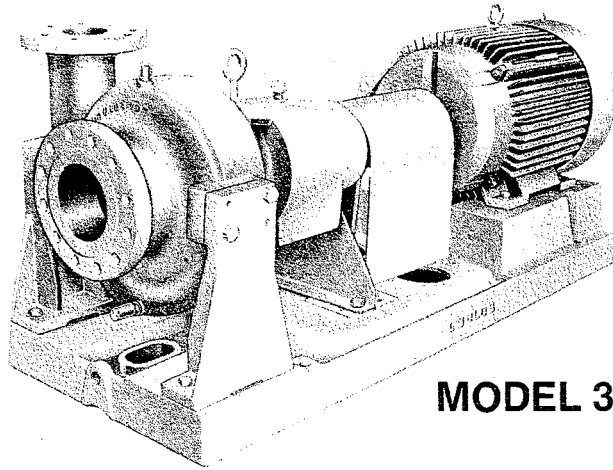


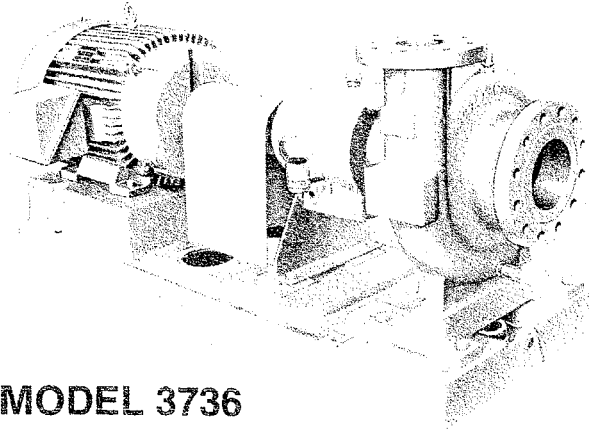


GOULDS PUMPS

Installation, Operation and Maintenance Instructions



MODEL 3735



MODEL 3736



ITT

IMPORTANT SAFETY NOTICE

To: Our Valued Customers

User safety is a major focus in the design of our products. Following the precautions outlined in this manual will minimize your risk of injury.

ITT Goulds pumps will provide safe, trouble-free service when properly installed, maintained, and operated.

Safe installation, operation, and maintenance of ITT Goulds Pumps equipment are an essential end user responsibility. This *Pump Safety Manual* identifies specific safety risks that must be considered at all times during product life. Understanding and adhering to these safety warnings is mandatory to ensure personnel, property, and/or the environment will not be harmed. Adherence to these warnings alone, however, is not sufficient — it is anticipated that the end user will also comply with industry and corporate safety standards. Identifying and eliminating unsafe installation, operating and maintenance practices is the responsibility of all individuals involved in the installation, operation, and maintenance of industrial equipment.

Please take the time to review and understand the safe installation, operation, and maintenance guidelines outlined in this Pump Safety Manual and the Instruction, Operation, and Maintenance (IOM) manual. Current manuals are available at www.gouldspumps.com/literature_ioms.html or by contacting your nearest Goulds Pumps sales representative.

These manuals must be read and understood before installation and start-up.

For additional information, contact your nearest Goulds Pumps sales representative or visit our Web site at www.gouldspumps.com.

SAFETY WARNINGS

Specific to pumping equipment, significant risks bear reinforcement above and beyond normal safety precautions.

 **WARNING**

A pump is a pressure vessel with rotating parts that can be hazardous. Any pressure vessel can explode, rupture, or discharge its contents if sufficiently over pressurized causing death, personal injury, property damage, and/or damage to the environment. All necessary measures must be taken to ensure over pressurization does not occur.

 **WARNING**

Operation of any pumping system with a blocked suction and discharge must be avoided in all cases. Operation, even for a brief period under these conditions, can cause superheating of enclosed pumpage and result in a violent explosion. All necessary measures must be taken by the end user to ensure this condition is avoided.

 **WARNING**

The pump may handle hazardous and/or toxic fluids. Care must be taken to identify the contents of the pump and eliminate the possibility of exposure, particularly if hazardous and/or toxic. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks.

 **WARNING**

Pumping equipment Instruction, Operation, and Maintenance manuals clearly identify accepted methods for disassembling pumping units. These methods must be adhered to. Specifically, applying heat to impellers and/or impeller retaining devices to aid in their removal is strictly forbidden. Trapped liquid can rapidly expand and result in a violent explosion and injury.

ITT Goulds Pumps will not accept responsibility for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this Pump Safety Manual or the current IOM available at www.gouldspumps.com/literature.

SAFETY

DEFINITIONS

Throughout this manual the words **WARNING**, **CAUTION**, **ELECTRICAL**, and **ATEX** are used to indicate where special operator attention is required.

Observe all Cautions and Warnings highlighted in this Pump Safety Manual and the IOM provided with your equipment.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Example: Pump shall never be operated without coupling guard installed correctly.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Example: Throttling flow from the suction side may cause cavitation and pump damage.




ELECTRICAL HAZARD

Indicates the possibility of electrical risks if directions are not followed.

Example: Lock out driver power to prevent electric shock, accidental start-up, and physical injury.



When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. If there is any question regarding these requirements or if the equipment is to be modified, please contact an ITT Goulds Pumps representative before proceeding.






Example:  Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.

General precautions



















WARNING:

A pump is a pressure vessel with rotating parts that can be hazardous. Hazardous fluids may be contained by the pump including high temperature, flammable, acidic, caustic, explosive, and other risks. Operators and maintenance personnel must realize this and follow safety measures. Personal injuries will result if procedures outlined in this manual are not followed. ITT Goulds Pumps will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual and the IOM provided with your equipment.

WARNING		NEVER APPLY HEAT TO REMOVE IMPELLER. It may explode due to trapped liquid.
WARNING		NEVER use heat to disassemble pump due to risk of explosion from tapped liquid.
WARNING		NEVER operate pump without coupling guard correctly installed.
WARNING		NEVER run pump below recommended minimum flow when dry, or without prime.
WARNING		ALWAYS lock out power to the driver before performing pump maintenance.
WARNING		NEVER operate pump without safety devices installed.
WARNING		NEVER operate pump with discharge valve closed.
WARNING		NEVER operate pump with suction valve closed.
WARNING		DO NOT change service application without approval of an authorized ITT Goulds Pumps representative.
WARNING		<p>Safety Apparel:</p> <ul style="list-style-type: none"> • Insulated work gloves when handling hot bearings or using bearing heater • Heavy work gloves when handling parts with sharp edges, especially impellers • Safety glasses (with side shields) for eye protection • Steel-toed shoes for foot protection when handling parts, heavy tools, etc. • Other personal protective equipment to protect against hazardous/toxic fluids
WARNING		Receiving:

4 General precautions

		Assembled pumping units and their components are heavy. Failure to properly lift and support equipment can result in serious physical injury and/or equipment damage. Lift equipment only at specifically identified lifting points or as instructed in the current IOM. Current manuals are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps sales representative. Note: Lifting devices (eyebolts, slings, spreaders, etc.) must be rated, selected, and used for the entire load being lifted.
WARNING		Alignment: Shaft alignment procedures must be followed to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.
WARNING		Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
CAUTION		Piping: Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.
WARNING		Flanged Connections: Use only fasteners of the proper size and material.
WARNING		Replace all corroded fasteners.
WARNING		Ensure all fasteners are properly tightened and there are no missing fasteners.
WARNING		Startup and Operation: When installing in a potentially explosive environment, please ensure that the motor is properly certified.
WARNING		Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
WARNING		Lock out driver power to prevent accidental start-up and physical injury.
WARNING		The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.
WARNING		If using a cartridge mechanical seal, the centering clips must be installed and set screws loosened prior to setting impeller clearance. Failure to do so could result in sparks, heat generation, and mechanical seal damage.
WARNING		The coupling used in an ATEX classified environment must be properly certified and must be constructed from a non-sparking material.
WARNING		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.

WARNING		Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
CAUTION		The mechanical seal used in an ATEX classified environment must be properly certified. Prior to start up, ensure all points of potential leakage of process fluid to the work environment are closed.
CAUTION		Never operate the pump without liquid supplied to mechanical seal. Running a mechanical seal dry, even for a few seconds, can cause seal damage and must be avoided. Physical injury can occur if mechanical seal fails.
WARNING		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
WARNING		Dynamic seals are not allowed in an ATEX classified environment.
WARNING		DO NOT operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.
WARNING		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
WARNING		Shutdown, Disassembly, and Reassembly: Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.
WARNING		The pump may handle hazardous and/or toxic fluids. Observe proper decontamination procedures. Proper personal protective equipment should be worn. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
WARNING		Operator must be aware of pumpage and safety precautions to prevent physical injury.
WARNING		Lock out driver power to prevent accidental startup and physical injury.
CAUTION		Allow all system and pump components to cool before handling them to prevent physical injury.
CAUTION		If pump is a Model NM3171, NM3196, 3198, 3298, V3298, SP3298, 4150, 4550, or 3107, there may be a risk of static electric discharge from plastic parts that are not properly grounded. If pumped fluid is non-conductive, pump should be drained and flushed with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.
WARNING		Never apply heat to remove an impeller. The use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.
CAUTION		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
CAUTION		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

4 General precautions

WARNING		<p>Noise:</p> <p>Sound pressure levels may exceed 80 dbA in operating process plants. Clear visual warnings or other indicators should be available to those entering an area with unsafe noise levels. Personnel should wear appropriate hearing protection when working on or around any equipment, including pumps. Consider limiting personnel's exposure time to noise or, where possible, enclosing equipment to reduce noise. Local law may provide specific guidance regarding exposure of personnel to noise and when noise exposure reduction is required.</p>
WARNING		<p>Temperature:</p> <p>Equipment and piping surfaces may exceed 130°F (54°C) in operating process plants. Clear visual warnings or other indicators should alert personnel to surfaces that may reach a potentially unsafe temperature. Do not touch hot surfaces. Allow pumps operating at a high temperature to cool sufficiently before performing maintenance. If touching a hot surface cannot be avoided, personnel should wear appropriate gloves, clothing, and other protective gear as necessary. Local law may provide specific guidance regarding exposure of personnel to unsafe temperatures.</p>
WARNING		<p>This product contains Carbon Black a chemical known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov</p>

ATEX CONSIDERATIONS and INTENDED USE

Special care must be taken in potentially explosive environments to ensure that the equipment is properly maintained. This includes but is not limited to:

1. Monitoring the pump frame and liquid end temperature.
2. Maintaining proper bearing lubrication.
3. Ensuring that the pump is operated in the intended hydraulic range.

The ATEX conformance is only applicable when the pump unit is operated within its intended use. Operating, installing or maintaining the pump unit in any way that is not covered in the Instruction, Operation, and Maintenance manual (IOM) can cause serious personal injury or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT Goulds Pumps. If there is any question regarding the intended use of the equipment, please contact an ITT Goulds representative before proceeding. Current IOMs are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps Sales representative.

All pumping unit (pump, seal, coupling, motor and pump accessories) certified for use in an ATEX classified environment, are identified by an ATEX tag secured to the pump or the baseplate on which it is mounted. A typical tag would look like this:



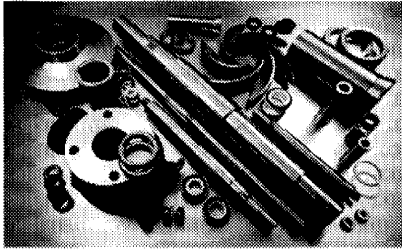
The CE and the Ex designate the ATEX compliance. The code directly below these symbols reads as follows:

- II = Group 2
- 2 = Category 2
- G/D = Gas and Dust present
- T4 = Temperature class, can be T1 to T6 (see Table 1)

Code	Max permissible surface temperature °F (°C)	Max permissible liquid temperature °F (°C)
T1	842 (450)	700 (372)
T2	572 (300)	530 (277)
T3	392 (200)	350 (177)
T4	275 (135)	235 (113)
T5	212 (100)	Option not available
T6	185 (85)	Option not available

The code classification marked on the equipment must be in accordance with the specified area where the equipment will be installed. If it is not, do not operate the equipment and contact your ITT Goulds Pumps sales representative before proceeding.

PARTS



The use of genuine Goulds parts will provide the safest and most reliable operation of your pump. ITT Goulds Pumps ISO certification and quality control procedures ensure the parts are manufactured to the highest quality and safety levels.

Please contact your local Goulds representative for details on genuine Goulds parts.

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INTRODUCTION

This instruction manual is intended to assist those involved with the installation, operation, and maintenance of Goulds Model 3735 and 3736 pumps. It

is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

SECTION I—GENERAL

A. IMPORTANCE OF INSTRUCTIONS

The design, material and workmanship incorporated in the construction of Goulds pumps makes them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, are enhanced and extended by correct application, proper installation, 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 the Sections I, II, III, and carefully follow the instructions for installation and operation. Sections IV, V, VII, and VIII are answers to trouble and maintenance questions. Keep this instruction manual handy for reference. Further information can be obtained by contacting the Engineered Products Division, Goulds Pumps, Inc., Seneca Falls, New York 13148, or your local branch office.

B. SPECIAL WARNINGS

Goulds Pumps, Inc. 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 stated in the original order acknowledgement without written permission of Goulds Pumps, Inc.

C. RECEIVING INSPECTION—SHORTAGES

Care should be taken when unloading pumps. If shipment is not delivered in good order and accor-

dance 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!!**

D. PRESERVATION AND STORAGE

Goulds normal domestic 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. Information about various long term preservation and storage options available can be obtained from your local Goulds representative.

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

E. HANDLING TECHNIQUES

Care should be used in moving pumps. Where required by size of units, slings should be put under both pump and motor.

SECTION II—INSTALLATION

A. LOCATION

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

B. FOUNDATION AND BASEPLATE

Bedplate mounted units are normally mounted on a concrete foundation of liberal thickness, poured on a solid footing and using a one-three-five mix.

The foundation should be substantial in order to absorb any vibration and to form a permanent, rigid support for the pumping unit.

1. The location and size of foundation bolts are shown on the outline assembly drawing supplied for the unit.

2. When unit is mounted on a concrete foundation, each foundation bolt should be installed with a pipe sleeve around it to allow for adjustment.

The I.D. of the sleeve should be $2\frac{1}{2}$ -3 times the bolt diameter. Place a washer between the bolt head and sleeve to hold bolts. (See Fig. 1).

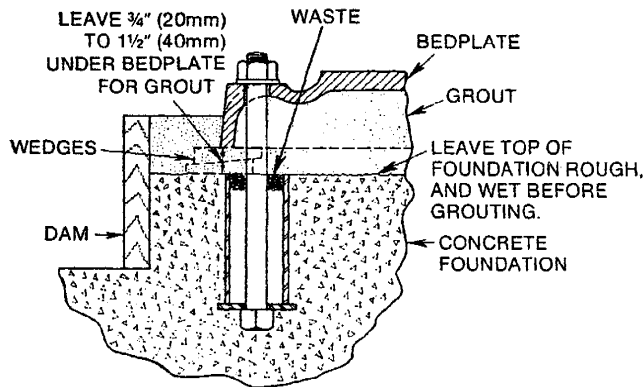


Figure 1

Stuff waste around bolts to prevent concrete from entering between bolt and sleeve. Bolts should be of sufficient length so that they project through the nuts approximately .25 inch (6mm) after allowance has been made for grouting, bedplate thickness, and nut thickness.

3. Put the unit in place on wedges. THE WEDGES SHOULD BE PLACED AT FOUR POINTS AS SHOWN IN FIG. 2. Some long installations may require additional wedges near the middle of the bedplate.

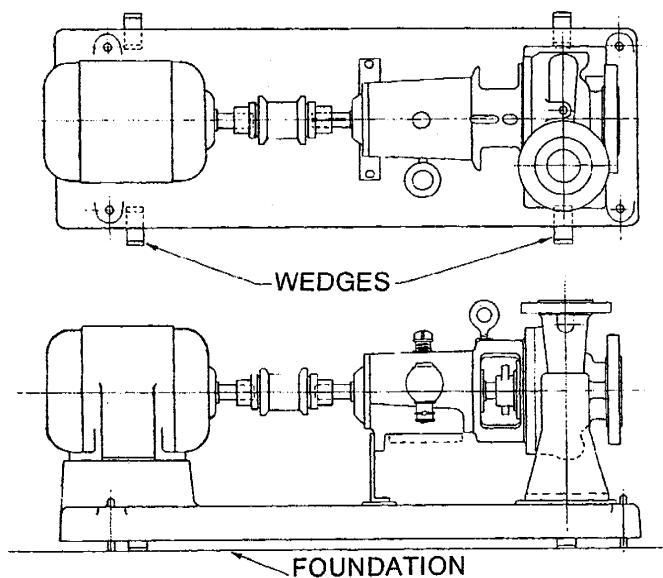


Figure 2

4. Disconnect coupling between pump and driver.

5. By adjustment of wedges, bring the bedplate to an approximate level and provide the proper distance above the foundation for grouting [$\frac{3}{4}$ " (20mm) to $1\frac{1}{2}$ " (40mm)]. Level or plumb the suction and discharge flanges. Bring pump and motor shafts into reasonable alignment making ABSOLUTELY CERTAIN that there is a sufficient thickness of shims under the motor feet to allow for adjustment during the alignment.

6. Snug foundation bolts to maintain the level of the bedplate while grout is being poured. NOTE:

Final tightening is done after pump is grouted and grout has set at least 48 hours.

7. Build wood dam around foundation as shown in Fig. 1, and thoroughly wet top surface of foundation. Pour grout in hole provided in top of bedplate. Use of non-shrink grout is recommended. Grout should be thin enough to flow out under the bedplate, but not so wet that sand and cement will separate. Grout should be puddled continuously as it is poured to expel the air and completely fill the space under the bedplate to the level of the grout hole. Strike along top of dam with trowel to give a neat finished appearance. Remove wedges when grout has hardened enough to support the unit. Allow grout to harden at least 48 hours.

8. Tighten foundation bolts.

9. Tighten pump hold-down bolts.

C. PIPING—GENERAL

1. All piping must be supported independently of the pump. The piping should always "line-up" naturally with the pump flanges. NEVER DRAW THE PIPING INTO PLACE BY USE OF FORCE AT THE FLANGED SUCTION AND DISCHARGE CONNECTIONS OF THE PUMP AS THIS MAY IMPOSE DANGEROUS STRAINS ON THE UNIT AND CAUSE MISALIGNMENT BETWEEN THE PUMP AND DRIVER.

2. The piping, both suction and discharge, should be as short and direct as possible. Avoid all unnecessary elbows, bends, and fittings, as they increase the friction losses in the piping. The size of pipe and fittings should be carefully selected and of sufficient size to keep the friction losses as low as practical.

3. Piping must not be connected to the pump until the grout has thoroughly hardened and the foundation bolts, as well as driver and pump hold down bolts, have been tightened.

4. When handling liquids at elevated temperatures, it is suggested that expansion loops or joints be properly installed in suction and/or discharge lines so that linear expansion of the piping will not draw the pump out of alignment.

If such expansion loops or joints are not used, the forces and moments due to thermal expansion of the piping system, that can act upon the pump inlet and discharge flanges, must be determined and must not exceed the limits permissible for the specific pump in question.

Such installations require extremely careful and precise attention to hot alignment procedures. See Section II-G entitled "Alignment Final."

D. PIPING—SUCTION

General

Properly installed suction piping is of extreme importance for trouble-free centrifugal pump operation.

1. Use of elbows close to the pump suction flange should be avoided. Where used, elbows should be long radius.
2. The suction pipe should never be of smaller diameter than the pump suction. Use of suction pipe one or two sizes larger than the pump suction, with a reducer at the pump suction flange, is desirable.
3. Reducers, if used, should be eccentric and preferably at the pump suction flange, sloping side down.
4. A CENTRIFUGAL PUMP SHOULD NEVER BE THROTTLED ON THE SUCTION SIDE.
5. Suction strainers, when used, should have a net "free area" of at least three times the suction pipe area.

Installations with pump above source of supply—Suction Lift

1. Keep suction pipe free from air pockets.
2. Piping should slope upwards from source of supply.
3. No portion of piping should extend above the pump suction nozzle.
4. All joints MUST be air tight.

Installation with pump below source of supply—Suction Head or Flooded Suction

1. A gate valve should be installed in the suction line to permit closing of the line for pump inspection and maintenance.
2. Keep suction pipe free from air pockets.
3. Piping should be level or slope gradually downward from the source of supply.
4. No portion of the piping should extend below pump suction flange.
5. The size of entrance from supply should be no smaller than the suction pipe.
6. The suction pipe should be adequately submerged below the liquid surface at the supply.

E. PIPING—DISCHARGE

1. Gate and check valves should be installed in the discharge line. The check valve should be located between the gate valve and pump to permit inspection and maintenance of the pump. The check valve is required to prevent reverse flow through the pump when the driver is turned off.
2. Increasesers, if used in discharge line, should be placed between the pump and check valves.
3. If quick-closing valves are installed in the system, cushioning devices should be used to protect the pump from surges and water hammer.

Additional piping information can be found in the "Hydraulic Institute Standards."

F. ALIGNMENT PROCEDURES

General

Alignment of the pump and driver is of extreme

importance for trouble-free mechanical operation. The following are suggested steps to establish the initial alignment of the unit.

NOTE: THIS IS AN INITIAL ALIGNMENT. The final alignment is done after the unit has been run under actual operating conditions. The final alignment procedure must be followed. Make sure motor starting switch is "locked out" to prevent accidental rotation.

Coupling manufacturer's instruction sheets, sent with the pump, should be studied and used when installing or servicing coupling. Note that coupling hubs are not necessarily mounted flush with the shaft ends. The alignment must agree with the recommendations of the pump and/or driver manufacturer. **NOTE THAT ALIGNMENT IN ONE DIRECTION MAY ALTER ALIGNMENT IN ANOTHER. CHECK THROUGH EACH ALIGNMENT PROCEDURE AFTER MAKING ANY ALIGNMENT ALTERATION.**

Angular Alignment

Unit is in angular misalignment when the shaft axes are concentric, but not parallel. Shim unit as required.

Place a dial indicator on one shaft hub and rotate that hub 360°. Take readings from the face of the other hub. Alignment is achieved when indicator does not deflect more than .002" (0.05mm), see Fig. 3. Coupling gap should be set per the pump dimension print or the recommendations of the coupling manufacturer.

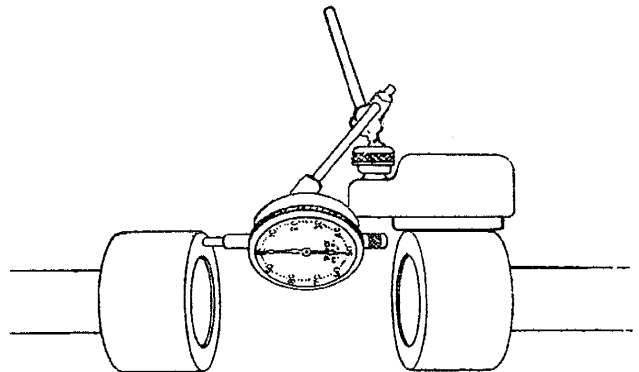


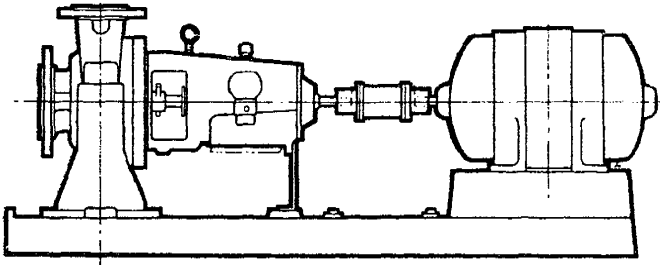
Figure 3

Parallel Alignment

Unit is in parallel misalignment when the shaft axes are parallel but not concentric. Shift driver as required.

In order to obtain vertical parallel alignment under actual operating conditions, the driver shaft may have to be set higher or lower (using thin shim stock) than the pump shaft due to differences in expansion rates. Pump expansion rates vary with pump design. The following is a suggested cold setting for motor driven units:

Pedestal Mounted Units



Set motor shaft .002"—.004" (0.05 to 0.10 mm) low, regardless of pumpage temperature.

Figure 4

Casing Mounted Units

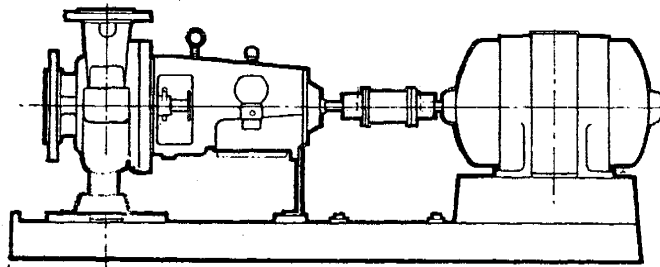


Figure 5

Pumpage Temperature Above Ambient Temperature	Set Motor Shaft
Ambient	.002"—.004" (0.05-0.10 mm) Low
100° F (40° C)	.000"—.002" (0.00-0.05 mm) High
200° F (90° C)	.004"—.006" (0.10-0.15 mm) High
300° F (150° C)	.008"—.010" (0.20-0.25 mm) High
400° F (200° C)	.012"—.014" (0.30-0.36 mm) High
500° F (260° C)	.016"—.018" (0.41-0.46 mm) High

To check the parallel alignment:

1. Refer to Fig. 4 or 5 and establish the elevation required by your pumpage temperature. Note that Fig. 4 or 5 relates to motor driven units only. For turbine driven units, consult the turbine manufacturer for thermal rise estimates.

2. Align the unit to the elevation required using a dial indicator mounted on one machine and reading on the other (See Fig. 6). Turning both machines together, take four readings at points 90° apart. Shim the driver as necessary to satisfy the elevation requirement. The alignment is satisfactory when the machines are within .002" (.05 mm) TIR of the elevation requirement established in step one and within .002" (0.05 mm) TIR side to side.

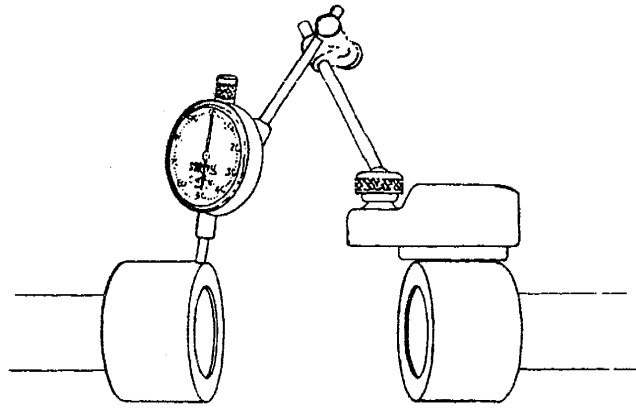


Figure 6

G. ALIGNMENT—FINAL

Final adjustment can only be accomplished after the unit has been run under actual operating conditions for a sufficient length of time to bring the unit up to operating temperature.

After this warm-up period has elapsed, stop the unit and IMMEDIATELY DISCONNECT THE COUPLING, LOOSEN THE FRAME FOOT TO RELIEVE ANY STRAIN DUE TO THERMAL EXPANSION, AND CHECK THE ALIGNMENT. Retighten frame foot while system is still at normal operating temperature. Make sure motor switch is "locked out" to prevent accidental rotation.

Repeat each alignment procedure outlined in II-F.

Reconnect coupling.

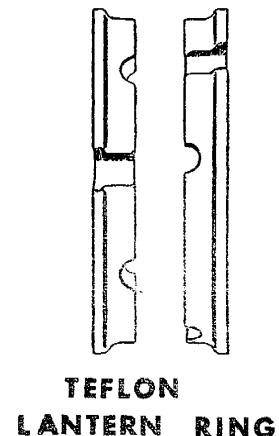
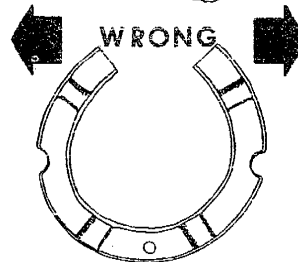
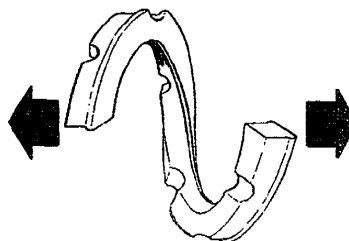
Check final alignment after approximately one week of operation.

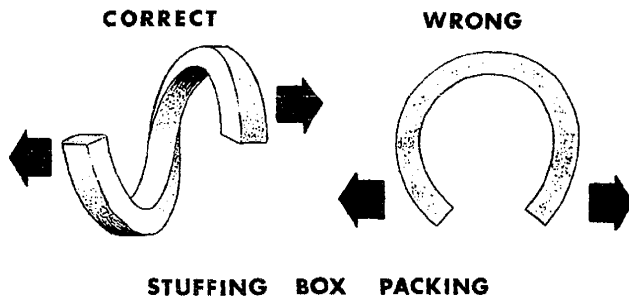
H. STUFFING BOX

1. Packing

Stuffing box packing, lantern ring and gland are in the box of fittings supplied with the pump. Install 3 rings of packing, the two piece lantern ring (notched sides facing), 3 more rings of packing

CORRECT





and the gland. Twist rings sideways, instead of straight out, when putting them on the shaft to avoid damaging them. Seat each ring firmly as it is installed, and stagger the joints 90°. Gland should be drawn up only finger tight.

Packing must not run dry. If the pumped liquid is clean, gland leakage of 40-60 drops per minute is satisfactory. If the liquid is dirty, connect a clean liquid flush to the lantern ring connection to keep solids out of the packing. Occasionally, the stuffing box is below atmospheric pressure (suction under vacuum, etc.). Under these conditions, supply sealing liquid through a line from the discharge of the pump to the lantern ring connection.

2. Mechanical Seals

When mechanical seals are supplied, they are installed in the pump. Mechanical seals must not run dry, or in abrasives. Connect recirculation, flush and/or cooling flows as required, following instructions on the seal print supplied for the order.

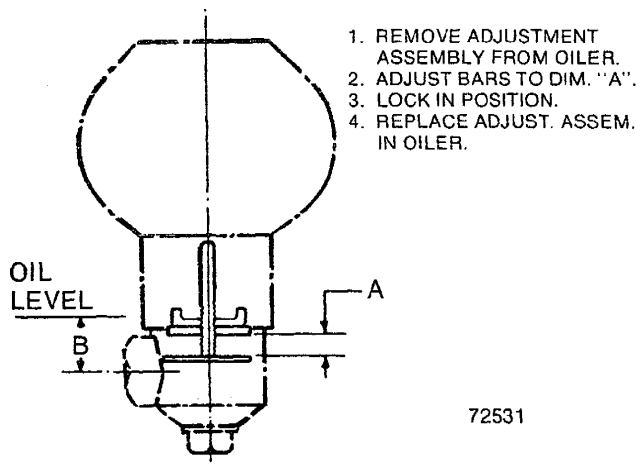
SECTION III—OPERATION

A. STARTUP

1. Checklist

a. Lubrication

Flood oil lubricated ball bearings are standard on all Model 3735 and 3736 units. THE BEARINGS ARE NOT LUBRICATED AT THE FACTORY. Use a high quality turbine type oil with rust and oxidation inhibitors. Oil lubricated pumps are supplied with an oiler which maintains a constant oil level in the bearing frame.



1. REMOVE ADJUSTMENT ASSEMBLY FROM OILER.
2. ADJUST BARS TO DIM. "A".
3. LOCK IN POSITION.
4. REPLACE ADJUST. ASSEM. IN OILER.

Figure 7

GROUP	OILER SIZE	A	B
M	#5 (8 oz.) (0.2 litre)	1 1/32" (8.7 mm)	1/4" (6.4 mm)
L	#5 (8 oz.) (0.2 litre)	3/16" (4.8 mm)	1/2" (12.7 mm)

- 1) Before installing the oiler on the bearing frame, check the oiler adjustment.
- 2) Install oiler on the bearing frame on the side where the oil level groove is located. Tap connection is 1/4" NPT.

The 3/8" NPT connection is to be used for draining only.

- 3) Fill oiler bottle with oil and place it in oiler housing. Oil reservoir in bearing frame is filled when oil remains visible in the bottle. Several fillings of the bottle will be required. Never fill through the oil vent or the oiler housing without use of the bottle.

NOTE: The inboard bearing on "L" group units has a smaller diameter than the outboard bearing. An oil flinger, located near the inboard bearing, is utilized as a safety precaution to prevent inboard bearing failure due to an abnormally low oil level.

b. Alignment

Check alignment as described in Section II-F.

c. Stuffing Box

On pumps with packed boxes, check to be sure gland nuts are finger tight only.

d. Stuffing Box Lubrication/Cooling

Check to be sure that any required auxiliary piping is installed and functioning. If cooling and/or flushing from an outside source is being used, establish these flows.

e. Priming

Pump and suction pipe must be full of liquid before pump is started. Usually, suction supply will be primed when pump shutoff valves are opened. If suction supply is below pump, priming by other means such as foot valve or ejector will be required.

f. Check for Free Turning

Before pump is started, rotate shaft by hand to be sure it is free. Drag from packing or seal is normal, but if pump cannot be turned by hand, or binding

and rubbing are noticed, correct before starting.

2. Startup Procedures

- a. Valves
Be sure suction valve is fully open. Normally, discharge valve should be at least partially closed so that flow will be controlled.
- b. Rotation check
Jog motor to double check that rotation is correct.
- c. Start
Pump is now ready to start.

B. OPERATIONAL 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. Check motor for excessive heating. Check complete unit for excessive vibration or unusual noise. Do not run pump at greatly reduced flow, because all the motor power will go into heating the liquid in the pump, and the damage may result.

C. SHUTDOWN PROCEDURE

Pump can be shut off without closing any valves, unless the pump is installed without a check valve. When no check valve is used, the discharge valve must be closed before the pump is stopped, to prevent backflow through the pump.

If the pump is to be serviced, be sure suction valves are closed, auxiliary cooling and flushing flows are shut off and motor is locked out before working on pump.

SECTION IV—PREVENTATIVE AND CORRECTIVE MAINTENANCE

A. LUBRICATION

Periodically check oiler. If there is oil in the bottle and the level adjustment is correct, the oil level in the bearing housing is correct. Keep sufficient oil in the bottle. Check level adjustment when refilling bottle.

B. STUFFING BOX

1. Packed Stuffing Box

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

After pump has been in operation for some time and the packing has been completely "run-in", at least 40 to 60 drops per minute of the liquid should be allowed to trickle from the stuffing box at all times for cooling and lubricating the packing

and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal

This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

C. VIBRATION

It is a good practice to periodically monitor vibration of the pump. Normally, vibration level will be well below 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.

D. ALIGNMENT

Check alignment as described in Section II-F when unit is down for maintenance.

E. PERFORMANCE

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

SECTION V—DISASSEMBLY AND REASSEMBLY

A. DISASSEMBLY

The back pull-out feature of this pump allows the complete back pull-out assembly (bearing frame and rotating element) to be removed without disturbing suction or discharge piping and driver.

The Sectional View and Parts List (Section VI-A) contains a complete sectional view of the pump and parts list with the proper identification numbers. Refer to this section as required during maintenance procedures and when ordering spare

or repair parts.

To prepare the pump for disassembly, proceed as follows:

1. Lock out power supply to motor.
2. Shut off valves controlling flow to and from the pump.
3. Drain liquid from pump. Remove casing pipe plug (353) which is located on the bottom of casing (100).
4. Remove all auxiliary tubing and piping.
5. *Flush the pump to remove corrosive or toxic*

pumpage if required.

6. Disconnect coupling, remove coupling spacer (refer to coupling instructions).
7. Drain oil (remove drain plug).
8. ON UNITS WITH STUFFING BOX PACKING, unbolt and remove split gland (107).

The numbers located on the following figures refer to the procedure steps. For example, number 1 on Fig. 8 refers to Step 1. The three and four digit numbers in parentheses (132), (370B), etc. refer to the part's item number.

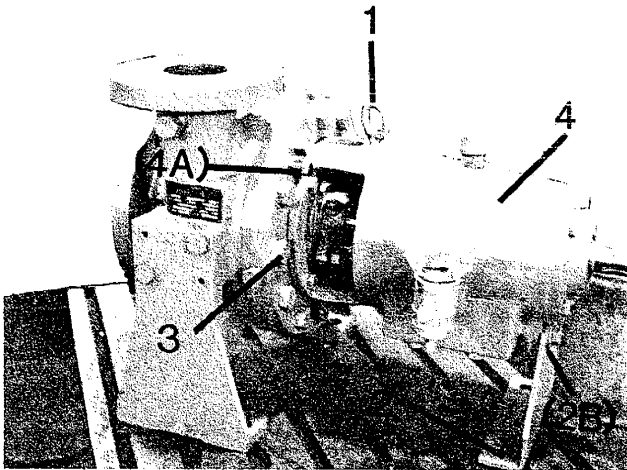


Figure 8

1. Place sling from hoist through eyebolt. (132)
2. Remove bolts from bearing frame support foot (241). Loosen upper foot bolt (2B) (370B).
3. Remove stuffing box-to-casing bolts (370A).
4. Adjust sling tension to support back pull-out assembly and slide assembly out of casing. Two jacking bolts (4A) are provided to assist the removal. Tighten bolts evenly, a flat at a time, to jack assembly from casing.

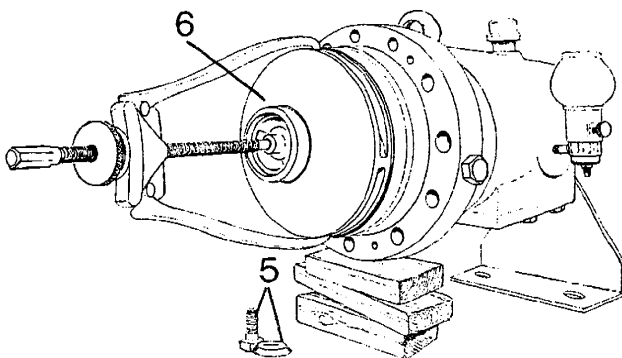


Figure 9

5. Remove impeller screw and washer (198 & 199).
6. Pull impeller (101) from shaft (122). It will be necessary to use a wheel puller that pushes against the end of the shaft with arms over the

- back impeller shroud. Remove impeller key (178).
7. IF UNIT HAS A MECHANICAL SEAL (383), remove gland nuts (355). Carefully slide gland (250) toward frame (228A). Protect exposed seal faces.

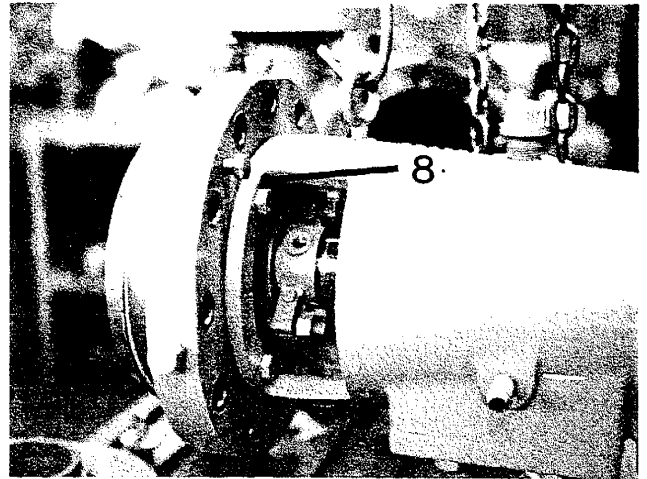


Figure 10

8. Remove stuffing box-to-bearing frame bolts (370H). A tapped hole is provided for insertion of an eyebolt to assist in the removal of the stuffing box cover. Remove stuffing box cover (184), carefully avoiding contact with the sleeve (126/126A), shaft or any mechanical seal parts.

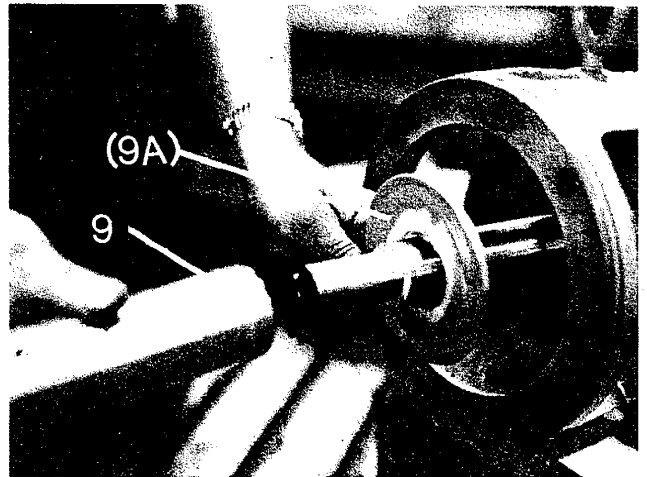


Figure 11

9. Remove sleeve (126/126A) using puller if necessary. If unit has a mechanical seal (383), the rotary will be attached to the sleeve (126). Carefully remove gland (280) and stationary seat assembly. Remove deflector (123) (9A).
10. Scribe shaft (122) at coupling hub for proper positioning of hub during reassembly and remove hub.
11. Remove outboard bearing end cover bolts (370W) and carefully pull end cover (109A), with coupling end oil seal (332A) in place, off shaft

(122). Do not damage oil seal (332A). See Section V-B "Inspection" (Oil Seals).

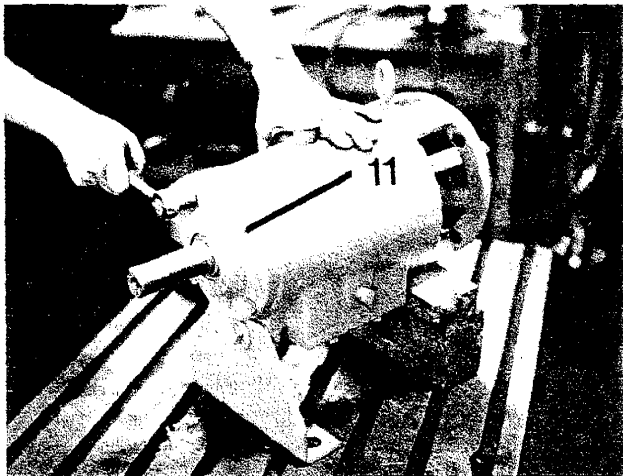


Figure 12

12. Carefully remove shaft (122) and bearing assembly from the bearing frame. Do not damage inboard oil seal (333A).

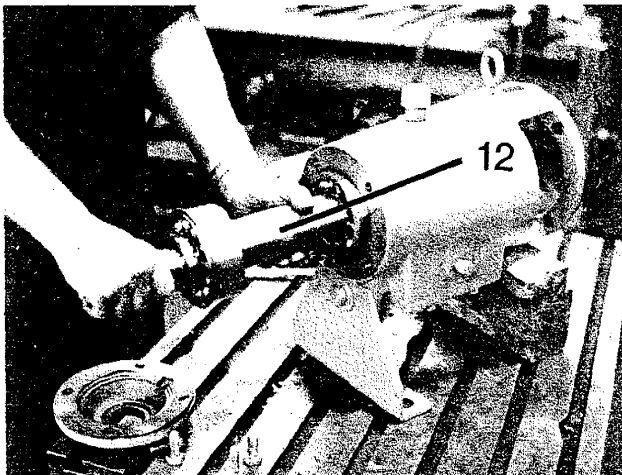


Figure 13

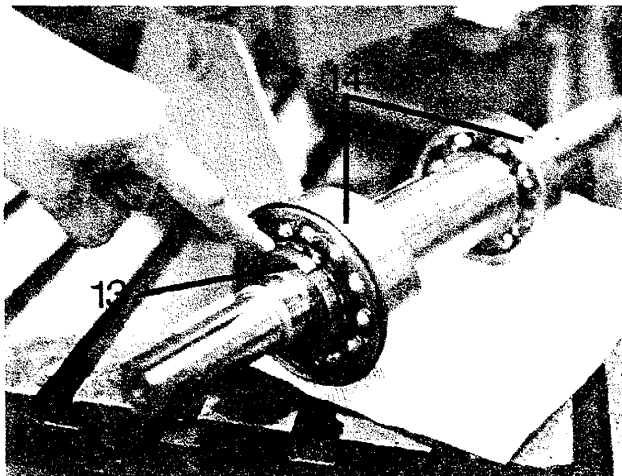


Figure 14

13. Straighten "tang" in lockwasher (382) and remove bearing locknut (136) and lockwasher (332). Use suitable spanner wrench.

14. Remove ball bearings (112A & 168A) using a bearing puller. Care must be taken to prevent damage to bearings. NEVER USE A HAMMER TO DRIVE SHAFT THROUGH BEARINGS. Protect bearings from contamination.

15. ON UNITS WITH STUFFING BOX PACKING, remove packing (106) and lantern ring (185) from stuffing box cover (184).

B. INSPECTION AND OVERHAUL

1. **Impeller (101)**—Replace if impeller shows excessive erosion, corrosion, or extreme wear. Clean and check impeller I.D. and shaft O.D. in impeller area. Fits must be from .0005" (0.013mm) interference to .001" (0.025mm) loose. Replace impeller or shaft if clearance is greater. Check impeller balance.

2. **Shaft (122)**—Check for run-out to see that shaft has not been bent. Bearing seats and oil seal areas on the shaft must be in perfect condition and free of scratches and grooves. Replace shaft if necessary.

3. **Shaft Sleeve (126, 126A)**—Sleeve surface in stuffing box area must be smooth and free of grooves. If grooved, replace.

4. **Mechanical Seal (383)**—Seal faces, gaskets, and shaft sealing members must be in perfect condition or excessive leakage may result. Replace worn or damaged parts. Protect lapped faces while working with seal.

5. **Ball Bearings (112A, 168A)**—Replace bearings if they are worn, loose or rough and noisy when rotated. New bearings should not be unwrapped until ready for use. Replacement bearings must be of proper size and type as specified in the Construction Details, Section VI-B.

6. **Oil Seals (332A, 333A)**—Replace seals if they are torn or otherwise damaged. See the following Table for suitable replacement oil seals. Seals are pressed into the bearing end covers and lips on seal should face inward toward bearings.

BEARING FRAME OIL SEALS

Group	* Goulds Identification			Vendor/Identification Number
		Item	Part No.	Part No.
M	Pump End	333A	8690-71187	Crane 187-262-12 STD
	Coupling End	332A	8690-64562	Crane 162-237-8 MO
L	Pump or Coupling End	332A or 333A	8690-60868	Chicago Rawhide 22477 Or Garlock 63X1494 or 65X1494 Or Johns-Manville 10418 LPD Or National 503165 Or Victor 60868

* Check with your local Goulds Sales Office for pump "Maintenance Kits".

7. Wearing Rings (202, 203, 164, 230)—Units are equipped with impeller, casing, and stuffing box wearing rings. When the clearance between rings become excessive, hydraulic performance decrease substantially. The diametrical clearance between rings should be as follows:

NOMINAL IMPELLER RING DIAMETER, inches (millimetres)		DIAMETRICAL CLEARANCE			
		CAST IRON		STAINLESS STEEL	
Equal to or Greater than	But less Than	Inches	mm	Inches	mm
		3.000 (76.20)	3.500 (88.90)	.014-.018	0.36-0.46
3.500 (88.90)	5.000 (127.00)	.016-.020	0.41-0.51	.021-.025	0.53-0.64
5.000 (127.00)	6.000 (152.40)	.017-.021	0.43-0.53	.022-.026	0.56-0.66
6.000 (152.40)	7.000 (177.80)	.018-.022	0.46-0.56	.023-.027	0.58-0.69
7.000 (177.80)	8.000 (203.20)	.019-.023	0.48-0.58	.024-.028	0.61-0.71

Clearance should be increased when temperature of pumpage exceeds 500°F. (260°C) or when liquid is extremely viscous.

Replacement of impeller and/or casing and stuffing box wearing rings is suggested when hydraulic performance has decreased substantially.

8. Replacement of Wearing Rings—Wearing rings are held in place by a press fit and locked by three (3) set screws.

- a. Removal
 1. Remove set screws.
 2. Use suitable puller or pry bar to remove ring.
- b. Installation
 1. Clean ring seat and tap new rings into place by using a hard wood block or a babbit hammer.
 2. Locate, drill, and tap three (3) new holes equidistant between existing set screw holes. Use a #23 drill .44" (11.9 mm) deep and a #10-24 U.N.C. tap. Set screws should be .25" (6.4 mm) long. CARE MUST BE TAKEN THAT THE GREATER PORTION OF THE HOLE IS IN THE CASING, STUFFING BOX COVER OR IMPELLER, NOT IN THE RING. Replace set screws. Upset first thread lightly after set screws are seated.
 3. Replacement impeller wearing rings (furnished for repairs) are supplied .020"-.030" (0.50-0.75 mm) oversize on the O.D. They should be turned to size after mounting on the impeller hub.

This procedure:

- a) Eliminates possibility of run-out.
- b) Eliminates distortion due to press fit.
- c) Permits exact fit with casing and stuffing box rings if they are worn.

Use dimensions given in the Table (Paragraph V B7) to determine correct impeller ring O.D.

9. Stuffing Box Throat Bushing (125)—Replace throat bushing if it is excessively worn.

C. REASSEMBLY OF PUMP

This procedure covers reassembly of pump after complete disassembly. Make sure all directions in Section V-B—"Inspection and Overhaul" have been followed.

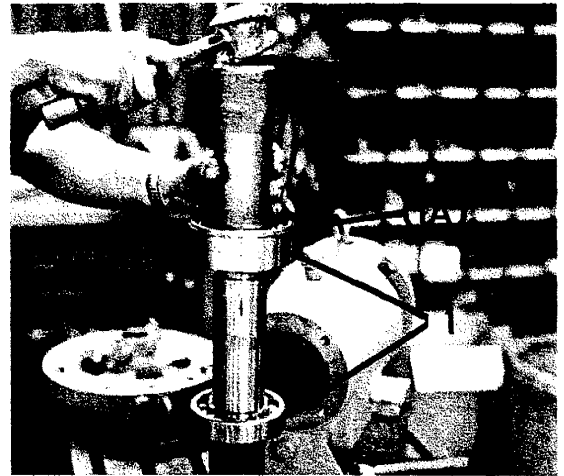


Figure 15

1. Oil bearing seats on shaft. Install bearings. Slide bearings on shaft as far as possible by hand. NOTE: COUPLING END BEARING IS DOUBLE ROW. MAKE SURE BEARING RING (1A) IS FACING TOWARD THE COUPLING END OF THE SHAFT. Place pipe or driving sleeve over shaft, making sure it rests against inner race only. Press or tap evenly until bearings are seated firmly against shaft shoulder. Do not mar the shaft, especially where it contacts the oil seals.

2. Oil frame (228A) at bearing seats and inboard oil seal.

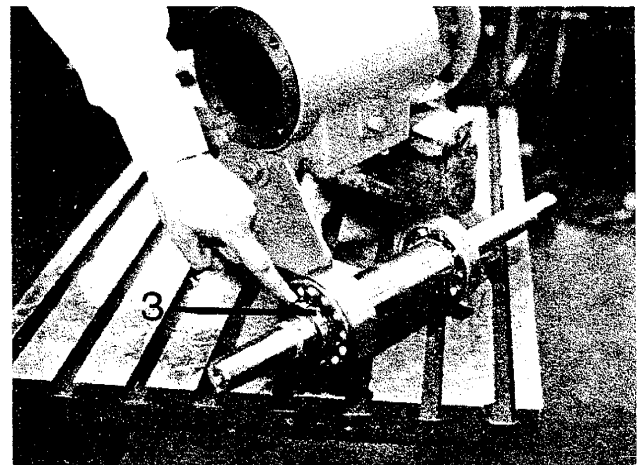


Figure 16

3. Place lockwasher (382) and bearing locknut (136) on shaft and tighten firmly. Bend "tang" of lockwasher into slot in locknut.

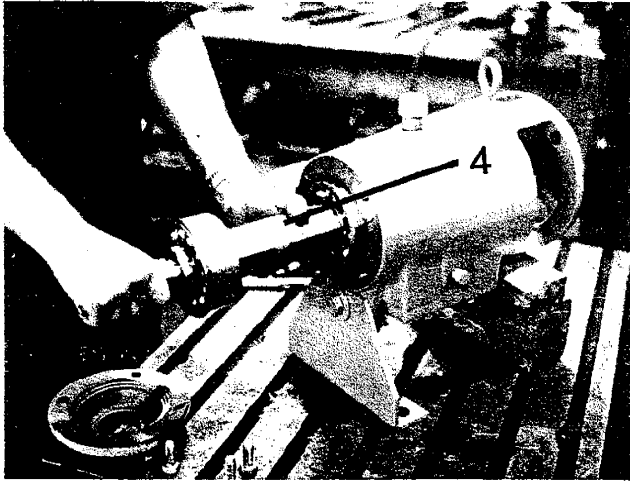


Figure 17

4. Carefully slide the shaft-bearing assembly into the frame (228A). Do not damage the pump end oil seal (333A).

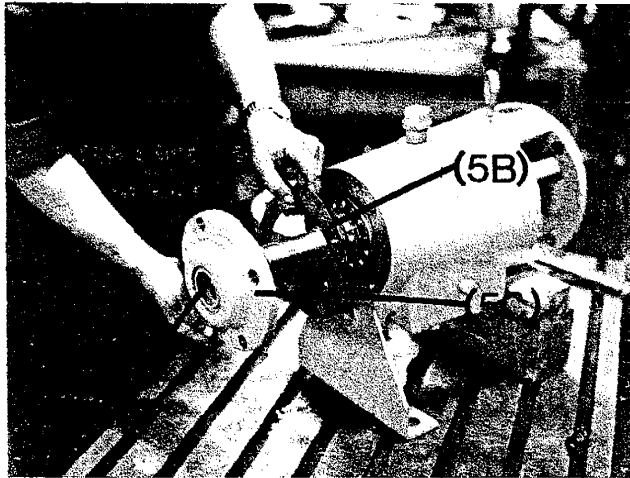


Figure 18

5. If a replacement oil seal is to be used, install new seal (332A) (5A) in bearing end cover (109A). Oil gasket (5B) lightly and install on frame (228A). Slide end cover (109A) (5C) in place and bolt it to frame (228A). NOTE: Bearing end cover must be properly positioned. The word "TOP" is cast in the cover to assist in proper positioning.

6. Slide deflector (123) on shaft (6A). Position new sleeve gasket on shaft (122) against shoulder (6B) on shaft.

7. To install shaft sleeve:

a) On units with a packed stuffing box, slide the sleeve over the shaft and position slot in sleeve over shaft keyway.

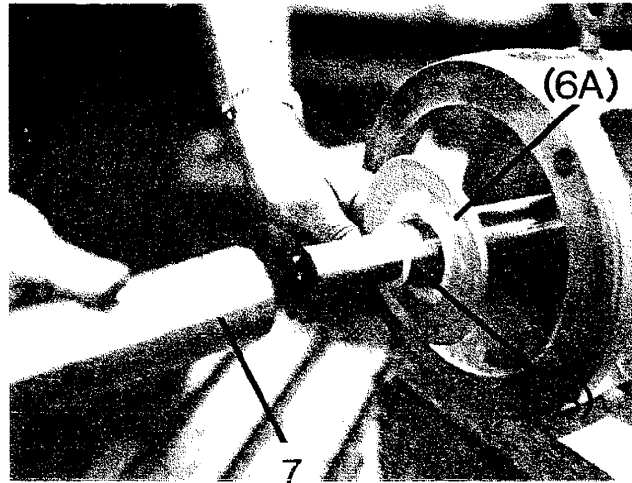


Figure 19

b) On units with a mechanical seal (383), slide the gland assembly (with gaskets and stationary seat in place) over the shaft (122). Lightly oil the rotary portion of the seal and slide onto the sleeve (126A). Position the rotary portion of the seal according to seal drawing dimensions. Tighten set screws. (An alternate method of positioning the rotary portion is described in Section V-D). Slide the seal—sleeve assembly over the shaft and position slot in sleeve over shaft keyway. NOTE: If the sleeve does not slide freely on shaft it may be necessary to relax the set screws. Retighten after sleeve is in place.

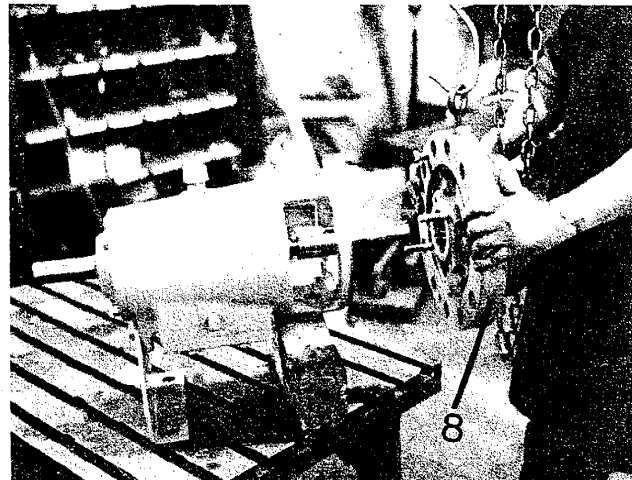


Figure 20

8. Slide the stuffing box cover (184) over the shaft, sleeve and mechanical seal rotary portion, if any. Do not allow stuffing box cover to contact the sleeve or mechanical seal.

9. Bolt the stuffing box cover (184) to the frame (228A). NOTE: IF UNIT HAS A MECHANICAL SEAL, MOUNT THE GLAND-STATIONARY SEAT ASSEMBLY, WITH GASKET IN PLACE, ON THE STUFFING BOX COVER. EVENLY AND FIRMLY TIGHTEN THE

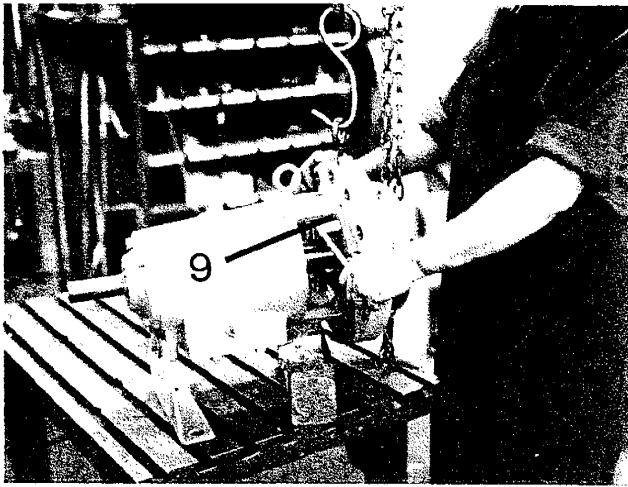


Figure 21

NUTS. USE NEW GLAND/SEAT GASKET IF THE OLD ONE IS WORN OR DAMAGED.

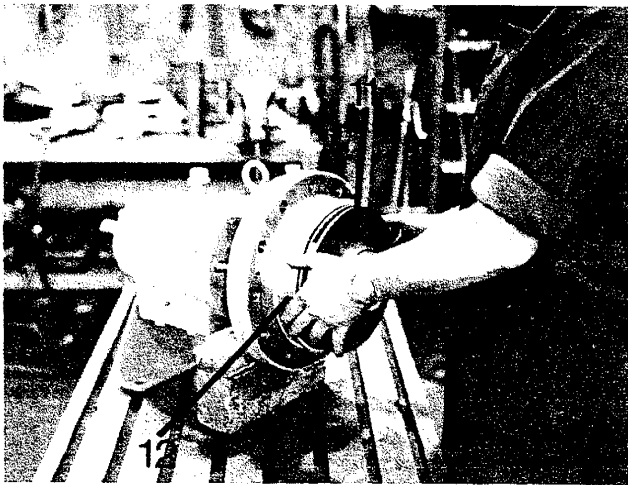


Figure 22

10. Position impeller key (178) on shaft (122). Make sure key engages the shaft sleeve.

11. Mount impeller (101) on shaft (122) and install impeller washer (199) and screw (198). Torque screw to values given below:

GROUP	TORQUE
M	100 Ft.-Lbs/135 Newton—Metres
L	165 Ft.-Lbs/224 Newton—Metres

12. Mount the gasket (351) on the stuffing box cover (184). Use of a new gasket is recommended. Rotate shaft several times to be sure there is no binding in the rotating element.

13. Slide the completed "back pull-out" assembly into the casing (100). Install the stuffing box cover-to-casing bolts (370A) and tighten bolts evenly until the parts make metal-to-metal contact. The contact assures that the casing and back pull-

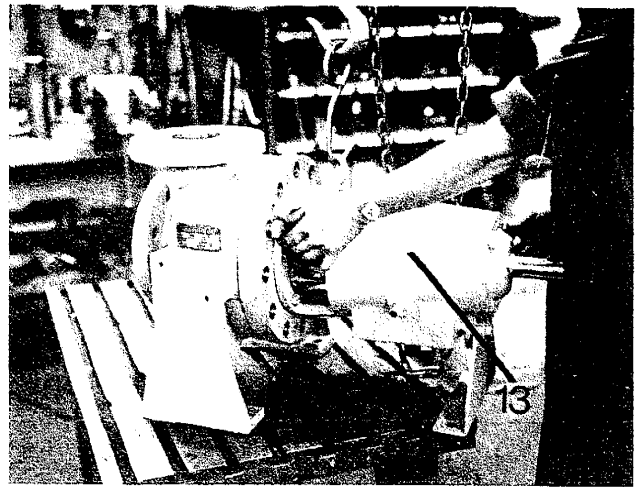


Figure 23

out assembly are perfectly aligned and that the gasket is compressed to provide optimum sealing capability.

14. If complete pump was removed from bedplate for disassembly, place pump back on bedplate. Install all flange and pump mounting bolts. Finally, secure upper frame foot bolt (370B). See Fig. 8.

15. Install and position pump half coupling hub at scribe mark on shaft.

16. On units with stuffing box packing, repack stuffing box as outlined in Section II-H. Assemble gland stud nuts finger tight.

17. Install auxiliary piping.

18. Follow procedures outlined in Sections I, II, and III for preparation and operation of the unit. PAY PARTICULAR ATTENTION TO INSTRUCTIONS CONCERNING ALIGNMENT AND LUBRICATION.

D. ALTERNATE METHOD OF SETTING MECHANICAL SEALS

1. With the frame-shaft assembly completed, carefully slide the gland-stationary seat assembly, with gaskets in place, on the shaft. Install shaft sleeve (126A).

2. Carefully slide the stuffing box cover (184) over the sleeve, and bolt it to the bearing frame.

3. Scribe the shaft sleeve lightly at the face of the stuffing box.

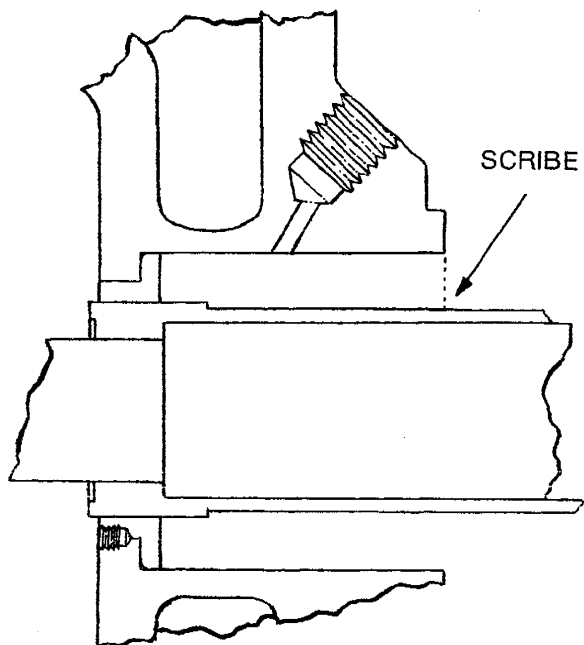


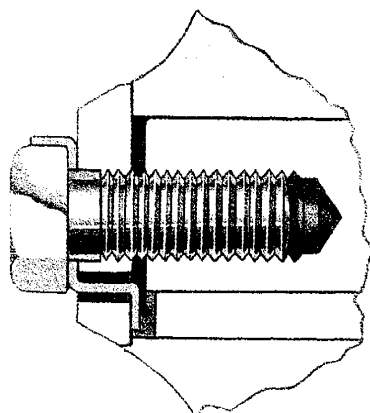
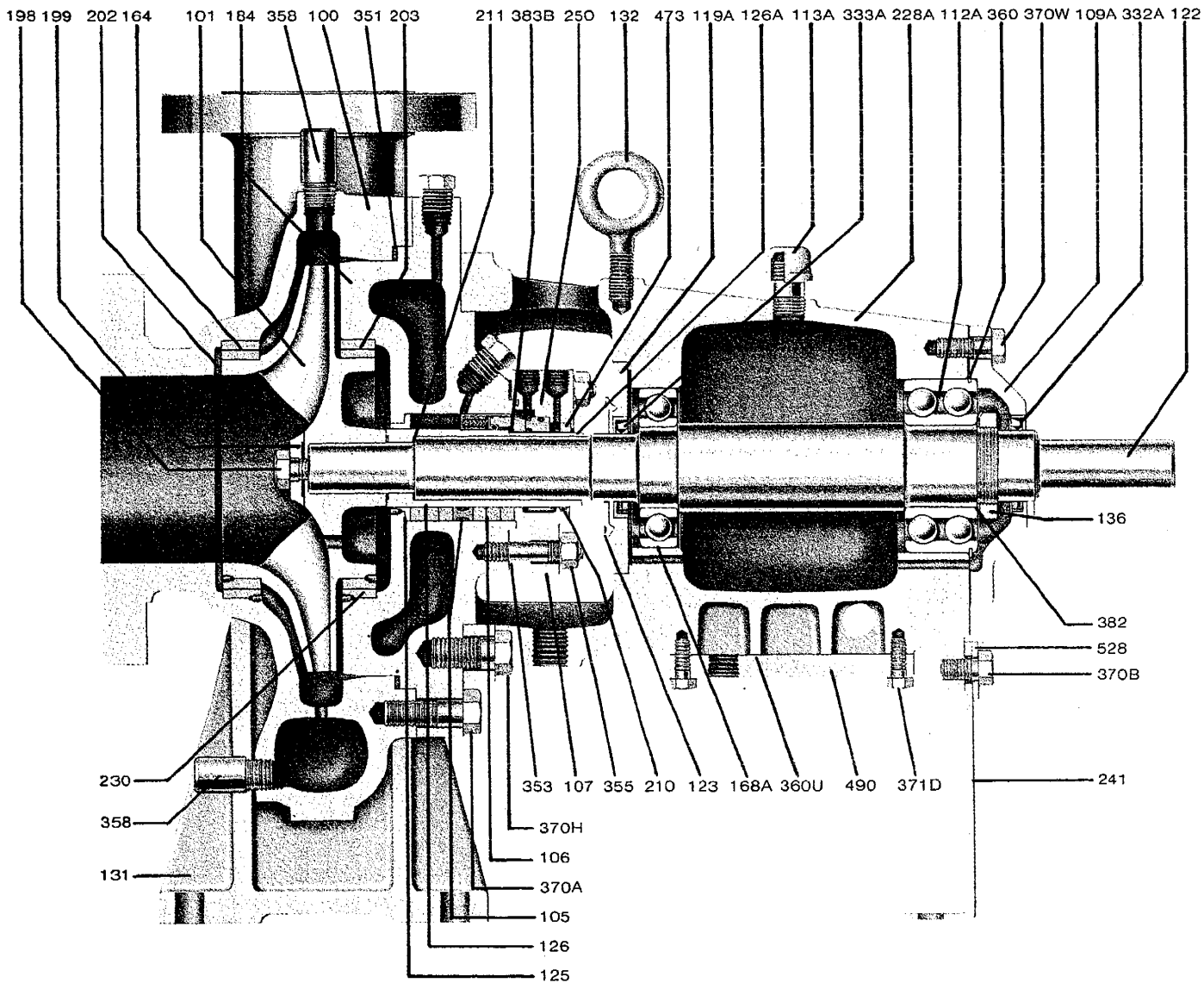
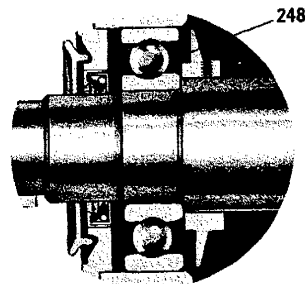
Figure 24

4. Unbolt and remove the stuffing box cover. Remove the shaft sleeve.
5. Lubricate rotary portion of seal (383) and slide onto shaft sleeve.
6. Refer to the seal manufacturer's drawing for correct seal setting from the face of the stuffing box (scribe mark).
7. Compress seal and tighten set screws.
8. Refer to Section V-C (step 8) for further assembly instructions.

SECTION VI-A.—SECTIONAL AND PARTS LIST

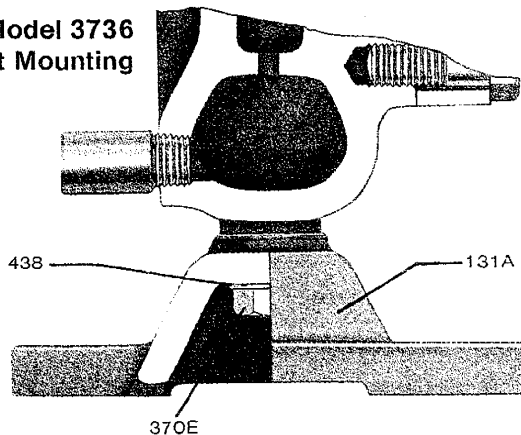
"L" Group—Oil Flinger

(Lubrication is basically fluid oil type. Flinger on L group is safety device for radial bearing if oil level drops below normal. Note that L group radial bearing is smaller diameter than thrust bearing.)



**Optional
Impeller
Locking Assembly**

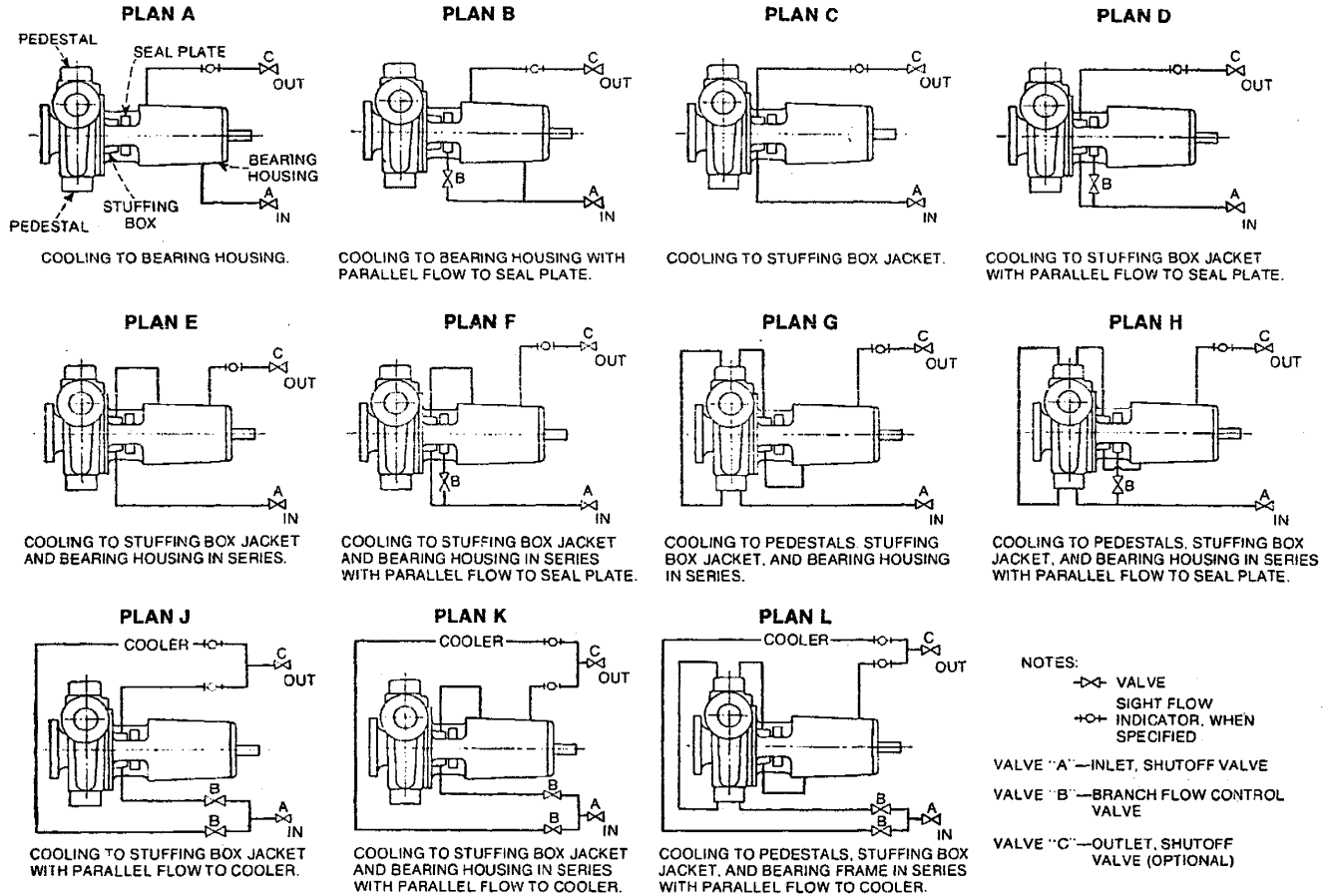
**Model 3736
Foot Mounting**



SECTION VI-B.—CONSTRUCTION DETAILS Dimensions in inches (millimetres) or as noted.

General	M GROUP																L GROUP			
	1 1/2 x 3-7	2 x 8-7	3 x 4-7	4 x 6-7	1 x 1 1/2-8	1 1/2 x 2-9	2 x 3-9	3 x 4-9	6 x 8-9	1 x 2-11	2 x 4-11	3 x 4-11	3 x 4-11H DV	4 x 6-11G DV	1 x 2-13	1 1/2 x 4-13	2 x 4-13	3 x 6-13 DV	4 x 6-13 DV	
Shaft Diameter	Minimum Casing Thickness	.44 (11.1)	.50 (12.7)	.56 (14.3)	.56 (14.3)	.44 (11.1)	.50 (12.7)	.50 (12.7)	.56 (14.3)	.56 (14.3)	.56 (14.3)	.56 (14.3)	.69 (17.5)	.56 (14.3)	.56 (14.3)	.56 (14.3)	.56 (14.3)	.56 (14.3)	.62 (15.9)	
	Max. Diameter Spherical Solids	.19 (4.8)	.41 (10.3)	.59 (15.1)	.84 (21.4)	.22 (5.6)	.22 (5.6)	.22 (5.6)	.28 (7.1)	.97 (24.6)	.59 (15.1)	.41 (10.3)	.41 (10.3)	.97 (24.6)	.59 (15.1)	.34 (8.7)	.34 (8.7)	.53 (13.5)	.53 (13.5)	
	Impeller Eye Area inch ² (mm ²)	7.05 (4548)	7.05 (4548)	12.60 (8129)	12.60 (8129)	3.96 (2555)	3.96 (2555)	5.92 (3819)	8.30 (5355)	28.26 (18232)	3.16 (2039)	14.20 (9161)	12.60 (8129)	14.20 (9161)	19.60 (12645)	3.32 (2142)	12.60 (8129)	12.60 (8129)	28.20 (18194)	28.20 (18194)
	Max. Impeller Diameter	7.38 (187)	7.38 (187)	7.38 (187)	7.38 (187)	8.88 (225)	9.25 (235)	9.25 (235)	9.25 (235)	9.25 (235)	11.25 (286)	11.25 (286)	11.25 (286)	11.25 (286)	11.25 (286)	13 (330)	13 (330)	13 (330)	13 (330)	13 (330)
	Tapped Openings (Vent & Drain)	1/2-14 NPT	1/2-14 NPT	3/4-14 NPT	3/4-14 NPT	1/2-14 NPT	1/2-14 NPT	1/2-14 NPT	3/4-14 NPT	3/4-14 NPT	1/2-14 NPT	1/2-14 NPT	3/4-14 NPT	3/4-14 NPT	3/4-14 NPT	1/2-14 NPT	3/4-14 NPT			
	Tapped Openings (Gage Connections)	1/2-14 NPT																		
Sleeve Diameter	At Impeller																	1.62 (41.3)		
	In Stuffing Box																	2 (50.8)		
Bearings	At Coupling End																	1.62 (41.3)		
	Between Bearings																	3.12 (79)		
	Packed Box																	2.50 (63.5)		
Stuffing Box	Radial (Pump End)	M.R.C. 310S or Equal																M.R.C. 312M or Equal		
	Thrust (Coupling End)	N.D. 45310 x 1A																M.R.C. 5313G or Equal		
Pressure Limits—Gage	Distance Between CL of Bearings	7.44 (189)																8.94 (227)		
	Distance from Impeller CL to CL Radial Bearing, Nominal	8.88 (225)								9.88 (251)	8.88 (225)	8.56 (217)	8.88 (225)	8.56 (217)	8.88 (225)	10.81 (275)				
	Bore	2.75 (69.9)																3.38 (85.7)		
	Depth	3 (76.2)																3.38 (85.7)		
Temperature Limits	Packing Size	.38 x .38 (9.5 x 9.5)																.44 x .44 (11.1 x 11.1)		
	No. of Rings	6																6		
	Width of Lantern Ring	.62 (15.9)																.62 (15.9)		
	Distance from End of Stuffing Box to First Obstruction	2.62 (66)																2.88 (73)		
Power Limits	Maximum Suction and/or Working Pressure (3735 & 3736)	REFER TO PRESSURE TEMPERATURE CURVES (SUPP. ENG. DATA SHEET)																		
	Maximum Test Pressure (3735 & 3736)	900 PSI (63 kg/cm ² or 6,200 kpa)																		
	Corrosion Allowance	.12 (3.2)																		
	Maximum Liquid Temp. w/o Cooling (3735 & 3736)	350 F (175 C)																		
	Max. Liquid Temp. w/St. Box Cooling (3735 & 3736)	500 F (260 C)																		
Flanges	Max. Liquid Temp. w/St. Box & Brg. Fr. Cooling (3735)	800 F (425 C)																		
	Max. Liquid Temp. w/St. Box & Brg. Fr. Cooling (3736)	500 F (260 C)																		
Flanges	3500 RPM	100 H.P. (75 kW)																350 H.P. (261 kW)		
	1750 RPM	50 H.P. (37 kW)																175 H.P. (131 kW)		
Flanges	ANSI Class 300 w/1/2 R.F.—STD																			
	ANSI Class 600 w/1/4 R.F.—OPT (Except 6 x 8-9)																			
	ANSI Class 300 RJF—OPT																			
	ANSI Class 600 RJF—OPT (Except 6 x 8-9)																			

SECTION VI-C.—COOLING WATER PIPING API-610



SECTION VII—TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSES & CORRECTIONS
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.
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	15, 16, 17, 29, 30, 31.
F-High bearing temperature	8, 24, 25, 26, 27.
G-Stuffing box overheating	8, 24, 25.

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 gage.
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 liq-

uid—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 II-F.
31. Improper bearing lubrication or bearings worn out—inspect and replace as required.

SECTION VIII—ORDERING OF SPARE PARTS

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.

The most desirable parts to have on hand are the following:

1. "Back Pull-Out assembly". This is a group of assembled parts which includes all parts except the casing and the coupling.
2. Stuffing box packing (106)—one set.
3. Stuffing box gland packing (107)—one set.
4. Mechanical seal (383)—one.

Order either 2 and 3 or 4 as required. With these parts on hand, pump can be easily and quickly reconditioned by replacing the worn parts.

An alternate, though not as desirable as that stated above, is to have on hand parts that are most likely to wear and which can be used as needed. See Section VI A, Parts List, for Recommended spare parts.

If it is not convenient or desirable to carry the spare parts listed in Section VI-A, the following list is suggested as a minimum for servicing the pump under ordinary conditions of wear:

- *1. Stuffing box packing (106)—one set for each

stuffing box.

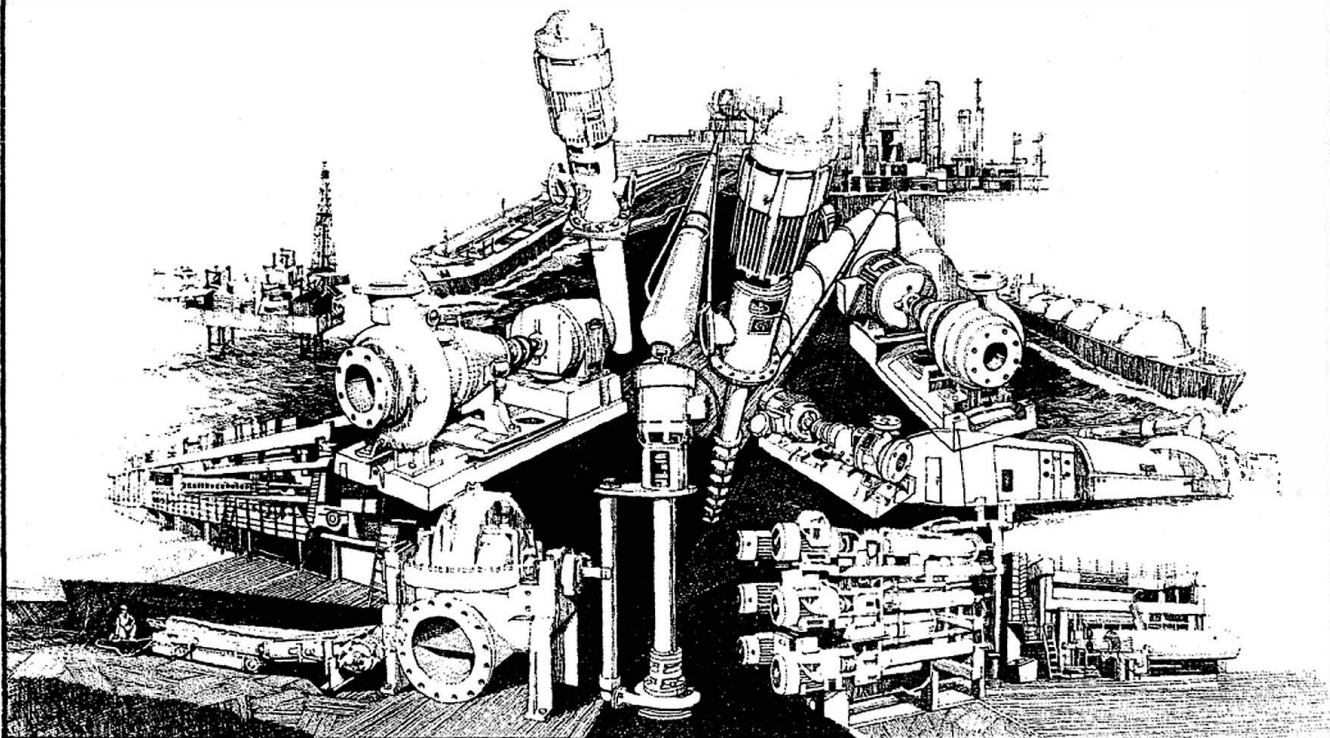
- *2. Stuffing box gland packing (107)—one set.
 - *3. Shaft sleeve (126).
 4. Ball bearings—(168A and 112A)
 5. Bearing locknut and washer (136 and 382)
 6. Gaskets
- *Required only on pumps supplied with packing.

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 No., size of the pump and serial number. These can all be obtained from the nameplate.
2. Write plainly the names, part numbers and materials of the parts required. These names and numbers should agree with those on the Sectional View in Section VI-A.
3. Give the number of parts required.
4. Give complete shipping instructions.
5. In an emergency many parts are in stock and can be shipped the same day on order is called in to the factory on your local Goulds Branch Office.

Pumps, and nothing but.



Goolds Pumps built its first pump in 1851 and has since grown to the largest manufacturer dealing exclusively with centrifugal pumps.

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 Beaumont—Beaumont, TX (713) 832-3447
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 Tulsa—Tulsa, OK (918) 622-2400
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International Sales Offices

Goolds Pumps, Inc.—Headquarters, Seneca Falls, NY (315) 568-2811 (TLX 93-7290)
 Goolds Pumps Southeast Asia Office—Singapore, Republic of Singapore 235-5715 (TLX 26126)
 Goolds Pumps European Office—Lucerne, Switzerland (041) 23-12-35 (TLX 72-452)
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 Goolds Bombas e Equipamentos LTDA—Sao Paulo, S.P. Brazil (11) 433-2911 (TLX 68233)
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 Miguel Schmidt & Cia. S.R.L.—Buenos Aires, Argentina 67-2319

Pump Service Facility

Goolds-Lecountonby Division—Newark, NJ (201) 589-2905 (TLX 138659)

Corporate Headquarters

Goolds Pumps, Inc.—Seneca Falls, NY (315) 566-2911 (TLX 63-7283)

*Stocking Warehouses



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