

INSTRUCTION AND PARTS MANUAL
MODEL PL8
PLANETARY HYDRAULIC WINCH

 **PULL**  **MASTER**

A  **DOVER** COMPANY

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 8/1/2008
SUPERSEDES ALL PRIOR WARRANTIES

Seller warrants that each article (whether Gear Drive Products, Brake Products and/or Winch Products, all of which are covered hereunder) 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. Buyer acknowledges that Buyer is knowledgeable concerning the articles covered by this Warranty and sold in connection therewith which are being purchased, that Buyer has reviewed this Warranty and that the remedies provided hereunder are adequate and acceptable to Buyer.

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 Buyer'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, incorrect installation, overloading, or employment for other than normal and ordinary use and service. This Warranty shall not apply to any article which has been repaired, altered or disassembled, or assembled by personnel other than those of Seller. This Warranty shall not apply to any article upon which repairs or alterations have been made (unless authorized in writing and in advance by Seller). 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.

Buyer expressly agrees that Seller is not responsible to perform any work or investigation related in any way to tensional vibration issues and is not responsible for the detection or remedy of Natural Frequency Vibration of the mechanical system in which the unit is installed. Buyer acknowledges, understands and agrees that this Warranty does not cover failures of the unit which result in any manner from the operation of the machine or unit at vibration frequencies at or near the natural frequency vibration of the machine in such a way that damage may result. Buyer expressly agrees that Seller is not responsible for failure damage or accelerated wear caused by machine or ambient vibration. Further, Buyer acknowledges and agrees that Buyer is always solely responsible for determination and final approval of the "application factor" which may be used in Seller's calculations, and this application factor is 1.0 unless otherwise stated in Seller's quotation specifications.

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 a writing signed by an executive officer of Seller and Buyer. This Warranty is non-transferable. If a party who had purchased articles from Buyer, or from persons in privity with Buyer, brings any action or proceeding against Seller for remedies other than those set forth in this Warranty, Buyer agrees to defend Seller against the claims asserted in such action or proceeding at Buyer's expense, including the payment of attorneys' fees and costs, and indemnify Seller and hold Seller harmless of, from and against all such claims, actions, proceedings or judgments therein. Buyer also agrees to defend and indemnify Seller of, from and against any loss, cost, damage, claim, debt or expenses, including attorneys' fees, resulting from any claims by Buyer or third parties to property or injury to persons resulting from faulty installation, repair or modification of the article and misuse or negligent operation or use of the article, whether or not such damage to property or injury to persons may be caused by defective material, workmanship, or construction. **ADVISORY:** *Winches and hoists are not approved for lifting or handling personnel or persons unless specifically approved in writing from Seller for the specific intended application.*

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. Buyer's purchase of any article(s) covered by this Warranty shall constitute acceptance of the terms and conditions hereof and shall be binding upon Buyer and Buyer's representatives, heirs and assigns. The laws of the Province of British Columbia shall govern Buyer's rights and responsibilities in regard to this Warranty and the transaction(s) subject thereto, and the Province of British Columbia shall be the exclusive forum and jurisdiction for any action or proceedings brought by Buyer in connection herewith or any dispute hereunder. If any of the terms and conditions contained within this Warranty are void, the remaining provisions thereof are and shall remain valid and enforceable.

Note: *Prices and specifications contained in this price book 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 and drives 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 five 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 89 dBA 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 PL8

GENERAL DESCRIPTION:

The PULLMASTER Model PL8 is a planetary, hydraulic winch having equal speed in both directions. The main components of this unit are:

- + Hydraulic gear motor
- + Multi-disc brake with static and dynamic function
- + Over-running clutch
- + Primary planet reduction
- + Final planet reduction
- + Brake housing
- + Final drive housing
- + Cable drum

FUNCTION IN FORWARD ROTATION (HOISTING):

In forward rotation, the output torque and rpm of the hydraulic motor are transmitted to the sun gear of the primary planet reduction. The output of the primary reduction stage is transmitted to the final reduction stage by the final sun gear shaft, which is splined to the primary planet hub. In forward rotation, or when a load is raised, an over-running clutch, which connects the motor drive shaft to the automatic brake assembly, permits free rotation of the sun gear without effecting the brake. When the winch rotation is stopped, the load on the cable drum causes the over-running clutch to lock and the maximum load is held safely by the disc brake.

FUNCTION IN REVERSE ROTATION (LOWERING):

In reverse rotation, hydraulic pressure from the reversing side of the hydraulic motor is channelled to the brake piston causing the brake piston to release the multi disc brake against a number of brake springs. The over-running clutch, connecting the motor drive shaft to the brake assembly, locks, causing the brake discs to rotate between divider plates which are engaged into the brake housing. If the load on the cable drum tends to effect the lowering speed, the resulting pressure drop in the brake piston causes friction between the brake discs and the divider plates. In this way, a completely smooth paying out speed can be achieved in a stepless operation by modulation of the winch control handle. When the control handle is returned to neutral position, rotation stops and the disc brake applies automatically. A hydraulic counterbalance valve or holding valve is not required for smooth and positive operation of the automatic brake.

During the lowering operation of the winch, the friction created by the brake discs results in temperature. This temperature is dissipated by an internal circulation flow, supplied out of the hydraulic motor or from an external source. For models with external circulation, supply winch with approximately 2.5 (US) gpm - 9.5 l/min circulation flow. This circulation flow must be returned directly to the reservoir with a permissible back pressure of 30 psi (2 bar).

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 seal separating the brake housing from the drum interior. Damage to this seal will cause the drum to fill up with hydraulic fluid.

EXPLANATION OF MODEL CODING

PL 8 - XX - XX - XX - X - XXXX

BASIC UNIT SERIES _____

SIZE OF UNIT _____

TYPE OF BRAKE _____

- 3 Automatic brake, counterclockwise drum rotation, internal circulation flow
- 4 Automatic brake, external brake release, counterclockwise drum rotation, internal circulation flow
- 5 Automatic brake, external brake release, clockwise drum rotation, internal circulation flow
- 6 Automatic brake, clockwise drum rotation, internal circulation flow
- 7 Automatic brake, counterclockwise drum rotation, external circulation flow
- 8 Automatic brake, external brake release, counterclockwise drum rotation, external circulation flow
- 9 Automatic brake, external brake release, clockwise drum rotation, external circulation flow
- 10 Automatic brake, clockwise drum rotation, external circulation flow

HYDRAULIC MOTOR _____

- 30 *COMMERCIAL WM31* hydraulic motor, 2 inch gear section
(Other gear sections for this motor are optional)

DRUM SIZE _____

- 1 9.6 inch drum diameter x 14.1 inch flange diameter x 8 inch length - STANDARD
(For other drum sizes refer to APPENDIX A)

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

CLOCKWISE ROTATION:

The drum rotation of the standard PULLMASTER Model PL8 planetary winch is counterclockwise for hoisting, when looking at the hydraulic motor of the winch. Drum rotation for clockwise 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.



DANGER

**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 PL8 planetary winch can be supplied with optional drums to accommodate large wire rope storage capacity.

DRUM GROOVING:

Cable drums for the PULLMASTER Model PL8 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 PL8 planetary winch is based on a COMMERCIAL WM31 hydraulic motor, having a 2 inch gear section. The performance of the winch can be changed by using different gear sections. (Contact the factory for performance information of different gear sections).

HYDRAULIC MOTORS FOR HIGH PRESSURE HYDRAULIC SYSTEMS:

The operating pressure of the PULLMASTER Model PL8 planetary winch is limited to 2150 psi (148 bar). For hydraulic systems operating with higher 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).

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

SPECIFICATIONS

Performance specifications are based on standard hydraulic motor, gear ratio and cable drum with 1/2 inch diameter wire rope. For other cable drums refer to APPENDIX A. Performance specifications for winches supplied with optional motors are provided in attached supplement.

CABLE DRUM DIMENSIONS (STANDARD DRUM):

Barrel diameter	9.63 in	244 mm
Flange diameter	14.13 in	359 mm
Barrel length	8.00 in	203 mm

CABLE STORAGE CAPACITY:

(Size of wire rope)	3/16 in	1234 ft	376 m
	1/4 in	684 ft	209 m
	5/16 in	462 ft	141 m
	3/8 in	294 ft	90 m
	7/16 in	215 ft	66 m
	1/2 in	196 ft	60 m
	9/16 in	140 ft	43 m

MAXIMUM OPERATING PRESSURE: 2150 psi 148 bar

MAXIMUM OPERATING VOLUME: 37 (US) gpm 140 l/min

MINIMUM OPERATING VOLUME: 11 (US) gpm 42 l/min

DRUM TORQUE AT MAXIMUM PRESSURE: 35438 lb-in 4004 Nm

DRUM RPM AT MAXIMUM VOLUME: 46 rpm

LINE PULL AT MAXIMUM PRESSURE:

Bare drum	7000 lb	31.1 kN
Full drum	5202 lb	23.1 kN

LINE SPEED AT MAXIMUM VOLUME:

Bare drum	122 fpm	37 m/min
Full drum	164 fpm	50 m/min

PERMISSIBLE SYSTEM BACK PRESSURE AT MOTOR RETURN PORT:

65 psi 4.5 bar

PERMISSIBLE PRESSURE

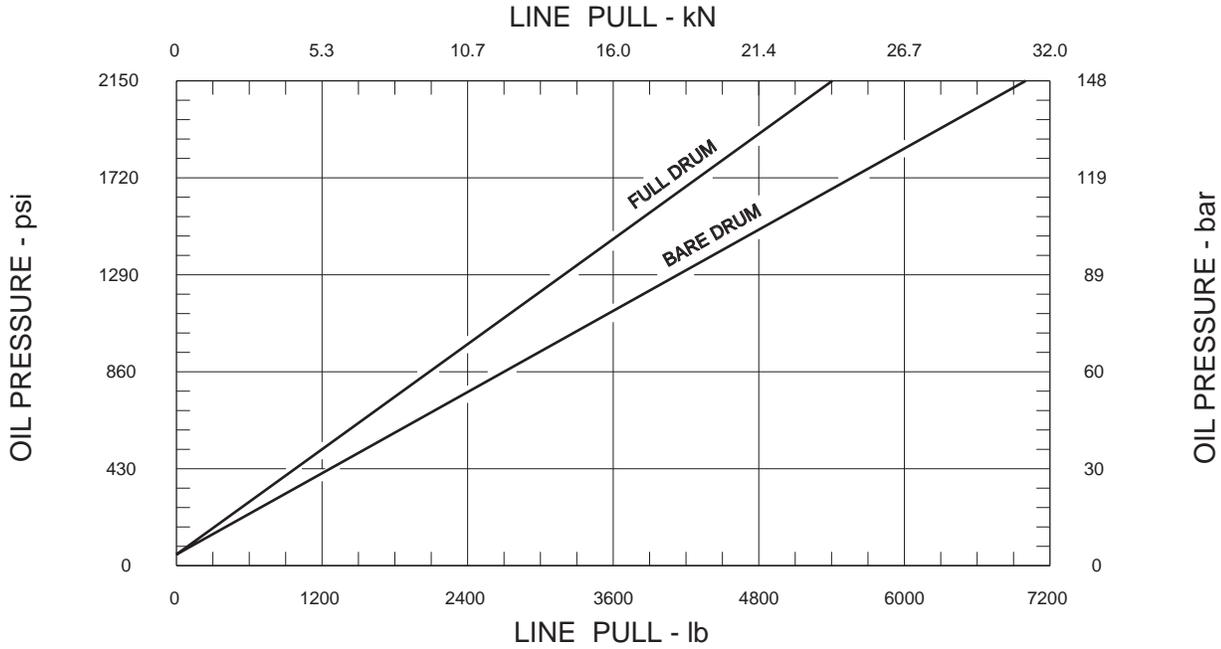
AT CIRCULATION RETURN PORT: 30 psi 2 bar

LUBRICATING OIL: Refer to RECOMMENDATIONS for viscosity and instructions.
Refer to APPENDIX A for oil volume required.

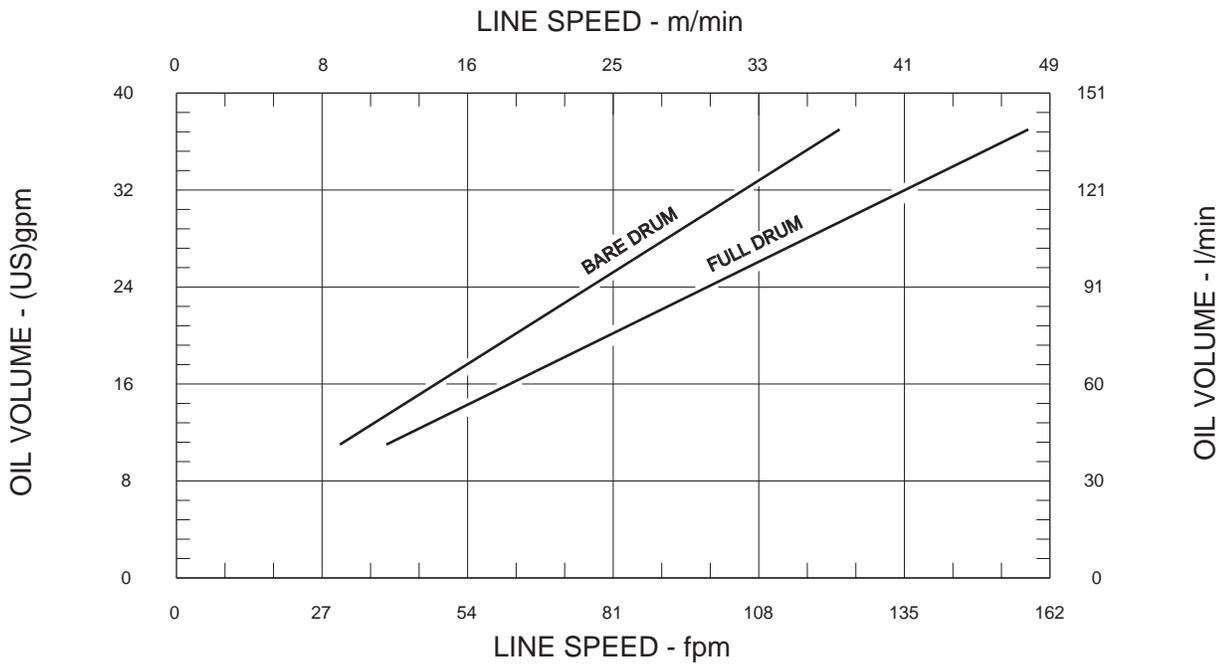
PERFORMANCE GRAPHS

PG-PL8

LINE PULL VS. OIL PRESSURE



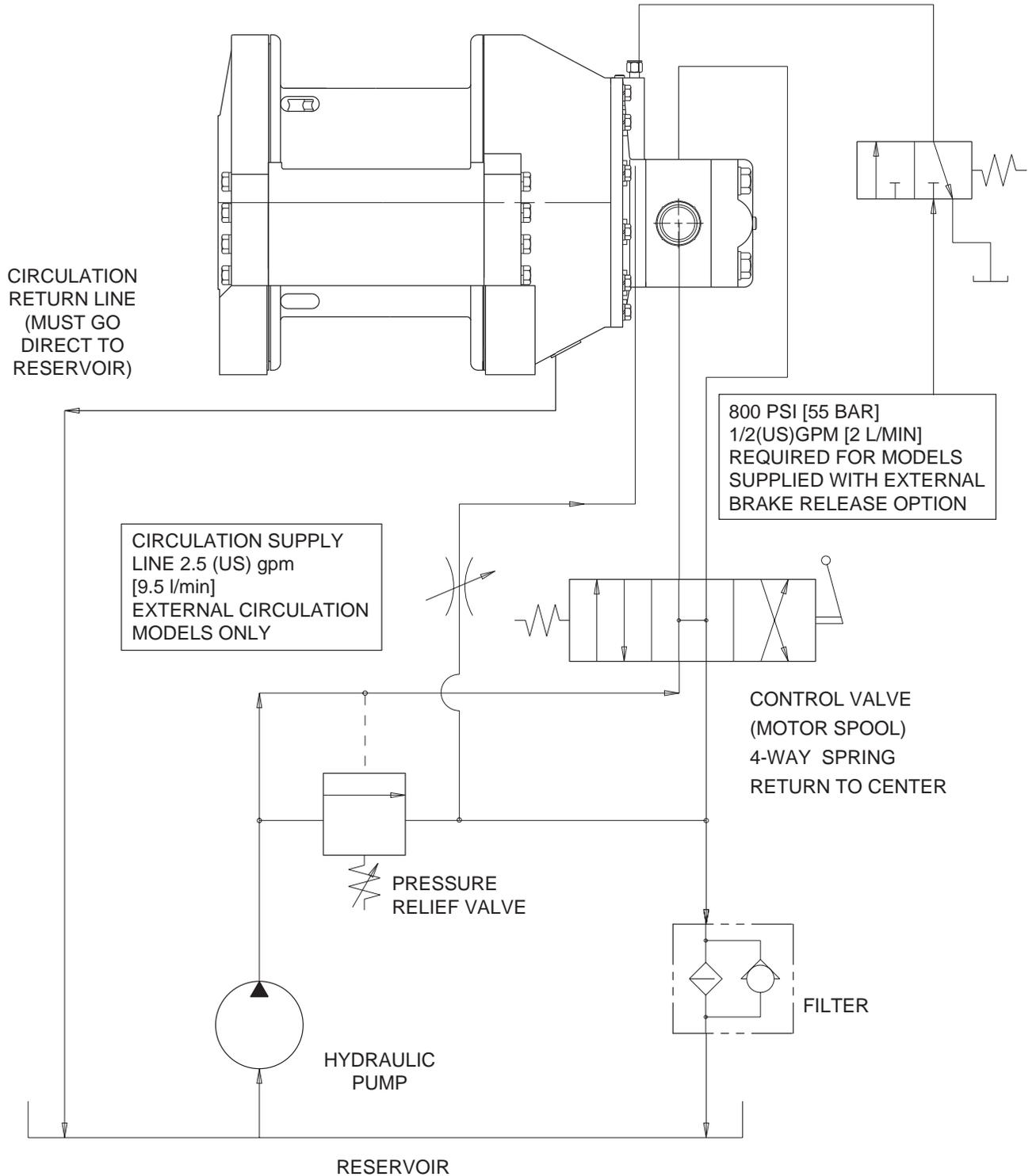
LINE SPEED VS. OIL VOLUME



Performance graphs are based on standard hydraulic motor, gear ratio and cable drum with 1/2 inch diameter wire rope.

TYPICAL HYDRAULIC CIRCUIT

HC-PL8



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 UP TO THE LEVEL OF THE OIL FILL PORT 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. Consult lubricating oil supplier or factory for temperatures beyond normal operating range.

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 operating 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" characteristics of the control valve. The better the oil flow is "metered" the better will be the speed control.

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 PL8 planetary winch:

Pressure lines:	Equivalent to SAE 100R12-16
Circulation return line:	Equivalent to SAE 100R4-12

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

HYDRAULIC FILTER:

Consult hydraulic component manufacturer for recommendation. Generally, 5 to 10 micron filters are acceptable. In order to prevent accidental stoppage of the return line flow, the 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.

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 as 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. Winches equipped with the internal circulation option will supply circulation flow only when the winch is run in the lowering direction.
- 8) If, after new installation, the winch does not function properly, refer to the TROUBLESHOOTING section of this manual.

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.

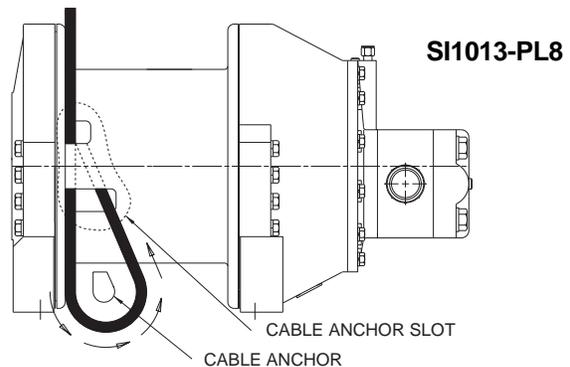
IMPORTANT: The ropes, chains, slings, etc. are not part of the winch and are not covered by this manual. Refer to manufacturer's handling, inspection and maintenance recommendations to avoid potential accidents. For selection of ropes, etc. please check following product standards: DIN 15020, prEN818-1/9,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

WIRE ROPE INSTALLATION

Counterclockwise hoisting winch shown.
(Use cable anchor slot on opposite side of drum for clockwise 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 5 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 for malfunction is found somewhere in the hydraulic circuit. Before the winch is removed from its mounting and disassembled, all of the hydraulic circuit components should be checked for proper function.

IMPORTANT:

The hydraulic oil 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, a loss of hydraulic flow somewhere in the hydraulic circuit can be analysed. If this condition exists, install a flow meter into the hydraulic circuit to check the volume of oil 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. If the pump is driven by V-belts, check for belt slippage.

The hydraulic pressure relates to the pulling capacity of the winch.

If the winch will not produce the specified maximum line pull, install a pressure gauge in 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. If the hydraulic pump is driven by V-belts, check for belt slippage. When checking oil pressure and volume in the hydraulic circuit, make sure that the hydraulic reservoir is filled to the top level and the hydraulic pump is running at maximum operating rpm.

Only after 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
Winch will not produce line pull at maximum pressure as listed in SPECIFICATIONS.	<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) The relief valve pressure may be set too low. e) Excessive back pressure in the hydraulic circuit might cause the automatic brake to release momentarily.
Winch will not produce line speed at maximum volume as listed in SPECIFICATIONS.	<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.
Winch will not reverse.	<ul style="list-style-type: none"> a) Leakage out of the brake piston prevents the disc brake from being released against the brake springs. This is caused by damaged O-ring seals on the brake piston. b) Insufficient hydraulic pressure. (See SPECIFICATIONS for minimum operating pressure.) c) Winch is mounted to an uneven surface. (See INSTALLATION INSTRUCTIONS.) d) Hydraulic pressure is not reaching the brake piston due to plugged passages.

TROUBLE SHOOTING CONTINUED

FAILURE	PROBABLE CAUSE
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 of the hydraulic circuit 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 surface 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 TYPICAL 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 (approx. 2-3 (US) gpm (8-11 l/min) when the winch is reversed. c) Control valve for the winch operation has poor metering characteristics. d) Damaged brake plates or divider plates. e) The over-running clutch, which connects the motor shaft with the brake assembly, is damaged. f) Air has mixed with hydraulic oil resulting in foamy oil.
Oil leaks.	<ul style="list-style-type: none"> a) Oil leaks from the motor flange are caused by a damaged O-ring seal on the motor flange. b) Oil leaks occurring between the cable drum flanges and housing are caused by excessive pressure in the brake housing. Excessive pressure in the brake housing will damage the oil seal between the brake housing and cable drum interior.

Refer to the SERVICE INSTRUCTIONS if it becomes necessary to disassemble the Model PL8 winch.

SERVICE INSTRUCTIONS

GENERAL:

Before attempting disassembly of the PULLMASTER Model PL8 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. It is therefore important to have a seal kit (Part No. 23101) and, providing the hydraulic motor has to be serviced, a seal kit (Part No. 23131) on hand before the unit is taken apart. Two new needle bearings, item 875, may also be required (Part No. 25322).

NOTE: Back up 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 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.

DISASSEMBLY:

For the majority of required service or repair work, disassembly is required only on the brake housing of the PULLMASTER Model PL8 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 MOTOR ASSEMBLY:

If the analysed service or repair work requires access to the interior of the brake housing, the hydraulic 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 the four hex capscrews, item 951, together with the lockwashers, item 953, from the motor assembly.

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

- 2) 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 the gear housing.
- 3) If thrust plate comes off with the end cover, carefully pry it off of the bearings, item 875, and discard pocket seals, item 887.
- 4) Remove gear set, item 881, which consists of two gears which are a matched set.
- 5) Carefully pry the gear housing, item 861, off of the motor adaptor, item 800. Thrust plate, item 885, and dowel pins, item 865, may stay in the gear housing.
- 6) If thrust plate stays on the motor adaptor, carefully pry it off of the bearings, item 875, and discard pocket seals, item 887.
- 7) Discard body 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 the ring seals.

SERVICE INSTRUCTIONS CONTINUED

Pocket seals, body seals, and ring seals in the hydraulic motor assembly are not part of the winch seal kit. The seal kit for the hydraulic motor can be ordered from the factory under Part No. 23131. All parts of the hydraulic motor, with the exception of the motor adaptor, item 800, are standard parts of the *COMMERCIAL WM31* hydraulic motor, having a 2 inch gear section. All of these parts can be ordered from PULLMASTER or COMMERCIAL INTERTECH dealers in Canada, the United States and in most overseas areas.

REMOVAL OF HYDRAULIC MOTOR ASSEMBLY

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

- 1) Remove the 12 hex head capscrews, item 821, with lockwashers, item 823, from the motor adaptor, item 800. Since brake springs, item 752, apply pressure against inside of the motor adaptor, it is recommended that hex capscrews are unscrewed, one turn at a time, until the spring pressure has been released. Complete motor assembly, including motor adaptor, can now be removed from brake housing assembly.
- 2) Remove and discard O-ring, item 801, and O-ring, item 707. (O-ring, item 801, seals pressure transfer hole for automatic brake release and is situated on flange of brake housing.)

DISASSEMBLY OF BRAKE HOUSING ASSEMBLY

- 1) After motor assembly has been removed, all parts of brake assembly are accessible. Remove 10 brake springs, item 752. Thoroughly examine springs for damage and measure overall length. Overall spring length should be 1.99 inches. If any spring measures less than 1.93 inches, replace all springs as a set.
- 2) Pull motor drive shaft, item 730, and complete brake hub assembly from brake housing.
- 3) Disassemble brake hub assembly by removing circlip, item 727, from motor drive shaft. Remove motor drive shaft from brake hub, item 720. Remove sprag clutch aligners, items 722 and 724, support washers, item 717, sprag clutch, item 723, and sprag clutch spacer, item 726, from brake hub.



DANGER

MINOR SURFACE DEFECTS WHERE THE SPRAG CLUTCH ENGAGES THE MOTOR DRIVE 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 REPLACE MOTOR DRIVESHAFT, SPRAG CLUTCH AND BRAKE HUB AS A SET.

- 4) Thoroughly inspect motor drive shaft, item 730, and brake hub, item 720, particularly surfaces where sprag clutch, item 723, engages. If any indentation or surface damage is detected, replace brake hub, sprag clutch and motor drive shaft as a set.
- 5) Pull the brake piston, item 750, out of brake housing using two 7/16-14NC bolts screwed into two puller holes in piston and discard O-rings, item 751 and item 753.
- 6) Thoroughly examine inner bores of the brake housing and outer diameters of the brake piston for scoring caused by hydraulic fluid contamination. Minor surface damage may be repaired by polishing with a fine emery cloth.

SERVICE INSTRUCTIONS CONTINUED



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 REPLACE FRICTION AND DIVIDER PLATES AS A SET.

- 7) Remove four friction plates, item 715, together with five divider plates, item 714, 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.
- 8) Remove brake spacer, item 712.
- 9) Remove oil seal, item 711, and backup washer, item 710, and discard.

All parts have now been removed from brake housing and there is no need for further disassembly unless a failure has been analyzed in the remaining winch assembly.

DISASSEMBLY OF PRIMARY DRIVE

If primary drive requires service or repair, disassemble as follows:

- 1) Remove pipe plug, item 503, from cable drum, item 500, to drain lubricating oil from winch interior.
- 2) Remove eight capscrews, item 971, and lockwashers, item 973. Remove two tie bars, item 970. Stand winch upright on its end housing.
- 3) Remove six capscrews, item 537, and lockwashers, item 541, through access opening in brake housing. Lift brake housing with bearing flange assembly out of cable drum, item 500. Remove and discard O-ring, item 539.
- 4) Pull bearing flange, item 530, and ball bearing, item 533, off of brake housing, item 700.
- 5) Remove circlip, item 535. Push ball bearing, item 533, out of bearing flange. Inspect and replace if damaged.
- 6) Remove and discard oil seal, item 531.
- 7) Inspect planet hub stopper, item 704, for damage or wear and replace if less than 0.13 inch thick.
- 8) Remove primary sun gear, item 440.
- 9) Remove primary planet hub assembly from cable drum.
- 10) Inspect planet hub stopper, item 402, for damage or wear and replace if less than 0.13 inch thick.
- 11) Inspect three primary planet gears, item 420, for damage or wear. If it is necessary to remove planet gears, remove circlip, item 411, and press planet pin, item 410, out of planet hub, item 400. Inspect needle bearing, item 423, and two thrust washers, item 421, and replace if damaged or worn.
- 12) Remove final sun gear, item 340, with circlip, item 341, and sun gear stopper, item 344. Inspect stopper for damage or wear. If stopper protrudes less than .03 inch from sun gear, stopper should be replaced.

SERVICE INSTRUCTIONS CONTINUED

DISASSEMBLY OF FINAL DRIVE

If final drive requires service or repair, disassemble as follows:

- 1) Remove final planet hub assembly from the cable drum.
- 2) Inspect three final planet gears, item 320, for damage or wear. If it is necessary to remove planet gears, remove circlip, item 311, and press planet pin, item 310, out of the final planet hub, item 300. Inspect seventeen loose rollers, item 323, and two thrust washers, item 321, and replace if damaged.

Winches with optional -2 drum only:

- 2A) Remove coupling, item 520, from end housing spline. Proceed to step 3.
- 3) Pull the end housing, item 100, out of the cable drum ball bearing, item 507.
- 4) Remove circlip, item 513. Push ball bearing, item 507, out of the cable drum. Inspect and replace if damaged.
- 5) Remove and discard oil seal, item 505.
- 6) Inspect cable drum gear teeth for damage or wear.

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 by reversing the disassembly procedure:

- 1) Press a new, well-greased oil seal, item 505, into cable drum, item 500.
- 2) Press ball bearing, item 507, into cable drum and secure with circlip, item 513.
- 3) Press end housing, item 100, into the cable drum ball bearing, item 507.

Winches with optional -2 drum only:

- 3A) Replace coupling, item 520, onto end housing spline. Proceed to step 4.
- 4) Reassemble final planet hub assembly. Use grease to temporarily hold 17 loose rollers, item 323, in the bore of the planet gear, item 320. Position thrust washers, item 321, on either side of the planet gear and press planet pin, item 310, into the final planet hub, item 300. Retain with circlip, item 311.
- 5) Insert final planet hub assembly into the cable drum. Ensure that the planet hub spline is fully engaged.

REASSEMBLY OF PRIMARY DRIVE

Reassemble primary drive by reversing the disassembly procedure:

- 1) Press a new, well-greased oil seal, item 531, into the bearing flange, item 530. Press ball bearing, item 533, into bearing flange and install circlip, item 535. Press bearing flange assembly onto brake housing hub.
- 2) Verify planet hub stopper, item 704, is installed on brake housing hub.
- 3) Verify sungear stopper, item 344, and circlip, item 341, are installed on final sungear, item 340.
- 4) Install final sungear into primary planet hub, item 400.
- 5) Reassemble primary planet hub assembly. Press needle bearing, item 423, into planet gear, item 420. Position thrust washers, item 421, on either side of planet gear and press planet pin, item 410, into the primary planet hub, item 400. Retain with circlip, item 411.

SERVICE INSTRUCTIONS CONTINUED

- 6) Verify planet hub stopper, item 402, is installed on planet hub.
- 7) Insert primary planet hub assembly into cable drum. Ensure that the final sungear, item 340, is fully engaged with final planet gears, item 320.
- 8) Install primary sungear, item 440.
- 9) Install new, well-greased O-ring, item 539, onto bearing flange, item 530. Lower brake housing, item 700, complete with bearing flange assembly, into cable drum. To fasten bearing flange to cable drum, align holes in the bearing flange with threaded holes in the cable drum. Install six capscrews, item 537, and lockwashers, item 541, through access opening in brake housing.
- 10) Use eight capscrews, item 971, and lockwashers, item 973, to secure tie bars, item 970.
- 11) Install pipe plug, item 503, into cable drum.

REASSEMBLY OF BRAKE HOUSING ASSEMBLY

Reassemble brake housing assembly by reversing the disassembly procedure:

- 1) Press needle bearing, item 733, into brake housing bore.
- 2) Press new, well-greased oil seal, item 711, and back-up washer, item 710, into brake housing bore.
- 3) Install sprag clutch, item 723, and sprag clutch spacer, item 726, into bore of brake hub, item 720. Position sprag clutch aligners, item 722 and 724, and support washer, item 717, on either side of brake hub. Carefully slide motor drive shaft, item 730, into brake hub assembly and secure with circlip, item 727.

IMPORTANT: For proper brake function, verify that the brake hub rotation is correct. When viewed from the motor end, the motor drive shaft of a counterclockwise hoisting winch must turn freely clockwise and lock in the counterclockwise direction.

- 4) Install motor drive shaft assembly, carefully twisting shoulder of shaft through oil seal, item 711. Ensure that oil seal is not damaged as motor drive shaft is installed.



DANGER

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

- 5) Install brake spacer, item 712, into brake housing, item 700. Starting and finishing with divider plate, alternately install five divider plates, item 714, and four friction plates, item 715.
- 6) Install new, well-greased O-rings, item 751 and 753, into piston glands, item 750. Carefully install brake piston in brake housing.
- 7) Install 10 brake springs, item 752, into the 12 holes of brake piston, leaving two holes vacant opposite each other.
- 8) Use grease to temporarily hold a new O-ring, item 801, into recess on the flange of motor adapter, item 800. Install new, well-greased O-ring item 707, onto motor adapter pilot.
- 9) Position motor adapter, with brake release pressure transfer holes of motor adapter and brake housing aligned. Tighten 12 capscrews, item 821, and lockwashers, item 823, one turn at a time to evenly compress springs.

SERVICE INSTRUCTIONS CONTINUED

REASSEMBLY OF HYDRAULIC MOTOR

If the hydraulic 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. 23131) for hydraulic motor.
- 2) Install six new pocket seals, item 887, on each thrust plate, item 885. The seal kit includes a single strip of rubber. Using a sharp knife, cut lengths to fit the openings in the thrust plates. Press one of the thrust plates, together with six pocket seals, onto bearings, item 875, installed in motor adaptor, item 800, so that pocket seals are against motor adaptor.
- 3) Install a well-greased body seal, item 869, on each side of gear housing, item 861. Slide the gear housing together with the body seals, onto motor adaptor, lined up on two dowel pins. Tap on tight using a soft headed hammer.
- 4) Install gear set, item 881, in gear housing (The longer gear with the internal spline goes into the top position).
- 5) Press the other thrust plate, complete with six new pocket seals, onto bearings installed in port end cover so pocket seals are facing 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 a soft headed hammer. Install and lightly torque four 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 four 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 housing 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.



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 PL8 planetary winch, always quote the complete model and serial numbers 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.

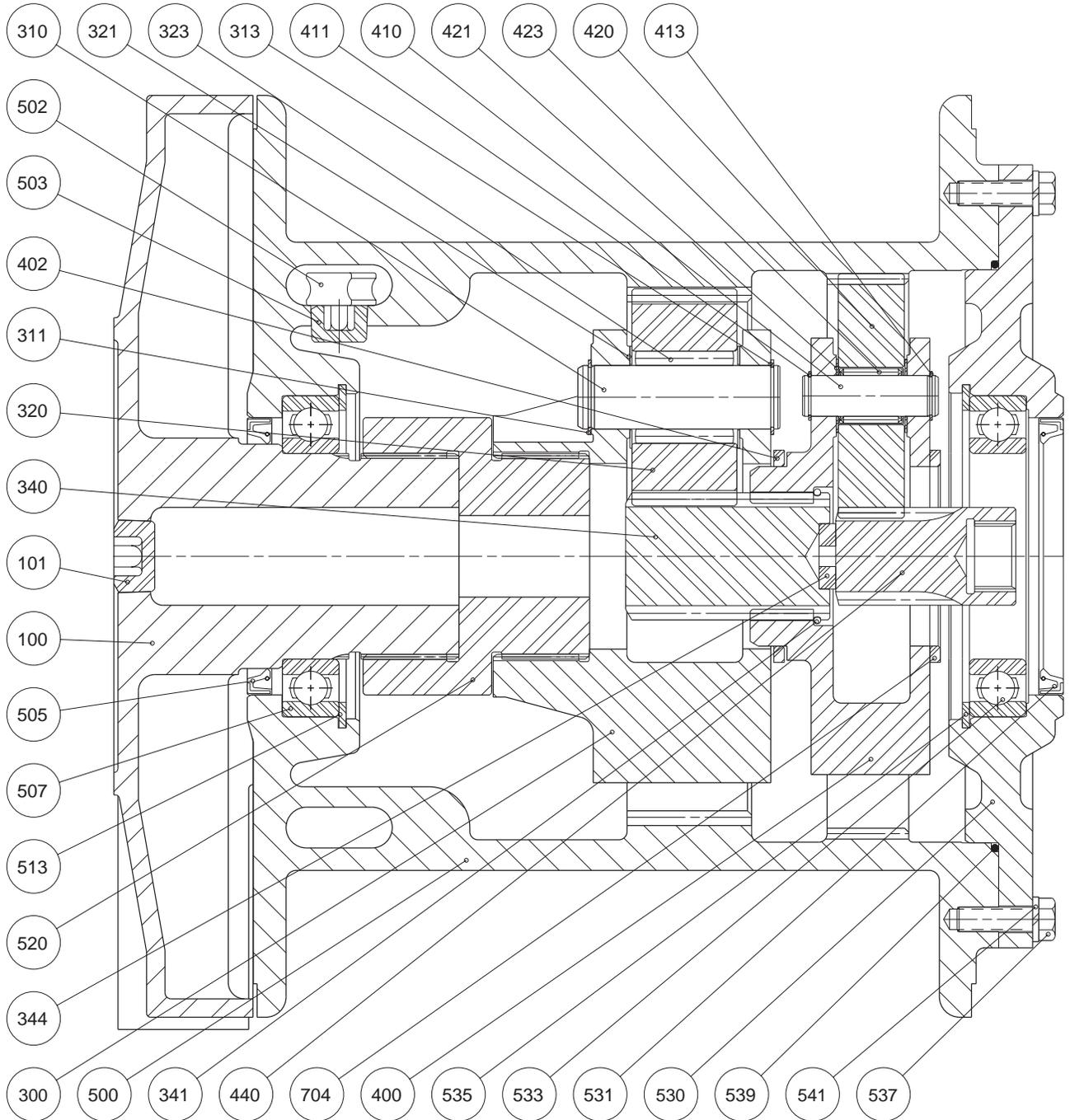
PARTS REFERENCE - DRUM GROUP

ITEM NO.	QTY.	PART NO.	DESCRIPTION
100	1	22137	END HOUSING
101	1	25237	PIPE PLUG 3/4 - 14 NPT
300	1	20433	PLANET HUB FINAL
310	3	20438	PLANET PIN FINAL
311	3	25122	CIRCLIP ROTOR CLIP C-100
313	3	25411	CIRCLIP ROTOR CLIP SH-100
320	3	20437	PLANET GEAR FINAL
321	6	25098	THRUST WASHER TORRINGTON #TRA 1625
323	51	25308	LOOSE ROLLER 7/32 DIA X 1.50
340	1	20441	SUNGEAR FINAL
341	1	25311	CIRCLIP ANDERTON #A1000-0200
344	1	20450	SUNGEAR STOPPER
400	1	20431	PLANET HUB PRIMARY
402	1	20449	PLANET HUB STOPPER
410	3	20080	PLANET PIN PRIMARY
411	3	25119	CIRCLIP ROTOR CLIP C-62
413	3	25119	CIRCLIP ROTOR CLIP SH-62
420	3	20439	PLANET GEAR PRIMARY
421	6	25064	THRUST WASHER TORRINGTON #TRA 1018
423	3	25269	NEEDLE BEARING TORRINGTON #BH1016
440	1	20440	SUNGEAR PRIMARY
500	1	*	CABLE DRUM
502	1	20085	CABLE ANCHOR
503	1	25032	PIPE PLUG 1/2 - 14 NPT
505	1	25327	OIL SEAL
507	1	25307	BALL BEARING 080 X 125 X 22 #6016
513	1	25086	CIRCLIP ROTOR CLIP HO-500
520	1	*	COUPLING
530	1	20432	BEARING FLANGE
531	1	25327	OIL SEAL
533	1	25307	BALL BEARING 080 X 125 X 22 #6016
535	1	25086	CIRCLIP ROTOR CLIP HO-500
537	6	25118	CAPSCREW - HEX HEAD 3/8 - 16NC X 1.25 GRADE 5
539	1	25109	O-RING -269 8-3/4" ID 1/8" CS
541	6	25037	LOCKWASHER 3/8"
704	1	20449	PLANET HUB STOPPER
		23101	WINCH SEAL KIT, CONSISTS OF ITEMS: 505, 531, 539, 707, 710, 711, 751, 753, AND 801.
			* These parts vary according to cable drum code. Refer to APPENDIX B.

Refer to PAGE 22 for motor seal kit and PAGE 26 for ASSEMBLY DRAWING.

DRUM GROUP

G1085-A



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 - BRAKE GROUP

ITEM NO.	QTY.	PART NO.	DESCRIPTION
700	1	22136	BRAKE HOUSING
703	1	25331	PLASTIC CAPLUG 3/4 NPT THR'D
707	1	25192	O-RING -174 8-3/4" ID 3/32" CS
710	1	20714	BACKUP WASHER FOR 25278
711	1	25278	OIL SEAL
712	1	21377	BRAKE SPACER
714	5	21252	DIVIDER PLATE
715	4	25194	FRICTION PLATE
717	2	25729	SUPPORT WASHER ANDERTON #R.28/40/2.0
720	1	20442	BRAKE HUB
722	1	21193	SPRAG CLUTCH ALIGNER
723	1	25187	SPRAG CLUTCH
724	1	21193	SPRAG CLUTCH ALIGNER
726	1	22672	SPRAG CLUTCH SPACER
727	1	25122	CIRCLIP ROTOR CLIP C-100
730	1	20448	MOTOR DRIVE SHAFT
731	1	25003	CIRCLIP ROTOR CLIP SH-75
733	1	25312	NEEDLE BEARING INA #HK3012
750	1	20434	PISTON
751	1	25309	O-RING -370 -90 DURO 8-1/4" ID 3/16" CS
752	10	20028	BRAKE SPRING
753	1	25309	O-RING -370 -90 DURO 8-1/4" ID 3/16" CS
800	1	21973	MOTOR ADAPTOR
801	1	25310	O-RING -012 -90 DURO 3/8" ID 1/16" CS
802	1	*	SHUTTLE
803	1	25370	PIPE PLUG 1/16 - 27 NPT
804	1	*	ORIFICE PLUG
805	3	25040	PIPE PLUG 1/8 - 27 NPT
807	1	*	*
809	1	*	PLASTIC CAPLUG 1/8 NPT
821	12	25118	CAPSCREW - HEX HEAD 3/8 - 16NC X 1.25 GRADE 5
823	12	25037	LOCKWASHER 3/8"
861	1	25323	GEAR HOUSING (2" GEARS) COMM. #312 8220 327
865	4	25326	DOWEL PIN COMMERCIAL #391 2082 032
869	2	25315	SEAL - BODY COMMERCIAL #391 2884 050
870	1	21759	PORT END COVER SUB-ASSY WITH PLUGS
875	4	25322	BEARING - ROLLER COMMERCIAL #391 0381 906
877	2	25908	SEAL - RING COMMERCIAL #391 2585 024
881	1	25317	GEAR SET (2" GEARS) COMM. #312 2820 007
885	2	25320	THRUST PLATE COMMERCIAL #391 2185 059
887	1	25321	SEAL STRIP COMMERCIAL #391 2882 051
899	2	25031	PIPE PLUG 1/4 - 18 NPT
929	1	*	*
950	1	*	SUB-ASSY MOTOR WM31 (2" GEARS)
951	4	25324	CAPSCREW - HEX HEAD 5/8 X 5.25 GRADE 5
953	4	25325	WASHER COMMERCIAL #391 3784 028
955	2	25556	PLASTIC CAPLUG 1.312" - 12
970	2	**	TIE BAR
971	16	25214	CAPSCREW - HEX HEAD 7/16 - 14NC X 1.50 GRADE 5
973	16	25328	LOCKWASHER 7/16"
		23131	MOTOR SEAL KIT, CONSISTS OF ITEMS: 869, 877, AND 887.
			MOTOR SUB-ASSY, ITEM 950, CONSISTS OF ITEMS: 800, 802, 803, 804, 805, 807, 809, 861, 865, 869, 870, 875, 877, 881, 885, 887, 899, 929, 951, 953, AND 955.
			* These parts vary according to brake code. Refer to APPENDIX C. ** These parts vary according to drum code. Refer to APPENDIX B.

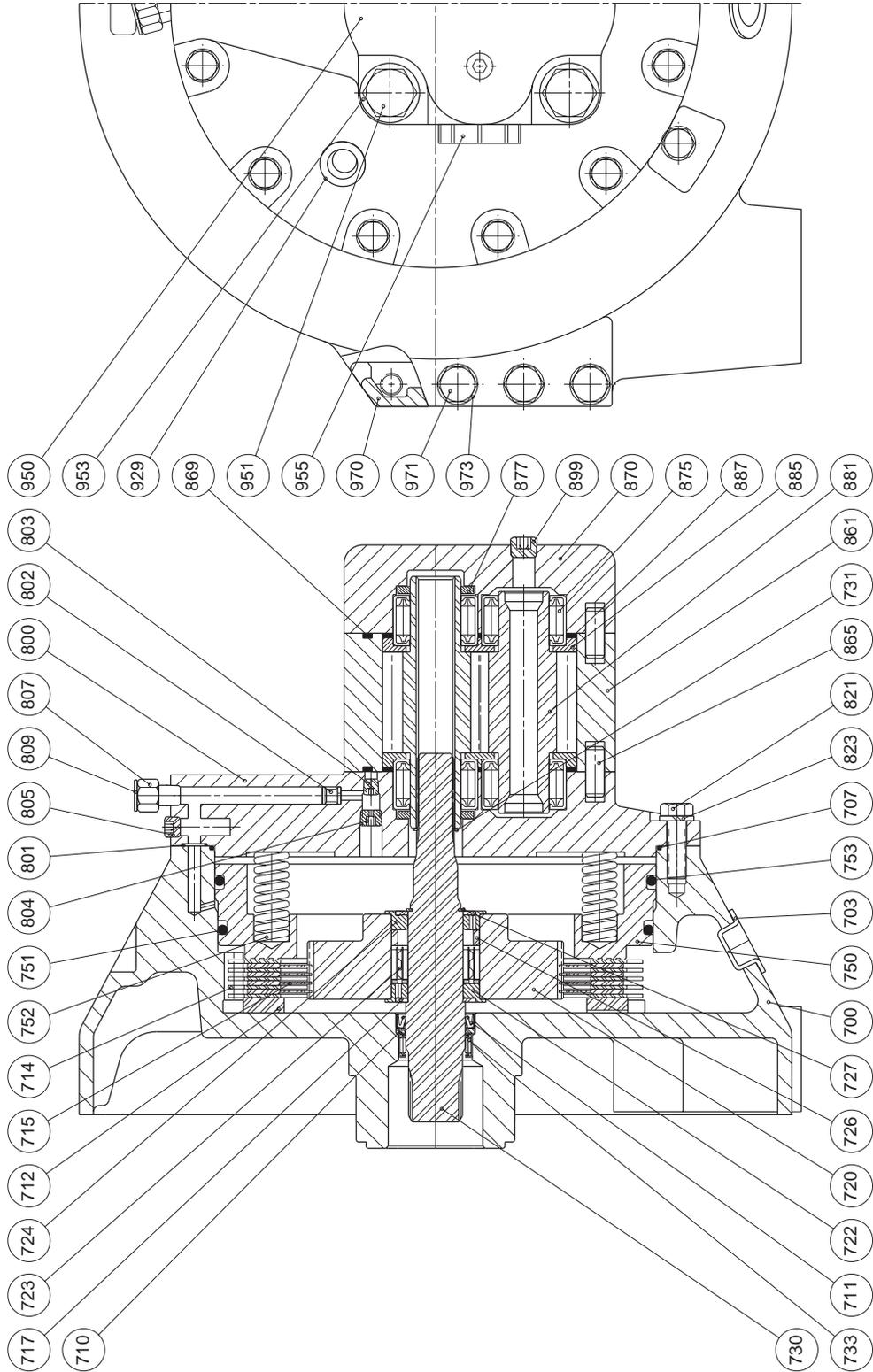
Refer to PAGE 20 for winch seal kit and PAGE 26 for ASSEMBLY DRAWING.

BRAKE GROUP

G1084-B

PRIOR TO SERIAL NO. 37869:

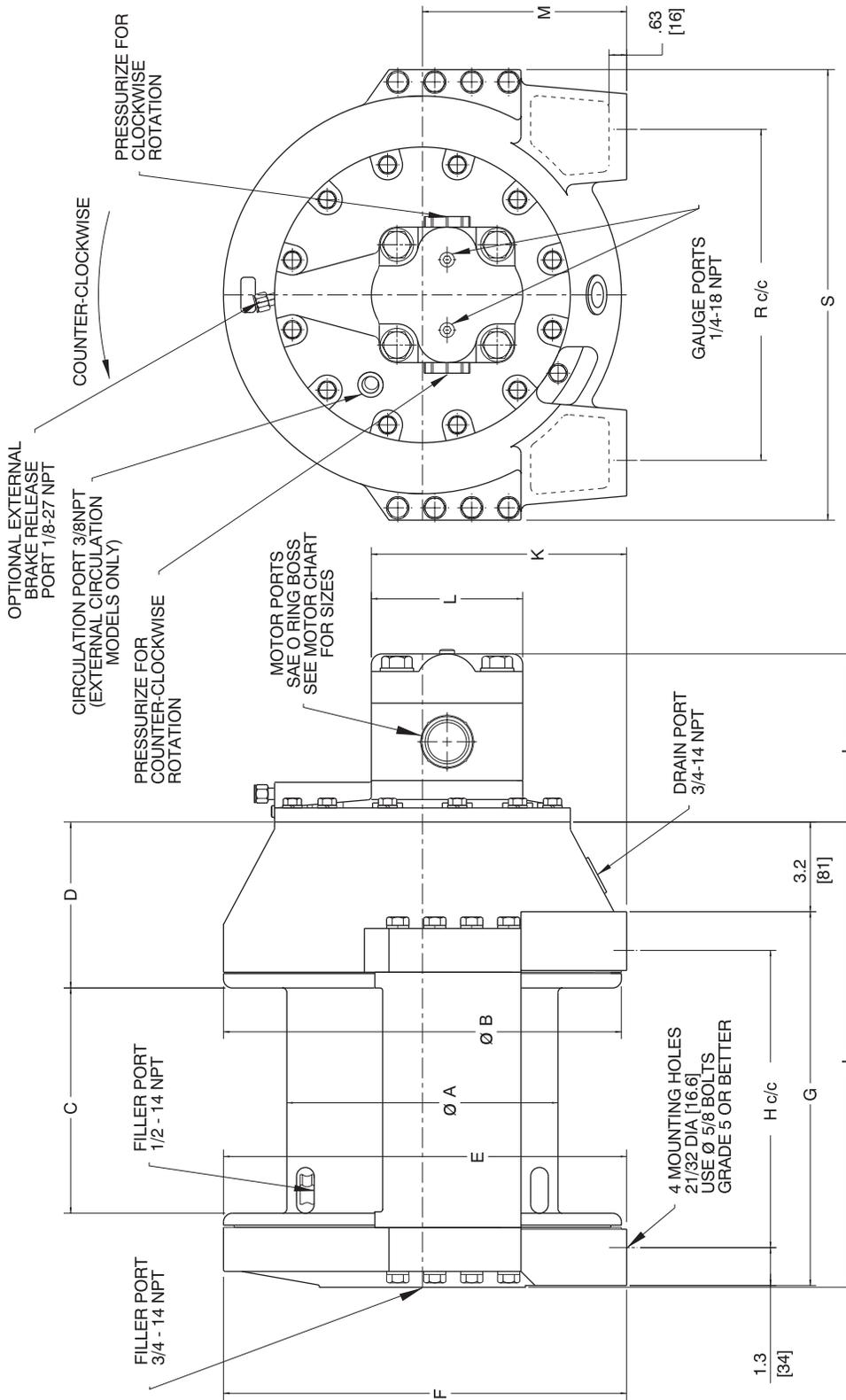
Item 723 - Was Part No. 25071 (Borg Warner sprag clutch # X13143 - Qty. 2)
Item 726 - Omitted



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

I1024-1-C



Standard cable anchor is suitable for 3/8 - 9/16 inch diameter rope.

FOR SAFETY:

A minimum of 5 wraps of wire rope must be maintained at all times.

INSTALLATION DIMENSIONS

I1024-2

DRUM CODE		A	B	C	D	E	F	G	H	J	K	M	R	S
- 1	in	9.6	14.1	8.0	5.9	14.3	14.3	13.3	10.557	16.5	9.1	7.25	11.750	16.0
	mm	244	359	203	150	364	364	337	268.15	420	230	184.2	298.45	406
- 2	in	9.6	14.1	10.0	5.9	14.3	14.3	15.3	12.557	18.5	9.1	7.25	11.750	16.0
	mm	244	359	254	150	364	364	388	318.95	471	230	184.2	298.45	406

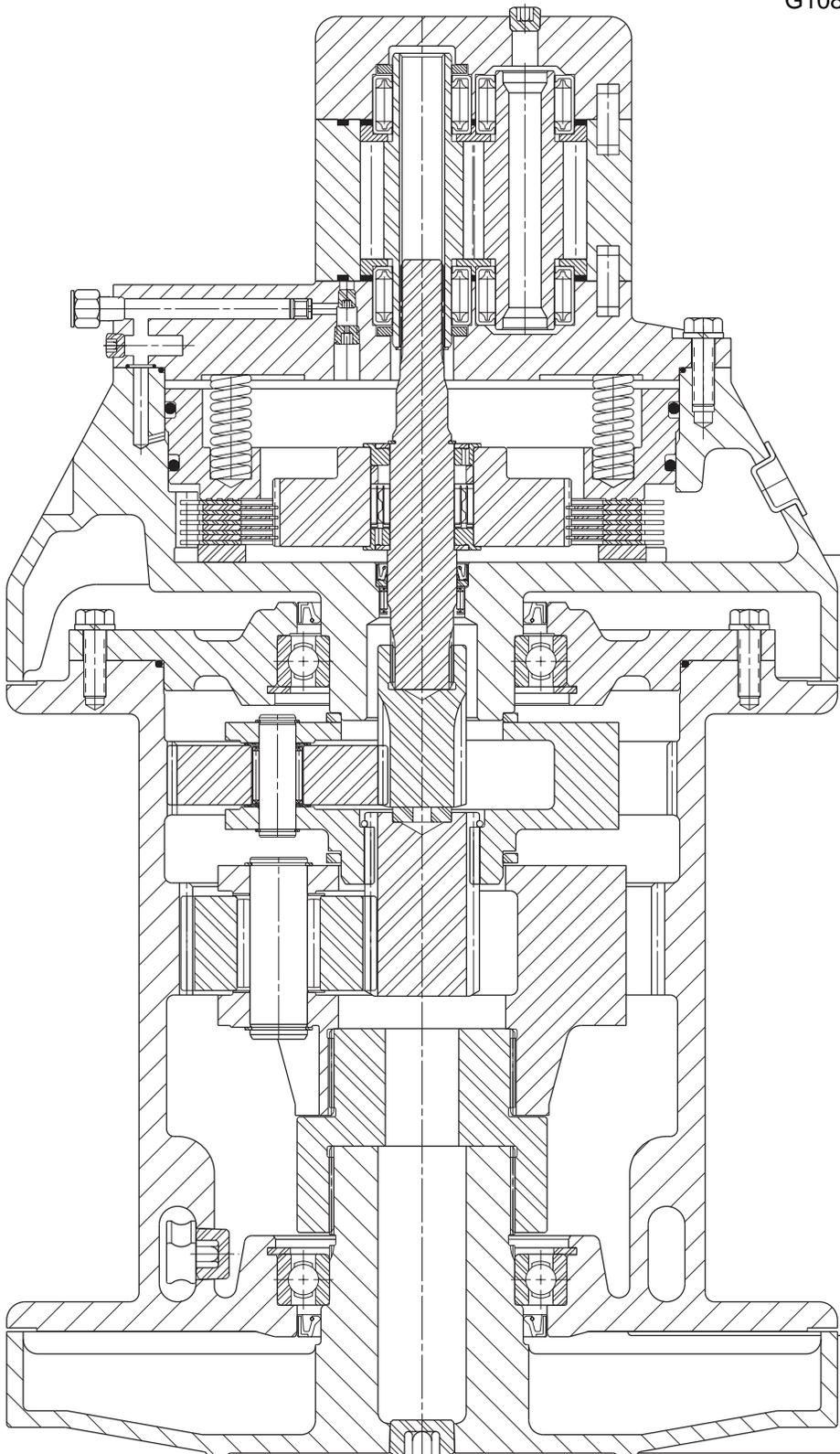
HYDRAULIC MOTORS

COMMERCIAL WM31 SERIES

MOTOR CODE	GEAR WIDTH	MOTOR PORT SIZE SAE O-RING		I	L
- 30	2.00 50.8	1 5/16 - 12	in mm	6.0 152	5.4 137
- 31	1.75 44.5	1 5/16 - 12	in mm	5.8 146	5.4 137
- 32	1.50 38.1	1 1/16 - 12	in mm	5.5 140	5.4 137
- 33	1.25 31.8	1 1/16 - 12	in mm	5.3 133	5.4 137

ASSEMBLY DRAWING

G1085-A & G1084-B



APPENDIX A

DRUM CODE	CABLE DRUM SIZES INCHES (MILLIMETERS)			WIRE ROPE STORAGE FEET (METERS)			LINE PULL AT MAXIMUM PRESSURE*		LINE SPEED AT MAXIMUM VOLUME*		LUBRICATING OIL VOLUME REQUIRED U.S. GALLONS (LITERS)
	BARREL	FLANGE	LENGTH	9/16 in	1/2 in	7/16 in	BARE DRUM	FULL DRUM	BARE DRUM	FULL DRUM	
-1	9.6 (244)	14.1 (359)	8.0 (203)	140 (43)	196 (160)	215 (66)	7000 (31.1)	5202 (23.1)	122 (37)	164 (50)	.5 (1.9)
-2	9.6 (244)	14.1 (359)	10.0 (254)	175 (53)	245 (75)	269 (82)	7000 (31.1)	5202 (23.1)	122 (37)	164 (50)	.8 (3.0)

* Performance specifications are based on standard hydraulic motor with 1/2 inch diameter wire rope.

APPENDIX B

DRUM CODE	ITEM		
	500	520	970
	CABLE DRUM	COUPLING	TIE BAR
-1	20430	-	20436
-2	20820	20826	20819

APPENDIX C

BRAKECODE

ITEM NO.	PART DESCRIPTION	- 3	- 4	- 5	- 6	- 7	- 8	- 9	- 10
		PART NUMBERS							
802	SHUTTLE	N/A	20849	20849	N/A	N/A	20849	20849	N/A
804	ORIFICE PLUG	21720	21720	21720	21720	N/A	N/A	N/A	N/A
804	1/8-27 NPT PIPE PLUG	N/A	N/A	N/A	N/A	25040	25040	25040	25040
807	1/8-27 NPT PIPE PLUG	25040	N/A	N/A	25040	25040	N/A	N/A	25040
807	1/8-27 NPT PIPE ADAPTOR	N/A	25622	25622	N/A	N/A	25622	25622	N/A
809	1/8 NPT CAPLUG	N/A	25374	25374	N/A	N/A	25374	25374	N/A
929	3/8 NPT CAPLUG	N/A	N/A	N/A	N/A	25393	25393	25393	25393
929	3/8-18 NPT PIPE PLUG	25085	25085	25085	25085	N/A	N/A	N/A	N/A
950	MOTOR SUB-ASSY	22026	22027	22028	22029	22303	22083	22084	22304

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.

