

D/G-04 Maintenance

NOTE: The numbers in parentheses are the Ref. Nos. on the illustrations in the Parts Manual.

Daily

Check the oil level and the condition of the oil. The oil level should be 1/4 in. (6 mm) above the cast surface in the upper oil reservoir.

Use the appropriate Hydra-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 (17) may be damaged. Refer to the Fluid-End 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.

Periodically

Change the oil after the first 100 hours of operation, then change according to the guidelines below. When changing, remove the drain plug (60) at the bottom of the pump so all oil and accumulated sediment will drain out.

Hours Between Oil Changes @ Various Process Fluid Temperatures

Pressure	RPM	<90°F (32°C)	<139°F (60°C)	<180°F (82°C)
<1500 psi (100 bar)	<1200	6,000	4,000	2,000
	<1800	3,000	2,000	1,500
<2500 psi (170 bar)	<1200	3,000	2,000	1,500
	<1800	1,500	—	1,000

NOTE: Minimum oil viscosity for proper hydraulic end lubrication is 16-20 cST (80-100 SSU).

NOTE: Use of an oil cooler is recommended when process fluid and/or hydraulic end oil exceeds 180°F (82°C).

CAUTION: Do not turn the drive shaft while the oil reservoir is empty.

Check the inlet pressure or vacuum periodically with a gauge. If vacuum at the pump inlet exceeds 7 in. Hg (180 mm Hg), check the inlet piping system for blockages. If the pump inlet is located above the supply tank, check the fluid supply level and replenish if too low.

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

Shutdown Procedure During Freezing Temperatures

Take all safety precautions to assure safe handling of the fluid being pumped. Provide adequate catch basins for fluid drainage and use appropriate plumbing from drain ports, etc., when flushing the pump and system with a compatible antifreeze.

1. Adjust the discharge pressure regulating valve so the pump runs under minimum pressure. Stop the pump.
2. Drain supply tank; open any draincocks in system piping and collect drainage. Drain as much fluid from the pump manifold and plumbing attached directly to the pump manifold by loosening fittings or removing plugs or gauges.
3. Close draincocks in system piping and tighten or replace any fittings, gauges or plugs.
4. Fill supply tank with enough antifreeze to fill system piping and pump.

NOTE: Disconnect the system return line from the supply tank and connect it to a separate reservoir.

5. Start the pump and allow it to run until the system is filled with antifreeze. **NOTE:** If the system has an airlock and the pump fails to prime, follow step 4 of the Initial Start-up Procedure to clear the air.
6. When mostly antifreeze is flowing from the system return line, stop the pump. Connect the system return line back to the supply tank and circulate the antifreeze for a short period.
7. It is also good practice to change the oil in the hydraulic end before storage for an extended period. This will remove any accumulated condensation and sediment from the oil reservoir. Drain and refill the hydraulic end with the appropriate Hydra-Oil and operate the pump for a short period to assure smooth performance.

D/G-04 Service (Fluid End)

NOTE: The number in parentheses are the Reference numbers on the illustration at right 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 capscrews (16) that screw through the diaphragm plate in the pump housing hold the diaphragm plate over the hydraulic end of the pump. Do not remove them except when repairing the hydraulic end.

Tools and Supplies

- Straightedge (at least 6 in. long)
- Grease or petroleum jelly
- Torque wrench, rated to at least 50 ft-lbs (70 N-m)
- Emery cloth
- 1/2-in. drive socket wrench
- 5/16-in. (8-mm) open-end wrench
- 5-mm hex Allen wrench
- 8-mm hex bit socket (1/2 inch drive)
- Wanner D-04/G-04 Tool Kit, which includes the following:
 - Seat puller
 - Plunger holder
 - Plunger guide lifter
 - Shaft rotator

Service Procedures

1. Remove Manifold (3) and Valve Plate (12)

- a. Remove all eight capscrews (1) around the manifold. Use an 8-mm hex Allen wrench.
- b. Remove the manifold (3).
- c. 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, place a straightedge across it. A warped manifold should be replaced.
- d. Remove the two socket-head capscrews (14) that hold the valve plate to the pump housing. Use a 5-mm hex Allen wrench.
- e. Inspect the valve plate in the same manner as the manifold, for excessive wear and/or warping. Replace if necessary.

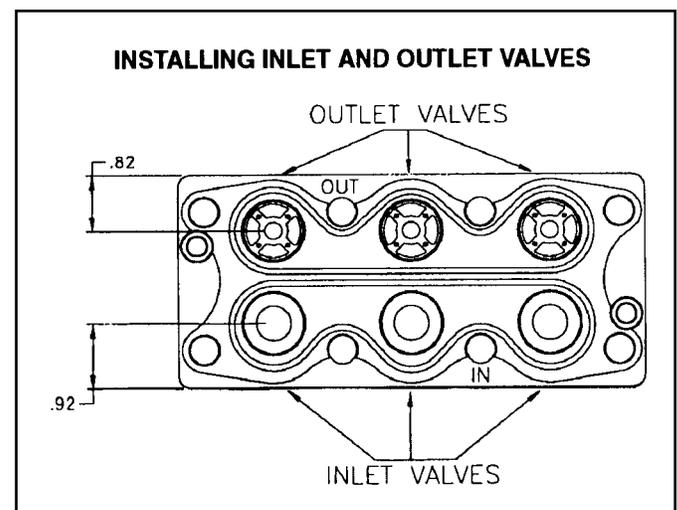
2. Inspect Valves (5-11)

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 (10), and replace if worn.
- b. Check the valve spring (8). If shorter than a new spring, replace it (do not stretch a used spring).
- c. Check the valve (7). If worn excessively, replace it.
- d. Remove the valve seat (6), O-ring (5), and dampening washer (11) (See note below). A seat puller is included in the Wanner Tool Kit. Inspect all parts for wear. In all instances, O-ring (5) should be replaced. Replace the valve seat and/or dampening washer if necessary.

NOTE: On newer pump models, the dampening washer (11) is not used because the valve seat (6) is thicker. When replacing the valve seat on an older pump model which has dampening washers, do **not** reinstall the dampening washers as the new valve seat is thicker than the original.

- 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 (5) on the valve seat (6).
 - **Inlet (3 lower valves in the illustration below).** Insert the spring retainer (10) into the valve plate, then insert the spring, valve, Tetra seal, valve seat, and dampening washer (8,7,9,6,11). A flat O-ring (Tetra seal, 9) goes between the retainer and seat.
 - **Outlet (3 upper valves in the illustration below).** Insert the dampening washer, valve seat, Tetra seal, valve, and spring, then the retainer. Install the flat O-ring (Tetra seal, 9) between the retainer and seat.



D/G-04 Service (Fluid End)

3. Inspect and Replace Diaphragms (17)

- a. Lift a diaphragm by one edge, and turn the pump shaft until the diaphragm moves up to “top dead center”. This will expose machined cross-holes in the plunger shaft behind the diaphragm.
- b. Insert the plunger holder tool through one of the machined cross-holes, to hold the diaphragm up. (Don't remove the tool until the new diaphragm is installed in step “f” below.)
- c. Unscrew the diaphragm. Use a 5/16-in. (8-mm) open-end wrench, and turn counterclockwise.
- d. Inspect the diaphragm carefully. A damaged diaphragm generally indicates a pumping system problem and replacing only the diaphragm will not solve the larger problem. Inspect the diaphragm for the following:
 - **Small puncture.** Usually caused by a sharp foreign object in the fluid, or by an ice particle.
 - **Diaphragm pulled away** from the metal insert. Usually caused by excessive inlet vacuum, or by overpressurization of the pump inlet.
 - **Outer diaphragm bead extruded.** Usually caused by overpressurization of the pump.
 - **Diaphragm becoming stiff** and losing flexibility. Usually caused by pumping a fluid that is incompatible with the diaphragm material.
 - **Cut diaphragm convolute.** Usually caused by excessive inlet vacuum.
- e. Clean away any spilled oil.
- f. Install a good or new diaphragm and tighten to 10 in.-lbs (110 N-cm).
- g. Repeat the above inspection procedure (and replacement, if necessary) with the other two diaphragms.

4. Flush Contaminant from Hydraulic End

(only if a diaphragm has ruptured)

- a. With the valve plate and manifold still removed (see above), remove the oil drain cap (60) allow all oil and contaminant to drain out.
- b. Fill the reservoir with kerosene or solvent, manually turn the pump shaft to circulate the kerosene, and drain. Dispose of this contaminated fluid properly.
- c. Repeat the flushing procedure (step “b” above).
- d. Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain 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.

5. Prime the Hydraulic Cells

- a. With the pump **horizontal**, fill the reservoir with the appropriate Hydra-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 the piston. Use a glove when turning the shaft by hand.

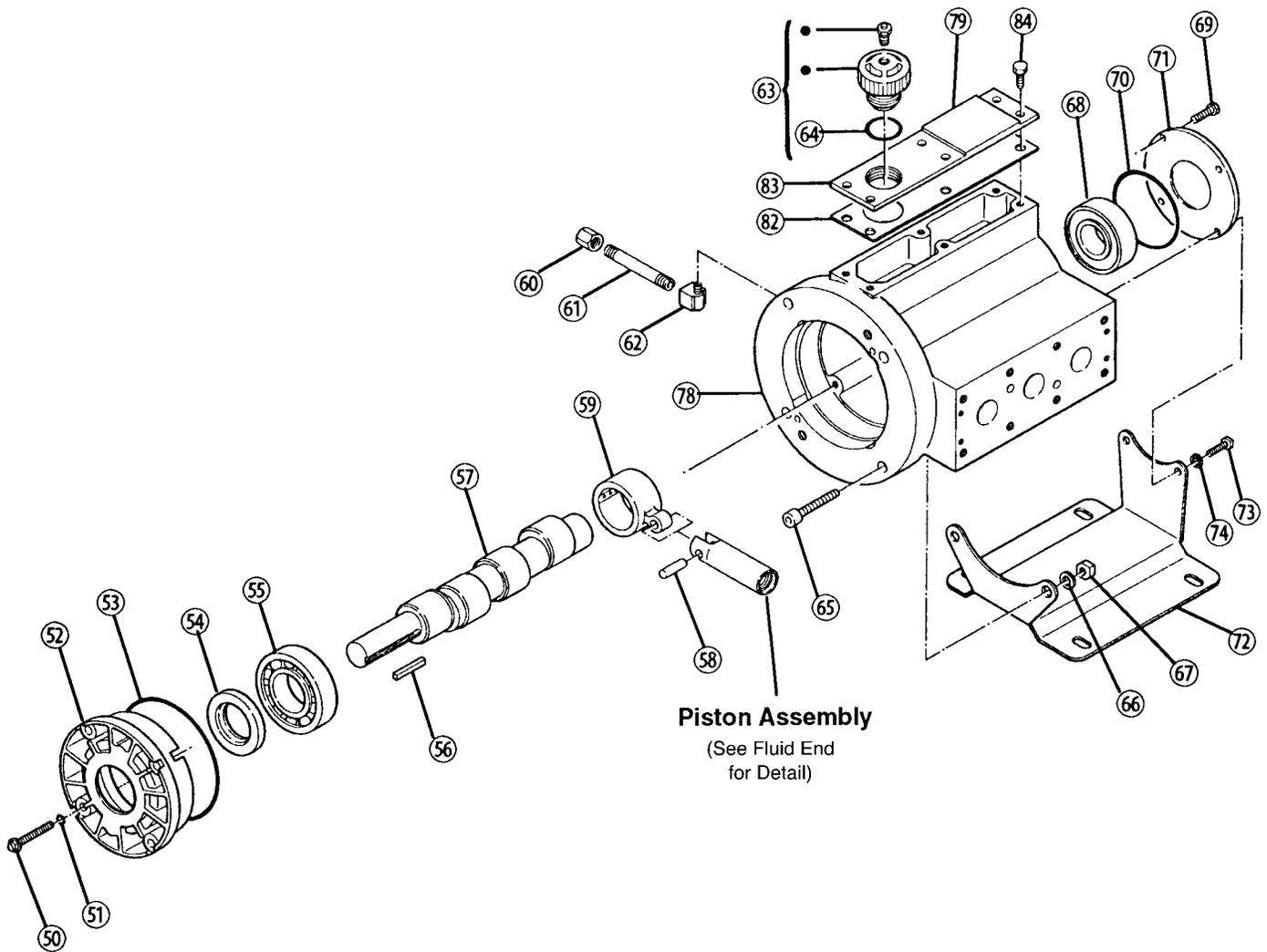
Turn the shaft until a **bubble-free** flow of oil comes from behind all the diaphragms. Watch the oil level in the reservoir: if it gets too low during priming, air will be drawn into the piston (inside the hydraulic end). This will cause the pump to run rough, and you will have to start over again with priming the hydraulic cells.
- c. After the Hydra-Cells are fully primed, ensure that the oil level is 1/4 in. (6 mm) above the cast surface in the upper oil reservoir.
- d. Wipe excess oil from the diaphragm plate and diaphragms.

D/G-04 Service (Fluid End)

6. Reinstall Valve Plate (12) and Manifold (3)

- a. Reinstall the valve plate (12), with the valve assemblies installed as outlined above, onto the diaphragm plate (18) and alignment pins (29).
Tighten the two socket-head capscrews evenly and snugly to compress the outer diaphragm beads and hold the valve plate in place.
- b. Reinstall the O-rings (4) on the front side of the valve plate. Use petroleum jelly or lubricating gel to hold them in place.
- c. Reinstall the manifold onto the valve plate.
- d. Insert all capscrews (1), with washers (2), around the edge of the manifold, and alternately tighten opposite bolts until all are secure. Torque to 50 ft-lbs (70 N-m).
- e. Recheck all bolts for tightness and proper torque.

D/G-04 Service (Hydraulic End)



D/G-04 Service (Hydraulic End)

NOTE: The numbers in parentheses are the Ref. Nos. on the illustrations in the Parts Manual.

This section explains how to disassemble and inspect the hydraulic end (oil reservoir) of the pump.

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.

Depending on the repair you are attempting, you may or may not have to remove the motor from a direct-drive pump/motor unit.

Internal piston components (21-27) can be serviced without removing the motor or crankshaft. The motor and crankshaft must be removed to service the connecting rod (59), piston housing (20), crankshaft (57), front bearing (68), back bearing (56), or seal (54).

Tools and Supplies

- Tools required for hydraulic end only:
 - Snap-ring pliers
 - Small hook
 - 8-mm socket wrench

To Service Pistons Without Removing Motor or Crankshaft

1. Disassemble Pistons

With the manifold, valve plate, diaphragm plate, and diaphragms removed, and the oil drained from the pump (see the Fluid-End Service Section):

- Remove the snap ring (27) from one of the pistons, using a standard snap-ring pliers.
- Pull out the valve plunger (24). This also removes the washer (26) and spring (25).
- Insert a small hook through the center hole of the valve cylinder (22), and pull the cylinder out of the piston. Be careful not to damage the piston.
- Inspect all parts, and replace the O-ring and any other parts that are worn or may be damaged.
- Repeat steps "a" through "d" for the remaining pistons.

2. Reassemble Pistons

- Tip the pump so the pistons are vertical.
- Drop a ball (21) into the opening in the bottom of the piston.
- Insert the valve plunger (24) into a valve cylinder (22). Slide a spring (25) over the plunger, inside the valve cylinder.
- Slide the assembled valve cylinder, plunger, and spring (22-25) into the piston (20).
- Insert the washer (26) over the plunger.
- Using the snap-ring pliers, insert a snap ring (27) into the piston.
- Repeat the above procedure for the other two pistons.

To Service Remainder of Hydraulic End

1. Remove Pump Housing

- Remove the manifold, valve plate, diaphragm plate, and diaphragms, as outlined in the Fluid-End Service Section.
- Drain the oil from the pump housing by removing the drain plug (60).
- Stand the pump on end, with the drive shaft up.
- Remove the bolts (50) that secure the back cover (52) to the housing (78). Use an 8-mm socket wrench. Save the O-rings (51).
- Remove the cover and the cover O-ring (53).
- Remove the crankshaft (57) by pulling it through the connecting rods (59).

2. Remove and Replace Pistons

To remove the pistons (20), first remove the connecting rod (59) and pin (58) by pressing the pin through the connecting rod.

Reverse the process to reinstall the piston.

Refer to Steps 5 and 6 below to replace the diaphragm and reassemble the pump.

D/G-04 Service (Hydraulic End)

3. Replace Shaft Seal

NOTE: Inspect the shaft seal (54) before continuing. If it looks damaged in any way, replace it.

- a. Press the back bearing (55) and seal (54) out of the cover (52). Discard the seal.
- b. Apply a coating of Loctite High-Performance Pipe Sealant with Teflon®, or a comparable product, to the outer surface of a new seal and the inside surface of the opening in the back cover (52) where the seal will rest.
- c. Press the new seal into the back cover.
- d. Inspect the bearing (55). If pitted or damaged, replace it.
- e. Apply a coating of Loctite Rc/609 Retaining Compound or comparable product to the outer surface of the bearing. Press the bearing into the back cover until it rests on the shoulder. The shield on the bearing must face away from the back cover.

4. Reassemble Housing and Back Cover

- a. Stand the pump on end.
- b. With the pistons and connecting rods in place, reinstall the crankshaft by threading it through the connecting rods.
- c. Reinstall the back cover, cover O-ring, and bolts (with their O-rings).

5. Reinstall Diaphragms

- a. Screw the plunger guide lifter (from the Wanner Tool Kit or Repair Kit) into the valve plunger (24). Pull out to expose the cross holes in the plunger. Rotate the shaft until the piston is at top dead center.
- b. Insert the plunger holder tool (from the Wanner Tool Kit), through the plunger hole — to hold the plunger away from the diaphragm plate (18), and to keep the plunger from turning when the diaphragm is being installed.
- c. Engage the diaphragm insert threads to the plunger threads, and turn the diaphragm by hand until the insert hits the shoulder of the valve plunger (24).
- d. Hold the plunger holder tool to secure the valve plunger, and torque the diaphragm insert to 10 in.-lbs (110 N-cm) using a 5/16-in. (8-mm) open-end wrench.
- e. Repeat the above procedure for the plungers and diaphragms of the other two cylinders.
- f. Fill the reservoir with fresh oil and prime the pump, as outlined in the Fluid-End Service Section.

6. Reassemble Pump

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