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Preventive Maintenance Procedure for Dionex ICS-1000, ICS-1100, ICS-1500, ICS-1600, ICS-2000, and ICS-2100 Ion Chromatography Systems

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

Preventive Maintenance Instructions

These instructions describe a preventive maintenance procedure for the Thermo Fisher Scientific Dionex™ ICS-1000, ICS-1100, ICS-1500, ICS-1600, ICS-2000, and ICS-2100 Ion Chromatography Systems. Thermo Fisher Scientific recommends performing this procedure annually, as well as before scheduled Performance Qualification tests.

The preventive maintenance procedure consists of the following steps:

- Rebuilding the injection valve
- (Optional) Rebuilding the auxiliary valve
- Replacing the pump check valves
- Replacing the pump piston rinse seals and piston seals
- Replacing the waste valve and priming valve O-rings
- Replacing the end-line filter

Included Parts

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

Part Number	Item	Quantity
057896	Injection Valve Rebuild Kit	1
045994	Pump check valve cartridge	2
048722	Pump piston rinse seal	2
055870	Pump piston seal	2
059283	O-ring for pump piston rinse seal	2
014895	O-ring for pump spacer	2
055752	O-ring for waste and priming valve	2
045987	End-line filter	1
062823	**NEXT DUE DATE** label	1

IMPORTANT **Substitution of non-Thermo Scientific/Dionex parts may impair system performance and void the product warranty. For details, see the warranty statement in the Dionex Terms and Conditions.**

Additional Items Required

The following items are provided in the Ship Kit for each system:

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

System	Ship Kit Part Number
Dionex ICS-1000 or ICS-1100	057905
Dionex ICS-1500 or ICS-1600	067110
Dionex ICS-2000 or ICS-2100	064375

The following items must be provided by the user:

- ASTM filtered, Type I (18 megohm-cm) deionized water
- Cleanroom gloves (lint-free, particle-free, and oil-free)
- 1/2-inch wrench (P/N 062336)
- Two 10-32 fitting plugs (P/N 042772)

Preventive Maintenance Checklist

For your convenience, a Preventive Maintenance Checklist is provided in Section 8. While performing preventive maintenance, record information on the checklist whenever instructed to do so. When you finish, save the checklist. The completed checklist verifies that the maintenance is performed at regularly scheduled intervals.

Time Required

30 to 45 minutes

IMPORTANT **DO NOT OVERTIGHTEN FITTINGS. Overtightening a fitting can restrict the tubing ID, which can cause damage to the system.**

The split-cone ferrules shown here are especially sensitive to overtightening. Tighten these fittings fingertight only and then tighten them slightly more only if they leak.

1. Rebuilding the Injection Valve

1. Turn off the pump.
2. Open the front door of the system.
3. Disconnect each liquid line connected to the injection valve.
4. Follow the instructions provided in the Rebuild Kit (P/N 057896) to replace the rotor seal, isolation seal, and stator face.
5. Reconnect all liquid lines to the injection valve (see Figure 1 for the Dionex ICS-1000/1100/1500/1600 or Figure 2 for the Dionex ICS-2000/2100).

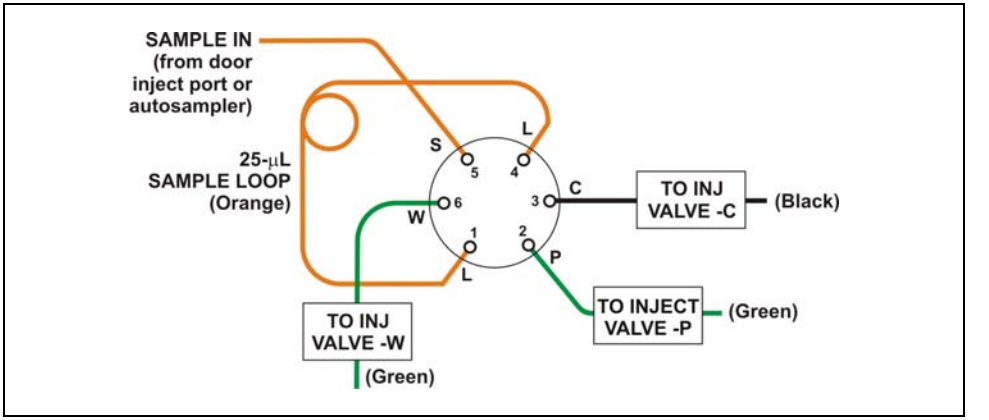

Figure 1. Dionex ICS-1000, ICS-1100, ICS-1500, and ICS-1600 Injection Valve Plumbing

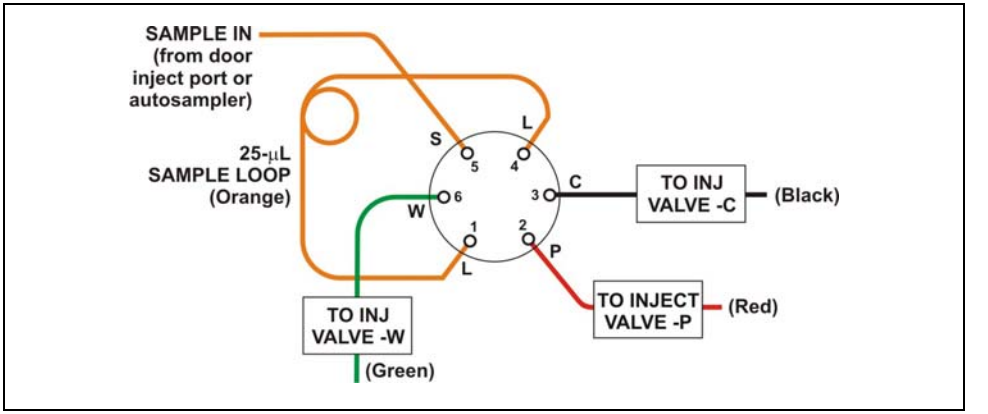

Figure 2. Dionex ICS-2000 and ICS-2100 Injection Valve Plumbing

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

6. Close the door.
7. Turn on the pump.

☑ Record the completed steps on the Preventive Maintenance Checklist.

2. (Optional) Rebuilding the Auxiliary Valve

If an auxiliary valve is installed and has been used enough to require maintenance, rebuild the valve by following the basic procedure described for rebuilding the injection valve (see Section 1). Use the appropriate Rebuild Kit and refer to the instructions included with the kit.

- For the 6-port auxiliary valve, use an Injection Valve Rebuild Kit (P/N 057896).
- For the 10-port auxiliary valve, use a 10-port Valve Rebuild Kit (P/N AAA-061759).

☑ Record the completed steps on the Preventive Maintenance Checklist.

3. Replacing the Pump Check Valves

Preparation

1. Rinse the pump flow path with deionized water. Direct the flow to waste by opening the waste valve on the secondary pump head (see Figure 3). To open the valve, turn the knob one-quarter to one-half turn counterclockwise.
2. After rinsing, close the waste valve and turn off the pump.
3. Close the eluent valve from the system Control panel in the Thermo Scientific Dionex Chromeleon™ Chromatography Data System or select **Eluent Valve Closed** on the touch screen **PUMP** page.
4. Turn off the main power switch and disconnect the power cord, to ensure that you do not unintentionally start the system.

Replacing Check Valves

1. To prevent contamination of pump parts, wear cleanroom gloves when disassembling the pump head.
2. Disconnect the tube fittings from the inlet and outlet check valve assemblies on the primary pump head (see Figure 3).
3. Use a 1/2-inch wrench (P/N 062336) to loosen both check valve assemblies. Remove the check valve assemblies from the pump head.

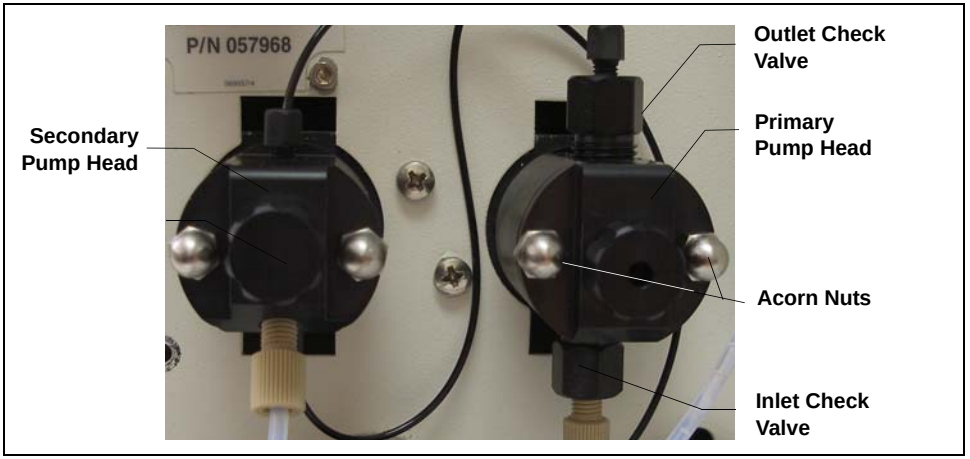

Figure 3. Pump Heads (Dionex ICS-1100/1600/2100 Pump Shown)

NOTE The *inlet* check valve assembly housing has a 1/4-28 port. The *outlet* check valve assembly housing has a 10-32 port (see Figure 4).

4. Place a new cartridge (P/N 045994) in the *inlet* check valve housing with the double-hole end of the cartridge visible. Place a new cartridge in the *outlet* housing with the single-hole end visible (see Figure 4).

   NOTE The pump will not operate properly unless the cartridge is installed in the housing in the correct orientation. Liquid enters through the check valve in the large single hole and exits through the small double holes.

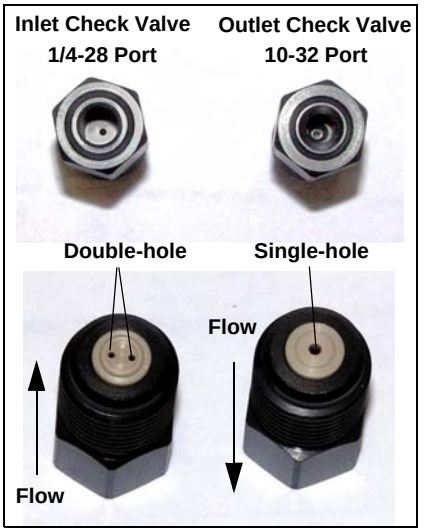

Figure 4. Inlet and Outlet Check Valve Housings

5. Install the inlet check valve assembly (P/N 045722) on the bottom of the primary pump head. Install the outlet check valve assembly (P/N 045721) on the top of the head. Tighten the check valves fingertight, and then use the 1/2-inch wrench 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.**

☑ Record the completed steps on the Preventive Maintenance Checklist.

4. Replacing Pump Piston Rinse Seals and Piston Seals

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.

Removing the Head and Piston

1. To prevent contamination of pump parts, wear cleanroom gloves while disassembling the pump head.
2. Disconnect all tubing connections to the pump head.
3. Use the 1/4 x 5/16-inch wrench (P/N 014605) to remove the two acorn nuts (see Figure 3) from the pump head.
4. 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.

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

5. Place the head (front end down) on a clean work surface and lift off the spacer to expose the piston seal (see Figure 5 or Figure 6).

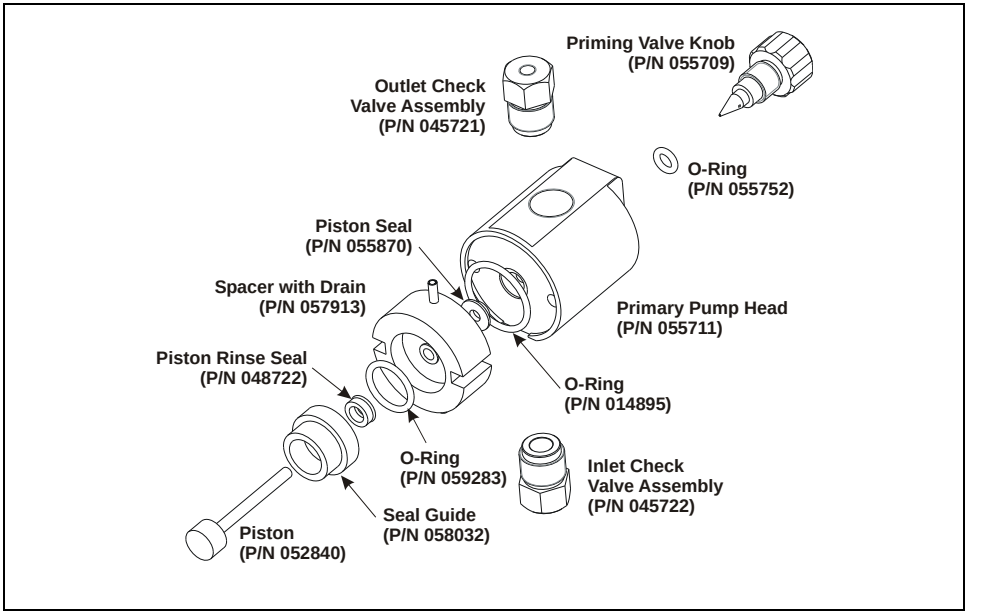

Figure 5. Primary Pump Head

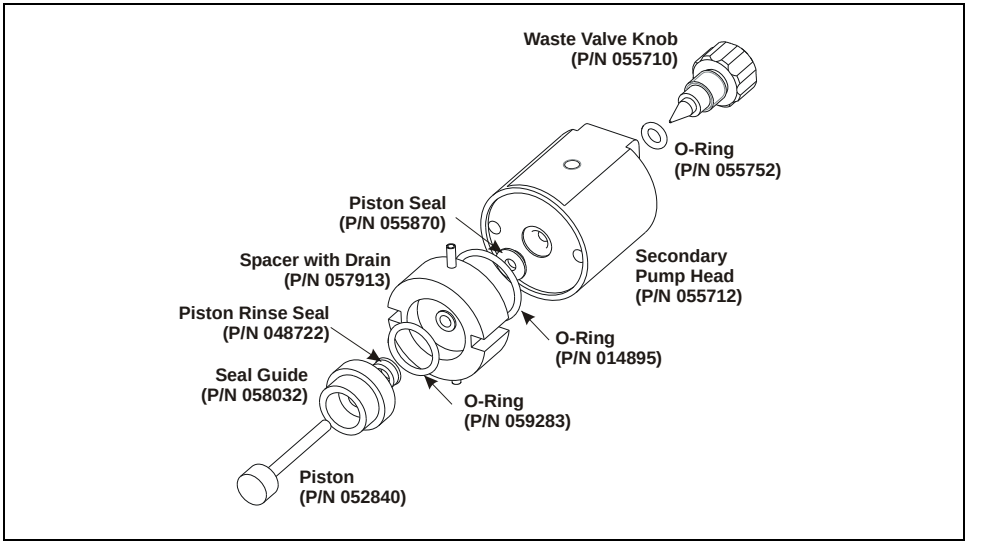

Figure 6. Secondary Pump Head

6. 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: hold the shaft of the piston (near the base), tilt the piston slightly, and pull the piston away from the pump.

Installing the New Piston Rinse Seal

1. Remove the guide from the spacer to expose the piston rinse seal and O-ring. Remove the O-ring.
2. Remove the old piston rinse seal from the guide as follows:
   a. Hold the 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 guide (see Figure 7).
   c. Pull the seal off the end of the piston shaft and remove the piston from the guide.

Figure 7. Removing the Piston Rinse Seal

3. Hold the new piston rinse seal (P/N 048722) with the grooved side facing up.
4. Using your fingertip, gently press the piston rinse seal into the guide until the edge of the seal is below the surface of the 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.**

5. Place the new O-ring (P/N 059283) into the groove in the guide.
6. 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).
7. 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.
8. Gently press the guide into the cavity in the spacer until it is fully seated.

Removing the Piston Seal from the Head

1. If this is the *primary* pump head, install a 10-32 fitting plug (P/N 042772) on the outlet check valve. Tighten the plug.
2. If this is the *secondary* pump head, install a 10-32 fitting plug (P/N 042772) in both the inlet and outlet ports. Tighten the plugs.
3. Fill the head cavity with deionized water by injecting the liquid through the piston opening.
4. Reinsert the piston approximately 3 mm (0.125 inch) into the seal.
5. Push the piston into the head. (This should hydraulically unseat the seal from the head.) Remove the piston and pull off the seal.

   NOTE If the piston seal is not removed, ensure that the 10-32 fitting plug(s) are tight and add more water. Verify that the head contains no air bubbles, and then repeat Step 4 and Step 5.

6. Remove the 10-32 fitting plug(s).

Installing 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 then 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 isopropyl alcohol to facilitate insertion.

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.

Reinstalling the 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 inch) 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).

☑ Record the completed steps on the Preventive Maintenance Checklist.

5. Replacing the Waste Valve and Priming Valve O-Rings

NOTE Complete these steps for each valve O-ring.

1. To remove the waste valve or priming valve from the pump head (see Figure 8), turn the knob counterclockwise until it is loose, and then pull the knob straight out of the cavity in the pump head.

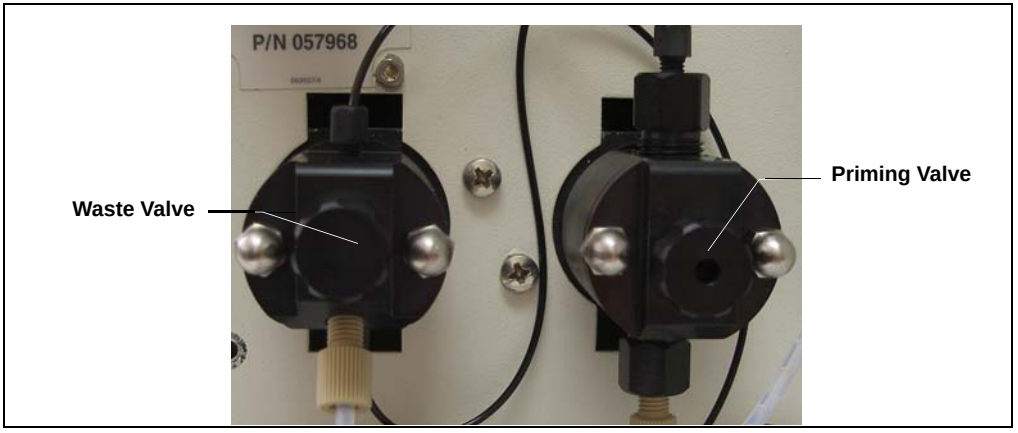

Figure 8. Waste and Priming Valves (Dionex ICS-1100/1600/2100 Pump Shown)

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 9). 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. **Do not scratch the cavity.**

IMPORTANT **Scratches in the cavity will cause leaks around the base of the knob while the pump is being primed.**

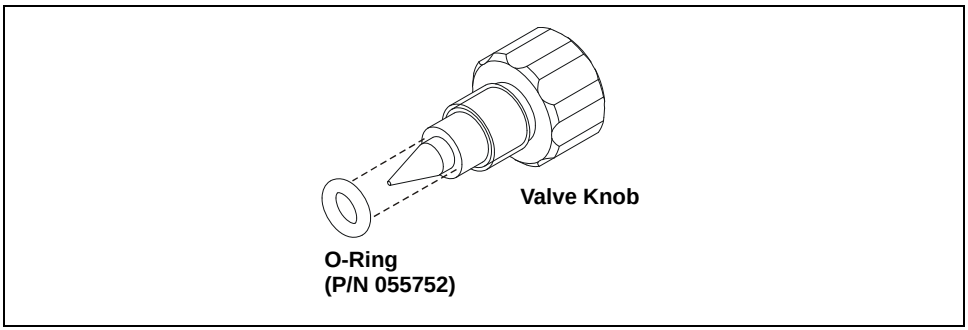

Figure 9. Waste Valve or Priming Valve O-Ring Replacement

3. Slide a new O-ring (P/N 055752) over the end of the valve.
4. Reinstall the valve 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.**

☑ Record the completed steps on the Preventive Maintenance Checklist.

6. Replacing the End-Line Filter

Install the new end-line filter (P/N 045987) on the end of the eluent or deionized water line, inside the reservoir. 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.

☑ Record the completed step on the Preventive Maintenance Checklist.

NOTE **If the system is in continuous operation, change the end-line filter weekly, or whenever it becomes discolored. Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent.**

7. Completing the Preventive Maintenance Procedure

1. Reconnect all liquid lines to the pump head.
2. Reconnect the power cord.
3. Turn on the system main power.
4. Open the eluent valve from the System Control panel in Chromeleon or select **Eluent Valve Open** on the touch screen **PUMP** page.
5. Prime the pump.
6. When the system is at operating pressure, check for leaks from the check valves. Tighten a check valve a *little more* only if it leaks.
7. Check for leaks from fittings and tighten as needed.
8. Record the date for the next preventive maintenance on the **NEXT DUE DATE** label (P/N 062823). Apply the label to a convenient place on the exterior of the system.
9. Complete the Preventive Maintenance Checklist.

8. Preventive Maintenance Checklist

Dionex Product Serviced:

☐ ICS-1000 ☐ ICS-1100 ☐ ICS-1500 ☐ ICS-1600 ☐ ICS-2000 ☐ ICS-2100

1. Injection valve rebuild (see Section 1)	**5. Waste valve and priming valve O-ring replacement (see Section 5)**
☐ Rebuilt injection valve ☐ Reconnected liquid lines to the valve	☐ Installed new O-ring in waste valve ☐ Installed new O-ring in priming valve
2. (Optional) Auxiliary valve rebuild (see Section 2)	**6. End-line filter replacement (see Section 6)**
☐ Rebuilt auxiliary valve ☐ Reconnected liquid lines to the valve	☐ Installed new end-line filter
3. Check valve replacement (see Section 3)	**7. Preventive maintenance completion (see Section 7)**
☐ Installed new inlet and outlet check valve cartridges in the housings ☐ Verified correct flow orientation of each cartridge ☐ Reinstalled inlet check valve assembly on bottom of primary pump head ☐ Reinstalled outlet check valve assembly on top of primary pump head	☐ Reconnected liquid lines to pump heads ☐ Primed pump ☐ Checked for leaks; tightened check valves and fittings as needed ☐ Recorded date for next maintenance and applied the label to the system
4. Pump piston rinse seal and piston seal replacement (see Section 4)	**Comments:**
☐ Installed new piston rinse seal in primary pump head ☐ Installed new piston seal in primary pump head ☐ Installed new piston rinse seal in secondary pump head ☐ Installed new piston seal in secondary pump head	

Preventive maintenance completed by: _____
(signature)

Date: _____