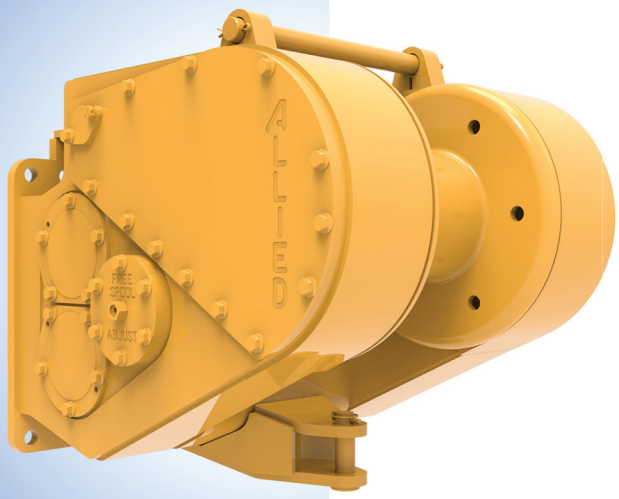
Allied® WINCH

Service Manual



Allied W5C

Power Controlled & Electronic Controlled Towing Winch

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

CUSTOMER EDITION

A PRODUCT OF Allied Systems COMPANY
SHERWOOD, OREGON USA

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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 _____

Safety Summary

General Safety Notices

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

NOTE: …

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

Safety Regulations

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

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

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

⚠ WARNING

The winch shall not be used for hoisting.

⚠ WARNING

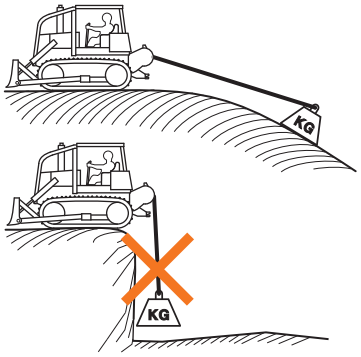
Use hearing protection when operating winches.

Operation, Inspection, and Maintenance Warnings

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

- Do not operate the winch unless you are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.
- Do not use the control levers for hand holds when entering or leaving the vehicle.

- Do not permit other people near the control area when you inspect or repair a machine.
- Never inspect, repair, or perform maintenance on a machine that is in motion.
- Inspect the winch before each use:
  - » Make sure that the controls and instruments operate correctly.
  - » Report the need for repairs immediately.
  - » Do not work with a damaged or worn wire rope.
  - » Do not use a winch that needs repairs.
  - » If the wire rope and ferrule must be removed from the drum, make sure the end of the wire rope and ferrule are controlled when the ferrule is released. The end of the wire rope can suddenly move from the drum like a compressed spring when the ferrule is released and cause an injury.
- Stay in the operator's seat when operating the winch.
- Do not stand on the vehicle when operating the winch.
- Avoid winch operation near people or other machines.
- Never stand nor permit others to stand in the bight (loop) of a wire rope.
- Do not stand nor permit others to be near the winch or wire rope when there is tension on the wire rope.
- Observe jobsite rules.
- Be in complete control at all times.
- Do not use the control levers as hangers for clothes, water bags, grease guns, lunch pails, etc.
- Do not leave the vehicle when the winch wire rope is under tension.
- Do not permit riders on the vehicle or load.
- Do not use the winch as an anchor for a double or two-part line.
- Do not pull the hook through the throat or over the drum, which will cause damage.
- When the winch is not in use, make sure the control lever is in **BRAKE-ON** position and the winch brake is applied.
- Do not use winch as a hoist. 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 599006W.
- 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 3-13 in Section 3.
- 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 USA

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.

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.

Contents

(continued on next page)

Contents (continued)

Notes

General

Introduction

This service manual is for the W5C winch. The following information is included in this manual:

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

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

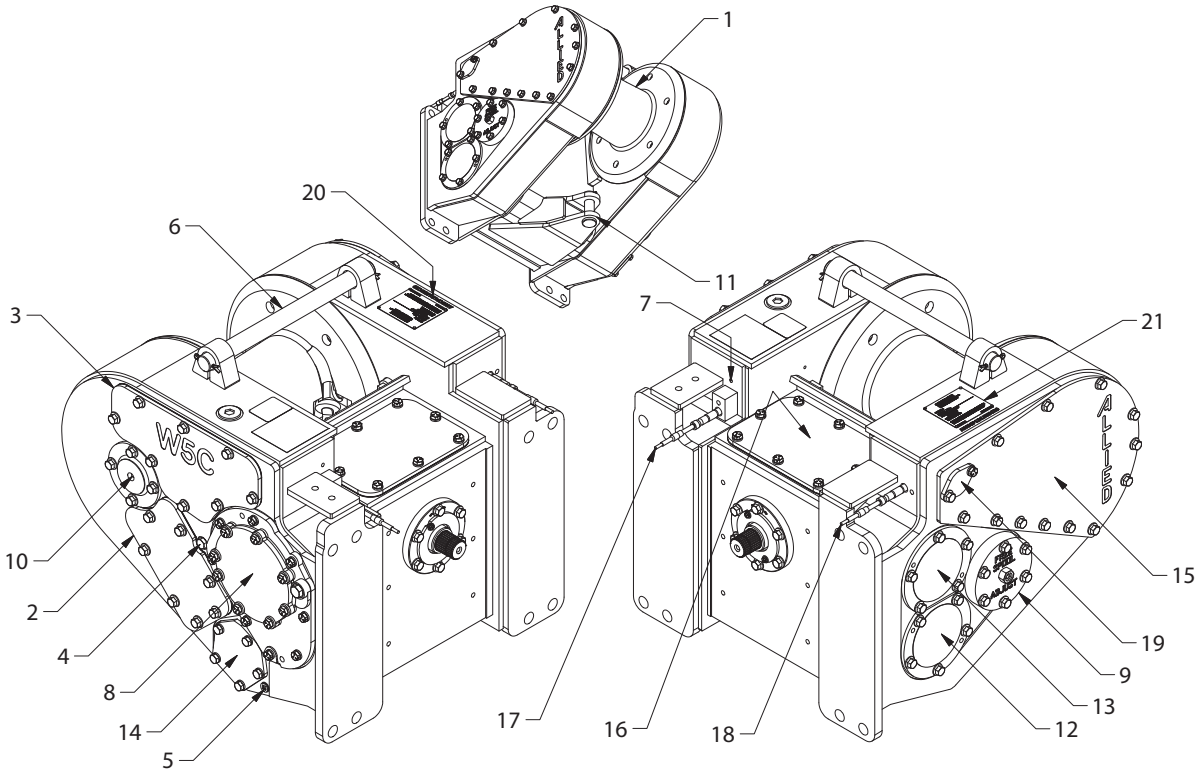
Section 3. Service provides a guide for periodic maintenance, checks and adjustments.

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

Description

The W5C 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 design of the winch case permits different arrangements of PTO assemblies to fit different tractors that use this winch.

The W5C winch has **BRAKE-OFF** and **FREESPOOL** functions. The **BRAKE-OFF** and **FREESPOOL** functions permit the wire rope to be pulled from the drum.



1. Drum
2. Access Cover for Filter
3. Access Cover for Hydraulic Valve and Oil Fill
4. Plug to Check Oil Level
5. Plug to Drain Oil
6. Tie Bar
7. Breather
8. Oil Brake
9. Bearing Retainer for Intermediate Shaft and **FREESPOOL** Drag Adjustment
10. Right Side Drum Shaft
11. Draw Bar
12. Bearing Retainer for Idler Shaft
13. Bearing Retainer for Brake/Clutch Shaft
14. Access Cover for Hydraulic System Strainer
15. Access Cover for Drum Gear
16. Access Cover for Ring and Pinion
17. Hydraulic Control Cable
18. **FREESPOOL** Control Cable (Cable Controls Only)
19. **FREESPOOL** Cover
20. Serial Number
21. Nameplate

Figure 1-1 W5C Winch

Identification - Unit

Allied Winch S/N Nameplate Data For Tractor Mountings

A W5C P 1 B 1555 C29

Manufactured By
A = Allied Systems Company

Winch Model

Type Drive
P = Power Controls
E = Electronic Controls

Gear Ratio Code
1 = 35:1
2 = 66:1
3 = 100:1
4 = 28:1

Internal Options
Power Forward and Reverse with Freespool = B
Power Forward and Reverse, Freespool and Underwind = U

Sequence Number

Tractor
See Figure A

Notes: **1.** In addition to the serial number plate, the serial number is stamped on the top right-hand side of the frame.

2. Circled numbers in **Figure A** indicate possible gear ratios. **Figure B** indicates the pump rotation, counter clockwise (CCW) or clockwise (CW).

3. Pump rotation affects hydraulic plumbing.

Figure A - Tractor Identification and Gear Ratio

Tractor Make Model and Starting Tractor Serial Number Where Applicable							
CODE	A Fiat-Hitachi/ New Holland	C Caterpillar	E John Deere	H Dresser/ Dressta	K Komatsu	R Case*	V Ranger
27					D41E-6 ②③		
28		D5N** (Mechanical Tractor Controls) ②③					
29		D5M, D6M PS ②③					
31							H67C ④
35				TD12B/C ②③		1150D/E/G ②③	
36					D53, D58, D63 ②③	1150H ②③	
360		D4H Series I & II ②③					

(Continued on next page)

Identification - Unit

Allied Winch S/N Nameplate Data For Tractor Mountings

Figure A - Tractor Identification and Gear Ratio

Tractor Make Model and Starting Tractor Serial Number Where Applicable							
CODE	**A** Fiat-Hitachi/ New Holland	**C** Caterpillar	**E** John Deere	**H** Dresser/ Dressta	**K** Komatsu	**R** Case*	**V** Ranger
37	New Holland DC130 ②③					1150K ②③	
370		D4H III, D5H PS, XL, LGP; 517 ②③					
38	New Holland DC150 PS ②③			TD14M ②③		1650K ②③	
381		D6H/R W/ ESCO Grapple ②③					
39	Fiat/Hitachi FD/FL10E, FD/DX145 ②③		700J ②③				
390		Challenger 65 - 69 ②③					
40	New Holland DC150 ②③		700H ②③			1650L ②③	
45			750C I & II ②③				
47		D6N** (Mechanical Tractor Controls) ②③			D61EX-12 ②③		
77		D5N*** (Pilot Hydr. Tractor Controls) ②③					

(Continued on next page)

Identification - Unit

Allied Winch S/N Nameplate Data For Tractor Mountings

Figure A - Tractor Identification and Gear Ratio (continued)

Tractor Make Model and Starting Tractor Serial Number Where Applicable							
CODE	A Fiat-Hitachi/ New Holland	C Caterpillar	E John Deere	H Dresser/ Dressta	K Komatsu	R Case*	V Ranger
78		D6N*** (Pilot Hydr. Tractor Controls) ②③					
81		D6N**** (Diff-Steer after Sep. 2005) ②③					
810		D6N Tier 4i ②③					

*** Tractors (C28 & C47) with mechanical controls,**
**** Tractors (C77 & C78) with pilot hydraulic controls, and**
***** Tractors (C81 & C810) with pilot hydraulic controls were effective with the following tractor serial numbers:**

Tractor Model	Tractor Serial Number	Tractor Code
D5N	AGG00000 to AGG01334	C28
	AKD00000 to AKD01134	
	AGG01335 and higher	C77
	AKD01135 and higher	
D6N	CBJ00000 to CBJ00399	C47
	ALH00000 to ALH00734	
	CCK00000 to CCK00499	
	ALR00000 to ALR00634	
	AKM00000 to AKM01234	
	ALY00000 to ALY01334	
	CBJ00400 and higher	C78
	ALH00735 and higher	
	CCK00500 and higher	
	ALR00635 and higher	
	AKM01235 to AKM01793	
	ALY01335 to ALY02065	
	AKM01794 and higher	C81
	ALY02066 and higher	
	Prefixes DJA, DJY, GHS, MLW & LJR	
	Prefixes PBA & PER	C810

Identification - Unit

Allied Winch S/N Nameplate Data For Tractor Mountings

Figure B - Pump Rotation

Tactor	Vehicle Code	Pump Rotation*
Case		
1150D/E/G	R35	CW
1150H	R36	CW
1150K	R37	CCW
1650K	R38	CW
1650L	R40	CCW
Caterpillar		
D5/6M PS	C29	CCW
D5N (Mech. Ctrl.)	C28	CCW
D6N (Mech. Ctrl.)	C47	CCW
D5N (Pilot Hyd.)	C77	CCW
D6N (Pilot Hyd.)	C78	CCW
D6N (Diff-Steer after Sep. 2005)	C81	CCW
D6N Tier 4i	C810	CCW
D4H Series I & II	C360	CCW
D5H PS & D4H PS Series III, XL, LGP	C370	CCW
D6H/R w/ ESCO Grapple	C381	CCW
Challenger 65-95	C390	CCW
Desser		
TD12B/C	H35	CCW
Fiat & Hitachi		
FL10E, FD10E, FD145, DX145	A39	CW
John Deere		
700J	E39	CCW
700H	E40	CCW
750C, 750C Ser. II	E45	CCW
Komatsu		
D41E-6	K27	CCW
D53, D58, D63	K36	CCW
D61EX-12	K47	CCW
New Holland		
DC150/DC150 PS; DC-130	A40/A38	CW
Ranger		
H67C	V31	CCW

* Viewing pump looking at the pump shaft.

Figure 1-3 List of Installation Drawings

W5C INSTALLATION DRAWINGS BY TRACTOR

Winch Serial Number	Description	Installation Drawing Part Number
Electronic Controls		
W5CE*B----C28	W5C CAT D5N	2310655
W5CE*B----C29	W5C CAT D5/6M	2310651
W5CE*B----C370	W5C CAT D5H	2310651
W5CE*B----C47	W5C CAT D6N	2310655
W5CE*B----C77	W5C CAT D5N	2310655
W5CE*B----C78	W5C CAT D6N PILOT HYD CNTLS	2310655
W5CE*B----C81	W5C CAT D6N	2310663
W5CE*B----E45	W5C JD 750C I & II	2310653
W5CE*B----K27	W5C KOMATSU D41E	2310652
W5CE*B----K47	W5C KOM D61EX-12 & -15	2310654
W5CE*B----R37	W5C CASE 1150K	2310662
W5CE*B----R371	W5C CASE 1150M	2314646
W5CE*B----R38	W5C CASE 1650K	2304863W
W5CE*B----R40	W5C CASE 1650L	2310664
Push Pull Cable Controls		
W5CP*B----A37	W5C NH DC 130	2306364W
W5CP*B----A38	W5C NH DC 150 PS	2304863W
W5CP*B----A39	W5C F/H FD10E/FD145	2303225W
W5CP*B----A40	W5C NEW HOLLAND DC-150	2304863W
W5CP*B----C28	W5C CAT D5N	2305621W
W5CP*B----C29	W5C CAT D5M, D6M PS	2302783W
W5CP2B----C360	W5C CAT D4H SERIES I & II	2311659
W5CP*B----C370	W5C CAT D5H	2302783W
W5CP*B----C381	W5C CAT D6H/R WITH ESCO GRAPPLE	2303465W
W5CP*B----C390	W5C CAT CHALLENGER 65-95	2304346W
W5CP*B----C47	W5C CAT D6N	2305621W
W5CP*B----C77	W5C CAT D5N	2305621W
W5CP*B----C78	W5C CAT D6N PILOT HYD CNTLS	2305621W
W5CP*B----C81	W5C CAT D6N	2310160
W5CP*B----C810	W5C CAT D6N TIER 4I	2314460
W5CP2B----E39	W5C JD 700J	2303735W
W5CP*B----E40	W5C JD 700H	2303735W
W5CP*B----E45	W5C JD 750C I & II	2303035W
W5CP*B----H35	W5C DRESSER TD12B/C	2302968W
W5CP*B----H38	W5C DRESSER TD14M	2313653
W5CP*B----K27	W5C KOMATSU D41E	2303000W
W5CP*B----K47	W5C KOM D61EX-12 & -15	2303811W
W5CP*B----R35	W5C CASE 1150E/G	2302887W
W5CP*B----R36	W5C CASE 1150H	2302887W
W5CP*B----R37	W5C CASE 1150K	2307362W
W5CP*B----R371	W5C CASE 1150M	2314370
W5CP*B----R38	W5C CASE 1650K	2304863W
W5CP*B----R40	W5C CASE 1650L	2310442
W5CP4B----V31	W5C RANGER H67C	2303490W

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 Engineering Department of Allied Systems Company.

Serial Number Codes

The serial number codes are described on page 1-2 of this manual. The serial number code is stamped on the right 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.

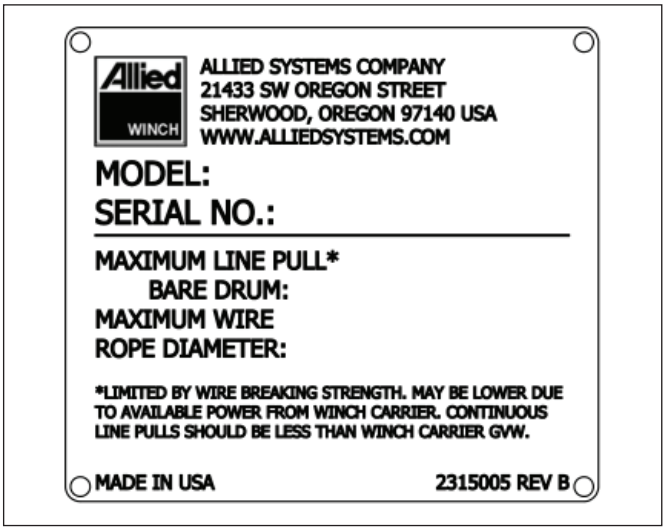


Figure 1-4 Nameplate

Wire Rope Selection

The winch can have a variety of wire rope sizes installed by the user. The maximum wire rope size is shown on the nameplate. See Figure 1-5 for approved wire rope sizes and drum capacities. The winch can create a tension in the wire rope that is greater than the strength of the wire rope. The user must be careful to select a wire rope that has enough strength and length for the job.

⚠ WARNING

During operation of the winch, the operator must know or estimate the line pull and make sure that the line pull is within the capacity of the winch and the specifications of the wire rope installed on the drum. A broken wire rope under high tension can return suddenly in the direction of the winch and cause injury and damage.

Wire Rope Diameter	Capacity
16 mm (5/8 in)	85 m (279 ft)
	129 m (423 ft)
19 mm (3/4 in)	60 m (197 ft)
	91 m (298 ft)
22 mm (7/8 in)*	43 m (142 ft)
	66 m (215 ft)

Notes:
1. Loosely or unevenly spooled line will change capacities.
2. Use flexible wire rope with independent wire rope center.
3. Ferule size: 2.0 in dia, 2 1/4 in long.

* If your winch is equipped with the optional arch, the largest wire rope diameter approved for use is 3/4 inch.

Figure 1-5 Drum Line Capacities

Tractor	Model	Pump Rotation *
Caterpillar	D4H & D5H PS Series III,XL,LGP, 517 D5M, D5N, D6M & D6N PS, D6H & D6R W/Esco Grapple Challenger D65 D75 D85 D95	CCW
Fiat-Hitachi / New Holland	FD10E FL10E FD145 DX145 DC-150	CW
Dresser / Dressta	TD12B TD12C	CCW
John Deere	750C, 700H	CCW
Komatsu	D41E-6 D53 D58 D61EX-12 D63	CCW
Case	1150D 1150E 1150G 1150H 1650K	CW
Ranger	H67C	CCW

* Rotation determined by looking at pump shaft.

Figure 1-6 Pump Rotation

Gear Train (See Fig. 1-7)

The tractor's power take-off (PTO) is used to transmit the power from the engine to the winch. The **SCH** (Self Contained Hydraulics) on the winch label indicates that the hydraulic system for control of the winch is inside of the winch case. When the PTO is operating, a hydraulic pump in the winch case takes hydraulic oil from the winch sump and sends it to the control valve (for cable control winches) or the valve manifold assembly (for electronic control winches). The control valve controls the operation of the winch. Removable covers on the winch case permit access for repairs and adjustments.

The PTO is connected to the bevel pinion assembly in the winch. The bevel pinion rotates the ring gears (bevel gear). The bevel gear is connected to an oil clutch for the **LINE-IN** (power forward) operation and another oil clutch for the **LINE-OUT** (power reverse) direction.

The power through the winch to the drum for the wire rope is controlled by a **LINE-IN** and a **LINE-OUT** clutch. When the **LINE-IN** clutch is applied, the drum rotates to pull the wire rope into the winch. When the **LINE-OUT** clutch is applied, the drum rotates to permit the wire rope to unwind from the winch at the speed controlled by the PTO rpm.

When the control lever is in the **BRAKE-ON** position, an oil brake is automatically applied by a spring to hold the drum in its position. If the control lever is moved to apply one of the clutches, the brake is released by the same oil pressure that applies the clutch. In the event that hydraulic power is lost, the brake remains applied and the winch will not turn.

The winch has an intermediate gear assembly that gives a gear reduction and increases the available torque at the winch drum. The **FREESPOOL** function has a sliding sleeve with splines that engages the drum pinion gear and the intermediate gear.

A drum gear is connected to the drum and engages the drum pinion gear. When power is applied to the gear train, the drum will rotate in the **LINE-IN** or **LINE-OUT** direction. One side of the winch case has a bearing support for the tapered roller bearings that hold the drum shaft. The drum shaft connects the drum to the drum gear. The other side of the drum runs on a roller bearing held by another drum shaft. This drum shaft is connected to the winch case.

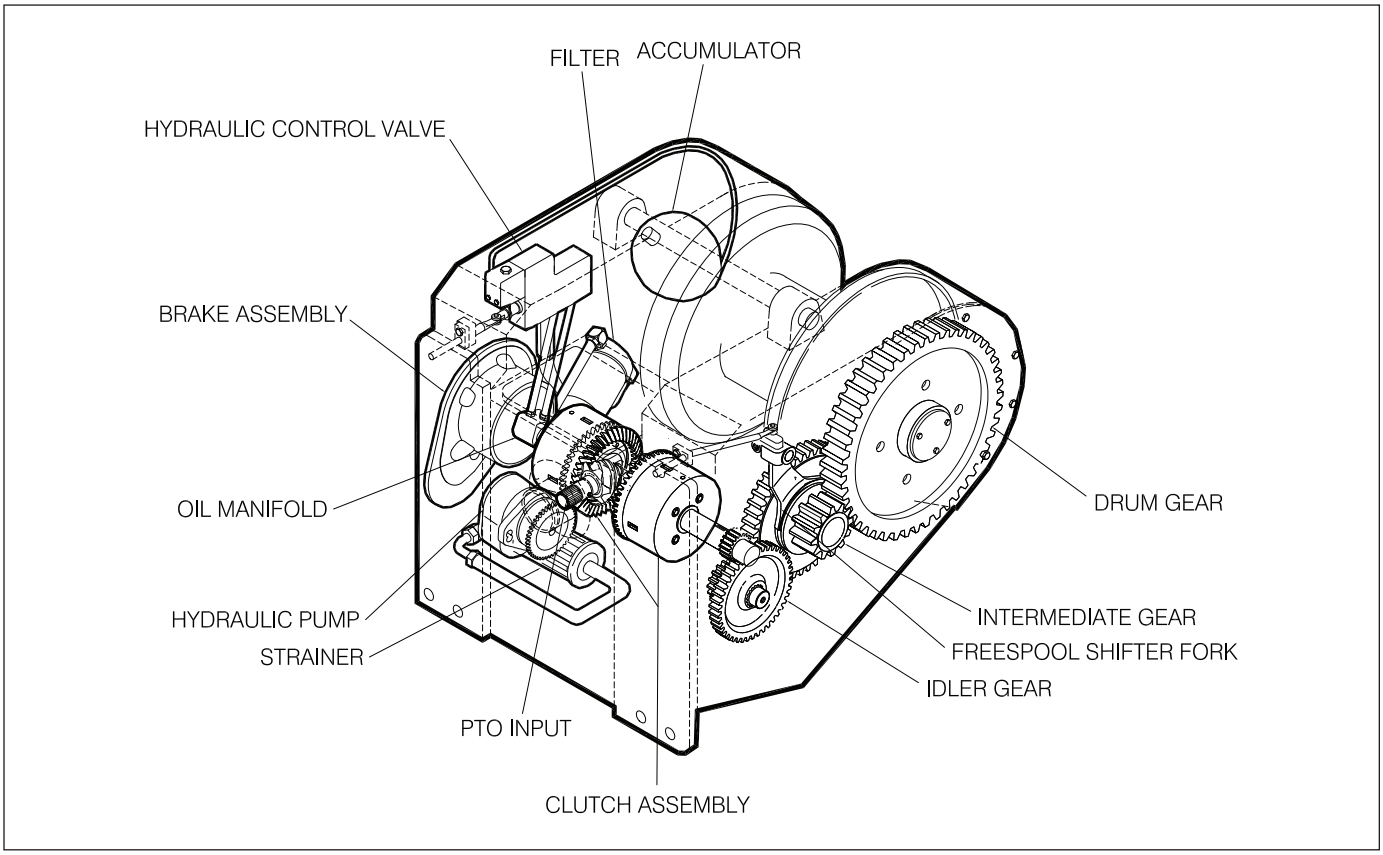


Figure 1-7 Gear Train (Power Controls Shown)

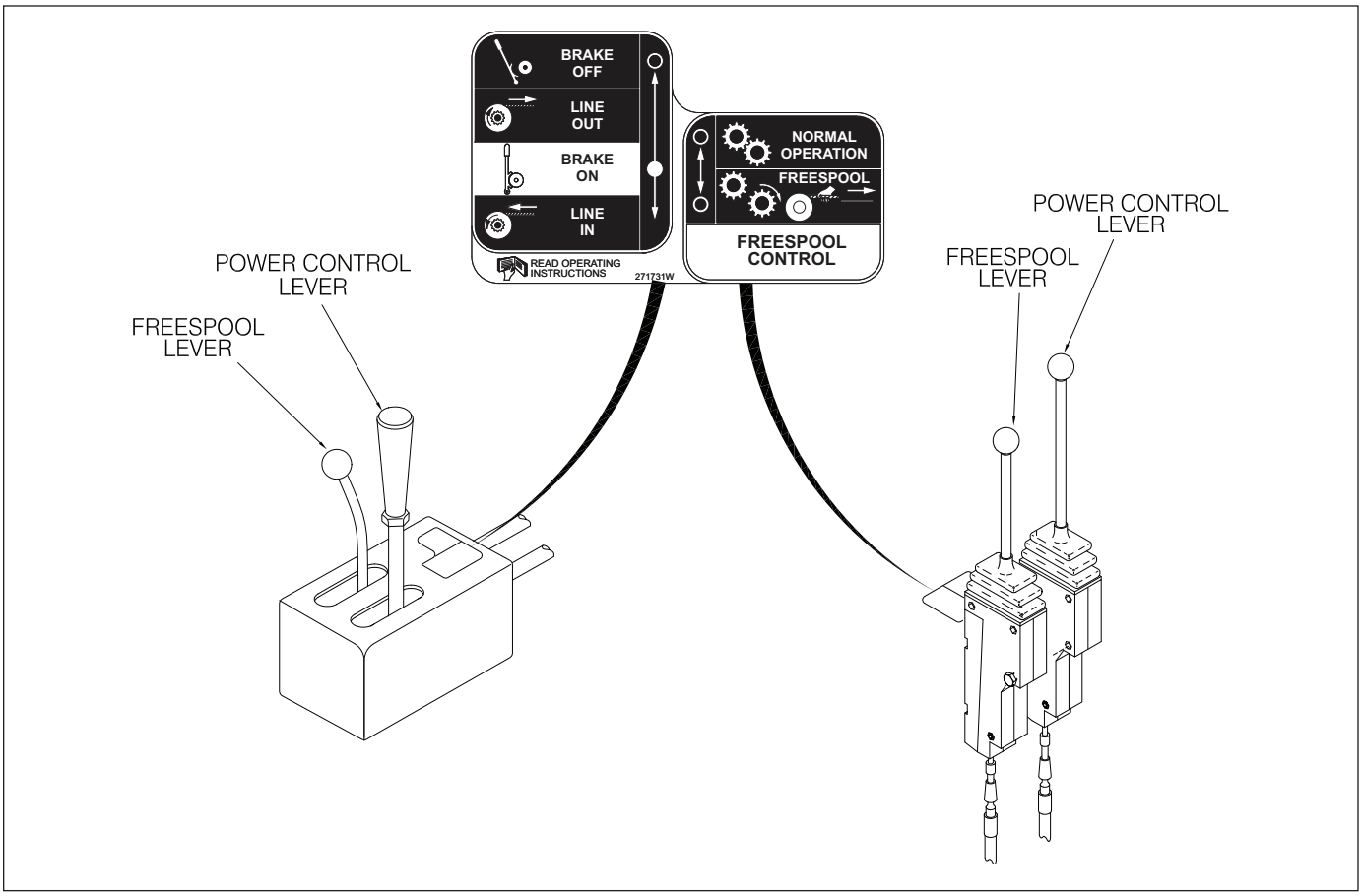


Figure 1-8 Typical Power Control Winch Lever Assemblies

Operation & Control, Power Controls (See Fig. 1-8)

The control lever assembly for power control winches has a control lever for the winch power control and a control lever for **FREESPOOL**. Both control levers are connected to the winch through control cables. The power control lever is connected to the spool in the control valve. The power control lever is used to select one of the following operations:

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

Except for the **BRAKE-OFF** position, the power control lever will return to the **BRAKE-ON** position when the control lever is released. A spring arrangement on the spool of the control valve returns the spool and control lever to the **BRAKE-ON** position. A ball and detent arrangement will hold the spool and control lever in the **BRAKE-OFF** position. The operator must pull the control lever from the **BRAKE-OFF** position.

The **BRAKE-ON** position is a neutral position. No hydraulic pressure is applied to the brake or the clutches. A spring applies the brake so that the winch drum will not rotate.

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

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

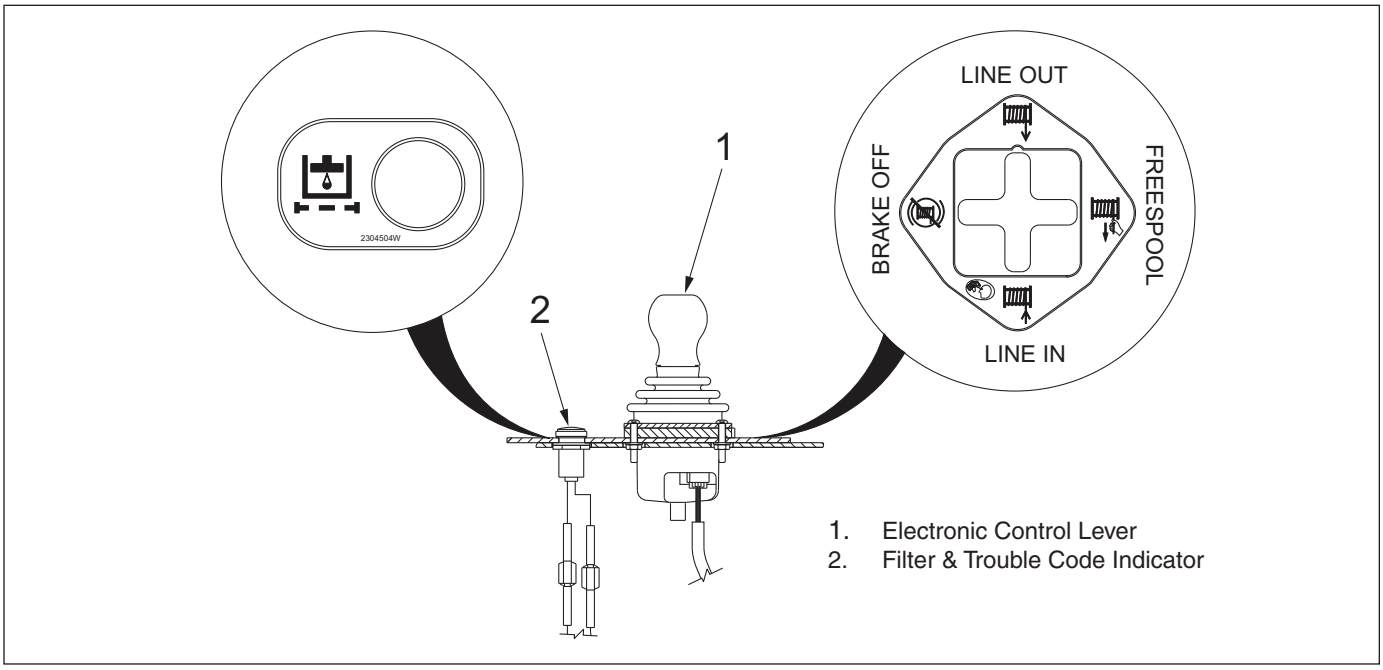


Figure 1-9 Electronic Winch Controls (Last Used on S/N AW5C-1665)

Operation & Control, Electronic Controls (See Fig. 1-9 through Fig. 1-11)

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

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

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

NOTE: The winch will not operate unless the control lever is centered at startup.

BRAKE-OFF and **FREESPOOL** are detented positions on the lever; the operator must pull the control lever to release it from those positions. A collar and spring arrangement on the control lever returns the lever from the **LINE-IN** and **LINE-OUT** positions to the **BRAKE-ON** position.

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

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

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

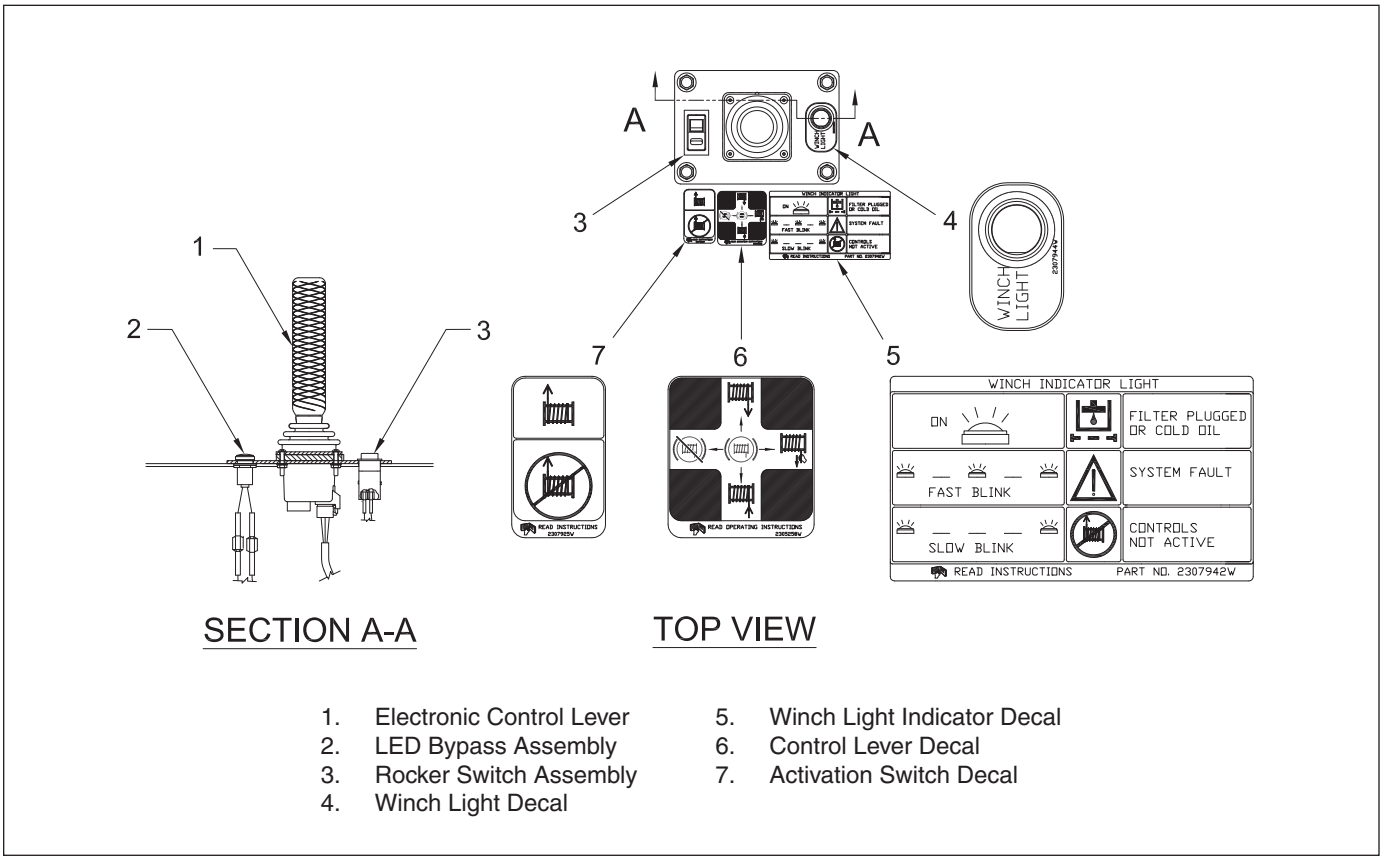
BRAKE-OFF position releases the brake through oil pressure but wire rope cannot be pulled from the winch by hand because of friction in the clutches, brake and gear train. **BRAKE-OFF** is used to move the tractor away from the load while keeping the wire rope tight.

⚠ WARNING

BRAKE-OFF should not be used to lower a suspended load that can slide down a slope.

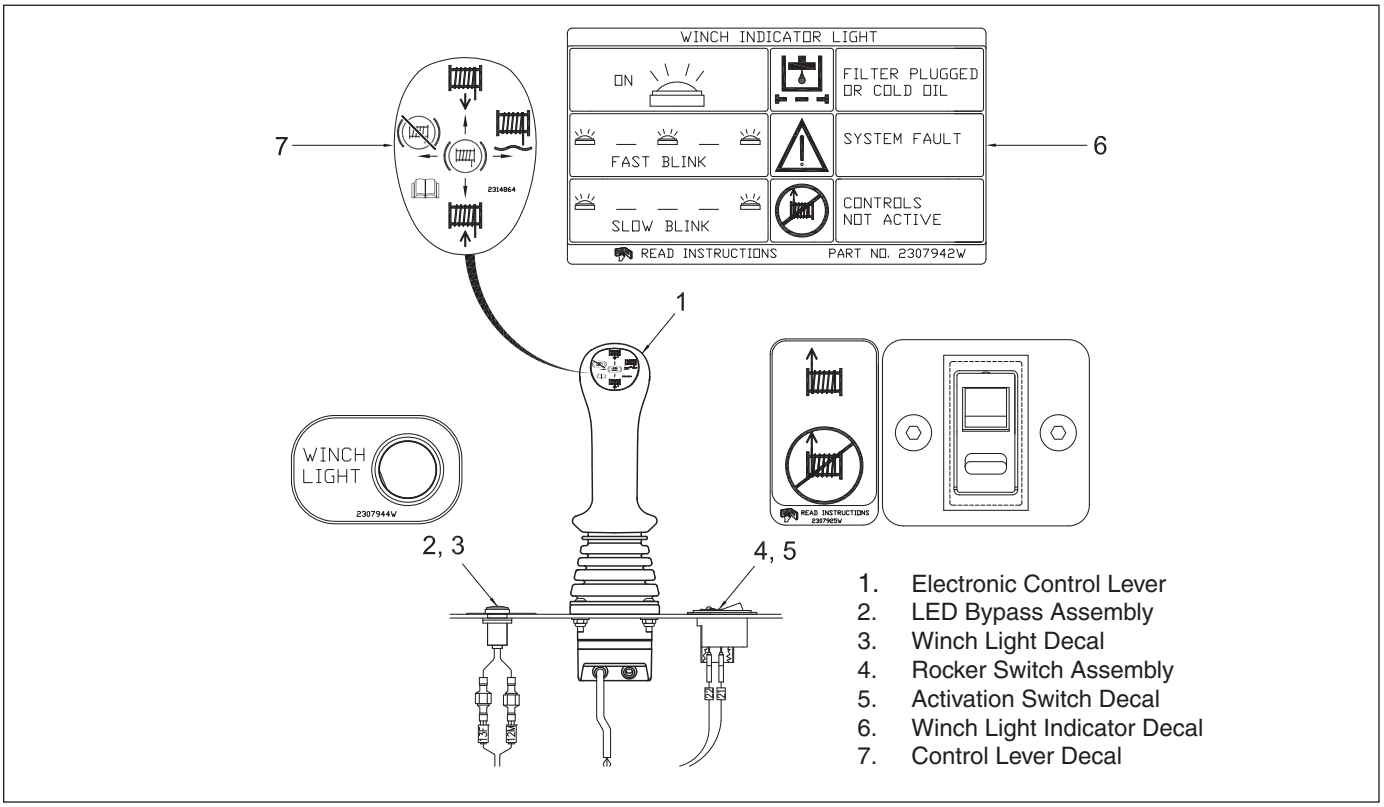
⚠ WARNING

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



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 1-10 Electronic Winch Controls (Used on S/N AW5C-1666 thru AW5C-1696)



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 1-11 Electronic Winch Controls (First Used on S/N AW5C-1697)

FREESPOOL Operation (See Fig. 1-12 thru 1-14)

The **FREESPOOL** arrangement allows mechanical disengagement of the drum gear from the remainder of the gear train. When the control lever is put in the **FREESPOOL** position, the dental clutch disengages the drum pinion and intermediate gear. If there is a load attached to the wire rope and the line is in tension, it may not be possible to move the control lever into **FREESPOOL** position.

⚠ 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.

1. Bearing Cone
2. Bearing Cup
3. Intermediate Gear
4. Dental Clutch
5. Drum Pinion
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
12. Freespool Adjust Retainer
13. Nut
14. Capscrew
15. Shaft
16. Shifter Fork
17. Ball Stud
18. Washer
19. Crank
20. Cotter Pin
21. Pin
22. Flat Washer
23. Snap Ring
24. Snap Ring
26. Pivot Bracket
27. Capscrew
28. Washer
29. Capscrew*
30. Washer*

* Flange screw replaces capscrew & washer after S/N AW5C-1287

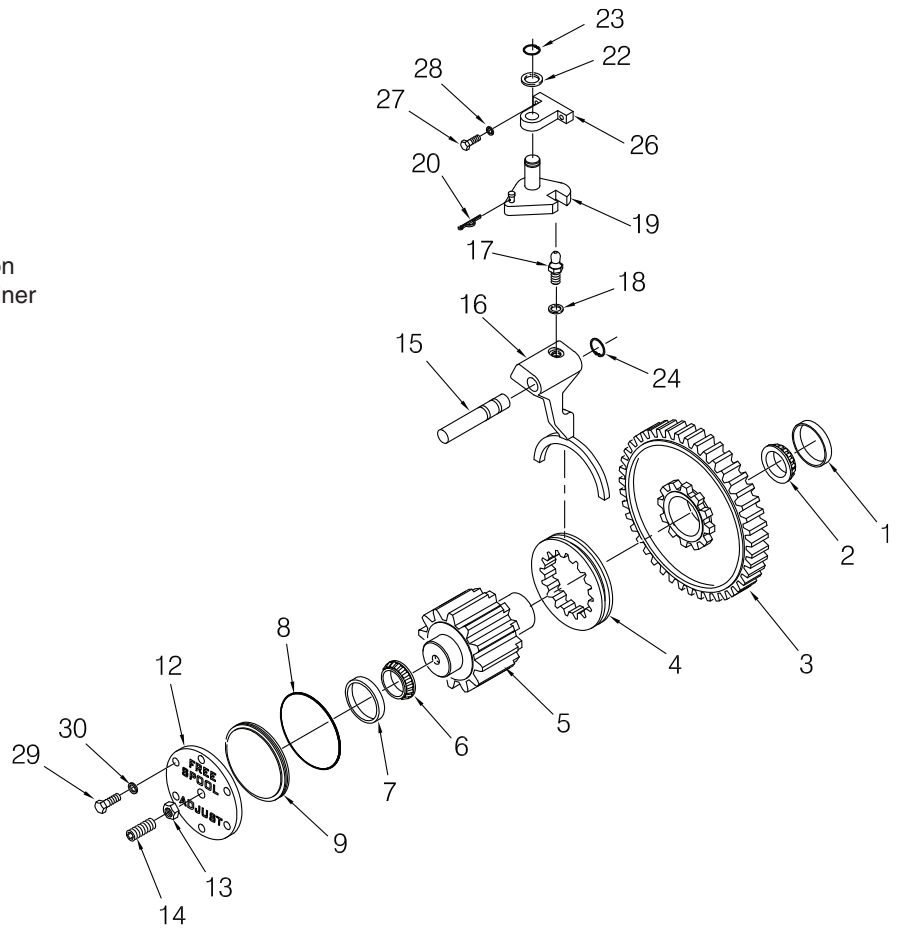


Figure 1-12 FREESPOOL, Power Controls

1. Bearing Cone
2. Bearing Cup
3. Intermediate Gear
4. Dental Clutch/Collar
5. Drum Pinion
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
10. Capscrew*
11. Lockwasher*
12. Freespool Adjust Retainer
13. Nut
14. Set Screw
15. Shaft
16. Shifter Fork
17. Fitting
18. Spring
19. O-Ring
20. Capscrew
23. O-Ring

* Flange screw replaces capscrew & washer after S/N AW5C-1287.

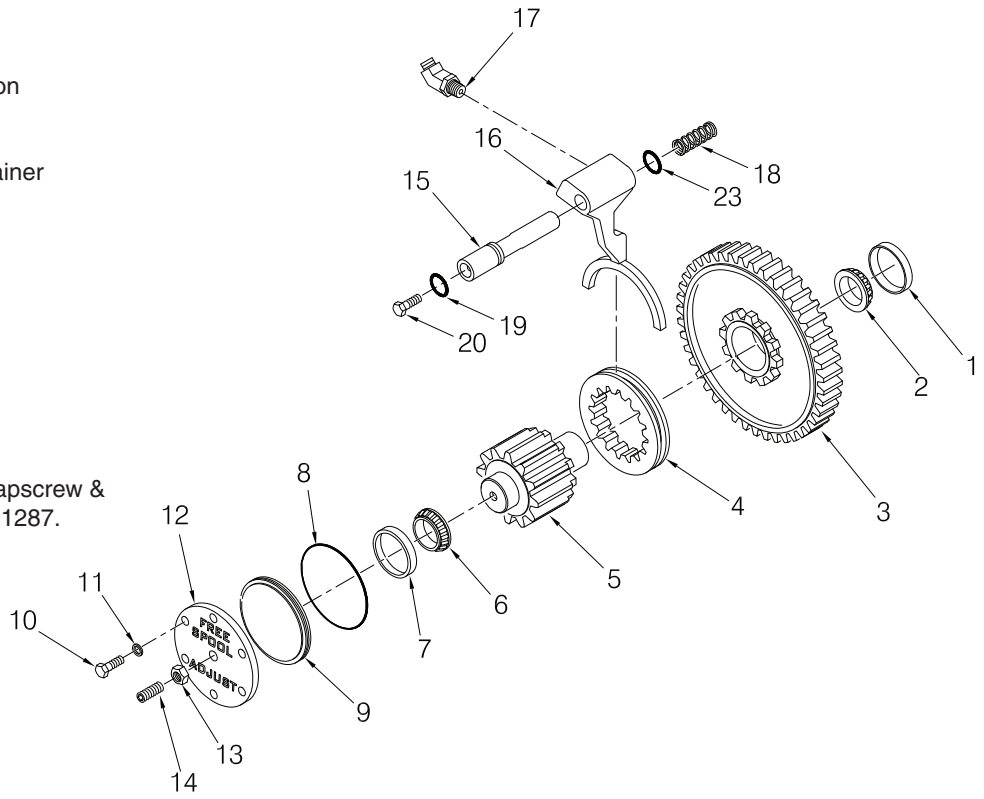


Figure 1-13 FREESPOOL, Electronic Controls

On power control winches, the power control lever must be in the **BRAKE-ON** or **BRAKE-OFF** positions to operate the **FREESPOOL** control lever. When the power controls **FREESPOOL** control lever or the electronic controls lever is moved to the **FREESPOOL** position, the dental clutch 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 on power control winches cannot be moved to engage the gear train for power operation, apply a clutch to move the gear train a small amount. This action will align the splines in the dental clutch so that the intermediate gear can be engaged.

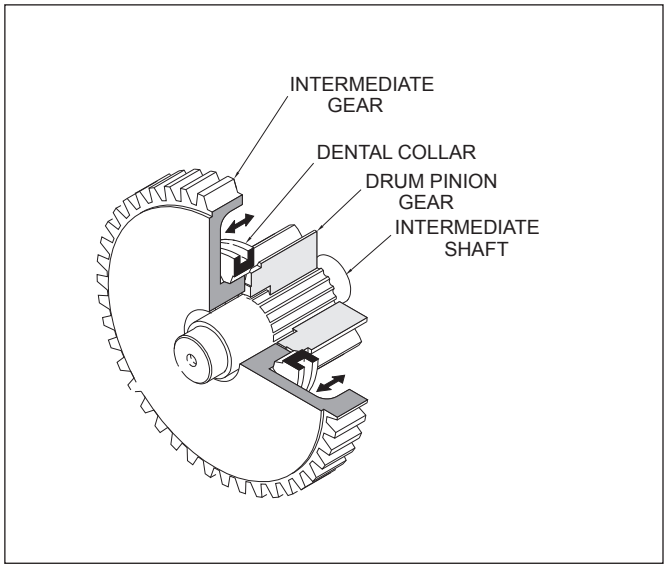
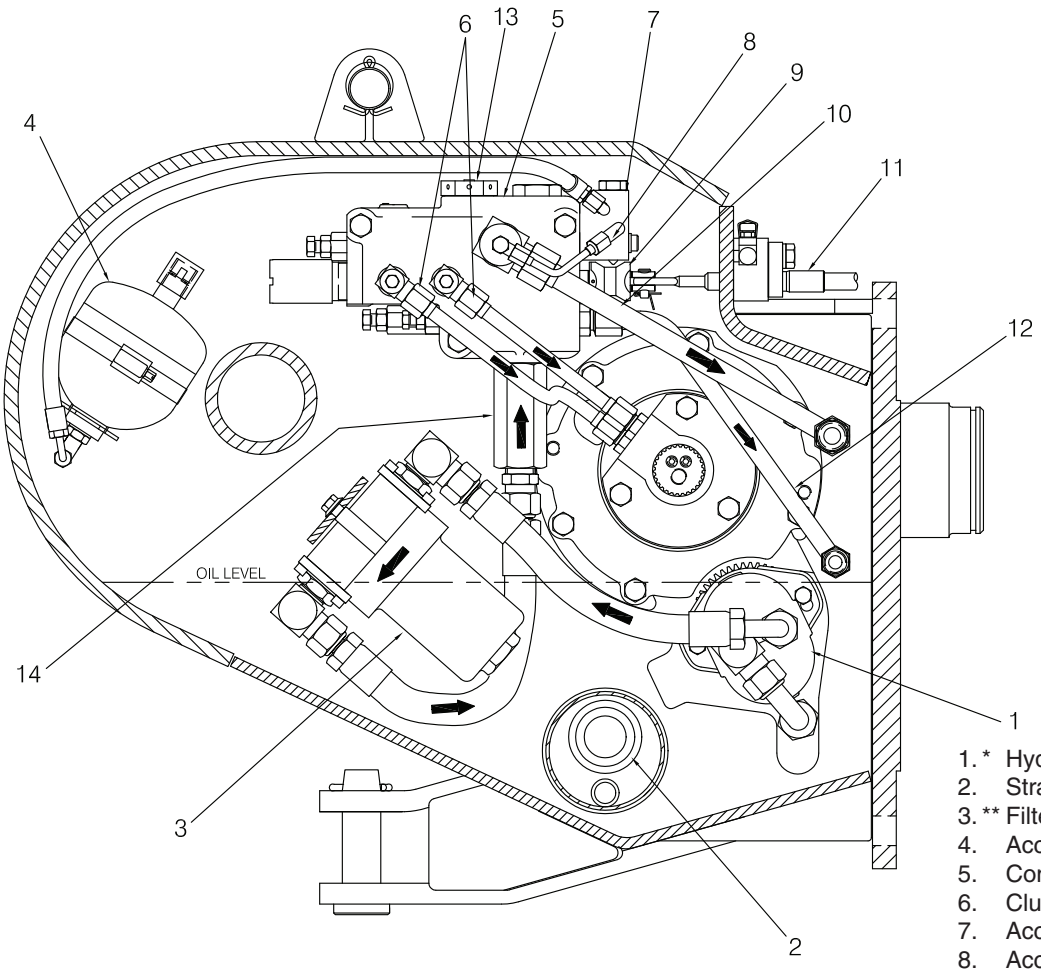


Figure 1-14 FREESPOOL Operation



1. * Hydraulic Pump
2. Strainer
3. ** Filter
4. Accumulator
5. Control Valve
6. Clutch Pressure Tube
7. Accumulator Valve
8. Accumulator Discharge Tube
9. Accumulator Valve Cam
10. Brake Pressure Tube
11. Control Valve Cable
12. Cooling Oil Tube
13. Cooling Oil Relief Valve
14. Check Valve

* Illustration shows counter clockwise pump rotation configuration.
** Torque filter to 30 LBS-FT.

Figure 1-15 Hydraulic System, Power Controls

Hydraulic System, Power Controls (See Fig.1-15)

For the Electronic Controls Hydraulic System, please refer to page 1-18.

The operation of the power controls winch is controlled by a hydraulic system. The hydraulic system directs the flow of oil for winch control functions. The hydraulic system is entirely contained within the winch. The bottom of the winch case is the sump for the hydraulic oil. The suction and pressure filters remove contaminants from the oil. The hydraulic pump supplies oil to the control valve. The control valve is connected by a cable to the control lever. The control valve meters the flow and pressure of hydraulic oil to the clutches and brake while maintaining the cooling oil flow. 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 1-18 through 1-21.

A separate accumulator valve, mounted on the front of the control valve body, controls the release of pressurized oil from the accumulator. The accumulator provides pressurized oil in the event 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 except when the intermediate shaft is disengaged for **FREESPOOL**.

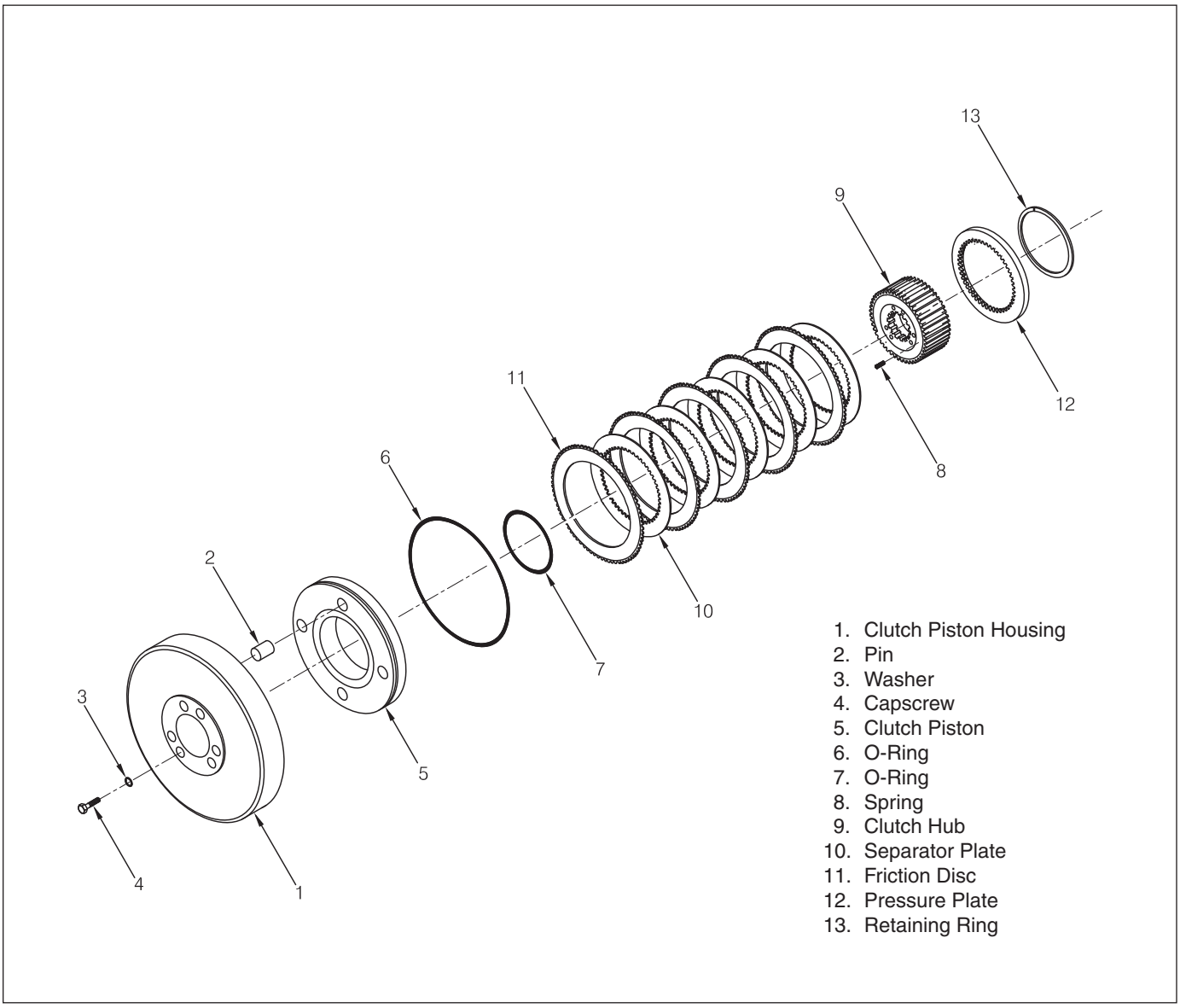


Figure 1-16 Oil Clutch

Oil Clutch (See Fig. 1-16)

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

The separator plates of the clutch are internally splined to the clutch hub. The friction discs have external teeth that fit the splines in the clutch housing. The separator plates rotate with the hub. The piston and clutch piston housing rotate with the clutch/brake shaft. Oil passages in the clutch shaft supply the oil pressure from the control valve/ valve manifold assembly to the piston. As pressurized oil is directed into the cavity between the piston and piston housing, the piston moves. When the oil pressure pushes the piston against the separator plates and friction discs, the clutch is applied. The torque from the input shaft is transferred through the clutch, and causes the winch to operate. Hydraulic oil also cools and lubricates the bearings and internal components of the clutch.

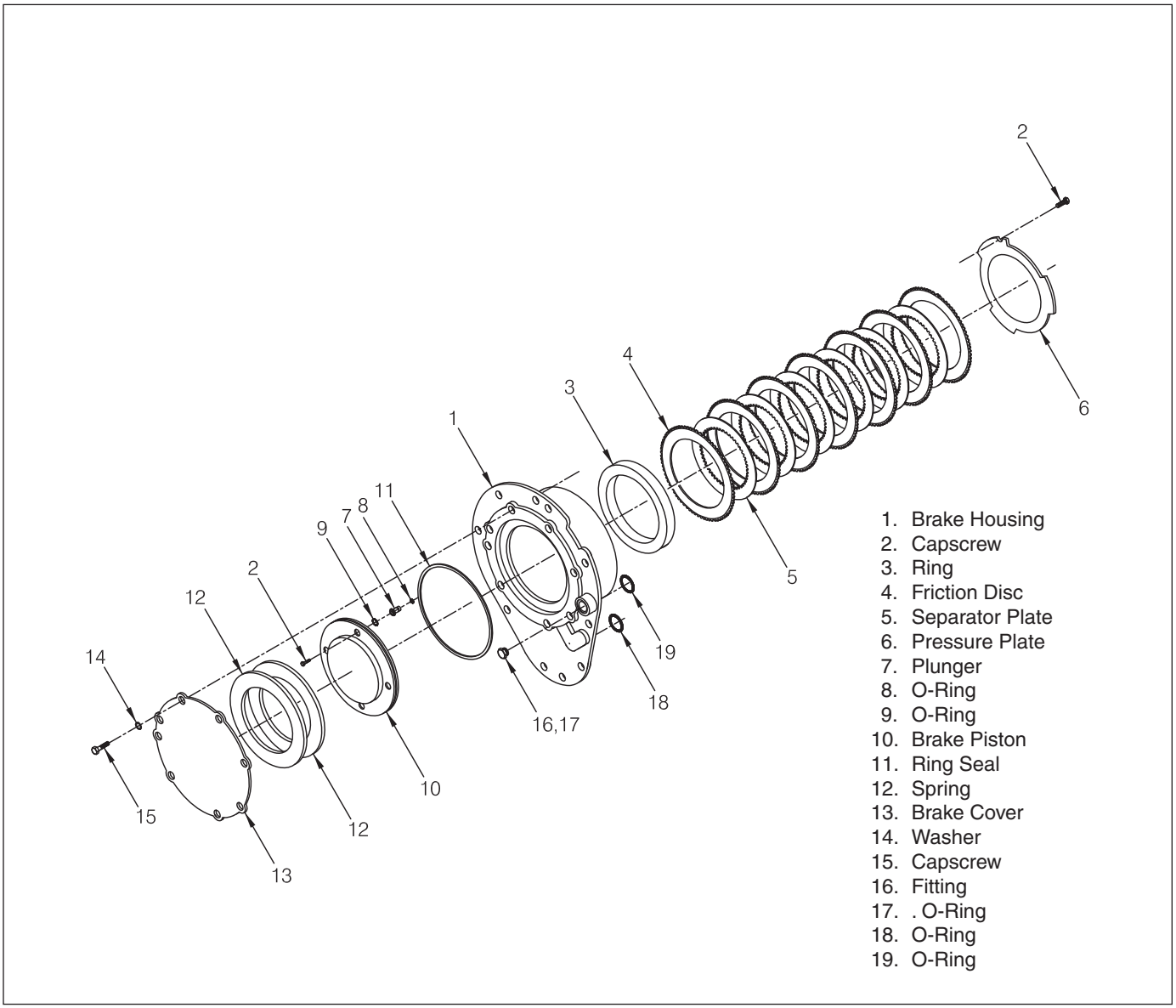


Figure 1-17 Oil Brake

Oil Brake (See Fig. 1-17)

The oil brake is a multi-disc brake that is spring applied and hydraulically released. The brake hub is connected to the clutch/brake shaft with splines. When oil pressure applies a clutch, oil pressure releases the brake. The brake will also be released when the hand lever is in the **BRAKE-OFF** position. Continuous low pressure oil flow is used for cooling the brake.

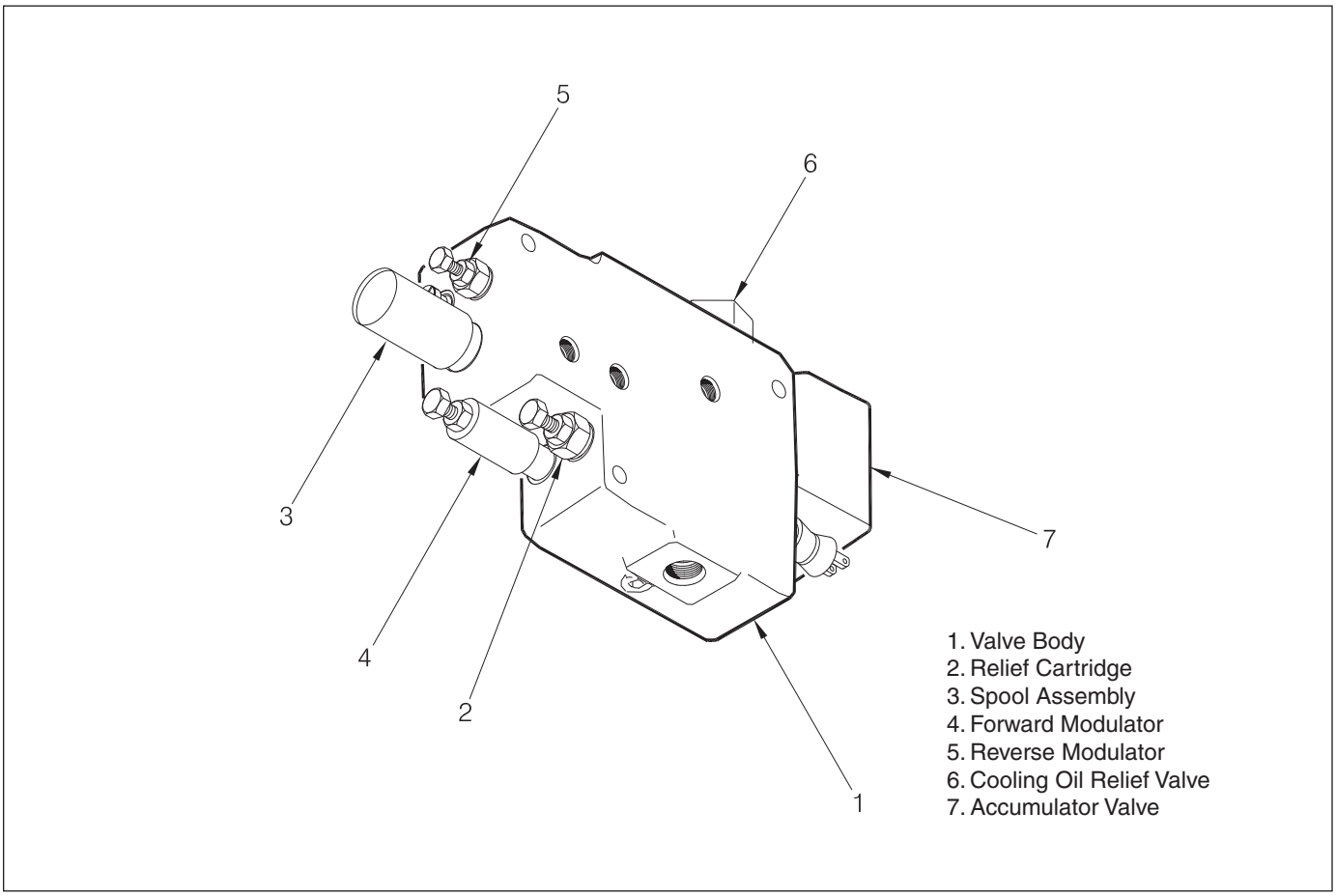


Figure 1-18 Hydraulic Control Valve, Power Controls

Hydraulic Control Valve, Power Controls (See Fig. 1-18)

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

The control valve spool is connected by a cable to the control lever. Built-in pressure modulators automatically ensure positive clutch engagement before the brake is fully released. The forward and reverse modulators are adjustable.

⚠ WARNING

Improper adjustment of the modulators can cause loss of load and result in injury and damage.

The control valve spool is spring loaded in the **BRAKE-ON** position and has a detented position to hold it in the **BRAKE-OFF** position.

Hydraulic Control Relief Valves, Power Controls

A pressure relief valve is installed in the control valve to prevent hydraulic oil pressure from becoming too great. The cooling relief is a spring loaded, poppet-type valve mounted in the control valve dump port. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove excess heat. The cooling oil relief valve prevents pressure from becoming high enough to engage the clutches when they are not applied. Overflow from the cooling oil relief valve is discharged directly to the inside of winch housing.

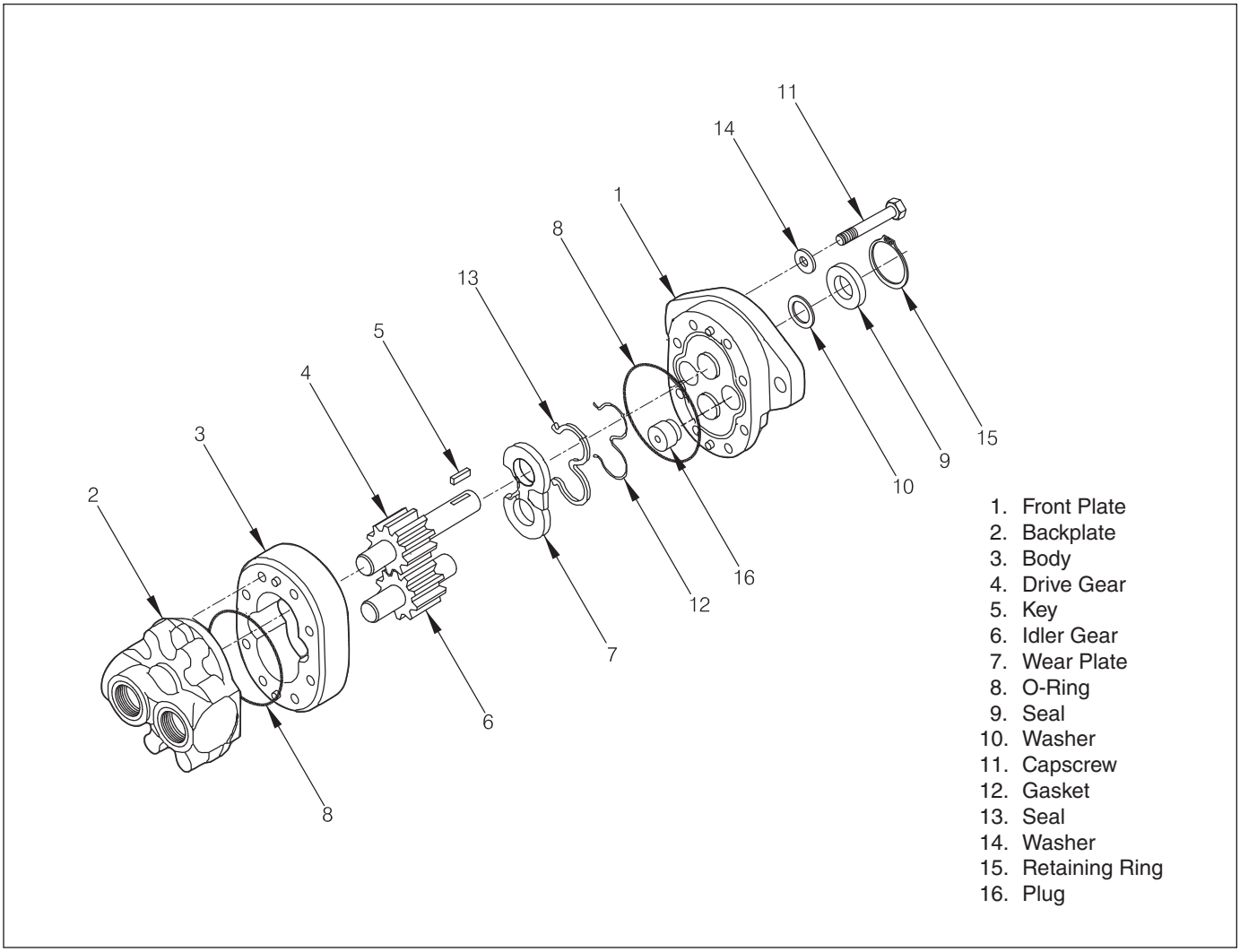


Figure 1-19 Hydraulic Pump

Hydraulic Pump (See Fig. 1-19)

The hydraulic pump is a positive displacement gear pump that supplies the hydraulic flow necessary for operation of the winch. The pump shaft is driven by a gear on a clutch housing. The pump's rotation is dependent upon the tractor's PTO.

Accumulator

A single accumulator is connected to the hydraulic system. The bladder has a nitrogen charge so that the oil stored in the accumulator will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts or if the PTO shaft stalls.

Accumulator Valve, Power Controls

The accumulator valve on cable control winches 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 accumulator.

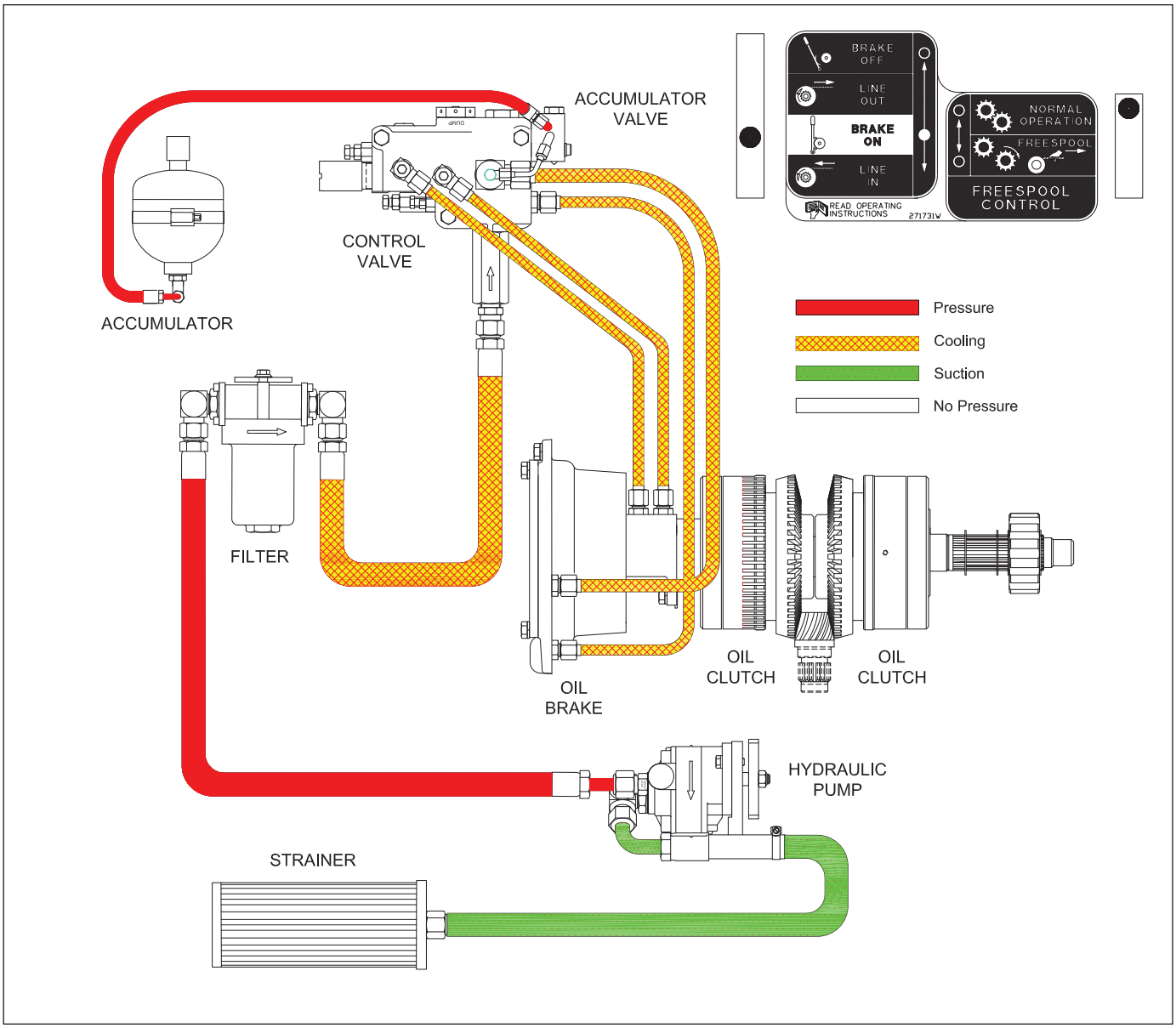


Figure 1-20 Hydraulic System, Power Controls - BRAKE-ON (Neutral)

Sequence of Operation, Power Controls - BRAKE-ON

The control valve spool is spring centered to **BRAKE-ON**. In this position, oil entering the open center valve flows into the low pressure passages. The cooling oil relief valve maintains hydraulic pressure in the cooling oil passage at a maximum of 10 psi (55 kPa). Cooling oil flows out of the valve to lubricate and cool the brake and clutch assemblies. Excess flow goes directly to the sump. Springs apply the brake so the winch drum will not rotate.

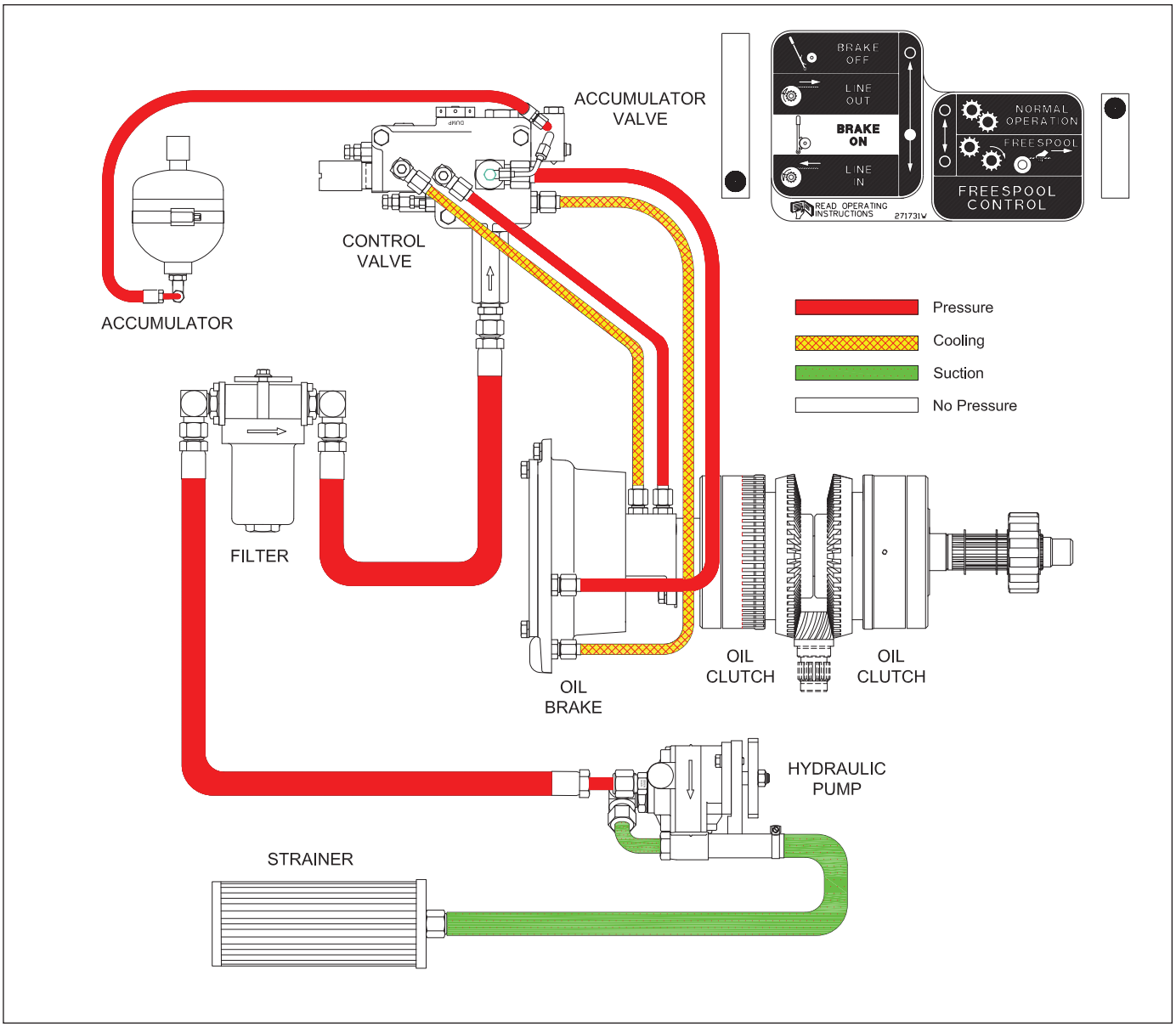


Figure 1-21 Hydraulic System, Power Controls - LINE-IN (Forward)

Sequence of Operation, Power Controls - LINE-IN

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

On a fast shift, the spool moves into the full forward position routing oil directly to the forward clutch bypassing the forward modulator valve completely, thereby avoiding any delay in operation. An orifice in the clutch port fitting assures that the clutch is not applied before the brake is released.

When pressure starts to rise above 250±5 psi (1725±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.

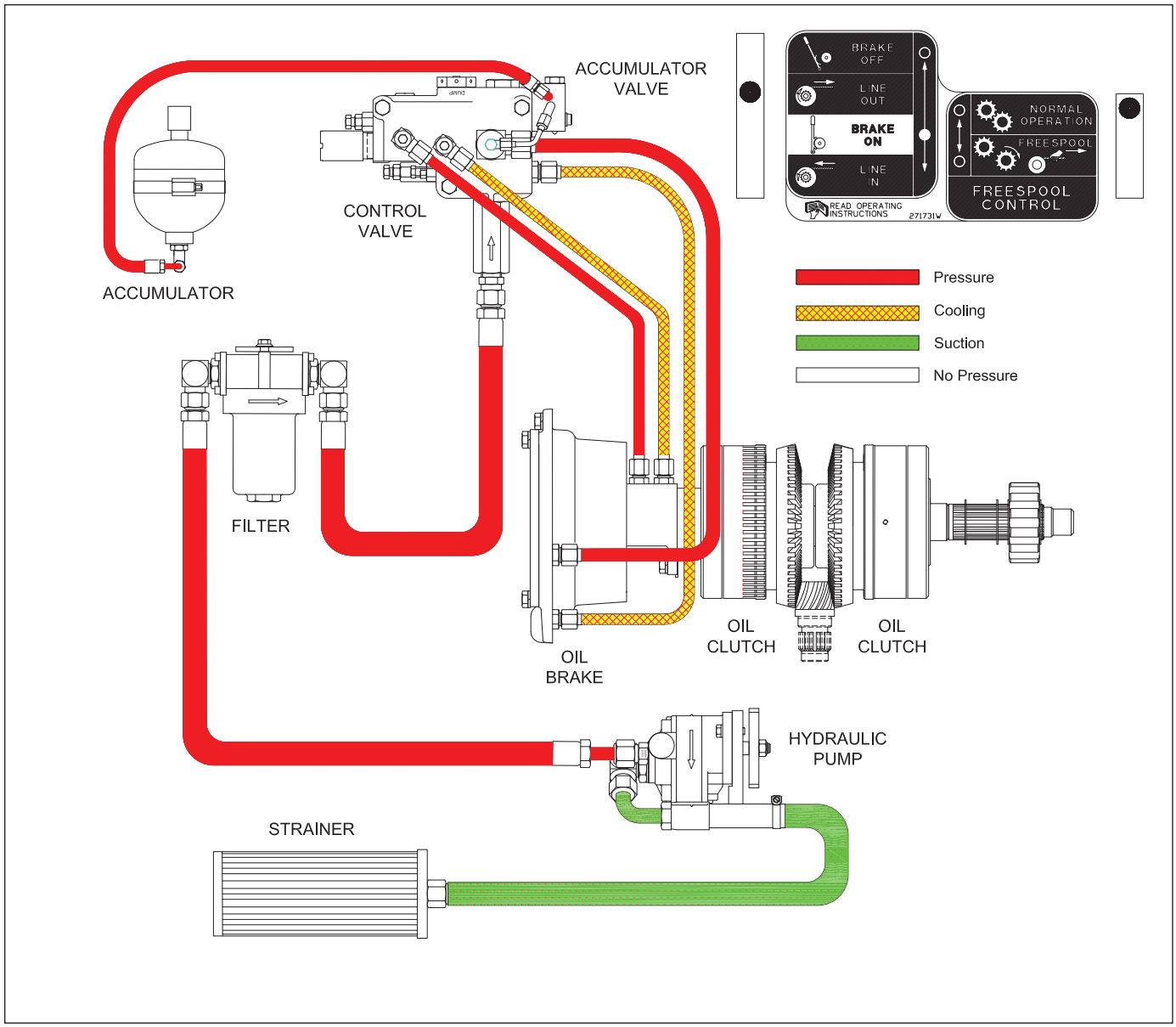


Figure 1-22 Hydraulic System, Power Controls - LINE-OUT (Reverse)

Sequence of Operation, Power Controls - LINE-OUT

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

On a fast shift, the spool moves into the full reverse position routing oil directly to the reverse clutch bypassing the reverse modulator valve completely, and thereby avoiding any delay in operation. An orifice in the clutch port fitting assures that the clutch is not applied before the brake is released.

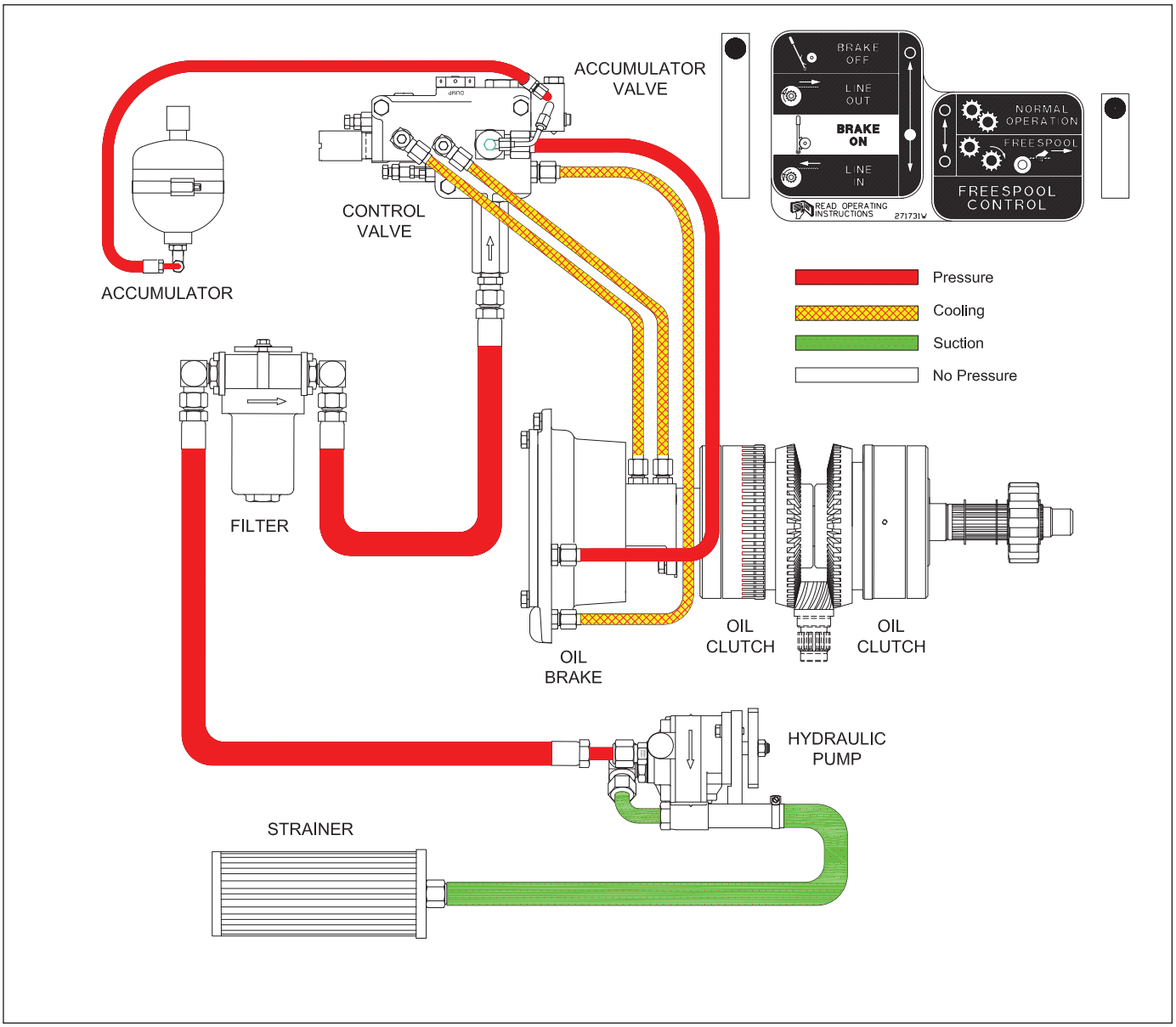


Figure 1-23 Hydraulic System, Power Controls - BRAKE-OFF

Sequence of Operation, Power Controls - 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 **BRAKE-ON** 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.

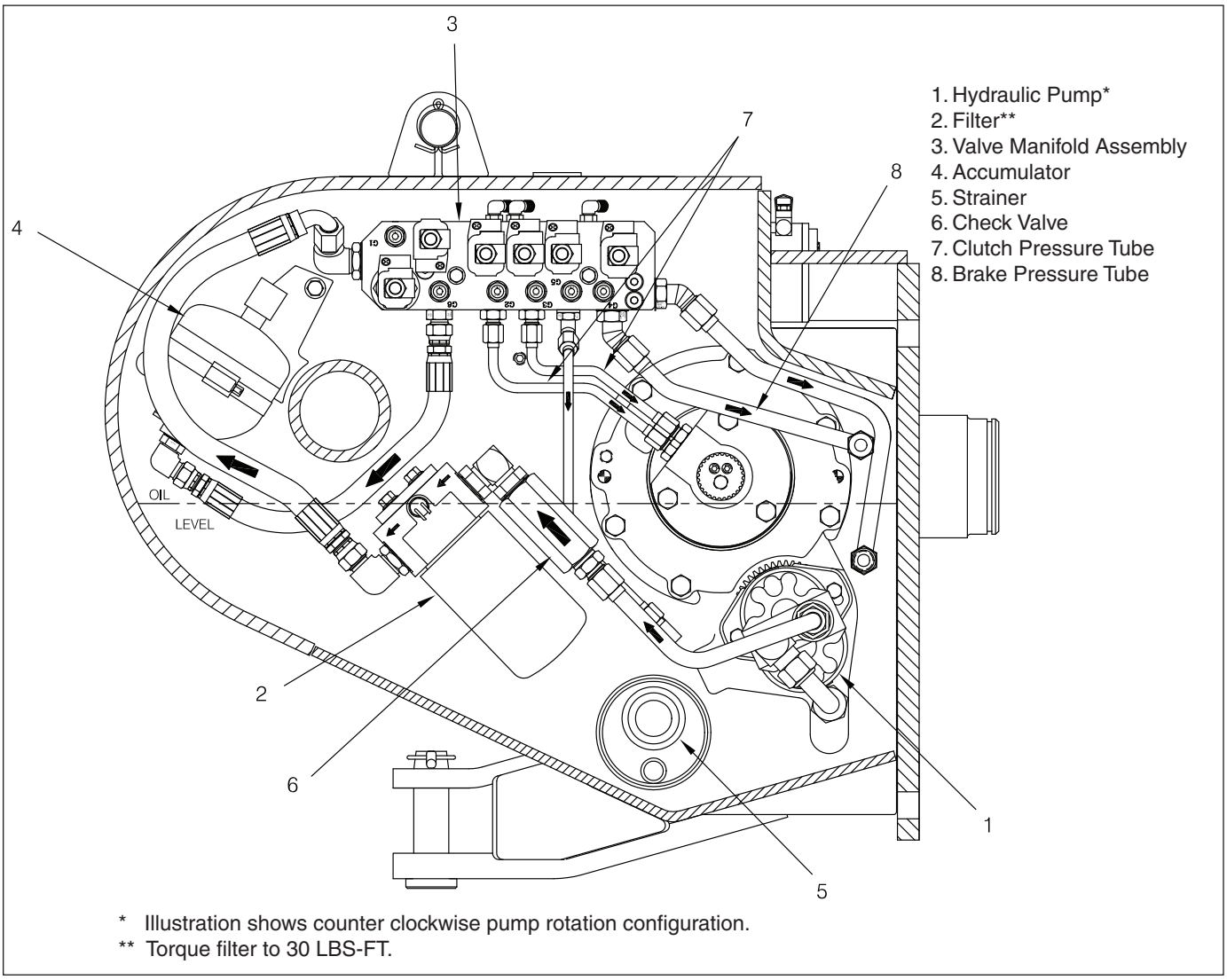


Figure 1-24 Hydraulic System, Electronic Controls

Hydraulic System, Electronic Controls (See Fig.1-24)

For the Power Controls Hydraulic System, please refer to page 1-14.

The operation of the winch is controlled by an internal hydraulic system. When the tractor's PTO is operating, this system provides pressure and directs the flow of oil for the main winch functions. The hydraulic flow path of these various functions is depicted in Figures 1-27 through 1-31.

The suction strainer and pressure filter remove contaminants from the oil. The hydraulic pump supplies pressurized oil for the system. The valve manifold assembly distributes and regulates the flow and pressure of hydraulic oil to the clutches and brake while maintaining the cooling oil flow. It also controls the release of pressurized oil from the accumulators. The accumulators provide pressurized oil for a limited amount of actuation if the hydraulic pump is not functioning. This allows the release of the winch brake when the tractor 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**.

Relief Valve, Electronic Controls

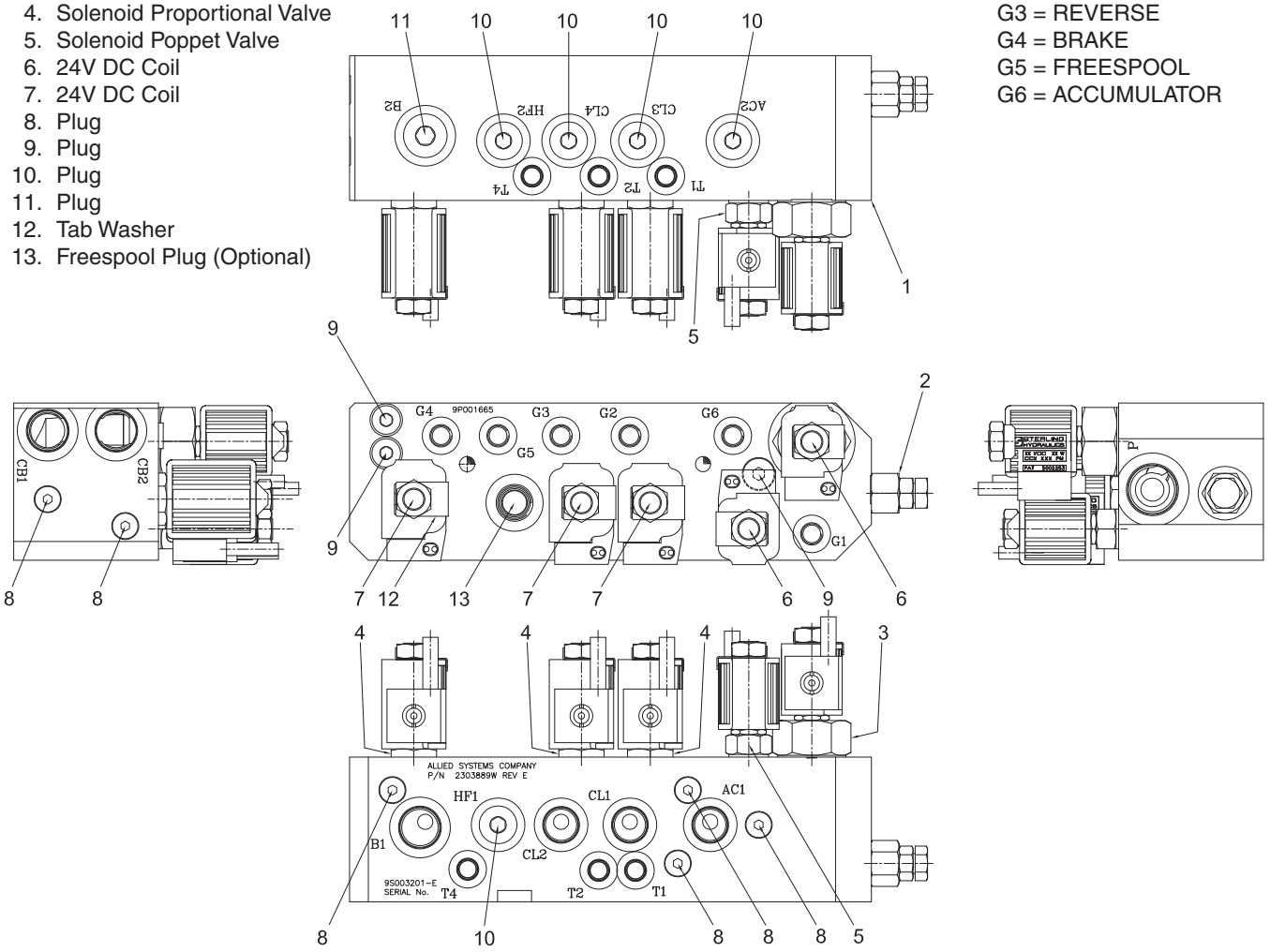
A pressure relief valve is installed in the valve manifold assembly to prevent excessive hydraulic oil pressure. It is a spring loaded, poppet-type valve mounted below the valve manifold assembly's inlet port. Cooling oil is distributed through the hydraulic lines to the brake and clutches to remove 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.

Valve Manifold Assembly, Electronic Controls (See Fig. 1-25)

The valve manifold assembly controls the flow of hydraulic oil to and from the clutches, brake and freespool mechanism. Passages inside the valve body connect the oil flow with the functions that control the winch. Various cartridge solenoid valves within the manifold cavity open and close passages to apply and release the clutches and brake.

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

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

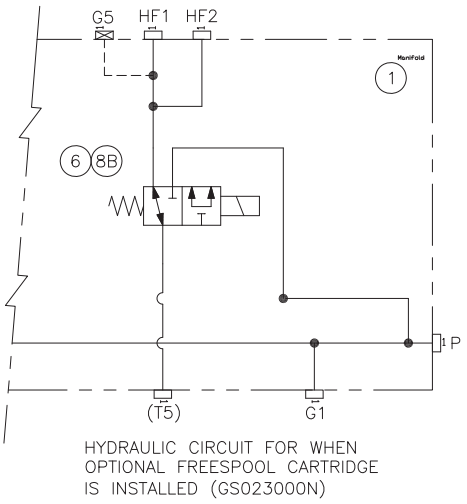


Valve Manifold Assembly
P/N 2303889W

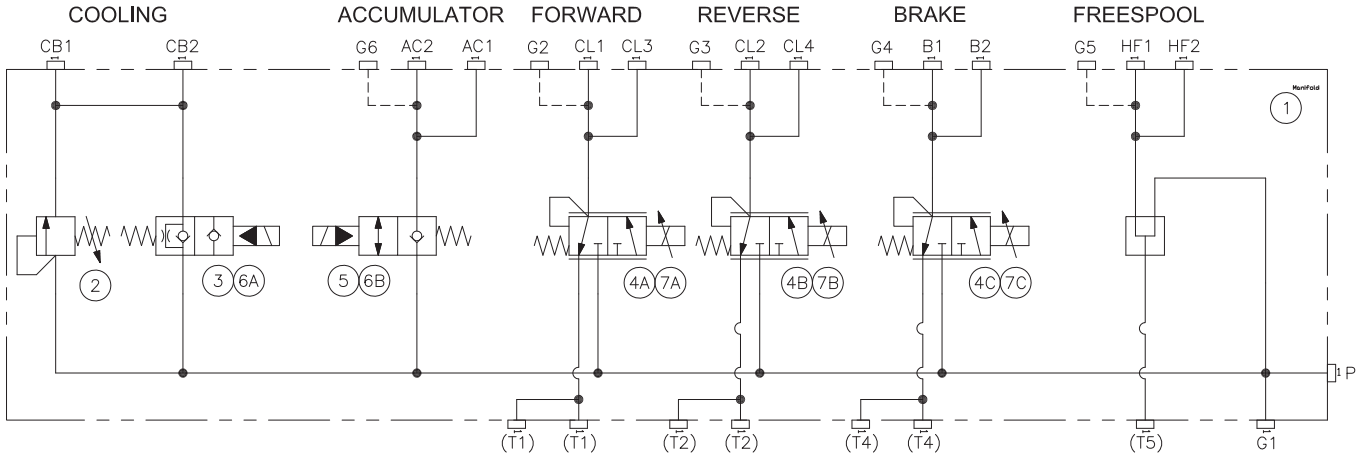
Figure 1-25 Valve Manifold Assembly and Hydraulic Schematic (1)
Usage - AW5C-1555 and below

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)

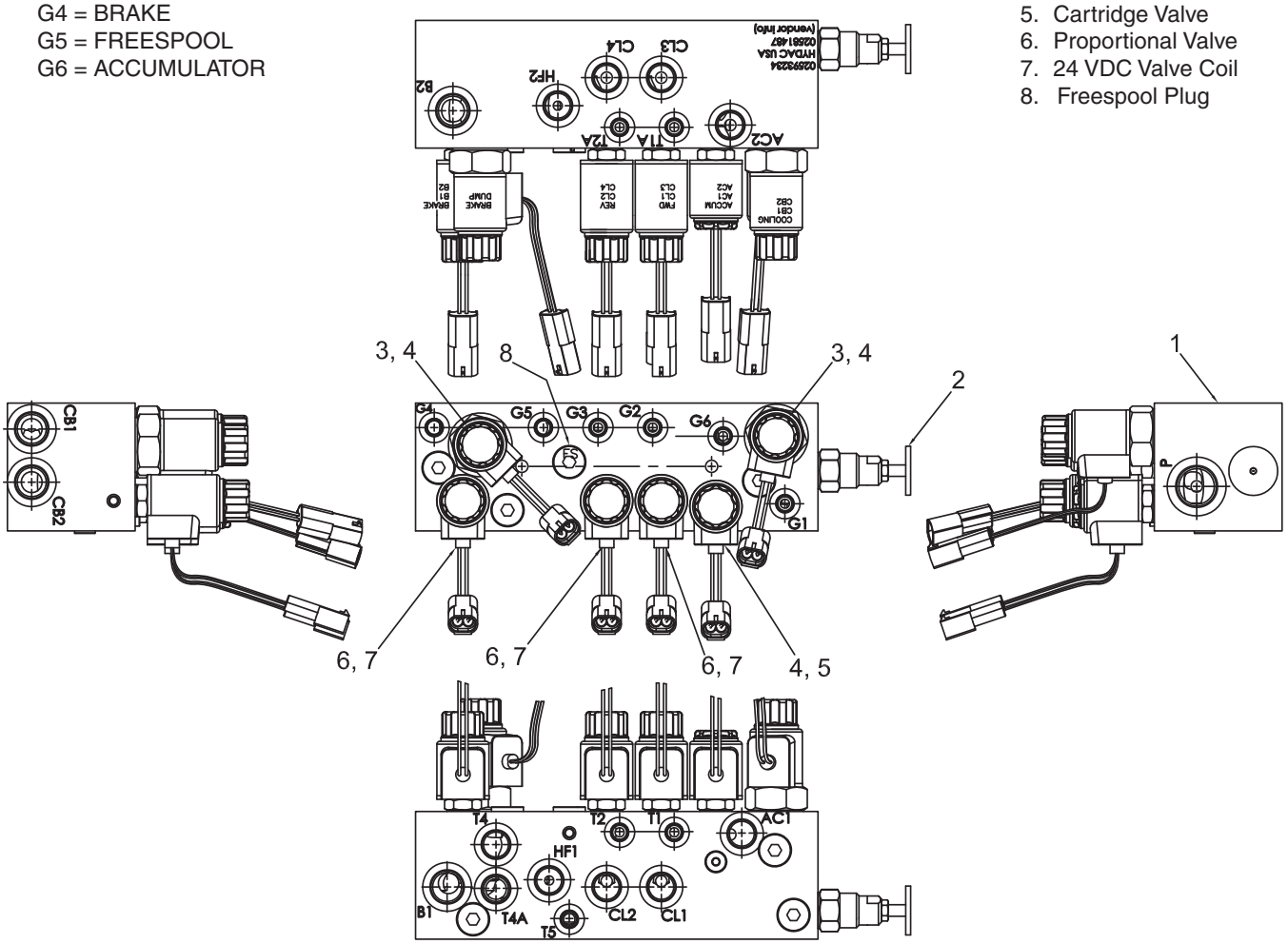


Hydraulic Schematic

Figure 1-25 Valve Manifold Assembly and Hydraulic Schematic (2)
Usage - AW5C-1555 and below

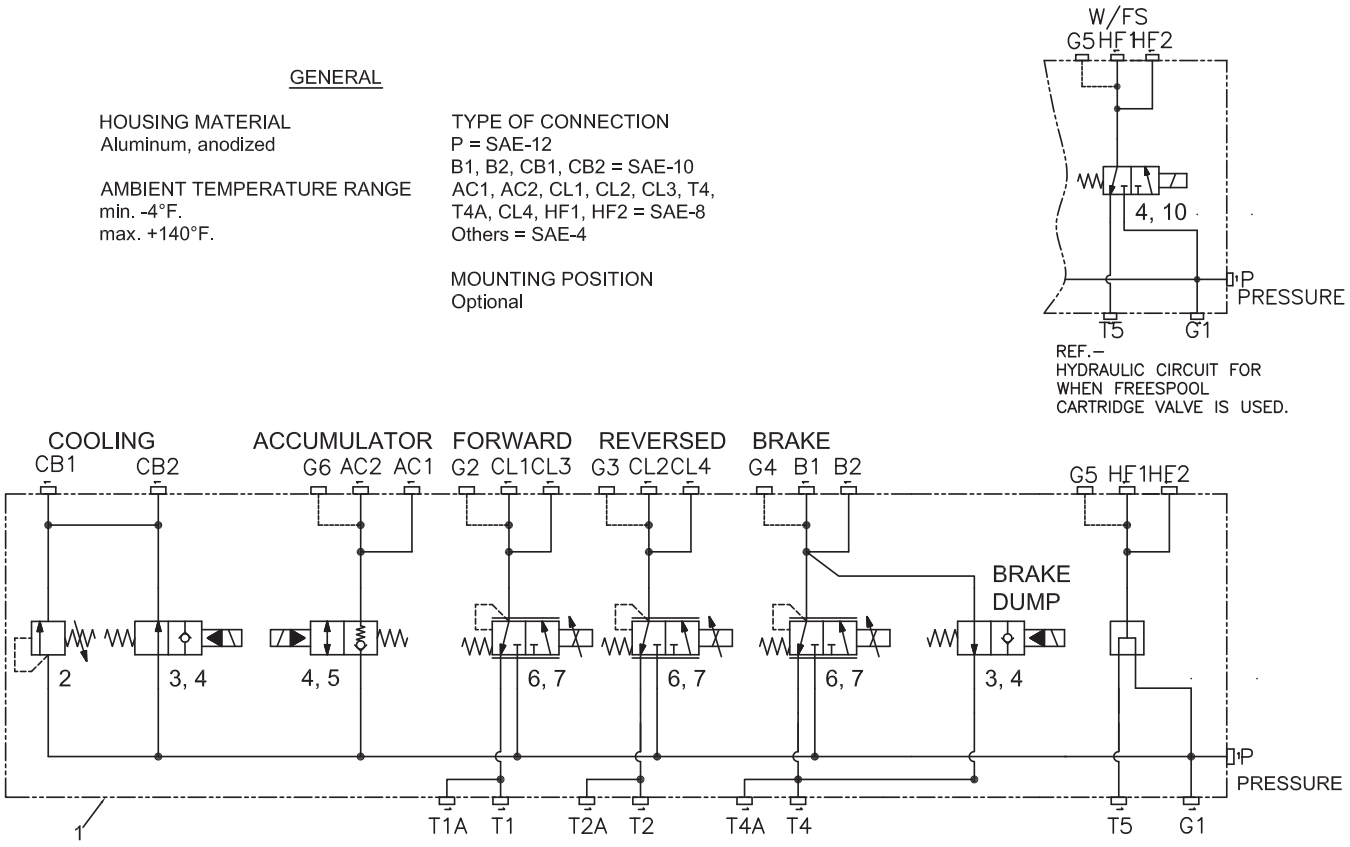
Gauge Port Labels
G1 = INLET
G2 = FORWARD
G3 = REVERSE
G4 = BRAKE
G5 = FREESPOOL
G6 = ACCUMULATOR

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



Valve Manifold Assembly
P/N 2306547W

Figure 1-26 Valve Manifold Assembly and Hydraulic Schematic (1)
Usage - AW5C-1556 through AW5C-1665



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 -22 Ohms

SWITCH-ON-TIME
100%
(CONTINUOUS OPERATION)

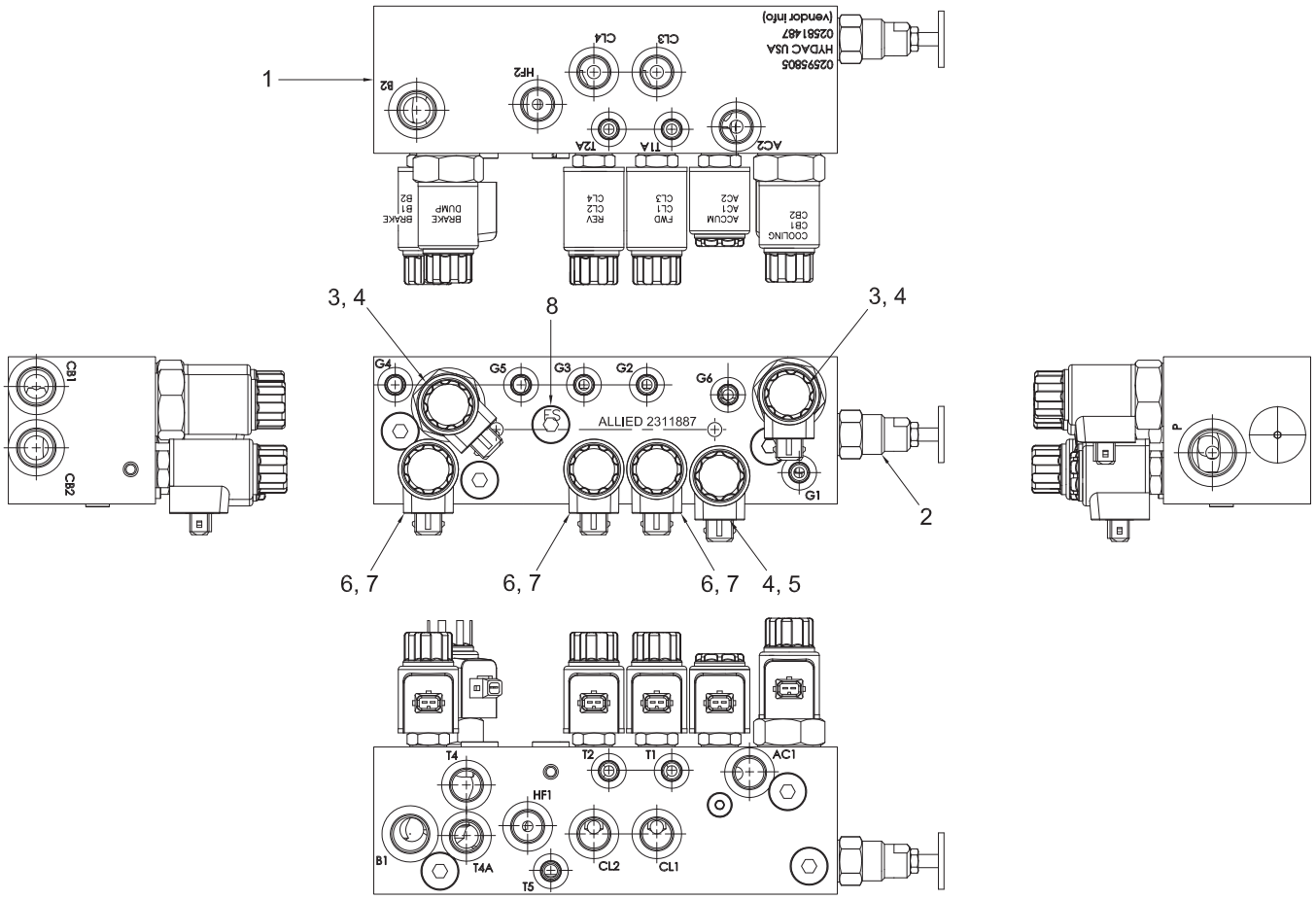
TYPE OF CONNECTION
Packard on flying leads.

Hydraulic Schematic
P/N 2306547W

Figure 1-26 Valve Manifold Assembly and Hydraulic Schematic (2)
Usage - AW5C-1556 through AW5C-1665

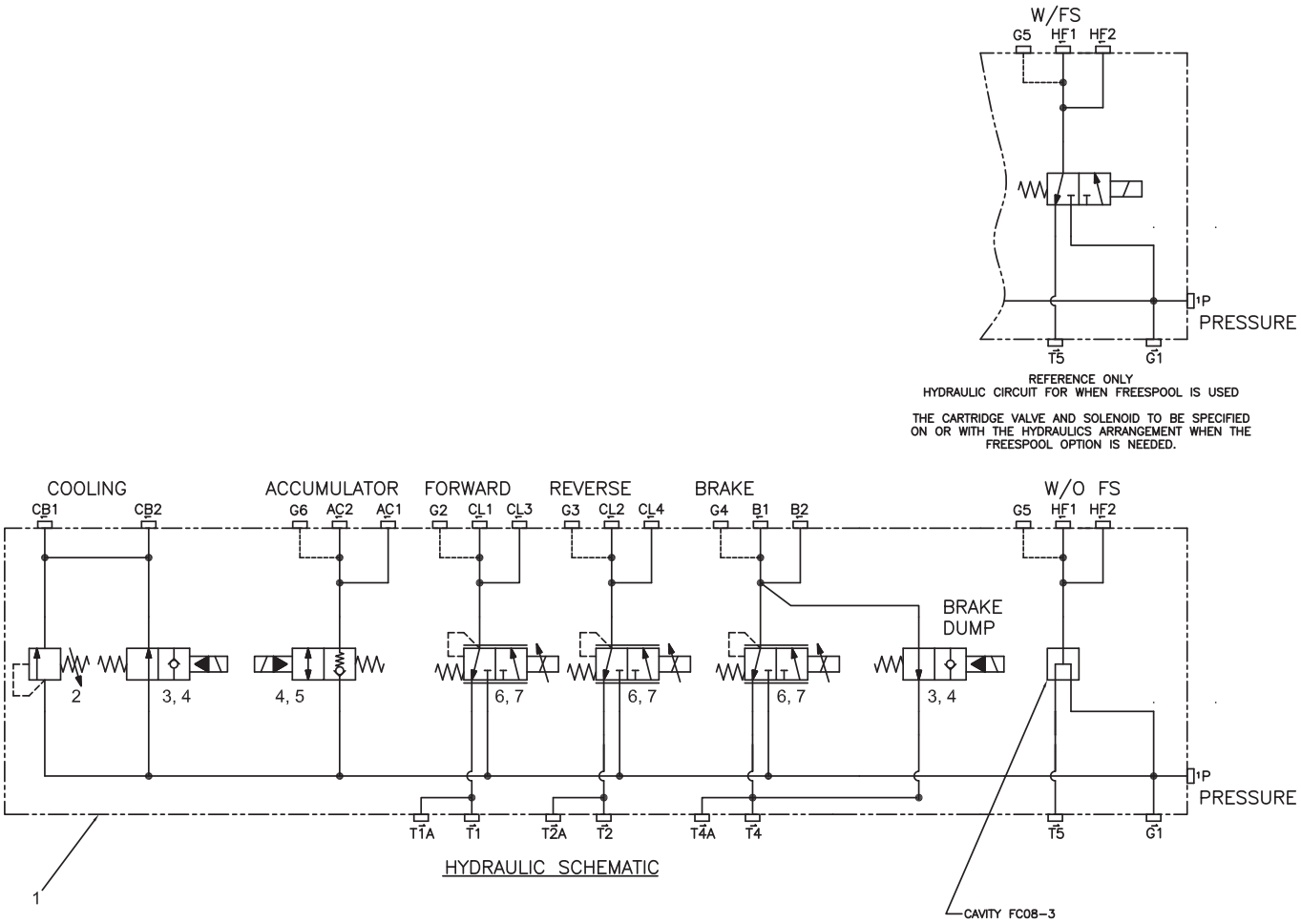
Gauge Port Labels
G1 = INLET
G2 = FORWARD
G3 = REVERSE
G4 = BRAKE
G5 = FREESPOOL
G6 = ACCUMULATOR

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



Valve Manifold Assembly
P/N 2311887

Figure 1-27 Valve Manifold Assembly and Hydraulic Schematic (1)
Usage - AW5C-1666 and above



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

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 $Beta_{20}$ equal to or less than 100. 2026

ELECTRICAL

NOMINAL VOLTAGE:
24 VDC

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

MAX COIL TEMP:
320°F (160°C)

TYPE OF CONNECTION:
AMP JR TIMER

Hydraulic Schematic
P/N 2311887

Figure 1-27 Valve Manifold Assembly and Hydraulic Schematic (2)
Usage - AW5C-1666 and above

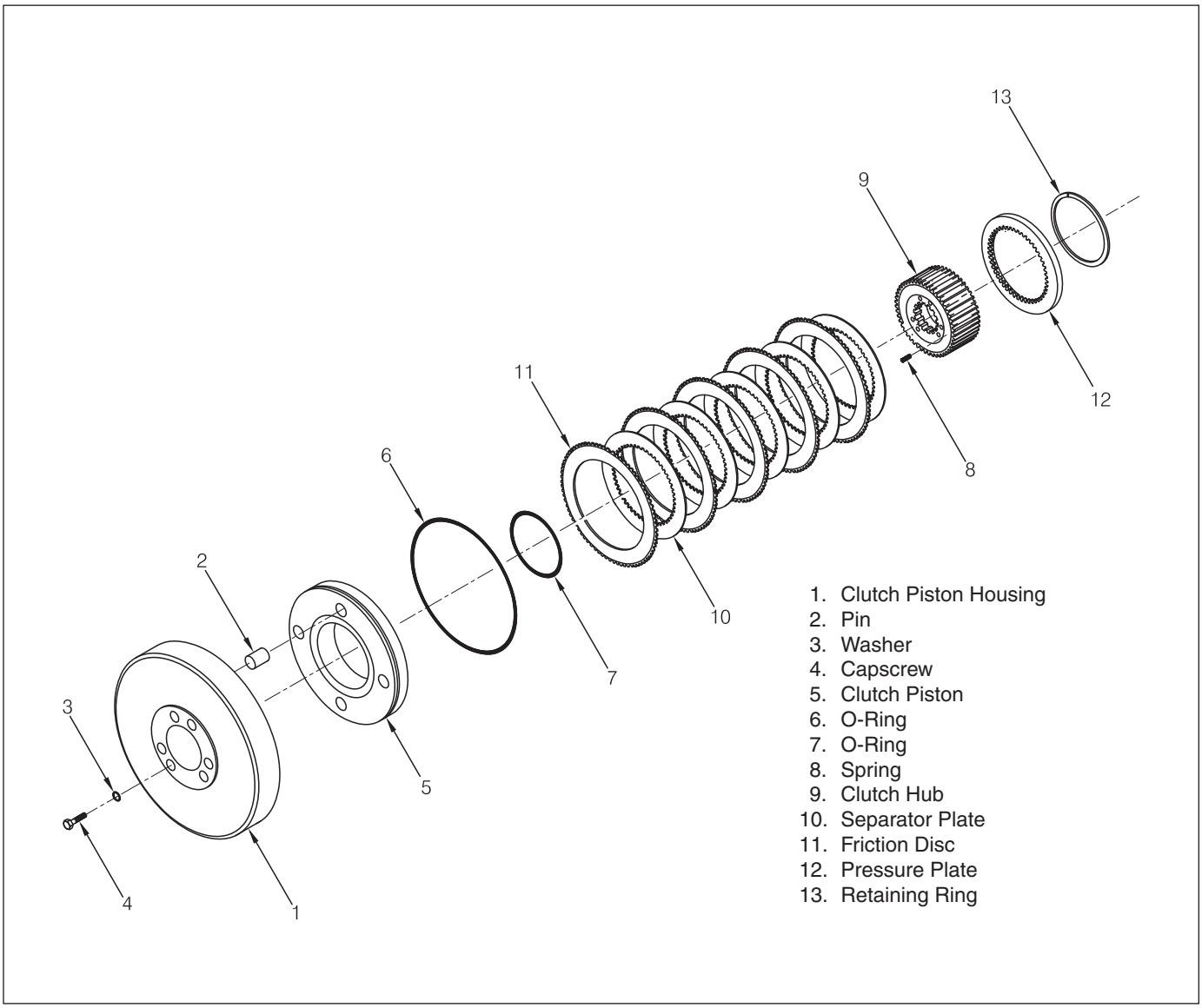


Figure 1-28 Oil Clutch

Oil Clutch (See Fig. 1-28)

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

The separator plates of the clutch are internally splined to the clutch hub. The friction discs have external teeth that fit the splines in the clutch housing. The separator plates rotate with the hub. The piston and clutch piston housing rotate with the clutch/brake shaft. Oil passages in the clutch shaft supply the oil pressure from the control valve/ valve manifold assembly to the piston. As pressurized oil is directed into the cavity between the piston and piston housing, the piston moves. When the oil pressure pushes the piston against the separator plates and friction discs, the clutch is applied. The torque from the input shaft is transferred through the clutch and causes the winch to operate. Hydraulic oil also cools and lubricates the bearings and internal components of the clutch.

Tractor PTO rotation varies from clockwise to counterclock wise depending upon the make and model of the tractor. Because of this difference in PTO rotation, a **LINE-OUT** clutch can be a **LINE-IN** clutch in another application. The hydraulic connections from the valve manifold assembly to each clutch are changed to the opposite clutch. This change keeps the **LINE-IN** and **LINE-OUT** rotation of the winch the same as indicated on the control lever.

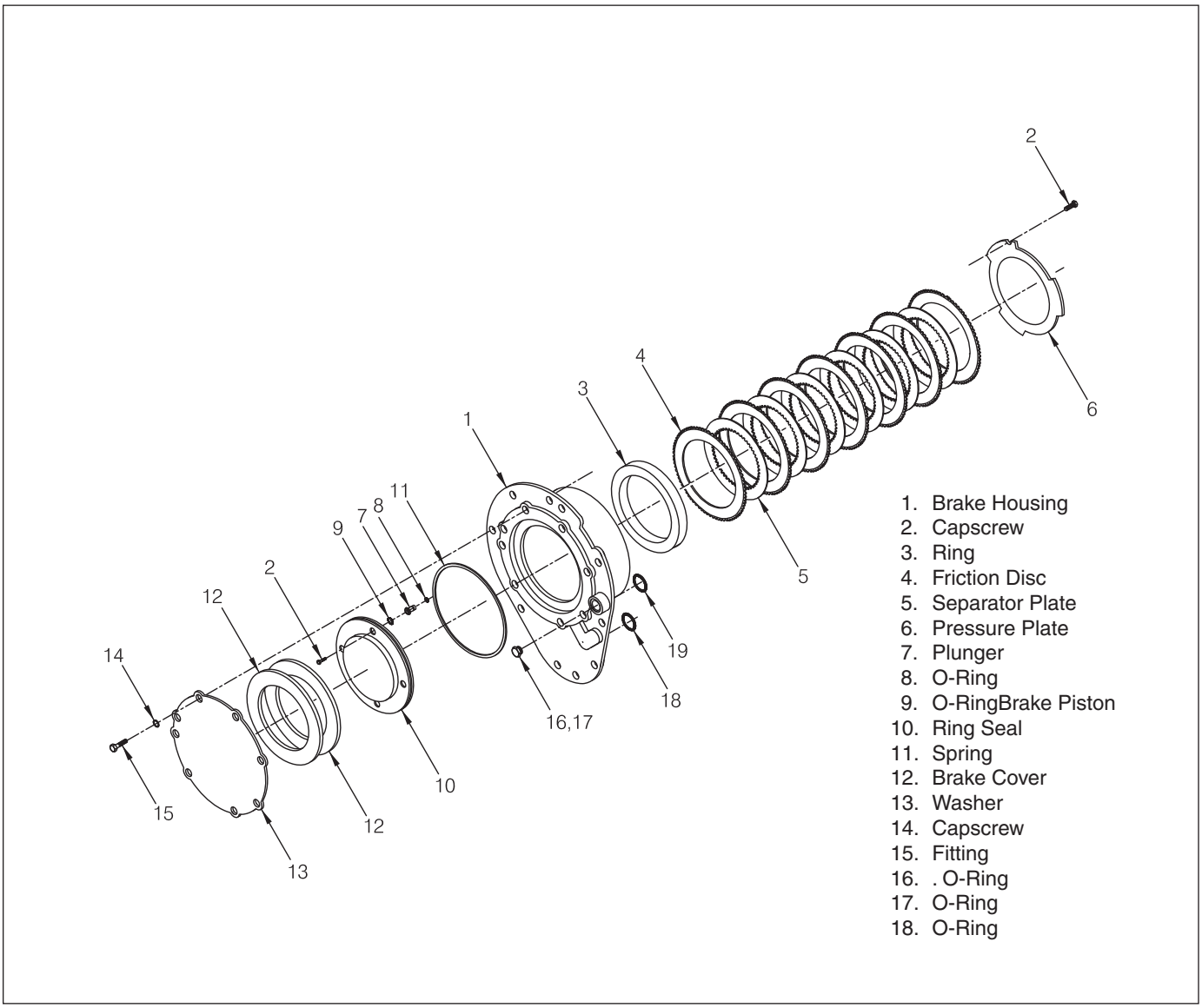


Figure 1-29 Oil Brake

Oil Brake (See Fig. 1-29)

The oil brake is a multi-disc brake that is spring applied and hydraulically released. The brake hub is connected to the clutch/brake shaft with splines. When oil pressure applies a clutch, oil pressure releases the brake. The brake will also be released when the hand lever is in the **BRAKE-OFF** position. Continuous low pressure oil flow is used for cooling the brake.

The brake is applied by springs in the brake housing. The springs push against a ring, applying pressure to the friction discs and the separator plates. As pressurized oil is directed into the cavity between the piston and piston housing, the piston moves outward, compressing the springs and releasing the brake.

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

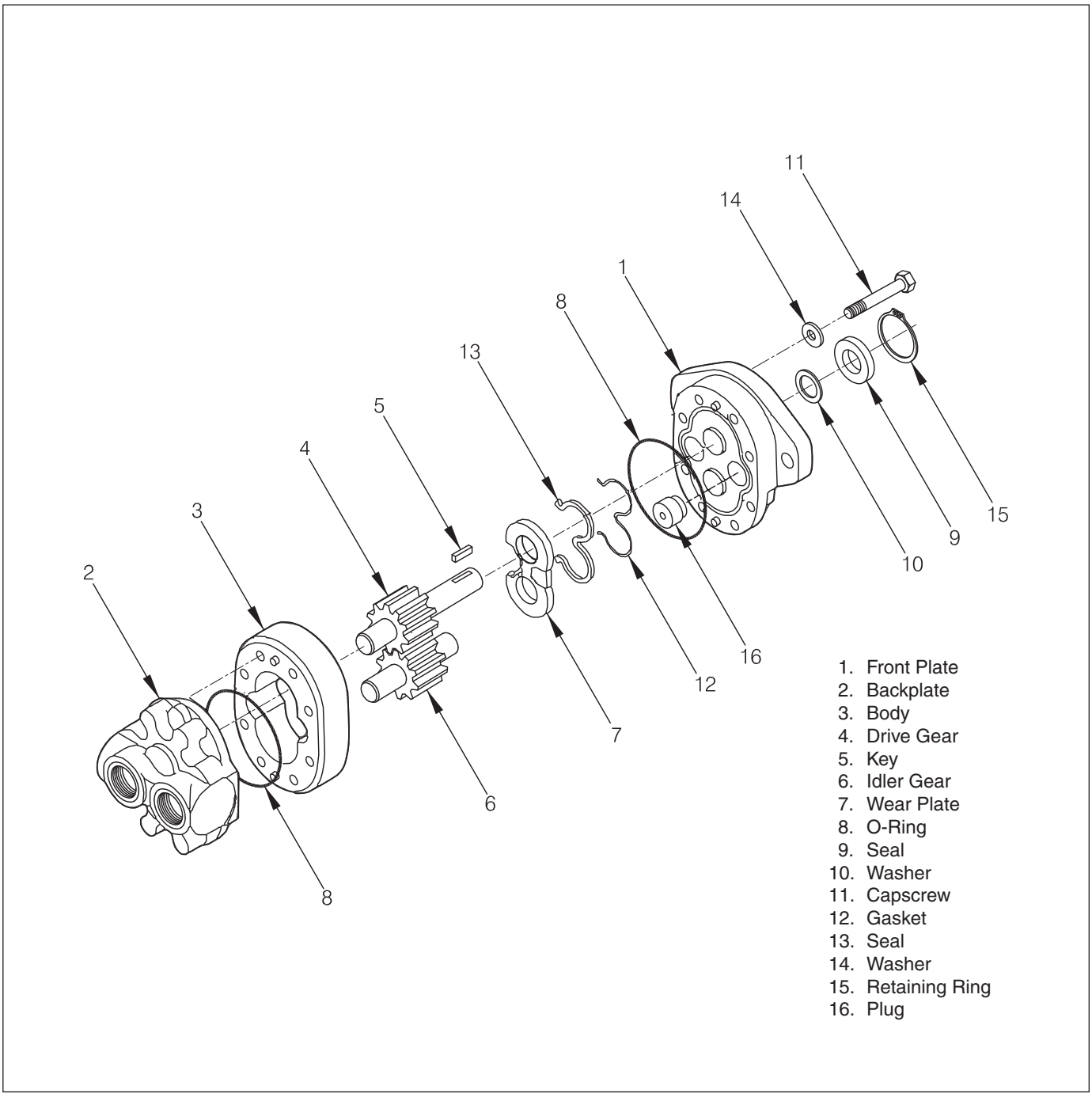


Figure 1-30 Hydraulic Pump

Hydraulic Pump (See Fig. 1-30)

The hydraulic pump is a positive displacement gear pump that supplies the hydraulic flow necessary for operation of the winch. The pump shaft is driven by a gear on a clutch housing. The pump's rotation is dependent upon the tractor's PTO. The inlet and outlet configuration of a clockwise pump is different than that of a counterclockwise pump. The pump inlet port is connected to the winch suction filter. The outlet is connected through the pressure filter to the control valve inlet port.

Accumulator

A single accumulator is connected to the hydraulic system. The bladder has a nitrogen charge so that the oil stored in the accumulator will be under pressure. When released, this oil will provide pressure for the hydraulic system during low engine rpm shifts or if the PTO shaft stalls.

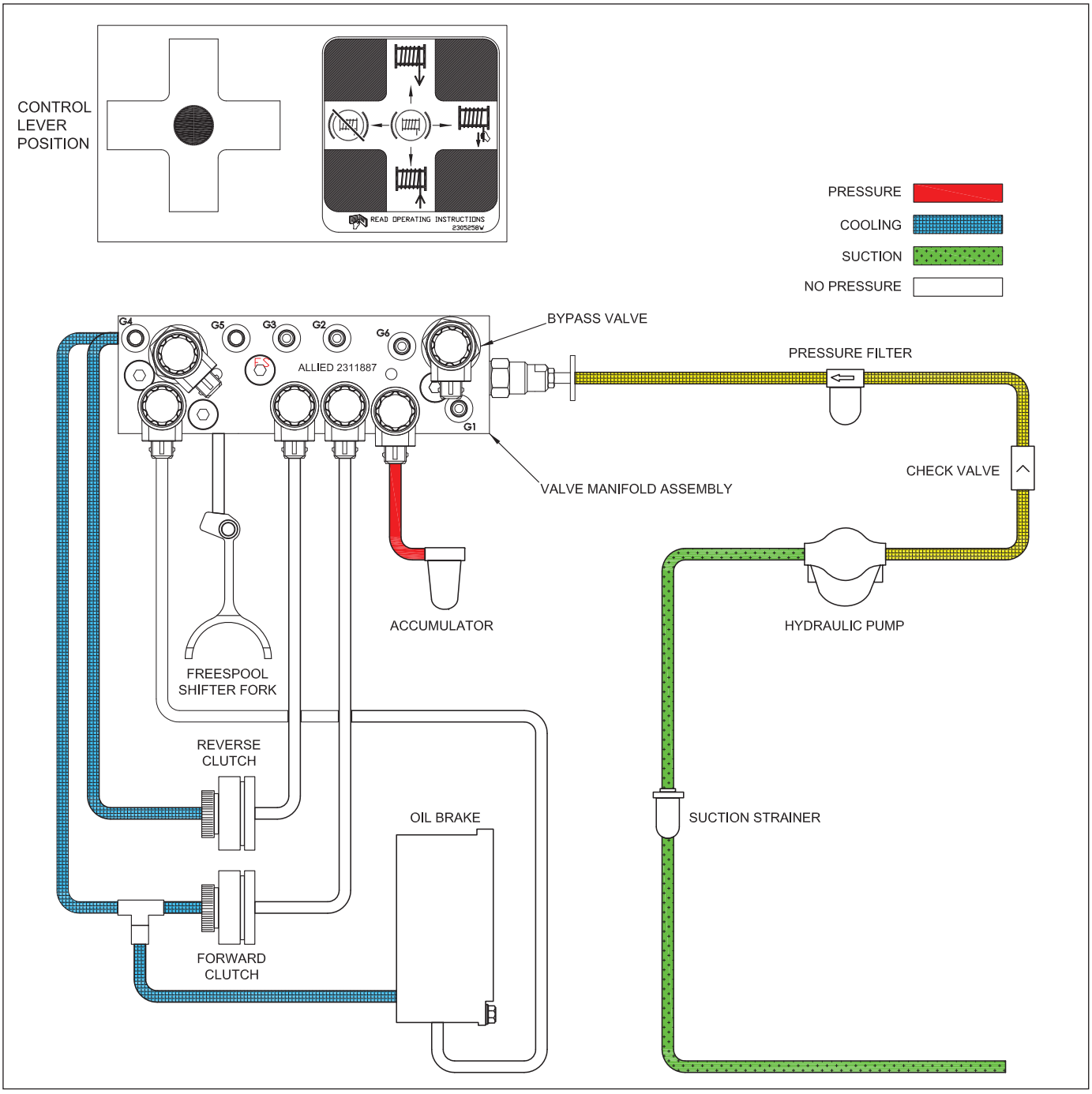


Figure 1-31 Hydraulic System, Electronic Controls - BRAKE-ON (Neutral)

Sequence of Operation, Electronic Controls - BRAKE-ON

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

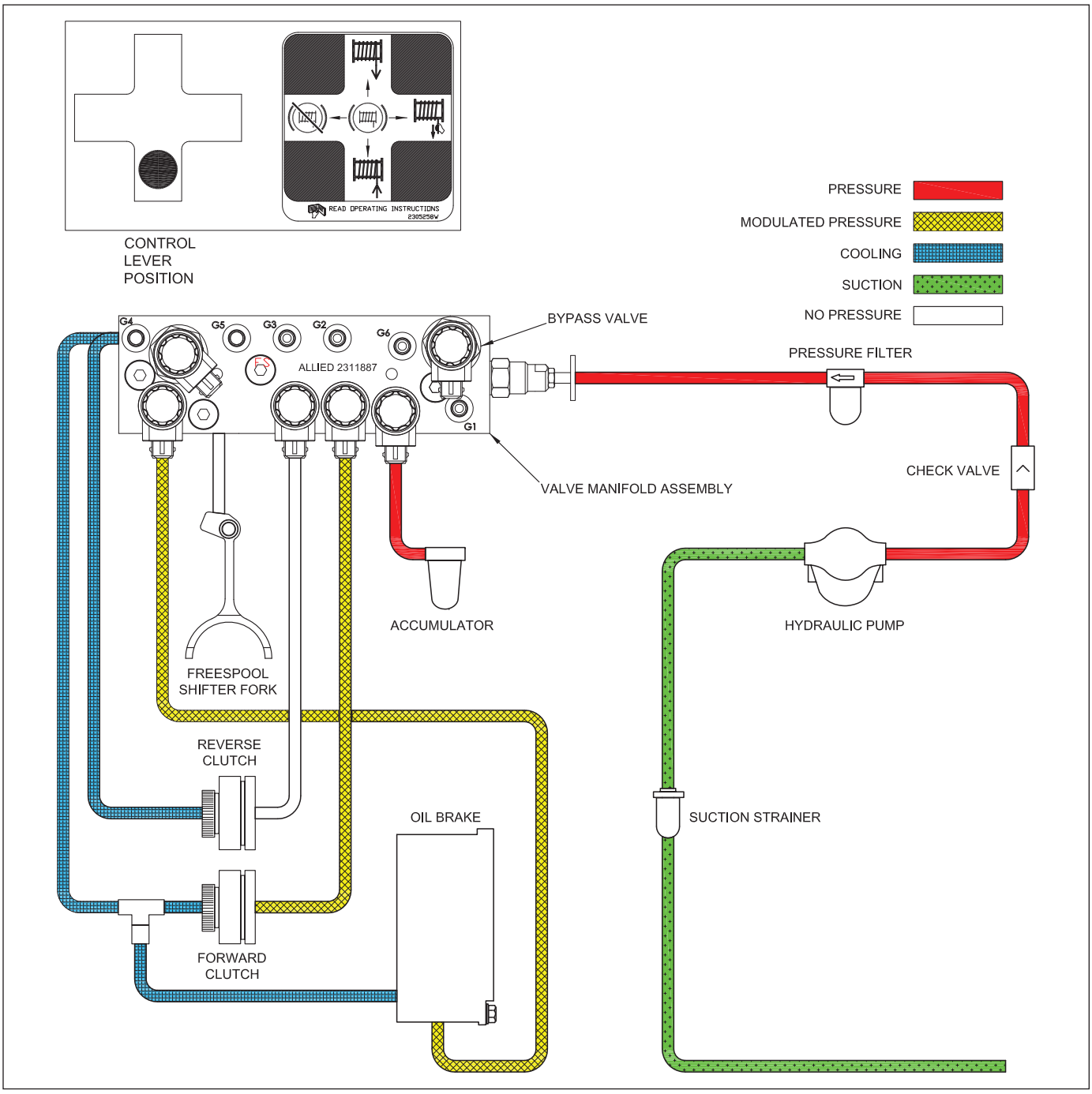


Figure 1-32 Hydraulic System, Electronic Controls - LINE-IN (Forward)

Sequence of Operation, Electronic Controls - LINE-IN

For **LINE-IN** (forward) operation, the operator pulls back on the control lever, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. The proportional brake and forward clutch valves open according to the control module program. Modulated pressure to the clutch and brake is supplied during inching (slight movement of the control lever from the **BRAKE-ON** position). Full pressure is applied to the clutch when the control lever is in full **LINE-IN** position. Brake pressure is limited to just above brake release pressure for faster response.

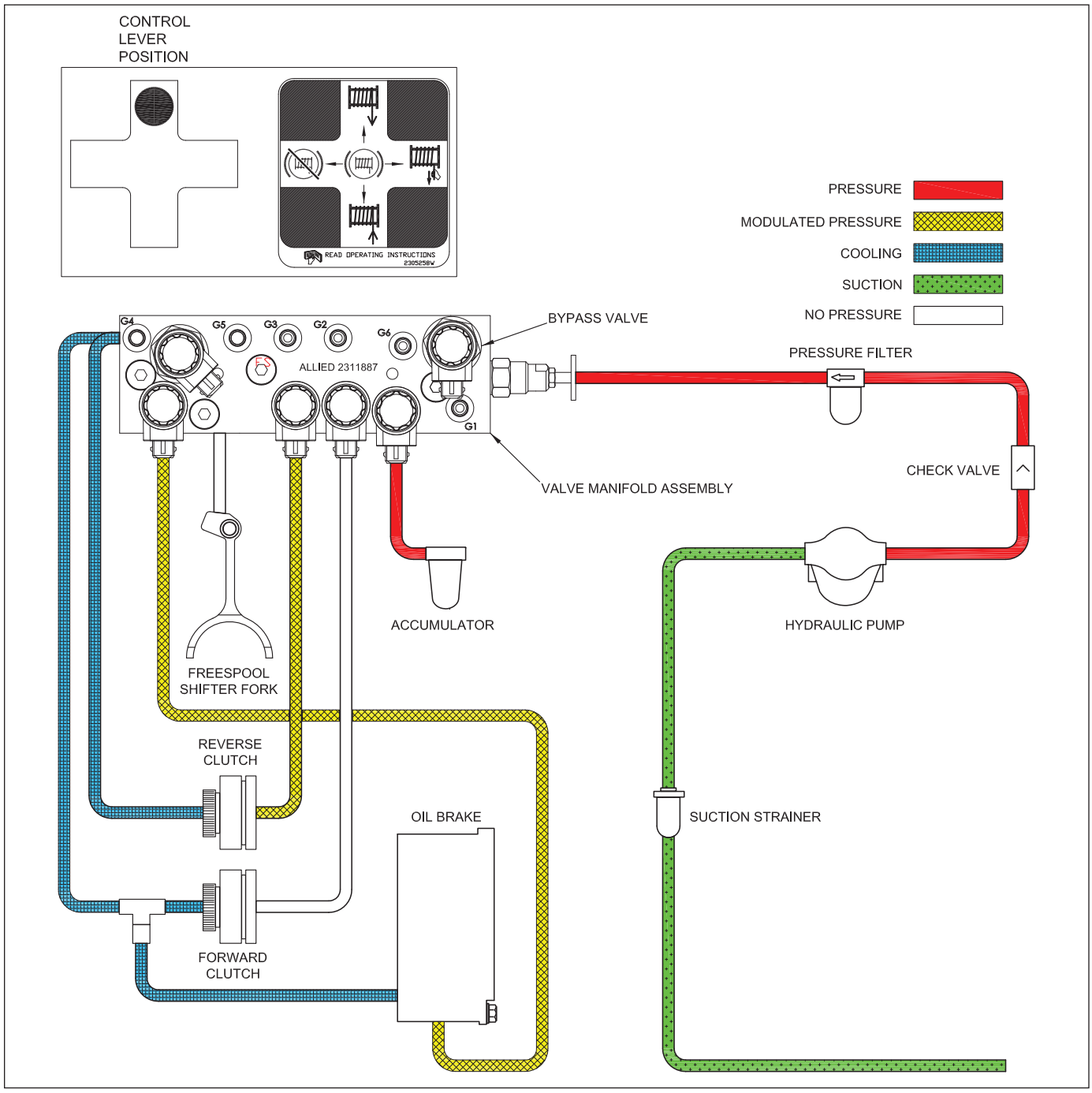


Figure 1-33 Hydraulic System, Electronic Controls - LINE-OUT (Reverse)

Sequence of Operation, Electronic Controls - LINE-OUT

LINE-OUT (reverse) operation is achieved by pushing the control lever forward from the **BRAKE-ON** position, which simultaneously closes the bypass valve and opens the accumulator valve. Oil flow from the pump and accumulators increases pressure. Brake pressure increases. The proportional brake and reverse clutch valves open according to the control module program. Modulated pressure to the clutch and brake is supplied during inching (slight movement of the control lever from the **BRAKE-ON** position). Full pressure is applied to the clutch when the control lever is in full **LINE-OUT** position. Brake pressure is limited to just above brake release pressure for faster response.

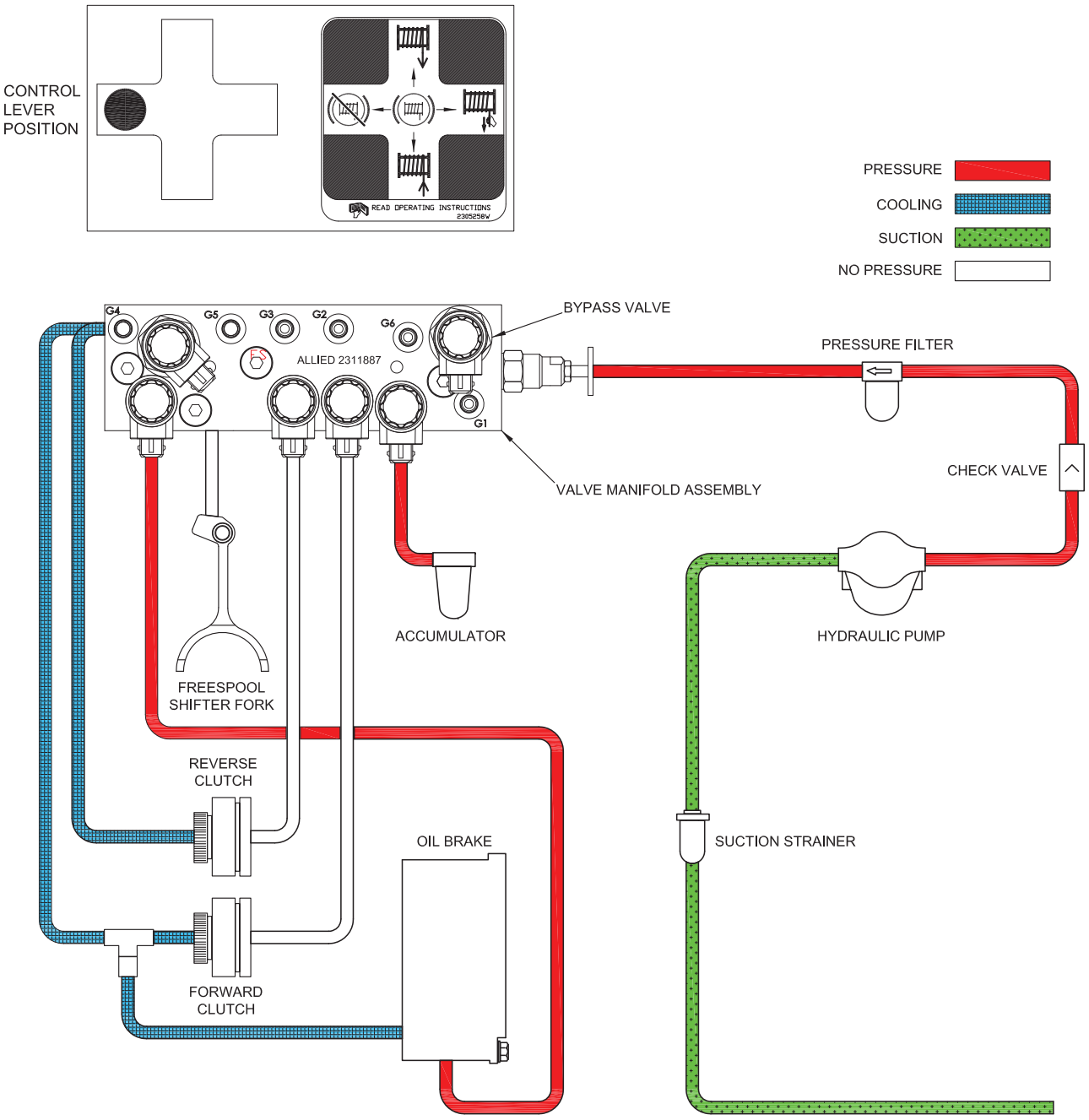


Figure 1-34 Hydraulic System, Electronic Controls - BRAKE-OFF

Sequence of Operation, Electronic Controls - BRAKE-OFF

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

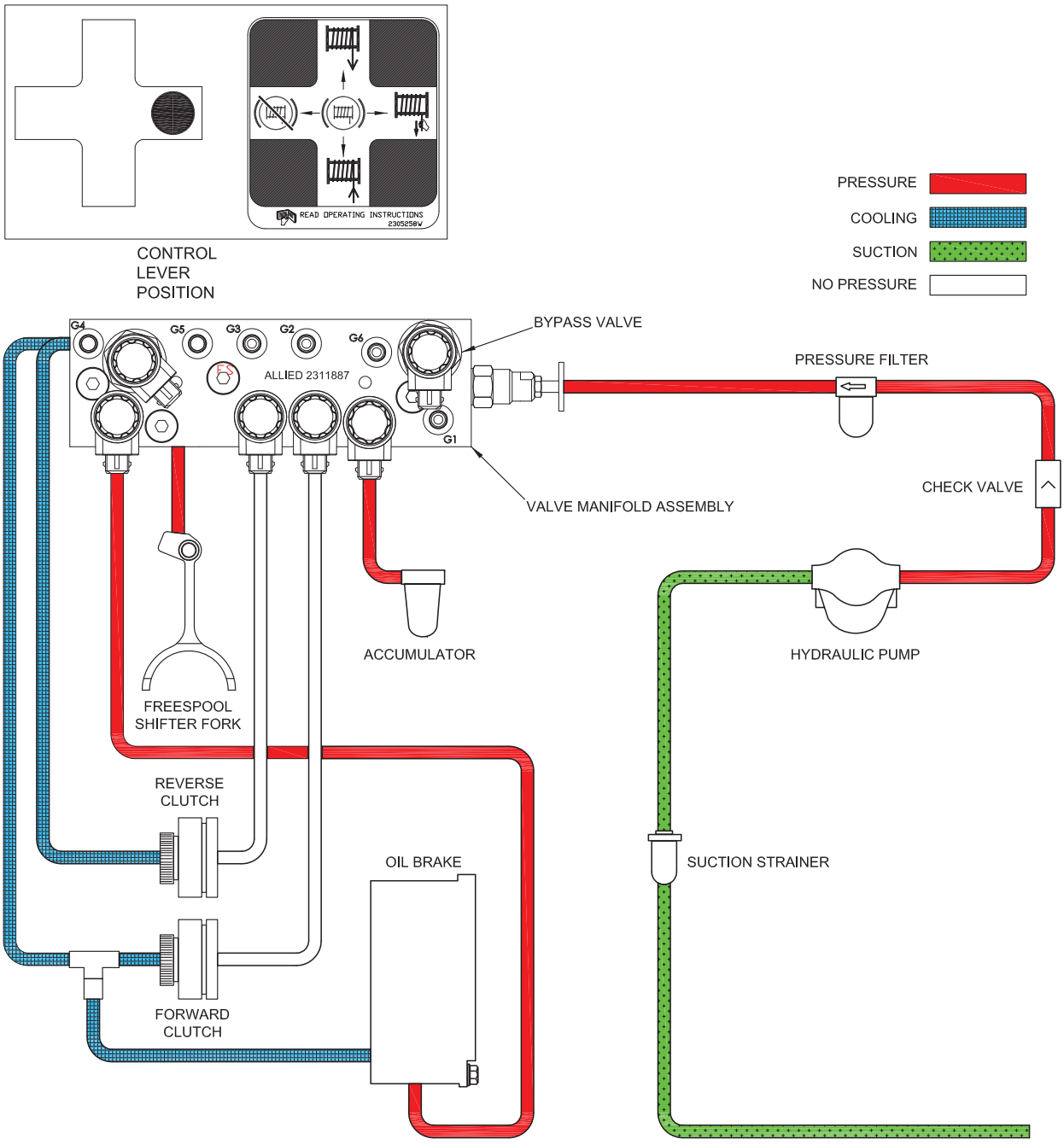


Figure 1-34 Hydraulic System, Electronic Controls - FREESPOOL

Sequence of Operation, Electronic Controls - FREESPOOL

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

⚠ WARNING

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

Notes

Troubleshooting

General

This section includes Figures 2-1 and 2-2, trouble analysis check charts for power controls and electronic controls, as well as Figure 2-4, a basic Electronic Control Module (ECM) troubleshooting chart, and Figure 2-5, an ECM LED description chart. Where appropriate, the charts list the most common troubles that may be encountered and suggest possible causes and corrective actions.

Figure 2-1 Power Controls Troubleshooting Analysis Check Chart (1)

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.
	Low oil pressure.	See item on troubleshooting low oil pressure directly below.
	Wrong oil.	Drain oil and replace with correct grade. Refer to the approved oil list in Section 3.
	Accumulator malfunction.	Check accumulator and recharge/replace as necessary.
	Tractor engine idling too low.	Increase tractor idle speed.
	Hydraulic system suction leaks. Observe oil exiting lube valve while tractor is operating. Suction leaks will cause oil to foam.	Check the following for air leaks: 1. Suction hose to pump connection 2. Pump shaft seal 3. Suction filter cover and gasket 4. Suction hose for cracks or collapsed sections
Low oil pressure	Leaking pressure hoses and fittings.	Check for leaks and replace components where necessary. Be sure hoses are not rubbing on any gears or winch components.
	Defective or improperly adjusted oil relief valve; poppet may be stuck open.	Clean relief valve if no pressure, then adjust. Check relief valve with pressure gauge. Replace if defective.
	Clogged suction strainer.	Check and clean or replace suction strainer.
	Oil brake leaking internally (indicated by low brake pressure).	Repair as required.
	Defective hydraulic pump.	Check pump pressure output only after all other checks have been made. Worn pump indicated by pressure variation with engine RPM. If pump is at fault, replace.

Continued on next page

Figure 2-1 Power Controls Troubleshooting Analysis Check Chart (2)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Brake does not release or winch stalls during low RPM shift	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Pressure modulator set improperly.	Turn modulator screw in for earlier brake release.
	Damaged brake piston, piston housing or seal rings.	Check piston and piston housing cavity for damage. Replace if scored or broken. Always replace seals when brake is repaired.
	Low clutch pressure or low oil pump volume.	Refer to "Low Forward or Reverse Clutch Pressure" troubleshooting item below.
Overheating	Plugged pressure filter.	Replace filter.
	Plugged suction filter.	Check suction filter and clean or replace.
	One or both clutches dragging.	Check by placing 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.
	Low or high cooling oil pressure.	Check cooling oil pressure. Replace relief valve if required.
	Clutch/brake shaft bearings set too tight.	Adjust accordingly.
	Control valve spool travel improperly adjusted.	Adjust accordingly.
	Excessive inching.	Avoid continuous operation in the inching zone.
	Low oil level.	Add oil.
Winch will not operate while tracks are turning	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Low oil pressure.	Refer to "Low Oil Pressure" troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage.

Continued on next page

Figure 2-1 Power Controls Troubleshooting Analysis Check Chart (3)

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.
	Cooling pressure too high.	Test and reset.
	Dowels out of holes.	Inspect clutch and realign dowels.
Forward or reverse clutch not engaging	Low oil pressure.	See "Low Oil Pressure" troubleshooting item above.
	Low forward or reverse clutch pressure.	See troubleshooting for "Low Forward or Reverse Clutch Pressure" item below.
	Inadequate piston travel.	Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.
	Control lever is in FREESPOOL mode.	Return control lever to normal operation mode.
Clutch does not apply correctly at low PTO rpm.	Accumulator not charged.	Check accumulator.
	PTO stalled (0 rpm).	Increase tractor rpm.
Low forward or reverse clutch pressure	Broken seal rings on the 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 clutch bleed-down test on clutch circuit.
Brake slipping or drum backspin on fast shift from neutral to forward	Low brake release pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 4.
Brake releases before forward clutch engagement	Modulator valve in control valve not functioning.	Check forward modulator valve.
	Low brake release pressure.	See "Brake Slipping" troubleshooting item above.
	Clutch line plugged.	Clean clutch line and orifices.

Continued on next page

Figure 2-1 Power Controls Troubleshooting Analysis Check Chart (4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Brake releases before reverse clutch engagement	Modulator valve in control valve not functioning.	Check reverse modulator valve.
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.
	FREESPOOL drag too loose.	Tighten setscrew to increase bearing preload. Refer to FREESPOOL drag adjustment instructions in Section 3.
Hard to shift	Linkage or cable binding or rusted.	Clean, straighten, repair or replace parts as necessary.
	Shifting collar too tight on splines or splines rough.	Remove shifting collar, dress splines with fine stone, and replace parts if necessary.
	Dental clutch installed backwards.	Install clutch so that chamfered ramp faces drum pinion gear.
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 intermediate gear.	Replace gear.
	Detent ring loose, damaged or sticking.	Clean or replace as necessary.
Winch will not FREESPOOL	Intermediate gear or shaft damaged or rusted.	Adjust and repair or replace as necessary.
	Control linkage improperly adjusted.	Check and adjust as necessary.
	Drum shaft assembly damaged, rusted or binding.	Clean or replace as necessary.
Winch FREESPOOLs too easily	Insufficient preload on intermediate shaft.	Tighten preload on the intermediate shaft using FREESPOOL drag adjustment instructions give in Section 3.
Winch requires too much effort to FREESPOOL	Too much preload on intermediate shaft.	Loosen preload on the intermediate shaft using FREESPOOL drag adjustment instructions give in Section 3.

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (1)

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

Continued on next page

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (2)

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.
	Low or high cooling oil pressure.	Check cooling oil pressure. Replace relief valve if required.
	Clutch/brake shaft bearings set too tight.	Adjust accordingly.
	Excessive inching.	Avoid continuous operation in the inching zone.
	Low oil level.	Add oil.
Winch will not operate while tracks are turning.	Accumulator system malfunction.	Check for: 1. Correct leakdown time as described in Section 3. 2. Leaking accumulator valve. 3. Leak in accumulator lines. 4. Damaged or defective accumulators.
	Low oil pressure.	Refer to “Low Oil Pressure” troubleshooting item above.
	Defective PTO shaft.	Inspect PTO shaft and coupling, clutch shaft bevel ring gear and PTO shaft pinion gear for wear or damage.

Continued on next page

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (3)

PROBLEM	POSSIBLE CAUSE	CORRECTION
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 DC-DC converter malfunction.	Replace converter if the red & green LEDs are not lit.
	Control module fault.	Check status indicator on module. Red LED should not be illuminated. If it is, consult factory.
	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 wrong 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.
	Relief pressure not being reached.	Check bypass coil & valve, replace faulty parts.
Forward or reverse clutch not releasing.	Broken or weak release springs.	Check springs and replace as necessary.
	Warped frictions or separators.	Replace as necessary.
	Cooling pressure too high.	Test and reset.
	Dowels out of holes.	Inspect clutch and realign dowels.
Forward or reverse clutch not engaging.	Low oil pressure.	See “Low Oil Pressure” troubleshooting item above.
	Low forward or reverse clutch pressure.	See troubleshooting for “Low Forward or Reverse Clutch Pressure” item below.
	Inadequate piston travel.	Remove the access cover and place the winch in gear while visually checking the clutch for piston movement.
	Worn friction discs and separator plates.	Replace the friction discs and separator plates if too thin, scored or distorted. Refer to Section 4.
Clutch does not apply correctly at low PTO rpm.	Accumulator not charged.	Check accumulator.
	PTO stalled (0 rpm).	Increase tractor rpm.

Continued on next page

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (4)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Low forward or reverse clutch pressure.	Broken seal rings on the clutch/ brake shaft.	Replace seal rings. 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 clutch bleed-down test on clutch circuit.
	Faulty valve or coil.	Check valve and coil for proper operation. Check coil for voltage.
Brake slipping or drum backspin on fast shift from neutral to forward.	Low brake release pressure.	Check brake release pressure. Replace friction discs and separator plates if too thin.
	Broken belleville spring.	Replace. Refer to Section 4.
Brake releases before forward clutch engagement.	Faulty forward clutch valve or coil.	Check forward clutch valve and coil.
	Low brake release pressure.	See “Brake Slipping” troubleshooting item above.
	Clutch line plugged.	Clean clutch line and orifices.
Brake releases before reverse clutch engagement.	Faulty reverse clutch valve or coil.	Check reverse clutch valve and coil.
Noisy buzz emanating from winch.	Air in relief valve.	This is not a detrimental condition. Noise may be intermittent.
Winch 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 or FREESPOOL.	Detent mechanism worn or broken.	1. Replace control lever assembly. 2. Adjust detent spring force (see Control Lever & Lubrication Adjustment in Section 3 for procedure).

Continued on next page

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (5)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Control lever does not return to neutral when released.	Insufficient lubrication.	Lubricate detent pin (see Control Lever Lubrication & Adjustment in Section 3 for procedure).
	Excessive detent force.	Remove knob and adjust detent force (see Control Lever Lubrication & Adjustment in Section 3 for procedure).
	Control lever is in detented position (BRAKE-OFF or FREESPOOL).	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.
Winch does not engage and tractor engine draws down in LINE-IN or LINE-OUT.	Plugged brake valve.	Replace valve.
	Faulty brake coil.	Replace coil.
	Open or shorted brake circuit.	Check wiring harness. See “Winch will not operate in any function” above.
Winch does not engage and/or load rolls out in LINE-IN or LINE-OUT.	Plugged forward or reverse valve.	Replace valve.
	Faulty forward or reverse coil.	Replace coil.
	Open or shorted forward/reverse circuit.	Check wiring harness. See “Winch will not operate in any function” above.
Filter LED blinking.	Open or shorted coil.	See the Control Module Troubleshooting section in this chapter for more information.
Filter LED illuminated.	Filter is clogged.	Change filter and oil. NOTE: Change filter only after first 50 hours of operation when winch is new or freshly 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.
Winch will not FREESPOOL.	Intermediate gear or shaft damaged or rusted.	Adjust and repair or replace as necessary.
	Drum shaft assembly damaged, rusted or binding.	Clean or replace as necessary.
	Faulty brake or freespool valve.	Check cartridge valves and coils.
Winch FREESPOOLs too easily.	Insufficient preload on intermediate shaft.	Tighten preload on the intermediate shaft using FREESPOOL drag adjustment instructions give in Section 3.
Winch requires too much effort to FREESPOOL.	Too much preload on intermediate shaft.	Loosen preload on the intermediate shaft using FREESPOOL drag adjustment instructions give in Section 3.

Continued on next page

Figure 2-2 E-Controls Troubleshooting Analysis Check Chart (6)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Jumps out of gear.	Shifting fork improperly adjusted.	Check and adjust as necessary.
	Worn shifter fork.	Replace shifter fork and related parts as necessary.
	Worn intermediate gear.	Replace gear.
	Detent ring loose, damaged or sticking.	Clean or replace as necessary.
	Pressure to FREESPOOL circuit at wrong time, winching in or out.	Verify 0 psi during winching. If pressure is present, seals on solenoid valves could be damaged, or solenoids being activated by stray voltage.
	Broken spring	Replace spring.

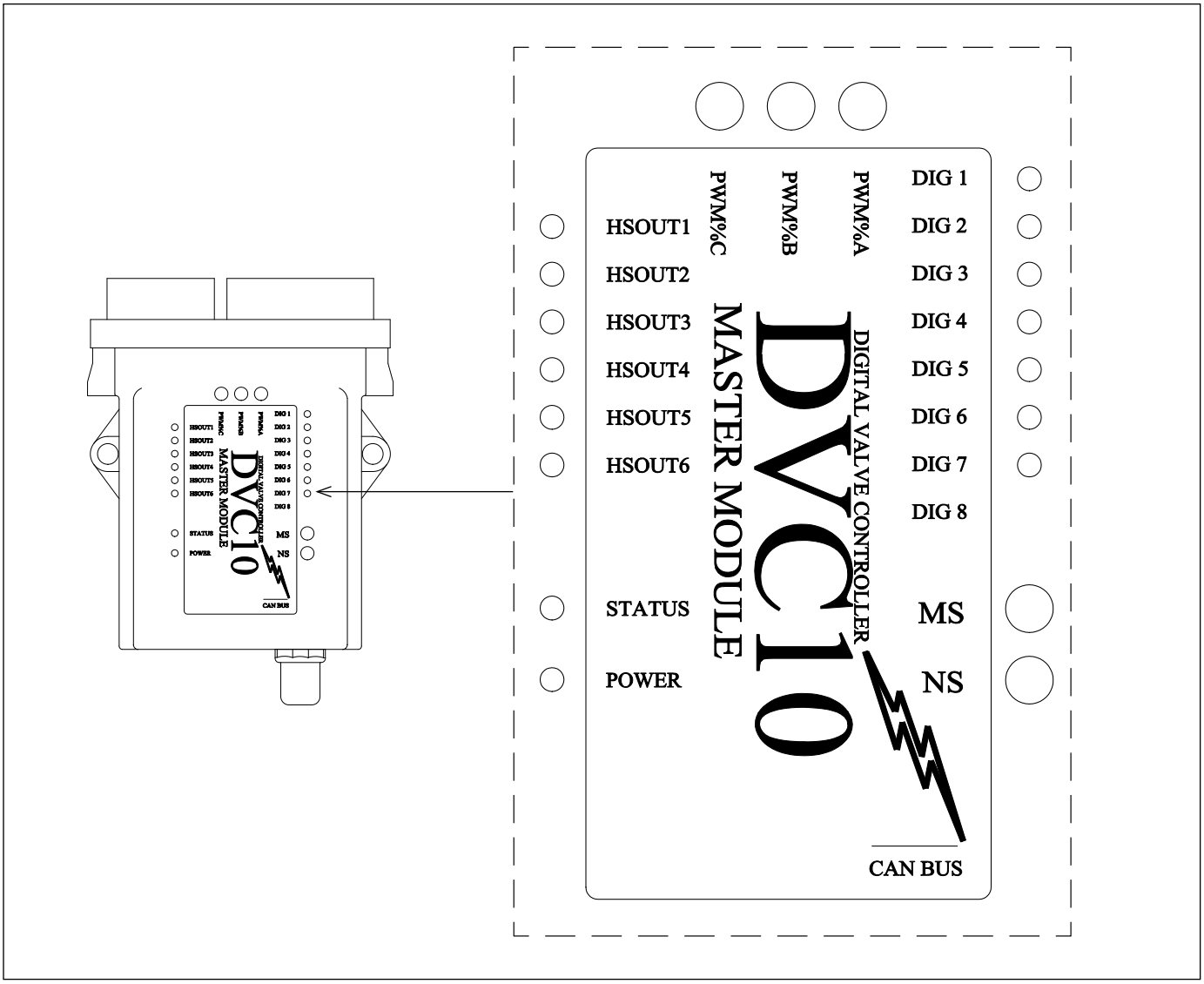


Figure 2-3 Electronic Control Module

Figure 2-4 Electronic Control Module LED Description Chart (See Figure 2-3)

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.

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.

Figure 2-5 Electronic Control Module Troubleshooting Chart

Interfacing with the Electronic Control Module (ECM)

The ECM regulates the cartridge valves on the valve manifold assembly, based on joystick input and a preset computer program. Occasionally, it may be necessary to download a new control program for the ECM or perform higher-level electronic control system troubleshooting through the ECM interface. Should this be necessary, a 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.

Notes

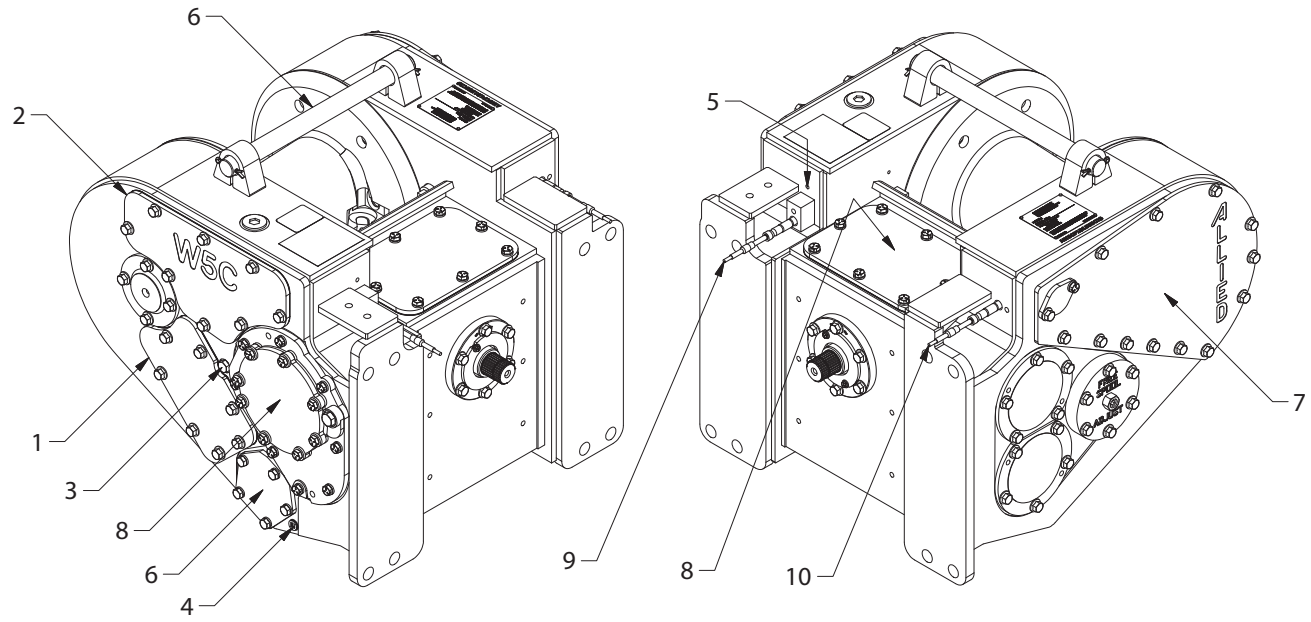
Service

General

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

Maintenance

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



1. Access Cover for Filter
2. Access Cover for Control Valve and Oil Fill
3. Plug to Check Oil
4. Plug to Drain Oil
5. Breather
6. Access Cover for Strainer
7. Access Cover for Drum Gear
8. Access Cover for Ring and Pinion
9. Hydraulic Control Cable
10. FREESPOOL Control Cable (Power Controls Only)

Figure 3-1 W5C Maintenance Points

Figure 3-2 Maintenance Schedule

INTERVAL	PROCEDURE OR QUANTITY	SPECIFICATION
50 hours or weekly *	Check oil at oil level at plug (item 3). Add oil as necessary. Do not operate the tractor when checking the oil level.	See Figure 3-15, Recommended Oil List.
	Clean the breather in the fill plug (item 5).	Remove debris around breather. Clean the breather with solvent if necessary.
	Lubricate the rollers on the cable guide rolls or fairlead assembly if the winch is equipped with either option.	Use multi-purpose grease with 2-4% molybdenum disulfide.
	POWER CONTROLS ONLY: Lubricate the winch control lever and the FREESPOOL control lever.	Use SAE 30 on the linkage as needed. Check that the control cable and control housing are fastened correctly.
500 hours or every 3 months	Clean the oil suction screen and magnets.*	Tilt the tractor approximately 15° to prevent loss of oil when the cover is removed. Use a new gasket between the cover and the suction tube.
	Clean the breather in the fill plug.	Clean the breather with solvent.
	Replace the filter.*	See the 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 17 gallons (65 liters) † of oil. Check the oil level at item 3.	See Figure 3-15, Recommended Oil List.
* NOTE: Clean the oil strainer screen and change the oil filter after the first 50 hours on new and rebuilt winches. † Amount of oil may vary slightly with tractor.		

Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance has been done at the recommended operating hours. See the Maintenance Schedule, Figure 3-2, for the W5C winch.

Checks During Operation

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

Power Controls - Checks and Adjustments

The checks and adjustments for the power controls winch cover the following areas:

- Control Cable Adjustments
- Freespool adjustment

Control Cable Adjustments (See Figs 3-3 thru 3-5)

A single control cable connects the power control 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 the **BRAKE-OFF** position as it is DETENTED. Cable adjustment is not necessary except to ensure full spool travel.

To adjust TYPE I control levers, proceed as follows:

1. Ensure that the cable bracket at the winch end of the 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 in elongated slots to improve position of control lever. Tighten nuts securely.

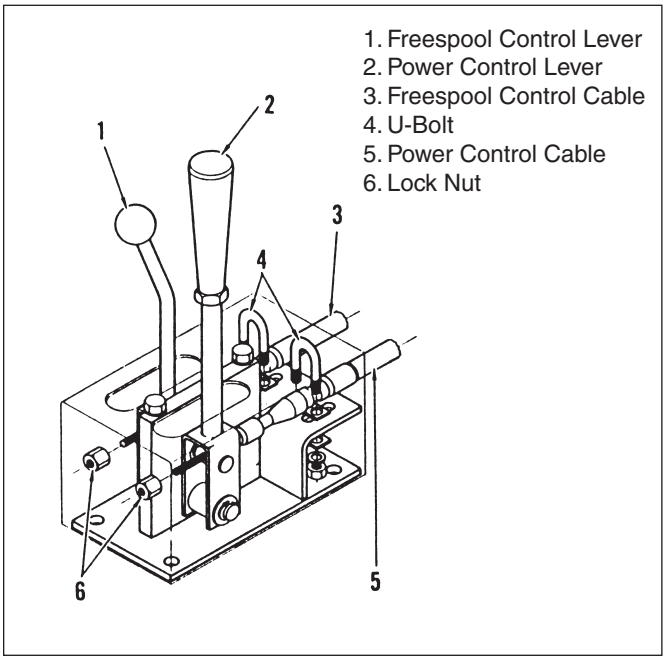


Figure 3-3 Control Cable Adjustments (Type I)

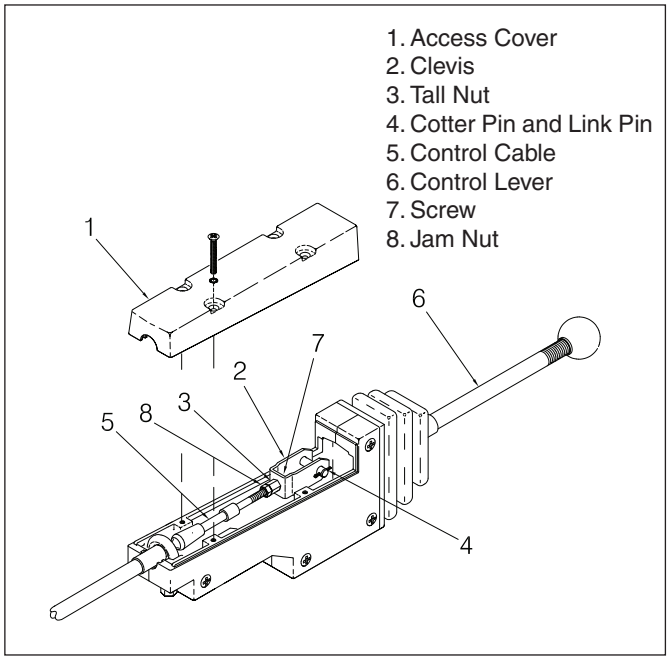


Figure 3-4 Control Cable Adjustments (Type II) - OBSOLETE

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

To adjust TYPE II control levers, 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.

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 operation and **FREESPOOL** positions. Check the operation of the **FREESPOOL** lever for smooth operation. Each of the two positions has a detent. The checks are the same for all types of current control levers.

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.

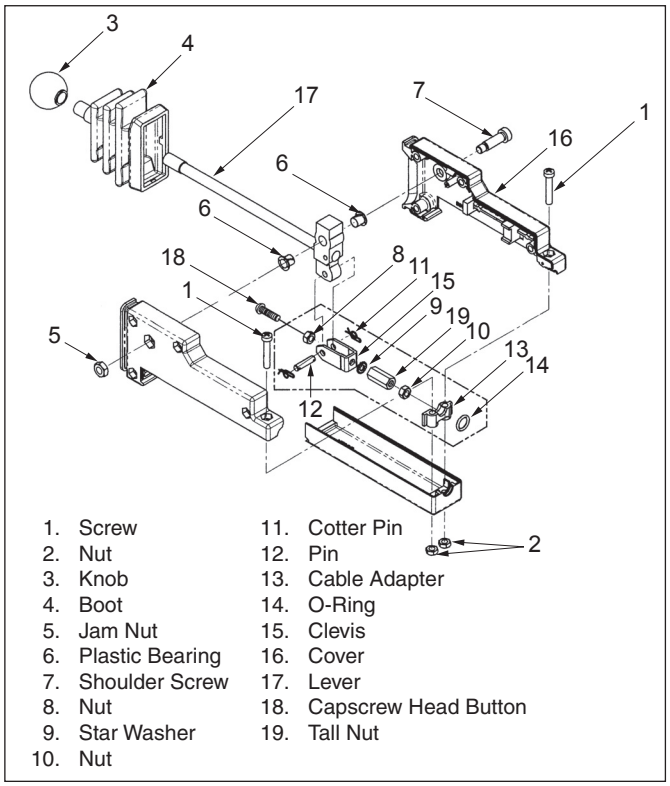


Figure 3-5 Control Cable Adjustments (Type II) - CURRENT

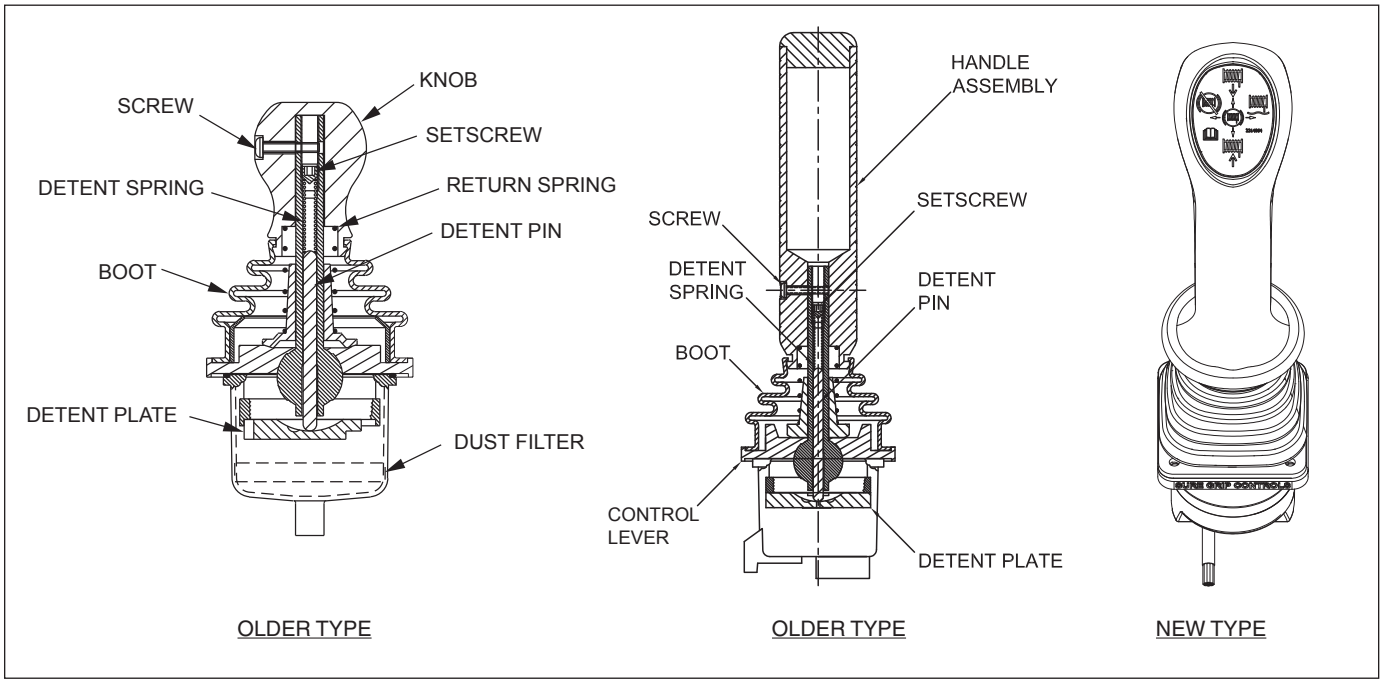


Figure 3-6 Control Levers

Electronic Controls - Control Lever Lubrication & Adjustment (See Fig. 3-6)

⚠ CAUTION

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

⚠ CAUTION

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

Control Lever Detent Pin Lubrication

1. Unscrew control lever assembly from bracket.
2. Push down on knob to balance spring force and remove screw on control lever knob. Lift knob and boot from control lever.
3. Remove setscrew and detent spring.
4. Apply a few drops of oil on top of detent pin inside bore.
5. Install spring, then setscrew.
6. Move control lever from **BRAKE-ON** to **BRAKE-OFF** and back to ensure detent force is satisfactory. If not, adjust detent force (see **Adjusting Control Lever Detent Force** below).
7. Place boot and knob over control lever, ensuring boot is securely installed, then install knob screw.
8. Install control lever assembly on bracket.

Adjusting Control Lever Detent Force

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

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

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

NOTE: No lubrication or adjustment is required for new type (Sure Grip) control lever.

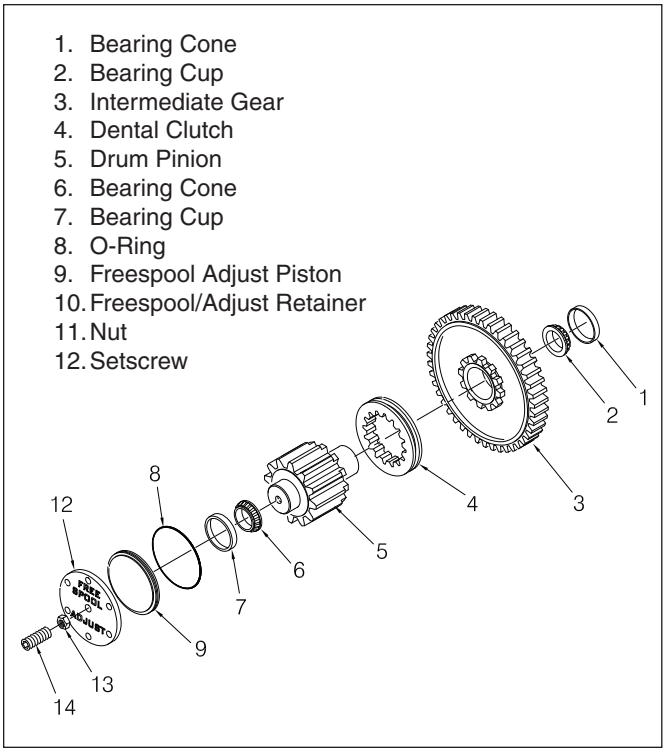


Figure 3-7 Freespool Adjustment

Freespool Adjustment For Both Cable and Electronic Controls (See Fig. 3-7)

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

An adjusting setscrew is located in the center of the cover for the intermediate shaft. This setscrew can be tightened or loosened to adjust the preload on the intermediate shaft. The jam nut will maintain the **FREESPOOL** setting.

⚠ WARNING

Do not over-tighten FREESPOOL drag as this will cause bearing and gear failures.

Power Controls - Hydraulic System Pressure Checks (See Figs. 3-8 and 3-9)

The hydraulic oil and filter(s) should be maintained as indicated in the Maintenance Schedule, Figure 3-2. If any problems are found, they should be corrected before operating the winch.

Preparation

1. These tests should be performed with a bare drum (no wire rope) since the drum will rotate during the tests.

⚠ WARNING

Tractor 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. The oil temperature in the winch must be at least 20°C (70°F).

3. Remove any dirt from the right side of the winch. Remove control valve access plate.

4. Stabilize engine speed at 1000 RPM for all tests except cooling oil pressure.

5. Leave test plugs securely installed unless testing that port.

6. After completing all pressure checks and making the necessary adjustments, ensure that all plugs and hoses are securely installed.

7. Install control valve access plate and tighten capscrews.

Pressure gauges

To perform the hydraulic pressure checks, calibrated pressure test gauges will be required. Two 400 psi (2800 kPa) and one 30 psi (200 kPa) test gauge will be needed.

Brake Pressure Check

With the engine shut off, connect one 400 psi pressure gauge to Brake Port C. Start the engine and follow procedure in Figure 3-11. 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

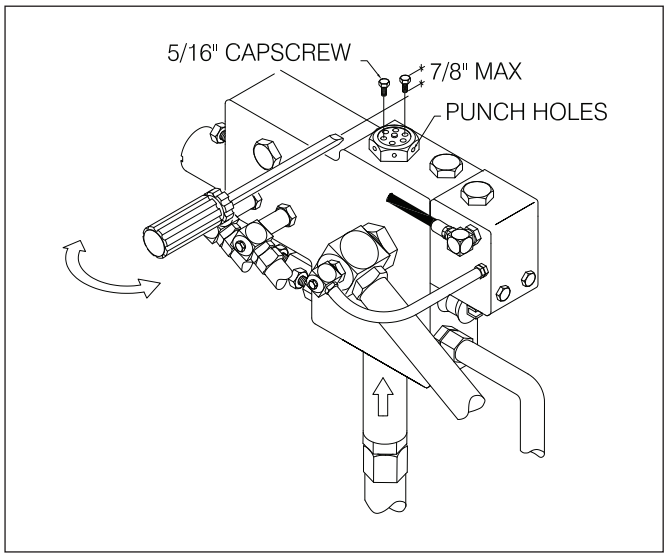


Figure 3-8 Cooling Oil Relief Pressure Setting

With the engine shut off, connect one 30 psi pressure gauge to Port A or B. Start the engine and check the cooling pressure against the values in Figure 3-11. If the cooling oil pressure is too high, it can stroke the clutch piston, causing the clutch pack to drag. 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.

1. Adjust Cooling Oil Relief Valve as follows:
2. Start engine and place control lever in **BRAKE-ON**.
3. Turn the cooling oil relief valve IN to increase pressure and OUT to decrease pressure (See Fig. 3-8, showing how to turn the valve using a screwdriver).
   Adjust pressures as shown in Figure 3-11.
4. Use a punch to deform the threads through one of the six holes in the side of the hex.

Accumulator Pressure Check

With the engine shut off, connect one 400 psi pressure gauge to Port C (see Figure 3-9). This check determines if the accumulators are functioning and have the correct nitrogen charge. Observe the following while following the accumulator procedures in Figure 3-11.

1. With engine running, place control lever in **BRAKE-OFF** and rev engine to maintain 245-255 psi (1690-1760 kPa) for one minute. This will ensure that the accumulator has a full supply of oil.
2. Return control lever to **BRAKE-ON**.
3. Shut the engine off and wait one minute.
4. Quickly place the control lever in the **BRAKE-OFF** position. This will release the oil in the accumulator. Observe the initial pressure reading and the time for the pressure to drop below that specified in Figure 3-11.

If the leak down time is less than specified in Figure 3-11, repeat steps 1 through 4, but do not wait one minute 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 accumulator 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. The accumulator is not rebuildable.

When replacing an accumulator, charge the new accumulator with dry nitrogen to 115 psi ± 5 psi.

NOTE: Use dry nitrogen ONLY to charge accumulators.

⚠ CAUTION

Ensure all oil is released from accumulator before attempting to charge.

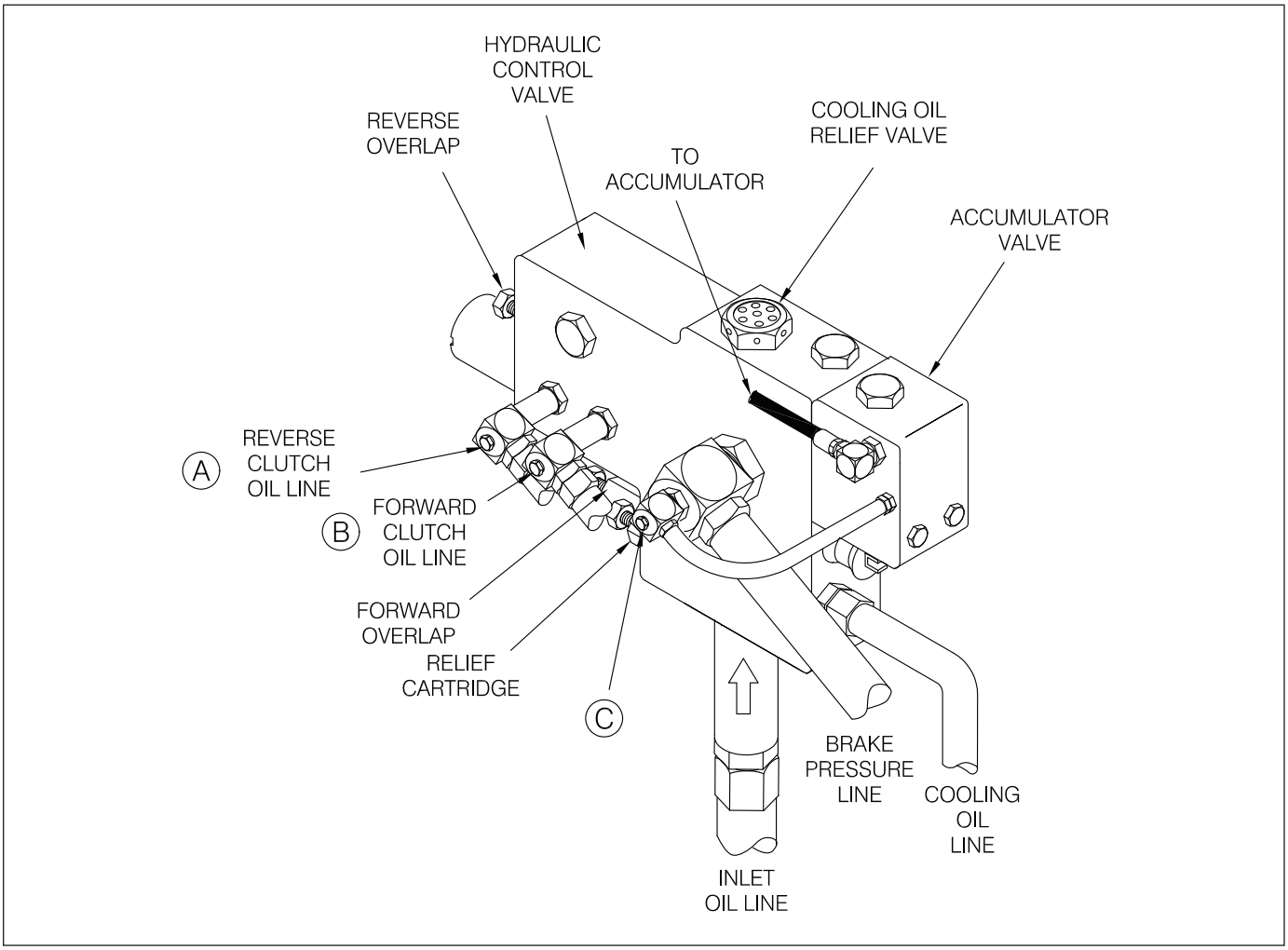


Figure 3-9 Hydraulic Pressure Test Ports

Forward Clutch Pressure Check and Forward Modulator Valve Check

With the engine shut off, connect a 400 psi 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 3-11. 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 3-11. If the pressure differential is too low, the brake will not release soon enough and cause a stall. If the pressure differential is too high, the brake will release too soon and allow the drum to roll back.

If the forward clutch pressure is not as specified in Figure 3-11, check for:

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

If in **LINE-IN INCHING** the pressure differential is not as specified in Figure 3-11, 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 toward **LINE-IN** until the brake pressure reads 150 PSI (1030 kPa).

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 3-11.

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

Reverse Clutch Pressure Check and Reverse Modulator Valve Adjustment

Shut off the engine and connect one 400 psi pressure gauge to Reverse Clutch Port A and one 400 psi pressure gauge to Brake Port C (see Figure 3-9). Start the engine. Place the control lever in **LINE-OUT** and check reverse clutch and **LINE-OUT INCHING** pressures as indicated in Figure 3-11. 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 3-11. 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 3-11, check for:

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

If in **LINE-OUT INCHING** the pressure differential is not as specified in Figure 3-11, 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 150 PSI (1030 kPa).
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 3-11.
3. Tighten locknut and recheck pressure. Repeat steps 1 and 2 if necessary.

Brake Release Pressure

With the overlap set, connect one 400 psi pressure gauge to Brake Port C. Move the control lever toward **LINE-OUT** until the drum is barely turning. This should occur at 95 to 115 psi.

Control Valve Spool Travel Check (See Fig. 3-10)

It may be necessary to check spool travel when control valve pressures do not meet specifications. Figure 3-10 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 the detent assembly in the spool end cap. If spool travel is found to be out of adjustment, the spool assembly or complete control valve assembly should be replaced. Ensure that the spool end cap is installed securely, then perform the check for smooth return of control lever to neutral from any other position. Any binding or sticking should be investigated by removing the spool cap and examining parts for wear.

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

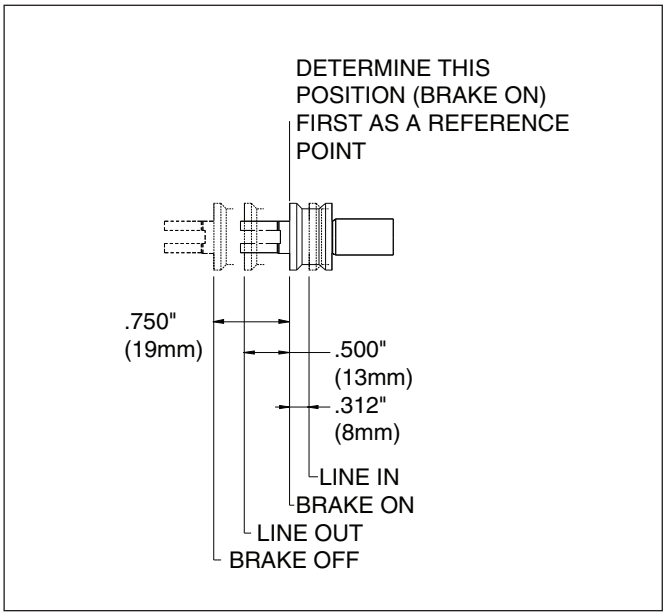
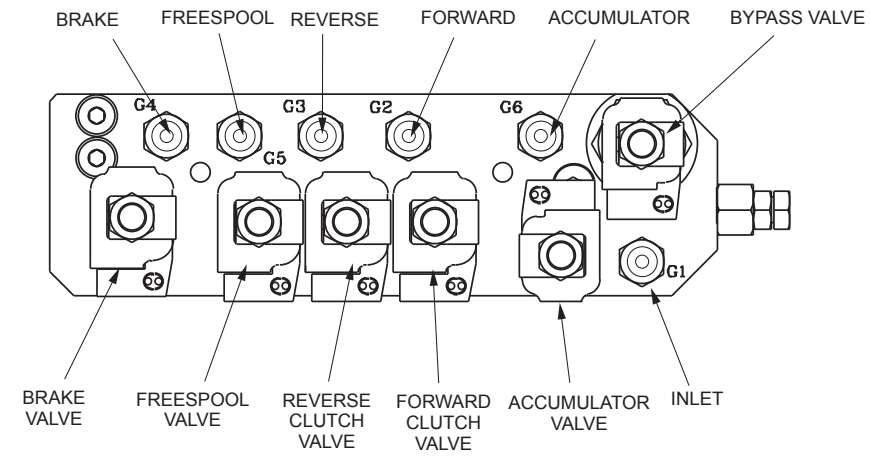


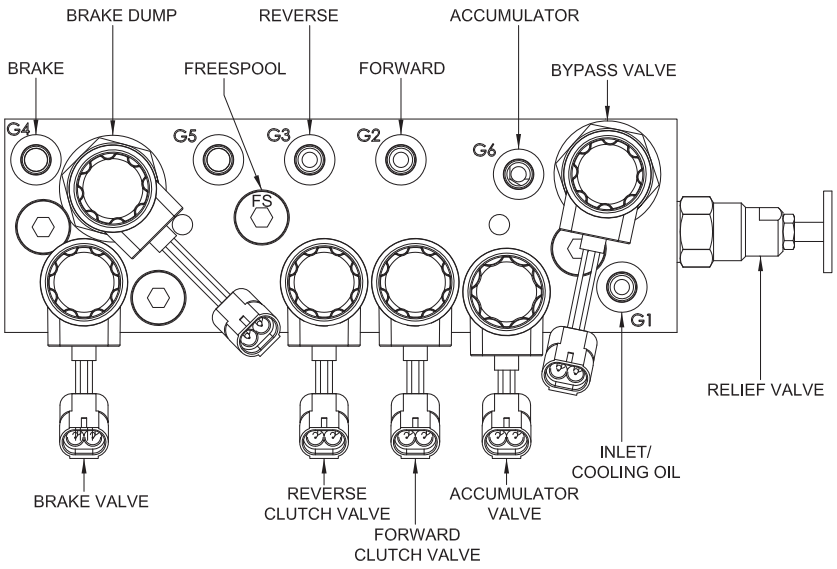
Figure 3-10 Control Valve Spool Travel

Figure 3-11 Hydraulic System Pressure Tests, Power Controls

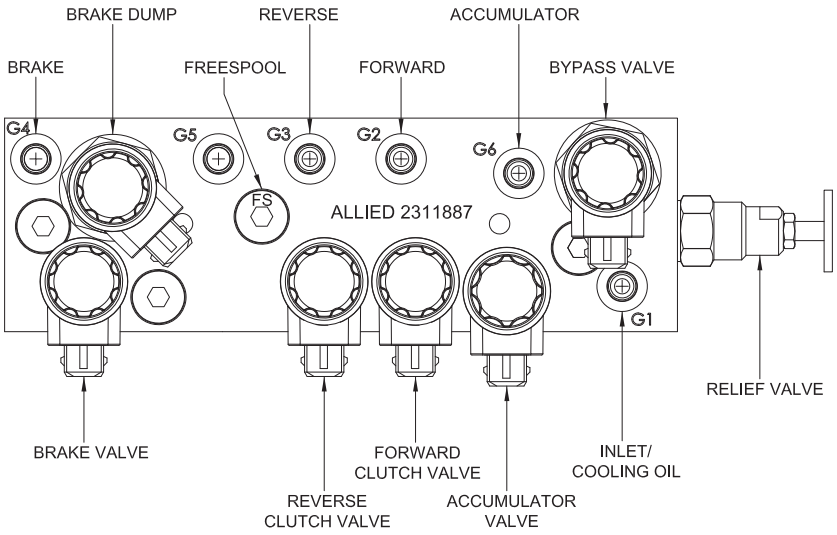
TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	C – Brake	400 psi (2800 kPa) gauge	BRAKE-OFF	245-255 psi (1690-1760 kPa)	Adjust relief valve.
Cooling	A or B – Cooling	400 psi (2800 kPa) gauge	BRAKE-ON	8-11 psi (54-76 kPa) at full throttle	Check plumbing for leakage or blockage; check bypass valve.
Accumulator	C – Brake	400 psi (2800 kPa) gauge	1. BRAKE-OFF 2. BRAKE-ON 3. Stop engine 4. BRAKE-OFF 5. Repeat if required	1. 245-255 psi (1690-1760 kPa) 2. None 3. None—wait 1 minute 4. 145 psi (1000 kPa) immediately & 100 psi (690 kPa) minimum after 30 seconds.	1. Check hydraulic lines for leaks. 2. Replace accumulator valve. 3. Check for defective accumulators.
LINE-IN (Forward)	B – Forward	400 psi (2800 kPa) gauge	LINE-IN	245-255 psi (1690-1760 kPa)	Refer to Section 2, Figure 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.
LINE-IN (Inching)	B – Forward C – Brake	2 – 400 psi (2800 kPa) gauge	Vary between BRAKE-ON and LINE-IN	Port B 45-55 psi 310-380 kPa) less than Port C	Adjust forward modulator valve.
LINE-OUT (Reverse)	A – Reverse	400 psi (2800 kPa) gauge	LINE-OUT	245-255 psi (1690 - 1760 kPa)	Refer to Section 2, Figure 2-1 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.
LINE-OUT (Inching)	A – Reverse C – Brake	2 – 400 psi (2800 kPa) gauge	Vary between BRAKE-ON and LINE-OUT	Port A 75-85 psi (515-585 kPa) less than Port C	Adjust reverse modulator valve.



P/N 2303889W
(Older Type.
The color of this one is red)



P/N 2306547W
(Old Type.
The color of this one is silver,
and coils have leads)



P/N 2311887
(New Type.
The color of this one is silver,
and coils do not have leads.)

Figure 3-12 Hydraulic Pressure Test Ports, Electronic Controls

Electronic Controls - Hydraulic System Pressure Checks (See Fig. 3-12)

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 entanglement during pressure checks since the drum will rotate during the tests.

⚠ WARNING

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

⚠ WARNING

Always wear gloves when handling wire rope.

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

Pressure gauges

Two 400 psi (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 accumulators.

Brake Pressure Check

With the engine shut off, connect a 400 psi pressure gauge to Brake Port G4. Start the engine and refer to Figure 3-13. 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 400 psi pressure gauge to Port G1. Start the engine and see the Cooling section in Figure 3-13. If the cooling oil pressure is too high or too low, overheating can occur.

Accumulator Pressure Check

With the engine shut off, connect a 400 psi 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 3-13.

1. With engine running, place control lever in **BRAKE-OFF** and rev engine to maintain 240-250 psi (1660-1720 kPa) for one minute. This will ensure the accumulators have a full supply of oil.
2. Return control lever to **BRAKE-ON**.
3. Shut the engine off and wait one minute, then turn key to the “ON” position but **do not start the engine.**
4. Place the control lever in the **BRAKE-OFF** position. This will release the oil in the accumulators. Observe the initial pressure reading and the time for the pressure to drop below that specified in Figure 3-13.

If the leak down time is less than specified in Figure 3-13, 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, there is probably a leak in the lines between the accumulators and the valve manifold assembly.

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

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

Forward Clutch Pressure Check

With the engine shut off, connect a 400 psi pressure gauge to Port G2. 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 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 3-13, check for:

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

Reverse Clutch Pressure Check

Shut off the engine and connect a 400 psi 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 3-13. 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 EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Brake	G4 – Brake	400 psi (2800 kPa) gauge	BRAKE-OFF	245-255 psi (1690-1760 kPa)	Adjust relief valve.
Cooling	G1 – Inlet	400 psi (2800 kPa) gauge	BRAKE-ON	Less than 140 psi (970 kPa)	Check plumbing for leakage or blockage; check bypass valve.
Accumulator	G4 – Brake	400 psi (2800 kPa) gauge	1. BRAKE-OFF 2. BRAKE-ON 3. Stop engine 4. BRAKE-OFF 5. Repeat if required	1. 245-255 psi (1690-1760 kPa) 2. None 3. None—wait 1 minute 4. 145 psi (1000 kPa) immediately & 100 psi (690 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	245-255 psi (1690-1760 kPa)	Refer to Section 2, Table 2-2 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.
LINE-OUT (Reverse)	G3 – Reverse	400 psi (2800 kPa) gauge	LINE-OUT	245-255 psi (1690-1760 kPa)	Refer to Section 2, Table 2-2 for Low Forward or Reverse Clutch Pressure troubleshooting procedures.

Figure 3-13 Hydraulic System Pressure Tests, Electronic Controls

NOTES:

1. Clutch and brake pressure are modulated (0-250 psi) in proportion to control lever travel.

2. Maximum brake pressure in **LINE-IN** and **LINE-OUT** may not equal relief pressure, depending on control program.

3. If the reverse clutch pressure is not as specified in Figure 3-13, check for:

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

Specifications

Hydraulic Specifications

Pump ..... Gear Type

Operating pressure.....250 psi (1720 kPa)

Filters..... Full flow magnetic strainer and 20 micron paper cartridge

Pump Performance (at 96% Efficiency)			
Winch	**PTO RPM**	**Pump RPM**	**Pump GPM**
All	1000		7.4
All Except Case 1150	1000		5.7
Case 1150	1000		5.4

Figure 3-14 Hydraulic Pump Performance

Oil Capacity & Recommended Oil List

The oil capacity for W5C winch is 14.5 gallons (54.9 liters). The type of oil used in Allied winches affects the line control. Use the following oils in the W5C winch:

Recommended Oils* - All Applications
(Applications such as equipment rescue, logging, cable plow, and inching applications such as pipe setting, yo-yo, line sagging, etc.)

		Ambient Temperature Range		Oil Temperature Range	
Manufacturer	**Oil Type**	**°F**	**°C**	**°F**	**°C**
Caterpillar	Multipurpose Tractor Oil (MTO)	-13 to 104	-25 to 40	-13 to 104	-25 to 40
John Deere	Hy-Gard™	-13 to 122	-25 to 50	-13 to 176	-25 to 80
ExxonMobil	Mobil Fluid 424 (Factory fill)	-13 to 122	-25 to 50	-13 to 176	-25 to 80
Chevron	1000 THF	-13 to 122	-25 to 50	-13 to 176	-25 to 80

Recommended Oils* - Low Temperature Applications
(Note: ExxonMobil and John Deere Oils are recommended for Inching Applications)

		Ambient Temperature Range		Oil Temperature Range	
Manufacturer	**Oil Type**	**°F**	**°C**	**°F**	**°C**
John Deere	Low Viscosity Hy-Gard	-40 to 86	-40 to 30	-40 to 150	-40 to 66
ExxonMobil	Mobil Fluid LT	-40 to 86	-40 to 30	-40 to 150	-40 to 66
Chevron	THF W	-40 to 86	-40 to 30	-40 to 150	-40 to 66

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

Figure 3-15 Recommended Oil List

Figure 3-16 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	Lb-Ft	N-m	kg-m
Housing Covers	57	77	7.9
PTO Shaft Assembly Bearing Carrier Capscrews	33	45	4.5
Filter Mounting Flange	15	20	2.1
Accumulator Mounting Bracket	23	31	3.2
Control Cable Anchors	57	77	7.9
FREESPOOL Bracket	57	77	7.9
Clutch Housing Capscrews	18	24	2.5
Accumulator Valve	13	18	1.8
Clutch Shaft Assembly			
Bearing Retainer Housing Capscrews	57	77	7.9
Ring Gear Capscrews	50	68	6.9
Brake Bearing Retainer Capscrew	4	5.0	0.6
Brake Cover Capscrews	57	77	7.9
Pump Mounting Capscrews	23	31	3.2
Idler Gear Bearing Carrier	57	77	7.9
Intermediate Shaft Bearing Carrier Capscrews	57	77	7.9
Drum Shaft Assembly			
RH Bearing Retainer Capscrews	57	77	7.9
Drum Shaft Retainer Capscrews	160	217	22.1
Drum Bearing Retainer Capscrews	57	77	7.9

Notes

Notes

Repairs

General

This section provides the instructions for disassembly and assembly of the winch for repairs. For most major repair jobs the winch must be removed from the tractor prior to disassembly. The sequence described is for a winch that is to be completely overhauled. The first part of this section describes the disassembly and inspection of all components. The second part of the section describes the assembly of the winch.

The instructions for the removal and installation of the winch on the vehicle are also included in this section.

Note: For winch that are within the warranty period, any disassembly of major components such as pump, control valves, etc, can avoid the warranty for that part.

Use only genuine Allied Systems replacement parts when rebuilding a winch.

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 completely cleaned to prevent the possibility of contamination.

Winch Removal

⚠ 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.

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.
3. Move the control lever to the **LINE-IN** position at least three times to discharge the pressure in the accumulator.
4. Disconnect the control cable (and in cable controls winches, the freespool cable) from winch.
5. Drain the oil from the winch.
6. Connect slings and a crane or lifting device to the winch.

⚠ WARNING

The slings and crane used to lift the winch must have a minimum lifting capacity of 1400 kg (3000 lb.).

Disassembly of the Winch

PTO Arrangement

The first step of disassembly of the winch is to remove the PTO gear arrangement. There are several different arrangements of PTO inputs available for the W5C winch. The pinion shaft inside the winch is common for all PTO arrangements. The pinion bearing carrier arrangements are similar for the different PTO assemblies.

Pinion Carrier

Remove the pinion carrier assembly from the winch frame. The drop boxes must be removed to have access to the pinion carrier assembly. The clutch shaft cannot be removed from the frame with the pinion in place.

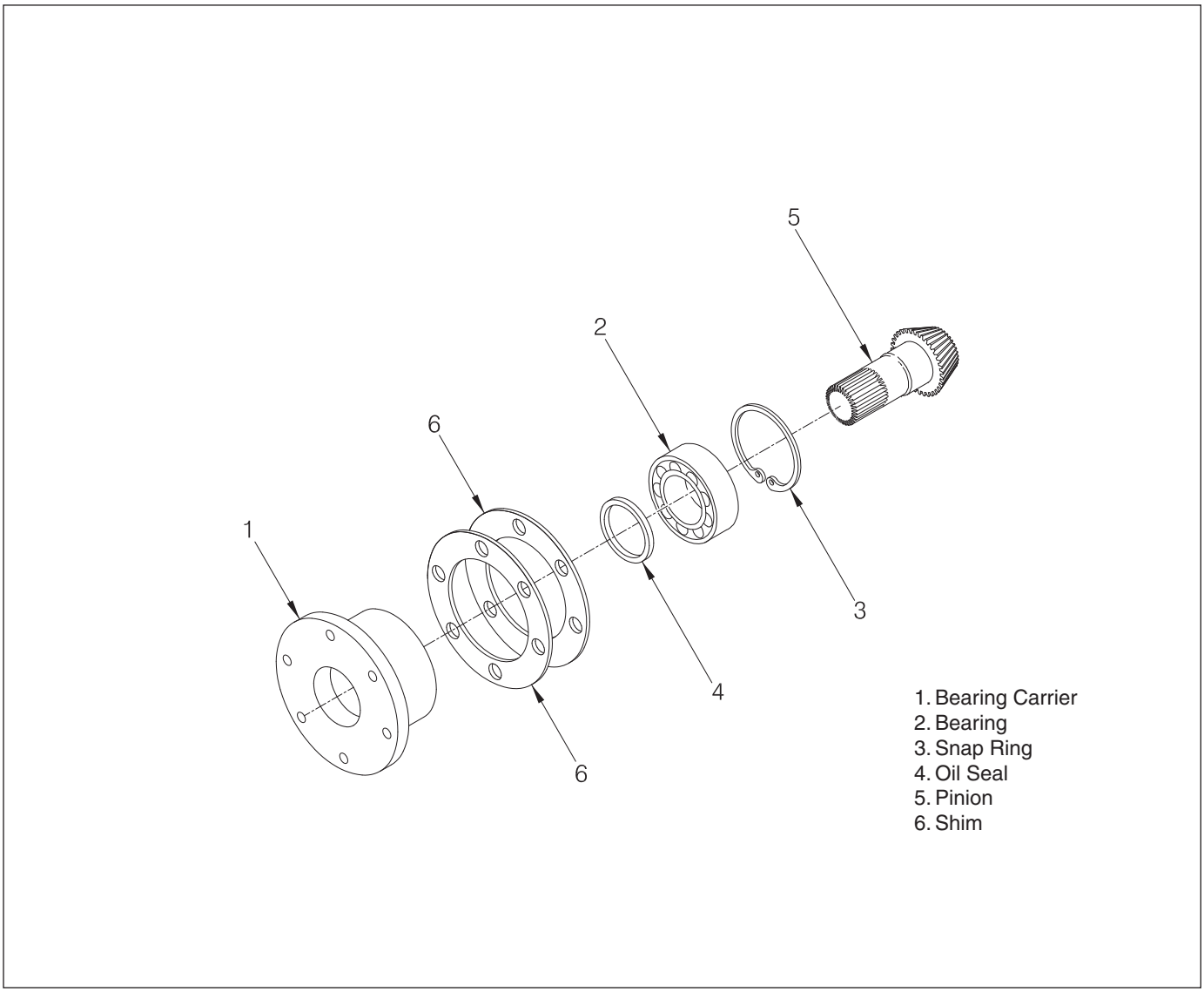


Figure 4-1 Typical Pinion Carrier Assembly

Frame and Covers

With the winch removed from the tractor and the oil drained, remove the cover plates to allow access to the winch components.

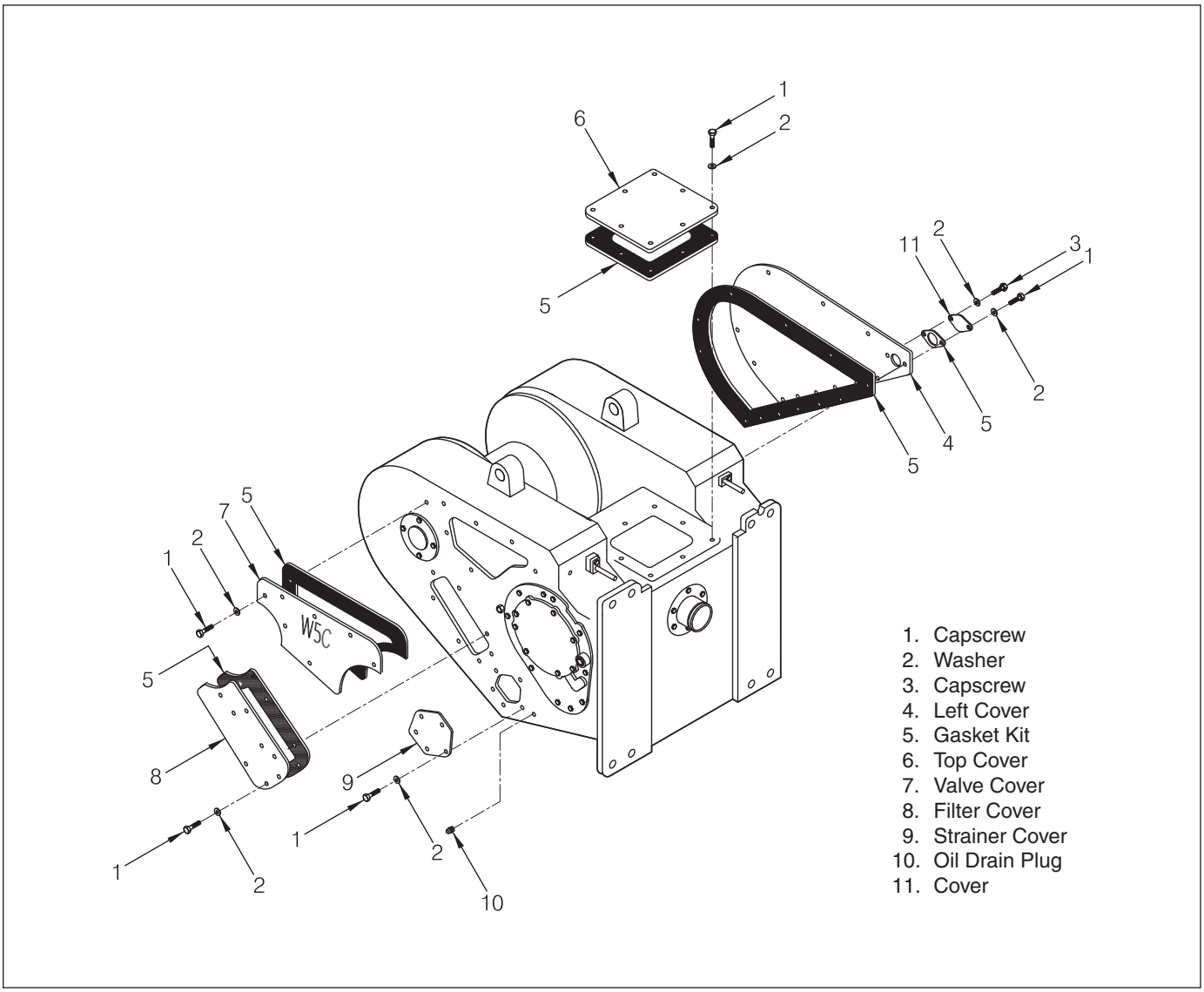
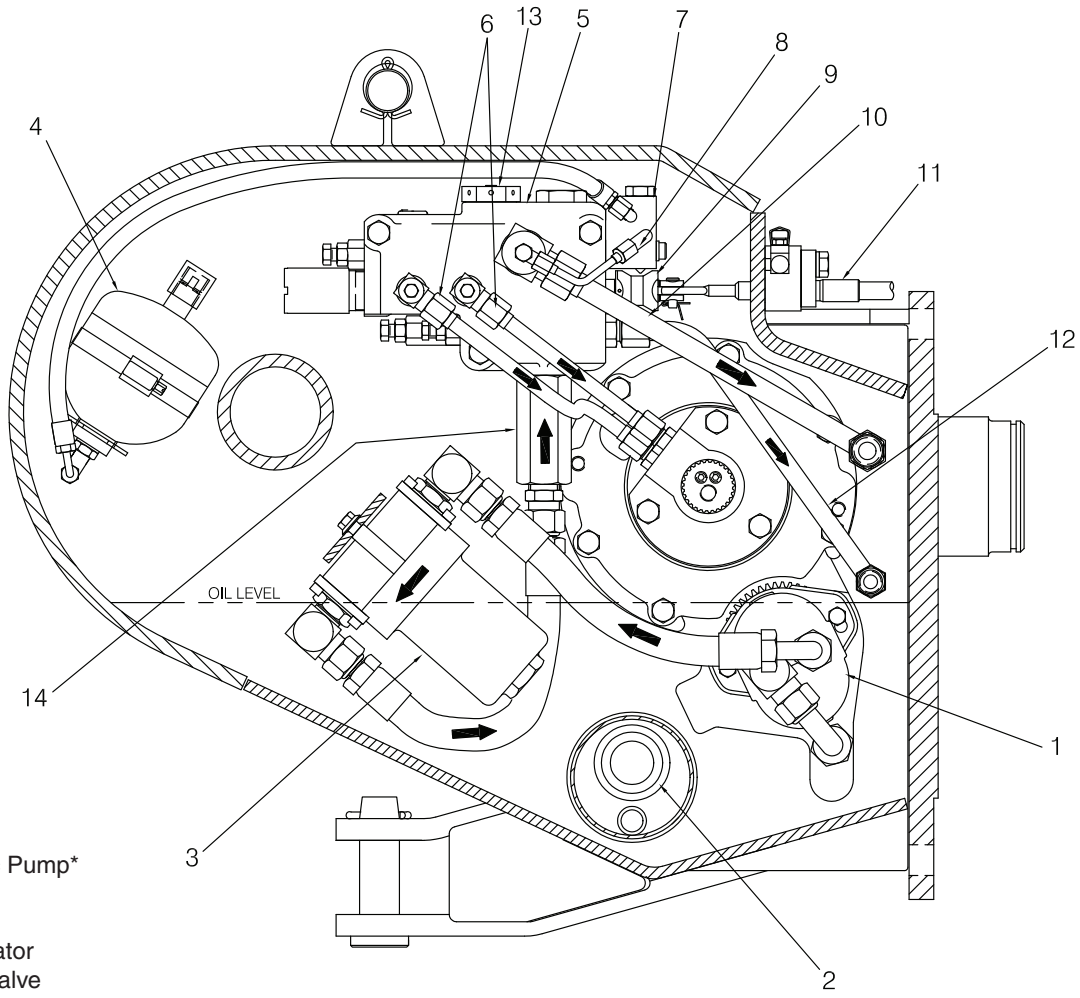


Figure 4-2 Frame and Covers

Hydraulic System

Make sure the accumulator is discharged. Move the handlever into the **LINE-IN** position three times to discharge the accumulator.

On a cable controls winch, the accumulator can also be discharged by putting a screwdriver under the control pin of the accumulator valve. Lift the control pin until the accumulator is discharged.



1. Hydraulic Pump*
2. Strainer
3. Filter
4. Accumulator
5. Control Valve
6. Clutch Pressure Tube
7. Accumulator Valve
8. Accumulator Discharge Tube
9. Accumulator Valve Cam
10. Brake Pressure Tube
11. Control Valve Cable
12. Cooling Oil Tube
13. Cooling Oil Relief Valve
14. Check Valve

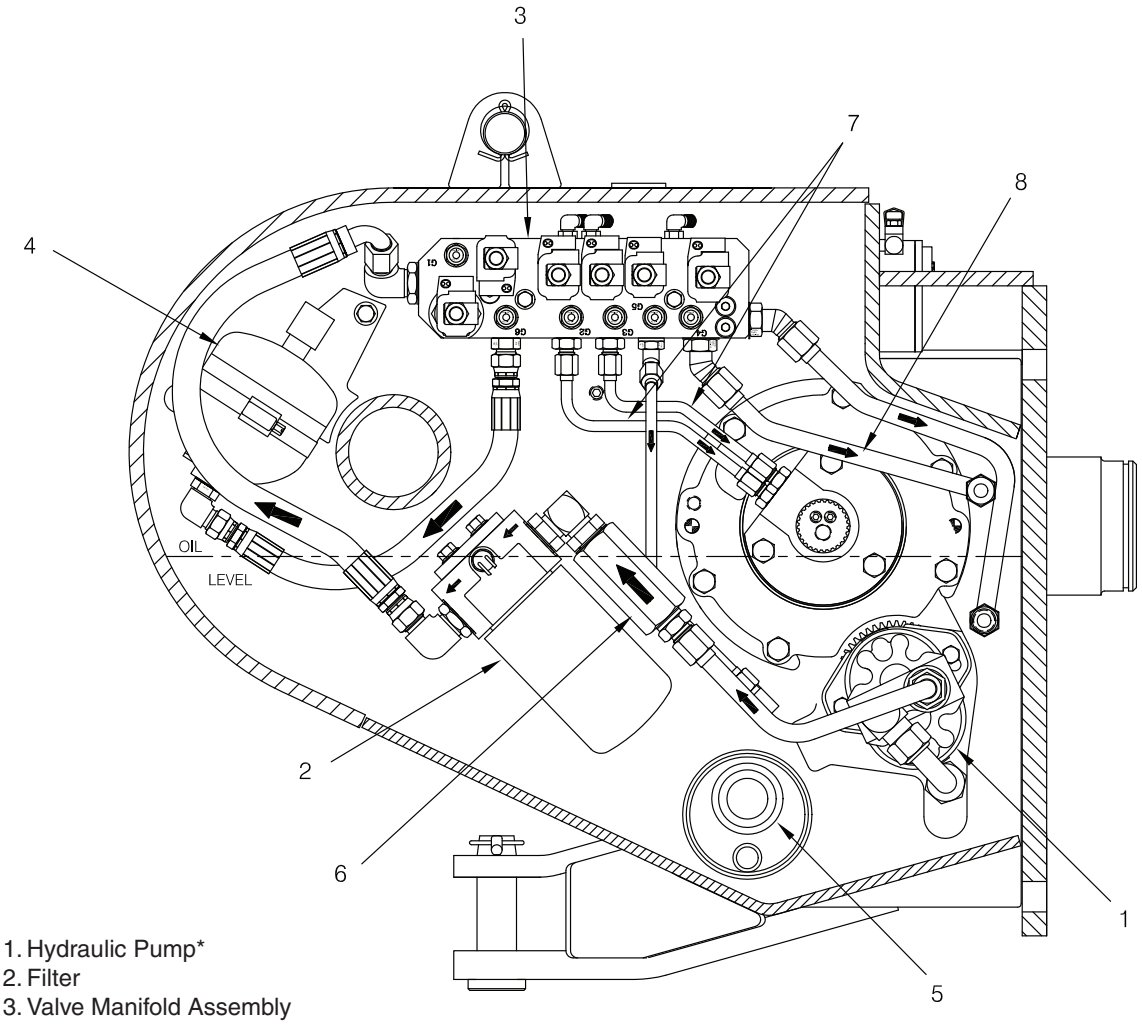
* Illustration shows counter clockwise pump rotation configuration.

Figure 4-3 Hydraulic System, Power Controls

With the accumulator discharged, remove the brake assembly. Then disconnect the hoses and tubes of the hydraulic system.

Remove the control valve, filter, pump, accumulator, and strainer.

Check hydraulic fittings for damaged threads. Inspect the hose and tube assemblies for wear or damage.



1. Hydraulic Pump*
2. Filter
3. Valve Manifold Assembly
4. Accumulator
5. Strainer
6. Check Valve
7. Clutch Pressure Tube
8. Brake Pressure Tube

* Illustration shows counter clockwise pump rotation configuration.

Figure 4-4 Hydraulic System, Electronic Controls

Drum

⚠ WARNING

Support the drum before removal procedures to avoid injury.

1. Remove the right hand drum shaft and drain oil from drum.
2. Remove the left hand drum shaft retainer and slide the drum shaft into the drum.
3. Remove the drum.
4. Remove the drum gear.
5. Remove the freespool intermediate gear and bearing assembly from frame.
6. Remove the bearings, seals, and spacer from the frame.
7. Inspect all components for missing teeth or wear.

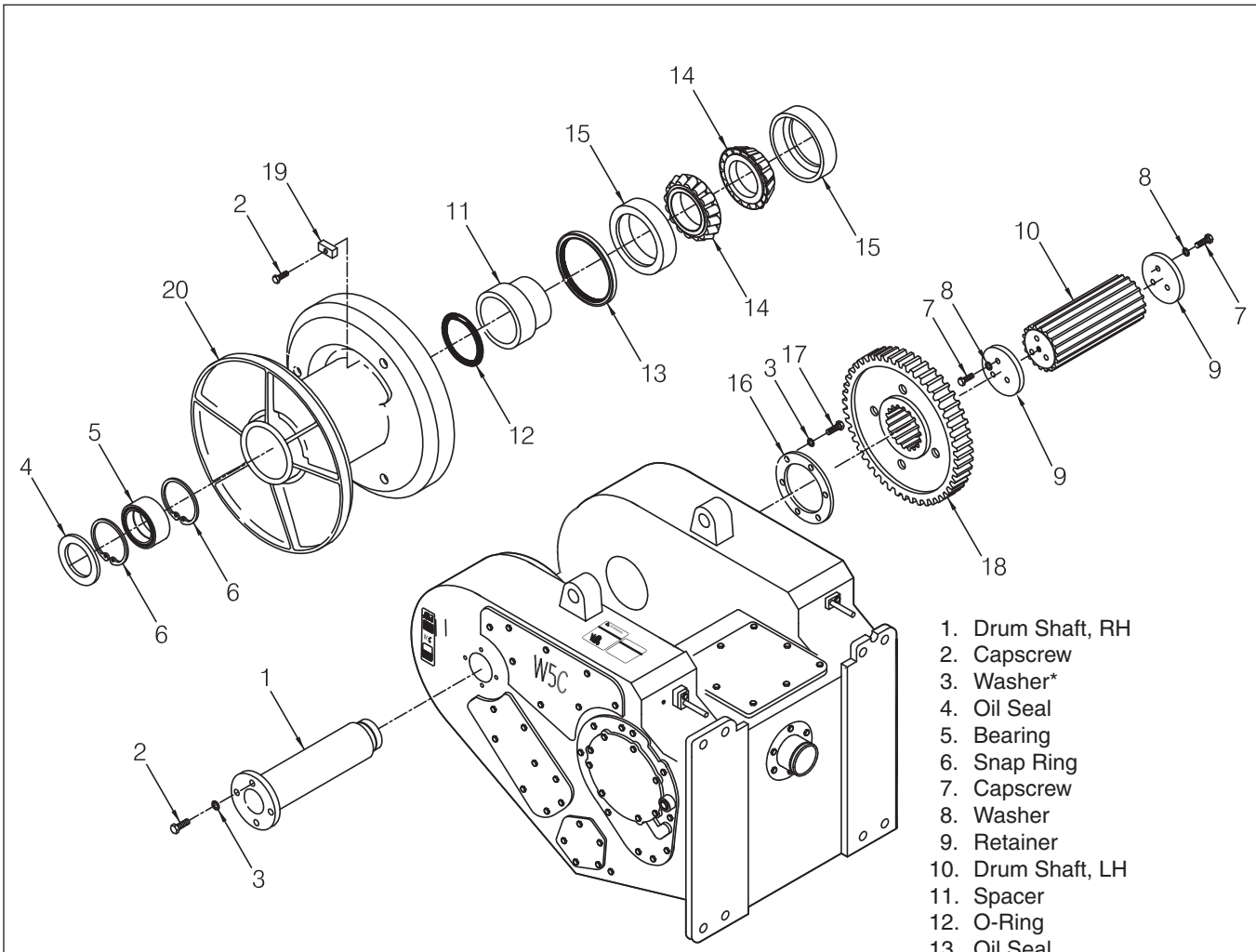
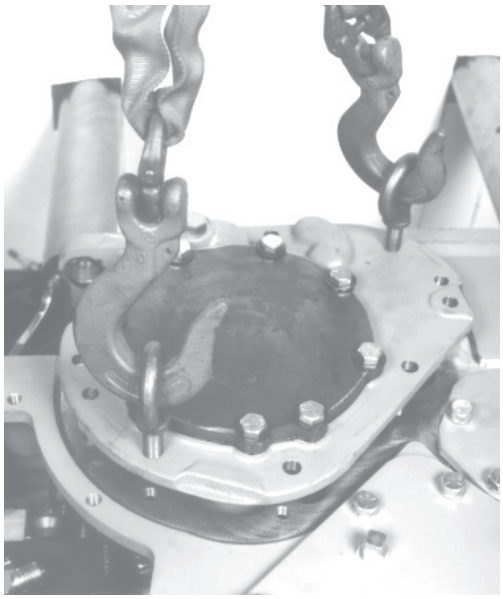
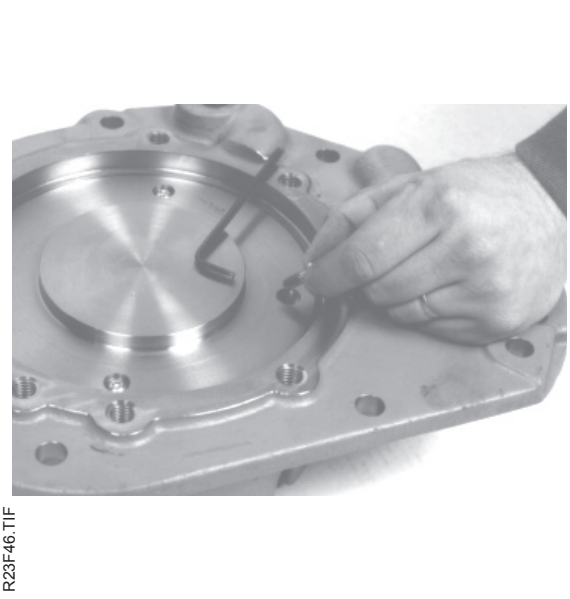


Figure 4-5 Drum Assembly

Brake

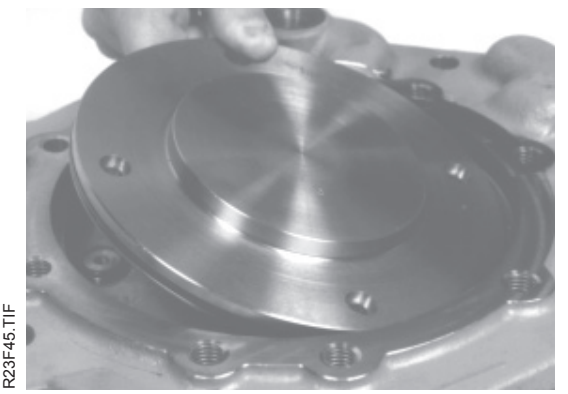


Remove the capscrews holding the brake assembly to the winch case. Insert two lifting eyes into the brake housing and, using an appropriate sling arrangement, gently lift out the brake assembly.



Remove the plunger screws.

Remove the cover plate capscrews evenly until the spring tension is released.



Remove the brake piston.

Remove the brake spring plates.

Turn the brake housing over. Remove the retaining screw for the pressure plate.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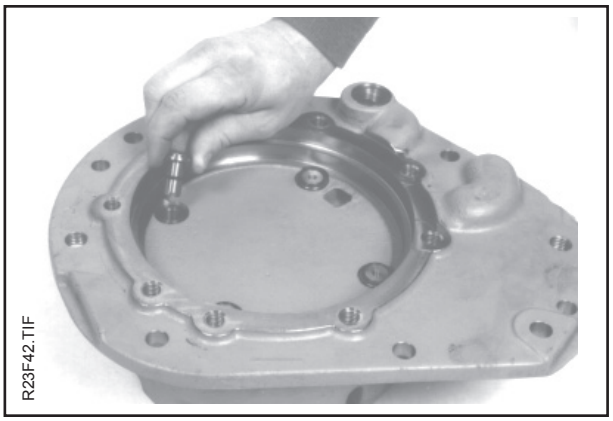
Remove the pressure plate.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Remove the plungers and O-rings. Inspect plungers for wear. Discard O-rings and replace with new.


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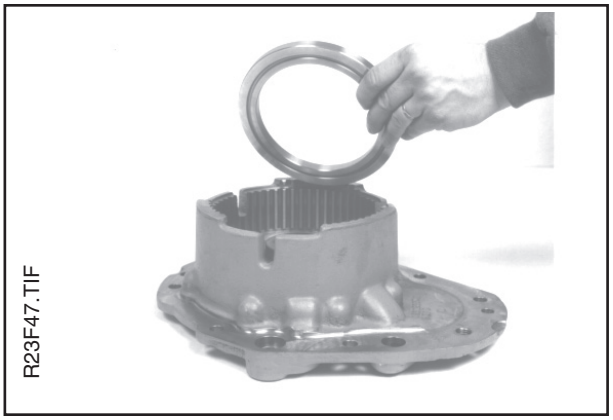
Remove the friction discs and separator plates. Inspect plate surfaces for wear and missing teeth.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Remove the ring.

Clean the joint surfaces of the brake housing. Make sure the surfaces do not have damage or there will be oil leaks.

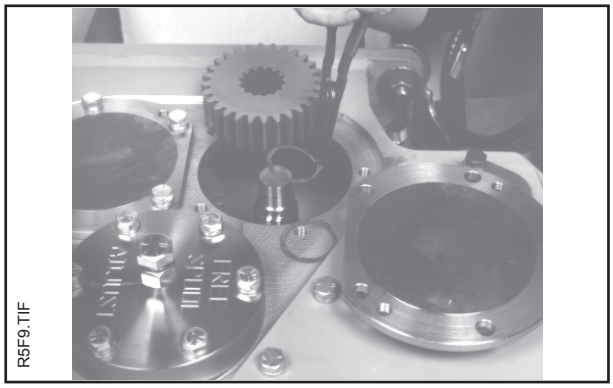
Inspect O-rings in frame under brake housing.

Figure 4-6 Oil Brake Visual Inspection

INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Check for cracked or broken conical washer spring.	Replace spring if cracked or broken.
Inspect oil brake cover for scoring, burrs, cracks or warping.	Replace cover if damage affects sealing.
Carefully inspect friction discs for facing wear, distortion and damaged teeth.	Replace friction discs if oil grooves are worn or distorted in any way, or if discs are burned, damaged or warped.
Carefully inspect separator plates to verify that surfaces are flat, as well as free of large blue areas (caused by overheating) and damaged surfaces.	Replace separator plates if damaged.
Inspect piston housing seal grooves and center bore for scoring, burrs and corrosion.	Replace piston or piston housing if damaged. Always replace the piston seal (ring seal) when brake is repaired.
Inspect brake housing for wear, scoring, burrs and cracks.	Replace housing if splines are notched or cage is cracked.
Inspect brake hub and shaft for wear, scoring, burrs and cracks.	Replace hub if splines are notched or hub is cracked. Replace shaft if damaged.
Check plungers for straightness, mushrooming and end faces out of square.	Replace if damaged enough to cause binding or if diameter, length or end squareness is distorted.
Check capscrews for tightness and depth in frame.	Tighten if loose.
Carefully check aligning dowels for grooves and distortion.	Replace if damaged sufficiently to cause binding or misalignment.

Brake/Clutch Shaft

Be sure that the pinion arrangement, hydraulic system, and brake assembly have been disconnected and removed prior to removing the brake/clutch shaft assembly.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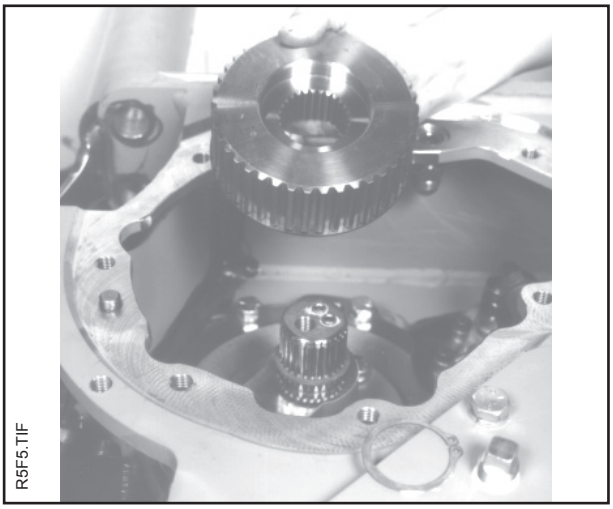
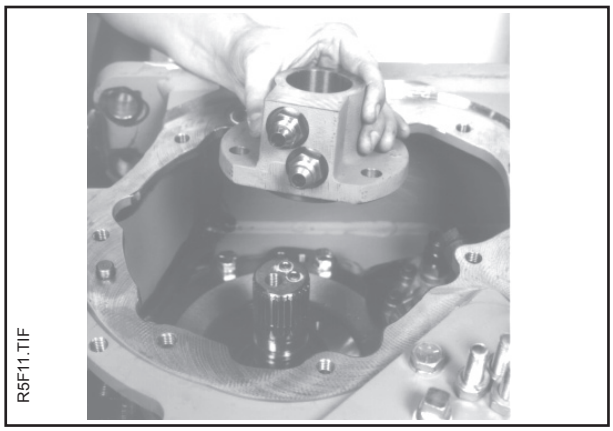
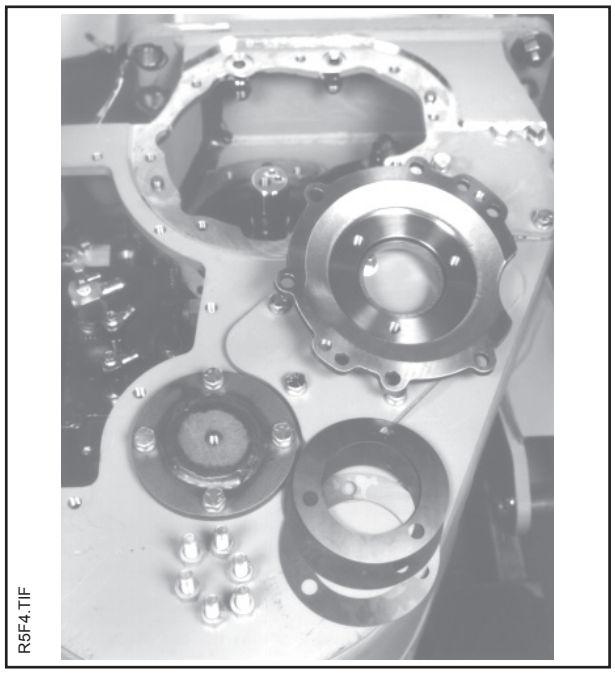
Remove the bearing carrier, gear and snap rings from right side of winch.


R5F5.TIF

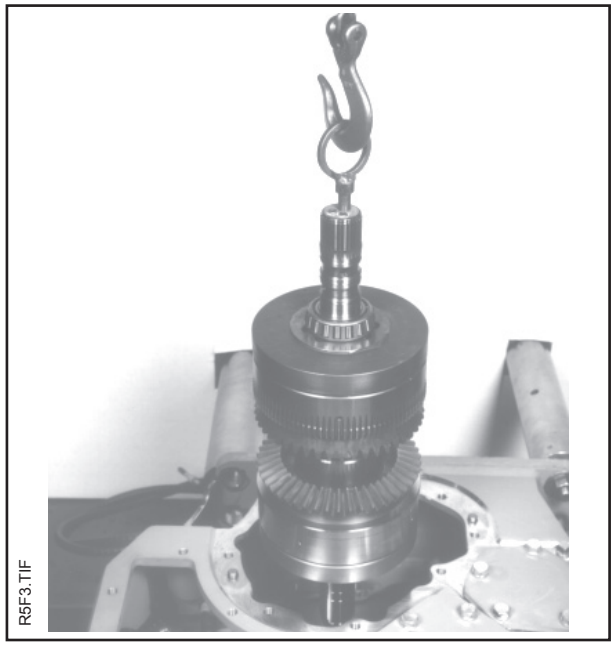
From the right hand side of the winch, where the brake assembly was, remove the brake hub and snap rings.


R5F11.TIF

Remove the oil manifold.


R5F4.TIF

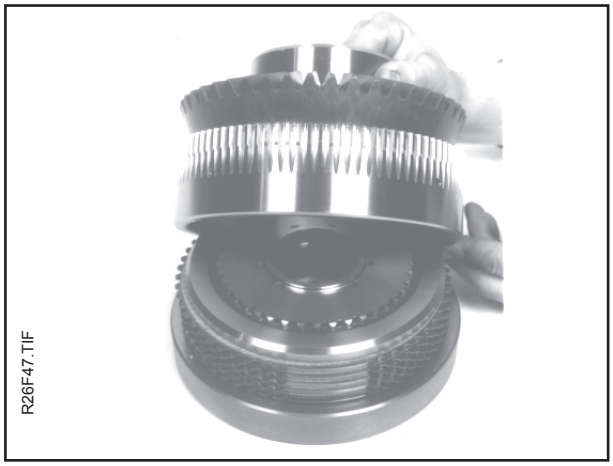
Remove the bearing carrier and shims.


R5F3.TIF

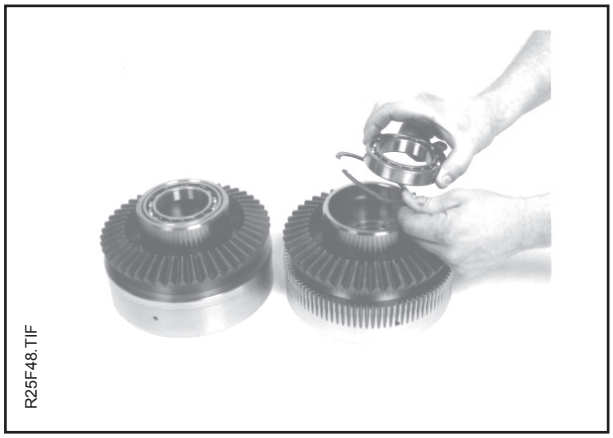
Place a lifting eye with 9/16-12 UNC thread into the end of the shaft assembly. Gently pull out the shaft assembly. Remove bearings and snap ring. Tap shaft on wooden block to break clutch assemblies free.

Clutch

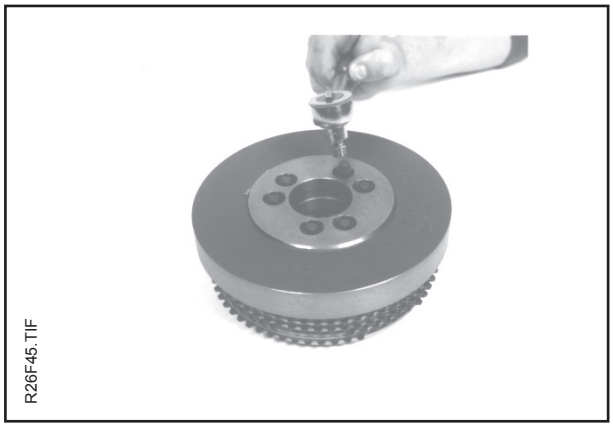
One clutch carrier assembly has external gear teeth to drive the hydraulic pump. The disassembly and assembly procedures are the same for both.



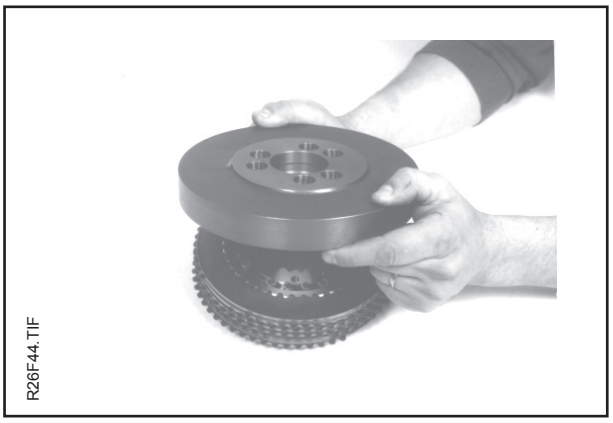
Remove the clutch carrier from the clutch. Inspect the bevel gear and clutch carrier for wear.



Remove the snap ring and bearing from the clutch carrier.

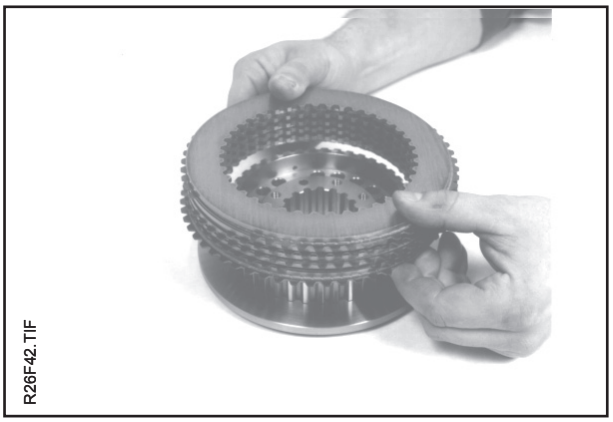


Remove the capscrews and washers.



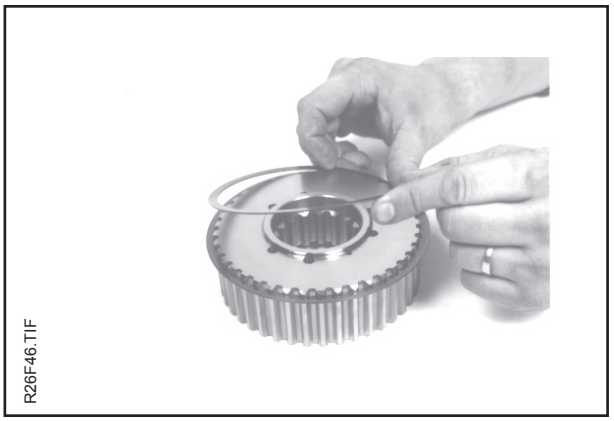
Remove the piston housing. Hit the center of the housing against a wood block. The piston will fall from the housing. Remove the piston from the housing. Discard the O-rings from the piston. Inspect the piston and housing O-ring grooves for wear. Inspect the housing and dowels for wear.

Remove and discard the springs. Heat generated in the clutches will make the springs weak.



Slide off the friction discs and separator plates. Inspect discs and plates for wear and to make sure they are flat.

Slide off the ring from the clutch hub. Inspect the ring for wear and check that the ring is flat.

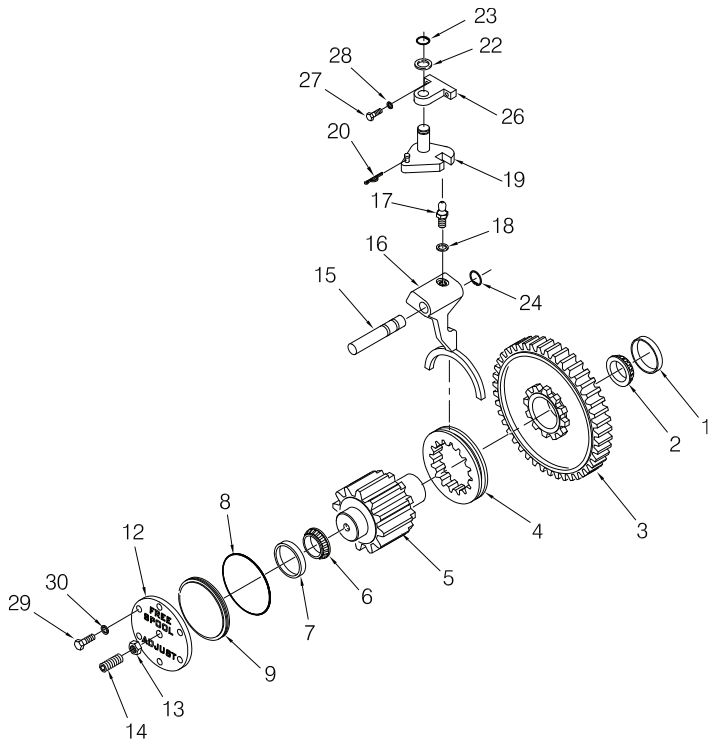


Remove the double spiral snap ring from the clutch hub. Inspect the groove for the snap ring and the splines of the hub for damage.

Figure 4-7 Oil Clutch Visual Inspection

INSPECTION REQUIREMENTS	CORRECTIVE ACTION
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 or if discs are damaged in any way.
Carefully inspect separator plates to verify that surfaces are flat as well as free of large blue areas (caused by overheating) and damaged surfaces.	Replace damaged separator plates.
Inspect piston, O-ring grooves, piston cavity and center bore for scoring, burrs and corrosion. Look for any internal cracks.	Replace piston if damaged.
Check for worn or collapsed release springs.	Replace spring(s) if distorted or damaged in any way.
Inspect piston seals (O-rings).	Always replace both O-rings when clutch is repaired.

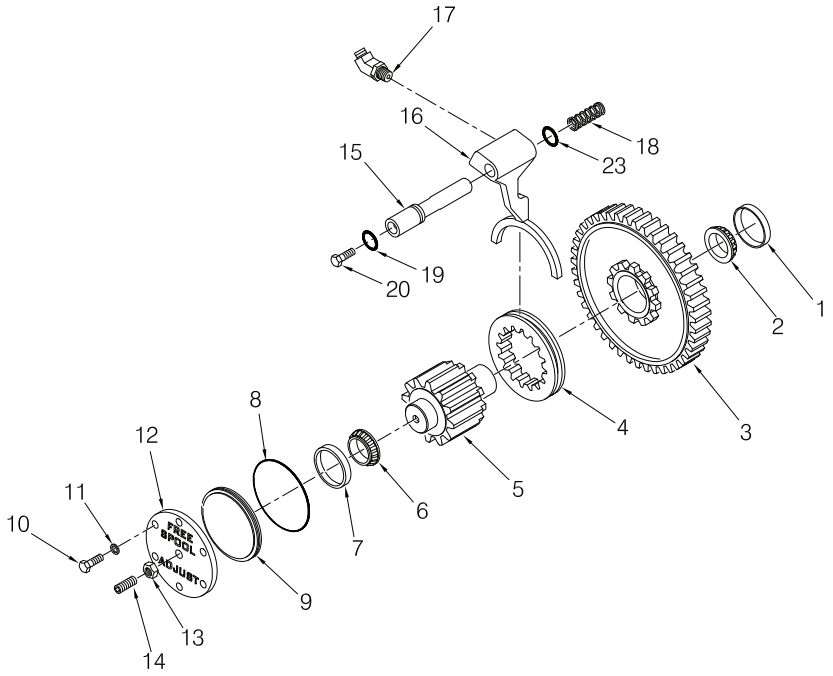
Intermediate/Freespool Shaft



1. Bearing Cone
2. Bearing Cup
3. Intermediate Gear
4. Dental Clutch
5. Drum Pinion
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
12. Freespool Adjust Retainer
13. Nut
14. Setscrew
15. Shaft
16. Shifter Fork
17. Ball Stud
18. Washer
19. Crank
20. Cotter Pin
21. Pin
22. Flat Washer
23. Snap Ring
24. Snap Ring
26. Pivot Bracket
27. Capscrew
28. Washer
29. Capscrew*
30. Washer*

* Flange screw replaces capscrew & washer after S/N AW5C-1287

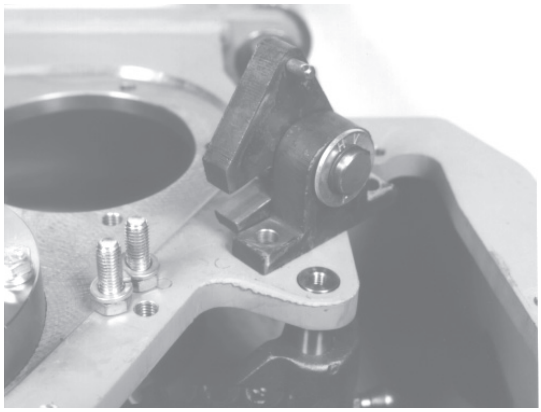
Figure 4-8 FREESPOOL, Power Controls



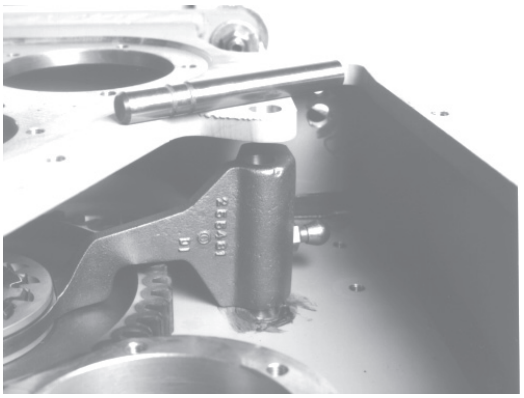
1. Bearing Cone
2. Bearing Cup
3. Gear
4. Gear Clutch
5. Drum Pinion
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
10. Capscrew*
11. Lockwasher*
12. Freespool Adjust Retainer
13. Nut
14. Set Screw
15. Shaft
16. Shifter Fork
17. Fitting
18. Spring
19. O-Ring
20. Capscrew
23. O-Ring

* Flange screw replaces capscrew & washer after S/N AW5C-1287

Figure 4-9 FREESPOOL, Electronic Controls


R4f3.TIF

POWER CONTROLS ONLY: Remove the pivot bracket assembly.


R4f4.TIF

POWER CONTROLS ONLY: Pull the shifter fork shaft. Remove the shifter fork.

Idler Shaft

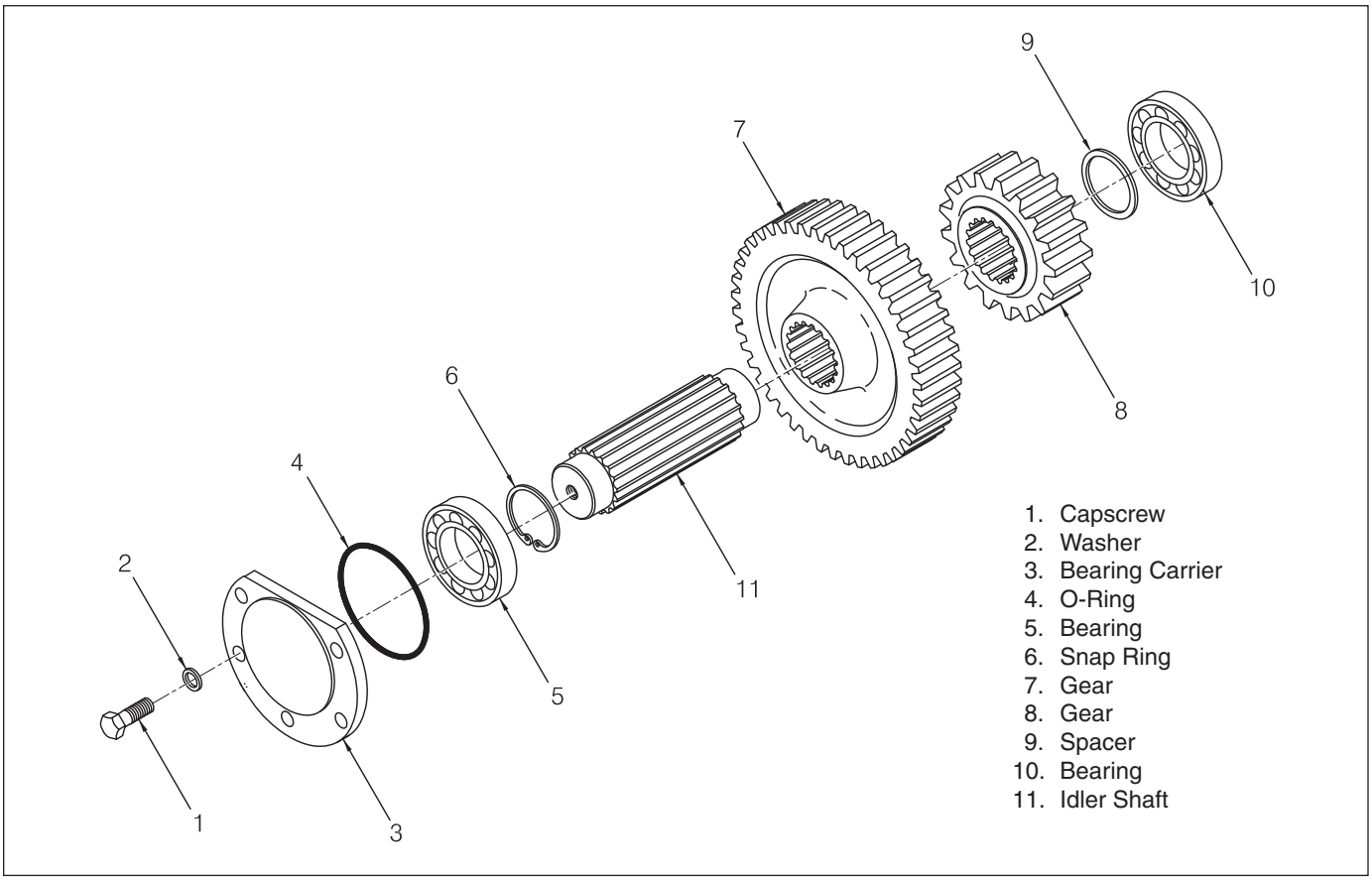


Figure 4-10 Idler Shaft

Note: Idler shaft is not used with all gear ratios.

Remove the capscrews and washers holding the bearing retainer to the winch frame. Attach a lifting eye with 1/2-12 UNC thread to the idler shaft. Gently remove the idler shaft. With the shaft removed, remove the gears and bearing from inside the frame. Inspect the shaft and gears for wear and damaged teeth.

Control Valve - Power Controls

Most of the parts of the control valve can be replaced. If the bores of the control valve are damaged so that the performance is changed, the valve must be replaced.

The control valve and accumulator valve can be removed and installed as one unit.

Control Valve Disassembly

1. Remove control valve assembly from winch.
2. Secure control valve to work bench or in a vice.
3. Remove check valve and all fittings.
4. Remove accumulator control valve.
5. Remove drive pin from accumulator actuator cam.
6. Slide cam off of spool.
7. Unscrew spool cap. (Do not remove cap at this stage.)
8. Slide spool assembly with cap in place out of the control valve body.
9. While keeping slight pressure on the detent retainer, remove the cap from the spool assembly. Release the detent retainer and capture the detent balls.
10. Slide spacer and ring from spool.

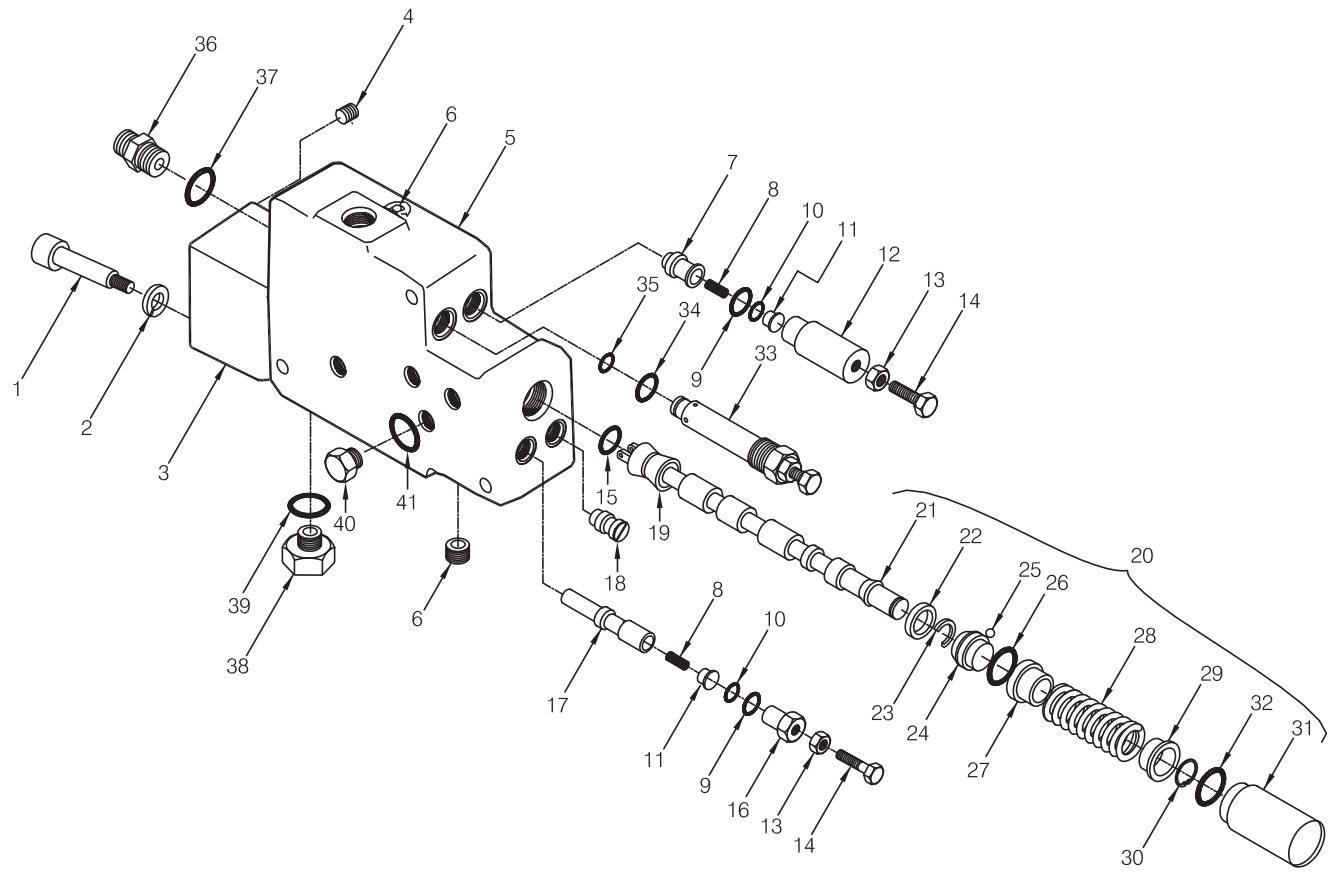
⚠ WARNING

The spool assembly contains a compressed spring. Do not permit the spring to be suddenly released and cause injury.

11. Using caution, compress the control valve centering spring and remove the snap ring from the end of the shaft. Without compressing the spring injury or damage may occur.
12. Decompress the spring and remove the remaining parts from the spool.
13. Remove the pressure relief cartridge from the control valve housing.
14. Remove both the forward and reverse modulator housings from the control valve housing. Remove springs, O-rings, plugs, and spools from the control valve housing. Use care to keep each modulator group separate.

Inspection

1. Clean all metal parts in a suitable cleaning solvent or kerosene. Dry carefully with a lint free cloth.
2. Blow all passages clear with compressed air. Lubricate parts with clean hydraulic oil during assembly.
3. Inspect all parts for wear. Replace any defective part.
4. Replace all O-rings.



1. Screw
2. Lockwasher
3. Valve
4. Fitting
5. Valve Body
6. Fitting
7. Fwd Mod Spool
8. Relief Spring
9. O-Ring
10. O-Ring
11. Plug
12. Fitting
13. Jam Nut
14. Capscrew
15. O-Ring
16. Fitting
17. Rev Mod Spool
18. Fitting
19. Cam & Pin (Not Illustrated)
20. Spool Assembly
21. . Spool
22. . Ring
23. . Ring
24. . Detent Retainer
25. . Ball
26. . O-Ring
27. . Spacer
28. . Spool Spring
29. . Spring Retainer
30. . Snap Ring
31. . Spool Cap
32. O-Ring
33. Relief Valve
34. . O-Ring
35. . O-Ring
36. Fitting
37. O-Ring
38. Fitting
39. O-Ring
40. Plug
41. O-Ring

Figure 4-11 Control Valve, Power Controls

Valve Manifold Assembly - Electronic Controls

Most of the parts of the valve manifold assembly can be replaced. If the bores of the valve body are damaged so that the performance is changed, the valve must be replaced.

Disassembly

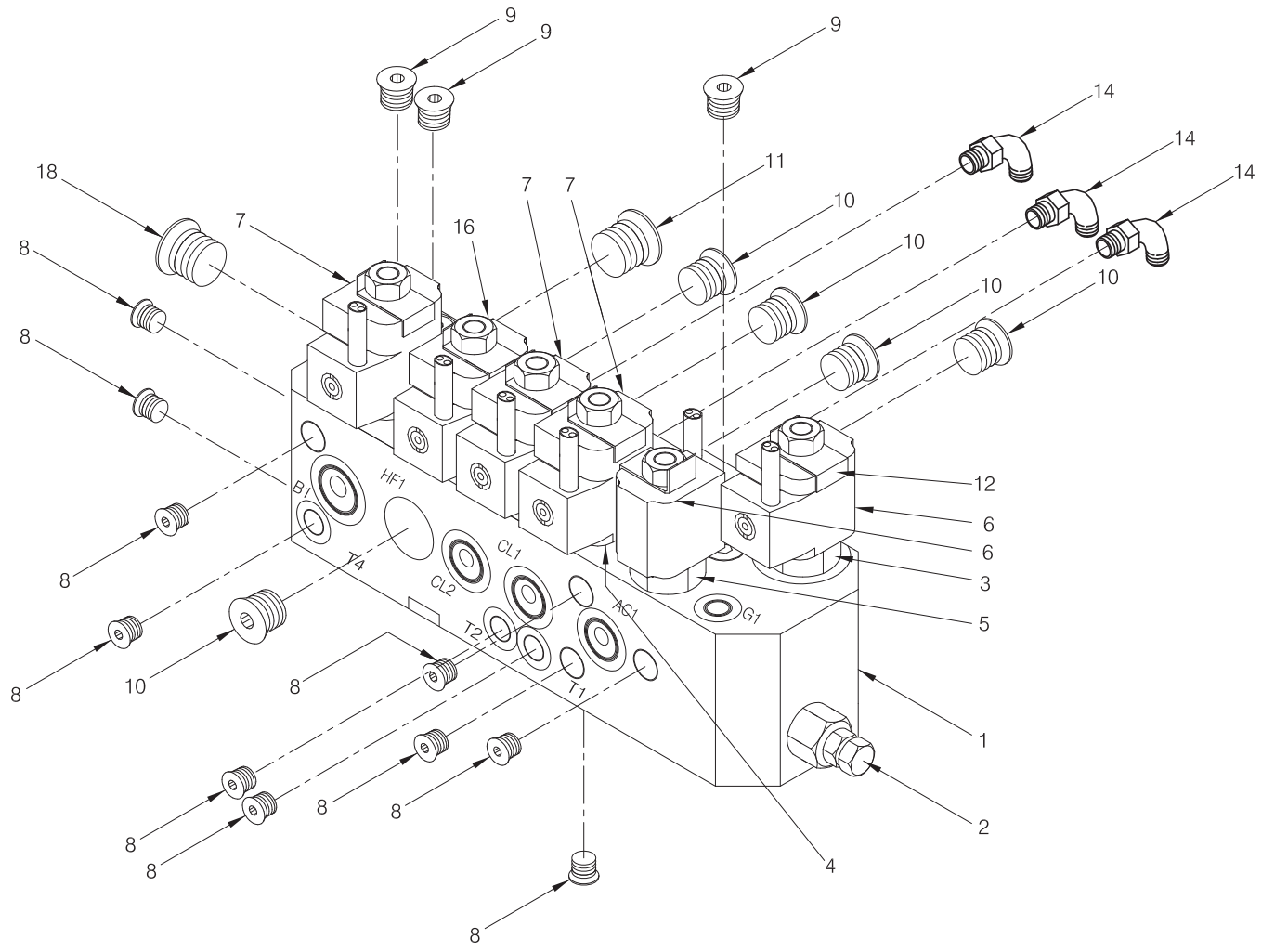
1. Remove valve manifold assembly from winch.
2. Secure valve to work bench or in a vice.
3. Remove relief valve and all fittings.
4. Unbend tab washer to unlock coil nut.
5. Remove coil and solenoid valve.

Inspection

1. Clean all metal parts in a suitable cleaning solvent or kerosene. Dry carefully with a lint free cloth.
2. Blow all passages clear with compressed air. Lubricate parts with clean hydraulic oil during assembly.
3. Inspect all parts for scoring, burrs, debris and wear. Replace any defective part.
4. Replace all O-rings. Ensure all O-rings are lubricated before installation.

Reassembly

1. Re-install coil and solenoid valves. Torque according to Torque Specification.
2. Bend end of tab washer up to lock coil nut in place.
3. Re-install fittings and relief valve; torque according to Torque Specification.
4. Re-install valve on winch.

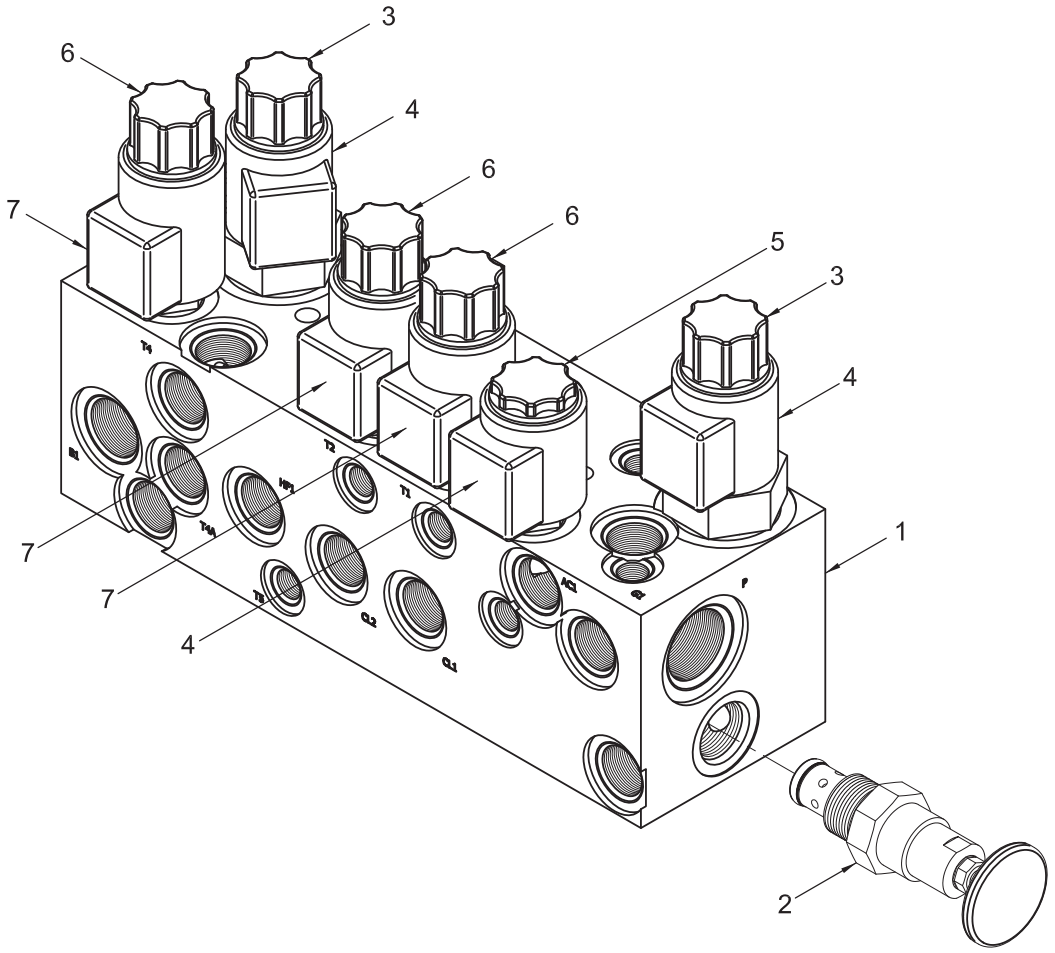


Valve Manifold Assembly Part Number:
2303889W
Last Used on S/N AW5C-1555

1. Block
2. Relief Valve
3. Solenoid Valve
4. Proportional Valve
5. Solenoid Valve
6. 24V Coil
7. 24V Coil
8. Plug Fitting
9. Plug Fitting
10. Plug Fitting
11. Plug Fitting
12. Tab Washer
14. Fitting
16. Coil Nut
18. Plug Fitting

TORQUE SPECIFICATION	
ITEM	**TORQUE VALUE**
Item 2, Relief Valve	25 ft-lbs (33.9 Nm)
Item 3, Solenoid Valve	80 ft-lbs (108.5 Nm)
Item 4, Proportional Valve	22 ft-lbs (29.8 Nm)
Item 5, Solenoid Valve	22 ft-lbs (29.8 Nm)
Items 6 & 7, Coil	3 ft-lbs (4 Nm)
Item 8, Plug Fitting	7 ft-lbs (9.5 Nm)
Item 9, Plug Fitting	30 ft-lbs (40.7 Nm)
Item 10, Plug Fitting	30 ft-lbs (40.7 Nm)
Item 11, Plug Fitting	46 ft-lbs (62.368 Nm)
Item 16, Coil Nut	3 ft-lbs (4 Nm)
Item 18, Plug Fitting	46 ft-lbs (62.368 Nm)

Figure 4-12 Valve Manifold Assembly, Electronic Controls



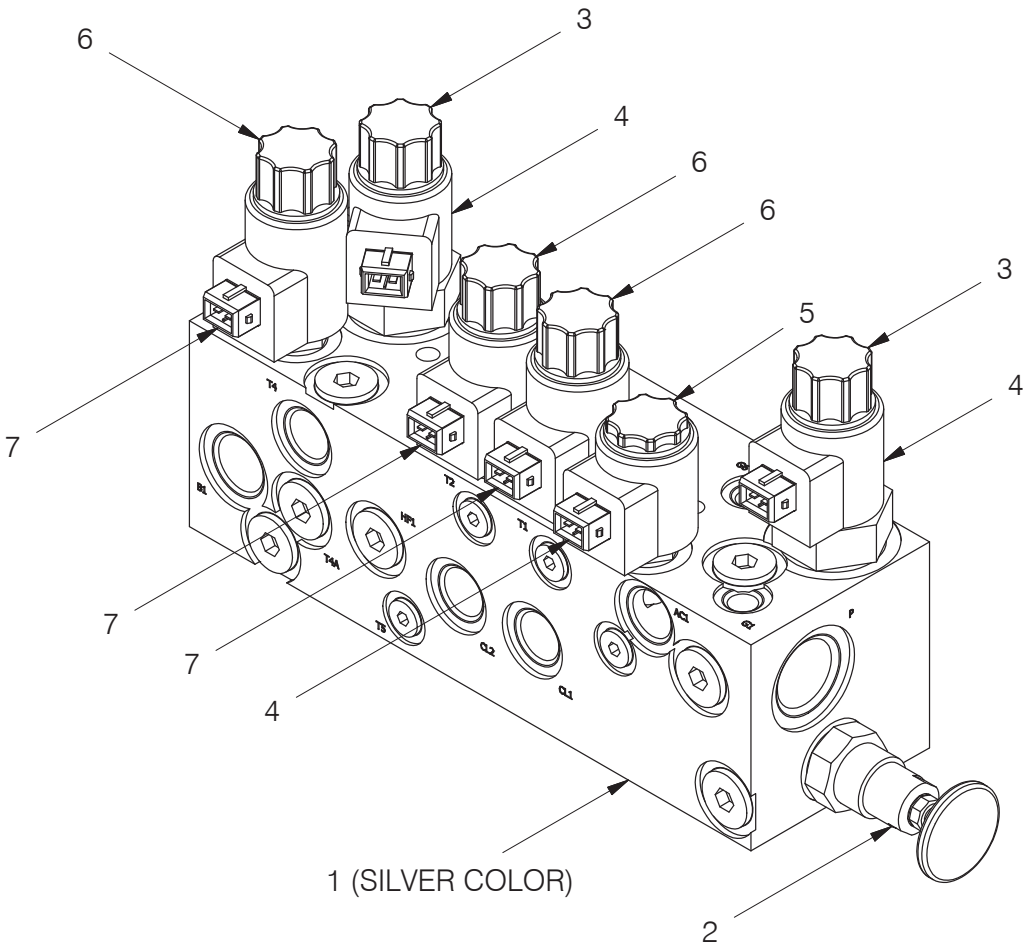
Valve Manifold Assembly Part Number: 2306547W

Used on S/N AW5C-1556 thru AW5C-1665

1. Block
2. Relief Valve
3. Cartridge Valve
4. Valve Coil
5. Cartridge Valve
6. Proportional Valve
7. Proportional Valve Coil

TORQUE SPECIFICATION	
ITEM	**TORQUE VALUE**
Item 2, Relief Valve	29.5 - 37 ft-lbs (40 - 50.2 Nm)
Item 3, Cartridge Valve	96 - 133 ft-lbs (130.2 - 180.3 Nm)
Item 4, Valve Coil	3 - 4.5 ft-lbs (4.1 - 6.1 Nm)
Item 5, Cartridge Valve	18 - 22 ft-lbs (24.4 - 29.8 Nm)
Items 6, Proportional Valve Coil	18.5 - 22 ft-lbs (25.1 - 29.8 Nm)
Item 7, Plug Fitting	3 - 4.5 ft-lbs (4.1 - 6.1 Nm)

Figure 4-13 Valve Manifold Assembly, Electronic Controls_1



Valve Manifold Assembly Part Number:
2311887
First Used on S/N AW5C-1666

1. Block
2. Relief Valve
3. Cartridge Valve
4. Valve Coil
5. Cartridge Valve
6. Proportional Valve
7. Proportional Valve Coil

Figure 4-13 Valve Manifold Assembly, Electronic Controls_2

Hydraulic Pump

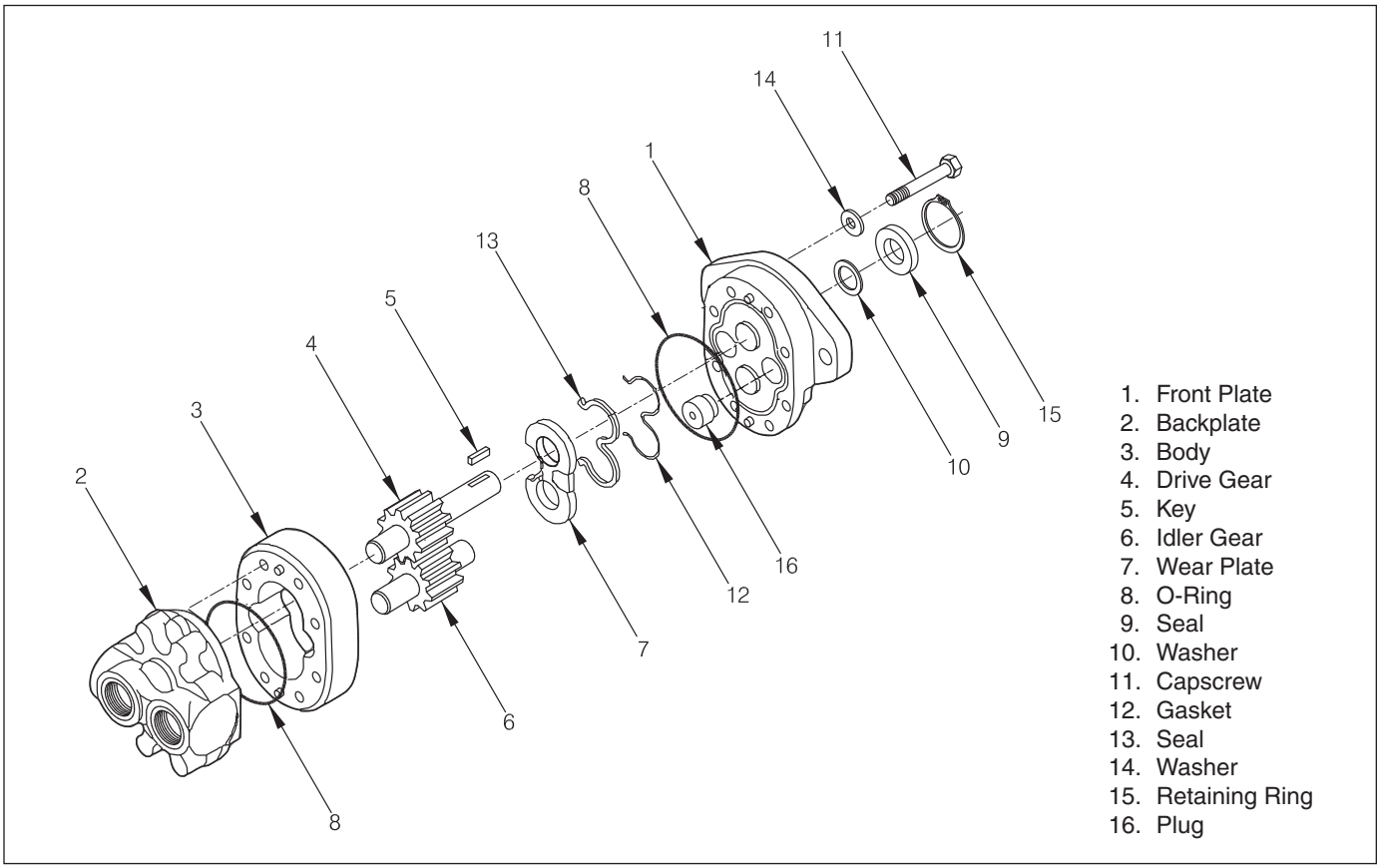


Figure 4-14 Hydraulic Pump

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

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 pump from vise, hold in hands and bump shaft against wooden block to separate front plate from backplate. Body will remain with either front plate or backplate.
6. To separate body from section that remains, place drive gear in bearing and tap protruding end with plastic hammer.
7. Remove O-ring from backplate assembly.
8. Remove idler gear from body.
9. Remove wear plate and O-ring seal, noting position of open side of wear plate.
10. Remove back-up gasket and seal from wear plate by extracting with O-ring tool.
11. Remove snap ring from front plate shaft seal area.
12. Remove the shaft seal and washer from the front plate with a blunt punch from the back.
13. Removing the plug is only necessary if you intend to change rotation.

Inspection

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

Gear Assembly

1. Inspect drive gear shaft for broken keyway.
2. Inspect all bushing points for excessive wear and rough surfaces.
3. Replace gear assembly if shafts measure less than .748 in (19 mm) in bushing area.
4. Inspect gear face for scoring and excessive wear.
5. Ensure 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.

Front and Backplates

1. Oil grooves in bearings should line up with dowel pin holes.
2. Replace plate if I.D. of bearings exceed .755 in. (19.2 mm)
3. Bushings in front plate should be at .126 in.(3.2mm) above surface of front plate.
4. Check for scoring on face of backplate; replace if wear exceeds .0015 in (.038 mm)

Body

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

Reassembly

1. During reassembly replace the wear plate, seal, back-up gasket, shaft seal, and O-rings as new parts.
2. Install O-ring in groove of front plate.
3. Apply a thin coat of petroleum jelly to both milled gear pockets of body. Slip body onto front plate with half moon port cavities in body facing away from front plate. Check that scribed location mark lines up.
4. Install new seal and new back-up gasket into wear plate.
5. Install new wear plate, seal and back-up gasket into gear pocket with seal and back-up gasket next to front plate.
6. Dip gear assembly into oil and slip into front plate bushings, and gears into pockets of body.
7. Install new O-ring in groove of backplate.
8. Make sure pump orientation is correct and then slide backplate over gear shafts until dowel pins are engaged.
9. Place pump in vise, shaft down, and install capscrews. Torque evenly 25 to 28 lb./ft. (33.9 to 38.0 Nm.)
10. Place washer over drive shaft into housing. Oil shaft seal with petroleum jelly and install over drive gear shaft taking care not to cut rubber sealing lip.
11. Place sleeve over shaft and press in shaft seal until flush with front surface of front plate.
12. Replace the driveshaft key.
13. Add a generous portion of clean oil to both ports to ensure that the pump is adequately lubricated. Rotate pump shaft by hand. Pump will have small amount of drag but should turn freely after short period of use.

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.

Assembly of the Winch

All components should be inspected for wear or damage as they are removed. Refer to Figure 4-15, 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 procedures are in the sequence that assumes a complete winch overhaul.

Figure 4-15 Visual Inspection (1)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
PTO Shaft with Integral Bevel Pinion	Check for broken or severely worn bevel gear teeth. Also check splines for wear or twisting. Observe tooth contact wear pattern.	Replace shaft if gear teeth are broken or severely worn, or if splines are not true.
Clutch Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	Inspect clutch shaft O-ring grooves for taper, scoring, burrs and corrosion.	Replace or repair shaft if surfaces of the seal groove are not damaged.
	Check for broken, scored, pitted and corroded cast iron seal rings.	Replace seal rings if worn or damaged slightly.
	Inspect clutch shaft bearings for wear or damage.	Replace worn or damaged bearings.
	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 loose plugs in the shaft ends.	Tighten.
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 bolts between gear and clutch assembly for tightness.	The gear should be replaced if the hub faces are defective in any way.

Continued on next page

Figure 4-15 Visual Inspection (2)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
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 or if discs are damaged in any way.
	Carefully inspect separator plates to verify that surfaces are flat as well as free of large blue areas (caused by overheating) and damaged surfaces.	Replace damaged separator plates.
	Inspect piston, O-ring grooves, piston cavity and center bore for scoring, burrs and corrosion. Look for any internal cracks.	Replace piston if damaged.
	Check for worn or collapsed release springs.	Replace spring(s) if distorted or damaged in any way.
	Inspect piston seals (O-rings).	Always replace both O-rings when clutch is repaired.
Oil Brake Assembly	Check for cracked or broken conical washer spring.	Replace spring if cracked or broken.
	Inspect oil brake cover for scoring, burrs, cracks or warping.	Replace cover if damage affects sealing.
	Carefully inspect friction discs for facing wear, distortion and damaged teeth.	Replace friction discs if oil grooves are worn or distorted in any way, or if discs are burned, damaged or warped.
	Carefully inspect separator plates to verify that surfaces are flat, as well as free of large blue areas (caused by overheating) and damaged surfaces.	Replace separator plates if damaged.
	Inspect piston housing seal grooves and center bore for scoring, burrs and corrosion.	Replace piston or piston housing if damaged. Always replace the piston seal (ring seal) when brake is repaired.
	Inspect brake housing for wear, scoring, burrs and cracks.	Replace housing if splines are notched or cage is cracked.
	Inspect brake hub and shaft for wear, scoring, burrs and cracks.	Replace hub if splines are notched or hub is cracked. Replace shaft if damaged.
	Check plungers for straightness, mushrooming and end faces out of square.	Replace if damaged enough to cause binding or if diameter, length or end squareness is distorted.
	Check capscrews for tightness and depth in frame.	Tighten if loose.
	Carefully check aligning dowels for grooves and distortion.	Replace if damaged sufficiently to cause binding or misalignment.

Continued on next page

Figure 4-15 Visual Inspection (3)

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
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 if teeth are broken or 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 if teeth are broken or severely worn.
Drum	Inspect O-ring groove for burrs, scoring and rust.	Replace drum or rebuild drum groove if a new O-ring will not seat properly.
Drum Spacer	Carefully inspect double seal contact surface for deep scratches, burrs and rust.	Replace if damaged.
Winch Frame	Check area around drum for damage if wire rope has slipped between wire rope guard and winch frame.	Consult the factory.

Hydraulic System

The first step to assembling the W5C winch is to install the hydraulic system into a clean frame. Install the control valve, filter, pump, accumulator, and strainer. Attach the hoses to the pump and strainer. The remaining hoses and tubes will be put in place after the clutch shaft is installed. Put all hydraulic fittings into the frame. If the winch is a drop box model, install the required fitting and tube to the PTO bore.

See figure 4-16 for the hydraulic configuration of the pump.

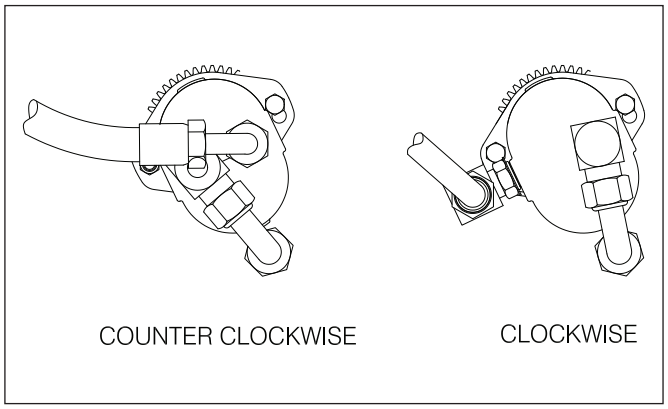
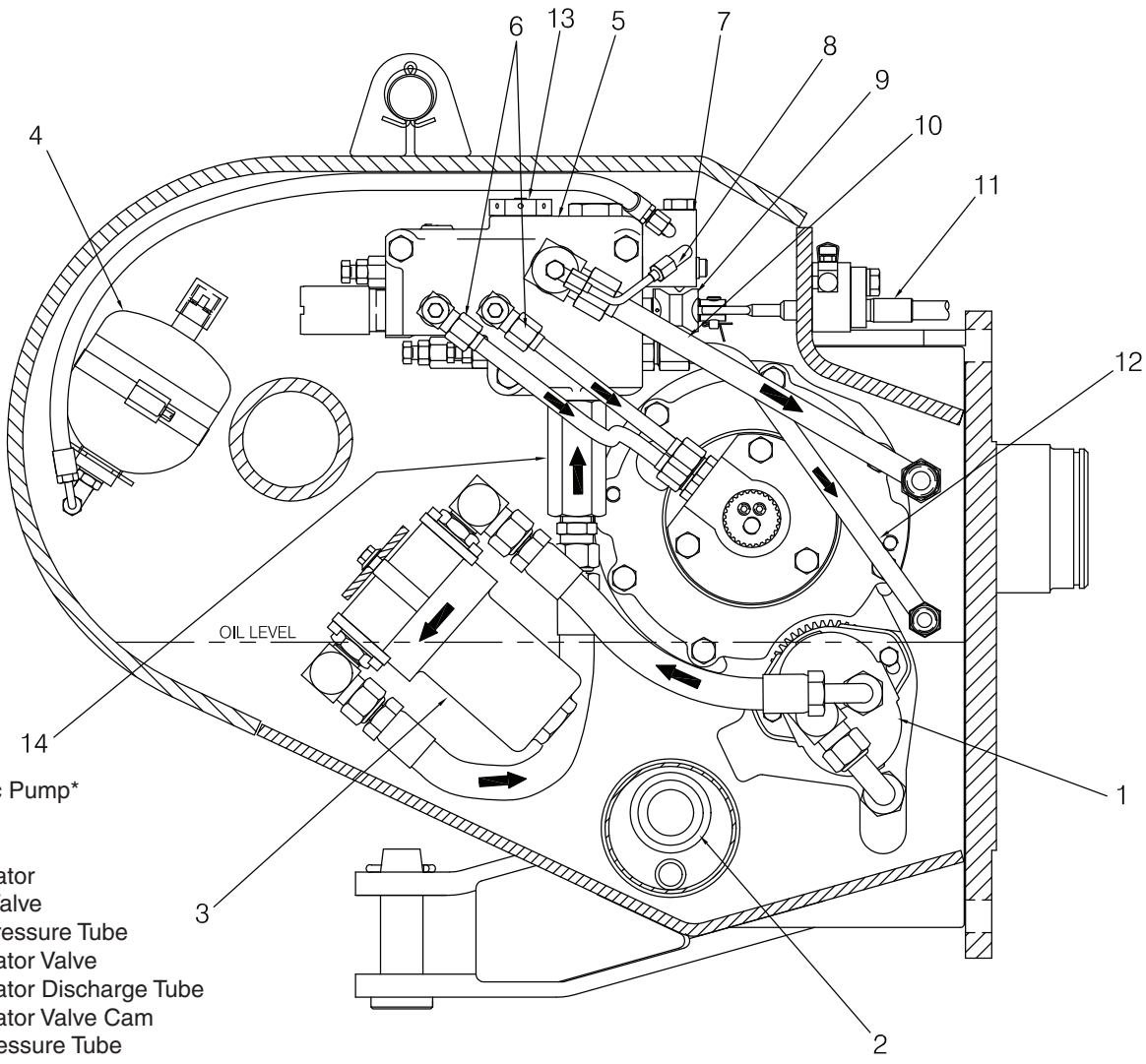


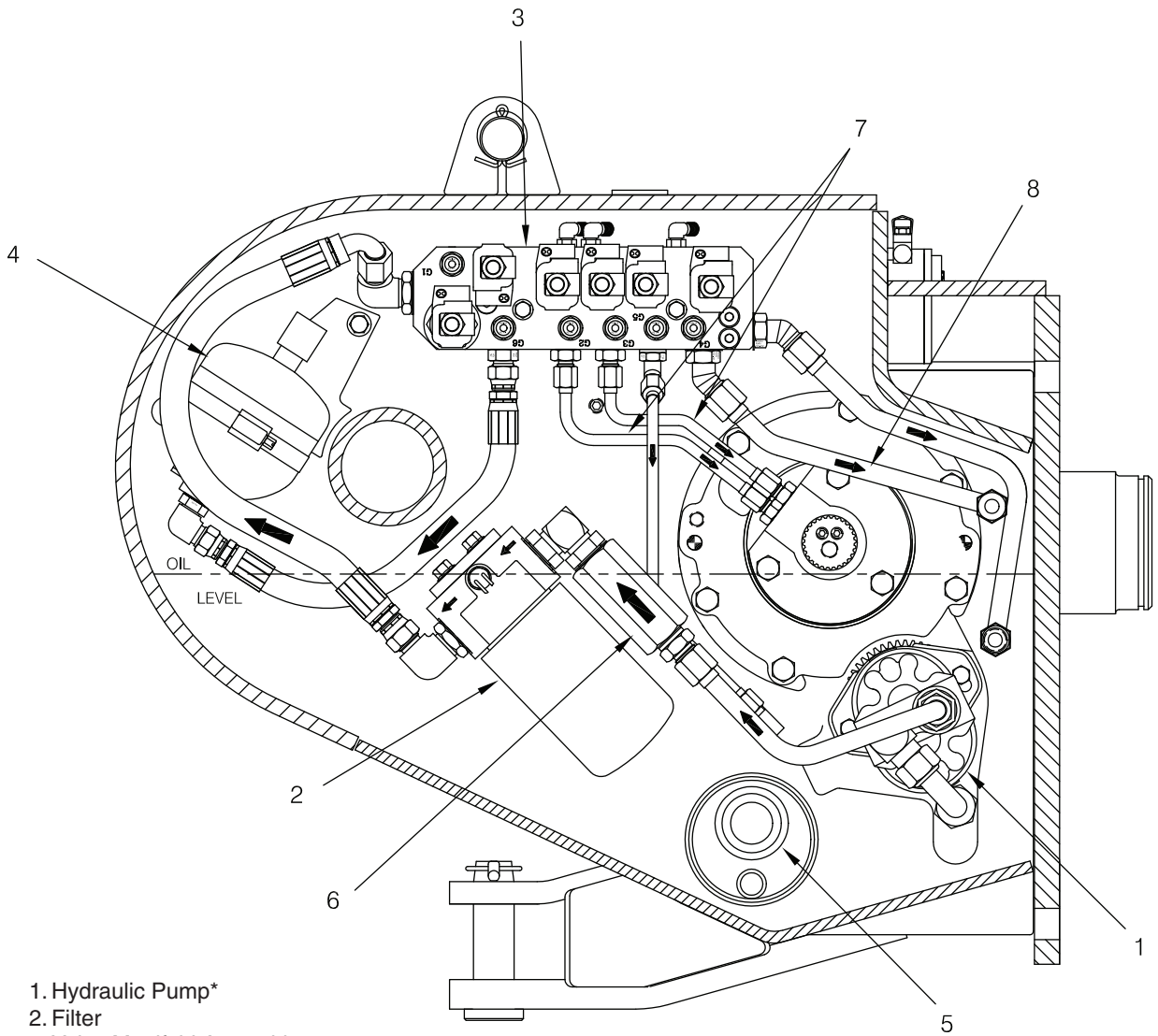
Figure 4-16 Hydraulic Pump Configuration



1. Hydraulic Pump*
2. Strainer
3. Filter
4. Accumulator
5. Control Valve
6. Clutch Pressure Tube
7. Accumulator Valve
8. Accumulator Discharge Tube
9. Accumulator Valve Cam
10. Brake Pressure Tube
11. Control Valve Cable
12. Cooling Oil Tube
13. Cooling Oil Relief Valve
14. Check Valve

* Illustration shows counter clockwise pump rotation configuration.

Figure 4-17 Hydraulic System, Power Controls



1. Hydraulic Pump*
2. Filter
3. Valve Manifold Assembly
4. Accumulator
5. Strainer
6. Check Valve
7. Clutch Pressure Tube
8. Brake Pressure Tube

* Illustration shows counter clockwise pump rotation configuration.

Figure 4-18 Hydraulic System, Electronic Controls

Clutch

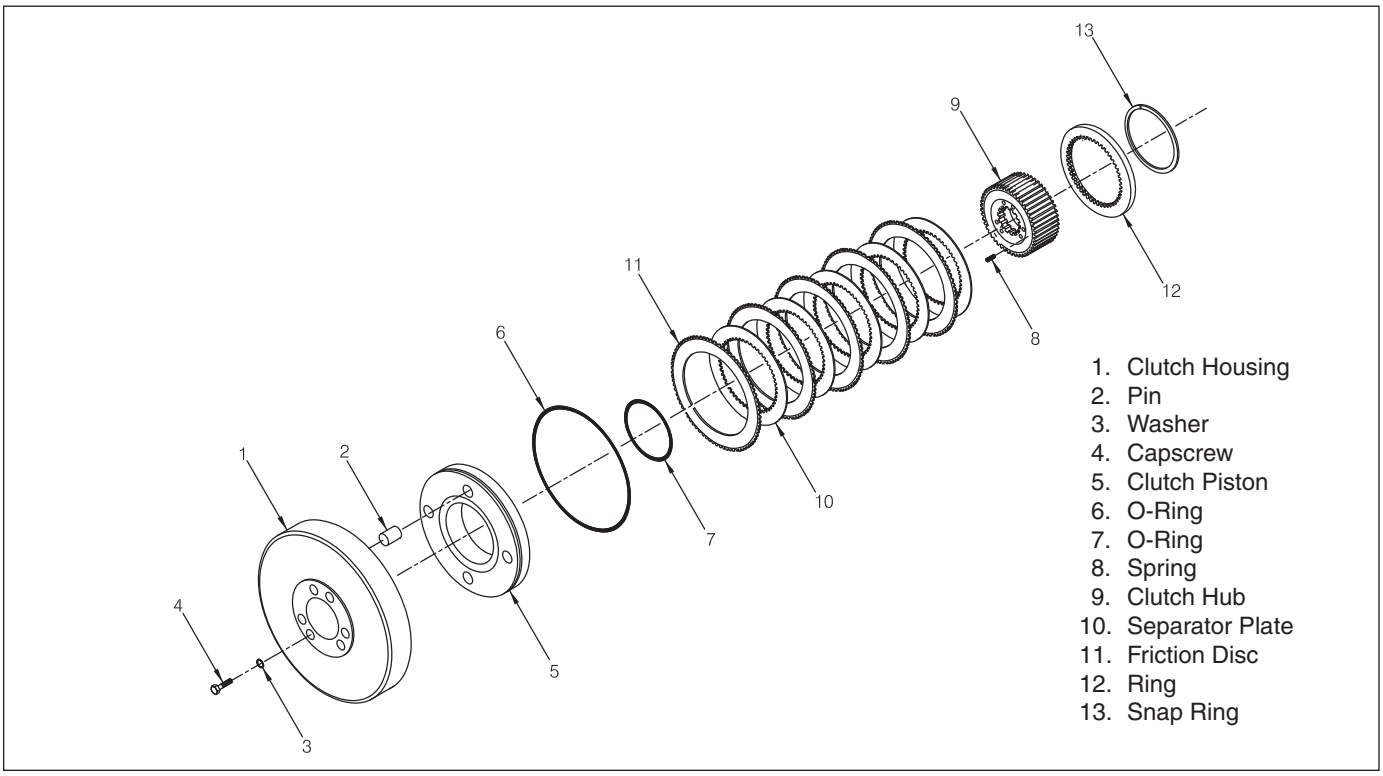
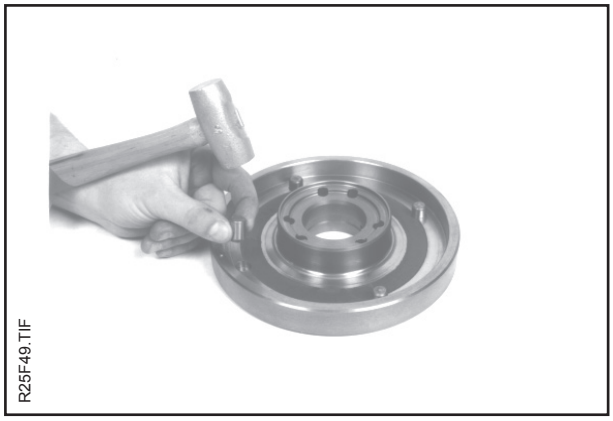
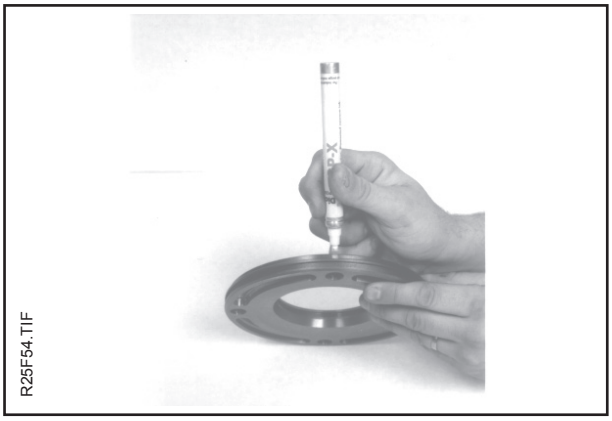


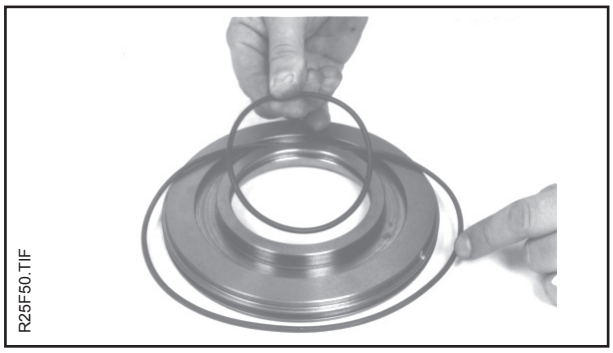
Figure 4-19 Clutch Assembly



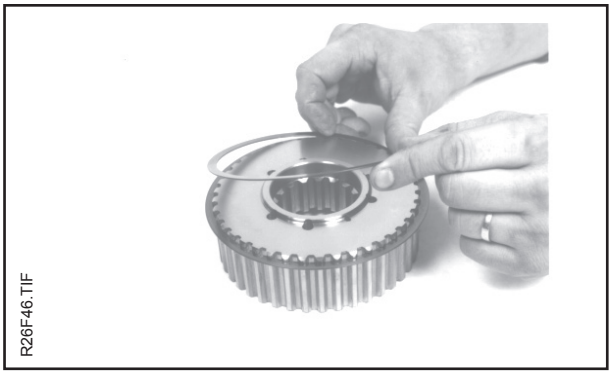
Tap dowels into the clutch housing.



Mark clutch piston with grease pen for alignment with dowels in clutch housing. Install into clutch housing.



Throughly clean the O-ring grooves of the piston. Install two new lubricated O-rings onto the clutch piston.



Install a new spiral snap ring on the clutch hub.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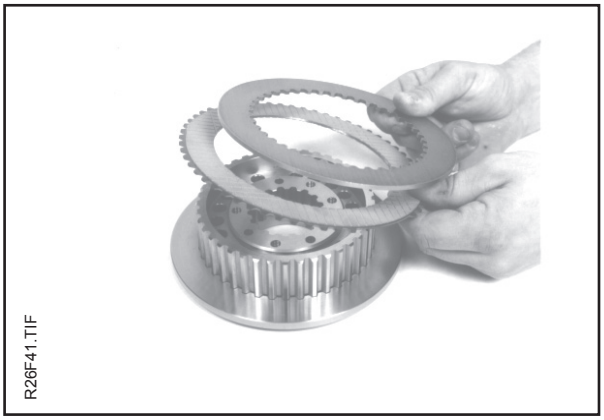
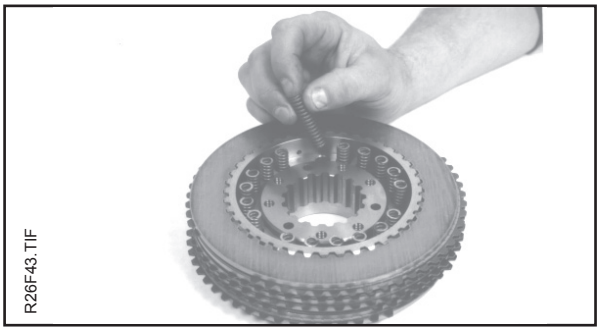
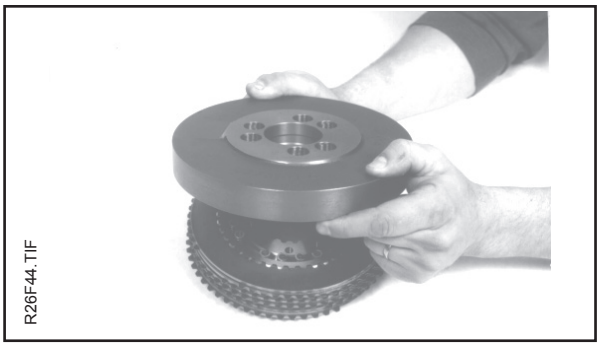
Place reaction ring onto clutch hub.


R26F41.TIF

Install a friction disc onto the clutch hub and reaction ring. Follow the friction disc with a separator plate. Install the remainder of the friction discs and separator plates in the same order.


R26F43.TIF

Install new clutch return springs.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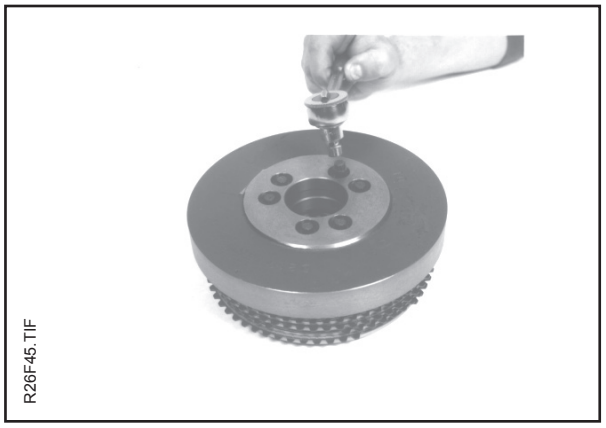
Place clutch piston housing onto the assembled clutch hub.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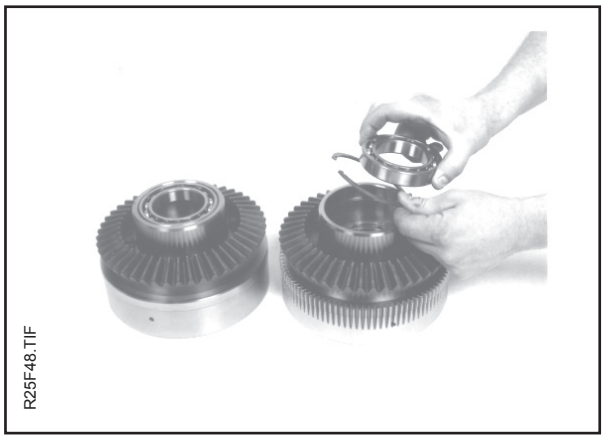
Tighten the capscrews and washers to connect the housing with the hub.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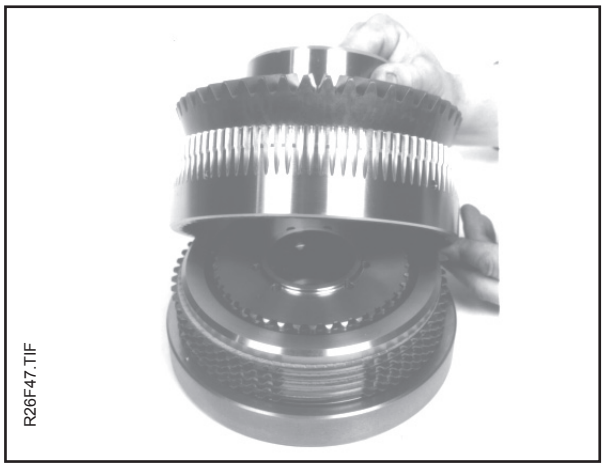
Install the lower and upper snap rings and bearings into each clutch carrier.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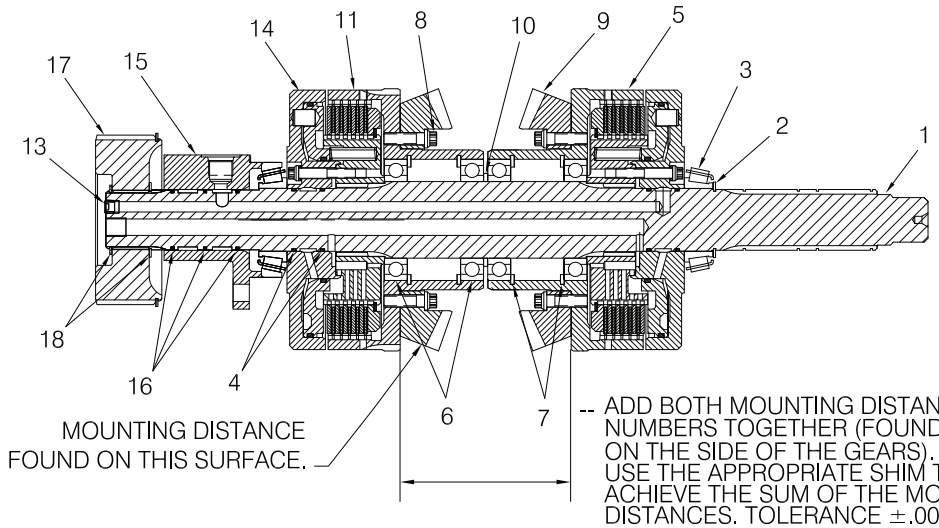
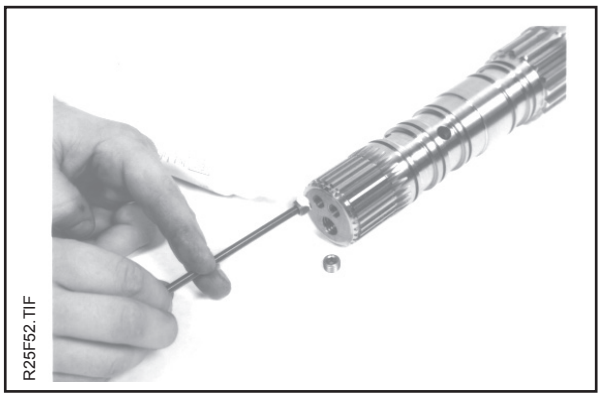
Install the clutch carrier over the clutch. Be careful not to bend or damage any of the teeth on the friction discs.

Brake/Clutch Shaft

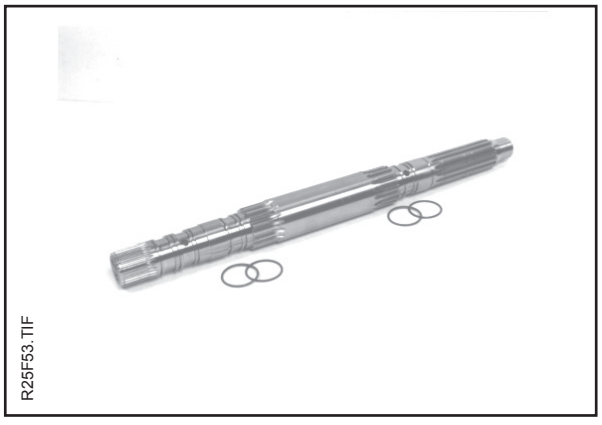


1. Shaft
2. Snap Ring
3. Bearing Cone
4. O-Ring
5. Clutch Housing
6. Bearing
7. Snap Ring
8. Capscrew
9. Bevel Gear
10. Spacer
11. Clutch Housing with Pump Drive Gear
13. Pipe Fitting
14. Clutch Piston Housing
15. Oil Manifold
16. Seal Ring
17. Brake Hub with Snap Ring
18. Snap Ring

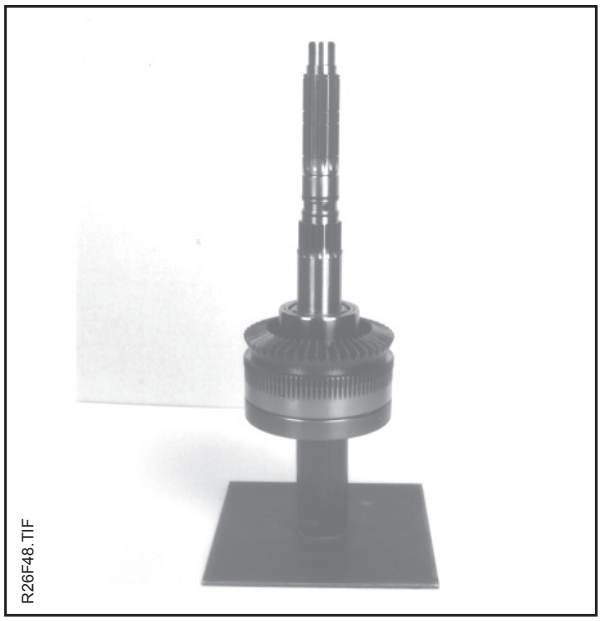
Figure 4-20 Brake/Clutch Shaft Assembly



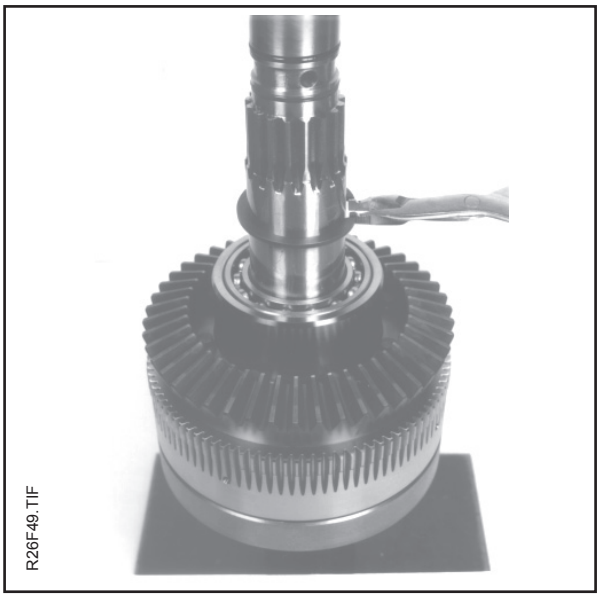
Install pipe fittings coated with sealer.



Install new lubricated O-rings onto shaft.

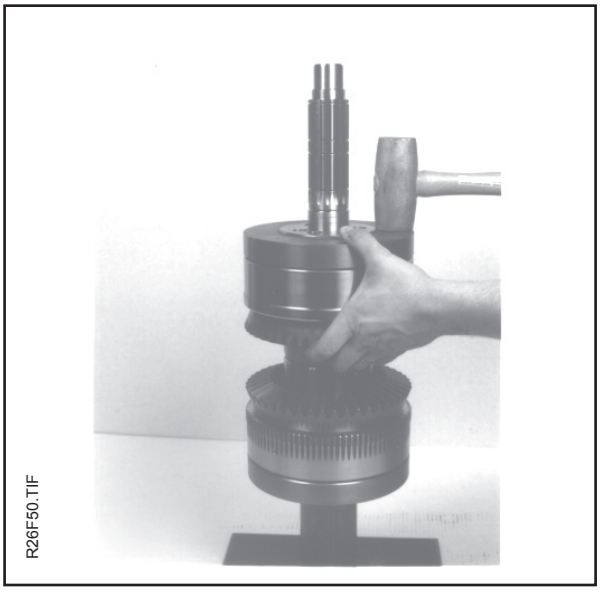


Slide a bearing cone onto the brake side of the shaft, followed by the clutch assembly with gear teeth for the hydraulic pump.

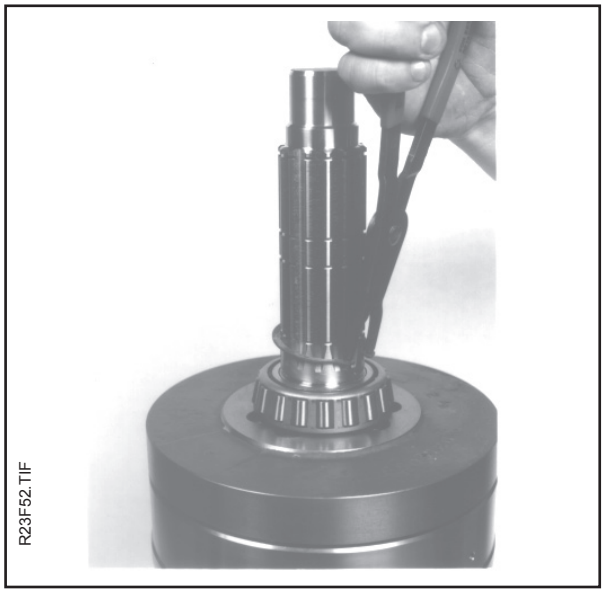


Install the center snap ring onto the shaft.

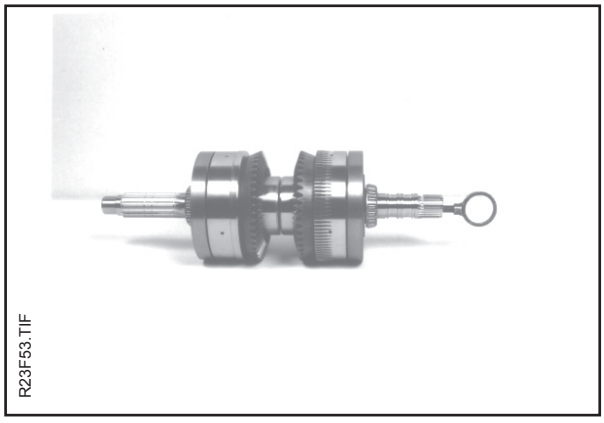
Slide bearing cone onto shaft.



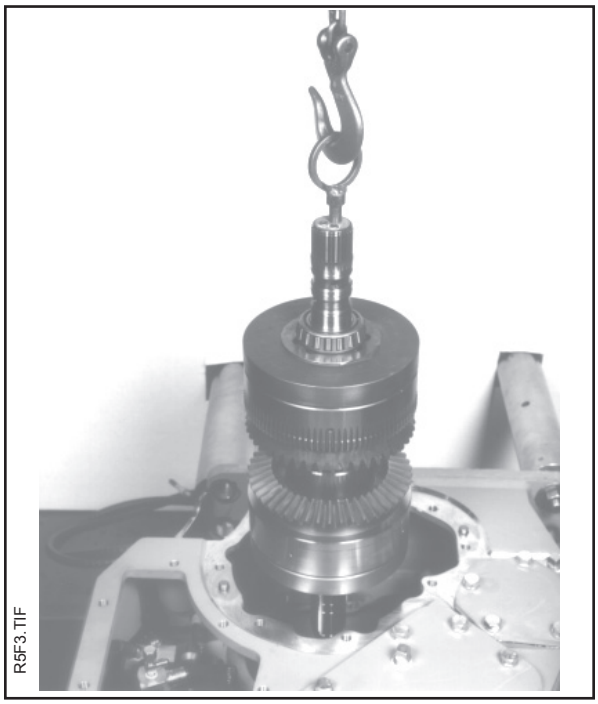
Slide other clutch assembly onto the shaft.



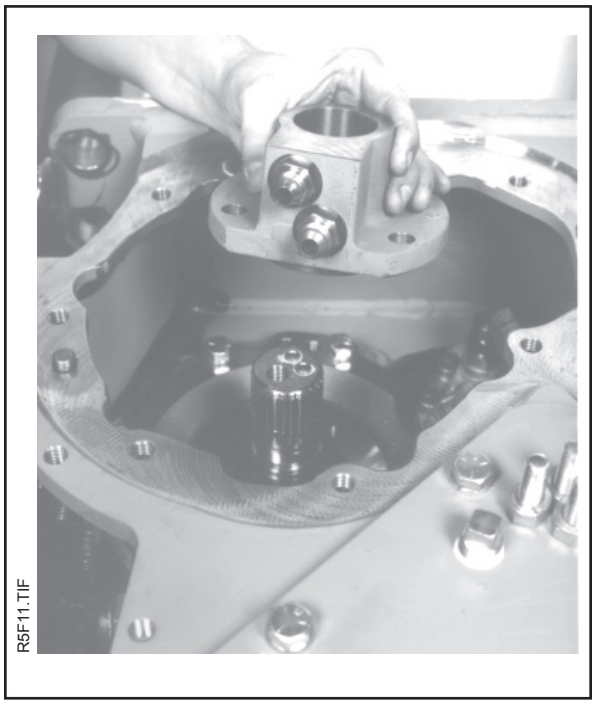
Install snap ring onto shaft.



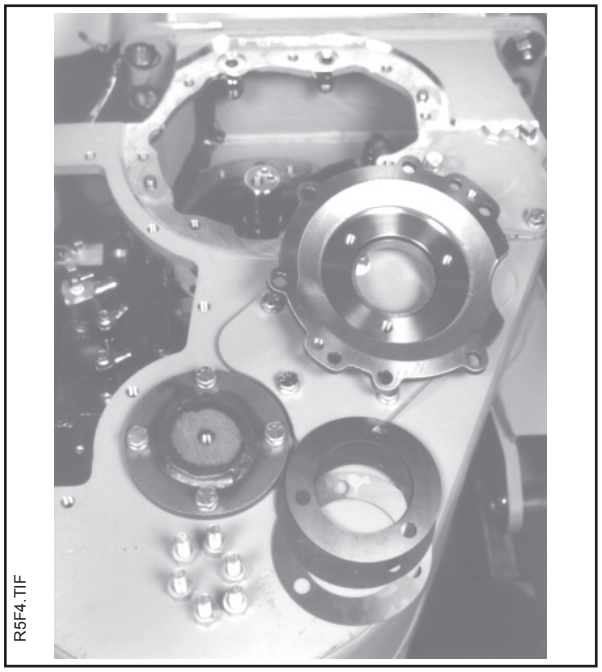
Place a lifting eye into the end of the shaft for installation into the frame.


R5F3.TIF

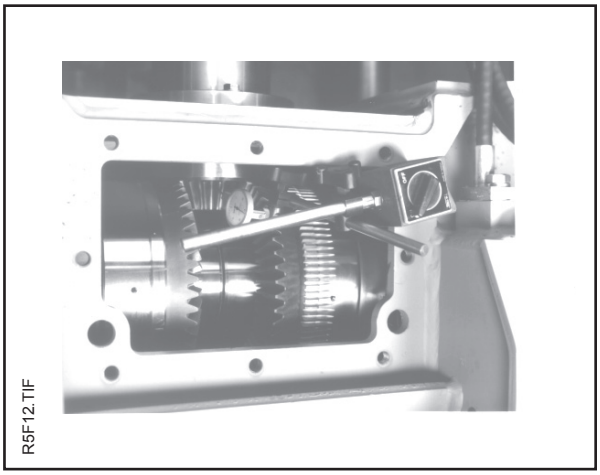
Install clutch shaft retaining plate, bearing cone, and shims from the left side of the frame. From the right side, install the shaft assembly.


R5F11.TIF

Install the oil manifold. Install the hydraulic fittings onto the oil manifold before placing into position.


R5F4.TIF

Install the bearing carrier and shims.


R5F12.TIF

Install the pinion carrier. Inspect the clearance between the bevel gears and the pinion. Normal backlash is .004-.007" at tightest point of tooth engagement measured at the heel perpendicular to the tooth surface. It is not to exceed .012" at loosest point.

With shaft assembly in place and adjusted, install all hydraulic plumbing and the hydraulic control cable (for cable controls winch) or electrical harness (for electronic controls winch).

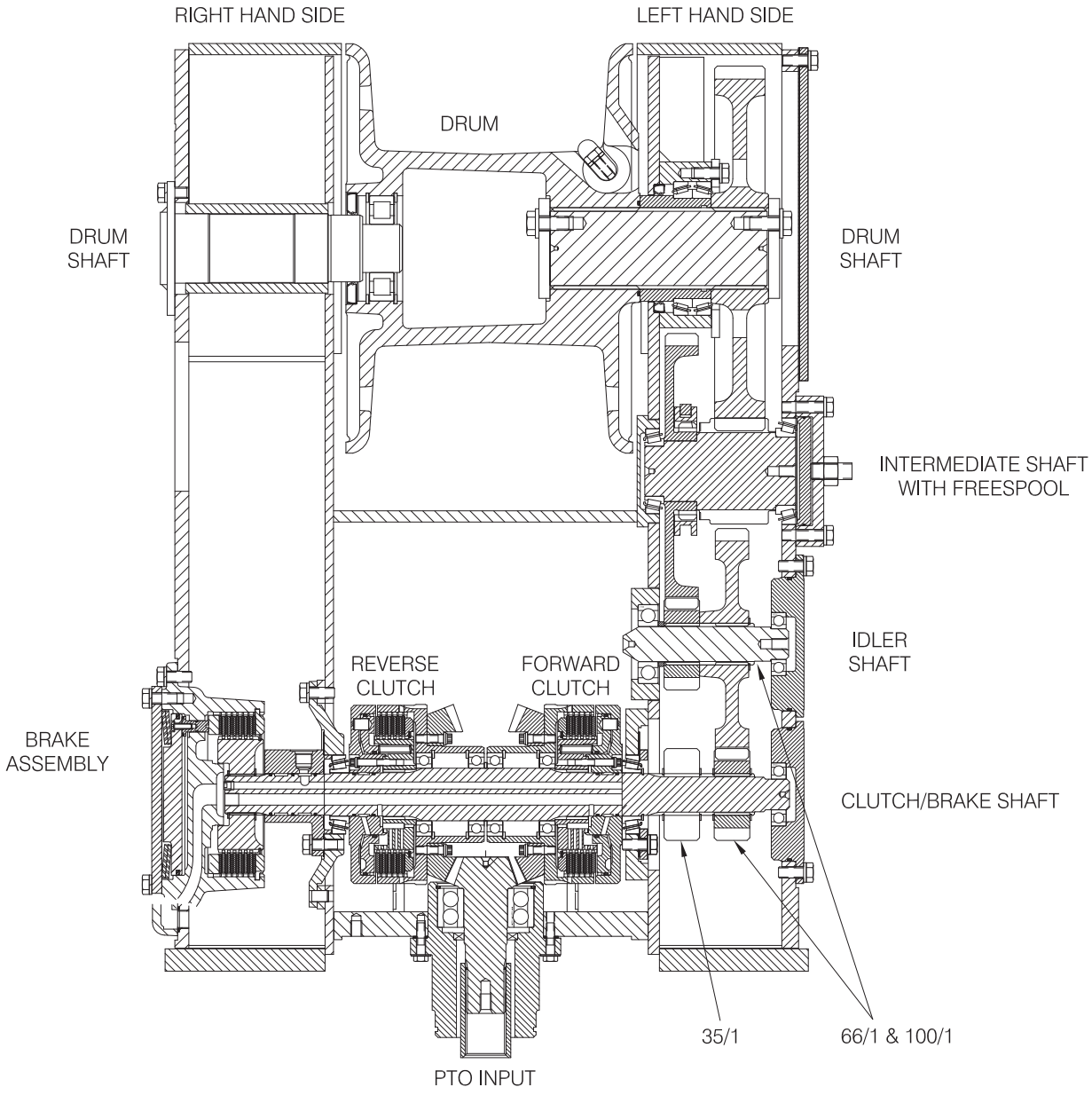


Figure 4 -21 W5C Winch Gear Arrangement

Brake

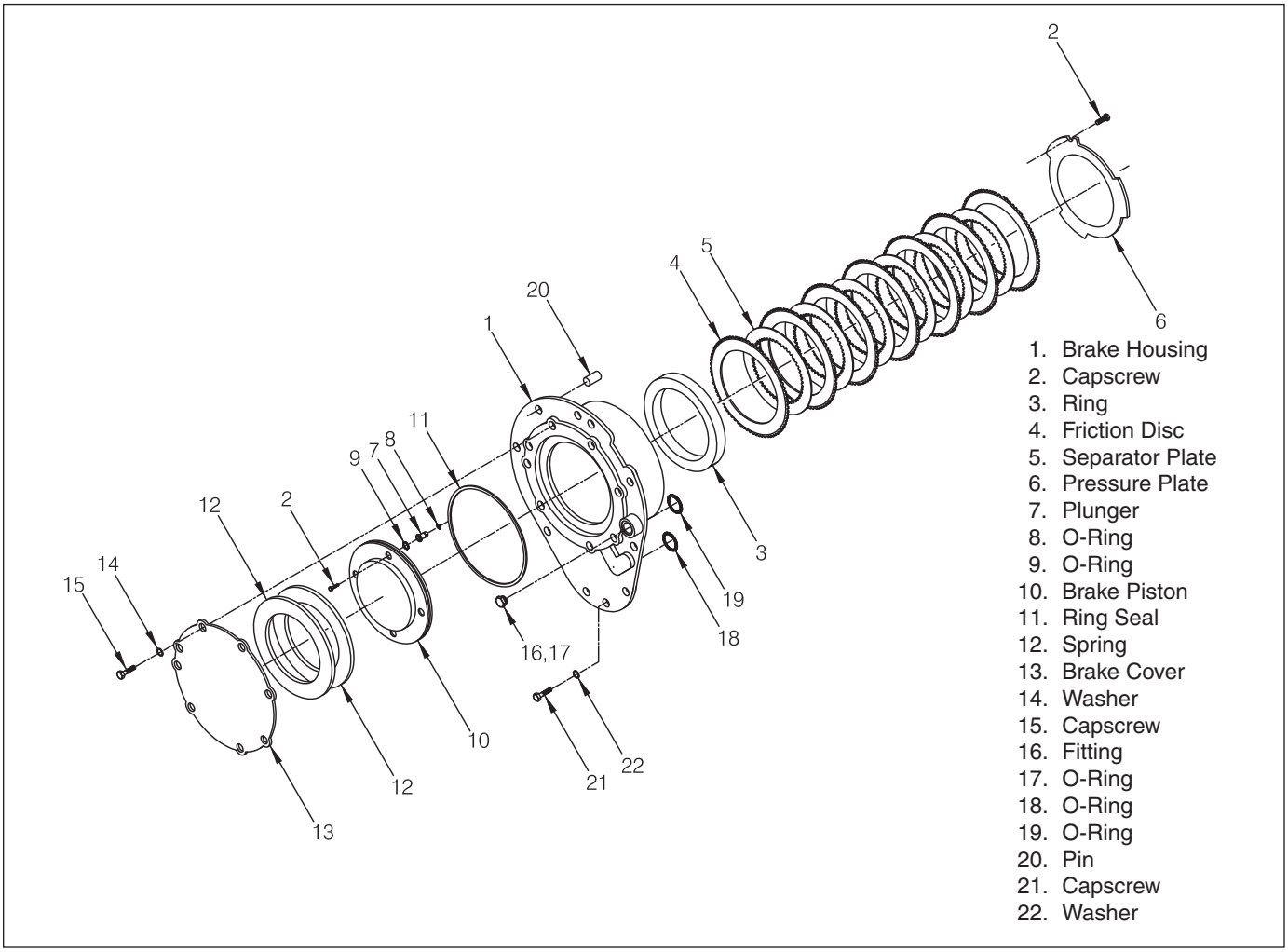
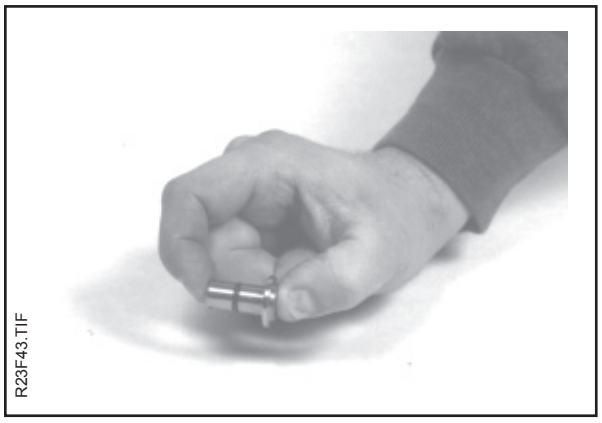
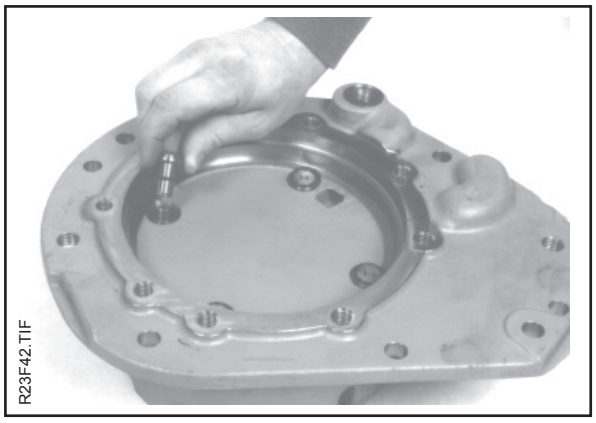


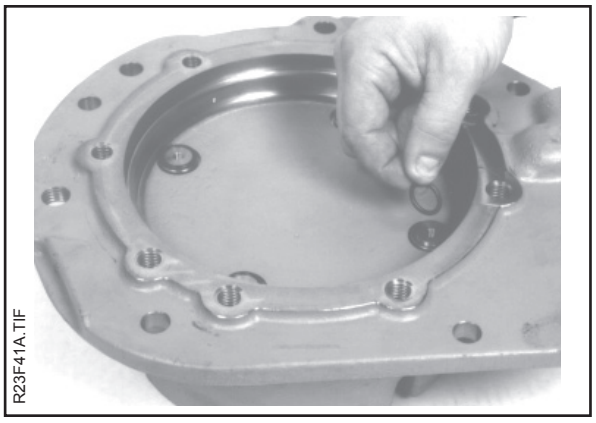
Figure 4-22 Brake Assembly



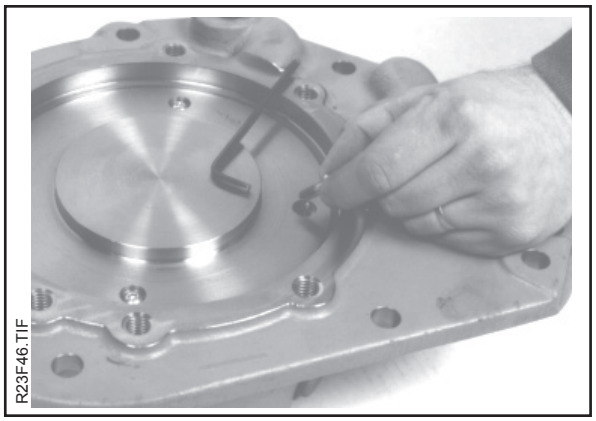
Install new lubricated O-ring onto plunger.



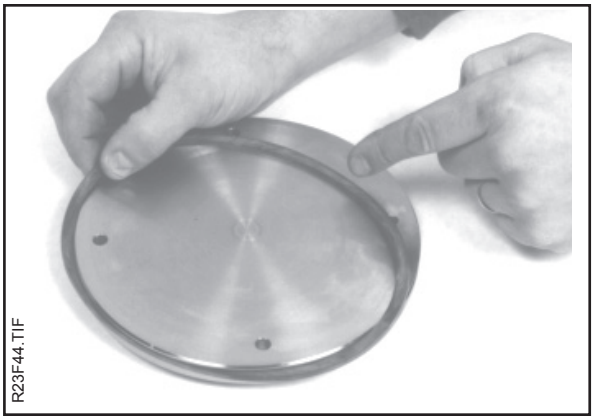
Lubricate the plungers and gently slide plunger into bore in housing. Be careful not to damage O-rings when installing.



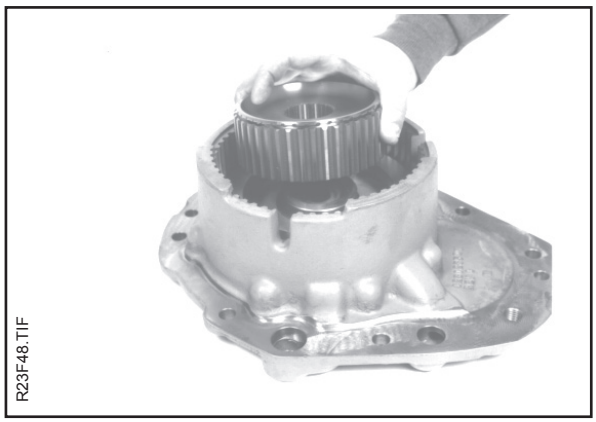
Install new lubricated O-rings on each plunger head.



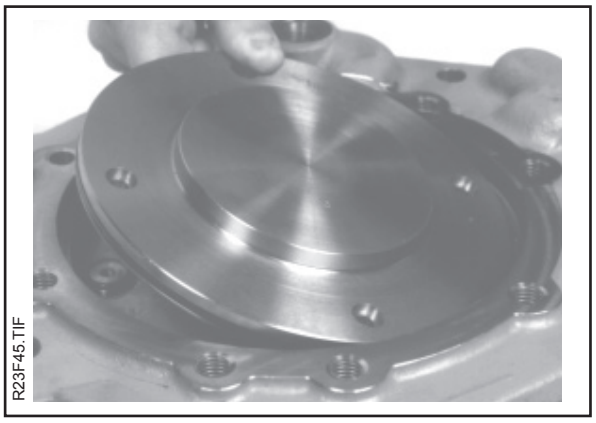
Install and tighten plunger screw.



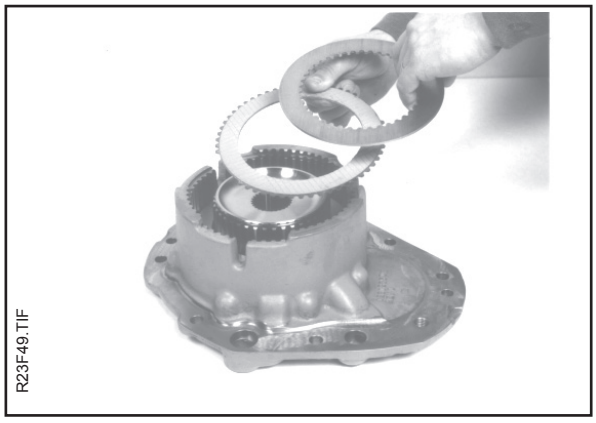
Place new seal ring on brake piston.



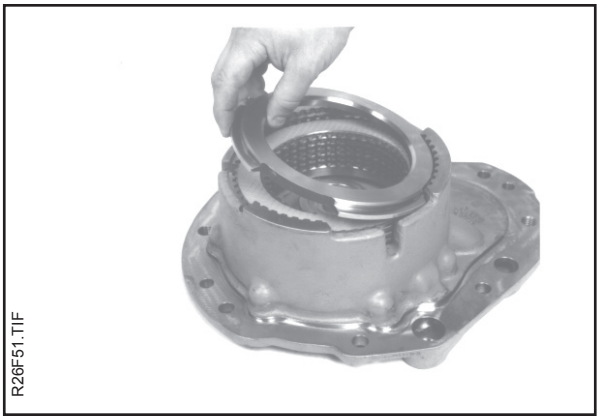
Place the brake hub without the snap ring into the housing. This will allow the friction discs and separator plates to be aligned.



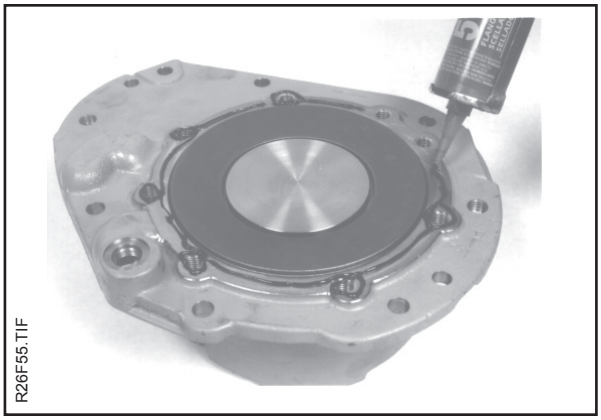
Align the holes in the piston with the plungers. Place in the brake piston.



Place the ring into the housing, followed by the friction discs and separator plates.

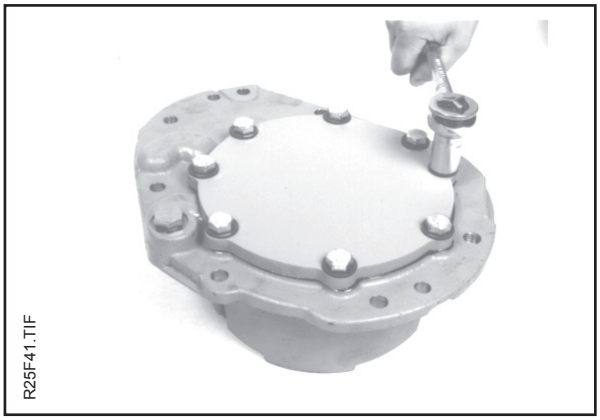


Install the flat side of the pressure plate against the last friction disc. Add the retaining ring to the brake hub to align the pressure plate.

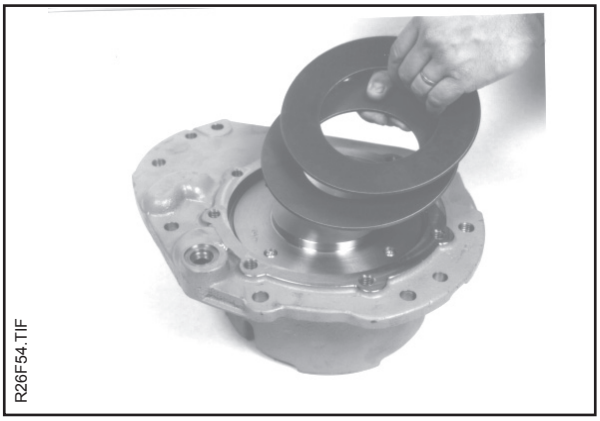


Place a bead of liquid gasket on the clean housing surface.

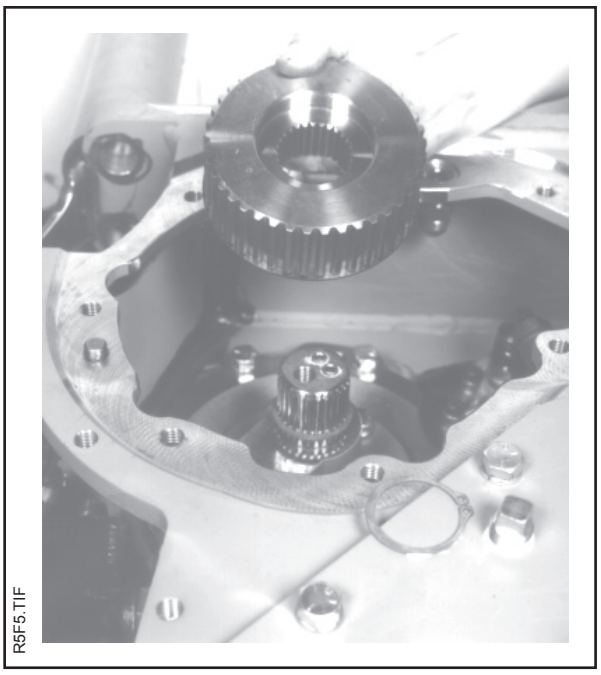
Insert and tighten the pressure plate screw in the pressure plate cut-out.



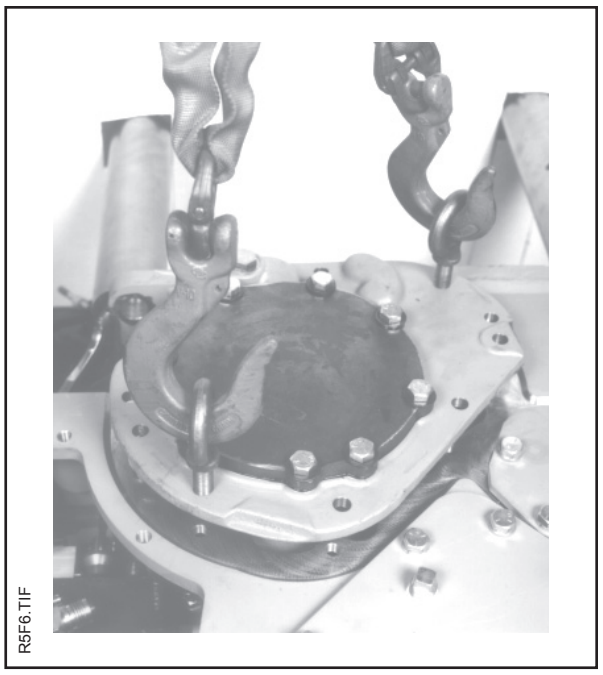
Tighten the cover plate capscrews evenly.



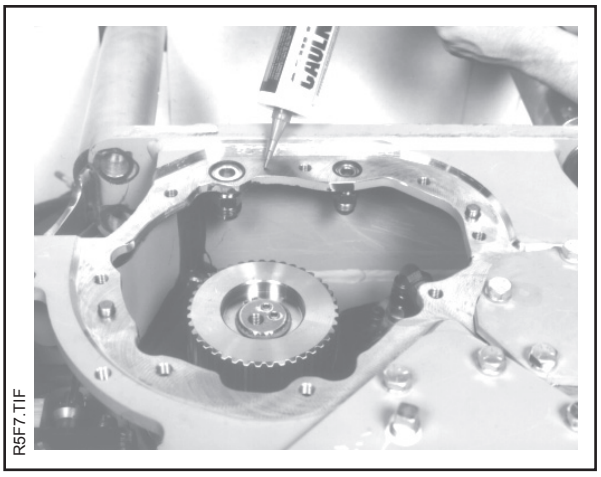
Install the brake springs with cones towards the piston.


R5F5.TIF

Install the brake hub with the snap ring already installed on the hub. Install the snap ring onto the shaft.


R5F6.TIF

Insert two lifting eyes into the brake housing and, using an appropriate sling arrangement, gently place the brake assembly into position in the frame. Tighten the brake housing into place with capscrews.


R5F7.TIF

Apply liquid gasket to clean frame surface. Install O-rings in frame.

Idler Shaft

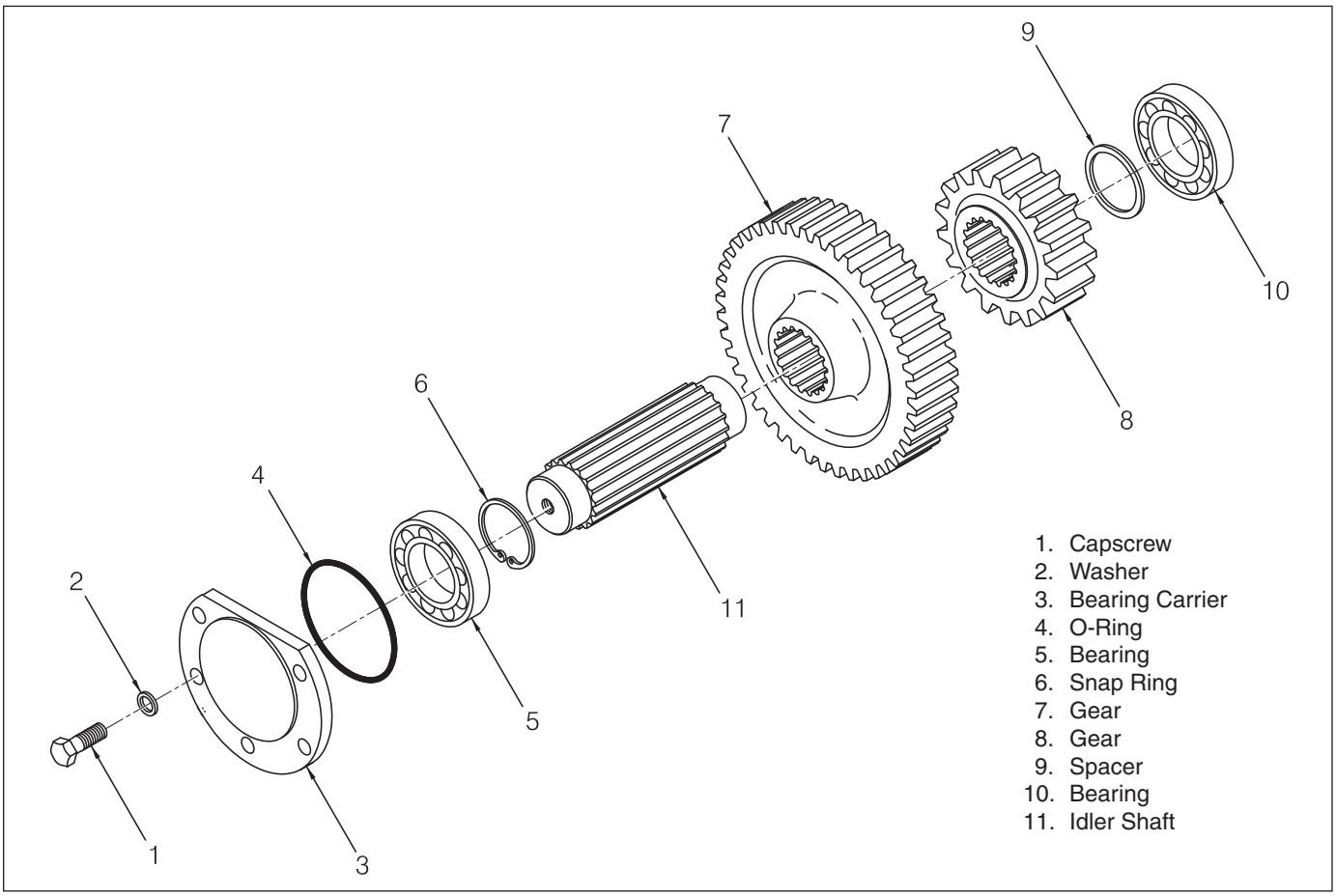
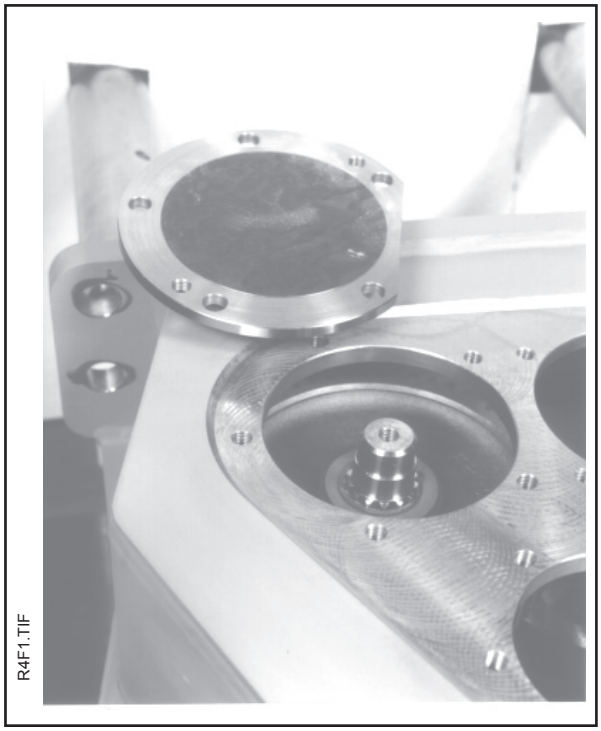


Figure 4-23 Idler Shaft Assembly

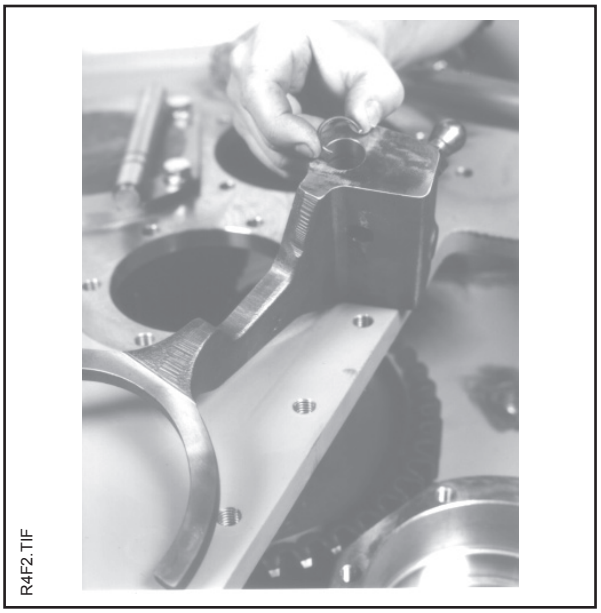
Install the idler shaft assembly. Note: Idler shaft is not used with all gear ratios.

Drive the bearing into the frame. Make a stack starting with the spacer, followed by the small gear, then the large gear. Install the snap ring onto the shaft. Slide the shaft, tapered end first, through the gears and spacer into the bearing. Install the bearing and O-ring into the bearing carrier. Install the bearing carrier.

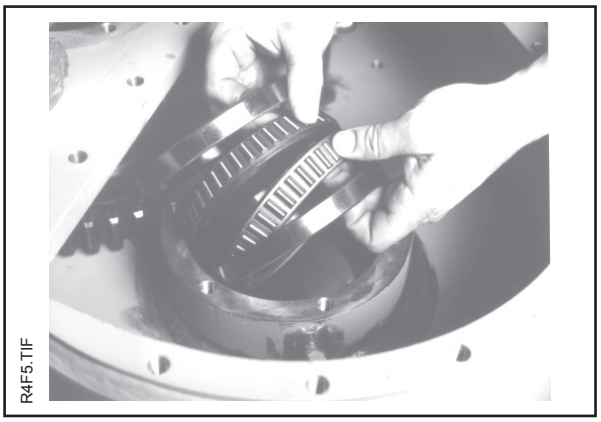


Drum

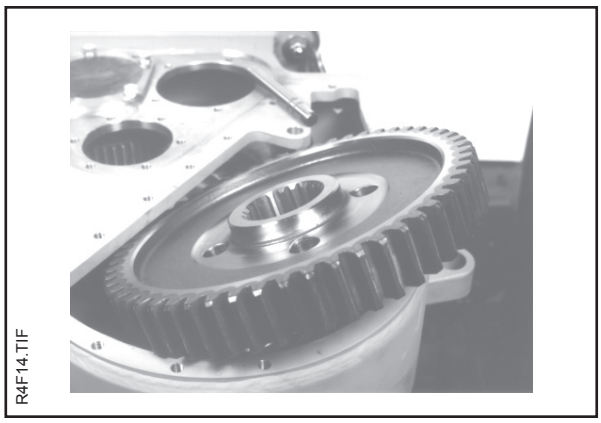
Due to the interaction of the drum gear and the **FREESPOOL** intermediate gear arrangement, it is necessary to install both subassemblies in similar order.



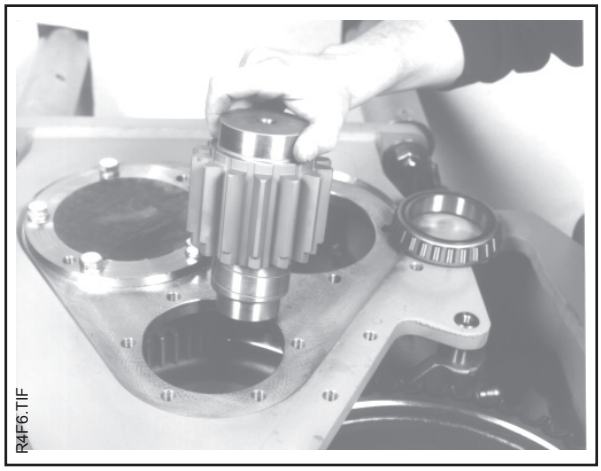
Install the snap ring inside the **FREESPOOL** shifter fork. Place the shifter fork, dental clutch, bearing, and gear into the frame because installation into the frame is impossible after installation of the drum gear.



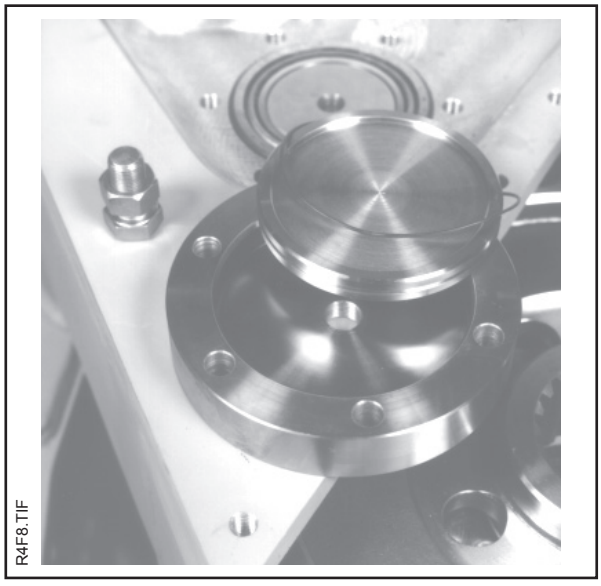
Insert the seal, bearing assembly, retainer and shims.



Install the Drum Gear.



Insert the drum pinion.



Install lubricated O-ring onto the **FREESPOOL** piston.

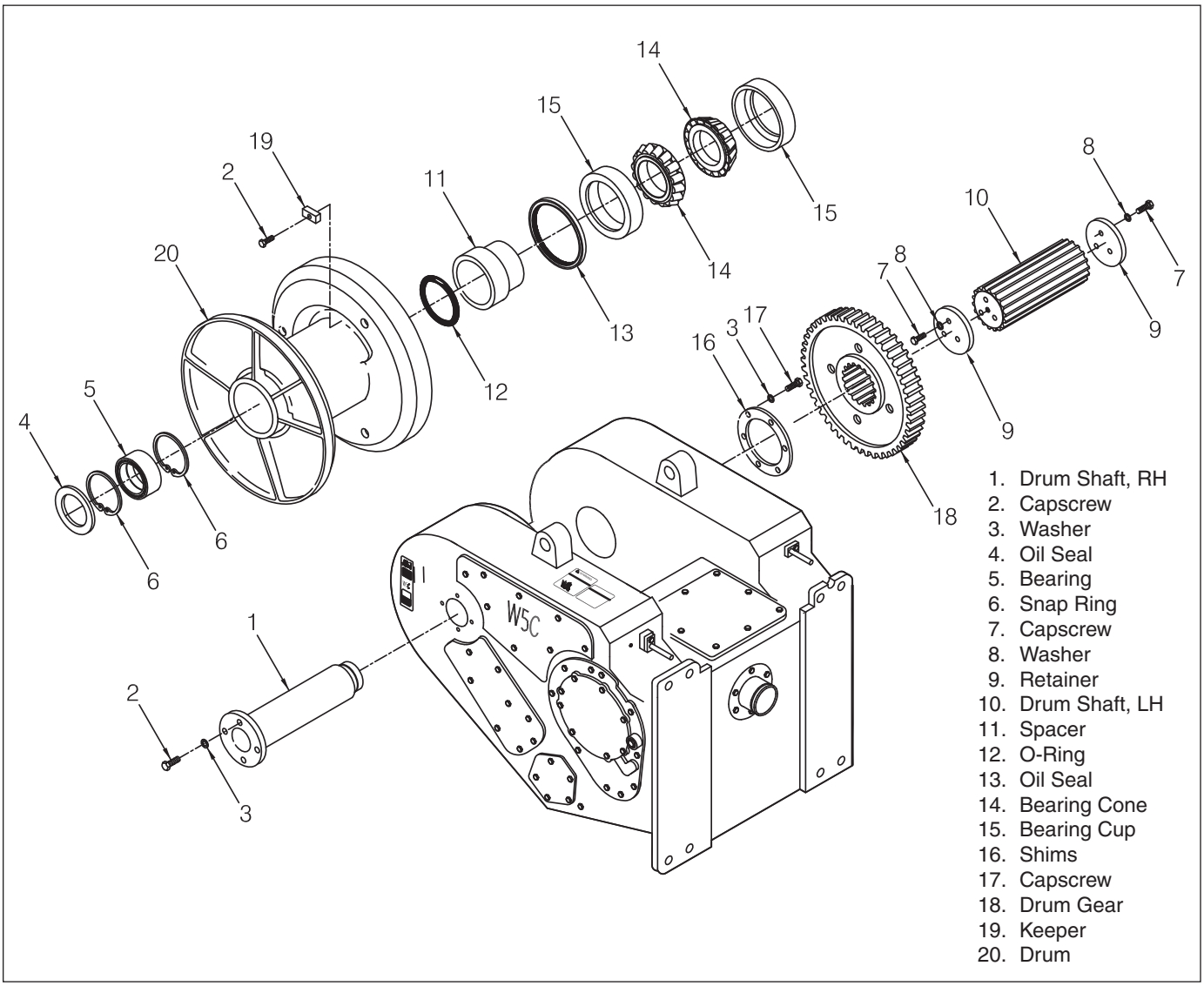
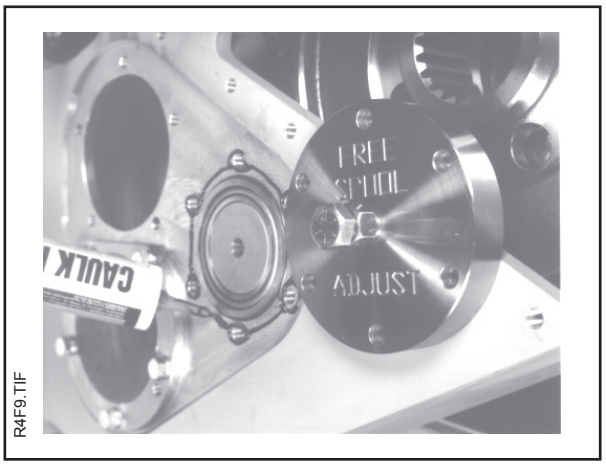
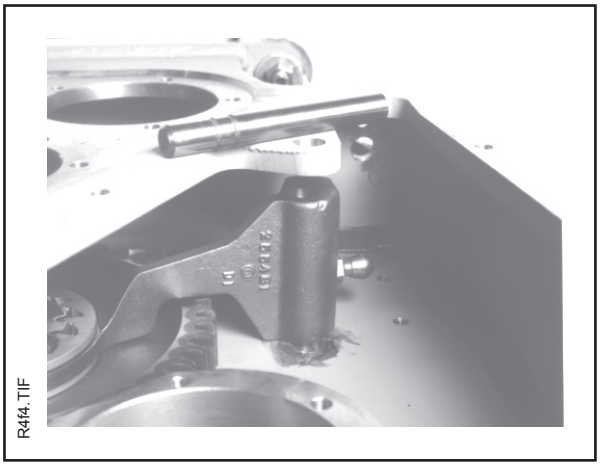


Figure 4-24 Drum Assembly



Apply liquid gasket to the clean frame and tighten down the **FREESPOOL** adjustment retainer.



Line up the shifter fork with the dental clutch and shaft holes. Install the shifter fork shaft, groove end first.

Intermediate/Freespool Shaft

1. Bearing Cone
2. Bearing Cup
3. Intermediate Gear
4. Dental Clutch
5. Drum Pinion
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
12. Freespool Adjust Retainer
13. Nut
14. Setscrew
15. Shaft
16. Shifter Fork
17. Ball Stud
18. Washer
19. Crank
20. Cotter Pin
21. Pin
22. Flat Washer
23. Snap Ring
24. Snap Ring
26. Pivot Bracket
27. Capscrew
28. Washer
29. Capscrew*
30. Washer*

* Flange screw replaces capscrew & washer after S/N AW5C-1287.

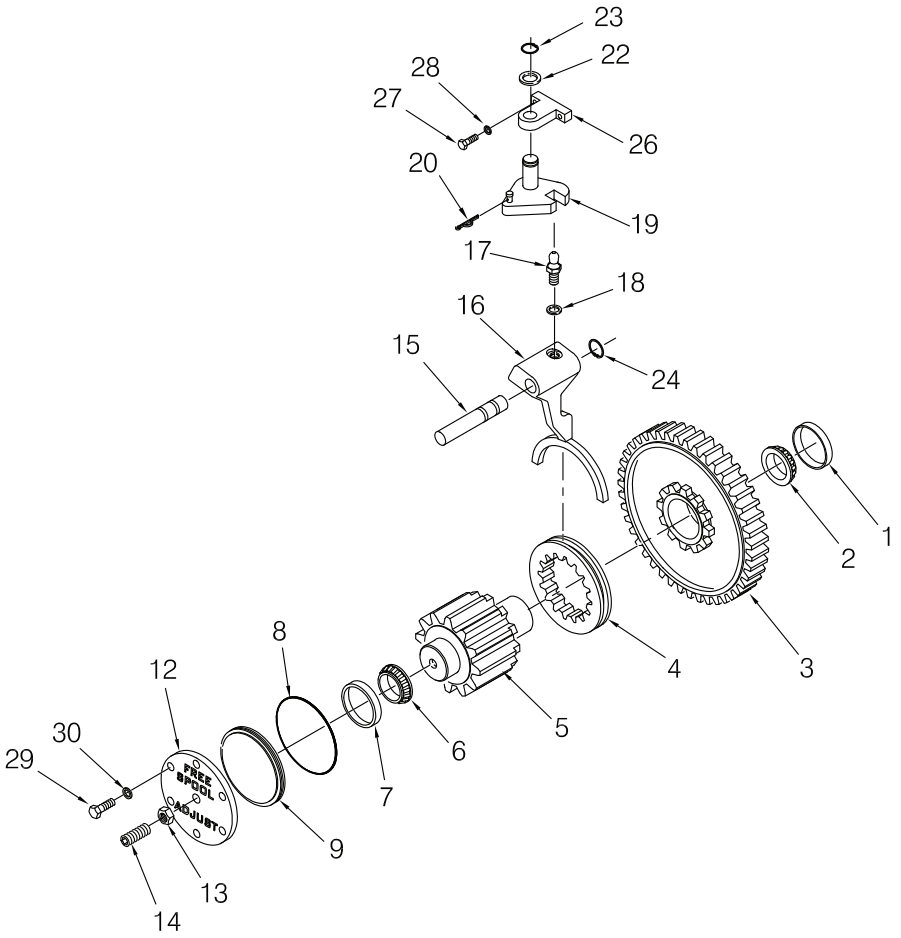


Figure 4-25 Intermediate/Freespool Shaft Assembly, Power Controls

1. Bearing Cone
2. Bearing Cup
3. Gear
4. Dental Clutch
5. Drum Gear
6. Bearing Cone
7. Bearing Cup
8. O-Ring
9. Freespool Adjust Piston
10. Capscrew*
11. Lockwasher*
12. Freespool Adjust Retainer
13. Nut
14. Set Screw
15. Shaft
16. Shifter Fork
17. Fitting
18. Spring
19. O-Ring
20. Capscrew
23. O-Ring

* Flange screw replaces capscrew & washer after S/N AW5C-1287.

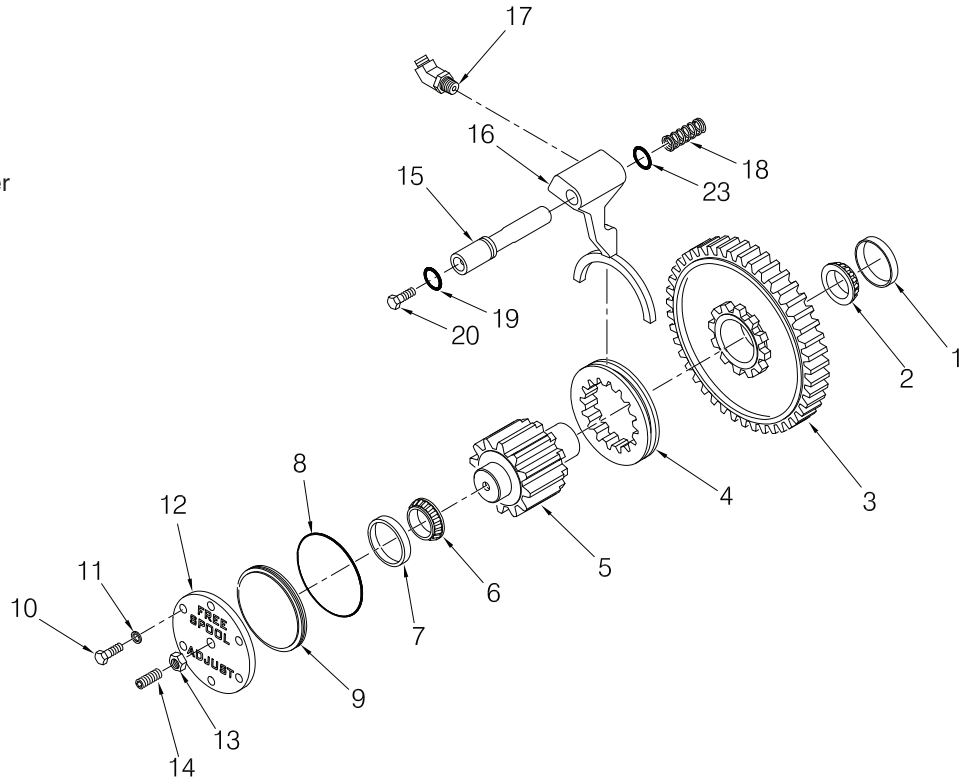
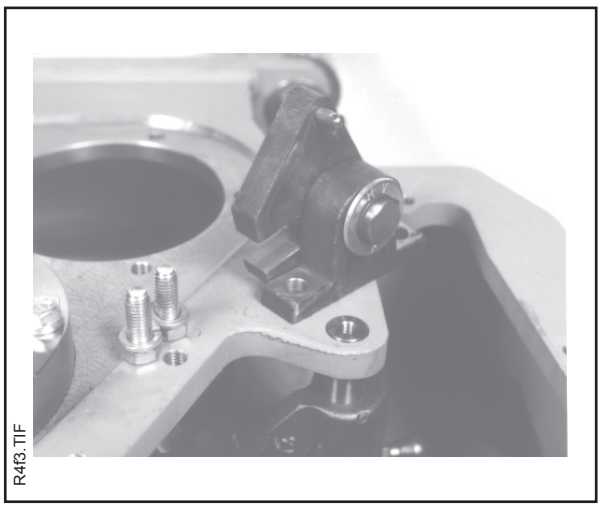
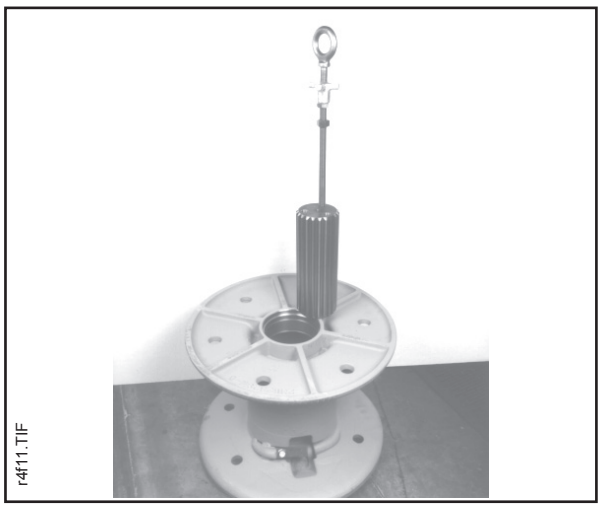


Figure 4-26 FREESPOOL, Electronic Controls



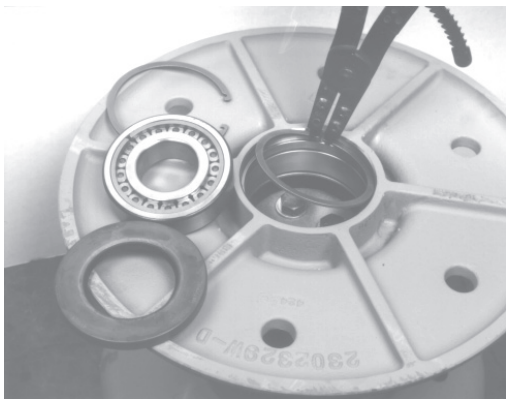
POWER CONTROLS: Install the pivot bracket assembly and **FREESPOOL** control cable.



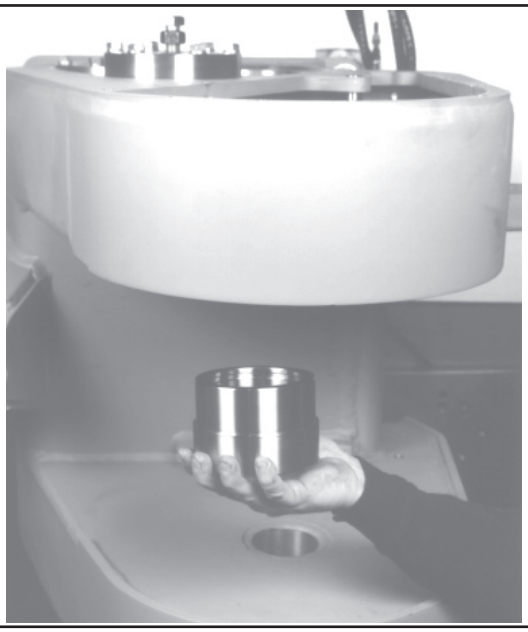
Insert the left hand shaft into the drum.


R4F12.TIF

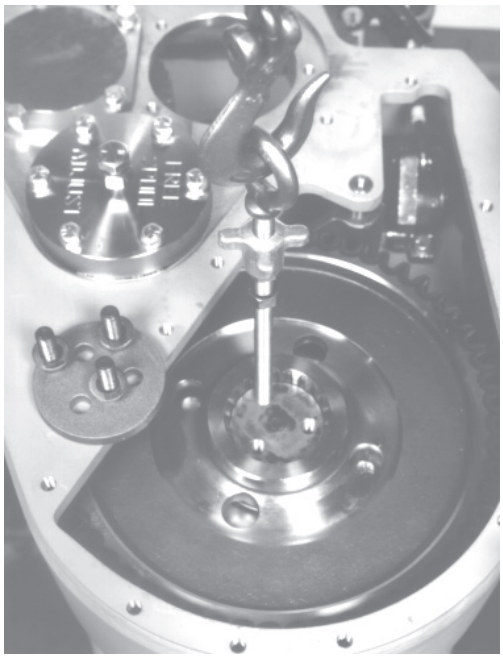
Fasten the shaft retainer onto the shaft inside the drum.


R5F10.TIF

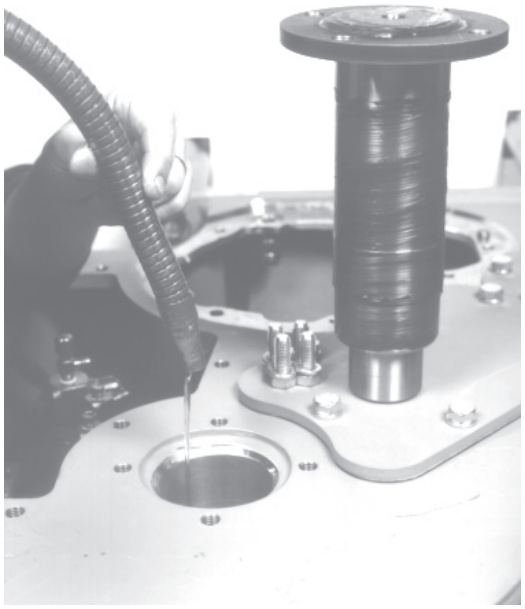
Insert the snap rings, bearing and seal into the drum.


R4F10.TIF

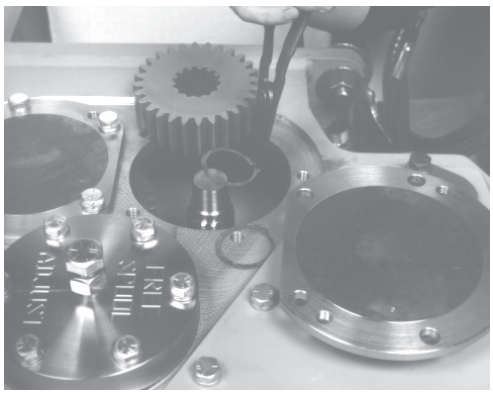
Insert the spacer. Install the O-ring into the drum. Slide drum into frame.


R5F1.TIF

Roll the drum gear into position. Align the drum gear teeth with the installed intermediate gear. Use a lifting eye to pull the partially assembled left hand drum shaft into position. Attach the retainer and tighten the capscrews.


R5F2.TIF

Pour one quart of oil into the drum. Lubricate and insert the right hand drum shaft. Tighten the capscrews.


R5F9.TIF

From the left hand side of the winch, install the snap rings, gear and bearing carrier to the clutch shaft. Align gear with the intermediate gear for 35/1 ratio winches or to the idler gear for 100/1 ratio winches.

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. Install the PTO attaching hardware required for your particular tractor.

3. Connect the lifting slings in the same manner as for winch removal.

4. Install the winch by sliping the PTO shaft onto the winch PTO shaft. Align the bolt holes on the bottom of the winch with the mounting holes on the tractor frame.

5. Apply thread locking compound (P/N 318702W) to the threads of the mounting bolts. Install the bolts or nuts and tighten.

Frame and Covers

With the winch fully assembled, install the cover plates. Fill with oil to the oil level plug.

1. Capscrew
2. Washer
3. Capscrew
4. Left Cover
5. Gasket Kit
6. Top Cover
7. Valve Cover
8. Filter Cover
9. Strainer Cover
10. Oil Drain Plug
11. Cover

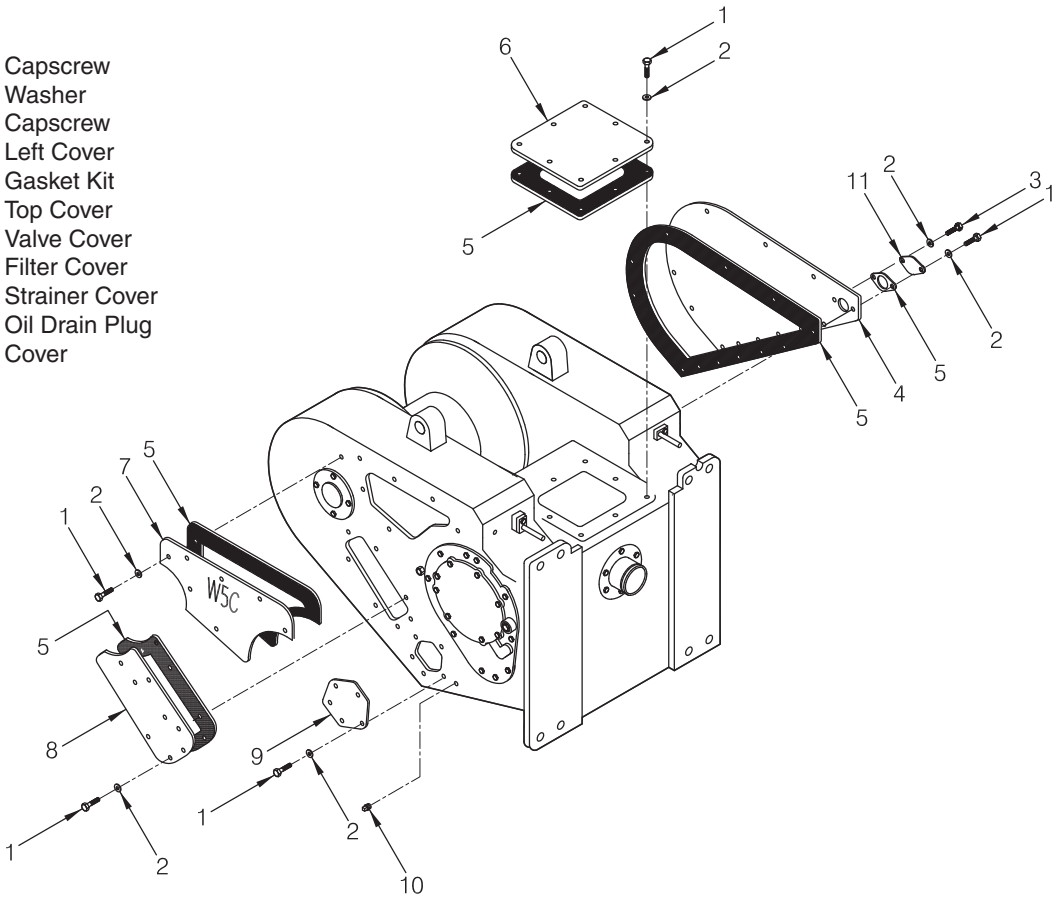


Figure 4-27 Frame and Covers

Notes

To find a dealer in your area,
Call: (503) 625-2560,
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