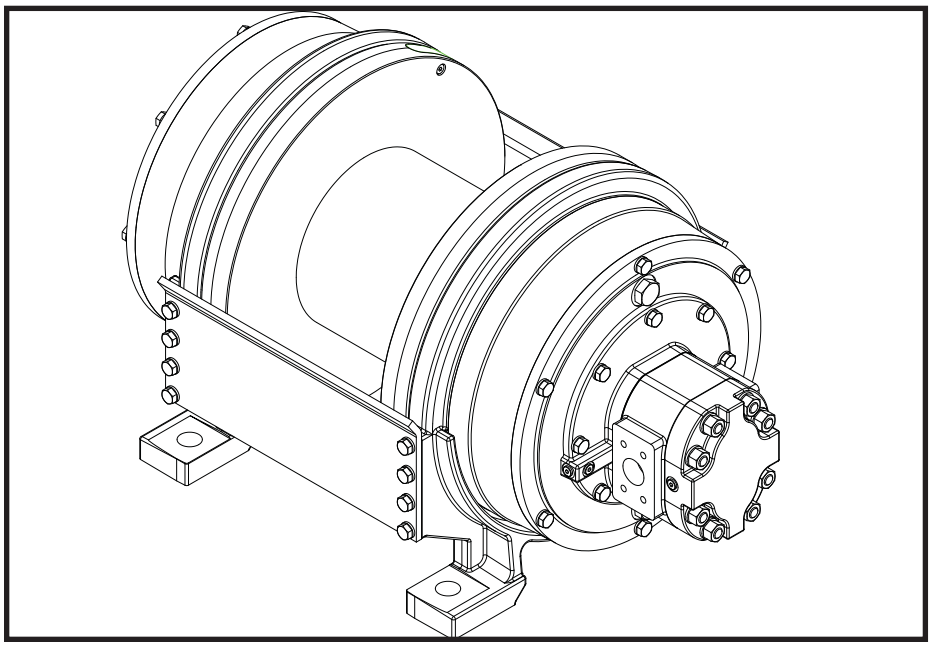
Gearmatic

GH30B

w/7 Bolt Motor Flange With and Without Free Fall Attachment

EQUAL SPEED HYDRAULIC HOIST
SERVICE AND MAINTENANCE MANUAL



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INTRODUCTION

The following service instructions have been prepared to provide assembly, disassembly, and maintenance information for the Gearmatic Model GH30B standard hoist. It is suggested that before doing any work on these units, all assembly and disassembly instructions should be read an understood.

Some illustrations in this manual may show details or attachments that are different from your hoist. Also, some components have been removed for illustrative purposes.

Continuing product improvement may cause changes in your hoist, which are not included in this manual. Whenever a question arises regarding your Gearmatic hoist or this manual, please contact Gearmatic Product Support Department for the latest available information.

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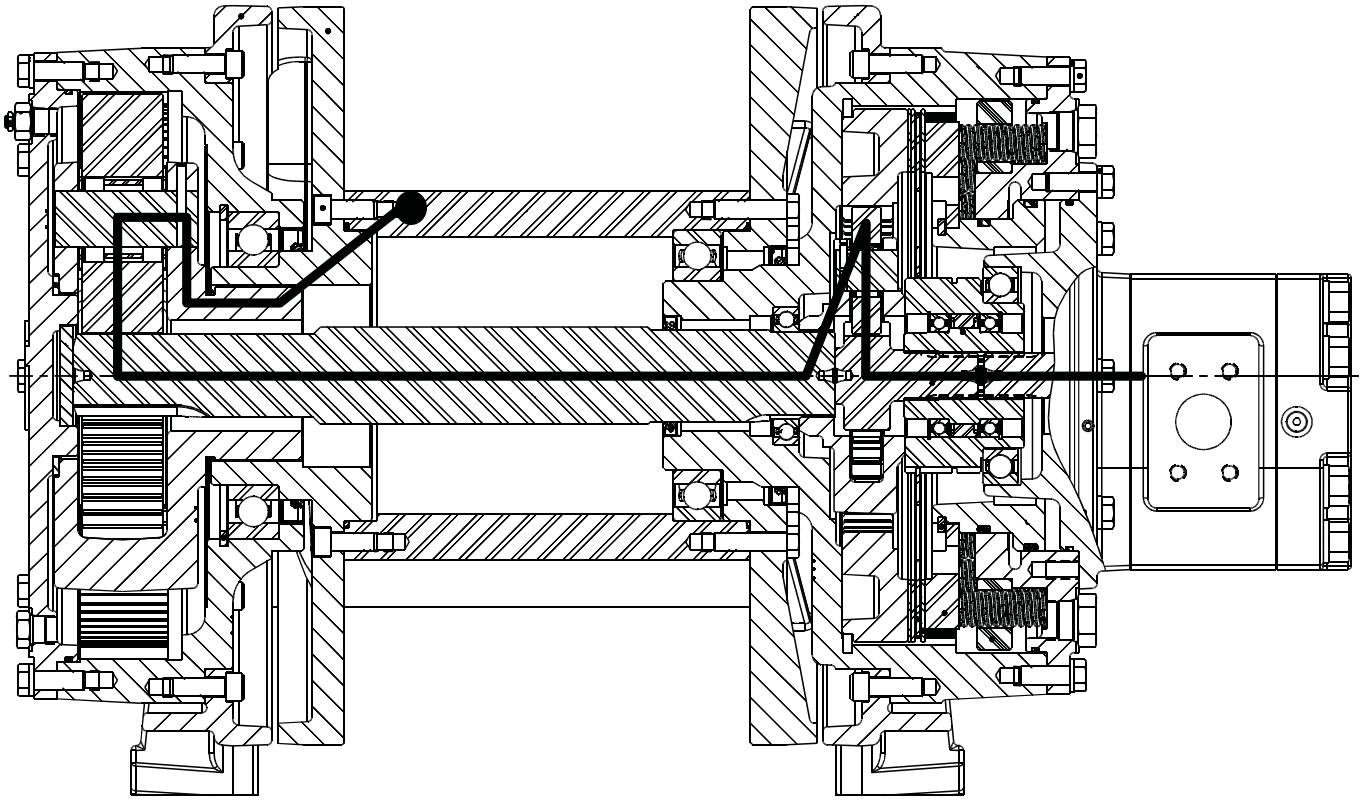
EXPLANATION OF MODEL NUMBER

GH30 B - SPL - 40 090 - 04

GH - DESIGNATES GEARMATIC HOIST
B - EVOLUTIONARY DESIGNATION
SPL - SPECIAL ORDER DESIGNATION
40 - TOTAL GEAR REDUCTION (40:1)
090 - MOTOR DISPLACEMENT (9 CU. IN/rev)
04 - DRUM OPTION
FF - FREE FALL EQUIPPED DESIGNATION



GENERAL SAFETY RECOMMENDATIONS

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure safety to others as well as yourself. To ensure safety, the prime mover and hoist must be operated with care and concern for the equipment and a thorough knowledge of the machine's performance capabilities. The following recommendations are offered as a general safety guide. Local rules and regulations will also apply.

1. Be certain equipment (boom, sheave blocks, pendants, etc.) is either lowered to the ground or blocked securely before servicing, adjusting, or repairing hoist.
2. Be sure personnel are clear of work area BEFORE operating hoist.
3. Read all warning and caution tags provided for safe operation and service of the hoist and become familiar with the operation and function of all controls before operating the hoist.
4. Inspect rigging and hoist at the beginning of each work shift. Defects should be corrected immediately. Do not operate a hoist with defects.
5. Keep equipment in good operating condition. Perform scheduled servicing and adjustments listed in the "Preventive Maintenance" section of this manual.
6. An equipment warm-up procedure is recommended for all start-ups and essential at ambient temperatures below +40°F (+4°C).
7. Do not exceed the maximum pressure (PSI, kPa) or flow (GPM, lpm) stated in the hoist specifications found in the specific sales brochure.
8. Operate hoist line speeds to match job conditions.
9. Protective gloves should be used when handling wire rope.
10. Never attempt to handle wire rope when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads, sheaves and hoist drum.
11. When winding wire rope on the hoist drum, never attempt to maintain tension by allowing wire rope to slip through hands. Always use "Hand-Over-Hand" technique.
12. Never use wire rope with broken strands. Replace wire rope that is damaged. Refer to wire rope supplier manual.
13. Do not weld on any part of the hoist without approval from PACCAR Hoist Engineering.
14. Use recommended hydraulic oil and gear lubricant.
15. Keep hydraulic system clean and free from contamination at all times.
16. Use correct anchor for wire rope and pocket in drum.
17. Do not use knots to secure or attach wire rope.
18. The Gearmatic designed wire rope anchors are not intended to support the rated load. ALWAYS maintain a minimum of five (5) wraps of wire rope on the drum. It is recommended that the last five (5) wraps of wire rope be painted bright red to serve as a visual reminder.
19. Never attempt to clean, oil or perform any maintenance on a machine with the engine or prime mover running, unless instructed to do so in this manual.
20. Never operate hoist controls unless you are properly positioned at the operators station and you are sure personnel are clear of the work area.
21. Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
22. Ground personnel should stay in view of the operator and clear of the hoist drum. Do not allow ground personnel near wire rope under tension. A safe distance of 1½ times the working length of the wire rope should be maintained.
23. Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the cable is wrapped onto the drum or drawn through guide rollers or potential "pinch points".
24. Install switches or valves that will shut off power to the hoist, in locations where they can be reached by anyone entangled in the wire rope before being drawn into the hoist or any "pinch point".
25. "Deadman" controls, which automatically shut off power to the hoist whenever the operator leaves his station or releases the hoist control lever, should be installed whenever practical.
26. Never allow anyone to position any part of body under a suspended load.
27. Avoid sudden "shock" loads or attempting to "jerk" a load free. This type of operation may cause heavy loads, in excess of rated capacity, which may result in failure of wire rope, hoist or crane structure.
28. Whenever possible, install the hoist in a location that is not immediately adjacent to a "normal" operator's station.
29. All hoist controls shall be located within easy reach of the operator. The controls shall be installed in such a location that the operator is removed from the electrical path to ground if the load, rigging, or wire rope come in contact with or within proximity to an electrically energized conductor.

GENERAL INSTALLATION

1 The hoist must be mounted with the centerline of the drum in a horizontal position. The mounting plane can be rotated to any position around this centerline, providing the vent plug is positioned above the oil level.

2. When mounting the hoist, use grade 8 capscrews or bolts and nuts using both mounting holes in each end plate. Use narrow, hardened washers under the bolt heads and nuts.

⚠ WARNING ⚠

DO NOT weld hoist to mounting surface. Welding may not provide adequate structural support for hoist loads. This may cause loss of load control, which could result in property damage, injury or death. Welding may also damage bearings and seals, resulting in premature failure.

3. The vent plug must always be located above the horizontal centerline of the hoist drum. If the hoist is mounted on a pivoting surface, be sure the vent remains above the centerline at all times. If necessary, reposition the bearing support.

4. It is important that the hoist be mounted on a surface that will not flex when the hoist is in use, since this could bind the working parts of the hoist. Also, be sure the hoist is mounted on a flat surface. If necessary, use shim stock to insure proper mounting. The mounting surface must be flat within 0.020 inches (.5 mm).

5. Hydraulic lines and components that operate the hoist should be of sufficient size to assure minimum back pressure at the hoist motor ports. To insure adequate static brake load holding ability, back pressure on the hoist should not exceed 100 psi (690 kPa).

6. Make certain that the hoist drum is centered behind the first sheave and the fleet angle does not exceed 1½ degrees.

The hoist should also be mounted perpendicular to an imaginary line from the center of the drum to the first sheave to ensure even spooling. (ref. drawing on page 4)

⚠ WARNING ⚠

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

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

8. The hydraulic oil filter should have a 10 micron nominal rating and be a full-flow type.

9. High quality hydraulic oil is essential for satisfactory performance and long hydraulic system component life.

Oil having 150 to 330 SUS viscosity at 100°F (38°C) and viscosity index of 100 or greater will give good results under normal temperature conditions. The use of an oil having a high viscosity index will minimize cold-start trouble and reduce the length of warm-up periods. A high viscosity index will minimize changes in viscosity with corresponding changes in temperature.

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

In general terms; for continuous operation at ambient temperatures between 50 and 110°F (10-43°C) use ISO VG 46 – 68 (SAE20); for continuous operation between 10 and 90°F (-12 and 32°C) use ISO VG 32 (SAE10W).

10. Install hydraulic oil circulating oil return line. See the hydraulic circuit drawing and circulating line size requirements on page 8.

⚠ WARNING ⚠

Using the free-fall brake to stop a load while it is in free-fall may result in death, personal injury, or property damage. For this reason, the full release free-fall circuit must be activated by a detent switch or valve.

DESCRIPTION OF OPERATION

DESCRIPTION OF HOIST

The hoist has three basic assemblies

1. Primary planetary housing and motor assembly

2. Final planetary housing assembly

3. Drum and Base assembly

The hydraulic motor is bolted to the primary housing cover bolted to the primary housing. The drum assembly is supported by both end plate assemblies which receive additional support from the side plates.

PLANETARY GEAR TRAIN

The hydraulic motor shaft is directly coupled to the inner race of the overrunning brake clutch. When driven by the primary sun gear, the primary planet gears walk around the ring gear in the primary housing and drive the primary planet carrier.

The primary planet carrier drives the output sun gear shaft which passes through the drum and drives the output planet gears. As the output planet gears are driven by the sun gear shaft, the planet gears walk around the ring gear machined in the final drive housing and drive the output planet carrier. As the output planet carrier rotates, it drives the drum through a splined connection.

BRAKE SYSTEM

The brake system contains three basic components.

1. Spring applied, friction disc brake

2. Overrunning brake clutch assembly

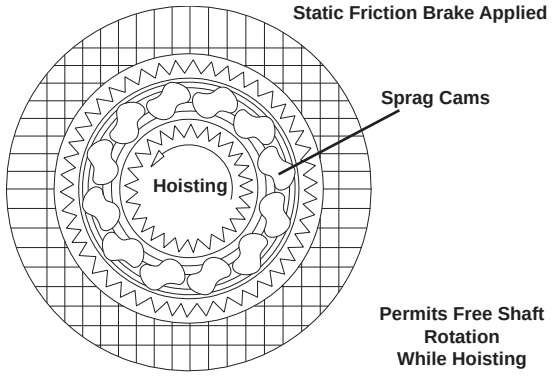
3. Hydraulic piston and cylinder

The brake consists of a friction disc which is internally splined to the outer clutch hub of the overrunning brake clutch. When spring force is applied, the brake piston clamps the brake plate which locks the overrunning brake clutch outer hub to the primary end housing.

The sprag type overrunning brake clutch is installed between the motor shaft and primary sun gear. The overrunning brake clutch allows the motor shaft to turn freely in the direction to haul-in cable and locks up to force the friction brake discs to turn with the motor shaft to pay out cable. The brake plate remains fully applied when hauling in cable and must be released by lowering pressure to pay out cable.

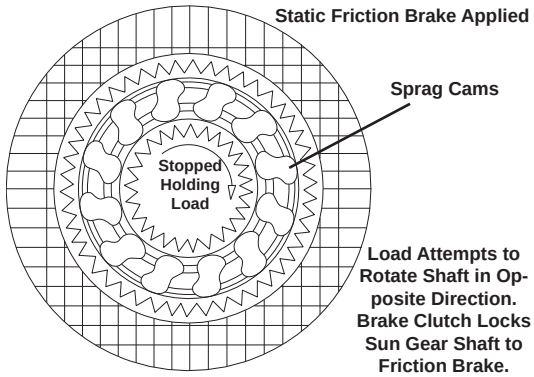
When hoisting or pulling a load, the brake clutch allows free rotation of the motor shaft and primary sun gear. The sprag cams lay over and permit the primary sun gear to turn free of the outer clutch hub. Figure 2. The friction brake remains fully engaged. The hoist is not affected by any braking action when hauling in.

Figure 2



When the haul in operation is stopped, the load attempts to turn the primary sun gear in the opposite direction. This reversed input causes the sprag cams to instantly engage and firmly lock the motor shaft and primary sun gear to the outer brake clutch hub. (Figure 3).

Figure 3



When the hoist is powered in reverse, to pay out cable, the motor and gear train will not rotate until sufficient lowering pressure is supplied to the brake release piston through the motor port to overcome the brake spring force. With no load on the hoist, approximately 400 PSI is required to compress the brake springs and allow the friction brake disc splined to the outer brake clutch hub to turn free. As lower pressure increases, the brake is gradually released allowing the motor to drive the gear train in reverse to pay out cable.

When the control valve is returned to neutral or “hold”, the lowering pressure will drop and the brake will apply to hold the load.

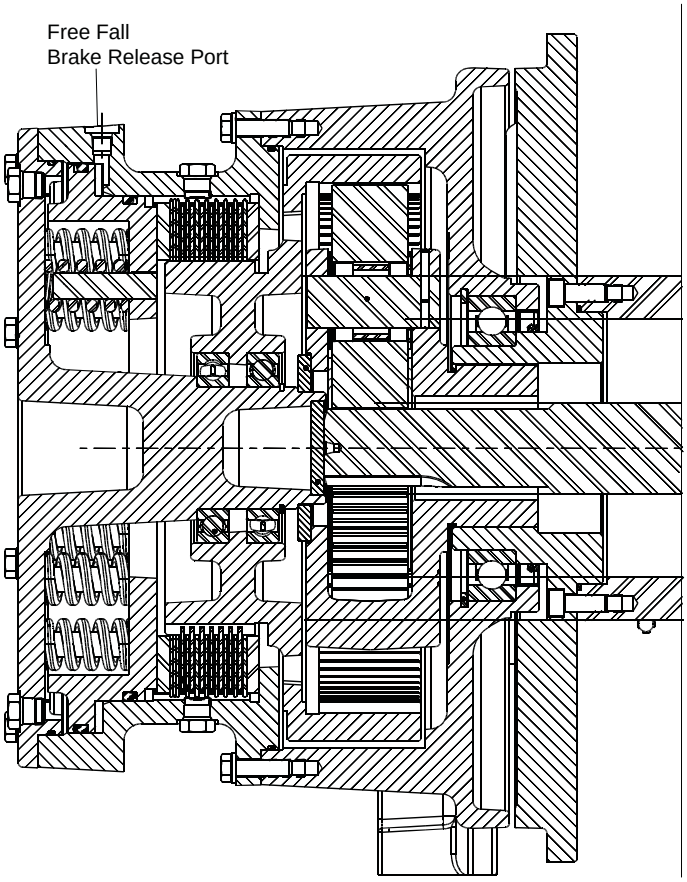
If the load on the drum barrel tries to drive the motor faster than the supply of oil will permit (i.e. if the motor tries to act as a pump), the hydraulic pressure acting on the brake piston will decrease, causing an increase in the effective spring load, resulting in an increase in braking effort. In this way, a balanced pressure is supplied to the motor and brake release piston according to the load on the hoist drum.

The speed of the hoist in reverse and forward is dependent only on the volume of oil supplied to the motor through the control valve.

DESCRIPTION OF FREE-FALL OPERATION

⚠ WARNING ⚠

Using the free-fall brake to stop a load while it is in free-fall may result in death, personal injury, or property damage. For this reason, the full release free-fall circuit must be activated by a detent switch or valve.



The primary sun gear is directly coupled to the hydraulic motor by over-running clutch in the static brake assembly. As the motor turns in the hoisting direction the planetary assemblies reduce the input speed of the motor and rotate the final planet carrier and winch drum.

The Free-Fall assembly contains the final drive planetary reduction for the winch. The final planet carrier is connected to the cable drum by splines and the internal ring gear is mounted on ball bearings. The internal ring gear is kept from rotating by a multi-disc brake. The brake is applied by springs that force the piston against the pressure plate which prevents the ring gear from rotating.

When hydraulic oil is introduced into the annular area between the piston and the freefall housing, the effective spring load is reduced as the hydraulic pressure increases. When a load is suspended on the winch cable and hydraulic pressure is applied to move the piston to the end of its travel, or the full release position, the internal ring gear and output carrier will rotate and allow the load to drop freely to the ground.

The free fall circuit must be activated by a detent switch. Release of the freefall brake with use of a metered and controlled hydraulic signal must be done by means of a detent type control. Using the freefall brake to stop a load during lowering once the freefall brake has been pressurized may result in winch damage.

Free Fall Release Pressure:

Initial Release - 420 psi (2896 kPa)
Full Release - 550 psi (3792 kPa)
Maximum Pressure - 1500 PSI (10,340 kPa)

HYDRAULIC CIRCUIT

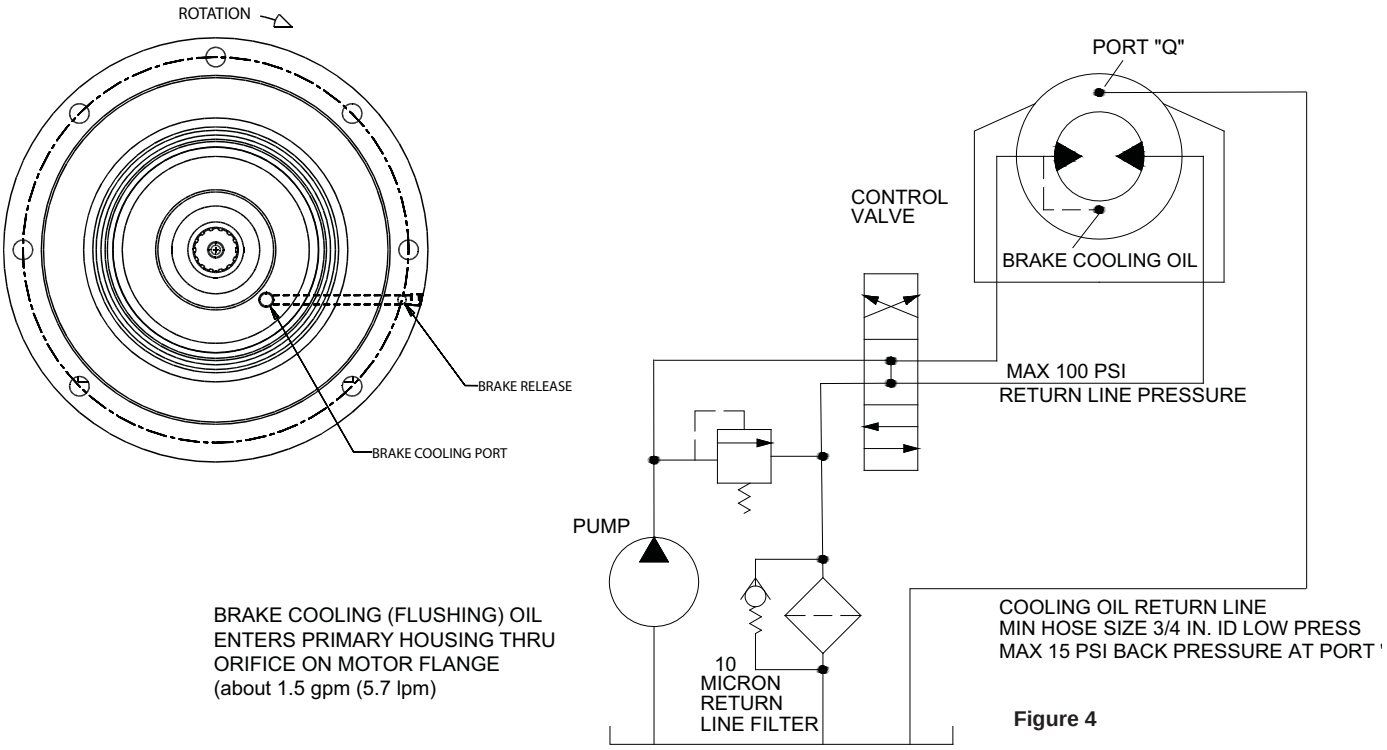


Figure 4

It is necessary to circulate oil through the primary housing. This provides cooling for the brake and also insures that the primary housing is completely filled with oil.

Figure 4 illustrates a basic hydraulic circuit. Oil is circulated through the primary housing so that it enters through the brake cooling orifice and leaves at port “Q”. Port “Q” should be located as close to top dead center as possible.

⚠ CAUTION ⚠

The pressure in the hoist case due to circulation must never exceed 15 psi. Excessive pressures will damage seals.

In order to maintain maximum efficiency in the hoist, select the size of hydraulic lines according to the maximum volume of oil to be used in the hoist (see Table). If the hydraulic lines used are too small, they may cause excessive back pressure at the reverse motor port sufficient to release the brake (125 psi maximum) (9/kg/cm^2).

The sizes shown in the table are to be used as a guide only. If trouble is experienced due to the use of long hoses it will be necessary to use hoses which are one size larger.

HOSE REQUIREMENTS		
Oil Flow GPM (l/min)	**Pressure Lines Inside Dia.**	**Return Lines Inside Dia.**
36-60 GPM (136-227 l/min)	1-1/4 in. (32 mm)	1-3/4 in. (44 mm)
61-80 GPM (228-303 l/min)	1-1/2 in. (38 mm)	2 in. (51 mm)
81-125 GPM (304-473 l/min)	2 in. (51 mm)	2-1/2 in. (64 mm)

Line from Port Q – ¾” (19 mm) Minimum

Once the hydraulic circuit has been completed, bleed all air from the primary housing before running the hoist.

In order to obtain smooth control during low speed lowering, it is recommended that the hydraulic pump is operated at maximum gpm (l/min) and that the control valve is used to control the speed.

WIRE ROPE INSTALLATION

⚠ WARNING ⚠

THE CABLE ANCHORS ALONE ON HOISTS ARE NOT INTENDED TO HOLD RATED LOADS.
Hoist loads applied directly to the wire rope anchor may cause the wire rope to pull free and result in the sudden loss of load control and cause property damage, personal injury or death. A minimum of 5 wraps of wire rope must be left on the drum barrel to achieve rated load.

The wedge and anchor pocket must be clean and dry. The end of the wire rope being anchored to the drum must be clean and dry and not frayed. Anything on the end of the wire rope to keep it from fraying (i.e. tape or wire) must not be in contact with the wedge when the installation is complete. Consult the wire rope manufacturer on the proper treatment of the dead end of the wire rope.

Some rope manufacturers recommend when using rotation resistant wire rope, that the rope end be seized, welded or brazed before inserting the wire rope into the wedge socket to prevent core slippage or loss of rope lay.

WIRE ROPE INSTALLATION

Winches built in August 2010 and later will be supplied with a cable drum that has two wire rope anchor pockets to enable the winch to be configured for underwound (Model code U) applications. Make certain to install the wire rope in the anchor pocket that is correct for your application.

⚠ WARNING ⚠

Attempting to use the incorrect wire rope anchor pocket may cause permanent damage to wire rope, cable drum and wire rope slipping free of wedge. These conditions may result in loss of load control, property damage, injury or death.

Take the free end of the wire rope and insert it through the small opening on the cable drum flange. Loop the wire rope and push the free end about 3/4 of the way back through the pocket. Install the wedge as shown in figure 1, then pull the slack out of the wire rope. The “dead” end of the rope needs to extend slightly beyond the end of the wedge as shown in figure 2.

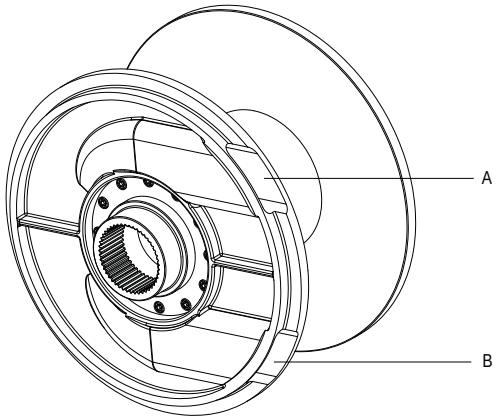
Using a hammer and brass drift, drive the wedge as deep into the pocket as possible to ensure it is fully seated and no further movement is detected. Applying a load on the wire rope will also help seat the wedge in the pocket.

Check to ensure the wedge does not protrude from either end of the pocket, causing it to interfere with proper spooling of wire rope onto the drum (see figures 1 & 2).

If there is interference or the wedge does not seat firmly, contact the Gearmatic Technical Support Department at 1-918-251-8511 to determine the proper wedge size.

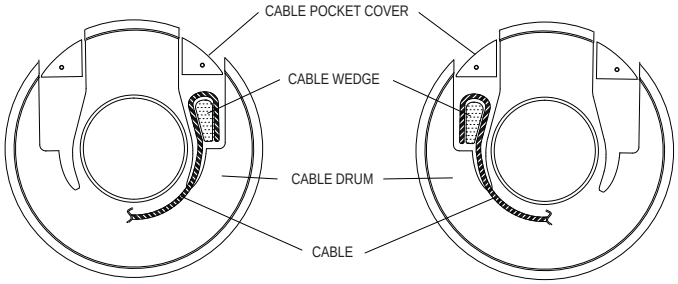
It is important that the wire rope have the proper tensioning when it is installed on the drum. When the wire rope is first installed, you should operate the hoist, with light to moderate loads, with reeving that let’s you place these loads on the block and the drum with all the rope off the drum except for the last five wraps.

CABLE WEDGE PLACEMENT



A) Wire rope anchor pocket for standard rotation. Drum rotates counter clockwise (CCW) to hoist a load when viewed from the motor end.

B) Wire rope anchor pocket for underwound rotation. U is the last character in the model code. Drum rotates clockwise (CW) to hoist a load when viewed from the motor end.



Cable Wedge Installation for -07 Drums

Check to ensure the wedge does not protrude from either end of the pocket, causing it to interfere with proper spooling of wire rope onto the drum (see figures 9 & 10). If there is interference or the wedge does not seat firmly, contact the Braden Product Support Department at 918-251-8511 to determine the proper wedge size.

It is important that the wire rope have the proper tensioning when it is installed on the drum. When the wire rope is first installed, you should operate the hoist, with light to moderate loads, with reeving that let's you place these loads on the block and the drum with all the rope off the drum except for the last three wraps.

Correct Installation

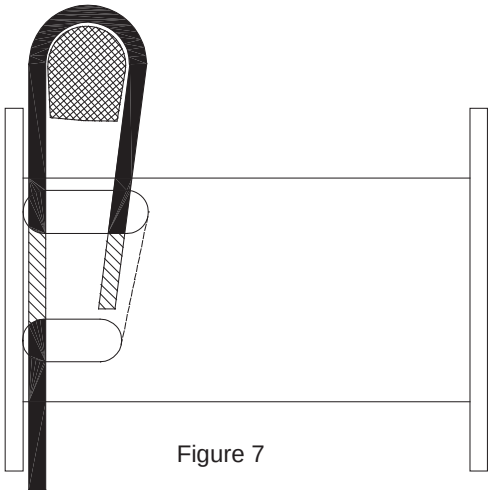


Figure 7

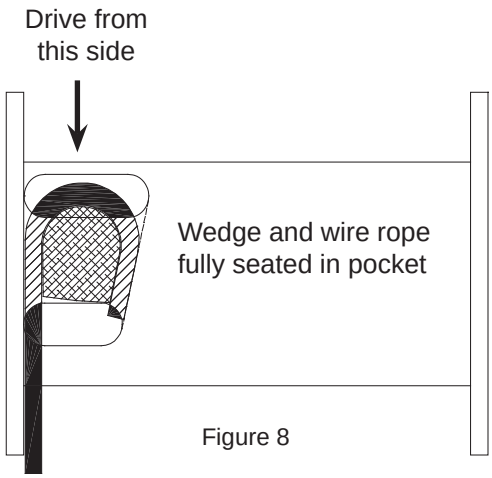
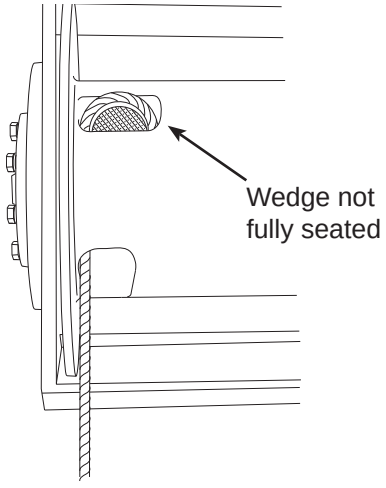


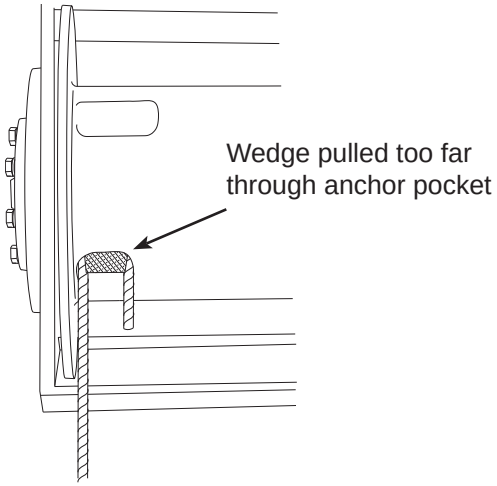
Figure 8

Incorrect Installation



- Wire rope not tight against wedge
- Wedge may be too large

Figure 9



- "Dead" end of wire rope and/or wedge may interfere with proper spooling
- Wedge may be too small

Figure 10

WIRE ROPE WEDGE PART NUMBERS

WEDGE PART NO.

24493 for 1/2 thru 5/8 in. (13 - 16 mm)

* 24494 for 3/4 thru 1 in. (19 - 25 mm)

* Standard Anchor

HOIST OPERATION

The following warnings and instructions are basic to safe hoist operation. Please read them carefully and follow them each time your hoist is operated. These instructions are provided in addition to any information furnished by the Original Equipment Manufacturer. Equipment operators should be completely familiar with the overall operation of the piece of equipment on which the hoist is mounted (i.e. crane, truck crane, etc.). If you have any questions concerning the safe operation of this hoist or the equipment it is mounted on, contact the equipment manufacturer that installed the hoist, or the Braden Product Support Department at 1-918-251-8511, Monday through Friday, 0800 to 1630 hours CST, by fax at 1-918- 259-1575, or via the internet at www.paccarwinch.com.

⚠ WARNING ⚠

Ground personnel must stay in view of the operator and clear of the load and hoist drum at all times. Do not allow personnel near the hoist line under tension. Do not allow personnel near the hoist drum while the hoist is in operation. Do not allow personnel to be in line with the load. Do not allow personnel to stand under a suspended load. A safe distance of at least 1½ times the working length of the cable should be maintained by ground personnel. A broken cable and/or lost load may cause property damage, personal injury or death.

⚠ WARNING ⚠

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

⚠ WARNING ⚠

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

⚠ WARNING ⚠

Using the free-fall brake to stop a load while it is in free-fall may result in death, personal injury, or property damage. For this reason, the full release free-fall circuit must be activated by a detent switch or valve.

Warm-up Procedures

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

The engine should be run at its lowest recommended RPM with the hydraulic hoist control valve in neutral allowing sufficient time to warm up the system. The hoist should then be operated at low speeds, raise and lower with no load on the hook, several times to prime all lines with warm hydraulic oil, and to circulate gear lubricant through the planetary gear sets.

⚠ CAUTION ⚠

If the hoist is mounted on a crane that has an extendable boom, care must be taken to pay-out cable as the boom is extended. Failure to pay-out sufficient cable could result in a “two-blocking” condition that could result in damage to and/or failure of the hoist, cable, sheaves and/or boom.

After the hoist/boom is properly positioned, we recommend the operator slowly pay-out, then haul-in a short length of cable. The hoist should perform these operations in a smooth and controlled manner. If the hoist does not operate smoothly or makes any unusual sounds, the source of the problem should be identified and corrected before any attempt is made to lift a load.

Slowly pay-out wire rope from the hoist drum until it reaches the load. Securely fasten the hoist cable to the load and be sure all ground personnel are a safe distance from the load. Slowly lift the load a short distance and stop. A small amount of “bounce” may be observed, depending on the weight of the load, size and type of wire rope, reeving and the amount of boom extension. Allow the load to stabilize and then watch for any sign of downward movement or cable drum rotation. The hoist static brake should hold the load in place without allowing any downward movement at all. If the load creeps down, it should be lowered to the ground immediately and the source of the problem identified and corrected.

If the hoist is holding the load securely, proceed with normal operations in accordance with the equipment manufacturer’s operating procedures and load charts.

PREVENTATIVE MAINTENANCE

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

The user of Gearmatic hoist products is responsible for hoist inspection, testing, operator training and maintenance noted below with frequency dependent upon the severity of the hoist duty cycle and the thoroughness of the preventive maintenance program. Field experience, supported by engineering tests, indicate the three service procedures listed below are the most critical to safe, reliable hoist operation and MUST be observed.

- Regular Gear Oil Changes -
- Use of Proper Gear Oil – recommended type for prevailing ambient temperatures and additives.
- Periodic Disassembly and Inspection of All Wear Components – in compliance with ANSI specification B30.5c, 1987 and API RP 2D.

Crane inspection records as well as records of preventive maintenance, repairs and modifications must be available for a minimum of five (5) years. These records should include but not limited to, hoist model and serial number, name and employer of repair technician, date and description of work performed.

Pre-use Inspection (each shift the hoist is used): This inspection must be performed prior to placing the crane into service and then as necessary during the day for extended operation.

1. Check for external oil leaks and repair as necessary. **This is extremely important due to the accelerated wear that can be caused by insufficient lubricating oil in the hoist.** Lubricant level must be visible in the lower half of the sight glass. Use only recommended lubricants. See Recommended Lubricants chart in this manual.
2. Check hydraulic plumbing for damage, such as chafed or deteriorating hoses and repair as necessary.
3. Visually inspect for loose or missing bolts, pins, keepers or cotter pins and replace or tighten as necessary.
4. The gear oil should be changed after the first 100 hours of operation or 30 days. The regular gear oil change intervals may be adopted after the first oil change.
5. Inspect the full length of wire rope, rigging and all sheaves according to the wire rope and crane manufacturer's recommendations.
6. A warm-up procedure is recommended at each start-up and is mandatory at ambient temperatures below +40°F (4°C). The engine should be run at its lowest RPM with the hydraulic hoist control in neutral allowing sufficient time to warm up the system. The hoist should then be operated at low speeds, hoisting and lowering with no load, several times to prime all hydraulic lines with warm oil and to circulate lubricant through the planetary gear sets.

⚠ WARNING ⚠

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

Quarterly Inspection (every 3 months) or monthly in Severe Duty Applications or prior to placing the machine in service if it has not been used for three months or more.

1. Perform the Pre-use Inspection.
2. Inspect all hoist fasteners for tightness and corrosion. Replace all corroded fasteners and tighten per the torque specifications on page 15.
3. The hydraulic system filters should be changed after the first 50 hours of operation then every 500 hours or quarterly or in accordance with the crane manufacturer's recommendations.
4. Take a sample of the gear oil from the hoist drum following the oil sampling procedure on page 15. The oil sample must be taken prior to changing the gear oil. Analyze the sample for wear metals, viscosity, signs of overheating, oxidation, water and other contaminants. If the oil sample contains an unusual amount of metallic particles, the hoist should be removed from service and undergo a tear-down inspection.

Annual Inspection, Testing & Preventive Maintenance or semi-annually in Severe Duty Applications.

1. Perform the Pre-Use and Quarterly Inspections.
2. Change the lubricating oil in the hoist drum after an oil sample is taken.

⚠ WARNING ⚠

The gear oil must be changed to remove wear particles that impede reliable and safe operation of the brake clutch and erode bearings and seals. Failure to change gear oil at recommended intervals may contribute to intermittent brake slippage, loss of load control, injury or death.

The gear oil should be changed whenever the ambient temperature changes significantly and an oil from a different viscosity range would be more appropriate. Oil viscosity is critical to reliable brake clutch operation. Our tests indicate that excessively heavy or thick gear oil may contribute to intermittent brake clutch slippage. Make certain the gear oil viscosity used in your hoist is correct for your prevailing ambient temperature.

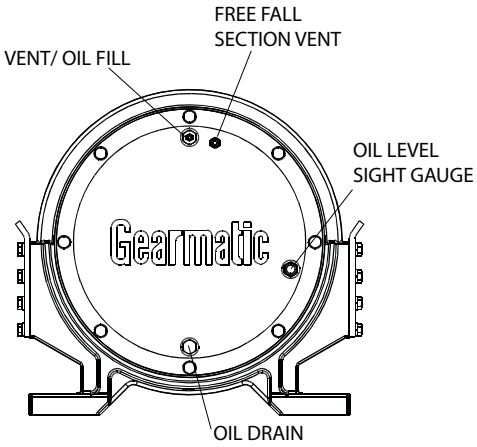
⚠ WARNING ⚠

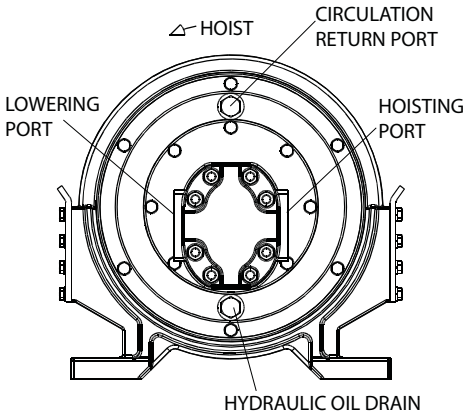
Failure to use the proper type and viscosity gear oil may result in loss of load control, property damage, injury or death.

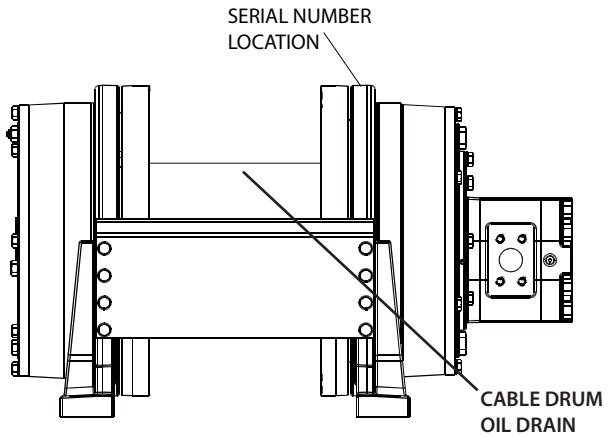
NOTE: *If the oil sampling/analysis has not been performed as required, tear-down inspections will be required. Refer to Hoist Disassembly section of this manual.*

To change the hoist gear oil, remove the drain plugs in the support end of the hoist and the drum. Remove the vent plug in the support end housing for faster draining. After the oil is completely drained, reinstall the drain plugs and refill the output housing with one of the recommended oils listed on page 14 to the oil level plug or to the center of the sight gage if installed. Fill the primary housing with hydraulic oil before operating the hoist.

3. The vent plug is located on the drum bearing support end of hoist. It is important to keep the vent plug clean and unobstructed. Whenever the gear oil is changed, the vent plug should be removed, cleaned in solvent and reinstalled. Do not paint over the vent plug or replace with a solid plug or grease fitting.



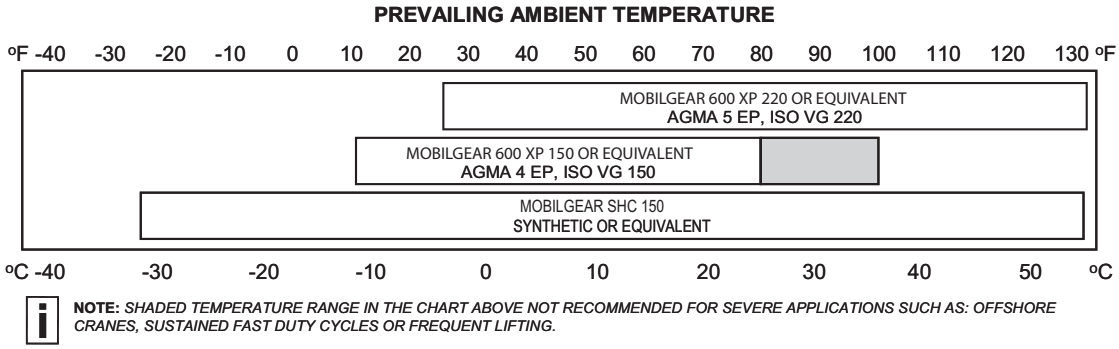




Recommended Planetary Gear Oil

⚠ WARNING ⚠

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



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

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

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

OIL CAPACITY FOR THE GH30B -01 and -04 DRUM EQUIPPED IS 16 PINTS (7.60 LITER)

Tear-down Inspection

Any hoist that has not been subjected to regular oil sample analysis should undergo a tear-down inspection every 24 months. Also, if a hoist has an unknown history of repair and/or maintenance, the hoist should undergo a tear-down inspection prior to being placed into service.

A tear-down inspection of the hoist should include the complete disassembly, cleaning, inspection and replacement of all worn, cracked, corroded or distorted parts such as pins, bearings, shafts and brake components. All seals and o-rings should be replaced during a tear-down inspection. Always use new Spirol pins in the planet gear shafts.

Any deficiency must be corrected Immediately.

Before placing the hoist back in service, the rebuilt hoist must be pull tested to the rated load of the hoist with a dynamometer or equivalent measuring device. The hoist should be dynamically tested by rotating the drum several times, in both raising and lowering directions, while under load of at least 30 % of the hoist rated lifting capacity. Check for smooth, quiet operation during this procedure.

OIL SAMPLING AND ANALYSIS

Proper oil sampling and analysis of the sample, is a vital part of a comprehensive preventive maintenance program. Information obtained from the oil analysis is best utilized in conjunction with a regular program of preventive maintenance. The early warning of abnormal wear provided by an analysis program allows the user to substitute preventive maintenance for a far more costly and dangerous failure that may lead to loss of load control that could result in property damage, personal injury or death. Early detection of accelerated component wear allows the scheduling of corrective maintenance and can reduce in-operation failures and costly down time.

Taking a Valid Oil Sample

Prepare the hoist by cleaning the drain area and drain extension tube in order to obtain an uncontaminated sample. Operate the hoist in both directions for one to two minutes and then take the oil sample from the drain port as soon as possible. Do not take the sample from the first oil out of the drain port. Take a sample from the mid-stream flow of the oil to obtain an accurate representation of the oil condition. After taking an oil sample, refill hoist with recommended lubricant.

⚠ WARNING ⚠

Hot oil may cause personal injury and/or burns to unprotected skin. Make certain the oil has cooled to a safe temperature (less than 110°F or 43°C) before taking an oil sample, changing oil or servicing the hoist.

Analysis

General Guide Lines
(After approximately 250 hours of operation)

Note: *The first oil change usually contains more "wear metals". Following the initial break-in period, the wear metal levels should stabilize at a lower number.*

Iron Contaminates

100 to 400 ppm	Normal
400 to 700 ppm	Caution – Abnormal Sample (monitor more frequently), tear-down inspection may be required.
701 ppm & up	Unacceptable – Abnormal Sample (tear down inspection required)

In all contaminate monitoring, equally important as the level of contamination, is the change in the amount of contamination compared to previous samples.

Moisture contamination will lead to the formation of acids that damage all internal components. Silica found in the oil typically indicates "dirt" and contaminated lubricant supply or poor maintenance practices.

RECOMMENDED BOLT TORQUE

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

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

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

RECOMMENDED FASTENER TORQUE

		Torque (LB-FT)			
Bolt Dia.	Thds Per	Grade 5		Grade 8	
Inches	Inch	Dry	Lubed	Dry	Lubed
1/4	20 28	8	6	12	9
5/16	18 24	17	13	24	18
3/8	16 24	31	23	45	35
7/16	14 20	50	35	70	50
1/2	13 20	75	55	110	80
9/16	12 18	110	80	150	110
5/8	11 18	150	115	210	160

		Torque (LB-FT)			
Bolt Dia.	Thds Per	Grade 5		Grade 8	
Inches	Inch	Dry	Lubed	Dry	Lubed
3/4	10 16	265	200	380	280
7/8	9 14	420	325	600	450
1	8 14	640	485	910	680
1 1/8	7 12	790	590	1290	970
1 1/4	7 12	1120	835	1820	1360
1 3/8	6 12	1460	1095	2385	1790
1 1/2	6 12	1940	1460	3160	2370

TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
A		
Hoist will not pull maximum load.	1. System relief valve may be set too low.	Install a pressure gauge in the hoisting port and apply a stall pull on the hoist. If pressure is low, increase relief valve setting until recommended pressure is obtained. NOTE: If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.
	2. If this trouble occurs suddenly after working at a maximum pull, a particle of dirt may be lodged under the system relief valve, holding it partially open. If this is the cause, a considerable loss in line speed may be noticed as the load on the cable is increased.	Remove relief valve, disassemble and clean parts thoroughly in a suitable solvent. Reassemble and install relief valve. Reset pressure according to specifications.
	3. If the pump is belt driven, the belts may be slipping.	Check belts when pump is at full PSI (kg/cm^2) (stall pull on hoist). Tighten belts if they are found to be slipping.
	4. The oil level in the reservoir may be too low. The suction line may be restricted or have an air leak causing cavitation at the inlet port. This will cause the pump to make a whining noise.	Check oil level in the reservoir. Check the suction line for damage, externally and internally. Replace suction line if necessary.
	5. The hoist may be mounted on an uneven or flexible surface which causes distortion of the hoist base and binding of the gear train. Binding in the gear train will absorb horsepower needed to generate the rated line pull and cause heat.	Reinforce mounting surface. If necessary, use steel shim stock to level hoist. First loosen, then evenly retighten all hoist mounting bolts to recommended torque.
	6. Be certain hydraulic system temperature is not more than 180 degrees F. Excessive hydraulic oil temperatures increase motor internal leakage and reduce motor performance.	Same as remedy for A-5. Same as remedy for B-4.
	7. Hoist line pull rating is based on 1st layer of wire rope. Expected line pull may be in excess of hoist rating.	Refer to hoist performance charts for additional information.
	8. After all the causes listed above have been investigated and it is found that the hoist will stall at maximum pressure without developing the maximum pull on the bare drum, the trouble may be in the hoist.	Install a pressure gauge in the motor haul-in port and apply a stall pull on the hoist. If the pressure is up to maximum and the bare drum line pull is less than the specified line pull, the trouble may be in the hoist or hydraulic motor. Disassemble hoist according to disassembly instructions and check that gear train turns freely. If gear train is found to be satisfactory, inspect the hydraulic motor, according to the service instructions for the hydraulic motor.

TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
B Considerable reduction in line speed.	1. Same as A-2. 2. Same as A-4. 3. Same as A-6. 4. If this trouble has increased gradually, the hydraulic pump or hoist motor may be worn.	Same as remedy for A-2. Same as remedy for A-4. Same as remedy for A-5 and B-4. Remove and inspect pump. If satisfactory, consult the disassembly instructions for the hoist and remove and inspect the motor according to the service instructions for the hydraulic motor.
C Reverse speed in slower than forward speed.	1. Control valve may be restricted in its travel. 2. Same as A-1. 3. Oil may be too thick causing a high resistance to rotation at the brake plates and causing the relief valve to by-pass. 4. Same as F-1.	Check the travel of the control valve spool. The spool travel should be the same in both directions. Same as remedy for A-1. Follow warm-up procedure in “Preventive Maintenance” section. Same as remedy for F-1.
D Brake will not hold when control valve is returned to neutral after lifting a load.	1. Excessive system back pressure acting on the brake release port. 2. Friction brake will not hold due to worn or damaged brake discs. 3. Brake clutch is slipping.	Install a pressure gauge at the lowering port of the hydraulic motor. Operate the pump at full throttle and monitor pressure in “neutral” and haul-in positions. If the pressure is greater than 100 PSI, check for restrictions in the return line from the hoist to the control valve and the control valve to the reservoir. Disassemble hoist to inspect/replace worn parts. Improper hydraulic oil may cause the brake clutch to slip. Replace brake parts and refill reservoir with recommended hydraulic oil. Brake clutch may be damaged or worn. Disassemble and inspect brake clutch.
E Brake will not control or stop the load when lowering.	1. Same as D-1, 2, or 3. 2. Hoist is being overloaded. 3. After the causes listed above have been investigated and found to be satisfactory, the trouble may be in the hoist.	Same as remedies for D-1, 2, or 3. Install a pressure gauge at the haul-in port and apply a stall pull on the hoist. If the pressure is higher than the maximum specified PSI, reduce the pressure. Disassemble the primary drive assembly according to the disassembly instructions. Inspect the brake springs, brake plate and brake hub assembly. Check that the brake hub assembly will “lock up” in the required direction of rotation.

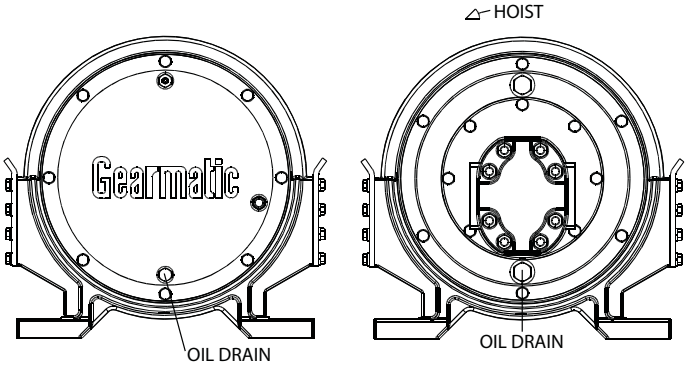
TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
F		
The hoist will not lower the load or not lower the load smoothly.	1. The friction brake may not be releasing as a result of a defective brake piston seal. NOTE: If the brake piston seal is defective, you will usually notice excessive oil flow from the hoist vent line.	Check brake piston seals.
	2. Friction brake will not release as a result of damaged brake disc.	Disassemble brake to inspect brake discs.
	3. Hydraulic system flow too low for smooth operation of hoist motor and brake release.	Operate pump at maximum RPM.
	4. Same as B-4.	Same as remedy for B-4.
	5. Same as A-3.	Same as remedy for A-3.
	6. Same as A-5.	Same as remedy for A-5.
	7. Control valve handle being operated too quickly.	Operate control valve smoothly when starting and stopping a load. Conduct operator training as required.
	8. No oil circulating through the hoist.	Install oil circulation line. See section on hydraulic circuit.
	9. Control Valve does not have good metering characteristics.	See “Hoist Installation” sections for control valve specifications.
G		
The hoist runs hot.	1. Same as A-5.	Same as remedy for A-5.
	2. Be certain that the hydraulic system temperature is not more than 180 degrees F. Excessive hydraulic oil temperatures may be caused by:	
	A. Plugged heat exchanger.	Thoroughly clean exterior and flush interior.
	B. Too low or high oil level in hydraulic reservoir.	Fill/drain to proper level.
	C. Same as A-1.	Same as remedy or A-1.
	D. Hydraulic pump not operating efficiently.	Remove and inspect pump. Check suction line for damage. If pump is belt driven, belts may be slipping. Replace/tighten belts.
	3. Excessively worn or damaged internal hoist parts.	Disassemble hoist to inspect/replace worn parts.
	4. Circulation oil drain line may be restricted.	Inspect the vent drain line for damage or restrictions.
H		
Hoist “chatters” while raising rated load.	1. Same as A-1.	Same as remedy for A-1.
	2. Same as B-4.	Same as remedy for B-4.
	3. Same as F-3.	Same as remedy for F-3.
	4. Same as F-7.	Same as remedy for F-7.

HOIST WITHOUT FREE FALL DISASSEMBLY

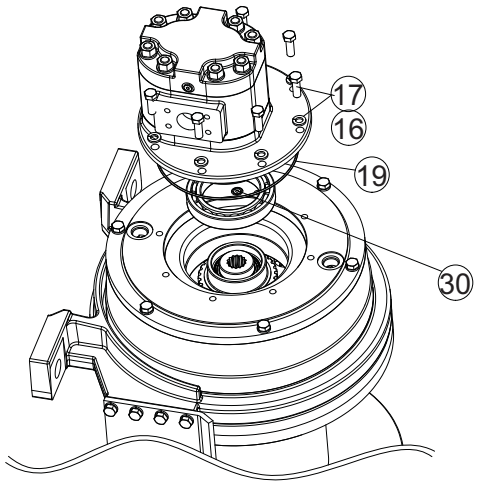
⚠ CAUTION ⚠

The GH30B weighs approximately 1500 lbs (680 kg). Make certain lifting equipment has adequate capacity. Using undersized or poorly maintained lifting equipment may result in a dropped load, property damage injury or death.

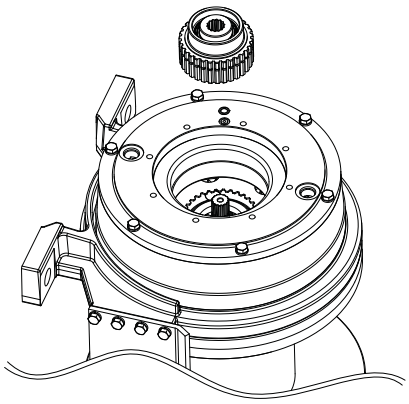


1. Remove the wire rope from the hoist. Drain the gear oil by removing the oil fill plug and the drain plug from the output gear side of the hoist. Drain the hydraulic oil from the input side of the hoist by removing the drain plug and the return hose.

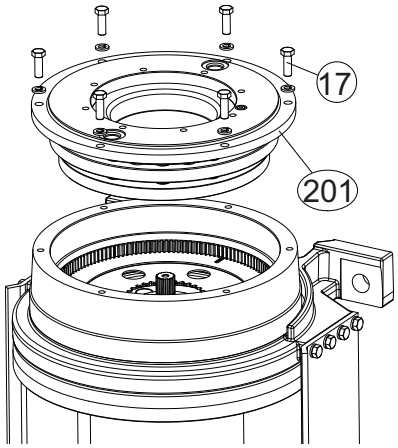
2. Remove the hydraulic hoses and mounting bolts, and clean the outside surface of the hoist in preparation for disassembly. To ease aligning parts on reassembly, mark the hoist bolted connections with a paint pin or scribe line.



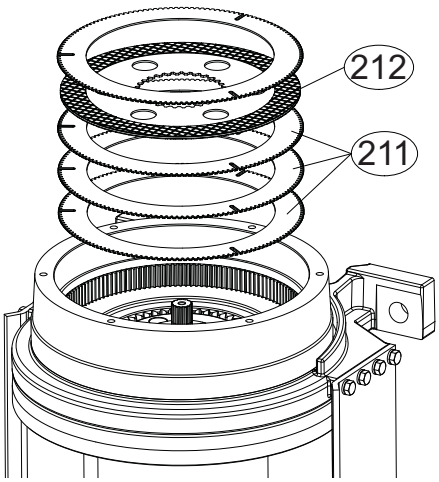
3. Stand the hoist on the output end. Remove the seven capscrews (17) and lockwashers (16) securing the motor to the primary housing cover and lift the motor off the hoist. Remove and discard the motor flange o-ring (19) and the brake release o-ring (30).



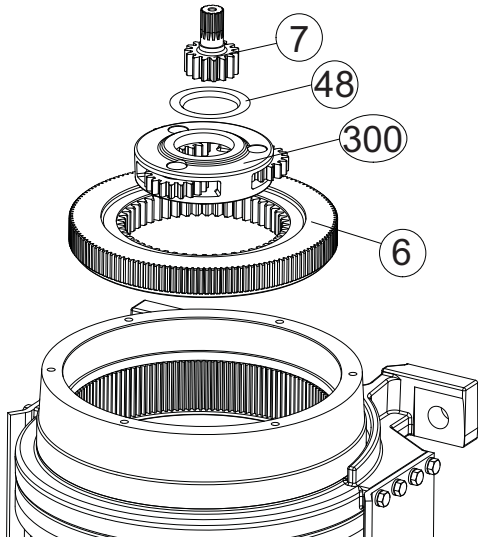
4. Remove Overrunning clutch assembly.



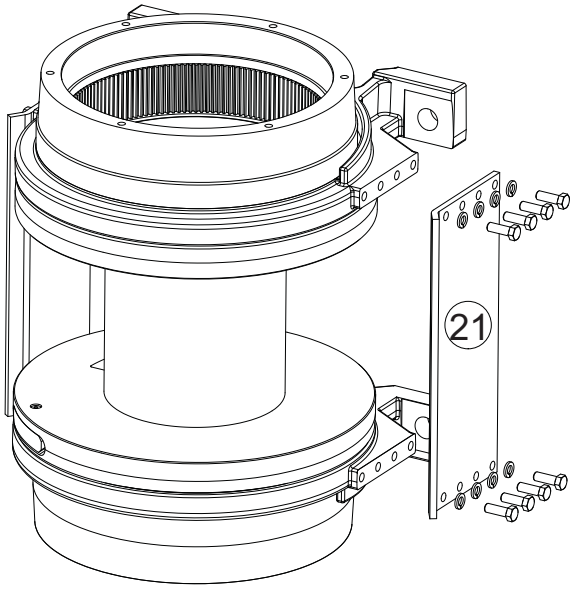
5. Note: The brake parts group will come out of the hoist with the primary housing cover because the parts are captured by the retaining ring (209). Remove the spring tension from the primary housing cover (201) by loosening the six capscrews (17) one turn each alternating across the housing. Remove the primary housing cover turning in a slight rotary motion when lifting out of the housing.



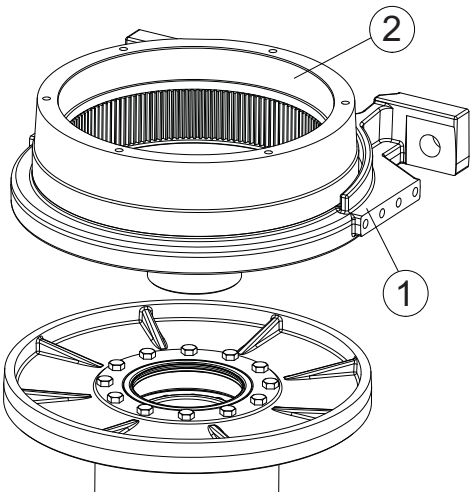
6. Remove the divider plates (211), and brake plate (212).



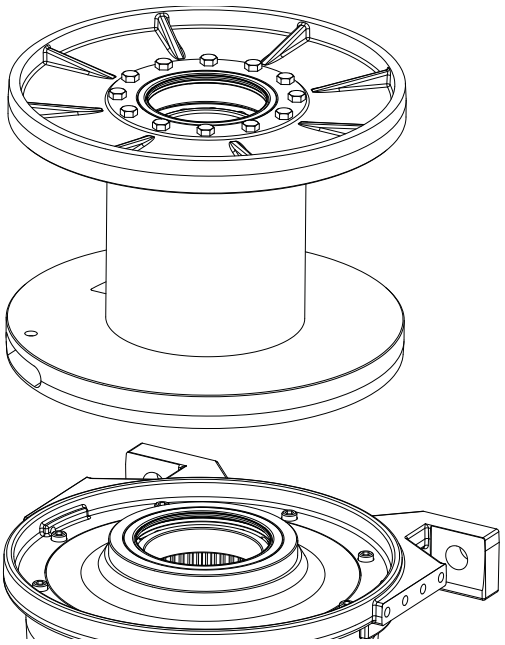
7. Remove the primary sun gear (7), thrust washer (48), primary planet carrier assembly (300), and primary ring gear (6).



8. Mark the tie plates to the side of the hoist to ease re-assembly. Remove the tie-plate capscrews and lock-washers and remove the tie-plates (21).



9. Remove the primary housing (2) and end-plate (1). Use eye-bolts and lift straight up off of the drum.



10. Remove the sun gear shaft (5). Use lifting clamps to lift the drum assembly straight up and off of the final drive housing.

If hoist has Free Fall, refer to Free Fall Disassembly on next page for remaining steps.

11. Place the final drive housing with the drum side down and remove capscrews (17) and lockwashers (16). Remove final drive housing cover (4).

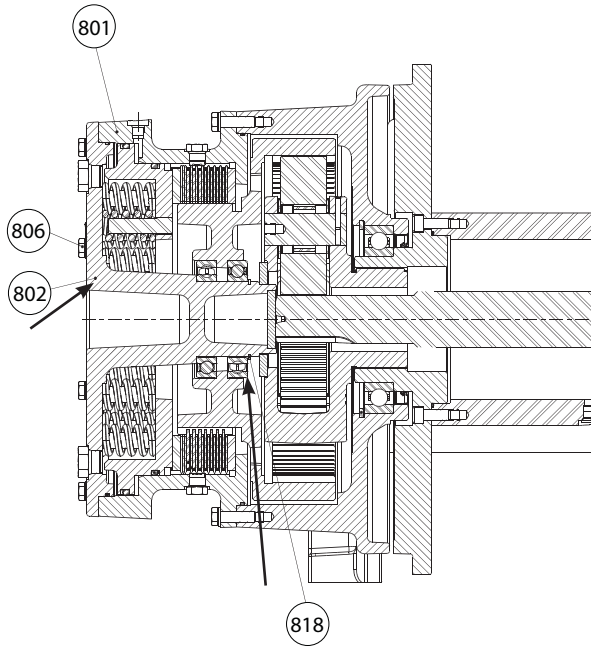
12. Remove thrust washer (26), thrust button (27), and output planet carrier assembly (400).

Refer to subassembly sections for disassembly and assembly of subassemblies.

HOIST WITH FREE FALL DISASSEMBLY

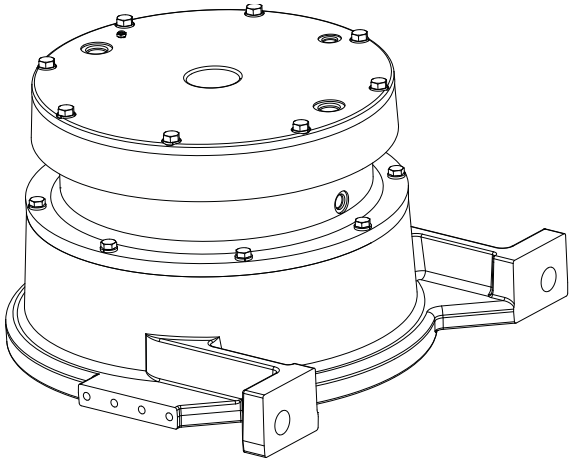
⚠ WARNING ⚠

DO NOT remove bolts (806) which fasten the bearing support (802) to the freefall housing (801) until the free fall assembly is removed from the hoist and retaining ring (818) is removed from the bearing support (802). Removing the bearing support bolts (806) with the retaining ring (818) on the bearing support will apply free fall spring force to retaining ring (818) and may result in property damage, personnel injury, or death. (Item numbers refer to drawing below.)

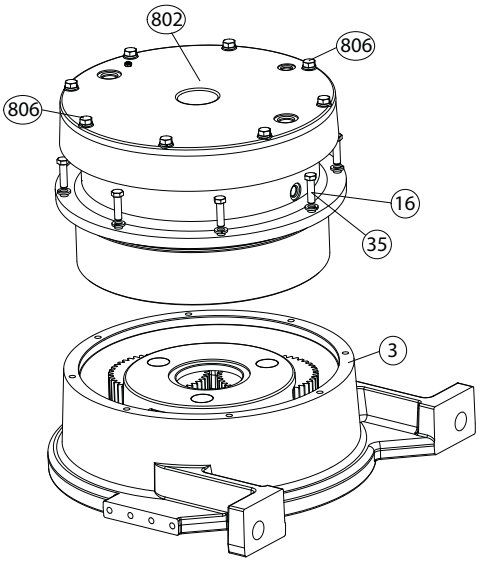


⚠ CAUTION ⚠

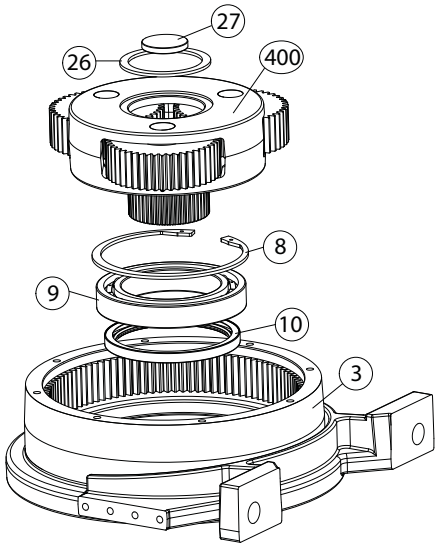
The complete freefall assembly must be removed to service the internal parts, because the bearing support (802) cannot be removed without first removing the freefall assembly at the support end-plate (3). This is done by removing the bolts and lockwashers (35 & 16).



1. Stand the freefall end of the hoist with the drum side down and place blocks under the end plate to balance the assembly.



2. Remove capscrews (35) and lockwashers (16) which secure the freefall assembly to the endplate (3). Remove two capscrews (806) in the bearing support, and install ½" -11 eyebolts in their place to lift the freefall assembly from the support endplate (3).



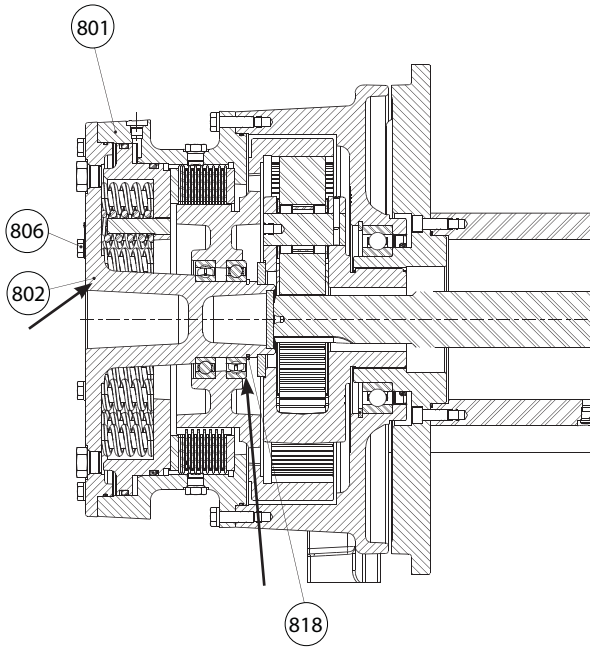
3. Remove the thrust button (27) and the output planet carrier assembly (400) from the endplate.

Refer to subassembly sections for disassembly and assembly of subassemblies.

FREE FALL ATTACHMENT

⚠ WARNING ⚠

DO NOT remove bolts (806) which fasten the bearing support (802) to the freefall housing (801) until the free fall assembly is removed from the hoist and retaining ring (818) is removed from the bearing support (802). Removing the bearing support bolts (806) with the retaining ring (818) on the bearing support will apply free fall spring force to retaining ring (818) and may result in property damage, personnel injury, or death. (Item numbers refer to drawing below.)



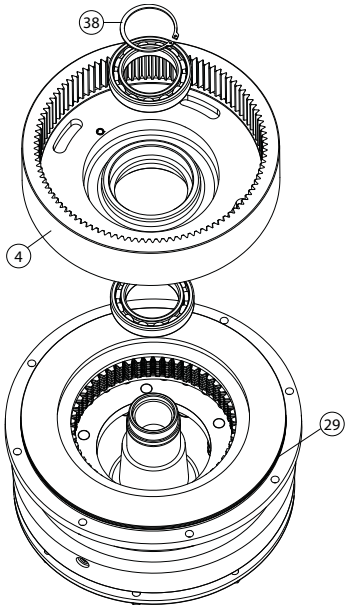
DISASSEMBLY

⚠ CAUTION ⚠

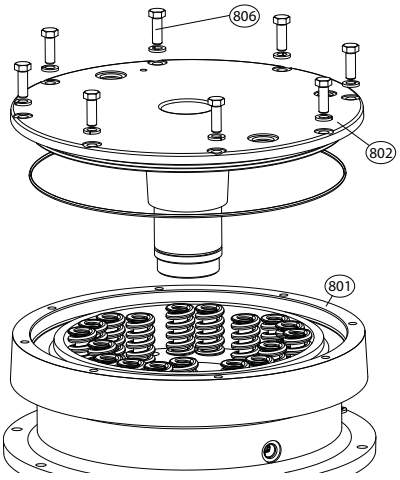
The GH30B freefall assembly weighs approximately 250 lb (114 kg). Make certain lifting equipment has adequate capacity. Using undersized or poorly maintained lifting equipment may result in a dropped load, property damage injury or death.

Refer to Winch disassembly to remove the freefall assembly from the winch.

Follow this procedure after the freefall assembly has been removed from the support end housing (3).



1. Set the freefall assembly with the freefall ring gear (4) up and remove retaining ring (38). Remove the freefall ring gear (4). Remove o-ring (29) and discard.

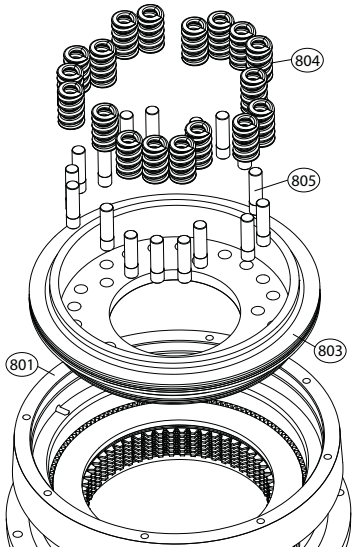


2. Turn the freefall assembly on the opposite side, so the bearing support capscrews (806) are facing up. Remove bolts securing bearing support (802) to freefall housing (801).

⚠ CAUTION ⚠

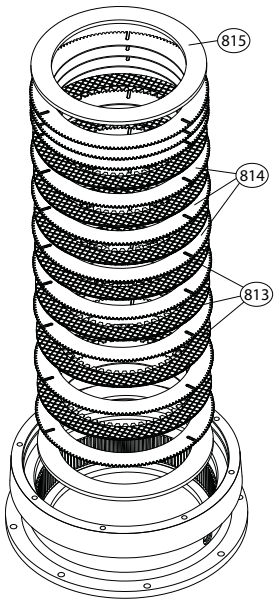
The bearing support is under spring tension from the freefall assembly brake springs. Loosen each bearing support capscrews on turn at a time until spring tension is released.

3. Remove the die springs (804) and freefall piston (803).



⚠ CAUTION ⚠

It may be necessary to apply a very short burst of shop air at the freefall release port to break free the piston from the freefall housing. If this is done, ensure all personnel are clear of the piston path. Loosely bolt the bearing support back onto the freefall housing and use shortest possible burst of low pressure shop air.



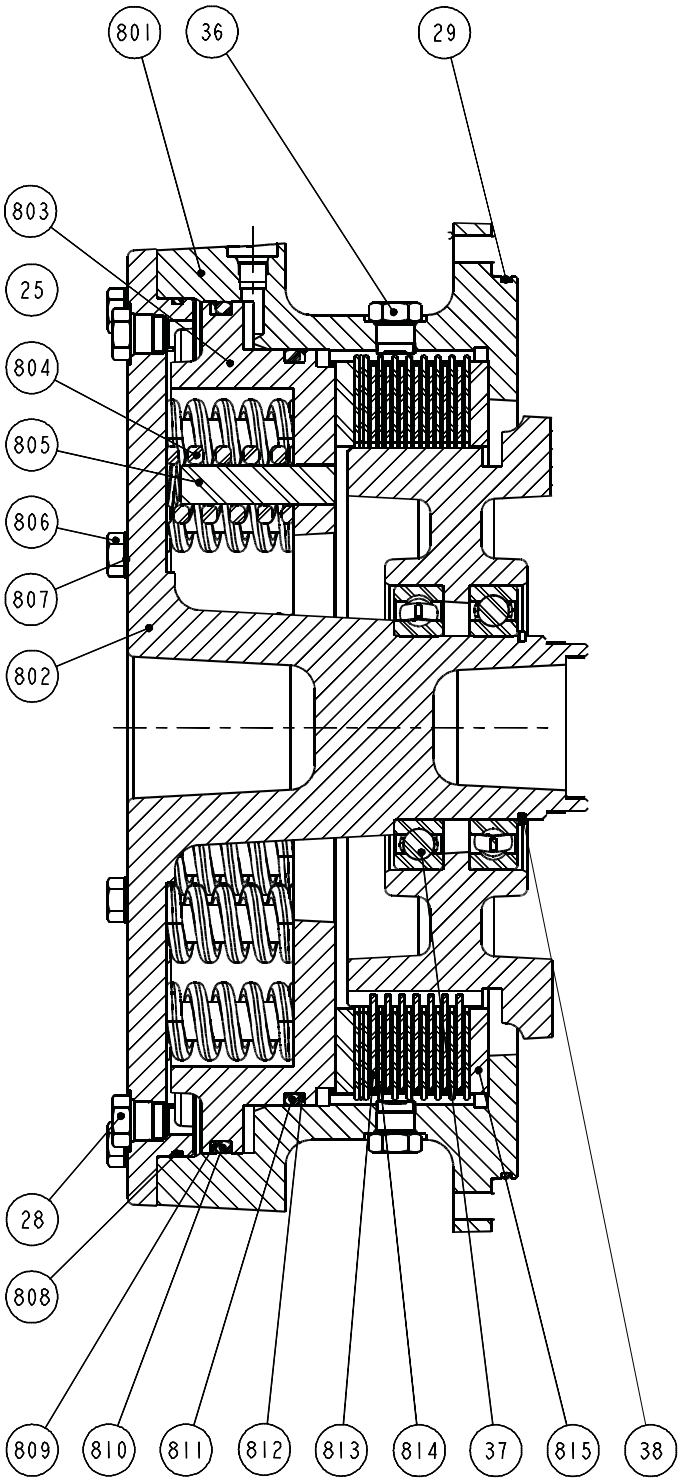
4. Remove the spacers (815), divider plates (814), and friction plates (813).

Clean and Inspect

1. Thoroughly clean and inspect all parts. Check sealing surfaces on the free fall housing, bearing support, and piston. Ensure the free fall release port is clean and free of debris.
2. Place free fall friction disc on a flat surface and check for distortion with a straight edge. Friction material should appear even across the entire surface with the groove pattern visible. Replace friction discs or divider plates if distorted, burned, wear is uneven, or splines are worn to a point.
3. Check free fall spring free length. Minimum free length is 2.910. If it is required by measurement to replace one spring, you must replace all springs.

FREE FALL ATTACHMENT

ASSEMBLY



1. Place the freefall housing (801) on a clean work surface with the bearing support (802) side facing up. Coat the friction plates with gear oil prior to installation.

2. Place a spacer (815) in the freefall housing. The seven (7) friction discs and ten (10) divider plates must be installed in the proper order. Install a divider plate (814) on top of the spacer (815). Install a friction disc (813) on the divider plate and alternate until all seven friction discs are installed. Install the remaining three divider plates on top of the last fiction plate. Install the remaining spacer (815) on top of the friction disc and divider plate stack.

3. Install o-rings (810 and 811) and back-up rings (809 and 812) in freefall piston (803) grooves. The back-up ring is always installed toward the low pressure side of the o-ring. In this case, the back-up rings are toward the outer surfaces with the concave surface toward the o-ring.

4. Apply a light coat of grease to the back-up rings, o-rings, and freefall housing piston surfaces. Ensure the freefall release port is vented to atmosphere, and set the piston (803) into the housing (801). Tap with a soft mallet to drive the piston into the housing. Install the springs (804) onto the pins in the brake piston.

5. Install o-ring (808) in the bearing support and coat lightly with grease. Set the bearing support in the housing and align in proper position in reference to the housing. Install capscrews (806) and lockwashers (807) hand tight. Evenly tighten the capscrews one turn at a time until the bearing support is seated with the housing. Torque the capscrews to 110 ± 10 lb-ft (149 N-m).

6. Turn over the freefall housing so the bearing support bolts are down. Install one of the bearings (37) onto the motor support.

7. Use a hand pump with a shut-off valve to the freefall release port and pressurize to 500 to 700 psi (3450 to 4820 kPa) and let stand for 5 five minutes. If there is any loss of pressure, the freefall piston should be removed and the sealing rings and surfaces inspected. WHILE THE PRESSURE IS APPLIED AND THE FREEFALL DISCS RELEASED, install the ring gear into the discs to align the friction disc teeth with the ring gear splines. Install the remaining bearing (815) and then install retaining ring (38) on the bearing support.

8. Install o-ring (29) in the freefall housing and grease lightly prior to bolting to the support end plate. Refer to Winch Assembly for instructions to complete assembly of the winch.

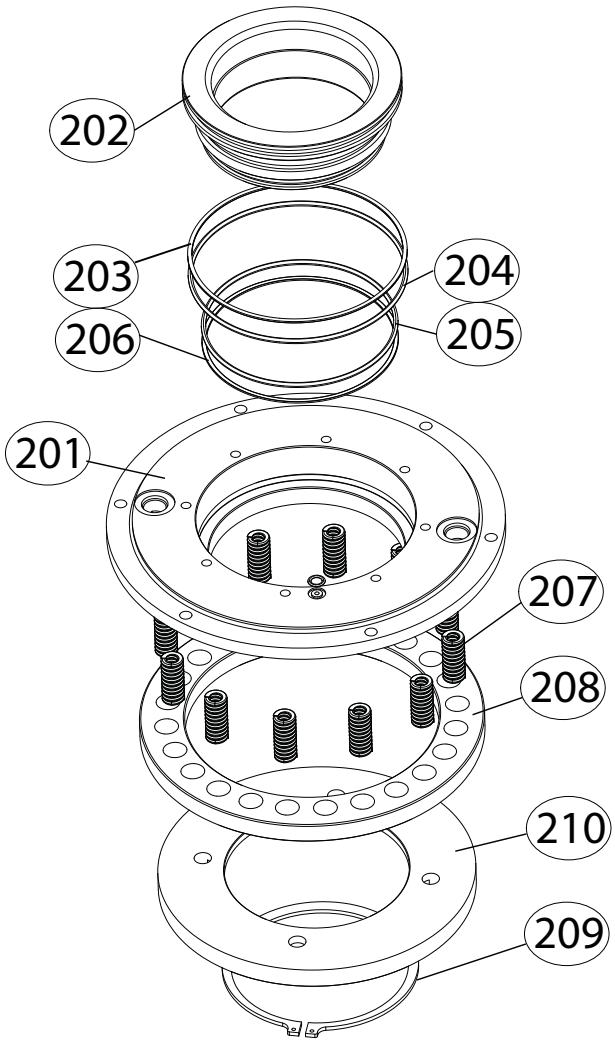
BRAKE CYLINDER SERVICE

DISASSEMBLY

1. A hydraulic press or spring compressor tool is required to disassemble the brake subassembly. Place the brake subassembly on the press with the primary housing cover (201) down. Place a heavy steel bar across the large diameter of the pressure plate (210) and compress the springs until spring force is removed from the retaining ring (209). Remove the retaining ring with retaining ring pliers. Slowly release the press force on the pressure plate.

2. Remove the pressure plate (210), spring separator (208), and springs (207).

3. Remove the brake piston (202) from the primary housing cover (201). Remove the o-rings and back-up rings from the brake piston and discard (items 203, 204, 205, and 206).



Clean and Inspect

1. Thoroughly clean and inspect all parts. Check sealing surfaces on the primary housing cover and brake piston. Ensure the brake release port is clean and free of debris.

2. Place brake friction disc on a flat surface and check for distortion with a straight edge. Friction material should appear even across the entire surface with the groove pattern visible. Replace friction discs or divider plates if distorted, burned, wear is uneven, or splines are worn to a point.

3. Check brake spring free length. Minimum free length is 2.910. If it is required by measurement to replace one spring, you must replace all springs.

BRAKE CYLINDER SERVICE

ASSEMBLY

1. A hydraulic press or spring compressor tool is required to assemble the brake subassembly. Place the brake housing cover (201) on a clean work surface with the motor side up and space it at least two (2) inches off the table with wood or metal blocks. This gives clearance for the brake piston (202) installation.

2. Install the o-rings (204, 205) and back-up rings (203, 206) in the piston. The back-up ring is always to the low pressure side of the o-ring, which is the outside surface of the piston for this part. The concave side of the back-up ring provides a seat for the o-ring. Lightly grease the o-rings and back-up rings.

3. Lightly grease the housing cover at the piston seating surface and install the brake piston in the primary housing cover (201) – if necessary, tap lightly to seat in the housing cover.

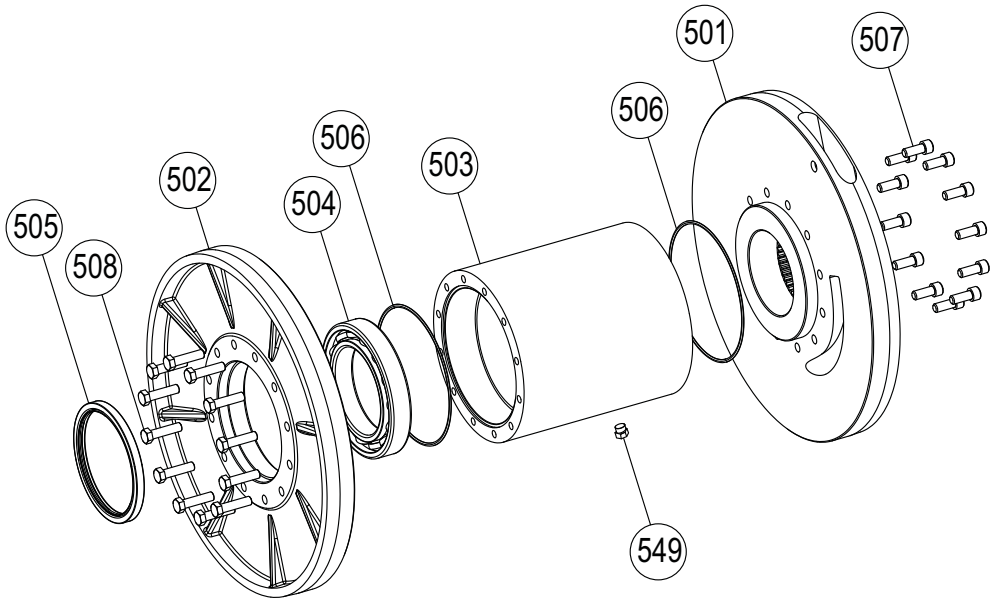
4. Place the primary housing cover on the press table with the motor side down. Place a spacer under the piston to keep it raised in the housing cover.

5. Install the spring separator (208). The spring spacer seats on the piston. Install the springs (207) in the spring separator and space evenly. There are 24 holes in the spring spacer, so with 12 springs put a spring in every other hole.

6. Install the pressure plate (210) onto the springs with the flat surface toward the springs.

7. Place a heavy steel bar across the outside diameter of the pressure plate. Use the press to compress the springs until there is clearance to install the retaining ring (209) into the groove in the piston. Install the retaining ring.

CABLE DRUM SERVICE



DISASSEMBLY

1. Stand the drum with the freefall end flange down. Remove the twelve capscrews (508) and lift the motor end flange (503) off of the drum barrel. Remove the oil seal (505) and o-ring (504) from the motor end flange and discard.

2. Use bearing pullers to remove the bearing (504) from the drum barrel.

3. Rotate the drum barrel so the freefall end flange is facing up. Remove the twelve capscrews (507) and lift the flange off of the drum barrel. Discard o-ring (506).

ASSEMBLY

Note: The capscrews used to fasten the drum flange to the drum barrel are different lengths for each drum flange. The motor end flange capscrews are 2 inch long hex heads, and the freefall end capscrews are 1 ¼ inch socket heads.

1. Install the bearing (504) into the motor end of the drum barrel (502) and ensure it is seated.

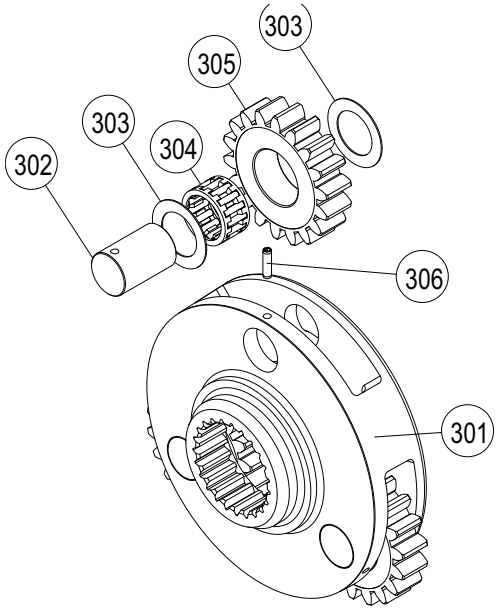
2. Apply Loctite Aviation Gasket sealant or equivalent to the outside diameter of the seal (505) and install the seal in the motor end drum flange (503) with the spring side of the seal toward the drum barrel.

3. Install o-ring (506) on the motor end drum flange and grease lightly. Slowly lower the motor end flange (503) onto the bearing end of the drum barrel (502). Apply Loctite 242 to the capscrews (508) and torque to 110 ±10 lb-ft (149 ±13 N-m).

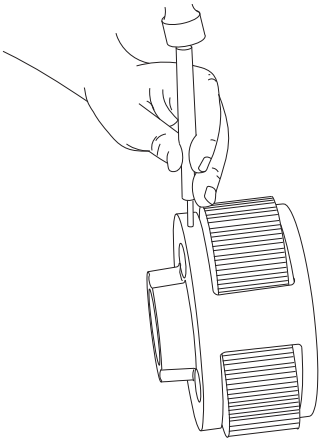
4. Set drum barrel on motor flange end. Install o-ring (506) on freefall end drum flange (501) and grease lightly.

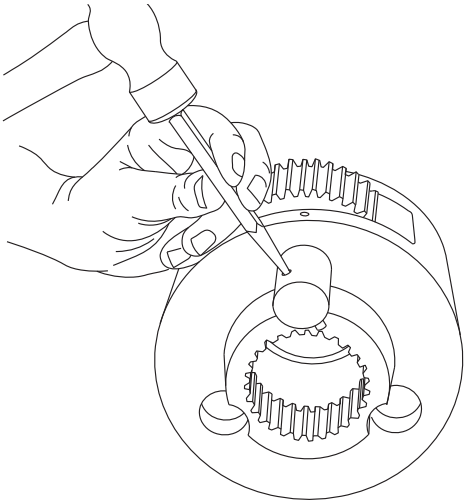
5. Slowly lower freefall end drum flange onto drum barrel. Apply Loctite 242 to the capscrews (507) and torque to 110 ±10 lb-ft (149 ±13 N-m).

PRIMARY PLANET CARRIER SERVICE



DISASSEMBLY



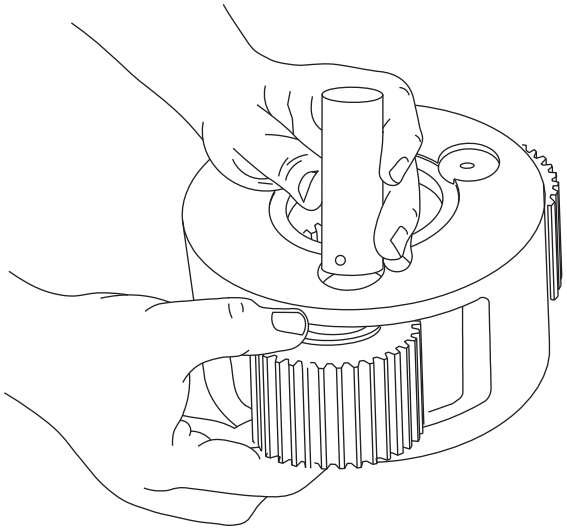


1. Remove the planet gears by first driving the roll pins (item 31) into the center of the planet gear shafts (item 28).

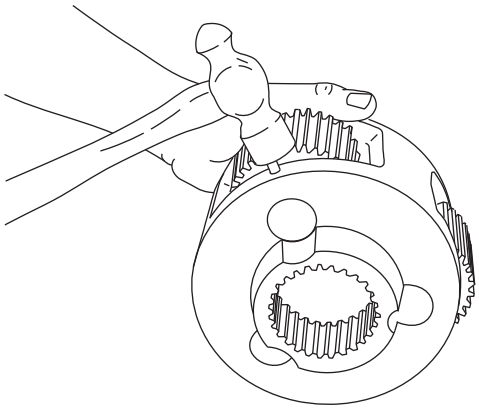
2. Use a punch to drive the roll pins from the planet gear shafts. DO NOT reuse the roll pins.

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

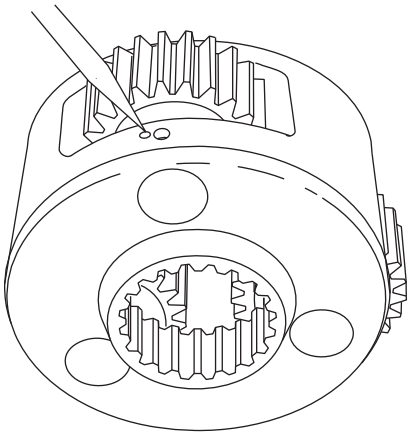
ASSEMBLY



1. Install a bearing into a planet gear and place a thrust washer on each side of the gear. Position this assembly into an opening in the carrier. Slide a planet gear shaft through the carrier, thrust washer, bearing and remaining thrust washer.



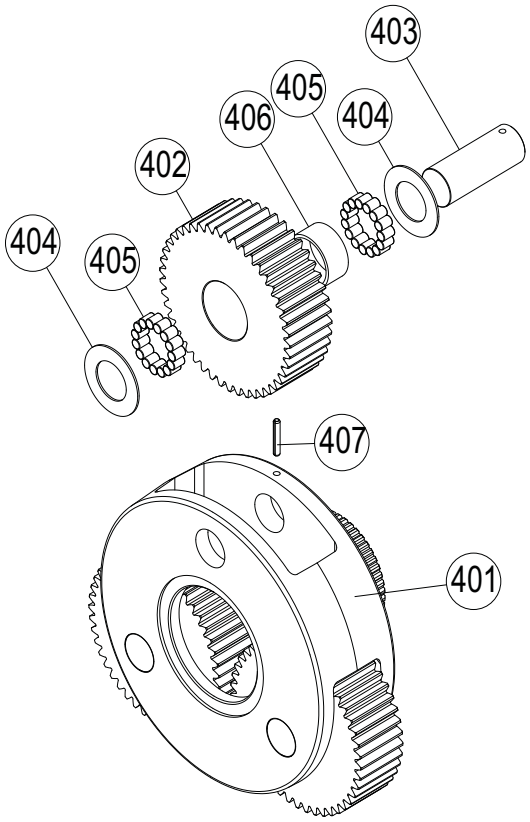
2. Carefully align the pin hole in the carrier with the hole in the shaft and drive a new roll pin into place. ALWAYS use NEW roll pins.



3. The roll pin is slightly recessed into the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole and prevent the pin from backing out in operation. Repeat these steps for each of the three planet gears.

OUTPUT PLANET CARRIER SERVICE

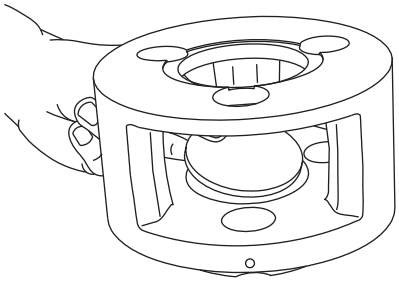
DISASSEMBLY



1. Follow steps 1 and 2 of the Primary Planet Carrier disassembly procedure to remove the roll pins from the planet gear shafts. Caution should be used when removing roller bearings; the roller bearings will fall out following removal of gear shaft (403).

2. Remove the planet shafts, bearings, spacers, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, they should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

ASSEMBLY



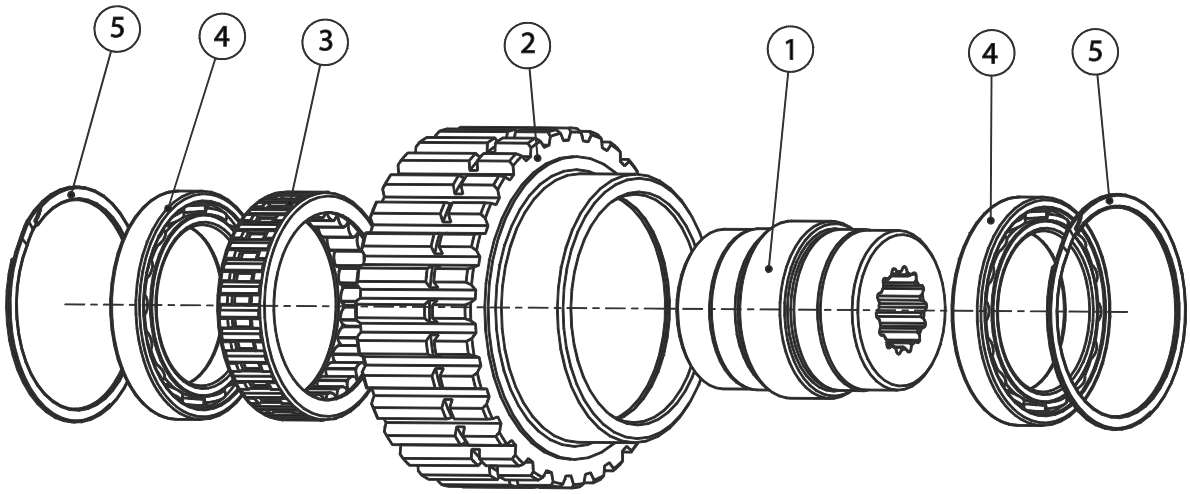
1. Place the output carrier on a clean work surface with the drive pins down.

2. Apply a liberal coat of oil soluble grease to a thrust washer and center it on one side of a planet gear. Place the planet gear on a clean work surface with the thrust washer down. Apply a liberal coat of oil soluble grease to the bore of the gear. Stack a row of loose roller bearings into the planet gear, using the grease to hold them in position. There are 15 rollers in each row. Install a bearing spacer. Stack a second row of loose roller bearings on top of the bearing spacer. Place a second thrust washer on the planet gear. Carefully slide the planet gear, bearings and thrust washers into the carrier. Install a planet gear shaft into the carrier and through the planet gear bearings.

3. Follow steps 2 and 3 of the Primary Planet Carrier assembly procedure to install and stake a NEW roll pin in the carrier.

Repeat this procedure for each of the planet gears.

OVER-RUNNING CLUTCH SERVICE



NOTE: *Outer race (item 2), Inner race (item 1) and Over-running clutch (item 3) are NOT SOLD individually as replacement parts. If any of these parts require replacement, the entire over-running clutch assembly must be replaced. Carefully note the relative orientation between the inner and outer races, and the direction of free rotation of the inner race. The clutch MUST be re-assembled correctly for proper hoist operation.*

⚠ WARNING ⚠

The polished surfaces of the inner and outer race and the over-running cams must be perfectly smooth to insure positive engagement of the clutch. The slightest defect may reduce clutch effectiveness, which may lead to loss of load control and result in property damage, injury or death. It is generally recommended to replace the entire clutch assembly if any component is defective. For these reasons, the over-running clutch assembly should be disassembled for inspection only if the hoist has exhibited any unusual operation that would point toward a clutch malfunction, or the over-running clutch assembly shows external signs of mechanical damage.

DISASSEMBLY

1. Remove one of the retaining rings (item 5) from the outer race (item 2). Push the inner race (item 1), bearings (item 4) and over-running clutch (item 3) through the outer race.

2. Use a small punch and hammer to tap one of the bearings (item 4) off of the inner race. The over-running clutch can now be removed from the inner race. Closely inspect the over-running clutch and the polished surfaces of the inner and outer race for wear, cracks, pitting, corrosion or mechanical damage. Closely inspect the bearings for any signs of damage, wear, corrosion, pitting or heat discoloration.

⚠ WARNING ⚠

Failure to assemble the over-running clutch assembly with all parts oriented correctly may result in reduced brake effectiveness, which may lead to loss of load control and result in property damage, injury or death.

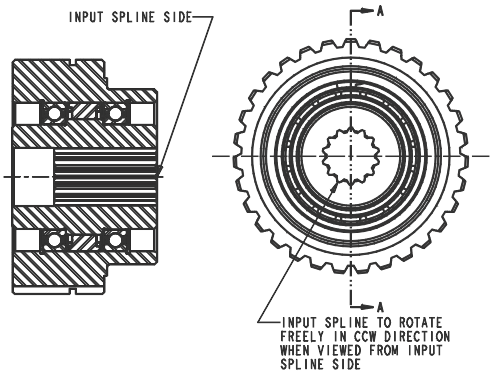
1. If both bearings (item 4) have been removed from the inner race, install one of them now.

2. Install the over-running clutch onto the inner race. Rotate the inner race slightly to get the clutch started onto the inner race.

3. Install the other bearing onto the inner race.

4. The outer race should have one retaining ring (item 5) installed in one end. Carefully slide the inner race, with bearings and clutch, into the outer race. Install the other retaining ring into the outer race.

For the GH30B, the input shaft will turn free in direction of drum rotation. For standard setup, see drawing below:



HOIST WITHOUT FREE FALL ASSEMBLY

1. Assemble Brake, Cable Drum, Overrunning Clutch, and Planet Carrier subassemblies following the procedures in the subassembly section of this manual.

2. If the primary housing (2) or final drive housing (3) was removed from it's end plate, reattach by applying Loctite 242 or equivalent to capscrews (14) and torque to 110 ± 10 lb•ft (149 ± 13 N•m).

3. Press ball bearing (9) into final drive housing (3) and install retaining ring (8). Set the final drive housing (9) with drum end up for seal installation. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the drum seal (10) and install the seal in the support end plate (3). Ensure the drum seal is flush with the final drive housing.

3. Set final drive housing (3) assembly with the drum end down and ensure it is level and stable. Carefully lower output carrier assembly (400) into the final drive housing.

4. Apply general purpose grease to thrust washer (26) and install on the final drive housing cover (4). Grease the thrust button (27) and install in the recess in the final drive housing cover. Apply enough grease to keep the thrust washer and thrust button in the housing cover when it is placed on the housing.

5. Install o-ring (29) on the final drive housing cover and apply a light coat of grease to the o-ring surface. Check proper alignment of housing cover (4) on final drive housing (vent at 12 o'clock and drain at 6 o'clock). Install the housing cover on the housing and secure with lockwashers (16) and capscrews (17). Torque to value on torque chart. Note: The capscrews may be torqued after the hoist is assembled and on its mounting feet.

6. Set final drive housing on the deck with the drum side up in preparation for installing the drum.

Steps 7 through 18 are the same for hoists with and without Free Fall.

7. Ensure bearing (504) and oil seal (505) are in the primary drive end of the drum. Apply grease to the inner race of the support end plate bearing (9) and seal (10). Use lifting straps to lower the drum assembly (500) onto the support end plate aligning the splines of the drum with the output planet carrier splines.

8. Grease the splines of the sun gear (5) and install into the output planet carrier assembly.

9. If the primary end plate (1) was removed from the primary housing (2), assemble by applying Loctite 242 to capscrews (14) and torque to 110 ± 10 lb•ft (149 ± 13 N•m).

10. Install bearing (12) in the primary housing. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the oil seal (11) and install in primary housing.

11. Lightly grease the inner race of the drum bearing (504) and drum seal (506). Lightly grease the inner race of the primary housing assembly bearing (12) and seal (11). Use ½ -13 eyebolts in the tapped holes of the primary housing and slowly lower it onto the drum.

12. Install the tie-plates (21) using the lockwashers (16) and capscrews (23). Torque to torque chart value.

13. Install the primary ring gear (6) into the primary housing (2) with the counter-bore along the ring gear teeth facing the motor side and the cast groove facing the drum.

14. Install the primary planet carrier subassembly (300) into the ring gear. Install the thrust washer (48) and primary sun gear (7).

15. There are four divider plates (211) and one brake plate (212) in the standard model GH30B hoist. First, install three divider plates in the primary housing. Apply gear oil to the friction surface of the brake plate and place on the three divider plates. Then install the remaining divider plate.

16. Install the overrunning clutch assembly (100) engaging the splines on the inner race with the sun gear (7) and the splines on the outer race with the brake plate (212).

17. Install the o-ring (15) in the primary housing cover (201) and grease lightly. Verify that the circulation return port in correctly clocked on the primary housing. Use ½-13 eyebolts in the primary housing cover (201) to lower the brake assembly into the primary housing. Install capscrews (17) and lockwashers (16) that fasten the housing cover to the primary housing. Tighten capscrews in a cross pattern one turn each time to evenly draw the housing cover down against spring force then torque to torque chart value.

18. Install the bearing (20) in the hydraulic motor flange adapter. Install and lightly grease the motor adapter o-ring (19) and apply grease to the inner race of bearing (20). Slowly lower the motor onto the primary housing. The motor flange adapter bearing (20) inner race contact surface is the brake hub. Tap the motor adapter lightly until seated on the primary housing cover then install capscrews (17) and lockwashers (16) and torque to value in torque chart.

HOIST WITH FREE FALL ASSEMBLY

1. Assemble Brake, Cable Drum, Freefall, and Planet Carrier subassemblies following procedures in the subassembly section of this manual.

2. Press ball bearing (9) into support end plate (3) and install the retaining ring (8). Turn the support end plate with drum end up for seal installation. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the drum seal (10) and install the seal in the support end plate (3).

3. Set freefall assembly on the floor with bearing support end down and ensure it is level and stable – it will remain in this position during winch assembly. Note the position of the vent and oil level sight glass to ensure proper position when the support end plate is installed in later steps.

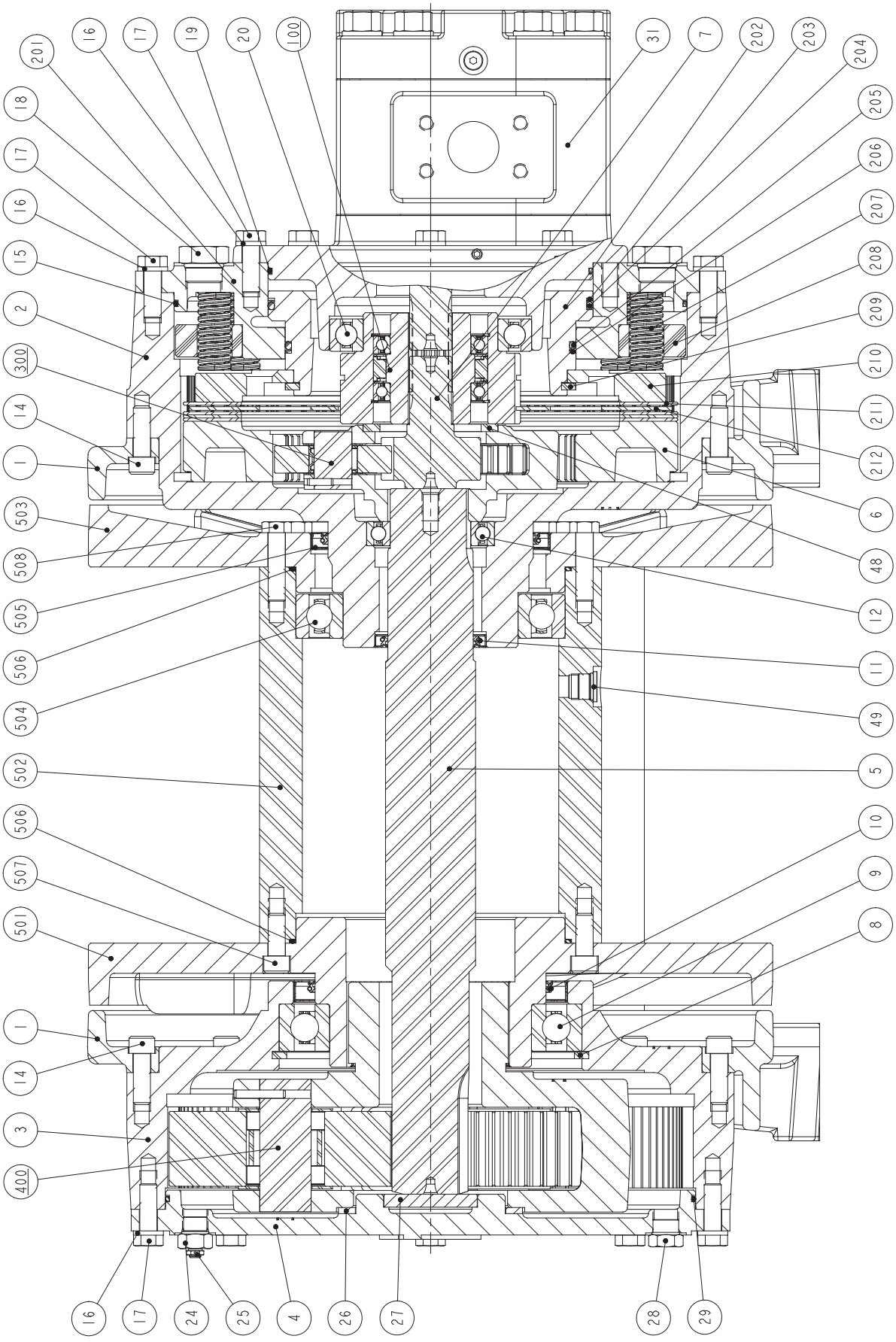
4. Apply general purpose grease to thrust washer (26) and install on outside diameter of the bearing support. Grease the thrust button (27) and install in the recess in the bearing support.

5. Install the output planet carrier assembly (400) into the ring gear (4) of the freefall assembly.

6. Ensure o-ring (29) is installed on the freefall assembly and apply a light coat of grease to the o-ring surface. Use ½ -13 eyebolts in the tapped holes for the tie plates to lift the support end plate and lower it onto the freefall assembly. Install the capscrews (35) and lockwashers (16) that fasten the freefall assembly to the bearing support and tighten. Note: The capscrews can be torqued after the hoist is assembled and on its mounting feet.

See steps 7 through 18 on page 32 for remaining steps.

HOIST without FREE FALL
CROSS-SECTION AND PARTS KEY



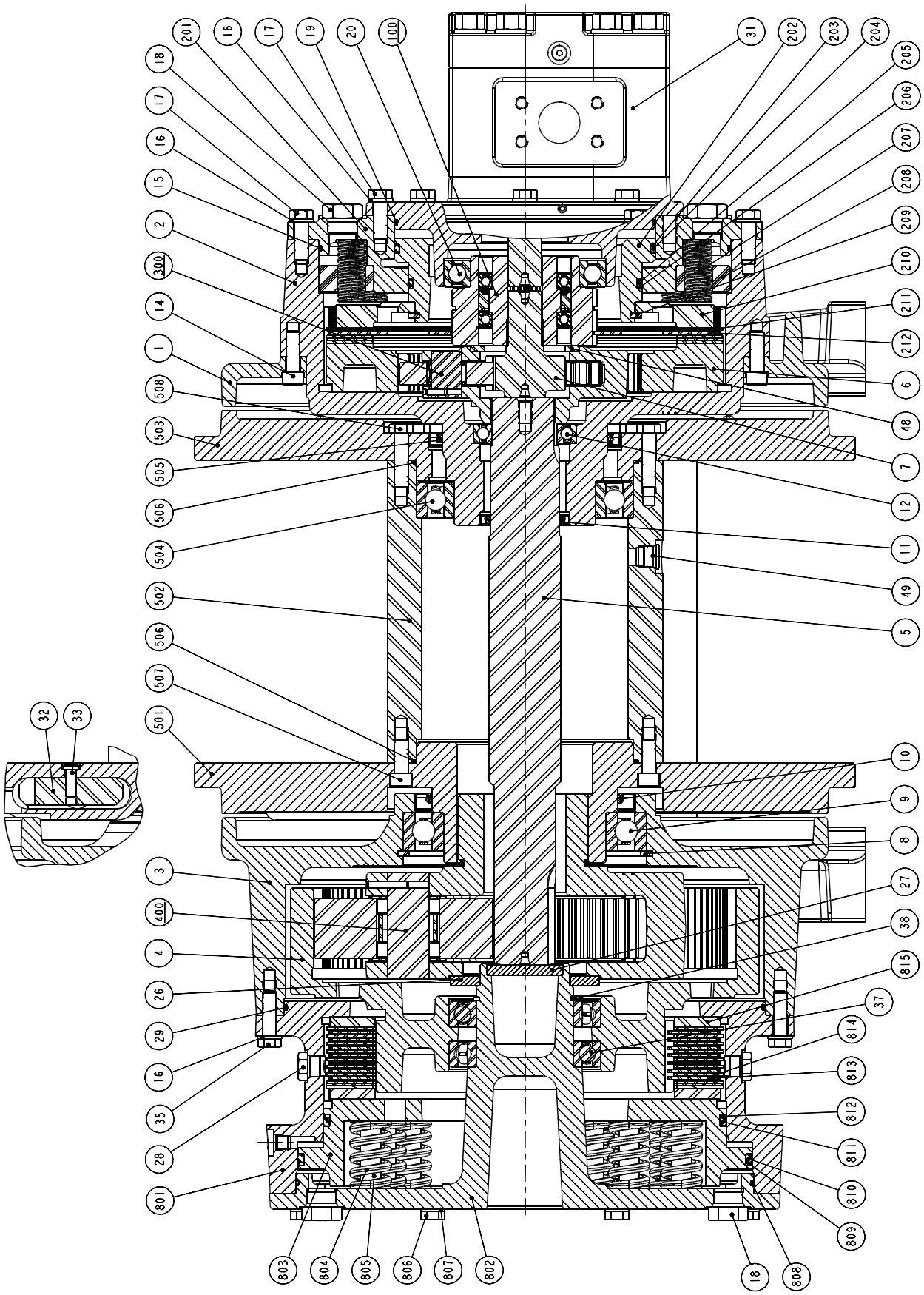
Item No	Description	Qty
1	END PLATE	2
2	HOUSING, PRIMARY	1
3	HOUSING, FINAL	1
4	COVER, HOUSING	1
5	GEAR, SUN	1
6	GEAR, PRIMARY RING	1
7	GEAR, SUN	1
8	RETAINING RING, INT	1
9	BALL BEARING	1
10	SEAL, LIP	1
11	OIL SEAL	1
12	BALL BEARING	1
14	CAPSCREW	16
15	O-RING	1
16	LOCKWASHER	37
17	CAPSCREW	21
18	PLUG	2
19	O-RING	1
20	BEARING, BALL	1
21	TIE PLATE	2
22	SIGHT GAUGE	1

Item No	Description	Qty
23	CAPSCREW	16
24	REDUCER	1
25	RELIEF VALVE 7.5-15 PSI	1
26	WASHER, THRUST	1
27	BUTTON, THRUST	1
28	PLUG	1
29	O-RING	1
30	O-RING	1
31	MOTOR, HYDRAULIC	1
32	FILLER, CABLE POCKET	1
33	CAPSCREW	1
34	CABLE WEDGE	1
36	PLUG, ORIFICE	1
48	THRUST WASHER	1
49	PLUG,O-RING FLUSH	1
100	**OVERRUNNING CLUTCH ASSY**	1
200	**BRAKE PARTS GROUP**	1
201	COVER, PRIMARY HOUSING	1
202	PISTON, BRAKE	1
203	BACK-UP RING	1
204	O-RING	1

Item No	Description	Qty
205	O-RING	1
206	BACK-UP RING	1
207	SPRING, DIE	12
208	SPRING SEPARATOR	1
209	RETAINING RING, EXT	1
210	PRESSURE PLATE	1
211	DIVIDER PLATE	4
212	FRICTION DISC	1
300	**PRIMARY CARRIER ASSY**	1
400	**OUTPUT CARRIER ASSY**	1
500	**CABLE DRUM ASSY**	1
501	FLANGE, CABLE DRUM	1
502	CABLE DRUM BARREL	1
503	FLANGE, CABLE DRUM	1
504	BALL BEARING	1
505	SEAL, LIP	1
506	O-RING	2
507	CAPSCREW	12
508	CAPSCREW	12

Items in bold font are assemblies consisting of multiple parts.

HOIST with FREE FALL
CROSS-SECTION AND PARTS KEY



Item#	Description	Qty
1	END PLATE	1
2	HOUSING, PRIMARY DRIVE	1
3	END PLATE	1
4	GEAR FREE FALL RING	1
5	GEAR, SUN	1
6	GEAR, PRIMARY RING	1
7	GEAR, SUN	1
8	RETAINING RING, INT	1
9	BALL BEARING	1
10	SEAL, LIP	1
11	OIL SEAL	1
12	BALL BEARING	1
14	CAPSCREW	8
15	O-RING	1
16	LOCKWASHER	37
17	CAPSCREW	13
18	PLUG	4
19	O-RING	1
20	BEARING, BALL	1
21	TIE PLATE	2
22	SIGHT GAUGE	1
23	CAPSCREW	16
24	HEX PLUG	1
25	RELIEF VALVE 7.5-15 PSI	1
26	WASHER, THRUST	1
27	BUTTON, THRUST	1
28	PLUG	2

Item#	Description	Qty
29	O-RING	1
30	O-RING	1
31	MOTOR, HYDRAULIC	1
32	FILLER, CABLE POCKET	1
33	CAPSCREW	1
35	CAPSCREW	8
36	PLUG, ORIFICE	1
37	BEARING,BALL	2
38	RETAINING RING, EXT	1
40	BOLTED FLANGE PROTECTOR	2
48	THRUST WASHER	1
49	PLUG,O-RING FLUSH	1
100	OVERRUNNING CLUTCH ASSY	1
200	BRAKE PARTS GROUP	1
201	COVER, PRIMARY HOUSING	1
202	PISTON, BRAKE	1
203	BACK-UP RING	1
204	O-RING	1
205	O-RING	1
206	BACK-UP RING	1
207	SPRING, DIE	12
208	SPRING SEPARATOR	1
209	RETAINING RING, EXT	1
210	PRESSURE PLATE	1
211	DIVIDER PLATE	4
212	BRAKE PLATE	1
300	PRIMARY CARRIER ASSY	1

Item#	Description	Qty
400	OUTPUT CARRIER ASSY	1
500	CABLE DRUM ASSY	1
501	FLANGE, CABLE DRUM	1
502	CABLE DRUM BARREL	1
503	FLANGE, CABLE DRUM	1
504	BALL BEARING	1
505	SEAL, LIP	1
506	O-RING	2
507	CAPSCREW	12
508	CAPSCREW	12
800	FREEFALL BRAKE ASSY	1
801	HOUSING, FREEFALL	1
802	BEARING SUPPORT	1
803	PISTON	1
804	DIE SPRING	18
805	PIN	18
806	CAPSCREW	8
807	LOCKWASHER	8
808	O-RING	1
809	BACK-UP, O-RING	1
810	O-RING	1
811	O-RING	1
812	BACK-UP, O-RING	1
813	FRICTION DISC	7
814	DIVIDER PLATE	10
815	SPACER	2

METRIC CONVERSION TABLE

English to Metric			Metric to English		
LINEAR					
inches (in.)	X 25.4	= millimeters (mm)	millimeters (mm)	X 0.3937	= inches (in.)
feet (ft.)	X 0.3048	= meters (m)	meters (m)	X 3.281	= feet (ft.)
miles (mi.)	X 1.6093	= kilometers (km)	kilometers (km)	X 0.6214	= miles (mi.)
AREA					
inches^2 (sq.in.)	X 645.15	= millimeters^2 (mm^2)	millimeters^2 (mm^2)	X 0.000155	= inches^2 (sq.in.)
feet^2 (sq.ft.)	X 0.0929	= meters^2 (m^2)	meters^2 (m^2)	X 10.764	= feet^2 (sq.ft.)
VOLUME					
inches^3 (cu.in.)	X 0.01639	= liters (l)	liters (l)	X 61.024	= inches^3 (cu.in.)
quarts (qts.)	X 0.94635	= liters (l)	liters (l)	X 1.0567	= quarts (qts.)
gallons (gal.)	X 3.7854	= liters (l)	liters (l)	X 0.2642	= gallon (gal.)
inches^3 (cu.in.)	X 16.39	= centimeters^3 (cc)	centimeters3 (cc)	X 0.06102	= inches^3 (cu.in.)
feet^3 (cu.ft.)	X 28.317	= liters (l)	liters (l)	X 0.03531	= feet^3 (cu.ft.)
feet^3 (cu.ft.)	X 0.02832	= meters^3 (m^3)	meters3 (m3)	X 35.315	= feet^3 (cu.ft.)
fluid ounce (fl.oz.)	X 29.57	= millileters (ml)	milliliters (ml)	X 0.03381	= fluid ounce (fl.oz.)
MASS					
ounces (oz.)	X 28.35	= grams (g)	grams (g)	X 0.03527	= ounces (oz.)
pounds (lbs.)	X 0.4536	= kilograms (kg)	kilograms (kg)	X 2.2046	= pounds (lbs.)
tons (2000 lbs.)	X 907.18	= kilograms (kg)	kilograms (kg)	X 0.001102	= tons (2000 lbs.)
tons (2000 lbs.)	X 0.90718	= metric tons (t)	metric tons (t)	X 1.1023	= tons (2000 lbs.)
tons (long) (2240 lbs.)	X 1013.05	= kilograms (kg)	kilograms (kg)	X 0.000984	= tons (long) (2240 lbs.)
PRESSURE					
inches Hg (60°F)	X 3600	= kilopascals (kPa)	kilopascals (kPa)	X 0.2961	= inches Hg (60°F)
pounds/sq.in. (PSI)	X 6.895	= kilopascals (kPa)	kilopascals (kPa)	X 0.145	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.0703	= kilograms/sq.cm. (kg/cm^2)	kilograms/sq.cm. (kg/cm2)	X 14.22	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.069	= bars	bars	X 14.5	= pounds/sq.in. (PSI)
inches H_2O (60°F)	X 0.2488	= kilopascals (kPa)	kilopascals (kPa)	X 4.0193	= inches H_2O (60°F)
bars	X 100	= kilopascals (kPa)	kilopascals (kPa)	X 0.01	= bars
POWER					
horsepower (hp)	X 0.746	= kilowatts (kW)	kilowatts (kW)	X 1.34	= horsepower (hp)
ft.-lbs./min.	X 0.0226	= watts (W)	watts (W)	X 44.25	= ft.-lbs./min.
TORQUE					
pound-inches (in.-lbs.)	X 0.11298	= newton-meters (N-m)	newton-meters (N-m)	X 8.851	= pound-inches (in.lbs.)
pound-feet (ft.-lbs.)	X 1.3558	= newton-meters (N-m)	newton-meters (N-m)	X 0.7376	= pound-feet (ft.-lbs.)
pound-feet (ft.-lbs.)	X .1383	= kilograms/meter (kg-m)	kilogram/meter (kg-m)	X 7.233	= pound-feet (ft.-lbs.)
VELOCITY					
miles/hour (m/h)	X 0.11298	= kilometers/hour (km/hr)	kilometers/hour (km/hr)	X 0.6214	= miles/hour (m/h)
feet/second (ft./sec.)	X 0.3048	= meter/second (m/s)	meters/second (m/s)	X 3.281	= feet/second (ft./sec.)
feet/minute (ft./min.)	X 0.3048	= meter/minute (m/min)	meters/minute (m/min)	X 3.281	= feet/minute (ft./min.)

TEMPERATURE

°Celsius = 0.556 (°F - 32) °Fahrenheit = (1.8°C) + 32

COMMON METRIC PREFIXES

mega	(M)	= 1,000,000 or 106	deci	(d)	= 0.1 or 10^{-1}
kilo	(k)	= 1,000 or 10^3	centi	(c)	= 0.01 or 10^{-2}
hecto	(h)	= 100 or 10^2	milli	(m)	= 0.001 or 10^{-3}
deka	(da)	= 10 or 10^1	micro	(m)	= 0.000.001 or 10^{-6}