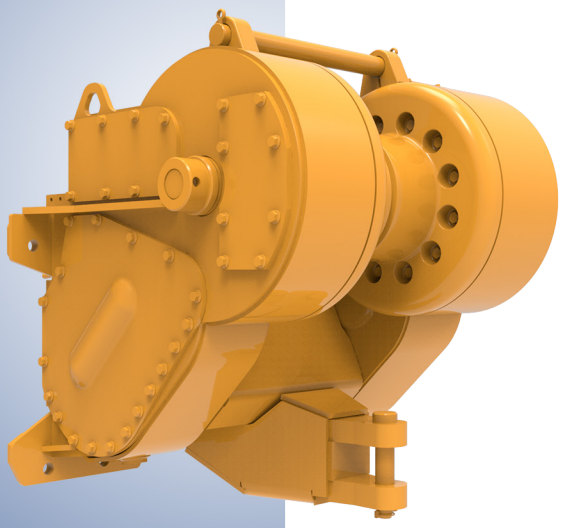
Service Manual



Allied W8L

Power Controlled & Electronic Controlled Towing Winch

APPLICABLE FOR ALLIED-BUILT WINCHES (SERIAL NO. AW8L-XXXX)

FOR HYSTER-BUILT WINCHES (SERIAL NO. W8L-XXXX) SEE SERVICE MANUAL #599787W

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

CUSTOMER EDITION

A PRODUCT OF Allied Systems COMPANY

P/N 599033W Printed in U.S.A. 5/07/2018

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

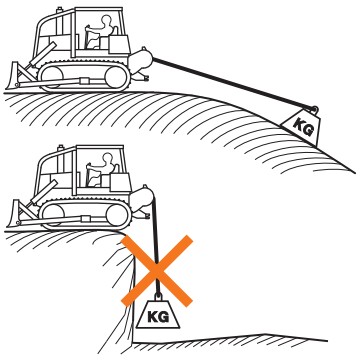
⚠ WARNING

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

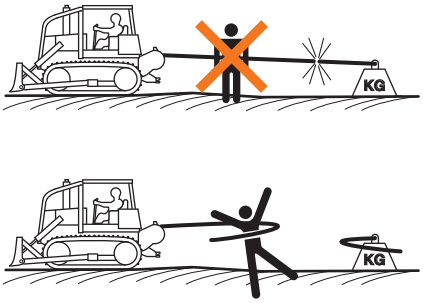
- Do not operate the winch unless your are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.
- 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 599781W.
- 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.
- 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

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

Contents

(continued on next page)

Contents (continued)

Notes

Notes

General

Introduction

This service manual is for the W8L 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 W8L 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 is produced inside the winch case.

The W8L winch has a **BRAKE-OFF** function, which permits the wire rope to be pulled from the drum. A **FREESPOOL** function is available as an option on the W8L winch.

The W8L winch has a rated line pull capacity of 355,480 N (80,000 lbf) when there is one layer of wire rope on the drum.

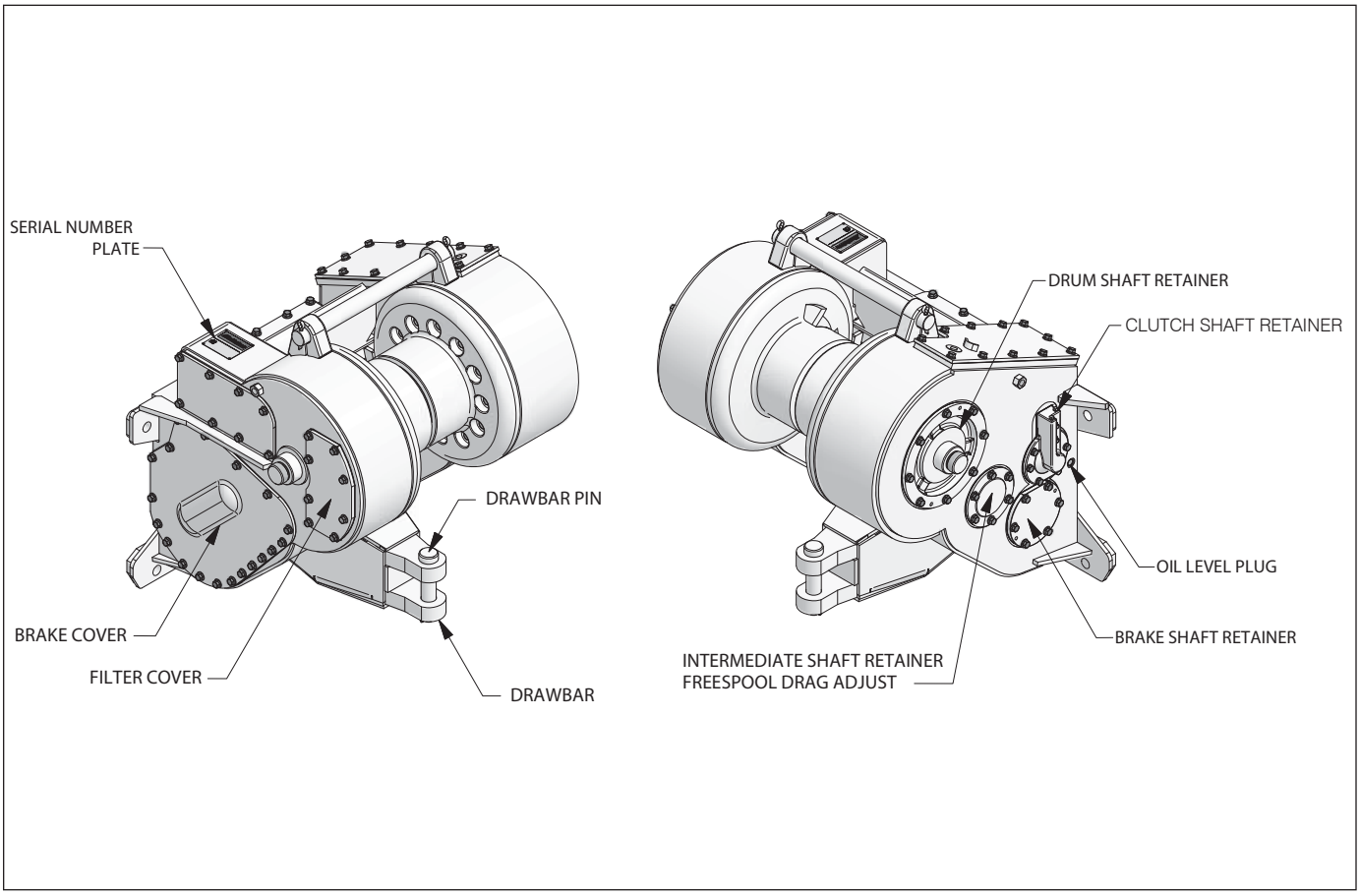


Figure 1-1 Model Views

Unit Identification

Allied Winch S/N Nameplate Data For Tractor Mountings

A W8L P 3 F 1555 H51

Manufactured By

A = Allied Systems Company
(no "A" = Hyster Company)

Winch Model

W8L = Standard
K8L = Special Design (Contact Factory)

Type Drive

P = Power Controls
E = Electronic Controls
X = Direct Drive (Gear Drive)

Gear Ratio

Code = Forward Ratio/Reverse Ratio
1 = 49.8:1/19.9:1
2 = 71.6:1/28.6:1 (95.4/38.1 - K50)
3 = 94.0:1/37.6:1 (125/50 - K50)
4 = 84.0:1/33.6:1 (Non-Current)
5 = 90.1:1/36.0:1 (Non-Current)
6 = 68.8:1/27.5:1 (49.8/19.9 Winch x 1.38 Gearbox)
7 = 47.1:1/31.1:1
8 = 125:1/190:1 (94/143 Winch x 1.33 Gearbox)
9 = 94:1/102:1
10 = 125:1/136:1 (94/102 Winch x 1.33 Gearbox)
11 = 85.4:1/34.1:1 (49.8/19.9 Winch x 1.71 Gearbox)

Internal Option

F = Freespool
N = Non-Freespool
V = Underwind Non-Freespool

Sequence Number

Vehicle Code

See Figure 1-2

Notes: 1. In Addition to the serial number plate, the serial number is stamped on to the left hand side of the frame. (See Figure 1-4 on page 1-4.)

2. Circled numbers in Figure 1-2 indicate possible gear ratios.

Figure 1-2 Tractor Identification and Gear Ratio

Tractor Make Model and Starting Tractor Serial Number Where Applicable							
CODE	A Fiat-Hitachi/ New Holland	C Caterpillar	G Terex	H Dresser	K Komatsu	M MF	N Zoomlion
48					D68ESS-12 ⑥		
50					D85E/PX-15 ②③⑧⑩		
51	16B PS S/N 10301 & UP ①②	D7F *a, D7G PS Series I ①②③⑦	D700A, 82-20B, 82-20 ①②③	TD20E/G/H PS, TD20M ①②③⑦	D80A-12 ②	D700C, D700D TEREX ①	
52	16B DD S/N 10301 & UP ②	D7F DD, D7G DD *b ②③			D85A-12 ①②		
53	AB/BD 20 PS, 20B FL20 ②	572 *c, 572G ①②③⑦			D85E-18, D85P-18 ①②③⑦		

(Continued on next page)

Figure 1-2 Tractor Identification and Gear Ratio (continued)

Tractor Make Model and Starting Tractor Serial Number Where Applicable							
CODE	A Fiat-Hitachi/ New Holland	C Caterpillar	G Terex	H Dresser	K Komatsu	M MF	N Zoomlion
54	20 DD ②	983 S/N 38K, D7R, D7H PS ①②③⑦⑧⑩			D85E-21, D85P-21 ①②③⑦		
55	FD20/FL20, FP60 ①②③⑦	D8N *d ③			D83-1, D85E-SS-1 ②③⑦		
56	DX255, FD255, D255 ①②③⑦	D8N *e, D8R ③⑧⑨⑩			D135A ③		
57		D7R PS ①②③⑦⑧⑩			D85E-SS-2 *f ⑤⑥⑪		ZD220 ③
58		D8R ③⑧⑩			D87E-2 ①⑤⑥		
59		D8R SERIES II ③⑧⑨⑩			D155AX-5 ①⑤⑥		
60		572R ③⑨					
70		572R SERIES II ③⑨					
72		D7R SERIES II ①②③ ⑦⑧⑨⑩					
74		D8T ③⑧⑨⑩					
83		D7G SERIES II ①②③⑦					
983		983 Track Loader S/N 38K ①②③⑦					

*a Caterpillar D7F S/N 94N5660 & UP
*b Caterpillar D7 DD S/N 91V, 93N, 64V & 45W
*c Caterpillar 572 S/N 40U, 6J
*d Caterpillar prior to D8N S/N 5TJ0001, same as C56 for AW8L-2293 & up; D7H not used
*e Caterpillar D8N S/N 5TJ0001 & UP
*f Komatsu D85E-SS-2 Gear Ratios 1 & 5 are both 90.1:1.

W8L INSTALLATION DRAWINGS BY TRACTOR

Winch Serial Number	Description	Installation Drawing Part Number
Electronic Control		
W8LE**C57	W8L CAT D7R	2310568
W8LE**C58	W8L CAT D8R	2310568
W8LE**C59	W8L CAT D8R SERIES II	2310568
W8LE**C60	W8L CAT 572R	2312113
W8LE**C72	W8L CAT D7R SERIES II	2310568
W8LE*NC74	W8L CAT D8T	2313767
Power Control (push pull cable)		
W8LP**A55	W8L F/H	308424W
W8LP**A56	W8L F/H FD255	2301867W
W8LP**C51	W8L CAT D7F & D7G SERIES 1	256611W
W8LP**C53	W8L CAT 572G	2313220
W8LP**C54	W8L CAT D7H/R	379453W
W8LP**C56	W8L CAT D8N PS	379453W
W8LP**C57	W8L CAT D7R	379453W
W8LP**C58	W8L CAT D8R	379453W
W8LP**C59	W8L CAT D8R SERIES II	379453W
W8LP**C60	W8L CAT 572R	2305491W
W8LP**C72	W8L CAT D7R SERIES II	379453W
W8LP**C74	W8L CAT D8T	2312690
W8LP**C83	W8L CAT D7G SERIES 2	2310921
W8LP**H51	W8L IH & DRESSER TD20E & G	338843W
W8LP**K48	W8L KOM D68ESS-12	2301259W
W8LP**K50	W8L KOM D85EX-15	2305919W
W8LP**K53	W8L KOM D85-18	304385W
W8LP**K54	W8L KOM D85-21	304385W
W8LP**K55	W8L KOM D83	1308404W
W8LP**K56	W8L KOM D135A	1310760W
W8LP**K57	W8L KOM D85ESS-2	2301259W
W8LP**K58	W8L KOMATSU D87	338843W
W8LP**N57	W8L ZOOMLION ZD220	2315560
W8LP6NU57	W8LP ON SHANTUI SD20-5	2313502
W8LP3NC983	W8LP ON CAT TRACK LOADER 983 S/N 38K	2314363

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.

Figure 1-3 List of Installation Drawings

Serial Number Codes

The serial number codes are described on pages 1-2 and 1-3 of this manual. The nameplate with the serial number code is found on the top left hand side of the winch case. The serial number code is also stamped on the left hand side of the winch frame.

Nameplate

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

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

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

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

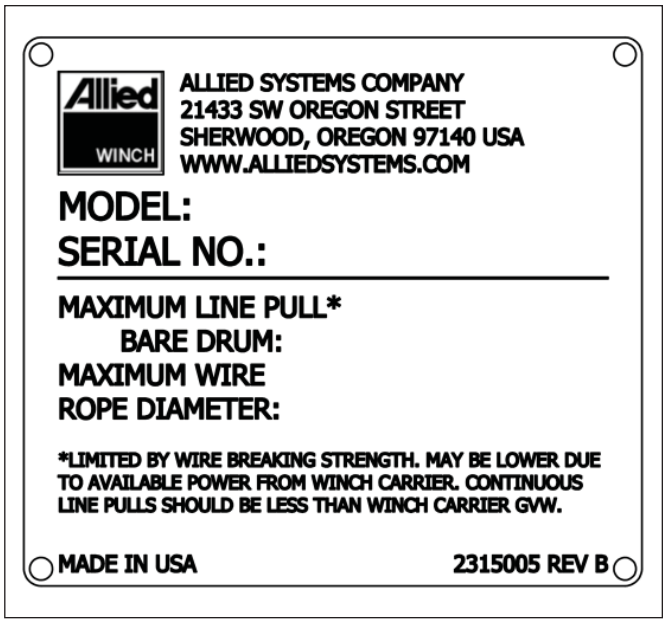


Figure 1-4 Nameplate

Warning and Maintenance Decals

The unit nameplate, a Warning Decal and a Maintenance Plate are located on the winch as shown in Figure 1-5. If the nameplate has been damaged, obtain a new one and install the new nameplate in the location shown in the figure. If the Warning Decal or Maintenance Plate have been damaged, install a new one in the location shown.

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

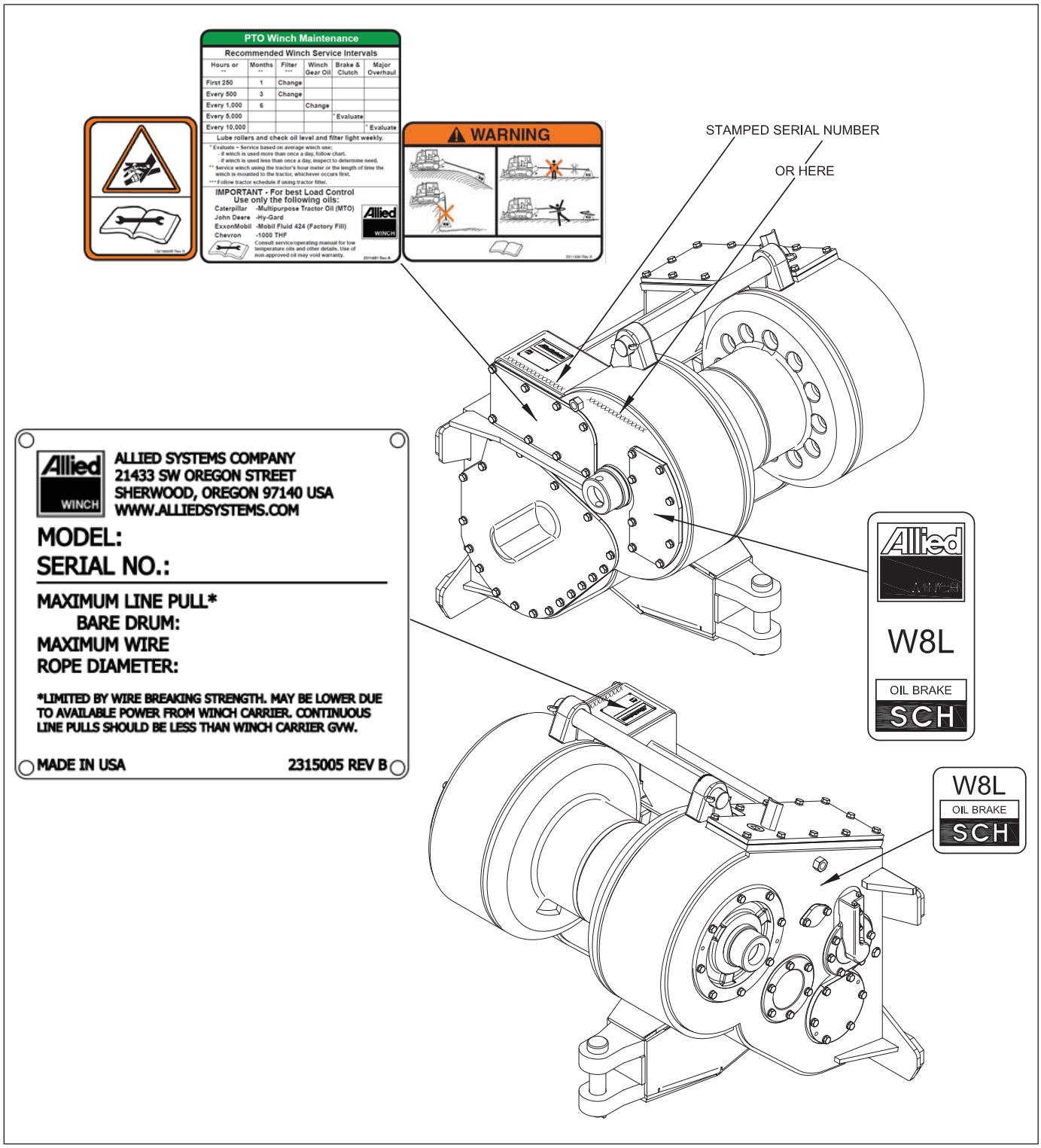


Figure 1-5 Decal Installaion

Gear Train (Ratios #1 - #7)

The gear train (Figure 1-6) consists of:

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

Torque transfer during operation is shown in Figure 1-7.

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

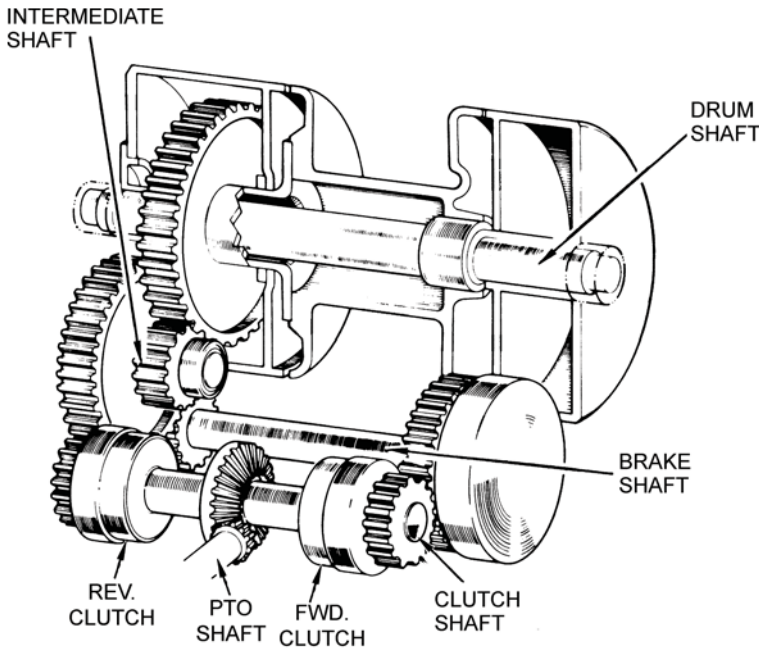
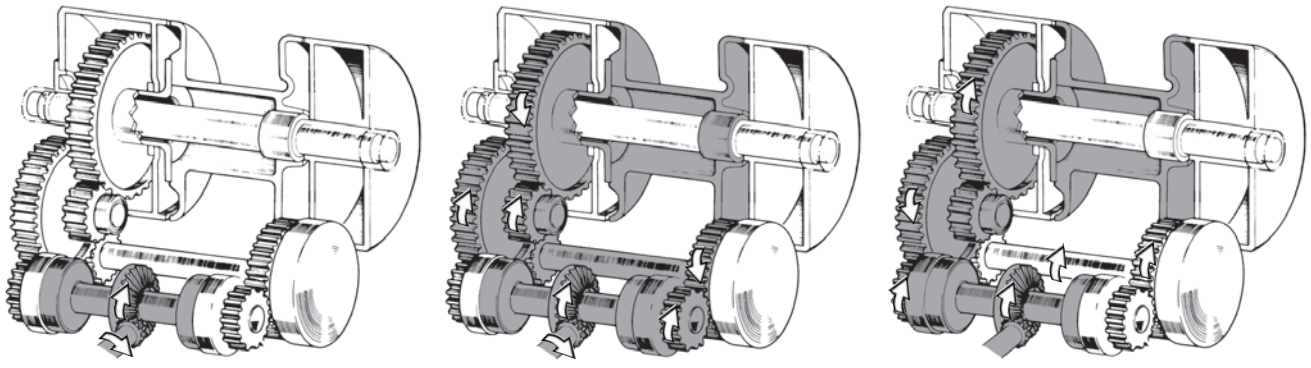


Figure 1-6 Gear Train (Ratios #1 - #7 only)



BRAKE-ON (Neutral) **LINE-IN** (Forward) **LINE-OUT** (Reverse)

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

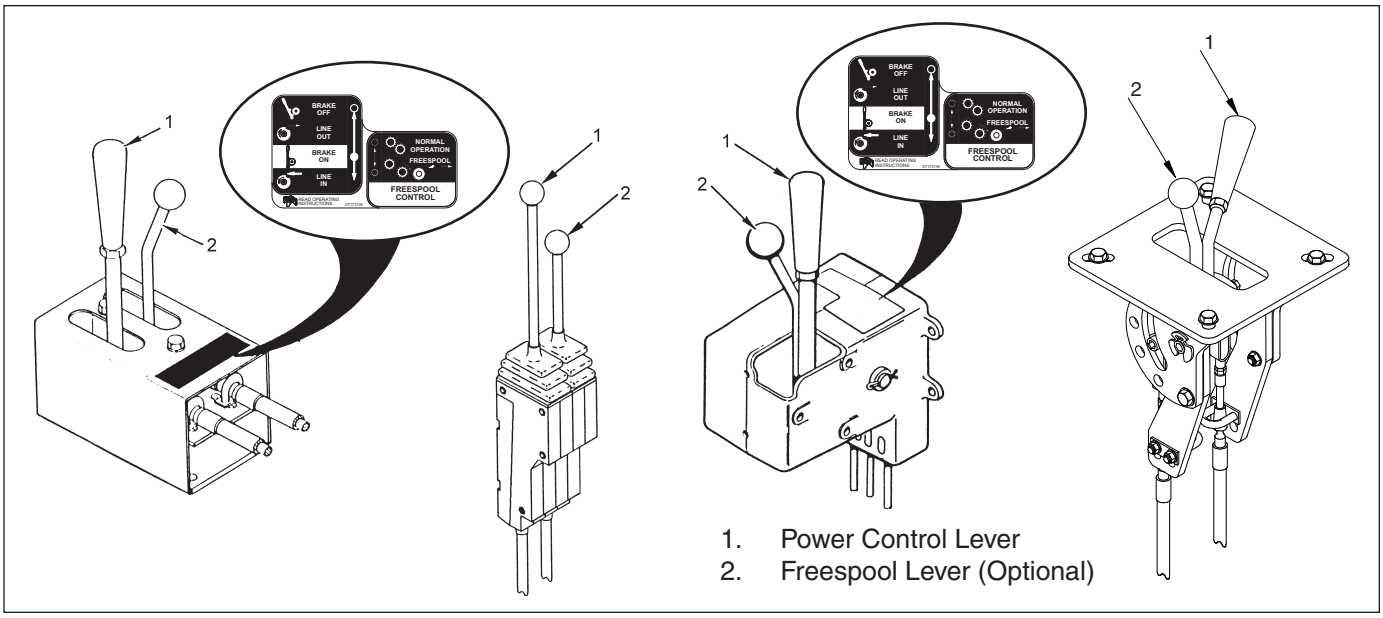


Figure 1-8 Typical Winch Power Controls

Operation and Control

Power Controls

The control lever assembly has a power control lever for winch control (See Figure 1-8). If the winch does not have the **FREESPOOL** function, the second control lever is not used. Both control levers are connected to the winch through control cables. The power control lever is connected to the spool in the control valve. The power control lever is used to select one of the following operations:

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

Electronic Controls

The electronic control assembly has one control lever (See Figures 1-9 and 1-10). 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 handlever (electronic controls) or control lever (power controls), 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.

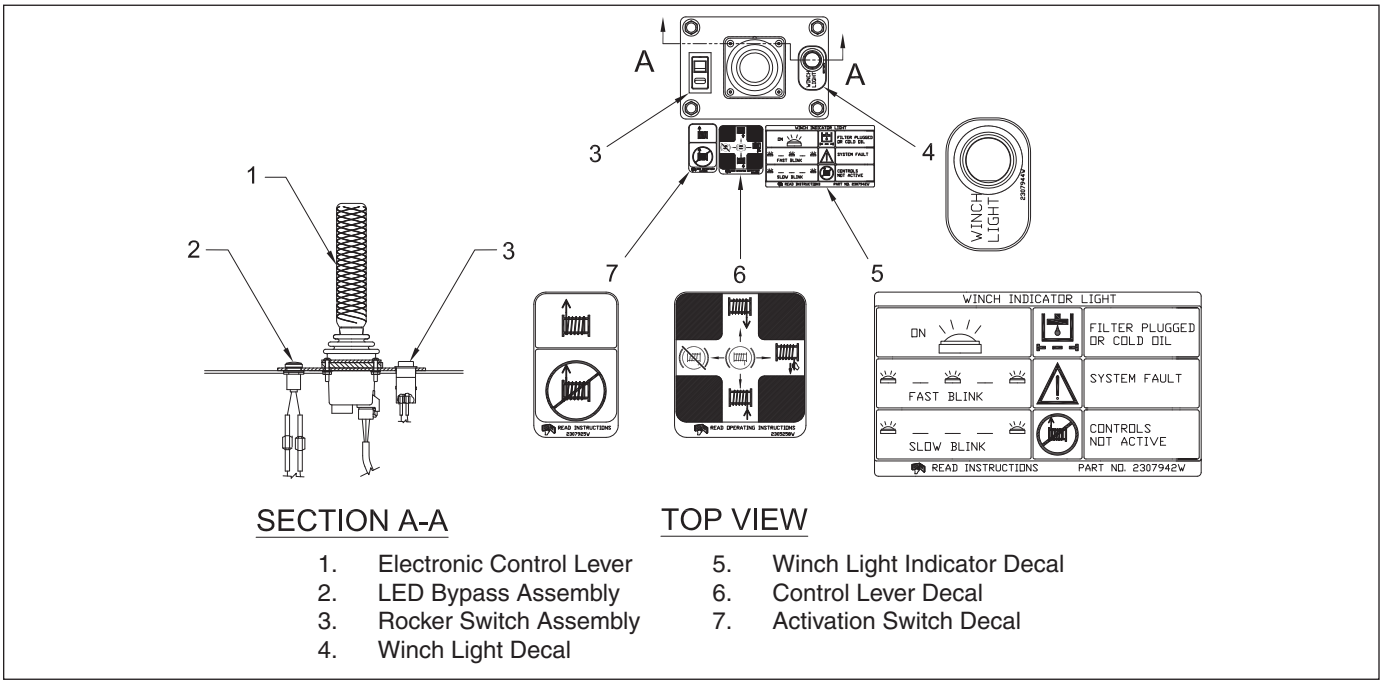
LINE-IN position applies the forward clutch and releases the brake. The winch will wind the wire rope at a speed controlled by the PTO speed of the tractor.

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.

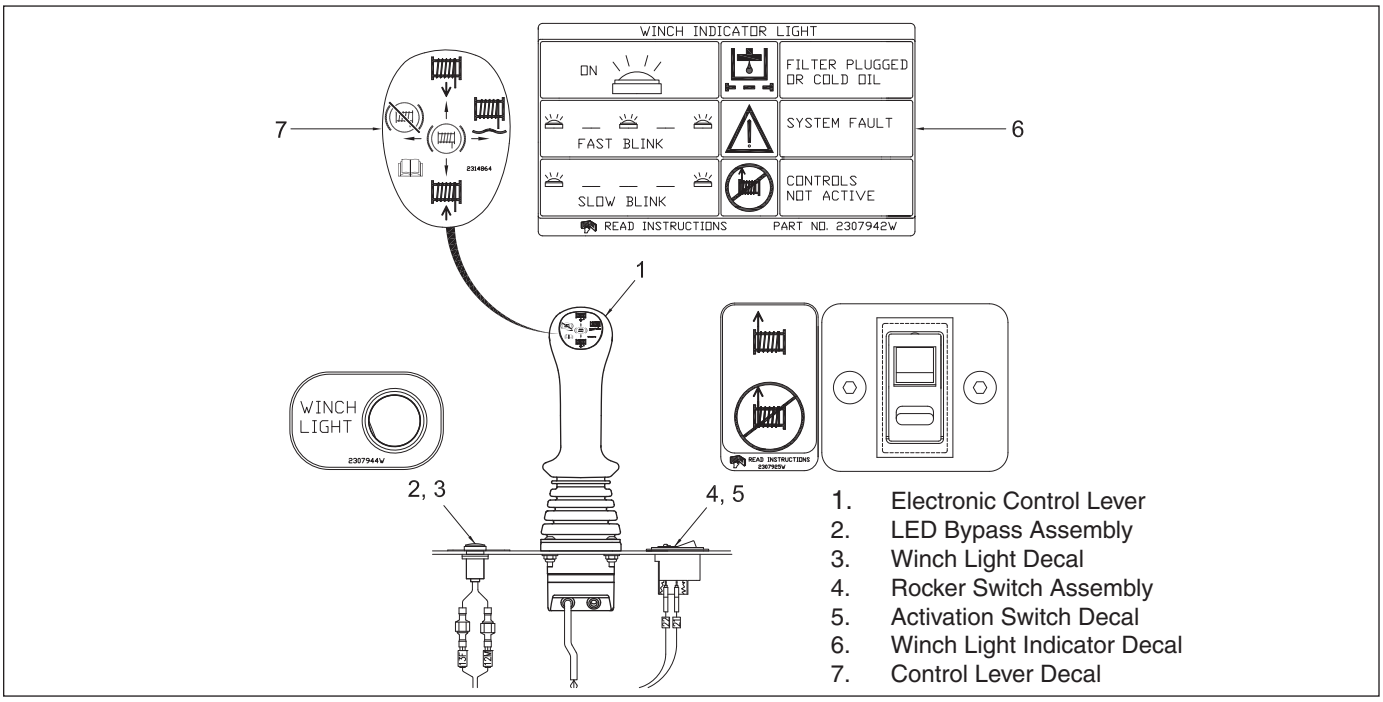
Inching (LINE-IN). This operation is used to slowly move a load toward the tractor. As the control lever is moved gradually towards the **LINE-IN** position, the control valve will cause the oil pressure to slowly release the brake and slowly apply the forward clutch. As the brake is released, the clutch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



1. Electronic Control Lever
2. LED Bypass Assembly
3. Rocker Switch Assembly
4. Winch Light Decal
5. Winch Light Indicator Decal
6. Control Lever Decal
7. Activation Switch Decal

Figure 1-9 Electronic Controls (Old Type)



1. Electronic Control Lever
2. LED Bypass Assembly
3. Winch Light Decal
4. Rocker Switch Assembly
5. Activation Switch Decal
6. Winch Light Indicator Decal
7. Control Lever Decal

Figure 1-10 Electronic Controls (New Type)

The **FREESPOOL** arrangement allows mechanical disengagement of the drum gear from the remainder of the gear train. When the **FREESPOOL** control lever is shifted, the dental clutch engages or disengages the drum pinion and intermediate gear. (See Figure 1-11)

⚠ WARNING

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

The power control lever must be in the **BRAKE-ON** or **BRAKE-OFF** positions to operate the **FREESPOOL** control lever. When the **FREESPOOL** control lever is moved to the **FREESPOOL** position, the sliding sleeve disengages the drum pinion gear from the intermediate gear. The gear train is disengaged from the drum gear so that the wire rope can be pulled from the drum by hand. Only the drum and drum pinion gear rotates when the wire rope is pulled during **FREESPOOL** operation. The resistance to rotation by the drum during **FREESPOOL** is controlled by the preload on the bearings for the intermediate shaft.

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

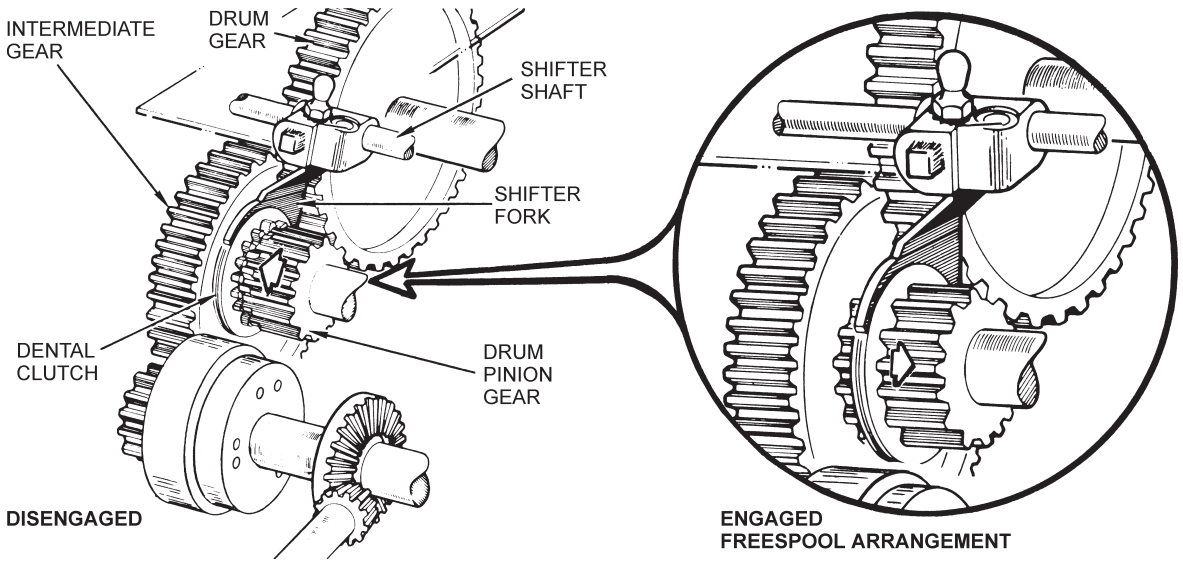


Figure 1-11 Freespool

Capacities and Specifications

Recommended Oil List

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

Recommended Oils* - Low Temperature Conditions			
Manufacturer	**Oil Type**	**Ambient Temperature Range**	
		°F	**°C**
ExxonMobil	Mobil Fluid LT	-40 to 86	-40 to 30
John Deere	Low Viscosity Hy-Gard	-40 to 86	-40 to 30
Chevron	THF W	-40 to 86	-40 to 30

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

Figure 1-12 Recommended Oil List

Winch Drum Line Capacities

Wire Rope Diameter	Capacity for 305 mm (12 in) Drum Diameter
22 mm (7/8 in)	108 m (354 ft)
25 mm (1 in)	84 m (275 ft)
28.6 mm (1 1/8 in)	67 m (220 ft)
NOTE: Loosely or unevenly spooled line will reduce capacities. Use flexible wire rope with independent wire rope center.	

Figure 1-13 Winch Drum Line Capacities

Winch Weight

Winch and Attachment	Weight
Winch	3,000 lb.
Bracket and Gearbox	702 lb.
Fairlead	900 lb.
Wire Rope	363 lb.
Total	**4,965 lb.**

Figure 1-14 Winch Weight

Winch Oil Capacity

Winch Model	Oil Capacity
W8L	20.0 Gallon (76 L)

Figure 1-13 Winch Oil Capacity

Torque Specifications

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

NOTE: All torque values given with threads lubricated.

ITEM	W8L	
	ft-lbs	kg-m
PTO Shaft Assembly		
Bearing Carrier Capscrews	75	10
Clutch Shaft Assembly		
Bearing Retainer Capscrews	75	10
Bearing Locknut	200	28
Pump Mounting Capscrews	25	4
Brake Shaft Assembly		
Bearing Retainer Capscrews	75	10
Intermediate Shaft Assembly		
Bearing Retainer Capscrews	75	10
Freespool Shift Shaft	75	10
Drum Shaft Assembly		
RH Bearing Retainer Capscrews	75	10
Drum Gear to Adapter Capscrews	180	24
Drum Shaft Nuts	400	55
Drum to Adapter Capscrews	220	30
Clutch Assembly		
Clutch Piston Housing Capscrews	70	10
Clutch Piston Housing Setscrews	40	6
Brake Assembly		
Cover Nuts	130	17
Control Valve		
Mounting Capscrews	50	7
Winch Mounting to Tractor		
Studs	500*	69*
Capscrews	500*	69*
Nuts (All Except Inside Nuts)	500	69
Inside Nuts (Castle Type with Cotter)	Hand	Hand
* With Loctite		

Figure 1-15 Torque Specifications (1)

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

Figure 1-15 Torque Specifications (2)

Hydraulic Specifications

Pump ..... Gear Type
10-13 gpm (38-50 l/min) at 1000 rpm

Operating pressure.....225 psi (1,550 kPa)

Valve.....One Spool (Power Controls)
.....Proportional Solenoid (Electronic Controls)

Filters.....Full flow magnetic strainer
20 micron paper cartridge (Power Controls)
.....10 micron spin on (Electronic Controls)

Notes

Power/Cable Controls

Hydraulic System

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 PTO is not operating.

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

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

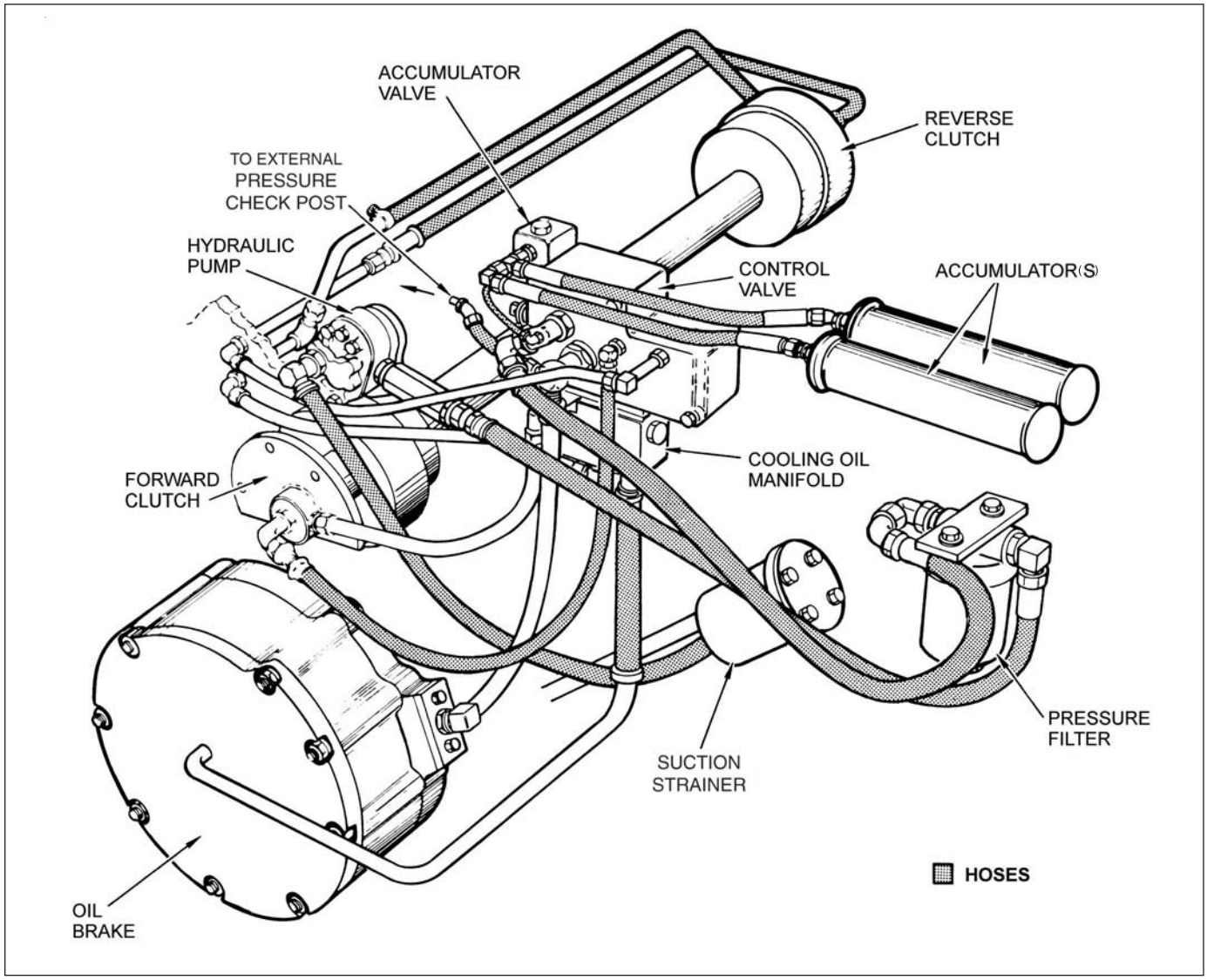


Figure 2-1 Hydraulic System (Power Controls) (Ratios #1 - #7)

Forward and Reverse Clutches

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.

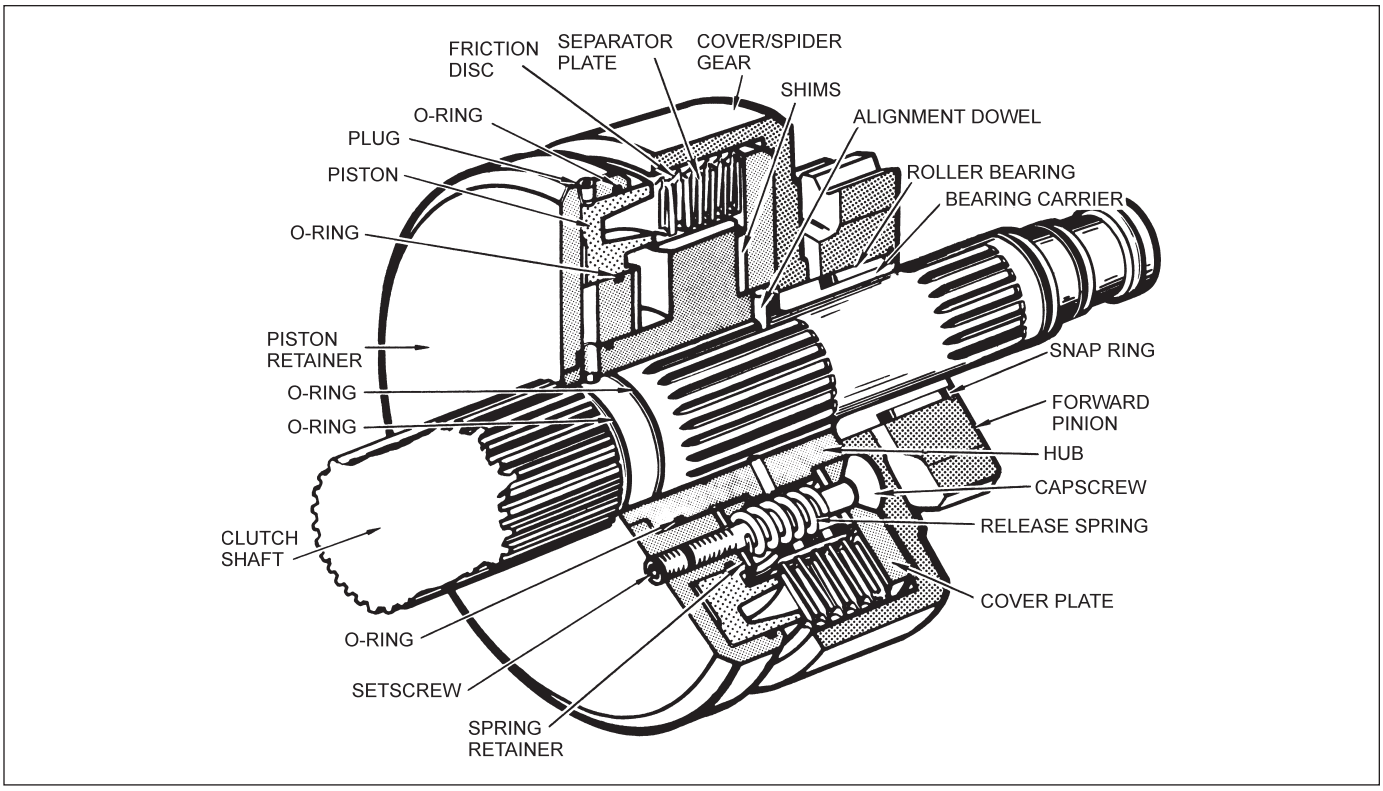


Figure 2-2 Forward Clutch

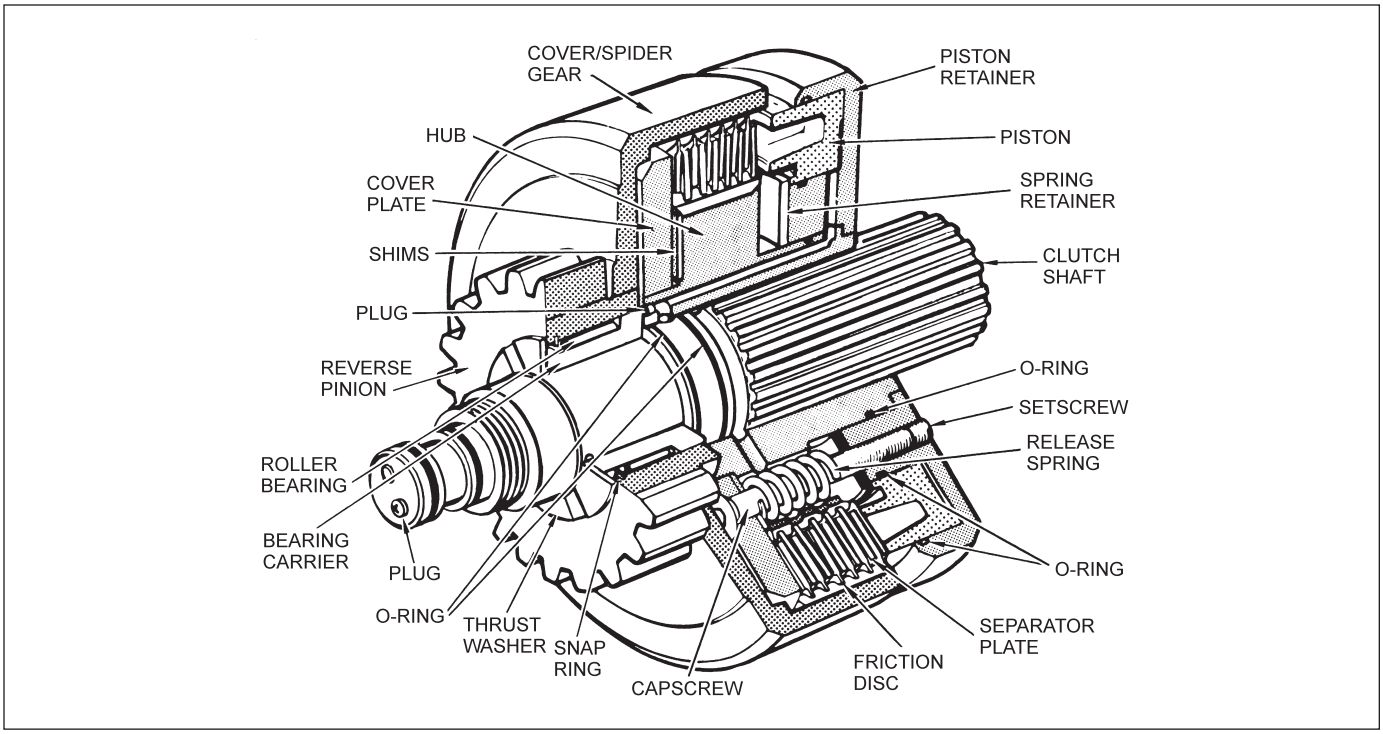


Figure 2-3 Reverse Clutch

Oil Brake Assembly

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. (See Figure 2-4)

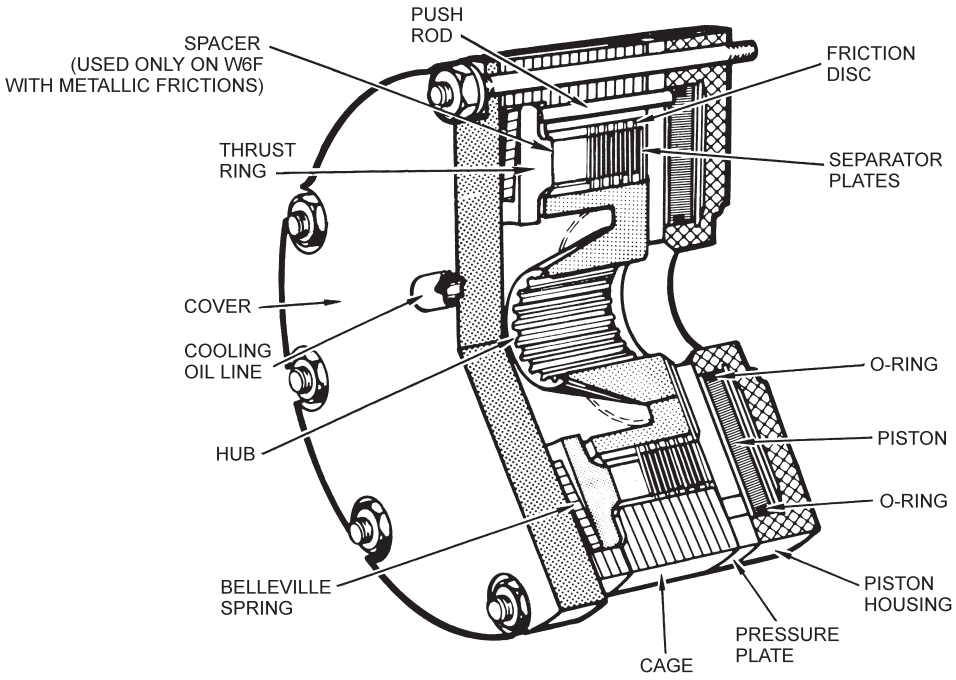


Figure 2-4 Oil Brake Assmbly

Hydraulic Control Valve

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. (See Figure 2-5)

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. Oil from the relief valve is discharged directly to the cooling circuit. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat.

Hydraulic Pump

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. (See Figure 2-6)

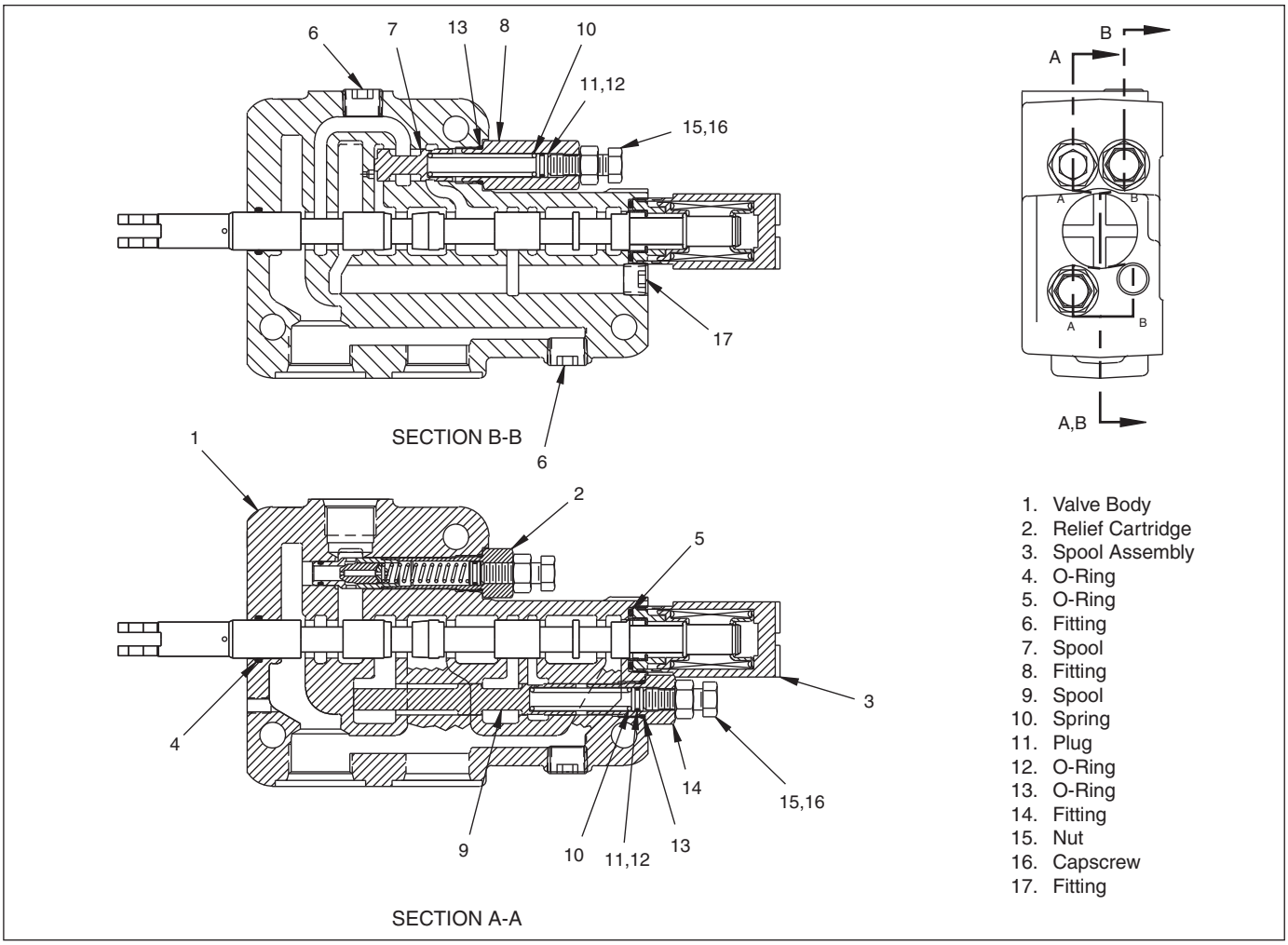


Figure 2-5 Hydraulic Control Valve

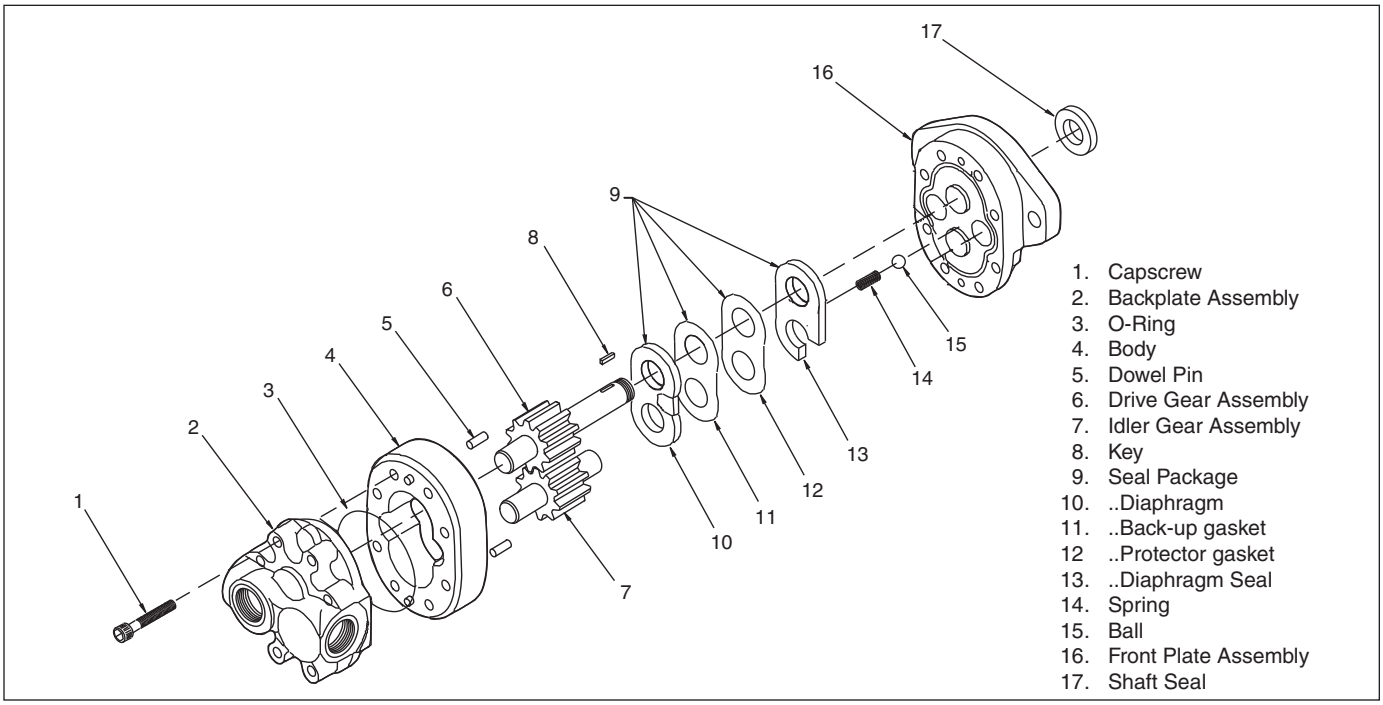


Figure 2-6 Hydraulic Pump

Accumulator(s)

Accumulator(s) is/are connected to the hydraulic system. The bladders have a nitrogen gas precharge so that the oil stored in the accumulators will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts and if the PTO shaft stalls. They are charged with nitrogen to 100 to 115 psi.

Accumulator Valve

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

Check Valve

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

Cooling Oil Relief Valve

The cooling oil relief valve is a spring-loaded, poppet-type valve. The valve is mounted in the control valve cooling oil cavity and maintains cooling oil pressure at 10 psi (0.75 kg/cm^2) max. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. Oil from the cooling oil relief valve is discharged directly into the inside of the winch housing. (See Figure 2-7)

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

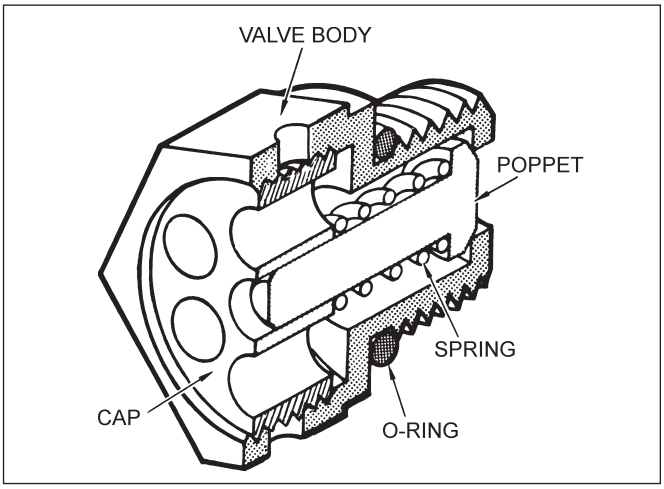


Figure 2-7 Cooling Oil Relief Valve

Sequence of Operation

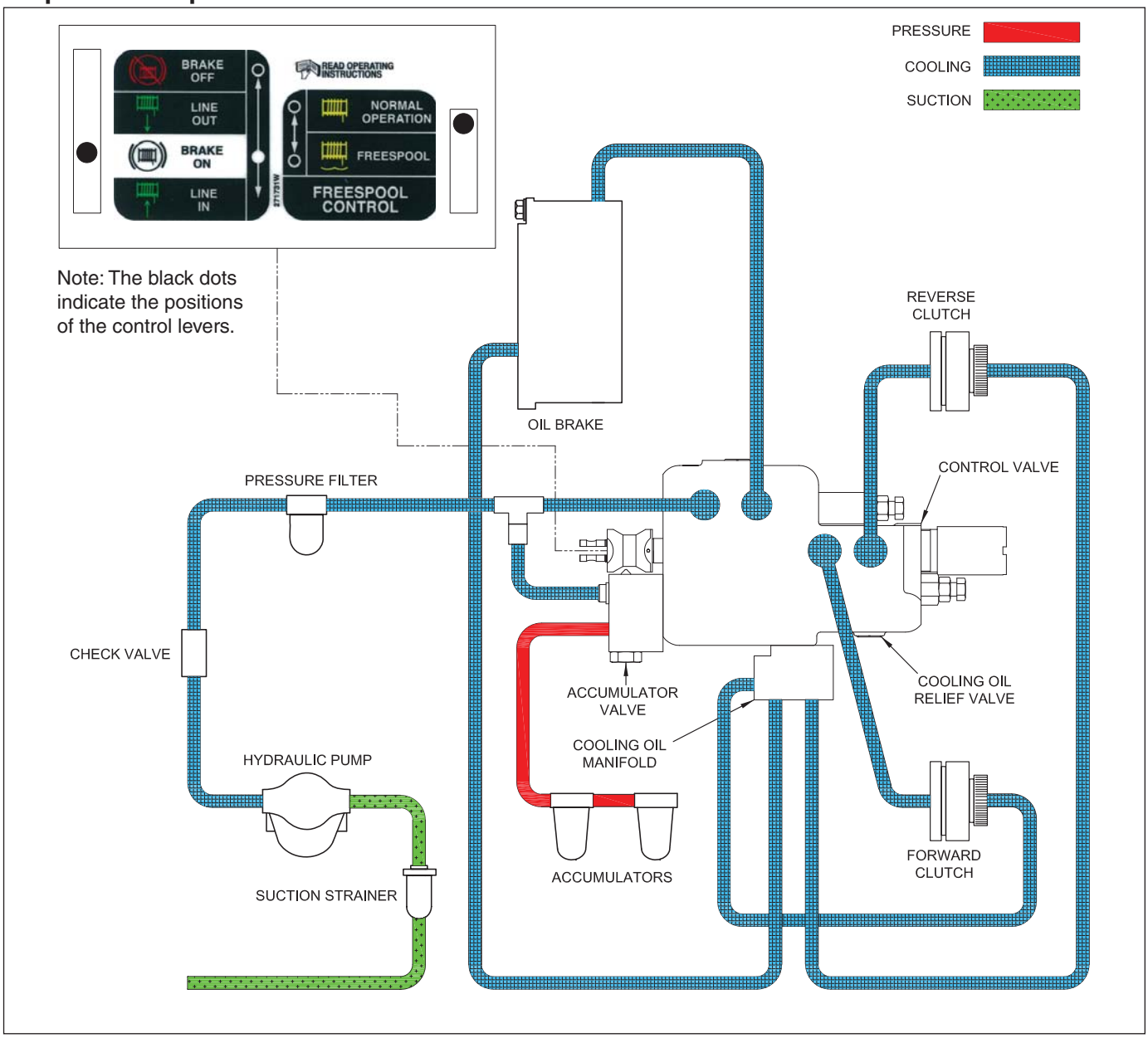


Figure 2-8 Hydraulic System - BRAKE-ON (Neutral)

Sequence of Operation - BRAKE-ON

The control valve spool is spring centered to **BRAKE-ON**. In this position, oil entering the valve flows into the cooling oil core passages. The cooling oil relief valve maintains hydraulic pressure in the cooling oil passage at 10 psi (68.75 kPa) max. Cooling oil flows out of the cooling oil manifold to lubricate and cool the brake and clutch assemblies. Excess flow goes directly to the sump.

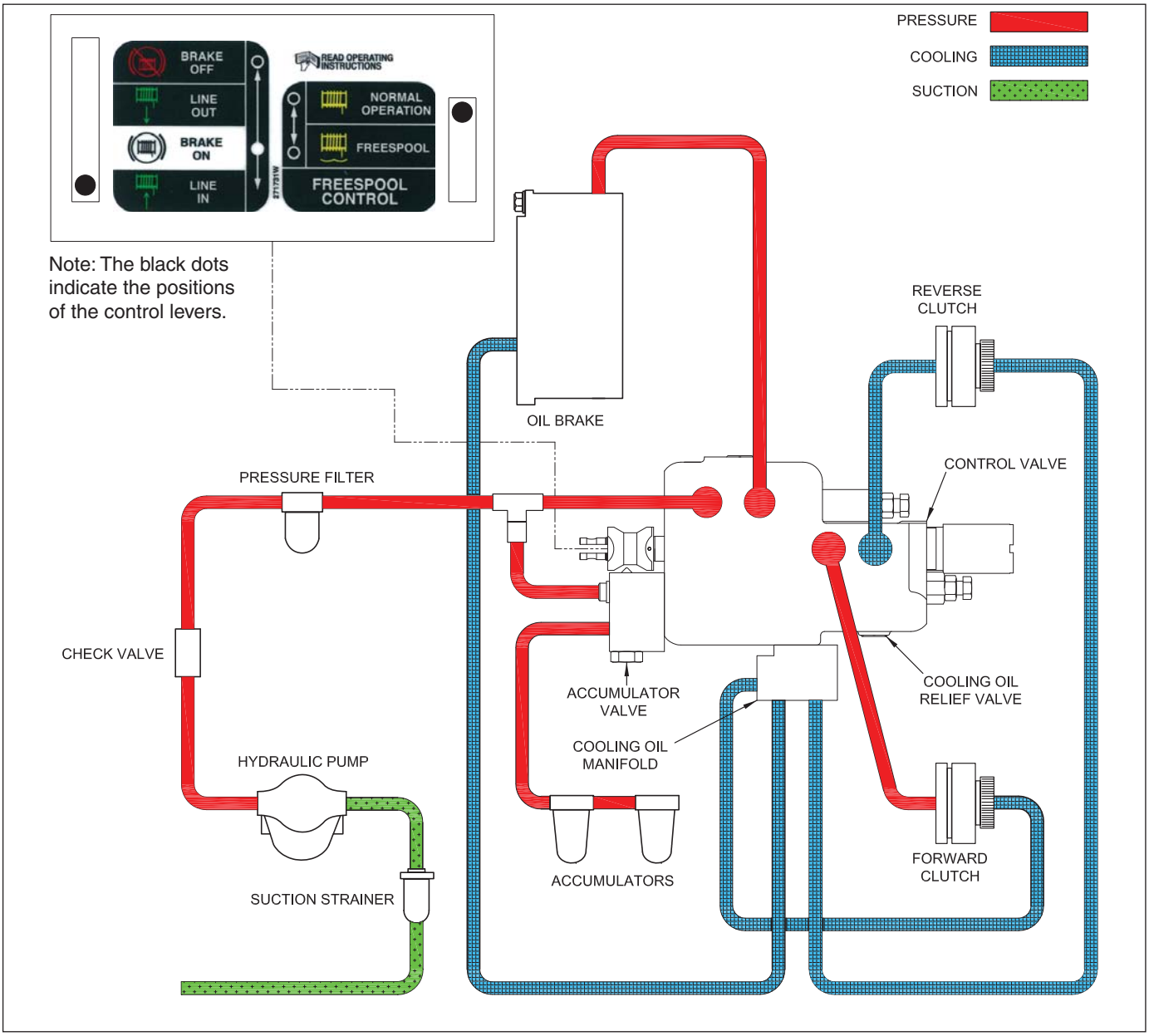


Figure 2-9 Hydraulic System - LINE-IN (Forward)

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 difference in pressure drop between the inlet and brake passage, depending on the amount of oil flow. 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 set at 50 psi for torque converter PTOs). At the end of the spool travel, a direct port to the clutch is opened to bypass the modulator.

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 rises 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.

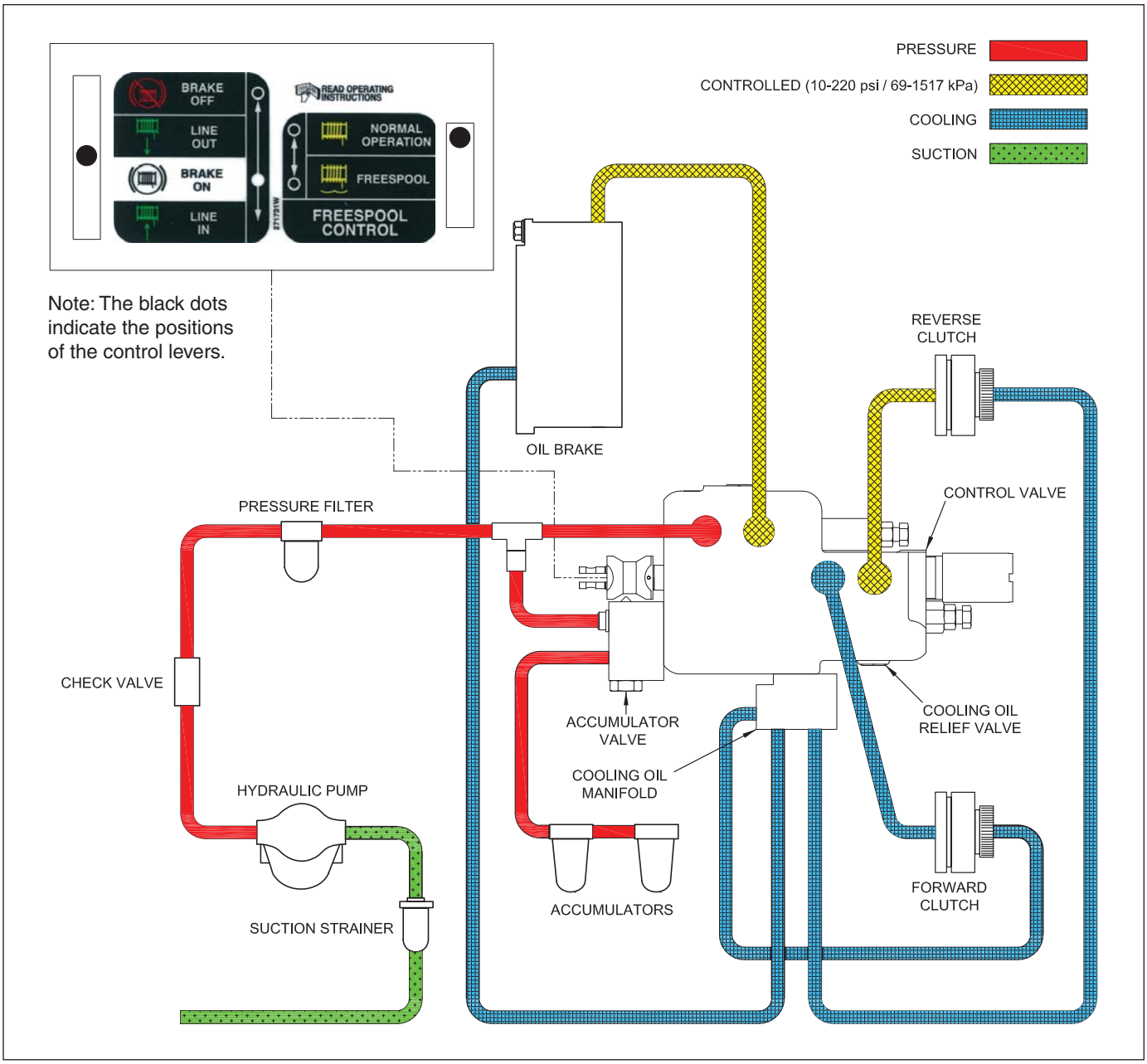


Figure 2-10 Hydraulic System - LINE-OUT INCHING

Sequence of Operation - LINE-OUT INCHING

LINE-OUT INCHING (gradual brake release) is achieved by slowly pushing the control lever away from the operator. As the control spool moves, the flow of oil to the cooling passage is slowly 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 differential between the inlet and brake passages, depending on the amount of oil flow. As the brake pressure increases, the reverse modulator valve will regulate the oil pressure on the reverse clutch and maintain a constant pressure differential between the brake and the clutch (factory set at 120 psi for torque converter PTOs) through the inching mode.

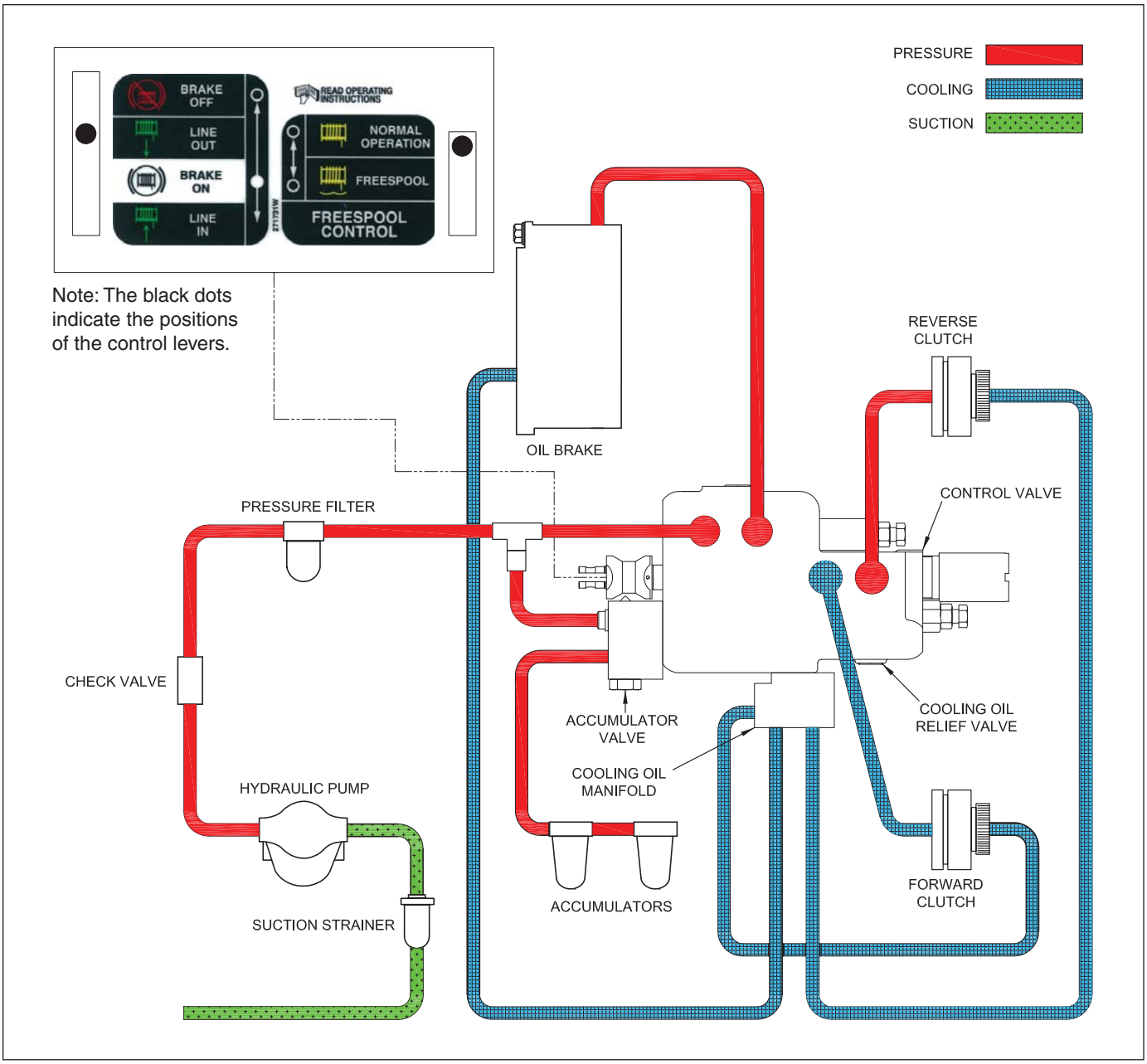


Figure 2-11 Hydraulic System - LINE-OUT (Reverse)

Sequence of Operation - LINE-OUT

At the end of spool travel, a direct port to the reverse clutch is opened. The modulator is bypassed.

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

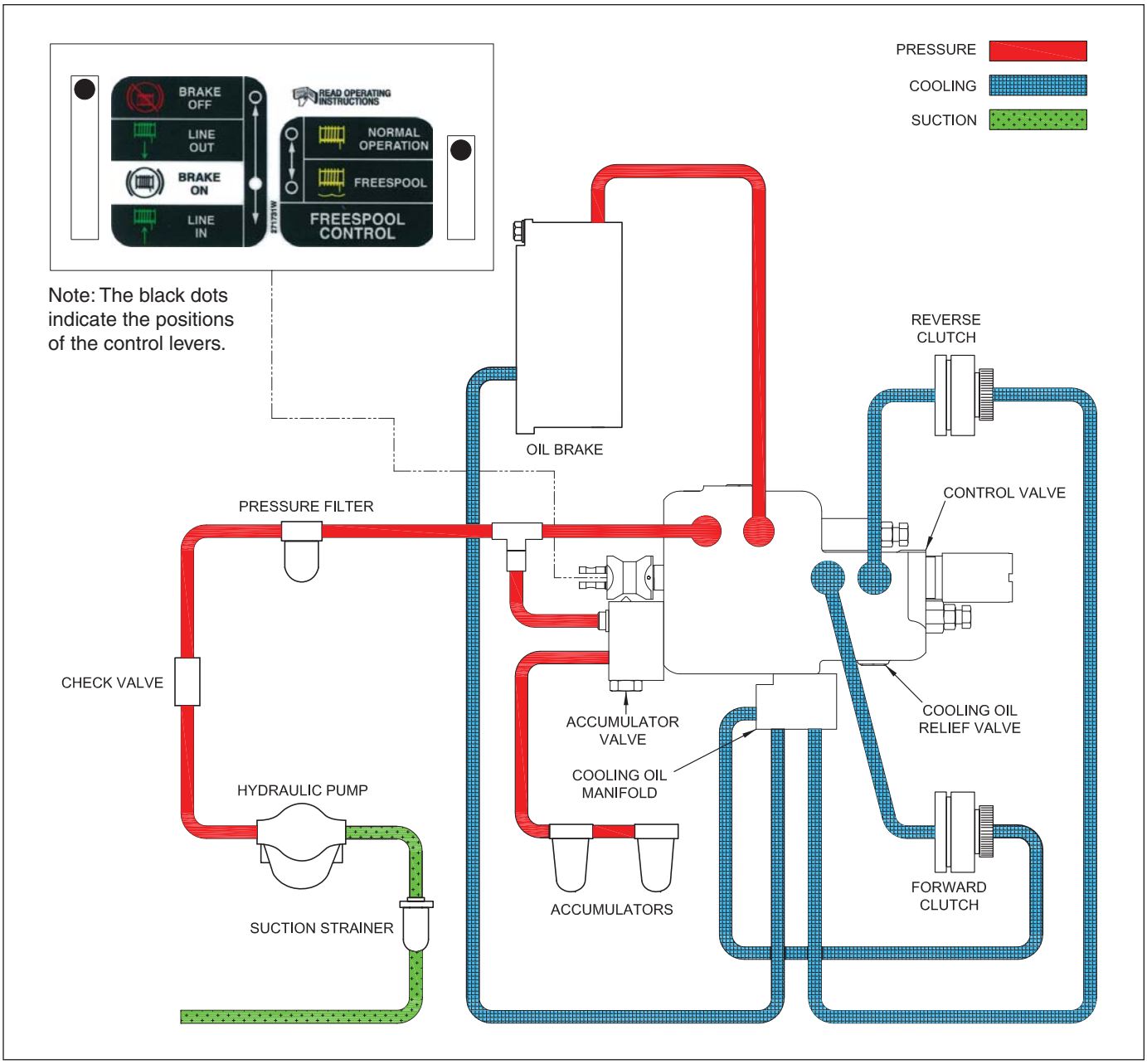


Figure 2-12 Hydraulic System - BRAKE-OFF

Sequence of Operation - BRAKE-OFF

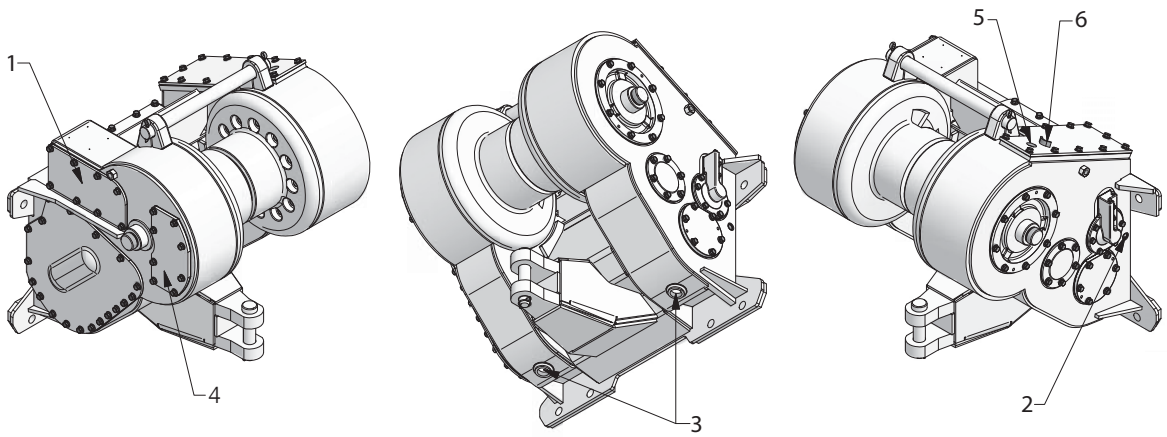
BRAKE-OFF is achieved by pushing the control lever to the **BRAKE-OFF** position. This position is detented and the control lever must be moved manually to return it to the neutral position. With the control spool in **BRAKE-OFF** position, oil flow to the clutches is blocked, and high pressure oil flows directly to the brake port to fully release the brake.

NOTE: From the LINE-OUT position, the lever must be pushed harder through the "Stop" into the detented position.

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 section.

Maintenance Points



1. Access Cover for Control Valve
2. Plug to Check Oil Level
3. Plug to Drain Oil
4. Cover for Filter
5. Fill Plug
6. Breather

Figure 2-13 W8L Maintenance Points

Maintenance Schedule

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating time on the hour meter of the 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). **Do not operate tractor when checking the oil level.**	See Figure 1-12 – 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 20 gallons (75 liters)†. Check the oil level at item 2.	See Figure 1-12 – 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 2-14 Maintenance Schedule

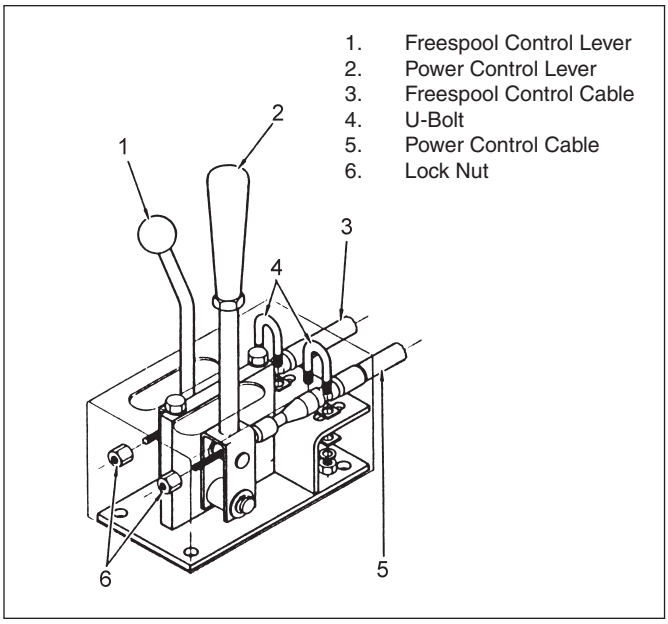


Figure 2-15 Control Cable Adjustments

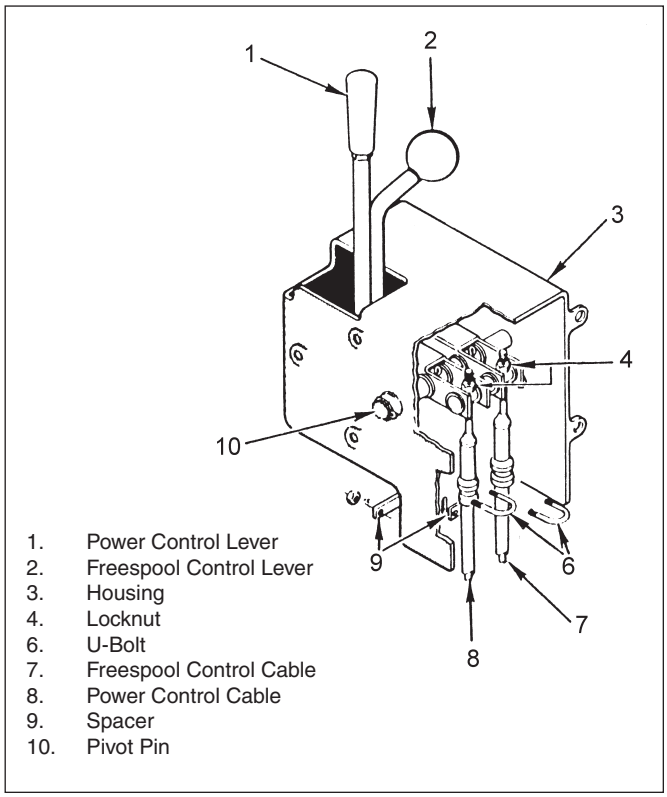


Figure 2-16 Control Cable Adjustments (this configuration last used in 1993)

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 charts in Troubleshooting subsection of 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
- Freespool cable adjustment

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 control levers depicted in Figures 2-15 through 2-17, 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 control lever 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 control lever housing. Move U-Bolt up or down the elongated slots to improve position of control lever. Tighten nuts securely.

3. Move control lever to **LINE-IN** and **BRAKE-OFF** positions and ensure that the lever holds in the **BRAKE -OFF** position. Check to ensure that the control lever does not hit the housing in either position. If interference is found, repeat step 2.

To adjust the control lever depicted in Figure 2-18, proceed as follows:

1. Adjust control lever position so full valve spool stroke is attained by screwing cable in or out of tall nut.

2. Install cable adapter in groove on control lever cover and attach cover.

3. Check for complete lever travel. Repeat steps 1 and 2 if adjustment is still incorrect.

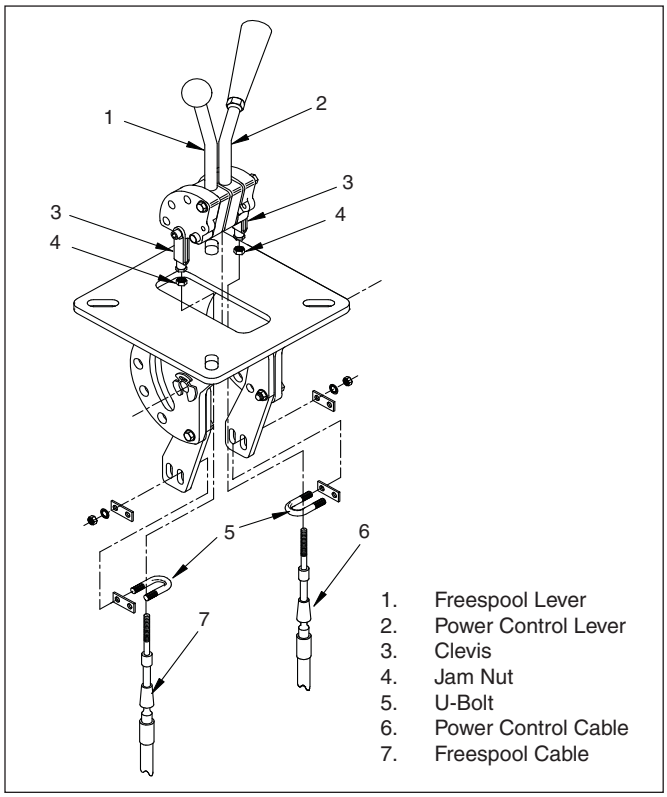


Figure 2-17 Control Cable Adjustments

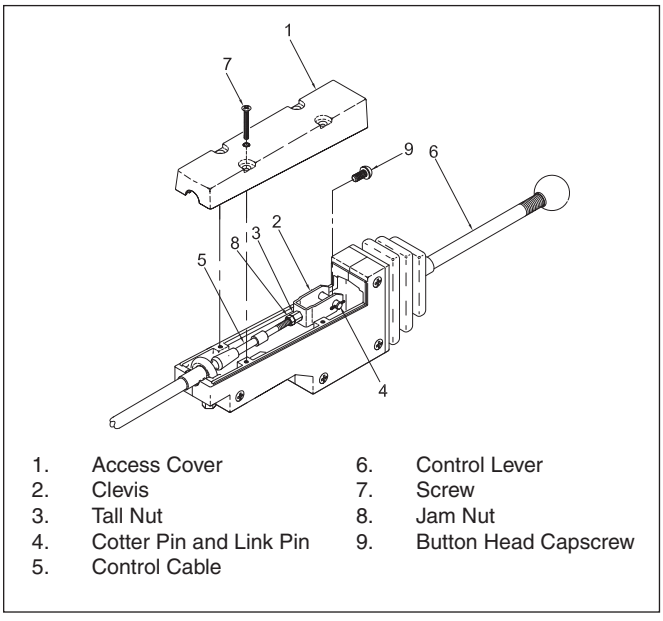


Figure 2-18 Control Cable Adjustments

FREESPOOL Cable Adjustment

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

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

FREESPOOL Drag Adjustment For AW8L-2032 and below, without Exterior Drag Adjust

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

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

FREESPOOL Drag Adjustment For AW8L-2033 and above, with Exterior Drag Adjust (See Figure 2-19)

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

On W8L winches S/N 2033 and above, an adjusting screw is located in the center of the bearing retainer for the intermediate shaft; please refer to Figure 2-19. This screw can be tightened or loosened to adjust the preload on the intermediate shaft. The jam nut will maintain the **FREESPOOL** setting.

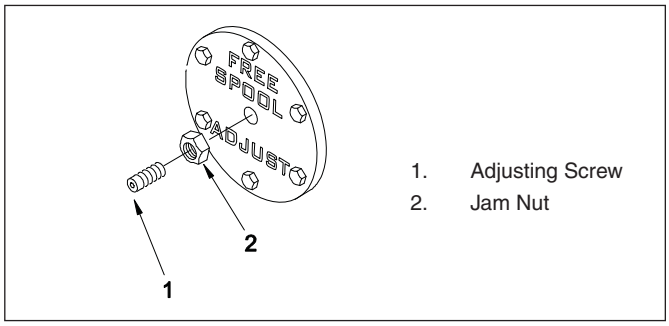


Figure 2-19 FREESPOOL Adjustments

⚠ CAUTION

Setting shaft too tight will cause bearing overload. Setting shaft too loose will allow

shaft not to be parallel. Use caution when adjusting. Start with loose, and adjust towards tight. Turn adjusting screw only 1/6 rotation max. Then strike housing with a hammer to make sure bearing is sliding.

Hydraulic System Pressure Checks

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

Preparation

Prior to checking the hydraulic pressures, perform the following:

1. Remove wire rope from drum to prevent engtanglement during pressure checks since the drum will rotate during the tests.

⚠ WARNING

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

⚠ WARNING

Always wear gloves when handling wire rope.

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

Pressure gauges

Two 400 psi (28 kg/cm²) and one 30 psi (2 kg/cm²) 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 accumulators when connecting/disconnecting gauges.

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 2-22. Adequate brake pressure is required to fully release the brake. If the pressure is not as specified, check for:

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

Cooling Oil Pressure Check

With the engine shut off, connect one low pressure gauge to Port C. Start the engine and see the Cooling section in Figure 2-22. If the cooling oil pressure is too high, it can stroke the clutch piston and drag the clutch pack. The result is overheating. Low cooling oil pressure will not produce enough cooling oil flow and cause overheating. Check for a defective cooling oil relief valve.

Adjust relief valve as follows:

1. Start engine and place 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 2-22.
3. Tighten locknut after adjustment is completed.
4. Recheck pressure reading and repeat steps 2 and 3 if necessary.

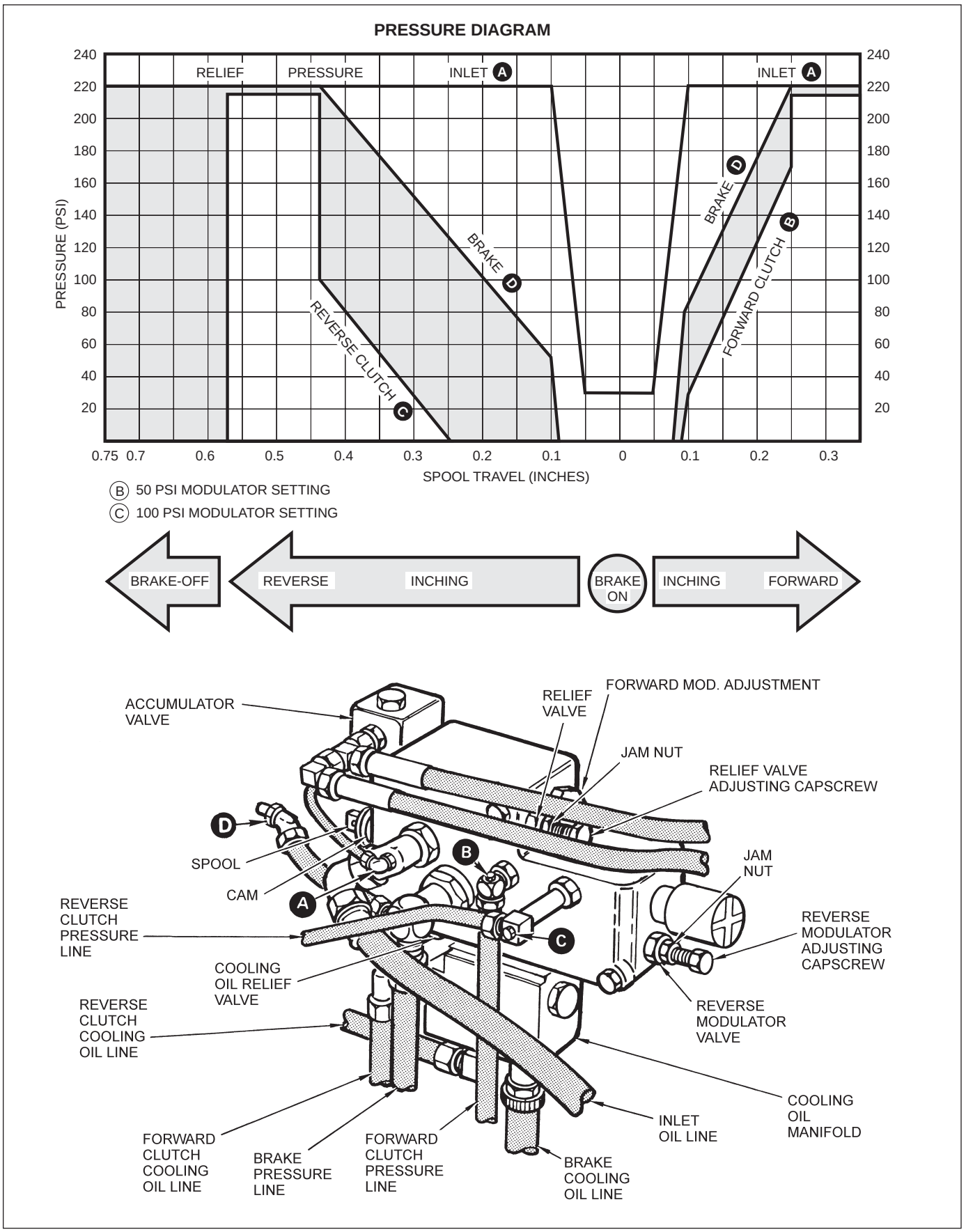


Figure 2-20 Hydraulic System Pressure Checks

Accumulator Pressure Check

With the engine shut off, connect one low pressure gauge to Port D. This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe the following while referring to the accumulator section in Figure 2-22.

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. Move the control lever quickly into 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 2-22. Low initial jump up indicates a bad accumulator.

If the leak down time is less than specified in Figure 2-22, 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 valve stem protective cover and push gently on valve stem. A ruptured bladder will emit oil. Accumulators are not rebuildable.

Forward Clutch Pressure Check and Forward Modulator Valve Check/Adjustment

With the engine shut off, connect one low pressure gauge to Port B. Start the engine and place control lever in **BRAKE-OFF** to build up the accumulator system pressure. Place control lever in **LINE-IN** position and check FORWARD (**LINE-IN**) clutch and **LINE-IN INCHING** pressures as indicated in Figure 2-22. On a fast shift the clutch pressure should come up with the brake pressure. In **LINE-IN INCHING** the clutch pressure should lag the brake release pressure as shown in Figure 2-22. 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 2-22, check for:

1. Leaking pressure hoses or fittings.

2. Damaged or worn clutch piston seals.

3. Improper control valve spool movement.

4. Broken seal rings on clutch shaft.

5. Damaged O-rings on clutch shaft. Troubleshooting information is given in the following subsection.

If the **LINE-IN INCHING** pressure differential is not as specified in Figure 2-22, remove the forward modulator valve and check for defective or dirty parts. To adjust the modulator valve, proceed as follows:

1. Loosen the forward modulator adjustment locknut. With engine running, move the control lever towards **LINE-IN** until the brake pressure reads 140 PSI (9.5 kg/cm^2). Use 180 PSI (12.7 kg/cm^2) for direct drive PTOs.

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 2-22.

3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

Reverse Clutch Pressure Check and Reverse Modulator Valve Check/Adjustment

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 2-22. 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 2-22. 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 2-22, 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 after the subsection.

If the **LINE-OUT INCHING** pressure differential is not as specified in Figure 2-22, 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/cm²). Use 180 PSI for direct drive PTOs.

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 2-22.

3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

Control Valve Spool Travel Check

It may be necessary to check spool travel when control valve pressures do not meet specifications. Figure 2-21 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.

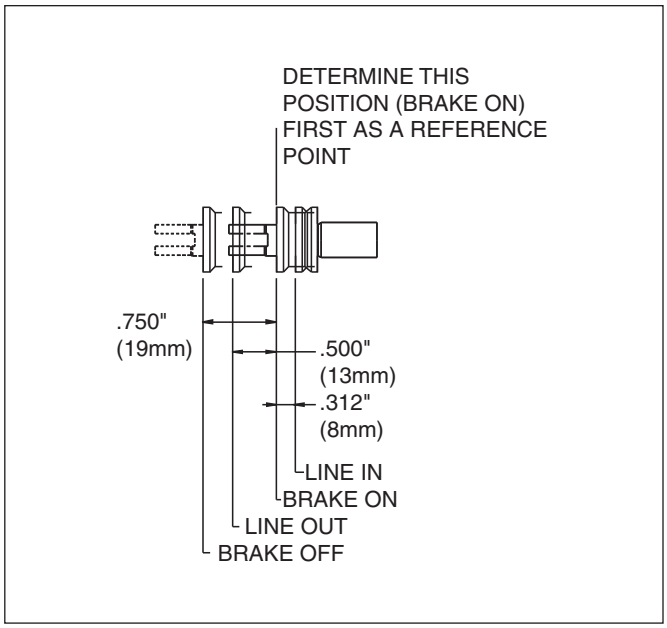


Figure 2-21 Control Valve Spool Travel

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 2-22 Hydraulic System Pressure Tests

ITEM FUNCTION	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	D – Brake	1 – 400 psi (25 kg/cm²) gauge	**BRAKE-OFF**	220 psi (15.5 kg/cm²) Pressure not to exceed 250 psi at high idle	Adjust relief valve
Cooling	C – Cooling	1 – 30 psi gauge	**BRAKE-ON**	8-11 psi (0.57-0.825 kg/cm²) at full throttle	Check or replace cooling oil relief valve
Accumulator	D – Brake	1 – 400 psi (25 kg/cm²) gauge	**1. BRAKE-OFF** **1. BRAKE-ON** 2. Stop engine **3. BRAKE-OFF** 4. Repeat if required	220 psi (15.5 kg/cm²) None None—wait 1 minute 145 psi (10.6 kg/cm²) minimum & 100 psi (7 kg/cm²) minimum after 30 seconds	1. Check hydraulic lines for leaks 2. Replace accumulator valve 3. Check for defective accumulators
LINE-IN (Forward)	B – Forward	1 – 400 psi (25 kg/cm²) gauge	**LINE-IN**	220 psi (15.5 kg/cm²)	Refer to the following subsection for Low Forward or Reverse Clutch Pressure troubleshooting procedures
LINE-IN (Inching)	B – Forward D – Brake	2 – 400 psi (25 kg/cm²) gauge	Vary between **BRAKE-ON** and **LINE-IN**	Port B 50 psi (3.5 kg/cm²) less than Port D (Direct Drive PTOs use 90 psi [6.3 kg/cm²])	Check or replace forward modulator valve
LINE-OUT (Reverse)	C – Reverse	1 – 400 psi (25 kg/cm²) gauge	**LINE-OUT**	220 psi (15.5 kg/cm²)	Refer to the following subsection for Low Forward or Reverse Clutch Pressure troubleshooting procedures
LINE-OUT (Inching)	C – Reverse D – Brake	2 – 400 psi (25 kg/cm²) gauge	Vary between **BRAKE-ON** and **LINE-OUT**	Port C 80 psi [5.6 kg/cm²] (torque converter PTO) or 120 psi [8.4 kg/ cm²] (direct driven PTO) less than Port D	Adjust reverse modulator

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

Troubleshooting

This section includes Figures 2-23 and 2-24, troubleshooting analysis check charts. The charts list the most common troubles that may be encountered. A possible cause and recommended corrective action are listed to restore the winch to normal operating condition. Figure 2-23 applies to W8L winch, Figure 2-24 applies to W8L winch equipped with optional **FREESPOOL.**

Figure 2-23 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 **BRAKE-OFF**. Normally drum will rotate slowly in the **LINE-IN** direction. If the reverse clutch is dragging, the drum will rotate in the **LINE-OUT** direction. If forward clutch is dragging, the drum will rotate positively in the **LINE-IN** 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 **BRAKE-ON**.	Make sure that there are no tight bends in the control cable (minimum bend redii 5.00”), or replace cable.
	Winch control lever left in **BRAKE-OFF.**	Return the lever to **BRAKE-ON**.
	Excessive inching.	Avoid continuous operation in the inching zone.
Operation is rough	Hydraulic oil is too cold.	Put the control lever in the **BRAKE-OFF** position. Run the engine at 1000 rpm to warm the oil before operating the winch.
	Low oil level.	Add hydraulic oil to the correct level.
	Low system pressure.	See item on troubleshooting low oil pressure directly below.
	Wrong oil.	Drain oil and replace with correct grade. Refer to Figure 1-12, 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: 1. Suction hose to pump connection 2. Pump shaft seal 3. Suction filter cover and gasket 4. Suction hose for cracks or collapsed sections
	Control 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.

(Continue on next page)

Figure 2-23 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 on page 2-17).
Brake does not release or winch stalls during low RPM shift	Low oil pressure.	Refer to “Low Oil Pressure” troubleshooting item above.
	Pressure modulator set too low.	Turn modulator screw IN for earlier brake release. Increase sequence differential.
	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Figure 2-22. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace both seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to “Low Forward or Reverse Clutch Pressure” troubleshooting item below.
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.
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.

(Continue on next page)

Figure 2-23 Troubleshooting Analysis Check Chart (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
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. **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.
	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: 1. Proper leakdown time as described in Figure 2-20. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Low oil pressure.	Refer to “Low Oil Pressure” troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage. Inspect magnetic suction screen.
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 in subsection of Oil Brake Reassembly & Installation in Section 4.
Forward or reverse oil clutch not releasing	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators	Replace as necessary.
	Lube pressure high.	Test and re-set 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 in subsection of Clutch Shaft Reassembly & Installation in Section 4.

Figure 2-24 Troubleshooting Analysis Check Chart for FREESPOOL Option

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

Notes

Notes

Electronic Controls

Hydraulic System

The operation of the winch is controlled by an internal hydraulic system (see Figure 3-1). When the tractor's PTO is operating, this system provides pressure and directs the flow of oil for the 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 (see Figures 3-2 and 3-5) 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 is not operating.

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

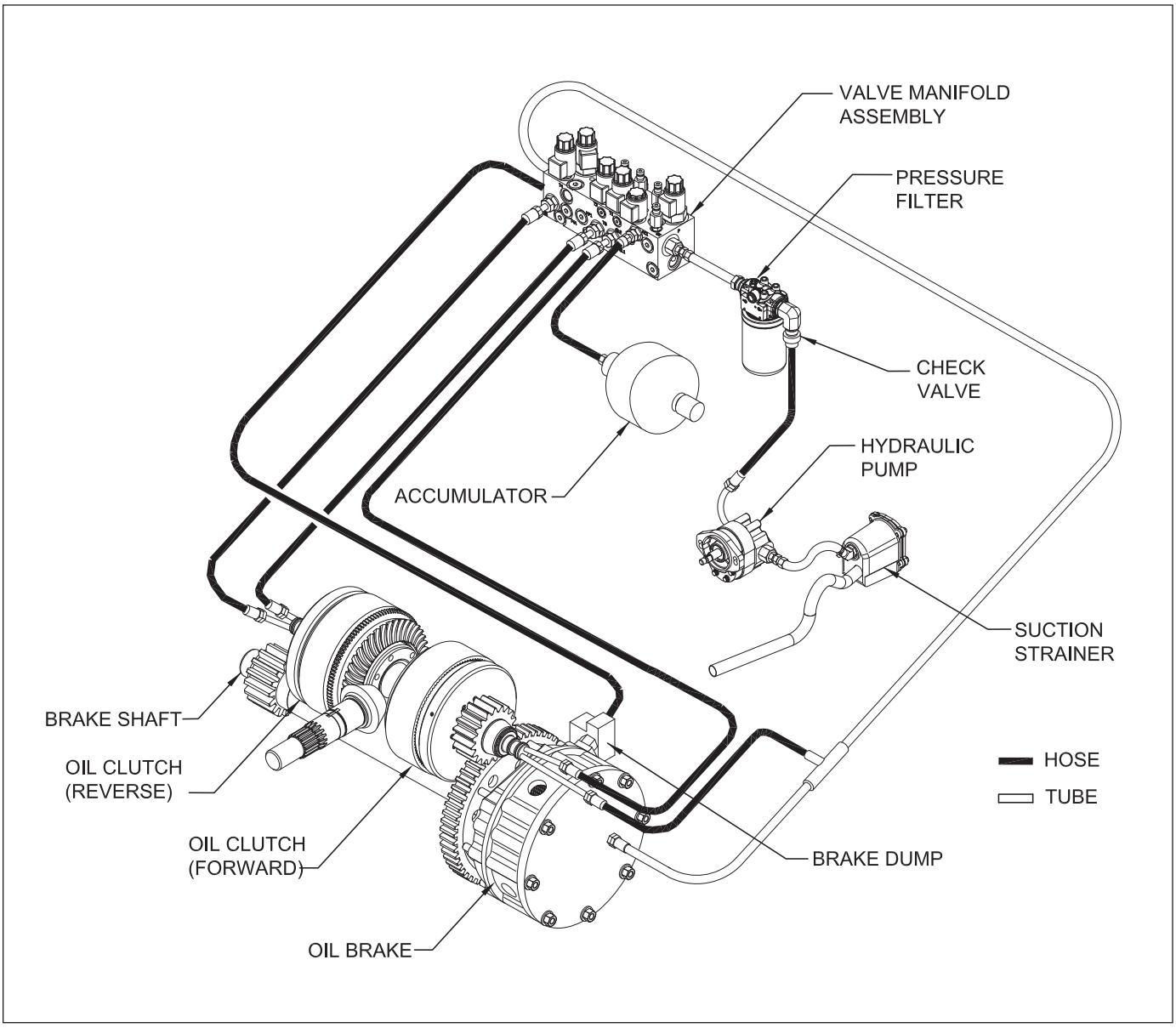
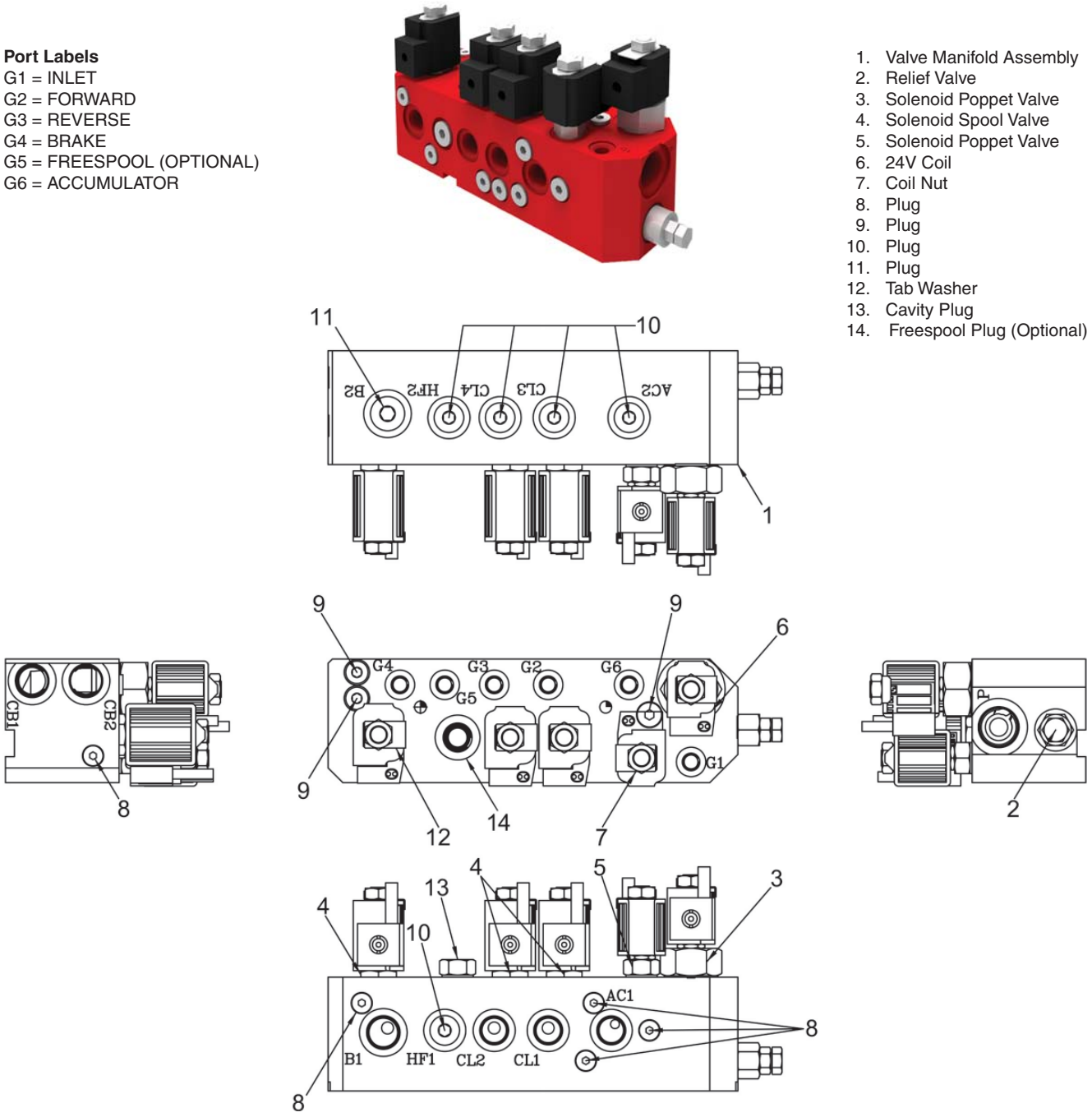


Figure 3-1 Hydraulic System (Electronic Controls)

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 and 3-3). See Figures 3-4 through 3-8 for gauge ports' connections and functions.

Port Labels
G1 = INLET
G2 = FORWARD
G3 = REVERSE
G4 = BRAKE
G5 = FREESPOOL (OPTIONAL)
G6 = ACCUMULATOR



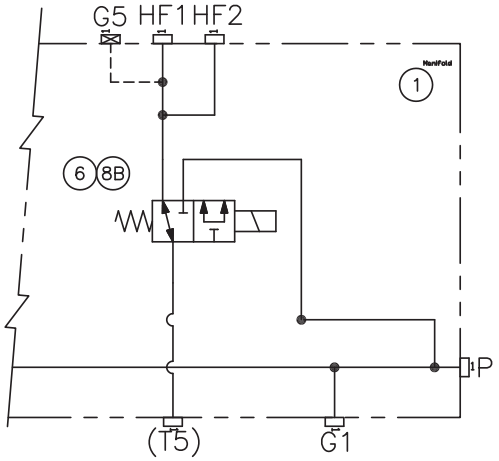
1. Valve Manifold Assembly
2. Relief Valve
3. Solenoid Poppet Valve
4. Solenoid Spool Valve
5. Solenoid Poppet Valve
6. 24V Coil
7. Coil Nut
8. Plug
9. Plug
10. Plug
11. Plug
12. Tab Washer
13. Cavity Plug
14. Freespool Plug (Optional)

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

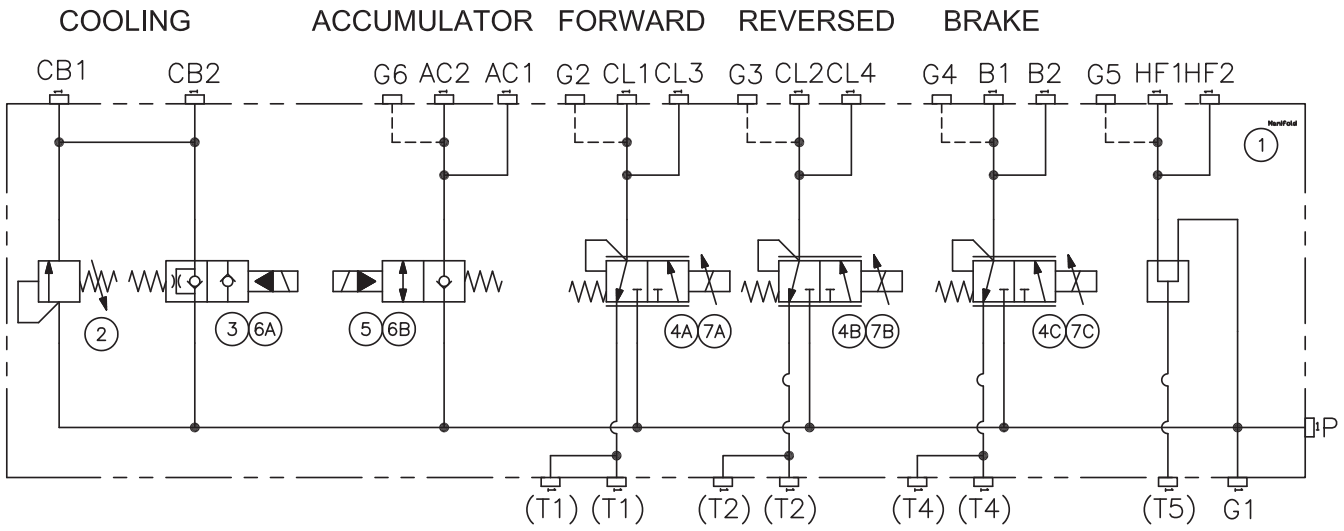
Figure 3-2 Valve Manifold Assembly and Hydraulic Schematic (1)
Last Used on S/N AW8L-3129

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 CIRCUIT FOR WHEN OPTIONAL FREESPOOL CARTRIDGE IS INSTALLED (GS023000N)

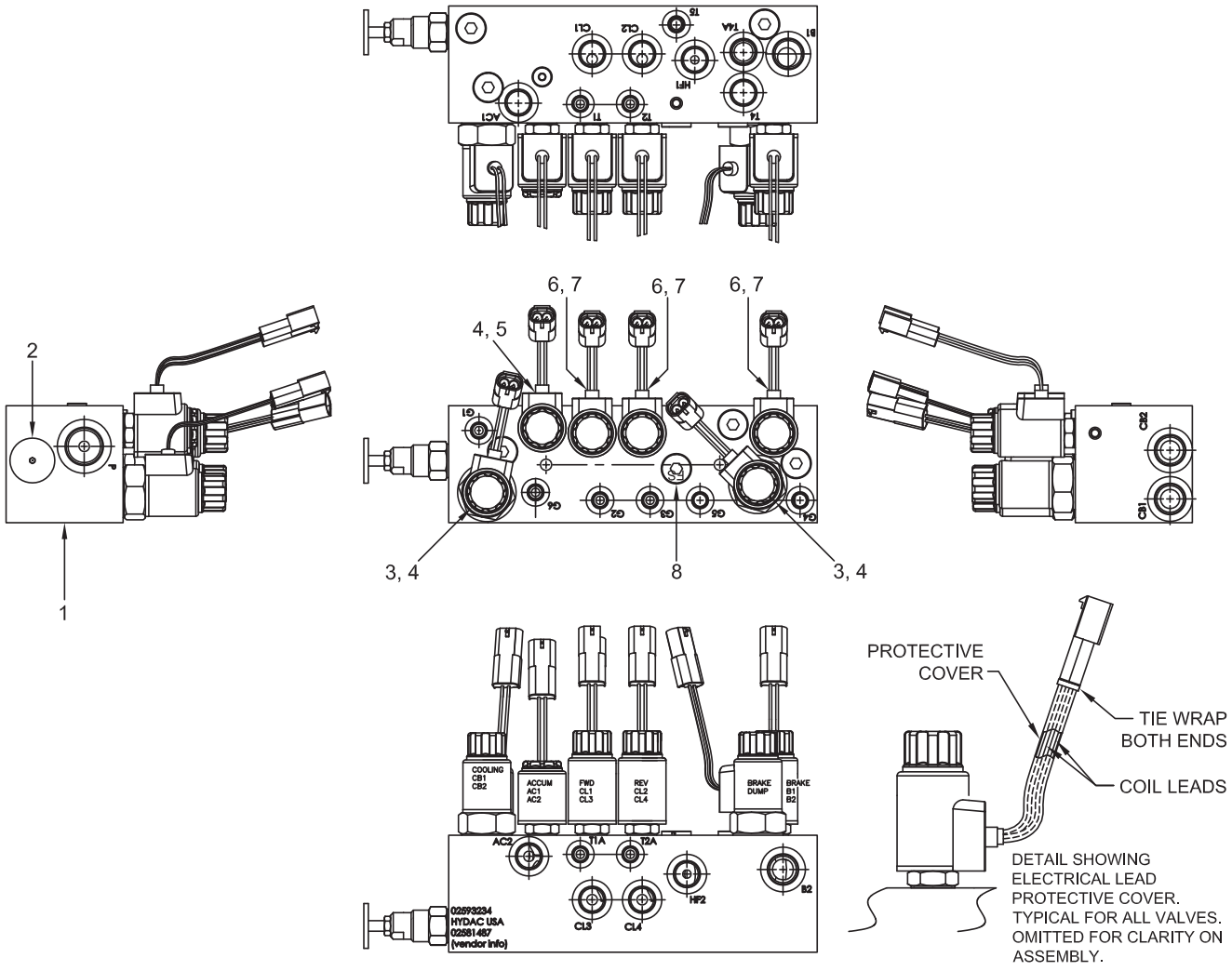


Hydraulic Schematic

Figure 3-2 Valve Manifold Assembly and Hydraulic Schematic (2)
Last Used on S/N AW8L-3129

Gauge Port Labels
G1 = INLET
G2 = FORWARD
G3 = REVERSE
G4 = BRAKE
G5 = FREESPOOL (OPTIONAL)
G6 = ACCUMULATOR

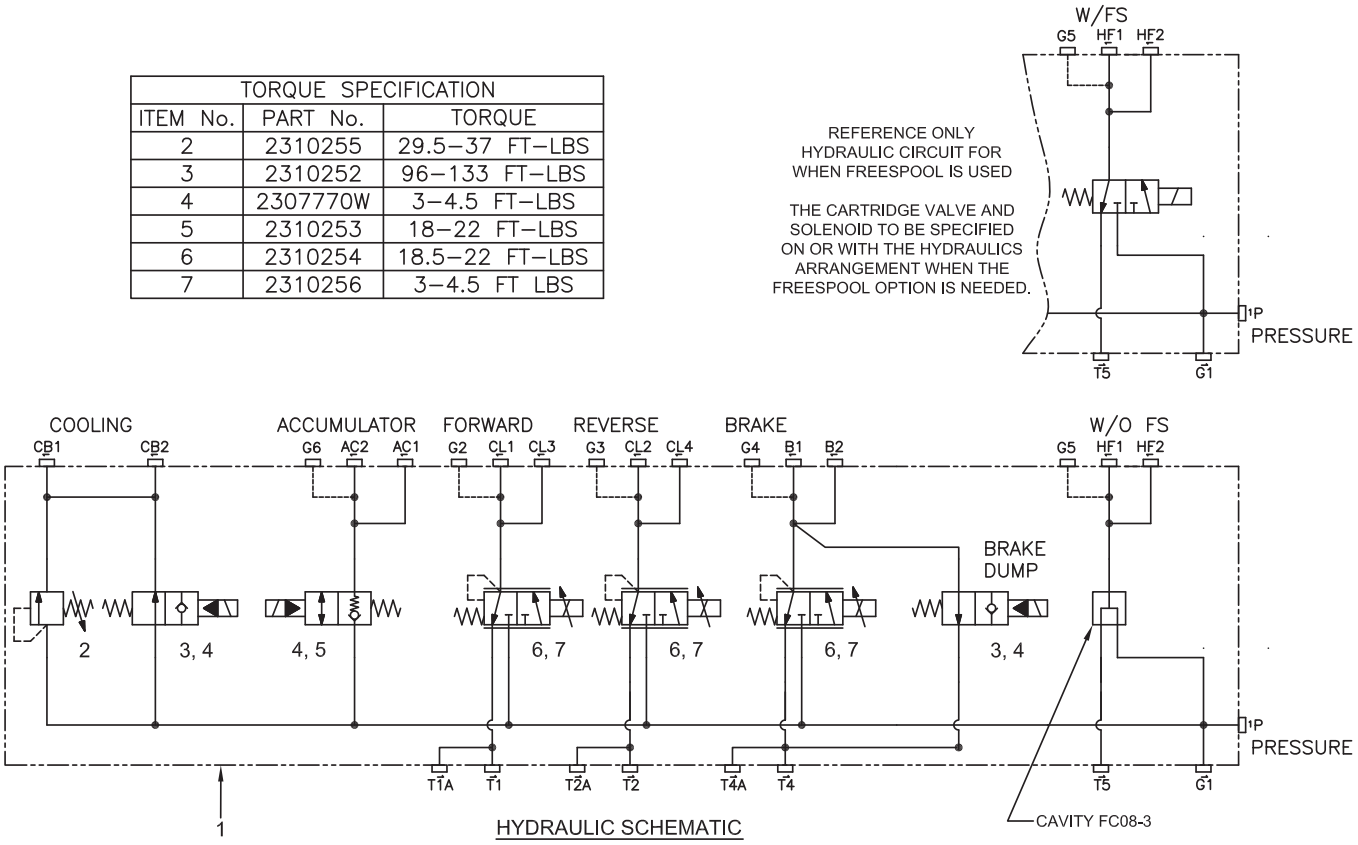
1. Manifold Block
2. Relief Valve
3. Cartridge Valve
4. 24 VDC Valve Coil
5. Cartridge Valve
6. Proportional Valve
7. 24 VDC Valve Coil
8. Freespool Plug (Optional)



Valve Manifold Assembly
P/N 2306547W
(The color of the manifold body is silver)

Figure 3-3 Valve Manifold Assembly and Hydraulic Schematic (1)
Used on S/N AW8L-3130 through S/N AW8L-3778

TORQUE SPECIFICATION		
ITEM No.	PART No.	TORQUE
2	2310255	29.5–37 FT–LBS
3	2310252	96–133 FT–LBS
4	2307770W	3–4.5 FT–LBS
5	2310253	18–22 FT–LBS
6	2310254	18.5–22 FT–LBS
7	2310256	3–4.5 FT LBS



HYDRAULIC SCHEMATIC

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 permissable 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

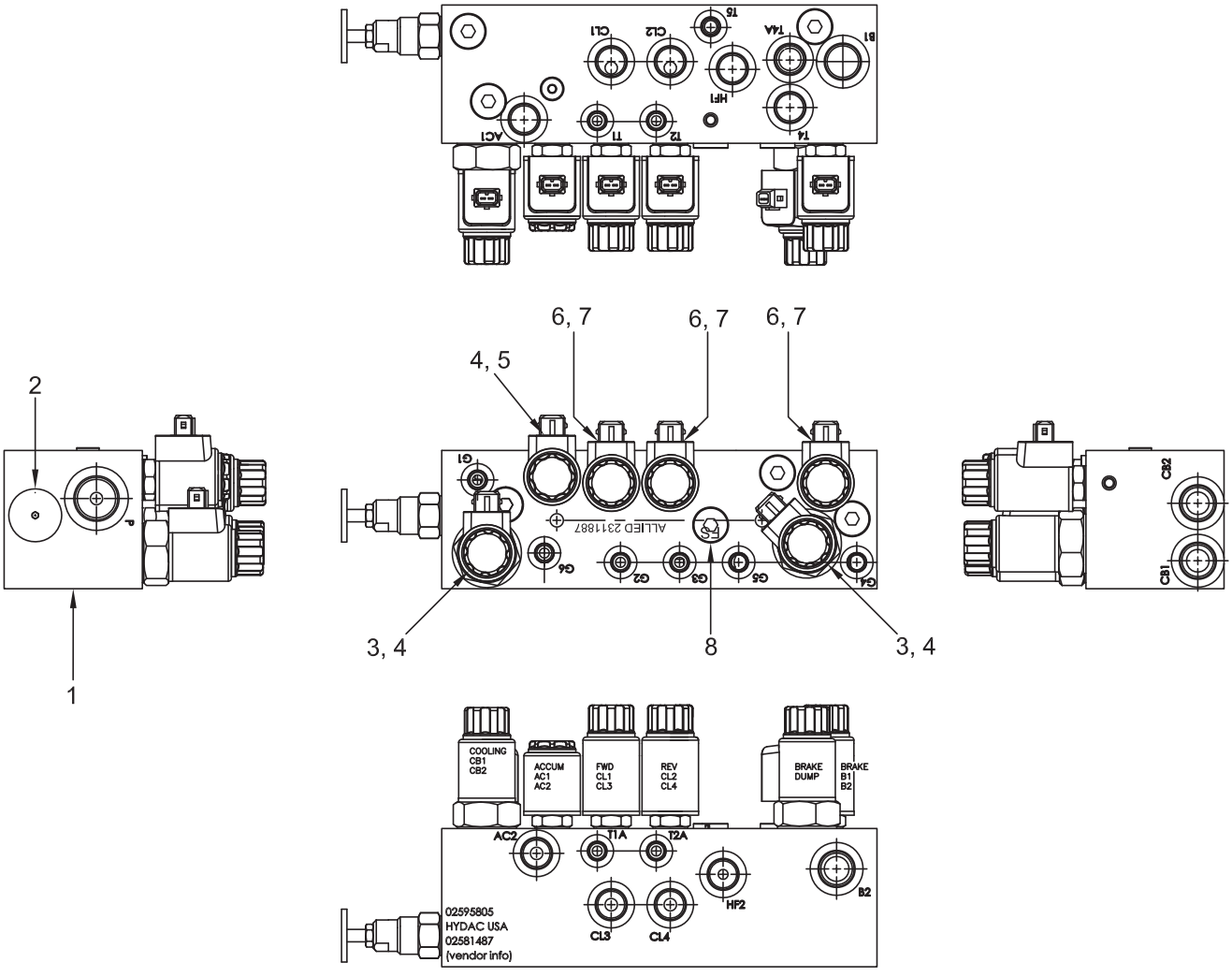
SWITCH-ON-TIME
100%
(CONTINUOUS OPERATION)

TYPE OF CONNECTION
Packard on flying leads.

Figure 3-3 Valve Manifold Assembly and Hydraulic Schematic (2)
Used on S/N AW8L-3130 through S/N AW8L-3778

Gauge Port Labels
G1 = INLET
G2 = FORWARD
G3 = REVERSE
G4 = BRAKE
G5 = FREESPOOL (OPTIONAL)
G6 = ACCUMULATOR

1. Manifold Block
2. Relief Valve
3. Cartridge Valve
4. 24 VDC Valve Coil
5. Cartridge Valve
6. Proportional Valve
7. 24 VDC Valve Coil
8. Freespool Plug (Optional)



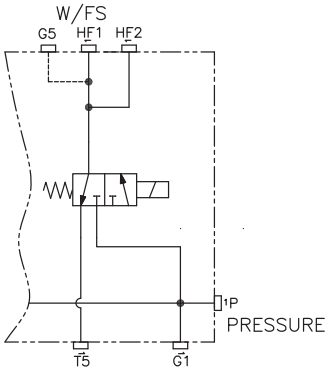
Valve Manifold Assembly
P/N 2311887
(The color of the manifold body is silver)

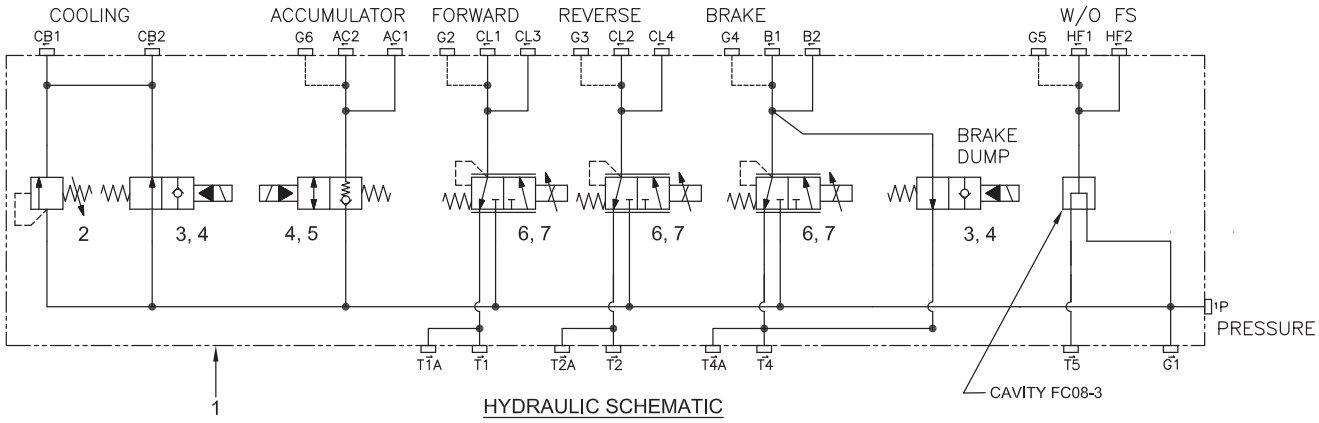
Figure 3-4 Valve Manifold Assembly and Hydraulic Schematic (1)
Used on S/N AW8L-3779 through S/N AW8L-3851

TORQUE SPECIFICATION		
ITEM No.	PART No.	TORQUE
2	2310255	29.5–37 FT–LBS
3	2310252	96–133 FT–LBS
4	2307770W	3–4.5 FT–LBS
5	2310253	18–22 FT–LBS
6	2310254	18.5–22 FT–LBS
7	2310256	3–4.5 FT LBS

REFERENCE ONLY
HYDRAULIC CIRCUIT FOR WHEN FREESPOOL IS USED

THE CARTRIDGE VALVE AND SOLENOID TO BE SPECIFIED ON OR WITH THE HYDRAULICS ARRANGEMENT WHEN THE FREESPOOL OPTION IS NEEDED.





HYDRAULIC SCHEMATIC

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

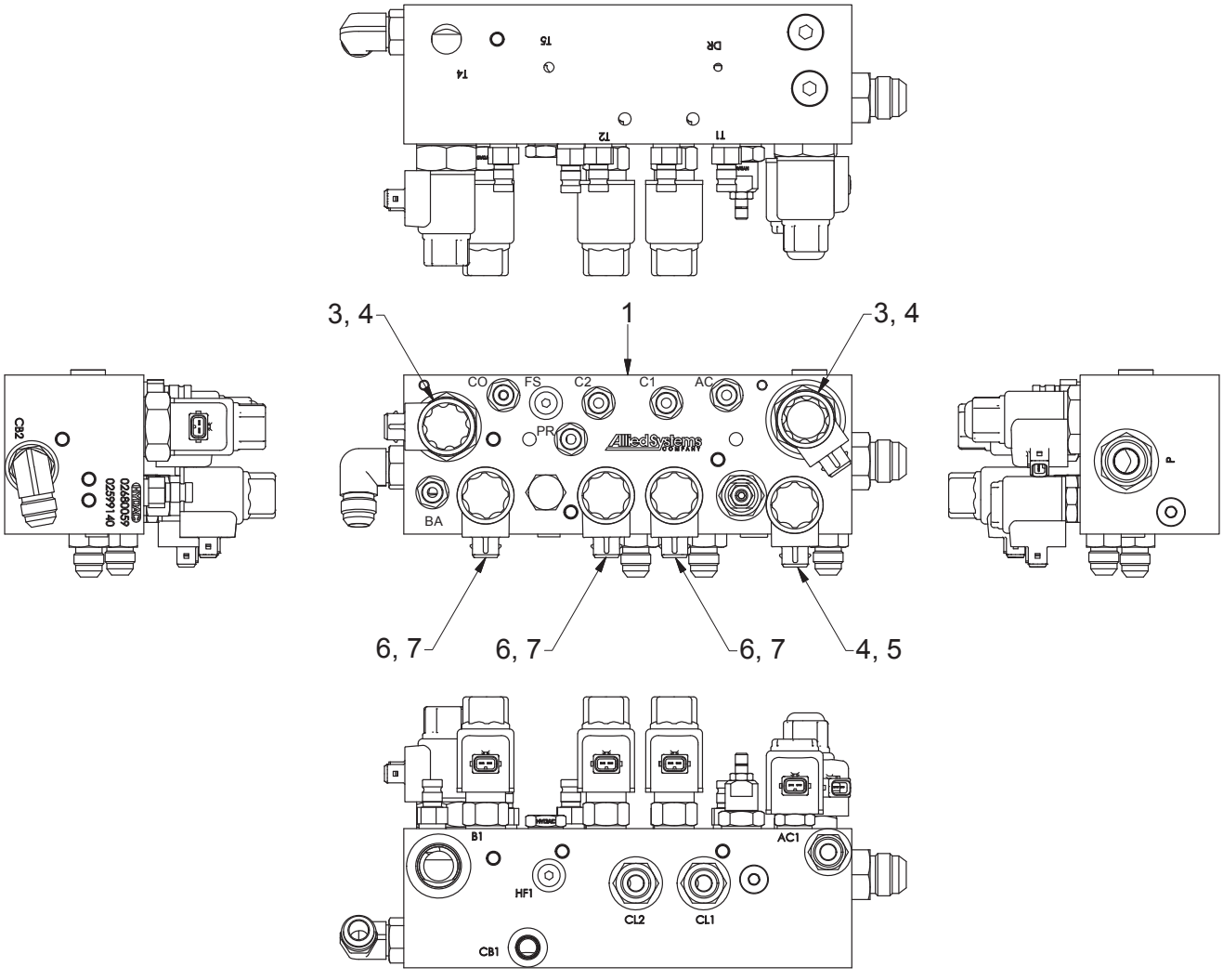
MAX COIL TEMP:
320°F (160°C)

TYPE OF CONNECTION:
AMP JR TIMER

Figure 3-4 Valve Manifold Assembly and Hydraulic Schematic (2)
Used on S/N AW8L-3779 through S/N AW8L-3851

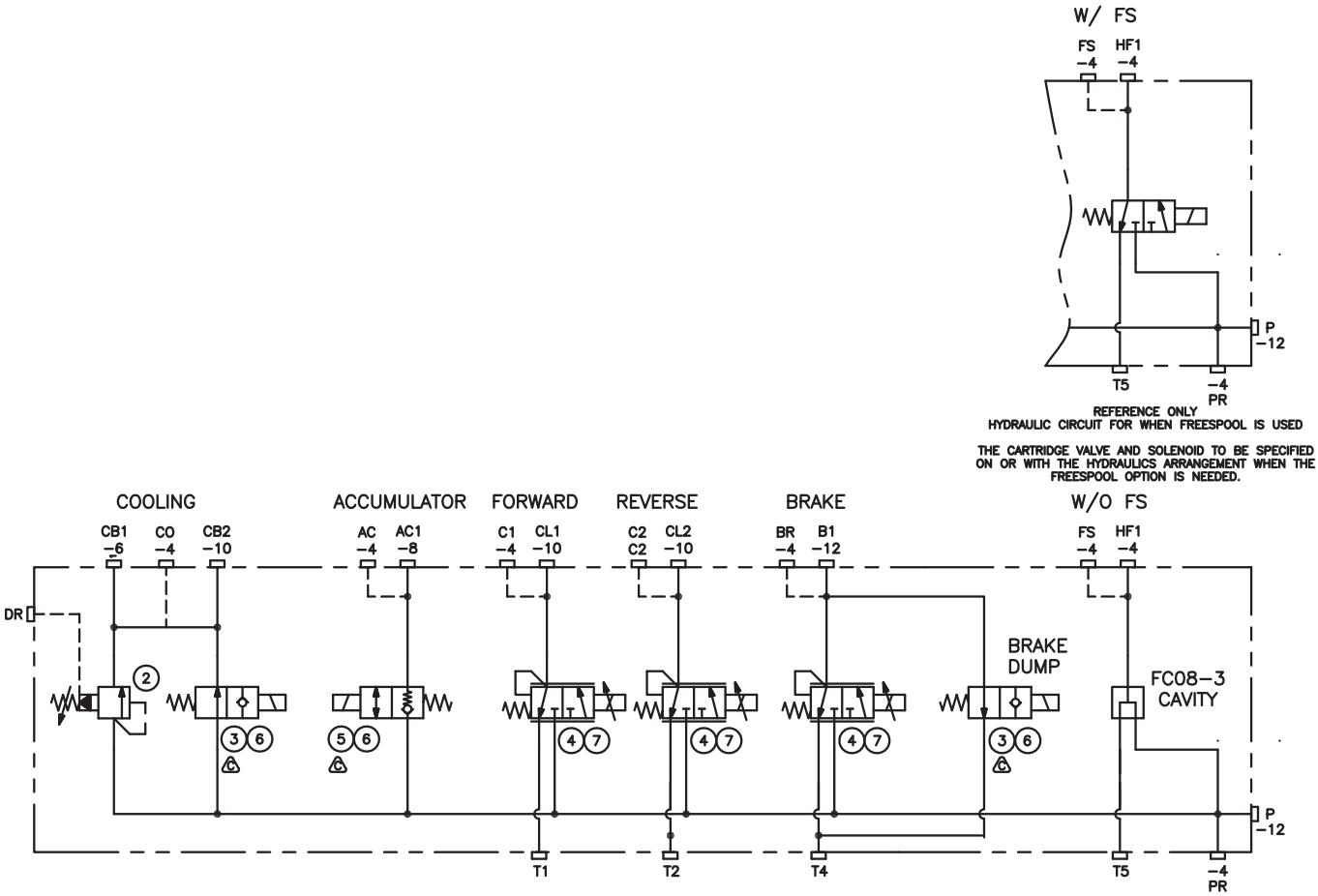
Port Labels
PR = SYSTEM PRESSURE
C1 = FORWARD
C2 = REVERSE
BR = BRAKE
FS = NOT USED
AC = ACCUMULATOR
CO = COOLING OIL

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 AW8L-3852



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 β > 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 AW8L-3852

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

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 brake for cable controls (See Figure 2-4).

Hydraulic Pump

The hydraulic pump for electronic controls is the same as the pump for cable controls (See Figure 2-6).

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 control lever 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.

Sequence of Operation

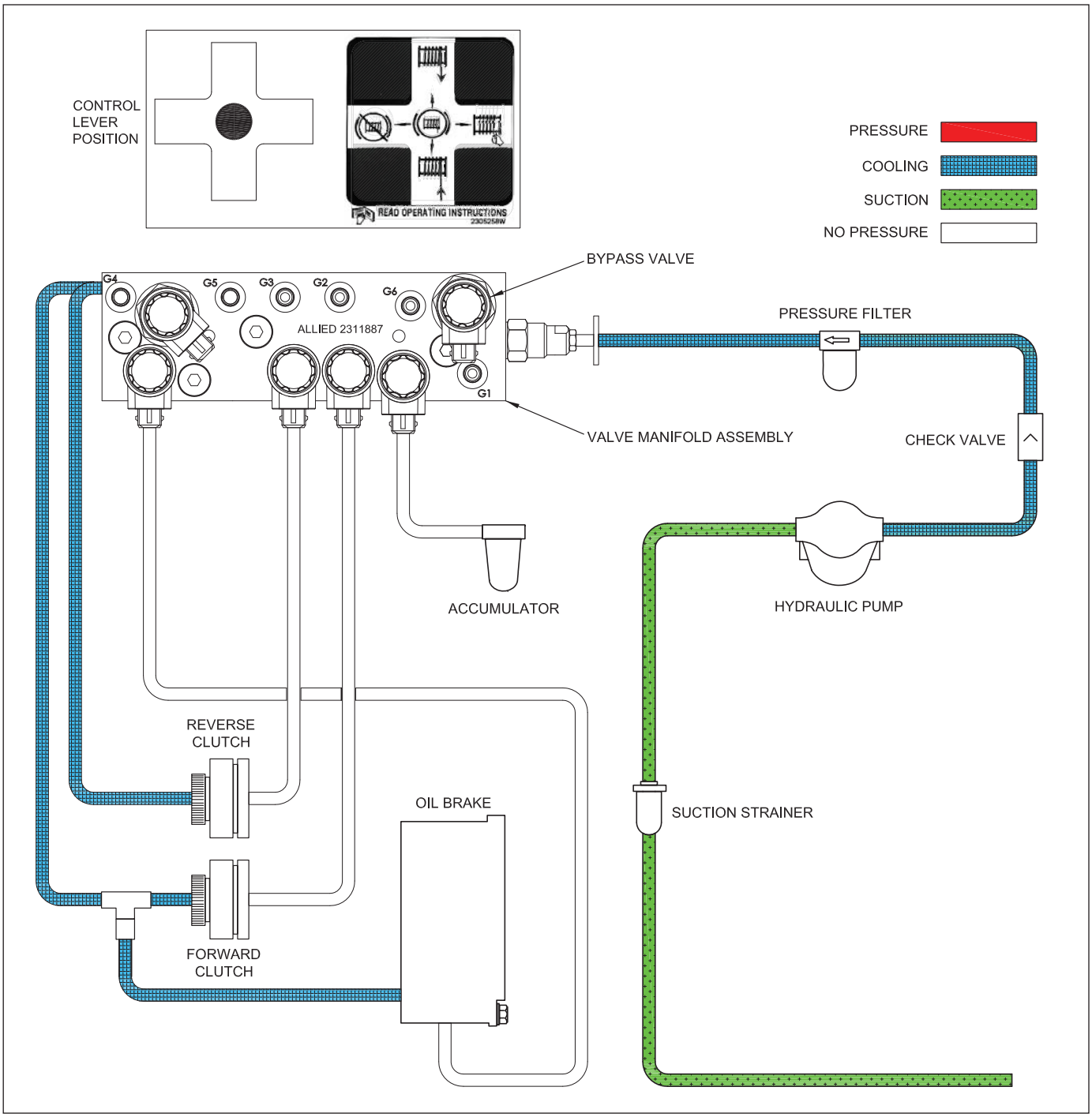


Figure 3-7 Hydraulic System, Electronic Controls - BRAKE-ON (Neutral)

NOTE: Figures 3-5 through 3-9 show the sequences of operation for the older type of manifold (See Figure 3-4).

Sequence of Operation - BRAKE-ON

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

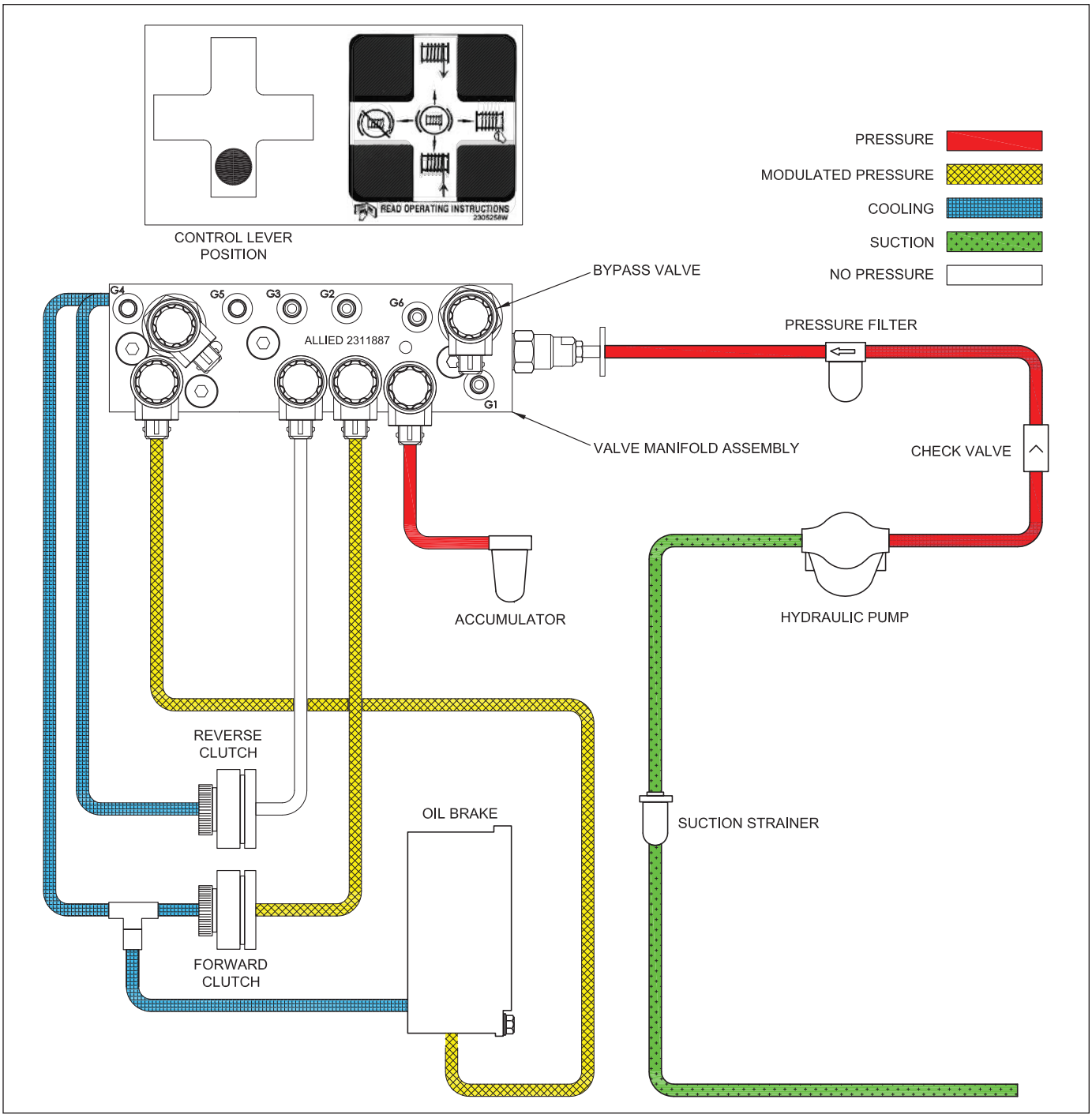


Figure 3-7 Hydraulic System - LINE-IN (Forward)

Sequence of Operation - LINE-IN

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

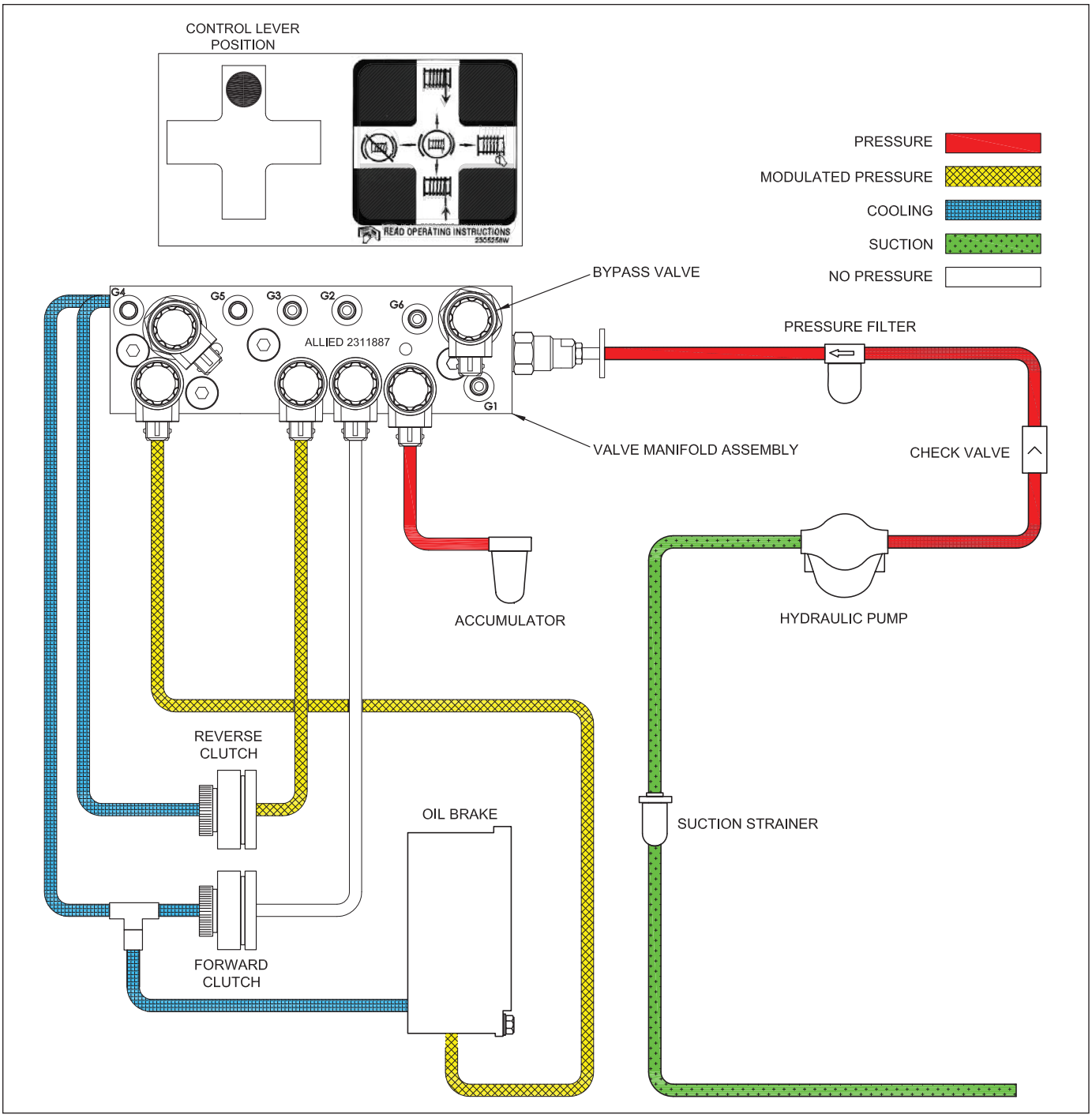


Figure 3-8 Hydraulic System, Electronic Controls - LINE-OUT (Reverse)

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 accumulator increases pressure. Brake pressure increases. The brake and reverse clutch proportional 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.

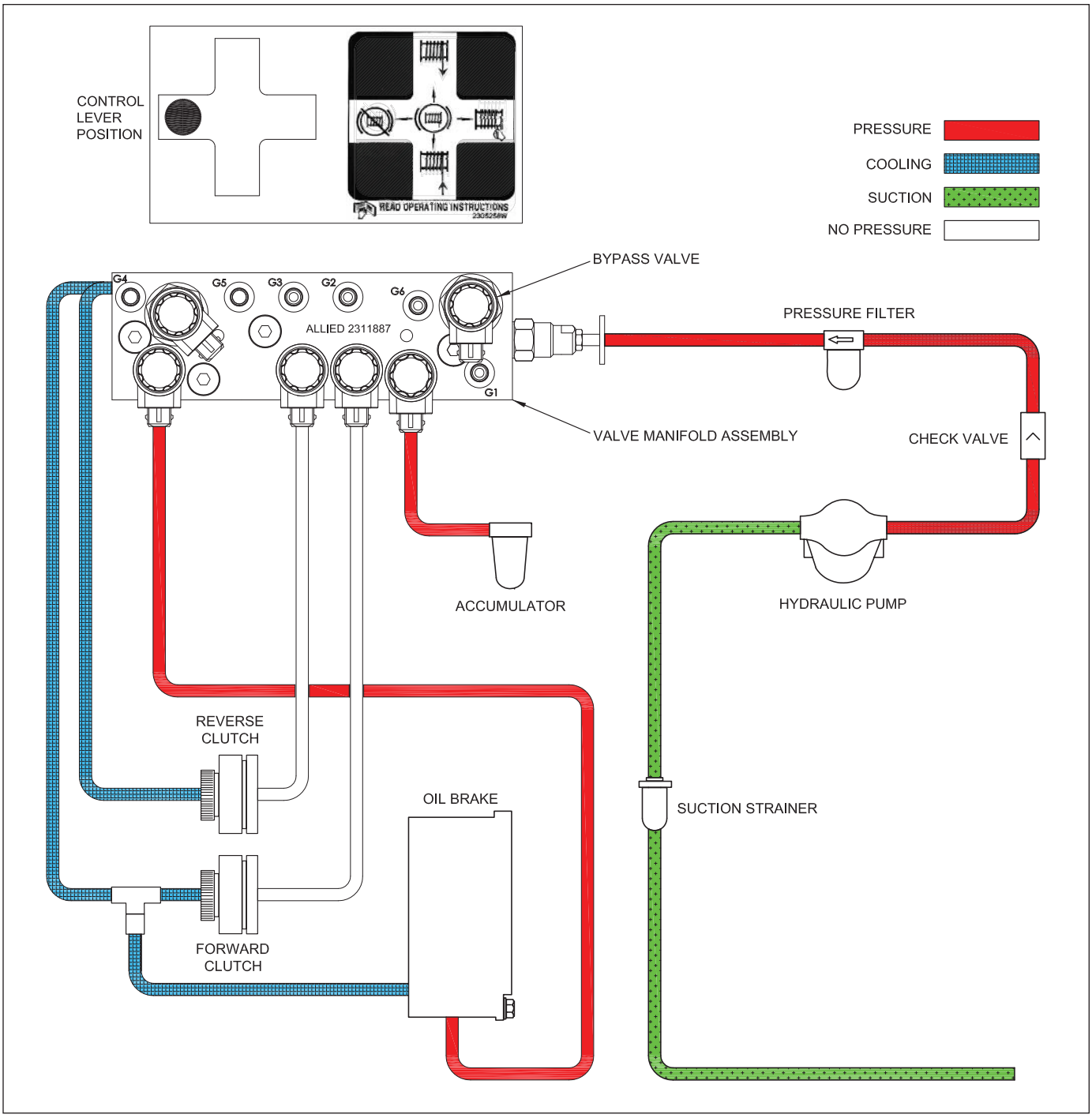


Figure 3-9 Hydraulic System, Electronic Controls - BRAKE-OFF

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 as the control lever moves toward to the detented position, when full release is achieved.

⚠ WARNING

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

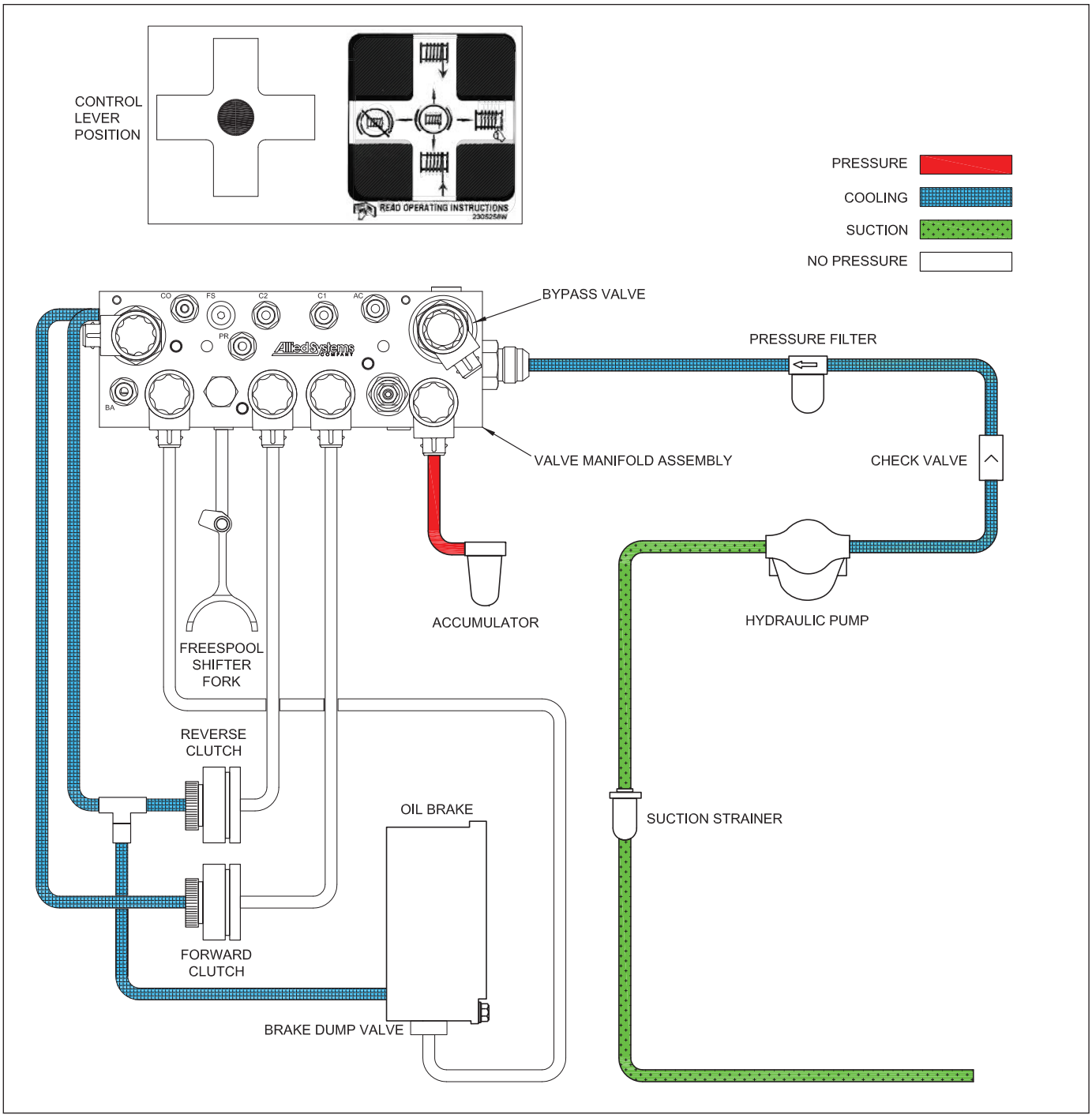


Figure 3-10 Hydraulic System, Electronic Controls - BRAKE-ON (Neutral)

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.

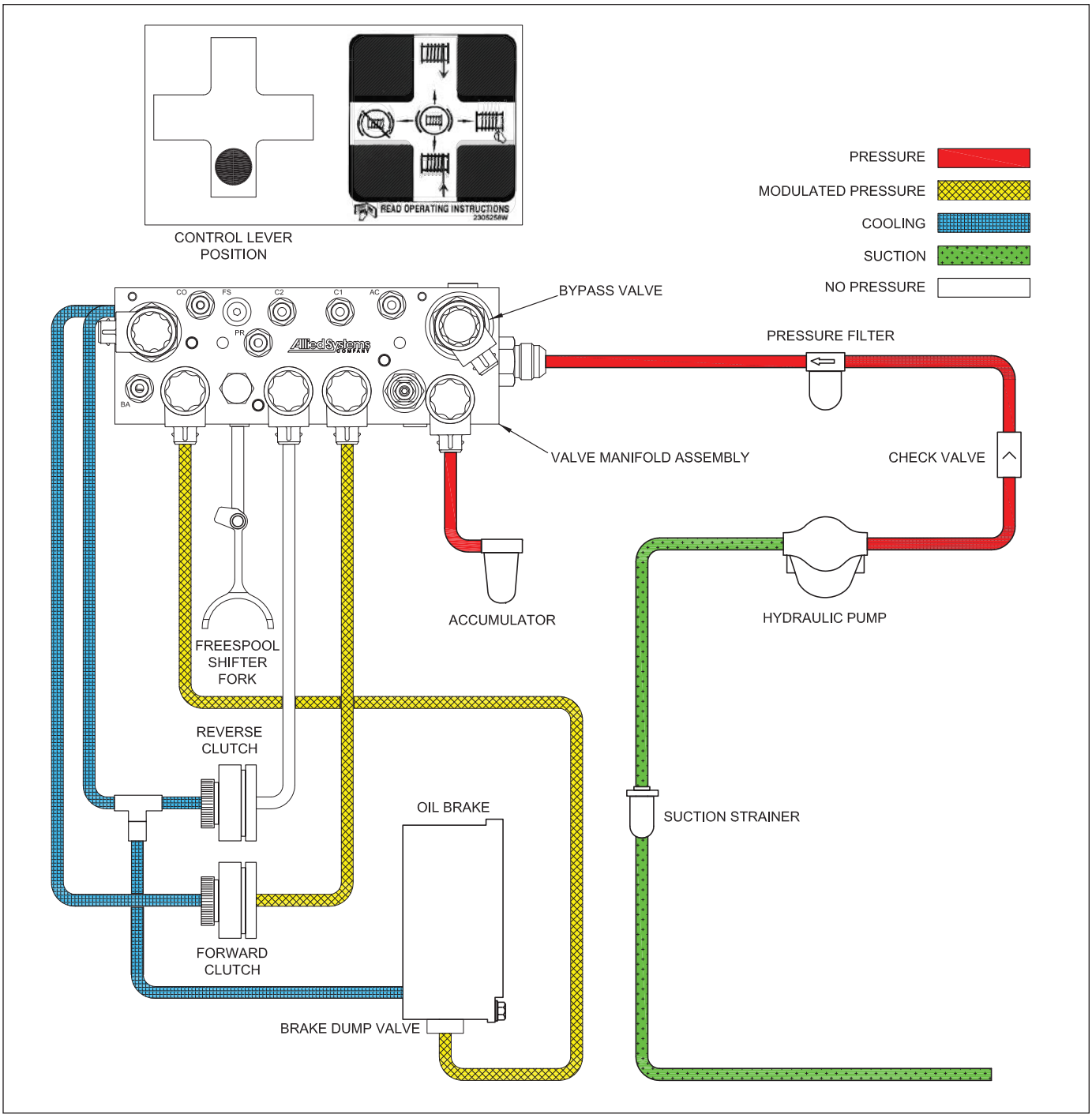


Figure 3-11 Hydraulic System - LINE-IN (Forward)

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 accumulator increases pressure. Brake pressure increases. The brake and forward clutch proportional 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.

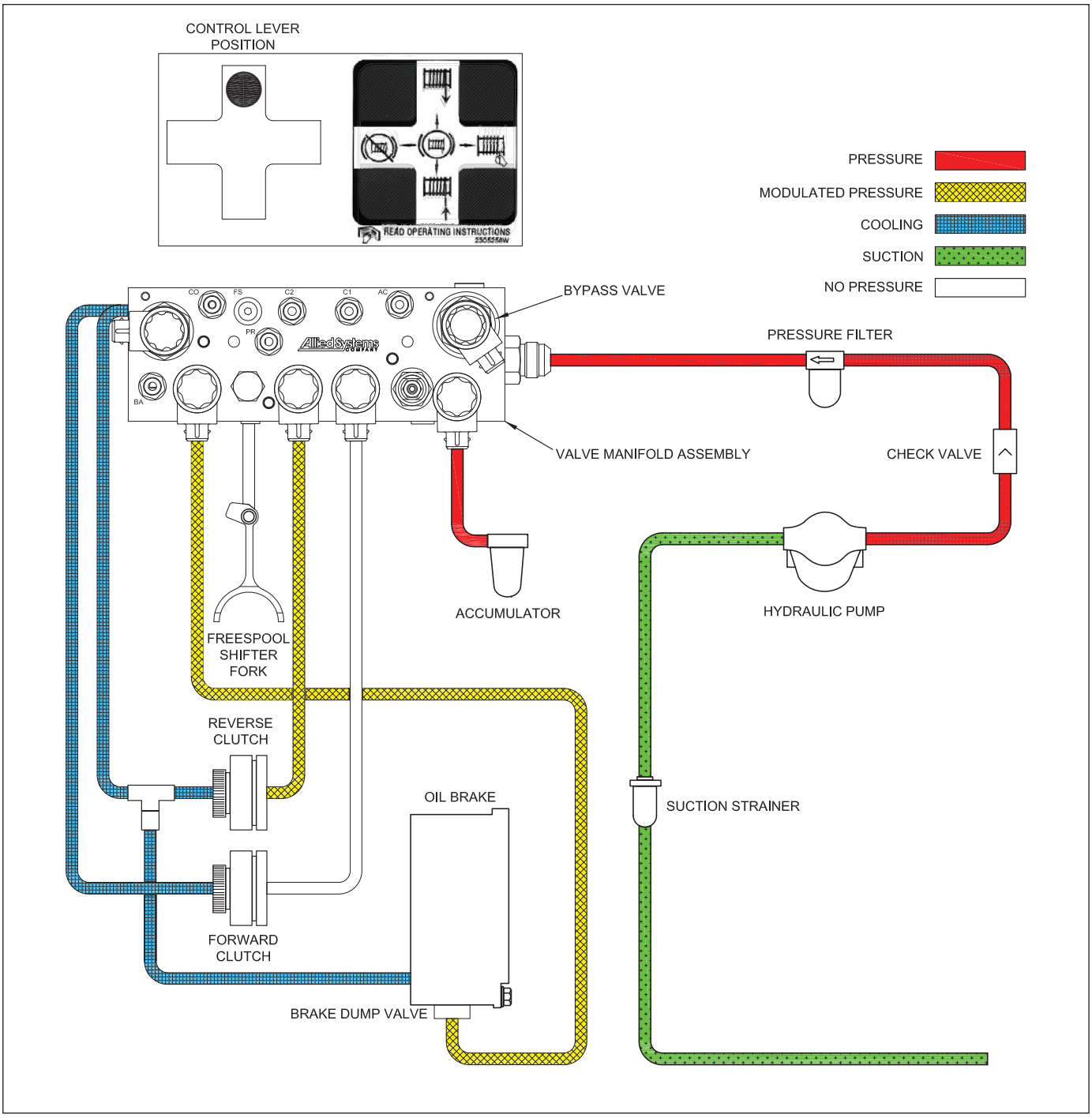


Figure 3-12 Hydraulic System, Electronic Controls - LINE-OUT (Reverse)

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 accumulator increases pressure. Brake pressure increases. The brake and reverse clutch proportional 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.

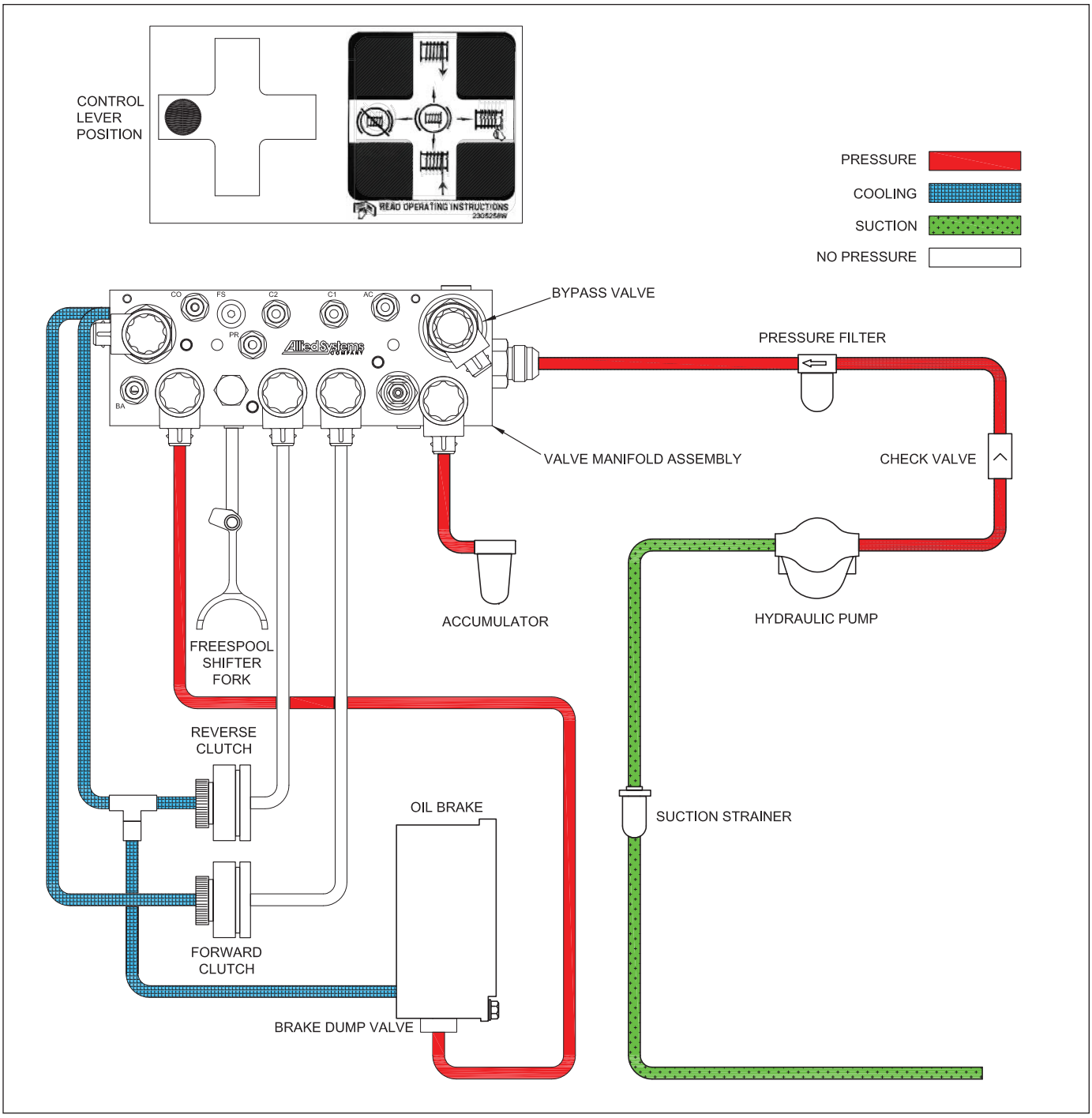


Figure 3-13 Hydraulic System, Electronic Controls - BRAKE-OFF

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 as the control lever moves toward to the detented position, when full release is achieved.

⚠ WARNING

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

Electronic Control Module (ECM)

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.

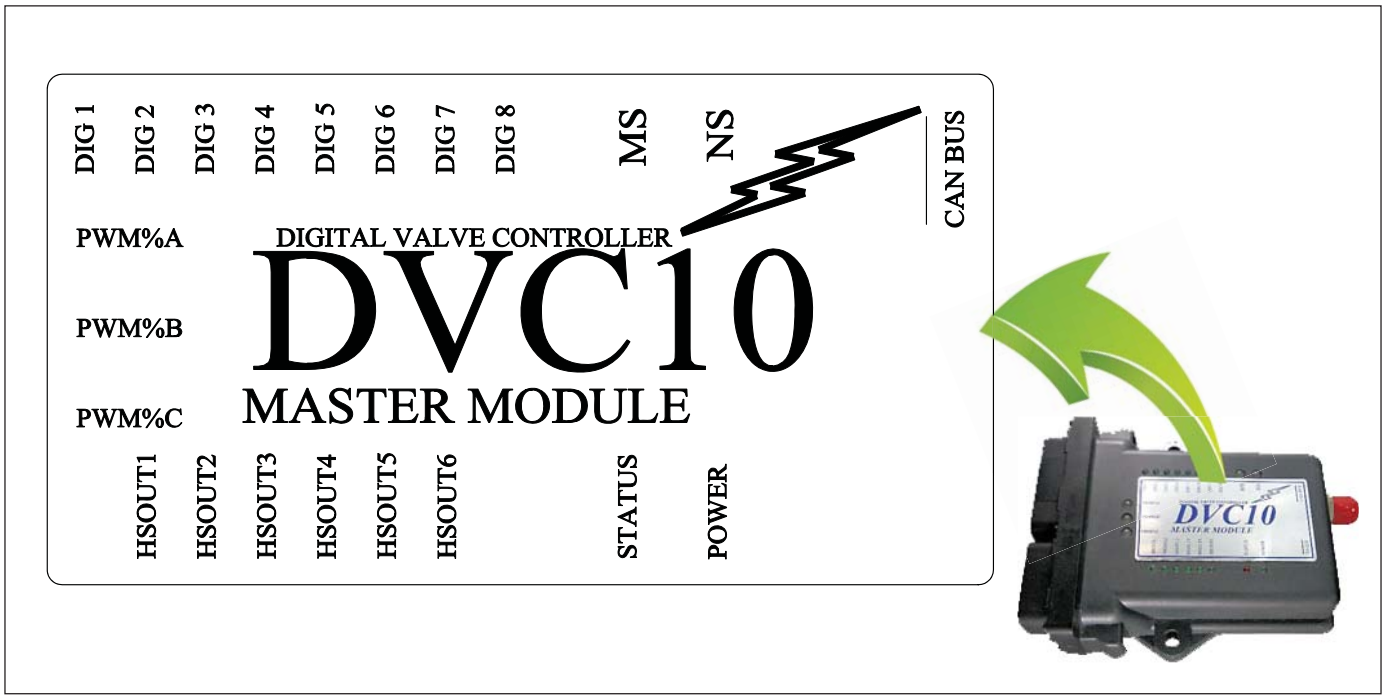


Figure 3-10 Electronic Control Module DVC10

Figure 3-11 Electronic Control Module LED States For Various Functions (See Figure 3-10)

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 **BRAKE-OFF**.
PWM%C	Fault detection	Solid at startup.
HSOUT1	Forward output	FWD operation.
HSOUT2	Reverse output	REV operation.
HSOUT3	Brake output	FWD, REV or **BRAKE-OFF** operation.
HSOUT4*	Accumulator/Cooling output	FWD, REV or **BRAKE-OFF** operation.
HSOUT5	Freespool output	**FREESPOOL** operation.
HSOUT6*	Brake dump output	FWD, REV or **BRAKE-OFF** operation.
STATUS	Not used	N/A
POWER	Power indicator	Lit after power-up.
* Note: When valve manifold assembly (P/N 2311887) was first used on AW8L-3779 (refer to Figure 3-17 for manifold identification), HSOUT4 = Brake Dump/Cooling Oil; HSOUT6 = Accumulator Output.		

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 ILLUMINATED GREEN
BRAKE-ON	Power MS
BRAKE-OFF	Power MS HSOUT3 HSOUT4 HSOUT6 PWM%B
LINE-IN	Power MS HSOUT1 HSOUT3 HSOUT4 HSOUT6 PWM%A PWM%B
LINE-OUT	Power MS HSOUT2 HSOUT3 HSOUT4 HSOUT6 PWM%A PWM%B

Figure 3-12 Electronic Control Module LED Description Chart

Electronic Control Program Diagram

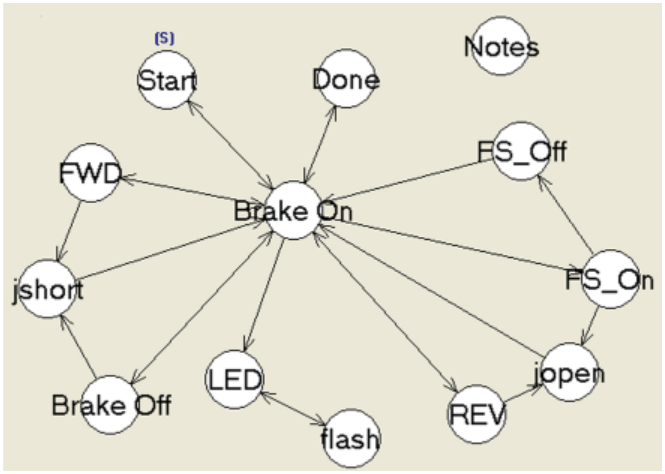


Figure 3-13 Electronic Control Program Diagram

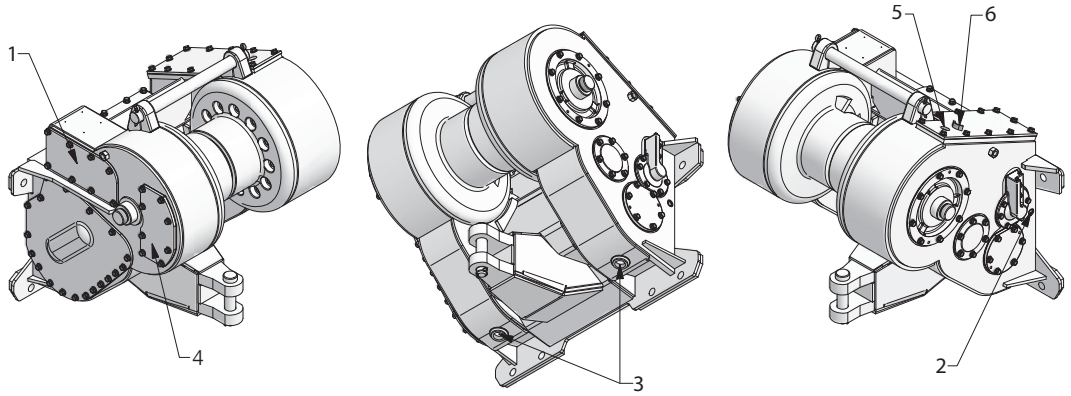
- When the controls are first turned on, the system starts at the "**Start**" bubble and will only transition to **BRAKE-ON** when:
  control lever is centered on X axis
  control lever is centered on Y axis
  Activation switch is turned on (i.e. controls are active) - Not all winches will have the activation 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.

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 section.

Maintenance Points



1. Access Cover for Control Valve
2. Plug to Check Oil Level
3. Plug to Drain Oil
4. Cover for Filter
5. Fill Plug
6. Breather

Figure 3-14 W8L Maintenance Points

Maintenance Schedule

The Maintenance Schedule is a program that includes periodic inspection and lubrication. Use the operating time on the hour meter of the 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). **Do not operate tractor when checking the oil level.**	See Figure 1-12 – Recommended Oil List.
	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 sealing O-ring between element and filter head. Torque filter to 30 LBS-FT.
1000 hours or every 6 months	Change the hydraulic oil. Drain oil from plug (item 3). Clean the oil strainer. Through fill plug (item 5), add 20 gallons (75 liters)†. Check the oil level at item 2.	See Figure 1-12 – Recommended Oil List.
	Check control lever.	See "Control Lever Detent Force Adjustment" and Figure 3-16 on next page.
* 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 3-15 Maintenance Schedule

Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See Figure 3-15, Maintenance Schedule.

Checks During Operation

The charts in Troubleshooting subsection of Section 3 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 Detent Force Adjustment

⚠ 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.

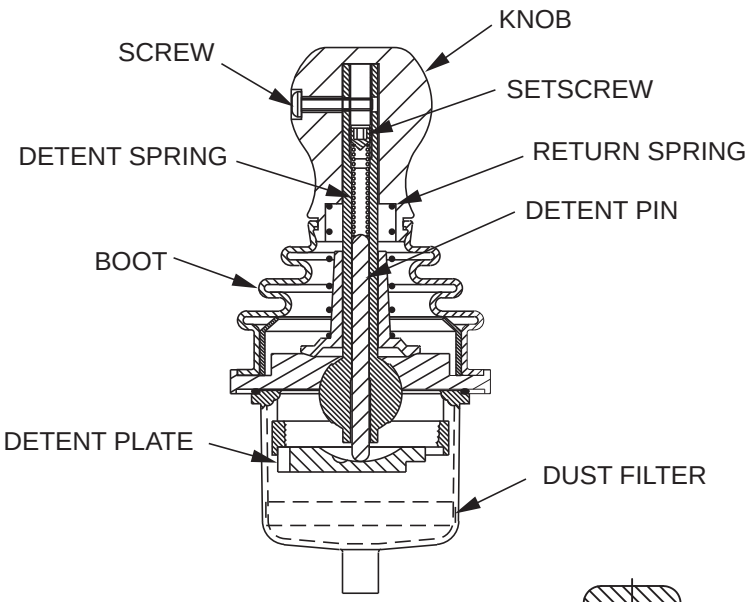
1. Remove screw on control lever knob/handle. Lift knob/handle and boot from control lever.

2. Using an Allen wrench, turn the setscrew inwards to increase detent force, or outwards to decrease detent force.

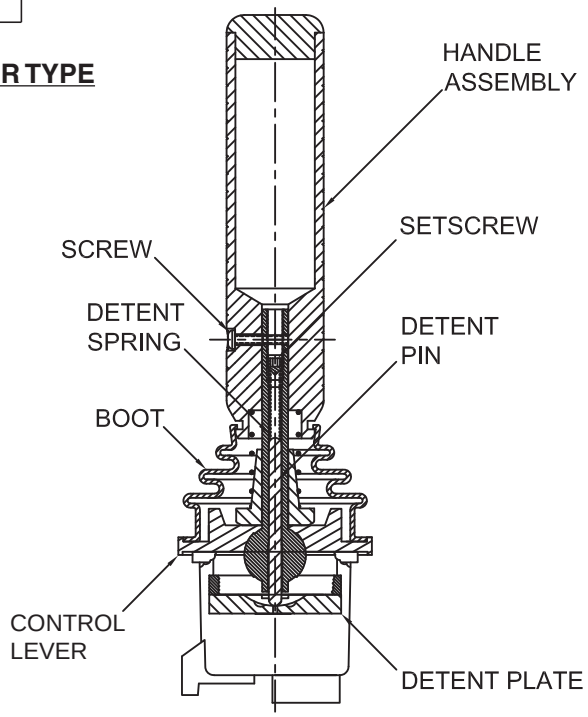
3. Move control lever from **BRAKE-ON** to **BRAKE-OFF** and back again. If detent force is still unsatisfactory, adjust setscrew again.

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

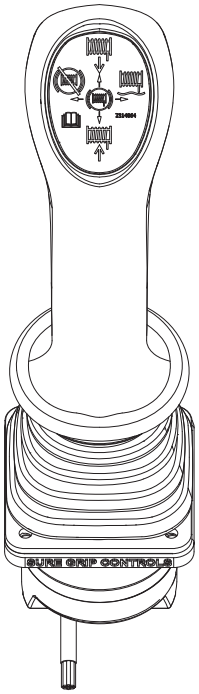
4. Place boot and knob/handle over control lever assembly, ensuring boot is securely installed, then install knob/handle screw.



OLDER TYPE

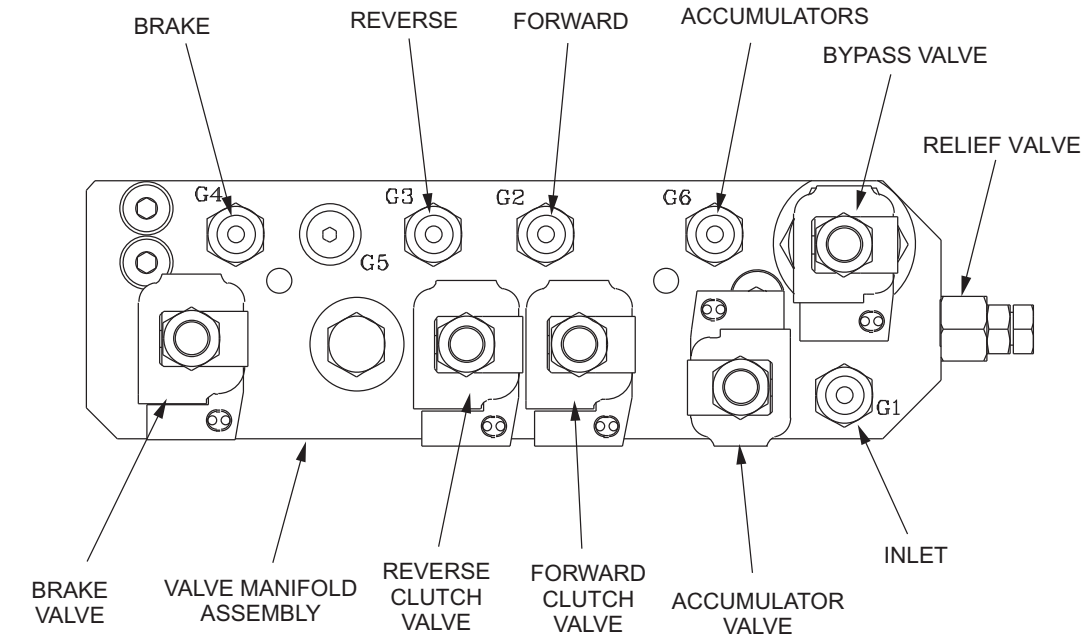


OLD TYPE

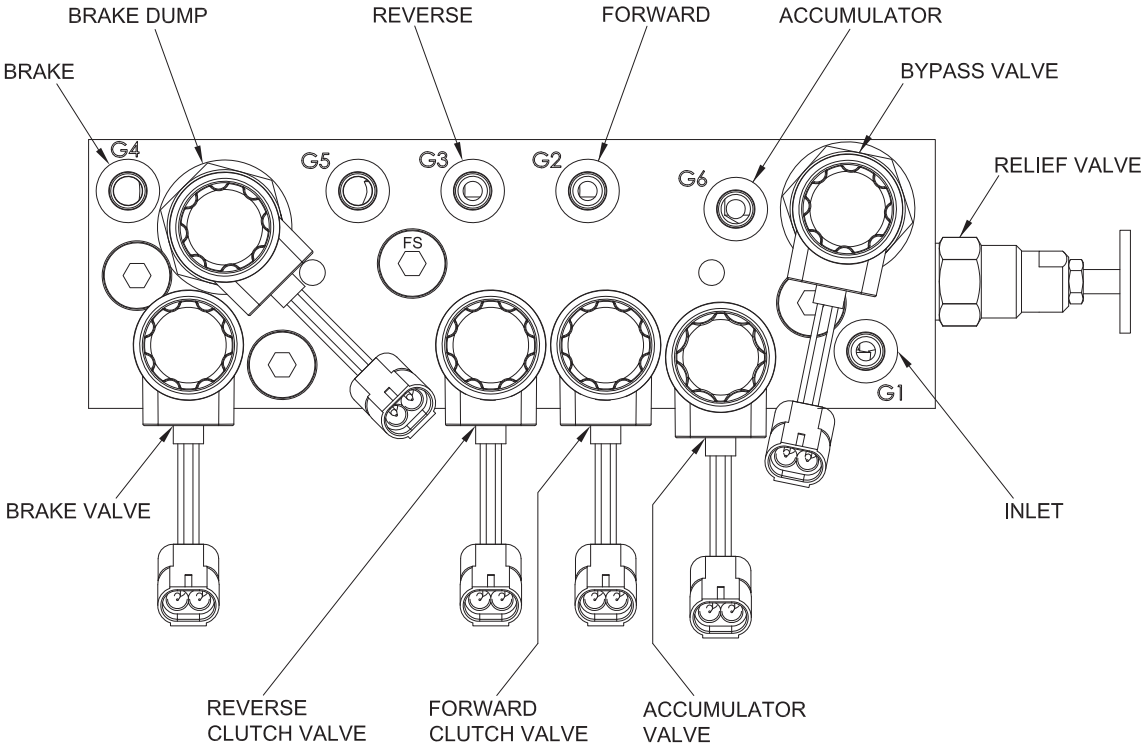


NEW TYPE

Figure 3-16 Control levers



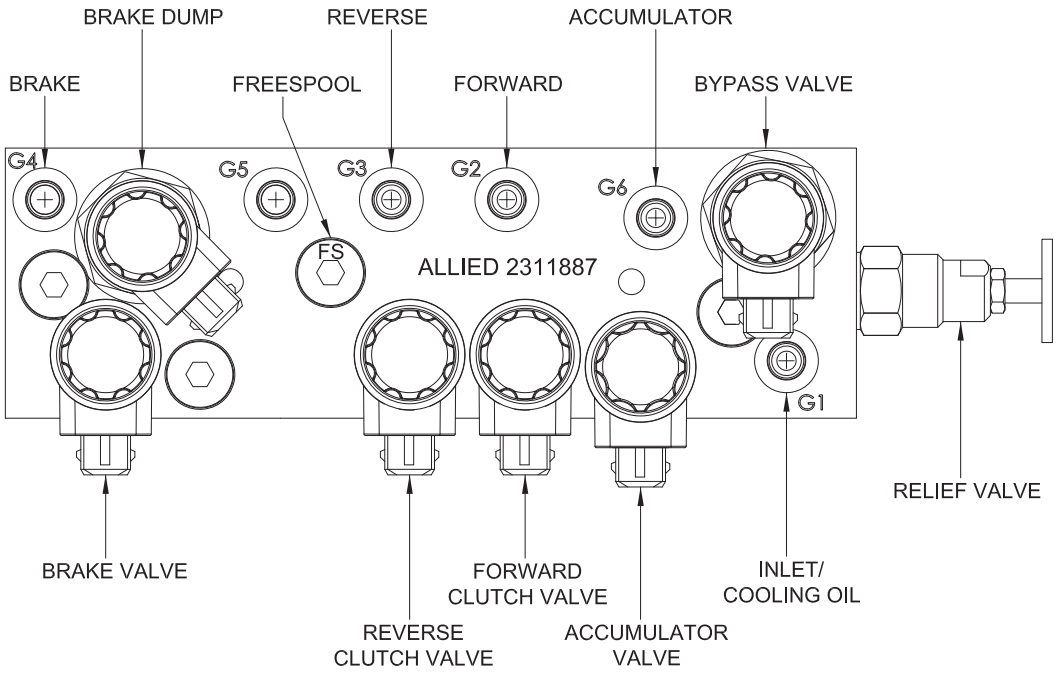
Last Used on S/N AW12E-1228



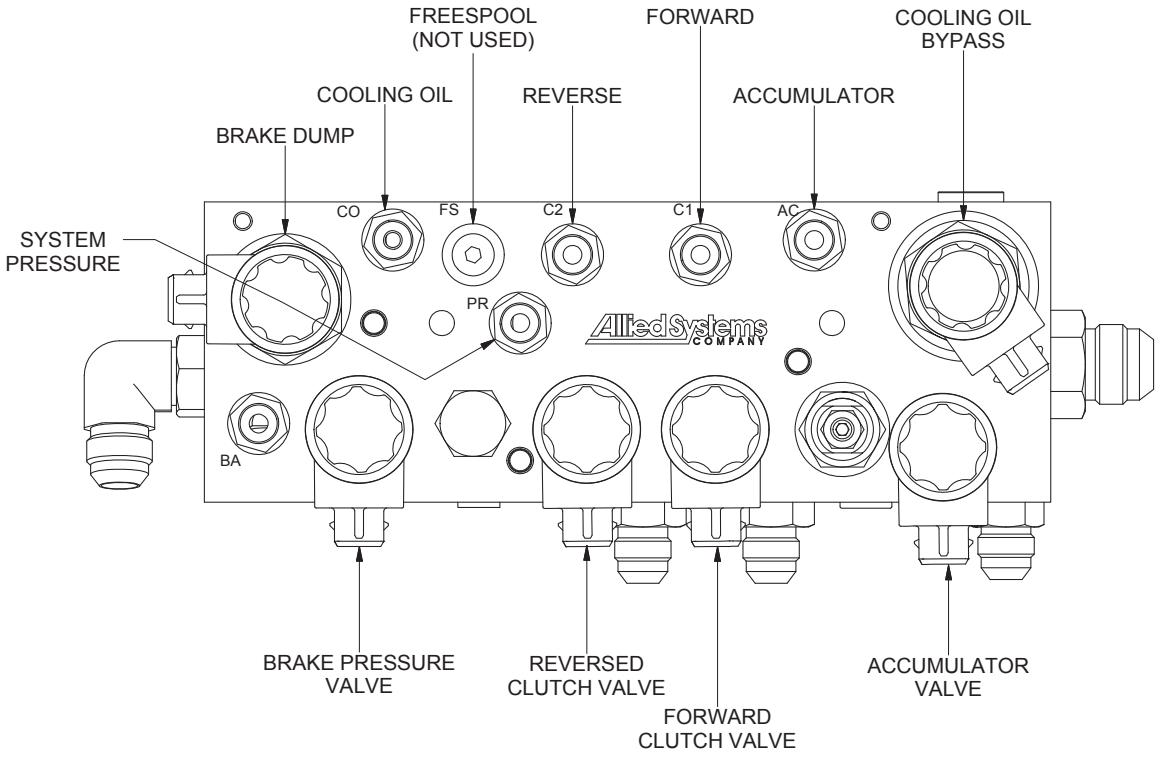
Used on S/N AW12E-1229 through AW12E-1456

Figure 3-17 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 3-17 Hydraulic Pressure Test Ports

Hydraulic System Pressure Checks (See Fig. 3-17)

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. (Engine off).

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. 3-14).

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 3-18. 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 3-18. 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 3-18.

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 accumulator 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 accumulator. Observe the initial pressure reading and the time for the pressure to drop below that specified in Figure 3-18.

If the leak down time is less than specified in Figure 3-18, 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 accumulator and the valve manifold assembly.

Accumulator valve performance can be checked by connecting a gauge to Port G6. After ensuring the accumulator 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 accumulator has 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 3-18, 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 after this subsection.

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 3-18. 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.

TEST ITEM	CHECK PORT	TEST EQUIP-MENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	G4 – Brake	400 psi (2800 kPa) gauge	**BRAKE-OFF**	170 to 220 psi (1172 to 1517 kPa)	Adjust relief valve.
Cooling	G1 – Inlet	400 psi (2800 kPa) gauge	**BRAKE-ON**	At 1000 RPM, 50 to 85 psi (343 to 586 kPa)	Check plumbing for leakage or blockage; check bypass valve.
Accumulator	G6 – Accumulator	400 psi (2800 kPa) gauge	**1. BRAKE-OFF** **2. BRAKE-ON** 3. Wait for accumulator and cooling valves to close 4. Stop Engine **5. BRAKE-OFF** 6. Repeat if required	1. 220 psi (1517 kPa) 2. None 3. None—wait 1 minute 4. 140 psi (962 kPa) immediately & 120 psi (828 kPa) minimum after 30 seconds	1. Check hydraulic lines for leaks. 2. Replace accumulator valve. 3. Check for defective accumulators.
LINE-IN (Forward)	G2 – Forward	400 psi (2800 kPa) gauge	**LINE-IN**	220 psi (1517 kPa) at full lever travel	Refer to Figure 3-19 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.
LINE-OUT (Reverse)	G3 – Reverse	400 psi (2800 kPa) gauge	**LINE-OUT**	220 psi (1517 kPa) at full lever travel	Refer to Figure 3-19 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.

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.

Figure 3-18 Hydraulic System Pressure Tests

Troubleshooting

This subsection includes Figure 3-19, Troubleshooting Analysis Check Chart for Operator, Figure 3-20, Troubleshooting Analysis Check Chart for Service Personnel, and Figure 3-21, 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 3-19 Troubleshooting Analysis Check Chart for Operators

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is rough or not regular	Hydraulic oil is too cold.	Put the control lever in the **BRAKE-OFF** position. Run the engine at 1000 RPM to warm the oil before operating the winch.
	Low oil level.	Add hydraulic oil to the correct level.
	Wrong oil.	Drain oil and replace with correct grade. Refer to Figure 1-12, 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 **BRAKE-OFF**. Normally drum will rotate slowly in either direction. If the reverse clutch is dragging, the drum will rotate in the **LINE-OUT** direction. If forward clutch is dragging the drum will rotate in the **LINE-IN** direction, and it will take more than 100 lbs of line pull to prevent drum rotation.
	Prolonged inching.	Avoid continuous operation in the inching zone.
	Low oil level.	Add oil.
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 open or shorted.	1. Check module output LEDs. Flashing LED indicates open or shorted circuit. 2. Check wiring harness continuity. 3. Replace faulty coil. **NOTE**: A working coil will have 15 to 50Ω resistance and will be magnetized when energized.
Clutch does not apply correctly at low PTO RPM.	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 3-19 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. 2. Add oil.
	Gears and bearings worn.	Replace components.
Control lever will not detent in **BRAKE-OFF.**	Detent mechanism worn or broken.	1. Replace joystick assembly. 2. Adjust detent spring force (see Control Lever Detent Force Adjustment in Section 3 for procedure).
Control lever does not return to neutral when released.	Insufficient lubrication.	Lubricate detent pin (see Control Lever Detent Force Adjustment in Subsection of Service for procedure).
	Excessive detent force.	Remove knob and adjust detent force (see Control Lever Detent Force Adjustment in Subsection of Service for procedure).
	Control lever is in detented position (**BRAKE-OFF**).	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. **NOTE**: Change filter only after first 250 hours of operation when winch is rebuilt.
	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 3-20 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 1-10 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: 1. Suction hose to pump connection. 2. Pump shaft seal. 3. Suction filter cover and gasket. 4. Suction hose for cracks or collapsed sections.
	Brake pressure fluxuates, air in valve, orifice missing from brake dump fitting (last used on S/N AW8L-3129).	
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: 1. Proper leakdown time as described in Figure 3-18. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Brake dump valve malfunction.	Check for proper operation.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to “Low Forward or Reverse Clutch Pressure” troubleshooting item below.

(Continued on next page)

Figure 3-20 Troubleshooting Analysis Check Chart for Service Personnel (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Overheating.	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Check suction filter and clean or replace.
	One or both clutches dragging.	Check by placing control lever in **BRAKE-OFF**. Normally drum will rotate slowly in either direction. If the reverse clutch is dragging, the drum will rotate in the **LINE-OUT** direction. If forward clutch is dragging the drum will rotate in the **LINE-IN** direction and it will take more than 100 lbs of line pull to prevent drum rotation.
	Low system pressure.	Adjust accordingly.
	High cooling oil pressure.	Check cooling oil pressure. Replace relief valve if required.
	Clutch/brake shaft bearings set too tight.	Adjust accordingly.
	Low oil level.	Add oil.
Winch will not operate while tracks are turning.	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Fig. 3-18. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Low oil pressure.	Refer to “Low Oil Pressure” troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage.
	Electric problem.	Troubleshoot the problem accordingly
Winch will not operate in any function.	Control lever off-center at startup.	Return control lever to neutral position and attempt function again.
	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.) 2. Check wiring harness continuity. 3. Replace faulty coil. **NOTE**: A working coil will have 15 to 50Ω resistance and will be magnetized when energized.
	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 3-20 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. **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.
	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.
	Program set for flat ground work.	Reprogram for application.
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.	Remove and reinstall shaft with proper alignment, see Step 10 in subsection of Clutch Shaft Reassembly & Installation in Section 4.

Figure 3-20 Troubleshooting Analysis Check Chart for Service Personnel (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
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. 2. Add oil.
	Gears and bearings worn.	Replace components.
Control lever will not detent in **BRAKE-OFF**	Detent mechanism worn or broken.	1. Replace control lever assembly. 2. Adjust detent spring force (see Control Lever Detent Force Adjustment in Subsection of Service for procedure).
Control lever does not return to neutral when released.	Insufficient lubrication.	Lubricate detent pin (see Control Lever Detent Force Adjustment in Subsection of Service for procedure).
	Excessive detent force.	Remove knob and adjust detent force (see Control Lever Detent Force 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 **LINE-IN** or **LINE-OUT**.	Plugged brake valve.	Replace valve.
	Faulty brake coil.	Replace coil.
	Open or shorted brake circuit.	Check wiring harness. See “Winch will not operate in any function” above.
	Brake dump stays open.	
Winch does not engage and/or load rolls out in **LINE-IN** or **LINE-OUT**.	Plugged forward or reverse valve.	Replace valve.
	Faulty forward or reverse coil.	Replace coil.
	Open or shorted forward/reverse circuit.	Check wiring harness. See “Winch will not operate in any function” above.
Filter LED blinking. 1/2 second ON; 1 second OFF; 3 seconds ON; 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 3-21 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; HSOUTx may be lit, but not flashing.	Winch won't function or only allows one function.	Control lever output faulty	Replace control lever.
PWM%C flashing; 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)

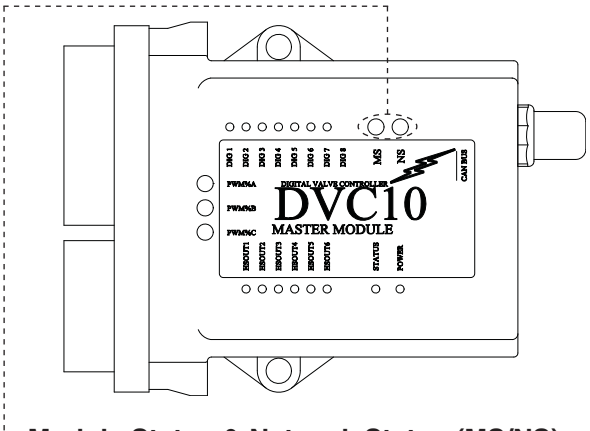
The ECM regulates the cartridge valves on the valve manifold assembly, based on control lever input and a preset computer program. Occasionally, it may be necessary to download a new control program for the ECM or perform higher-level electronic control system troubleshooting through the ECM interface. 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 3-22 Electronic Control Module DVC10

eControls Utility Instructions

- Interfacing with the Electronic Control Module on your Allied Winch Product

The Electronic Control Module

The Electronic Control Module (ECM) controls winch operation using a program that is specific to each winch model and application. The ECM monitors control inputs and actuates cartridge valves as needed to achieve the desired winch operation.

If the winch is modified, serviced or installed on a different model of tractor, it may be necessary to re-program the ECM. Or it may be necessary to perform higher-level electronic control system troubleshooting through the ECM interface.

The ECM is accessed for programming or troubleshooting by way of the 'Program Loader/Monitor' (PL/M) utility. An eControls software package, which contains the PL/M utility and necessary winch control programs, can be obtained from Allied Systems either through the Publications Locator at the Allied Systems Company's website, http://www.AlliedSystems.com or by obtaining an eControls software CD from Allied Systems. Contact your Allied Parts representative for more information at 503-625-5132.

System Requirements

The computer used for the ECM interface must meet or exceed the following requirements:

- Windows 95 or later.
- Minimum of 8 MB RAM, 16 MB or more or RAM is recommended.
- Functional Serial COM Port or USB port with a USB to Serial COM port adapter.
- CD-ROM drive or Internet connection.

Additionally, the following hardware is required:

- A printed copy of document 2305227W along with these instructions (document 599035W). These documents are included in the eControls software package.
- A communication cable (P/N 2304603W) is required to connect the ECM to the computer.

NOTE: The communication cable 2304603W requires a serial COM port. If a serial COM port is not available on your computer, a USB port to serial COM port adapter is available from Allied Systems (P/N 2310409). If using a USB port to serial COM port adapter, install the adapter drivers included on the CD with the adapter before attempting to program or interface with the ECM.

Downloading the eControls Software Package from the Website

1. Connect to http://www.alliedsystems.com.

2. Select 'Publications Locator' -> Select 'Allied Winch' -> Select 'eControls Download'.

3. Follow the instructions shown on the page for downloading the software to your computer.

Allied Systems recommends checking its website at http://alliedsystems.com for the most up-to-date versions of utility software and ECM programs any time an ECM is serviced.

About Programs and BIOS

The ECM (also known by the manufacturer's name 'DVC10') uses what is known as 'Flash memory' to store information. When the ECM is in 'Programming mode' it can write new programs or BIOS information to the flash memory. The terms 'Flash file' and 'Program' mean the same thing, as do 'flashing' and 'programming'.

The BIOS is the 'Basic Input/Output System'. The ECM uses the BIOS to know how to execute the program and utilize the full capabilities of the ECM. BIOS files for this ECM have a file name ending in '.sre'. It is not recommended that the BIOS be updated unless directed by Allied Systems or you experience a programming error as outlined in Allied Service Bulletin A99-Z-27.

Programs are used by the ECM to determine how the winch will operate. Different programs exist for different winch models, winch applications, and hydraulic or electronic design revisions. Winch programs each consist of two files: one file name ending with '.pgm' and one file name ending with '.mem'.

Example: program 2310941A consists of files
2310941A.pgm and 2310941A.mem.

When programming the ECM, only the '.pgm' file will be selected, but the ECM requires the '.mem' file as well. Both of these files must be located in the same computer directory.

It is important to take care to install the correct program on your winch. Using the incorrect program could result in poor winch performance or physical injury and death. Document 2305227 is included on the CD and in the download and can be used to determine the correct program for your winch. Contact Allied Systems if you have any questions or concerns about selecting the correct program.

Installing the Program Loader/Monitor

The current versions of the Program Loader/Monitor cannot be run from the CD and must be installed on the computer to be used for communication with the ECM.

Run the file 'Setup.exe' from the subdirectory 'PLM_ v4p73_Installer' on the eControls CD or download and follow the installation instructions. Note that the computer will need to be re-started to complete the installation.

ECM Access and Programming

1. Turn the tractor key switch to **RUN** so that the electronic control module is powered up (indicated by continuously illuminated Power and MS LEDs on the module). Make certain that the module is powered before connecting the communication cable in the next step. It is not necessary to start the tractor or engage the hydraulics in order to interface with the ECM or diagnose eControls concerns.

NOTE: If the ECM automatically and unintentionally goes into programming mode when powered up (indicated by the MS and NS lights flashing alternately), contact your dealer to see service bulletin A99-Z-27 for instructions as to how to correct this situation.

2. Attach the communications cable to the diagnostic plug on the winch external wiring harness and to one of the computer's COM ports or to a USB to serial COM port adapter. See Figure 3-23.

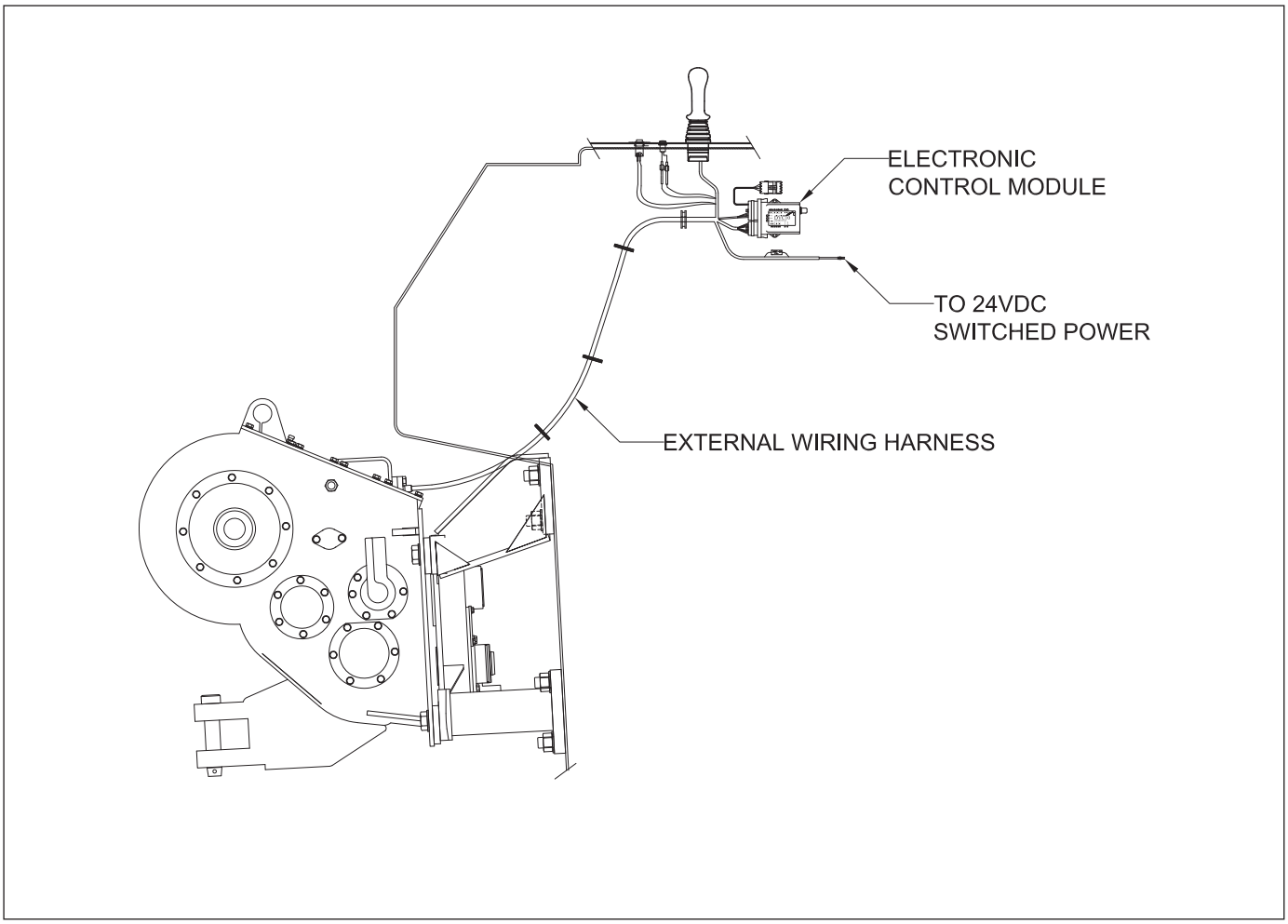


Figure 3-23 Electronic Control Module and Diagnostic Plug

3. Run the file HCT Products\Intella\PLM v4.73 from the Windows Start Menu.

4. A window called “Program Loader Monitor v4.73” should appear (see Figure 3-24).

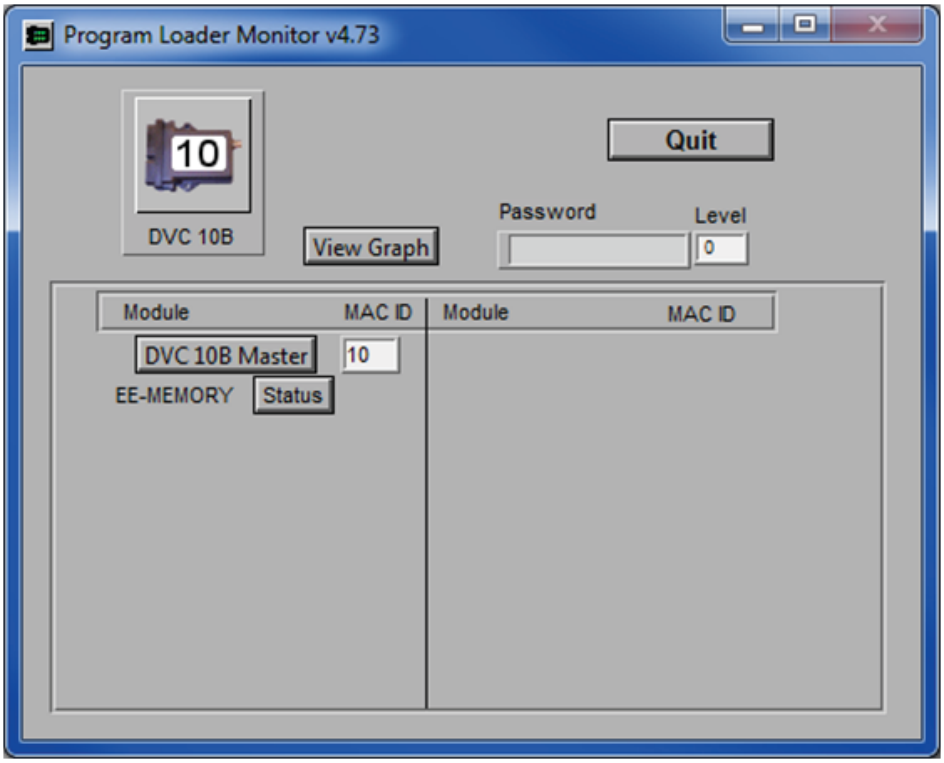


Figure 3-24 Program Loader Monitor v4.73

5. Select the ‘DVC10B Master Button’. This will launch the monitor window (see Figure 3-25).

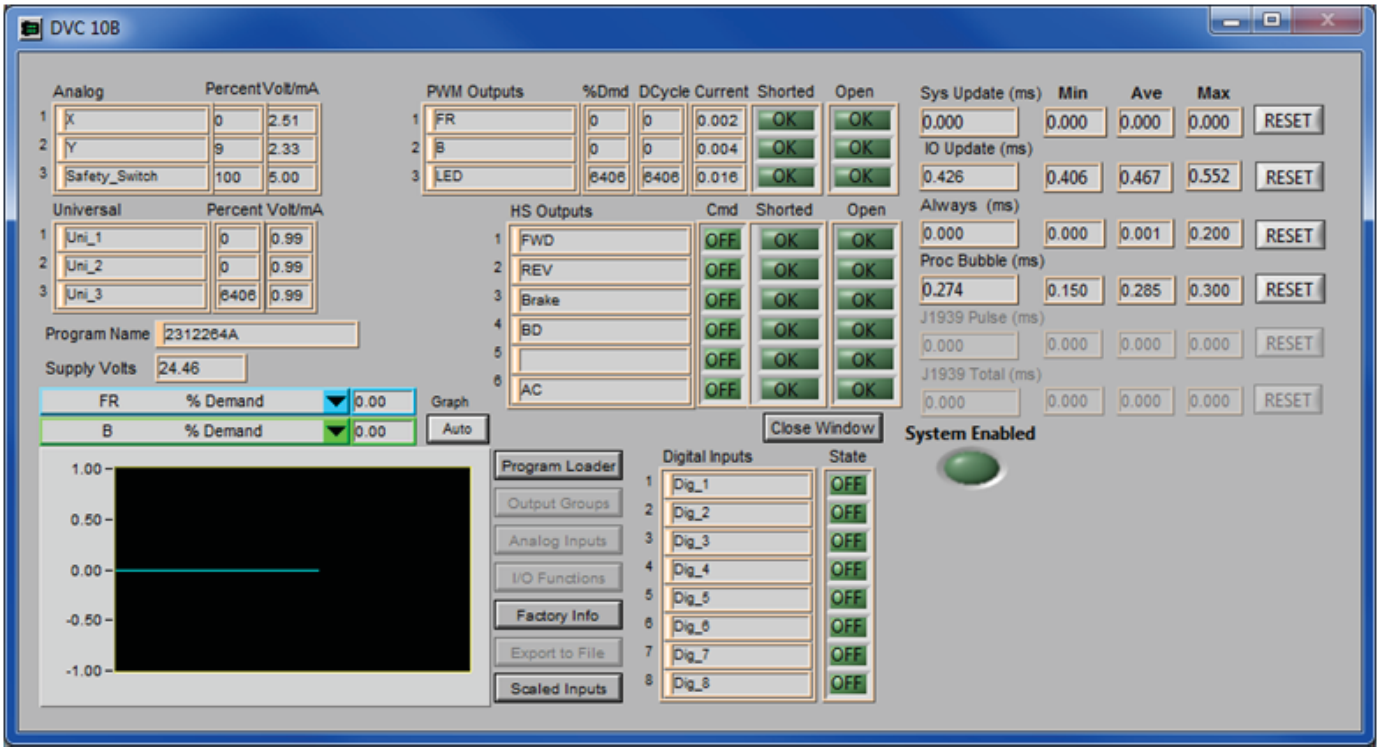


Figure 3-25 DVC10B Monitor Window

Note that advanced system troubleshooting can be performed at this level when the tractor key switch is 'on'. Detailed troubleshooting information can be found in Figure 3-21, on page 3-37.

"Program Name" identifies which program is currently loaded on your DVC10.

6. To flash a new program or BIOS, select the Program Loader button in the DVC10 monitor window. You will then see the 'Program Loader' window (see Figure 3-26).

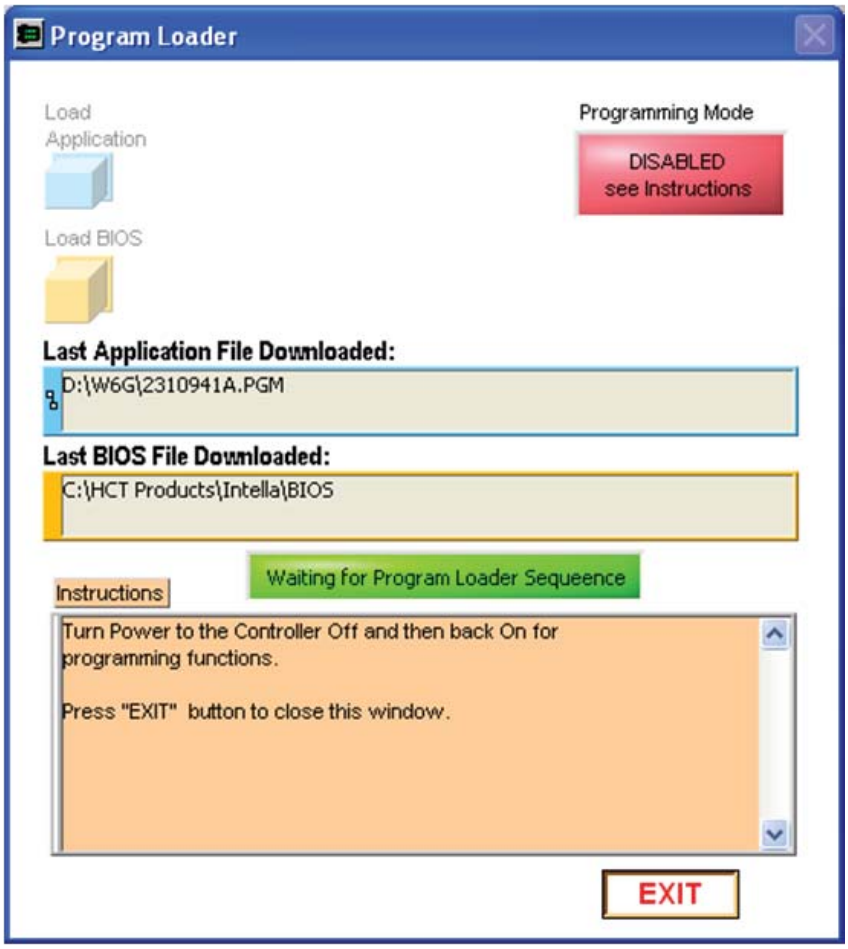


Figure 3-26 Program Loader

7. To exit this screen and retain the old program, select the Exit button instead of proceeding to the next step.

8. To enter 'Programming Mode', switch the power to the ECM off and wait five seconds to allow the ECM to completely power down. Then turn the power back on to enter programming mode. The MS and NS lights will flash alternately when the ECM is in 'Programming Mode'. Note that the ECM must completely power down before being re-activated for the ECM to enter 'Programming Mode'.

9. When the Program Loader sees the ECM enter programming mode, the "Load Application" and the "Load BIOS" buttons will no longer be grayed out and the Programming Mode light will turn green and say "Enabled" as shown in Figure 3-27.

NOTE: If at any time the ECM/DVC10 loses power while in programming mode, the module can become locked in programming mode. Contact your dealer to see Service Bulletin A99-Z-27 for correcting this situation.

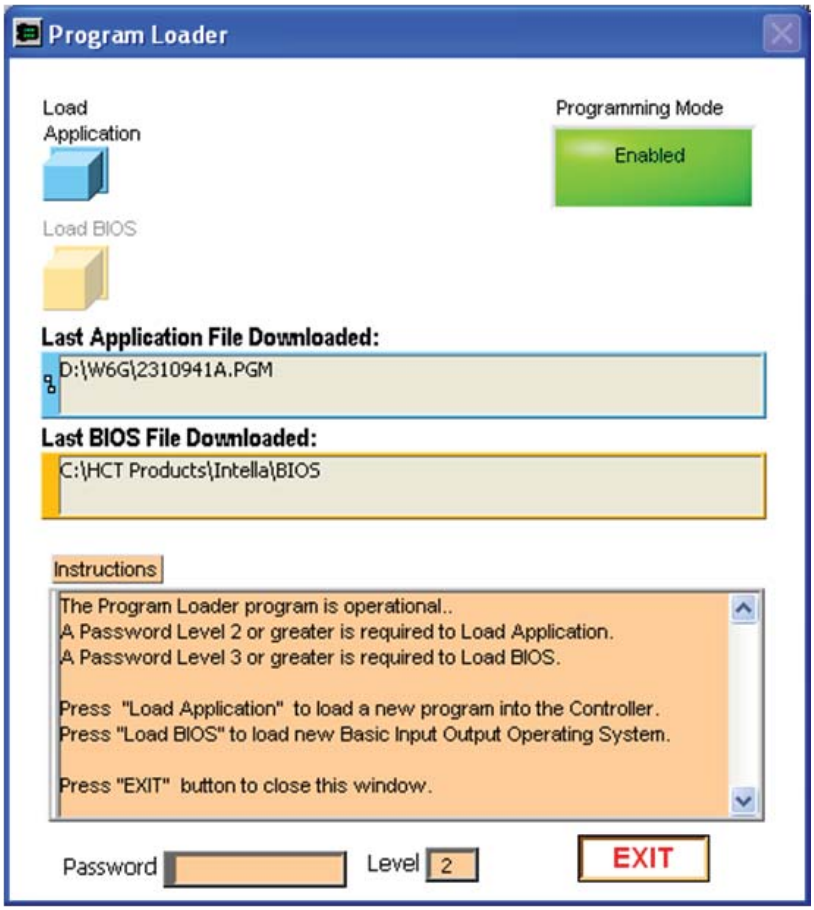


Figure 3-27 Enabled Program Loader

10. Click on the “Load Application” button as shown in Figure 3-29 and navigate to the correct program folder on the CD or in C:\WINCH if the software was downloaded from the Allied website. Programs are winch model specific and will be found in a directory named after the winch model in question as shown in Figure 3-28. Note that the only files that will be shown for selection are the ‘.pgm’ files.

11. Select the program, as shown in Figure 3-29, as an example, then select “Open” and wait for the file to be flashed onto the ECM. Depending on the speed of your computer, this may take several minutes (see Figure 3-30). When the process of flashing the ECM module is complete, the screen will be as shown in Figure 3-31.

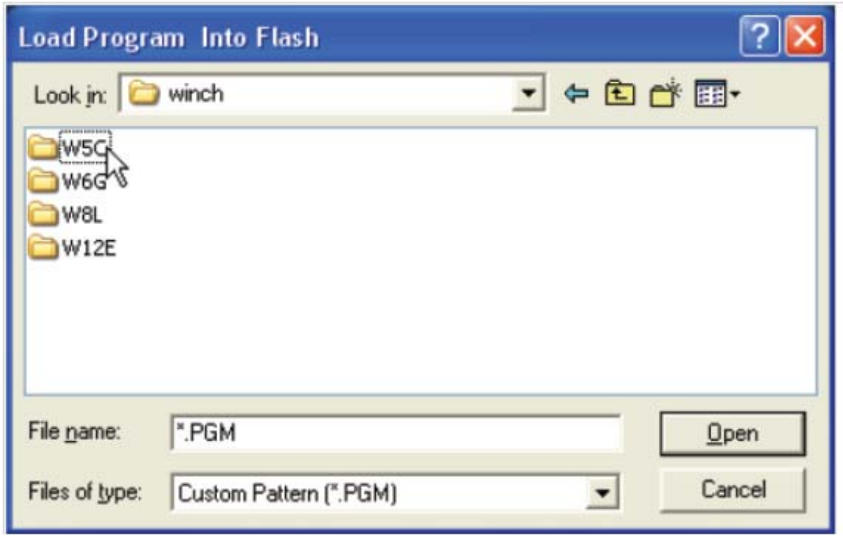


Figure 3-28 Selection Window

12. When programming is complete, switch the ECM power off and wait five seconds for the ECM to completely power down. Then switch the power back on to activate the newly programmed ECM.

13. The DVC10 Monitor screen will appear, and the newly flashed program name along with other variables will be visible. Verify that the "Program Name" on the newly flashed ECM matches the intended program.

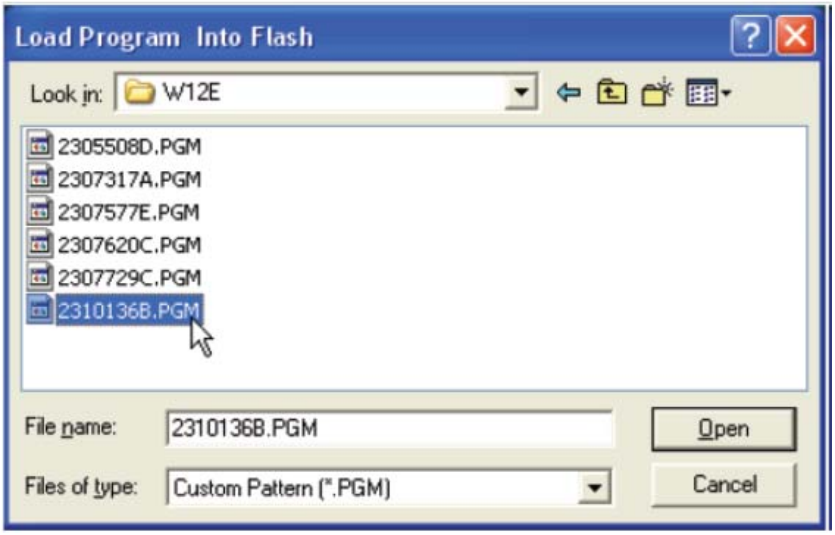


Figure 3-29 Program Selection

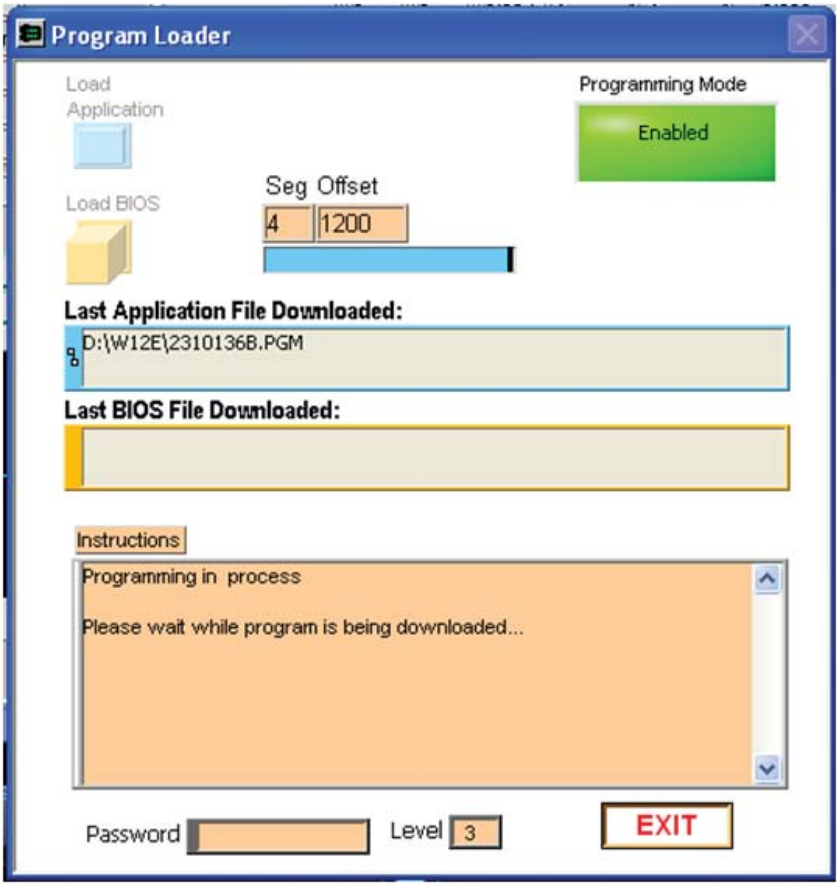


Figure 3-30 Program Loading in Process

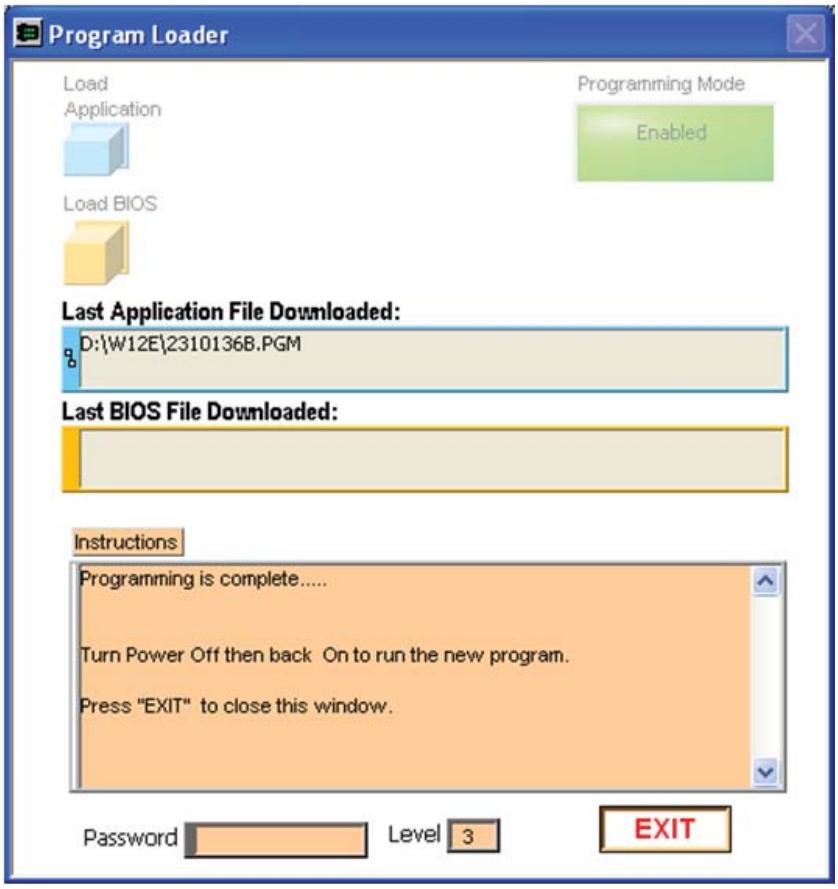


Figure 3-31 Program Loading Complete

14. The winch can be operated at this point. The DVC10 Monitor window can be left running for diagnostics and troubleshooting.

15. Click the “Close Window” button on the right of the screen to bring up the Main Menu window to exit the Monitor (see Figure 3-32). Select the Quit button to exit the Program Loader.

16. Detach the communication cable from the winch harness and insert the plug into the harness diagnostic connector.

17. The winch is now ready for use. It is recommended that the winch be tested without load for proper function prior to returning the winch to service.

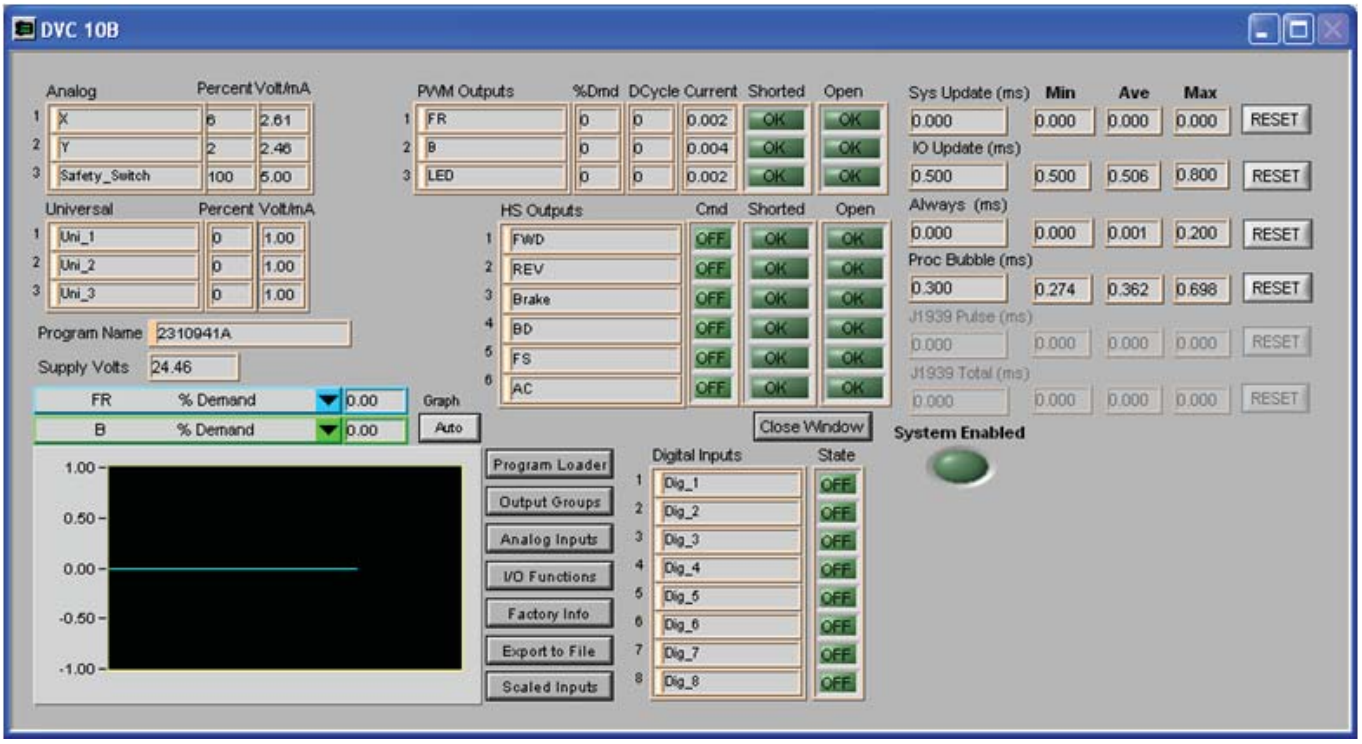


Figure 3-32 DVC10 Monitor Window

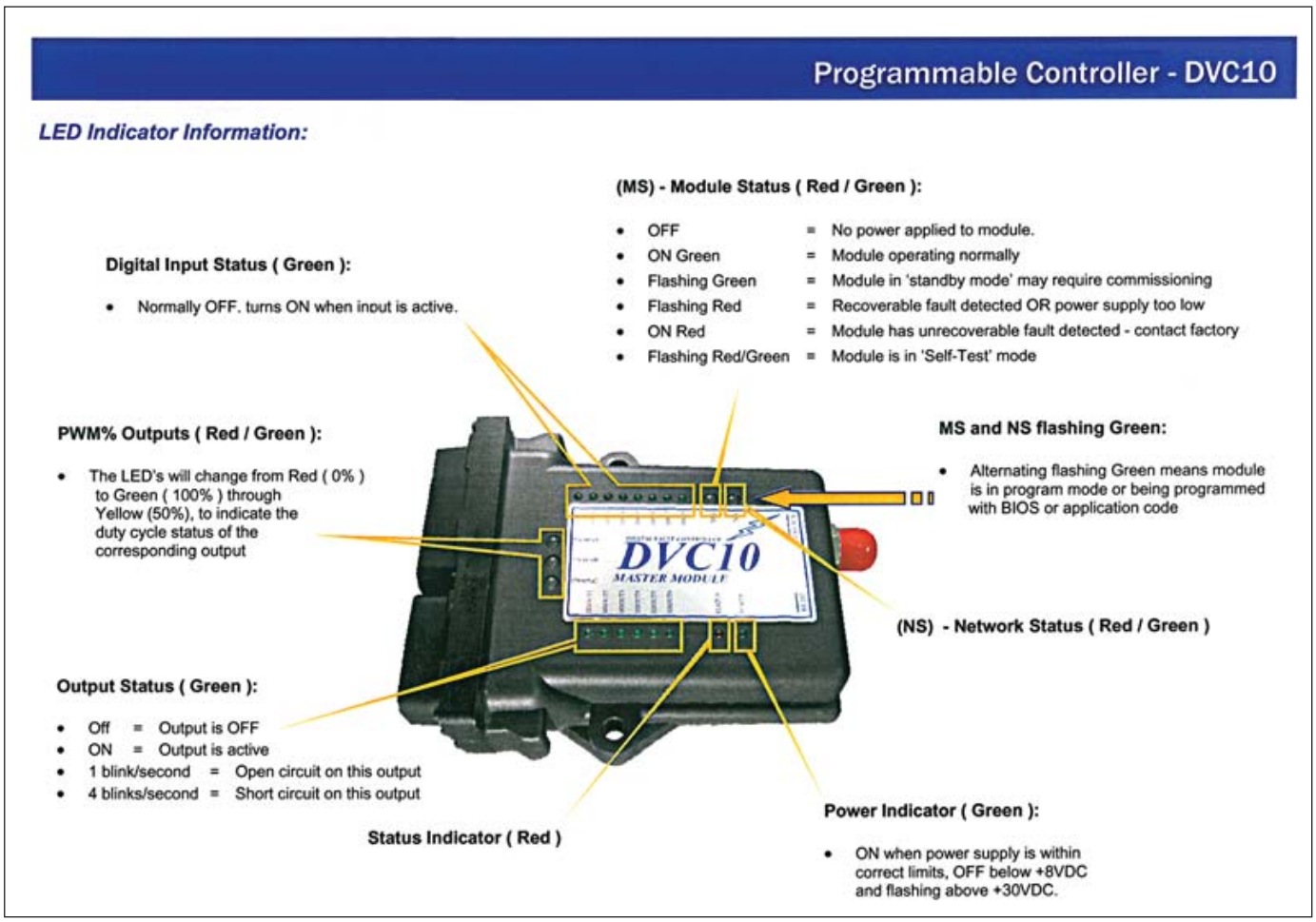


Figure 3-33 DVC10 LED Indicators

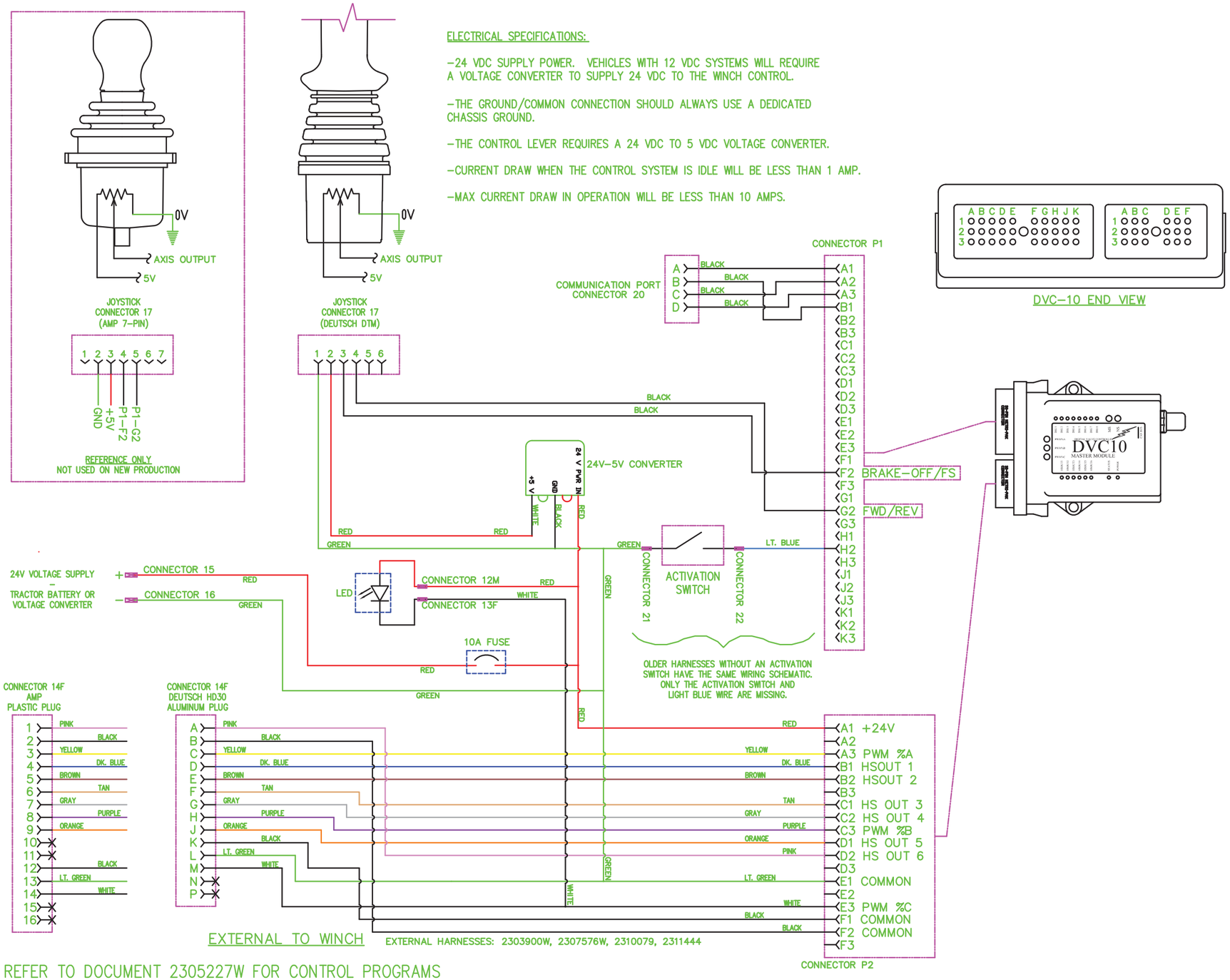
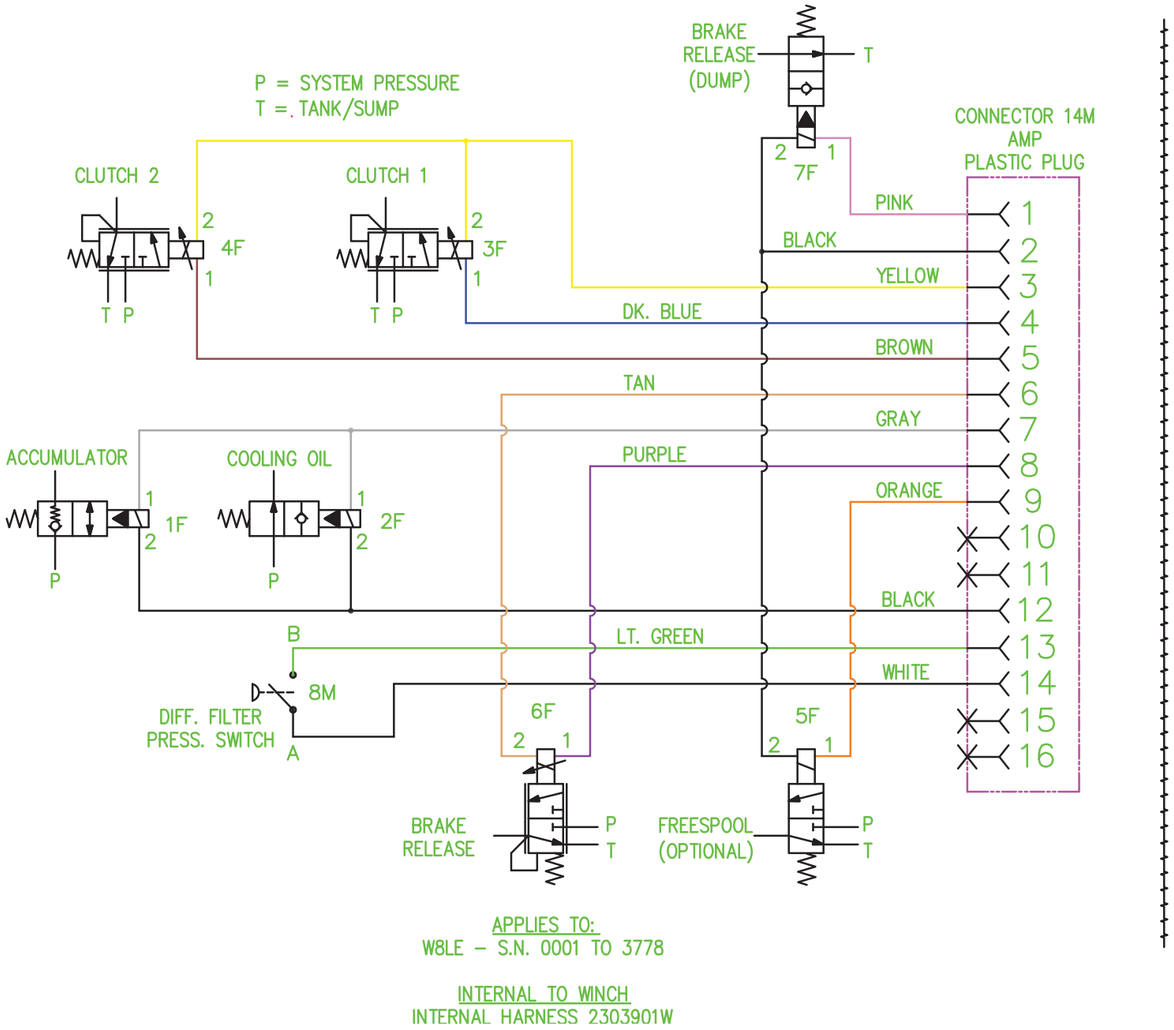


Figure 3-34 eControls Schematic (Rev. B) - 1



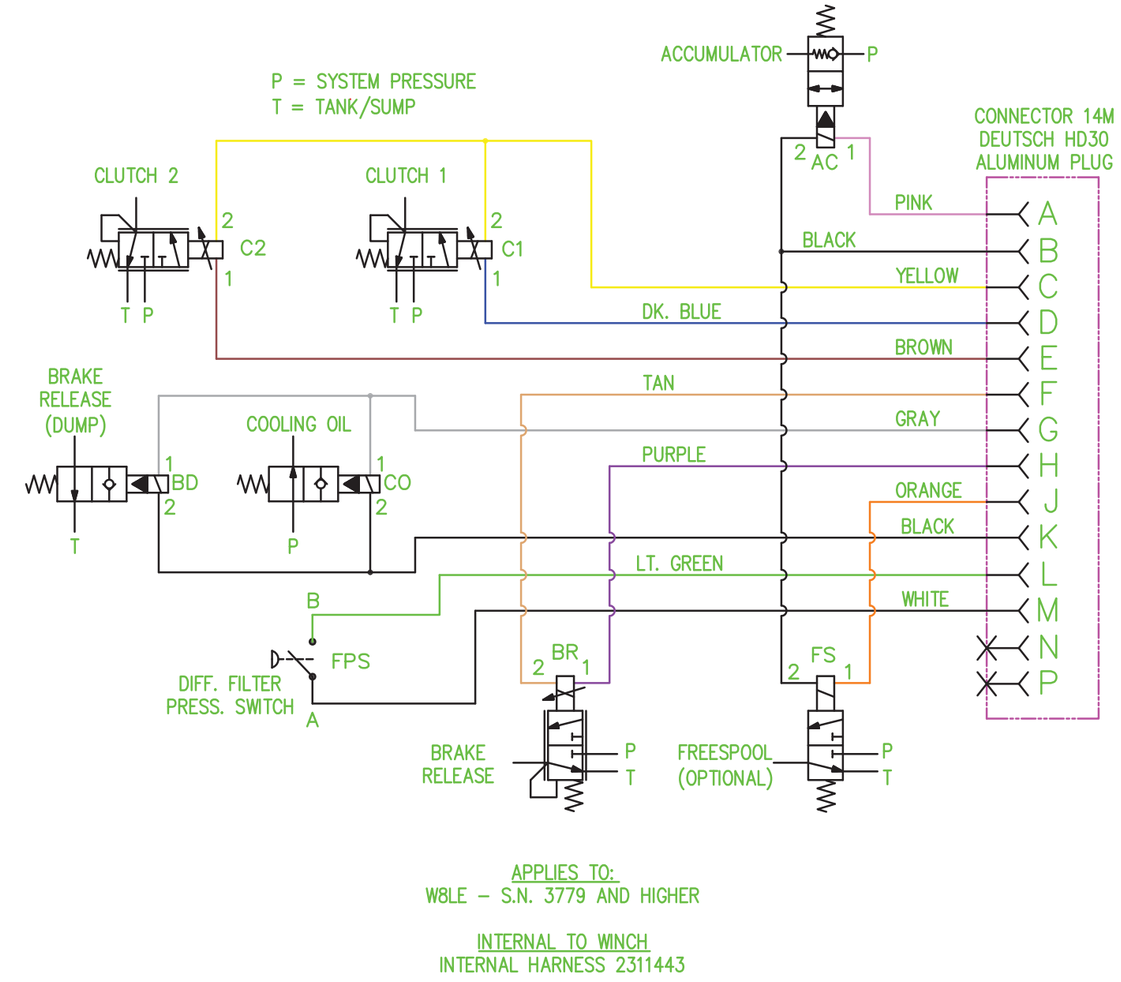
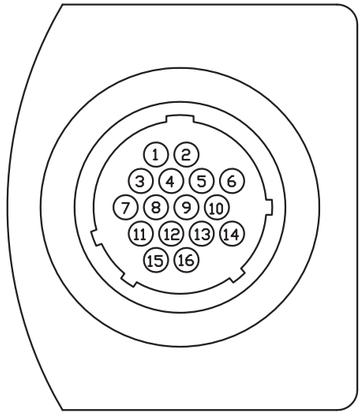
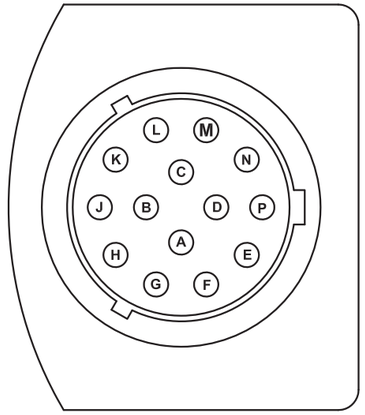


Figure 3-35 eControls Schematic (Rev. B) - 2



PLASTIC AMP PLUG
WINCH VIEW



METAL DEUTSCH PLUG
WINCH VIEW

SILVER HYDAC MANIFOLDS

SOLENOID FUNCTION	PIN COMBINATION		
	DEUTSCH PLUG	AMP PLUG	RESISTANCE
ACCUMULATOR OR BRAKE DUMP	A & B	1 & 2	30 OHMS
ACCUMULATOR OR BRAKE DUMP AND FREESPOOL IN SERIES (IF FS INSTALLED)	A & J	1 & 9	60 OHMS
FREESPOOL (IF FS INSTALLED)	B & J	2 & 9	30 OHMS
ACCUMULATOR OR BRAKE DUMP AND FREESPOOL IN SERIES (FS NOT INSTALLED)	A & J	1 & 9	OPEN CIRCUIT
FREESPOOL NOT INSTALLED	B & J	2 & 9	OPEN CIRCUIT
CLUTCH 1	C & D	3 & 4	21 OHMS
CLUTCH 2	C & E	3 & 5	21 OHMS
CLUTCH 1 + CLUTCH 2 (IN SERIES)	D & E	4 & 5	42 OHMS
BRAKE RELEASE	F & H	6 & 8	21 OHMS
BRAKE DUMP OR ACCUMULATOR + COOLING OIL (IN PARALLEL)	G & K	7 & 12	15 OHMS
FILTER SWITCH	L & M	13 & 14	OPEN CIRCUIT

RED STERLING MANIFOLDS

FUNCTION SOLENOID	PIN COMBINATION	RESISTANCE
	AMP PLUG	
ACCUMULATOR OR BRAKE DUMP	1 & 2	40 OHMS
BRAKE DUMP AND FREESPOOL IN SERIES (IF FREESPOOL INSTALLED)	1 & 9	80 OHMS
FREESPOOL (IF FS INSTALLED)	2 & 9	40 OHMS
BRAKE DUMP AND FREESPOOL IN SERIES (FREESPOOL NOT INSTALLED)	1 & 9	OPEN CIRCUIT
FREESPOOL NOT INSTALLED	2 & 9	OPEN CIRCUIT
CLUTCH 1	3 & 4	32 OHMS
CLUTCH 2	3 & 5	32 OHMS
CLUTCH 1 + CLUTCH 2 (IN SERIES)	4 & 5	64 OHMS
BRAKE RELEASE	6 & 8	32 OHMS
BRAKE DUMP AND COOLING OIL (IN PARALLEL)	7 & 10	20 OHMS
FILTER SWITCH	11 & 12	OPEN CIRCUIT

BLUE HIGH FLOW GEN–II MANIFOLDS

WINCH MODEL	SOLENOID FUNCTION	PIN COMBINATION	RESISTANCE
		DEUTSCH PLUG	
ALL	ACCUMULATOR	A & B	30 OHMS
W6GE ONLY	ACCUMULATOR AND FREESPOOL IN SERIES (IF FS INSTALLED)	A & J	60 OHMS
W12EE ONLY	ACCUMULATOR AND BRAKE DUMP (IN SERIES)	A & J	60 OHMS
W6GE ONLY	FREESPOOL (IF FS INSTALLED)	B & J	30 OHMS
W12EE ONLY	BRAKE DUMP	B & J	30 OHMS
W6GE OR W8L ONLY	ACCUMULATOR AND FREESPOOL IN SERIES (FS NOT INSTALLED)	A & J	OPEN CIRCUIT
W6GE OR W8L ONLY	FREESPOOL NOT INSTALLED	B & J	OPEN CIRCUIT
ALL	CLUTCH 1	C & D	21 OHMS
ALL	CLUTCH 2	C & E	21 OHMS
ALL	CLUTCH 1 + CLUTCH 2 (IN SERIES)	D & E	42 OHMS
ALL	BRAKE RELEASE	F & H	21 OHMS
W6GE OR W8L ONLY	BRAKE DUMP AND COOLING OIL (IN PARALLEL)	G & K	15 OHMS
W12EE ONLY	COOLING OIL	G & K	30 OHMS
ALL	FILTER SWITCH	L & M	OPEN CIRCUIT

RESISTANCES SHOULD READ WITHIN ~8 OHMS OF THE LISTED VALUES

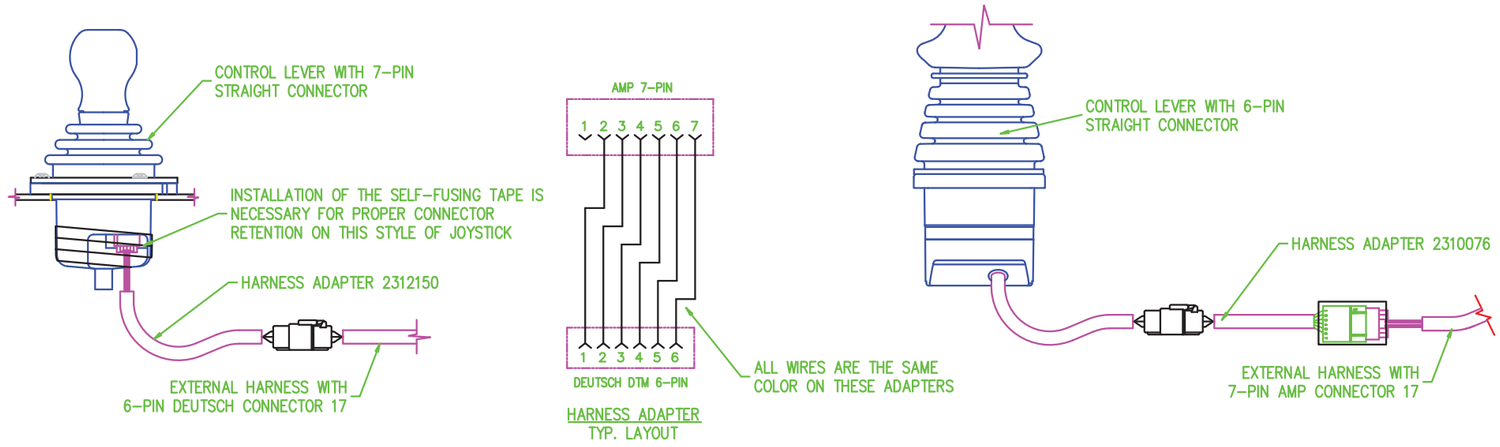


Figure 3-36 eControls Schematic (Rev. B) - 3

Notes

Notes

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 4-12 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 Sections 2 and 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 subsections of Service in Sections 2 and 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** or **LINE-OUT** position at least three times to discharge the pressure in the accumulator.

NOTE: Power must be turned on for winches with electronic controls.

4. Remove the control valve cover.

5. Disconnect control cable, freespool cable and/or wire harness from winch.

6. Connect slings and a crane or lifting device to the winch.

⚠ WARNING

Before lifting the winch, check Figure 1-14, Winch Weight, to make sure the minimum rated capacity for the slings, crane or other lifting devices exceeds the load being lifted.

7. Drain the oil from the winch.

8. Remove transmission cover.

9. Remove mounting nuts or capscrews and lockwashers securing winch to tractor and driveline (if applicable).

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.

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

General Gear Arrangement

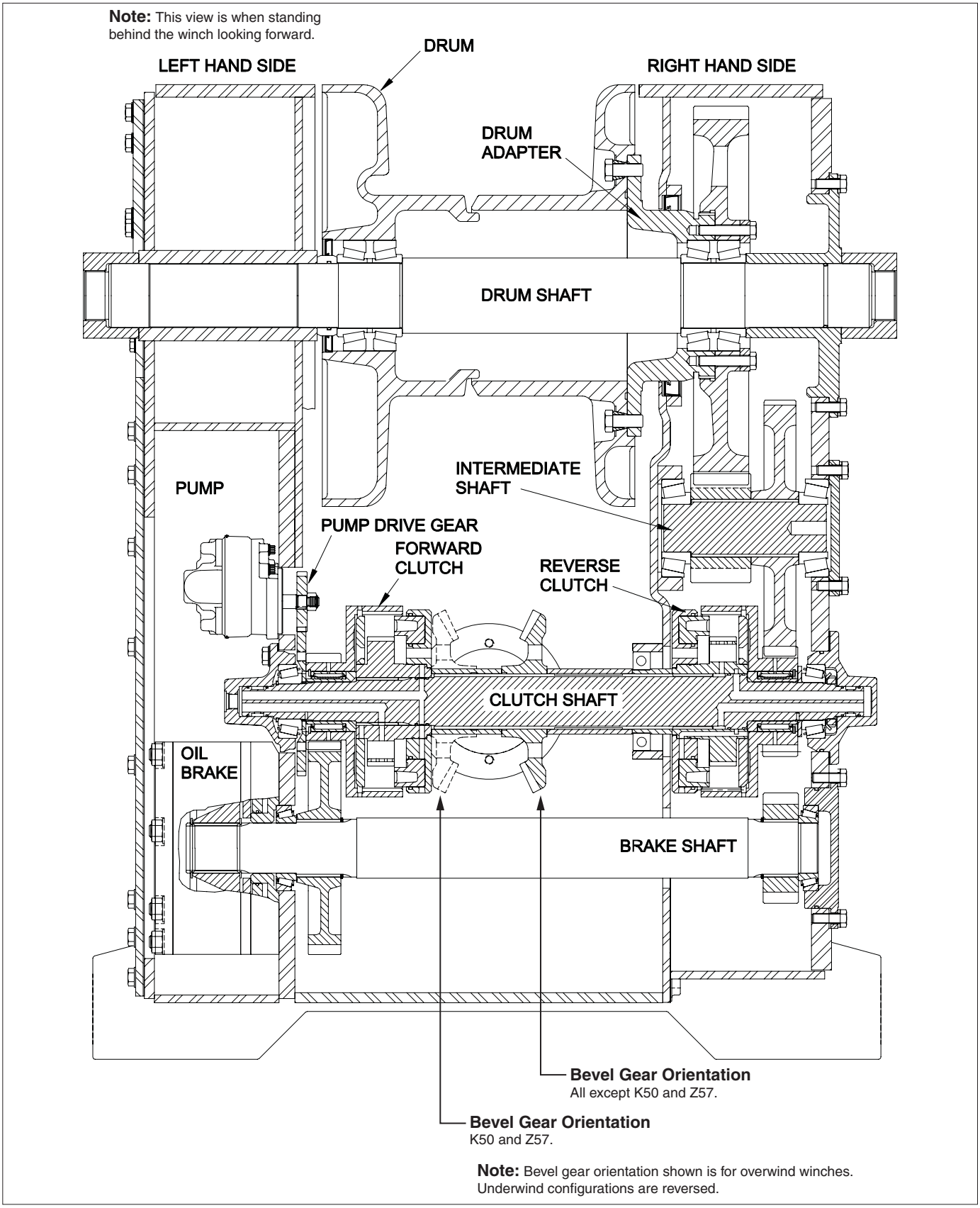


Figure 4-1 General Arrangement, Non-Freespool (Ratios #1 - #7)

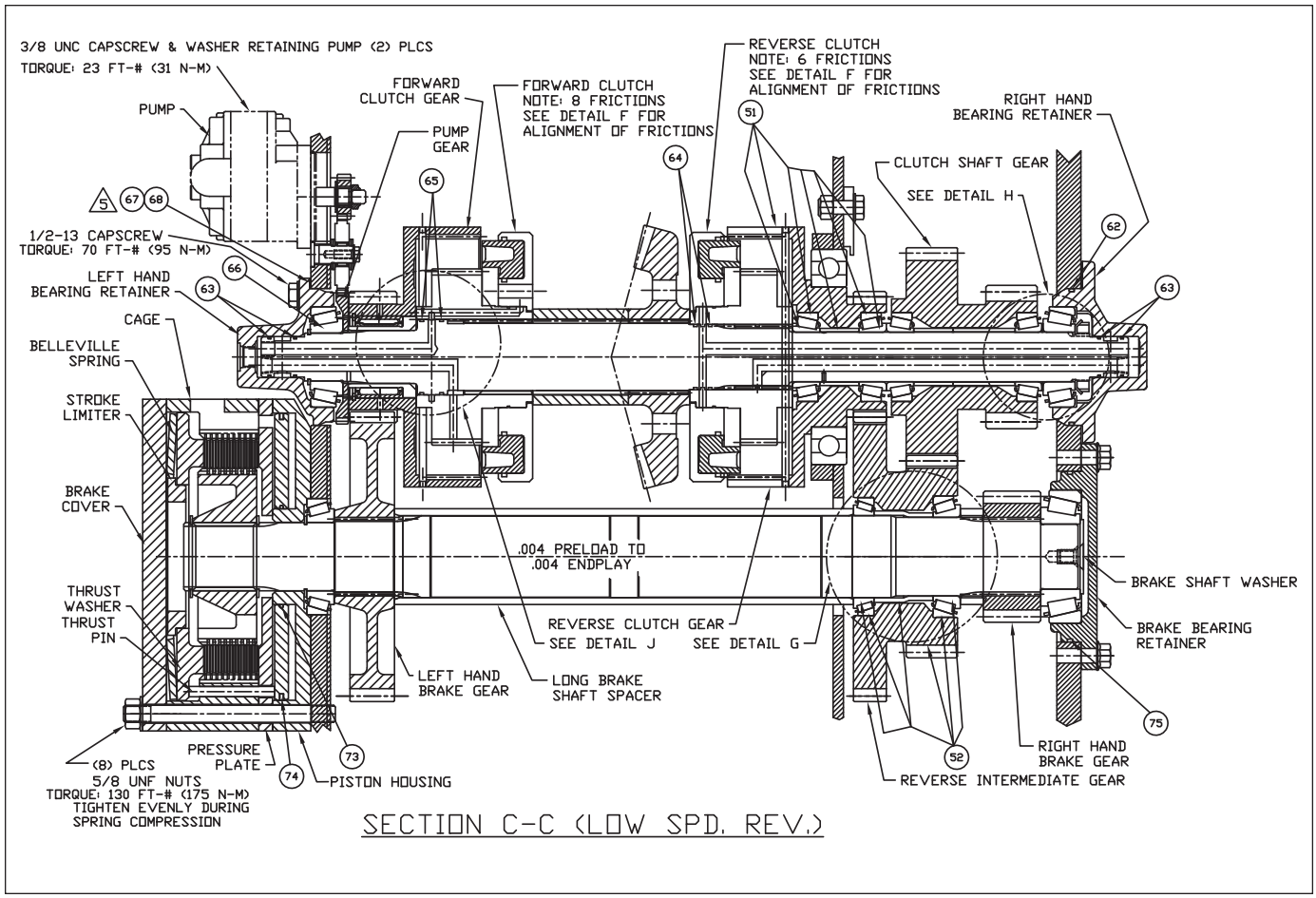


Figure 4-2 General Arrangement (Ratios #8 - #10)

Refer to Figure 4-12 on page 4-51

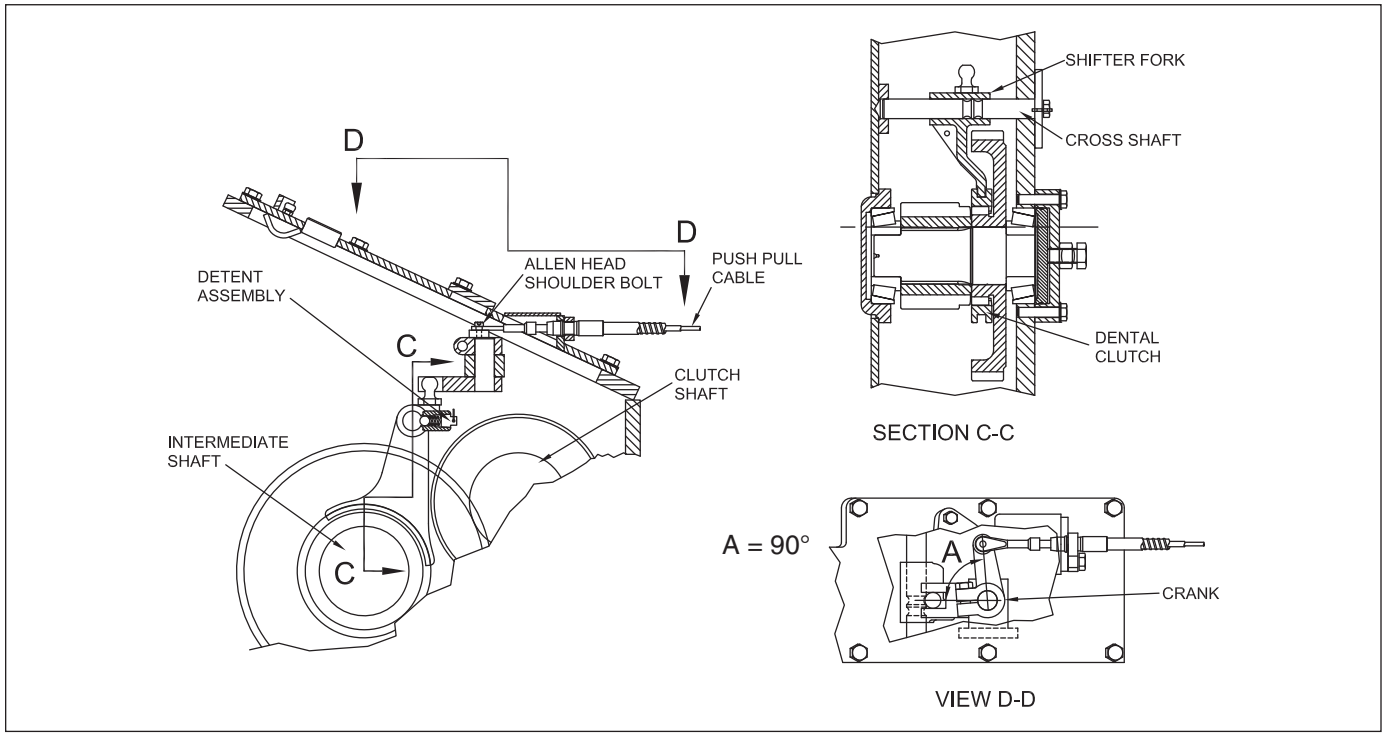


Figure 4 -3 Freespool Arrangement (Optional)

PTO Shaft Removal and Disassembly

Please refer to Figures 4-4 and 4-5. Before removing the PTO shaft assembly, the winch must be removed from the tractor as explained above in **Winch Removal**.

1. Remove dropbox (if applicable).

2. Remove sealing capscrews. If winch is equipped with a drive adapter, refer to Step 5.

3. Remove top center cover, pry or push PTO shaft assembly forward.

⚠ CAUTION

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

4. Disassemble and inspect PTO shaft (refer to Figures 4-4 and 4-5).

5. If equipped with a drive adapter, remove the drive adapter box first (refer to Figures 4-6 through 4-9), then the bevel pinion gear and carrier. Disassemble and inspect as required.

1. Spacer
2. PTO Shaft
3. Snap Ring
4. Capscrew
5. Gear
6. Bearing Cone
7. O-Ring
8. Bearing Carrier
9. Bearing Cup
10. Bevel Pinion Gear
11. Locknut
12. Lockwasher
13. Lockwire
14. Shim Pack

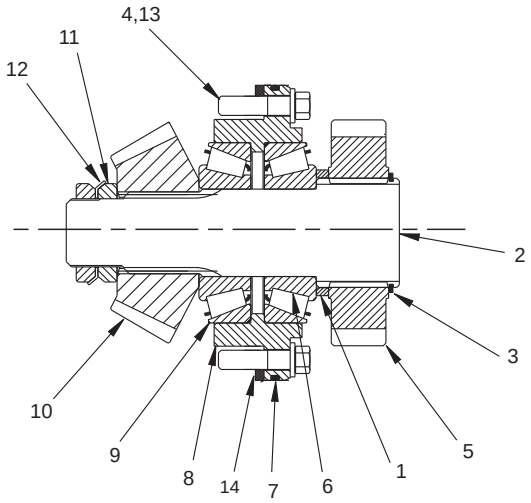
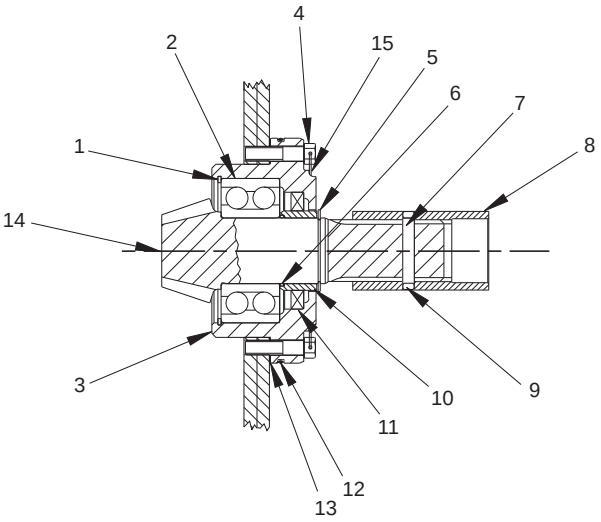
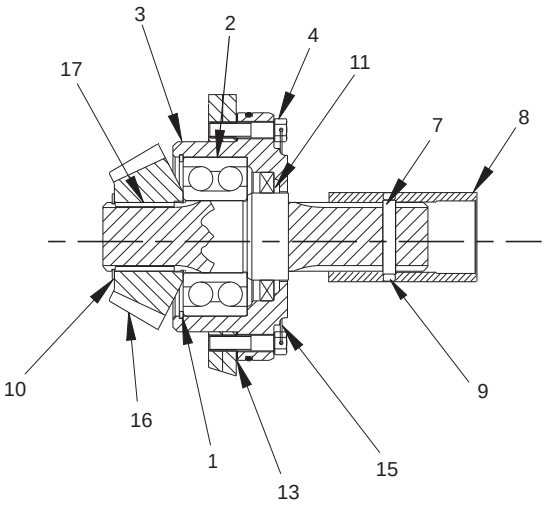


Figure 4-4 PTO Shaft for Komatsu D85ESS-2



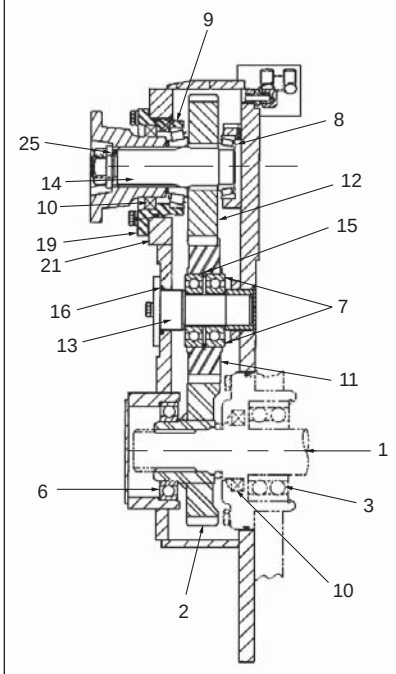
PTO Shaft With Removable Bevel Pinion Gear



PTO Shaft With Integral Bevel Pinion Gear

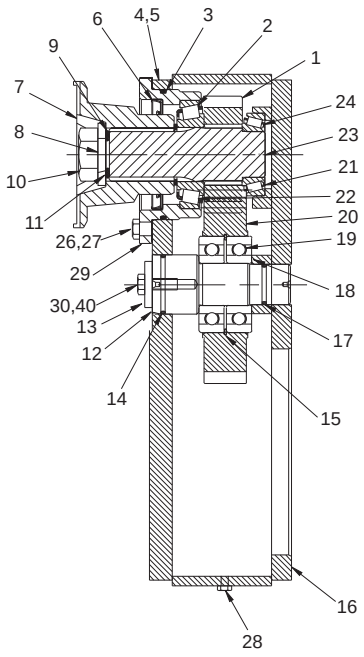
1. Snap Ring
2. Ball Bearing
3. Bearing Carrier
4. Capscrew
5. Lockring
6. O-Ring
7. Pin
8. Coupling
9. Lockring
10. Spacer
11. Oil Seal
12. O-Ring
13. Shim Pack
14. PTO Shaft
15. Lockwire

Figure 4-5 PTO Shafts, Used on AW8L-1001 and Up



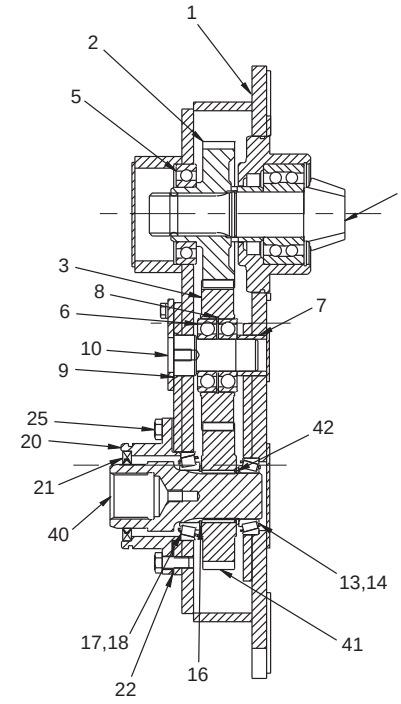
1. Pinion
2. Pinion Gear
3. Ball Bearing
6. Ball Bearing
7. Ball Bearing
8. Roller Bearing
9. Roller Bearing
10. Oil Seal
11. Idler Gear
12. Input Gear
13. Idler Shaft
14. Input Shaft
15. Snap Ring
16. O-Ring
19. Carrier
21. Shims
25. Silicone Sealant (Tighten nut to 176–230 Nm [130 to 170 ft.-lbs.])

Figure 4-6 Gearbox for Komatsu D83-1 & D85ESS-2



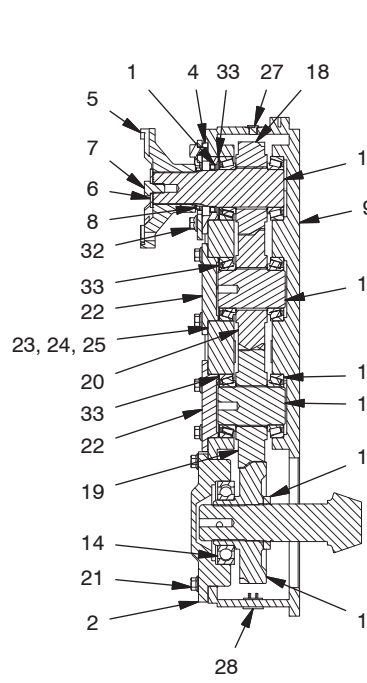
1. Pinion
2. Bearing
3. O-Ring
4. Shim
5. Shim
6. Oil Seal
7. Yoke
8. Washer
9. O-Ring
10. Nut
11. Snap-Ring
12. Shaft
13. Keeper
14. O-Ring
15. Snap Ring
16. Gear Housing
17. O-Ring
18. Snap Ring
19. Bearing
20. Idler Gear
21. Bearing Cup
22. Bearing Cone
23. Shaft
24. Bearing Cone
25. Fitting (Not Shown)
26. Capscrew
27. Washer
28. Plug
29. Bearing Carrier
30. Capscrew
40. Washer

Figure 4-8 Gearbox for Komatsu D85ESS-2



1. Drop Box
2. Top Gear
3. Idler Gear
5. Ball Bearing
6. Ball Bearing
7. Inner Race
8. Snap Ring
9. O-Ring
10. Pin
13. Bearing Cup
14. Bearing Cone
16. Snap Ring
17. Bearing Cone
18. Bearing Cup
20. Carrier
21. Seal
22. Shim pack
25. Sealing Capscrew

Figure 4-7 Gearbox for Caterpillar D6H/R, D7H PS, D8N, D7R & D8R



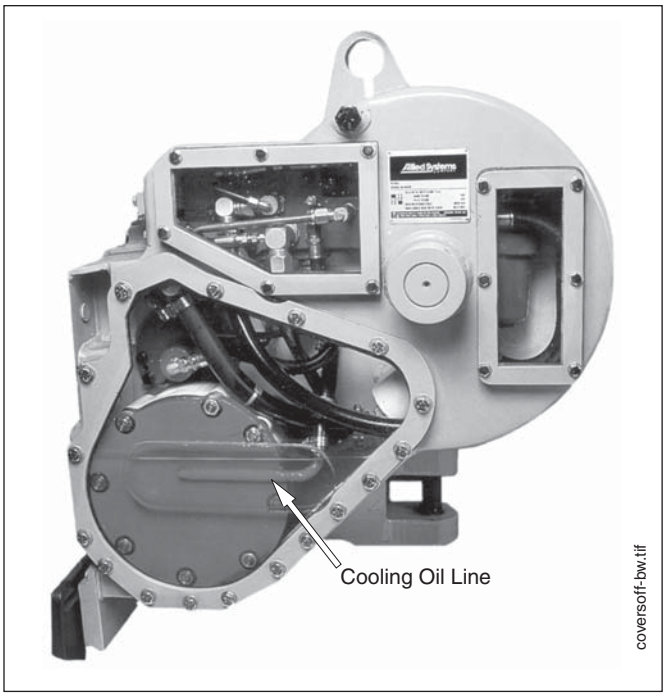
1. Seal - Lip
2. Bearing Carrier
4. Cover
5. Yoke
6. Washer
7. Capscrew
8. Snap Ring
9. Gear Box
10. Shaft - Idler
12. Shaft - Input
13. Spacer
14. Bearing - Ball
15. Bearing Cone
16. Bearing Cup
17. Gear
18. Gear
19. Gear
20. Gear
21. Screw
22. Cover
23. Shim
24. Shim
25. Shim
27. Fitting
28. Fitting
32. Screw
33. Shim

Figure 4-9 Gearbox for Komatsu D85EX-15

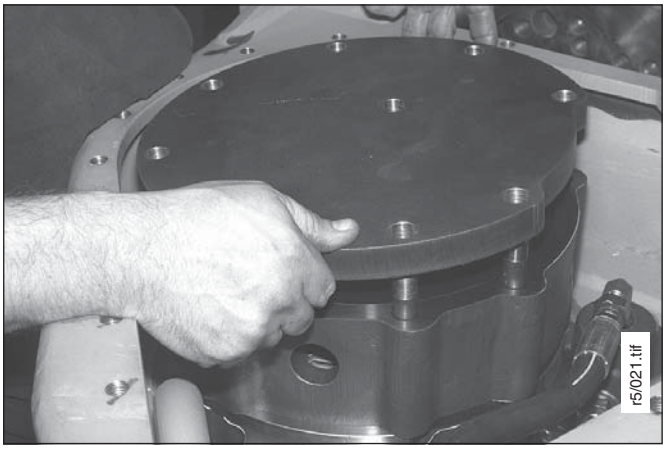
Oil Brake Removal & Disassembly

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 4-12.

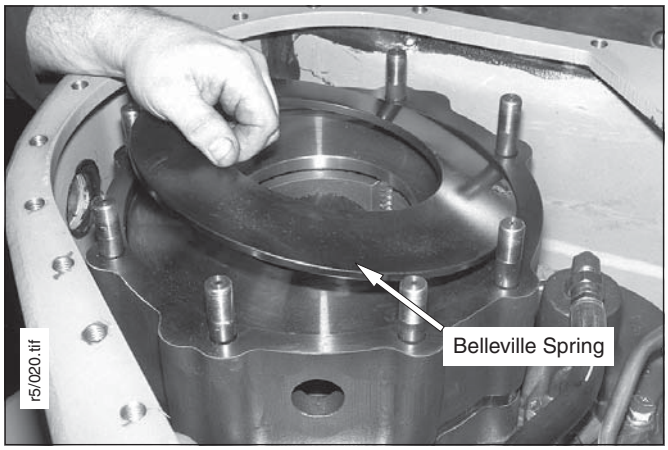
1. Drain oil from winch or position winch with left-hand side up. Remove brake assembly cover. Remove cooling oil hose line.



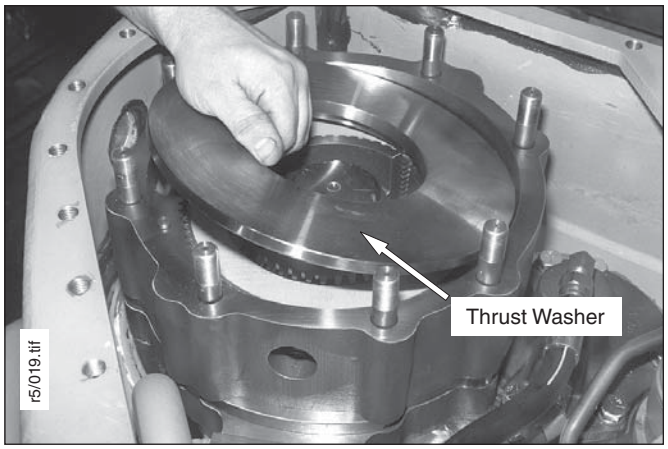
2. Loosen the locknuts evenly, then remove the brake assembly cover.



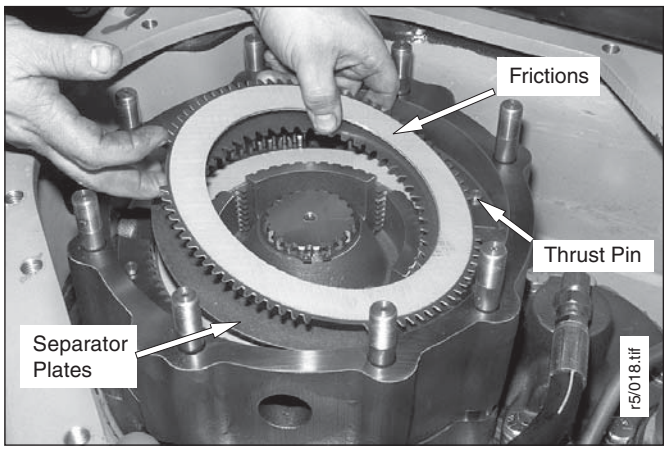
3. Remove brake stroke limiter (if applicable). Then, Remove belleville spring from cage assembly.



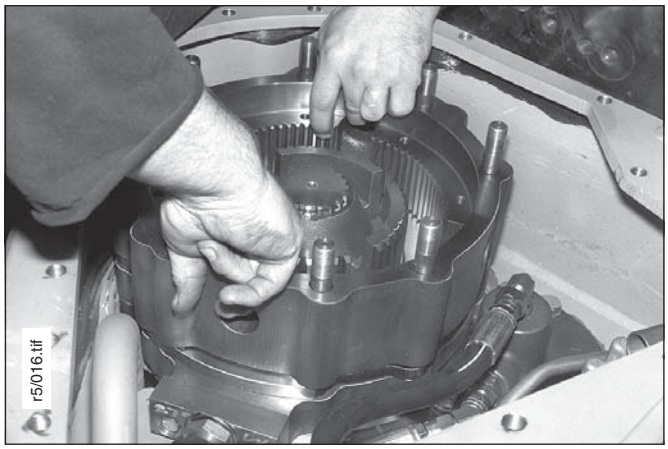
4. Remove the thrust washer.



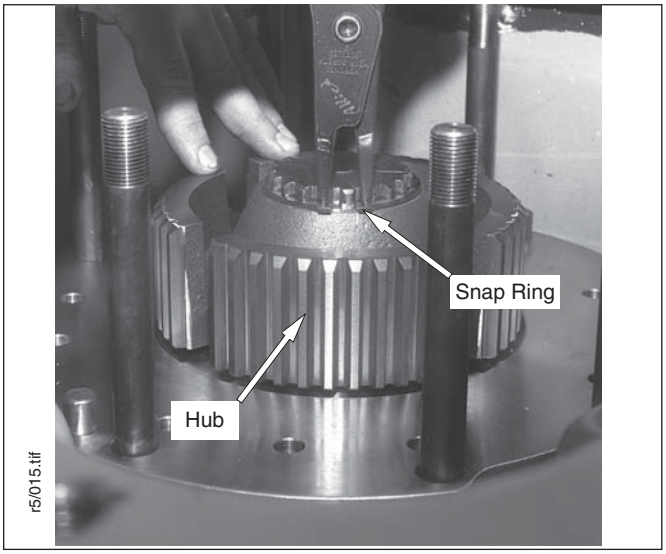
5. Remove friction discs, separator plates and thrust (or push) pins from the hub.



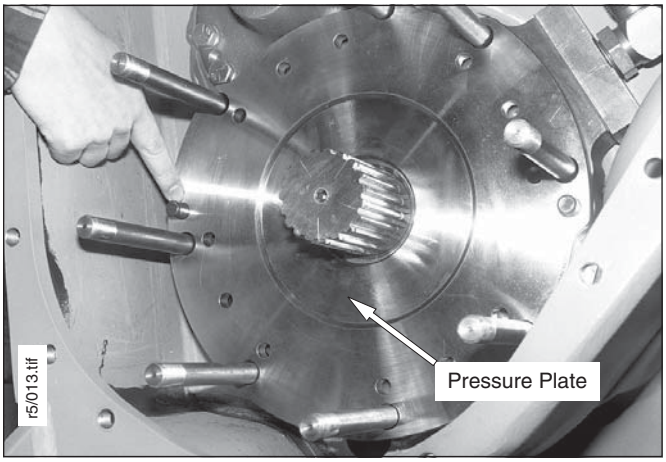
6. Remove cage from studs. It may be necessary to tap cage with a soft hammer to loosen it.



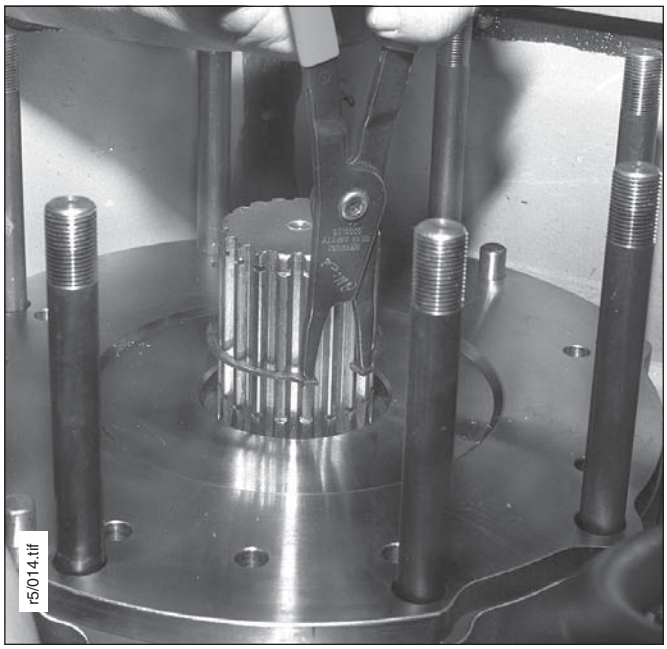
7. Remove snap ring from brake shaft and pull hub off brake shaft.



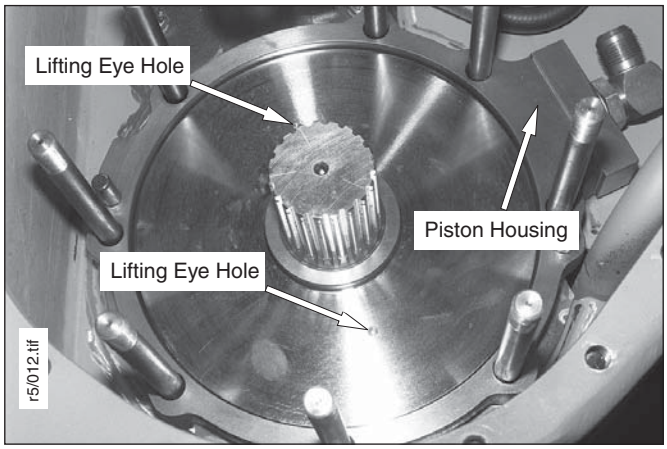
8. Remove pressure plate from studs.



9. Remove snap ring from brake shaft.



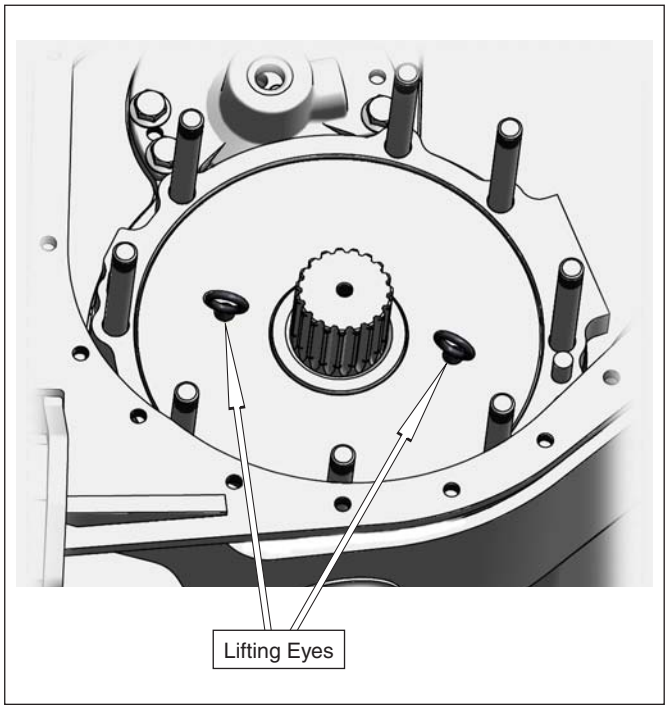
10. Slide the piston housing forward no more than one inch if only the clutch shaft bearing retainer is to be removed. To service the piston housing or brake shaft, remove the piston housing.



⚠ CAUTION

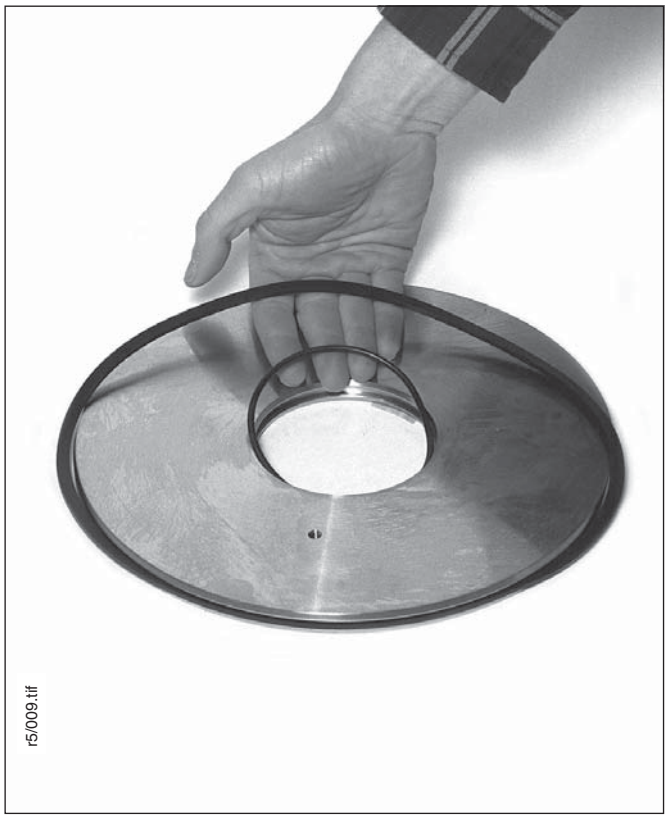
If the brake shaft is not to be removed, ensure that the bearing cup behind the piston housing remains in the winch case bore. If the cup falls out, the shaft will drop down and the right-hand bearing will drop out of its cup.

11. Install two lifting eyes (Allied P/N X-203348) into the two threaded holes (shown above) on the brake piston. See “Specialized Tools” at the end of section 4 for ordering information.



12. Pull the piston out of the housing using two lifting eyes described above, 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.

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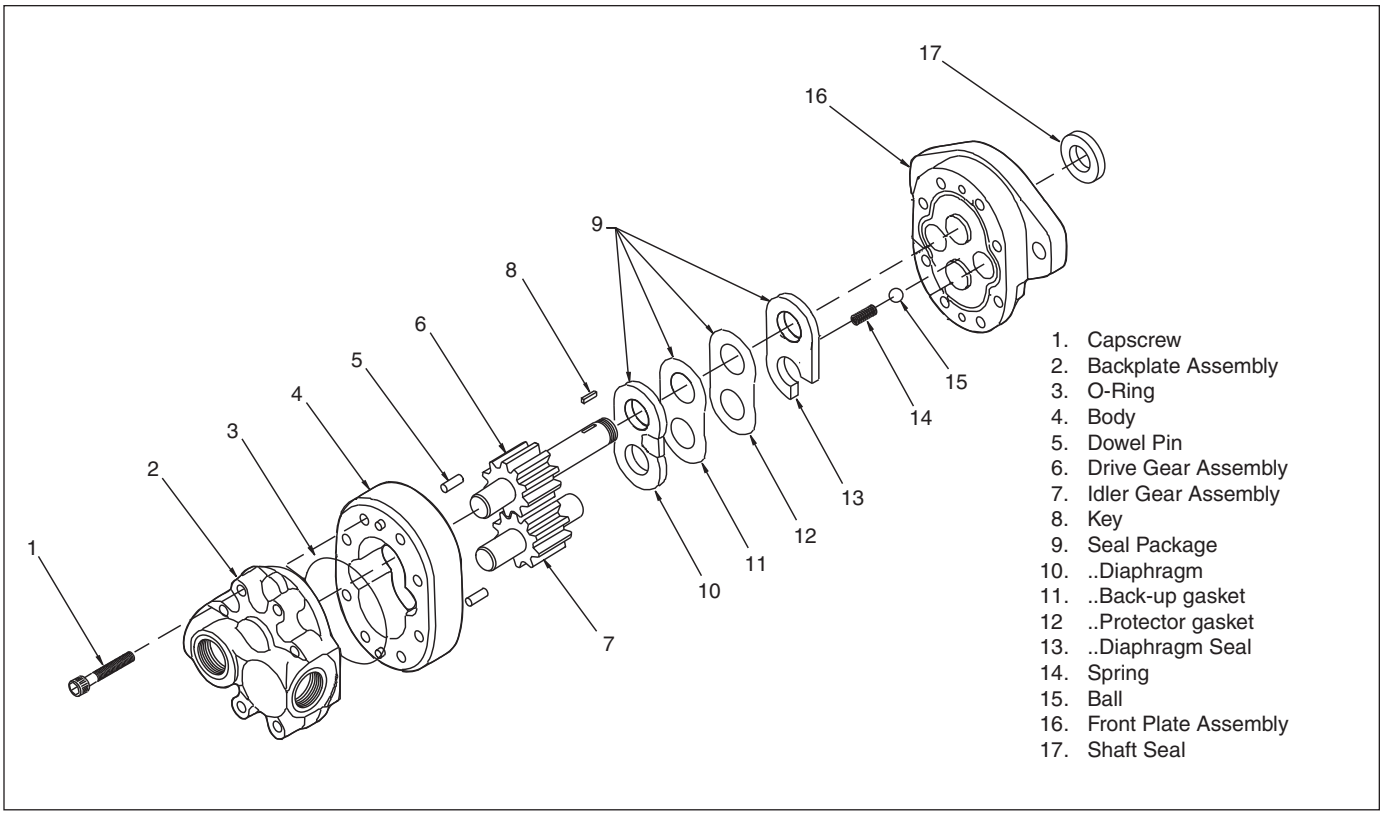
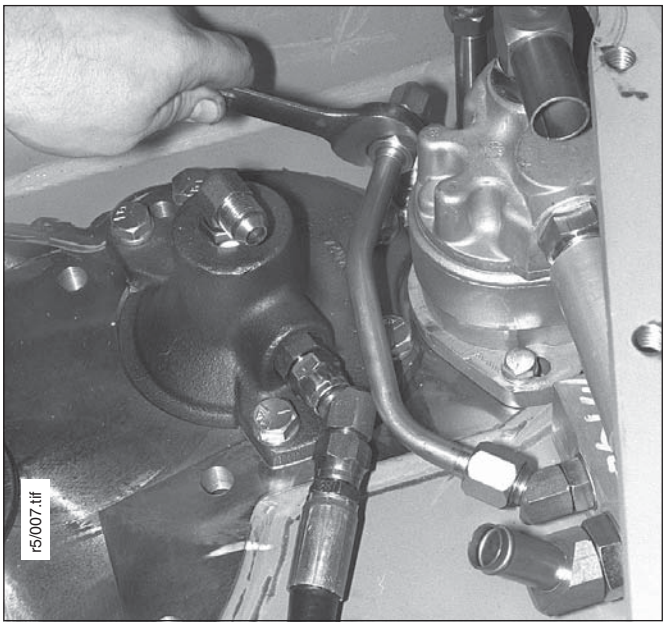


Figure 4-10 Hydraulic Pump

Hydraulic Pump Removal & Disassembly

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

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



2. Loosen pressure hose from pump check valve. Remove the two capscrews securing the pump, then remove the pump. See Figure 4-10 for an exploded view of the pump.

Pump Disassembly

1. Clean the pump thoroughly with solvent, kerosene, or other non-corrosive cleaning fluid which will not affect rubber components.

2. Clamp pump in vise, shaft down.

3. Scribe a line across the three sections of the pump to act as a guide in reassembly.

4. Remove capscrews.

5. Remove from vise. Hold pump in hands and bump shaft against wooden block to separate front plate (16) from backplate (2). Body (4) will remain with either front plate or backplate.

6. To separate body from section that remains, place drive gear (6) in bearing and tap protruding end with plastic hammer.

7. Remove O-Ring (3) from backplate assembly.

8. Remove diaphragm (10) from front plate by prying with O-ring pick.

9. Remove spring (14) and balls (15) from front plate.

10. Remove diaphragm seal (13) and shaft seal (17) from front plate.

Pump Inspection

1. Clean and dry all parts.

2. Remove nicks and burrs from all parts.

Pump Gear

1. Inspect drive gear shaft (6) for broken keyway.

2. Inspect all bearing points for excessive wear and rough surfaces.

3. Replace gear assembly if shafts measure less than .6580 in (17.40 mm) in bearing area.

4. Inspect gear face for scoring and excessive wear.

5. Assure that snap rings are in grooves on either side of drive and idler gears.

6. If edge of gear teeth are sharp, dull with emery cloth.

Pump Front and Backplates

1. Oil grooves in bearings should line up with dowel pin holes.

2. Replace plate if inner diameter of bearings exceed .691 in.
(17.55 mm).

3. Bearings in front plate should be flush with island in groove pattern.

4. Check for scoring on face of backplate, replace if wear exceeds .0015 in (.038 mm).

Pump Body

1. Check inside gear pockets for excessive scoring or wear of body.

2. Replace body if inner diameter of gear pocket exceeds 1.719 in. (43.66 mm).

Clutch Shaft Removal & Disassembly (Ratios #1 - #7)

Figure 4-1 shows the location of clutch shaft components. It will be easiest to perform steps 1 - 11 below with the winch upright (or still installed on the tractor). Prior to step 12, you may rotate the winch so that the right side is up.

Prior to removal of the clutch shaft, perform the following:

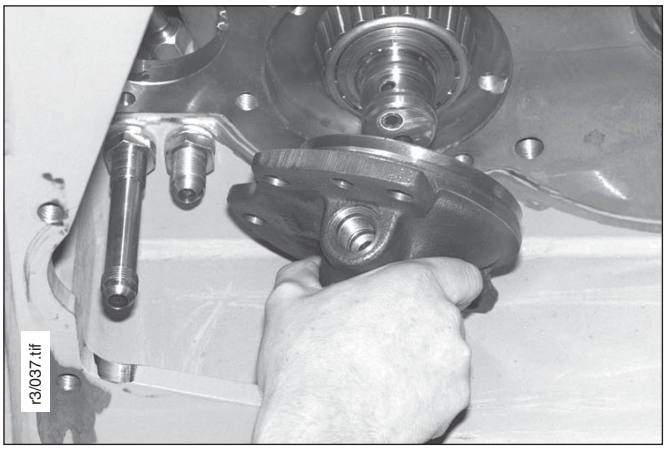
a) Drain oil from winch.

b) Remove all brake components as shown in the **Oil Brake Removal and Disassembly** section, steps 1 through 10.

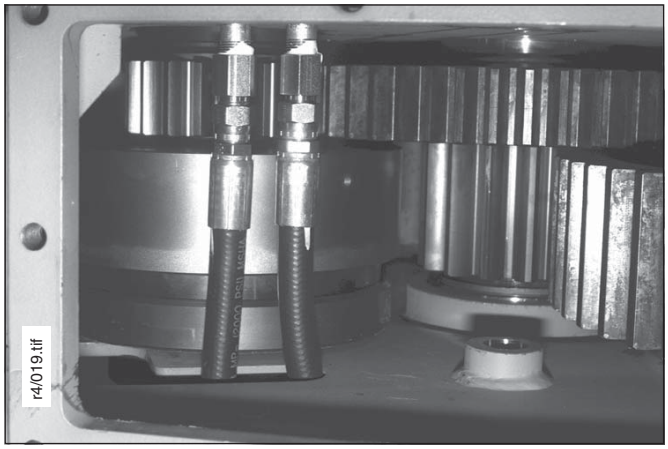
c) If equipped with freespool option remove freespool shifter shaft and fork.

1. Disconnect hydraulic lines from the left-hand bearing retainer.

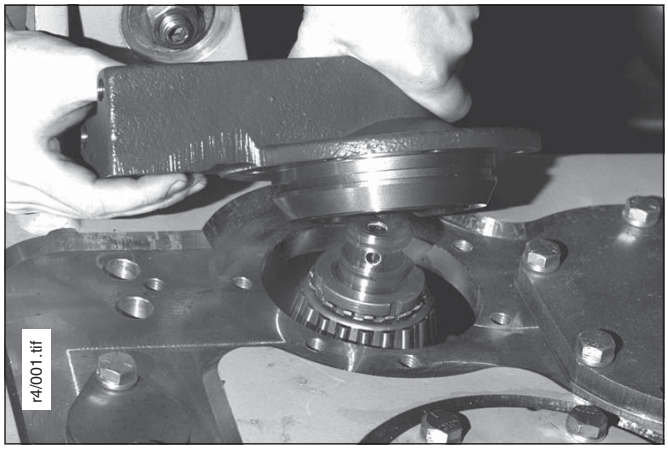
2. Remove left-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



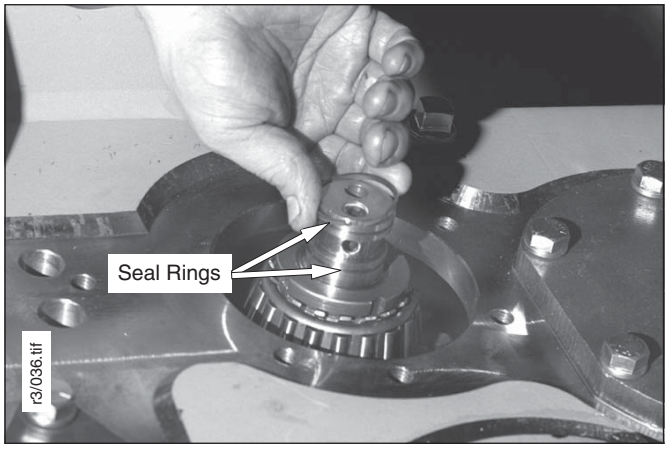
3. Remove hydraulic lines and fittings from the right-hand bearing retainer.



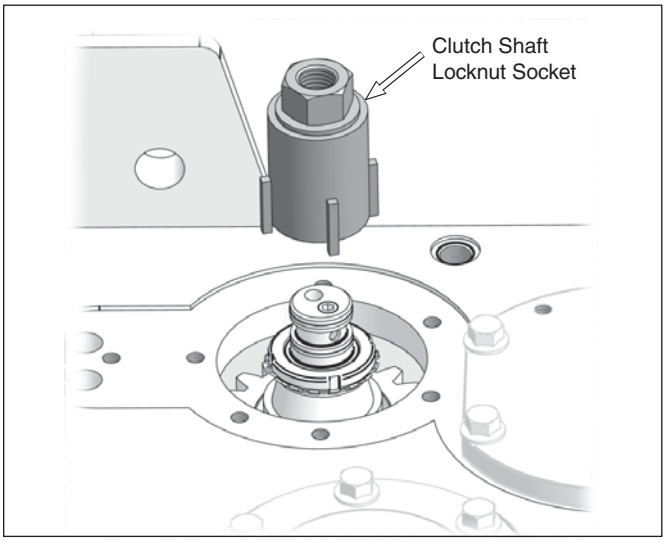
4. Remove right-hand bearing retainer and shim pack. Tag shims to aid in reassembly.



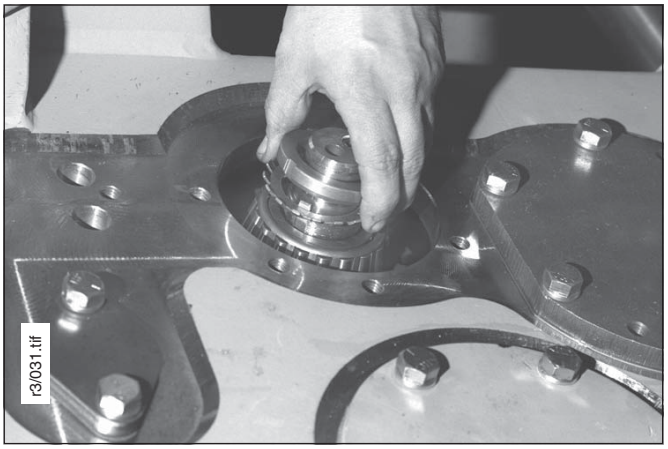
5. Remove the two seal rings from each end of the clutch shaft. Expand the seal rings just enough to slip over the end of the shaft.



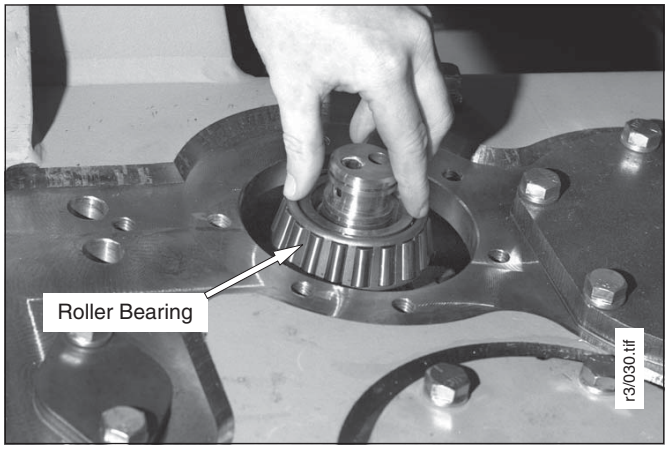
6. Straighten the lockwasher tang securing the locknut. Use clutch shaft locknut socket (Allied P/N X-203345) to remove the locknut. See “Specialized Tools” at the end of Section 4 for ordering information.



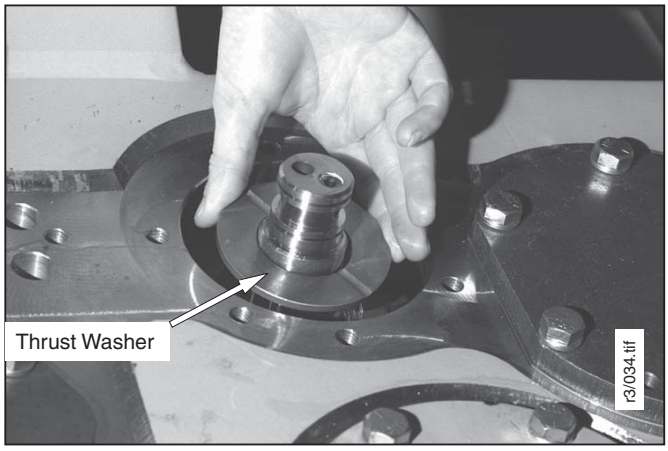
7. Remove the locknut and lockwashers.



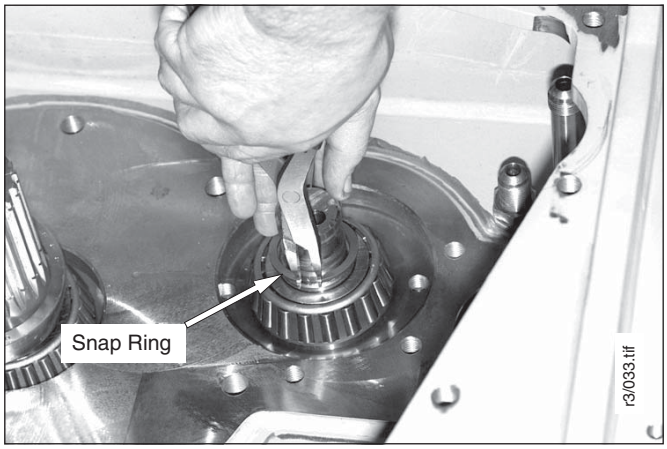
8. Remove the tapered roller bearing and thrust washer.



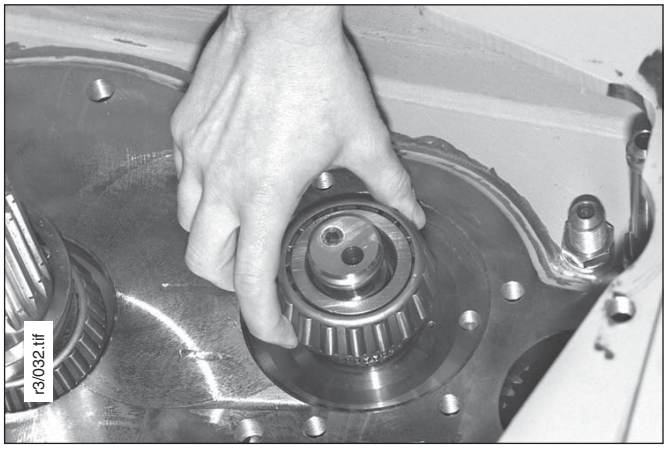
9. Remove the internal snap ring from the reverse spider gear bore.



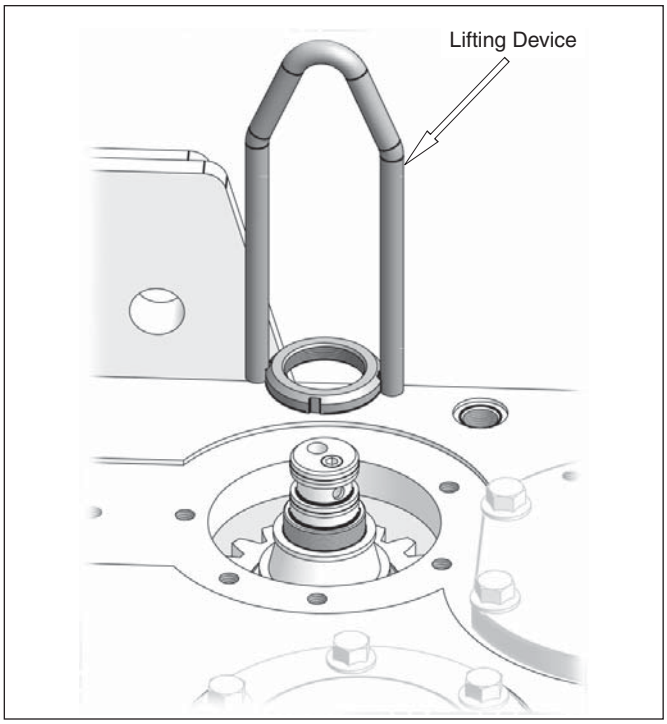
10. Remove the external snap ring form the left-hand end of the clutch shaft.



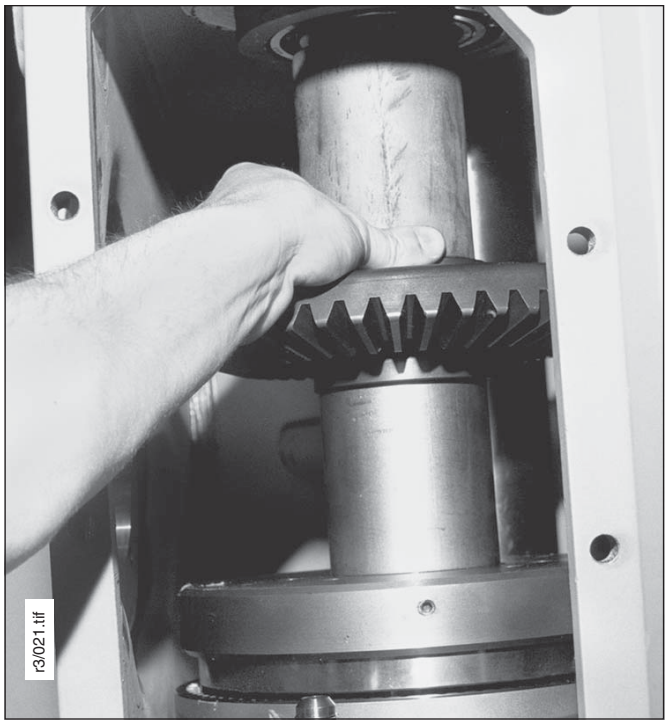
11. Remove the left-hand tapered roller bearing. Wrap end of shaft with tin or cardboard so gear will slide off end of shaft.



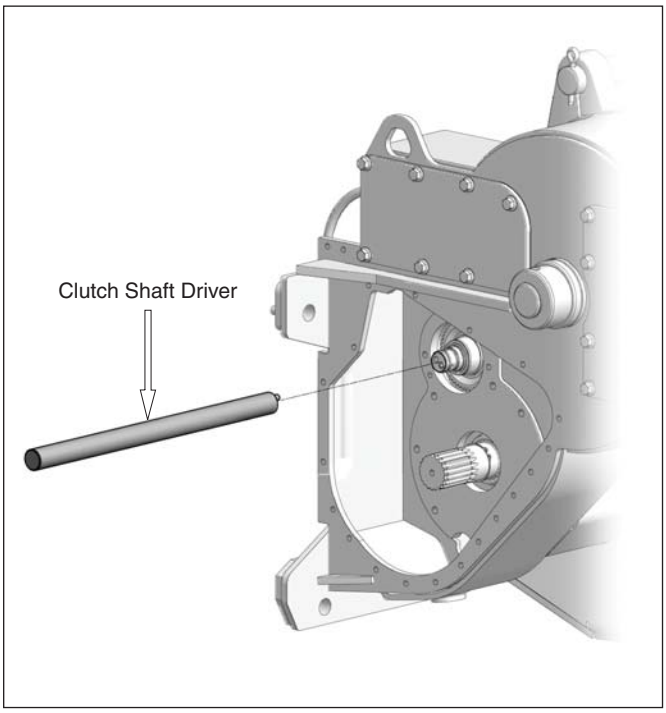
12. Attach lifting device (Allied P/N X-201962) to clutch shaft on right-hand side. See “Specialized Tools” at the end of Section 4 for ordering information.



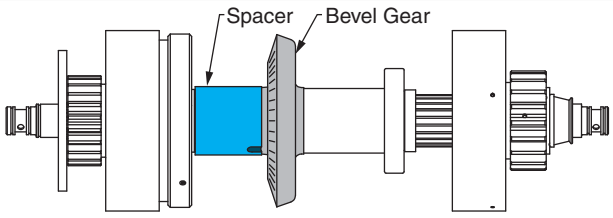
13. Pull the clutch shaft out far enough to remove the spacer between the bevel ring gear and the forward clutch assembly.



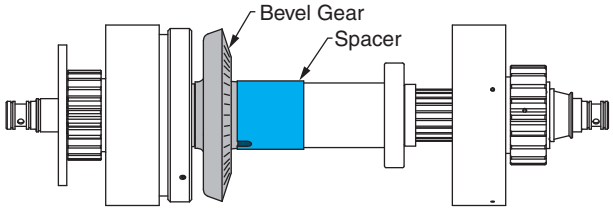
NOTE: If the winch is still mounted to the tractor, you can use a soft drift (brass, copper, aluminum, etc), or clutch shaft driver (Allied P/N X-203346) from the left-hand side of the winch. See “Specialized Tools” at the end of Section 4 for ordering information.



14. Note that the orientation of the bevel gear and the spacer are dependent on the tractor the winch is mounted on, and whether the wire rope is installed in an underwind or overwind configuration.



Bevel Gear Orientation
All except K50 and Z57

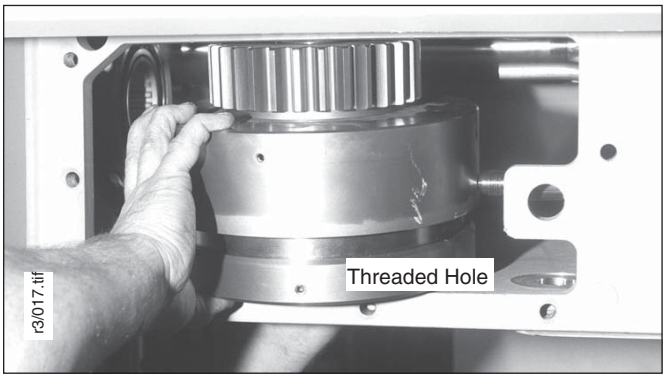


Bevel Gear Orientation
K50 and Z57

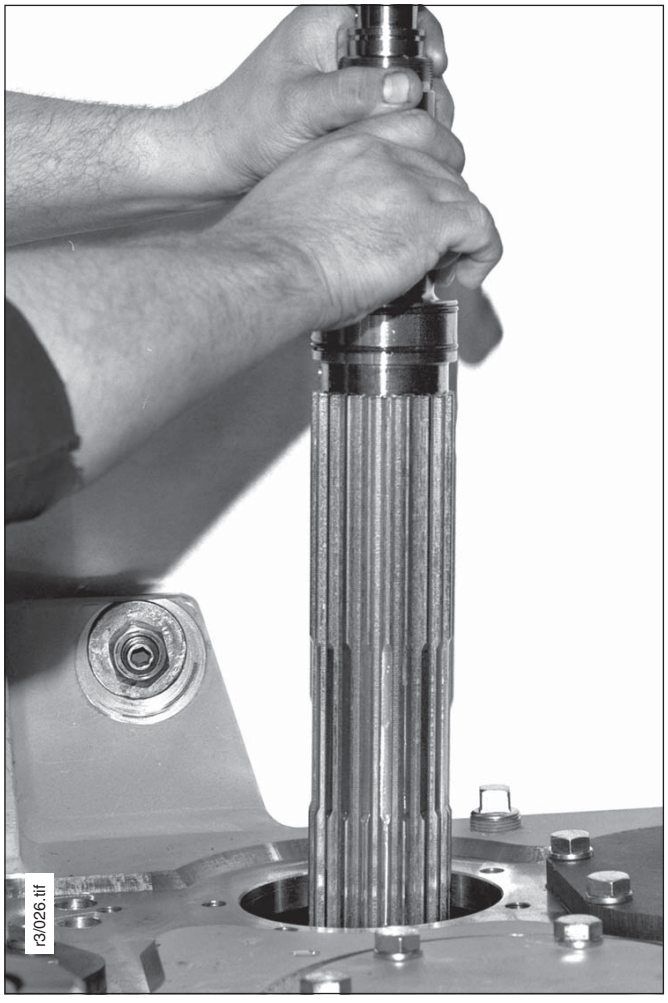
Note: Bevel gear orientations shown are for overwind winches. Underwind configurations are reversed.

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

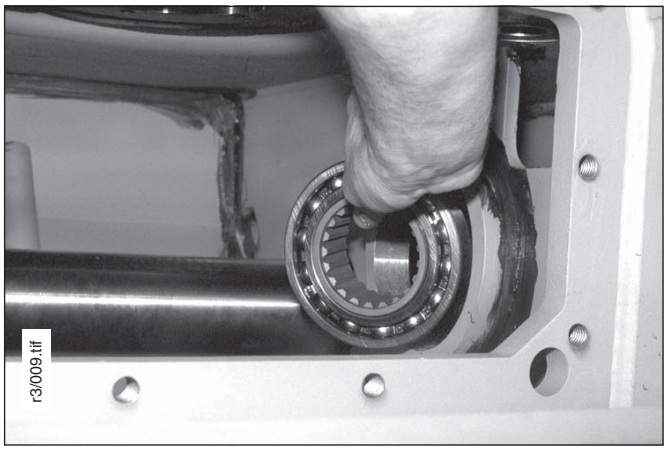
16. Install a lifting eye (Allied P/N X-203348) in the threaded hole of the forward clutch pack and lift it out. A nylon rope sling may be used. See “Specialized Tools” at the end of Section 4 for ordering information of the lifting eye.



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

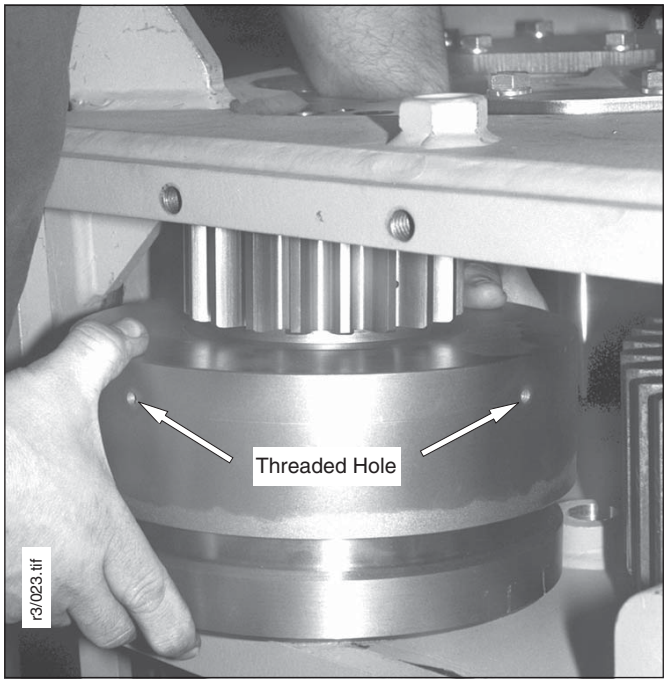


18. Remove the ball bearing and carrier.



19. Install a lifting eye (Allied P/N X-203348) in the threaded hole of the reverse clutch pack and lift it out. A nylon rope sling may be used. See “Specialized Tools” at the end of Section 4 for ordering information of the lifting eye.

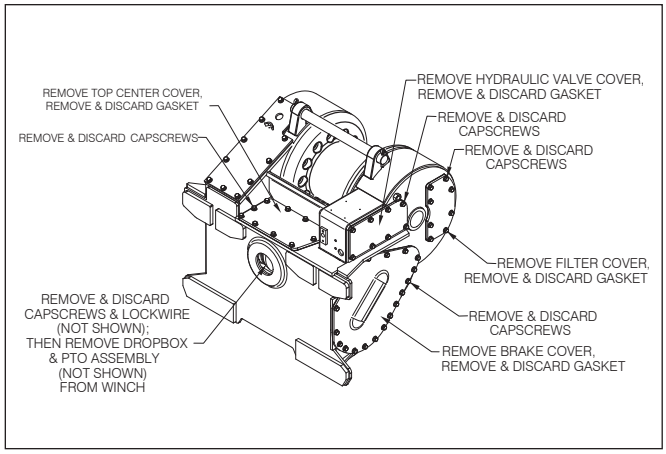
NOTE: If the winch is equipped with freespool, the freespool shifter assembly must be removed prior to removing the reverse clutch assembly. Refer to steps 1 to 4 in subsection of Intermediate Shaft Removal, Freespool.

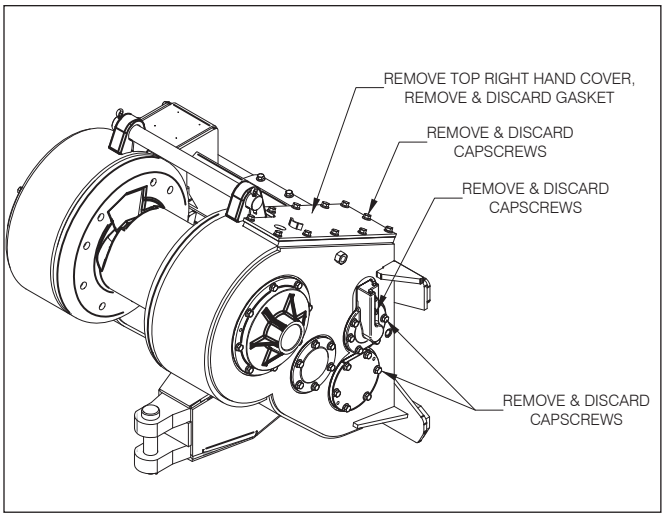


Removal & Disassembly of Parts Instructions for Repair of Reverse Clutch Gear (Ratios #8, #9, and #10 only)

NOTE: Clutch shaft removal for all other ratios is out the right-hand side.

1. In process of removing parts, discard parts as noted below.





2. Remove winch mounting bracket. Remove dropbox (drive adapter) assembly first, and then the PTO shaft assembly from winch. Important: tag the shim pack for the PTO assembly so that the exact number of shims are re-installed.

3. Lay winch on right hand side. Remove the brake cover, hydraulic valve cover, top center and top right hand cover illustrated above.

4. Remove hoses or disconnect hoses. plug hoses (6 #8 jic, 1 #12 jic) and cap fittings (4 #8 jic, 2 #12 jic) to reduce oil leakage while rotating winch. But do not remove yet the fittings between the left hand side and center cavity of frame.

5. Remove pump.

6. Remove electrical connection to solenoid on brake dump valve. Remove brake dump valve manifold from brake housing.

7. Loosen locknuts on brake cover evenly since it retains a spring for the brake, then remove brake assembly cover.

8. Remove belleville spring from cage assembly.

9. Remove thrust washer (and stroke limiter if E-controlled).

10. Remove friction discs and separator plates from hub, and then thrust pins.

11. Remove brake cage from studs.

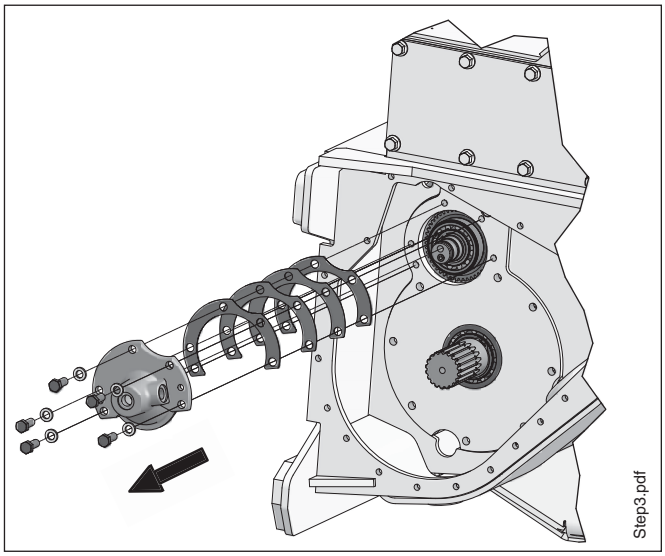
12. Remove snap ring from brake shaft & pull hub off brake shaft. Remove snap ring that was behind hub (but leave on the snap ring for now that is in front of the bearing).

13. Remove pressure plate from studs.

14. Remove piston, and discard seals on piston.

15. Remove piston housing.

16. Remove left hand bearing retainer and shim pack (tag shims to aid in reassembly) on clutch shaft.

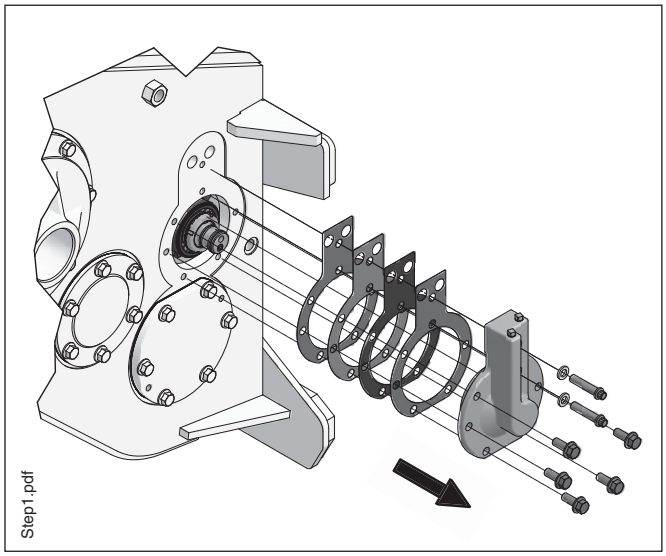


17. Reinstall brake piston housing & place two 3” long tubes to go over two of the 5/8” studs, then use 5/8” washers as necessary to then clamp down on with the 5/8 UNF nuts to retain piston housing.

18. Remove the two seal rings on the end of the clutch shaft.

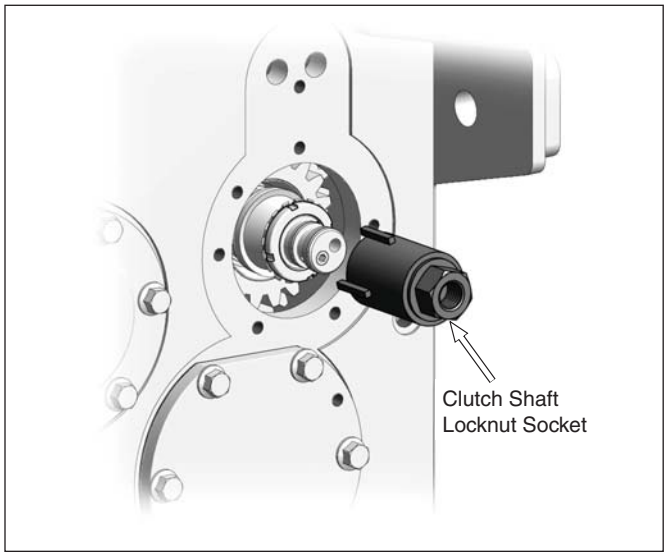
19. Rotate winch on left hand side (a gallon or more of oil will be in the winch & will spill out).

20. Remove the right hand bearing retainer and shim pack (tag shims to aid in reassembly). Remove and discard O-ring on the bearing retainer.

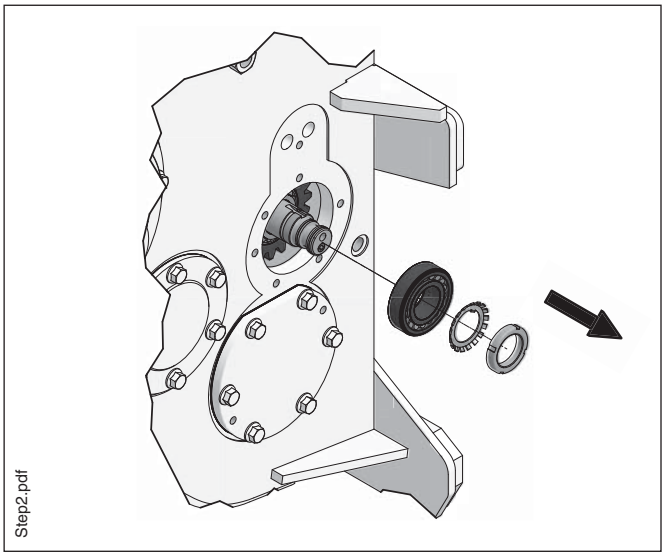


21. Remove the two seal rings on the end of the clutch shaft.

22. Straighten the lockwasher tang securing the locknut. Use clutch shaft locknut socket (Allied P/N X-203345) to remove the locknut. See “Specialized Tools” at the end of Section 4 for ordering information.



Straighten the lockwasher tang securing the locknut on the end on the end of the shaft & remove locknut & washer.



23. Take a dead blow hammer, and hit the end of the clutch shaft to loosen the pressure on the bearing against the snap ring on the left hand side of shaft.

⚠ CAUTION

Do not damage the end of the shaft.

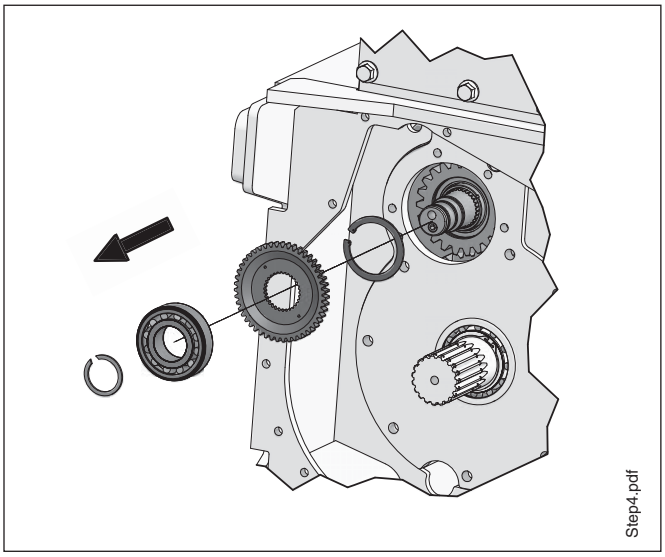
24. Remove the next bearing on the right hand side of shaft.

25. Rotate winch onto the right hand side, Important: use blocks to rest the winch on to avoid damaging the clutch shaft.

⚠ CAUTION

Spacers on clutch shaft may slide out during rotation of winch.

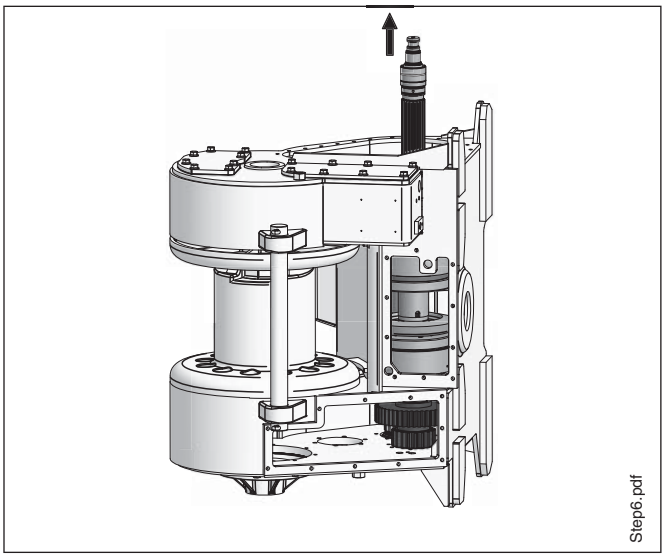
26. Remove snap ring on clutch shaft retaining the bearing. Remove & discard cone part of the bearing.



27. Remove pump gear on clutch shaft.

28. Remove snap ring from inside of forward clutch housing.

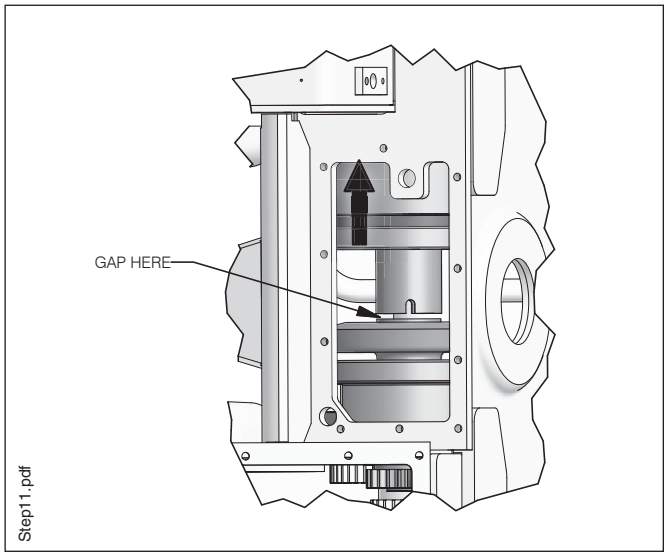
29. Use a ½-13 UNC eye bolt to pull clutch shaft out.



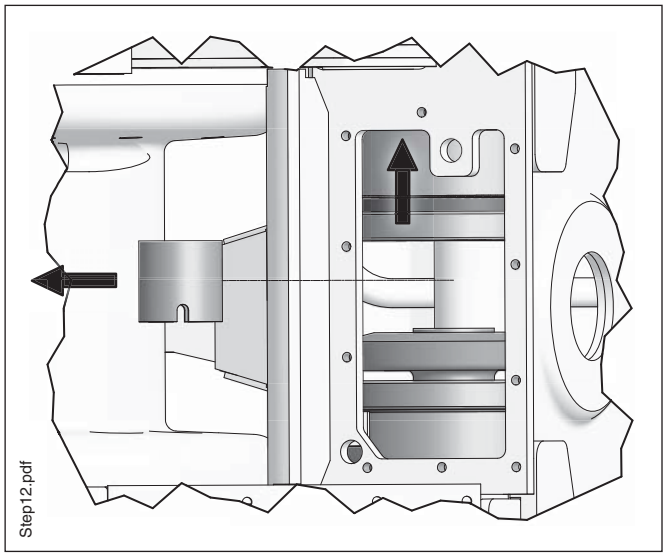
30. Remove and discard O-rings on the clutch shaft (2) places that was under the forward clutch and (2) places that was under the reverse clutch.

31. Note orientation of fittings that go between the center of winch and left hand side of frame, then remove.

32. By using a rod that fits through the ¼" slot in the center spacer of the clutch shaft & rope, lift up slightly to remove the bevel gear out of the winch, then with the rope, lower down parts onto the reverse clutch.



33. Lift up on the forward clutch to remove the center clutch shaft spacer.



34. Rotate the forward clutch to the vertical position, and remove from winch.

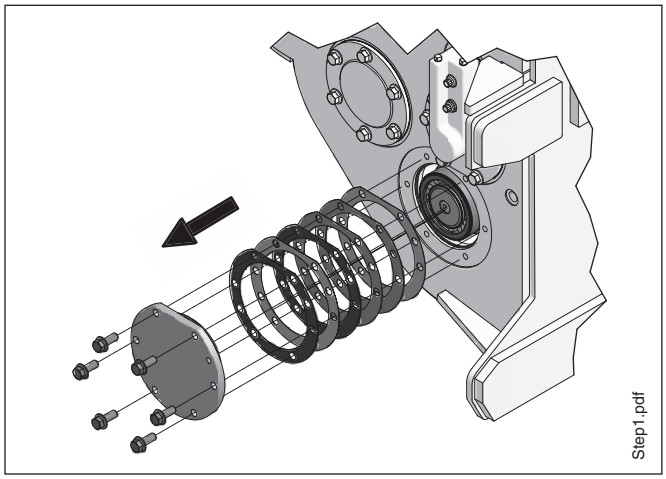
35. Pull reverse clutch out of the reverse clutch gear, and remove out of winch. Remove and discard bearings, spacer in the reverse clutch gear along with the reverse clutch gear.

36. Remove the tubes retaining the piston housing, and remove the piston housing.

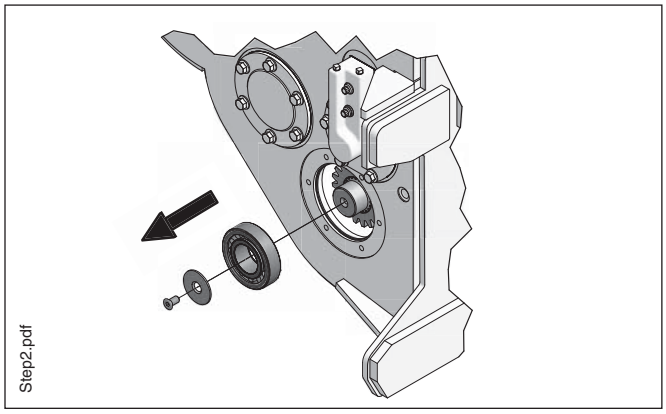
37. Remove snap ring on brake shaft retaining a bearing.

38. Rotate winch to the left hand side.

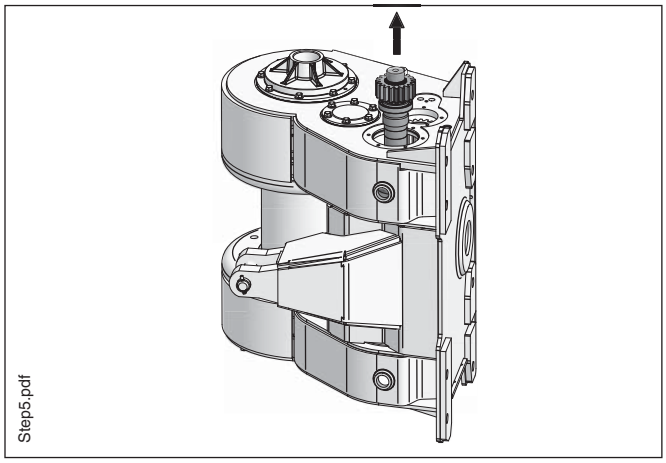
39. Remove brake bearing retainer and shims (tag shims to aid in reassembly). Discard of O-ring that is on the brake retainer.



40. Remove brake shaft capscrew, retaining washer and bearing.

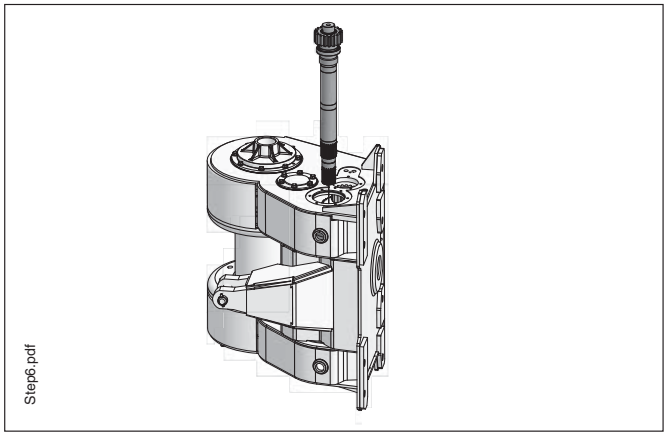


41. Use a ½-13 UNC eye bolt to pull brake shaft up gently.

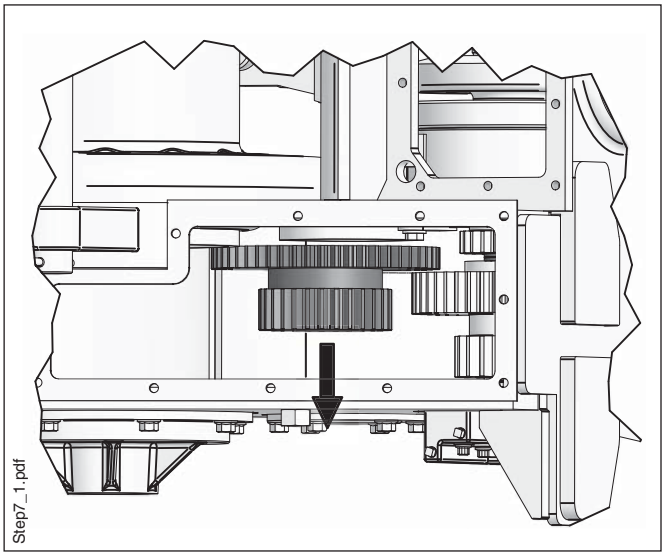


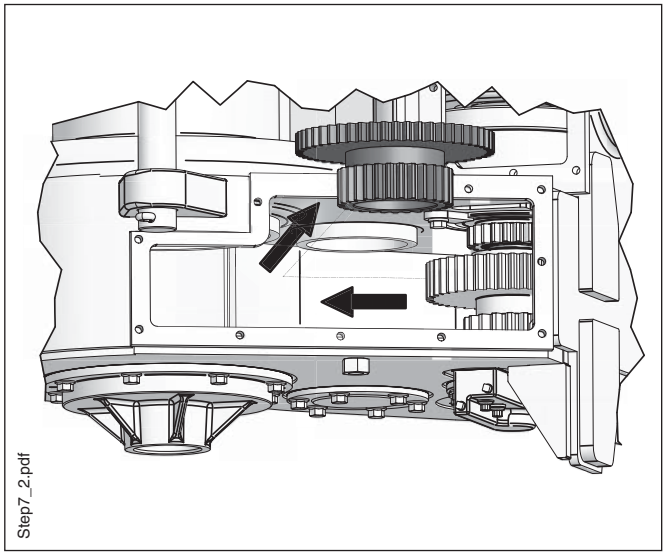
42. Tap on brake gear to push out bearing on the end of brake shaft on left hand side.

43. Pull out brake shaft.



44. Remove gears & bearings out of the winch that were on the brake shaft. Discard gear, bearings and spacer if failures are found.



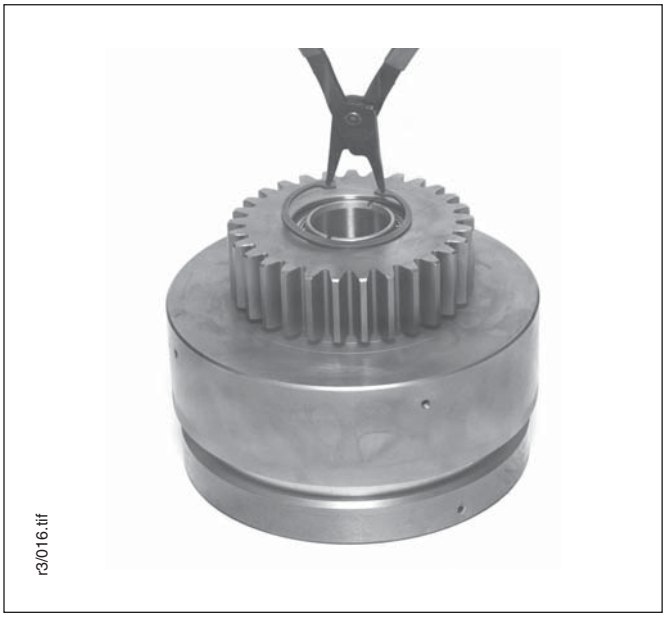


Oil Clutch Disassembly

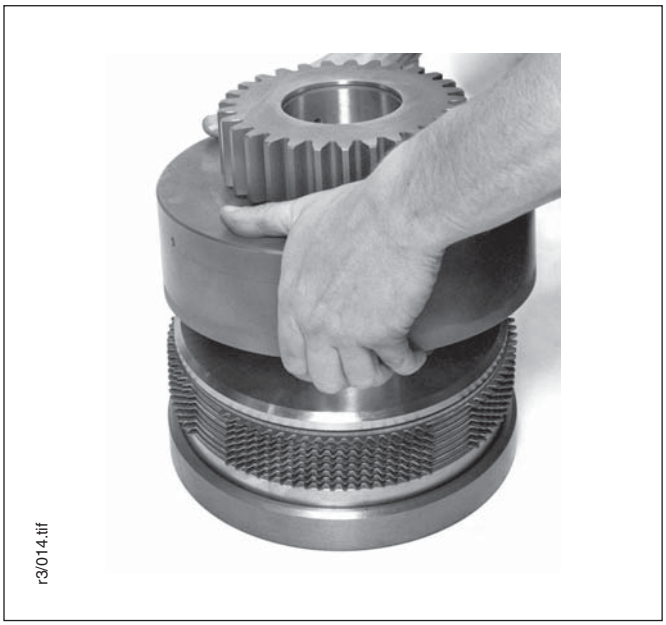
This section details the disassembly of the oil clutches. Removal of the clutch assemblies is shown in the **Clutch Shaft Removal & Disassembly** section.

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

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


r3/016.tif

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


r3/014.tif

3. Remove the setscrews that lock the special capscrews on the opposite side of the clutch.

4. Remove the special capscrews using the a hand impact driver initially. Hold firmly so as not to damage the clutch pack.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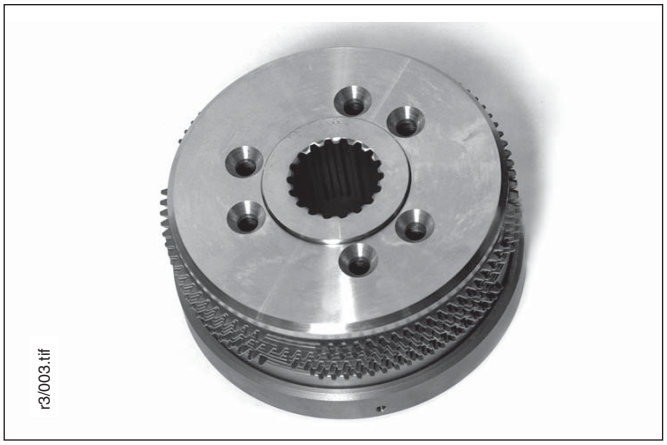
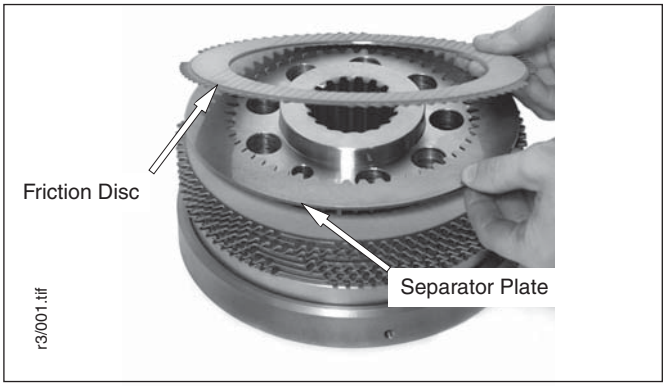
5. Match mark position on cover plate and hub to aid in reassembly. Lift cover plate from clutch assembly.


r3/003.tif

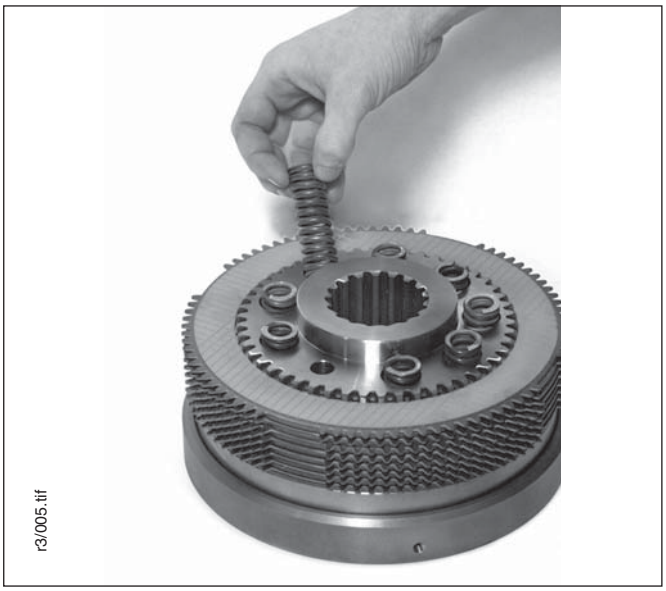
6. Remove and tag shims.

7. Remove the separator plates and friction discs from the hub. Inspect as described in Figure 4-11.



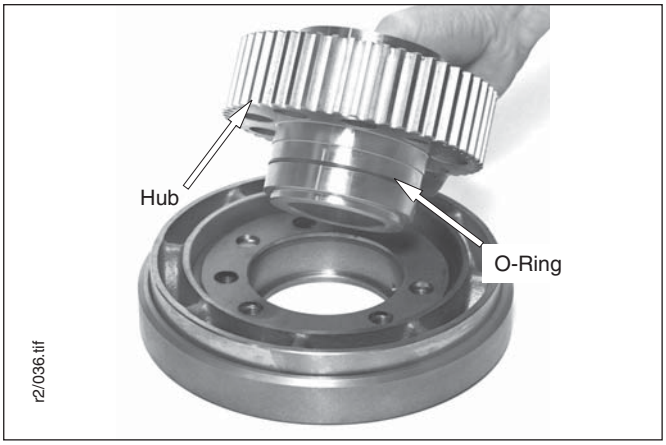
r3/001.tif

8. Remove and inspect the release springs. Refer to Figure 4-12.


r3/005.tif

NOTE: Arrangement shown for paper-type frictions.

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



r2/036.tif

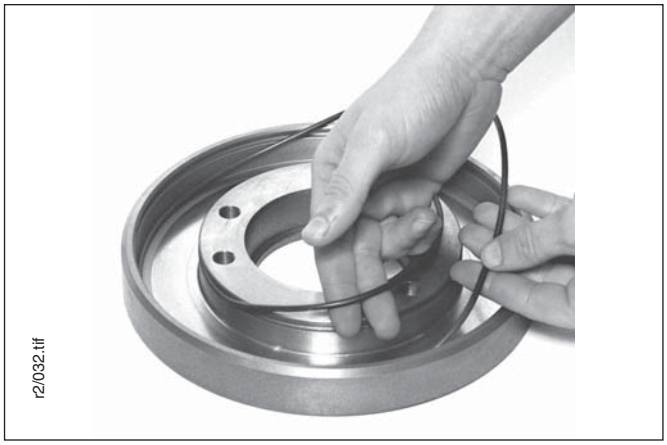
10. Remove spring retainer. Inspect for wear.


r2/034.tif

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


r2/033.tif

12. Remove and discard the two O-rings.


r2/032.tif

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

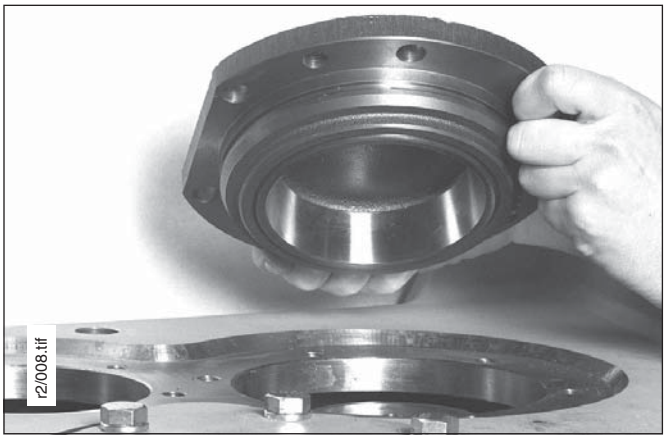
Brake Shaft Removal

NOTE: This subsection applies to ratios #1 through #7 only.

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:

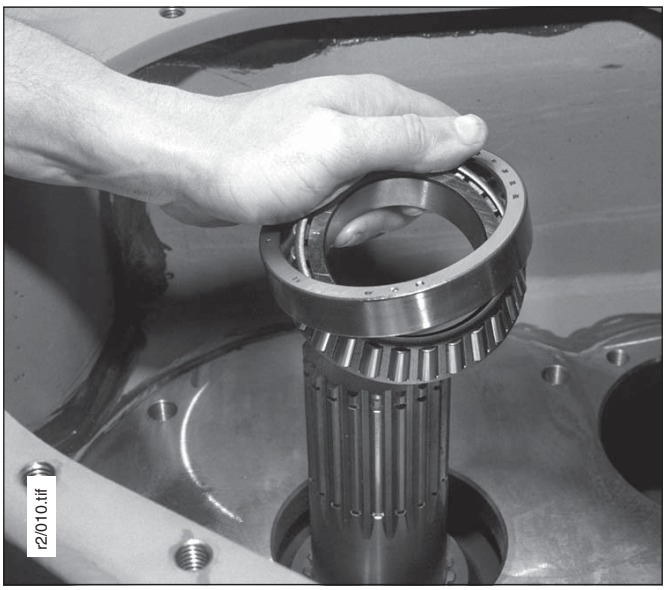
a) Remove the winch from the tractor (see subsection of **Winch Removal** at the beginning of this section).
b) Drain oil from winch.
c) Remove all brake components as shown in section of **Oil Brake Removal and Disassembly**.
d) Remove the brake shaft as shown in the following steps.

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

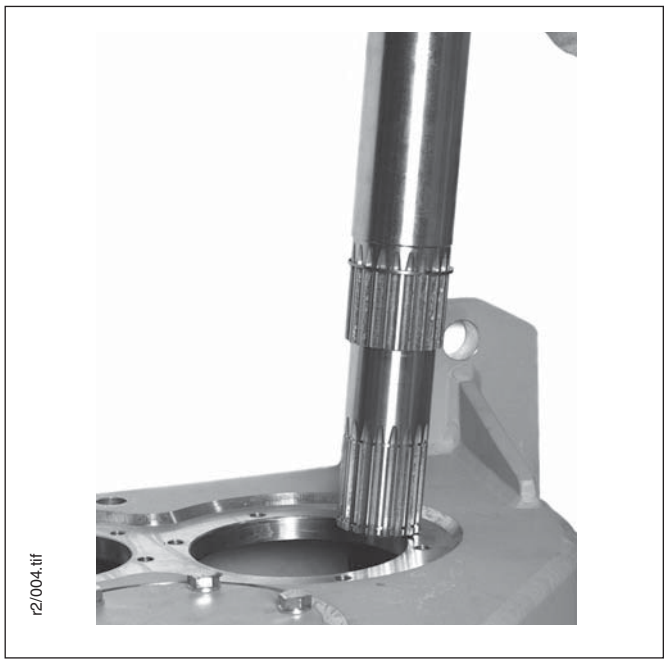


2. Pull brake shaft partially out of winch housing.

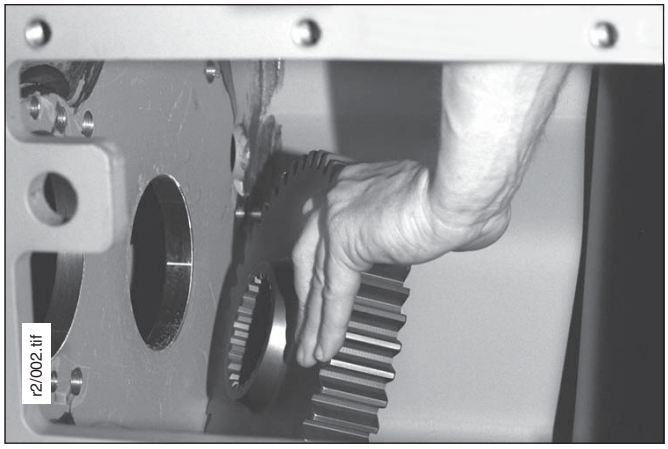
3. Tap the left-hand bearing off of shaft using reduction gear as driver.



4. Withdraw shaft from housing.



5. Remove gear from winch housing.



NOTE: Refer to Removal & Disassembly of Parts Instructions for Repair of Reverse Clutch Gear at the end of Clutch Shaft Removal & Disassembly for brake shaft removal of Gear Ratios #8, #9 & #10.

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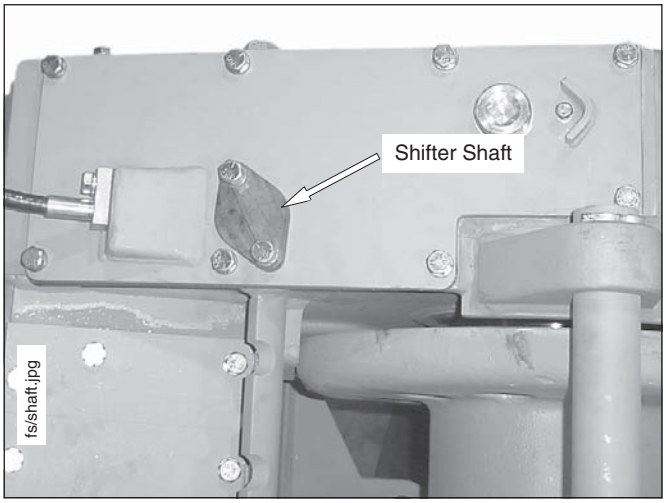
Intermediate Shaft Removal, Freespool

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

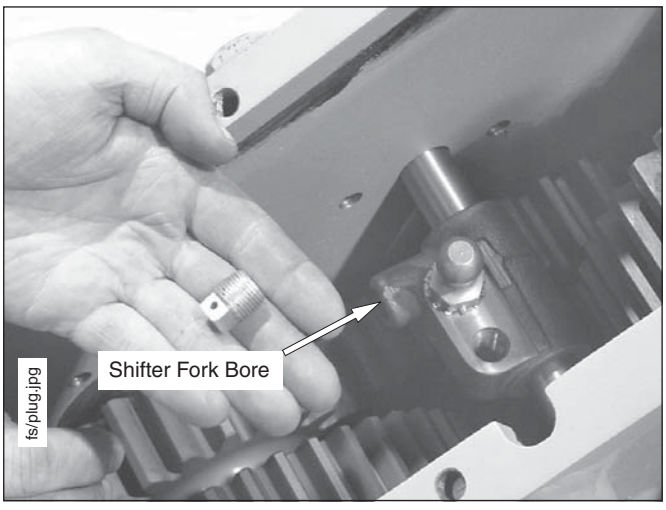
NOTE: The following steps show the winch removed from the tractor with the clutch shaft and brake shaft removed. This is the normal sequence for complete unit overhaul but it is not necessary for the removal of the intermediate shaft only.

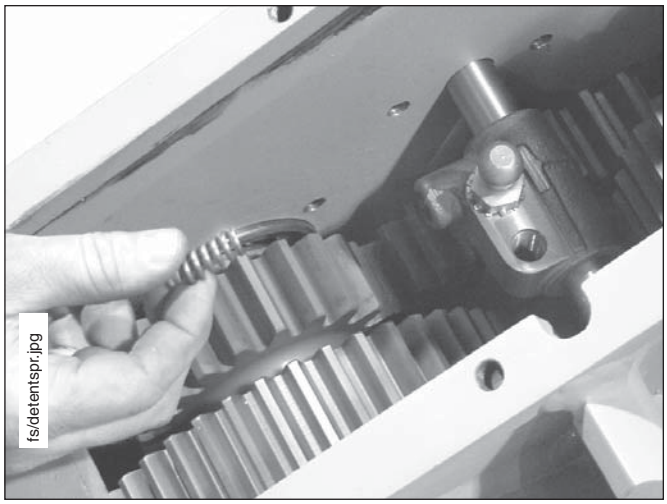
NOTE: The instructions below apply only to a winch equipped with the optional FREESPOOL arrangement. Refer to the previous subsection, Intermediate Shaft Removal, Non FREESPOOL, for instructions relevant to winches without the FREESPOOL option.

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

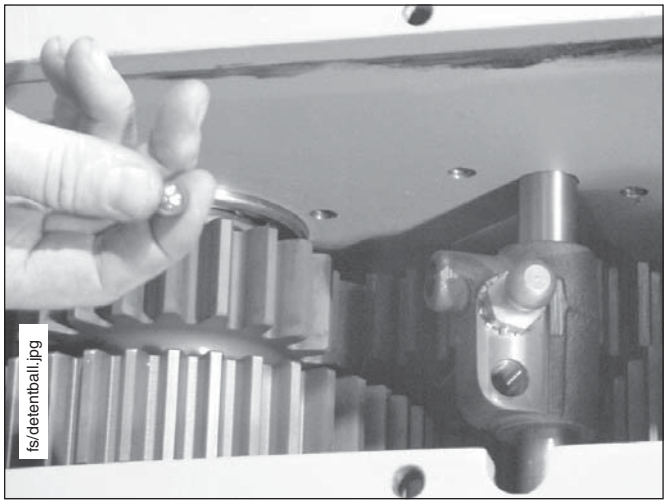


2. Remove the lockwire, and then remove the plug and spring from the freespool shifter fork.

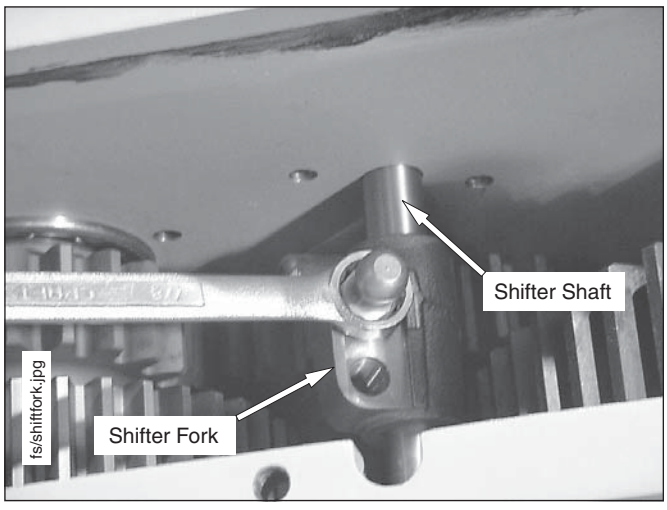




3. Use a magnet to remove the spring and the detent ball.



4. Withdraw the shaft and remove the fork.



5. Remove the intermediate shaft cover.

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

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

7. Screw a 3/4-10 UNC slide hammer into the end of the intermediate shaft and partially pull it out.

8. Remove the drum pinion gear and the inner bearing cone. Refer to Figure 4-3 for the location of components.

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

10. Remove intermediate gear.

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

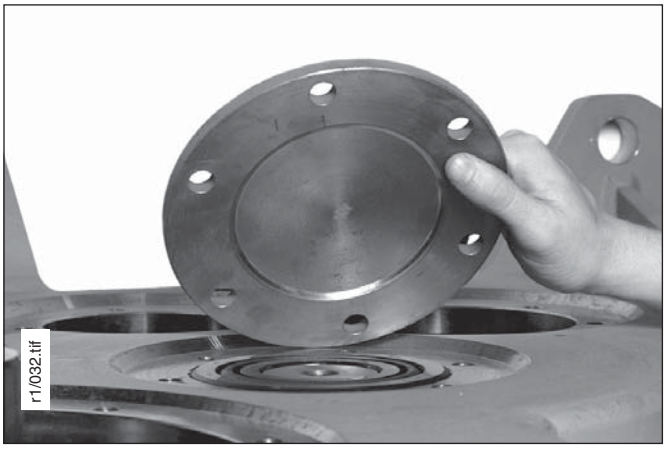
Intermediate Shaft Removal, Non-Freespool

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

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

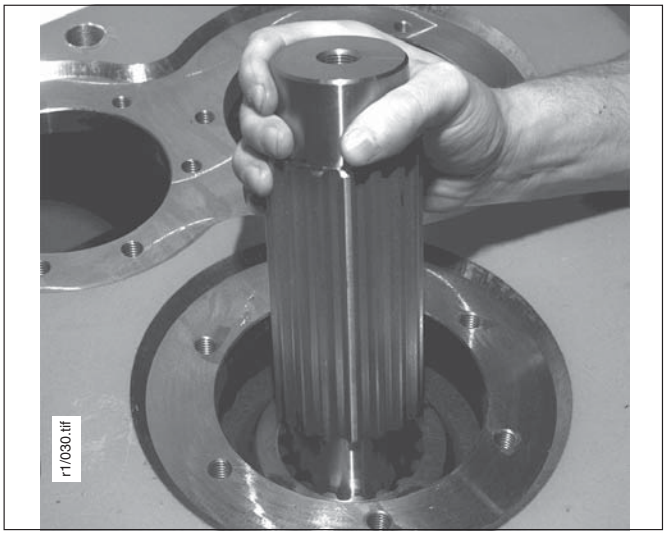
NOTE: The instructions below apply only to a winch NOT equipped with the optional FREESPOOL arrangement. Refer to the next subsection, Intermediate Shaft Removal, FREESPOOL, for instructions relevant to winches equipped with the FREESPOOL option.

1. Remove the intermediate shaft cover.

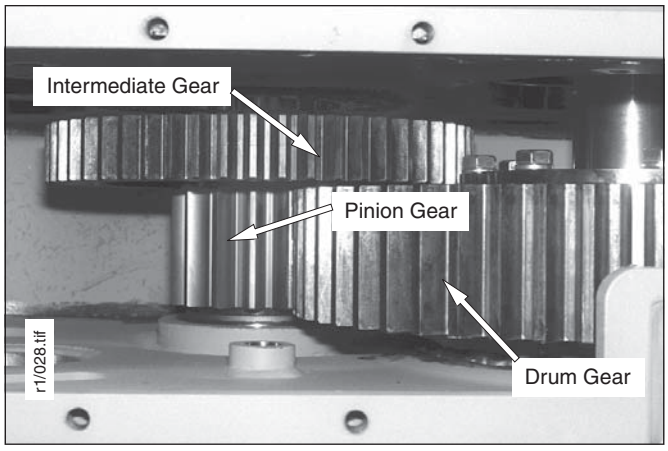


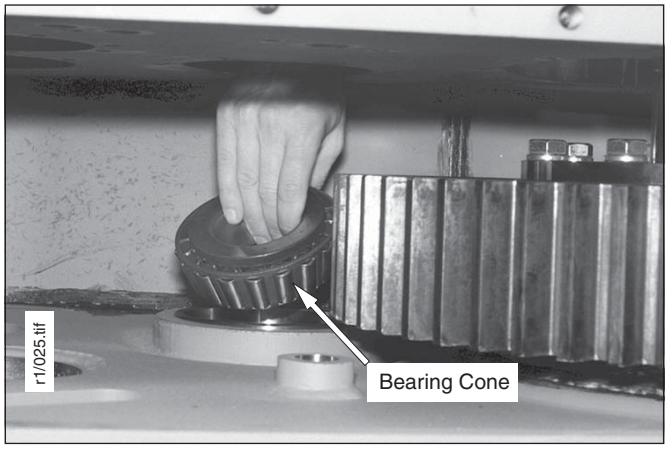
2. Screw a 3/4-10 UNC slide hammer into the end of the intermediate shaft and partially pull it out.

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

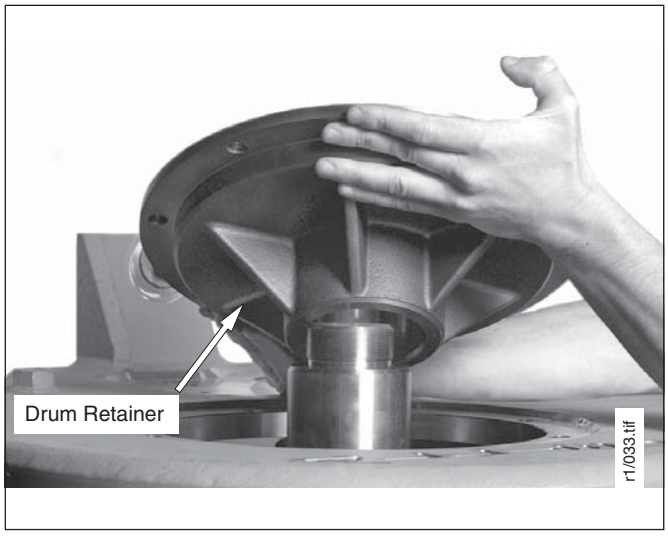


4. Remove the intermediate gear first, then the drum pinion gear and the inner bearing cone.





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



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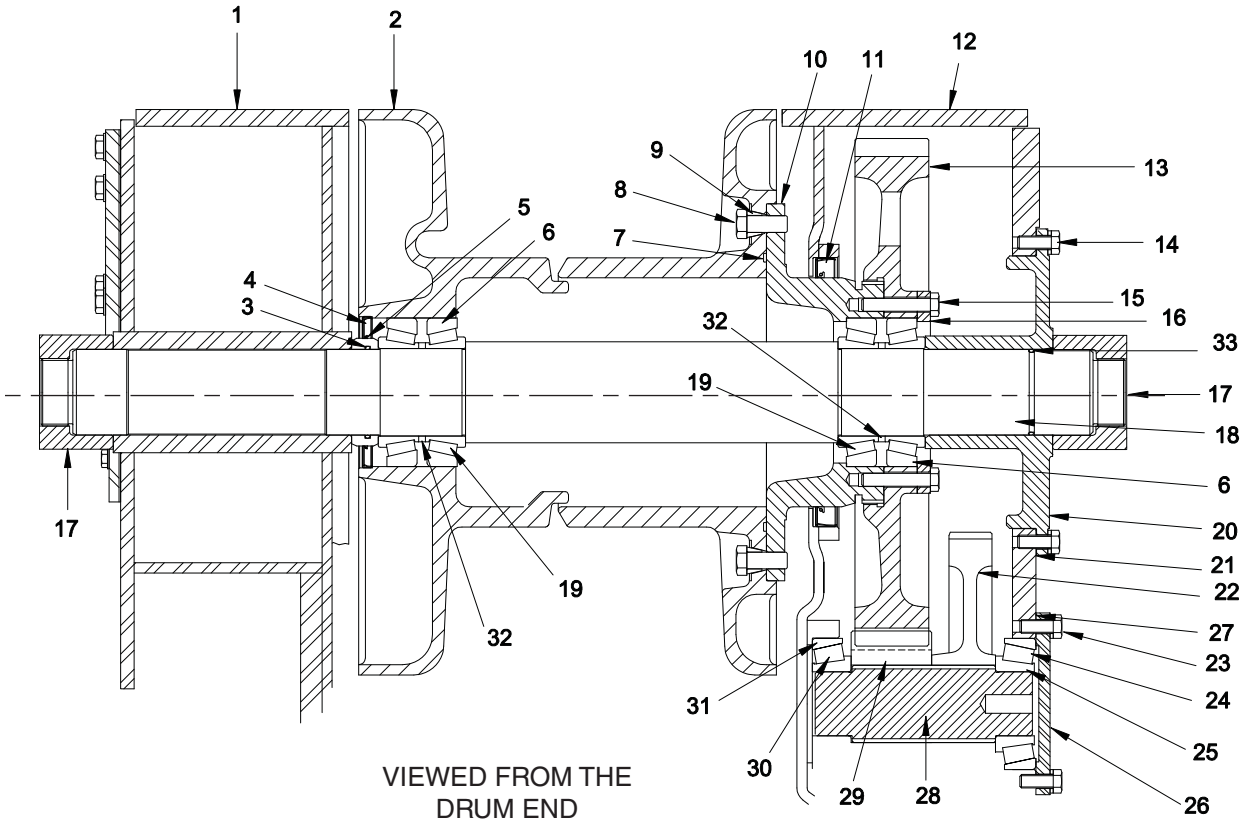
Drum Shaft & Drum Removal

Figure 4-11 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).

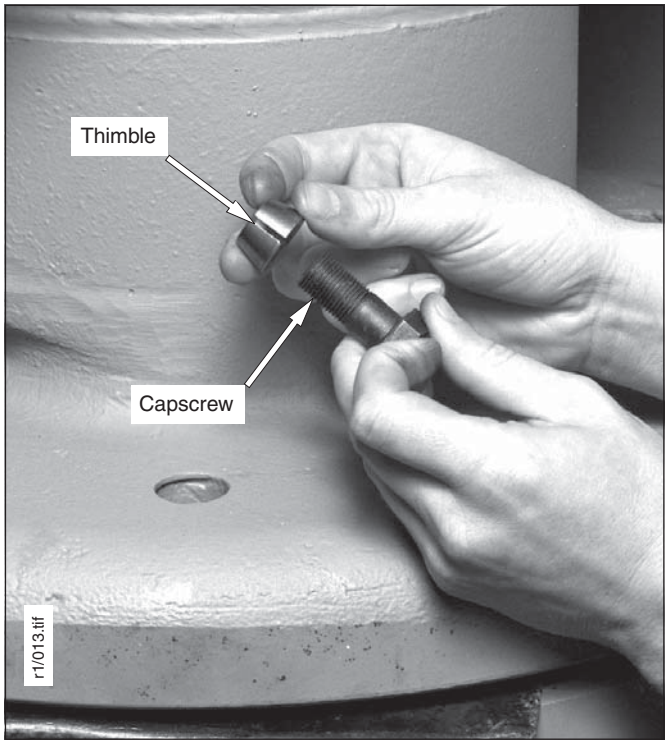


NOTE: Intermediate Shaft Assembly Shown Is Not Equipped with Freespool

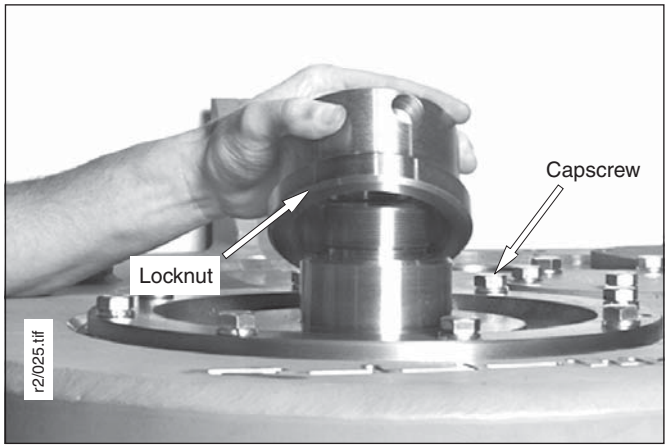
1. LH Winch Housing
2. Drum
3. O-Ring
4. Spacer
5. Oil Seal
6. Double Bearing Cup (Qty. 2)
7. Seal Ring
8. Capscrew (Qty. 10)
9. Thimble (Qty. 10)
10. Drum Adapter
11. Oil Seal
12. RH Winch Housing
13. Drum Gear
14. Sealing Capscrew & Washer
15. Capscrew
16. Retainer Plate
17. Shaft Nut
18. Drum Shaft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

Figure 4-11 Location of Drum and Drum Shaft Components

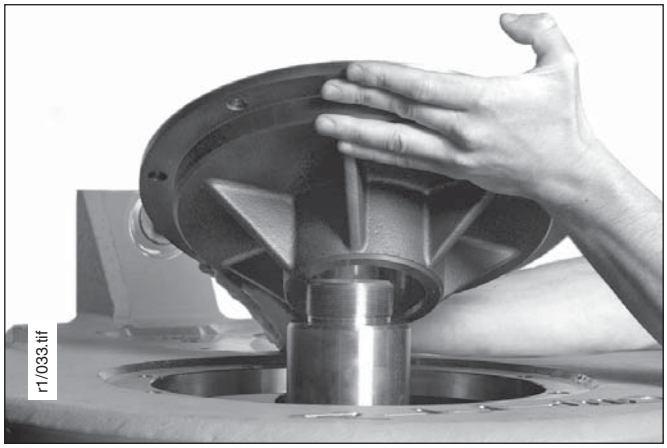
1. Loosen the drum capscrews, then remove capscrews with thimbles, leaving two located 180° apart.



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

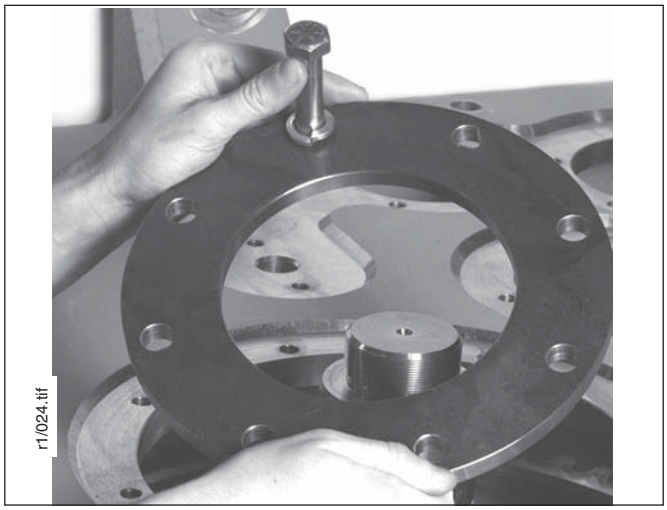


3. Remove bearing retainer and shim pack.

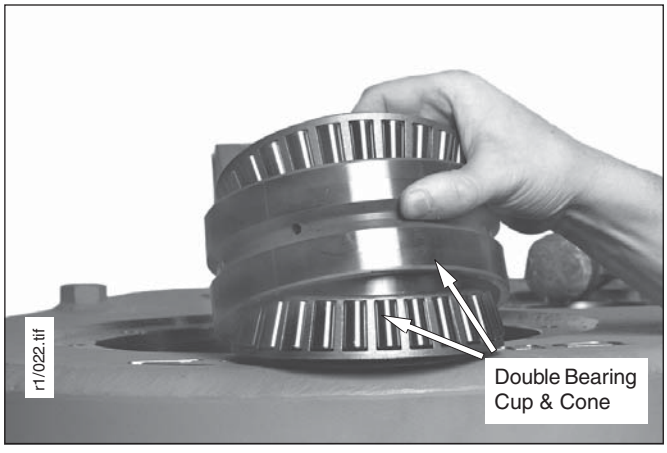


NOTE: Tag shim pack for reference during reassembly.

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.



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.

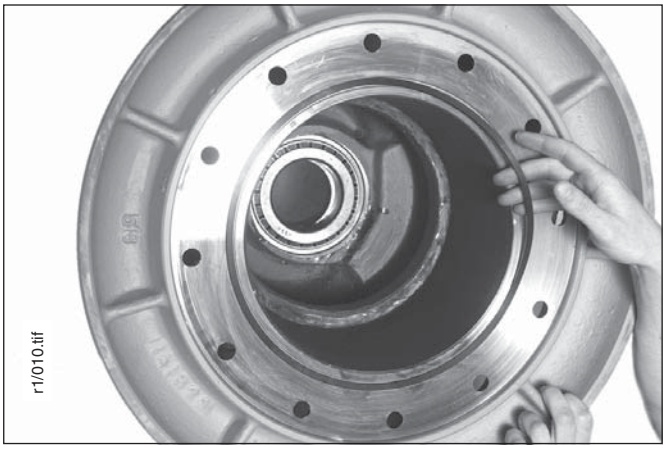
NOTE: Support or sling the drum gear so that it does not fall during shaft removal.

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.



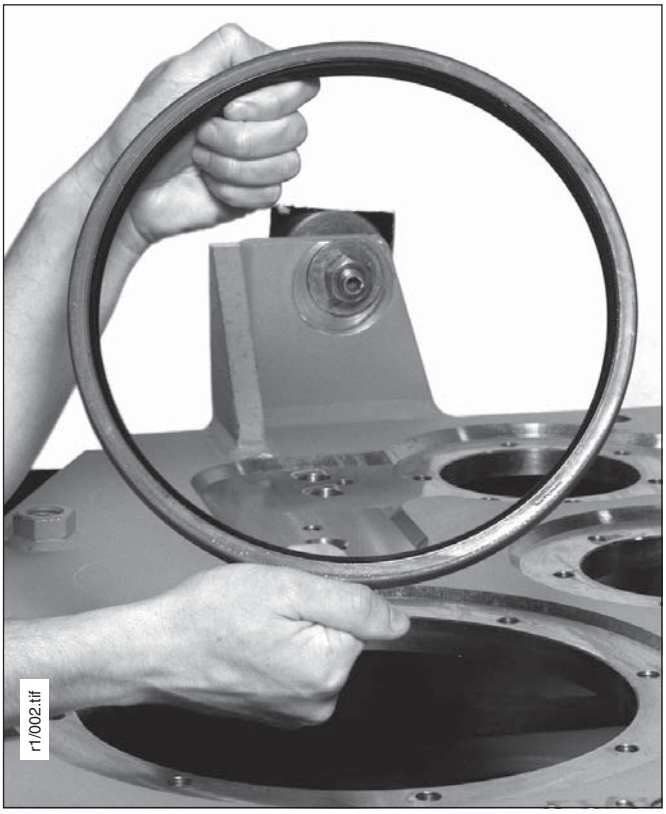
NOTE: This seal must be replaced with a new Allied Systems Company-approved seal during reassembly.

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

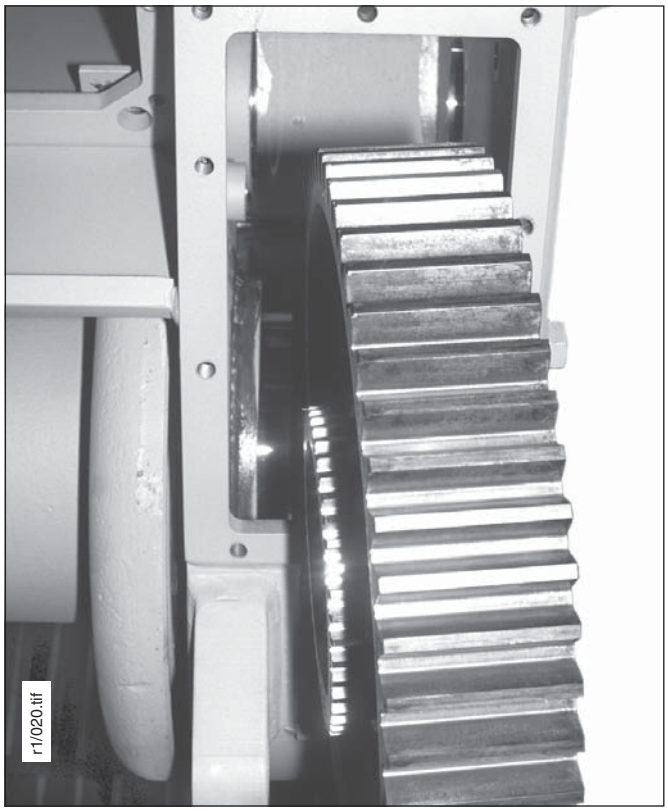
NOTE: Refer to Figure 4-10 for location of components.

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 4-12, 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 4-12 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.

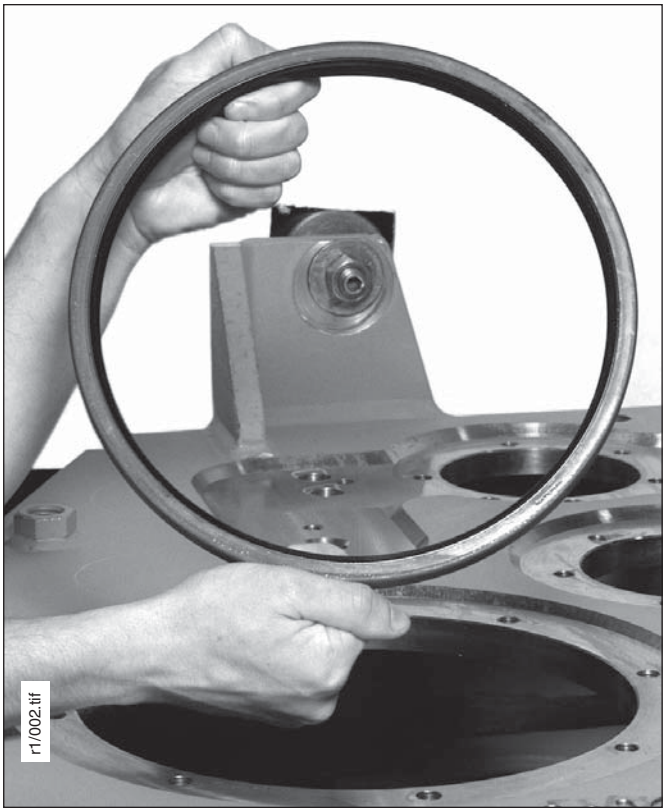
Figure 4-12 Visual Inspection (continued)

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.
Freespool Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing surfaces.	Dress surface or replace shaft if severely worn.
	Check O-ring groove and seal surface.	Dress groove or replace shaft if severely worn.
	Check for cross threaded or damaged threads.	Dress threads with thread chaser.
Drum Gear	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Drum	Inspect quad-ring groove for burrs, scoring and rust.	Replace drum or rebuild drum groove if a new quad-ring will not seat properly.
Drum Adapter	Carefully inspect double seal contact surface for deep scratches, burrs and rust.	Replace if damaged.
Winch Frame	Check area around drum and drum adapter for damage if cable has slipped between cable guard and winch frame.	Consult the factory.

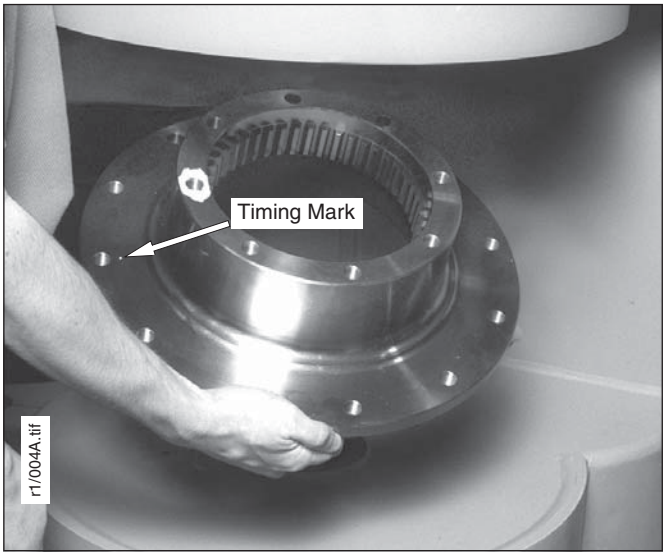
Drum and Drum Shaft Installation

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

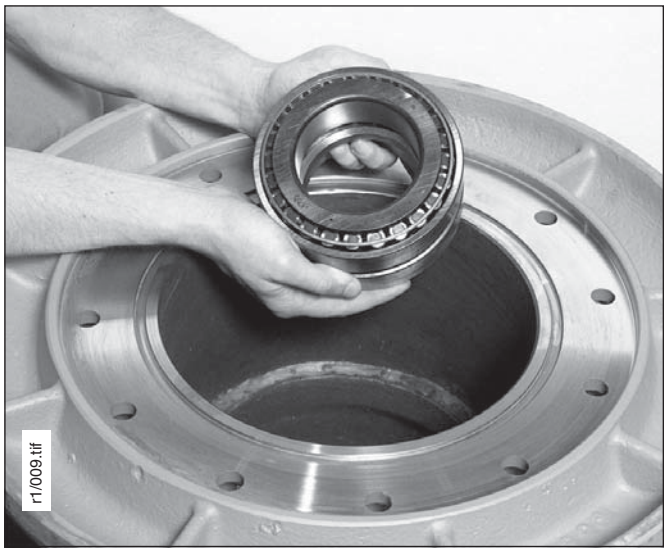
1. Lubricate seal bore with Lubriplate or other light lube grease. Install double-lip seal with smooth side toward the drum in the right hand side of the frame.



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



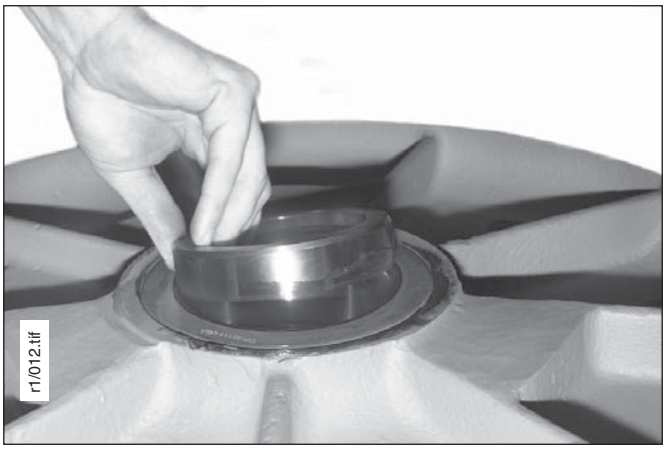
3. Lubricate the left-hand drum bore with Lubriplate or other light lube grease, then install double tapered roller bearing assembly.



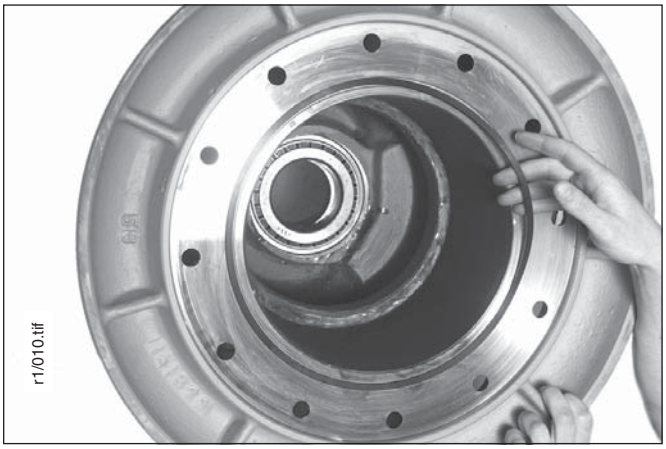
4. Install drum seal.

NOTE: Smooth side of seal must face outboard.

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

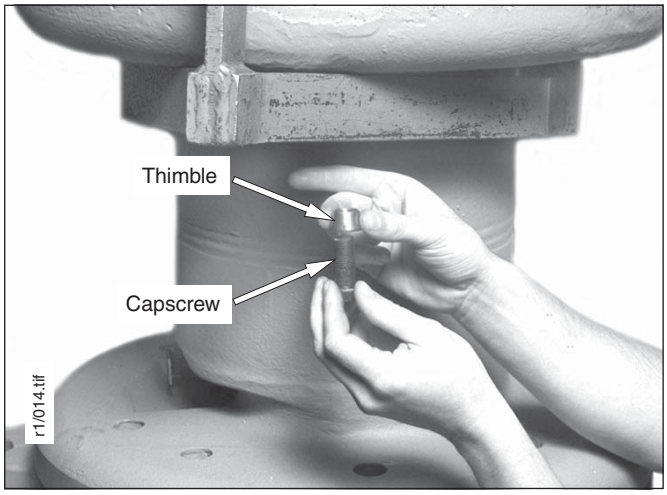


6. Lubricate right-hand drum bore. Coat right-hand seal ring and groove with O-ring lube. Install new seal ring.



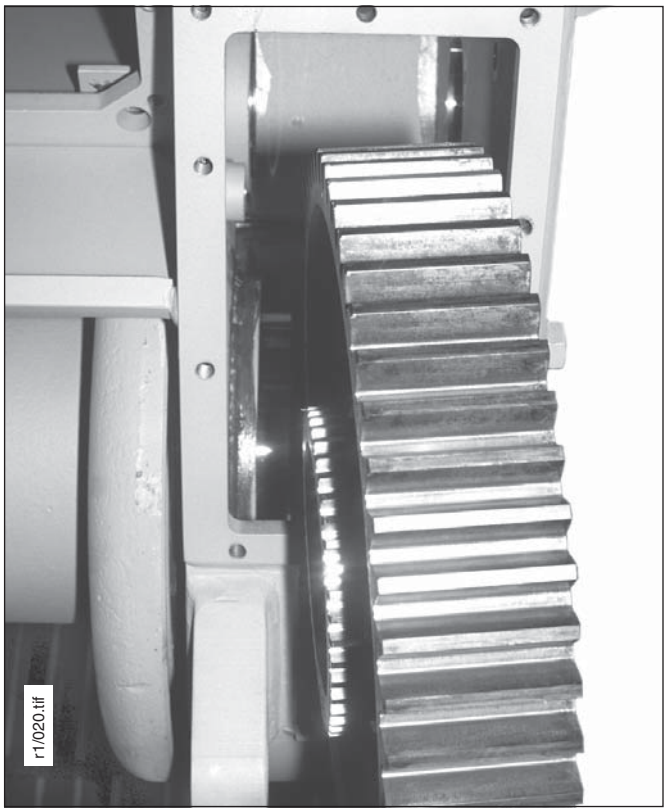
7. Move the drum into position while being careful not to move the seal ring.

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.



NOTE: The intermediate shaft bearing cup needs to be installed prior to drum gear installation because the drum gear blocks the access to the bearing bore.

9. Install drum gear.

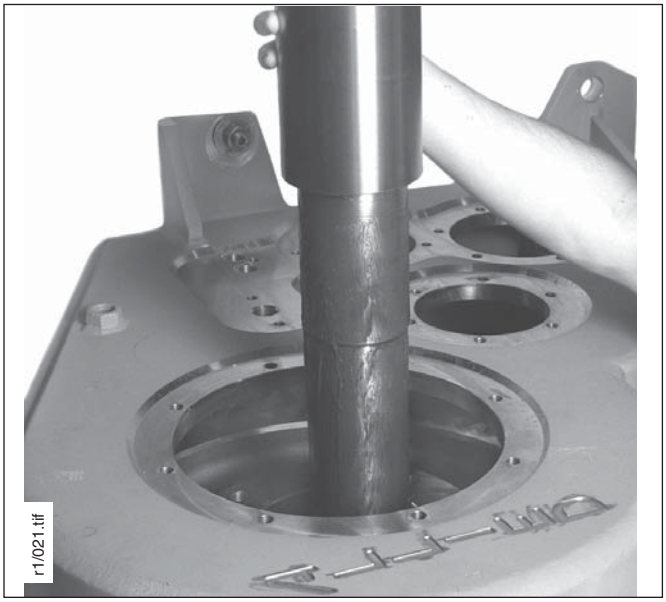


NOTE: The timing mark on the drum gear should be aligned with the timing mark on the drum adapter shown in Step 2.

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

11. Pour 2 quarts (2 liters) of the recommended oil (see Figure 1-10) into the drum to ensure initial bearing lubrication.

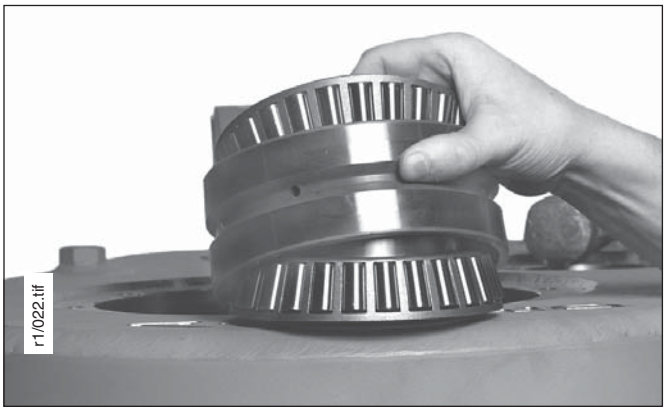
12. Make sure that double-tapered roller bearing, seal and spacer are properly seated in the left-hand side of the drum. Then install the shaft until it bottoms solidly against the left hand tapered roller bearing. Tighten left hand nut.



⚠ CAUTION

Do not hammer on drum shaft surface.

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

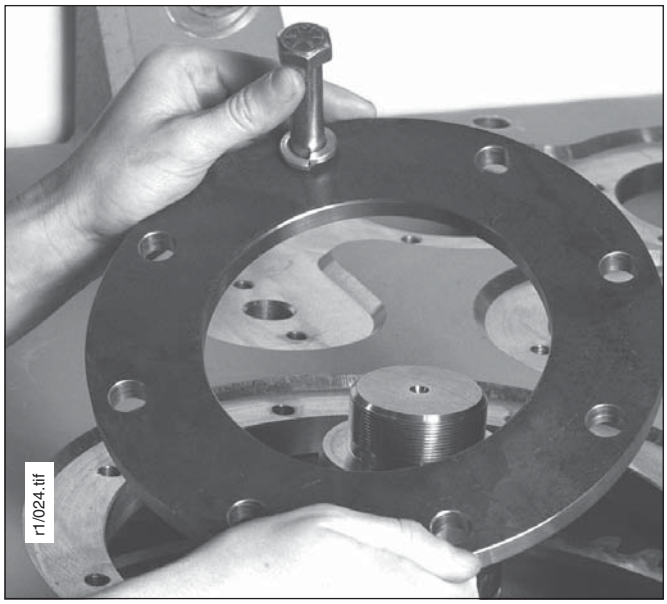


NOTE: Bearings go in reverse order from that shown above.

⚠ WARNING

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

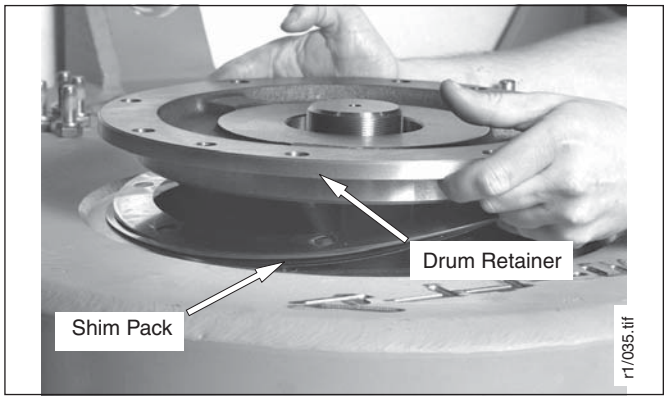
14. Install retainer plate using the eight special capscrews. Tighten capscrews to 180 ft-lbs (24 kg-m).



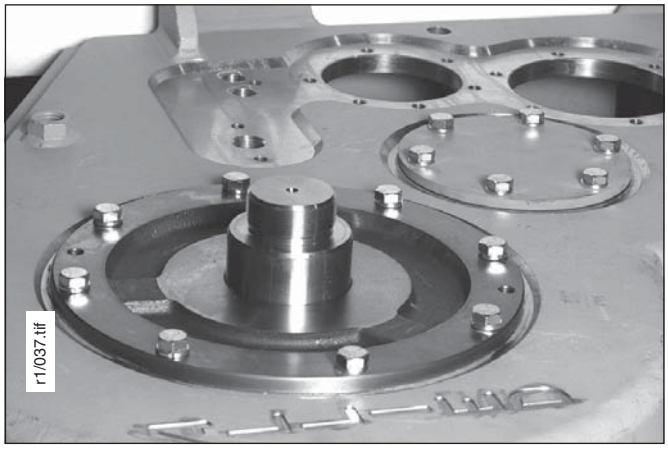
NOTE: Capscrews cannot be installed unless drum gear and drum adapter have been aligned as indicated in Step 8.

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

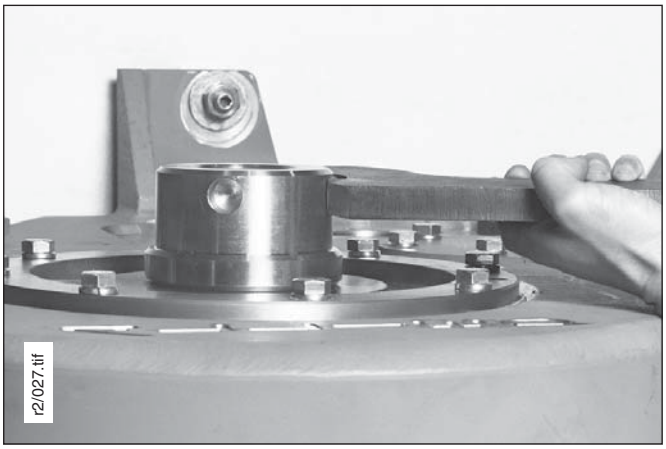
16. Coat winch frame and bearing retainer with Loctite. Install finalized shim pack (determined in step 15). If intermediate shaft assembly not installed, install before retainer.



17. Secure retainer with capscrews and lockwashers. Tighten capscrews to 75 ft-lbs (10 kg-m).



18. 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).



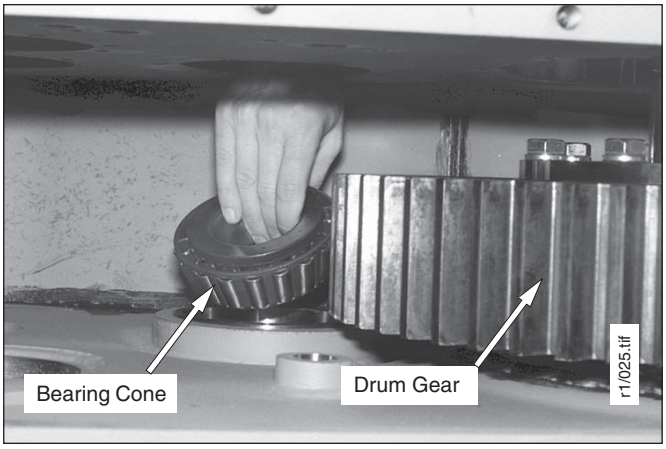
19. Tighten drum-to-adapter capscrews to 220 ft-lbs (30 kg-m) torque.

Intermediate Shaft Installation, Non Freespool

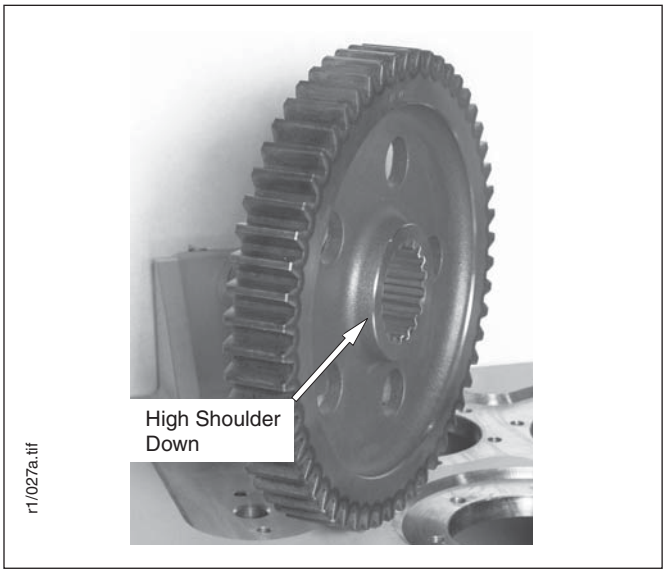
These figures show the winch removed from the tractor with the clutch shaft and brake shaft removed.

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

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

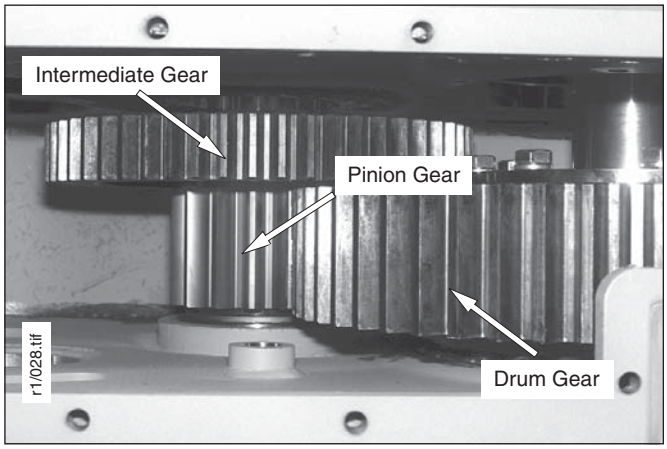


2. Position intermediate gear in housing. Install intermediate shaft far enough to support the gear.

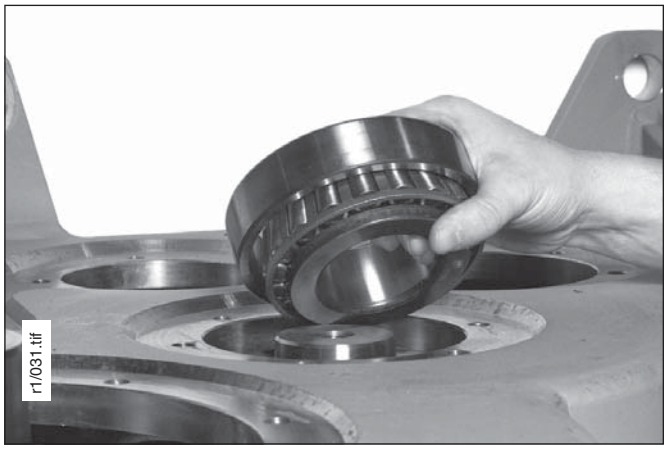


NOTE: Install intermediate gear with high shoulder down, towards the drum gear, to set enough clearance between the intermediate gear and the drum gear.

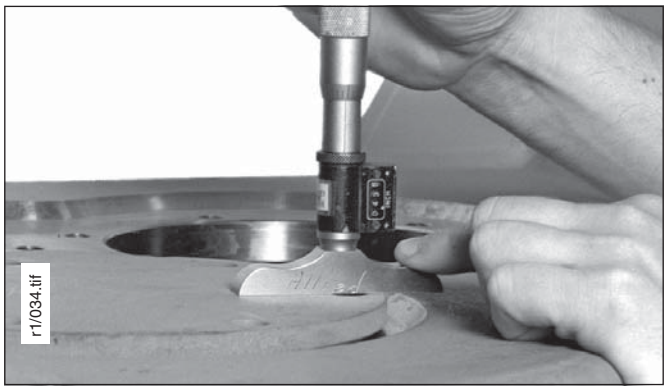
3. Position the pinion gear so that the teeth are splined to the intermediate shaft.



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

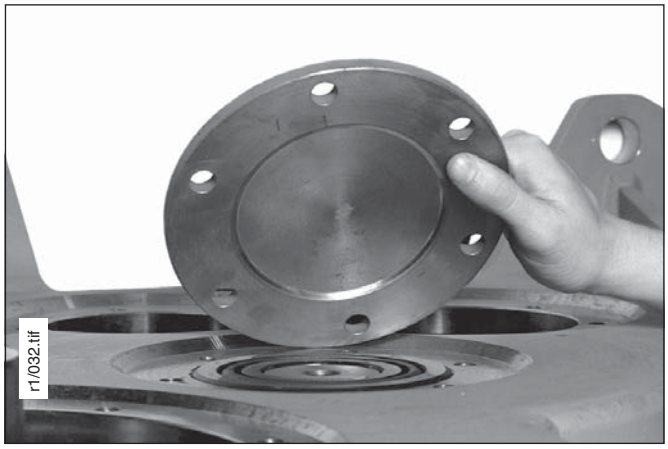


5. Using a depth gauge measure the distance from the face of the bearing cup to the winch housing. Add a shim pack of 0.004 to 0.007 in. (0.102-0.178 mm) greater than the measured distance. For example, if the measured distance is 0.004 in. (0.102 mm), add a shim pack with a total thickness of 0.008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



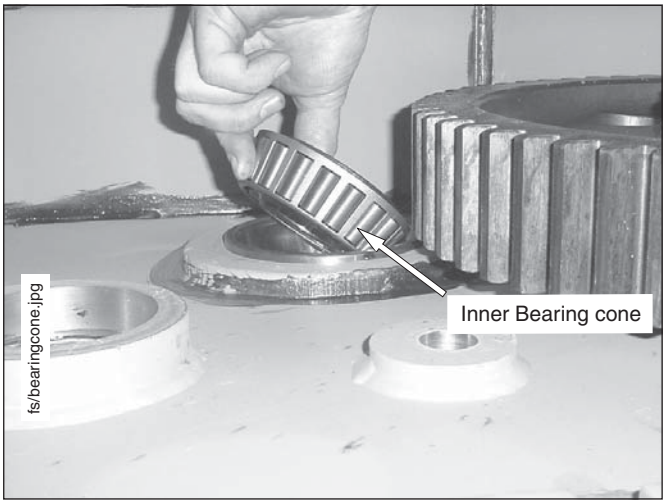
7. Tighten the six capscrews to 75 ft-lbs (10 kg-m).

Intermediate Shaft Installation, Freespool

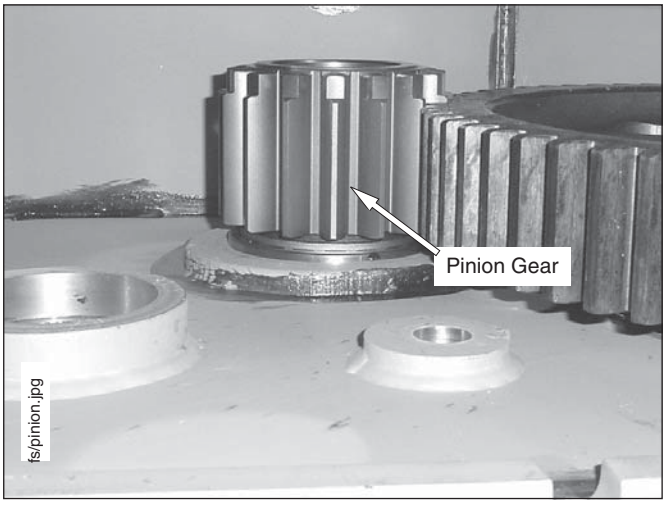
These figures show the winch removed from the tractor with the clutch shaft and brake shaft removed.

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

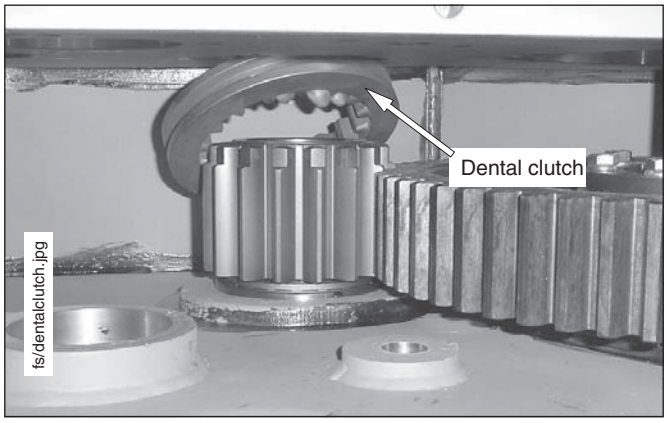
1. Install inner bearing assembly if previously removed. Use a liberal amount of lubriplate or other light lube grease to hold the inner bearing cone in place.



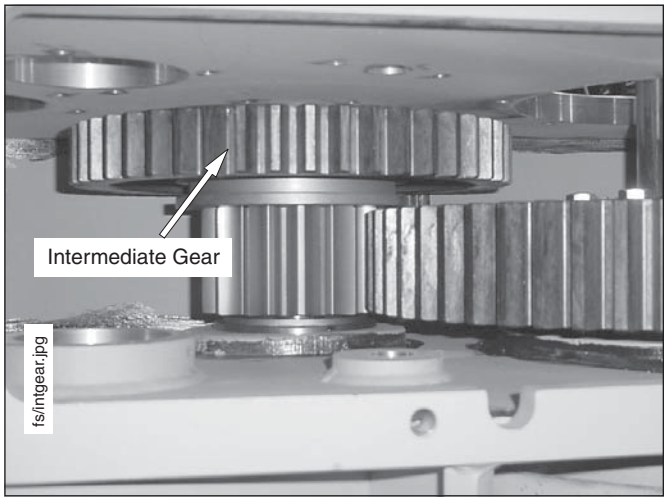
2. Position the freespool drum pinion in the housing.



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

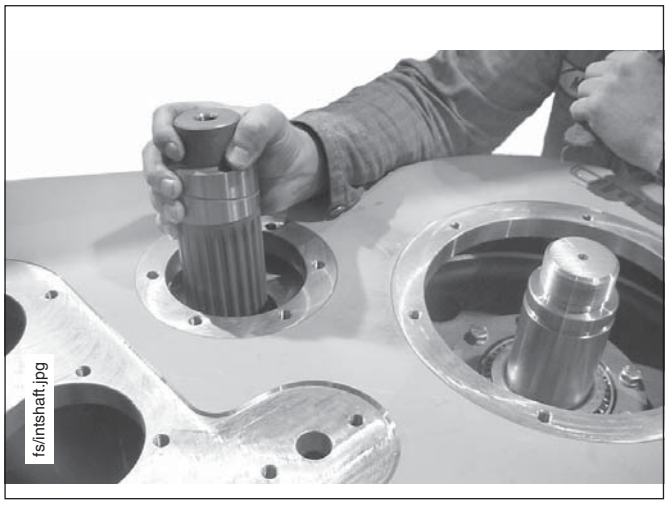


4. Position intermediate gear in housing.

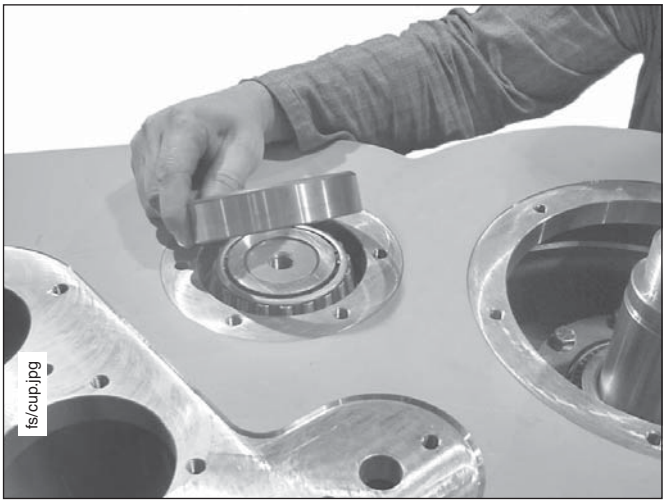


NOTE: Install intermediate gear with high shoulder down.

5. Install intermediate shaft.



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

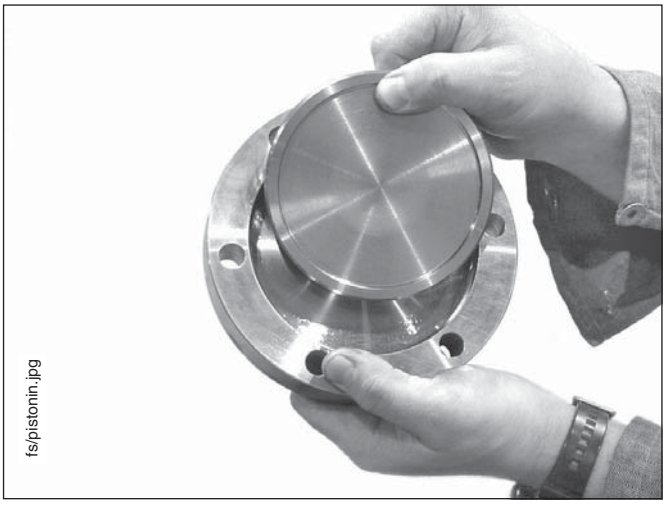


NOTE: The following step only applies to AW8L-2032 and below without exterior freespool drag adjust.

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

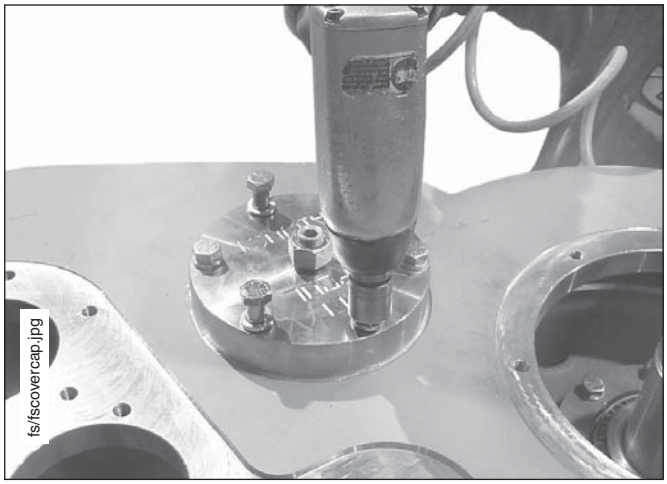
NOTE: The following step only applies to AW8L-2033 and above, with exterior freespool drag adjust.

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

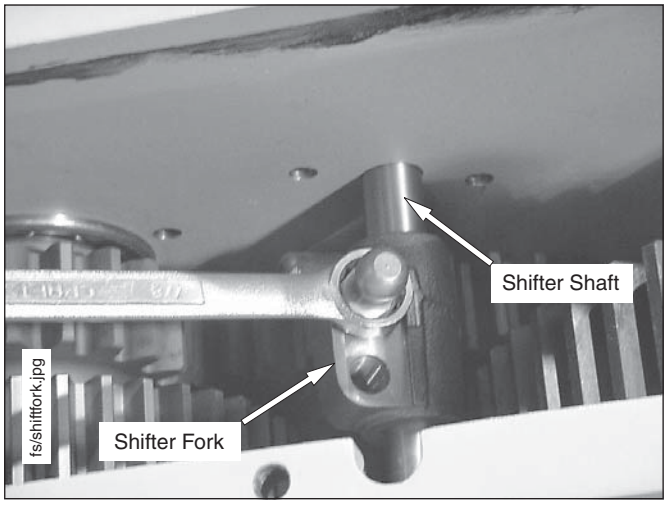


9. Coat the winch frame and retainer with Loctite or other suitable sealing compound. Install shim pack (if necessary) and cover.

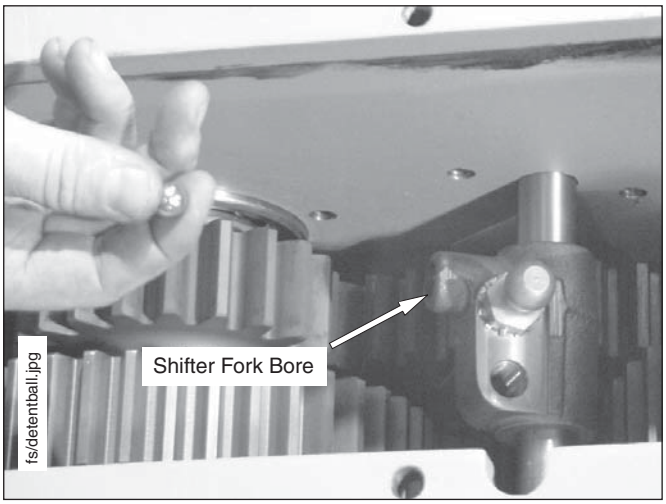
10. Tighten the six capscrews to 75 ft-lbs (10 kg-m).

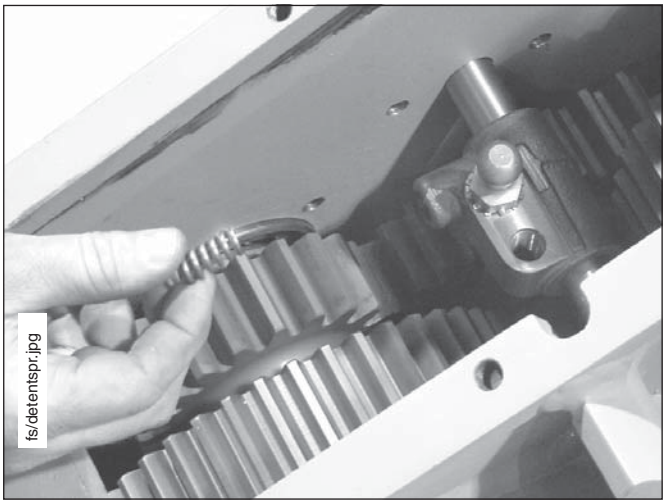


11. Position the freespool shifter fork on the dental clutch and install the shifter shaft.

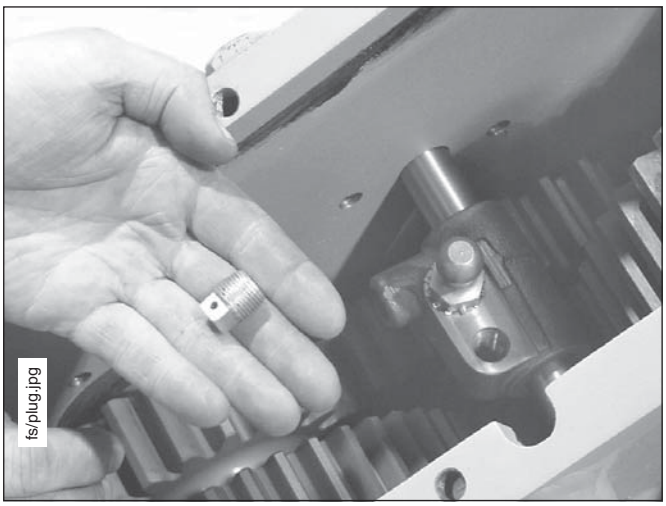


12. Install detent ball and spring into bore of the shifter fork.

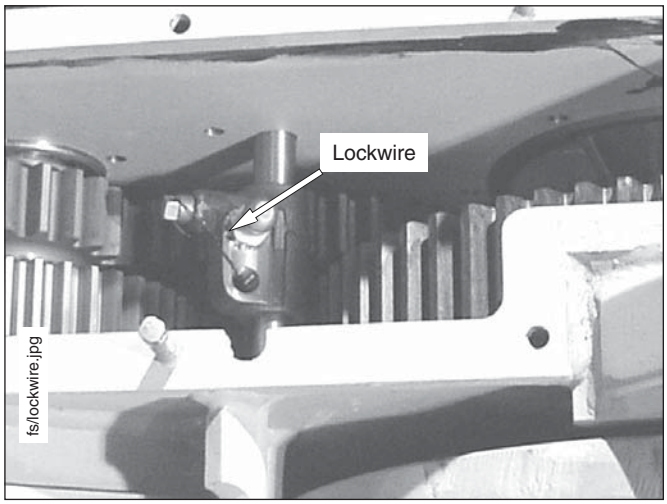




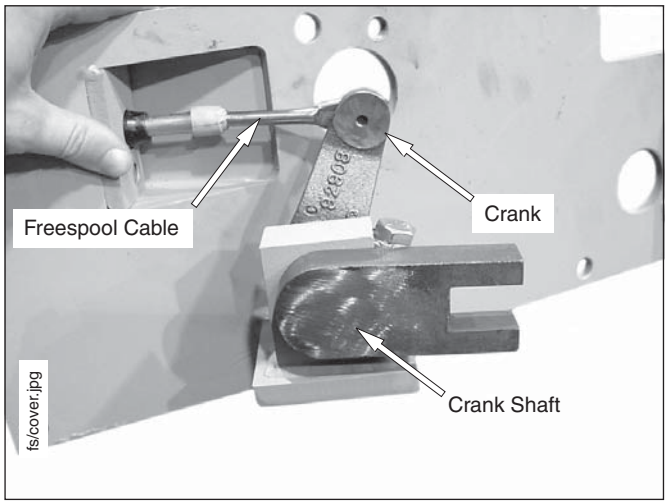
13. Install plug securely.



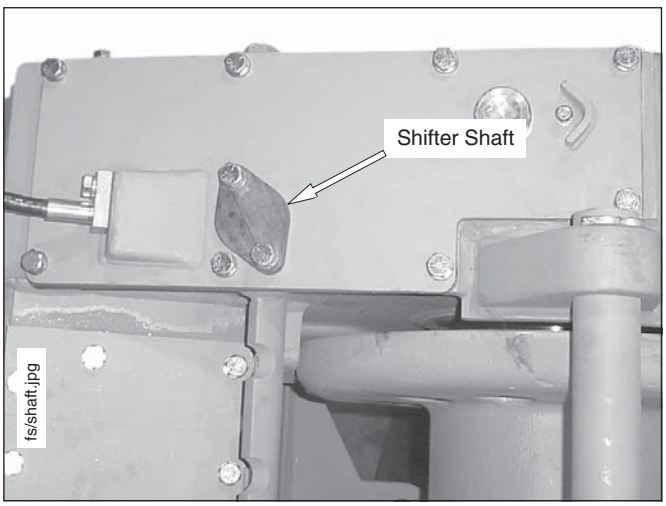
14. Lockwire as shown.



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



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



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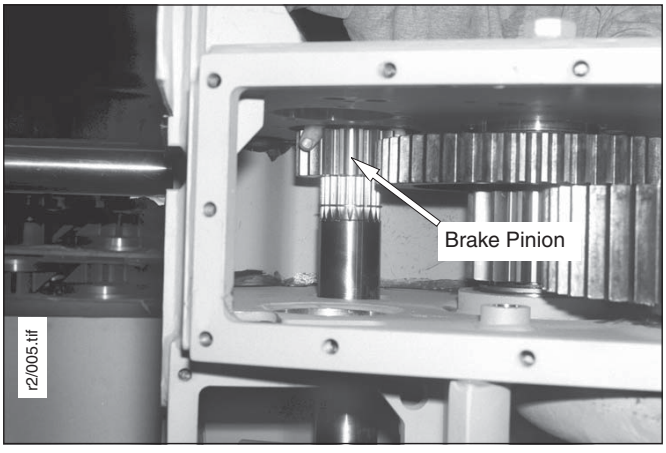
Brake Shaft Installation

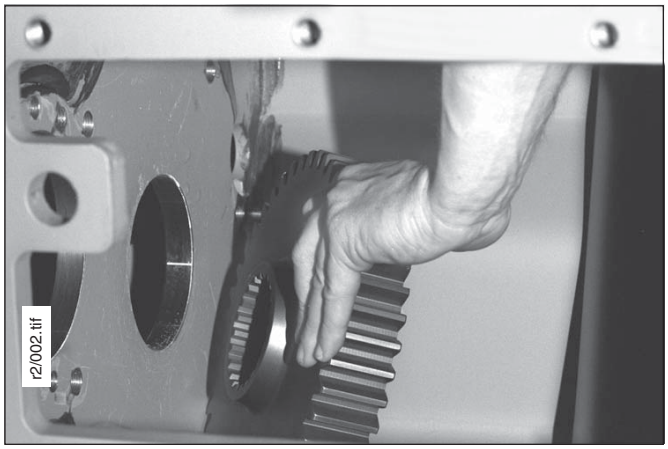
NOTE: This subsection applies to ratios #1 through #7 only. Installation steps for ratios #8 through #10 are somewhat different, essentially reverse of steps 37 through 44 on page 4-18 in subsection of Removal & Disassembly of Parts Instructions for Repair of Reverse Clutch Gear.

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

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



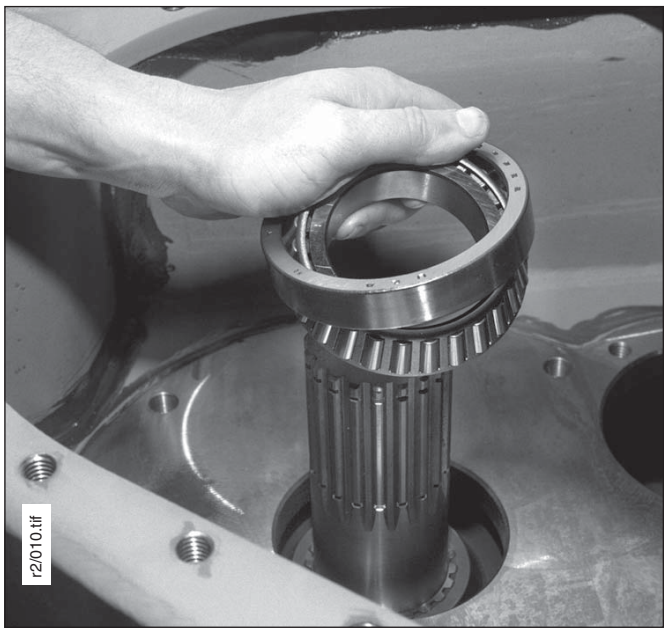
2. Install reduction gear and bearing cone on the left-hand end of the shaft.



⚠ CAUTION

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

3. Install left-hand bearing cup into housing.



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

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

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

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

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

NOTE: Refer to Rebuilding & Installation of Parts Instructions for Repair of Reverse Clutch Gear at the end of Clutch Shaft Reassembly & Installation for brake shaft installation of Gear Ratios #8, #9 & #10.

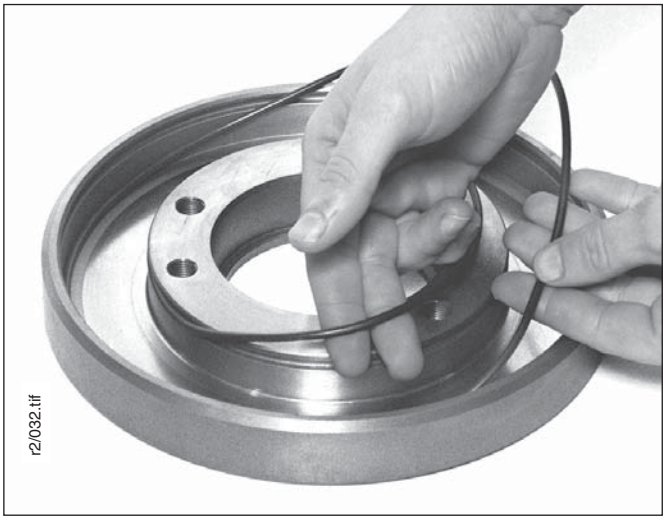
Oil Clutch Reassembly

⚠ CAUTION

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

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

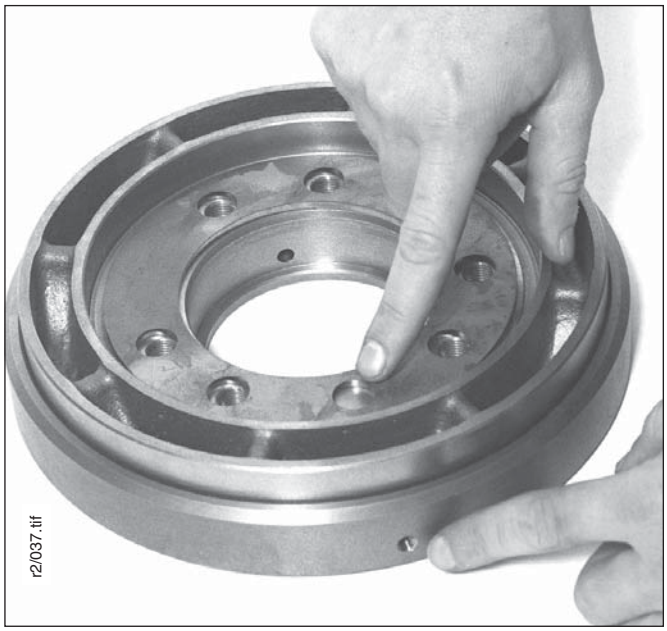
1. Install two new O-rings in piston housing. Lubricate piston cavity with O-ring lube.



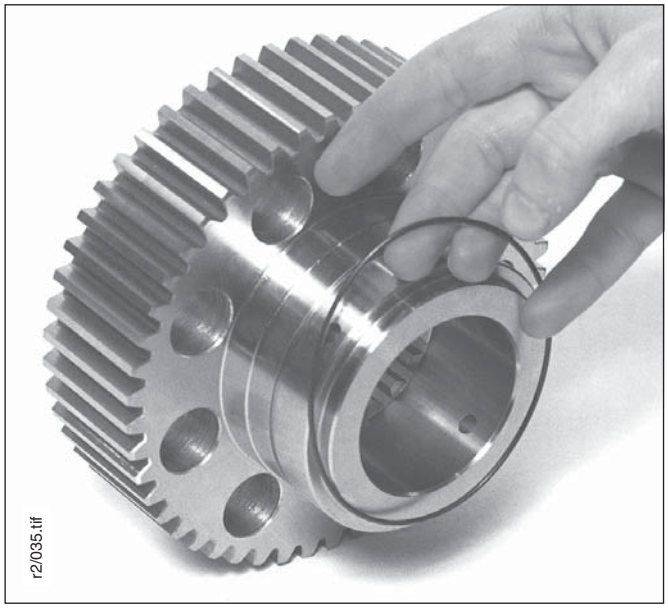
NOTE: It may be necessary to stretch the large O-ring so that it will stay in its groove during installation of the piston.

2. Carefully install the piston in the housing.

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

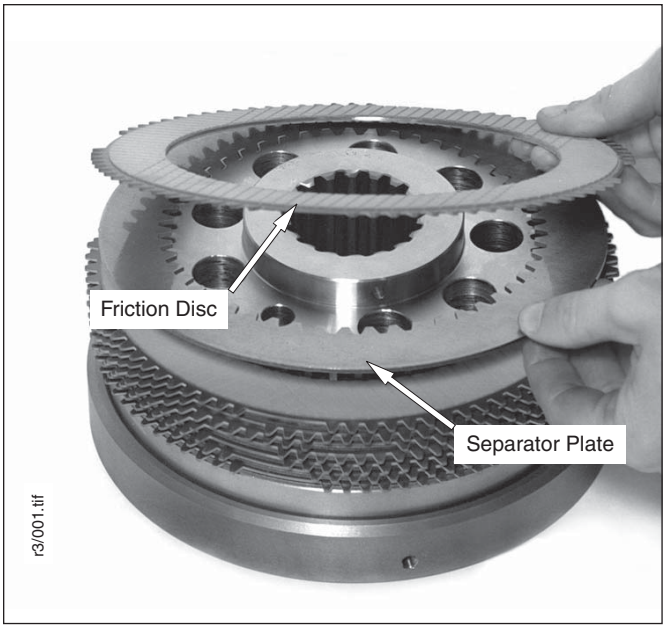


4. Install new O-ring on the hub. Lubricate with O-ring lube.



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

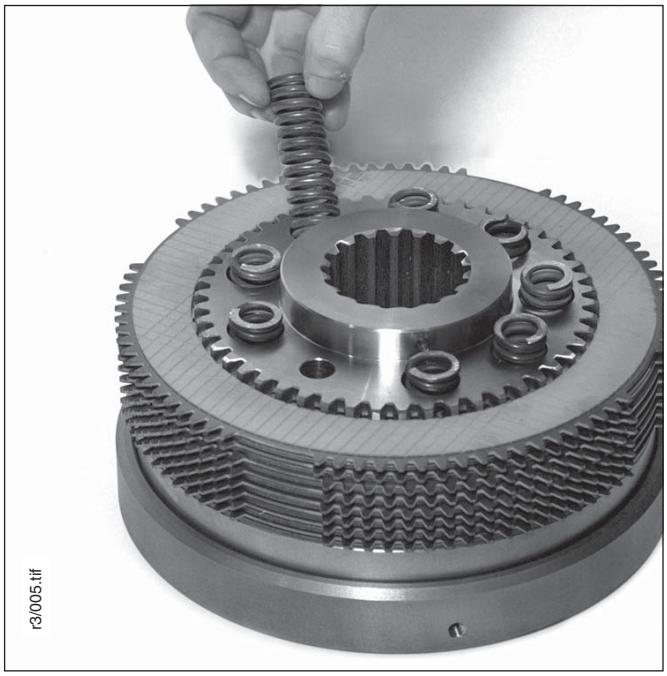
6. Starting with a separator plate on the hub, alternately place the separator plates and the friction discs on the clutch hub. The W8L winch uses 8 friction discs and separator plates.



NOTE: All the plates must be installed facing the same direction.

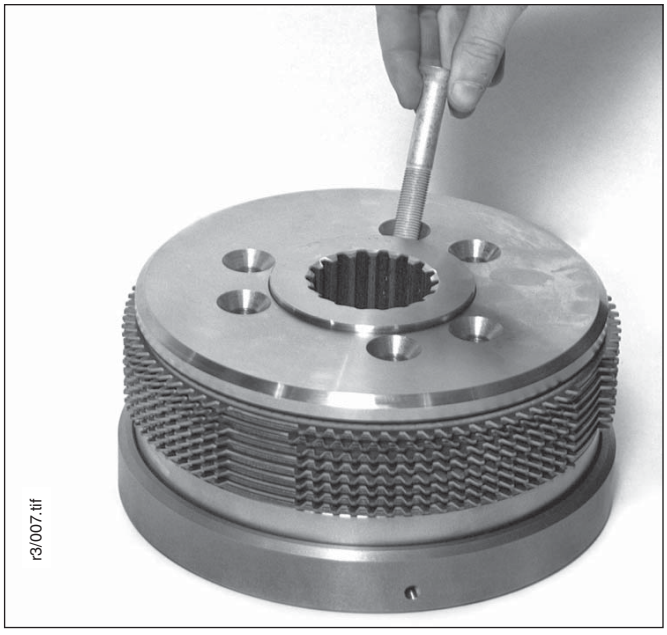
NOTE: Keep the blanked-out teeth of the friction discs in line.

7. Install the release springs and 2 pins. The W8L winch uses 8 springs.



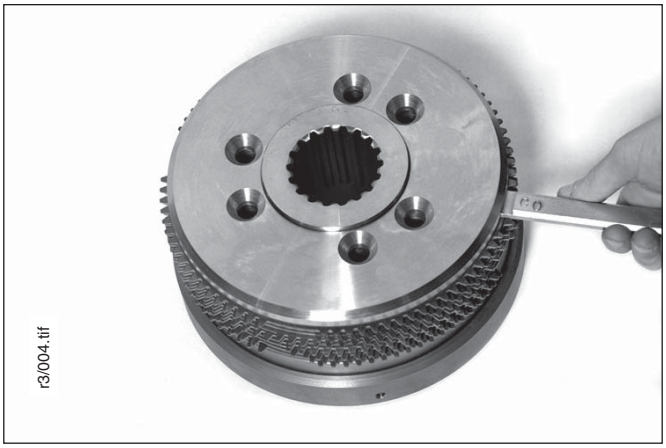
8. Install shims as tagged during removal.

9. Install the cover plate and capscrews as marked during disassembly. The W8L winch requires 6 capscrews.



10. Torque capscrews to 70 ft-lbs (10 kg-m).

11. Check clearance between the cover plate and friction discs in two places. Adjust shims (refer to Step 8) only as necessary to produce a clearance of 0.140-0.180 (3.6-4.6 mm).



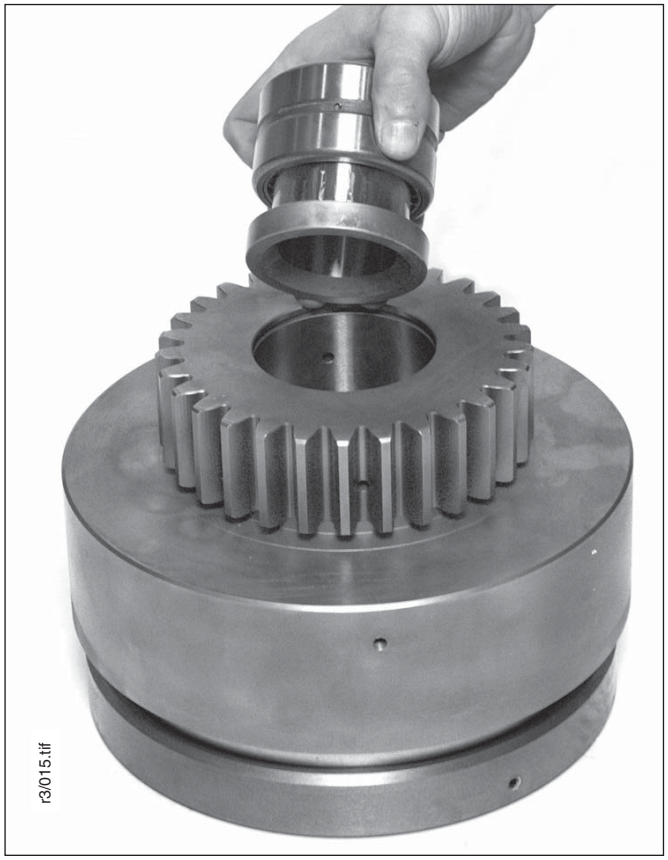
⚠ CAUTION

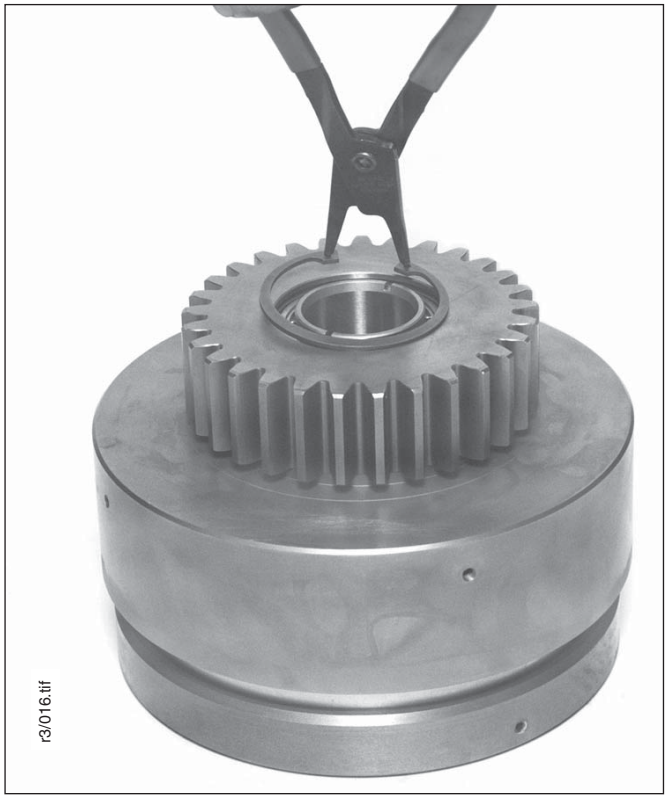
Cover plate must NOT extend above the face of hub regardless of specified clearance. Recheck clutch for proper assembly if this should occur.

12. Tighten setscrews to 40 ft-lbs (6 kg-m).

13. Carefully place spider/pinion assembly over clutch pack. Ensure the friction discs do not move out of alignment. Align blanked out teeth.

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





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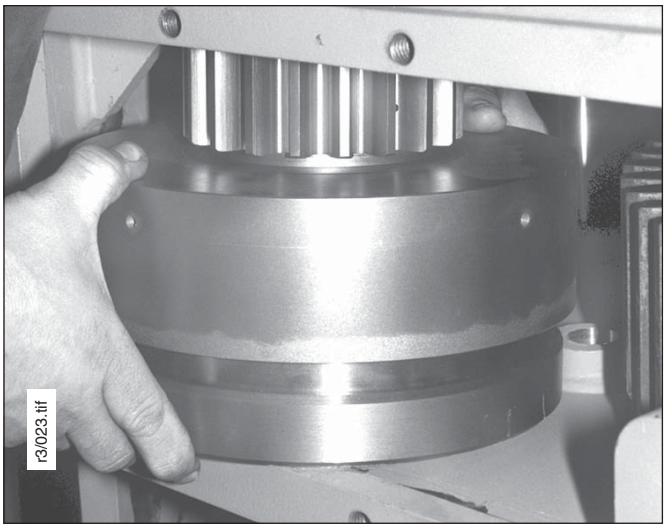
Clutch Shaft Reassembly and Installation

NOTE: This subsection applies to ratios #1 through #7 only, where the clutch shaft is installed from right-hand side. Installation of ratios #8 through #10 is quite different, including bearing installed from the left-hand side.

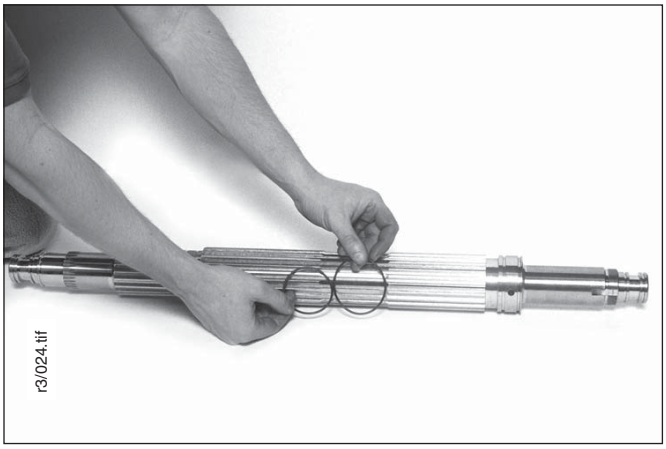
See Figure 4-1 for the location of clutch shaft components.

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

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

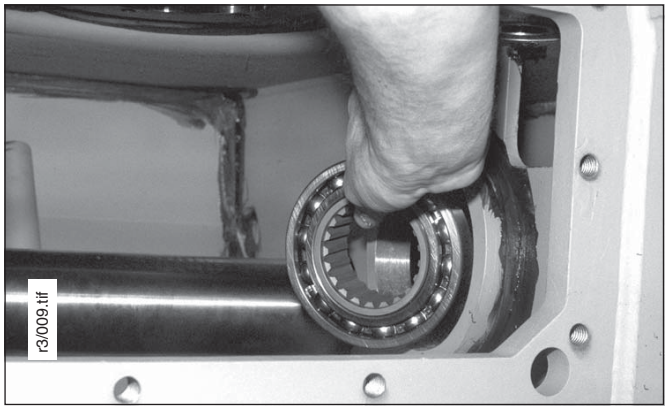


2. Install new O-rings on the clutch shaft and lubricate the entire shaft.

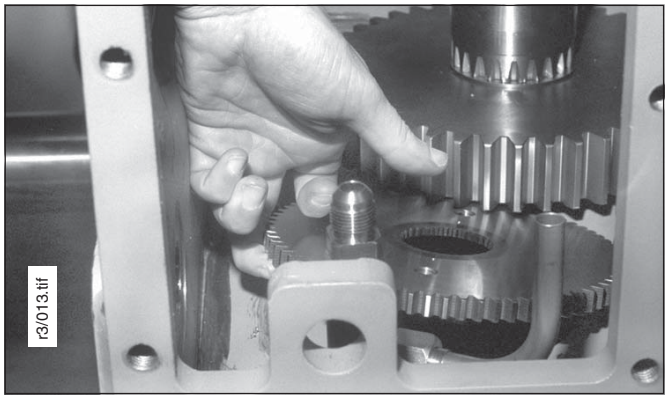


3. Position the clutch shaft so the blanked-out tooth is up. The pipe plug in the RH end of the shaft will be down.

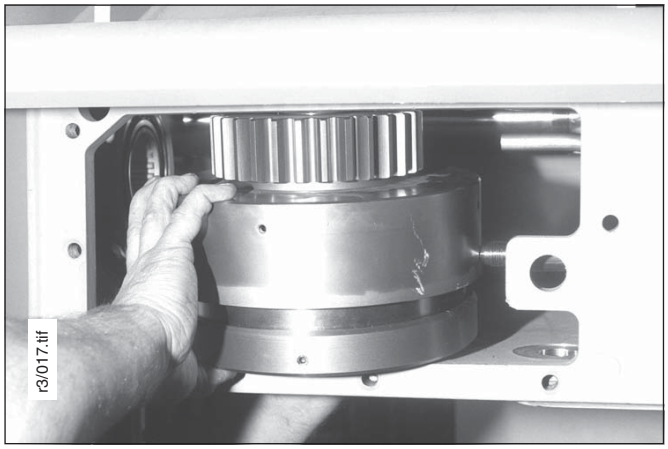
4. Install ball bearing and bearing carrier.



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



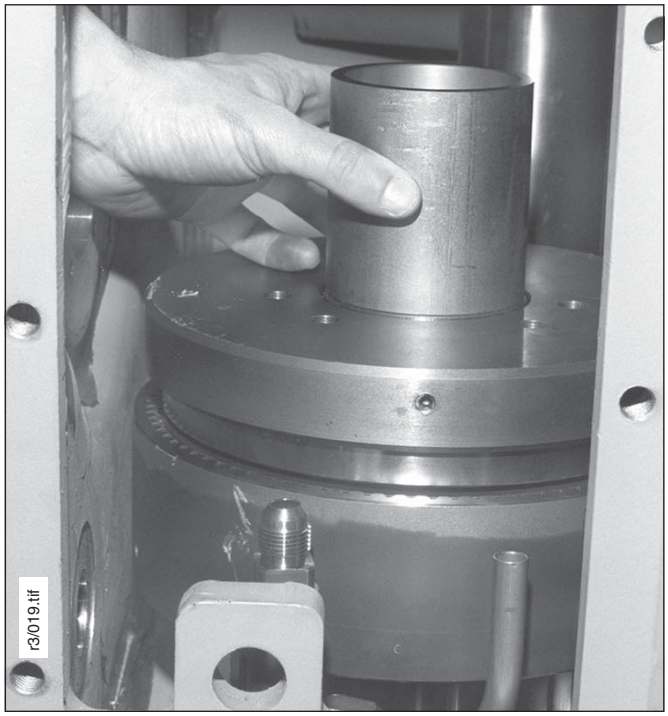
6. Install forward clutch assembly into the housing.



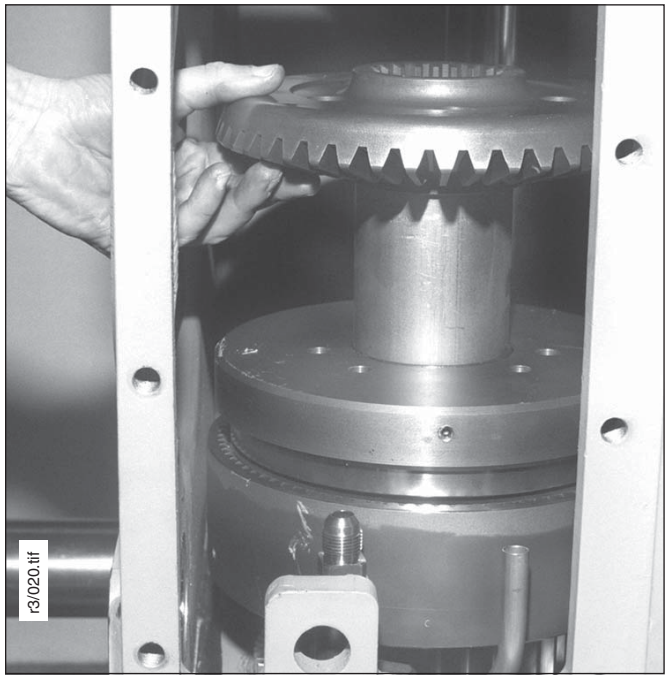
NOTE: Keep the oil hole plug in the piston housing on top. Scribe a vertical line on the housing for alignment with blanked-out spline on shaft.

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

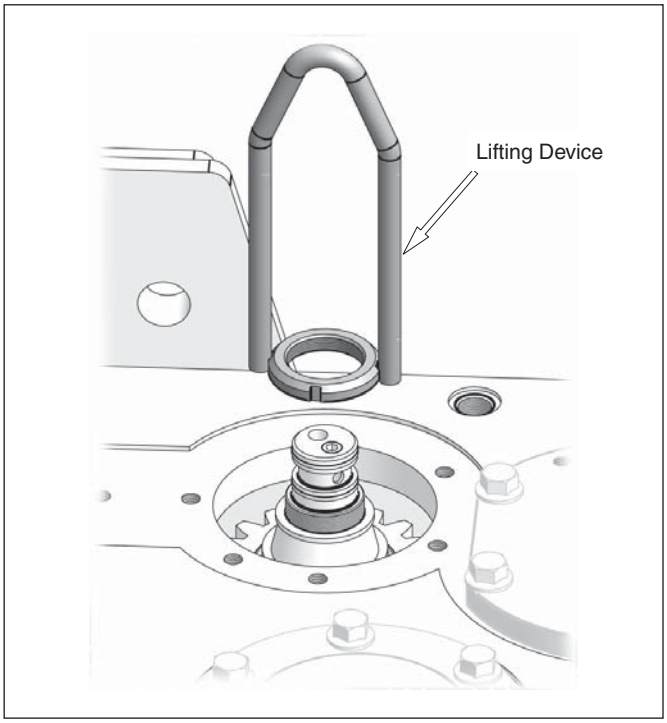
7. Install spacer next to forward clutch.



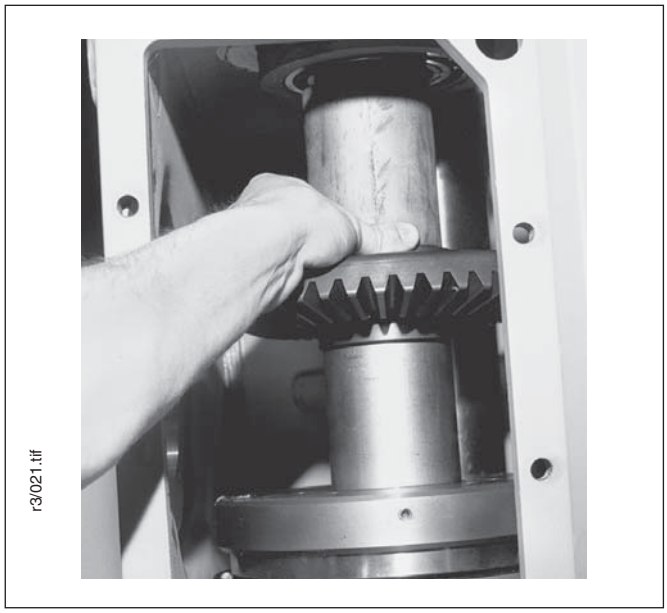
8. Insert the ring gear.



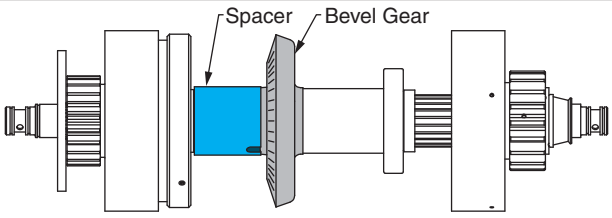
9. Attach lifting device (Allied P/N X-201962) to clutch shaft on right-hand side. See “Specialized Tools” at the end of Section 4 for ordering information.



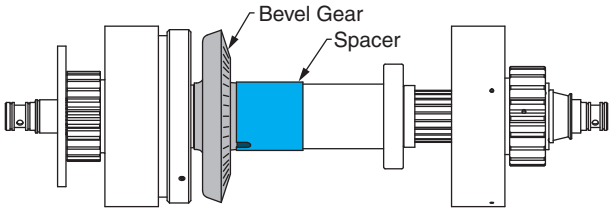
10. Insert clutch shaft far enough to install spacer between bevel gear and bearing and carrier.



11. Note that the orientation of the bevel gear and the spacer are dependent on the tractor the winch is mounted on, and whether the wire rope is installed in an underwind or overwind configuration



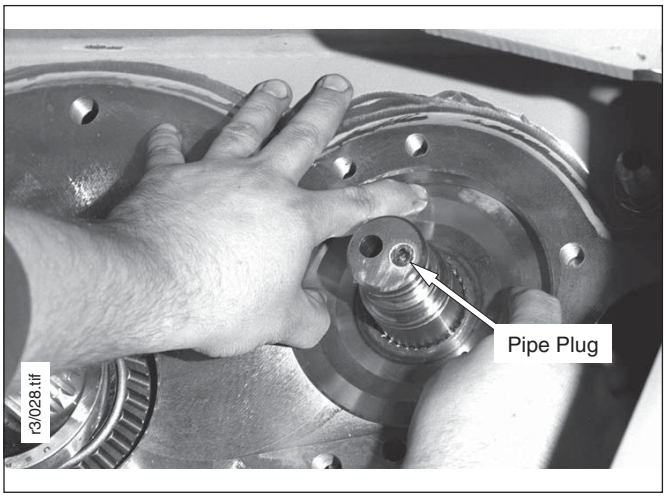
Bevel Gear Orientation
All except K50 and Z57



Bevel Gear Orientation
K50 and Z57

Note: Bevel gear orientations shown are for overwind winches. Underwind configurations are reversed.

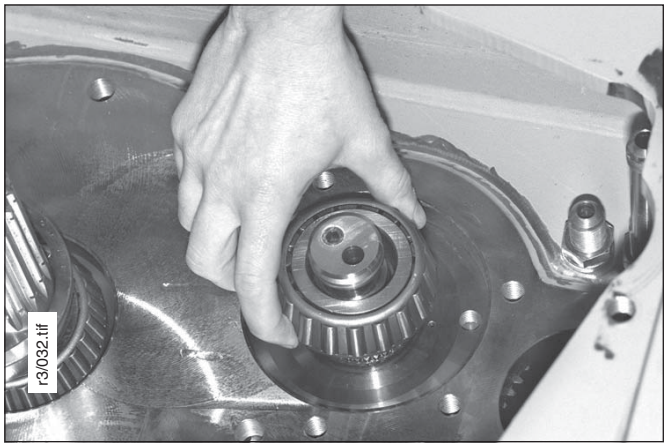
12. **To install the clutch shaft in the forward clutch assembly, the blanked-out tooth on the shaft spline must engage the alignment dowel in the forward clutch hub. Mark the right-hand end of the shaft to indicate the position of the blanked-out tooth. Rotate the clutch shaft so that the blanked-out 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.



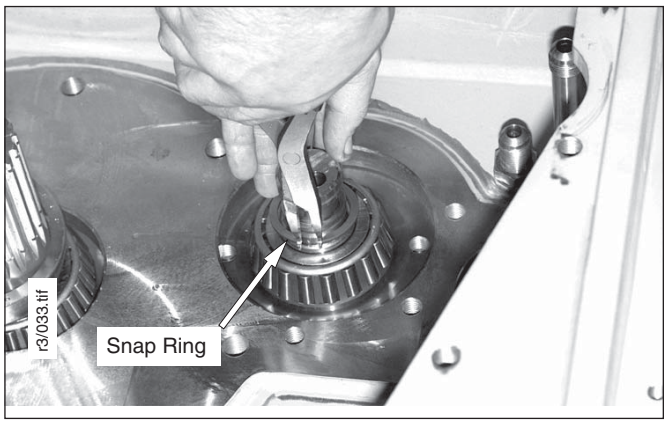
⚠ CAUTION

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

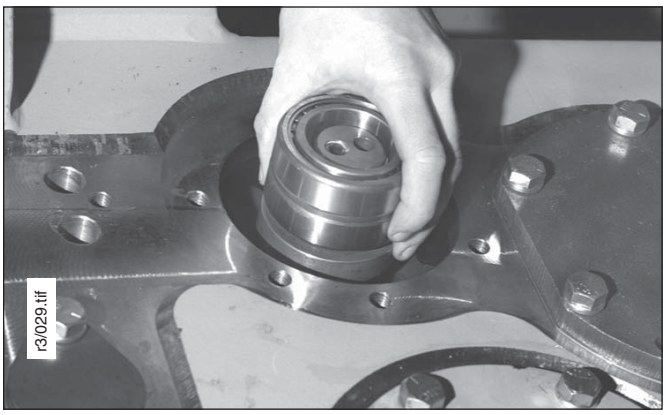
13. Remove capscrews from pump drive gear and install tapered roller bearing cone on left-hand end of the clutch shaft.



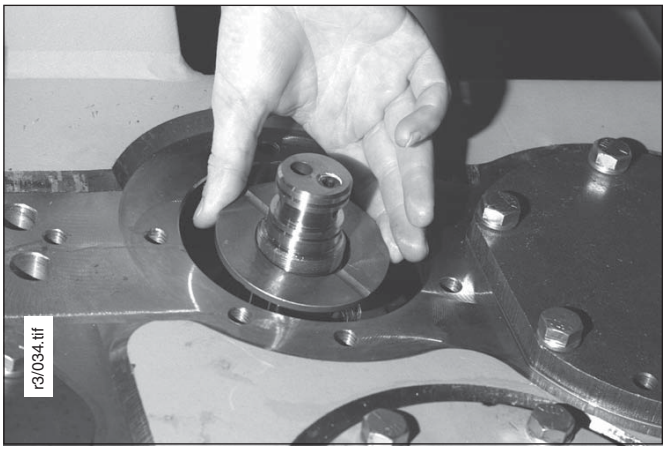
14. Secure the bearing with the snap ring.



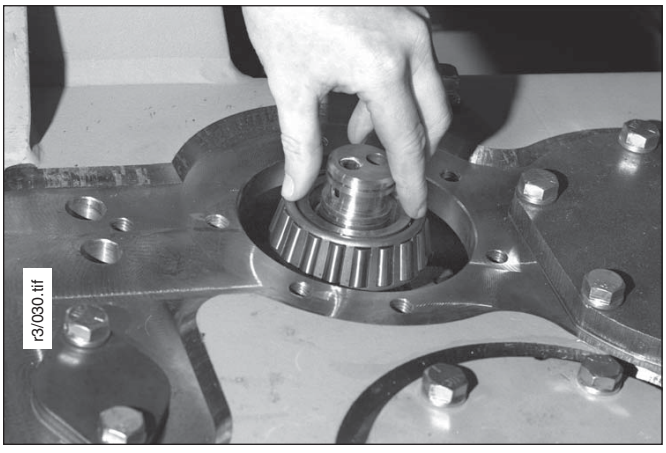
15. Pull shaft back towards the right. Install the roller bearing and carrier in the reverse clutch assembly and secure with the internal snap ring.



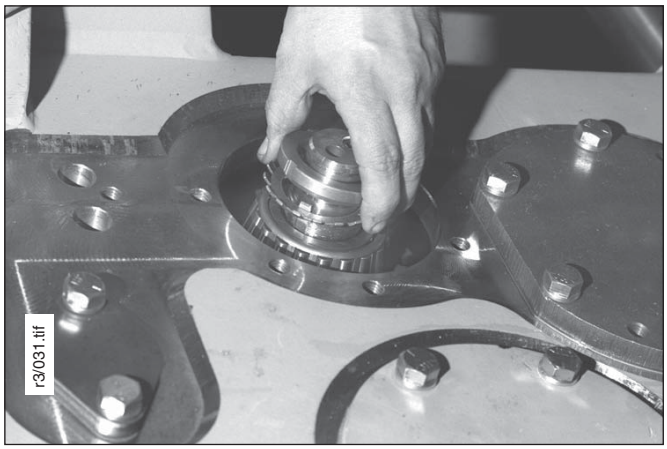
16. Install the thrust washer over the right-hand end of the shaft.



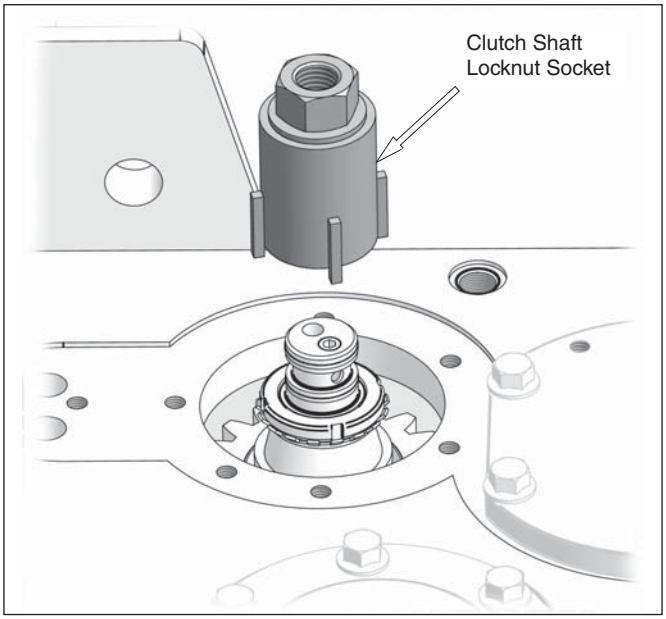
17. Install the tapered roller bearing.



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

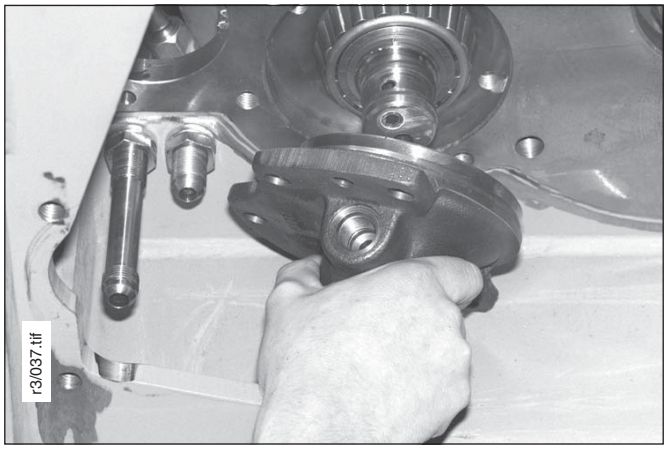


19. Use clutch shaft locknut socket (Allied P/N X-203345) to tighten the locknut to 200 ft-lbs (28 kg-m). See “Specialized Tools” at the end of Section 4 for ordering information.

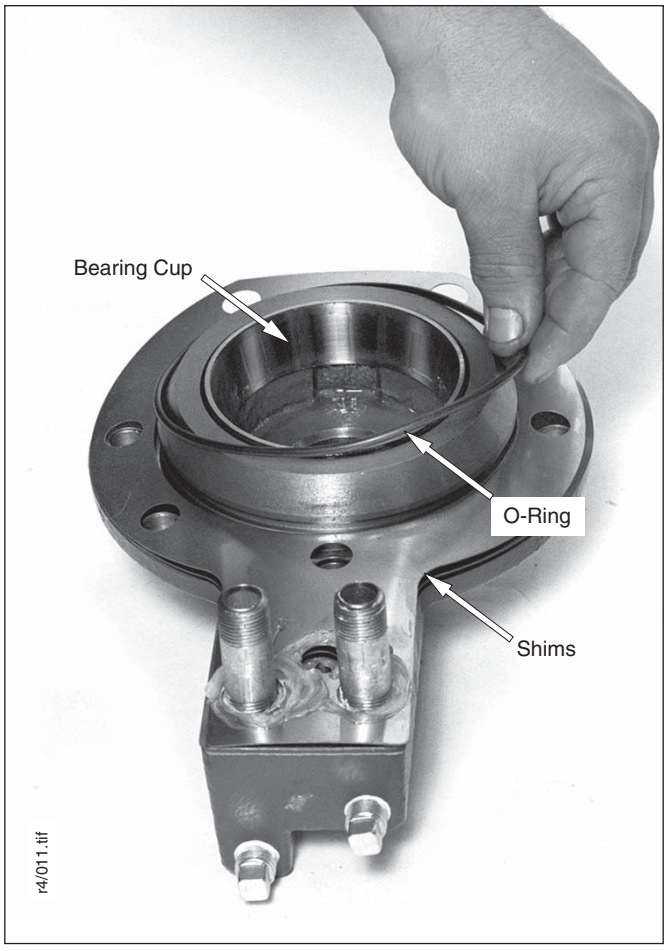


20. Bend two lockring tangs over flats of locknut.

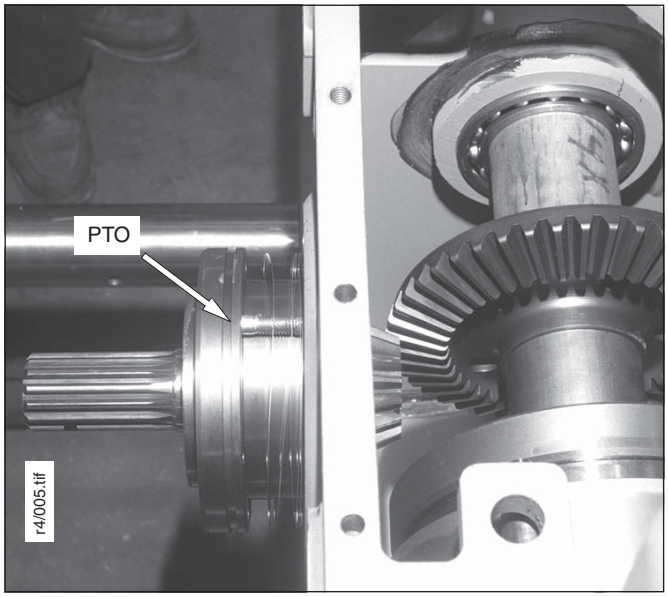
21. If removed, install bearing cup in the left-hand retainer. Assemble an approximately 0.025 in. (0.635 mm) shim pack on the left-hand bearing retainer, then install retainer. Tighten capscrews securely. Do not tighten to final torque or install cast-iron seal rings at this time.



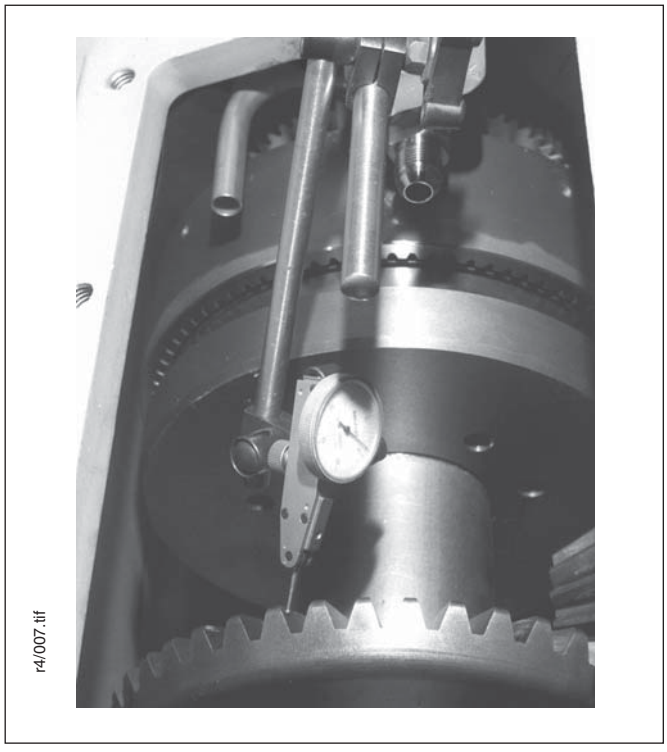
22. If removed, install bearing cup and O-ring in the right-hand retainer. Assemble a shim pack approximately 0.040 in. (1.02 mm) thick on the right-hand bearing retainer and install retainer. Do not install cast iron seals. Tighten capscrews securely. Do not tighten to final torque at this time.



23. Assemble PTO shaft as described in the **PTO Shaft Reassembly and Installation** section, if previously disassembled. Install PTO and add or subtract shims to get heel to heel contact. Tighten capscrews to 75 ft-lbs (10 kg-m). Lockwire capscrews upon completion of shimming. Use a pry bar to push the pinion gear away from the bevel gear.



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

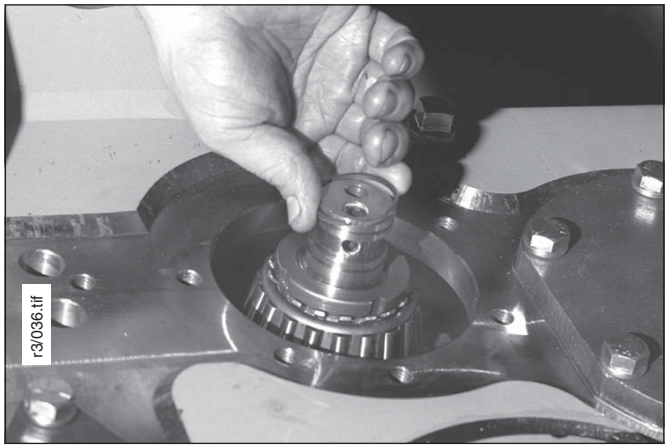


NOTE: Adding or subtracting shims from these retainers will affect pinion-to-bevel gear backlash. See step 24.

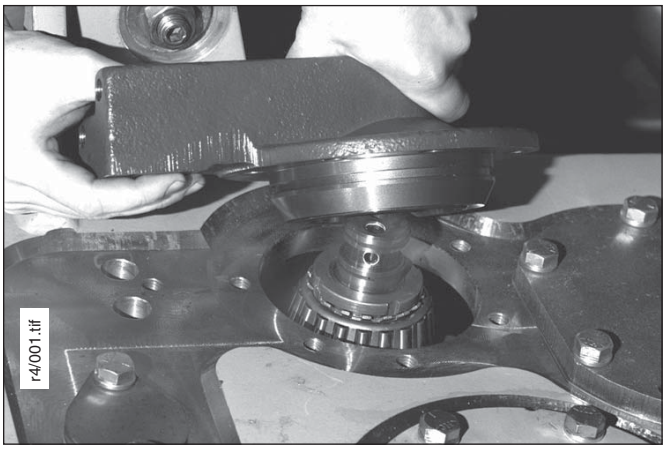
25. Use dial indicator to check pinion-to-bevel gear backlash. Backlash should be 0.006-0.014 in. (0.152-0.356 mm). If less than 0.006 in. (0.152 mm) remove shims from right-hand bearing retainer as required. Add same amount to left-hand retainer to maintain endplay (preload). RH and LH shims are not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

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

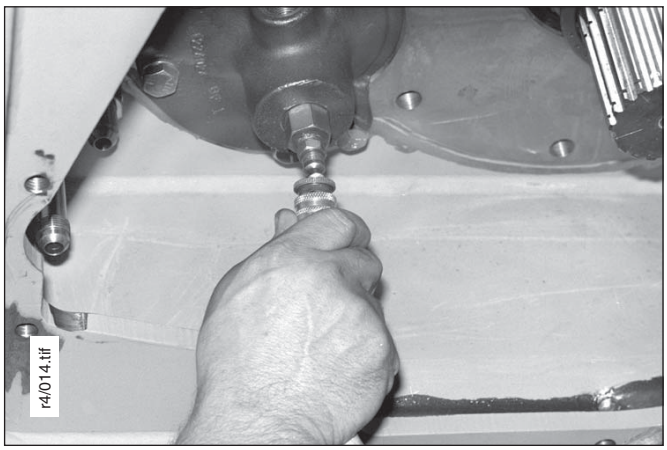
26. Remove both bearing retainers and install the cast iron seal rings. Ensure seal rings can freely rotate after installation.



27. 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.

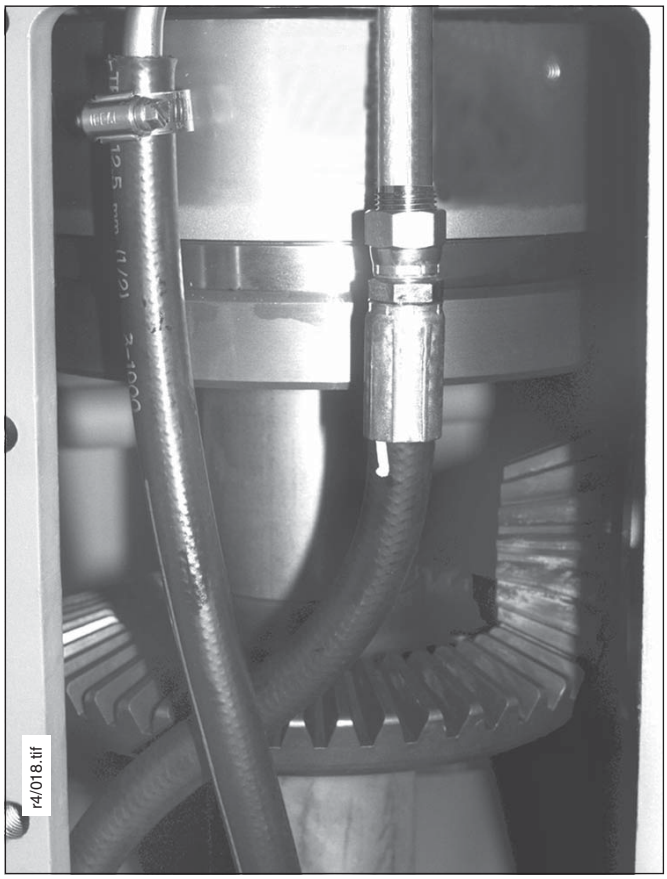


28. Apply air pressure to oil port on each end of the shaft and check clutch piston for movement. When air pressure is applied piston should move approximately 1/8 inch (3 mm) to 3/19 inch (5 mm).



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

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

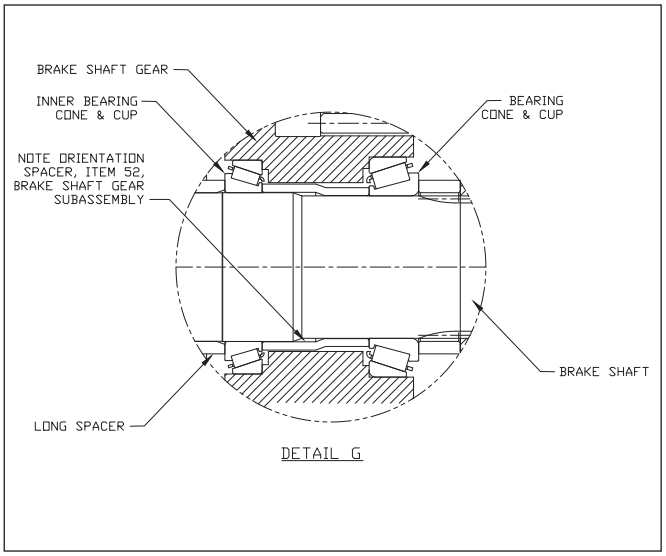


Rebuilding & Installation of Parts Instructions for Repair of Reverse Clutch Gear

1. Start with the winch laying on the left hand side with blocks on either side of the drum nut to level winch. This should be the position the winch was at from disassembly of winch.

2. Rebuild winch with the new and replacement parts as shown below with Bill of Materials, Figure 4-15.

3. Place left hand brake gear, long brake shaft spacer and new spacer, item 52, (leave off the cone part of bearing off of the smaller diameter gear side) (See Figure 4-14) into winch. Note the orientation of spacer as shown in DETAIL G. Center up parts.



4. Slide the brake shaft through the parts and the spline of the left-hand brake gear. May use a dead blow hammer to tap shaft to help it through the spline of the left hand brake gear. Bottom out the spline of the brake shaft on the left hand brake gear.

5. Install cone part of bearing that was left off from the spacer, item 52. Install short brake shaft spacer next.

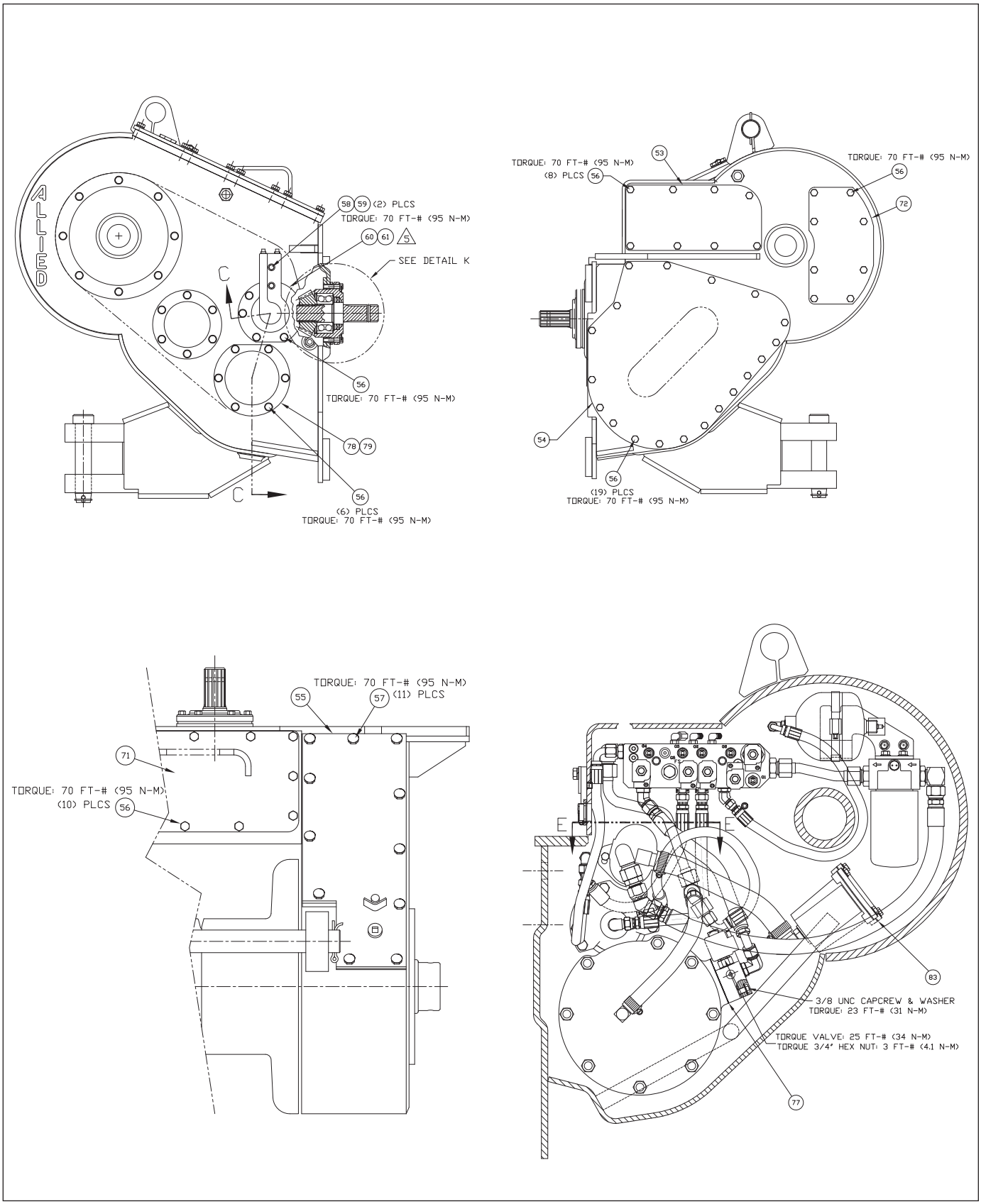


Figure 4-13 Service Kit Installed (Repair Kit Section)

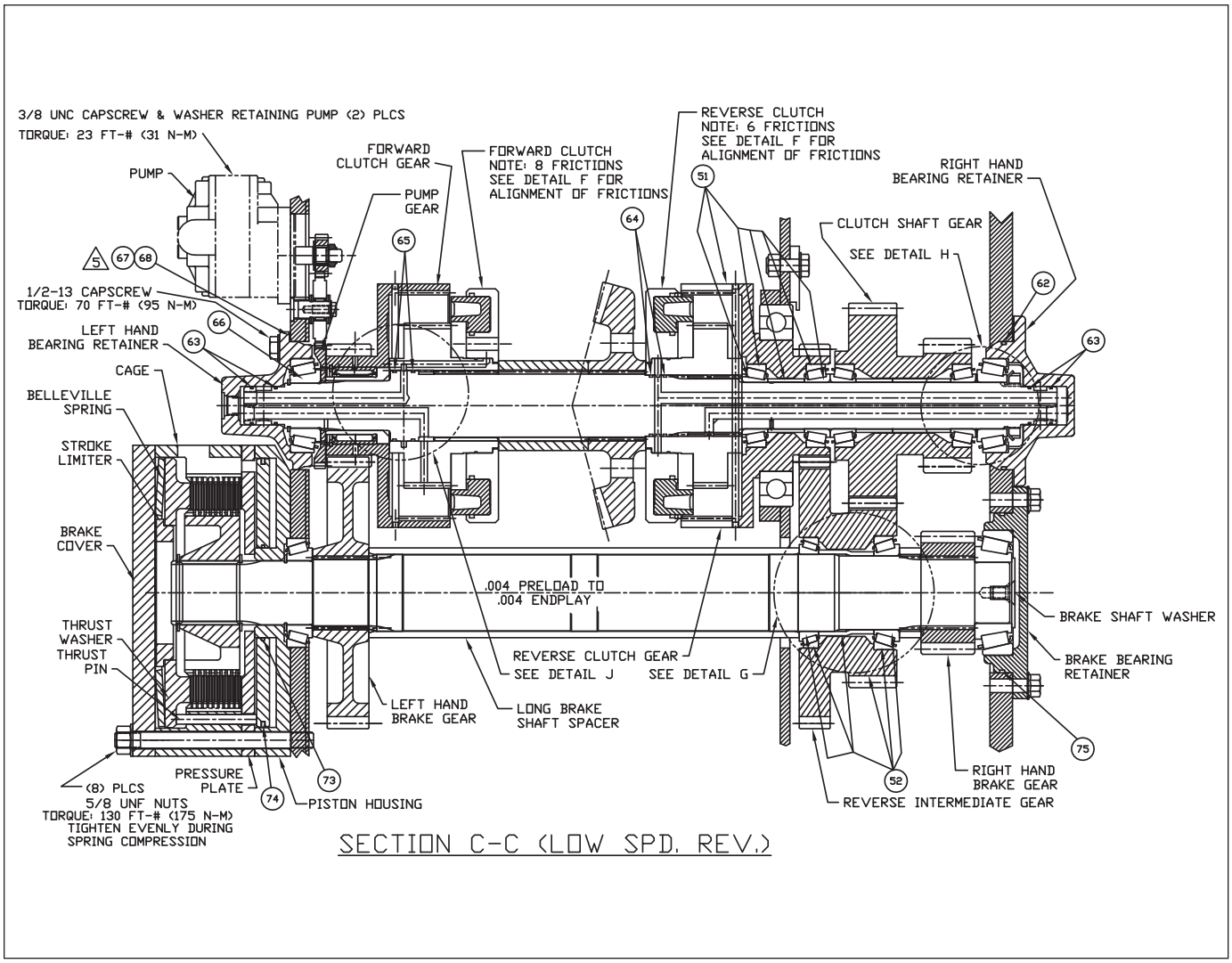
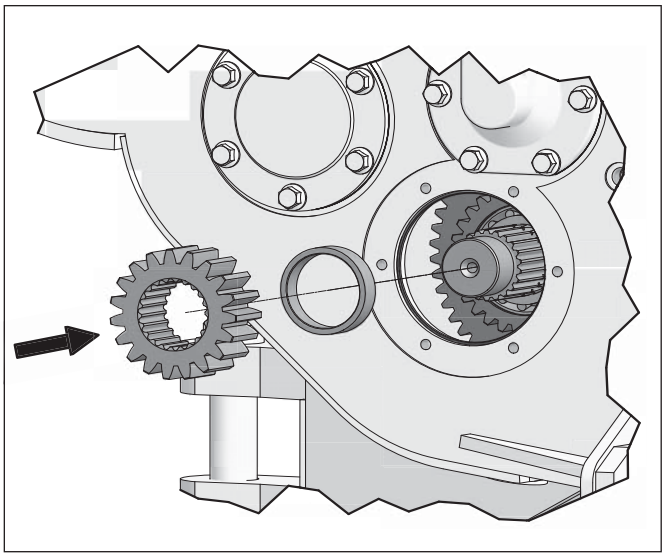


Figure 4-14 Service Kit Installed (Repair Kit Section)

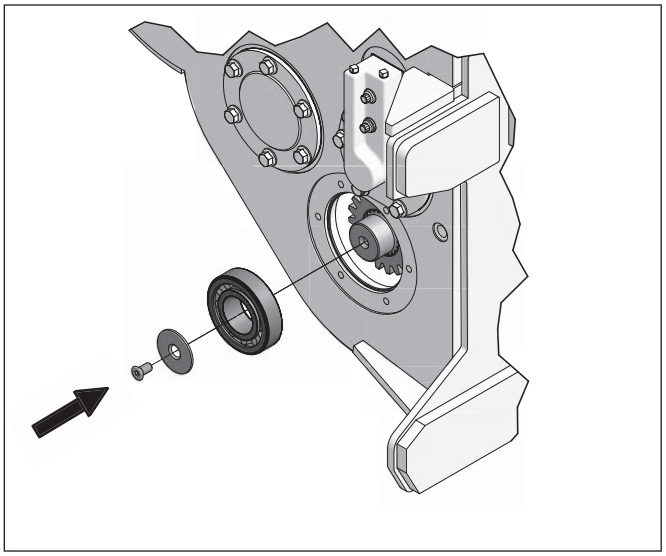
Item	Part No.	Description	Qty
51	2310503	Subassembly - Gear/Clutch Housing	1
52	2310505	Subassembly - Gear-Brake Shaft	1
53	2305271W	Gasket - Valve Cover	1
54	286044W	Gasket	1
55	142761W	Gasket	1
56	2303848W	Capscrew	56
57	2303902W	Capscrew	11
58	15158W	Washer	2
59	225264W	Capscrew	2
60	225255W	Shim - .005	4
61	225256W	Shim - .007	4
62	55289W	O-ring	1
63	95581W	Seal Ring	4
64	108877W	O-ring	2
65	39674W	O-ring	2
66	225262W	Cone - Bearing	1
67	225259W	Shim - .005	4
68	225260W	Shim - .007	4
69	169671W	Capscrew - SPL	6
70	67355W	Lockwire	6
71	253812W	Gasket - XMSN Cover	1
72	2304709W	Gasket - Filter Cover	1
73	79979W	O-ring	1
74	133927W	Ring - Piston Seal	1
75	60988W	O-ring	1
76	1314435W	Shim - .025	2
77	196022W	Gasket	1
78	134081W	Shim - .005	4
79	134082W	Shim - .007	4
80	134078W	Shim - .005	4
81	134079W	Shim - .007	4
82	79389W	Seal - Oil	1
83	2300935W	Gasket	1

Figure 4-15 Bill of Materials

6. Install right hand brake gear onto shaft.



7. Install top bearing cone onto end of shaft.



8. Install right hand bearing retainer with a loose fit of 1/8" from the machined frame. Do not include shim pack & O-ring on retainer. Use temporary cap screws (one of the discarded ones from disassembly). Do not tighten to final torque at this time.

9. Rotate winch on right hand side. If winch is already on right hand side, this step could be done first - prior to brake shaft installation.

10. Install bearing next to the left hand brake gear onto brake shaft. Install snap ring to retain bearing.

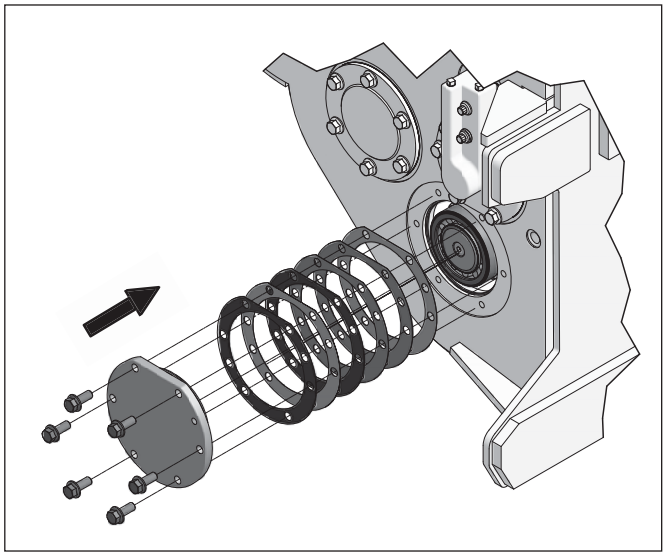
11. Install piston housing along with the two 3" long tubes & washers with the 5/8 UNF nut clamping down on two of the studs against the piston housing to secure it & retain the bearing.

12. Rotate winch on left hand side.

13. Tighten capscrews on brake bearing retainer cover to seat the brake shaft components.

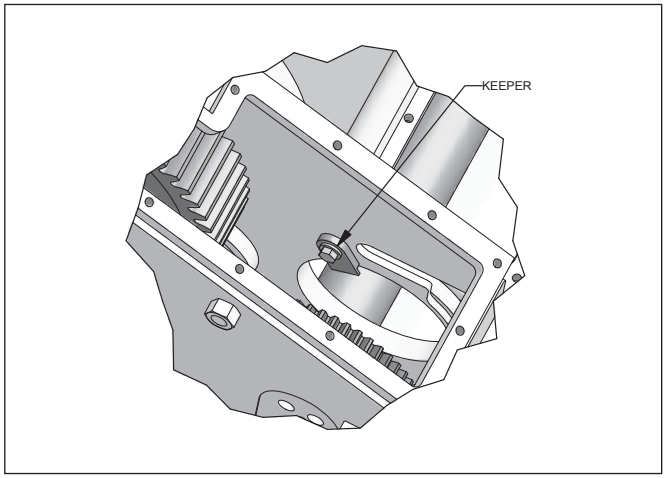
14. Loosen the capscrews previously tightened on the bearing retainer cover, then tighten finger tight only. Measure gap between retainer and winch frame in three places around retainer. Add the three measurements, and divide by 3 to obtain the average gap. Assemble shim pack 0.000" to 0.004" less than the average gap. This will place the desired preload on the brake shaft bearings. Extra shims are provided in the kit as needed.

15. Discard temporary capscrews, and use new capscrews. Put O-ring (item 75) on. Install calculated number of shims. Torque to the specified value with new capscrews.

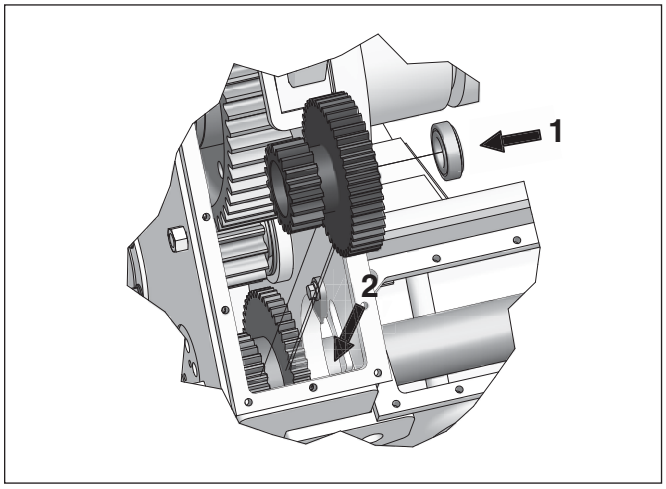


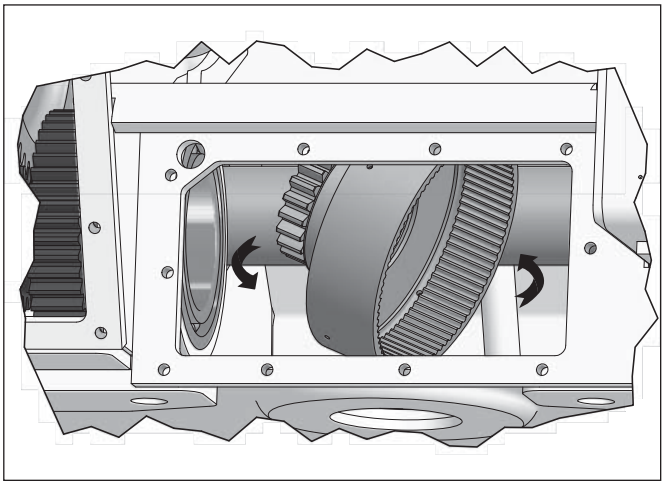
16. Rotate winch to the right hand side with blocks to allow the clutch shaft to stick out when it is assembled.

17. Check and make sure that the keeper is fixed in the position.



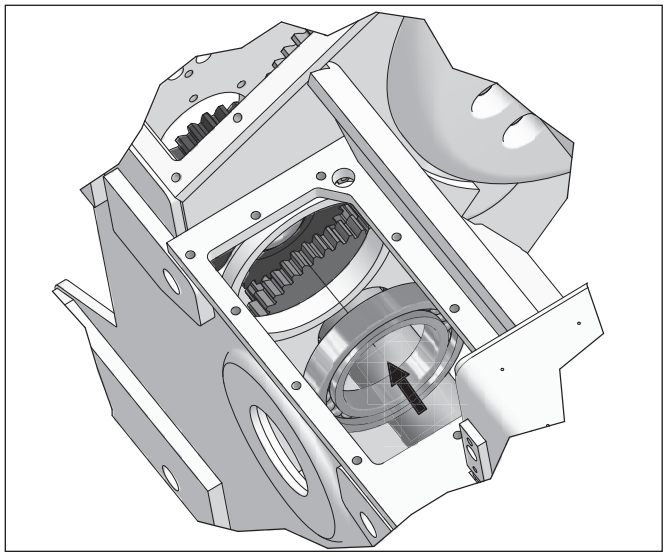
18. Install clutch shaft gear, bearings, and spacers.

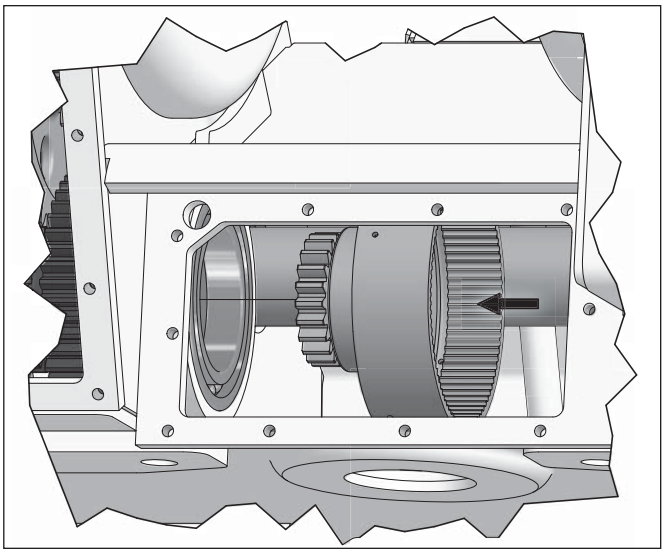




20 - 2

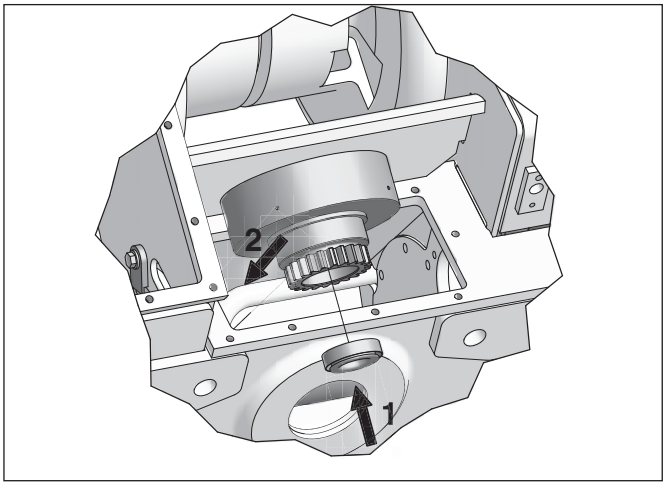
19. Install the top bearing on the right hand side of clutch shaft.



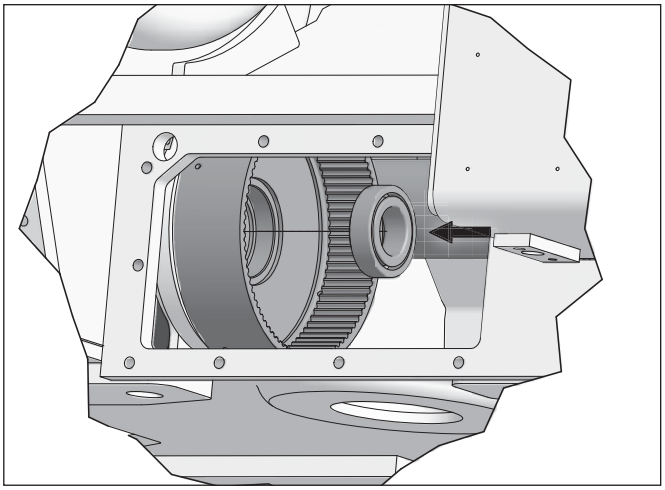


20 - 3

20. Install new reverse clutch gear, spacer, and bearings (item 51).

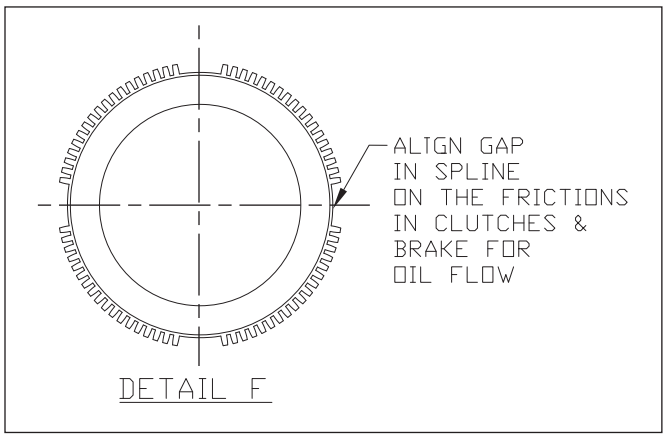


20 - 1

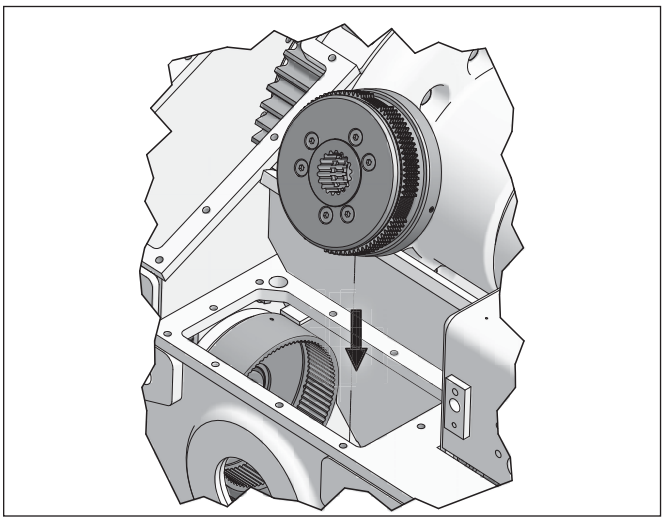


20 - 4

21. Realign frictions in the reverse clutch as shown in DETAIL F so that the gaps in the spline teeth are aligned. Note that the reverse clutch has 6 frictions.



22. Install reverse clutch into reverse clutch gear.



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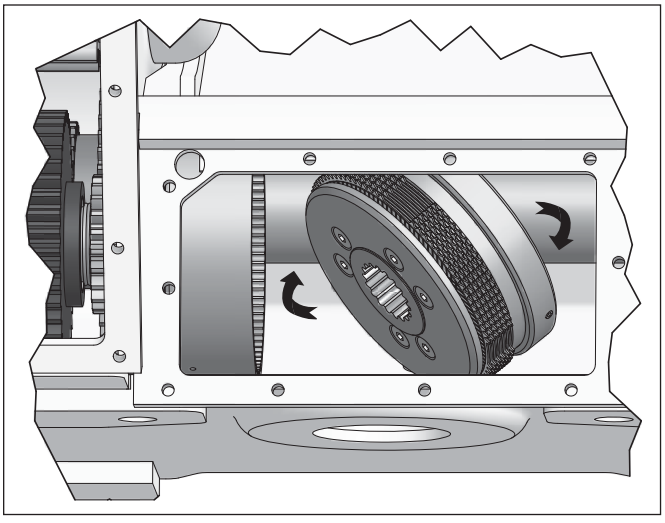

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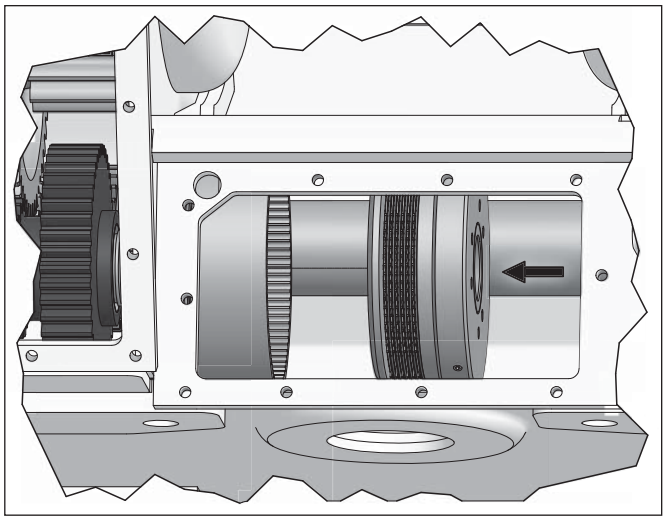
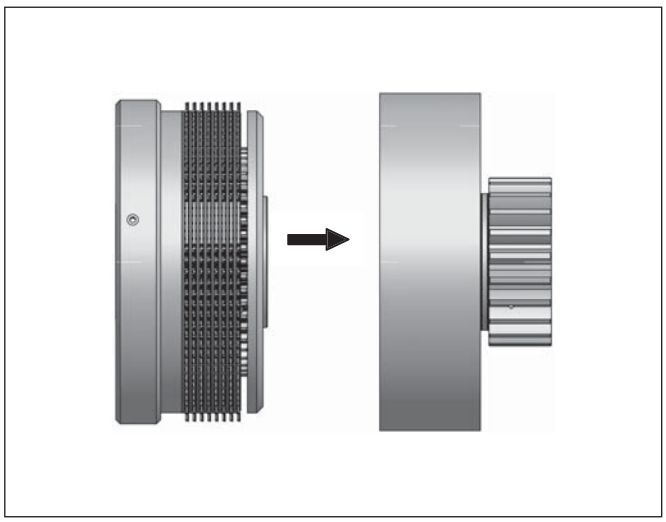
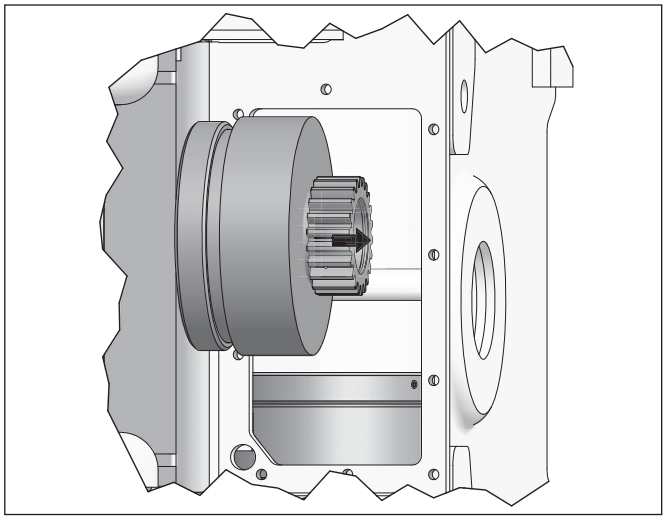


22 - 3

23. Temporarily install forward clutch with forward clutch gear assembly vertically into winch.



23 - 1



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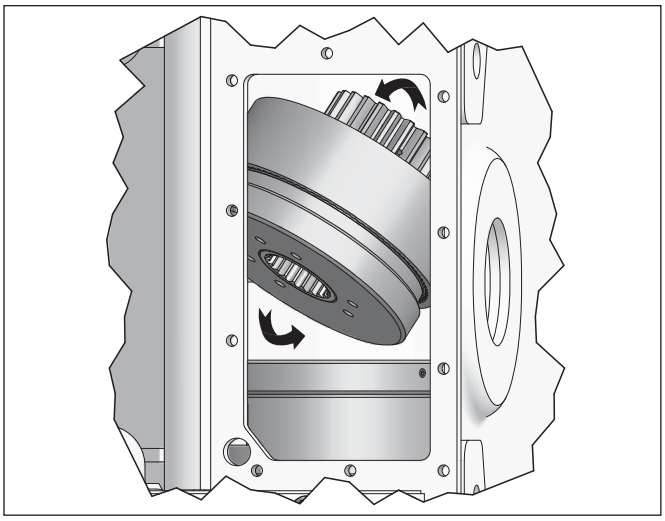

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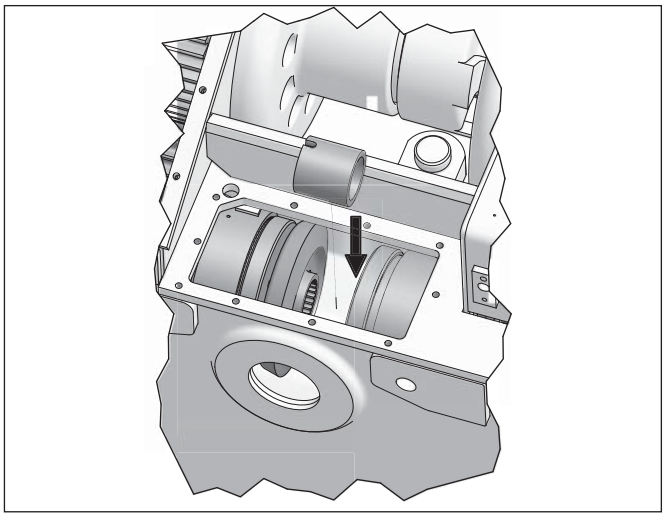
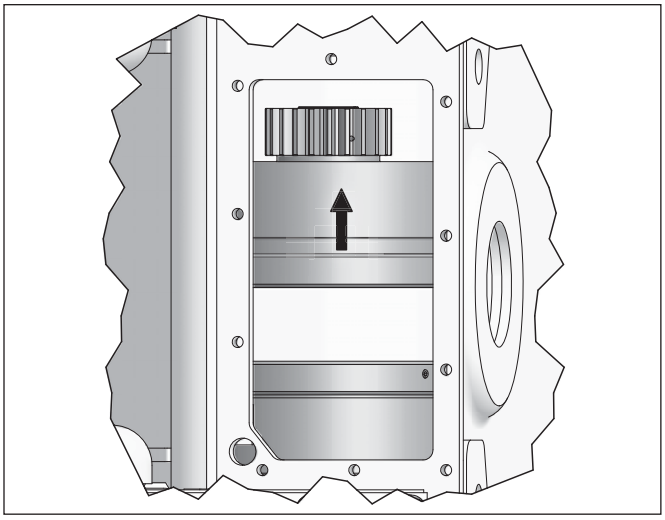


24 - 2



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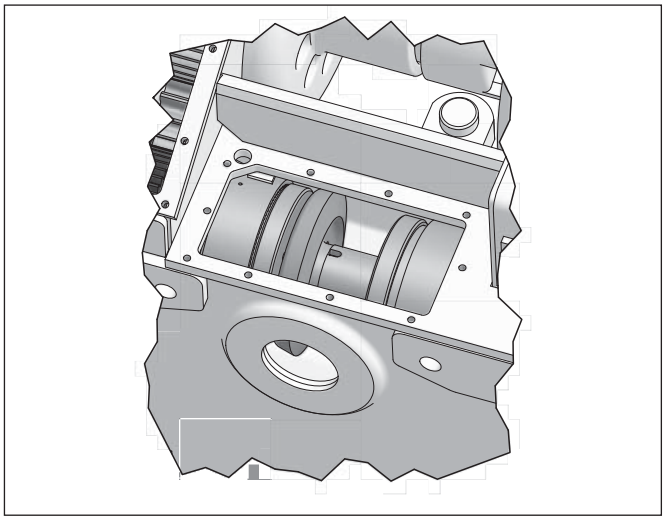
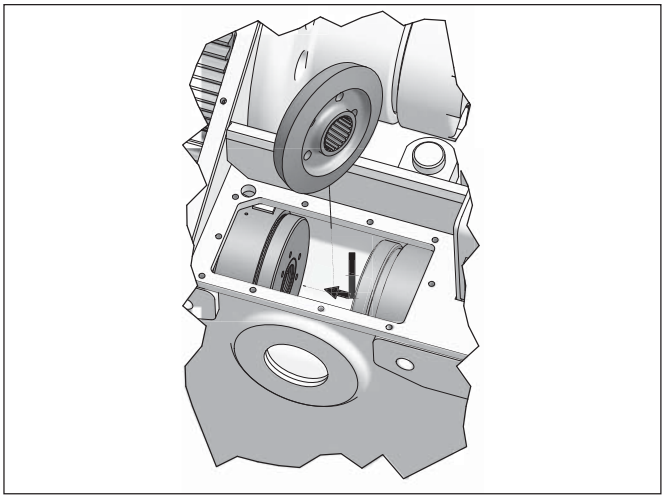


24 - 3

24. Install bevel gear and center clutch shaft spacer.



24 - 1

25. Place the forward clutch on top of the center clutch shaft spacer.

26. Pick up the forward clutch (if forward clutch gear has been removed from forward clutch, realign frictions as done with the reverse clutch as shown in DETAIL F) and center clutch shaft spacer with rope to allow installation of bevel gear. Note the orientation of bevel gear.

27. Lower parts down onto the bevel gear.

28. Push stacked parts (forward clutch & center spacer) towards the front wall of winch.

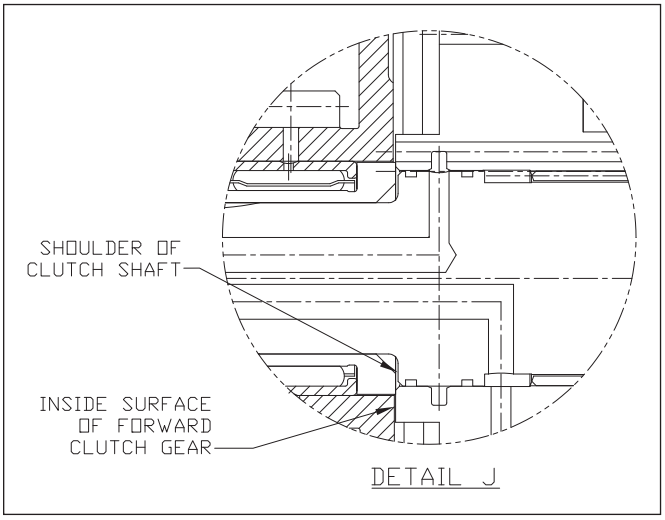
29. Install fittings that go between the center and left hand cavities. Install the fittings with the 90 degree tube first. Remember of the note at removal of how fittings are orientated.

30. Reposition stacked parts (forward clutch, center spacer, and bevel gear) over onto the reverse clutch, and recenter.

31. Make sure cutout in center spacer is visible through the winch center cavity opening to allow visibility of shaft installation.

32. Oil clutch shaft, and install O-rings (items 64 & 65).

33. Slide clutch shaft through stacked parts. When the shaft catches on splines, tap shaft with dead blow hammer to help it slide down. When shaft catches on largest spline on the forward clutch, hold onto the forward clutch, and rotate shaft to allow spline to engage. Tap shaft through. Double check centering of parts as they may drift during the process of installing of clutch shaft. Repeat process for bevel gear & reverse clutch. Tap shaft so that the shoulder is just below the inside surface of forward clutch gear as shown in DETAIL J. Make sure clutch shaft gear stays centered.



34. Install bearing carrier and bearing that are both inside of forward clutch gear along with the snap ring in the forward clutch gear to retain the bearing and retainer. May have to lift up on the forward clutch to allow installation of the snap ring.

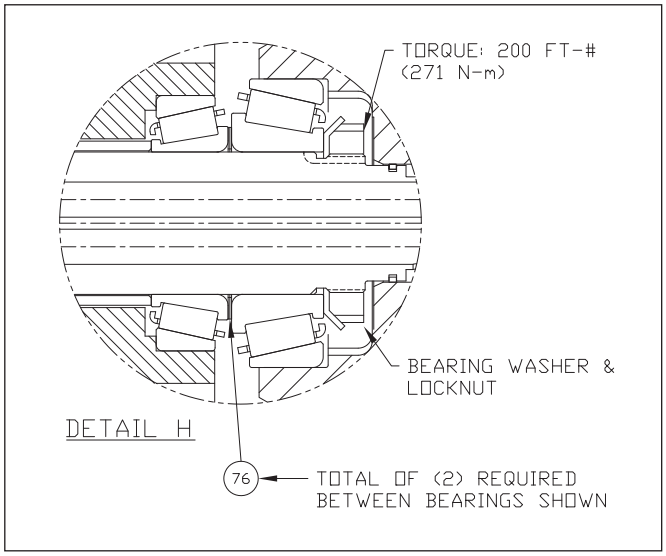
35. Install pump gear and top bearing (with new bearing cone item 66).

36. Rotate winch so top of winch is up.

37. Install the two spacers in clutch shaft gear (on the right hand side).

38. Install shims (item 76) as shown in DETAIL H.

Note: only a total quantity of two is required, winch may have already had these shims previously installed, do not install more than two.



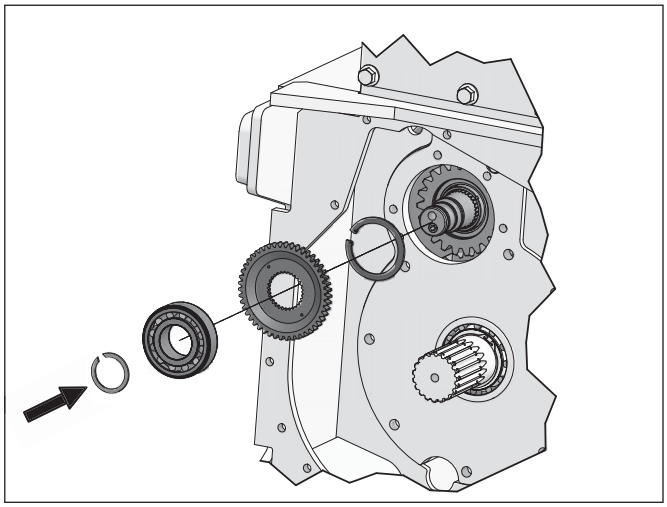
39. Install the top bearing on right hand clutch shaft.

40. Use a prybar to push clutch shaft gear to the left.

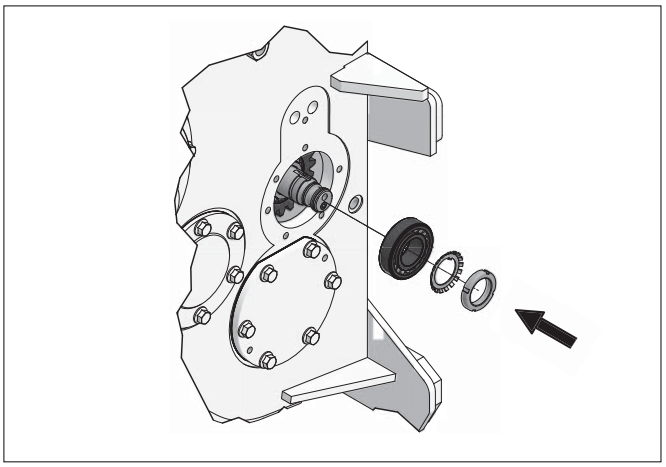
41. Install bearing lock washer.

42. Apply antiseize to bearing nut.

43. Install bearing nut, but do not torque down to specified torque.



44. Install snap ring on left hand side of clutch shaft.



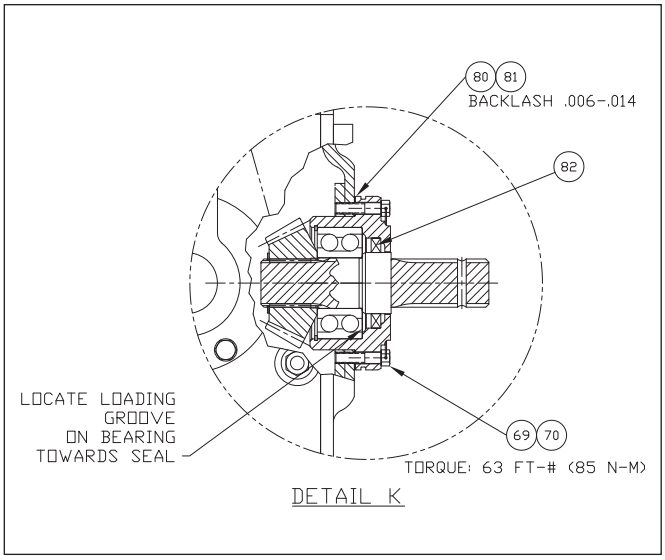
45. Align pump gear with pump idler gear to avoid binding or laying on top of each other.

46. Torque bearing nut to specified torque.

47. Install carbon seal rings (item 63) on clutch shaft (two on each end).

48. Remove brake piston housing.

49. Install new oil seal (item 82) in PTO bearing carrier.

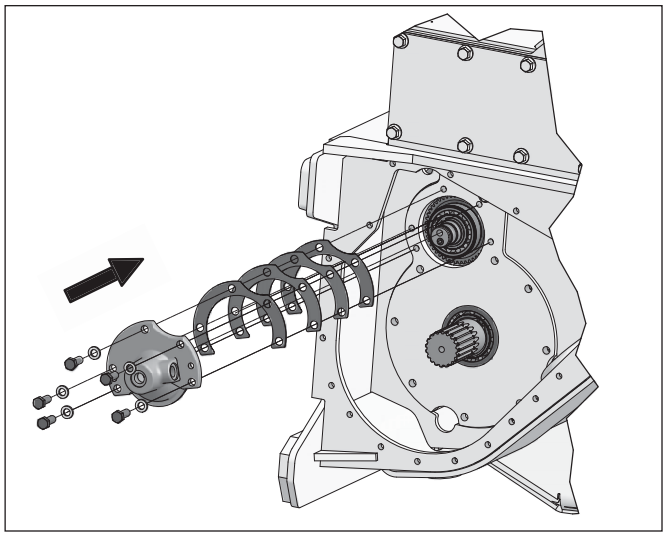


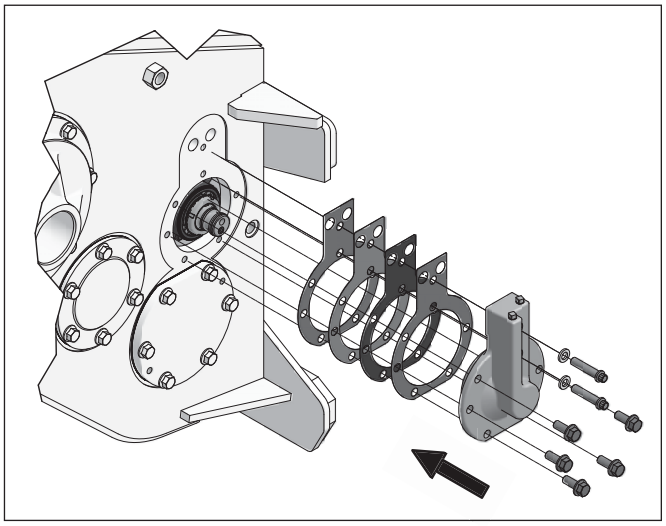
50. Note orientation of bearing with loading groove on bearing towards seal.

51. Place the carrier on the shaft, taking care not to damage the seal.

52. Place bevel pinion on shaft, and secure with snap ring.

53. Install left hand & right hand clutch shaft bearing retainer & shims.





54. Install PTO assembly and shim pack. Add or subtract shims to get heel to heel contact with bevel pinion and gear. Additional shims are include with kit, use as necessary.

55. Use a dial indicator onto bevel gear to measure endplay. Add or subtract shims from the two clutch shaft bearing retains to obtain zero endplay. When zero endplay is obtained, subtract 0.000” to 0.004” of shim(s) from the retainers. This will provide the desired preload on the clutch shaft. Extra shims are provided in the kit as needed.

56. Torque down to the specified torque for the left hand bearing retainer.

57. Remove right hand bearing retainer, and place a bead silicone on retainer machined surface. Place the calculated number of shims on retainer. Place another bead of silicone on the top shim. Install O-ring (item 62). Install bearing retainer, and torque down capscrews.

58. High tooth contact on the pinion-to-bevel gear indicates pinion is too far out. Use Prussian blue and rotate the PTO shaft to check the gear contact. Set the pinion to the correct depth by removing shims from the carrier.

59. By adding or subtracting shims from the left hand and right hand bearing retainer will affect pinion-to-bevel gear backlash. Use dial indicator to check pinion-to-bevel backlash. Backlash should be 0.006”-0.014”. If less than 0.006” remove shims from right-hand bearing retainer as required. Add same amount to left-hand retainer to maintain endplay (preload). Right hand and left hand shims are not interchangeable.

60. Remove PTO assembly. Place a bead of silicone onto bearing retainer surface of the PTO assembly. Install shims onto bearing retainer. Place another bead of silicone onto top shim. Reinstall PTO shaft assembly and shim stack. Torque capscrews to the specified torque.

61. Install brake piston housing.

62. Install seals (items 73 and 74) onto brake piston.

63. Install brake pressure plate.

64. Install thrust pins.

65. Install snap ring, hub and top snap ring.

66. Align frictions as shown in DETAIL F. Install brake frictions and separator pack.

67. Install thrust washer.

68. Install stroke limiter, belleville spring, brake cover, nuts and washers as instructed below.

Notes for installing brake stroke limiter installation: Take caution when reinstalling brake cover and torquing down 5/8 UNF nuts so that the stroke limiter does not fall behind the belleville spring (do not use an air ratchet). When tightening the nuts, if the brake cover does not mate up with the brake cage, it is possible that the stroke limiter has fallen behind the belleville spring. When this happens, remove brake cover and reposition stroke limiter. It is helpful to use a putty knife or similar tool to steady the belleville spring when installing the brake cover to help stop the stroke limiter from falling behind the spring.

69. Reinstall pump.

70. Reinstall hydraulic plumbing. Reinstall new cover gaskets and covers. Torque new cover capscrews to the specified torque listed in Figure 1-14.

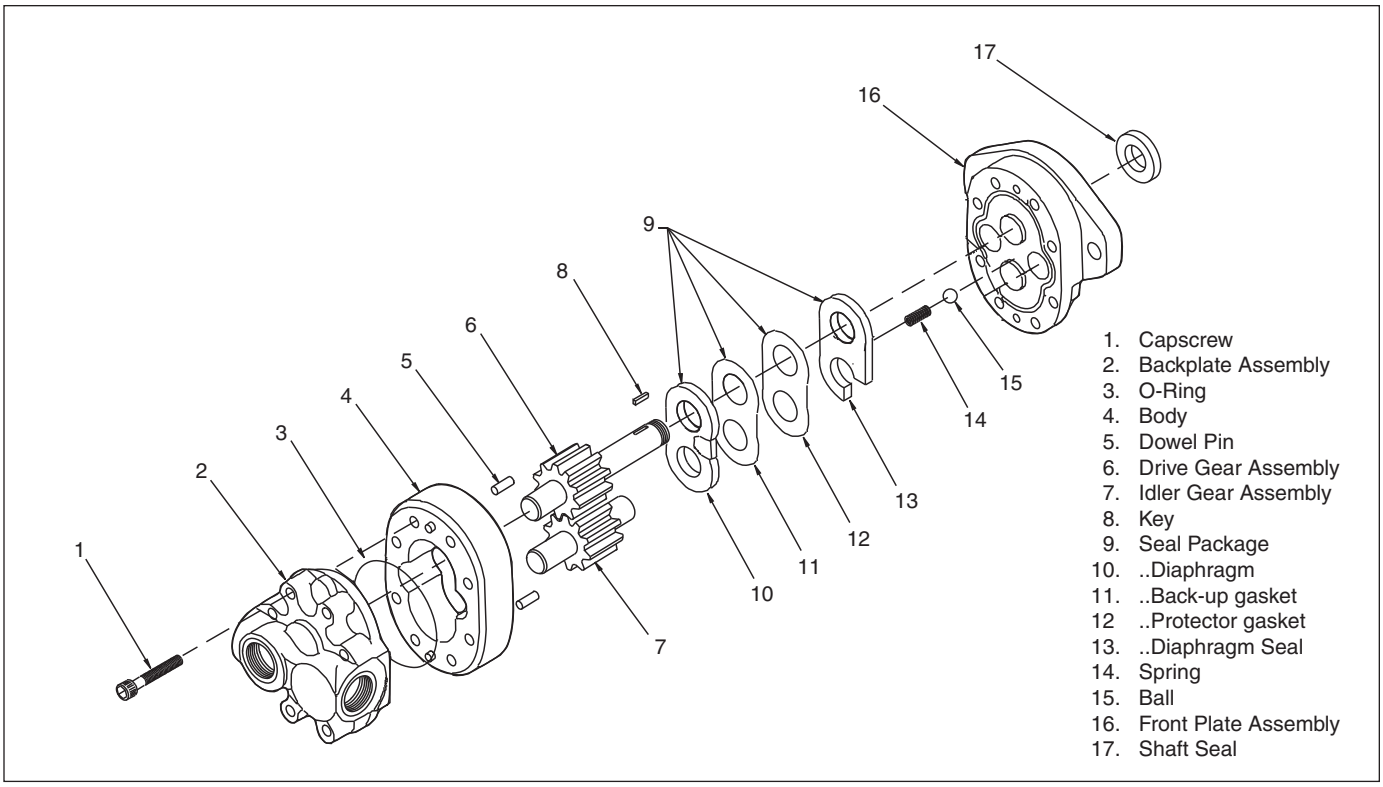


Figure 4-16 Hydraulic Pump

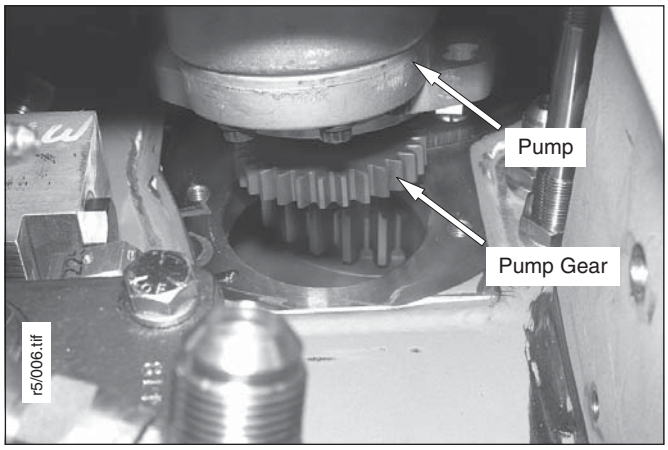
Hydraulic Pump Reassembly & Installation

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

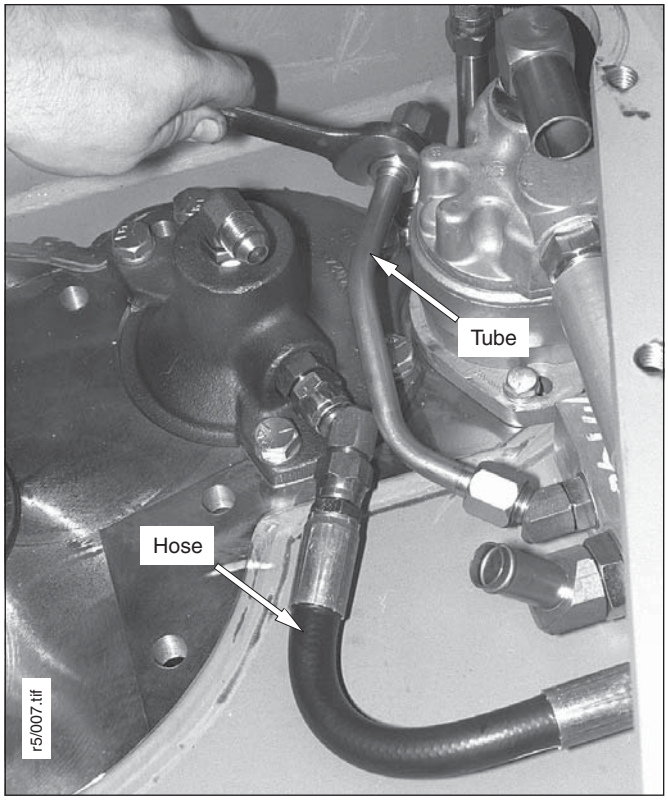
NOTE: To prime the pump, fill it with heavy oil such as SAE 90W prior to installation. This is important to protect the pump from aeration during initial operation.

Pump Installation

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



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

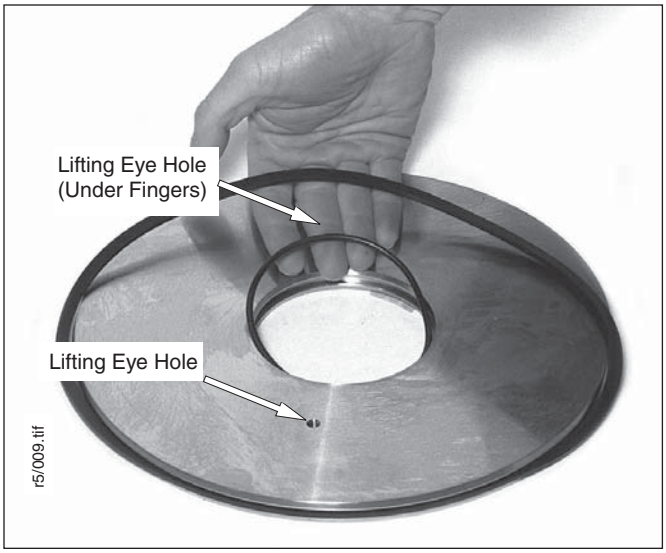


NOTE: Install hose before installing tube.

Oil Brake Reassembly and Installation

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

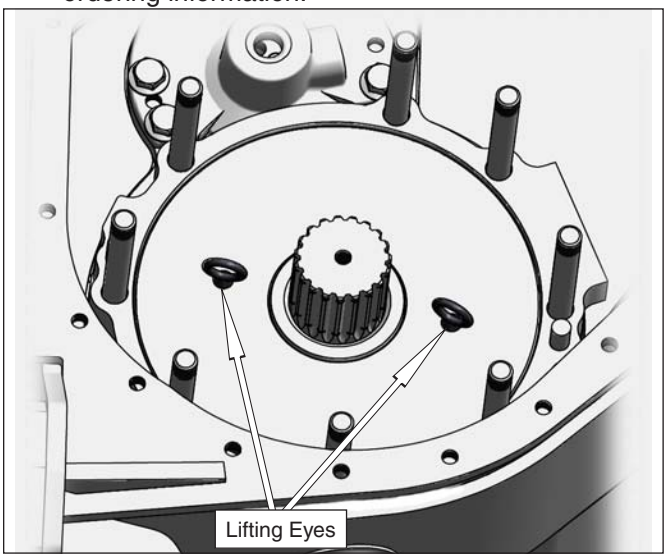
1. Lubricate and install two new O-rings in piston. It may be necessary to stretch inner O-ring to hold it in place until piston is installed in piston housing.



⚠ CAUTION

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

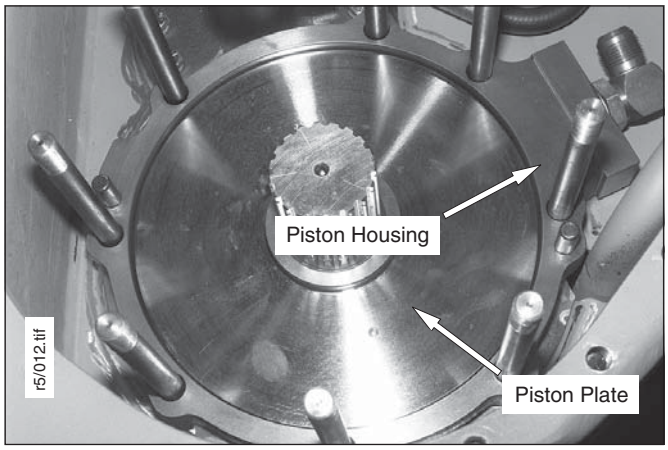
2. Install two lifting eyes (Allied P/N X-203348) into the two threaded holes (shown above) on the brake piston. Then, Install piston in housing. See “Specialized Tools” at the end of Section 4 for ordering information.



NOTE: Remove the lifting eyes after piston is in position.

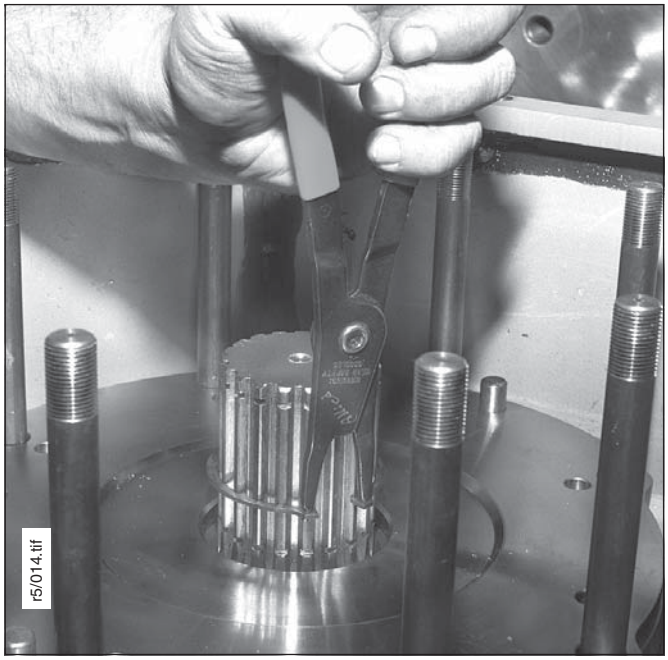
3. Ensure that the left-hand bearing is securely installed over the brake shaft.

4. Slide assembled piston and piston housing in place on studs.



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

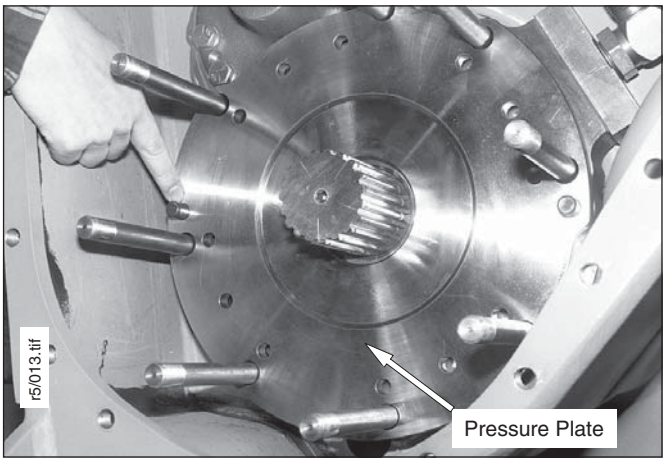
5. Install snap ring.



⚠ CAUTION

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

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

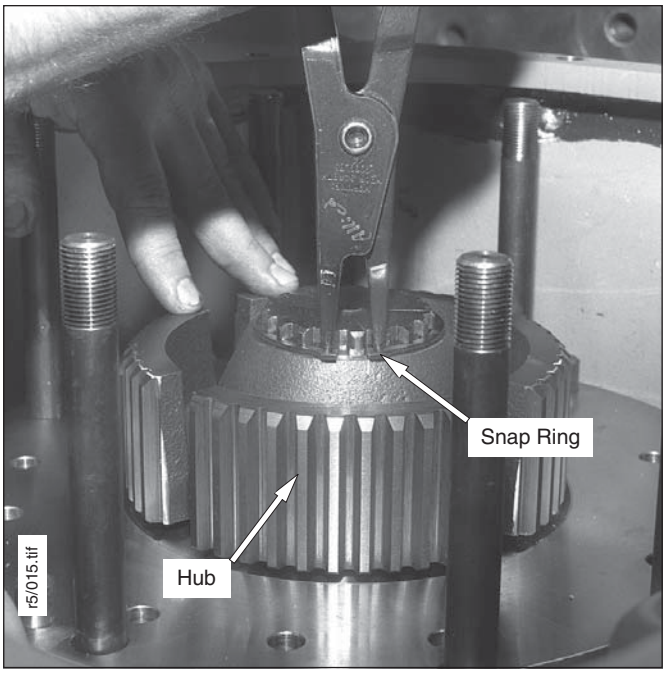


7. Install hub.

⚠ CAUTION

Do not reverse hub. Dish must face out.

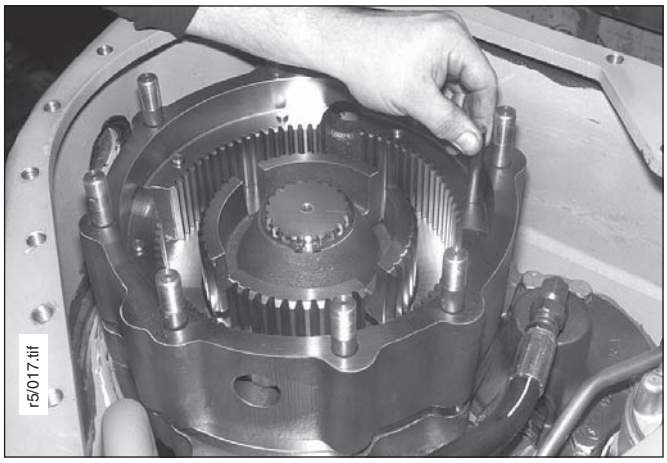
8. Install snap ring.



⚠ CAUTION

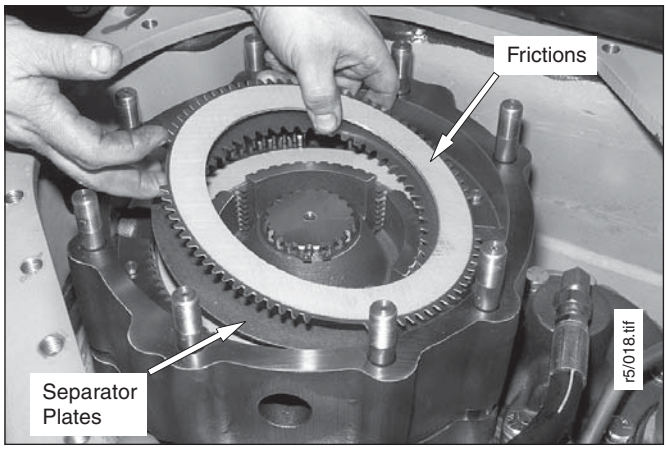
Make sure that snap ring is securely positioned in brake shaft groove.

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

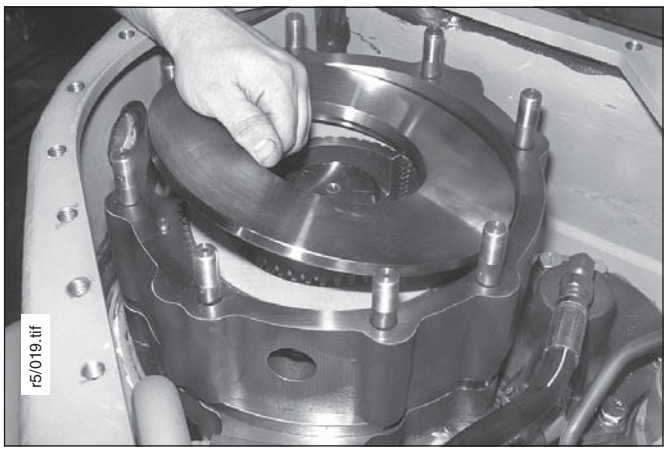


NOTE: Holes in cage are sequenced so that cage can only be installed as shown.

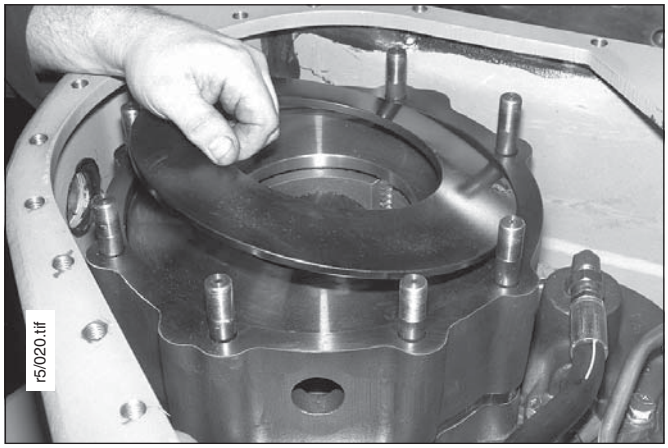
10. Install the friction discs and separator plates alternately starting with a friction disc. Align blanked-out teeth on all friction discs. 10 friction discs and 9 separator plates are used.



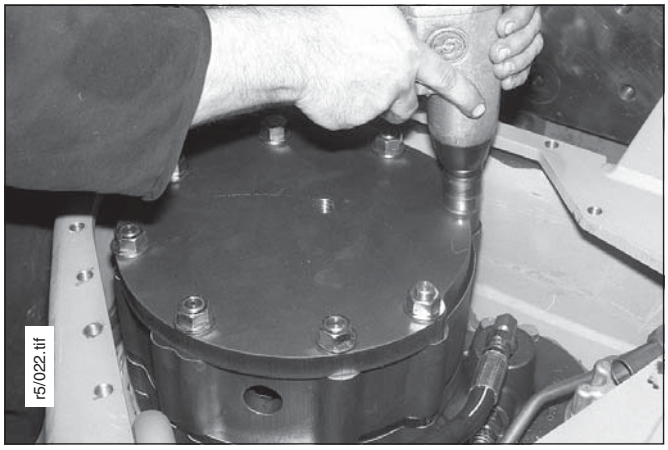
11. Install thrust ring, smooth side out.

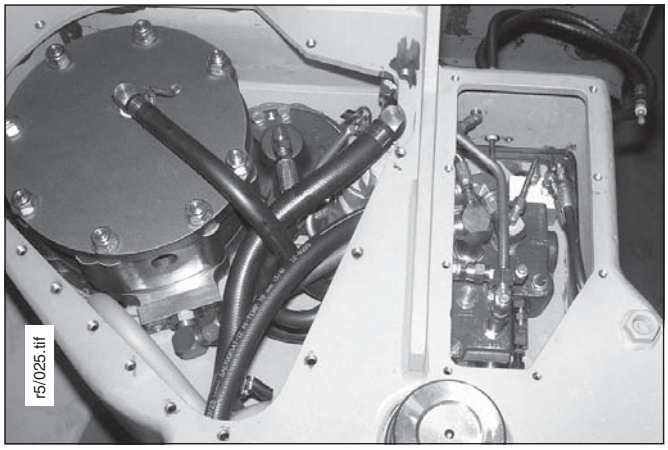


12. Install belleville spring with curved side pointing outward. The W8L winch uses one belleville spring.

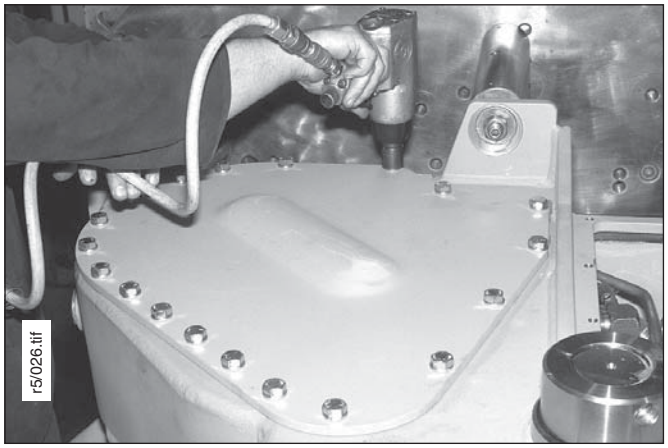


13. Install cover and secure with 8 nuts and washers. Tighten nuts alternately to 200 ft-lbs (28 kg-m). Install the brake pressure and cooling lines removed during disassembly.





14. Install winch covers and gaskets.



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PTO Shaft Reassembly and Installation

NOTE: If equipped with a gearbox refer to Figures 4-19 thru 4-22 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.
5. Assemble shim pack and install PTO shaft as described in the Clutch Shaft Reassembly and Installation section, steps 23 through 25. Coat the ring gear teeth with Prussian Blue or grease and rotate the PTO shaft to check the gear contact.

NOTE: If equipped with a gearbox, the PTO shaft assembly should be assembled and installed as described in step 23 of subsection of Clutch Shaft Reassembly and Installation. After the PTO shaft is installed, the adapter box can be placed over the PTO shaft assembly and secured with the winch.

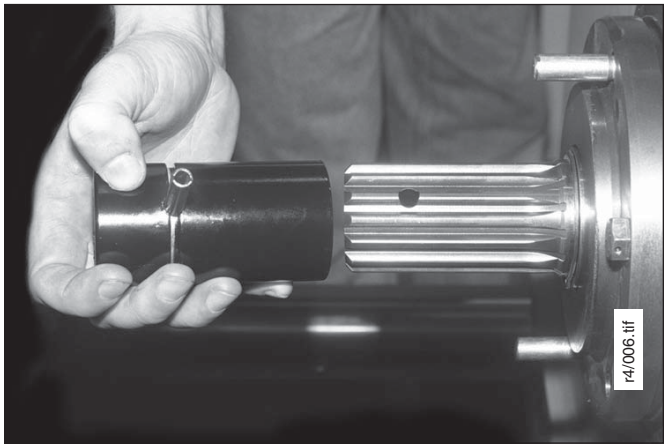
Use a pry bar to push the pinion gear away from the bevel gear.

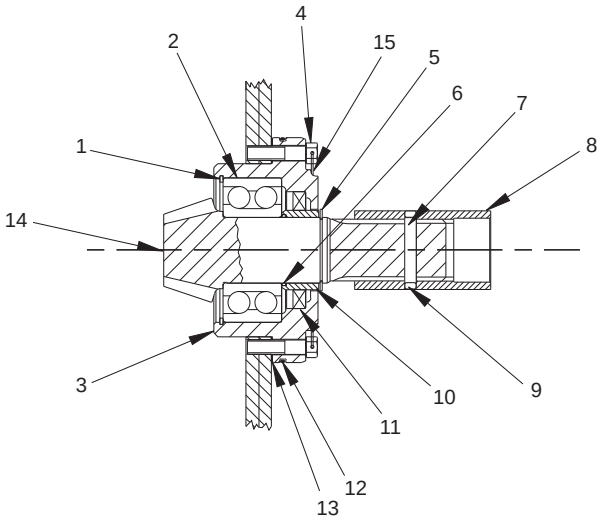
Correct/Incorrect tooth contact:

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

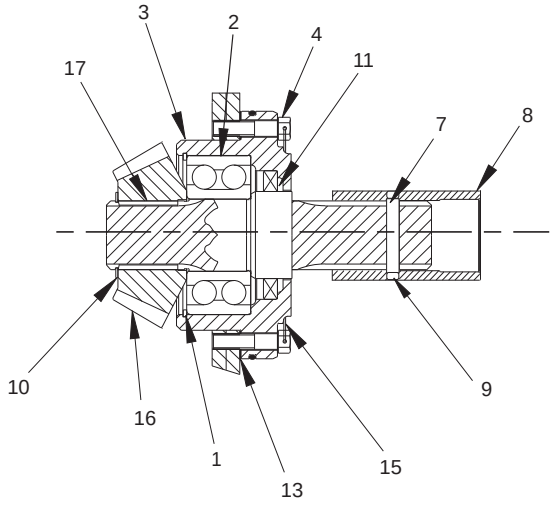
A low contact indicates pinion is too deep. Set the pinion to the correct depth by adding shims to the carrier.

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





PTO Shaft With Removable Bevel Pinion Gear



PTO Shaft With Integral Bevel Pinion Gear

1. Snap Ring
2. Ball Bearing
3. Bearing Carrier
4. Capscrew
5. Lockring
6. O-Ring
7. Pin
8. Coupling
9. Lockring
10. Spacer
11. Oil Seal
12. O-Ring
13. Shim Pack
14. PTO Shaft
15. Lockwire

Figure 4-17 PTO Shafts, Used on AW8L-1001 and Up

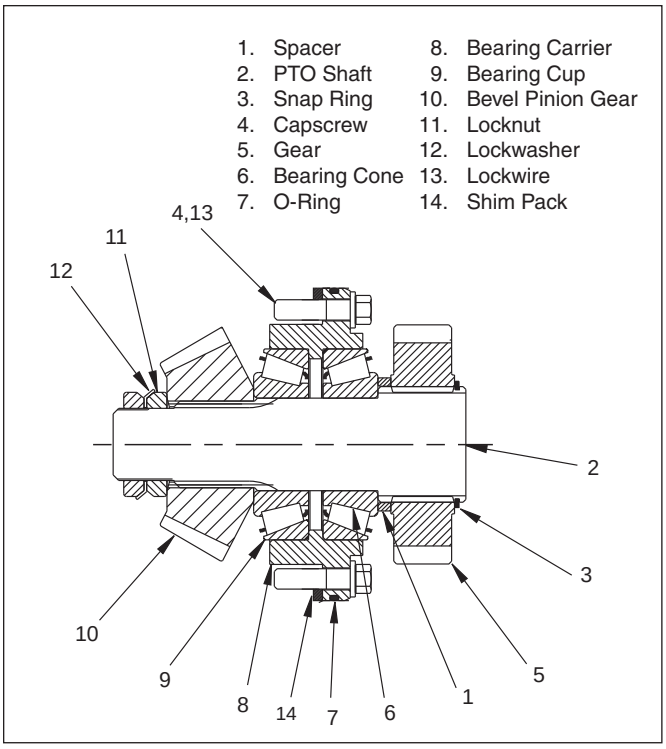


Figure 4-18 PTO Shaft on W8L for Komatsu D85ESS-2

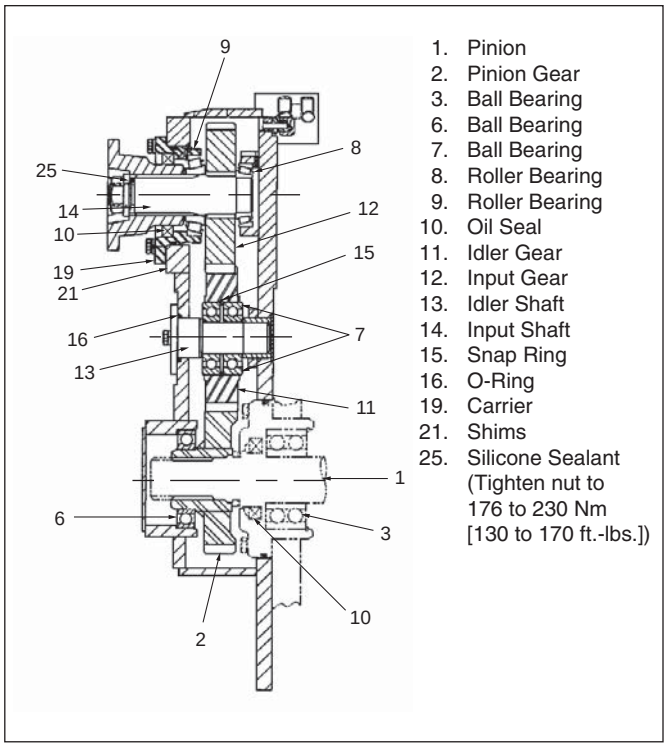


Figure 4-20 Gearbox on W8L for Komatsu D83-1 & D85ESS-2

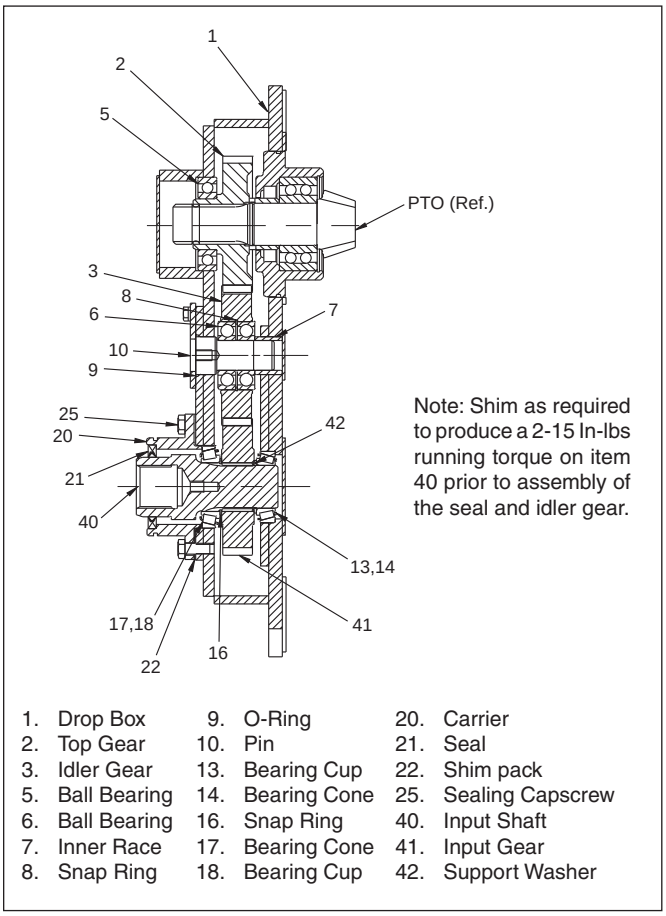


Figure 4-19 Gearbox on W8L for Caterpillar D6H/R, D7H PS, D8N, D7R & D8R

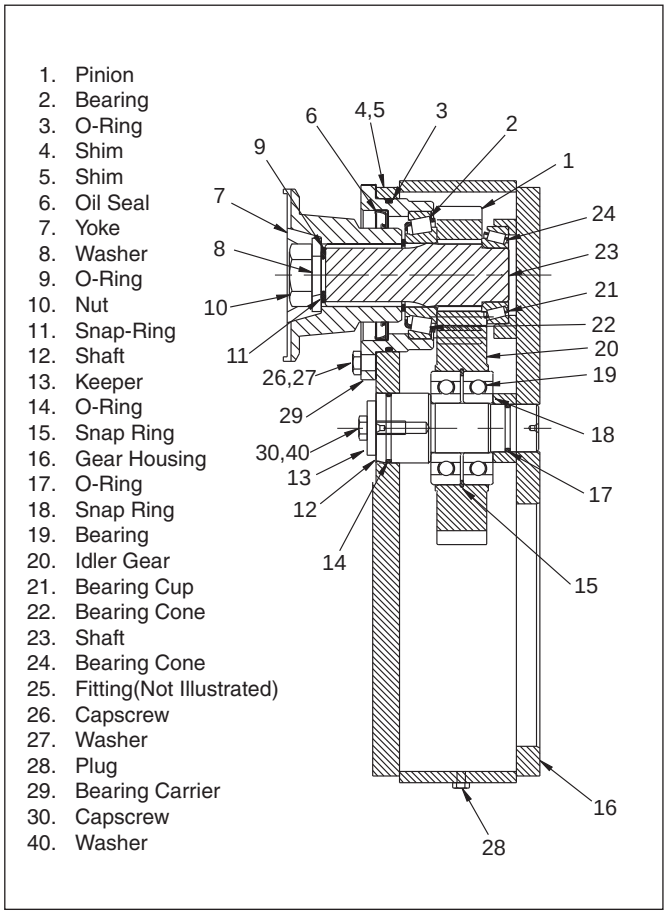


Figure 4-21 Gearbox on W8Lfor Komatsu D85ESS-2

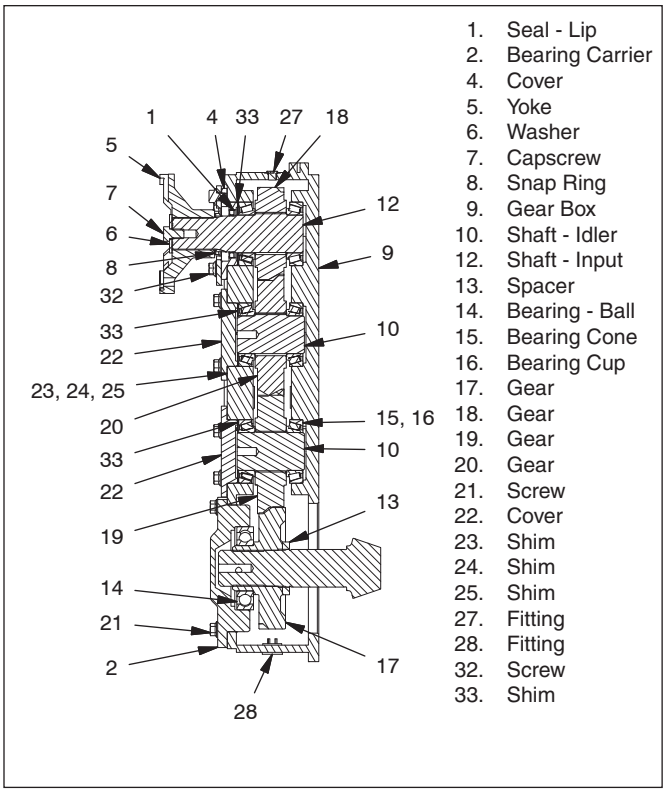


Figure 4-22 Gearbox for Komatsu D85EX-15

Winch Installation

1. Thoroughly clean the mounting surfaces on the winch and the tractor. Clean the mounting holes and hardware of dirt, grit and oil.

2. Lubricate the PTO shaft splines with grease, where applicable.

3. Check the condition of the mounting studs on the vehicle. Ensure that all studs are tight. Replace any studs that are loose, bent or otherwise damaged. Minor thread damage may be dressed with a thread chaser.

4. Loctite all studs.

5. Install mounting adapter, if required.

6. Attach sling or chain fall to lift points.

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

⚠ WARNING

Before lifting the winch, check Figure 1-14, Winch Weight, to make sure the minimum rated capacity for the slings, crane or other lifting devices excedes the load being lifted.

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

9. Loosely install the two top nuts or capscrews before the winch is fully seated against the tractor.

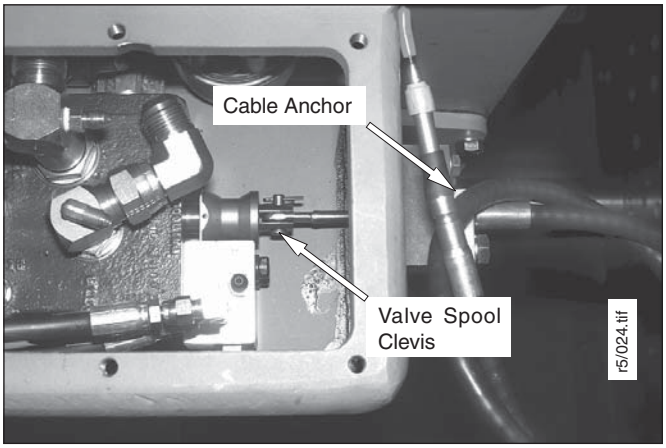
10. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts/capscrews alternately at each side of the winch to pull the winch evenly against the tractor. The two top inboard nuts should be snug then turned on to the next slot so that the cotter pin can be installed. All outboard nuts should be tightened to 500 ft-lbs (69 kg-m). Torque all nuts and capscrews as specified in Figure 1-14.

11. Install control lever assembly per mounting kit instructions.

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

13. Attach cable bracket(s) to winch. Do not tighten fasteners at this time.

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



15. Fill unit with oil.

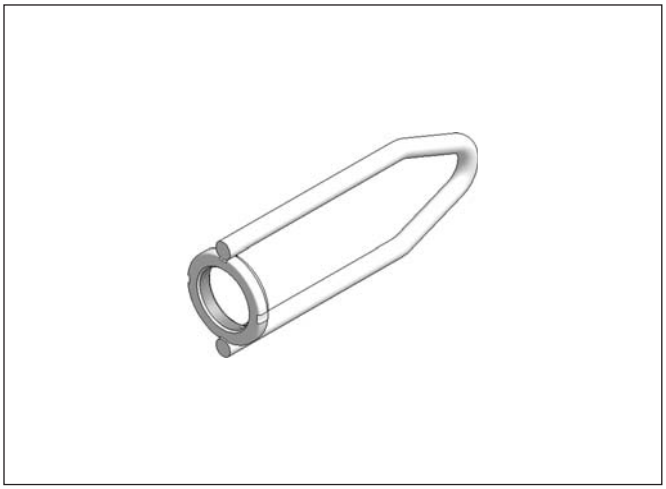
16. Adjust control cable and check hydraulic pressure settings as described in subsections of Service in Sections 2 and 3.

17. After winch installation, remove top cover and pry pinion towards tractor with a prybar to ensure the pinion is not jammed against the ring gear. This avoids excessive noise during winch operation.

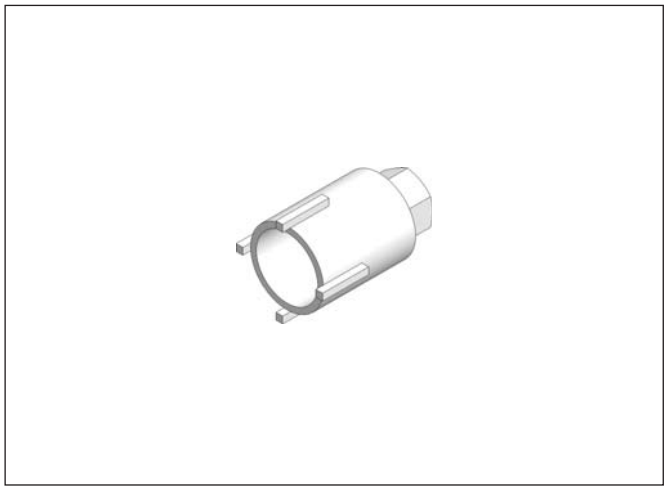
NOTE: Pressure checks in accordance with Figures 2-22 and 3-18 should be taken with hydraulic oil at operating temperature.

Specialized Tools

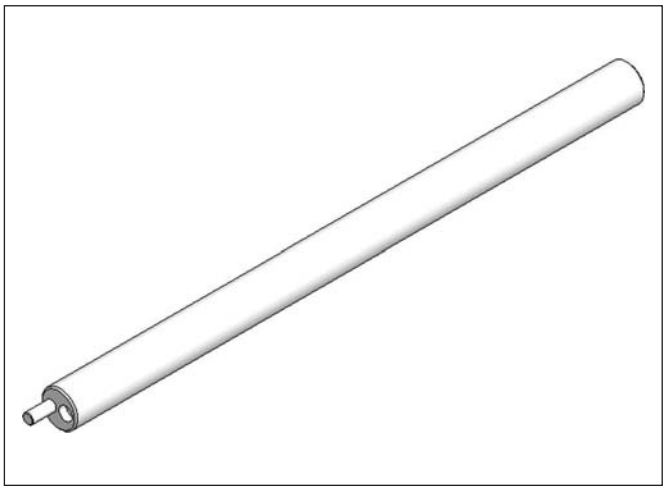
Order the following specialized tools for disassembly and reassembly of your winch.



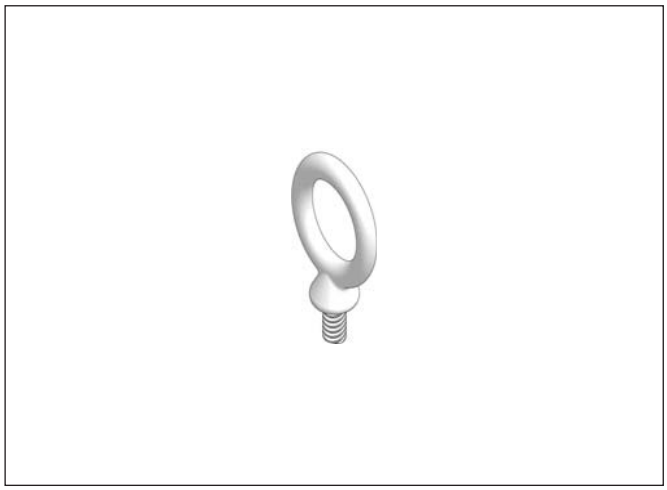
Lifting Device
P/N X-201962



Clutch Shaft Locknut Socket
P/N X-203345



Clutch Shaft Driver
P/N X-203346



Lifting Eye
P/N X-203348

For any further information on parts, service or ordering, 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, OR 97140
USA

Phone: 503-625-2560

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

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

Notes

Notes

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

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