



Thermo Scientific

# Preventive Maintenance Procedure

**Dionex Aquion**  
**Dionex ICS-1000**  
**Dionex ICS-1100**  
**Dionex ICS-1500**  
**Dionex ICS-1600**  
**Dionex ICS-2000**  
**Dionex ICS-2100**

031928      Revision 07      March 25, 2016

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Revision history: Revision 01 released February 2003

Revision 02 released March 2003

Revision 03 released October 2006

Revision 04 released September 2009

Revision 05 released October 2012; new part numbers assigned

Revision 06 released August 2013; new part numbers assigned

Revision 07 released March 2016; support for Dionex Aquion added, checklist removed

Software version: Chromeleon 7.2 SR4 and later required for Dionex Aquion support

**For Research Use Only. Not for use in diagnostic procedures.**

# Preventive Maintenance Procedure

## Dionex Aquion and ICS-1000/1100/1500/1600/2000/2100

This manual describes a preventive maintenance procedure for the Thermo Scientific™ Dionex™ Aquion, ICS-1000, ICS-1100, ICS-1500, ICS-1600, ICS-2000, and ICS-2100 Ion Chromatography Systems.

The procedure consists of:

- Rebuilding the high-pressure injection valve
- Rebuilding the auxiliary valve (optional)
- Replacing the pump check valve cartridges
- Replacing the pump seals
- Replacing the waste valve and priming valve O-rings
- Replacing the end-line filter

Thermo Fisher Scientific recommends performing this procedure annually, as well as before scheduled Performance Qualification tests.

### Time Required

30 to 45 minutes

### Parts Required

Before starting the preventive maintenance procedure, verify that all parts listed in this section are at hand.

**IMPORTANT** Substituting non-Dionex/Thermo Scientific parts may impair system performance, thereby voiding the product warranty. Refer to the warranty statement in the Dionex Terms and Conditions for more information.

### Included Parts

In addition to this manual, the Preventive Maintenance Kit (P/N 057954) includes the following items:

Part Number	Item	Quantity
014895	O-ring for pump spacer	2
045987	End-line filter	1
045994	Check valve cartridge	2
048722	Pump rinse seal	2
055752	O-ring for waste and priming valves	2
055870	Piston seal	2
059283	O-ring for pump piston rinse seal	2
062823	<b>NEXT DUE DATE</b> label	1
075973	Injection Valve Rebuild Kit, 6-port	1

## Items Provided in the System Ship Kit

The following items are provided in each system Ship Kit:

- 1/4 x 5/16-in open-end wrench (P/N 014605)
- 10 cc syringe (P/N 079803)

System	Ship Kit Part Number
Dionex Aquion, ICS-1000, ICS-1100, ICS-1500, or ICS-1600	057905
Dionex ICS-2000 or ICS-2100	064375

## Additional Items Required

The following items must be provided by the user:

- ASTM filtered, Type I (18 megohm-cm) deionized water
- Squirt bottle (optional)
- Standard disposable laboratory gloves (must be powder-free, oil-free, and particle-free)
- 0.2 micron filtered, Class 10, isopropyl alcohol (IPA) (optional)
- 1/2-in wrench (P/N 062336)
- Two 10-32 fitting plugs (P/N 042772)

**IMPORTANT** DO NOT OVERTIGHTEN FITTINGS. Overtightening a fitting can restrict the tubing ID, which can cause damage to the system. The split-cone ferrules are especially sensitive to overtightening (see [Figure 1](#)). Use a wrench to tighten the fittings. Tighten them slightly more only if they leak.

**Figure 1.** Split-cone ferrule



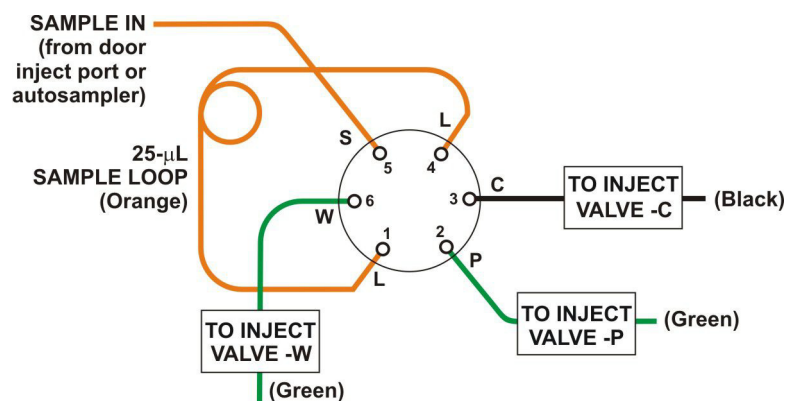
### ❖ To rebuild the high-pressure injection valve

1. Turn off the pump.
2. Open the front door of the system.
3. Disconnect all liquid lines to the pump head.
4. Disconnect each liquid line connected to the injection valve.
5. Follow the instructions provided in the Injection Valve Rebuild Kit, 6-port (P/N 075973) to replace the rotor seal and stator face seal.

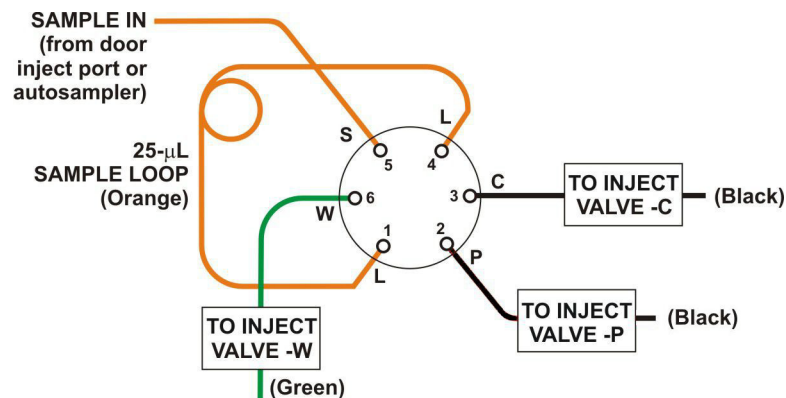
- Reconnect all liquid lines to the injection valve (see [Figure 2](#) or [Figure 3](#)).

**Note** A backpressure coil may be installed between port **P** and the line labeled **TO INJECT VALVE - P**.

**Figure 2.** Dionex Aquion or ICS-1000/1100/1500/1600 injection valve plumbing



**Figure 3.** Dionex ICS-2000/2100 injection valve plumbing



## Rebuilding the Auxiliary Valve (Optional)

## Replacing the Pump Check Valve Cartridges

If an auxiliary valve is installed and has been used enough to require maintenance, rebuild the valve by following the basic procedure described in “[Rebuilding the High- Pressure Injection Valve](#)” on [page 2](#). Use the appropriate Rebuild Kit and refer to the instructions included with the kit:

- For the 6-port auxiliary valve, use the Injection Valve Rebuild Kit (P/N 075973).
- For the 10-port auxiliary valve, use the 10-port Valve Rebuild Kit (P/N 079054).

### ❖ To remove the pump check valve cartridges

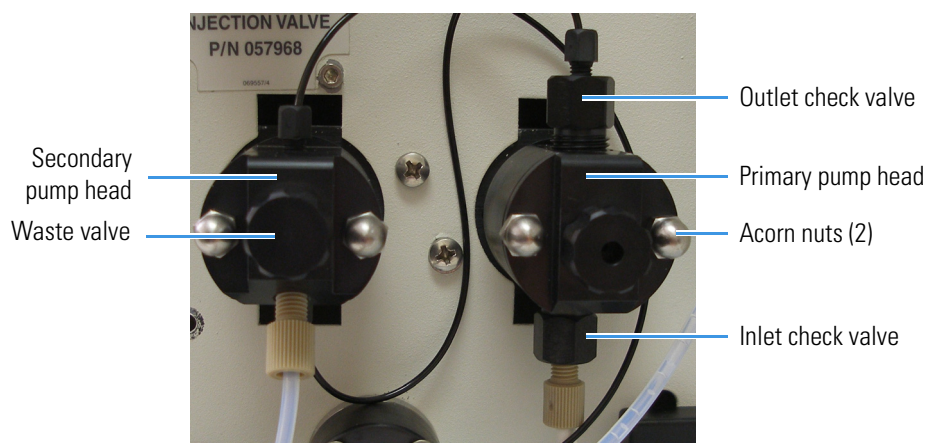
- Rinse the pump flow path with ASTM filtered, Type I (18 megohm-cm) deionized water. Direct the flow to waste by opening the waste valve on the secondary pump head (see [Figure 4](#)). To open the valve, turn the knob one-quarter to one-half turn counterclockwise.
- After rinsing, turn off the pump and close the waste valve.

3. To prevent contamination of pump parts, put on standard disposable laboratory gloves (must be powder-free, oil-free, and particle-free) before disassembling the pump head.

**Note** Never disassemble the pump head with bare hands. Even minute particles of dust, dirt, skin cells, etc., on the check valves or piston can contaminate the inside of the pump head and result in poor pump performance.

4. Disconnect the tube fittings from the inlet and outlet check valve assemblies on the primary pump head (see [Figure 4](#)).

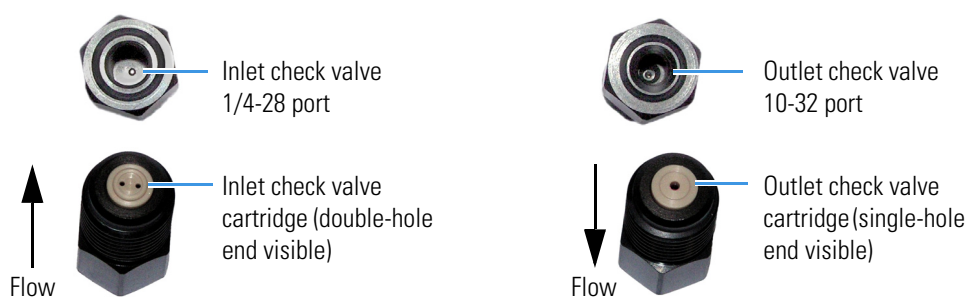
**Figure 4.** Pump heads (Dionex Aquion and ICS-1100/1600/2100 pump shown)



5. Using a 1/2-in wrench (P/N 062336), loosen both check valve assemblies and remove them from the pump head.

**Note** The *inlet* check valve assembly housing has a 1/4-28 port. The *outlet* check valve assembly housing has a 10-32 (smaller) port (see [Figure 5](#)).

**Figure 5.** Inlet and outlet check valve assemblies



**IMPORTANT** The pump will not operate properly and may be damaged unless the check valve cartridges are installed in their respective housings in the correct orientation. Liquid enters through the check valve in the large single hole and exits through the small double holes.

6. Remove the cartridges from the housings.

## Replacing the Pump Seals

### ❖ To install the new check valve cartridges

1. For the *inlet* check valve: Place a new cartridge (P/N 045994), with the double-hole end of the cartridge visible, in the housing.  
For the *outlet* check valve: Place a new cartridge, with the single-hole end visible, in the housing.
2. For the *inlet* check valve assembly: Install the check valve assembly on the *bottom* of the primary pump head.  
For the *outlet* check valve assembly: Install the check valve assembly on the *top* of the pump head.

**Note** The opening for the outlet check valve assembly is slightly closer to the back of the pump head than the opening for the inlet check valve assembly.

3. Tighten the check valves fingertight, and then use the 1/2-in wrench (P/N 062336) to tighten an additional one-quarter to one-half turn.

**IMPORTANT** Overtightening may damage the pump head and check valve housing and crush the check valve seats.

### ❖ Note about replacing a pump piston

Pump piston replacement is not part of the preventive maintenance procedure. However, if replacement is required (for example, because the piston is dirty, scratched, or broken), order the piston separately (P/N 052840) and follow the instructions in this section to remove the old piston and replace it with the new one.

**Note** Complete the following steps for each pump head in turn.

### ❖ To remove the pump head and piston

1. Disconnect all tubing connections to the pump head.
2. Using the 1/4 x 5/16-in wrench (P/N 014605), remove the two acorn nuts from the pump head (see [Figure 4](#)).
3. Slowly pull the head and allow it to separate from the housing. Carefully disengage the head from the piston by pulling the head straight off and away from its mounting studs.



**CAUTION** Lateral motion while disengaging the pump head from the piston may break the piston.



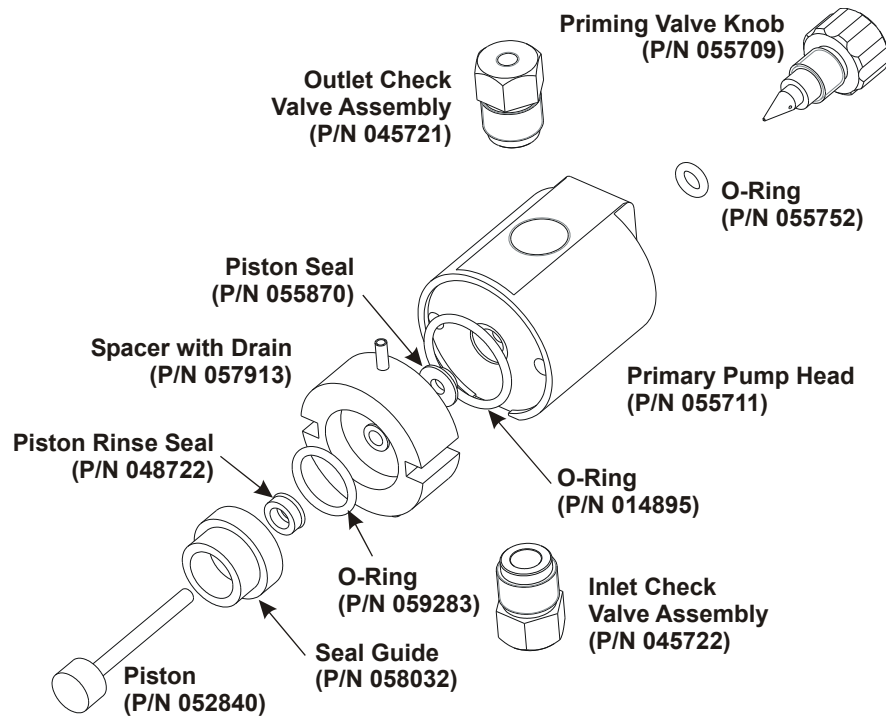
**CAUTION** Un mouvement latéral pendant la séparation de la tête et du piston peut casser le piston.



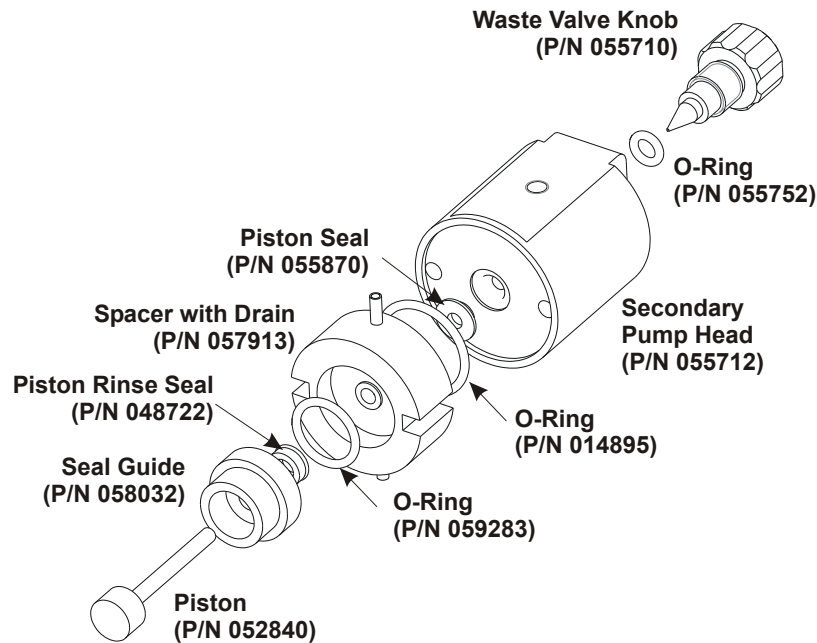
**CAUTION** Vermeiden Sie Seitwärtsbewegungen, wenn Sie den Kopf vom Kolben lösen. Andernfalls kann der Kolben brechen.

4. Place the head (front end down) on a clean work surface and lift off the spacer to expose the piston seal (see [Figure 6](#) for the primary pump head; see [Figure 7](#) for the secondary pump head).

**Figure 6.** Primary pump head



**Figure 7.** Secondary pump head

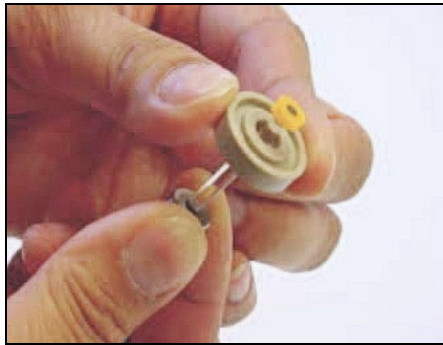


5. The piston does not come off as part of the pump head assembly because it is captured by a magnetic retention system. To remove the piston after removing the pump head:
  - a. Hold the shaft of the piston (near the base).
  - b. Tilt the piston slightly.
  - c. Pull the piston away from the pump.

❖ **To install the new piston rinse seal**

1. Remove the seal guide from the spacer to expose the piston rinse seal and O-ring.
2. Remove the O-ring.
3. Remove the old piston rinse seal from the seal guide:
  - a. Hold the seal guide with the flat side facing up.
  - b. To dislodge the piston rinse seal, gently insert the shaft of the piston through the small hole in the center of the seal guide (see [Figure 8](#)).

**Figure 8.** Removing the piston rinse seal



- c. Pull the seal off the end of the piston shaft and remove the piston from the seal guide.
4. Hold the new piston rinse seal (P/N 048722) with the grooved side facing up.
5. Using your fingertip, gently press the piston rinse seal into the seal guide until the edge of the seal is below the surface of the seal guide.

**IMPORTANT** The piston rinse seal is made of soft plastic. Do not press on the seal with anything hard or sharp, including your fingernail. If the seal is nicked or gouged, it will not seal properly and may result in leaks.

6. Place the new O-ring (P/N 059283) into the groove in the seal guide.
7. Remove the O-ring from the groove in the flat side of the spacer and replace it with the new O-ring (P/N 014895).
8. In one hand, hold the guide with the O-ring and piston rinse seal facing up (this prevents the O-ring from falling out). In the other hand, hold the spacer with the cavity facing down.
9. Gently press the seal guide into the cavity in the spacer until it is fully seated.

❖ **To remove the piston seal from the pump head**

1. For the *primary* pump head: Install a 10-32 fitting plug (P/N 042772) on the outlet check valve. Tighten the plug.  
For the *secondary* pump head: Install a 10-32 fitting plug (P/N 042772) in both the inlet and outlet ports. Tighten the plugs.

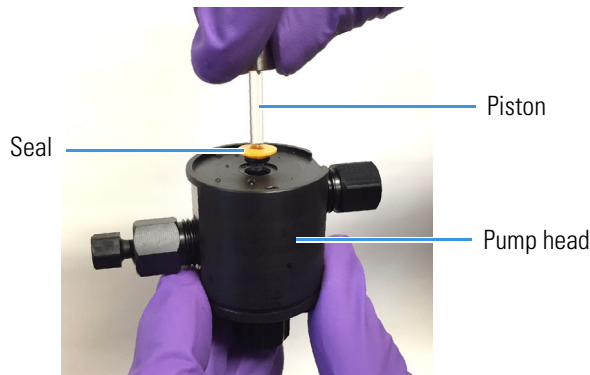
2. Close the priming valve.
3. Using a squirt bottle or a plastic syringe, fill the head cavity with deionized water through the piston opening (see [Figure 9](#)).

**Figure 9.** Filling the head cavity with deionized water (plastic syringe shown)



4. Reinsert the piston into the seal, and then push the piston into the head (see [Figure 10](#)). The seal should hydraulically pop out from the head.

**Figure 10.** Seal popping out from the head



5. Remove the piston and pull off the seal.
6. If the main seal was not removed in [Step 4](#), follow these steps:
  - a. Verify that the 10-32 fitting plugs in the inlet and outlet holes are tightened enough to prevent any leaks from the pump head.
  - b. Fill the piston cavity with water and check for bubbles.
  - c. If there are no bubbles, repeat [Step 4](#).
7. Remove the 10-32 fitting plug(s).

❖ **To install the new piston seal**

1. Open the priming valve knob (primary pump head) or waste valve knob (secondary pump head) by turning the knob one-quarter to one-half turn counterclockwise.
2. Push the piston through the spacer and through the new seal (P/N 055870). Insert the piston and seal into the pump head until the seal makes contact with the bottom of the counterbore.

**Note** If necessary, lubricate the seal with a small amount of 0.2 micron filtered, Class 10, isopropyl alcohol (IPA) to facilitate insertion.

## Replacing the Waste Valve and Priming Valve O-Rings

3. To seat the seal, push down on the spacer until it is flush with the head. A clicking sound indicates that the seal is correctly seated.
4. Close the priming valve knob or waste valve knob.

### ❖ To reinstall the pump head and piston

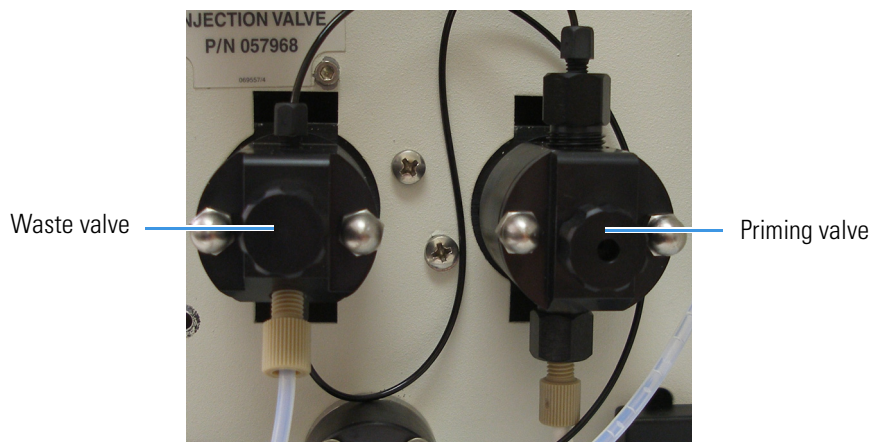
Thermo Fisher Scientific recommends reinstalling the head and piston as a single assembly, so that the piston centers itself onto the magnetic follower.

1. Hold the assembled spacer and guide with the drain tubes aligned vertically and press the spacer into the head until it is flush with the indented surface of the head.
2. Insert the piston so that 6 mm (1/4 in) of the shaft is exposed. This ensures that the magnet in the follower picks up the piston. (The follower is the cylinder that holds the piston in place as it moves in and out of the pump head assembly.)
3. Reinstall the head and piston assembly. Use a wrench to tighten the nuts evenly (12 in-lb torque).

### ❖ To replace the waste valve and priming valve O-rings

1. To remove the waste valve or priming valve from the pump head, turn the knob counterclockwise until it is loose, and pull the knob straight out of the cavity in the pump head (see [Figure 11](#)).

**Figure 11.** Waste and priming valves (Dionex Aquion and ICS-1100/1600/2100 pump shown)

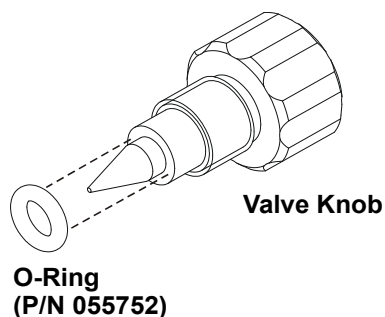


2. If the O-ring is removed with the valve knob in [Step 1](#), pull the O-ring off the end of the knob (see [Figure 12](#)).

If the O-ring is *not* removed with the valve knob, insert a thin object (for example, the bent end of a paper clip) into the cavity in the pump head and carefully extract the O-ring.

**IMPORTANT** Do not scratch the cavity. Scratches in the cavity will cause leaks around the base of the knob while the pump is being primed.

**Figure 12.** Waste valve or priming valve O-ring replacement



3. Slide a new O-ring (P/N 055752) over the end of the valve.
4. Reinstall the valve knob containing the new O-ring into the pump head, turn the knob clockwise, and tighten fingertight.

**Note** It is normal to encounter resistance after several rotations of the knob. The O-ring is being pushed into the cavity of the pump head.

## Replacing the End-Line Filter

### ❖ To replace the end-line filter

1. Install the new end-line filter (P/N 045987) on the end of the eluent or deionized water line, inside the reservoir.
2. Verify that the end of the filter extends to the bottom of the reservoir and that the filter is submerged in liquid. This prevents air from being drawn through the lines.

## Completing the Procedure

### ❖ To complete the preventive maintenance procedure

1. Reconnect all liquid lines to the pump head.
2. Prime the pump.
3. When the system is at operating pressure, check for leaks from the check valves. Tighten a check valve *one-eighth of a turn at a time* only if it leaks.
4. Check for leaks from fittings and tighten as needed.
5. Close the front door of the system.
6. Enter the date one year from today on the **NEXT DUE DATE** label (P/N 062823). Attach the label to a convenient place on the exterior of the system.