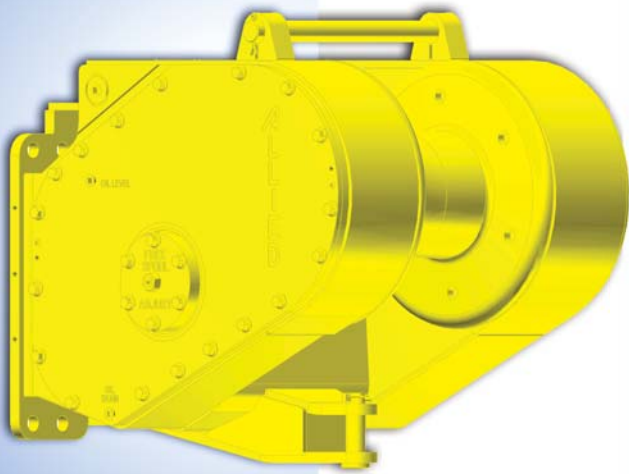




# Service Manual



## Allied H5C

### Hydraulic Towing Winch

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# CUSTOMER EDITION

A PRODUCT OF  
**Allied Systems**  
COMPANY

SHERWOOD, OREGON USA

P/N 599028W

Printed in USA

11/01/2012

## **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 \_\_\_\_\_

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## 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.

### WARNING

Maximum permissible pressure: 250 PSI.

### Operation, Inspection, and Maintenance Warnings

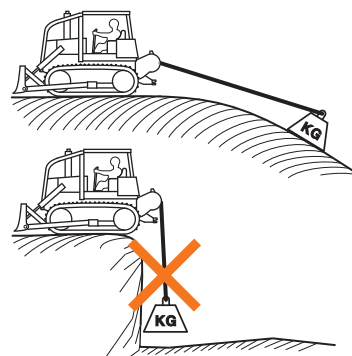


Obey the following cautions and warnings before using your winch to avoid equipment damage, personal injury or death.

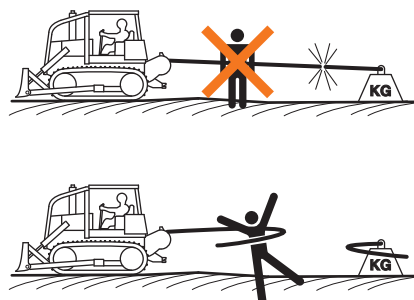
- Do not operate the winch unless you are authorized and trained to do so.
- Do not operate the winch unless the vehicle is equipped with a screen to protect the operator if the wire rope breaks.
- Read, understand, and follow the operating, inspection, and maintenance instructions in this manual.

- 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 599029W.
- 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 Pages 3-19 and 3-20.
- 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.



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## General

### Introduction

This service manual is for the H5C 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. Maintenance** provides a guide for periodic maintenance, checks and adjustments.

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

### Description

The H5C Winch is a Power Forward (**WINCH-IN**) and Power Reverse (**WINCH-OUT**) winch. The winch is powered by an internal hydraulic motor connected to the tractor hydraulic system. Oil flow and pressure are converted to rotational energy by the winch motor. On the H5C, torque is transmitted through a holding brake and two gear reductions to the drum. Hydraulic oil is supplied by the tractor mounted auxiliary pump circuit or designated winch pump. The winch utilizes oil, cooling, and sometimes filtration provided by the tractor circuit. Flow to the winch is controlled by a control lever and electrical switches located at the tractor's control station.

The H5C winch comes in two configurations: The Rescue configuration (Komatsu Level 1) is a high line-pull slow-speed winch for occasional recovery or utility use. The High-Performance configuration (Komatsu Level 2) is for high line-pull and high line-speed applications.

The H5C winch has a maximum rated line pull capacity of 222,400 N (50,000 lbf) when there is one layer or less of wire rope on the drum. When there is more than one layer of wire rope on the drum, the maximum rated line pull is reduced.

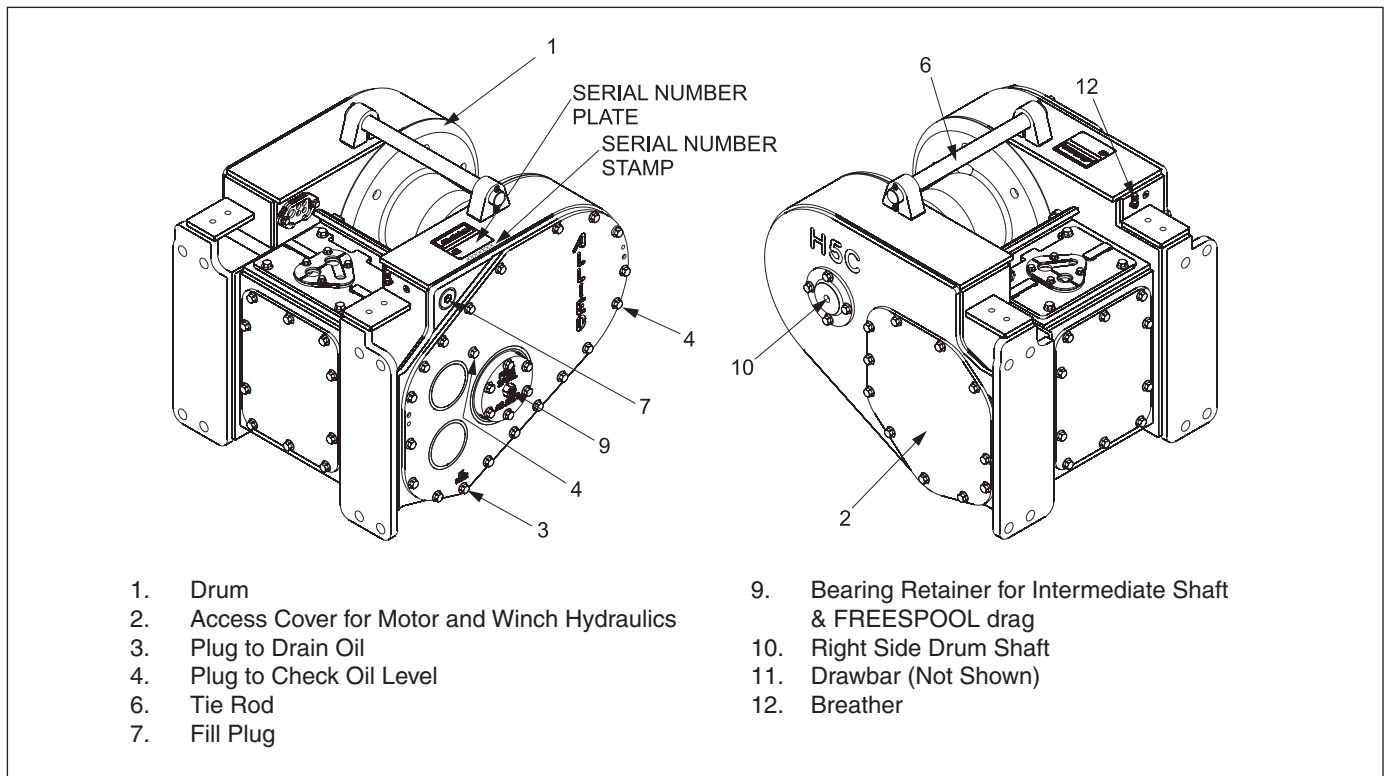
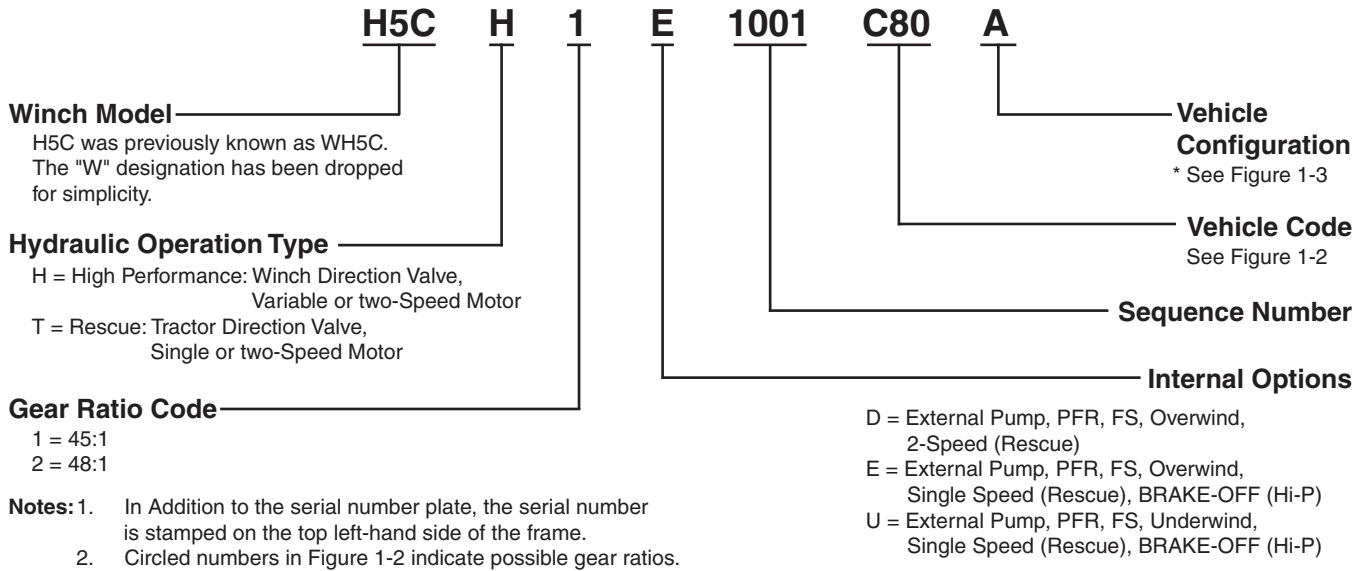


Figure 1-1 H5C Winch

## Unit Identification

Allied Winch Serial Number Nameplate Data For Tractor Mountings



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

Tractor Make Model and Starting Tractor Serial Number Where Applicable

Code	A New Holland & Fiat	C Caterpillar	E John Deere	H Dressta	K Komatsu	R Case
37					* D51EX-22 ① ②	
39			700J ①			
48			750J ①			
80		D6K ②				
391		PL61 ②				

Figure 1-2 Tractor or Skidder Identification Codes and Available Gear Ratios for H5C Winch

* Vehicle Configuration Prior to Winch Installation	
Configuration	Description
A	<b>Basic Track Type Tractor;</b> Bare back, without extra hydraulics for rear attachments.
B	<b>Ripper Ready;</b> Either with ripper attached or with just ripper ready hydraulics including handlever.
C	<b>Rescue Winch Ready;</b> Either from factory or by using the tractor OEM field installation package.
D	<b>Hi-P Winch Ready;</b> Either from factory or by using the tractor OEM field installation package.

Figure 1-3 Winch Choices for Vehicle Configuration Options for H5C Winch

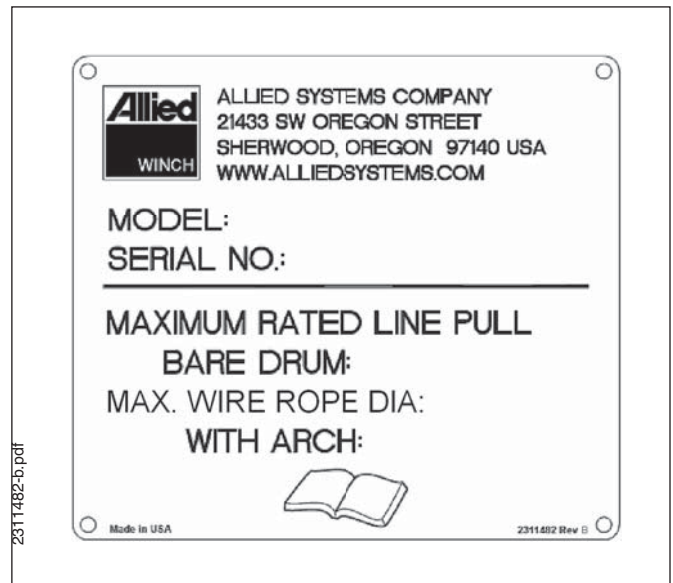
## Serial Number Codes

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

## Nameplate

The rated capacity for the winch, as it is equipped, is shown on the nameplate. Each winch is shipped from the factory with a nameplate as shown in Figure 1-4. If the nameplate is missing, or the wire rope does not match the information on the nameplate, do not operate the winch until its capacity is known and a new nameplate is installed. Each winch must be operated within its rated capacity as shown on the nameplate.

If the winch is equipped with a log arch, the maximum wire rope size is possibly reduced. Refer to the nameplate for details.



**Figure 1-4 Nameplate**

## Gear Train (See Fig. 1-5)

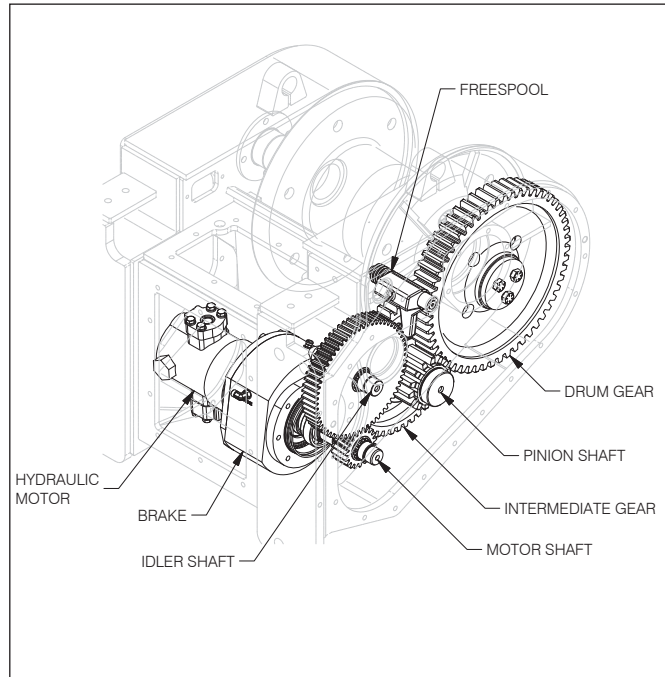
The tractor pump or designated winch pump drives the hydraulic motor with hydraulic oil supply. The amount of pressure in the motor is dependent on the size of the load. The motor shaft rotates to give **WINCH-IN** or **WINCH-OUT**. Return oil is directed back to the tractor reservoir in open loop systems and back to the pump in hydrostatic closed loop systems. The motor is attached to a spring applied multi-disc brake that holds the winch drum in a fixed position. When oil is supplied to the hydraulic motor, the brake is simultaneously released with pilot control pressure.

### H5CH\*\*E48 winch model

The hydraulic motor can operate at half displacement when the operator selects the **HI-SPEED** switch. At half displacement the gear train rotates at roughly twice the speed.

### H5CH\*\*C80, H5CH\*\*K37 winch models

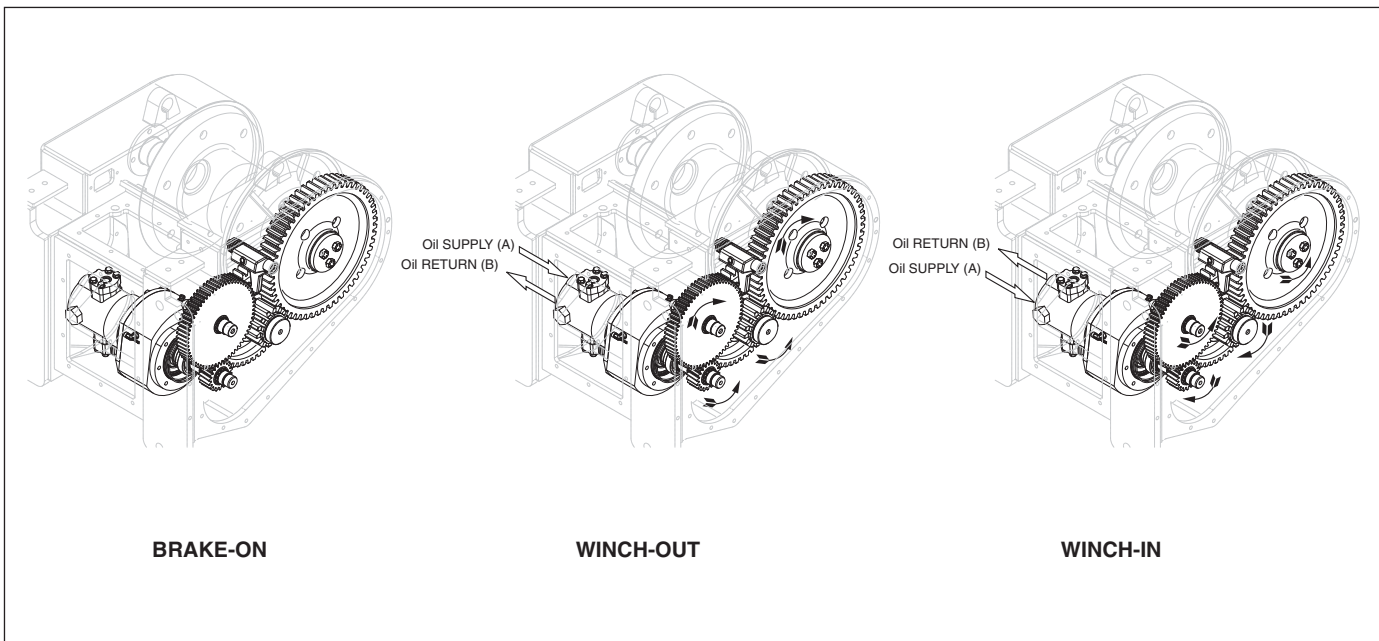
The hydraulic motor displacement can be infinitely varied from maximum to minimum as the operator moves the control lever. As the displacement of the motor decreases, the speed increases. At minimum displacement, the gear train rotates at over twice the speed.



**Figure 1-5 Gear Train**

An intermediate gear assembly gives further gear reduction to increase torque at the winch drum. A spring-loaded dental clutch with splines engages the drum pinion gear and the intermediate gear. The operator can disengage the dental clutch with an electric switch to activate the **FREESPOOL** feature.

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



**Figure 1-6 Rotation Torque Transfer**

## FREESPOOL Operation (See Fig. 1-7 & 1-8)

The **FREESPOOL** arrangement allows mechanical disengagement of the drum gear from the remainder of the gear train. When **FREESPOOL** is selected, a hydraulically-actuated sleeve disengages the dental clutch from the intermediate shaft. The drum is now disconnected from the brake and the winch cannot support a load.

### **⚠ WARNING**

**FREESPOOL** should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury or death.

The yellow indicator panel on the selector switch lights when the winch is in **FREESPOOL**. If equipped with brake-off, the red indicator in the **BRAKE-OFF** switch will also light even though that switch is in the off position.

**NOTE:** The dental clutch may not disengage if there is a load on the wire rope. Remove the load from the wire rope to activate the **FREESPOOL** function.

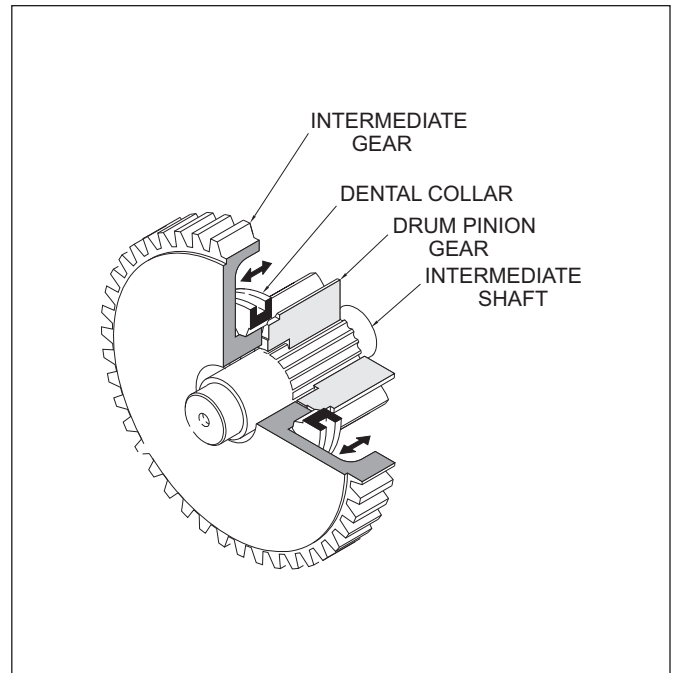


Figure 1-7 FREESPOOL Operation

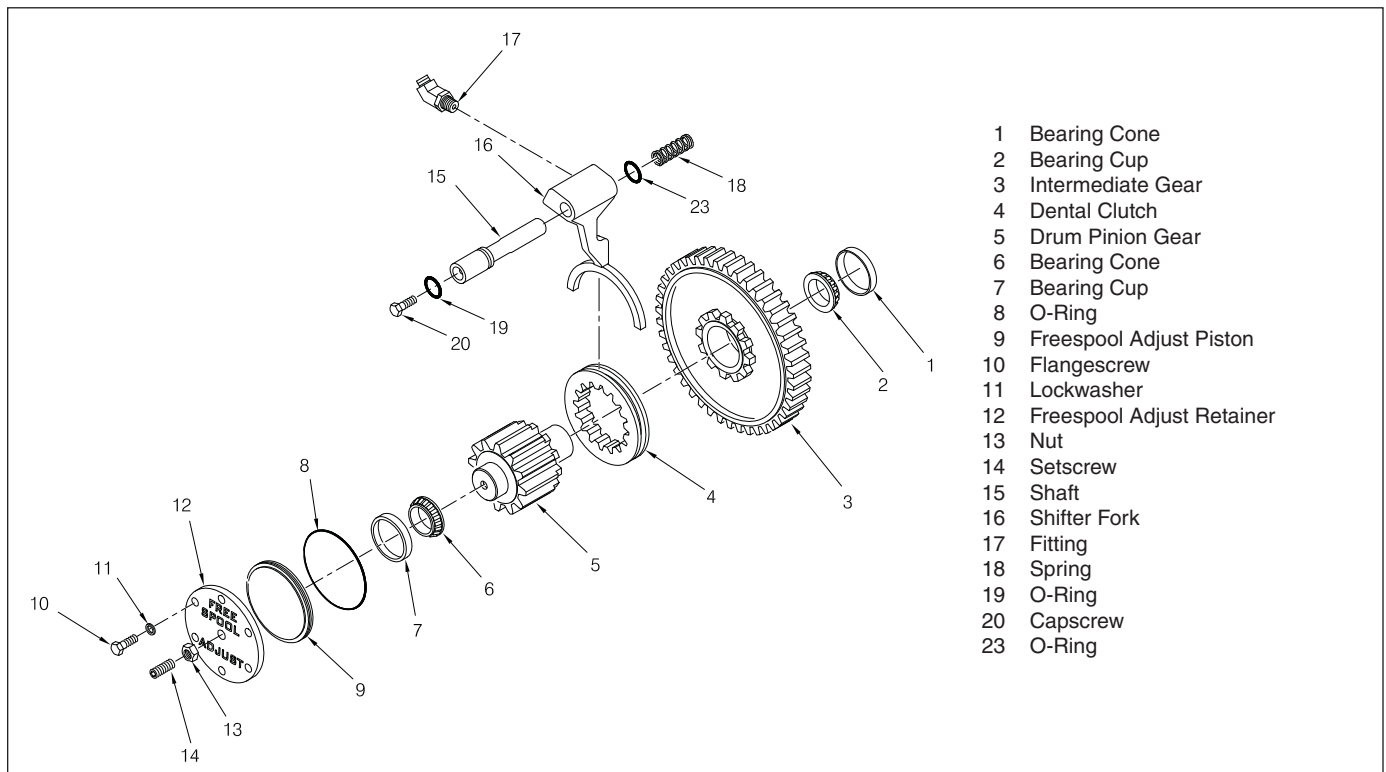


Figure 1-8 FREESPOOL Arrangement

## Operation & Control (See Figs. 1-9, 1-10, 1-11 & 1-12)

The H5C winch is designed to operate with a pilot operated hydraulic system. Hydraulic tractor power supplies include variable displacement with load sensing control, fixed displacement, and variable displacement hydrostatic. When the tractor is running, the winch is ready to operate but no oil is flowing to the winch. Control (pilot) pressure is present at the winch.

The control lever and electrical switches are used to select the following operations (not all winches are equipped with all options):

- BRAKE-ON** (spring-centered position)
- WINCH-IN**
- WINCH-OUT**
- BRAKE-OFF** (optional)
- FREESPOOL**
- HI-SPEED** (either **WINCH-IN** or **WINCH-OUT**) (optional)

The tractor must be running and the auxiliary hydraulic function switch, if equipped, must be on. **WINCH-IN**, **WINCH-OUT** and **BRAKE-ON** are controlled by a control lever.

When the control lever is in the **BRAKE-ON** or centered position, the holding brake is automatically applied. Pushing the lever away from the operator releases the brake and reels cable off the drum (**WINCH-OUT**). Pulling the lever towards the operator releases the brake and reels wire rope onto the drum (**WINCH-IN**). Releasing the lever causes it to return to the **BRAKE-ON** position, which stops the drum rotation and applies the holding brake. By moving the lever a small amount, slow wire rope movement is achieved for inching control. Line speed increases proportionally as the lever is moved farther.

The switch panel may contain three rocker switches that control **FREESPOOL**, **BRAKE-OFF** and **HI-SPEED**. Not every winch is equipped with all three. The tractor must be running to supply hydraulic power to operate these functions. The switch light illuminates when the switch is on.

The **FREESPOOL** and **BRAKE-OFF** switches incorporate a lock to prevent inadvertent actuation. The slide lock must be released before the switch can be turned on. When the **BRAKE-OFF** switch is selected, the holding brake is released, allowing the tractor to move slowly away from a towed load. The tractor must be operated at low speed or the load may still be dragged.

### CAUTION

**Before operating the winch in WINCH-IN or WINCH-OUT mode, ensure the FREESPOOL and BRAKE-OFF lights are not illuminated. Doing so may result in loss of load.**

On some winches **HI-SPEED** is selected with a dual-action momentary switch. A green light in the speed selector switch indicates **HI-SPEED** operation. Pushing it towards the light allows the winch to operate at low speed, while pushing the switch away from the light activates **HI-SPEED**. Some winches do not have a switch and shift automatically as the control lever is moved. When in **HI-SPEED** mode, the winch will automatically shift to low speed when the force needed exceeds a certain percentage of the rated load. For heavy loads or when better control is desired, the winch should be operated in low speed. For light loads and faster wire rope speed, operate the winch in **HI-SPEED** mode.

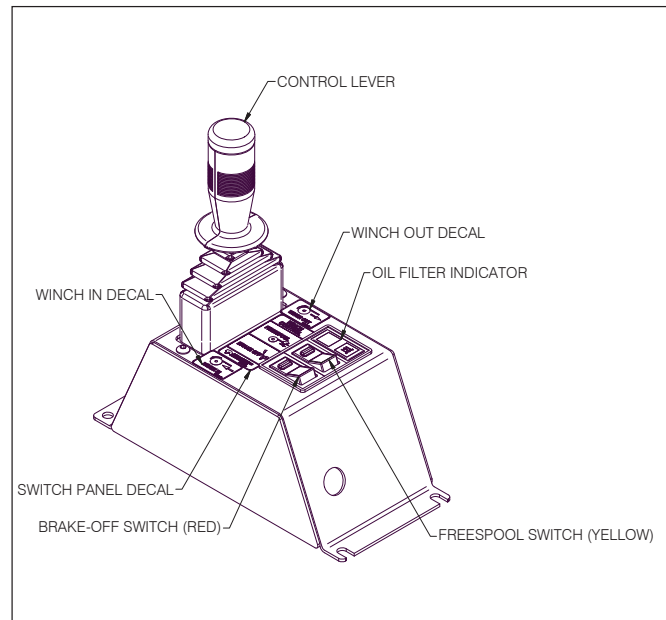
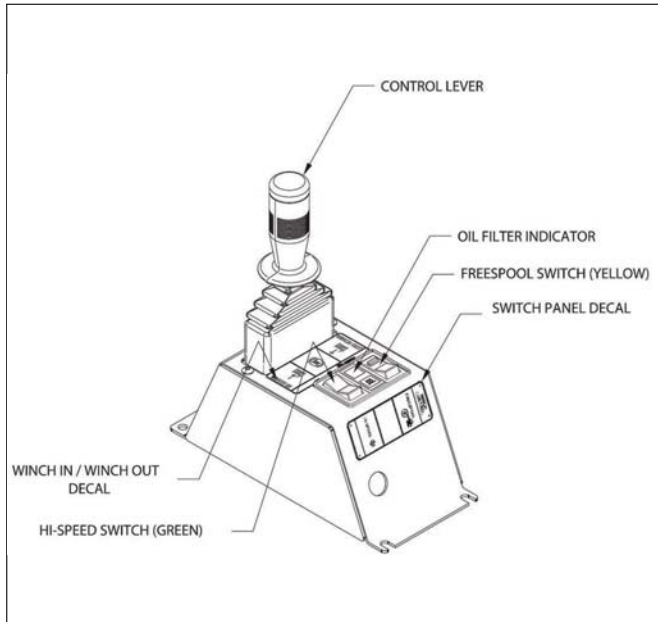
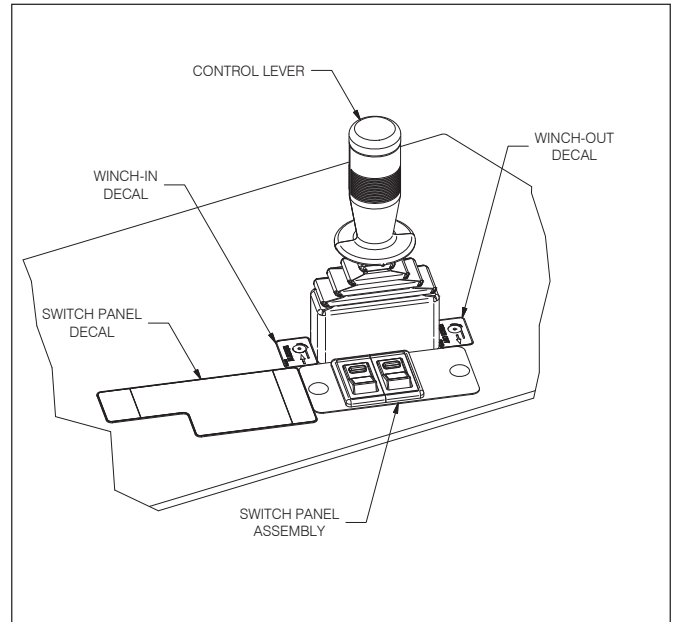


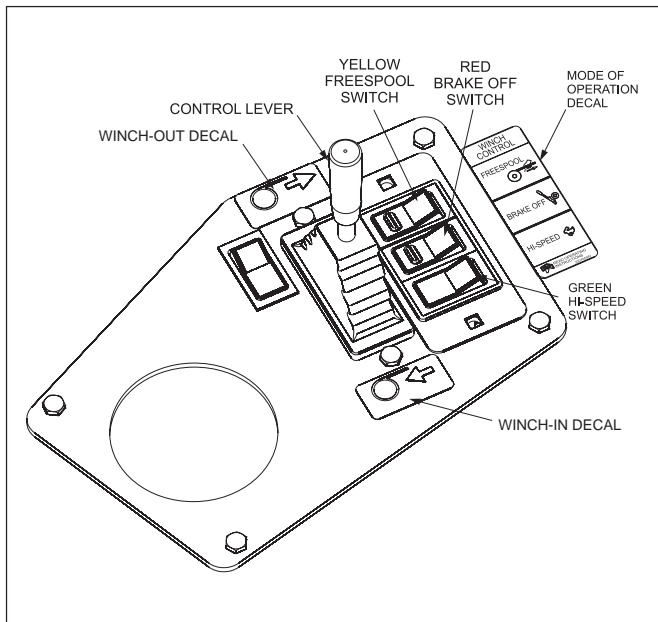
Figure 1-9 Winch Controls for C80



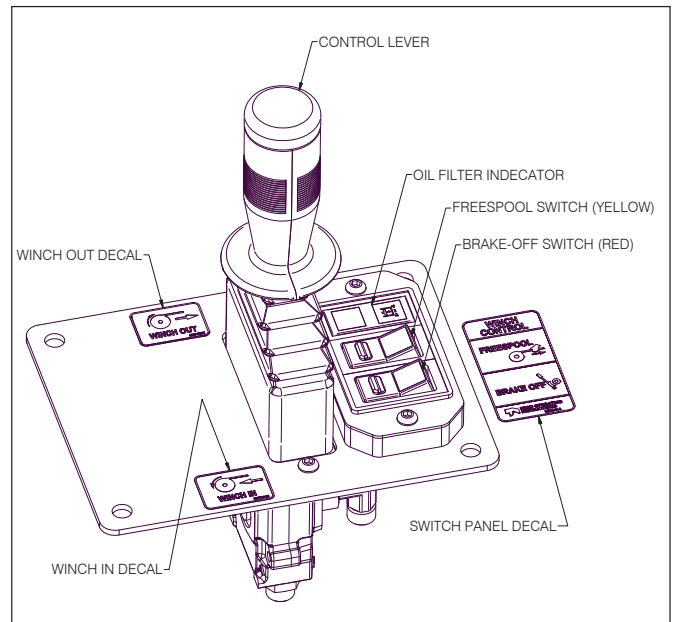
**Figure 1-10 Winch Controls for C391**



**Figure 1-12 Winch Controls for E39**

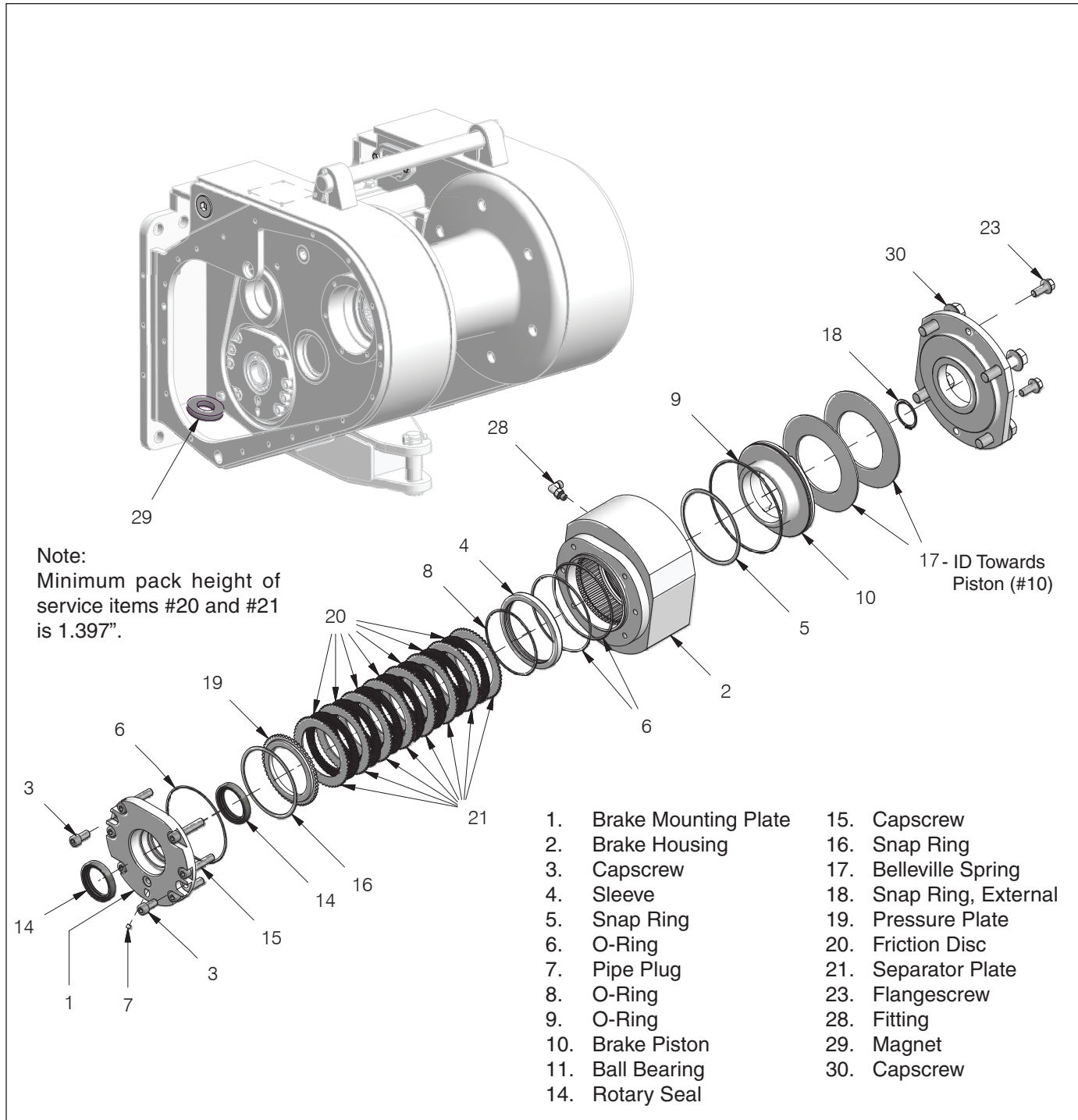


**Figure 1-11 Winch Controls for E48 and K37 (Rescue)**



**Figure 1-13 Winch Controls for K37 (Hi-P)**

## Hydraulic System



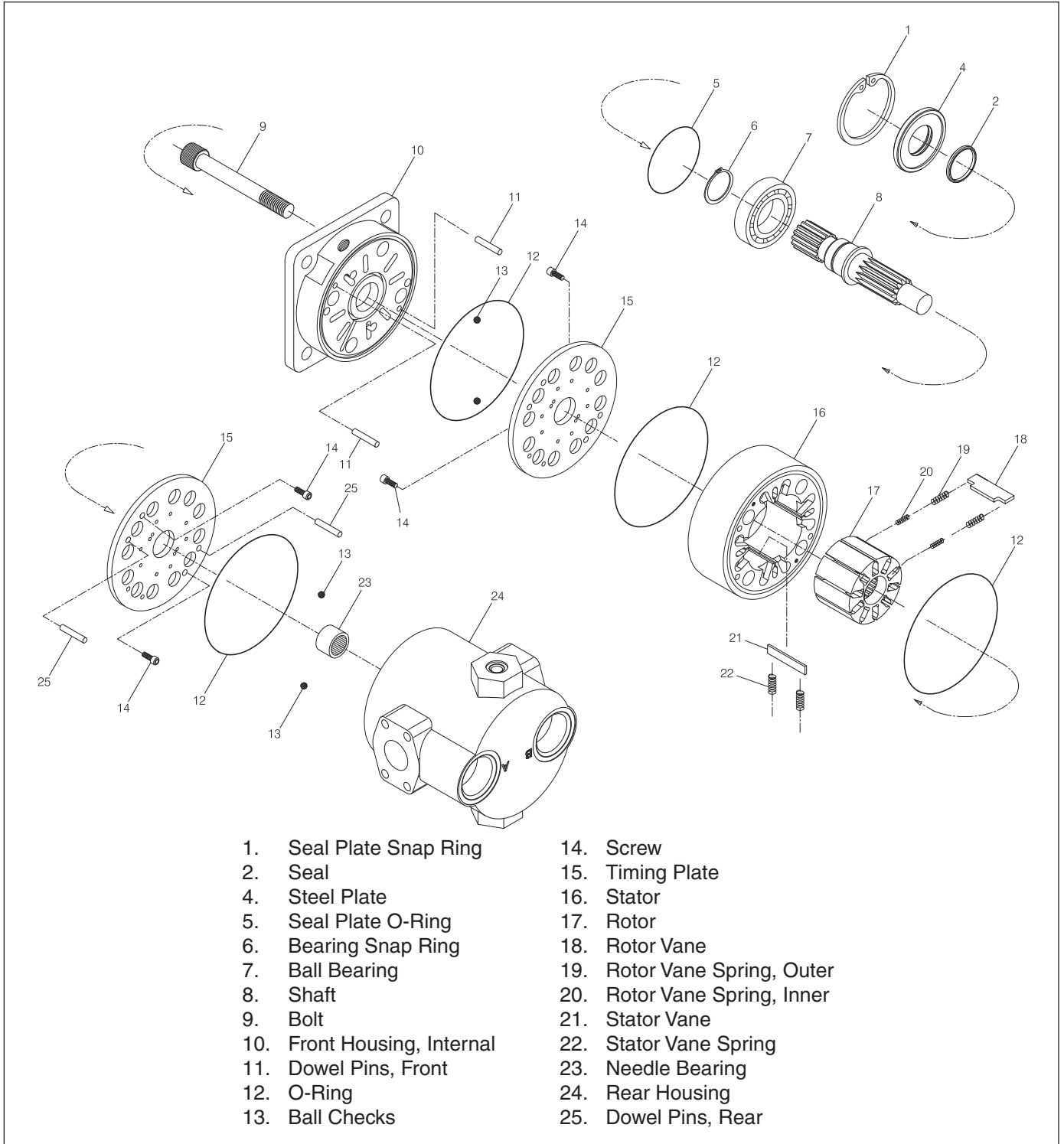
**Figure 1-14 Brake**

### Brake (See Fig. 1-14)

The brake is a dry multi-disc spring applied design. The springs push against a piston that applies force to the friction discs and separator plates. The brake valve directs

pressurized oil to the piston and pushes back on the brake springs to release the brake. The separator plates have teeth that engage the splines inside the brake housing and are held stationary. Teeth in the friction discs engage the splines on the motor shaft and rotate with the hub.





**Figure 1-15 Motor (Two-Speed Shown, H5CH\*\*E48)**

**Motor (See Figs. 1-15 & 1-16)**

The hydraulic motor is a dual displacement vane-type (H5CH\*\*E48), see Figure 1-15; a single-displacement vane-type (H5CT\*\*E39 and H5CT\*\*K37); or a variable-

displacement piston-type (H5CH\*\*C80, H5CT\*\*C391 and H5CH\*\*K37) motor, see Figure 1-16. Winch speed is proportionally varied by input flow from the pump and/or the displacement of the motor.

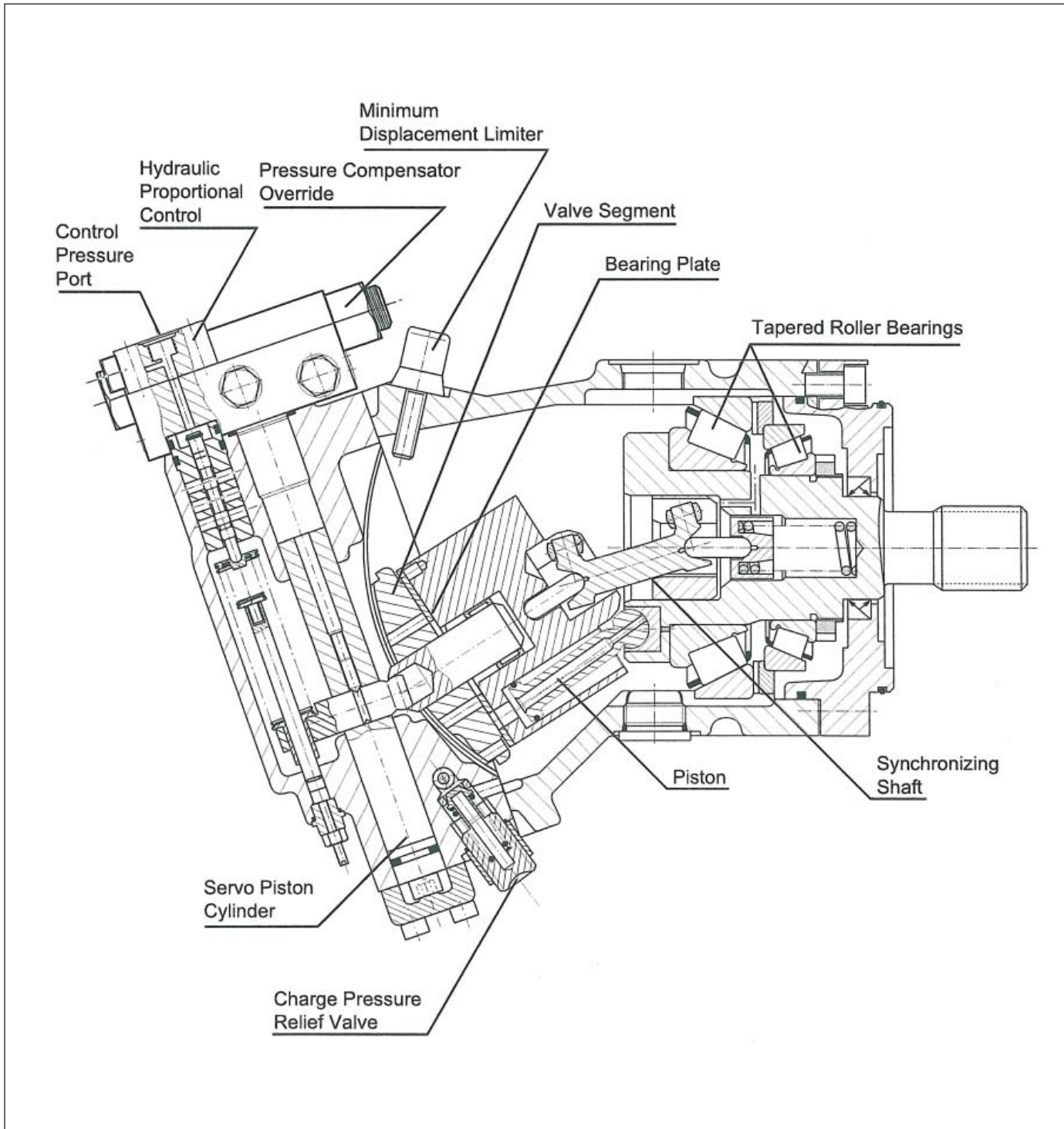


Figure 1-16 Motor (Variable Displacement Piston Type, H5CH\*\*C80, H5CH\*\*K37 & H5CT\*\*C391)

## Directional Manifold

### H5CH\*\*E48 and H5CT\*\*C391

The directional manifold controls the direction of hydraulic flow to the winch motor. When the operator moves the control lever into the **WINCH-IN** or **WINCH-OUT** position, a pressure response is signaled to one side of the direction control valve and oil flow is delivered to the motor. The directional manifold also houses several other winch control features including the counterbalance valve, load sense relief valve, and load sense check valves. The counterbalance valve is a load holding valve that blocks return oil flow from the motor in the event supply pressure drops below a set point in **WINCH-OUT** mode. This valve also acts as an overload relief valve when supply pressure exceeds the setting of the valve. The counterbalance valve allows oil to free flow in the **WINCH-IN** mode through a check valve. The load-sense relief valve limits the winch load signal to the tractor pump to limit the winch hydraulic system pressure. The load sense check valves are used to communicate winch motor pressure to the pump load sense controller. Another check valve in the load sense circuit is used to intensify the **BRAKE-OFF** (DV) control signal. See schematics at the end of this section.

### H5CT\*\*E39 and H5CT\*\*K37

The dozer ripper valve section controls the direction of hydraulic flow to the winch motor. Flow is proportionally controlled by the amount the control lever is moved.

### H5CH\*\*C80 and H5CH\*\*K37

The high performance winch pump controls the direction of hydraulic flow to the winch motor. Flow is proportionally controlled by the amount the control lever is moved.

## Control Manifold

The control manifold is used to communicate pressure signals that control the brake, **HI-SPEED**, **BRAKE-OFF**, and **FREESPOOL**. The manifold contains a series of shuttle valves, a directional valve, and solenoid valves. One shuttle is used to send a pressure response to the brake when the winch is shifted to **WINCH-IN** or **WINCH-OUT**. The other shuttle valves allow communication between **BRAKE-OFF**, **HI-SPEED**, and **FREESPOOL** functions. The brake valve provides pressure to the brake when the **WINCH-IN** or **WINCH-OUT** control pressure exceeds the pilot setting of the valve. The **BRAKE-OFF**, **HI-SPEED**, and **FREESPOOL** valves are 3-way electric over hydraulic valves that communicate pressure responses to respective functions when activated.

## BRAKE-OFF Manifold (H5CH Winches Only)

The **BRAKE-OFF** valve allows the motor to operate as a pump and circulate oil through an alternate circuit. An orifice in the manifold limits the motor rpm and therefore tractor ground speed in the **BRAKE-OFF** function.

## HI-SPEED Load Sensing Circuit

The **HI-SPEED** load-sensing circuit is comprised of a pressure switch and electric relay on H5CH\*\*E48 and H5CTD. When the **HI-SPEED** function is activated, the solenoid valve in the Logic Control Manifold directs oil to the motor speed spool in the motor. If high line pull causes the system pressure to exceed a certain percentage of the rated load, the pressure switch sends a signal to the relay, which then opens and deactivates **HI-SPEED**. The motor speed will not reactivate until you reinitialize the switch. This prevents the load from stalling the winch.

On H5CH\*\*C80 and H5CH\*\*K37, the load is sensed by controls inside the motor. If pressure in the main circuit exceeds a factory set level, the motor will automatically increase motor displacement to prevent motor stall.

## Electronic Control Panel

Depending on the options on the winch, the electronic control panel contains up to three electric rocker switches to operate **BRAKE-OFF**, **HI-SPEED**, and **FREESPOOL** functions. Each switch is equipped with integral LED indicator to show if the function is active. The **BRAKE-OFF** and **FREESPOOL** switches incorporate a lock to prevent the switch from being accidentally turned on. To operate, slide the locking tab first, and then push the rocker switch. The **HI-SPEED** switch is a three position switch on momentary rocker. High speed is deactivated by pulling a load that generates pressure beyond the setting of the **HI-SPEED** limit switch or manually by rocking the switch back.

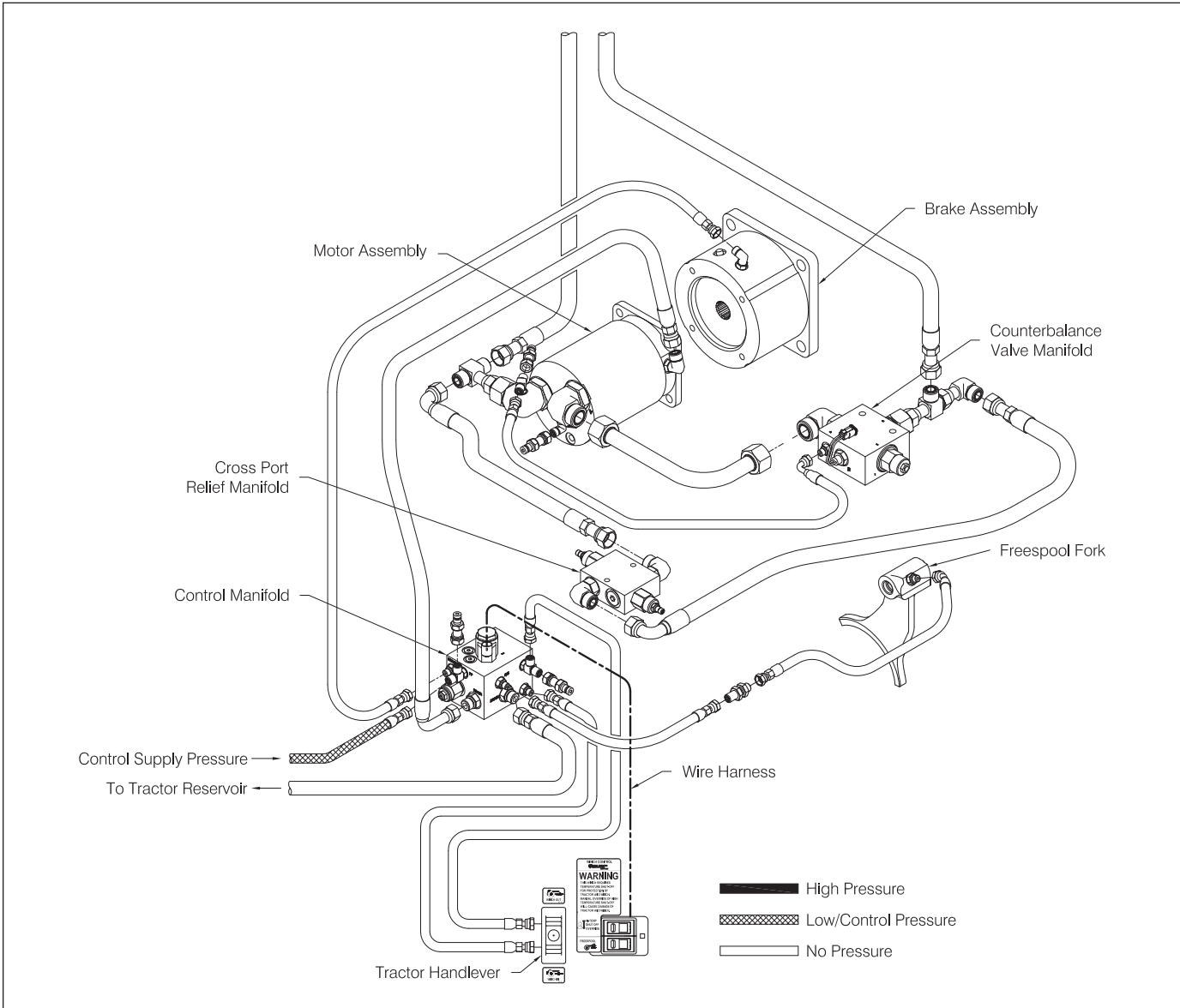
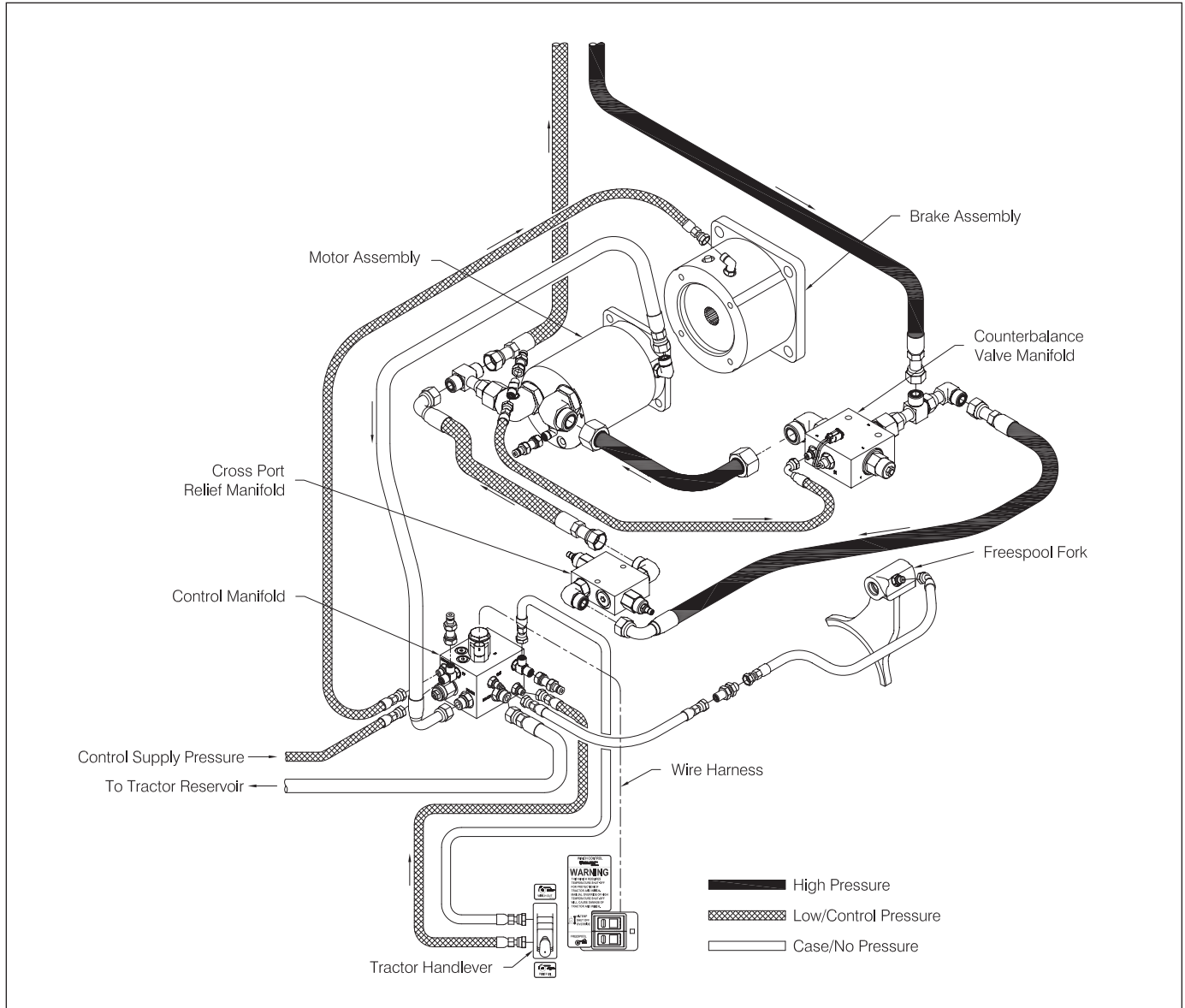


Figure 1-17 Sequence of Operation, H5CT Winch - BRAKE-ON

**Sequence of Operation, H5CT Winch - BRAKE-ON**

The direction control valve spool is spring centered to neutral. In this position, the motor work ports are closed to

the tractor reservoir. Pilot control pressure is available at the control manifold and the control lever.



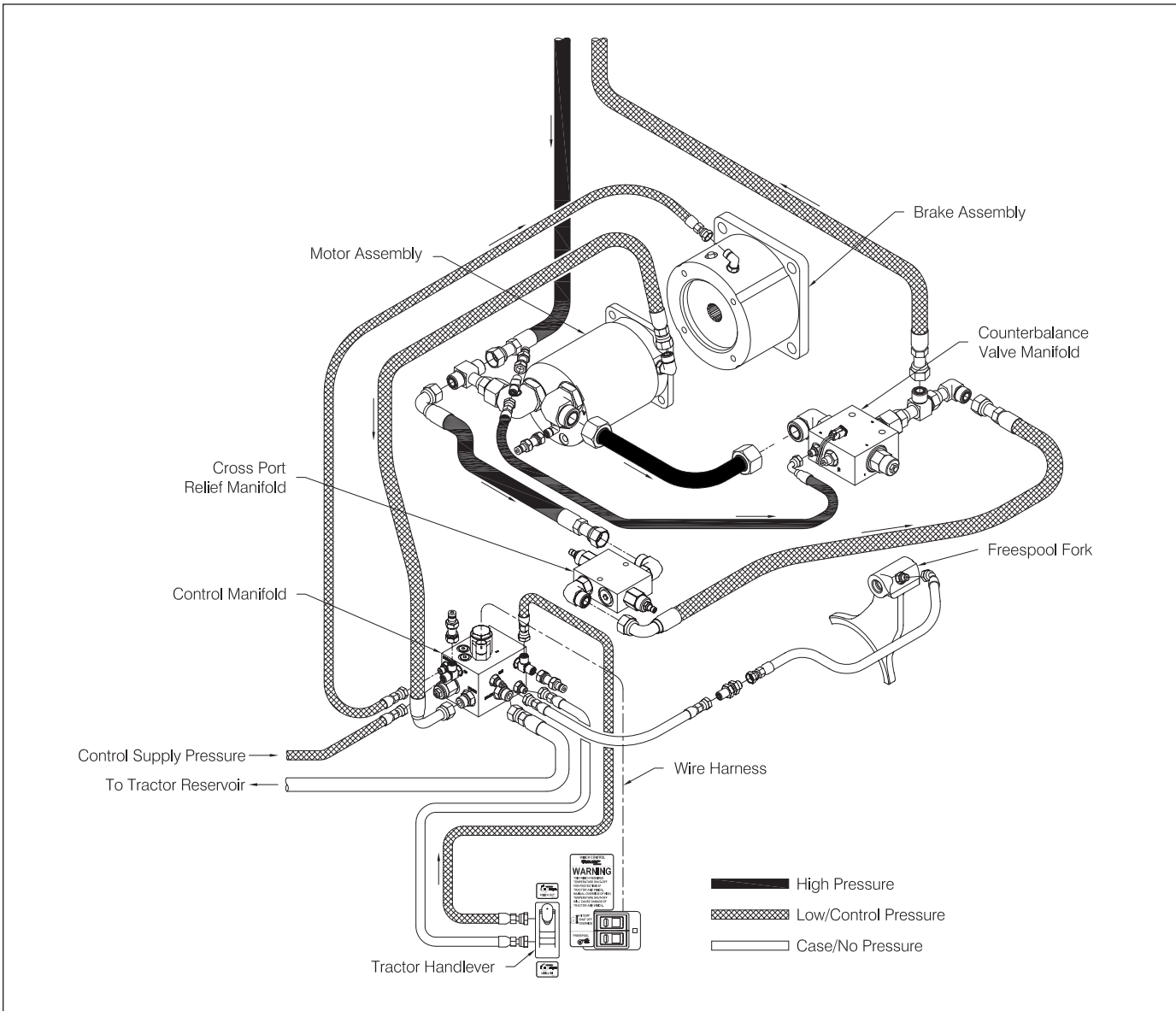
**Figure 1-18 Hydraulic System, H5CT Winch - WINCH-IN**

**Sequence of Operation, H5CT Winch - WINCH-IN**

The operator pulls back the control lever, which moves the direction control valve and commands the brake release valve. Oil flows from the pump supply line into the tractor direction control spool then to the winch through a check valve in the counterbalance cartridge. Oil flow continues through to the inlet A port of the hydraulic motor and builds pressure. Oil flows through the motor, back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is

connected to the brake port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor and valves back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 3500 psi, the cross-port relief valve opens. Excess oil flows from the high pressure A side of the motor to the low pressure B side to maintain no more than 3500 psi on the inlet.



**Figure 1-19 Hydraulic System, H5CT Winch - WINCH-OUT**

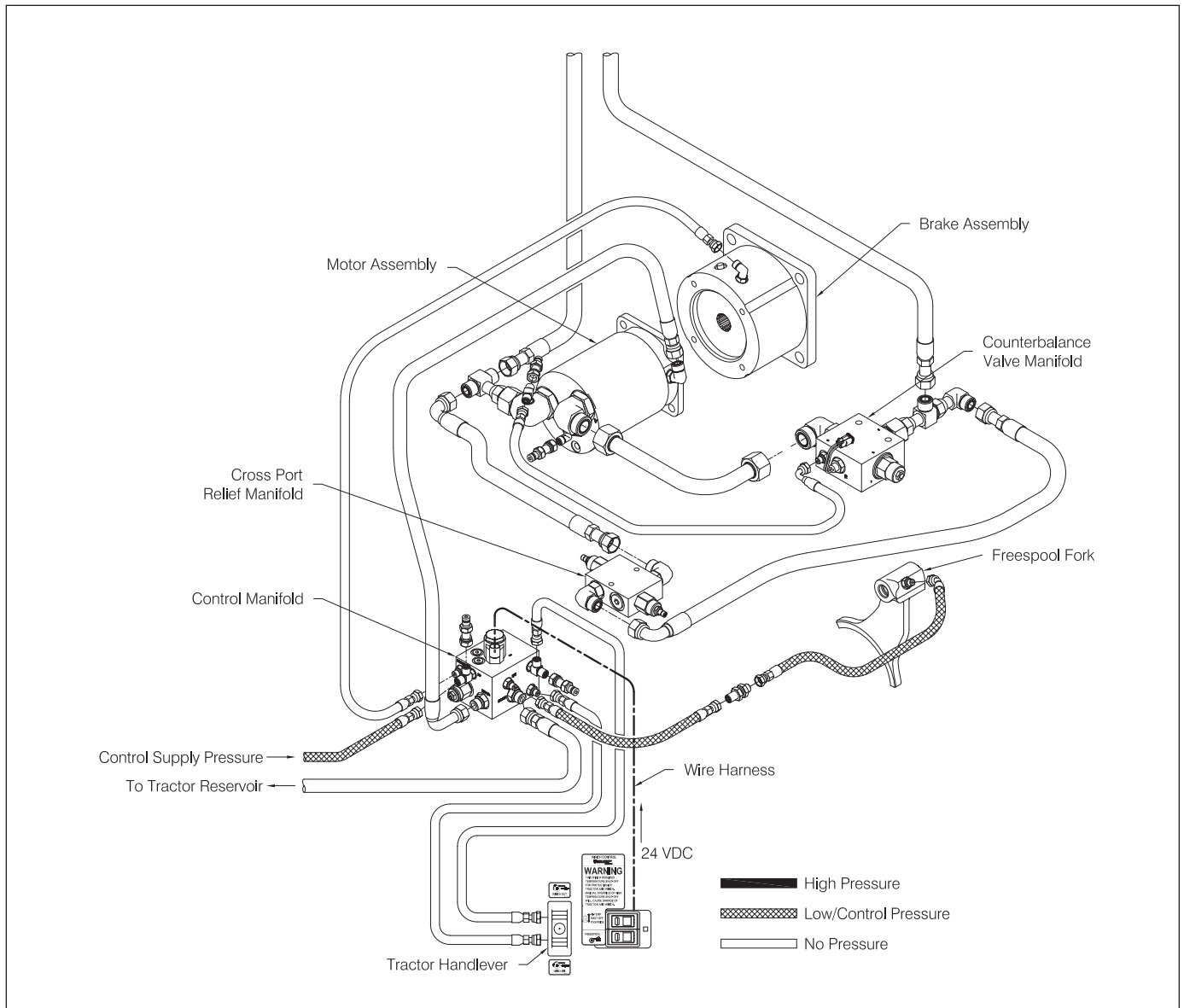
## Sequence of Operation, H5CT Winch - WINCH-OUT

The operator pushes the control lever, which moves the direction control valve and commands the brake release valve. Oil flows from the pump supply line into the tractor direction control spool then through the winch motor and counterbalance cartridge. Flow at the inlet B port of the hydraulic motor builds pressure which opens the counterbalance valve. If pressure at the inlet B port of the motor drops too low the counterbalance valve closes and provides hydraulic braking. Simultaneously, control pressure at the brake valve is connected to the brake port and the brake is fully released. Low pressure case drain

oil flows from the hydraulic motor and valves back to the tractor reservoir.

When pressure on the inlet B port of the motor exceeds 3500 psi, the cross-port relief valve opens. Excess oil flows from the high pressure B side of the motor to the low pressure A side to maintain no more than 3500 psi on the inlet.

When tension is on the wire rope, the A port is high pressure and B port is low pressure during **WINCH-OUT**.



**Figure 1-20 Sequence of Operation, H5CT Winch - FREESPOOL**

**Sequence of Operation, H5CT Winch - FREESPOOL**

The operator moves the slide lock and depresses the **FREESPOOL** switch. Pilot control pressure moves the **FREESPOOL** shifter fork, allowing the dental collar to disengage the drum pinion gear from the intermediate gear. The gear train is disengaged from the drum gear, so the wire rope can be pulled from the drum by hand. Simultaneously, the brake is released to dampen reengagement of the gear train when the **FREESPOOL** function is disabled.

**⚠ WARNING**

**FREESPOOL** should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.

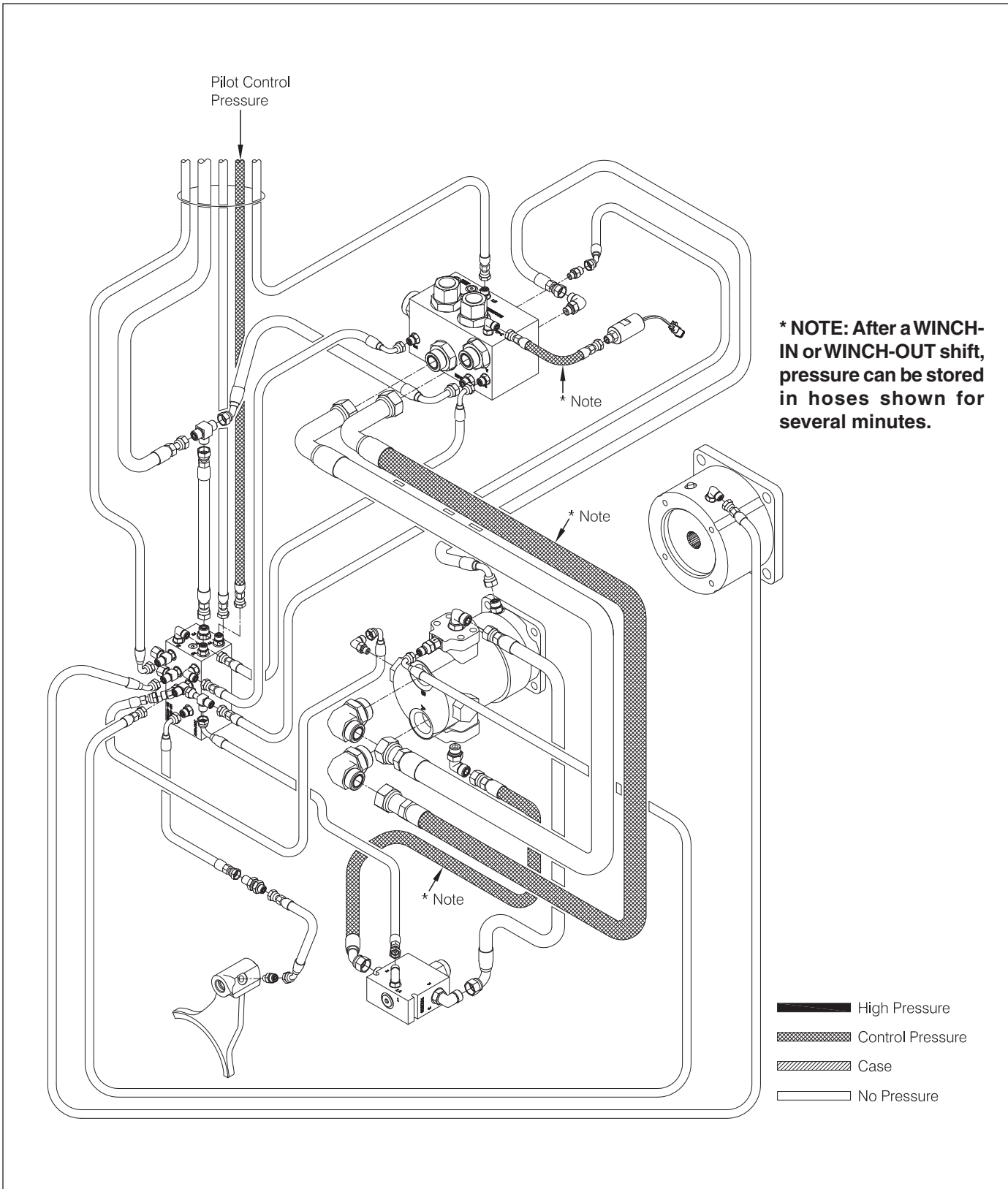


Figure 1-21 Sequence of Operation, H5CH\*\*E48 Winch - BRAKE-ON



## Sequence of Operation, H5CH\*\*E48 Winch - BRAKE-ON

The direction control valve spool is spring centered to neutral. In this position the motor work ports are open to the tractor reservoir and pump standby supply pressure is blocked. Pilot control pressure is available at the logic

control manifold and the control lever. Similarly, there is no pressure in the load sense line as it is vented back to the tractor reservoir through an orifice.

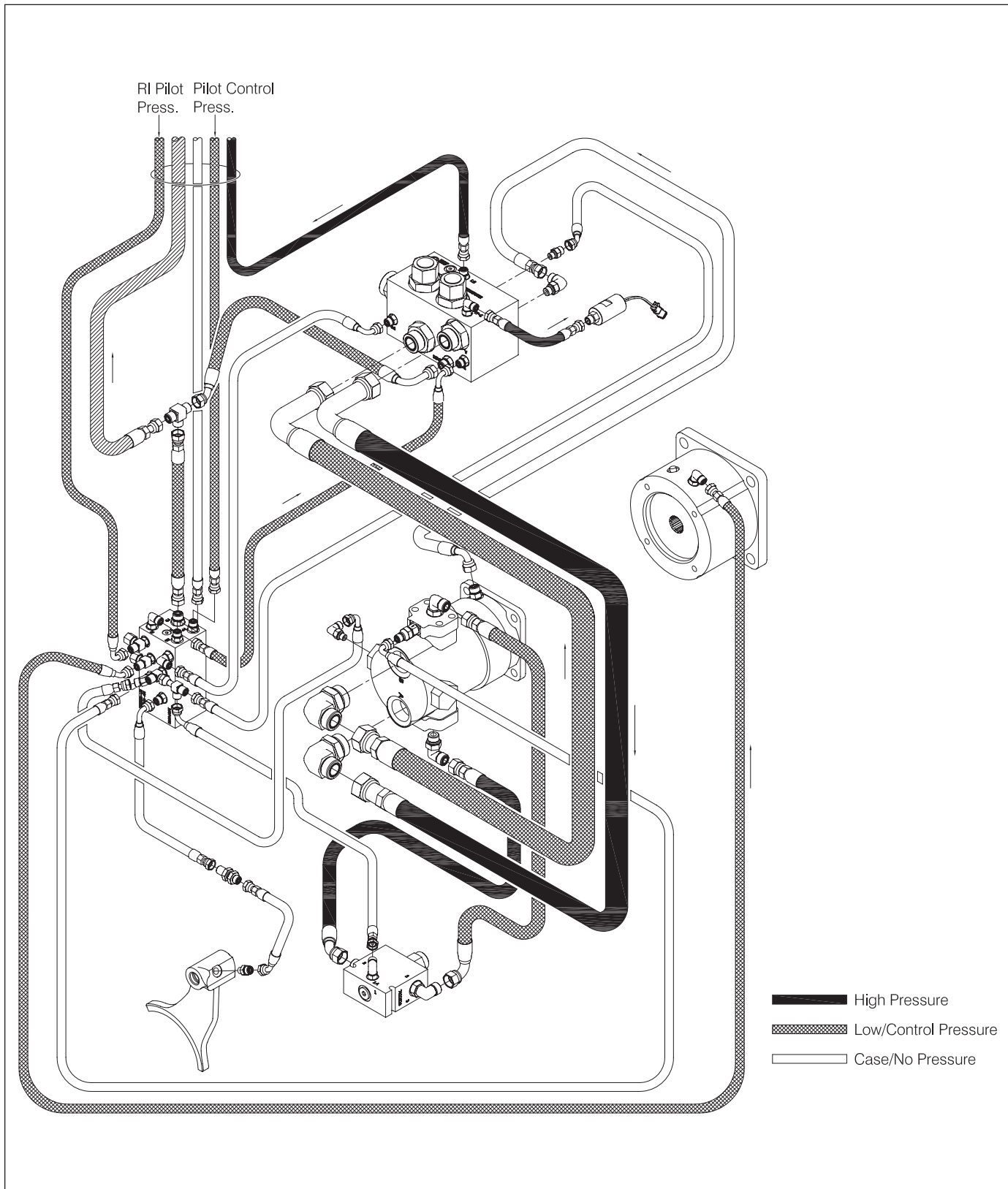


Figure 1-22 Hydraulic System, H5CH\*\*E48 Winch - WINCH-IN

## Sequence of Operation, H5CH\*\*E48 Winch - WINCH-IN

The operator pulls the control lever, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump into the direction control spool and through a check valve in the counterbalance valve cartridge. Oil flow continues through to the inlet A port of the hydraulic motor and builds pressure from the induced load on the winch. This pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor

back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 3500 psi, the load sense relief valve opens, and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount.

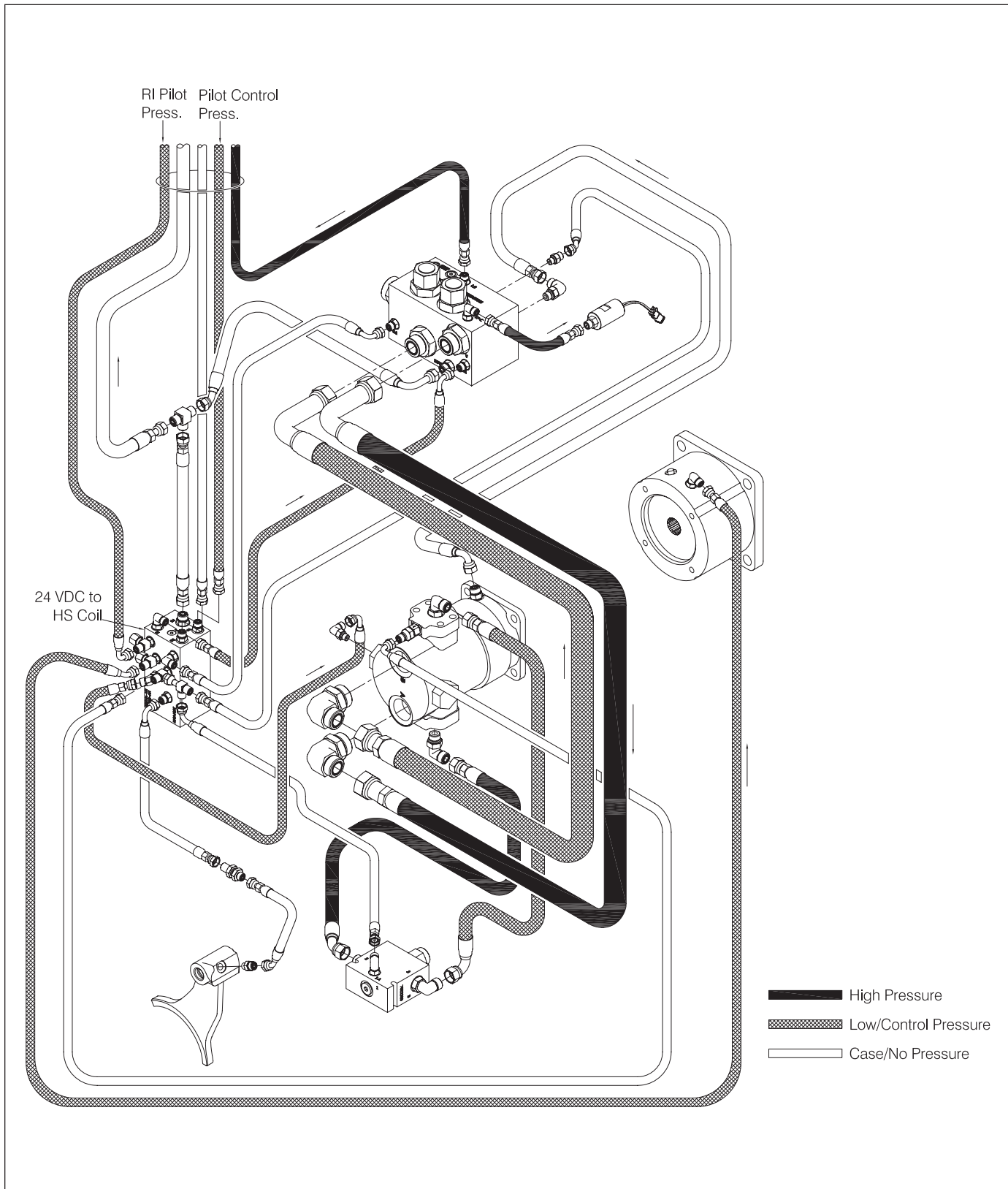


Figure 1-23 Hydraulic System, H5CH\*\*E48 Winch - HI-SPEED WINCH-IN

## Sequence of Operation, H5CH\*\*E48 Winch - HI-SPEED WINCH-IN

The operator depresses the **HI-SPEED** switch, which causes the **HI-SPEED** solenoid valve in the logic manifold to open and pilot control pressure is communicated to the **HI-SPEED** spool in the hydraulic motor. The spool shifts to close half of the power cavities in the motor. Full pump flow now flows through the motor at half displacement, thus doubling the output rpm.

The operator pulls the control lever which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump to the direction control spool, then through a check valve in the counterbalance valve cartridge. Oil flow continues through to the inlet A port of the hydraulic motor and builds pressure from the induced load on the winch. This pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount.

Inlet pressure to the hydraulic motor is sensed by a pressure switch in the direction control manifold. When pressure at the switch reaches 1750 psi, the switch opens and the circuit to the **HI-SPEED** solenoid valve is broken. Pressure at the **HI-SPEED** spool in the hydraulic motor is vented back to the reservoir and the spool spring biases back to the standard speed position. The winch remains in standard speed until the operator depresses the **HI-SPEED** switch again, and load induced pressure on the motor remains below 1750 psi. This prevents the load from stalling the motor. The operator may override the pressure switch by holding the **HI-SPEED** switch down. This allows the winch to remain in **HI-SPEED** at pressures above 1750 psi. For heavy loads or when better control is desired, the winch should be operated in the normal speed. For light loads and faster cable speed, operate the winch in **HI-SPEED** mode.

### **WARNING**

**Never press and hold the HI-SPEED switch to maintain HI-SPEED operation in the WINCH-OUT mode if there is a load attached to the wire rope.**

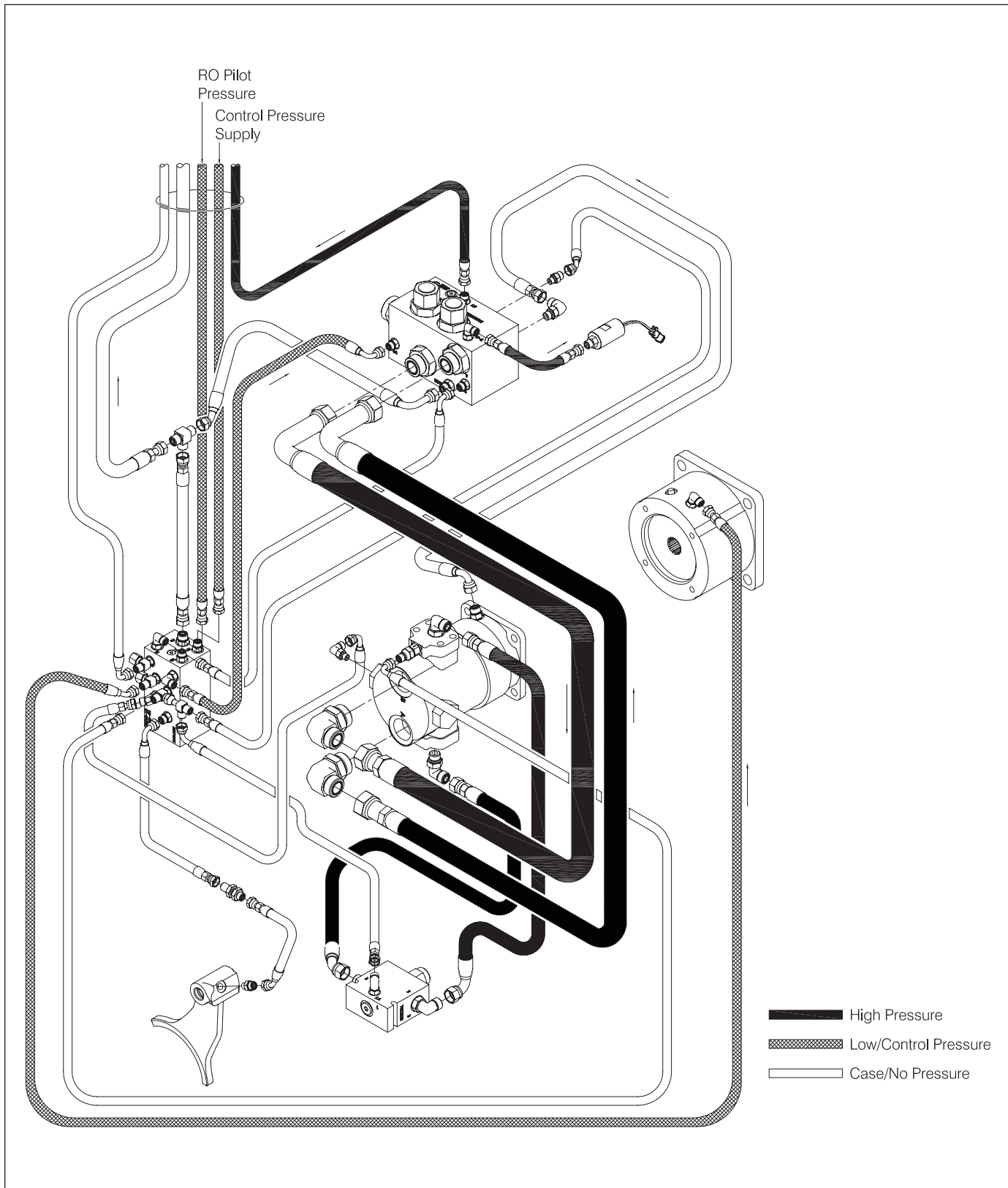


Figure 1-24 Hydraulic System, H5CH\*\*E48 Winch - WINCH-OUT

## Sequence of Operation, H5CH\*\*E48 Winch - WINCH-OUT

The operator pushes the control lever forward, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump supply line into the direction control spool cartridge and continue to the inlet B port of the hydraulic motor. Pressure builds from resistance against the counterbalance valve, mechanical, and volumetric resistance. This pressure supply communicates through a check valve to pilot the counterbalance valve open until the inlet pressure falls below a set value and the counterbalance valve closes. Similarly, the same pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the

brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir. This condition drives the winch drum in **WINCH-OUT**.

When the winch is operated in **WINCH-OUT** and a load pulls line from the winch, pressure builds on the A port of the motor up to the load sense relief setting. When pressure on the A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount. If pressure on the inlet B side of the hydraulic motor drops below the pilot setting of the counterbalance valve, the counterbalance valve closes and acts as a relief valve on the A port of the hydraulic motor. The valve relieves when pressure on the A port reaches 4500 psi.

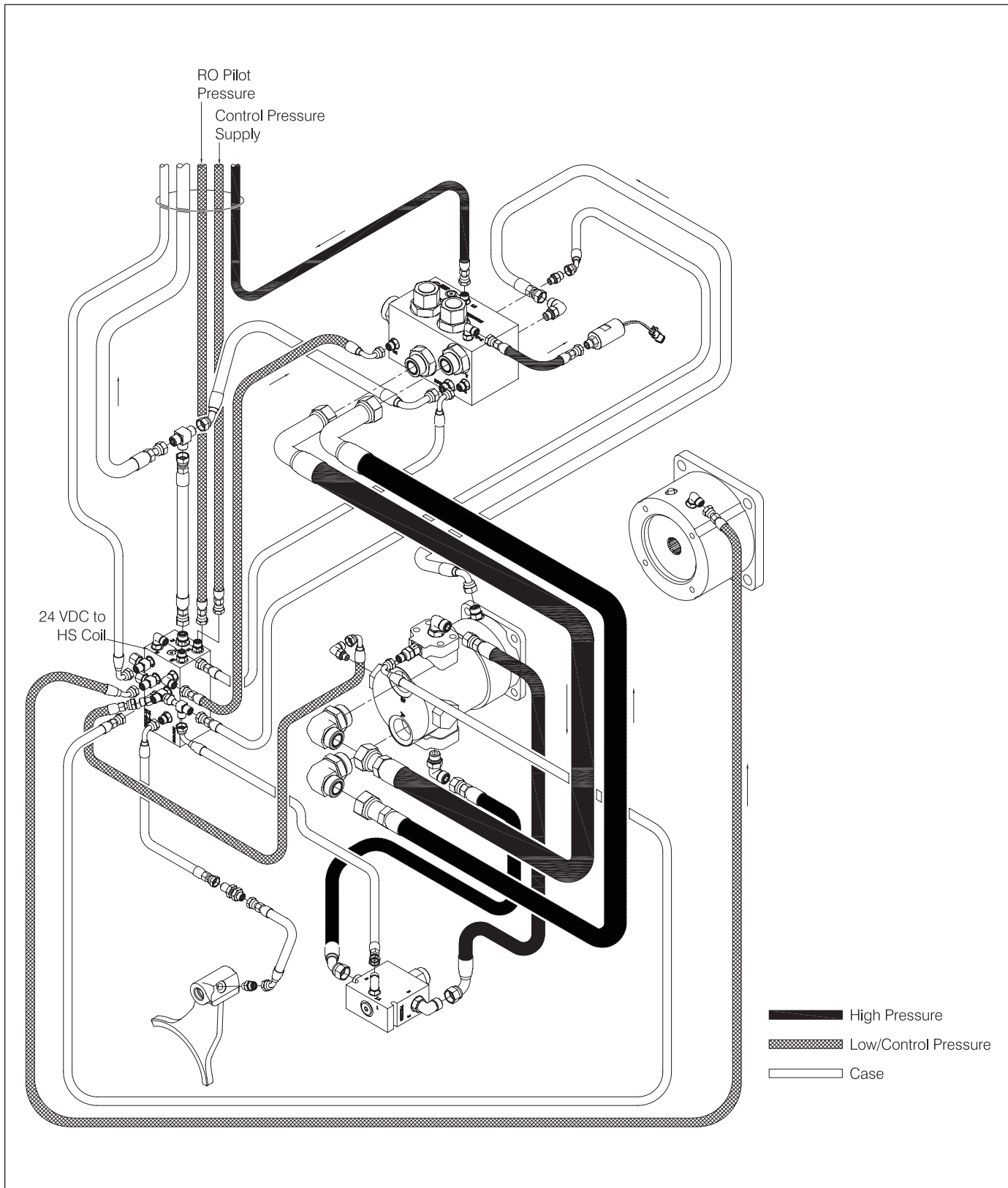


Figure 1-25 Hydraulic System, H5CH\*\*E48 Winch - HI-SPEED WINCH-OUT



## Sequence of Operation, H5CH\*\*E48 Winch - HI-SPEED WINCH-OUT

When the operator depresses the **HI-SPEED** switch, the **HI-SPEED** solenoid valve in the logic manifold opens and pilot control pressure is communicated to the **HI-SPEED** spool in the hydraulic motor. The spool shifts to close half of the vein ports in the motor. Full pump flow now flows through the motor at half displacement, thus increasing the output rpm.

The operator pushes the control lever forward, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump supply line into the direction control spool cartridge and continue to the inlet B port of the hydraulic motor. Pressure builds from resistance against the counterbalance valve, mechanical, and volumetric resistance. This pressure supply communicates through a check valve to pilot the counterbalance valve open until the inlet pressure falls below a set value and the counterbalance valve closes. Similarly, the same pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir. This condition drives the winch drum in **WINCH-OUT**.

When the winch is operated in **WINCH-OUT** and a load pulls line from the winch, pressure builds on the A port of the motor up to the load sense relief setting. When pressure on the A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back, reducing displacement so pressure at the hydraulic motor decreases a corresponding amount. If pressure on the inlet B side of the hydraulic motor drops below the pilot setting of the counterbalance valve, the counterbalance valve closes and acts as a relief valve on the A port of the hydraulic motor. The valve relieves when pressure on the A port reaches 4500 psi.

Pressure on the A port of the hydraulic motor is sensed by a pressure switch in the direction control manifold. When pressure at the switch reaches 1750 psi, the switch opens. Pressure at the **HI-SPEED** spool in the hydraulic motor is vented back to the reservoir, and the spool spring biases back to the standard speed position. The winch remains in standard speed until the operator depresses the **HI-SPEED** switch again, and load induced pressure on the motor remains below 1750 psi.

### **WARNING**

**Never press and hold the HI-SPEED switch to maintain HI-SPEED operation in the WINCH-OUT mode if there is a load attached to the wire rope.**

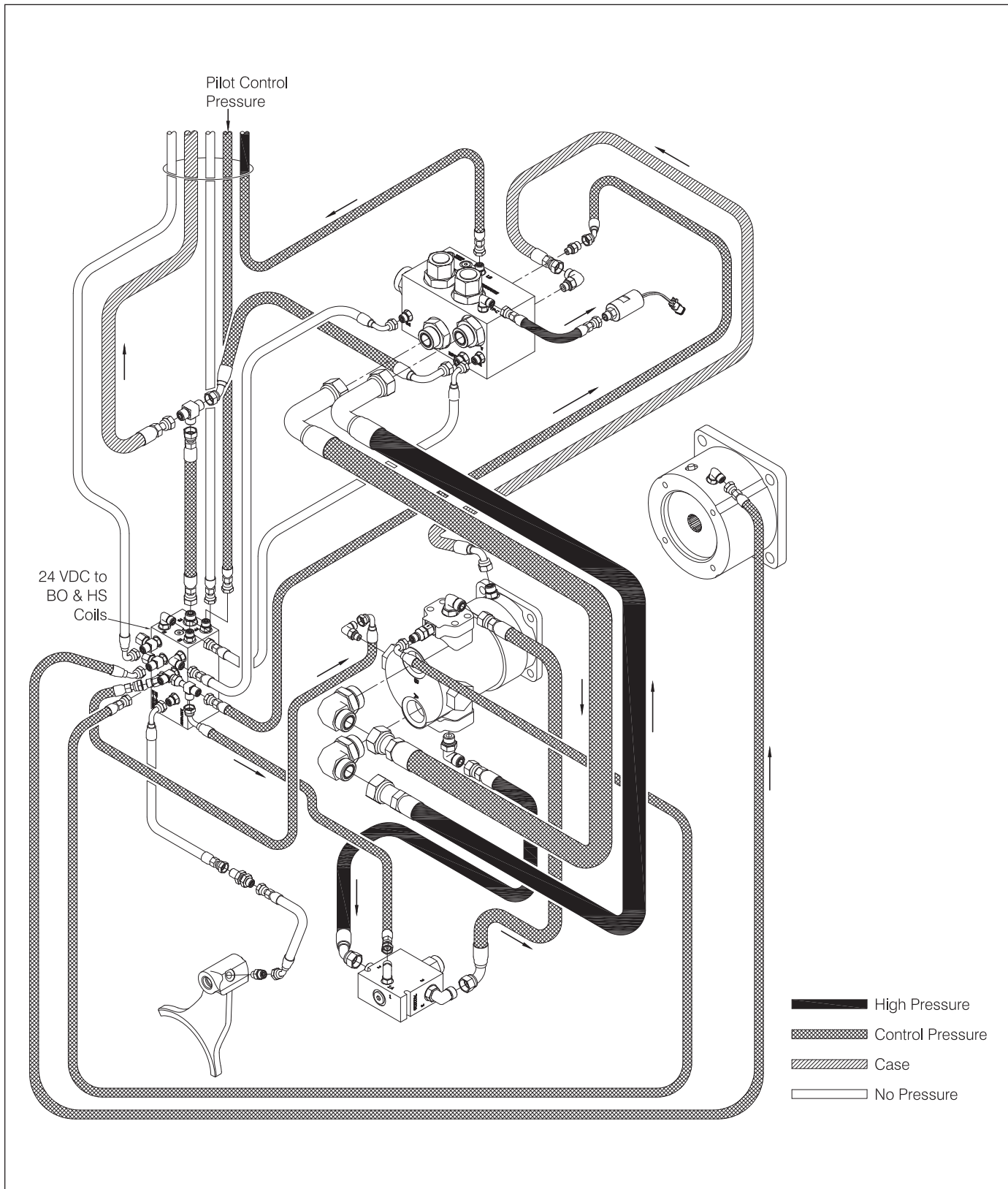


Figure 1-26 Hydraulic System, H5CH\*\*E48 Winch - BRAKE-OFF

## Sequence of Operation, H5CH\*\*E48 Winch - BRAKE-OFF

The operator moves the slide lock and depresses the **BRAKE-OFF** switch. Pilot control pressure communicates in the logic control manifold to release the brake, open the **BRAKE-OFF** valve, and shift the hydraulic motor to **HI-SPEED**. Pilot control oil flow also floods the inlet B port of the motor.

As the operator drives away from the load, the entire gear train rotates as wire rope spools off the drum. The hydraulic motor operates as a pump and circulates oil from the B port to A port through the **BRAKE-OFF** manifold. An orifice in the **BRAKE-OFF** manifold provides a resistance to flow across the hydraulic motor, and therefore limits the

rotating velocity by increasing the tractive effort required by the tractor to drive away from the load.

### **WARNING**

**FREESPOOL should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.**

**Never operate with a suspended load.**

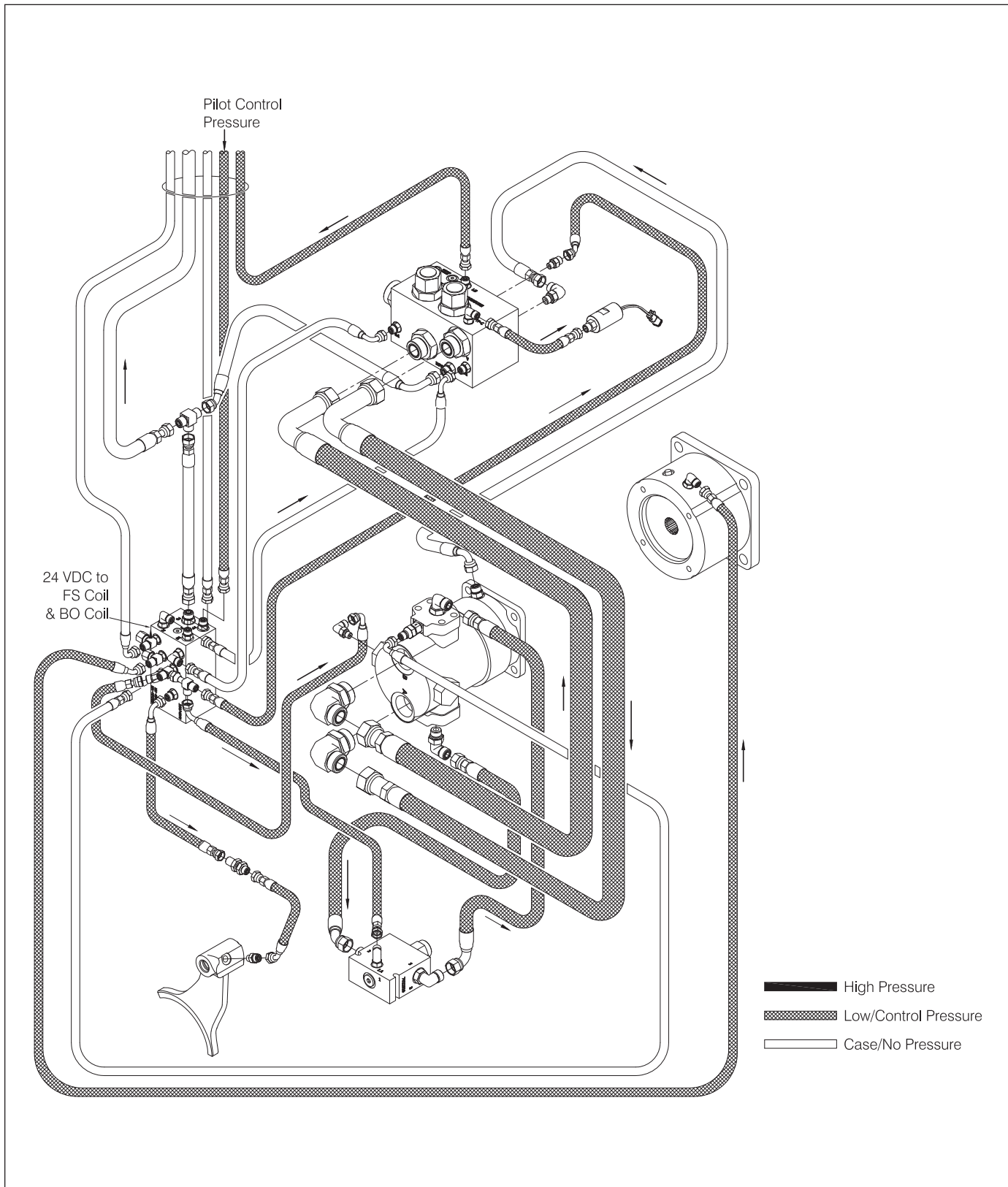


Figure 1-27 Hydraulic System, H5CH\*\*E48 Winch - FREESPOOL

## Sequence of Operation, H5CH\*\*E48 Winch - FREESPOOL

The operator moves the slide lock and depresses the **FREESPOOL** switch. Electronic circuitry also activates **BRAKE-OFF** function during **FREESPOOL** mode. This allows the operator to achieve **FREESPOOL** when the gear train is loaded by first operating in **BRAKE-OFF** to relieve load on the gear train. By depressing the **FREESPOOL** switch, oil pressure is diverted to the **FREESPOOL** piston, brake, **BRAKE-OFF** valve, **HI-SPEED** and the B port of the motor. The **FREESPOOL** piston shifts the dental collar to disconnect the gear train. The brake is released and the motor is shifted into high gear. The motor is flooded so it will rotate freely, thereby allowing the load to be dropped or the collar to be re-engaged easily. Pilot control oil flow also floods the inlet B port of the motor. Pilot control pressure moves 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 the wire rope can be pulled from the drum by hand.

When **BRAKE-OFF** is not activated, a load cannot be dropped, and the dental collar may not fully engage until the motor is powered in **WINCH-IN** or **WINCH-OUT**.

### **WARNING**

**FREESPOOL should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.**

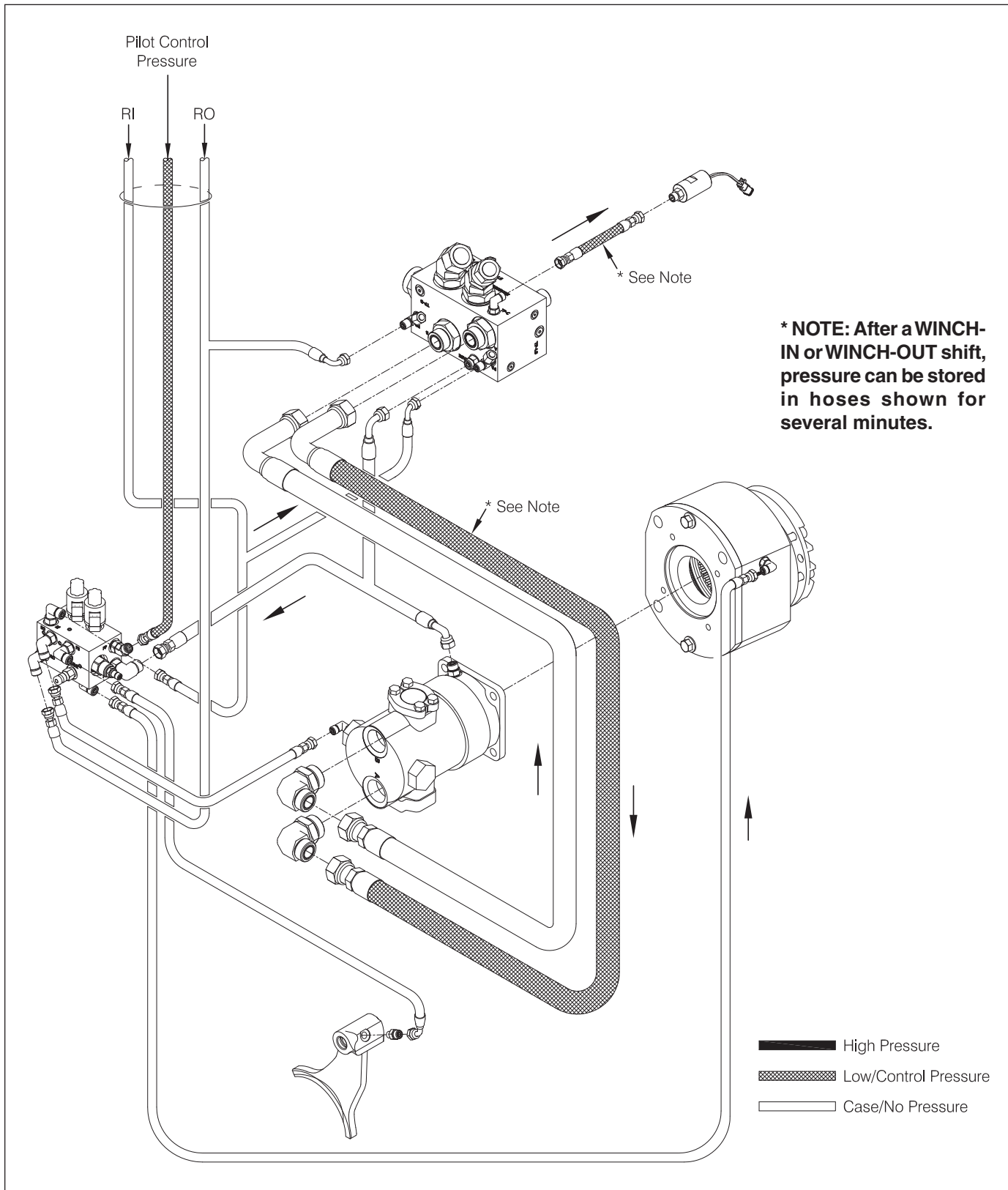


Figure 1-28 Hydraulic System, H5CH\*\*C391 Winch - BRAKE-ON

## Sequence of Operation, H5CH\*\*E48 Winch - BRAKE-ON

The direction control valve spool is spring centered to neutral. In this position the motor work ports are open to the tractor reservoir and pump standby supply pressure is blocked. Pilot control pressure is available at the logic

control manifold and the control lever. Similarly, there is no pressure in the load sense line as it is vented back to the tractor reservoir through an orifice.

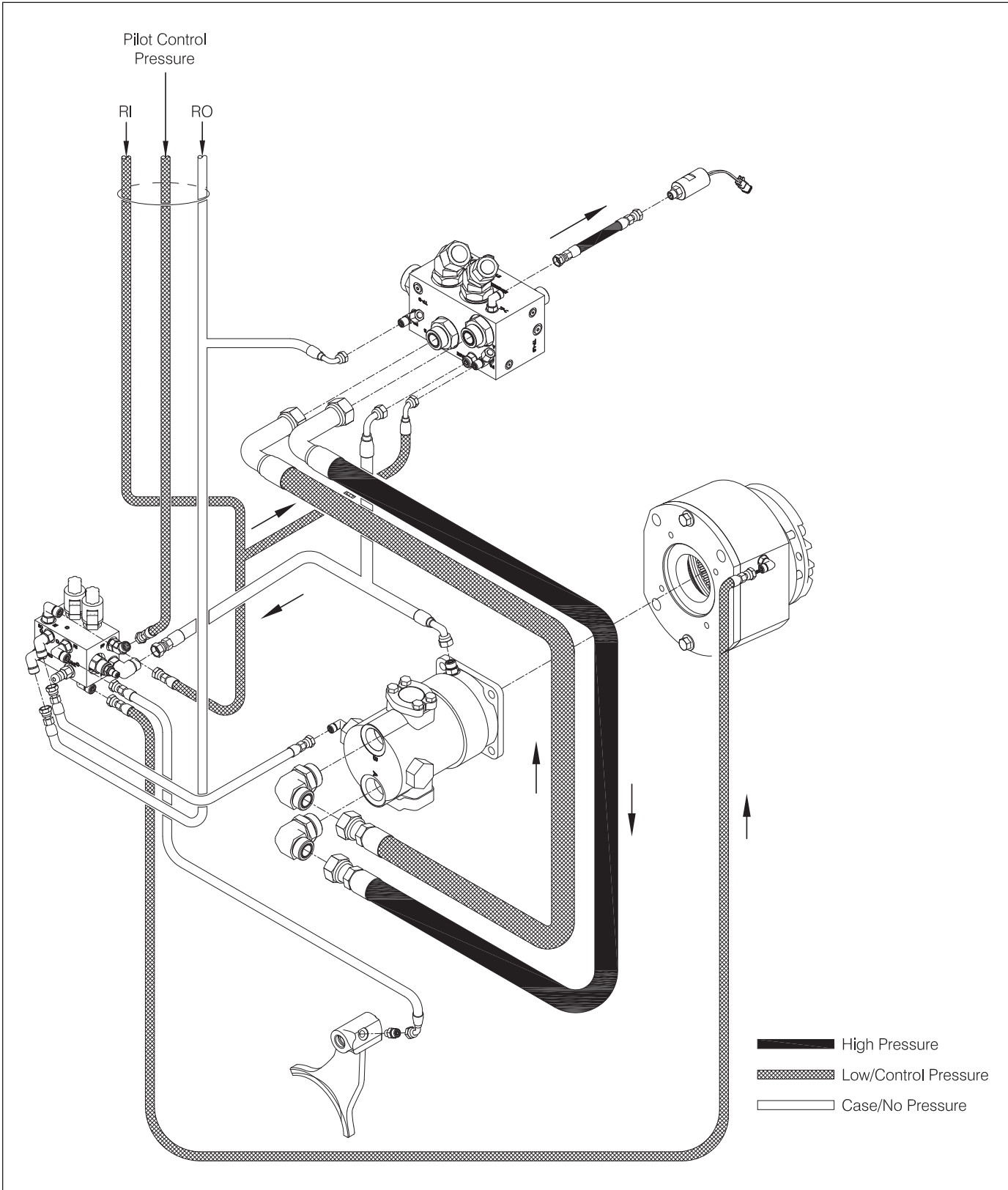


Figure 1-29 Hydraulic System, H5CH\*\*C391 Winch - WINCH-IN



## Sequence of Operation, H5CH\*\*C391 Winch - WINCH-IN

The operator pulls the control lever, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump into the direction control spool and through a check valve in the counterbalance valve cartridge. Oil flow continues through to the inlet A port of the hydraulic motor and builds pressure from the induced load on the winch. This pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor

back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 3500 psi, the load sense relief valve opens, and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount.

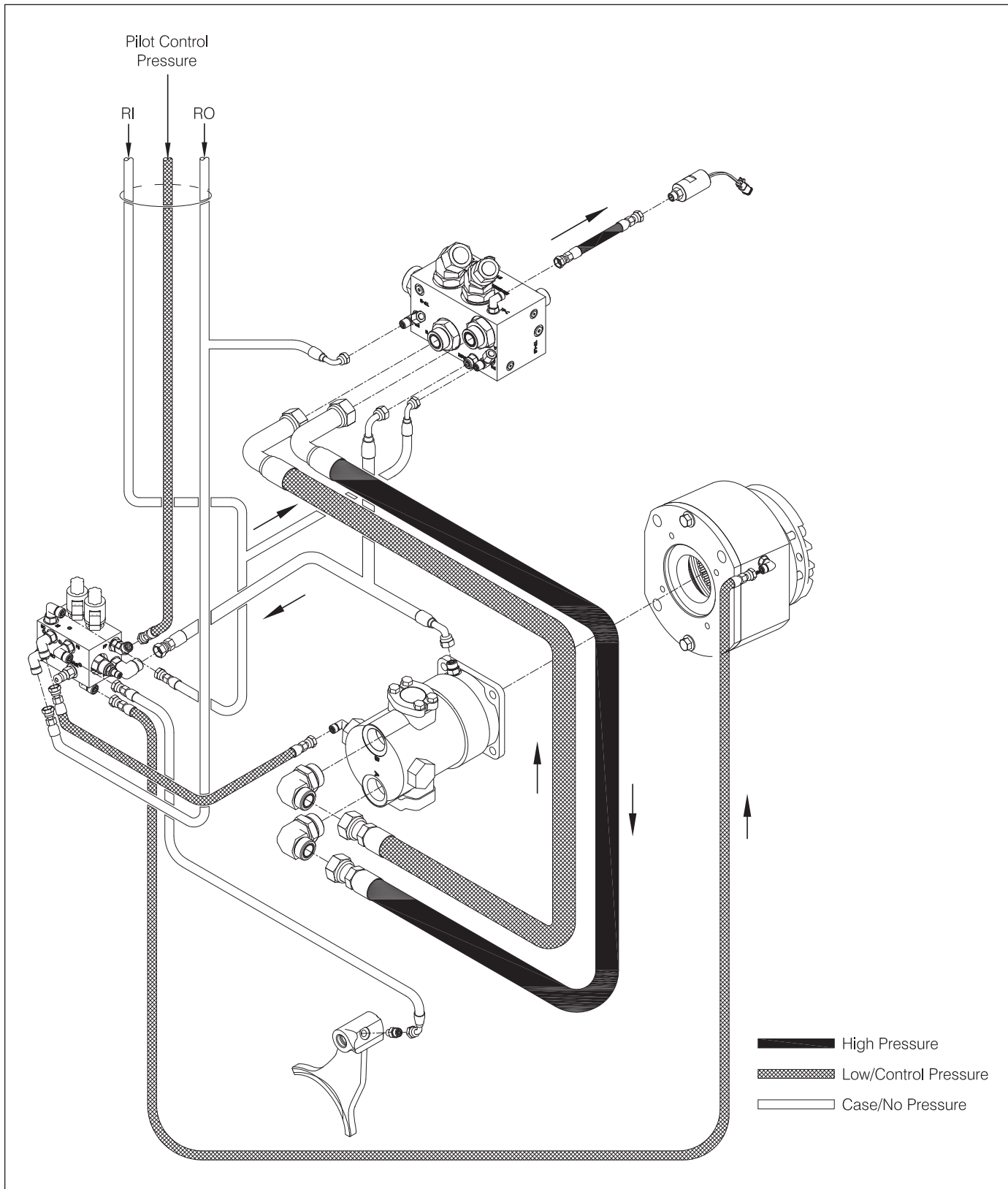


Figure 1-30 Hydraulic System, H5CH\*\*C391 Winch - HI-SPEED WINCH-IN

## Sequence of Operation, H5CH\*\*C391 Winch - HI-SPEED WINCH-IN

The operator depresses the **HI-SPEED** switch, which causes the **HI-SPEED** solenoid valve in the logic manifold to open and pilot control pressure is communicated to the **HI-SPEED** spool in the hydraulic motor. The spool shifts to close half of the power cavities in the motor. Full pump flow now flows through the motor at half displacement, thus doubling the output rpm.

The operator pulls the control lever which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump to the direction control spool, then through a check valve in the counterbalance valve cartridge. Oil flow continues through to the inlet A port of the hydraulic motor and builds pressure from the induced load on the winch. This pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount.

Inlet pressure to the hydraulic motor is sensed by a pressure switch in the direction control manifold. When pressure at the switch reaches 1750 psi, the switch opens and the circuit to the **HI-SPEED** solenoid valve is broken. Pressure at the **HI-SPEED** spool in the hydraulic motor is vented back to the reservoir and the spool spring biases back to the standard speed position. The winch remains in standard speed until the operator depresses the **HI-SPEED** switch again, and load induced pressure on the motor remains below 1750 psi. This prevents the load from stalling the motor. The operator may override the pressure switch by holding the **HI-SPEED** switch down. This allows the winch to remain in **HI-SPEED** at pressures above 1750 psi. For heavy loads or when better control is desired, the winch should be operated in the normal speed. For light loads and faster cable speed, operate the winch in **HI-SPEED** mode.

### **WARNING**

**Never press and hold the HI-SPEED switch to maintain HI-SPEED operation in the WINCH-OUT mode if there is a load attached to the wire rope.**

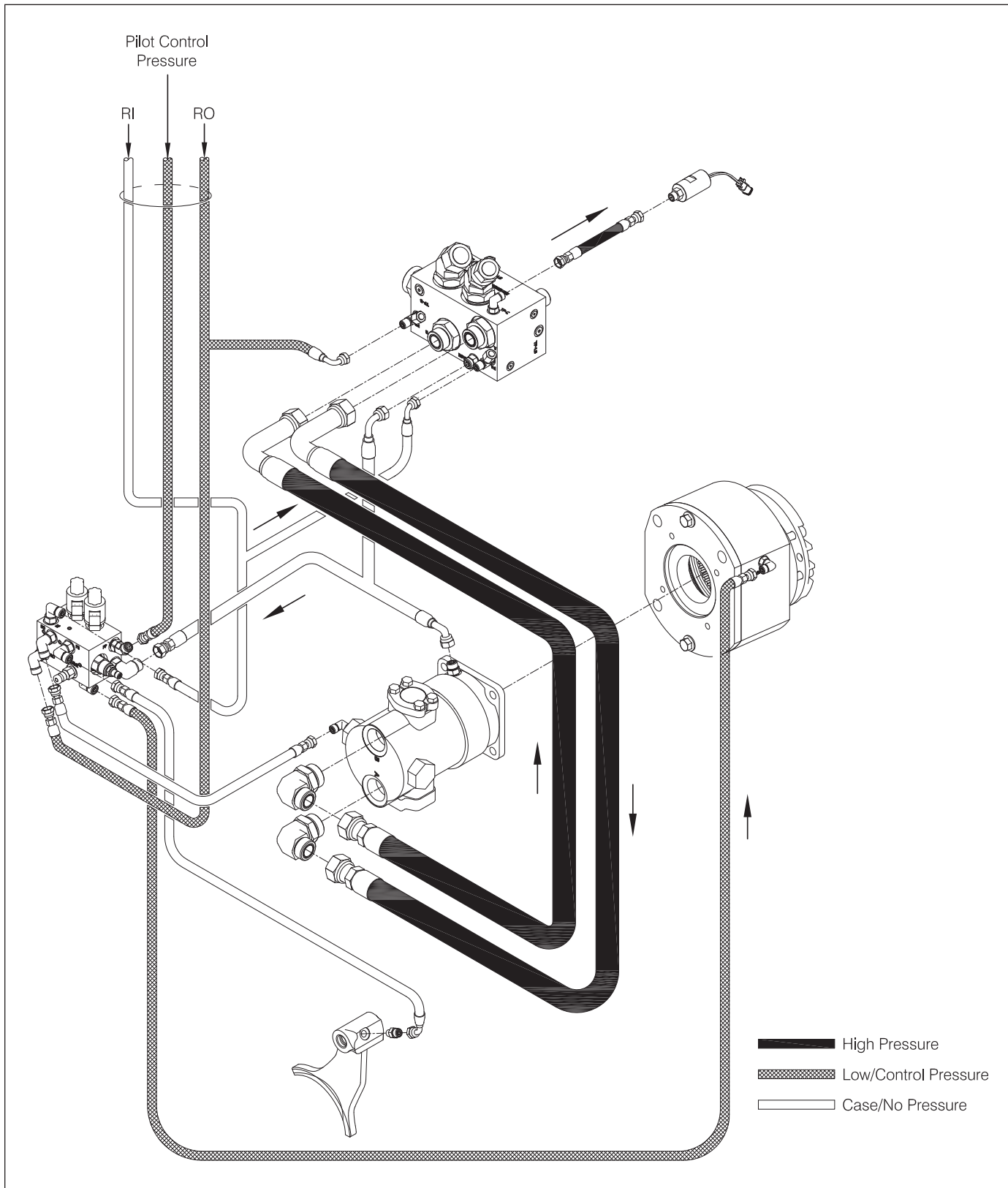


Figure 1-31 Hydraulic System, H5CH\*\*C391 Winch - WINCH-OUT

## Sequence of Operation, H5CH\*\*C391 Winch - WINCH-OUT

The operator pushes the control lever forward, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump supply line into the direction control spool cartridge and continue to the inlet B port of the hydraulic motor. Pressure builds from resistance against the counterbalance valve, mechanical, and volumetric resistance. This pressure supply communicates through a check valve to pilot the counterbalance valve open until the inlet pressure falls below a set value and the counterbalance valve closes. Similarly, the same pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the

brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir. This condition drives the winch drum in **WINCH-OUT**.

When the winch is operated in **WINCH-OUT** and a load pulls line from the winch, pressure builds on the A port of the motor up to the load sense relief setting. When pressure on the A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back reducing displacement so pressure at the hydraulic motor decreases a corresponding amount. If pressure on the inlet B side of the hydraulic motor drops below the pilot setting of the counterbalance valve, the counterbalance valve closes and acts as a relief valve on the A port of the hydraulic motor. The valve relieves when pressure on the A port reaches 4500 psi.

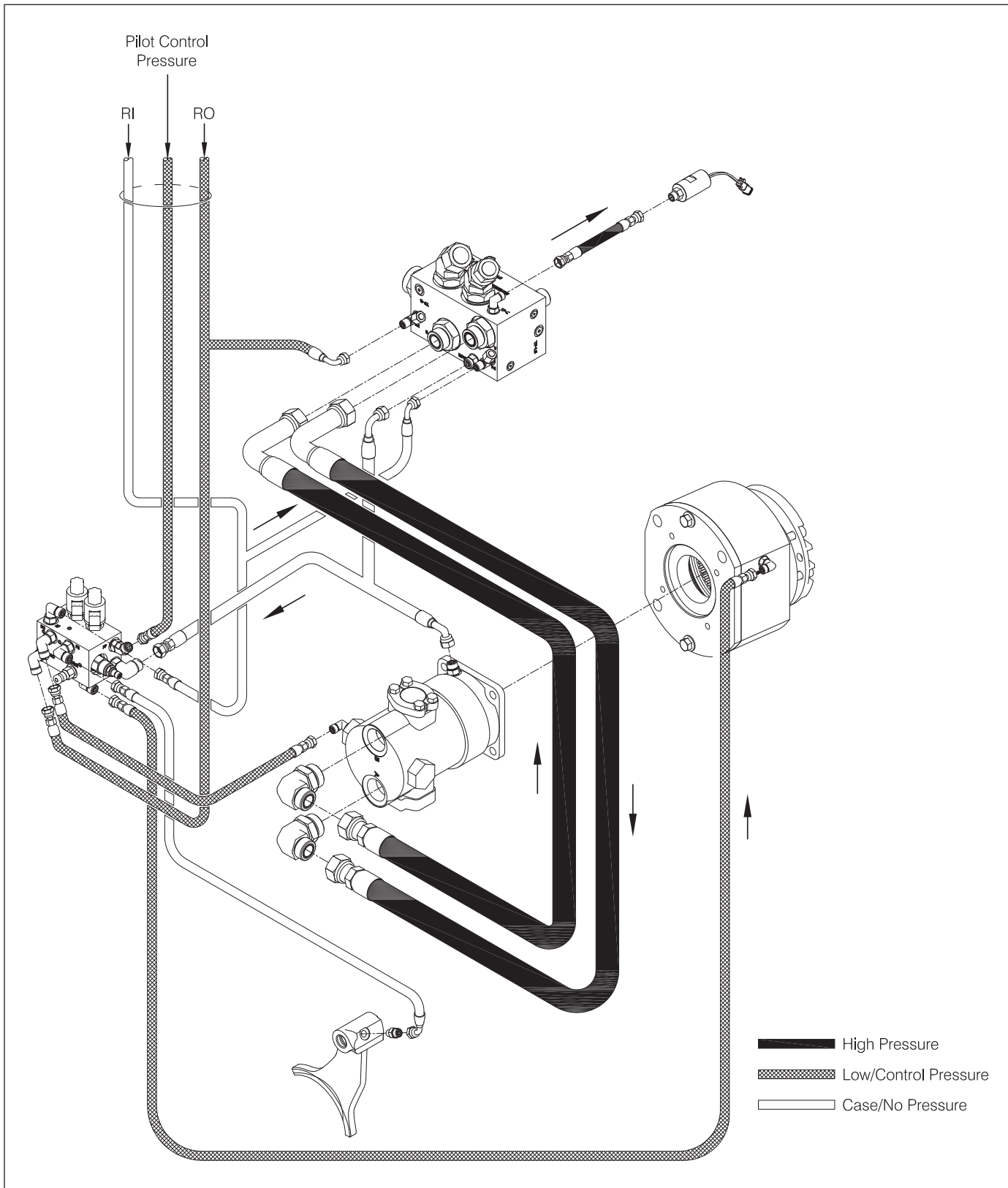


Figure 1-32 Hydraulic System, H5CH\*\*C391 Winch - HI-SPEED WINCH-OUT

## Sequence of Operation, H5CH\*\*C391 Winch - HI-SPEED WINCH-OUT

When the operator depresses the **HI-SPEED** switch, the **HI-SPEED** solenoid valve in the logic manifold opens and pilot control pressure is communicated to the **HI-SPEED** spool in the hydraulic motor. The spool shifts to close half of the vein ports in the motor. Full pump flow now flows through the motor at half displacement, thus increasing the output rpm.

The operator pushes the control lever forward, which sends pilot control pressure to the direction control valve and the brake release valve. Oil flows from the pump supply line into the direction control spool cartridge and continue to the inlet B port of the hydraulic motor. Pressure builds from resistance against the counterbalance valve, mechanical, and volumetric resistance. This pressure supply communicates through a check valve to pilot the counterbalance valve open until the inlet pressure falls below a set value and the counterbalance valve closes. Similarly, the same pressure is communicated to the tractor pump load sense controller and the pump displacement is increased or decreased depending on the load induced pressure. Oil flows through the motor back through the direction control spool and to the tractor reservoir. Simultaneously, pilot control pressure at the brake valve is connected to the brake release port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor back to the tractor reservoir. This condition drives the winch drum in **WINCH-OUT**.

When the winch is operated in **WINCH-OUT** and a load pulls line from the winch, pressure builds on the A port of the motor up to the load sense relief setting. When pressure on the A port of the motor exceeds 3500 psi, the load sense relief valve opens. The load sense pressure signal decreases and the tractor pump strokes back, reducing displacement so pressure at the hydraulic motor decreases a corresponding amount. If pressure on the inlet B side of the hydraulic motor drops below the pilot setting of the counterbalance valve, the counterbalance valve closes and acts as a relief valve on the A port of the hydraulic motor. The valve relieves when pressure on the A port reaches 4500 psi.

Pressure on the A port of the hydraulic motor is sensed by a pressure switch in the direction control manifold. When pressure at the switch reaches 1750 psi, the switch opens. Pressure at the **HI-SPEED** spool in the hydraulic motor is vented back to the reservoir, and the spool spring biases back to the standard speed position. The winch remains in standard speed until the operator depresses the **HI-SPEED** switch again, and load induced pressure on the motor remains below 1750 psi.

### **WARNING**

**Never press and hold the HI-SPEED switch to maintain HI-SPEED operation in the WINCH-OUT mode if there is a load attached to the wire rope.**

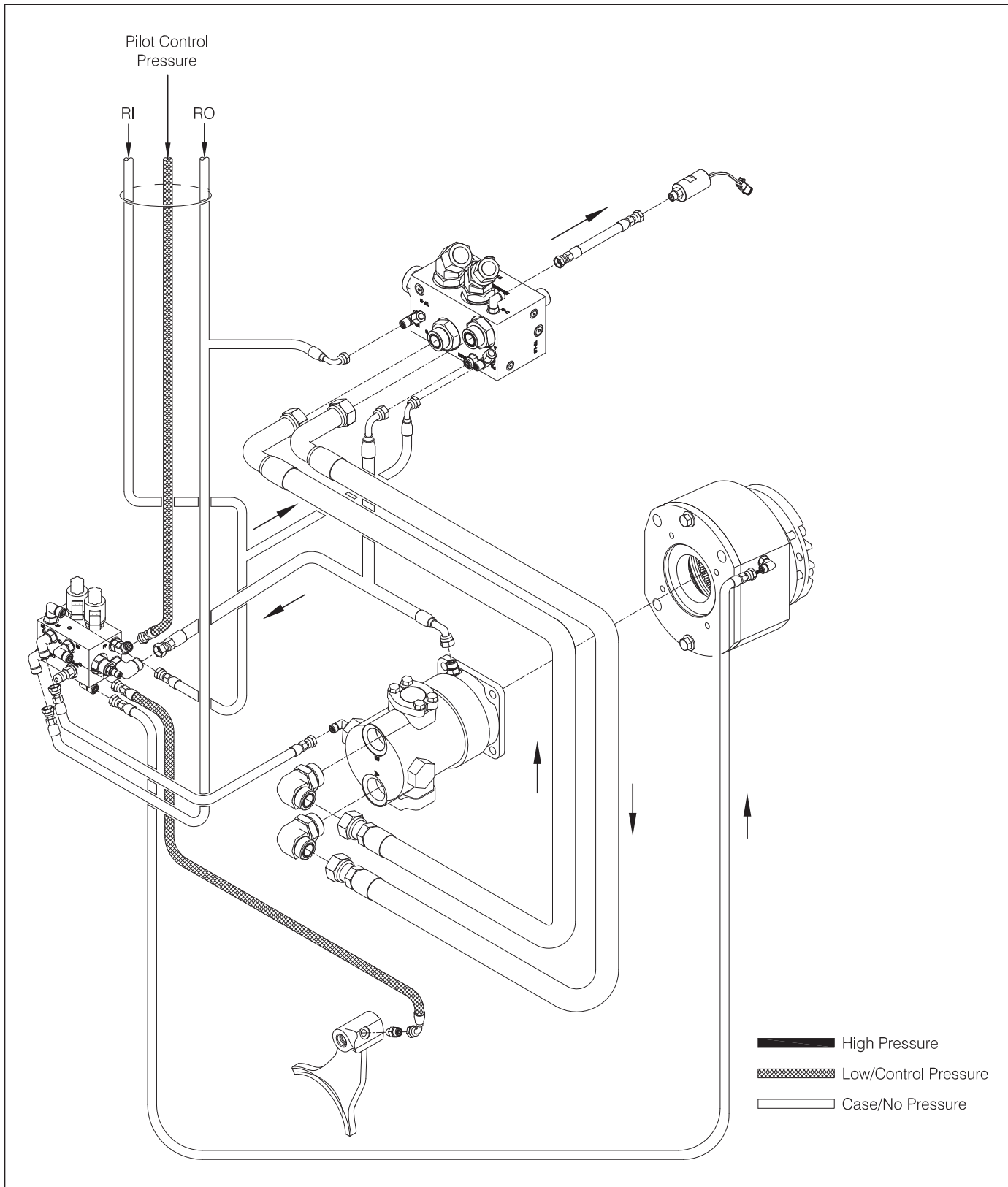


Figure 1-33 Hydraulic System, H5CH\*\*C391 Winch - FREESPOOL



## Sequence of Operation, H5CH\*\*C391 Winch - FREESPOOL

The operator moves the slide lock and depresses the **FREESPOOL** switch. Electronic circuitry also activates **BRAKE-OFF** function during **FREESPOOL** mode. This allows the operator to achieve **FREESPOOL** when the gear train is loaded by first operating in **BRAKE-OFF** to relieve load on the gear train. By depressing the **FREESPOOL** switch, oil pressure is diverted to the **FREESPOOL** piston, brake, **BRAKE-OFF** valve, **HI-SPEED** and the B port of the motor. The **FREESPOOL** piston shifts the dental collar to disconnect the gear train. The brake is released and the motor is shifted into high gear. The motor is flooded so it will rotate freely, thereby allowing the load to be dropped or the collar to be re-engaged easily. Pilot control oil flow also floods the inlet B port of the motor. Pilot control pressure moves 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 the wire rope can be pulled from the drum by hand.

When **BRAKE-OFF** is not activated, a load cannot be dropped, and the dental collar may not fully engage until the motor is powered in **WINCH-IN** or **WINCH-OUT**.

### **WARNING**

**FREESPOOL should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.**

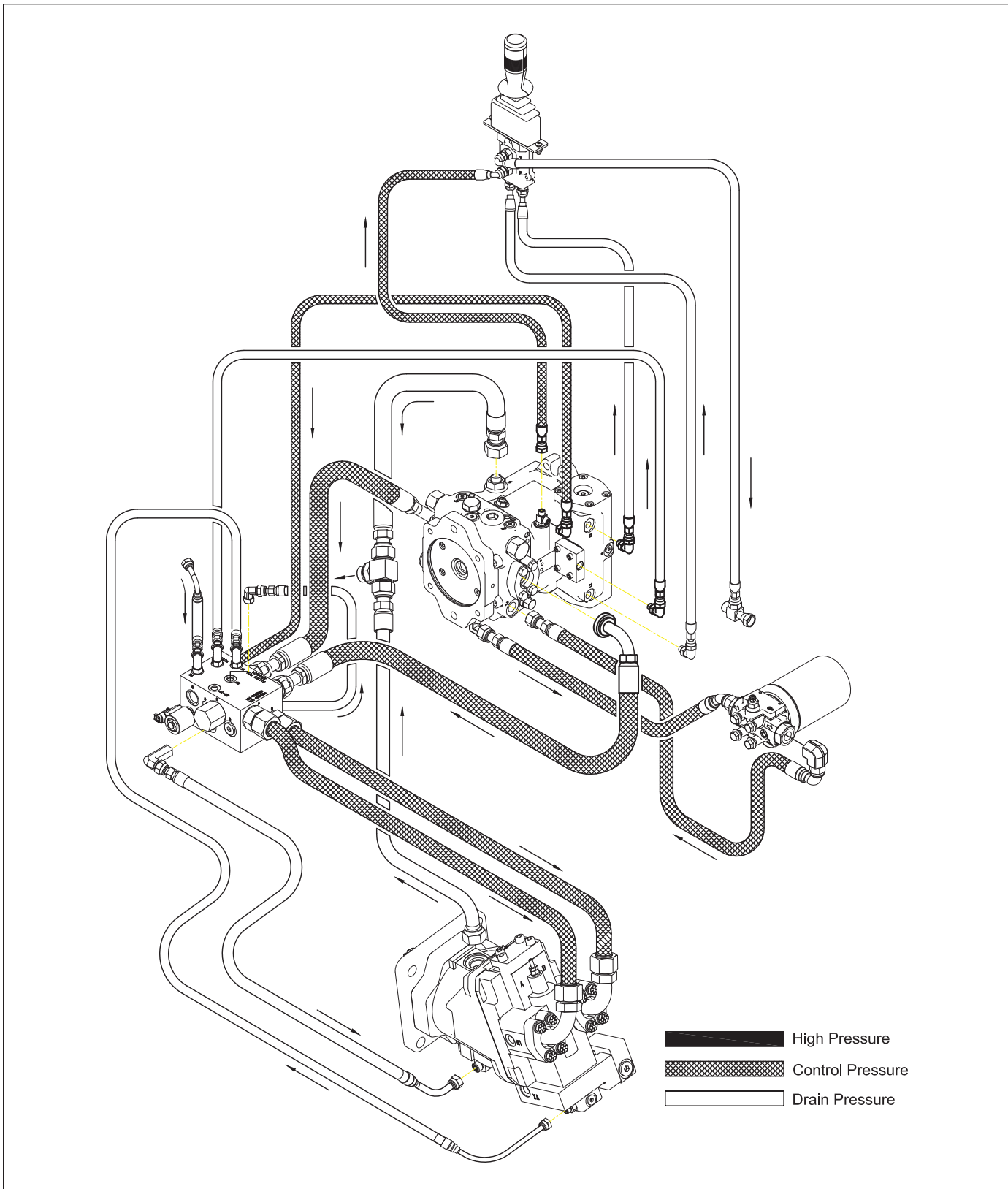


Figure 1-34 Sequence of Operation, H5CH\*\*K37 & C80 Winches - BRAKE-ON

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - BRAKE-ON

The pump swash plate angle is in the neutral or zero angle position. The brake is spring applied and main pump flow is not flowing to the winch motor. The charge pump inside the main pump circulates oil through the oil filter, provides

pilot control pressure to the control manifold and control lever, and introduces a constant low pressure supply in the work loop of the pump and motor.

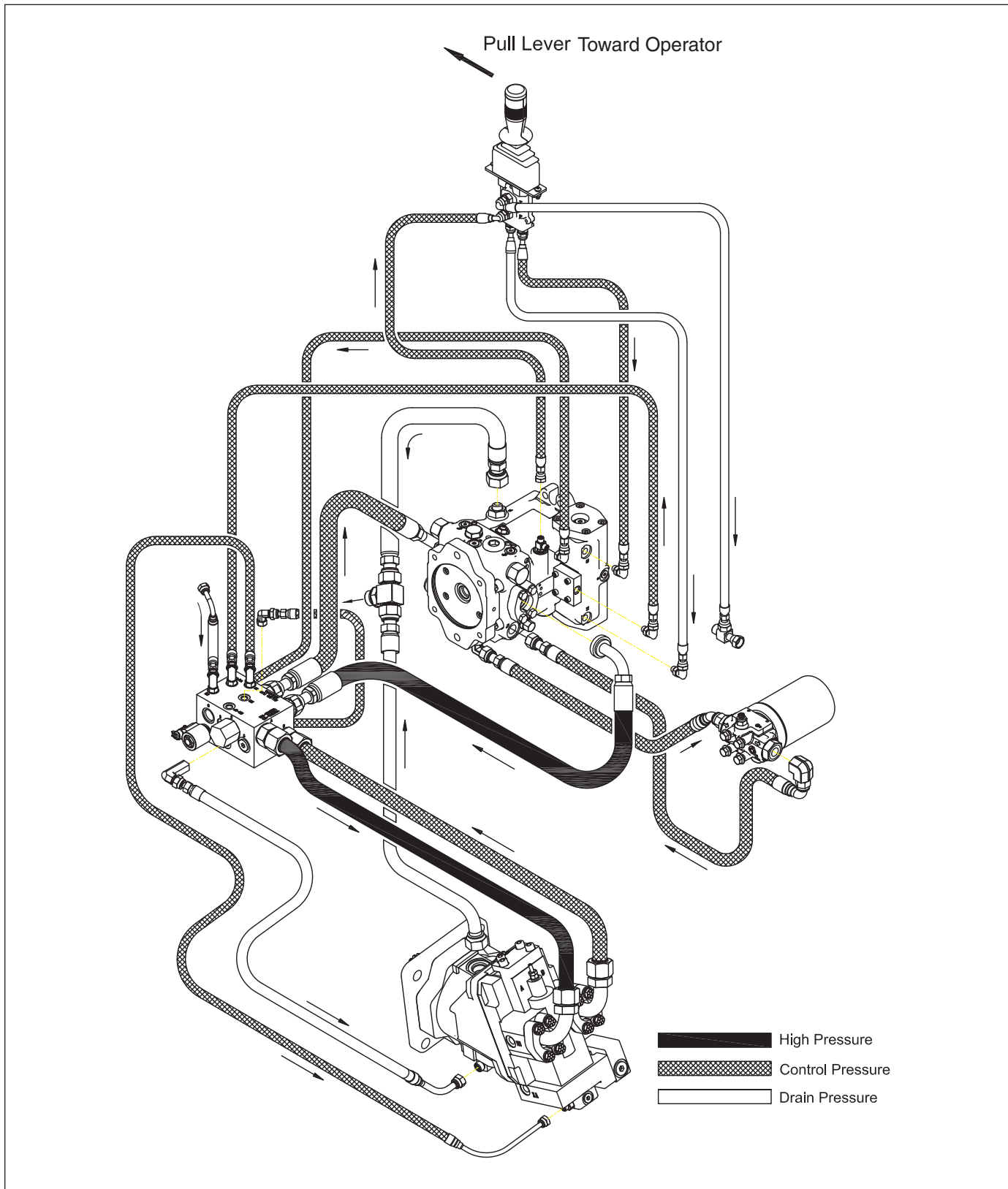


Figure 1-35 Hydraulic System, H5CH\*\*K37 & C80 Winches - WINCH-IN & HI-SPEED WINCH-IN

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - WINCH-IN

The operator pulls the control lever which sends pilot control pressure to the pump swash plate piston, motor swash plate piston, and to the brake release circuit. Oil flows from the main pump to the inlet A port of the winch motor and builds pressure from the induced load on the winch. Pump displacement is increased or decreased depending on the position of the hand lever. Oil flows through the motor back to the low pressure side of the pump in a closed circuit. Simultaneously, pilot control pressure at the brake valve is connected to the brake port and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor and pump back to the tractor reservoir.

When pressure on the inlet A port of the motor exceeds 6380 psi, the high pressure relief valve opens. Excess oil flows from the high pressure A side of the motor to the low pressure B side, to maintain no more than 6380 psi on the inlet.

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - HI-SPEED WINCH-IN

The operator pulls the control lever which sends pilot control pressure to the pump swash plate piston, motor swash plate piston, and to the brake release circuit. Oil flows from the main pump to the inlet A port of the winch motor and builds pressure required due to the load on the wire rope. Pump displacement is increased or decreased depending on the position of the control lever. Oil flows through the motor back to the low pressure side of the pump in a closed circuit. Simultaneously, pilot control pressure at the brake valve is connected to the brake port and the brake is fully released. Oil from the case drain flows from the hydraulic motor and pump back to the tractor reservoir.

The winch remains in standard speed until the control lever is moved approximately 75% of travel. At this time full pump flow is delivered to the winch motor. As the lever is moved beyond this point, motor displacement is variably reduced and automatically increases line speed nearly 2-1/2 times.

The winch remains in high speed until the operator pushes the control lever back toward the **BRAKE-ON** position, or load induced pressure on the motor rises above 5400 psi. When the motor senses 5400 psi on the inlet, it automatically shifts back toward maximum displacement, even if the operator has the control lever at full travel. This prevents the load from stalling the motor.

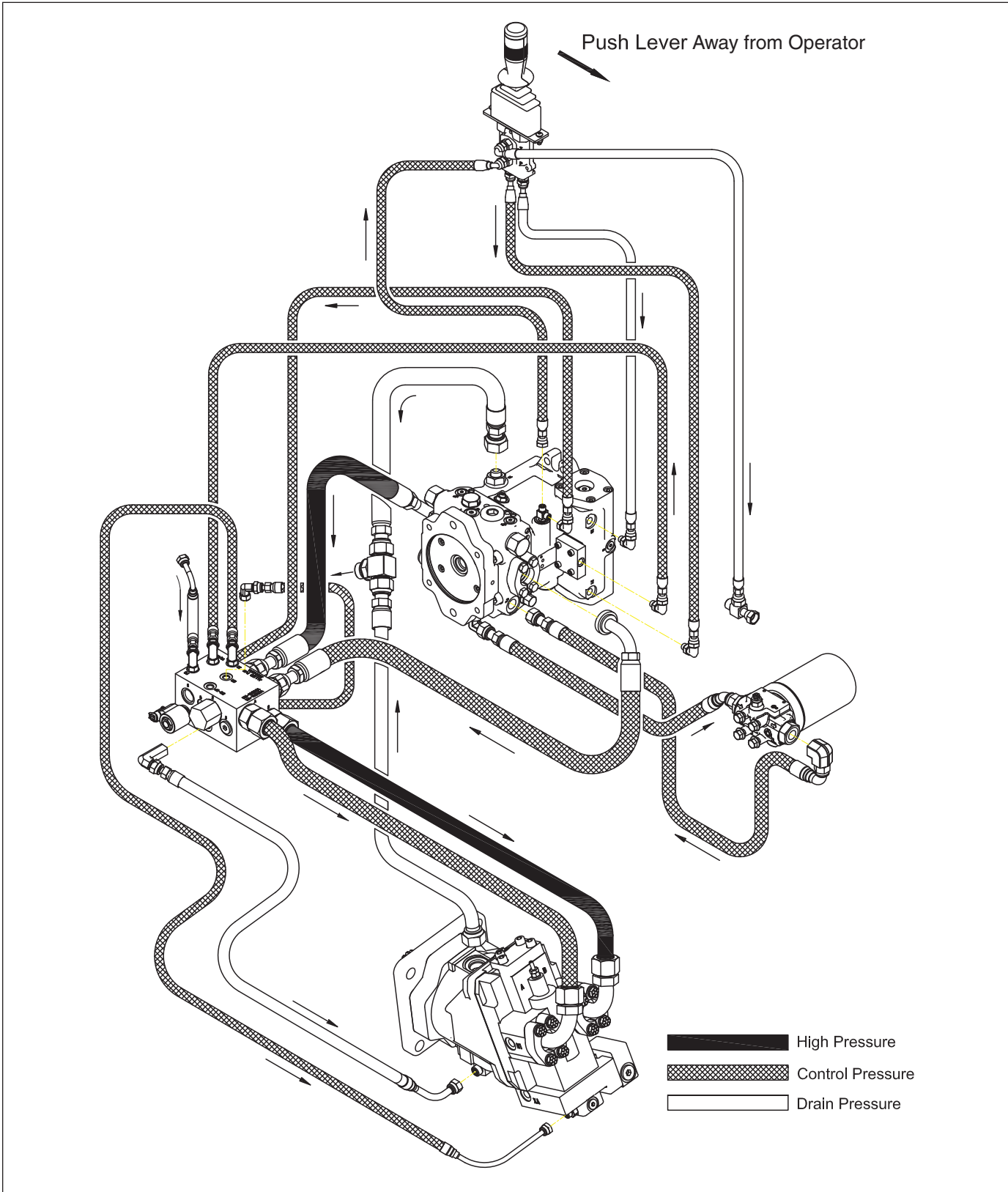


Figure 1-36 Hydraulic System, H5CH\*\*K37 & C80 Winches - WINCH-OUT & HI-SPEED WINCH-OUT

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - WINCH-OUT

The operator pushes the control lever which sends pilot control pressure to the pump swash plate piston, motor swash plate piston, and to the brake release circuit. Oil flows from the main pump to the inlet B port of the winch motor and builds pressure from the resistance in the winch piping. This operating condition drives the wire rope off of the drum. When a load is lowered down a slope, the load induced pressure acts on the A port of the winch motor, but the pump continues to supply oil flow to the B port. Pump displacement is increased or decreased depending on the position of the control lever. Oil flows through the motor back to the low pressure side of the pump in a closed circuit. Simultaneously, pilot control pressure at the brake valve is connected to the brake port, and the brake is fully released. Low pressure case drain oil flows from the hydraulic motor and pump back to the tractor reservoir.

When pressure on the A port of the motor exceeds 6380 psi, the high pressure relief valve opens. Excess oil flows from the high pressure A side of the motor to the low pressure B side to maintain no more than 6380 psi on the loaded side of the motor. The B port high pressure relief should only reach its maximum setting under conditions such as testing when loading against the winch brake.

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - HI-SPEED WINCH-OUT

The operator pushes the control lever which sends pilot control pressure to the pump swash plate piston, motor swash plate piston, and to the brake release circuit. Oil flows from the main pump to the inlet B port of the winch motor and builds pressure from the resistance in the winch piping. This operating condition drives the wire rope off of the drum. When a load is lowered down a slope, the load induced pressure acts on the A port of the winch motor but the pump continues to supply oil flow to the B port. Pump displacement is increased or decreased depending on the position of the control lever. Oil flows through the motor back to the low pressure side of the pump in a closed circuit. Simultaneously, pilot control pressure at the brake valve is connected to the brake port and the brake is fully released. Oil from the case drain flows from the hydraulic motor and pump back to the tractor reservoir.

The winch remains in standard speed until the control lever is moved approximately 75% of travel. At this time, full pump flow is delivered to the winch motor. As the control lever is moved beyond this point, motor displacement is variably reduced and automatically increases line speed nearly 2-1/2 times.

The winch remains in high speed until the operator pulls the control lever back toward the **BRAKE-ON** position, or load induced pressure on the motor rises above 5400 psi. When the motor senses 5400 psi on the inlet, it automatically shifts back to a maximum displacement, even if the operator has the control lever at full travel. This prevents the load from stalling the motor.

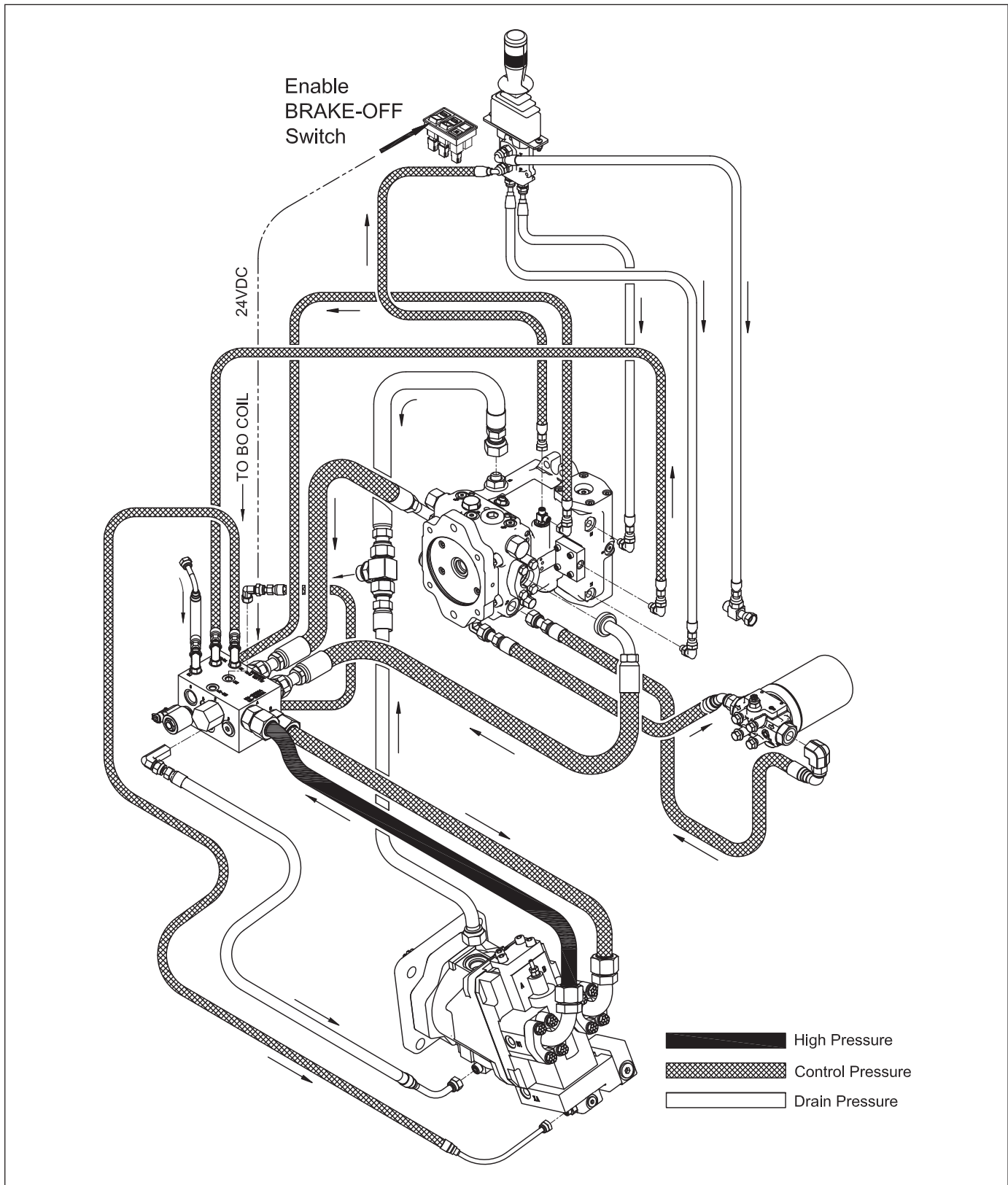


Figure 1-37 Hydraulic System, H5CH\*\*K37 & C80 Winches - BRAKE-OFF



## Sequence of Operation, H5CH\*\*K37 & C80 Winches - BRAKE-OFF

The operator moves the slide lock and depresses the **BRAKE-OFF** switch. Pilot control pressure communicates in the control manifold to release the brake, open the **BRAKE-OFF** valve, and shift the hydraulic motor to **HI-SPEED** displacement.

### **WARNING**

**FREESPOOL should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.**

As the operator drives away from the load, the entire gear train rotates as the wire rope spools off the drum. The hydraulic motor operates as a pump and circulates oil from the B port to A port through the **BRAKE-OFF** valve. An orifice in the **BRAKE-OFF** manifold provides a resistance to flow across the hydraulic motor, and therefore limits the rotating velocity by increasing the tractive effort required by the tractor to drive away from the load.

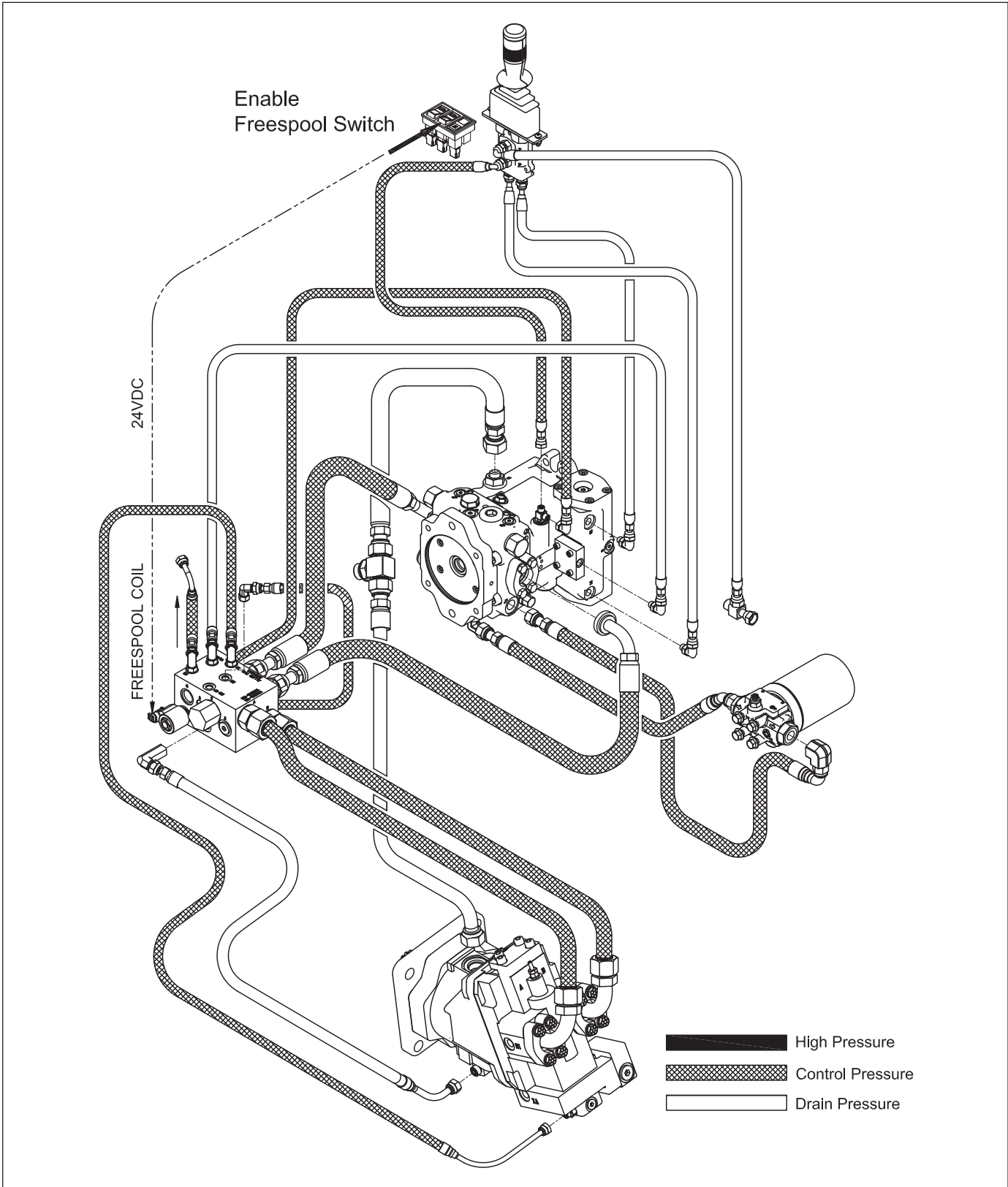


Figure 1-38 Hydraulic System, H5CH\*\*K37 & C80 Winches - FREESPOOL

## Sequence of Operation, H5CH\*\*K37 & C80 Winches - FREESPOOL

The operator moves the slide lock and depresses the **FREESPOOL** switch. Electronic circuitry also activates **BRAKE-OFF** function during **FREESPOOL** mode. This allows the operator to achieve **FREESPOOL** when the gear train is loaded by first operating in **BRAKE-OFF** to relieve load on the gear train. By depressing the **FREESPOOL** switch, oil pressure is diverted to the **FREESPOOL** piston, brake, **BRAKE-OFF** valve, and **HI-SPEED** port of the motor. The **FREESPOOL** piston shifts the dental collar to disconnect the gear train. The brake is released and the motor is shifted into **HI-SPEED**. The motor rotates freely, thereby allowing the load to be dropped, or the collar to be re-engaged easily. Pilot control pressure communicates to the **FREESPOOL** shifter fork, allowing the dental clutch to disengage the drum pinion gear from the intermediate

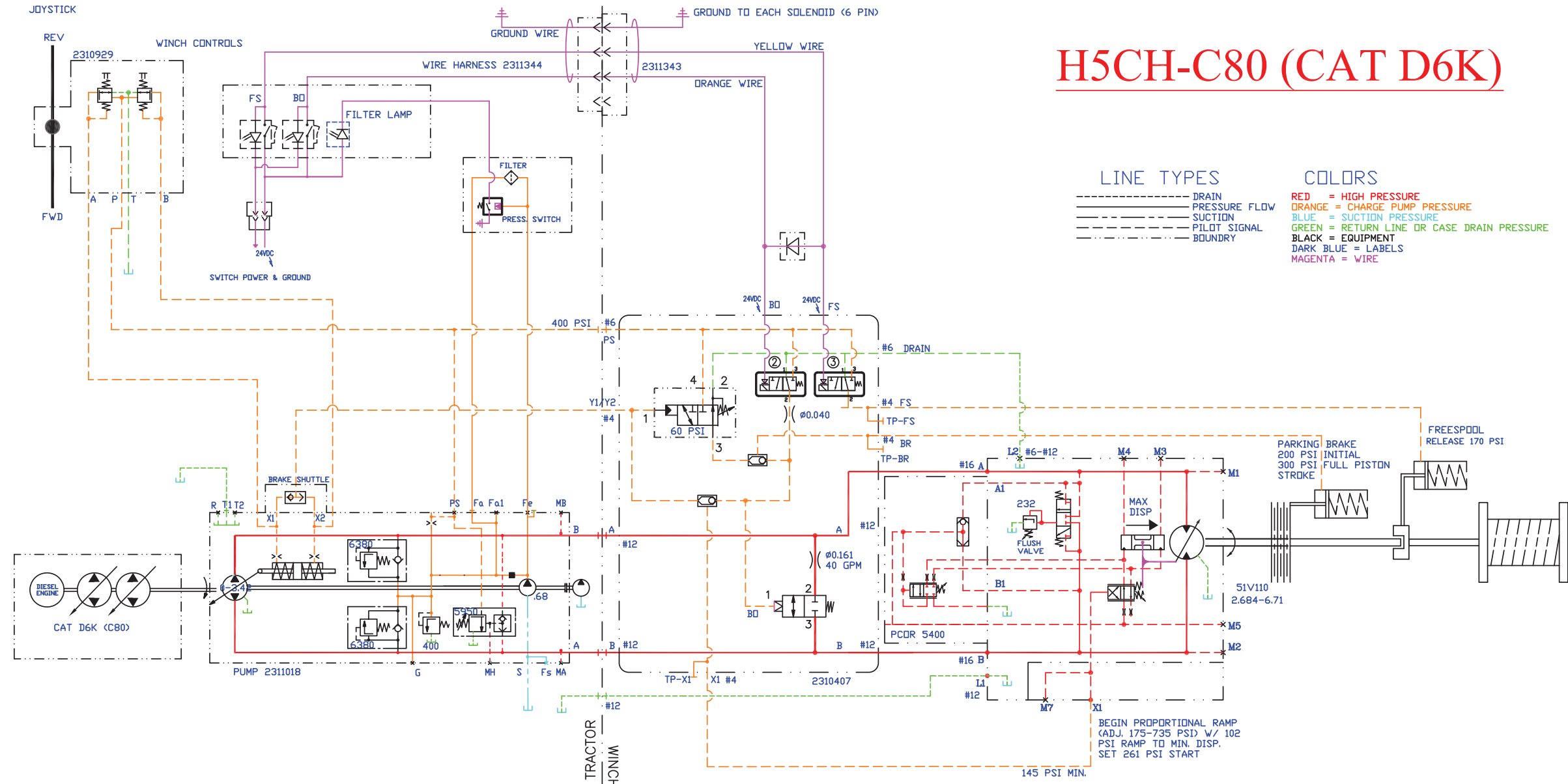
gear. The gear train is disengaged from the drum gear, so the wire rope can be pulled from the drum by hand.

When **BRAKE-OFF** is not activated, a load cannot be dropped and the dental collar may not fully engage until the motor is powered in **WINCH-IN** or **WINCH-OUT**.

### **WARNING**

**FREESPOOL should not be used if there is a load on the wire rope. An uncontrolled release of the load will occur. Loss of the load can result in equipment damage, personal injury, or death.**





# H5CH-C80 (CAT D6K)

LINE TYPES	COLORS
--- DRAIN	RED = HIGH PRESSURE
--- PRESSURE FLOW	ORANGE = CHARGE PUMP PRESSURE
--- SUCTION	BLUE = SUCTION PRESSURE
--- PILOT SIGNAL	GREEN = RETURN LINE OR CASE DRAIN PRESSURE
--- BOUNDARY	BLACK = EQUIPMENT
	DARK BLUE = LABELS
	MAGENTA = WIRE

**Direction of rotation-Control-Throughput flow direction:**  
 Clockwise rotation  
 Solenoid Control pressure Direction of flow Operating pressure  
 A X1 A to B MB  
 B X2 B to A MA

**CONTROL MANIFOLD PORTS**  
 A,B Main pressure lines  
 Y1/Y2 Control pressure to brake valve and motor displacement controller.  
 PS Pilot pressure supply  
 DRAIN Drain port for BR, FS, BD, and X1  
 TP-FS Gauge port-Freespool pressure.  
 TP-BR Gauge port-Brake pressure  
 TP-X1 Gauge port-motor displacement  
 X1 Motor displacement control pressure port

**NOTES:**  
 1. DETAIL FOR COILS. ALL EQUIPPED WITH TRANSIENT VOLTAGE SUPPRESSOR



**PUMP PORTS:**

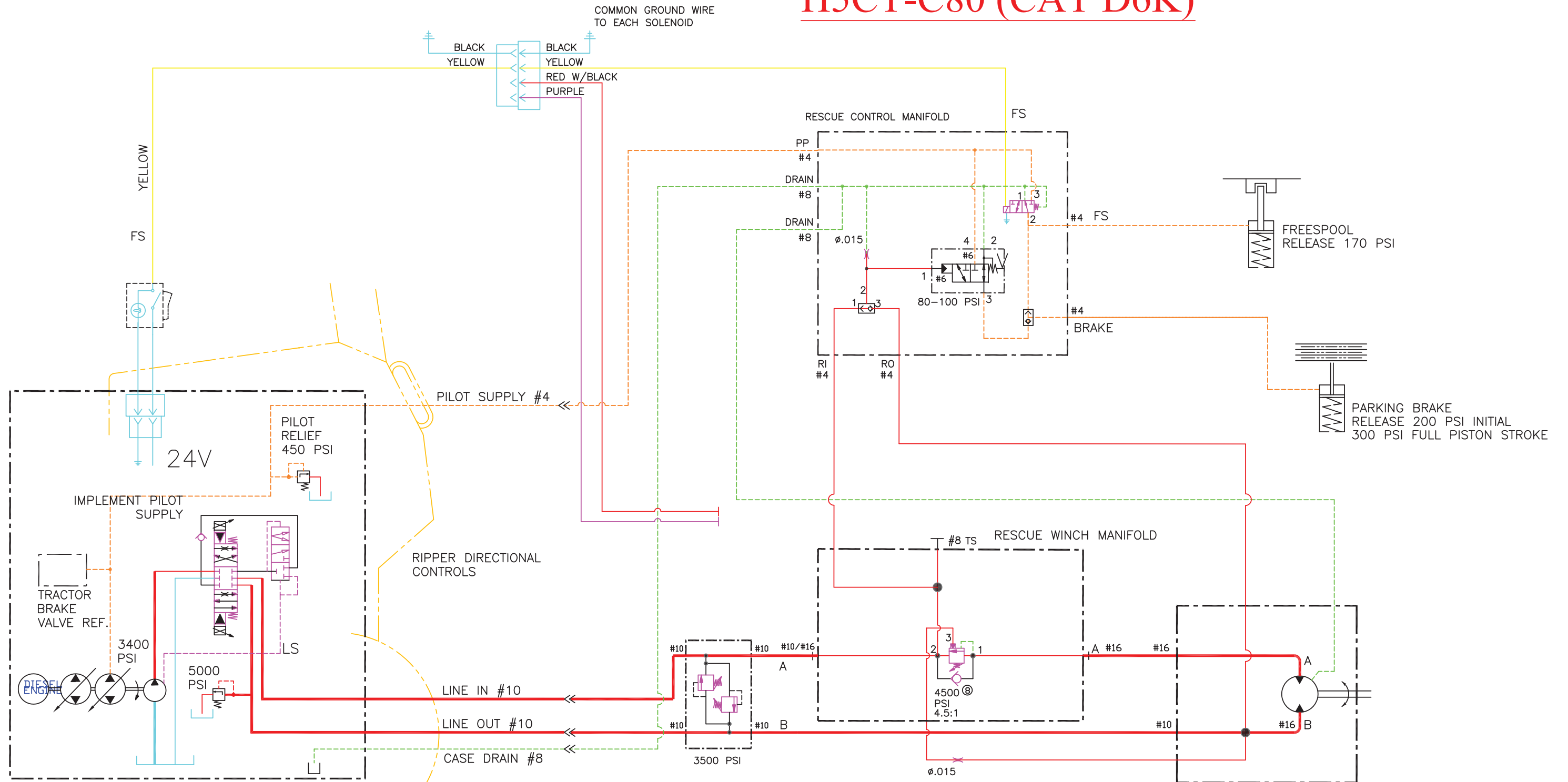
A	B	high pressure ports 3/4" SAE 420 bar (6000 psi-code 62)
T		case drain or filling port 1 1/16-12UN-2B
TP		case drain port 1 1/16-12UN-2B
M		gauge port-sys. pressure A 7/16-20UNF-2B
M		gauge port-sys. pressure B 7/16-20UNF-2B
R		case vent port 7/16-20UNF-2B
S		charge suction port 1 5/16-12UN-2B
X	X	stroking pressure ports 7/16-20UNF-2B
G		charge pressure port 9/16-18UNF-2B
R		control pressure gauge port 9/16-18UNF-2B
Fa		filter outlet 3/4-16UNF-2B
Fa		filter outlet (filter assembly) M18x1.5
Fe		filter inlet 3/4-16UNF-2B
Fs		port from filter to suction line (cold start) M18x1.5
M		gauge port-high pressure 7/16-20UNF-2B

**MOTOR PORTS:**  
 A,B Main pressure lines (max allowable 6960 psi)  
 L1,L2 Drain lines  
 M1,M2 Gauge port for port A & B  
 M3,M4 Gauge port-servo pressure  
 M5 Gauge port-servo supply  
 M7 Gauge port-control pressure  
 X1 Control pressure port

Flow to A for line-in.  
 Biased to max. displacement  
 Control end min. displacement  
 PCDR (w/o brake press. defeat)--Automatic shift to max. disp. @ 5400 psi.  
 Ramp from min. to max. disp. < 145 psi when PCDR activated.

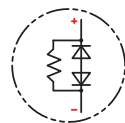
Figure 1-39 H5C Hydraulic Schematic, High-Performance Winch

# H5CT-C80 (CAT D6K)



**NOTES:**

1. DETAIL FOR COILS. ALL EQUIPPED WITH TRANSIENT VOLTAGE SUPPRESSOR



SINGLE SPEED MOTOR  
 15 CU IN/REV  
 3000 PSI CONT.  
 3500 PSI INTERM.  
 1500 RPM MAX CONT.  
 RINEER M015-61

Figure 1-40 H5C Hydraulic Schematic, Rescue Winch

# H5CH-C391 (CAT PL61 PIPELAYER)

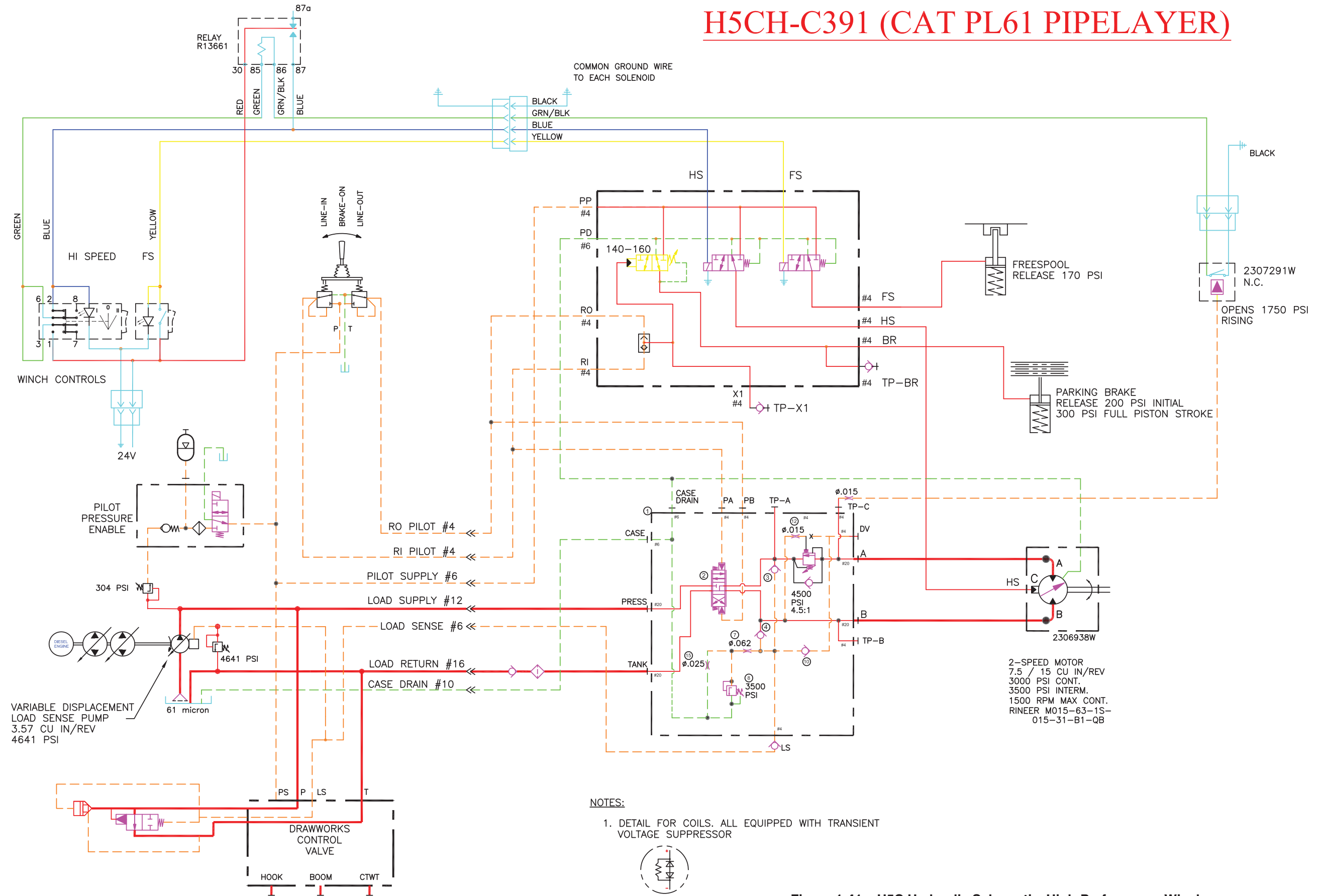
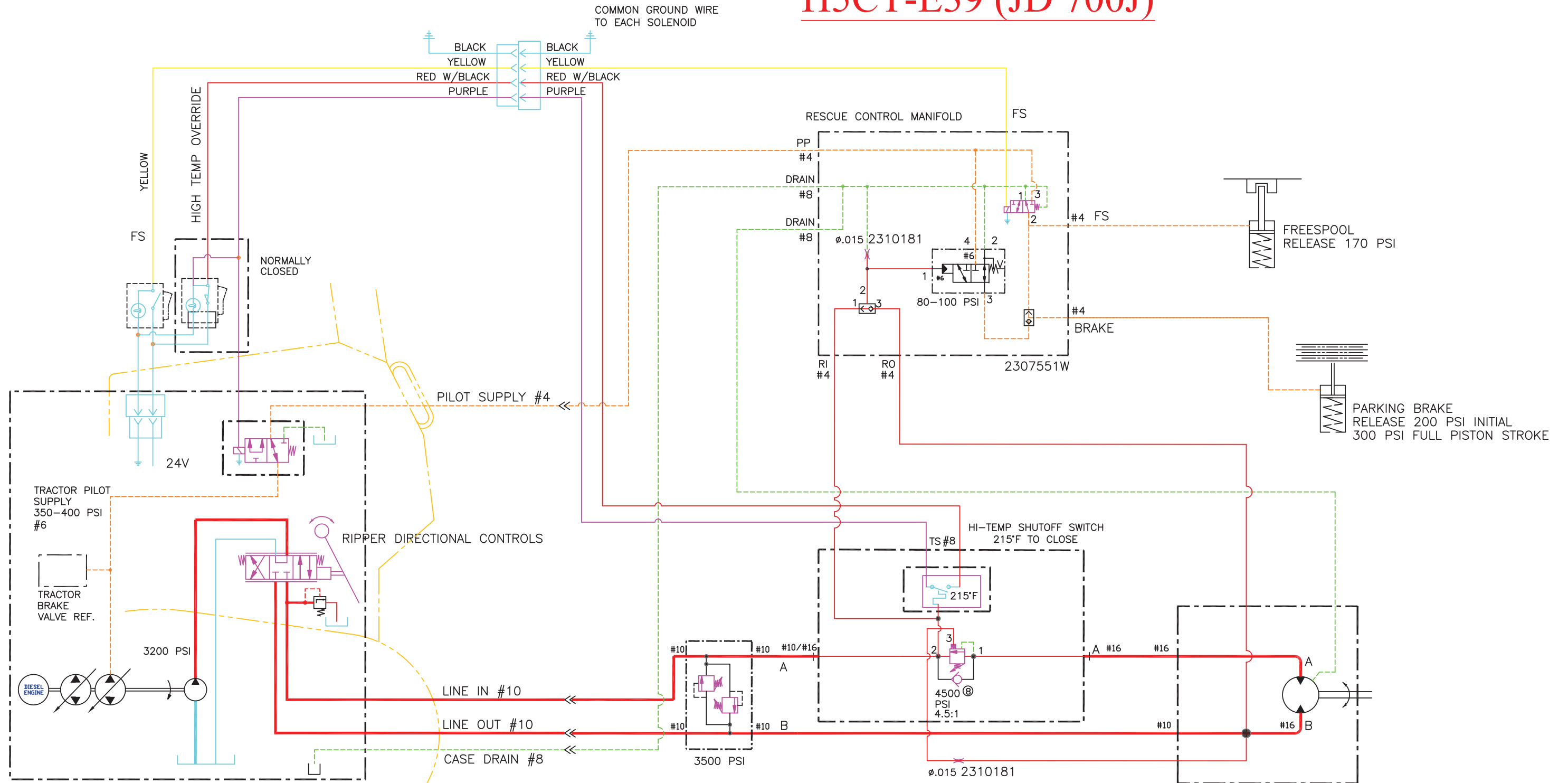


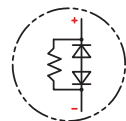
Figure 1-41 H5C Hydraulic Schematic, High-Performance Winch

# H5CT-E39 (JD 700J)



**NOTES:**

1. DETAIL FOR COILS. ALL EQUIPPED WITH TRANSIENT VOLTAGE SUPPRESSOR

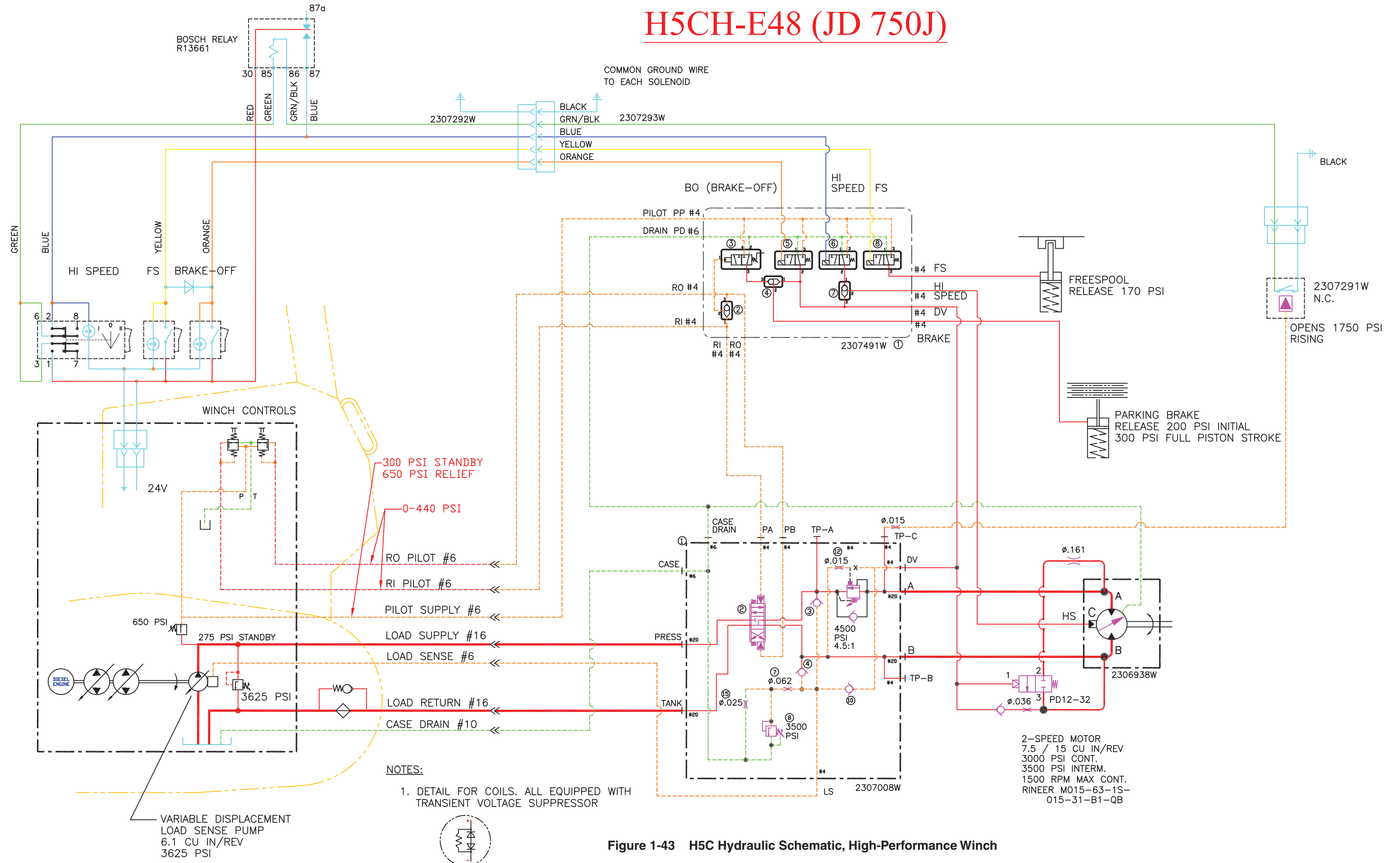


SINGLE SPEED MOTOR  
 15 CU IN/REV  
 3000 PSI CONT.  
 3500 PSI INTERM.  
 1500 RPM MAX CONT.  
 RINEER M015-61

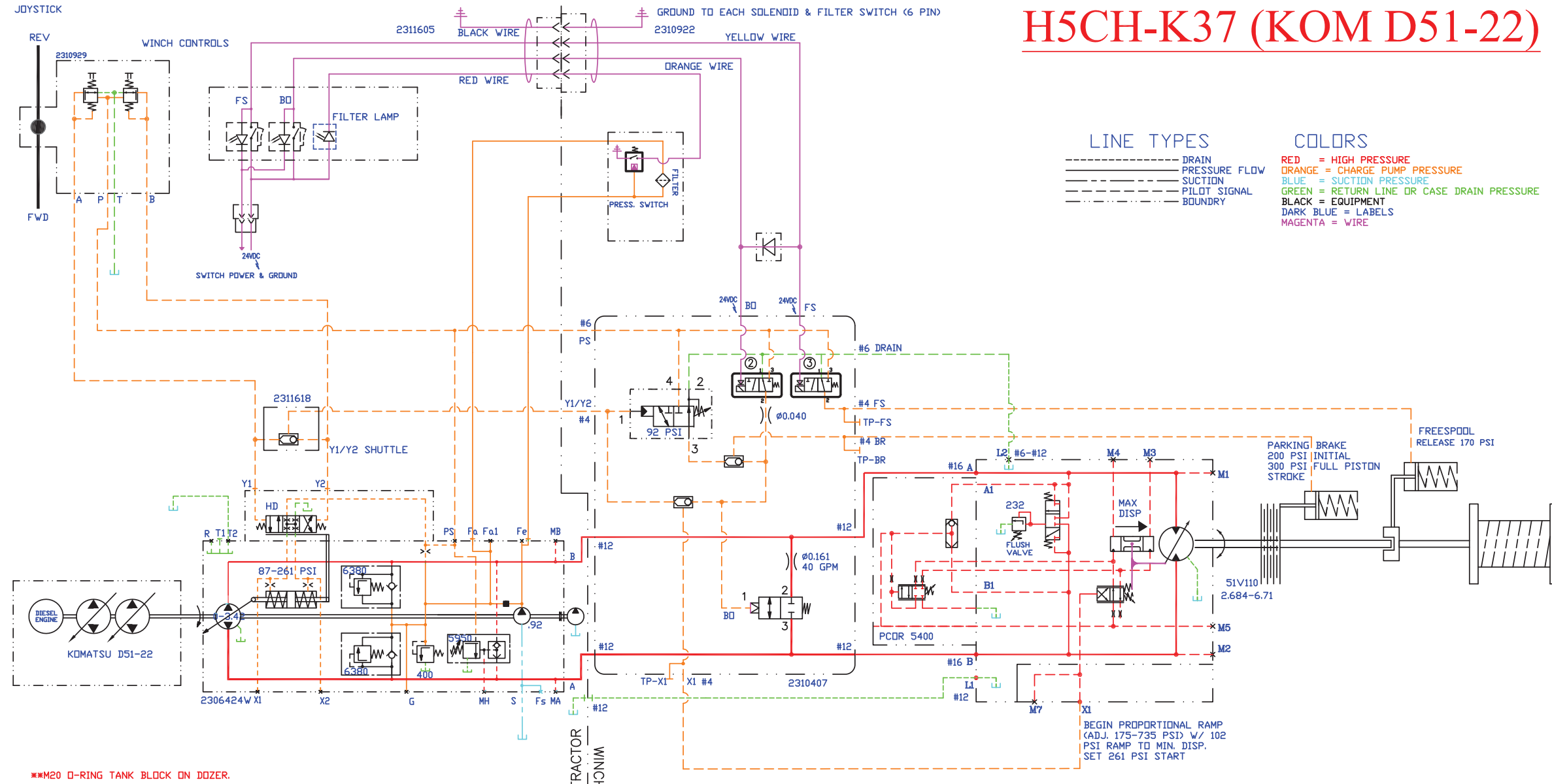
Figure 1-42 H5C Hydraulic Schematic, Rescue Winch



# H5CH-E48 (JD 750J)



# H5CH-K37 (KOM D51-22)



**LINE TYPES**  
 - - - - - DRAIN  
 ———— PRESSURE FLOW  
 - - - - - SUCTION  
 - - - - - PILOT SIGNAL  
 - - - - - BOUNDARY

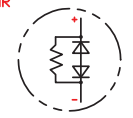
**COLORS**  
 RED = HIGH PRESSURE  
 ORANGE = CHARGE PUMP PRESSURE  
 BLUE = SUCTION PRESSURE  
 GREEN = RETURN LINE OR CASE DRAIN PRESSURE  
 BLACK = EQUIPMENT  
 DARK BLUE = LABELS  
 MAGENTA = WIRE

**\*\*M20 O-RING TANK BLOCK ON DOZER.**

**Direction of rotation-Control-Throughput flow direction:**  
 Clockwise rotation  
 Pilot pressure      Control pressure      Direction of flow      Operating pressure  
 Y1                      X1                      A to B                      MB  
 Y2                      X2                      B to A                      MA

**CONTROL MANIFOLD PORTS**  
 A,B    Main pressure lines  
 Y1/Y2    Control pressure to brake valve and motor displacement controller.  
 PS    Pilot pressure supply  
 DRAIN    Drain port for BR, FS, BD, and X1  
 TP-FS    Gauge port-Freespool pressure.  
 TP-BR    Gauge port-Brake pressure  
 TP-X1    Gauge port-motor displacement  
 X1    Motor displacement control pressure port

**NOTES:**  
 1. DETAIL FOR COILS. ALL EQUIPPED WITH TRANSIENT VOLTAGE SUPPRESSOR



**PUMP PORTS:**

A	B	high pressure ports 3/4" SAE 420 bar (6000 psi-code 62)
T <sub>1</sub>		case drain or filling port      1 1/16-12UN-2B      20 deep
TP		case drain port      1 1/16-12UN-2B      20 deep
M <sub>A</sub>		gauge port-sys. pressure A      7/16-20UNF-2B      12 deep
M <sub>B</sub>		gauge port-sys. pressure B      7/16-20UNF-2B      12 deep
R		case vent port      7/16-20UNF-2B      12 deep
S		charge suction port      1 5/16-12UN-2B      20 deep
X	X	stroking pressure ports      7/16-20UNF-2B      12 deep
C		charge pressure port      9/16-18UNF-2B      13 deep
F <sub>1</sub>		control pressure gauge port      9/16-18UNF-2B      13 deep
F <sub>2</sub>		filter outlet      3/4-16UNF-2B      15 deep
F <sub>3</sub>		filter outlet (filter assembly)      M18x1.5      12 deep
F <sub>4</sub>		filter inlet      3/4-16UNF-2B      15 deep
F <sub>5</sub>		port from filter to suction line (cold start)      M18x1.5      12 deep
M <sub>1</sub>	M <sub>2</sub>	gauge port-high pressure      7/16-20UNF-2B      12 deep
Y	X	Remote control ports      9/16-18UNF-2B      12 deep

**MOTOR PORTS:**  
 A,B    Main pressure lines (max allowable 6960 psi)  
 L1,L2    Drain lines  
 M1,M2    Gauge port for port A & B  
 M3,M4    Gauge port-servo pressure  
 M5    Gauge port-servo supply  
 M7    Gauge port-control pressure  
 X1    Control pressure port

Flow to A for line-in.  
 Based to max. displacement  
 Control end min. displacement  
 PCDR (w/o brake press. defeat)--Automatic shift to max. disp. @ 5400 psi.  
 Ramp from min. to max. disp. < 145 psi when PCDR activated.

Figure 1-44 H5C Hydraulic Schematic, High-Performance Winch

# H5CT-K37 (KOM D51)

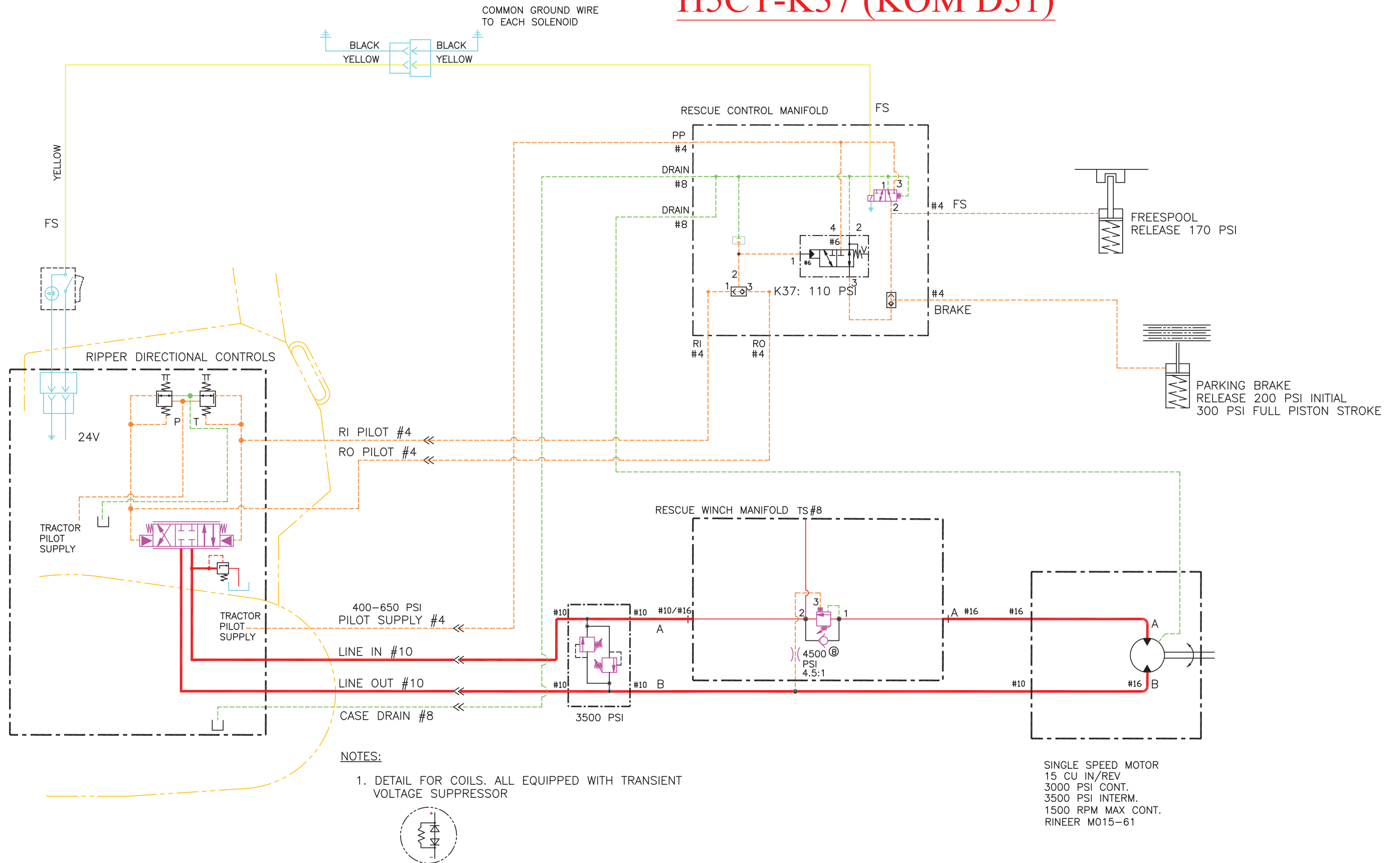


Figure 1-45 H5C Hydraulic Schematic, Rescue Winch

# H5CT-K37 2-SPEED (KOM D51-22)

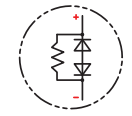
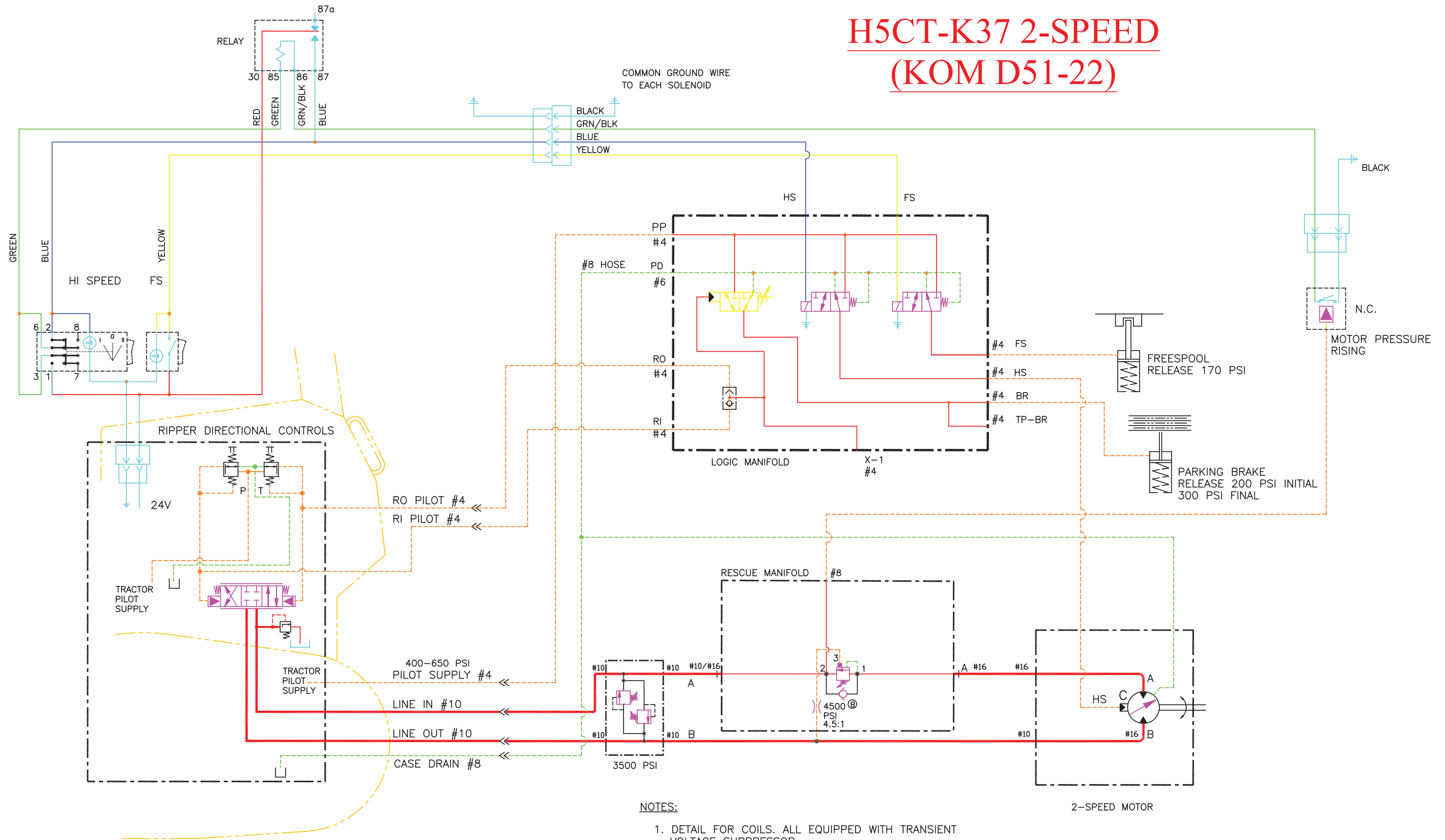


Figure 1-46 H5C Hydraulic Schematic, High-Performance Winch





## Troubleshooting

### General

Winch problems generally fall into one of three categories: controls, hydraulic system, or mechanical system. Follow the troubleshooting steps below to isolate the probable location of the malfunction.

1. Check the oil level and type. Ensure the operating temperature range for the oil is suitable for the conditions. Check the filter indicator.
2. Make sure the handlever assembly (including pilot controller unit) is functioning properly, with a full range of motion.

3. Check winch hydraulic pressures. Start with control pressures, then check main system pressures.
4. Inspect the winch gear train for problems.



### CAUTION

**For best operation and life, the winch oil operating temperature should not exceed 180°F (82°C). Winch oil reservoir temperature is monitored at the dozer. The JD750J/850J warning light will come on at 200°F (93°C).**

### Step-by-Step Pump and Controller Troubleshooting

#### 1. Winch does not operate with the tractor running.

- |     |   |     |   |
|-----|---|-----|---|
| 1.1 | Is there oil in the reservoir?  | No  | Fill tractor reservoir.   |
|     |   | Yes | Proceed to step 1.2.  |
| 1.2 | Is the winch in <b>FREESPOOL</b> ?  | No  | Proceed to step 1.3.  |
|     |   | Yes | Shift winch out of <b>FREESPOOL</b> function.                       |
| 1.3 | Is there a broken tube, loose fitting, or burst hose?                     | No  | Proceed to step 1.4.  |
|     |   | Yes | Repair the fault.   |
| 1.4 | Is the brake released?  | No  | Check brake release circuit or mechanism.                           |
|     |   | Yes | Proceed to step 1.5.  |
| 1.5 | Is the hydraulic hose routing in accordance with the hydraulic schematic? | No  | Correct the routing. Refer to the schematic & installation drawing. |
|     |   | Yes | Proceed to step 1.6.  |

#### Pilot Reducing Valve (Located on Tractor) E48

- |     |   |     |                       |
|-----|---|-----|-----------------------|
| 1.6 | Is there any pilot pressure from the tractor (port P at tractor interface or pilot check port right side of dozer)? | No  | Proceed to step 1.12. |
|     |   | Yes | Proceed to step 1.7.  |
| 1.7 | Is the pilot standby pressure at least 275±15 psi while the dozer is running at slow idle?                          | No  | Proceed to step 1.8.  |
|     |   | Yes | Proceed to step 1.10. |
| 1.8 | Is the pilot pressure 650 psi when the dozer blade is held over relief?   | No  | Proceed to step 1.10. |
|     |   | Yes | Proceed to step 1.12. |

1.10 Can the pilot pressure be increased by adjusting the tractor pilot reducing valve? No Proceed to step 1.11  
Yes Adjust to 650 psi. Proceed to 1.12.

1.11 Remove pilot reducing cartridge valve and inspect. Is it damaged? No Refit cartridge and proceed to step 1.12.  
Yes Replace cartridge and return to step 1.6.

## Winch Control

1.12 Is lever control unit connected to pilot supply? No Connect control lever and check that control signal RI & RO is actually being supplied to the winch.  
Yes Proceed to step 1.13.

1.13 Is case pressure less than 35 psi? No Check drain hoses for restriction.  
Yes Proceed to step 1.14.

1.14 Operate lever in both directions (for E48). Is pressure at RI & RO greater than the standby pilot pressure of 275±15 psi? No Verify that pilot pressure to direction spool PA & PB will cause the pump to load sense & cause pilot pressure to increase. Return to step 1.12. (See Figure 3-11)  
Yes Proceed to step 1.15 for C80 (see Figure 3-9) & K37 (see Figures 3-12 & 3-13).

1.15 Install gauges at motor ports A & B. Disconnect the brake line and move the control lever in **WINCH-IN** and **WINCH-OUT**. If pressure is below SPEC psi, is it possible to adjust the relief valve? (Refer to Section 3 for more details on pressure check procedures.) No Replace high pressure relief valve cartridge and return to step 1.12.  
Yes Adjust high pressure relief valve to SPEC psi. Proceed to step 1.16.

1.16 Re-connect the brake line and put control lever in **WINCH-IN** and **WINCH-OUT** positions. Does winch operate? No Check for mechanical faults in the drive beyond the motor shaft.  
Yes Operate the winch.

## 2. Winch is sluggish or erratic

2.1 Is the lever assembly in good condition? Is there air in pilot lines? No Repair or replace the lever assembly. If there is air in the pilot lines, bleed them.  
Yes Proceed to step 2.2.

2.2 Is the brake fully released? No Check brake release circuit or mechanism. See shuttle valve & brake valve in brake release circuit.  
Yes Operate the winch.



### 3. Winch drives in one direction only.

- 3.1 With the control lines switched does the winch drive in opposite direction only?
- No Proceed to step 3.2.
- Yes Control signal from one side of control lever does not work properly. Repair as necessary.
- 3.2 With control lines still switched, does winch drive in initial direction only?
- No Proceed to step 3.3.
- Yes Problem is one side of winch direction spool. Proceed to step 3.3.
- 3.3 Is there control pressure to PA & PB as well as from RI & RO (E48)? Refer to Figure 3-11 for the pressure at RI or RO when winch begins to drive.
- No Correct control signal problem.
- Yes Operate the winch.
- 3.4 Is there control pressure to PA & PB as well as from X1 & X2 (C80)? Refer to Figure 3-9 for the pressure at X1 or X2 when winch begins to drive.
- No Correct control signal problem.
- Yes Operate the winch.
- 3.5 Is there control pressure to PA & PB as well as from Y1 & Y2 (C80)? Refer to Figures 3-12 & 3-13 for the pressure at Y1 or Y2 when winch begins to drive.
- No Correct control signal problem.
- Yes Operate the winch.

**Figure 2-1 Troubleshooting Chart**

PROBLEM	POSSIBLE CAUSE	CORRECTION
Winch gets very hot.	Low oil level.	Add oil; refer to tractor oil specifications.
	Improper oil viscosity.	Use correct oil grade; refer to tractor oil specifications.
	Winch coated with dirt.	Clean winch.
	Clogged filter or strainer.	Replace tractor filter.
	Clogged cooler.	Clean cooler.
Operation is rough.	Low oil level.	Add oil; refer to tractor oil specifications.
	Low pilot pressure.	Look for leaks in hydraulic system. If none are found, see Pilot Supply Reducing Valve Adjustment. (E48) (see Figure 3-11)
	Wire rope jumps layers on drum.	Spool wire rope more evenly.
	Motor hunting between high and low speed.	Clean or replace high speed component.

(Continued on next page)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Operation is noisy ( <b>NOTE: motor is significantly noisier in HI-SPEED mode</b> ).	Incorrect oil used.	Drain reservoir and re-fill with correct oil; refer to tractor oil specifications.
	Air in the hydraulic oil (indicated by foaming or milky-colored oil).	Replace oil and inspect for leaks and other sources of air induction.
	Motor damaged.	Some noise is normal. However, excessive clattering could indicate damage. Inspect pump and motor thoroughly.
	Gear or bearing damage.	Visually inspect & repair as needed.
Drum continues to rotate after control lever is returned to <b>BRAKE-ON</b> .	Direction spool not shifting to centered position.	Direction spool sticking. Clean or replace. Control lever valve plunger sticking. Repair.
	Brake not engaged or worn.	Repair brake.
	Counterbalance valve stuck open.	Repair or replace valve.
Winch will not generate sufficient line pull or does not line in or line out.	Worn or damaged components in the gear train.	Visually Inspect to identify damaged components. Repair and replace as necessary.
	Brake not releasing due to insufficient brake release pressure or leak in brake.	Check that brake release pilot pressure is more than 200 psi in <b>WINCH-IN</b> and <b>WINCH-OUT</b> functions. If pilot pressure is too low, check for leaks, faulty control lever, or insufficient pilot supply pressure. See Step By Step Pump and Controller Troubleshooting section in this chapter. If brake is leaking, repair as needed.
	Brake shuttle valve stuck.	Clean or replace as necessary.
	Leak in hydraulic system other than brake assembly.	Plug brake line and check that pressure at motor ports A & B (See Hydraulic System Pressure Check Tables).
	Leak in motor speed spool relief cartridge ( <b>HI-SPEED</b> only).	Check that the pressures at motor test ports A & B are sufficient for operating the winch in <b>WINCH-IN/OUT</b> with the brake line plugged. If the pressure is low and registered simultaneously at A and B, leakage is occurring past the relief valve. Remove and repair the valve.
	Clogged filter.	Tractor filter indicator light will illuminate if filter is clogged. Replace filter. Refer to tractor specifications.
	Wrong oil.	Use correct oil grade; refer to tractor oil specifications.
	Low oil level in reservoir.	Add oil; refer to tractor oil specifications.
	Tractor pump not generating adequate pressure. (E39, E48 & K37 Rescue)	Hold blade over relief and measure supply pressure at right side of dozer. If pressure is below 3625 psi see tractor service manual for proper adjustment.
	Damaged freespool components may be causing winch to be stuck in <b>FREESPOOL</b> .	Inspect freespool shaft for wear or damage, repair or replace as necessary.
Motor damaged.	Repair or replace motor (refer to Section 4).	

Figure 2-1 Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>BRAKE-OFF</b> function will not operate or is difficult to engage.	<b>BRAKE-OFF</b> solenoid is not energized.	Check resistance to ensure it's 35 ohms at the coil. Repair power supply or replace coil and/or solenoid.
	Insufficient control pressure from tractor pilot supply.	<ol style="list-style-type: none"> <li>1. Measure control pressure to <b>BRAKE-OFF</b> bypass valve (170 psi to shift). (E48)</li> <li>2. Check for leaks at hydraulic connections.</li> <li>3. See Pilot Supply Relief Adjustment.</li> </ol>
<b>FREESPOOL</b> will not function or is difficult to engage.	<b>FREESPOOL</b> shifter fork or collar stuck.	Remove top covers and inspect shifter fork & collar with joystick in <b>FREESPOOL</b> position. Repair parts if damaged.
	Leakage at hydraulic connection or <b>FREESPOOL</b> shaft.	Remove top covers and inspect shifter fork with joystick in <b>FREESPOOL</b> position. Replace seals if leaking.
	Insufficient control pressure from tractor pilot supply.	<ol style="list-style-type: none"> <li>1. Measure control pressure at brake (BR) port and <b>FREESPOOL</b> (FS) hose (refer to Section 3).</li> <li>2. Check for leaks at hydraulic connections.</li> </ol>
	<b>FREESPOOL</b> solenoid is not energized.	Repair power supply or replace coil and/or solenoid.
	Load on wire rope.	Move lever to <b>WINCH-OUT</b> to release load.
<b>HI-SPEED</b> function will not operate.	2-speed spool in motor stuck.	Clean and/or repair 2-speed spool.
	2-speed pressure switch malfunctioning (normally closed.)	Repair or replace 2-speed pressure switch.
	2-speed relay malfunctioning.	Repair or replace relay.
	2-speed solenoid is not energized.	Repair power supply or replace coil and/or solenoid.
Winch case oil level too high.	Too much oil added.	Drain oil until level at oil level plug.
Winch case oil level too high and tractor reservoir too low.	Oil leak from <b>FREESPOOL</b> hose or piston.	Visually inspect and repair as needed.
Lever does not automatically return to <b>BRAKE-ON</b> position.	<ol style="list-style-type: none"> <li>1. Plunger seal sticking in lever.</li> <li>2. Spring in pilot controller unit broken.</li> </ol>	Remove and inspect pilot controller unit on control lever assembly. Replace worn parts or entire assembly as necessary.
Winch does not respond to control lever movement.	<ol style="list-style-type: none"> <li>1. Leak in the pilot controller unit on control lever assembly.</li> <li>2. Control valve seized or blocked.</li> </ol>	Check for leaks in control lever assembly and replace if necessary.
	Leak in hydraulic system, or loose hydraulic connections.	Visually inspect winch for leaks, and ensure hydraulic connections are secure.
Line speed is abnormally slow for <b>WINCH-IN</b> , <b>WINCH-OUT</b> or both.	<ol style="list-style-type: none"> <li>1. Poor pressure signal.</li> <li>2. Leak in the pilot controller unit in the control lever assembly.</li> </ol>	Visually inspect to check for wear on control lever assembly. Check for leaks in pilot controller unit and replace if necessary.
	Leak in hydraulic system, or loose hydraulic connections.	Visually inspect winch for leaks, and ensure hydraulic connections are secure.
Lever handle turns.	Handle parts loose.	Tighten all lever handle parts.
LEDs in switch panel do not illuminate.	Polarity backward.	Reverse plug connection.
	Faulty LED.	Replace LED.

Figure 2-1 Troubleshooting Chart



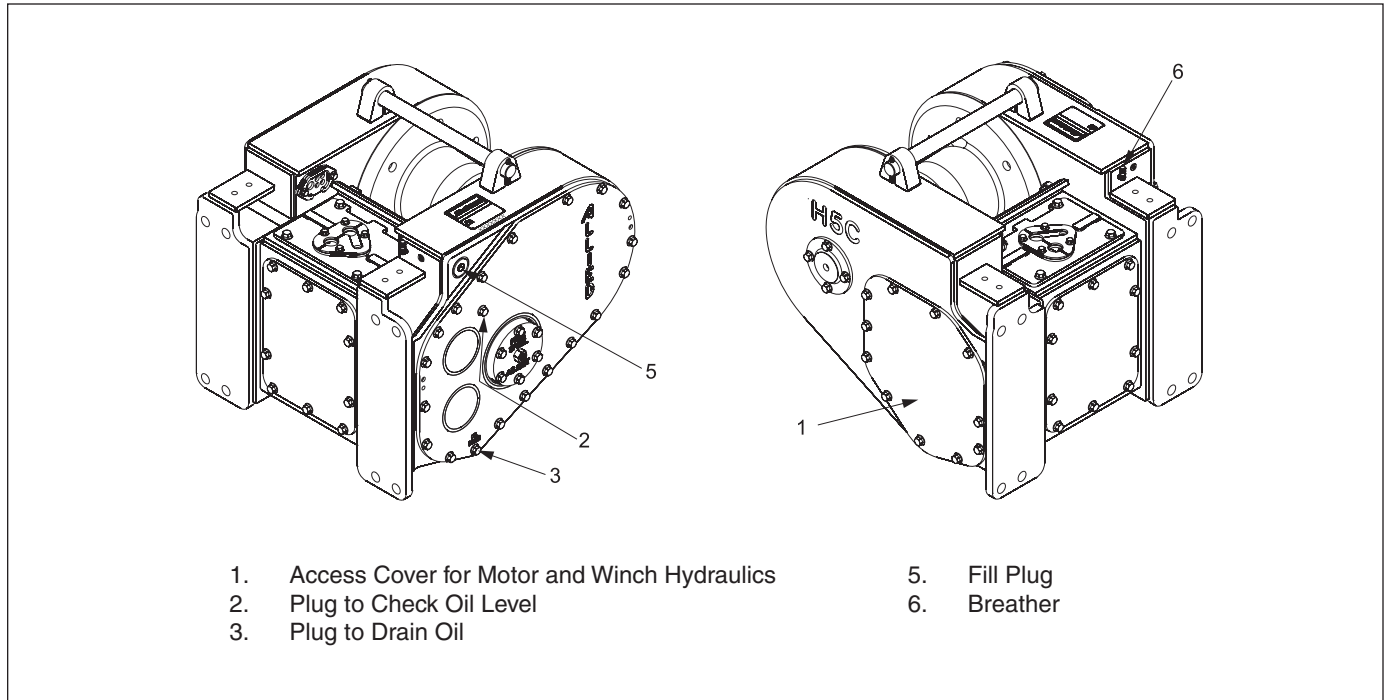
## Service

### 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.



**Figure 3-1 - H5C Winch Maintenance Points**

INTERVAL	PROCEDURE OR QUANTITY	SPECIFICATION
50 hours or weekly	Check oil level at plug (item 2). Add oil as necessary through fill plug (item 5). <b>Do not operate tractor when checking the oil level.</b>	Use transmission fluid or gear lubricant.
	Clean the breather (item 6).	Remove debris around breather. Clean the breather with solvent if necessary.
	Lubricate the rollers on the integral arch or the fairlead assembly, if the winch is equipped with either of these options.	Use multi-purpose grease with 2-4% molybdenum disulfide.
2000 hours or every 12 months	Change the gear oil. Drain oil from plug (item 3). Add 5 gallons through fill plug (item 5). Check the oil level at oil level check plug (item 2).	Use transmission fluid or gear lubricant (see Figure 3-24).

**Figure 3-2 - H5C Winch Maintenance Schedule**

## Checks Before Operation

Check that the wire rope and hook are not worn or damaged. Check that the periodic inspection and maintenance have been done at the recommended operating hours. See the H5C Winch Maintenance Schedule on page 3-1.

## 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.

## FREESPOOL Drag Adjustment (See Fig. 3-3)

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

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

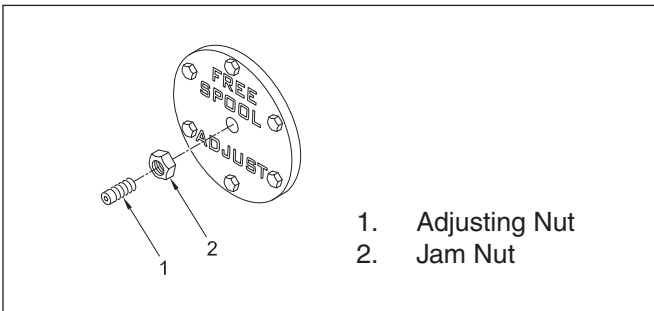


Figure 3-3 Freespool Adjustments

## Hydraulic System Pressure Checks

The hydraulic oil and filter(s) should be maintained as indicated in the tractor Service Manual. 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 **WINCH-OUT** to raise the oil temperature. Another way to elevate the reservoir temperature is to hold the tractor blade over relief. The oil temperature in the winch or tractor reservoir must be at least 20°C (70°F).
3. Remove any dirt from the left side of the winch. Remove control valve access plate.
4. Stabilize engine speed at idle RPM for all tests.
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 side covers and tighten capscrews.

### Pressure gauges

Six calibrated pressure test gauges are required to perform the hydraulic pressure checks: four 1000 psi (6895 kPa) and two 7500 psi (51,710 kPa) test gauges.

### Standby Pilot Supply Pressure Check (E48)

With the engine shut off, connect a 1000 psi gauge to the tractor pilot test port. This is behind the battery access panel and is the quick-connect port on the pilot reducing manifold (see tractor Service Manual). Start the engine and follow procedure in Figures 3-17 through 3-21. Adequate standby pilot supply is required for both tractor and winch functions.

If the pressure is not as specified, check for:

1. Improper pilot supply reducing valve setting or malfunction (See tractor Service Manual)

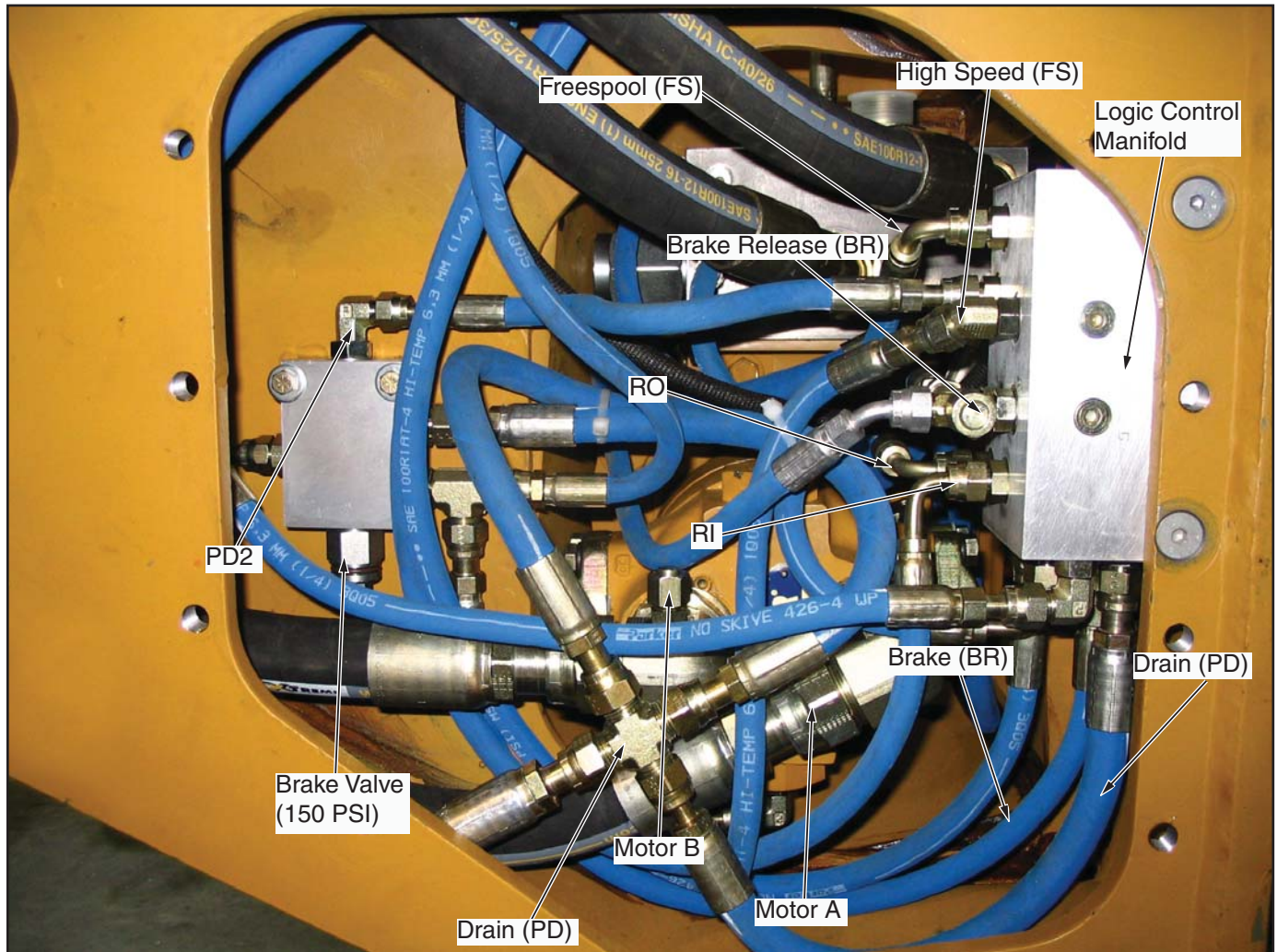


Figure 3-4 Hydraulic Pressure Test Ports: S/N H5CH-1020 and below

2. Pump standby pressure setting incorrect (See tractor Service Manual)
3. Leaking pressure hoses or fittings

#### Maximum Pilot Supply Pressure Check

With the same gauge installed from the Standby Pilot Pressure Check, bottom tractor blade cylinders and measure Relief Pilot Supply Pressure. When the tractor pump senses a load, the maximum pilot supply pressure is reduced to the setting of the tractor pilot reducing valve. Excessive pilot supply pressure may cause damage to tractor and winch components.

If pressure is not as specified in Figures 3-17 through 3-21, check the following:

1. Improper pilot supply reducing valve setting or malfunction (See tractor Service Manual)
2. Leaking pressure hoses or fittings

#### Counterbalance Valve Pressure Check (E48, K37 Rescue, E39)

With the engine shut off, connect one 7500 psi pressure gauge to Motor Port B. Start the engine and place control lever in **WINCH-OUT** to build pressure against the counterbalance valve. Check pressure as indicated in Figures 3-17 through 3-21. Pressure on the B side of the motor is a ratio of the relief setting of the counterbalance valve. If pressure is not to specification, do not adjust valve until remaining pressure diagnostics are performed and other problems are identified.

## Counterbalance valve adjustment:

1. Start engine and place control lever in **WINCH-OUT** position
2. Measure pressure at Motor Port B.
3. Loosen Counterbalance Valve locknut. Turn counterbalance valve adjusting capscrew **IN** to decrease pressure and **OUT** to increase pressure. Adjust pressures as shown in Figures 3-17 through 3-21.

## Motor Supply Pressure Check

With the engine shut off, connect one 7500 psi pressure gauge to Motor Port A and one 7500 psi gauge to Motor Port B. Disconnect and plug the brake release hose from the brake. This will lock the winch brake to build pressure in the motor. Check pressure as indicated in Figures 3-17 through 3-21. If pressure is too high, adjust the load sense relief valve (see Figure 3-5 for E48), or main relief (see

Figure 3-6 for C80 and K37). If it is too low, proceed with pressure diagnostics to identify other possible problems. A damaged motor or pump can cause low pressure at the motor.

## Load sense valve adjustment (E48):

1. Leave the brake pressure supply disconnected.
2. Start the engine and operate the winch in **WINCH-IN** or **WINCH-OUT**.
3. Measure the pressure at Motor Port A for **WINCH-IN** or Port B for **WINCH-OUT**.
4. Loosen Load Sense Valve locknut. Turn adjusting capscrew **OUT** to decrease pressure and **IN** to increase pressure. Adjust pressures as shown in Figures 3-17 through 3-21.
5. Reconnect brake pressure supply hose.

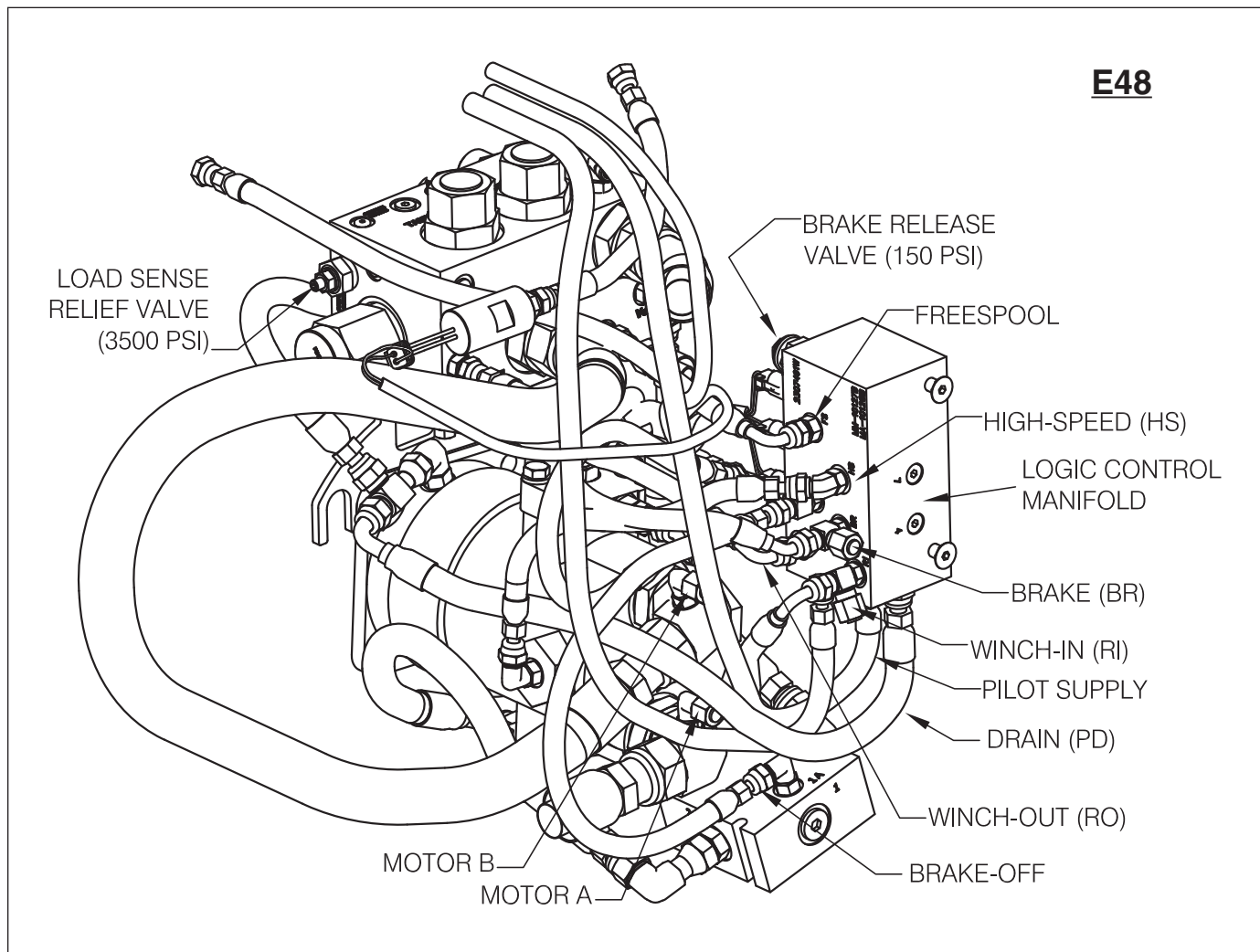
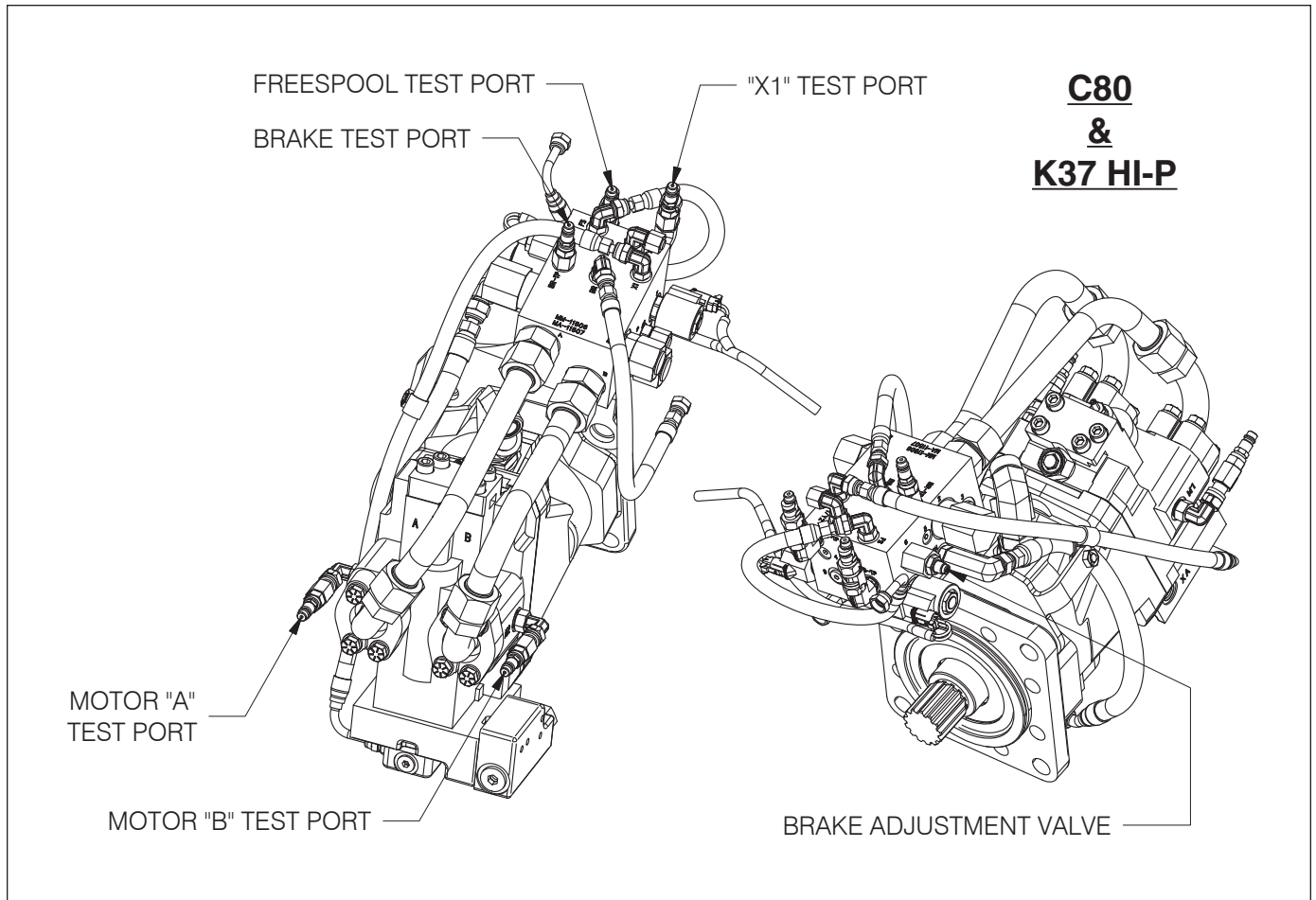
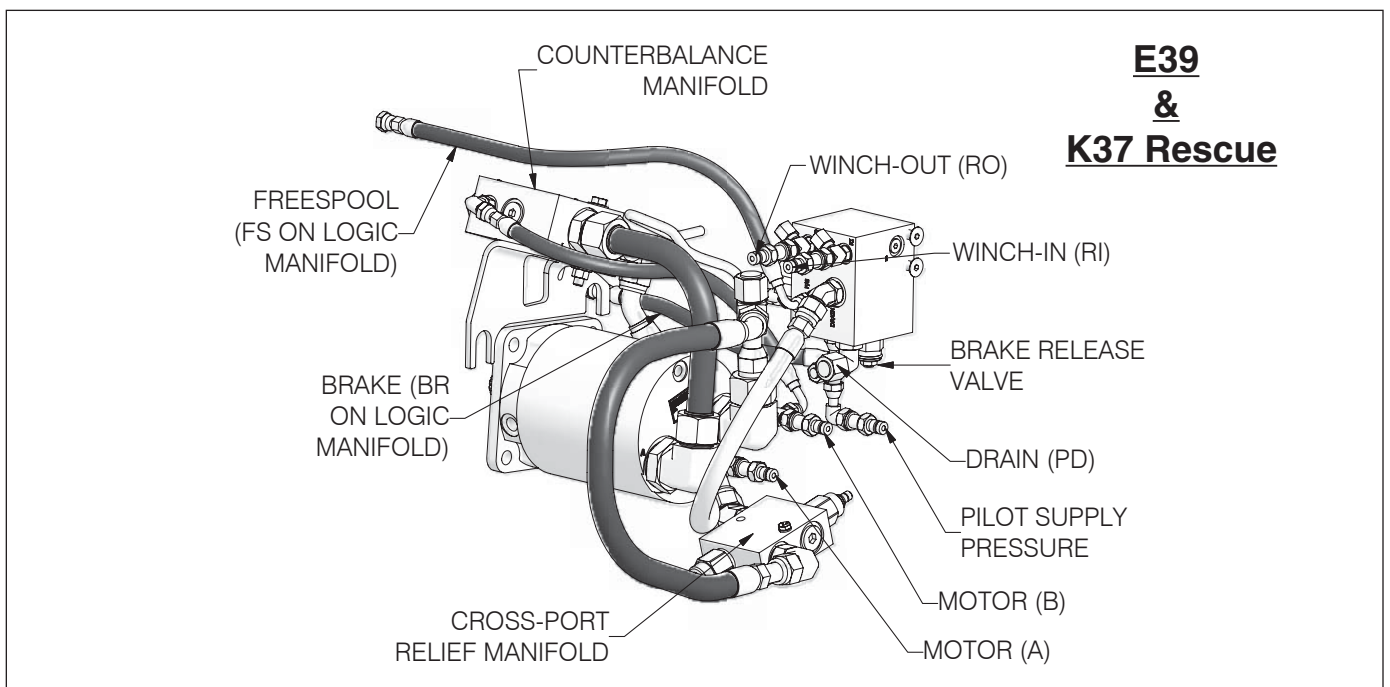


Figure 3-5 Hydraulic Pressure Test Ports: S/N H5CH-1021 and above (some items removed for clarity)





**Figure 3-6 Hydraulic Pressure Test Ports for H5CH Winches (some items removed for clarity)**



**Figure 3-7 Hydraulic Pressure Test Ports for H5CT Winches (some items removed for clarity)**

**E39**

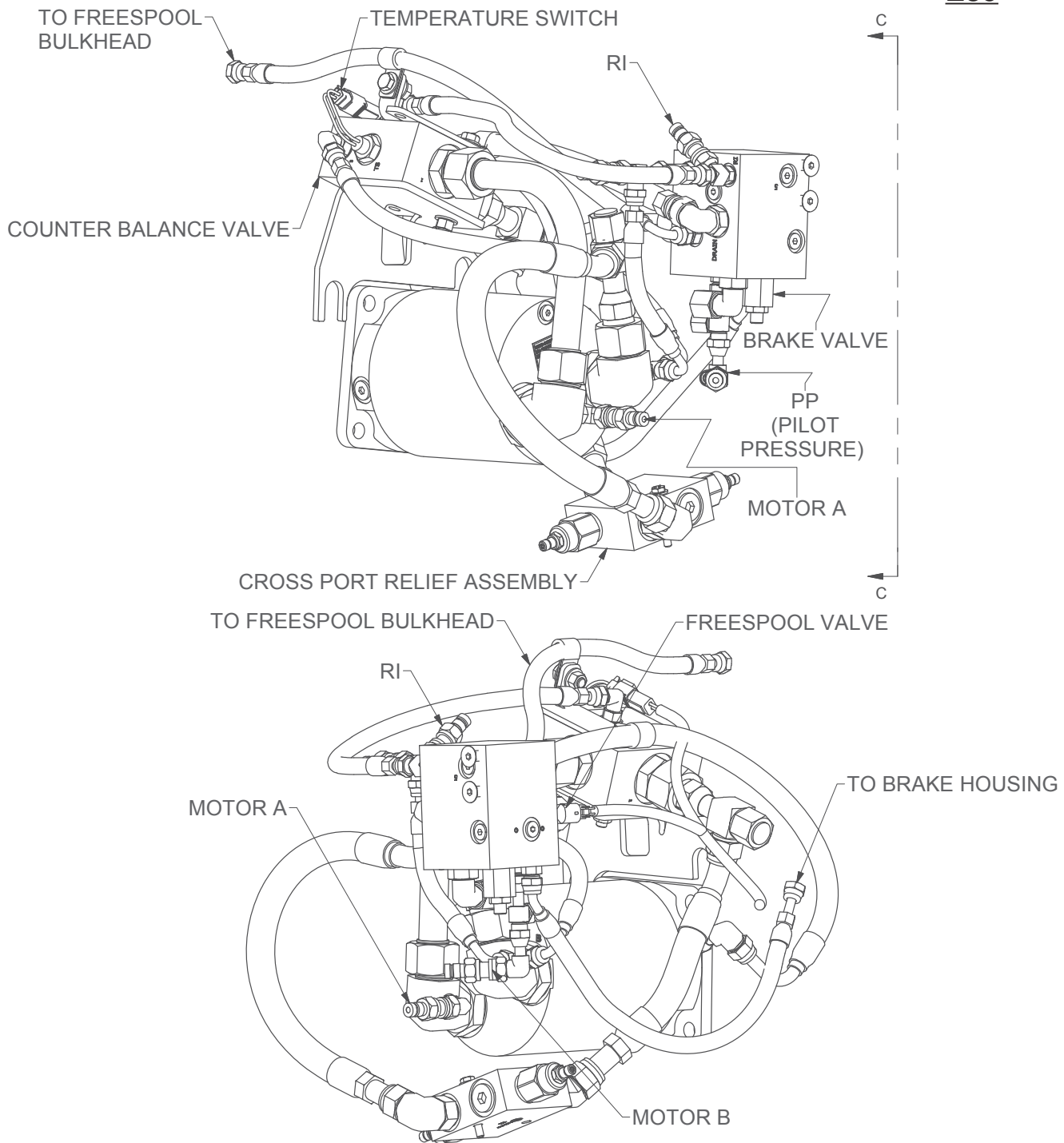


Figure 3-8 Hydraulic Pressure Test Ports: H5CT\*E/U (some items removed for clarity)

**K37**

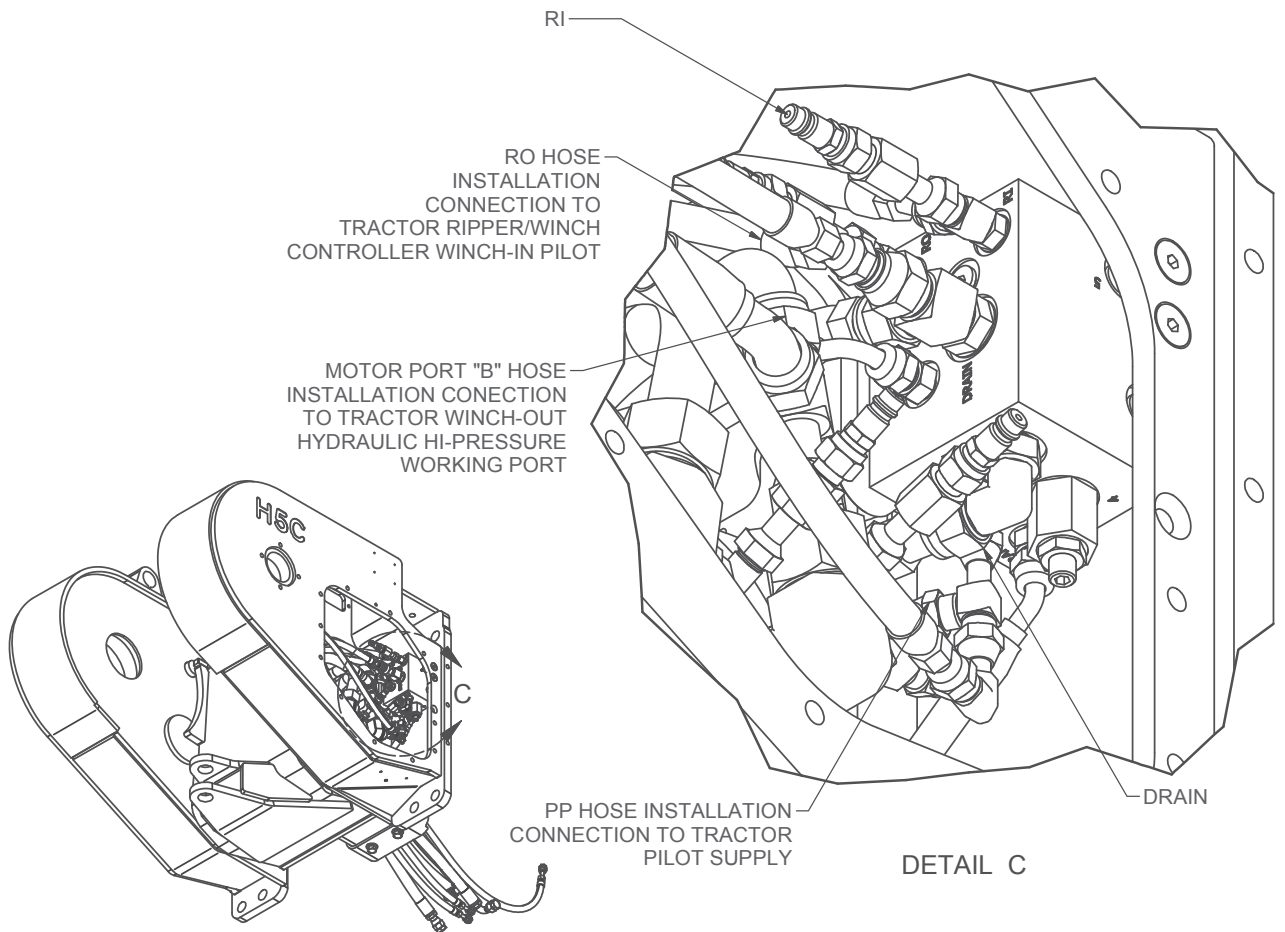


Figure 3-9 Hydraulic Pressure Test Ports: H5CT\*\*K37 (some items removed for clarity)

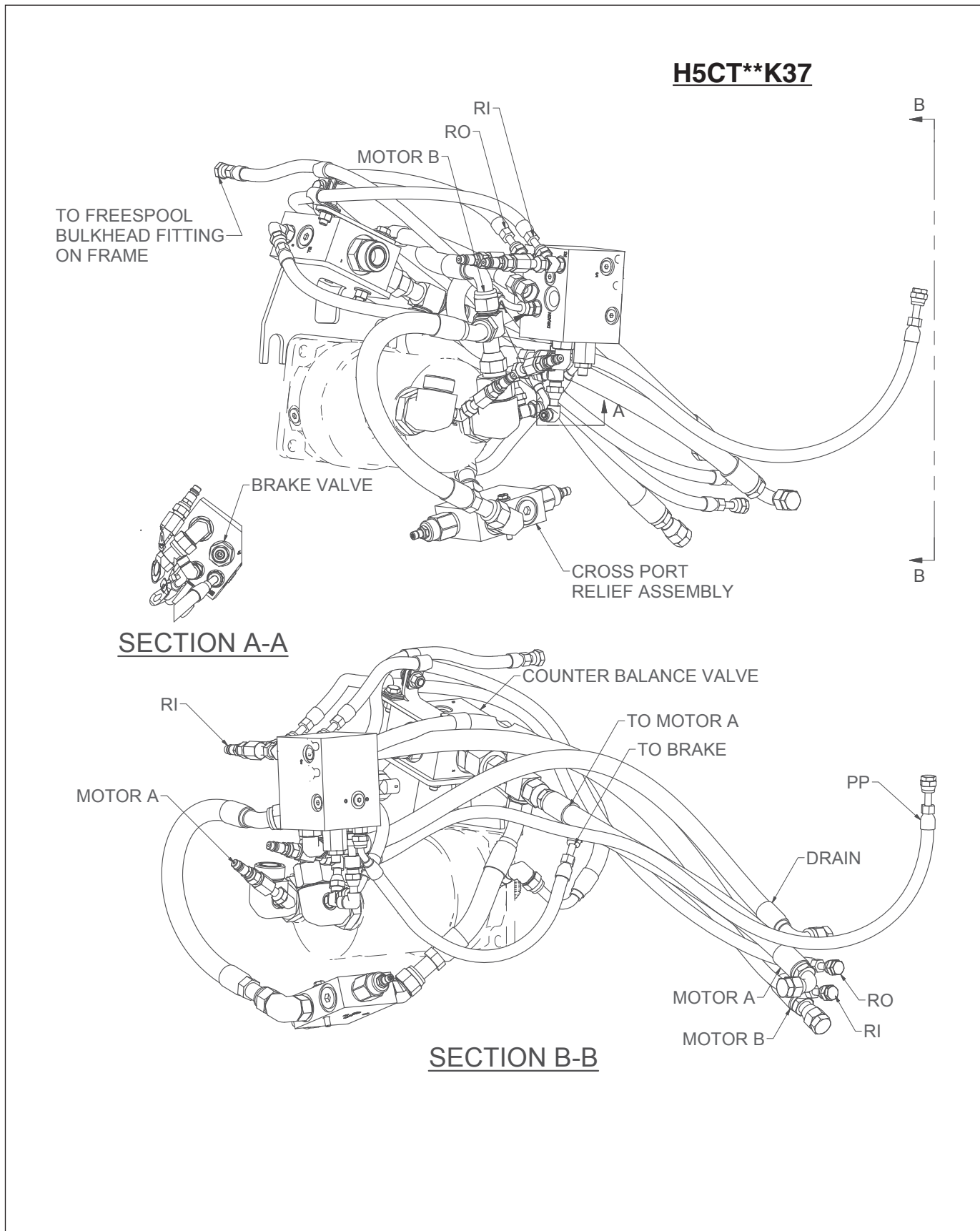


Figure 3-10 Hydraulic Pressure Test Ports: H5CT\*\*K37 (some items removed for clarity)

**H5CT\*\*DK37**

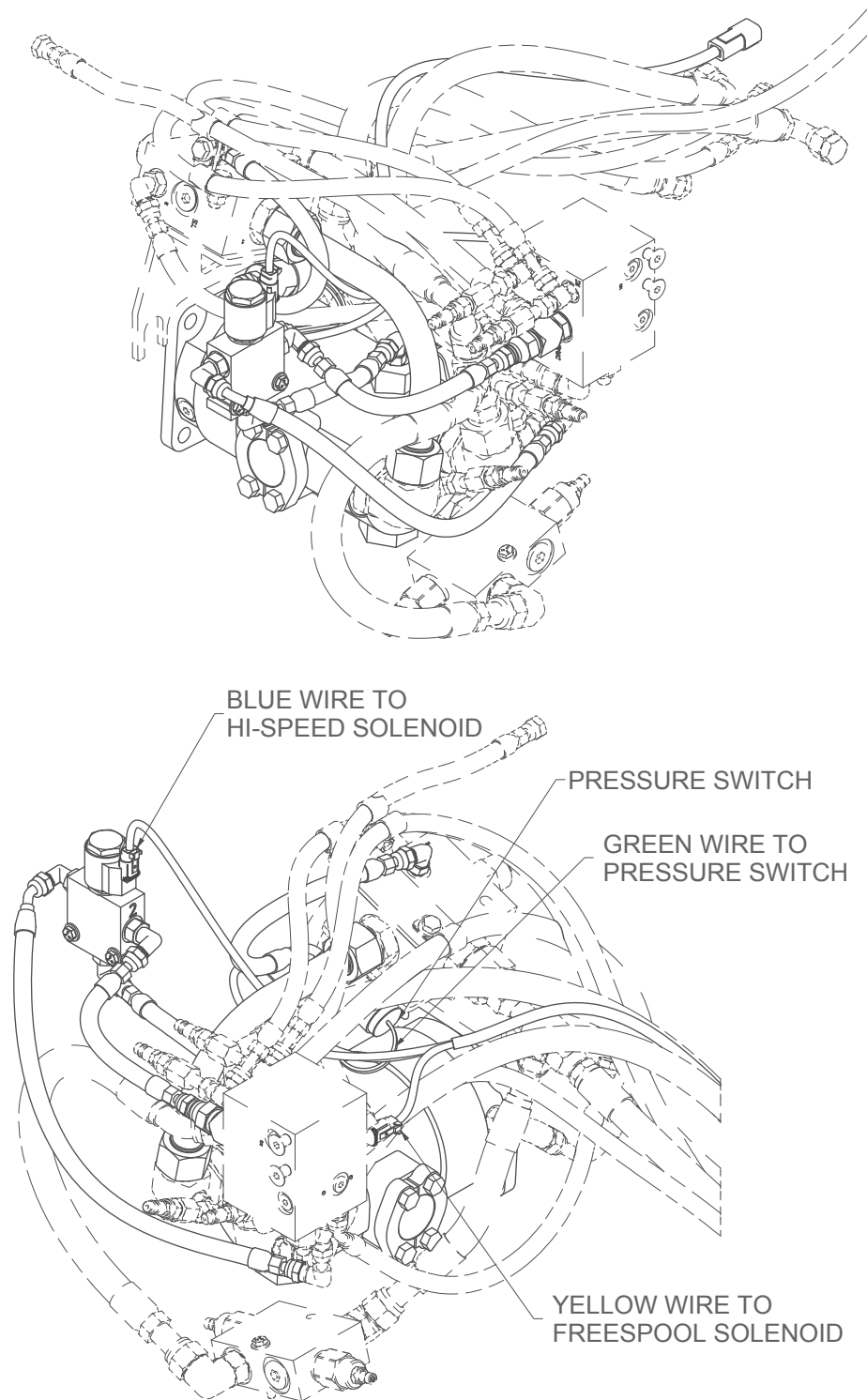
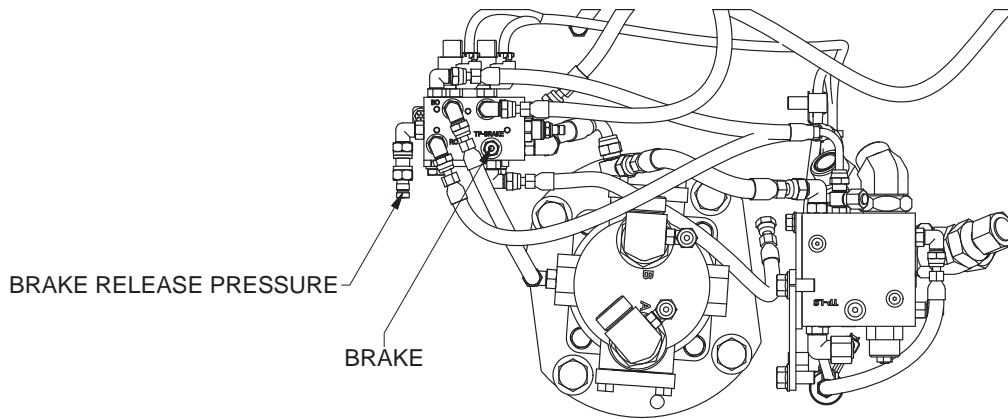
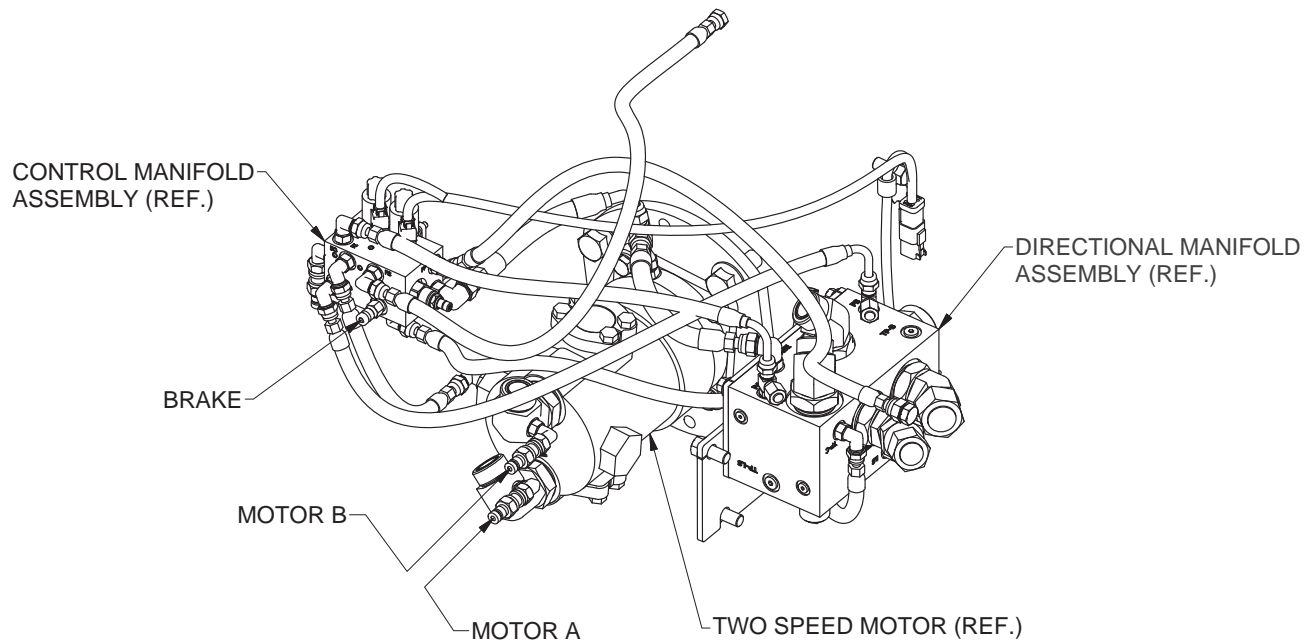


Figure 3-11 Hydraulic Pressure Test Ports: H5CT\*\*DK37 (some items removed for clarity)

**H5CT\*\*C391**



WINCH RIGHT SIDE



**Figure 3-12 Hydraulic Pressure Test Ports: H5CT\*\*C391 (some items removed for clarity)**

## Brake Pressure Check

With the engine shut off, connect one 1000 psi pressure gauge to the BR pressure test port on the logic control manifold. Start the engine and operate the winch in **WINCH-IN** and **WINCH-OUT**. Check pressure as indicated in Figures 3-17 through 3-21. The brake requires a minimum of 200 psi to release. Low pressure will result in premature wear of the friction discs and added heat generation.

If the brake pressure is not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure.
2. Malfunctioning control lever; low Y1/Y2 (for C80 and K37), RI and/or RO pressure.
3. Leaking pressure hoses or fittings.
4. Restriction in pressure hose or manifold port.

## Brake Valve Pressure Check

With the engine shut off, connect one 1000 psi pressure gauge to the BR pressure test port and one 1000 psi pressure gauge to the RI pressure test port (for E48, K37 Rescue, and E39 rescue), or Y1/Y2 port (for C80 and K37) on the logic control manifold. Start the engine and slowly meter the control lever into the **WINCH-IN** position while monitoring both gauges. BR pressure will jump to full pilot supply pressure when RI reaches the RI pilot setting of the valve. Check pressure as indicated in Figures 3-17 through 3-21. The brake valve sets the overlap between the hydraulic motor drive and brake release. A low setting on the brake release valve will release the brake before the motor begins driving. A high setting on the brake release valve will momentarily drive the motor against the brake before the brake releases.

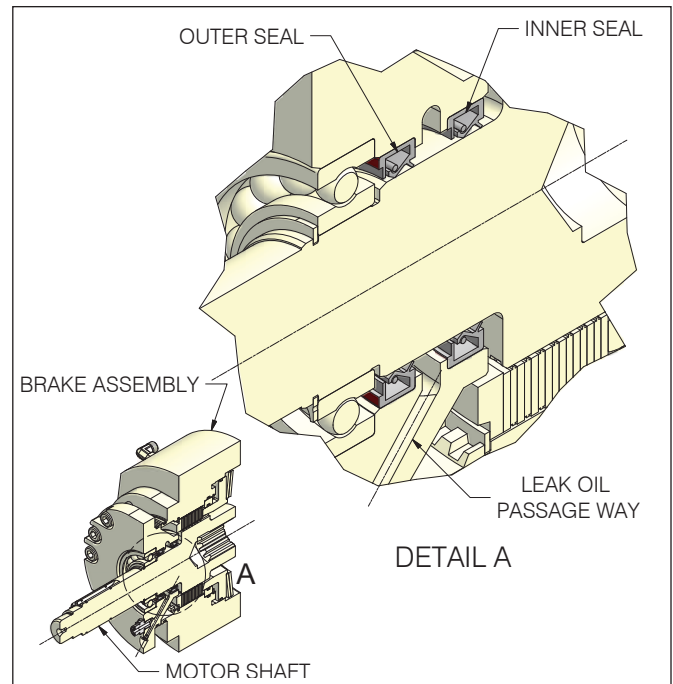
Brake Valve Adjustment:

1. Slowly meter the control lever into the **WINCH-IN** position.
2. Measure pressure at BR and RI pressure test ports.
3. Loosen Brake Valve locknut. Turn adjusting capscrew **OUT** to decrease pressure and **IN** to increase pressure. Adjust pressures as shown in Figures 3-17 through 3-21.

## Brake Piston Leakage Check

One indication of brake service being needed is if oil is

detected leaking in to the center section of the frame under the hydraulic motor, towards the front. There is a threaded port in the bulkhead that is connected by a hose to a passage between the two oil seals on the motor shaft. The first seal is designed to keep the gear case oil from leaking in to the brake area. The second seal on the brake side of the passage way is a back up, to make sure the brake disc area stays free from any oil.



**Figure 3-13 Brake Seals**

The brake can be tested for holding power by performing the motor supply pressure check described earlier in this section. If the drum turns during this test, then the brake will need to be disassembled and repaired.

A second test to isolate the brake problem, is for the brake piston seals. These can be tested by pressurizing the brake port on the brake assembly with a hand pump. Pump it up to 300 psi and it should hold. If the pressure bleeds off, that means the brake piston seals have failed and the brake discs are saturated with oil. **Oil-saturated brake discs must be replaced.**

If you need to service the brake piston, the hydraulic motor will need to be removed first to provide access to the entire brake assembly.

If the brake piston passes the seal test, then you can access the brake disc from the gear case side using the procedures described as Brake Assembly Removal in Section 4.

## FREESPOOL Pressure Check

For E48, with the engine shut off, connect 1000 psi pressure gauges in line on the FS port at the logic control manifold, BR pressure test port, in line on the HS hose, and in line on the DV hose. Start the engine and measure pressure at each respective gauge with the **FREESPOOL** switch activated. **FREESPOOL** mode simultaneously sends pilot pressures to the **FREESPOOL** shift fork, the brake, the motor speed spool, and the **BRAKE-OFF** valve. All **BRAKE-OFF** functions occur when the winch is in **FREESPOOL** mode. This includes a pilot pressure signal that load senses the pump and elevates the pilot pressure to each respective port. Therefore, pressures will be greater than the standby pilot setting. The **FREESPOOL** shift fork will shift at a minimum of 170 psi. However, the added features of **BRAKE-OFF** mode will not be active at this pressure.

For C80 and K37, with the engine shut off, connect 1000 psi pressure gauges in line on the FS port at the logic control manifold, BR pressure test port, in line on the X1 port in manifold. Start the engine and measure pressure at each respective gauge with the **FREESPOOL** switch activated. **FREESPOOL** mode simultaneously sends pilot pressures to the **FREESPOOL** shift fork, the brake, the motor speed spool, and the **BRAKE-OFF** valve. All **BRAKE-OFF** functions occur when the winch is in **FREESPOOL** mode. The **FREESPOOL** shift fork will shift at a minimum of 170 psi. However, the added features of **BRAKE-OFF** mode will not be active at this pressure.

All pressures should be as specified in Figures 3-17 through 3-21.

If pressures are not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure
2. Malfunctioning solenoid valve.
3. Leaking pressure hoses or fittings
4. Restriction in pressure hose or manifold port
5. Loose DV lube orifice in B motor port block fitting.

## HI-SPEED Pressure Check

For E48, with the engine shut off, connect a 1000 psi pressure gauge in line on the HS hose at the logic control manifold. Start the engine and measure pressure with the **HI-SPEED** switch activated. The **HI-SPEED** mechanism also incorporates a pressure switch and electric relay. The

pressure switch opens at a set load on the winch when the winch is operated in **HI-SPEED**. The **HI-SPEED** electric signal is opened when the relay opens and the winch automatically shifts to the slow speed mode. To check that this feature is functioning properly, without wire on the drum, disconnect and plug the brake pressure hose. Activate the **HI-SPEED** switch and operate the winch in **WINCH-IN**. Pressure at the HS gauge should decrease to a low value, equal to case pressure, and the LED light in the **HI-SPEED** switch will deactivate.

For C80 and K37, with the engine shut off, connect a 1000 psi pressure gauge in line on the X1 port at the logic control manifold. Start the engine and measure pressure with the lever in reel.

All pressure should be as specified in Figures 3-17 through 3-21.

If the **HI-SPEED** pressure is not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure.
2. Malfunctioning solenoid valve.
3. Leaking pressure hoses or fittings.
4. Restriction in pressure hose or manifold port

If the **HI-SPEED** automatic shift down does not function for E48, check for:

1. Faulty pressure switch or relay.
2. Stuck motor speed spool.

## BRAKE-OFF Pressure Check

For E48, with the engine shut off, connect 1000 psi pressure gauges on the BR pressure test port, in line on the HS hose, and in line on the DV hose. Start the engine and measure pressure at each respective gauge with the **BRAKE-OFF** switch activated. **BRAKE-OFF** mode simultaneously sends pilot pressures to the brake, the motor speed spool, and the **BRAKE-OFF** manifold. This includes a pilot pressure signal that load senses the pump and elevates the pilot pressure to each respective port. Therefore, pressures will be greater than the standby pilot setting. Also, a flow of several gallons of oil from the DV pilot signal is flooded into the B motor port for lubrication as the motor circulates during **BRAKE-OFF** mode.

For C80 and K37, with the engine shut off, connect 1000 psi pressure gauges on the BR pressure test port, in line



on the X1 port at the logic control manifold. Start the engine and measure pressure at each respective gauge with the **BRAKE-OFF** switch activated. **BRAKE-OFF** mode simultaneously sends pilot pressures to the brake, the motor speed spool, and the **BRAKE-OFF** manifold.

All pressures should be as specified in Figures 3-17 through 3-21.

If pressures are not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure.
2. Malfunctioning solenoid valve.
3. Leaking pressure hoses or fittings.
4. Restriction in pressure hose or manifold port.
5. Loose DV lube orifice in B motor port block fitting (E48).

### WINCH-IN Pressure Check

For E48, with the engine shut off, connect a 1000 psi pressure gauge in line on the RI hose at the logic control manifold. Start the engine and measure pressure with the control lever in the **WINCH-IN** position. Pressure will be greater than the standby pilot pressure due to mechanical drag, and if there is resistance on the winch, such as a high freespool drag setting.

For C80 and K37, with the engine shut off, connect a 1000 psi pressure gauge in line on the X1 port at the logic control manifold. Start the engine and measure pressure with the control lever in the **WINCH-IN** position. Pressure will be greater than the standby pilot pressure due to mechanical drag, and if there is resistance on the winch, such as a high freespool drag setting.

All pressures should be as specified in Figures 3-17 through 3-21.

If the **WINCH-IN** pressure is not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure.
2. Malfunctioning control lever.
3. Leaking pressure hoses or fittings
4. Restriction in pressure hose or manifold port

### WINCH-OUT Pressure Check

For E48, With the engine shut off, connect a 1000 psi pressure gauge in line on the RO hose at the logic control manifold. Start the engine and measure pressure with the control lever in the **WINCH-OUT** position. Pressure will be greater than the standby pilot pressure due to mechanical drag, and if there is resistance on the winch, such as a high freespool drag setting.

For C80 and K37, with the engine shut off, connect a 1000 psi pressure gauge in line on the X1 port at the logic control manifold. Start the engine and measure pressure with the control lever in the **WINCH-OUT** position. Pressure will be greater than the standby pilot pressure due to mechanical drag and if there is resistance on the winch, such as a high freespool drag setting.

All pressures should be as specified in Figures 3-17 through 3-21.

If the **WINCH-OUT** pressure is not as specified in Figures 3-17 through 3-21, check for:

1. Improper pilot supply pressure.
2. Malfunctioning control lever.
3. Leaking pressure hoses or fittings.
4. Restriction in pressure hose or manifold port.

## Valve Setting Procedures

### Load sense relief valve (E48)

Disconnect brake hose from logic control manifold. Plug manifold brake port. Connect a 7500-psi gauge to motor test port A. At engine idle, hold winch control lever in **WINCH-IN** position for 5 seconds while monitoring gauge. Adjust valve in to increase, out to decrease. Setting is 3450-3600 psi.

### Brake release valve

Connect a 1000-psi gauge at the brake test port and another 1000-psi gauge at the RI (**WINCH-IN** control reference) test port. At engine idle, slowly meter control lever into the **WINCH-IN** position while monitoring both gauges. Increase control lever stroke until the RI gauge reaches the pressure specified in Figures 3-17 through 3-21; brake pressure should jump to full pilot supply pressure specified in Figures 3-17 through 3-21 at this point.

If the brake pressure jumps up before the pressure at RI reaches the pressure specified in Figures 3-17 through 3-21, adjust valve in until the increase occurs at the pressure specified in Figures 3-17 through 3-21. Similarly, if the spike does not occur until the pressure at RI is more than the pressure specified in Figures 3-17 through 3-21, adjust valve out until it occurs at the pressure specified in Figures 3-17 through 3-21.

### Pilot supply reducing valve (E48)

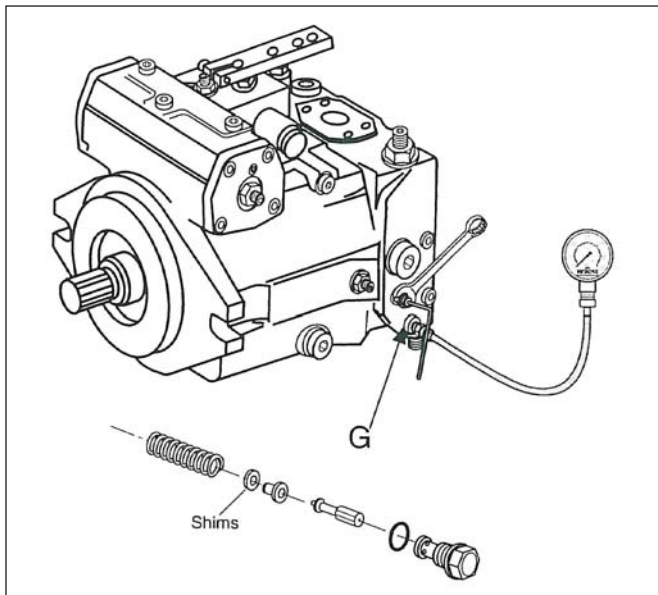
See tractor service manual.

### Charge pressure relief valve adjustment (C80 and K37 High Performance) (See Figure 3-8)

With pressure gauge installed at G port, run pump at normal operating speed and temperature. If pressure is low, remove relief valve and add shim(s). If pressure is high, remove relief valve and take shim(s) out.

**NOTE: 1mm = 56.5 psi (3.9 bar)**

Pump Size	Allen Wrench	Box Wrench	Wrench To Remove
28 - 56	N/A	N/A	27 mm



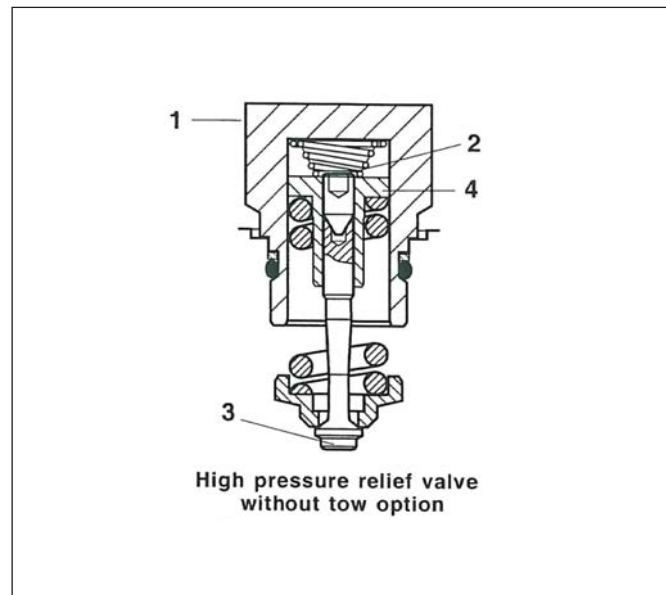
**Figure 3-14 Charge Pressure Relief Valve Adjustment**

### High pressure relief valve adjustment (C80 and K37) (See Figures 3-15 & 3-16)

High pressure relief valve adjustment procedure:

**NOTE: Use 3mm Allen wrench and 5mm box wrench.**

1. Turn POR adjusting screw in (clockwise) until firm resistance is encountered. Do not force beyond this point. See location in Figure 3-15.
2. Apply the winch brake by removing the pressure line and plugging.
3. Remove relief valve cover from pump (ref. item 1).
4. Loosen jam screw (ref. item 2).
5. Holding spring loading nut (ref. item 4) adjust valve Spindle (ref. item 3). One turn equals 630 psi (44 bar).
6. Proper pressure setting is 6380 psi +/-110 psi.
7. After adjustment is completed, tighten jam screw (ref. item 2) to 5 ft-lbs. (7 Nm).
8. Install relief valve assembly into pump, tighten cover (ref. item 1) to 66 ft-lbs. (90 Nm).

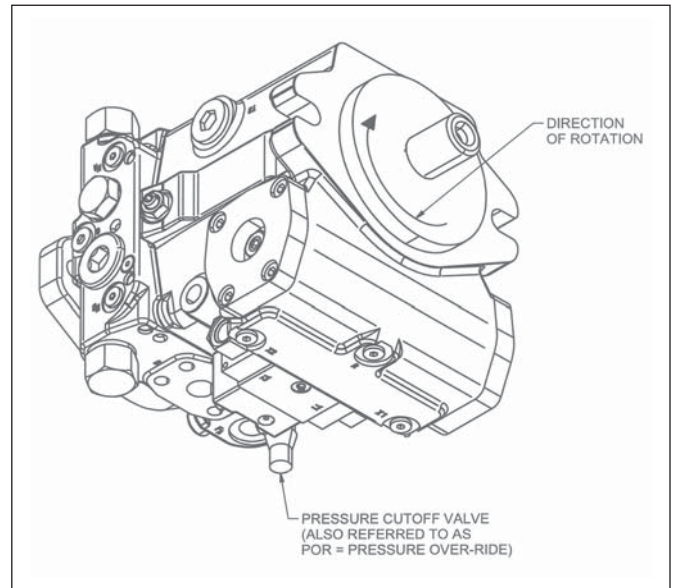


**Figure 3-15 High Pressure Relief Valve Adjustment**

After adjusting high pressure relief valves, adjust POR valve as follows:

**NOTE: Use 4mm Allen wrench and 13mm box wrench.**

1. Neutralize the pump control and turn the POR adjusting screw counterclockwise, all the way out.
2. Stroke the pump fully in either direction, then turn the POR adjusting screw in (clockwise) until the pressure setting is 5945 psi. One turn equals 1200 psi.
3. Stroke the pump in the opposite direction. Equal pressure should be seen both sides of center.



**Figure 3-16 Pressure Over-Ride Valve Adjustment**

**Figure 3-17 Hydraulic System Pressure Tests for Caterpillar D6K (C80)**

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Pilot Supply (Pump Change)	Control Manifold PS Port	1000 psi (6895 kPa) gauge	<b>BRAKE-ON</b>	400-435 psi (2757-2999 kPa)	Adjust pump setting.
Motor Supply	Motor Ports A & B	7500 psi (51,710 kPa)	<b>WINCH-IN/OUT</b> with brake pressure port blocked.	6380 psi +/-110 (43,988 kPa +/-689)	Adjust Pump Relief Valve.
Brake	BR: Brake	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> <b>WINCH-OUT</b>	400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check brake for leakage.
Brake Valve	BR: Brake X1: <b>WINCH-IN</b>	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> (see Brake Valve Setting Procedure)	BR = 400-435 psi (2757-2999 kPa) X1 = 50-70 psi (344-482 kPa)	Adjust Brake Valve.
<b>FREESPOOL</b>	FS: <b>FREE-SPOOL</b> BR: Brake X1: <b>HI-SPEED</b>	1000 psi (6895 kPa) gauge	<b>FREESPOOL</b>	FS = 400-435 psi (2757-2999 kPa) BR = 400-435 psi (2757-2999 kPa) X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check respective solenoid valves.
<b>HI-SPEED</b>	X1	1000 psi (6895 kPa) gauge	Full <b>WINCH-IN</b>	X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage or contaminants.
<b>BRAKE-OFF</b>	BR: Brake X1: <b>HI-SPEED</b>	1000 psi (6895 kPa) gauge	<b>BRAKE-OFF</b>	BR = 400-435 psi (2757-2999 kPa) X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check respective solenoid valves.

**Figure 3-18 Hydraulic System Pressure Tests for John Deere 700J (E39) Rescue**

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Pilot Supply	Tractor Pilot Test Port	1000 psi (6895 kPa) gauge	<b>BRAKE-ON</b>	280-400psi(1930-2757 kPa)	Adjust setting. See tractor service manual.
Counterbalance Valve	Motor Port B	5000psi (34,474 kPa)	<b>WINCH-OUT</b> - Drum Inching	700-1000 psi (4827-6895 kPa)	Adjust Counterbalance Valve.
Motor Supply	Motor Ports A & B	5000psi (34,474 kPa)	<b>WINCH-IN/OUT</b> with brake pressure port blocked.	3200 psi (22,063 kPa)	
Brake	BR: Brake	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b>		Check plumbing for leakage. Check brake for leakage.
Brake Valve	BR: Brake RI: <b>WINCH-IN</b>	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> (see Brake Valve Setting Procedure)	BR = 280-400 psi (1930-2758 kPa) RI = 50-70 psi (344-482 kPa)	Adjust Brake Valve.
<b>FREESPOOL</b>	FS: <b>FREE-SPOOL</b> BR: Brake	1000 psi (6895 kPa) gauge	<b>FREESPOOL</b>	280-400 psi (1930-2758 kPa)	Check plumbing for leakage. Check solenoid valve.

**Figure 3-19 Hydraulic System Pressure Tests for John Deere 750J (E48) and Caterpillar PL61 (C391)**

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Standby Pilot Supply	Tractor Pilot Test Port	1000 psi (6895 kPa) gauge	<b>BRAKE-ON</b>	275psi(1896 kPa)	Adjust pump standby setting. See tractor service manual
Maximum Pilot Supply	Tractor Pilot Test Port	1000 psi (6895 kPa) gauge	Tractor blade over relief	650psi(4482 kPa)	Adjust tractor pilot reducing valve. See tractor service manual
Counterbalance Valve	Motor Port B	5000 psi (34,474 kPa)	<b>WINCH-OUT</b>	700-1000 psi (4827-6895 kPa)	Adjust Counterbalance Valve
Motor Supply	Motor Ports A & B	5000 psi (34,474 kPa)	<b>WINCH-IN/OUT</b> with brake pressure port blocked.	3500 psi (24,132 kPa)	Adjust Load Sense Relief Valve
Brake	BR: Brake	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b>	275-650psi(1896-4482 kPa)	Check plumbing for leakage. Check brake for leakage
Brake Valve	BR: Brake RI: <b>WINCH-IN</b>	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> (see Brake Valve Setting Procedure)	BR = 275 psi RI = 150 psi	Adjust Brake Valve
<b>FREESPOOL</b>	FS: <b>FREE-SPOOL</b> BR: Brake HS: <b>HI-SPEED</b> DV: <b>BRAKE-OFF</b> pilot, lube, & load sense	1000 psi (6895 kPa) gauge	<b>FREESPOOL</b>	All 350-650 psi (2068-4482 kPa)	Check plumbing for leakage. Check DV lube orifice. Check respective solenoid valves.
<b>HI-SPEED</b> (High Performance Winch only)	HS- <b>HI-SPEED</b>	1000 psi (6895 kPa) gauge	<b>HI-SPEED</b>	275psi(1896 kPa)	Check <b>HI-SPEED</b> spool in motor. Check solenoid valve.
<b>BRAKE-OFF</b> (John Deere 750J only)	BR: Brake HS: <b>HI-SPEED</b> DV: <b>BRAKE-OFF</b> pilot, lube, & load sense	1000 psi (6895 kPa) gauge	<b>BRAKE-OFF</b>	All 350-650 psi (2068-4482 kPa)	Check plumbing for leakage. Check DV lube orifice. Check respective solenoid valves

**Figure 3-20 Hydraulic System Pressure Tests for Komatsu D51EX/PX-22 (K37) Hi-Performance**

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Pilot Supply (Pump Change)	Control Manifold PS Port	1000 psi (6895 kPa) gauge	<b>BRAKE-ON</b>	400-435 psi (2757-2999 kPa)	Adjust pump setting.
Motor Supply	Motor Ports A & B	7500psi(51,710kPa)	<b>WINCH-IN / OUT</b> with brake pressure port blocked.	6380 psi +/-110 (43,988 kPa +/-689)	Adjust Pump Relief Valve
Brake	BR: Brake	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> <b>WINCH-OUT</b>	400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check brake for leakage
Brake Valve	BR: Brake Y1/Y2: <b>WINCH-IN</b>	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> (see Brake Valve Setting Procedure)	BR = 400-435 psi (2757-2999 kPa) Y1/Y2 = 80-100 psi (551-689 kPa)	Adjust Brake Valve
<b>FREESPOOL</b>	FS: <b>FREE-SPOOL</b> BR: Brake X1: <b>HI-SPEED</b>	1000 psi (6895 kPa) gauge	<b>FREESPOOL</b>	FS = 400-435 psi (2757-2999 kPa) BR = 400-435 psi (2757-2999 kPa) X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check respective solenoid valves.
<b>HI-SPEED</b>	X1	1000 psi (6895 kPa) gauge	Full <b>WINCH-IN</b>	X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage or contaminants.
<b>BRAKE-OFF</b>	BR: Brake X1: <b>HI-SPEED</b>	1000 psi (6895 kPa) gauge	<b>BRAKE-OFF</b>	BR = 400-435 psi (2757-2999 kPa) X1 = 400-435 psi (2757-2999 kPa)	Check plumbing for leakage. Check respective solenoid valves

**Figure 3-21 Hydraulic System Pressure Tests for Komatsu D51EX/PX-22 (K37) Rescue**

TEST ITEM	CHECK PORT	TEST EQUIPMENT REQUIRED	CONTROL POSITION	PRESSURE	CORRECTIVE ACTION
Pilot Supply	PP Test Port	1000 psi (6895 kPa) gauge	<b>BRAKE-ON</b>	300-400 psi (2068-2757 kPa)	Adjust setting. See tractor service manual.
Counterbalance Valve	Motor Port B	5000 psi (34,474 kPa)	<b>WINCH-OUT</b> - Drum Inching	700-1000 psi (4826-6894 kPa)	Adjust Counterbalance Valve.
Motor Supply	Motor Ports A & B	5000 psi (34,474 kPa)	<b>WINCH-IN/OUT</b> with brake pressure port blocked.	3500 psi (24,132 kPa)	Adjust Cross-Port Relief Valve.
Brake	BR: Brake	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b>	300-400 psi (2068-2757 kPa)	Check plumbing for leakage. Check brake for leakage.
Brake Valve	BR: Brake RI: <b>WINCH-IN</b>	1000 psi (6895 kPa) gauge	<b>WINCH-IN</b> (see Brake Valve Setting Procedure)	BR = 300-400 psi (2068-2757 kPa) RI = 100-120 psi (689-827 kPa)	Adjust Brake Valve.
<b>FREESPOOL</b>	FS: <b>FREE-SPOOL</b> BR: Brake	1000 psi (6895 kPa) gauge	<b>FREESPOOL</b>	300-400 psi (2068-2757 kPa)	Check plumbing for leakage. Check solenoid valve.

## Specifications

### Drum Line Capacities

Wire Rope Diameter	Capacity
16mm (5/8 in.)	129 m (423 ft)
19mm (3/4 in.)	91 m (298 ft)
22mm (7/8 in.)	66 m (215 ft)

Note: Loosely or unevenly spooled line will change capacities. Use flexible wire rope with independent wire rope center.

Figure 3-22 Drum Line Capacities

### Hydraulic Specifications

Motor ..... Dual or single displacement vane-type  
 Variable displacement piston-type

Brake ..... Dry multi-disc spring applied

Oil Capacity ..... 17 quarts (16 liters)

### Oil Selection

The main consideration while selecting hydraulic fluid is the estimated oil temperature extremes that will be experienced during service so the most suitable temperature-viscosity characteristics are obtained.

rienced during service so the most suitable temperature-viscosity characteristics are obtained.

VISCOSITY GRADE		OIL OPERATING TEMPERATURE RANGE		TYPICAL AMBIENT TEMPERATURE RANGE	
ISO	SAE	°F	°C	°F	°C
VG 22	10W	-5 to 140	-20 to 60	-5 to 40	-20 to 4
VG 32	15W	10 to 160	-12 to 71	10 to 55	-12 to 13
VG 46	20	20 to 180	-7 to 82	20 to 70	-7 to 21
VG 68	20	30 to 200	-1 to 93	30 to 90	-1 to 32
VG 100	30	40 to 220	4 to 104	40 to 110	4 to 43

Figure 3-23 Oil Selection Chart

Factory fill is Exxon-Mobil 424, which has an ISO Viscosity Grade 46 to 68.

hydraulic fluid) the hydraulic circuit and winch gear housing may have different fluids. Note that some hydraulic system oils are not recommended for use inside the winch.

For external pump winches (the winch pump uses tractor

For inside winch housing, use the following oils:

	HYDRAULIC SYSTEM (PUMP)	WINCH CASE (GEAR TRAIN)
<b>Caterpillar</b>	Use Tractor Fluid	TDTO TO-4 MTO
<b>John Deere</b>	Use Tractor Fluid	Hy-Gard
<b>Komatsu</b>	Use Tractor Fluid	Universal Tractor Fluid
<b>Chevron</b>	Use Tractor Fluid	1000 THF
<b>Exxon-Mobil</b>	Use Tractor Fluid	Mobil Fluid 424
<b>Case</b>	Use Tractor Fluid	Hy-Tran Ultra
<b>New Holland</b>	Use Tractor Fluid	Multitran

Figure 3-24 Recommended Oil List - 1



## Hydraulic Winch Maintenance

### Recommended Winch Service Intervals

Hours or **	Months **	Filter ***	Winch Gear Oil	Brake & Clutch	Major Overhaul
First 250	1	Change			
Every 500	3	Change			
Every 2,000	12		Change		
Every 5,000				* Inspect	
Every 10,000					* Evaluate

**Lube rollers and check oil level and filter light weekly.**

\* Evaluate = Service based on average winch use;  
 - if used more than once a day, perform overhaul.  
 - if used less than once a day, remove covers and check to determine need.

\* Inspect = disassemble and inspect for wear.

\*\* Service winch using the tractor's hour meter or the length of time the winch is mounted to the tractor, whichever occurs first.

\*\*\* Follow tractor schedule if using tractor filter.

**Recommended Gear Compartment Oil:**

Caterpillar -Multipurpose Tractor Oil (MTO)

John Deere -Hy-Gard

ExxonMobil -Mobil Fluid 424 (Factory Fill)

Chevron -1000 THF

Consult service/operating manual for low temperature oils and other details. Tractor final drive oils may be used in winch.

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**Figure 3-25 Recommended Oil List - 2**

### Torque Specifications

ITEM	TORQUE VALUES		
	ft-lbs.	N-m	kg-m
Housing Covers (1/2 UNC Gr. 8)	80	108	11
Drum Shaft Assembly			
Drum Adapter to Drum Capscrews (5/8 UNF Gr. 8)	200	271	28
Bearing Retainer Capscrews (1/2 UNF Gr. 8)	80	108	11
Motor Shaft Gear Retainer Capscrews (3/8 UNC Gr. 8)	25	34	3
3-Port Manifold to Motor Capscrews (7/16 UNC Gr. 8)	53	72	7
Directional Manifold Mounting Capscrews (3/8 UNC Gr. 8)	33	44	4

**Figure 3-26 Torque Specifications**



## Repairs

### General

This section includes the disassembly of select components, the inspection of all major assemblies, and reassembly and installation. The wear points detailed in Figure 4-4 should be inspected at the time of disassembly so that worn parts may be ordered and replaced prior to reassembly.

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

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

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

### CAUTION

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

### Winch Removal

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

### WARNING

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

3. Disconnect hoses and wire harness from tractor.
4. Connect slings and a crane or lifting device to the winch. Install lifting eyes into the lifting holes provided in the frame.

### WARNING

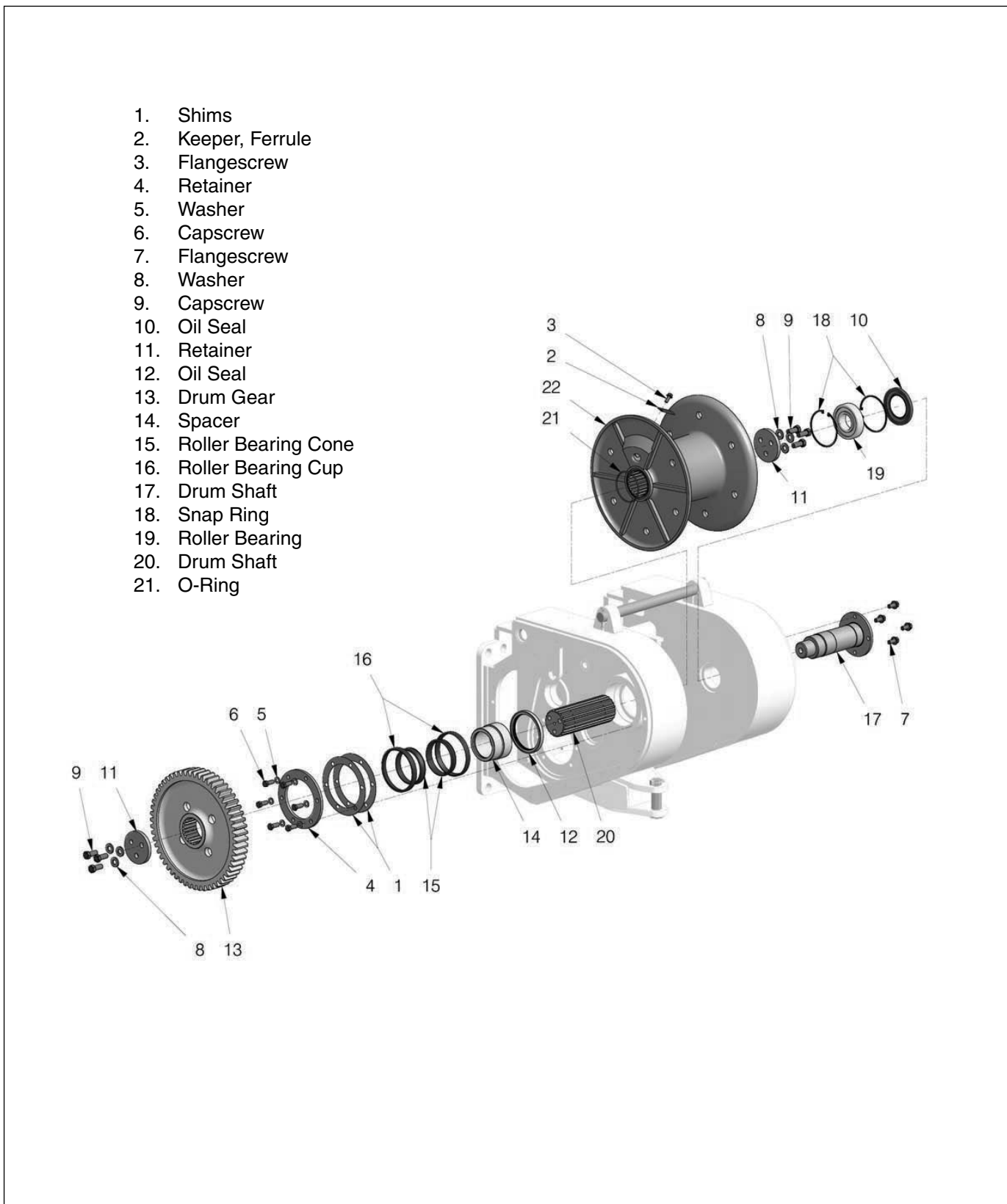
**The slings and crane used to lift the winch must have a minimum lifting capacity of 1500 kg (3000 lb.).**

5. Drain the oil from the winch.
6. Remove mounting hardware securing winch to tractor.

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

### Winch Disassembly

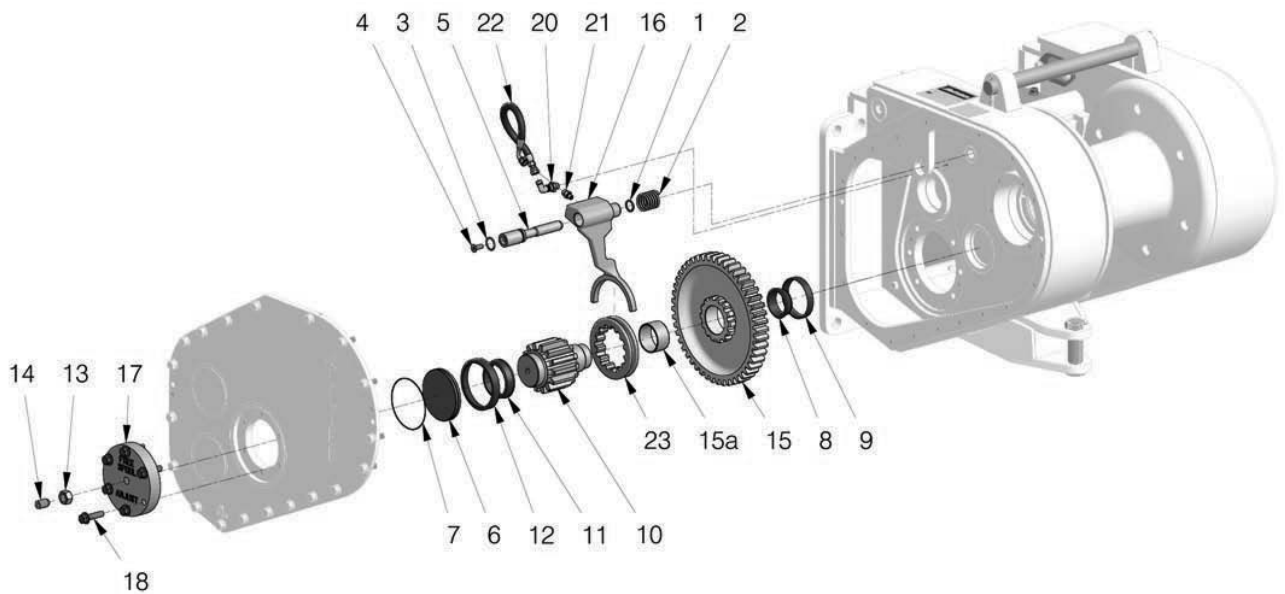
See Figures 4-1 and 4-2 for the location of the Drum and Drum Shaft as well as the Freespool and Intermediate Shaft components.



1. Shims
2. Keeper, Ferrule
3. Flangescrew
4. Retainer
5. Washer
6. Capscrew
7. Flangescrew
8. Washer
9. Capscrew
10. Oil Seal
11. Retainer
12. Oil Seal
13. Drum Gear
14. Spacer
15. Roller Bearing Cone
16. Roller Bearing Cup
17. Drum Shaft
18. Snap Ring
19. Roller Bearing
20. Drum Shaft
21. O-Ring

Figure 4-1 Location of Drum and Drum Shaft Components

- |                            |                              |
|----------------------------|------------------------------|
| 1. O-Ring                  | 11. Roller Bearing Cone      |
| 2. Spring, Freespool       | 12. Roller Bearing Cup       |
| 3. O-Ring                  | 13. Nut                      |
| 4. Capscrew                | 14. Screw                    |
| 5. Freespool Shaft         | 15. Intermediate Gear        |
| 6. Freespool Adjust Piston | 16. Freespool Shifter Fork   |
| 7. O-Ring                  | 17. Freespool Adjust Housing |
| 8. Bearing Cone            | 18. Flangescrew              |
| 9. Roller Bearing Cup      | 21. Fitting                  |
| 10. Pinion Shaft           | 22. Hose Assembly            |



**Figure 4-2 Location of Freespool and Intermediate Shaft Components**

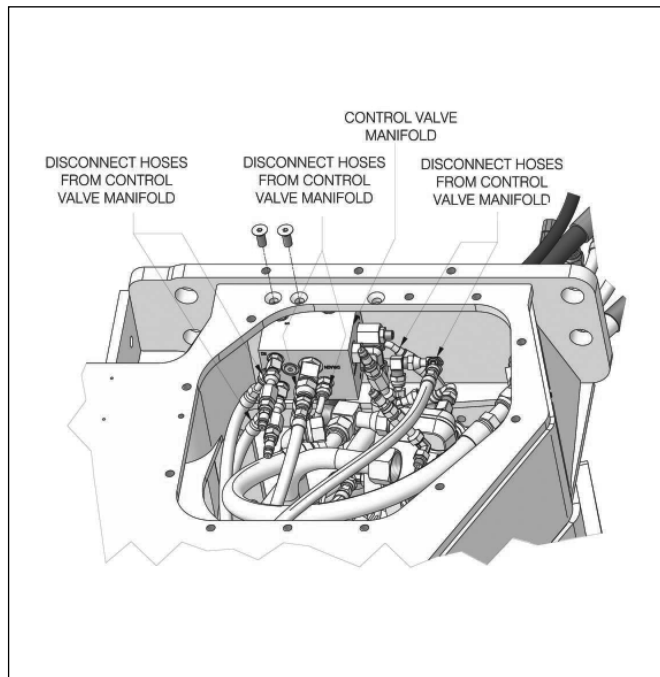
## Motor Removal

### H5CT - Rescue Winch Motor Removal (K37)

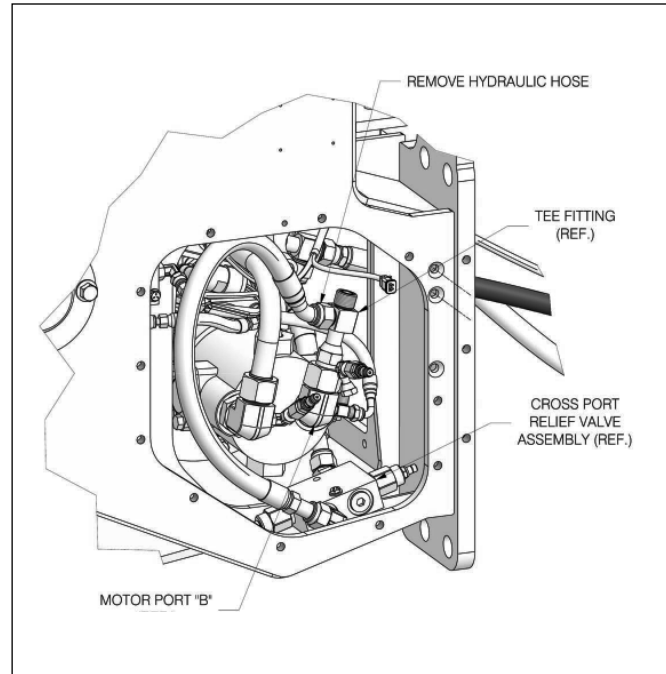
1. Drain oil from gear compartment or remove breather and install pipe plug.

**Note: Tag or label all hydraulic hose ends and tubes to aid during reinstallation. Also note the location of any hose clamps.**

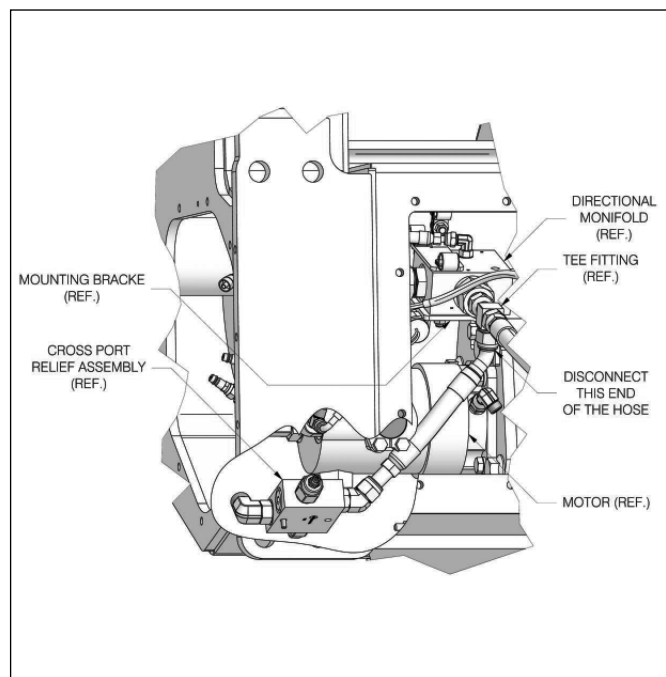
2. Remove winch from tractor.
3. Position winch on its left side and block securely.
4. Remove right-hand side cover, front cover, and top cover.
5. Disconnect hoses from control valve manifold mounted on the front upper corner of the frame opening, and then remove control valve.



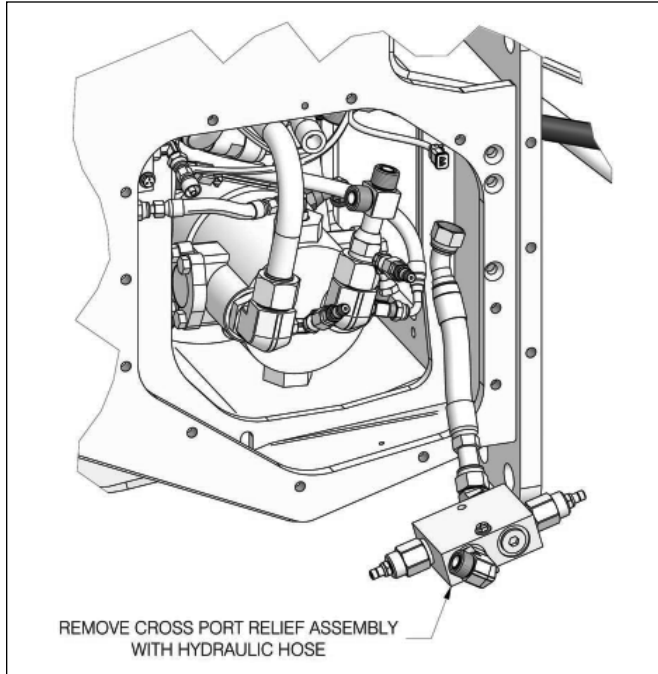
6. Remove hydraulic hose connecting the fitting on cross port relief valve (mounted on the floor of the winch motor cavity) to the tee fitting on motor port "B".



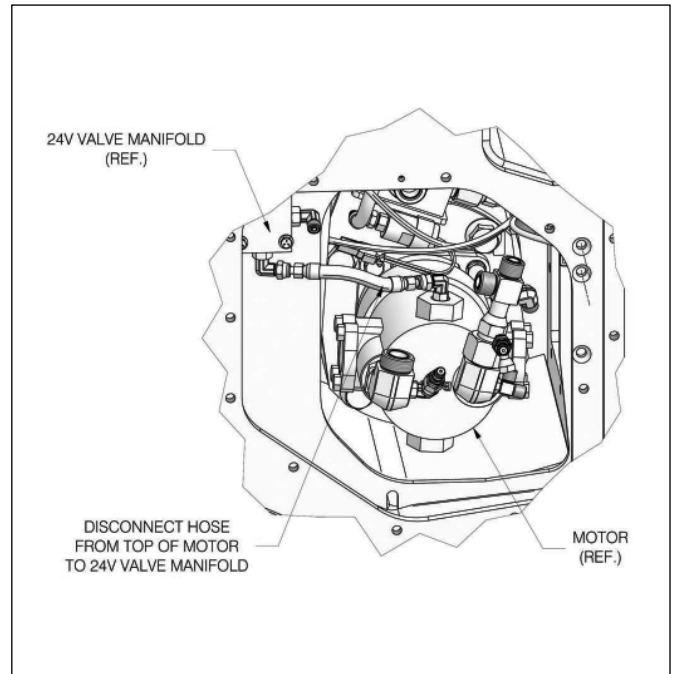
7. Disconnect opposite end of hydraulic hose that is routed to the inside fitting on cross port relief. This is connected to the tee fitting on the right-side port on the directional manifold. Directional manifold is mounted on a bracket above the motor.



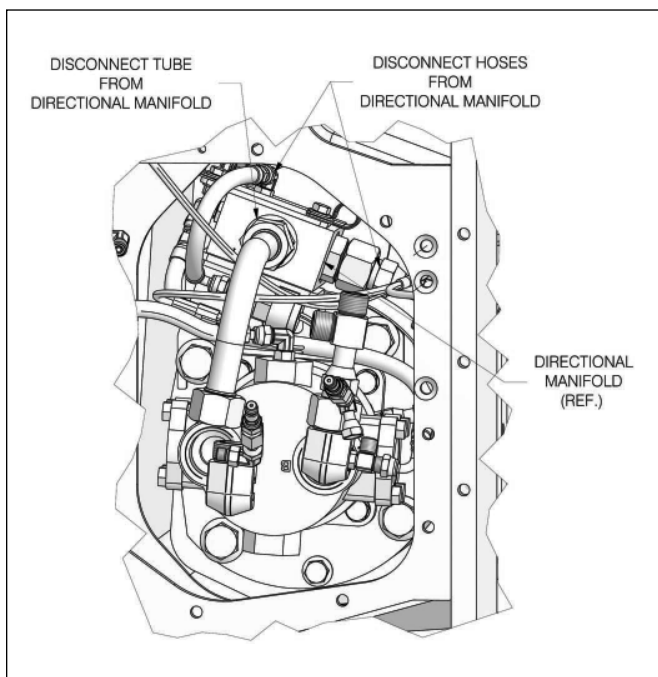
8. Remove cross port relief with hose still connected.



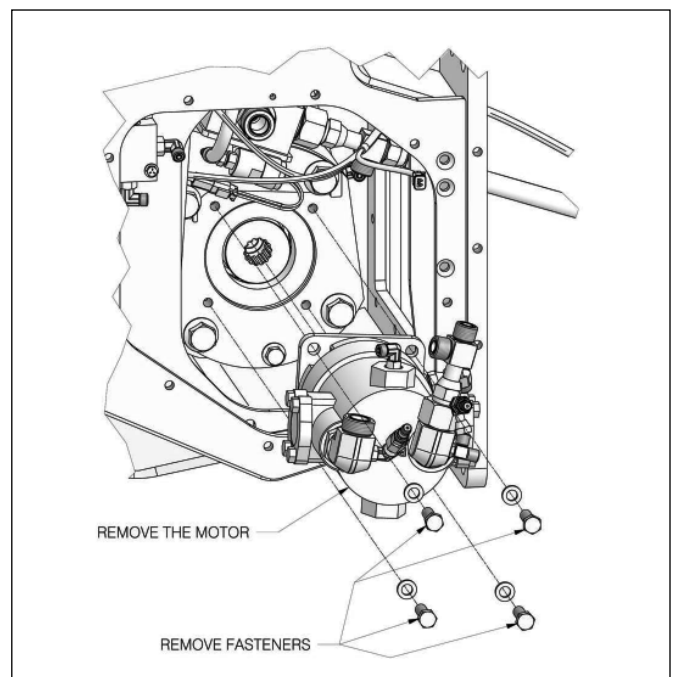
10. Disconnect the hose from top of the motor to 24V valve manifold assembly.



9. Disconnect hoses and tubes from the directional manifold to the motor.



11. Remove the four fasteners in the motor flange. Then remove the motor, using a suitable lifting strap or device. Note motor orientation to aid in reinstallation.



12. Transport motor to a suitable work bench.
13. With the new motor sitting next to the one that was removed, compare them to verify it is the correct replacement.
14. Using the used motor as a guide, transfer all of the hydraulic fittings and plugs to the new motor.

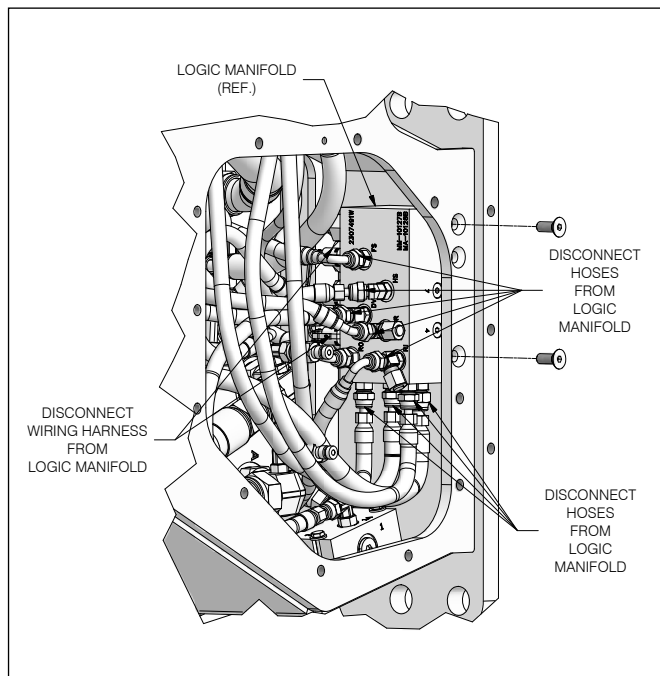
**Note: Never reuse o-rings, seals, or gaskets, always replace with new.**

## H5CH - 2 Speed Winch Motor Removal (E48)

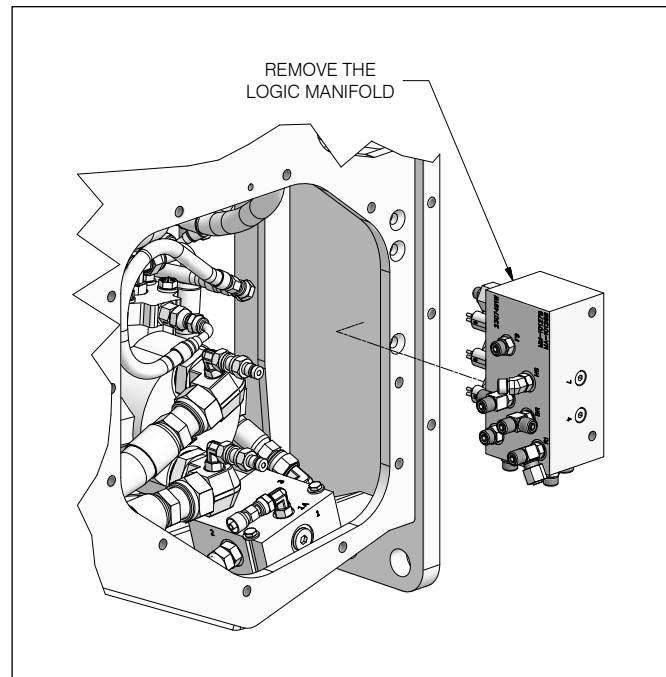
1. Drain oil from gear compartment or remove breather and install pipe plug.

**Note: Tag or label all hydraulic hose ends and tubes to aid during reinstallation. Also note the location of any hose clamps.**

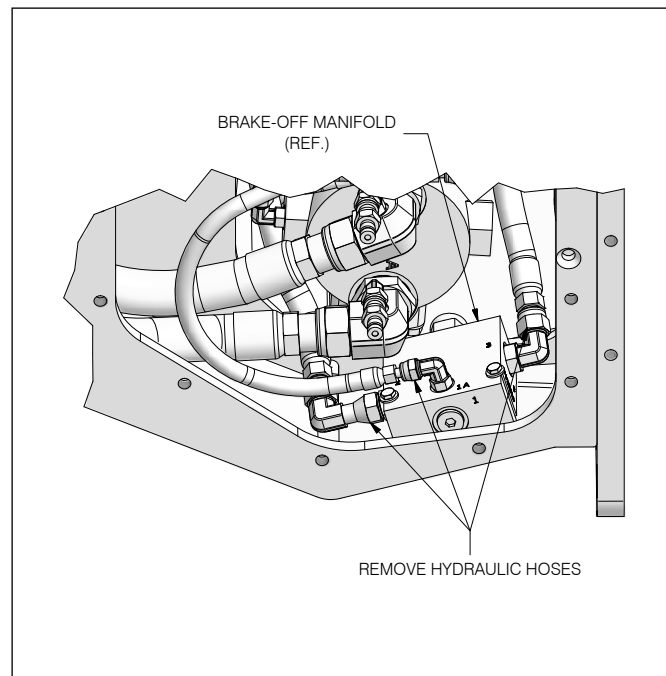
2. Remove winch from tractor.
3. Position winch on its left side and block securely.
4. Remove right-hand side cover, front cover, and top cover.
5. Disconnect hoses and wiring harness from logic manifold mounted on the front upper corner of the frame opening.



6. Remove the logic manifold.

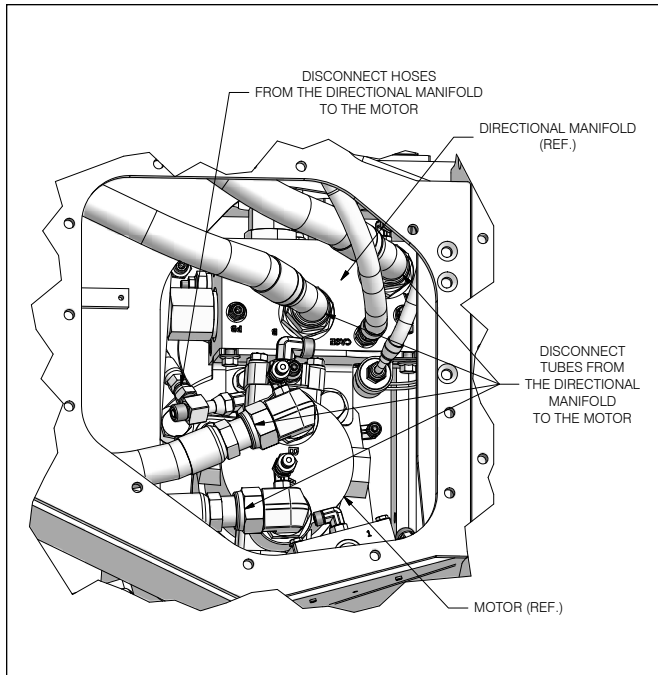


7. Remove hydraulic hoses from fittings on brake-off manifold to the motor.

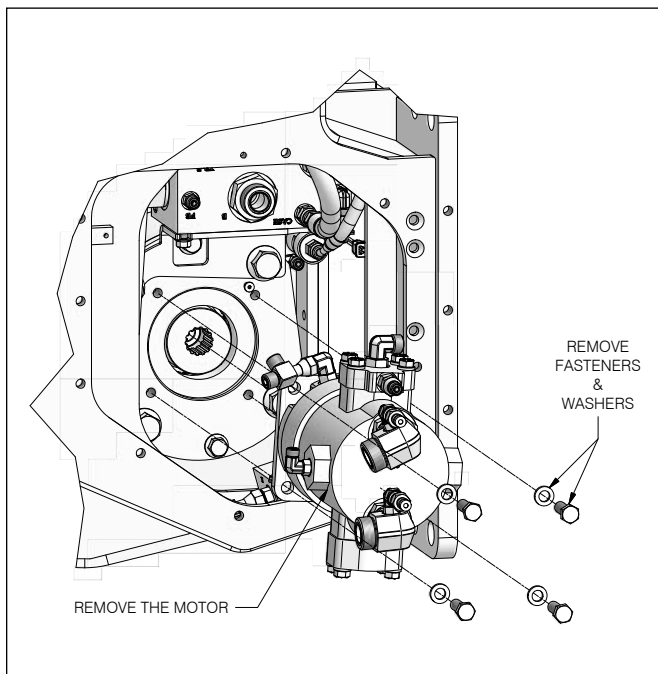




- Disconnect hoses and tubes from the directional manifold to the motor.



- Remove the four fasteners in the motor flange. Then you can remove the motor, using a suitable lifting strap or device. Note motor orientation to aid in re-installation.



- Transport motor to a suitable work bench.
- With the new motor setting next to the one that was removed, compare them to verify it is the correct replacement.
- Using the removed motor as a guide, transfer all of the hydraulic fittings and plugs to the new motor.

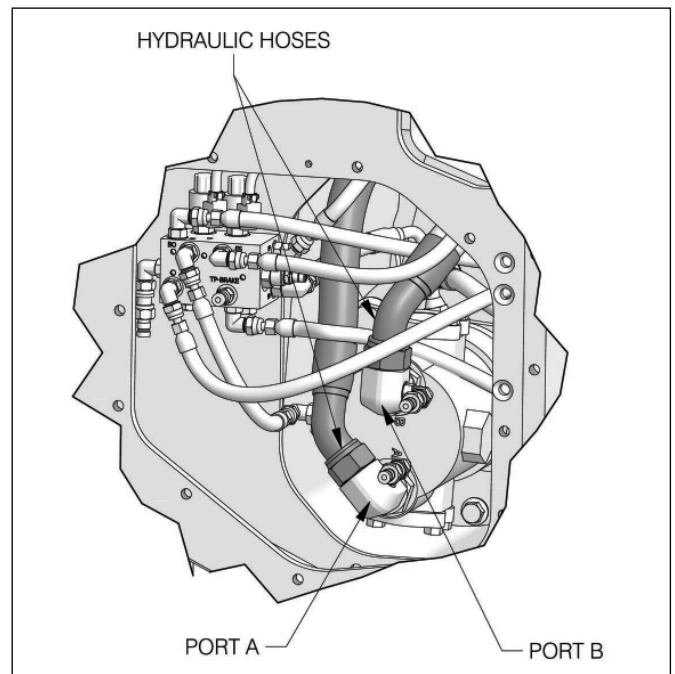
**Note: Never reuse o-rings, seals, or gaskets, always replace with new.**

### H5CH - 2 Speed Winch Motor Removal (C391)

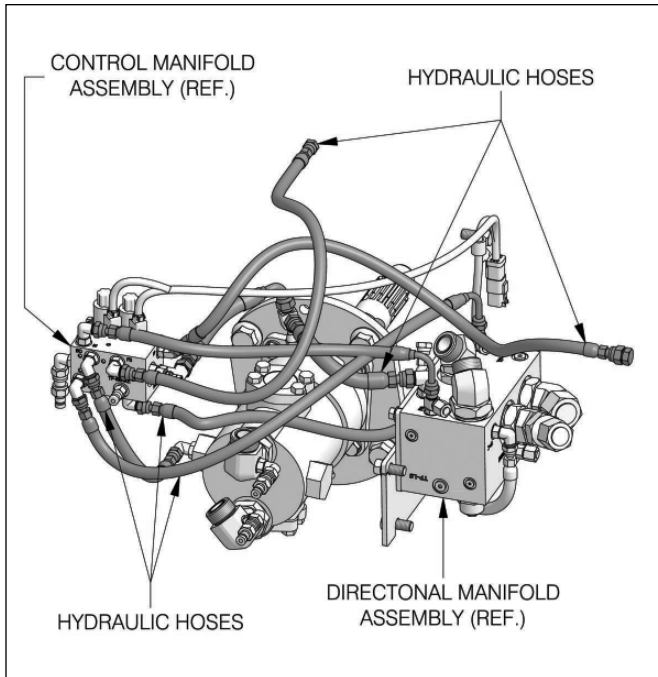
- Drain oil from gear compartment or remove breather and install pipe plug.

**Note: Tag or label all hydraulic hose ends and tubes to aid during reinstallation. Also note the location of any hose clamps.**

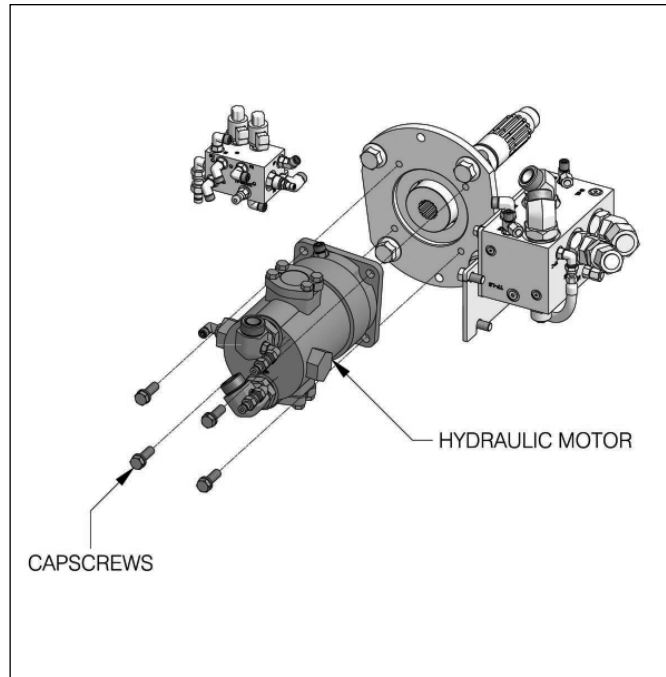
- Remove winch from tractor.
- Position winch on its left side and block securely.
- Remove right-hand side cover, front cover, and top cover.
- Disconnect hoses from the ports "A" and "B".



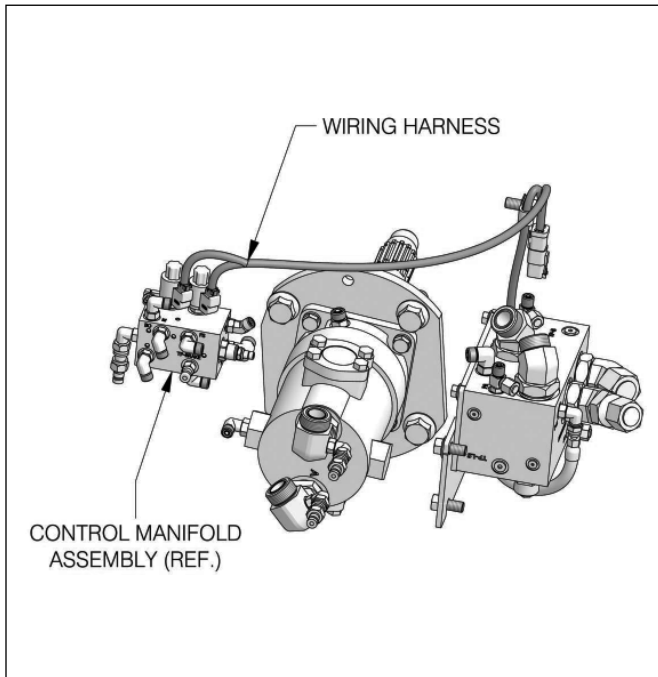
- Disconnect and remove hydraulic hoses from fittings on both control manifold and directional manifold assemblies. (Note: Winch frame and some parts are not shown for clarity.)



- Remove the four capscrew in the motor flange. Then you can remove the motor, using a suitable lifting strap or device. Note motor orientation to aid in re-installation.



- Disconnect the wiring harness from the control manifold.



- Transport motor to a suitable work bench.
- With the new motor setting next to the one that was removed, compare them to verify it is the correct replacement.
- Using the removed motor as a guide, transfer all of the hydraulic fittings and plugs to the new motor.

**Note: Never reuse o-rings, seals, or gaskets, always replace with new.**

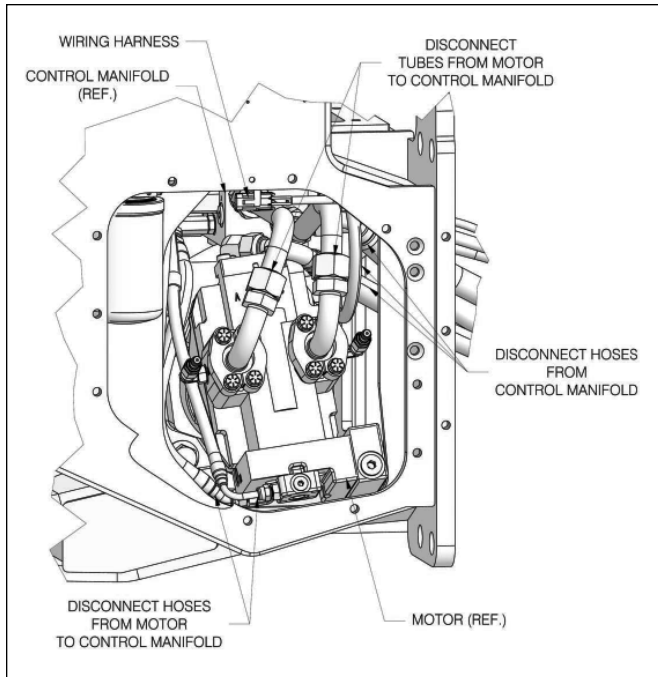
## H5CH - Variable Speed Winch Motor Removal (K37 & C80)

- Drain oil from gear compartment or remove breather and install pipe plug.

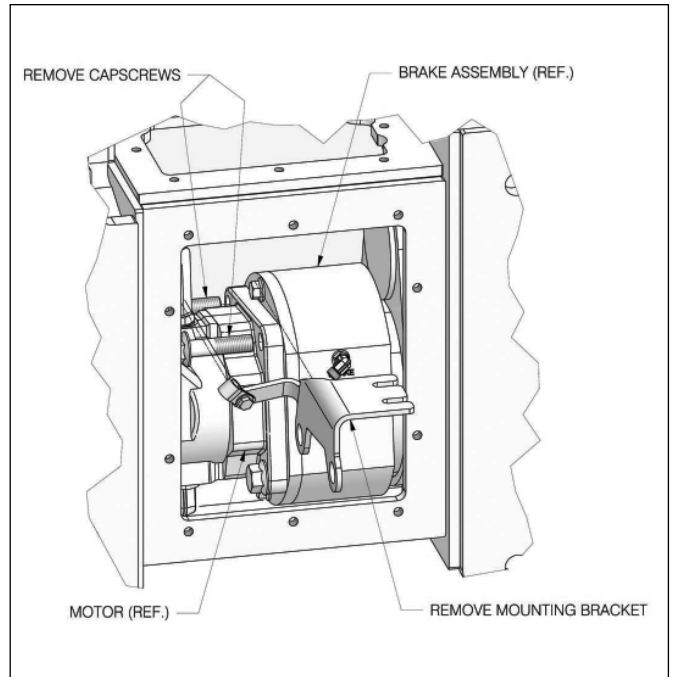
**Note: Tag or label all hydraulic hose ends and tubes to aid during reinstallation. Also note the location of any hose clamps.**

- Remove winch from tractor.
- Position winch on its left side and block securely.
- Remove right-hand side cover, front cover, and top cover.

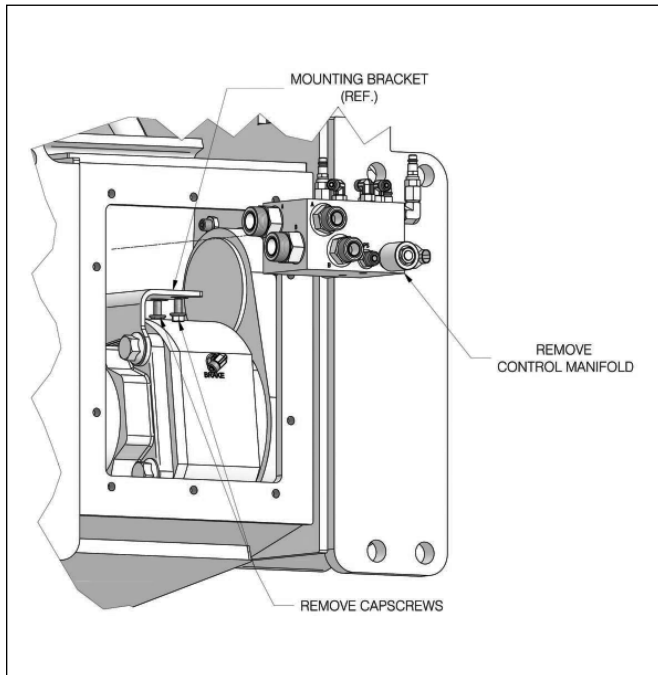
5. Disconnect hoses, tubes and wiring harness from the control manifold.



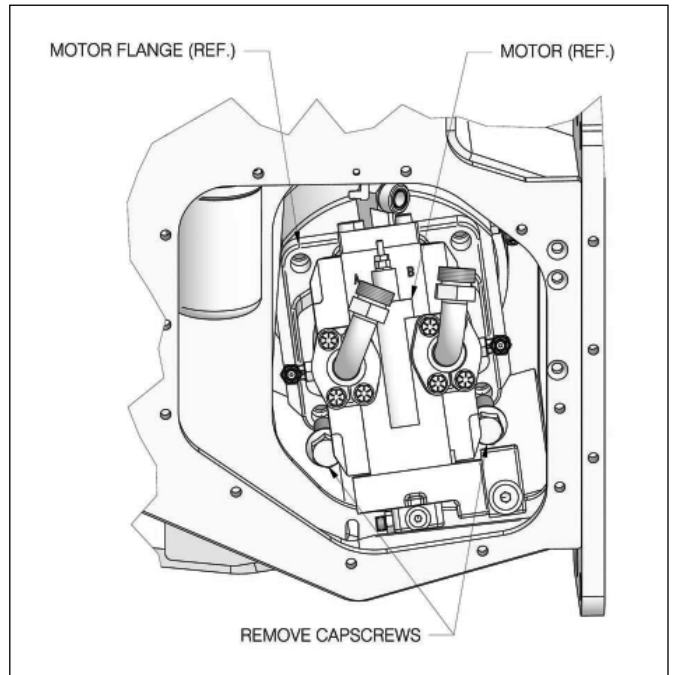
7. Remove two capscrews from the top of the motor flange, then remove the control manifold mounting bracket.



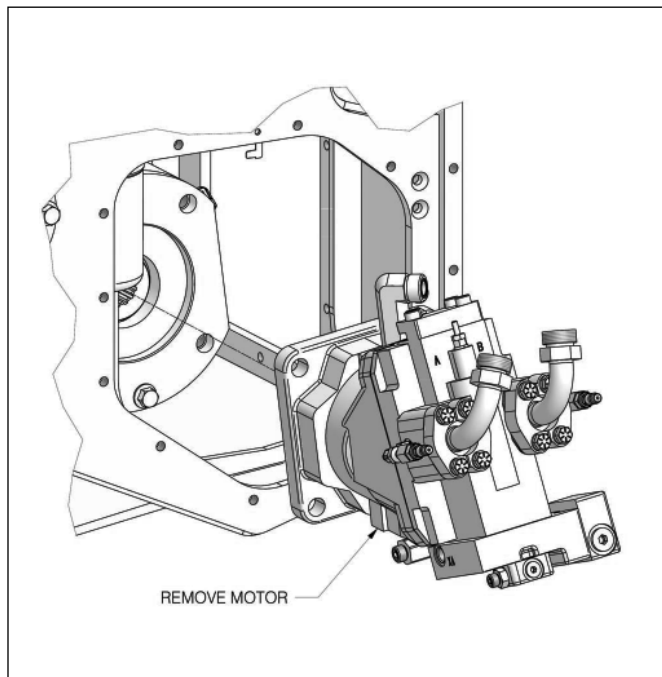
6. Remove the two capscrews from the bottom of the control manifold mounting bracket, and remove the manifold.



8. Remove the two remaining capscrews at the bottom of motor flange.



9. Remove the motor, using a suitable lifting strap or device. Note motor orientation to aid in reinstallation. Tapped holes in motor are metric threads.



10. Transport motor to a suitable work bench.
11. With the new motor sitting next to the one that was removed, compare them to verify it is the correct replacement.
12. Using the removed motor as a guide, transfer all of the hydraulic fittings and plugs to the new motor.

**Note: Never reuse o-rings, seals, or gaskets, always replace with new.**

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## Motor Disassembly (E48, E39, K37 Rescue)

**NOTE:** Disassembling the motor while it's still under its warranty period immediately invalidates the warranty. If the motor malfunctions before its warranty period expires, please contact Allied Systems Company first before attempting to repair it.

1. Remove snap ring.



### CAUTION

Use caution when removing snap ring. If released accidentally, it can become an airborne hazard.

2. Pry out shaft seal plate with two screwdrivers. Remove seal plate O-ring from groove in bearing bore.



3. Mark one side of the motor for proper assembly, paying careful attention that the cartridge will not be installed upside down. Secure the motor prior to loosening the 5/8-11 bolts.



4. Remove front housing. **NOTE:** Two 5/16" ball checks and one main body O-ring may be dislodged and fall free.



5. With the seal plate removed, press shaft and ball bearing out of front housing.



6. Remove snap ring from shaft. Press shaft out of bearing.



9. Remove O-ring and springs with a small screwdriver. Remove dowel pins.



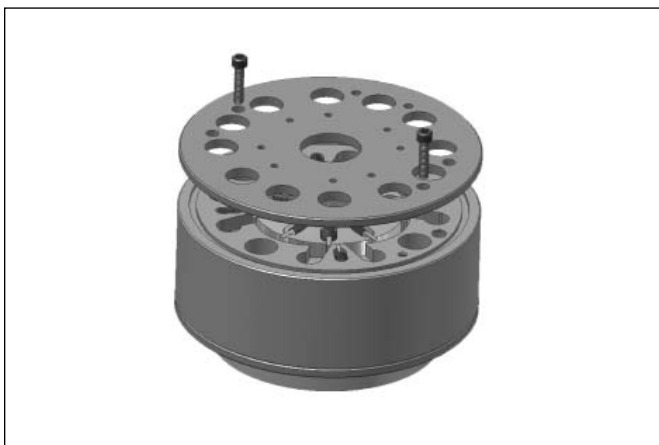
7. Lift up rotor/stator cartridge and remove from the rear housing.



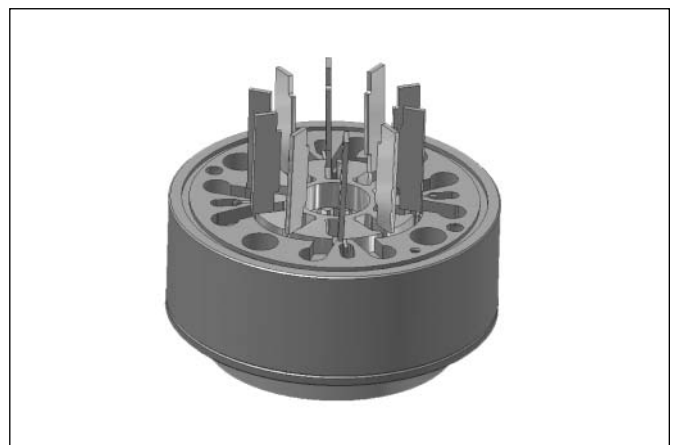
10. Replace plate on rotor/stator cartridge. Turn rotor/stator cartridge over.



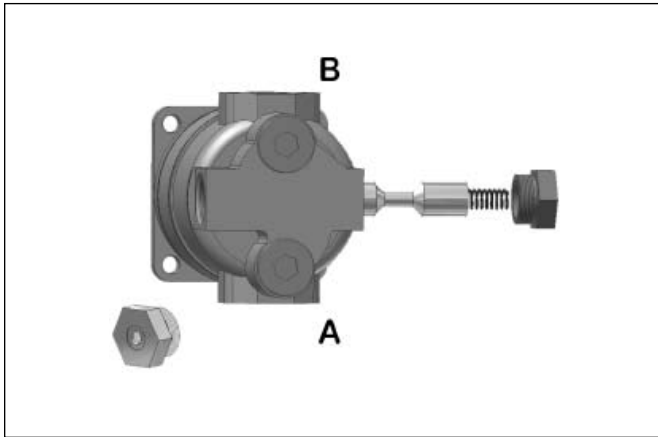
8. Place cartridge on any object which will hold it off the table. Remove screws and timing plate.



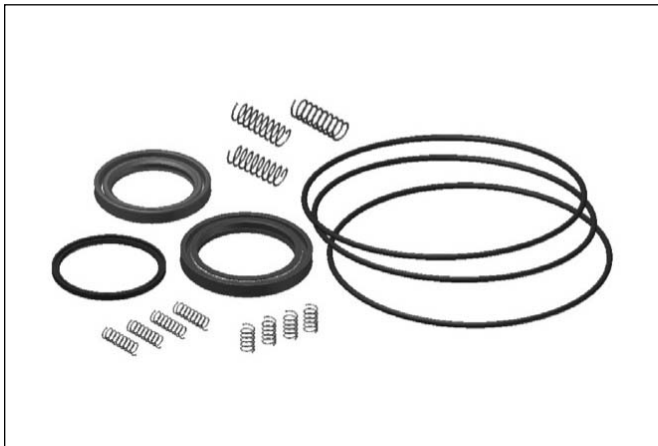
11. Remove the rotor. Remove both the rotor and stator vanes.



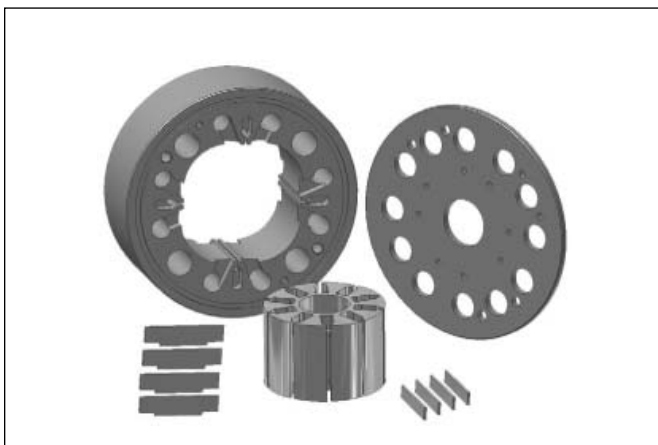
12. Remove the spool assembly.



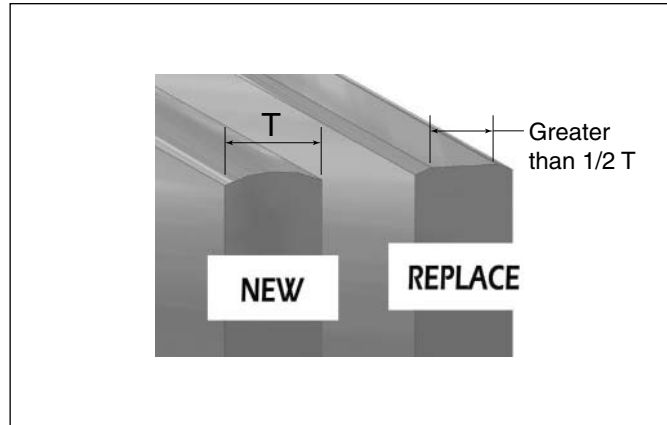
13. Inspect all springs and seals. We recommend replacement of all seals and springs whenever the motor has been disassembled.



14. Inspect all parts and replace any parts which obviously show excessive wear or damage.



15. **Vanes:** Normal wear results in slight flattening of vane tips which does not impair motor performance. Replace vane if radius is reduced by 50%. Clearance between the rotor vane and rotor vane slot varies with the vane selection. The design allows the vane to “lean” slightly in the slot, providing the required mechanical seal.



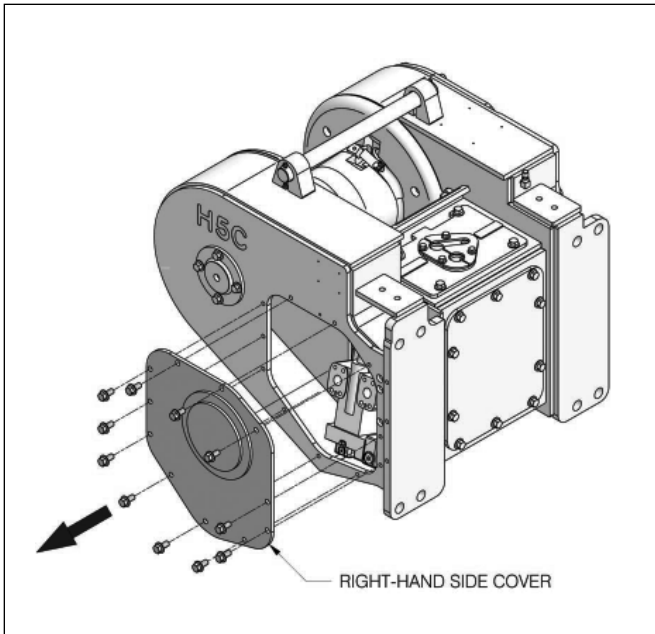


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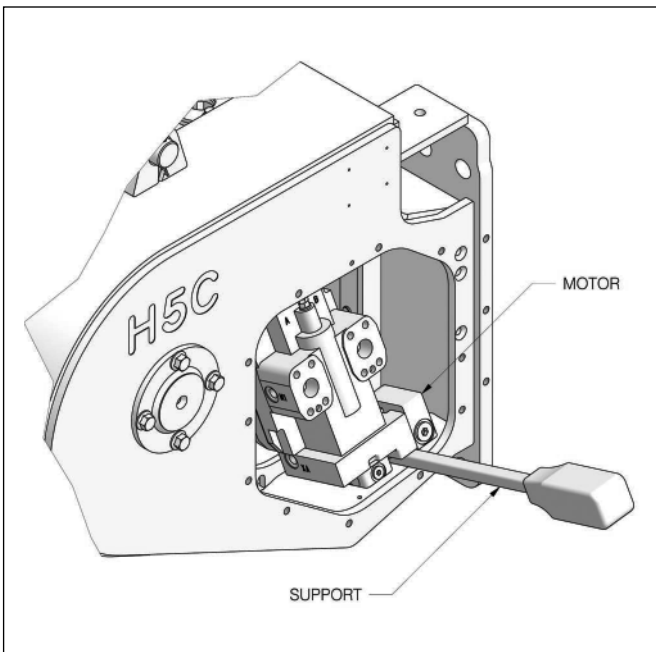
## Brake Removal

If you need to service the brake piston, you need to remove the hydraulic motor to get access to the entire brake assembly by using the following procedure.

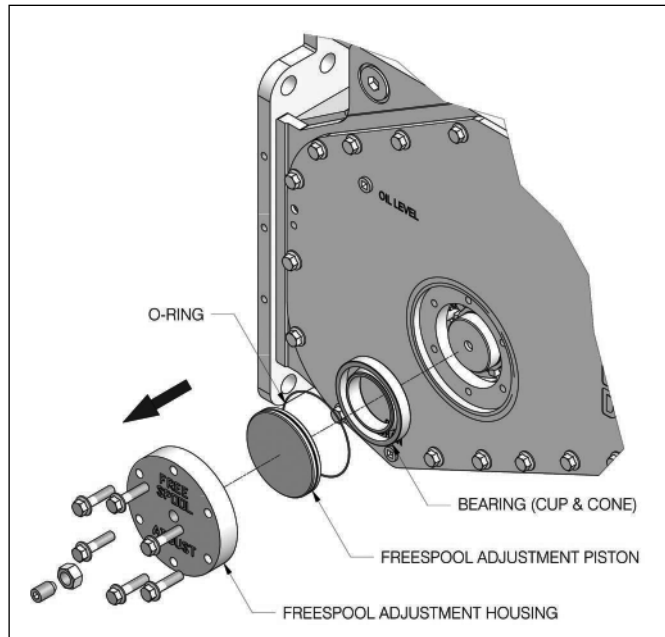
1. Drain winch case oil into a suitable container and dispose of properly.
2. Position the winch in the upright position. Remove the right hand side cover.



3. Place a support under winch motor to hold it in position.

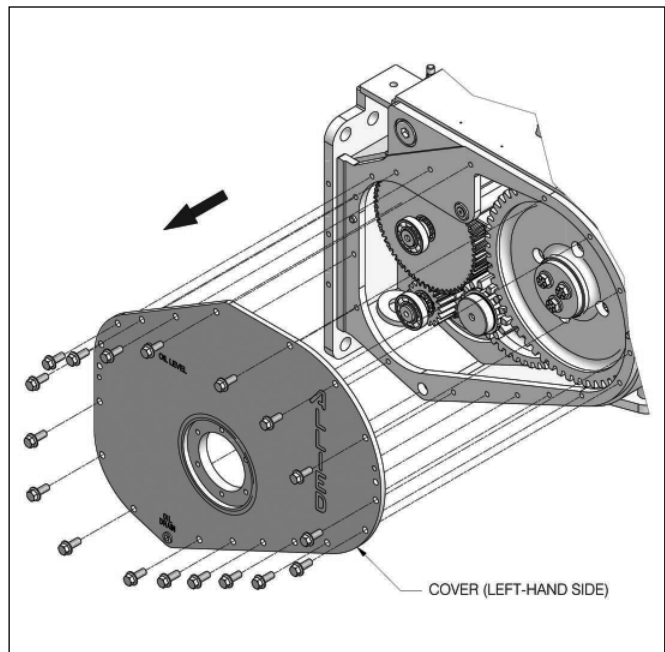


4. On the left side cover, remove the freespool adjustment housing, freespool adjustment piston, the bearing cup and cone.

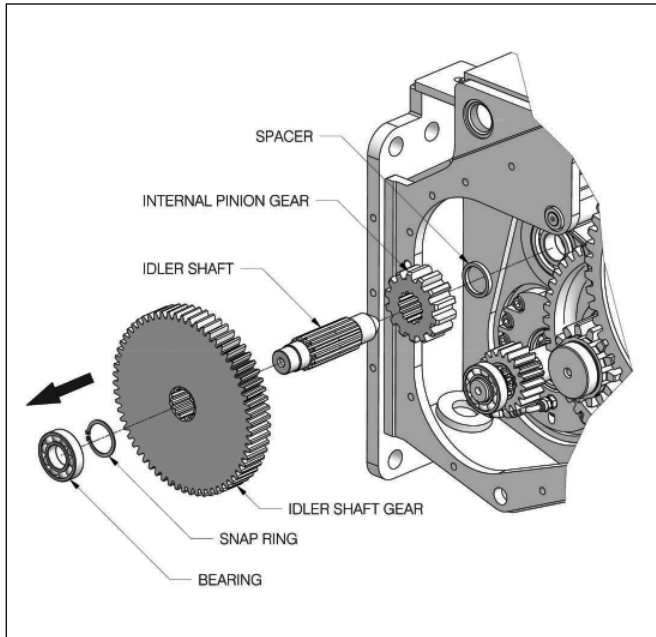


5. Remove the left hand frame side cover.

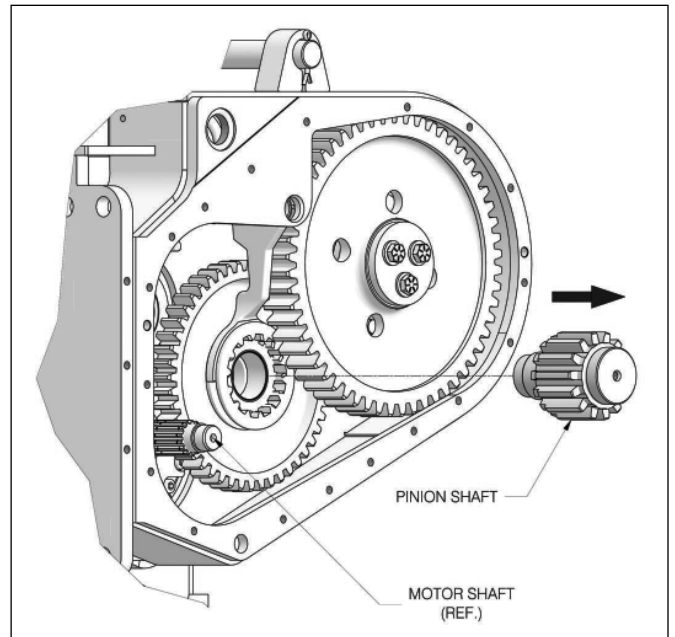
**Note:** Be aware that the freespool shaft, idler shaft and bearing, and the bearing for the motor shaft may drop down out of position.



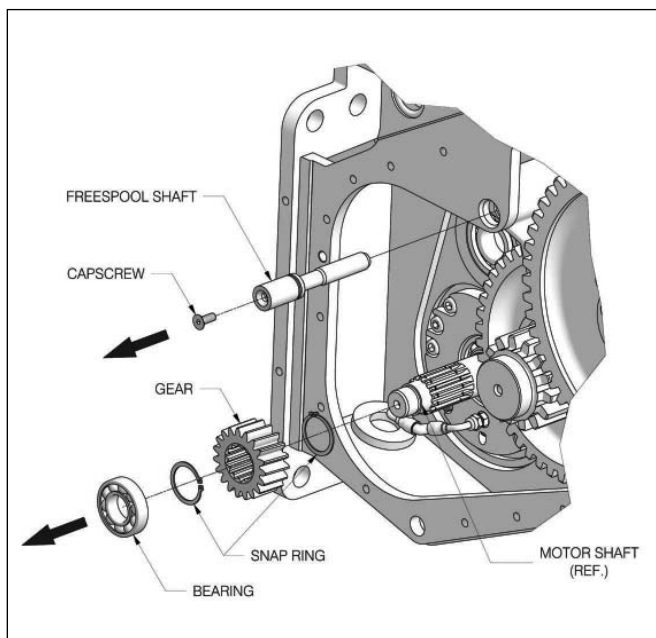
6. Remove the idler shaft and gears.



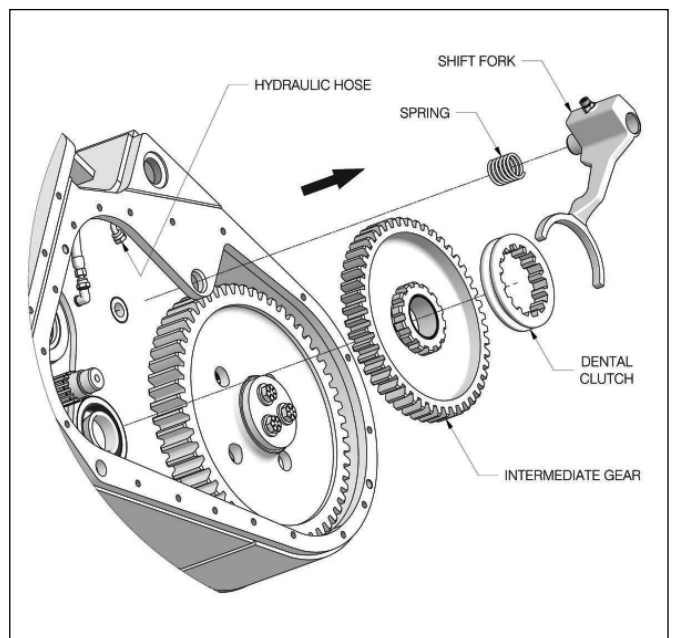
8. Remove the pinion shaft.



7. Remove freespool shaft, the gear and the bearing from the motor shaft.

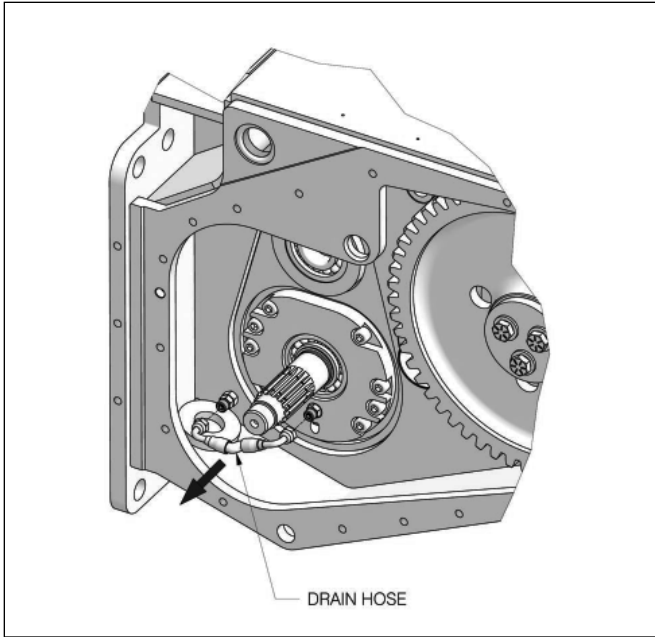


9. Disconnect the freespool hydraulic hose, remove the shift fork assembly and the intermediate gear.

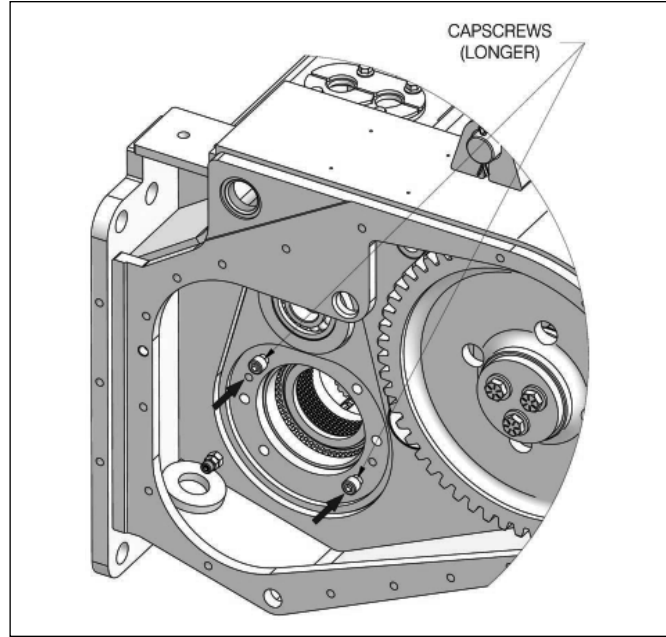


# Repairs - Brake Removal

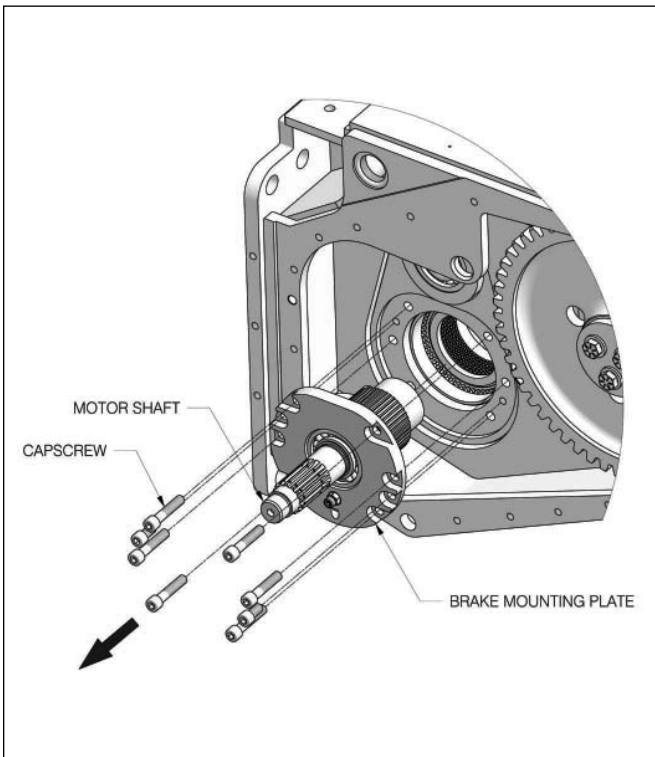
10. Remove the drain hose from the brake mounting plate to the winch frame.



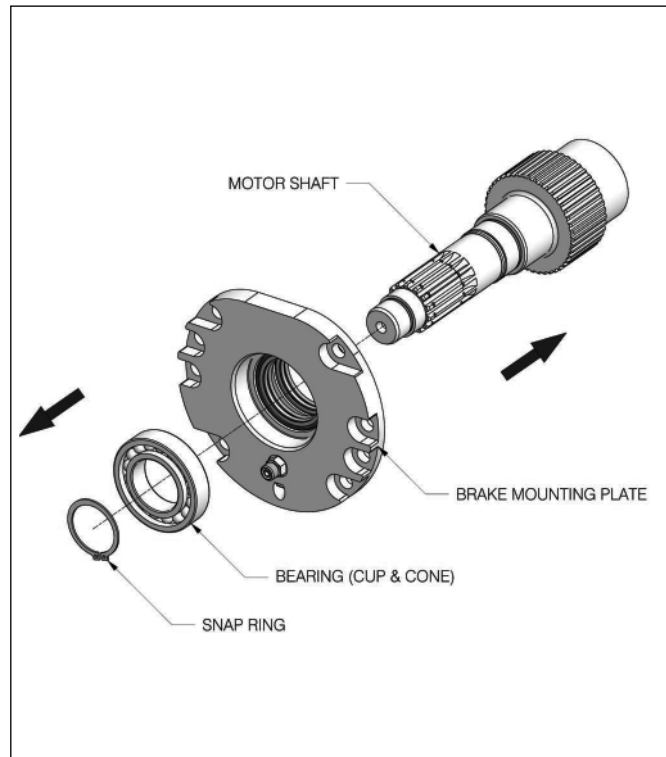
12. Temporarily install two longer cap screws removed from the brake mounting plate, to hold the brake housing to the winch frame. These cap screws need to be snug tight.



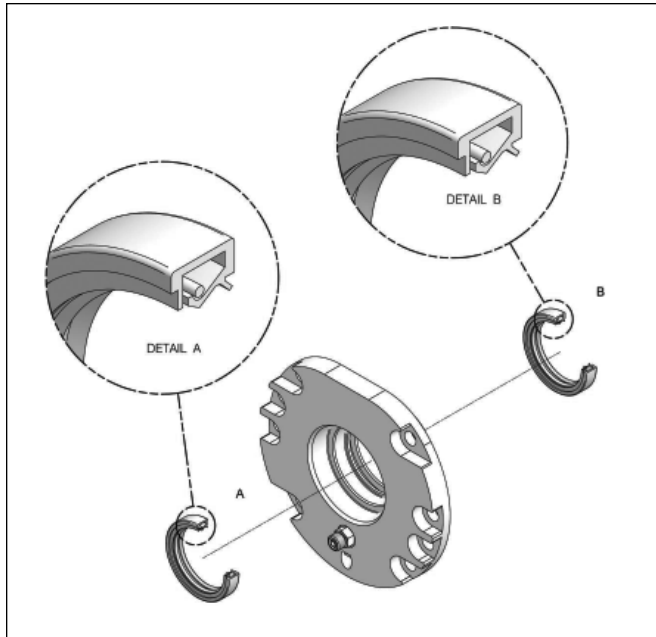
11. Remove the cap screws from the brake mounting plate, and use the shaft-like slide hammer to pull out the motor shaft and the brake mounting plate together.



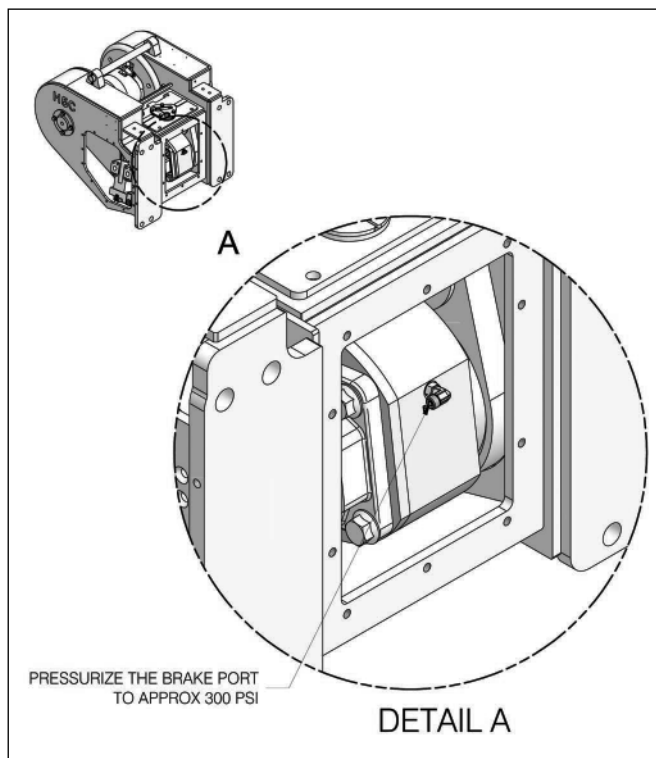
13. Remove the snap ring holding the roller bearing, and separate the brake mounting plate and the motor shaft.



14. The oil seals are contained in the brake mounting plate. Inspect the seals for damage and note the direction they are installed.



15. To remove the internal snap ring that holds the brake discs in place you will need to pressurize the brake port to approximately 300 psi, using a suitable hand pump.

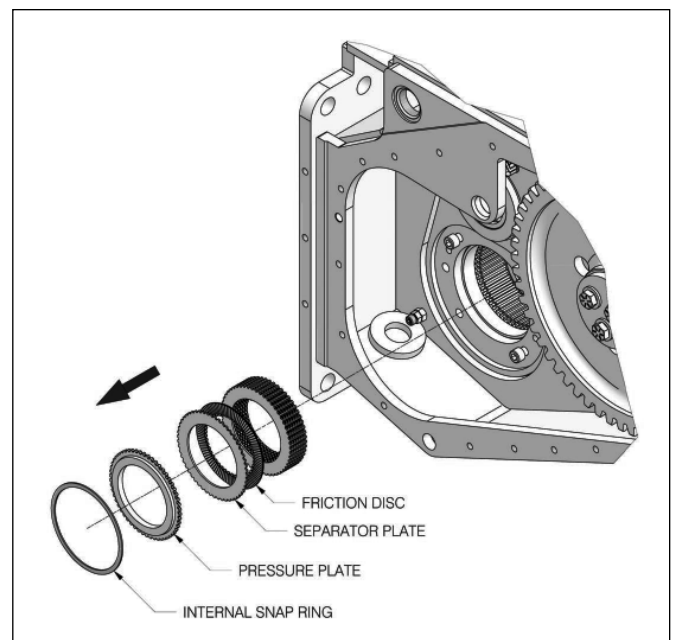


This holds the brake piston back and relieves the tension on the brake disc.

## ⚠ CAUTION

**Should pressure be lost during this procedure, personal injury may occur from pinched fingers and flying tools.**

16. Once the internal snap ring is fully removed, slowly release the pressure from the brake port. The pressure plate and brake disc should move out as the pressure is released.



17. Inspect the friction disc for wear and the separator plates for wear and flatness.

**Note: Care should be taken to keep the friction disc free from oil contamination. Any oil on the friction disc will decrease the holding capacity of the brake and they must be replaced.**

At this point if you need to access the piston, then disconnect and remove the winch motor and housing as an assembly. You must remove the two temporary capscrews installed after the removal of the brake mounting plate in step 9.

## Brake Disassembly

1. Remove the motor from the motor mounting plate. Refer to Hydraulic Motor Removal procedures described earlier. Then loosen the two 1/2" capscrews (one at the 12 o'clock, and one at the 6 o'clock position).

### ⚠ CAUTION

The mounting plate holds the brake springs under tension. Loosen capscrews alternating, one turn each to slowly un-cage the springs.

2. Once all tension is relieved from the mounting plate, remove the capscrews, and pull out the two springs. Note the spring orientation for re-assembly.
3. Remove brake piston and brake discs.

### ⚠ CAUTION

The brake is a dry multi-disc design. Do not get any oil on the friction disc. If the friction discs are contaminated with oil, the brake will greatly reduce holding power, and the brake discs must be replaced.

4. Remove the external snap ring and sleeve from brake housing.
5. Using a small magnet, remove friction and separator discs from brake housing.
6. To remove brake housing, the brake mounting plate and motor shaft must be removed from gear side of winch.

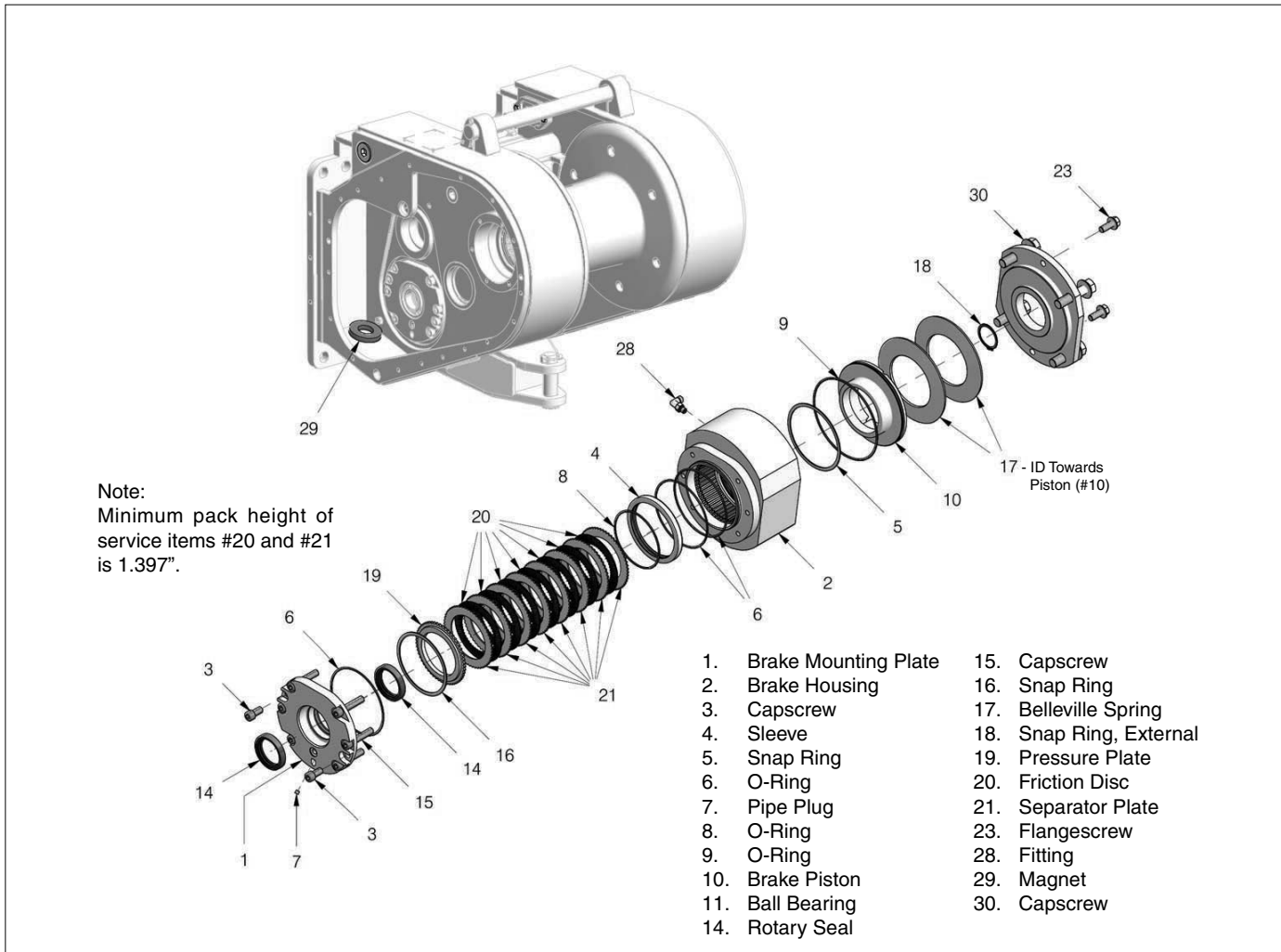


Figure 4-3 Brake Assembly

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## Winch Assembly

All components should be inspected for wear or damage as they are removed. Refer to Figure 4-4, Visual Inspection. All seals that were removed should be replaced during assembly. Carefully inspect all bearings that have been removed. Used bearings often appear satisfactory,

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

**Figure 4-4 Visual Inspection**

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Brake Assembly	Check for cracked or broken belleville/coil springs.	Replace springs if cracked or broken.
	Inspect housing and covers for leakage or damage.	Replace component if sealing surfaces or splines are damaged.
	Check the friction discs for wear, distortion, or damage. The discs should be free of hydraulic oil. The minimum pack thickness is 1.397".	Replace the friction discs if the wear grooves are worn away, the discs are burned, damaged, warped, or exposed to oil. Brake cleaner may be used to clean dust from the discs but will not remove impregnated oil.
	Check the brake/motor shaft seals for leakage into the brake housing.	Replace damaged seals.
	Inspect the brake/motor shaft for wear or damage.	Replace a damaged shaft.
	Check that the separator plates are flat, free of large blue areas (caused by overheating) or damaged surfaces.	Replace damaged separator plates.
	Inspect the piston for damage. Make sure the seal groove and sealing surfaces are in good condition.	Replace a damaged piston. Always replace the piston seals when the brake is repaired.
Winch Motor	Inspect motor shaft seal for wear or damage.	Note: A leaky motor shaft seal will contaminate the brake with oil and the brake will likely require service. Replace seal.
	Inspect vanes for wear or damage.	Normal wear results in slight flattening of vane tips, which does not impair motor performance. Replace vanes if radius is reduced by 50%.
	Inspect plates for wear or damage.	Normal wear results in marking of timing plates which does not impair motor performance. Replacement of the timing plate is required if any smearing, galling, or heat cracks are present.
	Inspect stator for wear or damage.	Normal wear results in polishing of cam form which does not impair motor performance. Noticeable wear may be apparent along the corner of one side of the vane slot. This does not require replacement of the stator, but may slightly affect volumetric efficiency.
Direction Control Manifold	Check that all passages and cartridge valves are free of contaminants.	Clean or replace cartridge valves. Clean all hydraulic passages.

(Continued on next page)



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

ITEM	INSPECTION REQUIREMENTS	CORRECTIVE ACTION
Logic Control Manifold	Check that all passages and cartridge valves are free of contaminants.	Clean or replace cartridge valves. Clean all hydraulic passages.
	Check torque on solenoid coils. Do not over-tighten.	Check that solenoid spool moves freely. Replace cartridge if stiction is present. Torque for solenoid cartridge is 20 ft-lbs. Torque for coil retaining nut is 5 ft-lbs.
<b>BRAKE - OFF</b> Manifold	Check that all passages and cartridge valves are free of contaminants.	Clean or replace cartridge valve. Clean all hydraulic passages.
	Check that 2-speed switch illuminates when <b>BRAKE-OFF</b> activated.	If no fault in 2-speed switch check or replace wire harness.
	Check that 2-speed switch illuminates when activated and turns off when deactivated.	Check harness connections or replace relay and pressure switches.
Freespool Shifter	Check oil level in winch is not over full. This is an indication that the freespool hose or piston seals are leaking.	Tighten or replace freespool shifter hose. Replace piston seals.
Freespool Dental Clutch	Check for broken or worn teeth.	Replace dental clutch if teeth are broken or severely worn.
Intermediate Shaft	Check for deep scratches or scoring on bearing surfaces at each end of shaft.	Dress surface or replace shaft if severely worn.
	Check for broken or severely worn splines.	Replace if splines are broken or severely worn.
Intermediate Gears	Inspect both gears for broken or severely worn teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gears if teeth are broken or severely worn.
Drum Shaft	Check for deep scratches or scoring on bearing surfaces.	Dress surface or replace shaft if severely worn.
	Check O-ring groove and seal surface.	Dress groove or replace shaft if severely worn.
	Check for crossthreaded or damaged threads.	Dress threads with thread chaser.
Drum Gear	Check for broken or severely worn gear teeth. Pay particular attention to leading edges of straight-cut gear teeth.	Replace gear if teeth are broken or severely worn.
Drum	Inspect quad-ring groove for burrs, scoring and rust.	Replace drum or rebuild drum groove if a new quad-ring will not seat properly.
Drum Adapter	Carefully inspect double seal contact surface for deep scratches, burrs and rust.	Replace if damaged.
Winch Frame	Check area around drum and drum adapter for damage if cable has slipped between cable guard and winch frame.	Consult the factory.

## Brake Assembly

1. Clean all parts thoroughly.
2. Install brake discs starting with a separator disc, and then alternate with a friction disc. You should start and end with a separator disc.

### ⚠ CAUTION

**The brake is a dry multi-disc design. Do not get any oil on the friction discs. If the friction discs are contaminated with oil, the brake will greatly reduce holding power, and the brake discs must be replaced.**

3. Install new o-rings on the piston and lightly coat with hydraulic oil. Do not get any oil on brake discs, see Caution above.

4. Install brake springs. Make sure that they are stacked together like dinner plates with the outer rim towards you.
5. Install mounting plate. Hand tighten all four cap-screws evenly. Then tighten one turn at a time in rotation until mounting plate is flat against the brake housing. Torque capscrews to 285 lbs ft.
6. Reinstall the motor, replace o-rings on motor pilot. Torque 1/2" capscrews to 80 lbs ft. (3/4" capscrews to 285 lbs ft.).
7. Connect hydraulic hard lines and hose. Replace any o-rings that were disturbed with new.
8. Install side cover. Once winch is reinstalled on the tractor, check for leaks, pressure settings, and proper operation.

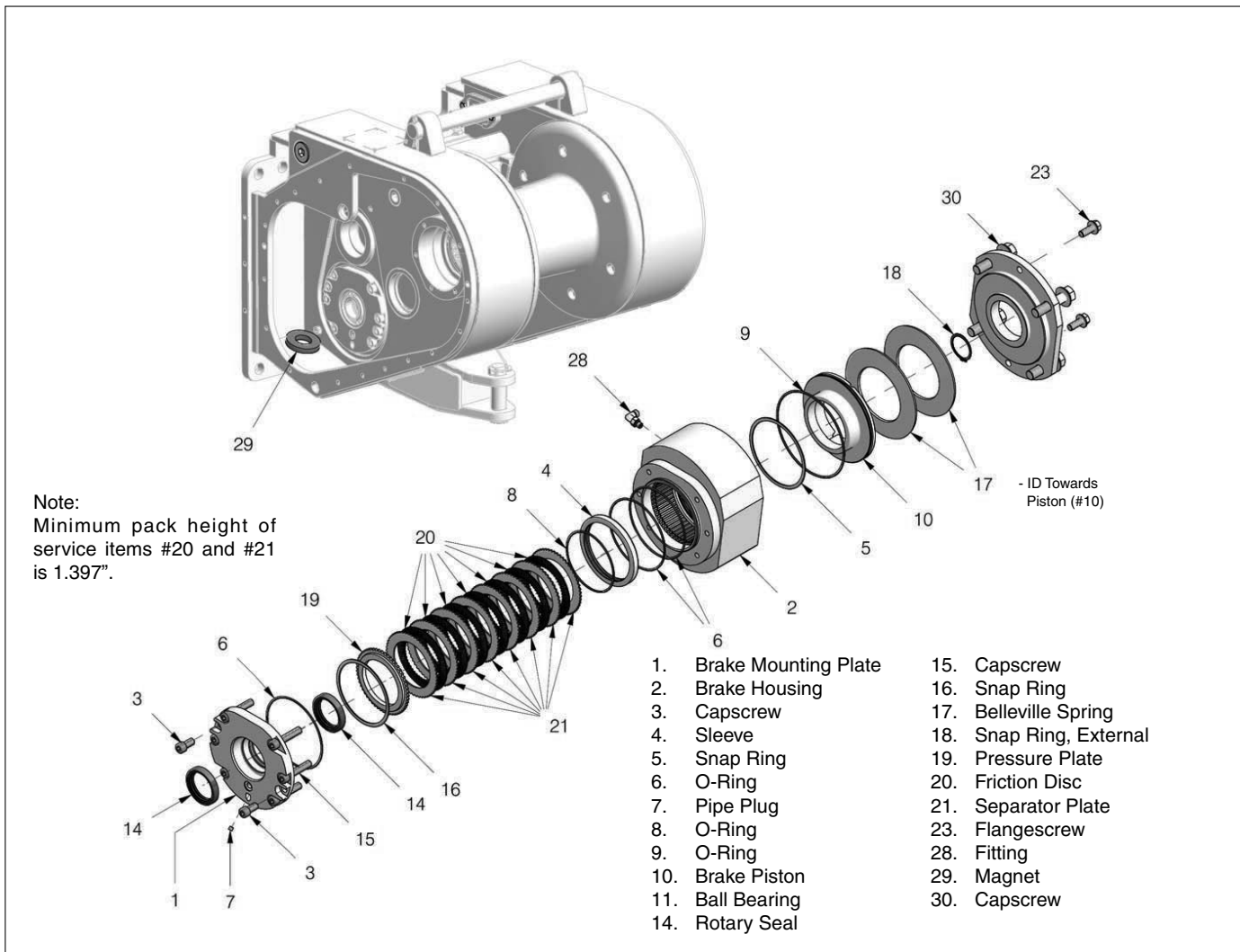
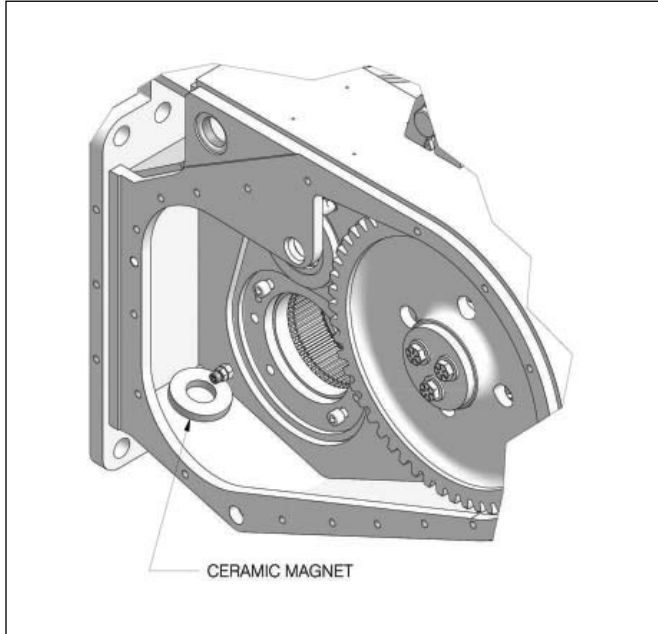


Figure 4-5 Brake Assembly

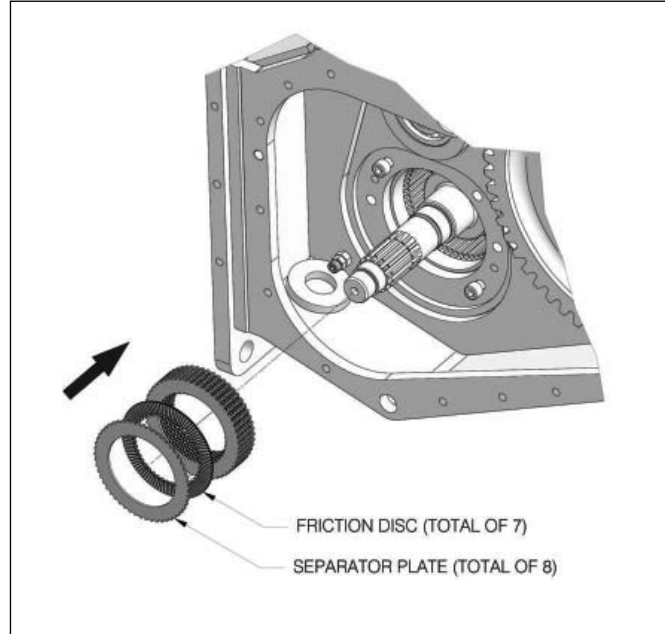
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## Brake Installation

1. Remove, clean, and then re-install the round magnet that is positioned on the bottom of the winch case ahead of the drain port.

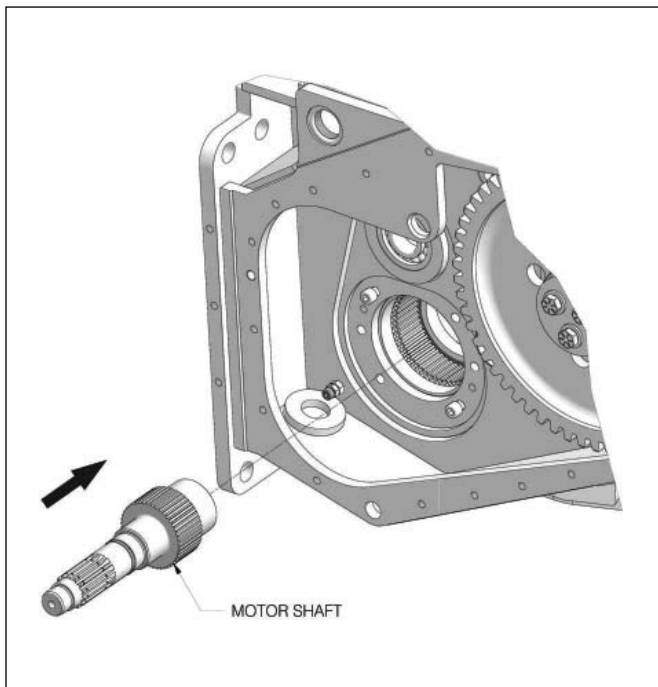


3. Install the brake disc starting with separator plate, then a friction, and continue alternating. You should end with a separator plate. There should be a total of (8) separator plates and (7) friction discs.

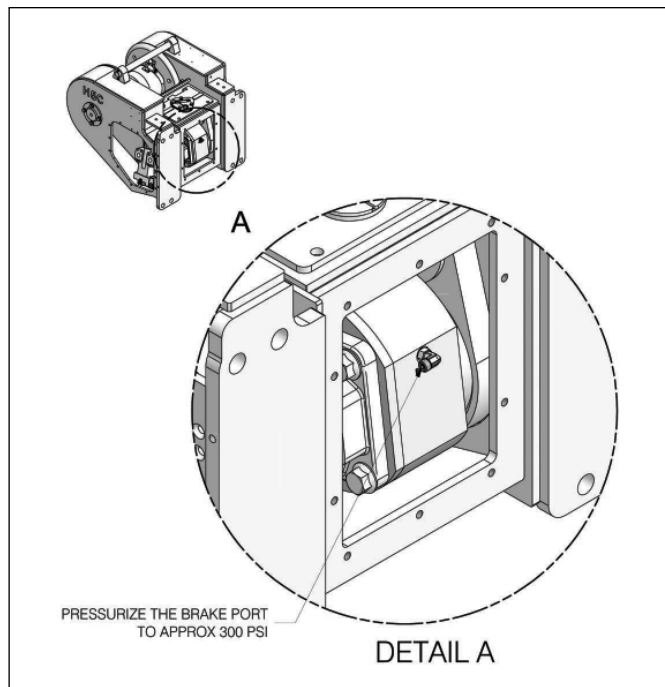


**Note: Care should be taken to keep the friction disc free from oil contamination. Any oil on the friction discs will decrease the holding capacity of the brake and they must be replaced.**

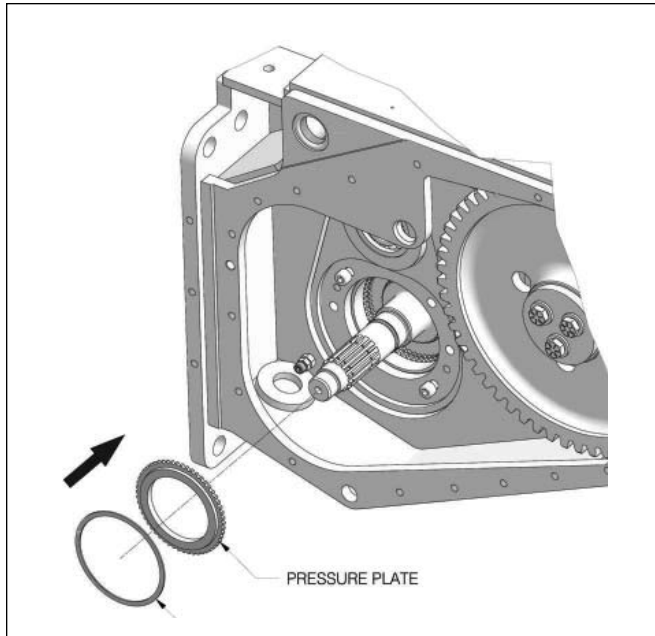
2. Insert the motor shaft, engaging the splines on the motor.



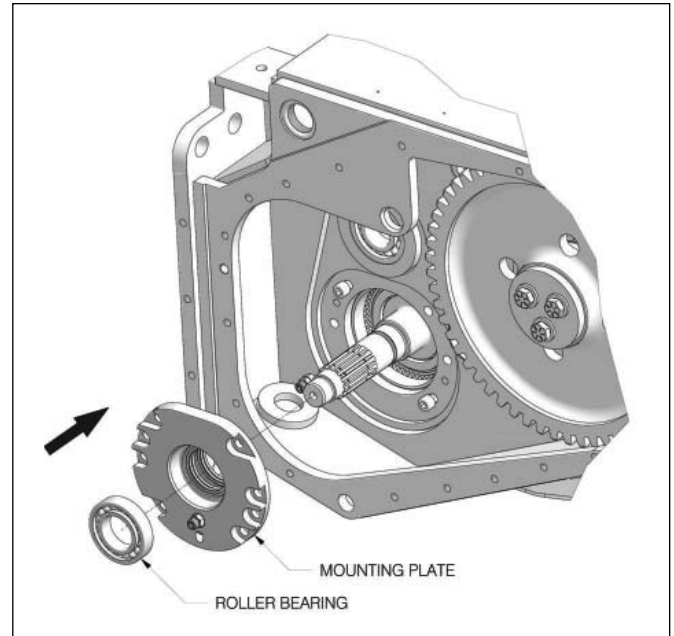
4. Connect the hand pump to the brake port and pressurize to 300 psi.



- With the piston fully retracted, install the pressure plate and the internal snap ring into the groove in the brake housing. Once the pressure plate and the internal snap ring are fully seated, slowly release the pressure.



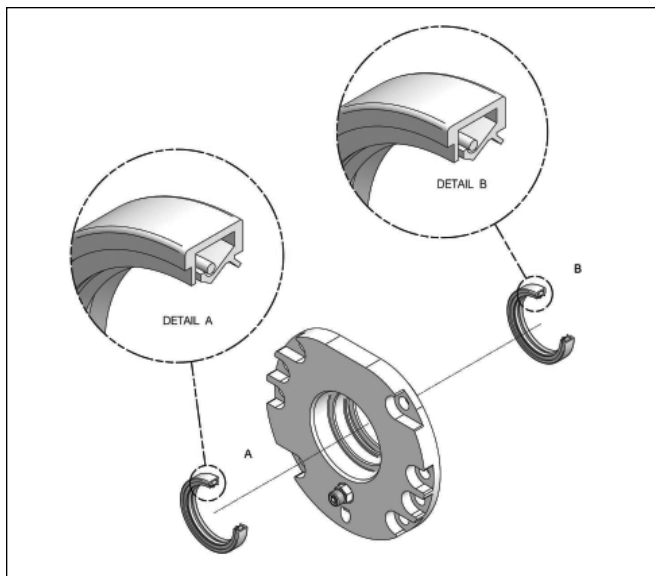
- Install the roller bearing in to the mounting plate to help guide the seals over the shaft, to prevent damage to the lip seals.



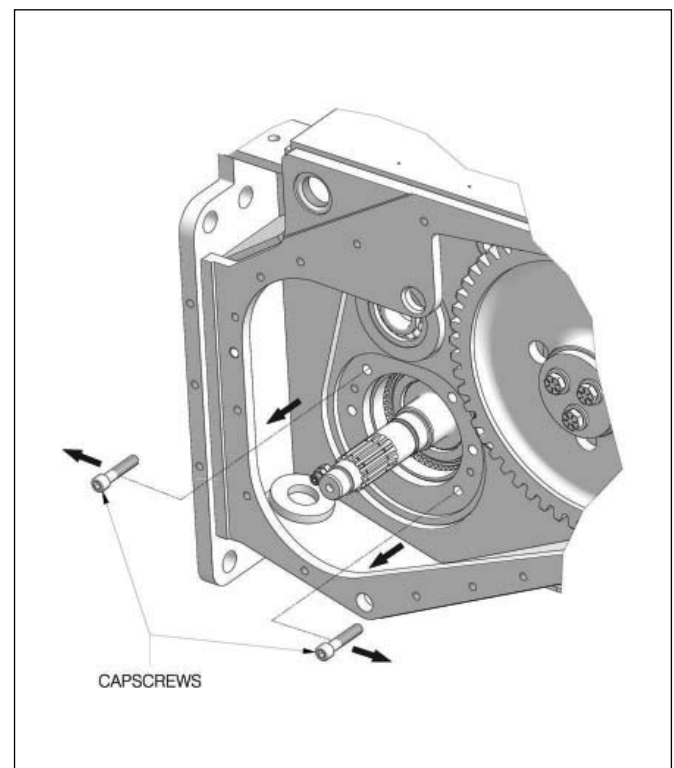
## ⚠ CAUTION

**Should pressure be lost during this procedure, personal injury may occur from pinched fingers and flying tools.**

- Install new seals in the brake mounting plate. Be sure to install the seals in the correct direction. Lubricate new seals with a very light coat of hydraulic oil. **Do not get any oil in the brake housing where the brake discs are.**



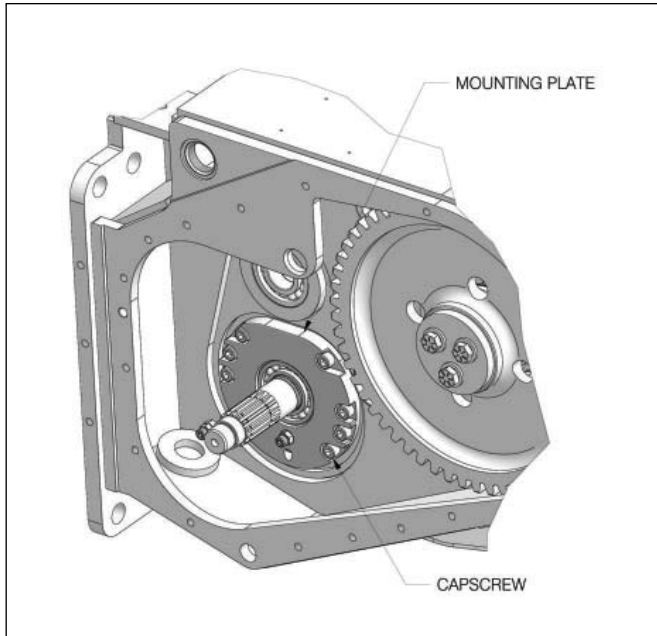
- Remove the two temporary capscrews.



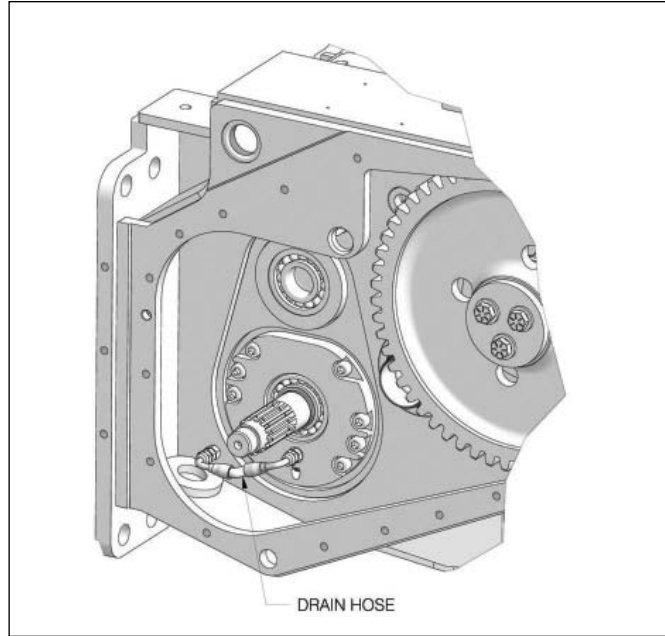
# Repairs - Brake Installation



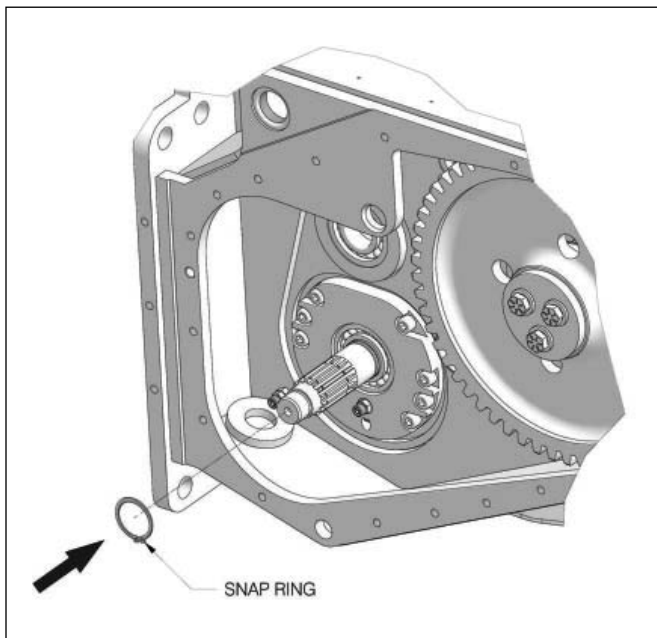
9. Install the mounting plate, and torque the capscrews to 80 LBS FT.



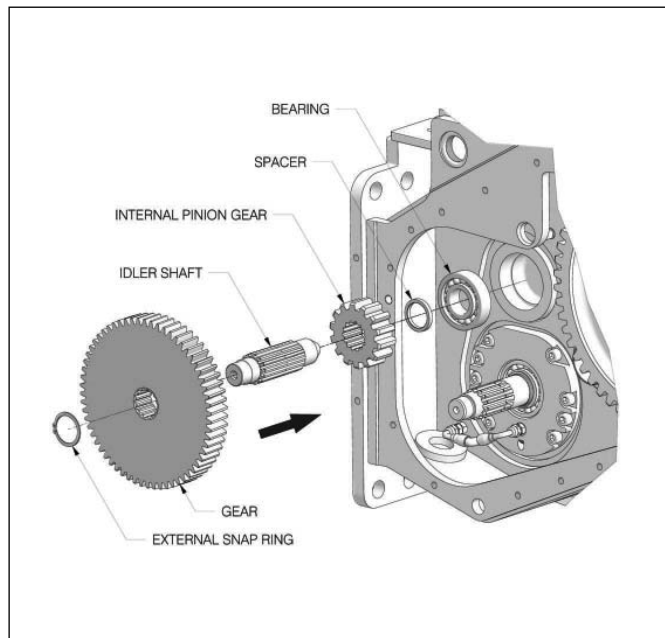
11. Connect drain hose from the brake mounting plate to the fitting on the winch frame. If the fitting was removed, use pipe sealant on the threads when re-installing it. **The drain hose must be clean and free from any oil residue.**



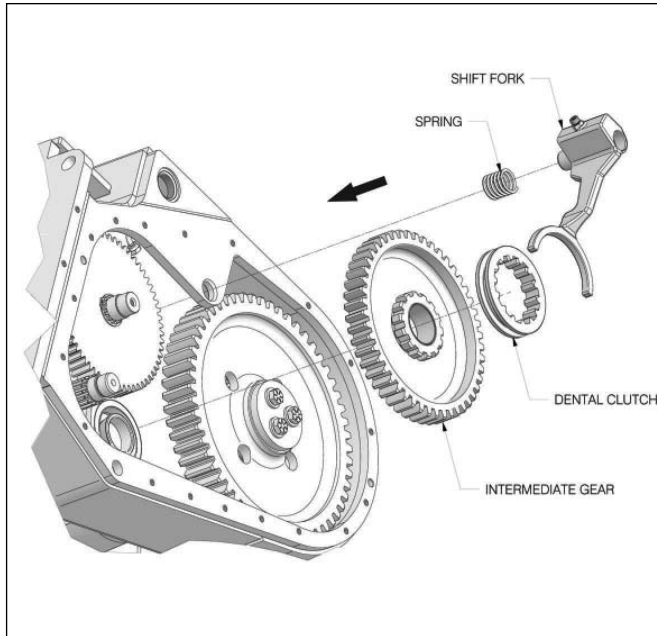
10. Install snap ring on motor shaft to retain the roller bearing.



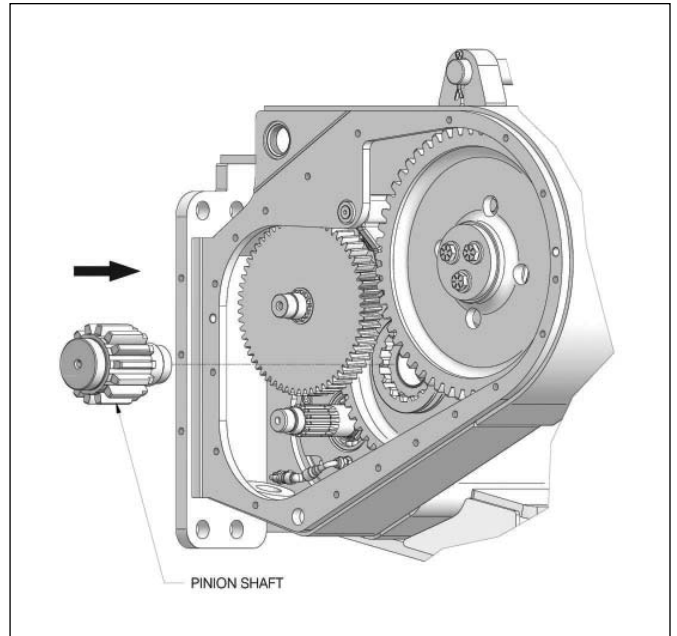
12. Install inner support bearing for the idler shaft, and then the spacer, the idler shaft, and the internal pinion gears.



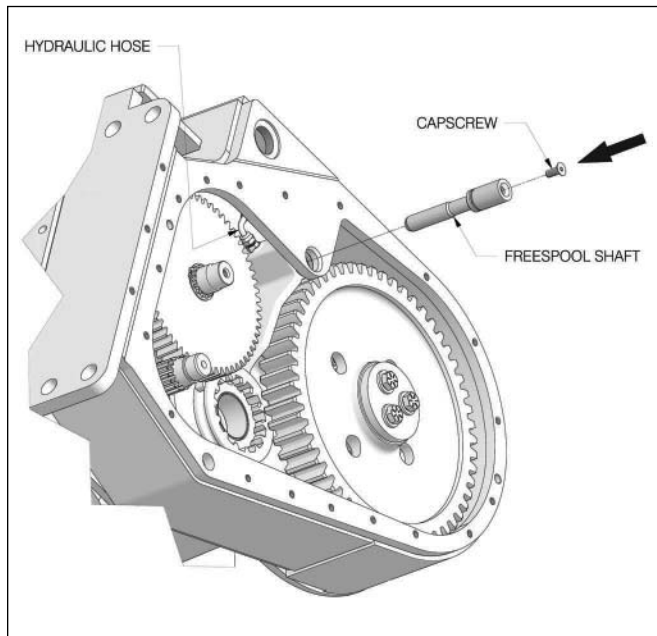
13. Install the intermediate gear, the dental clutch, and the freespool shift fork with the spring.



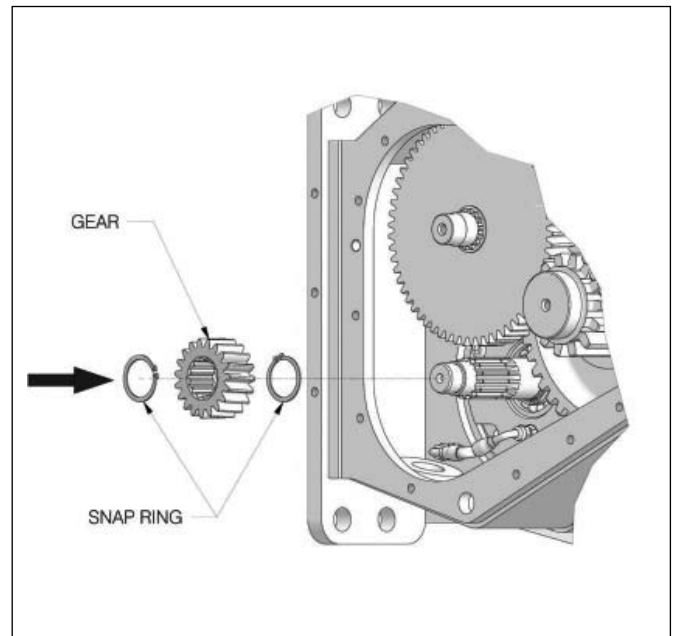
15. Install the pinion shaft.



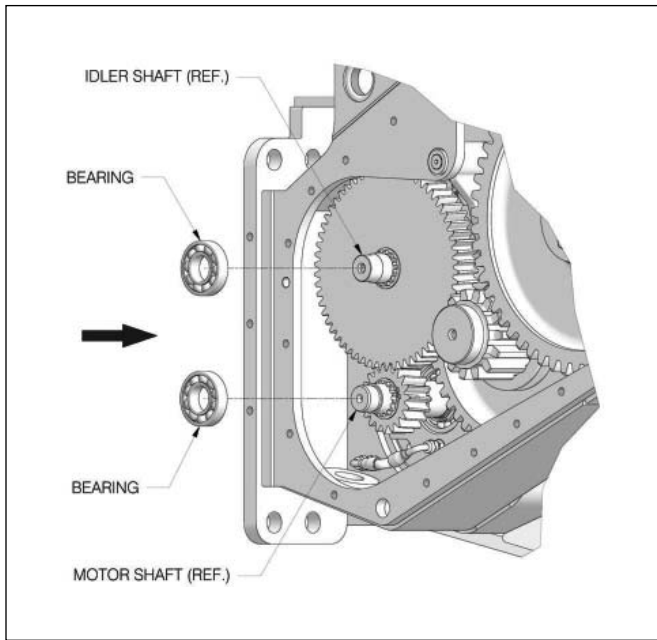
14. Install the freespool shaft and the capscrew. Reconnect the hydraulic hose from the shift fork to the fitting on the winch frame.



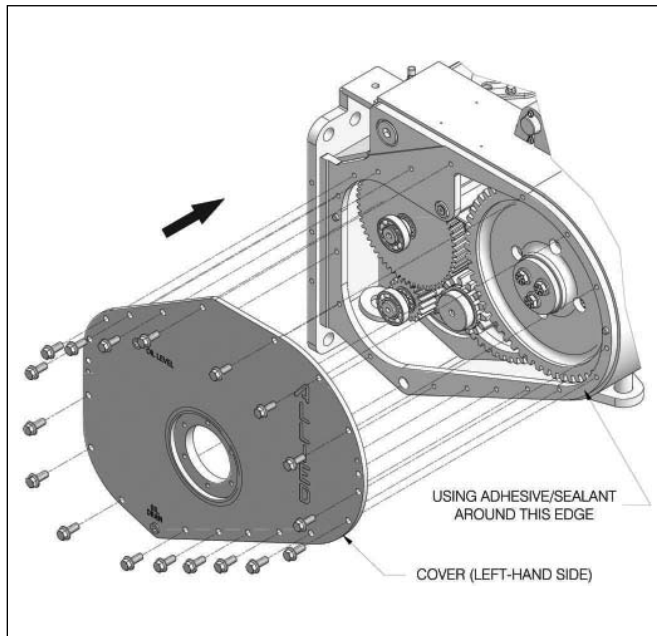
16. Install the gear on the motor shaft, install both snap rings.



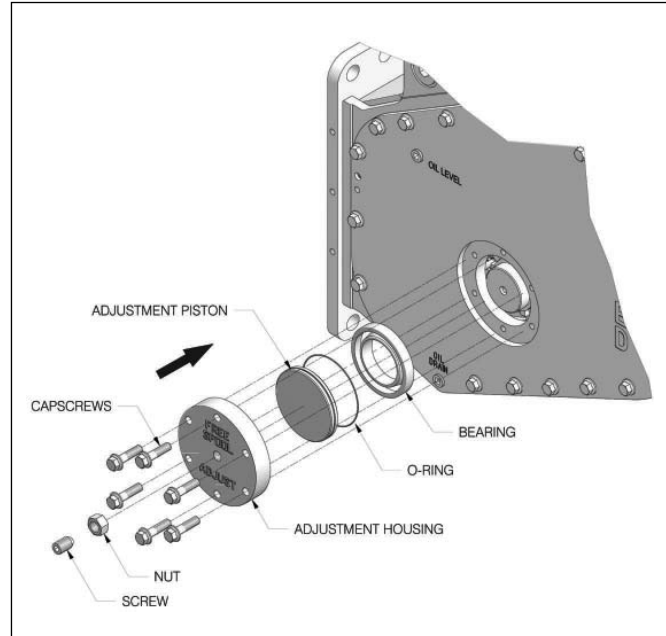
17. Position the bearings on the end of the motor and the idler shafts.



18. Using adhesive/sealant install the left hand frame cover. Torque capscrews to 80 LBS FT.



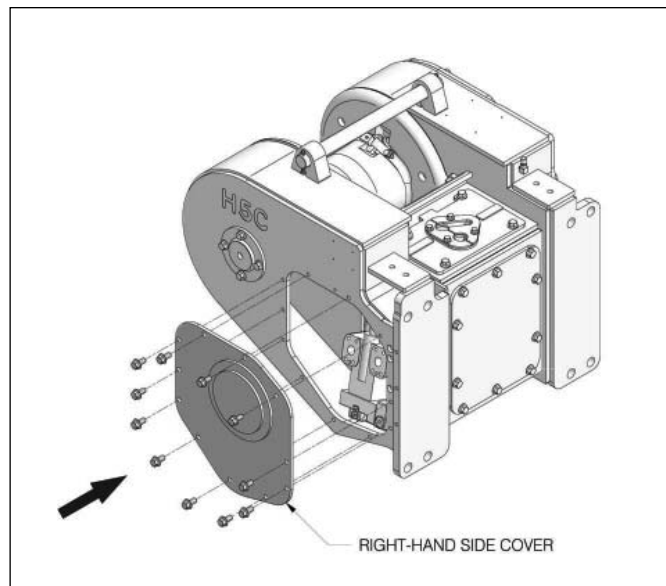
19. Install the freespool bearing (cone and cup). Inspect o-ring on freespool adjustment piston, and replace if damaged. Then, install freespool adjustment housing using adhesive/sealant. Torque capscrews to 80 LBS FT.



**Note: Back adjustment screw out until there is no pressure on the piston. This will be adjusted when winch is mounted and on the tractor.**

20. Refill the winch case with an approved oil listed in the service section of this manual up to the oil level port on the left side cover. Approximately 5-6 gallons. (To be verified by final assembly.)

21. Install the right-hand side frame cover. Torque capscrews to 80 LBS FT.



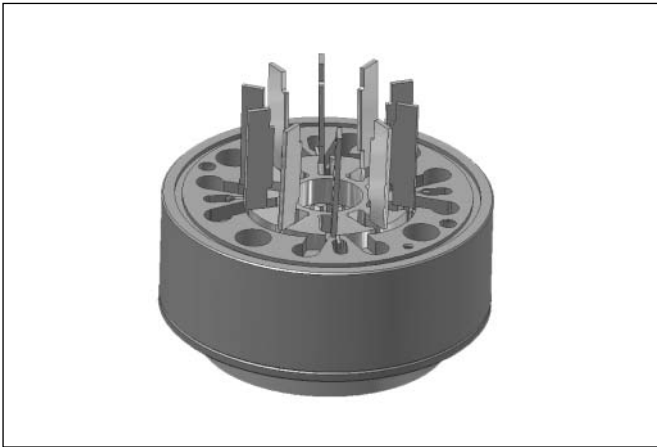


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## Motor Assembly (E48, E39, K37 Rescue)

**NOTE:** Disassembling the motor while it's still under its warranty period immediately invalidates the warranty. If the motor malfunctions before its warranty period expires, please contact Allied Systems Company first before attempting to repair it.

1. Install the rotor and stator vanes. Install the rotor.



**NOTE:** Make sure that the radiused edge of each stator vane points to the rotor and the radiused edge of each rotor vane points to the stator.

2. Replace timing plate on rotor/stator cartridge. Install O-ring and springs, and install dowel pins. Turn plate over and repeat.



**NOTE:** Make sure springs are seated in the bottom of the spring pocket in both the rotor and stator.

3. Place cartridge on any object which will hold it off the table. Install screws and timing plate.



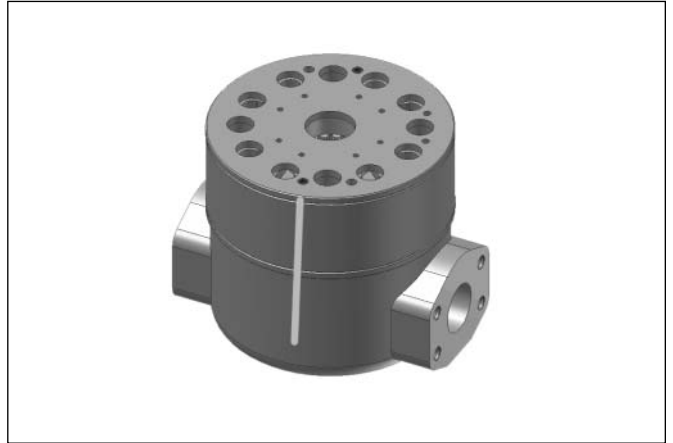
4. Press bearing onto shaft. Install snap ring.



5. Press shaft and bearing assembly into front housing by pressing on the outer race of bearing.



8. Place rotor/stator cartridge onto rear housing.  
**NOTE: Make sure assembly marks from step 3 in the Motor Assembly section are lined up.**



6. Place seal in seal plate. Place O-ring into groove in the front housing, then press seal plate into housing. Install snap ring.



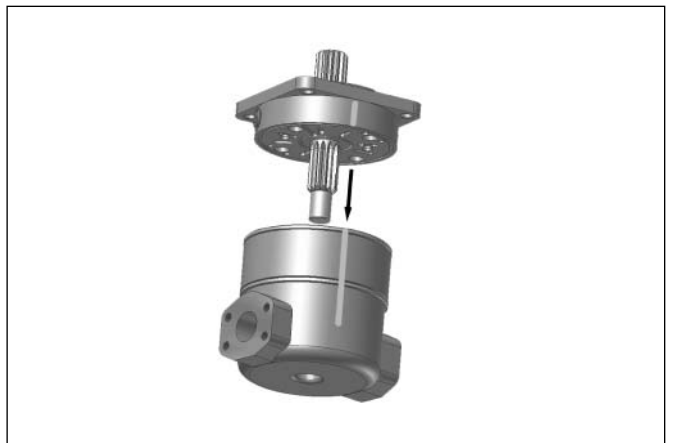
9. Install main body O-ring and ball checks into front housing. Place a small amount of grease over ball checks and O-ring, then wipe off excess grease.



7. Install dowel pins and ballchecks into rear housing. Install main body O-ring.



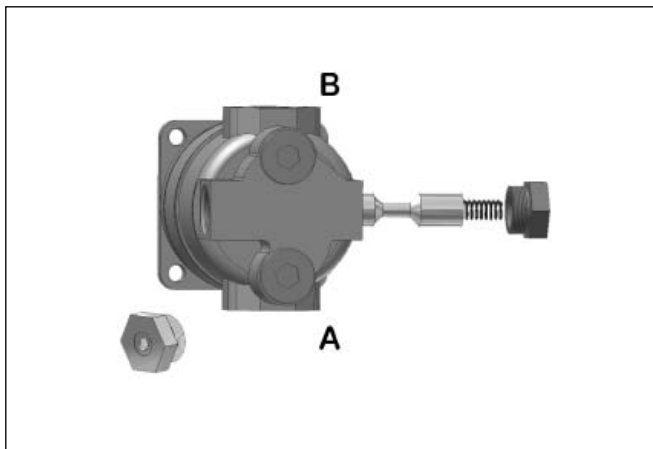
10. Install dowel pins into rotor/stator cartridge. Pour a small amount of clean oil into the cartridge, then install front housing. Make sure alignment marks are lined up.



11. Install 5/8-11 bolts. Torque bolts to 50 ft. lbs.



13. Reassemble the spool assembly. Ensure spool, spring and plug are oriented as shown for high-performance winches.



12. Rotate shaft in both directions to assure that the shaft turns smoothly. Torque motor to 190 ft. lbs. Rotate shaft again in both directions to assure that the shaft turns smoothly.



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## Motor Installation

### H5CT - Rescue Winch Motor Installation (K37) (Refer to the illustrations in Motor Removal subsection)

1. Using suitable lifting device position new motor in winch frame, in the same orientation as original motor. Install four fasteners in motor flange.
2. Install directional control manifold and hand tighten fasteners only. Install tube from directional manifold to fitting on motor port "A", also hand tight. Once both ends of the tube are hand tight, tighten fittings, then tighten directional control manifold.
3. Install cross port relief manifold with hose still connected. Route hose to tee on the right-hand port of the directional manifold and hand tighten hose fitting. Mount cross port relief and then tighten hose.
4. Install the other hose from the cross port relief manifold to the tee on the motor port "B".
5. Install control valve manifold. Use blue loc-tite on fasteners that thread into the aluminum manifold and tighten to 33 ft-lbs.
6. Install all remaining hoses and clamps.
7. Install right-hand side cover and reposition winch to the upright position. Refill gear compartment with the proper oil, or remove installed pipe plug and reinstall breather.
8. Install winch on tractor and test for proper operation.

### H5CH - 2 Speed Winch Motor Installation (E48) (Refer to the illustrations in Motor Removal subsection)

1. Using suitable lifting device position new motor in winch frame, in the same orientation as original motor. Install four fasteners in motor flange.
2. Ensure clamp for pressure switch is on right-hand fastener. Install hydraulic fittings hand-tight only.
3. Install hose from directional manifold port "B" to motor port "B" first, hand-tight only. Then install hose from directional port "A" to motor port "A" hand-tight. Position hoses and tighten all fittings and hose ends.
4. Install brake-off manifold and connect hoses. Tighten fasteners to 7 ft-lbs.
5. Install logic manifold. Use blue loc-tite on fasteners that thread into the aluminum manifold and tighten to 33 ft-lbs. Connect wire harness to solenoids and connect all remaining hoses and clamps.
6. Refill gear compartment with the proper oil if needed, or remove installed pipe plug and reinstall breather. Check for proper oil level.
7. Install winch on tractor, test for proper operation and inspect for hydraulic leaks.
8. Reinstall all covers.

## **H5CH - 2 Speed Winch Motor Installation (C391) (Refer to the illustrations in Motor Removal subsection)**

1. Using suitable lifting device position new motor in winch frame, in the same orientation as original motor. Install four capscrews in motor flange.
2. Ensure clamp for pressure switch is on right-hand fastener. Install hydraulic fittings hand-tight only.
3. Install hose from directional manifold port "B" to motor port "B" first, hand-tight only. Then install hose from directional port "A" to motor port "A" hand-tight. Position hoses and tighten all fittings and hose ends.
4. Connect wire harness to solenoids, and connect all remaining hoses and clamps.
5. Refill gear compartment with the proper oil if needed, or remove installed pipe plug and reinstall breather. Check for proper oil level.
6. Install winch on tractor, test for proper operation and inspect for hydraulic leaks.
7. Reinstall all covers.

## **H5CH - Variable Speed Winch Motor Installation (K37) (Refer to the illustrations in Motor Removal subsection)**

1. Using suitable lifting device position new motor in winch frame, in the same orientation as original motor. Install two bottom fasteners in motor flange. These are shorter than the ones used in the top holes.
2. Install directional control mounting bracket using the longer fasteners through the motor mounting flange. Adjust bracket to be level and tighten fasteners to 80-84 ft-lbs.
3. Install directional control manifold and hand tighten fasteners only. Install tube from directional manifold to fitting on motor port "A" and then port "B" hand tight only. Once both ends of both tubes are hand tight, tighten all of the fittings, and then tighten directional control manifold to bracket.
4. Install the removed hoses.
5. Install all remaining hoses and clamps.
6. Install winch on tractor, test for proper operation and inspect for hydraulic oil leaks.
7. Refill gear compartment with the proper oil if needed, or remove installed pipe plug and reinstall breather. Check for proper oil level.
8. Reinstall all removed covers.

## 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. Attach sling or chain fall to lift points.
3. Raise the winch.
4. Align the studs with the mounting holes to prevent thread damage.
5. Loosely install the two top nuts or capscrews before the winch is fully seated against the tractor.
6. Secure the winch in place using the parts listed in the mounting kit instructions. Tighten the nuts/capscrews alternately at each side of the winch to pull the winch evenly against the tractor.
7. Install control lever assembly per mounting kit instructions.

### **WARNING**

**Make sure the lifting device has a minimum rated capacity of 1,500 kg (3,500 lbs.) before lifting the winch.**











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