

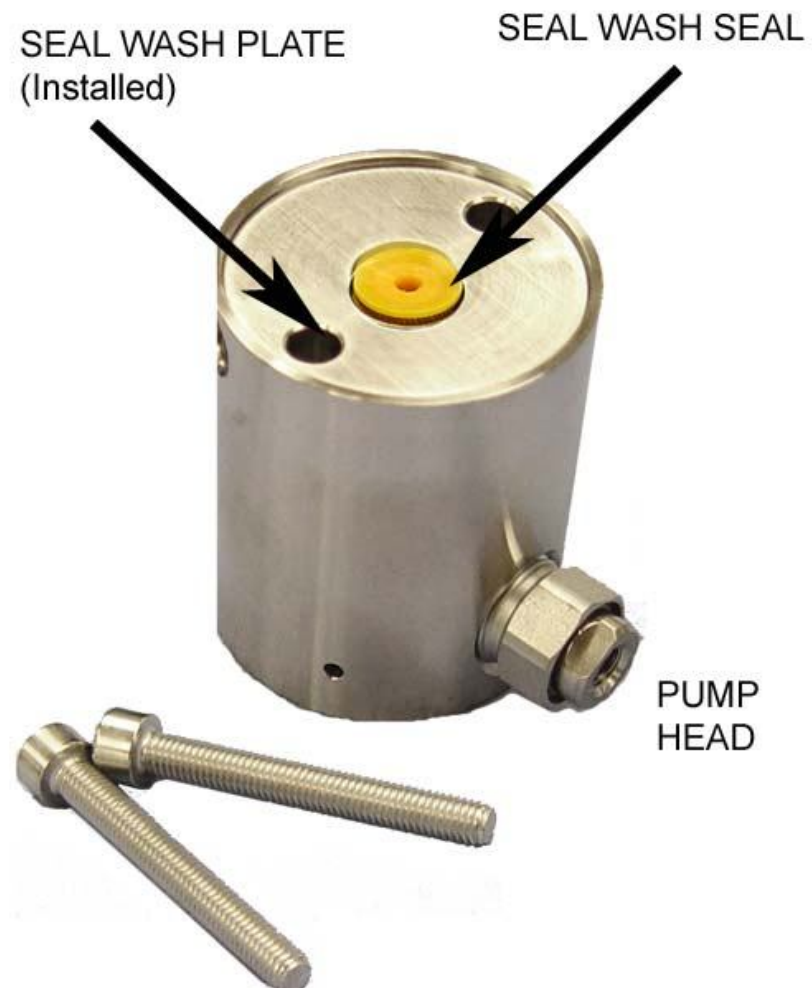
Chapter One

Removing and Replacing Solvent Manager Head Seals and Plungers

Waters
THE SCIENCE OF WHAT'S POSSIBLE.™

- Removing and Replacing Seals
- Removing and Attaching Head
- Changing Head Seals
- Replacing Plungers
- Installing Check Valve

Removing and Replacing Solvent Manager Head Seals



Removing and Replacing Solvent Manager Head Seals

- Tools and materials required:
 - T27 Torx screwdriver
 - Wash bottle with methanol or isopropanol
 - Waste container
 - ¼ and 5/16" open end wrench

Required Parts

Part Number	Description
425000306	Seal wash rebuild kit
700002598	Wash Seal 2 pack
700002599	UP30 Head Seal and Spacer, 2 pack
WAT076152	Teflon O – Ring 2-016

Procedure

The procedure to replace the pump head seals consists of five sections:

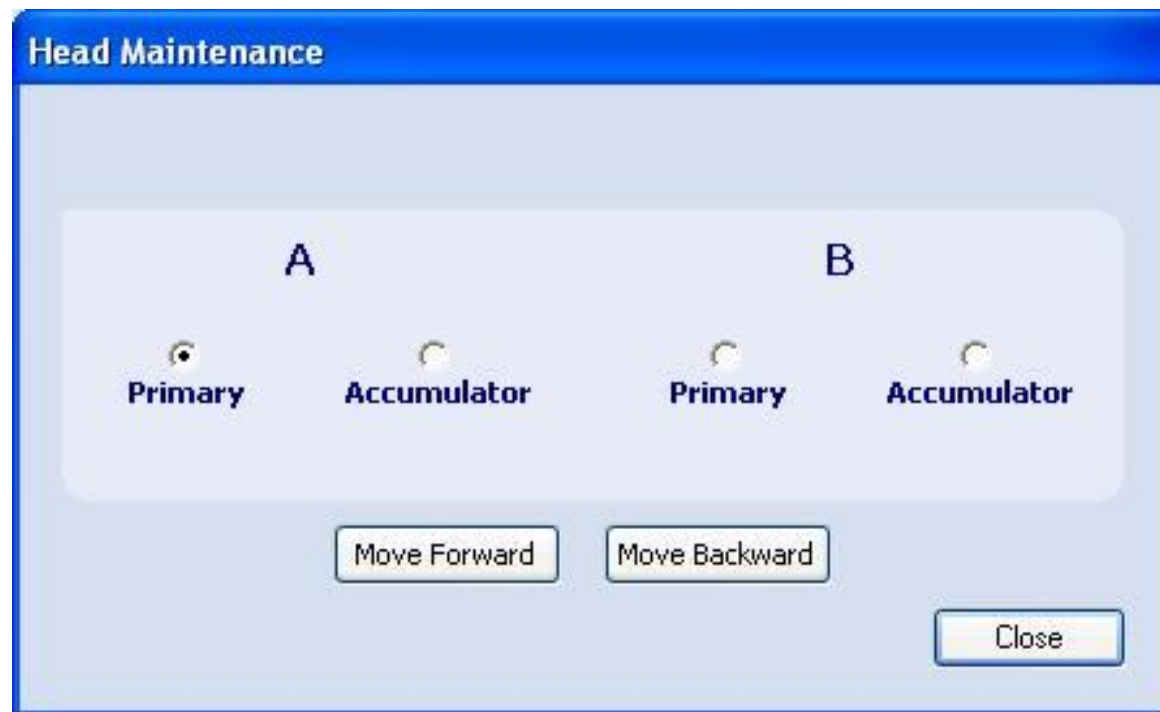
1. Removing the pump head.
2. Replacing the pump head seals.
3. Replacing the pump head.
4. Priming the seal wash and pump.
5. Performing the static decay test.

Removing the Pump Head

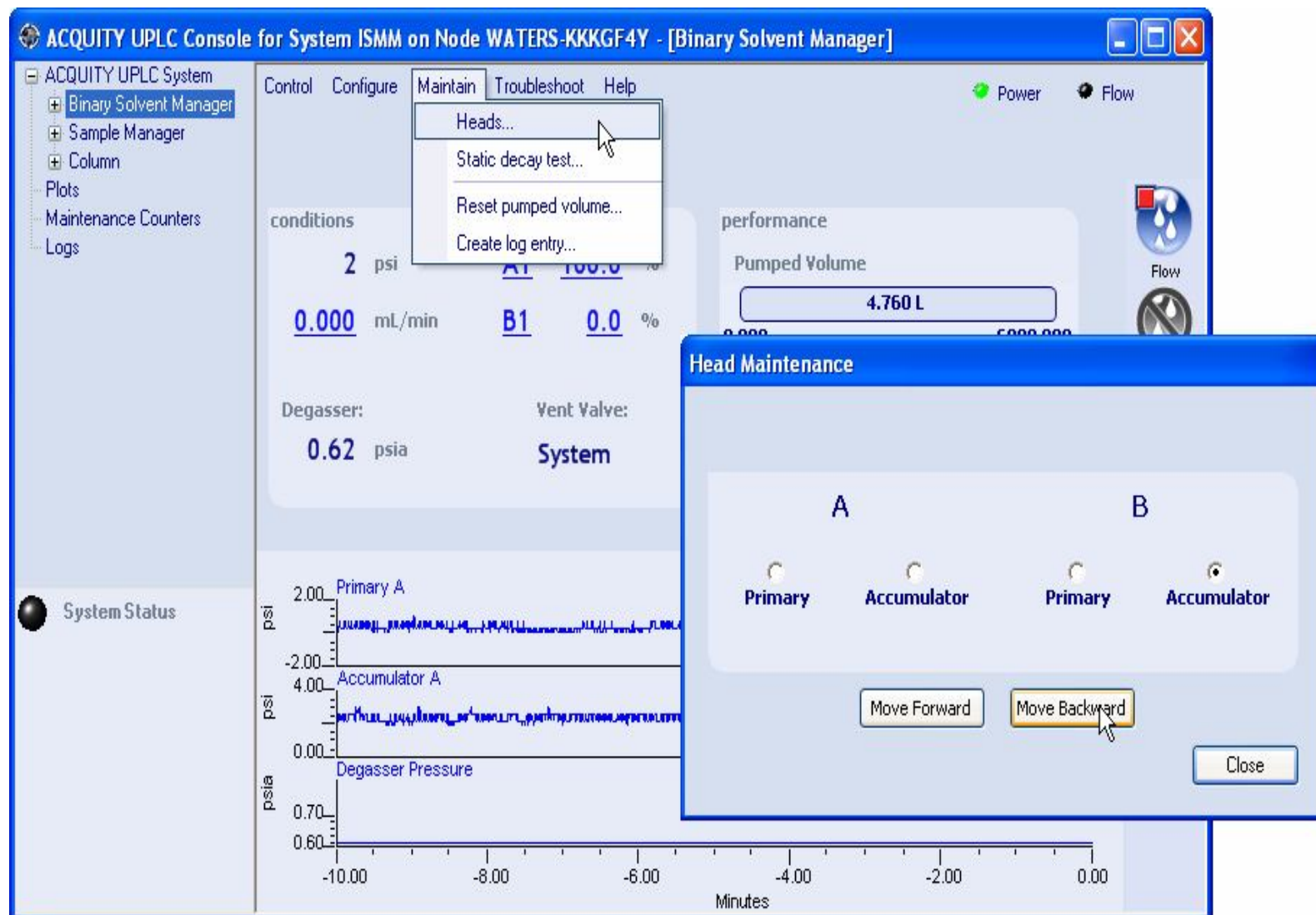
- Before performing this procedure, lower the appropriate solvent reservoir to prevent siphoning.
- Before removing the pump head it will be necessary to retract the plunger into the pump head to minimize the risk of it breaking.

Removing and Replacing the Solvent Manager Head Seals

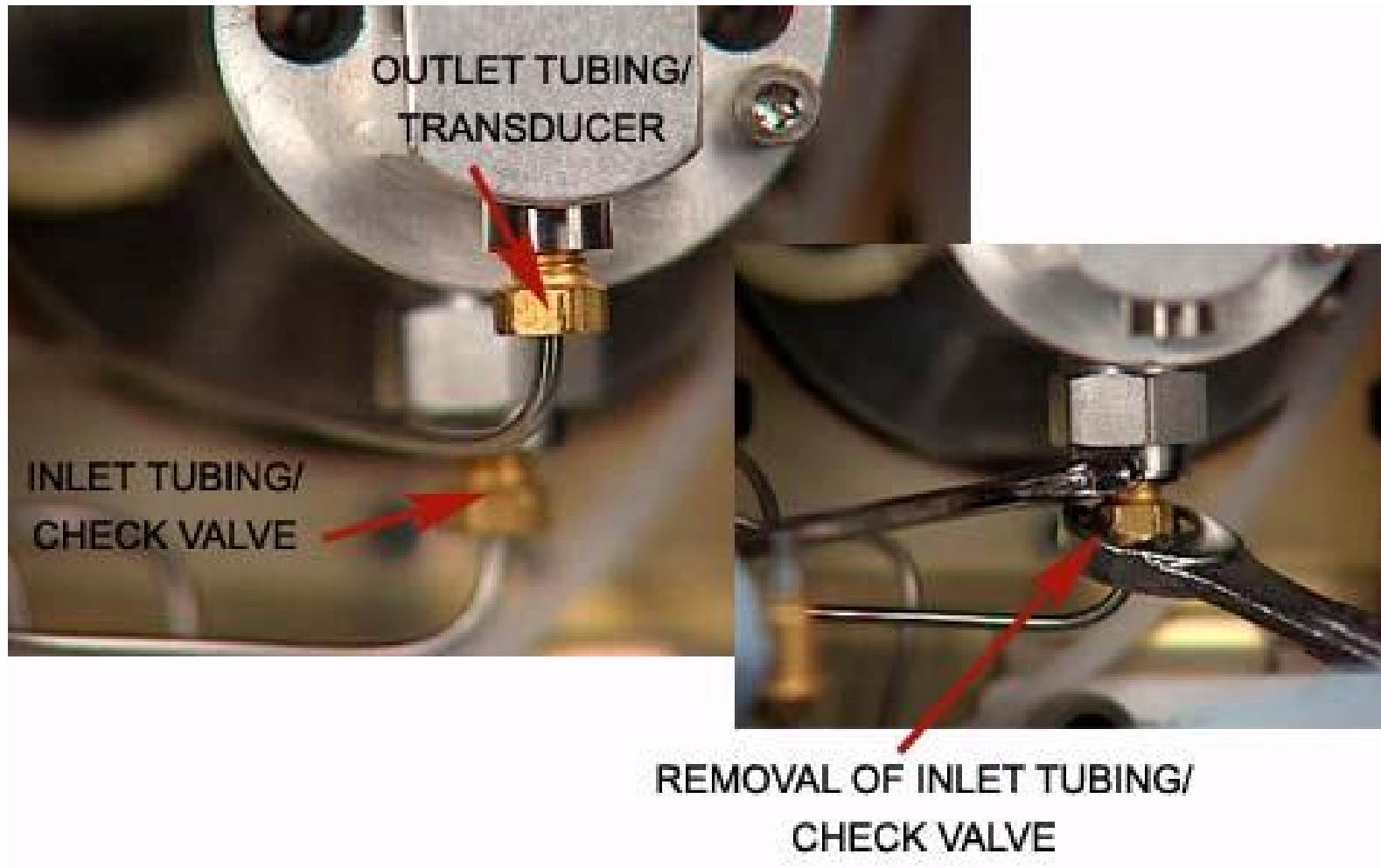
- Move the appropriate plunger (primary or accumulator) of the appropriate solvent manager (A or B) to the appropriate location:
 - Backward for pump head removal



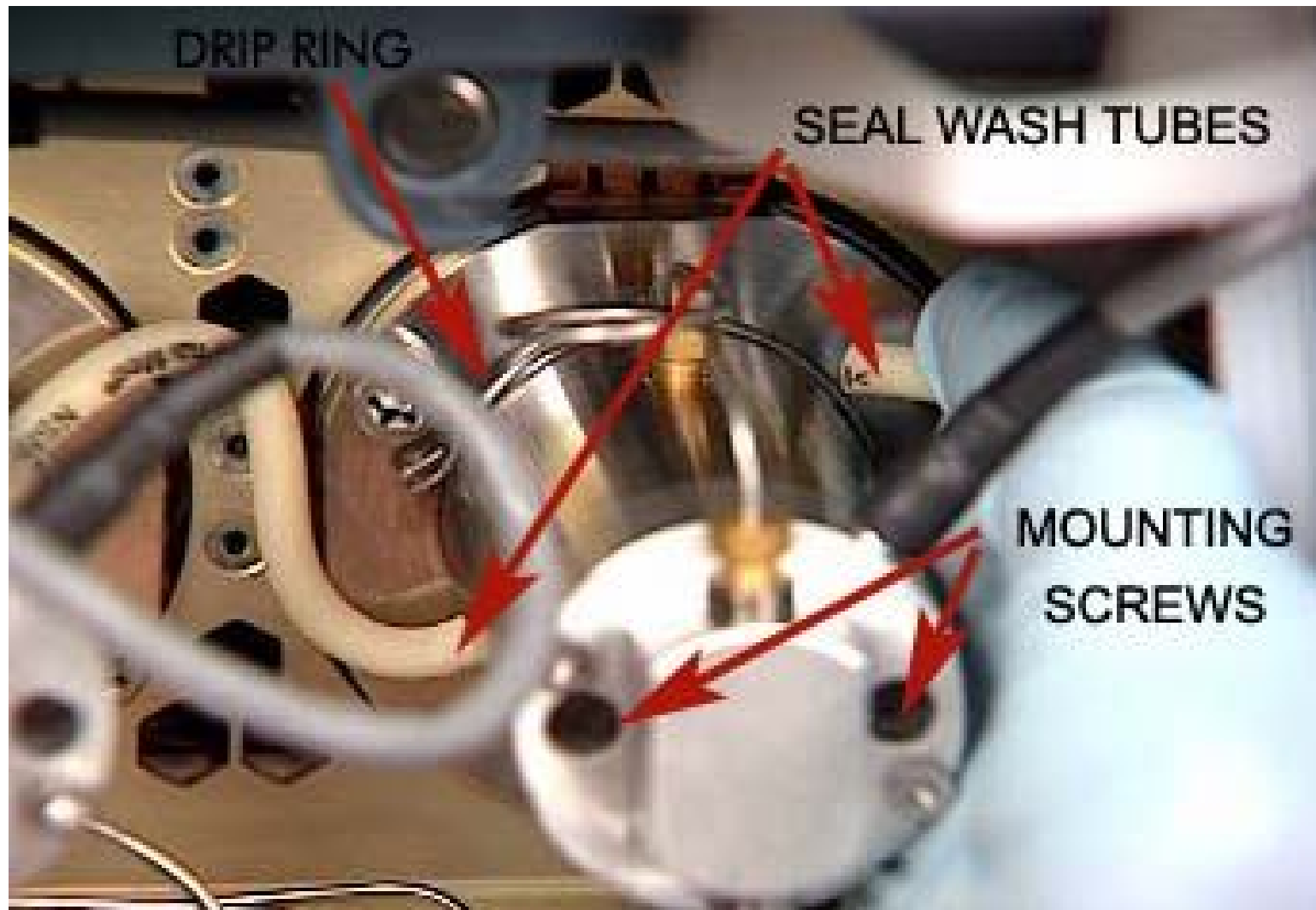
Removing the Pump Head



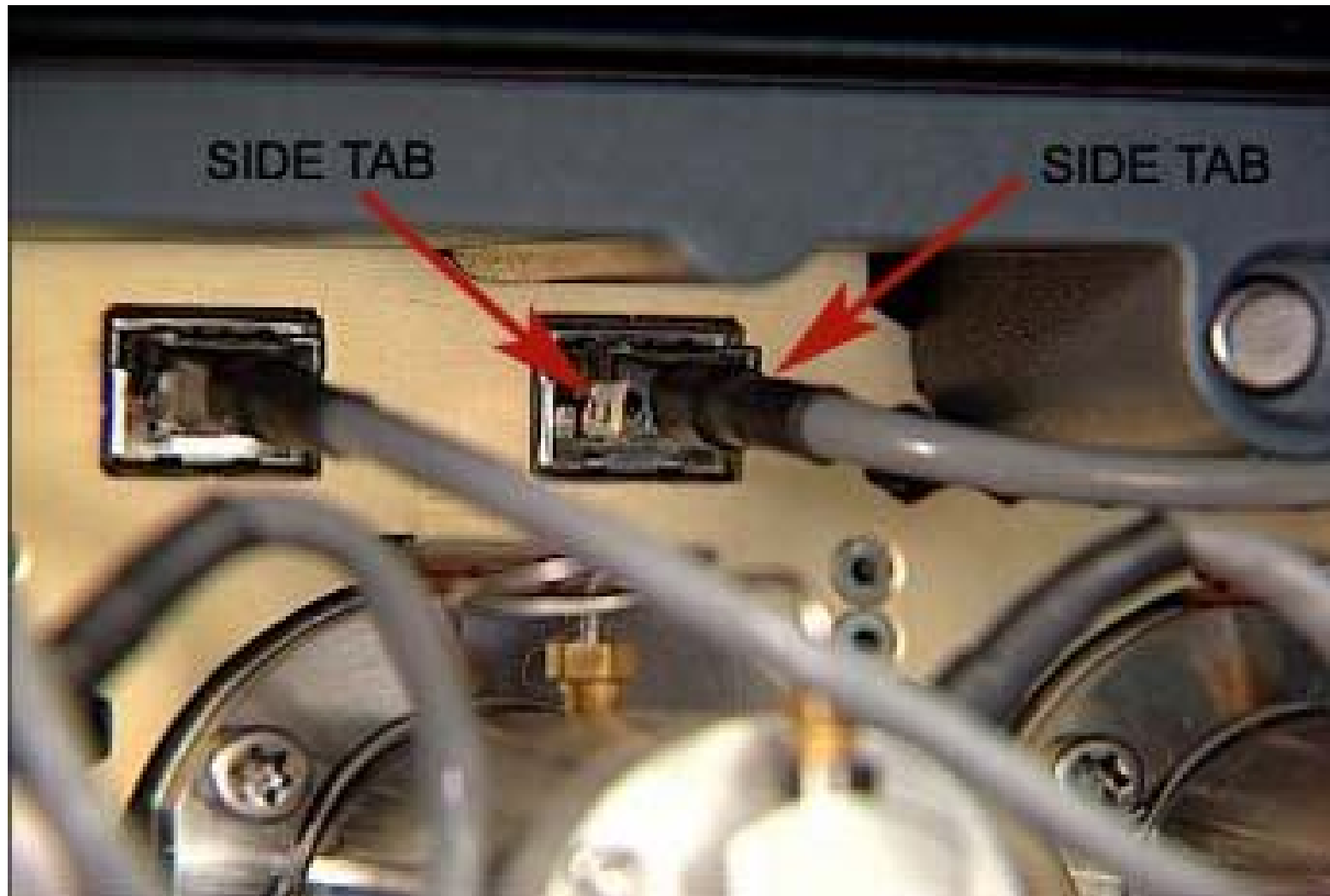
Removing the Pump Head



Removing the Pump Head



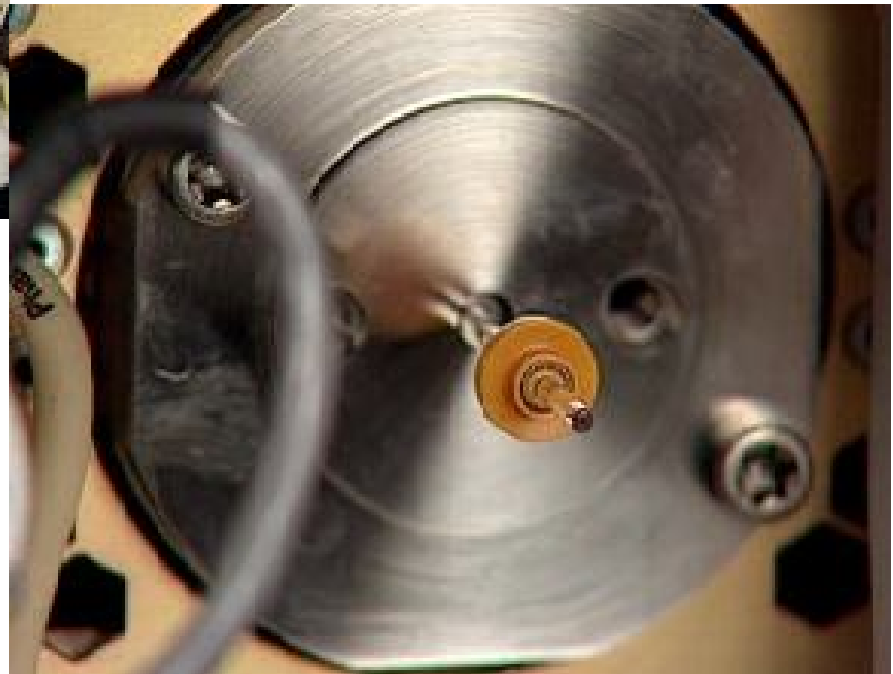
Removing the Pump Head



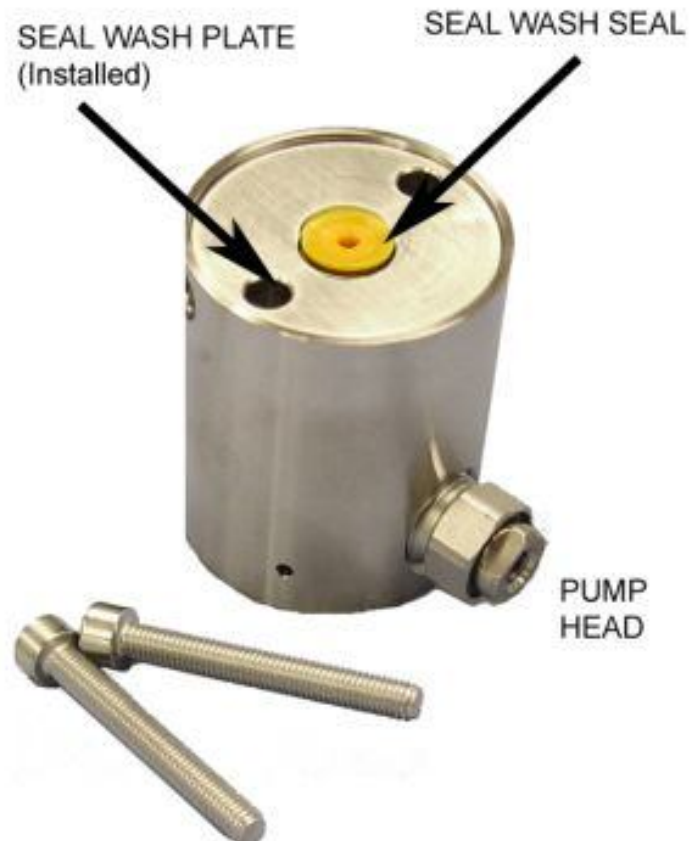
Removing the Pump Head



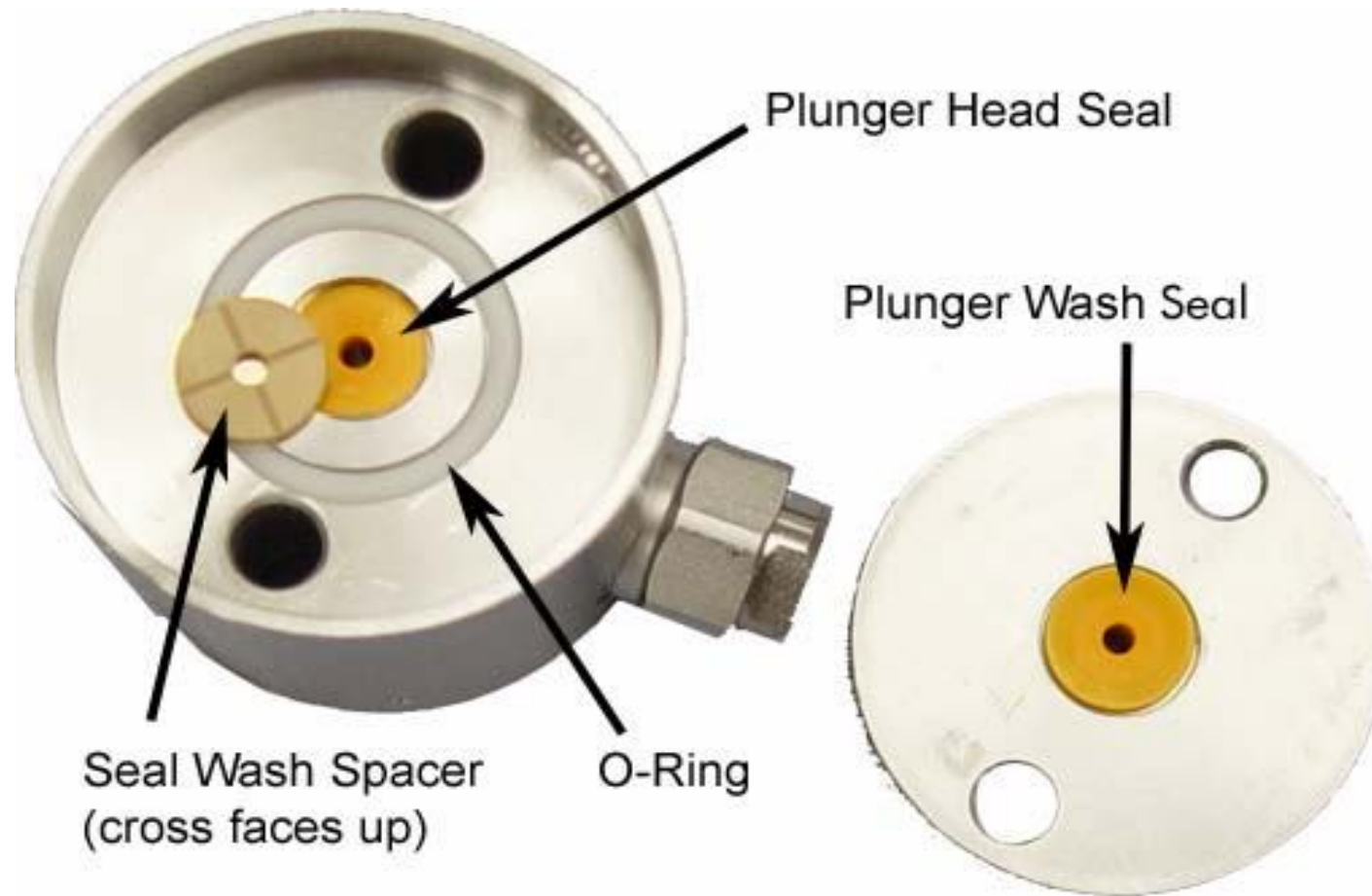
Replacing the Pump Head Seals



Replacing the Pump Head Seals



Seal Removal

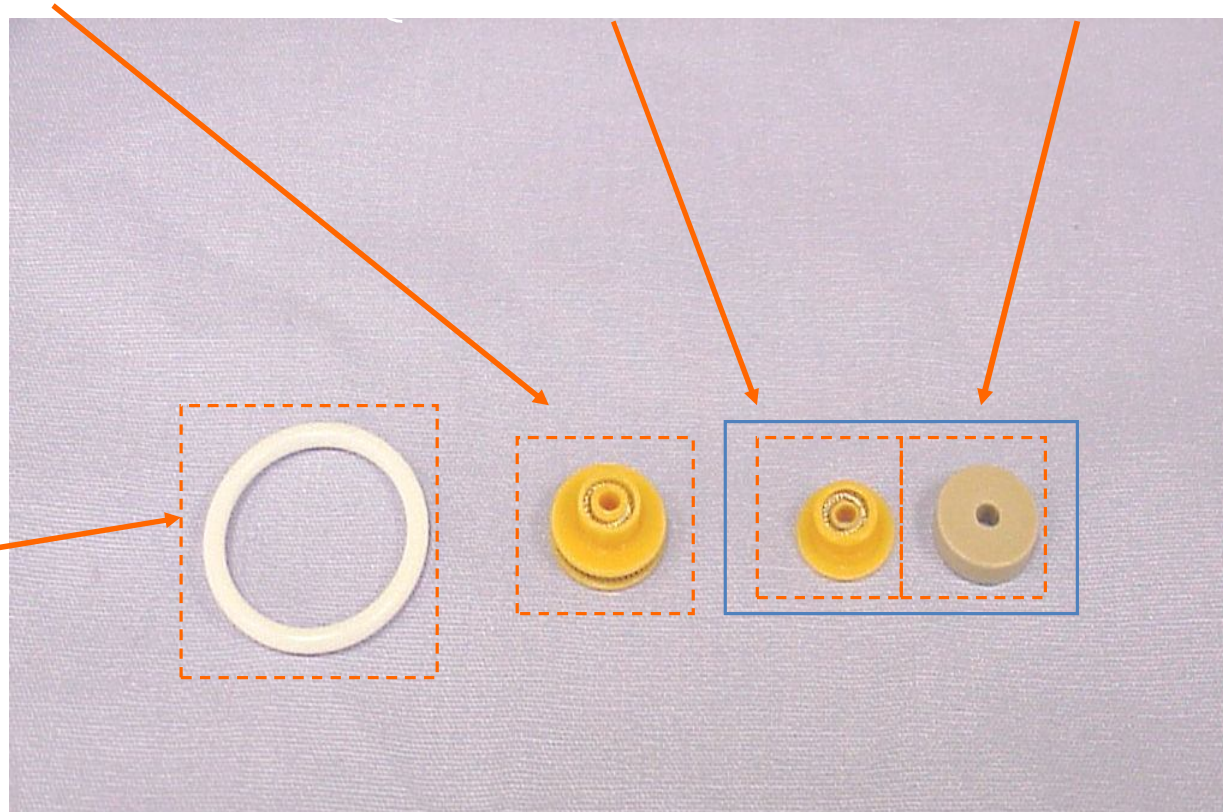


Head Seals

Seal Wash Housing Seal
(700002598)

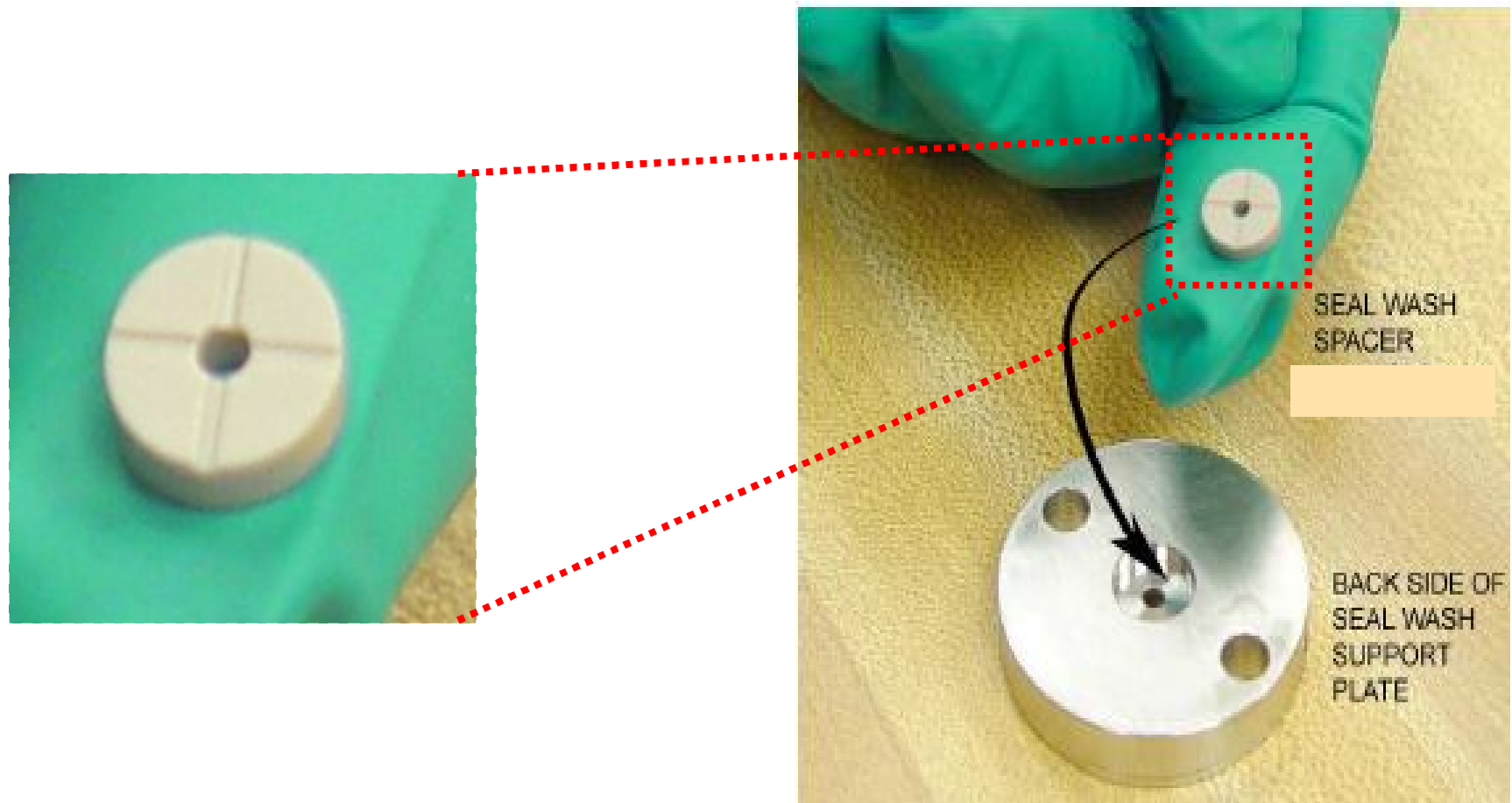
Seal Wash Spacer & Head Plunger Seal
(70002599) both pieces in one kit

O-Ring
(WAT076152)



Seal Wash Rebuild Kit

Replacing the Pump Head Seals

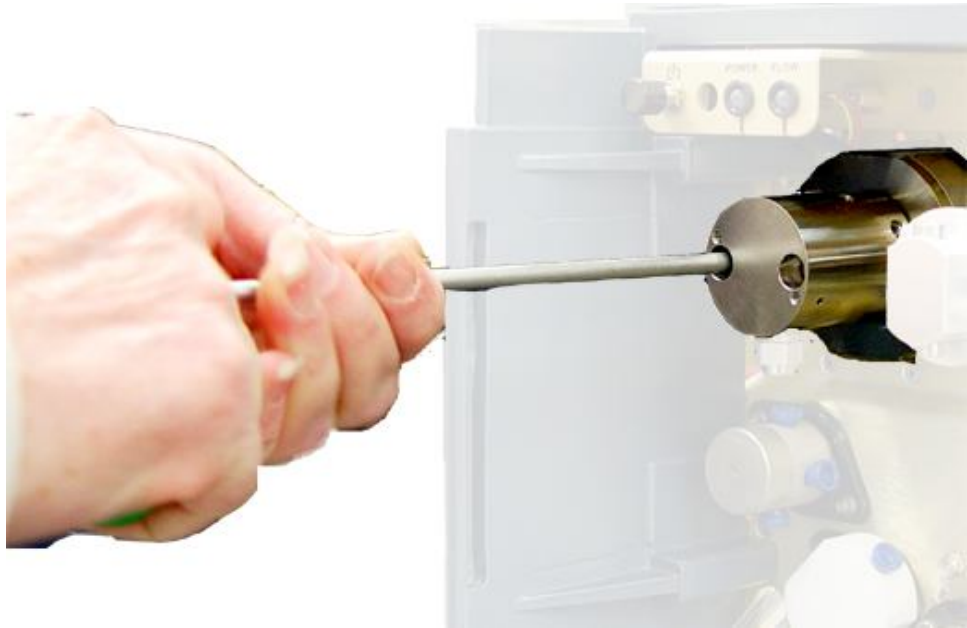


Placement of the Seal Wash Spacer

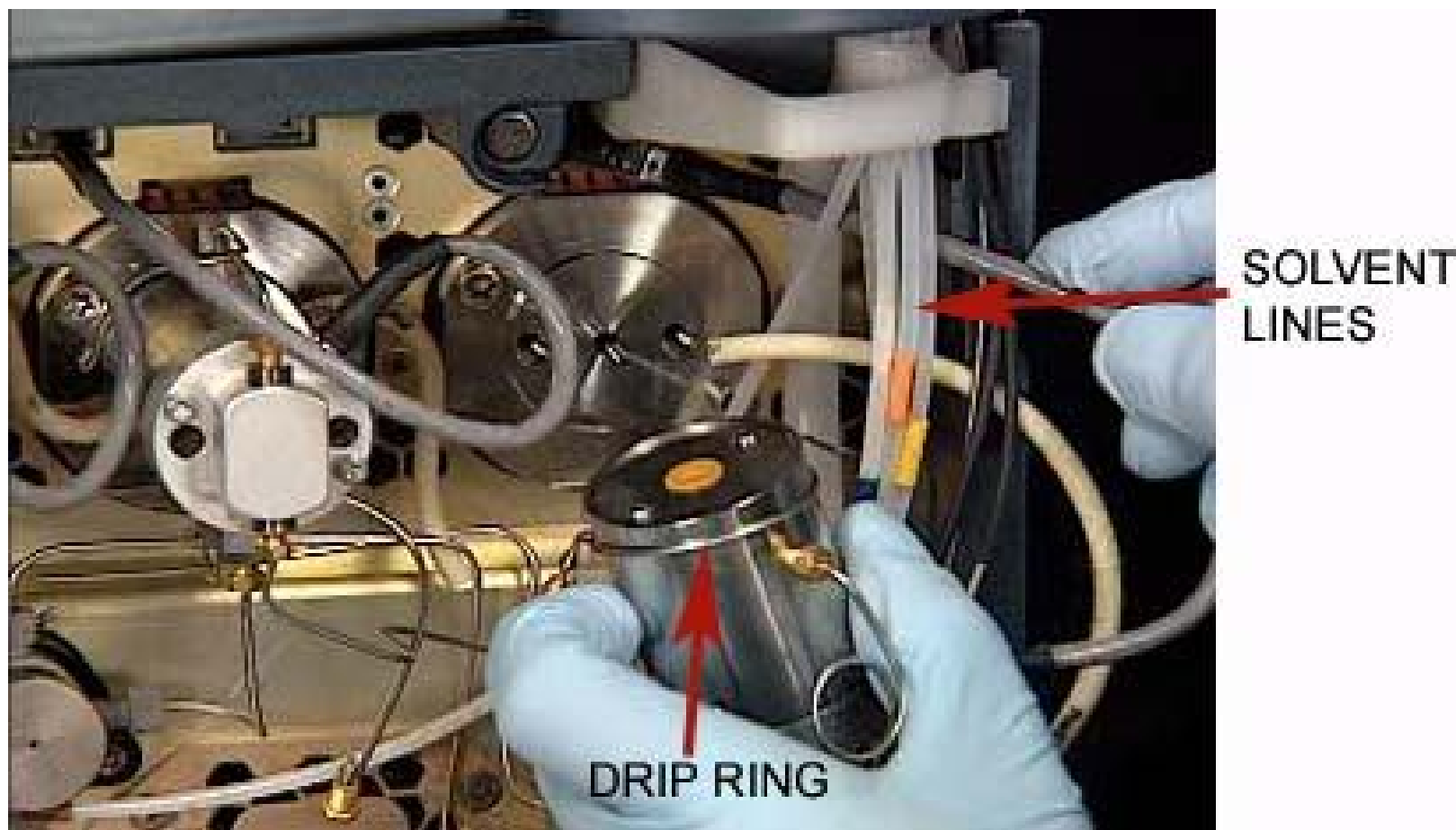
Installing a new seal



Attaching the Pump Head



Replacing the Pump Head



Replacing the Pump Head

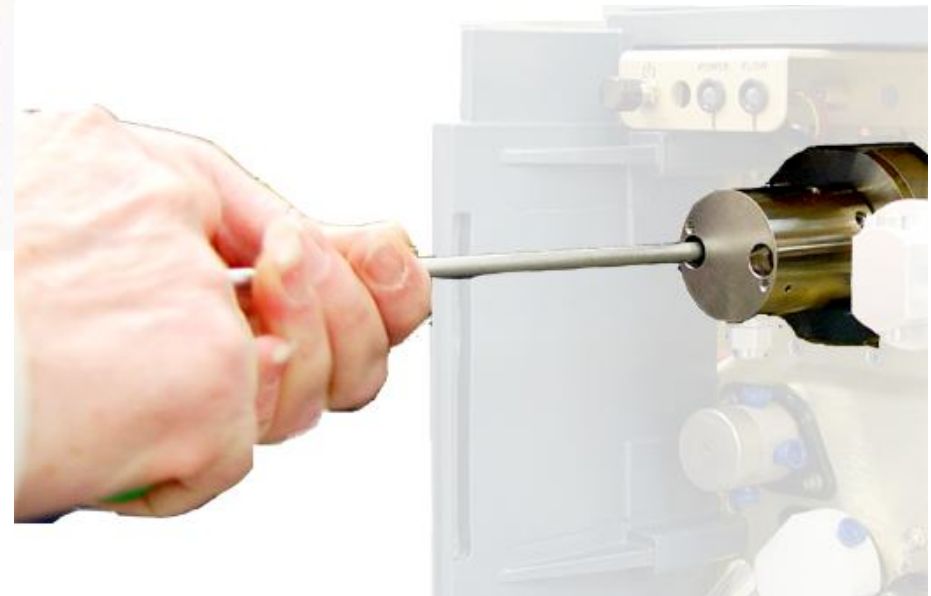


Replacing the Solvent Manager Plungers

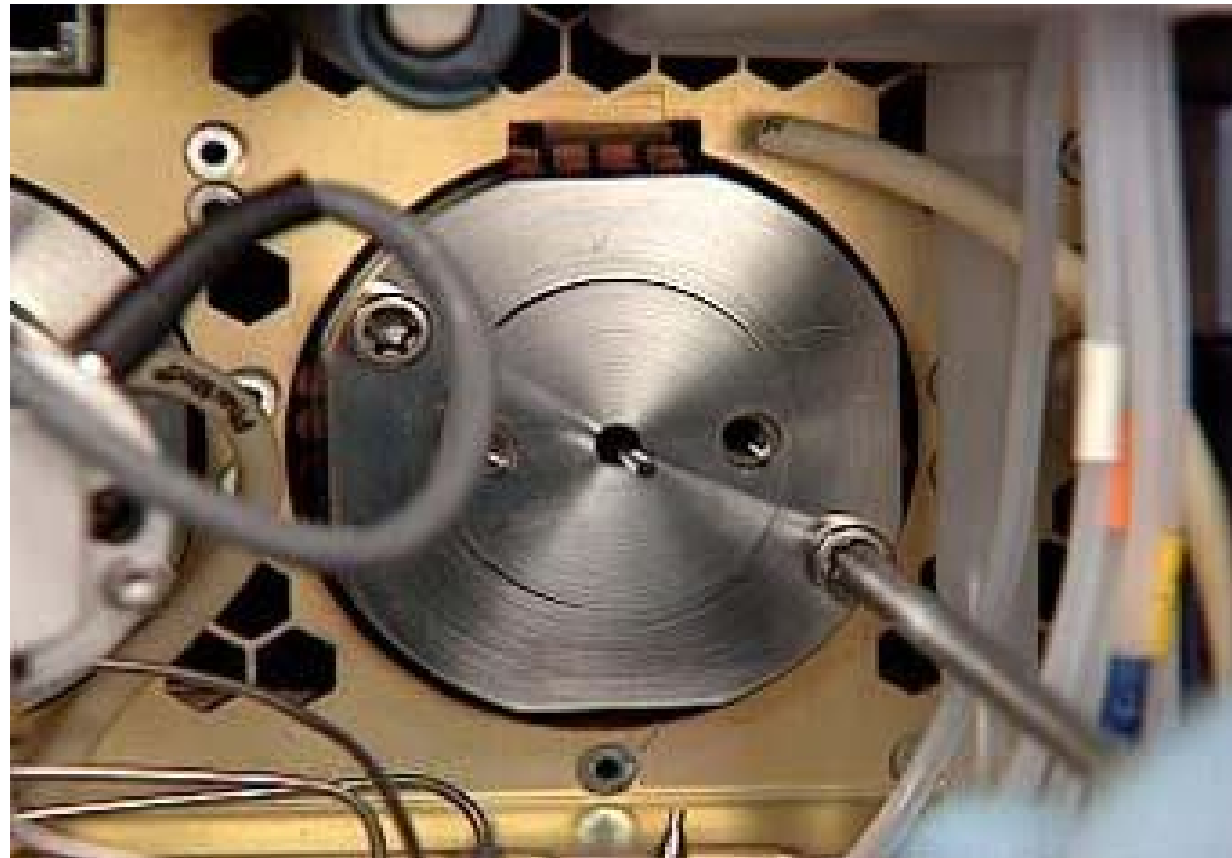
- The appropriate plunger (primary or accumulator) of the appropriate solvent manager (A or B) must be moved to the appropriate location:
 - Forward for plunger replacing



Removing the Solvent Manager Head



Replacing the Plunger



Removing the Plunger

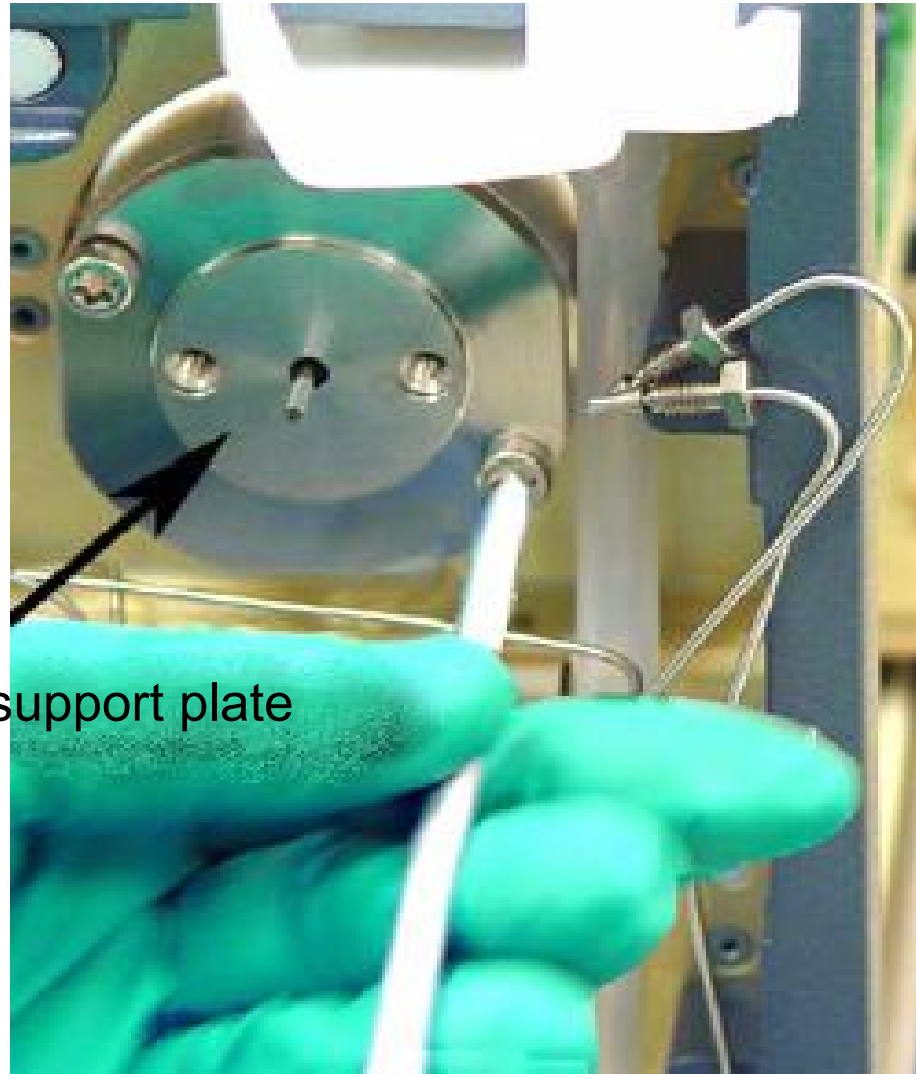


2 mm Plunger

- Plunger
 - P/N: 7000002600

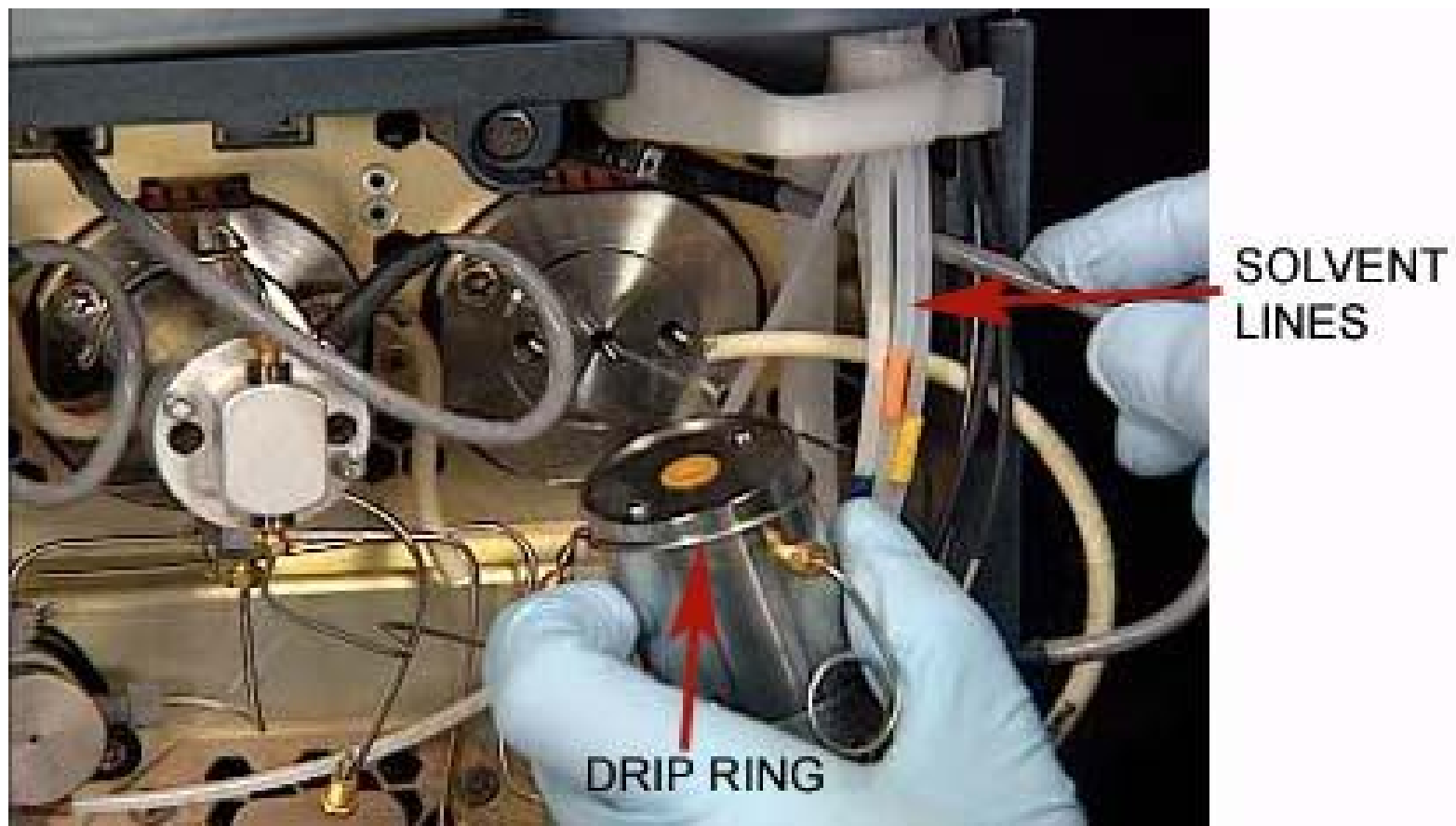


Replacing the Plunger



Seal wash support plate

Replacing the Pump Head



Replacing the Pump Head



Priming the Pump



Prime Solvent Lines

The screenshot displays the ACQUITY UPLC Console for System ACQUITY_UPLC3 on Node CORE-EMPOWER-27. The Binary Solvent Manager is active, showing a menu with options: Set flow..., Stop flow, Prime A/B solvents..., Prime seal wash, and Reset BSM. The main interface shows solvent composition: A1 at 100.0% and B1 at 0.0%. The flow rate is 0.000 mL/min, and the degasser pressure is 0.46 psi[a]. The vent valve is set to System. Performance metrics include BSM Pumped Volume at 0.790 L and pressure ripple (psi, 1 min) with Minimum, Maximum, and Delta all at 0. The System Status is green. A red dotted line indicates the flow path from the Prime A/B solvents menu item to the Prime A/B Solvents dialog box.

Prime A/B Solvents

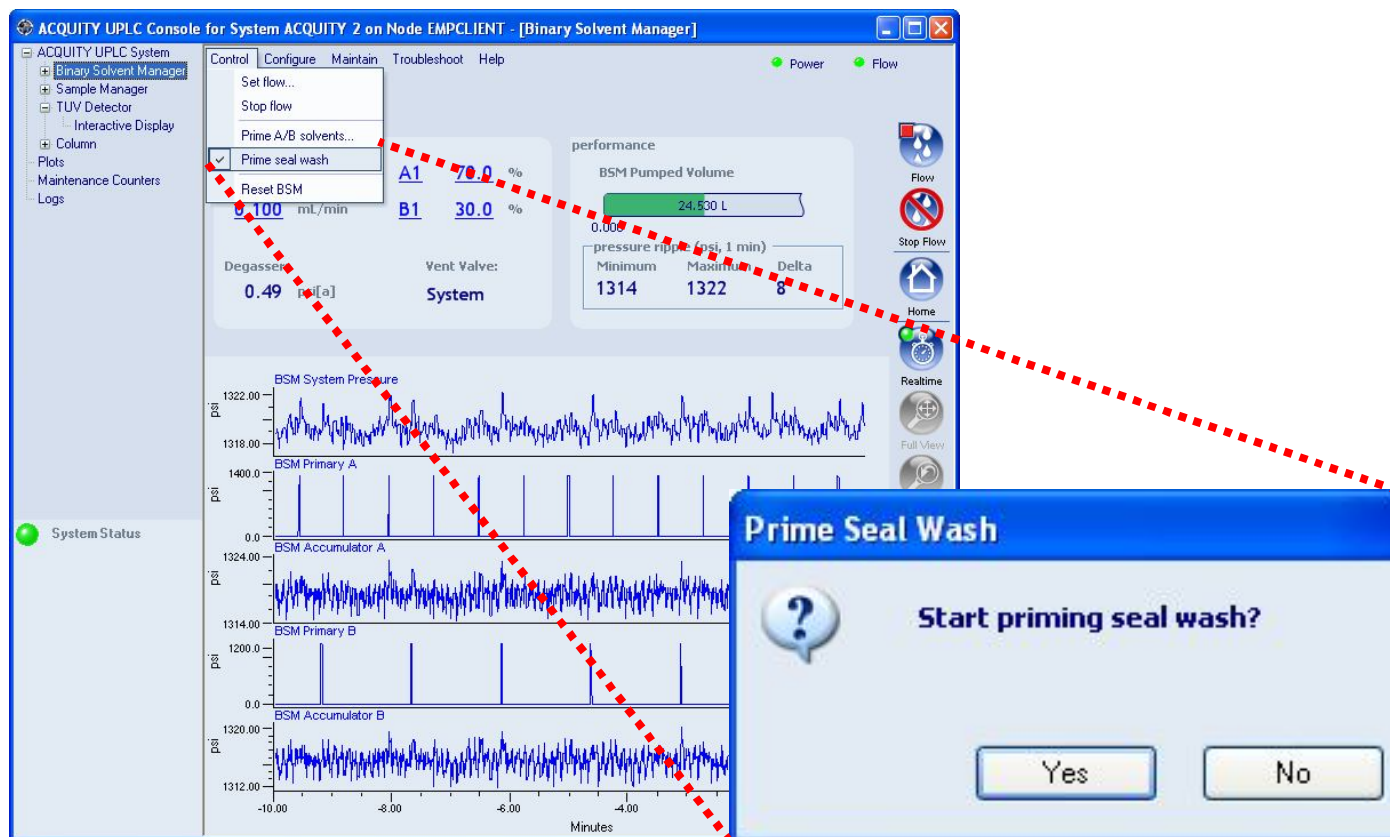
Solvent Line(s) to Prime

- ☒ A A1
- ☒ B B1

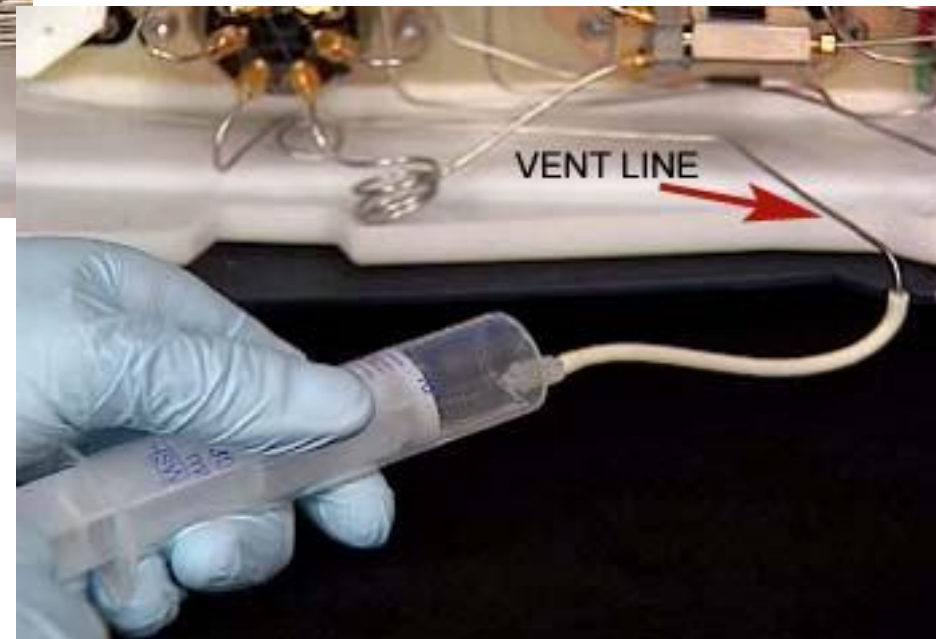
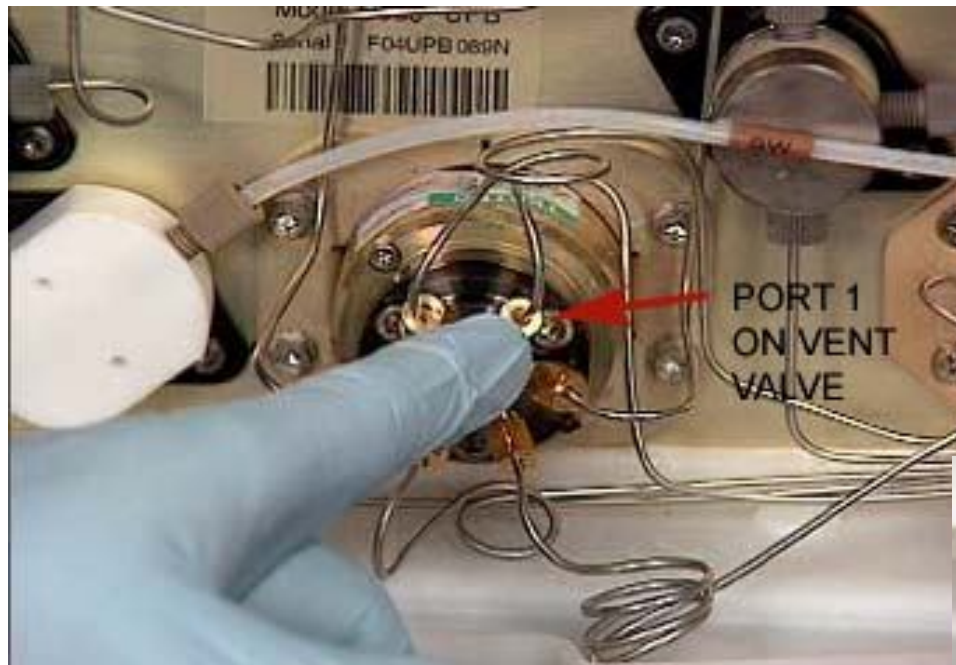
Time: 1.0 min

Start Close

Priming the Seal Wash and Pump



Priming the Seal Wash and Pump



Prime Solvent Lines

The screenshot displays the ACQUITY UPLC Console for System ACQUITY_UPLC3 on Node CORE-EMPOWER-27. The Binary Solvent Manager is active, showing a menu with options: Set flow..., Stop flow, Prime A/B solvents..., Prime seal wash, and Reset BSM. The main interface shows solvent percentages (A1: 100.0%, B1: 0.0%), flow rate (0.000 mL/min), degassing pressure (0.46 psi[a]), and vent valve status (System). Performance metrics include BSM Pumped Volume (0.790 L) and pressure ripple (0 psi, 1 min). A graph at the bottom shows BSM System Pressure, BSM Flow Rate, and BSM Composition A over time.

The Prime A/B Solvents dialog box is open, showing the Solvent Line(s) to Prime section with checkboxes for A and B, and dropdown menus for A1 and B1. The Time is set to 1.0 min. The Start and Close buttons are visible at the bottom.

Prime A/B Solvents

Solvent Line(s) to Prime

- ☒ A A1
- ☒ B B1

Time: 1.0 min

Start Close

ACQUITY UPLC Diagnostics: Static Decay Test

- No tools are needed
 - Methanol (preferred solvent)
 - Paper towels
 - Waste container

ACQUITY UPLC Diagnostics: Static Decay Test

- When?
 - After every pump maintenance
 - Pressure fluctuates
 - Sensitivity is an issue
 - Retention time repeatability is a problem
 - Baseline is noisy

- Why?
 - To check for leaks

Performing the Static Decay Test

The screenshot displays the ACQUITY UPLC Console for System ACQUITY 2 on Node EMPCLIENT. The interface includes a sidebar with system components, a main control panel, and a status section.

Control Panel:

- conditions:** 844 psi, 0.050 mL/min, B1, 50.0 %
- Degasser:** 0.49 psi[a]
- Vent Valve:** System
- performance:** BSM Pumped Volume: 24,550 L, pressure ripple (psi, 1 min): Minimum 835, Maximum 846, Delta 11

Static Decay Test Dialog Box:

Test Parameters:

- Module: A
- Accumulator: 14000 psi
- Run Time: 0.0 min

Buttons: Start, << Results, Close, Print...

Results Section:

Primary		Accumulator	
Decay Rate:	psi/min	Decay Rate:	psi/min
Leak Rate:	µL/min	Leak Rate:	µL/min
% of Stroke:	%	% of Stroke:	%
Final Pressure:	psi	Final Pressure:	psi

Static Decay Test: Binary Solvent

The screenshot displays the ACQUITY UPLC Console for System ACQUITY_UPLC3 on Node CORE-EMPOWER-27. The main window is titled "ACQUITY UPLC Console for System ACQUITY_UPLC3 on Node CORE-EMPOWER-27 - [Binary Solvent Manager]". The left sidebar shows a tree view with "Binary Solvent Manager" selected. The main area has tabs for Control, Configure, Maintain, Troubleshoot, and Help. The "Maintain" tab is active, showing a menu with options: Heads..., Static decay test..., Dynamic leak test..., Reset pumped volume..., and Create log entry... A red dotted line connects the "Static decay test..." option to a separate "Static Decay Test" window.

The "Static Decay Test" window has a blue title bar and contains the following sections:

- Test Parameters:**
 - Module: A (dropdown)
 - Accumulator: 14000 psi
- Run Time:** 0.0 min (displayed in a box)
- Buttons:** Start, << Results, Close, Print...
- Results:**
 - Primary:**
 - Decay Rate: psi/min
 - Leak Rate: µL/min
 - % of Stroke: %
 - Final Pressure: psi
 - Accumulator:**
 - Decay Rate: psi/min
 - Leak Rate: µL/min
 - % of Stroke: %
 - Final Pressure: psi

The background console window shows the following data:

- conditions:** -4 psi, 0.000 mL/min, B1, 10.0 %
- Degasser:** 0.46 psi[a]
- Vent Valve:** System
- performance:** BSM Pumped Volume

Static Decay Test Results

Static Decay Test

Test Parameters

Module: **A**

Accumulator: **14000** psi

Run Time: **0.0** min 0.0 4.9

Results

Primary

Test Passed

Decay Rate: **110** psi/min

Leak Rate: **0.074** μ L/min

% of Stroke: **13.3** %

Final Pressure: **11424** psi

Accumulator

Test Passed

Decay Rate: **111** psi/min

Leak Rate: **0.077** μ L/min

% of Stroke: **15.2** %

Final Pressure: **13357** psi

Acquity
Ultra Performance LC

Static Decay Test

User: Student
System: ACQUITY 2
Instrument: ACQ-BSM#L04UPB403R

Binary Solvent Manager Static Decay Test

Pump A Results:

Accumulator:

Test Passed

Decay Rate: 111 psi/min

Leak Rate: 0.077 μ L/min

Percent of Stroke: 15.2 %

Final Pressure: 13357 psi

Primary:

Test Passed

Decay Rate: 110 psi/min

Leak Rate: 0.074 μ L/min

Percent of Stroke: 13.3 %

Final Pressure: 11424 psi

Summary

- Static decay test checks for leaks in the high-pressure part of the solvent management system.
- Run the system at 4500 psi (310 bar) for 5 to 10 minutes before performing the test.
- Run the test when:
 - You suspect you have a leak or faulty check valve.
 - You rebuild or repair the pump heads.
 - You change high pressure fittings or tubing on the solvent management system.

Summary

- Rebuild the heads as part of the performance maintenance.
- Check all part numbers.
 - The seal wash seals and plunger seals look similar.
- Thoroughly clean all parts before reassembling.
- Run a static decay test or a flow rate accuracy test after rebuilding the pump heads.