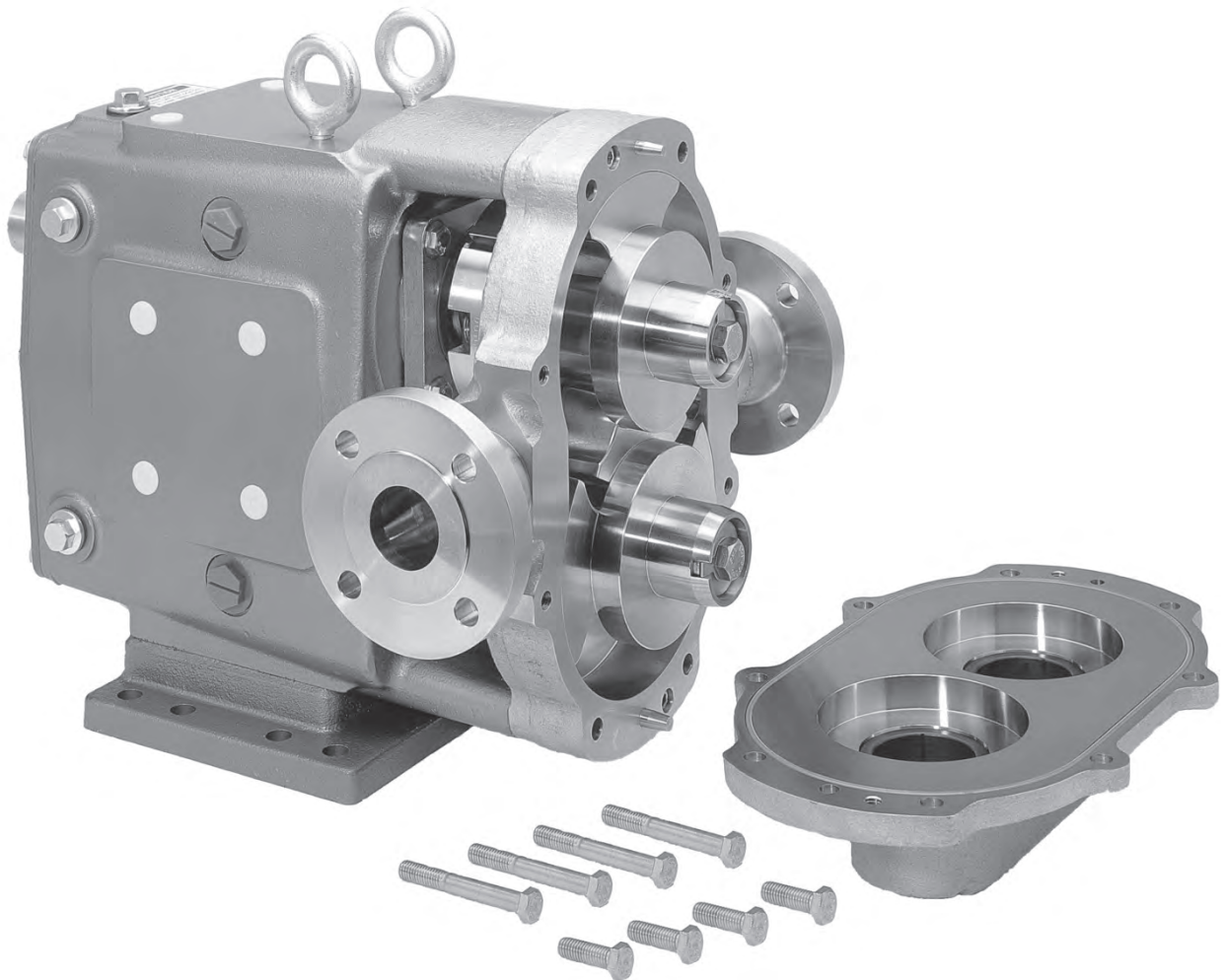


Universal 5000 Industrial Series

ROTARY POSITIVE DISPLACEMENT PUMP

FORM NO.: 95-03012 REVISION: 12/2015

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



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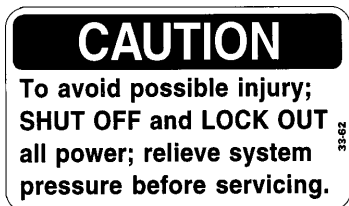
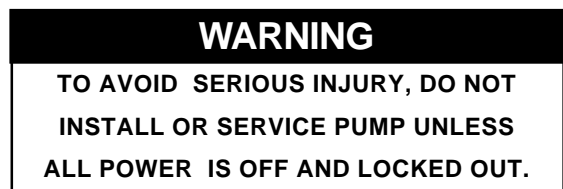
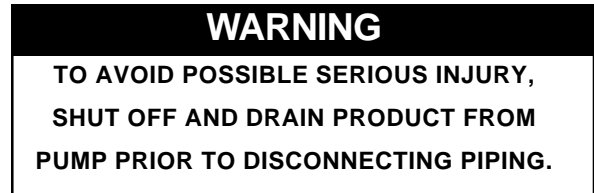
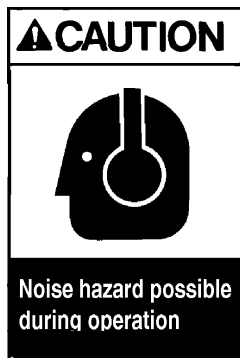
SAFETY

Warnings, cautions and notes are contained in this manual. To avoid serious injury and/or possible damage to equipment, pay attention to these messages.

WARNING Hazards or unsafe practices which COULD result in severe personal injury or death and how to avoid it.

CAUTION Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

NOTE Important information pertaining directly to the subject.
(Information to be aware of when completing the task.)



REPLACEMENT LABEL
See Page 57



REPLACEMENT LABEL
See Page 57

SEE PAGE 57 FOR LABEL PLACEMENT



SECTION I

RECEIVING AND WARRANTY

WAUKESHA CHERRY-BURRELL WARRANTY

Seller warrants its products to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. This warranty shall not apply to products which require repair or replacement due to normal wear and tear or to products which are subjected to accident, misuse or improper maintenance. This warranty extends only to the original Buyer. Products manufactured by others but furnished by Seller are exempted from this warranty and are limited to the original manufacturer's warranty.

Seller's sole obligation under this warranty shall be to repair or replace any products that Seller determines, in its discretion, to be defective. Seller reserves the right either to inspect the products in the field or to request their prepaid return to Seller. Seller shall not be responsible for any transportation charges, duty, taxes, freight, labor or other costs. The cost of removing and/or installing products which have been repaired or replaced shall be at Buyer's expense.

Seller expressly disclaims all other warranties, express or implied, including without limitation any warranty of merchantability of fitness for a particular purpose. The foregoing sets forth Seller's entire and exclusive liability, and Buyer's exclusive and sole remedy, for any claim of damages in connection with the sale of products. In no event shall Seller be liable for any special consequential incidental or indirect damages (including without limitation attorneys' fees and expenses), nor shall Seller be liable for any loss of profit or material arising out of or relating to the sale or operation of the products based on contract, tort (including negligence), strict liability or otherwise.

FACTORY INSPECTION

Each WAUKESHA pump is shipped completely assembled, lubricated and ready for use. (See OPERATION on page 15). The WAUKESHA pump is a precision product, designed to provide long, trouble-free service in a properly designed system with normal maintenance.

RECEIVING INSPECTION

Ports are covered at the factory to keep out foreign objects. If covers are missing or damaged, a thorough inspection of fluid head, by removing pump cover, is recommended. Be sure pumping head is clean and free of foreign material before rotating shaft.

LOSS OR DAMAGE

If your pump has been lost or damaged in transit, file a claim at once with the delivering carrier and ask for an Inspector to call. The carrier has signed the Bill of Lading acknowledging that the shipment has been received from us in good condition.

We will of course assist you in every way in collecting claims for loss, or damage, however, we are not responsible for the collection of claims or replacement of material.

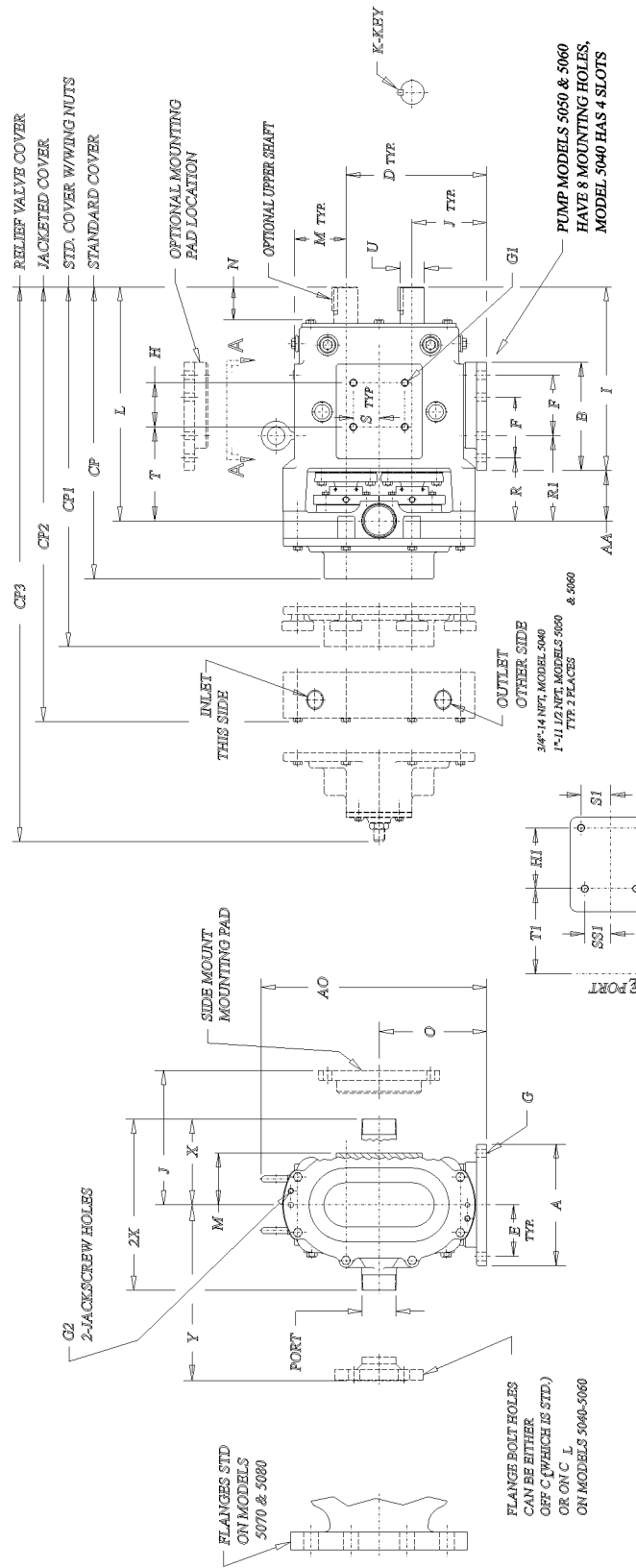
WARRANTY

Please read the Warranty statement to correctly determine if you have a claim. In warranty claims you must have a "Returned Goods Authorization" (RGA) from the manufacturer before any returns will be accepted. Your Distributor will help you in a warranty problem. (See page 55 for Information required)

SECTION II INSTALLATION

UNIVERSAL-INDUSTRIAL PUMP DIMENSIONAL STAINLESS STEEL BODIES

PUMP SHOWN IS A MODEL 5000U



NOTES: 1) TO HOLD PORT TO MOUNTING THE SAME AS OLD "T" PUMPS.
USE HOLES DIMENSIONED FROM PORT BY "R"
2) TO HOLD SHAFT TO MOUNTING THE SAME AS OLD "T" PUMPS.
USE HOLES DIMENSIONED FROM PORT BY "RI"

FOR MODELS 5040, 5050 & 5060
FLANGE OPTIONS ARE THE
SAME SIZE, 150# FLANGES.

150# FLANGE
LARGE 5040/5060
NPT
STD
COVER

PUMP MODELS 5050 & 5060
HAVE 8 MOUNTING HOLES,
MODEL 5040 HAS 4 SLOTS

SIZE PUMP	A	AA	A0	B	CP	CP1	CP2	CP3	D	E	F	G	G1	G2	H	HI	I	J	K	L	M	N	O	PORT	R	RI	S	SI	SS1	T	TI	U	X	2X	Y	2Y	WT.
5040	IN 6.25	4.06	10.04	4.25	16.52	16.52	16.91	18.84	6.86	2.31	2.56	4.16	30-16x58	5/16-18	1.81	2.75	8.83	3.56	.25	12.88	2.62	2.32	5.21	1 1/2"-11 1/2" NPT	4.87	-	1.12	1.12	1.12	5.28	4.87	1.250	4.69	9.37	5.96	11.91	100
MM	159	103	255	108	419	419	430	473	174	59	65	106	-	-	46	70	224	90	63	327	67	59	132	-	124	-	28	28	28	134	124	31.75	119	238	151	303	45
5050	IN 8.25	3.40	15.31	7.38	19.83	19.83	20.4	23.08	9.59	3.50	4.13	.56	1/2-13x7/8	3/8-16	3.00	4.13	12.49	5.06	.375	15.98	3.50	2.26	7.31	2"-11 1/2" NPT	4.28	5.78	1.75	2.00	1.75	6.37	5.78	1.625	5.81	11.62	6.63	13.25	240
MM	210	86	393	167	504	504	519	596	243	89	105	14	-	-	76	105	317	129	92	404	89	57	166	-	109	147	44	51	44	162	147	41.28	148	295	168	337	109
5060	IN 8.25	4.10	15.31	7.38	20.78	20.78	21.38	24.03	9.56	3.50	4.13	.56	1/2-13x7/8	3/8-16	3.00	4.13	12.49	5.06	.375	15.98	3.50	2.25	7.31	2 1/2"-9" NPT	4.97	6.47	1.75	2.00	1.75	7.07	6.47	1.625	5.81	11.83	6.75	13.90	245
MM	210	104	389	187	528	528	543	610	243	89	105	14	-	-	76	105	317	129	92	421	89	57	186	-	126	164	44	51	44	160	164	41.28	148	295	171	343	111
5070	IN 11.00	4.27	18.13	9.50	26.31	26.31	28.31	28.90	12.39	4.75	7.50	.66	1/2-13x1.00	1/2-13	5.38	5.38	15.29	6.38	.50	19.86	4.50	2.75	9.38	4"-150# FLANGE	5.27	-	2.69	2.69	2.69	7.07	7.07	2.000	-	-	7.37	14.75	47.5
MM	279	108	466	241	668	668	-	724	314	121	191	17	-	-	137	137	398	162	127	497	114	70	238	-	134	-	68	68	68	190	190	90.00	-	-	187	375	215
5080	IN 12.00	4.12	21.38	11.63	30.17	30.17	-	34.05	13.88	5.25	8.00	.66	1/2-13x1.00	5/8-11	5.38	5.38	17.80	6.86	1.625	21.02	5.06	4.06	10.38	6"-150# FLANGE	5.37	-	2.69	2.69	2.69	8.37	8.37	2.375	-	-	8.00	16.00	81.0
MM	305	105	568	285	768	768	-	865	353	133	203	17	-	-	137	137	452	175	159	557	129	103	264	-	136	-	68	68	68	213	213	60.33	-	-	203	406	367

INSTALLATION

PUMP INSTALLATION

The installation of your Waukesha pump and its piping system should follow the practices described to give optimum performance, and be in accordance with local codes and restrictions.

All system equipment, such as motors, sheaves, drive couplings, speed reducers, etc., must be properly sized to insure satisfactory operation of your Waukesha pump within its limits.

CAUTION: Waukesha pumps are positive displacement, low slip design and will be severely damaged if operated with closed valves in discharge or inlet lines. Pump warranty is not valid for damages caused by a hydraulic overload from operation or start-up with a closed valve in the system.

WARNING

Full coupling guards must be installed to isolate operators and maintenance personnel from rotating components. Coupling guards are provided with Waukesha pumps as a part of a complete pump and drive package.

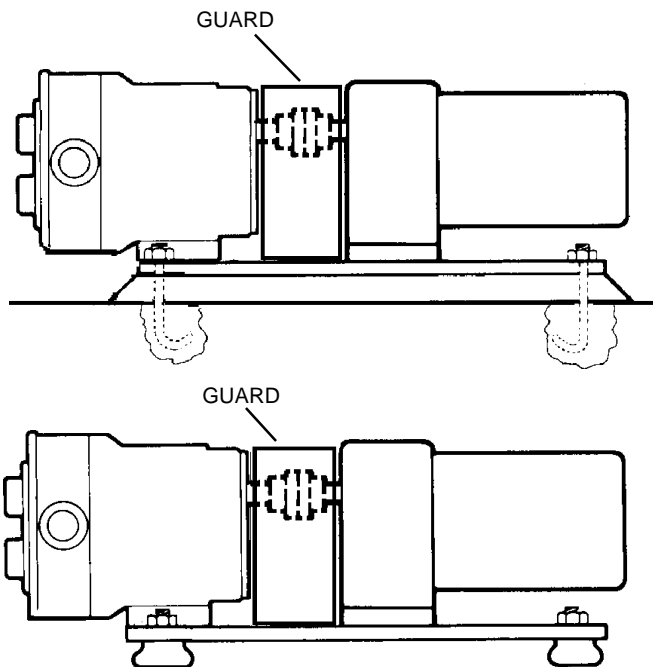
1. Installing the Pump and Drive Unit. Pumps of this type and size are generally mounted on a common base plate with the drive.

The unit can be installed in the plant location in several ways:

Permanent installation on foundation with bolts and grout. (Level unit before grouting.)

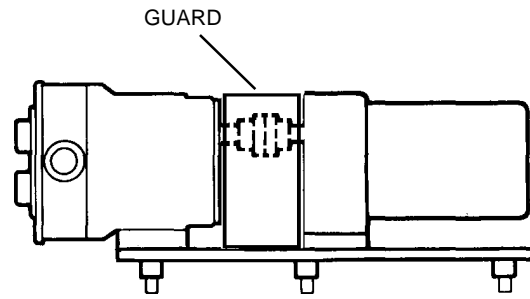


Leveling and/or vibration isolation pads.

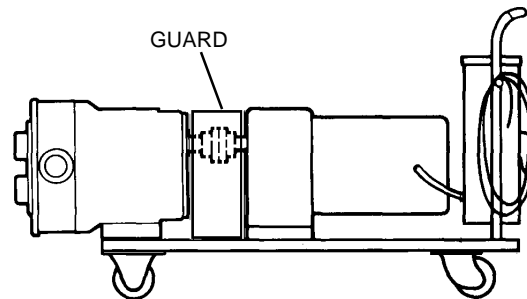


Many commercial types available.

Adjustable leg base, commonly used for sanitary pumps. For washdown under base. Can be easily moved or repositioned.



Portable bases-for movement to different locations.



WARNING
 TO AVOID SERIOUS INJURY, DO NOT
 INSTALL OR SERVICE PUMP UNLESS
 ALL POWER IS OFF AND LOCKED OUT.

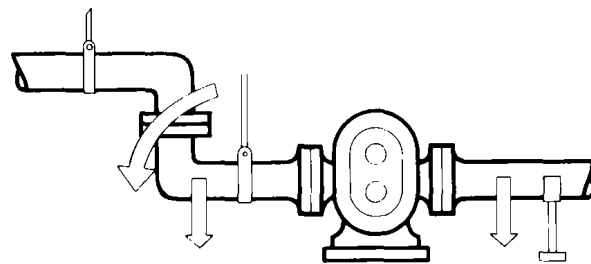
2. Good Piping Practice.

All piping to the pump should be supported independently, to minimize the forces exerted on the pump. Such forces can cause misalignment of pump parts and lead to excessive wear of rotors, bearings and shafts.

NOTE: Pump dimensions and pump weights are on page 4.

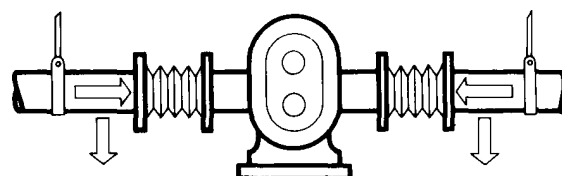
Piping support:

Weight of piping and fluid-support piping independently with hangers or pedestals.



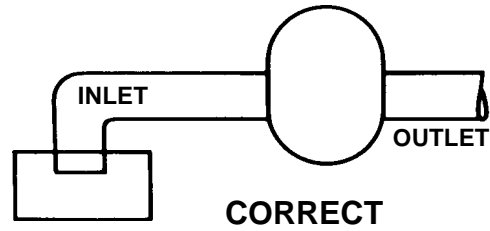
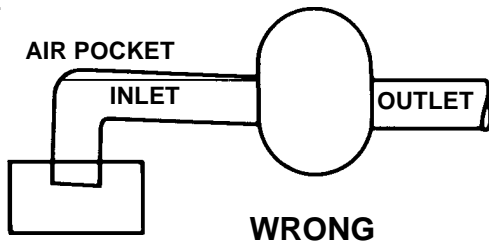
Thermal expansion of piping-can cause tremendous forces. Use thermal expansion joints to minimize forces on pump.

Flexible joints can also be used to limit the transmission of mechanical vibration. Anchor free ends of any flexible hose in system.

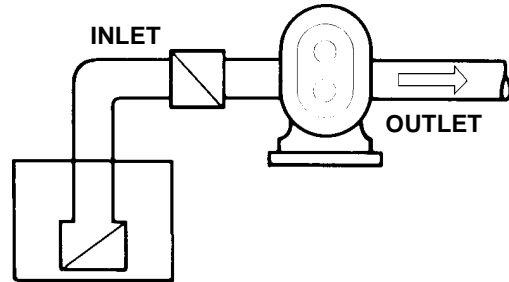


Piping Layout

Inlet side: Slope piping up to inlet to avoid air pocket.

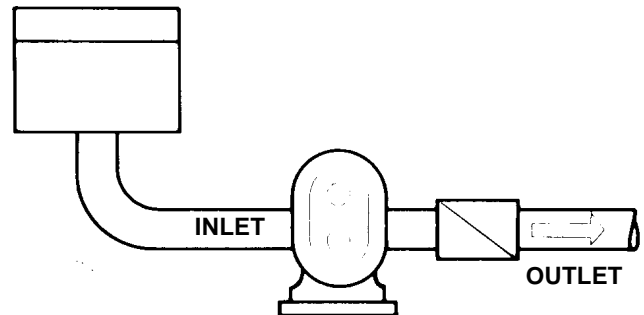


Inlet side-use check valves to keep inlet line full, particularly with low viscosity fluids, and in start-stop operation.

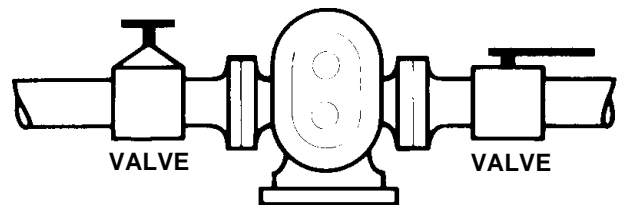


Inlet Vacuum Service-use check valve on outlet side.

- Prevents backflow (air or fluid).
- Facilitates initial start-up (minimizes differential pressure pump must supply to start flow).

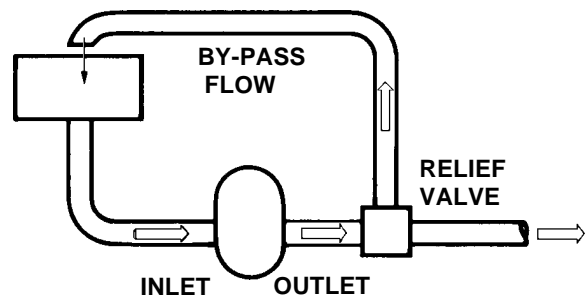


"Isolation" Valves-permit pump maintenance and removal safely and without emptying entire system relief valve.

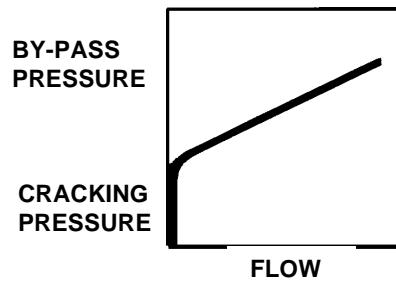


Relief Valve

To protect the pump and piping system against excessive pressure, a relief valve should be installed. An integral relief valve, designed to bypass the fluid internally from the pump outlet to the inlet, should not be used on applications where the discharge must be closed for more than a few minutes. Prolonged operation of the pump with closed discharge will cause heating of the fluid circulating through the relief valve. When such operation is necessary, the relief valve, whether integral, attachable, or line-mounted, should discharge externally through piping connected to the fluid source, or if that is not practical, into the inlet piping near the source.



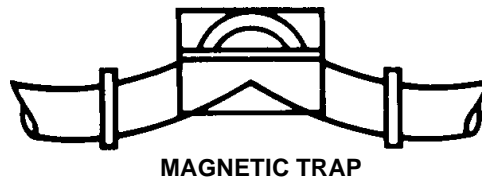
A particular relief valve design will have a characteristic curve such as shown. The "cracking pressure" can usually be set by spring adjustment, or by adjustable pneumatic pressure, etc. Flow will begin to bypass when this "cracking pressure" is reached. As flow increases through the bypass, the system pressure will also increase.



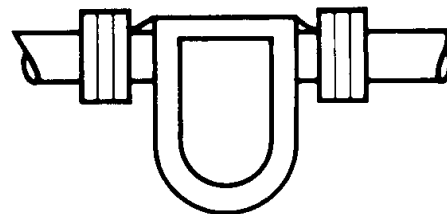
The pressure increase for a given valve design depends on the valve setting, the flow rate, and the viscosity of the fluid being pumped. If the full-flow bypass pressure exceeds the maximum allowable for the particular pump and piping system, an oversize attachable relief valve may sometimes be used to limit the full-flow bypass pressure to an acceptable value.

Inlet Side-Strainers and Traps.

Inlet side strainers and traps can be used to prevent pump damage from foreign matter. Selection must be carefully made as clogging can easily occur, restricting the inlet, causing cavitation and flow stoppage.



MAGNETIC TRAP

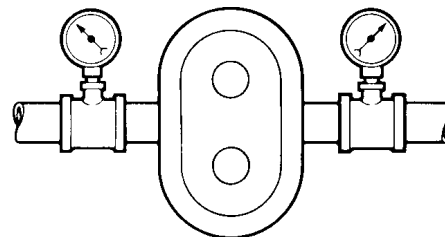


STRAINER

Pressure Gauges

Pressure and Vacuum gauges provide the easiest way to tell you something about the pump operation.

- Normal or abnormal pressures
- Overload conditions
- Indication of flow
- Changes in pump condition
- Changes in system conditions
- Changes in fluid viscosity



Wherever possible-install gauges!!

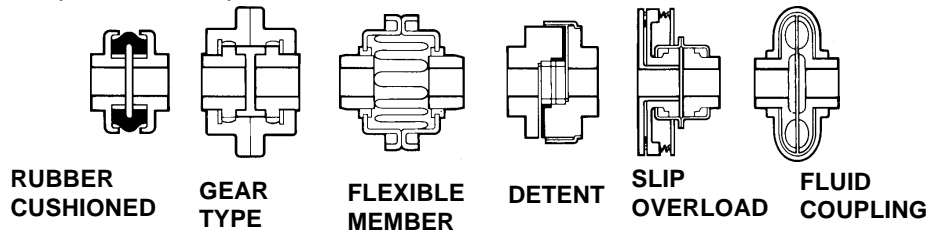
3. Alignment of Pump to Drive.

Pumps and drives which are ordered from the factory and mounted on a common base plate are accurately aligned before shipment. The alignment should be rechecked after the complete unit has been installed and the piping completed. Periodic rechecking is advisable during the pump service life.

WARNING
TO AVOID SERIOUS INJURY, DO NOT
INSTALL OR SERVICE PUMP UNLESS
ALL POWER IS OFF AND LOCKED OUT.

In-line Drives. For initial pump installation, and for rechecking alignment, the following steps are advised:

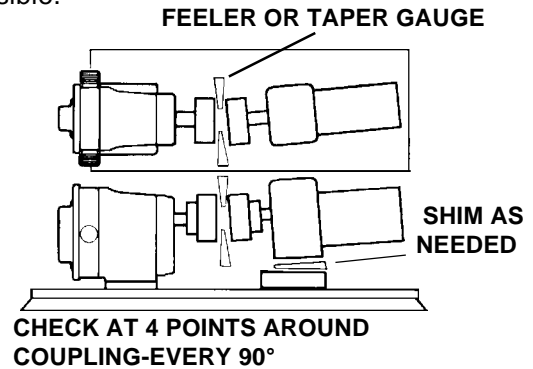
Use a flexible coupling to connect the drive to the pump. Many different types are available, including couplings with slip or overload provision.



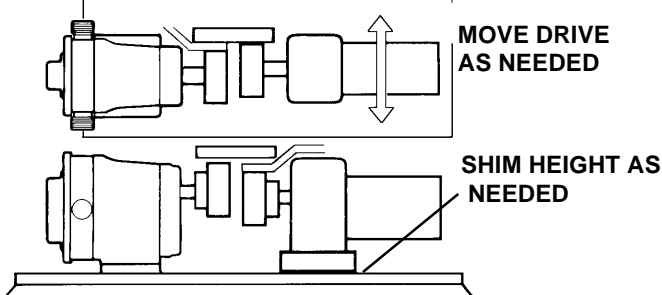
A flexible coupling is used to compensate for end play and small differences in alignment. The pump and drive shaft should be aligned as closely as is possible.

Check angular alignment:

Using feeler gauges, or taper gauges. Adjust to get equal dimension at all points. At the same time set space between coupling halves to manufacturer's recommended distance.



Check parallel misalignment: Use straight edges and shims:



After piping is complete, and drive and couplings are aligned, turn pump shaft manually to see if it turns freely without binding.

Check rotation direction of drive to see that pump will rotate in proper direction. ("Liquid End" of pump is shown below.)

Note: Covers have been removed for illustration purposes only. The pump cannot be operated with the cover removed.

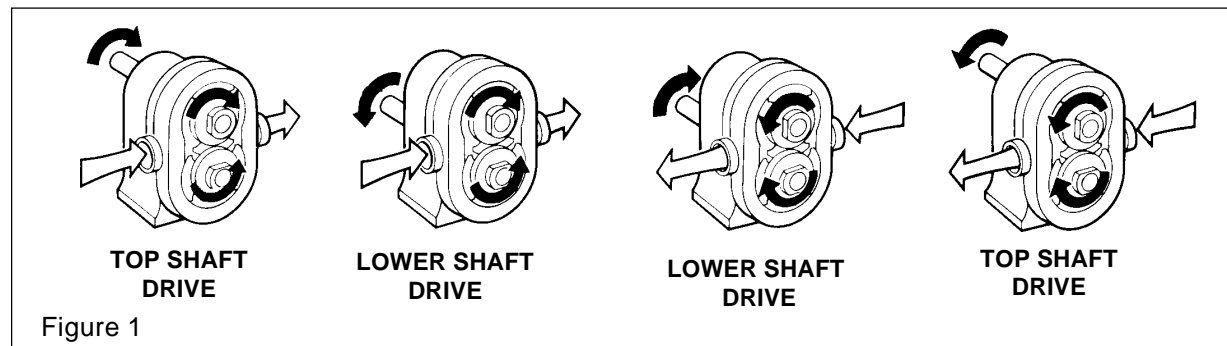
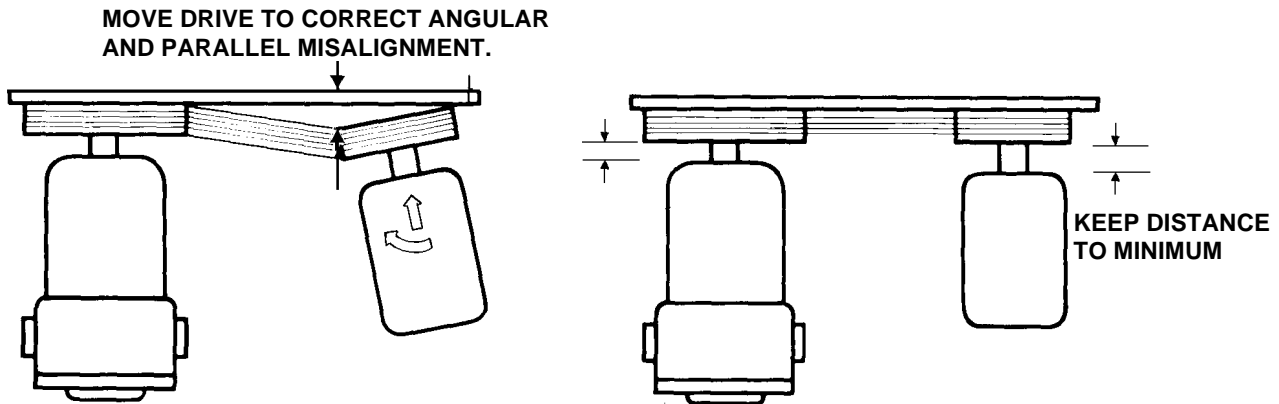


Figure 1

**Determine rotation direction by looking at the motor coupling.
CONNECT COUPLING HALVES AND INSTALL COUPLING GUARD.**

Aligning belt and chain drives. Using straight-edges and visual check:



After piping is complete and before belts are installed, **turn pump shaft manually** to see that it turns freely.

Check rotation direction of pump to see that pump will rotate in proper direction (see figure 1, page 9)

Install belts and tension them correctly. Install belt guard.

SECTION III

START-UP CHECK LIST

The Waukesha Pump is a positive displacement pump and thus can develop very high pressures. To protect lines, equipment and personnel, certain precautions must be taken.

1. Review Section II, page 7, particularly "Relief Valves". Install relief valves if needed in system.
2. Check that piping and pump are clean and free of foreign material, such as welding slag, gaskets, etc. **Do not use pump to flush system.**
3. See that all piping connections are tight and leak-free. Where possible, check system with "non-hazardous" fluid.
4. Check to see that pump and drive are lubricated. See Section V, page 15. Check Drive Lubrication Instruction.
5. Check that all guards are in place and secure.
- 6 Seals: Double mechanical and double O-ring seals with flushing require adequate supply and flow of clean flushing fluids.
7. See that all valves are open on discharge system, and that free flow path is open to destination.
8. See that all valves are open on inlet side, and that fluid can reach pump.
9. Check direction of pump and drive rotation. (See page 9)
10. Start pump drive. Where possible, start at slow speed, or jog.

Check to see that liquid is reaching pump within several minutes. If pumping does not begin and stabilize, check items under "No Flow" or "Insufficient Flow" in Section IV, (Page 11)

SECTION IV

TROUBLESHOOTING A PUMPING SYSTEM

Once a pump is properly selected and installed in a system, operation should be trouble free. However, in existing systems, or as pump and system conditions change, problems may develop. Following are some troubleshooting hints to help identify and solve problems.

WARNING

**TO AVOID SERIOUS INJURY, DO NOT
INSTALL OR SERVICE PUMP UNLESS
ALL POWER IS OFF AND LOCKED OUT.**

WARNING

**TO AVOID POSSIBLE SERIOUS INJURY,
SHUT OFF AND DRAIN PRODUCT FROM
PUMP PRIOR TO DISCONNECTING PIPING.**

Problem	Probable Causes	Solutions
No flow, pump not turning	Drive motor not running	Check resets, fuses, circuit breakers
	Keys sheared or missing	Replace
	Drive belts, power transmission components slipping or broken	Replace or adjust
	Pump shaft, keys, or gears sheared	Inspect: replace parts
No flow, pump turning	Wrong direction of rotation	Reverse direction
No flow, pump not priming	Valve closed in inlet line	Open valve
	Inlet line clogged or restricted	Clear line, clean filters, etc.
	Air leaks due to bad seals or pipe connections	Replace seals; check lines for leakage (can be done by air pressure or by filling with liquid and pressurizing with air)
	Pump speed too slow	Increase speed. Filling inlet lines with fluid may allow initial start-up. Foot valve may solve start-up problems permanently.
	Liquid drains or siphons from system during off periods	Use foot valve or check valves

TROUBLESHOOTING


Problem	Probable Causes	Solutions
No flow, pump not priming	"Air" lock. Fluids which "gas off", or vaporize, or allow gas to come out of solution during off periods	Manual or automatic air bleed from pump or lines near pump
	Extra clearance rotors, worn pump	Increase pump speed, use foot valve to improve priming
	Net inlet pressure available too low	Check NIPA, NIPR~, recalculate system. Change inlet system as needed.
	On "Vacuum" inlet system: On initial start-up, atmospheric "blow back" prevents pump from developing enough differential pressure to start flow.	Install check valve in discharge line
No flow	Relief valve not properly adjusted, or held off seat by foreign material (flow is being recirculated to inlet)	Adjust or clear valve
Insufficient flow	Speed too low to obtain desired flow	Check flow-speed curve
	Air leak due to bad seals or pipe connections	Replace seals, check inlet fittings.
Fluid vaporization ("starved" pump inlet)	Strainers, foot valves, inlet fittings or lines clogged	Clear lines. If problem continues, inlet system may require change
	Inlet line size too small, inlet line too long. Too many fittings or valves. Foot valve, strainers too small .	Increase inlet line size. Reduce length, minimize direction and size changes, reduce number of fittings.
	NIPA too low	Raise liquid level in source tank
	NIPA too low	Increase by raising or pressurizing source tank

NIPA - Net Inlet Pressure Available at Pump
NIPR - Net Inlet Pressure Required by Pump

TROUBLESHOOTING

Problem	Probable Causes	Solutions
Fluid vaporization ("starved" pump inlet)	NIPA too Low	Select larger pump size with smaller NIPR
	Fluid viscosity greater than expected	Reduce pump speed and accept lower flow, or change system to reduce line losses.
	Fluid temperature higher than expected (vapor pressure higher)	Reduce temperature, reduce speed and accept lower flow or change system to increase NIPA
Insufficient flow. Fluid being bypassed somewhere	Relief valve not adjusted or jammed	Adjust or clear
	Flow diverted in branch line, open valve, etc.	Check system and controls
Insufficient flow. High slip	Hot (HC) or extra clearance rotors on "cold" fluid, and/or low viscosity fluid	Replace with standard clearance rotors
	Worn pump	Increase pump speed (within limits). Replace rotors, recondition pump.
	High pressure	Reduce pressure by system changes
Noisy operation	Cavitation	
	High fluid viscosity, High vapor pressure fluids, High temperature	Slow down pump, reduce temperature, change system
	NIPA less than NIPR see Engineering Manual	To increase NIPA or reduce NIPR,
	Air or gas in fluid	
	Leaks in pump or piping	Correct leaks
	Dissolved gas or naturally aerated products	Minimize discharge pressure. Also see "Cavitation" above.
	•Mechanical noises Rotor to body contact	
	Improper assembly	Check clearance with shims. See page 34 and 35.

TROUBLESHOOTING

Problem	Probable Causes	Solutions
<p>Noisy operation</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>CAUTION</p>  <p>Noise hazard possible during operation</p> </div>	<ul style="list-style-type: none"> • Rotor to body contact Distortion of pump due to improper piping installation. Pressure higher than rated Worn bearing Worn gears <p style="text-align: center;">Rotor to rotor contact</p> <ul style="list-style-type: none"> Loose or mis-timed gears. twisted shaft, sheared keys. worn splines <ul style="list-style-type: none"> • Relief valve chattering • Drive component noise-gear trains, chains, couplings, bearings. 	<ul style="list-style-type: none"> Reassemble pump or re-install piping to assure free running Reduce pressure if possible Rebuild with new bearings. Lubricate regularly Rebuild with new gears. Lubricate regularly <p style="text-align: center;">Rotor to rotor contact</p> <ul style="list-style-type: none"> Rebuild with new parts <ul style="list-style-type: none"> Re-adjust, repair or replace Repair or replace drive train
<p>Pump requires excessive power (overheats, stalls. high current draw, breakers trip)</p>	<ul style="list-style-type: none"> • Higher viscous losses than expected • Higher pressure than expected • Fluid characteristics <ul style="list-style-type: none"> Fluid colder than expected. viscosity high Fluid sets up in line and pump during shut down Fluid builds up on pump surfaces (example. latex, chocolate. fondants) 	<ul style="list-style-type: none"> If within pump rating, increase drive size Reduce pump speed, increase line sizes Heat fluid. insulate or heat trace lines. Use pump with more running clearances. Insulate or heat trace line. Install "soft start" drive. Install recirculating bypass system. Flush with other fluid. Use pump with more running clearance
<p>"Short" pump service life</p>	<ul style="list-style-type: none"> High corrosion rate Pumping abrasives Speeds and pressures higher than rated Worn bearings and gears due to lack of lubrication Misalignment of drive and piping. Excessive overhung load or misaligned couplings. 	<ul style="list-style-type: none"> Upgrade material of pump Larger pumps at slower speeds, can help Reduce speeds and pressures by changes in system Set up and follow regular lubrication schedule Check alignment of piping. Check drive alignment and loads. (Page 9)

SECTION V OPERATION


Normal operation covers a speed range of 0-600 RPM and pressure range of 0-200 PSI. Temperature range with standard rotors is -40° to 200° F. and with hot clearance rotors, 180° to 300° F. (*For operation at higher temperatures, consult SPX FLOW.*)

See START-UP CHECK LIST (Page 10) and TROUBLESHOOTING (Page 11-14) for additional operation information.

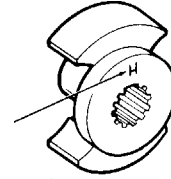
CAUTION

To avoid possible injury; **SHUT OFF and LOCK OUT all power; relieve system pressure before servicing.**

CAUTION



Noise hazard possible during operation



NOTE: All hot clearance rotors are identified with an etched letter "H" on rotor hub.

LUBRICATION

The gears are factory lubricated with ISO Grade 320 oil at the quantity shown for top or bottom shaft mounts. If you mount your pump other than top or bottom shaft drive, check oil level.

The bearings are factory greased with NLGI Grade No. 2, EP.

Change oil every 750 hours. If pump is installed where moisture and condensation are heavy, change oil more frequently.

Bearings must be greased every 750 hours or less depending on moisture and condensation conditions. Excess grease will accumulate in the gear case and can be removed through the cleanout hole covered with plastic plug.

NOTE: For hot or cold extremes use appropriate lubricant as shown in the following tables.

OIL
ISO Grade 320, SAE 140 or AGMA Number 6EP

GREASE
NLGI Grade No. 2, EP, Lithium-based lubricant is standard

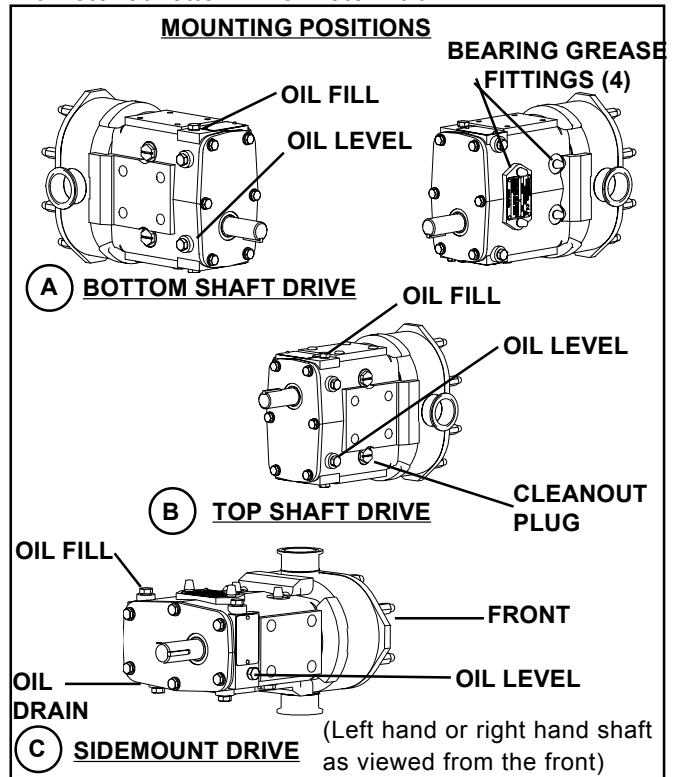
DRIVE LUBRICATION

Refer to drive manufacturer's manual shipped with unit.

CLEANING

The Waukesha pump is designed to be completely disassembled for thorough and easy cleaning. Clean the pump every day or at the end of a process. Disassemble the fluid head as outlined. Remove and clean the O-rings, sleeves and pump seals. Where possibility of material "setting up" during shut down exists, flushing with solvent or disassembly of fluid head and manual cleaning are required.

The Ductile Iron Pump should be coated with a rust preventative during extended shutdown periods and prior to storage.



MODEL	*OIL CAPACITY (GEARS)	
	SHAFT	
	TOP OR BOTTOM	SIDE MOUNT
5040	2 oz. (60 ml)	4 oz. (120 ml)
5050	6 oz. (170 ml)	9.5 oz. (280 ml)
5060	6 oz. (170 ml)	9.5 oz. (280 ml)
5070	11 oz. (320 ml)	20 oz. (600 ml)
5080	17 oz. (500 ml)	44 oz. (1300 ml)

*Oil Capacities are shown for reference. Fill oil to oil level line.

SECTION VI MAINTENANCE

GENERAL

In the maintenance of pumps it is important to recognize when parts are wearing excessively. Detecting wear in the early stages will let you repair your pump at minimum cost and get it back into operation at the earliest date.

Periodic cleaning and a simple "look-feel" inspection of your pump are recommended as good operating procedures and as a means of detecting signs of trouble at an early stage. They require only a few minutes and may save you an appreciable amount of money.

A more detailed maintenance inspection should be scheduled annually. See ANNUAL MAINTENANCE, Page 20.

The following routine "look-feel" checks are to be made by the system operator during shut-down periods.

WARNING
Disconnect power from pump drive before removing cover.

VISUAL CHECKS

CHECK ROTOR TIPS FOR WEAR AND CLEARANCE

Removal required: Cover, Rotors; see pages 21-22

1. Indications of metal-to-metal contact between rotor wings means the pump should be repaired or replaced.

CHECK ROTOR SPLINES FOR WEAR

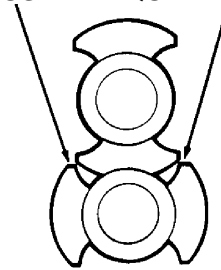
Cause	Corrective Measure
Worn shaft spline	Replace shaft.
Worn rotor spline	Replace rotor.

NOTE: Usually both parts will wear. The usual cause is a rotor which has been loose for extended running periods.

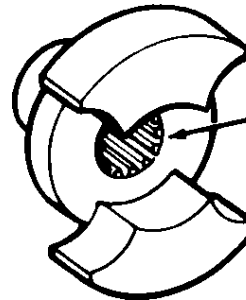
CHECK ROTOR HUB END for signs of wear. (End locks against the shaft shoulder.)

Cause	Corrective Measure
Extended running with loose rotor retaining bolts	Replace rotor or reshim shaft to maintain back face clearance. See Table 1 (Page 35) and Section IX, (Page 26)

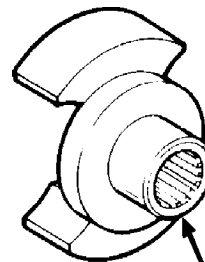
**CLEARANCE BOTH SIDES
MUST BE EQUAL**



SPLINE



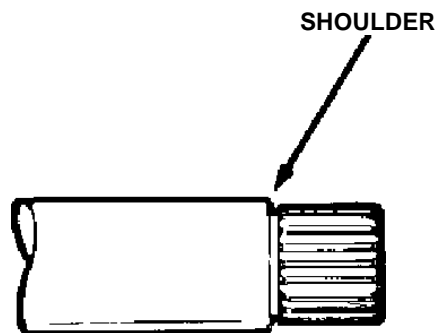
SPLINE



AREA OF WEAR

3. **CHECK SHAFT SHOULDER** for deterioration.
(Rotor hub locates against.)

Cause	Corrective Measure
Loose rotor shaft.....	Reshim or replace to maintain correct running clearances. (See table 1, Page 35)
Loose gears.....	Remove gear and inspect key, keyway and shaft. If all are in good condition, re-assemble and retighten gear retaining nuts to specified torque. (See Table 2. Page 35)



Worn gears.....	Replace gears.
Twisted shaft	Replace shaft.

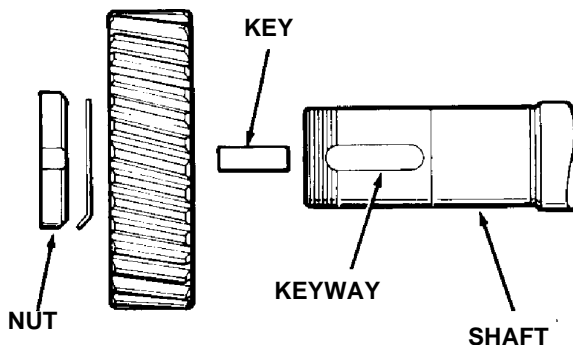
"FEEL" CHECKS

GEAR/BEARING CHECK

Removal required: Gearcase oil, gear cover, gears.
Page 31

1. **Gear Back Lash** - If there is any free movement when rotating either shaft without transmitting motion to other shaft, the back lash is excessive.

Cause	Corrective Measure
Worn gear teeth.....	Replace gear.
Gear loose on shaft	Remove gear and inspect key, keyway and shaft. If all are in good condition, re-assemble and re-tighten gear retaining nuts to specified torque. (See Table 2. Page 35)



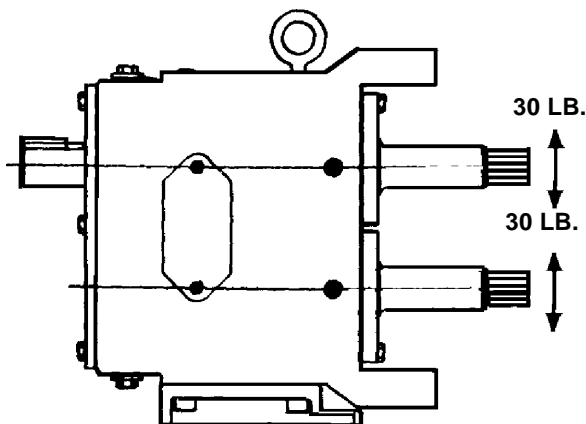
NOTE: Replace oil seal in cover when assembling.

CHECK BEARING CONDITION

Removal required; Fluid Head Assembly and Seals
Pages 21-22

2. **Bearing Condition** - If movement of either shaft can be detected when hand loading the rotor end of the shaft (approximately 30 lbs. force applied as illustrated), bearing may be failing.

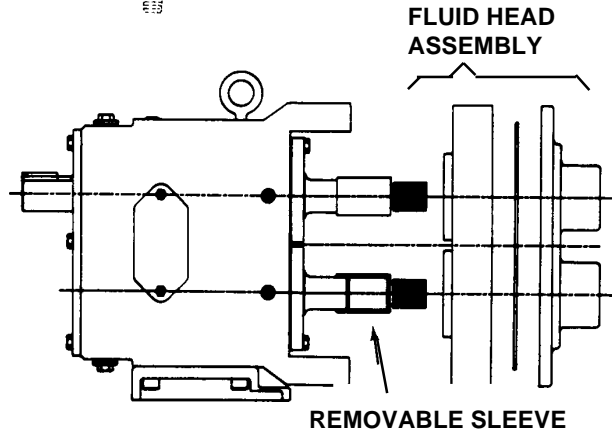
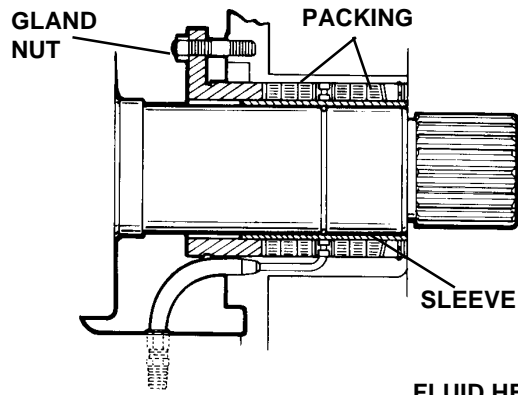
Cause	Corrective Measure
Lack of lubricant or high overload.....	Replace bearings and review lubrication schedule. (Page 15) Check for means to reduce hydraulic loads.



SEAL MAINTENANCE

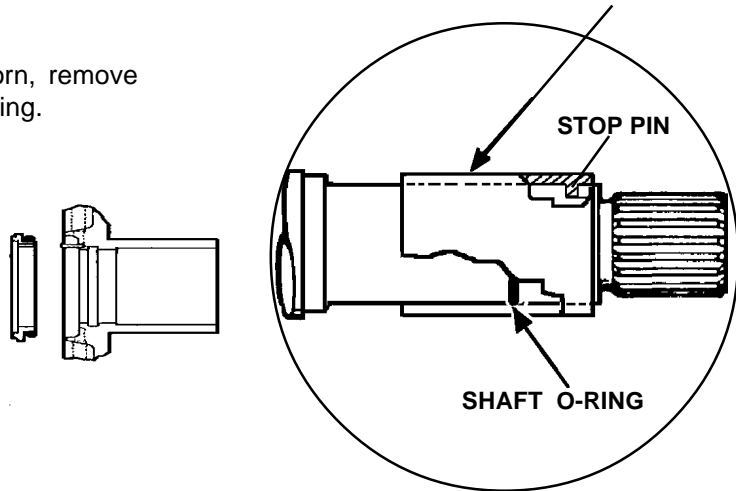
1. Packing Seal

- a. To suit the required service, a variety of packing materials and replaceable shaft sleeves are available. Standard packing material is braided teflon-compounds. Standard sleeves are 316 stainless; optional sleeves of ceramic coated stainless are available.
- b. External adjustment with gland nuts will maintain sealing until worn packing can be conveniently replaced.
- c. New packing ring can be installed by loosening gland, sliding it back and inserting packing into the cavity in front of gland.
- d. **DO NOT TIGHTEN GLAND EXCESSIVELY.** A small amount of liquid leakage is normal for packing lubrication.

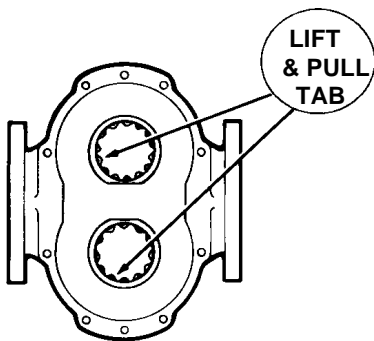


Packing Replacement

- a. To facilitate repacking, disassemble the fluid head assembly from bearing gear case. (See Section VIII, page 21)
- b. Clean and inspect shaft sleeves; if worn, remove and replace both sleeve and shaft O-ring.

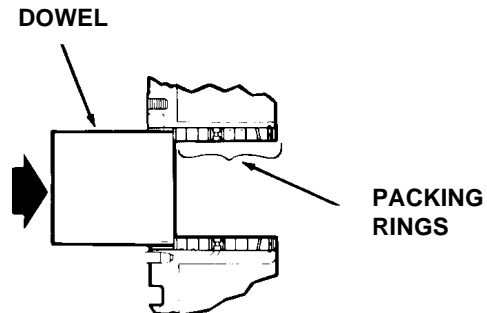


c. Remove packing retainers with a screwdriver.



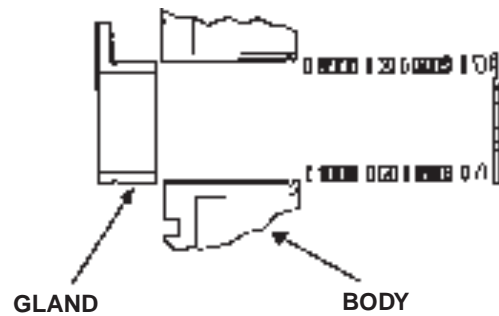
- d. Turn body over, remove gland and use a dowel and soft hammer to drive packing rings from body.

NOTE: Seat Retainer may also be called gland.



- e. Refer to parts list and drawing for your pump. Assemble packing components into body cavity as shown in the drawing. Stagger the end joints in the packing rings so they do not line up. Snug up gland but DO NOT tighten.
- f. Make final adjustment of packing glands after startup.

NOTE: The pump can be repacked without removing fluid head if proper tools and expertise are available. See pictures for helpful hints.



2. Mechanical Seals

A copy of seal manufacturer's descriptive literature is sent with your pump for service and parts identification.

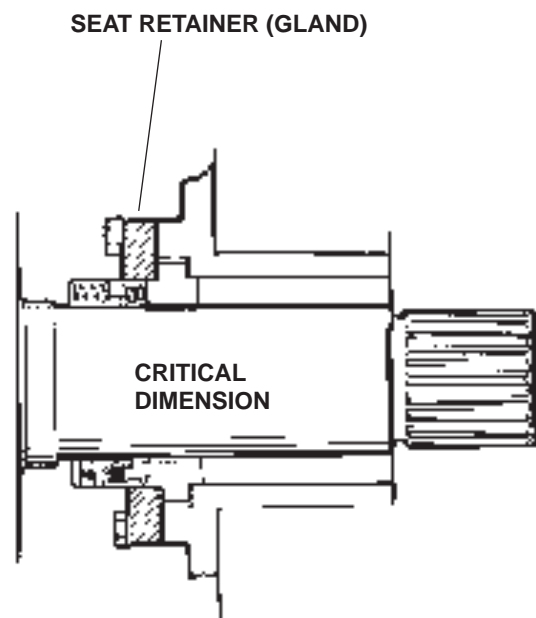
Shut off power and close isolation valves.

WARNING

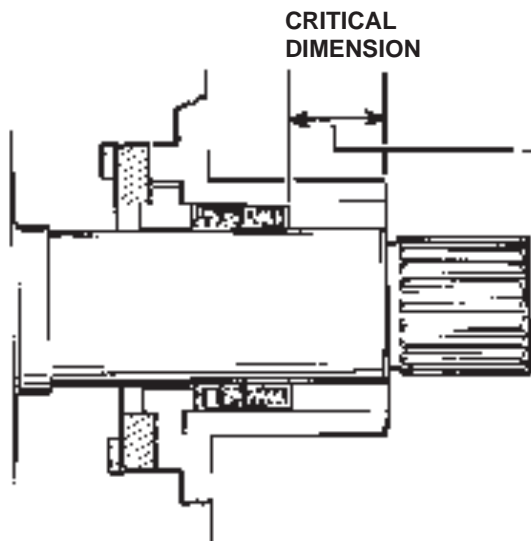
When working with hazardous fluids it is recommended the pumping head be drained and flushed before disengaging seal faces.

Outside Seal

- a. Flush off any scale or crusted product that may have accumulated around the shaft, seal face and seal springs.
- b. Check to see if seal is tight against seat. Repositioning seal to increase face seating pressure is suggested.
- c. Check for cracked or damaged seal face by removing seal seat retainer bolts and sliding retainer back to expose sealing faces. If no faults are visible and leak persists or damaged is found, the replacement of seal and seal seat is recommended. To replace seal and seat, the head must be removed. See Section VIII for proper procedure. (Page 21-22)



ALL STANDARD SEALS ARE SHOWN ON PAGES 51-55



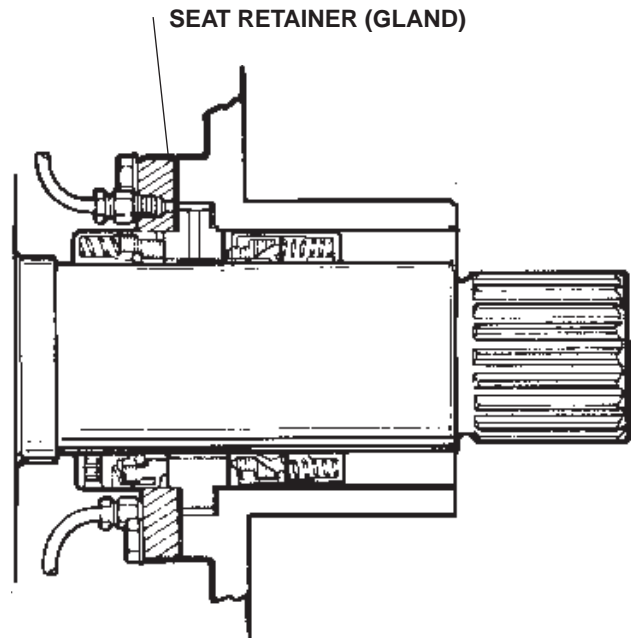
Critical dimension is set at factory and is unique to each different type of seal used. Measure and record before removing from shaft.

Inside Seal

- a. If seal is leaking, replacement is recommended.
- b. To replace seal and seal seat, the fluid head must be removed. See Section IX for proper procedure. (Page 26)

Dual Inside and Outside Seal

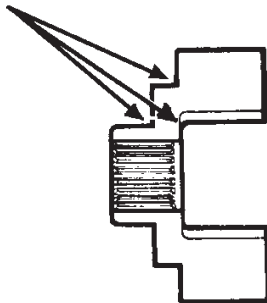
- a. Turn on seal water.
- b. If water leaks past the outside seal, flush off any scale or crusted product that may have accumulated around the shaft and seal area and seal springs.
- c. Check to see if seal is tight against seat. Repositioning seal to increase face seating pressure is suggested.
- d. Check for cracked or damaged seal face by removing seal seat retainer bolts and sliding retainer back to expose sealing faces. If no faults are visible and leak persists or if damaged face is found, the replacement of seal and seal seat is recommended. To replace seal and seat, the fluid head must be removed. See Section VIII (Page 21) for proper procedure.
- e. Remove pump cover and turn on seal water.
- f. If water leaks past inside seal into pump body, replace entire seal assembly and seal seat. (See Section IX. Page 26)



WARNING
Disconnect and lock out power from pump drive before performing maintenance.

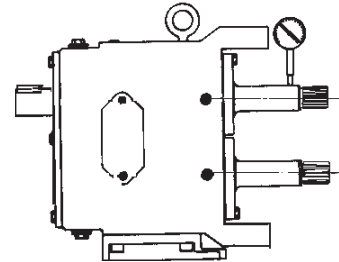
ANNUAL MAINTENANCE

ROTOR STRESS POINTS



The same general procedures and corrective measures outlined above should be performed and in addition the following preventive maintenance operations should be carried out at this annual checkout period.

1. Check bearing with a dial indicator for shaft radial play. If deflection is equal to or greater than rotor to body diametrical clearance (see Table 1, Page 35) replace bearings.
2. Remove gear cover and inspect gears for wear, back lash and looseness. Re-torque gear retaining nuts to proper torque. (See Table 2, Page 35)
3. Thoroughly inspect rotors for worn splines, bearing shoulder wear, and stress cracks. Use dye check method to detect any fatigue type cracks at the stress points that may develop into serious trouble.



4. Review performance record on pump and check radial and back face clearances to determine wear and its effect on desired performance. (See Table 1, Page 35) and Section IX (Page 26). An adjustment on operating speed can compensate for wear in some applications. When wear and subsequent performance is objectionable, we suggest you take advantage of our reconditioning program. (See Section VII Page 21)

CAUTION: If bearings or shafts are replaced in the field, extreme care should be exercised to position the shaft, by shimming, to maintain sufficient running clearances between the rotor wing faces and the pump body faces (backface and cover face). Refer to Table 1 (Page 35) and BACKFACE CLEARANCE, Section IX (Page 26). If rotors are slightly out of time, they can be re-timed by shimming the gears.

It is important to hold the same back face dimension for both rotors to avoid crossover interference.

SECTION VII FACTORY RECONDITIONING

Waukesha Industrial pumps are designed so that they may be factory reconditioned twice and backed with a new pump warranty each time.

Factory reconditioning involves replacement of all worn parts such as shafts, bearings, oil seals, gears, etc. The pump body and cover are re-machined and new rotors are installed. The pumps are stamped R-1 or R-2, after the serial number, designating that they have been reconditioned once or twice.

NOTE: It is advisable to contact the factory and furnish the serial number of any pump being considered for reconditioning.

When pumps require reconditioning it is recommended that they be returned to Waukesha Cherry-Burrell with proper purchase order. Where this is not practical, a "reconditioned" pump may be ordered in advance of the actual return of the pump being replaced.

While a large stock of reconditioned pumps is maintained, normal delivery of four weeks should be anticipated. In these cases an invoice will be issued for the price of a new pump with credit allowed upon receipt of the old pump at the factory so that net cost will be that of a reconditioned pump.

INTERCHANGEABILITY

All new pumps are identified by a serial number on bearing gear case nameplate and stamped on top of pump body. The gear case and body must be kept together as a unit because of back face clearance. The rotors, seals and covers can be interchanged between units.

ALL reconditioned pump parts must be kept together as a unit. These are specially machined and are not interchangeable.

CAUTION: If new body is replaced in the field, it is most important to check back face and front face clearances (See Table 1, Page 35). Re-shim shafts if required to avoid rotor and cover contact. Both rotors must have the same clearance to avoid crossover interference.

SECTION VIII DISASSEMBLY PROCEDURES

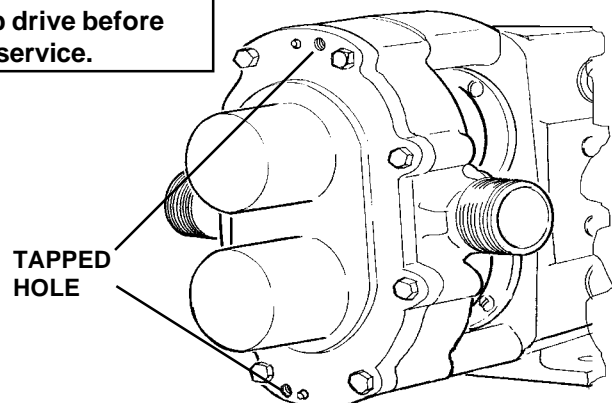
(Refer to Section X (Page 35) for parts identification, drawings, and tables)

WARNING
Disconnect and lock out all power from pump drive before performing service.

FLUID HEAD DISASSEMBLY

REMOVE COVER

1. Remove eight cap screws from cover. Use two as jack bolts in tapped holes on top and bottom of cover and turn in evenly to push cover off dowels and rotor hubs. Be sure to have adequate support when sliding cover free, especially on the larger units.



2. Remove O-ring from cover groove and inspect. Discard if not in good condition.

REMOVE ROTORS

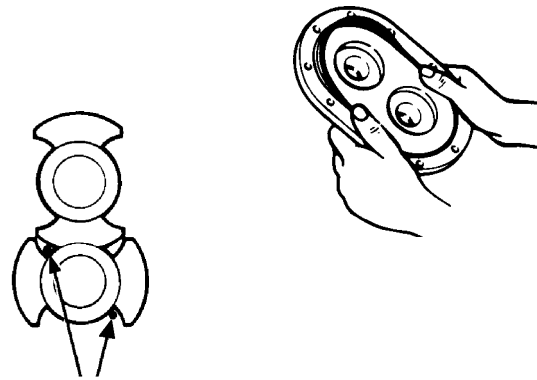
3. Turn shaft to orient rotors as shown for easy removal one at a time.

- a. To remove rotor retainer bolts, straighten lock clip tabs using a screw driver or drift. Then, when clear, use a conventional wrench and a sharp counterclockwise impact to loosen bolt. Remove the rotor which has both wings exposed first.

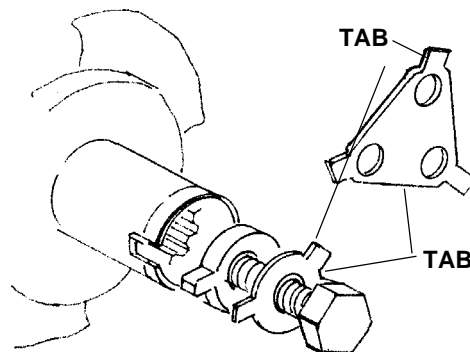
CAUTION

Some mechanical seal models use the back side of rotor as a spring retainer and will, if not restrained, push rotor off shaft with possible damage to rotor.

- b. If rotor can not be removed by hand, use more forceful means such as, A standard gear puller used in the conventional manner, or a piece of hard wood used as a lever between back of rotor hub and body. (Do not use metal bar, etc.)
4. Remove the second rotor in the same way.



APPLY GEAR PULLER HERE



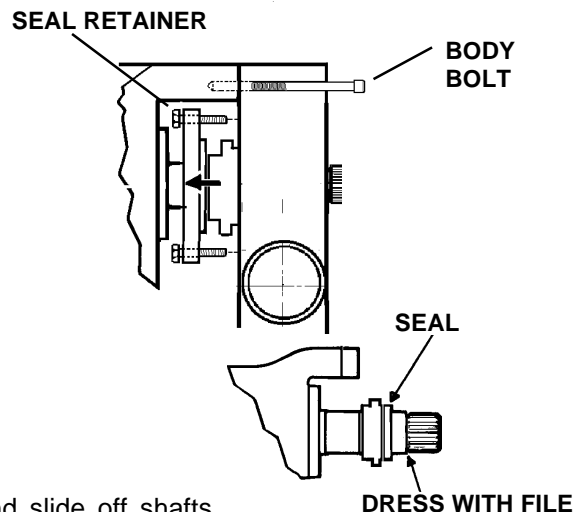
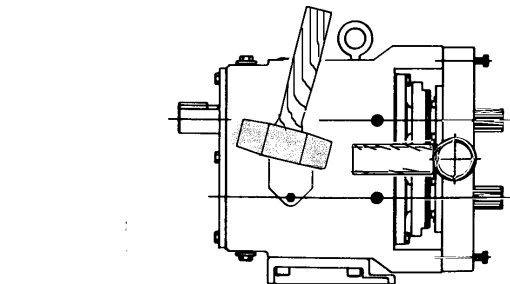
REMOVE BODY

Body with Packing Seal

1. Remove packing gland nuts.
2. Remove body socket head retaining bolts. Using a block against the base of the ports, tap the block, alternating sides, to drive the fluid head off of the locating dowel pins, and slide body off shaft.
3. See SEAL MAINTENANCE, Section VI, (Page 18) for disassembly procedure of packing.

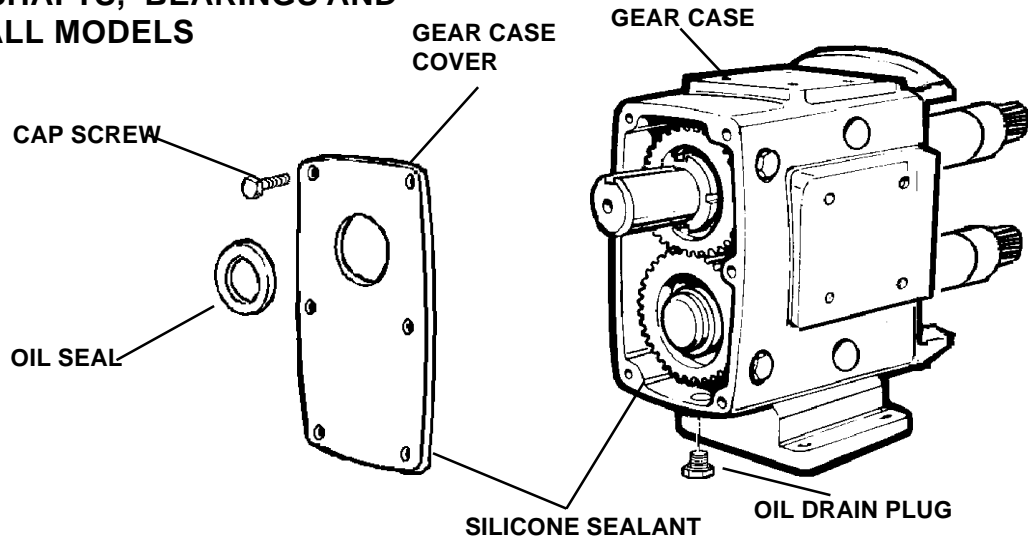
Body with Mechanical Seals

1. Remove cap screws from seal seat retainers and slide retainers back against bearing gear case.
2. Loosen body retaining bolts and tap body with soft hammer to drive body loose from bearing gear case and dowel pins. Remove retaining bolts and slide body off shafts.
3. Thoroughly clean the shafts. Dress off shaft around shoulder against which rotor bottoms to remove "flared end" to aid in seal removal.
4. Loosen both inboard seals and slide off shafts. Then remove the seal seat and gaskets.

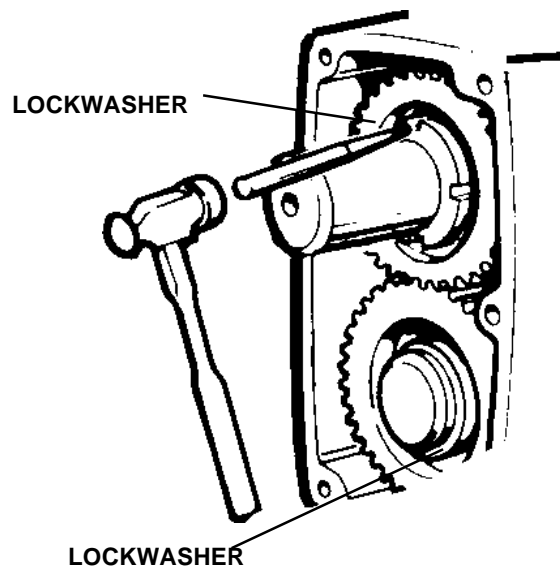


5. If equipped with outside seal, loosen set screws and slide off shafts.
6. Dress off burrs on shaft which resulted from seating of set screws with a file or emery cloth.

REMOVE SHAFTS, BEARINGS AND GEARS - ALL MODELS



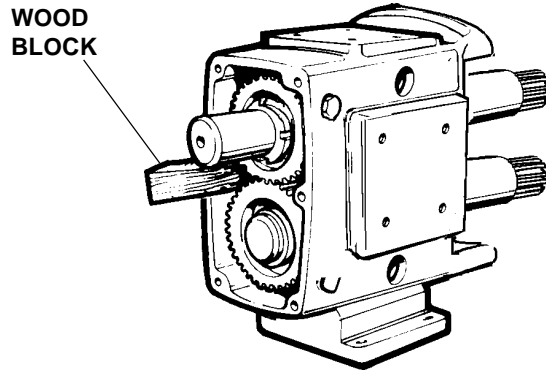
1. Remove oil drain plug and drain oil.
2. Remove cap screws from gear case cover.
3. Pull cover off shaft extension. If cover sticks, use soft hammer to loosen it.
4. Scrape silicone sealant from gear case and cover.
5. Remove oil seal from cover with an arbor press and discard.



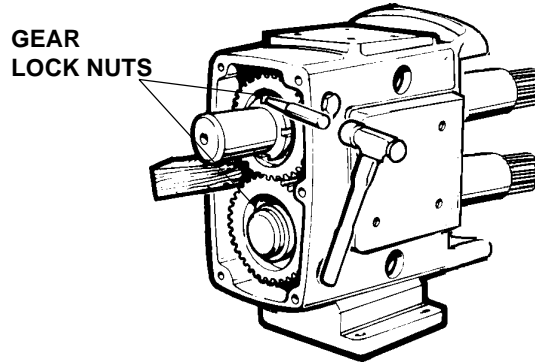
6. Straighten locking tab of lockwashers.

SHAFT REMOVAL

7. Prevent shafts from turning by wedging a wooden block between the gears.

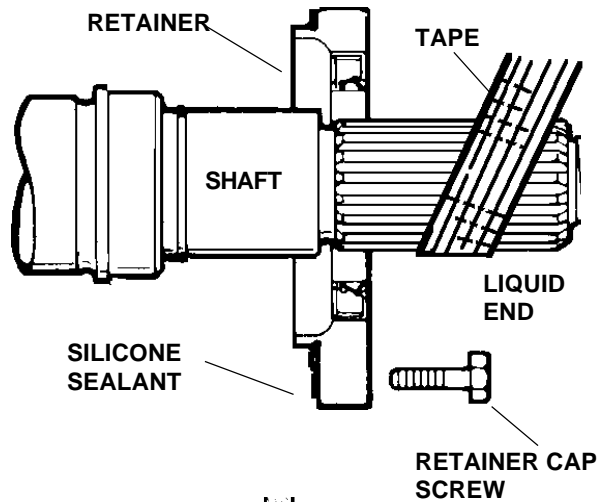


8. Use spanner wrench or drift to remove gear lock nuts. Gears will be removed later. See step 10 below.

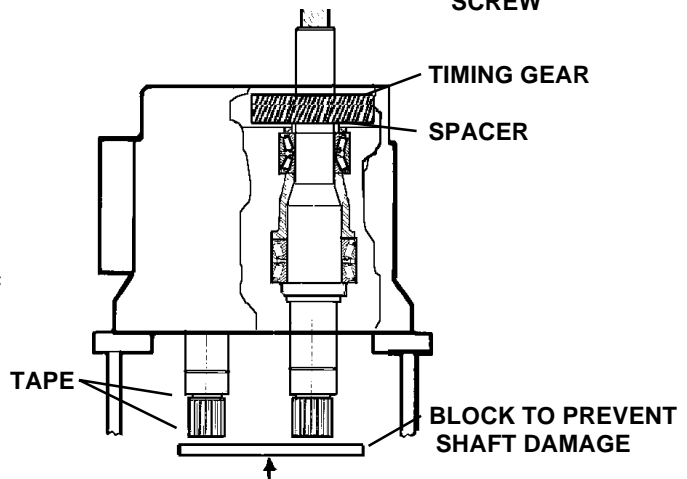


NOTE: Protect liquid end of shafts by wrapping them with tape.

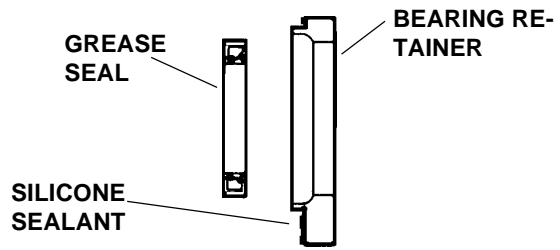
9. Remove front bearing retainer bolts and pull off retainers. Scrape silicone sealant from retainer and case. (If retainer is stuck, leave it in place; it will press out when shaft is removed.)



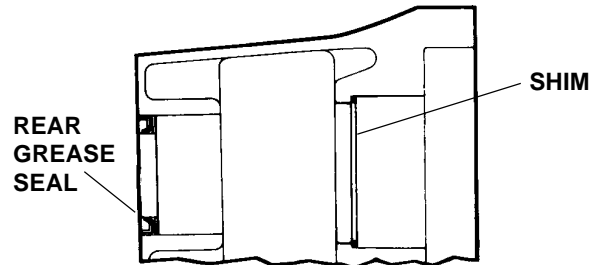
10. Place gear case on an arbor press with liquid end down. Protect shaft ends with wood or plastic block and press shafts out of gear case. Remove timing gears and spacers from drive end. (See Table 4 on Page 35 for hydraulic press tonnage required..)



11. Scrape silicone sealant; press out and discard grease seal from front bearing retainers.



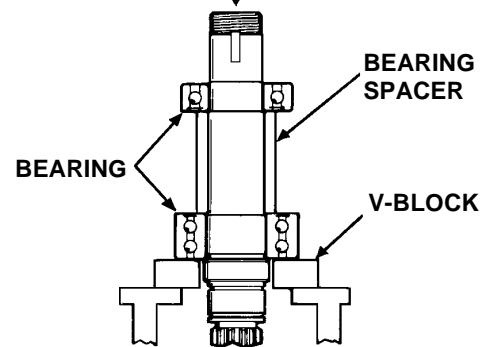
12. Remove shims. If they are to be re-used, identify them with the shaft on which they were used.



13. Press out and discard both rear grease seals in gear case.

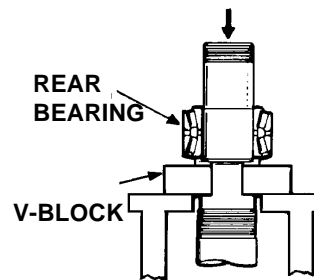
ALL MODELS EXCEPT 5080

1. Use hydraulic press and V-blocks to remove bearings and spacer. (See Table 4 on Page 35.)

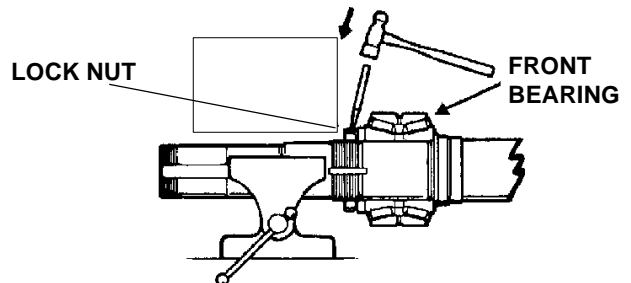


MODEL 5080

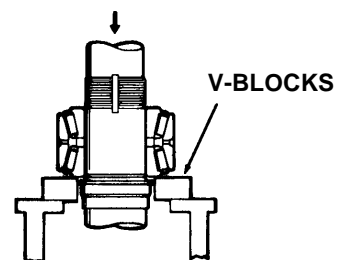
2. Remove rear bearing by using V-blocks and a hydraulic press. (See Table 4 on Page 35.)



3. Secure shaft assembly in a soft jawed vise as shown. Open tab in lock washer. Remove front bearing lock nut using a spanner wrench or drift punch.



4. Remove front bearings using V-blocks and a hydraulic press. (See Table 4 on Page 35.)



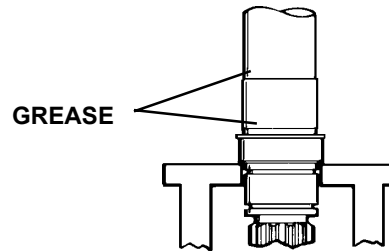
5. Clean and inspect all parts thoroughly if they are to be re-used.

SECTION IX ASSEMBLY PROCEDURES

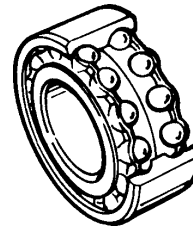
MODEL 5040 Shaft Assembly

1. Front Bearing Assembly

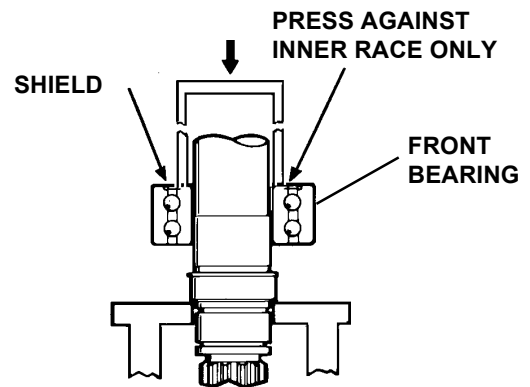
a. Coat front bearing area of shaft with grease.
Place upright in hydraulic press with spline end down.



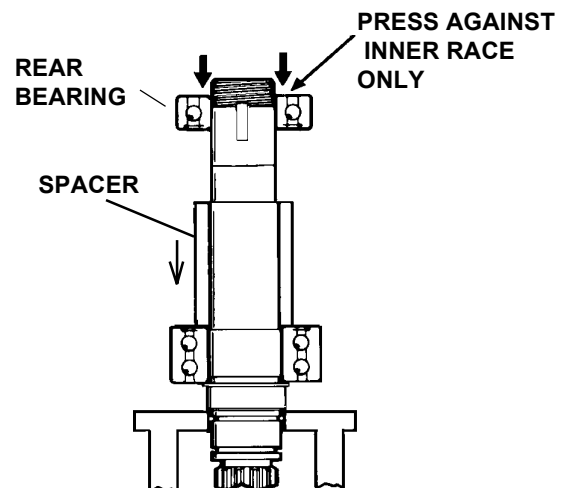
b. Unwrap front bearing assembly.



c. Place front bearing over shaft with shield side up.
Press onto shaft until seated against shaft shoulder.
(See Table 4 on Page 35.)



d. Place spacer over shaft onto bearing.
e. Coat shaft rear bearing area with grease.



f. Slip rear bearing over shaft with shield side down.
Press bearing onto shaft until it seats against spacer and front bearing.

MODEL 5050, 5060, 5070 AND 5080

Shaft Assembly

1. Front Bearing Assembly

a. Coat front bearing area of shaft with grease. Place upright in hydraulic press with spline end down.

b. Unwrap front bearing assembly. Do not interchange parts of one bearing assembly with another. These parts are precisely matched in manufacture and must be installed as a matched assembly.

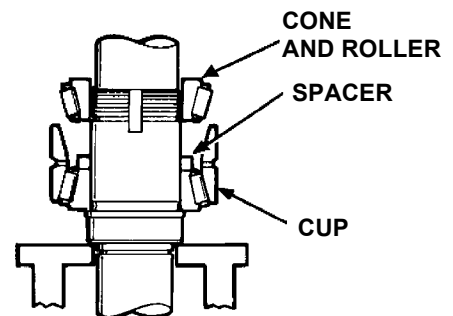
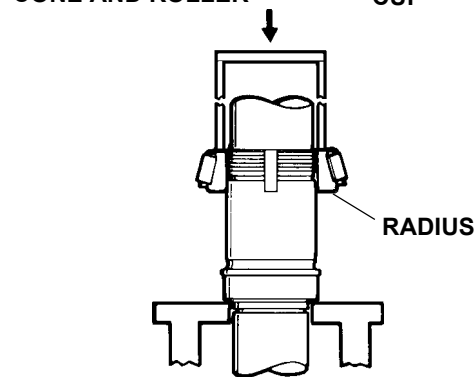
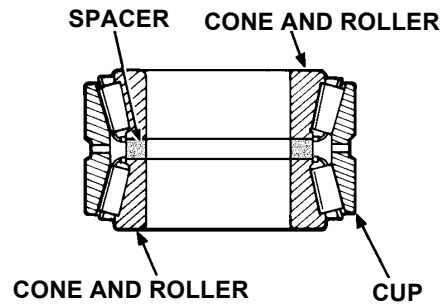
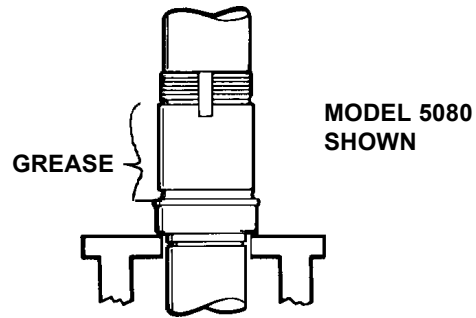
c. Lift cone and roller assembly out of bearing stack and place on shaft with radius down as shown. Press onto shaft until seated against shaft shoulder.

(See Table 4 on Page 35.)

d. Place spacer over shaft onto bearing cone.

e. Place bearing cup over cone and roller assembly, keeping the cup oriented with proper roller assembly.

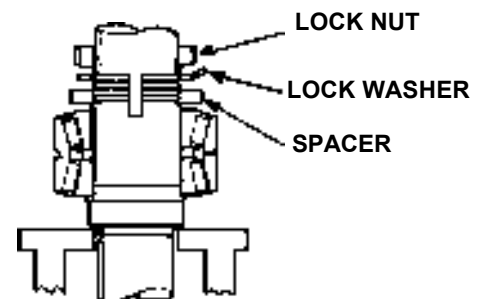
f. Coat remaining bearing cone and roller inside diameter with grease and slip them over the shaft with roller radius up. Press onto shaft and into cup to complete assembly of front bearing on shaft.



5080 ONLY

g. Apply grease to threaded area on shaft and face of lock nut.

h. Install spacer, lock washer and lock nut. Fingertighten nut.

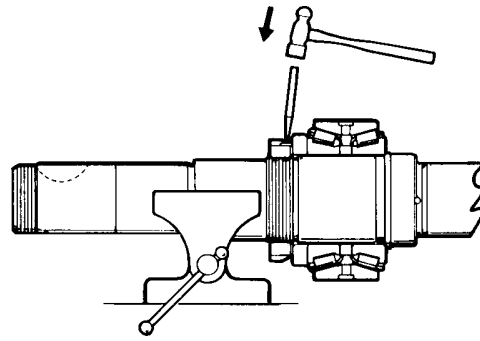


5080 ONLY

MODEL 5080 only

i. Clamp shaft behind lock nut in a soft jawed vise and drive lock nut tight using a spanner wrench or drift. (See Table 2 on Page 35 for torque requirements).

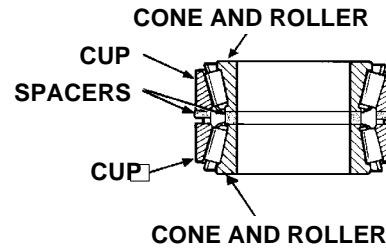
j. Bend lock washer tab into groove on nut to secure assembly.



MODEL 5040,5050,5060,5070 and 5080

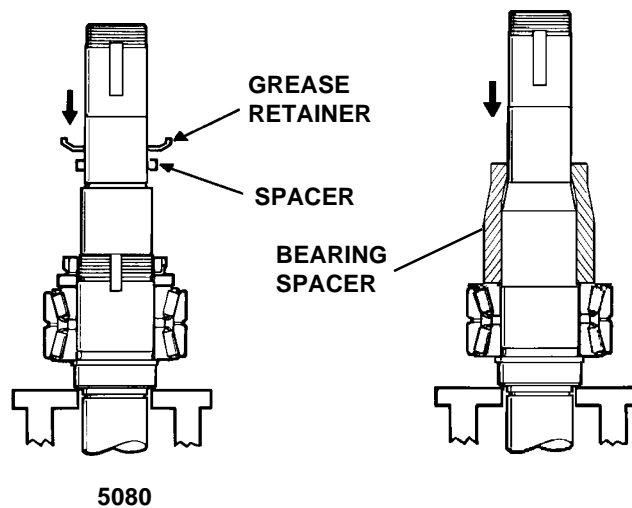
2. Rear Bearing Assembly

a. Unwrap rear bearing assembly. Do not interchange parts of one bearing assembly with another. These parts are precisely matched in manufacture and must be installed as a matched assembly.



b. Place shaft upright in an arbor press with gear end up. Install bearing spacer on all model shafts.

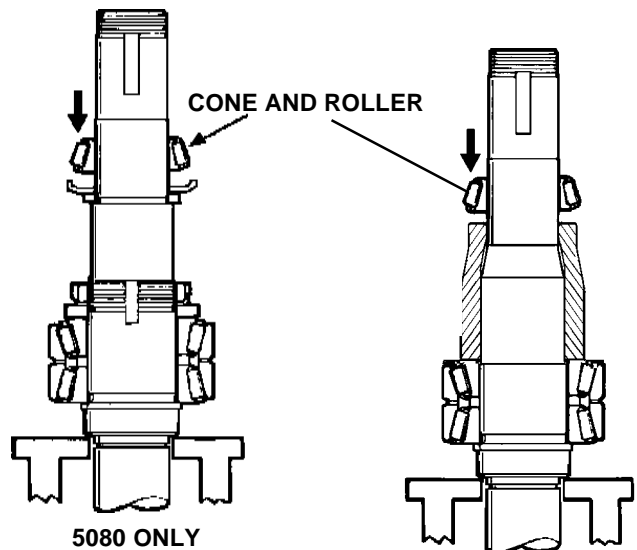
NOTE: On 5080 only, install spacer and grease retainer with flange up.



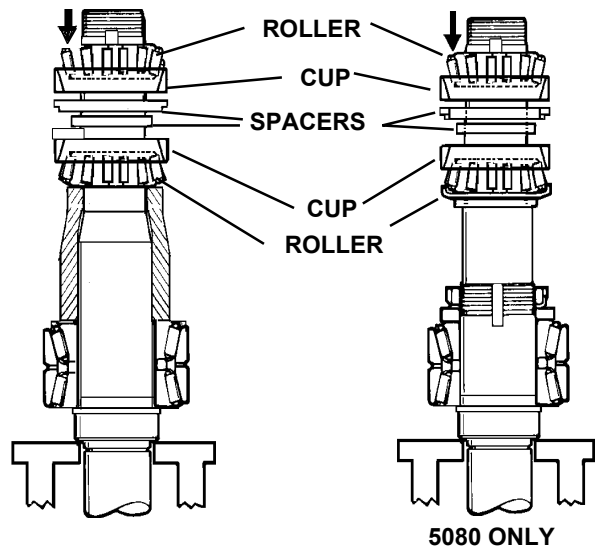
c. Coat shaft bearing area with grease. Press bearing cone and roller assembly (with radius down) onto shaft. (For hydraulic press tonnage required, see Table 4 on Page 35)

5080

Press cone and roller assembly until it seats against grease retainer and spacer.



d. Apply grease again. Slip bearing cup over roller assembly. Install both inner and outer spacers. Place remaining cup onto outer spacer and press on the remaining cone and roller assembly. (See Table 4 on Page 35.)
Be sure outer spacer is concentric on shaft.



Gear Case Assembly

1. Shaft Installation

Front Bearing Grease Seals-5080 only

- Place bearing gear case on arbor press. Install front bearing grease seals, with lip towards center of cavity, flush with back face of bore.
- Coat lip seals with grease.

Shims - ALL MODELS

c. To determine the shim thickness required for the front bearing, measure dimension "A" in the gear case and dimension "B" on the shaft to three decimal places (1.000, for example).

Using these values to calculate the shim thickness as follows:

Dimension "A" minus dimension "B" = required shim thickness.

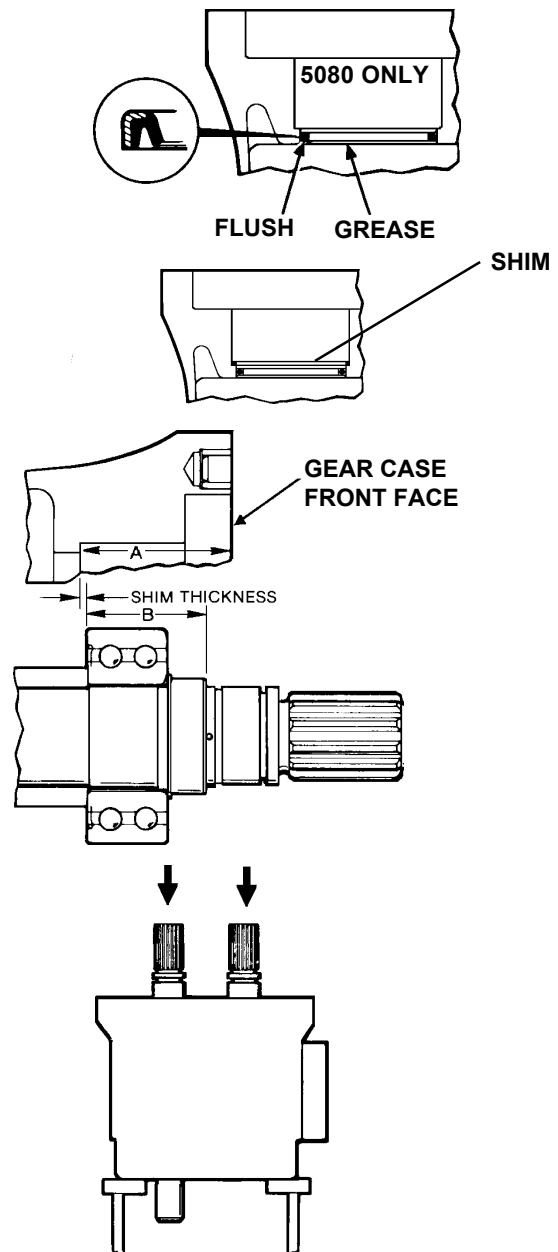
d. Use standard shim packs to equal the required shim thickness. Place against shoulder in front bearing bore. (Also see Page 35.)

(SUGGESTED SHIMS)

Model	OLD SHAFT	NEW SHAFT	RECONDITIONED SHAFT	
			R1	R2
ALL	.116 - .120	.110	.090	.090

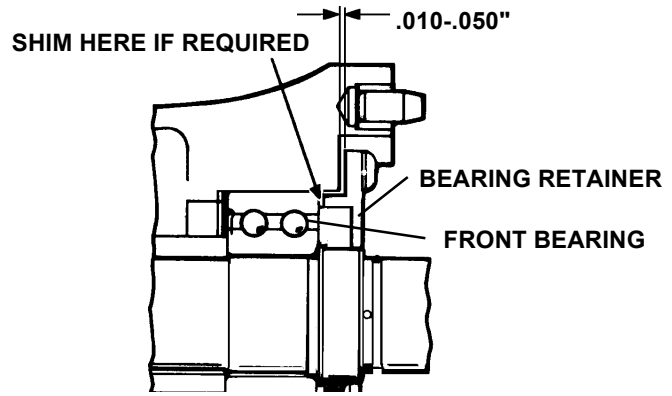
INSTALL SHAFTS

Install shaft assemblies in gear case with spline end up and the drive shaft in proper location to give top or bottom drive as required. Press shafts into gear case until seated against shim pack.



e. Secure shaft assemblies in gear case with bearing retainers. No silicone sealant at this time.

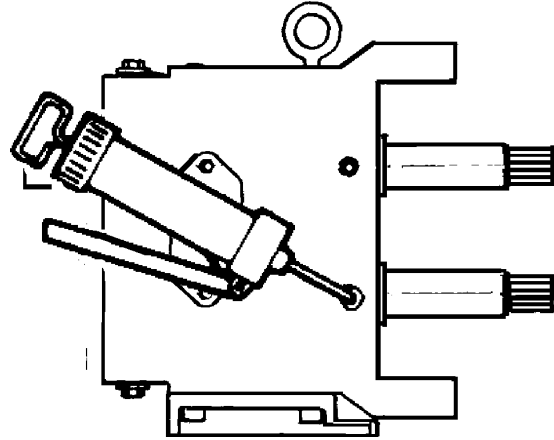
NOTE: Retainer must seat firmly against bearing and leave .010"-.050" clearance with gear case. Use shims between bearing and retainer if required.



g. Check back face clearance. See Table 4 on Page 35 and BACK FACE CLEARANCE, page 34.

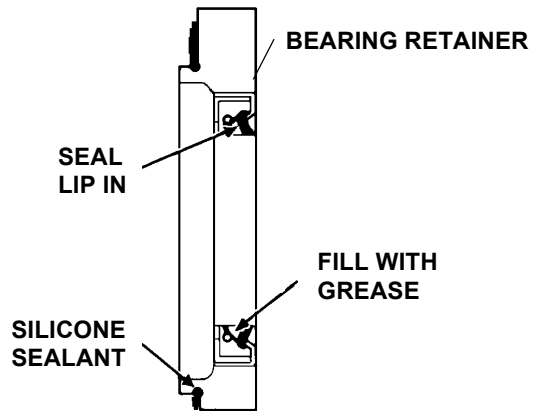
h. Remove bearing retainers.

i. Grease front and rear bearing through grease fittings until grease is visible around ball assemblies.



j. Install grease seals in bearing retainers (lip in) and coat seal lips with grease. Coat retainer flanges with silicone sealant.

k. Install bearing retainers.



2. Rear Seal Assembly

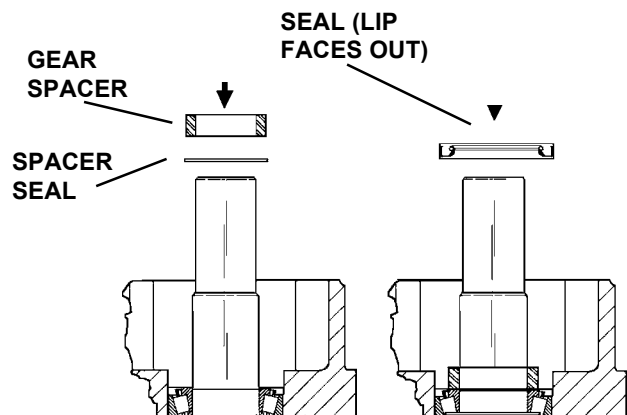
a. Install spacer seals and gear spacers.

b. Coat lip of seals with grease.

c. Press in rear seals with lip facing out.

NOTE: Place plastic bag over shaft end to prevent cutting seal when installing.

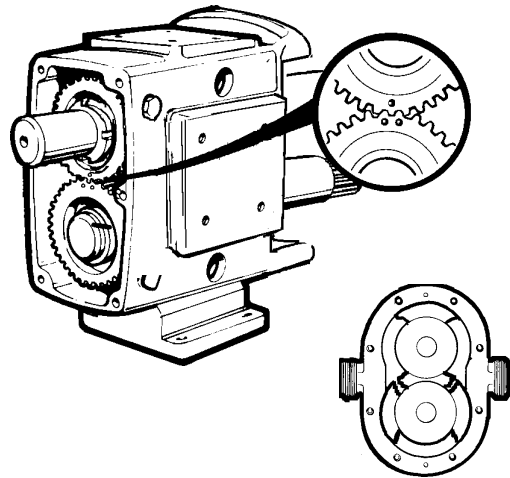
NOTE: Seal is flush with gear case on Model 5050, 5060 and 5080 pumps. On the 5070 pump the seal will protrude 1/8-inch out side of gear case surface.



TIMING GEAR AND GEAR COVER ASSEMBLY- ALL MODELS

1. Place keys into shaft key slots. Slide gear with single punch mark onto drive shaft. Slide gear with two punch marks onto the short shaft with punch marks straddling single mark of drive gear.

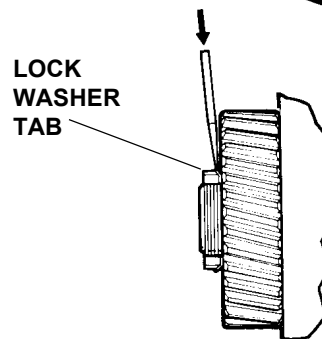
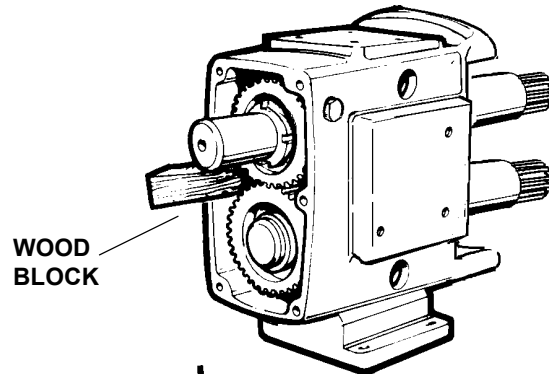
NOTE: Rotors must be at right angles. Shim a gear out to obtain proper timing if necessary.



2. Secure shafts from turning with a wood block wedged between gears or rotors.

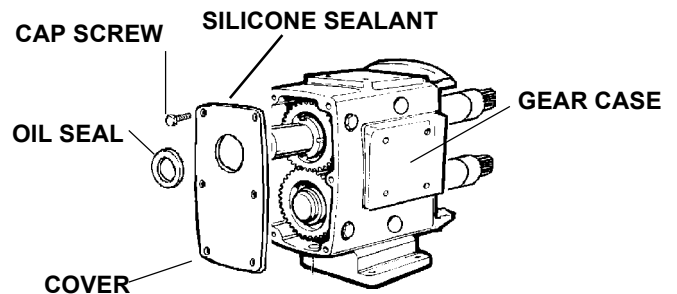
3. Apply grease to threaded area on shafts and face of lock nuts.

4. Slip on lock washers and lock nuts. Tighten lock nuts with a spanner wrench or drift. Bend locking tab to secure. See Table 2 on Page 35 for proper torque limit.

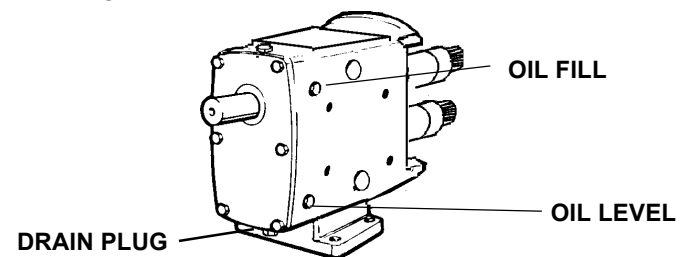


5. Press new oil seal into gear cover with lip facing in.

6. Place silicone sealant on back of gear cover and mount cover assembly onto gear case. (*Tape shaft end to prevent cutting seal on keyway.*) Secure with cap screws.



7. Install oil drain plug. Fill gear case with oil to proper level. (See OPERATION on page 15)



FLUID HEAD ASSEMBLY

Mechanical Packing

1. Place O-rings into grooves on shafts then slip sleeves onto shafts with pin indexed into notch on shaft.
2. For parts identification and correct order of assembly see packing parts list and sectional drawing in Section XII, starting on page 38.
3. Mount body (with packing material) onto shafts and secure to bearing gear case with two socket head cap screws.
4. Make final gland adjustment when pump is in service.

Mechanical Seals

NOTE: Handle all seal components with extreme care.

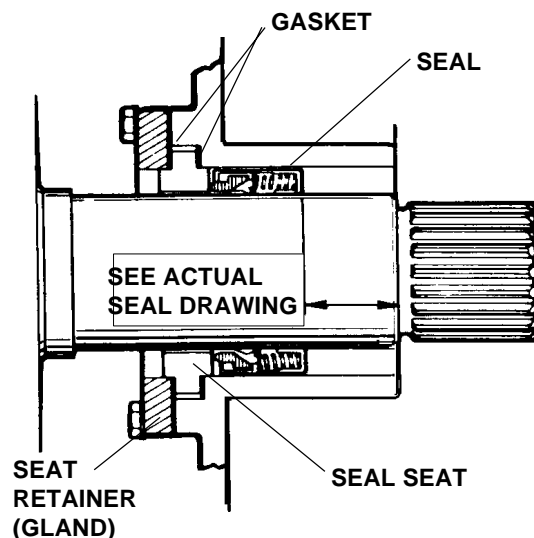
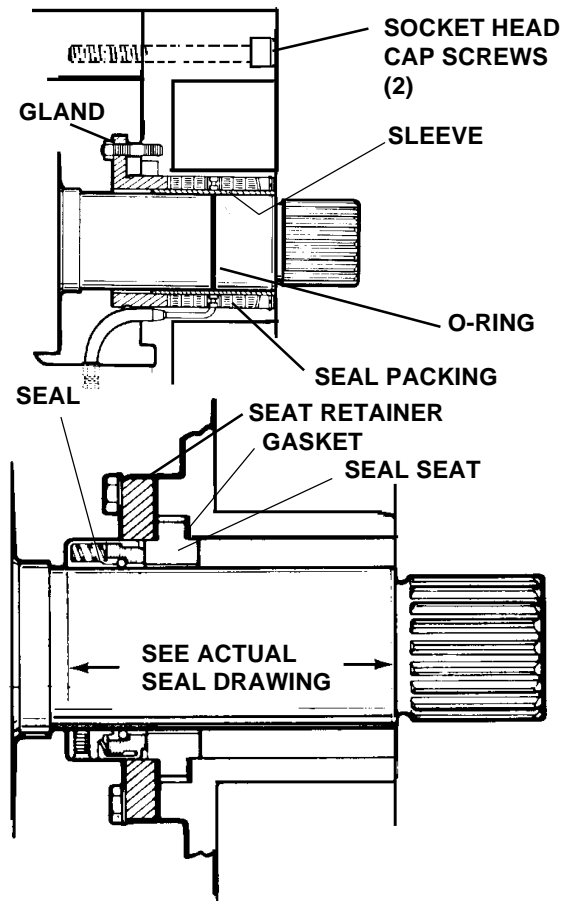
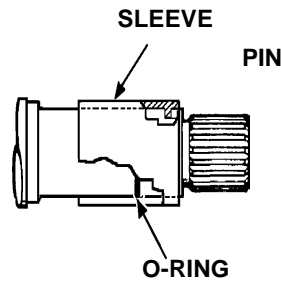
1. External Type

- a. Place seal rotating member onto shaft with seal face out. Lock seal onto shaft at proper location. (See seal assembly drawing for correct location dimension.)
- b. Slip seal seat retainer, retainer gasket, seal seat, and seat gasket onto shaft in that order.
- c. Mount body on bearing gear case with two socket head screws being sure to insert gaskets and seal seats into cavities on back of body. Secure seal seats with retainers using cap screws. ***Record dimension prior to disassembly. Refer to page 19.**

2. Internal Type

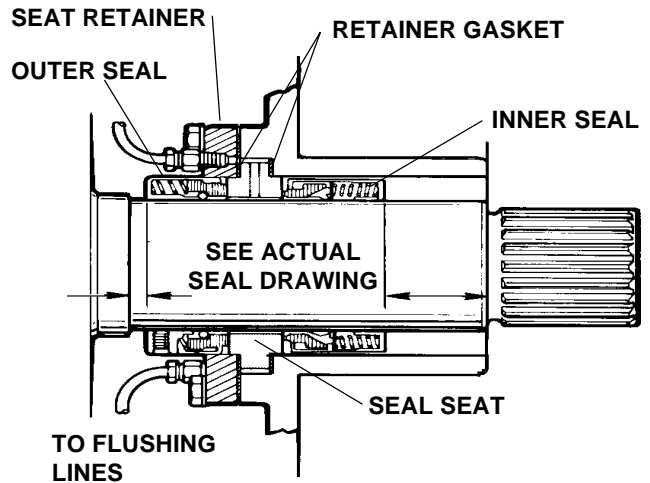
- a. Slip seal seat retainers onto shafts followed by gasket, seal seat and seat gasket.
- b. Slip seals with seal face towards bearing gear case onto shafts and secure at proper location with set screws. (See seal assembly drawing for correct location dimension.)
- c. Secure pump body to bearing gear case with two cap screws.
- d. Slip seat gasket into body followed by seal seat. Install seat retainer and gasket and secure with cap screws. (See Torque Table 1 on Page 35.)

NOTE: Seat Retainer may also be called gland.

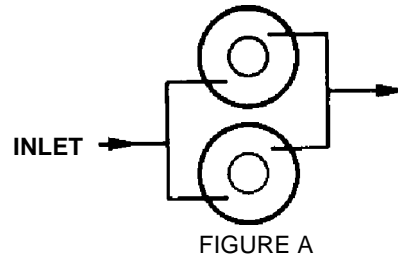


3. Double Seal with Flushing

- a. Place outer seal rotating member onto shaft with seal face toward fluid head. Lock seal onto shaft at proper location. *(See seal assembly drawing for correct location dimension.)*
- b. Slip seal seat retainer, retainer gasket, seal seat, and seal gasket onto shaft in that order.
- c. Slip inner seals with seal face towards bearing gear case onto shafts and secure at proper location with set screws. *(See seal assembly drawing for correct location dimension.)*
- d. Mount body on bearing gear case with two socket head screws being sure to insert gasket and seal seats into cavities on back of body. Secure seal seats with retainers using cap screws (refer to seal assembly drawing.)
- e. Connect flushing lines after pump is installed.



NOTE: Seat Retainer may also be called gland.



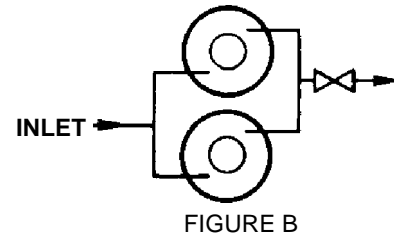
4. Flushing Connections (1/8" NPT-F)

NOTE: Flushing media should be piped into lower connection of each shaft seal and discharged out upper connections. Both inlets and both outlets may be manifolds to simplify piping. (Figure A)

Typical Flush Piping

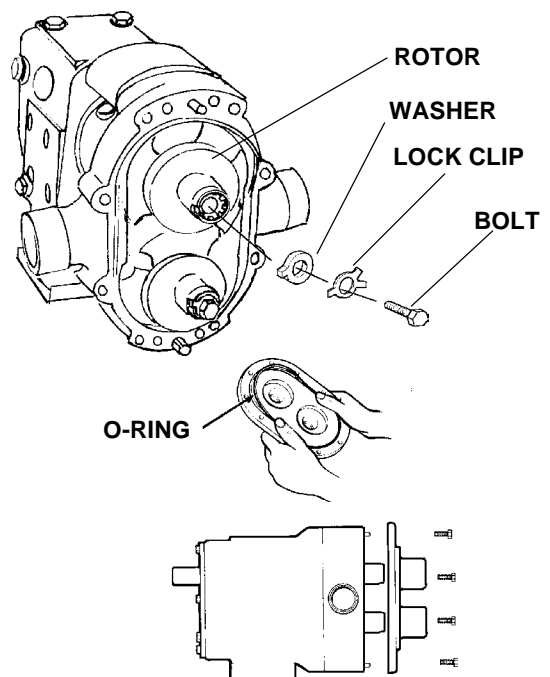
NOTE: High pressure outside seal is required.

1. Flushing media is restricted on discharge side of pump flushing glands. (Figure B)
2. Set flow rate of approximately 1/4 GPM for most applications. For high temperature applications, increase flow.



Rotor and Cover Assembly

1. Install rotors onto shaft splines and secure with retainer washers, lock clips and retainer bolts. Lock bolts with locking clip tab. *(Apply anti-seize compound to bolts.)*
2. Insert O-ring in cover groove.
3. Mount cover over rotor hubs and body dowells. Secure with 8 cap screws. *(See page 36 for relief cover installation and adjustment.)*



PROPER CLEARANCES

1. All Waukesha pumps are designed with close running clearances and the back face clearance is established with shims during assembly. The shaft is positioned with shims behind the front bearing and locked into bearing gear case. The rotors lock against the shaft shoulder and the resultant clearance between body back face and rotor wing is the back face clearance. (See Table 1, Page 35, for STANDARD CLEARANCES)

2. To check back face clearance, mount body onto bearing gear case and secure with retaining screws. Assemble rotors and secure with retainer washers and cap screws.

Measure clearance between body back face and rotor wing with feeler gauges. This can be done by inserting the feeler gauge in between the rotor wings and bending the gauge into position behind the wing or inserting the gauge into a side port and behind the rotor wing.

Check readings against recommended STANDARD back face clearance in Table 1, Page 35. Make note of any corrections required and follow examples to determine exact shim adjustment to make and avoid unnecessary disassembly and reassembly.

3. To make shim adjustments it is necessary to disassemble rotors and body and remove shafts. (See Section VIII, FLUID HEAD DISASSEMBLY on page 21.) Make required shim adjustment and reassemble. Recheck back face clearances. Be sure both rotors have the same clearance to avoid crossover interference.

TOO MUCH CLEARANCE (FIGURE B)

(The rotor seat shoulder of the shaft is projecting past the body surface.)

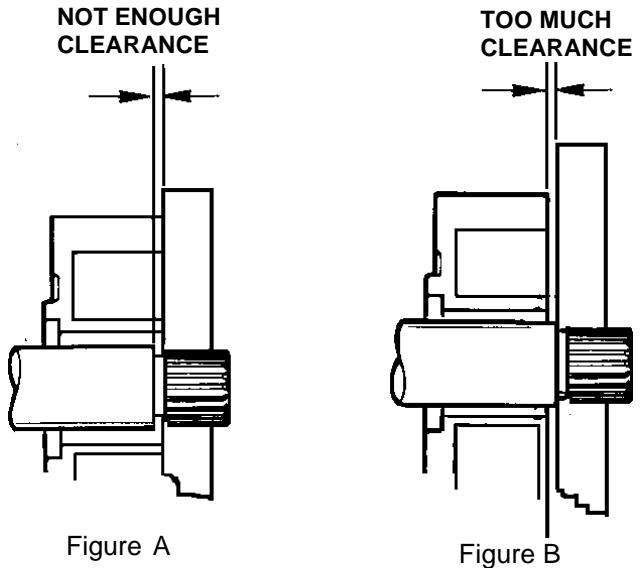
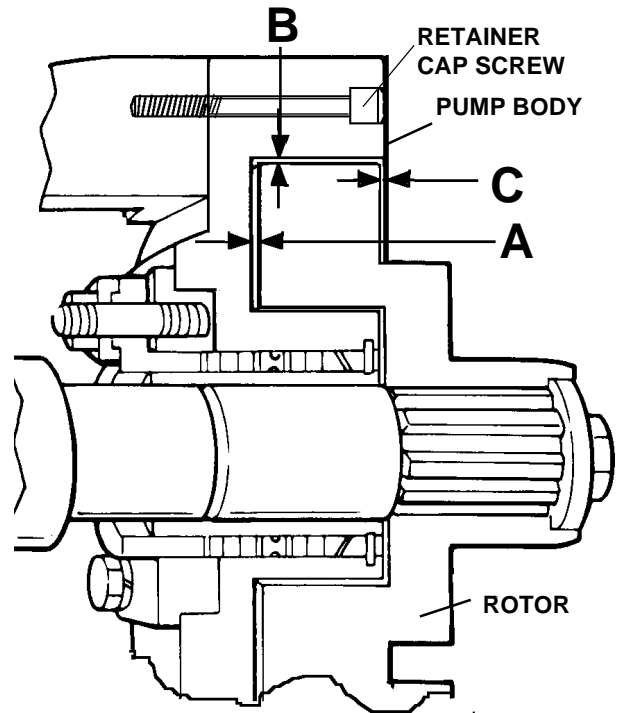
Remove shims equal (or as close as possible) to difference between measured clearance and specified back face clearance.

NOT ENOUGH CLEARANCE (FIGURE A)

(The rotor seat shoulder of the shaft is below the body surface.)

To determine amount of shims to add, use a straight edge or a parallel bar and depth gauge and measure the dimension between the shaft shoulder and the face of the pump body as illustrated. Add shims equal (or as close as possible) to that dimension plus specified back face clearance.

A= BACK FACE CLEARANCE
B=ROTOR TO BODY CLEARANCE
C=FRONT FACE CLEARANCE



Object: The dimension between the shaft shoulder and the body must be zero for both shafts.

NOTE: Back face clearance for, both rotors must be the same to avoid crossover interference with rotor hubs.

SECTION X

REFERENCE TABLES AND REPAIR PARTS LIST

TABLE 1. STANDARD ROTOR CLEARANCES*

MODEL	A BACK FACE	B ROTOR TO BODY	C FRONT FACE
5040	.002-.0025	.003-.004	.0025-.005
5050	.002-.0025	.003-.004	.004-.006
5060	.0025-.003	.0035-.005	.004-.006
5070	.004-.005	.004-.0055	.004-.008
5080	.005-.006	.005-.007	.005-.009

**For non-standard rotor clearance, contact Application Engineering at Waukesha Cherry-Burrell*

TABLE 2. TORQUE VALUES-FT-LBS

MODEL	LOCK NUTS		
	FRONT BEARING	GEAR	ROTOR RETAINER
5040	-	100	30
5050	-	140	38
5060	-	140	38
5070	-	230	38
5080	360	320	38

TABLE 3. SUGGESTED SHIMS

MODEL	ORIGINAL SHAFT	REC. SHAFT		
		NEW SHAFT	R ₁	R ₂
5040	.116-.120	.110	.090	.060
5050	.116-.120	.110	.090	.060
5060	.116-.120	.110	.090	.060
5070	.116-.120	.110	.090	.060
5080	.120-.126	.110	.090	.060

TABLE 4. ARBOR OR HYDRAULIC PRESS REQ'D - TONS

MODEL	SHAFT		FRONT BEARING		REAR BEARING SHAFT	
	IN	OUT	ON	OFF	ON	OFF
5040	0.25	0.5	0.5	0.1	0.5	0.1
5050-5060	0.5	1	2	5	3	5
5070	0.5	1	5	15	5	15
5080	0.5	1	5	20	5	20

SECTION XI

WAUKESHA INTERNAL BY-PASS RELIEF VALVE

FOR INDUSTRIAL STAINLESS STEEL ("I") AND DUCTILE IRON ("DI") PUMP MODELS 5040, 5050, 5060, 5070, and 5080

Adjustable spring tension operated piston opposite the pumped fluid. The pump cover is reversible for right or left hand flow direction. O-ring seals are furnished in materials compatible with the product being pumped.

INSTALLATION

Valve Mechanism MUST BE ON DISCHARGE SIDE.

ADJUSTMENT:

With pressure gauge and valve in discharge line.

1. Turn adjusting screw counterclockwise until loss of spring pressure is felt. then turn clockwise until light spring pressure is resumed.

2. Turn on pump.

a) Close discharge valve slowly and observe gauge. Do NOT ALLOW PRESSURE to exceed 200 PSI.

b) Turn adjusting screw clockwise. Observe gauge. When desired relief pressure is observed, lock adjusting screw with locknut.

c) Open discharge valve. Relief valve is set and will open if system pressure exceeds preset limit.

Without pressure gauge in discharge Line.

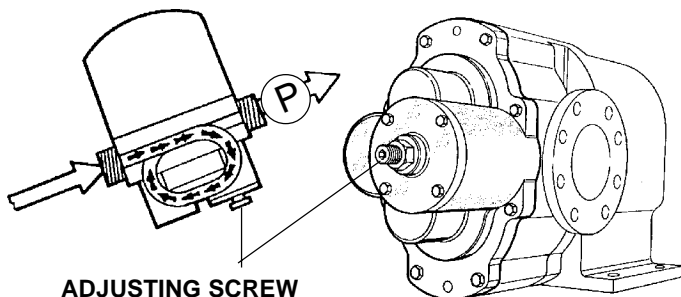
1. Turn adjusting screw clockwise and observe product flow at discharge of system.

2. When product flow reaches maximum or desired flow rate, lock adjusting screw with locknut.

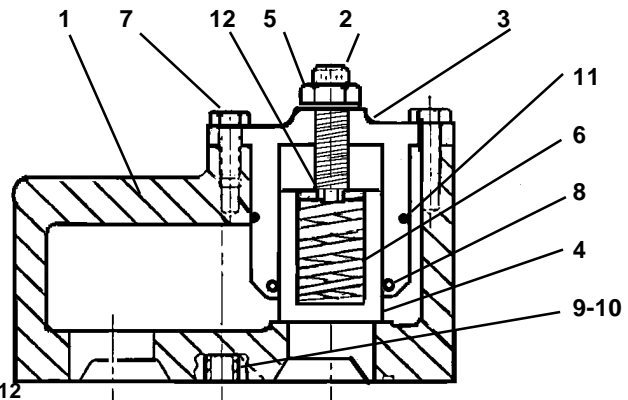
PARTS LIST

ITEM	QTY	DESCRIPTION	5040	5050/5060	5070	5080
1	1	Cover Assembly	020 002 001	050 002 001	200 022 001	300 022 001
		Cover 316 SS	020 020 001	050 002 001	200 002 001	300 020 004
2	1	Socket Head Cap Screw	000 060 002	000 060 001	000 060 001	000 060 001
3	1	Adapter	020 071 000	050 071 000	200 071 000	300 071 000
4	1	Piston	020 073 000	050 073 000	200 073 000	300 073 000
5	1	Hex Jam Nut	36-92	36-99	36-99	36-99
6	1	Spring, Relief Valve	000 076 003	000 076 002	000 076 005	000 076 006
7	2	Hex Head Capscrew	30-283	-	-	-
	4		-	30-349	-	-
	6		-	-	30-349	30-349
8	1	O-Ring Buna - N	N70222	N70041	N70232	N70235
9*	1	Bushing SST	020 116 002	050 116 002	-	-
10*	1	Bushing SST	020 116 003	050 116 003	-	-
11	1	O-Ring Buna - N	N70034	N70227	N70045	N70157
12	1	Spring, Retainer Steel	020 176 000	050 176 000	200 176 000	200 176 000

*Bushings are shipped loose. Orient them with body dowel pins. Be sure VALVE mechanism is on DISCHARGE SIDE of pump.



ADJUSTING SCREW (ITEM 2) ON DISCHARGE SIDE.



Relief Valve Data

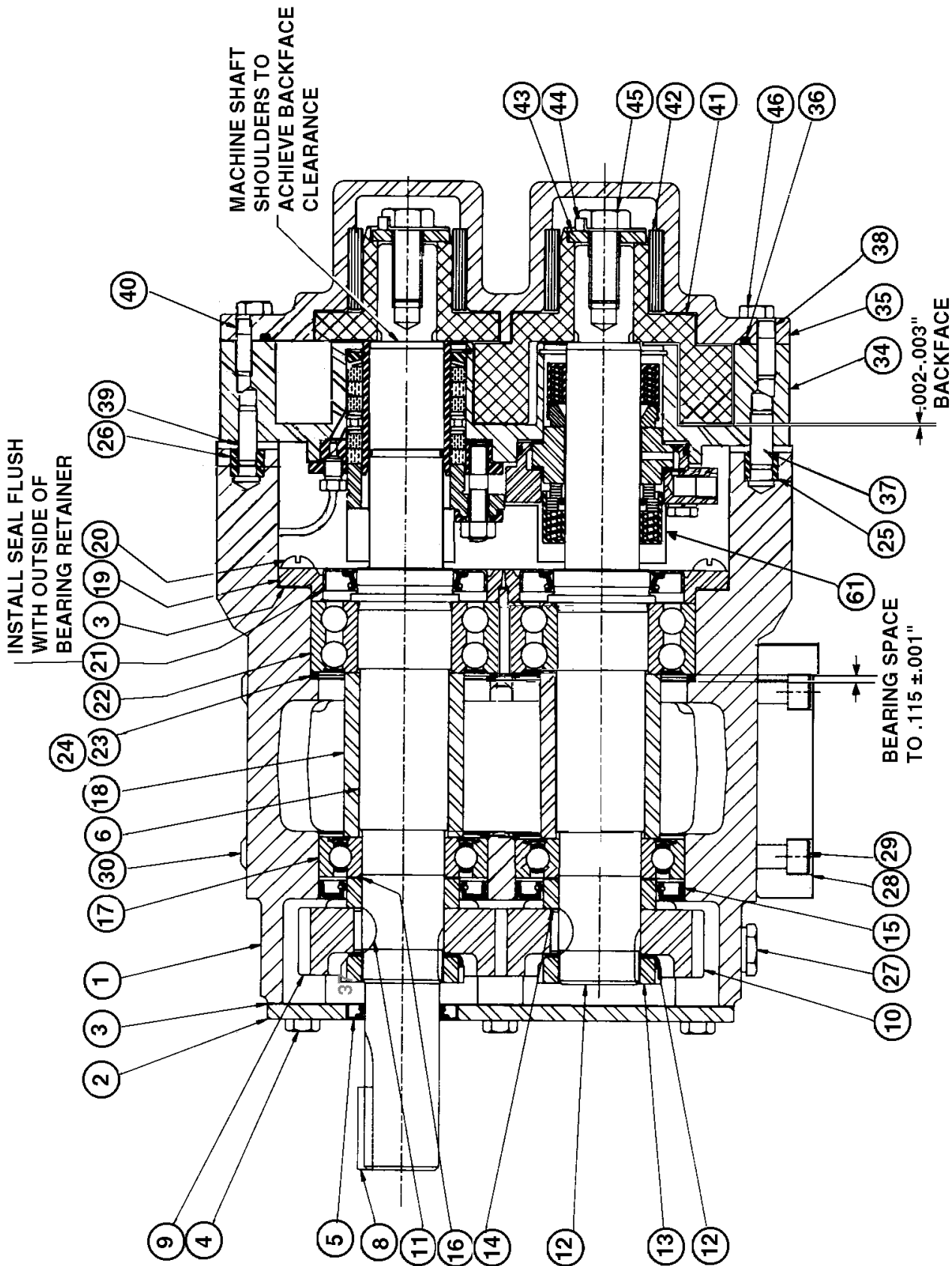
Pump Model	5040	5050/5060
Valve face area (sq. inches)	2.483	2.776
Maximum valve travel (inches)	0.9 1	0.96
Spring rate (lbs per 0.1 inch) Ref. spring part number 000-076-006	40	70
Adjustment screw pitch (threads per inch)	13	10
Amount of spring compression (No. of turns/inches 5040/inches 5050-60)	Product cracking pressure/ Remaining available travel (psi/inches)	
1 turn / 0.08 in / 0.1 inch	16 psi/0.83 in	25 psi/0.86 in
2 turns / 0.15 in / 0.2 inch	32 psi/0.76 in	50 psi/0.76 in
3 turns / 0.23 in / 0.3 inch	48 psi/0.68 in	76 psi/0.66 in
4 turns / 0.31 in / 0.4 inch	64 psi/0.60 in	101 psi/0.56 in
5 turns / 0.38 in / 0.5 inch	81 psi/0.53 in	126 psi/0.46 in
6 turns / 0.46 in / 0.6 inch	96 psi/0.45 in	151 psi/0.36 in
7 turns / 0.54 in / 0.7 inch	113 psi/0.37 in	177 psi/0.26 in
8 turns / 0.62 in / 0.8 inch	129 psi/0.29 in	202 psi/0.16 in
9 turns / 0.69 in / 0.9 inch	145 psi/0.22 in	227 psi/0.06 in
10 turns / 0.77 inch	161 psi/0.14 in	solid
11 turns / 0.85 inch	solid	

Pump Model	5070	5080
Valve face area (sq. inches)	4.43	5.67
Maximum valve travel (inches)	0.9	1.1
Spring rate (lbs per 0.1 inch) Ref. spring part number 000-076-006	120	120
Adjustment screw pitch (threads per inch)	10	10
Amount of spring compression (No. of turns/inches)	Product cracking pressure/ Remaining available travel (psi/inches)	
1 turn/ 0.1 inch	27 psi/.08 inch	21 psi/1.0 inch
2 turns / 0.2 inch	54 psi/0.7 inch	42 psi/0.9 inch
3 turns / 0.3 inch	81 psi/0.6 inch	63 psi/0.8 inch
4 turns / 0.4 inch	108 psi/0.5 inch	84 psi/0.7 inch
5 turns / 0.5 inch	135 psi/0.4 inch	105 psi/0.6 inch
6 turns / 0.6 inch	162 psi/0.3 inch	126 psi/0.5 inch
7 turns / 0.7 inch	185 psi/0.2 inch	147 psi/0.4 inch
8 turns / 0.8 inch	216 psi/0.1 inch	168 psi/0.3 inch
9 turns / 0.9 inch	solid	189 psi/0.2 inch
10 turns / 1.0 inch		210 psi/0.1 inch
11 turns / 1.1 inch		solid

Note: Spring force on valve increases as valve opens, and at the same rate as an equal amount of valve stem adjustment. For example, if the valve opens 0.2 inches, the increase in spring load is the same as making two turns of the adjustment screw.

SECTION XII UNIVERSAL INDUSTRIAL PARTS LIST

5040



5040 UNIVERSAL INDUSTRIAL PUMP

5040 UNIVERSAL INDUSTRIAL PUMP

ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	40053	UI GEARCASE 040 MACHINED	1	34	40057	BODY, 5040 1-1/2 NPT STD PKG	1
2	040 006 000	COVER, 040 UI	1	35	40058	BODY, 5040 1-1/2 NPT STD MECH.	1
3	000 142 300	SEALANT, RTV SILICONE BLUE	AS REQ'D	36	OBI 002 000	COVER, STD 316 SS	1
4	30-283	CAP SCREW, HEX HD 5/16 18 X .75	6	37	N70261	O-RING, COVER NITRILE	1
5	000 030 013	SEAL, SHAFT 1.250 DIA. X .250 WD	1	38	BDO 040 300	PIN, DOWEL	1
6	40059	SHAFT, DRIVE PACKING SEAL	1	39	BDO 040 100	PIN, DOWEL	1
7	40065	SHAFT, SHORT DRIVE MECH. SEAL	1	40	BDO 040 200	PIN, DOWEL	1
8	40060	SHAFT, SHORT PACKING SEAL	1	41	BDO 040 000	PIN, DOWEL	1
9	40066	SHAFT, SHORT MECH. SEAL	1	42	OBI 010 200	ROTOR, 2W STD 88	2
10	000 037 002	KEY, 1/4 X 1/4 X 1-3/4	1	43	OBI 048 000	COVER, BUSHING CARBON	2
11	030 007 001	GEAR, RH	1	44	OBI 052 A00	WASHER, ROTOR RETAINER	2
12	030 007 002	GEAR, LH	1	45	OBI 052 C00	ROTOR LOCK CLIP	2
13	BDO 037 000	KEY, WOODRUFF	2	46	30-36X	CAP SCREW, HEX HD 1/2-13 X 1.25	2
14	CDO 036 W00	LOCK WASHER	2	47	30-96	SCREW, HEX HD 5/16-18 X 2.5	4
15	CDO 036 N00	LOCK NUT	2	48	*30-211	SCREW, SOC HD 1/4-20 X 2	2
16	030 055 000	SPACER, GEAR	2	49	*30-34	CAP SCREW, HEX HD 5/16-18 X 1.0	4
17	000 030 014	SEAL, 48MM SHAFT DIA. X 7	2	50	*001 061 015	NAME PLATE, NON SANITARY	1
18	030 127 000	SPACER, SEAL	2	51	*33-22	NAMEPLATE, CAUTION	2
19	030 035 000	BEARING, REAR	2	52	*BDO 092 000	GREASE FITTING	4
20	030 055 001	SPACER, BEARING	2	53	*BDO 093 000	PLASTIC CAP, GC-1 RED	4
21	030 080 000	BRG RETAINER, FRONT	2	54	*BDO 121 100	PLASTIC CLEAN OUT PLUG	2
22	30-296	SCREW, BHD SOC, 5/16-18 X .75	8	55	*30-355	SCREW, DRIVE	8
23	40062	SEAL, OIL	1	56	*000 165 000	PAINT, EPOXY 2 PART TNEMEC #10	1
24	030 036 000	BEARING, FRONT	2	57	*40808	KIT, UI MAINTENANCE	2
25	030 054 050	SPACER	4	60	111575	SHAFT GUARD (Mechanical Seal Only)	2
26	030 054 _	SHIM (VARIOUS THICKNESSES)	AS REQ'D	61			
27	BDO 116 100	BUSHING, DOWEL G.C.	1				
28	BDO 116 000	BUSHING, DOWEL G.C.	1				
29	000 046 003	PLUG OIL, DRAIN AND LEVEL	6				
30	40323	SHIM, 040 UI GEARCASE FINISHED	1				
	30-344	CAP SCREW, SOC HD 3/8-16 X1	4				
	000 121 002	PLUG, 3/8 PLASTIC	8				

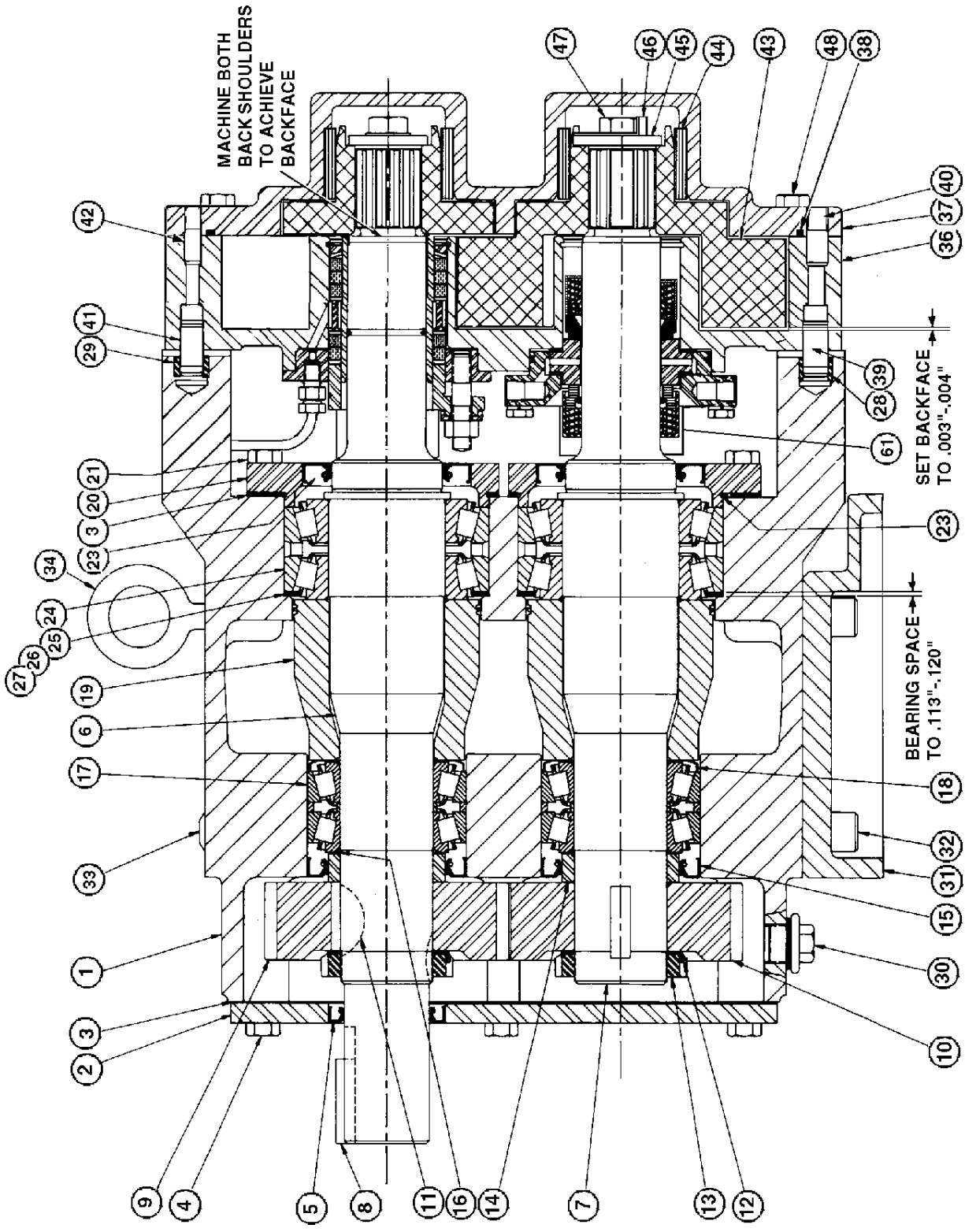
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5050 UNIVERSAL INDUSTRIAL PUMP

5050 UNIVERSAL INDUSTRIAL PUMP

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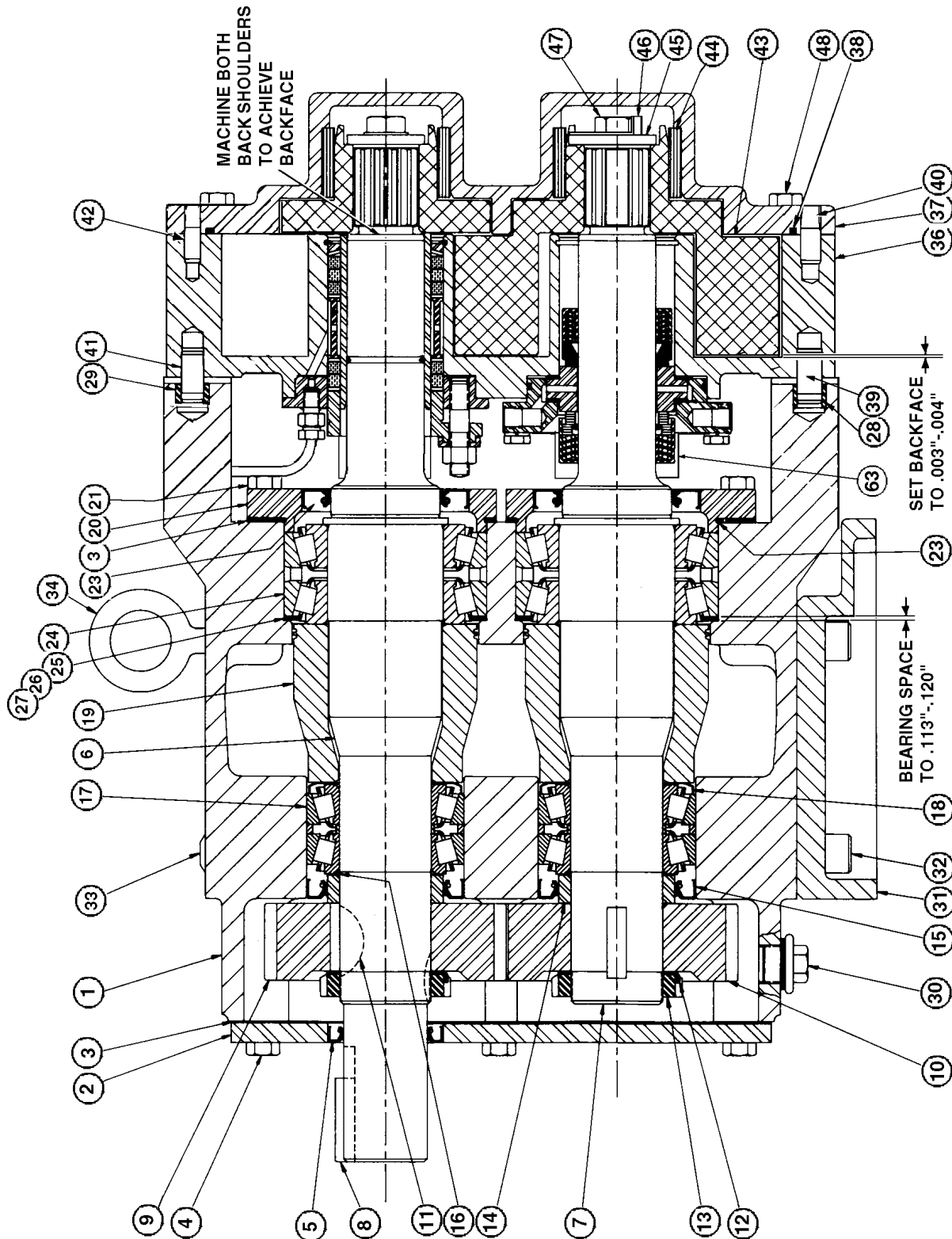
ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	40054	GEAR CASE, 070 UI MACHINED	1	32	30-275	CAP SCREW, SOC HD 1/2-13 X 1.25	4
2	070 006 000	COVER, 070 UI GEARCASE FINISHED	1	33	000 121 001	PLUG, 1/2" PLASTIC	6
3	000 142 300	SEALANT, RTV SILICONE BLUE AS REQ'D	1	34	30-360	EYE, BOLT 1/2-13 X .75 PLATED	2
4	30-314	SCREW, HX HD 3/8-16 X .75 6	1	36	40088	BODY, 5050 2 NPT STD PACK	1
5	000 030 012	SEAL, 1.625 SHAFT DIA X .312 WD	1	40091	BODY, 5070 2 NPT STD MECH	1	
6	40094	SHAFT, 5050 DRIVE PACKING SEAL	1	37	OCI 002 000	COVER, STD 316 SS	1
7	40086	SHAFT, 5050 DRIVE MECHANICAL SEAL	1	38	S75128	O-RING, COVER 9-5/8 ID SILICONE	1
8	40095	SHAFT, 5050 SHORT PACKING SEAL	1	T85272	O-RING, COVER TEFLON	1	
9	40087	SHAFT, 5050 SHORT MECHANICAL SEAL	1	V70272	O-RING, COVER VITON	1	
10	060 007 001	GEAR, RH	1	N70272	O-RING, COVER NITRILE	1	
11	060 007 002	GEAR, LH	1	E70272	O-RING, COVER E.P.	1	
12	060 037 000	GEAR KEY	2	39	CDO 040 100	PIN, DOWEL	1
13	STD 136 009	LOCK WASHER, W09	2	40	CDO 040 R10	PIN, DOWEL	1
14	STD 236 009	LOCK NUT, N09	2	41	CDO 040 R00	PIN, DOWEL	1
15	060 055 000	SPACER, GEAR	2	42	CDO 040 000	PIN, DOWEL	1
16	000 030 011	SEAL, 2.250 SHAFT DIA. X .375 WD	2	43	OCI 010 200	ROTOR, 2W STD #88	2
17	060 127 000	SPACER	2	44	OCI 048 W00	COVER, BUSHING #88	2
18	060 035 000	BEARING, REAR	2	OCI 048 000	COVER, BUSHING CARBON	2	
19	STD 091 002	RETAINER, GREASE	2	OCI 052 A00	WASHER, RETAINER	2	
20	060 055 003	BEARING SPACER, FINISHED 60/130	2	OCI 052 C00	ROTOR LOCK CLIP	2	
21	060 080 000	BEARING RETAINER	2	OCI 052 004	CAP SCREW	2	
22	30-351	CAP SCREW, HXHD 3/8-16 X 1.25	8	40768	CAP SCREW, HEX HD 3/8-16 X 3	4	
23	40084	SEAL, OIL 3.256 OD X .375 WIDE	2	*40770	SCREW, SOC HD 5/16-18 X 2	2	
24	N70154	O-RING, NITRILE	2	*OCI 011 000	CAP SCREW, HEX HD, 3/8-16 X 1.75	4	
25	060 036 000	BEARING, FRONT	2	*001 061 015	NAME PLATE, NON-SANITARY PUMPS	1	
26	40458	SPACER, .060 MISC .050 THICK	4	*33-62	LABEL CAUTION	2	
27	40459	SPACER, .060 MISC .010 THICK	2	*BDO 092 000	GREASE FITTING	4	
28	40460	SPACER, .060 MISC .002 THICK	2	*BDO 093 000	CAP, PLASTIC GC-1 RED	4	
29	CDO 116 100	BUSHING, DOWEL	1	*BDO 121 100	PLUG, PLASTIC CLEAN OUT	2	
30	CDO 116 000	BUSHING, DOWEL	1	*30-355	SCREW, DRIVE	4	
31	000 046 004	PLUG, WASHER 3/4-16	6	*000 165 000	PAINT, EPOXY 2 PART TNEMEC #104	1	
	40324	SHIM, 070 UI GEAR CASE FINISHED	1	*400808	KIT, UI MAINTENANCE	1	
				111575	SHAFT GUARD (Mechanical Seal Only)	2	

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5060 UNIVERSAL INDUSTRIAL PUMP

5060 UNIVERSAL INDUSTRIAL PUMP

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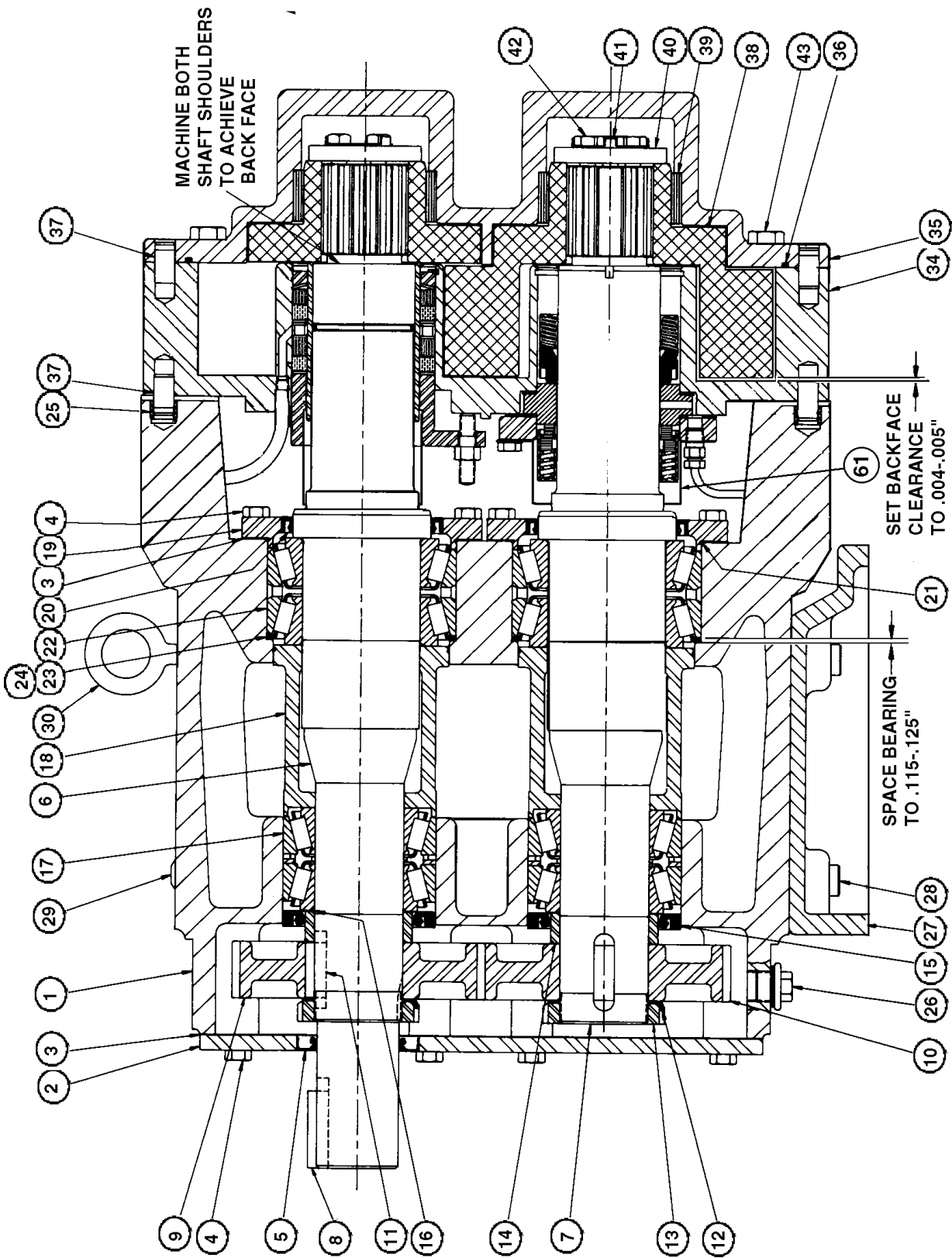
ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	40054	GEAR CASE, 070 UIMACHINED	1	32	30-275	CAP SCREW, SOC HD 1/2-13 X 1.25	4
2	070 006 000	COVER, 070 UI GEARCASE FINISHED	1	33	000 121 001	PLUG, 1/2" PLASTIC	4
3	000 142 300	SEALANT, RTV SILICONE BLUE AS REQ'D	1	34	30-360	EYE, BOLT 1/2-13 X .75 PLATED	2
4	30-314	SCREW, HX HD 3/8-16 X .75 6	1	36	40078	BODY, 5060 2 NPT STD PACKING	1
5	000 030 012	SEAL, 1.625 SHAFT DIA X .312 WD	1	40081	BODY, 5060 2 NPT STD MECH	1	
6	40096	SHAFT, 5060 DRIVE PACKING SEAL	1	37	OC1 002 000	COVER, 316 SS	1
7	40076	SHAFT, 5060 DRIVE MECHANICAL	1	38	133117013	O-RING, COVER 9-5/8 ID SILICONE	1
8	40097	SHAFT, 5060 SHORT PACKING SEAL	1	T80272	O-RING, COVER TEFLON	1	
9	40077	SHAFT, 5060 SHORT MECHANICAL	1	V70272	O-RING, COVER VITON	1	
10	000 037 003	KEY, 3/8 X 3/8 X 1-5/8	1	N70272	O-RING, COVER NITRILE	1	
11	060 007 001	GEAR, RH	1	E70272	O-RING, COVER E. P.	1	
12	060 007 002	GEAR, LH	1	CDO 040 100	PIN, DOWEL	1	
13	060 037 000	GEAR KEY	2	CDO 040 R10	PIN, DOWEL	1	
14	STD 136 009	LOCK WASHER, W09	2	CDO 040 R00	PIN, DOWEL	1	
15	STD 236 009	LOCK NUT, N09	2	CDO 040 000	PIN, DOWEL	1	
16	060 055 000	SPACER, GEAR	2	OEI 010 200	ROTOR, 2W STD 88	2	
17	000 030 011	SEAL, 2.250 SHAFT DIA. X .375 WD	2	OCI 048 W00	COVER, BUSHING #88	2	
18	060 127 000	SPACER	2	OCI 048 000	COVER, BUSHING CARBON	2	
19	060 035 000	BEARING, REAR	2	OCI 052 A00	WASHER, RETAINER	2	
20	STD 091 002	RETAINER, GREASE	2	OCI 052 C00	ROTOR LOCK CLIP	2	
21	060 055 003	BEARING SPACER, FINISHED 60/130	2	30-36X	CAP SCREW, HEX HD 1/2-13 X 1.25	2	
22	060 080 000	BEARING RETAINER	2	30-317	CAP SCREW, HEX HD 3/8-16 X 3	4	
23	30-351	CAP SCREW, HEX HD 3/8-16 X 1.25	8	*30-319	CAP SCREW, HEX HD 5/16-18 X 2	2	
24	40084	SEAL, OIL 3.256 OD X .375 WIDE	2	*30-60	CAP SCREW, HEX HD 3/8-16 X 1.75	4	
25	N70154	O-RING, NITRILE	2	*001 061 015	NAMEPLATE NON-SANITARY PUMPS	1	
26	060 036 000	BEARING, FRONT	2	*33-62	CAUTION LABEL	2	
27	40458	SPACER, 060 MISC .050 THICK	4	*BD0 092 000	GREASE FITTING	4	
28	40459	SPACER, 060 MISC .010 THICK	2	*BD0 093 000	PLASTIC CAP, GC-1 RED	4	
29	40460	SPACER, 060 MISC .002 THICK	2	*BD0 121 100	PLASTIC CLEAN OUT PLUG 2	4	
30	CDO 116 100	BUSHING, DOWEL	1	*30-355	SCREW, DRIVE	4	
31	CDO 116 000	BUSHING, DOWEL	1	*000 165 000	PAINT EPOXY 2 PART TNEMEC #104	1	
	000 046 004	PLUG, WASHER 3/4-16	6	*400808	KIT, UI MAINTENANCE	1	
	40324	SHIM, 070 UI GEAR CASE FINISHED	1	111576	SHAFT GUARD (For Mechanical Seals only)	2	

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5070 UNIVERSAL INDUSTRIAL PUMP

5070 UNIVERSAL INDUSTRIAL PUMP

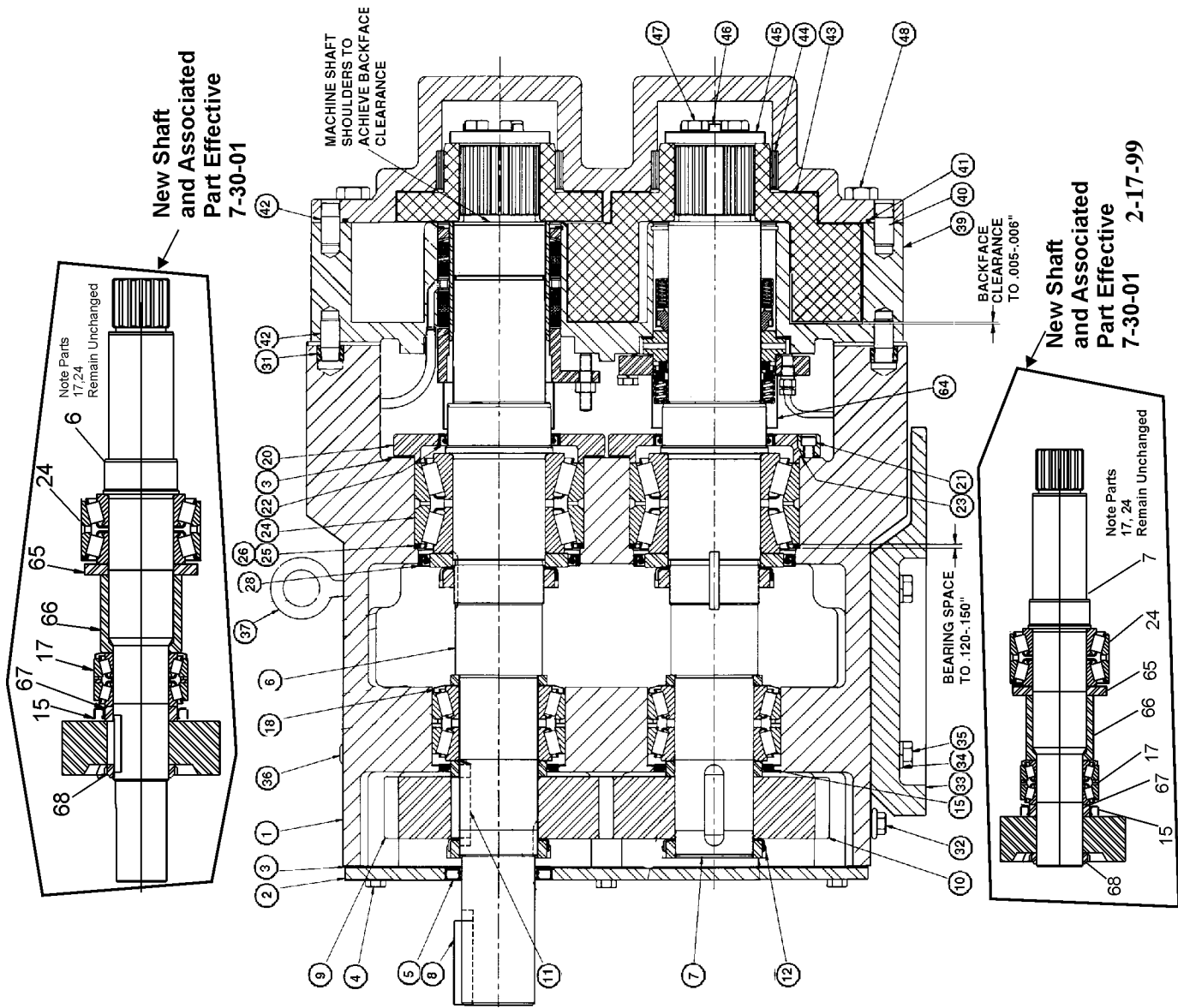
ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	40454	GEAR CASE 230 UI MACHINED	1	28	30-315	CAP SCREW, SOC. HD 1/2-13X 1.5	1
2	230 006 000	COVER 230 UI GEAR CASE	1	29	000 121 001	PLUG, 1/2" PLASTIC	4
3	000 142 300	SEALANT RTV SILICONE	AS REQD	30	30-360	EYE, BOLT 1/2-13 X .75 PLATED	2
4	30-351 CAP	SCREW HX HO 3/8-18 x 1.25	16	34	40313	BODY, 5070 4-150# FLG STD MECH	1
5	STD 030 006	SEAL, 2.000 SHAFT DIA x .312 WD	1	34	40316	BODY, 5070 4-150# FLG STD PACKING	1
6	40810	SHAFT, 5070 DRIVE MECH SEAL	1	35	200 002 000	2001 COVER, STD 316 SS	1
7	40819	SHAFT, 5070 DRIVE MECH SEAL	1	36	GD0 117 000	O-RING, COVER NITRILE	1
7	40811	SHAFT, 5070 SHORT MECH SEAL	1	37	CD0 040 R10	PIN, DOWEL	4
7	40820	SHAFT, 5070 SHORT PACKING SEAL	1	38	200 010 000	2001 ROTOR, 2W STD 88	2
8	000 037 004	KEY 1/2 x 1/2 x 1-7/8	1	39	200 048 000	COVER, BUSHING CARBON	2
9	200 007 001	GEAR, RH	1	40	200 052 000	ROTOR RETAINING NUT	2
10	200 007 002	GEAR, LH	1	41	200 053 000	LOCK CLIP	2
11	200 037 000	GEAR KEY	2	42	30-55X	CAP SCREW, HXHD 3/8-16 x 1.5 SS	6
12	STD 136 011	LOCK WASHER, W11	2	43	30-324	SCREW, HX HD 1/2-13 X 4.5 SS 18-8	4
13	STD 236 011	LOCK NUT, N11	2	44	*30-326	SCREW, SOC HD 3/8-16 X 3.5 SS 18-8	2
14	40878	SPACER, 5070 GEAR	2	45	*30-36X	CAP SCREW, HEX HD, 1/2-13 X 1.25 SS	4
15	STD 119 002	SEAL, 2.625 SHAFT DIA x .375 WD	2	51	*001 061 015	NAME PLATE, NON-SANITARY PUMPS	1
16	200 127 000	SPACER	2	52	*33-62	CAUTION LABEL	2
17	200 035 000	BEARING, REAR	2	53	*BDO 092 000	FITTING, GREASE	4
18	40752	SPACER, 5070 BEARING	2	54	*BDO 093 000	CAP, PLASTIC GC-1 RED	4
19	220 080 000	BEARING RETAINER	2	55	*BDO 121 100	PLUG, PLASTIC CLEAN OUT	2
20	STD 030 002	SEAL, GREASE, 3.375 SET .375 WD	2	56	*30-355	SCREW, DRIVE	4
21	B70 137 047	O-RING, NITRILE	2	57	*000 165 000	PAINT, EPOXY 2 PART TNEMEC #104	1
22	200 036 000	BEARING, FRONT	2	60	*400808	KIT, UI MAINTENANCE	1
23	220 054 050	SHIM	4	61	111577	SHAFT GUARD (Mechanical Seal only)	2
24	220 054 ---	SHIM, VARIOUS THICKNESSES	AS REQ'D				
25	CD0 116 100	BUSHING, DOWEL	2				
26	000 046 004	PLUG, WASHER 3/16	6				
27	40817	SHIM, 230 UI GEARCASE FINISHED	1				

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5080 UNIVERSAL INDUSTRIAL PUMP

ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	40616	HOUSING 330 GEARCASE FINISHED	1	39	40803	BODY, 5080 6 150# FLG STD MECH	1
2	40669	COVER, 330 GEARCASE PLATE	1	40	40804	BODY, 5080 6 150# FLG STD PACKING	1
3	000 142 300	SEALANT, RTV SILICONE BLUE	AS REQ'D	41	OHI 002 000	COVER, IND STD 316 SS	1
4	30-314	CAP SCREW, HX HD 3/8-16 X.75	6	41	N70280	O-RING, COVER NITRILE	1
5	STD 030 004	SEAL, 2.375 DIA X .375 .625 WD	1	42	OHI 040 000	PIN, DOWEL	4
6	113514	SHAFT, DRIVE IND MECH	1	43	OHI 010 200	ROTOR, 2W STD 88	2
	113512	OPTIONAL 17-4 SHAFT	1	44	OHI 048 000	COVER, BUSHING CARB	2
	113510	SHAFT, DRIVE IND PKG	1	45	OHI 052 000	ROTOR RETAINER WASHER	2
	113515	SHAFT, IND MECH	1	46	OHI 053 000	ROTOR LOCK CLIP	2
7	113513	OPTIONAL 17-4 SHAFT	1	47	30-127X	CAP SCREW, HEX HD 1/2-13 X 1.75 SS	6
	113511	SHAFT, IND PACKING	1	48	30-117	CAP SCREW, HEX HD 5/8-11 X5.5	4
8	000 037 005	KEY, 5/8 X 5/8 X 2-3/4	1	49	*30-323	SCREW, SOC HD 3/8-16 X 4	2
9	OHI 007 001	GEAR, RH	1	50	*30-105	CAP SCREW, HEX HD 5/8-11 X 1.5	4
10	OHI 007 002	GEAR, LH	1	54	*001 061 015	NAMEPLATE, NON-SANITARY PUMPS	1
11	OHI 037 000	KEY, GEAR .625 SQ. X 1.94/1.97	2	55	*33-62	NAMEPLATE, CAUTION	2
15	102475	SEAL, TIMING GEAR	2	56	*BDO 092 000	FITTING, GREASE	4
17	OHI 036 000	BEARING REAR	1	57	*BDO 093 000	CAP, PLASTIC G.C. RED	4
18	STD 091 000	RETAINER, GREASE	2	58	*BDO 121 100	PLUG, PLASTIC CLEAN OUT	2
20	OHI 080 000	RETAINER, BEARING	2	59	*30-555	DRIVE SCREW	4
21	30-343	CAP SCREW, SOCKET HD, 5/16-18 X 1	8	60	*000 165 000	PAINT, EPOXY 2 PART TNE MEC #104	1
22	STD 030 002	SEAL, GREASE 3.375 SFT D/.375 WD	2	63	*40808	KIT, UI MAINTENANCE	2
23	N70050	O-RING, 5.25 ID NITRILE	2	64	111578	SHAFT GUARD (Mechanical Seal Only)	1
24	OHI 036 003	BEARING, FRONT	2	65	102473	SPACER FRONT BEARING	1
25	OHI 054 050	SHIM	4	66	102472	SPACER BEARING FRONT TO REAR	1
26	OHI 054 020	SHIM	AS REQ'D	67	102474	SPACER TIMING GEAR	1
28	STD 030 003	SEAL, GREASE 4.500 SFT D/.375WD	2	68	105697	BEARING LOCKNUT	1
31	OHI 116 000	BUSHING, DOWEL	2				
32	000 046 004	PLUG W/ WASHER, 3/4-16	6				
33	40288	SHIM, 324 324A GEARCASE	1				
34	43-177	LOCK WASHER, 1/2	4				
35	30-250	CAPSCREW, HEX HD 1/2-13 X 1.75	4				
36	000 121 001	PLUG, 1/2 PLASTIC	6				
37	30-360	EYE BOLT, 1/2-13 X 1.5 PLATED	3				

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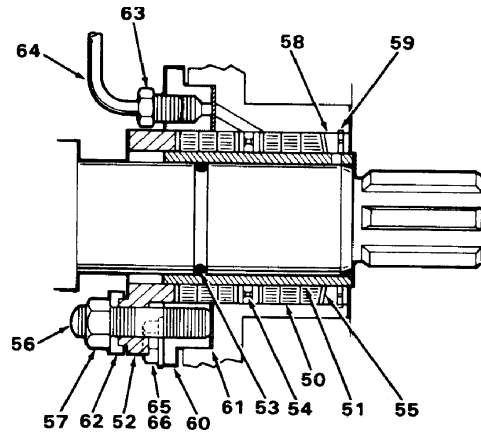
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5040 PACKING AND SEALS

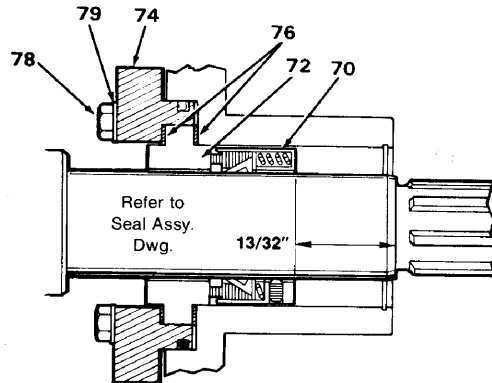
MECHANICAL PACKING (STANDARD SEAL PACKAGE)

Item	Part No.	Description	Qty
63	STD 299 022	NUT 6100x2	4
64	87-699	TUBE-1 .187"x.030"W COPPER	24
52	OB1 004 000	GLAND SS	2
50	OB1 033 000	PACKING	10
55	OB1 033 100	PACKING SPACER	8
61	OB1 043 300	GASKET INSERT	2
54	OB1 047 000	LANTERN RING-GLASS FILLED	2
57	36-41	HEX NUT, 5/16-18 18-8 REG	4
60	OB1050 200	GLAND, INSERT	2
58	OB1 051 000	PACKING ,RETAINING RING 316SS	2
51	OB1 098 000	SLEEVE	2
79	43-22	LOCK WASHER, 1/4" 18-8 REG	8
65	30-62	HHCS 1/4-20 x .50" 18-8	8
56	200 050 000	STUD-PACKING GL	4
59	40067	RETAINER-5040-RING 2.154 OD	2
53	N70024	O-RING, SHAFT, NITRILE BUNA	2



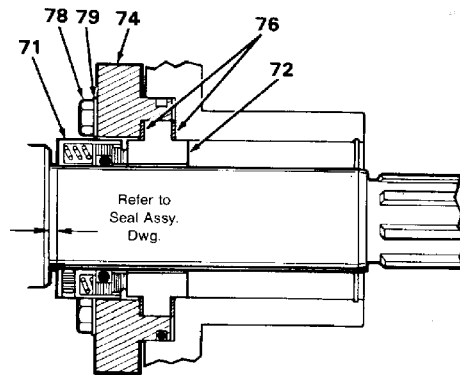
INSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
70	OB1 114 000	SEAL, JC #9	2
72	025 014 012	SEAT, SEAL, CERAMIC 5040 T STYLE	2
	025 014 013	SEAT, SEAL, TUNGSTEN	2
	025 014 016	SEAT, SEAL, SILICON	2
74	OB1 034 001	GLAND, SS	2
76	025 04 200	GASKET, SEAT RING-OUTER	4
79	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
78	30-93	HHCS, 1/4-20 x 1.0" 18-8	8



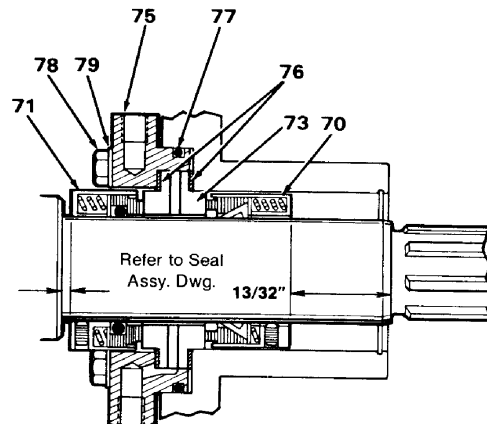
OUTSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
71	OB1 114 FP0	SEAL JC #8B2 CARBON	2
72	025 014 012	SEAT, SEAL CERAMIC 5040 T STYLE	2
	025 014 013	SEAT, SEAL, TUNGSTEN	2
	025 014 016	SEAT, SEAL, SILICON	2
74	OB1 034 001	GLAND, SS	2
76	025 042 001	GASKET, SEAT RING-OUTER	4
79	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
78	30-93	HHCS ,1/4-20 x 1.0" 18-8	8



INSIDE-OUTSIDE MECHANICAL SEAL

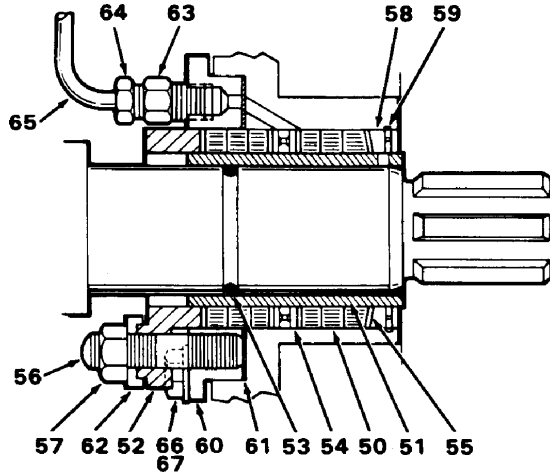
Item	Part No.	Description	Qty
70	OB1 114 000	SEAL JC #9	2
71	OB1 114 FP0	SEAL JC #8B2 CARBON	2
73	025 014 027	SEAT, SEAL, FLUSH, CERAMIC	2
	025 014 028	SEAT, SEAL, FLUSH, TUNGSTEN	2
	025 014 031	SEAT, SEAL, FLUSH, SILICON	2
75	OB1 034 003	GLAND, FLUSH	2
76	025 042 001	GASKET, SEAT RING, OUTER	4
77	V70147	O-RING-147 FDA VITON	2
79	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
78	30-93	HHCS 1/4-20 x 1.0" 18-8	8



5050 PACKING AND SEALS

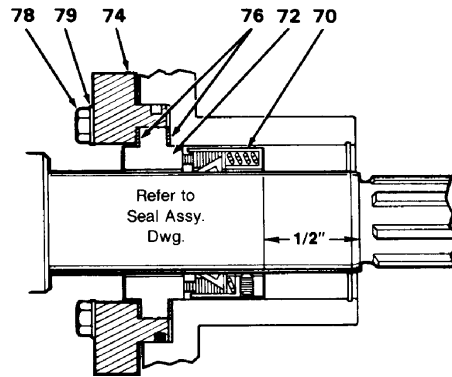
MECHANICAL PACKING (STANDARD SEAL PACKAGE)

Item	Part No.	Description	Qty
63	STD 299 003	FITTING 6200X3	4
64	STD 299 023	FITTING 6100X3	4
65	87-699	TUBE-1 .187"x.030" COPPER IN.	24
52	OC1 004 000	GLAND	2
67	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
50	OC1 033 000	PACKING	12
55	OC1 033 100	PACKING SPACER	8
61	OC1 043 300	GASKET INSERT	2
66	30-62	HHCS 1/4-20 x .50" 18-8	8
54	OC1 047 000	RING, LANTERN GLASS FILLED	2
62	OC1 049 000	GLAND WASHER	4
56	OC1 050 000	STUD, 3/8-16 .375D 1.87LG	4
57	36-45	HEX NUT, 3/8-16 18-8 REGULAR	4
60	OC1 050 200	GLAND INSERT	2
58	OC1 051 000	PACKING, RET RING 316SS	2
51	OC1 098 000	SLEEVE	2
59	40068	RETAINER-5050-RING, 2.413OD	2
53	N70228	O-RING, NITRILE BUNA	2



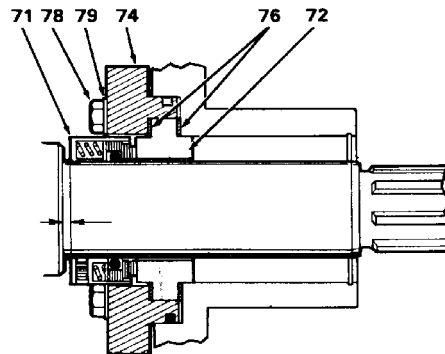
INSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
70	OC1 114 000	SEAL, JC #9	2
72	055 014 012	SEAL, SEAT-CERAMIC	2
	055 014 013	SEAT, SEAL, TUNGSTEN	2
	055 014 016	SEAT, SEAL, SILICON	2
74	OC1 034 001	GLAND, 55 & 125I, 316	2
76	055 042 001	GASKET	4
78	43-22	LOCK WASHER 1/4" 18-8 REG.	8
79	30-93	HHCS, 1/4-20 x 1.0" 18-8	8



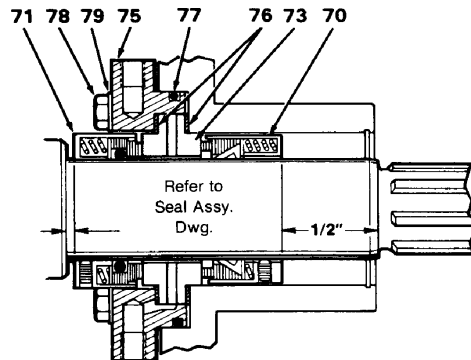
OUTSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
71	OC1 114 008	SEAL JC #8B2	2
72	055 014 012	SEAL SEAT-CERAMIC	2
	055 014 013	SEAT, SEAL, TUNGSTEN	2
	055 014 016	SEAT, SEAL, SILICON	2
74	OC1 034 001	GLAND, 55 & 125I, 316	2
76	055 042 001	GASKET	4
78	43-22	LOCK WASHER 1/4" 18-8 REG.	8
79	30-93	HHCS, 1/4-20 x 1.0" 18-8	8



INSIDE-OUTSIDE MECHANICAL SEAL

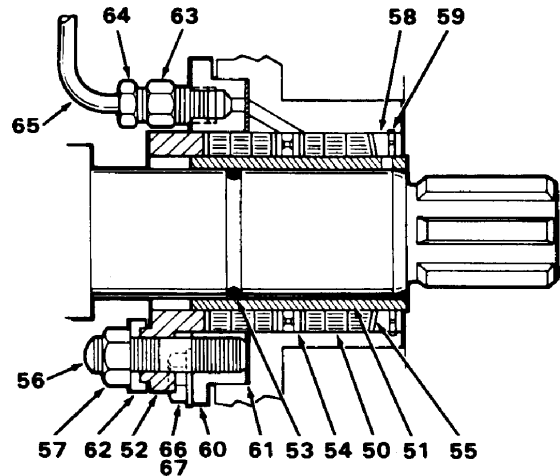
Item	Part No.	Description	Qty
70	OC1 114 000	SEAL JC #9	2
71	OC1 114 008	SEAL JC #8B2	2
73	055 014 027	SEAL SEAT, FLUSH CERAMIC	2
	055 014 028	SEAL SEAT, FLUSH, TUNGSTEN	2
	055 014 031	SEAL SEAT, FLUSH, SILICON	2
75	OC1 034 003	GLAND, FLUSH	2
76	055 042 001	GASKET	4
77	V70152	O-RING-152 FDA VITON	2
78	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
79	30-93	HHCS 1/4-20 x 1.0" 18-8	8



5060 PACKING AND SEALS

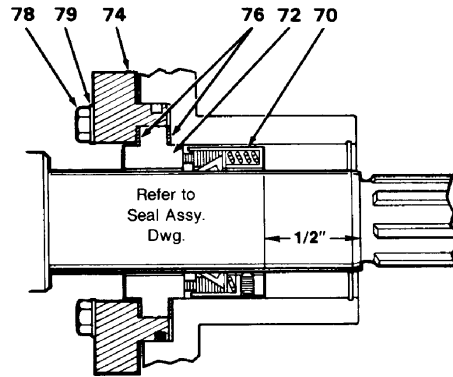
MECHANICAL PACKING (STANDARD SEAL PACKAGE)

Item	Part No.	Description	Qty
63	STD 299 003	FITTING 6200X3	4
64	STD 299 023	FITTING 6100X3	4
65	87-699	TUBE-1 .187"x.030" COPPER IN.	24
52	OC1 004 000	GLAND	2
67	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
50	OC1 033 000	PACKING	12
55	OC1 033 100	PACKING SPACER	8
61	OC1 043 300	GASKET INSERT	2
66	30-62	HHCS, 1/4-20 x .50" 18-8	8
54	0E1 047 000	RING, LANTERN GLASS FILLED	2
62	OC1 049 000	GLAND WASHER	4
56	OC1 050 000	STUD, 3/8-16 .375D 1.87LG	4
57	36-45	HEX NUT, 3/8-16 18-8 REGULAR	4
60	OC1 050 200	GLAND INSERT	2
58	OC1 051 000	PACKING, RETAINING RING 316SS	2
51	OC1 098 000	SLEEVE	2
	OC1 098 001	SLEEVE, CERAMIC COATED	2
59	40068	RETAINER-5050-RING 2.413OD	2
53	N70228	O-RING, NITRILE BUNA	2



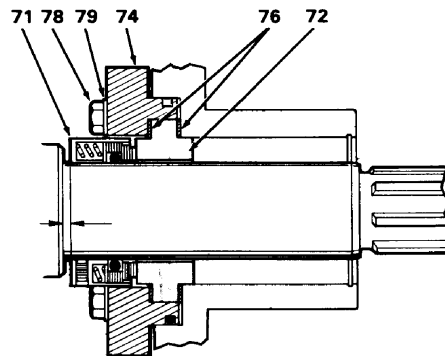
INSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
70	OC1 114 000	SEAL, JC #9	2
72	055 014 012	SEAL SEAT, CERAMIC	2
	055 014 013	SEAL SEAT, TUNGSTEN CARBIDE	2
	055 014 016	SEAL SEAT, SILICON	2
76	OC1 034 001	GLAND, 55 & 125I, 316	2
79	055 042 001	GASKET	4
78	43-22	LOCK WASHER 1/4" 18-8 REG.	8
79	30-93	HHCS, 1/4-20 x 1.0" 18-8	8



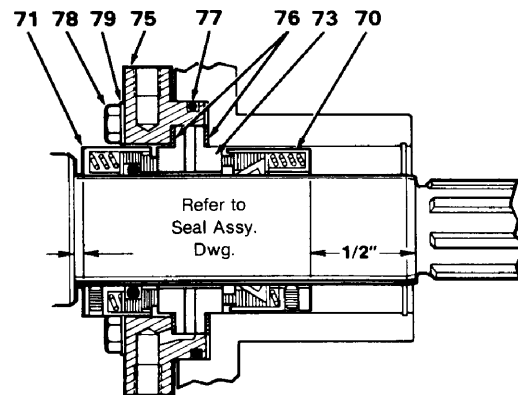
OUTSIDE MECHANICAL SEAL

Item	Part No.	Description	Qty
71	OC1 114 008	SEAL, JC #8B2	2
72	055 014 012	SEAL SEAT-CERAMIC	2
	055 014 013	SEAL SEAT, TUNGSTEN CARBIDE	2
	055 014 016	SEAL SEAT, SILICON	2
74	OC1 034 001	GLAND, 55 & 125I, 316	2
76	055 042 001	GASKET	4
78	43-22	LOCK WASHER 1/4" 18-8 REG.	8
79	30-93	HHCS, 1/4-20 x 1.0" 18-8	8



INSIDE-OUTSIDE MECHANICAL SEAL

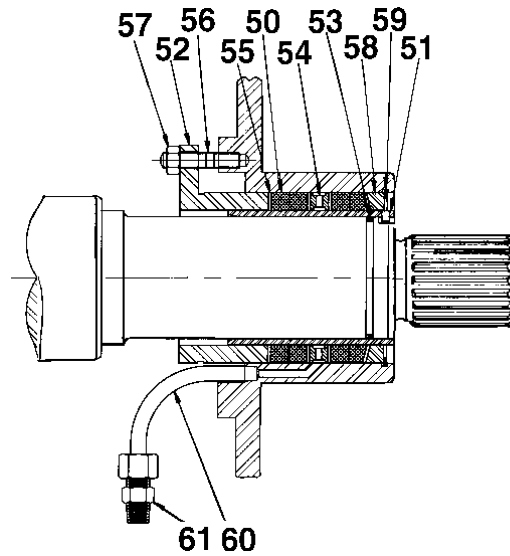
Item	Part No.	Description	Qty
70	OC1 114 000	SEAL, JC #9	2
71	OC1 114 008	SEAL, JC #8B2	2
73	055 014 027	SEAL SEAT, FLUSH CERAMIC	2
	055 014 028	SEAL SEAT, FLUSH TUNGSTEN	2
	055 014 031	SEAL SEAT, FLUSH SILICON	2
75	OC1 034 003	GLAND, FLUSH	2
76	055 042 001	GASKET	4
77	V70152	O-RING-152 FDA VITON	2
78	43-22	LOCK WASHER, 1/4" 18-8 REG.	8
79	30-93	HHCS 1/4-20 x 1.0" 18-8	8



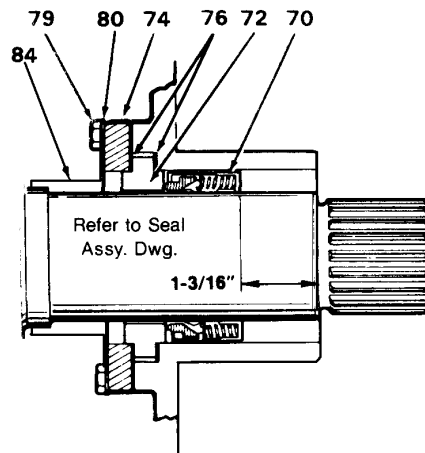
5070 PACKING AND SEALS

MECHANICAL PACKING (STANDARD SEAL PACKAGE)

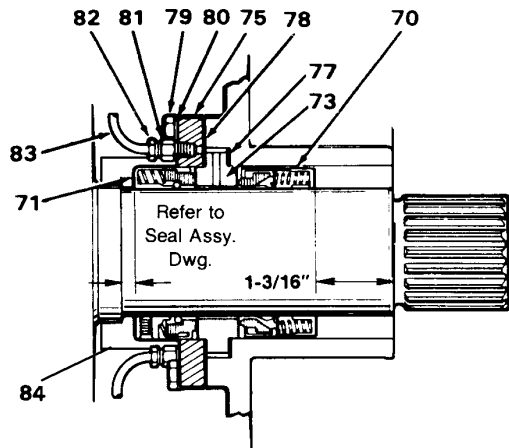
Item	Part No.	Description	Qty
57	36-41	HEX NUT, 5/16-18 18-8 REG	4
61	000 299 032	FITTING, MALE BRASS	4
52	200 004 000	PACKING GLAND	2
55	200 032 000	PACKING SPACER	8
50	200 033 000	PACKING C-13	8
54	200 047 000	LANTERN RING, GLASS FILLED	2
56	200 050 000	STUD, PACKING GL	4
58	200 051 000	PACK, RETAINING RING	2
51	200 098 000	SLEEVE, STAINLESS	2
	200 098 003	SLEEVE, CERAMIC COATED	2
60	200 317 000	TUBE, FLUSHING 5/16 STEEL	4
59	40069	RETAINER, 5070-RING, 3.636OD	2
53	N70140	O-RING, SHAFT, NITRILE BUNA	2



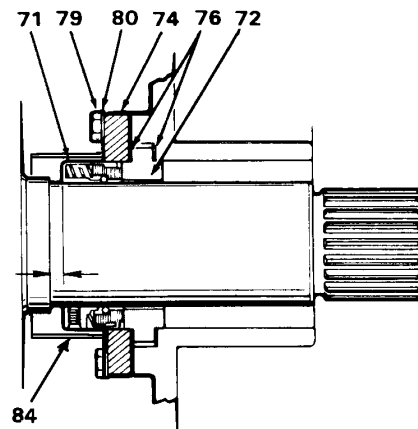
Item	Part No.	Description	Qty
70	200 114 000	CRANE SEAL, #9	2
71	200 114 002	CRANE SEAL, 8B2	2
73	200 014 027	SEAL SEAT, FLUSH CERAMIC	2
	200 014 028	SEAL SEAT, FLUSH TUNGSTEN	2
	055 014 031	SEAL SEAT, FLUSH, SILICON	2
75	200 034 001	GLAND, FLUSH	2
77	200 042 001	GASKET, INNER T-SEAT VITON	2
78	200 042 002	GASKET, OUTER	2
79	30-34	HHCS, 5/16-18 x 1.0"	8
80	43-15	LOCK WASHER, 5/16	8
84	111577	SHAFT GUARD	



INSIDE MECHANICAL SEAL



INSIDE-OUTSIDE MECHANICAL SEAL

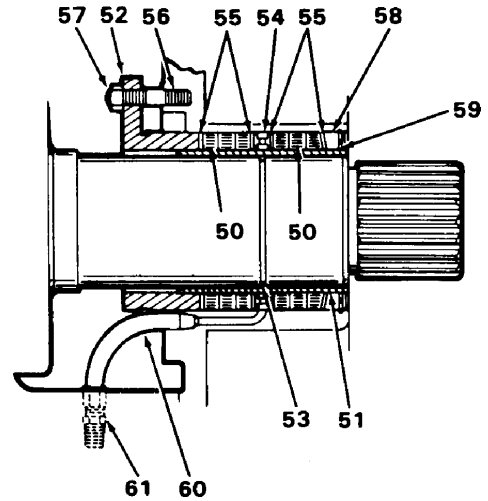


OUTSIDE MECHANICAL SEAL

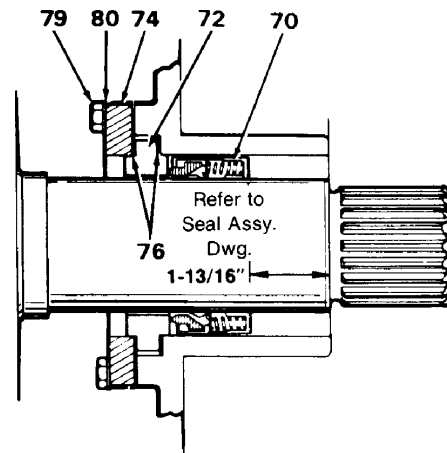
5080 PACKING AND SEALS

MECHANICAL PACKING (STANDARD SEAL PACKAGE)

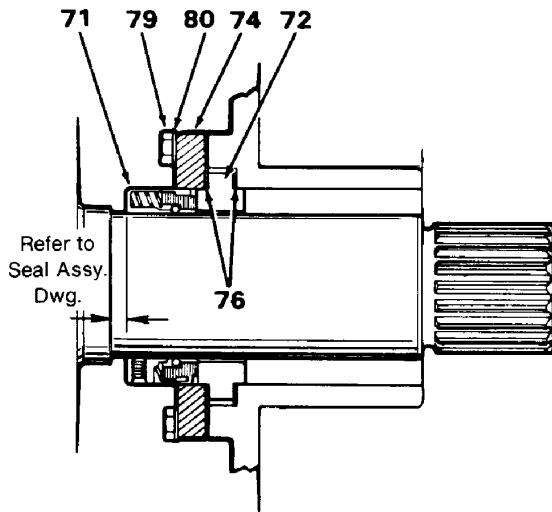
Item	Part No.	Description	Qty
56	0C1 050 000	STUD, 3/8-16 .375D 1.87LG	4
57	36-45	HEX NUT, 3/8-16 18-8 REG.	4
61	000 299 032	FITTING, MALE BRASS	4
60	200 317 000	TUBE, FLUSHING 5/16 STEEL 4"	4
52	300 004 000	PACKING GLAND	2
	20-138	4.0" OD X 3.375 ID X 1/16" TEFLON	8
50	300 033 000	PACKING-C 13	8
	300 047 000	LANTERN RING, GLASS FILL	2
	300 051 000	PACKING RETAINING RING	2
	300 098 000	SLEEVE, 3.250 OD X 3.003/.006	2
	40070	RETAINER, 5080-RING 4.157 OD	2
53	N70149	O-RING, SHAFT, NITRILE, BUNA	2



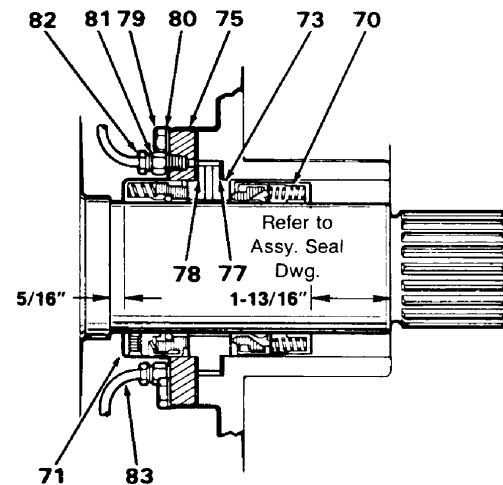
Item	Part No.	Description	Qty
70	300 114 000	SEAL, #9 CRANE	2
71	300 114 002	SEAL, #8-B2 CRANE	2
72	300 014 012	SEAL SEAT, CERAMIC	2
	300 014 013	SEAL SEAT, TUNGSTEN CARBIDE	2
	300 014 016	SEAL SEAT, SILICON	2
73	300 014 027	SEAL SEAT, FLUSH CERAMIC	2
	300 014 028	SEAL SEAT, FLUSH TUNGSTEN	2
	300 014 031	SEAL SEAT, FLUSH, SILICON	2
74	300 034 000	GLAND	2
75	300 034 001	GLAND, FLUSHING	2
	STD 128 500	PIPE PLUG	4
76	300 042 001	GASKET	4
77	300 042 001	GASKET, INNER T-SEAT VITON	2
78	300 042 002	GASKET, OUTER T-SEAT W/FLUSH	2
80	43-28	LOCK WASHER, 3/8" 18-8 REG	8
79	30-60	HHCS, 3/8-16 x 1.25" 18-8	8
81	STD 299 003	MALE CONNECTOR	4
82	STD 299 023	FITTING	4
83	87-699	TUBIN G, COPPER	4



INSIDE MECHANICAL SEAL

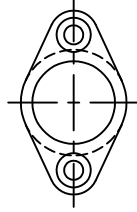


OUTSIDE MECHANICAL SEAL

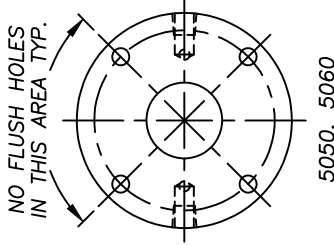
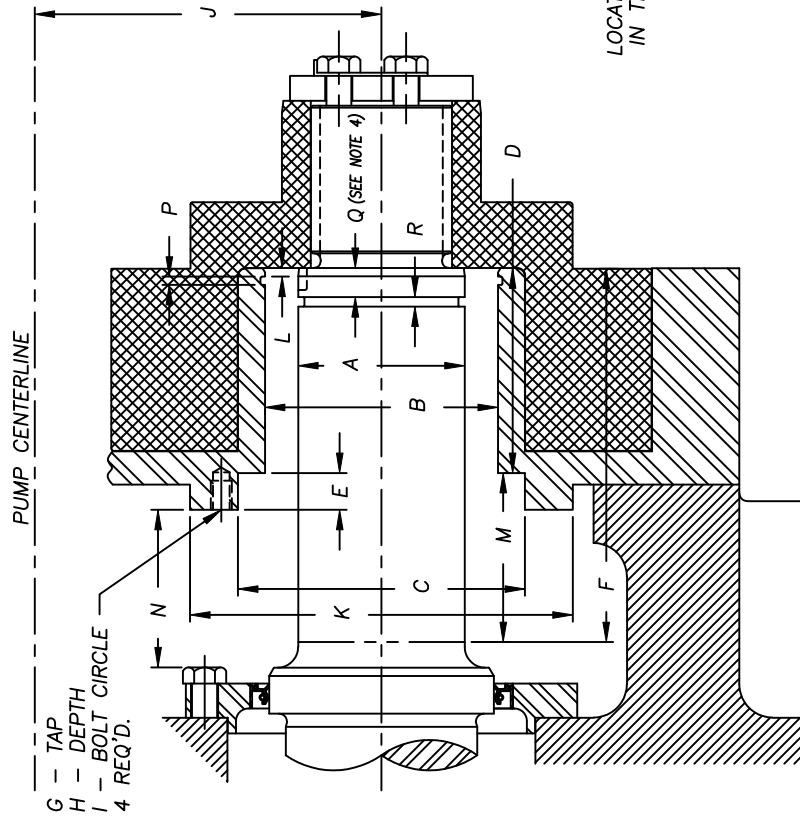


INSIDE-OUTSIDE MECHANICAL SEAL

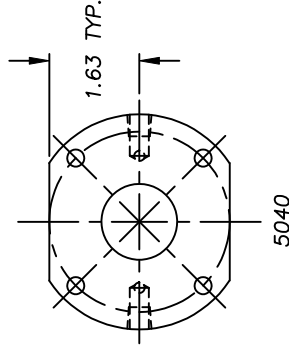
MODEL	A $\pm .001$	B $\pm .001$	C $\pm .003$ $-.001$	D	E $\pm .002$	F	G	H	I	J	K	L	M	N	P	Q	Q'	R
5040	1.251	2.000	2.882	1.625	.373	3.562	1/4-20	.312	3.250	1.650	3.500	.130	1.937	1.553	.068	.44	1.87	.120
5050	1.501	2.250	3.504	1.814	.435	3.625	1/4-20	.312	3.875	2.250	4.437	.130	1.812	1.500	.087	.44	2.00	.120
5060	1.501	2.250	3.504	2.750	.435	4.562	1/4-20	.312	3.875	2.250	4.437	.130	1.812	1.507	.087	.44	2.00	.120
5070	2.501	3.500	4.312	3.071	.554	5.568	5/16-18	.437	4.812	3.000	5.750	.130	2.497	2.273	.125	.44	1.50	.112
5080	3.001	4.000	4.880	3.698	.554	5.884	3/8-16	.562	5.625	3.500	6.188	.130	2.186	2.323	.125	.44	1.87	.112



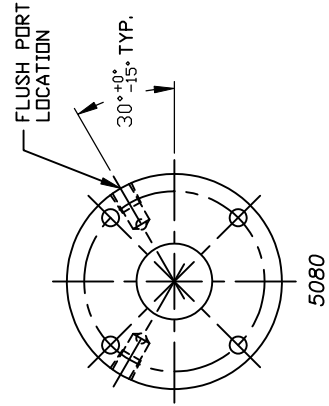
GLAND (PACKING SEAL)



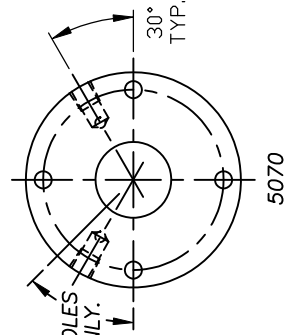
5050, 5060



5040



5080

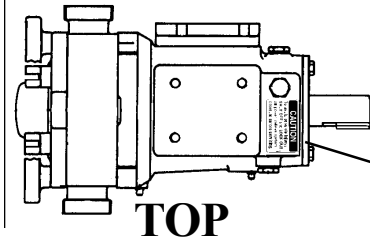


5070

GLAND (MECHANICAL SEAL)

- NOTES:
1. GLAND BOLT LENGTH NOT TO EXCEED 'N' DIMENSION.
 2. ALL DIMENSIONS ARE REFERENCE UNLESS TOLERANCE IS SPECIFIED.
 3. DIMENSIONS 'Q' AND 'R' APPLY ONLY TO PACKING SEAL PUMPS.
 4. ON EARLY UNIVERSAL INDUSTRIAL PUMPS THE O-RING GROOVE IS LOCATED AT Q.'

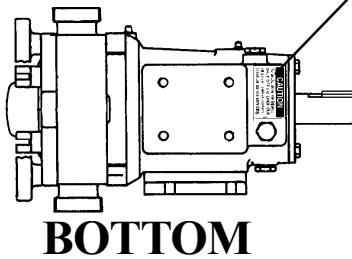
LABEL PLACEMENT



CAUTION
To avoid possible injury:
SHUT OFF and LOCK OUT
all power; relieve system
pressure before servicing.

CAUTION
To avoid possible injury;
SHUT OFF and LOCK OUT
all power; relieve system
pressure before servicing.

33-62



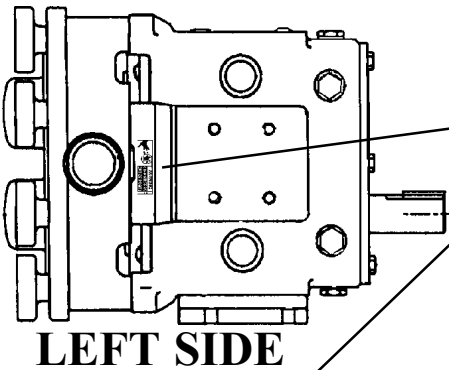
1

WARNING
KEEP FINGERS
OUT OF PORTS

33-60

WARNING
KEEP FINGERS
OUT OF PORTS

33-61



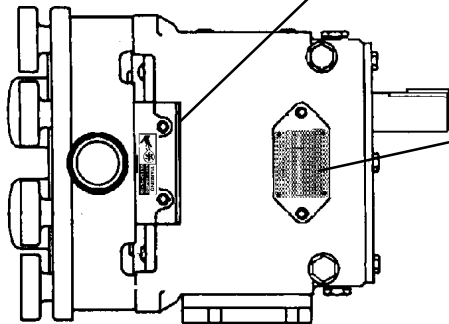
WARNING
KEEP FINGERS
OUT OF PORTS

WARNING
KEEP FINGERS
OUT OF PORTS

33-63

Relative Sizes

PUMP MODEL	1	2	
	33-62	33-60	33-63
**5040	•		•
5050	•		•
5060	•		•
5070, 5080	•		•



Waukesha
Fluid Handling
A Fluid Control Company
SERIAL NO. _____
MODEL _____
READ AND UNDERSTAND
OPERATION AND MAINTENANCE
MANUAL BEFORE OPERATION.
Delavan, WI U.S.A. **CE**

**Place label behind grease fittings
(on right side) • = 2 each

Part Number 001 061
002

APPLICATION INSTRUCTIONS

Apply to clean, dry surface. Remove backing; position in place, lay cover sheet over and burnish. (*Alternate method; Use soft rubber roller to press label in place.*)

Apply all labels to be readable from front of pump

Effective Date:
January 26, 1995

Universal 5000 Industrial Series

ROTARY POSITIVE DISPLACEMENT
PUMP

SPXFLOW

SPX FLOW, Inc.

611 Sugar Creek Road

Delavan, WI 53115

P: (262) 728-1900 or (800) 252-5200

F: (262) 728-4904 or (800) 252-5012

E: wcb@spxflow.com

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Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing.

Please contact your local sales representative for product availability in your region. For more information visit www.spx.com.

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ISSUED 12/2015

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