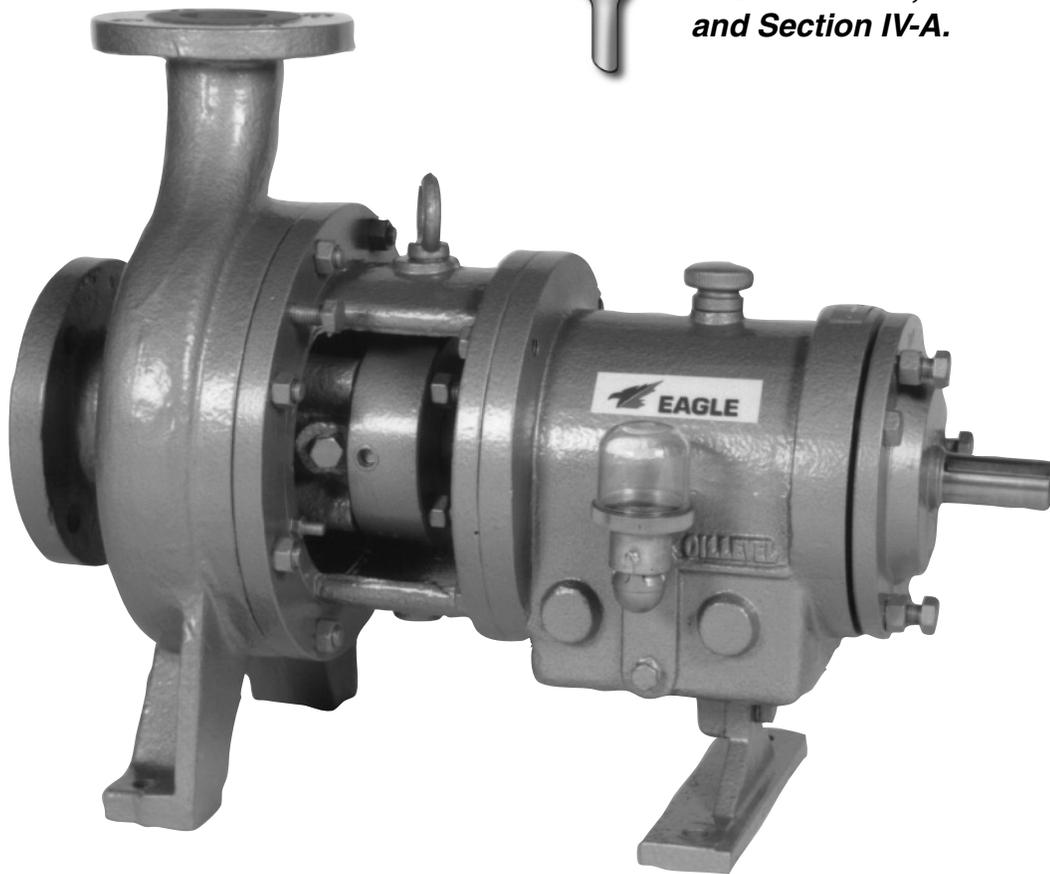




# Installation, Operation and Maintenance Instructions



*Lubrication information is  
in Section III-A, Item 1b.  
and Section IV-A.*



# EAGLE MODEL A100 ANSI PUMPS

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## **SECTION I—GENERAL**

### **Introduction**

This instruction manual is intended to assist those involved with the installation, operation and maintenance of Eagle Model A100 pumps. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

### **I-A. Importance of Instructions**

The design, material and workmanship incorporated in the construction of Eagle pumps make them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by periodic inspection and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and correct methods of installing, operating, and maintaining these pumps.

Study thoroughly Sections I, II, III, and carefully follow the instructions for installation and operation. Sections IV, V, VI, VII, and VIII are answers to trouble and maintenance questions. Keep this instruction manual handy for reference.

### **I-B. Special Warnings**

Eagle Pump and Compressor will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual. This pump is not to be operated at speeds, working pressures, discharge pressures, or temperatures higher than nor used with liquids other than originally intended for, without written permission of Eagle Pump.

### **I-C. Receiving Inspection—Shortages**

Care should be taken when unloading pumps. If shipment is not delivered in good order and in accordance with the Bill-of-Lading, note the damage or shortage on both receipt and freight bill. MAKE ANY CLAIMS TO THE TRANSPORTATION COMPANY PROMPTLY.

Instruction sheets on various components as well as the Instruction Book for the pump are included in the shipment. DO NOT DISCARD!

### **I-D. Preservation and Storage**

Eagle's normal domestic shipping and storage preparation is suitable for protecting the pump during shipment in covered trucks. It also provides protection during covered storage at the jobsite, and for a short period between installation and start-up. If the pump is to be idle and exposed to the elements for an extended period, either before or after installation, special precautions are required. One approach is to provide special preservatives and wrapping before shipment. However, after installation the protective wrappings will have been removed. Therefore, application of preservatives after installation is considered a good practice.

The driver, coupling, and mechanical seal manufacturers should be contacted for their recommendations on preservation and protection procedures.

### **I-E. Handling Techniques**

Care should be used in moving pumps. Pumps should not be hoisted by eyebolts. These eyebolts are intended for removing the back pull-out assembly for maintenance and inspection. An assembled pump should be hoisted using a sling under suction flange and under rear of bearing frame. Bedplate mounted units should be hoisted using slings under bedplate below both pump and driver.

## **SECTION II—INSTALLATION**

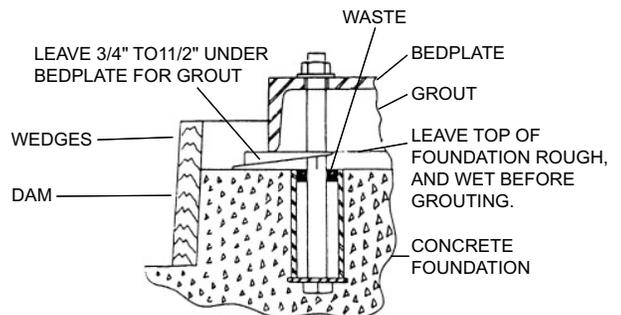
### **II-A. Location**

Pumping unit should be placed as close as practical to the source of supply. Floor space and headroom allotted to the unit must be sufficient for inspection and maintenance. Be sure to allow for crane or hoist service.

### **II-B. Foundations**

1. **Grouted**—Bedplate mounted units are normally grouted-in on a concrete foundation, which has been poured on a solid footing. This allows a permanent, vibration-absorbing base for the unit. The location and size of foundation bolts are shown on the outline assembly drawings supplied for the unit. Fig. 1 illustrates a typical foundation bolt installation.

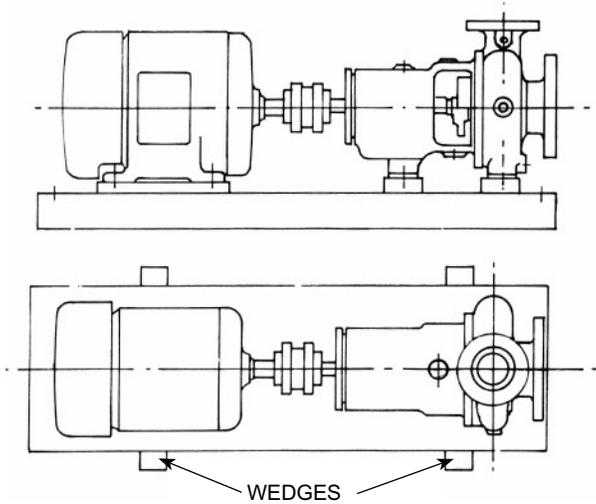
2. **Flexibly Mounted**—Installation and leveling of the optional flexibly mounted bedplate should be carried out in accordance with assembly drawings supplied in the data package for the unit.



**Figure 1**

## II-C. Leveling and Grouting of Baseplate Initial Alignment Check

1. Put the unit in place on wedges located at four points as shown in Fig. 2. Some long installations may require additional wedges near center of bedplate.



**Figure 2**

2. Adjust wedges to level unit (approximately), placing unit between  $\frac{3}{4}$ " and  $1\frac{1}{2}$ " above foundation. Level or plumb suction and discharge flanges. Then, bring the coupling halves into reasonable alignment by adjusting the wedges as needed.

3. Make sure that the baseplate is not distorted and that final accurate coupling alignment can be established within the limits of movement of motor and by shimming motor if necessary.

4. Tighten foundation bolts finger tight. Build dam around foundation and pour grout. Fill to level of grout hole making sure that the areas under the pump and motor feet are filled solid. Allow grout to harden at least 48 hours before further tightening foundation bolts. Tighten pump hold down bolts.

## II-D. Piping Practices

Guidelines for piping are given in the "Hydraulic Institute Standards" and should be reviewed prior to pump installation. All piping should be supported independently of, and line up naturally with, the pump flanges. NEVER DRAW PIPING INTO PLACE BY USE OF FORCE AT THE FLANGED CONNECTIONS OF THE PUMP.

Both suction and discharge piping should be as short and direct as possible to minimize friction losses. Foundation, pump and driver hold-down bolts should be tightened prior to connecting suction or discharge piping to the pump.

On units handling corrosives, the piping can be arranged to allow flushing of the pump prior to opening of the unit for servicing. After connecting suction and discharge piping to the pump, rotate pump by hand to be sure that there is no binding.

## II-E. Alignment—Preliminary

Alignment of the pump and driver is of extreme importance for trouble-free mechanical operation. Alignment should be obtained by adding or removing shims from under the motor feet. The pump bearing frame foot should never be adjusted to obtain alignment. The proper shimming is installed under the bearing frame foot at the factory on units shipped with bedplates. Changing the pump casing or bearing frame in the field will require a reshimming of the frame foot. The proper number of shims is installed when the pump shaft is level and parallel to the bedplate surface. Proper shimming is achieved by loosening frame foot and tightening casing foot. This should create a gap between the frame foot and bedplate between 0 and .040 inches (1mm). This must be filled with shims and the frame foot retightened. If this procedure is not followed, mechanical problems can result. The final alignment is done after the unit has been run under actual operating conditions. The following are suggested steps for aligning the unit, prior to initial startup.

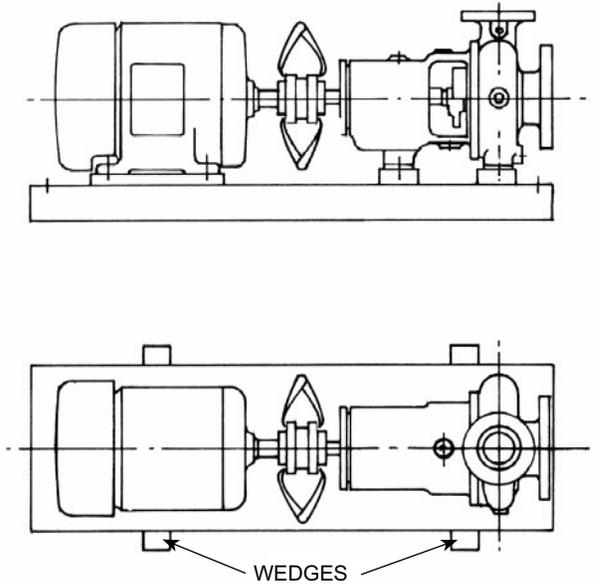
1. **Parallel Alignment:** The unit is in parallel misalignment when the shaft axes are parallel, but not concentric. During initial alignment, vertical parallel alignment may be different, due to thermal expansion of the unit at actual operating conditions. The following is a suggested cold setting for motor driven units:

Pumpage Temperature	Set Motor Shaft
Above Ambient	
Ambient	.002-.004" low (.05-.10 mm)
100° F	.000-.002" high (.00-.05 mm)
200° F	.004-.006" high (.10-.15 mm)
300° F	.008-.010" high (.20-.25 mm)
400° F	.012-.014" high (.30-.35 mm)
500° F	.016-.018" high (.40-.45 mm)

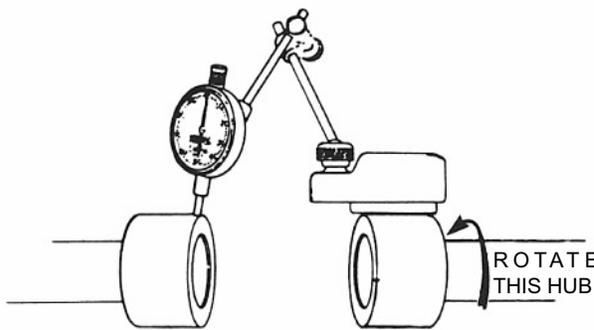
2. To check the parallel alignment of "spider-insert" couplings, place a straight edge across both hubs at four points, 90° apart (see Fig. 3). To check the parallel alignment of flexible spacer couplings, place a dial indicator on one hub and rotate that hub 360° while taking readings on the outside diameter of the other hub. Alignment occurs when indicator deflection does not exceed .002" T.I.R. (see Fig. 4) of the recommended cold setting in elevation and not more than .002" T.I.R. side to side.

To check angular alignment of a "spider-insert" coupling, use calipers at 90° intervals on the circumference on the outer end of hubs. When caliper measurements are identical, the unit is in angular alignment. The correct gap between the hub and insert will be given in the coupling manufacturer's instructions supplied for the pump.

To check angular alignment of flexible spacer couplings, place a dial indicator on one shaft hub and rotate the hub 360°. Take readings from the face of the other hub. Alignment is achieved when deflection does not exceed .002" (see Fig. 5).

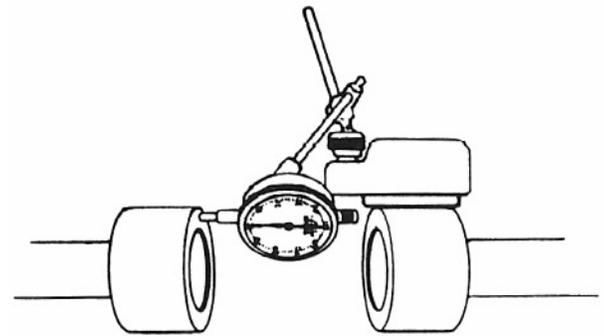


**Figure 3**



**Figure 4**

PRIOR TO COUPLING DRIVER TO PUMP, ROTATION OF DRIVER SHOULD BE CHECKED! Serious damage can result if pump is rotated in wrong direction. Once motor rotation is checked, connect coupling, following the manufacturer's instructions. If a coupling guard is furnished with the unit, ensure that it is securely fastened in place.



**Figure 5**

## II-F. Stuffing Box

### 1. Packing:

If the pumpage is dirty or hot, it is not suitable to lubricate the packing. An external source must be utilized, unless the bypass is equipped with proper separator, filter, and/or cooling system. This must be piped into the lantern ring connection, also (refer to packing recommendations).

### 2. Mechanical Seals:

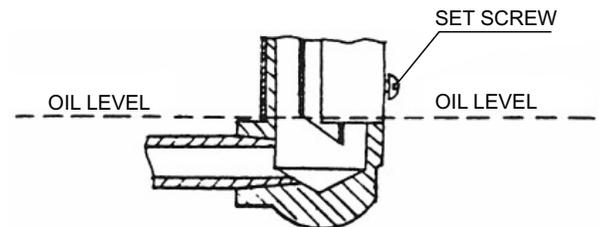
When mechanical seals are supplied, they are installed and adjusted at the factory. They must not run dry or in abrasives. Connect recirculation, flush and/or cooling lines as required, following instructions on the seal print supplied for the unit.

## SECTION III—OPERATION

### III-A. Startup

#### 1. Check List

- a. Lubrication—Pump bearings are normally oil lubricated. (THE BEARINGS ARE NOT LUBRICATED AT THE FACTORY.) These pumps are supplied with an oiler which maintains a constant oil level in the bearing frame. Locate oiler as shown on the outline drawings supplied for the unit. See Fig. 6 for correct adjustment of oiler.



**Figure 6**

- b. A high quality turbine type oil with rust and oxidation inhibitors should be used. Under normal operating conditions, an oil of 300 SSU viscosity at 100° F. (approximately SAE 20) should be used. Fill oiler bottle and replace in oiler housing. Repeat until oil remains visible in bottle. Do not add oil through the vent or breather. Optional grease lubricated bearings are lubricated at the factory and need lubrication only after 2,000 hours of operation, or every 3 months, whichever occurs first. On pumps supplied with greased-for-life bearings, no additional lubrication is required for the life of the bearing.  
Oil Mist lubrication of bearings is available on A100-X frames. This can be supplied at time of order, or field conversion can be done. Refer to the instructions of the manufacturer of the Oil Mist System.
- c. Priming—Pump and suction piping must be full of liquid before pump is started. Usually suction supply will be primed when shutoff valves are opened, if pump is below suction supply. If suction supply is below pump, priming by other means, such as a foot valve or ejector, will be required.
- d. Free Rotation—Rotate shaft by hand to make sure it is free. Drag from packing or seal is normal but, if pump cannot be rotated by hand or binding or rubbing is noticed, correct before starting pump.

**2. Startup**

- a. Valves—Be sure suction valve is fully open. Normally, discharge valve should be at least partially closed for flow control.

- b. Rotation Check—if not already done, uncouple the unit and jog the motor to check for proper rotation (refer to Section II-E-2, page 5).

**III-B. Operation Checks**

Inspect pump carefully and frequently during the first few hours of operation. If packing runs hot, shut pump down, allow box to cool, loosen gland if necessary. (Do not loosen gland until packing has cooled.) Mechanical seal may weep slightly, but should “run-in” in a few hours. Be sure all auxiliary lines (cooling, flushing, sealing, etc.) are functioning properly. Check pump bearings for excessive heating. Bearing housing operating temperatures vary depending on a wide variety of conditions. However, normal temperatures should be 120° to 180° F. (49° to 82° C). A change of temperature can indicate a problem, and operating temperatures outside of the normal range should be addressed with manufacturer. Check complete unit for excessive vibration and unusual noises. Do not run pump at greatly reduced flow because damage can result.

**III-C. Shutdown Procedure**

Back flow through pump will cause reverse rotation. If backflow is excessive, and there is a possibility of the pump being turned on during this period of reverse rotation, then precautions should be taken to prevent the backflow. This can be done by installing a check valve in the discharge line, or by closing a discharge valve immediately prior to shutting down the pump. NOTE: IT IS NOT RECOMMENDED THAT THE PUMP RUN LONGER THAN ABSOLUTELY NECESSARY AGAINST A CLOSED DISCHARGE VALVE.

**SECTION IV—PREVENTIVE AND CORRECTIVE MAINTENANCE**

**IV-A. Lubrication**

Oil lubricated units require that oil be visible in the reservoir at all times. Oil should be changed every 4000 hours of operation. Grease lubricated units should be regressed every 2000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers’ lubrication instructions.

**IV-B. Stuffing Box**

**1. Packing Stuffing Box:**

Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely “run-in”, a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

**2. Stuffing Boxes with Mechanical Seal:**

Although this type of box requires no attention, a periodic inspection of the circulating lines will ensure that they do not become clogged.

**IV-C. Vibration**

It is good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

**IV-D. Alignment—Final**

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

**IV-E. Performance**

If performance deteriorates, refer to Trouble Shooting, Section VII.

# SECTION V—DISASSEMBLY AND REASSEMBLY

## V-A. Disassembly

(refer to Sectional Views in Part VI)

### 1. Prepare pump for disassembly as follows:

- a. Lock out power supply to motor.
- b. Shut off valves controlling flow to and from pump.
- c. Flush pump of all corrosive or toxic liquid, if required.
- d. Remove all auxiliary tubing and piping.
- e. Disconnect coupling and remove coupling spacer.
- f. Drain oil.
- g. On units with packed stuffing box, unbolt packing gland (107).

### 2. Disassemble pump as follows:

- a. Place sling from hoist through eyebolt (132). On S units, place sling through frame (228A) above shaft (122).
- b. Remove frame foot hold down bolts.
- c. Remove bolts (370) holding frame (228A) or frame adapter (108) to casing (100).
- d. Slide back pull-out assembly from casing, using jacking bolts (418) provided.
- e. Remove casing gasket (351).
- f. Unscrew impeller (101) from shaft (122). The threads are right hand. Remove O-ring (412A) which seals between the impeller and shaft or sleeve.
- g. (1) On units with inside mechanical seal, remove gland stud nuts (355) and carefully slide gland toward bearing frame (228A).  
(2) On units with outside mechanical seal, loosen set screws holding rotary portion of seal to shaft and slide seal toward bearing frame. Remove gland stud nuts and carefully slide gland off studs.
- h. Remove stud nuts (370H) which hold stuffing box cover (184) to frame adapter. Pull stuffing box cover from frame or adapter. Slide sleeve (if any) off shaft.
- i. On units with mechanical seal, loosen set screws holding rotary portion of seal to shaft, and carefully slide seal and gland assembly off shaft. On units having a shaft sleeve, it is not necessary to remove rotary portion of seal from sleeve unless replacement of seal is required.
- j. Slide deflector (123) off shaft.
- k. Scribe shaft at coupling hub for proper positioning of hub during reassembly and remove hub.
- l. Remove bearing housing bolts (370C). Using impeller adjustment bolts (370D) for jacking, remove shaft and bearing assembly from frame. This will include the shaft, both bearings (112A) and (168A), and bearing housing (134A). Do not lose or damage O-ring (496).
- m. Remove inboard bearing (168A) using a bearing puller. Never use a hammer to drive shaft through bearing! Protect bearing from contamination.
- n. Scribe bearing housing for proper positioning prior to disassembly on S, M and L models, remove bearing housing retaining ring (361A) and slide bearing housing off ball bearing. Do not damage oil seal (332A). On X units, remove bearing end cover bolts (109A) and slide cover off shaft. Do not damage oil seal (332A). Slide bearing housing off shaft.

- o. Straighten tang in lock washer and remove bearing locknut (136) and lock washer (382). Remove ball bearing (112A) using a bearing puller. Protect bearing from contamination.
- p. On units with stuffing boxes, remove lantern ring (105) and packing rings (106) from stuffing box cover (184).

## V-B. Inspection and Parts Replacement Guidelines

1. Impeller—Replace if impeller shows excessive erosion, corrosion, extreme wear, or vane breakage. O-ring groove and impeller hub must be in good condition. Check impeller balance if possible. Reduction in hydraulic performance and reduced mechanical seal, packing or thrust bearing life may be caused by excessive impeller wear.

2. Shaft—Check for runout (.005" max) to see that shaft has not been bent. On pumps without shaft sleeves, shaft surface in stuffing box area must be smooth and free of grooves. Bearing seats and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Metalize or replace shaft if necessary.

3. Shaft Sleeve—Sleeve surface in stuffing box must be smooth. If grooved, replace or metalize.

4. Mechanical Seal—Seal faces, gaskets, and shaft sealing members must be in perfect condition or leakage may result. Replace worn or damaged parts.

5. Ball Bearings—Replace if worn, loose or rough and noisy when rotated.

6. Oil Seals—Replace if worn or otherwise damaged.

7. General—All parts should be clean before assembly. All burrs should be removed.

## V-C. Reassembly Procedures

This procedure covers reassembly of pump after complete disassembly. Make sure all directions outlined in Section V-B have been followed.

1. Oil shaft at thrust bearing fit on coupling end of shaft (122A). Slide thrust (coupling end) bearing (112A) on shaft as far as possible by hand. Place pipe or driving sleeve over shaft, making sure it rests against inner face only. Make sure bearing is "square" on shaft. Tap or press evenly until bearing is seated firmly against shaft shoulder. Do not mar the shaft.

2. Place lockwasher and bearing locknut (136) on shaft and tighten firmly. Bend "tang" of lockwasher into slot in locknut.

3a. On S, M and L models. Take care not to damage oil seal (332A), slide the bearing housing (134A) with O-ring (496) in place over drive end of the shaft, and in place over the bearing.

b. On X models. Slide bearing housing (134A) with O-ring over impeller end of the shaft, and in place over the bearing. Install O-ring (496A) on bearing end cover (109A) and slide into bearing housing (134A) and tighten into place with fasteners and ensure that there is no remaining end float in bearing outer race and that bearing operates smoothly.

4. On S, M and L models, insert retaining ring (361A) into groove in bearing housing (134A). Flat side of retaining ring must be against bearing (112A). On X units, slide bearing end cover (109A) and gasket (360C) on shaft. Ensure the “top” of end cover (109A) lines up with the “top” of bearing housing (134A), check scribe marks. If the bearing housing (134A) is not installed properly (oil drain groove in bottom), oil will not be able to drain from bearing causing it to overheat and fail prematurely.

5. Oil inboard bearing seat on shaft. Slide inboard ball bearing (168A) on shaft (122) as far as possible by hand. Continue as in Step 1 above.

6. Place a small amount of O-ring lubricant on inside of bearing frame (228A) at bearing housing (134A), at inboard bearing seats (168A), on O-ring (496), and on inboard oil seal (333A). Carefully slide shaft assembly into bearing frame. Do not damage inboard oil seal (333A). Screw bearing housing bolts (370C) about ½” into bearing frame (228A) .

7. Slide deflector (123) on shaft (122).

8. If unit has packed stuffing box, place stuffing box cover (184) against adapter (108), making sure that studs (370H) align with proper holes in adapter. Replace nuts and firmly tighten. Slide sleeve (if any) on shaft. Make sure grooves in end of sleeve engage drive pin on shaft. Continue assembly at Step 10.

9. If unit has mechanical seal:

The following instructions refer to pumps equipped with mechanical seals, either with or without sleeves.

If the unit has a single inside or double seal, a preliminary impeller adjustment must be performed to assure proper positioning of mechanical seal.

- (1) Position sleeve (126), if any, on shaft (122) and engage groove in sleeve with drive pin (469) on shaft. Place stuffing box cover (184) against frame (228). Make sure studs (370H) align with proper holes in frame. Firmly tighten nuts or bolts.
- (2) Screw impeller (101) with O-ring (412A) in place on shaft. Make sure that shaft assembly extends through stuffing box cover (184) so that the impeller will NOT contact face of stuffing box cover.
- (3) Using impeller adjusting bolts (370C and 370D), adjust the impeller end clearance 0.015 with volute in place. Mark shaft sleeve.

The following instructions are for three basic seal types: Single Inside, Single Outside, and Double Seals. Refer to seal manufacturer’s drawing seal type and positioning dimension. Follow pertinent procedures.

#### a. Single Inside Seal

- (1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box.
- (2) Remove the impeller and stuffing box.
- (3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).

- (4) Slide the rotary portion of the seal on the shaft (122) (or shaft sleeve) (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer’s drawing. Tighten set screws.
- (5) Reinstall the stuffing box cover and tighten. Do not damage the seal parts.
- (6) Reinstall the impeller with O-ring.
- (7) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage the seal parts.
- (8) Refer to Step 12 for further assembly details.

#### b. Double Seals

- (1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box.
- (2) Remove the impeller and stuffing box.
- (3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).
- (4) Slide the rotary portion of the seal on the shaft (122) or shaft sleeve (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer’s drawings. Tighten set screws.
- (5) Place inboard stationary seat and gaskets into bottom of stuffing box.
- (6) Reinstall the stuffing box cover and tighten. Do not damage seal parts.
- (7) Reinstall the impeller with O-ring.
- (8) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage seal parts.
- (9) Refer to Step 12 for further assembly details.

#### c. Single Outside Seal

Preliminary impeller adjustment is not necessary with this type of mechanical seal.

- (1) If unit has shaft sleeve (126), slide on shaft (122) and engage groove in sleeve with drive pin (469) on shaft.
- (2) Lubricate rotary portion of seal and slide on shaft sleeve. Do not tighten set screws.
- (3) Assemble gland (250), gaskets, and stationary seat and slide assembly on shaft or sleeve.
- (4) Place stuffing box cover (184) against frame making sure that the studs (370H) align with the proper holes in frame. Firmly tighten nuts.
- (5) Screw impeller with O-ring on shaft making sure impeller does not make contact with stuffing box cover. If the impeller does hit, use impeller adjusting cap screws to correct.
- (6) Place gland assembly against face of stuffing box and firmly tighten stud nuts.
- (7) Slide rotary portion toward gland until it contacts stationary seat. Compress the rotary. Tighten screws.

10. Screw impeller (101) with O-ring (412A) in place, on the shaft (122).

11. On units with stuffing box packing (106), repack stuffing box as outlined in Section II-F. Assemble gland stud nuts finger tight.

12. Install and position coupling hub at scribe mark on shaft.

13. Place casing gasket (351) against shoulder in casing.

14. Slide the pullout assembly into the casing (100). Drain slot in stuffing box cover (184) should line up with drain connection in casing. Install frame-to-casing bolts (370) and tighten evenly while rotating shaft (122) by hand. If impeller ceases to turn freely, stop tightening operation and adjust the impeller setting with the adjusting bolts (370C and 370D) before resuming tightening of frame-to-casing bolts (370).

#### 15. Impeller Clearance

The impeller clearance is an important factor in maintaining optimum pump performance. The nominal clearance is .015" with the recommended minimum being .008". The actual clearance setting is dependent on the specific operating conditions, taking into account temperature, solids, etc. For maximum service flexibility pumps are shipped from the factory with the clearance set at .015". The desired clearance is obtained in the following manner:

- a. Loosen bolts (370C and 370D).
- b. Tighten bolts (370C) with turning shaft clockwise until impeller starts to rub against casing.
- c. Loosen bolts (370C) until a feeler gauge, corresponding to the desired clearance, can be placed between the bolt head and bearing housing.
- d. Tighten bolts (370D) evenly. Bearing housing shaft and impeller will be jacked to proper clearance from casing. Tighten bolts (370C) and jam nuts on bolts (370D).
- e. If desired, a dial indicator can be used instead of a feeler gauge to check that the bearing housing has been moved the correct distance.

## V-D. Additional Details

An alternate method for setting inside mechanical seals is the "Modified Visegrip Method".

1. Follow assembly up to Step 7.
2. Assemble the gland with stationary seat and gaskets.
3. Install the shaft sleeve, if used on the shaft, and engage groove in sleeve with drive pin (469) on shaft.
4. Slide gland assembly over the shaft or shaft sleeve.
5. Install the stuffing box cover and impeller. Establish a preliminary rotor adjustment (refer to Section V-C-9).
6. Slide gland assembly against stuffing box. Do not bolt the gland to the stuffing box.
7. Clamp the modified visegrip on the shaft or sleeve directly behind and against the gland.
8. Leave the visegrip in place and remove the impeller and stuffing box cover.
9. Lubricate the rotary portion of seal and slide it on the shaft until it comes in contact with the stationary seat in the gland.
10. Compress rotary portion of seal to correct dimension as shown on seal manufacturer's drawing. Tighten set screws.
11. Remove visegrip and reinstall stuffing box cover and tighten.
12. Reinstall impeller with O-ring.
13. Slide the gland assembly against the stuffing box and tighten nuts evenly.
14. Refer to Step 12, etc.

## **SECTION VI—PRODUCT DESCRIPTION**

See pages 10, 11,12, 13 and 14 for Sectional Views, Parts List and Materials of Construction.

# Parts List and Materials of Construction

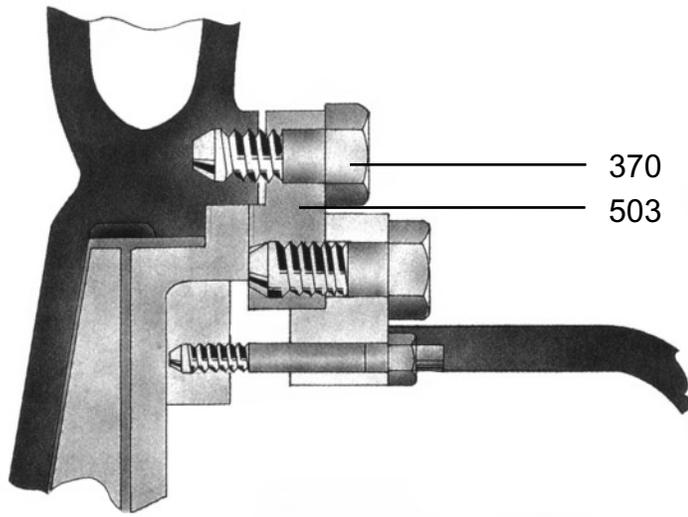
Item No.	No. Req'd. Per Pump	Part Name	MATERIAL							
			All Carbon Steel	All 316SS	All CD4MCu	All C-20	All Monel	All Nickel	*All Hast.	All <sup>1</sup> Titanium
100	1	Casing	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
101	1	Impeller	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
105	1	Lantern Ring	Stainless Steel							
106	1 Set	Stuffing Box Packing	Teflon							
107	1	Gland (Packed Box)	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
108	1	Frame Adaptor	Cast Iron							
109A	1	Bearing End Cover	Cast Iron							
112A	1	Ball Bearing-Outboard	Steel							
113A	1	Bearing Frame Breather	Stainless Steel							
122*	1	Pump Shaft (Less Sleeve)	4340	316		C-20	Monel	Nickel	Hast.	Titanium
122A	1	Pump Shaft (With Sleeve)	4340				316			
123	1	Deflector	Stainless Steel							
126	1	Shaft Sleeve	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium	
131	1	Casing Foot	Cast Iron							
132	1	Eye Bolt	Steel							
134A	1	Bearing Housing	Cast Iron							
136	1	Bearing Locknut	Steel							
168A	1	Ball Bearing-Inboard	Steel							
184	1	Stuffing Box Cover-Standard	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
184A	1	Stuffing Box Cover-Jacketed	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
210	1	Mechanical Seal Guard	316							
228A	1	Bearing Frame	Cast Iron							
239	1	Drain Plug	C S	316	CD4M	C-20	Monel	Nickel	Hast.	Titanium
241	1	Bearing Frame Foot	Cast Iron							
251	1	Constant Level Oiler (Not Illustrated)	Aluminum Alloy/Plastic							
261	1	Mechanical Seal Gland Gasket	Manila Paper							
332A	1	Oil Seal-Outboard	Buna Rubber							
333A	1	Oil Seal-Inboard	Buna Rubber							
351	1	Gasket-Casing	Non-Asbestos (C4400)							
353	2	Gland Stud	304				Monel			
355	4	Gland Stud Nut	304				Monel			
360D	1	Gasket-Brg Frame-Adaptor	Vellumoid							
361A	1	Retaining Ring-Bearing Housing	Steel							
370	4-24	Cap Screw-Frame Adapt. to Casing	Steel	304						
370C	3-4	Cap Screw-Bearing Housing	Steel							
370D	3-4	Cap Screw-w/Jam Nut-Impeller Adjust.	Steel							
370E	2	Cap Screw-Casing Foot	Steel							
370F	1-2	Cap Screw-Frame Foot	Steel							
370H	2	Stud & Nut-Cover to Adaptor	304							
371C	6	Cap Screw-End Cover to Brg. Housing	Steel							
382	1	Bearing Lockwasher	Steel							
412A	1	"O" Ring-Impeller	Teflon							
418	2-3	Cap Screw-Jacking (not shown)	304							
469B	2	Dowel Pin-Frame to Adaptor	Steel							
469D	1	Drive Pin-Shaft Sleeve	420							
496	1	"O" Ring-Bearing Housing	Buna Rubber							
496A	1	"O" Ring-Bearing End Cover	Buna Rubber							
503	1	Adaptor Ring	Cast Iron							

\*Available in Hast-B or Hast-C Material. NOTES: <sup>1</sup>Not available on all sizes.

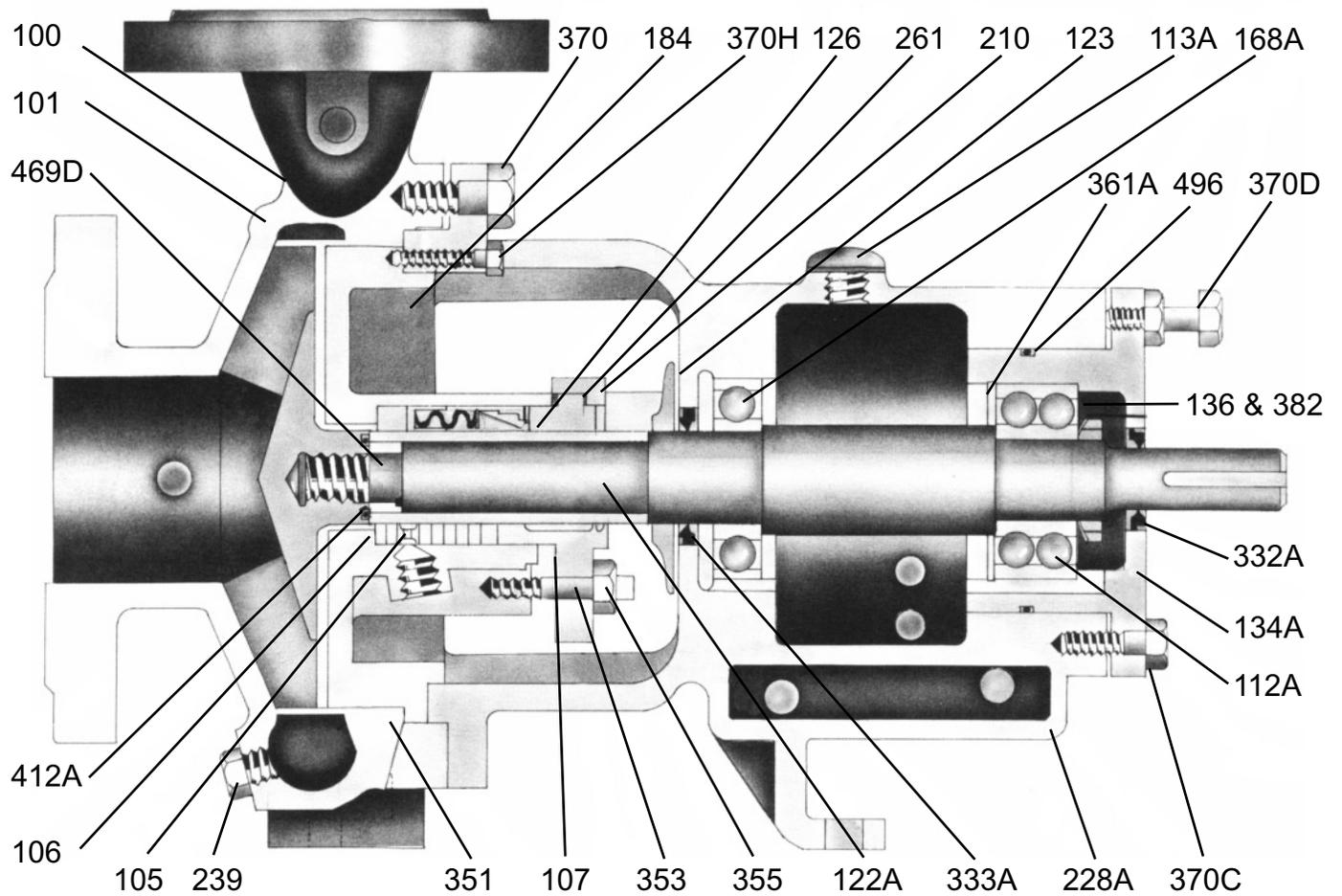
Recommended Spare Parts		
101	1	Impeller
106	1 set	Stuffing Box Packing (2)
112A	1	Ball Bearing-Outboard.
126	1	Shaft Sleeve
168A	1	Ball Bearing-Inboard
261	1	Mechanical Seal Gland Gasket (3)
332A	1	Oil Seal-Outboard
333A	1	Oil Seal-Inboard
351	1	Gasket-Casing
360C	1	Gasket-Bearing End Cover-Bearing Housing
360D	1	Gasket-Bearing Frame-Adaptor (not shown) (4)
412A	1	"O" Ring-Impeller
469D	1	Drive Pin-Shaft Sleeve
496	1	"O" Ring Bearing Housing
		Mechanical Seal (3)

NOTES: (2) - Required on packed pumps only.  
 (3) - Required on pumps equipped with mechanical seal only.  
 (4) - For M & L pumps only.

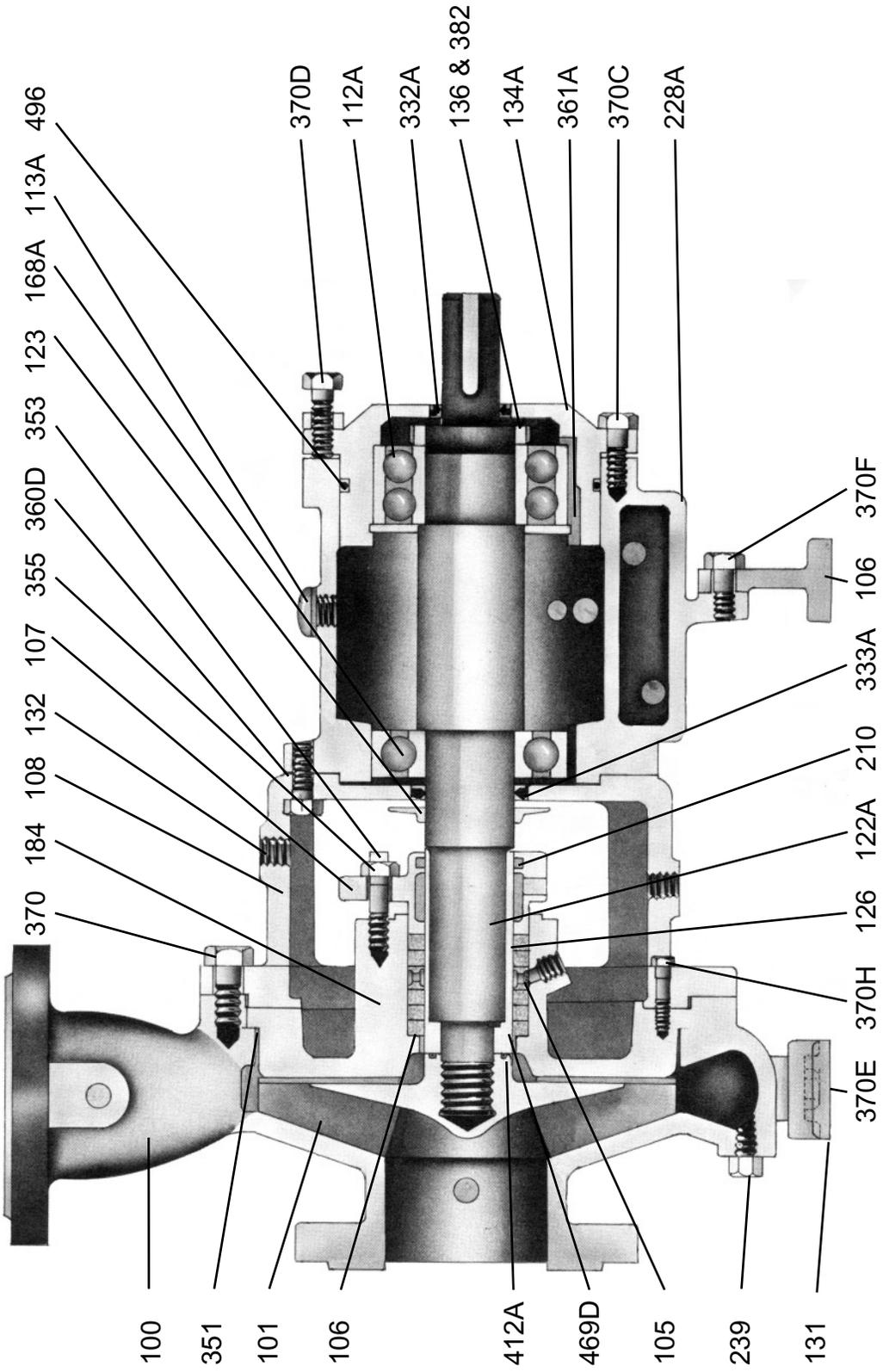
# Model A100 S, M, L



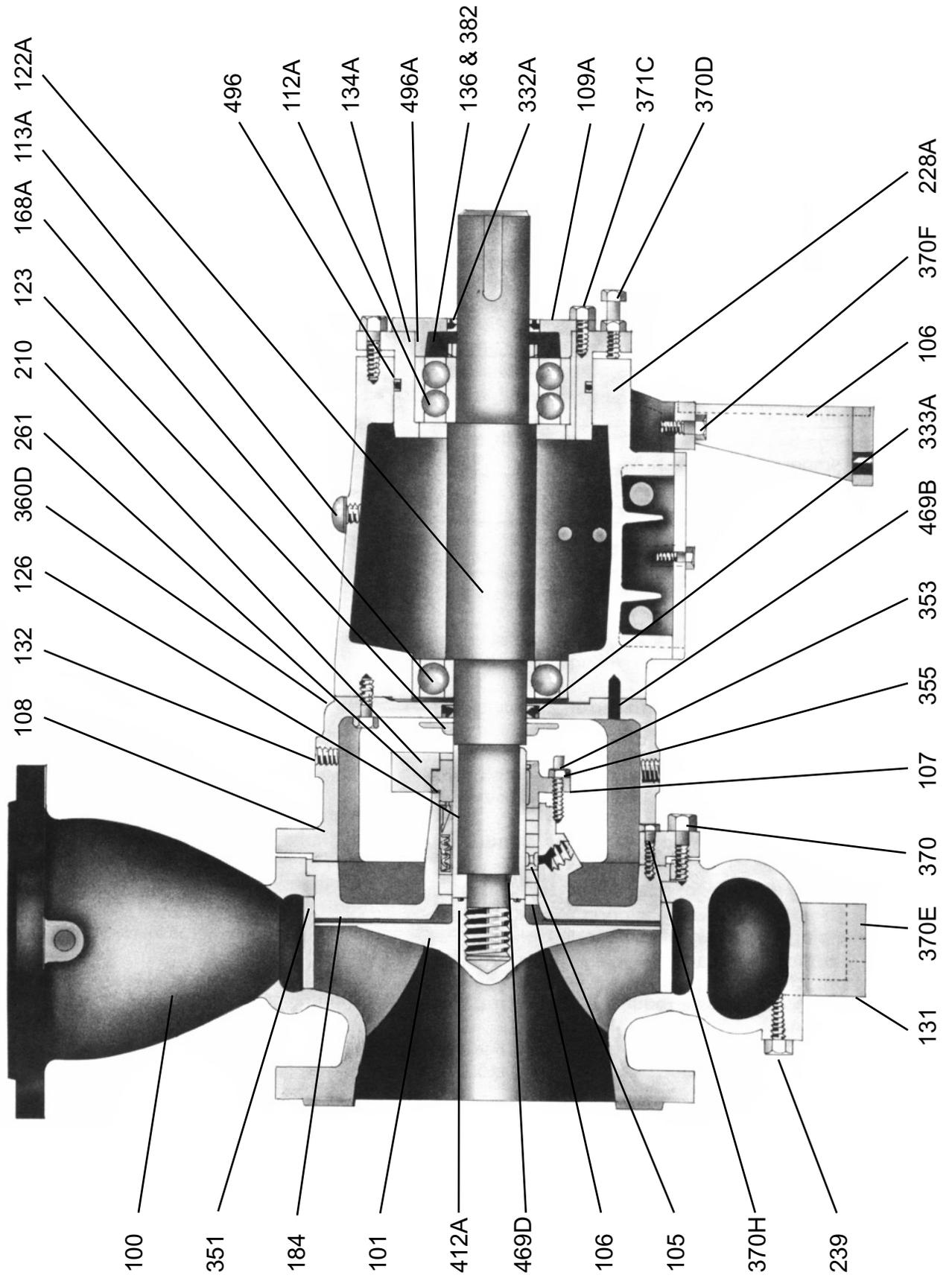
## Assembly View of 8" Pumps Only



# Model A100 M, L



# Model A100 X



## **SECTION VII—TROUBLE SHOOTING**

<b>Problem</b>	<b>Possible Causes &amp; Corrections</b>
A. No liquid delivered, not enough liquid delivered, or not enough pressure	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20.
B. Pump works a while and then quits	4, 5, 7, 8, 9, 11, 12, 20.
C. Pump takes too much power	6, 13, 14, 15, 16, 21, 22, 23, 24, 31.
D. Pump is noisy or vibrates	15, 16, 17, 28, 31.
E. Pump leaks excessively at stuffing box	8, 24, 25, 26, 27.
F. High bearing temperature	15, 16, 17, 29, 30, 31.
G. Stuffing box overheating	8, 24, 25, 26, 27.

### **Causes & Corrective Measures**

1. Pump not primed or properly vented—check that casing and suction pipe are completely filled with liquid.
2. Speed too low—check whether motor wiring is correct and receives full voltage or turbine receives full steam pressure.
3. System discharge head too high—check system head (particularly friction losses).
4. Suction lift too high—check NPSH available (suction piping too small or long may cause excessive friction losses). Check with vacuum or compound gauge.
5. Impeller or piping obstructed—check for obstructions.
6. Wrong direction of rotation—check rotation.
7. Air pocket or leak in suction line—check suction piping for air pockets and/or air leaks.
8. Stuffing box packing or seal worn allowing leakage of air into pump casing—check packing or seal and replace as required. Check for proper lubrication.
9. Not enough suction head for hot or volatile liquids—increase suction head, consult factory.

10. Foot valve too small—install correct size foot valve.
11. Foot valve or suction pipe not immersed deep enough—consult factory for proper depth. Use baffle to eliminate vortices.
12. Entrained air or gases in liquid—consult factory.
13. Impeller clearance too great—check for proper clearance.
14. Impeller damaged—inspect and replace as required.
15. Rotating parts bind—check internal wearing parts for proper clearances.
16. Shaft bent—straighten or replace as required.
17. Coupling or pump and driver misaligned—check alignment and realign if required.
18. Impeller diameter too small—consult factory for proper impeller diameter.
19. Improper pressure gauge location—check correct position and discharge nozzle or pipe.
20. Casing gasket damaged—check gaskets and replace as required.
21. Speed too high—check motor winding voltage or steam pressure received by turbine.
22. Head lower than rating; pumps too much liquid—consult factory. Install throttle valve, cut impeller.
23. Liquid heavier than anticipated—check specific gravity and viscosity.
24. Stuffing box not properly packed (insufficient packing, not properly inserted or run in, packing too tight)—check packing and repack stuffing box.
25. Incorrect packing or mechanical seal—consult factory.
26. Damaged mechanical seal—inspect and replace as required. Consult factory.
27. Shaft sleeve scored—remachine or replace as required.
28. Cavitation—increase NPSH available. Consult factory.
29. Pump capacity too low—consult factory for minimum continuous flow.
30. Excessive vibration—See Section D.
31. Improper bearing lubrication or bearings worn out—inspect and replace as required.

## **SECTION VIII—ORDERING SPARE PARTS**

### **VIII-A. Spare Parts**

To insure against possible long and costly downtime periods, especially on critical services, it is advisable to have spare parts on hand.

1. For critical services: It is recommended that a “back pull-out assembly” be kept on hand. This is a group of assembled parts which includes all parts except the casing and the coupling.

If this unit is equipped with stuffing box packing, one set of stuffing box packing (item 106) should be on hand.

2. An alternative, though not as desirable as that stated above, can be used on non-critical services. This involves having on hand parts that are most likely to wear and can be used as needed. See Section VI, Parts List, for these recommended spares.

### **VIII-B. Instructions for Ordering Spare Parts**

Repair orders will be handled with the minimum of delay if the following directions are followed:

1. Give model number, size of pump, and serial number. These can be obtained from the nameplate on the pump.

2. Write plainly the name, part number, and material of each part required. These names and numbers should agree with those on the sectional drawing in Section VI.

3. Give the number (quantity) of parts required.

4. Give complete shipping instructions.



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