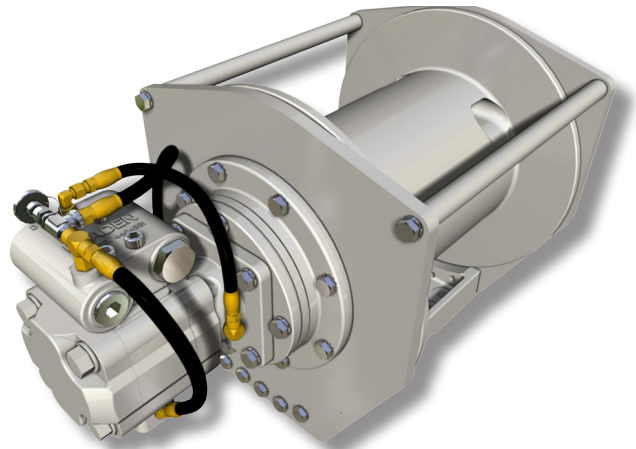


# Hydraulic Hoist Series PD12C, PD15B, PD17A

## INSTALLATION, MAINTENANCE, AND SERVICE MANUAL



**WRITE HOIST SERIAL NUMBER BELOW**

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First 2 numbers indicate  
year manufactured

For serial number location see page 3

Visit our Web site at [www.paccarwinch.com](http://www.paccarwinch.com) for the most comprehensive collection of winch, hoist, and drive information on the Internet. Most publications and specification sheets are available for downloading.

# Table of Contents

Foreword.....	3
Explanation of Model Number.....	3
General Safety Recommendations .....	4
Theory of Operation .....	5
Hoist Installation .....	7
Recommended Fastener Torque.....	9
Wire and Braided Rope Installation .....	9
Two-speed Motor Case Drain Plumbing .....	10
Preventive Maintenance .....	10
Recommended Oil Change Information.....	11
Troubleshooting.....	12
Hoist Disassembly .....	16
List of Components.....	18
Exploded-view Drawing .....	19
Planet Carrier Service.....	20
Motor Support – Brake Cylinder Service.....	22
Brake Clutch Service.....	26
Hoist Assembly .....	28
Brake Valve Service .....	32
Reversing Direction of Drum Rotation.....	34
PD17A Rotation Indication Proximity Sensor.....	36
Service Bulletin, Brake Piston Seal.....	37
Metric Conversion Table .....	39

# FOREWORD

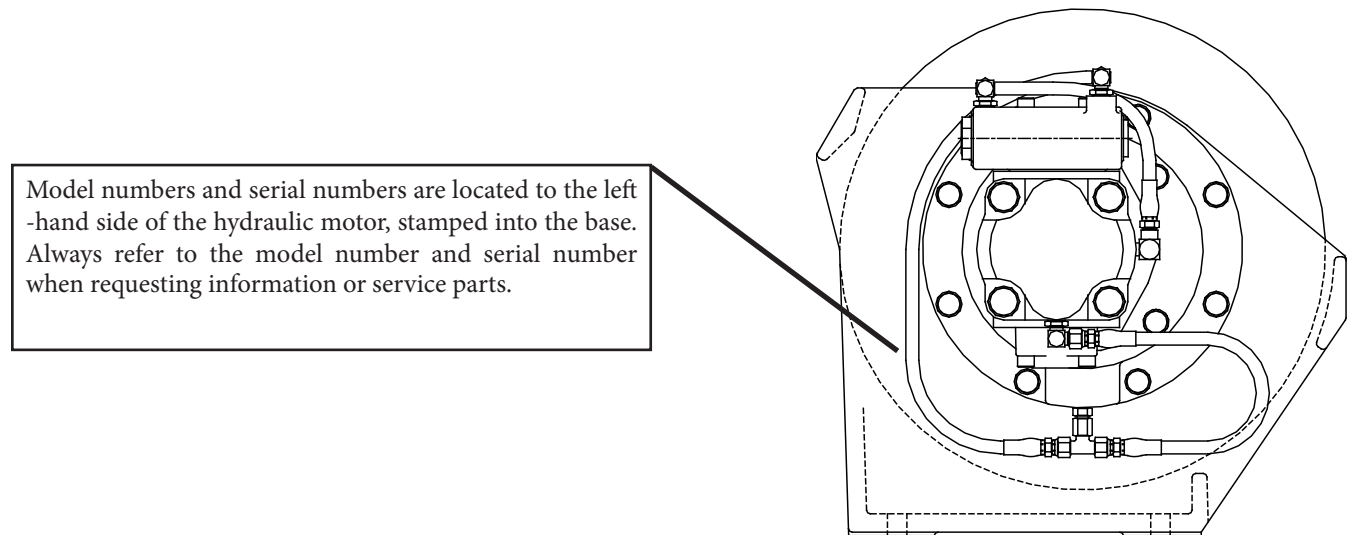
Read this entire publication and retain it for future reference.

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, PD15B and PD17A series hoist. It is suggested that 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.



## EXPLANATION OF MODEL NUMBER

<b>PD</b>	<b>12</b>	<b>C</b>	<b>29</b>	<b>064</b>	-	<b>02</b>	-	<b>U</b>	-	<b>L</b>	-	<b>1</b>
POWER DRUM	MAX RATING	DESIGN SERIES	GEAR RATIO	MOTOR SIZE		DRUM OPTION		ROTATION		BASE		OPTION

- PD** Power drum
- 12** 12,000 lb. approximate first-layer line pull
- C** Model series relating to design changes
- 29** Total gear reduction (other ratios include 21, 41, 59, 34, etc.)
- 064** Hydraulic motor displacement in cu. in./rev (Decimal point eliminated. Example 064 = 6.4 cu. in./rev)
- 02** Drum option (other drums include 01, 04, 05, 23 g, etc.)
- U** Underwound cable drum - optional
- L** Left-hand base - optional; blank designates standard right-hand base
- 1** Permits testing and inspection per API 2C for offshore cranes - optional

## GENERAL SAFETY RECOMMENDATIONS

Safety and informational callouts used in this manual include:



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



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

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

1. Be certain equipment (boom, sheave blocks, pendants, etc.) is either lowered to the ground or blocked securely before servicing, adjusting, or repairing hoist.
2. Be sure personnel are clear of work area BEFORE operating hoist.
3. Read all warning and caution 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 that 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 (kPa), 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:

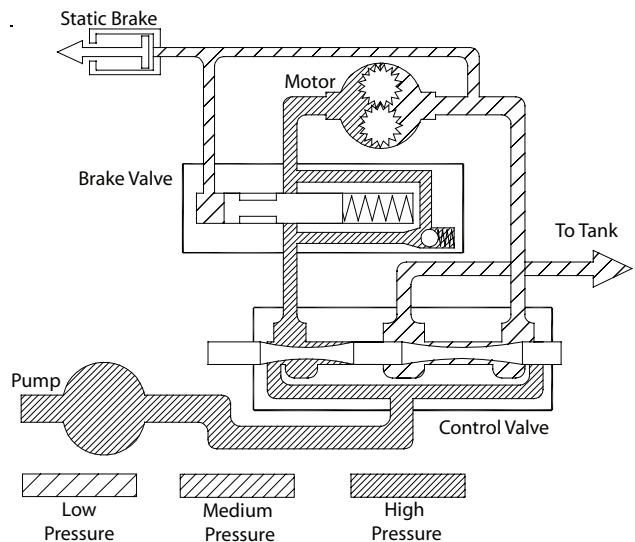
1. Brake valve assembly
2. Hydraulic motor

The brake valve is basically a counterbalance valve with good metering characteristics. 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 that 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 valve cracks open, (300-500 psi 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.

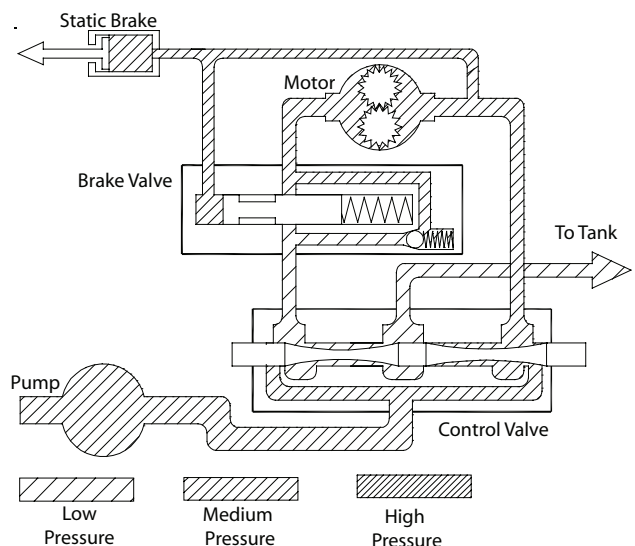
The static brake system has three operating components:

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

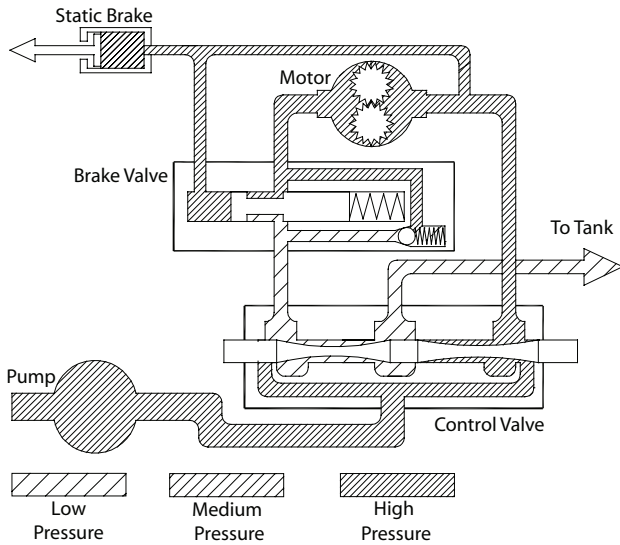
**Figure 1  
HOISTING**



**Figure 2  
LOWERING 1**



**Figure 3**  
**LOWERING 2**



The static brake is released by the brake valve pilot pressure at a pressure lower than that required to open the pilot operated spool valve. This sequence assures that dynamic braking takes place in the brake valve and that 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 that required to open the brake valve. The extent to which the brake valve opens will determine the amount of oil that can flow through it and the speed at which the load will be lowered. Increasing the flow of oil to the motor will cause

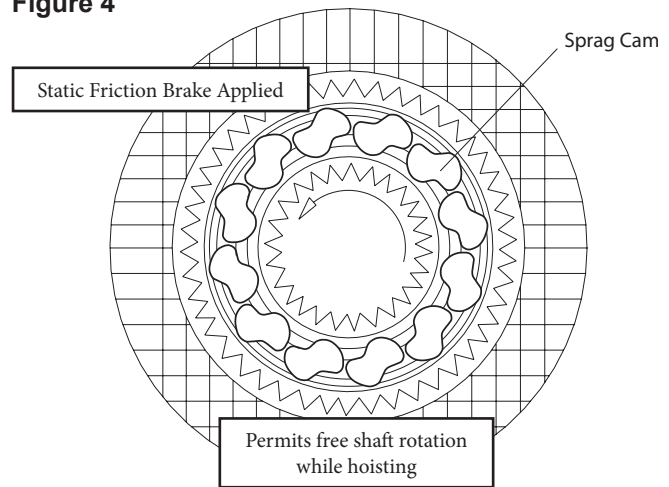
the pressure to rise and the opening in the brake valve to enlarge, speeding up the descent of the load. Decreasing this flow causes the pressure to lower and the opening in the brake valve to decrease thus slowing the descent of the load.

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.

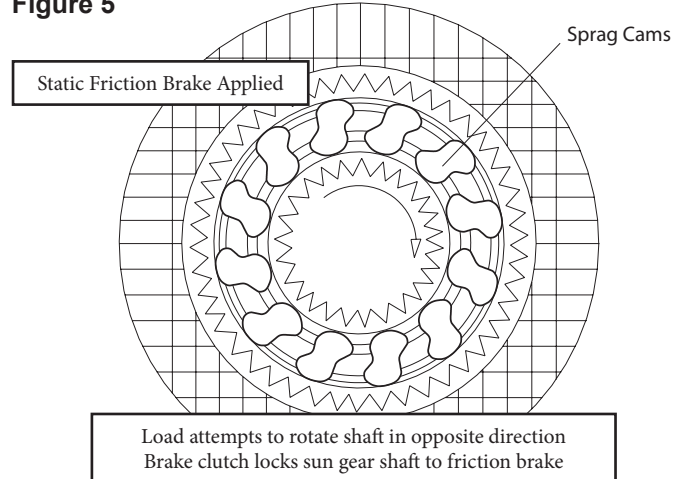
When lowering a load very slowly for precise positioning, no oil flow actually occurs through the hoist motor. The pressure will build up to a point where the brake will release sufficiently to allow the load to rotate the motor through its own internal leakage. This feature results in a very slow speed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

The friction brake receives very 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**



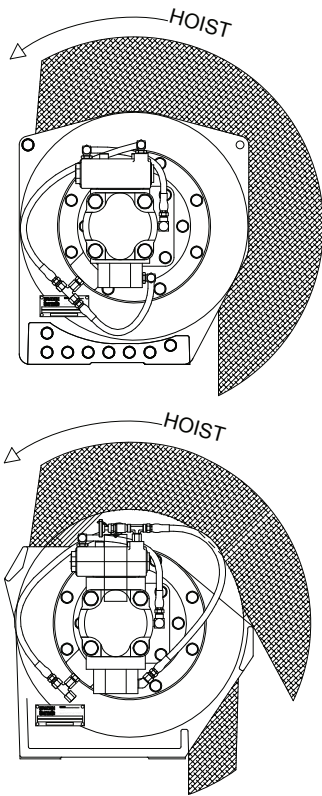
**Figure 5**





# 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.

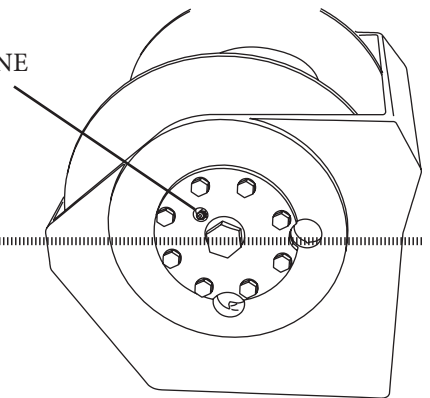


2. Because of the design of the mounting base, the direction of line pull should only be as shown in the above illustration. Line pulls in any other direction must be approved by BRADEN Engineering.
3. When mounting the hoist, use all eight (8) mounting holes and grade 8 capscrews and nuts. Tighten to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

It is important that the hoist is mounted on a surface that 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 insure the mounting surface is flat within 0.020 in. (0.5 mm). Use stainless steel shim stock as required.

VENT PLUG  
ABOVE CENTERLINE

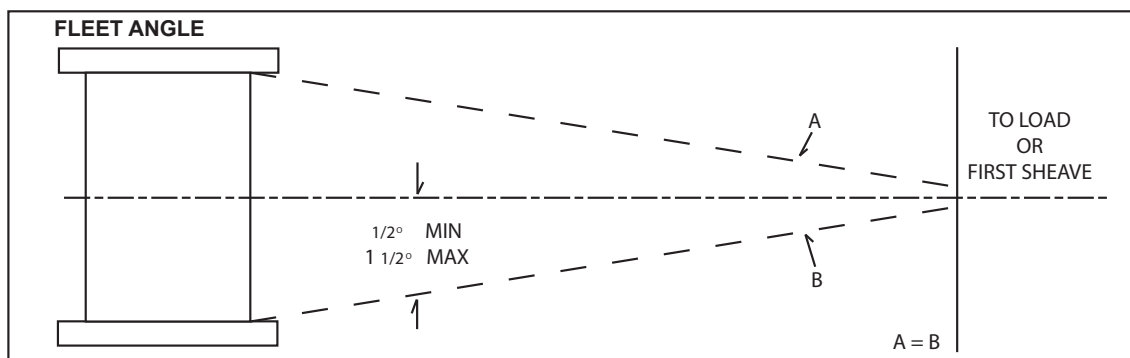
CenterLine

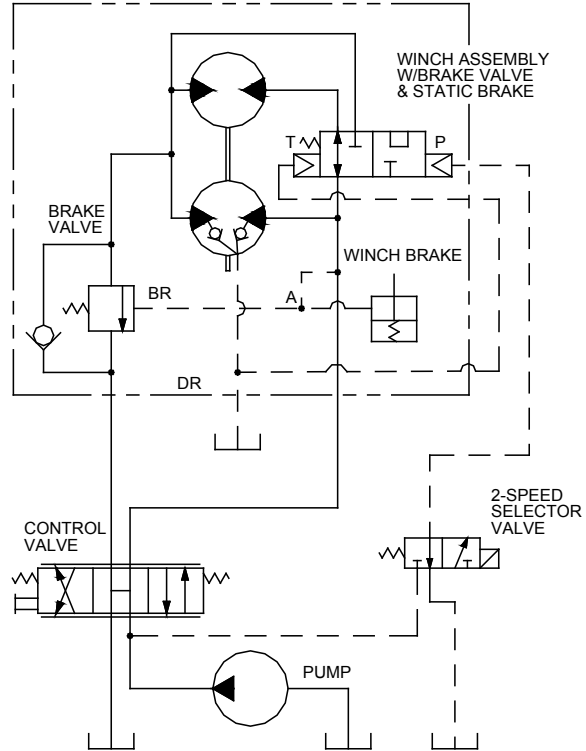
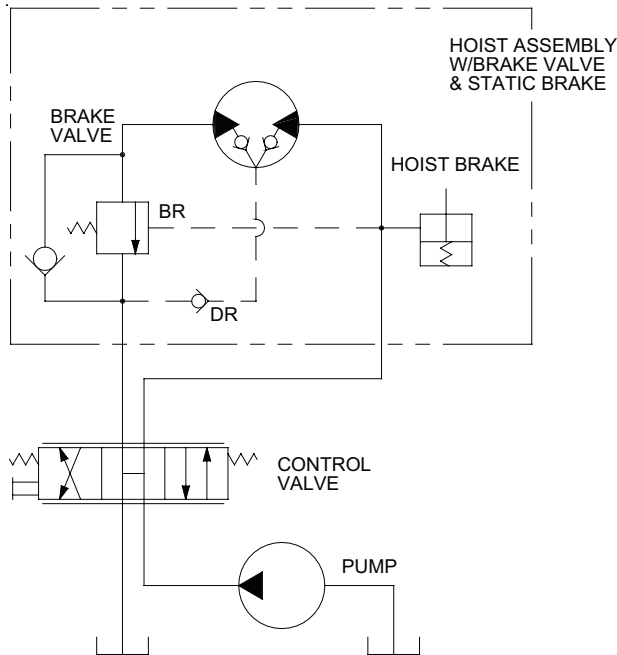


4. The vent plug must always be located above the horizontal centerline. **If the hoist is mounted on a pivoting surface, be sure vent plug remains above the centerline in all positions.** If necessary, reposition bearing support and vent plug as follows:
  - A. Remove bearing support bolts.
  - B. Rotate 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 that operate 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 be less than 100 PSI (690 kPa) at full operating flow. **Back-pressure in excess of 100 PSI (690 kPa) 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 (290 kPa); shaft seal damage will occur.

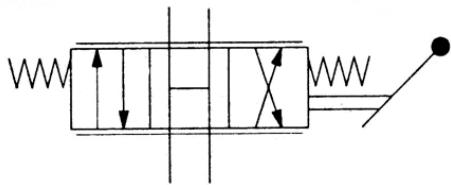
6. The hoist should be mounted perpendicular to an imaginary line from the center of the drum to the first sheave to insure even spooling. Make certain the fleet angle does not exceed 1-1/2 degrees.





## ⚠ WARNING ⚠

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



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

7. 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.

8. 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.

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

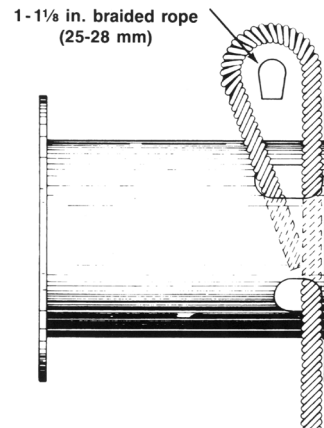
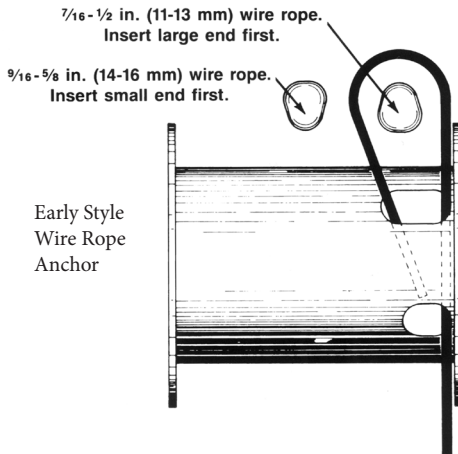
Bolt Diam. Inches	Thread per inch	Torque LB-FT (N.m)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
3/4	10	265 (359)	200 (271)	380 (515)	280 (380)
	16				
7/8	9	420 (569)	325 (441)	600 (813)	450 (610)
	14				
1	8	640 (868)	485 (658)	910 (1234)	680 (922)
	14				
1 1/8	7	790 (1071)	590 (800)	1290 (1749)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

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

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## WIRE AND BRAIDED ROPE INSTALLATION

### ANCHORING WIRE ROPE



Take the free end of the wire rope and insert it through the small opening of the anchor pocket. Loop the wire rope and push the free end about half of the way back through the pocket. Install the wedge, then pull the slack out of the wire rope. The wedge will slip into the pocket and secure the wire rope into the drum. The early style anchor wedge is designed to accommodate several different sizes of wire rope. You may anchor 7/16 and 1/2 in. (11 & 13 mm) wire rope by inserting the wedge, large end first. Anchor 9/16 and 5/8 in. (14 & 16 mm) wire rope by inserting the wedge, small end first.

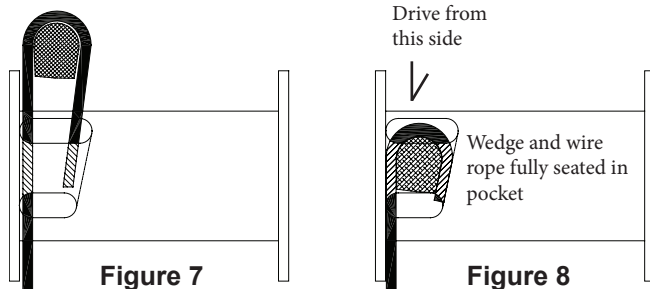
A special wedge is used to anchor 1 and 1 1/8 in. (25 & 28 mm) braided synthetic rope. The installation procedure is the same as for anchoring wire rope.

## ⚠ WARNING ⚠

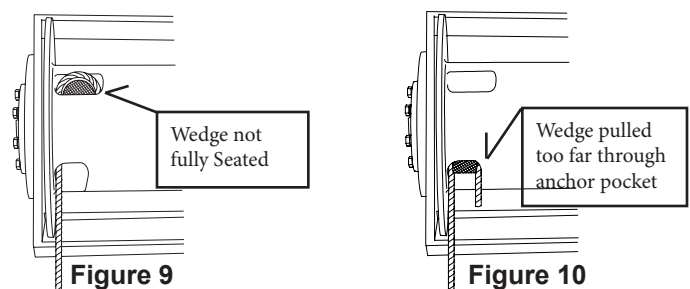
Must keep at least 5 wraps of wire rope on cable drum at all times.

### ANCHORING BRAIDED ROPE

#### CORRECT INSTALLATION



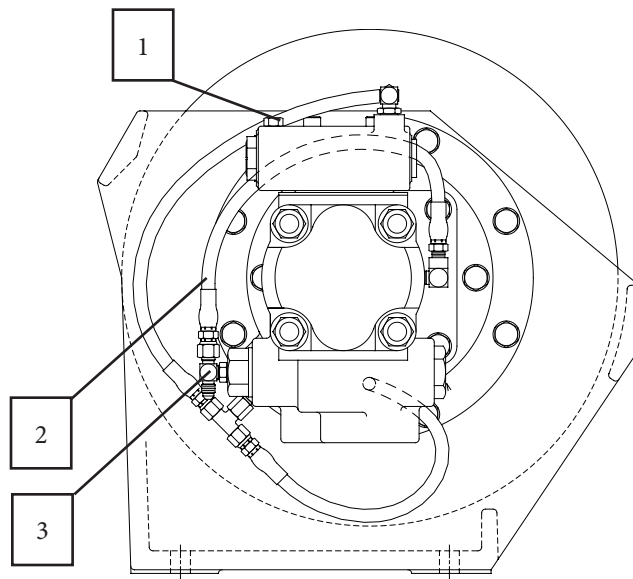
#### INCORRECT INSTALLATION



## 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 (690 kPa) 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 Svl/-4 Hose/ 1/8 NPT ml)	1	13707
3	Tee -4 (ORB Branch -4 JIC Run)	1	29078

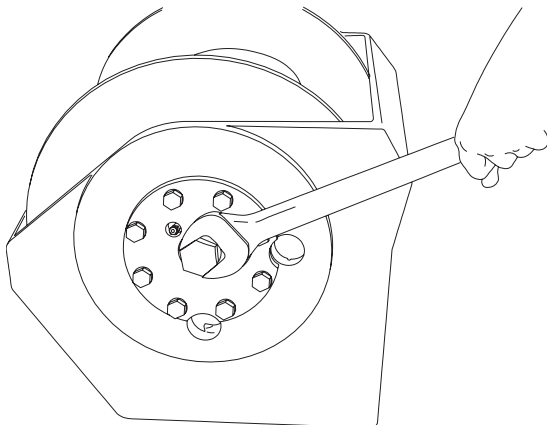
## PREVENTIVE MAINTENANCE

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.

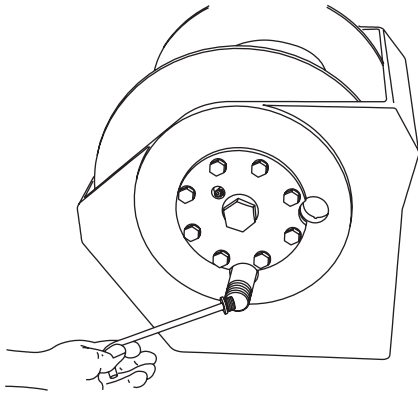
- Regular Gear Oil Changes – every 1000 hours or six (6) months
- Use of Proper Gear Oil – recommended type for prevailing ambient temperature
- Periodic disassembly and inspection of all wear items.

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



### 1. OIL LEVEL

The gear oil level should be checked every 500 operating hours or three (3) months, whichever occurs first. To check the oil level, remove the large plug located in the center of the drum support. The oil should be level with the bottom of this opening or approximately half-way up in a sight glass. **This is extremely important due to the accelerated wear that can be caused by insufficient lubricating oil in the hoist.** If additional oil is needed, refer to “Recommended Planetary Gear Oil”.



## 2. OIL CHANGE

The gear oil should be changed after the first one hundred (100) hours of operation, then every 1,000 operating hours or six (6) months, whichever occurs first. The gear oil must be changed to remove wear particles that 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 that excessively heavy or thick gear oil may contribute to intermittent brake clutch slippage. Make certain that 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 very 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.**

## 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.

## ⚠ 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 DISASSEMBLY OF Hoist, page 16; and PLANET CARRIER SERVICE, page 20.

B. **Brake Cylinder** – Refer to MOTOR SUPPORT – BRAKE CYLINDER SERVICE, pages 22 and 23.

C. **Brake Clutch** – Refer to BRAKE CLUTCH SERVICE, page 26.

## ⚠ WARNING ⚠

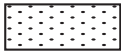
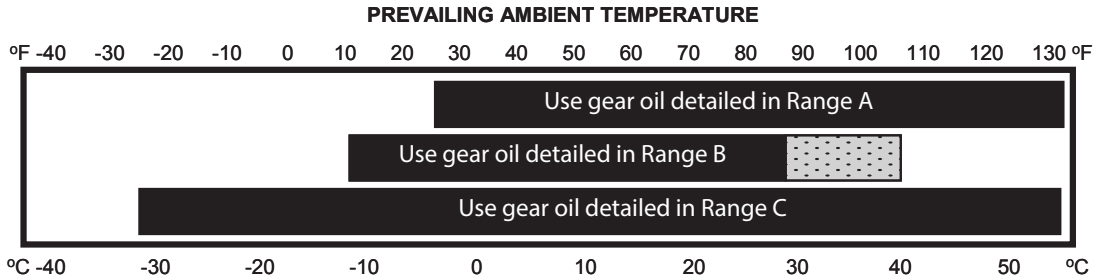
Failure to use the proper type and viscosity of planetary gear oil may contribute to intermittent brake clutch slippage which could result in property damage, severe personal injury or death. Some gear lubricants contain large amounts of EP (extreme pressure) and anti-friction additives which may contribute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

## 9. RECOMMENDED PLANETARY GEAR OIL

Use of the proper planetary gear oil is essential to reliable and safe operation of the brake clutch and obtaining long gear train life.

For simplicity, BRADEN has listed one (1) readily available product in each temperature range which has been tested and found to meet our specifications.

## RECOMMENDED GEAR OIL



SHADED TEMPERATURE RANGE IN THE CHART ABOVE NOT RECOMMENDED FOR SEVERE APPLICATIONS SUCH AS SUSTAINED FAST DUTY CYCLES OR FREQUENT WINCHING.

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

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

### 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)  
 (PD17A) 27G DRUM - 20 PINTS (9.5 L)

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

## ⚠ 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.

## TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>A</b></p> <p>The hoist will not lower the load or not lower the load smoothly.</p>	<p>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.</p> <p>2. The friction brake may not be releasing as a result of a defective brake cylinder seal.</p> <p>NOTE: If the brake cylinder seal is defective you will usually find oil leaking from the hoist vent plug.</p>	<p>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.</p> <p>2. Check brake cylinder seal as follows:</p> <p>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 J.I.C. fitting in the brake release port.</p> <p>b. Apply 1000 PSI (6,900 kPa) to the brake. Close shut-off valve and let stand for five (5) minutes.</p> <p>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”.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>A</b></p> <p>The hoist will not lower the load or not lower the load smoothly.</p>	<p>3. Friction brake will not release as a result of damaged brake discs.</p>	<p>3. Disassemble brake to inspect brake discs. Check stack-up height as described in “Motor Support-Brake Cylinder Service”.</p>
<p style="text-align: center;"><b>B</b></p> <p>Oil leaks from vent plug.</p>	<p>1. Same as PROBABLE CAUSE A2.</p> <p>2. Motor seal may be defective as a result of high system back pressure or contaminated oil.</p> <p>a. Vent positioned below oil level.</p> <p>b. Oil expansion due to overheating.</p>	<p>1. Same as REMEDY A2.</p> <p>2. System back pressure must not exceed 150 PSI (1,035 kPa). 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.</p> <p>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>
<p style="text-align: center;"><b>C</b></p> <p>The brake will not hold a load with the control lever in neutral.</p>	<p>1. Excessive system back pressure acting on the brake release port.</p> <p>2. Friction brake will not hold due to worn or damaged brake discs.</p> <p>3. Brake clutch is slipping.</p>	<p>1. Same as REMEDY B2.</p> <p>2. Same as REMEDY A3.</p> <p>3. Brake Clutch Slipping:</p> <p>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 refill hoist with recommended planetary gear oil listed in “Preventive Maintenance”.</p> <p>b. Brake clutch may be damaged or worn. Disassemble and inspect brake clutch as described in “Brake Clutch Service”.</p>

**TROUBLE****PROBABLE CAUSE****REMEDY**

<b>D</b>		
<p>The hoist will not hoist the rated load.</p>	<ol style="list-style-type: none"> <li>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.</li> <li>2. System relief valve may be set too low. Relief valve needs adjustment or repair.</li> <li>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.</li> <li>4. Hoist line pull rating is based on 1st layer of wire rope.</li> <li>5. Rigging and sheaves not operating efficiently.</li> </ol>	<ol style="list-style-type: none"> <li>1. Mounting Surface:               <ol style="list-style-type: none"> <li>a. If necessary, use shim stock to level hoist. Refer to "Hoist Installation".</li> <li>b. First loosen, then evenly retighten all hoist mounting bolts to recommended torque.</li> </ol> </li> <li>2. Check relief pressure as follows:               <ol style="list-style-type: none"> <li>a. Install an accurate 0-4000 psi (27,580 kPa) gauge into the inlet port of the brake valve.</li> <li>b. Apply a stall pull load on the hoist while monitoring pressure.</li> <li>c. Compare gauge reading to hoist specifications. Adjust relief valve as required.</li> </ol> <p>NOTE: If pressure does not increase in proportion to adjustment, relief valve may be contaminated or worn out. In either case, the relief valve may require disassembly or replacement.</p> </li> <li>3. Temperature:               <ol style="list-style-type: none"> <li>a. Same as remedies for PROBABLE CAUSE D1 &amp; D2.</li> <li>b. Same as remedies for PROBABLE CAUSE E2.</li> </ol> </li> <li>4. Refer to hoist performance charts for additional information.</li> <li>5. Perform rigging service as recommended by crane manufacturer.</li> </ol>
<p><b>E</b></p> <p>The hoist runs hot.</p>	<ol style="list-style-type: none"> <li>1. Same as PROBABLE CAUSE D1.</li> <li>2. Be certain that the hydraulic system temperature is not more than 180 degrees F. Excessive hydraulic oil temperatures may be caused by:               <ol style="list-style-type: none"> <li>a. Plugged heat exchanger.</li> <li>b. Too low or too high oil level in hydraulic reservoir.</li> <li>c. Same as D2.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Same as REMEDY D1.</li> <li>2a. Thoroughly clean heat exchanger exterior and flush interior.</li> <li>b. Fill/drain to proper level.</li> <li>c. Same as REMEDY D2</li> </ol>



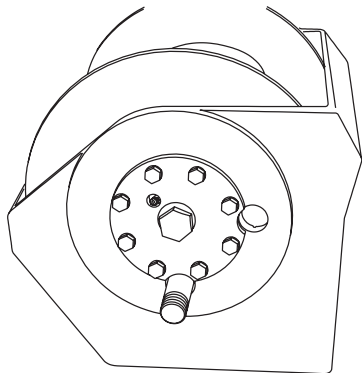
TROUBLE	PROBABLE CAUSE	REMEDY
<p style="text-align: center;"><b>E</b></p> <p>The hoist runs hot.</p>	<p>d. Hydraulic pump not operating efficiently.</p> <p>3. Excessively worn or damaged internal hoist parts.</p>	<p>d. HYDRAULIC Pump:</p> <p>d1. Same as REMEDY D2.</p> <p>d2. Prime mover low on horsepower or R.P.M. 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>
<p style="text-align: center;"><b>F</b></p> <p>Hoist “chatters” while raising rated load.</p>	<p>1. Same PROBABLE CAUSE as D2.</p> <p>2. Hydraulic oil flow to motor may be too low.</p> <p>3. Controls being operated too quickly.</p>	<p>1. Same as REMEDY for D2.</p> <p>2. Same as REMEDY for E2.</p> <p>3. Conduct operator training as required.</p>
<p style="text-align: center;"><b>G</b></p> <p>The wire rope does not spool smoothly on the drum.</p>	<p>1. The hoist may be mounted too close to the main sheave, causing the fleet angle to be more than 1-1/2 degrees.</p> <p>2. The hoist may not be mounted perpendicular to an imaginary line between the center of the cable drum and the first sheave.</p> <p>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.</p> <p>4. The hoist may have been overloaded, causing permanent set in the wire rope.</p>	<p>1. Check mounting distance and fleet angle. Reposition hoist as required.</p> <p>2. Refer to “Hoist Installation”.</p> <p>3. Consult wire rope manufacturer for recommendation of wire rope that best suits your application.</p> <p>4. Replace wire rope and conduct operator/rigger training as required.</p>

# HOIST DISASSEMBLY

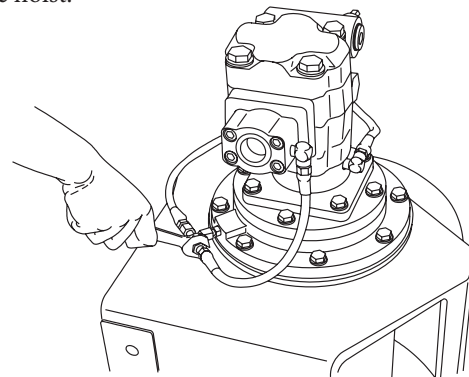
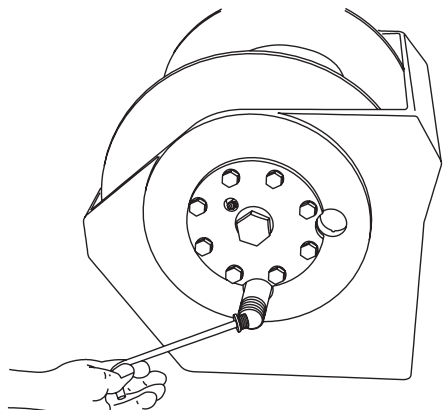
## SERVICE PRECAUTIONS

- 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 for optimum results. Never reuse expendable parts such as oil seals and O-rings.
- 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.
- 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.

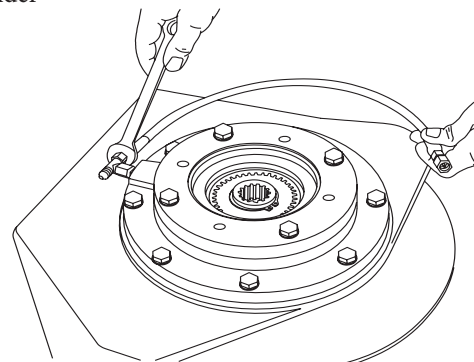
After troubleshooting the hoist and its hydraulic system as covered in the “Troubleshooting” section, and the problem is determined to be in the hoist, use the following procedure to disassemble the hoist.

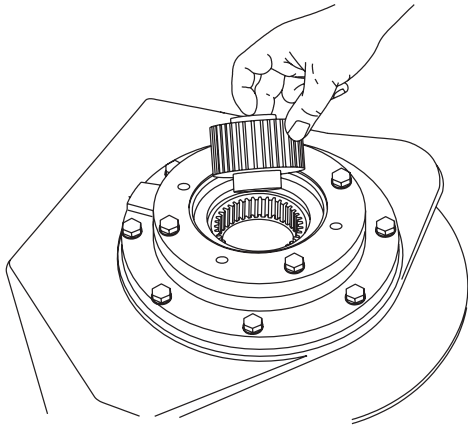


1. Remove the wire rope from the cable drum and align the drain hole in the drum with a hole in the support side plate before removing the hoses and mounting bolts. After the hoist is removed from its mounting, thoroughly clean the outside surfaces. To drain the oil, install a short piece of 1 inch pipe 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 that connect the brake valve and manifold to the brake cylinder.

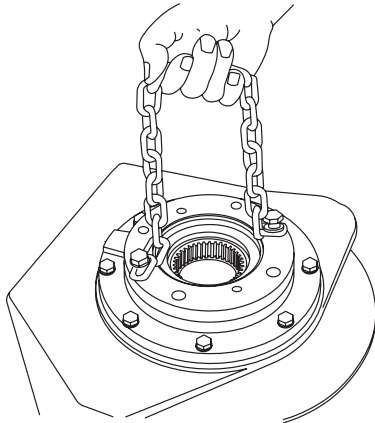


4. Remove the capscrews securing the motor, and lift the motor off the hoist. Remove and discard the O-ring installed on the pilot of the motor.
5. Tag and remove the hoses and fittings from the brake cylinder release port.
6. Remove the brake clutch assembly from the motor support. Refer to “Brake Clutch 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



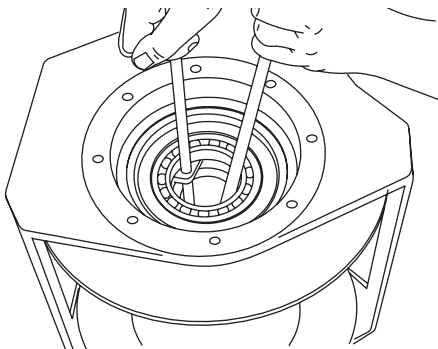


8. Remove the brake cylinder capscrews and install two (2) capscrews and a short piece of chain into the motor support mounting bolt holes. Using the chain as a handle, lift the brake cylinder out of the drum and base, being careful to avoid damaging the sealing or bearing surfaces. Refer to “Motor Support-Brake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

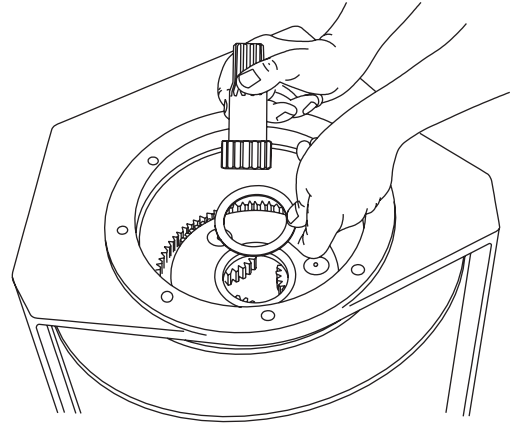


**For PD15B hoists**, the drum closure cannot be removed through the opening in the base. If your hoist has a one-piece cast base, remove the bearing support, as described in step 15, and remove the drum from the base. Then proceed with steps 9 thru 14. If your hoist has a three piece base, remove the motor end side plate and continue with step 9.

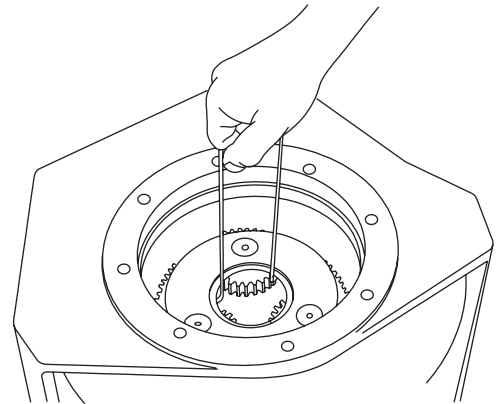
9. Using two heel type pry bars placed between the primary planet carrier and the drum closure, pry upward to remove the drum closure. Remove and discard the O-ring from the outside of the drum closure. Some drum closures have 3/8-16 tapped lifting eye holes that may be used in place of the heel bars



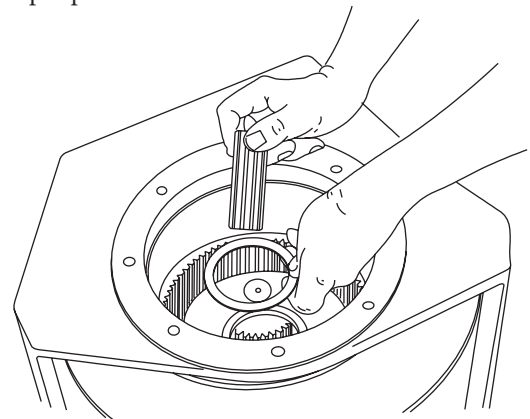
10. Remove the seal and bearing from inside of closure.
11. Remove the primary sun gear and thrust washer from the primary planet carrier.



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

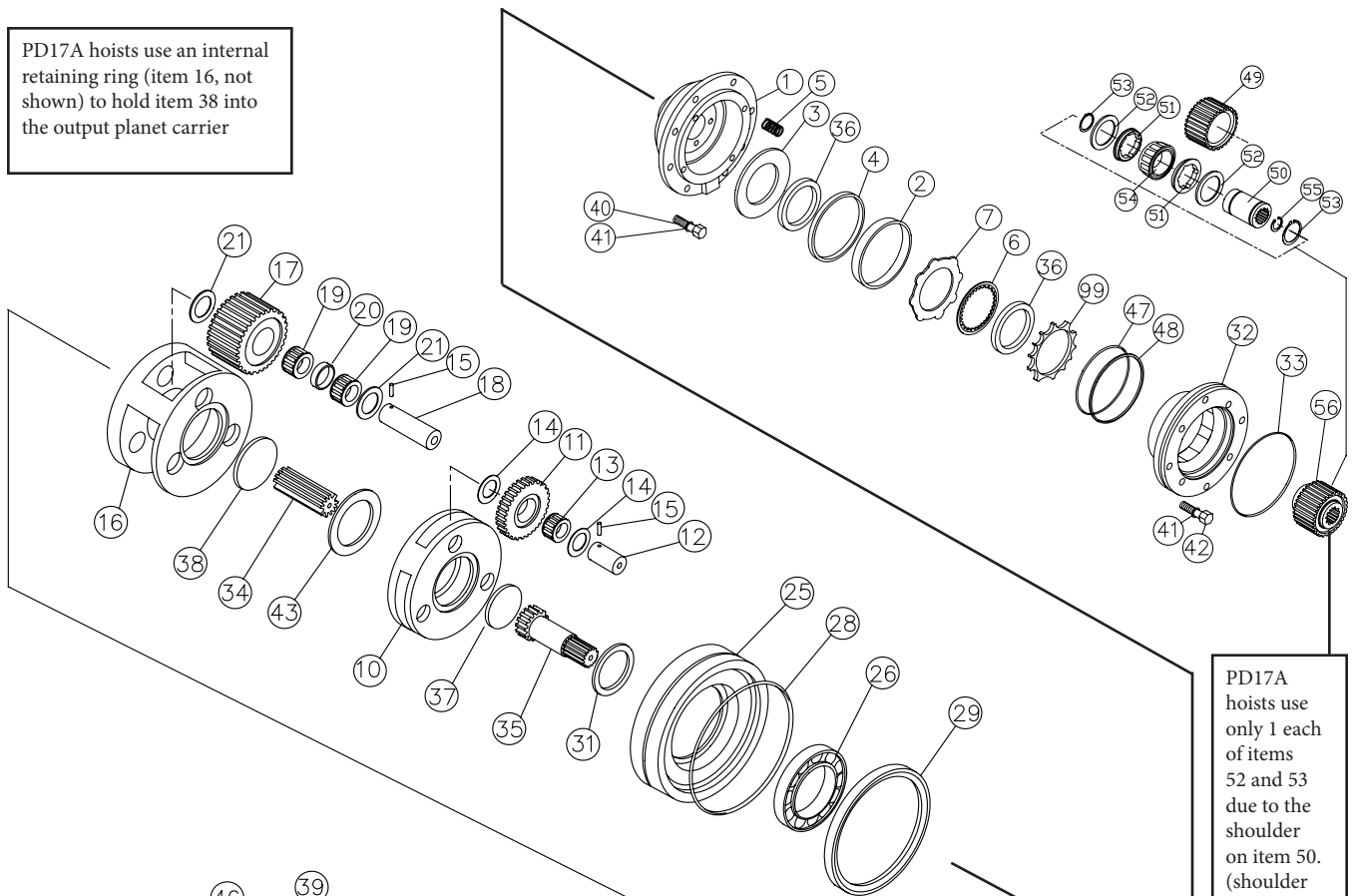
ring gear (machined into inside surface of drum) teeth for nicks, spalling or excessive wear. Replace if wear is greater than 0.015 in. (0.4 mm) when compared to un-worn area of teeth.

**BRADEN PD12C/PD15B/PD17A LIST OF COMPONENTS**

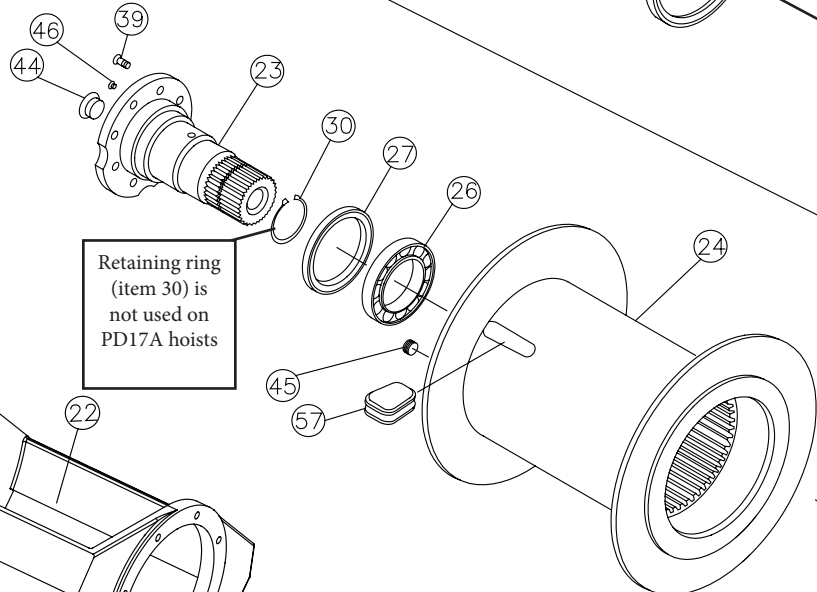
ITEM NO.	DESCRIPTION	PART NO.	QTY.
000	Sprag clutch assembly (C spl shaft)	81716	1
000	Primary planet carrier assembly	82342	1
000	Planet carrier assembly	81845	1
000	Cable drum	28832	1
000	Hydraulic motor subassembly (6.4 C.I.)	61704	1
000	Brake cylinder assembly, 4-bolt C	82266	1
000	Nameplate, CE	108591	1
000	Drive screw	11842	4
001	Brake cylinder	100035	1
002	Seal	25642	1
003	Pressure plate	25635	1
004	Piston backup ring	25636	1
005	Die spring	25644	12
006	850170 disc, friction	21036	7
007	Brake disk	100027	8
010	Primary planet carrier	100852	1
011	Primary planet gear	26466	3
012	Primary planet gear shaft	25614	3
013	Roller bearing	24175	3
014	Thrust washer	25361	6
015	Spirol pin	24113	3
016	Planet carrier	25602	1
017	Planet gear	26467	3
018	Planet gear shaft	25613	3
019	Roller bearing	25292	6
020	Bearing spacer	25443	3
021	Thrust washer	24306	6
022	Base	26344	1
023	Bearing support, SP only	106459	1
025	Cable drum closure	27866	1
026	Ball bearing	24110	2
027	Oil seal	24109	1
028	O-ring	76208	1
029	Seal, oil	22818	1
030	Retaining ring, external	70575	1
031	Thrust washer	40128	1
032	Motor support	100028	1
033	O-ring	10330	1
034	Output sun gear	100854	1

ITEM NO.	DESCRIPTION	PART NO.	QTY.
035	Primary sun gear	26479	1
036	Spacer	25637	1
037	Spacer, primary	25729	1
038	Spacer, output	25638	1
039	Spacer	26223	2
040	Capscrew	104174	20
041	Lockwasher	11026	16
042	Capscrew	29855	4
043	Thrust washer	40129	1
044	16166-16 O-ring plug, hex head	31386	1
045	16496-8 plug, O-ring flush	32411	1
046	Relief valve 7.5-15 PSI	18062	1
047	O-ring	24981	1
048	Backup ring	25643	1
049	Outer brake race	25075	1
050	Inner brake race	25609	1
051	Sprag bearing	27684	2
052	Thrust bearing	24581	2
053	21-B3-1 snap ring	12034	2
054	Sprag clutch	24839	1
055	Retaining ring	24506	1
056	Shipping plug, hydraulic	25403	1
057	Cable wedge	40130	1
058	Manifold	24779	1
059	O-ring	13838	1
060	Capscrew	21144	4
061	Capscrew	21134	4
062	Brake valve assy. - 1.25-61	81712	1
063	Hose assembly	25952	1
064	Hose assembly	13704	1
065	Adapter	25864	1
066	2685008 elbow TBG fitting	21163	1
067	Swivel tee	25748	1
068	Elbow fitting	25302	1
069	Reducer elbow	24236	1
071	Hose assembly	25935	1
072	Hydraulic motor, gear	25777	1
079	Side plate support end	27212	1
080	Side plate motor end	27213	1
083	Capscrew	103314	16
084	Lockwasher KEV1	12781	24

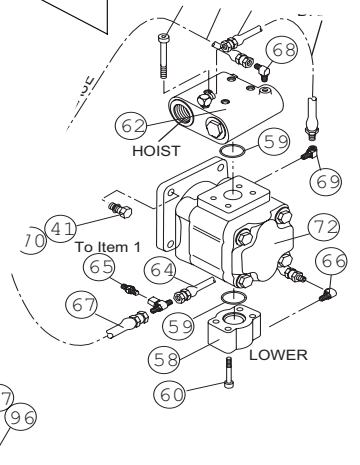
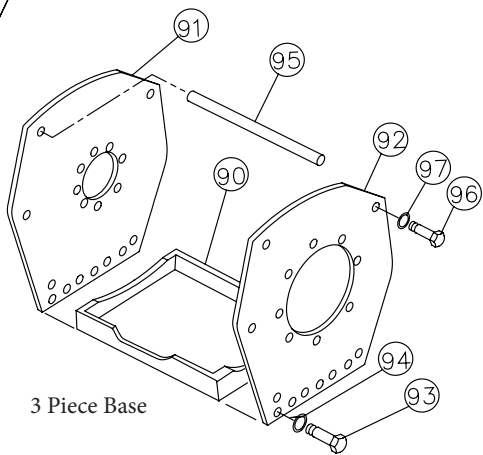
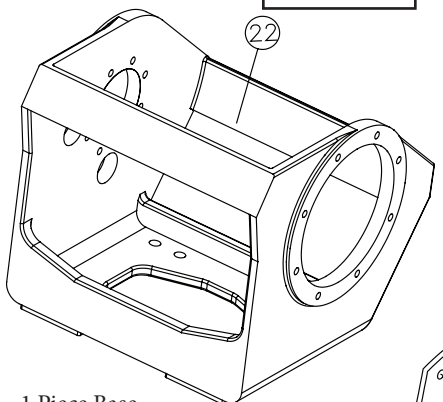
PD17A hoists use an internal retaining ring (item 16, not shown) to hold item 38 into the output planet carrier



PD17A hoists use only 1 each of items 52 and 53 due to the shoulder on item 50. (shoulder is toward motor)

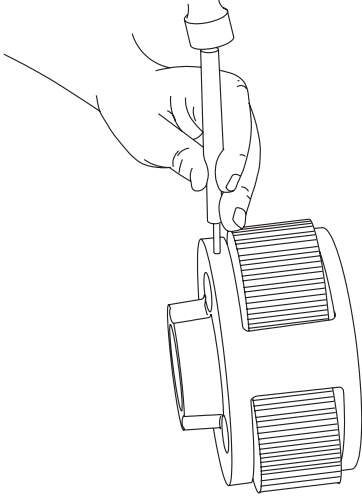


Retaining ring (item 30) is not used on PD17A hoists

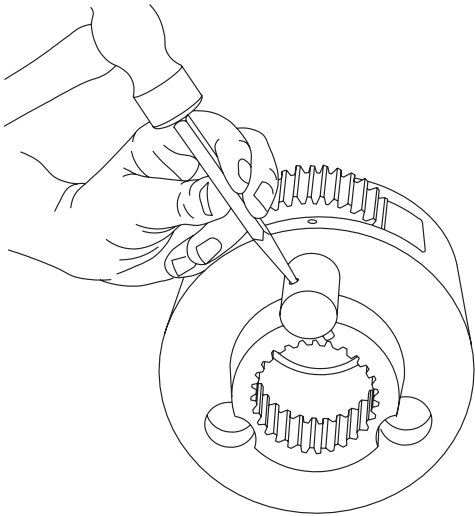


# PLANET CARRIER SERVICE

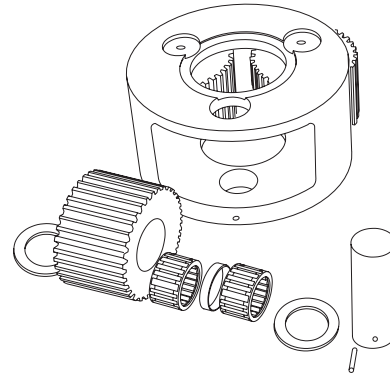
## OUTPUT PLANET CARRIER DISASSEMBLY



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



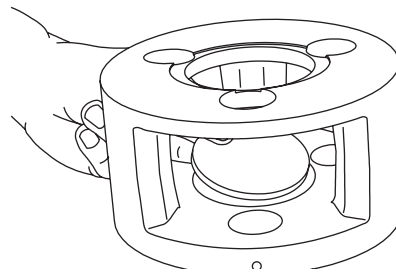
2. Use a punch to drive the roll pins from the planet shafts. Do not reuse the roll pins.



3. Now you can 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, the bearing should be replaced. Likewise, the cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage that will impair the cage's ability to separate, retain and guide the rollers properly, the bearing should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

## ASSEMBLY

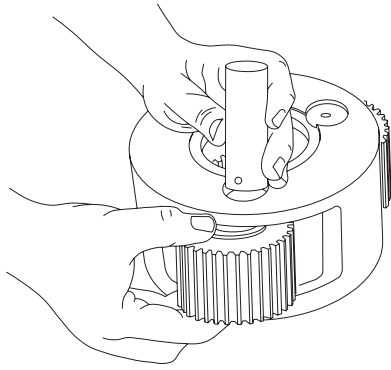
1. Place the output planet carrier on workbench with splined coupling side down. Install output thrust plate in center of carrier.



## ⚠ CAUTION ⚠

PD17A hoists have an internal retaining ring to hold the thrust plate into the carrier. This retaining ring **MUST** be properly installed and fully seated before the planet gears are installed.

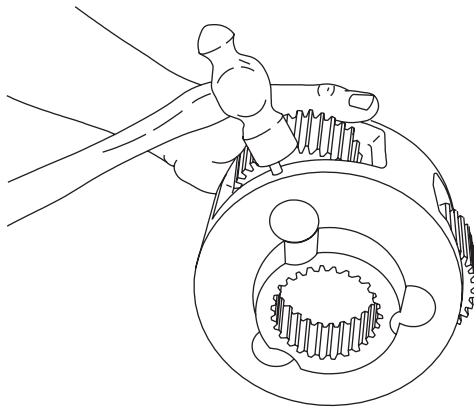




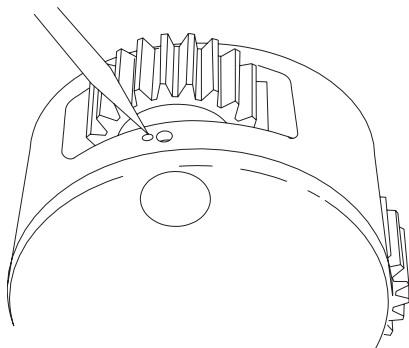
## PRIMARY PLANET CARRIER

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.

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.



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.

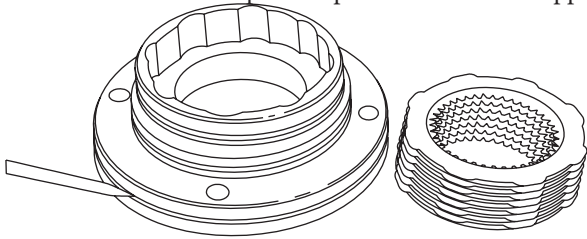


4. Note that the roll pin is recessed approximately 1/16 in. (.06 mm) in the carrier when properly installed. With a center punch, stake the carrier next to the pin hole as shown. This will distort the hole so the pin will not back out. Repeat these steps for each of the three planet gears.

# 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.

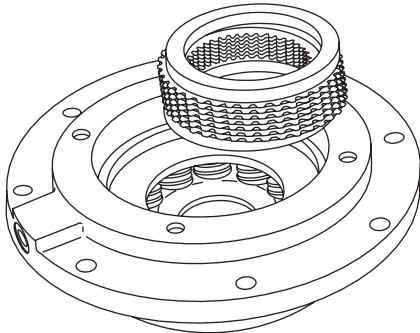


Note groove on outside diameter of motor support.

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

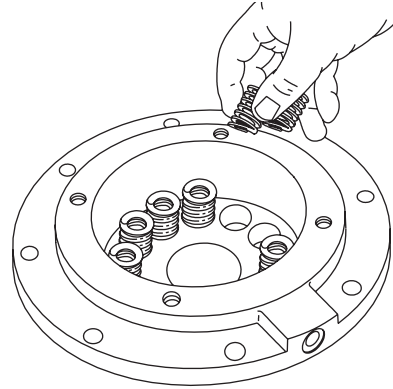
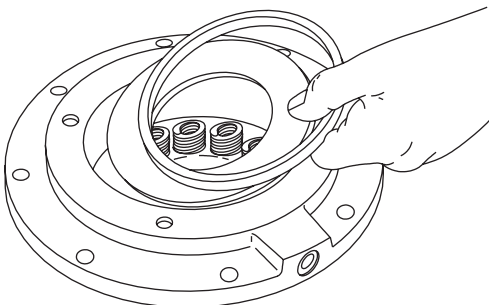
## DISASSEMBLY

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.



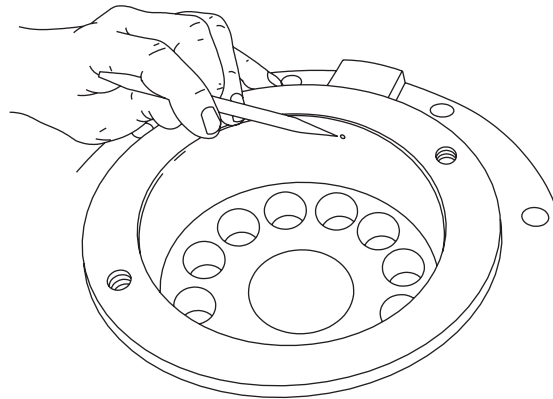
2. Remove the piston backup ring and pressure plate.

3. Remove the brake springs.

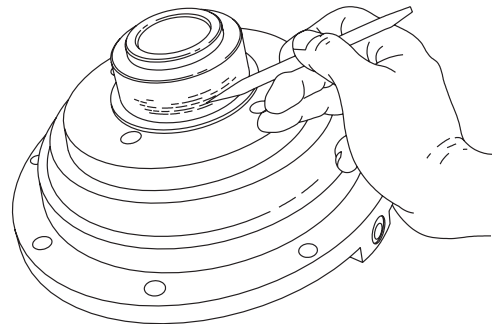


## CLEAN AND INSPECT

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.



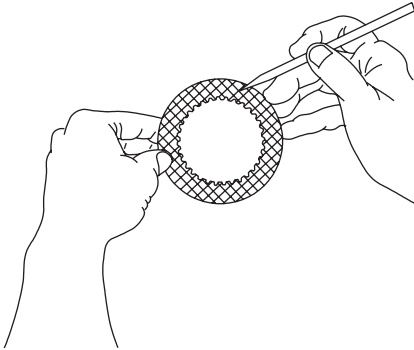
2. Check oil seal and bearing surfaces on brake cylinder for damage or wear.



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.

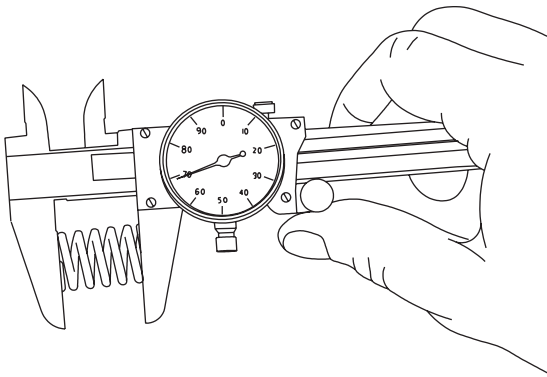
## ⚠ CAUTION ⚠

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



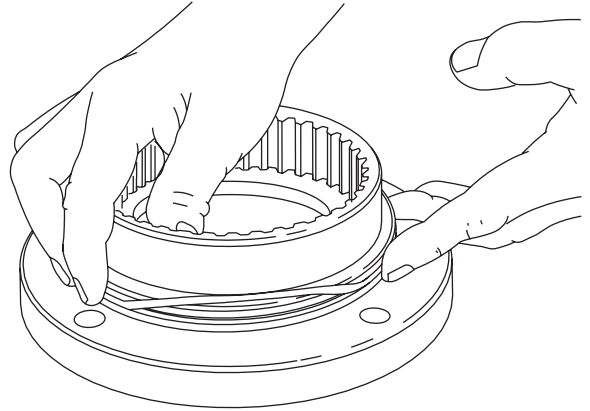
4. Place steel brake disc on flat surface and check for distortion with a straight edge. Check surface for signs of material transfer or heat. Replace steel disc if splines are worn to a point, disc is distorted or heat discolored.
5. Check brake spring free length; minimum free length is 1 3/16 in. (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

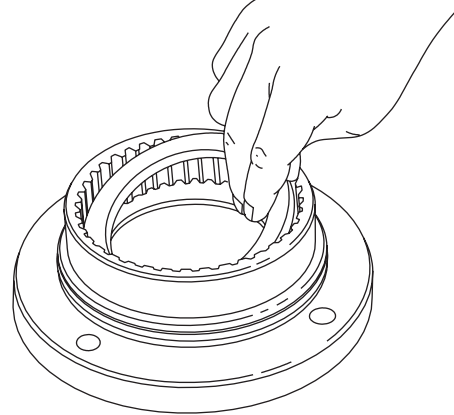


1. Begin assembly by placing motor support on workbench with motor mounting surface down. Install new O-ring and backup ring as shown.
2. Install a brake spacer into the motor support. (NOT REQUIRED WITH LOBED DISCS.)
3. Insert first, a steel brake disc against the spacer followed by a friction brake 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.

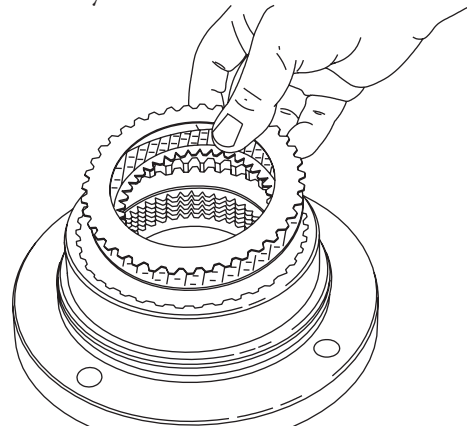
**NOTE:** It is a good practice to pre-lubricate the discs in hydraulic oil prior to assembly.

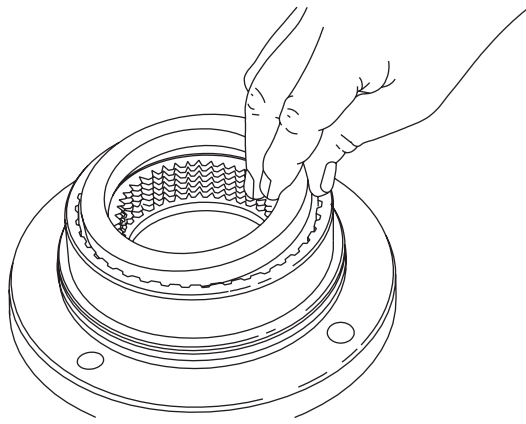


4. Install the remaining brake spacer on top of the last steel brake disc. (This is the only spacer used with lobed discs.)

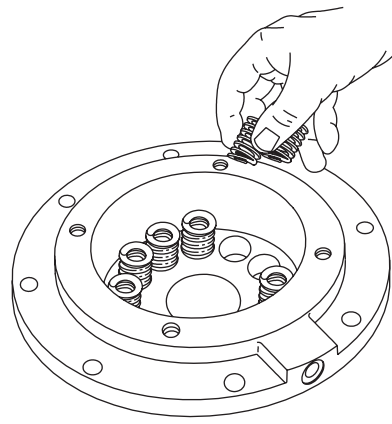


5. To check brake stack height, place pressure plate on top of brake spacer. Hold pressure plate down firmly by hand and measure clearance in three places between motor support and pressure plate. Average gap must measure between .153 in. (4 mm) maximum and .080 in. (2 mm) minimum. If the gap exceeds 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.

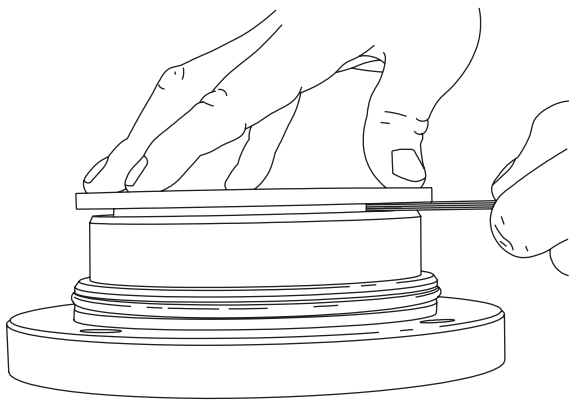




6. Lubricate the brake piston seal and motor support sealing surface with petroleum jelly or hydraulic oil. Install new piston seal to motor support, seal lip down.



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.

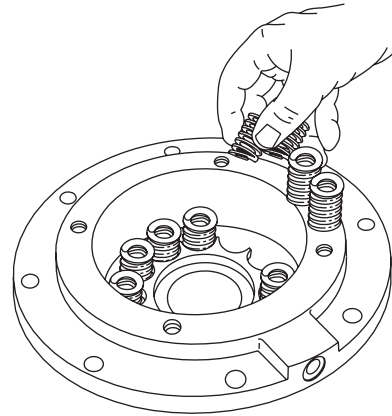


#### OLDER STYLE BRAKE CYLINDER

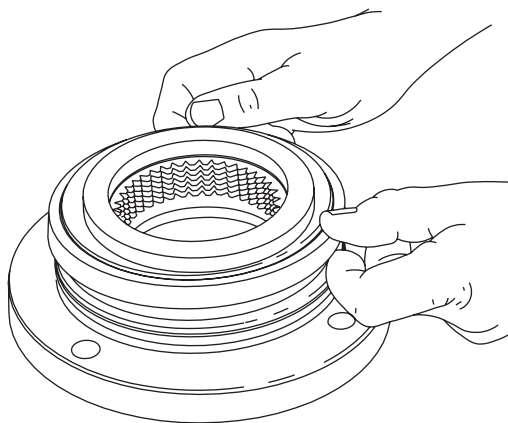
7. Install brake springs into brake cylinder

#### NEW STYLE BRAKE CYLINDER

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

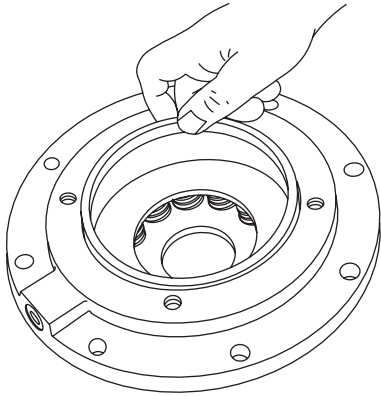


9. Apply petroleum jelly to the entire sealing surface of the brake cylinder and to the piston seal. Install the brake cylinder over the motor support being careful to avoid damaging the piston seal or motor support O-ring. (A press may be necessary to avoid cocking the brake cylinder during installation.)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



### ⚠ WARNING ⚠

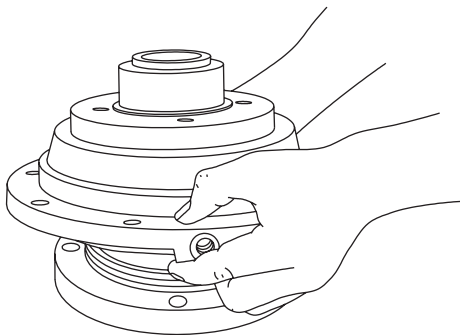
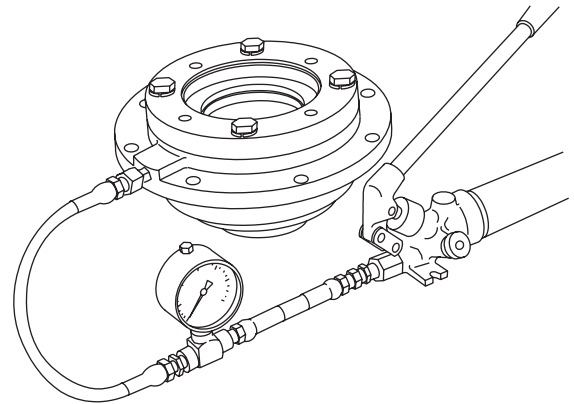
Always use the molded spring spacer with the new brake cylinder. The brake springs must be properly positioned by the spring spacer. Failure to install the spring spacer may allow the springs to contact each other and become damaged. This could result in loss of load control, property damage, injury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



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.

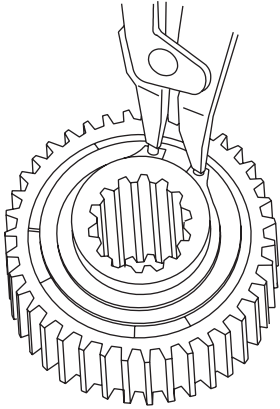
### **BRAKE CYLINDER PRESSURE TEST**

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 (6,900 kPa) 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.



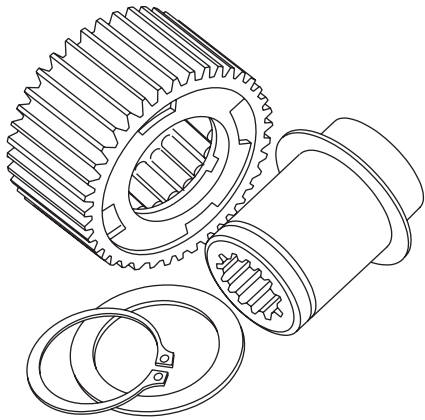
# BRAKE CLUTCH SERVICE

## DISASSEMBLY

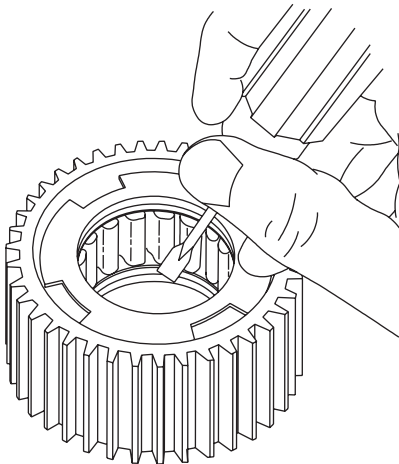


1. Remove the snap ring and sprag bushing retainer from one end only.

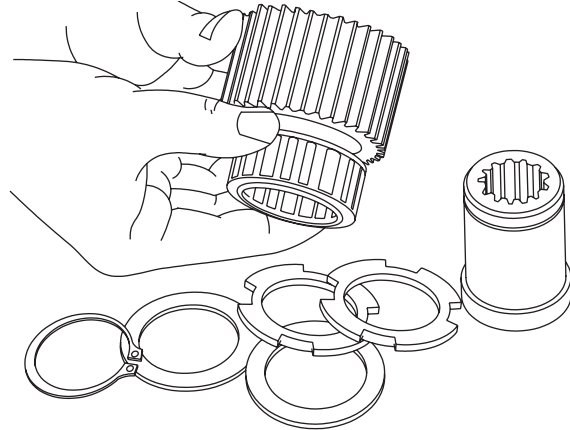
**NOTE:** The brake clutch on PD17A hoists use a stepped inner race, which eliminates one retaining ring and bushing retainer. The larger end of the inner race is toward the motor.



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.

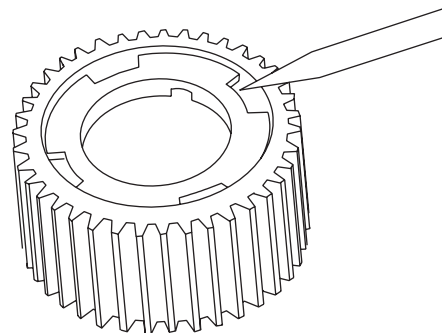


4. Next, slide the sprag clutch out, inspect the sprag clutch closely for abnormal wear, cracks, pitting or corrosion. Check small clips for breakage or bright spots; the signs of excessive wear. Unless the outer race or remaining sprag bushing is damaged or shows excessive wear, there is no need for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

## ASSEMBLY

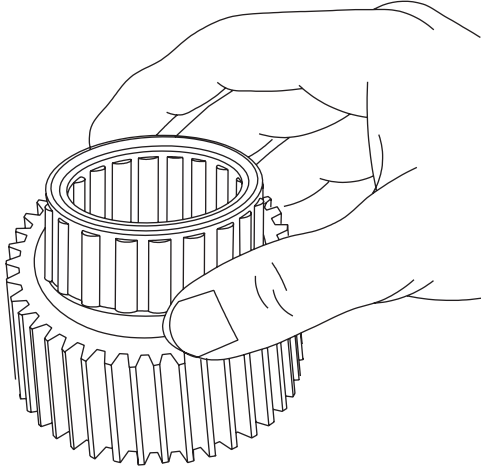
### ⚠ WARNING ⚠

The polished surfaces of the races and sprag cams must be perfectly smooth to insure 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.

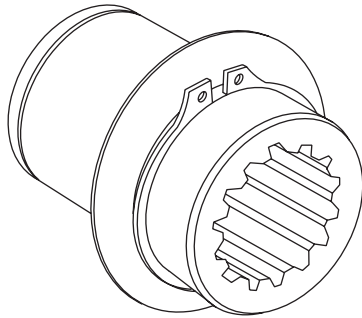


1. Press a sprag bushing into the outer race, using a mechanical or hydraulic press. A flat plate of approximately the same diameter as the bushing flange outside diameter should be placed between the press and bushing during assembly to protect the bushing. Be certain the bushing flange is against the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

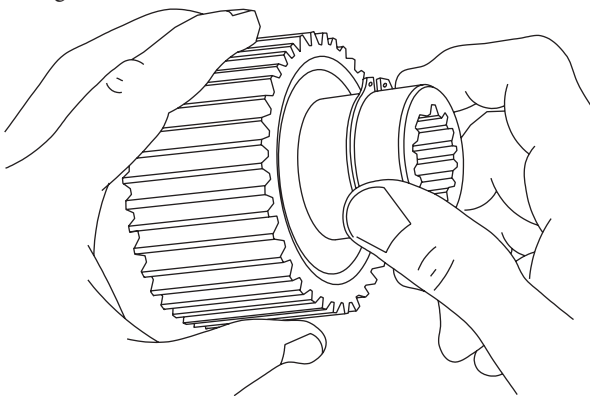




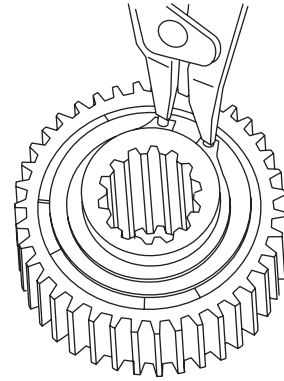
2. Turn the assembly over and install the sprag clutch in the bore of the outer race.
3. Press the remaining bushing into the race. Again, make sure the bushing is against the shoulder.



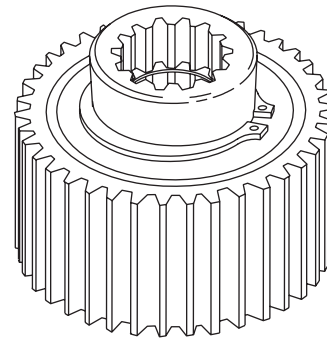
4. Next, install a sprag bushing retainer, then a snap ring on the inner race. Be sure the snap ring is seated in the snap ring groove. NOT necessary on PD17A due to stepped design.



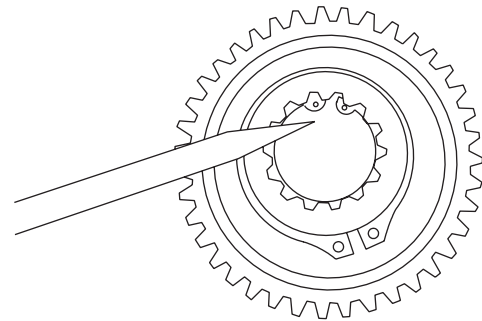
5. Slide the inner race through the bushings and sprag clutch (the race will have to be rotated in the free-wheeling direction to start it through the sprag clutch). If the inner race will not go through the bushings, the bushings have probably been damaged and should be replaced.



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.



7. This is a completed brake clutch assembly.



## ⚠ 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

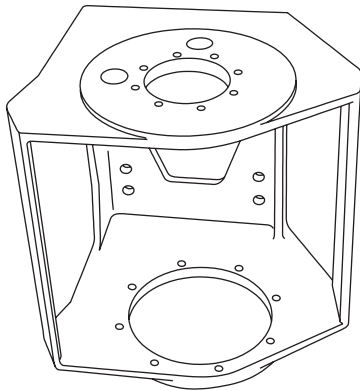
The drum closure will not fit through the opening in the base. For hoists with a three piece base, first assemble the bearing support side plate (91) to the base plate (90). Go to step 1 and follow the assembly procedure. Install the motor end side plate and tie bar(s) after installing the drum closure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

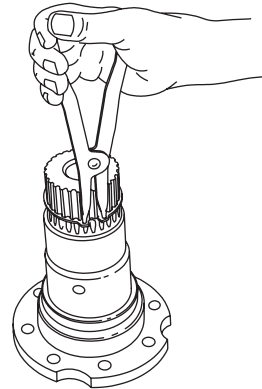
### ⚠ CAUTION ⚠

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.

## PD12C, PD15B, PD17A

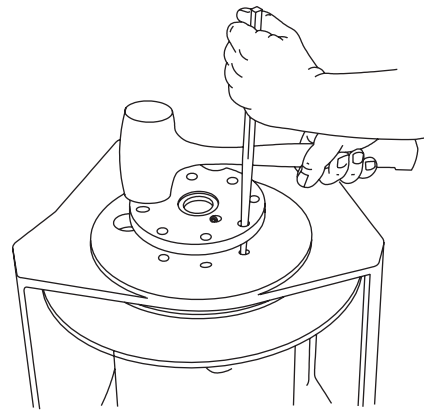


1. Place hoist base on side with bearing support end up.
2. Install a new bearing in the drum if replacement is necessary. Apply a non-hardening sealant on the outside diameter of the new seal. Install the spring side of the seal next to the bearing, then press into the drum, using a flat plate to avoid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



### ⚠ 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.

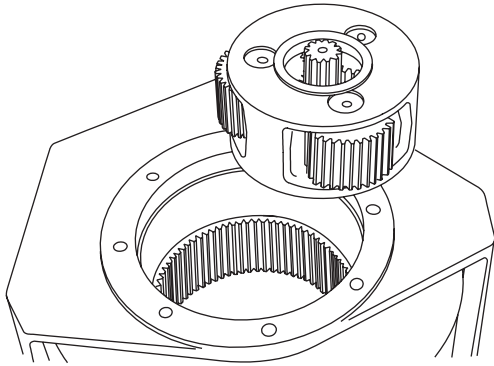


3. Center the drum in the opening of the base. Lubricate the bearing support with petroleum jelly or gear oil and install in base and drum.

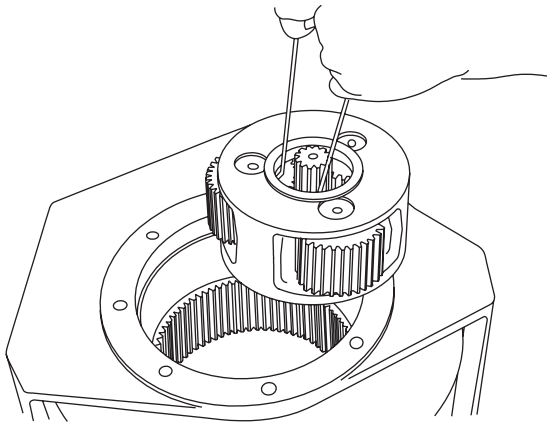
**⚠ CAUTION ⚠**

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

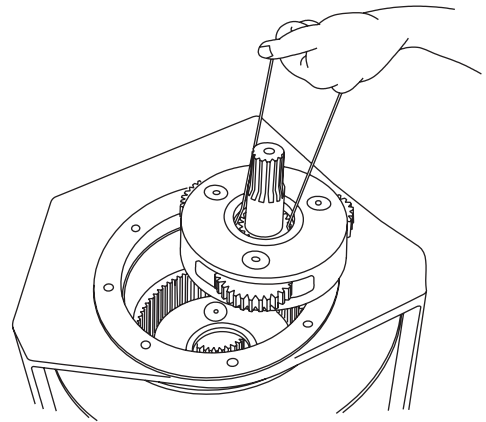
4. Tighten the bearing support capscrews to the recommended torque.



5. Stand hoist on bearing support end. Install the output sun gear and thrust washer into output planet carrier.
6. 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.



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

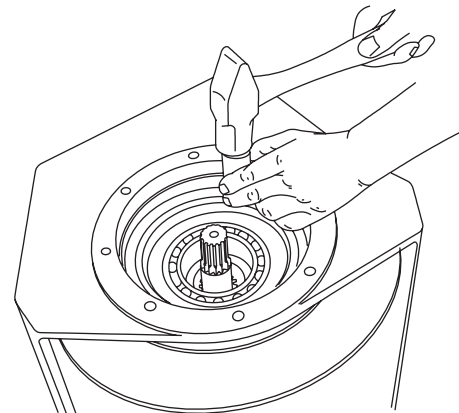


8. Install the primary planet carrier, meshing the planet gears with the ring gear and the planet housing with the output sun gear.



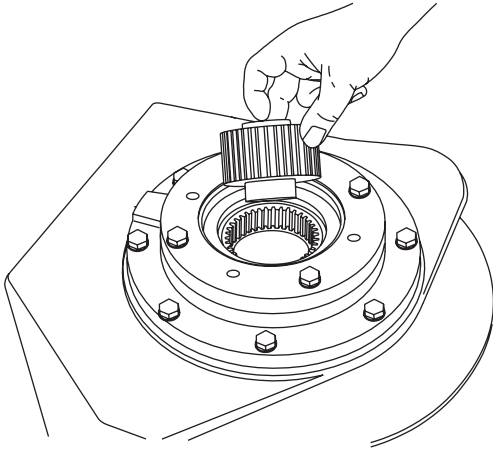
9. Install a new bearing in the drum closure as required. Use sealant on the outside surface of the oil seal. Install with spring side of the seal toward bearing, using a flat plate to avoid distortion.

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



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

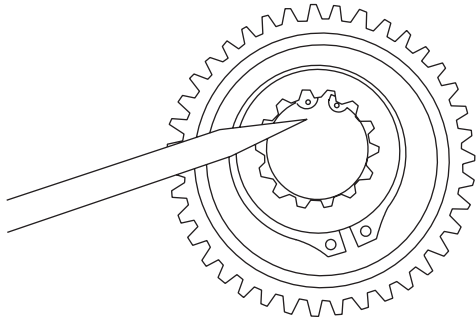
- Lubricate the pilot, oil seal and bearing surfaces of the brake cylinder and carefully install brake cylinder into base and drum. Locate the brake release port toward the lower rear corner of the base. Tighten brake cylinder capscrews to recommended torque.



- Install the brake clutch assembly with the short end of the inner race toward motor.

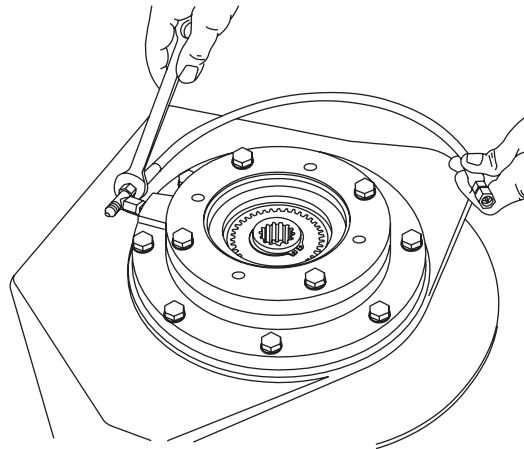
When installed correctly, the inner race should turn freely in the opposite direction the drum turns to pull wire rope in. An easy way to check the rotation is to hold the outer race in one hand, and rotate the inner race.

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 brake discs are misaligned, preventing the installation of the clutch, then with a hand pump, apply 750-1000 psi 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.

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



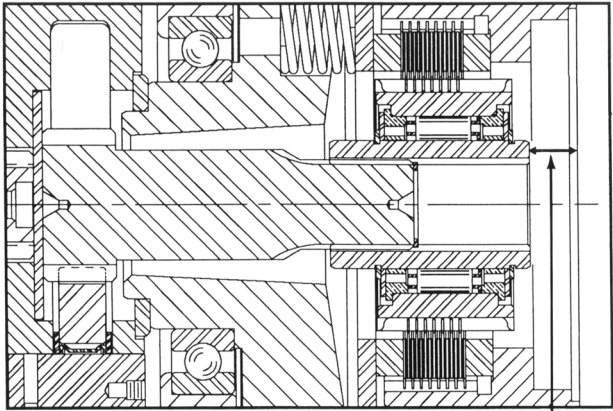
**NOTE:** The following caution **DOES NOT** apply to PD17A hoists. Proceed to step 16.

**⚠ 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.

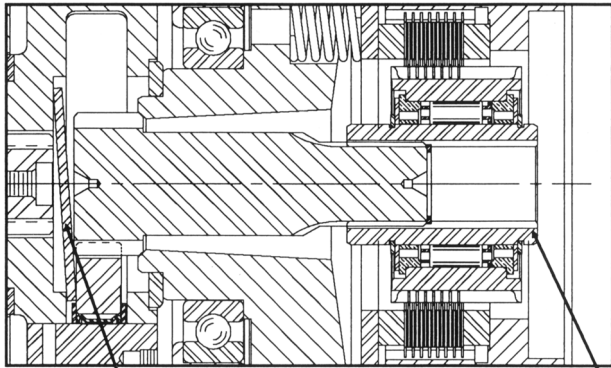
**⚠ WARNING ⚠**

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.



**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.

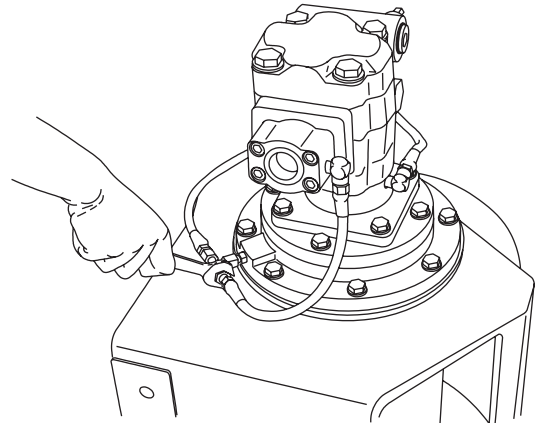


**PRIMARY THRUST PLATE**

**BRAKE CLUTCH  
INNER BRAKE RACE**

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

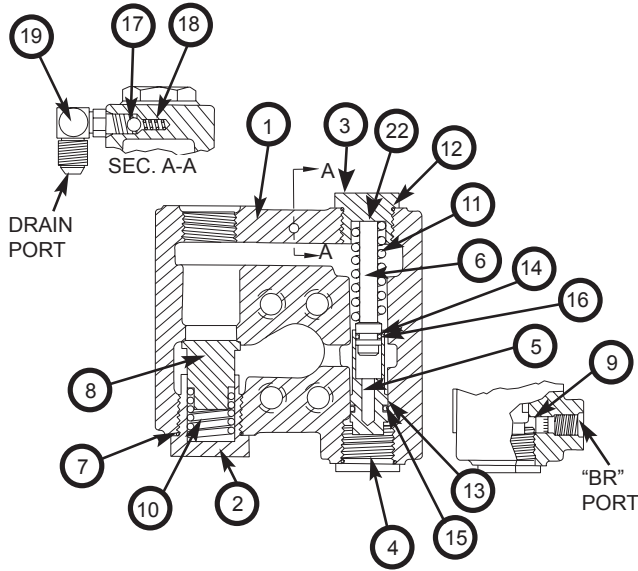
16. Engage the motor shaft with the brake clutch inner race and lower motor into place. Tighten capscrews to recommended torque.



17. Install the hoses that connect 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



ITEM	DESCRIPTION	QTY
1	BRAKE VALVE HOUSING	<b>NSS</b>
2	VALVE SPRING RETAINER	1
3	SPRING RETAINER	1
4	PLUG	1
5	SPOOL	<b>NSS</b>
6	DAMPER PISTON	<b>NSS</b>
7	O-RING	2
8	CHECK VALVE POPPET	<b>NSS</b>
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	<b>AR</b>

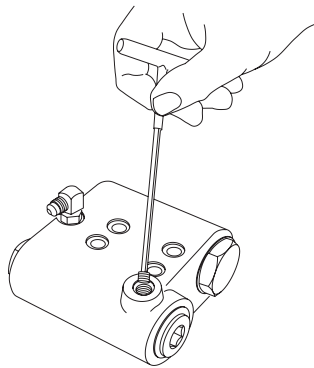
**NSS** - NOT SOLD SEPARATELY - REPLACE COMPLETE VALVE ASSEMBLY  
**AR** - AS REQUIRED

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 as replacement parts.

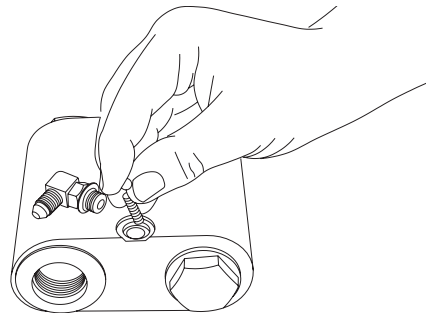
Before disassembling the brake valve, be sure you have conducted all applicable troubleshooting operations and are certain the brake valve is causing the malfunction.

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.

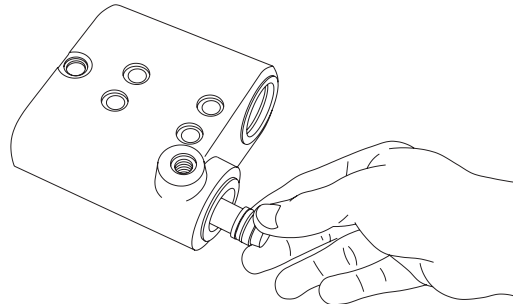
## DISASSEMBLY



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



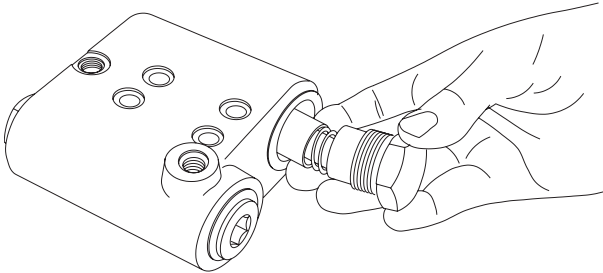
2. Remove the elbow fitting, motor drain check ball and spring.



3. 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.
4. Remove spool plug and carefully remove spool assembly.



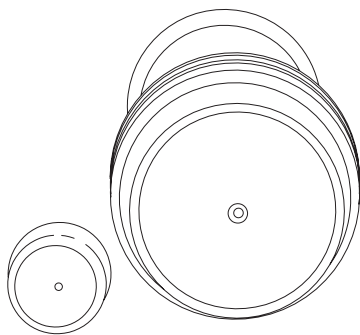
- Remove the damper piston from the spool. The piston will come out slowly, because of a partial vacuum formed as it is removed. Use extreme care to avoid damaging the polished surfaces of the piston or spool.



- 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.

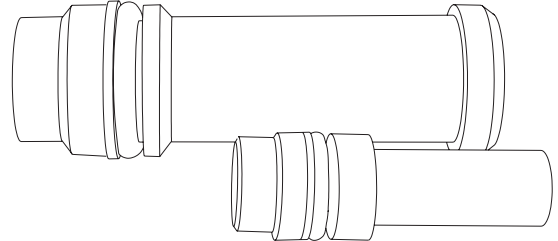
### CLEAN AND INSPECT

- 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 that 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.
- Inspect the .020 inch (.5 mm) orifice in the end of the spool and the pilot orifice to be certain they are open.

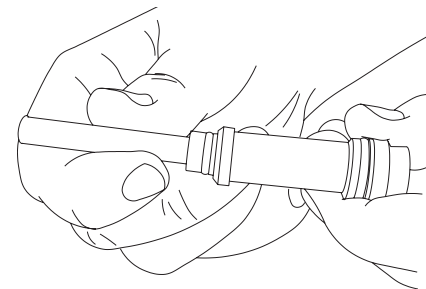


### ASSEMBLY

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

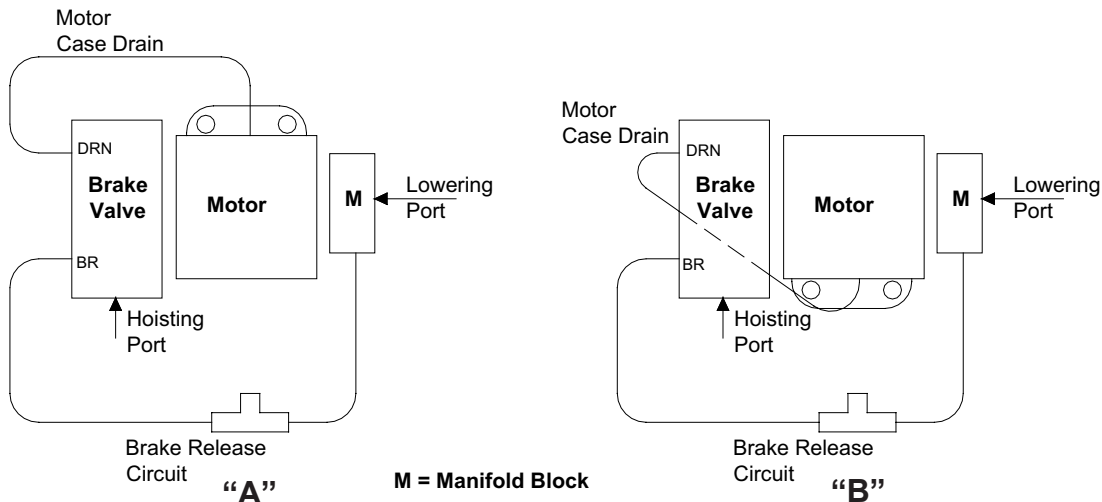


- Install new O-rings and backup rings on the spool and damper piston as shown. It is important that each backup ring is on the correct side of its O-ring. Take care not to cut the O-rings during assembly. Let the spool and damper piston set for ten minutes before installing them in their respective bores. This will allow the O-rings to return to their original size after being stretched.
- Lubricate the spool and damper piston O-rings with hydraulic oil. Carefully install the damper piston into the spool.
- 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.



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

# REVERSING DIRECTION OF DRUM ROTATION

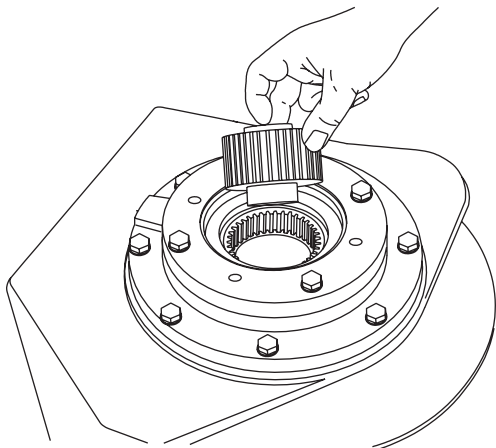


In order to change the direction of rotation and brake operation, 2 components must be changed on the hoist. First, the motor must be made to rotate in the opposite direction. This is done by exchanging positions of the brake valve and manifold block on the motor. Secondly, the brake clutch assembly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

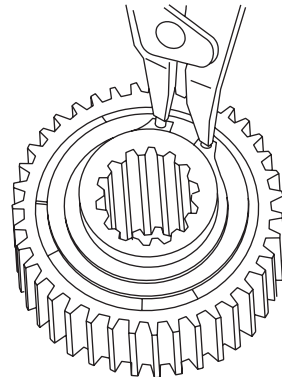
Figures “A” and “B” above show typical PD12C motor installations. Note that the only difference between the two drawings is the motor is rotated 180° (the “belly” of the motor moves to the opposite side). If the motor shaft rotates clockwise in figure “A” when the hoisting port is pressurized, it will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

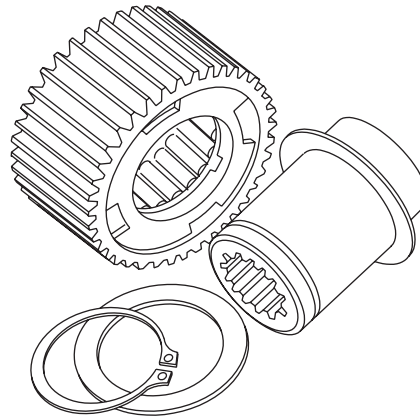
2. Before removing the motor, it is a good idea to note or mark the position of the motor in relation to the hoist, since it will be rotated 180° when reinstalled. Remove the capscrews securing the motor to the hoist and carefully remove the motor.



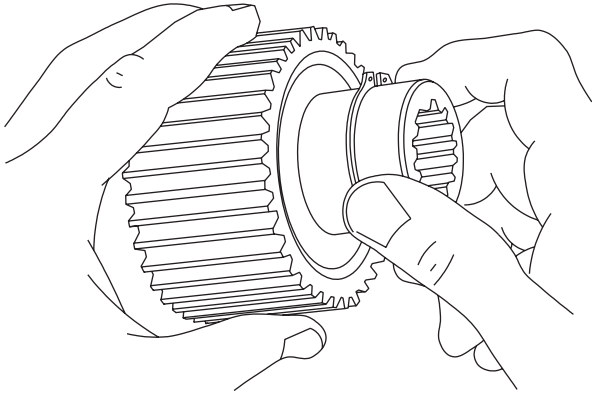
3. Remove the brake clutch assembly from the motor support.



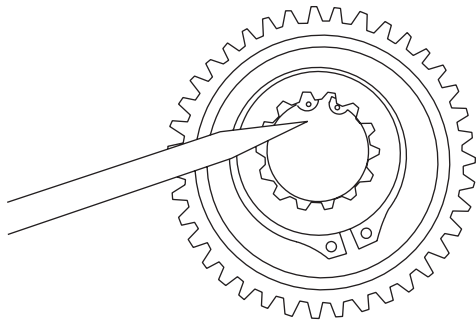
4. Remove the snap ring and sprag bushing retainer from one end only of the brake clutch assembly.



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 “TROUBLE-SHOOTING” for additional information.

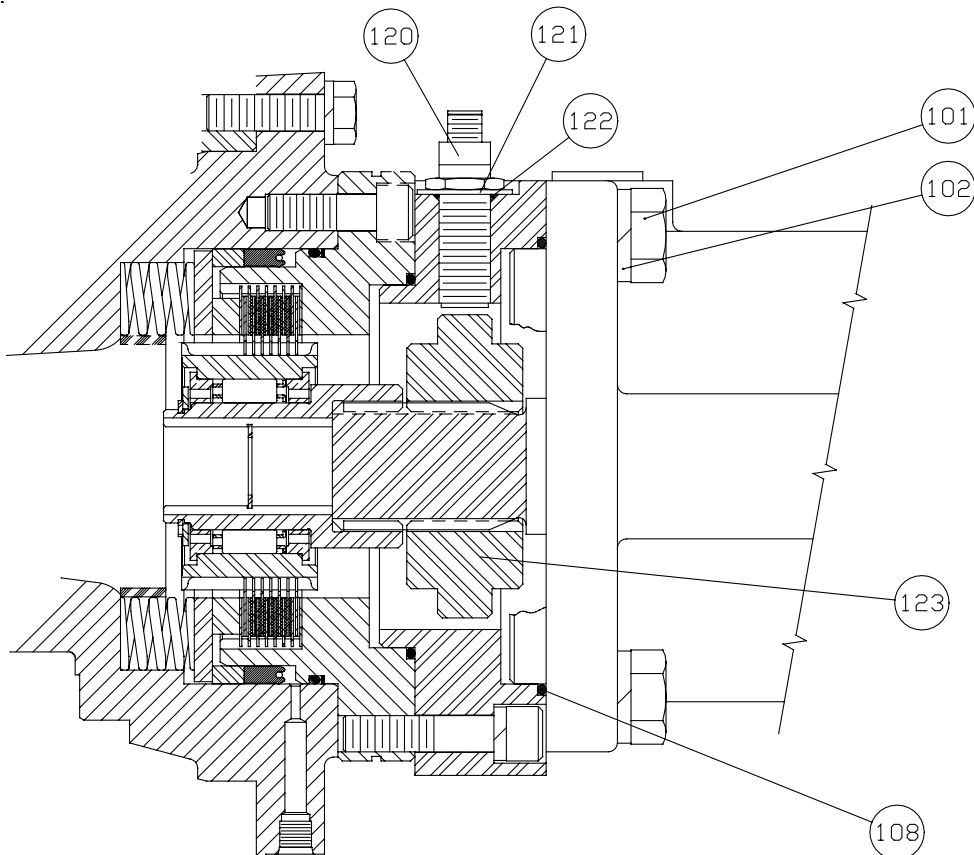
# PD17A ROTATION INDICATION PROXIMITY SENSOR

Early PD17A models have a rotation indicator proximity sensor and hub between the motor and the hoist. If the sensor is removed or replaced, use the following procedure for adjustment and testing. Refer to the drawing below for item numbers.

## ⚠ CAUTION ⚠

If sensor hub is not correctly positioned with a lobe directly under the sensor port, proper adjustment may not be possible and severe damage to the sensor and internal hoist components may result.

1. Install a new O-ring (item 108) onto motor pilot.
2. Install sensor hub (item 123) onto motor shaft, positioning the sensor hub so that one of the lobes will be directly under the sensor port.
3. Install the motor onto the hoist.
4. Install capscrews and lockwashers (items 101 & 102) securing the motor to motor adapter.
5. Install flatwasher (item 121) and O-ring (item 122) onto new sensor (item 120).
6. Apply a small amount of silicone sealant to the threads just below the washer and O-ring. **(DO NOT apply sealant to the end of the sensor or to the threads of the sensor port where it could be pushed into the hoist.)**
7. Install the sensor into the motor adapter until it contacts the sensor hub.
8. Back sensor out of the port 2 complete turns.
9. Attach wire harness to sensor to verify proper sensor operation. IT IS NOT necessary to operate the hoist motor.
10. If sensor light is on, hold sensor from turning and tighten jam nut against motor adapter. If light is off or blinks intermittently, adjust sensor inward toward sensor hub until light remains on, then tighten jam nut.



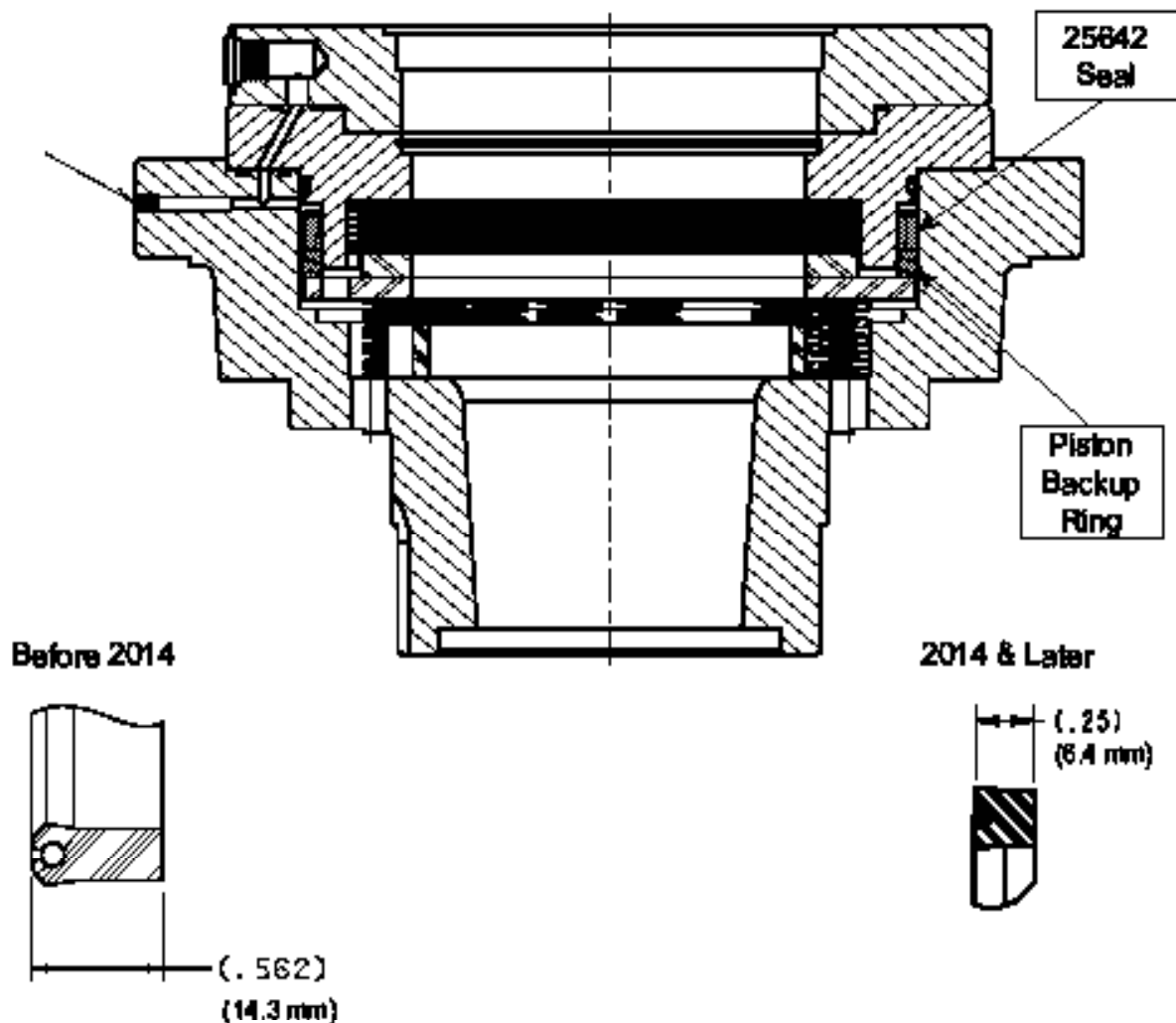
LIT2636 R1  
February 2014**25642 BRAKE PISTON SEAL**

**MODELS AFFECTED:** BG8A, BG8B, BH3A, GPH40A, H20R, H35R, H55R, H80, H85, H90, HP35A, HP50B, HRD40A, HUP12A, PA90, PCD24B, PD10E, PD12C, PD15B, PD17A, PD18B, PD18C, PD18D, PD33A, PD35A, PD7C, SB18A, SD86A

Beginning January 2014 the 25642 seal has been modified as specified below.

To improve quality to our customers the overall dimension of the 25642 seal was shortened from .562 in. (14.3mm) in overall length to .25 in. (6.4mm). This will result in more accurate end of the line testing from our factories to detect leaks in our brake assemblies. The longer seal would fill voids during our leak test not allowing the operator to detect a leak.

Please note modifications below:



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# METRIC CONVERSION TABLE

English to Metric

Metric to English

English to Metric			Metric to English		
<b>LINEAR</b>					
inches (in.)	X 25.4	= millimeters (mm)	millimeters (mm)	X 0.03937	= inches (in.)
feet (ft.)	X 0.3048	= meters (m)	meters (m)	X 3.281	= feet (ft.)
miles (mi.)	X 1.6093	= kilometers (km)	kilometers (km)	X 0.6214	= miles (mi.)
<b>AREA</b>					
inches <sup>2</sup> (sq.in.)	X 645.15	= millimeters <sup>2</sup> (mm <sup>2</sup> )	millimeters <sup>2</sup> (mm <sup>2</sup> )	X 0.000155	= inches <sup>2</sup> (sq.in.)
feet <sup>2</sup> (sq.ft.)	X 0.0929	= meters <sup>2</sup> (m <sup>2</sup> )	meters <sup>2</sup> (m <sup>2</sup> )	X 10.764	= feet <sup>2</sup> (sq.ft.)
<b>VOLUME</b>					
inches <sup>3</sup> (cu.in.)	X 0.01639	= liters (l)	liters (l)	X 61.024	= inches <sup>3</sup> (cu.in.)
quarts (qts.)	X 0.94635	= liters (l)	liters (l)	X 1.0567	= quarts (qts.)
gallons (gal.)	X 3.7854	= liters (l)	liters (l)	X 0.2642	= gallon (gal.)
inches <sup>3</sup> (cu.in.)	X 16.39	= centimeters <sup>3</sup> (cc)	centimeters <sup>3</sup> (cc)	X 0.06102	= inches <sup>3</sup> (cu.in.)
feet <sup>3</sup> (cu.ft.)	X 28.317	= liters (l)	liters (l)	X 0.03531	= feet <sup>3</sup> (cu.ft.)
feet <sup>3</sup> (cu.ft.)	X 0.02832	= meters <sup>3</sup> (m <sup>3</sup> )	meters <sup>3</sup> (m <sup>3</sup> )	X 35.315	= feet <sup>3</sup> (cu.ft.)
fluid ounce (fl.oz.)	X 29.57	= milliliters (ml)	milliliters (ml)	X 0.03381	= fluid ounce (fl.oz.)
<b>MASS</b>					
ounces (oz.)	X 28.35	= grams (g)	grams (g)	X 0.03527	= ounces (oz.)
pounds (lbs.)	X 0.4536	= kilograms (kg)	kilograms (kg)	X 2.2046	= pounds (lbs.)
tons (2000 lbs.)	X 907.18	= kilograms (kg)	kilograms (kg)	X 0.001102	= tons (2000 lbs.)
tons (2000 lbs.)	X 0.90718	= metric tons (t)	metric tons (t)	X 1.1023	= tons (2000 lbs.)
tons (long) (2240 lbs.)	X 1013.05	= kilograms (kg)	kilograms (kg)	X 0.000984	= tons (long) (2240 lbs.)
<b>PRESSURE</b>					
inches Hg (60 °F)	X 3600	= kilopascals (kPa)	kilopascals (kPa)	X 0.2961	= inches Hg (60 °F)
pounds/sq.in. (PSI)	X 6.895	= kilopascals (kPa)	kilopascals (kPa)	X 0.145	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.0703	= kilograms/sq.cm. (kg/cm <sup>2</sup> )	kilograms/sq.cm. (kg/cm <sup>2</sup> )	X 14.22	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.069	= bars	bars	X 14.5	= pounds/sq.in. (PSI)
inches H <sub>2</sub> O (60 °F)	X 0.2488	= kilopascals (kPa)	kilopascals (kPa)	X 4.0193	= inches H <sub>2</sub> O (60 °F)
bars	X 100	= kilopascals (kPa)	kilopascals (kPa)	X 0.01	= bars
<b>POWER</b>					
horsepower (hp)	X 0.746	= kilowatts (kW)	kilowatts (kW)	X 1.34	= horsepower (hp)
ft.-lbs./min.	X 0.0226	= watts (W)	watts (W)	X 44.25	= ft.-lbs./min.
<b>TORQUE</b>					
pound-inches (in.-lbs.)	X 0.11298	= newton-meters (N-m)	newton-meters (N-m)	X 8.851	= pound-inches (in.-lbs.)
pound-feet (ft.-lbs.)	X 1.3558	= newton-meters (N-m)	newton-meters (N-m)	X 0.7376	= pound-feet (ft.-lbs.)
pound-feet (ft.-lbs.)	X .1383	= kilograms/meter (kg-m)	kilogram/meter (kg-m)	X 7.233	= pound-feet (ft.-lbs.)
<b>VELOCITY</b>					
miles/hour (m/h)	X 0.11298	= kilometers/hour (km/hr)	kilometers/hour (km/hr)	X 0.6214	= miles/hour (m/h)
feet/second (ft./sec.)	X 0.3048	= meter/second (m/s)	meters/second (m/s)	X 3.281	= feet/second (ft./sec.)
feet/minute (ft./min.)	X 0.3048	= meter/minute (m/min)	meters/minute (m/min)	X 3.281	= feet/minute (ft./min.)
<b>TEMPERATURE</b>					
°Celsius = 0.556 ( °F - 32)			°Fahrenheit = (1.8 °C) + 32		
<b>COMMON METRIC PREFIXES</b>					
mega	(M)	= 1,000,000 or 10 <sup>6</sup>	deci	(d)	= 0.1 or 10 <sup>-1</sup>
kilo	(k)	= 1,000 or 10 <sup>3</sup>	centi	(c)	= 0.01 or 10 <sup>-2</sup>
hecto	(h)	= 100 or 10 <sup>2</sup>	milli	(m)	= 0.001 or 10 <sup>-3</sup>
deka	(da)	= 10 or 10 <sup>1</sup>	micro	(µ)	= 0.000.001 or 10 <sup>-6</sup>

