

# Vertical Turbine Pump with Suction Can Types VTP and VTM

## INSTRUCTIONS

- **Installation**
- **Operation**
- **Maintenance**
- **Repair**

### ***Read this entire bulletin***

before attempting to repair this pump. For installation and operation refer to instruction bulletin 2880549. Properly installed, your Peerless pump will give you satisfactory, dependable service. We urge that you carefully read these step-by-step instructions, to simplify any problems of installation, operation or repair.

Failure to read and comply with installation and operating instructions will void the responsibility of the manufacturer

and may also result in bodily injury as well as property damage.

This book is intended to be a permanent part of your pump installation and should be preserved in a convenient location for ready reference. If these instructions should become soiled, obtain a new copy from Peerless Pump. Include pump model and/or serial number with your request.

## WARRANTY

New equipment manufactured by Seller is warranted to be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment; Seller's obligation under this warranty being limited to repairing or replacing at its option any part found to its satisfaction to be so defective provided that such part is, upon request, returned to Seller's factory from which it was shipped, transportation prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operation, maintenance, installation, modification or adjustment. This warranty does not cover parts repaired outside Seller's factory without prior written approval. Seller makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture, since the same are usually covered by warranties of the respective manufacturers thereof.

In the event, notwithstanding the terms of this agreement, it is determined by a court of competent jurisdiction that an express warranty has been given by Seller to Purchaser with respect to the head, capacity or other like performance characteristics of said equipment, Seller's liability for breach of the same shall be limited to accepting return of such equipment F.O.B. plant of manufacture, refunding any amount paid thereon by Purchaser (less depreciation at the rate of 15% per year if Purchaser has used the equipment for more than thirty (30) days) and canceling any balance still owing on the equipment.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SELLER SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.



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## IMPORTANT SAFETY PRECAUTIONS

Pump parts, and the tools and rigging equipment used in installing pump, are heavy and may easily cause personal injury if dropped or carelessly handled. The normal precautions and safety rules associated with the erection of heavy machinery, in regard to manual lifting, use of power equipment, and handling of tools, must be observed in the installation of this pump.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in event of sling or hoist failure. Disregard of this warning could result in grave personal injury.

Before opening the conduit box of an electric motor, be certain that the current to the motor is shut off. An electrical shock from contact with live motor leads can be fatal.

Before attempting repairs to pump, open the disconnect switch to electric motor. This prevents accidental running of pump motor. Starting motor during pump repair activities could damage pump and may cause personal injury.

### WARNING

The pumps described by this bulletin must not be installed in any manner except as specified herein and must not be operated at temperatures or pressures exceeding those specified on the order. Fluids to be pumped, or having been pumped, be this pump should be reviewed for their effect on the specific materials of which it is constructed.

Hidden, corrosive and abrasive damage caused by pumping unsuitable fluids can accumulate and cause sudden or unexpected failure of the pump.

Violation of this warning will void the warranty and may result in serious property damage or grave personal injury.

## INTRODUCTION

### UPON RECEIPT OF PUMP EQUIPMENT:

Check carefully to see that all of the equipment has been received and is in good working condition. Report immediately any shortages or damages to the transportation company handling the shipment, noting the extent of the damage or shortage on the freight bill and bill of lading.

Do not leave the unit exposed to weather or construction hazards. The pump may become mechanically damaged or the motor and ball bearings could become wet. This pump

is a well designed and carefully manufactured unit. It should be given the same careful attention accorded to any precision machine.

The satisfactory operation of a VT pump depends to a large extent upon proper installation. These instructions cannot answer every question that may arise as each installation will be different. *The installer and the operator of this equipment must use good sound judgment to adapt these procedures to his installation.*

## PUMP TYPES

Since this manual covers several variations in pump construction, it is recommended that the operator mark the paragraphs and figure numbers which pertain to the construction of the pumps furnished.

Peerless Pump VT pumps are furnished in two types,

depending upon the manner of shaft sealing specified.

Type VTP pumps are furnished with PACKED sealing using an graphited synthetic packing.

Type VTM pump are furnished with MECHANICAL SEALS using a single bellows type replaceable seal.

## INSTALLATION

### NOTE

**Location:** The pump should be installed in a clean, well-drained and ventilated location; be accessible to inspection and proper care; and be convenient for short, direct suction piping. Ample head room should be provided for a hoist or tackle.

**FLOOR MOUNTING:** A raised concrete foundation may be provided for convenience of elevation but it is not required if the floor is level. Provide expansion type bolts in the floor (see Figure 1) so the unit can be properly

secured to assure a permanent installation. If a concrete foundation is provided, it should be solid and rigid to support the complete unit without deflection or vibration.

**SOUND ISOLATION:** Where exceptionally quiet operation is essential or if the floor and building construction is resonant, it may be advisable to employ a series of sound isolation dampeners. Sound dampeners should normally be used in conjunction with flexible pipe connectors in both suction and discharge lines.

**CAUTION** Make certain that the pump assembly piping strains which may cause misalignment, resulting in a possible binding of the rotating element. *Avoid springing the piping into line and use caution when tightening the connections.* Provide a suitable means (other than the pump) to support the weight of the suction and discharge piping. Excessive weight may cause the pump components to break or wear. *It is important, particularly in new pipe lines, that the piping is properly cleaned of all foreign material such as pebbles, cinders, nail, wrenches, cement, rags, etc., otherwise the impellers may clog and damage will result.*

**PIPING:** The suction piping should not be smaller than the inlet connection of the pump.

The piping should be arranged to avoid an excessive number of elbows, tees and other fittings. Avoid pockets and loops in the suction line.

Provide gate valves close to the pump suction and discharge to permit repairs of the pump when necessary. A check valve should be installed on the discharge side of the pump.

**WARNING** Before making electrical connections to the control panel, be certain that the power supply is turned off and that the disconnect switch is open. Disregard of this warning could result in fatal shock.

**WIRING AND CONTROLS:** Always provide a fused disconnect switch on the power line and a suitable device for motor overload protection. When wiring, *be sure that current characteristics are identical to those marked on the motor nameplate.* Motors may be of the dual voltage type and care should be taken in selecting the proper motor leads for the voltages used.

Wire temperature switch and thermal safety valve in series to 115 volt power source.

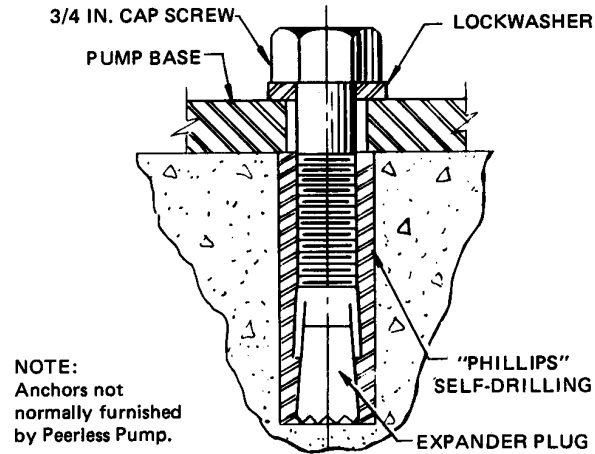


Figure 1. Anchor Bolt Detail (Expansion Type)

**OPERATION**

**WARNING** Peerless Pump VT pumps must be wired for the proper rotation. Running the motor in reverse may disengage the pump shaft from the motor and cause severe equipment damage or personal injury.

**BEFORE STARTING THE PUMP:**

1. *Make sure the motor is lubricated.* Small motors have grease lubricated bearings; larger motors have oil lubricated upper thrust bearings. *Proper oil must be added to the oil chamber per grade and amount shown on the motor nameplate.*
2. Check that the voltage and frequency on the motor nameplate match the current supply.
3. Make temporary wiring connections to the motor. *Be sure the motor is wired for correct voltage.*
4. Check that all thermal overload relays are of the proper size and "set" for operation.
5. Refer to Figure 2. Unscrew the motor drip cover cap screws and remove the cover.
6. Unscrew the two top shaft nut locking screws and remove top shaft nut, top drive coupling and gib key from shaft.
7. Momentarily energize the motor to check that the motor rotor rotates counterclockwise (looking down on motor) as shown by the arrow on the discharge head. Do not allow the motor to run for any length of time. If the rotation is incorrect, and the motor is 3 phase, interchange any 2 of the 3 motor power leads at the motor. If the motor is single-phase, directions for reversing rotation are

given on the nameplate, or request motor manufacturer's instructions to change the rotation. Mark the leads to indicate the correct connections.

8. Make the final electrical connections to the motor, using the lead markings previously designated to ensure correct directions of rotation. If there is any doubt, recheck the rotation **MOMENTARILY**. All connections must be insulated in accordance with the local electrical code.

9. Install the top drive coupling over the top shaft, the holes in the bottom of the coupling engaging the drive pins protruding from the rotor hub or ratchet coupling. Align the keyways in the shaft and in the coupling, and insert the gib key (see Fig. 2). Install the cap screws holding the top drive coupling to the rotor hub or ratchet coupling.

10. Close the suction valve. Push the end of the top shaft down firmly.

11. Screw the top shaft nut onto the shaft by hand until it just touches the motor coupling. Measure the distance from the top of the top nut to the top of the top shaft. Tighten the top nut with a wrench, while holding the top shaft from turning, until the measured distance is 1/8 to 1/64 inch greater than the initial distance. This sets the impellers 1/8 inch from the bottom of the bowls for running clearance and sets the seal compression on VTM pumps. Replace the locking screws in the top shaft nut. The nut may have to be turned slightly for the locking screws to be screwed into the top drive coupling. Turn the top shaft by hand to see that it rotates freely.

12. Tighten the locking screws and replace the motor cover.

**WARNING** Be sure to replace and tighten the top shaft nut locking screws. Failure to secure the top shaft nut will cause severe mechanical damage to pump and motor and may result in fatal personal injury.

13. Close the discharge valve. Flood the can by opening the suction valve and let the entrapped air escape through the breather vent on the seal flange (602), Figure 8 (mechanical seal pumps), or by loosening the compression fitting nut on the lower end of by-pass line on packed type pumps, Figure 8.

14. *Slowly open the discharge valve.* Turn on power supply.

#### AFTER STARTING THE PUMP:

1. Check the pump for evidences of rubbing or binding which may have been caused by piping strains (see "CAUTION", p. 2).

2. See that all pipe connections are tight and that the check valve in discharge line is functioning.

3. Check the packing carefully, allowing a slight leakage for lubrication. Never force the packing into a leak-proof position since this will create excessive friction and premature damage to the packing and the shaft. Maximum packing life can be expected when the leakage approximates a minimum of 40-60 drops per minute. A reduction of leakage considerable reduces the life of both the packing and shaft.

If leakage is excessive, tighten the gland bolts evenly, about 1/6 of a turn at a time. Do not be confused if the leakage seems to increase after an adjustment of the packing has been made. The leakage will normally reduce after a period of time as the packing adjusts itself to the new position. It should be kept in mind that it takes time for newly installed packing to "run-in" and that during this initial period, frequent attention and adjustments are necessary. It sometimes takes several days to achieve the desired results.

#### IF PUMP AND MOTOR FAIL TO START:

1. Check for blown fuses or a tripped thermal overload relay.

2. Shaft may be stuck or binding due to rubbing of clogged impeller or other mechanical defect. Impellers could have been set incorrectly and may be either too high or too low in the bowl. (See section on OPERATION, Note 11. for proper adjustment.) On VTP (packed) pump, the packing glands may be screwed down too tight, thus binding the shaft.

3. Starter contacts may be corroded, shorted, or terminal connections may be broken somewhere in the circuit.

4. The wiring hookup or voltage provided may be incorrect or switches may not be "set" for operation.

#### IF INSUFFICIENT OR NO WATER IS DELIVERED:

1. Pump may not be primed.

2. The speed may be too slow. Check for low voltage.

3. The required discharge pressure may be higher than anticipated.

4. Suction pressure may be lower than anticipated.

4. On VTM (Mechanical Seal) pumps, make certain that pump is still primed and that seal is still flooded by opening

breather vent (602) (Fig. 8). Water should spray immediately from breather to indicate good seal water supply.

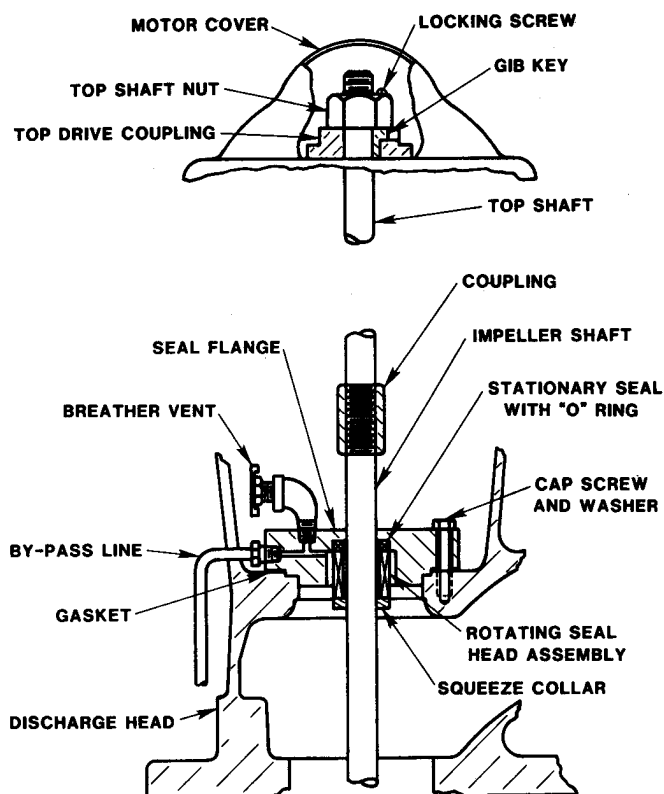


Figure 2. Type VTM (Mechanical Seal) Seal Assembly

### LOCATING TROUBLE

5. The impeller may be clogged or damaged.

6. Wrong rotation. Check direction of shaft rotation with arrow on the discharge head.

7. The suction or discharge lines may be clogged or valves in lines may not be fully open.

8. Impellers may be incorrectly set. (See section on OPERATION, Note 11. for proper adjustment.)

#### IF PUMP LOSES SUCTION OR PRIME:

1. The suction line may be leaking.

2. The suction pressure may be too low.

3. The pumped liquid may contain air or gas.

#### IF PUMP VIBRATES OR IS NOISY:

1. The foundation may be insufficient or not secure.

2. The impellers may be partially clogged causing an unbalanced condition.

3. Mechanical defects may be evident, such as a bent shaft, rotating element binding or worn bearings.

4. Suction or discharge pipes may not be anchored sufficiently.

5. The pump may be vapor bound – not fully primed.

**WARNING** Before starting any repairs requiring dismantling of the pump, open the disconnect

switch to cut off power to the motor. Temporarily secure the switch so it cannot be closed. Attach note, "Do not close switch – pump repair in process." Starting the motor during repair of the unit could cause material damage and personal injury.

**WARNING** Repair of some parts requires the use of power lifting equipment. Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in the event of a sling or hoist failure. Disregard of this warning could result in grave personal injury.

On VTP (packed) pump, see that leakage from the packing gland (17) approximates 40-60 drops per minute.

## SHAFT SEAL REPLACEMENT

### TYPE VTP (PACKED PUMPS): (See Figure 8)

1. Disconnect electrical power.
  2. Close the suction and discharge valves and remove drain plug (Figure 8) from can assembly (315).
  3. Loosen the nuts and remove packing gland.
  4. Remove all the old packing.
- Note:** Inspect the shaft in the packing box area to see if it is worn or grooved. If the area is not smooth, the shaft should be replaced. Do not repack a pump if the shaft is damaged in the packing area.
5. Fill the packing box with packing rings, allowing the packing gland to enter the bore of the box. When installing, stagger the joints of each ring as placed and be sure they enter the box square with the shaft. This can be accomplished by using the gland and/or a split bushing as each individual ring is inserted.
  6. When all packing is in place, position the gland and firmly seat on the packing to help form around the shaft. Then back off the gland until free from the packing.

**CAUTION** Be sure at all times that the gland enters the box square to the shaft so that uniform pressure is exerted around the packing – a tipped gland can cause excessive leakage, shaft wear and premature packing failure.

7. Start the pump and allow the packing to "breathe" into position. If leakage is excessive, tighten the gland by turning the gland nuts alternately, approximately 1/6 to 1/4 turn at a time. Control the leakage slowly. Allow the packing to seat itself after each increment of adjustment, even if it takes readjustment over a period of several days to get proper control. If, after adjustment, the leakage seems greater than before, do not continue tightening the gland. This is often a natural phenomenon and when the packing has a chance to reposition itself, the leakage will decrease.

### TYPE VTM (MECHANICAL SEAL PUMP) (See Figure 8)

1. Disconnect electrical power.

2. Follow steps 2 through 6 in the pump disassembly instructions (p. 5).

ON VTM (mechanical seal) pump, quickly open and close the breather vent (602) to insure that the seal is still flooded.

**FREEZING:** Where the pump is installed in an unheated location, precaution must be taken to protect the pump and pipe lines from freezing. If the unit is to remain idle for long periods during cold weather, the pump must be drained by removing the drain plug in the bottom of the can assembly (315). Drainage can be improved by opening a pipe fitting on the bypass line (VTP pumps) or opening the breather vent (VTM pumps).

**LUBRICATION:** The pump requires no lubrication except when reassembling the pump. For proper motor lubrication, request specific motor manufacturer's instructions.

3. Follow steps 9 and 11 in the disassembly instructions.
4. Clean and polish the impeller shaft above the squeeze collar. The shaft must be free of nicks or burrs to avoid damage to the seal.
5. Wrap 0.001-inch shim stock or Teflon tape around the threads on the shaft to prevent damaging the new seal. Lubricate the shaft with Molycote R, 3% detergent solution, mild soap solution, glycerin or ethylene glycol.
6. Slide the seal down the shaft until it sets squarely on the squeeze collar.
7. The replacement seal is factory shipped correctly assembled. Do not disassemble the seal except to separate the

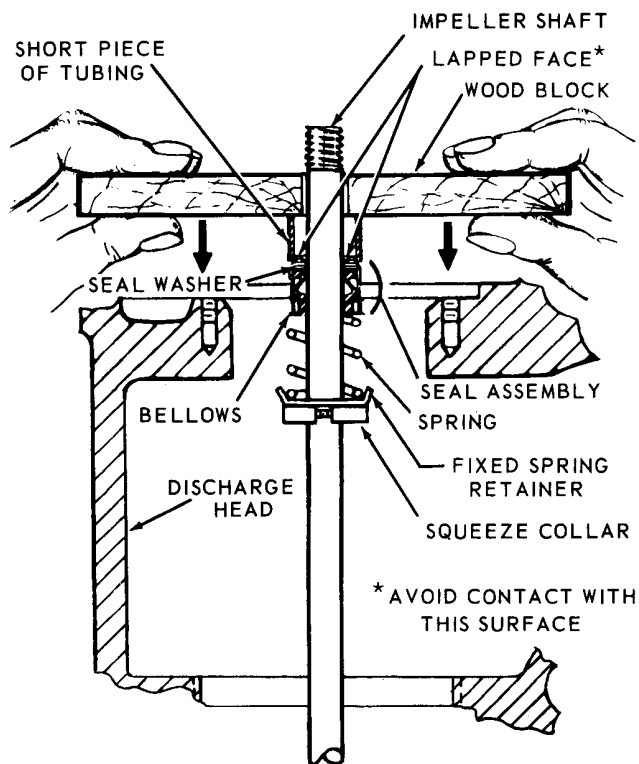


Figure 3. Seal Insertion for VTM (Mechanical Seal) Pumps

stationary seal with o-ring from the remaining seal assembly. Do not discard the cardboard separator. Place the new rotating seal head assembly over the shaft and slide down on the spring. If it is not possible to press the seal assembly on with the fingers, a short length of tubing slightly larger than the diameter of the face of the sealing washer may be used to apply leverage (see Figure 3). Be careful that the tubing does not come in contact with the face of the seal.

8. Remove the old stationary seal from the seal flange and wipe out the stationary seal cavity with a clean cloth. Apply Molykote®, 3% detergent solution, mild soap solution, glycerin, or ethylene glycol to the outer surface of the new stationary seal and push it into the seal cavity, seating it firmly and squarely. If it is not possible to do

this by hand, place the cardboard shipping disc over the face of the stationary seal to prevent marring the lapped face of the seat, and press into place.

9. Wipe the lapped faces of the seal washer and the stationary seal with clean soft cloth, *being careful not to scratch or mar the lapped surfaces* (use *clean* fingers). Lower the seal flange with gasket over the shaft and onto the discharge head. Finger tighten the four seal flange cap screws and then tighten them further by turning down all screws evenly.

10. Follow pump reassembly instructions (p. 8), steps 24 and 26 through 31. No leakage should occur with the mechanical seal.

## PUMP DISASSEMBLY

**WARNING** Before starting any repairs requiring dismantling of the unit, open the disconnect switch to cut off power to the motor. Temporarily secure the switch so it cannot be closed. Attach note “Do not close switch – pump repair in process.” Starting the motor during removal of the pump could cause material damage and personal injury.

**WARNING** Repair of some pump parts requires the lifting equipment. Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in the event of a sling or hoist failure. Disregard of this warning could result in grave personal injury.

**WARNING** Before working on electrical equipment power to the electrical control panel is disconnected. Failure to do this may result in a fatal electrical shock.

1. Shut off the electrical power to the motor. *Lock open or temporarily disable the disconnect switch.* Disconnect and tag the motor leads to maintain proper phasing on reassembly.
2. Close the suction and discharge valves and remove the drain plug (Figure 8) from the can assembly (315).
3. Remove the cover on the motor.
4. Remove the locking screws. Take off the top nut (66), gib key and the top drive coupling.
5. Remove the top shaft (10) from the shaft coupling (70) by holding the coupling and turning the top shaft clockwise with pipe wrenches. Be careful not to bend the shaft.
6. Slide the top shaft slowly out the top of the motor, being careful not to bind or bend shaft. If the shaft is nicked or marred, it may have to be removed with the motor.
7. Remove the motor cap screws and motor.
8. If there is sufficient head room to remove the pump from the can assembly (315), unscrew the discharge head screws and bolts on the discharge flange and lift the pump assembly out of the can (315). If head room is not sufficient for this, remove the bolts from the suction flange and base of the can, and move the entire pump and can assembly to a suitable work area.

9. Unscrew shaft coupling (70) from the impeller shaft (6). As thread is left hand, turn clockwise to loosen.

10. VTP only: Remove the rubber deflector ring (40) packing gland (17) and packing (13). Disconnect and remove seal piping. Remove packing container (83) and gasket (73).

11. VTM only: Remove the four seal flange cap screws and lock washers and lift off the seal flange (603) with gasket (73) and stationary seal with o-rings intact. Carefully pull out the rotating seal head assembly.

12. Unbolt or unscrew the discharge head from the bowl assembly and remove the shaft squeeze collar (604) from the shaft above the top bowl (VTM pump only).

13. Unscrew the plug in the bottom of the suction manifold (55). Unscrew or unbolt the suction manifold from the bowl assembly. Chain tongs should be used for threaded manifolds.

14. Check the impeller shaft (6) near the impeller (2) for a scribe mark (see Figure 6). If the original scribe mark does not appear on the impeller shaft in the same plane as the lower face of the impeller skirt, scribe the shaft at this point. On reassembly, it is important that the impellers be remounted in the same position on the shaft as in the initial installation.

15. Tap the impeller taper lock bushing (Figure 6) out of the bottom impeller with a beater. The use of a beater to install a bushing is shown in Figure 4. Remove the impeller from the shaft.

**Note:** A beater can be ordered from Peerless Pump. If this is inconvenient, a makeshift beater can be made from a short heavy piece of pipe with an ID slightly larger than the shaft diameter. The OD should be turned down a small distance so that it will fit inside the small end of the impeller bore.

16. Spread the taper lock bushing with a screwdriver and slide it from the shaft. Unscrew or unbolt the bottom bowl (Figure 5) to remove.

**Note:** Steps 15 and 16 are repeated until every bowl and impeller have been removed from the shaft.

## INSPECTION

1. Before the pump is reassembled, make sure the shafts are straight. Lateral bowl wear rings (601), all bearings, shafts (6) (10) and impellers (2) should be checked for excessive wear. Refer to Table I for proper bearing to shaft, and wear ring to impeller clearances. If these clearance tolerances are exceeded, the parts should be replaced.

2. Check the shaft (6) for nicks and scratches especially around the packing or seal area, and remove them with a fine emery cloth.  
3. Packing and/or mechanical seals should be replaced when rebuilding pumps.

## REASSEMBLY

1. Support the impeller shaft on a set of wood V blocks on a table or on the floor. Find the scribe mark on the shaft which locates the bottom impeller. If the shaft does not have a scribe mark, Table I may be used to locate the scribe mark (A).

2. Place a taper lock bushing (311), large end first, and then an impeller (2), large end first, onto the lower end (Figure 6) of the impeller shaft (6). Slide the impeller past the scribe mark and then back again until the impeller skirt face is in the same plane as the scribe mark. Hold the impeller in place while gently tapping the taper lock bushing into the impeller bore until snug. (See Figure 4).

3. Slowly slide the suction manifold (55), flange end first, up the shaft until it seats on the impeller. Insert a cap screw (5/8-11 UNC x 2) and a 5/8-inch washer (1/4-inch thick, at least 1-3/4-inch OD) into the bottom of the shaft and screw in only until snug (see Figure 5). Use a beater (as described in disassembly), sliding it up and down the shaft to drive the taper lock bushing tightly into the impeller bore. Remove the suction manifold and check to insure that the impeller is still even with the scribe mark. Replace the suction manifold, this time tightening the 5/8 cap screw.

4. Coat the upper face of the suction manifold flange (55) (threads on screw type) with lubricant.

5. Place the bottom bowl (310) on the shaft, female end first, using care not to damage the shaft threads.

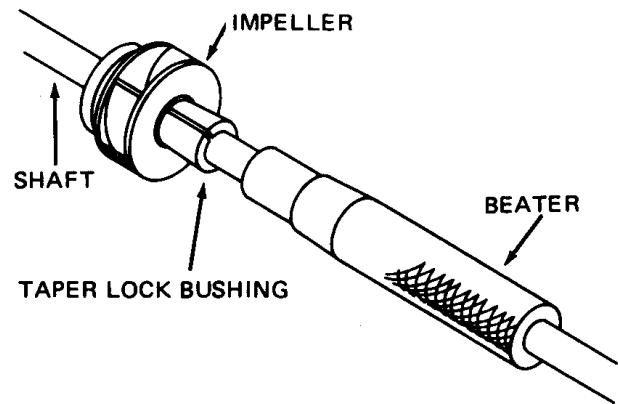


Figure 4 Installing Taper Lock Bushings

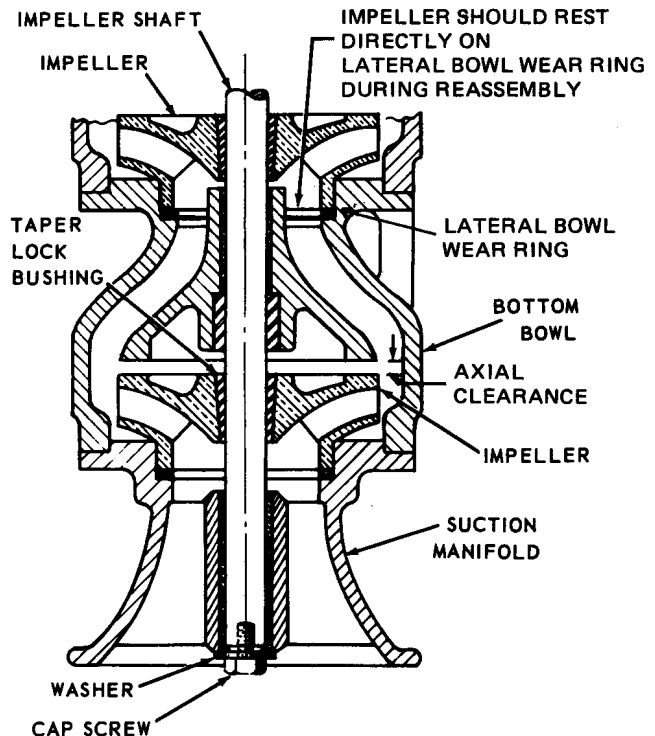


Figure 5. Reassembly Detail

Table I. Assembly Dimensions and Clearances

Bowl Design No.	Suction	A	B	C		D	
				min	max	min	max
6LB	bell	3.38	9/32	.007	.011	.005	.010
7LB	bell	7.00	5/16	.010	.015	.005	.011
8LB	bell	4.38	9/32	.008	.012	.005	.011

All dimensions are inches

A. The distance from the lower face of the bottom impeller to the end of the shaft.

B. Minimum axial impeller clearance.

C. The diametrical clearance between the impeller skirt and bowl side seal.

D. The diametrical clearance between shaft and bearings.

6. Threaded bowls should be tightened in the suction manifold with chain tongs until the manifold flange butts tightly against the bowl.



7. Non-threaded bowls should have cap screws inserted in the suction manifold flange and tightened securely.
8. Slip the next impeller and taper lock bushing on the shaft. Seat the impeller on the previously assembled bowl and drive the bushing into the impeller bore. The remaining impellers and bowls should be assembled in the same manner. Make sure that each joint is coated and tightened until the bowl flanges butt together.
9. After all the bowls are assembled, remove the screw and washer from the bottom of the shaft. Pack the bottom of the suction manifold hub with waterproof grease and install plug.
10. Mount the discharge head (304) on the bowl assembly and bolt or screw the top bowl tightly to the head.

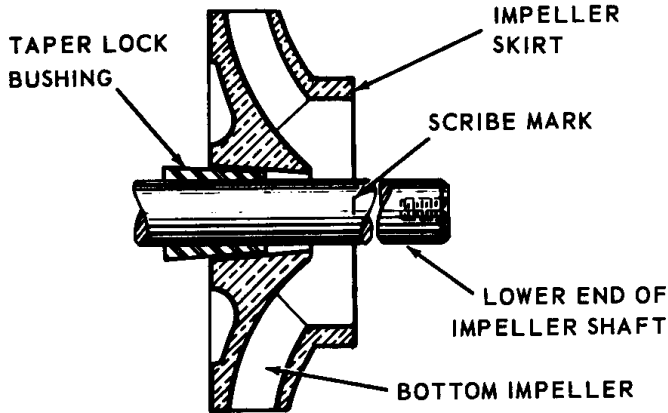


Figure 6. Location of Impeller

11. Put the gasket (73A) on top of the can assembly (315) and lower the bowl units into the can until the discharge head assembly rests on the can. Bolt the discharge head to the can, making sure the suction and discharge flanges are facing in the correct relative directions.
12. VTM only: Slide the squeeze collar (604) on the shaft and down until the top of the collar is  $9/32 \pm 1/64$  inches from the seal flange seat on the discharge head (304) (see Figure 7) and securely tighten in position. This dimension is critical and is necessary for the proper seal compression.

**Note:** It may be necessary to grind short arm of the hexagon key wrench, making arm shorter to reach socket head cap screw for locking squeeze collar in position.

13. VTM only: Clean polish the impeller shaft above the squeeze collar. The shaft must be free of nicks or burrs to avoid damage to the seal.
14. VTM only: Wrap 0.001-inch shim stock or Teflon tape around the threads on the shaft to prevent damaging the new seal. Lubricate the shaft with Molykote®, 3% detergent solution, mild soap solution, glycerin or ethylene glycol.
15. VTM only: Slide the seal down the shaft until it sets squarely on the squeeze collar.

16. VTM only: The replacement seal is factory shipped correctly assembled. Do not disassemble the seal except to separate the stationary seal with o-ring from the remaining

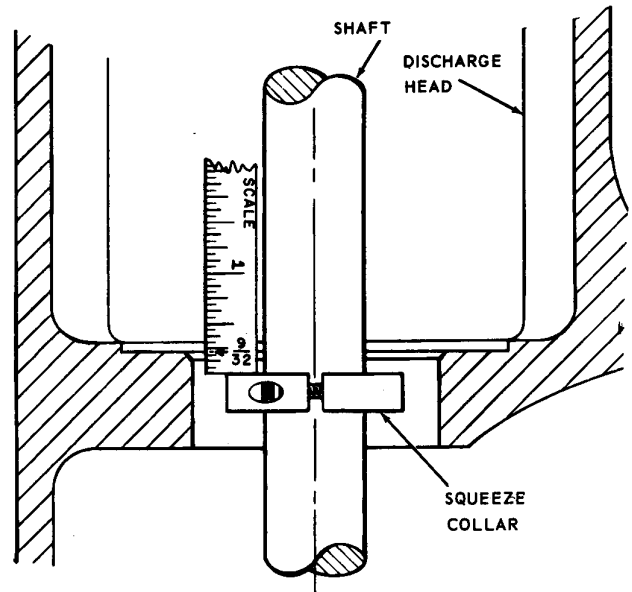


Figure 7. Location of Squeeze Collar

seal assembly. Do not discard the cardboard separator. Place the new rotting seal head assembly over the shaft and slide down on the spring. If it is not possible to press the seal assembly on with the fingers, a short length of tubing slightly larger than the diameter of the face of the sealing washer may be used to apply leverage (see Figure 3). Be careful that the tubing does not come in contact with the face of the seal.

17. VTM only: Remove the old stationary seal from the seal flange and wipe out the stationary seal cavity with a clean cloth. Apply Molykote®, 3% detergent solution, mild soap solution, glycerin or ethylene glycol to the outer surface of the new stationary seal and push it into the seal cavity, seating it firmly and squarely. If it is not possible to do this by hand, place the cardboard shipping disc over the face of the stationary seal to prevent marring the lapped face of the seat, and press into place.

18. VTM only: Wipe the lapped faces of the seal washer and the stationary seal with clean soft cloth, *being careful not to scratch or mar the lapped surfaces* (use clean fingers). Lower the seal flange with gasket over the shaft and onto the discharge head. Finger tighten the four seal flange cap screws and then tighten them further by turning down all screws evenly.

19. VTP only: Place the packing container (83) with gasket (73), small end first, over the shaft and slide down until the packing container flange rests on the discharge head. Bolt in place.

20. VTP only: Fill the packing box with packing rings, allowing the packing gland to enter the bore of the box. When installing, stagger the joints of each ring as placed and be sure they enter the box square with the shaft. This can be accomplished by using the gland and/or a split bushing as each individual ring is inserted.

21. VTP only: When all packing is in place, position the gland and firmly seat on the packing to help form around the shaft. Then back off the gland until free from the packing.

**Caution**

Be sure at all times that the gland enters the box square to the shaft so that uniform pressure is exerted around the packing – a tipped gland can cause excessive leakage, shaft wear and premature packing failure.

22. VTP only: (AFTER STARTING THE PUMP) Check the packing carefully, allowing a slight leakage for lubrication. Never force the packing into a leak-proof position, since this will create excessive friction and premature damage to the packing and the shaft or shaft sleeve. Maximum packing life can be expected when the leakage approximates a minimum of 40-60 drops per minute. A reduction of leakage considerably reduces the life of both the packing and shaft. If leakage is excessive, tighten the gland bolts evenly, about 1/6 of a turn at a time. Do not be confused if the leakage seems to increase after an adjustment of the packing has been made. The leakage will normally reduce after a period of time as the packing adjusts itself to its new position. It should be kept in mind that it takes time for newly installed packing to “run-in” and that during this initial period, frequent attention and adjustments are necessary. It sometimes takes several days to achieve the desired results.

23. VTP only: Stretch the rubber deflector ring (40) over the end of the shaft and slide down until clear of the shaft threads.

24. Install the shaft coupling (70), LH thread, on the impeller shaft.

25. Carefully lower the motor down on the discharge head assembly and bolt in place. Rewire the motor and start it only for an instant to insure that it runs in a direction which would tend to tighten the left hand threaded shaft

coupling. (Counter clockwise from the top.) If not, and the motor is 3 phase, reverse any two of the motor leads. If the motor is single-phase, directions for reversing rotation are given on the nameplate or request motor manufacturer's instructions to change the rotation.

26. Lower the top shaft (10) slowly down through the motor and install tightly into the shaft coupling (Left Hand thread.) Extreme care should be taken when lowering top shaft through motor, as 3600 RPM motors are furnished with a close tolerance steady bushing on the lower end of motor (Figure 8).

27. Install the top drive coupling over the top shaft, the holes in the bottom of the coupling engaging the drive pins protruding from the rotor hub or ratchet coupling. Align the keyways in the shaft and in the coupling, and insert the gib key (see Figure 2). Install the cap screws holding the top drive coupling to the rotor hub or ratchet coupling. Screw the top nut (66) by hand onto the top shaft until snug against the motor coupling.

28. Measure the distance from the top of the top nut to the top of the top shaft. Tighten the top nut with a wrench, while holding the top shaft from turning, until the measured distance is  $1/8 \pm 1/64$  inch greater than the initial distance. This sets the impellers 1/8 inch from the bottom of the bowls for running clearance and sets the seal compression on VTM pumps. Replace the locking screws in the top shaft nut. The nut may have to be turned slightly for the locking screws to be screwed into the top drive coupling. Turn the shaft by hand to see that it rotates freely.

29. Replace locking screws, motor cover and drain plug.

30. Connect pipelines and motor power leads.

31. Follow “operation” instructions to check out pump.

## VERTICAL CANNED TURBINE PUMPS

### Types VTM, VTP

#### PUMP PARTS LIST

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
2	Impeller	66	Top Shaft Nut
6	Impeller Shaft	70	Shaft Coupling
10	Top Shaft	73	Packing Container or Mech. Seal Flange Gasket
13	Packing		
15	Top Bowl	73A	Head to Can Gasket
17	Split Gland	83	Packing Container
39A	Top Bowl Bearing	304	Discharge Head
39B	Top Bowl Bearing	310	Standard Bowl
39C	Std. Bowl Bearing	311	Taper lock Bushings (Collets)
39D	Std. Bowl Bearing	315	Suction Can
39E	Suction Bell Brg.	601	Lateral Bowl Wear Ring
39F	Suction Bell Brg.	602	Vent Valve
40	Top Shaft Seal Ring	603	Mech. Seal Flange
55	Suction Bell	604	Shaft Collar
63	Pkg. Container Brg.	605	Gland Bolts
64	Sand Collar	606	Gland Bolt Nuts
65-80	Mechanical Seal	607	Gland Clamp
		608	Pkg. Container Washer

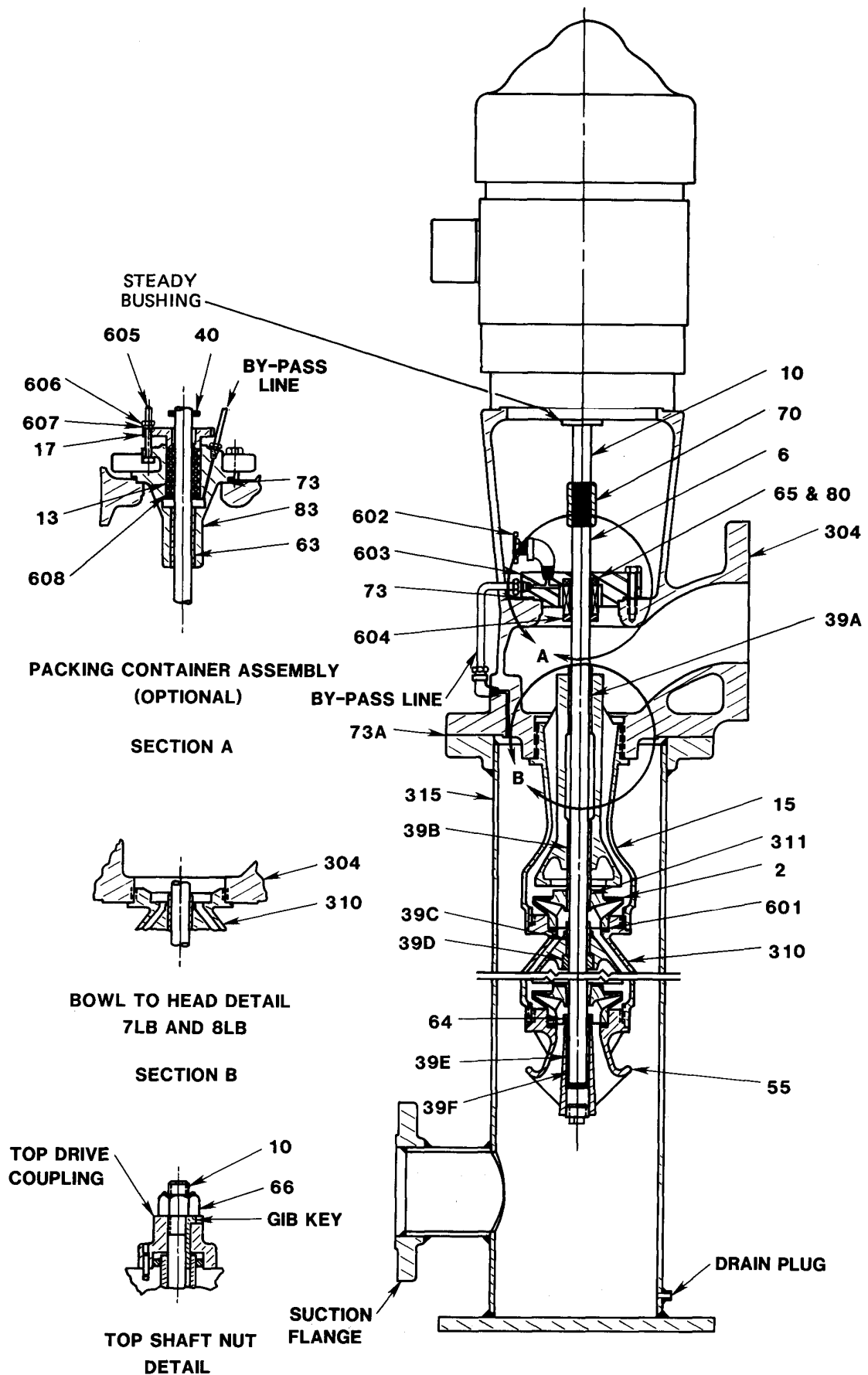


Figure 8 Pump Cross Section



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