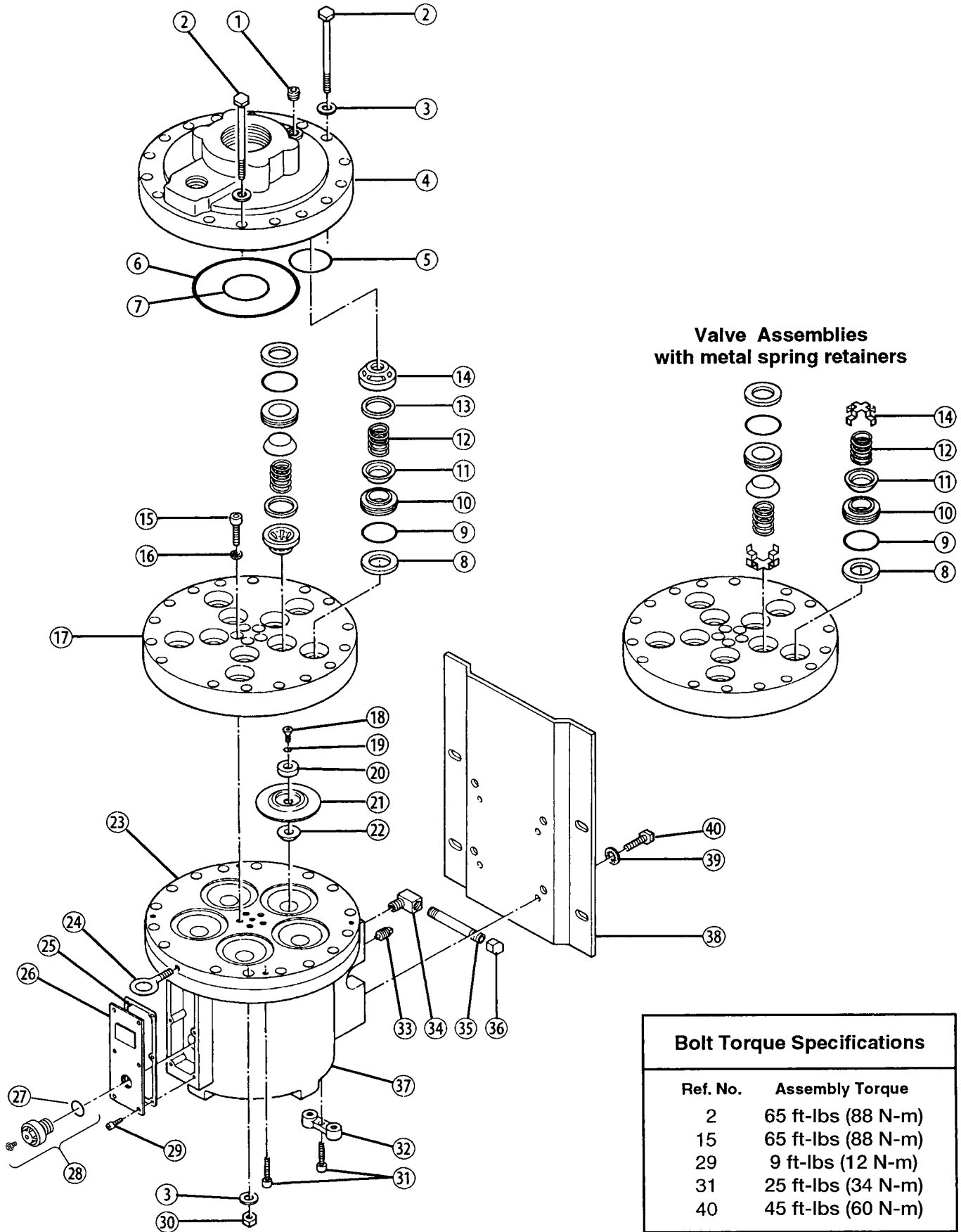


D-35/G-35 Service (Fluid End)



D-35/G-35 Service (Fluid End)

NOTE: The number in parentheses are the Reference numbers on the illustration on the preceding page.

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 (612-332-5681) or the distributor in your area.

CAUTION: Do not remove the four socket-head capscrews (31) that go through the back of the pump housing (37) and thread into the cylinder housing (23), unless you are repairing the hydraulic end of the pump.

Tools and Supplies

The following tools and supplies are recommended for servicing the fluid end of the pump:

- Wanner D-35/G-35 Tool Kit, P/N A03-200-1100
- 18-mm hex socket
- 18-mm box-end wrench
- Two 19-mm open-end wrenches
- Large Phillips-head screwdriver
- Mallet
- Torque wrench to 70 ft-lbs (100 N-m)
- New oil
- Lubricating gel
- Fine emery cloth

The following additional supplies are recommended for servicing the hydraulic end of the pump:

- 17-mm hex socket or box-end wrench
- Grease
- Anaerobic seal sealant

Service Procedure

1. Remove Manifold and Valve Plate (4, 17)

- a. **Manifold.** Using an 18-mm hex socket and 18-mm box-end wrench, remove the 16 bolts (2) and hex nuts (30). **Do not remove** the four socket-head capscrews (31). Remove the manifold.

NOTE: When you remove the valve plate in the following step, some oil will leak out from behind the diaphragms. Provide something to catch this oil leakage.

- b. **Valve Plate.** Reinsert two of the perimeter bolts (2) through the pump housing from the shaft end at approximately the 2 and 10 o'clock positions, to hold the valve plate when the five capscrews (15) are removed. Using a 10-mm hex wrench, remove the five socket-head capscrews and the valve plate.

CAUTION: Don't turn the pump drive shaft while the manifold and valve plate are off the pump, except when removing diaphragms or repriming the hydraulic cells.

- c. Inspect the manifold for warping or wear around the inlet and outlet ports. If wear is excessive, replace the manifold.

Inspect the valve plate in the same manner.

2. Inspect Valves (8-14)

NOTE: Wanner Valve Kits include items 8 - 14 and all O-rings for sealing the manifold to the valve plate.

The five inlet and five outlet valve assemblies are identical, but face in opposite directions. Inspect each valve as follows:

- a. Check the spring retainer (14), and replace if worn or damaged.
- b. Check the valve spring (12). If it is worn or shorter than a new spring, replace it. Don't just stretch the old spring.
- c. Check the valve (11) for wear or damage. If worn excessively, replace it.

NOTE: If your pump has plastic spring retainers, there is a Tetra seal (flat O-ring) (13) between the spring retainer (14) and valve seat (10). Pumps with metal spring retainers do not have the Tetra seal.

- d. Check the dampening washer (8), and replace if damaged.
- e. Remove the valve seat (10). A Seat Puller Tool is included in the Wanner Tool Kit. Inspect the valve seat for wear, and replace it if worn. Install a new O-ring (9).

NOTE: Whenever you replace any worn valve or valve seat, we recommend that you replace all the valve assemblies to ensure reliable operation. All the necessary parts are included in a replacement Valve Kit.

D-35/G-35 Service (Fluid End)

- f. Reinstall the valve assemblies:
- Clean the valve ports and shoulders in the valve plate (17) with a Scotch-Brite™ pad or fine emery cloth. Wash the valve plate after cleaning, and lubricate the valve ports with a compatible grease, oil, or lubricating gel.
CAUTION: If the elastomers are EPDM material, do not use a petroleum-based lubricant on them. Instead, use an EPDM-compatible lubricant. If the product is food-grade, use a compatible food-grade lubricant.
 - Install the O-ring (9) on the valve seat (10), and lubricate it. Do this on all ten valve seats.
 - **Inlet Valves (five center valves).** Insert the spring retainer (14) into the valve plate (17), then insert the spring (12) into the spring retainer (14). If the pump has plastic spring retainers (14), insert the Tetra seal (13) between the retainer and valve seat (10). Insert the valve (11) on top of the valve spring (12), then insert the valve seat (10). The side of the seat that has the deepest chamfer should face the valve. Finally, insert the dampening washer (8). A compatible grease or oil will help the dampening washer to stick to the valve seat (10) for easier assembly.
 - **Outlet Valves (five outer valves).** Insert the dampening washer (8), valve seat (10), valve (11), and spring (12), then the spring retainer (14). If the pump has plastic retainers, install the Tetra seal (13) between the valve seat (10) and spring retainer (12).
- **Slice in ridge of diaphragm.** Usually occurs when a diaphragm is operated at temperatures below its rated capability.
 - **Diaphragm edge chewed away.** Usually caused by overpressurizing the system. Could also be caused by the center and exterior bolts not being torqued to their correct values.
- e. Inspect the plunger (22) for any rough surfaces or edges. **Do not remove** the plunger from the valve plunger (69). **CAUTION: If a diaphragm was damaged 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 (21) ridge-side out. We recommend that you not reuse old diaphragms, because the material may have taken a compression set and thus will not seal properly.
- g. Clean the screw (18), follower (20), and the threads in the valve plunger (69). Remove any oil from the valve plunger. Apply a medium-strength threadlocker (Loctite® 242) to the screw (18). Re-install the screw, O-ring (19), and follower, and tighten the screw to 18 in-lbs (200 N-cm).
- h. Repeat the above inspection and replacement procedure with the other four diaphragms.

3. Inspect and Replace Diaphragms (21)

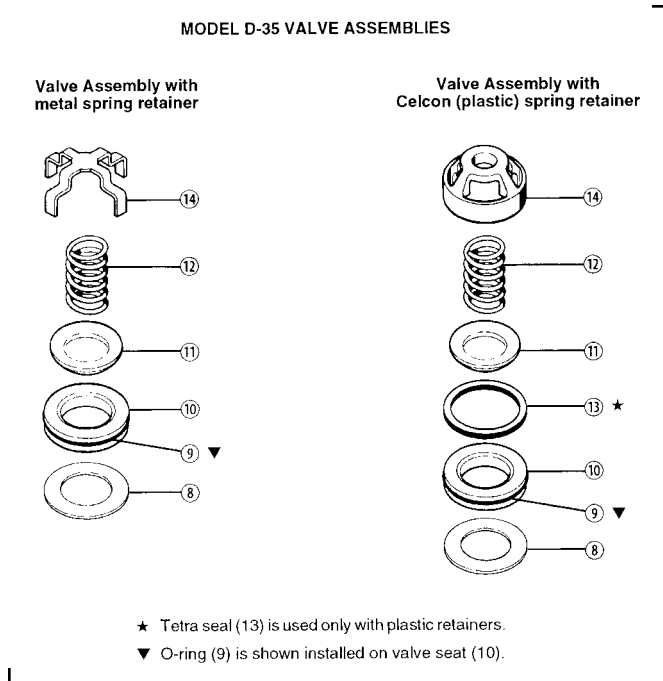
- a. Lift the diaphragm by one edge, and turn the pump shaft until the diaphragm pulls up. This will expose machined cross-holes in the valve plunger (69) behind the diaphragm.
- b. Insert the Valve Plunger Holder (from the Wanner Tool Kit) through one of the cross-holes, to hold the diaphragm up.
- c. Grasp the Plunger Holder so the valve plunger (69) won't rotate, remove the screw (18), O-ring (19), and follower (20) from the center of the diaphragm.
- d. Remove the diaphragm and inspect it 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:
- **Half-moon marks.** Usually caused by cavitation of the pump (refer to "Troubleshooting", page 11).
 - **Concentric circular marks.** Usually caused by cavitation of the pump (refer to "Troubleshooting", page 11).
 - **Small puncture.** Usually caused by a sharp 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.

4. Flush Contaminate 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 (38). Allow all oil and contaminate to drain out (catch and dispose of it properly).
- b. Fill the reservoir with kerosene or solvent, manually turn the pump shaft to circulate the kerosene, and drain. Catch and dispose of the contaminated fluid properly.
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" above).
- d. Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain once again. Catch the oil and dispose of it properly.
- e. Refill the reservoir. If the oil appears milky, there is still contaminate in the reservoir. Repeat the flushing procedure until the oil appears clean.

D-35/G-35 Service (Fluid End)



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 Wannier 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

D-35/G-35 Service (Fluid End)

be connected at this time, but end of line must be open to allow air to pass out.

- 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.

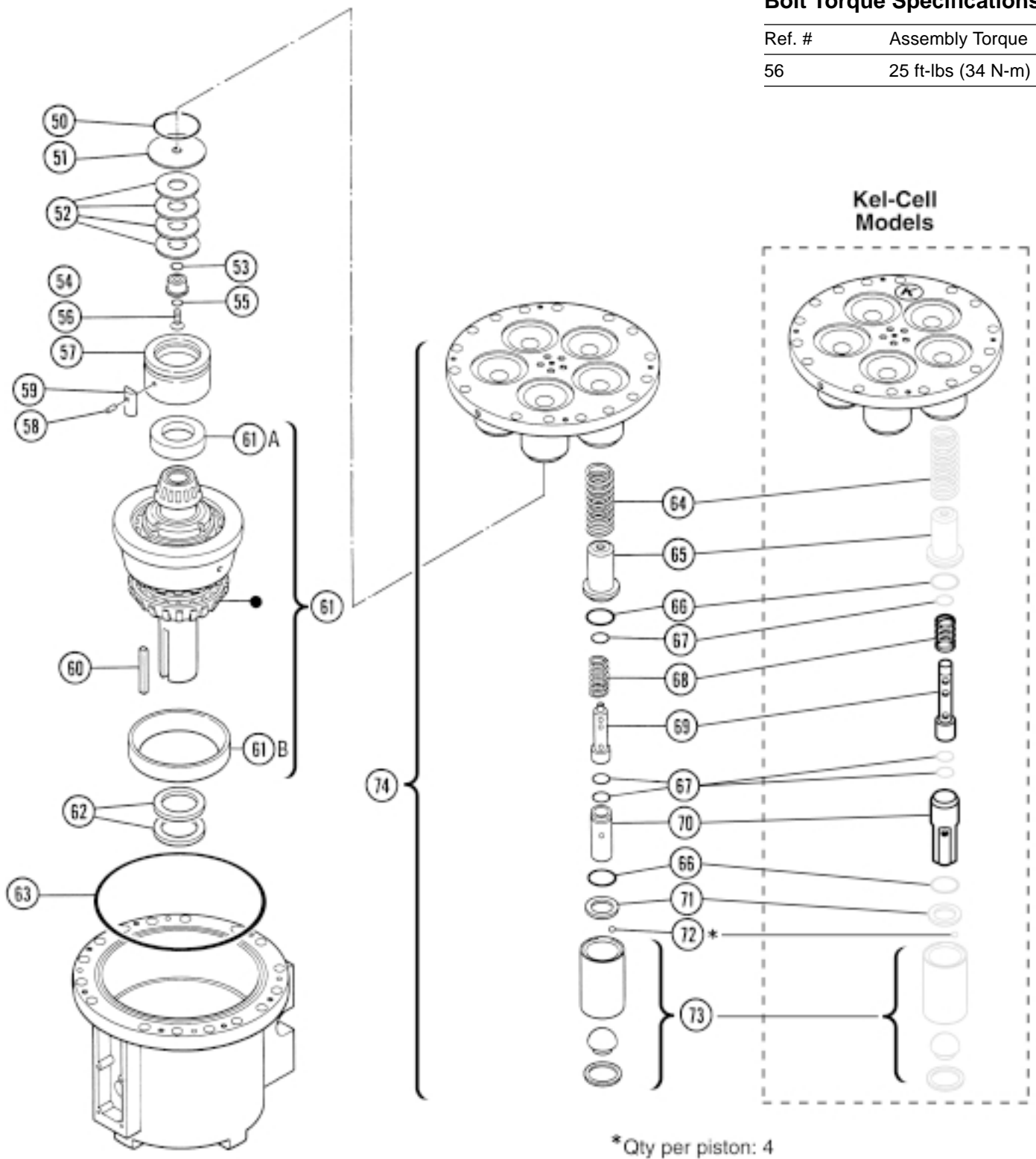
6. Reinstall Valve Plate and Manifold (4, 17)

- a. Reinstall the valve plate (17), with the valve assemblies installed as outlined above, onto the cylinder housing (23).
- b. Insert two perimeter bolts (2) at the 10 and 2 o'clock positions, through the pump housing (39) from the shaft end, and then through the cylinder housing and valve plate. They will be used to hold the valve plate and manifold during reassembly.
- c. Place a lock washer (16) on each socket-head capscrew (15), and install all five centerbolts through the valve plate, then thread them into the cylinder housing. Before tightening these capscrews, install at least ten of the perimeter bolts (2) through the valve plate and cylinder housing holes, to make sure the alignment is good. Using a 10-mm hex socket and torque wrench, torque the five capscrews (15) to 65 ft-lbs (88 N-m). Then remove the ten perimeter bolts.
- d. Lubricate the O-rings (5-7) with petroleum jelly or lubricating gel to hold them in place. If this is a food-grade application or using EPDM elastomers, be sure the lubricating gel is compatible with the application. Install the O-rings in the grooves on the manifold (4).
- e. Reinstall the manifold onto the valve plate. Be sure the drain plug (1) is at the bottom of the manifold.
- f. Insert all 16 bolts (2), with washers (3) and hex nuts (32), around the edge of the manifold. Using an 18-mm hex socket and 18-mm box-end wrench, alternately tighten opposite bolts until all are secure. Torque to 65 ft-lbs (88 N-m).

D-35/G-35 Service (Hydraulic End)

Bolt Torque Specifications

Ref. #	Assembly Torque
56	25 ft-lbs (34 N-m)



*Qty per piston: 4

D-35/G-35 Service (Hydraulic End)

NOTE: The number in parentheses are the Reference numbers on the illustration on the preceding page.

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 (612-332-5681) or the distributor in your area.

CAUTION: The four socket-head capscrews (31) that screw through the back of the pump housing (37) into the cylinder housing (23) hold these parts together. Do not remove these four screws except when repairing the hydraulic end.

NOTE: The following service procedures refer several times to the Wanner D-35/G-35 Tool Kit. 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 Engineering or your local distributor). Refer also to the list of tools and supplies in the Fluid-End Service Section.

Service Procedure

1. Remove Pump Housing

- Remove the manifold and valve plate, and the diaphragms, from the pump. Refer to the Fluid-End Service Section
- Drain the oil from the pump housing by removing the drain plug (36). Dispose of the oil properly.
- Check the shaft for sharp burrs. Smooth any burrs, to prevent scarring the seals (62) when removing the shaft.
- Reinsert two perimeter bolts (2) through the pump housing (37) and cylinder housing (23) from the shaft end, at the 10 and 2 o'clock positions, to support the parts as the pump is being disassembled.
Install the Shaft Rotator (from the Tool Kit) over the shaft. Push it on all the way, so the front of the Rotator touches the pump housing. Tighten the Rotator set screw into the keyway. This will keep the shaft assembly (61) attached to the pump housing (37) when the cylinder housing (23) is removed.
- Using three Assembly Studs from the tool kit, insert them (equally spaced) through the pump housing flange and cylinder housing. Tighten nuts to within 3/4" (17 mm) from the housing. (The Assembly Studs will "catch" the cylinder housing as you unbolt it and allow you to remove it slowly under spring tension.)
- Remove the four socket-head capscrews (31) that are threaded into the cylinder housing (23). Slide the cylinder housing out on the two bolts (2) that were inserted for support in Step d above. The preload on the piston return springs will push the cylinder housing out of the pump housing. Remove the cylinder housing assembly.
- Remove the shaft assembly (61) by loosening the set screw in the Shaft Rotator and sliding the shaft out of the seals (59). The parts are heavy and you may need a second person or a lifting device to move some of them.

2. Disassemble Pistons

- Place the cylinder housing assembly (23) on a clean flat surface, with the piston-feet side down.
- With the diaphragms removed (see the Fluid-End Service Section), thread a follower screw (18) approximately three turns into one of the valve plungers (69). Tap the follower screw lightly with a hammer, and the plunger (22) should slip off the valve plunger (69). Remove the follower screw. The hydraulic piston assembly (74) can then be removed. Repeat this for all five cylinders.
- Inspect and clean all parts of the piston assembly (74), and replace all O-rings and any other parts that are worn or damaged. Repeat this on all five assemblies.

3. Reassemble Pistons

NOTE: When reassembling the hydraulic pistons, use new plungers (22). They are press-fit onto the valve plungers (69) and are not reusable.

- Drop a ball (72) into each opening in the bottom of the piston assembly (73).
NOTE: Using grease on the O-rings, and lubricating the parts, will aid in assembly.
- Insert a retaining washer (71) and O-ring (66) to hold the balls in place.
- Insert a valve plunger (69) into the valve cylinder (70). Slide a spring (68) over the valve plunger (69), inside the valve cylinder (70).
- Insert an O-ring (67) into the spring retainer (65).
- Install two O-rings (67) onto the valve cylinder (70).
- Install an O-ring (66) onto the spring retainer (65).
- Slide the assembled valve cylinder (70), valve plunger (69), and spring (68) into the spring retainer (65).
- Slide the complete cylinder-and-retainer assembly into the piston assembly.
- Insert a piston return spring (64) into the piston assembly.
- Repeat the above procedure for the other four pistons.

4. Remove Shaft Seals (62)

Inspect the shaft seals (62) before continuing. If they look damaged in any way, replace them. Remove by pounding them out from inside the pump housing. Replace both shaft seals at the same time. Clean the bore in the housing using emery cloth or Scotch-Brite™.

D-35/G-35 Service (Hydraulic End)

5. Reassemble Pump Housing, Shaft Assembly, and Cylinder Housing

- a. With the pump housing horizontal and mounted on the baseplate, insert the cam assembly (61) into the pump housing. If the shaft seals (62) are still in the pump housing (37), cover the shaft keyway with masking tape and slide it through the seals. Then remove the tape.

Place the Shaft Rotator (from the Tool Kit) over the end of the shaft and slide it up tight against the pump housing. Keep the cam assembly (61) tight against the pump housing bearing, and horizontal, and tighten the Shaft Rotator set screw to the shaft keyway. This will hold the cam assembly horizontal and aid in assembly.

- b. Install the O-ring (63) into the pump housing O-ring groove. Use grease to hold the O-ring in the groove.
- c. Place the cylinder housing (23) face-down on a clean surface.
- d. Insert the bearing adjustment plate (57), with the bearing cup (61A), dowel pin (58), and key (59), into the cylinder housing (23).
- e. Insert the five piston assemblies into the cylinder housing.
- f. To aid in assembly, insert two perimeter bolts (2) through the pump housing from the shaft side, at the 10 and 2 o'clock positions.
- g. Pick up the cylinder housing assembly and slide it onto the two bolts (2) that are in the pump housing. It will slide on until the piston feet contact the cam. Insert up to eight more bolts (2) through the pump housing and cylinder housing to aid in alignment.
- h. Using a 17-mm hex socket or box-end wrench, install the four 10-mm x 100-mm fully-threaded bolts (from the Tool Kit) through the pump housing where the four socket-head capscrews (31) were fastened. Tighten these four bolts evenly, and the cylinder housing assembly should pull itself tight against the pump housing.
One at a time, remove the fully-threaded bolts and replace them with the capscrews (31). Tighten all four capscrews to 25 ft-lbs (34 N-m).
- i. Remove the Shaft Rotator that was installed on the shaft to aid in assembly.

6. Install Shaft Seals (59)

- a. Cover shaft keyway with masking tape to protect inside diameter of seals. Grease the shaft and slide on one seal up to pump housing.

Pack the inside (spring side) of the second seal half-full with grease. Slide this seal on and flush against the first seal. Make sure the outside diameters of the two seals are clean and free of grease. Remove the protective tape from the shaft.

- b. Apply an anaerobic seal sealant or bearing retaining

compound (such as Loctite® 601 or 609) to the outside diameter of the seals.

Install the Shaft Rotator/Seal Insertor (from the Tool Kit) over the shaft. Using a mallet, tap the tool to push the two seals into the pump housing. Wipe off excess sealant.

7. Reinstall Plungers (22)

NOTE: If the plungers (22) have been removed from the valve plungers (69), do not reuse them. Install new ones instead.

- a. Place a plunger (22) onto the exposed screw end of the Plunger Guide Lifter Tool (from the Tool Kit). The flat side of the plunger should face the tool.
- b. Screw the Guide Tool (with the plunger) into the valve plunger (69) until tight.
- c. Pull the valve plunger up until its cross holes are exposed. Insert the Valve Plunger Holder (from the Tool Kit) through the top cross hole.
- d. Hold the hex bolt with a wrench. At the same time, tighten the hex nut against the plunger (22) with another wrench. The shield will seat the plunger onto the valve plunger (69).
- e. Remove the Plunger Guide Tool.
- f. **Before** you remove the Valve Plunger Holder, install a new diaphragm. See "Reinstall Diaphragms" below.
- g. Repeat the procedure on the other four cylinders.

8. Reinstall Diaphragms (21)

NOTE: Keep the Valve Plunger Holder through the valve plunger (69), as described above under "Reinstall Plungers".

- a. Place the diaphragm (21) onto the plunger (22), ridge side out.
- b. Center the follower (20) on the diaphragm.
- c. Place the O-ring (19) onto the follower screw (18).
- d. Apply a small amount of threadlocker (e.g., Loctite 242) to the threads of the follower screw (18).
- e. Insert the follower screw (18), with its O-ring (19), through the follower (20) and diaphragm (21). Then screw it into the valve plunger (69).
- f. Hold the Valve Plunger Holder and tighten the follower screw (18) to 18 in-lbs (200 N-m).
- g. Repeat the above procedure for the other four cylinders.
- h. Fill the reservoir with fresh oil and prime the pump, as outlined in the Fluid-End Service Section.