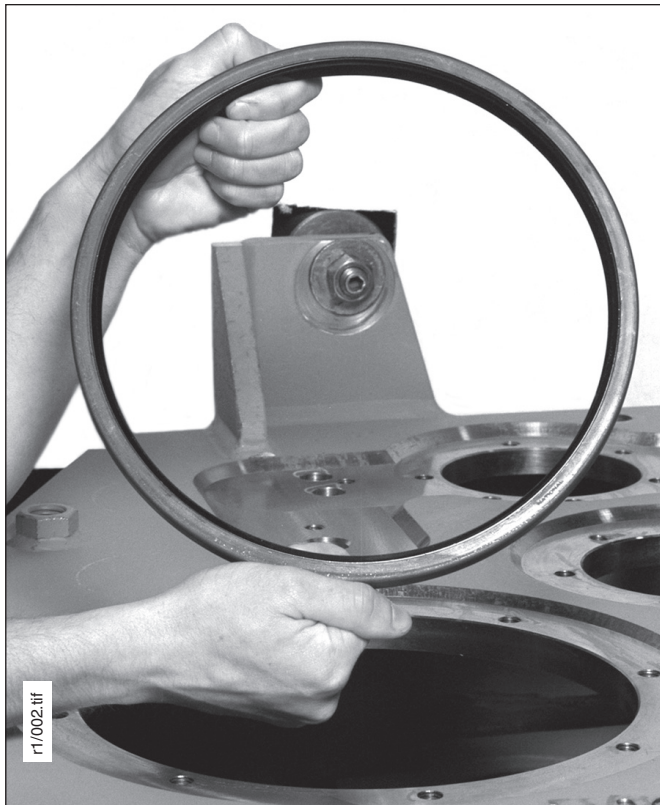
| ITEM               | INSPECTION REQUIREMENTS   | CORRECTIVE ACTION  |
|--------------------|---|--|
| Brake Assembly     | Check for cracked or broken belleville spring(s).   | Replace spring(s) if cracked or broken.  |
|                    | Inspect oil brake cover for scoring, burrs, cracks or warping.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



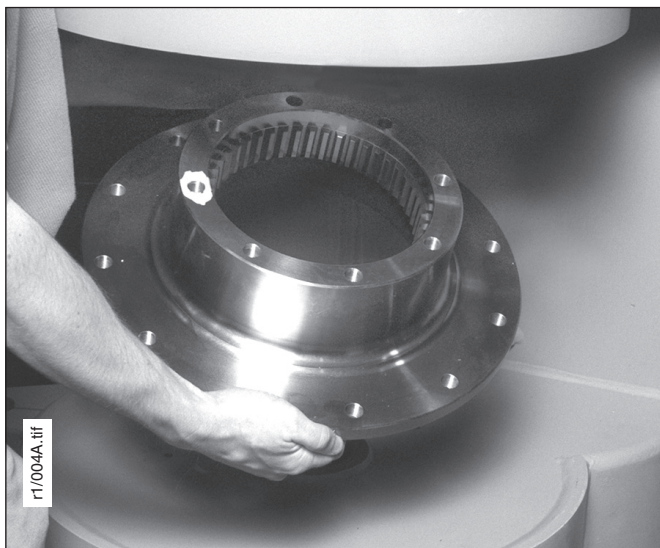
## Drum and Drum Shaft Installation (for all ratios)

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

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



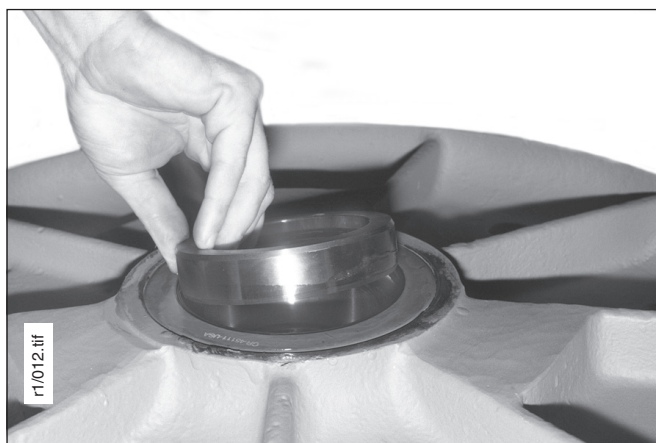
2. Install drum adapter by pushing it through the double-lip seal.



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



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

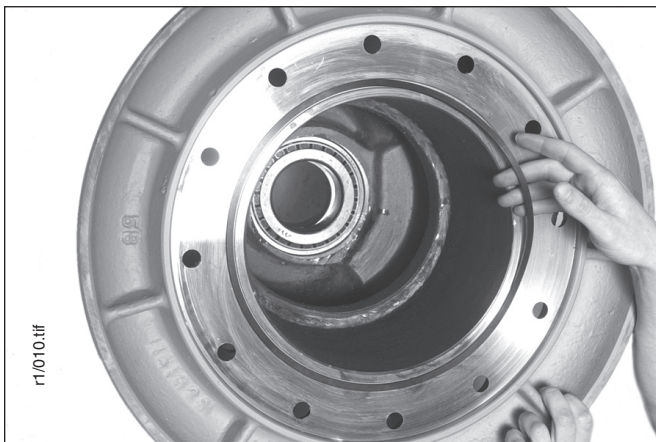


5. Install drum seal.



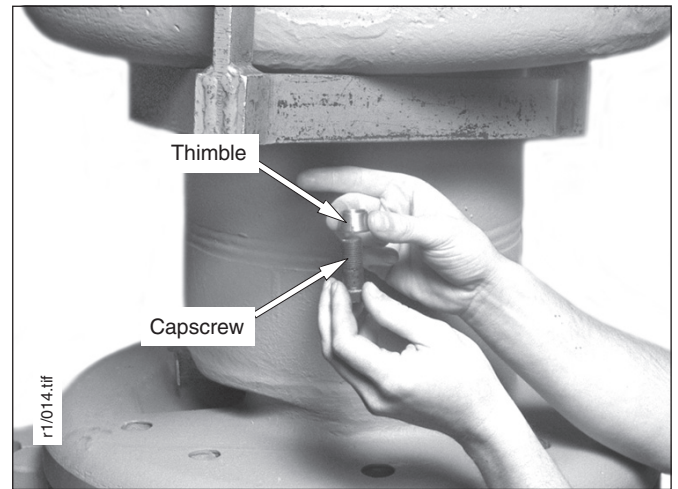
**NOTE: Smooth side of seal must face outboard.**

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

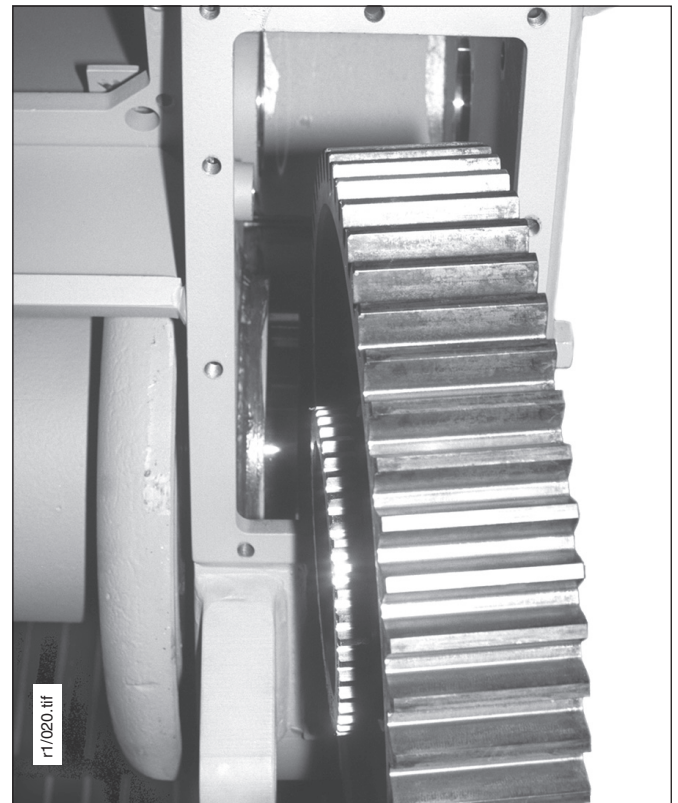


7. Move the drum into position while being careful not to move the seal ring.

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



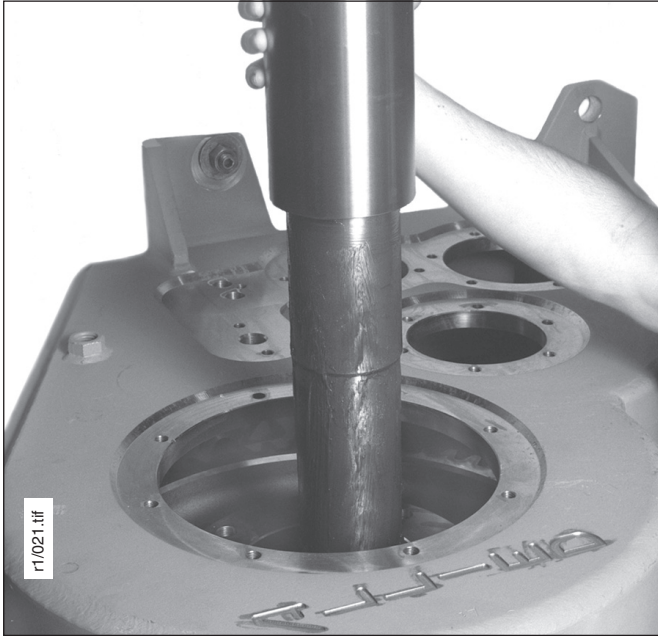
9. Install drum gear.



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



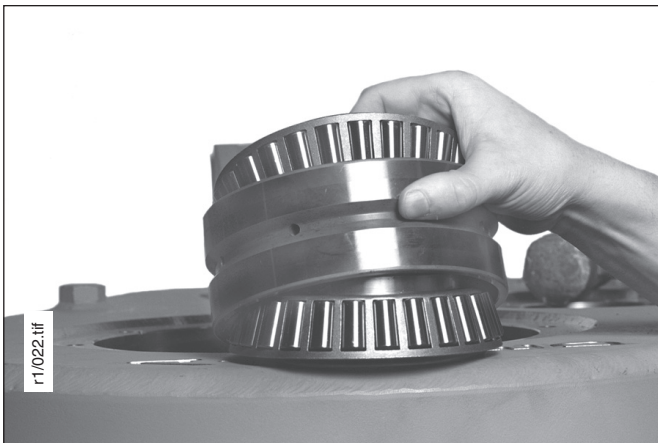
11. Make sure that double-tapered roller bearing, seal and spacer are properly seated in the left-hand side of the drum. Then install the shaft until it bottoms solidly against the left hand tapered roller bearing. Tighten left hand nut.



## ⚠ CAUTION

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

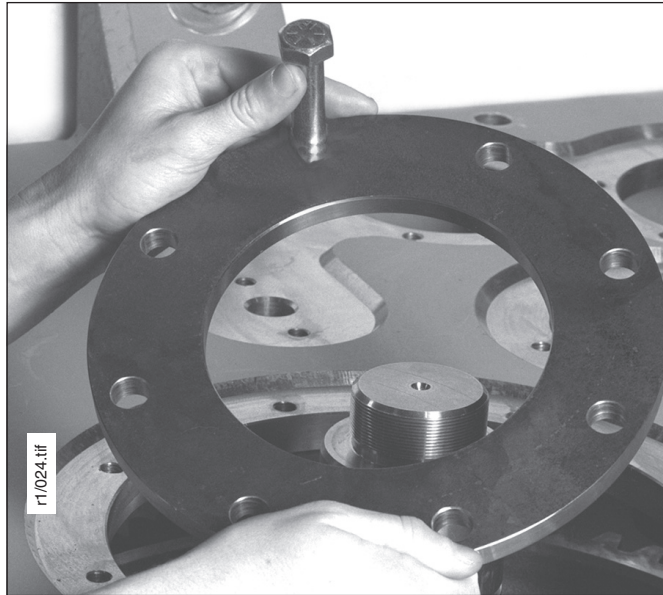
12. Remove the retainer plate, pour 2 quarts (2 liters) of the recommended oil into the drum to ensure initial bearing lubrication, and install the bearing assembly. If the spacer has a shoulder, its orientation is not important for reassembly.



## ⚠ WARNING

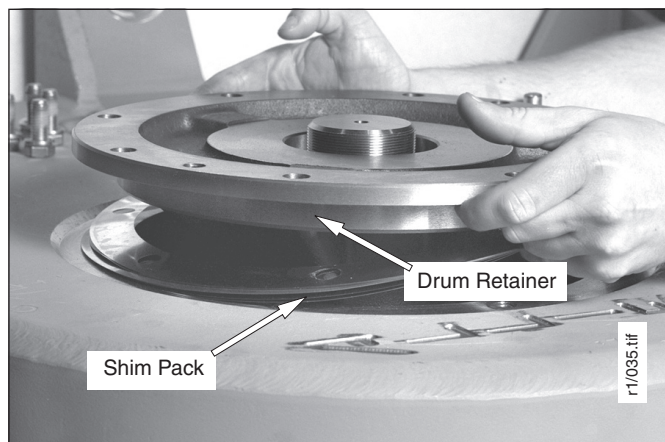
**Make sure the drum gear does not fall off the adapter.**

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

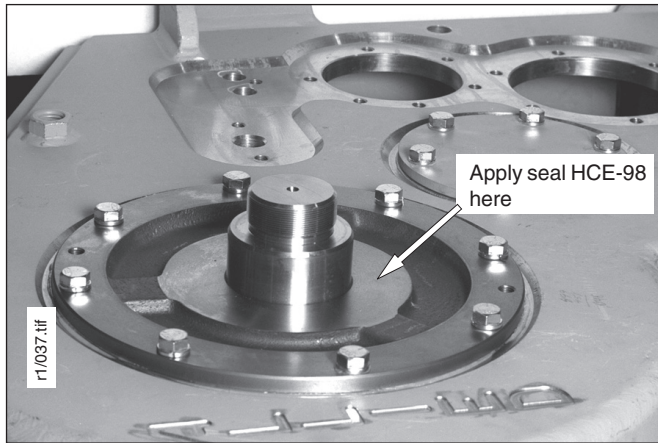


**NOTE: Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.**

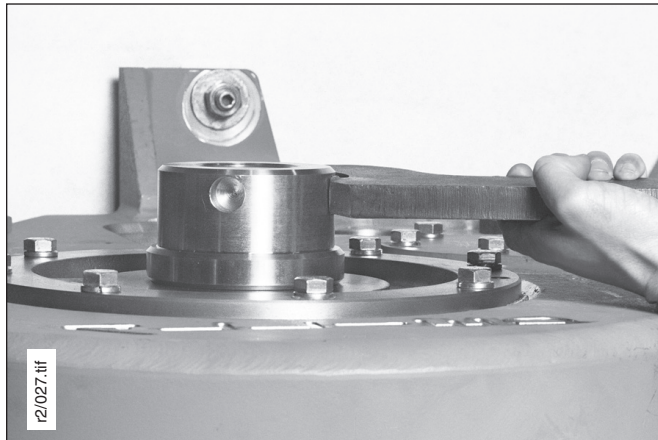
14. Set bearing retainer into place and securely tighten capscrews (do not tighten to final torque). Measure gap between retainer and winch frame in three places around the retainer. Add the three indications and divide by three to add obtain the average gap. Assemble shim pack to provide a net fit with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



16. Secure retainer with capscrews and lockwashers. Tighten capscrews to 150 ft-lbs (20 kg-m).



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



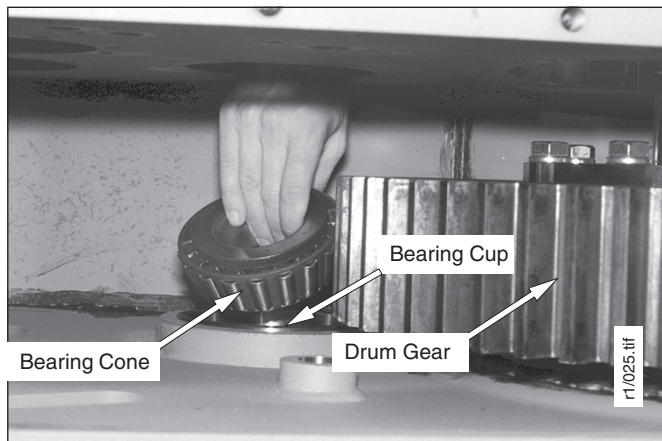
18. Tighten drum-to-adapter capscrews to 220 ft-lbs (29 kg-m) torque.



## Intermediate Shaft Installation

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

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.



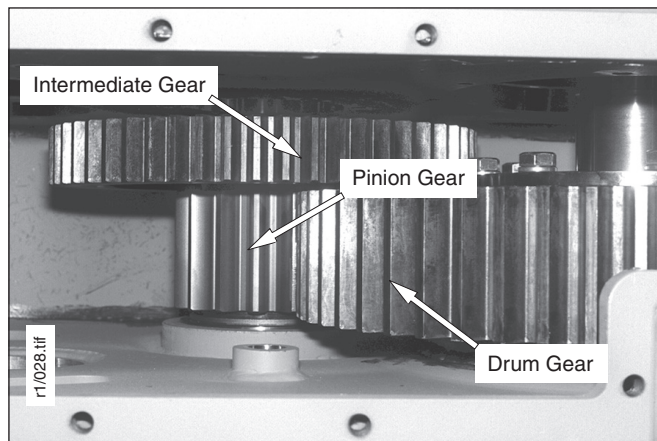
**NOTE:** The bearing cup should be installed before the installation of the drum gear.

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

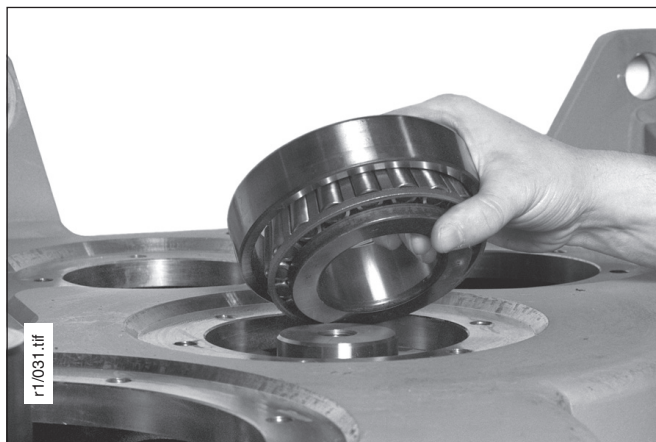


**NOTE:** Install intermediate gear with high shoulder down, towards the drum gear, to set enough clearance between the intermediate gear and the drum gear.

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.

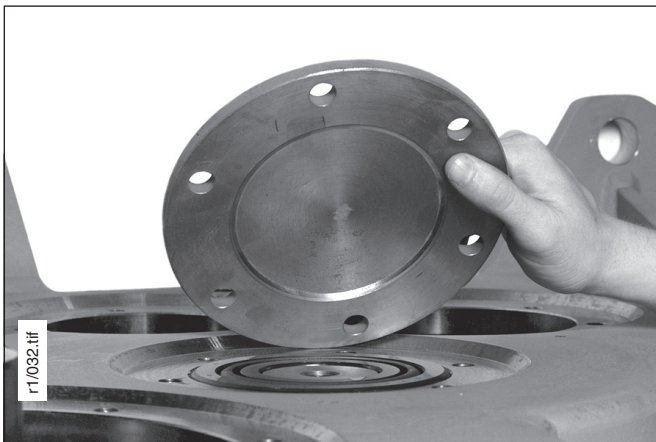


5. Using a depth gauge measure the distance from the face of the bearing cup to the winch housing. Add a shim pack of 0.004 to 0.007 in. (0.102-0.178 mm) greater than the measured distance. For example, if the measured distance is 0.004 in. (0.102 mm), add a shim pack with a total thickness of 0.008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



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

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

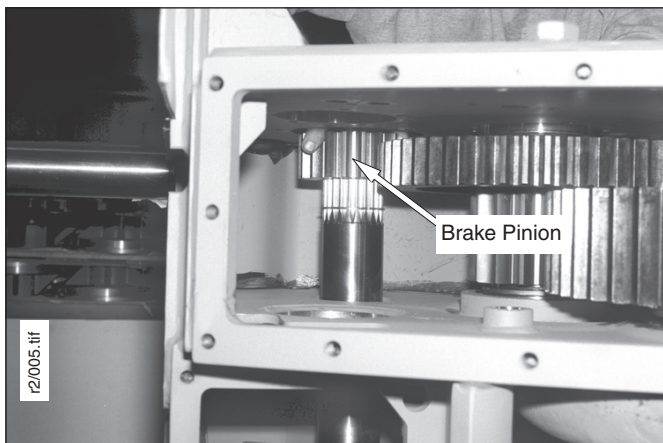
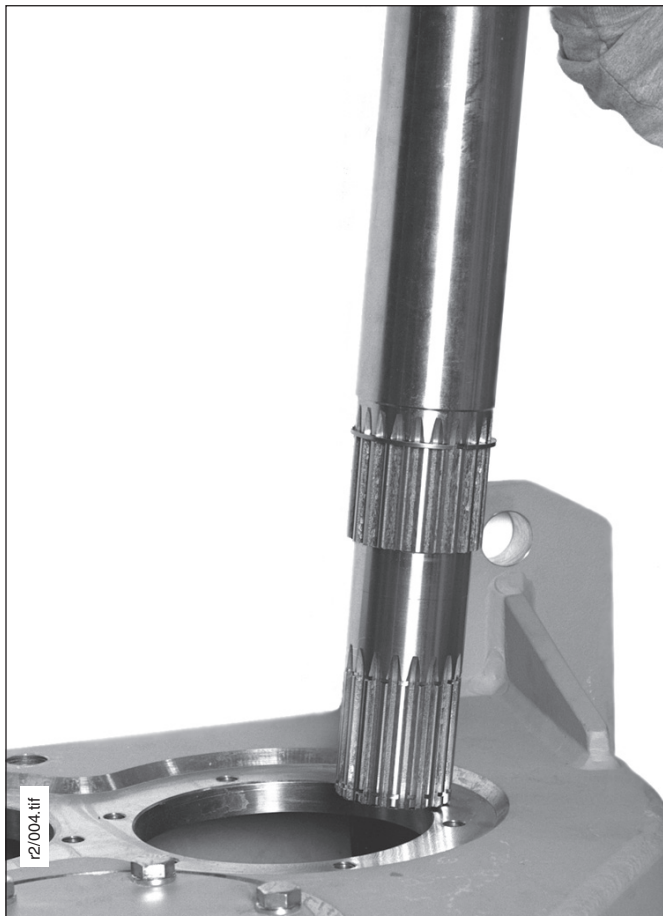


7. Tighten the six capscrews to 75 ft-lbs (10 kg-m).

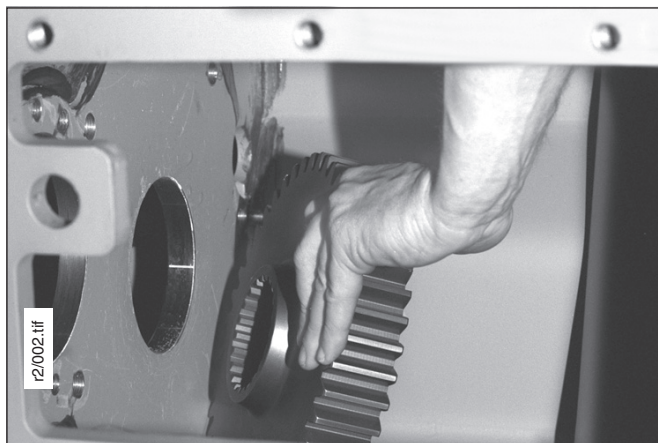
## Brake Shaft Installation

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

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



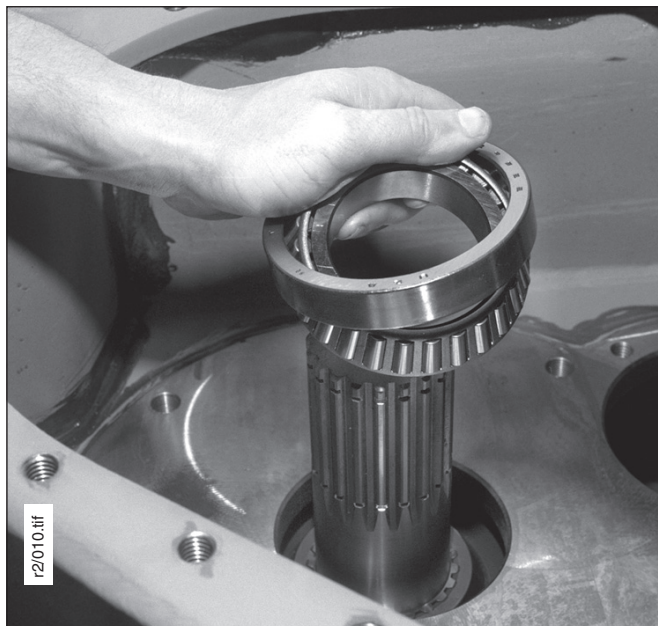
2. Install reduction gear and bearing cone on the left-hand end of the shaft.



### CAUTION

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

3. Install left-hand bearing cup into housing.



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



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



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

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

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

## Oil Clutch Reassembly (for All Ratios)

### CAUTION

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

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

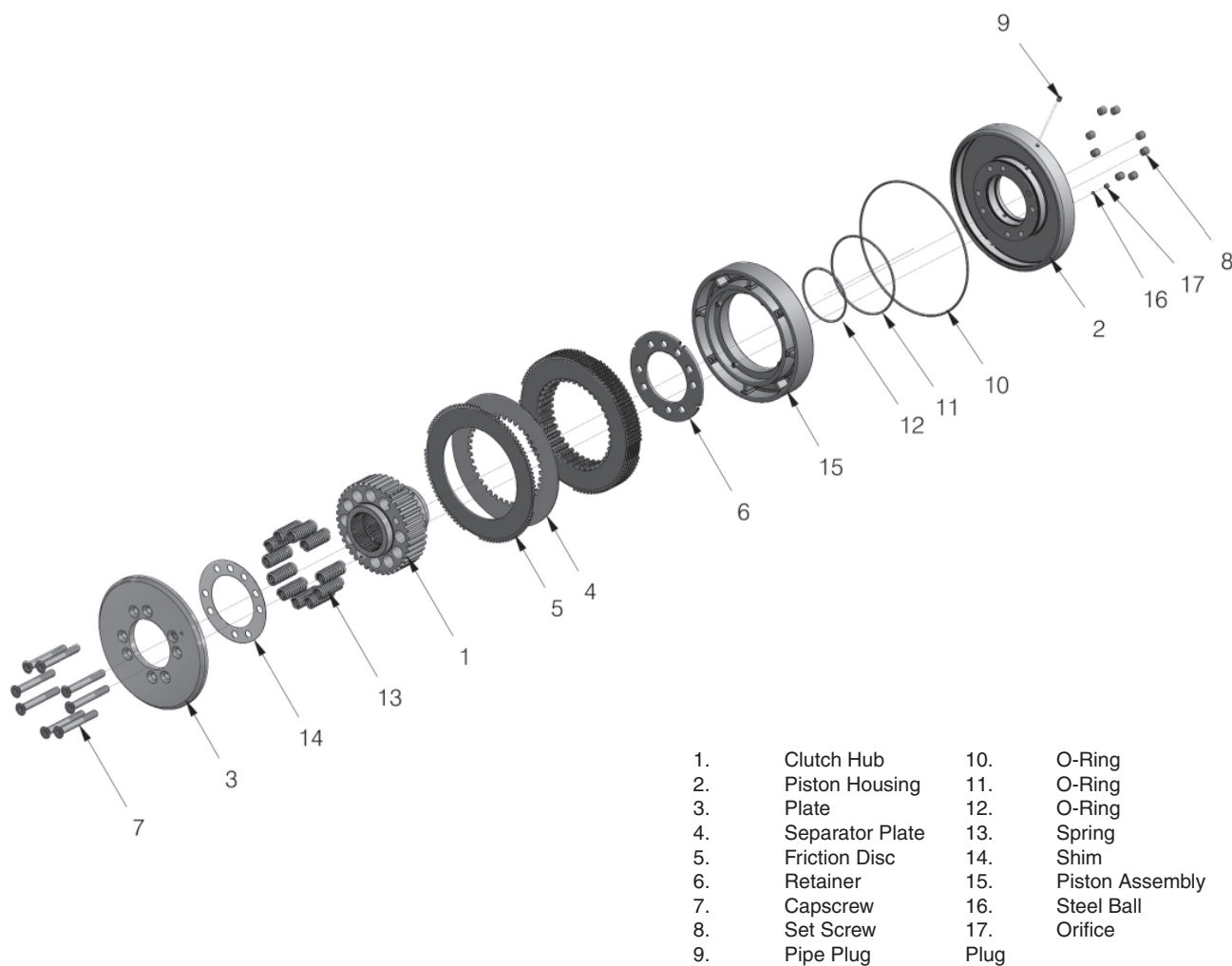
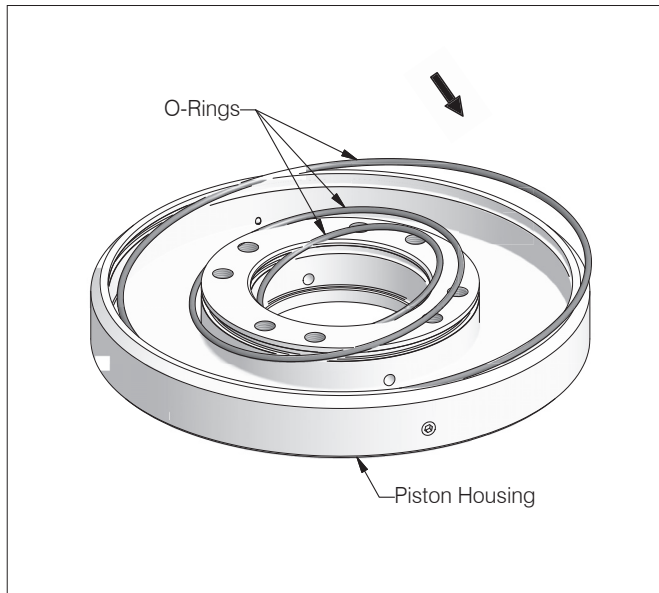


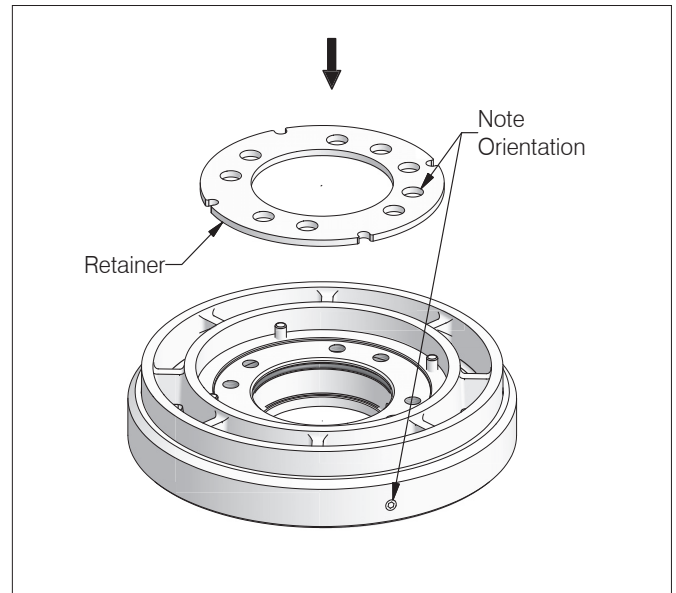
Figure 4-12 Oil Clutch Assembly

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



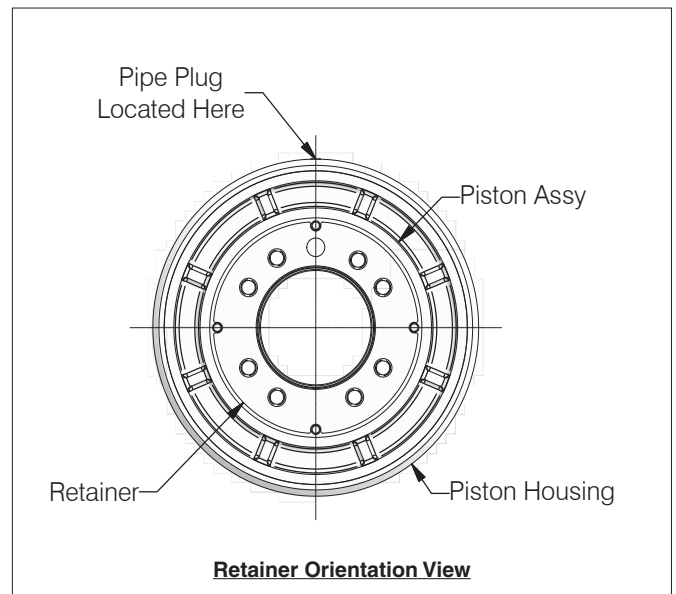
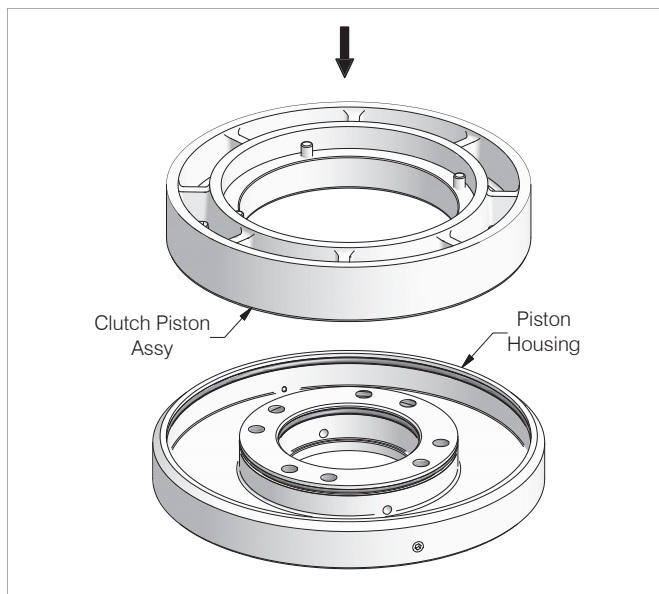
**NOTE:** It may be necessary to stretch both the large and the small O-ring so that it will stay in its groove during installation of the piston.

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

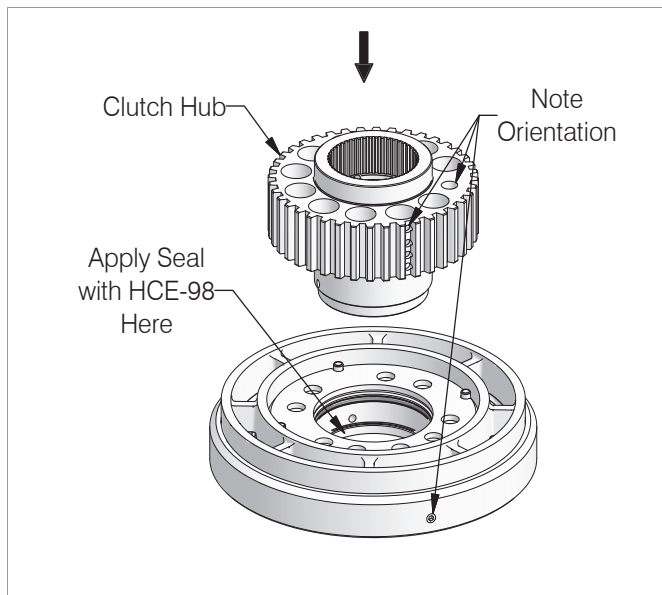


**NOTE:** If the retainer is reassembled upside down, the holes will almost align, but not enough to reassemble properly.

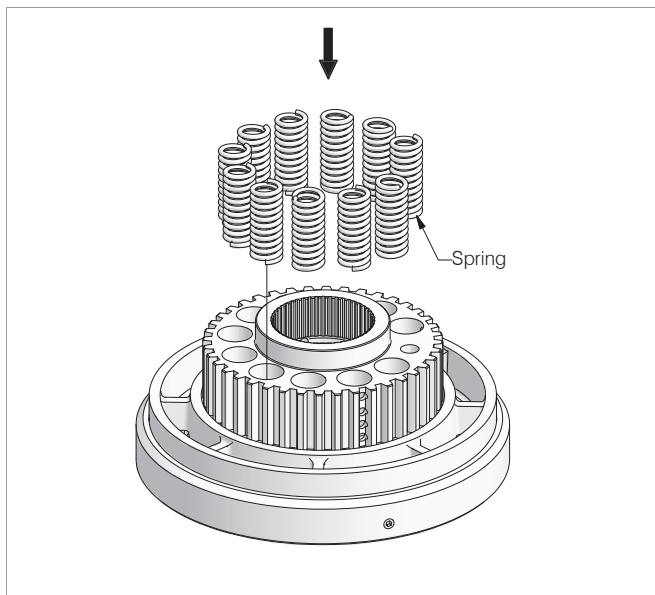
2. Carefully install the piston in the housing.



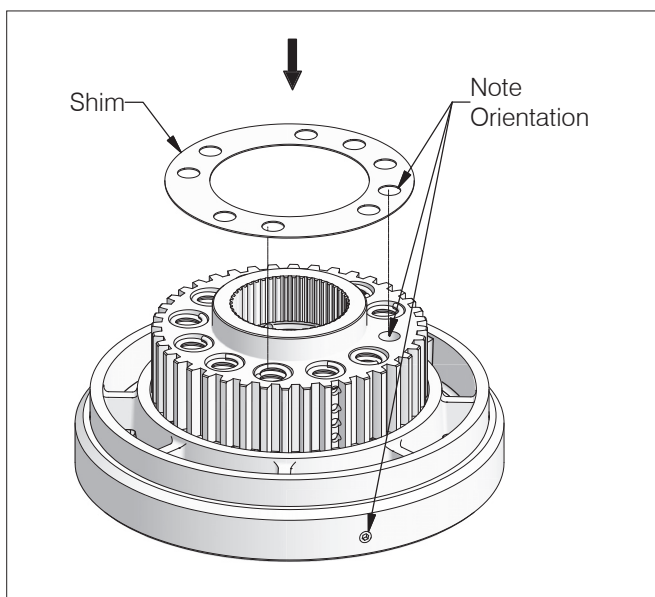
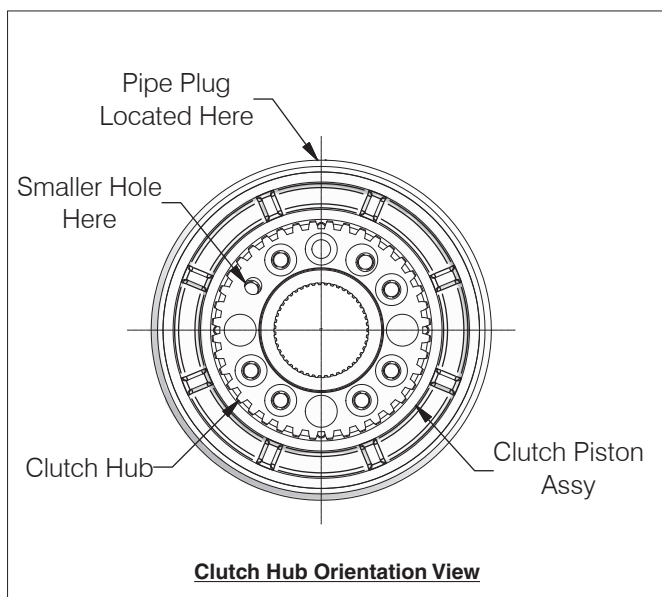
4. Install the clutch hub in the piston housing. Ensure that the holes are properly sequenced with those in the piston housing. Refer to the Clutch Hub Orientation View below.



5. Install the release springs into the clutch hub.

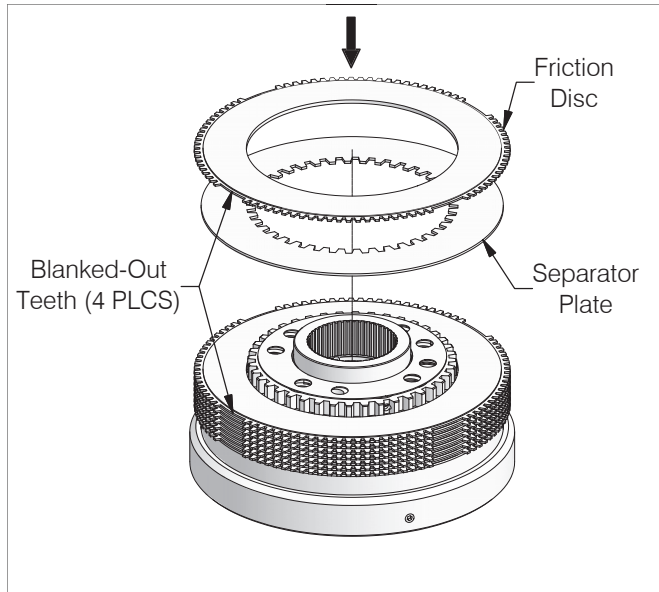


6. Install the shim. Pay attention to the orientation, and note that if the shim is reassembled upside down, the holes will almost align, but not enough to reassemble properly.

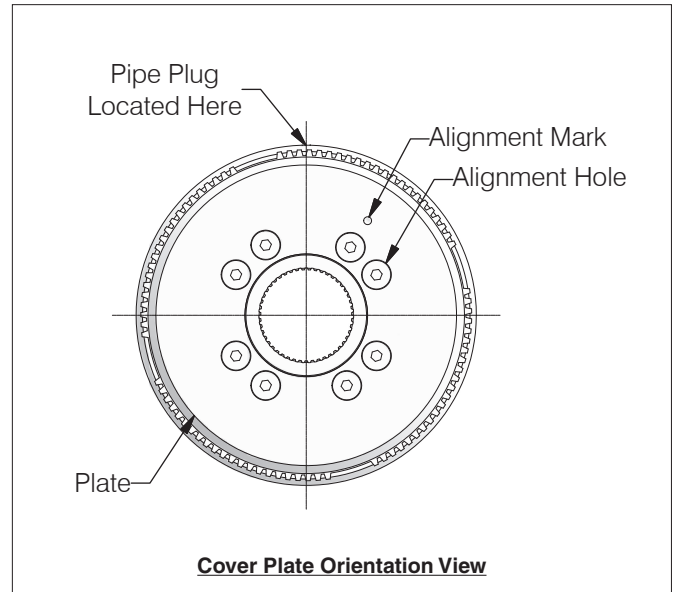




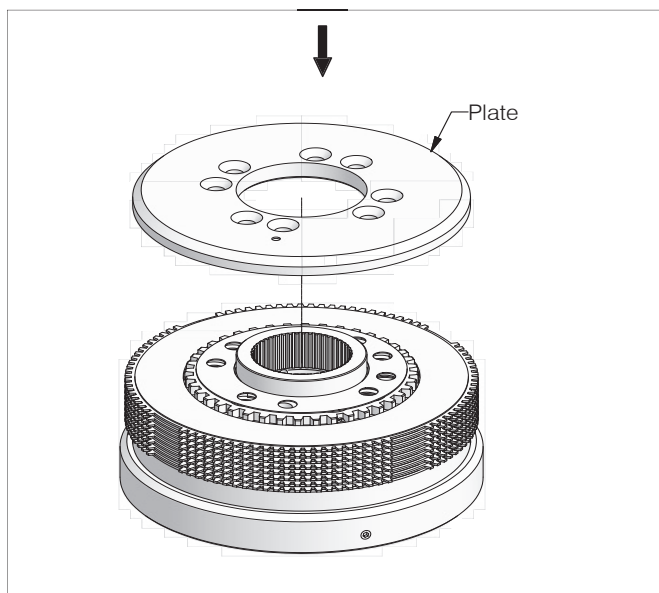
7. Starting with a separator plate on the hub, alternately place the separator plates and the friction discs on the clutch hub. The W12E winch uses 8 friction discs and separator plates.



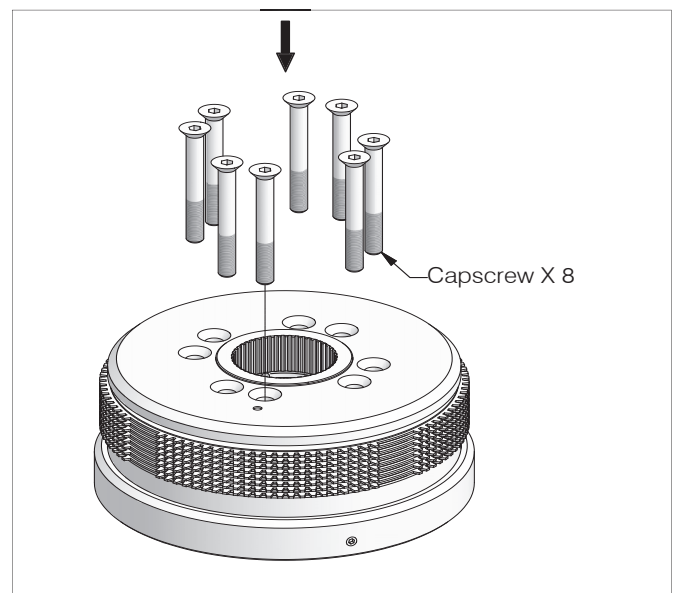
**NOTE:** The blanked-out teeth of the friction discs must be assembled in line.



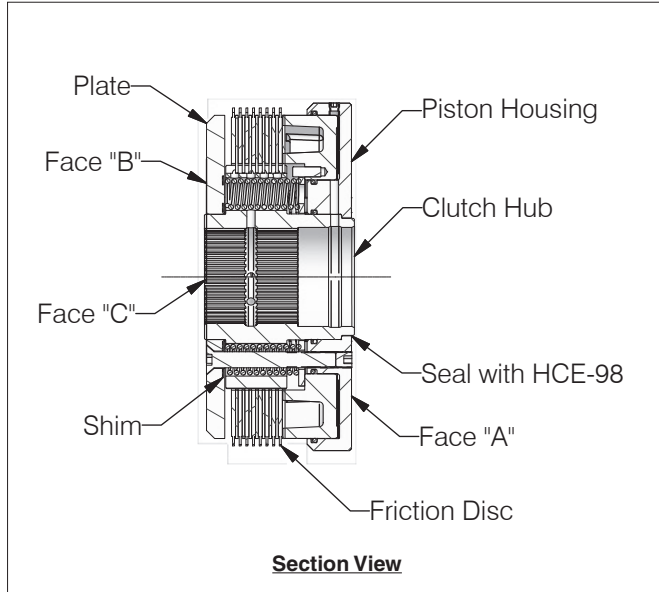
8. Install the cover plate as marked during disassembly. Pay attention to the orientation as shown in Cover Plate Orientation View below.



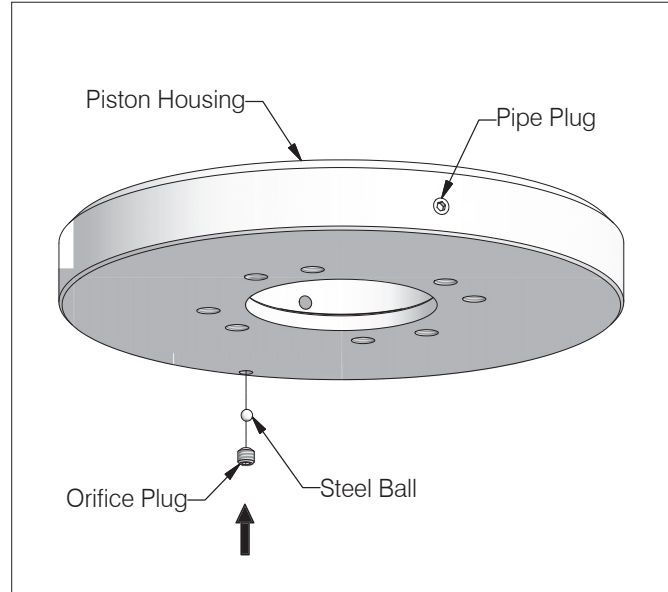
9. Install capscrews by torquing them to 70 ft-lbs (10 kg-m).



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



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

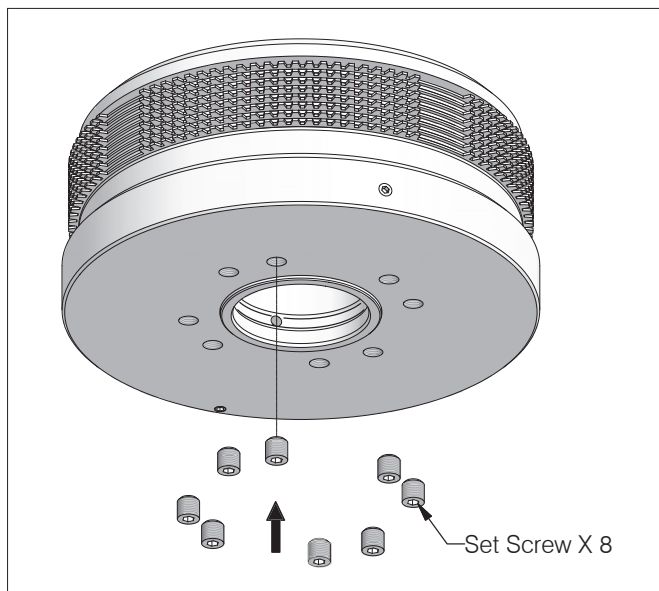


## CAUTION

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

**NOTE:** The pipe plug must not extend into the piston bore.

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



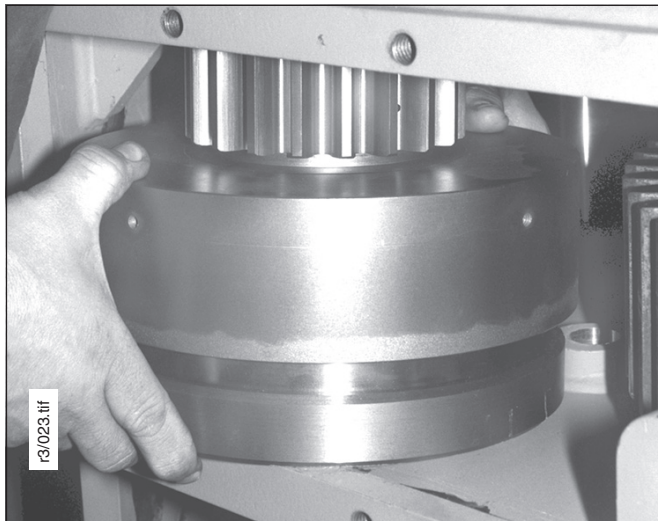
## Clutch Shaft Reassembly and Installation

See Figure 4-1 on page 4-2 for the location of clutch shaft components.

### NOTE:

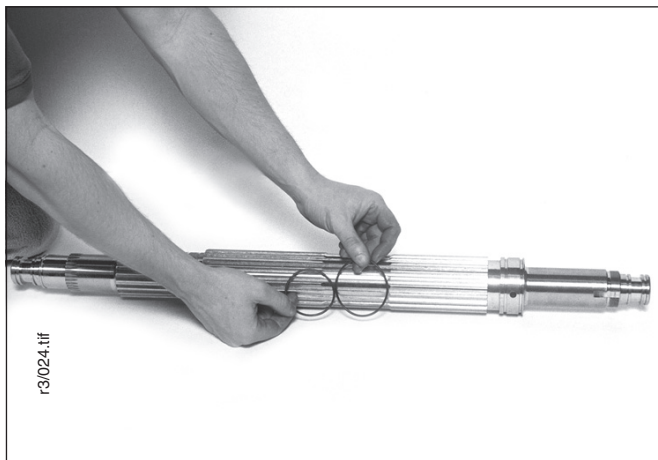
**1. The reduction gear (see Brake Shaft Installation, Step 2) must be installed before installation of the clutch shaft assembly. This is due to insufficient clearance for installing the reduction gear when the bevel gear shaft is installed.**

1. Using 1/4"-20 lifting eye (Allied P/N X-203348, see page 4-66) installed in the spider, lower the reverse clutch assembly into the housing.



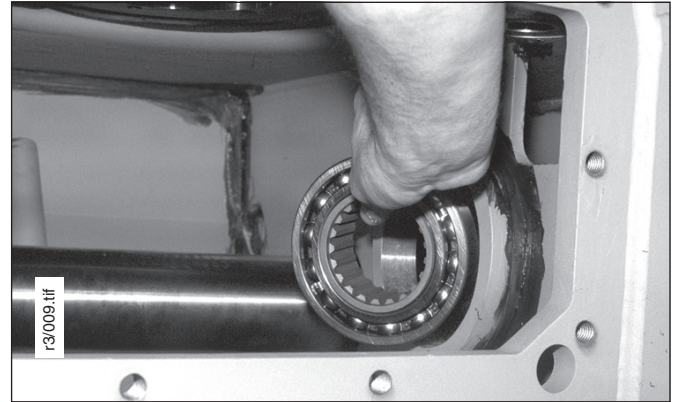
**NOTE: There are two roller bearings inside the reverse clutch housing.**

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

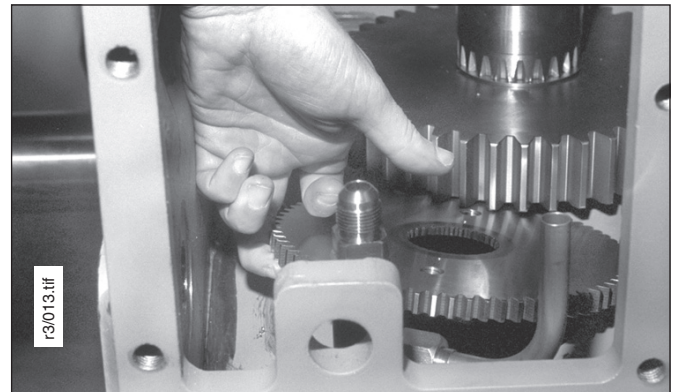


3. Position the clutch shaft so the blanked-out tooth is up. The pipe plug in the RH end of the shaft will be down.

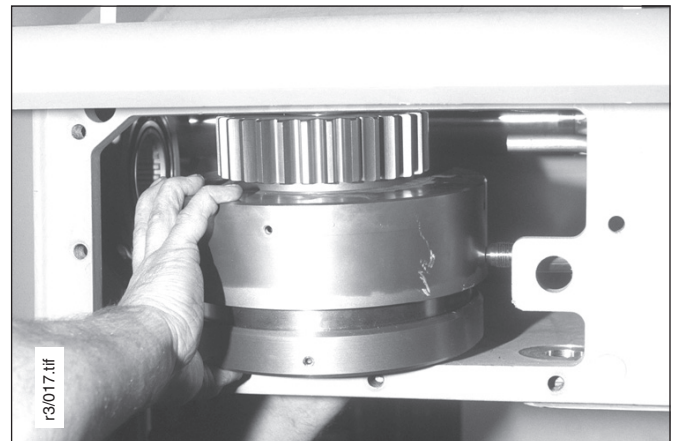
4. Install ball bearing and bearing carrier.



5. Place the pump drive gear in the housing as shown. Ensure that the dished side of the gear faces toward the brake compartment.



6. Install forward clutch assembly into the housing.



**NOTE: There is one roller bearing inside the forward clutch housing.**

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

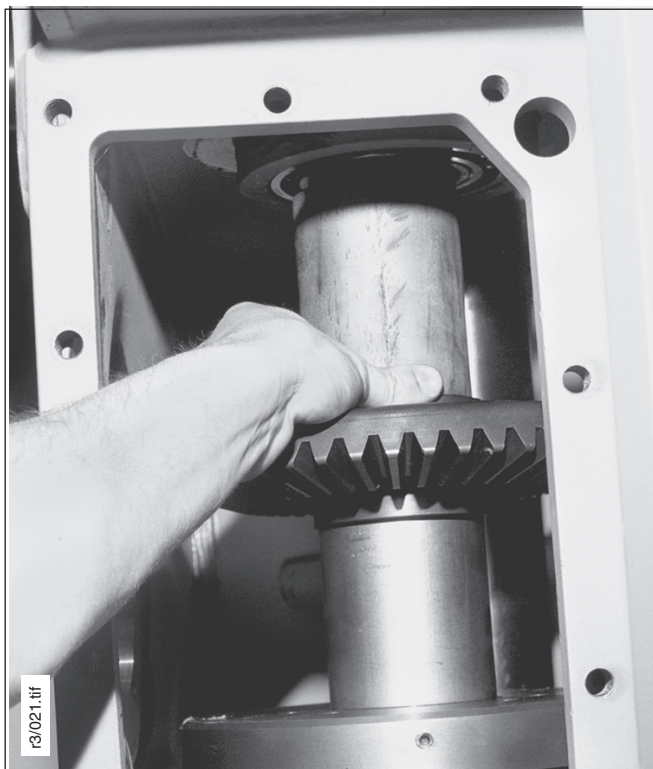
**NOTE: Ensure that the bearing and bearing carrier are installed as shown in the Oil Clutch Reassembly subsection, Step 14.**



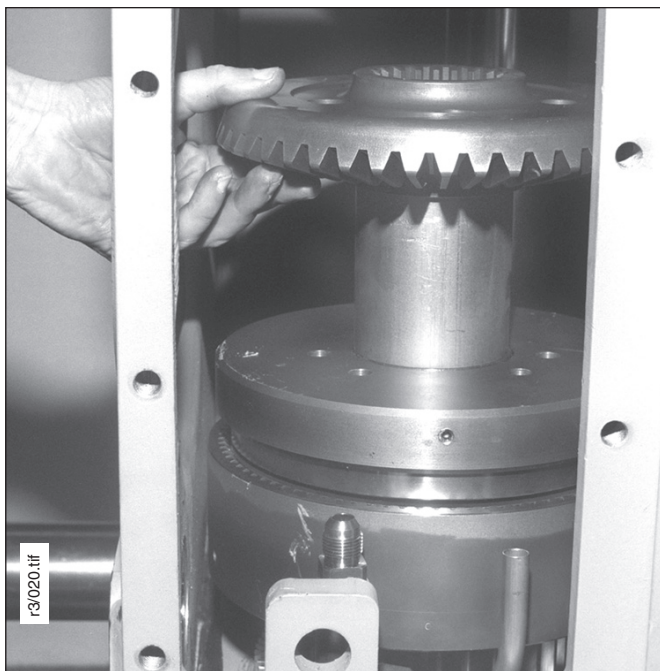
7. Install spacer next to forward clutch.



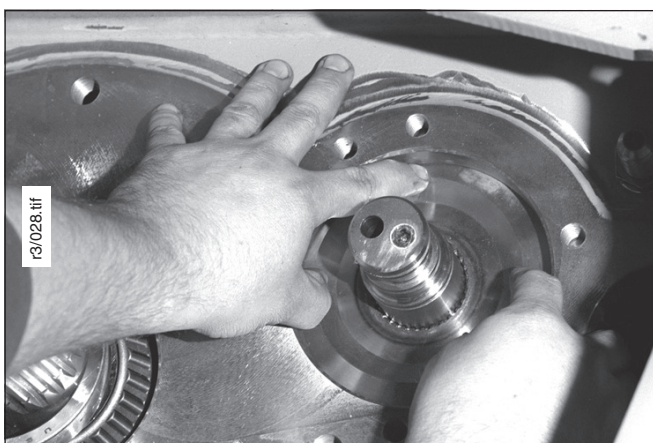
9. Insert clutch shaft far enough to install spacer between bevel gear and bearing and carrier.



8. Insert the ring gear.



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

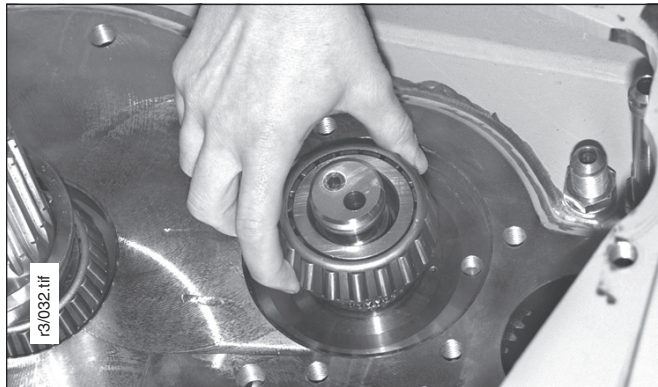




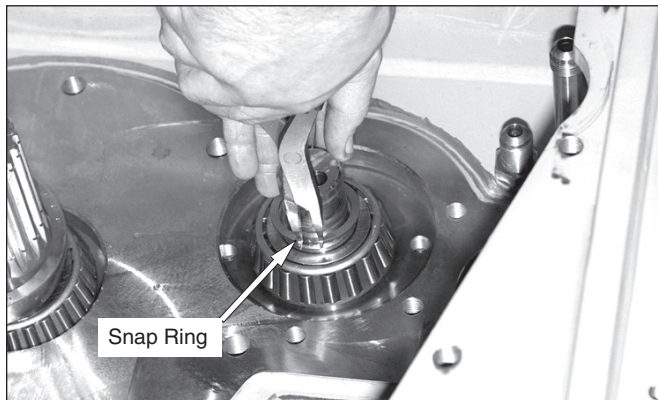
## ⚠ CAUTION

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

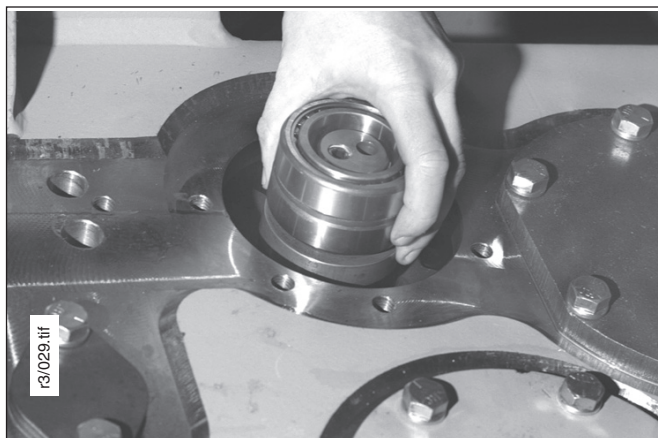
11. Remove capscrews from pump drive gear and install tapered roller bearing cone on left-hand end of the clutch shaft.



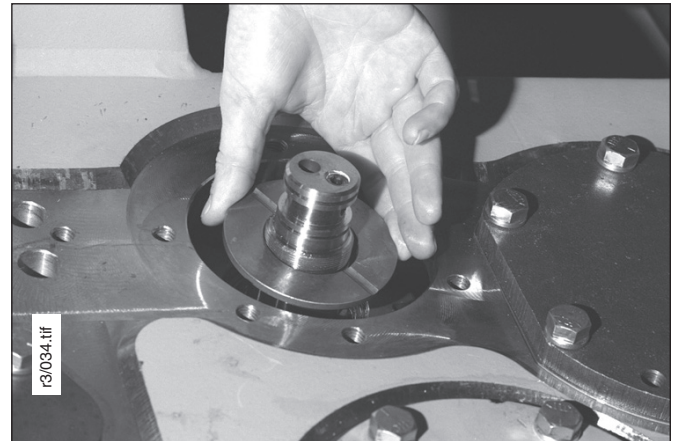
12. Secure the bearing with the snap ring.



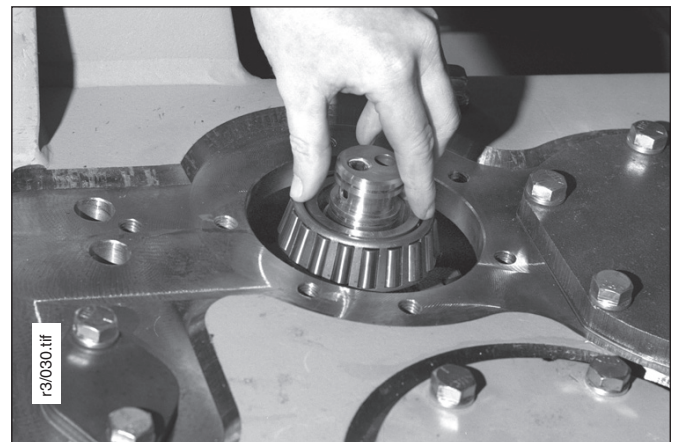
13. Pull shaft back towards the right. Install the roller bearing and carrier in the reverse clutch assembly and secure with the internal snap ring.



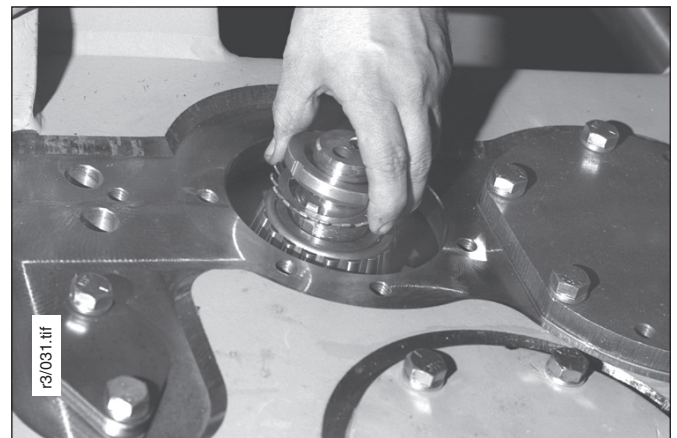
14. Install the thrust washer over the right-hand end of the shaft.



15. Install the tapered roller bearing.

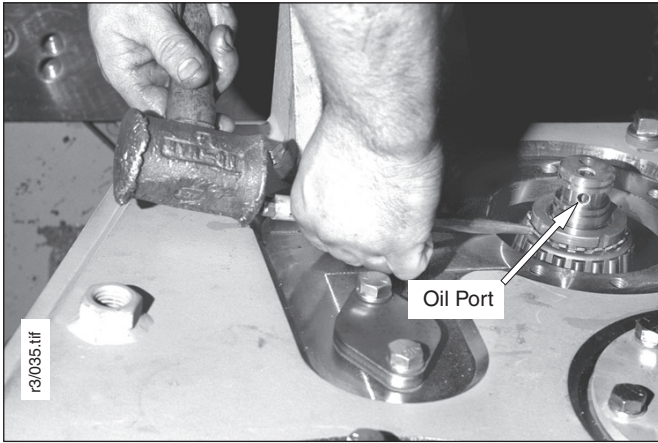


16. Install the lock ring and special nut as shown.



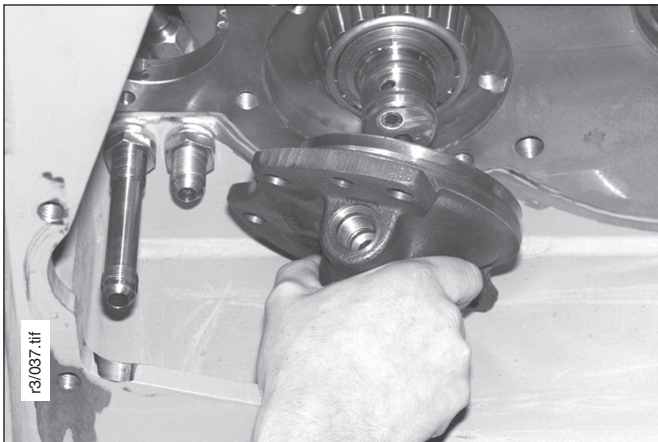


17. Use clutch shaft locknut socket specified on page 4-66 to tighten the locknut to 200 ft-lbs (28 kg-m). Bend two locking tangs over flats of locknut.

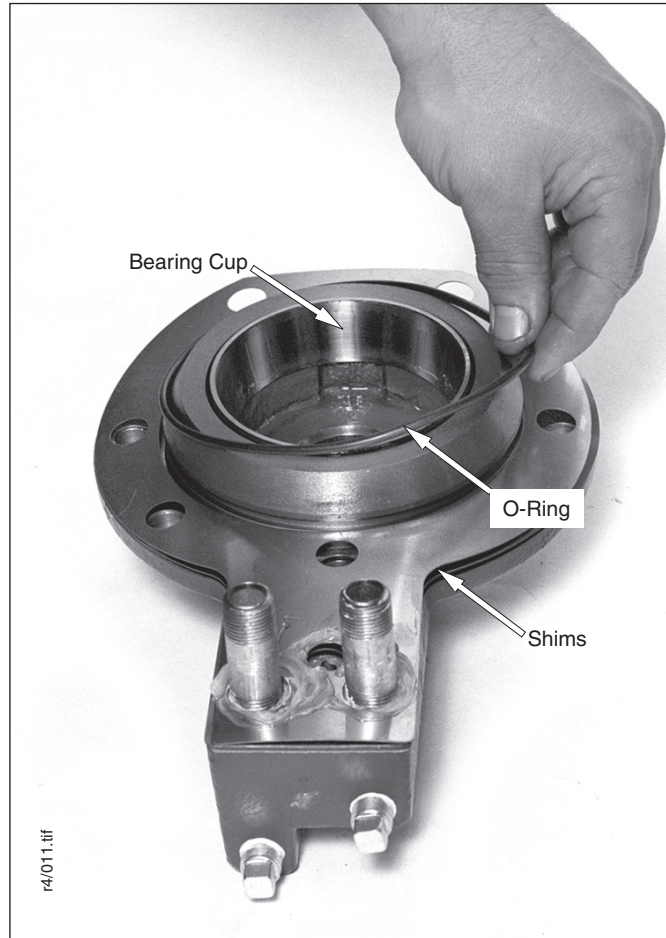


Apply air pressure to oil port on each end of the shaft and check clutch piston for movement. When air pressure is applied piston should move approximately 1/8 inch (3 mm) to 3/19 inch (5 mm).

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



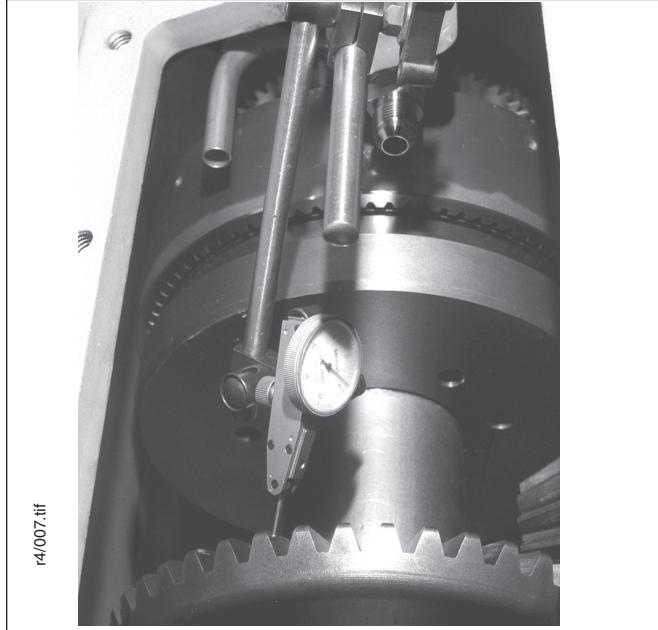
19. If removed, install bearing cup and O-ring in the right-hand retainer. Assemble a shim pack approximately 0.040 in. (1.02 mm) thick on the right-hand bearing retainer and install retainer. Do not install cast iron seals. Tighten capscrews securely. Do not tighten to final torque at this time.



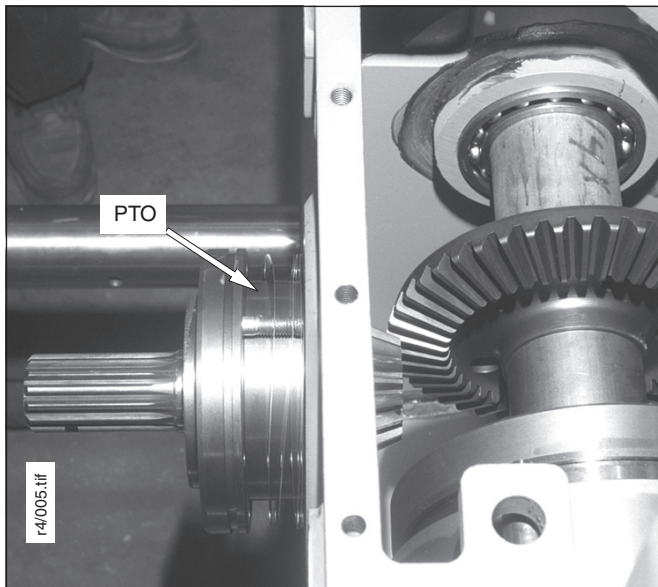
20. Apply air pressure to oil port on each end of the shaft and check clutch piston for movement. When air pressure is applied piston should move approximately 1/8 inch (3 mm) to 3/19 inch (5 mm).



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

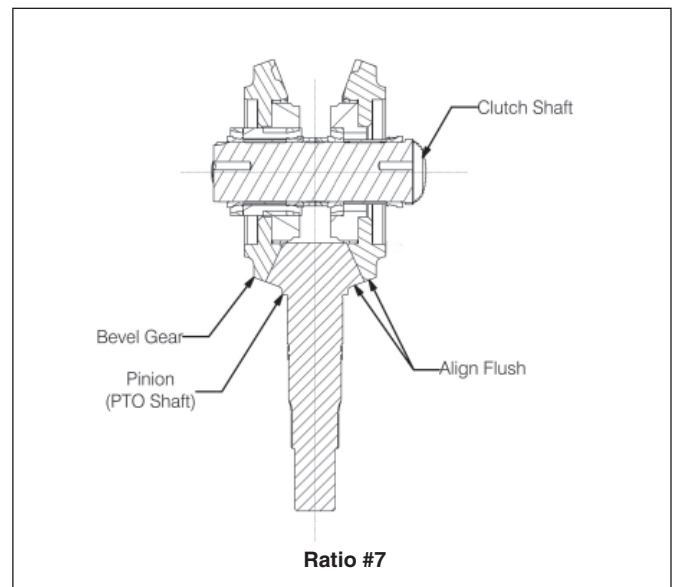
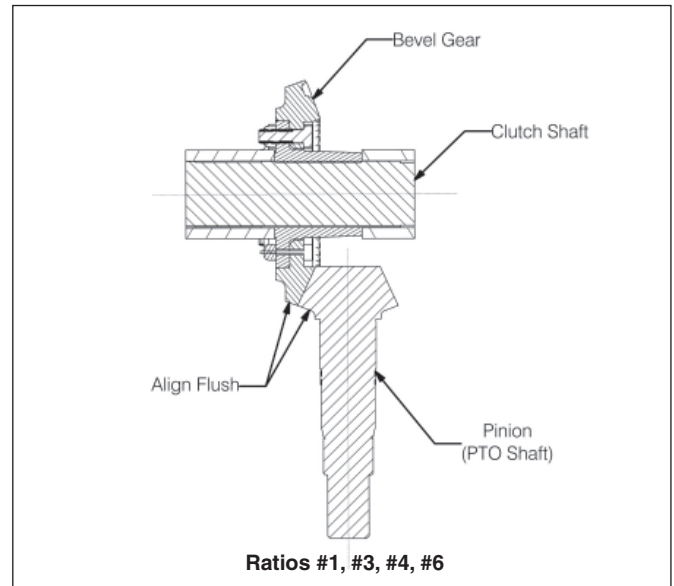


22. Assemble PTO shaft as described in the **PTO Shaft Reassembly and Installation** subsection, if previously disassembled. Install PTO and add or subtract shims to get heel to heel alignment. Tighten capscrews to 75 ft-lbs (10 kg-m). Lockwire capscrews upon completion of shimming.



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

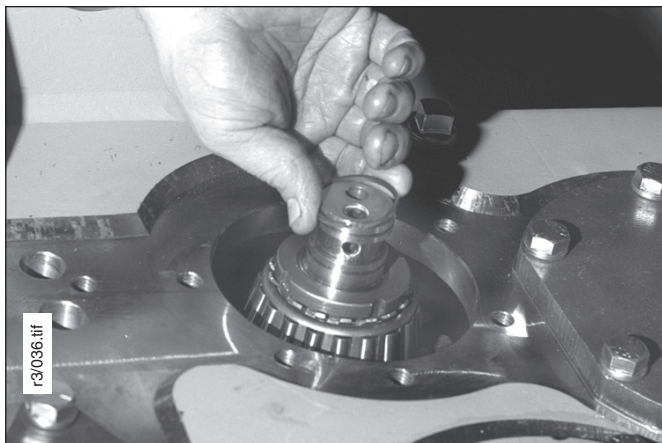
23. Use dial indicator to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.014 in. (0.152-0.356 mm). If the backlash is not within this range either the pinion or the ring gear will need to be moved. A gear contact pattern check will determine which gear needs to be moved. Moving the ring gear 0.0014" (0.036 mm) will change the backlash 0.001" (0.025 mm). Moving the pinion 0.004" (0.102 mm) will change the backlash 0.001" (0.025 mm). Add or subtract shims from each side in equal amounts to change the backlash without affecting the bearing preload setting.



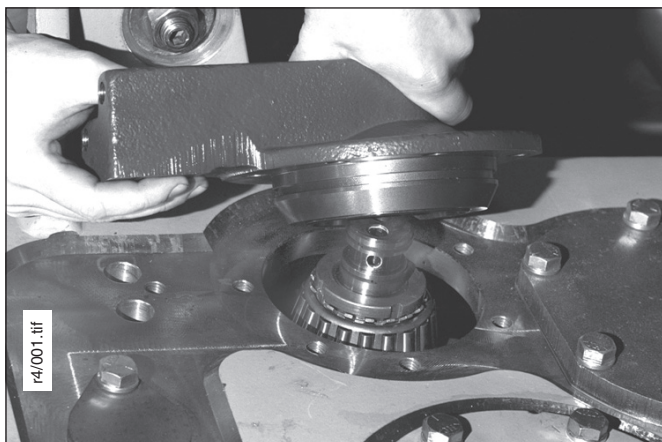
**NOTE:** Prior to checking pinion-to-bevel gear backlash place the clutch shaft in a normal operating position by forcing the ring gear away from the pinion gear laterally along the clutch shaft. Check the gear contact as shown in PTO Shaft Reassembly and Installation subsection, step 5.



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

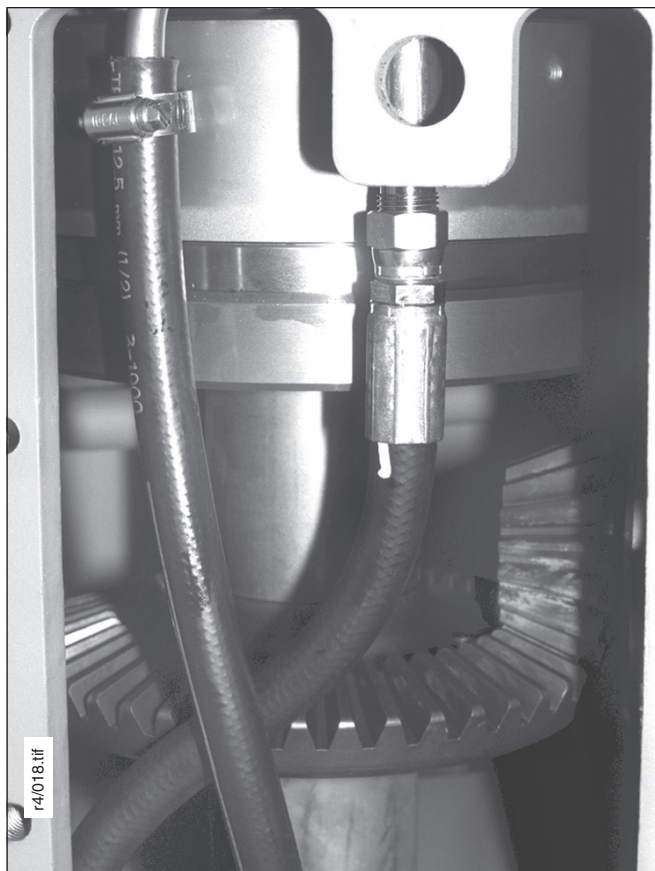


25. Install a new O-ring on the bearing retainer. Lube bore and O-ring. Coat the shim packs with Loctite. Carefully install both bearing retainers with their finalized shim packs.

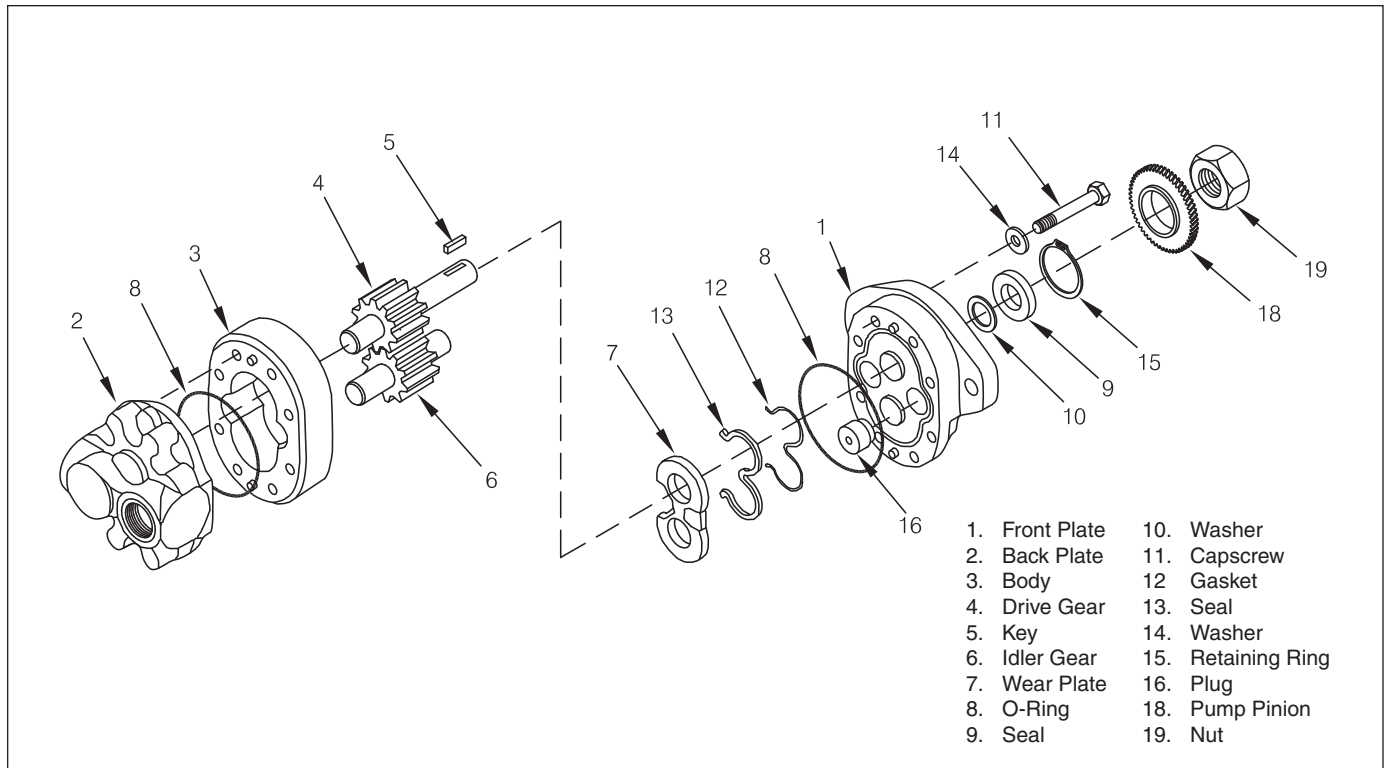


26. Tighten capscrews on both bearing retainers to 75 ft-lbs (10 kg-m).

27. Install clutch crossover hoses as shown and tighten securely. Twist pressure hose to route away from bevel gear. Lock in rotated position.



## Hydraulic Pump Reassembly & Installation (for all ratios)



**Figure 4-13 Hydraulic Pump**

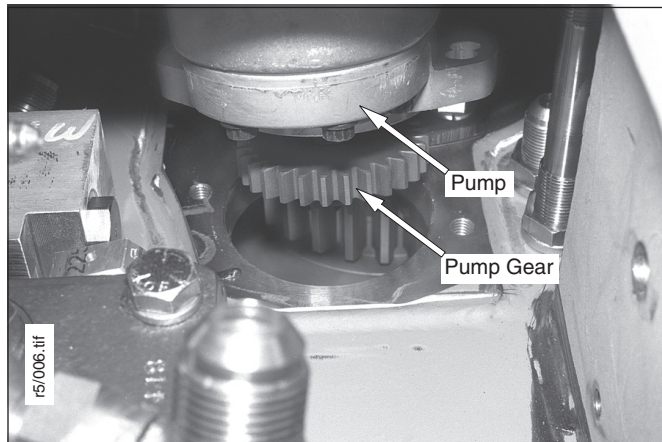
### Hydraulic Pump Reassembly

1. Replace as new parts seal kit (7, 12, 13), O-ring (8), and shaft seal (9).
2. Press protector gasket (12) and back-up seal (13) into wear plate (7).
3. Drop plug (16) into right-side hole in the front plate (1) as shown in Figure 4-13 above.
4. Place wear plate (7), along with gasket (12) and seal (13), on top of the inside face of the front plate - bronze face up.
5. Install O-ring (8) in the groove of front plate.
6. Dip gear assembly into oil.
7. Apply a thin coat of petroleum jelly to both milled gear pockets of body. Slip body over gears onto front plate with half moon port cavities in body facing backplate. Check if scribed location mark lines up.
8. Install O-ring (3) in groove of backplate.
9. Slide back plate over gear shafts. Line up scribed location mark.
10. Place pump in vise, shaft down, and install capscrew (11) with washer (14). Torque evenly 25 to 28 lb/ft. (33.9 to 38.0 Nm).
11. Oil shaft seal (9) with petroleum jelly and work shaft seal over drive gear shaft taking care not to cut rubber sealing lip.
14. Seat shaft seal carefully by tapping with plastic hammer.
15. Add a generous portion of clean oil to both ports to ensure that the pump is adequately lubricated. Rotate pumpshaft by hand. Pump will have small amount of drag but should turn freely after short period of use.
16. Replace the driveshaft key (5).

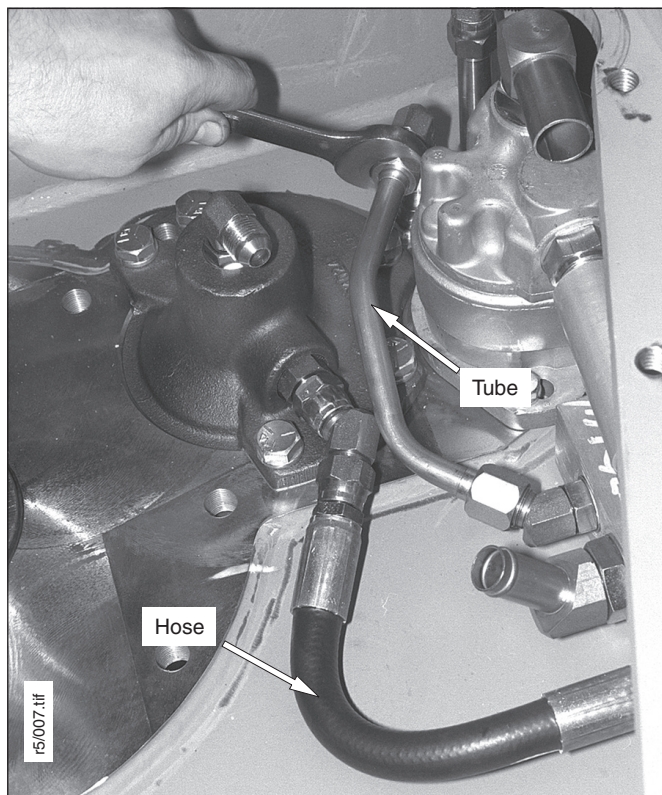
**NOTE: Fill the pump with the same oil used in the winch prior to installation. This is important to protect the pump from aeration during initial operation.**

## Pump Installation

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



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



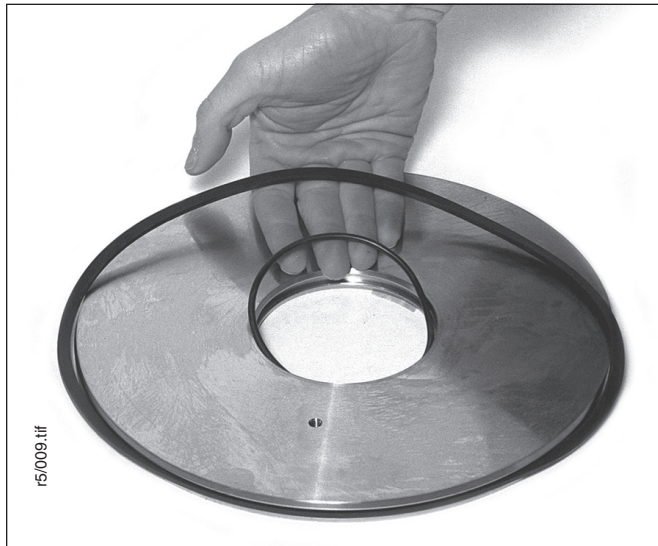
**NOTE:** Install hose before installing tube.



## Oil Brake Reassembly and Installation

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

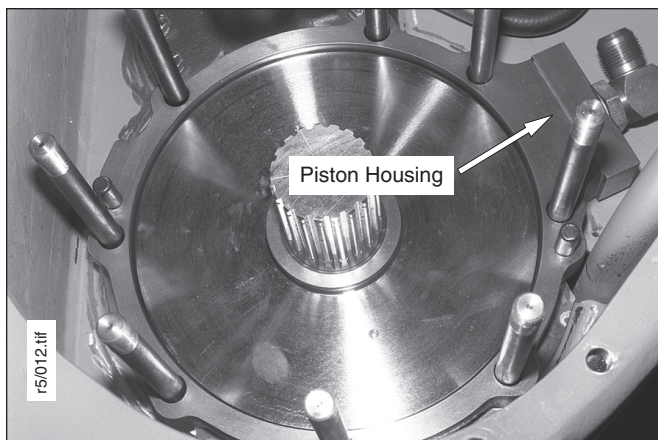
1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston housing.



### **CAUTION**

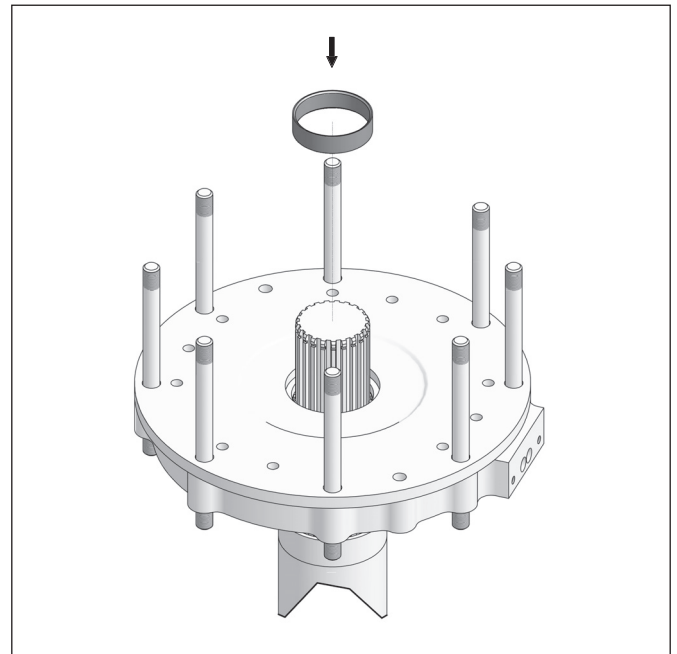
Use only Allied Systems Company approved O-rings to ensure proper sealing.

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

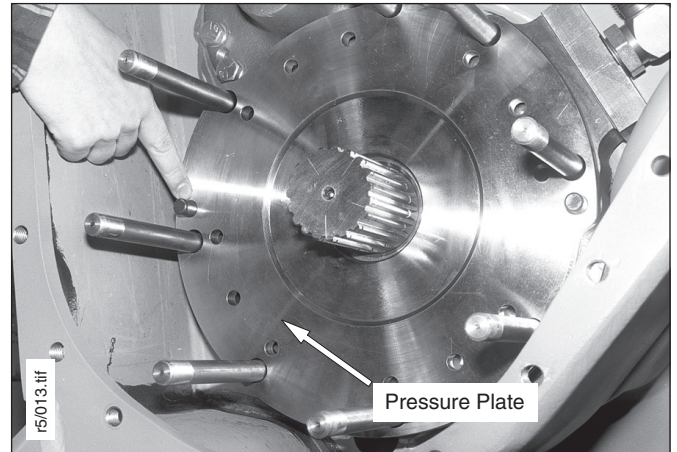


**NOTE:** Make sure that bearing on brake shaft is properly positioned before installing housing.

5. Install the spacer.



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

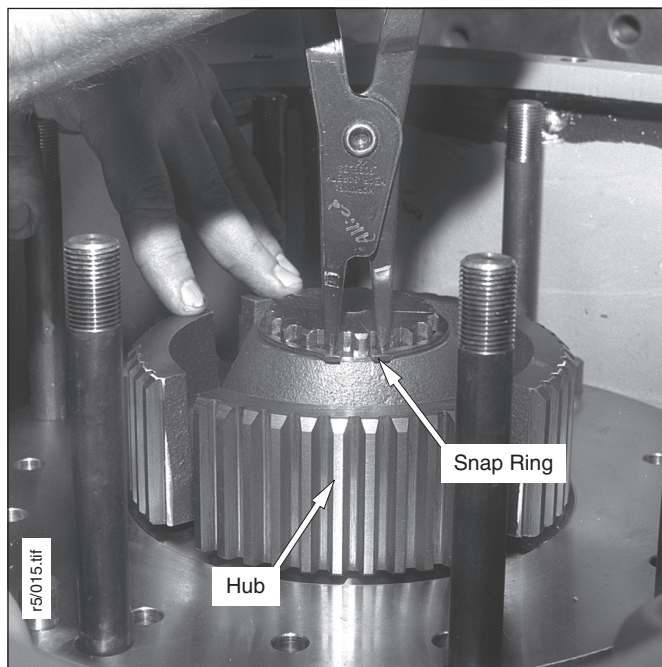


7. Install hub.

### **CAUTION**

Do not reverse hub. Dish must face out.

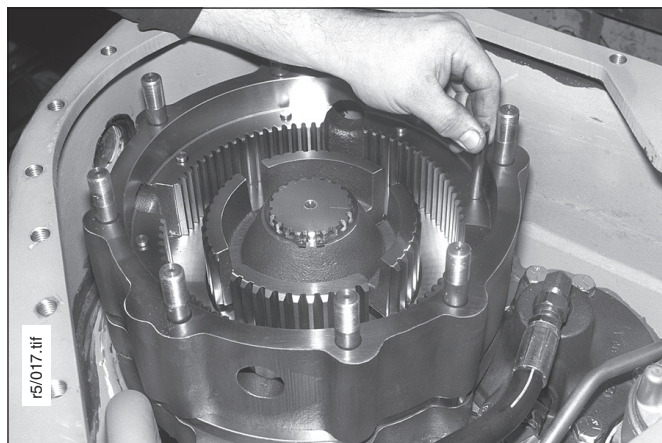
8. Install snap ring.



## ⚠ CAUTION

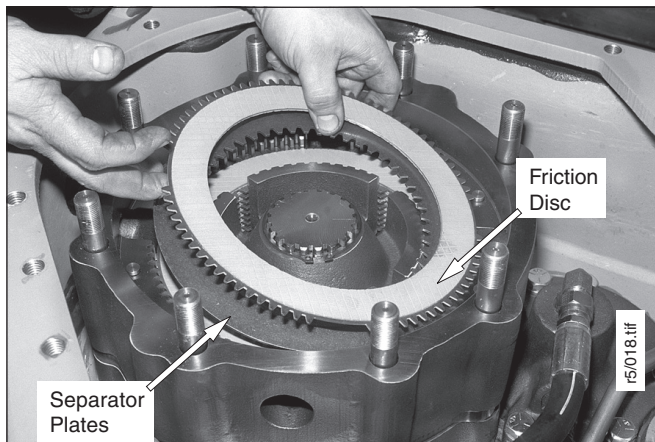
Make sure that snap ring is securely positioned in brake shaft groove.

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



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

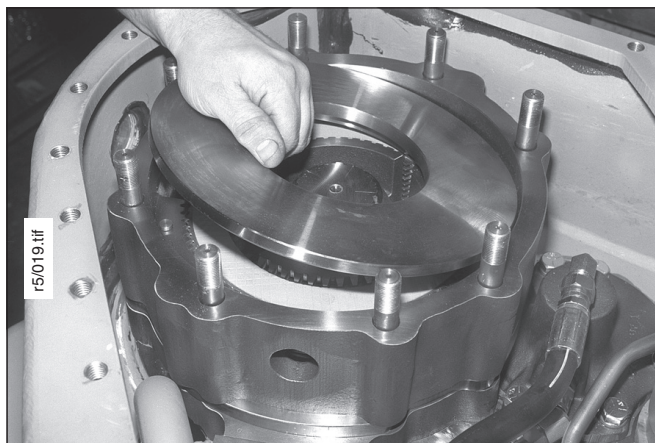
10. Install the friction discs and separator plates alternately starting with a friction disc. Align blanked-out teeth on all friction discs. 10 friction discs and 9 separator plates are used.



## ⚠ CAUTION

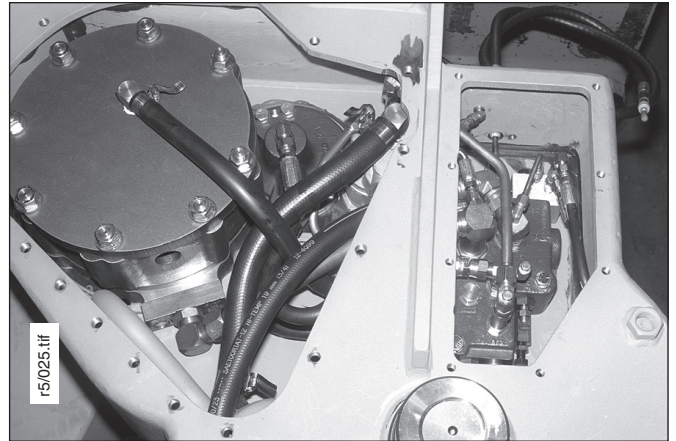
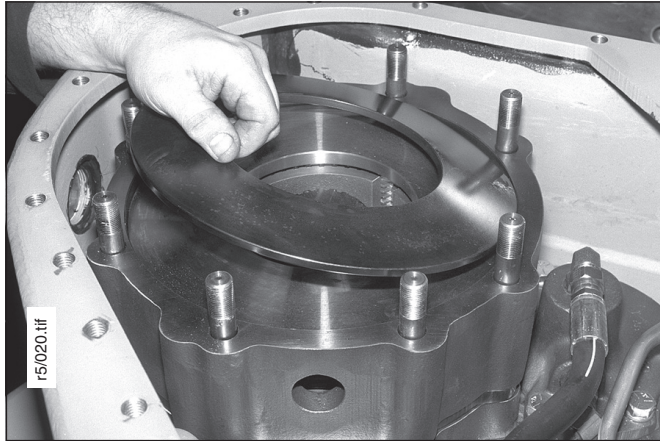
Face all separator plates in the same direction. All dished sides must face either inward or outward.

11. Install thrust ring, smooth side out.

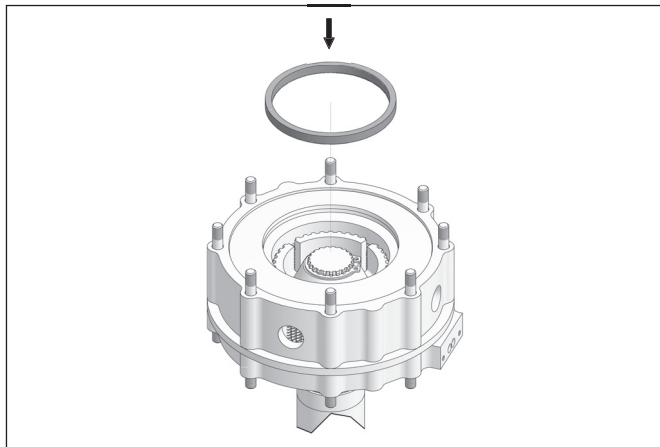




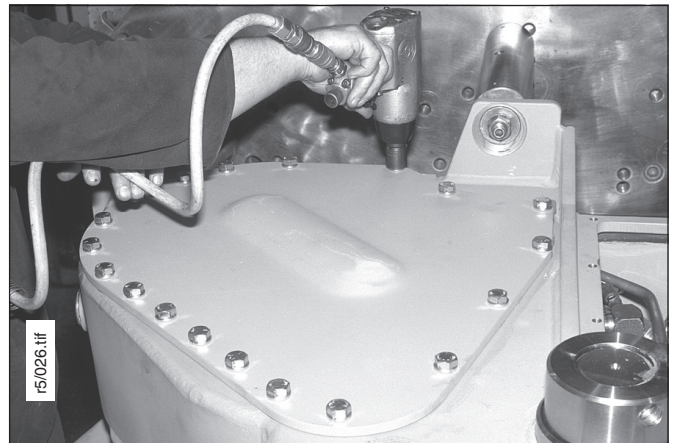
12. Install two belleville springs with curved side pointing outward.



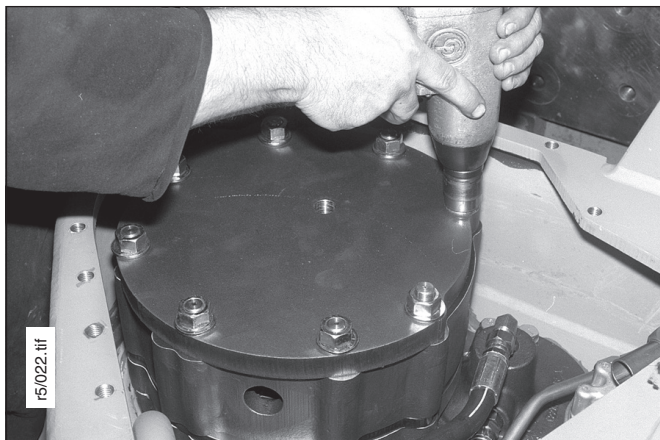
13. Install the stroke limiter.



15. Install winch covers.



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



## PTO Shaft Reassembly and Installation

**NOTE:** If equipped with a dropbox, refer to Figures 4-17 through 4-19 on pages 4-51 and 4-52 for location of components. Assembly of the PTO shaft is essentially the same for most tractors as shown in steps 1 through 5.

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

**NOTE:** If equipped with a dropbox, the PTO shaft assembly should be assembled and installed as described in the Clutch Shaft Reassembly and Installation subsection, step 22. After the PTO shaft is installed the adapter box can be placed over the PTO shaft assembly and secured with the winch.

### Correct/Incorrect tooth contact:

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

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

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

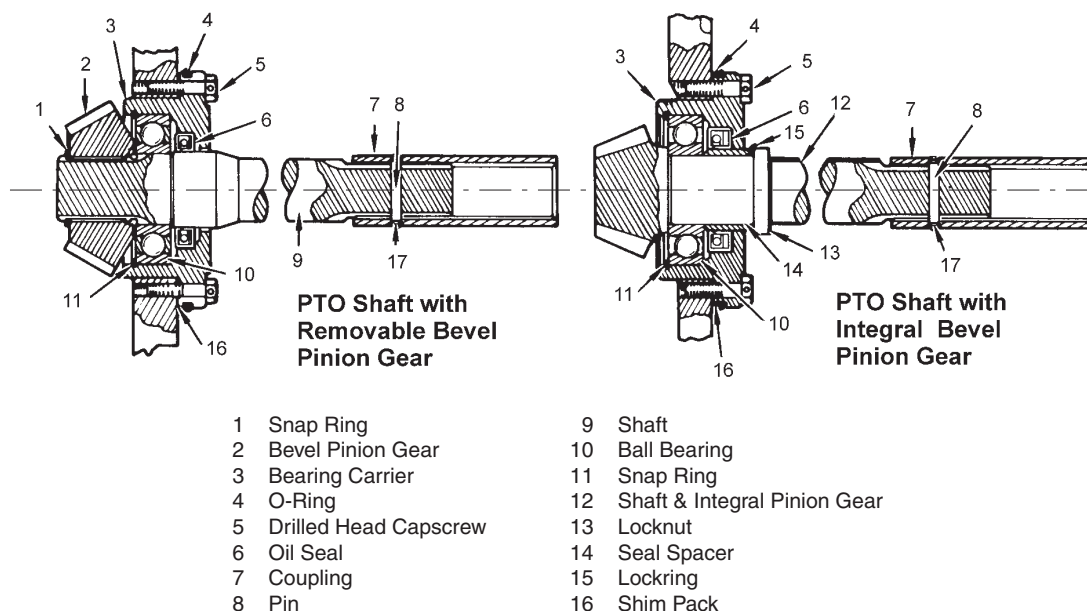
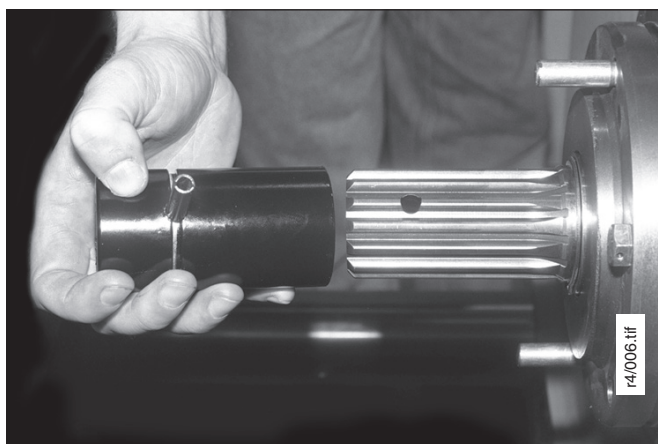
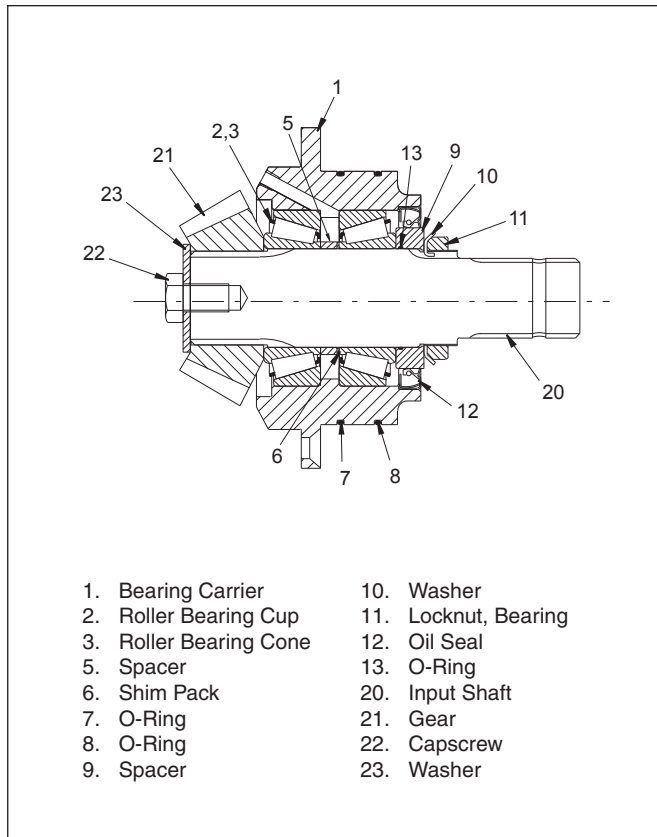
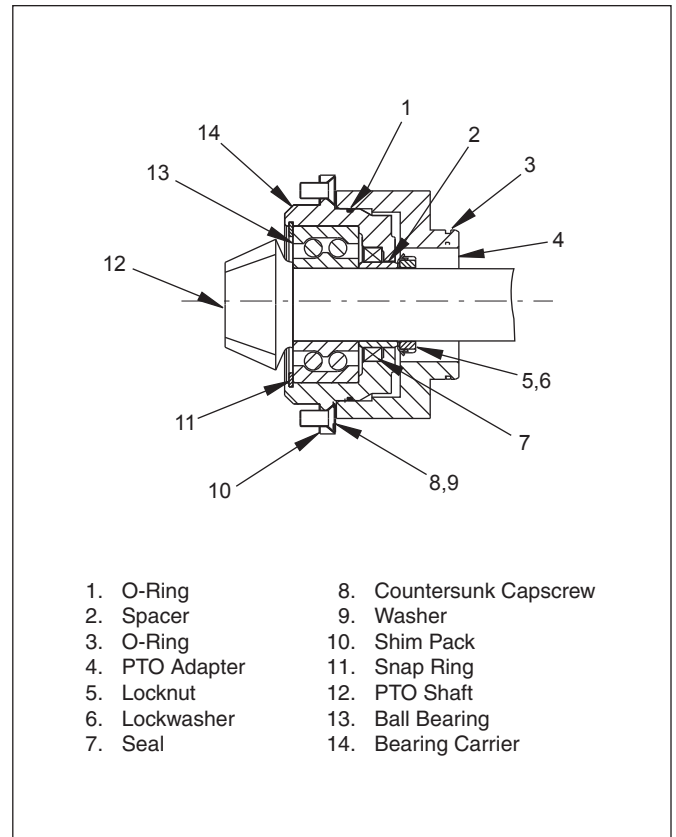


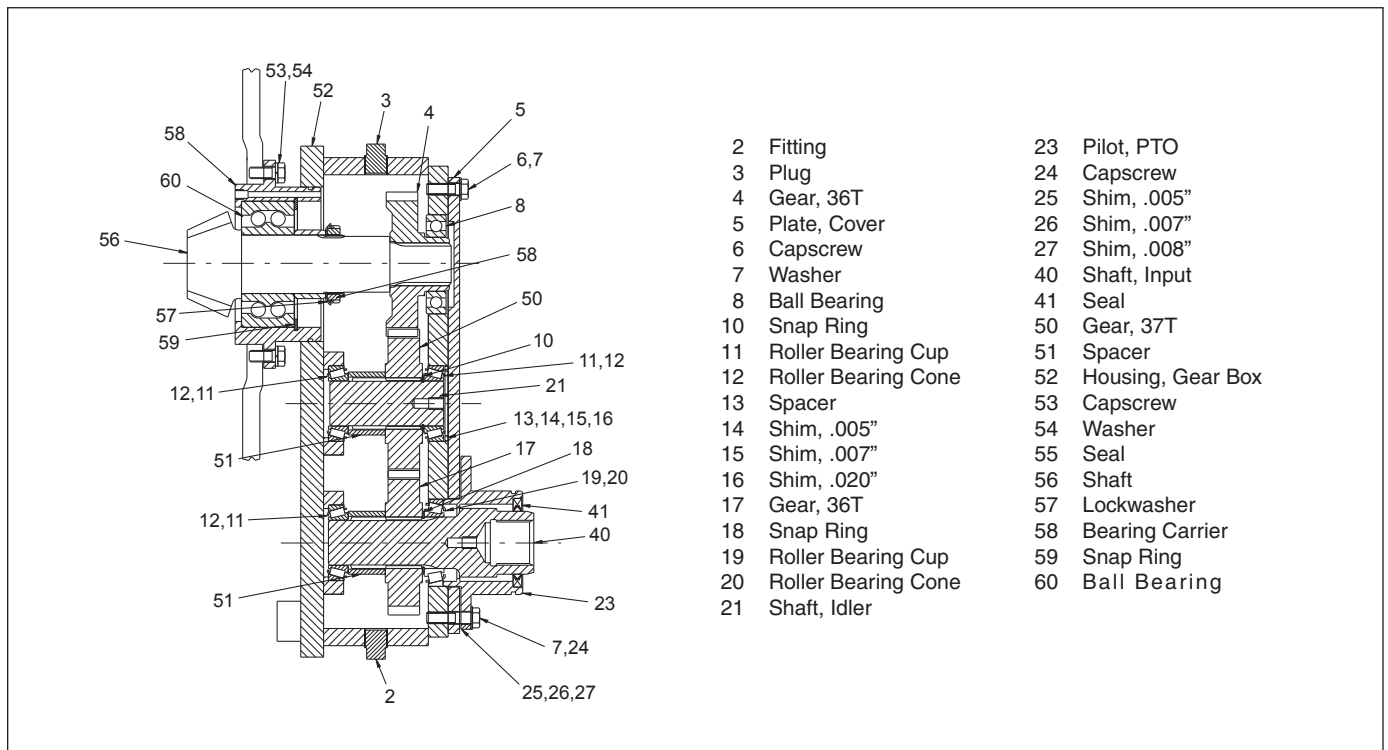
Figure 4 - 14 PTO Shafts



**Figure 4-15 PTO Shaft for Caterpillar D8,L, D9N & D10N;  
Komatsu 375A-1; New Holland FH/FD30B**

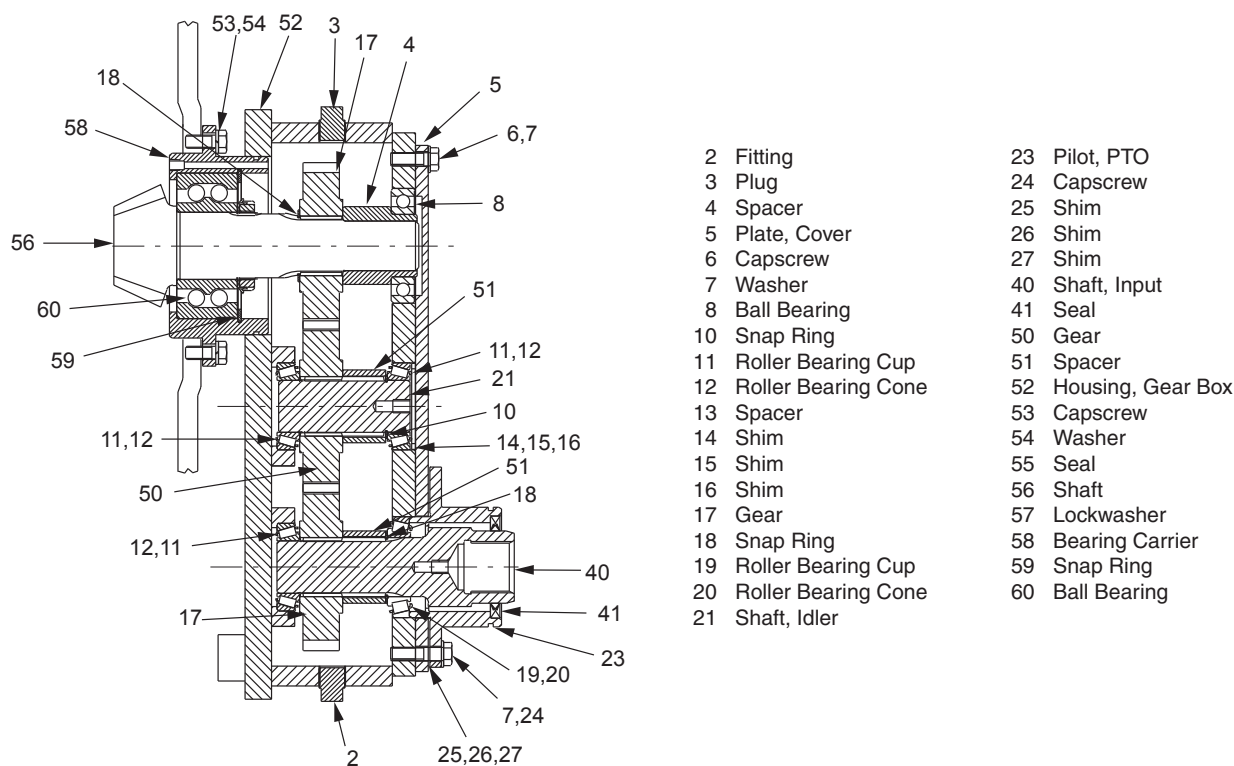


**Figure 4-16 PTO Shaft for Dresser TD25E/G**

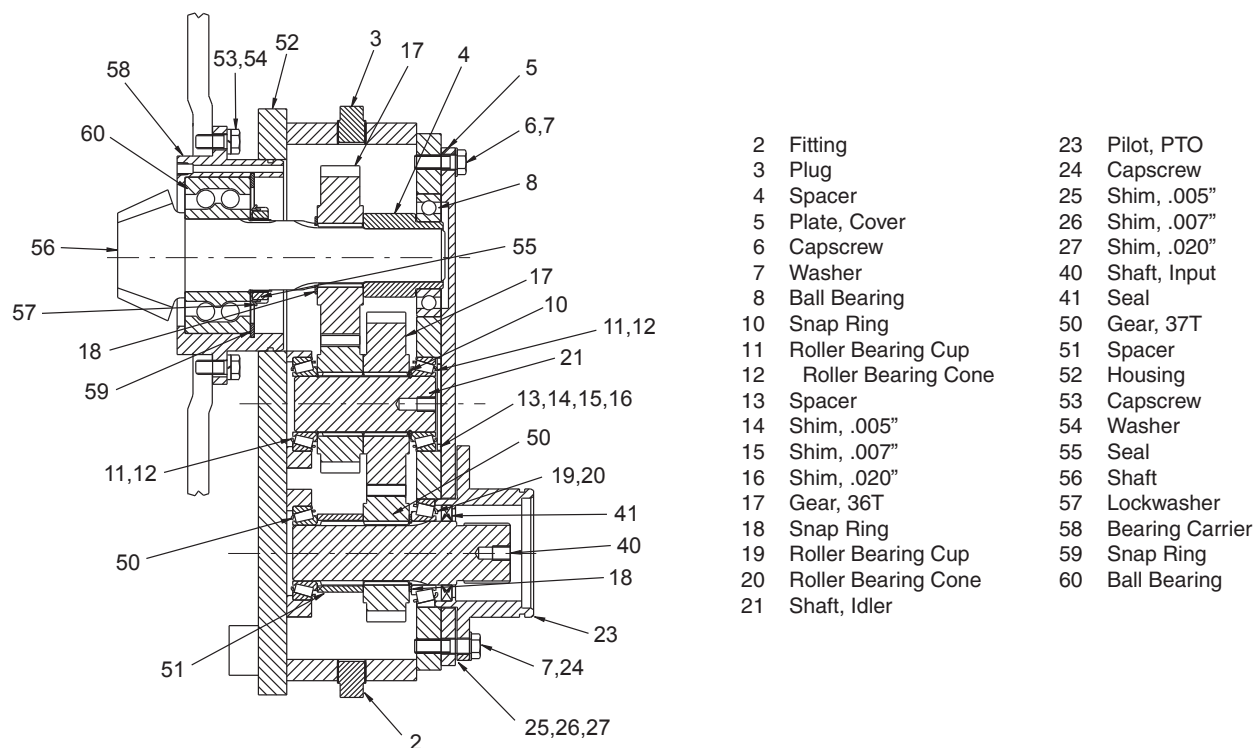


**Figure 4-17 1:1 Dropbox for Caterpillar 583R, 583T, 587T, D8R, D8T  
Last Used on AW12E-1103**





**Figure 4-18 1:1 Dropbox for Caterpillar 583R, 583T, 587T, D8R, D8T  
First Used on AW12E-1104**



**Figure 4-19 1.8:1 Dropbox for Caterpillar D9N, D9R, D9T  
(Similar to D10N/R/T)**

## Clutch Shaft Location

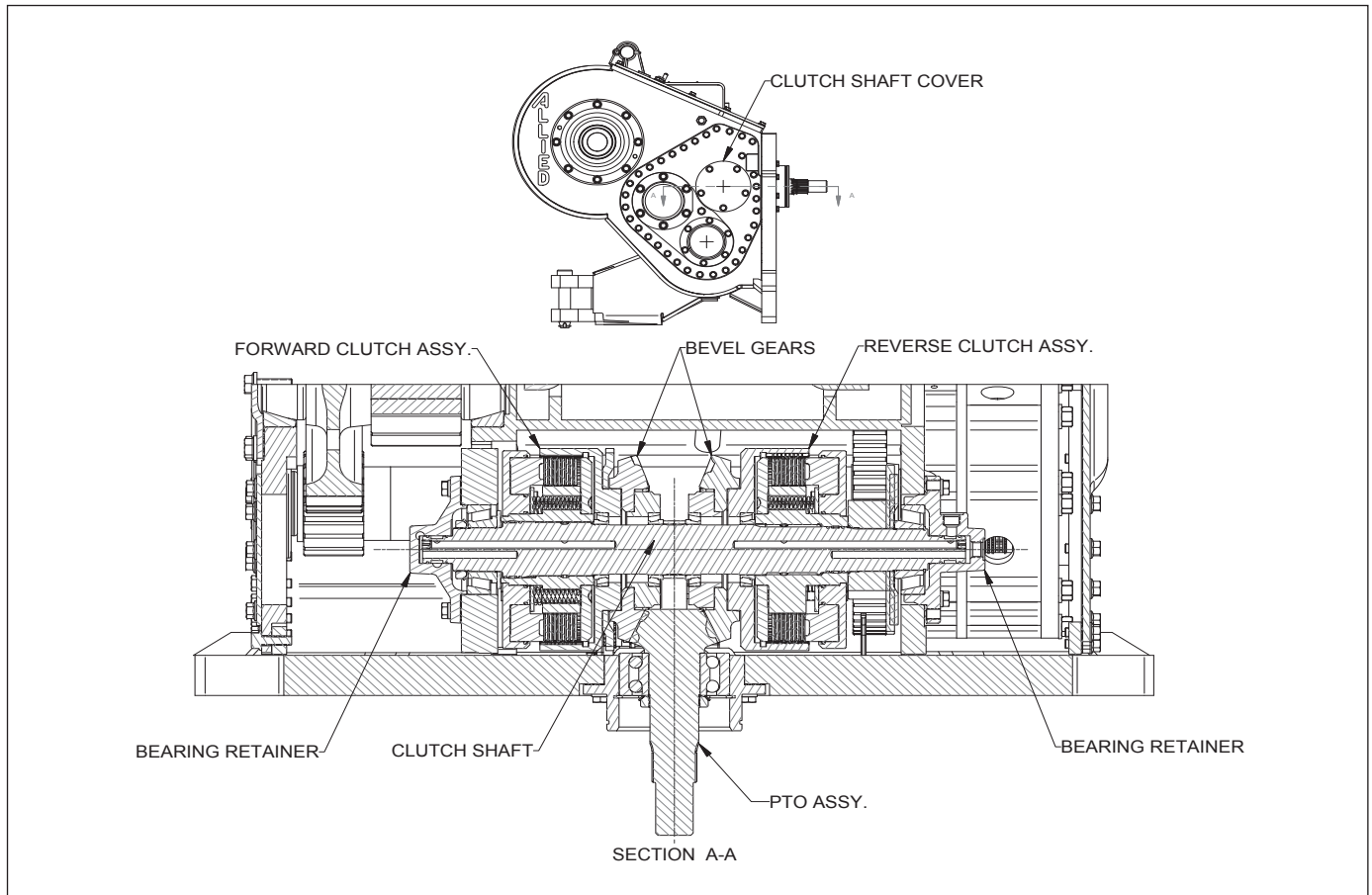


Figure 4-20 Clutch Shaft - Ratio #7

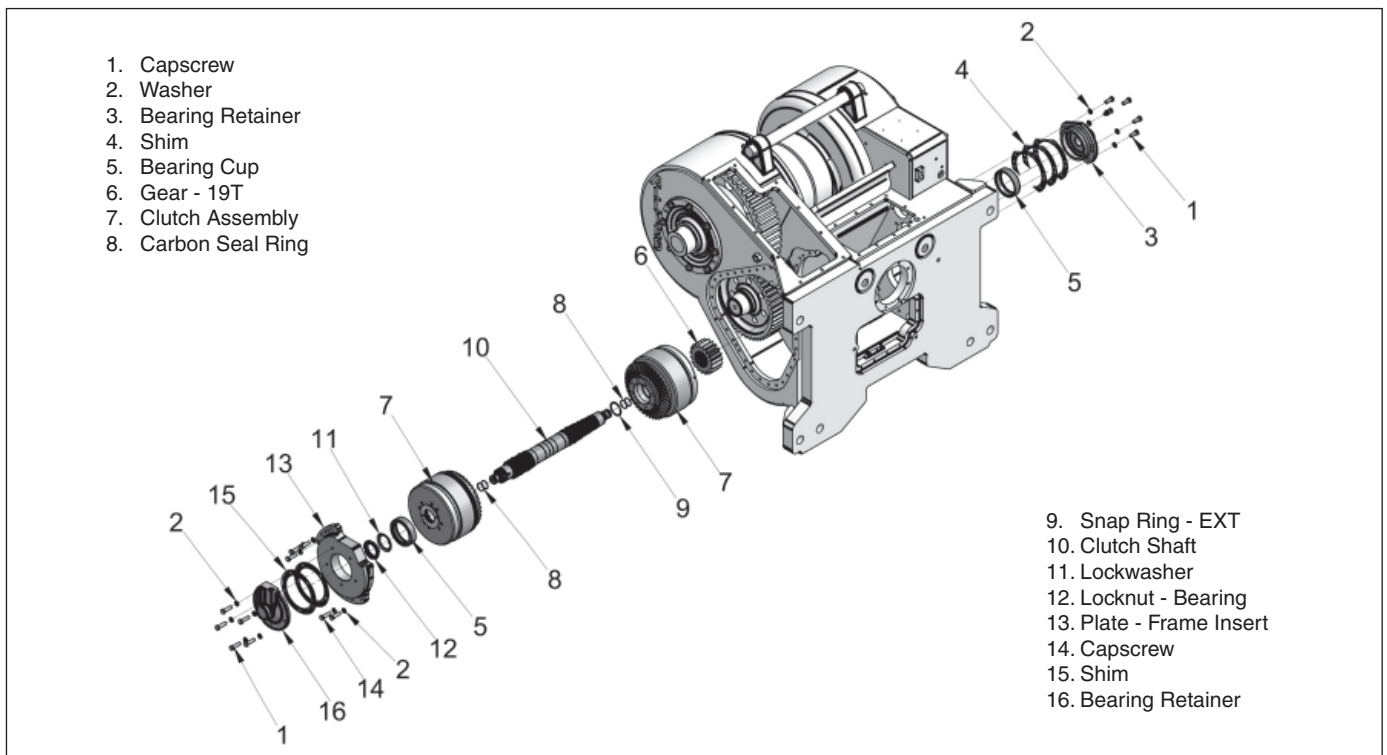


Figure 4-21 Location of Clutch Shaft - Ratio #7

**NOTE:** This subsection includes steps and procedures of both removal/disassembly and reassembly/installation information for Ratio #7. Please refer to the previous subsection for the common steps and procedures with Ratios #1, #3, #4 and #6.

## PTO Shaft Removal and Disassembly

(See pages 4-3 and 4-4 only if removing the clutch shaft)

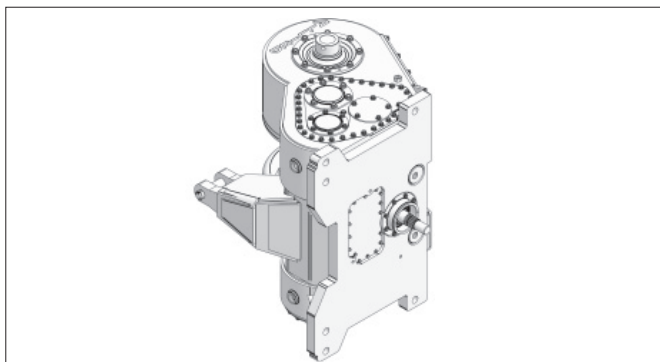
## Oil Brake Removal and Disassembly

(See pages 4-5 through 4-7)

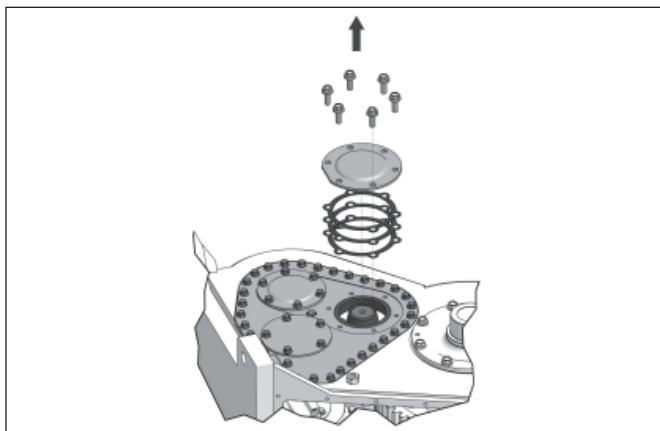
## Intermediate Shaft Removal

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

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

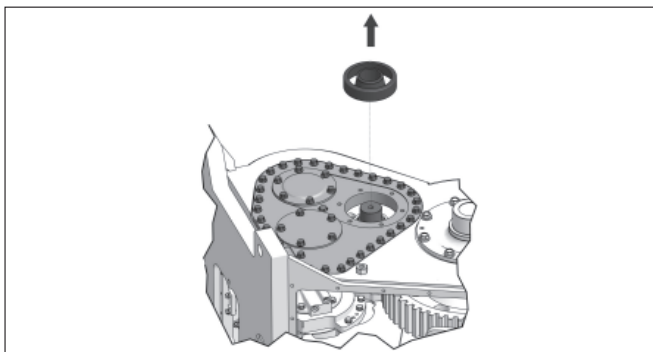


2. Remove the intermediate shaft cover and shims. Tag the shims for reference during reassembly.

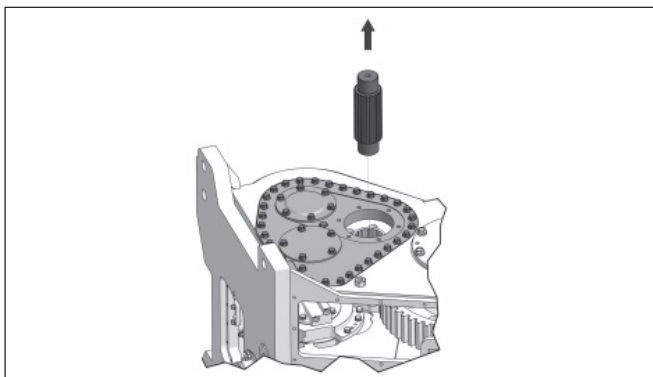


**NOTE:** Timken bearing cup for intermediate shaft inner support needs to be removed after the drum gear has been removed, but the cup needs to be installed prior to installation of the drum gear.

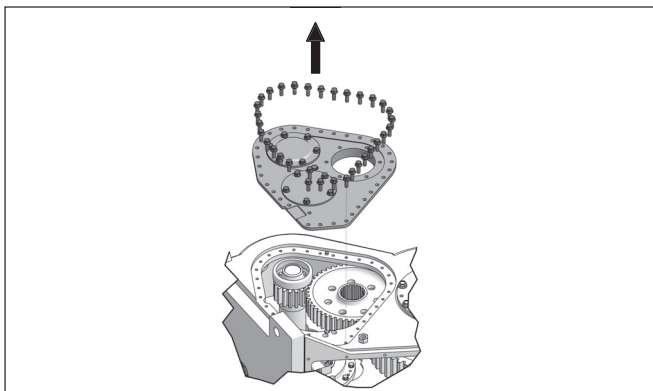
3. Remove the bearing cup and bearing cone.



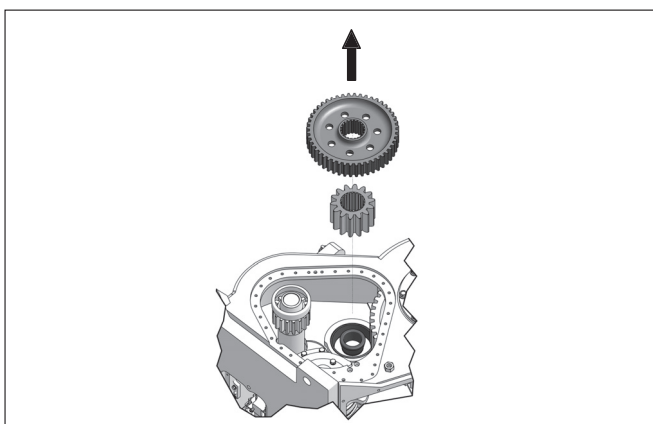
4. Remove the intermediate shaft.



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

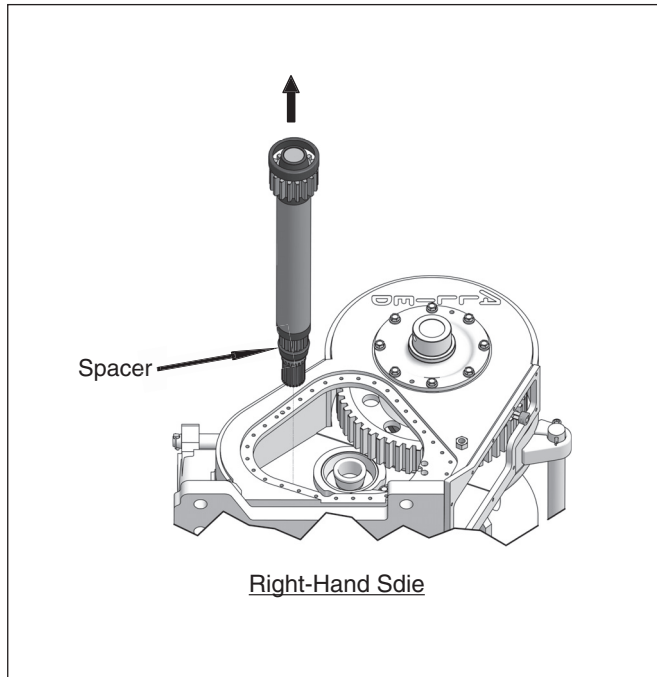


6. Remove the intermediate gear and the pinion gear.



## Brake Shaft Removal

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



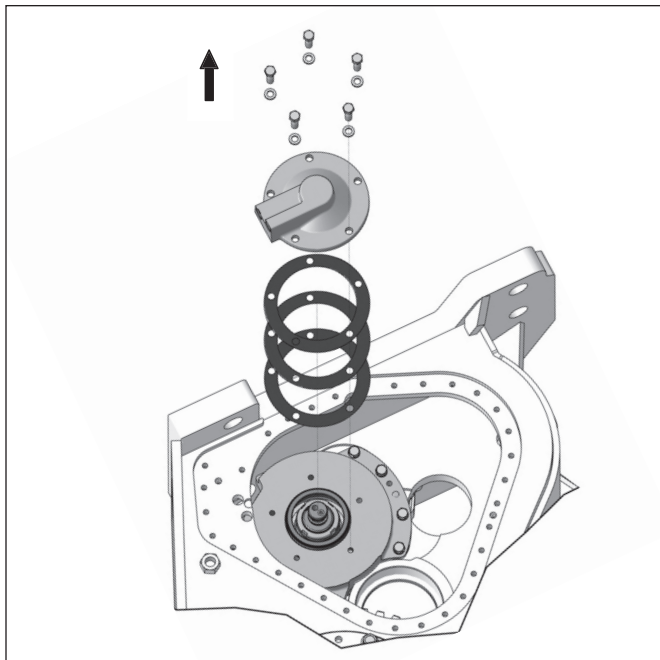
2. Left-hand side gear remains on the frame. Left-hand side cup and cone could fall from frame but may be held in place by the tight fit of the cup on the frame.

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

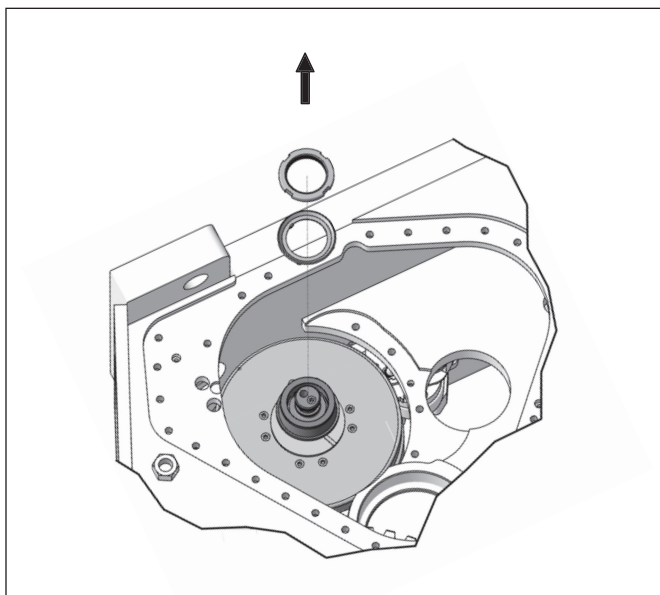
## Clutch Shaft Removal & Disassembly

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

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

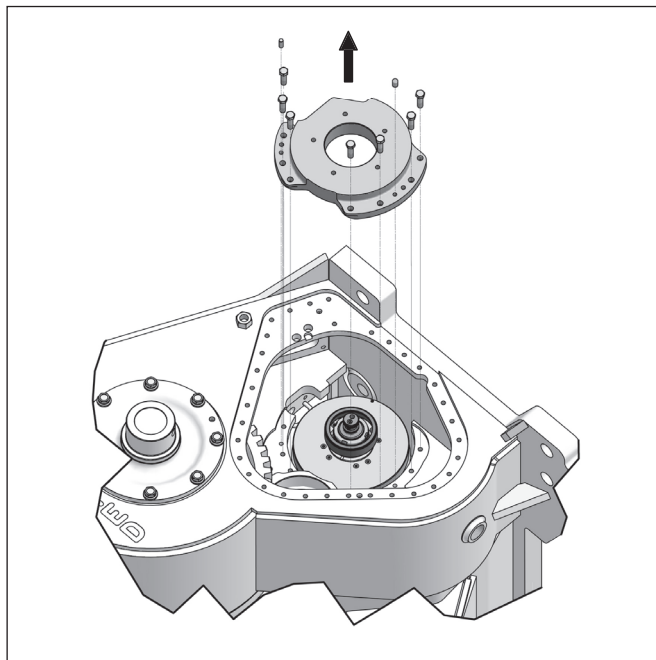


2. Straighten the lockwasher tang securing the locknut. Use clutch shaft locknut socket (see page 4-66) to remove the locknut.
3. Remove the locknut and lockwashers.

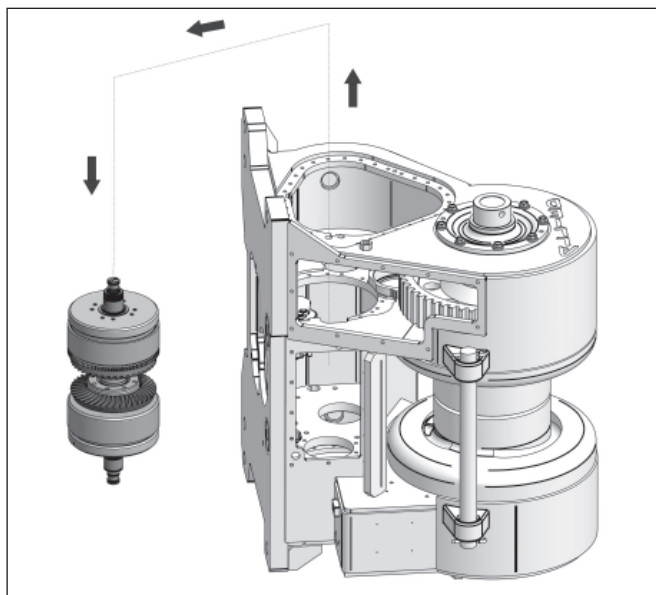


4. Attach the lifting device (see page 4-66) to the clutch shaft on the right-hand side.

5. Remove the frame insert plate.



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





7. Install a 1/4"-20 lifting eye (Allied P/N X-203348, see page 4-66) and pull clutch assemblies and spacers away from the shaft.



**NOTE:** Please refer to Clutch Shaft Removal and Disassembly on pages 4-10 through 4-12 for common steps with ratios #1, #3, #4 and #6.

## Drum and Drum Shaft Removal

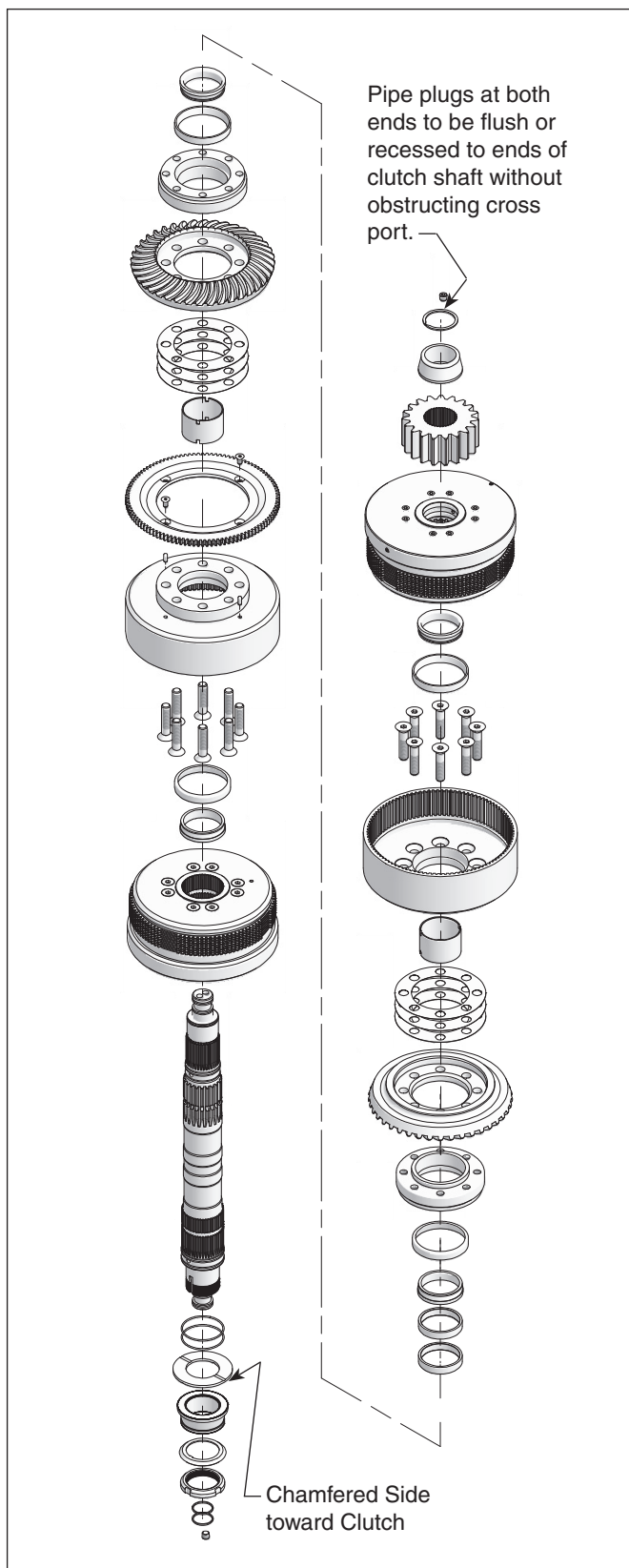
The steps of drum and drum shaft removal for Ratio #7 are the same as those for Ratios #1, #3, #4 and #6 described on pages 4-21 through 4-23.

## Drum and Drum Shaft Installation

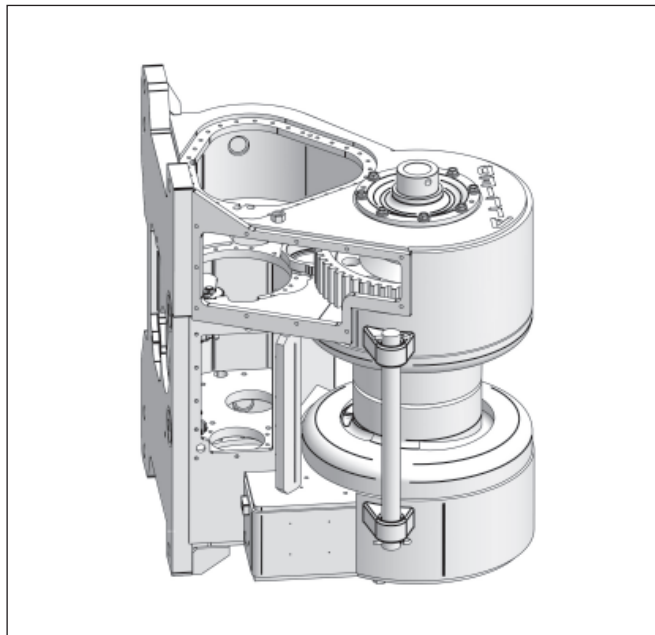
The steps of drum and drum shaft installation for Ratio #7 are the same as those for Ratios #1, #3, #4 and #6 described on pages 4-26 through 4-29.

## Clutch Shaft Reassembly & Installation

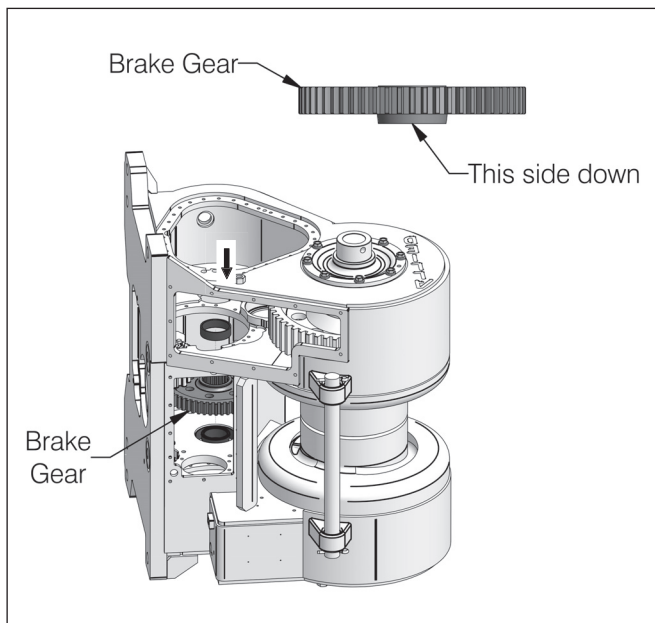
1. Install the reverse and the forward clutch assemblies, along with spacers onto the clutch shaft.



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

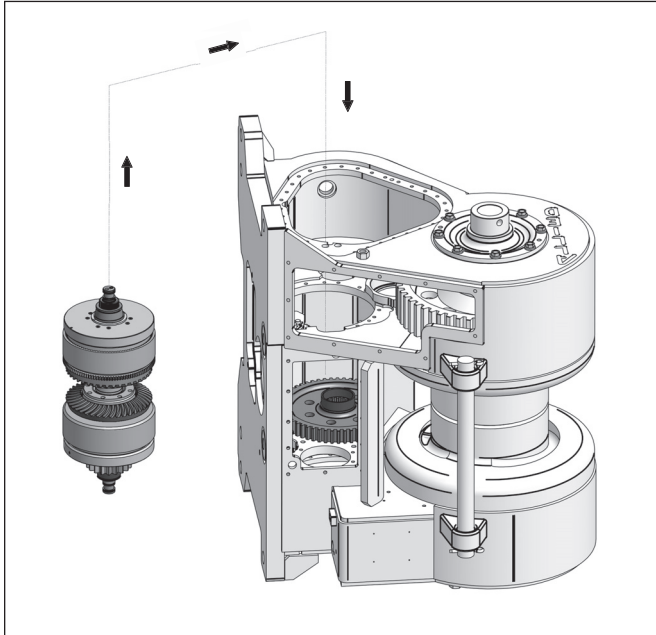


3. Place the brake bearing cup and cone, the brake gear and the spacer into the frame. Pay attention to the side of the gear as shown below.

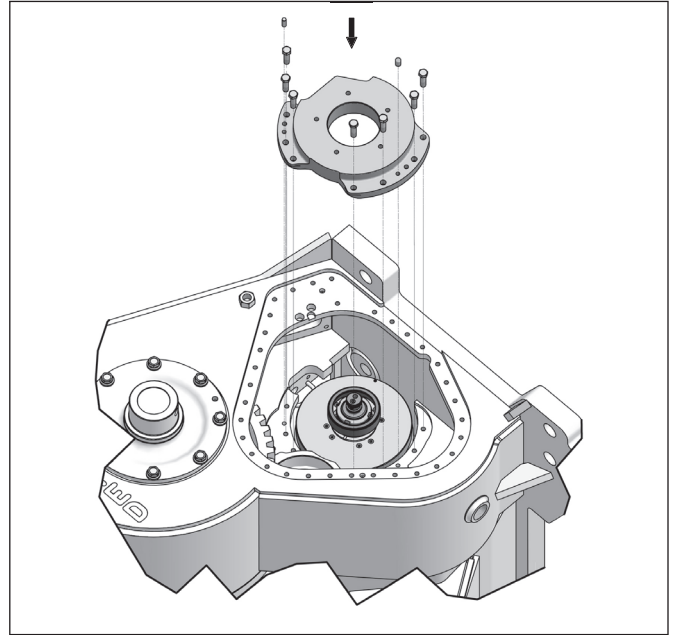


4. Remove the locknut and the lockwasher, attach the lifting device (see page 4-66) to the right-hand end of the clutch shaft.

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

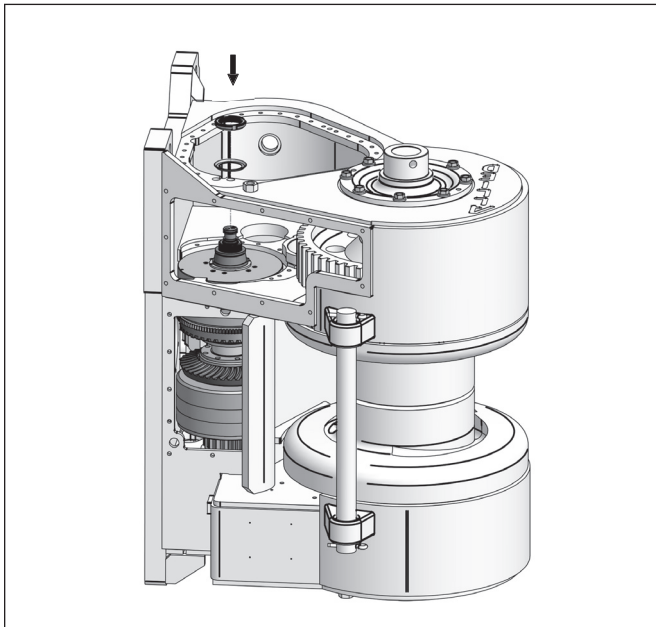


8. Install the frame insert plate from the right-hand side.

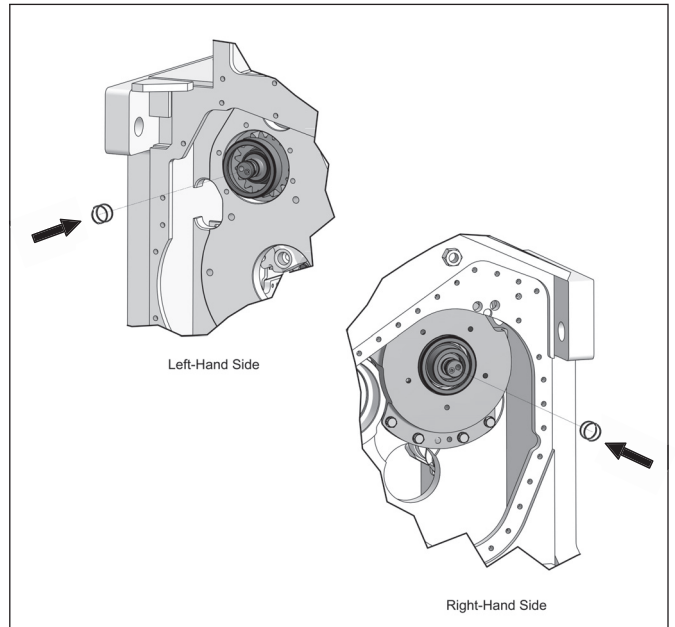


6. Remove the puller from the shaft. Install the locknut with the lockwasher on the shaft.

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

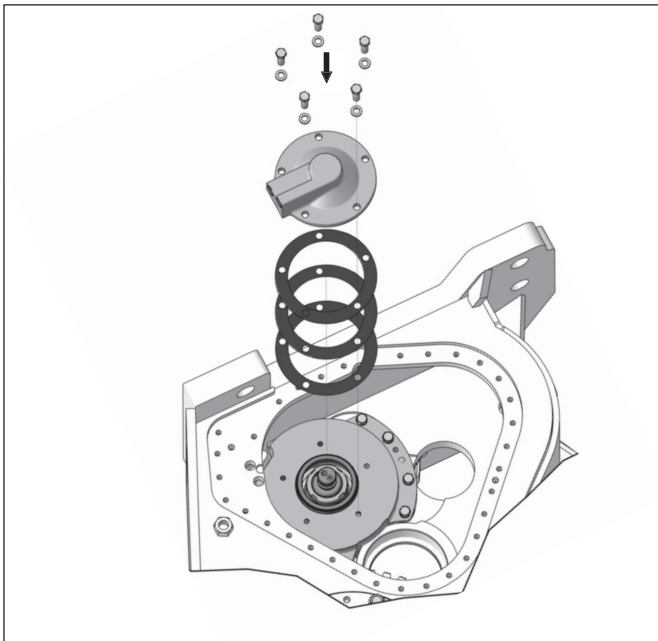


9. Place the two seal rings into the grooves on each end of the clutch shaft by expanding the seal rings just enough to slip over the ends of the shaft.

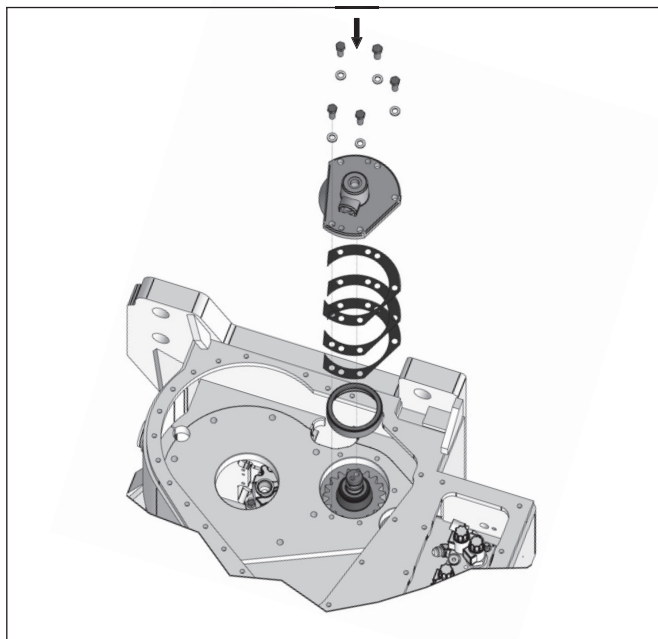


7. Bend the lockwasher tang to secure the locknut.

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



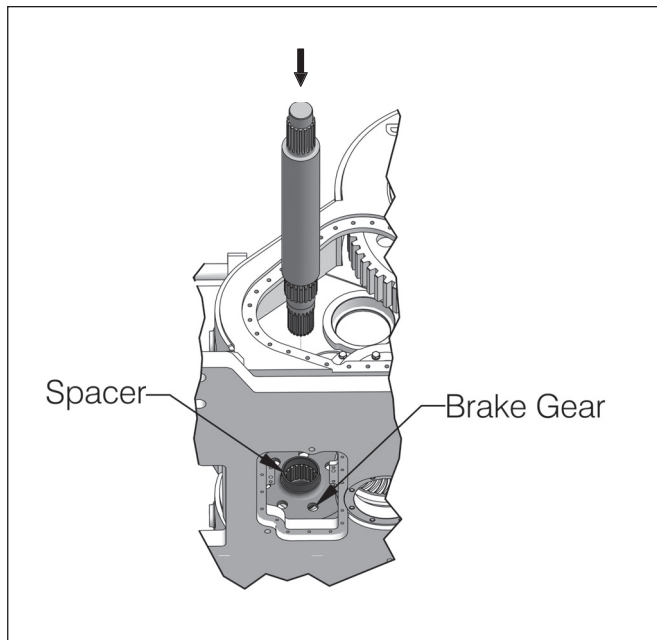
11. Reconnect relevant hydraulic hoses near the right-hand side bearing retainer.
12. Install the left-hand side shim pack, bearing cup and retainer.



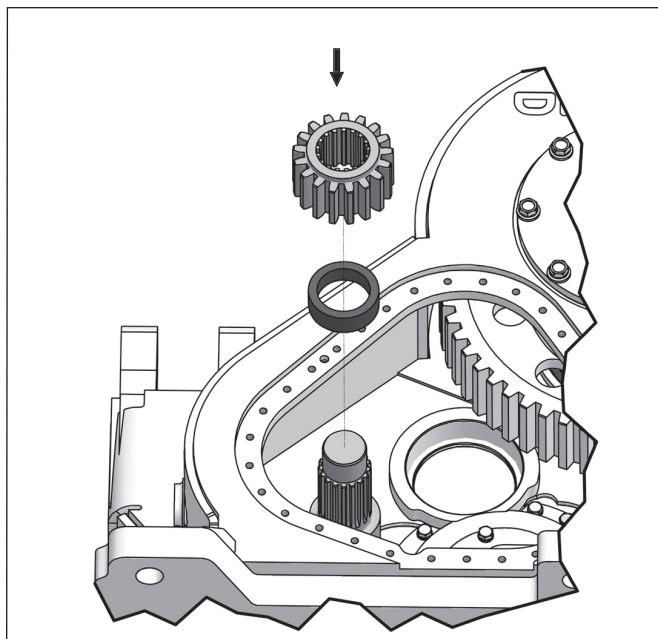
13. Reconnect relevant hydraulic hoses near the left-hand side bearing retainer.

## Brake Shaft Installation

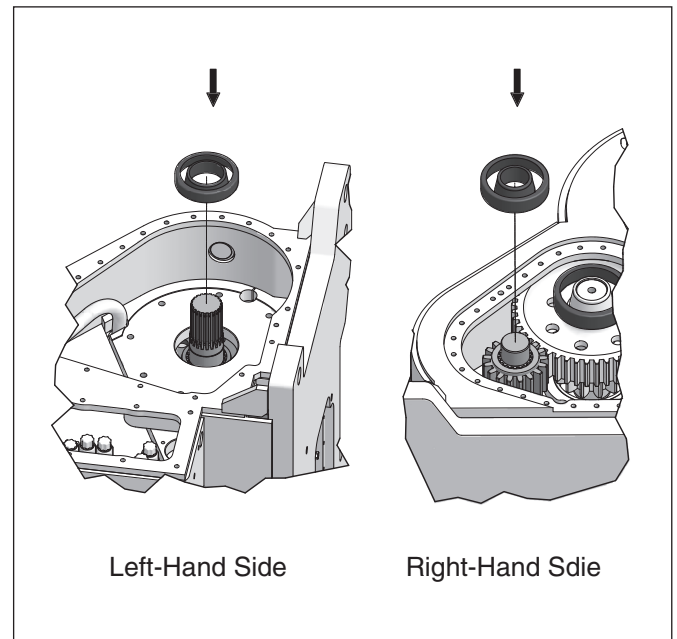
1. Perform oil brake reassembly and installation described on pages 4-47 through 4-49 first; then place the brake bearing cup and cone, the brake gear and the spacer in position into the frame (refer to step 3 in Clutch Shaft Reassembly and Installation on page 4-58); rotate the winch until the right-hand side is on top and horizontal, install the brake shaft in the winch frame.



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



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

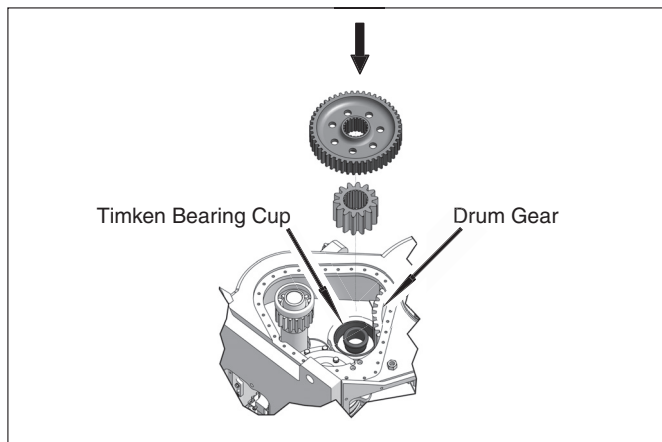




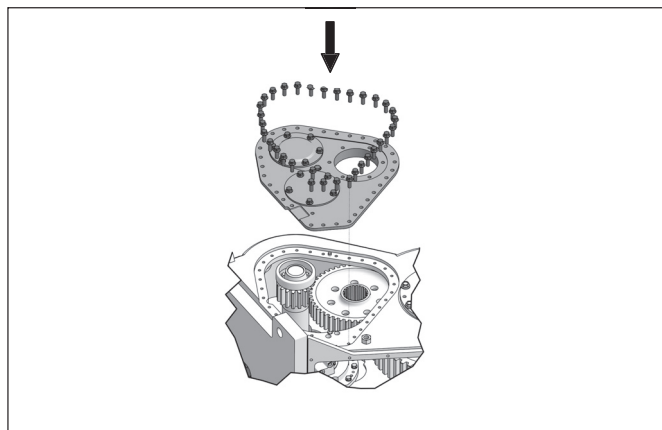
## Intermediate Shaft Installation

1. Install the pinion gear and the intermediate gear.

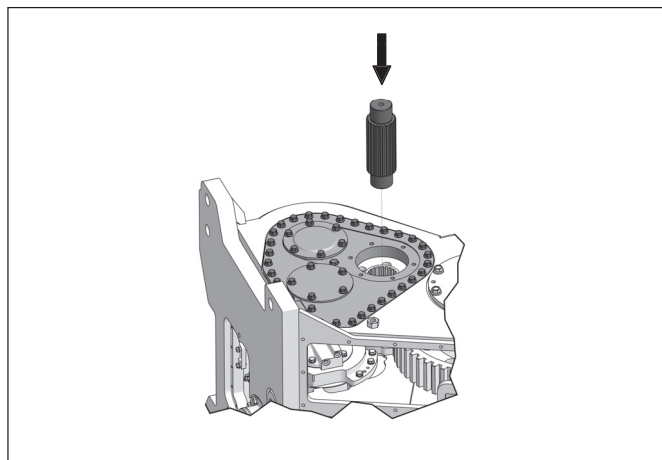
**NOTE:** The Timken bearing cup must be installed prior to installation of the drum gear.



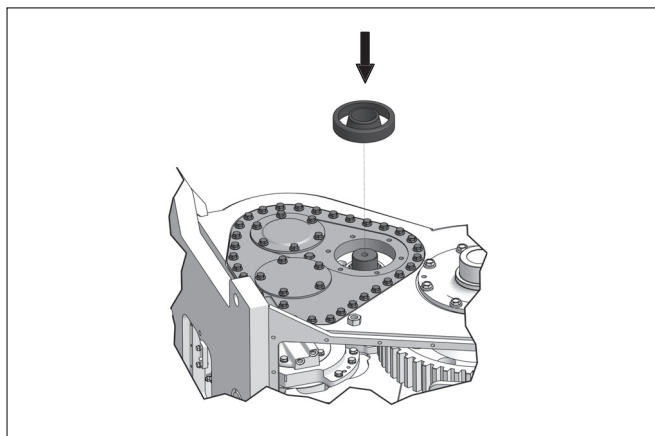
2. Install the right-hand side frame cover plate.



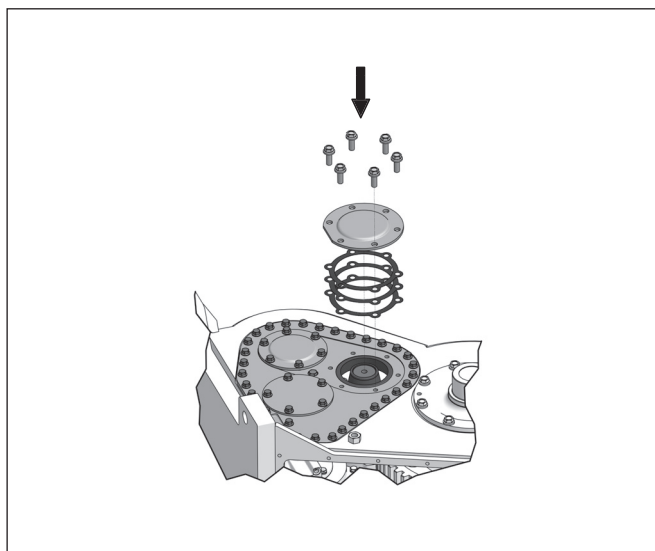
3. Remove the intermediate shaft.



4. Install the bearing cup and bearing cone.



5. Install the intermediate shaft cover and shims.



## Hydraulic Pump Assembly Installation

### NOTES:

1. Refer to Hydraulic Pump Removal & Disassembly on pages 4-8 and 4-9, making sure that the winch must be removed from the tractor and the input gearbox must be removed if it is equipped with

the winch.

2. Refer to Hydraulic Pump Reassembly and Installation on pages 4-45 and 4-46.

1. Assemble the hydraulic pump assembly as illustrated below.

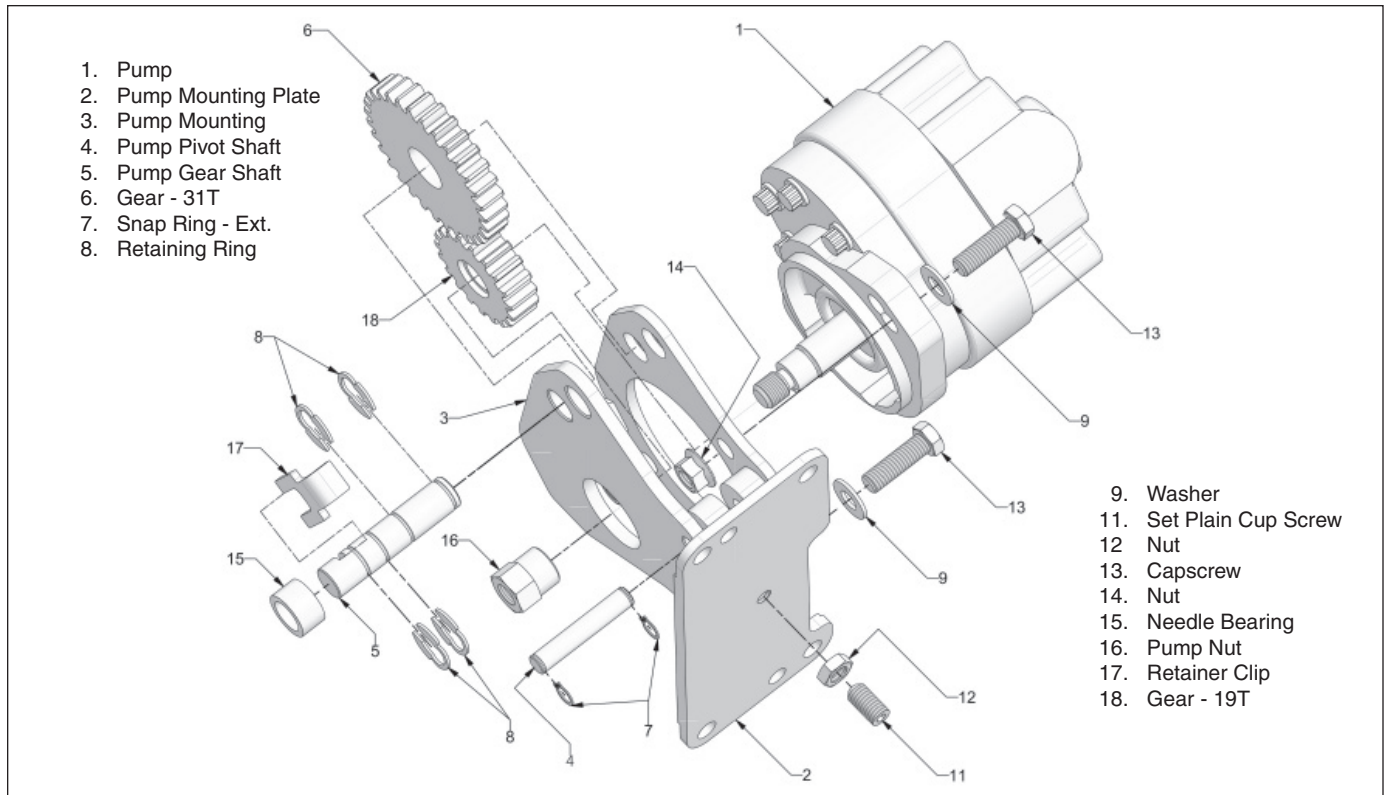
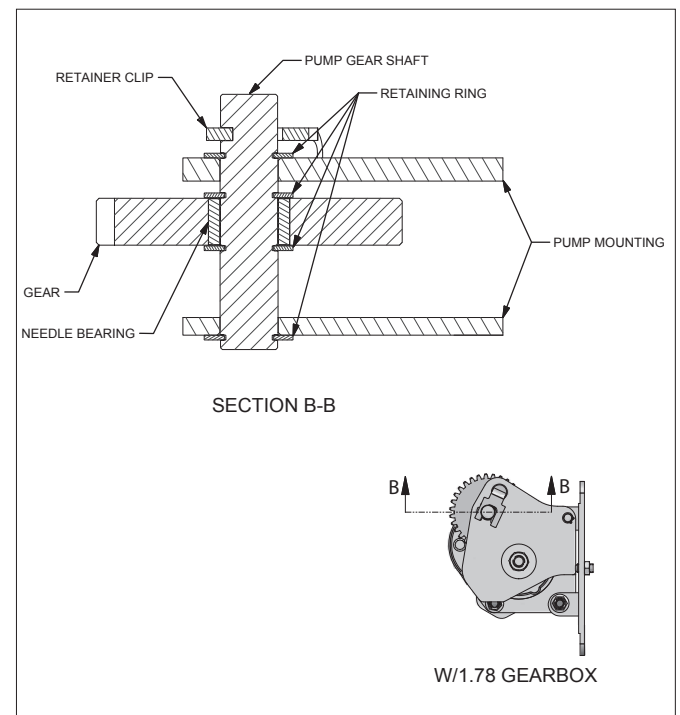
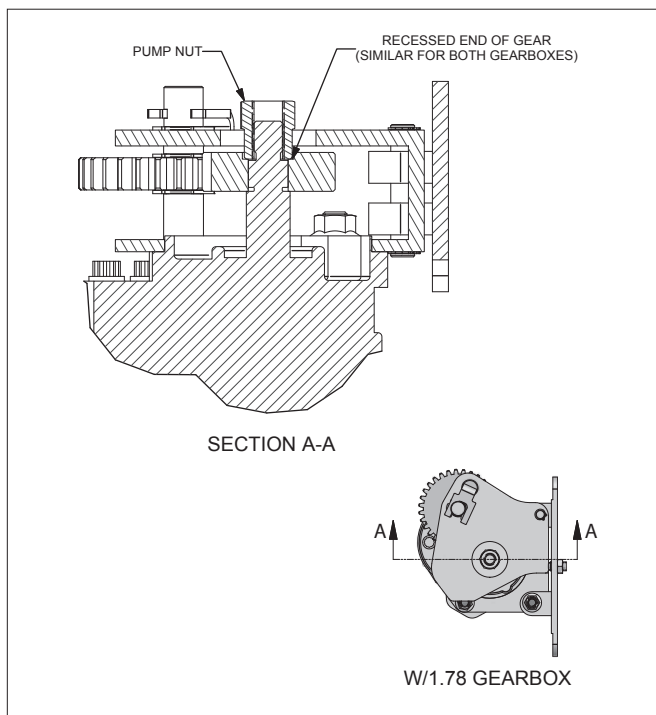


Figure 4-22 Hydraulic Pump Assembly - Ratio #7



2. Install the assembly in the position shown in Figure 4-23.

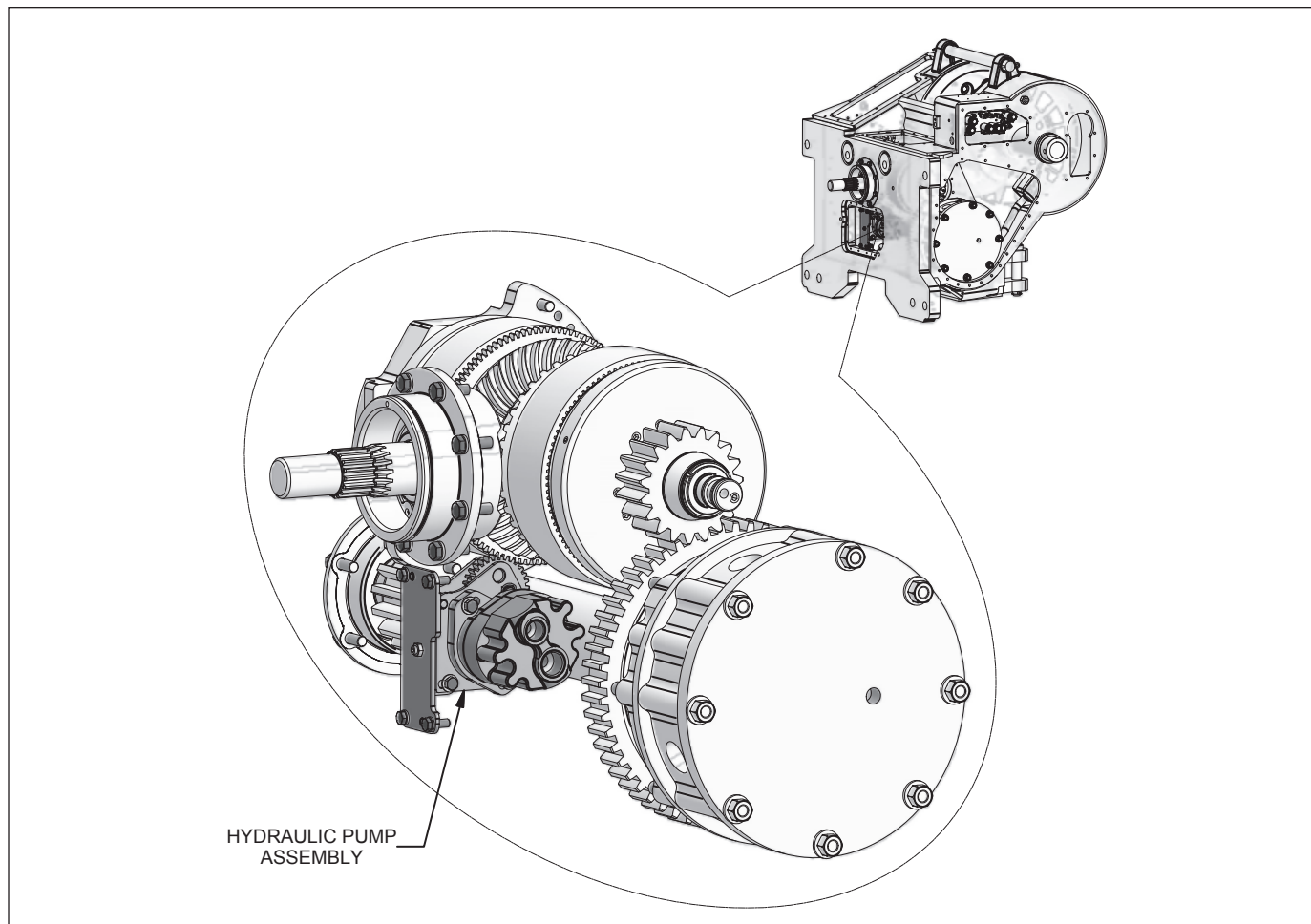


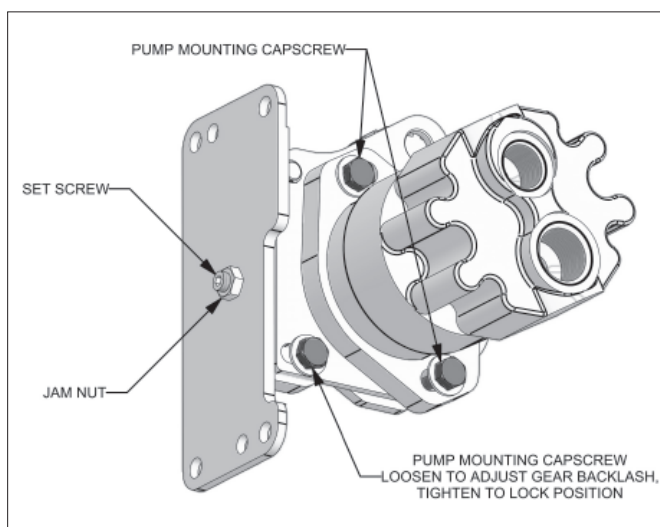
Figure 4-23 Location of Hydraulic Pump - Ratio #7

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

**NOTE: Backlash: 0.004" - 0.010"**

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

4. Connect the pump to the suction strainer with the suction hose, and connect the pump to the check valve with the pressure hose.



## Winch installation

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

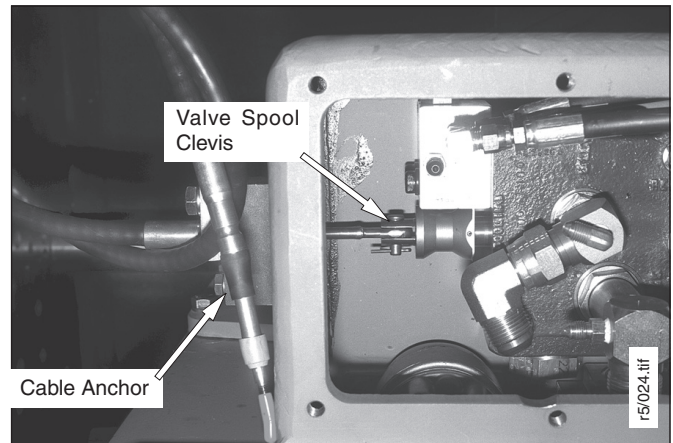


### WARNING

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

8. Align the studs with the mounting holes to prevent thread damage.
9. Loosely install the two top nuts or capscrews before the winch is fully seated against the tractor.
10. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts/capscrews alternately at each side of the winch to pull the winch evenly against the tractor. On winches without dropbox, the two top inboard nuts should be snug then turned on to the next slot so that the cotter pin can be installed. All outboard nuts should be tightened to 500 ft-lbs (69 kg-m) or to torque specified on instruction drawing. See Figure 1-16 in Section 1 for Bolt Torque Specifications.
11. Install control lever assembly per mounting kit instructions.
12. Attach push-pull cable to control lever assembly.
13. Attach cable bracket to winch. Do not tighten fasteners at this time.

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

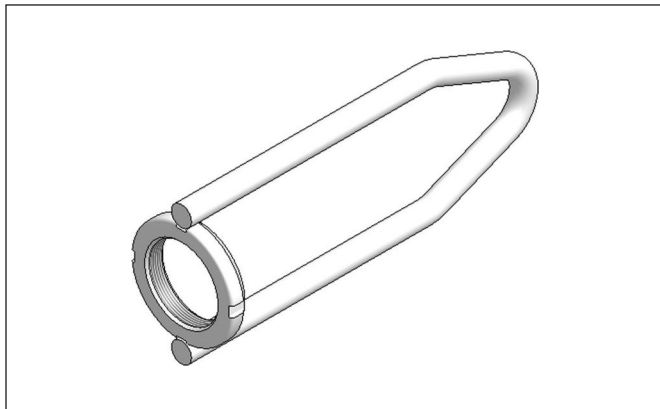


15. Fill unit with oil.
16. Adjust control cable at control lever, and check hydraulic pressure settings as described in Service Subsections in Section 2 and Section 3.
17. If there is no dropbox after winch installation, remove top cover and pry pinion towards tractor with a prybar to ensure the pinion is not jammed against the ring gear. This avoids excessive noise during winch operation.

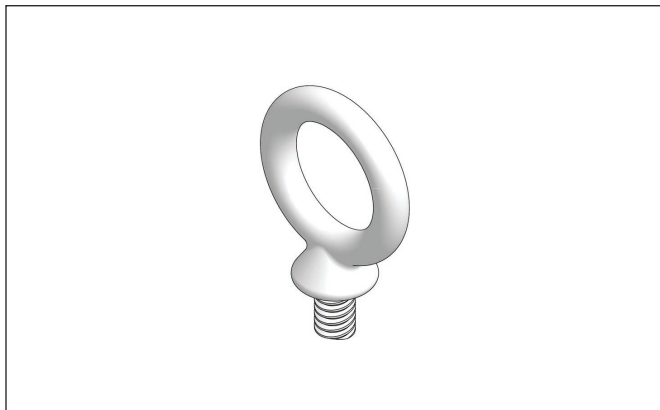
**NOTE: Pressure checks according to Figure 2-20 in Section 2 and Figure 3-23 in Section 3 should be taken with hydraulic oil at operating temperature.**

## Specialized Tools

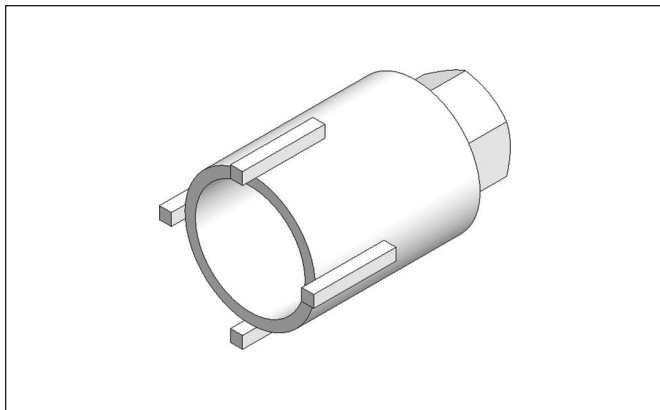
Order the following specialized tools for disassembly and reassembly of your winch.



**Lifting Device**  
P/N X-201918



**Lifting Eye**  
P/N X-203348



**Clutch Shaft Locknut Socket**  
P/N X-201480

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

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

Phone: 503-625-2560

Parts Department:  
Fax: 503-625-5132  
E-mail: [parts@alliedsystems.com](mailto:parts@alliedsystems.com)

Service Department:  
Fax: 503-625-7616  
E-mail: [service@alliedsystems.com](mailto:service@alliedsystems.com)



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