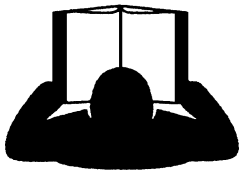


INSTRUCTION AND PARTS MANUAL
MODEL HL25
PLANETARY HYDRAULIC WINCH



THE LOGICAL CHOICE



READ THIS MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS PRODUCT. THIS MANUAL CONTAINS IMPORTANT INFORMATION. MAKE THIS MANUAL AVAILABLE TO ALL PERSONS RESPONSIBLE FOR THE OPERATION, INSTALLATION, SERVICING AND MAINTENANCE OF THIS PRODUCT.

PULLMASTER LIMITED WARRANTY

Effective 1/1/2002

SUPERSEDES ALL PRIOR WARRANTIES

Seller warrants that each article sold under this order shall at the time of shipment (i) conform to applicable specifications, and (ii) be free from defects in material and workmanship during normal and ordinary use and service (the "Warranty").

Buyer's exclusive remedy and Seller's sole obligation under this Warranty shall be, at Seller's option, to repair or replace any article or part thereof which has proven to be defective, or to refund the purchase price of such article or part thereof.

This Warranty shall expire one (1) year from the date the article is first shipped by Seller. Notice of claimed breach of this Warranty must be given by Buyer to Seller within the applicable period. Such notice shall include an explanation of the claimed warranty defect and proof of date of purchase of the article or part thereof for which warranty coverage is sought. No allowances shall be made by Seller for any transportation, labor charges, parts, "in and out" costs, adjustments or repairs, or any other work, unless such items are authorized in writing and in advance by Seller. Nor shall Seller have any obligation to repair or replace items which by their nature are expendable.

If an article is claimed to be defective in material or workmanship, or not to conform to the applicable specifications, Seller will either examine the article at Seller's site or issue shipping instructions for return to Seller. This Warranty shall not extend to any articles or parts thereof which have been installed, used, or serviced otherwise than in conformity with Seller's applicable specifications, manuals, bulletins, or instructions, or which shall have been subjected to improper installation, operation, or usage, misapplication, neglect, overloading, or employment for other than normal and ordinary use and service.

This Warranty shall not apply to any articles or parts thereof furnished by Seller to Buyer's specifications and/or furnished by Buyer or acquired from others at Buyer's request.

SELLER MAKES NO EXPRESS WARRANTIES AND NO IMPLIED WARRANTIES OF ANY KIND, OTHER THAN THE WARRANTY EXPRESSLY SET FORTH ABOVE. SUCH WARRANTY IS EXCLUSIVE AND IS MADE AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedies for this Warranty shall be only those expressly set forth above, to the exclusion of any and all other remedies of whatsoever kind. The limited remedies set forth above shall be deemed exclusive, even though they may fail their essential purpose. No agreement varying or extending the foregoing Warranty, remedies, exclusions, or limitations shall be effective unless in writing signed by an executive officer of Seller and Buyer. This Warranty is non-transferable.

Under no circumstances shall Seller be liable (i) for any damage or loss to any property other than the warranted article or part thereof, or (ii) for any special, indirect, incidental, or consequential damage or loss, even though such expenses, damages, or losses may be foreseeable.

The foregoing limitations on Seller's liability in the event of breach of warranty shall also be the absolute limit of Seller's liability in the event of Seller's negligence in manufacture, installation, or otherwise, with regard to the articles covered by this Warranty, and at the expiration of the Warranty period as above stated, all such liabilities shall terminate.



WARNING

PULLMASTER planetary winches/drives are not designed for operations involving lifting or moving personnel. The **PULLMASTER WINCH CORPORATION** cannot be held liable or responsible for any accident resulting from such use of **PULLMASTER** planetary winches/drives.

Note: Specifications contained in this Instruction and Parts Manual are subject to change without notice.

SAFETY RECOMMENDATIONS



DANGER

FAILURE TO COMPLY WITH THE FOLLOWING SAFETY RECOMMENDATIONS AND LOCAL RULES AND REGULATIONS WILL RESULT IN PROPERTY DAMAGE, SEVERE INJURY OR DEATH.



Definition: **Caution** indicates a potentially hazardous situation which, if not avoided may result in minor or moderate injury.



Definition: **Warning** indicates a potentially hazardous situation which, if not avoided could result in death or serious injury.



Definition: **Danger** indicates a potentially hazardous situation which, if not avoided will result in death or serious injury.

The planetary hydraulic winches are made for hoisting and lowering loads and to be operated by trained and professional personnel. They are not designed for operations involving lifting or moving personnel. The winches are powered by hydraulic power. The ropes / cables for hoisting operations are not supplied by PULLMASTER. The winches are always assembled in an application, they do not function as an independent machine and it is not allowed to use them as such.

The winches are to be used within the specifications as listed in the manual under "SPECIFICATIONS". Other use as foreseen in the functional description of the hydraulic winch is not allowed without written permission from PULLMASTER.

1. Do not install, operate or service winch before reading and understanding manufacturer's instructions.
2. The winch described herein is not designed for operations involving lifting or moving personnel.
3. Do not lift or carry loads over people.
4. Do not exceed recommended operating pressure (psi) and operating volume (gpm).
5. Do not jerk the winch. Always smoothly accelerate and decelerate load.
6. Do not operate a damaged, noisy or malfunctioning winch.
7. Do not leave a load suspended for any extended period of time.
8. Never leave a suspended load unattended.
9. Winch should be maintained and operated by qualified personnel.
10. Inspect winch, rigging, mounting bolts and hoses before each shift.
11. Warm-up equipment before operating winch, particularly at low ambient temperatures.
12. Verify winch function by raising and lowering a full test load to a safe height before each shift.
13. Do not weld any part of the winch.
14. Verify gear lubrication and brake circulation supply and return before operating winch.
15. Be sure of equipment stability before operating winch.
16. Wear proper clothing to avoid entanglement in rotating machinery.
17. Always stand clear of the load.
18. Use only recommended hydraulic oil and gear lubricant.
19. Keep hydraulic system clean and free from contamination at all times.
20. Maintain winch and equipment in good operating condition. Perform scheduled maintenance regularly.
21. Keep hands clear when winding wire rope onto the winch drum.
22. Do not use the wire rope as a ground for welding.
23. Rig the winch carefully. Ensure that the wire rope is properly anchored to the correct cable anchor slot at the cable drum.
24. Do not lift a load with a twisted, kinked or damaged wire rope.
25. Consult wire rope manufacturer for size, type and maintenance of wire rope.
26. Maintain three wraps of wire rope on the cable drum at all times.
27. In case of a power failure or breakdown leading to an unexpected stop of the hydraulic power circuit, stand clear of the area and the load being hoisted, take the necessary precautions to prevent access to area where the load is halted.
28. The noise level of the winch is 87dBA measured on a distance of 1.00 meter, 1.60 meters high. The measuring equipment used was: Realistic #42-3019.
29. Clean up any oil spillage immediately.
30. Wear proper clothing and personal protection equipment such as, footwear, safety goggles and a hard hat. Read manual first.



DESCRIPTION OF THE MODEL HL25

GENERAL DESCRIPTION:

The PULLMASTER Model HL25 is a planetary, hydraulic winch with two forward speeds and one reverse speed. At low forward or hoisting speed this unit has a line pull capacity of 25,000 lb on the first layer of wire. In the "rapid forward" mode the line pull capacity is reduced by a ratio of 4.67 and the line speed increases by the same ratio. The change from low speed to rapid forward speed is actuated hydraulically and can be made while the drum is rotating. The main components of this unit are:

- ◇ Hydraulic motor
- ◇ Multi-disc brake with static and dynamic function
- ◇ High speed clutch
- ◇ Primary planet reduction
- ◇ Final planet reduction
- ◇ Brake housing
- ◇ Final drive housing
- ◇ Cable drum

FUNCTION IN FORWARD ROTATION:

LOW FORWARD SPEED

During low forward speed the output torque and rpm of the hydraulic motor is transmitted by the motor drive shaft to the primary sun gear of the primary drive. The output torque and rpm of the primary drive is transmitted to the final drive by the final sun gear, which is splined to the primary planet hub. The output torque and rpm of the final drive is transmitted to the cable drum by a spline, attaching the final planet hub to the cable drum.

The motor drive shaft is splined to a clutch hub which connects to a set of friction and divider plates. During low speed operation, a pressure plate, which is "spring applied" and "pressure released", permits free rotation of the friction plates.

The motor drive shaft is also attached to a connecting shaft by a sprag clutch which permits free rotation of the motor drive shaft while the connecting shaft is stationary. The connecting shaft is held stationary by another sprag clutch to a brake hub. During low forward speed operation, the automatic brake remains applied, hence, the brake hub, the connecting shaft and the internal gear do not rotate.

RAPID FORWARD SPEED

When rapid forward speed is actuated, hydraulic pressure is channelled from the motor to the center bore of the motor drive shaft to the clutch piston. The hydraulic pressure causes the clutch to engage against the clutch springs. The clutch hub is splined to the motor drive shaft and the drive gear is splined to the connecting shaft, the internal gear of the primary drive will rotate with the motor drive shaft. Thus, the planetary drive is eliminated. The elimination of the primary drive results in a forward or hoisting line speed 4.67 times faster than low forward speed. The line pull capacity during "rapid forward" operation must be decreased by a ratio of 4.67. When the pressure is removed from the clutch, the clutch is disengaged by the clutch springs and the unit reverts to low forward speed. Since the sprag clutch, which connects the connecting shaft to the brake hub, permits free rotation, the automatic brake of the winch is not affected during rapid forward speed.

NOTE: The change over from low forward speed to rapid forward speed can be made while the drum is rotating, providing the load on the wire rope does not exceed 5357 lb (23.8 kN) on the first layer of wire rope. If this load is exceeded, winch will stall.

DESCRIPTION OF THE MODEL HL25

CONTINUED

FUNCTION IN REVERSE ROTATION:

RAPID REVERSE

When the hydraulic motor is pressurized for rapid reverse, the rotation of the motor drive shaft causes the sprag clutch to lock, resulting in a solid assembly between the motor drive shaft and the connecting shaft. Rotation of the connecting shaft causes the sprag clutch between the connecting shaft and the brake hub to lock making a solid assembly between these two components. Hydraulic pressure is automatically transmitted to the brake piston, forcing the brake piston to release brake against a series of brake springs. The friction plates, which are engaged in the brake hub, can now rotate between the divider plates. Since both sprag clutches are locked, the friction plates, brake hub, connecting shaft, internal gear and primary sun gear turn at the same revolution as the motor drive shaft. Thus, the primary drive is eliminated, resulting in a reversing speed 4.67 times faster than low forward speed.

If a load on the cable drum tends to affect the reversing speed, the resulting pressure drop in the brake piston causes friction between the friction plates and the divider plates. Thus, a completely smooth reversing speed can be controlled in a stepless operation by modulation of the winch control handle. When the control is returned to neutral position, rotation stops and the disc brake applies automatically. The pressure in the brake piston is vented to the reservoir by the **motor spool** of the winch control valve.

During reverse operation of the winch, or when a load is being lowered, the friction created by the brake disc results in temperature. On the standard Model HL25 this temperature is dissipated by a circulation flow of hydraulic fluid, supplied from an external source (see HYDRAULIC CIRCUIT). For efficient cooling of the automatic brake, the external circulation flow should be adjusted to 7 (US) gpm (26 l/min). This circulation flow must be returned directly to the reservoir with a permissible back pressure of 30 psi (2 bar) (see HYDRAULIC CIRCUIT).

IMPORTANT: Under no circumstances must the back pressure in the brake housing be permitted to exceed 30 psi (2 bar). Excessive pressure in the brake housing will damage the oil seals separating the brake housing from the drum interior. Damage to this seal will cause the cable drum to fill up with hydraulic fluid. In order to prevent potential damage to the drum seals and the end cover of the winch, when the cable drum fills up with hydraulic fluid, a breather relief (see PARTS REFERENCE, item 130) is installed on the end cover. The breather relief bleeds to atmosphere and serves as a warning signal that the oil seal between the brake housing and drum has been damaged.

EXPLANATION OF MODEL CODING

HL 25 X - XX - XX - XX X - X XXXX

BASIC UNIT SERIES _____

HL = Rapid forward and reverse

SIZE OF UNIT _____

REDUCTION RATIO _____

Only used for non standard reduction ratios

TYPE OF BRAKE _____

- 7 Automatic brake, clockwise drum rotation, external circulation flow
- 8 Automatic brake, external brake release, clockwise drum rotation, external circulation flow
- 9 Automatic brake, external brake release, counterclockwise drum rotation, external circulation flow
- 10 Automatic brake, counterclockwise drum rotation, external circulation flow

HYDRAULIC MOTOR _____

- 86 Standard hydraulic gear motor - *WM76* (12.3 in³ displacement)
- 129 Standard hydraulic piston motor - *VOLVO 110 cc* (6.7 in³ displacement)
(For other motor options contact factory)

DRUM SIZE _____

- 1 10 inch drum diameter X 17 inch flange diameter X 11 inch length - STANDARD
(For other drum sizes refer to APPENDIX A)

OPTIONS _____

- F Hydraulically actuated **freespooling**

DESIGN REVISION _____

SPECIFICATION NUMBER _____

Describes features not identified by preceding codes

NOTE: Clockwise and counterclockwise drum rotation is the direction of rotation for pulling or hoisting, established by looking at the hydraulic motor.

OPTIONS

COUNTERCLOCKWISE ROTATION:

The drum rotation of the standard PULLMASTER Model HL25 planetary winch is clockwise for hoisting when looking at the hydraulic motor of the winch. Drum rotation for counterclockwise hoisting direction is available as an option.

EXTERNAL BRAKE RELEASE:

PULLMASTER planetary winches can be supplied with an **external brake release** which permits release of the automatic disc brake from an external pressure source.



FAILURE TO PROPERLY VENT EXTERNAL BRAKE RELEASE PORT WILL TRAP BRAKE PRESSURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. WINCHES SUPPLIED WITH EXTERNAL RELEASE OPTION MUST BE CONNECTED ACCORDING TO TYPICAL HYDRAULIC CIRCUIT.

CABLE DRUM SIZES:

Aside from the standard drum sizes listed in APPENDIX A, the PULLMASTER Model HL25 planetary winch can be supplied with optional drums to accommodate large wire rope storage capacity.

DRUM GROOVING:

Cable drums for the PULLMASTER Model HL25 planetary winch can be grooved. Where this option is a requirement, it is necessary to state the size of wire rope which is to be used with the winch.

OPTIONAL GEAR SECTION FOR THE HYDRAULIC MOTOR:

The performance of the standard PULLMASTER Model HL25 planetary winch may be changed by using a different displacement motor. (Contact the factory for performance information.)

HYDRAULIC MOTORS FOR HIGH PRESSURE HYDRAULIC SYSTEMS:

The operating pressure of the PULLMASTER Model HL25 planetary winch is limited to 2500 psi (172 bar). For hydraulic systems operating with a higher range of hydraulic pressure, the winch can be supplied with a hydraulic piston motor, which will provide for the same basic performance in terms of line pull and line speed capacity. (Contact the factory for this requirement.)

FREESPOOLING:

This option permits wire rope being pulled off the cable drum by an operator. **Freespooling** should not be confused with **free fall**. The **freespool** clutch cannot be disengaged or re-engaged with a load on the wire rope or while the cable drum is turning.

The PULLMASTER WINCH CORPORATION will consider other options for quantity requirements.

RECOMMENDATIONS

HYDRAULIC FLUID:

The hydraulic fluid selected for use with PULLMASTER planetary winches should be a high grade, petroleum based fluid, with rust, oxidation and wear resistance. Fluid cleanliness and operating viscosity are critical to winch reliability, efficiency and service life.

For optimum performance, the recommended viscosity range at operating temperature is 81 - 167 SUS (16 - 36 CS). For extreme operating conditions of short duration, the maximum viscosity range of 58 - 4635 SUS (10 - 1000 CS) should not be exceeded.

For optimum performance, the winch recommended hydraulic fluid temperature operating range is 80 - 150F (27 - 66 C). For extreme operating conditions of short duration, the maximum temperature range of -5 - 180F (-21 - 82 C) should not be exceeded.

LUBRICATION:

The winch gear train requires oil bath lubrication. The winch is shipped from the factory without lubricating oil.

IMPORTANT: ADD LUBRICATING OIL BEFORE RUNNING WINCH.

Refer to INSTALLATION DIMENSIONS for location of lubricating oil fill port. Refer to APPENDIX A for quantity of oil required. For normal operating temperature use SAE 90 lubricating oil. For temperatures beyond normal operating range, consult lubricating oil supplier or factory.

HYDRAULIC PUMP:

For maximum performance of the PULLMASTER planetary winch, the hydraulic pump must supply the maximum flow of hydraulic fluid at the hydraulic pressure stated in SPECIFICATIONS.

HYDRAULIC CONTROL VALVE:

The standard control valve used for operation of the PULLMASTER planetary winch must have a four-way, spring return to neutral feature, which provides for open flow from the pressure ports of the winch to the reservoir in neutral position of the control (motor spool). It is important to point out that good speed control, especially when lowering a load, depends on the "metering"

HYDRAULIC PRESSURE RELIEF:

The hydraulic circuit for the PULLMASTER planetary winch requires a pressure relief set at the operating pressure (see SPECIFICATIONS). Usually, a pressure relief is part of the hydraulic control valve. Where this is not the case, a separate pressure relief valve must be installed and set at the recommended maximum pressure.

HYDRAULIC RESERVOIR:

It is recommended that the hydraulic reservoir has sufficient capacity to provide good heat dissipation in order to prevent over-heating of the hydraulic fluid. The hydraulic reservoir should be made from clean and scale-free material to prevent contamination of the hydraulic fluid. In order to prevent air from being mixed with the hydraulic fluid, the reservoir should have an over-flow baffle separating the return lines from the suction line and all return lines should enter the reservoir below the fluid level. The reservoir should be mounted close to and above the hydraulic pump in a location which provides for free air circulation around the reservoir.

HYDRAULIC HOSES:

The following hydraulic hoses are recommended for maximum efficiency of the PULLMASTER Model HL25 planetary winch:

Pressure lines:	Equivalent to SAE 100R12-32
Circulation return line:	Equivalent to SAE 100R4-16
Circulation supply line:	Equivalent to SAE 100R6-6
High speed shifting line:	Equivalent to SAE 100R1-4

It is recommended that a larger size of hydraulic hose is installed where the pressure lines or the circulation lines are excessively long.

HYDRAULIC FILTER:

Hydraulic filter recommendations for the hydraulic circuit of the PULLMASTER planetary winch, based on a return line filter, are given as follows:

Average Atmosphere:	10 microns
Dusty Atmosphere:	5 microns

In order to prevent accidental stoppage of the return line flow, the oil filter should have a by-pass feature.

USE OF AN E STOP:

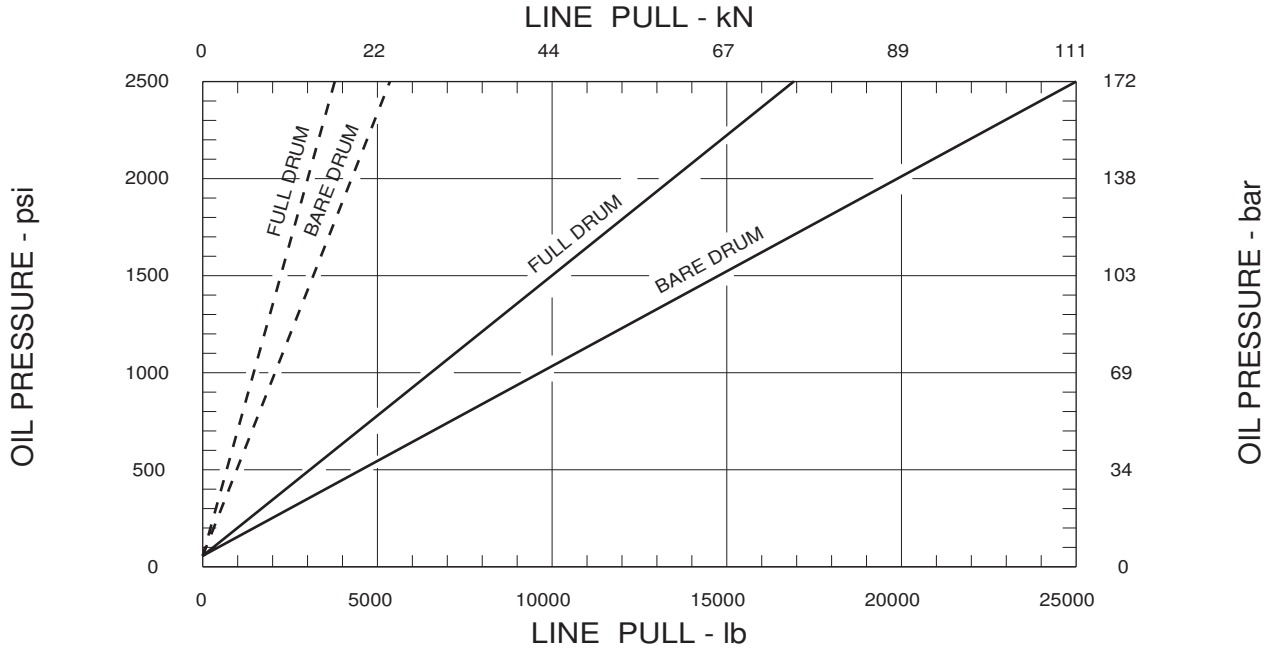
(FOR EUROPEAN MACHINERY DIRECTIVE APPLICATIONS)

The use of an E stop (emergency) is mandatory in the controls circuit. The E stop is to be placed in the operator's control panel. The E stop must be designed and placed in line with EN 60204 and EN 418.

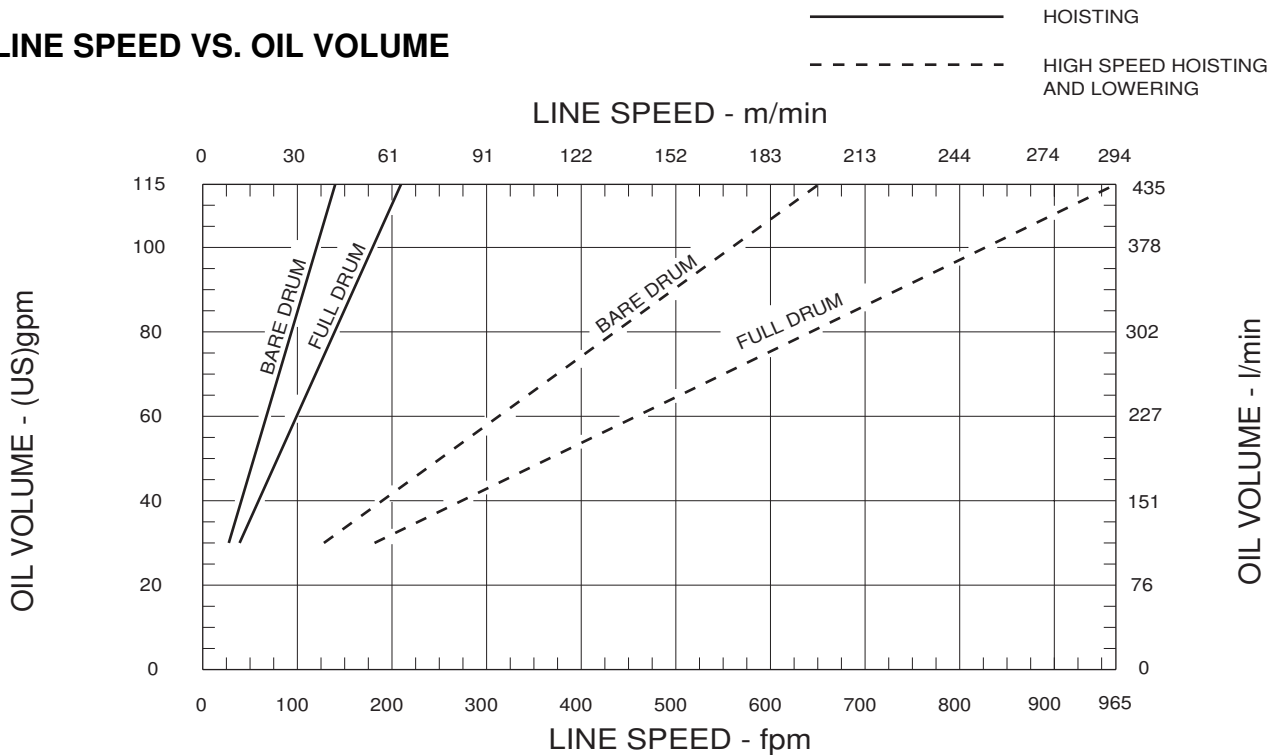
PERFORMANCE GRAPHS FOR STANDARD GEAR MOTOR

PG-HL25-86-A

LINE PULL VS. OIL PRESSURE



LINE SPEED VS. OIL VOLUME



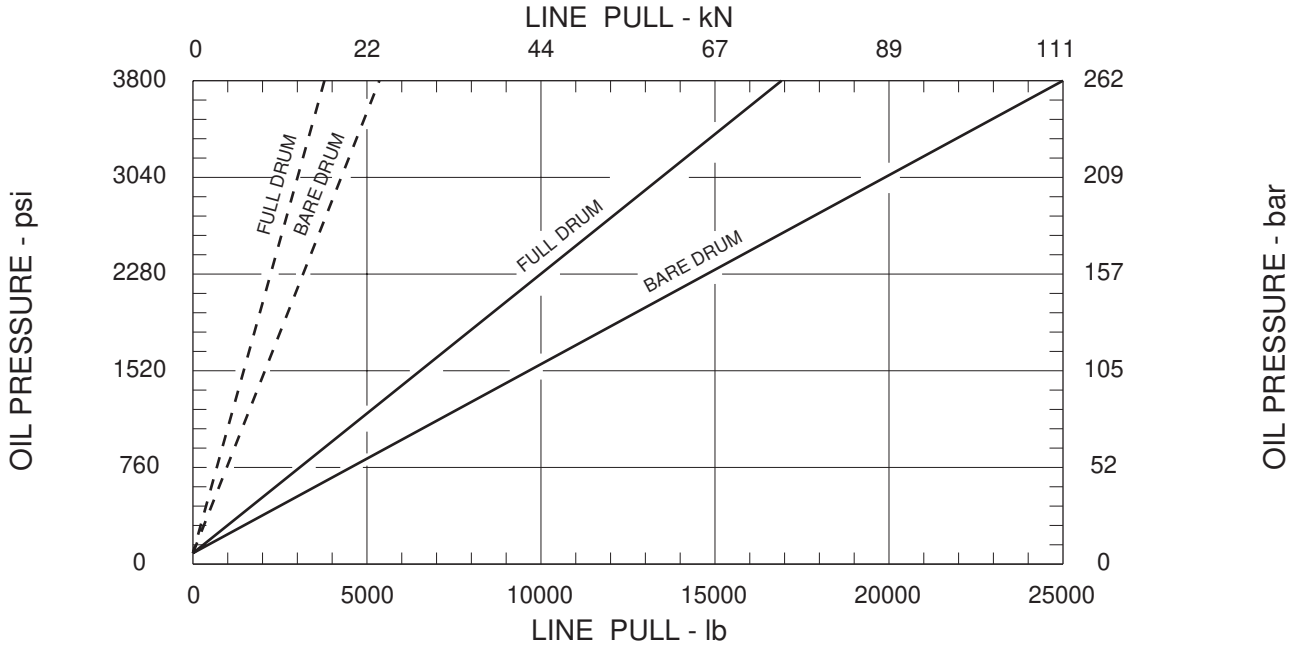
Performance graphs are based on standard hydraulic motor, gear ratio and cable drum with 7/8 inch diameter wire rope.

PERFORMANCE GRAPHS

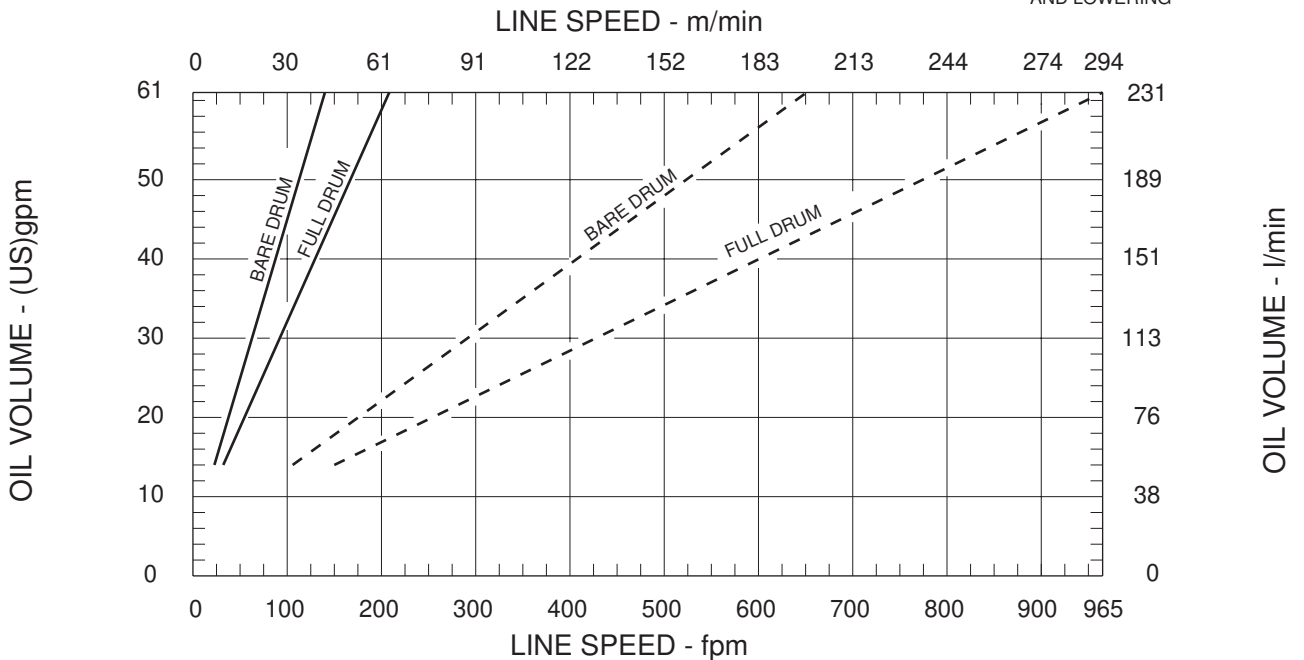
FOR STANDARD PISTON MOTOR

PG-HL25-129-A

LINE PULL VS. OIL PRESSURE



LINE SPEED VS. OIL VOLUME

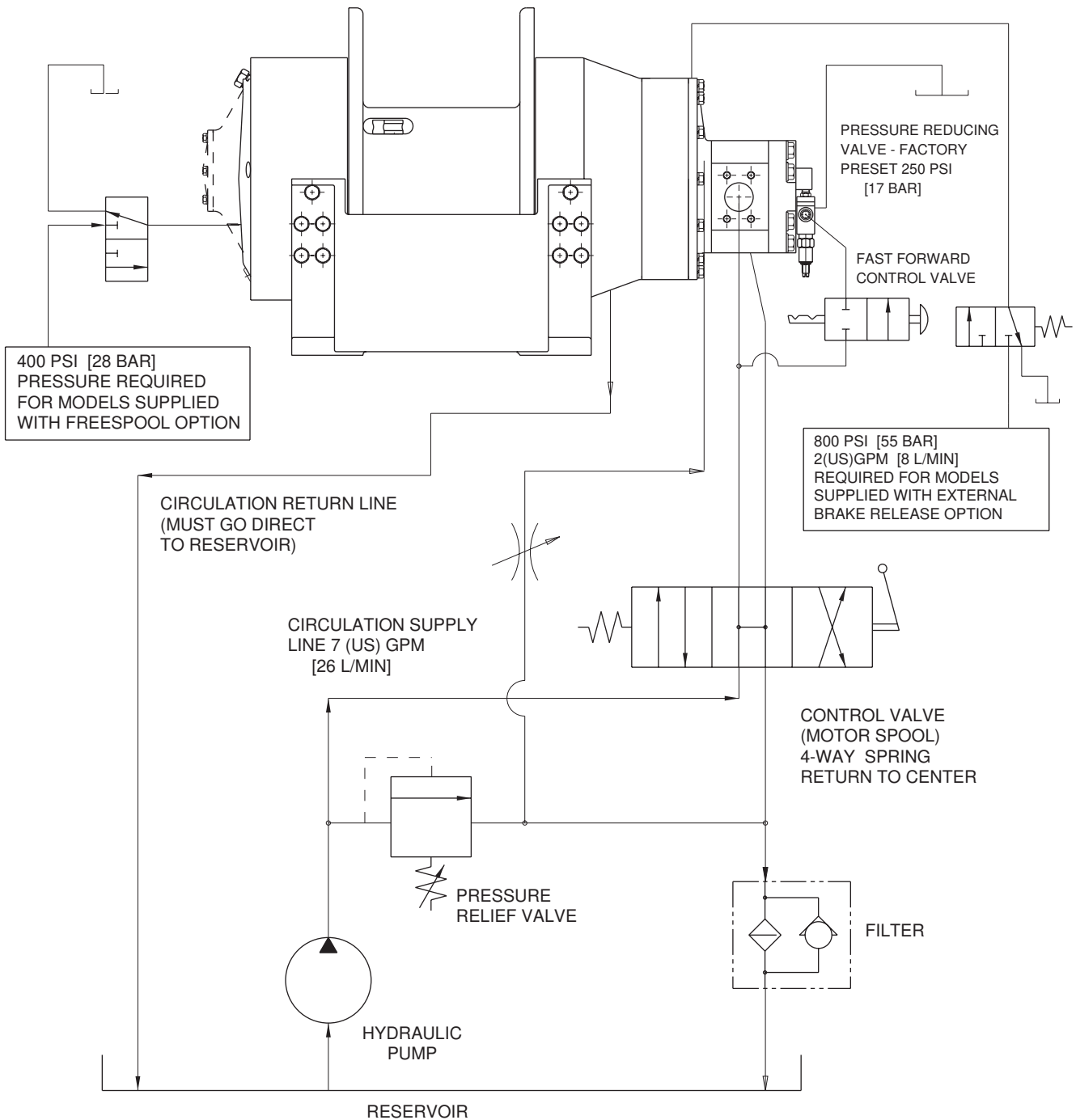


Performance graphs are based on standard hydraulic motor, gear ratio and cable drum with 7/8 inch diameter wire rope.

TYPICAL HYDRAULIC CIRCUIT

GEAR MOTOR

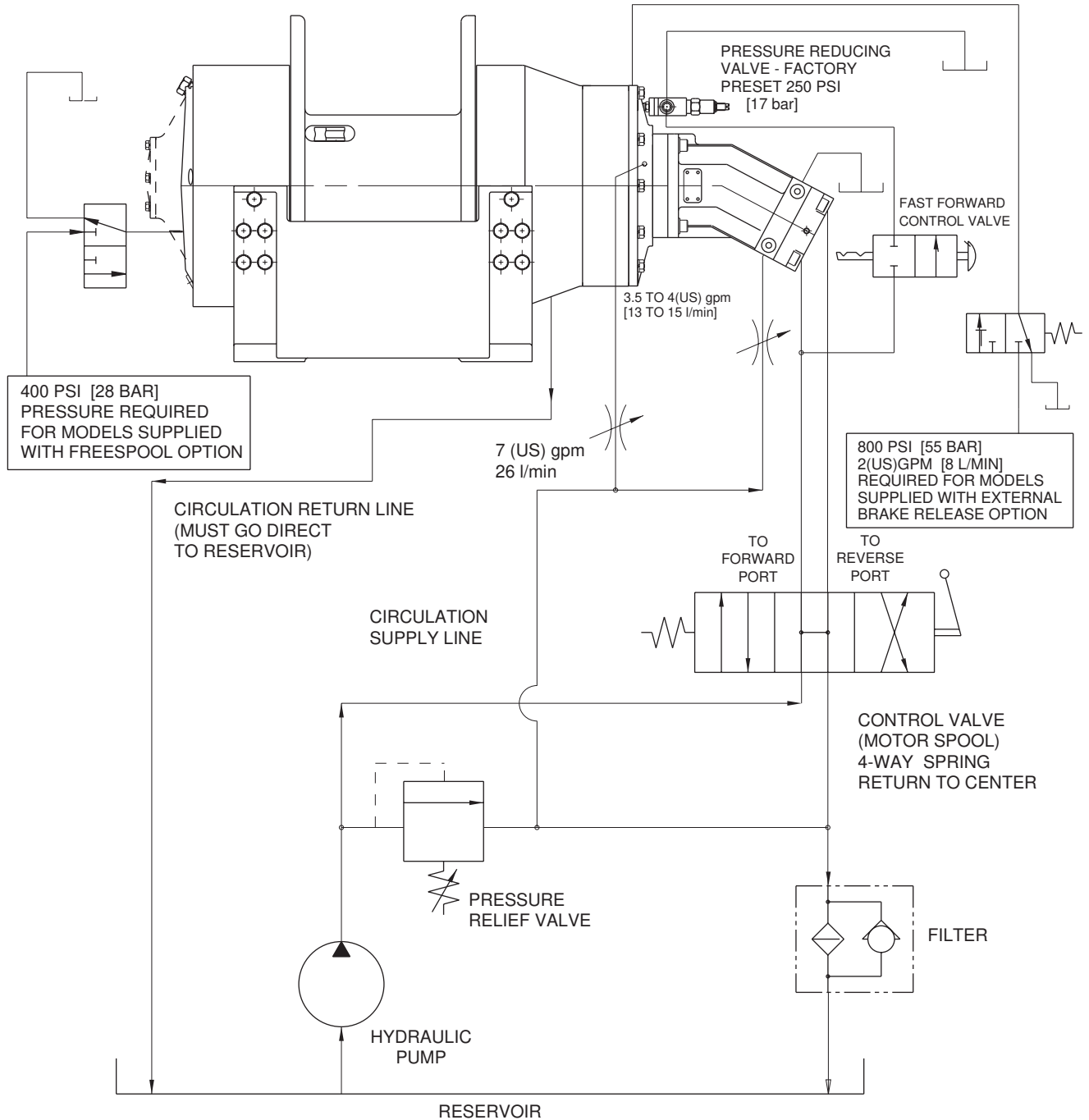
HC-HL25-D



TYPICAL HYDRAULIC CIRCUIT

PISTON MOTOR

HC-HL25-129-C



INSTALLATION INSTRUCTIONS



DANGER

**FAILURE TO FOLLOW INSTALLATION INSTRUCTIONS WILL
RESULT IN PROPERTY DAMAGE, SEVERE INJURY OR DEATH.**

The initial installation or mounting of a PULLMASTER planetary winch is critically important for proper operation and performance. If the winch is mounted to an uneven surface, the centre line of the unit can be distorted to a point where the winch will not operate in either direction. It is therefore very important that the following instructions are observed when a PULLMASTER planetary winch is installed:

- 1) Make certain that the mounting platform is sufficiently strong in order to avoid deflection when a load is lifted.
- 2) Set the winch on the mounting platform and check for surface contact on all mounting pads of the winch.
- 3) If there is a space between the mounting surface and one of the mounting pads, the mounting surface is not even and the space below the mounting pad must be shimmed. If this condition exists, proceed as follows:
 - a) Install mounting bolts snug tight on the three mounting pads which are in contact with the mounting surface. (For mounting bolt size and grade see INSTALLATION DIMENSIONS.)
 - b) Measure the space underneath the fourth mounting pad with a feeler gauge and use shim stock of equivalent thickness in the space between the mounting pad and the mounting surface.
 - c) Only after this procedure should the fourth mounting bolt be installed. Tighten all four bolts per BOLT TORQUE CHART.
- 4) Fill the winch with lubricating oil. (See APPENDIX A for oil volume required.)
- 5) Use recommended circuit components and hydraulic hoses.
- 6) The circulation return line of the winch should be plumbed in such a manner that the brake housing remains full of oil at all times. Connect the return line directly to reservoir. Do not connect to a common return line.
- 7) Before operating the winch with a load, verify adequate circulation flow through the circulation return line as stated in TYPICAL HYDRAULIC CIRCUIT. Verify that pressure measured at the circulation supply port does not exceed the permissible pressure stated in SPECIFICATIONS. Ensure there is no back pressure at pressure reducing valve tank port.
- 8) Verify that breather relief, item 130, is above oil level on end cover, item 120. Rotate end cover if breather relief is below oil level.

IMPORTANT: Do not replace breather relief with a pipe plug. The breather relief does not prevent oil seal failure but serves as an indicator or warning that the oil seals between brake housing and the cable drum interior have failed and must be replaced immediately. If these oil seals are changed, additional failure of the drum seal and potential damage to the end cover is prevented.

- 9) Ensure brake housing and clutch housing are full of oil at all times.

OPERATING INSTRUCTIONS



DANGER

**FAILURE TO FOLLOW OPERATING INSTRUCTIONS WILL
RESULT IN PROPERTY DAMAGE, SEVERE INJURY OR DEATH.**

After the PULLMASTER planetary winch has been installed in accordance with the INSTALLATION INSTRUCTIONS, the wire rope can be fastened to the cable drum.

IMPORTANT: The ropes, chains, slings, etc. are not part of the winch and are not covered by this manual. Refer to manufacturer's handling, inspection and maintenance recommendations to avoid potential accidents. For selection of ropes, etc. please check following product standards: DIN 15020, prEN818-1/9, prEN 1492-1/2, prEN 1677-1/3 and other relevant product standards.

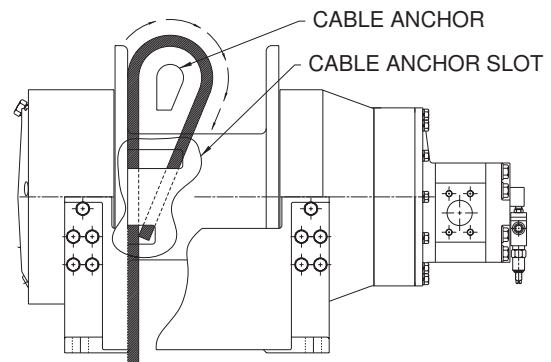
- 1) The cable drum of the PULLMASTER planetary winch has two cable anchor slots, one for clockwise and one for counterclockwise hoisting. Standard rotation for hoisting is clockwise when looking at the hydraulic motor of the unit. It is critical to select the cable anchor slot which will permit winding of the wire rope on the drum in the correct direction of rotation. If the wire rope is wound on the cable drum in the wrong direction of rotation, the winch will have no braking capacity. Each winch is shipped from the factory with a label on the drum indicating the correct cable anchor slot.

SI1013 - HL25

WIRE ROPE INSTALLATION

Clockwise hoisting winch shown.
(Use cable anchor slot on opposite side of drum for counterclockwise hoisting winch.)

Feed the wire rope through the cable anchor slot. Loop rope back into slot as shown. Insert cable anchor into slot, small end first and long side nearest the drum flange. Pull rope tight to wedge rope in slot.



- 2) On wire rope installation, care must be taken that the wire rope is wrapped completely around the cable anchor and properly pulled into the cable anchor slot in the cable drum. The cable drum requires 3-4 wraps of wire rope for safety.
- 3) The winch operation is controlled by a single control valve lever which has a **forward**, a **reverse** and a **neutral** position. Speed control in either direction is obtained by modulation of the control valve lever. Maximum line speed in either direction is obtained when the control valve lever is moved as far as it can go. The disc brake of the winch will come on automatically when the winch control lever is returned to **neutral**.
- 4) Always warm up equipment prior to operating winch, particularly in low ambient temperature. Circulate hydraulic oil through the winch control valve for several minutes to warm the hydraulic system. To prime the winch with warm oil, operate the winch at slow speed, forward and reverse, several times.
- 5) Prevent corrosion damage to winch interior. If not used regularly, run winch up and down at least once every two weeks.
- 6) To ensure proper winch installation and function, raise and lower a full test load to a safe height before using winch for regular operation at the start of each shift.

If, after a new installation, the winch does not function properly, refer to the TROUBLESHOOTING section of this manual.

TROUBLE SHOOTING

GENERAL:

In most cases, when the hydraulic winch does not perform satisfactorily, the cause of malfunction is found somewhere in the hydraulic circuit. Before the winch is removed from its mounting and disassembled, all hydraulic circuit components should be checked for proper function. Make certain hydraulic reservoir is filled to top level. If the pump is drive by v-belts, check for belt slippage.

IMPORTANT:

The hydraulic operating volume relates to the line speed or rpm of the winch.

Therefore, if the winch does not produce the specified maximum rated line speed or drum rpm, install a flow meter into the hydraulic circuit to check the volume supplied to the pressure port of the hydraulic winch motor when the winch control is completely opened. The flow meter should indicate the maximum operating volume. If this test indicates a loss of hydraulic flow, check the hydraulic pump, the relief valve and the control valve.

The hydraulic operating pressure relates to the line pull or lifting capacity of the winch.

If the winch will not lift the specified maximum line pull, install a pressure gauge into the pressure line leading to the hoisting port on the hydraulic winch motor. Stall the winch to prevent rotation of the drum and then open the control valve. Check the hydraulic pressure reading of the installed pressure gauge. If the pressure reads below the specified maximum operating pressure, look for trouble in the hydraulic pump, the relief valve and the control valve.

Only if the hydraulic system has been checked and found to be in order, use the following indications for probable causes of failure in the winch:

FAILURE	PROBABLE CAUSE
<p>Winch will not produce line pull at maximum pressure as listed in SPECIFICATIONS.</p>	<ul style="list-style-type: none"> a) Winch is mounted to an uneven surface. (See INSTALLATION INSTRUCTIONS.) b) Cable sheaves or block purchase operated with the winch are not turning freely. c) Damage or wear in the hydraulic motor. d) Excessive back pressure in the hydraulic system. e) Relief valve may be set too low. (See SPECIFICATIONS for maximum operating pressure.) f) Winch is in high speed mode.
<p>Winch will not produce line speed at maximum volume as listed in SPECIFICATIONS.</p>	<ul style="list-style-type: none"> a) Winch is mounted to an uneven surface. (See INSTALLATION INSTRUCTIONS.) b) Cable sheaves or block purchase operated with the winch are not turning freely. c) Damage or wear in the hydraulic motor d) Excessive back pressure in the hydraulic circuit.
<p>Winch will not reverse.</p>	<ul style="list-style-type: none"> a) Leakage out of the brake piston prevents the brake from being released against the brake springs. This is caused by damaged O-ring seals on the brake piston. b) The O-ring seals, on the brake release channel between the motor adaptor, clutch housing or brake housing is damaged. If this failure occurs there will be leakage either from the motor adaptor, clutch housing or brake housing. c) Insufficient hydraulic pressure. (See SPECIFICATIONS for minimum operating pressure.) d) Winch is mounted to an uneven surface. (See INSTALLATION INSTRUCTIONS.) e) Hydraulic pressure is not reaching the brake piston (plugged brake release passage in the brake housing).

TROUBLE SHOOTING CONTINUED

FAILURE	PROBABLE CAUSE
Clutch will not engage (will not shift into rapid forward speed).	<ul style="list-style-type: none"> a) Loss of clutch release pressure. Check pressure reducing valve and O-rings. b) Seized clutch piston caused by contamination in oil supply. c) Incorrect hydraulic connections. Refer to TYPICAL HYDRAULIC CIRCUITS.
Brake will not hold.	<ul style="list-style-type: none"> a) Brake plates or divider plates have been damaged by contamination in the hydraulic fluid, or lack of circulation flow in the brake housing. b) Brake piston is seized in the brake housing because of contamination in the hydraulic fluid. c) Excessive back pressure in the return line causes the brake to release. d) Control valve has incorrect spool, which traps hydraulic pressure in the brake piston when the control valve handle is returned to neutral position. For proper function of the automatic brake, both pressure ports of the winch must be open to the reservoir in neutral position of the control valve. e) Wire rope is fastened to the incorrect cable anchor slot. f) Sprag clutch is damaged or surfaces where sprag clutch engages on motor drive shaft or brake hub are worn or indented. g) Winch supplied with external brake release option is not plumbed per HYDRAULIC CIRCUIT. Failure to vent external brake release port to reservoir may trap pressure and cause winch brake to slip.
Brake vibrates when lowering a load.	<ul style="list-style-type: none"> a) Pump is too slow. Pump rpm must be maintained at normal operating speed when a load is lowered. b) Brake is running too hot. This is caused by a complete lack of, or insufficient circulation flow. To check the circulation, observe the flow of oil from the circulation return line of the winch. (See TYPICAL HYDRAULIC CIRCUIT when the winch is reversed.) c) Control valve has poor metering characteristics. d) Damaged brake plates or divider plates. e) The sprag clutch, which connects the motor shaft with the brake assembly, is damaged. f) Air mixed with hydraulic oil (foamy oil).
Oil leaks.	<ul style="list-style-type: none"> a) Oil leaks from the hydraulic motor flange and the motor adaptor are caused by damaged O-ring seals. b) Oil leaks occurring between the cable drum flanges and housings are caused by excessive pressure in the brake housing. Excessive pressure will damage the oil seal which separates the brake housing from the cable drum interior. c) If the breather relief on the end cover leaks, the seal between the drum interior and the brake housing is damaged and must be replaced. This condition is caused by excessive pressure in the brake housing of the winch, operation with the incorrect hydraulic fluid during cold weather, or a restriction in the circulation return line leading back to reservoir.

Refer to the SERVICE INSTRUCTIONS if it becomes necessary to disassemble the Model HL25 winch.

SERVICE INSTRUCTIONS

GENERAL:

Before attempting disassembly of the PULLMASTER Model HL25 planetary winch, the following instructions for disassembly and reassembly should be read and understood:

It is suggested that all expendable parts, such as O-rings and oil seals, are not reused on reassembly. Because the following service instructions cover the HL25 planetary winch with either a gear motor or a piston motor, verify the proper seal kits are on hand before disassembly. For models with a gear motor, use seal kit (Part No. 23120) and, providing the hydraulic motor has to be serviced, seal kit (Part No. 23117). Two new roller bearings, item 875, may also be required (Part No. 25352). For models with a piston motor, use seal kit (Part No. 23140).

NOTE: Backup washers may be included with seal kit. Install with oil seals as per instructions. If not present in seal kit, the oil seals supplied do not require backup washers.

A clean working area is of prime importance, similar to conditions used for service work on any other hydraulic component.

All parts, as they are removed from the winch assembly, should be inspected for wear and damage. Worn or damaged parts must be replaced. Thoroughly clean parts before reassembly. Do not use solvent to clean the brake or clutch friction plates.

During reassembly, lubricate all O-rings and oil seals with grease before installation.

In the following service instructions, reference to parts is made by numbers and shown on the applicable group drawings. The service instructions cover assembly and disassembly of Model HL25 with either hydraulic gear or piston motors. Refer to appropriate instructions and group drawing for each motor. The remaining instructions apply to all Model HL25s.

DISASSEMBLY

For the majority of required service or repair work, disassembly is required only in the brake housing or clutch housing of the PULLMASTER Model HL25 planetary winch. There are no special tools needed for the service or repair work and no adjustments or calibrations are necessary. Proceed with the disassembly as follows:

DISASSEMBLY OF HYDRAULIC GEAR MOTOR ASSEMBLY:

If the analysed service or repair work requires access to the interior of the brake housing or clutch housing, the hydraulic gear motor should not be disassembled. In this case, the hydraulic motor should be removed together with the motor adaptor as a complete assembly. If a problem has been analysed to be in the hydraulic motor, proceed with the disassembly as follows:

- 1) Remove two socket head capscrews, item 849, and lockwashers, item 847, from transfer tube housing, item 846. Remove transfer tube housing from end cover, item 870. Remove and discard O-ring, item 112. If pressure reducing valve, item 841, is faulty, replace at this time.
- 2) Press slotted spring pins, item 848, partially out of transfer tube housing, item 846, to release tube locator, item 848. Remove and discard O-ring, item 113.
- 3) Remove transfer tube assembly, item 844, from center of motor drive gear, which is part of gear set, item 881. Remove and discard O-ring, item 879.
- 4) Remove eight hex capscrews, item 951, together with lockwashers, item 953, from motor assembly.

IMPORTANT: Failure to exercise care when removing motor port end cover or gear housing could permanently damage machined surfaces of these motor components. Take care not to damage machined surfaces of motor components at disassembly.

- 5) Remove (pry loose if necessary) port end cover, item 870, together with bearings, item 875, and ring seal, item 877. Thrust plate, item 885, and dowel pins, item 865, may stay in gear housing.

SERVICE INSTRUCTIONS CONTINUED

- 6) If thrust plate comes off with end cover, carefully pry it off of bearings, item 875, and discard teflon seals, item 887.
- 7) Remove gear set, item 881, which consists of two gears which are a matched set.
- 8) Carefully pry gear housing, item 861, off of motor adaptor, item 800. Thrust plate, item 885, and dowel pins, item 865, may stay in gear housing.
- 9) If thrust plate stays on motor adaptor, carefully pry it off of bearings, item 875, and discard teflon seals, item 887.
- 10) Discard gasket seals, item 869. It is also advisable to replace ring seals, item 877, at this time. Bearings, item 875, have to be removed to allow access to ring seals.

Teflon seals, gasket seals and ring seals in the hydraulic motor assembly are not part of winch seal kit. Seal kit for hydraulic motor can be ordered from factory under Part No. 23117. All parts of the hydraulic motor, with exception of motor adaptor, item 800, and port end cover, item 870, are standard parts of the hydraulic motor, having a 3 inch gear section. All of these parts can be ordered from PULLMASTER or Authorized Distributors/Dealers in Canada, the United States and in most overseas areas.

REMOVAL OF HYDRAULIC GEAR MOTOR ASSEMBLY:

If disassembly of the hydraulic gear motor is not necessary, proceed as follows:

- 1) Remove transfer tube assembly, item 844, as instructed in step 1 - 3 under DISASSEMBLY OF HYDRAULIC GEAR MOTOR ASSEMBLY.
- 2) Remove nine hex head capscrews, item 931, with lockwashers, item 541, and remove motor adaptor, item 800, from clutch housing, item 650.
- 3) Remove and discard three O-rings, item 801, from flange of motor adaptor.

REMOVAL OF HYDRAULIC PISTON MOTOR:

If fitted with a piston motor, proceed as follows:

- 1) Remove brake tube assembly, item 852, from motor and motor adaptor, item 800.
- 2) Remove four hex head capscrews, item 815, and lockwashers, item 817, from motor, item 850. Pull motor out of motor adaptor, item 800, and discard O-ring, item 819.
- 3) Remove nine hex head capscrews, item 931, with lockwashers, item 933. Remove motor adaptor, item 800, and discard three O-rings, item 801.
- 4) Unscrew six socket head capscrews, item 687, with lockwashers, item 685, and remove bearing carrier, item 664, from motor adaptor. Discard, O-ring, item 667. Remove two seal rings, item 666.
- 5) Remove clutch connector, item 668, from bearing carrier, item 664, and check that oil passages are clear.
- 6) Inspect ball bearing, item 665, for damage. If replacement is required, press out of bearing carrier, item 664.
- 7) Inspect needle bearing, item 669, in motor adaptor. If damaged, press out of motor adaptor and replace.

DISASSEMBLY OF CLUTCH ASSEMBLY:

- 1) Remove three socket head capscrews, item 682, and lockwashers, item 683, from clutch housing, item 650. Since brake springs, item 752, apply pressure against inside of clutch housing, it is recommended that these three capscrews are unscrewed, one turn at a time, until spring pressure has been released. Remove and discard O-ring, item 707, and O-ring, item 651. Remove and discard three O-rings, item 763.
- 2) Pull motor drive shaft, item 730, and complete clutch assembly, from brake housing.
- 3) Disassemble clutch assembly by removing circlip, item 671, from clutch hub, item 670. Remove clutch plate, item 654, external retaining ring, item 658, eight friction plates, item 673, and seven divider plates, item 675.

SERVICE INSTRUCTIONS CONTINUED

Clamp clutch hub, item 670, to pressure plate, item 652, and remove circlip, item 679. Remove clutch hub, three clutch springs, item 676, pressure plate, item 652, and gland, item 656, from motor drive shaft. Remove and discard O-rings, item 653, 657 and 735.

Models with piston motors only: Discard two O-rings, item 689.

- 4) The surface of motor drive shaft which engages sprag clutch, item 672, should be inspected for wear or indentations. If motor drive shaft shows any surface damage, it should be replaced.
- 5) Inspect three clutch springs for damage and measure overall length. Overall spring length should be 1.25 inch. If any spring measures less than 1.19 inch, all three springs should be replaced as a set.
- 6) Inspect eight friction plates, item 673, for damage or excessive wear. Plates should be flat and smooth. Plates should not show heat discoloration. Paper material on friction plates should be intact and grooved. If any damage is detected, replace friction plates and divider plates as a set.
- 7) Remove circlip, item 661, and slide drive gear, item 660, off of connecting shaft, item 600.

DISASSEMBLY OF BRAKE HOUSING ASSEMBLY:

- 1) Remove 18 brake springs, item 752, from brake piston, item 750. Thoroughly examine springs for damage and measure overall length. Overall spring length should be 2.27 inch. If any spring measures less than 2.21 inch, replace all springs as a set.
- 2) Pull brake piston, item 750, out of brake housing using two 5/8-11NC bolts screwed into two puller holes in piston and discard O-rings, item 751 and 753.
- 3) Thoroughly examine inner bores of brake housing and outer diameters of brake piston for scoring caused by hydraulic fluid contamination. Minor surface damage may be repaired by polishing with a fine emery cloth.



DANGER

DAMAGED FRICTION OR DIVIDER PLATES WILL REDUCE BRAKING CAPACITY AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. SOLVENT MAY DAMAGE THE FRICTION PLATES. DO NOT USE SOLVENT TO CLEAN THE FRICTION PLATES. PERFORM THOROUGH INSPECTION AND, IF NECESSARY, REPLACE FRICTION AND DIVIDER PLATES AS A SET.

- 4) Remove five friction plates, item 715, together with six divider plates, item 713, and inspect for damage or wear. Plates should be flat and smooth. Plates should not show heat discoloration. Paper material on friction plates should be intact and grooved. If any damage is detected, replace friction and divider plates as a set.
- 5) Remove brake spacer, item 712.

DISASSEMBLY OF FINAL DRIVE:

- 1) Remove drain plug, item 121, from end cover, item 120, and drain lubricating oil from final drive assembly and the cable drum interior. (To drain all oil out of cable drum interior, winch should be tipped to an angle and filler plug, item 503, removed.)
- 2) Remove internal retaining ring, item 124, and pull end cover, item 120, out of final drive housing, item 100.
- 3) Discard O-ring, item 123, and inspect planet hub stopper, item 126, and sungear stopper, item 122, for excessive wear. Replace planet hub stopper if less than .30 inch and sungear stopper if less than .21 inch thick.
- 4) Remove final planet hub assembly from final housing, item 100.

SERVICE INSTRUCTIONS CONTINUED

- 5) Inspect three final planet gears, item 320, for damage or wear. If necessary to remove final planet gears, remove circlip, item 311, and press planet pin, item 310, out of planet hub, item 300. Inspect loose rollers, item 323, and two thrust washers, item 321, and replace if damaged.

DISASSEMBLY OF PRIMARY DRIVE AND CABLE DRUM ASSEMBLY:

For ease of working on remainder of unit, set winch upright on final drive housing.

- 1) Remove the two winch base halves, item 550 and 552, by removing the 28 hex capscrews, item 551, and lockwashers, item 553.
- 2) Remove access plug, item 734, using a 1/2-13NC bolt (motor adaptor bolt, item 821, is suitable), from inside brake housing and discard O-ring, item 735.
- 3) Remove six hex capscrews, item 537, with lockwashers, item 541, from bearing flange, item 530, by rotating brake housing until access hole is over top.
- 4) Lift brake housing, together with the bearing flange and primary planet hub assembly, out of cable drum, item 500, and discard O-ring, item 539.
- 5) Remove retaining ring, item 401, and remove primary planet hub assembly from inside internal gear, item 430.
- 6) Inspect three primary planet gears, item 420, for damage or wear. If necessary to remove primary planet gears, remove circlip, item 411, and press planet pin, item 410, out of planet hub, item 400. Inspect loose rollers, item 423, and two thrust washers, item 421, and replace if damaged.
- 7) Remove primary sun gear, item 440, from center of connecting shaft, item 600.
- 8) Remove circlip, item 431, and internal gear, item 430, from connecting shaft spline.
- 9) Remove and inspect two thrust washers, item 433, and thrust bearing, item 435. Replace if cracked or otherwise damaged.
- 10) Connecting shaft, item 600, can now be pulled out of brake housing. Remove and inspect two thrust washers, item 615, and thrust bearing, item 617. Replace if cracked or otherwise damaged.
- 11) Remove sprag clutch aligner, item 677, and sprag clutch, item 672, from connecting shaft, item 600.
- 12) Remove needle bearing, item 603, inspect and replace if damaged.
- 13) Remove and discard oil seal, item 607, and if present, backup washer, item 606, from inside of connecting shaft.
- 14) Remove sprag clutch aligner, item 722, from outside of connecting shaft. Remove brake hub, item 720, sprag clutch, item 723, and sprag clutch aligner, item 724. Thoroughly inspect surfaces where sprag clutches ride on and in connecting shaft. If damaged or indented, connecting shaft must be replaced.



DANGER

MINOR SURFACE DEFECTS WHERE THE SPRAG CLUTCH ENGAGES THE CONNECTING SHAFT AND BRAKE HUB, WILL RESULT IN BRAKE FAILURE AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. THOROUGHLY INSPECT THESE AREAS AND, IF NECESSARY, REPLACE BRAKE HUB, SPRAG CLUTCH AND CONNECTING SHAFT AS A SET.

SERVICE INSTRUCTIONS CONTINUED

- 15) Remove and discard oil seal, item 711, and if present, backup washer, item 710, from bore of brake housing. Inspect two needle bearings, item 605, and replace if necessary.
- 16) To separate bearing flange, item 530, and brake housing, item 700, use a standard bearing puller or insert two heel bars in slot between bearing flange and brake housing and pry brake housing out of ball bearing, item 533.
- 17) Remove internal retaining ring, item 534, to remove ball bearing, item 533. Remove and discard oil seal, item 531.

REASSEMBLY

Thoroughly clean all parts. Use only new, well-greased O-rings and oil seals. Unless otherwise specified, torque fasteners per BOLT TORQUE CHART at back of manual.

REASSEMBLY OF FINAL DRIVE:

Reassemble final drive end of winch as follows:

- 1) Press new, well-greased oil seal, item 105, into final housing, item 100.
- 2) Press ball bearing, item 103, into final housing and secure with retaining ring, item 104.
- 3) Press cable drum, item 500, into ball bearing, item 103, and secure with circlip, item 513.
- 4) Reassemble final planet hub assembly. Use grease to temporarily hold 24 loose rollers, item 323, in bore of planet gear, item 320. Position thrust washers, item 321, on either side of planet gear and press planet pin, item 310, into final planet hub, item 300. Retain with circlip, item 311.
- 5) Insert final planet hub assembly into final housing, item 100. Ensure that final planet hub spline is fully engaged with cable drum, item 500.
- 6) Install new, well-greased O-ring, item 123, into end cover, item 120. Verify that planet hub stopper, item 126, and sun gear stopper, item 122, are installed into end cover.
- 7) Gently insert end cover into final housing, item 100, and fasten with retaining ring, item 124.

REASSEMBLY OF PRIMARY DRIVE:

Turn winch over, resting on end cover with cable drum opening facing up. Reassemble primary drive as follows:

- 1) Press new, well-greased oil seal, item 531, into bearing flange, item 530. Press ball bearing, item 533, into bearing flange and secure with retaining ring, item 534.
- 2) Press bearing flange assembly onto brake housing, item 700, and install new, well-greased O-ring, item 539.
- 3) Install new, well-greased oil seal, item 607, with backup washer (if included in seal kit), item 606, into connecting shaft, item 600.
- 4) Press needle bearing, item 603, into connecting shaft, item 600.
- 5) If removed, replace two needle bearings, item 605, by pressing into brake housing, item 700. Install new, well-greased oil seal, item 711, with backup washer (if included in seal kit), item 710, into brake housing.
- 6) Slide sprag clutch aligner, item 724, onto connecting shaft, item 600, followed by sprag clutch, item 723, and sprag clutch aligner, item 722. Twist connecting shaft assembly through center of brake hub, item 720, as shown in BRAKE GROUP drawing.

IMPORTANT: For proper brake function, verify that sprag clutch is installed correctly. When viewed from motor end, connecting shaft of clockwise hoisting winch must run freely clockwise and lock in counterclockwise direction.

SERVICE INSTRUCTIONS CONTINUED

- 7) Place thrust bearing, item 617 (held between two thrust washers, item 615), onto sprag clutch aligner, and against brake hub, item 720.
- 8) Install connecting shaft, item 600, with brake hub assembly, into bore of brake housing, item 700, and through oil seal, item 711. Place thrust bearing, item 435 (held between two thrust washers, item 433), onto internal gear, item 430. Install internal gear onto spline of connecting shaft, item 600, and fasten with circlip, item 431.
- 9) Reassemble primary planet hub assembly. Use grease to temporarily hold 20 loose rollers, item 423, in bore of planet gear, item 420. Verify placement of sungear stopper, item 444. Position thrust washers, item 421, on either side of planet gear and press planet pin, item 410, into final planet hub, item 400. Retain with circlip, item 411.
- 10) Insert primary sungear, item 440, between three planet gears and insert sungear shaft into connecting shaft, engaging planet gears with internal gear. Fasten with retaining ring, item 401.
- 11) Insert final sungear, item 340, into cable drum and engage three planet gears, item 320.
- 12) Lower brake housing assembly onto cable drum, while engaging spline of final sungear with primary planet hub, item 400. Line up mounting holes of bearing flange, item 530, with those in cable drum.
- 13) Rotate brake housing to line up access holes and fasten bearing flange, using six capscrews, item 537, and lockwashers, item 541.
- 14) Install new, well-greased O-ring, item 735, into access plug, item 734. Install access plug into access hole inside brake housing.
- 15) Attach base halves, item 500 and 552, using 28 capscrews, item 551, and lockwashers, item 553.

REASSEMBLY OF BRAKE HOUSING ASSEMBLY:

Reassemble brake housing assembly as follows:

- 1) Install brake spacer, item 712, into brake housing.



INCORRECT ASSEMBLY OF THE FRICTION PLATE AND DIVIDER PLATE STACK WILL REDUCE BRAKING CAPACITY AND ALLOW THE LOAD TO DROP, CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. REASSEMBLE PER INSTRUCTIONS.

- 2) Starting and finishing with a divider plate, alternately install seven divider plates, item 713, and six friction plates, item 715.
- 3) Liberally grease O-ring, item 751, and O-ring, item 753, and install on brake piston, item 750.
- 4) Slide brake piston into brake housing with holes for brake springs facing out of brake housing assembly.
- 5) Install 18 brake springs, item 752, in brake piston. (Brake piston has 20 holes and two empty holes should be opposite each other.)
- 6) Liberally grease three new O-rings, item 763, and install into recesses on clutch housing, item 650. Install new, well-greased O-ring, item 707, on flange of clutch housing.
- 7) Using three socket head capscrews, item 682, and high collar lockwashers, item 683, fasten clutch housing, item 650, to brake housing, item 700. Ensure brake release passage way is to right side below center and capscrews are at 2 o'clock, 6 o'clock and 10 o'clock positions. Tighten one turn at a time to compress brake springs, item 752.
- 8) Install sprag clutch, item 672, and sprag clutch aligner, item 677, into bore of connecting shaft, item 600.

SERVICE INSTRUCTIONS CONTINUED

REASSEMBLY OF CLUTCH ASSEMBLY:

Reassemble clutch assembly as follows:

- 1) Install drive gear, item 660, onto connecting shaft, item 600, and fasten with circlip, item 661.
- 2) Install new, well-greased O-ring, item 735, into motor drive shaft, item 730.
- 3) Install new, well-greased O-ring, item 657, into gland, item 656, and install gland onto motor drive shaft.
- 4) Install new, well-greased O-ring, item 653, into pressure plate, item 652, and install pressure plate onto motor drive shaft and gland.
- 5) Install three clutch springs, item 676, into holes in clutch piston, item 670, and install clutch piston onto motor drive shaft, item 730. While holding clutch springs compressed, install circlip, item 679, which fastens clutch hub onto motor drive shaft.
- 6) Starting and finishing with a friction plate, alternately install eight friction plates, item 673, and seven divider plates, item 675, onto clutch hub, item 670. Install external retaining ring, item 658, into clutch hub. Install clutch plate, item 654, and fasten with circlip, item 671.

TESTING PROCEDURE:

Before clutch assembly is installed into winch, it should be tested for proper operation. Apply pressure to motor drive shaft and verify friction and divider plates close tight. Release pressure and verify that plates are loose and run free.

- 7) Verify circlip, item 727, is on motor drive shaft. Insert end of motor drive shaft into sprag clutch aligner, item 677. Twist motor drive shaft to allow each divider plate to engage with drive gear, item 660.

IMPORTANT:

For proper drive function, verify that sprag clutch, item 672, is installed correctly. When viewed from motor end, motor drive shaft of a clockwise hoisting winch must turn freely clockwise and lock in counterclockwise direction.

RE-INSTALLATION OF HYDRAULIC PISTON MOTOR:

For models with hydraulic piston motors, proceed as follows:

- 1) Install two new, well-greased O-rings, item 689, into exposed grooves of motor drive shaft, item 730. Verify pipe plug, item 663, is installed tightly into end of motor drive shaft.
- 2) If removed, press ball bearing, item 665, into bearing carrier, item 664.
- 3) Install clutch connector, item 668, into ball bearing, item 665. Tap tight with a soft-headed hammer if necessary.
- 4) Install two seal rings, item 666, onto clutch connector. Notched sides must face each other. Install new, well-greased O-ring, item 667, into bearing carrier, item 664, and install assembly onto motor adaptor, item 800. Fasten with six socket head capscrews, item 687, and lockwashers, item 685.
- 5) Liberally grease three new O-rings, item 801, and install into recesses on motor adaptor, item 800. Install new, well-greased O-ring, item 707, onto flange of motor adaptor.
- 6) Install motor adaptor assembly onto clutch housing, item 650. Engage clutch connector, item 666, with clutch hub, item 670, and fasten with nine hex head capscrews, item 931, and lockwashers, item 541.
- 7) Install new, well-greased O-ring, item 819, onto hydraulic piston motor, item 850, and install motor into motor adaptor, item 800. Fasten with four hex head capscrews, item 815, and lockwashers, item 817.
- 8) Install brake tube assembly, item 852.

SERVICE INSTRUCTIONS CONTINUED

REPLACEMENT OF HYDRAULIC GEAR MOTOR ASSEMBLY:

- 1) Liberally grease three new O-rings, item 801, and install into recesses on motor adaptor, item 800. Install new, well-greased O-ring, item 707, on flange of motor adaptor.
- 2) Slide hydraulic motor assembly on splined end of motor drive shaft, item 730, and line up pressure transfer holes of clutch housing and motor adaptor. Tighten nine capscrews, item 931, and lockwashers, item 541.

REASSEMBLY OF HYDRAULIC GEAR MOTOR:

If the hydraulic gear motor was disassembled, the following procedure should be followed for reassembly:

- 1) Clean all parts thoroughly before reassembly and apply grease liberally to all seals. Use only new seals (seal kit Part No. 23117) for hydraulic motor.
- 2) Install two new teflon seals, item 887, on each thrust plate, item 885. Press one of thrust plates, together with two teflon seals, onto bearings, item 875, installed in motor adaptor, item 800.
- 3) Install new, well-greased gasket seal, item 869, on each side of gear housing, item 861. Slide gear housing together with gasket seals, onto motor adaptor, lined up on two dowel pins. Tap on tight using soft headed hammer.
- 4) Install gear set, item 881, in gear housing. (Longer gear with internal spline goes into top position.)
- 5) Press other thrust plate, complete with two new teflon seals, onto bearings installed in port end cover.
- 6) Install port end cover, item 870, together with two bearings, item 875, and new ring seal, item 877, onto gear housing, lined up on two dowel pins, item 865. Tap on tight using soft headed hammer. Install and lightly torque eight hex capscrews, item 951, and lockwashers, item 953, to approximately 50 ft-lb (70 Nm).
- 7) Plumb winch assembly to a hydraulic supply and torque motor capscrews according to the following procedure:
 - Ensure that circulation supply flow is being supplied to the brake housing.
 - Run the winch, with no load, in the hoisting direction at reduced speed (approximately 30% of maximum hydraulic volume).
 - With winch running, evenly tighten eight capscrews, item 951, to 200 ft-lb (270 Nm).
 - Test motor operation by running winch at full speed in both directions.

IMPORTANT: Before operating the winch, add lubricating oil up to the level of the end cover oil fill port. (Refer to INSTALLATION INSTRUCTIONS for location of fill port. Refer to APPENDIX A for oil volume required.)

To ensure proper reassembly, run the winch in both directions without load.

- 8) Install new, well-greased O-ring, item 879, into transfer tube assembly, item 844. Install transfer tube assembly through port end cover, item 870, and engage motor drive shaft, item 730.
- 9) Install new, well-greased O-ring, item 113, into tube locator, item 848, and install tube locator into transfer tube housing, item 846. Press two slotted spring pins, item 859, which stop tube locator from spinning, into place.
- 10) Install new, well-greased O-ring, item 112, onto transfer tube housing, item 846. Install transfer tube housing, with pressure reducing valve, item 841, attached, onto port end cover, item 870. Fasten with two socket head capscrews, item 849, and high collar lockwashers, item 847.



DANGER

LIFTING A LOAD WITH A NEWLY SERVICED WINCH WILL ENABLE AN INSTALLATION OR SERVICE PROBLEM TO GO UNDETECTED AND ALLOW THE LOAD TO DROP CAUSING PROPERTY DAMAGE, SEVERE INJURY OR DEATH. TO ENSURE PROPER REINSTALLATION, REFER TO PROCEDURES AND TESTS DESCRIBED IN "INSTALLATION" AND "OPERATING INSTRUCTIONS".

RECOMMENDED MAINTENANCE

Winch gear train lubricating oil should be changed after the initial six months or 50 hours of operation, whichever comes first. Lubricating oil should then be changed every 12 months or 500 operating hours, whichever comes first.

Hydraulic system fluid should be changed at least once every 12 months.

For optimum performance over an extended period of time, the following preventive maintenance service should be done every 12 months or 500 operating hours (whichever comes first):

- 1) Disconnect all hydraulic hoses and remove the winch from its mounting.
- 2) Disassemble the winch as per instructions.
- 3) Discard and replace all O-rings and oil seals.
- 4) Clean all parts and inspect for wear and damage as per instructions. Replace worn or damaged parts as required.
- 5) Reassemble the winch as per instructions.
- 6) Follow INSTALLATION and OPERATING INSTRUCTIONS when returning winch to its mounting.

When ordering parts for the PULLMASTER Model HL25 planetary winch, always quote the complete model and serial number of the unit.

MODEL NO. _____

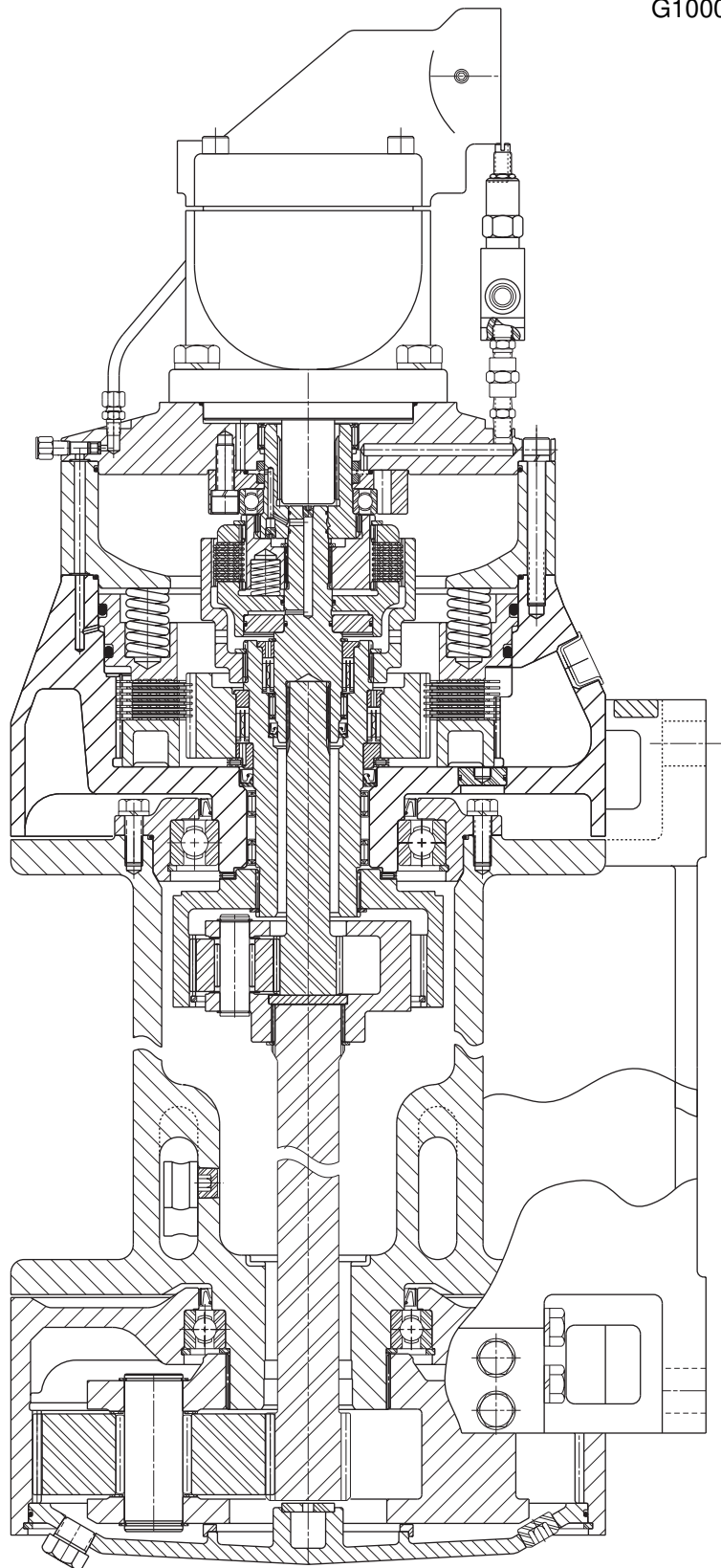
SERIAL NO. _____

PULLMASTER WINCH CORPORATION reserves the right to change specifications and the design of PULLMASTER planetary winches at any time without prior notice and without incurring any obligations.

ASSEMBLY DRAWING

PISTON MOTOR

G1000-A & G1003-B & G1010-E



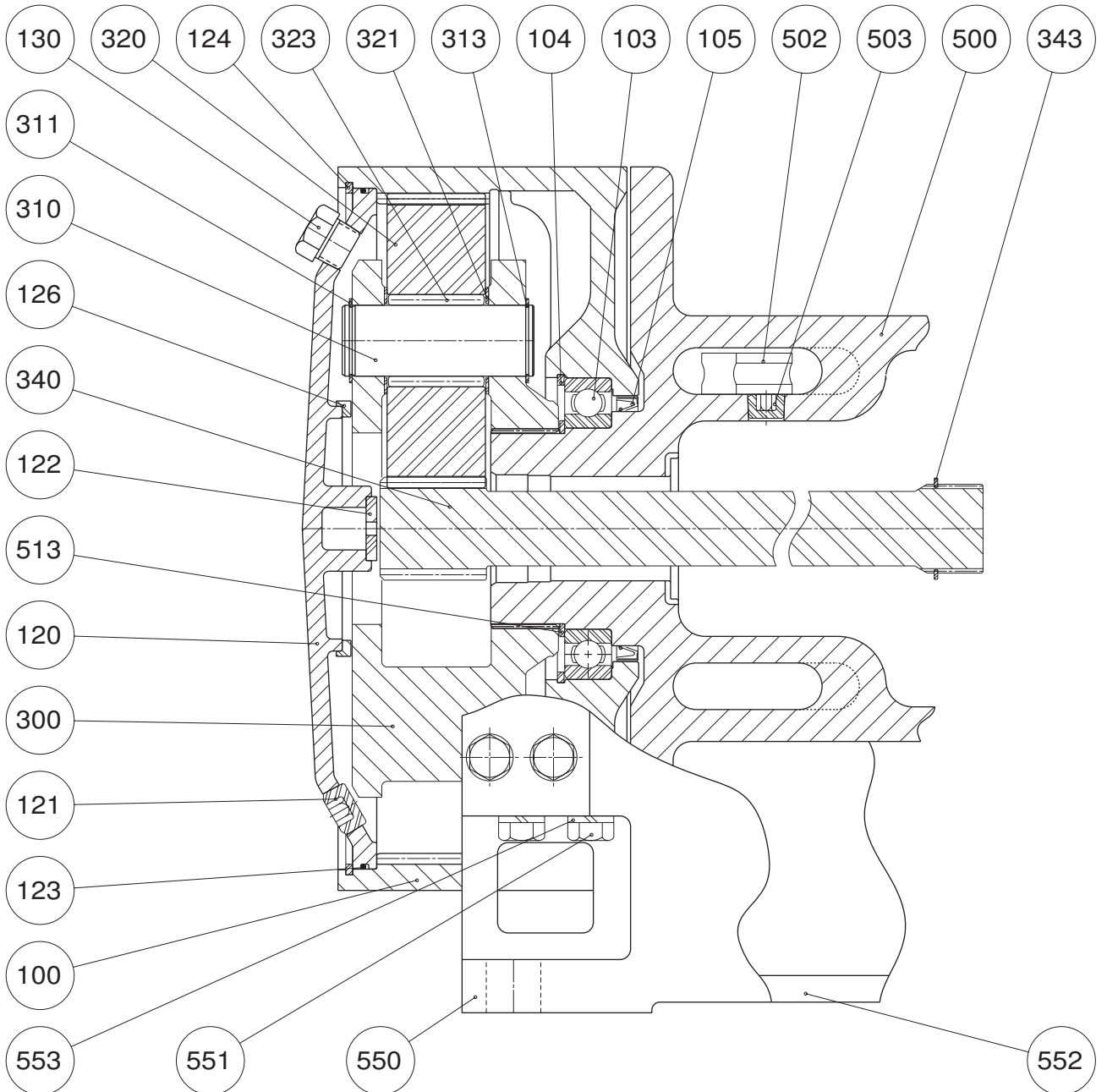
PARTS REFERENCE - FINAL DRIVE

ITEM NO.	QTY.	PART NO.	DESCRIPTION
100	1	20399	FINAL HOUSING
103	1	25332	BALL BEARING # 6024
104	1	20460	BEARING RETAINER
105	1	25148	OIL SEAL
120	1	21816	END COVER
121	2	25237	PIPE PLUG 3/4 - 14 NPT
122	1	19036	SUNGEAR STOPPER
123	1	25340	O-RING -281 15" ID 1/8" CS
124	1	20416	RETAINING RING
126	1	20418	PLANET HUB STOPPER
130	1	20677	BREATHER RELIEF ASSEMBLY
300	1	20398	PLANET HUB
310	3	20406	PLANET PIN
311	3	25199	CIRCLIP ROTOR CLIP SH-168
313	3	25199	CIRCLIP ROTOR CLIP SH-168
320	3	20405	PLANET GEAR
321	6	25167	THRUST WASHER TORRINGTON # TRB 2840
323	72	25297	LOOSE ROLLER TORRINGTON # G613 - Q
340	1	*	SUNGEAR
343	1	25242	CIRCLIP ROTOR CLIP SH-206
500	1	*	CABLE DRUM
502	1	20423	CABLE ANCHOR
503	1	25032	PIPE PLUG 1/2 - 14 NPT
513	1	25337	CIRCLIP ROTOR CLIP SH-475
550	1	*	BASE
551	28	25346	CAPSCREW - HEXHEAD 5/8 - 11NC X 1.75 GRADE 5
552	1	*	BASE
553	28	25359	LOCKWASHER 5/8"
		23120	WINCH SEAL KIT FOR MODELS WITH GEAR MOTORS, CONSISTS OF ITEMS: 105, 123, 531, 539, 607, 651, 653, 657, 659, 707, 711, 735, 751, 753, 763, 801, 837, 839, 845 AND 879
		23140	WINCH SEAL KIT FOR MODELS WITH PISTON MOTORS, CONSISTS OF ITEMS: 105, 123, 531, 539, 607, 651, 653, 657, 659, 667, 689, 707, 711, 735, 751, 753, 763, 801, 819 AND 845
			* These parts vary according to drum code. Refer to APPENDIX B.

Refer to PAGE 25 for ASSEMBLY DRAWING - PISTON MOTOR and
PAGE 38 for ASSEMBLY DRAWING - GEAR MOTOR.

FINAL DRIVE GROUP

G1000-A



Groups drawings may reference more parts than are actually present in a specific assembly. Parts that are referenced on the drawing but are not on the PARTS REFERENCE list should be ignored.

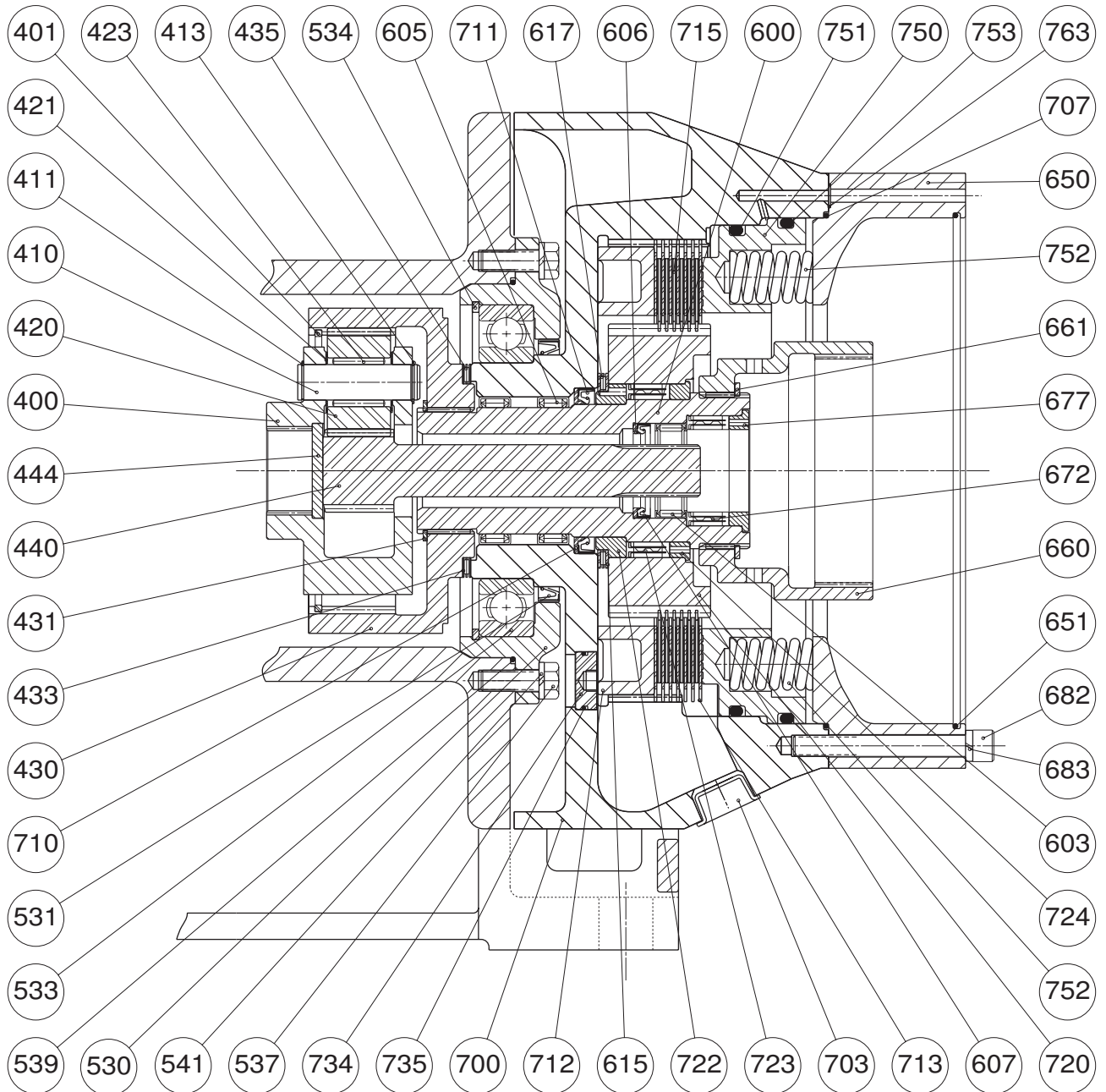
PARTS REFERENCE - BRAKE GROUP

ITEM NO.	QTY.	PART NO.	DESCRIPTION
400	1	20404	PLANET HUB
401	1	20417	RETAINING RING
410	3	20369	PLANET PIN
411	3	25004	CIRCLIP ROTOR CLIP C-87
413	3	25091	CIRCLIP ROTOR CLIP SH-87
420	3	20370	PLANET GEAR
421	6	25068	THRUST WASHER TORRINGTON # TRA 1423
423	60	25270	LOOSE ROLLER 5/32 X 1.25 TORRINGTON # E151 - Q
430	1	20411	INTERNAL GEAR
431	1	25338	CIRCLIP ROTOR CLIP SH-300
433	2	25363	THRUST WASHER TORRINGTON #TRA 6881
435	1	25362	THRUST BEARING TORRINGTON #NTA 6881
440	1	21036	SUNGEAR
444	1	20419	SUNGEAR STOPPER
530	1	20402	BEARING FLANGE
531	1	25148	OIL SEAL
533	1	25333	BALL BEARING #6026
534	1	20461	BEARING RETAINER
537	6	25081	CAPSCREW - HEX HEAD 1/2 - 13NC X 1.50 GRADE 5
539	1	25109	O-RING - 269 8-3/4 ID 1/8" CS
541	6	25014	LOCKWASHER 1/2"
600	1	21088	CONNECTING SHAFT
603	1	25361	NEEDLE BEARING TORRINGTON #B-3012
605	2	25366	NEEDLE BEARING TORRINGTON #NBH 4812
607	1	26009	OIL SEAL
615	2	25296	THRUST WASHER TORRINGTON #TRB 6074
617	1	25690	THRUST BEARING TORRINGTON #NTA 6074
650	1	21090	CLUTCH HOUSING
651	1	25339	O-RING -278 12" ID 1/8" CS
660	1	21135	DRIVE GEAR
661	1	25696	CIRCLIP ROTOR CLIP SH-375
672	1	25303	SPRAG CLUTCH BORG WARNER # 140373 "B"
677	1	21095	SPRAG CLUTCH ALIGNER
682	3	21140	CAPSCREW - SOC HEAD 1/2 - 13NC X 4-1/4 LONG GRADE 8
683	3	25161	LOCKWASHER 1/2" HI COLLAR
700	1	20390	BRAKE HOUSING
703	1	25347	PLASTIC CAPLUG 1 NPT THREADED
707	1	25339	O-RING -278 12" ID 1/8" CS
711	1	25933	OIL SEAL
712	1	21125	BRAKE SPACER
713	7	25305	DIVIDER PLATE
715	6	25304	FRICTION PLATE
720	1	21087	BRAKE HUB
722	1	21118	SPRAG CLUTCH ALIGNER
723	1	25663	SPRAG CLUTCH
724	1	21097	SPRAG CLUTCH ALIGNER
734	1	20422	ACCESS PLUG
735	1	25344	O-RING - 123 1-3/16" ID 3/32" CS
750	1	20397	PISTON
751	1	25343	O-RING -90 DURO -451 11" ID 1/4" CS
752	18	20413	BRAKE SPRING
753	1	25342	O-RING -90 DURO -452 11-1/2" ID 1/4" CS
763	3	25127	O-RING -90 DURO -013 7/16" ID 1/16" CS

Refer to PAGE 26 for winch seal kit and PAGE 25 for ASSEMBLY DRAWING - PISTON MOTOR
or PAGE 38 for ASSEMBLY DRAWING - GEAR MOTOR.

BRAKE GROUP

G1003-B



Group drawings may reference more parts than are actually present in a specific assembly. Parts that are referenced on the drawing but are not on the PARTS REFERENCE list should be ignored.

PARTS REFERENCE - GEAR MOTOR GROUP

ITEM NO.	QTY.	PART NO.	DESCRIPTION
112	1	25694	O-RING -022 1" ID 1/16" CS
113	1	25695	O-RING -015 9/16" ID 1/16" CS
541	9	21139	CAPSCREW - HEX HEAD 1/2 - 13NC X 4-3/4 LONG GRADE 5
652	1	21134	PRESSURE PLATE
653	1	25588	O-RING -126 1-3/8" ID 3/32" CS
654	1	21136	CLUTCH PLATE
656	1	21137	GLAND
657	1	25703	O-RING -153 3-1/2" ID 3/32" CS
658	1	20172	RETAINING RING
670	1	21133	CLUTCH HUB
671	1	25369	CIRCLIP ROTOR CLIP SH-387
673	8	25623	FRICITION PLATE
675	7	25624	DIVIDER PLATE
676	3	20340	CLUTCH SPRING
679	1	25710	CIRCLIP ROTOR CLIP SHR-125
727	1	25335	CIRCLIP ROTOR CLIP SH-196
730	1	21131	MOTOR DRIVE SHAFT
731	1	25288	CIRCLIP ROTOR CLIP C-112
735	1	25344	O-RING -123 1-3/16" ID 3/32" CS
800	1	21112	MOTOR ADAPTOR
801	3	25127	O-RING -90 DURO -013 7/16" ID 1/16" CS
802	1	*	*
805	2	25040	PIPE PLUG 1/8
807	1	*	*
809	1	*	*
813	2	25993	PIPE PLUG 1/4 NPT SOCKET HEAD 'LEVL-SEAL' UNBRAKO
827	3	26276	PLASTIC CAPLUG 3/8 NPT
841	1	25714	PRESSURE REDUCING VALVE
843	1	25715	PIPE ADAPTOR #6 SAE X 1/4 NPT AIRWAY 6401-6-4
844	1	21113	TRANSFER TUBE ASSY (INCLUDES ITEM 867)
845	1	25716	O-RING -906 SAE ORB #06
846	1	21114	TRANSFER TUBE HOUSING
847	2	25298	LOCKWASHER 3/8" HIGH COLLAR
848	1	21115	TUBE LOCATOR
849	2	25772	CAPSCREW - SOCKET HEAD 3/8 - 16NC X 1.00 GRADE 5
859	2	25717	SLOTTED SPRING PIN 1/16" DIA X 1/4 LONG
861	1	25350	GEAR HOUSING
865	4	25356	DOWEL PIN
867	1	25608	LOOSE ROLLER 2.5 MM DIA X 15.8 MM
869	2	25348	GASKET SEAL
870	1	21117	PORT END COVER
875	4	25352	ROLLER BEARING
877	2	25646	RING SEAL
879	1	25018	O-RING -010 1/4" ID 1/16" CS
881	1	25645	GEAR SET
885	2	25644	THRUST PLATE
887	4	25647	TEFLON SEAL
899	2	25993	PIPE PLUG 1/4 NPT SOCKET HEAD "LEVL-SEAL" UNBRAKO
927	1	25031	PIPE PLUG 1/4 NPT
933	9	25014	LOCKWASHER 1/2"
950**	1	*	SUB - ASSY MOTOR
951	8	25357	CAPSCREW - HEX HEAD 5/8 X 6.75 GRADE 5
953	8	25325	WASHER
955	2	25559	PLASTIC CAPLUG 2.0" DAEMAR T-21
		23117	MOTOR SEAL KIT FOR GEAR MOTOR, CONTAINS ITEMS: 869, 877 AND 887.

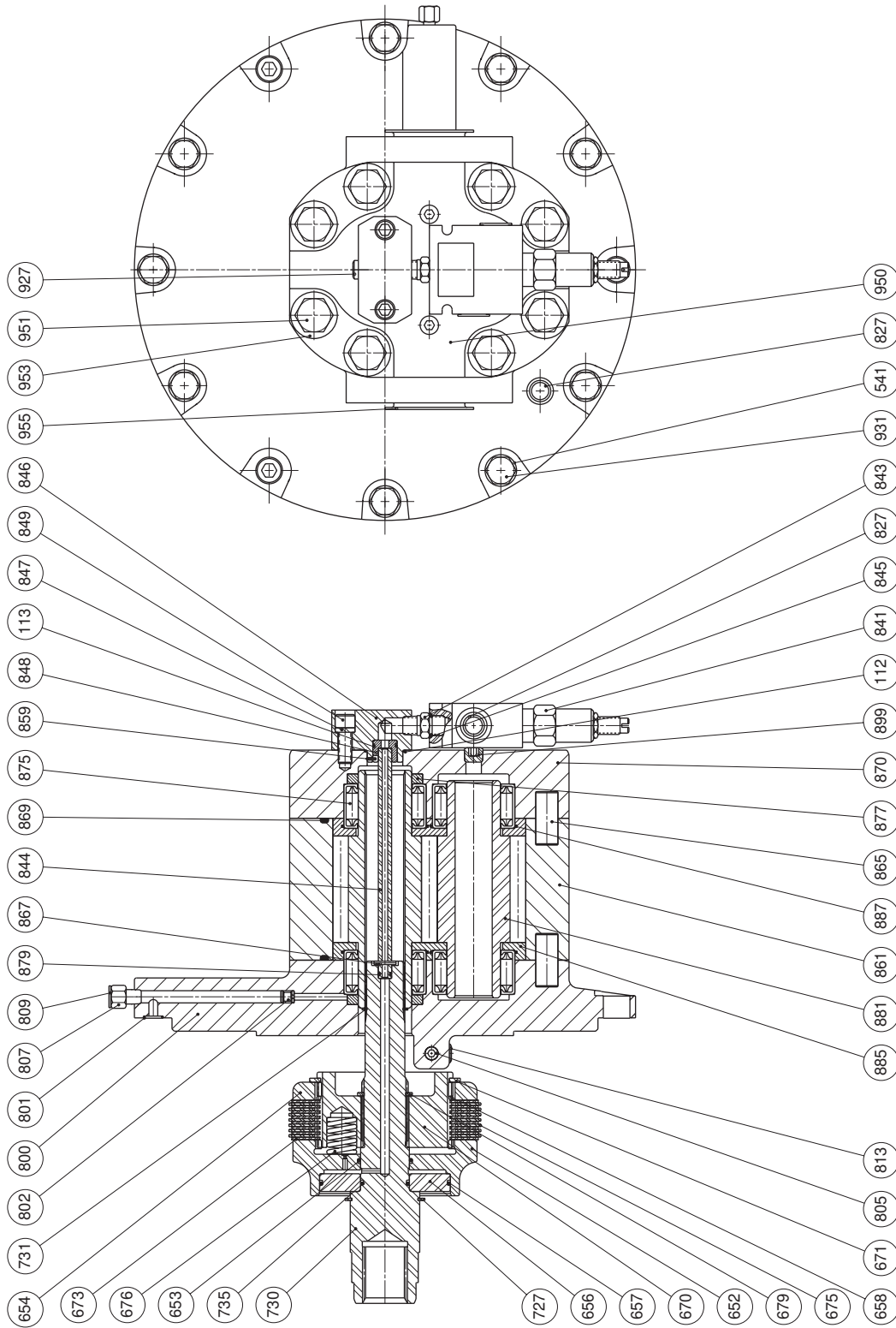
* These part numbers and descriptions vary according to brake code.
Refer to APPENDIX C.

** ITEM 950 MOTOR SUB-ASSY, CONSISTS OF ITEMS:
800, 802, 803, 804, 805, 807, 809, 846, 848, 849, 859, 861, 865,
869, 870, 875, 877, 881, 885, 887, 899, 929, 951, 953 AND 955.

Refer to PAGE 26 for winch seal kit and PAGE 38 for ASSEMBLY DRAWING.

GEAR MOTOR GROUP

G1007-B



Group drawings may reference more parts than are actually present in a specific assembly. Parts that are referenced on the drawing but are not on the PARTS REFERENCE list should be ignored.

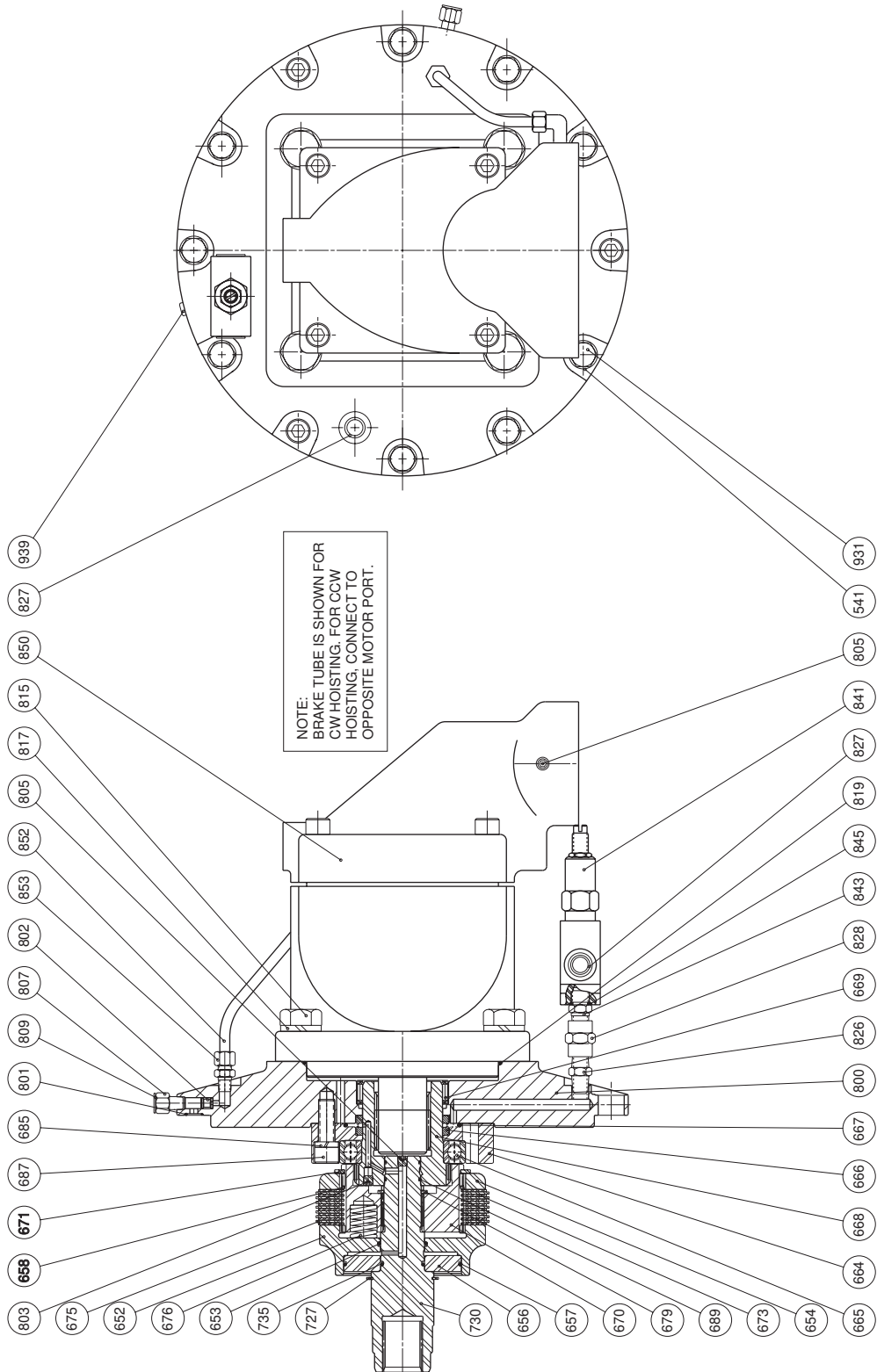
PARTS REFERENCE - PISTON MOTOR GROUP

ITEM NO.	QTY.	PART NO.	DESCRIPTION
541	9	25014	LOCKWASHER 1/2"
652	1	21635	PRESSURE PLATE
653	1	25588	O-RING -126 1-3/8" ID 3/32" CS
654	1	21136	CLUTCH PLATE
656	1	21137	GLAND
657	1	25703	O-RING -153 3-1/2" ID 3/32" CS
658	1	20172	RETAINING RING
664	1	21568	BEARING CARRIER
665	1	25810	BALL BEARING 065 X 100 X 18 # 6013
666	2	21634	SEAL RING
667	1	25858	O-RING -237 3-3/8 ID 1/8 CS
668	1	21623	CLUTCH CONNECTOR
669	1	25856	NEEDLE BEARING TORRINGTON # NB4012
670	1	21549	CLUTCH HUB
671	1	25369	CIRCLIP ROTOR CLIP SH-387
673	8	25623	FRICTION PLATE
675	7	25624	DIVIDER PLATE
676	3	20340	CLUTCH SPRING
679	1	25710	CIRCLIP ROTOR CLIP SHR-125
685	6	25161	LOCKWASHER 1/2" HI COLLAR
687	6	25424	CAPSCREW - SOCKET HEAD 1/2 - 13NC X 1.50 GRADE 5
689	2	25694	O-RING -022 1" ID 1/16" CS
727	1	25335	CIRCLIP ROTOR CLIP SH-196
730	1	21570	MOTOR DRIVE SHAFT
735	1	25344	O-RING -123 1-3/16" ID 3/32" CS
800	1	22116	MOTOR ADAPTOR
801	3	25127	O-RING -90 DURO -013 7/16" ID 1/16" CS
803	1	25370	PIPE PLUG 1/16 NPT
805	2	25040	PIPE PLUG 1/8
807	1	25040	PIPE PLUG 1/8
815	4	25564	CAPSCREW - HEX HEAD 3/4 - 10NC X 2.00 GRADE 5
817	4	25299	LOCKWASHER 3/4"
819	1	25061	O-RING -163 6" ID 3/32" CS
826	1	25491	PIPE NIPPLE 1/4 NPT AIRWAY 5405-4-4
827	3	26276	PLASTIC CAPPLUG 3/8 NPT
828	1	26048	PIPE COUPLING 1/4 NPT AIRWAY 5000-4-4
841	1	25714	PRESSURE REDUCING VALVE
843	1	25715	PIPE ADAPTOR #6 SAE X 1/4 NPT AIRWAY 6401-6-4
845	1	25716	O-RING -906 SAE ORB #06
850	1	23223	MOTOR -129 VOLVO F12-110
852	1	22715	TUBE ASSEMBLY 1/4" OD 1/8 NPT X 1/8 NPT -90L
931	9	21139	CAPSCREW - HEX HEAD 1/2 - 13NC X 4-3/4 LONG
939	1	25040	PIPE PLUG 1/8 NPT

Refer to PAGE 26 for winch seal kit and PAGE 25 for ASSEMBLY DRAWING.

PISTON MOTOR GROUP

G1010-E

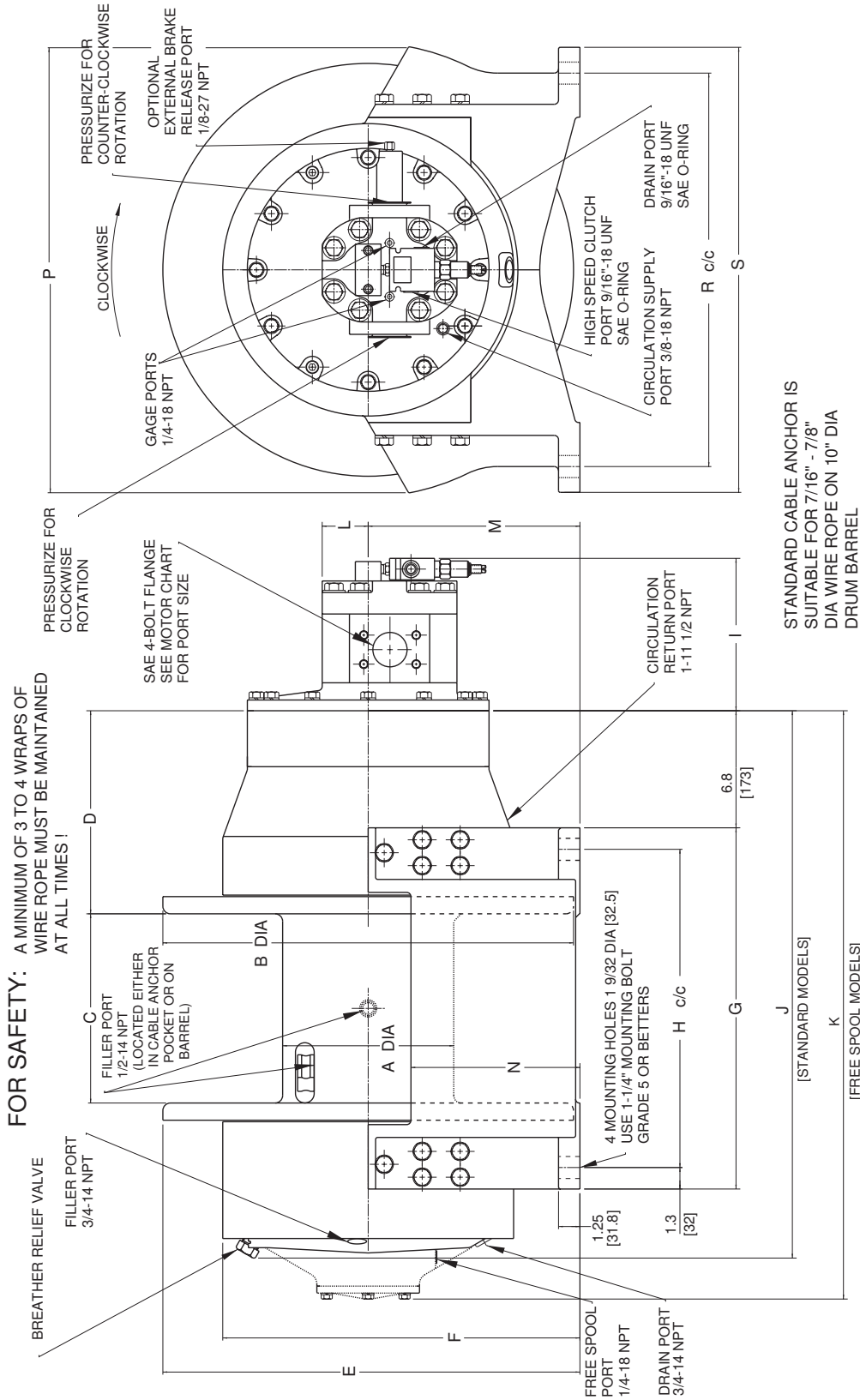


Group drawings may reference more parts than are actually present in a specific assembly. Parts that are referenced on the drawing but are not on the PARTS REFERENCE list should be ignored.

INSTALLATION DIMENSIONS

GEAR MOTOR

I1006-1-D



STANDARD CABLE ANCHOR IS SUITABLE FOR 7/16" - 7/8" DIA WIRE ROPE ON 10" DIA DRUM BARREL

INSTALLATION DIMENSIONS

GEAR MOTOR

I1006-2 & I1006-3-A

Dimensions in inches (Dimensions in millimeters)

DRUM	A	B	C	D	E	F	G	H	J	K	M	N	P	R	S
-1	10.0 (254)	17.0 (432)	11.0 (279)	11.8 (300)	19.9 (505)	19.9 (505)	21.0 (533)	18.500 (469.90)	31.8 (808)	34.2 (869)	11.38 (289)	8.9 (225)	20.8 (527)	17.750 (450.85)	20.8 (527)
-2	10.0 (254)	24.0 (610)	11.0 (279)	11.8 (300)	24.4 (619)	20.9 (530)	21.0 (533)	18.500 (469.90)	31.8 (808)	34.2 (869)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)
-3	10.0 (254)	24.0 (610)	17.0 (432)	11.8 (300)	24.4 (619)	20.9 (530)	27.0 (686)	24.500 (622.30)	37.8 (961)	40.2 (1021)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)
-4	10.0 (254)	24.0 (610)	22.0 (559)	11.8 (308)	24.4 (619)	20.9 (530)	32.0 (813)	29.500 (749.30)	42.8 (1088)	45.2 (1148)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)

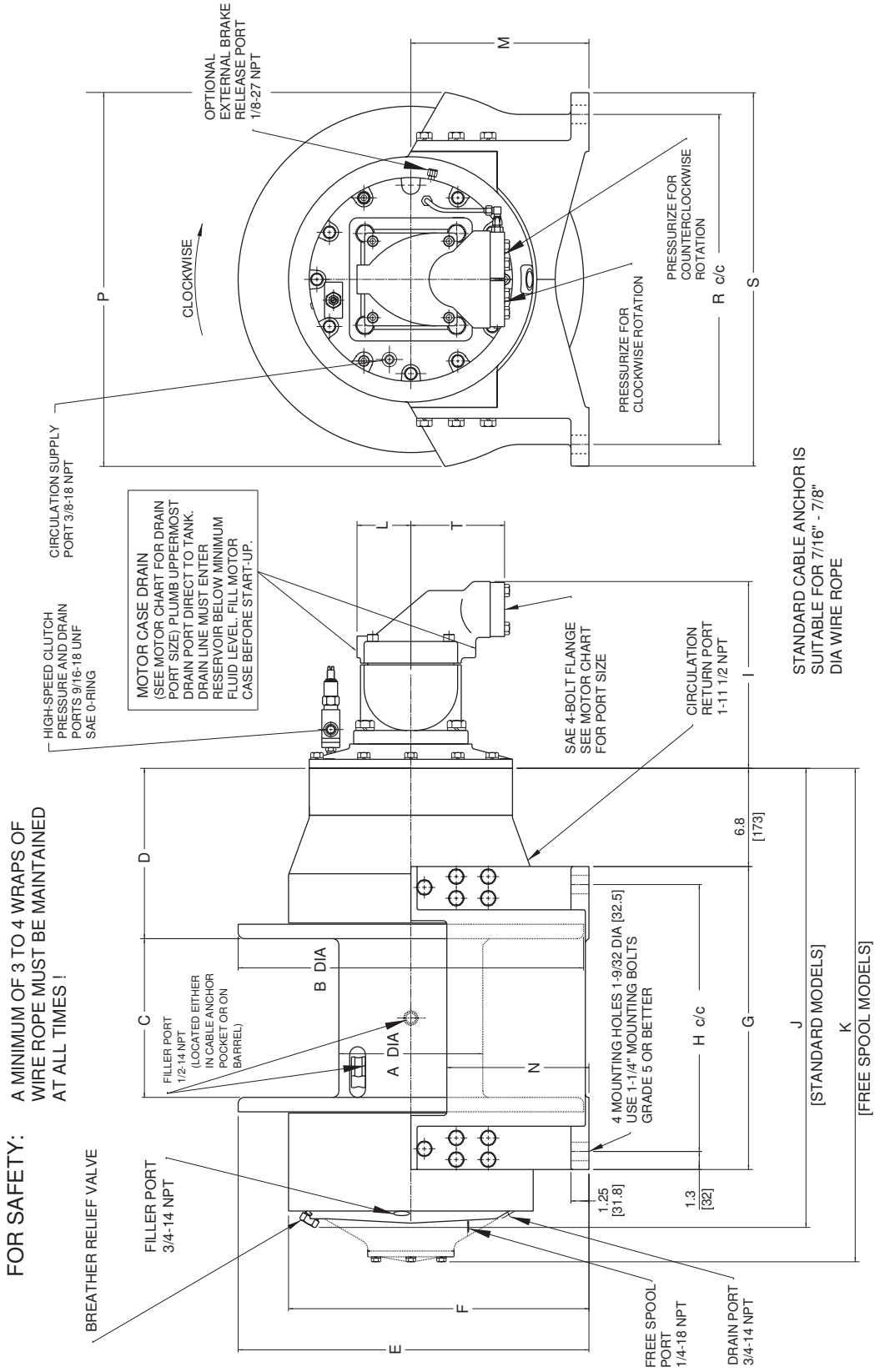
Dimensions in inches (Dimensions in millimeters)

HYDRAULIC GEAR MOTORS										
COMMERCIAL WM76 SERIES					COMMERCIAL M365 SERIES					
MOTOR CODE	GEAR WIDTH	MOTOR PORT SIZE SAE 4-BOLT FLANGE CODE 61	I	L	MOTOR CODE	GEAR WIDTH	MOTOR PORT SIZE SAE 4-BOLT FLANGE CODE 61	I	L	
-86	3.00 (76.2)	2.0	8.9 (225)	2.7 (68)	-42	2.50 (63.5)	1.5	9.3 (236)	2.5 (64)	
-87	2.75 (69.9)		8.6 (219)	2.7 (68)	-101	2.25 (57.2)		9.0 (229)	2.5 (64)	
-88	2.50 (63.5)	1.5	8.4 (212)	2.7 (68)	-102	2.00 (50.8)		8.8 (223)	2.5 (64)	
-89	2.25 (57.2)		8.1 (206)	2.7 (68)						
-90	2.00 (50.8)		7.9 (200)	2.7 (68)						
-91	1.75 (44.5)	1.25	7.6 (193)	2.7 (68)						
-92	1.50 (38.1)		7.4 (187)	2.7 (68)						
-93	1.25 (31.8)		7.1 (181)	2.7 (68)						
-94	1.00 (25.4)	1.00	6.9 (174)	2.7 (68)						

INSTALLATION DIMENSIONS

PISTON MOTOR

I1007-1-E



INSTALLATION DIMENSIONS

PISTON MOTOR

I1007-2-E & I1007-3-E

Dimensions in inches (Dimensions in millimeters)

DRUM CODE	A	B	C	D	E	F	G	H	J	K	M	N	P	R	S
-1	10.0 (254)	17.0 (432)	11.0 (279)	11.8 (300)	19.9 (505)	19.9 (505)	21.0 (533)	18.500 (469.90)	31.8 (808)	34.2 (869)	11.38 (289)	8.9 (225)	20.8 (527)	17.750 (450.85)	20.8 (527)
-2	10.0 (254)	24.0 (610)	11.0 (279)	11.8 (300)	24.4 (619)	20.9 (530)	21.0 (533)	18.500 (469.90)	31.8 (808)	34.2 (869)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)
-3	10.0 (254)	24.0 (610)	17.0 (432)	11.8 (300)	24.4 (619)	20.9 (530)	27.0 (686)	24.500 (622.30)	37.8 (961)	40.2 (1021)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)
-4	10.0 (254)	24.0 (610)	22.0 (559)	11.8 (308)	24.4 (619)	20.9 (530)	32.0 (813)	29.500 (749.30)	42.8 (1088)	45.2 (1148)	12.38 (314)	10.0 (254)	25.9 (657)	22.875 (581.03)	25.9 (657)

Dimensions in inches (Dimensions in millimeters)

HYDRAULIC PISTON MOTOR							
VOLVO F SERIES							
MOTOR CODE	MODEL NO.	MOTOR PORT SIZE SAE 4-BOLT FLANGE	SCREW THREAD	DRAIN PORT	I	L	T*
-68	F11 150	1 1/2" CODE 62	M16 x 2	3/4" BSP	15.6 (396)	4.6 (118)	7.8 (197)
* -129	F12 110	1 1/4" CODE 62	1/2"-13	1 1/16"-12 SAEORB	12.0 (305)	3.3 (85)	6.7 (170)
-130	F11 78	1 1/4" CODE 62	M14 x 2	3/4" BSP	12.9 (327)	3.7 (95)	6.5 (165)
-166	F12 80	1" CODE 62	7/16"-14	7/8"-14 SAEORB	11.1 (282)	3.1 (78)	6.3 (160)

* INCLUDES SANDWICH GAGE BLOCK

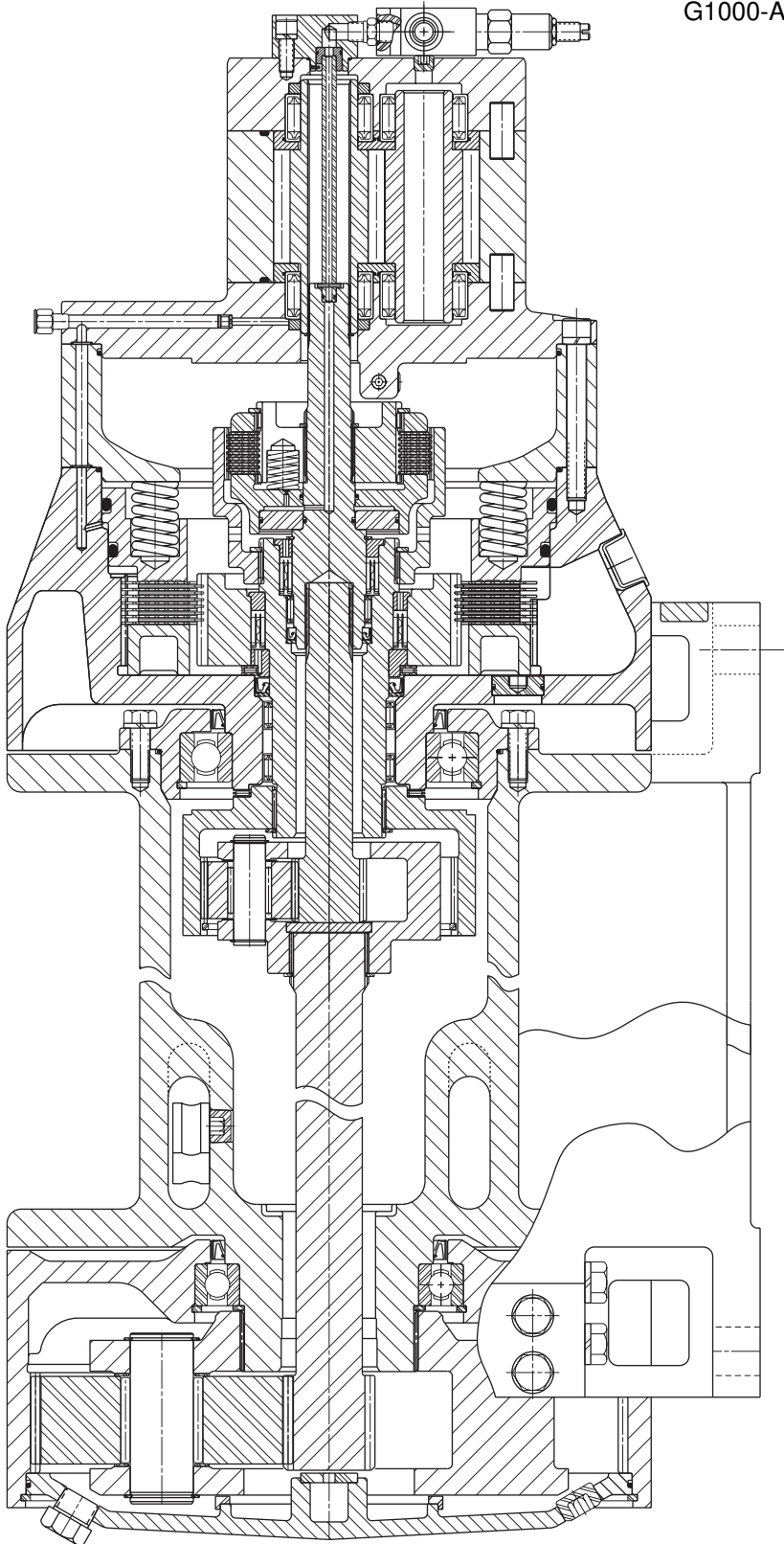
*** PRIOR TO SERIAL # 52015:**

-129 Motor was Model F11-110 with 1 1/4" 4 bolt flange ports with M14 x 2 screw threads. Drain ports were 3/4" BSP.

ASSEMBLY DRAWING

GEAR MOTOR

G1000-A & G1003-B & G1007-B



APPENDIX A

DRUM CODE	CABLE DRUM SIZES INCHES (MILLIMETERS)			WIRE ROPE STORAGE FEET (METERS)			LOW SPEED HOISTING				HIGH SPEED HOISTING & LOWERING				LUBRICATING OIL VOLUME REQUIRED U.S. GALLON (LITERS)
							LINE PULL AT MAXIMUM PRESSURE*		LINE SPEED AT MAXIMUM VOLUME*		MAXIMUM ALLOWABLE LINE PULL*		LINE SPEED AT MAXIMUM VOLUME*		
	BARREL	FLANGE	LENGTH	3/4 inch	7/8 inch	1 inch	POUNDS (KILONEWTONS)		FEET/MINUTE (METERS/MINUTE)		POUNDS (KILONEWTONS)		FEET/MINUTE (METERS/MINUTE)		
							BARE DRUM	FULL DRUM	BARE DRUM	FULL DRUM	BARE DRUM	FULL DRUM	BARE DRUM	FULL DRUM	
-1	10.0 (254)	17.0 (432)	11.0 (279)	210 (64)	140 (43)	91 (28)	25000 (111.2)	16860 (75.0)	140 (43)	207 (63)	5357 (23.8)	3613 (16.1)	651 (198)	965 (294)	2.3 (8.7)
-2	10.0 (254)	24.0 (610)	11.0 (279)	515 (157)	398 (121)	264 (80)	25000 (111.2)	11757 (52.3)	140 (43)	297 (90)	5357 (23.8)	2519 (11.2)	651 (198)	1384 (422)	2.3 (8.7)
-3	10.0 (254)	24.0 (610)	17.0 (432)	796 (243)	615 (187)	408 (124)	25000 (111.2)	11757 (52.3)	140 (43)	297 (90)	5357 (23.8)	2519 (11.2)	651 (198)	1384 (422)	3.0 (11.3)
-4	10.0 (254)	24.0 (610)	22.0 (559)	1031 (314)	796 (243)	528 (161)	25000 (111.2)	11757 (52.3)	140 (43)	297 (90)	5357 (23.8)	2519 (11.2)	651 (198)	1384 (422)	3.6 (13.6)

* Performance specifications are based on standard hydraulic motor with 7/8 inch diameter rope.

APPENDIX B

ITEM	340	500	550 / 552
DRUM CODE	FINAL SUNGEAR	CABLE DRUM	BASE
- 1	20409	20395	20671
- 2	20409	20396	20444
- 3	20408	20393	20443
- 4	20407	20391	20403

APPENDIX C

BRAKE CODE

ITEM NO.	PART DESCRIPTION	- 7	- 8	- 9	- 10
		PART NUMBERS			
802	SHUTTLE	N/A	20849	20849	N/A
807	1/8-27 NPT PIPE PLUG	25040	N/A	N/A	25040
807	1/8-27 NPT PIPE ADAPTOR	N/A	25622	25622	N/A
809	1/8 NPT CAPLUG	N/A	26276	26276	N/A
950	MOTOR SUB-ASSY	22054	22055	22056	22057

BOLT TORQUE CHART

BOLT DIAMETER Inches	TORQUE lb-ft	TORQUE Nm
1/4	9	12
5/16	18	24
3/8	32	43
7/16	50	68
1/2	75	102
9/16	110	149
5/8	150	203
3/4	265	359
7/8	420	569
1	640	868
1 1/8	800	1085
1 1/4	1000	1356
1 3/8	1200	1627
1 1/2	1500	2034

NOTE: Unless otherwise specified, torque bolts per above chart.

