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Revision history:
Revision 01 released July 2010
Revision 02 released February 2011
Revision 03 released October 2012; new part numbers assigned

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

These instructions describe a preventive maintenance procedure for two Thermo Scientific Dionex™ products: the Dionex ICS-5000 Dual Pump (DP) and the Dionex ICS-5000 Single Pump (SP). Instructions for analytical pumps and capillary pumps are included. Thermo Fisher Scientific recommends performing this procedure annually for analytical pumps and every 18 months for capillary pumps.

During this procedure, the following parts in each pump are replaced:

- Main piston seals
- Piston seal wash body O-rings
- Piston seal wash seals
- Inlet and outlet check valves (primary pump head only)
- Priming valve seal (secondary pump head only)
- Piston seal wash system tubing

For a DP, Thermo Fisher Scientific recommends finishing the preventive maintenance procedure for pump 1 before going on to pump 2.

Preventive Maintenance Checklist

For your convenience, a Preventive Maintenance Checklist is provided in Section 8 of this manual. 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 DP/SP maintenance is performed at regularly scheduled intervals.

Estimated Time Required

60 minutes per pump
2 Parts Required

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

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

**Pump Preventive Maintenance Kits**

There are two versions of the Pump Preventive Maintenance Kit (one for analytical pumps and one for capillary pumps). Each kit contains all of the parts that need to be replaced for one pump. If you are performing preventive maintenance on a DP, you will need two kits. Verify that you have the correct kit or kits for your pump:

- Dionex ICS-5000 Analytical Pump Preventive Maintenance Kit (P/N 075038)
- Dionex ICS-5000 Capillary Pump Preventive Maintenance Kit (P/N 075039)

Table 1 lists the parts in the analytical pump kit.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
<th>Quantity in Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>065394</td>
<td>Dionex ICS-5000 Dual Pump and Dionex ICS-5000 Single Pump Preventive Maintenance Procedure</td>
<td>1</td>
</tr>
<tr>
<td>063382</td>
<td>Piston seal wash seal/priming valve seal</td>
<td>3</td>
</tr>
<tr>
<td>040695</td>
<td>O-ring</td>
<td>2</td>
</tr>
<tr>
<td>064946</td>
<td>Main piston seal</td>
<td>2</td>
</tr>
<tr>
<td>045722</td>
<td>Inlet check valve assembly</td>
<td>1</td>
</tr>
<tr>
<td>045721</td>
<td>Outlet check valve assembly</td>
<td>1</td>
</tr>
<tr>
<td>063268</td>
<td>PharMed™ tubing, 0.159-cm (0.0625-in) ID</td>
<td>30 cm (12 in)</td>
</tr>
<tr>
<td>064079</td>
<td>Tygon™ 2075 tubing, 0.15-cm (0.060-in) ID</td>
<td>51 cm (20 in)</td>
</tr>
</tbody>
</table>

**Table 1. Dionex ICS-5000 Analytical Pump Preventive Maintenance Kit Contents**
Table 2 lists the parts in the capillary pump kit.

Table 1. Dionex ICS-5000 Analytical Pump Preventive Maintenance Kit Contents (Continued)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
<th>Quantity in Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>062823</td>
<td>NEXT DUE DATE label</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Dionex ICS-5000 Capillary Pump Preventive Maintenance Kit Contents

NOTE Do not be concerned about minor design differences between parts in the Preventive Maintenance Kit and parts currently installed in your pump. As part of our ongoing quality improvement program, Thermo Fisher Scientific reserves the right to introduce new pump parts periodically.
Additional Items Required

The following items are provided in the pump Ship Kit:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>062338</td>
<td>3.0-mm hex key</td>
</tr>
<tr>
<td>042772</td>
<td>Three 10-32 fitting plugs</td>
</tr>
<tr>
<td>079803</td>
<td>10-cc syringe</td>
</tr>
<tr>
<td>063675</td>
<td>Seal insertion tool</td>
</tr>
<tr>
<td>062336</td>
<td>1/2-inch wrench</td>
</tr>
</tbody>
</table>

The following items must be provided by the user:

- Cleanroom gloves (lint-free, particle-free, and oil-free)
- Small beaker
- ASTM Type I (18 megohm-cm) filtered and deionized water that meets the specifications listed in Section 1.5
- Methanol (optional)
- 0.2 micron filtered, Class 10, isopropyl alcohol (IPA)
- Lint-free paper towels (KIMWIPES™ or equivalent)
- Large flat-blade screwdriver
- 0.2 micron filtered, canned air duster (ITW Chemtronics Ultrajet™ or equivalent)

3 Replacing the Piston Seals and Check Valves

Replace the piston seals in both pump heads. Replace the check valves in the primary pump head.

3.1 Removing the Pump Head and Piston

1. Turn off the pump flow.
2. Open the DP/SP door to access the mechanical components.
3. Open the priming valve on the secondary pump head by turning it one-half turn counterclockwise.

4. Begin monitoring the **Current Pressure** reading on the **Pump** panel on the Thermo Scientific Dionex Chromeleon™ 7 ePanel Set or Thermo Scientific Dionex Chromeleon 6.8 panel tabset. When the system pressure reaches zero, do the following:
   - Disconnect the pump from the software by clicking **Connected** on the **Pump** panel.
   - Press the **POWER** button on the front of the DP/SP for 2 seconds to turn off the pump.

5. Five red Phillips screws are installed on the component mounting panel before shipment from the factory. Remove these screws, if present.

6. Use the handles on the component mounting panel to pull the panel forward until it reaches the stop.

7. To prevent contamination of pump parts, wear cleanroom gloves while disassembling the pump head.

**IMPORTANT**

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

8. Disconnect all tubing connections to the pump head.
9. The primary and secondary pump heads have different components. When disassembling a pump head, refer to Figure 1 for a primary pump head or Figure 2 for a secondary pump head.

**Figure 1.** Primary Pump Head Assembly for Analytical and Capillary Pumps

- **1. Piston**
  - P/N 068646 (Capillary)
  - P/N 079857 (Analytical)
- **2. Seal Retainer**
  - P/N 068627 (Capillary)
  - P/N 062092 (Analytical)
- **3. Piston Seal Wash Seal**
  - P/N 068628 (Capillary)
  - P/N 063382 (Analytical)
- **4. Seal Wash Body**
  - P/N 074446 (Capillary)
  - P/N AAA-062064 (Analytical)
- **5. O-Ring**
  - P/N 040695 (Capillary and Analytical)
- **6. Backup Ring**
  - P/N 074371 (Capillary only)
- **7. Main Piston Seal**
  - P/N 075493 (Capillary)
  - P/N 064946 (Analytical)
- **8. Primary Pump Head**
  - P/N 074447 (Capillary)
  - P/N 062083 (Analytical)
- **9. Outlet Check Valve Assembly**
  - P/N 044540 (Capillary)
  - P/N 045721 (Analytical)
- **10. Inlet Check Valve Assembly**
  - P/N 044541 (Capillary)
  - P/N 045722 (Analytical)

*Note:* Each check valve assembly includes a valve body (B) and a cartridge (C).
10. Using a 3.0-mm hex key (P/N 062338), loosen the two Allen screws on the pump head. Remove the Allen screws, and then carefully remove the head and place it on a clean surface.

11. Remove the seal wash body from the pump head. Or, if the seal wash body was not removed with the pump head in Step 9, pull it straight out of the pump mechanism now.

12. Pull the piston out of the pump mechanism.

**NOTE** A magnet secures the piston in place. If the magnetic force makes the piston difficult to remove, tilt the piston to one side and then pull it out of the pump mechanism.

---

**Figure 2. Secondary Pump Head Assembly for Analytical and Capillary Pumps**
3.2 Cleaning the Piston

1. Place the piston in a small beaker containing ASTM filtered, Type I (18 megohm-cm) deionized water or methanol and sonicate for several minutes.

2. After cleaning, rinse the piston thoroughly with deionized water and dry it with a lint-free paper towel.

3. Inspect the piston carefully; if the piston is dirty or scratched, it should be replaced before you resume operation.

Because piston replacement is not usually required during annual preventive maintenance, new pistons are not provided in the DP/SP Preventive Maintenance Kits; they must be ordered separately (P/N 068646, for capillary pump; P/N 079857, for analytical pump).


- **IMPORTANT**
  Even minute scratches or particles of dust, dirt, etc. on the check valves or piston can contaminate the inside of the pump head and result in poor pump performance.

- Record the required information on the Preventive Maintenance Checklist.

3.3 Removing the Main Piston Seal

1. If this is the primary pump head, insert a 10-32 fitting plug (P/N 042772) into the 10-32 outlet hole of the check valve nut.

2. If this is the secondary pump head, insert a 10-32 fitting plug (P/N 042772) into both the 10-32 inlet and outlet holes.

3. Using a 10-cc syringe (P/N 079803), inject a few drops of ASTM filtered, Type I (18 megohm-cm) deionized water through the main piston seal (P/N 064946) and into the piston cavity.
4. Reinsert the piston approximately 3 mm (0.125 in) into the piston seal and press gently. The seal should pop out of the head and onto the piston.

**IMPORTANT** Do not use a sharp tool (such as tweezers) to remove the piston seal. This will scratch the inside of the pump housing; these scratches will prevent a proper seal and cause leakage.

5. If the piston 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**.

### 3.4 Removing the Piston Seal Wash Seal

1. Remove the O-ring (P/N 040695) from the seal wash body. If this is a capillary pump, also remove the backup ring.

2. Follow these steps to remove the piston seal wash seal (P/N 063382) from the seal wash body:
   a. Using a large flat-blade screwdriver, remove the retainer (PN 062092) for the seal wash seal from the seal wash body.
   b. Insert the piston into the seal wash body from the O-ring side and gently push the seal out of the retainer.

**IMPORTANT** Do not use a sharp tool (such as tweezers) to remove the piston seal wash seal. This may scratch the seal and the inside of the pump housing; scratches may prevent a proper seal and cause leakage.
3.5 Installing the New Seals and O-Ring

1. Follow these steps to reassemble the seal wash body:
   a. Place the seal wash body on a clean work surface.
   b. Slide the new seal wash seal (P/N 063382), with the open side of the seal facing upward, onto the seal insertion tool (P/N 063675) (see Figure 3).
   c. Insert this end of the tool partway into the seal wash body. Make sure the tool is centered and does not rock back and forth. Then, press firmly on the tool and the seal wash body until they snap together.
   d. Remove the seal insertion tool from the seal wash body.
   e. The seal wash seal is now partially installed. To complete the seal installation, place the retainer in the seal wash body and use the large flat-blade screwdriver to tighten the retainer.
   f. Place the new O-ring (P/N 040695) on the seal wash body.
   g. If this is a capillary IC pump, place the new backup ring (P/N 074371) on the seal wash body.

2. Rinse the new main piston seal (P/N 075493, for capillary pump; P/N 064946, for analytical pump) with isopropyl alcohol (IPA) or dip it into a container of IPA. (The seal is easier to install when it is moist.)

3. Insert the piston through the seal wash assembly, and then through the new main piston seal.
4. Make sure the piston seal is centered.

**IMPORTANT** If the piston seal is not centered now, applying pressure to it in Step 7 will damage the seal and make it unusable.

5. Place the front of the pump head, flat side down, on a clean work surface.

**IMPORTANT** Make sure the open side of the piston seal faces away from the retainer for the seal wash seal.

6. Using IPA, rinse inside the pump head cavity where the seal will be installed and then blow inside the cavity to dry it using the 0.2 micron filtered, canned air duster. Inspect the cavity for any particulate matter. If necessary, rinse and dry again, until the cavity is clean. Fill the cavity with ASTM Type I (18 megohm-cm) filtered and deionized water.

7. Place the components on the pump head and *gently* press the housing until the piston seal snaps into place.

   When pressing the seal in place, ensure that the piston is free to move out, to relieve the pressure in the pump head during seal installation.

**IMPORTANT** Do not use a sharp tool (such as tweezers) to install the piston seal. This will scratch the seal and the inside of the pump housing; these scratches will prevent a proper seal and cause leakage.

8. Remove the 10-32 fitting plugs from the pump head.

9. If this is the *secondary* pump head, go directly to Section 3.7 to place the pump head back on the pump.

   If this is the *primary* pump head, follow the steps below to install new check valves. When you finish, go on to Section 3.7.
3.6 Replacing the Check Valves

Before continuing, verify that you have the correct check valve assembly for the pump type.

<table>
<thead>
<tr>
<th>Pump Type</th>
<th>Check Valve Assembly</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capillary IC</td>
<td>Inlet</td>
<td>044541</td>
</tr>
<tr>
<td></td>
<td>Outlet</td>
<td>044540</td>
</tr>
<tr>
<td>Analytical IC</td>
<td>Inlet</td>
<td>045722</td>
</tr>
<tr>
<td></td>
<td>Outlet</td>
<td>045721</td>
</tr>
</tbody>
</table>

1. Using the 1/2-inch wrench (P/N 062336) provided in the pump Ship Kit, loosen both check valve assemblies.

2. Remove both check valve assemblies from the pump head.
   - The *inlet* check valve assembly housing has a 1/4-28 port.

   ![Inlet Check Valve Assembly](Image)

   ![Inlet Check Valve 1/4-28 Port](Image)

   - The *outlet* check valve assembly housing has a smaller, 10-32 port.

   ![Outlet Check Valve Assembly](Image)

   ![Outlet Check Valve 10-32 Port](Image)

3. Inspect the new inlet check valve assembly to verify that the double-hole end of the cartridge (see Figure 5) is visible.

   If the double-hole end is not visible, remove the cartridge from the housing and install it correctly.

   **Figure 4. Inlet Check Valve Assembly**
4. Inspect the new outlet check valve assembly to verify that the single-hole end of the cartridge is visible (see Figure 5).

If the single-hole end is not visible, remove the cartridge from the housing and install it correctly.

![Outlet Check Valve Assembly](image)

**NOTE** The pump cannot operate properly unless the 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.

5. Before installing the inlet and outlet check valves, rinse the bottom of the check valve ports in the pump head with isopropyl alcohol and blow them clean using a 0.2 micron filtered, canned air duster. Inspect the bottom of each port for any particulate matter. If necessary, rinse and dry again, until they are clean.

6. Install the inlet check valve assembly on the bottom of the primary pump head. Install the outlet 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.

7. 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.

### 3.7 Reinstalling the Piston and Pump Head

1. Slide the piston *partway* into the pump head; approximately 6 mm (1/4 in) of the sapphire part of the piston should extend from the head.

2. Place the pump head back on the pump.
3. Reinstall the Allen screws in the pump head. Using the 3.0-mm hex key, tighten the screws just until they come into contact with the pump head. Then, tighten the screws another one-quarter to one-half turn, one-eighth of a turn at a time.

4. Reconnect the tubing to the outlet check valve nut.

Record the required information on the Preventive Maintenance Checklist.

4 Replacing the DP/SP Priming Valve Seal

1. The priming valve is located on the secondary pump head (see Figure 6). To remove the valve, turn it counterclockwise all the way and then pull it straight off the pump head.

2. Pull the old seal off the end of the priming valve knob.

3. Hold the new seal (P/N 063382) with the groove in the priming valve seal facing away from the knob (see Figure 7). Carefully slide the seal onto the knob; avoid scratching or nicking the sides.

Do not use a sharp tool to install the seal. This may scratch the seal and the surface of the priming valve knob. These scratches will prevent a proper seal and cause leakage.
4. Insert the priming valve into the secondary pump head, turn the knob clockwise, and tighten fingertight.

☑ Record the required information on the Preventive Maintenance Checklist.

5 DP Maintenance

If you are performing maintenance on a DP, repeat Section 3 and Section 4 for the second pump.

6 Replacing the Piston Seal Wash Tubing

Removing the Old Tubing

1. Remove the PharMed tubing from the peristaltic pump (see Figure 8) as follows:
   a. Lift the lever up and to the right and hold it in that position with one hand.
   b. With your other hand, pull the PharMed tubing away from the rotor and out of the lower notch on the left side of the mounting plate.
   c. Release the lever.
d. Pull on the fitting slightly to remove the PharMed tubing from the upper notch on the pump mounting plate.

Figure 8. Peristaltic Pump for Seal Wash System

2. Pull off the PharMed and Tygon 2075 tubing from the fitting. Save the fitting.

3. Pull off all seal wash tubing from the seal wash reservoir and the primary and secondary pump heads.

4. Cut three new pieces of Tygon 2075 tubing (0.15 cm (0.060 in) ID; P/N 064079) and one piece of PharMed tubing (0.159 cm (0.0625 in) ID; P/N 063268) to the same lengths as the tubing just removed.
5. Connect the new tubing pieces to the seal wash reservoir and pump heads (see Figure 9).

6. Push the tubing onto the fitting that was removed in Step 2.

7. Connect the PharMed tubing to the peristaltic pump as follows:
   a. Push the tubing into the lower notch on the pump mounting plate.
   b. Lift the lever to the right and hold it in that position with one hand.
   c. With your other hand, wind the tubing around the rotor.
   d. Release the lever.

   Figure 9. Piston Seal Wash Tubing Connections

   e. Pull on the fitting slightly to slide the tubing into the upper notch.
   f. Make sure there is no slack in the tubing. If necessary, lift the lever again, adjust the tubing around the rotor and through the lower notch to remove any slack, and release the lever.

✓ Record the required information on the Preventive Maintenance Checklist.
7 Completing the Preventive Maintenance Procedure

1. Reconnect all tubing connections to the pump. If this is a DP, reconnect all tubing connections to both pumps. Tighten connections fingertight, and then tighten an additional one-quarter turn only.

2. Push the component mounting panel back into the pump enclosure, using the handle in the center of the panel. Close the DP/SP door.

3. Press the POWER button on the front of the DP/SP to turn on the pump.

4. Complete the following steps for an SP or for each pump of a DP:
   a. Reconnect the pump to the software by clicking Connected on the Pump panel.
   b. Turn on the pump flow.
   c. Prime the pump.
   d. Begin monitoring the Current Pressure reading on the Pump panel to verify that the pressure remains stable. When the pump is at operating pressure, check for leaks from the check valves. Tighten a check valve a little more only if it leaks.
   e. Enter the date one year from today on the NEXT DUE DATE label (P/N 062823) and attach the label to the pump.

5. Complete the Preventive Maintenance Checklist.
8 DP/SP Preventive Maintenance Checklist

☐ Dionex ICS-5000 Dual Pump (Analytical/Analytical)
☐ Dionex ICS-5000 Dual Pump (Capillary/Capillary)
☐ Dionex ICS-5000 Dual Pump (Analytical/Capillary)
☐ Dionex ICS-5000 Single Pump (Analytical)
☐ Dionex ICS-5000 Single Pump (Capillary)

<table>
<thead>
<tr>
<th>Piston seal replacement (both pump heads)</th>
<th>Pump 1</th>
<th>Pump 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaned piston (see Section 3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed new piston seal wash seal (see Section 3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed new O-ring (see Section 3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capillary IC only: Installed new backup ring (see Section 3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed new main piston seal (see Section 3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinstalled piston (see Section 3.7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Check valve replacement (primary pump head)</th>
<th>Pump 1</th>
<th>Pump 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed new inlet check valve on bottom of primary pump head (see Section 3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed new outlet check valve on top of primary pump head (see Section 3.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priming valve seal replacement (secondary pump head)</th>
<th>Pump 1</th>
<th>Pump 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed new priming valve seal (see Section 4)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seal wash tubing replacement</th>
<th>Pump 1</th>
<th>Pump 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replaced PharMed tubing connection (see Section 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced Tygon 2075 tubing connections (see Section 6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preventive maintenance completion</th>
<th>Pump 1</th>
<th>Pump 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconnected all tubing connections to pump (see Section 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primed pump (see Section 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached NEXT DUE DATE label to pump (see Section 7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comments:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Preventive maintenance completed by:

________________________________________________

(signature)

Date: ________________