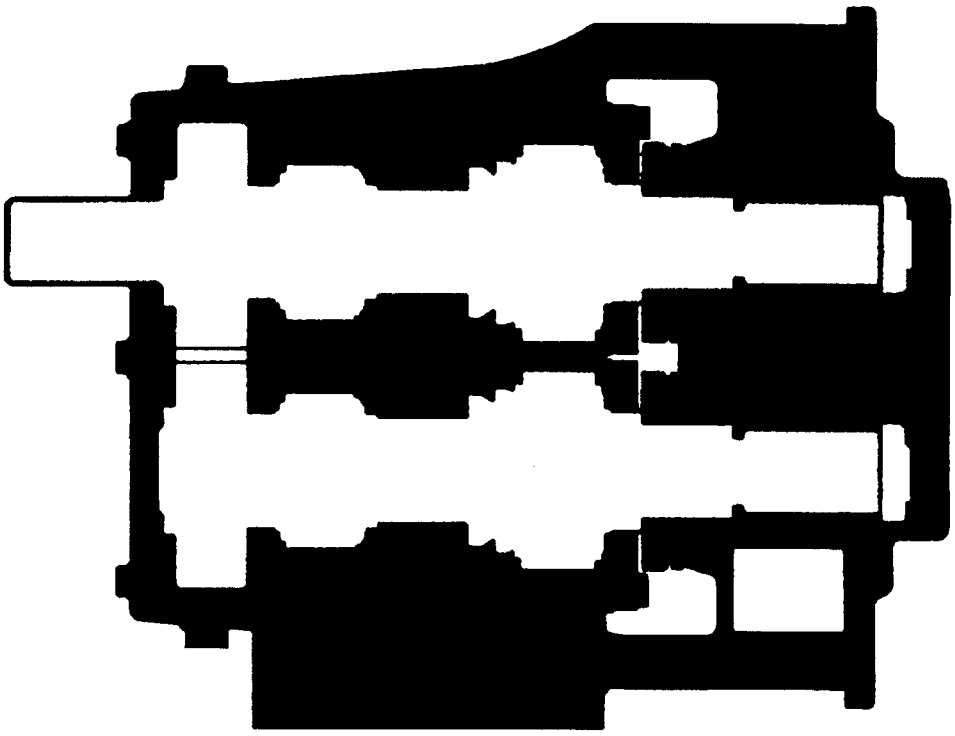
Waukesha Cherry-Burrell

Read and understand this manual prior to installing, operating or maintaining this pump.



Waukesha Pump

SANITARY "DO" SERIES

SERVICE ONLY

OPERATION
MAINTENANCE
& PARTS LIST

TABLE OF CONTENTS

SECTION I
RECEIVING AND WARRANTY

FACTORY INSPECTION

Each "WAUKESHA" pump is shipped completely assembled, lubricated and ready for use. 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. They have signed the Bill of Lading acknowledging that the shipment has been received from us in good condition. Our responsibility for the shipment has ceased.

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

To insure full warranty coverage of your new pump, be sure to fill out the "Warranty Validation" form, shipped with your pump, to properly describe your pumping system. This will enable the factory to have a complete file on your pump and provide a ready reference for trouble shooting if problems develop.

WARRANTY

PROVIDED THE ITEMS COVERED ARE USED AS RECOMMENDED AND HAVE NOT BEEN SUBJECTED TO ACCIDENT, ALTERATION, ABUSE OR MIS-USE, SELLER WARRANTS EVERY PART MANUFACTURED BY IT TO BE FREE OF DEFECTS OF MATERIAL AND WORKMANSHIP AND UPON PREPAID RETURN OF DEFECTIVE MATERIALS OR COMPONENTS, WILL SHIP REPLACEMENT PARTS TO PURCHASER F.O.B. SHIPPING POINT. ALL PARTS OR COMPONENTS NOT MANUFACTURED BY SELLER ARE WARRANTED ONLY TO THE EXTENT OF THE WARRANTY OF THE RESPECTIVE MANUFACTURERS. ALL CLAIMS FOR CONSEQUENTIAL DAMAGES ARE EXPRESSLY WAIVED BY PURCHASER AND THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED.

Waukesha Cherry-Burrell

611 Sugar Creek Rd. / Delavan, WI 53115
414-728-4320 / Fax: 414-728-4320 / 1-800-274-9468

Cut Here

WARRANTY VALIDATION

(Please fill out in full and return to Waukesha)

Customer Name: J.D.Co. P.O. No. W-2506

Address: 1610 1ST ST. Start Up Date: 11/4/75

ANYTOWN, U.S.A.

Distributor UNKNOWN Shipped Date: _____

Pump Model 55 GT Serial No. 1846555 Speed 300

Drive Type VAR. SPEED (55-550) H.P. 7.5

(See other side)

INSTRUCTIONS FOR IN WARRANTY REPAIR

"If your "WAUKESHA" pump has been in use less than one year and becomes defective, it may be returned to Waukesha Pumps in accordance with the Warranty on reverse side.

In the event that the pump qualifies for "free repairs", it will be repaired and returned to you prepaid. If it does not qualify for "free repairs", you will be so advised, and the reason therefore given. You will also be informed of the cost involved in making the necessary repairs, and in such event, no work will be undertaken to repair the pump, until after you have requested that the necessary repairs be made and you will have approved the charges for the same".

This guarantee is based upon your date of purchase. Please fill in the following information now. *If service becomes necessary,* return this form with letter of transmittal.

Date of Purchase _____

Size of Pump _____

Name of Your Company _____

Serial Number _____

WARRANTY VALIDATION

(Please fill in as much as possible)

Fluid Name/Type Corn Syrup

Viscosity 2000 **CPS** _____ **SSU**

Temp. 110 °F **S.G.** 1.25 **V.P.** ?

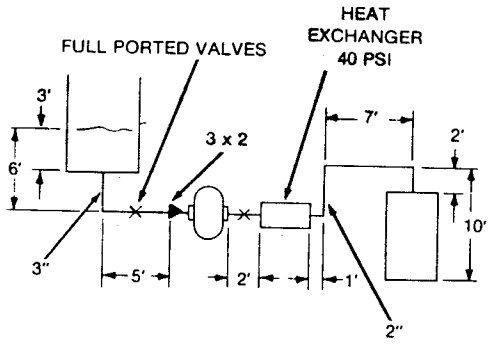
Solids _____ % **Particle Size** _____

Particle Description DISSOLVED

☐ **Abrasive** ☒ **Nonabrasive**

Inlet 9 **NIPA Outlet** 80 **PSI**

Schematic:



SECTION II
INSTALLATION

The installation of your Waukesha pump and its piping system should follow good practice 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.

PUMP INSTALLATION

The installation of your Waukesha pump and its piping system should follow good practice to give optimum performance.

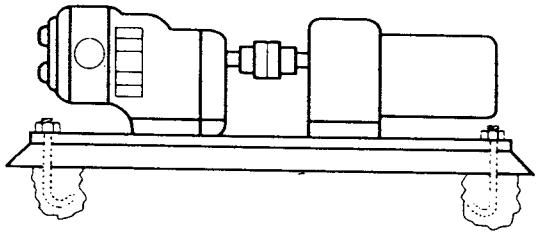
1. Installing the Pump and Drive Unit.

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:

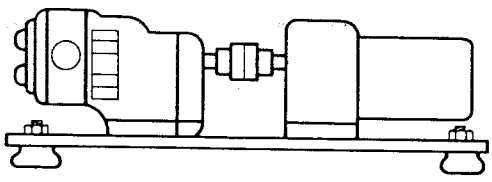
Permanent installation on foundation with bolts and grout.

Level unit before grouting.

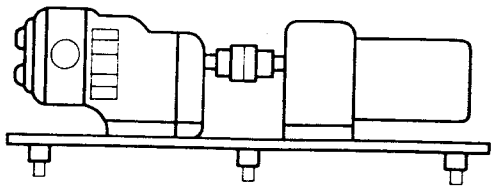


Leveling and/or vibration isolation pads.

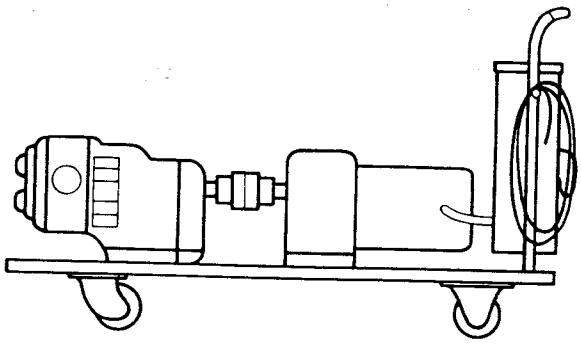
Many commercial types available.



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



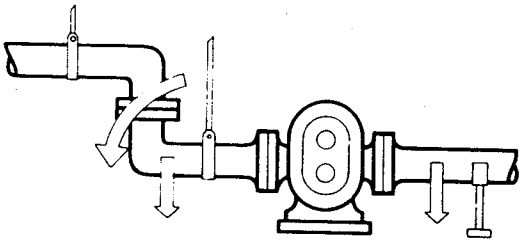
Portable bases—for movement to different locations.

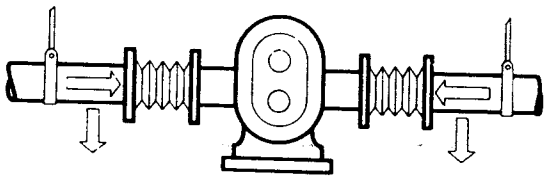


2. Good Piping Practice.

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.

Piping support:
Weight of piping and fluid—support piping independently with hangers or pedestals.



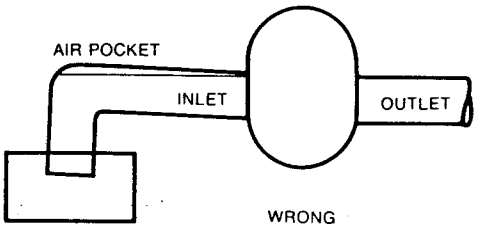


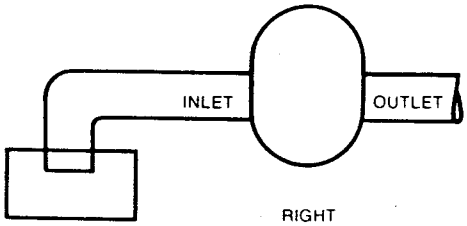
Thermal expansion of piping—can cause tremendous forces. Use thermal expansion joints to minimize forces on pump.

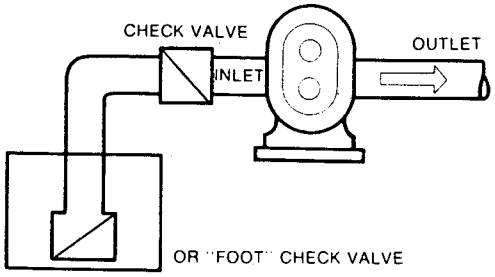
Flexible joints can also be used to limit the transmission of mechanical vibration. Anchor free ends of any flexible hose in system.

Piping Layout

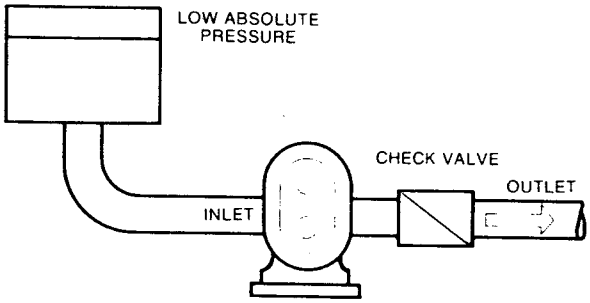
Inlet side—slope piping up to inlet to avoid air pocket.







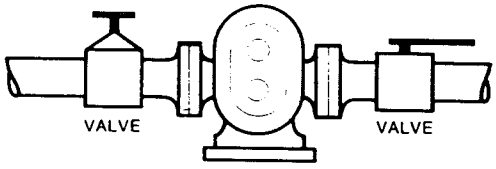
Inlet side—use check valves to keep inlet line full, particularly with low viscosity fluids, and in start-stop operation.

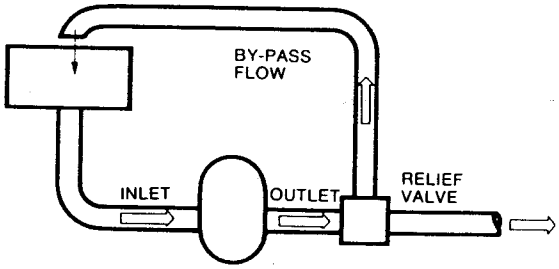


Inlet "Vacuum" Service—use check valve on outlet side

- 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

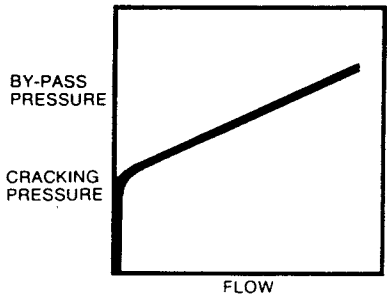




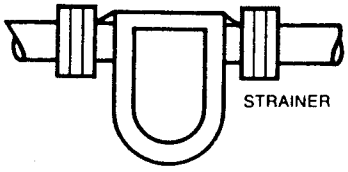
Relief Valve

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.



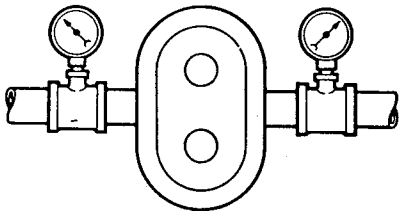
Inlet Side—Strainers and Traps.

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.

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



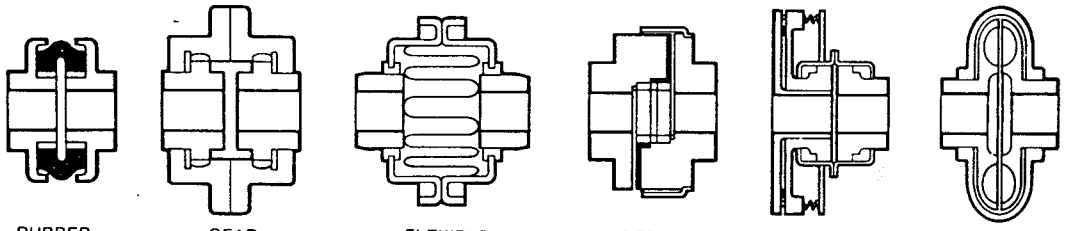
Wherever possible—install gauges!!

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 re-checked after the complete unit has been installed and the piping completed. Periodic re-checking is advisable during the pump service life.

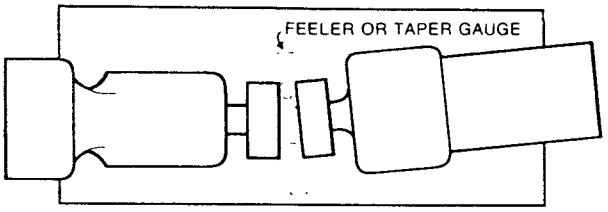
In-line Drives. For initial pump installation, and for re-checking alignment, the following steps are advised.

A flexible coupling should be used to connect the drive to the pump. Many different types are available, including couplings with slip or overload provision.

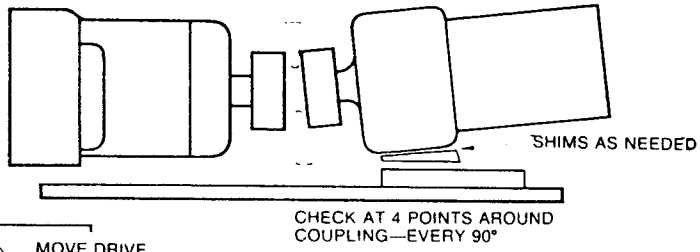


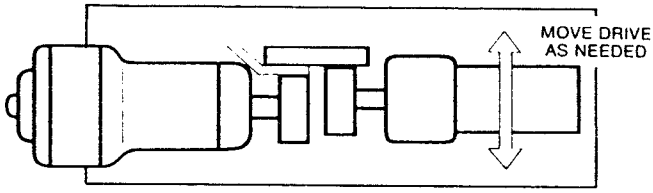
A flexible coupling is used to compensate for end play and **small** differences in alignment. The pump and drive shaft should be aligned as closely as is possible.

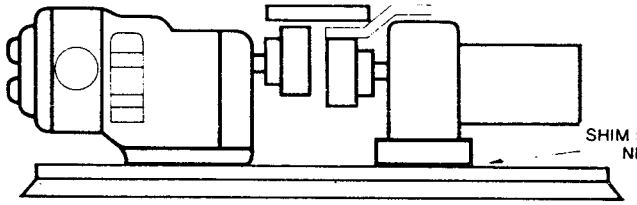
Checking angular alignment:
Using feeler gauges, or taper gauges.



Adjust to get equal dimension at all points—at the same time set space between coupling halves to manufacturer's recommended distance.







Checking Parallel Misalignment:
Using straight edges and shims:

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

Check rotation direction of drive to see that pump will rotate in proper direction. Facing "Liquid End" of pump:

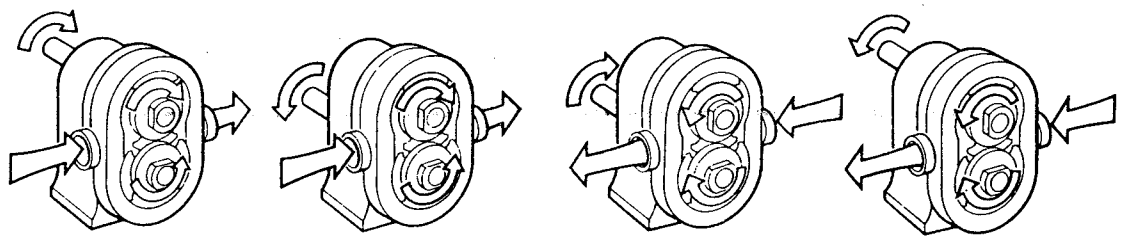
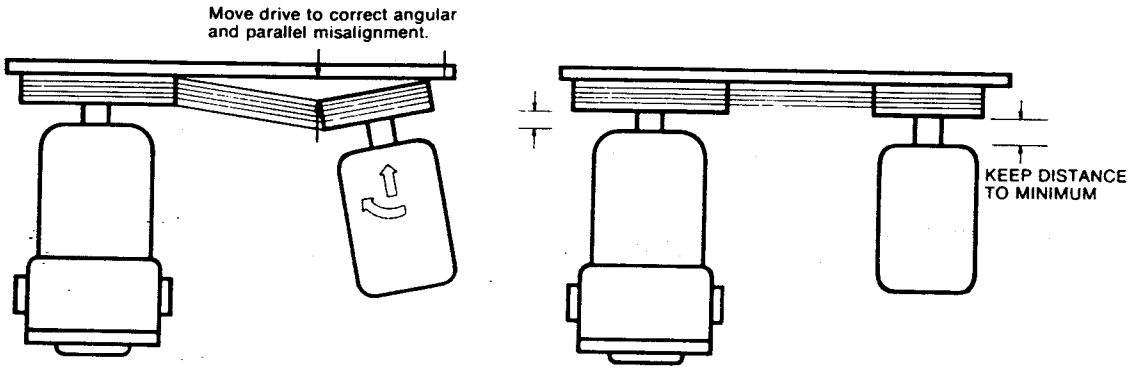


Fig. 1 TOP SHAFT DRIVE | LOWER SHAFT DRIVE | LOWER SHAFT DRIVE | TOP SHAFT DRIVE

THEN CONNECT COUPLING HALVES

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).
Then install belts and tension them correctly.

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, 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. Install breather screw. Check Drive Lubrication Instruction.
5. Check that all guards are in place and secure.
6. Seals: Packing — supply flushing fluid if needed. Leave packing gland loose for normal 'weepage'! Make adjustments as initial conditions stabilize, to maintain normal weepage. Mechanical seals with flushing — supply adequate 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 (jogging is recommended).
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, Troubleshooting a Pumping System.

SECTION IV
TROUBLESHOOTING A PUMPING SYSTEM

TROUBLESHOOTING A PUMPING SYSTEM

Once a pump is properly selected and installed in a system, operation should be troublefree. 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.

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
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

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 length too long. Too many fittings or valves. Foot valves, 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

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	To increase NIPA or reduce NIPR, see Engineering Manual
	• **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 pages 46 and 47.

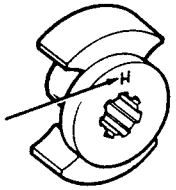
Problem	Probable Causes	Solutions
Noisy operation	• **Rotor to body contact**	
	Distortion of pump due to improper piping installation	Reassemble pump or re-install piping to assure free running
	Pressure higher than rated	Reduce pressure if possible
	Worn bearing	Rebuild with new bearings, lubricate regularly
	Worn gears	Rebuild with new gears, lubricate regularly
	• **Rotor to rotor contact**	
	Loose or mis-timed gears, twisted shaft, sheared keys, worn splines	Rebuild with new parts
	• **Relief valve chattering**	Re-adjust, repair or replace
	• **Drive component noise—gear trains, chains, couplings, bearings.**	Repair or replace drive train
Pump requires excessive power (overheats, stalls, high current draw, breakers trip)	• **Higher viscous losses than expected**	If within pump rating, increase drive size
	• **Higher pressure than expected**	Reduce pump speed, increase line sizes
	• **Fluid characteristics**	
	Fluid colder than expected, viscosity high	Heat fluid, insulate or heat trace lines. Use pump with more running clearances.
	Fluid sets up in line and pump during shut down	Insulate or heat trace line. Install "soft start" drive. Install recirculating bypass system. Flush with other fluid.
	Fluid builds up on pump surfaces (example, latex, chocolate, fondants)	Use pump with more running clearance
"Short" pump service life	High corrosion rate	Upgrade material of pump
	Pumping abrasives	Larger pumps at slower speeds, can help
	Speeds and pressures higher than rated	Reduce speeds and pressures by changes in system
	Worn bearings and gears due to lack of lubrication	Set up and follow regular lubrication schedule
	Misalignment of drive and piping. Excessive overhung load or misaligned couplings.	Check alignment of piping. Check drive alignment and loads.

SECTION V
OPERATION

NORMAL OPERATION

Normal operation covers a speed range of 0-600 RPM and pressure range of 0-150 PSI for all models except the new universal series which are rated at 0-200 PSI. Temperature range with standard rotors is -40 to 180° F and with hot clearance rotors, 180 to 300° F. (For operation at higher temperatures, consult factory.)

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



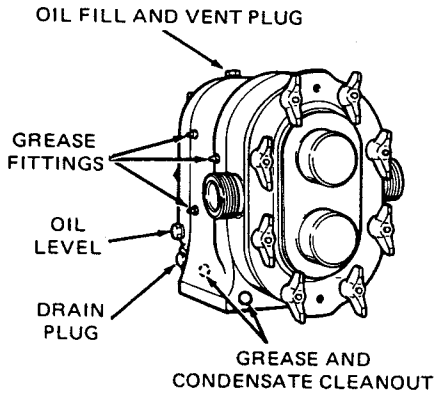
LUBRICATION

The gears are factory lubricated with Micro-Plate No. 140 oil.

The bearings are factory greased with Micro-Plate #2 grease.

Change oil every 500 hours. If pump is installed where moisture and condensation are heavy, change oil more frequently.

Bearings must be greased every 250 hours or less depending on moisture and condensation conditions. Excess grease will accumulate in the bearing housing 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 table.

OIL	GREASE
Micro-Plate #140 (-10 to 450° F)	Silicone (-20 to +5° F) Micro-Plate #2 (+5 to +400° F)

DRIVE LUBRICATION

Refer to drive manufacturer's manual shipped with unit.

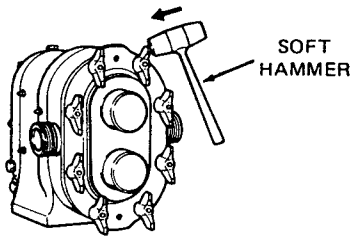
CLEANING AND STERILIZING

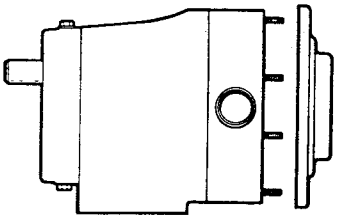
The "Waukesha" pump is designed to be completely disassembled for thorough and easy cleaning. Clean the pump every day or at the end of a process. Disassemble the fluid head as outlined below. Remove and clean the "O" rings, sleeves and pump cover gaskets. Cleaning the pump "in-place" is not recommended.

FLUID HEAD DISASSEMBLY - ALL MODELS

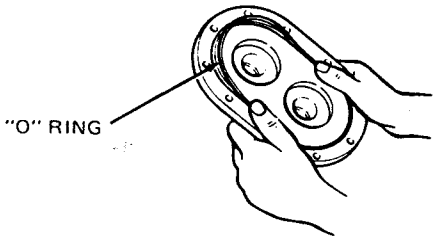
1. Shut off power and isolation valves and disconnect inlet and discharge lines.

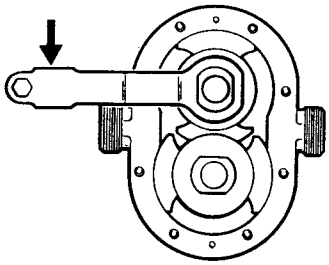
2. Remove wing nuts using soft hammer to loosen them.





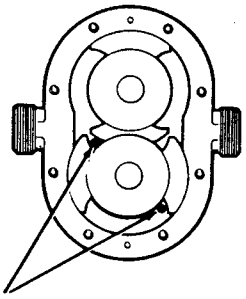
3. Remove cover. If it is stuck, loosen it with a soft hammer. Remove and discard cover "O" ring.

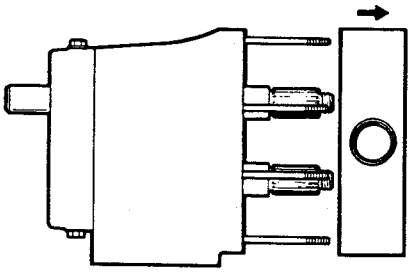




4. Remove rotor retaining nuts. Use the special wrench supplied with pump and hit it sharply with a soft hammer to loosen nuts.

5. Orient rotors perpendicular to each other and remove rotor with both wings exposed first. Handle rotors with care to avoid knicks and scratches. If it is stuck tight, use a gear puller or hardwood lever behind rotor hub to force it off spline.





6. Remove pump body by pulling it straight off studs. Use a soft hammer to assist if body is stuck tight.

7. See Section VI for seal disassembly procedure.

8. Clean and inspect body thoroughly.

CAUTION: Body must be reassembled on bearing housing from which it was removed. Both are identified with same serial number.

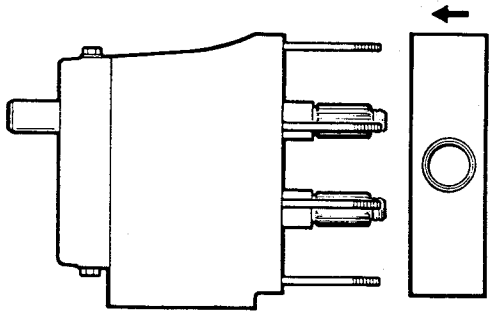
FLUID HEAD ASSEMBLY - ALL MODELS

Seal Assembly

See SEAL MAINTENANCE, page 21 for assembly procedure on all models.

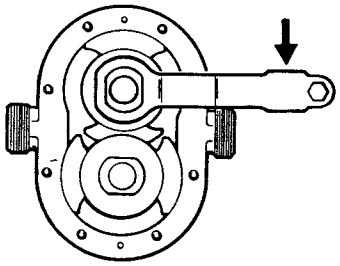
Body Assembly

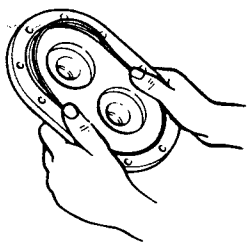
1. Slide body over shafts and studs being careful seal components are not knicked or knocked out of place. Press body firmly against housing engaging dowels.



Rotor Assembly

Assemble a rotor onto shaft engaging the large spline tooth with the large groove in rotor. Rotate shaft until rotor wings are on vertical centerline. Install the second rotor and secure both with rotor retaining nuts. Lock the nuts by hitting wrench sharply with a soft hammer.



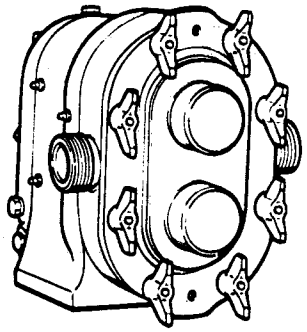


Cover Assembly

1. Install "O" ring in cover groove.

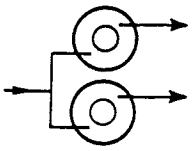
2. Mount cover on studs and push it against body being sure "O" ring remains in the groove.

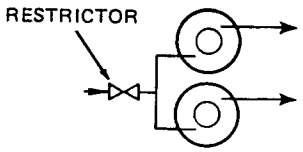
3. Attach wing nuts and tighten by hitting them sharply with a soft hammer.



Flushing Connection

NOTE: Flushing media should be piped into lower connection of each shaft seal and discharged from upper connection. Both inlets and outlets may be manifolded to simplify piping.





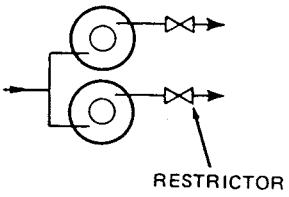
1. Low Pressure Flush

a. Set flow rate of approximately 1/4 GPM for most applications. For high temperature applications increase flow.

b. Flushing media is restricted on inlet side and has free flow to drain on outlet side.

2. High Pressure Flush

Flushing media is restricted on discharge side of pump flushing glands.



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.

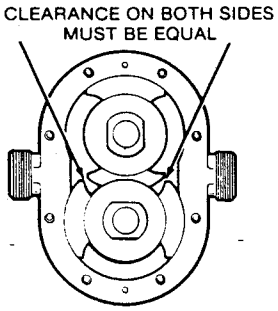
A more detailed maintenance inspection should be scheduled annually. See ANNUAL MAINTENANCE, Page 20.

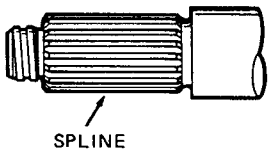
The following routine "look-feel" checks are to be made by the system operator during shut-down periods.

VISUAL CHECKS

1. Rotor wing tips for indications of metal-to-metal contact between rotor wings.

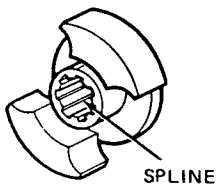
If this condition exists, the pump should be repaired or replaced.

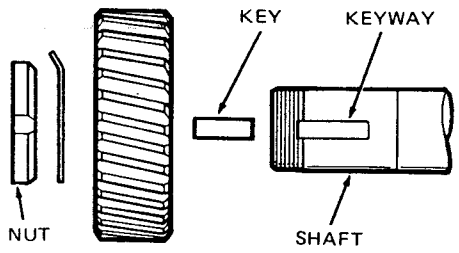




Cause	Corrective Measure
Worn shaft spline	Replace shaft.
Worn rotor spline	Replace rotor.

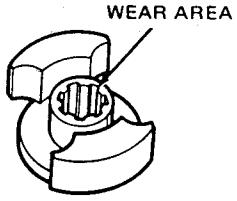
NOTE: Usually both parts will wear. The usual cause is a rotor which has been loose for extended running periods.



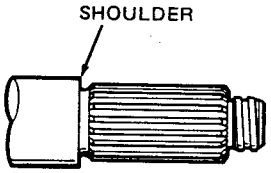


Loose gears	Remove gear and inspect key, keyway and shaft. If all are in good condition, reassemble and retighten gear retainer nuts to specified torque. (See Table 2.)
Worn gears	Replace gears.
Twisted shaft	Replace shaft.

2. Rotor hub end which locks against the shaft shoulder for signs of wear.



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

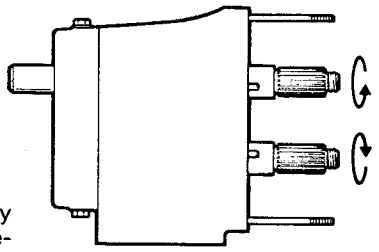


3. Shaft shoulder against which rotor hub locates and locks for deterioration.

Cause	Corrective Measure
"Steps" worn into locating face by loose rotor	Reshim or replace shaft to maintain correct running clearances. (See Table 1.)

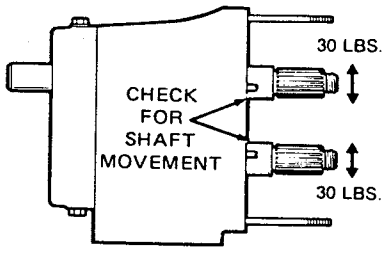
"FEEL" CHECKS

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, reassemble and retighten gear retaining nuts to specified torque. (See Table 2.)

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.

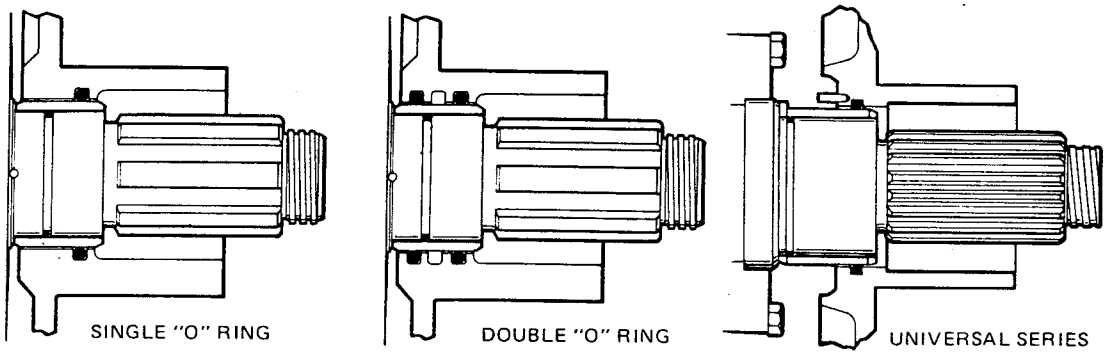


Cause	Corrective Measure
Lack of lubricant or high overload	Replace bearings and review lubrication schedule. Check for means to reduce hydraulic loads.

SEAL MAINTENANCE

NOTE: To service seals it is necessary to disassemble fluid head. See FLUID HEAD DISASSEMBLY - ALL MODELS in Section V for procedure.

1. "O" Ring - DO Style Single and Double.



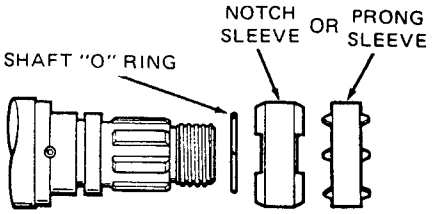
Service

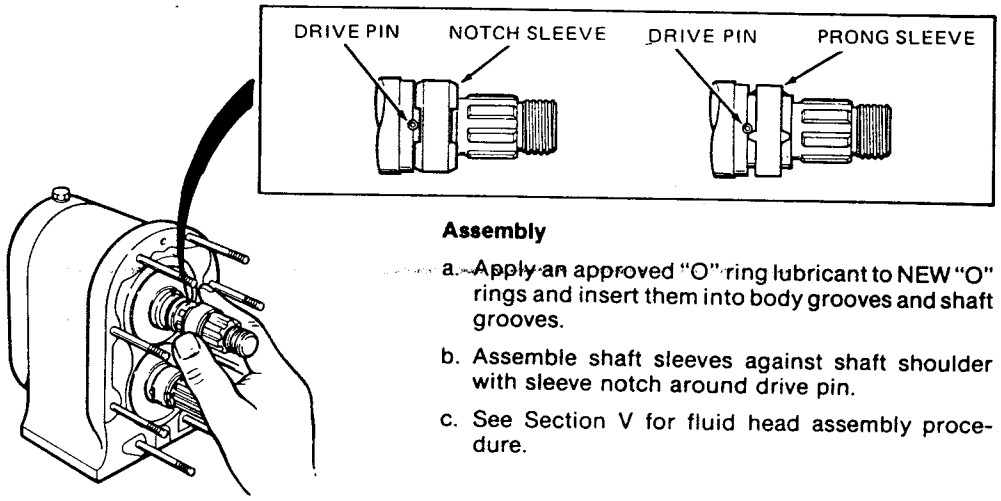
a. Remove and discard body "O" rings.

NOTE: Use "O" ring removal tool furnished with pump.

b. Remove shaft sleeves and shaft "O" rings.

c. Thoroughly clean and inspect grooves, shafts and sleeves. DO NOT re-use sleeves that are grooved or scratched.





Assembly

a. Apply an approved "O" ring lubricant to NEW "O" rings and insert them into body grooves and shaft grooves.

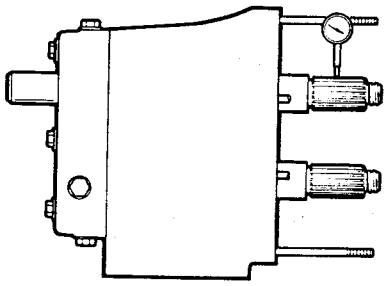
b. Assemble shaft sleeves against shaft shoulder with sleeve notch around drive pin.

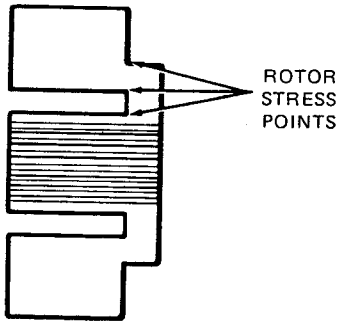
c. See Section V for fluid head assembly procedure.

ANNUAL MAINTENANCE

The same general procedures and corrective measures outlined above should be followed and in addition the following preventive maintenance operations should be carried out at this annual check out 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), replace bearings.





2. Remove gear cover and inspect gears for wear, back lash and looseness. Retorque gear retaining nuts to proper torque. (See Table 2)

3. Thoroughly inspect rotors for worn splines, bearing shoulder wear, and stress cracks. Use dye check method to detect any fatigue type cracks 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 and Section IX.) 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.)

NOTE: 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 (back face and cover face). See Table 1 and BACKFACE CLEARANCE, Section IX. If rotors are slightly out of time, they can be retimed 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 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 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 Pumps 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 of a given model are identified by a serial number on bearing housing nameplate and stamped on top of pump body. The housing 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.

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

SECTION VIII
DISASSEMBLY PROCEDURES

FLUID HEAD - ALL MODELS

Follow the instructions under FLUID HEAD DISASSEMBLY - ALL MODELS in Section V.

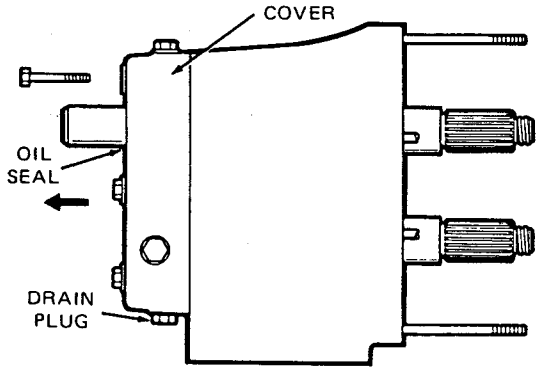
SEALS - ALL MODELS

Follow the instructions under SEAL MAINTENANCE in Section VI.

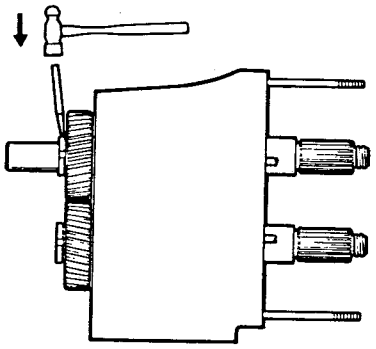
GEAR COVER AND GEARS - ALL MODELS

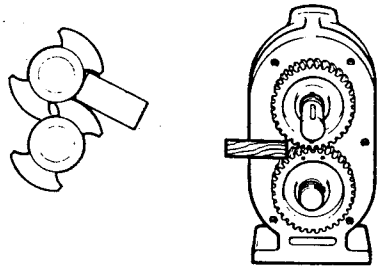
1. Remove oil drain plug and drain oil.
2. Remove cap screws from gear cover.
3. Pull gear cover off shaft extension. If cover sticks, use soft hammer to loosen it.
4. Remove and discard gear cover gasket.
5. Remove oil seal from cover with an arbor press and discard.

NOTE: Model 2-BB (DO) has a bearing in the cover behind oil seal; press it and oil seal out at the same time.



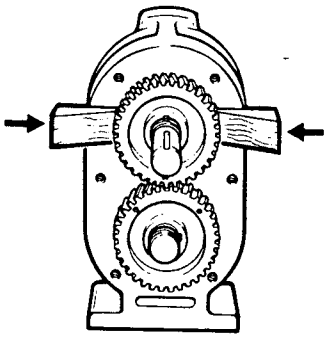
6. Straighten locking tab of lockwashers. Use spanner wrench or drift to remove gear lock nuts.

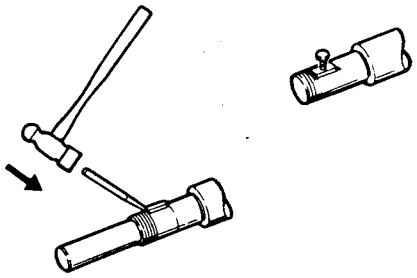




7. Prevent shafts from turning by wedging a wooden block between the gears or by installing the rotors and wedging a wooden block between them.

8. Use gear puller or hardwood wedges to remove gears. File any burrs that may develop.





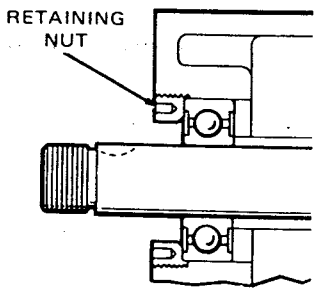
9. Remove keys from keyslots with a drift pin or jack screw. Use file to remove burrs from shaft if required.

SHAFT REMOVAL

Model 2

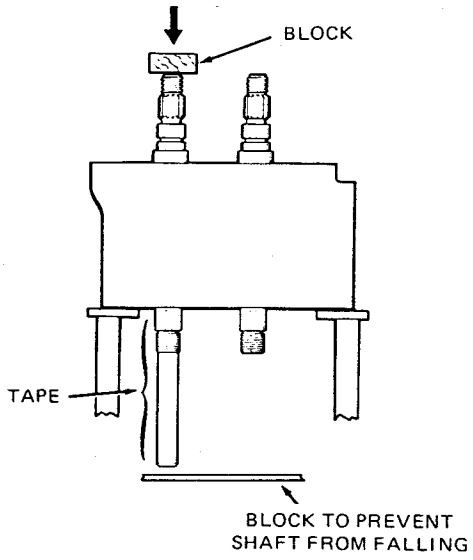
1. Remove bearing retaining nuts using a spanner wrench or a hammer and drift.

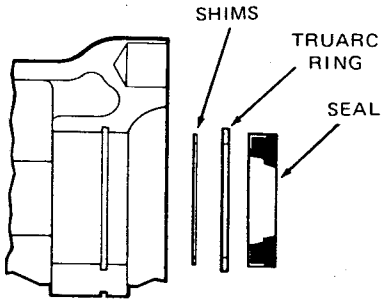
NOTE: File off solder locking spot to aid in disassembly.



2. Place bearing housing on arbor press with shaft splines up.

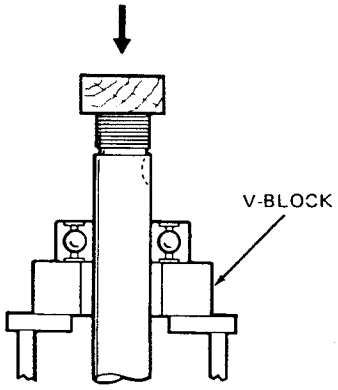
3. Protect shaft ends with wood or plastic blocks and press out shafts. See Table 4. Protect liquid end of shafts by wrapping them with tape.





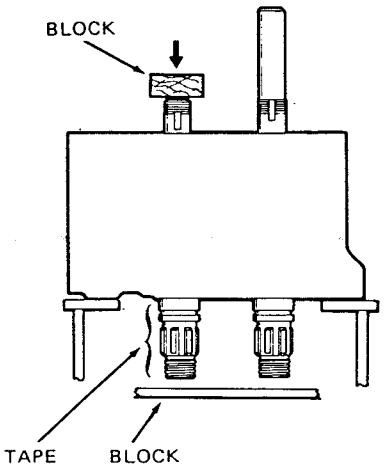
4. Use a hammer and drift to drive out front seals from back side.

5. Remove Truarc retaining rings and shims from housing.



6. Remove rear bearings from shaft using V-blocks and an arbor press. See Table 4.

7. Remove bearing spacers and press off front bearings using V-blocks and arbor press. See Table 4.

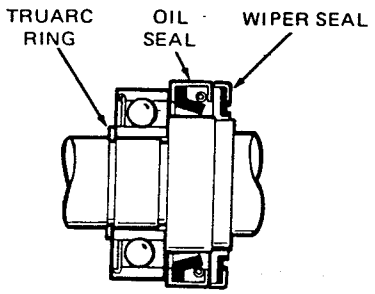


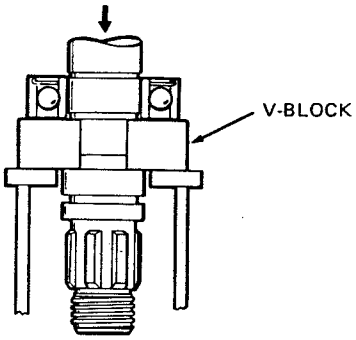
Models 3, 10, 16, 25, 55, 100, 125 and 200

1. Protect liquid end of shafts by wrapping them with tape.

2. Place housing assembly on an arbor press with liquid end down. Use wood or plastic block to protect shaft ends and press out shafts. (See Table 4.)

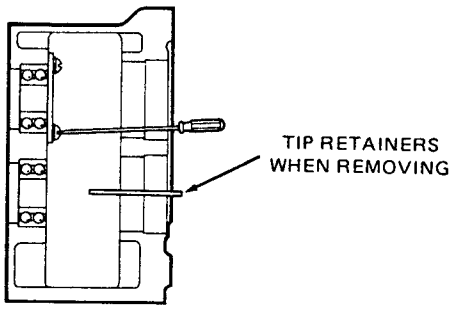
3. Discard wiper seals and front grease seals.
4. Remove Truarc retaining ring from shafts.

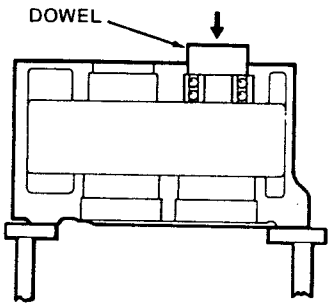




5. Remove front bearing from shaft using V-blocks and an arbor press. (See Table 4.)

6. Set housing on bench. Reach through front of housing with screw driver and remove bearing retainer bolts and retainers. Tip retainers flat to clear through front hole.



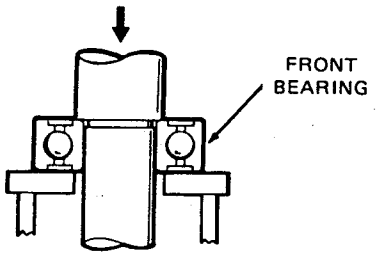


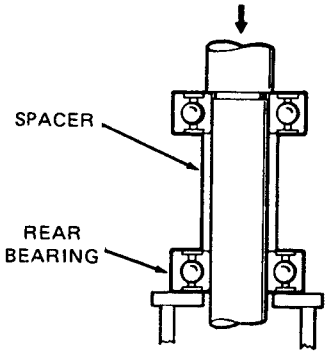
7. Return housing to arbor press and with proper diameter dowel, press out rear bearing and oil seal. Remove them through front bearing opening.
8. Clean and inspect thoroughly all parts which are to be re-used.

SECTION IX
ASSEMBLY PROCEDURES

MODEL 2

1. Coat shaft with Molykote grease to aid assembly. Press front bearings onto shafts using an arbor or hydraulic press.



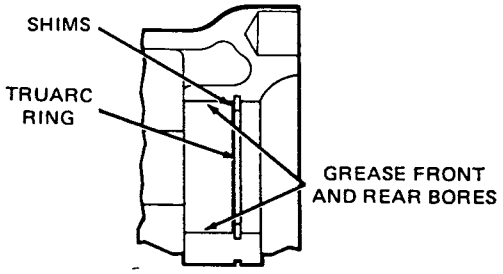


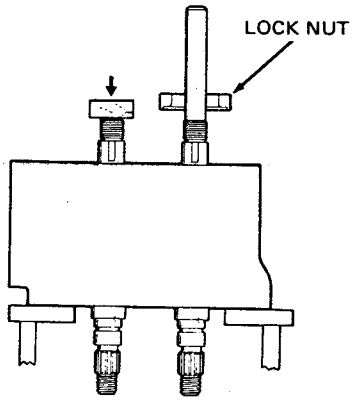
2. Slip front bearing spacer onto shaft and press on the rear bearing.

3. Install Truarc rings in housing.

4. Install shim pack in housing. (See Table 3.)

5. Coat bearing bores in housing with Molykote grease.



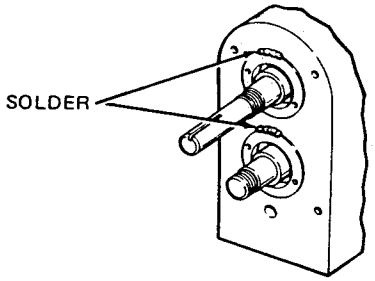


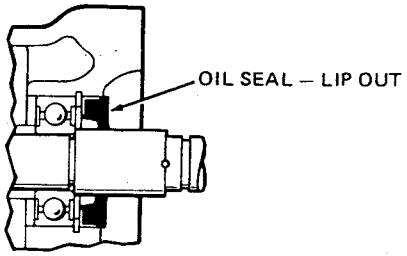
6. Press shaft assemblies into housing. Be sure drive shaft is in proper location for top or bottom drive.

7. Install bearing lock nuts to secure shaft assembly.

8. Check back face clearance. Refer to Table 1 and BACKFACE CLEARANCE, page. 46.

9. After back face clearance has been established, lock bearing lock nut with a 1/2" long solder spot.

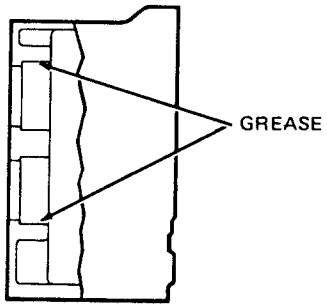


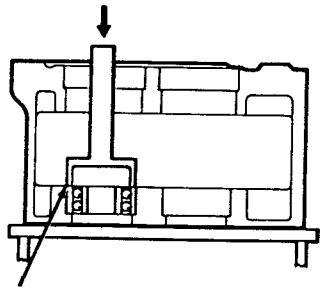


10. Press front oil seals into housing with lip out.

MODELS 3, 10, 16, 25, 55, 100, 125 and 200

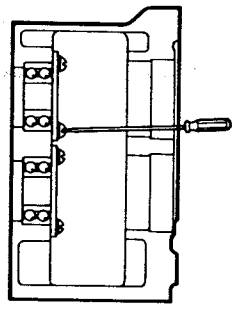
1. Coat rear bearing bores of bearing housing with Molykote grease.



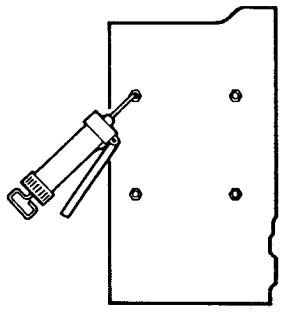


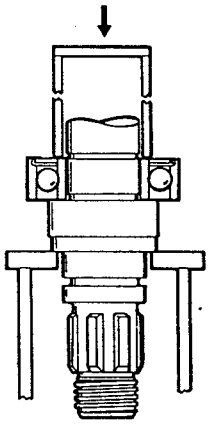
2. Press rear bearings into housing using an arbor press. (See Table 4.)

3. Install rear bearing retainers through front bearing bores and secure with round head machine screws.



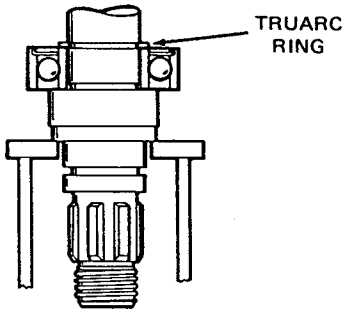
4. Grease rear bearings through grease fittings on housing with grease gun using Micro-Plate #2 grease. Pump in grease until it squirts out inside of retainers.



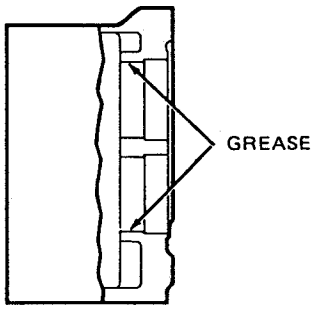


5. Coat front bearing area of the shaft with Molykote grease.

6. Press front bearings onto shafts using an arbor press. (See Table 4.)

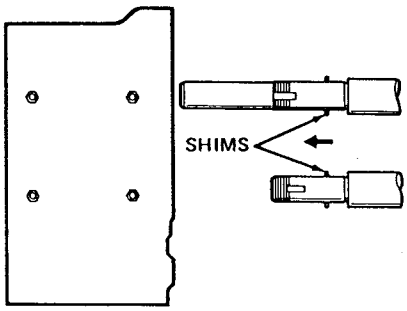


7. Install Truarc retaining rings to lock front bearing in place.



8. Coat front bearing bores with Molykote grease.

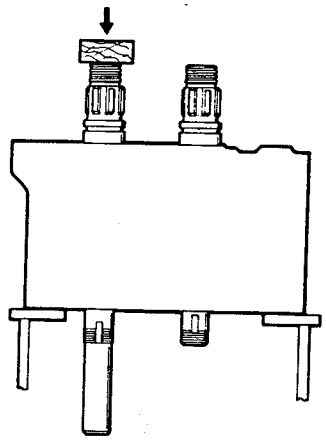
9. Place shim packs onto shafts and insert into housing. (See Table 3.)

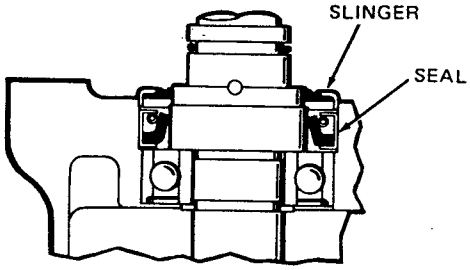


10. Place assembly onto arbor press. Using a plastic or brass plate to protect splines, press shafts into rear bearings. (See Table 4.)

NOTE: Install drive shaft in proper location for top or bottom drive. The gear cover is machined to match the drive shaft location and is not interchangeable.

11. Check backface clearance. Refer to Table 1 and BACKFACE CLEARANCE, page 46.

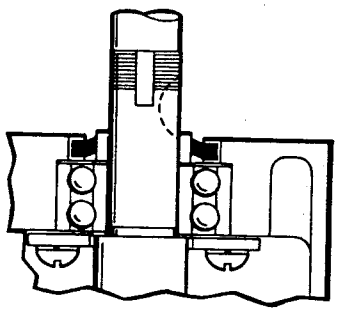


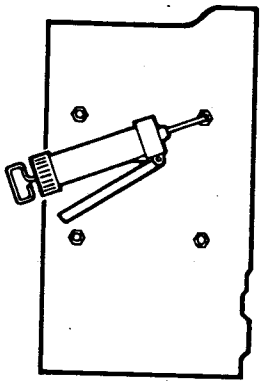


12. Press front grease seals into housing orienting sealing lip as shown.

13. Press on slingers tight against shaft shoulder.

14. Rear seal installation: Install spacer seal and spacer. Then press in rear seal flush with back face of housing.



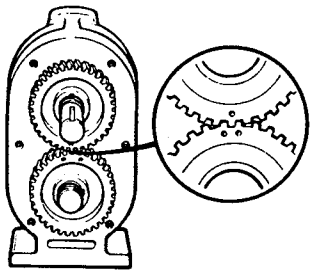


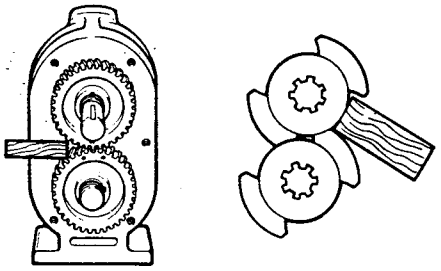
15. Grease both front and rear bearings with Micro-Plate #2 grease.

GEAR AND GEAR COVER ASSEMBLY - ALL MODELS

1. Place keys into shaft keyslots. Then slide gear with single punch mark onto drive shaft and the 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 gears to obtain proper timing.

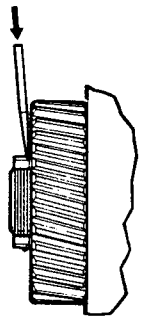


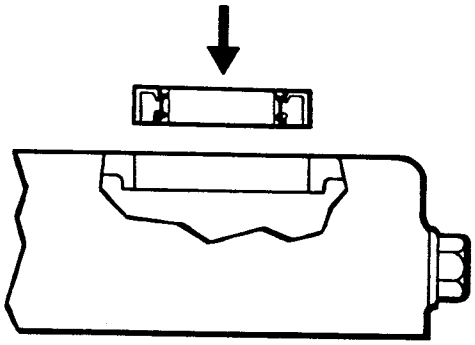


2. Secure shafts from turning with a wood block wedged between gears or rotors.

3. Apply Molykote grease to threaded area on shafts.

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 for proper torque limit.



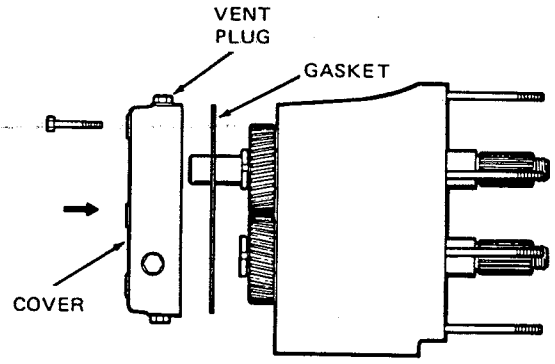


5. Press new grease seal into gear cover.

NOTE: On Model 2 press in cover bearing.

6. Place gasket over gear cover and mount cover assembly over shaft extension onto bearing housing.

7. Fill gear cover with Micro-Plate #140 oil to proper level. Install vent plug.

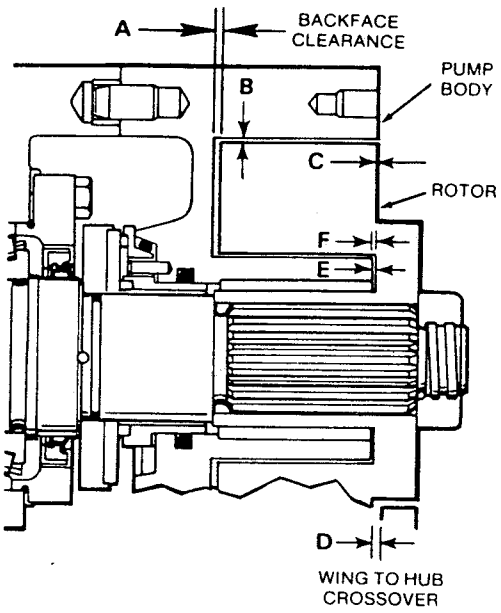


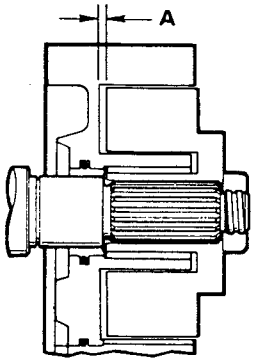
BACK FACE CLEARANCE

1. All Waukesha Pumps are designed with close running clearances and the back face clearance is established with shims during assembly. The rotors lock against a shaft shoulder and the shaft is positioned with shims and locked into bearing housing. The resultant clearance between body back face and rotor wing is the back face clearance. (See Table 1.)

2. To check back face clearance mount body, less seals, onto housing. Assemble rotors and secure with rotor retaining nut. Measure clearance between body back face and rotor wing with feeler gauges. Check readings against recommended back face clearance in Table 1. Make note of any corrections required and follow examples to determine exact adjustment to make and avoid unnecessary assembly-disassembly.

3. To make shim adjustments it is necessary to disassemble rotors and body and remove shafts. (See Section VIII.) 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

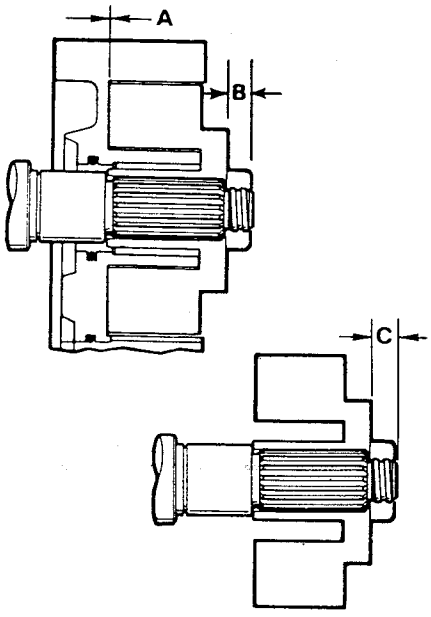
Measure back face clearance (Dimension A). If clearance is greater than the clearance specified in Table 1, remove shims equal (or as close as possible) to difference between measured clearance and specified clearance.

Not Enough Clearance

If back face clearance is less than the clearance specified in Table 1, shims must be added. To determine amount of shims to add, use a straight edge and depth gauge and measure Dimension B between the front rotor surface and end of shaft.

Remove rotors and then the pump body. Reinstall the rotors on shafts and secure them with rotor nuts and measure Dimension C.

Add shims equal to (or as close as possible to) the difference between Dimensions B and C.



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. CLEARANCES

MODEL	A BACK FACE	B ROTOR TO BODY	C FRONT FACE	D WING TO HUB	E HUB TO HUB	F BODY HUB UNDERCUT
2	.0015	.001	.001-.002	.0005-.0015	.001-.002	ext. .004
3,10,16	.002	.0015	.002-.003	.0025-.0035	.0015-.003	.0015-.002
25	.0025	.002	.002-.003	.0015-.0025	.002-.003	.003-.0035
55,100,125	.004	.003	.0035-.0045	.0035-.0045	.0035-.005	.004-.0045
200	.005	.005	.0045-.0055	.0095-.0105	.0045-.0055	

TABLE 2. TORQUE VALUES - FT-LBS

MODEL	LOCK NUTS	
	BEARING	GEAR
2		60
3,10,16		75
25		100
55,100,125		140
200		230

TABLE 3. SUGGESTED SHIMS

MODEL	STD. PUMP	NEW SHAFT	REC. PUMP SHAFT	
			R_1	R_2
2	.016	.010	.080	.060
25	.016	.010	.080	.060
3,10,16	.016	.010	.080	.060
55,100,125	.016	.010	.080	.060
200	.016	.010	.080	.060

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

MODEL	SHAFT		FRONT BEARING		REAR BEARINGS			
					HOUSING		SHAFT	
	IN	OUT	ON	OFF	IN	OUT	ON	OFF
2	.25	.5	.25	.5	.25	.5		
3,10,16	.25	.5	.5	1	.5	1		
25	.25	.5	.5	1	5	1		
55,100,125	.5	1	2	5	2	5		
200	.5	1	5	10	3	5		

VENTED COVER

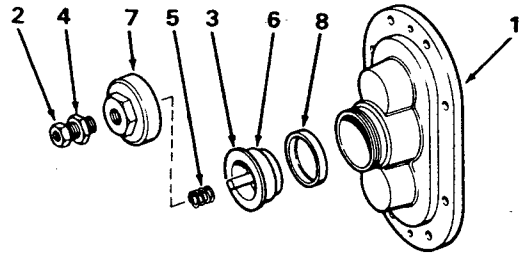
INTERNAL RELIEF VALVE

The Waukesha Vented Cover is a unique integral, compact, internal by-pass valve which can be used as a pressure relief valve. It is bi-directional; that is, the pump flow or rotation can be in either direction. However, the combinations of flow, pressure, and viscosity which may be encountered may exceed the by-pass capability of the vented cover passages. Specific operating conditions should be furnished to Waukesha Pumps for recommendations.

Three types of "Vented Cover" are available:

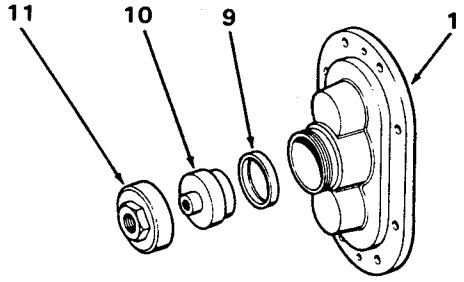
1. Manual

By-pass pressure is adjusted by a threaded adjusting screw (2) which compresses a spring (5). Several spring sizes are available, each with limited operating range.



2. Pneumatic

By-pass pressure is adjusted by regulated air or gas pressure, operating on the side of a diaphragm (9) opposite the pumped fluid. Most sensitive control of the three types.



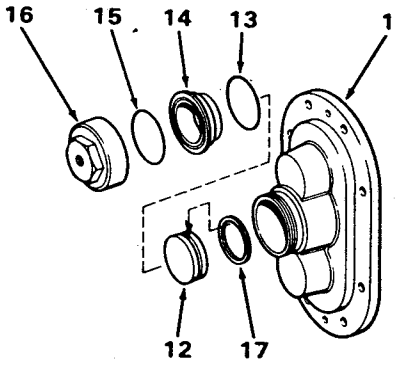
TYPE	ITEM	DESCRIPTION	QTY.	PART NUMBER BY MODEL				
				2	3, 10, 16	25	55, 100, 125	200
MANUAL		Cover Assembly		002-002-V00	010-002-V00	025-002-V00	055-002-V00	210-002-V10
	1	Pump Cover	1	FBB-002-V00	ADO-002-VS0	BDO-002-VS0	CDO-002-VS0	GDO-002-VS0
	2	Adjusting Screw	1	FBB-072-000	ADO-072-000	ADO-072-000	ADO-072-000	GDO-072-100
	3	Spring Plunger	1	FBB-073-000	ADO-073-000	ADO-073-000	CDO-073-000	GDO-073-000
	4	Locknut	1	FBB-074-000	ADO-074-000	ADO-074-000	ADO-074-000	GDO-074-000
	5	Spring Low	1	ADO-076-L00	ADO-076-L00	ADO-076-000	ADO-076-000	— —
		Spring Medium	1	ADO-076-000	ADO-076-000	ABB-076-100	ABB-076-100	— —
		Spring High	1	ABB-076-100	ABB-076-100	ABB-076-200	ABB-076-200	GDO-076-100
	6	Diaphragm Bushing	1	FBB-077-000	ADO-077-000	ADO-077-000	CDO-077-000	GDO-077-000
	7	Cover Nut	1	FBB-075-000	ADO-075-000	ADO-075-000	CDO-075-000	GDO-075-000
	8	Rubber Diaphragm	1	FBB-078-000	ADO-078-000	ADO-078-000	CDO-078-000	GDO-078-000
PNEUMATIC		Cover Assembly		002-002-VP0	010-002-VP0	025-002-VP0	055-002-VP0	— —
	1	Vented Cover	1	FBB-002-V00	ADO-002-VS0	BDO-002-VS0	CDO-002-VS0	— —
	9	Diaphragm	1	FBB-078-000	ADO-078-000	ADO-078-000	CDO-078-000	— —
	10	Diaphragm Bushing	1	FBB-077-P00	ADO-077-P00	ADO-077-P00	CDO-077-P00	— —
	11	Cover Nut	1	FBB-075-P00	ADO-075-P00	ADO-075-P00	CDO-075-P00	— —
PISTON		Cover Assembly		— —	010-002-VP1	025-002-VP1	055-002-VP1	210-002-VP1
	1	Vented Cover	1	— —	ADO-002-VS0	BDO-002-VS0	CDO-002-VS0	GDO-002-VS0
	12	Piston	1	— —	ADO-073-P10	ADO-073-P10	CDO-073-P10	GDO-073-P10
	13	Bushing Seal	1	— —	ADO-133-200	ADO-133-200	CDO-133-200	BDO-117-000
	14	Diaphragm Bushing	1	— —	ADO-077-P10	ADO-077-P10	CDO-077-P10	GDO-077-P10
	15	Nut Seal	1	— —	ADO-133-100	ADO-133-100	CDO-133-100	BDO-117-000
	16	Cover Nut	1	— —	ADO-075-P10	ADO-075-P10	CDO-075-P10	GDO-075-P10
	17	Piston Seal	1	— —	ADO-133-000	ADO-133-000	CDO-133-000	GDO-133-000

3. Piston

By-pass pressure is adjusted by regulated air or gas pressure, operating on the side of a metal piston (12), opposite the pumped fluid. Extended pressure range possible.

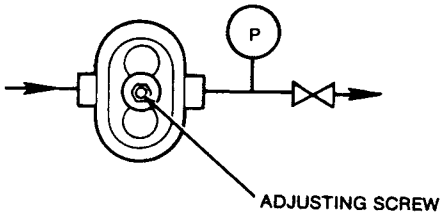
NOTE: On all types of relief valve covers the temperature and chemical resistance of the elastomer diaphragms and "O" rings determine the useful range.

Buna-N ..... Material supplied as standard
Silicone Rubber ..... Optional material upon request

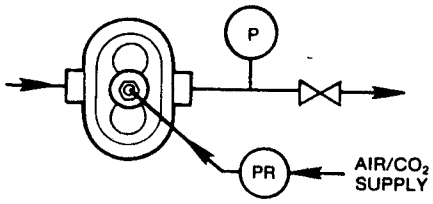


INSTALLATION ADJUSTMENT

MANUAL



PNEUMATIC



1. Manual: Turn adjusting screw counterclockwise to its farthest position, then clockwise until light spring pressure is felt.

1. Pneumatic and Piston: Set air/gas regulator at 2-5 PSI on relief valve.

2. Turn on pump.

3. Manual:

With pressure gauge and valve in discharge line.

a. Close discharge valve.

b. Turn adjusting screw clockwise until desired relief pressure registers on gauge. Lock adjusting screw with lock nut.

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

Without pressure gauge in discharge line.

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

b. When product flow reaches maximum or desired flow rate, lock adjusting screw with lock nut.

3. Pneumatic and Piston:

With pressure gauge and valve in discharge line.

a. Close discharge valve slowly and observe gauge pressure. DO NOT ALLOW PRESSURE TO EXCEED 150 PSI.

b. Increase air/gas pressure to relief valve, with regulator, until desired relief pressure registers on gauge. Lock regulator adjusting screw with lock nut.

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

Without pressure gauge in discharge line.

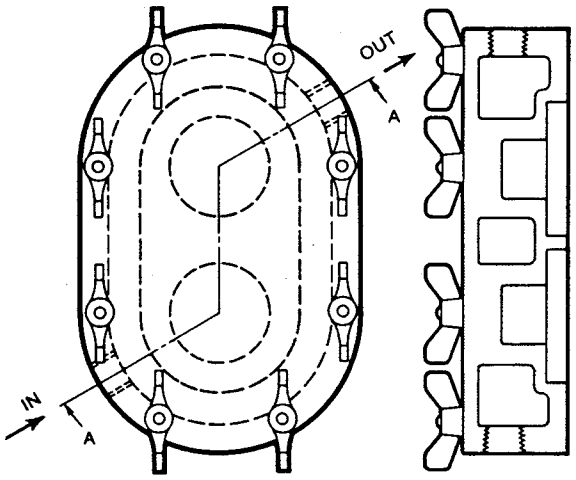
a. Increase air/gas pressure to relief valve, with regulator, and observe product flow at discharge of system.

b. When product flow reaches maximum or desired flow rate, lock regulator adjusting screw with lock nut.

JACKETED COVER
Available On Models 2, 3, 10, 16, 25, 55, 60, 100, 125

The Jacketed Cover is designed to allow circulation of a heating or cooling medium. The purpose is to help preheat or cool the pumping head and sustain operating temperature during short shut down periods. It should not be used as a heat exchanger to control pumping temperature during operation.

NOTE: Pressure limit for cover media is 60 PSI.



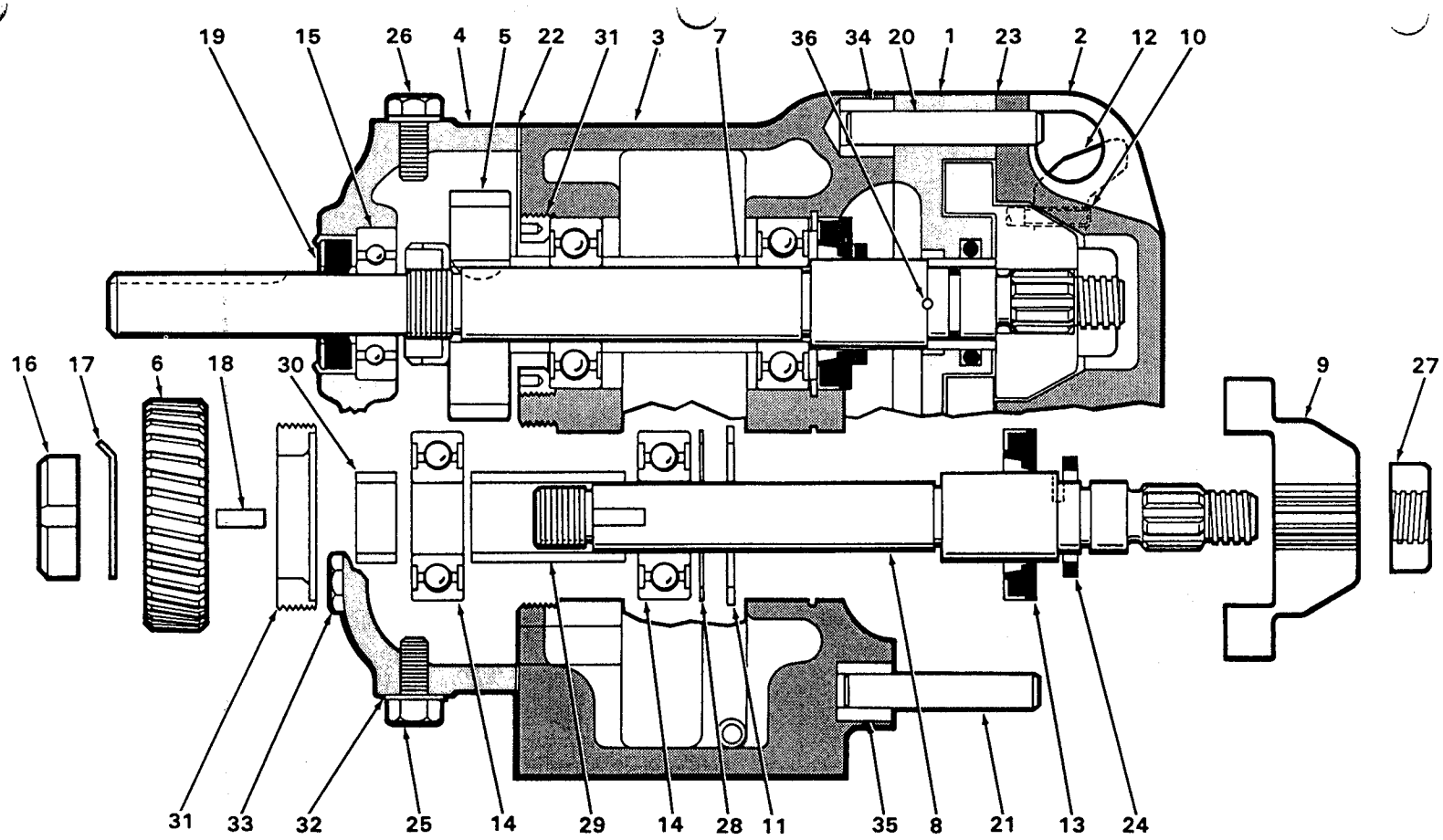
SECTION "A-A"

CONNECTIONS

Model Number	
2, 3, 10, 16 and 25	55, 60, 100, 125
3/4" Pipe Tap	1" Pipe Tap

PUMP JACKETS

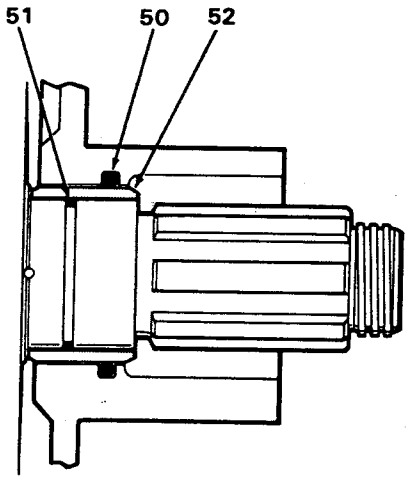
Split Cast Aluminum Jackets with cast in pipe passages are available for higher pressures and temperatures. Consult factory for recommendations.



MODEL 2-BB

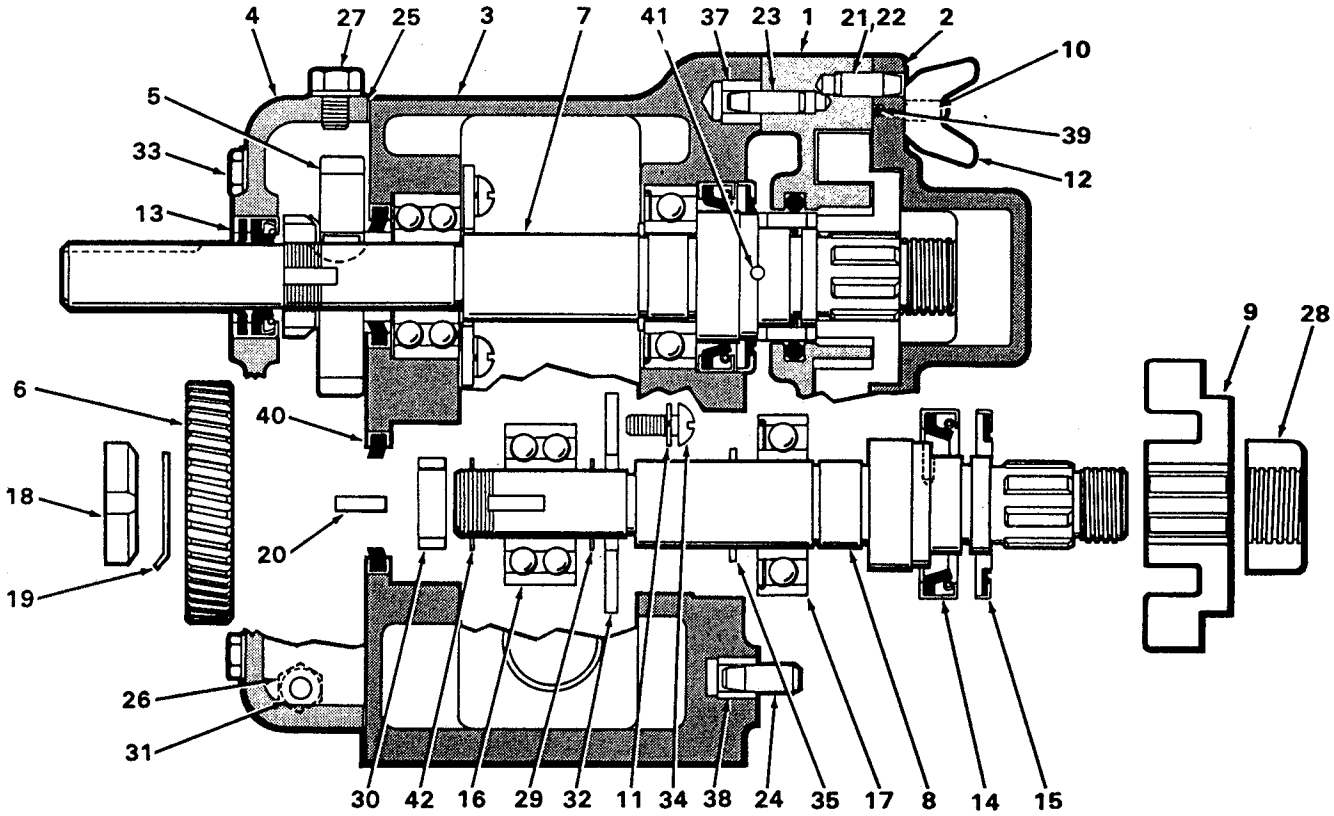
Item	Description	Qty	Part No.	Item	Description	Qty	Part No.	Item	Description	Qty	Part No.
1	Body	1	FBB-001-000	17	Lockwasher	2	FBB-036-W00	33	Hex Cap Screw	4	ADO-081-000
2	Cover	1	FBB-002-000	18	Key - Gear	2	FBB-037-000	34	Dowel Bushing - Upper	1	FBB-116-000
	Cover - Vented*	1	002-002-V00	19	Oil Seal - B.H. Cover	1	FBB-038-000	35	Dowel Bushing - Lower	1	FBB-116-100
3	Bearing Housing	1	FBB-005-000	20	Dowel Pin - Upper	1	FBB-040-000	36	Drive Pin	2	FBB-126-000
4	Bearing Housing Cover	1	FBB-006-A00	21	Dowel Pin - Lower	1	FBB-040-A00				
5	Gear - Drive Shaft	1	FBB-007-H10	22	Gasket - B.H. Cover	1	FBB-042-A00		OIL MICRO-PLATE #140		
6	Gear - Short Shaft	1	FBB-007-H20	23	Gasket - P.C.	1	FBB-043-000		1 - Gallon Can		OBI-140-000
7	Drive Shaft	1	FBB-008-010	24	Slinger	2	FBB-045-R00		1 - Quart Can		OBI-141-000
8	Short Shaft	1	FBB-009-010	25	Cap Screw - Oil Level - Drain	5	ADO-046-000		GREASE MICRO-PLATE #2		
9	Rotor	2	FBB-010-200	26	Breather Cap Screw	1	ADO-046-100		1 - Pound Tube		OBI-142-000
10	Stud	4	FBB-011-000	27	Rotor Nut	2	FBB-052-000				
11	Truarc Ring	2	FBB-013-000	28	Shim (.002 & .006)	As Reqd.	FBB-054-000	†	"O" Ring Tool		ADO-096-001
12	Wing Nut	4	ADO-016-000					†	Rotor Nut Wrench		FBB-019-000
13	Oil Seal	2	FBB-030-000	29	Spacer - Front	2	FBB-055-000				
14	Bearing - Bearing Housing	4	FBB-036-000	30	Spacer - Rear	2	FBB-055-A00		†Not Shown		
15	Bearing - B.H. Cover	1	FBB-036-A00	31	Bearing Ret. Nut	2	FBB-057-000				
16	Lock Nut	2	FBB-036-N00	32	Fiber Washer	6	BDO-065-000		*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.		

MODEL 2 SEAL



MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	FBB-079-000
	"O" Ring - Body - Viton	2	FBB-079-V00
	"O" Ring - Body - E.P.	2	FBB-079-002
51	"O" Ring - Shaft - Buna N	2	FBB-097-000
52	Sleeve - Prong Type	2	FBB-098-001



MODEL 3-DO

Item	Description	Qty	Part No.
1	Body	1	ADO-001-300
2	Cover	1	ADO-002-S00
	Cover - Vented*	1	010-002-V00
	Cover - Jacketed	1	ADO-002-J10
3	Bearing Housing	1	ADO-105-000
4	Bearing Housing Cover - Upper	1	ADO-106-U00
	Bearing Housing Cover - Lower	1	ADO-106-L00
5	Gear - Drive Shaft	1	ADO-007-H10
6	Gear - Short Shaft	1	ADO-007-H20
7	Drive Shaft	1	ADO-008-000
8	Short Shaft	1	ADO-009-000
9	Rotor - Twin Blade	2	ADO-010-230
10	Stud	8	ADO-011-000
11	Lockwasher	6	ADO-013-000
12	Wing Nut	8	ADO-016-000
13	Oil Seal - B.H. Cover	1	ADO-030-000
14	Oil Seal - Front	2	ADO-030-100
15	Wiper Seal	2	ADO-030-1W0
16	Bearing - Rear	2	ADO-036-000
17	Bearing - Front	2	015-035-000
18	Lock Nut - Gear	2	ADO-036-N00

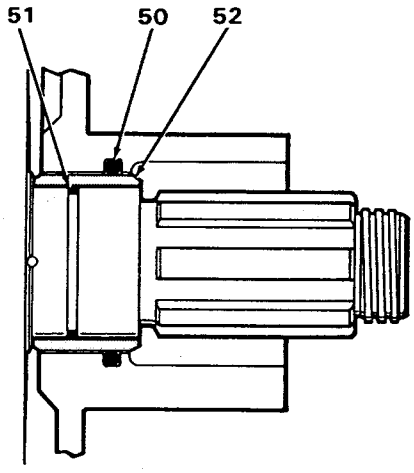
Item	Description	Qty	Part No.
19	Lockwasher - Gear	2	ADO-036-W00
20	Woodruf Wey - Gear	2	ADO-037-000
21	Dowel Pin - Upper	1	ADO-040-000
22	Dowel Pin - Lower	1	ADO-040-100
23	Dowel Pin Body - Upper	1	ADO-040-R00
24	Dowel Pin Body - Lower	1	ADO-040-R10
25	Gasket - B.H. Cover	1	ADO-042-000
26	Hex Cap Screw	2	ADO-046-000
27	Breather Screw	1	ADO-046-100
28	Rotor Retaining Nut	2	ADO-052-000
29	Shim (.002 & .006)	As Reqd.	ADO-054-000
30	Spacer	2	ADO-055-000
31	Fiber Washer	3	BDO-065-000
32	Bearing Retaining Plate	2	ADO-080-000
33	Hex Cap Screw	6	ADO-081-000
34	Rd. Hd. Cap Screw	8	BDO-083-000
35	Truarc Ring	2	ADO-087-R00
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush. - Upper	1	ADO-116-000
38	Dowel Bush. - Lower	1	ADO-116-100

Item	Description	Qty	Part No.
39	"O" Ring - Cover - Buna N	1	ADO-117-000
	"O" Ring - Cover - Viton	1	ADO-117-V00
	"O"Ring - Cover - Silicone	1	ADO-117-SC0
	"O" Ring - Cover - Teflon	1	ADO-117-T00
40	Oil Seal - Rear	2	ADO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	ADO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Tool		ADO-096-001
†	Rotor Nut Wrench		ADO-019-000

†Not Shown

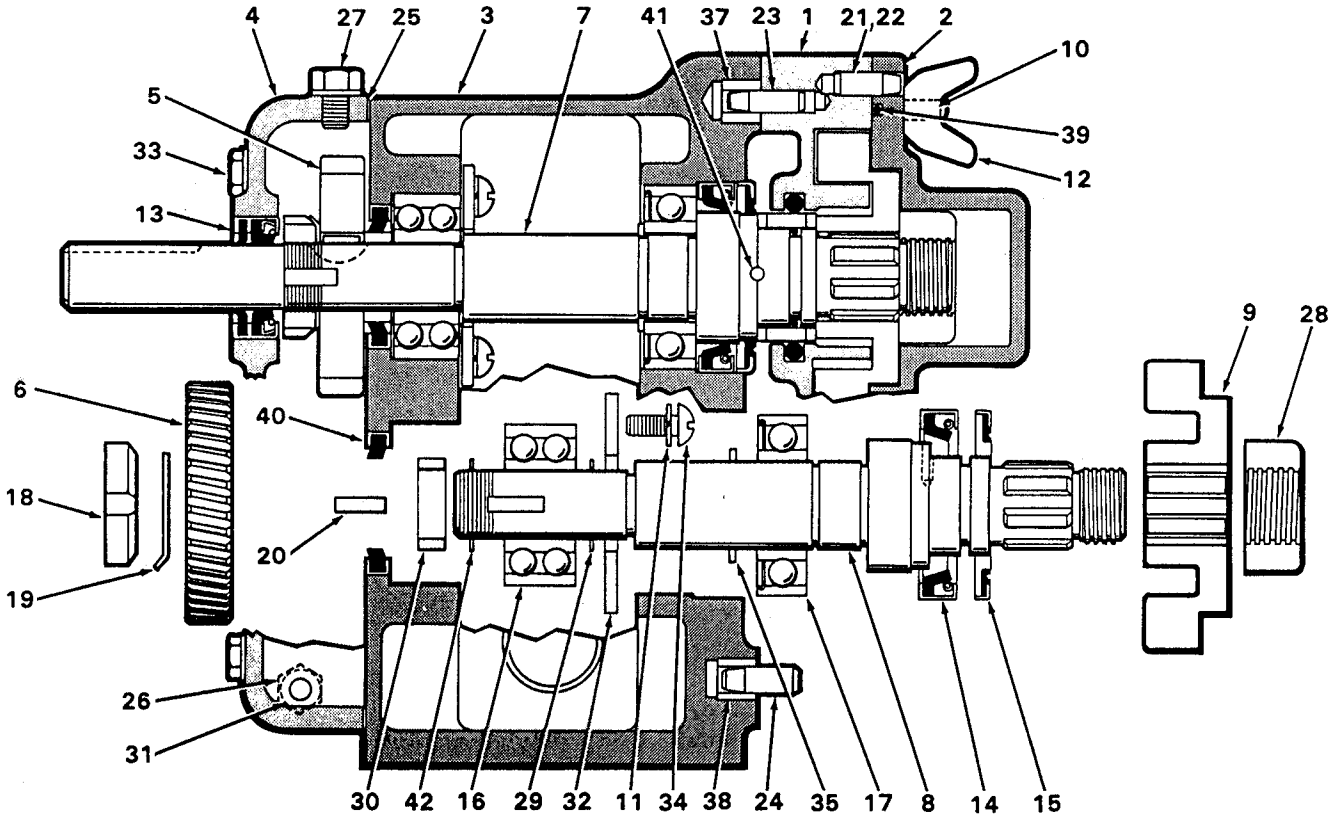
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODEL 3 SEAL



MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring Body - Buna N	2	ADO-079-000
	"O" Ring Body - Viton	2	ADO-079-V00
	"O" Ring Body - Silicone	2	ADO-079-SC0
	"O" Ring Body - E.P.	2	ADO-079-002
	U-Cup Body - Buna N	2	ADO-079-U00
51	"O" Ring - Shaft - Buna N	2	ADO-097-000
	"O" Ring - Shaft - Viton	2	ADO-097-V00
	"O" Ring - Shaft - Silicone	2	ADO-097-002
52	Sleeve - Prong	2	ADO-098-001



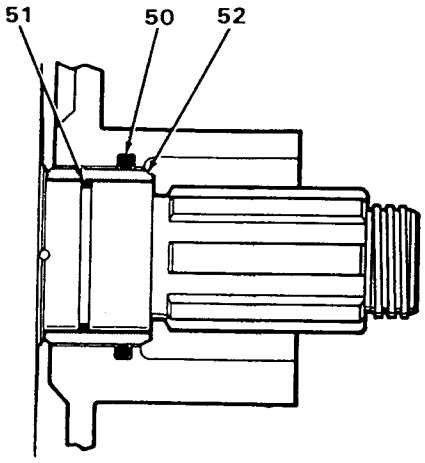
MODELS 10-DO AND 10-GT

Item	Description	Qty	Part No.
1	Body - DO	1	ADO-001-0S0
	Body - GT	1	AGT-001-000
2	Cover	1	ADO-002-S00
	Cover -Vented*	1	010-002-V00
	Cover - Jacketed	1	ADO-002-J10
3	Bearing Housing	1	ADO-105-000
4	B.H. Cover - Upper	1	ADO-106-U00
	B.H. Cover - Lower	1	ADO-106-L00
5	Gear - Drive Shaft	1	ADO-007-H10
6	Gear - Short Shaft	1	ADO-007-H20
7	Drive Shaft - DO	1	ADO-008-000
	Drive Shaft - GT	1	AGT-008-000
8	Short Shaft - DO	1	ADO-009-000
	Short Shaft - GT	1	AGT-009-000
9	Rotor - Twin Blade	2	ADO-010-000
10	Stud	8	ADO-011-000
11	Lockwasher	8	BDO-013-000
12	Wing Nut	8	ADO-016-000
13	Oil Seal - B.H. Cover	1	ADO-030-000
14	Oil Seal - Front	2	ADO-030-100
15	Wiper Seal	2	ADO-030-1W0
16	Bearing - Rear	2	ADO-036-000
17	Bearing - Front	2	015-035-000
18	Locknut - Gear	2	ADO-036-N00
19	Lockwasher - Gear	2	ADO-036-W00
20	Key - Gear	2	ADO-037-000
21	Dowel Pin - Upper	1	ADO-040-000
22	Dowel Pin - Lower	1	ADO-040-100
23	Dowel Pin Body - Upper	1	ADO-040-R00
24	Dowel Pin Body - Lower	1	ADO-040-R10
25	Gasket - B.H. Cover	1	ADO-042-000
26	Cap Screw	2	ADO-046-000
27	Breather Screw	1	ADO-046-100
28	Rotor Nut	2	ADO-052-000
29	Shims (.002 & .006)	As Reqd.	ADO-054-000
30	Spacer	2	ADO-055-000
31	Fiber Washer	2	BDO-065-000
32	Bearing Retainer Plate	2	ADO-080-000
33	Hex Cap Screw	6	ADO-081-000
34	Rd. Hd. Cap Screw	8	BDO-083-000
35	Truarc Ring	2	ADO-087-R00
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush. - Upper	1	ADO-116-000
38	Dowel Bush. - Lower	1	ADO-116-100
39	"O" Ring - Cover - Buna N	1	ADO-117-000
	"O" Ring - Cover - Viton	1	ADO-117-V00
	"O" Ring - Cover - Silicone	1	ADO-117-SC0
	"O" Ring - Cover - Teflon	1	ADO-117-T00
40	Oil Seal - Rear	2	ADO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	ADO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
☆	Rotor Nut Wrench		ADO-019-000

†Not Shown

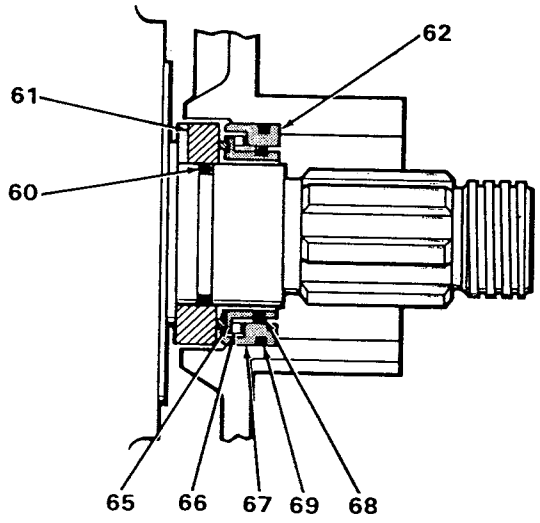
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODEL 10 SEAL OPTIONS



MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	ADO-079-000
	"O" Ring - Body - Viton	2	ADO-079-V00
	"O" Ring - Body - Silicone	2	ADO-079-SC0
	"O" Ring - Body - E.P.	2	ADO-079-002
	U-Cup - Body - Buna N	2	ADO-079-U00
51	"O" Ring - Shaft - Buna N	2	ADO-097-000
	"O" Ring - Shaft - Viton	2	ADO-097-V00
	"O" Ring - Shaft - Silicone	2	ADO-097-SC0
52	Sleeve - Prong	2	ADO-098-001

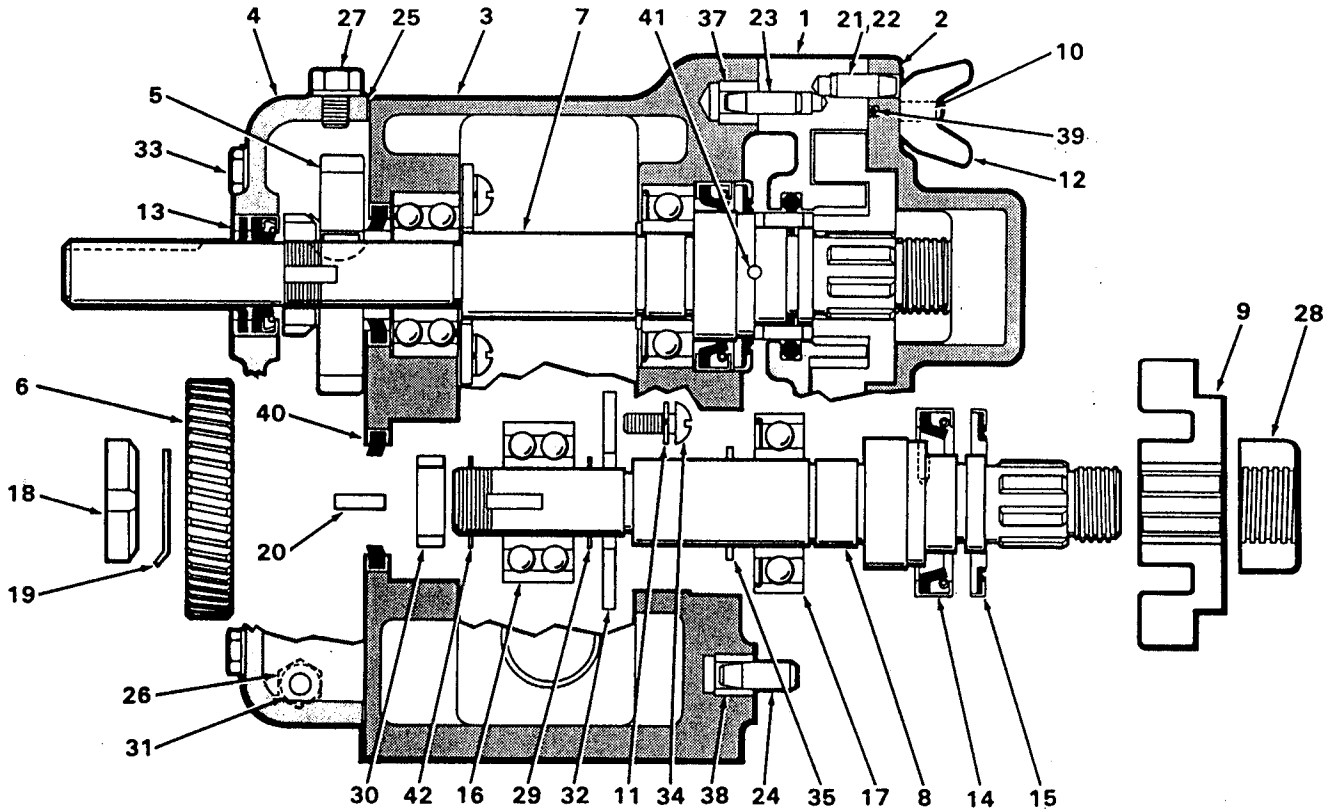


MODEL GT MECHANICAL SEAL

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	ADO-097-000
	"O" Ring - Shaft - Viton	2	ADO-097-V00
	"O" Ring - Shaft - Silicone	2	ADO-097-SC0
61	Seal Seat - Carp. 20	2	AMF-014-000
62	Seal Case Assembly**	2	AGT-305-101
	Carbon Carrier Assembly**	2	AGT-306-101

**Seal Assembly Breakdown

65	Carrier - Carbon	2	AGT-306-000
66	Wave Spring	2	AGT-304-000
67	Seal Case	2	AGT-305-000
68	"O" Ring - Carrier - Buna N	2	B70-137-123
69	"O" Ring - Case - Buna N	2	B70-137-128



MODEL 16-DO

Item	Description	Qty	Part No.
1	Body	1	ADO-001-160
2	Cover	1	ADO-002-S00
	Cover - Vented*	1	010-002-V00
	Cover - Jacketed	1	ADO-002-J10
3	Bearing Housing	1	ADO-105-000
4	Bearing Housing Cover - Upper	1	ADO-106-U00
	Bearing Housing Cover - Lower	1	ADO-106-L00
5	Gear - Drive Shaft	1	ADO-007-H10
6	Gear - Short Shaft	1	ADO-007-H20
7	Drive Shaft	1	ADO-008-160
8	Short Shaft	1	ADO-009-160
9	Rotor - Twin Blade	2	ADO-010-160
10	Stud	8	ADO-011-160
11	Lockwasher	6	BDO-013-000
12	Wing Nut	8	ADO-016-000
13	Oil Seal - B.H. Cover	1	ADO-030-000
14	Oil Seal - Front	2	ADO-030-100
15	Wiper Seal	2	ADO-030-1W0
16	Bearing - Rear	2	ADO-036-000
17	Bearing - Front	2	015-035-000
18	Lock Nut - Gear	2	ADO-036-N00

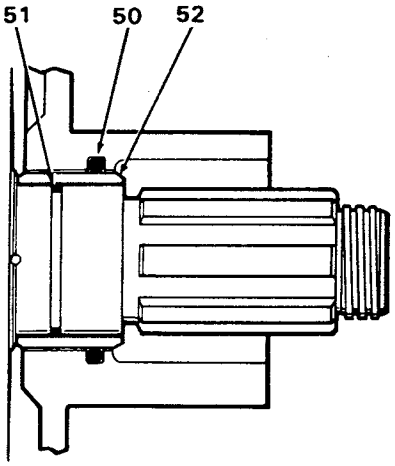
Item	Description	Qty	Part No.
19	Lockwasher - Gear	2	ADO-036-W00
20	Woodruf Key - Gear	2	ADO-037-000
21	Dowel Pin - Upper	1	ADO-040-000
22	Dowel Pin - Lower	1	ADO-040-100
23	Dowel Pin Body - Upper	1	ADO-040-R00
24	Dowel Pin Body - Lower	1	ADO-040-R10
25	Gasket - B.H. Cover	1	ADO-042-000
26	Hex Cap Screw	2	ADO-046-000
27	Breather Screw	1	ADO-046-100
28	Rotor Retaining Nut	2	ADO-052-000
29	Shim (.002 & .006)	As Reqd.	ADO-054-000
30	Spacer	2	ADO-055-000
31	Fiber Washer	3	BDO-065-100
32	Bearing Retaining Plate	2	ADO-080-000
33	Hex Cap Screw	6	ADO-081-000
34	Rd. Hd. Cap Screw	8	BDO-083-000
35	Truarc Ring	2	ADO-087-R00
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush. - Upper	1	ADO-116-000
38	Dowel Bush. - Lower	1	ADO-116-100

Item	Description	Qty	Part No.
39	"O" Ring - Cover - Buna N	1	ADO-117-000
	"O" Ring - Cover - Viton	1	ADO-117-V00
	"O" Ring - Cover - Silicone	1	ADO-117-SC0
	"O" Ring - Cover - Teflon	1	ADO-117-T00
40	Oil Seal - Rear	2	ADO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	ADO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
†	Rotor Nut Wrench		ADO-019-000

†Not Shown

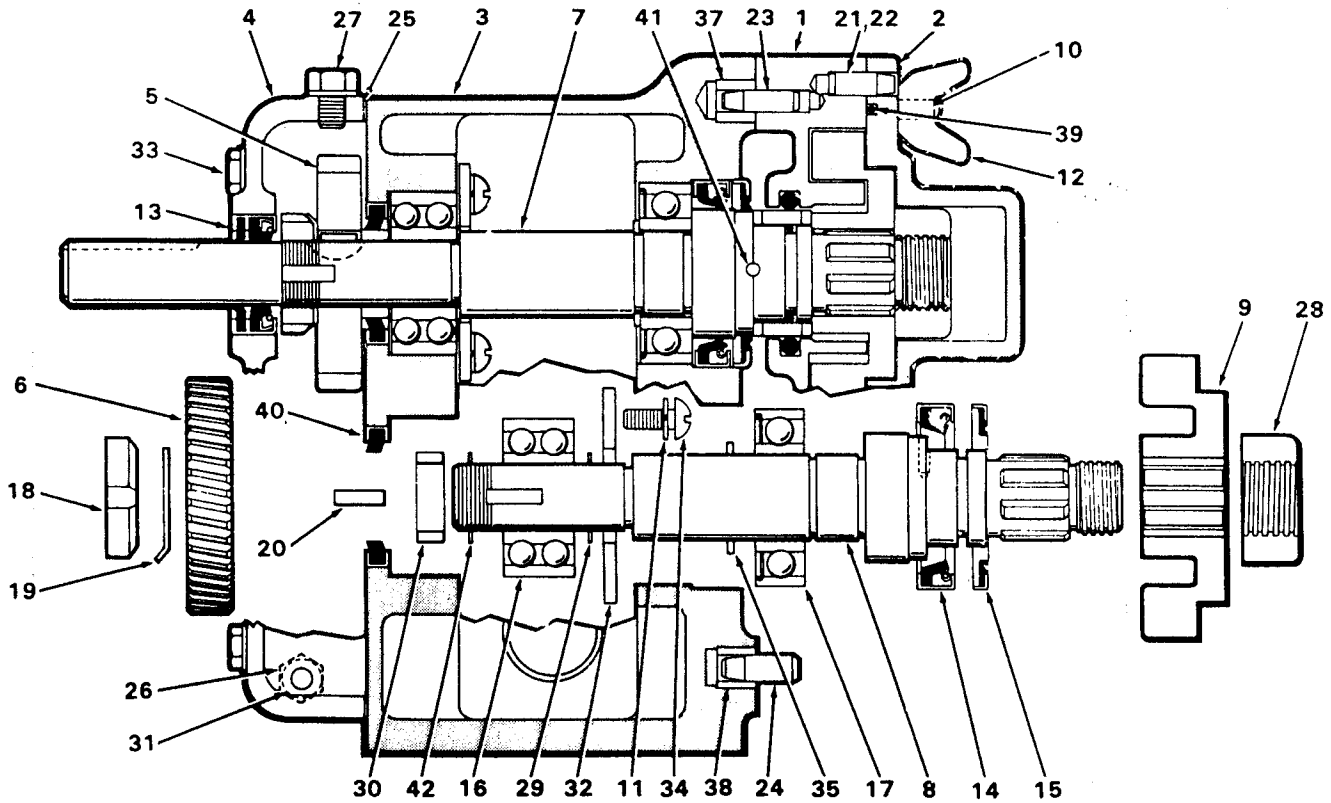
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODEL 16 SEAL



MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	ADO-079-000
	"O" Ring - Body - Viton	2	ADO-079-V00
	"O' Ring - Body - Silicone	2	ADO-079-SC0
	"O" Ring - Body - E.P.	2	ADO-079-002
	U-Cup - Body - Buna N	2	ADO-079-U00
51	"O" Ring - Shaft - Buna N	2	ADO-097-000
	"O" Ring - Shaft - Viton	2	ADO-097-V00
	"O" Ring - Shaft - Silicone	2	ADO-097-002
52			
	Sleeve - Prong	2	ADO-098-001



MODELS 25-DO, 25-TO AND 25-GT

Item	Description	Qty	Part No.
1	Body - DO	1	BDO-001-OS0
	Body - TO	1	BDO-001-T00
	Body - GT		BDO-001-GT0
2	Cover	1	BDO-002-S00
	Cover - Vented*	1	025 002-V00
	Cover - Jacketed	1	BDO-002-J10
3	Bearing Housing	1	BDO-105-000
	Bearing Housing - Side Mt.	1	BDO-105-SM0
4	Bearing Housing Cover - Upper	1	BDO-106-U00
	Bearing Housing Cover - Lower	1	BDO-106-L00
	Bearing Housing Cover - Side Mt.	1	BDO-106-SM0
5	Gear - Drive Shaft	1	BDO-007-H10
6	Gear - Short Shaft	1	BDO-007-H20
7	Drive Shaft - DO	1	BDO-008-000
	Drive Shaft - TO, GT	1	BDO-008-T00
8	Short Shaft - DO	1	BDO-009-000
	Short Shaft - TO, GT	1	BDO 009-T00
9	Rotor - Twin Blade	2	BDO 010-000
10	Stud	8	BDO-011-000
11	Lockwasher	6	BDO-013 000
12	Wing Nut	6	BDO-016-002
13	Oil Seal - B.H. Cover	1	BDO-030-000
14	Oil Seal - Front	2	BDO 030-100

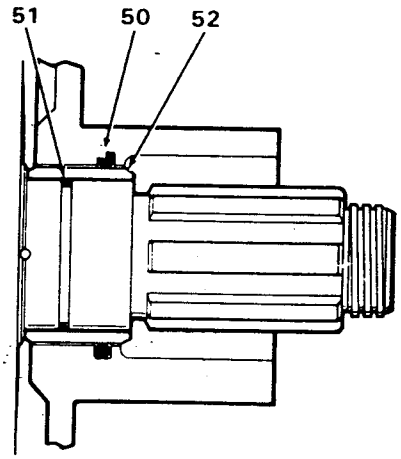
Item	Description	Qty	Part No.
15	Wiper Seal	2	BDO-030-1W0
16	Bearing - Rear	2	BDO-036-000
17	Bearing - Front	2	BDO-035-300
18	Lock Nut - Gears	2	BDO-036-N00
19	Lockwasher - Gears	2	BDO-036-W00
20	Key - Gear	2	BDO 037-000
21	Dowel Pin - Upper	1	BDO-040-000
22	Dowel Pin - Lower	1	BDO-040-100
23	Dowel Pin Body - Upper	1	BDO-040-200
24	Dowel Pin Body - Lower	1	BDO-040-300
25	Gasket - B.H. Cover	1	BDO-042-000
	Gasket - B.H.C. Side Mt.	1	BDO-042-SM0
26	Hex Cap Screw	2	BDO-046-000
27	Breather Screw	1	BDO-046-100
28	Rotor Retaining Nut	2	BDO-052-000
29	Shim (.002 & .006)	As Reqd.	BDO-054-000
30	Spacer	2	BDO-055-000
31	Fiber Washer	3	BDO 065-100
32	Bearing Retaining Plate	2	BDO 080-000
33	Hex Cap Screw	6	BDO-081-000
34	Rd. Hd. Cap Screw	8	BDO-083 000
35	Truarc Ring	2	BDO-087 R00

Item	Description	Qty	Part No.
36	Grease Fitting	4	BDO-092-000
37	Dowel Bush. - Upper	1	BDO-116-000
38	Dowel Bush. - Lower	1	BDO-116 100
39	"O" Ring - Cover - Buna N	1	BDO 117-000
	"O" Ring - Cover - Viton	1	BDO-117-V00
	"O" Ring - Cover - Silicone	1	BDO-117-SC0
40	Oil Seal - Rear	2	BDO-119-000
41	Drive Pin	2	BDO-126 000
42	Spacer Seal	2	BDO-127-000
	OIL MICRO-PLATE =140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE =2		
	1 - Pound Tube		OBI-142-000
*	"O" Ring Removal Tool		ADO 096 001
*	Rotor Nut Wrench		BDO 019 000

*Not Shown

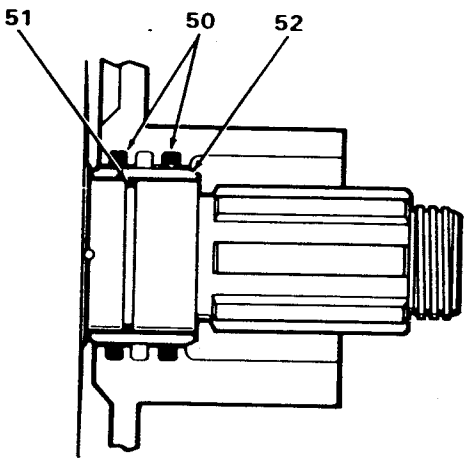
See Vented Cover Section page 34 for Assembly Options and Parts Breakdown

MODELS 25-DO, 25-TO AND 25-GT SEALS



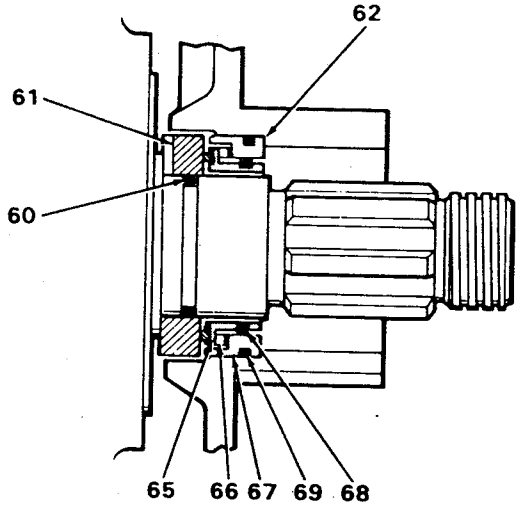
MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	BDO-079-000
	"O" Ring - Body - Viton	2	BDO-079-V00
	"O" Ring - Body - Silicone	2	BDO-079-SC0
	"O" Ring - Body - E.P.	2	BDO-079-002
	U-Cup - Body - Buna N	2	BDO-079-U00
51	"O" Ring - Shaft - Buna N	2	BDO-097-000
	"O" Ring - Shaft - Viton	2	BDO-097-V00
	"O" Ring - Shaft - Silicone	2	BDO-097-SC0
52	Sleeve - Prong	2	BDO-098-001



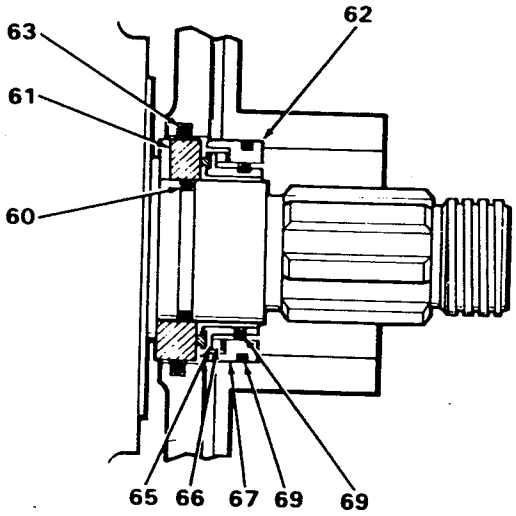
MODEL TO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	4	BDO-079-000
	"O" Ring - Body - Viton	4	BDO-079-V00
	"O" Ring - Body - Silicone	4	BDO-079-SC0
	"O" Ring - Body - E.P.	4	BDO-079-002
	U-Cup - Body - Buna N	4	BDO-079-U00
51	"O" Ring - Shaft - Buna N	2	BDO-097-000
	"O" Ring - Shaft - Viton	2	BDO-097-V00
	"O" Ring - Shaft - Silicone	2	BDO-097-SC0
52	Sleeve - Prong		BDO-098-T00



MODEL GT MECHANICAL SEAL

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	BDO-097-000
	"O" Ring - Shaft - Viton	2	BDO-097-V00
	"O" Ring - Shaft - Silicone	2	BDO-097-SC0
61	Seal Seat - Ceramic	2	BGT-014-000
62	Seal Case Assembly**	2	BGT-305-101
	Carbon Carrier Assembly**	2	BGT-306-101
	Ceramic Carrier Assembly**	2	BGT-306-111



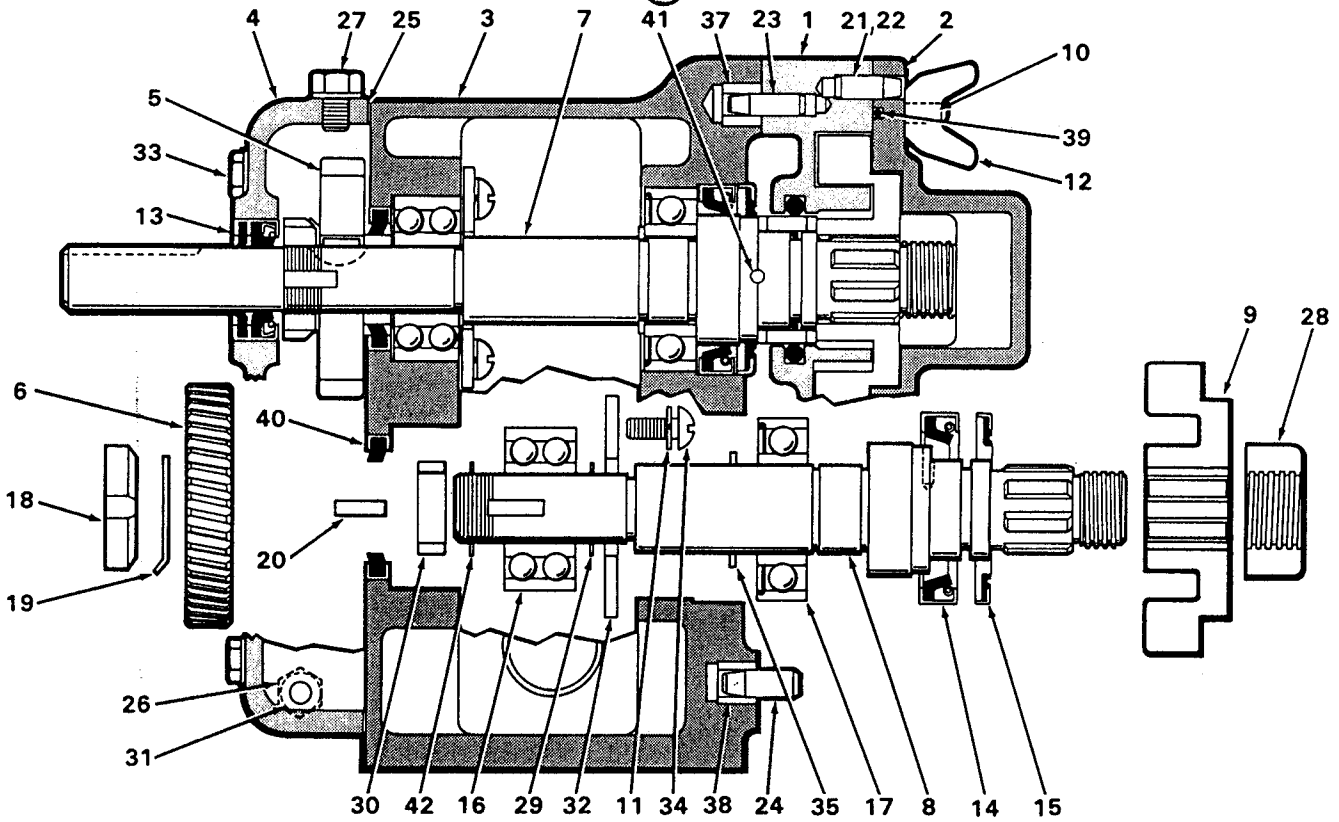
MODEL GT MECHANICAL SEAL/B-B FLUSH

Use Body BDO-1-GTB

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	BDO-097-000
	"O" Ring - Shaft - Viton	2	BDO-097-V00
	"O" Ring - Shaft - Silicone	2	BDO-097-SC0
61	Seal Seat - Ceramic	2	BGT-014-000
62	Seal Case Assembly	2	BGT-305-101
	Carbon Carrier Assembly	2	BGT-306-101
	Ceramic Carrier Assembly	2	BGT-306-111
63	"O" Ring - Buna	2	BGT-079-000
	"O" Ring - Viton	2	BGT-079-V00
	"O" Ring - E.P.	2	BGT-079-002

**Seal Assembly Breakdown

65	Carrier - Carbon	2	BGT-306-000
	Carrier - Ceramic	2	BGT-306-010
66	Wave Spring	2	BGT-304-000
67	Seal Case	2	BGT-305-000
68	"O" Ring Carrier - Buna N	2	BGT-302-000
	"O" Ring Carrier - Viton	2	BGT-302-V00
69	"O" Ring Case - Buna N	2	BGT-303-000
	"O" Ring Case - Viton	2	BGT-303-V00



MODELS 55-DO, 55-TO AND 55-GT

Item	Description	Qty	Part No.
1	Body - DO	1	CDO-001-OS0
	Body - TO	1	CDO-001-T00
	Body - GT	1	CDO-001-GT0
2	Cover	1	CDO-002-S00
	Cover - Vented*	1	055-002-V00
	Cover - Jacketed	1	CDO-002-J10
3	Bearing Housing	1	CDO-105-000
	Bearing Housing - Side Mt.	1	CDO-105-SM0
4	Bearing Housing Cover - Upper	1	CDO-106-U00
	Bearing Housing Cover - Lower	1	CDO-106-L00
	Bearing Housing Cover - Side Mt.	1	CDO-106-SM0
5	Gear - Drive Shaft	1	CDO-007-H10
6	Gear - Short Shaft	1	CDO-007-H20
7	Drive Shaft - DO	1	CDO-008-000
	Drive Shaft - TO	1	CDO-008-T00
	Drive Shaft - GT	1	CDO-008-GT0
8	Short Shaft - DO	1	CDO-009-000
	Short Shaft - TO	1	CDO-009-T00
	Short Shaft - GT	1	CDO-009-GT0
9	Rotor - Twin Blade	2	CDO-010-000
10	Stud	8	CDO-011-000
11	Lockwasher	6	CDO-013-000
12	Wing Nut	8	CDO-016-002
13	Oil Seal - B.H. Cover	1	CDO-030-000

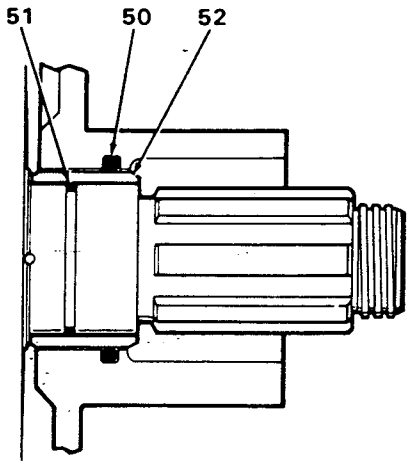
Item	Description	Qty	Part No.
14	Oil Seal - Front	2	CDO-030-100
15	Wiper Seal	2	CDO-030-1W0
16	Bearing - Rear	2	CDO-036-000
17	Bearing - Front	2	CDO-036-300
18	Lock Nut - Gears	2	CDO-036-N00
19	Lockwasher - Gears	2	CDO-036-W00
20	Key - Gear	2	CDO-037-000
21	Dowel Pin - Upper	1	CDO-040-000
22	Dowel Pin - Lower	1	CDO-040-100
23	Dowel Pin Body - Upper	1	CDO-040-R00
24	Dowel Pin Body - Lower	1	CDO-040-R10
25	Gasket - B.H. Cover	1	CDO-042-000
	Gasket - B.H.C. - Side Mt.	1	CDO-042-SM0
26	Hex Cap Screw	2	CDO-046-000
27	Breather Screw	1	CDO-046-100
28	Rotor Retaining Nut	2	BDO-052-000
29	Shim (.002 & .006)	As Reqd.	CDO-054-000
30	Spacer	2	CDO-055-000
31	Fiber Washer	3	ADO-064-000
32	Bearing Retaining Plate	2	CDO-080-000
33	Hex Cap Screw	6	CDO-081-000
34	Rd. Hd. Cap Screw	8	CDO-083-000
35	Truarc Ring	2	CDO-087-R00

Item	Description	Qty	Part No.
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush	1	CDO-116-000
38	Dowel Bush	1	CDO-116-100
39	"O" Ring - Cover - Buna N	1	CDO-117-000
	"O" Ring - Cover - Viton	1	CDO-117-V00
	"O" Ring - Cover - Silicone	1	CDO-117-SC0
40	Oil Seal - Rear	2	CDO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	CDO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
†	Rotor Nut Wrench		CDO-019-000

†Not Shown

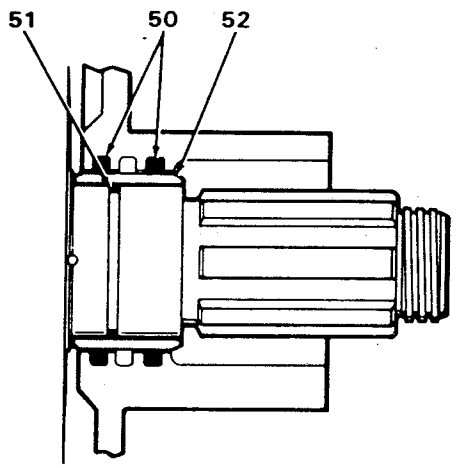
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODELS 55-DO, 55-TO AND 55-GT SEALS



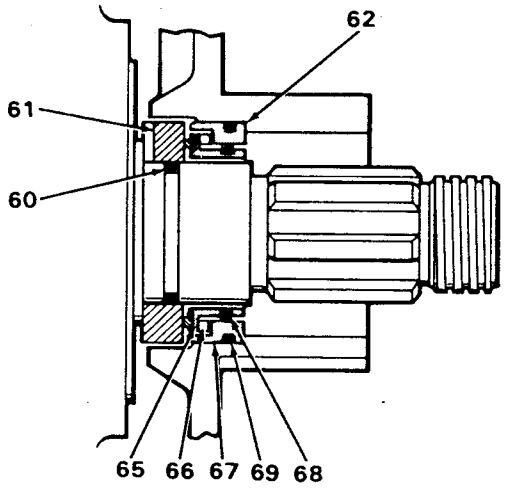
MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	CDO-079-000
	"O" Ring - Body - Viton	2	CDO-079-V00
	"O" Ring - Body - Silicone	2	CDO-079-SC0
	"O" Ring - Body - E.P.	2	CDO-079-002
	U-Cup - Body - Buna N	2	CDO-079-U00
51	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
52	Sleeve - Prong	2	CDO-098-001



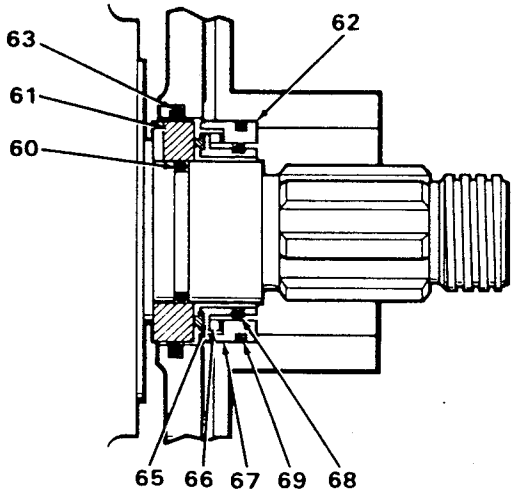
MODEL TO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	4	CDO-079-000
	"O" Ring - Body - Viton	4	CDO-079-V00
	"O" Ring - Body - Silicone	4	CDO-079-SC0
	"O" Ring - Body - E.P.	4	CDO-079-002
	U-Cup - Body - Buna N	4	CDO-079-U00
51	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
52	Sleeve - Notched	2	CDO-098-T00



MODEL GT MECHANICAL SEAL

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
61	Seal Seat - Ceramic	2	CGT-014-000
62	Seal Case Assembly**	2	CGT-305-101
	Carbon Carrier Assembly**	2	CGT-306-101
	Ceramic Carrier Assembly**	2	CGT-306-111



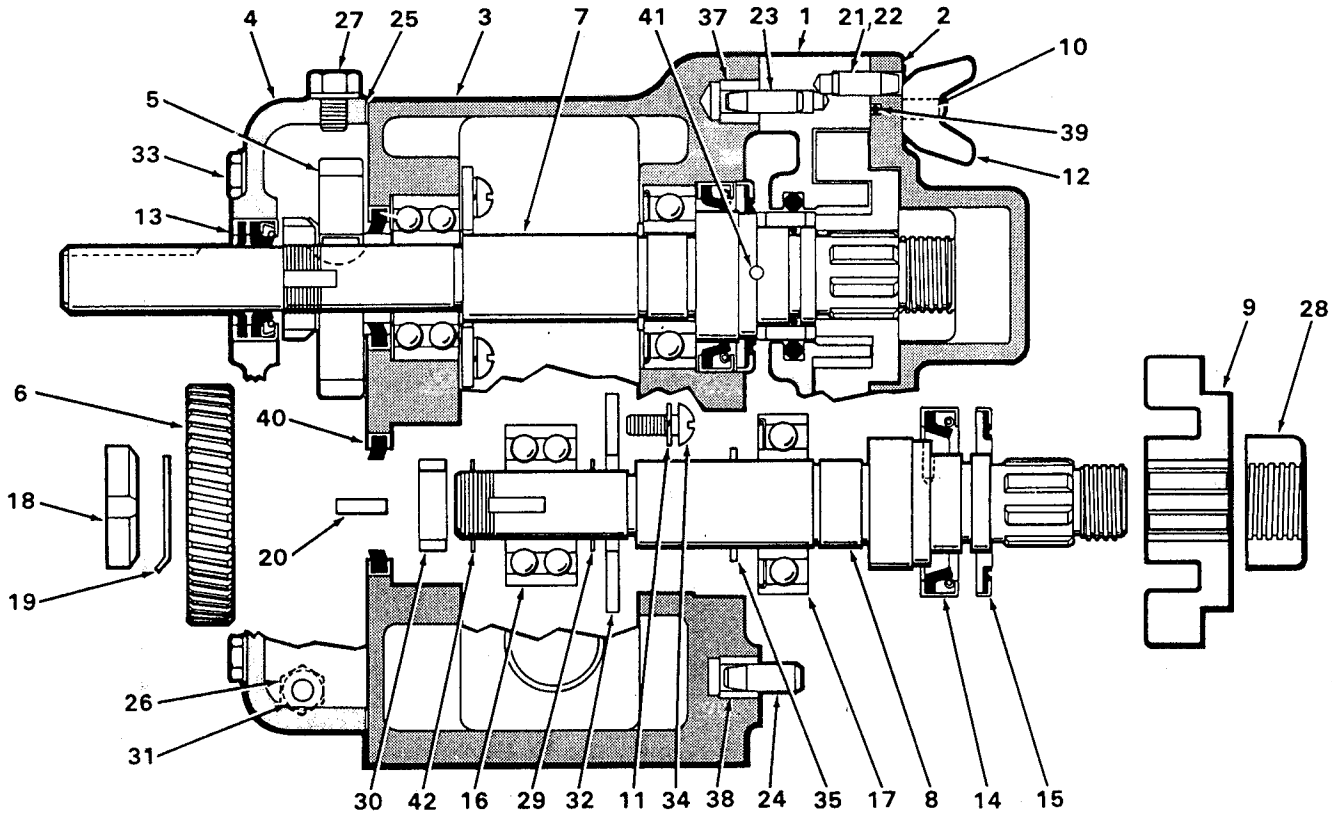
MODEL GT MECHANICAL SEAL/BB FLUSH

Use Body CDO-1-GTB

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
61	Seal Seat - Ceramic	2	CGT-014-000
62	Seal Case Assembly	2	CGT-305-101
	Carbon Carrier Assembly	2	CGT-306-101
	Ceramic Carrier Assembly	2	CGT-306-111
63	"O" Ring - Buna	2	CGT-079-000
	"O" Ring - Viton	2	CGT-079-V00
	"O" Ring - E.P.	2	CGT-079-002

**Seal Assembly Breakdown

65	Carrier - Carbon	2	CGT-306-000
	Carrier - Ceramic	2	CGT-306-010
66	Wave Spring	2	CGT-304-000
67	Seal Case	2	CGT-305-000
68	"O" Ring Carrier - Buna N	2	CGT-302-000
	"O" Ring Carrier - Viton	2	CGT-302-V00
69	"O" Ring Case - Buna N	2	CGT-303-000
	"O" Ring Case - Viton	2	CGT-303-V00



MODEL 100-DO

Item	Description	Qty	Part No.
1	Body - DO	1	DDO-001-0S0
2	Cover	1	CDO-002-0S0
	Cover - Vented*	1	055-002-V00
	Cover - Jacketed	1	CDO-002-J10
3	Bearing Housing	1	CDO-105-000
	Bearing Housing - Side Mt.	1	CDO-105-SM0
4	Bearing Housing Cover - Upper	1	CDO-106-U00
	Bearing Housing Cover - Lower	1	CDO-106-L00
	Bearing Housing Cover - Side Mt.	1	CDO-106-SM0
5	Gear - Drive Shaft	1	CDO-007-H10
6	Gear - Short Shaft	1	CDO-007-H20
7	Drive Shaft - DO	1	DDO-008-000
8	Short Shaft - DO	1	DDO-009-000
9	Rotor - Twin Blade	2	DDO-010-000
10	Stud	8	DDO-011-000
11	Lockwasher	6	CDO-013-000
12	Wing Nut	8	CDO-016-002
13	Oil Seal - B.H. Cover	1	CDO-030-000
14	Oil Seal - Front	2	CDO-030-100
15	Wiper Seal	2	CDO-030-1W0
16	Bearing - Rear	2	CDO-036-000
17	Bearing - Front	2	CDO-036-300

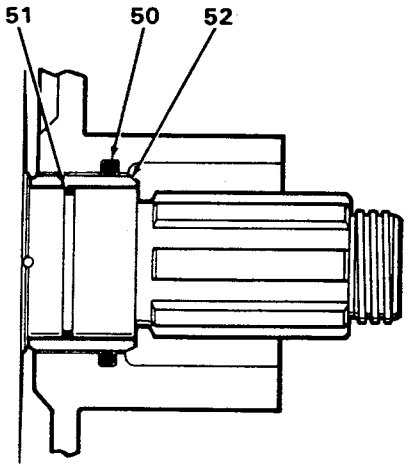
Item	Description	Qty	Part No.
18	Lock Nut - Gears	2	CDO-036-N00
19	Lockwasher - Gears	2	CDO-036-W00
20	Key - Gear	2	CDO-037-000
21	Dowel Pin - Upper	1	CDO-040-000
22	Dowel Pin - Lower	1	CDO-040-100
23	Dowel Pin - Body - Upper	1	CDO-040-R00
24	Dowel Pin - Body - Lower	1	CDO-040-R10
25	Gasket - B.H. Cover	1	CDO-042-000
	Gasket - B.H.C. - Side Mt.	1	CDO-042-SM0
26	Hex Cap Screw	2	CDO-046-000
27	Breather Screw	1	CDO-046-100
28	Rotor Retaining Nut	2	BDO-052-000
29	Shim (.002 & .006)	As Reqd.	CDO-054-000
30	Spacer	2	CDO-055-000
31	Fiber Washer	3	ADO-064-000
32	Bearing Retaining Plate	2	CDO-080-000
33	Hex Cap Screw	6	CDO-081-000
34	Rd. Hd. Cap Screw	8	CDO-083-000
35	Truarc Ring	2	CDO-087-R00
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush.	1	CDO-116-000

Item	Description	Qty	Part No.
38	Dowel Bush.	1	CDO-116-100
39	"O" Ring - Cover - Buna N	1	CDO-117-000
	"O" Ring - Cover - Viton	1	CDO-117-V00
	"O" Ring - Cover - Silicone	1	CDO-117-SC0
40	Oil Seal - Rear	2	CDO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	CDO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
†	Rotor Nut Wrench		CDO-019-000

†Not Shown

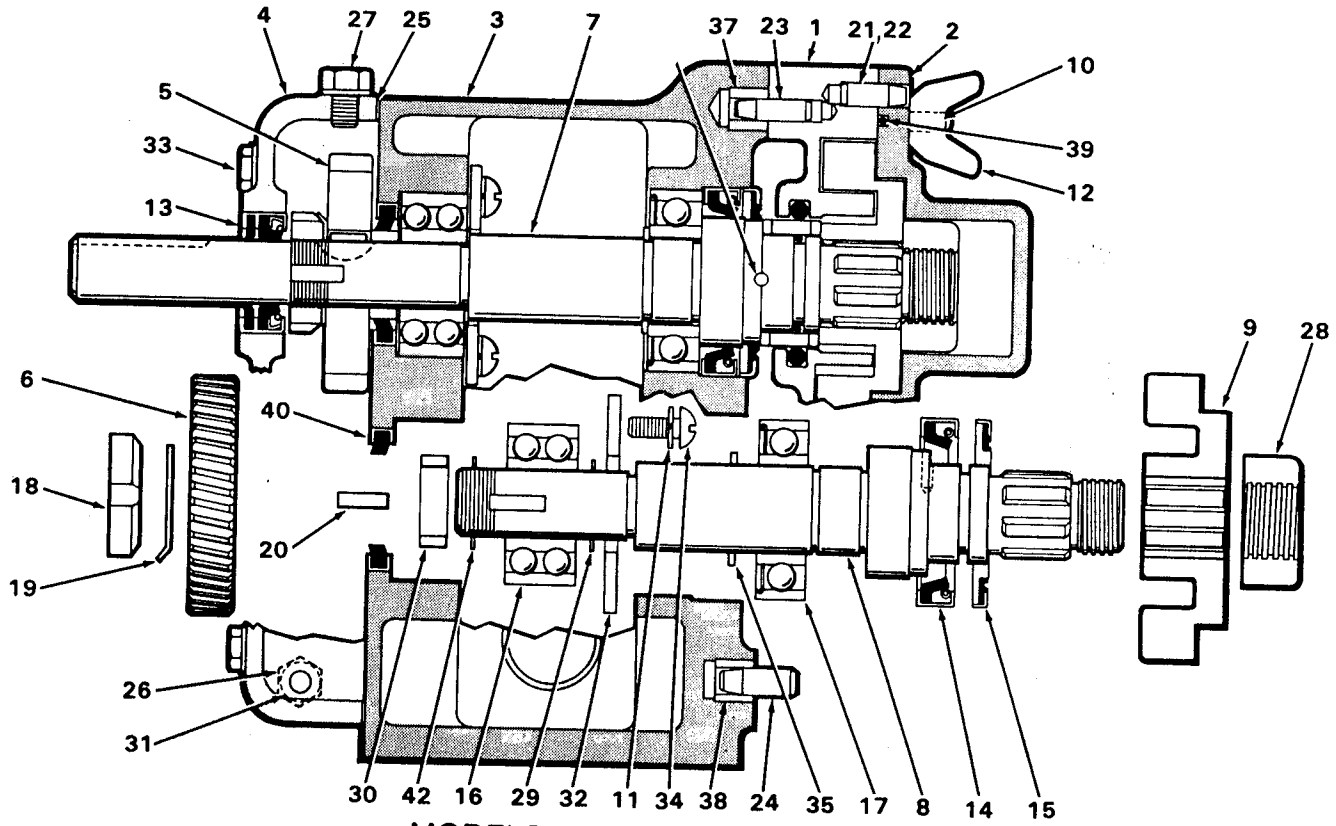
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown

MODEL 100-DO SEAL



MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	CDO-079-000
	"O" Ring - Body - Viton	2	CDO-079-V00
	"O" Ring - Body - Silicone	2	CDO-079-SC0
	"O" Ring - Body - E.P.	2	CDO-079-002
	U-Cup - Body - Buna N	2	CDO-079-U00
51	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
52	Sleeve - Prong	2	CDO-098-001



MODELS 125-DO, 125-TO AND 125-GT

Item	Description	Qty	Part No.
1	Body - DO	1	EDO-001-OS0
	Body - TO	1	EDO-001-T00
	Body - GT	1	EDO-001-GT0
2	Cover	1	CDO-002-S00
	Cover - Vented*	1	055-002-V00
	Cover - Jacketed	1	CDO-002-J10
3	Bearing Housing	1	CDO-105-000
	Bearing Housing - Side Mt.	1	CDO-105-SM0
4	Bearing Housing Cover - Upper	1	CDO-106-U00
	Bearing Housing Cover - Lower	1	CDO-106-L00
	Bearing Housing Cover - Side Mt.	1	CDO-106-SM0
5	Gear - Drive Shaft	1	CDO-007-H10
6	Gear - Short Saft	1	CDO-007-H20
7	Drive Shaft - DO	1	EDO-008-000
	Drive Shaft - TO	1	EDO-008-T00
	Drive Shaft - GT	1	EDO-008-GT0
8	Short Shaft - DO	1	EDO-009-000
	Short Shaft - TO	1	EDO-009-T00
	Short Shaft - GT	1	EDO-009-GT0
9	Rotor - Twin Blade	2	EDO-010-000
10	Stud	8	EDO-011-000
11	Lockwasher	6	CDO-013-000
12	Wing Nut	8	CDO-016-002
13	Oil Seal - B.H. Cover	1	CDO-030-000

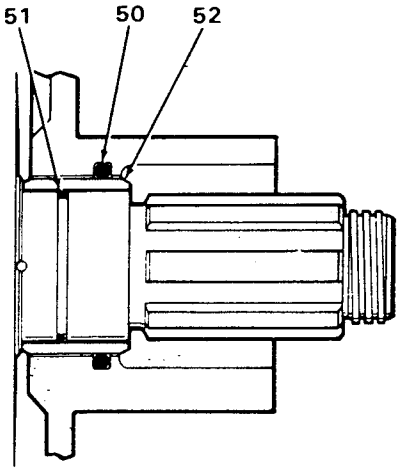
Item	Description	Qty	Part No.
14	Oil Seal - Front	2	CDO-030-100
15	Wiper Seal	2	CDO-030-1W0
16	Bearing - Rear	2	CDO-036-000
17	Bearing - Front	2	CDO-036-300
18	Lock Nut - Gears	2	CDO-036-N00
19	Lockwasher - Gears	2	CDO-036-W00
20	Key - Gear	2	CDO-037-000
21	Dowel Pin - Upper	1	CDO-040-000
22	Dowel Pin - Lower	1	CDO-040-100
23	Dowel Pin - Body - Upper	1	CDO-040-R00
24	Dowel Pin - Body - Lower	1	CDO-040-R10
25	Gasket - B.H. Cover	1	CDO-042-000
	Gasket - B.H.C. - Side Mt.	1	CDO-042-SM0
26	Hex Cap Screw	2	CDO-046-000
27	Breather Screw	1	CDO-046-100
28	Rotor Retaining Nut	2	BDO-052-000
29	Shim (.002 & .006)	As Reqd.	CDO-054-000
30	Spacer	2	CDO-055-000
31	Fiber Washer	3	ADO-064-000
32	Bearing Retaining Plate	2	CDO-080-000
33	Hex Cap Screw	6	CDO-081-000
34	Rd. Hd. Cap Screw	8	CDO-083-000
35	Truarc Ring	2	CDO-087-R00

Item	Description	Qty	Part No.
†36	Grease Fitting	4	BDO-092-000
37	Dowel Bush.	1	CDO-116-000
38	Dowel Bush.	1	CDO-116-100
39	"O" Ring - Cover - Buna N	1	CDO-117-000
	"O" Ring - Cover - Viton	1	CDO-117-V00
	"O" Ring - Cover - Silicone	1	CDO-117-SC0
40	Oil Seal - Rear	2	CDO-119-000
41	Drive Pin	2	CDO-126-000
42	Spacer Seal	2	CDO-127-000
	OIL MICRO-PLATE #140		
	1 - Galllon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
†	Rotor Nut Wrench		CDO-019-000

†Not Shown

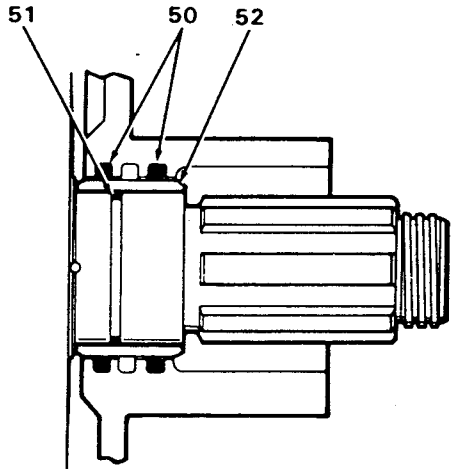
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODELS 125-DO, 125-TO AND 125-GT SEALS



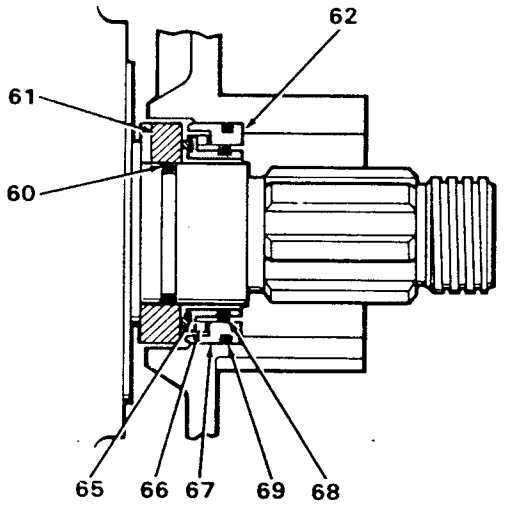
MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	2	CDO-079-000
	"O" Ring - Body - Viton	2	CDO-079-V00
	"O" Ring - Body - Silicone	2	CDO-079-SC0
	"O" Ring - Body - E.P.	2	CDO-079-002
	U-Cup - Body - Buna N	2	CDO-079-U00
51	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
52	Sleeve - Prong	2	CDO-098-001



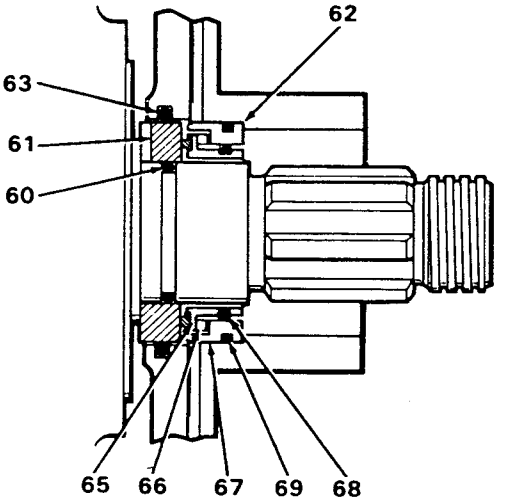
MODEL TO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna N	4	CDO-079-000
	"O" Ring - Body - Viton	4	CDO-079-V00
	"O" Ring - Body - Silicone	4	CDO-079-SC0
	"O" Ring - Body - E.P.	4	CDO-079-002
	U-Cup - Body - Buna N	4	CDO-079-U00
51	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
52	Sleeve - Notched	2	CDO-098-T00



MODEL GT MECHANICAL SEAL

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
61	Seal Seat - Ceramic	2	CGT-014-000
62	Seal Case Assembly**	2	CGT-305-101
	Carbon Carrier Assembly**	2	CGT-306-101
	Ceramic Carrier Assembly	2	CGT-306-111



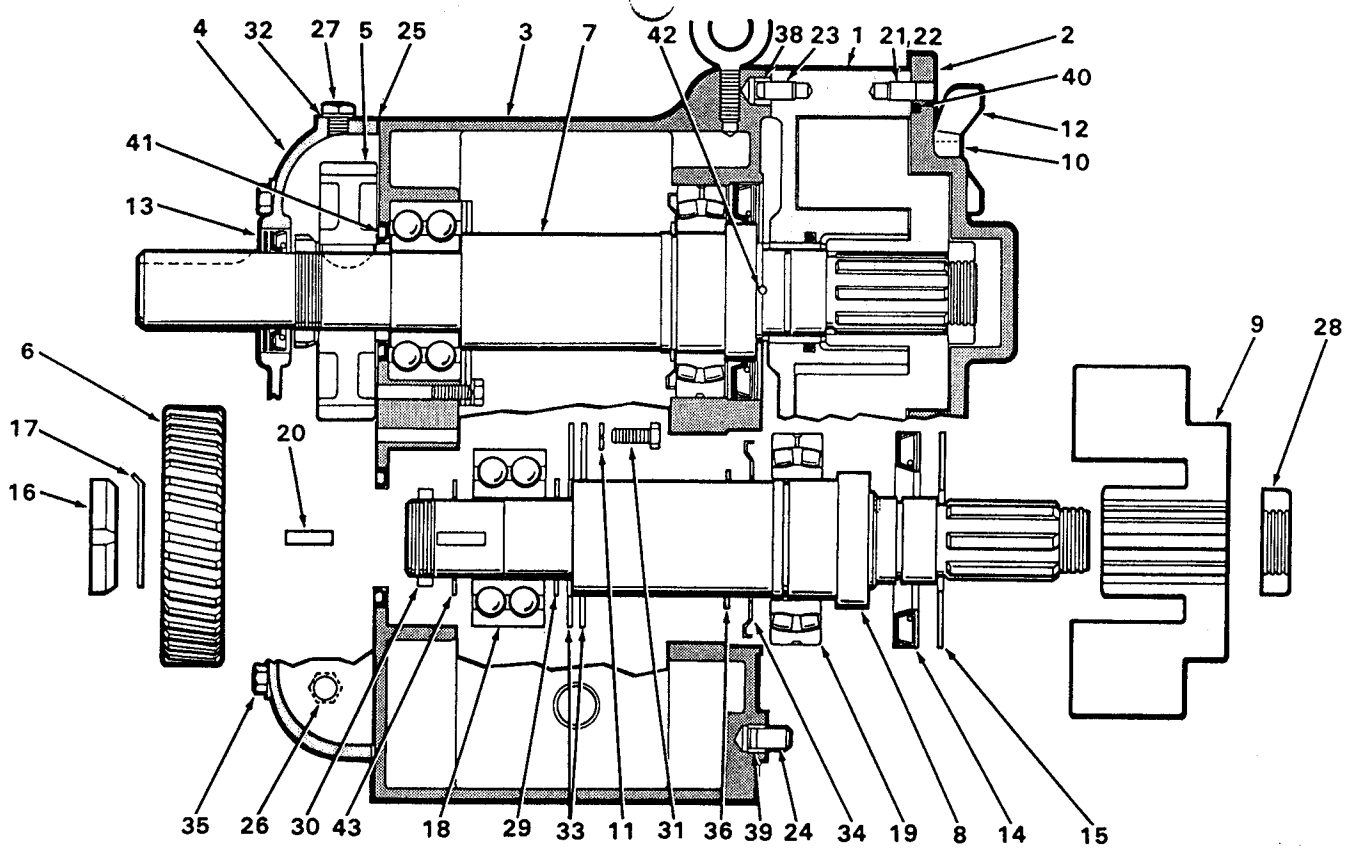
MODEL GT MECHANICAL SEAL/B-B FLUSH

Use Body EDO-1-GTB

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	CDO-097-000
	"O" Ring - Shaft - Viton	2	CDO-097-V00
	"O" Ring - Shaft - Silicone	2	CDO-097-SC0
61	Seal Seat - Ceramic	2	CGT-014-000
62	Seal Case Assembly**	2	CGT-305-101
	Carbon Carrier Assembly**	2	CGT-306-101
	Ceramic Carrier Assembly	2	CGT-306-111
63	"O" Ring - Buna	2	CGT-079-000
	"O" Ring - Viton	2	CGT-079-V00
	"O" Ring - E.P.	2	CGT-079-002

**Seal Assembly Breakdown

65	Carrier - Carbon	2	CGT-306-000
	Carrier - Ceramic	2	CGT-306-010
66	Wave Spring	2	CGT-304-000
67	Seal Case	2	CGT-305-000
68	"O" Ring Carrier - Buna N	2	CGT-302-000
	"O" Ring Carrier - Viton	2	CGT-302-V00
69	"O" Ring Case - Buna N	2	CGT-303-000
	"O" Ring Case - Viton	2	CGT-303-V00



MODELS 200-DO, 200-TO AND 200-GT

Item	Description	Qty	Part No.
1	Body - DO	1	GDO-001-TSI
	Body - TO	1	GDO-001-TOS
	Body - GT	1	GDO-001-GTO
2	Cover	1	GDO-002-S00
	Cover - Vented*	1	210-002-V10
3	Bearing Housing	1	GDO-105-000
	Bearing Housing - Side Mt.	1	GDO-105-SM0
4	Bearing Housing Cover - U	1	GDO-106-U00
	Bearing Housing Cover - L	1	GDO-106-L00
	Bearing Housing Cover - SM	1	GDO-106-SM0
5	Gear - Drive Shaft	1	GDO-007-H10
6	Gear - Short Shaft	1	GDO-007-H20
7	Drive Shaft - DO & TO	1	GDO-008-T00
	Drive Shaft - GT	1	GDO-008-GTO
8	Short Shaft - DO & TO	1	GDO-009-T00
	Short Shaft - GT	1	GDO-009-GTO
9	Rotor - Twin Blade	2	GDO-010-000
10	Studs	8	GDO-011-000
11	Lockwasher	6	GDO-013-000
12	Wing Nut	8	GDO-016-002
13	Seal - Gear Cover	1	GDO-030-000
14	Seal - Bearing Housing Front	2	GDO-030-100
15	Seal - Wiper	2	GDO-030-1W0

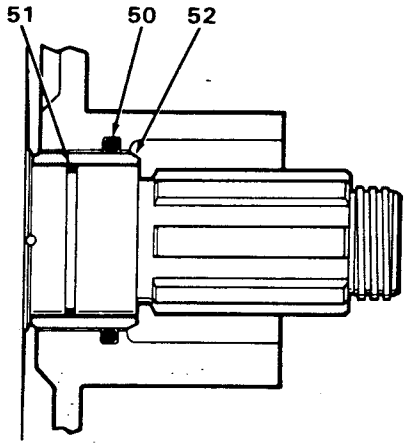
Item	Description	Qty	Part No.
16	Lock Nut - Gear	2	GDO-036-N00
17	Lockwasher - Gear	2	GDO-036-W00
18	Bearing - Rear	2	GDO-036-000
19	Bearing - Front	2	GDO-036-300
20	Key - Gear	2	GDO-037-000
21	Dowel Pin - Upper	1	GDO-040-000
22	Dowel Pin - Lower	1	GDO-040-100
23	Dowel Pin	1	CDO-040-R00
24	Dowel Pin	1	CDO-040-R10
25	Gasket - B.H. Cover	1	GDO-042-000
	Gasket - B.H. Cover	1	GDO-042-SM0
26	Hex Cap Screw	2	CDO-046-000
27	Hex Cap Screw - Vented	1	CDO-046-100
28	Rotor Nut	2	GDO-052-000
29	Shim (.002 & .006)	As Reqd.	GDO-054-000
30	Spacer	2	GDO-055-000
31	Hex Cap Screw	6	BBB-058-000
32	Fiber Washer	2	ADO-064-000
33	Bearing Retainer Plate	4	GDO-080-000
34	Bearing Seal	2	GDO-080-200
35	Hex Cap Screw	6	GDO-081-000
36	Ext. Truarc Ring	2	GDO-087-000

Item	Description	Qty	Part No.
†37	Grease Fitting	4	BDO-092-000
38	Dowel Bushing	1	CDO-116-000
39	Dowel Bushing	1	CDO-116-100
40	"O" Ring - Cover - Buna	1	GDO-117-000
	"O" Ring - Cover - Viton	1	GDO-117-V00
	"O" Ring - Cover - Silicone	1	GDO-117-SC0
41	Seal - B.H. Rear	2	GDO-119-000
42	Drive Pin	2	CDO-126-000
43	Spacer Seal	2	GDO-127-000
	OIL MICRO-PLATE #140		
	1 - Gallon Can		OBI-140-000
	1 - Quart Can		OBI-141-000
	GREASE MICRO-PLATE #2		
	1 - Pound Tube		OBI-142-000
†	"O" Ring Removal Tool		ADO-096-001
†	Rotor Nut Wrench		GDO-019-000

†Not Shown

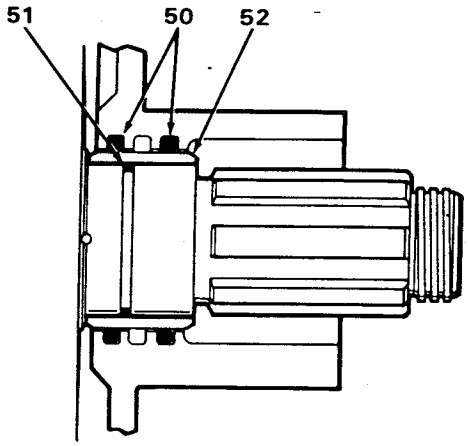
*See Vented Cover Section, page 34, for Assembly Options and Parts Breakdown.

MODELS 200-DO, 200-TO AND 200-GT SEALS



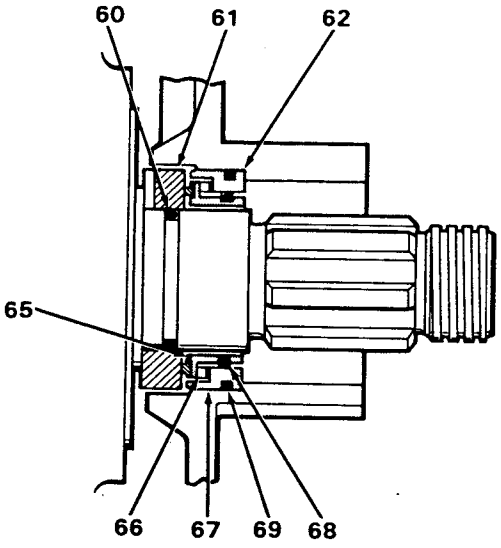
MODEL DO "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna	2	GDO-079-000
	"O" Ring - Body - Viton	2	GDO-079-V00
	"O" Ring - Body - Silicone	2	GDO-079-SC0
	"O" Ring - Body - E.P.	2	GDO-079-002
	U-Cup - Body - Buna N	2	GDO-079-U00
51	"O" Ring - Shaft - Buna N	2	GDO-097-000
	"O" Ring - Shaft - Viton	2	GDO-097-V00
	"O" Ring - Shaft - Silicone	2	GDO-097-SC0
52	Sleeve - Prong Type	2	GDO-098-T01



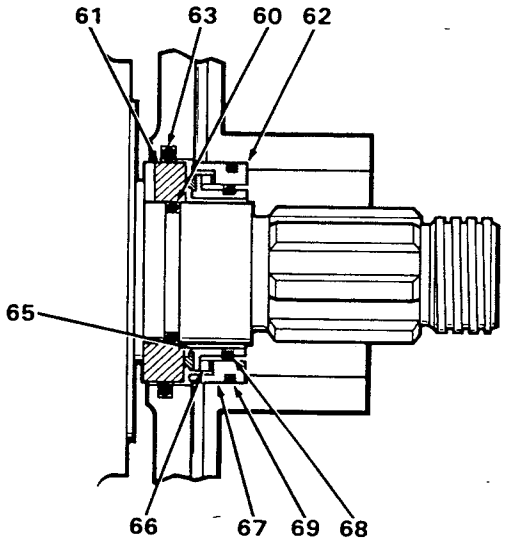
MODEL TO DOUBLE "O" RING SEAL

Item	Description	Qty	Part No.
50	"O" Ring - Body - Buna	4	GDO-079-000
	"O" Ring - Body - Viton	4	GDO-079-V00
	"O" Ring - Body - Silicone	4	GDO-079-SC0
	"O" Ring - Body - E.P.	4	GDO-079-002
	U-Cup - Body - Buna N	4	GDO-079-U00
51	"O" Ring - Shaft - Buna N	2	GDO-097-000
	"O" Ring - Shaft - Viton	2	GDO-097-V00
	"O" Ring - Shaft - Silicone	2	GDO-097-SC0
52	Sleeve - Prong Type	2	GDO-098-T01



MODEL GT MECHANICAL SEAL

Item	Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	GDO-097-000
	"O" Ring - Shaft - Silicone	2	GDO-097-SC0
	"O" Ring - Shaft - Viton	2	GDO-097-V00
61	Seal Seat - Ceramic	2	GGT-014-000
62	Seal Case Assembly**	2	GGT-305-101
	Carbon Carrier Assembly**	2	GGT-306-101
	Ceramic Carrier Assembly**	2	GGT-306-111



MODEL GT MECHANICAL SEAL/B-B FLUSH

Item	Use Body GDO-1-GTB Description	Qty	Part No.
60	"O" Ring - Shaft - Buna N	2	GDO-097-000
	"O" Ring - Shaft - Silicone	2	GDO-097-SC0
	"O" Ring - Shaft - Viton	2	GDO-097-V00
61	Seal Seat - Ceramic	2	GGT-014-000
62	Seal Case Assembly**	2	GGT-305-101
	Carbon Carrier Assembly**	2	GGT-306-101
	Ceramic Carrier Assembly**	2	GGT-306-111
63	"O" Ring - Body - Buna	2	GGT-079-000
	"O" Ring - Body - Viton	2	GGT-079-V00
	"O" Ring - Body - E.P.	2	GGT-079-002

**Seal Assembly Breakdown

65	Carrier with Carbon	2	GGT-306-000
	Carrier with Ceramic	2	GGT-306-010
66	Wave Spring	2	GGT-304-000
67	Seal Case	2	GGT-305-000
68	"O" Ring Carrier - Buna N	2	GGT-302-000
	"O" Ring Carrier - Viton A	2	GGT-302-A00
69	"O" Ring - Case - Buna N	2	GGT-303-000
	"O" Ring - Case - Viton A	2	EDO-133-V00

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