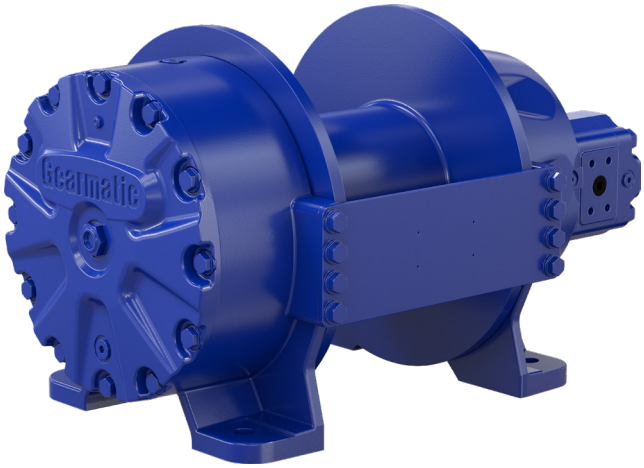
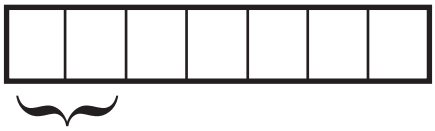
GM12A PLANETARY HOIST
EQUAL SPEED AND HIGH SPEED REVERSE



Record serial number below:



First 2 numbers indicate year of manufacture
(for serial number location, see page 3).

Visit www.arrowheadwinch.com for the most up-to-date product and service information.
Technical publications for most Arrowhead Winch products are available for download.

ARROWHEAD WINCH

800 East Dallas | Broken Arrow, OK 74012
www.arrowheadwinch.com | 918.251.8511

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FOREWORD

Read this entire publication and retain it for future reference.

For inquiries regarding your Gearmatic Planetary Hoist or this publication, please contact Gearmatic Service Department at 918-251-8511, Monday through Friday, 8:00 a.m. to 4:30 p.m. (CST).

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

The following service instructions have been prepared to provide assembly, disassembly and maintenance information for the Gearmatic GM12A hoist. Before doing any work on these units, all assembly and disassembly instructions should be read and understood.

Some illustrations in this manual may show details or attachments different from your hoist. Some components have been removed for illustrative purposes. Drawings in this manual represent a typical unit sold through our distribution channels. Some hoists, particularly those sold directly to original equipment manufacturers (OEM), may differ in appearance and options.

GENERAL SAFETY RECOMMENDATIONS

Safety and informational callouts used in this manual include:

⚠ WARNING ⚠

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

⚠ CAUTION ⚠

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

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure safety to others as well as yourself. 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 tag information provided for safe operation and service of hoist.
4. Inspect rigging and hoist at the beginning of each work shift. Defects should be corrected immediately.
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). Refer to “Warm-up Procedure” listed in the “Preventive Maintenance” section of this manual.
7. Operate hoist line speeds to match job conditions.
8. Leather gloves should be used when handling wire rope.
9. Never attempt to handle wire rope when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and hoist drum.
10. 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.
11. Never use wire rope with broken strands. Replace wire rope.
12. Do not weld on any part of the hoist.
13. Use recommended hydraulic oil and gear lubricant.
14. Keep hydraulic system clean and free from contamination at all times.
15. Use correct anchor for wire rope and pocket in drum.
16. Do not use knots to secure or attach wire rope.
17. The BRADEN designed wire rope anchors are capable of supporting the rated load when installed properly. For additional safety, ALWAYS maintain a minimum of five (5) wraps of wire rope on the drum.
18. 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.
19. Never operate hoist controls unless you are properly positioned at the operators station and you are sure personnel are clear of the work area.
20. Assure personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
21. Ground personnel should stay in view of the operator and clear of hoist drum. Do not allow ground personnel near hoist line under tension. A safe distance of at least 1-1/2 times the length of the cable should be maintained.
22. Do not exceed the maximum pressure, PSI (bar), or flow, GPM (LPM), stated in the hoist specifications.
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.
24. “Deadman” controls, which automatically shut off power to the hoist whenever the operator leaves his station, should be installed whenever practicable.
25. Never allow anyone to stand under a suspended load.
26. Avoid sudden “shock” loads or attempting to “jerk” load free. This type of operation may cause heavy loads, in excess of rated capacity, which may result in failure of cable and hoist.

EXPLANATION OF MODEL NUMBER

① ② ③ ④ ⑤ ⑥

GM 12 A - 41 051 - 01

1. GM – Gearmatic Model
2. 12 – 12,000 lb. Maximum rated bare drum line pull (5,443 kg)
3. A – Design generation (A is the first generation design, B is the second, etc.)
4. 41 – Total gear reduction (41:1)
5. 051 – Motor displacement in cubic inches (5.1 CID)
6. 01 – Drum size option code…(other options include 05)

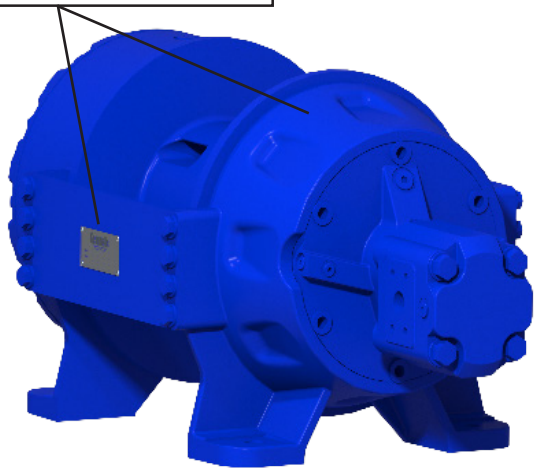
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

GM 12 A - HSR - 41 / 90 - 051 - 01

1. GM – Gearmatic Model
2. 12 – 12,000 lb. Maximum rated bare drum line pull (5,443 kg)
3. A – Design generation (A is the first generation design, B is the second, etc.)
4. HSR – High-Speed Reverse
5. Gear Ratio – Hoisting/reeling in - 41:1
6. Gear Ratio – Lowering/reeling out - 9:1
7. 051 – Motor displacement in cubic inches (5.1 CID)
8. 01 – Drum size option code…(other options include 05)

NOTE: The GM12A High-Speed Reverse Winch lowers the load 4.41 times faster than the hoisting speed.

Model numbers and serial numbers are located on the name plate and stamped on the brake housing. Always refer to the model number and serial number when requesting information or service parts.



THEORY OF OPERATION

DESCRIPTION OF HOIST

The hoist has three basic assemblies

1. Brake housing and motor assembly
2. Output housing assembly
3. Drum
4. Tie plates

The hydraulic motor is bolted to the brake cylinder bolted to the brake housing. The drum assembly is supported by both end bracket assemblies which receives additional support from the tie 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 cable drum 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 output end bracket 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.

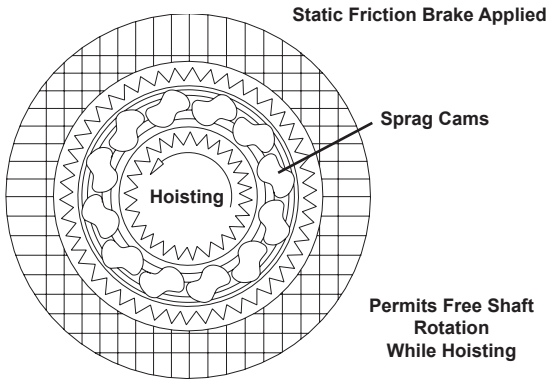
1. Spring applied, disc multi-friction brake
2. Overrunning brake clutch assembly
3. Hydraulic piston and cylinder

The brake consists of friction discs which are internally splined to the outer hub of the overrunning brake clutch. Spring force applied to the brake piston clamps the brake discs lock 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.

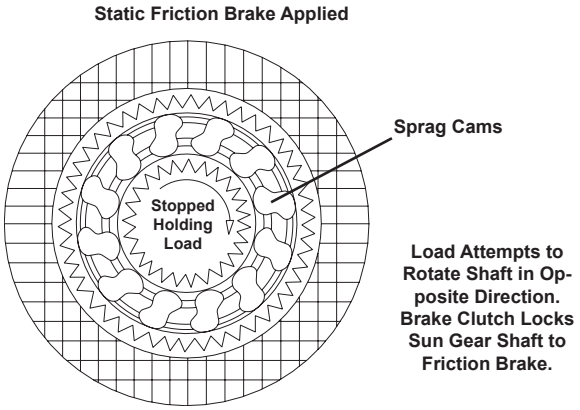
When hoisting or pulling a load, the brake clutch allows free rotation of the motor shaft and primary sun gear. The sprag cams lay over and permit the primary sun gear to turn free of the outer clutch hub. Figure 1. The friction brake remains fully engaged. The hoist is not affected by any braking action when hoisting.

Figure 1



When the hoisting 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 2).

Figure 2



When the hoist is powered in reverse, to lower the load, 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 500 PSI is required to compress the brake springs and allow the friction brake discs splined to the outer brake clutch hub to turn free. As lowering pressure increases, the brake is gradually released allowing the motor to drive the gear train in reverse to reel out wire rope.

When the control valve is returned to neutral or “hold”, the lowering pressure will decrease 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.

HIGH-SPEED REVERSE LOWERING

When reeling out, hydraulic pressure from the reversing side of the hydraulic motor is directed to the brake piston, causing the brake piston to release the multi-disc brake against the brake springs. The overrunning clutch is connecting the motor drive shaft with the internal gear of the primary planet reduction. This allows the internal gear to rotate at the same speed as the primary sun gear. When this occurs the primary reduction stage is eliminated and the output torque and speed of the hydraulic motor are connected directly to the final planet reduction planetary gearset. With the primary reduction stage eliminated, the gear reduction is reduced to a ratio of 9.3:1 and the cable drum will rotate 4.4 times faster than in forward or hoisting speed.

If the load on the cable drum tends to affect the lowering speed, the resulting pressure drop in the brake piston causes friction between the brake friction discs and steel separator. This allows precise lowering speed by operation of the hoist control handle. When the control handle is returned to neutral rotation stops, and the disc brake automatically applies.

During the lowering operation of the hoist, the friction created by the brake discs results in heat. This is dissipated by cooling flow supplied by the hydraulic motor or an external source. The circulation return line must return flow to the reservoir.

HOIST 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.
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
3. 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).
4. 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).

⚠ 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, personal injury or death. Welding may also damage bearings and seals, resulting in premature failure.

5. 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.
6. 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 page 11.
7. The hydraulic oil filter should have a 10 micron nominal rating and be a full-flow type.
8. High quality hydraulic oil is essential for satisfactory performance and long hydraulic system component life.

   Oil having 150 to 330 SUS viscosity (150 ISO CT) 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).

   NOTE: *Install hydraulic oil circulating oil return line. See the hydraulic circuit drawing and circulating line size requirements on page 11*

⚠ 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.

9. The minimum flow required for smooth lowering operation is 20 gpm (76 lpm). If operating the hoist at less flow, a BRADEN brake valve can be added to ensure smooth lowering. See hydraulic circuit information on page 11 and drawings on page 55.

RECOMMENDED FASTENER TORQUE

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 30wt engine oil applied to threads and face of bolt or nut.

Avoid using thread lubricants (such as anti-seize compound) as the applied torque may vary by 10-40%, depending upon the product used.

Bolt Diam. Inches	Thread per inch	Torque LB-FT (N.m)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
1/4	20 28	8 (11)	6 (8)	12 (16)	9 (12)
5/16	18 24	17 (23)	13 (17)	24 (33)	18 (24)
3/8	16 24	31 (42)	23 (31)	45 (61)	35 (47)
7/16	14 20	50 (68)	35 (47)	70 (95)	50 (68)
1/2	13 20	75 (102)	55 (75)	110 (149)	80 (108)
9/16	12 18	110 (149)	80 (108)	150 (203)	110 (149)
5/8	11 18	150 (203)	115 (156)	210 (285)	160 (217)

Bolt Diam. Inches	Thread per inch	Torque LB-FT (N.m)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
3/4	10 16	265 (359)	200 (271)	380 (515)	280 (380)
7/8	9 14	420 (569)	325 (441)	600 (813)	450 (610)
1	8 14	640 (868)	485 (658)	910 (1234)	680 (922)
1 1/8	7 12	790 (1071)	590 (800)	1290 (1749)	970 (1315)
1 1/4	7 12	1120 (1518)	835 (1132)	1820 (2468)	1360 (1817)
1 3/8	6 12	1460 (1979)	1095 (1485)	2385 (3234)	1790 (2427)
1 1/2	6 12	1940 (2360)	1460 (1979)	3160 (4284)	.2370 (3214)

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

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WIRE AND SYNTHETIC ROPE INSTALLATION

Below provides instructions on installing wire and synthetic rope using various anchoring methods.

⚠ WARNING ⚠

Wire and synthetic rope anchors alone are not designed to hold rated loads. Loads applied directly to the anchor may cause the rope to pull free and result in the sudden loss of load control, property damage, serious injury or death.

⚠ WARNING ⚠

A minimum number of five wraps of rope must be on the drum to handle full rated load.

WEDGE ANCHOR — WIRE ROPE

If the drum is designed with an anchor pocket, follow these steps:

1. Make sure the anchor pocket and wedge are 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.
2. Take the free end of the wire rope and insert it through the small opening of the anchor pocket.
3. Loop the wire rope and push the free end about 3/4 of the way back through the pocket.
4. Install the wedge as shown in Figure 1 then pull the slack from the cable.

   NOTE: An early style wedge was designed to accommodate multiple sizes of wire rope. It may need to be inserted large end first or small end first depending on the diameter of rope being anchored.
5. The “dead” end of the rope should extend slightly beyond the end of the wedge as shown in Figure 2.
6. Using a hammer and brass drift, drive the wedge as deep into the pocket as possible to ensure it is fully seated.
7. Check to ensure the wedge does not protrude from either end of the pocket, which will cause it to interfere with proper spooling of rope onto the drum (see Figures 3 and 4).

PART NUMBERS — WIRE ROPE WEDGE

76285 for 9/16” to 5/8” wire rope (standard anchor)

76281 for 3/4” wire rope

WEDGE ANCHOR — SYNTHETIC ROPE

If the drum is designed with an anchor pocket approved for use with synthetic rope, follow these steps:

1. Make sure the anchor pocket and wedge are clean and dry. The end of the synthetic rope being anchored to the drum must be clean and dry and not frayed.
2. Make sure you are using the correct wedge anchor for synthetic rope.

WIRE AND SYNTHETIC ROPE INSTALLATION

Correct Installations

Wire Rope

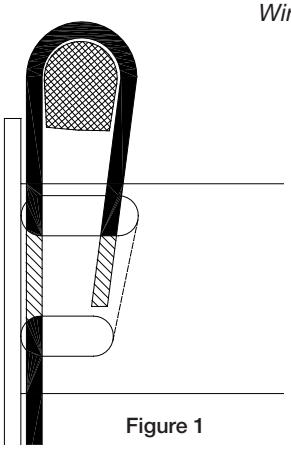


Figure 1

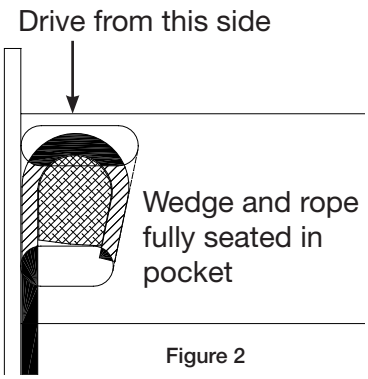


Figure 2

Synthetic Rope

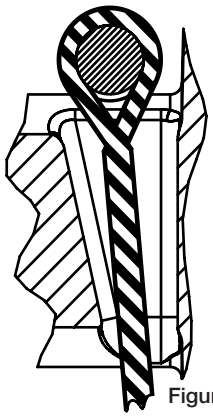


Figure 5

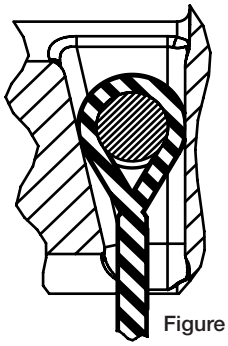


Figure 6

Incorrect Installations

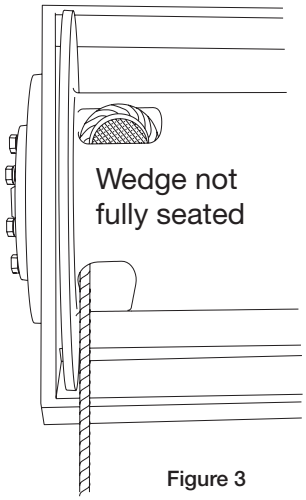


Figure 3

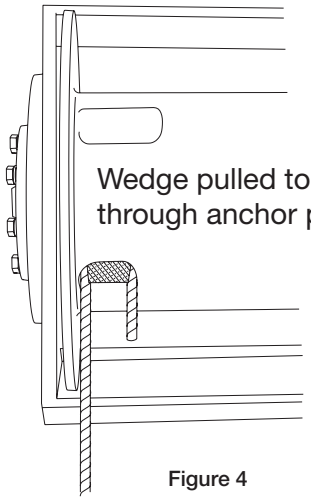
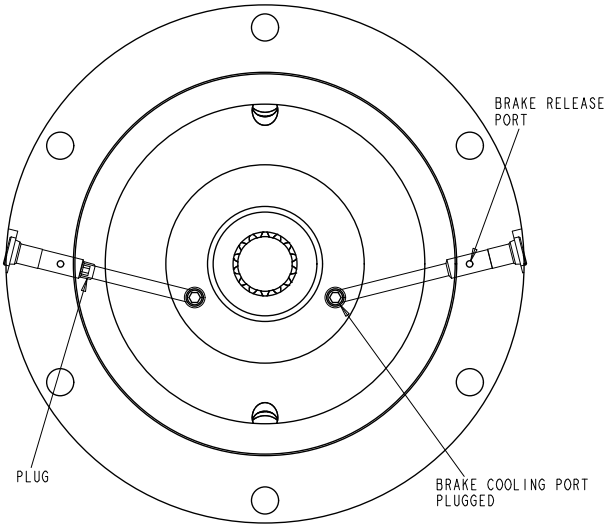


Figure 4

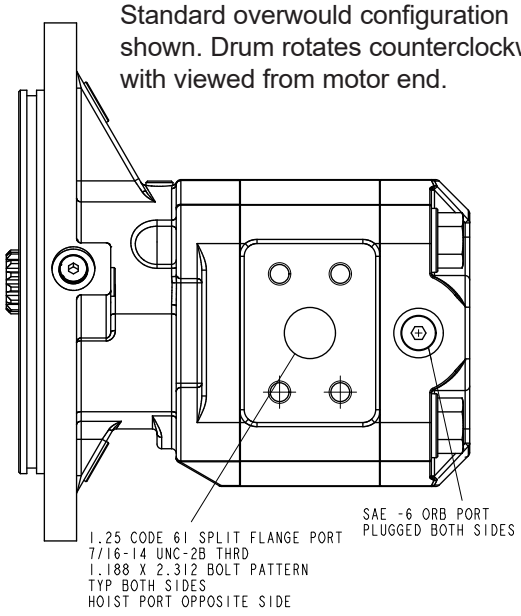
- Rope not tight against wedge
- Wedge may be too large

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

HYDRAULIC CIRCUIT



Standard overwould configuration shown. Drum rotates counterclockwise with viewed from motor end.



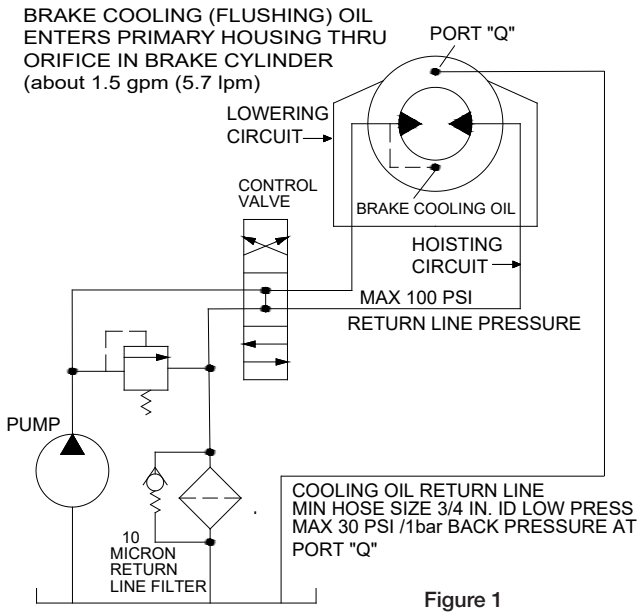


Figure 1

CIRCULATION RETURN PORT IN THE MOTOR END MUST BE CONNECTED TO TANK WITH A TANK LINE.

Line from Port Q – ¾ inch (19 mm) minimum

HOSE REQUIREMENTS		
Oil Flow gpm (l/min)	Pressure Lines Inside Dia.	Return Lines Inside Dia.
95-140 gpm 360-530 l/min	2 in. (51 mm)	2¼ in. (57 mm)
70-94 gpm 265-359 l/min	1½ in. (38 mm)	1¾ in. (44 mm)
45-69 gpm 170-264 l/min	1¼ in. (32 mm)	1½ in. (38 mm)

Line From Case Drain - ¾ in. (19 mm) Minimum

Figure 1 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.

Hydraulic oil must circulate through the housing. This provides cooling for the brake and also ensures that the housing is completely filled with oil.

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 excess back pressure at the reverse motor port sufficient to release the brake (100 psi maximum) (6.9 bar).

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.

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 hoist speed.

LOW FLOW APPLICATIONS

When operating the hoist using flows less than 20 gpm (76 lpm), a BRADEN brake valve can be installed to ensure smooth operation during lowering.

Add the BRADEN brake valve (PN 81984) to the hoisting side of the hydraulic motor with four socket head capcrews (PN 21134) and o-ring (PN 13838).

Connect a size -4 hydraulic hose from the lowering side of the hoist to the BR port on the brake valve.

See drawings on page 55 for more details.

PREVENTIVE 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

Inspection records as well as records of preventive maintenance, repairs and modifications must be retained for a minimum of four (4) years. These records should include but are not limited to, hoist model and serial number, date, description of the problem, repairs performed, parts used and description of the final test.

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 11.
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 16. 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 hoist gear oil after a sample is taken.

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. Testing indicates 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 ⚠

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.

⚠ 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 and analysis has not be performed as required, tear-down inspections are needed. Refer to the hoist disassembly section of this manual.*

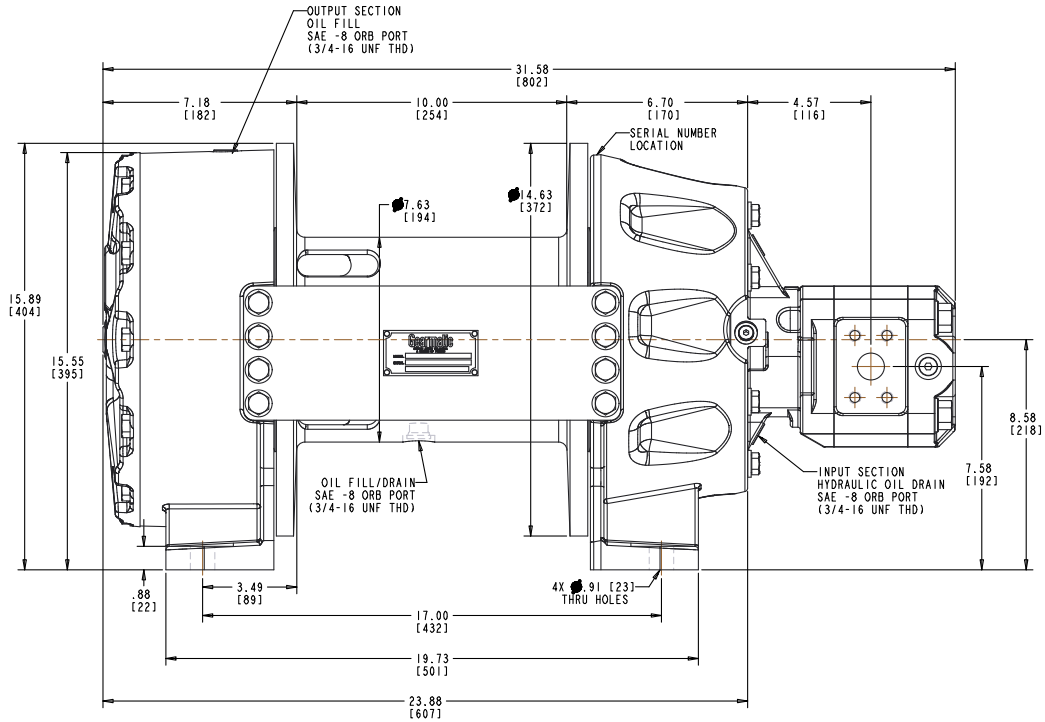
Drain the *hydraulic* oil from the brake housing by removing the plug on the hoist motor end flange. Drain the *gear* oil from the drum and output housing by removing the drain plug on the hoist output end cover and the drain plug in the drum. Ensure both end housings are vented for faster draining. After all the oil is drained, reinstall the drain plugs and re-fill the output housing with one of the recommended oils listed on page 16 to the oil level plug or sight gage. The brake housing will fill hydraulic oil via the orifice in the brake cylinder.

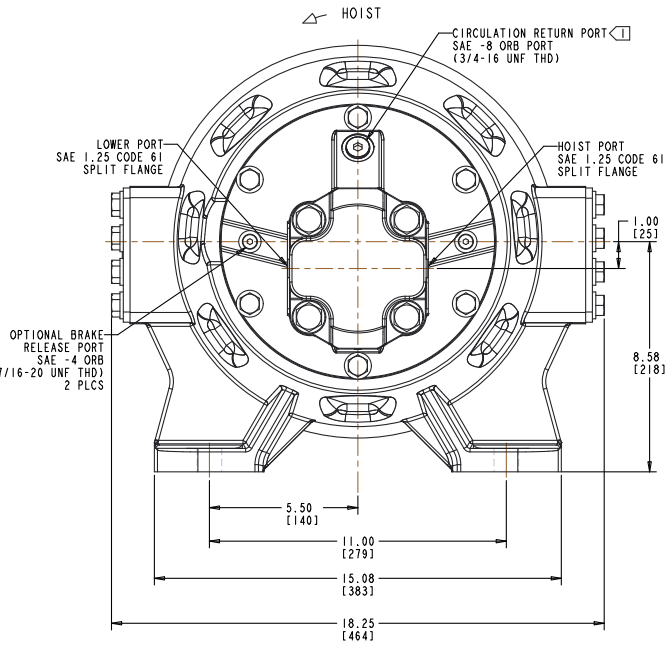
⚠ WARNING ⚠

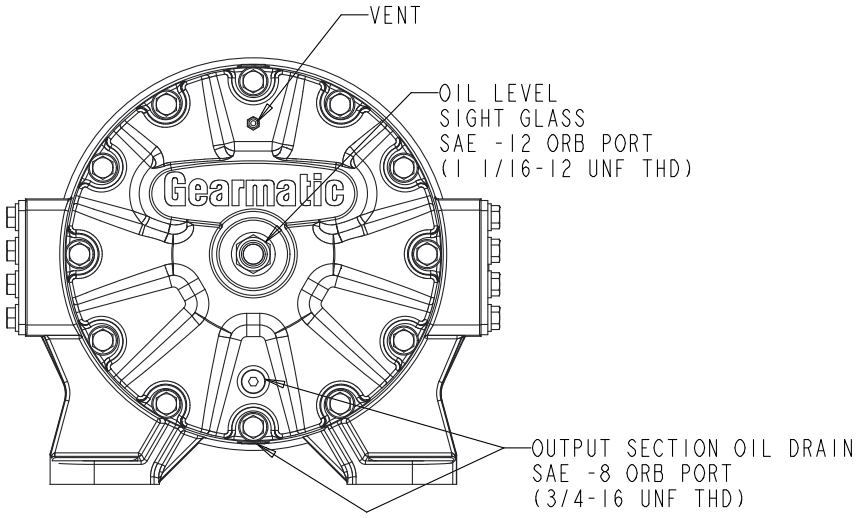
DO NOT insert fingers through oil drain hole to determine drain hole alignment. Movement of the drum could result in sever injury should appendages be present in the drain hole.

The vent plug is located in the output end cover. 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.

The vent plug should always be installed above the level of the hydraulic oil.







NOTES:

1. 30 PSI (2.07 BAR) MAX RETURN LINE PRESSURE
2. WINCH REQUIRES ONE CIRCULATION RETURN PORT TO BE CONNECTED BACK TO TANK

LONG TERM STORAGE

STORAGE PRECAUTIONS

If your GM12A hoist is not used for extended periods of time should be kept indoors in a climate controlled structure when possible.

The drum should be rotated at least every 6 months using the procedure outlined below to coat the seals, seal surfaces, internal gearing and static brake system with oil. It should not be exposed to moisture, which causes rust and corrosion.

MAINTENANCE INSTRUCTIONS

1. Check the gear oil level as described in the service manual. Add gear oil if required to fill to the correct level.
2. Using paint or marker, mark the drum flange and side plate at the top of the drum when the winch or hoist is in the storage position (Figure 3).
3. Place splash pan under the hydraulic motor.
4. Remove plugs in the hydraulic motor work ports.
5. Connect the reel in and reel out hose ports to vehicle or HPU*.
6. If the winch or hoist is equipped with separate case drain, connect it to the hydraulic tank.
7. Rotate the winch or hoist in both directions 5 complete turns.
8. Rotate the winch or hoist an additional 1/2 turn to ensure that the drum is 180° from the procedure starting point.
9. Remove hydraulic hoses.
10. Replace plugs in the hydraulic motor work ports to prevent corrosion.
11. If the winch or hoist must be stored outside, apply corrosion inhibitor between the outside drum flange and side plates.
12. Wipe any oil from winch or hoist.

*In order to keep the hydraulic motor lubricated, the winch or hoist must be connected to an adequate source of hydraulic flow when turning the unit. A vehicle hydraulic system or Hydraulic Power Unit (HPU) and associated hydraulic plumbing can be used to generate the flow needed to rotate the hoist and release the spring applied hydraulically released static brake.

Figure 1

Figure 2

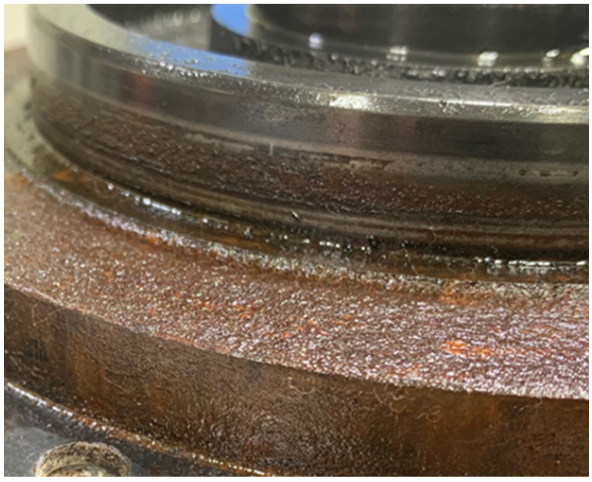


Figure 3

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 the sudden loss of load control, property damage, serious injury or death.

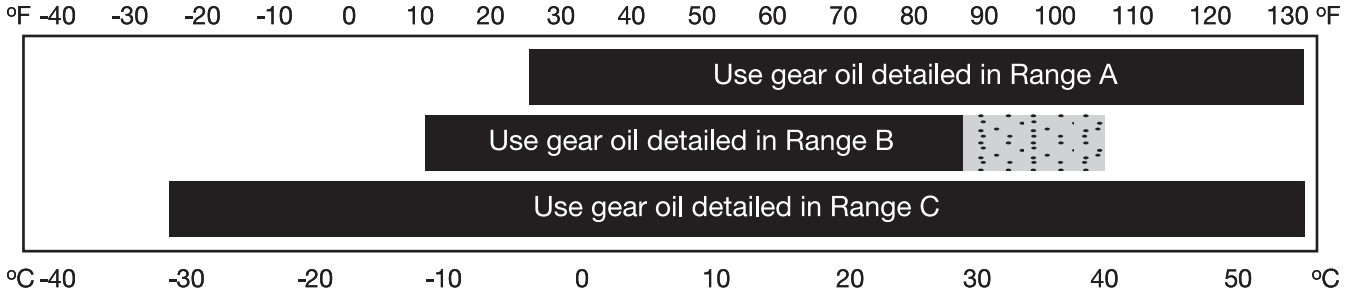
⚠ WARNING ⚠

Some gear lubricants contain large amounts of EP (Extreme Pressure) and anti-friction additives, which may contribute to brake clutch slippage or damage to brake friction discs or seals. DO NOT use oil labeled as meeting "API Service GL-5."

⚠ WARNING ⚠

Oil viscosity is affected by ambient temperature and is critical to reliable brake clutch operation. Tests indicate that excessively heavy or thick gear oil may contribute to intermittent brake clutch slippage. Ensure the gear oil viscosity used in your hoist is appropriate for the prevailing ambient temperature.

PREVAILING AMBIENT TEMPERATURE



Shaded temperature range in the chart above is not recommended for severe applications such as sustained fast duty cycles or frequent winching/hoisting.

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

	Mobil	Shell	Chevron
Range A	Mobilgear 600 XP 200	Omala S2 GX 220	Gear Compounds EP 220 or Meropa 220
Range B	Mobilgear 600 XP 150	Omala S2 GX 150	Gear Compounds EP 150 or Meropa 150
Range C	Mobilgear SHC 150	Omala S4 GX 150	

Arrowhead Winch winches/hoists are factory filled with Mobilgear 600 XP 150 or equivalent. Consult with your oil supplier for equivalent oil options as required.

The hydraulic 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 operation. Our tests indicate that excessively heavy or thick oil may contribute to intermittent brake slippage. Make certain the oil viscosity used in your hoist is correct for your prevailing ambient temperature.

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.*

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, dredge, drill rig, 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 Gearmatic Technical Support Department at 1-918-251-8511, Monday through Friday, 0800 to 1630 hours CST or via the internet at arrowheadwinch.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.

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.

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.

⚠ 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.

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.

⚠ 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.

Tear-Down Inspection

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.

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.
	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.	**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. 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°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 hoist 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.	Same as remedy for A-2.
	2. Same as A-4.	Same as remedy for A-4.
	3. Same as A-6.	Same as remedy for A-5 and B-4.
	4. If this trouble has increased gradually, the hydraulic pump or hoist motor may be worn.	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.
	5. Prime mover(engine or electric motor) may be operating at low speed.	Check/Adjust throttle speed, tune engine.
C		
Lowering speed is significantly slower than hoisting speed.	1. Control valve may be restricted in its travel.	Check the travel of the control valve spool. The spool travel should be the same in both directions.
	2. Same as A-1.	Same as remedy for 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.	Follow warm-up procedure in “Preventive Maintenance” section.
	4. Same as F-1.	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.	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 (6.9 bar), check for restrictions in the return line from the hoist to the control valve and the control valve to the reservoir.
	2. Friction brake will not hold due to worn or damaged brake discs.	Disassemble hoist to inspect/replace worn parts.
	3. Brake clutch is slipping.	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.	Same as remedies for D-1, 2, or 3.
	2. Hoist is being overloaded.	Install a pressure gauge at the hoist port and apply a stall pull on the hoist. If the pressure is higher than the maximum specified PSI, reduce the pressure.
	3. After the causes listed above have been investigated and found to be satisfactory, the trouble may be in the hoist.	Disassemble the primary drive assembly according to the disassembly instructions. Inspect the brake springs, brake discs and brake clutch assembly. Check that the brake clutch 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. ***NOTE:*** If circulation return hose was not installed, drum seals will quickly fail. Also If the brake piston seal is defective, you will usually notice excessive oil flow from the hoist circulation vent port.	1. The friction brake may not be releasing as a result of a defective brake piston seal.	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. Install brake valve per instructions on page 11.
	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 return 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°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.

SERVICE KITS

65888 - EQUAL SPEED SEAL KIT

PART NO.	DESCRIPTION	QTY
103393	V-RING SEAL	2
29139	LIPSEAL	1
105790	OIL SEAL	1
108033	OIL SEAL	1
105499	LIP SEAL	1
113431	O-RING	1
77278	BACK-UP RING	1
22357	O-RING	1
70140	O-RING	2
102272	BACK-UP RING	1
21033	O-RING	1
22520	O-RING	1

65884 - EQUAL SPEED BEARING KIT

PART NO.	DESCRIPTION	QTY
29142	BALL BEARING	2
113436	ROLLER BEARING	3
24915	BEARING ROLLER	6
24914	THRUST WASHER	6
113440	PRIMARY PLANET PIN	3
12025	ROLLPIN	3
113433	THRUST WASHER	1
113428	ROLLER BEARING	3
24482	THRUST BEARING	6
113427	OUTPUT PLANET PIN	3
23584	PIN-SPIROL	3
107013	THRUST WASHER	1
73184	BUSHING	1
108215	THRUST WASHER	1

65886 - EQUAL SPEED BRAKE KIT

PART NO.	DESCRIPTION	QTY
113456	DIVIDER PLATE	7
113446	BRAKE PLATE	2
77278	BACK-UP RING	1
22357	O-RING	1
70140	O-RING	2
102272	BACK-UP RING	1
21033	O-RING	1
103151	DIE SPRING	10
22520	O-RING	1

65889 - HIGH SPEED REVERSE SEAL KIT

PART NO.	DESCRIPTION	QTY
103393	V-RING SEAL	2
29139	LIPSEAL	1
105790	OIL SEAL	1
28844	LIP SEAL	1
105499	LIP SEAL	1
113431	O-RING	1
77278	BACK-UP RING	1
22357	O-RING	1
70140	O-RING	2
102272	BACK-UP RING	1
21033	O-RING	1
22520	O-RING	1

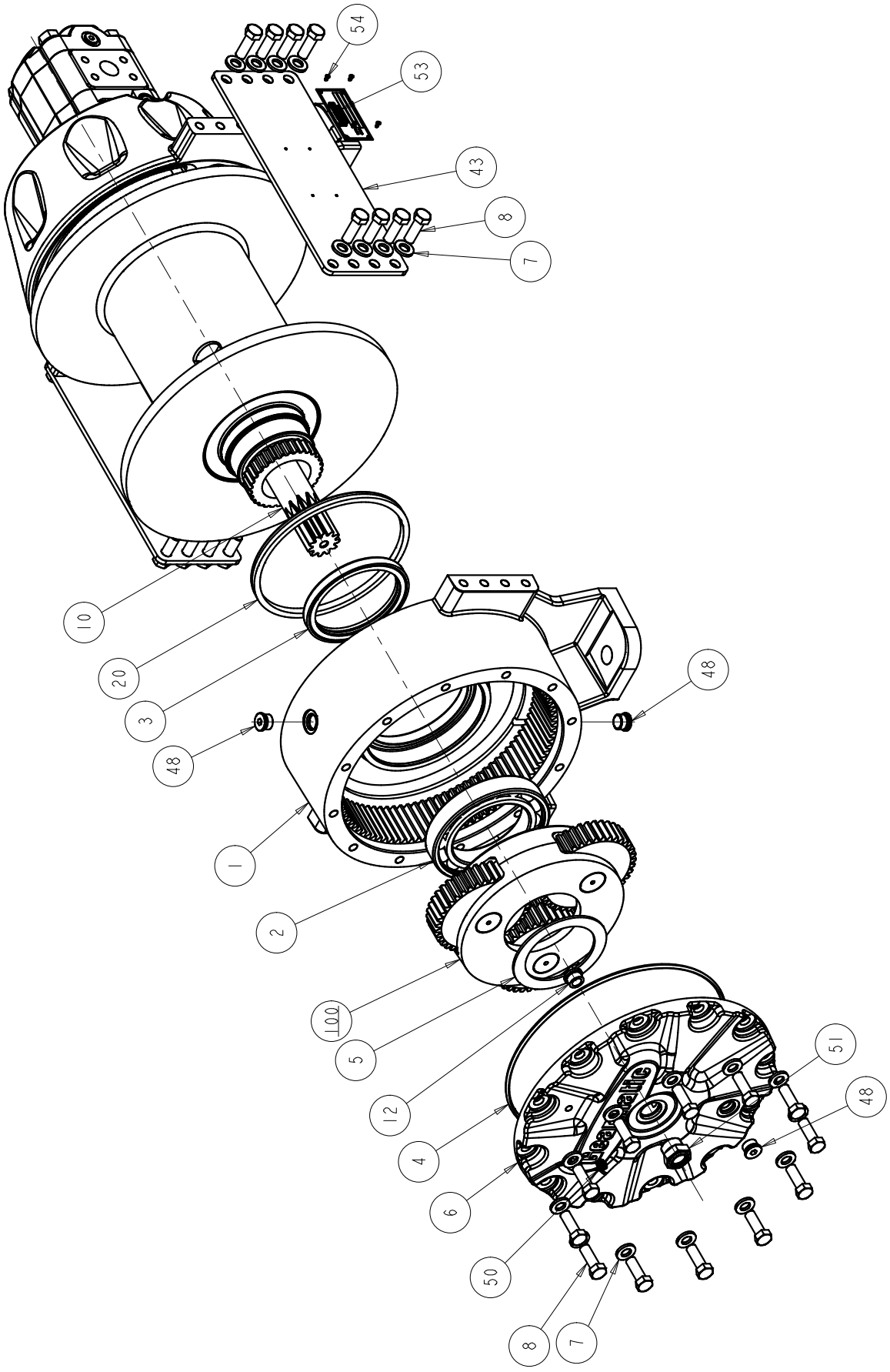
65885 - HIGH SPEED REVERSE BEARING KIT

PART NO.	DESCRIPTION	QTY
29142	BALL BEARING	2
113436	ROLLER BEARING	3
24915	BEARING ROLLER	6
24914	THRUST WASHER	6
113440	PRIMARY PLANET PIN	3
12025	ROLLPIN	3
113433	THRUST WASHER	1
113428	ROLLER BEARING	3
24482	THRUST BEARING	6
113427	OUTPUT PLANET PIN	3
23584	PIN-SPIROL	3
107013	THRUST WASHER	1

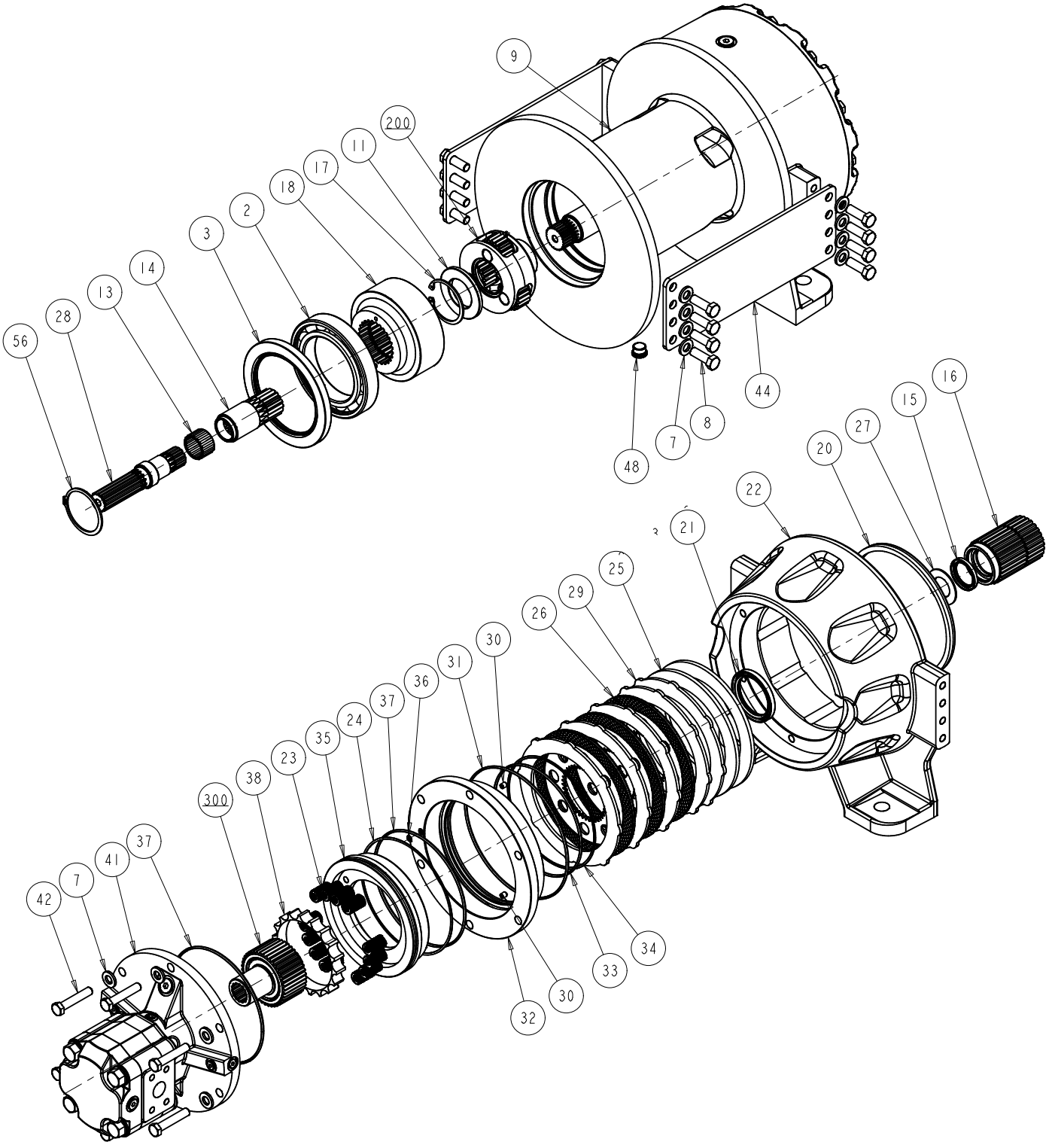
65887 - HIGH SPEED REVERSE SPEED BRAKE KIT

PART NO.	DESCRIPTION	QTY
113456	DIVIDER PLATE	5
113446	BRAKE PLATE	4
77278	BACK-UP RING	1
22357	O-RING	1
70140	O-RING	2
102272	BACK-UP RING	1
21033	O-RING	1
103151	DIE SPRING	18
22520	O-RING	1

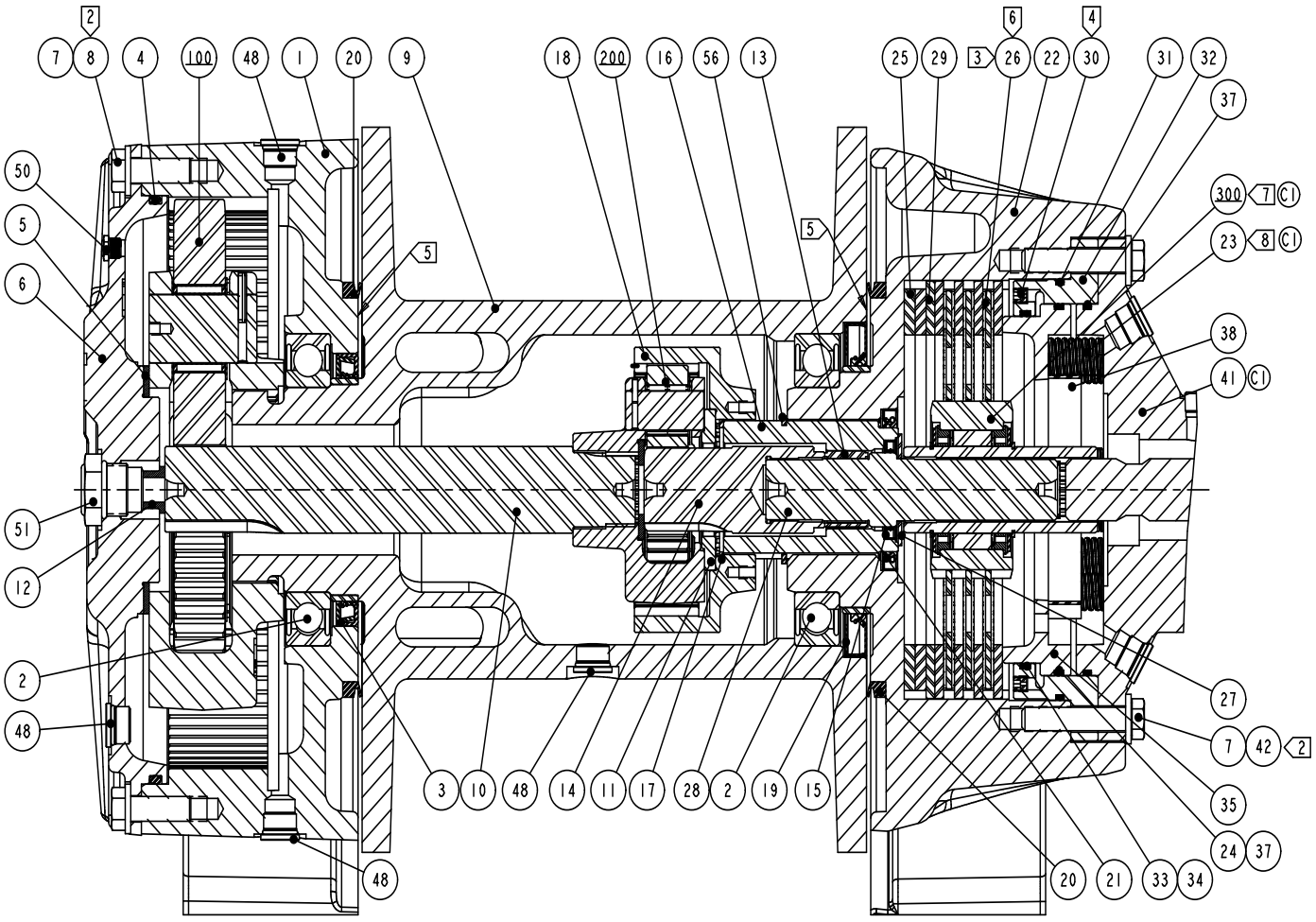
MAIN ASSEMBLY COMPONENTS - EQUAL SPEED



MAIN ASSEMBLY COMPONENTS - EQUAL SPEED



MAIN ASSEMBLY COMPONENTS - EQUAL SPEED

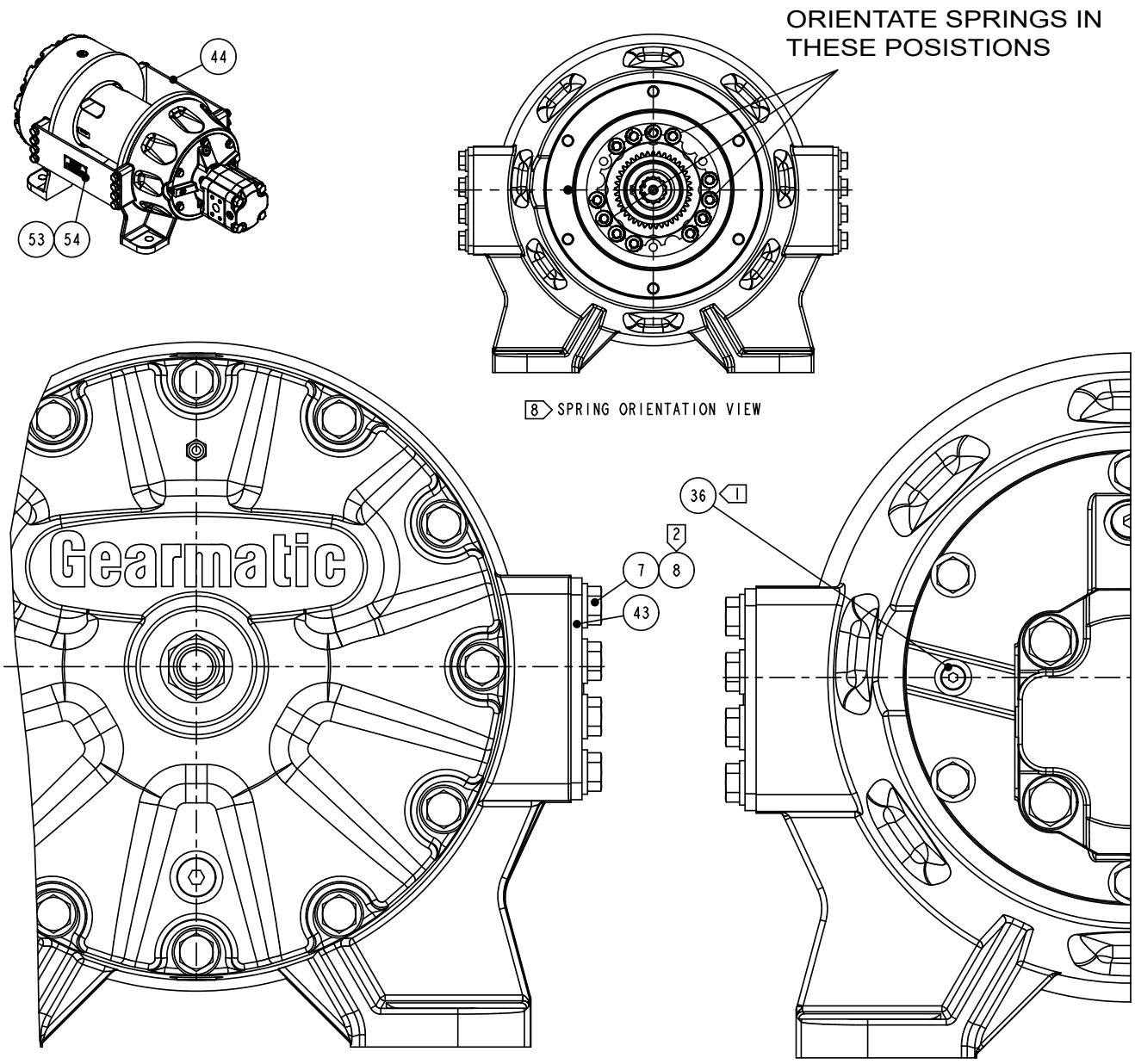


NOTES:

1. O-RING (ITEM 36) IS LOCATED BETWEEN MOTOR (ITEM 41) AND BRAKE CYLINDER (ITEM 32)
2. APPLY LOCTITE 242 TO CAPSCREW (ITEM 8 & 42) AND TORQUE TO 75±10 FT LBS [102±14 Nm]
3. LUBRICATE BRAKE DISC (ITEM 303) WTTH HYDRAULIC OIL BEFORE ASSEMBLY
4. INSTALL PIPE PLUGS (ITEM 30) UNTIL FLUSH W/ SURFACE OF BRAKE CYLINDER (ITEM 32)
5. APPLY AQUA LUBE IN THESE AREAS
6. ALIGN SLOTS IN BRAKE DISCS (ITEM 303)
- (C1) 7. SPRAG CLUTCH (ITEM 300) INPUT ROTATION TO BE CCW FOR HOISTING VIEWED FROM MOTOR SIDE
8. SEE SPRING ORIENTATION VIEW FOR CORRECT SPRING ORIENTATION

9. ITEM NOT SHOWN: CABLE WEDGE (ITEM 52), 2X SHIPPING PLATE (ITEM 55)

MAIN ASSEMBLY COMPONENTS - EQUAL SPEED



MAIN ASSEMBLY COMPONENTS - EQUAL SPEED

PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
85006	OUTPUT PLANET CARRIER ASSEMBLY (see page 50)	100	1
85007	PRIMARY PLANET CARRIER ASSEMBLY (see page 48)	200	1
85008	SPRAG/BRAKE CLUTCH (see page 52)	300	1
113449	GEAR HOUSING, SUPPORT SIDE	1	1
29142	BEARING	2	2
29139	OIL SEAL	3	1
113431	O-RING	4	1
107013	THRUST WASHER	5	1
113448	GEAR HOUSING COVER	6	1
100859	WASHER	7	34
104322	CAPSCREW	8	28
65890	CABLE DRUM, -01, PARTS GROUP	9	1
113430	OUTPUT SUN GEAR	10	1
107295	THRUST WASHER	11	1
113598	BUSHING	12	1
113436	NEEDLE BEARING	13	1
113708	PRIMARY SUN GEAR	14	1
113520	OIL SEAL	15	1
113710	RING GEAR ADAPTER	16	1
70516	RET RING	17	1
113432	RING GEAR	18	1
105499	OIL SEAL	19	1
103393	V-RING SEAL	20	2
108033	OIL SEAL	21	1
65892	BRAKE HOUSING PARTS GROUP	22	1
103151	DIE SPRING	23	12
102272	BACK-UP O-RING	24	1
113456	BRAKE SPACER	25	2
113446	BRAKE DISC	26	3
108215	THRUST WASHER	27	1
113709	INPUT SHAFT	28	1
113706	DIVIDER PLATE	29	5
27748	ORIFICE PLUG	30	2
21033	O-RING	31	1
107266	MOTOR MOUNT	32	1
77278	BACK-UP O-RING	33	1
22357	O-RING	34	1
107260	PISTON	35	1
22520	O-RING	36	1
70140	O-RING	37	2
106000	SPRING SPACER	38	1

MAIN ASSEMBLY COMPONENTS - EQUAL SPEED (continued)

PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
114002	HYDRAULIC MOTOR (OVERWOUND CONFIGURATION - STANDARD)*	41	1
113574	HYDRAULIC MOTOR (UNDERWOUND CONFIGURATION)*		
104131	CAPSCREW	42	6
113458	TIE PLATE	43	1
113439	TIE PLATE	44	1
32411	PLUG	48	4
18062	RELIEF VALVE	50	1
70193	SIGHT GLASS	51	1
76285	CABLE WEDGE	52	1
76323	NAMEPLATE	53	1
11842	DRIVE SCREW	54	4
105826	SHIPPING PLATE	55	2
32089	RETAINING RING	56	1

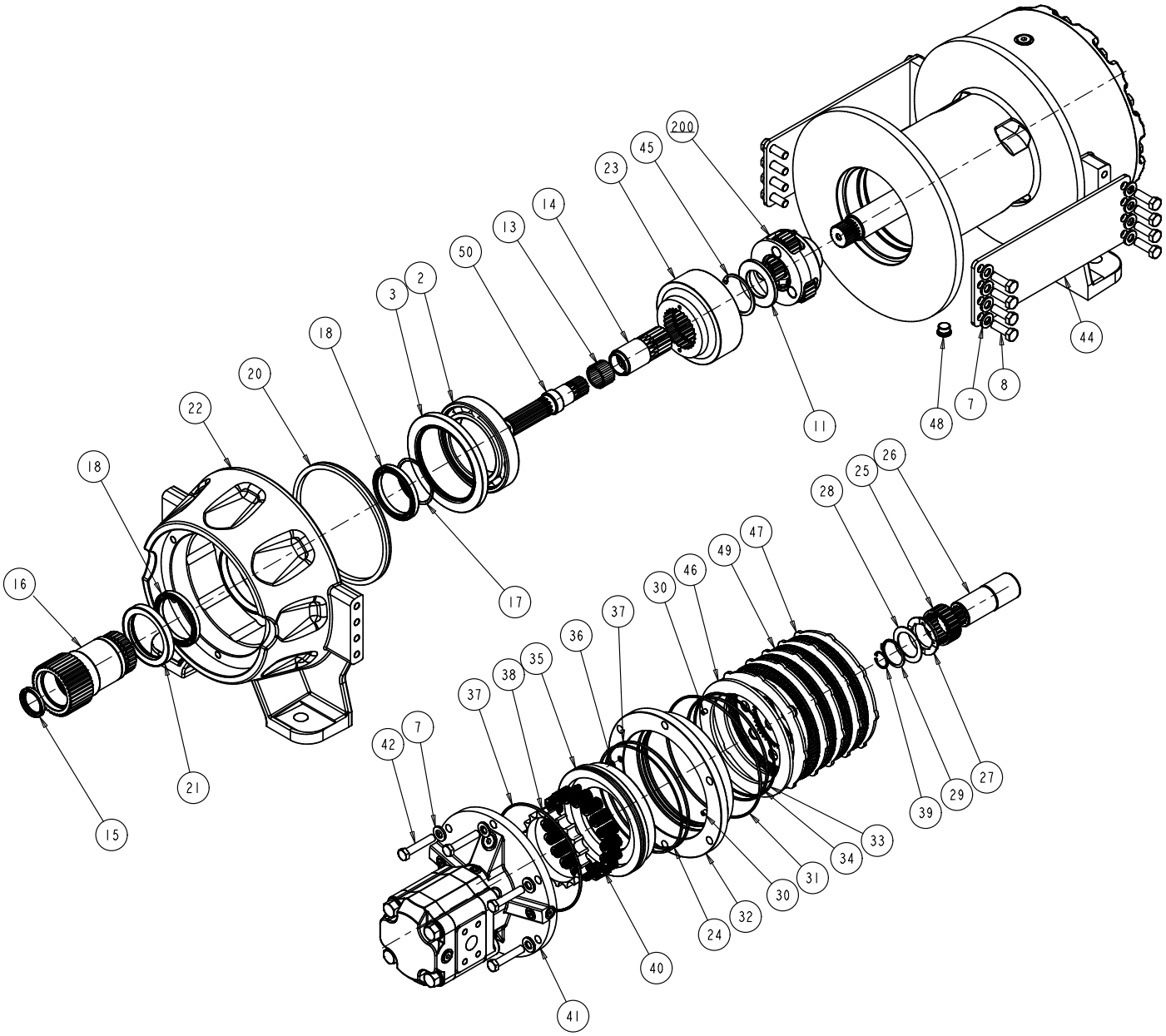
* When viewed from the motor end of the winch.

STAINLESS STEEL LAND

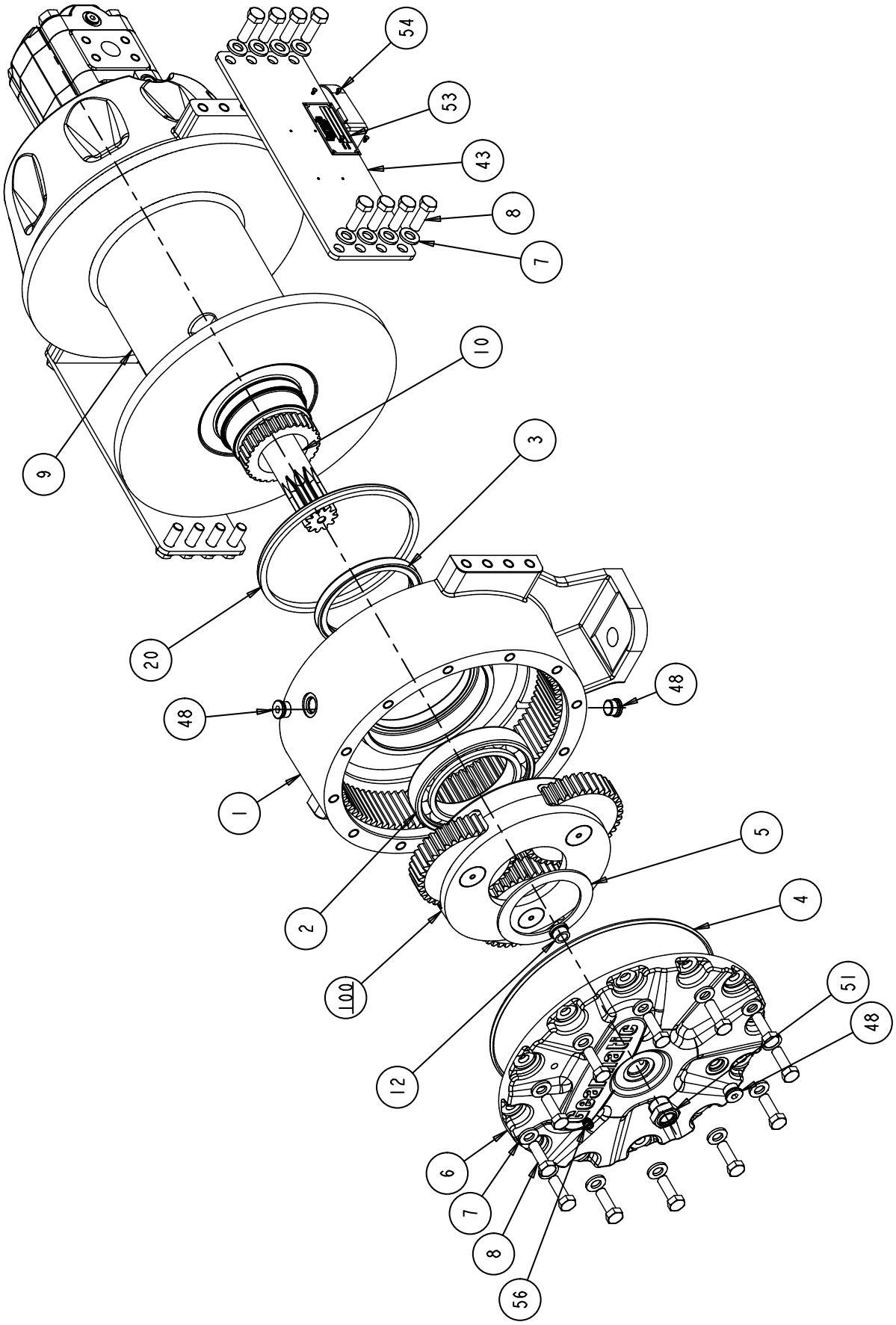
STAINLESS STEEL LAND

The stainless-steel seal sleeves are press fitted onto the cable drum and brake housing at the factory and are used to reduce wear and contamination that might occur during operation in the marine environment.

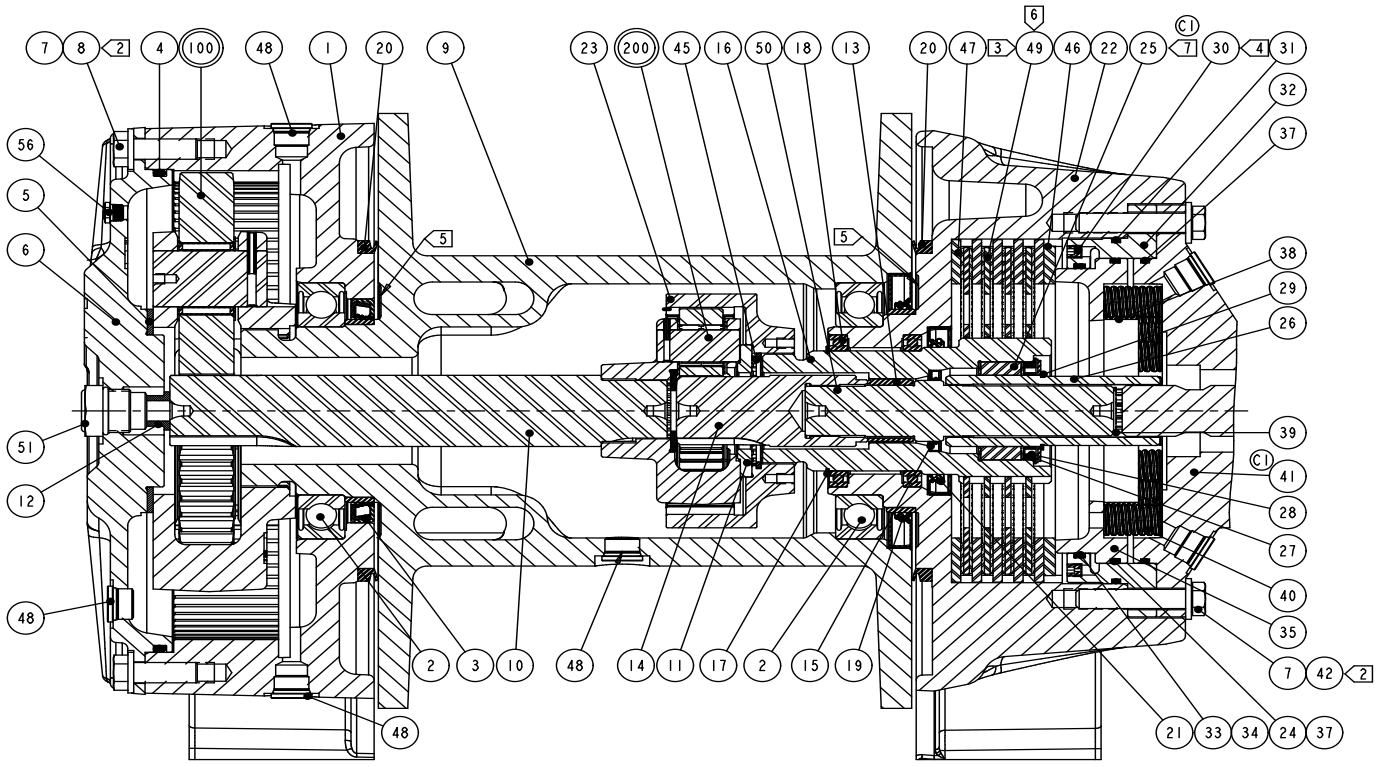
MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE



MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE



MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE



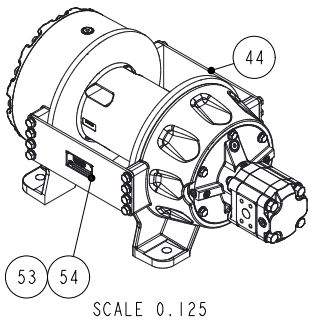
SECTION B-B

NOTES: (C1)

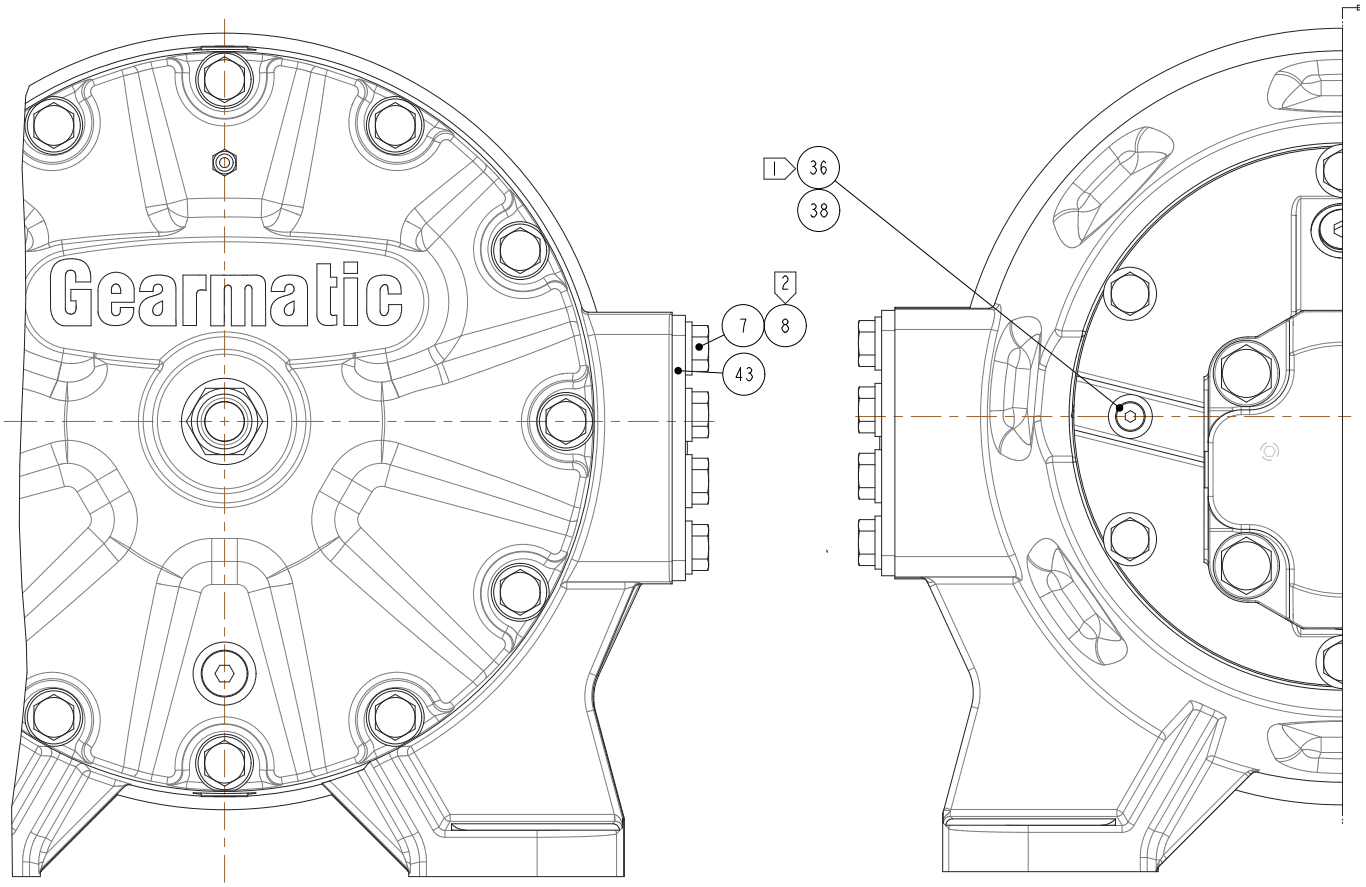
1. O-RING (ITEM 36) IS LOCATED BETWEEN MOTOR (ITEM 41) AND BRAKE CYLINDER (ITEM 32)
2. APPLY LOCTITE 242 TO CAPSCREW (ITEM 8 & 42) AND TORQUE TO 75±10 FT LBS [102±14 Nm]
3. LUBRICATE BRAKE DISC (ITEM 49) WTTH HYDRAULIC OIL BEFORE ASSEMBLY
4. INSTALL PIPE PLUGS (ITEM 30) UNTIL FLUSH W/ SURFACE OF BRAKE CYLINDER (ITEM 32)
5. APPLY AQUA LUBE IN THESE AREAS
6. ALIGN SLOTS IN BRAKE DISCS (ITEM 49)
7. SPRAG CLUTCH (ITEM 25) INPUT ROTATION TO BE CCW FOR HOISTING VIEWED FROM MOTOR SIDE

8. ITEM NOT SHOWN: CABLE WEDGE (ITEM 52), 2X SHIPPING PLATE (ITEM 55)

MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE



SCALE 0.125



MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE

PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
85006	OUTPUT PLANET CARRIER ASSEMBLY (see page 50)	100	1
85007	PRIMARY PLANET CARRIER ASSEMBLY (see page 48)	200	1
113449	GEAR HOUSING, SUPPORT SIDE	1	1
29142	BEARING	2	2
29139	OIL SEAL	3	1
113431	O-RING	4	1
107013	THRUST WASHER	5	1
113448	GEAR HOUSING COVER	6	1
100859	WASHER	7	34
104322	CAPSCREW	8	28
65890*	CABLE DRUM, -01 PARTS GROUP	9	1
113430	OUTPUT SUN GEAR	10	1
107295	THRUST WASHER	11	1
113598	BUSHING	12	1
113436	NEEDLE BEARING	13	1
113708	PRIMARY SUN GEAR	14	1
113520	OIL SEAL	15	1
113711	TORQUE TUBE / HSR SHAFT	16	1
113435	RET RING	17	1
113434	BEARING	18	2
105499	OIL SEAL	19	1
103393	V-RING SEAL	20	2
28844	OIL SEAL	21	1
65893	BRAKE HOUSING PARTS GROUP	22	1
113432	RING GEAR	23	1
102272	BACK-UP O-RING	24	1
24839	SPRAG	25	1
113438	COUPLING	26	1
27684	SPRAG BEARING	27	1
24581	THRUST BEARING	28	1
12034	RET RING	29	1
27748	ORIFICE PLUG	30	2
21033	O-RING	31	1
107266	MOTOR MOUNT	32	1
77278	BACK-UP O-RING	33	1
22357	O-RING	34	1
107260	PISTON	35	1
22520	O-RING	36	1
70140	O-RING	37	2
106000	SPRING SPACER	38	1
24506	RET RING	39	1
103151	DIE SPRING	40	18

MAIN ASSEMBLY COMPONENTS - HIGH SPEED REVERSE (continued)

PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
114002	HYDRAULIC MOTOR (OVERWOUND CONFIGURATION - STANDARD)*	41	1
113574	HYDRAULIC MOTOR (UNDERWOUND CONFIGURATION)*		
104131	CAPSCREW	42	6
113458	TIE PLATE	43	1
113439	TIE PLATE	44	1
70516	RETAINING RING	45	1
113456	BRAKE SPACER	46	1
113706	DIVIDER PLATE	47	5
32411	PLUG	48	4
113446	BRAKE DISC	49	4
113709	INPUT SHAFT	50	1
70193	SIGHT GLASS	51	1
76285	CABLE WEDGE	52	1
76323	NAMEPLATE	53	1
11842	DRIVE SCREW	54	4
105826	SHIPPING PLATE	55	2
18062	RELIEF VALVE	56	1

* When viewed from the motor end of the winch.

STAINLESS STEEL LAND

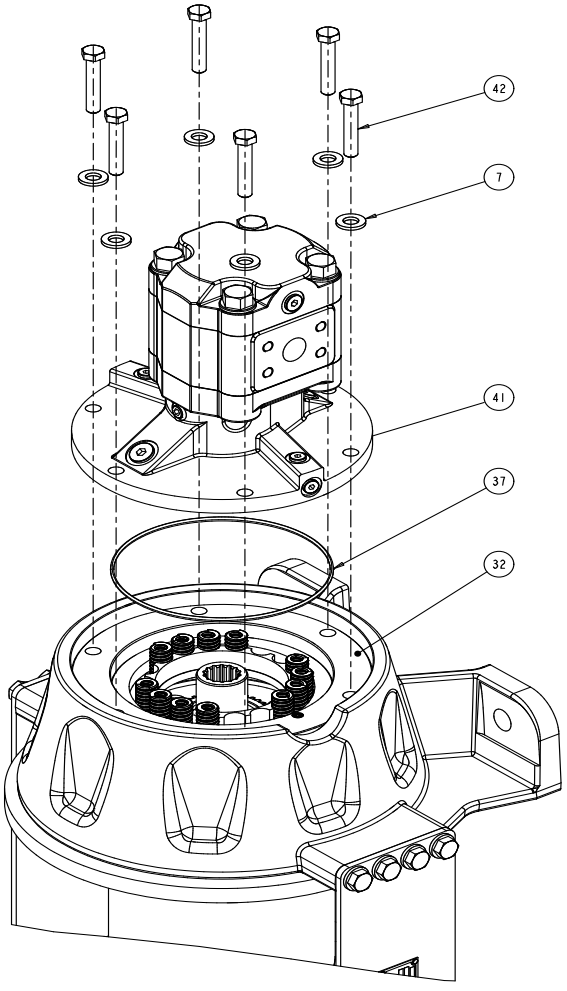
STAINLESS STEEL LAND

The stainless-steel seal sleeves are press fitted onto the cable drum and brake housing at the factory and are used to reduce wear and contamination that might occur during operation in the marine environment.

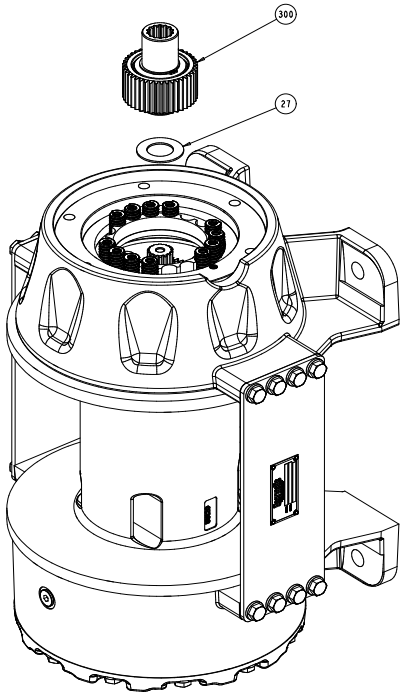
EQUAL SPEED HOIST DISASSEMBLY

INPUT END DISASSEMBLY

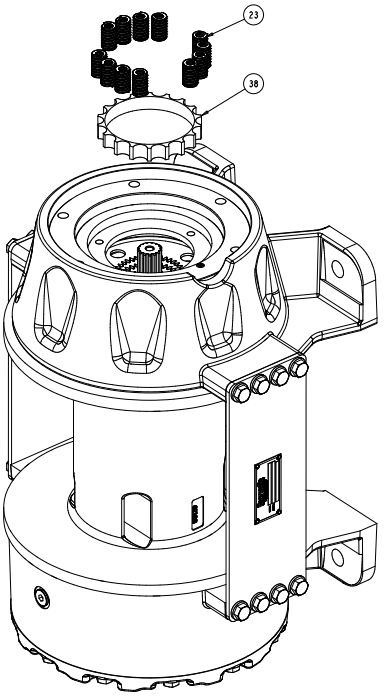
1. Remove the wire rope from the hoist. Drain the oil from the output gear side of the hoist by removing the drain plug (48). To allow for getter flow when draining oil, remove the vent relief valve (50). Drain the hydraulic oil from the motor side of the hoist using the drain plug (48) at the bottom of the motor. Dispose of oil in an environmentally responsible manner.
2. Remove the hydraulic hoses and mounting bolts. 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 pen or scribe line.
3. Stand hoist with motor end up and secure hoist to prevent falling. Remove the spring tension from the hydraulic motor (41) to the brake cylinder (32) by loosening the six capscrews (42) one turn each alternating across the motor. Remove the six capscrews (42) and lockwashers (7) secure the motor to the brake cylinder and lift the motor of the hoist by turning in a slight rotary motion when lifting out of the housing. Remove and discard the motor O-ring (37).



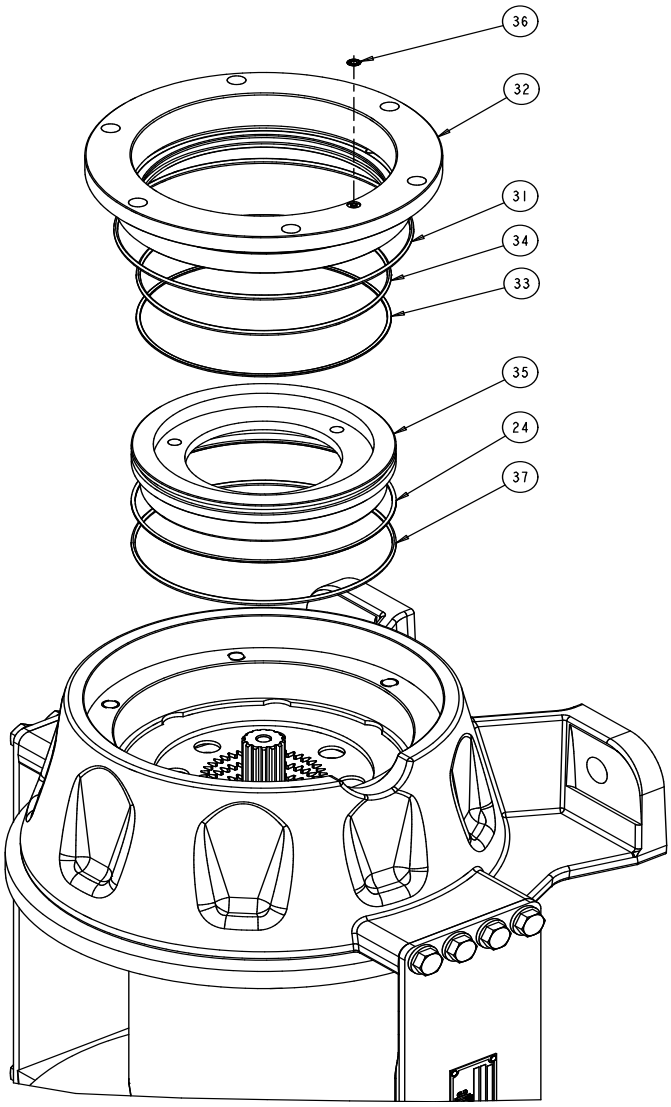
4. Remove the overrunning clutch assembly (300) and thrust washer (27).



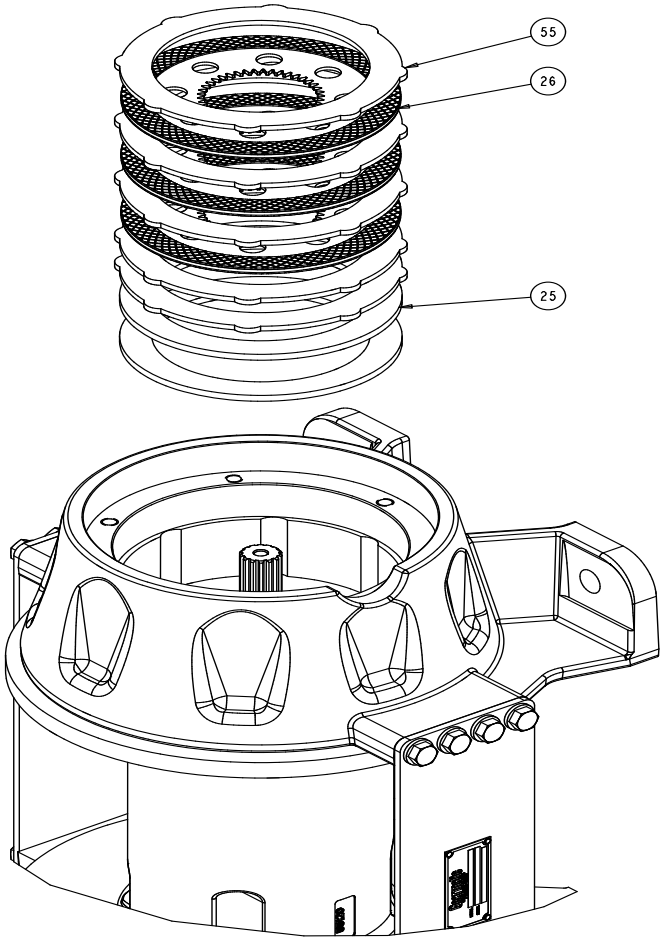
5. Remove the spring spacer (38) and the twelve die springs (23).
6. Remove the brake piston (35). Remove and discard the brake piston O-ring (37) and backup ring (24). Remove the motor mount (32), O-ring (36), O-ring (31), O-ring (34), and backup ring (33).



EQUAL SPEED HOIST DISASSEMBLY

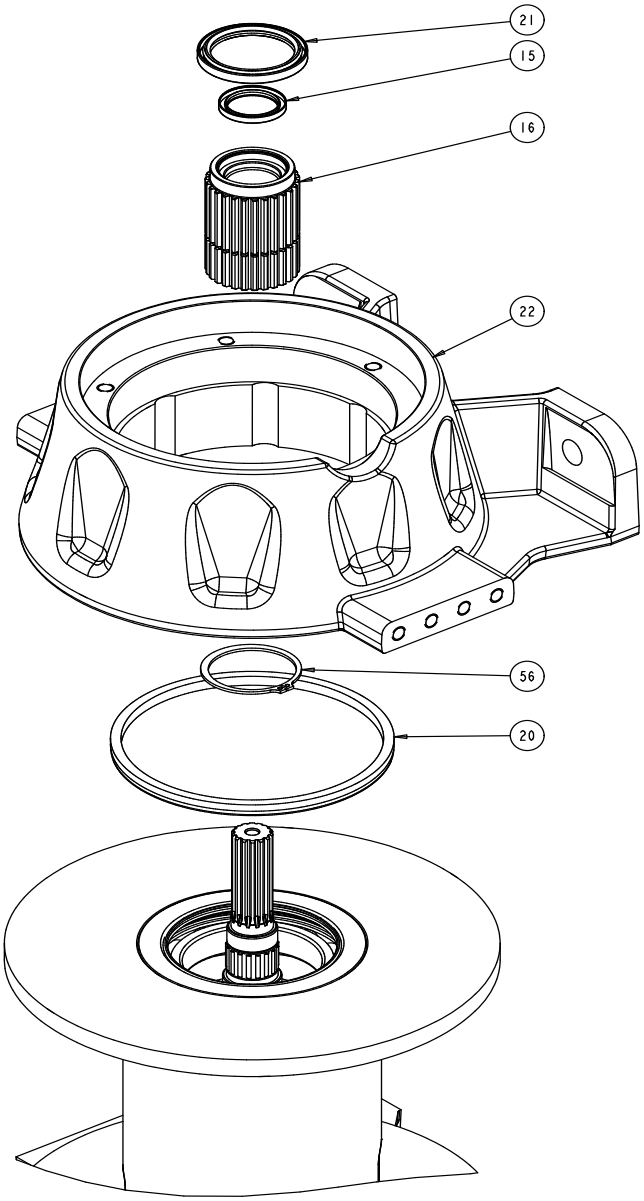


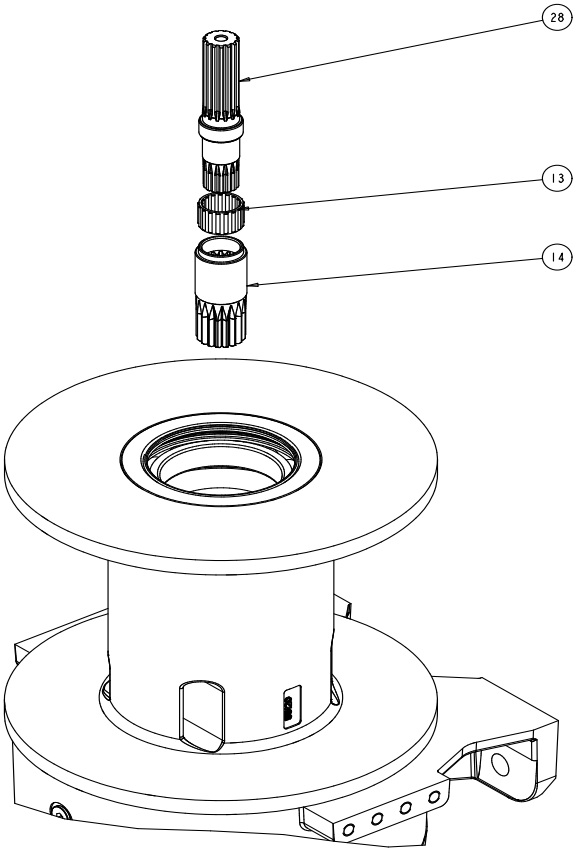
7. Remove the five steel brake discs (29), two brake spacers (25) and three brake friction discs (26). **NOTE:** The bottom two brake spacers do not have lobes.

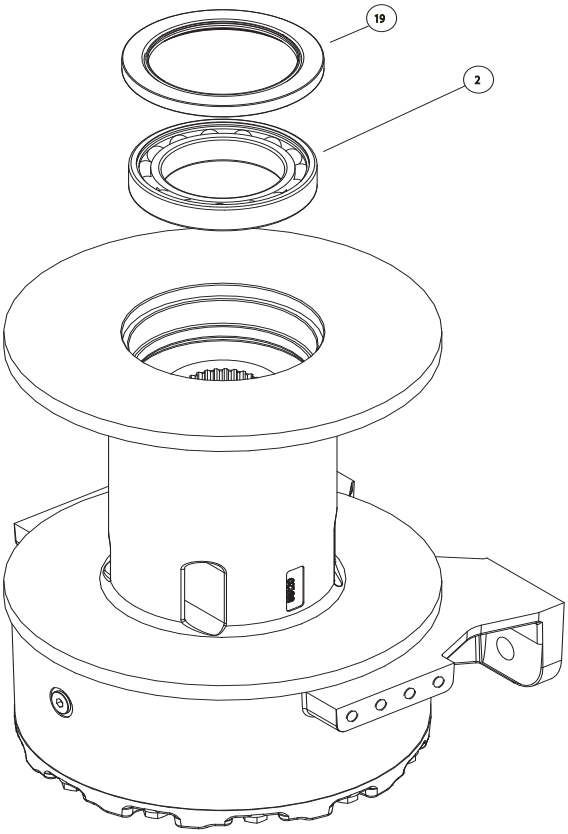


8. Mark the tie plates to the side of the hoist to ease re-assembly. Support the brake housing (22) with an overhead hoist. Remove the top 4 bolts (8) on each tie plate (43-44) and loosen the bolts on the bottom.
9. Use eye bolts and lift the brake housing (22) straight off the drum. The ring gear adapter (16), retaining ring (56), seal (21), V-ring seal (20), and seal (15) will follow.

EQUAL SPEED HOIST DISASSEMBLY

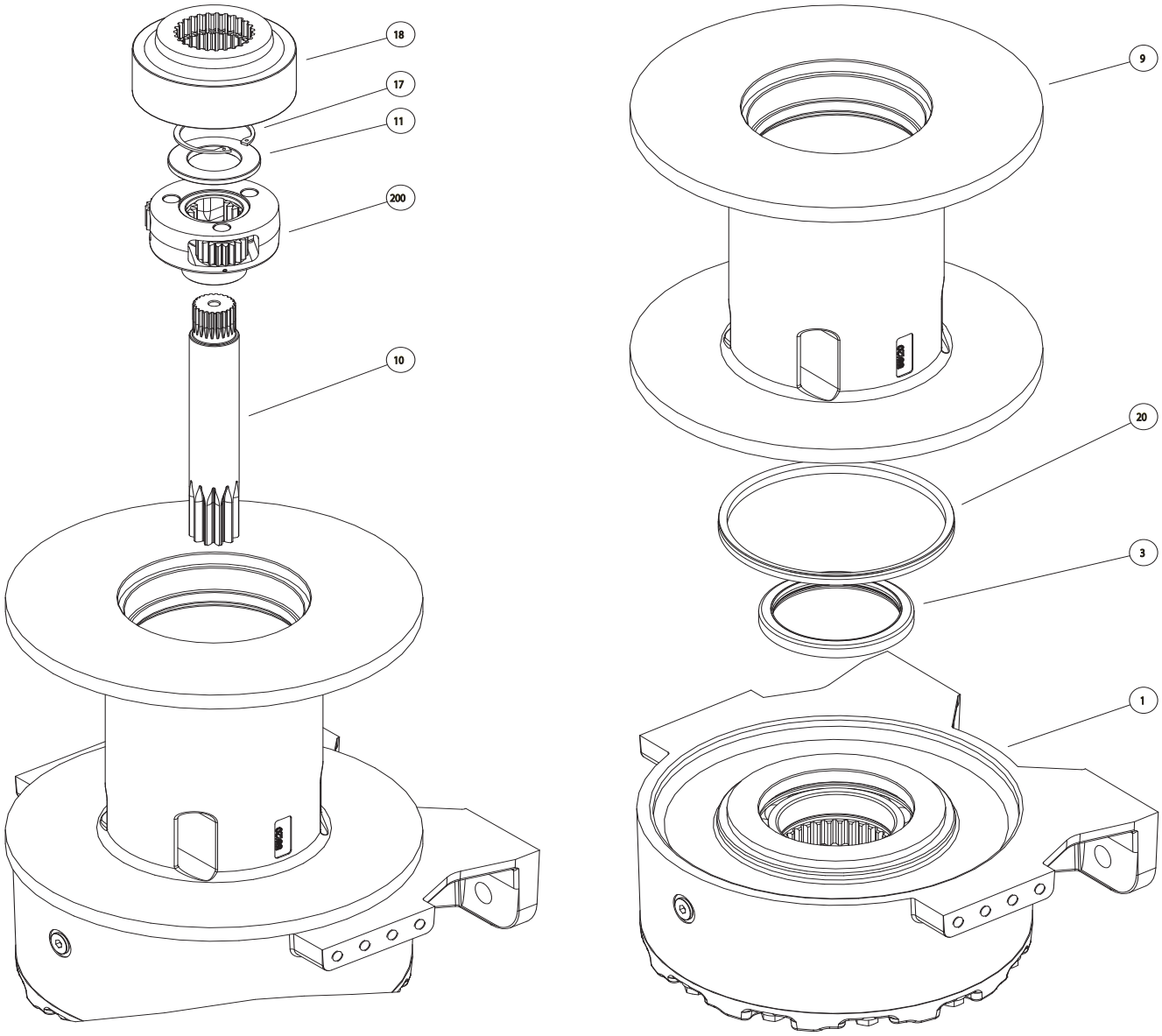






10. Remove the input shaft (28) roller bearing (13) and primary sun gear (14).
11. Remove and discard the drum seal (19). Remove the bearing (2).
12. Remove the ring gear (18), retaining ring (17), thrust washer (11), primary planet carrier assembly (200) and output sun gear (10).
13. Use lifting clamps to lift drum (9) straight up and off the output housing (1). Remove the V-ring seal (20) and seal (3) that are on the output housing (1).

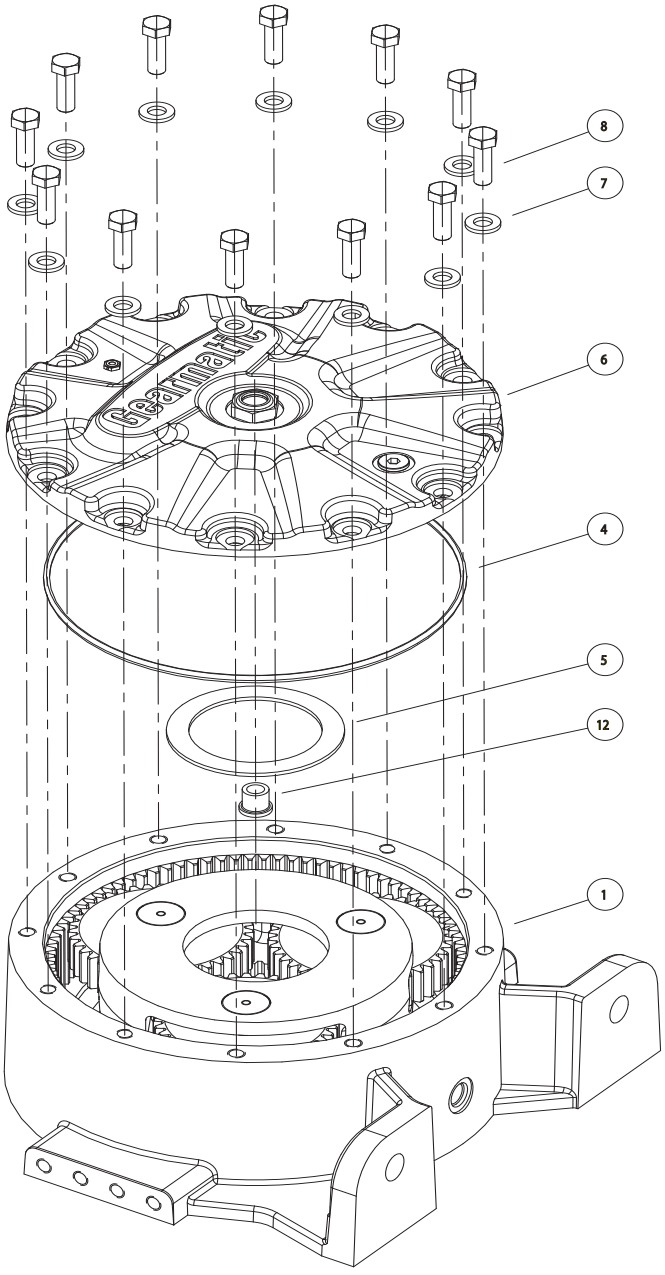
EQUAL SPEED HOIST DISASSEMBLY



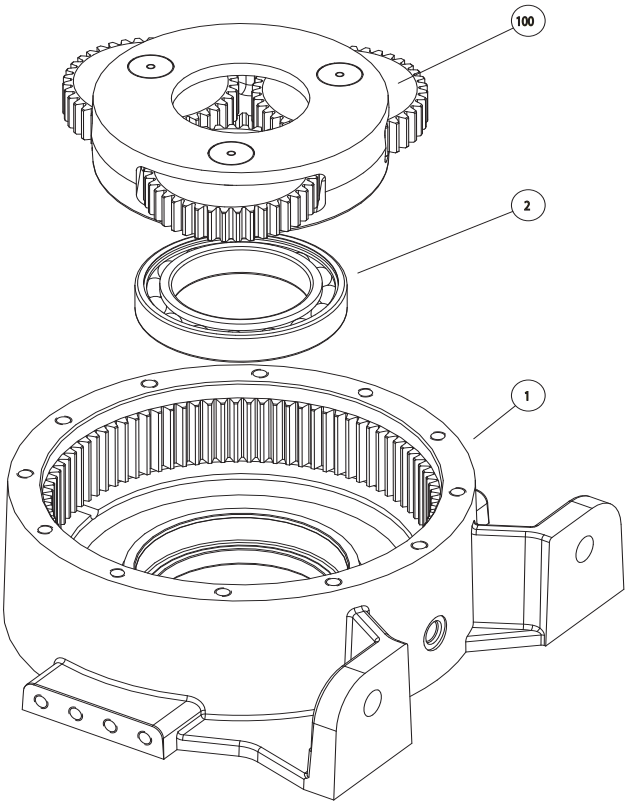
EQUAL SPEED HOIST DISASSEMBLY

OUTPUT END DISASSEMBLY

1. Remove capscrews (8) and lockwashers (7) securing housing cover (6) to output housing (1). Remove housing cover (6). Remove and discard the o-ring (4). Remove thrust washer (5) and thrust button (12).



2. Remove the output planet carrier (100) and bearing (2).



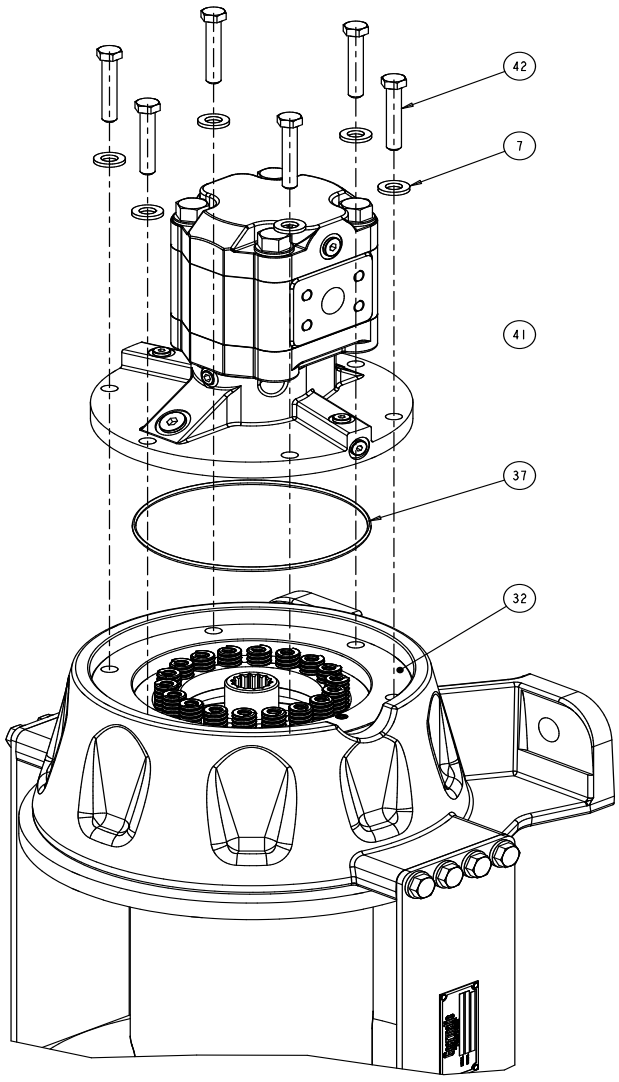
EQUAL SPEED HOIST ASSEMBLY

1. Assemble planet carrier assemblies (100) and (200) and the brake clutch assembly (300).
2. Set output housing with drum end down and ensure it is level and stable. Press ball bearing (2) into output housing (1). Carefully lower output carrier assembly (100) into the output housing (1).
3. Apply general-purpose grease to the thrust washer (5) and install it onto the housing cover (6). Grease the thrust button (12) and install it in the recess in the housing cover (6).
4. Install O-ring (4) onto the housing cover (6) and apply a light coat of grease to the O-ring surface. Check proper alignment of housing cover (6) on output housing (1). Install the housing cover (6) on the output housing (1) and secure it with lockwashers (7) and capscrews (8). Torque to value on torque chart. **NOTE:** The capscrews may be torqued after the hoist is assembled and on its mounting feet.
5. Set the output housing on the deck with the drum side up in preparation for installing the seal, V-ring seal, and drum.
6. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the drum seal on the output housing and install the seal (3) into the output housing (1). Ensure the drum seal is flush with the output housing. Install the V-ring seal (20) onto the output housing.
7. Apply grease to the inner race of the output housing bearing (2) and seal (3).
8. Liberally grease the flange close to the splined snot of the cable drum (9) with marine-grade grease.
9. Use lifting straps or some lifting device to lower the drum (9) onto the end aligning the splines of the drum (9) with the output planet carrier splines.
10. Install the output sun gear (10) into the output planet carrier assembly (100).
11. Install the primary planet carrier assembly (200) onto the splined connection on the output sun gear (10). Apply general-purpose grease to the thrust washer (11) and place it in the recess in the primary planet carrier assembly (200).
12. Install the retaining ring (17) into the groove in the ring gear (18) and install, using the gears, to align onto the primary planet carrier assembly (200).
13. Press bearing (2) into the cable drum. Install the oil seal (19) into the cable drum (9).
14. Install the primary sun gear (14) into the primary planet carrier (100).
15. Install the seal (15) into the ring gear adapter (16). Ensure the seal (15) is flush with the ring gear adapter (16).
16. Install the seal (21) into the brake housing (22). Ensure the seal (21) is flush with the brake housing (22).
17. Install ring gear adapter (16) into the brake housing (22) and retain it using the retaining ring (56). Install the V-ring seal (20) onto the brake housing (22).
18. Liberally grease the flange close to the oil seal of the cable drum (9) with marine-grade grease.
19. Lightly grease the inner race of the drum bearing (2) and drum seal (19). Use ½ -13 eyebolts in the tapped holes of the primary housing and slowly lower it onto the drum.
20. Apply general-purpose grease onto a needle bearing (13) and install into the ID of the ring gear adapter (16) then slide the input shaft (28) there the ID of the bearing then install the thrust washer (27).
21. Attach tie plates (43 and 44), twelve washers (7), and capscrews (8) and torque to proper specification. It may be necessary to loosen bolts and retighten when hoist is installed on final mounting surface.
22. Install two brake spacers (25), two steel divider plates (55), a brake discs (26), steel divider plate (55), a brake disc (26), steel divider plate (55), a brake disc (26), and finally a steel divider plate (55) into the lobes in the output housing (22). **NOTE:** The brake disc should be soaked in hydraulic oil prior to assembly. The holes in the brake disc (26) should line up to allow for proper oil flow.
23. Install two orifices (30) into the brake cylinder (32), install O-ring (31) on the OD and O-ring (33), and backup ring (34) in the ID. **NOTE:** Coat all O-rings with grease prior to assembly.
24. Lower this onto the brake housing and align the thru holes with the tapped holes in the brake housing.
25. Install O-ring (37) and backup ring (24) into the brake piston (35). Apply grease onto the minor and major ID of the brake cylinder (32) then slide the brake piston (35) into the assembly. Align the thru-holes with the brake cylinder thru-holes. A rubber mallet may be needed to ensure the piston is seated properly. Install o-ring (36) into face seal on brake cylinder (32) **NOTE:** Coat all O-rings with grease prior to assembly. A press may be required to press piston into brake.
26. Install the spring spacer (38) and twelve springs (23) on top of the brake piston (35).
27. Align the brake disc (26) splines in preparation for the brake clutch assembly (300) and install the brake clutch assembly (300) onto the input shaft (28).
28. Install the hydraulic motor (41) into the assembly.
29. Install six washers (7) and capscrews (42) and tighten evenly in an alternating pattern. Once tight, torque the capscrews to specification.
30. Once completely assembled, ensure all capscrews are torque accurately according to the torque specification provided in this service manual.

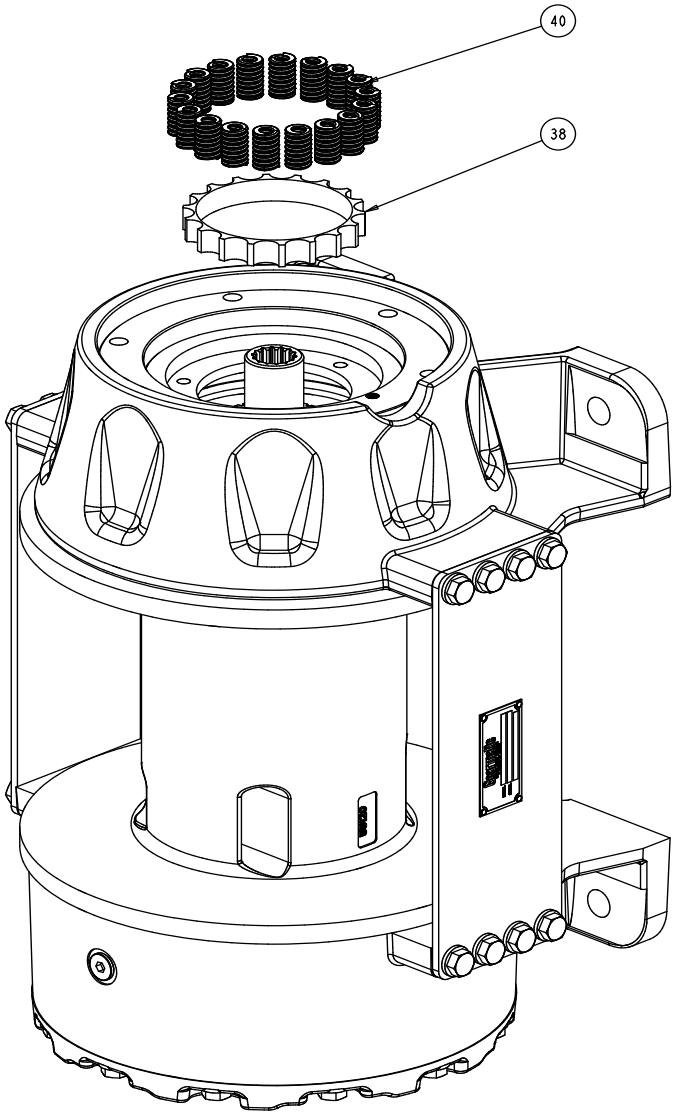
HIGH SPEED REVERSE HOIST DISASSEMBLY

INPUT END DISASSEMBLY

1. Remove the wire rope from the hoist. Drain gear cavity oil by removing the oil from the output gear side of the hoist by the drain plug (48). Drain the hydraulic oil from the motor side of the hoist using the drain plug at the bottom of the motor. Dispose of oil in an environmentally responsible manner.
2. Remove the hydraulic hoses and mounting bolts. 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 pen or scribe line.
3. Stand hoist with motor end up and secure hoist to prevent falling. Remove the spring tension from the hydraulic motor (41) to the brake cylinder (32) by loosening the six capscrews (42) one turns each alternating across the motor. Remove the six capscrews and lockwashers (7) secure the motor to the brake cylinder and lift the motor of the hoist by turning in a slight rotary motion when lifting out of the housing.

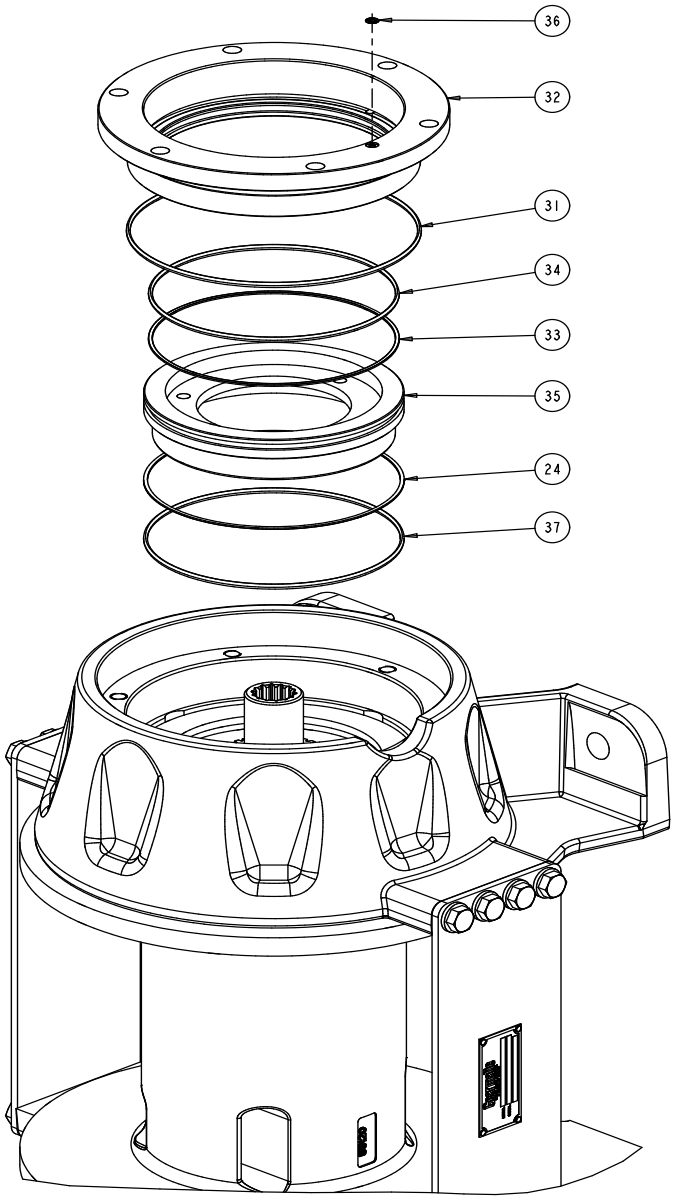


4. Remove the spring spacer (38) and the eighteen die springs (40).

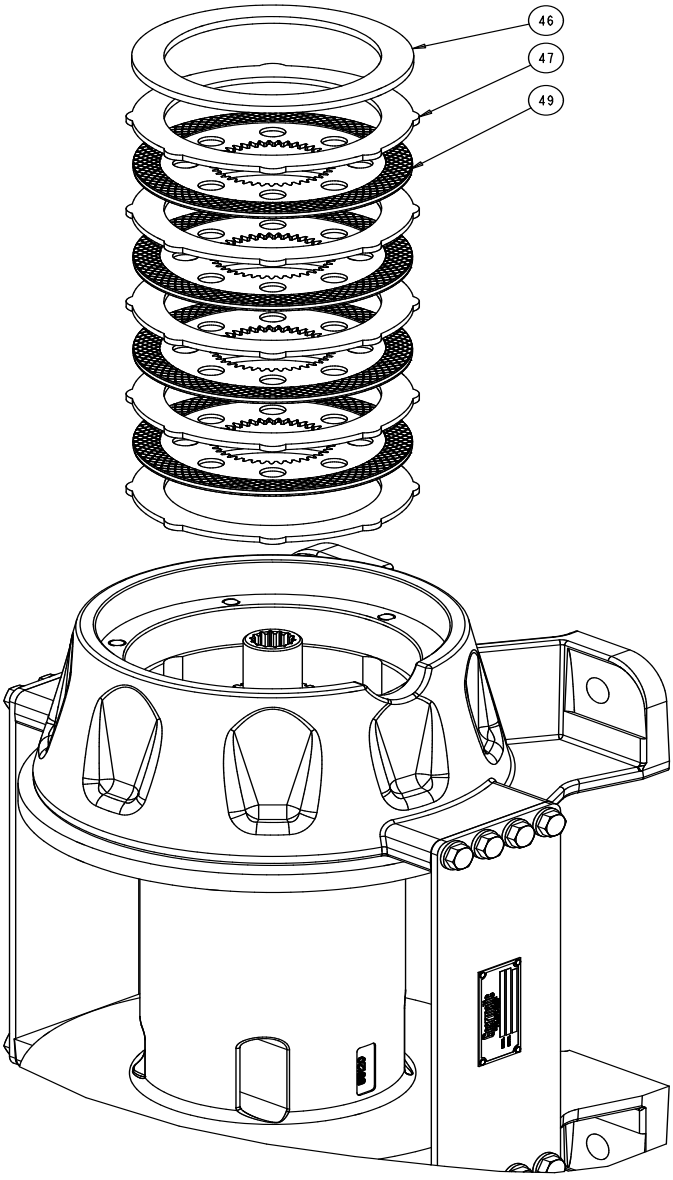


HIGH SPEED REVERSE HOIST DISASSEMBLY

5. Remove the brake cylinder (32) and piston (35). Remove and discard the brake piston O-ring (37) and backup ring (24). Remove the brake cylinder (32), O-ring (36), O-ring (31), O-ring (33), and backup ring (34).

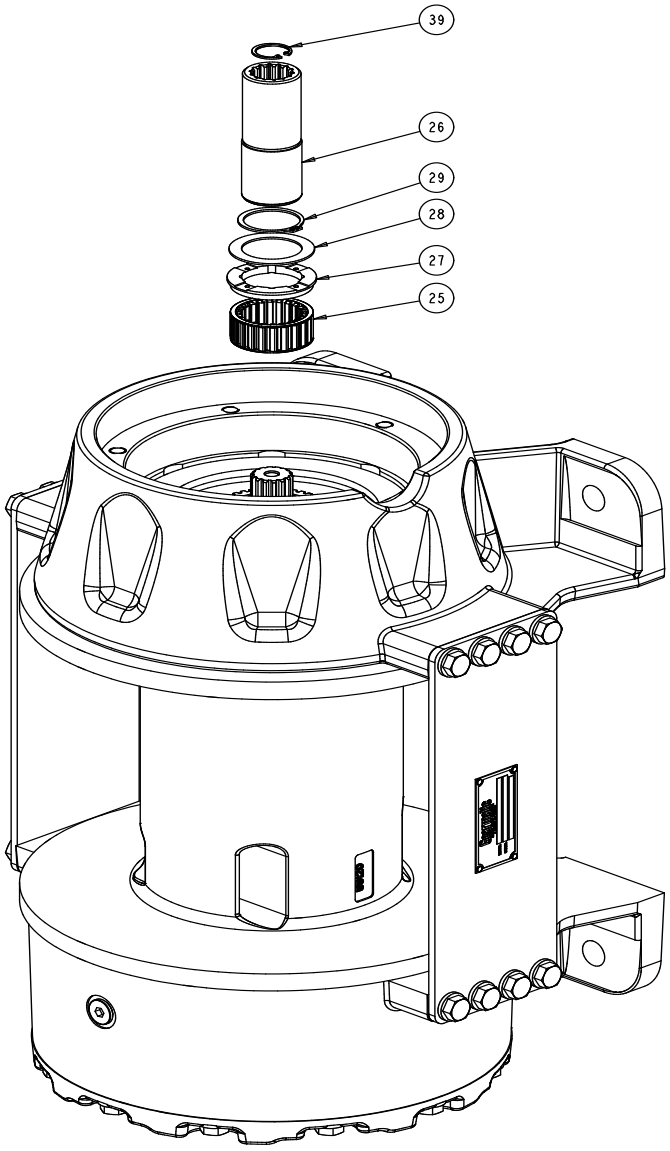


6. Remove one brake spacer (46), five steel brake discs (47), and four brake friction discs (49). **NOTE:** Top brake disc does not have lobes.

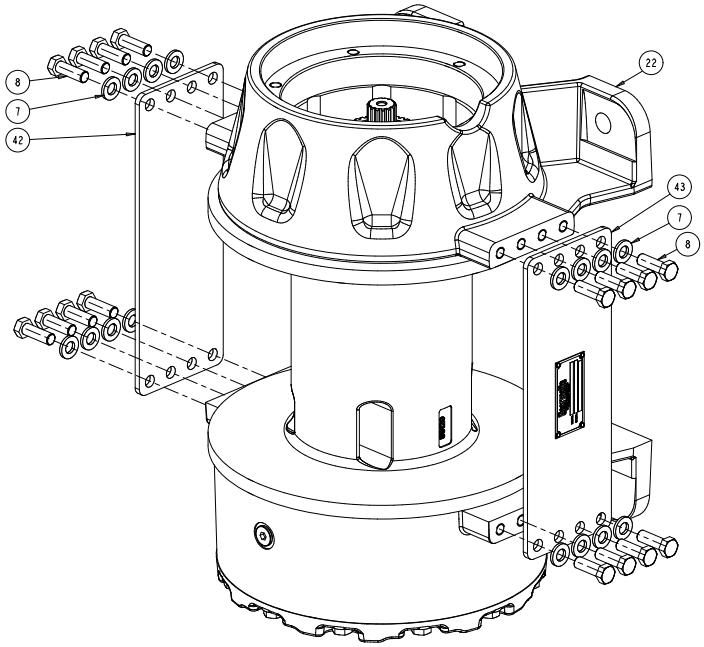


HIGH SPEED REVERSE HOIST DISASSEMBLY

7. Remove the inner brake race (26), retaining ring (29), thrust bearing (28), sprag bearing (27), and sprag (25).



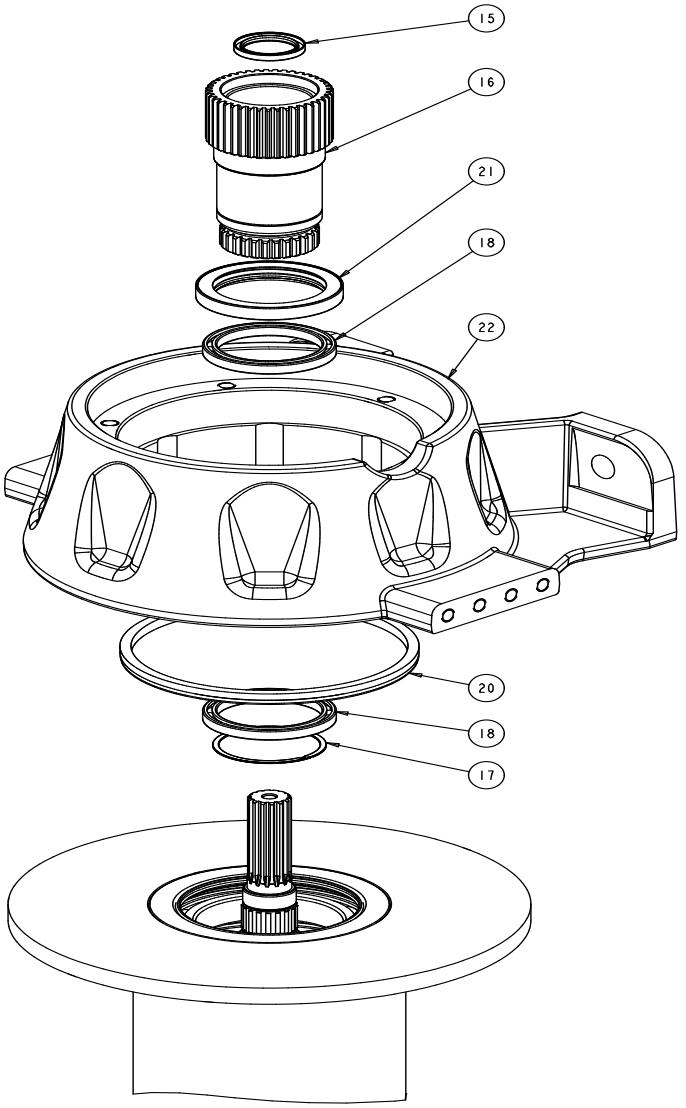
8. Mark the tie plates to the side of the hoist to ease re-assembly. Support the brake housing (22) with an overhead hoist. Remove the top 4 bolts (8) on each tie plate (43-44) and loosen the bolts on the bottom.



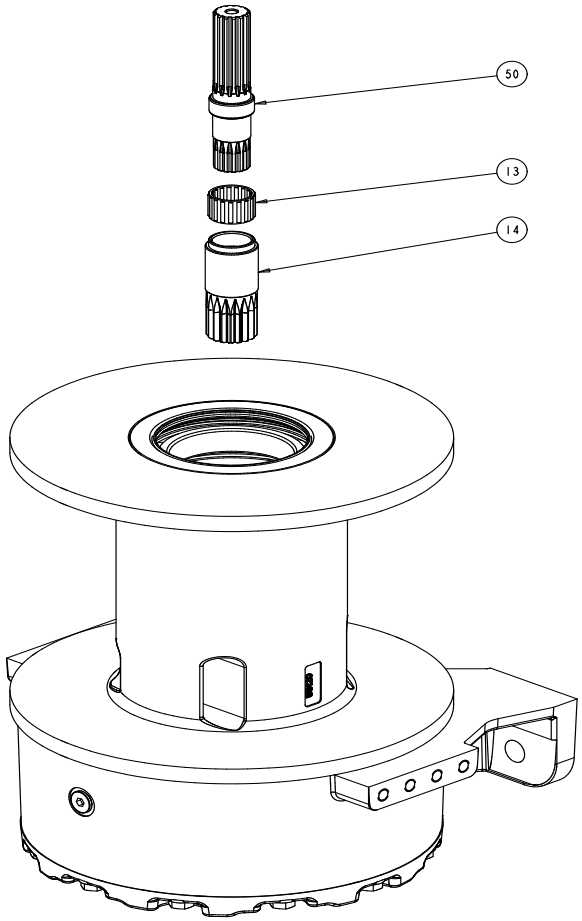
9. Use eye bolts and lift the brake housing straight off the drum. The torque tube (16), 2x bearing (18), seal (21), seal (15), V-ring seal (20), and retaining ring (17) will follow.

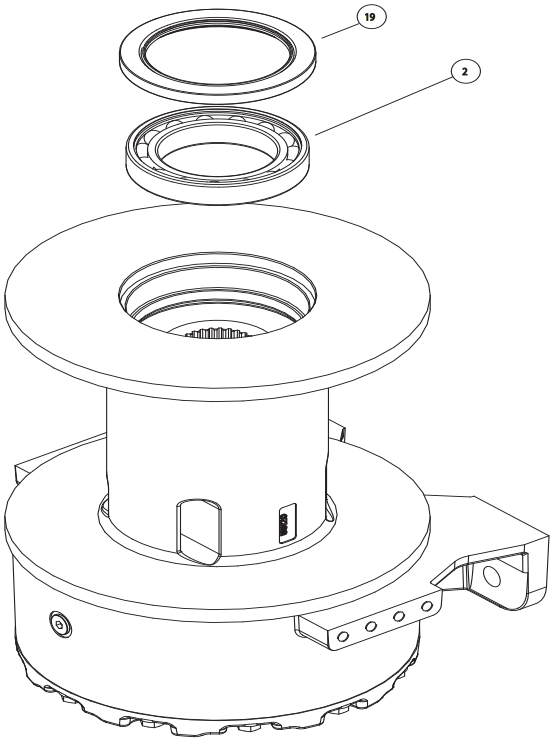
HIGH SPEED REVERSE HOIST DISASSEMBLY

10. Remove the primary sun gear (14), bearing (13) and input shaft (50)
11. Remove the bearing (2) and drum seal (19).



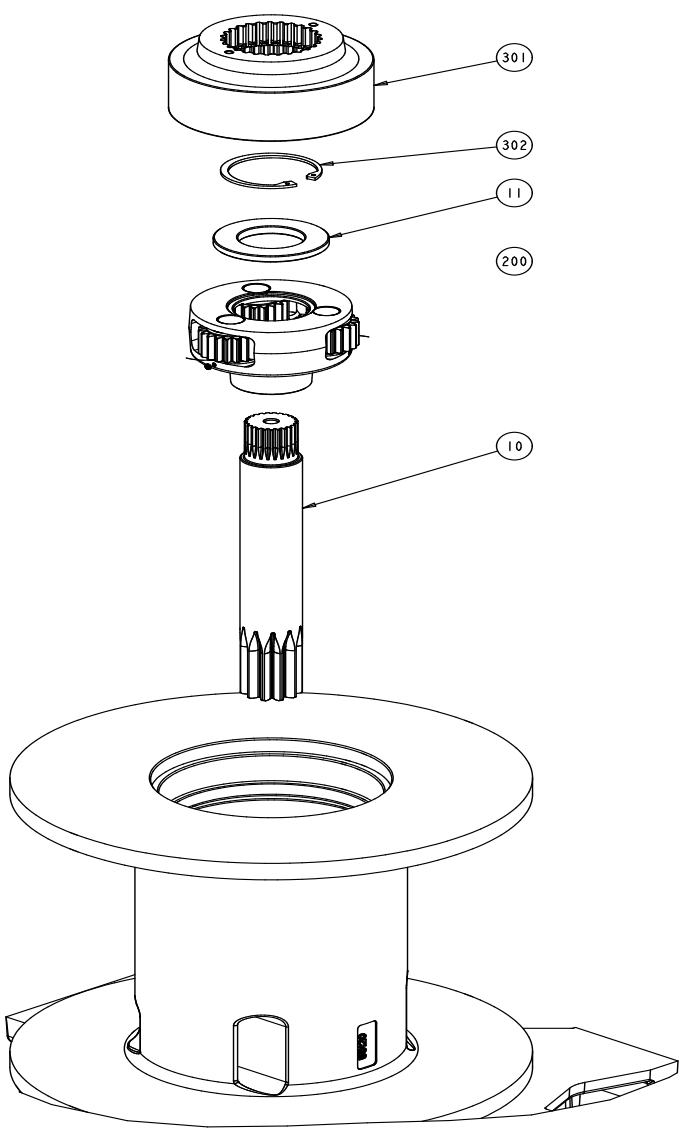
12. Remove the ring gear (18), retaining ring (17), thrust washer (11), primary planet carrier assembly (200, and output sun gear (10).

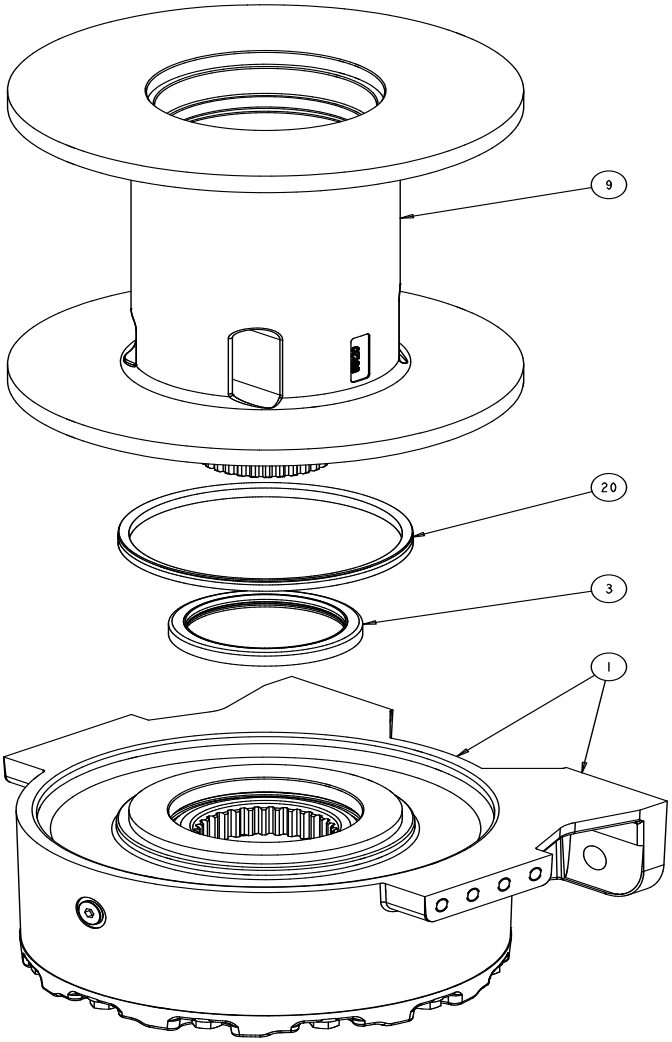




HIGH SPEED REVERSE HOIST DISASSEMBLY

13. Use lifting clamps to lift drum (9) straight up and off the output housing (1). Remove the V-ring seal (20) and seal (3) from the output housing (1).

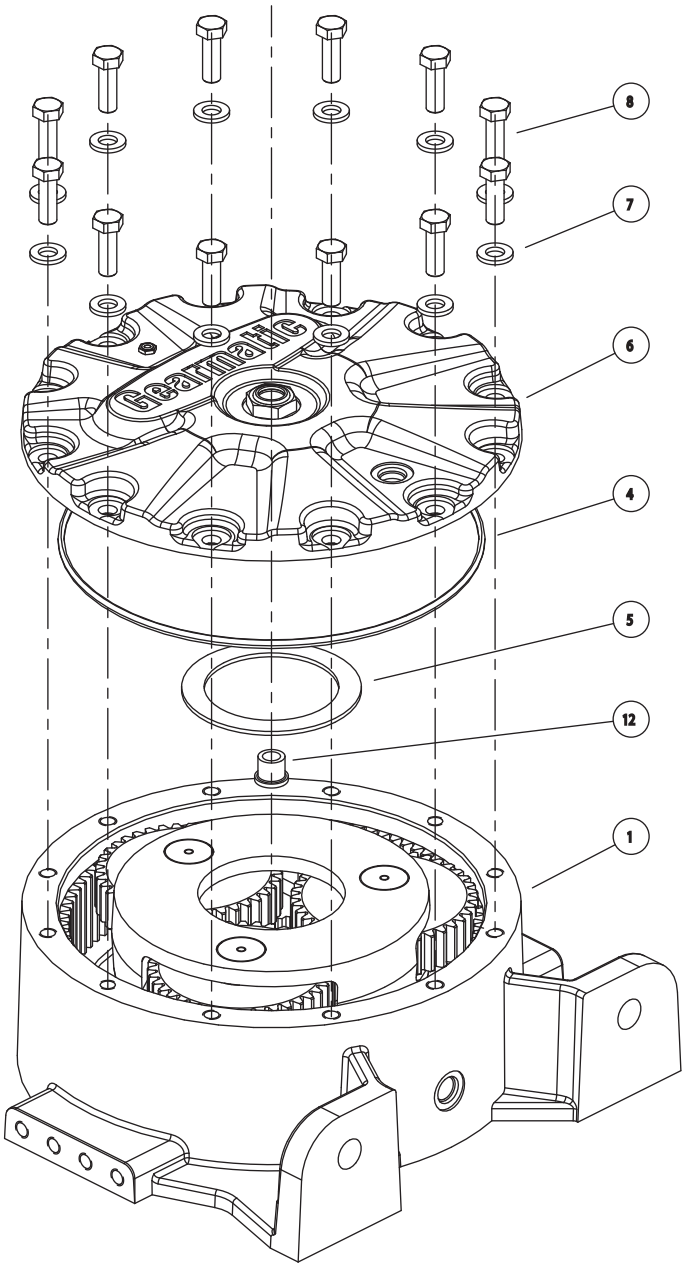


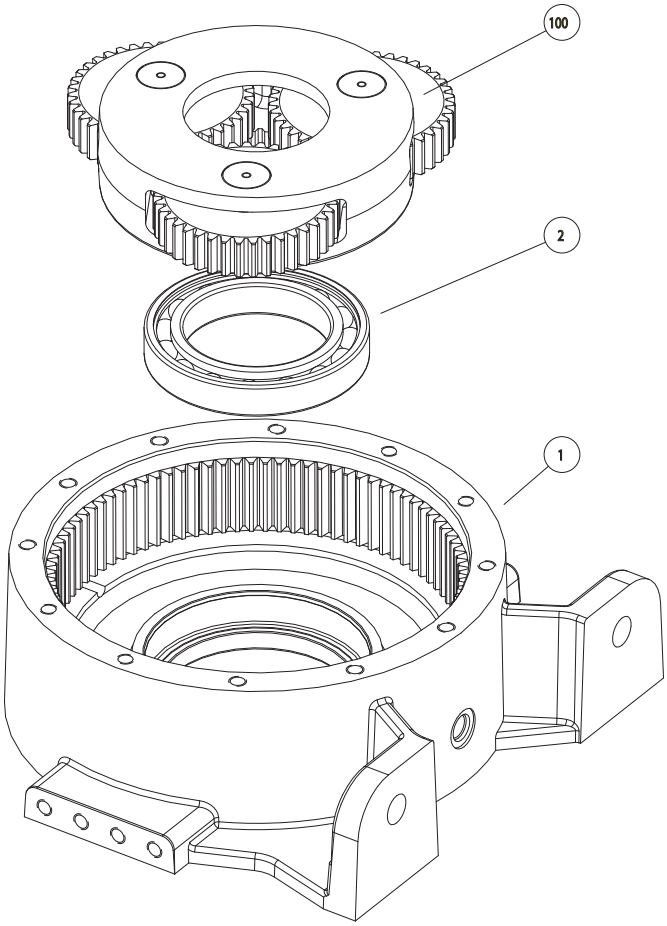


HIGH SPEED REVERSE HOIST DISASSEMBLY

OUTPUT END DISASSEMBLY

1. Remove capscrews (8) and lockwashers (7) securing housing cover (6) to output housing (1). Remove housing cover (6). Remove and discard the o-ring (4). Remove the thrust washer (5) and thrust button (12).
2. Remove the output planet carrier (100) and bearing (2).

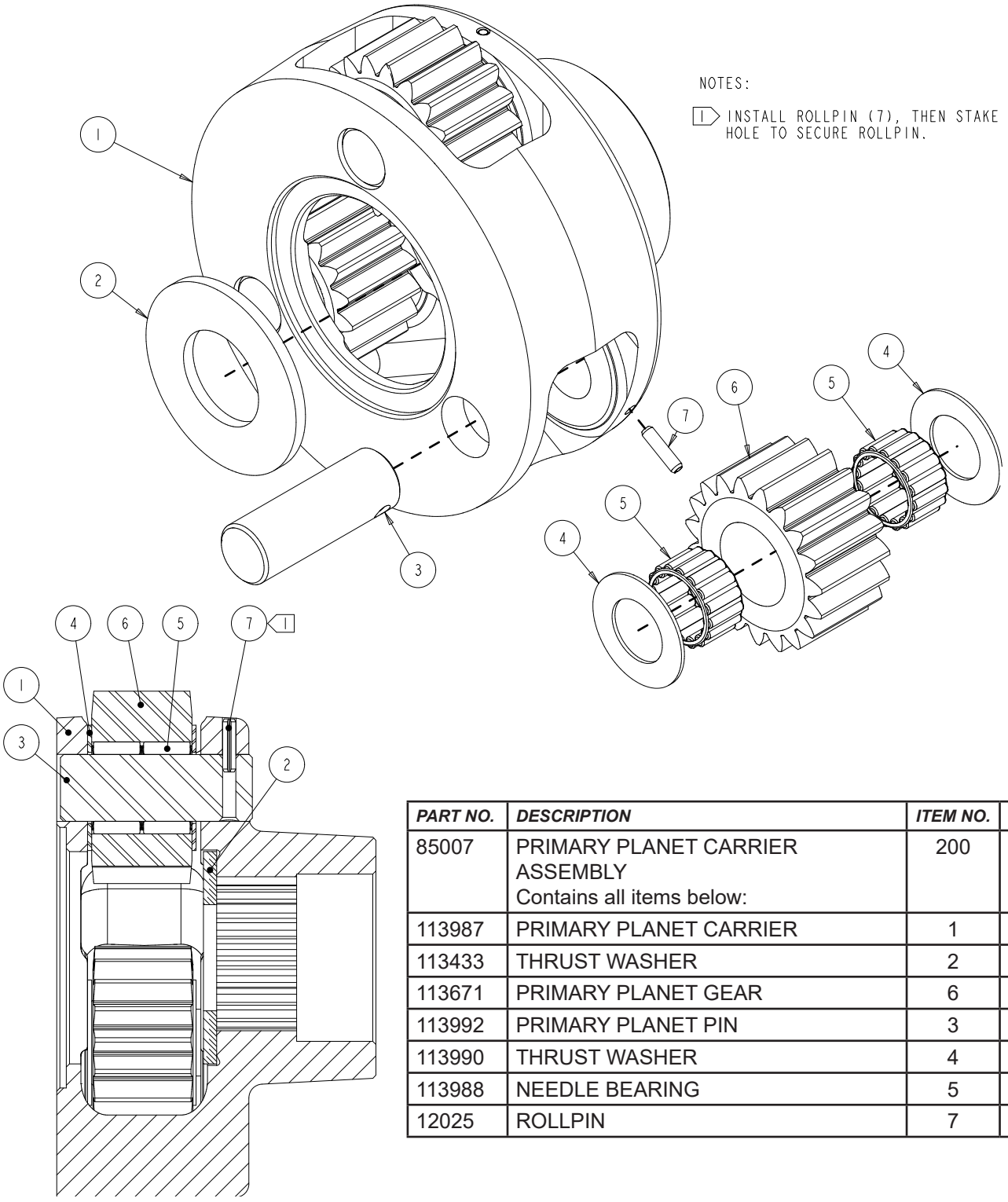




HIGH SPEED REVERSE HOIST ASSEMBLY

1. Assemble planet carrier assemblies (100) and (200) and the brake clutch assembly (300).
2. Set output housing with drum end down and ensure it is level and stable. Press ball bearing (2) into output housing (1). Carefully lower output carrier assembly (100) into the output housing (1).
3. Apply general-purpose grease to the thrust washer (5) and install it onto the housing cover (6). Grease the thrust button (12) and install it in the recess in the housing cover (6).
4. Install O-ring (4) onto the housing cover (6) and apply a light coat of grease to the O-ring surface. Check proper alignment of housing cover (6) on output housing (1). Install the housing cover (6) on the output housing (1) and secure it with lockwashers (7) and capscrews (8). Torque to value on torque chart. **NOTE:** The capscrews may be torqued after the hoist is assembled and on its mounting feet.
5. Set the output housing on the deck with the drum side up in preparation for installing the seal (3), v-ring seal (20), and drum (9).
6. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the drum seal on the output housing and install the seal (3) into the output housing (1). Ensure the drum seal is flush with the output housing. Install the V-ring seal (20) onto the output housing.
7. Apply grease to the inner race of the output housing bearing (2) and seal (3).
8. Liberally grease the flange of the cable drum (9) with marine-grade grease.
9. Use lifting straps to lower the drum (9) onto the end aligning the splines of the drum (9) with the output planet carrier splines.
10. Install the output sun gear (10) into the output planet carrier assembly (100).
11. Install the primary planet carrier assembly (200) onto the splined connection on the output sun gear (10). Apply general-purpose grease to the thrust washer (11) and place it in the recess in the primary planet carrier assembly (200).
12. Install the retaining ring (17) into the groove in the ring gear (18) and install, using the gears, to align onto the primary planet carrier assembly (200).
13. Install the primary sun gear (14) into the primary planet carrier (100).
14. Install bearing (2) in the cable drum. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the oil seal (19) and install it in the cable drum (9).
15. Apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the seal (15) and install it into the torque tube (16). Ensure the seal (15) is flush with the torque tube face (16).
16. Install two ball bearings (18) and apply Loctite Aviation Gasket Sealant (or a non-hardening sealant) to the outside diameter of the seal (21) and install it into the output housing (22). Slide the torque tube into the output housing and install the retaining ring (17) into the groove in the torque tube (16).
17. Apply general-purpose grease on the OD and ID of the needle bearing (13) and slide it into the opening in between the primary sun gear (14) and the torque tube (16).
18. Slide the input shaft (27) into the torque tube ID.
19. Install the V-ring seal (20) onto the brake housing (22).
20. Liberally grease the flange of the cable drum (9) with marine-grade grease.
21. Lightly grease the inner race of the drum bearing (2) and drum seal (19). Use ½ -13 eyebolts in the tapped holes of the primary housing and slowly lower it onto the drum.
22. Install steel divider plates (304), brake discs (305), steel divider plates (304), brake discs (305), steel divider plates (304), brake discs (305), steel divider plates (304), brake discs (305), steel divider plates (304), and brake spacer (303) into the output housing (22) and the splined connection in the torque tube (16). **NOTE:** The brake discs should be soaked in hydraulic oil prior to assembly.
23. Install the inner race (26), sprag (25), sprag bearing (27), thrust bearing (28), retaining ring (29), and retaining ring (39).
24. Install two orifices (30) into the brake cylinder (32), install O-ring (31) on the OD and O-ring (33), and backup ring (34) in the ID. **NOTE:** Coat all O-rings with grease prior to assembly.
25. Lower this onto the brake housing and align the thru holes with the tapped holes in the brake housing.
26. Install O-ring (37) and backup ring (37) into the brake piston (35). Apply grease onto the minor and major ID of the brake cylinder (32) then slide the brake piston (35) into the assembly. Align the thru-holes with the brake cylinder thru-holes. A rubber mallet may be needed to ensure the piston is seated properly. Install o-ring (36) into the face of the brake cylinder (32). **NOTE:** Coat all O-rings with grease prior to assembly.
27. Install the spring spacer (38) and eighteen springs (23) on top of the brake piston (35).
28. Install the hydraulic motor (41) brake release port and install it into the assembly.
29. Install six washers (7) and capscrews (42) and tighten them evenly in an alternating pattern. Once tight, torque the capscrews to specification.
30. Once completely assembled, ensure all capscrews are torque accurately according to the toque specification provided in this service manual.

PRIMARY PLANET CARRIER ASSEMBLY



PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
85007	PRIMARY PLANET CARRIER ASSEMBLY Contains all items below:	200	1
113987	PRIMARY PLANET CARRIER	1	1
113433	THRUST WASHER	2	1
113671	PRIMARY PLANET GEAR	6	3
113992	PRIMARY PLANET PIN	3	3
113990	THRUST WASHER	4	6
113988	NEEDLE BEARING	5	6
12025	ROLLPIN	7	3

PRIMARY PLANET CARRIER SERVICE

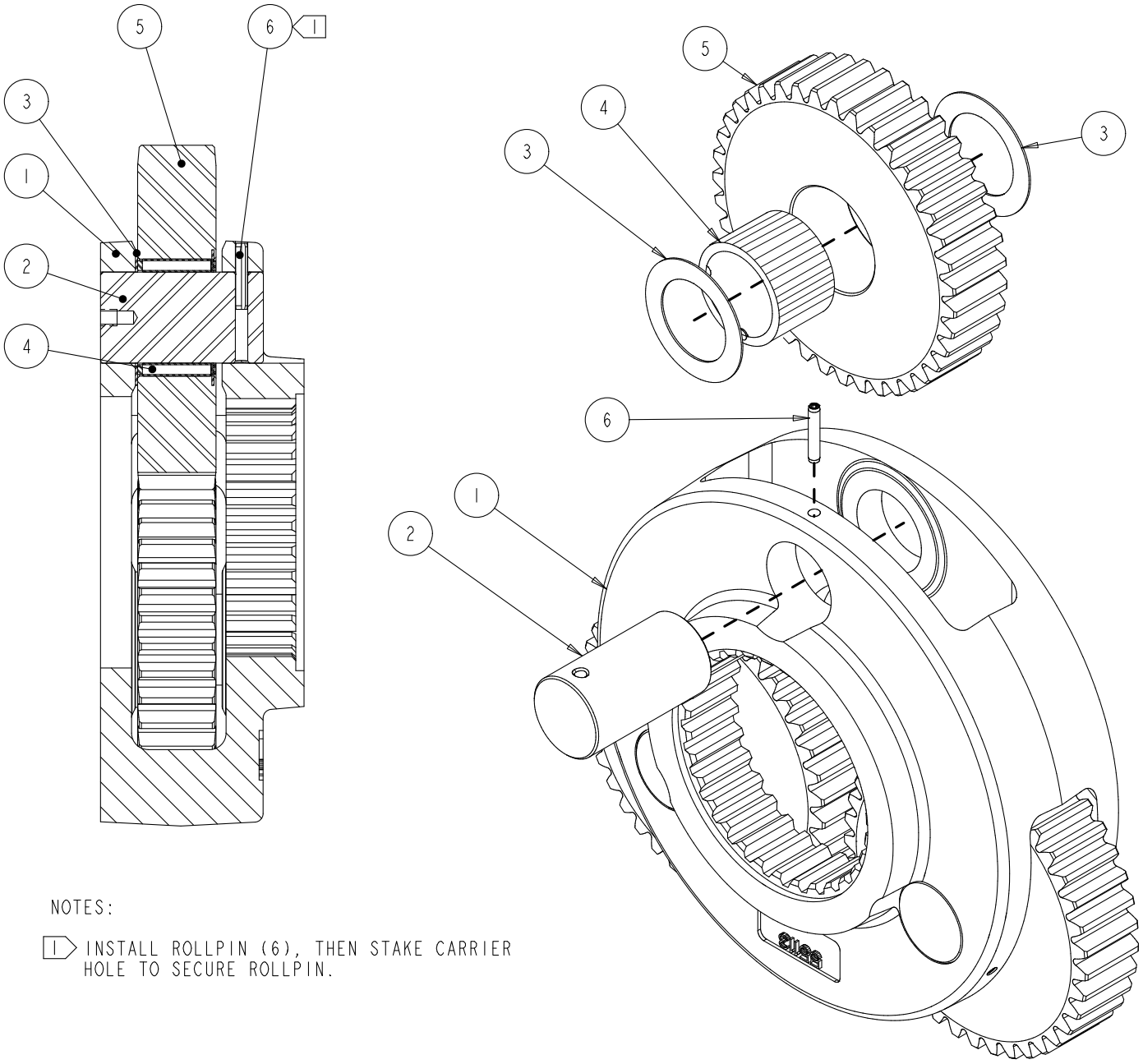
DISASSEMBLY

1. Remove the planet gears by first driving the roll pins into the center of the planet gear shafts.
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, gears, and the thrust washer. 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 the thrust washer then 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 pinhole 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 ASSEMBLY



NOTES:

1. INSTALL ROLLPIN (6), THEN STAKE CARRIER HOLE TO SECURE ROLLPIN.

PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
85006	OUTPUT PLANET CARRIER ASSEMBLY Contains all items below:	100	1
113429	OUTPUT PLANET CARRIER	1	1
113426	OUTPUT PLANET GEAR	5	3
113428	NEEDLE BEARING	4	3
113427	OUTPUT PLANET PIN	2	3
24482	THRUST WASHER	3	6
23584	SPIROL PIN	6	3

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.
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. Install the thrust washer then 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 pinhole as shown. This will distort the hole and prevent the pin from backing out in operation. Repeat these steps for each of the three planet gears.

BRAKE CLUTCH SERVICE

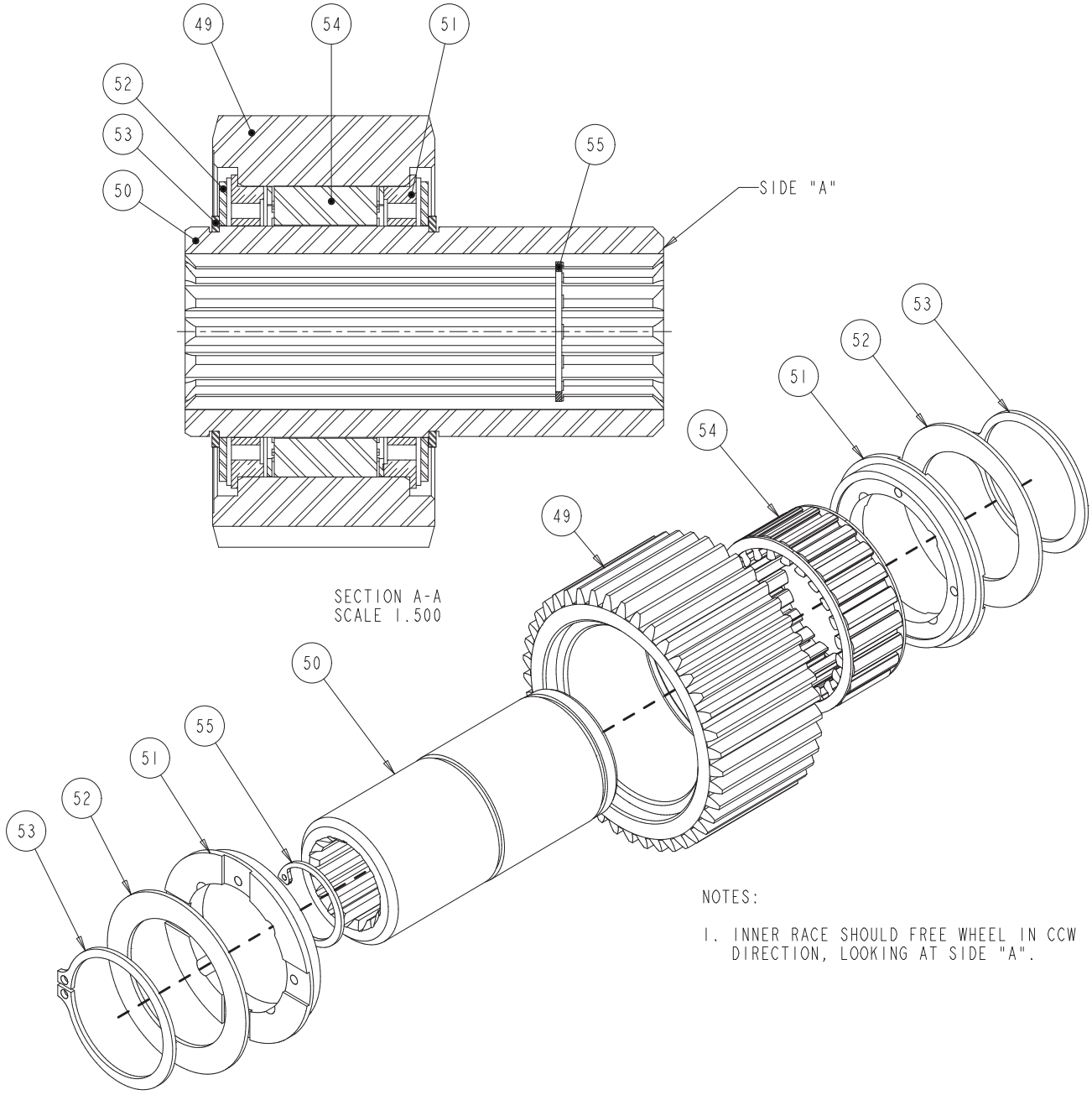
DISASSEMBLY

1. Remove one of the retaining rings (53) from the inner race (50). Push the outer race (49), thrust bearings (52), sprag bearing (51), and over-running clutch (54) off the inner race.
2. Remove the remaining retaining rings (53) from the inner race (50), thrust bearings (52), and sprag bearing (52). Remove the snap ring (55) in the ID of the inner race.
3. Closely inspect the over-running clutch and the polished surfaces of the inner and outer race for wear, cracks, pitting, corrosion, or mechanical damage.

ASSEMBLY

1. Install one of the retaining rings (53) and thrust bearing (52) onto the inner race (50).
2. Install one of the sprag bearings (52), the over-running clutch (54), then the other sprag bearing (52) into the outer race (49). Slide the assembly onto the inner race.
3. Install the remaining thrust bearing (52) and retaining ring (53) onto the assembly.
4. Install the snap ring (55) into the inner race (50).

BRAKE CLUTCH SERVICE - EQUAL SPEED



PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
85008	BRAKE CLUTCH (SPRAG) Contains all items below:	300	1
24863	OUTER RACE	49	1
24839	SPRAG	54	1
27684	THRUST BEARING	51	2
113454	INNER RACE	50	1
24581	THRUST WASHER	52	2
12034	RET RING	53	2
24506	RET RING	55	1

REVERSING DIRECTION OF DRUM ROTATION

GENERAL INFORMATION

To change the direction of the hoist, the following changes are required.

1. Reversing the brake clutch (sprag) operation.
2. Reversing the hydraulic motor direction.
3. Reassembly.

REVERSING BRAKE CLUTCH

Modify the brake clutch assembly per the instructions below. This will ensure that the brake clutch operates properly for the new direction of rotation.

Equal Speed Models

1. Install one of the retaining rings (53) and thrust bearing (52) onto the inner race (50).
2. Install one of the sprag bearings (52), the over-running clutch (54), then the other sprag bearing (52) into the outer race (49). Slide the assembly onto the inner race.
3. Install the remaining thrust bearing (52) and retaining ring (53) onto the assembly.
4. Install the snap ring (55) into the inner race (50).

⚠ WARNING ⚠

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

High Speed Reverse Models

1. Pull the input shaft coupling out of the brake housing. Inspect the race for any signs of scoring, wear, or indentations caused by the sprag cams. If the inner race is not completely smooth, replaced it.
2. Remove the sprag from the inner diameter (ID) of the torque tube.
3. Turn the sprag clutch around and slide the input shaft coupling through the sprag clutch. It may be necessary to rotate the race in the free-wheeling direction to start it through the sprag clutch. Ensure that the snap ring is properly seated in the groove.
4. Before installing the motor, confirm the inner race turns freely in the opposite direction to the drum's intended rotation for hauling in the wire rope. You can check this by rotating the torque tube and ensuring that it freely rotates in the intended direction.

REVERSING MOTOR DIRECTION

Refer to Hydraulic Circuit on page 11 for view.

1. Remove both SAE -4 ORB plugs on the outer diameter of the motor flange.

   NOTE: The SAE -4 ORB ports on the motor flange face boss do not need to be removed.
2. Insert an allen key into the brake release port cavity and remove the 1/16-27 NPT pipe plug.

   NOTE: For CW rotation the 1/16-27 NPT pipe plug is in the "Lower" port side, for CCW rotation the 1/16-27 NPT pipe plug is in the "Hoist" port side
3. Clean the pipe plug.
4. Insert the pipe plug into the opposite brake release port cavity and tighten.
5. Insert both SAE-4 ORB ports into the ports on the outer diameter of the motor face flange.

REASSEMBLY

1. Rotate the motor support 180˚ to ensure the brake release port is in line with the open brake release port in the motor face.
2. Install a new O-ring on the motor pilot and brake release port.
3. Install and tighten motor capscrews to recommended torque.
4. Connect Hoist and Lower hoses to their correct ports.
5. Operate the hoist slowly in both directions and check for oil leaks and/or unusual sounds. The hoist should operate smoothly in both directions. Refer to "WIRE AND BRAIDED ROPE INSTALLATION" and properly install rope onto the hoist drum.
6. Before returning the hoist to full service, a light load should be lifted and held three feet (1 meter) off the ground to be sure the static brake is functioning properly. The hoist should also be able to slowly lower the load in a smooth and controlled manner. If the hoist does not perform either of these functions, refer to "TROUBLESHOOTING" for additional information.

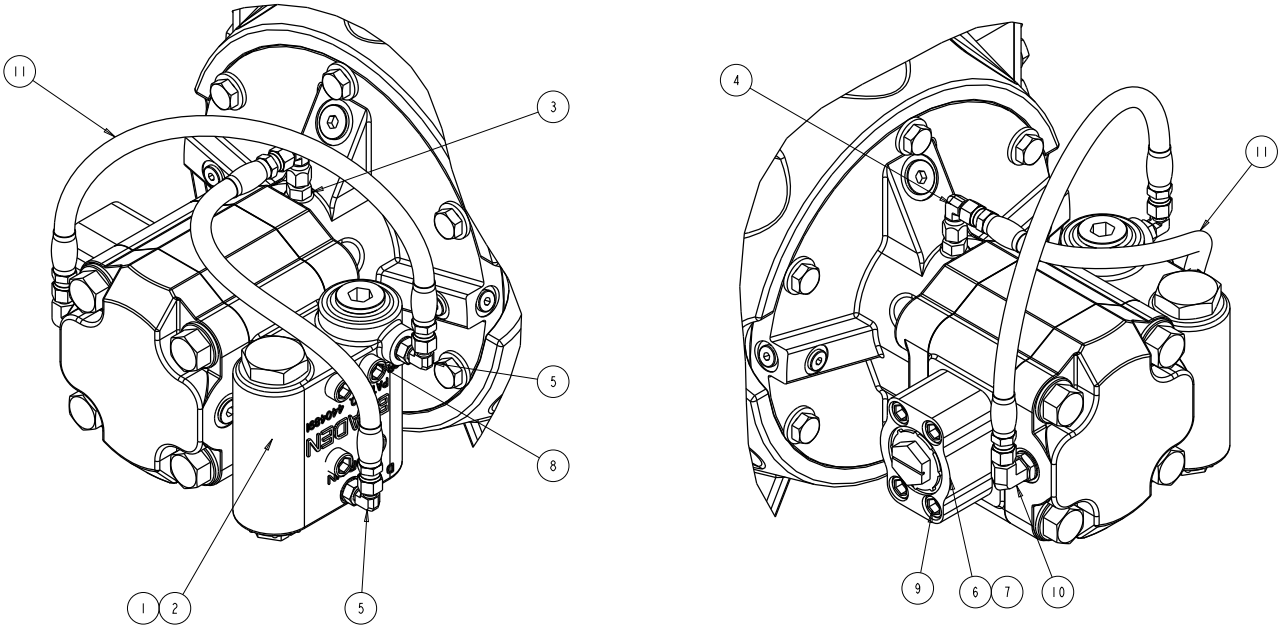
SERVICE PART INFORMATION

114002: Counter-clockwise standard hydraulic motor*

113574: Clockwise hydraulic motor*

*When viewed from the motor end of the winch.

BRADEN BRAKE VALVE INSTALLATION



PART NO.	*DESCRIPTION*	*ITEM NO.*	*QTY.*
81984	BRAKE VALVE ASSY	1	1
13838	O-RING	2	1
26001	ADAPTER	3	1
26140	SWIVEL NUT 90 DEG. ELBOW	4	1
25302	ELBOW FITTING	5	2
24779	MANIFOLD	6	1
21150	O-RING	7	1
21134	CAPSCREW	8	4
21144	CAPSCREW	9	4
25131	ELBOW	10	1
72318	HOSE ASSY	11	2

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