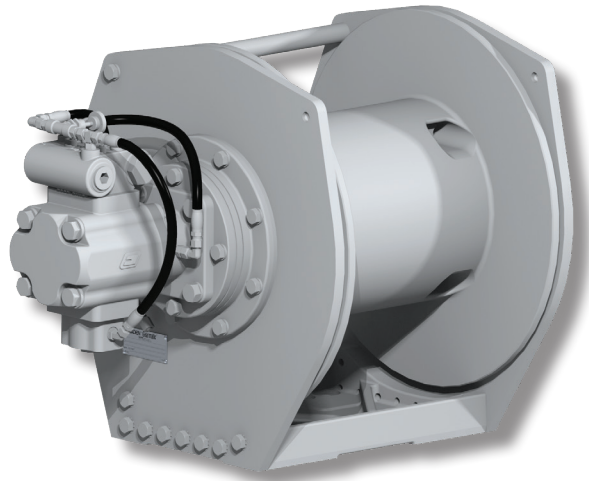


PD12C AND PD15B HYDRAULIC PLANETARY HOISTS



Record serial number below:

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

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Technical publications for most PACCAR Winch products are available for download.

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FOREWORD

Read this entire publication and retain it for future reference.

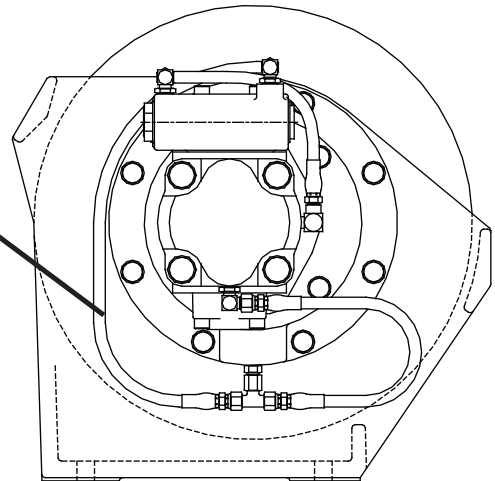
For inquiries regarding your BRADEN Planetary Hoist or this publication, please contact BRADEN Service Department at 918-251-8511, Monday through Friday, 8:00 a.m. to 4:30 p.m. (CST).

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 BRADEN Model PD12C and PD15B series 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.

Model numbers and serial numbers are located to the left-hand side of the hydraulic motor, stamped into the base. Always refer to the model number and serial number when requesting information or service parts.



PLANETARY HOIST MODEL NUMBER EXPLANATION

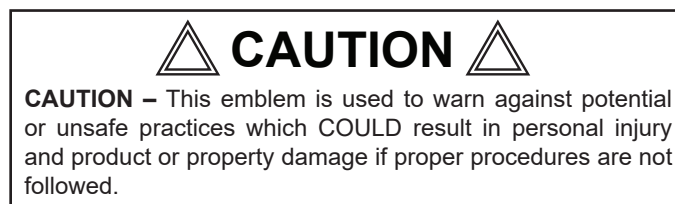
This document provides information on the meaning of the numbers and letters in the BRADEN planetary hoist model nomenclature.

For example: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
PD 12 C - SPL - 41 P 051 - 05 U - 1

1. **Product Family** – Letters represent product family
2. **Capacity** – Numbers represent maximum rated line pull based on structural capacity
3. **Generation** – Letters represent major design changes in a product family (A, B, etc.)
*NOTE: Sometimes the “A” will not be included in the model number of the first design generation
4. **Special Features** – Letters represent special unit features (optional)
5. **Gear Ratio** – Numbers represent ratio of the input to the hoist to the drum rotation speed
6. **Motor Code** – Letters represent type of motor (optional)
7. **Motor Size** – Numbers represent displacement of hydraulic motor measured in cubic inches per one rotation (variable displacement numbers are indicated by highest/lowest, such as 128/064)
*NOTE: 000 indicates the hoist was built without a hydraulic motor
8. **Drum Code** – Numbers represent different drum sizes (drum flange height, barrel diameter, distance between flanges)
9. **Drum Options** – Letters indicate special drum features
10. **Other Options** – May be numbers or letters (optional)

GENERAL SAFETY RECOMMENDATIONS

Safety and informational callouts used in this manual include:



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.

THEORY OF OPERATION

DESCRIPTION OF HOIST

The hoist has four basic component parts:

1. Hoist base
2. Hydraulic motor and brake valve
3. Brake cylinder and motor support
4. Drum assembly

The drum assembly consists of three basic assemblies:

1. Drum with integral ring gear
2. Output planetary gear set
3. Primary planetary gear set

The hydraulic motor is bolted to the motor support which in turn is bolted to the brake cylinder and the base. The motor end of the drum, running on a ball bearing, is supported by the brake cylinder. The other end of the drum runs on a ball bearing on the support bolted to the base. The ring gear for both planetary sets is machined into the drum's inside surface.

HOIST OPERATION

The hydraulic motor drives the sun gear of the primary planetary gear set through the splined inner race of the overrunning brake clutch. When driven by the sun gear, the primary planet gears walk around the ring gear in the drum and drive the primary planet carrier.

The primary planet carrier drives the output planet sun gear which, in turn drives the output planet gears. The output planet carrier is splined to the bearing support and cannot rotate. Therefore, as the output planet gears are driven by the sun gear, they will drive the ring gear/drum.

DUAL BRAKE SYSTEM - DESCRIPTION

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

The dynamic brake system has two operating components:

1. Brake valve assembly
2. Hydraulic motor

The brake valve functions as a counterbalance valve, but delivers fine load control by effectively metering flow. It contains a check valve to allow free flow of oil to the motor in the hoisting direction and a pilot operated, spring-loaded spool valve, which blocks the flow of oil out of the motor when the control valve is placed in neutral. When the control valve is placed in the lowering position, the spool valve remains closed until sufficient pilot pressure is applied to the end of the spool to shift it against spring pressure and open a passage. After the spool begins to

open at 300-500 psi (20.7-34.5 bar) cracking pressure the pilot pressure becomes flow-dependent and modulates the spool valve opening which controls the lowering speed. Refer to figures 1, 2, and 3.

The static brake system has three operating components:

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

Figure 1
HOISTING

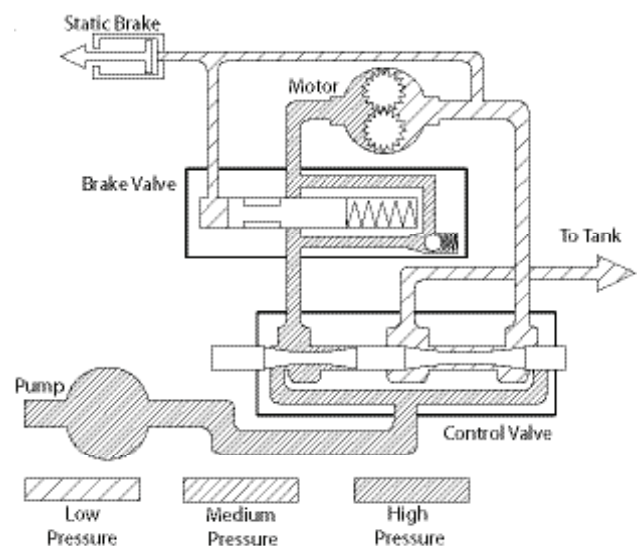
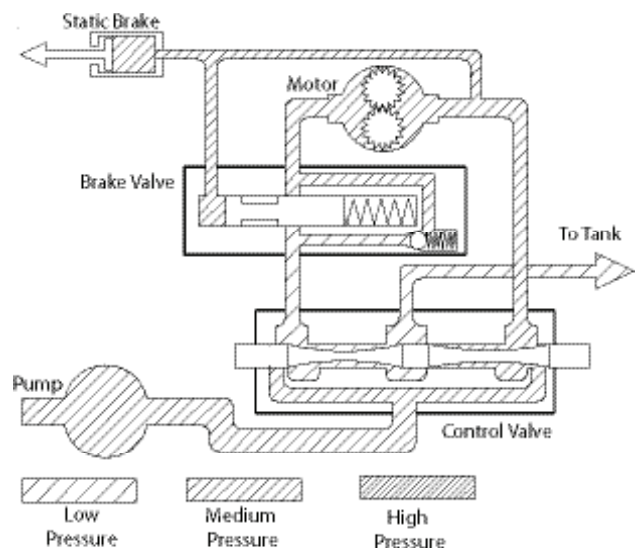
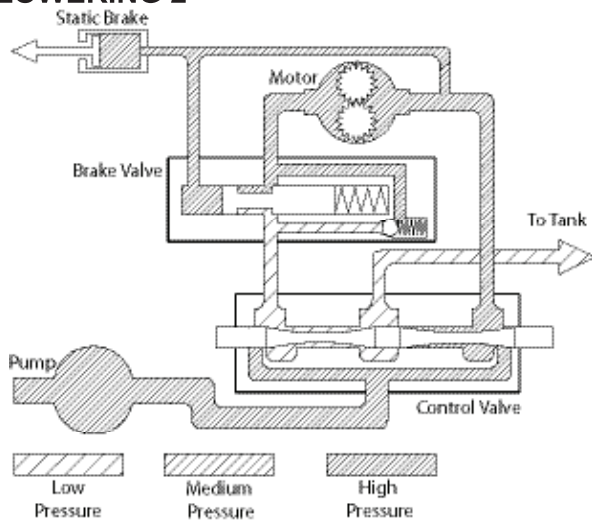


Figure 2
LOWERING 1



THEORY OF OPERATION

Figure 3
LOWERING 2



The static brake is released by the brake valve pilot pressure at a pressure lower than required to open the pilot operated spool valve. This sequence ensures dynamic braking takes place in the brake valve and little, if any, heat is absorbed by the friction brake.

The friction brake is a load holding brake only and has nothing to do with dynamic braking or rate of descent of a load.

The overrunning brake clutch is splined to the primary sun gear shaft between the motor and the primary sun gear. It will allow this shaft to turn freely in the direction to raise a load and lock up to force the brake discs to turn with the shaft in the direction to lower a load. Refer to figures 4 and 5.

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

DUAL BRAKE SYSTEM – OPERATION

When hoisting a load, the brake clutch which connects the motor shaft to the primary sun gear, allows free rotation. The sprag cams lay over and permit the inner race to turn free of the outer race. Figure 4. The friction brake remains fully engaged. The hoist, in raising a load, is not affected by any braking action. Figure 1.

When the lifting 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 roll upward and firmly lock the shaft to the fully engaged friction brake. Figure 5.

When the hoist is powered in reverse, to lower the load, the motor cannot rotate until sufficient pilot pressure is present to open the brake valve. Figures 2 & 3. The friction brake within the hoist will completely release at a pressure lower than required to open the brake valve. The extent to which the brake valve opens will determine the amount

of oil flowing through it and the speed at which the load will be lowered. Increasing the flow of oil to the motor will cause the pressure to rise and the opening in the brake valve to enlarge, speeding up the descent of the load. Decreasing this flow causes the pressure to lower and the opening in the brake valve to decrease thus slowing the descent of the load.

When the control valve is shifted to neutral, the pressure will drop and the brake valve will close, stopping the load. The friction brake will engage and hold the load after the brake valve has closed.

When lowering a load slowly for precise positioning, no oil flow actually occurs through the hoist motor. The pressure will build up to a point where the brake will release sufficiently to allow the load to rotate the motor through its own internal leakage. This feature results in a slow speed and accurate positioning.

The friction brake receives little wear in the lowering operation. All of the heat generated by the lowering and stopping of a load is absorbed by the hydraulic oil where it can be readily dissipated.

Figure 4

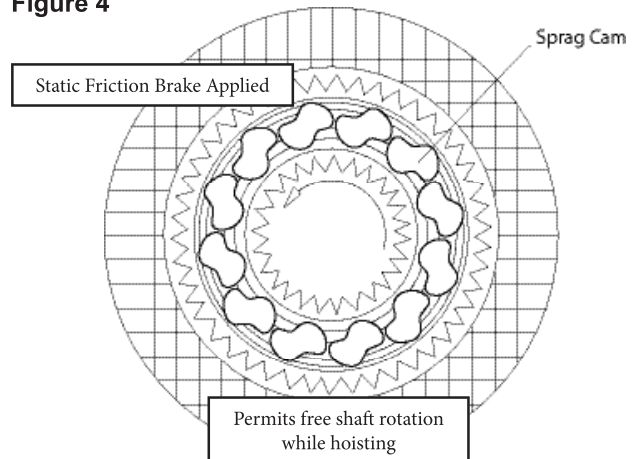
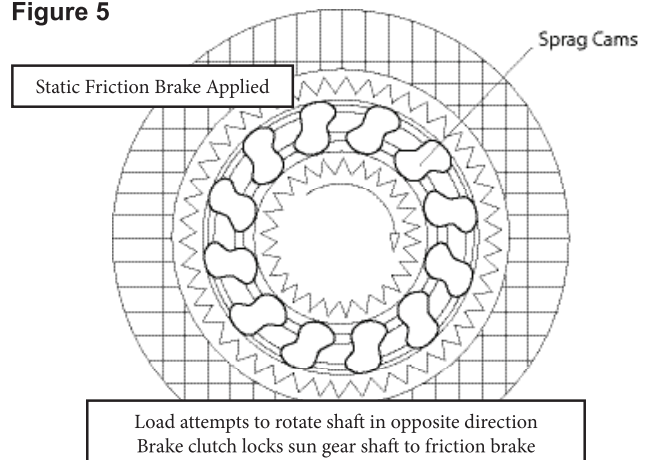
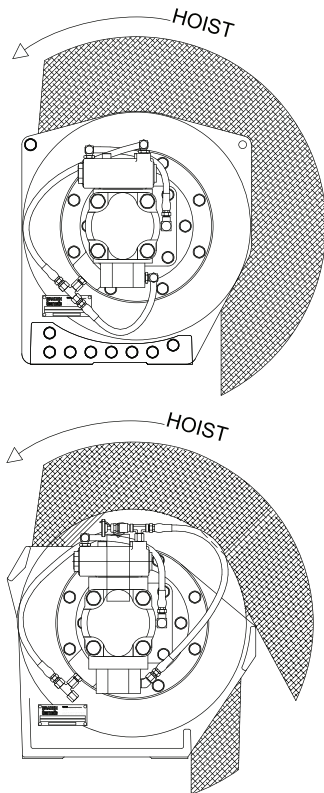


Figure 5



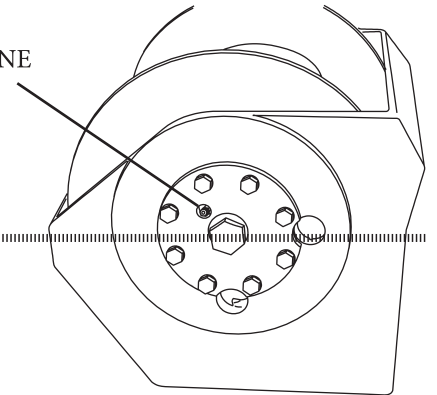
HOIST INSTALLATION

1. The hoist should be mounted with the centerline of the drum in a horizontal position. The mounting plane of the base may be rotated in any position around this centerline.



VENT PLUG
ABOVE CENTERLINE

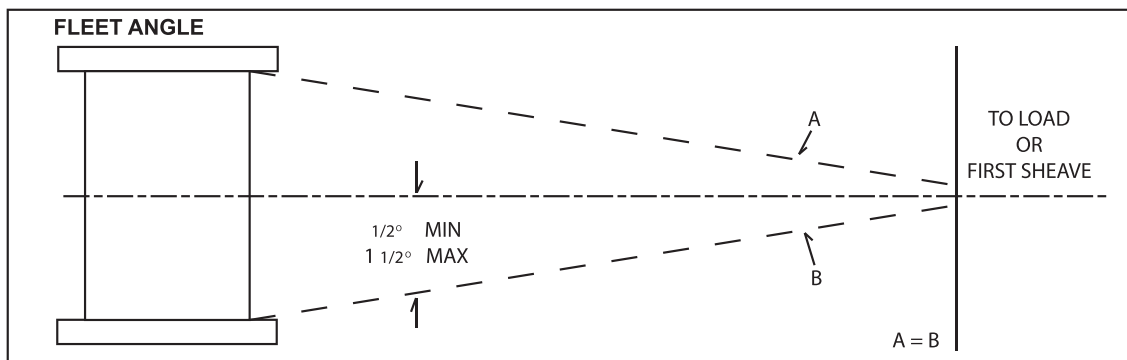
CenterLine



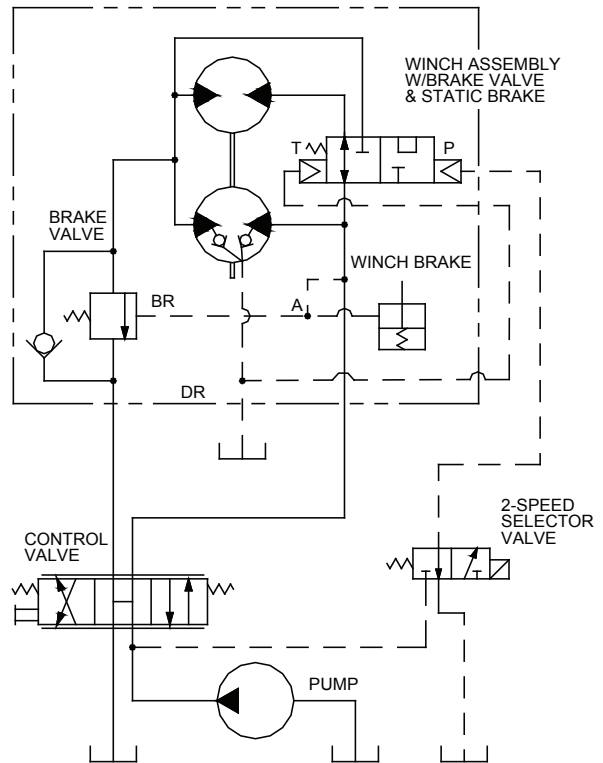
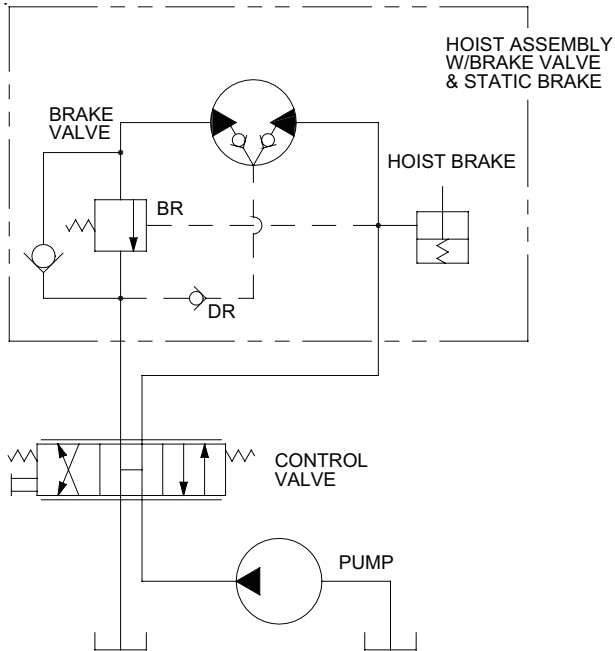
2. Because of the design of the mounting base, the direction of line pull should only be as shown in the above illustration. Line pulls in any other direction must be approved by BRADEN Engineering.
3. When mounting the hoist, use all eight (8) mounting holes and grade 8 capscrews and nuts. Tighten to recommended torque.

The hoist must be mounted on a surface which will not flex when in use, and cause binding of the gear train. Binding in the gear train will result in accelerated wear and heat. Also, be sure the hoist is mounted on a flat surface. If necessary, use shim stock to ensure the mounting surface is flat within 0.020 in. (0.5 mm). Use stainless steel shim stock as required.

4. The vent plug must always be located above the horizontal centerline. **If the hoist is mounted on a pivoting surface, be sure vent plug remains above the centerline in all positions.** If necessary, reposition bearing support and vent plug as follows:
 - A. Remove bearing support bolts.
 - B. Rotate bearing support until vent plug is positioned correctly and bolt holes are aligned.
 - C. Evenly tighten bolts to recommended torque.
5. Hydraulic lines and components operating the hoist must be of sufficient size to assure minimum back-pressure at the hoist motor ports. The hydraulic back-pressure measured at the motor work ports must not exceed 100 PSI (6.9 bar) at full operating flow. **Back-pressure in excess of 100 PSI (6.9 bar) will shorten motor shaft seal life and partially release the load holding brake.** The standard hoist is supplied with the gear motor internally drained and connected the drain by-pass port on the BRADEN brake valve. If high back-pressures are encountered, the motor should be externally drained directly to the reservoir and the "DRAIN" port on the brake valve capped. All piston motors **MUST** be drained directly to the reservoir. The piston motor case drain port must **NEVER** be exposed to more than 42 PSI (2.9 bar); shaft seal damage will occur.
6. The hoist should be mounted perpendicular to an imaginary line from the center of the drum to the first sheave to ensure even spooling. Make certain the fleet angle does not exceed 1-1/2 degrees.

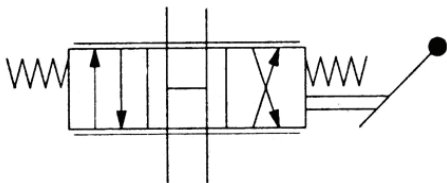


HOIST INSTALLATION



⚠ WARNING ⚠

DO NOT use a control valve with any detents or latching mechanism which 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.



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

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

Oil having 150 to 330 SUS (30-60 cSt) viscosity at 104°F (40°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 (1000 cSt) with a pour point at least 20°F (11°C) lower than the minimum temperature.

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

In general terms; for continuous operation at ambient temperatures between 50 and 110°F (10 to 43°C) use ISO 46; for continuous operation between 10 and 90°F (-12 to 32°C) use ISO 32; for applications colder than 10°F (-12°C), contact the BRADEN Service Department. The use of multi-viscosity oils is generally not recommended.

- The hydraulic oil filter should have a 10 micron nominal rating and be full flow type and meet the requirements of the hydraulic pump manufacturer.

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.

RECOMMENDED FASTENER TORQUE						RECOMMENDED FASTENER TORQUE					
		Torque (LB-FT)						Torque (LB-FT)			
Bolt Dia. Inches	Thds Per Inch	Grade 5		Grade 8		Bolt Dia. Inches	Thds Per Inch	Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed			Dry	Lubed	Dry	Lubed
1/4	20 28	8	6	12	9	3/4	10 16	265	200	380	280
5/16	18 24	17	13	24	18	7/8	9 14	420	325	600	450
3/8	16 24	31	23	45	35	1	8 14	640	485	910	680
7/16	14 20	50	35	70	50	1 1/8	7 12	790	590	1290	970
1/2	13 20	75	55	110	80	1 1/4	7 12	1120	835	1820	1360
9/16	12 18	110	80	150	110	1 3/8	6 12	1460	1095	2385	1790
5/8	11 18	150	115	210	160	1 1/2	6 12	1940	1460	3160	2370

WIRE AND SYNTHETIC ROPE INSTALLATION

This document 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.

SETSCREWS — WIRE ROPE

If the drum is designed with a cast-in, pass-through hole with 2 setscrews, follow these steps:

1. Determine the proper direction to wrap rope onto the drum.
2. Insert rope into the anchor hole until it is even with the other end of the hole.
3. Coat 2 anchor setscrew threads with antiseize compound and then tighten to recommended torque.
4. Wind rope onto the drum.

WEDGE ANCHOR — WIRE ROPE

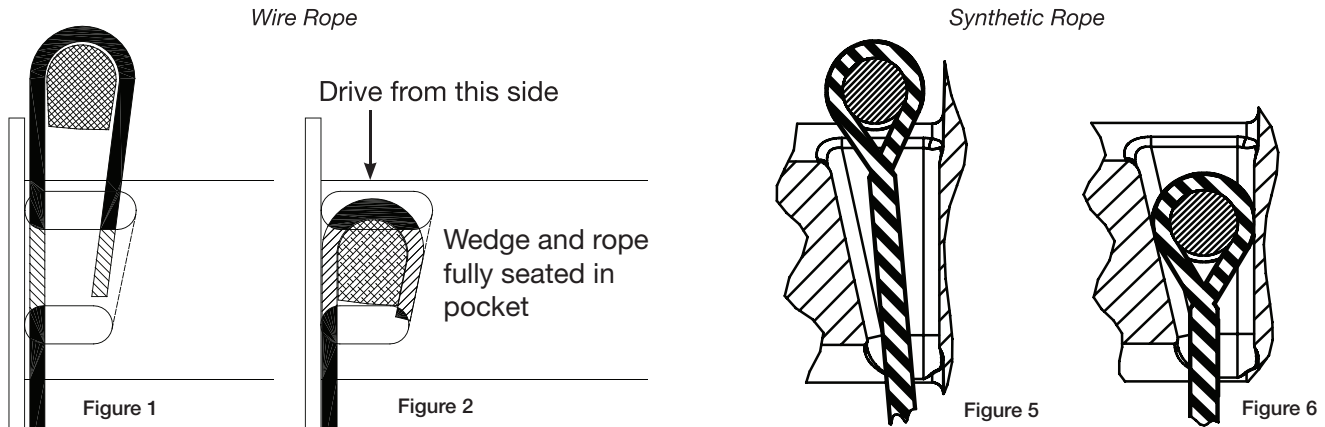
If the drum is designed with an anchor pocket, follow these steps:

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.

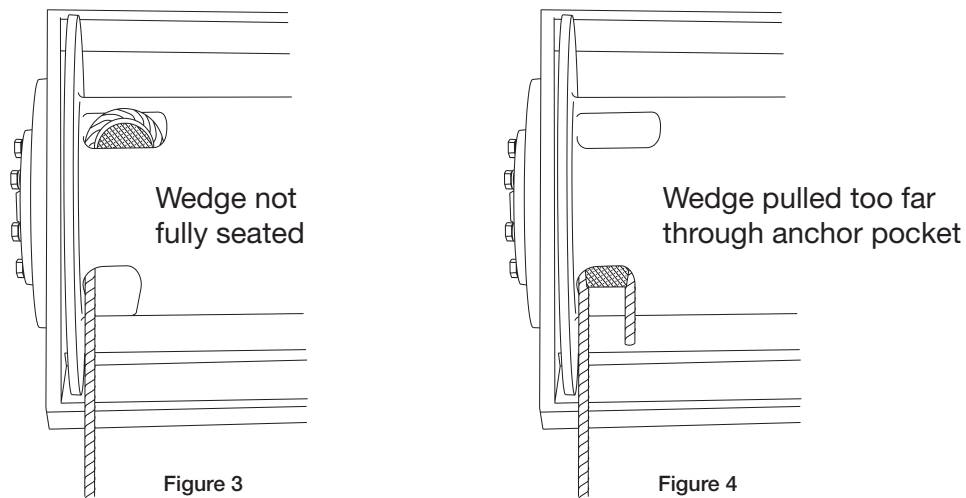
WIRE AND SYNTHETIC ROPE INSTALLATION

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).

Correct Installations



Incorrect Installations



- 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

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

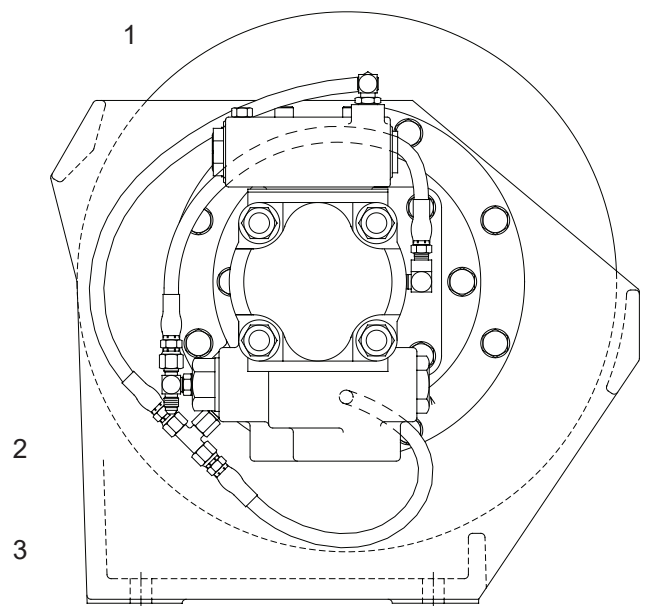
3. Splice an eye at the end of the rope to be inserted into the anchor pocket. It is recommended to wrap the eye with electrical tape to allow the rope to slide into the pocket easily.
4. Insert the eye through the small opening of the anchor pocket.
5. Place the wedge anchor inside the eye of the rope and make sure the rope is seated within the flanges of the anchor as shown in Figure 5.
6. Apply approximately 5% of the load rating to the rope to fully seat the wedge into the anchor pocket as shown in Figure 6.
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).

NOTE: For best performance, synthetic rope should not be installed on drums which have previously had wire rope installed.

TWO-SPEED MOTOR CASE DRAIN PLUMBING

Some hoists with two speed gear motors may have been installed with the motor case drain connected to the drain port of the brake valve. This system may result in accelerated motor shaft seal wear and leakage. The following modification should be made to the motor hydraulic piping to prevent this type of seal damage.

1. Remove the motor case drain hose from the brake valve drain port and install plug, Item 1, into the valve port. Remove the hose from the case drain port elbow, Item 4.
2. Install a new case drain hose, Item 2, onto the motor case drain elbow, Item 4.
3. Install the tee adapter, Item 3, into the two-speed motor shift valve drain port (identified by long end cap).
4. Install the new motor case drain hose, Item 2, onto the tee adapter.
5. Install a case drain hose for the tee directly to the reservoir. Minimum hose size is -6, 3/8 in. (9.5 mm). Maximum drain line back pressure is 100 PSI (6.9 bar) measured at the motor case drain port.



ITEM	DESCRIPTION	QTY	PART #
1	Plug, -4 ORB	1	25663
2	Hose, 17-in. OAL (-4 JIC Fml Sv/-4 Hose/ 1/8 NPT ml)	1	13707
3	Tee -4 (ORB Branch -4 JIC Run)	1	29078

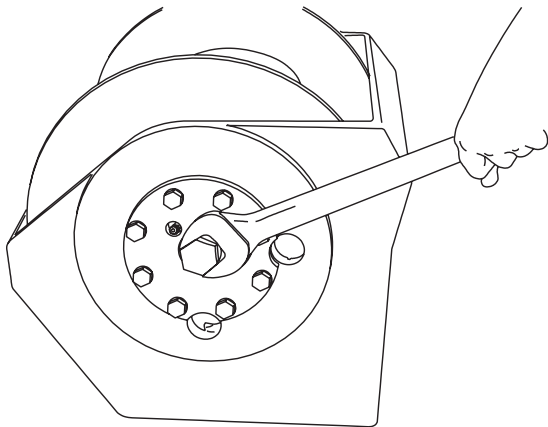
PREVENTIVE MAINTENANCE

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

Field experience, supported by engineering tests, indicate the three (3) service procedures listed below are the MOST critical to safe, reliable hoist operation and must be observed.

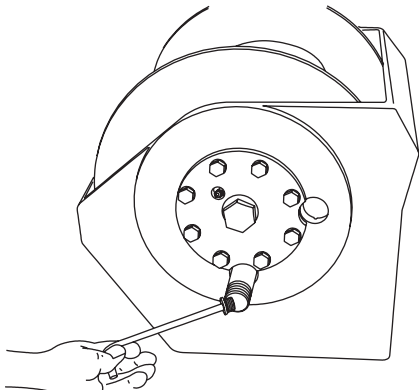
- Regular Gear Oil Changes
- Use of Proper Gear Oil – recommended type for prevailing ambient temperature
- Periodic disassembly and inspection of all wear items.

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



1. OIL LEVEL

Check for external oil leaks and repair as necessary. This is extremely important due to accelerated wear that will result from insufficient lubrication. For hoists with a sight glass, ensure that the sight glass is clear and functional, then visually check oil level daily. For hoists without a sight glass, check oil level monthly if no external oil leaks are detected. Lubricant level must be maintained between the minimum and maximum levels, midway up the sight glass or at the bottom of the level plug port as equipped. Use only the recommended type of lubricant.



2. OIL CHANGE PROCEDURE

Gear oil should be changed after 100 hours of use for new installation of the hoist to remove initial wear particles from normal break-in of the hoist. A minimum oil change interval of one year is required. Refer to BRADEN Technical Document LIT2739 (PB308) Inspection, Maintenance, Testing and Special Operating Instructions for BRADEN Planetary Hoists for best practice for onshore hoisting and additional requirements for personnel handling or offshore lifting operations. The gear oil must be changed to remove wear particles which impede the reliable and safe operation of the brake clutch and erode bearings, gears and seals. Failure to change gear oil at these suggested minimum intervals may contribute to intermittent brake slippage which could result in property damage, severe personal injury or death.

The gear oil should also be changed whenever the ambient temperature changes significantly and an oil from a different temperature range would be more appropriate. Oil viscosity with regard to ambient temperature is critical to reliable brake clutch operation. Our tests indicate 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. Failure to use the proper type and viscosity of planetary gear oil may contribute to brake clutch slippage which could result in property damage, severe personal injury or death. Refer to "Recommended Planetary Gear Oil" for additional information.

3. VENT PLUG

The vent plug is located in the drum support as shown. It is important to keep this vent clean and unobstructed. Whenever gear oil is changed, remove vent plug, clean in solvent and reinstall.

Do not paint over the vent or replace with a solid plug or grease fitting.

4. HYDRAULIC SYSTEM

The original filter element should be replaced after the first fifty (50) hours of operation, then every 500 operating hours or three (3) months, or in accordance with the equipment manufacturer's recommendations.

5. WIRE ROPE

Inspect entire length of wire rope according to wire rope manufacturers recommendations.

6. MOUNTING BOLTS

Tighten all hoist base mounting bolts to recommended torque after the first one hundred (100) hours of operation, then every 1000 operating hours or six (6) months, whichever occurs first.

PREVENTIVE MAINTENANCE

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.

7. 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 prime mover 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, several times to prime all lines with warm hydraulic oil, and to circulate gear lubricant through the planetary gear sets.

8. INSPECTION

- A. **Bearings and Gears** – Refer to HOIST DISASSEMBLY, pages 19 and 20; and PLANET CARRIER SERVICE, pages 30 and 31.
- B. **Brake Cylinder** – Refer to MOTOR SUPPORT – BRAKE CYLINDER SERVICE, pages 42 to 45.
- C. **Brake Clutch** – Refer to BRAKE CLUTCH SERVICE, pages 46 and 47.

9. RECOMMENDED PLANETARY GEAR OIL

The use of proper gear oil, in conjunction with employing a preventative maintenance program, may extend the life of your BRADEN planetary winch, hoist or drive while ensuring safe and reliable operation.

The gear oils detailed on page 14 have been factory tested to meet BRADEN specifications within different ambient temperature ranges. If these products are not available in your area, an equivalent lubricant may perform equally well, although it has not been factory tested to ensure compatibility with BRADEN products.

RECOMMENDED 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 !

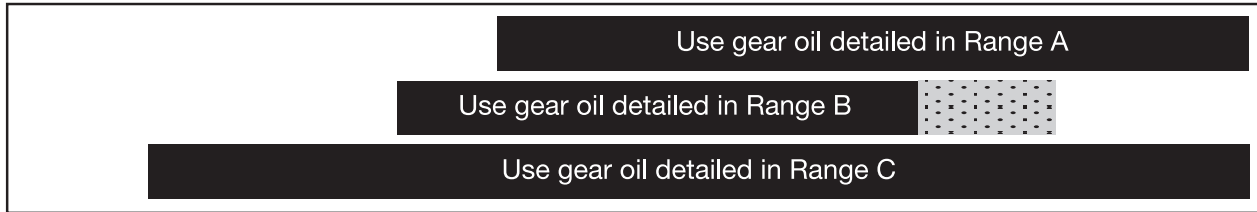
Some gear lubricants contain large amounts of EP (Extreme Pressure) and anti-friction additives, which may contribute to brake clutch slippage or damage to brake friction discs or seals. **DO NOT** use oil labeled as meeting "API Service GL-5."

! 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

°F -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 °F



°C -40 -30 -20 -10 0 10 20 30 40 50 °C

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	

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

OIL CAPACITIES:

(PD12C/PD15B) 01, 02 & 22 DRUM - 6 PINTS (2.8 L) (PD12C/PD15B) 04, 05 & 23G DRUM - 7 PINTS (3.3 L)
 (PD12C/PD15B) 06 DRUM - 18 PINTS (8.6 L) (PD12C/PD15B) 24G & 25G DRUM - 11.5 PINTS (5.4 L)

NOTE: Capacities are approximate. Refer to "Oil Level" earlier in this section of the manual.

TROUBLESHOOTING

⚠ WARNING ⚠

If a hoist ever exhibits any sign of erratic operation, or load control difficulties (i.e. load creeping or chattering) appropriate troubleshooting tests and repairs should be performed immediately. Continued operation in this manner may result in property damage, serious personal injury or death.

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;">A</p> <p>The hoist will not lower the load or not lower the load smoothly.</p>	<ol style="list-style-type: none"> 1. The problem could be a plugged or loose pilot orifice. The pilot orifice is a small pipe plug with a hole drilled through it, located behind the pilot port fitting on the brake valve. If it becomes plugged, it will prevent the pilot pressure, from the manifold, from opening the brake valve. If it becomes loose, it will allow an unregulated amount of oil in to operate the brake valve which cause erratic brake valve operation. 2. The friction brake may not be releasing as a result of a defective brake cylinder seal. <p>NOTE: <i>A defective brake cylinder seal will cause oil to leak from the vent plug.</i></p> <ol style="list-style-type: none"> 3. Friction brake will not release as a result of damaged brake discs. 	<ol style="list-style-type: none"> 1. Remove pilot hose and fitting from brake valve, then use a 5/32 inch Allen wrench to remove pilot orifice. The diameter of the orifice is approximately .020 inches. Clean and install pilot orifice tightly in the brake valve. 2. Check brake cylinder seal as follows: <ol style="list-style-type: none"> a. Disconnect the swivel tee from the brake release port. Connect a hand pump with accurate 0-2000 PSI gauge and shut-off valve to the -4 JIC fitting in the brake release port. b. Apply 1000 PSI (68.9 bar) to the brake. Close shut-off valve and let stand for five (5) minutes. c. If there is any loss of pressure in five (5) minutes, the brake cylinder should be disassembled for inspection of the sealing surfaces and replacement of the seals. Refer to "Motor Support-Brake Cylinder Service." 3. Disassemble brake to inspect brake discs. Check stack-up height as described in "Motor Support-Brake Cylinder Service."

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;">B</p> <p>Oil leaks from vent plug</p>	<ol style="list-style-type: none"> 1. Same as PROBABLE CAUSE A2. 2. Motor seal may be defective as a result of high system back pressure or contaminated oil. <ol style="list-style-type: none"> a. Vent positioned below oil level. b. Oil expansion due to overheating. 	<ol style="list-style-type: none"> 1. Same as REMEDY A2. 2. Hydraulic system back pressure must not exceed 100 PSI (6.9 bar). Inspect hydraulic system for a restriction in the return line from the control valve to the reservoir. Be sure control valve and plumbing is properly sized to hoist motor. 3. Oil analysis may indicate contamination has worn motor shaft and seal. Thoroughly flush entire hydraulic system and install new filters and oil. Install new motor seal.
<p style="text-align: center;">C</p> <p>The brake will not hold a load with the control lever in neutral.</p>	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1. Same as REMEDY B2. 2. Same as REMEDY A3. 3. Brake Clutch Slipping: <ol style="list-style-type: none"> a. Improper planetary gear oil may cause the brake clutch to slip. Drain old gear oil and flush hoist with solvent. Thoroughly drain solvent and re-fill hoist with recommended planetary gear oil listed in "Preventive Maintenance." b. Brake clutch may be damaged or worn. Disassemble and inspect brake clutch as described in "Brake Clutch Service."
<p style="text-align: center;">D</p> <p>The hoist will not hoist the rated load.</p>	<ol style="list-style-type: none"> 1. 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 hoist the rated load and cause heat. 2. System relief valve may be set too low. Relief valve needs adjustment or repair. 	<ol style="list-style-type: none"> 1. Mounting Surface: <ol style="list-style-type: none"> a. If necessary, use shim stock to level hoist. Refer to "Hoist Installation." b. First loosen, then evenly retighten all hoist mounting bolts to recommended torque. 2. Check relief pressure as follows: <ol style="list-style-type: none"> a. Install an accurate 0-5000 psi (350 bar) gauge into the inlet port of the brake valve. b. Apply a stall pull load on the hoist while monitoring pressure. c. Compare gauge reading to hoist specifications. Adjust relief valve as required.

TROUBLE	PROBABLE CAUSE	REMEDY
<p>Trouble "D" Continued From Previous Page</p>	<p>3. Be certain hydraulic system temperature is not more than 180 degrees F. Excessive hydraulic oil temperatures increase motor internal leakage and reduce motor performance.</p> <p>4. Hoist line pull rating is based on 1st layer of wire rope.</p> <p>5. Rigging and sheaves not operating efficiently.</p>	<p>NOTE: <i>If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.</i></p> <p>3. Temperature:</p> <p>a. Same as remedies for PROBABLE CAUSE D1 & D2.</p> <p>b. Same as remedies for PROBABLE CAUSE E2.</p> <p>4. Refer to hoist performance charts for additional information.</p> <p>5. Perform rigging service as recommended by crane manufacturer.C. Compare gauge reading to hoist specifications. Adjust relief valve as required.</p> <p>NOTE: <i>If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.</i></p>
<p>E The hoist runs hot.</p>	<p>1. Same as PROBABLE CAUSE D1.</p> <p>2. Hydraulic system temperature should never exceed 180° F (82° C).</p> <p>a. Plugged heat exchanger.</p> <p>b. Too low or too high oil level in hydraulic reservoir.</p> <p>c. Same as D2.</p> <p>d. Hydraulic pump not operating efficiently.</p> <p>3. Excessively worn or damaged internal hoist parts.</p>	<p>1. Same as REMEDY D1.</p> <p>2a. Thoroughly clean heat exchanger exterior and flush interior.</p> <p>b. Fill/drain to proper level.</p> <p>c. Same as REMEDY D2</p> <p>d. HYDRAULIC Pump:</p> <p>d1. Same as REMEDY D2.</p> <p>d2. Prime mover low on horsepower or RPM. Tune/adjust prime mover.</p> <p>d3. Check suction line for damage.</p> <p>d4. If pump is belt driven, belts are slipping. Replace/tighten belts.</p> <p>d5. Pump worn. Replace pump.</p> <p>3. Disassemble hoist to inspect/replace worn parts.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;">F</p> <p>Hoist “chatters” while raising rated load.</p>	<ol style="list-style-type: none"> 1. Same PROBABLE CAUSE as D2. 2. Hydraulic oil flow to motor may be too low. 3. Controls being operated too quickly. 	<ol style="list-style-type: none"> 1. Same as REMEDY for D2. 2. Same as REMEDY for E2. 3. Conduct operator training as required.
<p style="text-align: center;">G</p> <p>The wire rope does not spool smoothly on the drum.</p>	<ol style="list-style-type: none"> 1. The hoist may be mounted too close to the main sheave, causing the fleet angle to be more than 1-1/2 degrees. 2. The hoist may not be mounted perpendicular to an imaginary line between the center of the cable drum and the first sheave. 3. Could possibly be using the wrong lay rope. There is a distinct advantage in applying rope of the proper direction of lay. When the load is slacked off, the several coils on the drum will stay closer together and maintain an even layer. If rope of improper lay is used, the coils will spread apart each time the load is removed. Then, when winding is resumed, the rope has a tendency to crisscross and overlap on the drum. The result is apt to be a flattened and crushed rope. 4. The hoist may have been overloaded, causing permanent set in the wire rope. 	<ol style="list-style-type: none"> 1. Check mounting distance and fleet angle. Reposition hoist as required. 2. Refer to “Hoist Installation.” 3. Consult wire rope manufacturer for recommendation of wire rope best suiting your application. 4. Replace wire rope and conduct operator/rigger training as required.

SERVICE KITS

61567 - BRAKE VALVE O-RING KIT		
DESCRIPTION	PART NO.	QTY.
O-RING	24186	1
O-RING	23601	2
O-RING	24193	1
O-RING	24194	1
BACK-UP RING	24195	1
BACK-UP RING	24196	1
O-RING	21150	2
O-RING	13838	2

64586- BEARING KIT		
DESCRIPTION	PART NO.	QTY.
BALL BEARING	24110	2
THRUST WASHER	40129	1
THRUST WASHER	40128	1
BEARING RACE	25361	6
ROLLER BEARING	24175	3
SPIROL PIN	24113	3
PRIMARY PLANET GEAR SHAFT	25614	3
THRUST WASHER	24306	6
ROLLER BEARING	25292	6
BEARING SPACER	25443	3
SPIROL PIN	23584	3
PLANET GEAR SHAFT	25613	3

61715 - SEAL KIT		
DESCRIPTION	PART NO.	QTY
O-RING	13838	1
O-RING	12465	2
O-RING	25366	2
O-RING	78312	2
O-RING	22586	1
O-RING	21150	1
O-RING	21063	1
O-RING	76208	1
O-RING	23950	1
O-RING	24186	1
O-RING	72117	1
SEAL	25642	1
OIL SEAL	24109	1
O-RING	21033	1
SEAL-OIL	22818	1
O-RING	10330	1
O-RING	24981	1
BACK-UP RING	25643	1

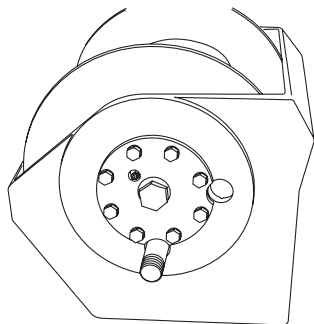
64335 - BRAKE SERVICE KIT		
DESCRIPTION	PART NO.	QTY.
SEAL	25642	1
DIE SPRING	25644	12
850170 DISC-FRICTION	21036	7
BRAKE DISK	100027	8
O-RING	24981	1
BACK-UP RING	25643	1
O-RING	22586	1

HOIST DISASSEMBLY

SERVICE PRECAUTIONS

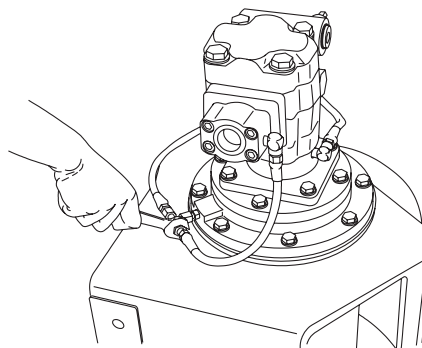
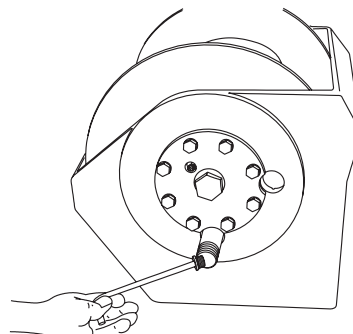
- Before any part is removed from the hoist, all service instructions should be read and understood.
- Work in a clean, dust free area as cleanliness is of utmost importance when servicing hydraulic equipment.
- Inspect all replacement parts, prior to installation, to detect any damage which might have occurred in shipment.
- Use only genuine BRADEN replacement parts. Never reuse expendable parts such as oil seals and O-rings.
- Replace bent or deformed hoist structural components such as side plates or base. Do not attempt to straighten.
- Inspect all machined surfaces for excessive wear or damage . . . before reassembly operations are begun.
- Lubricate all O-rings and oil seals with gear oil prior to installation.
- Remove wire rope prior to removing hoist from crane.
- Use a sealing compound on the outside surface of oil seals and a light coat of thread sealing compound on pipe threads. Avoid getting thread compound inside parts or passages which conduct oil.
- Thoroughly clean all parts in a good grade of non-flammable safety solvent. Wear protective clothing as required.

After troubleshooting the hoist and its hydraulic system as covered in the "Troubleshooting" section, and the problem is determined to be in the hoist, use the following procedure to disassemble the hoist.

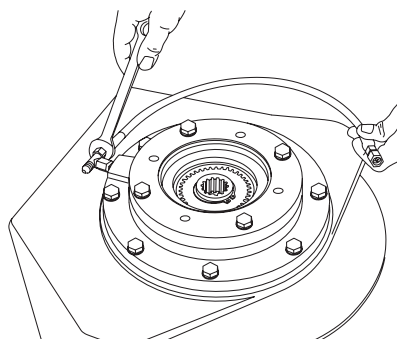


1. Remove the wire rope from the cable drum and align the drain hole in the drum with a hole in the support side plate before removing the hoses and mounting bolts. After the hoist is removed from its mounting, thoroughly clean the outside surfaces. To drain the oil, install a short piece of 1 inch pipe in the larger threads of the drain hole. If necessary, insert a bar into the anchor pocket and manually rotate the drum in the direction to hoist a load until the drain holes are aligned.
2. Use a 5/16 inch Allen wrench to remove the drain plug through the pipe.
3. Begin disassembly by removing the oil level plug or sight glass and standing the hoist on the bearing support end. Tag and remove the hydraulic hoses

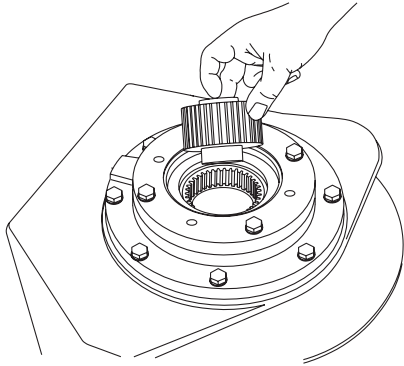
connecting the brake valve and manifold to the brake cylinder.



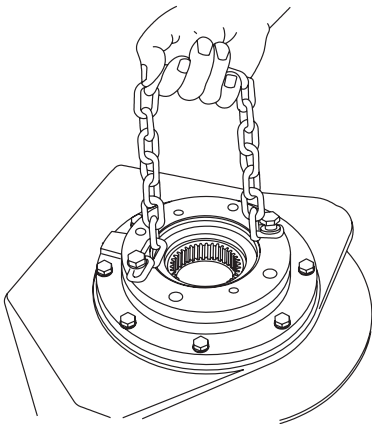
4. Remove the capscrews securing the motor, and lift the motor off the hoist. Remove and discard the O-ring installed on the pilot of the motor.
5. Tag and remove the hoses and fittings from the brake cylinder release port.
6. Remove the brake clutch assembly from the motor support. Refer to "Brake Clutch Service" for additional information.
7. Remove the motor support capscrews and install two (2) capscrews and a short piece of chain into the motor mounting bolt holes. Using the chain as a handle, lift the motor support out of the brake cylinder being careful to avoid damaging the sealing surfaces. Remove and discard the O-ring and backup ring from the motor support. Refer to "Motor Support-Brake Cylinder Service" for additional information. Note the location of the brake release port in relation to hoist prior to removing the brake cylinder



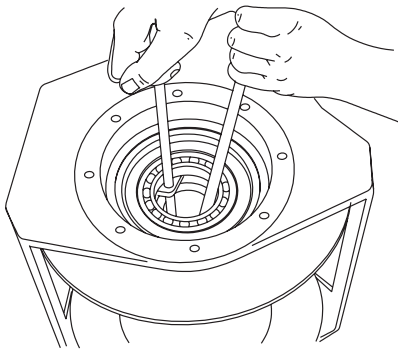
HOIST DISASSEMBLY



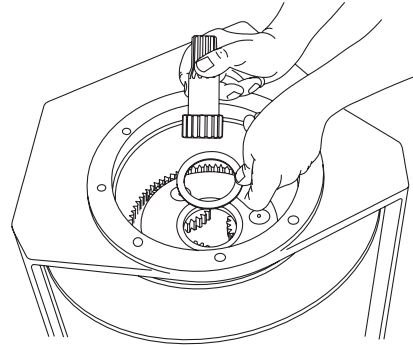
8. Remove the brake cylinder capscrews and install two (2) capscrews and a short piece of chain into the motor support mounting bolt holes. Using the chain as a handle, lift the brake cylinder out of the drum and base, being careful to avoid damaging the sealing or bearing surfaces. Refer to "Motor Support-Brake Cylinder Service" for additional information.



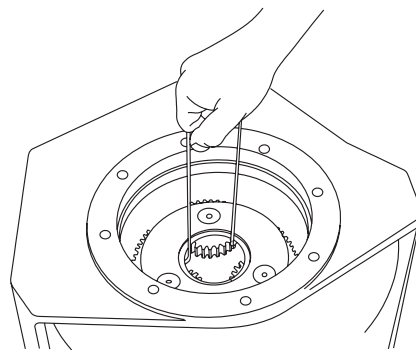
9. Using two heel type pry bars placed between the primary planet carrier and the drum closure, pry upward to remove the drum closure. Remove and discard the O-ring from the outside of the drum closure. Some drum closures have 3/8-16 tapped lifting eye holes which may be used in place of the heel bars



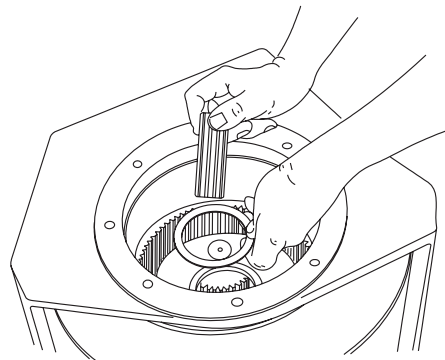
10. Remove the seal and bearing from inside of closure.
11. Remove the primary sun gear and thrust washer from the primary planet carrier.



12. Remove the primary planet carrier from the drum. Refer to "Planet Carrier Service" for additional information.

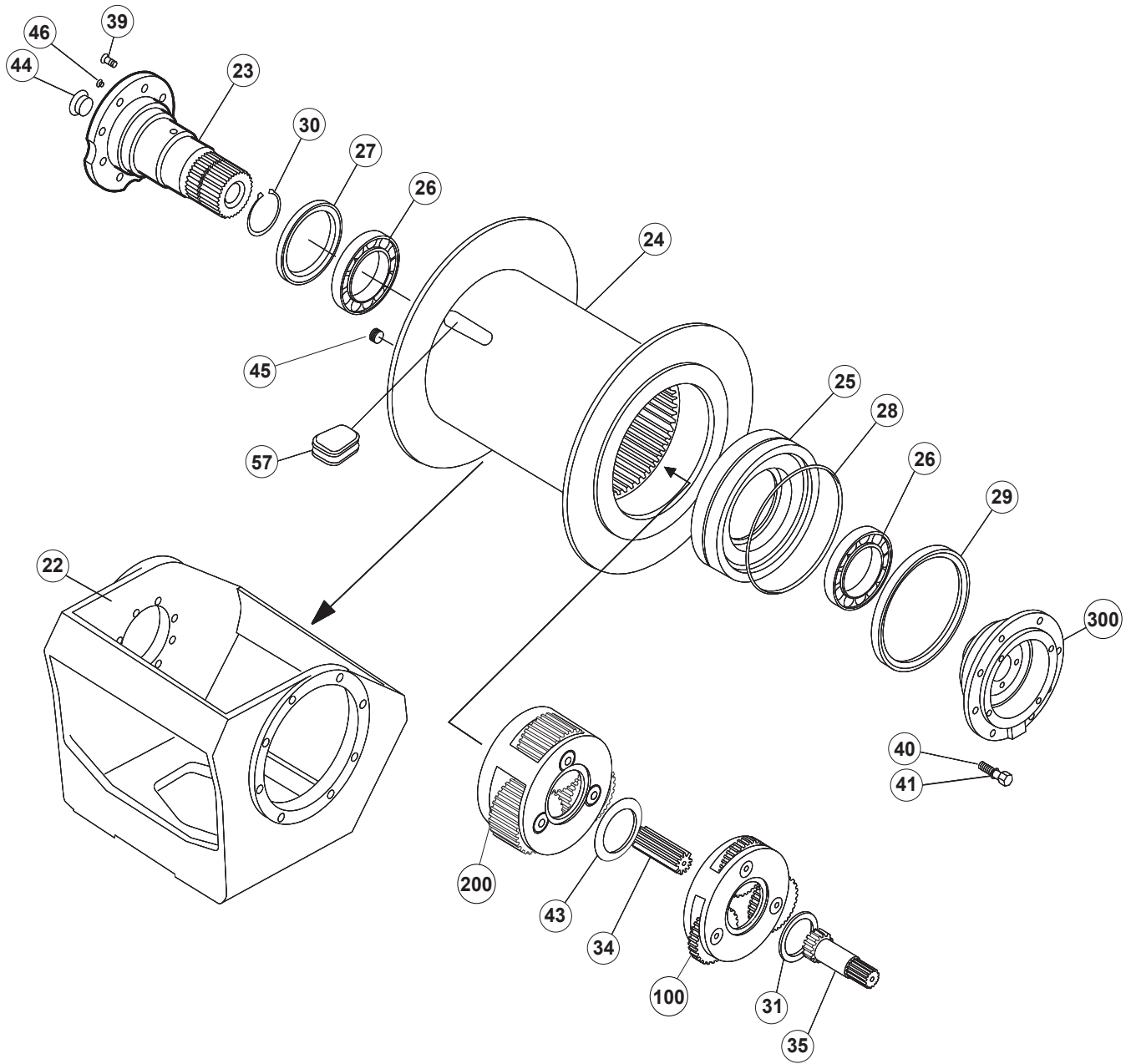


13. Remove the output sun gear and thrust washer from the output planet carrier.



14. Remove the output planet carrier from the drum. Refer to "Planet Carrier Service" for additional information.
15. Stand hoist on motor end with bearing support up; then remove eight (8) bearing support capscrews and bearing support being careful to avoid damaging the sealing or bearing surfaces.
16. Slide drum out of base onto a work bench and remove seal and bearing from support end.
17. Thoroughly clean and inspect drum and base. Check ring gear (machined into inside surface of drum) teeth for nicks, spalling or excessive wear. Replace if wear is greater than 0.015 in. (0.4 mm) when compared to unworn area of teeth.

MAIN ASSEMBLY COMPONENTS



MAIN ASSEMBLY COMPONENTS

ITEM	DESCRIPTION	PD12C PART NO.	PD15B PART NO.	QTY
22	BASE CONFIGURATIONS (SEE PGS 8-9)	--	--	1
24	CABLE DRUM (01 DRUM)	26757	N/A	1
	CABLE DRUM (02 DRUM)	25518	N/A	1
	CABLE DRUM (04 DRUM) FROM S/N 9102358	28831	28832	1
	CABLE DRUM (05 DRUM)	25901	26464	1
25	PD12C CABLE DRUM CLOSURE (CONSULT FACTORY WITH HOIST SERIAL NUMBER TO CONFIRM PART NUMBER)	26763 or 25561	N/A	1
	PD15B CABLE DRUM CLOSURE (04, 06 DRUM)	N/A	27866	
	PD15B CABLE DRUM CLOSURE (05 DRUM)	N/A	26480	
26	BALL BEARING	24110	24110	2
27	OIL SEAL (SUPPORT END) *	24109	24109	1
28	O-RING *	21033	76208	1
29	OIL SEAL (DRUM CLOSURE) *	22818	22818	1
31	PRIMARY THRUST RACE	40128	40128	1
34	OUTPUT SUN GEAR	SEE TABLE BELOW		1
35	PRIMARY SUN GEAR			1
40	CAPSCREW (02 & 05 DRUM), HEX HEAD (1/2-13 X 1-1/2 GD8 Z)	104322	104322	8
	CAPSCREW (01 & 04 DRUM), HEX HEAD (1/2 13 X 1-1/4 GD8 Z)	104174	104174	8
41	LOCKWASHER (1/2)	11026	11026	8
43	OUTPUT THRUST RACE	40129	40129	1
45	DRAIN PLUG	32411	32411	1
45a	O-RING	23950	23950	1
57	CABLE WEDGE STANDARD (7/16 - 5/8 IN)	40130	40130	1
	CABLE WEDGE (3/8 IN. 10 MM)	24494	24494	1
	CABLE WEDGE (3/4 IN. 19 MM)	24492	24492	1
	CABLE WEDGE (POLY ROPE 1- 1 1/8 IN)	24413	24413	1
100	PRIMARY PLANET CARRIER ASSEMBLY	SEE PAGE 30		1
200	OUTPUT PLANET CARRIER ASSEMBLY	SEE PAGE 30		1
300	BRAKE CYLINDER ASSEMBLY	SEE PAGE 29		1

*Included in seal kit 61715

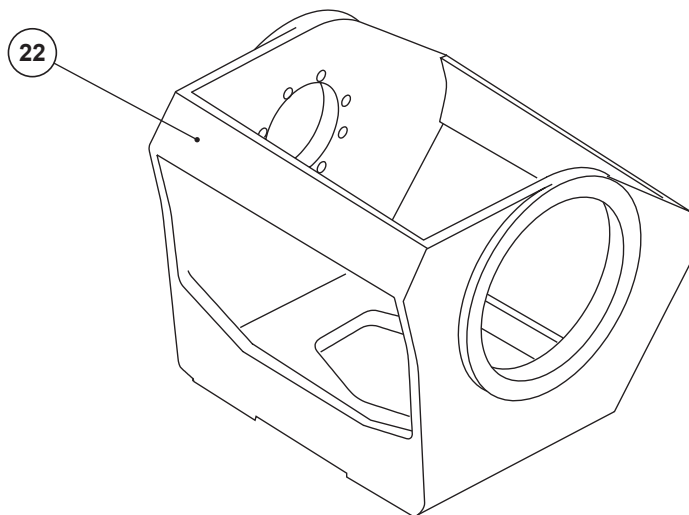
ITEM	DESCRIPTION	PART NO.					QTY
		GEAR REDUCTION					
		21:1	29:1	34:1	41:1	59:1	
34	PD12C OUTPUT SUN GEAR	25608	25608	N/A	25610	25610	1
	PD15B OUTPUT SUN GEAR (SERIAL NUMBER 9702222 AND HIGHER)	N/A	N/A	100854	100854	N/A	1
	PD15B OUTPUT SUN GEAR (SERIAL NUMBER 9702221 AND LOWER)	N/A	N/A	26478	26478	N/A	1
35	PD12C PRIMARY SUN GEAR	25714	25652	N/A	25652	25640	1
	PD15B PRIMARY SUN GEAR	N/A	N/A	40238	26479	N/A	1

BASE CONFIGURATIONS

COMMON BASE PARTS

ITEM	DESCRIPTION	PART NO.	QTY.
30	RETAINING RING	70575	1
44	PLUG HEX (STANDARD WINCHES)	31386	1
	PLUG FLUSH	24420	1
	SIGHT GLASS (-1 OPTION)	25958	1
44a	O-RING FOR ITEM 44 PLUGS*	24186	1
46	RELIEF VALVE	18062	1

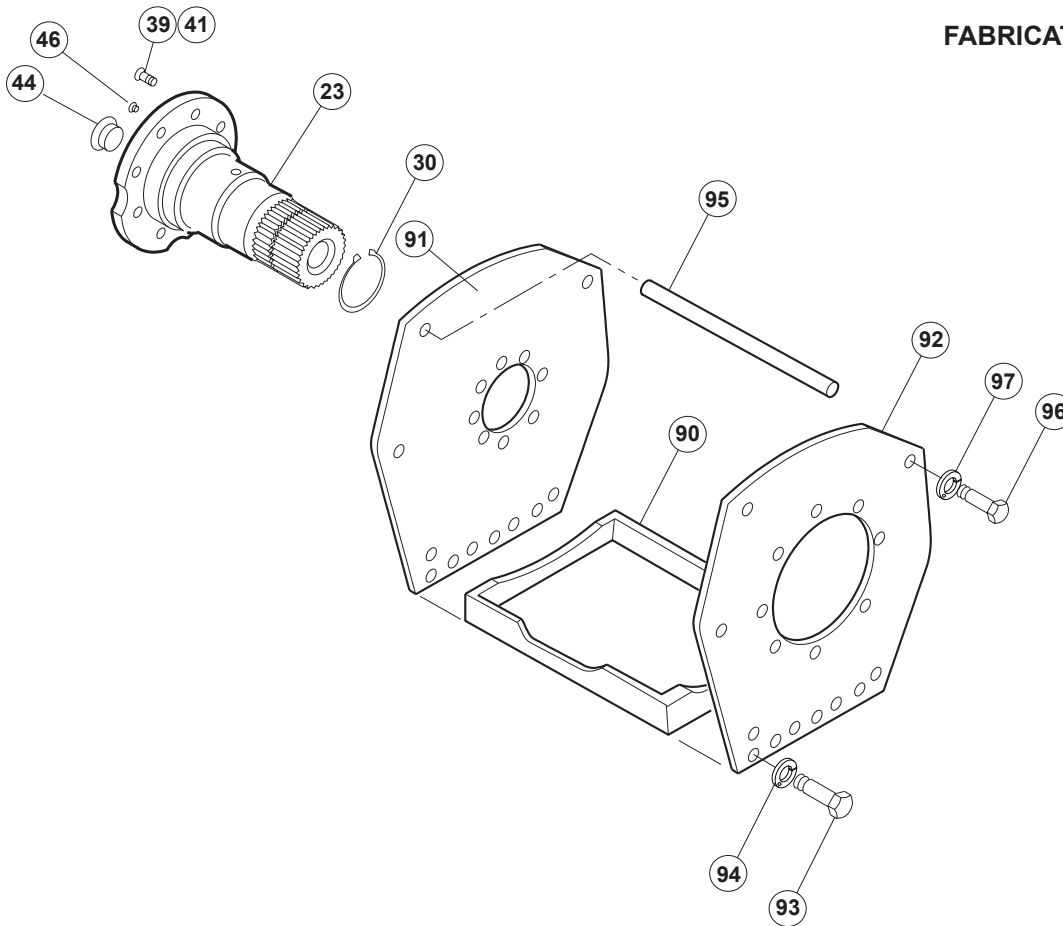
CAST BASE



ITEM	DESCRIPTION	PART NO.	QTY
22	BASE (RIGHT HAND)	25615	1
	BASE (LEFT HAND)	101074	1
23	BEARING SUPPORT (01 DRUM)	106459	1
	BEARING SUPPORT (02 & 05 DRUM)	101644	1
39	CAPSCREW, HEX HEAD (1/2-13 X 1-1/2 GD8 Z)	104322	8
41	LOCKWASHER (05 DRUM)	11026	8

BASE CONFIGURATIONS

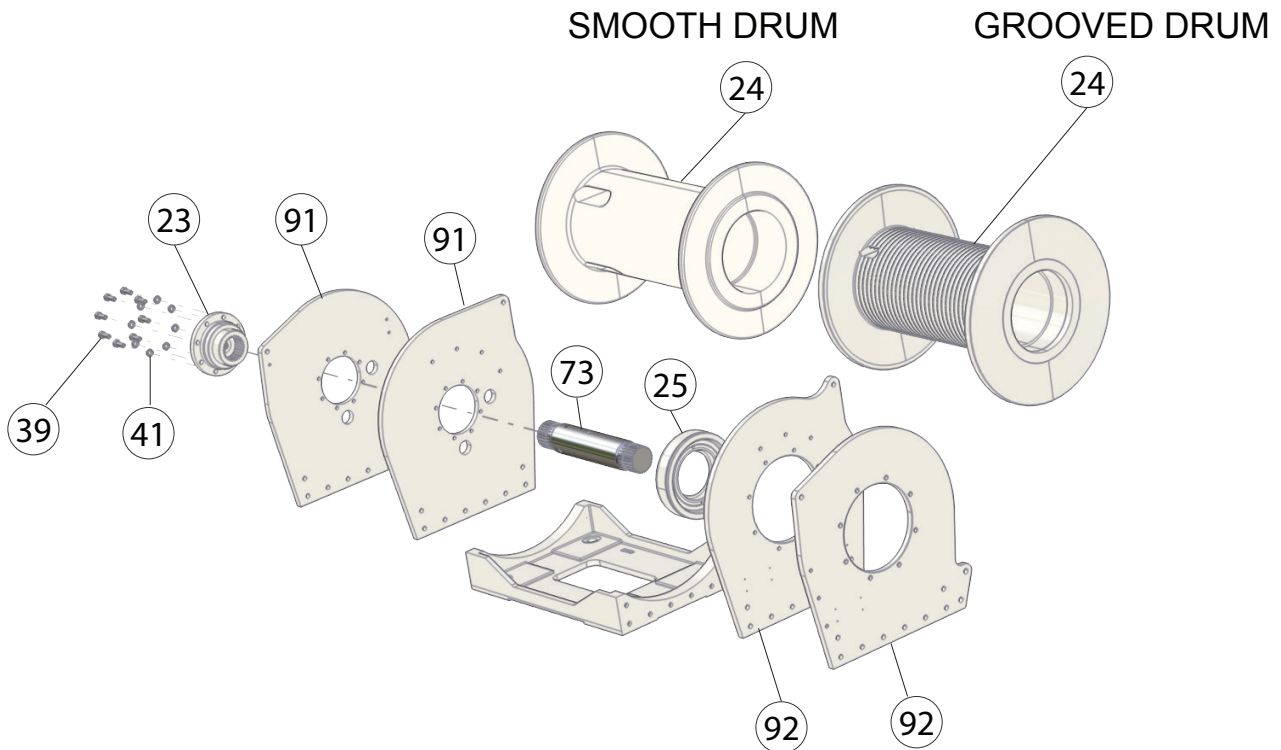
FABRICATED BASE



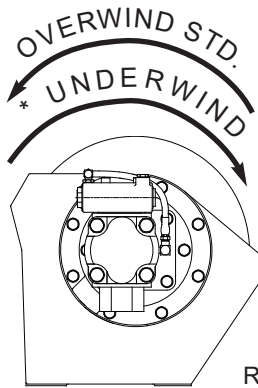
ITEM	DESCRIPTION	DRUM OPTION CODE				QTY
		-01	-02 / -05	-02 (LH)	-04	
		PART NO.				
23	BEARING SUPPORT	106459	106459	106459	106459	1
39	CAPSCREW, HEX HEAD (1/2-13 X 1-1/4 GD8 Z)	104174	104174	104174	104174	8
90	BASE	26344	26344	26344	26344	1
91	SIDE PLATE, BEARING SUPPORT END	26764	106466	106466	27212	1
92	SIDE PLATE, MOTOR END	26765	106465	106537	27213	1
93	CAPSCREW, HEX HEAD (1/2-13 X 1-1/2 GD8 Z) (SPECIAL)	103314	103314	103314	103314	16
94	LOCKWASHER 1/2 Z EXTERNAL TOOTH	12781	12781	12781	12781	16
95	TIE BAR	26223	26223	26223	--	1
	TIE BAR	--	--	--	26223	2
96	CAPSCREW, HEX HEAD (1/2-13 X 1-1/4 GD8 Z)	104174	104174	104174	--	2
	CAPSCREW, HEX HEAD (1/2-13 X 1-1/4 GD8 Z)	--	--	--	104174	4
97	LOCKWASHER (1/2 Z)	11026	11026	11026	--	2
	LOCKWASHER (1/2 Z)	--	--	--	11026	4

SPECIAL DRUM CODE 06 COMPONENTS PD15B ONLY

Winch Model	Winch Part No	Cable Drum	Sideplate - Motor End	Sideplate - Bearing Support	Base	Bearing Support	Bearing Support Shaft	Drum Closure	Cable Wedge
ITEM #	N/A	24	92	91	90	23	73	25	(Not pictured)
-06UG Underworld Grooved Drum	05156	104057	102033	102032	102031	102012	102030	27866	102385
-06G Standard Rotation Grooved Drum	05191	103949	103929	103930	102031	102012	102030	27866	102385
-06U Underworld Smooth Drum	05111	103619	102033	102032	102031	102012	102030	27866	102385

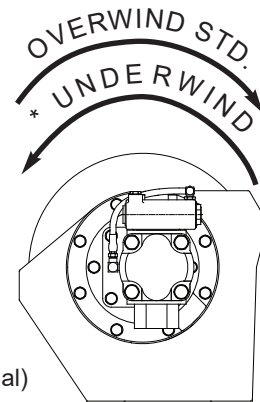


DRUM ROTATION TO HOIST (04 & 05 DRUM/BASE SHOWN)



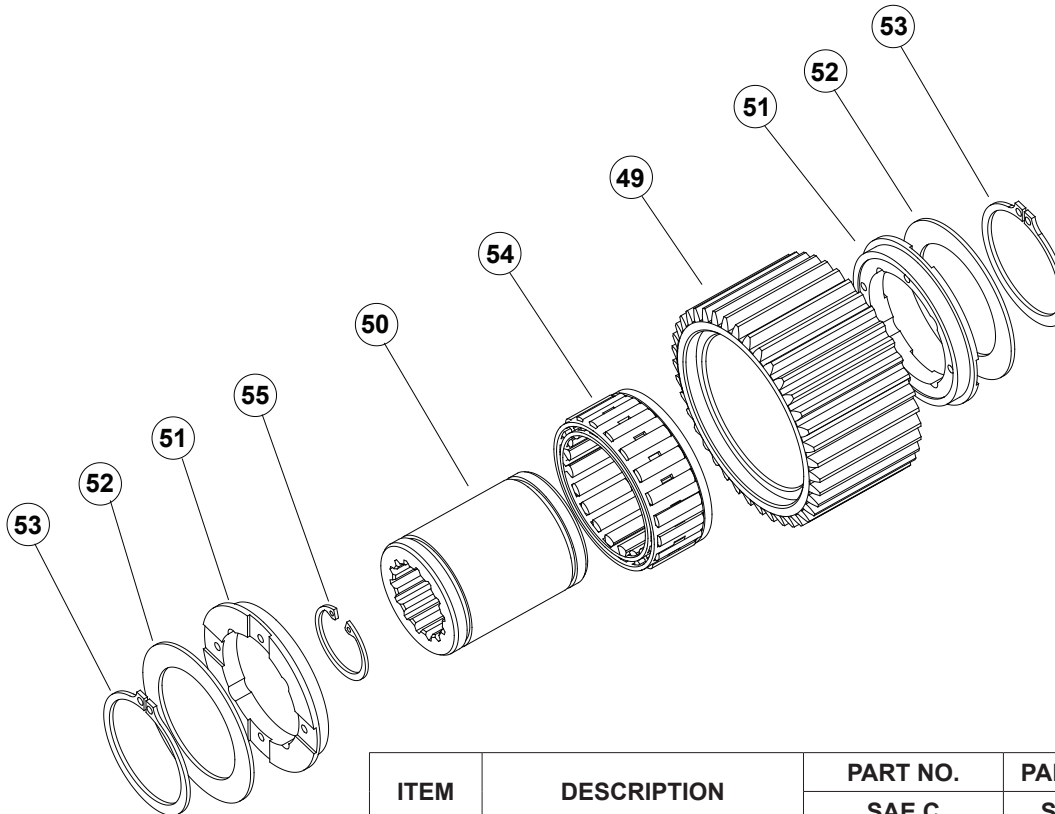
RH BASE (Standard)

UNDERWOUND MODELS
DESIGNATED BY "-U"
(EXAMPLE: PD12C-41051-04U)



LH BASE (Optional)

OVERRUNNING CLUTCH COMPONENTS



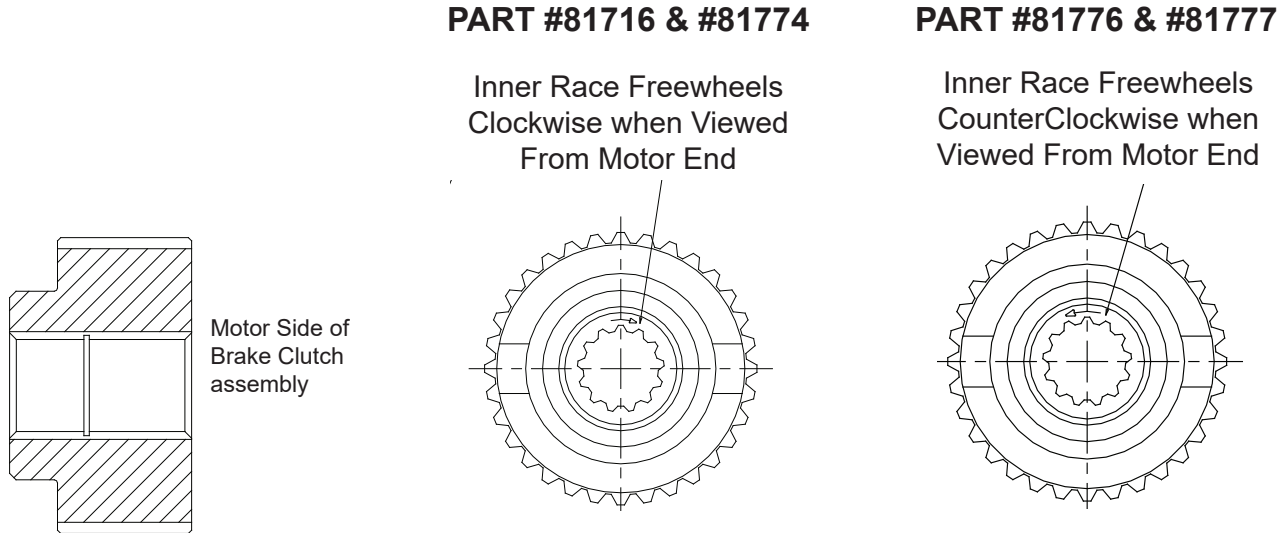
ITEM	DESCRIPTION	PART NO.		QTY.
		SAE C	SAE B	
49	OUTER BRAKE RACE	NSS	NSS	1
50	INNER BRAKE RACE	NSS	NSS	1
51	SPRAG BEARING	27684	27684	2
52	THRUST BEARING	24581	24581	2
53	RETAINING RING	12034	12034	2
54	SPRAG CLUTCH	NSS	NSS	1
55	RETAINING RING	24506	24031	1

NSS – NOT SERVICED SEPARATELY
ORDER ENTIRE BRAKE CLUTCH ASSEMBLY

BRAKE CLUTCH ROTATION

Note: Designation of cable drum rotation is determined by viewing winch from hydraulic motor end while hoisting.

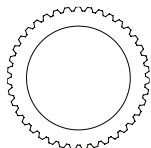
The inner race of the brake clutch sprag assembly, when viewed from the motor side, must freewheel in the direction opposite as the cable drum during hoisting



COMPLETE BRAKE CLUTCH ASSEMBLIES

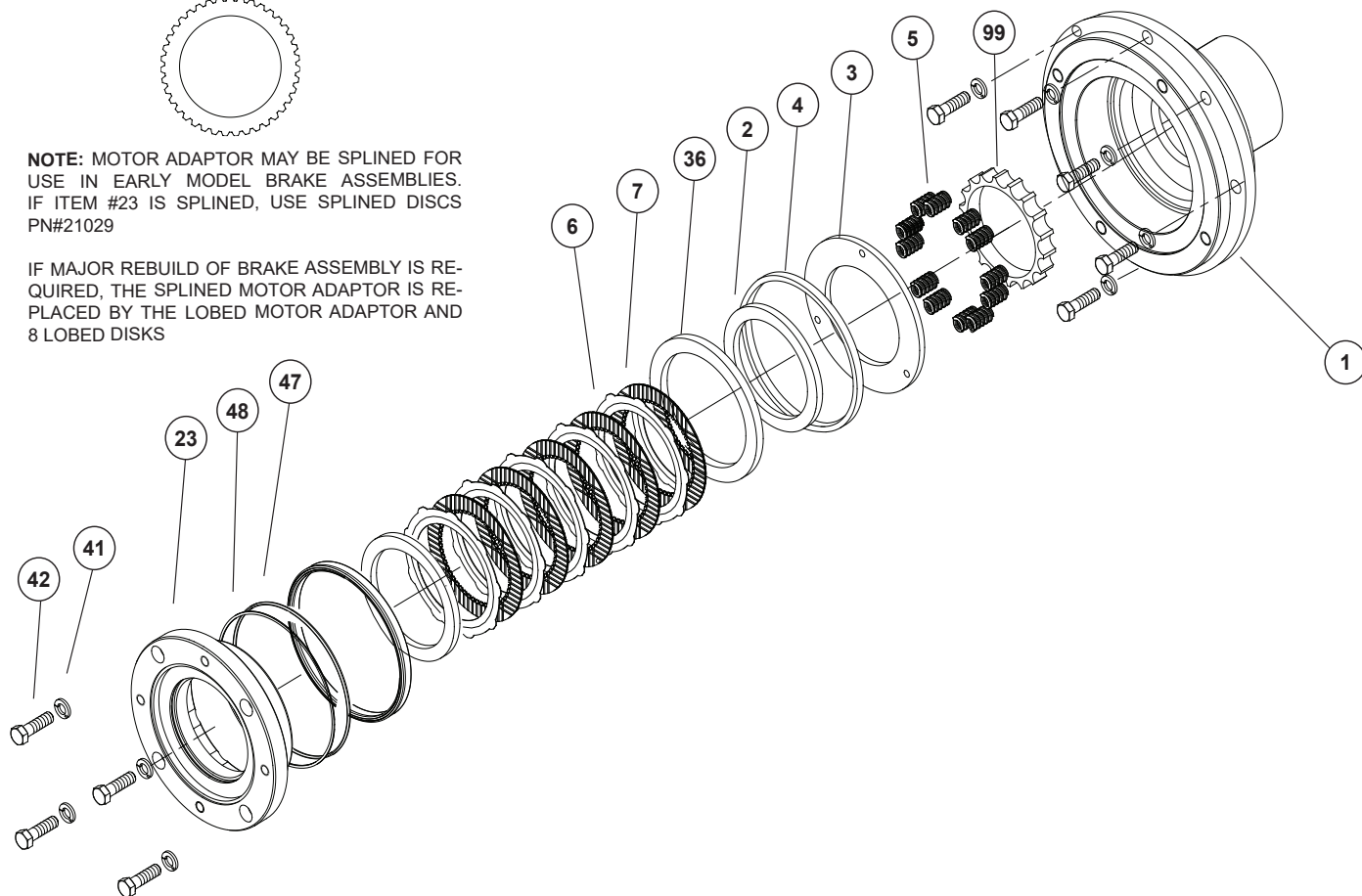
DESCRIPTION	APPLICATION	PART NO.
SAE C 14T	RH BASE OVERWIND, LH BASE UNDERWIND	81716
	RH BASE UNDERWIND, LH BASE OVERWIND	81776
SAE B 13T	RH OVERWIND, LH UNDERWIND	81774
	RH UNDERWIND, LH OVERWIND	81777

BRAKE CYLINDER ASSEMBLY



NOTE: MOTOR ADAPTOR MAY BE SPLINED FOR USE IN EARLY MODEL BRAKE ASSEMBLIES. IF ITEM #23 IS SPLINED, USE SPLINED DISCS PN#21029

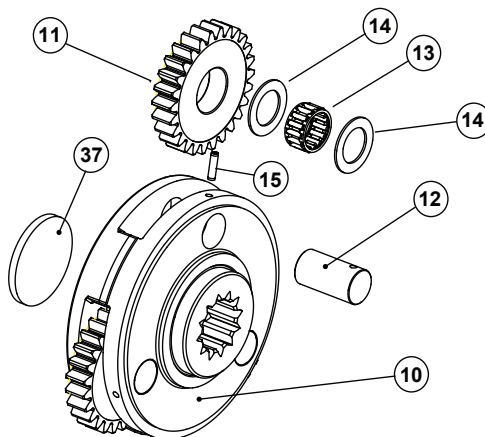
IF MAJOR REBUILD OF BRAKE ASSEMBLY IS REQUIRED, THE SPLINED MOTOR ADAPTOR IS REPLACED BY THE LOBED MOTOR ADAPTOR AND 8 LOBED DISKS



ITEM	DESCRIPTION	PART NO.	QTY.
1	BRAKE CYLINDER (LOBED DISC)	100035	1
2	BRAKE PISTON SEAL	25642	1
3	PRESSURE PLATE	25635	1
4	PISTON BACKUP RING	25636	1
5	DIE SPRING	25644	12
6	FRICTION DISC	21036	7
7	BRAKE DISC, STEEL, LOBED	100027	8
	BRAKE DISC, STEEL, SPLINED	21029	
23	MOTOR ADAPTER (4 BOLT C) 051, 064, 049/024, 064/032	100028	1
	MOTOR ADAPTER (2 BOLT C) VARIOUS		
	MOTOR ADAPTER (2 BOLT B) 029, 034, 039	100458	
	MOTOR ADAPTER (2 BOLT A) 080	100097	
36	SPACER	25637	1
41	LOCKWASHER (4 BOLT C, 2 BOLT A)	11026	4
	LOCKWASHER (2 BOLT B)	12781	
42	CAPSCREW, HEX HEAD (1/2-13 X 2 GD8 Z)	29855	4
47	O-RING	24981	1
48	BACKUP RING	25643	1
99	SPRING SPACER	100200	1
* ITEMS 1 AND 99 REPLACE PART NO 25564, BRAKE CYLINDER W/CAST IRON SPRING POCKETS			

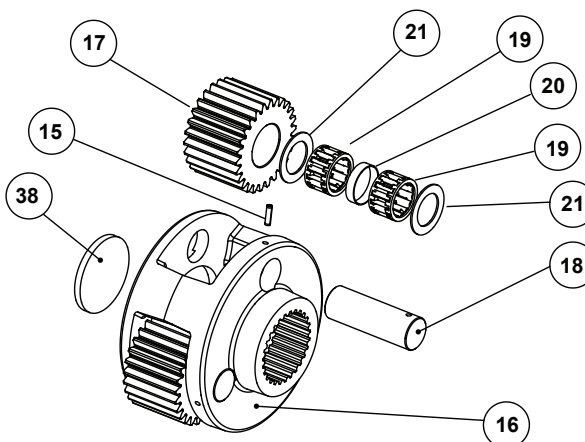
PLANET CARRIER ASSEMBLIES PD12C ONLY

PRIMARY PLANET CARRIER ASSEMBLY



ITEM	DESCRIPTION	21:1	29:1	41:1	59:1	QTY.
		PART NO.				
	PRIMARY PLANET CARRIER ASSEMBLY	81805	81806	81807	81801	1
10	PRIMARY PLANET CARRIER	25715	25730	25606	25604	1
11	PRIMARY PLANET GEAR	26280	2278	26278	26276	3
12	PRIMARY PLANET GEAR SHAFT	25614	25614	25614	25614	3
13	BEARING	24175	24175	24175	24175	3
14	THRUST WASHER	25361	25361	25361	25361	6
15	ROLLPIN (PRIMARY PLANET CARRIER)	24113	24113	24113	24113	3
37	PRIMARY THRUST PLATE	25729	25729	25729	25729	1

OUTPUT PLANET CARRIER ASSEMBLY

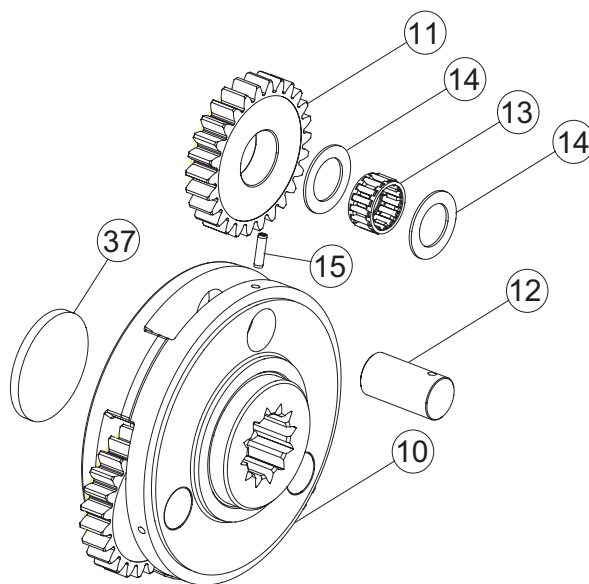


ITEM	DESCRIPTION	21:1	29:1	41:1	59:1	QTY
		PART NO.				
	OUTPUT CARRIER ASSEMBLY	81804	81804	81802	81802	1
15	ROLL PIN (OUTPUT PLANET CARRIER)	23584	23584	23584	23584	3
16	OUTPUT PLANET CARRIER	25602	25602	25562	25562	1
17	OUTPUT PLANET GEAR	26279	26279	26277	26277	3
18	OUTPUT PLANET GEAR SHAFT	25613	25613	25613	25613	3
19	BEARING	25292	25292	25292	25292	6
20	BEARING SPACER	25443	25443	25443	25443	3
21	THRUST WASHER	24306	24306	24306	24306	6
38	OUTPUT THRUST PLATE	25638	25638	25638	25638	1

PLANET CARRIER ASSEMBLIES PD15B ONLY

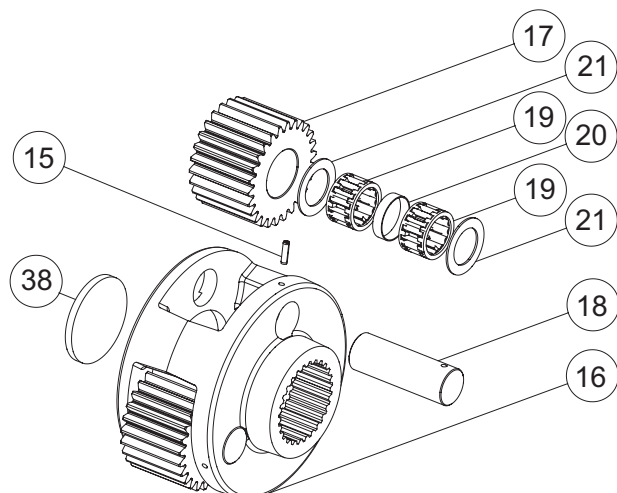
PRIMARY PLANET CARRIER ASSEMBLY

Part Number 82342 (serial number 9702222 and higher)



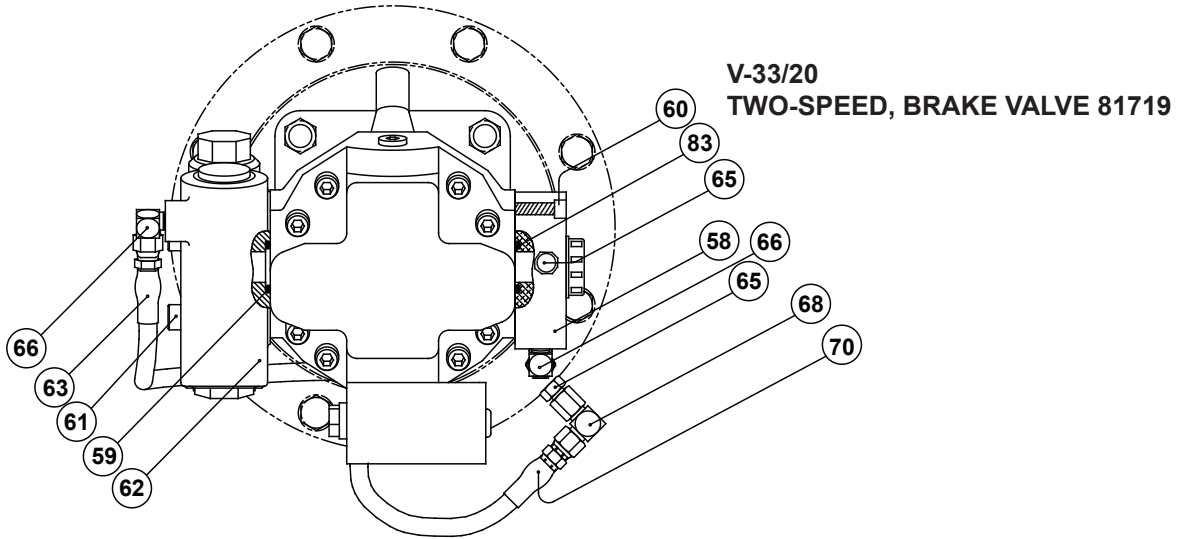
ITEM	DESCRIPTION	34:1 RATIO	41:1 RATIO SERIAL # 970221 & LOWER	41:1 RATIO SERIAL # 970222 & HIGHER	QTY.
		PART NO.			
-	PRIMARY PLANET CARRIER ASSEMBLY	82343	81844	82342	1
10	PRIMARY PLANET CARRIER	100853	25730	100852	1
11	PRIMARY PLANET GEAR	40237	26466	26466	3
12	PLANET GEAR SHAFT	25614	25614	25614	3
13	ROLLER BEARING	24175	24175	24175	3
14	THRUST WASHER	25361	25361	25361	6
15	ROLL PIN (3/16 X 3/4)	24113	24113	24113	3
37	PRIMARY THRUST PLATE	25729	25729	25729	1

OUTPUT PLANET CARRIER ASSEMBLY

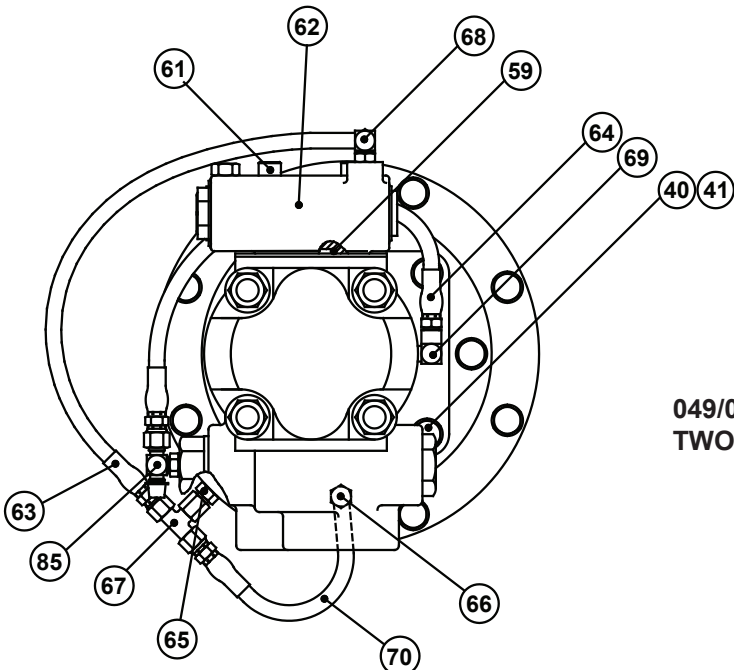
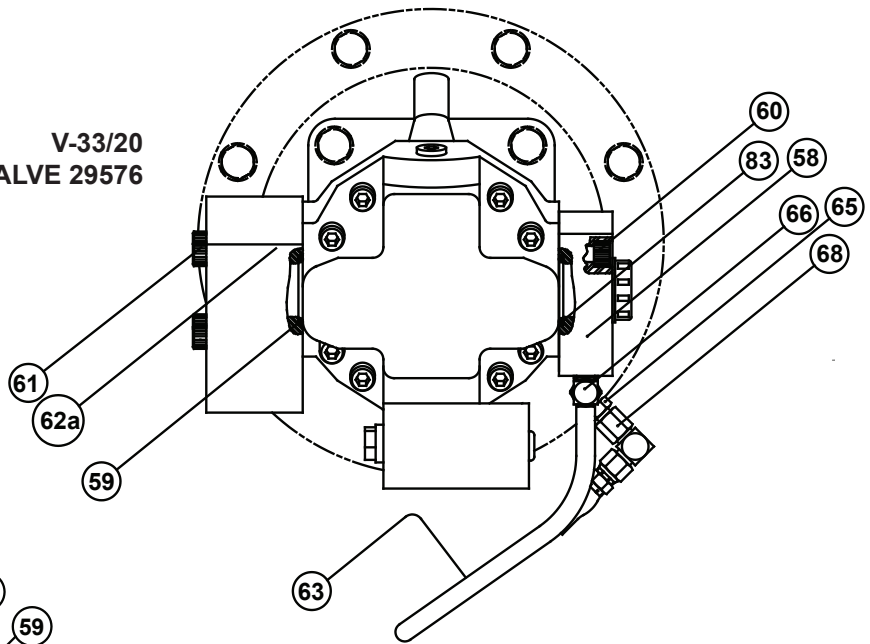


ITEM #	DESCRIPTION	PART #	QTY.
-	OUTPUT CARRIER ASSEMBLY	81845	1
15	ROLL PIN (3/16 X 1)	23584	3
16	OUTPUT PLANET CARRIER	25602	1
17	OUTPUT PLANET GEAR	26467	3
18	OUTPUT PLANET GEAR SHAFT	25613	3
19	ROLLER BEARING	25292	6
20	BEARING SPACER	25443	1
21	THRUST BEARING	24306	6
38	OUTPUT THRUST PLATE	25638	1

MOTOR GROUPS (STANDARD)

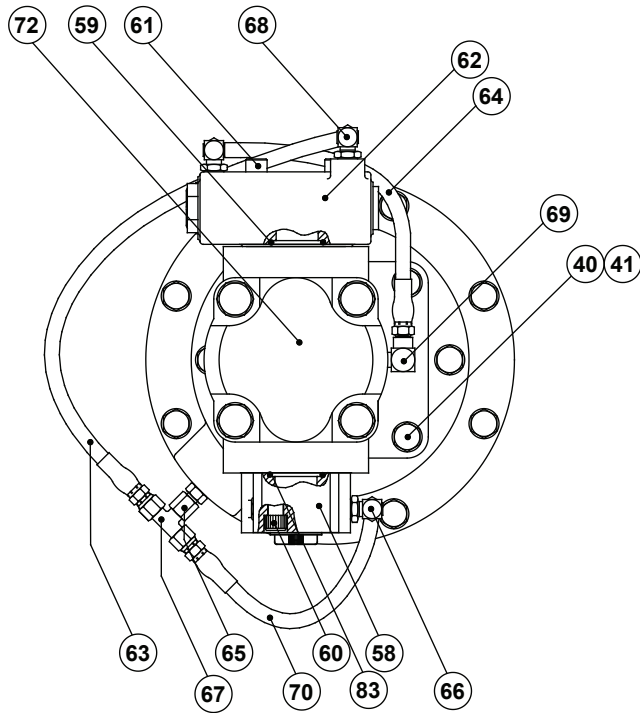


V-33/20
TWO-SPEED, BRAKE VALVE 29576

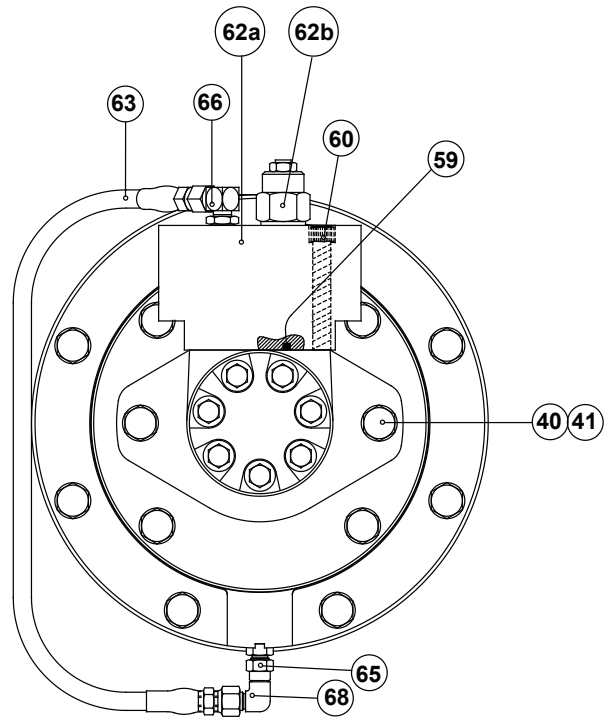


049/024 & 064/032 MOTOR
TWO-SPEED

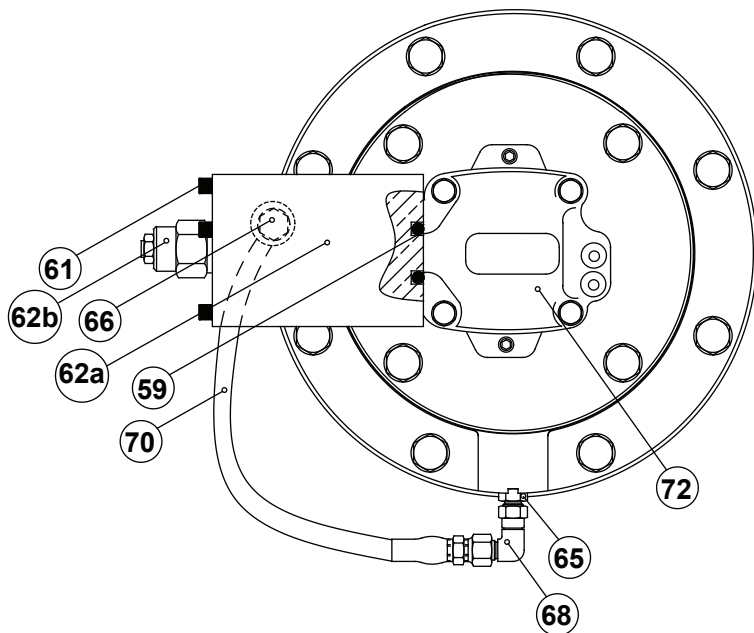
MOTOR GROUPS (STANDARD)



**051 & 064 MOTOR
SINGLE-SPEED**

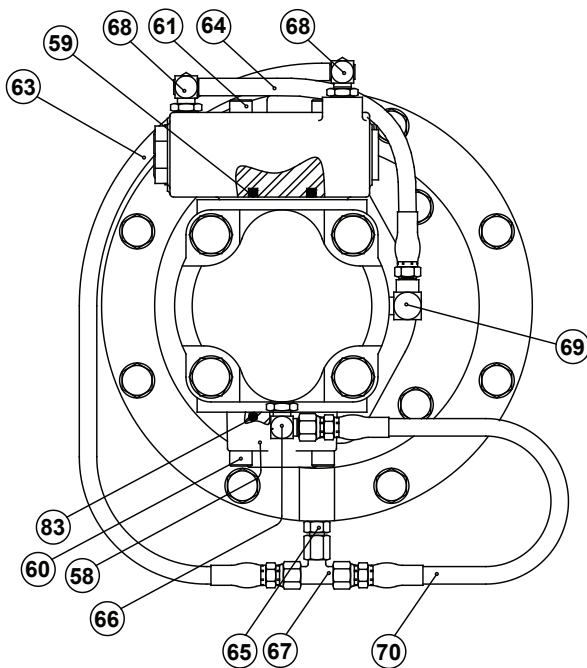


**071 & 062 MOTOR
SINGLE-SPEED**



**080 MOTOR
SINGLE-SPEED**

MOTOR GROUPS (STANDARD)



**029, 034, & 039 MOTOR
SINGLE-SPEED**

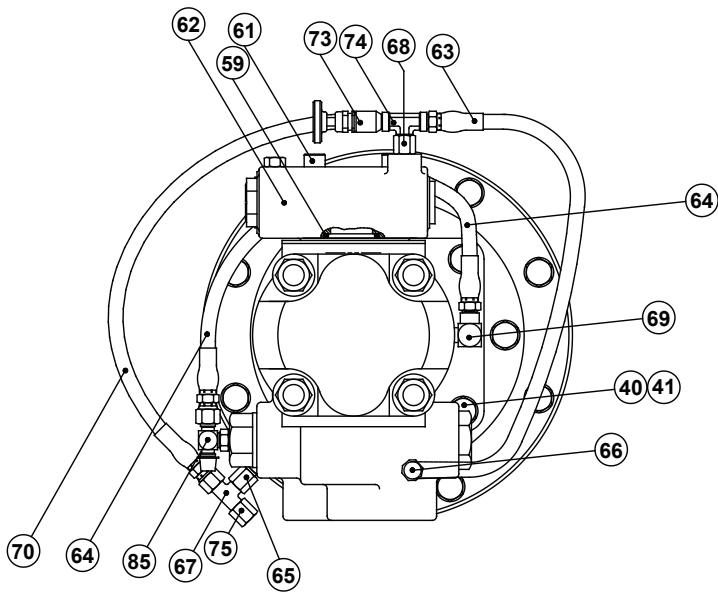
ITEM	DESCRIPTION	PART NO.	QTY	PILOT O-RING
5	029 (2 BOLT B)	25385	1	21063
	034 (2 BOLT B)	25912	1	21063
	034 (2 BOLT B) UNDERWOUND	103887	1	21063
	039 (2 BOLT B)	25515	1	21063
	039 (4 BOLTC) CT WINCHES	25896	1	10330
	051 (4 BOLT C)	25897	1	10330
	064 (4 BOLT C)	25777	1	10330
	049/024 (4 BOLT C)	26182	1	10330
	V33/20 (4 BOLT C)	100714	1	10330
	064/032 (4 BOLT C)	28956	1	10330
	071 REPLACED BY 062 (2 BOLT B)	106079	1	21063
	080 (2 BOLT A)	26124	1	22586

NOTE: These drawings are standard configurations. Verify hoses, fittings, and capscrews using tables found on pages 21 and 22.

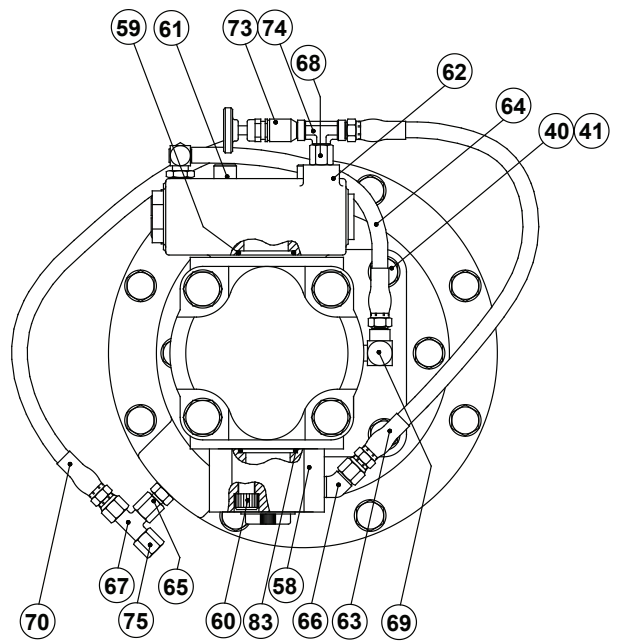
MOTOR GROUPS (STANDARD)

			039, 051, 064	049/024 064/032	029, 034, 039	080	071/062	V33/20
			4 BOLT-C	4 BOLT-C	2 BOLT-B	2 BOLT-A	2 BOLT-B	4 BOLT-C
ITEM	QTY	DESCRIPTION	PART NO.					
40	4	CAPSCREW 1/2-13 X 1-1/2 GD8 Z HX HD	104322	104322	104322		104322	104322
		CAPSCREW 1/2-13 X 1-1/2 ASTM A574 SKT HD	--	--	--	21908	--	--
41	4	LOCKWASHER (1/2 Z)	11026	11026	11026	11026	11026	11026
58	1	MANIFOLD	24779	--	25539	--	--	25664
59	1	O-RING	13838	13838	25366	78312	12273	12465
60	4	CAPSCREW 7/16 - 14 X 2 ASTM A574 SKT HD	21144	--	--	--	29631	--
	4	CAPSCREW (EARLY) 3/8 - 16 X 1-1/2 ASTM A574 SKT HD			13544			13544
	4	CAPSCREW (CURRENT) 3/8 - 16 X 1-1/4 ASTM A574 SKT HD	--	--	13827	--	--	13827
61	4	CAPSCREW 7/16-14 X 3 ASTM A574 Z SKT HD	21134	21134			--	--
		CAPSCREW 3/8-16 X 2-3/4 ASTM A574 SKT HD	--	--	25622	--	--	--
		CAPSCREW 3/8-16 x 4 ASTM A574 SKT HD	--	--	--	29630	--	--
		CAPSCREW 3/8-16 x 3 ASTM A574 SKT HD						13587
62	1	BRAKE VALVE ASSY	81712	81984	81715		--	81719
62A	1	BRAKE VALVE BLOCK	--	--	--	26125	27403	29576
62B	1	BRAKE VALVE CARTRIDGE	--	--	--	26126	27258	29598
63	1	HOSE ASSY	25749	25749	25749	--	25952	25952
64	1	HOSE ASSY	13704	13707	13704	--	--	--
65	1	ADAPTER	25864	25864	25864	25864	25864	25864
66	1	FITTING	21163	25864	25131	31284	25302	25302
67	1	SWIVEL TEE	25748	25748	25748	--	--	--
68	1	CONNECTOR	25302	25302	25302	26140	26140	26140
69	1	REDUCER ELBOW	24236	24236	24236	--	--	--
70	1	HOSE ASSY	25750	25750	25750	25750	--	25952
72	1	HYD. MOTOR	--	--	--	--	--	--
73	1	NEEDLE VALVE	--	--	--	--	--	--
74	1	TEE-MALE BRANCH	--	--	--	--	--	--
75	1	CAP NUT	--	--	--	--	--	--
76	1	WARNING TAG	--	--	--	--	--	--
83	1	O-RING	21150	--	25366	--	--	12465
85	1	TEE, -4 ORB	--	29078	--	--	--	--

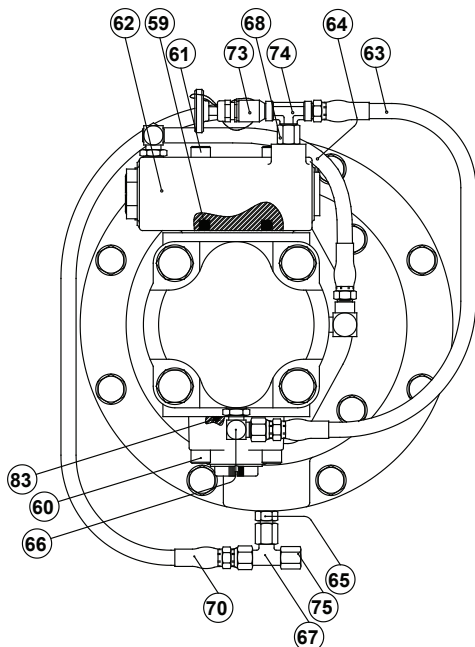
MOTOR GROUPS (-1 OPTION, PERSONNEL HANDLING)



**049/024 & 064/032 MOTOR
TWO-SPEED PERSONNEL HANDLING**



**051 & 064 MOTOR
TWO-SPEED PERSONNEL HANDLING**



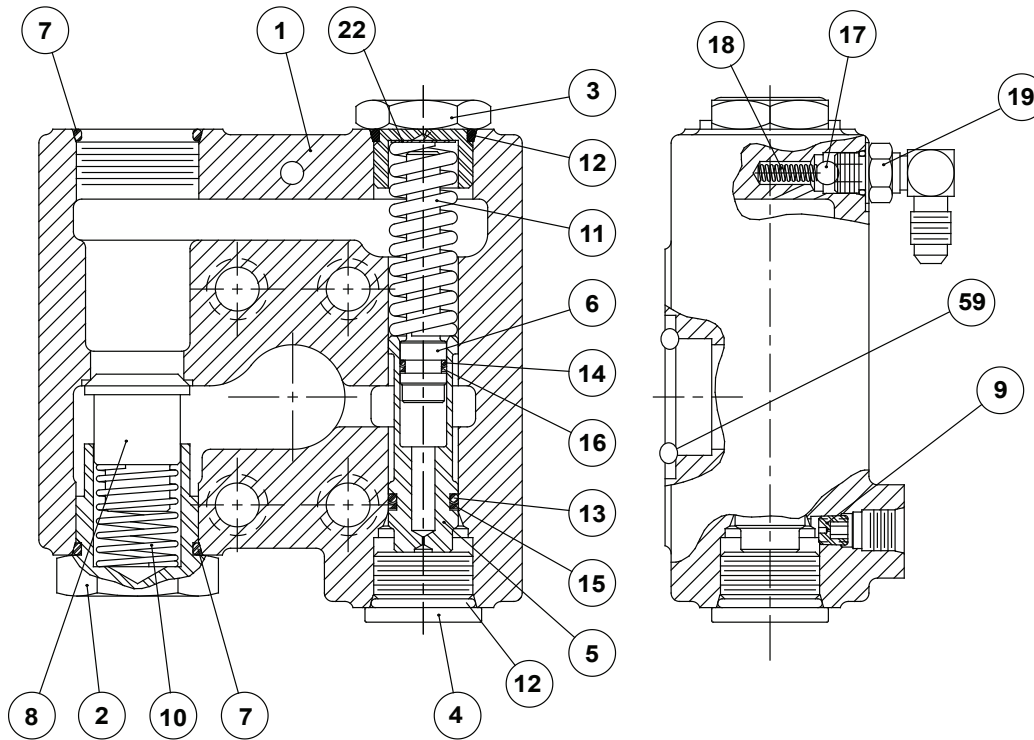
**029, 034 & 039 MOTOR
SINGLE-SPEED PERSONNEL HANDLING**

MOTOR GROUPS (-1 OPTION, PERSONNEL HANDLING)

ITEM	DESCRIPTION	051 & 64	064/032 049/024	029/034/039	QTY
		PART NO.			
40	CAPSCREW 1/2-13 X 1-1/2 GD8 Z HX HD	104322	104322	104322	4
41	LOCKWASHER 1/2 Z	11026	11026	11026	4
58	MANIFOLD	24779	--	25539	1
59	O-RING	13838	13838	25366	1
60	CAPSCREW 7/16-14 X 2 GD5 SKT HD ASTM A574 Z	21144	--	--	4
	CAPSCREW 3/8-16 x 1-1/2 ASTM A574 SKT HD (EARLY)	--	--	13544	
	CAPSCREW 3/8-16 X 1-1/4 ASTM A574 SKT HD (CURRENT)	--	--	13827	
61	CAPSCREW 7/16-14 X 3 ASTM A574 Z SKT HD	21134	21134	--	4
	CAPSCREW 3/8-16 X 2-3/4 ASTM A574 SKT HD	--	--	25622	
62	BRAKE VALVE ASSY	81712	81984	81715	1
62A	BRAKE VALVE BLOCK	--	--	--	1
62B	BRAKE VALVE CARTRIDGE	--	--	--	1
63	HOSE ASSY	13707	13707	13707	1
64	HOSE ASSY	13704	13704	13704	1
65	ADAPTER	25864	25864	25864	1
66	FITTING	21165	25302	25131	1
67	SWIVEL TEE	25748	25748	25748	1
68	CONNECTOR	24784	24784	24784	1
69	REDUCER ELBOW	24236	24236	24236	1
70	HOSE ASSY	13731	13731	13731	1
72	HYD MOTOR	--	--	--	1
73	NEEDLE VALVE	25258	25258	25258	1
74	TEE-MALE BRANCH	22934	22934	22934	1
75	CAP NUT -4	70182	70182	70182	1
76	WARNING TAG	25257	25257	25257	1
83	O-RING	21150	--	25366	1
85	TEE, -4 ORB	--	29078	--	1

NOTE: These drawings are standard configurations. Verify hoses, fittings, and capscrews using tables found on pages 21 and 22.

BRAKE VALVE ASSEMBLY



ITEM	DESCRIPTION	PART NO.	QTY
1	BRAKE VALVE HOUSING	NSS	1
2	VALVE SPRING RETAINER	24424	1
	RELIEF RETAINER (81719 VALVE)	29609	1
3	SPRING RETAINER	24183	1
4	PLUG	22450	1
5	SPOOL	NSS	1
6	DAMPER PISTON	NSS	1
7	O-RING	24186	2
8	CHECK VALVE POPPET	24423	1
	RELIEF ASSEMBLY (81719 VALVE)	82132	1
9	PILOT ORIFICE	24200	1
10	CHECK VALVE SPRING	24190	1
11	SPOOL SPRING	24192	1
12	O-RING	23601	2
13	O-RING	24193	1
14	O-RING	24194	1
15	BACK-UP RING	24195	1
16	BACK-UP RING	24196	1
17	BALL, STEEL	21158	1
18	COMPRESSION SPRING	25480	1
19	ELBOW FITTING	25302	1
19	PLUG, -4 ORB (81984 & 81719)	25663	1
22	SHIM, VALVE SPRING	25661	-
59	O-RING	13838	1

BRAKE VALVES	
FLANGE	PART NO.
1-1/4 IN. CODE 61	81712
1 IN. CODE 61	81715
3/4 IN. CODE 62	81719
1-1/4 IN. CODE 61	81984
SEAL KIT	61567

FASTENERS, ADAPTER, AND HOSE ASSEMBLIES

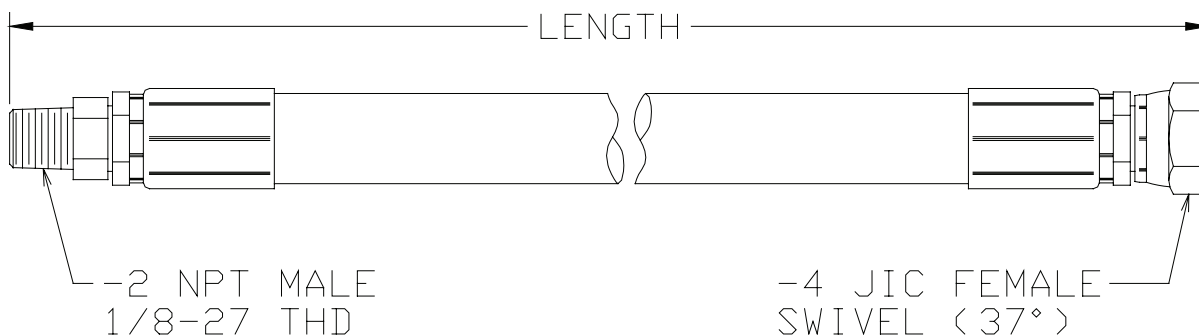
CAPSCREWS AND LOCKWASHERS

PART NO.	DESCRIPTION	
29631	5/16 NC X 3 G8, SOCKET HEAD	
21654	3/8 NC X 3 1/2 G8, SOCKET HEAD	
25622	3/8 NC X 2 3/4 G8, SOCKET HEAD	
29630	3/8 NC X 4 G8, SOCKET HEAD	
13587	3/8 NC X 3 G8, SOCKET HEAD	
13544	3/8 NC X 1 1/2 G8, SOCKET HEAD	(EARLY)
13827	3/8 NC X 1 1/4 G8, SOCKET HEAD	(CURRENT)
21135	7/16 NC X 1 1/2 G8 Z SOCKET HEAD	
104318	7/16 NC X 1 3/4 G8 Z HEX HEAD	
21144	7/16 NC X 2 G8 Z SOCKET HEAD	
21134	7/16 NC X 3 G8 Z SOCKET HEAD	
101150	7/16 NC X 3 3/4 G8 Z SOCKET HEAD	
104174	1/2 NC X 1 1/4 G8 Z HEX HEAD	
104322	1/2 NC X 1 1/2 G8 Z HEX HEAD	
21908	1/2 NC X 1 1/2 G8 Z SOCKET HEAD	
29855	1/2 NC X 2 G8 Z HEX HEAD	
103249	5/8 NC X 1 3/4 G8 Z HEX HEAD	
11026	LOCKWASHER 1/2 SPLIT, Z	
102423	LOCKWASHER 5/8 SPLIT, Z	

NSS - NOT SERVICED SEPARATELY
 * = INCLUDED IN BRAKE O-RING KIT #61567

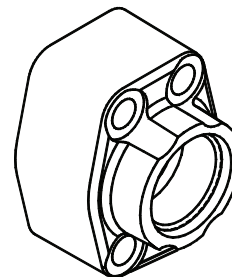
HOSE ASSEMBLIES

PART NO.	LENGTH	
13710	8 IN.	NPT -2 TO JIC -4
13711	10 IN.	NPT -2 TO JIC -4
13704	12 IN.	NPT -2 TO JIC -4
13706	16 IN.	NPT -2 TO JIC -4
13707	17 IN.	NPT -2 TO JIC -4
13731	22 IN.	NPT -2 TO JIC -4
24948	30 IN.	NPT -2 TO JIC -4
25750	17 IN.	JIC -4 BOTH ENDS
25952	20 IN.	JIC -4 BOTH ENDS
25749	22.5 IN.	JIC -4 BOTH ENDS
106269	14 IN.	ORFS SWIVEL -8
106270	17 IN.	ORFS SWIVEL -8

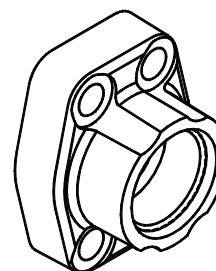


SPLIT FLANGE ADAPTER

PART NO.	DESCRIPTION
25539	SPLIT FLANGE ADAPTER

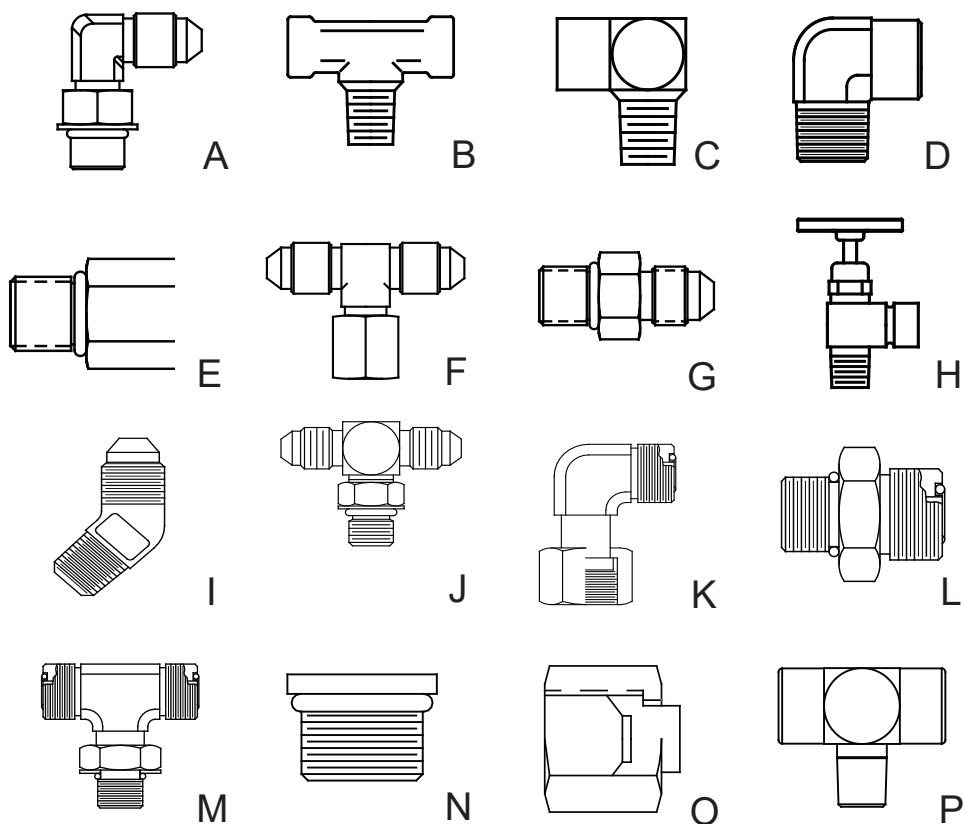


EARLY - Use socket head capscrews 13544.



CURRENT - Use socket head capscrews 13827.

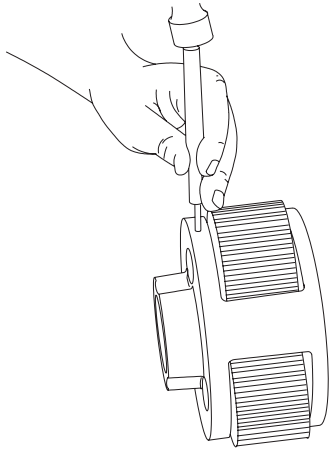
FITTINGS



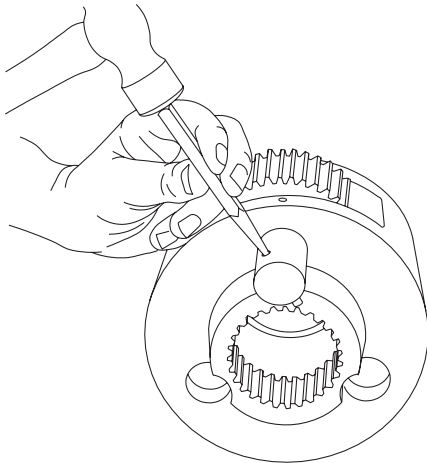
PART NO.	DESCRIPTION	ID
25302	ELBOW -4 JIC TO -4 ORB	A
25131	ELBOW -4 JIC TO -6 ORB	A
22934	TEE, 1/8-27 NPT-F RUN TO 1/8-27 NPT-M BRANCH	B
24236	STREET ELBOW, REDUCER, 1/4-18 M TO 1/8-27F	C
13708	STREET ELBOW, 1/8-27	D
24784	ADAPTER, -4 ORB TO -2 NPT-F	E
25748	SWIVEL TEE, -4 JIC M RUN X -4 JIC F SWIVEL BRANCH	F
25864	ADAPTER, -4 JIC TO -4 ORB	G
31284	ADAPTER, -4 JIC TO -6 ORB	G
25258	NEEDLE VALVE	H
21165	ELBOW (45°) -2 NPT TO -4 JIC	I
21163	ELBOW (90°) -2 NPT TO -4 JIC	I
29078	TEE, -4 ORB TO -4 JIC	J
100945	ELBOW, ORFS SWIVEL	K
100946	ADAPTER, -4 ORB TO -6 ORFS	L
102632	TEE, -4 ORFS TO -6 ORB	M
69325	PLUG, -4 ORB	N
70182	CAP, -4 JIC	O
22934	TEE, FEMALE PIPE TO MALE PIPE -2	P
23508	REDUCER PIPE -4 TO -2	-
26140	ELBOW JIC SWIVEL -4/4	-

PLANET CARRIER SERVICE

OUTPUT PLANET CARRIER DISASSEMBLY

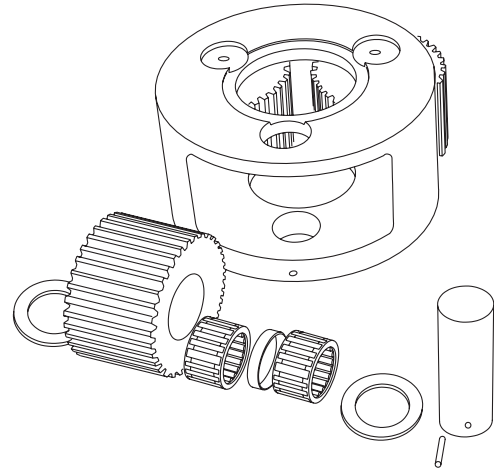


1. Remove the planet gears by driving the roll pins into the center of the planet shafts.



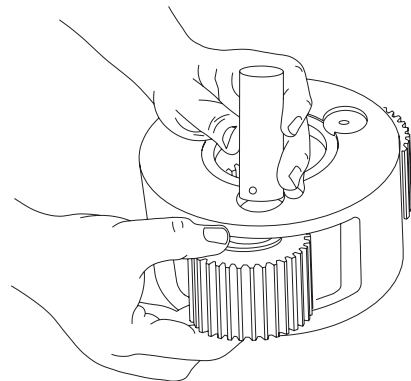
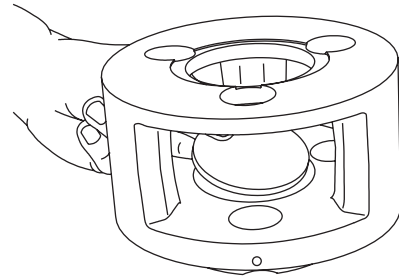
2. Remove the planet shafts, bearings, spacer, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, replace the bearing. Likewise, the cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage which 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 causing abrasions or friction. Inspect gears and shafts for abnormal wear or pitting.

3. Use a punch to drive the roll pins from the planet shafts. Do not reuse the roll pins.



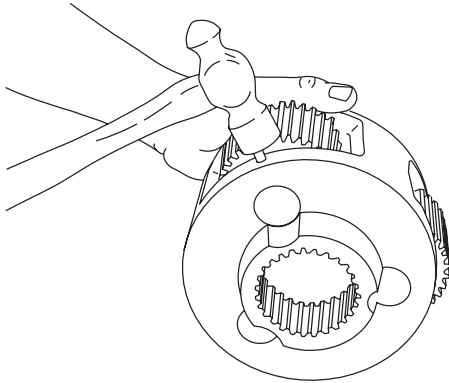
ASSEMBLY

1. Place the output planet carrier on workbench with splined coupling side down. Install output thrust plate in center of carrier.

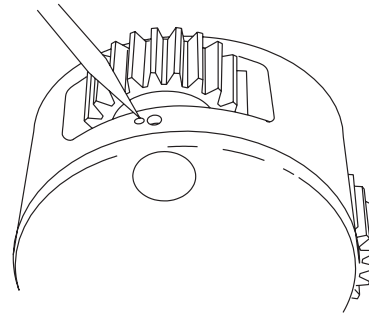


2. Insert two (2) bearings and a bearing spacer into a gear with the spacer between the bearings. Place a thrust washer on each side of the gear and position in a carrier opening. Slide the shaft through the carrier, thrust washer, bearing-gear sub-assembly and remaining thrust washer. Be careful to avoid damaging thrust washers when installing planet shafts.

PLANET CARRIER SERVICE



3. Carefully align the pin hole in the carrier with the hole in the planet gear shaft and drive the roll pin into place. Always use NEW roll pins.



4. The roll pin is recessed approximately 1/16 in. (.06 mm) in the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole so the pin will not back out. Repeat these steps for each of the three planet gears.

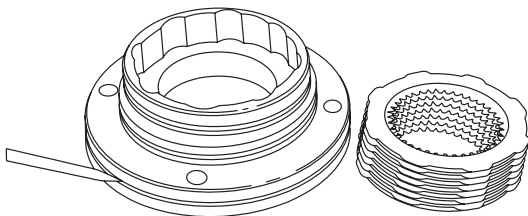
PRIMARY PLANET CARRIER

1. To service the primary planet carrier, the steps are the same as for the output carrier except there is only one bearing for each gear and no bearing spacer.

MOTOR SUPPORT — BRAKE CYLINDER SERVICE

NOTE: Starting mid-year 1996, BRADEN changed the steel brake separator discs from a splined tooth design to a lobed design. This required a change to the motor support and brake cylinder and the addition of a spring spacer. A hoist with the lobed discs can be identified by a machined groove on the outside diameter of the motor support. When replacing steel brake discs, the motor support or brake cylinder, care must be taken to properly identify the correct parts. Splined discs will remain available as spare parts.

New lobed steel brake separator plates and motor support.

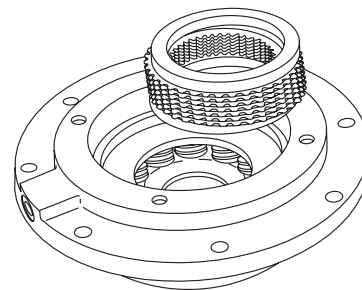


Note groove on outside diameter of motor support.

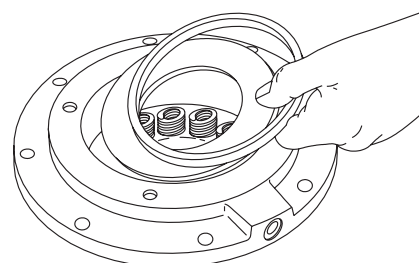
Although most photos in this section show splined discs, all procedures are the same except where specifically noted.

DISASSEMBLY

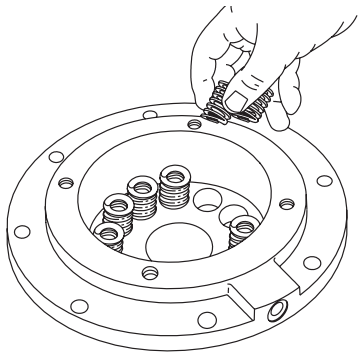
1. After removing the motor support and brake clutch assembly, continue brake cylinder disassembly by removing the spacers, friction brake discs and steel brake discs.



2. Remove the piston backup ring and pressure plate.
3. Remove the brake springs.

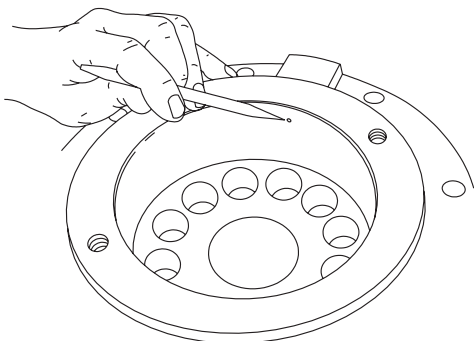


MOTOR SUPPORT — BRAKE CYLINDER SERVICE

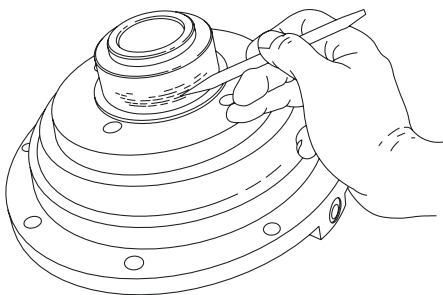


CLEAN AND INSPECT

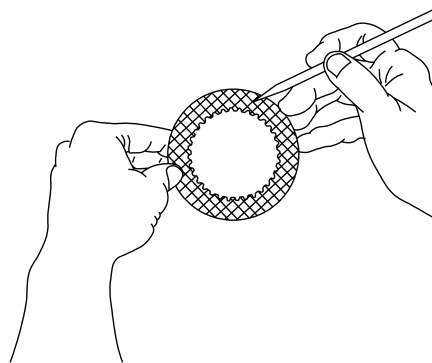
1. Thoroughly clean and inspect all parts at this time. Check brake piston sealing surfaces on brake cylinder and motor support. Be sure brake release port is free of contamination.



2. Check oil seal and bearing surfaces on brake cylinder for damage or wear.

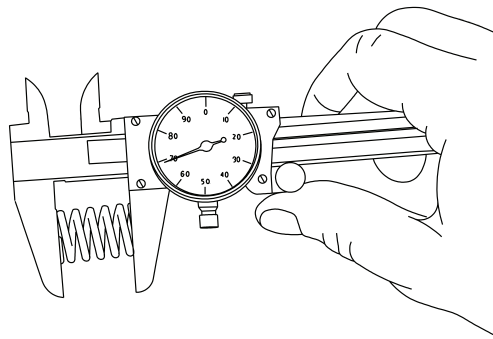


3. Place friction brake disc on flat surface and check for distortion with a straight edge. Friction material should appear even across entire surface with groove pattern visible. Replace friction disc if splines are worn to a point, disc is distorted, friction material is worn unevenly, or groove pattern is worn away.

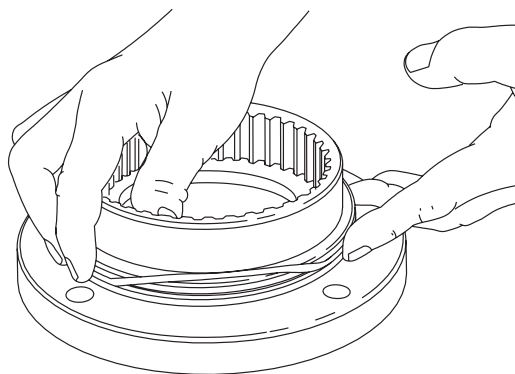


4. Place steel brake disc on flat surface and check for distortion with a straight edge. Check surface for signs of material transfer or heat. Replace steel disc if splines are worn to a point, disc is distorted or heat discolored.
5. Check brake spring free length; minimum free length is 1 3/16 in. (30.2 mm). Check springs for any sign of cracking or failure. If a brake spring must be replaced for any reason, then ALL brake springs must be replaced.

ASSEMBLY



1. Begin assembly by placing motor support on workbench with motor mounting surface down. Install new O-ring and backup ring as shown.



2. Install a brake spacer into the motor support. (NOT REQUIRED WITH LOBED DISCS.)



CAUTION

Failure to replace brake springs as a set may result in uneven brake application pressure and repeated brake spring failure.

MOTOR SUPPORT — BRAKE CYLINDER SERVICE

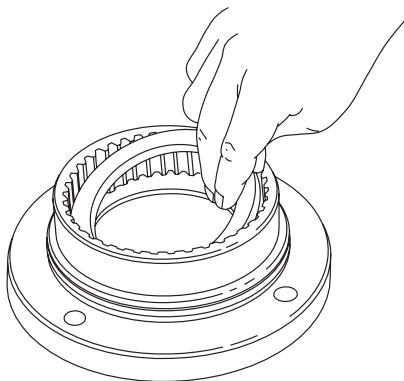
3. Insert first, a steel brake disc against the spacer followed by a friction brake disc then alternate steel and friction discs until seven (7) friction and eight (8) steel discs have been installed. Finish with a steel brake disc on top.

NOTE: Lubricate the discs in gear oil prior to assembly.

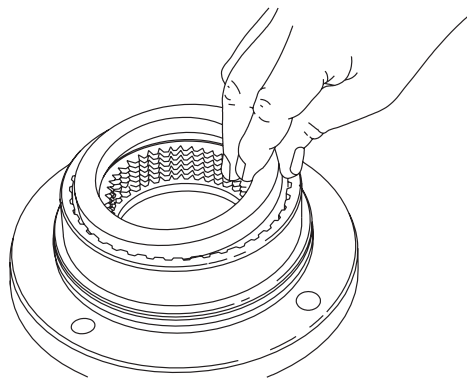
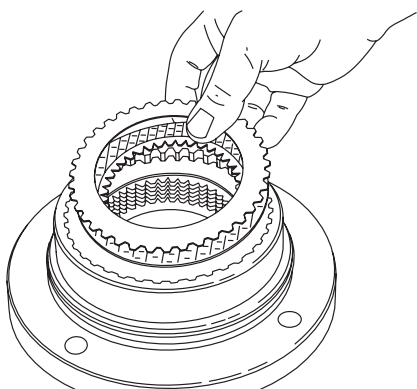
⚠ WARNING ⚠

DO NOT clean brake friction disks in solvent. Solvent may cause damage to friction material which may result in brake failure and loss of load control.

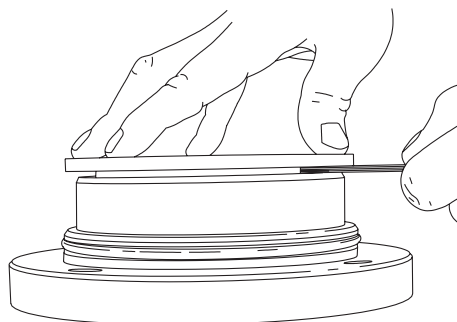
4. Install the remaining brake spacer on top of the last steel brake disc. (This is the only spacer used with lobed discs.)



5. To check brake stack height, place pressure plate on top of brake spacer. Hold pressure plate down firmly by hand and measure clearance in three places between motor support and pressure plate. Average gap must measure between .153 in. (4 mm) maximum and .080 in. (2 mm) minimum. If the gap exceeds the maximum limit, there are too many brake discs in stack-up or the discs are distorted. If the gap is less than the minimum, there are too few discs in stack-up or the discs are worn out. When stack height is correct, remove pressure plate and continue assembly.



6. Lubricate the brake piston seal and motor support sealing surface with petroleum jelly or hydraulic oil. Install new piston seal to motor support, seal lip down. Note the height of the brake piston seal was changed in 2014 from 0.562 in. (0.562mm) to 0.25 inch (6.4mm).

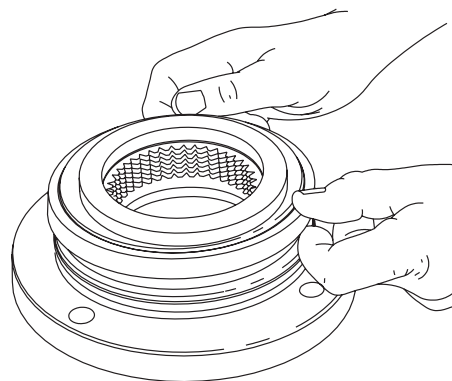


OLDER STYLE BRAKE CYLINDER

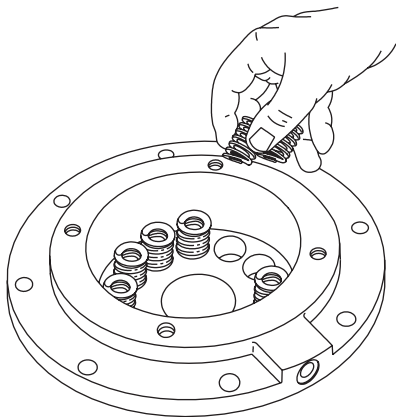
7. Install brake springs into brake cylinder

NEW STYLE BRAKE CYLINDER

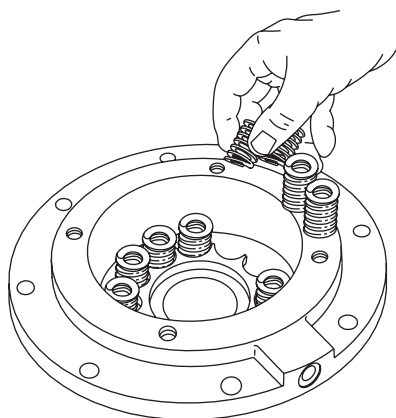
- 7A. When using the new style brake cylinder without milled spring pockets, install the spring spacer, then the brake springs.



MOTOR SUPPORT — BRAKE CYLINDER SERVICE



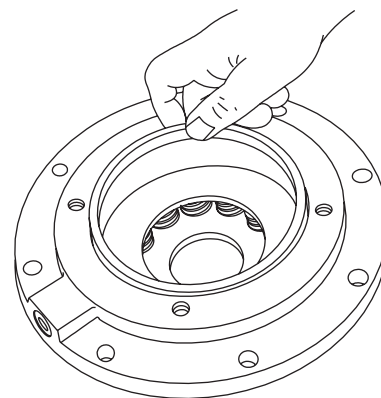
8. Install pressure plate into brake cylinder followed by the piston backup ring. The close-fitting piston backup ring may be depressed slightly to one side to lodge the backup ring in the brake cylinder bore and temporarily hold the pressure plate and springs in place while you lower the brake cylinder over the motor support.



9. Apply petroleum jelly to the entire sealing surface of the brake cylinder and to the piston seal. Install the brake cylinder over the motor support being careful to avoid damaging the piston seal or motor support O-ring. (A press may be necessary to avoid cocking the brake cylinder during installation.)
10. Install motor support capscrews and evenly tighten to recommended torque.

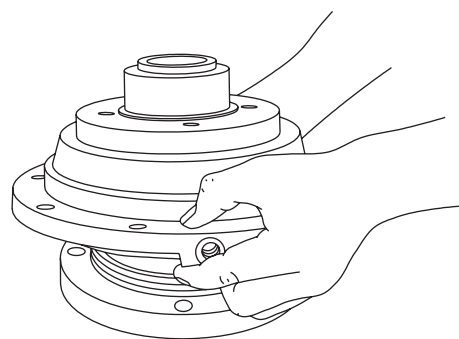
⚠ WARNING ⚠

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

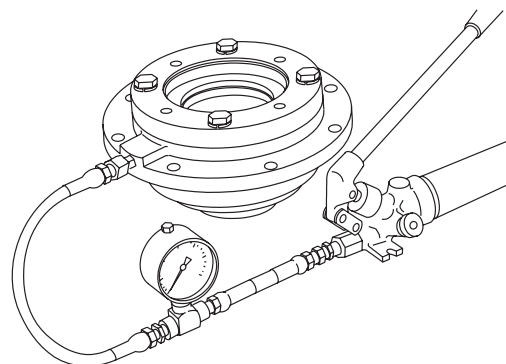


BRAKE CYLINDER PRESSURE TEST

1. Install the -4 JIC fitting into the brake release port. Connect a hand pump with accurate 0-2000 PSI (0-13,800 kPa) gauge and shut-off valve to this fitting. Apply 1000 PSI (68.9 bar) to the brake. Close shut-off valve and let stand for five (5) minutes. If there is any loss of pressure in five (5) minutes, the brake cylinder should be disassembled for inspection of the sealing surfaces and brake piston.

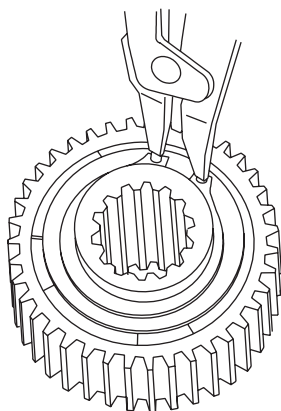


2. WHILE PRESSURE IS APPLIED AND THE BRAKE RELEASED, install the brake clutch assembly in the brake pack, short end of the inner race toward motor. Turn the clutch back and forth as you align the outer race splines with the brake disc splines.
3. Release the pressure on the brake cylinder then remove the brake clutch assembly. The brake cylinder assembly is now complete and ready to be installed in the hoist.

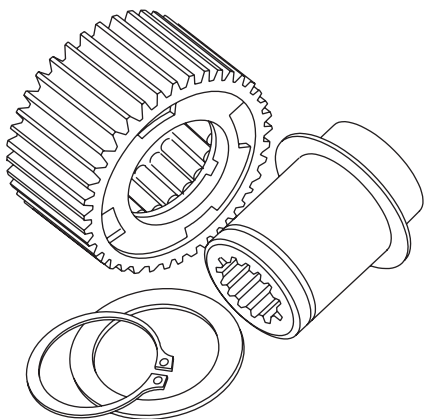


BRAKE CLUTCH SERVICE

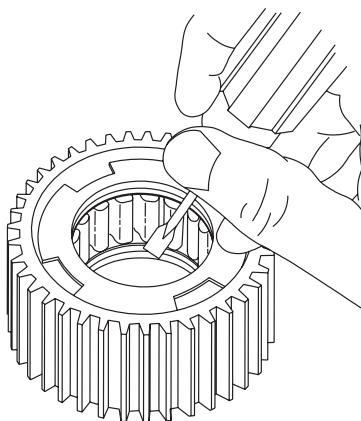
DISASSEMBLY



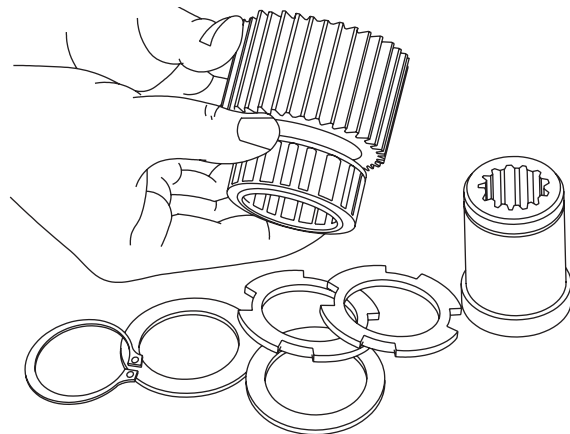
1. Remove the snap ring and sprag bushing retainer from one end only.



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



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

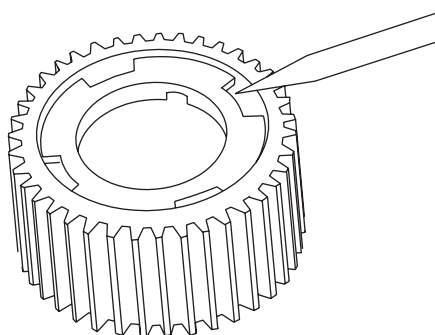


4. Next, slide the sprag clutch out, inspect the sprag clutch closely for abnormal wear, cracks, pitting or corrosion. Check small clips for breakage or bright spots; the signs of excessive wear. Unless the outer race or remaining sprag bushing is damaged or shows excessive wear, there is no need for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

ASSEMBLY

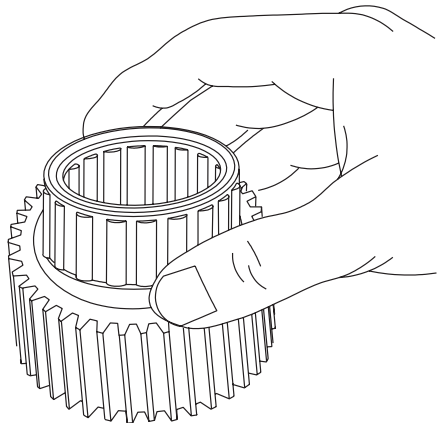
⚠ WARNING ⚠

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

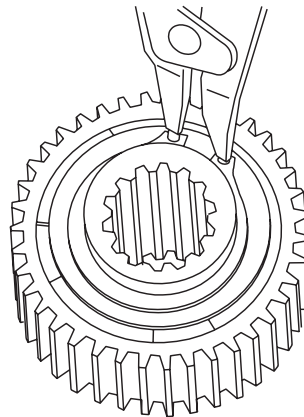


1. Press a sprag bushing into the outer race, using a mechanical or hydraulic press. A flat plate of approximately the same diameter as the bushing flange outside diameter should be placed between the press and bushing during assembly to protect the bushing. Be certain the bushing flange is against the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

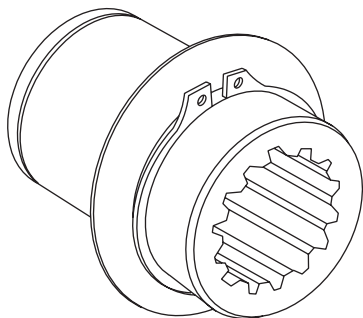
BRAKE CLUTCH SERVICE



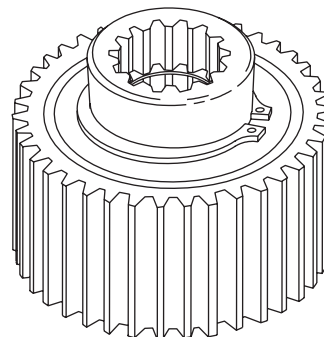
2. Turn the assembly over and install the sprag clutch in the bore of the outer race.
3. Press the remaining bushing into the race. Again, make sure the bushing is against the shoulder.



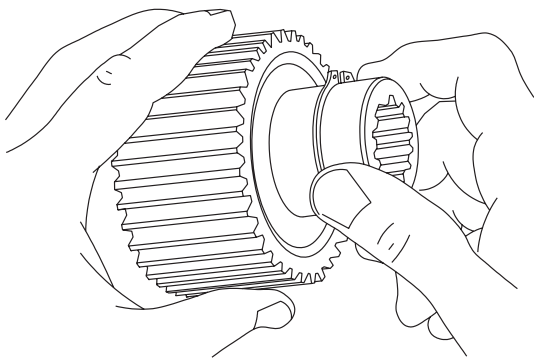
6. Turn the assembly over with the snap ring down. Install the second retainer and snap ring. Make certain the snap ring is seated in the groove properly.



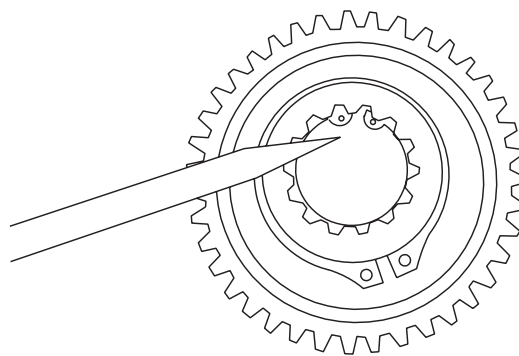
4. Next, install a sprag bushing retainer, then a snap ring on the inner race. Be sure the snap ring is seated in the snap ring groove.



7. This is a completed brake clutch assembly.



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



⚠ WARNING ⚠

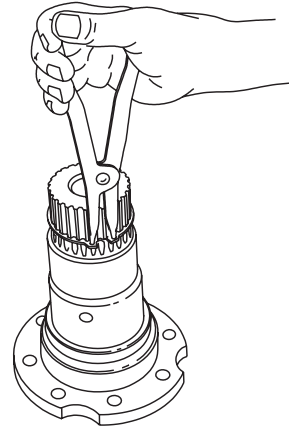
Be certain the snap ring is seated in the groove in the splined bore of the inner race. This snap ring will keep the brake clutch assembly correctly positioned in the center of the friction brake pack. Binding of the brake or brake failure may occur if this snap ring is omitted.

HOIST ASSEMBLY

NOTE: PD15B HOISTS ONLY

The drum closure will not fit through the opening in the base. For hoists with a three piece base, first assemble the bearing support side plate (91) to the base plate (90). Go to step 1 and follow the assembly procedure. Install the motor end side plate and tie bar(s) after installing the drum closure in step 10.

For hoists with a one piece cast base, use the following assembly procedure. With the drum horizontal, install the output planet carrier assembly, output sun gear (34), thrust washer (43), primary planet carrier assembly, thrust washer (31) and drum closure. (Apply a light coat of grease to the thrust washer to hold them in position.) Position the drum in the base and install the bearing support. (Refer to step 3 for two caution statements.) It may be necessary to rotate the bearing support or planet gears to engage the bearing support with the output planet carrier. Install and hand tighten the bearing support capscrews. Stand hoist on bearing support end and visually check to verify the primary thrust plate is properly positioned. (Refer to caution and drawings in step 16.) Install the primary sun gear and proceed to step 11 to complete hoist assembly. Tighten bearing support capscrews to recommended torque after motor is installed.

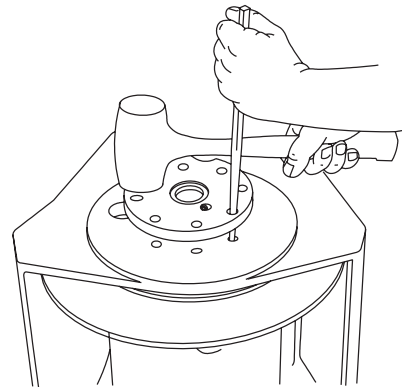


⚠ CAUTION ⚠

Make certain the snap ring is installed on the bearing support. This snap ring will keep the output planet carrier correctly positioned in the hoist. Gear train damage may occur if this snap ring is omitted.

⚠ CAUTION ⚠

Hoists with a three piece fabricated base use special shoulder capscrews to fasten side plates to the base plate. DO NOT use standard capscrews in their place.



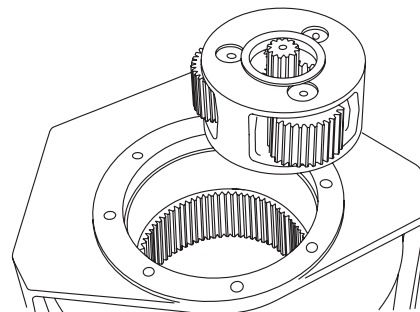
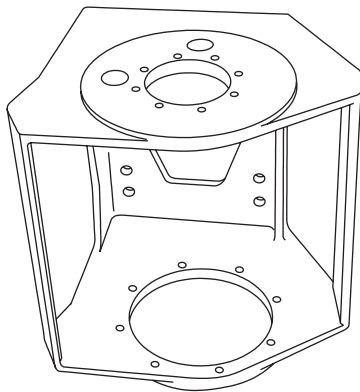
3. Center the drum in the opening of the base. Lubricate the bearing support with petroleum jelly or gear oil and install in base and drum.

⚠ CAUTION ⚠

Be sure the vent plug is located above the horizontal centerline for the intended application. Oil leakage may occur if vent is positioned incorrectly.

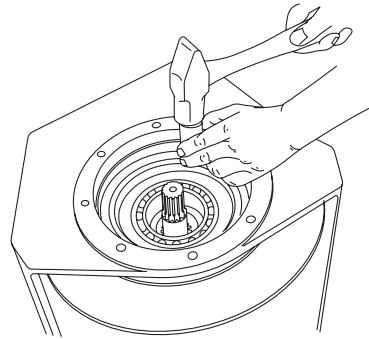
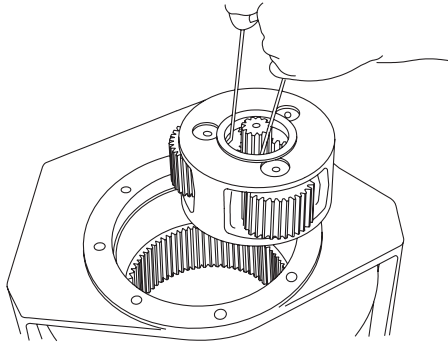
4. Tighten the bearing support capscrews to the recommended torque.

1. Place hoist base on side with bearing support end up.
2. Install a new bearing in the drum if replacement is necessary. Apply a nonhardening sealant on the outside diameter of the new seal. Install the spring side of the seal next to the bearing, then press into the drum, using a flat plate to avoid distortion. Be sure drain plug is installed securely.



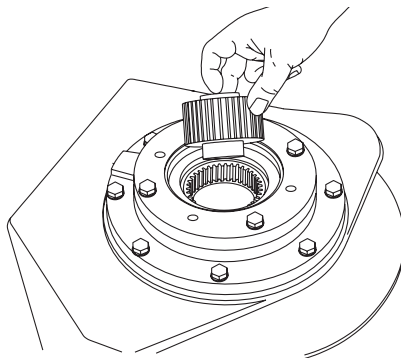
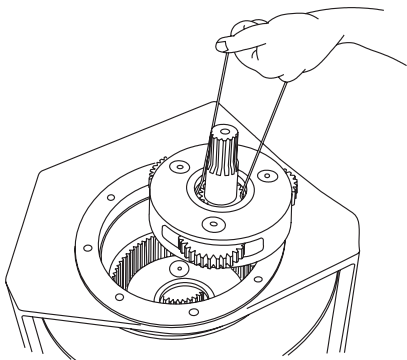
HOIST ASSEMBLY

- Stand hoist on bearing support end. Install the output sun gear and thrust washer into output planet carrier.
- Install the output planet carrier into the drum while meshing the planet gears with the ring gear and the planet housing with the bearing support.



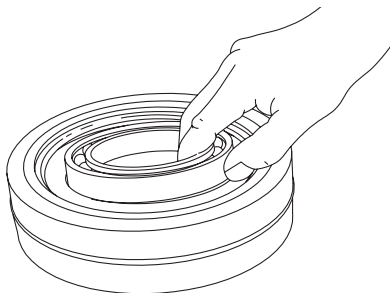
- Lubricate the pilot, oil seal and bearing surfaces of the brake cylinder and carefully install brake cylinder into base and drum. Locate the brake release port toward the lower rear corner of the base. Tighten brake cylinder capscrews to recommended torque.

- Install the primary sun gear and thrust washer into the primary planet carrier.



- Install the primary planet carrier, meshing the planet gears with the ring gear and the planet housing with the output sun gear.

- Install the brake clutch assembly with the short end of the inner race toward motor. When the brake clutch is properly engaged in all friction discs, the snap ring in the inner race of the brake clutch will be resting on the top of the primary sun gear shaft.



- Install a new bearing in the drum closure as required. Use sealant on the outside surface of the oil seal. Install with spring side of the seal toward bearing, using a flat plate to avoid distortion.

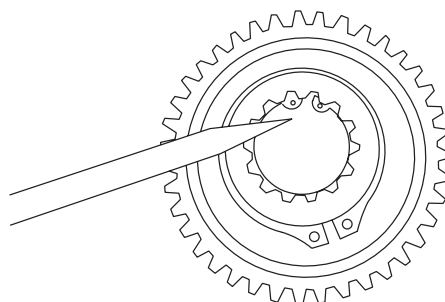
Install a new O-ring in the groove on the outer diameter of the drum closure.

- Lubricate the O-ring and drum opening with petroleum jelly or gear oil and install the drum closure into the drum.

When installed correctly, the inner race should turn freely in the opposite direction the drum turns to pull wire rope in. An easy way to check the rotation is to hold the outer race in one hand, and rotate the inner race.

If the clutch free wheels in the wrong direction, disassemble the clutch and reverse the inner race. Refer to "Brake Clutch Service" for additional information.

If the hoist is used in an offshore application, replace the sprag-style brake clutch (sprag)



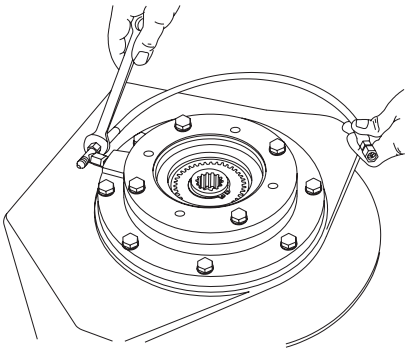
HOIST ASSEMBLY

13. If the brake discs are misaligned, preventing the installation of the clutch, then with a hand pump, apply 750-1000 PSI (51.7-68.9 bar) to the brake release port. The brake discs will move freely with the brake released, permitting alignment of the discs, brake clutch and input sun gear.

⚠ WARNING ⚠

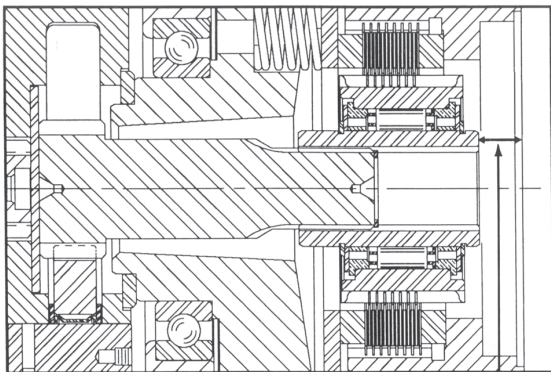
Be certain the snap ring is seated in the groove in the splined bore of the inner race. This snap ring will keep the brake clutch assembly correctly positioned in the center of the friction brake pack. Binding of the brake or brake failure may occur if this snap ring is omitted.

14. Install the hoses and fittings to the brake cylinder release port.
15. Install a new O-ring on the motor pilot then lubricate with petroleum jelly or gear oil.



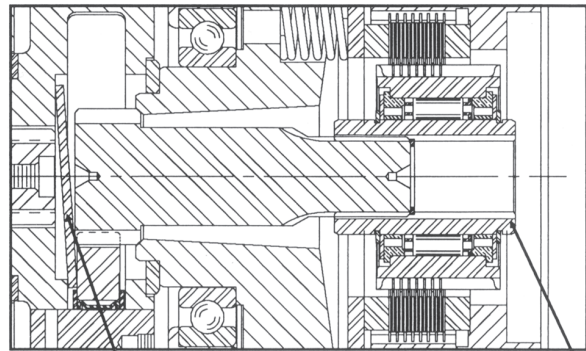
⚠ CAUTION ⚠

Care must be taken to assure the primary thrust plate remains properly located in its counterbore when the motor is installed for the first time, or is being reinstalled on the hoist. It is possible for the primary thrust plate to drop out of its counterbore and become wedged between the planet gears and the planet carrier. If the hoist is operated with the primary thrust plate wedged between primary gears and the planet carrier, or with a thrust washer out of position, severe damage to internal hoist components could result.



MEASURE THIS DISTANCE

Measure the distance from the motor mounting surface to the inner brake race. With all components properly installed, this distance should be 11/16 in. (17.5 mm) to 3/4 in. (19.1 mm). If this distance is less than 9/16 in. (14.3 mm), the primary spacer may be positioned as shown below and should be checked.

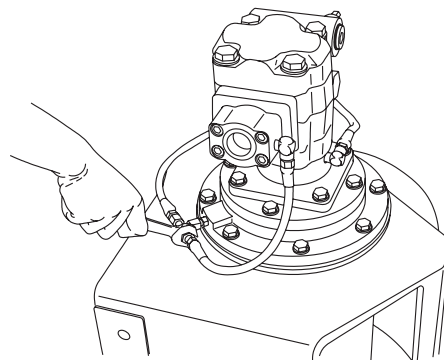


PRIMARY THRUST PLATE

BRAKE CLUTCH
INNER BRAKE RACE

The Primary Thrust Plate is shown wedged between the planet gears and the planet carrier. The Primary Sun Gear and the entire Brake Clutch Assembly have moved to the right (toward the hydraulic motor).

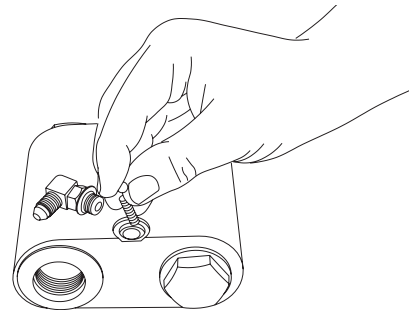
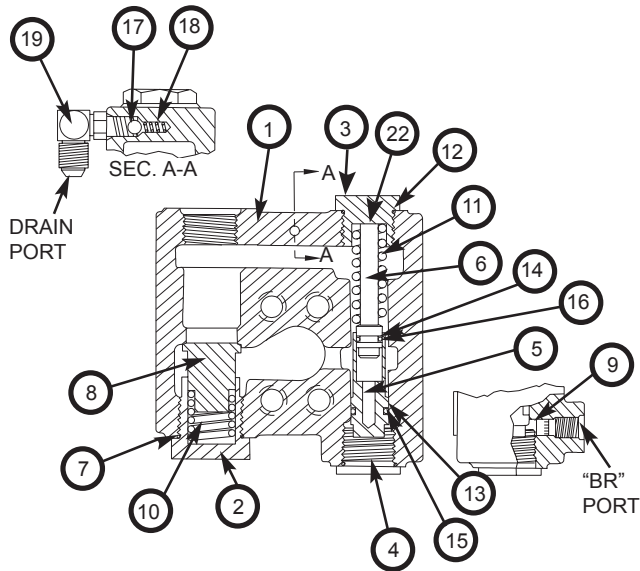
16. Engage the motor shaft with the brake clutch inner race and lower motor into place. Tighten capscrews to recommended torque.



17. Install the hoses connecting the manifold and brake valve to the brake cylinder.
18. After the hoist assembly is complete, check all capscrews and fittings to make certain they have been tightened correctly.

Refill the hoist with the recommended oil listed under "Preventive Maintenance," and install the oil level plug.

BRAKE VALVE SERVICE



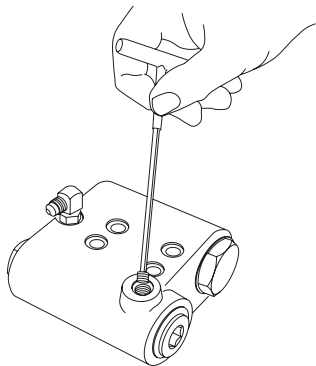
- Remove the elbow fitting, motor drain check ball and spring.

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

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

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

DISASSEMBLY

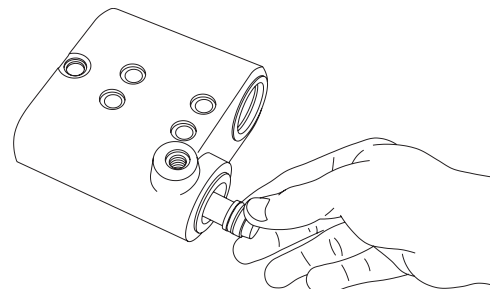


- Remove the pilot orifice from the brake release (BR) port using a 5/32 in. Allen wrench.

ITEM	DESCRIPTION	QTY
1	BRAKE VALVE HOUSING	NSS
2	VALVE SPRING RETAINER	1
3	SPRING RETAINER	1
4	PLUG	1
5	SPOOL	NSS
6	DAMPER PISTON	NSS
7	O-RING	2
8	CHECK VALVE POPPET	NSS
9	PILOT ORIFICE	1
10	CHECK VALVE SPRING	1
11	SPOOL SPRING	1
12	O-RING	1
13	O-RING	1
14	O-RING	1
15	BACK-UP RING	1
16	BACK-UP RING	1
17	STEEL BALL	1
18	COMPRESSION SPRING	1
19	ELBOW FITTING	1
22	SHIM, VALVE SPRING	AR

NSS - NOT SOLD SEPARATELY - REPLACE COMPLETE VALVE ASSEMBLY

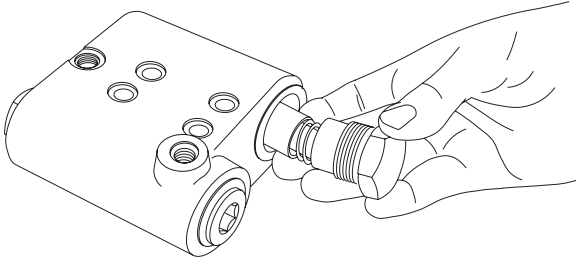
AR - AS REQUIRED



- Remove the spool spring retainer and spool spring. Check spring free length. Replace spring if less than 1 15/16 in. (49.2 mm) long.

BRAKE VALVE SERVICE

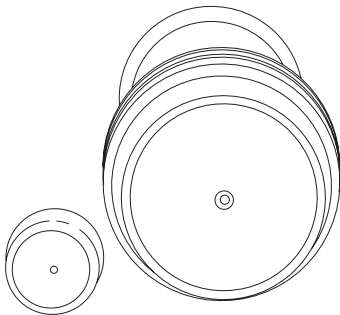
4. Remove spool plug and carefully remove spool assembly.
5. Remove the damper piston from the spool. The piston will come out slowly, because of a partial vacuum formed as it is removed. Use extreme care to avoid damaging the polished surfaces of the piston or spool.



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

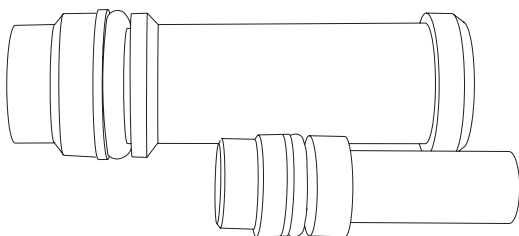
CLEAN AND INSPECT

1. Discard all O-rings and backup rings. Clean all parts in solvent and blow dry. Inspect polished surfaces of spool and damper piston for damage which may cause binding or leakage. Inspect spool bore in valve housing for damage or scoring. Inspect check valve seat in valve housing and check valve poppet. If the spools, bores or valves are damaged, the entire valve must be replaced as these parts are not serviced separately.
2. Inspect the .020 inch (.5 mm) orifice in the end of the spool and the pilot orifice to be certain they are open.

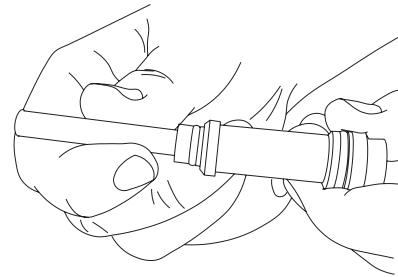


ASSEMBLY

1. Install new O-rings on the plug and spring retainers.

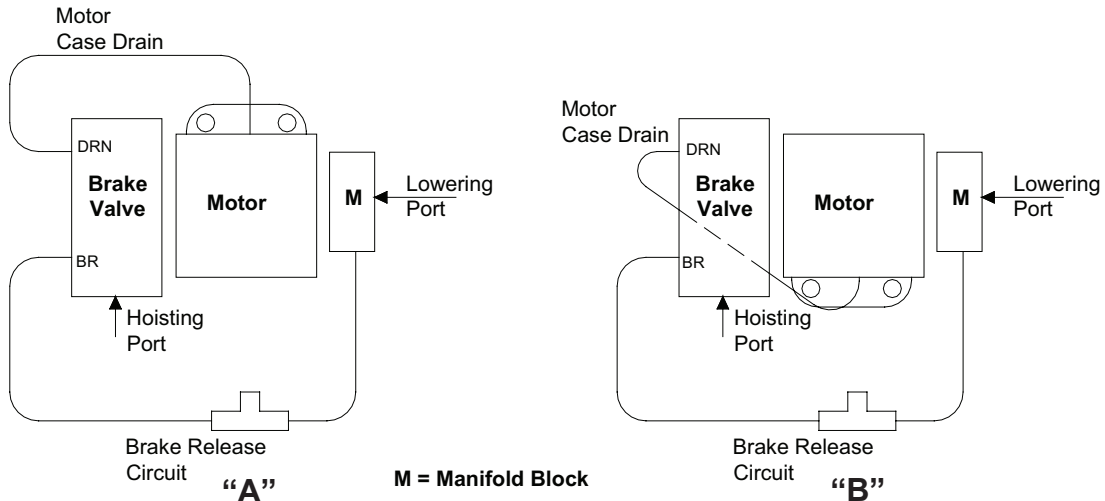


2. Install new O-rings and backup rings on the spool and damper piston as shown. Ensure each backup ring is on the correct side of its O-ring. Take care not to cut the O-rings during assembly. Let the spool and damper piston set for ten minutes before installing them in their respective bores. This will allow the O-rings to return to their original size after being stretched.
3. Lubricate the spool and damper piston O-rings with hydraulic oil. Carefully install the damper piston into the spool.
4. Lubricate the spool bore and spool O-rings with hydraulic oil. Carefully install the spool into the valve housing. Always install the spool from the plug end as shown to minimize the possibility of damaging the O-ring. Install the plug, spool spring and spring retainer.



5. Install the check valve poppet, spring and check valve spring retainer.
6. Install the motor drain check ball, spring and elbow fitting.
7. Install the pilot orifice into the valve housing.
8. The brake valve is complete and ready to be installed on hoist motor.

REVERSING DIRECTION OF DRUM ROTATION



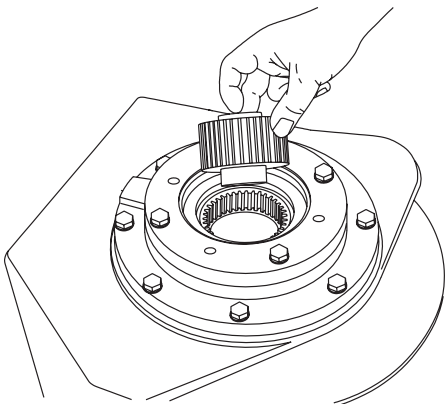
In order to change the direction of rotation and brake operation, 2 components must be changed on the hoist. First, the motor must be made to rotate in the opposite direction. This is done by exchanging positions of the brake valve and manifold block on the motor. Secondly, the brake clutch assembly must be made effective for the opposite direction of rotation. This is done by reversing the inner race of the brake clutch assembly.

Figures "A" and "B" above show typical PD12C motor installations. The only difference between the two drawings is the motor is rotated 180° (the "belly" of the motor moves to the opposite side). If the motor shaft rotates clockwise in figure "A" when the hoisting port is pressurized, it will rotate counterclockwise in figure "B."

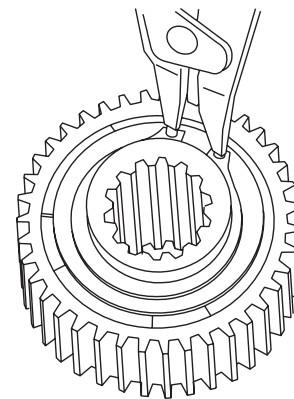
1. Remove the four capscrews securing the brake valve to the motor. Remove the four capscrews securing the manifold block to the motor. Disconnect the motor case drain hose at the motor.

NOTE: Some installations have the brake release hose connected directly to the motor, instead of to the manifold block. In this case, disconnect the brake release hose at the motor port. Stand hoist up on drum support with the motor end up and secure in this position.

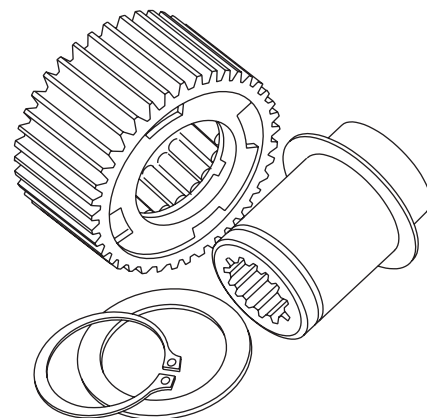
2. Before removing the motor, it is a good idea to note or mark the position of the motor in relation to the hoist, since it will be rotated 180° when reinstalled. Remove the capscrews securing the motor to the hoist and carefully remove the motor.



3. Remove the brake clutch assembly from the motor support.

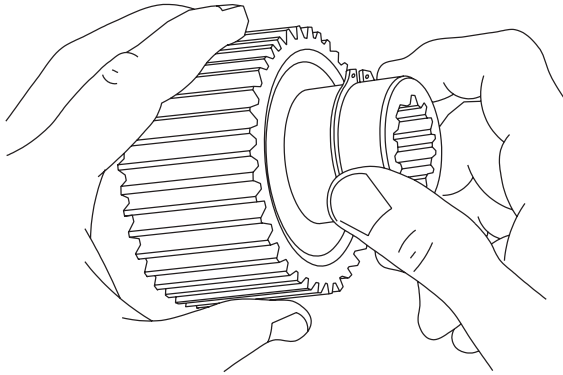


4. Remove the snap ring and sprag bushing retainer from one end only of the brake clutch assembly.

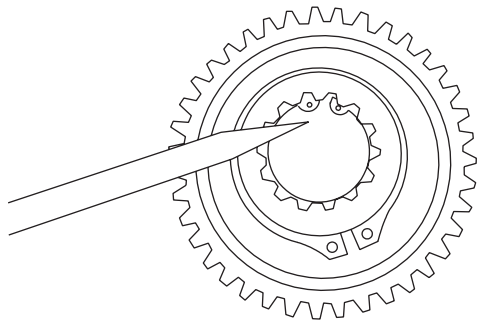


REVERSING DIRECTION OF DRUM ROTATION

5. Pull the inner race out. Examine the race for scoring, wear or indentations caused by the sprag cams. If the inner race is not completely smooth, the assembly should be replaced.



6. Turn the sprag assembly around and slide the inner race (with 1 snap ring and bushing retainer) through the bushings and sprag clutch (the race will have to be rotated in the free-wheeling direction to start it through the sprag clutch). Install the remaining bushing retainer and snap ring. Make certain the snap ring is properly seated in the groove.



⚠ 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.

7. Before installing the brake clutch, be sure the inner race turns free in the opposite direction the drum will turn to haul-in wire rope. An easy way to check the rotation is to hold the outer race in one hand and rotate the inner race. Install the brake clutch with the short end of the inner race toward the motor.
8. Install a new O-ring on the motor pilot. Rotate the motor 180° from its original position and install it onto the hoist. Install and tighten motor capscrews to recommended torque.

9. Install new O-rings in the brake valve and manifold block. Attach the brake valve and manifold block to the motor using the original capscrews and tighten to recommended torque.

10. Connect the motor case drain hose to the motor case drain port.

NOTE: On two speed motors, the case drain and shift drain should be connected directly to tank. DO NOT use the drain connection on the brake valve. See "TWO SPEED MOTOR CASE DRAIN PLUMBING" for additional information.

11. If your hoist had the brake release hose connected directly to the motor, the original motor port must be plugged and the hose connected to the motor pressure port near the manifold block (lowering port).
12. 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.
13. 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.

