

D-10/G-10 Service (Fluid End)

NOTE: The numbers in parentheses are the Ref. Nos. on the exploded view at right, on the following page, and in the Parts Manual.

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: 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 (29; 25 or 44) 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. Remove Manifold (6), Valve Plate (16)

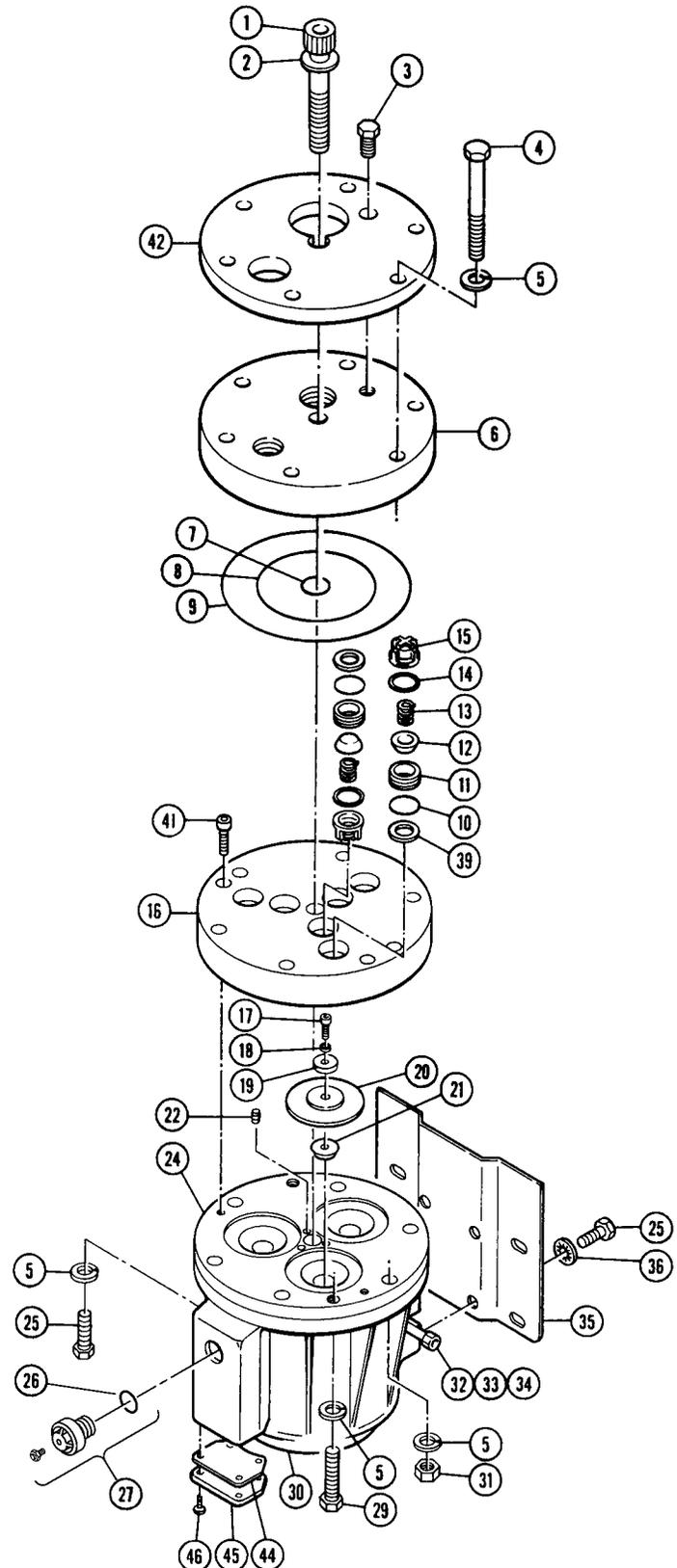
- Remove all nuts (31) and bolts (4) around the manifold. Do not remove the two bolts (29; 25 or 44) that are installed through the back of the pump housing.
- Use a 3/8-in. (10-mm) hex Allen wrench to remove the centerbolt (1) and its washer (2).

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), and support plate (42) [non-metallic pump head only]. The valve plate (16) will remain on the cylinder casting (24).
- Inspect the manifold for warping or wear around the inlet and outlet ports. If wear is excessive, replace the manifold.

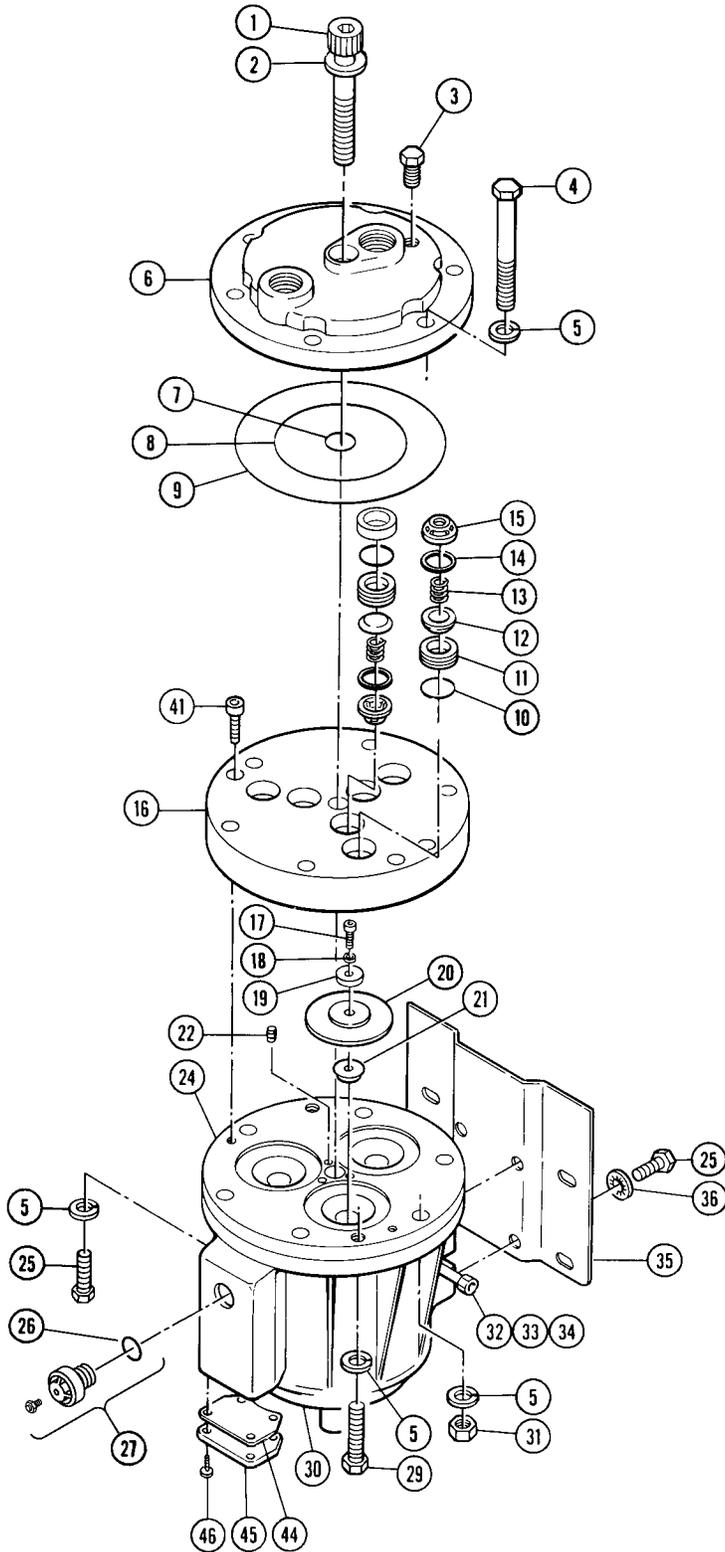
To check if the manifold is warped, remove the O-rings and place a straightedge across it. A warped manifold should be replaced.

**Model D-10/G-10
With Non-Metallic Pump Head**

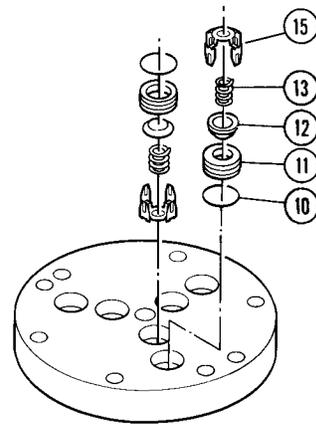


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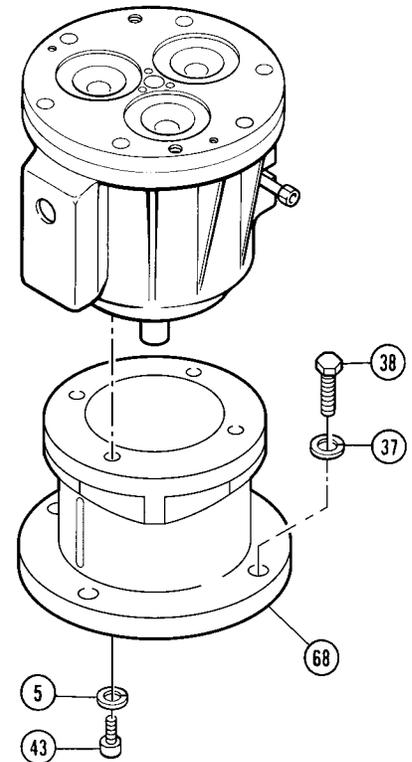
**Model D-10
with Metallic Pump Head**



**Valve Assemblies with
Metal Retainers**



**Pump Housing with
Motor Adapter**



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2. Inspect Valves (10-15, 39)

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

- a. Check the spring retainer (15), and replace if worn.

Note: if your pump has either abrasive duty valve assemblies or a non-metallic pump head there will be a plastic dampening washer (39) at the bottom of each seat. Inspect each one for wear or cracks and replace if necessary.

- b. Check the valve spring (13). If it is shorter than a new spring, replace it (don't just stretch the old spring).
- c. 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).

- d. 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.
- e. 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 (13,12,11). If the pump has plastic spring retainers, a flat O-ring (14) goes between the retainer and seat. Insert dampening washer (39) if included in your valve assembly.
 - **Outlet (3 outer valves).** Insert dampening washer (39) if included in your valve assembly. Insert the valve seat, valve, and spring, then the retainer. If the pump has **plastic** retainers, install the flat O-ring between the retainer and seat. 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 below).

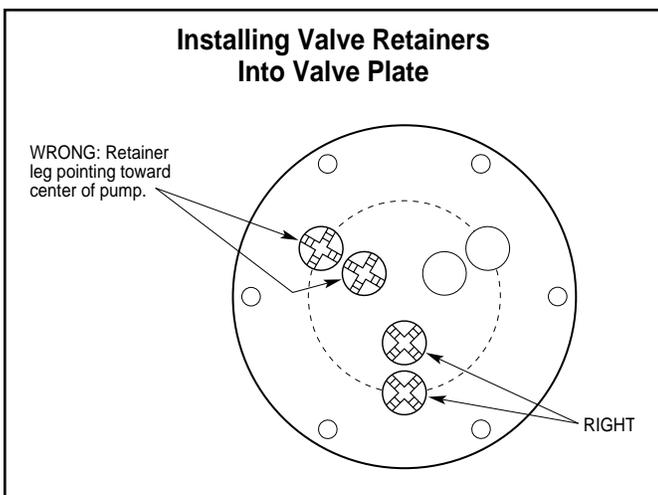
3. Inspect and Replace Diaphragms (20)

If necessary to service the diaphragms, remove the two socket-head cap screws (41) that secure the valve plate (16) to the cylinder casting (24). Inspect the valve plate in the same manner 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.
- b. Insert an Allen wrench through one of the holes, to hold the diaphragm up. The proper size tool is included in the Wanner 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 the "Troubleshooting" section).
 - **Concentric circular marks.** Usually caused by cavitation of the pump (refer to the "Troubleshooting" section).
 - **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 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 (or reinstall the old one, as appropriate), 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.



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4. Flush Contaminant from Hydraulic End

(only if a diaphragm has ruptured)

- Remove the oil drain cap (34) and allow all oil and contaminate to drain out.
- 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.
- Repeat the flushing procedure (step b).
- Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain once again.
- Refill the reservoir. If the oil appears milky, there is still contaminate in the reservoir. Repeat the flushing procedure until the oil appears clean.

5A. Prime the Hydraulic Cells on Standard Pumps

- With the pump horizontal, and the fluid-end head removed, fill the reservoir with the appropriate Hydra-oil for the application. Have a catch basin for oil that leaks from behind the diaphragms when priming. Catch the oil and dispose of it properly; **do not reuse it**.
- All air in the oil within the hydraulic cell (behind the diaphragms) must be forced out by turning the shaft (and thus pumping the piston). A shaft rotator 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.
- Wipe excess oil from the cylinder casting (24) and diaphragms (20).
- Ensure that the oil is 1 inch (25 mm) from the top of the fill port.
- Replace oil fill cap (27).

5B. Priming the Hydraulic Cells for Kel-Cell Pumps

NOTE: Providing oil prime to Kel-Cell fitted pumps requires pressure be applied to the diaphragms. This can be done manually, with the system head pressure, or with pressurized air if available. Review all methods below to determine the procedure most suitable.

Method #1 (system head pressure *less* than 2 psi)

- Install the valve plate (16) but without the outlet valves installed (or else remove the outlet valves; leave the seats installed) onto the cylinder housing. Tighten the two

socket-head screws (41).

- Fill the reservoir with appropriate Hydra-oil to the fill port.
- With a blunt pointer (eraser end of pencil), reach in through each outlet valve port and push the follower-diaphragm backwards. Note the air bubbles coming out at the oil fill port. Now turn the shaft about 1/2 turn.
- Repeat depressing diaphragms and rotating shaft (approx. 4-6 times) until no more air bubbles escape and the oil has dropped about 1 inch (25 mm) from the top of the fill port. The hydraulic cells are now primed. Replace the oil fill cap.
- Install outlet valve assemblies in each outlet valve port. See Parts Manual for correct assembly order. You may have to tip pump (head upward) in order to keep the valve centered on the seat and allow the retainer to fit all the way into port flush.
- Install manifold (6) and complete installation.

Alternative Method #1:

With the pump horizontal, and the fluid-end head removed, fill the reservoir with the appropriate Hydra-oil for the application. Have a catch basin for oil that leaks from behind the diaphragms when priming. Catch the oil and dispose of it properly; **do not reuse it**.

- All air in the oil within the hydraulic piston behind the diaphragms must be forced out by turning the shaft (and thus pumping the piston). A shaft rotator is included in the Hydra-Cell Tool Kit. Keep pressure on the diaphragms while turning the shaft until a bubble-free flow of oil comes from behind all the diaphragms. Maintain the oil level in the reservoir. Do not allow oil level to be lower than the reservoir.
- Quickly attach the loaded valve plate (16) (before the oil runs out past the diaphragms) with socket head screws (41), but do not tighten completely. Leave a gap between the valve plate and the cylinder housing. Turn the shaft 2-3 turns to finish forcing out air behind the diaphragms. The hydraulic cells are now primed. Now finish tightening the valve plate with the two socket head screws and add pump manifold.
- Wipe excess oil from around the pump head.
- Check that the oil level is 1 inch (25 mm) from the top of the fill port.
- Replace the oil fill cap and complete installation.

Method #2 (head pressure *greater* than 2 psi)

This simple and clean method of priming the Hydra-cells requires an inlet head pressure of at least 5 feet (1.5 m) or 2 psi (.14 bar). The pressure source is required to hold the diaphragms back while the piston moves so as to force out the air.

Completely assemble the pump and fill the reservoir with the appropriate Hydra-oil to the fill port.

- When tank head pressure is being used to prime**, install the pump back into the system and connect the tank supply line to pump inlet. Pump discharge line may be connected at this time, but end of line must be open to allow air to pass out.

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- b. Slowly turn the pump shaft by hand and watch for bubbles exiting the oil reservoir fill opening. This will take several rotations; when no more bubbles come out and the reservoir level has dropped about 1" (25 mm), the hydraulic cells are primed.
- c. Replace the oil fill cap and complete installation.
- d. **When compressed air is being used to prime**, insert a clean air hose to the pump inlet and restrict the pump outlet. Turn the shaft a quarter turn and then apply air pressure into the manifold to put pressure on the diaphragms. This will force air out from inside the pistons and you will see bubbles at the reservoir opening. Repeat for several rotations until no more air bubbles come out and the reservoir level has dropped about 1" (25 mm). The hydraulic cells are now primed.
- e. Replace the oil fill cap and complete installation.

6. Reinstall Pumping Head

MODEL D-10

NOTE: Use the bolt (29) protruding through the cylinder casting at the 10 o'clock position to locate the valve plate on the cylinder casting. Place the "blind hole" on the valve plate over this bolt.

- a. Reinstall the valve plate (16), with the valve assemblies installed as outlined above, onto the cylinder casting. Recheck that the blind hole is over the protruding bolt at the 10 o'clock position. Install the socket-head cap screws (41) and secure the valve plate to the cylinder casting.
- 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.
NOTE: on pumps with non-metallic head position support plate (42) onto manifold with ports and bolt holes aligned properly.
- d. Insert all bolts (4), washers (5), and nuts (31). Hand tighten.
- e. Reinstall the centerbolt (1) with its washer (2), and torque to 45 ft-lbs.
- f. Alternately tighten perimeter bolts (4) until all are secure. Torque to 45 ft-lbs.
- g. Recheck all bolts for tightness.

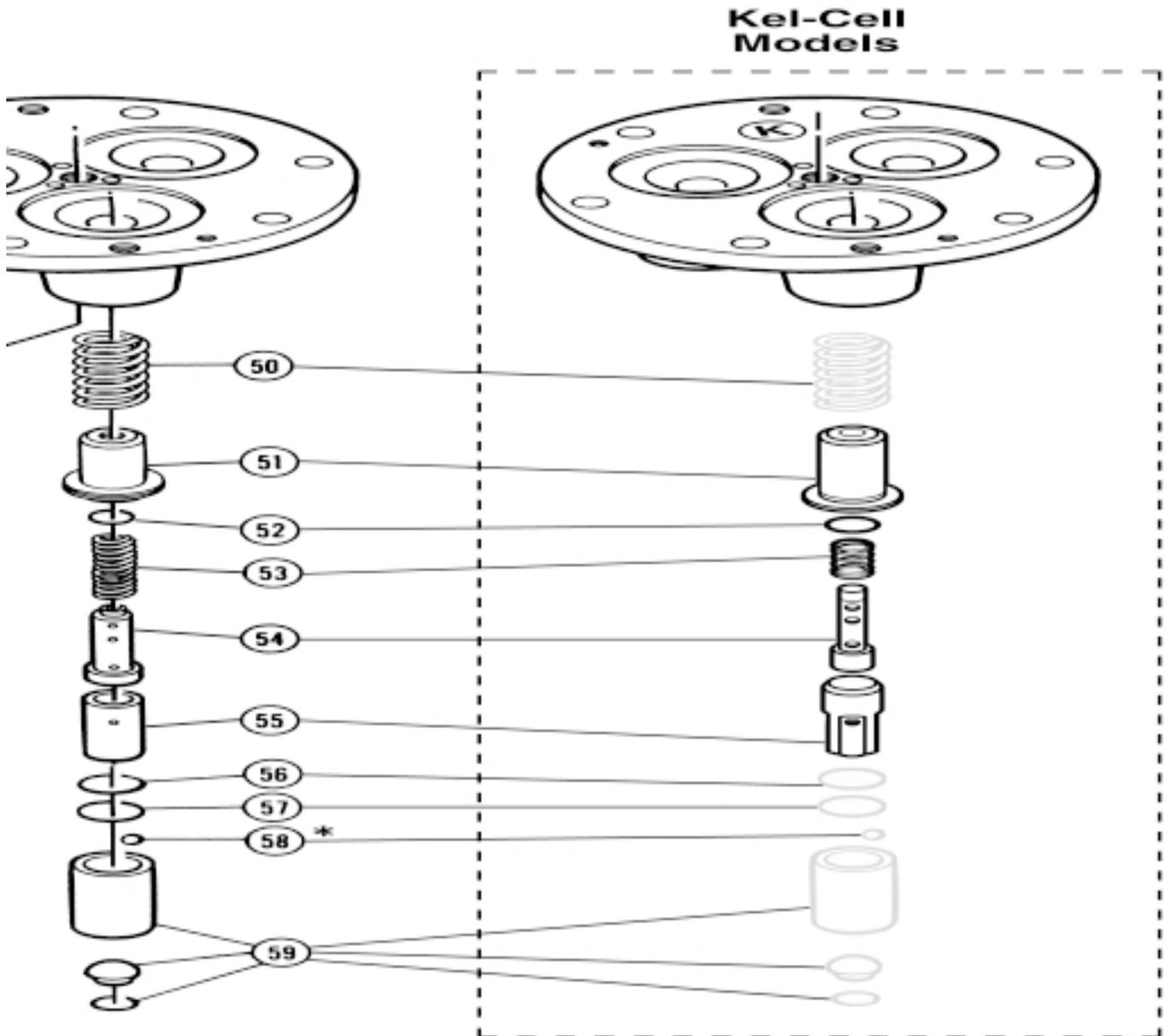
MODEL G-10

NOTE: Use the bolt (29) protruding through the cylinder casting at the 10 o'clock position to locate the valve plate on the cylinder casting. Place the "blind hole" on the valve plate over this bolt.

- a. Reinstall the valve plate (16), with the valve assemblies installed as outlined above, onto the cylinder casting. Recheck that the blind hole is over the protruding bolt at the 10 o'clock position. Install the two socket-head cap screws (41) and secure the valve plate to the cylinder casting.
- 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.
NOTE: on pumps with non-metallic head position support plate (42) onto manifold with ports and bolt holes aligned properly.
- d. Insert all six bolts (4) around the edge of the manifold. Reinstall the pump centerbolt (1) with its washer (2).
- e. Alternately tighten perimeter bolts (4) until all are secure. Torque to 54 N-m.
- f. Tighten the pump centerbolt. Torque to 54 N-m.
- g. Recheck all bolts for tightness.

D-10/G-10 Service (Hydraulic End)

Model D-10 Housing Shown



*Qty per piston: 4

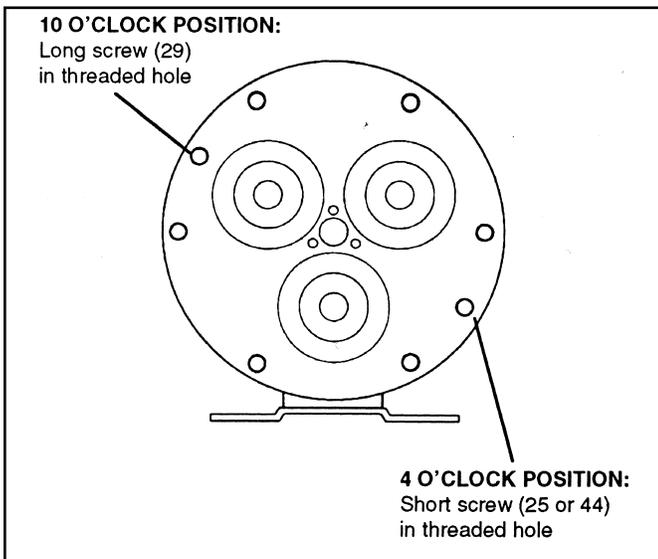
D-10/G-10 Service (Hydraulic End)

NOTE: The numbers in parentheses are the Ref. Nos. on the exploded view on the previous page and in the Parts Manual.

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 (29; 25 or 44) that screw through the back of the housing into the cylinder housing (24) hold the housing 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 (P/N A03-175-1101). We strongly urge you not to try to repair the hydraulic end of the pump without using the tools in this kit (available from Wanner or your local distributor).



1. 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 (34).
- Set the hydraulic end of the pump face-down on the cylinder housing (24), onto a smooth, clean surface.
- Check the shaft for sharp burrs. Smooth any burrs, to prevent scarring the housing seals (64) when you disassemble the pump.
- Remove the bolts (29; 25 or 44) that secure the housing to the cylinder casting. The piston return springs (50) will force the cylinder housing and housing apart.

NOTE: When reassembling later, note that one bolt (29) is 1/4" (5 mm) longer than the other (25 or 44). The longer bolt must be installed in the 10 o'clock position of the cylinder housing (24).

- Lift off the housing (30).
- 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, replace them both.

2. Disassemble Pistons

- With the pump housing removed (see above), turn the unit over and set it on a flat surface, piston side down.
- 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 that are worn or damaged.

- 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.

3. Reassemble Pistons

- Drop a ball (58) into each opening in the bottom of a piston assembly (59).
- Insert a retaining washer (57) and O-ring (56) to hold the balls in place.
- Insert a valve plunger (54) into a valve cylinder (55). Slide a spring (53) over the plunger, inside the valve cylinder.
- Insert an O-ring (52) into a spring retainer (51).
- Slide the assembled valve cylinder, plunger, and spring (53-55) into the spring retainer (51).
- Slide the complete cylinder-and-retainer assembly (51-55) into the piston assembly (59).
- 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.
- Repeat the above procedure for the other two pistons.

4. Reassemble Pump Housing and Cylinder Housing

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. Clean the bore in the housing using emery cloth or ScotchBrite™.

- Place the cylinder housing (24) face-down on a flat surface.
- Insert the assembled pistons (50-59) into the cylinder housing. The holes on the foot end of the pistons should all point toward the center of the casting.
- Note the location of the outer ring of holes in the cylinder housing and in the pump housing flange (in particular, the holes where bolts 29 and 25 or 44 will be installed).
- Stand the camshaft assembly (62) on the cylinder housing (24).
CAUTION: The pilot bearing MUST be properly nested in the bearing race during assembly. If misaligned, the bearing will be damaged and the pump will fail within the first hours of operation.

D-10/G-10 Service (Hydraulic End)

- e. Using petroleum jelly or grease to retain it, install the O-ring (65) and slide the housing (30) down over the shaft. Be sure the holes in the housing and the cylinder housing are properly aligned.
- f. Install two assembly studs from Tool Kit, washers and nuts on the threaded studs, but don't tighten yet. You may want to insert two or more bolts (4) into the unthreaded holes of the housing and cylinder housing to help align the parts.
- g. Alternately tighten the nuts of the assembly studs to evenly draw the housing down to the cylinder housing. Be sure the O-ring (65) stays in place.
Also, as you tighten the nuts keep checking the shaft alignment by turning the shaft (use the rotator in the Wanner Tool Kit). If the shaft begins to bind and become difficult to turn, back off the nuts and realign the shaft. When the housing is tight against the cylinder housing, you should be able to turn the shaft smoothly.
- h. After the pump housing and cylinder housing are together, insert bolt (25) with lock washer (5) (at the 4 o'clock position) through the pump housing and into the cylinder housing. Repeat with a bolt (29) in the 10 o'clock position. Tighten evenly and then remove assembly studs.
- i. Turn the shaft again to check its alignment.

5. 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® High-Performance Pipe Sealant With Teflon®, or a comparable product, to the outer surface of both seals and the inside surface of the opening in the pump housing where the seals 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.

6. Adjust CamShaft Endplay

- a. Remove the three set screws (22) from the cylinder casting (24), 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 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 0.006 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).

7. Install Plungers

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

- a. Rotate the pump shaft so the piston is at the top-dead-center position.
- b. Place a plunger on the exposed screw end of the plunger guide tool from the Wanner Tool Kit. The larger-diameter side of the plunger should face the tool.
- c. Screw the guide (with the plunger) into the valve plunger (54) until tight.
- d. Hold the single bottom handle of the guide, and turn the double top handle to force the plunger to seat on the valve plunger. This is a press-fit – when installed, the plunger should be tight against the shoulder of the valve plunger.
NOTE: Do not remove the plunger guide until the diaphragm is installed (see below).
- e. Install the diaphragm as outlined below, then repeat the procedure for the other two plungers and diaphragms.

8. 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 a similar dowel-type object, through the top hole — 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 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 torque the follower screw to 18 in.-lbs (2.0 N-m).
- 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.

9. Reassemble Pump Head

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