

# Maintenance

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## Daily

Check the oil level and the condition of the oil. When the pump is operating, the oil in the pump housing gets warm and expands, filling into the oil reservoir. Depending on the type of oil and the operating temperature of the system, the oil level will vary in the reservoir. If there is no oil in the reservoir when the system has reached operating temperature, add oil through the fill cap on the reservoir. Fill the reservoir about 25% full.

If the pump is too full of oil, it will overflow the reservoir and reach equilibrium. This is no cause for concern. When the unit is shut down and the oil has cooled, the oil will drain out of the reservoir and back into the pump housing.

Use the appropriate Wanner Hydra-Oil brand motor oil for the application (contact Wanner Engineering if in doubt).

**Caution:** If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (20) may be damaged. Refer to the Service Section. Do not operate the pump with a damaged diaphragm.

**Caution:** Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil. This will help prevent corrosion of internal pump components.

## Periodically

Change the oil after the first 100 hours of operation, and every 1000 operating hours thereafter. To change the oil:

1. Disconnect or lock out the electrical power to the pump motor.
  2. Remove the access plate on the tank, so there is room to hinge the pump/motor to the horizontal position (see the illustration on page 2).
  3. Remove the four bolts that hold the pump base to the tank.
  4. Hinge the pump/motor to the horizontal position, and support it in that position.
  5. Place a pan under the pump oil drain. Remove the drain plug (30) and fill plug (28) from the pump housing. The drain plug is magnetic — clean any metal from the magnet on the plug.
- Caution:** Do not turn the drive shaft while the oil reservoir is empty.
6. When the oil has drained, reinstall the drain plug (30). Refill with the appropriate oil, and install the fill plug (28). Tighten to 25 ft/lbs (30 N-m).
  7. Hinge the pump/motor back to the vertical position. Reinstall the four bolts that held the pump base to the tank, and reinstall the access plate.
  8. Restore the electrical power.
  9. Follow the "Initial Startup Procedures", page 5.

**Caution:** Protect the pump from freezing. Refer also to the "Shutdown Procedure".

## Shutdown Procedure

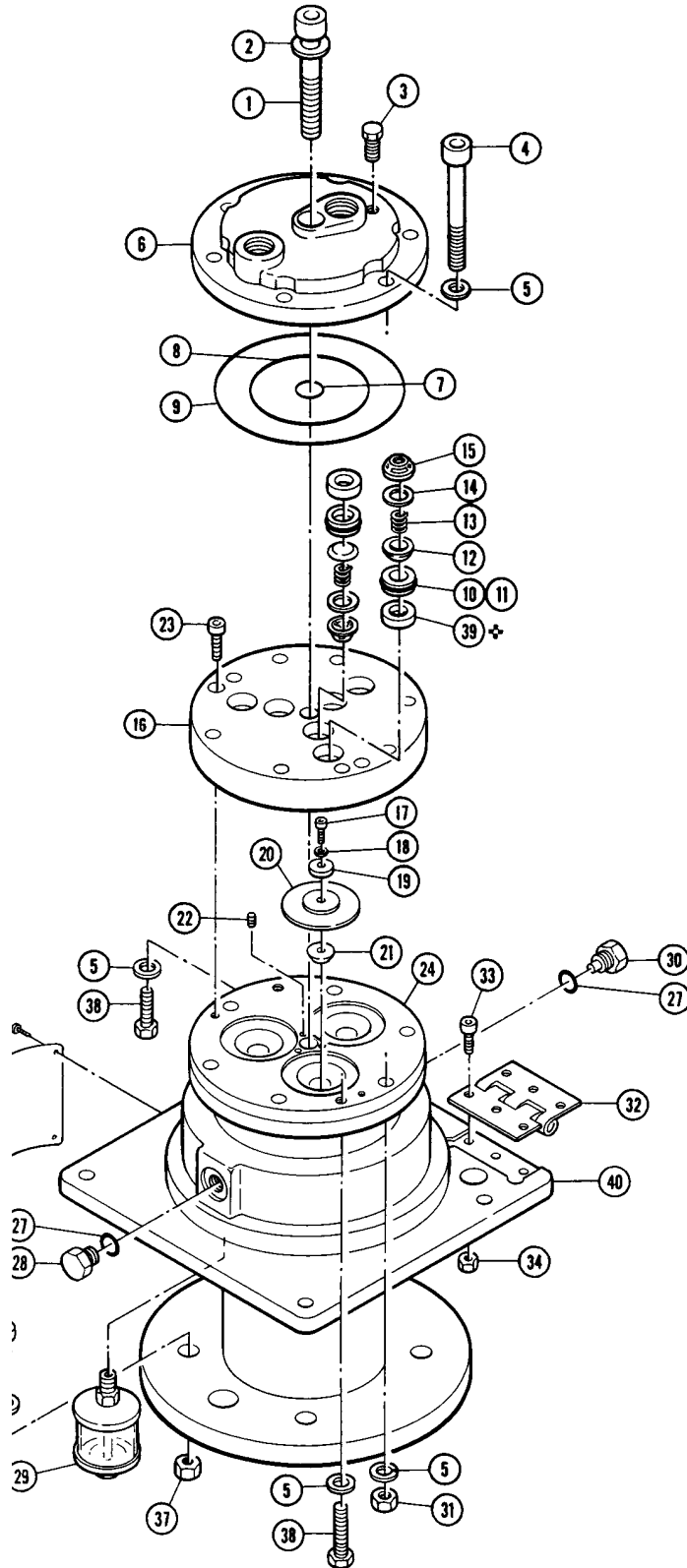
### During Freezing Temperatures

1. Disconnect the inlet and outlet piping from the pump.
2. Remove the drain plug (3) at the bottom center of the manifold.
3. Open any draincocks in the piping.
4. Start the pump, and allow it to run until all fluid is removed from the pump head.
5. Stop the pump, and reinstall the drain plug.
6. Fill the pump with antifreeze.

When you put the pump back into service, thoroughly flush the antifreeze.

# Service (Fluid End)

MODELS D-12/G-12  
WITH STANDARD  
VALVE ASSEMBLIES



# Service (Fluid End)

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This section explains how to disassemble and inspect all easily-serviceable parts of the pump. Repair procedures for the hydraulic end (oil reservoir) of the pump are included in a later section of the manual.

**Caution: Always disconnect power from the motor before doing maintenance on the pump or motor.**

**Caution: Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact Wanner Engineering (Tel 612-332-5681 or Fax 612-332-6937) or the distributor in your area.**

**Caution: The two bolts (38) that screw through the back of the housing into the cylinder casting hold the casting over the hydraulic end of the pump. Do not remove them except when repairing the hydraulic end.**

## 1. Hinge Pump to Horizontal Position

## 2. Disconnect all Electrical Connections (or lock out power to the unit)

## 3. Remove Manifold (6), Valve Plate (16)

- Remove all nuts (31), bolts (4), and washers (5) around the manifold. Do not remove the two bolts (38) that are installed through the back of the pump housing.
- Use a 10-mm hex Allen wrench to remove the pump centerbolt (1) and its washer (2) in the center of the manifold.

**Caution: Do not turn the pump drive shaft while the manifold and valve plate are off the pump, except when removing diaphragms or repriming the hydraulic cells.**

- Remove the manifold (6). The valve plate (16) will remain on the cylinder housing (24).
- Inspect the manifold for warping or wear around the inlet and outlet ports. If wear is excessive, replace the manifold or return it to Wanner Engineering for resurfacing.

To check if the manifold is warped, remove the O-rings and place a straightedge across it. A warped manifold should be replaced.

## 4. Inspect Valves (10-15)

The three inlet and three outlet valve assemblies are identical (but face in opposite directions). Inspect each valve as follows:

- Check the spring retainer (15), and replace if worn.
- Check the valve spring (13). If it is shorter than a new spring, replace it (don't just stretch the old spring).
- Check the valve poppet (12). If worn excessively, replace it.

**Note: If your pump has plastic spring retainers, there is a tetra seal (flat O-ring, 14) between the retainer (15) and valve seat (11).**

- Remove the valve seat (11). A seat remover is included in the Wanner Tool Kit. Inspect the valve seat for wear, and replace it if necessary.
- Reinstall the valve assemblies:

- Clean the valve ports and shoulders with emery cloth, and lubricate them with lubricating gel or petroleum jelly.
- Install the O-ring (10) on the valve seat (11).

- Inlet (3 center valves).** Insert the spring retainer (15) into the valve plate, then insert the spring, valve, and valve seat (11,12,13). If the pump has **plastic** spring retainers, install a flat O-ring (14) between the retainer and seat. On **abrasive-duty** pumps, install a dampening washer (39) on top of the seat.

- Outlet (3 outer valves).** Insert the valve seat, valve, and spring, then the retainer. If the pump has **metal** spring retainers in the outlet valves, position them so a leg does not point toward the center of the pump (refer to the illustration). On **abrasive-duty** pumps, install a dampening washer (39) into the valve plate before installing the other parts.

# Service (Fluid End)

## 5. Inspect and Replace Diaphragms (20)

If it is necessary to service the diaphragms, use a 5-mm Allen wrench to remove the two Allen-head bolts (23) that secure the valve plate (16) to the cylinder housing (24). Inspect the valve plate as you did the manifold.

- a. Lift the diaphragm by one edge, and turn the pump shaft until the diaphragm pulls up. This will expose machined cross-holes in the plunger shaft behind the diaphragm. To turn the pump over, turn the motor shaft over by turning the motor fan. The fan guard on the motor may have to be removed to allow you to turn the shaft. Reattach the fan guard to the motor when done with maintenance.

**Note:** Alternatively, remove the coupler access plate and rotate the coupler by hand.

- b. Insert an Allen wrench through one of the cross-holes in the plunger shaft, to hold the diaphragm up. The proper size tool is included in the Wanner A03-200-1101 Tool Kit.
- c. Remove the screw (17), O-ring (18), and follower (19) in the center of the diaphragm.
- d. Remove the diaphragm, and inspect it carefully. A ruptured diaphragm generally indicates a pumping system problem, and replacing only the diaphragm will not solve the larger problem. Inspect the diaphragm for the following:

- **Half-moon marks.** Usually caused by cavitation of the pump (refer to “Troubleshooting”).
- **Concentric circular marks.** Usually caused by cavitation of the pump (refer to “Troubleshooting”).
- **Small puncture.** Usually caused by a sharp foreign object in the fluid, or by an ice particle.
- **Diaphragm pulled away** from the center screw, or from the cylinder casting or casting sides. Usually caused by fluid being frozen in the pump, or by overpressurization of the pump.
- **Diaphragm becoming stiff** and losing flexibility. Usually caused by pumping a fluid that is incompatible with the diaphragm material.
- **Slice in ridge of diaphragm.** Occurs when a Viton diaphragm is operated at cold temperatures.
- **Diaphragm edge chewed away.** Usually caused by overpressurizing the system.

- e. Inspect the plunger (21) for any rough surfaces or edges. **Do not** remove the plunger from the plunger shaft. Smooth the surfaces and edges as necessary with emery cloth or a fine file.

**Caution: If a diaphragm has ruptured and foreign material or water has entered the oil reservoir, do not operate the pump. Check all diaphragms, then flush the reservoir completely (as outlined below) and refill it with fresh oil. Never let the pump stand with foreign material or water in the reservoir, or with the reservoir empty.**

- f. Install a new diaphragm, ridge side out.
- g. Clean the screw (17) and remove any oil from it. Apply medium-strength threadlocker to the screw. Reinstall the screw and follower (19), and a new O-ring (18). Tighten to 18 in.-lbs (2.0 N-m).
- h. Repeat the above inspection procedure (and replacement, if necessary) with the other two diaphragms.

## 6. Flush Contaminant from Hydraulic End (only if a diaphragm has ruptured)

- a. Remove the oil drain cap (30) and allow all oil and contaminant to drain out. Dispose of it properly.
- b. Fill the reservoir with kerosene or solvent, manually turn the pump shaft to circulate the kerosene, and drain.

**Caution: If you have EPDM diaphragms, or if food-grade oil is in the reservoir, do not use kerosene or solvents. Instead, flush with the same lubricant that is in the reservoir. Pumps with EPDM diaphragms have an “E” as the 7th digit of the Model No.**

- c. Repeat the flushing procedure (step b).
- d. Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain once again.
- e. Refill the reservoir. If the oil appears milky, there is still contaminant in the reservoir. Repeat the flushing procedure until the oil appears clean.

# Service (Fluid End)

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## 7. Prime the Hydraulic Cells

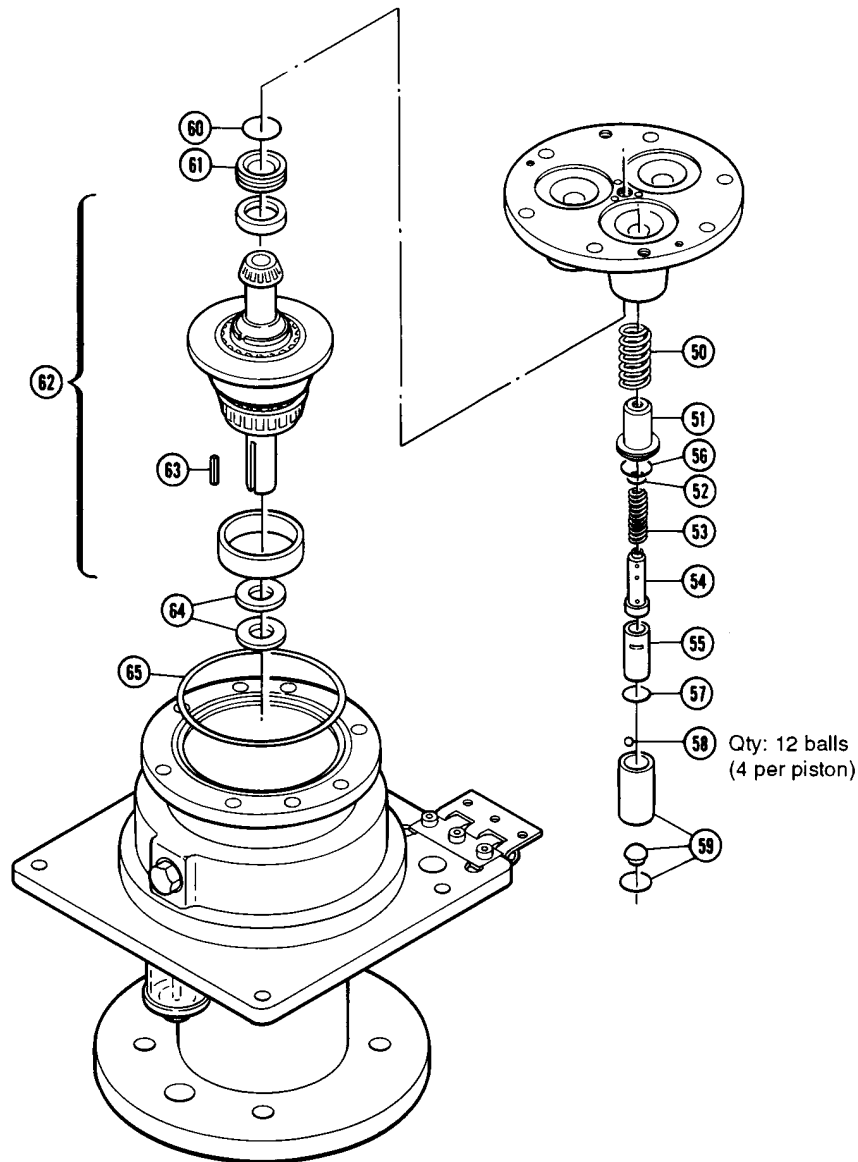
- a. With the pump **horizontal and the fluid-end head removed**, fill the reservoir with the appropriate Hydra-Oil brand motor oil for the application).
- b. All air in the oil within the hydraulic cell (behind the diaphragms) must be forced out by turning the shaft (and thus pumping oil into the piston). If the motor is connected to the pump, rotate the shaft by rotating the motor fan blade. If the motor and coupler have been removed from the pump, use the shaft rotator that is included in the Wanner Tool Kit. Turn the shaft until a **bubble-free** flow of oil comes from behind all the diaphragms. Watch the oil level in the reservoir; if it gets too low during priming, air will be drawn into the pistons (inside the hydraulic end) and will cause the pump to run rough.
- c. Wipe excess oil from the cylinder casting and diaphragms.

## 8. Reinstall Valve Plate (16), Manifold (6)

- a. Reinstall the valve plate (16), with the valve assemblies installed as outlined above, onto the cylinder casting. Using a 5-mm hex Allen wrench, install the two socket-head capscrews (23) and secure the valve plate to the cylinder housing.
- b. Reinstall the O-rings (7,8,9) on the rear side of the manifold. Use petroleum jelly or lubricating gel to hold them in place.
- c. Reinstall the manifold onto the valve plate. Be sure the drain plug (3) is at the bottom of the manifold.
- d. Insert all six bolts (4) around the edge of the manifold. Reinstall the pump centerbolt (1) with its washer (2).
- e. Alternately tighten the perimeter bolts until all are secure. Torque to 45 ft-lbs (54 N-m).
- f. Tighten the pump centerbolt. Torque to 45 ft-lbs (54 N-m).
- g. Recheck all bolts for tightness.

## 9. Reconnect Electrical Power to Motor (or remove lock-out from power source)

# Service (Hydraulic End)



**Caution:** Do not disassemble the hydraulic end of the pump unless you are a skilled mechanic. For assistance, contact Wanner Engineering (Tel 612-332-5681 or Fax 612-332-6937) or the distributor in your area.

**Caution:** The two bolts (38) that screw through the back of the pump housing (40) into the cylinder casting (24) hold the casting to the pump housing. Do not remove them except when repairing the hydraulic end.

**Note:** The following service procedures refer several times to the Wanner Tool Kit. We strongly urge you not to try to repair the hydraulic end of the pump without using the tools in this kit, Part No. A03-200-1101 (available from Wanner or your local distributor).

## 1. Remove Motor and Coupler from Pump

## 2- Disconnect all Electrical Connections (or lock out power to the unit)

## 3. Remove Pump Housing

- Remove the head of the pump, and the diaphragms, as outlined in the Fluid End Service Section.
- Drain the oil from the pump housing by removing the drain plug (30).
- Stand the hydraulic end of the pump face-down on the cylinder casting (24).
- Check the shaft for sharp burrs. Smooth any burrs, to prevent scarring the housing seals (64) when you disassemble the pump.

# Service (Hydraulic End)

- e. Remove the bolts (38) that secure the housing to the cylinder casting. The piston return springs (50) will force the cylinder casting and housing apart.
- f. Lift off the housing (40).
- g. Inspect the cam and bearings (62), and the bearing race in the rear of the housing. If the bearings are pitted or binding, or if the housing race is worn, contact Wanner Engineering.

## 4. Disassemble Pistons

- a. With the pump housing removed (see above), turn the unit over and set it on a flat surface, piston side down.
- b. With the diaphragms removed (see the Fluid End Service Section), reinsert a follower screw (17) into the hole in one of the valve plungers (54). Tap the screw lightly with a hammer; the plunger (21) should slip off the valve plunger (54).  
The hydraulic piston assembly (50-59) can now be disassembled. Inspect all parts, and replace all O-rings and any other parts which are worn or damaged.
- c. Repeat step "b" for the remaining pistons.

**Note: When you reassemble the hydraulic piston, use new plungers (21). They are press-fit onto the valve plungers (54) and are not reusable.**

## 5. Reassemble Pistons

- a. Drop a ball (58) into each opening in the bottom of a piston assembly (59).
- b. Insert a retaining washer (57) and O-ring (56) to hold the ball in place.
- c. Insert a valve plunger (54) into a valve cylinder (55). Slide a spring (53) over the plunger, inside the valve cylinder.
- d. Insert an O-ring (52) into a spring retainer (51).
- e. Slide the assembled valve cylinder, plunger, and spring (53-55) into the spring retainer (51).
- f. Slide the complete cylinder-and-retainer assembly (51-55) into the piston assembly (59).
- g. Insert a return spring (50) into the piston assembly, wide end first. This is a tight fit, and can best be done by "screwing" the spring in counterclockwise.
- h. Repeat the above procedure for the other two pistons.

## 6. Reassemble Housing and Casting

**Note: Inspect the shaft seals (64) before continuing. If they look damaged in any way, replace them (remove by pounding them out from inside the pump housing). Both seals should be replaced at the same time. Be careful not to damage the seal bore.**

- a. Place the cylinder casting (24) face-down on a flat surface.
- b. Insert the assembled pistons (50-59) into the cylinder casting.
- c. Note the location of the outer ring of holes in the cylinder casting and in the pump housing flange (in particular, the holes where bolts (38) will be installed).
- d. Stand the camshaft assembly (62) on the cylinder casting (24).

**Caution: The pilot bearing must be properly nested in the bearing race (62) during assembly. If misaligned, the bearing will be damaged and the pump will fail within the first hours of operation.**

- e. Install the O-ring (65) and slide the housing (40) down over the shaft and onto the threaded studs (from step c). Be sure the holes in the housing and the cylinder casting are properly aligned.
- f. Using the two threaded studs in the Wanner Tool Kit, put a nut on the studs. Thread the nut down on the stud so the threaded end of the stud can be put through one of the bolt holes in the cylinder casting and through the housing casting. Start another nut on this end of the stud. Now put the other stud through the hole on the other side of the cylinder casting and through the housing. Start this nut.  
Using both studs and the nuts, tighten evenly to draw the cylinder casting tight to the housing. Be sure the O-ring (65) stays in place when pulling the two parts together.  
When tight, install the bolts (38) and washer into the cylinder casting to hold it to the housing. Remove the two studs and nuts that were part of the Wanner Tool Kit.
- g. Turn the shaft again to check its alignment.

## 7. Replace Shaft Seals

- a. Apply a thin film of grease on the seal protector tool (part of the Wanner Tool Kit). Slide both seals onto the tool, with the spring side of the seals toward the open end of the tool.  
Apply a heavier coat of grease between the seals and press them together.
- b. Apply a coating of Loctite® 601 or equivalent locking compound to the outside surface of both seals and the inside surface of the opening in the pump housing where the seal will rest.
- c. Apply a light film of grease to the drive shaft.. Slide the seal protector tool (with the two seals) over the end of the shaft.
- d. Slide the seal inserter tool (from the Wanner Tool Kit) over the seal protector tool, and press the seals completely into place. Tap the tool with a soft mallet to firmly seat the seals.

# Service (Hydraulic End)

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## 8. Adjust Camshaft Endplay

- a. If the three set screws (22) are in the cylinder casting (24), remove and clean them.
- b. Insert the centerbolt (1) into the hole in the center of the cylinder casting. Turn it in to move the bearing adjusting plate (61) and cup tight against the bearing cone.
- c. Back out the centerbolt two full turns, then turn it back in again until it is tight against the adjusting plate (61).
- d. Back out the centerbolt or set screw **exactly 1/4** of a turn.
- e. With a plastic mallet (or a regular mallet and wooden board) to prevent damage to the shaft, rap the end of the shaft 3 or 4 times. This will provide about .006 in. (0.15 mm) endplay in the shaft.
- f. Apply removable threadlocker to the threads of the three cleaned set screws (22).  
Screw the three set screws (22) into the cylinder casting until they contact the bearing adjusting plate (61).
- g. Remove the centerbolt (1).

## 9. Reinstall Plungers

**Note: If the plungers (21) have been removed from the valve plungers (54), do not reuse them. Install new ones instead.**

- a. Place a plunger on the screw end of the plunger guide tool from the Wanner Tool Kit. The flat side of the plunger should face the tool.
- b. Screw the guide (with the plunger) into the valve plunger (54) until tight.
- c. Hold the stud with a wrench, and tighten the nut against the plunger guide. This will press-fit the plunger onto the valve plunger. **Never reinstall used plungers (21).**  
**Note: Do not remove the plunger guide until the diaphragm is installed (see below).**
- d. Install the diaphragm as outlined below, then repeat the procedure (steps 9a - 9c) for the other two plungers and diaphragms.

## 10. Reinstall Diaphragms

- a. With the plunger guide tool still screwed into the valve plunger (54), pull the valve plunger up until the cross-holes in the valve plunger are exposed.
- b. Insert a diaphragm Allen wrench (from the Wanner Tool Kit), or similar dowel-type object, through the holes — to hold the plunger (21) away from the cylinder casting, and to keep the valve plunger from turning when the diaphragm is being installed.
- c. Place the diaphragm (20) onto the plunger (21), ridge-side out.
- d. Center the diaphragm follower (19) on the diaphragm.
- e. Place the O-ring (18) onto the follower screw (17).
- f. Apply a small amount of Loctite 242 threadlocker to the threads of the follower screw.
- g. Insert the follower screw (with O-ring) through the diaphragm follower (19) and diaphragm (20), and screw it into the valve plunger (54).
- h. Hold the diaphragm Allen wrench, and tighten the follower screw to 18 in.-lbs (2.0 N-m) of torque.
- i. Repeat the above procedure for the plungers and diaphragms of the other two cylinders.
- j. Fill the reservoir with fresh oil and prime the pump, as outlined in the Fluid End Service Section.

## 11. Reassemble Pump Head

**Reassemble the pump head as outlined in the Fluid End Service Section.**

## 12. Reconnect Electrical Power to Motor (or remove lock-out from power source)