

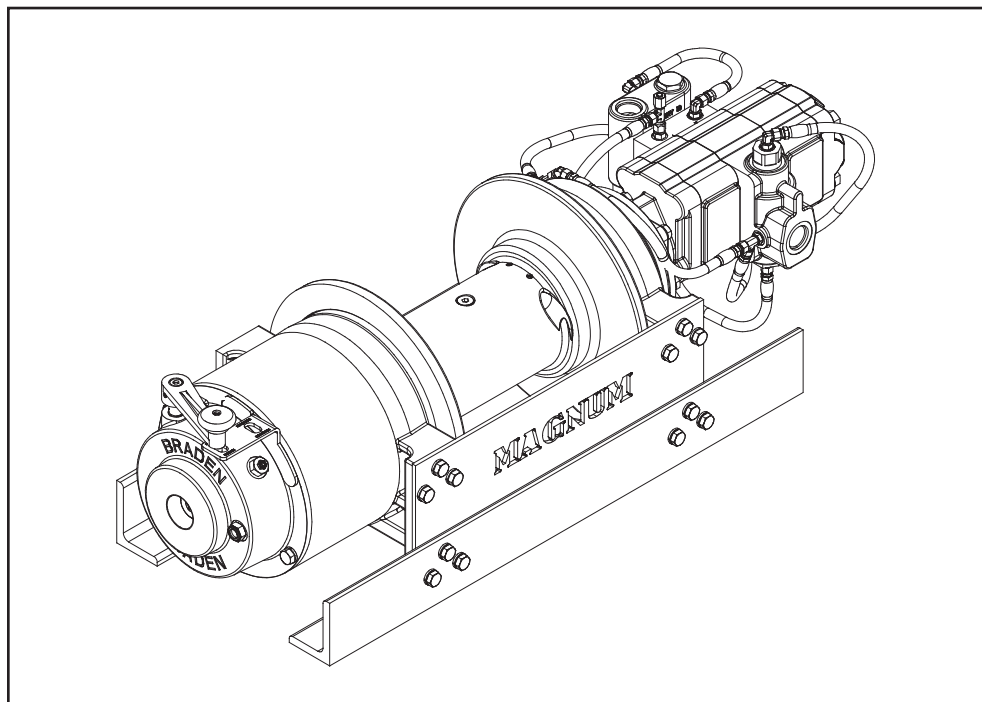
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# BRADEN

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## HP35A

# HYDRAULIC PLANETARY RECOVERY WINCH



## INSTALLATION, MAINTENANCE, AND SERVICE MANUAL

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## EXPLANATION OF MODEL NUMBER

**HP 35 A - 35 119 - 01 - EB**

<b>HP</b>	<b>DESIGNATES HYDRAULIC PLANETARY RECOVERY WINCH</b>
<b>35</b>	<b>DESIGNATES 35,000 POUND FIRST LAYER LINE PULL</b>
<b>A</b>	<b>DESIGNATES THE MODEL SERIES RELATING TO DESIGN CHANGES</b>
<b>35</b>	<b>DESIGNATES TOTAL GEAR REDUCTION</b>
<b>119</b>	<b>DESIGNATES HYDRAULIC MOTOR DISPLACEMENT (119 - 11.9 CU IN/REV)</b>
<b>01</b>	<b>DESIGNATES THE DRUM OPTION</b>
<b>EB</b>	<b>DESIGNATES THE EXTENSION SHAFT</b>

# FOREWORD

Read and understand this manual before operating or servicing your BRADEN winch. Retain this manual for future reference.

The minimum service intervals specified are for the operating hours of the prime mover.

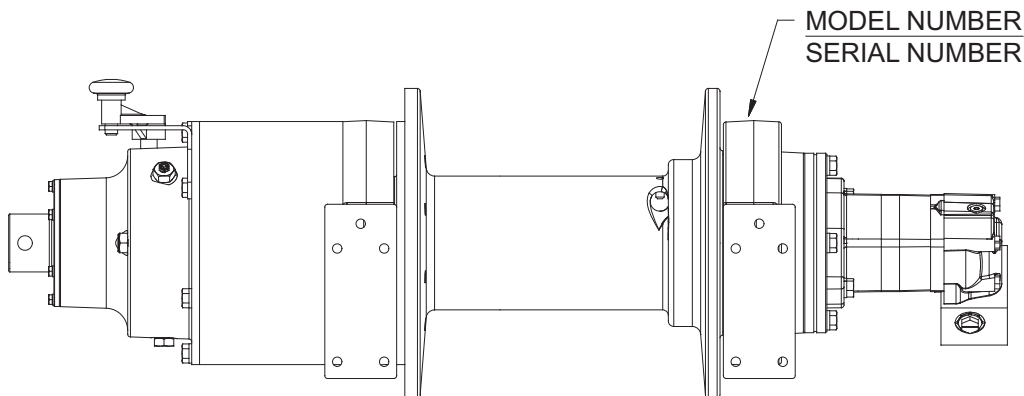
This manual contains installation, operation and preventive maintenance instructions for current Model HP35 BRADEN Planetary Recovery winches. As there are many product variations, you must become familiar with your BRADEN winch to fully benefit from the information contained within this publication.

Some illustrations in this manual may show details or attachments that may be different from your winch, and some components may be removed for illustrative purposes.

Whenever a question arises regarding your BRADEN winch or this manual, please contact your nearest BRADEN distributor or the PACCAR Winch Division Product Support Department at (918)-251-8511, Monday – Friday, 0800 – 1630 hours CST, by fax at (918)-259-1575, or via the internet at [www.paccarwinch.com](http://www.paccarwinch.com). Provide the complete winch model and serial number when making inquiries.

## Parts and Service

BRADEN provides parts and service through a network of BRADEN distributors. Parts and service are not available directly from the PACCAR Winch Division. For the name of your nearest BRADEN distributor, consult your local phone directory, or contact BRADEN as defined above.



The winch model number is an important reference as to what optional components were used when the winch was manufactured. The model and serial numbers are stamped into the gear housing as shown above.

Record the information below for future reference. Always include the model and serial numbers when inquiring or ordering parts.
<b>Model No.</b> _____
<b>Serial No.</b> _____
<b>In-Service Date</b> _____



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# GENERAL SAFETY RECOMMENDATIONS

Safety informational callouts used in this manual include:

## **WARNING**

This emblem is used to warn against hazards and unsafe practices which **COULD** result in severe injury or death if proper procedures are not followed.

## **CAUTION**

This emblem is used to warn against potential or unsafe practices which **COULD** result in injury and product or property damage if proper procedures are not followed.

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure the safety of others as well as yourself. To properly ensure safety, the prime mover and winch **MUST** be operated with care and concern by the operator of the equipment. The operator **MUST** also have a thorough knowledge of the machine's performance capabilities.

## **WARNING**

Failure to obey the following safety recommendations may result in property damage, injury, or death.

1. Read and understand **ALL** warning tag information, and become familiar with **ALL** controls **BEFORE** operating the winch.
2. **NEVER** attempt to clean, oil or perform maintenance on a machine with the engine or prime mover running, unless instructed to do so in this manual.
3. **NEVER** operate the winch controls unless you are properly positioned at the operator's station, you are sure **ALL** personnel are clear of the work area **AND** you are properly trained in the operation of the winch.
4. Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by all involved.
5. Ground personnel should stay in view of the operator and clear of the winch drum. **DO NOT** allow ground personnel near a winch line under tension. A safe distance of at least 1½ times the length of the outstretched cable should be maintained.
6. On machines having hydraulically, mechanically and/or cable controlled equipment or attachments, ensure the equipment is blocked securely before servicing, adjusting or repairing the winch. **ALWAYS** apply the parking brakes before dismounting a vehicle.
7. Inspect the winch and rigging at the beginning of each work shift. Defects should be corrected immediately. **DO NOT** operate a defective winch.
8. Keep equipment in good operating condition. Perform scheduled service and adjustments as defined in the "Preventive Maintenance" section of this manual.
9. An equipment warm-up procedure is recommended for all start-ups, and is essential at ambient temperatures below +40°F (5°C). Refer to the "Warm-Up Procedure" listed in the "Preventive Maintenance" section of this manual.
10. The winches described in this manual are neither designed nor intended for use or application to equipment used in the lifting or moving of persons.
11. **DO NOT** exceed the maximum pressure, PSI (kPa), or flow, GPM (LPM), stated in the winch specifications.
12. Operate at winch line speeds to match the job conditions.
13. Protective gloves should be worn when handling wire rope.
14. **NEVER** attempt to handle wire rope when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and winch cable drum.
15. When winding wire rope on the cable drum, **NEVER** attempt to maintain tension by allowing the wire rope to slip through hands. **ALWAYS** use the "Hand-Over-Hand" technique.
16. **NEVER** use wire rope with broken strands. Replace damaged wire rope.
17. **DO NOT** weld on any part of the winch without approval of PACCAR Winch Division Engineering.
18. Use the recommended hydraulic oil and gear lubricant.
19. Keep the hydraulic system clean and free of contamination at all times.

20. Use the correct anchoring method for attaching the wire rope to the drum. **DO NOT** use knots to secure or attach the wire rope.
21. The cable anchor or U-clamp is **NOT** intended to support full rated load. **ALWAYS** maintain a minimum of five (5) wraps on the drum. It is recommended the last five (5) wraps of wire rope be painted bright red to serve as a visual reminder.
22. Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the cable is wrapped onto the drum or drawn through guide rollers or other “pinch points”.
23. Install switches or valves that will shut off power to the winch and/or capstan, in locations where they can be reached by anyone entangled in the wire rope before being drawn into the winch drum, capstan or other “pinch point”.
24. “Deadman” controls, which automatically shut off power to the winch or capstan drive whenever the operator leaves his station must be installed.
25. **NEVER** allow anyone to stand or position any part of the body under a suspended load.
26. Avoid sudden “shock” loads, or attempting to “jerk” a load free. This type of operation may cause heavy loads, in excess of rated capacity, which may result in a failure of the wire rope and/or the winch.
27. Whenever possible, install the winch in a location such that the rotating capstan or the extension shaft is not immediately adjacent to any operator’s station.
28. **ALL** winch and/or capstan controls should be located within easy reach of the operator. The controls shall be installed in such a location that the operator is removed from the electrical path to ground if the load, rigging or wire rope comes into contact with or within proximity to an electrically energized conductor.
29. Periodically inspect the overall condition of the capstan, paying particular attention to the sharp corner of the lock-pocket as shown on page 16. **DO NOT** use capstans with a worn lock-pocket or a missing or damaged spring.
30. Spool the free end of the rope neatly on the ground, to avoid the rope becoming tangled around your feet and/or legs.
31. If the original capstan pin is replaced with a bolt, you **MUST** use a Grade 8 fastener with a self-locking hex nut.
32. Load ratings, or line pulls, of capstans are dependent on the hydraulic motor used and the length of the extension shaft beyond the last bearing support. Do not extend the shaft or use any non-approved capstan.
33. Appropriate guarding should be installed around the exposed portions of the extension shaft and/or capstan to prevent personnel from getting any part of body or clothing caught during operation.
34. **ALL** rope used on a capstan **MUST** be non-conducting such that the operator is removed from the electrical path to ground if the load, rigging or rope should come in contact with or within proximity of an energized conductor.

**⚠ WARNING ⚠**

Exposed areas of capstans and extension shafts are extremely dangerous. Clothing and other items may become entangled and wrapped around the rotating shaft. Install appropriate guarding to prevent any part of the body or clothing from making contact with the shaft when it is rotating. Failure to provide adequate guarding could result in property damage, injury, or death.



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# DESCRIPTION OF OPERATION

## (Winch with Overrunning Clutch)

The HP35A winch comes in two basic configurations:

1. Winch has an overrunning clutch and the brake is released during reel-out only.
2. Winch has a solid brake coupling and the brake is released during reel-in and reel-out. Generally, the winches with a solid brake coupling will be units with extension shafts.

The description of operation for both configurations is included in this manual.

### BASIC DESCRIPTION

The winch consists of the following sub-assemblies:

1. Hydraulic motor and brake valve
2. Planetary gear reducer assembly
3. Static brake system
4. Cable drum, drum shaft and clutch
5. Base

The primary sun gear is directly coupled to the hydraulic motor by the inner race of the brake clutch assembly. As the motor shaft turns in the haul-in direction, the planetary assemblies reduce the speed input by the motor to rotate the cable drum. In the haul-in direction, the static brake remains fully applied and the input shaft rotates freely through the sprag clutch. When the motor is stopped, the load attempts to rotate the winch gear train in the opposite direction locking the brake clutch to the input shaft, allowing the fully applied static brake to hold the load firm.

### DUAL BRAKE SYSTEM

The dual brake system consists of a dynamic brake system and a static brake system.

The dynamic brake system has two operating components:

1. Brake Valve Assembly
2. Hydraulic Motor

The brake valve is basically a counterbalance valve with better metering characteristics for load control. It contains a check valve to allow free oil flow to the motor in the haul-in direction, and a pilot operated, spring-loaded spool valve that blocks the flow of oil out of the motor when the control valve is placed in neutral. With the control valve lever moved toward the pay-out direction, the spool valve remains closed until sufficient pilot pressure is applied to the end of the spool to shift it against the spring pressure and open a passage. After the spool valve cracks open, the pilot pressure becomes flow dependent and modulates the spool valve opening, controlling the pay-out speed of the winch. See Figures 1, 2, and 3.

The static brake system has three main components for all winches:

1. Spring-Applied, Multiple Friction Disc Static Brake
2. Hydraulic Piston and Cylinder
3. Brake Clutch Assembly

The static brake is released by the brake valve pilot pressure at a pressure lower than that required to open the pilot operated spool valve. This sequence ensures that dynamic braking takes place within the brake valve, and that little, if any, heat is absorbed by the static, friction brake. The static friction brake is load holding brake only, and has nothing to do with dynamic braking or the rate of descent of a load.

The brake clutch assembly is splined to the primary sun gear shaft between the hydraulic motor and primary sun gear. It will allow this shaft to turn freely in the direction to haul-in a load, and locks up to force the brake discs to turn with the shaft in the pay-out direction. See Figures 4 and 5.

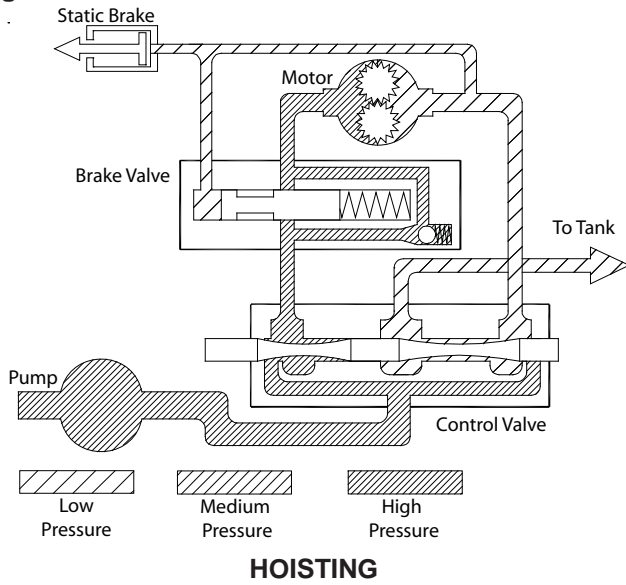
The hydraulic brake cylinder, when pressurized, will release the spring pressure on the brake discs, allowing the discs to turn freely.



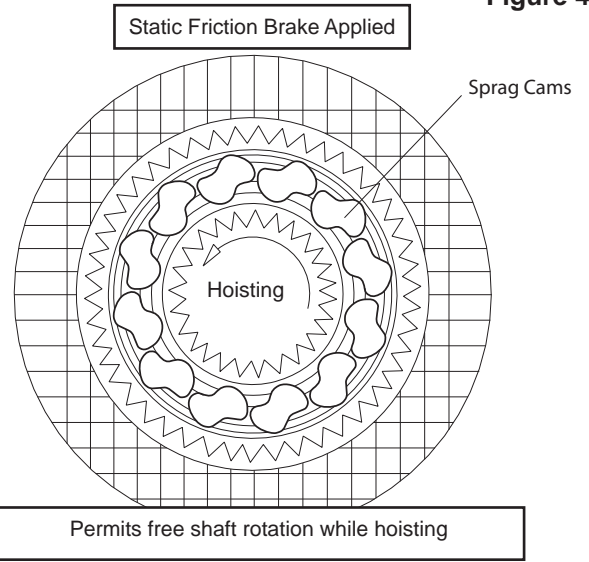
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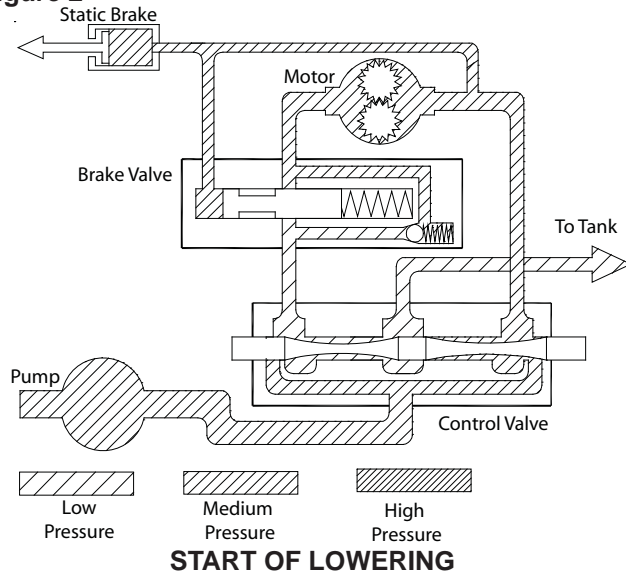
**Figure 1**



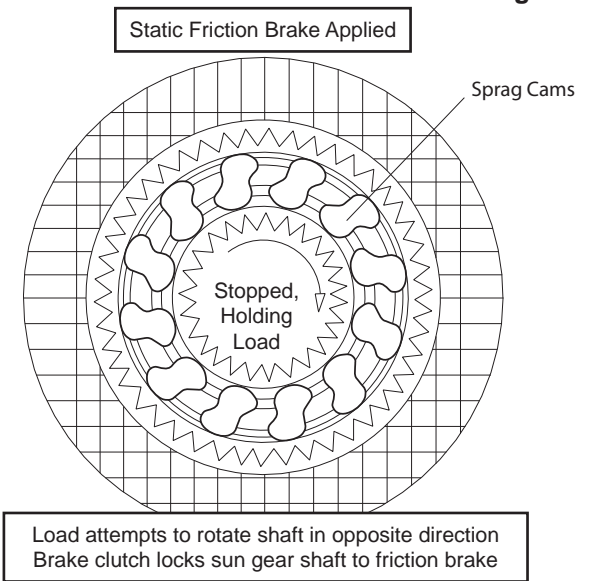
**Figure 4**



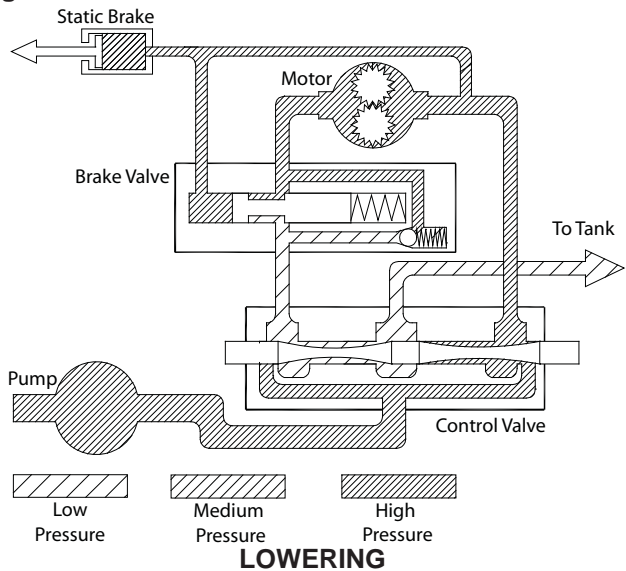
**Figure 2**



**Figure 5**



**Figure 3**



# DESCRIPTION OF OPERATION

## (Winch with Solid Brake Coupling)

The HP35A winch comes in two basic configurations:

1. Winch has an overrunning clutch and the brake is released during reel-out only.
2. Winch has a solid brake coupling and the brake is released during reel-in and reel-out. Generally, the winches with a solid brake coupling will be units with extension shafts.

The description of operation for both configurations is included in this manual.

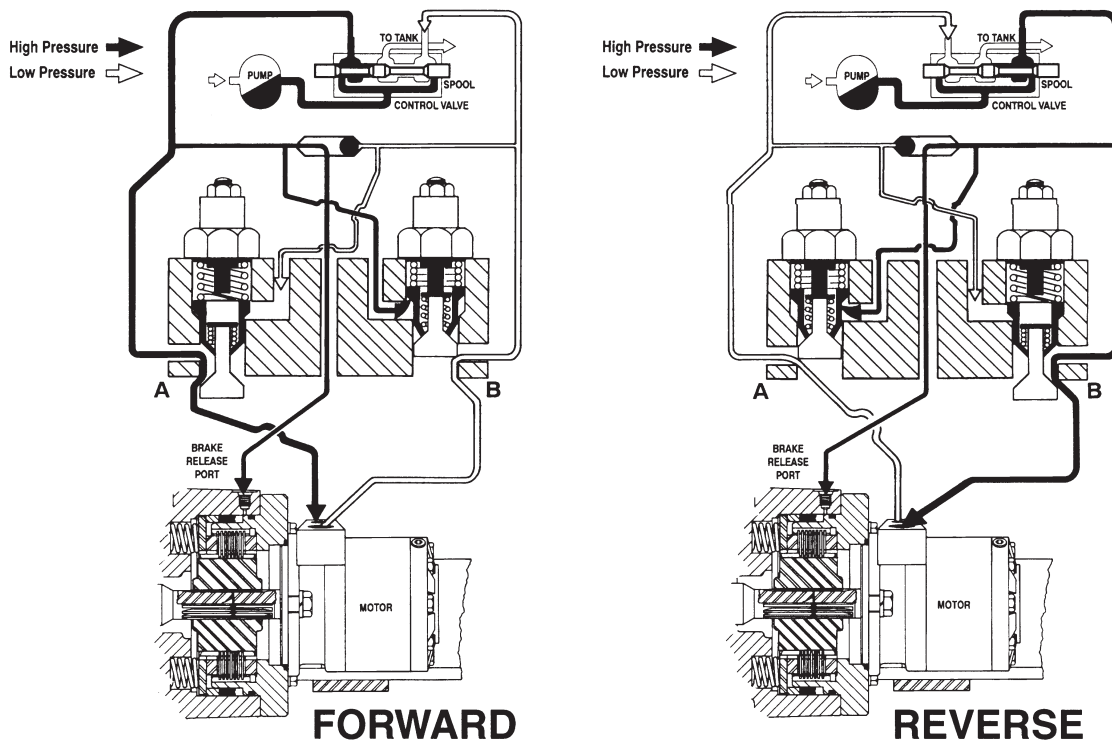
The HP35 winch consist of the following sub-groups:

1. Hydraulic Motor and Brake Valve
2. Static Brake Assembly
3. Planetary Gear Set
4. Cable Drum, Drum Shaft and Bearings
5. Drum Clutch
6. Bumper Assembly with Fairlead
7. Extension Shaft Option

The static brake assembly is a multiple disc, bathed in oil (wet) brake pack that is spring-applied and hydraulically released. It is equipped with a solid brake hub that couples the motor shaft to the primary planetary sun gear. Whenever the winch is stopped with the controls in neutral, the static brake is applied holding the hydraulic motor shaft firm and not allowing the cable drum to rotate in either direction.

During operation, the static brake must be hydraulically released when the winch is operated in either direction. With the control lever moved in either the REEL-IN or REEL-OUT direction, hydraulic oil is piloted to the brake release piston and routed to the motor at the same time. Oil flow out of the motor is initially blocked by the active counterbalance cartridge. As hydraulic oil pressure increases, the static brake releases. At this time, oil flow out of the motor is still blocked. As pressure continues to increase, the cartridge is piloted open allowing the motor shaft to rotate. This sequence ensures the static brake is completely released before any rotation occurs, resulting in minimal wear of the friction discs.

The extent to which the cartridge opens determines the amount of oil allowed to flow through it, and thus the speed of the cable drum. Increasing the flow of oil to the winch motor will cause the pressure to rise and the opening in the cartridge to enlarge, allowing more oil to flow and increasing the speed of the winch. Decreasing this flow causes the pressure to lower, decreasing the opening in the cartridge and slowing the speed of the winch. When the control valve is returned to center, or neutral, and oil flow is stopped, motor shaft rotation stops and the static brake is fully applied by the force of the brake springs.





# WINCH INSTALLATION

The standard HP Series winches are configured for bed mount on a truck with the motor end to the passenger side of the vehicle and the wire rope overwound on the drum. Any other installation arrangement will require modifications to the winch before installation.

Headache racks or other protective structures designed to protect the winch, truck, cab, and vehicle occupants should be designed to enable easy access and servicing of the winch. Braden recommends using a structure designed to be easily removed should the need arise to disassemble the winch for servicing.

1. The winch must be mounted to a flat, rigid surface which will not flex under load. The mounting surface must be flat within .020 in. (.05 mm) between mounting fasteners. If necessary, use shim stock to ensure proper mounting.

## ⚠ WARNING ⚠

Flexing or uneven mounting surfaces will produce internal winch distortion which may result in rapid component wear, overheating, poor winch performance or an improperly engaged drum clutch which may become disengaged and result in dropped loads or loss of load control causing property damage, severe injury or death.

2. The centerline of the cable drum must be horizontal and mounted perpendicular to the direction of pull. The fleet angle, or the angle created from an imaginary line from the center of the cable drum to the load or first sheave and from this load point back to the drum barrel intersection with the drum flange, must not exceed 1½°. Fleet angles in excess of 1½° will create uneven spooling resulting in rapid drum or wire rope wear.
3. Grade 8, or better, fasteners are recommended for mounting fasteners.
4. The winch base angles must be mounted securely to the vehicle frame in a manner acceptable to the vehicle manufacturer. Any frame adapter brackets used should be bolted to the winch base angles as close to the gear housing and bearing leg assemblies as possible. This will ensure the greatest strength while minimizing distortion. Consult vehicle manufacturer before making any modifications to the vehicle frame.
5. Hydraulic lines and components to operate the winch should be of sufficient size as to minimize the backpressure at the hydraulic motor work ports.

For conventional gear type motors, backpressure at full flow should NOT exceed 100 PSI (690 kPa) for maximum motor shaft seal life. If high backpressures are

encountered, the motor case drain can be connected direct to the reservoir. For backpressures in excess of 100 PSI (690 kPa), contact PACCAR Winch Division Technical Support.

Winches equipped with Rineer vane type or piston type motors MUST be limited to 35 PSI (240 kPa) backpressure.

6. The winch directional control valve MUST be a three-position, four-way valve without detents and with a spring-centered motor spool, such that the valve returns to the center (Neutral) position whenever the handle is released, and both work ports are opened to tank (open center, open port).

## ⚠ WARNING ⚠

**DO NOT** use a control valve with any detents or latching mechanism that will hold the control valve in an actuated or running position when the operator releases the control lever. Use of the wrong type of control valve could lead to unintentional operation of the winch, which could result in property damage, injury or death.

7. The hydraulic oil filter should have a 10 micron nominal rating and be a full-flow type.
8. High quality hydraulic oil is essential for satisfactory performance and long hydraulic system component life.

Hydraulic oils having 150 to 300 SUS viscosity at 100°F (38°C) and a viscosity index (VI) of 100 or greater will provide good results under normal temperature conditions. The use of oils having a high VI will minimize cold start-up problems and reduce the length of warm-up periods. A high VI will also minimize changes in viscosity with corresponding changes in temperature.

Maximum cold weather start-up viscosity should not exceed 5000 SUS with a pour point of at least 20°F (11°C) lower than the minimum expected temperature.

Under continuous operating conditions the temperature of the oil at any point in the system should not exceed 180°F (82°C). 120° to 140°F (49° to 60°C) is generally considered optimum.

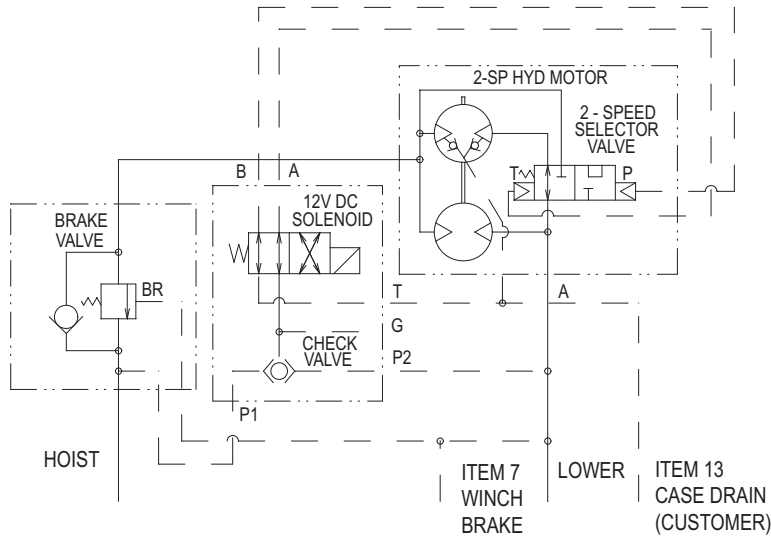
In general terms; for continuous operation at ambient temperatures 50° to 110°F (10° to 43°C), use SAE 20W; for continuous operation at 10° to 90°F (-12° to 32°C), use SAE 10W; and for applications at ambient temperatures below 10°F (-12°C), contact the PACCAR Winch Division Product Support Department. **NOTE:** *The use of multi-viscosity oils is not recommended.*

9. Maximum air pressure of 130 psi for clutch and brake air cylinders.

## TYPICAL HYDRAULIC CIRCUITS

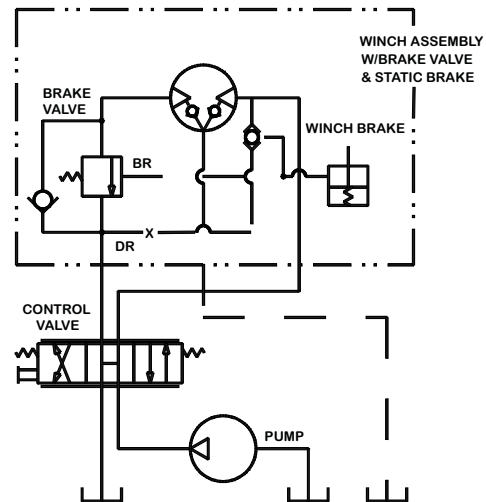
**NOTE:** The hydraulic circuits shown below are representative of typical HP35A winches with single and two-speed hydraulic motors and brake valves. Options and accessory equipment may result in changes to the circuits shown. If there are any questions regarding the hydraulic circuit, contact the PACCAR Winch Division Product Support Department. (ALWAYS have the winch model and serial number available when contacting PACCAR Winch Division.)

### Two Speed



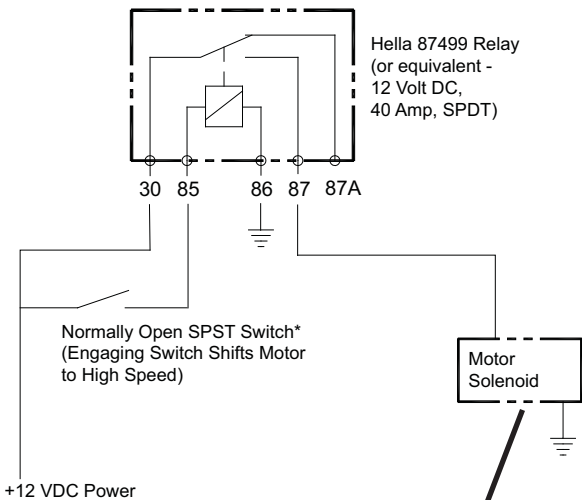
2-Speed Hyd. Motor Sub-Assy Control Circuit  
("A" Port Toward Flange)

### Single Speed

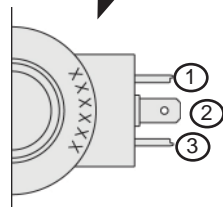


**WINCH CONTROL CIRCUIT  
EXTERNAL CASE DRAIN REQ'D**

#### Electric Shift Circuit

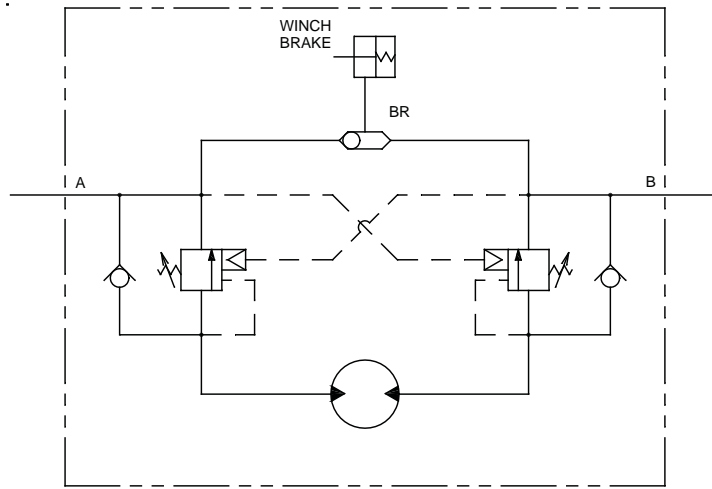


\* DO NOT use a momentary contact switch. This type of switch will return to the open position when released, shifting the motor back to low speed.



1. Ground
2. Empty
3. Apply 12V DC power to shift motor to High Speed

**NOTE:**  
Terminals 1 and 3 may be reversed since the solenoid is not polarity sensitive.



**Low Speed High Torque Motor**

Case drain required if back pressure is greater than 100 psi.



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# WIRE ROPE INSTALLATION

Winches are rated at bare drum line pull, meaning the maximum load capability will be reached on the first layer of wire rope. As the cable drum fills and adds layers of wire rope, the line pull will decrease (loss of leverage) as the line speed increases (larger circumference). Therefore, it is best to install the minimum length of wire rope possible for your application so the winch will operate on the lowest layers, delivering the maximum load capability.

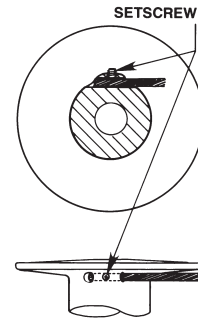
Use of larger diameter wire rope will not always increase strength as the larger wire rope may be more prone to bending fatigue failure due to the drum diameter. Consult your wire rope supplier for their recommendations regarding the best wire rope and rigging for your application.

## ⚠ WARNING ⚠

Winch wire rope anchors or U-Bolts are NOT intended to hold rated loads. Winch loads applied directly to the cable anchor may cause the wire rope to pull free and result in sudden loss of load control and cause property damage, injury, or death. A minimum of five (5) wraps of wire rope must be left on the drum barrel to achieve rated load.

### INSTALLATION OF SET SCREW CLAMPS:

Prepare the end of the wire rope as recommended by the wire rope manufacturer. Insert the proper size rope through the anchor hole until it is almost flush with the other end. Apply "Loctite" or equivalent removable thread locking compound to the clean, dry threads of the setscrew and install the setscrew. Tighten the setscrew until the rope is slightly deformed and held securely.



## PRE-DELIVERY CHECKLIST

Before releasing the winch to the end user, the following checklist should be reviewed and each item verified.

INSPECTION	✓
Check gear oil and refill as needed.	
Lubricate all grease fittings.	
Inspect winch mounting fasteners and torque as required.	
Check for loose or missing bolts, pins, keepers and cotter pins. Replace as needed.	
Check controls - adjustment and operation.	
Verify winch operating pressure and flow.	
Inspect for external oil leaks. Repair as needed.	

# WINCH OPERATION

The following warnings and instructions are basic to safe winch operation. Please read them carefully and follow them any time the winch is in use. These instructions are provided in addition to any information provided by the Original Equipment Manufacturer of the platform the winch is mounted on. Equipment operators should be completely familiar with the overall operation of the vehicle to which the winch is installed. If you have any questions concerning the safe operation of this winch or the equipment to which it is mounted, contact the equipment manufacturer that installed the winch, or the PACCAR Winch Division Product Support Department, as previously defined.

## ⚠ WARNING ⚠

Ground personnel **MUST** stay in view of the operator and clear of the load and cable drum at all times. **DO NOT** allow personnel near the winch line while under tension. **DO NOT** allow personnel near the cable drum during winch operation. **DO NOT** allow personnel to be in line with the load. **DO NOT** allow personnel to stand under a suspended load. A safe distance of 1 1/2 times the working length of the cable should be maintained by ground personnel. A broken wire rope and/or lost load may cause property damage, injury or death.

## ⚠ WARNING ⚠

Failure to properly warm up the winch, particularly under low ambient temperature conditions, may result in temporary brake slippage due to high back pressures attempting to release the brake, which may result in property damage, injury or death.

## ⚠ WARNING ⚠

Failure to use the proper type and viscosity of planetary gear oil may contribute to intermittent brake clutch slippage which could result in property damage, injury or death. Some gear lubricants contain large amount of EP (extreme pressure) and anti-friction additives which may contribute to brake slippage and damage to brake friction discs or seals. Oil viscosity with regard to ambient temperature is also critical to reliable brake operation. Testing indicates that excessively heavy or thick gear oil may contribute to intermittent brake slippage. Use only approved gear oil. (See page 45.)

The winch directional control valve, described earlier, controls haul-in and pay-out functions of the winch. Moving the control lever in the haul-in direction will cause the winch to pull in the load toward the vehicle. Moving the control lever in the pay-out direction will cause the winch to feed wire rope off the drum.

**NOTE:** During winching operations, it is recommended to operate the vehicle engine or hydraulic pump drive at high idle RPM and use the winch control valve to control oil flow, and thus winch line speed as needed.

Position the vehicle such that the centerline of the winch drum is perpendicular to the winch load whenever possible. The wire rope fleet angle must not exceed 1½°. If the fleet angle exceeds 1½°, the wire rope will not spool correctly, eventually resulting in damaged wire rope and prematurely worn winch components.

Either power out the wire rope using the hydraulic system, or disengage the drum clutch and pull the wire rope off the drum by hand (freespool).

Securely attach the wire rope to the load in such a manner as to avoid damaging the load or rigging. Fully engage the drum clutch (see Drum Clutch Operation).

Observe the winch operation carefully to make certain all ground personnel remain clear of the wire rope and load, and that the load does not shift, which may require repositioning the wire rope or the vehicle.

Once the load is positioned properly, move the lever back to neutral to stop the winch. Secure the load as required. Pay out just enough wire rope to remove all tension on the cable drum. Disengage the drum clutch and disconnect the wire rope from the load.

Re-engage the drum clutch. Ensure the drum clutch is fully engaged. (See drum clutch operation on page 14.)

Wind the wire rope onto the cable drum while maintaining the minimum fleet angle and sufficient tension to allow the wire rope to spool properly, being careful to keep hands and clothing away from the cable drum and/or fairlead rollers.

## ⚠ WARNING ⚠

If oil is leaking from the vent relief valve (see drawing on page 19) or winch, immediately remove the winch from service and determine the cause.

High pressure in the winch may result in property damage, personal injury, or death.

# DRUM CLUTCH OPERATION

Visually ensure that the drum clutch is fully engaged and the clutch control lever is at full travel and locked in its detent **BEFORE** attempting to use the winch under load.

## ⚠ WARNING ⚠

**DO NOT** move the load, the winch, or the winch platform **BEFORE** making certain the drum clutch is set to “ENGAGE” and the clutch is fully engaged. A partially engaged drum clutch may “jump out” of engagement. A load on the winch line may prevent a partially engaged clutch from disengaging, but any change in load condition may allow the clutch to become disengaged unexpectedly. This action may cause a loss of load control which could result in property damage, injury or death.

**NOTE:** Actuation of the drum clutch is typically accomplished using either air cylinder controls or some form of mechanical control (i.e. push-pull cable, mechanical linkages, etc.). Any means used to control the drum clutch must allow full travel of the lever without binding the clutch, or should include locking detents at each position.

### To ENGAGE the drum clutch (Disengage the Capstan):

1. Insure the winch motor is stopped and there is no load on the wire rope. The prime mover must be stopped in neutral and the parking brake must be set.
2. Move the clutch control lever fully into the “Engage” position. If the lever will not settle into the fully engaged position, the clutch is not fully engaged. At this point, it may be necessary to MANUALLY rotate the cable drum slightly in either direction to align the clutch collar splines with the drum driver splines, while continuing to hold slight pressure on the control lever. Once the clutch collar splines are properly aligned, the clutch should easily engage fully with the clutch plate on the cable drum.

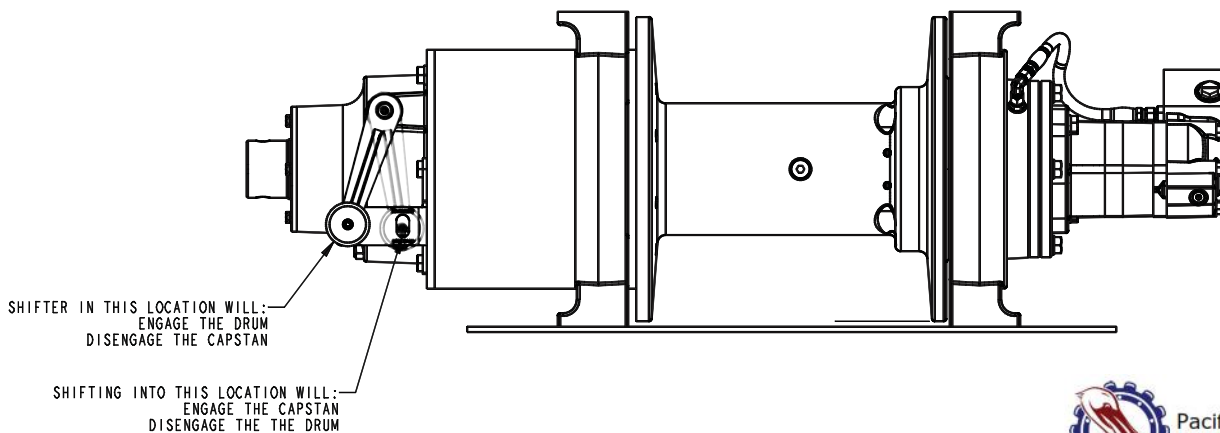
### To DISENGAGE the drum clutch (Engage the Capstan):

1. Insure the winch motor is stopped and there is no load on the wire rope. The prime mover must be stopped in neutral and the winch parking brake set.
2. Move the control lever fully into the “Drum Disengage” position. If the control lever has any resistance to shift, the cable drum may be MANUALLY rotated in the direction to haul-in wire rope to align the clutch collar splines and allow the clutch to properly disengage from the drum and engage the capstan shaft.

## ⚠ WARNING ⚠

**DO NOT** attempt to engage the drum clutch while the cable drum is rotating. **DO NOT** attempt to disengage the drum clutch with a load applied to the wire rope. **DO NOT** use “cheaters” to extend the shift lever length or other means to apply undue force on the lever. Engaging or disengaging the drum clutch while the cable drum is rotating or under load, or the use of undue force, may result in damage to the drum clutch components. Damaged drum clutch components may allow the drum clutch to become disengaged under load, and cause a loss of load control, which could result in property damage, injury or death.

The winch capstan rotates approximately 6 times faster than the winch drum because the output planet carrier reduction is not used.

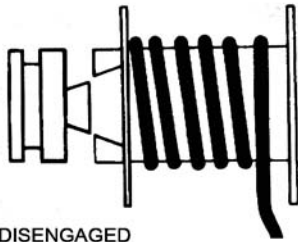


Authorized Distributor:  
Pacific Marine & Industrial  
www.pacificmarine.net  
info@pacificmarine.net



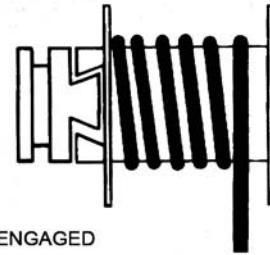
## WINCH DRUM CLUTCH CONTROL

### ⚠ WARNING ⚠



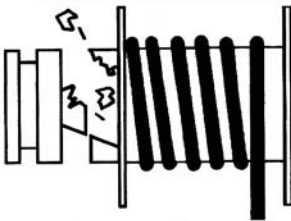
DISENGAGED

- **DO NOT** move the load or the winch platform, or operate the winch before making certain the drum clutch is set to “engage” and the clutch is fully engaged.



ENGAGED

A load on the winch line may prevent a partially-engaged clutch from disengaging, but any change in the load may allow the clutch to disengage unexpectedly. This could result in loss of load control, property damage, injury, or death.



- **DO NOT** attempt to engage drum clutch while cable drum is rotating.
- **DO NOT** attempt to disengage drum clutch with a load applied to the winch cable.

Engaging or disengaging the drum clutch while the cable drum is rotating or under load may result in damage to drum clutch components. Damaged drum clutch components may disengage under load, which could result in loss of load control, property damage, injury, or death.

Refer to the appropriate BRADEN maintenance publication for more information.

Install this label near winch controls.



PN 100600

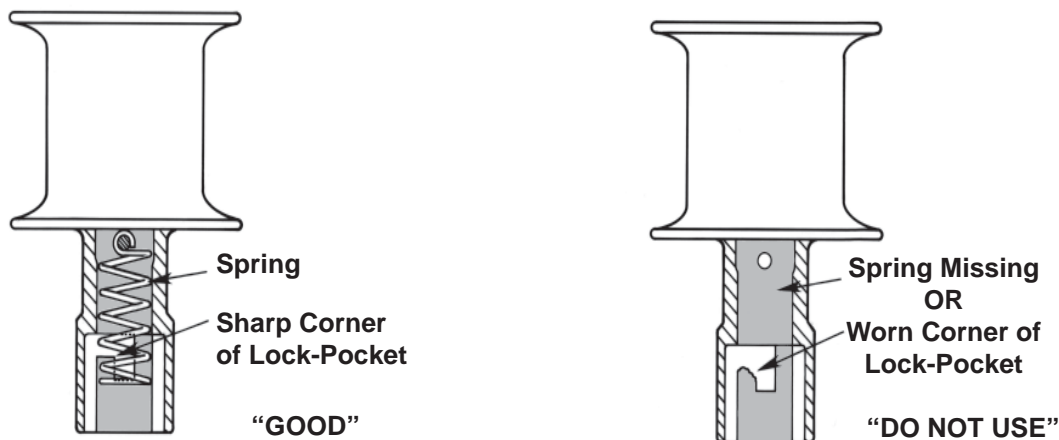
Copies of the Warning Label shown above are available through all Braden dealers. Have your dealer order part number 100600. It is a self-adhesive weather-resistant vinyl label that we recommend be installed near the winch controls of all Braden winches with a drum clutch.

# CAPSTAN USE

Presently, Braden uses only one type of capstan – the quick disconnect bayonet type. Other types have been used previously, including a bolt-on type.

## ⚠ WARNING ⚠

- BEFORE installing a bayonet type capstan, make certain the spring is properly located in the bore. The spring holds the capstan in the “lock” position on the extension shaft. If the spring is missing or omitted, the capstan may come off the shaft and cause a sudden loss of load control which may result in property damage, injury or death. Also, closely inspect the edges of the of the lock pocket to insure they are still sharp and not rounded from use. A badly worn lock pocket may prevent the capstan from locking securely to the shaft, which could allow the capstan to come off the shaft and cause a sudden loss of load control which may result in property damage, injury or death.
- Make certain the vehicle is positioned such that the load line and hand line are perpendicular to the capstan barrel. DO NOT allow rope to pull against either flange of the capstan, as the rope may get damaged or “jump” over the flange and cause a sudden loss of load control which may result in property damage, injury or death.
- If a bolt-on type of capstan is used, make certain that a ¼ in. X 5-¼ in. Grade 8 (M20 X 133 mm, Class 10.9) cap-screw and self-locking hex nut are used. A soft bolt or pin may shear off and cause a sudden loss of load control which may result in property damage, injury or death.



To install the bayonet type capstan, push the capstan onto the extension shaft, against spring tension, then turn the capstan counter-clockwise (CCW) to the stop. Release the capstan and verify the spring has pushed the capstan back outward into the “lock” position.

HP35 winches use a load holding brake that must be released when the winch is operated in both directions. This allows the rope to be wound around the capstan in either direction during capstan use.

## ⚠ WARNING ⚠

Exposed areas of capstans and extension shafts are extremely dangerous. Clothing and other items may become entangled and wrapped around the rotating shaft. Install appropriate guarding to prevent any part of the body or clothing from making contact with the shaft when it is rotating. Failure to provide adequate guarding could result in property damage, injury or death.

# AUXILIARY RIGGING

## Snatch Block

An auxiliary sheave, or snatch block, increases the versatility of the winch, and is highly recommended in the following applications:

- When fleet angles exceed  $1\frac{1}{2}^\circ$ ;
- When winch loads exceed the safe winch or wire rope capacity;
- When slower line speeds are required for precise load control.

Securely attach the snatch block to the anchor point following the block manufacturer's recommendations.

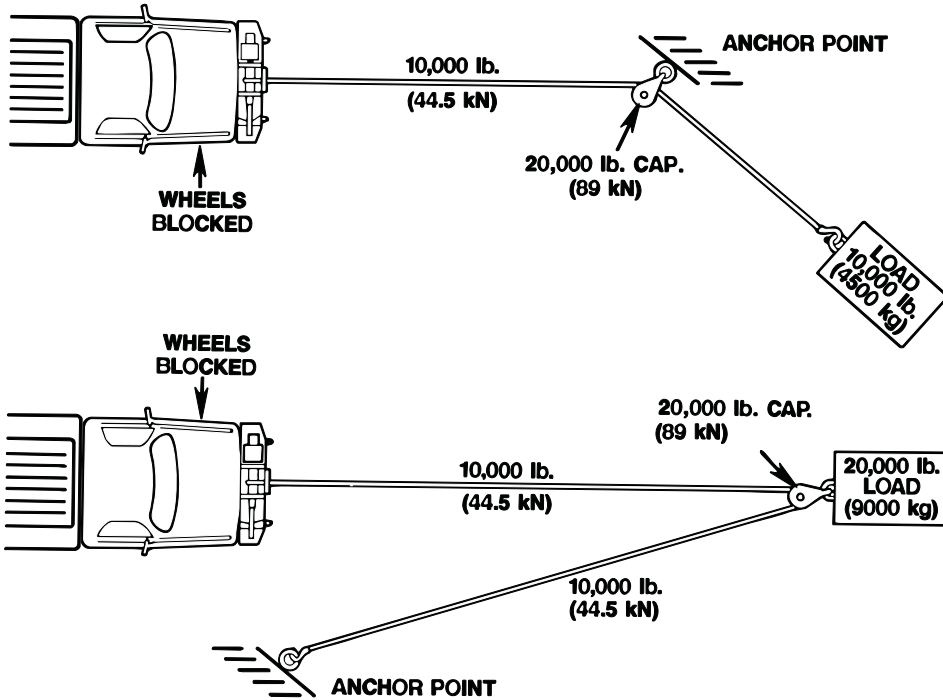
## Tree Protector

If the wire rope or a snatch block must be anchored to a tree or other structure for recovery purposes, a heavy nylon web sling of proper capacity rating should be used to avoid causing serious damage to the tree.

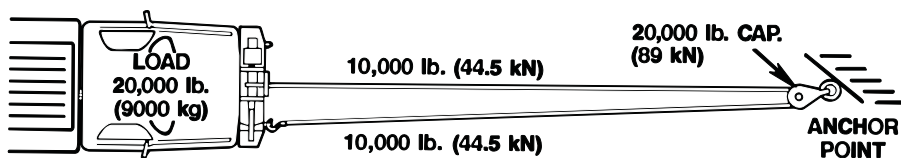
**⚠ WARNING ⚠**

A poorly attached or undersized snatch block may break loose from the anchor point and cause a sudden loss of load control, which may result in property damage, injury or death.

### TO MOVE A LOAD



### SELF RECOVERY



# PREVENTIVE MAINTENANCE

A regular program of preventive maintenance for your winch is required to minimize the need for emergency servicing and will promote safe, reliable winch operation.

## ⚠ WARNING ⚠

Any problems identified must be corrected before the winch is returned to service. Failure to correct may result in property damage, personal injury, or death.

The user of PACCAR Winch products is responsible for winch inspection, testing, operator training and the maintenance noted below, with frequency dependent on the severity of the winch duty cycle and the thoroughness of the preventive maintenance program.

Field experience, supported by engineering testing, indicate the two service procedures listed below are the most critical to safe, reliable winch operation and **MUST** be observed.

- Recommended Gear Oil Changes
- Use of Proper Gear Oil – recommended type for prevailing ambient temperatures and additives.

## ⚠ WARNING ⚠

**NEVER** attempt to service a winch with the prime mover running as accidental engagement may result in property damage, injury or death.

Make certain **ALL** load is removed from the wire rope and winch cable drum **BEFORE** servicing the winch. A loaded wire rope may rapidly and unexpectedly unspool, resulting in property damage, injury or death.

### Recommended Preventive Maintenance Intervals:

#### Daily (when winch is in use)

1. Inspect the wire rope and rigging for broken wires or other damage, as recommended by the wire rope and rigging manufacturer(s).
2. Carefully inspect the drum clutch and adjust the shift mechanism as required to ensure the clutch can be fully engaged and disengaged. (Refer to “Drum Clutch Operation”.)
3. Check for external oil leaks – both hydraulic and gear oil – and repair as required. This is extremely important due to the accelerated wear that can be caused by insufficient lubrication within the winch. Gear oil must be maintained at the proper level. Use only recommended lubricants. (See “Recommended Lubricants” in this manual.)
4. Check hydraulic motor plumbing for damage, such as chafed or deteriorating hoses, and repair as needed.
5. Visually inspect for loose or missing bolts, pins, keepers or cotter pins, and tighten or replace as needed.

#### Weekly

1. Perform all daily inspections.
2. Check gear oil level, and refill as needed with the recommended lubricant.
3. Lubricate the grease fittings on the bearing leg, cable drum ends and clutch. On some winches, you will have to disengage the clutch to gain access to the drum bushing grease fitting on the clutch end of the drum. Use a high-quality, moly-type grease, with a rating of NLGI-2 or better.
4. Inspect the gear housing breather to ensure the fitting is not clogged with dirt or grease. Clean or replace as needed.
5. Inspect all winch mounting fasteners. Retighten or replace as required.
6. Inspect any structural welds, and repair as needed.

#### Monthly

1. Perform all daily and weekly inspections.
2. Inspect the drum clutch and clutch plate to ensure the negative draft angle is clearly evident. Replace worn clutch components as required. (Refer to “Drum Clutch Operation” in this manual.)
3. Check the hydraulic system relief valve setting to en-

## ⚠ WARNING ⚠

**DO NOT** use the winch if the negative draft angle on the clutch is not present or is worn straight, or if the clutch plate edges are rounded or chipped. A defective drum clutch may suddenly become disengaged causing a loss of load control, which may result in property damage, injury or death.

sure proper performance and protection of hydraulic components. Adjust or repair as required.

4. Inspect hydraulic system filters and strainers. Follow the system manufacturer’s service recommendations for repair or replacement.

#### Yearly

1. Perform all daily, weekly and monthly inspections.
2. Replace gear oil.  
**NOTE:** *If the winch is used in excess of 50 hours per week, the gear oil should be changed every 6 months.*

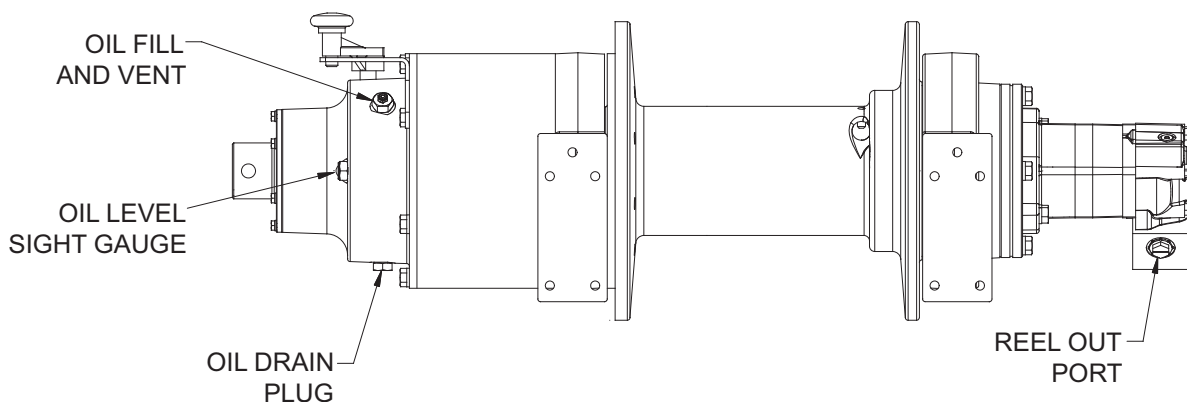
## ⚠ WARNING ⚠

Hot oil can cause severe injury. Make certain the oil has cooled to a safe temperature before servicing.

Inspection Performed	Inspection Interval			
	Daily	Weekly	Monthly	Yearly
Inspect wire rope and rigging	X	X	X	X
Inspect drum clutch and shift mechanism for proper engagement	X	X	X	X
Inspect for external oil leaks	X	X	X	X
Check for damaged hoses / lines	X	X	X	X
Check for loose or missing bolts, pins, keepers, or cotter pins	X	X	X	X
Check gear oil level / refill		X	X	X
Lubricate grease fittings		X	X	X
Inspect breather fitting		X	X	X
Inspect winch mounting fasteners - torque as required		X	X	X
Inspect structural welds		X	X	X
Check hydraulic relief valve setting			X	X
Inspect hydraulic filters / strainers			X	X
Replace gear oil			See Notes (1) and (2)	X

**NOTES:**

- (1) Change the gear oil after the first 100 hours or 30 days of use, whichever occurs first.
- (2) For winch operation in excess of 50 hours per week, oil changes should occur every 6 months instead of yearly.



Authorized Distributor:  
 Pacific Marine & Industrial  
[www.pacificmarine.net](http://www.pacificmarine.net)  
[info@pacificmarine.net](mailto:info@pacificmarine.net)

# SPECIFICATIONS

## HP35A

	<b>11.9 Low Speed High Torque Motor</b>	<b>10.2/5.1 2-Speed Gear Motor</b>	<b>11.0 Gear Motor</b>
<b>Rated Bare Drum Line Pull</b>	35,000 Lb (15,905 kg)	35,000 Lb (15,905 kg)	35,000 Lb (15,905 kg)
<b>Bare Drum Line Speed - Single Speed</b>	27 fpm (8 mpm)	57 fpm (17 mpm)	52 fpm (16 mpm)
<b>Cable Drum Diameter</b>	6.06 in. (154 mm)	6.06 in. (154 mm)	6.06 in. (154 mm)
<b>Cable Drum Flange Diameter</b>	14.0 in. (356 mm)	14.0 in. (356 mm)	14.0 in. (356 mm)
<b>Distance Between Flanges</b>	12.37 in. (314 mm)	12.37 in. (314 mm)	12.37 in. (314 mm)
<b>Wire Rope Capacity - 3/4" (20 mm)</b>	187 ft. (57 m)	187 ft. (57 m)	187 ft. (57 m)
<b>Overall Gear Ratio</b>	35:1	35:1	35:1
<b>Maximum Pressure</b>	2,578 PSI (178 Bar)	2,754 PSI (190 Bar)	2,509 PSI (173 Bar)
<b>Maximum Flow</b>	30 GPM (113 lpm)	60 GPM (227 lpm)	60 GPM (227 lpm)
<b>Capstan Rating (7" Capstan)</b>	3,200 Lb (1,450 kg)	N/A	N/A
<b>Capstan Speed</b>	185 ft (56.4 m)	N/A	N/A
<b>Winch Weight</b>	650 Lb (295 kg)	650 Lb (295 kg)	650 Lb (295 kg)
<b>- Add for Extension Shaft</b>	90 Lb (41 kg)	N/A	N/A
<b>Gearbox Oil Capacity</b>	10.5 pt (5.0 L)	10.5 pt (5.0 L)	10.5 pt (5.0 L)
<b>Capstan Ratio</b>	5.4:1	N/A	N/A



# TROUBLESHOOTING

The following troubleshooting section is provided as a general guide. You may also need to contact the Original Equipment Manufacturer (OEM) of the winch mounting platform for additional information.

## ⚠ WARNING ⚠

**If a hoist exhibits any sign of:**

- Erratic operation such as poor load control, load creeping down or chattering.
- Unusual noise.
- Gear oil leaks
- A sudden rise in wear particles noticed during oil change.

The winch **MUST** be removed from service until the problem has been corrected. If a winch has been subjected to a sudden heavy load (shock-load) or overload, it must be removed from service, disassembled and all internal components thoroughly inspected for damage. Continued operation with a defect may result in loss of load control, property damage, injury or death.

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>A</b></p> <p>The winch will not reel-in or reel-out or will not reel-in or reel-out smoothly. (Winches with an overrunning clutch release the brake on reel-out only)</p>	<p>1. The friction brake may not be re-releasing as a result of a defective brake cylinder seal.</p> <p><i><b>NOTE:</b> If the brake cylinder seal is defective you will usually find oil leaking from the winch vent plug.</i></p> <p>2. Friction brake will not release as a result of damaged brake discs.</p>	<p>Check brake cylinder seal as follows:</p> <p>A. Disconnect the hose from the brake release port. Connect a hand pump with accurate 0-2000 psi (13,800 kPa) gauge to the fitting in the brake release port.</p> <p>B. Apply 1000 psi (6,900 kPa) to the brake. Close isolation valve and let stand for five (5) minutes.</p> <p>C. If there is any loss of pressure in five (5) minutes, the brake cylinder should be disassembled for inspection of the sealing surfaces and replacement of the seals. Refer to "Brake Cylinder Service" section of this manual.</p> <p>Disassemble brake to inspect brake discs as described in "Brake Cylinder Service" section of this manual.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>B</b></p> <p>Oil leaks from vent plug</p>	<ol style="list-style-type: none"> <li>1. Same as A1.</li> <li>2. Motor seal may be defective as a result of high back pressure in the motor case drain circuit or contaminated oil. Contamination will usually cause the seal to wear a groove in the motor shaft. Contact motor manufacturer for repair of motor shaft.</li> </ol>	<p>Same as A1.</p> <p>Case drain back pressure must not exceed 100 psi (690 kPa). Inspect hydraulic system for a restriction in the return line to the reservoir.</p> <p>Oil analysis may indicate contamination has worn motor shaft and seal. Thoroughly flush entire hydraulic system and install new filters and oil. Install new motor seal.</p>
<p style="text-align: center;"><b>C</b></p> <p>The brake will not hold a load with the control lever in neutral</p>	<ol style="list-style-type: none"> <li>1. Excessive system back pressure acting on the brake release port.</li> <li>2. Friction brake will not hold due to worn or damaged brake discs.</li> <li>3. Overrunning clutch damaged.</li> <li>4. Improper gear oil.</li> </ol>	<p>The pressure at the motor ports is also transmitted to the brake release pilot circuit. Inspect hydraulic circuit for restrictions, plugged filters or control valves not centering.</p> <p>Same as Remedy of Trouble A2.</p> <p>Inspect and repair/replace.</p> <p>Fill with proper oil. (See procedure on page 46.)</p>
<p style="text-align: center;"><b>D</b></p> <p>The hoist will not hoist the rated load</p>	<ol style="list-style-type: none"> <li>1. The winch may be mounted in an uneven or flexible surface which causes distortion of the winch and binding of the gear train. Binding in the gear train will absorb horsepower needed to winch the rated load and cause heat.</li> <li>2. System relief valve may be set too low. Relief valve needs adjustment or repair.</li> </ol>	<p>Reinforce mounting surface.</p> <p>If necessary, use shim stock to level winch. Refer to "Winch Installation". First loosen, then evenly retighten all winch mounting bolts to recommended torque.</p> <p>Check relief pressure as follows:</p> <ol style="list-style-type: none"> <li>1. Install an accurate 0-3000 psi (20,700 kPa) gauge into the reel-in port.</li> <li>2. Apply a stall pull load on the winch while monitoring pressure.</li> <li>3. Compare gauge reading to winch specifications. Adjust relief valve as required.</li> </ol> <p><b>NOTE:</b> <i>If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.</i></p>

TROUBLE	PROBABLE CAUSE	REMEDY
<p>Trouble "D" Continued From Previous Page</p>	<p>3. Ensure the hydraulic system temperature is below 180°F (82°C). Excessive hydraulic oil temperatures increase motor internal leakage and reduces motor performance.</p> <p>4. Hoist line pull rating is based on 1st layer of wire rope.</p> <p>5. Rigging and sheaves not operating efficiently.</p>	<p>See remedies for Trouble D1 &amp; D2. Same as remedies for Trouble E2.</p> <p>Refer to hoist performance charts for additional information.</p> <p>Perform rigging service as recommended by crane manufacturer.</p>
<p><b>E</b></p> <p>The winch runs hot</p>	<p>1. Same as D1.</p> <p>2. Ensure the hydraulic system temperature is below 180°F (82°C). Excessive hydraulic oil temperatures may be caused by:</p> <p>A. Plugged heat exchanger.</p> <p>B. Too low or too high oil level in hydraulic reservoir.</p> <p>C. System relief lifting.</p> <p>D. Hydraulic pump not operating efficiently.</p> <p>E. Hydraulic oil is wrong viscosity for operating conditions.</p> <p>3. Excessively worn or damaged internal winch parts.</p>	<p>Same as remedies for Trouble D1.</p> <p>Thoroughly clean exterior and flush interior.</p> <p>Fill/drain to proper level.</p> <p>Same as remedies for Trouble D2.</p> <p>Check relief valve setting.</p> <p>Engine low on horsepower or R.P.M. Tune/adjust engine.</p> <p>Check suction line for damage.</p> <p>Pump worn. Replace pump.</p> <p>Use correct hydraulic oil.</p> <p>Disassemble hoist to inspect/ replace worn parts.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>F</b></p> <p>Hoist “chatters” or surges while reeling-in rated load.</p>	<ol style="list-style-type: none"> <li>1. Relief valve lifting.</li> <li>2. Hydraulic oil flow to motor may be too low.</li> <li>3. Controls being operated too quickly.</li> </ol>	<p>See remedies for Trouble D2.</p> <p>Same as remedies for Trouble E2.</p> <p>Conduct operator training as required.</p>

# SERVICE PRECAUTIONS

Before any part is removed from the hoist or drive gearbox, all service instructions should be read and understood.

Work in a clean, dust free area as cleanliness is of utmost importance when servicing hydraulic equipment.

Inspect all replacement parts, prior to installation, to detect any damage which might have occurred in shipment.

Use only genuine BRADEN replacement parts for optimum results. Never re-use expendable parts such as o-rings and oil seals.

Inspect all machined surfaces for excessive wear or damage before reassembly operations are begun.

Lubricate all o-rings and oil seals with gear oil prior to installation.

Lubricate all bearings with oil soluble grease prior to assembly.

Use a sealing compound on the outside surface of oil seals and a light coat of thread sealing compound on pipe threads. Avoid getting sealing compound inside parts or passages which conduct oil.

Before starting disassembly of the winch, remove the wire rope, drain the oil and clean the outside surfaces to avoid contaminating gears and bearings.

Service should be performed by a mechanic who has read this manual and is skilled in heavy equipment service and repair.

# RECOMMENDED BOLT TORQUE

The general purpose torque shown in the chart applies to SAE Grade 5 & Grade 8 bolts, studs and standard steel full, thick and high nuts.

Higher or lower torques for special applications will be specified such as the use of spanner nuts, nuts on shaft ends, jam nuts and where distortion of parts or gaskets is critical.

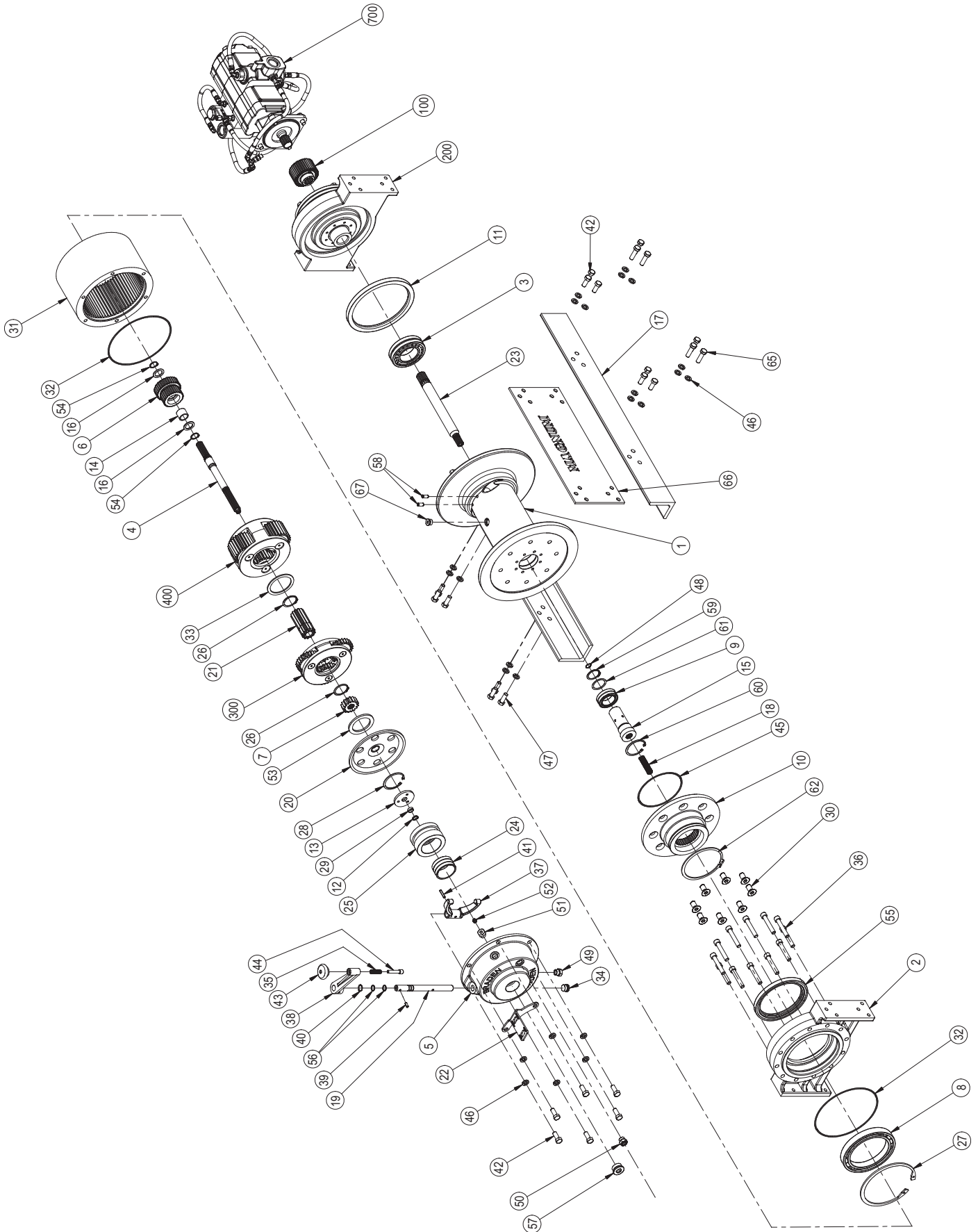
Lubricated torque values based on use of SAE 30 engine oil applied to threads and face of bolt or nut.

Bolt Diam. Inches	Torque LB-FT (N.m)				Bolt Diam. Inches	Torque LB-FT (N.m)			
	Grade 5		Grade 8			Grade 5		Grade 8	
	Dry	Lubed	Dry	Lubed		Dry	Lubed	Dry	Lubed
1/4	8 (11)	6 (8)	12 (16)	9 (12)	3/4	265 (359)	200 (271)	380 (515)	280 (380)
5/16	17 (23)	13 (17)	24 (33)	18 (24)	7/8	420 (569)	325 (441)	600 (813)	450 (610)
3/8	31 (42)	23 (31)	45 (61)	35 (47)	1	640 (868)	485 (658)	910 (1234)	680 (922)
7/16	50 (68)	35 (47)	70 (95)	50 (68)	1 1/8	790 (1071)	590 (800)	1290 (1749)	970 (1315)
1/2	75 (102)	55 (75)	110 (149)	80 (108)	1 1/4	1120 (1518)	835 (1132)	1820 (2468)	1360 (1817)
9/16	110 (149)	80 (108)	150 (203)	110 (149)	1 3/8	1460 (1979)	1095 (1485)	2385 (3234)	1790 (2427)
5/8	150 (203)	115 (156)	210 (285)	160 (217)	1 1/2	1940 (2360)	1460 (1979)	3160 (4284)	2370 (3214)

To convert LB-FT to Kg-m, multiply LB-FT value by 0.1383

4-2010

# HP35A COMPONENT EXPLOSION





# HP35A COMPONENT PARTS KEY

Item No	Description	Qty
49	PLUG	1
50	SIGHT GAUGE	1
51	REDUCER	1
52	RELIEF VALVE 7.5-15 PSI	1
53	THRUST WASHER	1
54	SNAP RING	2
55	OIL SEAL	1
56	O-RING	2
57	PLUG	1
58	SETScrew	2
59	RETAINING RING	1
60	RETAINING RING	1
61	THRUST WASHER	1
62	RETAINING RING	1
65	CAPSCREW	6
66	TIE PLATE	1
67	PLUG, -8 O-RING FLUSH	1
<b>100</b>	<b>SPRAG CLUTCH ASSY</b>	<b>1</b>
<b>200</b>	<b>BRAKE CYLINDER SUPPORT ASSY</b>	<b>1</b>
<b>300</b>	<b>PRIMARY PLANET CARRIER ASSY</b>	<b>1</b>
<b>400</b>	<b>PLANET CARRIER ASSY</b>	<b>1</b>
<b>700</b>	<b>HYD MOTOR SUB ASSY</b>	<b>1</b>

ASSEMBLIES IN BOLD FONT

Item No	Description	Qty
25	CLUTCH COLLAR	1
26	RETAINING RING	2
27	RETAINING RING	1
28	RETAINING RING	1
29	BUSHING	1
30	CAPSCREW	8
31	RING GEAR	1
32	O-RING	2
33	THRUST WASHER	1
34	PLUG, ORB -10	1
35	SHFTR FORK SPG	1
36	CAPSCREW	12
37	SHIFTER FORK	1
38	SHIFTER HANDLE	1
39	ROLLPIN	1
40	SNAP RING	1
41	PIN	1
42	CAPSCREW (1/2 X 1 1/4)	12
43	SHFTR FORK HDL	1
44	HANDLE STEM	1
45	O-RING	1
46	LOCKWASHER	24
47	CAPSCREW	6
48	RETAINING RING	1

Item No	Description	Qty
1	CABLE DRUM	1
2	DRIVE END SUPPORT	1
3	BEARING	1
4	SHIFTING SHAFT	1
5	SHIFTER HOUSING	1
6	SHIFTING COLLAR	1
7	PRIMARY SUN GEAR	1
8	BEARING	1
9	BEARING	1
10	DRUM DRIVER	1
11	SEAL	1
12	RETAINING RING	1
13	THRUST WASHER	1
14	BUSHING	1
15	SHAFT ADAPTER	1
16	THRUST WASHER	2
17	BASE ANGLE	2
18	SPRING	1
19	SHIFTER SHAFT	1
20	KEEPER	1
21	SUN GEAR	1
22	SHIFT BRACKET	1
23	DRUM SHAFT	1
24	BUSHING	1

# WINCH DISASSEMBLY

Refer to Drawing and Parts Key on pages 26 and 27.

## ⚠ WARNING ⚠

The HP35 winch weighs approximately 650 lbs (295 kg) without any accessories. Ensure all lifting equipment including the overhead hoist and rigging have adequate capacity. Use of lifting equipment that does not have adequate lifting capacity or is not properly maintained may result in property damage, personal injury, or death.

1. Remove the wire rope from the winch. Drain the gear oil from the winch by removing the drain plugs on the bottom of the winch gearbox and winch drum. Remove the fill/vent plug to speed draining.
2. Take precautions to collect hydraulic oil then remove the hydraulic hoses connected to the winch motor. Disconnect the extension shaft if equipped and remove the winch from the mounting.
3. Set the winch on clean work bench rated for the winch weight - approximately 650 lbs (295 kg) without accessories.
4. Remove the hose connecting the winch parking brake to the brake valve on the motor then remove the motor from the winch (item 700) by removing the capscrews securing the winch motor to the winch.
5. Remove the overrunning clutch assembly (100) from the brake cylinder assembly (200). On winches with an extension shaft, remove the solid brake coupling rather than an overrunning clutch. Remove the drum shaft (23) from the drum (1).

## ⚠ CAUTION ⚠

The tie plate (66) and base angles (17) hold the brake cylinder (200) into the winch drum (1). The brake cylinder may fall away from the drum when the tie plate and base angles are removed. Failure to support the brake cylinder when the tie plate and base angles are removed may result in personal injury or property damage.

6. While supporting the brake cylinder (200). Remove the tie plate (66) and base angles (17) from the brake cylinder.
7. Pull the brake cylinder assembly (200) from the winch drum. Refer to the Brake Cylinder Service section of this manual for service information on the brake cylinder assembly.

## ⚠ CAUTION ⚠

The shifter housing (5) is retained on the ring gear (31) by the retaining ring (12) and the capscrews (42). Failure to remove the retaining ring (12) before removing the shifter housing will result in damage to internal winch shifter housing parts.

## ⚠ CAUTION ⚠

The winch drum (1) is retained to the drive-end support (2) by a retaining ring (62) on the drive-end drum bearing (8). The planet carrier assemblies must be removed from the ring gear (31) to remove the retaining ring (62) and disconnect the drum from the drive-end bearing support.

8. Remove the plug (57) to access the retaining ring (12) which holds the shifting shaft (4) in the housing and remove the retaining ring (12). Remove the capscrews (42) and lockwashers (46) and pull the shifter housing away from the ring gear.
9. Remove the thrust washer (13) from the shifter shaft (4).
10. Remove the keeper (20) and thrust washer (53).
11. Remove the primary planet carrier assembly (300). Refer to the Planet Carrier section of this manual for service information on the primary planet carrier assembly.
12. Remove the thrust washer (33) and then the output planet carrier assembly (400).
13. Remove the shifter shaft (4) and shifting collar (6).
14. Remove the retaining ring (62) from the drum driver (10), and pull the ring gear (31) from the drum driver (10).
15. Remove the retaining ring (60) from the drum and then remove the shaft adapter (15) from the drum.
16. If necessary, remove the ring gear (31) from the drive end support (2) by removing the twelve capscrews (36).
17. If necessary, remove the drum driver (10) from the drum (1) by removing the capscrews (30).
18. Remove the spring (18) from the shaft adapter (15). Remove the retaining ring (59) from the shaft adapter (15) and remove the thrust washer (61) and bearing (9).

# WINCH ASSEMBLY

Refer to Drawing and Parts Key on pages 26 and 27.

The brake cylinder assembly, the primary and secondary planet carrier assemblies, and the hydraulic motor assembly should be assembled before starting this procedure.

Unless a specific torque value is given in the procedure, all fasteners should be torqued to the value given in the torque table in this manual.

Assembly of the drive end of the winch is best done if the drum is stood vertically on the motor end. Blocks should be placed under the drum flange to support the drum.

1. Install bearing (9) on the shaft adapter (15) and install thrust washer (61) and retaining ring (59). Install the retaining ring (48) and spring (18) in the shaft adapter (15).
  2. Install the shaft adapter (15) including the parts installed in previous step into the drum. Install the retaining ring (60) to secure the shaft adapter in place.
  3. Install o-ring (45) in drum driver (10) and lubricate o-ring lightly with grease. Apply Loctite 242 to fasteners (30) and install drum driver onto drum. Torque fasteners (30) to 117 ft-lbs (158 N-m).
  4. Press ball bearing (8) into drive end support (2) and install the retaining ring (27).
  5. Ensure lip seal seating surface on the drive end support (2) is clean and dry. Apply Loctite Aviation Gasket Sealant to the outer diameter of seal (55) and install the seal into the drive end support.
  6. If the drive end support (2) was removed from the ring gear (31), install o-ring (32) to drive end support (2) and lower drive end support onto ring gear (31) side with twelve tapped holes. Apply Loctite 242 to cap screws (36) and torque to 117 ft-lbs (158 N-m).
  7. Apply grease to the inner race of the seal (55) and bearing (8). Carefully lower the ring gear (31) and drive end support (2) onto the drum driver (10). Install the retaining ring (62) to secure in place.
  8. Inspect bushing (14) inside of shifting collar (6) and replace if pitted or damaged. Install shifting collar onto shifting shaft and secure in place with the two thrust washers (16) and two retaining rings (54).
  9. Lower output planet carrier assembly (400) into ring gear (31) and ensure the output planet carrier splines engage with the shifting collar (6) splines.
  10. Install one of the retaining rings (26) on the middle groove of the output sun gear (21). Slide the sun gear into the primary planet carrier assembly (300) and install second retaining ring (26) so secure output sun gear in primary planet carrier.
  11. Apply grease to thrust washer (33) and push onto primary planet carrier (300) to hold in position. Lower primary planet carrier assembly into ring gear and ensure thrust washer on primary carrier stays in position.
  12. Install the primary sun gear (7) in primary planet carrier (300).
  13. Install thrust washer (53) and keeper (20) onto primary planet carrier assembly (300).
  14. Inspect bushing (29) on shifting shaft (4) and install a new one if necessary.
  15. Install the spacer (13) into the clutch collar (25) and secure in place with retaining ring (28).
  16. Assemble clutch shifter shaft (19) to shifter handle (38). Install o-rings (56) and retaining ring (40). Slide clutch shifter shaft (19) into shifter housing (5) and slide shaft through shifter fork (37) after it enters the housing.
  17. Slide the clutch collar (25) over the housing bushing engaging the shifter fork (37) into the groove on the clutch collar. Drive roll pin (39) through shifter fork and into clutch shifter shaft to lock in position.
  18. Install o-ring (32) over shifter housing (5) and grease lightly.
  19. Slide shifter housing (5) with assembled parts onto ring gear (31) and drive shifting shaft (4) ensuring the spacer (13) seats on the drive shifting shaft. Apply Loctite 242 to fasteners (42) and install with lockwashers (46) into shifter housing and torque to 117 ft-lbs (158 N-m).
  20. Remove plug (57) from shifter housing (5) to install retaining ring (12) on shifting shaft (4) and install plug (57).
- NOTE:** Stand winch on the drive end assembly and block in stable posting for the remaining assembly steps. Assemble the brake cylinder following the procedure in this manual before proceeding with the steps below.
21. Drive bearing (3) into motor end of winch drum.
  22. Apply Loctite Aviation Gasket Sealant to outer diameter of seal (11) and install into brake cylinder housing (200).

23. Lightly grease the bearing and seal inner races and lower the brake cylinder assembly (200) onto the drum.
24. Install the tie plate (72) and base angles (17) with cap-screws (42, 47, and 65) and torque. See drawing to identify capscrews.

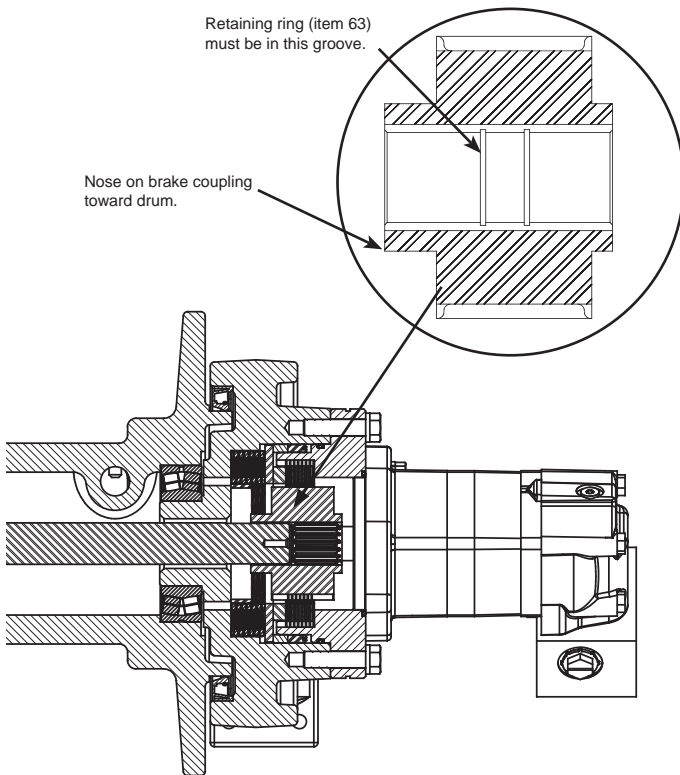
**⚠ WARNING ⚠**

The brake coupling or overrunning clutch must be installed in the winch in the correct orientation for the winch brake to work properly. See the drawings below for proper installation orientation. Failure to install the brake coupling or overrunning clutch in the proper orientation may result in property damage, personal injury, or death.

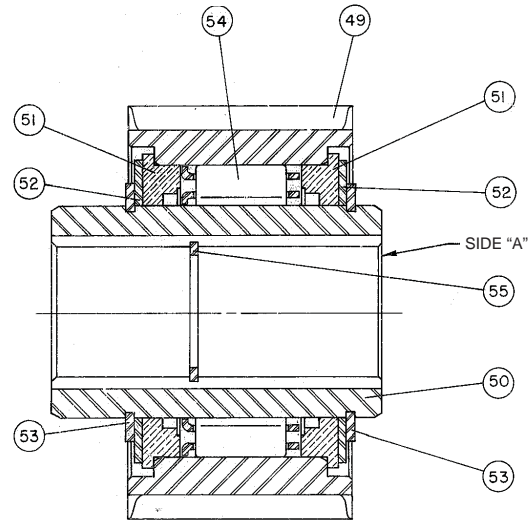
**⚠ WARNING ⚠**

The retaining ring installed in the inner race of the brake coupling must be installed on the drum side as shown below. Failure to install the retaining ring in the proper groove may result in property damage, personal injury, or death.

25. If the winch has a solid brake coupling, ensure the retaining ring (63) is installed in the brake hub (62) and install the brake hub in the brake cylinder (use a hand pump to release the force on the brake plates to align the plates if necessary).



26. If the winch has an overrunning clutch, ensure it is installed with the Side "A" in the drawing below toward the motor. For standard rotation winches the inner race should turn freely in the clockwise direction and lock in the counter clockwise direction while holding the outer race.

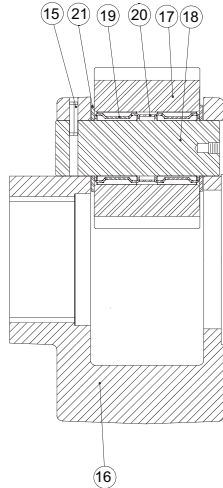


27. Install the winch motor (700) and connect the brake release hose from the brake valve to the winch parking brake.

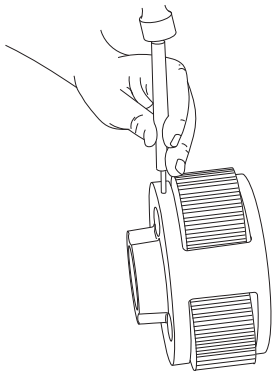
# PLANET CARRIER SERVICE

## OUTPUT PLANET CARRIER

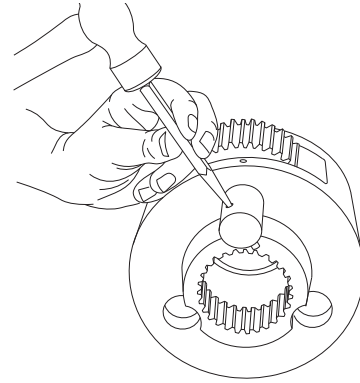
### DISASSEMBLY



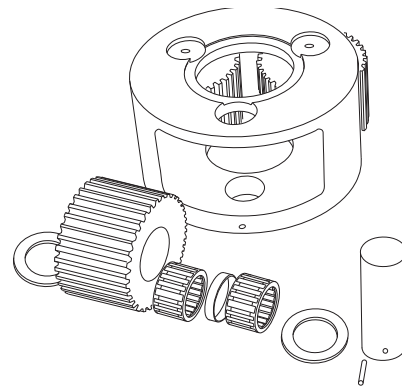
Item	Description	Qty
15	Spirol Pin	3
16	Planet Carrier	1
17	Planet Gear	3
18	Planet Gear Shaft	3
19	Roller Bearing	6
20	Bearing Spacer	3
21	Thrust Washer	6



1. Remove the planet gears (17) by driving the spirol pins (15) into the center of the planet shafts (18).



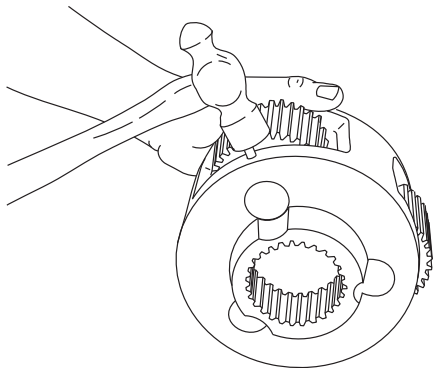
2. Use a punch to drive the spirol pins from the planet shafts. Do not reuse the spirol pins.



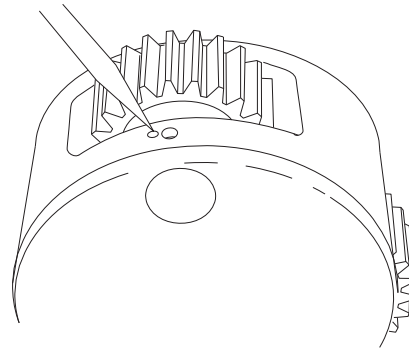
3. Remove the planet shafts (18), bearings (19), spacer (20), thrust washers (21) and gears (17). Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, the bearing should be replaced. Likewise, the cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage that will impair the cage's ability to separate, retain and guide the rollers properly, the bearing should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

## ASSEMBLY

1. Place the output planet carrier (16) on workbench with splined coupling side down. Insert two bearings (19) and a bearing spacer (20) into a gear (17) with the spacer between the bearings. Place a thrust washer (21) on each side of the gear and position in a carrier opening. Slide the shaft (18) through the carrier, thrust washer, bearing-gear sub-assembly and remaining thrust washer. Be careful to avoid damaging thrust washers when installing planet shafts.



2. Carefully align the pin hole in the carrier with the hole in the planet gear shaft and drive the spirol pin (15) into place. Always use NEW spirol pins. When properly positioned, 50% of the spirol pin will engage the planet gear shaft and 50% will remain in the planet carrier.

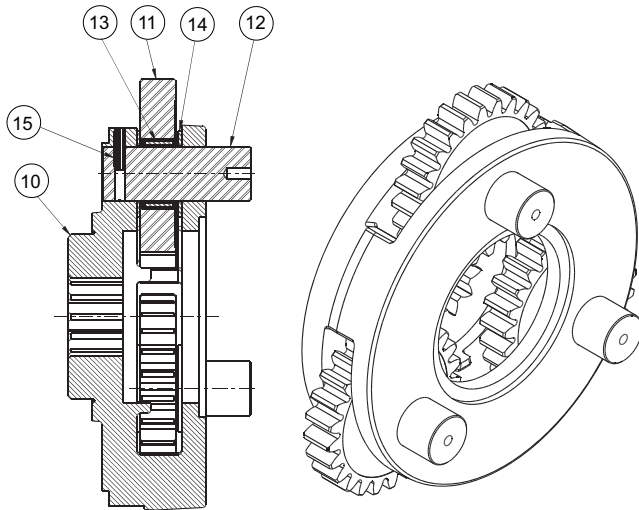


3. Note that the spirol pin is slightly recessed in the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole so the pin will not back out. Repeat these steps for each of the three planet gears.



# PRIMARY PLANET CARRIER

## DISASSEMBLY



Item	Description	Qty
10	Planet Carrier	1
11	Planet Gear	3
12	Planet Gear Shaft	3
13	Roller Bearing	3
14	Thrust Washer	6
15	Spirol Pin	3

**Note:** Units without an extension shaft will use shorter planet gear shafts (item 12).

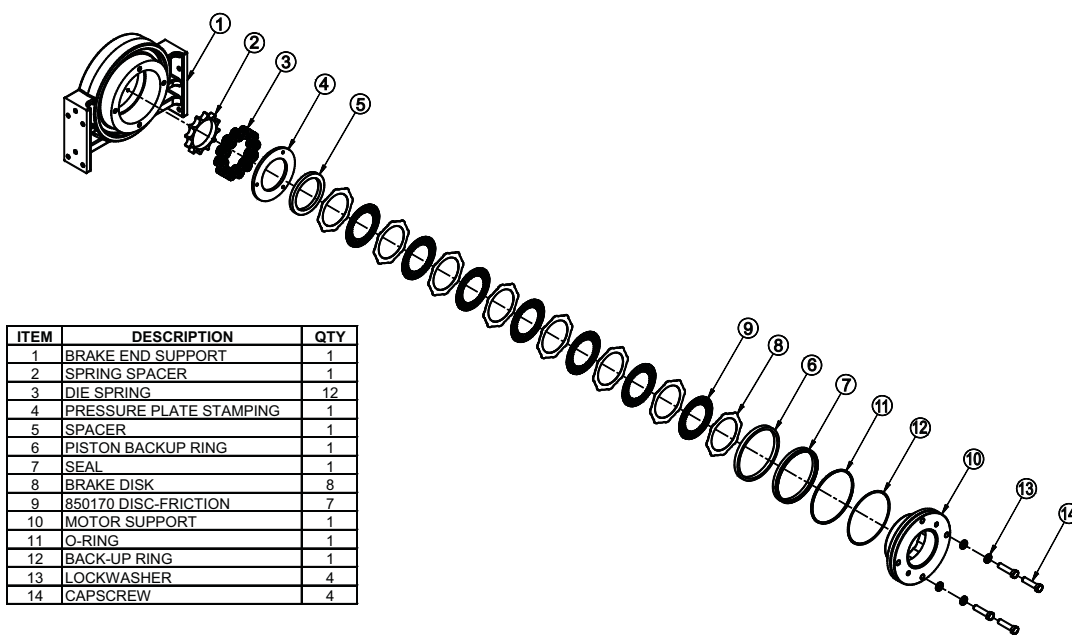
1. Remove the planet gears by first driving the spirol pins (item 15) into the center of the planet gear shafts (item 12).
2. Use a punch to drive the roll pins from the planet gear shafts. **DO NOT** reuse the roll pins.
3. Remove the planet shafts, roller bearings, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, the bearing should be replaced. Likewise, the roller bearing cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage that will impair the cage's ability to separate, retain and guide the rollers properly, the bearing should be replaced. The thrust washer contact areas should be free from any

surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

## ASSEMBLY

1. Install a bearing (item 13) into a planet gear (11) and place a thrust washer (14) on each side of the gear. Position this assembly into an opening in the planet carrier (10). Slide a planet gear shaft (12) through the carrier, thrust washer, bearing and remaining thrust washer.
2. Carefully align the pin hole in the carrier with the hole in the shaft and drive a new spirol pin into place. **ALWAYS** use **NEW** spirol pins. When properly positioned, 50% of the spirol pin will engage the planet gear shaft and 50% will remain in the carrier.
3. Note that the spirol pin is slightly recessed into the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole and prevent the pin from backing out in operation. Repeat these steps for each of the three planet gears.

# BRAKE CYLINDER SERVICE



ITEM	DESCRIPTION	QTY
1	BRAKE END SUPPORT	1
2	SPRING SPACER	1
3	DIE SPRING	12
4	PRESSURE PLATE STAMPING	1
5	SPACER	1
6	PISTON BACKUP RING	1
7	SEAL	1
8	BRAKE DISK	8
9	850170 DISC-FRICTION	7
10	MOTOR SUPPORT	1
11	O-RING	1
12	BACK-UP RING	1
13	LOCKWASHER	4
14	CAPSCREW	4

## DISASSEMBLY

### ⚠ CAUTION ⚠

The motor adapter is under spring tension from the brake springs. Loosen each of the cap screws one turn at a time until spring tension is released.

1. Set the brake assembly on a work bench with the motor adapter up. Remove the cap screws (item 14) and lockwashers (item 13). Use a crisscross pattern and loosen each cap screw one turn at a time until spring tension is released.
2. Remove the motor adapter (item 10). Lift out all the brake discs (item 8), friction discs (item 9) and the spacer (item 5).
3. Remove and discard the O-Ring and backup ring (items 11 & 12) from the motor adapter. Remove and discard the brake piston seal (item 7) from the brake cylinder. Remove the steel piston backup ring (item 6).
4. Remove the pressure plate (item 4) and the springs and spring spacer (items 2 & 3) from the brake cylinder.

## Clean and Inspect

1. Thoroughly clean and inspect all parts at this time. Check sealing surfaces on both the motor adapter and brake cylinder. Be sure the brake release port is open and free of contamination.
2. Place each friction brake disc on flat surface and check for distortion with a straight edge. Friction material should appear even across entire surface with groove pattern visible. Replace any friction disc if splines are worn to a point, disc is distorted, friction material is burned or worn unevenly, or groove depth is less than 0.003 in. (0.08 mm).
3. Place steel disc on flat surface and check for distortion with a straight edge. Check surface for signs of material transfer or excessive heat. Replace any steel disc if distorted, heat discolored, or mechanically damaged.
4. Check brake spring free length. Check springs for any signs of cracking or failure. If a brake spring must be replaced for any reason, then ALL brake springs must be replaced.

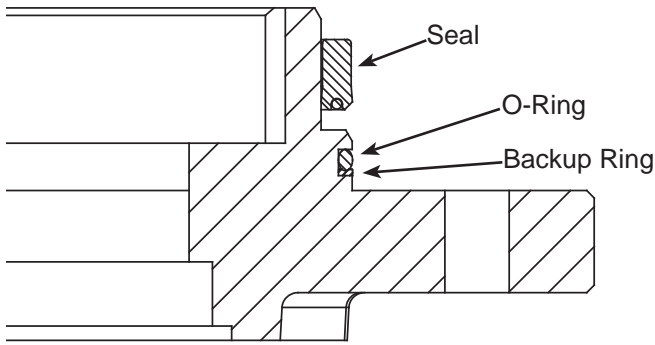
### Minimum Free Length

HP35A                      1-3/16 inch (30.2 mm)

### ⚠ WARNING ⚠

Brake springs must be replaced as a set. Failure to replace brake springs as a set may result in uneven brake application pressure and repeated brake spring failure, resulting in personal injury or death.

## ASSEMBLY



1. Place the motor adapter (item 10) on a clean work surface with the motor mounting surface down. Apply a light coat of oil to a new backup ring (item 12) and O-Ring (item 11) and install them into the groove on the motor adapter. Backup rings are always placed on the low pressure side of the O-Ring. In this case, the backup ring is toward the motor mounting surface. Lightly oil the new brake cylinder seal (item 7) and install it onto the motor adapter with the seal lip down.
2. Lubricate the friction discs with the same oil used in the winch. Install a steel brake disc (item 8) into the motor adapter, followed by a friction disc (item 9). Continue to alternately install steel and friction discs until there are 8 steel and 7 friction discs. A steel disc will be on top.
3. Install the brake plate spacer (item 5) on top of the last steel disc.
4. Place the brake housing (item 1) on a clean work surface with the motor end facing up. Install the spring spacer (item 2), then the 12 springs (item 3).
5. Install the pressure plate (item 4) into the brake housing. Be careful that none of the springs fall over. Install the steel backup ring (item 6).

**NOTE:** The close fitting backup ring may be depressed slightly to one side to lodge it in the brake cylinder bore and temporarily hold the pressure plate and springs in place while the brake cylinder is inverted and lowered over the motor adapter. As an alternate, the motor adapter and brake plates can be turned over and installed into the brake cylinder, holding the brake plates and spacer in place through the center opening. Be careful to not pinch your fingers between the spacer plate and the pressure plate.

6. Apply petroleum jelly or oil soluble grease to the sealing surface of the brake housing and the piston seal. Turn the brake housing over and lower it onto the motor adapter, being careful not to damage the piston seal or O-Ring on the adapter. The alternate assembly method above can also be used.
7. Turn the entire assembly over and install the capscrews (14) and lockwashers (13). After the capscrews make contact with the motor adapter, evenly tighten them one turn at a time until the motor adapter is drawn tight against the brake cylinder, then torque to the recommended value.

### ⚠ WARNING ⚠

Always use the molded spring spacer to properly position the springs in the brake cylinder. Failure to install the spring spacer may allow the springs to contact each other and become damaged. This could result in loss of load control, property damage, injury or death.

## BRAKE CYLINDER PRESSURE TEST

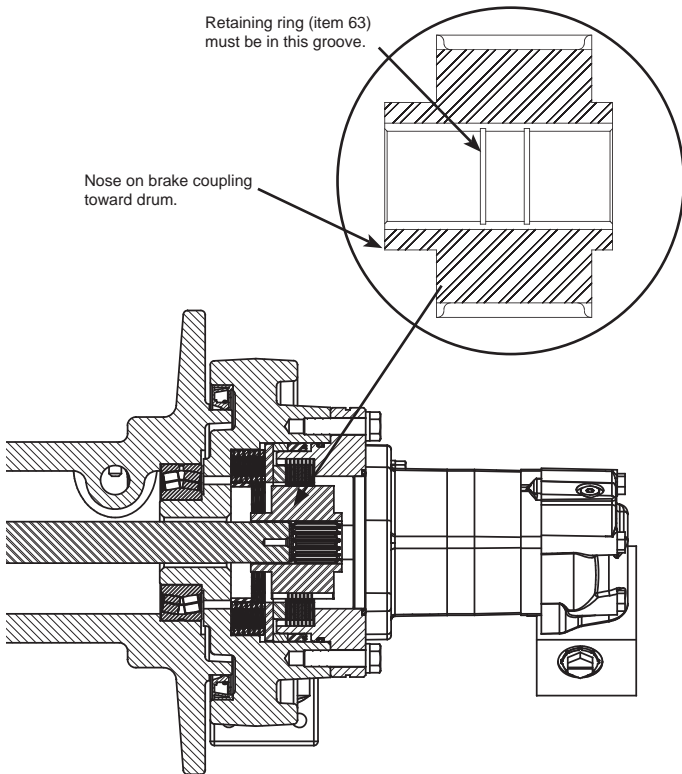
1. Install a -4 ORB fitting into the brake release port on the motor adapter. Connect a hand pump with an accurate 0-2,000 psi (0-13,800 kPa) gauge and shut-off valve to this fitting. Apply 1,000 psi (6,900 kPa) to the brake and close the shut-off valve. Let the unit stand for five minutes. If there is any loss of pressure, the brake cylinder should be disassembled for inspection of the sealing surfaces, seal and O-Ring. When the source of the pressure leak has been determined and corrected, re-assemble the brake cylinder and repeat the test.
2. WHILE PRESSURE IS APPLIED AND THE BRAKE IS RELEASED, install the brake coupling into the brake pack. Turn the brake coupling back and forth to align the splines on all the friction discs. Release the pressure on the brake cylinder and remove the brake coupling assembly. The brake cylinder is now complete and ready to be installed in the winch.

### ⚠ WARNING ⚠

The brake coupling must be installed in the winch in the correct orientation for the winch brake to work properly (see drawing). Failure to install the brake coupling in the proper orientation may result in death or personnel injury.

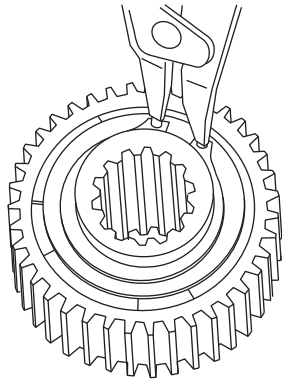
### ⚠ WARNING ⚠

The retaining ring installed in the inner race of the brake coupling must be installed on the drum side as shown below. Failure to install the retaining ring in the proper groove may result in death or personnel injury.

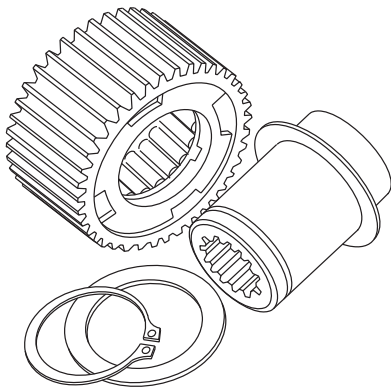


# BRAKE CLUTCH SERVICE

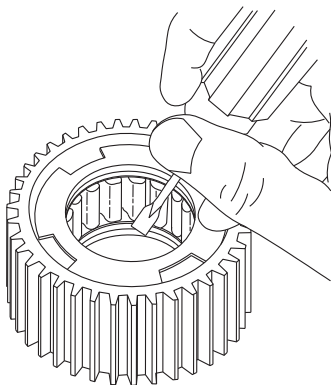
## DISASSEMBLY



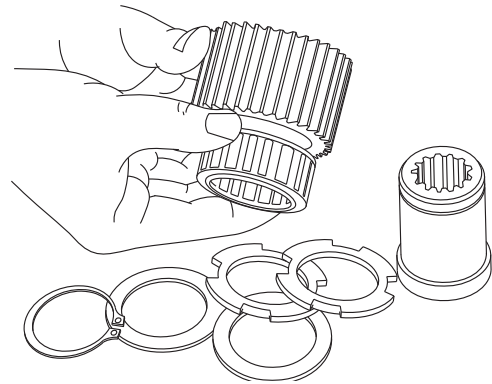
1. Remove the snap ring and sprag bushing retainer from one end only.



2. Pull the inner race out. Examine the race for scoring, wear or indentations caused by the sprag cams.



3. Use a screwdriver and mallet to remove the sprag bushing from one end of the outer race. There are four special cut-outs in the bushing for this purpose. Be careful not to damage the bushing inside surface. If a bushing's inside surface is damaged or shows wear, replace it.

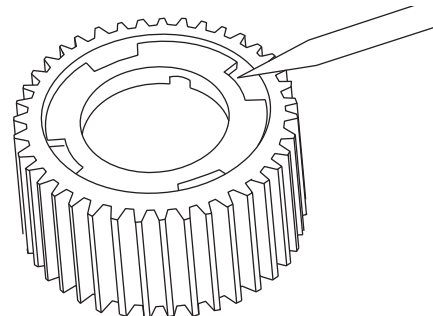


4. Next, slide the sprag clutch out, inspect the sprag clutch closely for abnormal wear, cracks, pitting or corrosion. Check small clips for breakage or bright spots; the signs of excessive wear. Unless the outer race or remaining sprag bushing is damaged or shows excessive wear, there is no need for further disassembly. If disassembly is necessary, remove the bushing according to the procedure covered in Step No. three (3). All brake clutch assembly parts should be thoroughly cleaned and inspected before assembly.

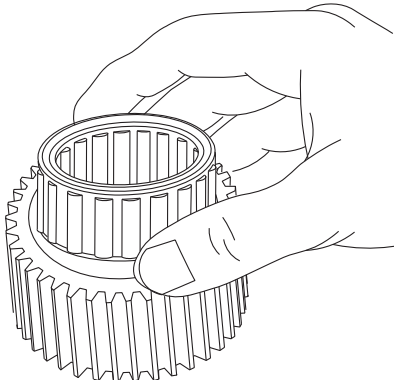
## ⚠ WARNING ⚠

The polished surfaces of the races and sprag cams must be perfectly smooth to insure positive engagement of the clutch. The slightest defect may reduce brake clutch effectiveness, which may lead to loss of load control and result in property damage, personal injury or death. It is generally recommended to replace the entire brake clutch assembly if any component is defective.

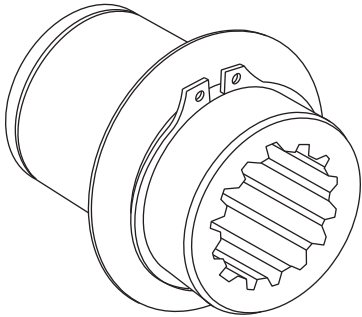
## ASSEMBLY



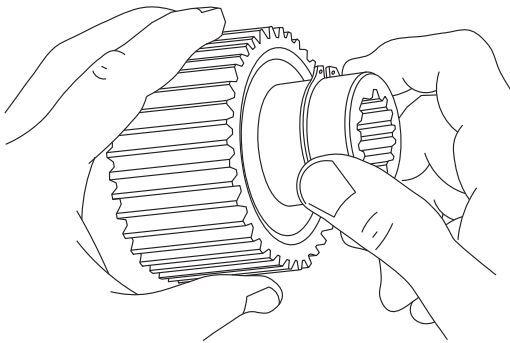
1. Press a sprag bushing into the outer race, using a mechanical or hydraulic press. A flat plate of approximately the same diameter as the bushing flange outside diameter should be placed between the press and bushing during assembly to protect the bushing. Be certain the bushing flange is against the shoulder in the outer race.



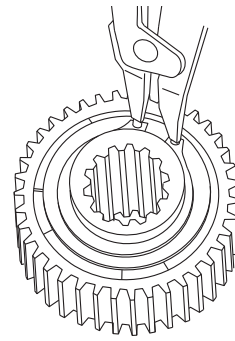
2. Turn the assembly over and install the sprag clutch in the bore of the outer race.
3. Press the remaining bushing into the race. Again, make sure the bushing is against the shoulder.



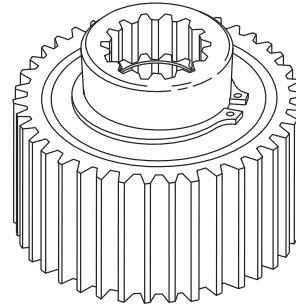
4. Next, install a sprag bushing retainer, then a snap ring on the inner race. Be sure the snap ring is seated in the snap ring groove.



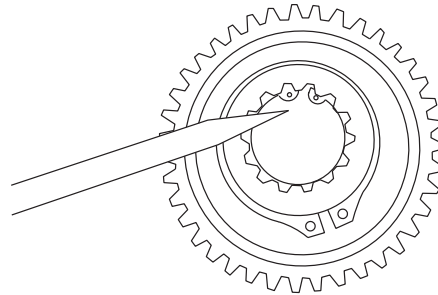
5. Slide the inner race through the bushings and sprag clutch (the race will have to be rotated in the free-wheeling direction to start it through the sprag clutch). If the inner race will not go through the bushings, the bushings have probably been damaged and should be replaced.



6. Turn the assembly over with the snap ring down. Install the second retainer and snap ring. Make certain the snap ring is seated in the groove properly.



7. This is a completed brake clutch assembly.



### ⚠ WARNING ⚠

Be certain the snap ring is seated in the groove in the splined bore of the inner race. This snap ring will keep the brake clutch assembly correctly positioned in the center of the friction brake pack. Binding of the brake or brake failure may occur if this snap ring is omitted and may result in property damage, personal injury, or death.

**NOTE:** Viewed from the hydraulic motor side of the brake clutch, the inner race should turn freely in the same direction the drum turns to reel-in while holding the outer race stationary.



# BRAKE VALVE SERVICE

The brake valve is a reliable hydraulic valve with internal components manufactured to close tolerances. Due to the close tolerances and mating of components, the valve housing, spool, piston and check poppet are not available as replacement parts.

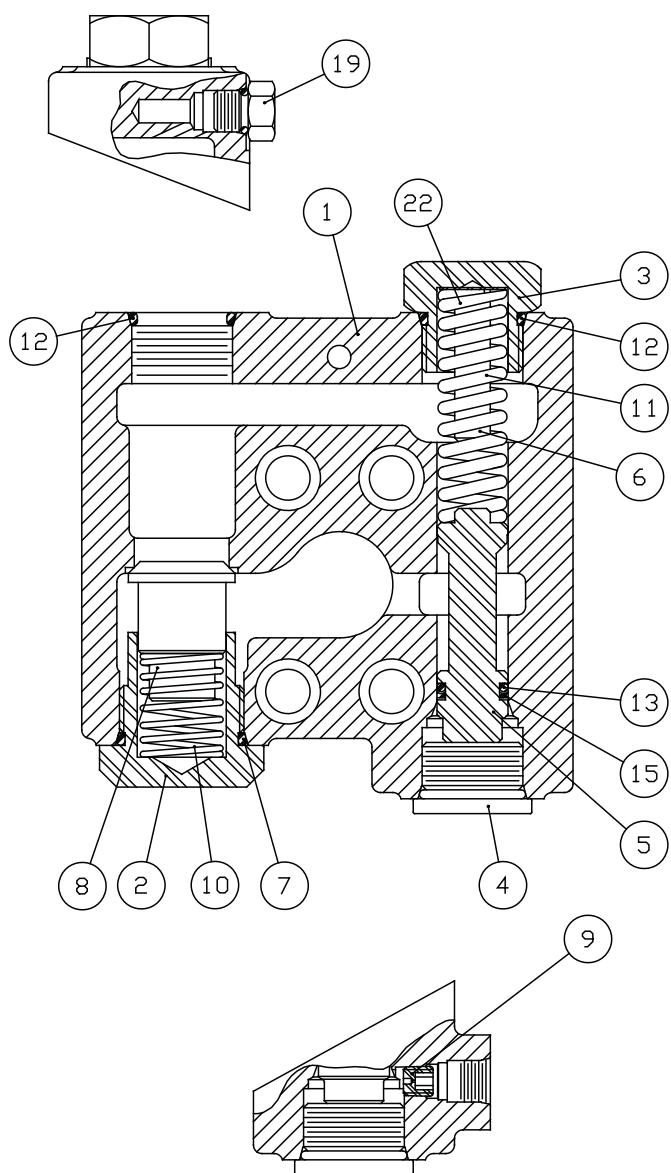
Before disassembling the brake valve, be sure you have conducted all applicable troubleshooting operations and are certain the brake valve is causing the malfunction.

Thoroughly clean the outside surfaces of the valve and work in a clean dust free area, as cleanliness is of utmost importance when servicing hydraulic components.

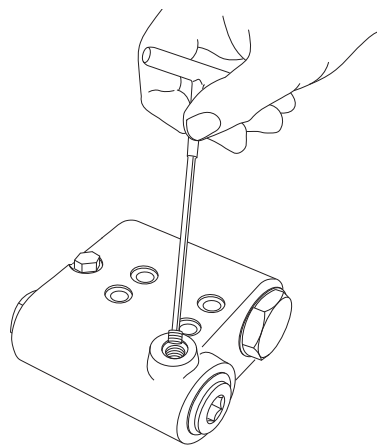
BRAKE VALVE ASSEMBLY		
ITEM	DESCRIPTION	QTY.
1	VALVE HOUSING (NSS)	1
2	CHECK VALVE RETAINER	1
3	SPRING RETAINER	1
4	PLUG	1
5	SPOOL (NSS)	1
6	DAMPER PISTON (NSS)	1
7	O-RING	1
8	CHECK VALVE POPPET (NSS)	1
9	PILOT ORIFICE	1
10	CHECK VALVE SPRING	1
11	SPOOL SPRING	1
12	O-RING	2
13	O-RING	1
14	O-RING	1
15	BACK-UP RING	1
16	BACK-UP RING	1
19	PLUG	1
22	SHIM	A-R

NSS - NOT SERVICED SEPARATELY. REPLACE COMPLETE VALVE ASSEMBLY.

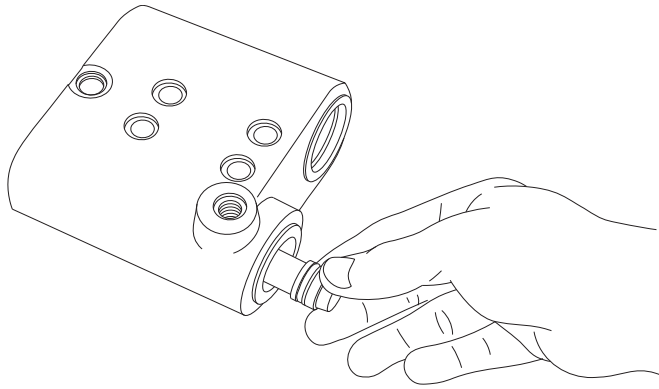
A-R - AS REQUIRED



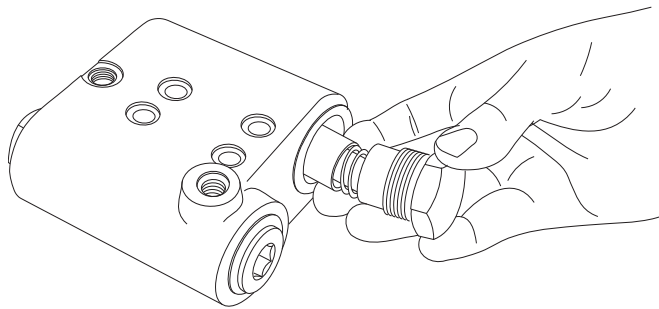
## DISASSEMBLY



1. Remove the pilot orifice (9) from the brake release (BR) port using a 5/32 in. Allen wrench.
2. Remove the plug (19) from the drain port.
3. Remove the spool spring retainer (3) and spool spring (11). Check spring free length. Replace spring if less than 1 15/16 in. (49.2 mm) long.



4. Remove spool plug (4) and carefully remove spool (5).



5. Remove the check valve spring retainer (2), spring (10) and check valve poppet (8). Check spring free length. Replace spring if less than 1-1/2 in. (38.1 mm) long.

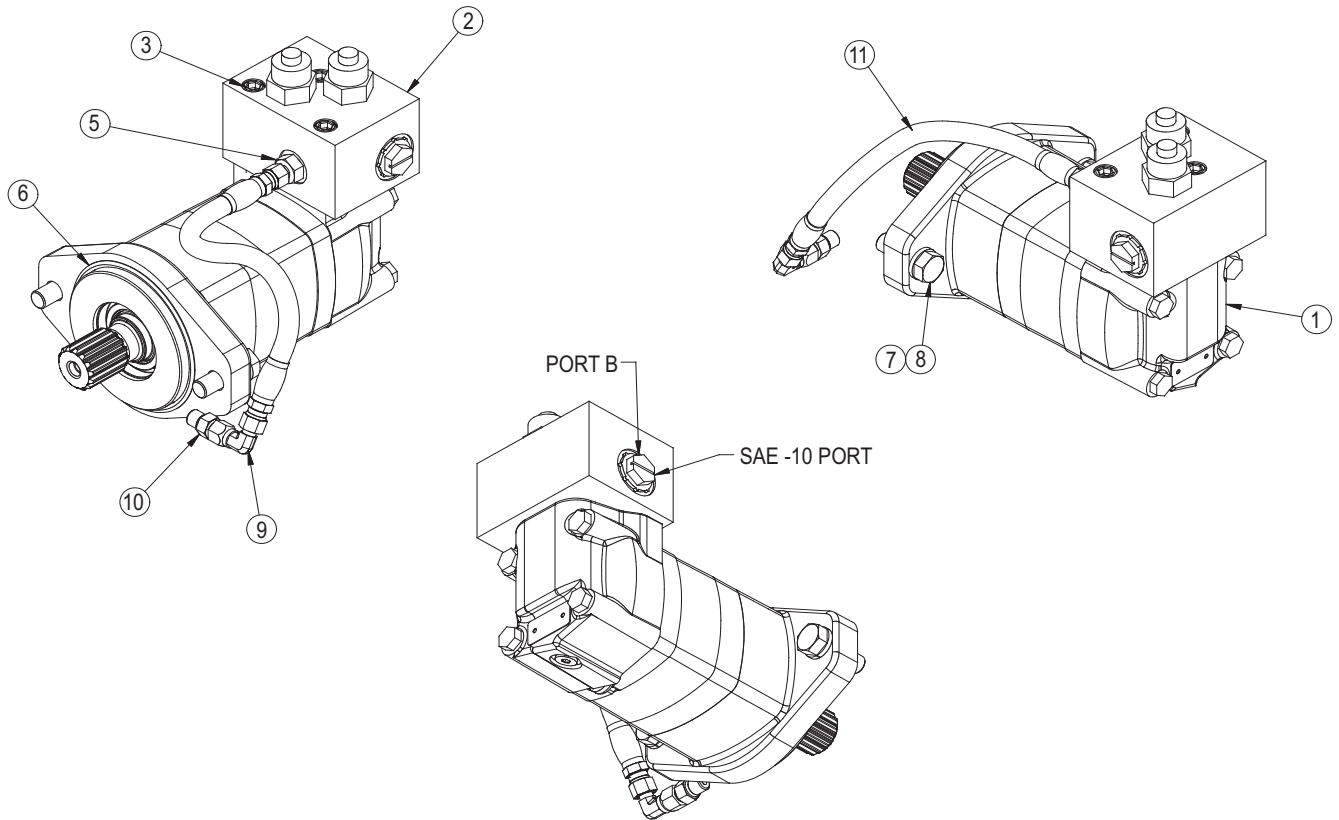
## CLEAN AND INSPECT

1. Discard all O-rings and back-up rings. Clean all parts in solvent and blow dry. Inspect polished surfaces of spool for damage that may cause binding or leakage. Inspect spool bore in valve housing for damage or scoring. Inspect check valve seat in valve housing and check valve poppet. If the spools, bores or valves are damaged, the entire valve must be replaced as these parts are not serviced separately.
2. Inspect the .020 inch orifice in the pilot orifice (9) to be certain it is open.

## ASSEMBLY

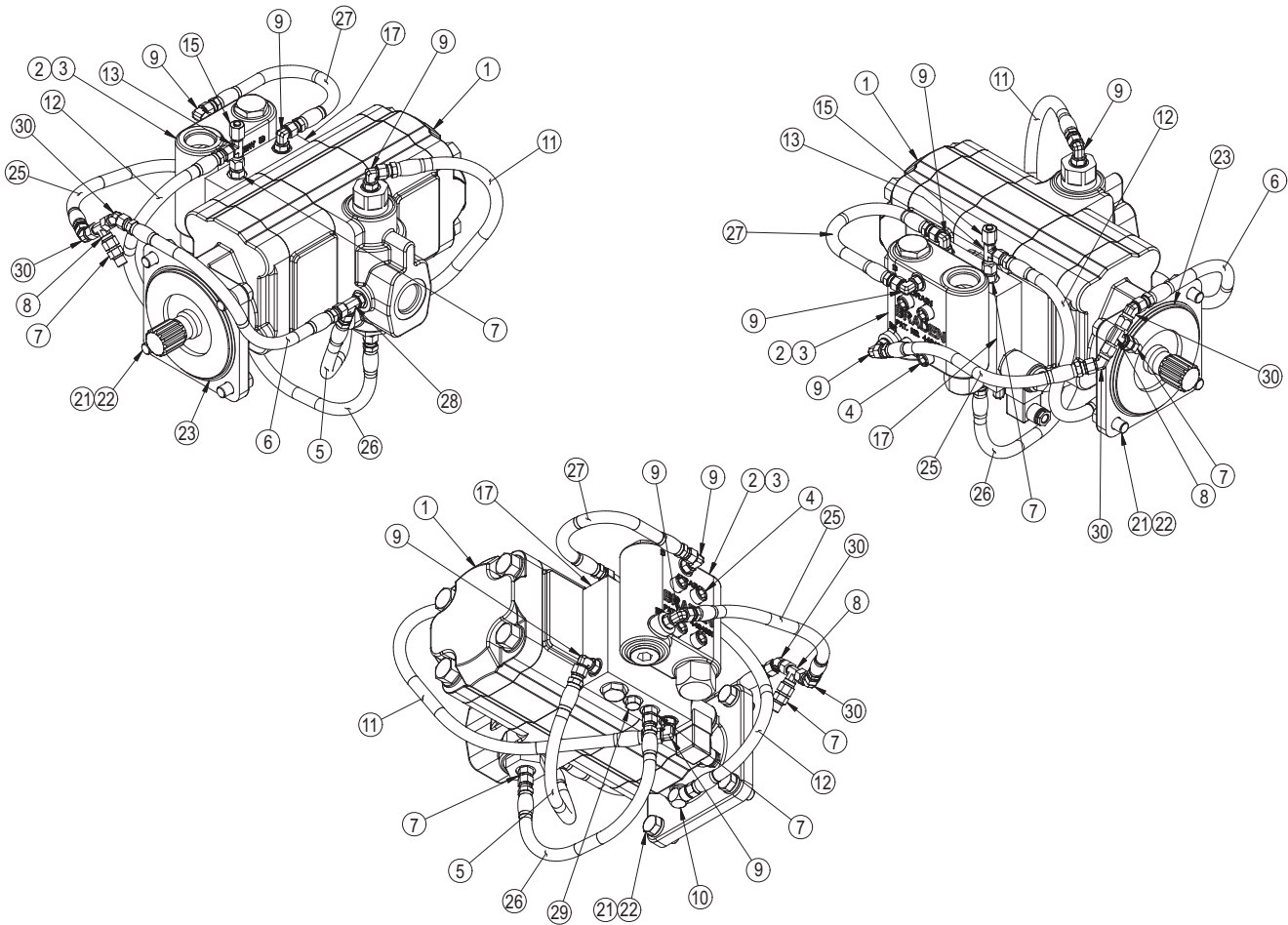
1. Install new O-rings on the plug and spring retainers.
2. Install new O-rings and back-up rings on the spool. It is important that the back-up ring is on the correct side of its O-ring. Take care not to cut the O-ring during assembly. Let the spool set for ten minutes before installing them in their respective bores. This will allow the O-ring to return to their original size after being stretched.
3. Lubricate the spool bore and spool O-rings with hydraulic oil. Carefully install the spool into the valve housing. Always install the spool from the plug end as shown to minimize the possibility of damaging the O-ring. Install the plug, spool spring and spring retainer.
4. Install the check valve poppet, spring and check valve spring retainer.
5. Install the solid plug into the "drain" port.
6. Install the pilot orifice into the valve housing.
7. The brake valve is complete and ready to be installed on winch motor.

# HP35A Low Speed High Torque Hydraulic Motor



ITEM NO	DESCRIPTION	QTY
1	HYDRAULIC MOTOR	1
2	BRAKE VALVE ASSY	1
3	CAPSCREW	3
5	ADAPTER	1
6	O-RING	1
7	LOCKWASHER	2
8	CAPSCREW (1/2 - 13 X 1-1/2 G8 Z)	2
9	SWIVEL NUT 90° ELBOW	1
10	ADAPTER	1
11	HOSE ASSY	1

# HP35A Two-Speed Hydraulic Motor



ITEM NO	DESCRIPTION	QTY
1	HYDRAULIC MOTOR - 2 SPEED	1
2	BRAKE VALVE ASSY	1
3	O-RING	1
4	CAPSCREW	4
5	HOSE	1
6	HOSE	1
7	ADAPTER	4
8	SWIVEL TEE	1
9	ELBOW FITTING	6
10	REDUCER ELBOW	1
11	HOSE	1
12	HOSE	1

ITEM NO	DESCRIPTION	QTY
13	SWIVEL TEE	1
15	CAP NUT	1
17	MANIFOLD WITH SOLENOID	1
21	LOCKWASHER	4
22	CAPSCREW	4
23	O-RING	1
25	HOSE	1
26	HOSE	1
27	HOSE	1
28	TEE, RUN	1
29	HEX HEAD PLUG	1
30	MALE UNION	2

# Low Speed High Torque Motor Changing Direction of Rotation

With “brake effective both directions”, the static brake will keep both the cable drum and extension shaft from rotating in either direction. Cable can be wrapped on the drum in either direction with no other modification required.

In operation, the friction brake must be hydraulically released when the winch is operated in either the reel-in or reel-out direction.

When the winch is powered in either direction, the motor cannot rotate until sufficient pilot pressure is present to open the correct brake valve cartridge. The friction brake will completely release at a pressure lower than that required to open the brake valve cartridge. The extent to

which the cartridge opens will determine the amount of oil that can flow through it and the speed at which the cable drum will turn. Increasing the flow of oil to the winch motor will cause the pressure to rise and the opening in the brake cartridge to enlarge, speeding up the cable drum. Decreasing this flow causes the pressure to lower and the opening in the brake valve cartridge to decrease thus slowing down the cable drum.

# HP35A ROTATION CHANGE

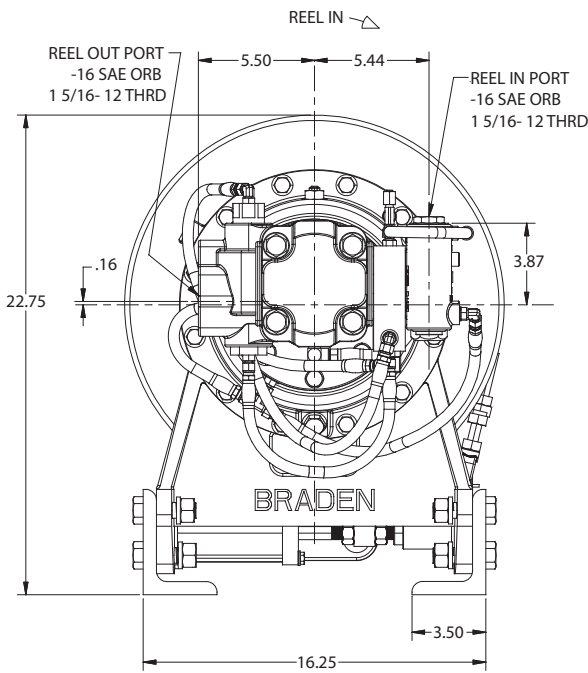
## (For Winches with a Gear Motor and Overrunning Clutch)

This standard winch as shipped from the factory is configured for installation with the motor on the passenger side of the truck bed and the cable reeling-in over the drum as shown below.

The two basic changes that are required to reverse the rotation and are detailed in this procedure are:

1. The brake valve and shift block must be moved to the opposite side of the hydraulic motor.
2. The brake clutch assembly must be set-up for the new direction of rotation. For the HP35A this requires disassembly of the brake clutch.

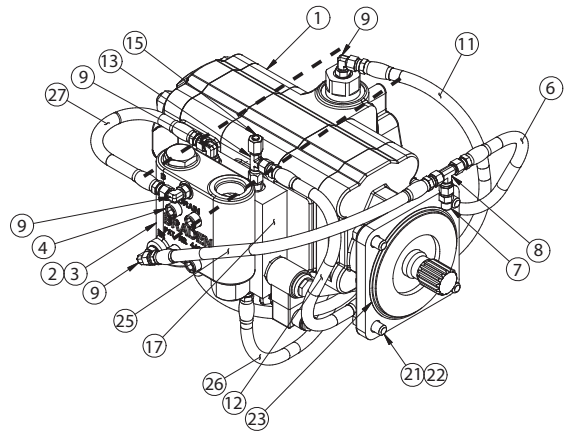
The drawing below is the standard configuration of the winch as shipped from the factory.



If the winch must be mounted behind the truck cab with the motor on the driver's side of the truck and the winch reeling-in over the drum, the following changes must be made for proper operation:

1. The brake valve and shift block must be moved to the opposite side of the winch motor.

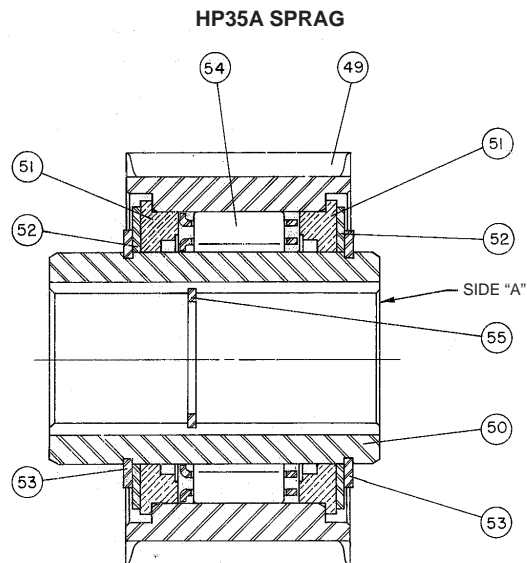
**a) For the Commercial two-speed motor ONLY:** This procedure should be done by a Parker/Commercial dealer so that the hydraulic motor retains its warranty. The motor must be taken apart and the center section (dotted lines) rotated 180 degrees to get the brake valve on the opposite side. This must be done because this two speed motor has a -16 ORB port on the reel-out side of the hydraulic motor.



**b) For the Rineer two-speed motor and Commercial single speed motor,** the brake valve and shift-block must be moved to the opposite side motor split flange port. The plumbing must be changed so the lowering signal to the brake and brake valve comes from the opposite side as originally plumbed.

2. The brake clutch must be configured for counter clockwise rotation viewed from the hydraulic motor side of the drum.

**a) For the HP35A** the brake clutch must be taken apart and the sprag flipped. After reassembly, the inner race should free turn in the CCW direction viewed from the motor side.



Free rotation is changed to CCW viewed from side "A" (motor side) when motor is mounted on driver's side and rope winds over drum.

## RECOMMENDED PLANETARY GEAR OIL

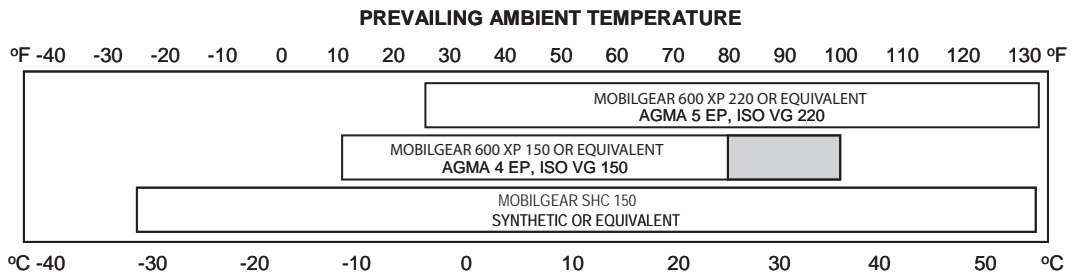
Field experience, supported by engineering endurance tests, indicates the use of the proper gear oil and a program of regular preventive maintenance will help provide extended gear train life and reliable winch brake performance. For this reason, BRADEN has published the following specifications to assist in determining which lubricant is best suited to your application.

### ⚠ WARNING ⚠

Failure to use the proper type and viscosity of planetary gear oil may contribute to intermittent brake clutch slippage which could result in property damage, personal injury, or death. Some gear lubricants contain large amounts of EP (extreme pressure) and anti-friction additives which may contribute to brake clutch slippage or damage to brake friction discs or seals. Oil viscosity with regard to ambient temperature is also critical to reliable brake clutch operation. Our tests indicate that excessively heavy or thick gear oil may contribute to intermittent brake clutch slippage. Make certain that the gear oil viscosity used in your winch is correct for your prevailing ambient temperature.

For simplicity, BRADEN has listed available products in each temperature range that have been tested and found to meet our specifications. This is not to say that other lubricant brands would not perform equally as well.

If the following lubricant brands are not available in your area, make certain your lubricant vendor supplies you with oil that is equivalent to those products listed below.



**i** **NOTE:** SHADED TEMPERATURE RANGE IN THE CHART ABOVE NOT RECOMMENDED FOR SEVERE APPLICATIONS SUCH AS: OFFSHORE CRANES, SUSTAINED FAST DUTY CYCLES OR FREQUENT LIFTING.

Planetary hoists are factory filled with Mobilgear 600 XP 150, or equivalent. Consult your oil supplier for other equivalent oils if required.

Mobil	Shell	Chevron	Texaco
Mobilgear 600 XP 150	Omala 150	Gear Compounds EP 150	Meropa 150
Mobilgear 600 XP 220	Omala 220	Gear Compounds EP 220	Meropa 220

Unless otherwise specified, it is recommended that the gear oil be changed after the first one hundred (100) hours or thirty (30) days of machine operation, then every one thousand (1,000) hours or twelve (12) months, whichever occurs first. The gear oil should also be changed whenever the ambient temperature changes significantly and an oil from a different temperature range would be more appropriate.

A warm-up procedure is recommended at each start-up and is essential at ambient temperatures below +40°F (4°C).

The prime mover should be run at its lowest recommended RPM with the hydraulic winch control valve in neutral allowing sufficient time to warm up the system. The winch should then be operated at low speeds, forward and reverse, several times to prime all lines with warm hydraulic oil and to circulate gear lubricant through the planetary gear sets.

### ⚠ WARNING ⚠

Failure to properly warm up the winch, particularly under low ambient temperature conditions, may result in temporary brake slippage due to high back pressures attempting to release the brake, which could result in property damage, personal injury, or death.

If you have any questions regarding this bulletin or your BRADEN planetary winch, please contact the BRADEN Product Support Department at 1-918-251-8511, Monday through Friday from 08:00 to 16:30 hours CST, or by fax at 1-918-259-1575.