

# INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

## Ranger 48 Series Pump



489P, 489M

### RANGER INC.

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#### **WARNING**

**DO NOT DISCARD THIS MANUAL**

SEE WARNING ON OPPOSITE

PAGE & BACK COVER

# **WARNING**

## **DO NOT DISCARD THIS MANUAL**

READ INSTALLATION, OPERATION,  
AND MAINTENANCE MANUAL  
BEFORE INSTALLING, PERFORMING  
MAINTENANCE, OR OPERATING A  
RANGER PUMP.

ATTACH THIS MANUAL TO THE  
PUMP IF YOU ARE INSTALLING  
THE PUMP, BUT WILL NOT BE  
THE OPERATOR.

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## Section A INTRODUCTION

**CONGRATULATIONS!** You have purchased a quality built RANGER pump. This pump was built to very close tolerances to ensure long, dependable service.

This manual is designed to provide you with installation, maintenance and operating instructions.

Read and understand this entire manual before removing pump from box and installing.

Immediately inspect your pump for damage and report any damage to your freight carrier before he leaves. After reporting damage fill out a detailed report including value, quantity, and description of damaged or lost items to your carrier.

Ranger, Inc. is not responsible for damaged or items lost during shipments. We ship F.O.B. point of manufacture unless otherwise agreed upon in writing.

## Section B WARRANTY

**One Year Limited Warranty.** Seller's products are warranted against defects in material or workmanship for a period of one (1) year from the date of shipment, except as hereinafter stated. Seller is not liable for any consequential damages caused by defects in materials or workmanship. Seller's obligation under this warranty is limited to the replacement without charge, F.O.B. factory, of the parts or part which, upon Seller's examination, prove to Seller's satisfaction to have been defective, and which have not been abused or carelessly handled by Buyer or Buyer's customer. Buyer must give immediate written notice upon delivery of defect. Goods must be returned to factory for Seller's inspection, freight prepaid. Where Seller finds goods to have been defective, freight charges will be refunded to Buyer or credited to Buyer's account. **SELLER MAKES NO OTHER WARRANTY EXPRESS OR IMPLIED, INCLUDING WARRANTIES OR MERCHANTABILITY AND/OR FITNESS FOR PARTICULAR PURPOSE.**

## Section C

### MAXIMUM PUMP RATING

125 psi (862 Kpa) maximum inlet and discharge pressure.

750 RPM maximum. (See speed vs. viscosity curve for maximum R.P.M.)

212° F (100° C) maximum temperature for Buna-N mechanical seal.

\* 400° F (205° C) maximum temperature for Viton mechanical seal.

350° F (177° C) maximum temperature for standard packing.

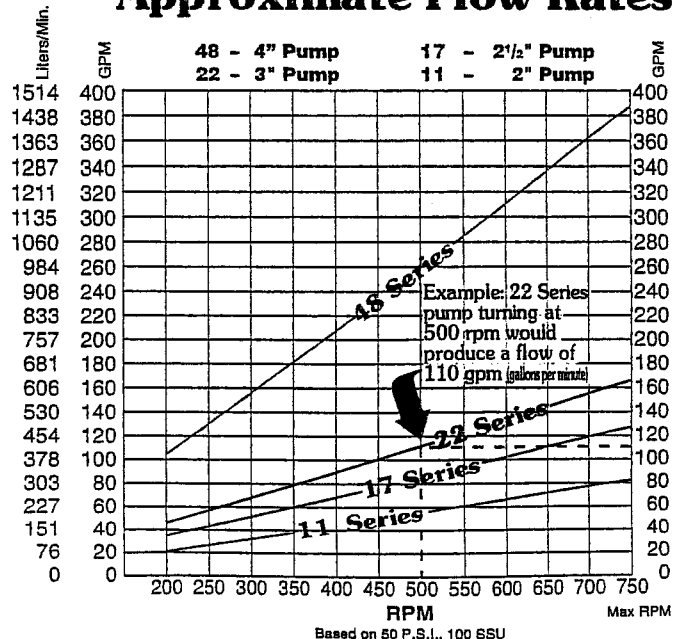
\* 450° F (260° C) maximum temperature for graphite TFE packing.

\* 450° F (345° C) maximum temperature for carbon graphite packing.

\* Consult Ranger for any application over 350° F (177° C).

**WARNING: Never operate Ranger Pumps over 450° F**

## Approximate Flow Rates



## Section D SAFETY INFORMATION



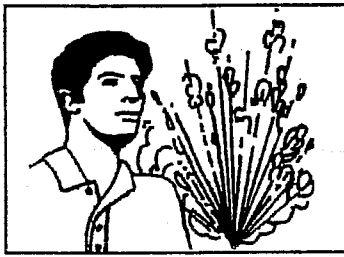
**PLEASE READ ALL INSTRUCTIONS AND SAFETY INFORMATION IN THIS MANUAL.**

**WARNING:** Never operate this pump without installing belt, guards and /or coupling guards. Always use extreme caution when working near rotating parts when pump is running.

**WARNING:** Always lock out the pump driver (electric motor, gas or diesel engine, etc.) before starting to work on or disassemble pump.

**WARNING:** Why should you NEVER adjust packing when the pump is running? It is for your own safety. Operators have been injured and loss of life could occur by letting loose clothing get caught by the pump driver. NEVER work on a pump when the pump is running or is not locked out.

**WARNING:** Safe installation, operation and maintenance requires proper training of all personnel and their managers.



**WARNING:** High pressure leaks could cause injury. Never operate this pump beyond a maximum 125 PSI. The operator must know the **DESIGNED SYSTEM PRESSURE** and should NEVER exceed this. This pressure is **USUALLY LESS** than maximum pump pressure of 125 PSI. Always make sure that all components are rated for system pressure.

**WARNING:** Always install an external relief valve for safety reasons.

Internal relief is designed for emergency use only, and should not be used longer than one minute intervals.

**WARNING:** Use caution when pumping **HIGH TEMPERATURE LIQUIDS**. This could cause burns if the operator comes in contact with equipment or leaking fluids.

**WARNING:** Never operate this pump beyond 750 RPM. There are many factors that must be considered before setting system RPM, PSI and temperature. All of these must be considered by a qualified design person.

**WARNING:** The owner, contractor and user is responsible to comply with all OSHA, state and local laws.

**WARNING:** Always use extreme care when pumping hazardous or volatile liquids. Shut pump down immediately if a leak occurs. Clean up leaks and spills immediately using proper safety equipment.

**WARNING:** Never try to dislodge material in pump by poking any object into a suction or pressure port unless pump driver has been disconnected and proper safety equipment is being worn and used.



**WARNING:** Never operate this pump while under the influence of drugs and /or intoxicants.

**WARNING:** Always use proper safety equipment, goggles and gloves for protection.

**WARNING:** Always practice safe working habits.

**WARNING:** Check proper rotation of drive shaft and gears before starting pump.

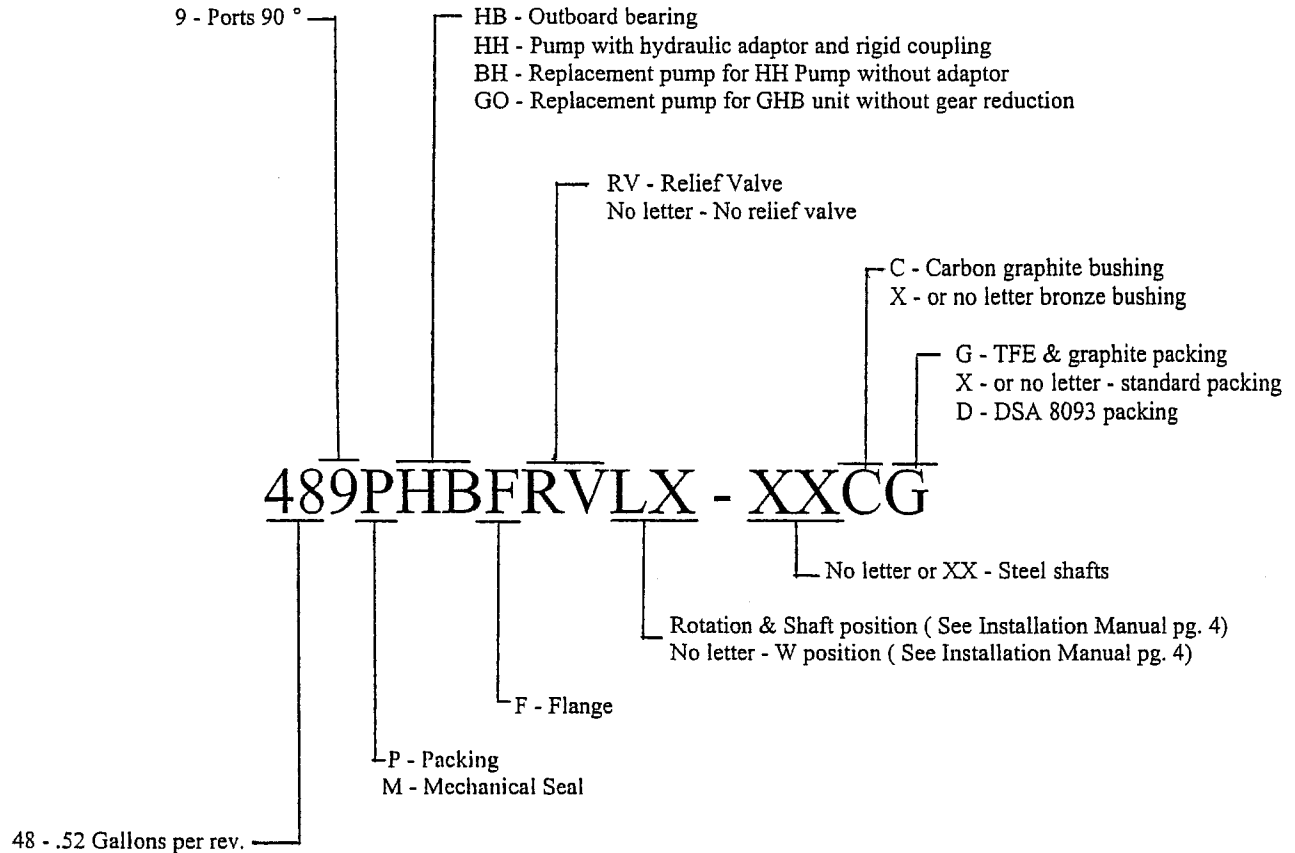
**WARNING:** Make sure that the relief valve end plate is in the proper position in reference to drive shaft rotation and discharge side of pump. Please see page 4 for further information.

## Section E

### PUMP IDENTIFICATION

Ranger, Inc. uses four (4) ways to identify our pumps. **MODEL NUMBER**, **SPEC NUMBER**, **TYPE** and **SERIAL NUMBER**. Each pump has an identification plate containing the above information with the exception of some pumps do not require a spec number.

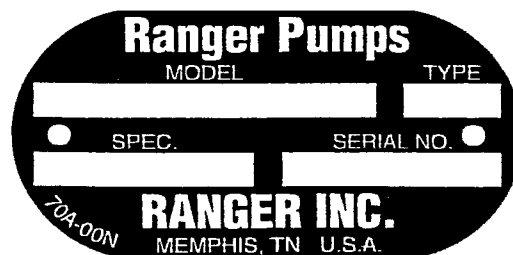
**MODEL** Number nomenclature -



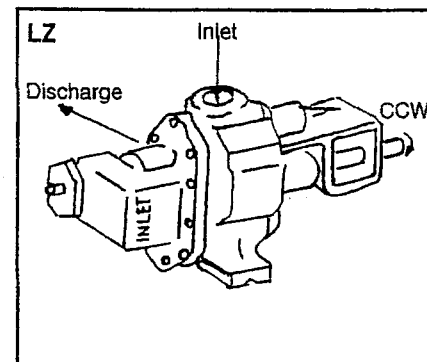
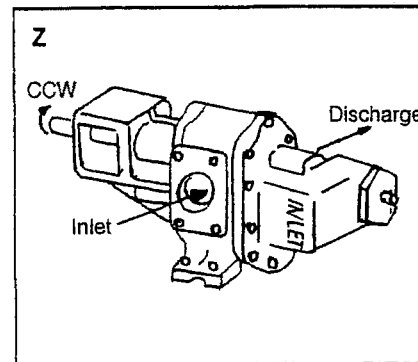
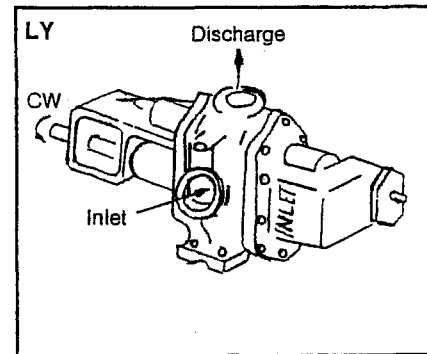
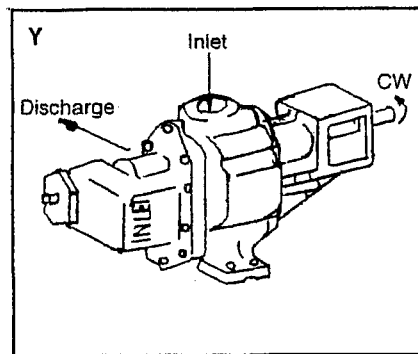
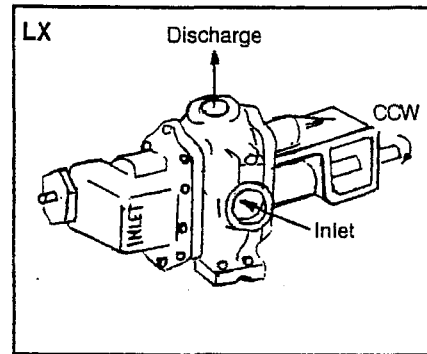
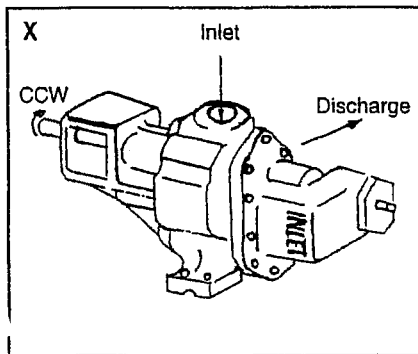
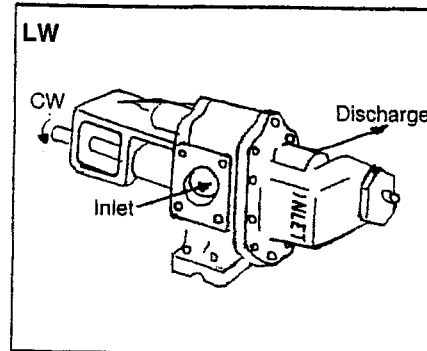
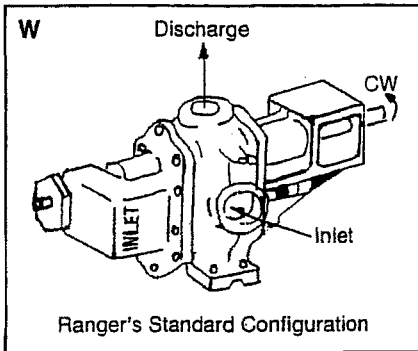
**SPECification Number** - This is used to identify special construction of our pumps, ie carbon bushings, special packing, stainless steel shafts etc.

**TYPE NUMBER** - This is used internally by Ranger, Inc. to identify current design type.

**SERIAL NUMBER** - Is assigned by Ranger, Inc. to identify each pump manufactured.



## Direction of Rotation for "HB" "BH" Pump Configurations RV Style Relief Valve



Rotation is determined by facing the end of drive shaft ○  
High Drive and Low Drive CW

## Section F PUMP INSTALLATION

**F1.** Always have a qualified person to select the proper pump and design the system.

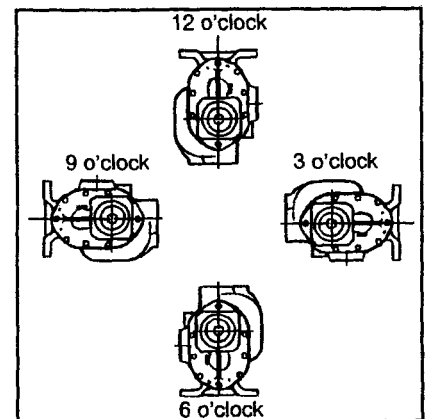
LOCATION and PIPE SIZE are extremely important to a proper installation. Locate the pump suction port as close to the liquid source with as few elbows and fittings as possible. Make sure the pipe size is adequate to maintain a low friction loss. To make pump selection and design system piping the designer will need to consider G.P.M., pipe friction, viscosity of liquid, lubricity of liquid, temperature, suction liquid level, discharge liquid level, discharge pressure and if excessive abrasives are present, etc.

**F2. BASE MOUNTED PUMPS:** Install the pump base so that the drive and pump are level and well supported. When a rigid foundation is to be used, the entire pumping system should be mounted on a foundation and accurately leveled with wedges or shims. The baseplate should then be grouted to the foundation. After hardening, the wedges should be removed and the unit tightened down, ensuring that it is level in all directions.

**F3. TRUCK MOUNTING:** Always check with PTO manufacturer to determine the alignment required for proper operation of the PTO and the guard or guards that must be used. The pump mounting pad located on the truck should be rigid and properly aligned with the driver. Ranger pumps are designed to be mounted by their feet. **DO NOT** mount these pumps by their flanges or ports.

These pumps may be mounted in the 12 o'clock, 3 o'clock, 6 o'clock or 9 o'clock position.

**F4. ALIGNING PUMP:** Always properly align flexible coupling or belt and sheaves when installing pump and driver. Never try to compensate for misalignment of pump shaft and driver when using flexible coupling. Read the coupling instructions for leaving the proper amount of distance between coupling halves. You may use a straight edge and a feeler gauge to check alignment.



When using sheaves and belts we recommend that a separate drive shaft be mounted on pillow blocks to support the side load of the sheaves and belts with a flexible coupling to drive the pump shaft. In the long run this will extend the pump life. Also make sure that the driver shaft and pump shaft are parallel and that the belts are at a right angle to the shafts.

**CAUTION:** Installation is not complete until guards are installed to assure proper protection from injury. Request instruction and safety manual from coupling or sheave supplier.

## Section G INFORMATION

Ranger, Inc. does not recommend or approve systems that our pump may be used in. The system may be unsafe unless the system designer has taken proper precautions.

Ranger pumps are general purpose pumps used for a wide range of applications. They are not designed to be used for every type of service.

We have designed this manual for general information concerning the inspection, installation and repair of our pump. We can not foresee all hazards that an operator or service person may experience. The user of the equipment **MUST BE** properly trained and should be familiar with sound safety and operating practices.



## **Section H**

### **USING AND SETTING RELIEF VALVE**

#### **H1. DIRECTION OF ROTATION FOR RV ENDPLATE**

Read safety instruction on page 2 before proceeding. See pump **WARNING TAG ILLUSTRATIONS** on page 7. For correct relief valve position for any of the pump orientations, see page 4. The inlet marking on the RV endplate **MUST BE** on the **INLET** side of the pump. The discharge **WILL BE** on the opposite side of the inlet. The 90 degree ported pumps will have an internal passage to connect one side of the pump to the top port of the pump.

#### **H2. RELIEF VALVE ADJUSTMENT**

A built-in relief valve should not be used on applications where the discharge must be closed for more than one minute. Prolonged operation with the relief valve fully by-passing will cause heating of the liquid circulating through the valve resulting in possible damage.

**WARNING:** Take precautions to prevent personal injury or physical damage that could be caused by any loss of the product being pumped while adjusting the relief valve. The relief valve cap and adjusting screw are offset to the discharge side of the pump.

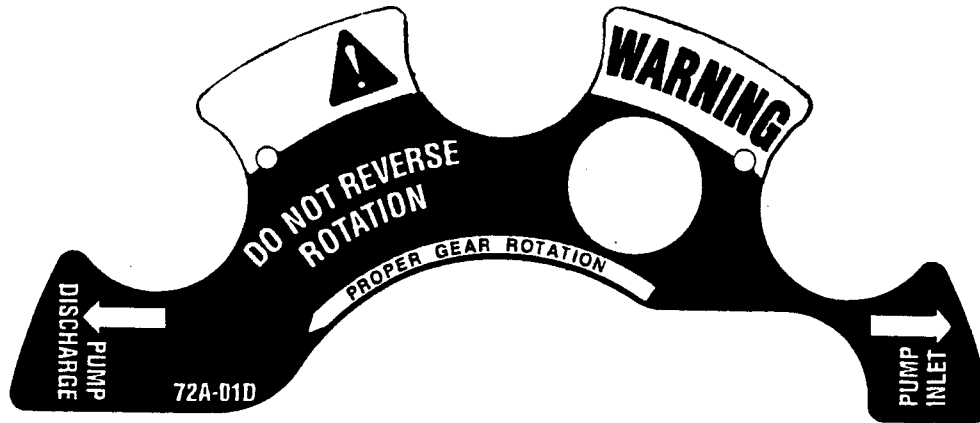
The relief valve must be adjusted under conditions identical to the operating conditions. (Viscosity, RPM, etc.)

- STEP 1. Connect a pressure gauge near the pump in the discharge line between the pump and the point where the discharge line will be closed. Most pumps have tapped and plugged holes in the case near the outlet or in the discharge flange which may be used for the purpose.
- STEP 2. Loosen the locknut (42) on the adjusting screw (17).
- STEP 3. Back the adjusting screw out to the point where the end of the adjusting screw will be 1 ½ inches from the plug cap.
- STEP 4. Start pump and close discharge line slowly. **DO NOT** exceed pressure rating of pump or other equipment between pump and discharge line valve. If this pressure is reached while closing the discharge valve, do not close any further. This might occur with very high viscosity liquids and it would then be necessary to install a separate relief valve in the unit for protection. **DO NOT RUN PUMP WITH CLOSED DISCHARGE LINE FOR MORE THAN ONE (1) MINUTE AT A TIME.**
- STEP 5. With discharge valve closed, turn adjusting screw (17) clockwise in ½ turn increments until the pressure gauge shows the desired pressure setting.
- STEP 6. Tighten locknut seal (42).
- STEP 7. Open discharge line and turn pump off.

#### **H3. PLAIN FACE ENDPLATE**

**CAUTION:** The user must install a Relief Valve in the pump discharge line. The plain face endplate has no way of relieving pressure.

**CAUTION:** A HAZARDOUS CONDITION WOULD EXIST IF NO RELIEF VALVE WAS INSTALLED IN THE SYSTEM. THIS COULD LEAD TO AN INJURY OR RESULT IN DEATH.



Warning tag found on Relief Valve Rearplate

## Section I

### DISASSEMBLY OF R.V. STYLE RELIEF VALVE

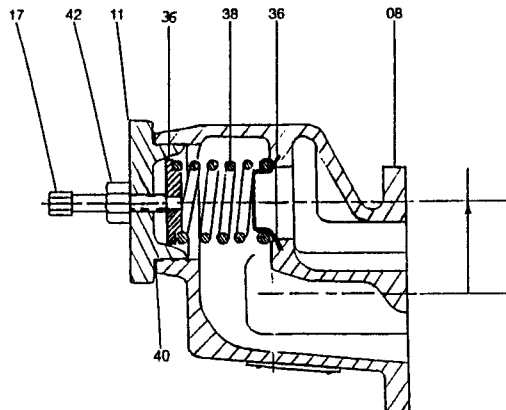
**▽ WARNING: Relief Valve cap (11) contains a strong spring that could cause severe injury if released abruptly.**

**CAUTION:** Lock out pump driver and disconnect drive coupling. Make sure all pressure is out of system. Close discharge and suction valves. Drain suction and discharge line by removing the lowest drain plug in rearplate (08) and rotating the drive shaft slowly in one direction. When flow ceases repeat this step by rotating the drive shaft in opposite direction.

STEP 1: Loosen locknut seal (42) and turn the adjustment screw (17) counterclockwise, removing it from the relief valve cap (11).

STEP 2: Remove relief valve cap (11). Remove spring guide (36) and springs (38) and (39). Spring (39) will be inside spring (38) if pump is assembled for high pressure. Next remove relief valve poppet (36).

STEP 3: Inspect worn parts and replace.



## Section J

### ASSEMBLY OF RV STYLE RELIEF VALVE

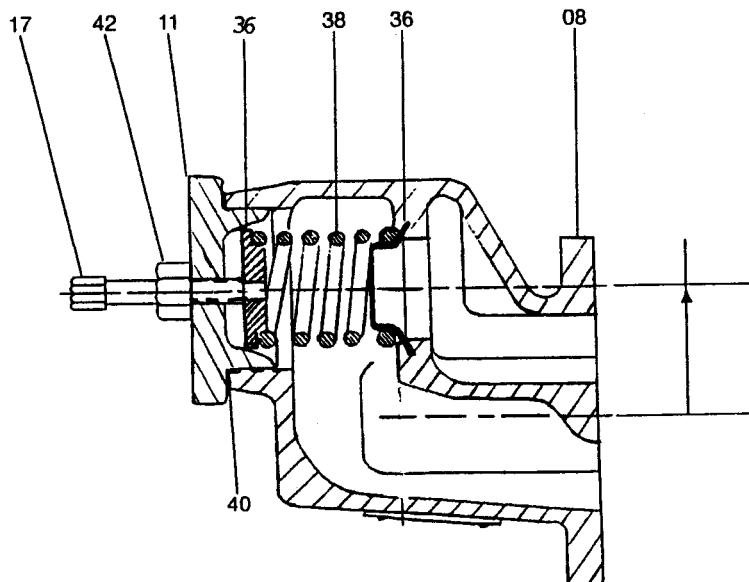
- STEP 1: Install RV Poppet / Guide Spring (36) into RV endplate (08), make certain the angled side is next to relief valve seat.
- STEP 2: Install spring (38) in between the RV Poppet / Guide Spring (36) . Install spring (39) inside spring (38) if high pressure setting is required. Two of part (36) are used. One side acts as a poppet (or female guide for the small end of the adjustment screw (17)), and the other side as a guide for the spring.
- STEP 3: Install adjustment screw (17) and lock nut seal (42) into relief valve cap (11).
- STEP 4: Carefully install O'Ring (40) onto the relief valve cap (11). Fasten relief valve cap (11) to RV rearplate assembly (08) with two hex head cap screws (27) and one nut (22).
- STEP 5: Loosen the relief valve adjustment screw (17) to a point where the end of the adjustment screw will be 1 ½ inches from the plug cap.
- STEP 6: The factory presets the full by-pass pressure between 10 and 40 PSI. The actual setting is dependent on RPM and Viscosity of your liquid.

SEE SECTION H, PAGE 7, "USING AND SETTING RELIEF VALVE"

**CAUTION:** Never reverse rotation without reversing RV rearplate (08). See warning tag on page (7), also direction of rotation page (4).

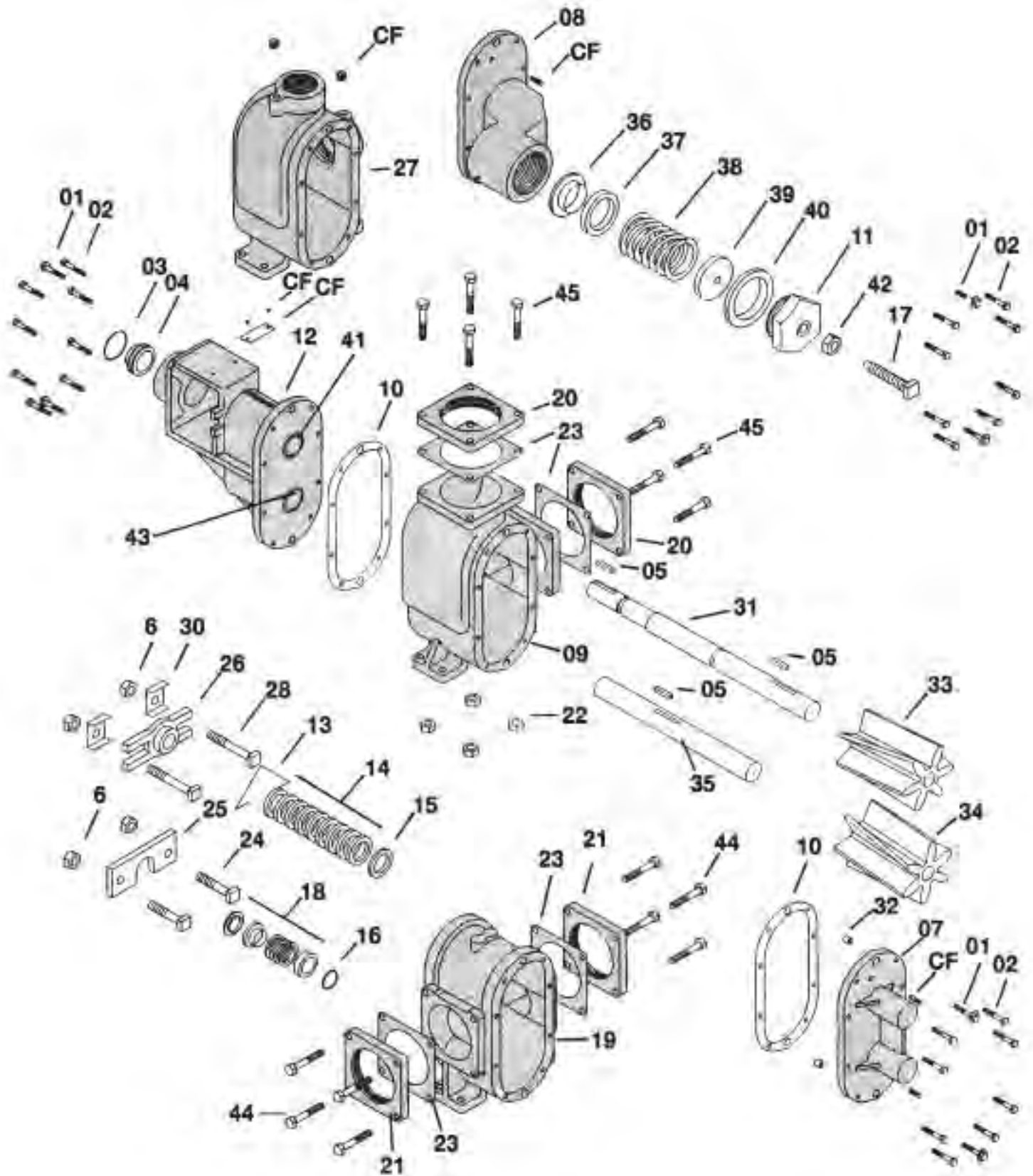
**CAUTION:** You should never use the built-in relief valve on application when the discharge will be closed for longer that one minute.

**CAUTION:** Never operate the pump with RV rearplate (08) in the wrong position. The relief valve will be inoperable (see proper relief valve position illustration on page (4)). Having the RV rearplate in the wrong position may create high pressure in the discharge line causing pipe, pump or other components to rupture resulting in injury or death.



**Picture RA**  
**119P-228M HB, F, RV**

RANGER PUMPS  
MEMPHIS, TN



## **Section K**

### **PUMP REMOVAL FROM EQUIPMENT**

**CAUTION:** Before proceeding, read Section (D), Safety Equipment Guide, page 2.

**STEP 1:** Pump driving unit to be turned off and locked out before pump removal is begun.

**CAUTION:** Be positive the drive unit cannot be turned on during pump removal.

**STEP 2:** Remove coupling guard and disconnect drive coupling from pump.

**STEP 3:** Depressurize system and close the pump suction and discharge valve completely isolating pump from the system's fluid. If an air or liquid bleed valve is available, open to depressurizing pump. Remove lower 1/4" drain plug located on rear assembly rearplate to drain pump. Use caution in removing the drain plug if the pump is still pressurized. A container should be used to receive fluid drained from pump. Rotate shaft slowly in one direction and then reverse rotation until all fluid is drained from the pump. Always use proper safety equipment when draining system.

**STEP 4:** Disconnect pressure and suction piping from the pump. Before removing the four mounting bolts, provide adequate equipment to safety support the pump for removal. Remove pump's four mounting bolts and safely lift the pump from equipment.

## **Section L**

### **DISASSEMBLY OF "HB" "BH" PUMPS WITH PACKING OR MECHANICAL SEAL**

Refer to parts drawing, page 9

**CAUTION:** Before proceeding, read Section (D) Safety Equipment Guide, page 2.

**TOOLS:** Tools required: 3/4" wrench or socket, 9/32" Allen wrench and a 13/16" wrench.

**STEP 1:** Completely clean pump with your approved cleaning solvent or cleaners to remove grit or other foreign material.

**STEP 2:** Clamp or bolt pump mounting base to work table to stabilize for disassembly.

**STEP 3:** For pumps with the RV rearplate (08), completely remove the pressure adjustment screw (17) to relieve spring tension. Next, use a 3/4" wrench to take out the bolts (27) and a 13/16 wrench to take off the nut (22) from the stud to remove the relief valve plug cap (11). Remove all the internal parts of the relief valve rearplate (08). See detailed RV disassembly and assembly instructions, Section 1.

**STEP 4:** Remove the RV or plain rearplate assembly (07) (08) from pump case (09) by removing the 8 hex head cap screws (02) using the 3/4" wrench. Separate the rearplate from case (may need to pry or tap to separate due to dowel pins or gasket adhesion. With rearplate removed, the drive gear (33), idler gear (34), idler shaft (35), and the two dowel pins (32) can be removed. (NOTE: If pump is a HH style, the drive shaft is equipped with two retainer rings, located on each end of drive gear; the outer retainer ring needs to be removed before sliding gear from shaft. The inner retaining ring must be removed on mechanical seal pumps before sliding shaft through driveplate assembly.)

**(Note HH style pump has no outboard bearing)**

- STEP 5: Remove driveplate (12) after removing the 8 hex head cap screws (2) using 3/4 "wrench. May need to separate the driveplate (12) from case as described in Step 4 above. Remove the two dowel pins (32). Disassemble the driveplate assembly (12) in the following manner.  
**Note:(For standard packing, use steps 6,7, and 8; for mechanical seal, use steps 9,10, and 11.)**
- STEP 6: **Standard Packing.** Remove the two packing gland lock nuts (6) and bolts (28) using 3/4 " end wrench. This allows the removal of two packing gland clips (30), spring clip (13) and the packing gland (26).
- STEP 7: Continue the disassemble of the driveplate (12), remove drive shaft key (05), the bearing retainer ring (3) (using a small flat point screwdriver). Next, remove the two allen set screws located in ball bearing race (4) (using 9/32 "allen wrench). Clean the exposed end of the drive shaft of all paint, rust or burrs. Next, remove the drive shaft (31) and ball bearing (4) together or separately from driveplate (drive shaft alone may be removed from either direction). The removal should be accomplished easily, but due to shaft corrosion, you may need to use a press or bearing puller to assist with the separations.
- STEP 8: Remove packing (14) and packing washer (15) from driveplate (12). A packing hook can aid in removing packing. Packing hooks are in stock and available from Ranger's Distributor.
- STEP 9: **Mechanical Seal.** Remove the two mechanical seal retaining plate bolts (24) and the lock nuts (6) (using 3/4" end wrench). The retaining plate (25) can now be removed.
- STEP 10: To continue the disassembly of the driveplate (12), remove the drive shaft key (5) and the ball bearing retainer ring (3) (using a small flat point screwdriver). The drive shaft must be removed in one direction only which is through ball bearing casting hole because of the mechanical seal shaft retainer ring.  
**Note: (If pump is a HH style, the drive shaft is equipped with two retainer rings located on each end of drive gear; these rings must be removed prior to shaft removal.)**
- STEP 11: The shaft must be removed slowly toward keyed end of drive shaft, removing ball bearing from casting, also allowing the mechanical seal to be removed carefully with the shaft. Once shaft bearing and seal are removed, the shaft can now be cleaned thoroughly of all paint, rust or burrs for the ball bearing removal. Once the ball bearing is removed or pressed from shaft, the shaft can now be repolished and lubricated for mechanical seal removal. Depending on the condition of the seal, it is possible for it to be reused.
- STEP 12: The removal of the three long (43) and one short (41) shaft bushings is sometimes one of the more difficult jobs to perform. The more common bushing materials are bronze, iron or carbon. The removal may be performed with a "Snap On" (trade name ) tool P.N. CG-45 puller. Another method is to use a power hack saw or chisel to make cuts down through the bushing side 180° apart. This procedure will usually loosen the bushing to where it can be removed. Note: Bushing bores (holes) in the castings must not be scored as a damaged wall would effect the new bushing installation.
- STEP 13: With the disassembly complete, all parts should now be thoroughly cleaned with your approved cleaning solution. Gasket surfaces need to be scraped and inspected for defects. A visual inspection of all parts for re-use is hardly adequate for many of the parts. Since very close tolerances for operating parts are necessary for efficient pumping, micrometer, caliper or other means of accurate measurements should be used to ensure which parts are reusable. Pump parts specification measurements, see page 12. Parts that are to be replaced may be ordered from Ranger's Distributor. Usually parts ordered are shipped same day order is received.

## Section N

### DIMENSIONAL DATA FOR INTERNAL PARTS

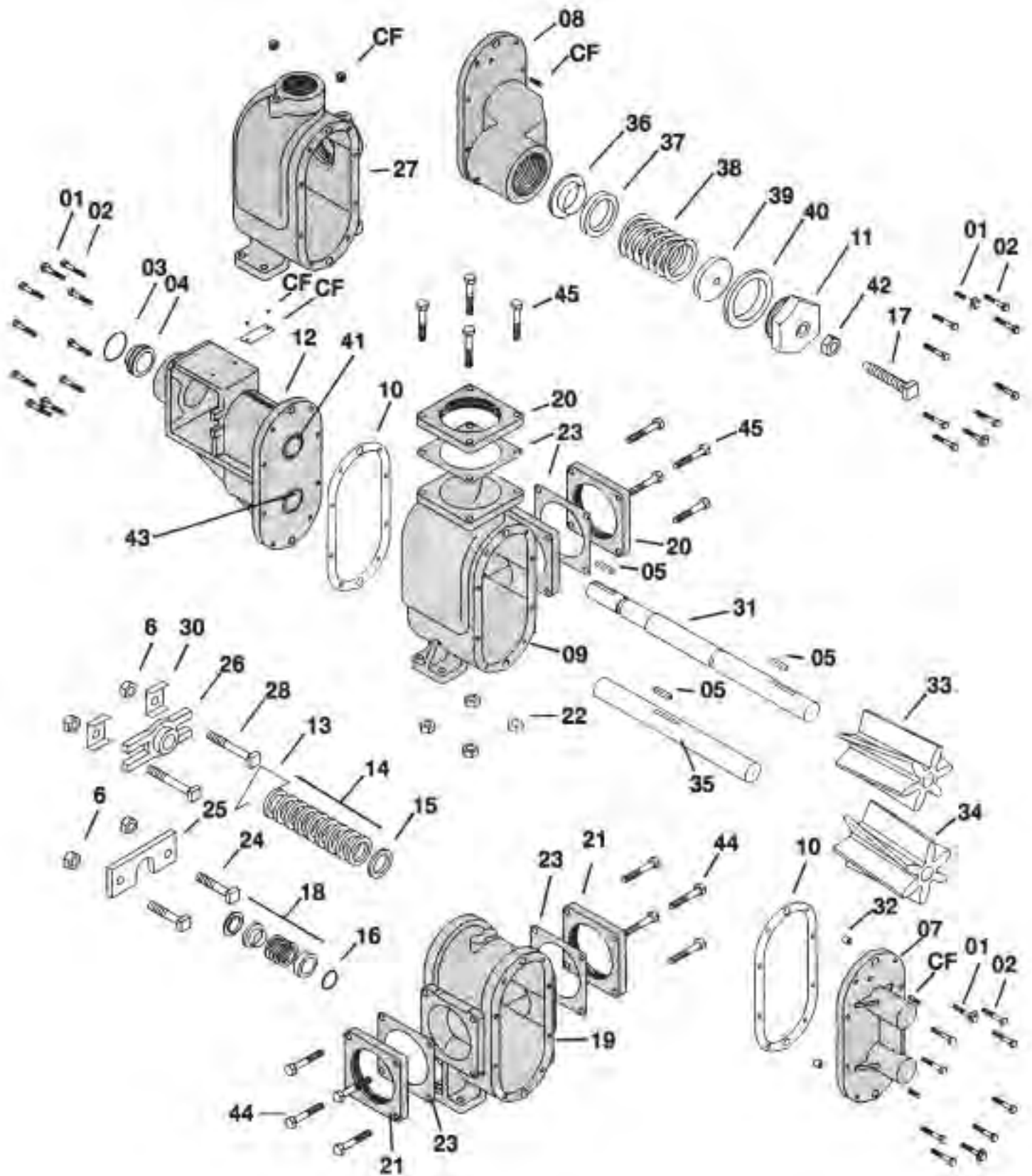
The below dimensions are nominal. Your actual measurement should not vary by more than 0.0015.

| ITEM  | PUMP SIZE<br>48 |
|---|-----------------|
| Bore for Bearings                           | 1.751           |
| Shaft O.D.                                  | 1.4365          |
| Case Bores                                  | 5.011           |
| Gear O.D.                                   | 4.999           |
| Gear O.D. to Case Bore Diametral Clearance  | .012            |
| Bronze Bearing O.D.                         | 1.7525          |
| Bronze Bearing Press Fit                    | .0015 min.      |
| Bronze Bearing I.D. (Free)                  | 1.4416          |
| Bronze Bearing I.D. (Installed)             | 1.4445          |
| Shaft to Bronze Bearing Diametral Clearance | .008            |
| Carbon Bearing O.D.                         | 1.7535          |
| Carbon Bearing Press Fit                    | .0025 min.      |
| Carbon Bearing I.D. (Free)                  | 1.4455          |
| Carbon Bearing I.D. (Installed)             | 1.4432          |
| Shaft to Carbon Bearing Diametral Clearance | .0067           |
| Case Width                                  | 7.501           |
| Gasket Thickness (One)                      | .006            |
| Compressed Gasket Thickness (Three)         | .013            |
| Gear Face Width                             | 7.499           |
| Lateral Clearance (Two Compressed Gaskets)  | .015            |



**Picture RA**  
**119P-228M HB, F, RV**

RANGER PUMPS  
MEMPHIS, TN





## Section O

### ASSEMBLY OF 48 "HB "BH" PUMPS WITH PACKING OR MECHANICAL SEAL

Refer to parts drawing page (13)

**TOOLS REQUIRED:** Soft face hammer, 13/16" & 3/4" wrench or socket, flat tip screwdriver, snap ring tool, 6" adjustable wrench, & a 9/32 " Allen wrench.

**NOTE:** Before proceeding, read Section (D), Safety Information Guide, page (2).

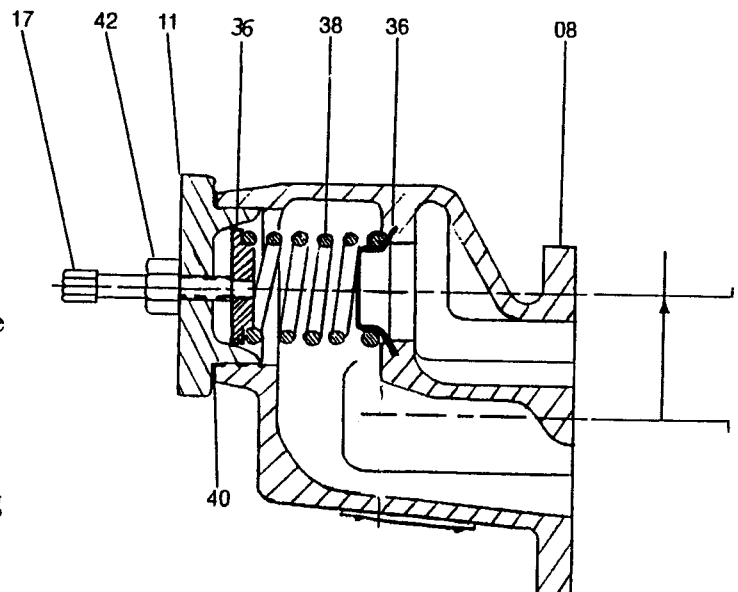
**NOTE:** The purchaser should select the pump's material construction based on properties of liquid being pumped. Some of the parts available to resist corrosion and improve wear are stainless steel relief valve parts, graphite packing, stainless steel drive and idler shaft and carbon bushings. Ranger has those parts available.

**STEP 1:** Clamp or bolt pump case to work table to stabilize the assembly process.

**STEP 2:** Visually check all used parts planned to be assembled for cleanness or imperfection. Measure questionable parts with accurate measuring devices to be sure they conform to manufacturer's specifications. For pump part specification measurements, refer to page (12). Pump efficiency and operation will be affected if defective parts are used. Parts needing to be replaced can be furnished by Ranger Distributor and can usually offer same day shipment.

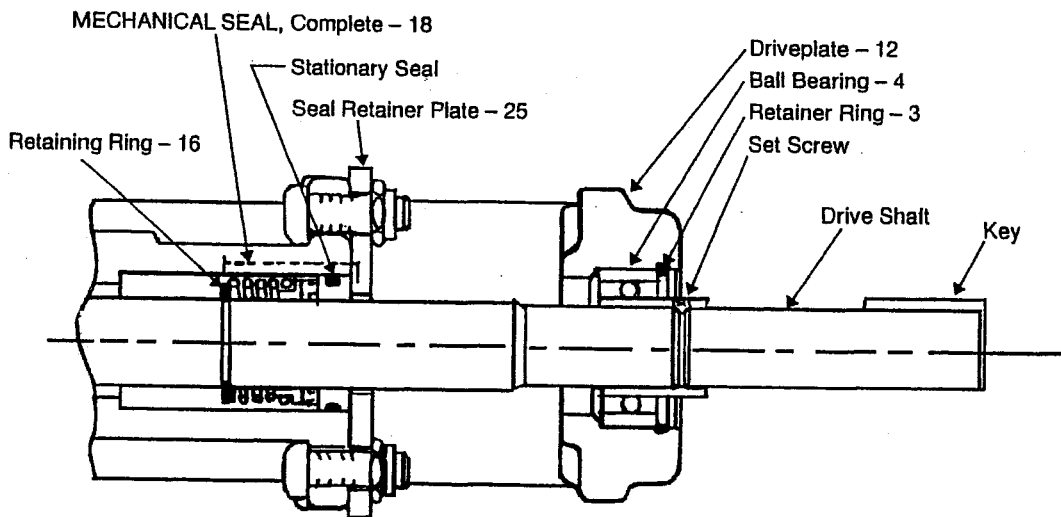
**STEP 3:** Many methods of ways to assembly pumps can be used that can be considered satisfactory methods. The steps we are listing have provided a good method for assembly. Install bushing (41) (43) in both endplates by providing a support for the endplates with milled face upward and perpendicular to press ram (specification dimensions of bushing and casting bore, see page (12). Use a small amount of an approved lubricant in each bushing bore. Verify that the expansion washer is in place in each blind bushing bore. Place bushing a the casting hole directly under press ram with oil grooves aligned with grooves in the faceplate. The bushing must be maintained perpendicular to the face of casting as it is being pressed into the endplate. The press is completed when bushing reaches a point .005" or less below face of casting. A press tool is necessary between the press ram and the bushing. The other three bushings can be installed by this same method. Lightly lubricate the bushing with an approved lubricant.

**STEP 4: Assembly of the RV style relief valve.**  
See diagram this page. Lay the Rv rear-plate (08) face down on a protected, smooth, clean area. Install the poppet (36) making sure the poppet is seated properly. Place the relief valve spring (38) centered on the poppet guide. (If using a high pressure spring (39) install it inside the RV spring (38). Place the relief valve guide spring (36) center over spring. Install lock seal nut (42) on the RV adjustment screw (17) with locknut tapered seal toward point of screw. Install cap O'Ring (40) lightly lubricate the threads and the O'Ring on the relief valve plug cap (11).



Screw the adjustment screw (17) into the relief valve plug cap (11) far enough for small end of adjustment screw to center in the relief valve spring guide (36). Install the two bolts (27) and the nut (22) with a 3/4" wrench to secure the RV cap (11) to the rearplate (08). Loosen the relief valve adjustment screw (17) to a point where the end of the adjustment screw will be 1 1/2 inches from the plug cap. Final pressure adjustment is made when pump is put in service. The lock nut seal (42) to be left positioned in place against plug cap (11).

**STEP 5: Assembly of driveplate with conventional packing.** (Refer to parts drawing page 13) Lightly lubricate the drive shaft bushing and stuffing box bore. Install drive shaft (31) into driveplate, through ball bearing hole, leaving the drive key end approximately 5" outside the driveplate. Install packing washer (15) on drive shaft (31) seating it into the bottom of the stuffing box. Install packing rings (14) in stuffing box bore, offsetting the packing joints approximately 180°. Seat packing rings individually and press into place. Do not overfill stuffing box, leave space for packing gland (26) to enter packing bore. Place packing gland (26) around drive shaft (31) with small end of gland against packing. Place the 2 packing gland clips (30) on each side of packing gland lugs to hold packing gland in place. Install the 2 packing gland bolts (28) (square head inserted in casting slot) with the clip spring (13) to support them. Install the 2 lock nuts (6) on packing gland bolts and tighten to compress packing in stuffing box. Do not over-tighten as this will restrict shaft movement at this time. On HB pumps install ball bearing (4) on the key way end of drive shaft. **(Hydraulic drive pump model HH has no ball bearing)** Position bearing where the 2 set screws located on the bearing race are centered on the bearing recess groove on drive shaft. Tighten and torque the two " set screws to secure bearing to shaft. May now shove drive shaft and bearing (4) firmly into the driveplate until the bearing is firmly seated in bearing hole. Install bearing retainer ring (3) to lock bearing in place. (Note: Drive gear and retainer rings for hydraulic drive pump model HH must be installed at this time.)



**STEP 6: Assembly of driveplate with Type 21 mechanical seal.** See diagram above. Install the mechanical seal retaining ring (16) on the drive shaft (31) in the retainer ring groove located "from keyed end of drive shaft. Clean, dress and polish drive shaft in the area of the mechanical seal. Any burrs or roughness can damage the seals. Apply recommended lubricant to shaft, stuffing box and to both I.D. and O.D. of the sealing section of the mechanical seal. Slide seal onto the shaft (31), positioning the spring end of seal against the retainer ring (16). Be sure the **polished side of stationary seal** faces the rotating seating surface of the seal. For HB pumps install ball bearing (4) onto shaft, positioning the bearing 2 set screws over the bearing recess groove. Tighten firmly the 2 sets screws to secure bearing to shaft. **(Hydraulic drive pump model HH has no ball bearing)** Install drive shaft with mechanical seal attached through bearing hole into endplate carefully to protect the mechanical seal. Hold the spring end of the rotating seal against the retainer ring (16) and insert this part of the seal into stuffing box. As the

drive shaft continues into endplate, insert shaft bearing and firmly seat it in bearing hole. Install bearing retainer ring (3) to lock bearing in place. Next, slide the stationary part of the mechanical seal into the entrance of the stuffing box. The outer "O" ring on the stationary seal must be compressed to enter. This step of the installation is critical and care should be used. A slight bevel at the entrance of the stuffing box bore is helpful for the insertions. Install the mechanical seal retaining plate (25) using 2 bolts (24) and locknuts (9).

STEP 7: Install the 1/4 " key (05) in the drive gear key way slot on drive shaft. Slip drive gear (33) onto drive shaft (31) and key to check for proper fit. If the fit is satisfactory, remove gear for later installation. See page 4 to determine proper pump configuration. Install 2 dowel pins (32) in face of case (09). Place the case gasket (10) (lightly lubricated with approved lubricant or gasket seal) in place against the case face in alignment with dial pin and bolt holes. Install the driveplate assembly in alignment with dial pins. Bolt the 8 hex head cap screws (2) (screw length, 1 1/2 ") to the case (09). Tighten bolts evenly for a proper gasket seat to 40 Ft. lbs. with a torque wrench.

STEP 8: Install key (05) in idler shaft (35) and insert shaft into idler gear (34). Lubricate both idler and drive shaft bushing lightly with an approved lubricant. Install the idler gear and shaft into case. Next, slide drive gear (33) on keyed shaft (31). (**Hydraulic drive pump model HH has two spiral retaining rings to secure drive gear.**) The RV or plain rearplate can now be installed. The positioning of the RV rearplate depends on direction of rotation and the arrangement of the installation can now be made. The plain rearplate can be installed in either position. Install 2 dowel pins (32) in case face (09). Lubricate the case gasket (10) using an approved lubricant or gasket seal. Next, place the case gasket (10) against the case face in alignment with dowel pins. Bolt rearplate to case using 2 washer head cap screws (1) (screw length ") in dial pin holes using 8 hex head cap screws (2) (screw length, 1 1/2 ") in 8 holes. Tighten the 8 cap screws evenly for a proper gasket seat to 30 Ft. lbs. with a torque wrench.

STEP 9: Rotate pump to check for freedom of rotation. Packing that has been overly tightened can offer resistance to shaft turning by hand. By using means to overcoming this friction, the rotation should be smooth without a binding of the gears. Minor rubbing by the gear against the case wall is considered normal.

## **Section P**

### **SHAFT SEALING**

#### **P1. PACKING BOX PUMPS**

Operate the pump under normal conditions and before start up tighten the locknuts evenly - no more than one turn. After a short run-in period examine the packing for leakage. If leakage is excessive, tighten locknuts evenly until there is only slight leakage from the packing. A slight leakage is a necessary and normal condition for packing and allows for expansion and seating.

**WARNING: NEVER TIGHTEN PACKING WHEN PUMP IS RUNNING.**

**FULL PRECAUTIONS SHOULD BE TAKEN AT ALL TIMES  
WHERE LIQUID IS HAZARDOUS OR VOLATILE.**

**NEVER REPLACE PACKING WITHOUT TURNING OFF PUMP  
AND LOCKING DRIVER OUT.**

To replace packing, remove two bolts, clips, spring clip, and packing gland. Packing hooks are available to remove used packing rings. Clean the shaft and gland. Examine the shaft. If it is worn or scored replace the shaft.

Insert packing rings making sure the joints are staggered 180 degrees. Each ring is the same so it does not matter which order they are placed in the pump. Use split ring bushings or a flexible packing tamper to seat each ring before adding the next ring. **DO NOT** seat rings to tightly.

Check shaft for free movement after rings are installed. Allow about 1/4" for entry of the packing gland. Then re-assemble the packing gland, clips, bolt and nuts. Tighten each bolt evenly and **DO NOT** cock the packing gland. This will cause overheating and binding.

Care must be taken not to over tighten the packing and score the shaft.

**NEVER WORK ON PACKING WHILE PUMP IS RUNNING.**

#### **P2. MECHANICAL SEAL PUMPS TO REMOVE MECHANICAL SEAL**

See Section L, Steps 9, 10 & 11

#### **TO INSTALL MECHANICAL SEAL**

See Section O, Step 6.

**IF MECHANICAL SEAL STARTS LEAKING, REPLACE IT IMMEDIATELY.**

## Section Q

### CHECKING PUMP PERFORMANCE

A summary of the causes of common malfunctions.

|   |  |
|---|--|
| <p><b>NO LIQUID DELIVERED</b></p>           | <ol style="list-style-type: none"> <li>1. Pump not primed. If pump fails to deliver liquid after a minute, stop the pump and prime it by pouring some liquid into the discharge side of the pump.</li> <li>2. Rotating in wrong direction.</li> <li>3. Inlet lift too high. Check this with gauge at pump inlet.</li> <li>4. Clogged inlet line.</li> <li>5. Air pockets or vapor lock.</li> <li>6. Air leaks in inlet line.</li> <li>7. Foreign matter under valve seat or poppet. Remove and clean poppet and valve seat. <b>CAUTION:</b> If poppet or seat is damaged it must be remachined or replaced.</li> </ol>   |
| <p><b>INSUFFICIENT LIQUID DELIVERED</b></p> | <ol style="list-style-type: none"> <li>1. Air leaks in inlet line.</li> <li>2. Air leaks through packing or mechanical seal.</li> <li>3. Speed too slow.</li> <li>4. Excessive lift at inlet. Check this with gauge at the pump inlet.</li> <li>5. Viscosity of liquid too high for size and length of inlet pipe.</li> <li>6. Foot valve or end of inlet pipe not immersed deeply enough in liquid.</li> <li>7. Foot valve, if used, too small, stuck, or not working properly.</li> <li>8. Partial air pockets or vapor lock.</li> <li>9. Pump damaged by foreign matter or misalignment.</li> <li>10. Excessive clearance in pump caused by wear or corrosion.</li> <li>11. Relief valve set too low, or stuck partially open.</li> </ol> |
| <p><b>RAPID WEAR</b></p>                    | <ol style="list-style-type: none"> <li>1. Abrasives in liquid.</li> <li>2. Compatibility of liquid and pump material.</li> <li>3. Excessive pressure.</li> <li>4. Non-lubricating liquid.</li> <li>5. Pipe stress on pump.</li> <li>6. Excessive abrasives in liquid.</li> </ol>   |
| <p><b>EXCESSIVE NOISE</b></p>               | <ol style="list-style-type: none"> <li>1. Starved pump.</li> <li>2. Air leaks in inlet line.</li> <li>3. Air or gases in liquid.</li> <li>4. Pump speed too high.</li> <li>5. Relief valve chatter. Check pressure setting.</li> <li>6. Improper mounting. Check alignment thoroughly. See instructions for aligning driver and pump and preparation of foundation for baseplate mounted pumps.</li> </ol>   |
| <p><b>PUMP TAKES TOO MUCH POWER</b></p>     | <ol style="list-style-type: none"> <li>1. Speed too high.</li> <li>2. Liquid more viscous than previously anticipated.</li> <li>3. Operating pressure higher than specified. Check this with gauge at the pump outlet.</li> <li>4. Outlet line obstructed.</li> <li>5. Mechanical defect, such as bent shaft, packing gland too tight, or misalignment of piping.</li> <li>6. Relief valve not operating properly.</li> </ol>  |

# RANGER, INC.

Ranger, Inc.  
R06-11-1

## USE PICTURE REFERENCE RA

### RANGER 489M, 489P, HB, F, RV (Reference Roper® 3611-3722HB)

| PIC NO. | PART DESCRIPTION           |        | 35                           |                                   | 48                                |                                   | 58                                |                                   |
|---------|----------------------------|--------|------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
|         |                            |        | RANGER PART #                | Competitor PART#                  | RANGER PART #                     | Competitor PART#                  | RANGER PART #                     | Competitor PART#                  |
| 01      | Key                        | 1      | 05C-252520                   | D30-10                            | 05C-252523                        | D30-11                            | 05C-252520                        | D30-10                            |
| 02      | Hex Hd. Cap Screw          | 14     | N/A                          | _____                             | B60-050150                        | G49-050150                        | N/A                               | _____                             |
| 03      | Retaining Ring             | 1      | 03C-284I                     | G41-5                             | 03C-284I                          | G41-5                             | 03C-284I                          | G41-5                             |
| 04      | Ball Bearing               | 1      | 04C-144284                   | G40-35                            | 04C-144284                        | G40-35                            | 04C-144284                        | G40-35                            |
| 05      | Key Std.                   | 2      | 05C-252520                   | D30-10                            | 05C-252520                        | D30-10                            | 05C-252520                        | D30-10                            |
| 06      | Locknut 1/2-13             | 2      | N61-050                      | G43-12                            | N61-050                           | G43-12                            | N61-050                           | G43-12                            |
| 07*     | Plain Rearplate Assy.      | 1      | N/A                          | _____                             | <b>REFER TO CHART</b>             | <b>CHART</b>                      | N/A                               | _____                             |
| 08*     | RV Rearplate Assy.         | 1      | N/A                          | _____                             | <b>REFER TO CHART</b>             | <b>CHART</b>                      | N/A                               | _____                             |
| 09      | Case                       | 1      | N/A                          | _____                             | 09I-48U                           | P1-48I                            | N/A                               | _____                             |
| 10      | Gasket Case                | 2      | N/A                          | _____                             | 10F-02U                           | D11-397                           | N/A                               | _____                             |
| 11      | Plug Cap, RV               | 1      | 11I-02U                      | P14-44                            | 11I-02U                           | P14-44                            | 11I-02U                           | P14-44                            |
| 12*     | Driveplate Assy.           | 1      | N/A                          | _____                             | <b>REFER TO CHART</b>             | <b>CHART</b>                      | N/A                               | _____                             |
| 13      | Spring Clip                | 1      | 13C-02U                      | D42-3                             | 13C-02U                           | D42-3                             | 13C-02U                           | D42-3                             |
| 14      | Packing Set TFE (Std.)     | 1      | 14X-02U                      | N43-3                             | 14X-02U                           | N43-3                             | 14X-02U                           | N43-3                             |
| 14      | Packing Set Graphite       | 1      | 14G-02U                      | N43-156                           | 14G-02U                           | N43-156                           | 14G-02U                           | N43-156                           |
| 15      | Washer Packing             | 1      | 15C-02U                      | G8-249                            | 15C-02U                           | G8-249                            | 15C-02U                           | G8-249                            |
| 16      | Retaining Ring External    | 1      | 03C-144E                     | G41-155                           | 03C-144E                          | G41-155                           | 03C-144E                          | G41-155                           |
| 17      | RV Screw Adjust            | 1      | B60-100NPTS                  | D15-42                            | B60-100NPTS                       | D15-42                            | B60-100NPTS                       | D15-42                            |
| 18      | Mech Seal Compl., Buna-N   | 1      | 18B-144225                   | G4-112                            | 18B-144225                        | G4-112                            | 18B-144225                        | G4-112                            |
| 18      | Mech Seal Compl., Viton    | 1      | 18V-144225                   | G4-142                            | 18V-144225                        | G4-142                            | 18V-144225                        | G4-142                            |
| 19      | Hex Head Cap Screw         | 8      | N/A                          | _____                             | B62-063225                        | G49-062200                        | B62-063225                        | G49-062200                        |
| 20      | Flange, 3" Straight NPT    | 2      | N/A                          | _____                             | 20I-22NPT3                        | P23-10                            | N/A                               | _____                             |
| 21      | Flange, Straight 4" (Std.) | 2      | 21I-22NPT                    | P23-19                            | 21I-22NPT4                        | P23-19                            | N/A                               | _____                             |
| 22      | Nut Plug Cap               | 1      | N/A                          | _____                             | N60-050T                          | G44-050                           | N/A                               | _____                             |
| 23      | Gasket, Flange             | 2      | N/A                          | _____                             | 23V-22U                           | D11-90                            | N/A                               | _____                             |
| 24      | Square Head Bolt           | 2      | B40-050150                   | G67-050125                        | B40-050150                        | G67-050125                        | B40-050150                        | G67-050125                        |
| 25      | Retainer Plate, Seal       | 1      | 25C-02U                      | D23-267                           | 25C-02U                           | D23-267                           | 25C-02U                           | D23-267                           |
| 26      | Packing Gland              | 1      | 26I-02U                      | P10-179                           | 26I-02U                           | P10-179                           | 26I-02U                           | P10-179                           |
| 27      | Hex Head Cap Screw         | 2      | N/A                          | _____                             | B60-050600                        | G49-05060                         | N/A                               | _____                             |
| 28      | Square Head Bolt           | 2      | B40-050275                   | G67-050300                        | B40-050275                        | G67-050300                        | B40-050275                        | G67-050300                        |
| 29      | Flange, Elbow Kit 4"       | 1 or 2 | 29I-48SK                     | N14-24                            | 29I-48SK                          | N14-24                            | N/A                               | _____                             |
| 30      | Clip, Packing Gland        | 2      | 30C-02U                      | D42-4                             | 30C-02U                           | D42-4                             | 30C-02U                           | D42-4                             |
| 31      | Shaft, Drive               | 1      | N/A                          | _____                             | 31C-48R                           | D1-2009                           | 31C-48R                           | D1-2009                           |
| 32      | Dowel Pin                  | 4      | N/A                          | _____                             | D70-050150                        | D48-49                            | N/A                               | _____                             |
| 33      | Gear, LH                   | 1      | N/A                          | _____                             | 33I-48U                           | P6-383                            | N/A                               | _____                             |
| 34      | Gear, RH                   | 1      | N/A                          | _____                             | 34I-48U                           | P6-384                            | N/A                               | _____                             |
| 35      | Shaft, Idler               | 1      | N/A                          | _____                             | 35C-48U                           | D1-2087                           | 35C-48U                           | D1-2087                           |
| 36      | RV Poppet/Guide Spring     | 2      | 36C-02U                      | D16-112                           | 36C-02U                           | D16-112                           | 36C-02U                           | D16-112                           |
| 37      | Stud                       | 1      | N/A                          | _____                             | P78-050150                        | _____                             | _____                             | _____                             |
| 38      | Spring, Standard           | 1      | 38C-02U                      | G10-383                           | 38C-02U                           | G10-383                           | 38C-02U                           | G10-383                           |
| 39      | Spring, High Pressure      | 1      | 38C-02H                      | G10-386                           | 38C-02H                           | G10-386                           | 38C-02H                           | G10-386                           |
| 40      | O Ring Gasket, Plug Cap    | 1      | 40B-350013                   | G14-485                           | 40B-350013                        | G14-485                           | 40B-350013                        | G14-485                           |
| 41**    | Bushing, Short             | 1      | <b>PLEASE REFER TO CHART</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> |
| 42      | Nut Lock Seal              | 1      | N65-100NPTS                  | G33-6                             | N65-100NPTS                       | G33-6                             | N65-100NPTS                       | G33-6                             |
| 43**    | Bushing, Long              | 3      | <b>PLEASE REFER TO CHART</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> | <b>AT THE BOTTOM OF THIS PAGE</b> |
| 44      | Pipe Plug 1/4" NPT         | 2      | P45-025NPT                   | G56-12                            | P45-025NPT                        | G56-12                            | P45-025NPT                        | G56-12                            |
| 45      | Hex Hd Cap Screw           | 2      | _____                        | _____                             | B66-063175                        | _____                             | _____                             | _____                             |
| 46      | Hex Hd Cap Screw           | 2      | _____                        | _____                             | B62-063650                        | _____                             | _____                             | _____                             |
| 47      | Lube Filling               | 1      | _____                        | _____                             | 73B-019050                        | _____                             | _____                             | _____                             |

**\*ENTER MATERIAL CODES TO COMPLETE REQUIRED PART NUMBERS**

PLAIN REARPLATE

RV REARPLATE

DRIVEPLATE ASSY

0 7 - 0 2 U

0 8 - 0 2

1 2 - 0 2

BUSHING MATERIAL CODE

RV CODE

MODEL CODE

B = Bronze  
C = Carbon

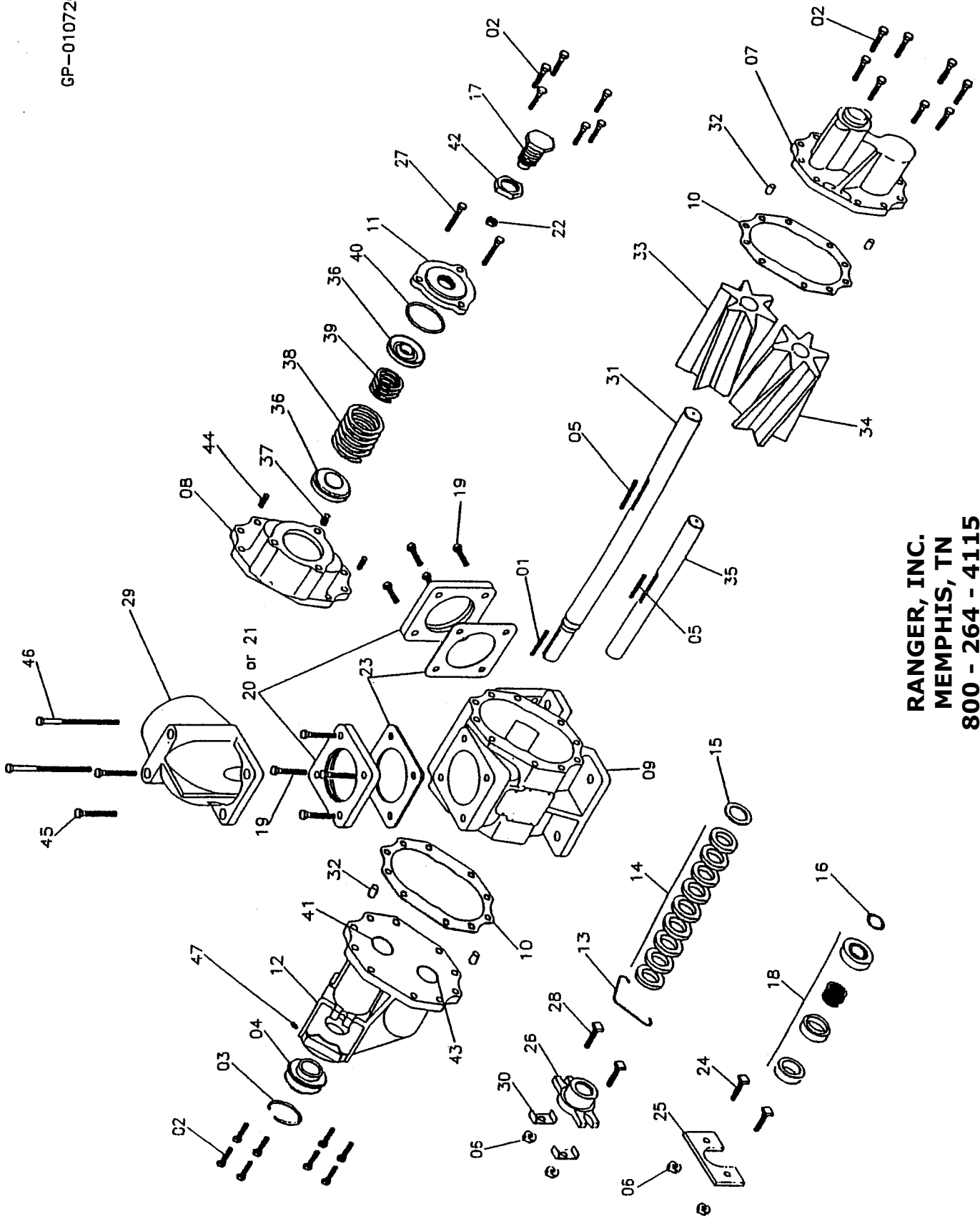
U = No RV Parts  
R = Regular  
H = Hi-Pressure

R = Regular (HB)  
H = Hydraulic Drive  
G = Gear Reduction

**\*\*Bushing Part Number**

43B-02U Bronze, Long  
41B-02U Bronze, Short  
43C-02U Carbon, Long  
41C-02U Carbon, Short

GP-010720



**RANGER, INC.**  
**MEMPHIS, TN**  
**800 - 264 - 4115**

# Ranger Pumps

## Precision Rebuild Kits

- “48” Kit with Bronze Bushings, Steel Shafts  
P.N. 48HBRVXXBG
- “48” Kit with Carbon Bushings, Steel Shafts  
P.N. 48HBRVXXCG
- “48” Kit with Bronze Bushings, Steel Shafts  
P.N. 48HBRVXXBX
- “48” Kit with Carbon Bushings, Steel Shafts  
P.N. 48HBRVXXCX

### EACH KIT CONSISTING OF:

- |                           |                                |
|---------------------------|--------------------------------|
| 1 ea. Idler Shaft         | 1 ea. Standard or H. P. Spring |
| 1 ea. Drive Shaft         | 1 ea. Ball Bearing             |
| 3 ea. Keys                | 1 ea. Retaining Ring           |
| 2 ea. Flange Gaskets      | 1 ea. PTFE or Graphite Packing |
| 2 ea. Case Gaskets        | 1 ea. Spring Clip              |
| 1 ea. Cap Gasket          | 2 ea. Packing Gland Clip       |
| 3 ea. Long Bushing        | 1 ea. Right Hand Gear          |
| 1 ea. Short Bushing       | 1 ea. Left Hand Gear           |
| 1 ea. RV Adjustment Screw | 1 ea. Nut Lock Seal            |

“A Winning Combination”  
SATISFACTION GUARANTEED

**RANGER Inc.**

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800-264-4115  
FAX-901-388-0470



# **WARNING**

## **DO NOT DISCARD THIS MANUAL**

READ INSTALLATION, OPERATION,  
AND MAINTENANCE MANUAL  
BEFORE INSTALLING, PERFORMING  
MAINTENANCE, OR OPERATING A  
RANGER PUMP.

ATTACH THIS MANUAL TO THE  
PUMP IF YOU ARE INSTALLING  
THE PUMP, BUT WILL NOT BE  
THE OPERATOR.